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PAULBRONNIMANNINAE RETTORI & ZANINETTI, 1993 (FORAMINIFERIDA, AMMODISCIDAE) AND OTHER ANISIAN FORAMINIFERS FROM THE PIZ DA PERES SECTION (VALDAORA-OLANG, PUSTERIA VALLEY, DOLOMITES, NE ITALY)

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Key-words: Foraminifers, Middle Triassic, Pelsonian, New Genus, New species, Biostratigraphy, Sequence stratigraphy.

Riassunto. La successione stratigrafica anisica affiorante nel versante settentrionale di Piz da Peres (Valdaora-Olang, Val Pusteria, Dolomiti), ha fatto l'oggetto di un'analisi sequenziale da parte di De Zanche et al., 1992. Tale analisi ha permesso a questi Autori di individuare nella serie anisica del Piz da Peres quattro sequenze di 3° ordine (A1-A4) ipotizzando una loro possibile estensione a tutto il Sudalpino.

Il presente lavoro si riferisce allo studio micropaleontologico dei Foraminiferi anisici rinvenuti nella Dolomia del Serla inferiore, nel Conglomerato di Voltago e nel Calcare di Recoaro. In base ai risultati ottenuti dallo studio micropaleontologico il Calcare di Recoaro (sequenza A3 di De Zanche et al., 1992), di età Pelsonico, risulta essere l'unità micropaleontologicamente più ricca, essendosi depositata durante una fase di highstand. Il Calcare di Recoaro, contiene l'associazione a *Meandrospira dinarica-Pilammina densa*, ormai classicamente indicativa del Pelsonico, la specie *Paulbronnimannia judicariensis* (Premoli Silva, 1971), anch'essa tipica del Pelsonico, e la specie *Paulbronnimannella whittakeri* Rettori gen. n., sp. n., qui istituita, probabilmente esclusiva del Pelsonico superiore. Possiamo quindi ipotizzare che tutti questi Foraminiferi e forse anche *Pilamminella grandis* (Salaj) che non è stata rinvenuta nel nostro materiale, ma che spesso fa parte dell'associazione a *Meandrospira dinarica-Pilammina densa*, siano indicativi della sequenza deposizionale A3 dell'Anisico di De Zanche et al. (1992).

Abstract. The anisian succession exposed in the Piz da Peres area, studied by De Zanche et al. (1992) using sequence stratigraphy, is here examined from a micropaleontological point of view. The Recoaro Limestone, deposited during highstand time, contains the most diversified microfauna of the stratigraphic succession; it is Pelsonian in age, with the typical association *Meandrospira dinarica-Pilammina densa*; the coeval Pelsonian foraminifers *Paulbronnimannia judicariensis* (Premoli Silva, 1971) and *Paulbronnimannella whittakeri* Rettori gen. n., sp. n., are also present.

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Résumé. La série stratigraphique anisienne, qui affleure sur le versant septentrional du Piz da Peres, a fait l'objet d'une analyse stratigraphique séquentielle par De Zanche et al. (1992); elle est ici réétudiée du point de vue micropaléontologique. Le Calcaire de Recoaro est l'unité la plus riche en microfaunes de la série anisienne, s'étant déposé durant une période de *highstand*. Il contient l'association typiquement pelsonienne *Meandrospira dinarica-Pilammina densa* et les foraminifères *Paulbronnimannia judicariensis* (Premoli Silva, 1971), également d'âge pelsonien, et *Paulbronnimannella whittakeri* Rettori gen. n., sp. n., du Pelsonien supérieur.

Introduction.

In 1992 De Zanche et al., proposed a revision based on sequence stratigraphy of the Anisian succession exposed on the northern slope of the Piz da Peres, South of Valdaora (Olang, Val Pusteria, Dolomites). The Authors distinguished three terrigenous units of different Anisian age (Piz da Peres Conglomerate, Aegean-?Bithynian; Voltago Conglomerate, ?Bithynian-Earliest Pelsonian; and Richthofen Conglomerate, Early Illyrian) as well as two Anisian carbonate platforms (Upper Serla Formation and Contrin Formation). These stratigraphic units are correlated with other coeval successions exposed in the western Dolomites and in the Recoaro area. Using sequence stratigraphy, De Zanche et al. (1992) identified four Anisian depositional sequences within the Dolomites in the Recoaro area, which might even extend to the Southern Alps. For a more detailed lithostratigraphic analysis of the Anisian succession in the studied area, see De Zanche et al. (1992).

