Praesphaerammina, a new genus of Cenozoic deep-water agglutinated foraminifera from the Carpathian flysch deposits

Michael A. Kaminski[1] and Sorin Filipescu[2]

[1]*Research School of Geological and Geophysical Sciences, Birkbeck College and University College London, Gower Street, London WCIE 6BT, U.K.; and KLFR, 3 Boyne Avenue, Hendon NW4 2JL, U.K*

[2]*Department of Geology, Babes-Bolyai University, Kogalniceanu 1, RO-3400 Cluj-Napoca, Romania*

email: m.kaminski@ucl.ac.uk; fsorin@bioge.ubbcluj.ro

ABSTRACT: The genus *Praesphaerammina* Kaminski and Filipescu is newly described based on a revision of the type species *Cystammina subgaleata* Vašíček 1947. The genus differs from the Holocene genus *Sphaerammina* Cushman 1910 emend. Loeblich and Tappan 1964, in possessing a less embracing final chamber and in its interio-areal to areal aperture that lacks any tooth. The definition of the subfamily Sphaeramminae is accordingly emended as well. The genus is common in the Eocene of the Carpathian flysch deposits, but the type species *Praesphaerammina subgaleata* (Vašíček 1947) is also observed in the Caribbean region and West Africa, where it ranges into the Miocene.

INTRODUCTION

The species *Cystammina subgaleata* first described by Vašíček (1947) is commonly observed in the Eocene of the Carpathian Flysch deposits, where it has been recorded by various authors. In this region it occasionally forms nearly monospecific assemblages (Jurkiewicz 1967; Jednorowska 1968, Sandulescu and Bratu 1981), especially in the Magura Unit and its lateral equivalent, the Petrova Nappe in Romania.

Ever since it was first described, the generic affiliation of the species has been uncertain. First described as *Cystammina* by Vašíček (1947), the species was later placed in the genus *Ammosphaeroidina* by Hanzlíková (1965). Jednorowska (1968) transferred the species to the genus *Sphaerammina* Cushman 1910 based on her observations of sectioned specimens that demonstrated the species is planispirally coiled. Jednorowska pointed out the morphological similarities between *C. subgaleata* and the type species of the genus, *Sphaerammina ovata* (Cushman) which was newly emended by Loeblich and Tappan (1964). However, this generic assignment has been long disputed owing to the different apertural features of *Sphaerammina ovata*. Additionally, because the type specimens of *C. subgaleata* were presumed lost, it was not possible to revise the species based on a restudy of type material.

In this study, we redescribe the species *C. subgaleata* based on our study of paratype specimens that have been recently found in the micropalaeontological collections of the Jagiellonian University (Kraków). We also studied specimens from new material collected from the Magura, Botiza, and Petrova Nappes in Poland and Romania, and from archive samples housed in the collections of the Czech Geological Survey, Brno. We conclude that the Eocene species *C. subgaleata* possesses morphological features that are more primitive than those in the modern genus *Sphaerammina*, and therefore belongs in a different genus.

MATERIAL

As part of a larger investigation of the Paleogene agglutinated foraminiferal assemblages in the Pienides of the Transcarpathian area in Romania, we studied samples from two localities where the species was found in abundance (text-fig. 1).

At Rona de Sus, blue-grey Eocene claystones outcrop along a road between Sighet and Viseu. These belong to the Petrova Formation of the Petrova Nappe. In the Valea Vinului near Botiza, similar lithologies are found in the upper part of the sequence of the Botiza Nappe (Valea Vinului Formation).

Additional specimens were studied from outcrop samples collected from the Magura Nappe in southern Poland, and from miscellaneous slides housed in the Geroch Collection (Kraków), and in slides from the type locality of *C. subgaleata* (Hluk, Moravia) housed in the collections of the Czech Geological Survey, Brno. Specimens were photographed using a Zeiss-940 SEM, and in immersion oil using a Zeiss SV-11 photomicroscope with a transilluminator. The lectotype specimen of *C. subgaleata* is deposited in the micropalaeontological collections of the Natural History Museum (London). All other figured specimens are currently housed in the Kaminski Collection at UCL.

