

REMARKS ON THE SUBFAMILY TROCHAMMINELLINAE BRÖNNIMANN, ZANINETTI AND WHITTAKER (PROTISTA: FORAMINIFERIDA)

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ABSTRACT

The genera *Ammoglobigerinoides* Frerichs, 1969 and *Pseudotrochammina* Frerichs, 1969, both originally described from deep waters of the Gulf of Mexico, are distinct and valid taxa belonging to the trochamminacean subfamily Trochamminellinae Brönnimann, Zaninetti and Whittaker, 1983. *Atlantiella* Saidova, 1981 is a junior synonym of *Pseudotrochammina* and, therefore, suppressed.

The genus *Septibaella* Brönnimann and Dias Brito, 1982, from shallow waters of the Brazilian Shelf, is transferred to the trochamminacean subfamily Bykoviellinae Loeblich and Tappan, 1984. The definition of the subfamily Trochamminellinae, as originally defined in 1983, is maintained contrary to the emendation of Loeblich and Tappan, 1985.

Keywords: Taxonomy, Trochamminellinae, Bykoviellinae, Foraminiferida.

RESUMEN

Los géneros *Ammoglobigerinoides* Frerichs, 1969 y *Pseudotrochammina* Frerichs, 1969, ambos descritos originalmente en las aguas profundas del Golfo de Méjico, son distintos y válidos, pertenecientes a la subfamilia Trochamminellinae Brönnimann, Zaninetti y Whittaker, 1983. Mientras que *Atlantiella* Saidova, 1981 es un sinónimo de *Pseudotrochammina* y por tanto se suprime.

El género *Septibaella* Brönnimann y Dias Brito, 1982, de las aguas someras de la plataforma brasileña, se transfiere a la subfamilia Bykoviellinae Loeblich y Tappan, 1984, de los Trochamminidos. La definición original de la subfamilia Trochamminellinae se mantiene en contra de la enmienda propuesta para la misma, por Loeblich y Tappan (1985).

Palabras clave: Taxonomía, Trochamminellinae, Bykoviellinae, Foraminiferida.

INTRODUCTION

Since Brönnimann, Zaninetti and Whittaker's (1983) publication on the classification of the superfamily Trochamminacea Schwager, 1877, a number of new taxa have subsequently been introduced and taxonomic changes proposed, mainly by Loeblich and Tappan (1984; 1985), which make it necessary to revise certain of these changes.

The present note, which deals only with the subfamily Trochamminellinae Brönnimann, Zaninetti

and Whittaker, 1983, considers aspects of the morphological analysis of type material and its taxonomic consequences. The re-examination of the type specimens of the genera *Trochamminella* Cushman, 1943 (see Brönnimann and Whittaker, 1984) *Ammoglobigerinoides* Frerichs, 1969, *Pseudotrochammina* Frerichs, 1969, and *Atlantiella* Saidova, 1981 (a junior synonym of *Pseudotrochammina*) shows that the definition of the subfamily Trochamminellinae, as it was originally proposed (*loc. cit.*, 1983), should be maintained and not emended as proposed by Loeblich and Tappan.

THE DEFINITION OF THE SUBFAMILY TROCHAMMINELLINAE AND THE PROBLEM OF *AMMOGLOBIGERINOIDES* VIS-À-VIS *PSEUDOTROCHAMMINA*

The type genus of the subfamily Trochamminellinae Brönnimann, Zaninetti and Whittaker, 1983 (Family Trochamminidae Schwager, 1877) is *Trochamminella* Cushman, 1943. Brönnimann and Whittaker (1984, p. 299-301) re-examined the type-species, *Trochamminella siphonifera* Cushman, 1943, from off Puerto Rico, and emended the definition of *Trochamminella* using as generic features: (a) the adult growth form with the spongy calcareous substance and the tunnel-like radial extensions, and; (b) the characteristics of the single areal aperture.

In the 1983 classification of the superfamily Trochamminacea Schwager, 1877, Brönnimann *et al.* (p. 205) also included within the Trochamminellinae the genera *Ammoglobigerinoides* Frerichs, 1969 (with the deepwater species *A. dehiscens* Frerichs, 1969 as type-species, *Pseudotrochammina* Frerichs 1969 (with the deepwater species *P. triloba* Frerichs, 1969 as type-species) and *Sepetibaella* Brönnimann and Dias Brito, 1982 (with *S. sepetibaensis* Brönnimann and Dias Brito, 1982 as type-species). *Atlantiella* Saidova, 1981 (with the relatively shallow, North Atlantic species, *Trochamminella atlantica* Parker, 1952 as type-species was synonymised with *Pseudotrochammina*.

The genus *Sepetibaella* Brönnimann and Dias Brito, 1982 is here transferred to the subfamily Bykoviellinae Loeblich and Tappan, 1984 (Family Trochamminidae Schwager, 1877), characterised by a single areal and terminal aperture.