The present paper is referred to the study of the foraminiferal assemblages recorded in the Anisian succession of the Valdaora area (Fig. 1, 2) (Lower Serla Dolomite, Voltago Conglomerate and specially Recoaro Limestone).

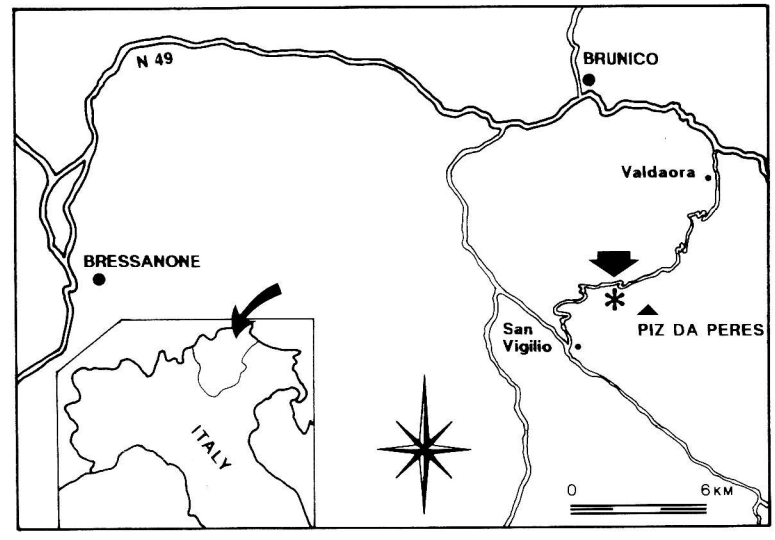

Fig. 1 - Location map of the Piz da Peres area (Valdaora-Olang, Pusteria Valley, Dolomites).