TAXONOMIC PART

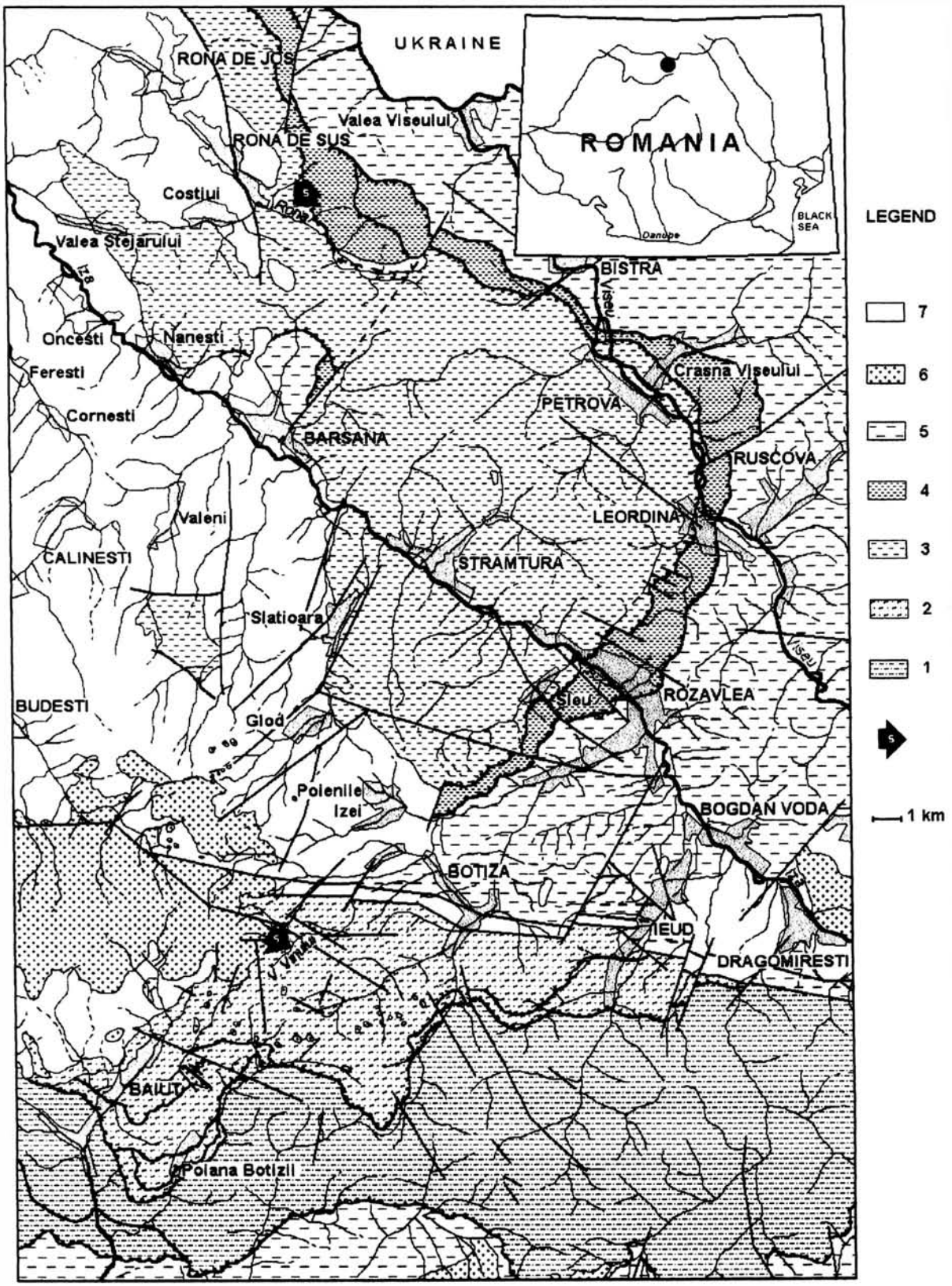
Family **SPHAERAMMINIDAE** Cushman 1933 **emend.** Kaminski and Filipescu

Sphaeramminidae LOEBLICH and TAPPAN 1982, p. 27, nom. transl. ex subfamily.