The overall adult morphology, in particular the apertural systems of Frerich's deep water genera were re-examined by Brönnimann using the type material housed in the collections of the U.S. National Museum in Washington. As apertural criteria are used by us as features of subfamilial rank, Brönnimann *et al.* (1983, p. 205) defined the subfamily Trochamminellinae as follows:

"Aperture areal, single or double".

Loeblich and Tappan (1984, p. 13) accepted the subfamily Trochamminellinae but significantly emended, without saying as much, our definition, as follows:

"Chambers in a low trochospiral coil, free in early stage, later may be attached and surrounded by a low spreading area of agglutinated material or "puffermasse"; aperture ovate, areal, on the umbilical side".

In this new definition Loeblich and Tappan used an admixture of features of both generic and subfamily rank. They also recognised in the Trochamminellinae only a **single** areal aperture, whe-

reas Brönnimann *et al.* (1983), on the basis of their re-examination of the type species of the constituent genera, recognised the presence of a **single or a double** areal aperture. In 1985 (Abstract, p. 195), Loeblich and Tappan again emended the subfamily definition by adding the words "... to slitlike...", referring to the shape of the areal aperture which, in our classification, is a **generic** feature and therefore out of place in a subfamily definition. In reality, these authors' subfamily definition reads more like that of the genus *Trochamminella* Cushman, 1943 than that of a suprageneric taxon.

Loeblich and Tappan (1985, p. 195) added, after their "Description" of the subfamily Trochamminellinae, the following "Remarks":

"The original definition of the subfamily Trochamminellinae stated only 'aperture areal, single or double', and the subfamily definition is here modified to include reference to the occasional attachment and surrounding "puffermasse", and to limit the apertural character to a single primary opening. As noted in the remarks under *Pseudotrochammina*, the supposed secondary areal opening of *Ammoglobigerinoides* cannot be demonstrated in the holotype, hence as first revisers (*sic*), we suppress that genus as a synonym of *Pseudotrochammina*. No other member of the subfamily has a secondary areal opening, hence the definition is here modified".

To these "Remarks" we feel the following comments should be made:

1. During September 1981 Brönnimann examined in the U.S. National Museum, Washington, D.C., the holotype of *Ammoglobigerinoides* Frerichs (U.S.N.M. registration no. 687466, Gulf of Mexico, sediment core, 5994 feet depth). The holotype is about 1 mm in diameter, tightly enrolled, apparently trochospiral, with 4 subglobular chambers in the final whorl. It shows **two** elongate slit-like areal openings, one on the umbilical and one on the spiral side of the ultimate chamber. Both apertures have everted borders, rounded extremities, and are similarly developed in appearance and dimension. They are situated relatively symmetrically in respect to the preceding chambers. The holotype was, after the publications of Loeblich and Tappan (1984; 1985), again examined, this time by Whittaker who confirmed the presence of two areal openings. Whilst on loan, camera lucida drawings were made of this specimen and they are reproduced in text-figs. 1 A, B herein. The genus *Ammoglobigerinoides* Frerichs is therefore distinct and Loeblich and Tappan's synonymisation of it with *Pseudotrochammina* Frerichs is rejected. *Ammoglobigerinoides* is formally re-instated herein.

2. At the same time Brönnimann also examined the holotypes of *Pseudotrochammina triloba* Frerichs, 1969 and *P. mexicana* Frerichs, 1969. Both types came from the same core sample from the

sediment of the Gulf of Mexico, depth 5010 feet. In the present authors' opinion the slight morphological differences (number of chambers in the final whorl) between the two species do not warrant their separation. It is therefore suggested that *P. mexicana* be considered a junior synonym of *P. triloba* which, by original designation, is the type species of *Pseudotrochammina*. For further comments on this synonymy, see p. 90, below.

3. The holotype of *Pseudotrochammina triloba* Frerichs, 1969 (U.S.N.M. reg. no. 687467) differs in all important features, particularly in its low trochospiral, non-lepidoid adult growth form and in its single areal aperture, from *Ammoglobigerinoides dehiscentes*. The single slit-like areal aperture, with everted border and rounded extremities, situated on the umbilical side of the ultimate chamber is **not in symmetric position** above the umbilicus as claimed by Loeblich and Tappan (1985). Rather, it is situated asymmetrically in respect to the small axial depression ("umbilicus") or to the axis of enrolment. A camera lucida drawing of the holotype of *P. triloba* is shown in text-figs. 1 C, D.