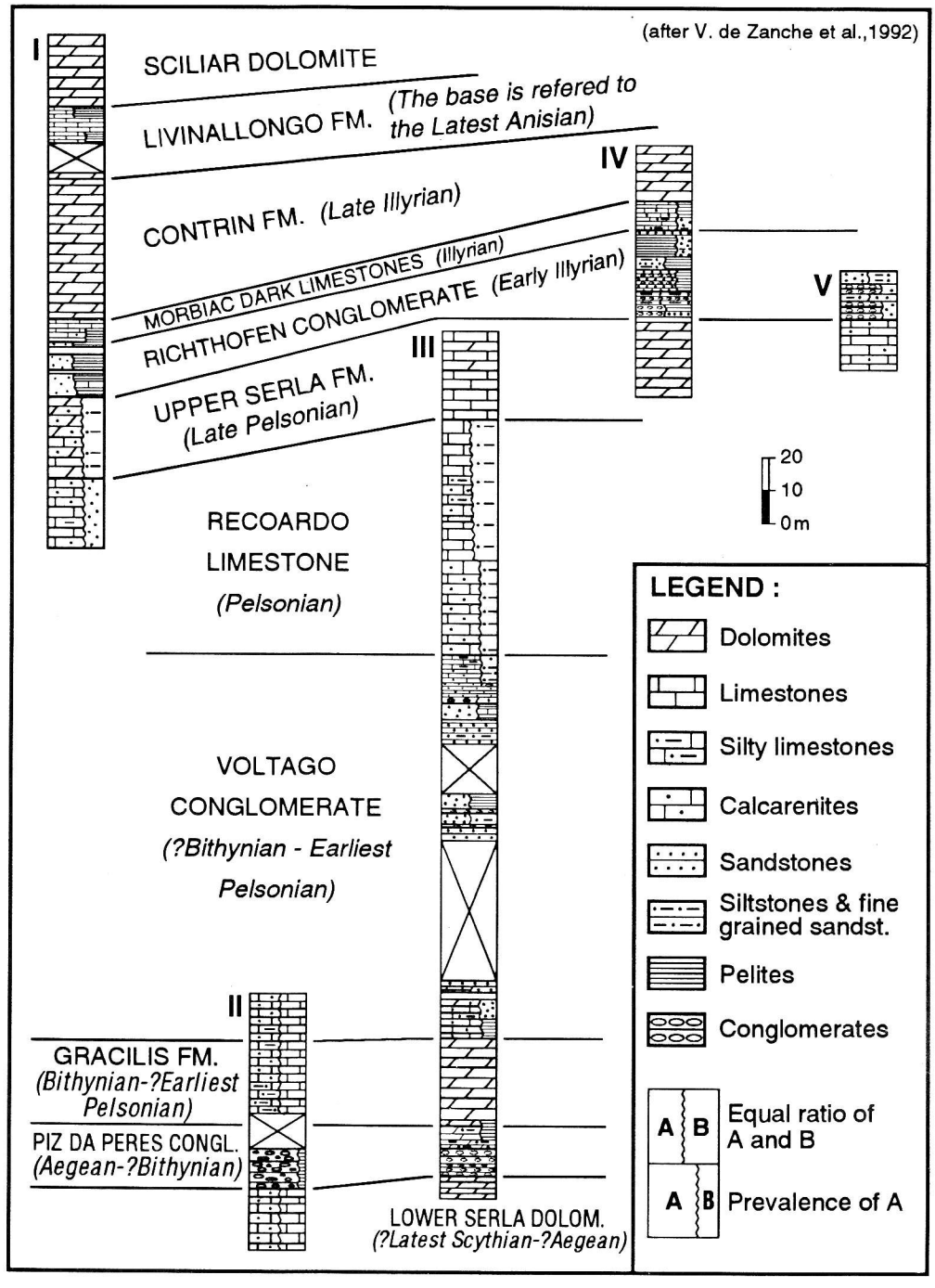

Fig. 2 - . Lithostratigraphy of the Anisian Piz da Peres section (De Zanche et al., 1992, modified).

Lower Serla Dolomite.

Sample PPS 101 from stratigraphic section II (Fig. 2) (De Zanche et al., 1992; fig. 1,3-4) contains a restricted micropaleontological assemblage.

The microfauna consists of few specimens of a tubular irregularly coiled foraminifer tentatively referred to ?"*Meandrospira* " *deformata* Salaj (in Salaj et al., 1967; Pl. 2, fig. 13). It is from the base of the Anisian (Aegean) (De Zanche et al.,1992; fig. 6). We can emphazise the fact that this stratigraphic position corresponds to the so called "*Meandrospira deformata* Zone" established by Gazdzicki et al. (1975) and subsequently recognized by several Authors (Salaj et al., 1983, 1988; Trifonova, 1992).

It is pointed out that the morphological characteristics of *Meandrospira deformata*, as generally identified by the Authors, do not correspond to the type-material described by Salaj et al. (1967) and reillustrated in Salaj et al. (1983, pl. 53, fig. 1-4).

Gracilis Formation.

Just one and unidentified foraminifer (not illustrated) has been recorded in the micropaleontologically poor Gracilis Formation.

In this lithostratigraphic unit of Bithynian-?Early Pelsonian age, De Zanche et al. (1992, p. 134) erroneously mentioned (V. De Zanche, pers. comm.) the occurrence of the Pelsonian foraminifer *Agathammina judicariensis* Premoli Silva, 1971 (=*Paulbronnimannia judicariensis*). In the Anisian succession of the studied area, this species is not present lower than the upper part of the Recoaro Limestone (Fig. 2) (stratigraphic section I in De Zanche et al., 1992) of Pelsonian age (see discussion below).

Voltago Conglomerate.