Sphaeramininae CUSHMAN 1933, p. 87 (subfamily),

Ammosphaerulininae SAIDOVA 1981, p. 14 (subfamily).

Test planispiral and involute, later chambers almost completely enclosing earlier ones; wall agglutinated with organic cement; aperture interio-areal to areal, rounded, reniform, or slitlike,



TEXT-FIGURE 1
Tectonic units of the Maramures region of Romania, showing sample localities (based on Borcos et al. 1980; Patrulius et al. 1968; Sandulescu and Badescu 1994; Sandulescu and Bratu 1981; Sandulescu and Russo-Sandulescu 1981; Sandulescu et al. 1991, and our observations). 1. Wildflysch Nappe; 2. Botiza Nappe; 3. Petrova Nappe; 4. Leordina Nappe; 5. Post-tectonic cover of the Median Dacides; 6. Neogene volcanic rocks; 7. Neogene sedimentary rocks; S. sample localities.

may be simple or have a simple projecting tooth. Paleocene-Holocene.

Remarks: The definition of the family is here emended to include forms with an interio-areal to areal aperture and forms that lack a tooth. We include those Paleogene forms such as *Praesphaerammina* that may be ancestral to the Holocene species. In our view the *Praesphaerammina* forms an evolutionary series with *Sphaerammina*, and therefore the two genera belong in a single family.

Genus *Praesphaerammina* Kaminski and Filipescu, **n. gen.**
Type species: *Cystammina subgaleata* Vašíček 1947

Description: Test planispirally enrolled involute, with about four strongly overlapping chambers per whorl, with the final embracing chamber overlapping 50-70% of the test in the adult stage. Wall simple, imperforate, finely to coarsely agglutinated, with organic cement. Aperture interio-areal in the juvenile stage, becoming areal in the adult, oval to reniform in outline, with a thin lip. Paleocene – Miocene: Carpathians, Caribbean, West Africa, North Sea.

Remarks: Differs from *Sphaerammina* in possessing a less embracing final chamber (*Sphaerammina ovalis* is ~80% embracing) and in its simple aperture, which lacks a tooth.

Praesphaerammina subgaleata (Vašíček) **emend herein.**

Cystammina subgaleata Vašíček 1947, p. 247, pl. 1, fig. 15a,b,c; textfig. 3. —GEROCH 1960, pl. 2, fig. 12.— JURKIEWICZ 1967, pl. 7, fig. 2.
Sphaerammina subgaleata (Vašíček).— JEDNOROWSKA 1968, pl. 14, figs. 1a-12b. — MORGIEL and OLSZEWSKA 1981, pl. 9, fig.2. —HANZLÍKOVÁ 1983, pl. 9, figs. 8 10. —GEROCH and NOWAK 1984, pl. 2, fig. 28; pl. 6, fig. 6.

Description: Test large, coiled in an involute planispire with four to six chambers visible from the exterior. The final chamber embraces about 50-60% of the test. Outline is slightly lobate; sutures are usually depressed, but in some specimens are poorly defined. Microsphaeric forms have as many as 5 chambers in the final whorl. Megalosphaeric forms possess about three chambers in the last whorl, and increase in size more rapidly. Wall several grains thick, comprised of medium sized agglutinated grains, with a terazzo surface, imperforate, with silicified cement. Aperture is oval or reniform, without any sign of a tooth, interio-areal in the juvenile stage, migrating to areal position in the adult. The aperture is bordered by a thin lip that consists of a single layer of imbricated agglutinated grains. The aperture is often surrounded a depression that forms a re-entrant when the aperture is at the base of the apertural face, or an irregular excavation when the aperture is areal in position. Specimens are always compressed in various planes, but were probably originally spherical.

Size: Holotype was reported to be 0.9mm in diameter. Paratypes from the Vašíček Collection range in size from 0.5 to 1.26mm.

Remarks: Based on her study of sectioned specimens, Jednorowska (1968) transferred *Cystammina subgaleata* Vašíček 1947 to the genus *Sphaerammina* Cushman because of its planispiral coiling. In the past, this species has been confused with *Saccammina sphaerica,* and specimens should be viewed in immersion oil in order to observe the chambers. Such is the case with specimens housed in the Bermudez Collection (the Mesa Grande Oil Co. collections) in Caracas Venezuela, where it was given the working name *Saccammina* sp. 7.

TEXT-FIGURE 2
Holotype of *Cystammina subgaleata* from Vašíček (1947), ×47.

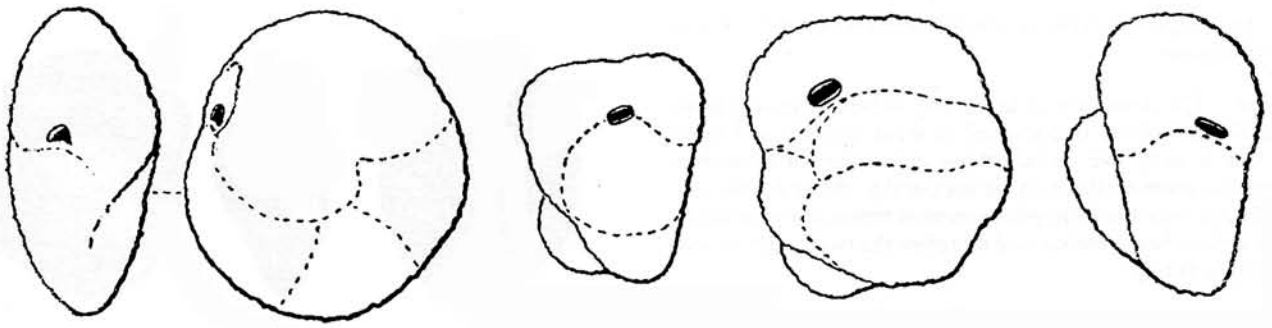
The Vašíček collection was originally deposited at the Czech Geological Survey, Prague. Although some picked slides from the Hluk-3 borehole still exists, the collection of Vašíček's primary types is presumed lost. Fortunately, paratypes of *Cystammina subgaleata* Vašíček 1947 were found in the collection of S. Geroch at the Jagiellonian University in Kraków. Because the holotype of *Cystammina subgaleata* is presumed lost, we have designated a lectotype specimen from among the paratype specimens. This specimen is from a slide containing three specimens from the Hluk-3 borehole (565.20-565.30 m) that were sent to Prof. Stanislaw Geroch by Miroslav Vašíček in the early 1960's. These specimens are from the same depth interval in the well as the holotype, and therefore must be considered syntypic. The specimen selected herein as the lectotype (pl. 1, fig. 1a-c) is one that best conforms to the type figure of Vašíček (1947). Additional topotype specimens from the Hluk-3 and Hluk-4 boreholes are housed in the collections of the Czech Geological Survey (Brno Branch) in Brno.

The type species of the genus *Sphaerammina* (*Sphaerammina ovalis*), described by Cushman (1910) from the Philippine Seas has a finely agglutinated test and a more embracing final chamber. Specimens from the South China Sea in the collection of Dr. Marietta de Leon (National Institute of Geological Sciences, University of the Philippines) have a final chamber that is about 80% embracing. Its wall is thinner, and it has a distinct tooth. These features are clearly visible in the dissected specimens figured by Loeblich and Tappan (1964).