Both samples PPS 14 and PPS 15 from stratigraphic section III (Fig. 2) (De Zanche et al., 1992, fig. 1, 3-4) have been collected from the overlying Voltago Conglomerate. The two samples contain the small characteristic foraminifer *Meandrospira pusilla* (Ho, 1959) from the Early to Early-Middle Triassic, while sample PPS 14 also contains "*Glomospira*" *sinensis* (Ho, 1959); in the clast sample PPS 15 *Meandrospira cheni* (Ho, 1959) (Pl. 2, fig. 11), which is restricted to the Uppermost Early Triassic, occurs together with *Meandrospira pusilla* (Fig. 3).

In the studied area, *Meandrospira pusilla* shows the typical morphological and dimensional features of the well known Triassic Tethyan species (Pl. 2, fig. 10); it occurs in the Anisian stratigraphic succession of the Dolomites at the base of the Voltago Conglomerate of Early Pelsonian age which corresponds to the base of stratigraphic sequence A3 by De Zanche et al. (1992; fig. 6). As *M. pusilla* does not seem to be reworked from the Early Triassic, the stratigraphic range of the species extending from the Uppermost Early Triassic (probably Spathian) to the Anisian is also estab-

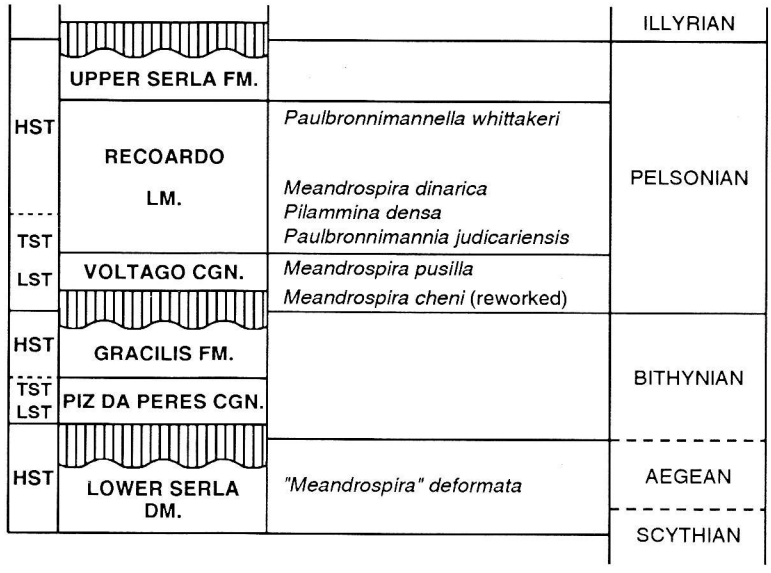

Fig. 3 - Stratigraphic distribution of the recorded foraminifera, with reference to the anisian sequence stratigraphy of the Piz da Peres section.

lished in the Dolomites, as pointed out in different areas of the Tethyan realm (see Rettori et al., 1994).

Meandrospira cheni is here distinguished from *M. pusilla* on the basis of the larger tubular chamber and test. The species has been recorded in a probably Early Triassic (Werfen Formation) calcareous clast from the Voltago Conglomerate. As recently established by Baroz et al. (1990) and confirmed by Rettori et al. (1994) the stratigraphic range of *M. cheni* is restricted to the upper part of the Early Triassic (probably Spathian), but it never reaches the Middle Triassic like *M. pusilla.*

Recoaro Limestone.

This Pelsonian limestone (De Zanche et al., 1992; fig. 6) is micropaleontologically the richest and most diversified unit of the studied area. The microfossiliferous samples (PPS 17, PPS 119, PPS 120) come from the upper part of the Recoaro Limestone, about 15-20 m below the overlying Upper Serla Dolomite Formation (Fig. 3).

In sample PPS 17 (stratigraphic section III in De Zanche et al., 1992; fig. 1, 3-4) the typical Pelsonian microfauna with *Meandrospira dinarica* Kochansky-Devidé & Pantic, 1965 and *Pilammina densa* Pantic, 1966, has been recorded.

In sample PPS 119 (stratigraphic section I in De Zanche et al., 1992; fig. 1, 3-4) abundant specimens of *Paulbronnimannia judicariensis* (Premoli Silva, 1971) occur; the species is the dominant representative of the foraminifers, together with scarce fragments of unidentified foraminifers.