Praesphaerammina subgaleata differs from *S. ovalis* in its thicker and more coarsely agglutinated wall, more distinct sutures, in its tendency to have a more lobate periphery (*S. ovalis* has a circular outline) and by its more evolute coiling. Our observations of specimens in immersion oil (plate 2) confirm that the species is coiled in a planispiral manner. Additionally, in *S. subgaleata* the aperture is surrounded by a thin lip and is typically situated within a broad depression. There is no evidence of a "simple to elongate projecting tooth" as in *Sphaerammina ovalis*.

The Paleocene species *Praesphaerammina gerochi* (Hanzlíková), also described from the Carpathian flysch, differs in its smaller size and thinner, more finely agglutinated test.

Observed occurrences: Vašíček originally recorded this species as *Cystammina subgaleata* from the Eocene to lower Oligocene Zlin Formation of the Raca Unit of the external Carpathians in



TEXT-FIGURE 3
Drawings of type specimens of "*Cystammina subgaleata*" showing various states of deformation and the positions of the apertures (after Vašíček 1947). Apertures in the small specimens are drawn at the base of the last chamber, whereas in larger specimens the apertures are clearly areal. Magnification not given.

the Czech Republic. The type material from the Hluk-3 Borehole was probably of middle or late Eocene age. The species was subsequently reported by Geroch (1960) and Jurkiewicz (1967) as *Cystammina subgaleata,* and by Jednorowska (1968) and Morgiel and Olszewska (1981) as *Sphaerammina subgaleata* from the Eocene of the Polish Carpathians. Hanzlíková (1965) reported it as *Ammosphaeroidina subgaleata* from the middle to upper Eocene of the Magura Unit in Moravia and Slovakia. The species has been observed to form almost monospecific assemblages in certain units of Carpathians. For example, in the middle to upper Eocene Sub-Magura beds of the Magura Unit (Jednorowska 1968), in the middle Eocene of the Botiza Nappe of the Romanian Carpathians (Sandulescu and Bratu 1981), and in the middle Eocene Luhačovice Member in borehole Luhačovice-BJ.321 (M. Bubik, personal communication). Its stratigraphical range was given as middle Eocene (*C. amplectens* Zone) to late Eocene (*C. rotundidorsata* Zone) by Geroch and Nowak (1984). Hanzlíková (1983) reported it as ranging upwards from planktonic foraminiferal Zone P14 in the Outer Flysch basins of Moravia.

We have observed specimens that are very similar to this species from the Miocene of exploration wells from offshore Louisiana, and in a sample from the Trujillo Formation of western Venezuela housed in the Bermudez Collection at Intevep S.A. in Caracas. *Praesphaerammina* is also present in the Miocene of offshore Cabinda wells (reported as *Sphaerammina* by Preece 1999).

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PLATE 1
Praesphaerammina subgaleata (Vašíček); SEM images. [Magnifications not changed]

1a-2c Eocene, Zlin Formation, Hluk-3 borehole, 565.20-565.30m. Paratype specimens from the Geroch Collection, 1. Lectotype ×75; 2. Paralectotype, ×75; 1c. x350; 2c. ×375.

3-4b Eocene, Magura Unit, Poland, *R. amplectens* Zone, from a sample given to W. A. Berggren by A. Jednorowska. 3. ×50; 4a. ×75; 4b. ×350.

5 Eocene, Valea Vinului Formation, Botiza Nappe, near Botiza, Romania, ×75.

6a,b Eocene, Petrova Nappe, near Rona de Sus, Romania. Broken specimen showing thick, coarsely agglutinated wall, 6a. ×55; 6b, ×350.

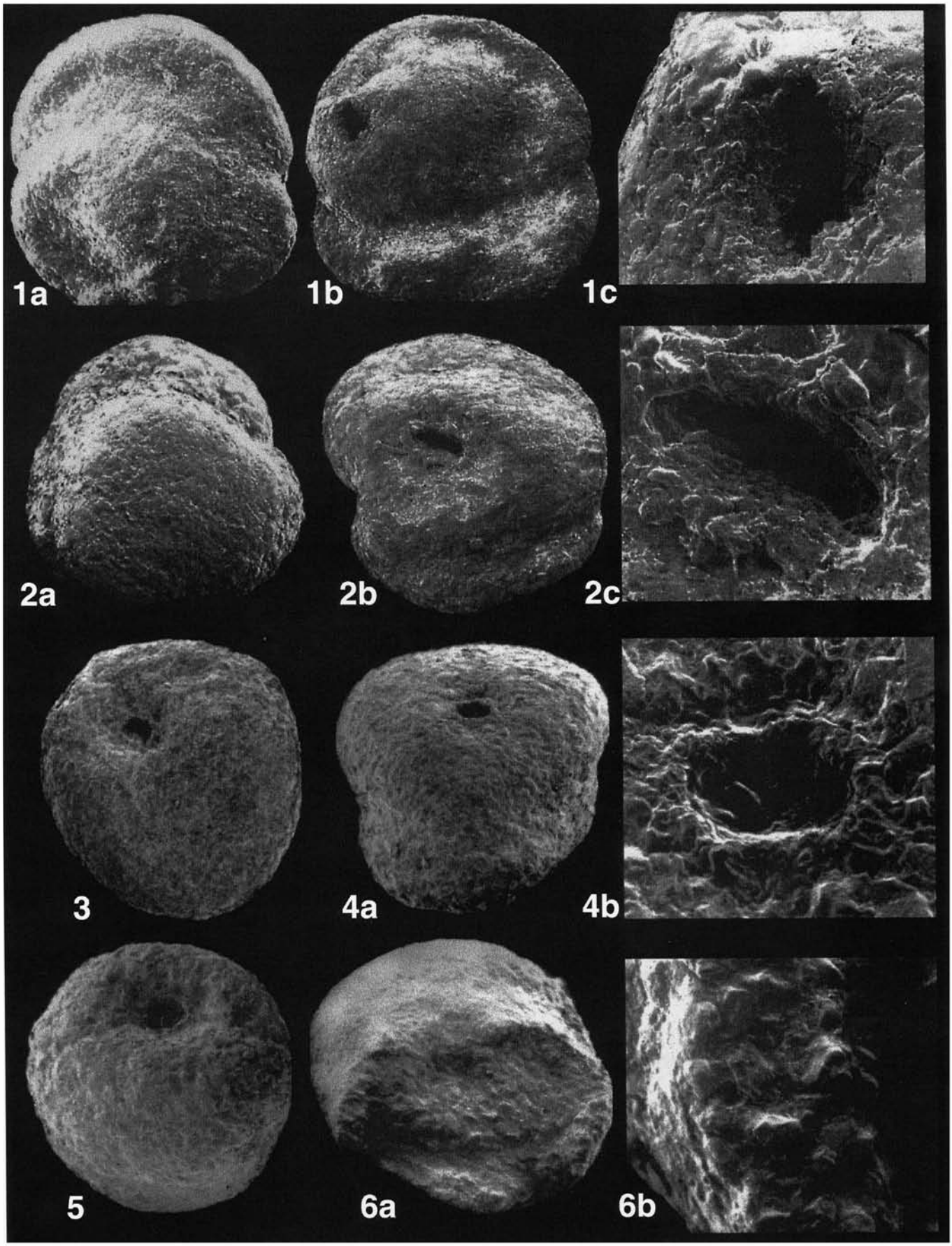
1a
1b
1c
2a
2b
2c
3
4a
4b
5
6a
6b

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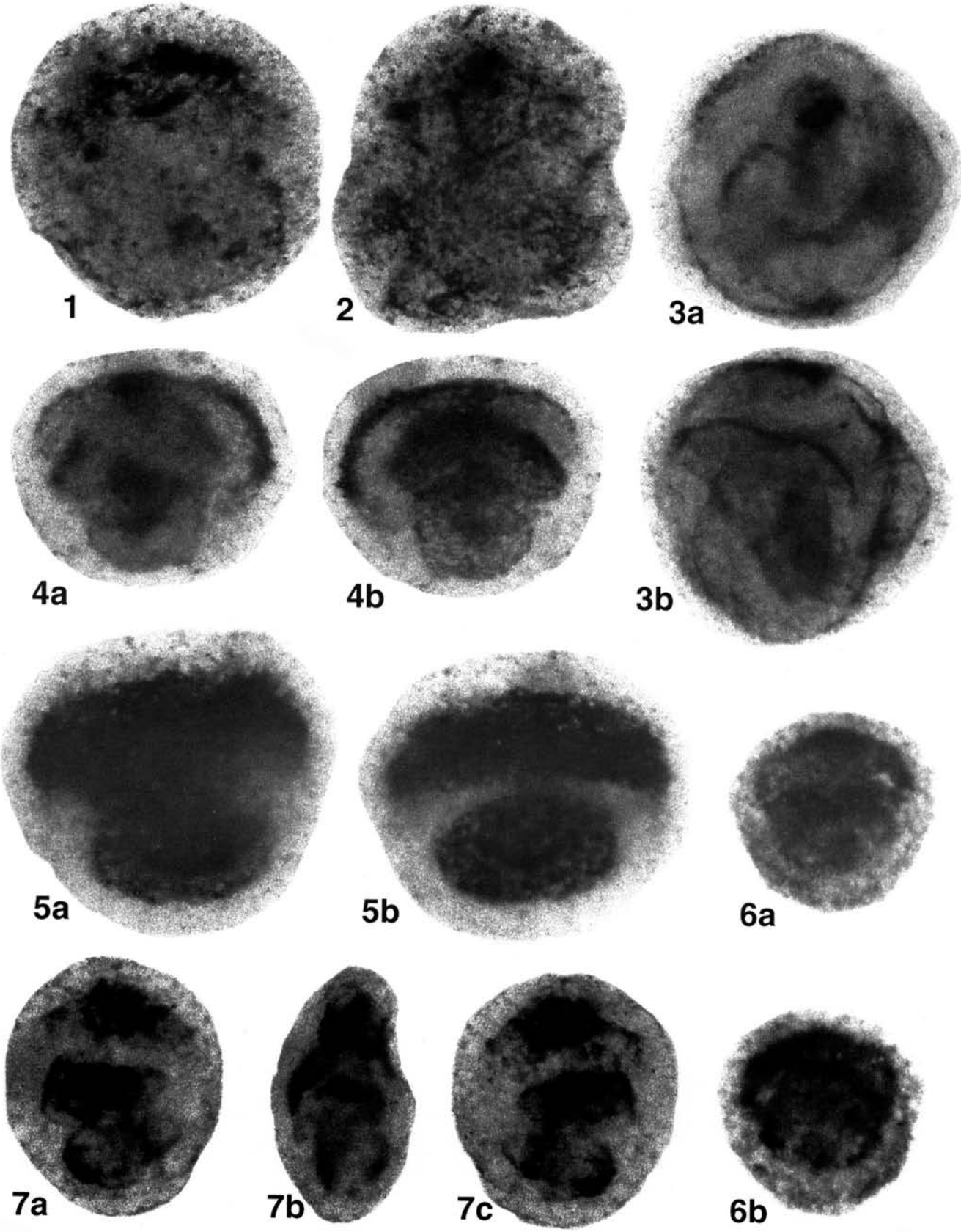
PLATE 2

Praesphaerammina subgaleata (Vašíček); Transmitted light photographs. All specimens photographed at ×52.

1-6. Coarsely agglutinated specimens from Rona de Sus, Romania. 1, Specimen compressed perpendicular to plane of coiling showing areal aperture. 2, Specimen compressed in the plane of coiling. 3a,b, A more finely agglutinated (?microsphaeric) specimen showing interior outines of chambers. 4a-5b, Presumed megalosphaeric forms, showing high growth rate of chambers. 6a,b, A juvenile specimen with three chambers.

7a,b,c. A microsphaeric specimen from Valea Vinului, Romania, showing five chambers in the final whorl.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4b
3b
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