Taxonomical remarks concerning *Paulbronnimannia judicariensis* are expressed in a separate note entirely dedicated to the species by Rettori & Zaninetti (1993). These Authors describe *Paulbronnimannia*, which is included in the family Ammodiscidae, subfam. Paulbronnimanninae Rettori & Zaninetti, 1993; the Pelsonian age of the type-species *Agathammina judicariensis* Premoli Silva is also confirmed.

Sample PPS 120 (Recoaro Limestone, stratigraphic section I in De Zanche et al., 1992; fig. 1, 3-4) has been collected few meters above sample PPS 119; it contains abundant foraminifers referable to a new species, herein described and assigned to *Paulbronnimannella whittakeri* gen. n., sp. n.

Taxonomy

Superfamily *Ammodiscacea* Reuss, 1862

Family *Ammodiscidae* Reuss, 1862

Subfamily *Paulbronnimanninae* Rettori & Zaninetti, 1993

Genus **Paulbronnimannella** Rettori gen. n.

Type-species: *Paulbronnimannella whittakeri* Rettori gen. n., sp. n.

Derivatio nominis. The new genus is named after its phylogenetic relationship with the genus *Paulbronnimannia* Rettori & Zaninetti, 1993. In the evolution of the Paulbronnimanninae Rettori & Zaninetti, *Paulbronnimannella* gen. n., derives from the older genus *Paulbronnimannia*, with a reduced "miliolid" initial stage and a more developed planispiral final stage.

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

Composition. The new genus is so far only referable to the species *Paulbronnimannella whittakeri* Rettori gen. n., sp. n., type-species.

Remarks. *Paulbronnimannella* gen. n. can be distinguished from *Paulbronnimannia* by the smaller size of the enrolled initial portion and by the more developed oscillating to planispiral later stage. This morphological evolution can be roughly compared to the morphological distinction made between the involute test of the genus *Sigmoilina* Schlumberger, 1887, and the evolute, sigmoid to planispiral test of *Sigmoilinita* Seiglie, 1965. From a morphological point of view the evolution of the Paulbronnimanninae Rettori & Zaninetti, 1993 (evolution from *Paulbronnimannia* to *Paulbronnimannella* gen. n.) is similar to that of other representatives of the family Ammodiscidae: transition from *Glomospira* to *Glomospirella* or transition inside the Triassic lineage *Pilammina-Pilamminella.*

Paulbronnimannella gen. n. is also distinguished from the Triassic foraminiferal genus *Gandinella* Ciarapica & Zaninetti, 1985 (type-species *Gandinella apenninica* Ciarapica & Zaninetti, 1985) through the outline of the test and also because *Gandinella* is characterized by several sigmoid stages, each of them followed by one to one and a half whorl with a 90° change in plane of coiling.

Distribution. *Paulbronnimannella* gen. n. is present in the Anisian (Late Pelsonian, pers. comm. V. De Zanche) of the Italian Dolomites (Valdaora area, type-locality of *Paulbronnimannella whittakeri* gen. n., sp. n.).

Paulbronnimannella whittakeri Rettori gen. n., sp. n.

Pl. 2, fig. 1-9

Origin of name. The species is dedicated to Dr. John E. Whittaker, Department of Palaeontology, British Museum (Nat. Hist.), London. The writers wish to thank Dr. Whittaker for the micropaleontological research lead together with Professor Paul Brönnimann and for their mutual esteem and affection for so many years.

Material. Several cross sections of *Paulbronnimannella whittakeri* gen. n., sp. n., in the monospecific sample PPS 120.

Holotype. Cross section of the specimen illustrated in Pl. 2, fig. 1, sample PPS 120, Piz da Peres section (stratigraphic section I in De Zanche et al., 1992, fig. 1,3-4), Dolomites, NE Italy (Fig. 1). The holotype is deposited at the Dipartimento di Geologia, Paleontologia e Geofisica, Università di Padova, Italy.

Paratypes. Specimens illustrated in Pl. 2, fig. 2-9.

Type-locality. Northern slope of the Piz da Peres, South Valdaora, Pusteria Valley, Dolomites, Italy (Fig. 1).

Type-level. Uppermost part of the Recoaro Limestone, about 20 m below the base of the overlying Upper Serla Formation, stratigraphic section I (De Zanche et al., 1992). Anisian (Late Pelsonian).

Description. Test free, small (max. diameter: 0.5 mm); globular proloculus followed by long, narrow tubular undivided second chamber; early stage involute, coiled in various planes radially arranged, as in *Paulbronnimannia*, but reduced and may be absent in the more flattened macrospheric generation (Pl. 2, fig. 5). Later stage evolute consisting of a short to completely reduced sigmoiline series of coils, followed by 4-5 (B-form) to 8-10 (A-form) slightly oscillating to planispiral whorls. Wall calcareous, thin, microgranular, dark in transmitted light. Aperture probably simple, terminal.

Dimensions:
Maximum diameter of the test: 0.5 mm
Height of the involute early stage: absent to 0.1 mm
Height of the evolute terminal portion: 0.03-0.04 mm
Height of the chamber lumen in the evolute portion: 0.015-0.02 mm.

Remarks. The morphological differences between the type-species of *Paulbronnimannella* gen. n., *Paulbronnimannella whittakeri* gen. n., sp. n., and the type-species of *Paulbronnimannia* Rettori & Zaninetti, *Agathammina judicariensis* Premoli Silva, are those already discussed for the new genus.

Distribution. Same as the distribution mentioned for the herein established new genus *Paulbronnimannella* gen. n.

Conclusion.

The microbiostratigraphic data, compared and integrated with those based on sequence stratigraphy (De Zanche et al., 1992) in the Anisian sections of the Piz da Peres area, allow to emphasize that the most diversified foraminiferal microfauna occurs in the Recoaro Limestone (stratigraphic sequence A3 of De Zanche et al., 1992), deposited during highstand time (Fig. 3). In fact the Recoaro Limestone contains the typical Anisian *Meandrospira dinarica/Pilammina densa* foraminiferal assemblage, recognized in the Tethys realm as Pelsonian in age. In the same lithostratigraphic unit the Pelsonian foraminifer *Paulbronnimannia judicariensis* also occurs, as well as the new species *Paulbronnimannella whittakeri* gen. n., sp. n., which seems to be restricted to the Late Pelsonian. The conclusion is that all these foraminifers, and may be also *Pilamminella grandis* (Salaj) which is not present in our material, but frequently associated with *Meandrospira dinarica-Pilammina densa*, are indicators of the 3rd order Anisian depositional sequence A3 by De Zanche et al. (1992).

The modern approach of integrating micropaleontology and sequence stratigraphy is fairly new as far as Triassic foraminiferal biostratigraphy is concerned. The data here reported for the Anisian will certainly lead to major and useful developments in future correlations based on micropaleontological analysis and/or sequence stratigraphy in the Middle Triassic.

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PLATE 1

Pelsonian Foraminifera.

Fig. 1-18 - *Paulbronnimannia judicariensis* (Premoli Silva). Sample PPS 119, Recoaro Limestone.

The graphic scale is 0.2 mm.

PLATE 2

Aegean and Pelsonian Foraminifera.

Fig. 1-9 - *Paulbronnimannella whittakeri* gen. n., sp. n. Sample PPS 120, Recoaro Limestone, Late Pelsonian. 1) Holotype; 2-9) Paratypes; 5) macrospheric form.

Fig. 10 - *Meandrospira pusilla* (Ho). Sample PPS 14, Voltago Conglomerate, Early Pelsonian.

Fig. 11 - *Meandrospira cheni* (Ho). Sample PPS 15. Specimen in Early Triassic (Werfen Fm.) calcareous clast from the Voltago Conglomerate.

Fig. 12 - *Hoyenella sinensis* (Ho). Sample PPS 14, Voltago Conglomerate, Early Pelsonian.

Fig. 13 - ? "*Meandrospira*" *deformata* Salaj. Sample PPS 101, Lower Serla Dolomites, Aegean.

Fig. 14 - *Meandrospira dinarica* Kochansky-Devidé & Pantic. Sample PPS 17, Recoaro Limestone, Pelsonian.

Fig. 15, 16 -*Pilammina densa* Pantic. Sample PPS 17, Recoaro Limestone, Pelsonian.

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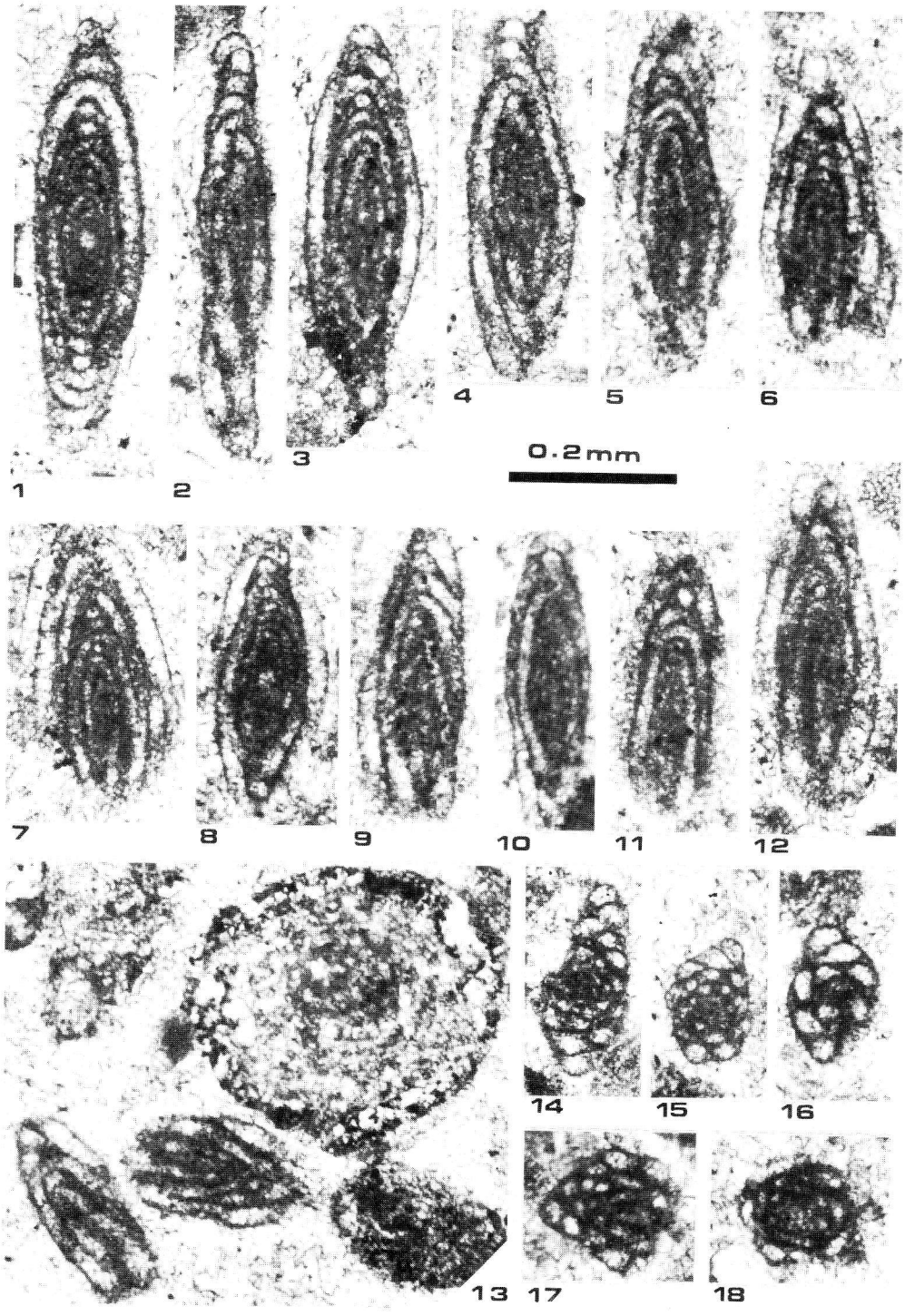
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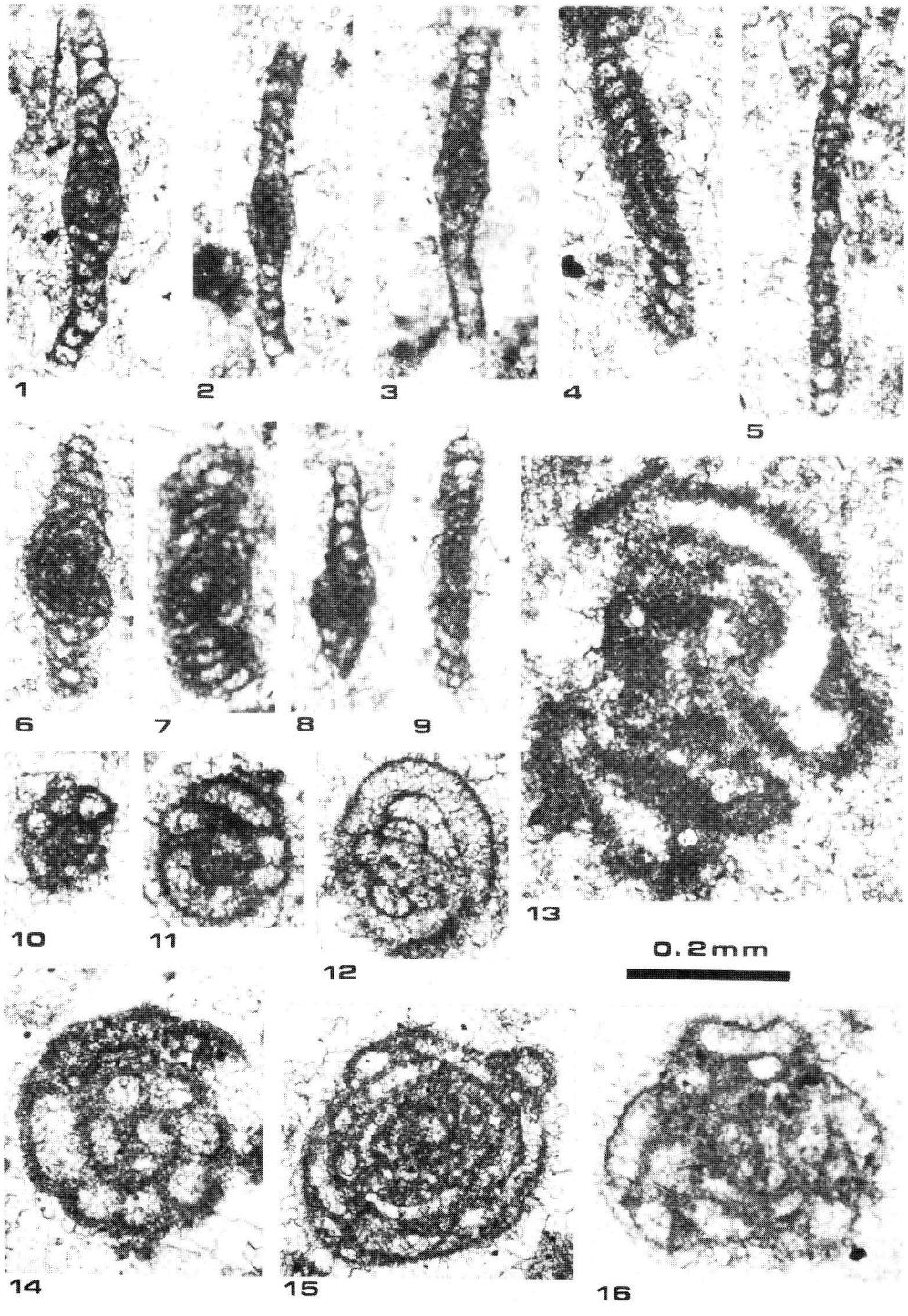
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