4. In the definition of the subfamily Trochamminellinae reference should not be made to the "occasional attachment and surrounding 'puffermasse'", as these features are those of the genus *Trochamminella* Cushman alone, and are not criteria of subfamily rank. Apart from *Trochamminella* no other genus of the Trochamminellinae develops the spongy calcareous substance with tunnel-like extensions so characteristic of the fixed specimens of *T. siphonifera* Cushman, 1943 and *T. conica* (Brady, 1884) (originally described as *Valvulina conica* Brady (Brady, 1884, pl. 49, figs. 15, 16)). Whether this substance, agglutinated or secreted, is the same as that referred to as "puffermasse" by Rhumbler (1938) is not known.

5. Finally, as a digression, certain terms are used in Loeblich and Tappan (1984; 1985) which are not accepted here. The term **description**, in our opinion, should only be used to describe the features of a **particular specimen** (holotype, paratype, hypotype, etc.) (One describes the look of things). When dealing with **abstract taxonomic concepts** (species, genus, subfamily, etc.), instead of the term description, that of **definition** should be employed. We follow, in this respect, Hyman (1940 *et. seq.*) who, in her definitions of phyla, for instance, enumerates and explains (not describes) the nature of the essential and limiting criteria of the phyla. An important point in these definitions is always the need to carefully determine the boundaries with other phyla. The distinction between the terms "description" and "definition", once recognised, will force a taxonomist to consider the essential qualities of a taxon, thus producing formulations without an admixture of features representing different taxa levels of the same group of forms.

IS ATLANTIELLA SAIDOVA A DISTINCT GENUS?

Having elucidated the taxonomic problems posed by Frerichs' (1969) two genera *Ammoglobigerinoides* and *Pseudotrochammina* with the result that both are here retained, we now have to turn our attention to the morphology of *Trochamminella atlantica* Parker, 1952 and to the taxonomic status of the genus *Atlantiella* Saidova, 1981 (of which *T. atlantica* is type-species). Loeblich and Tappan (1985, p. 195) regarded the genus *Atlantiella* as being different from *Pseudotrochammina*, whereas Brönnimann *et al.* (1983) placed *Atlantiella* into synonymy with *Pseudotrochammina*.

To resolve this problem we need to go back to the type species of *Atlantiella* and re-examine its morphology afresh. Parker's (1952, p. 409, pl. 4, figs. 17 a, b (holotype), 18, 19 (paratypes)) original species definition of *Trochamminella atlantica*, the types of which came from core no. 16. depth 124 m, in Melville Sound, off Greenland (lat. 74°34'N, long. 110°40'W), reads as follows:

"Test small, slightly (axially) compressed with a low trochoid spire; periphery rounded, very lobulate; chambers 5-6 in the adult whorl, more commonly 5, inflated, especially toward the outer part; sutures distinct, depressed, slightly curved; wall thin, slightly rough, composed of medium sand grains of varying size; aperture an elongate slit near the inner margin of the chamber, with a distinct lip. Maximum diameter 0.47 mm., maximum thickness 0.22 mm."

Parker further mentioned that her new species... "is often found associated with *T. bullata* Hoeglund but may be distinguished easily by its somewhat larger size, lower spire and more numerous, less globose chambers. Some specimens appear distorted owing to the uneven inflation of the chambers. Except for the character of the aperture the species shows a rather close resemblance to *Trochammina advena* Cushman." (Regarding the latter species, see Brönnimann 1979, p. 10, 16 where the reasons why "*Trochammina advena*" Cushman, 1922 should no longer be used are explained. See also the illustration of a hypotype of "*T. advena*" in Parker, 1952, pl. 4, figs. 3 a, b, for comparison with *Trochamminella atlantica*).

From Parker's (1952) species definition, illustrated by the holotype and two paratypes, the following definition can be deduced for the genus to which *Trochamminella atlantica* belongs:

Definition: Adult test free, a very low trochospire composed of fairly inflated chambers (non-lepidoid test); single areal slit-like aperture with everted border and rounded extremities, on umbilical side near lower margin of septum, close to, but outside of small axial depression (asymmetric).

Our definition makes use only of the generically significant features, i.e. the adult growth form and the details of the aperture. It is different from that of *Trochamminella* Cushman, 1943 (see Brönnimann and Whittaker, 1984), hence Parker's *atlantica* must be placed in another genus. After an analysis of Parker's (1952) figures of "*Trochamminella*" *atlantica* and a comparison with those of *Pseudotrochammina triloba* and *P. mexicana*, published by Frerichs (1969, pl. 1 and pl. 2) (the respective holotypes are reproduced in our text-figs. 3.3 b-d and 3.2 b-d), and after the re-examination of the three above-mentioned species in the collections of the U.S. National Museum, Brönnimann *et al.* (1983) came to the conclusion that Parker's *atlantica* and Frerichs' *triloba/mexicana* belong to the same genus, i.e. *Pseudotrochammina* Frerichs, 1969. The genus *Atlantiella*, with "*Trochamminella*" *atlantica* Parker as type species, is junior to *Pseudotrochammina* and was in consequence suppressed by us. However, Loeblich and Tappan (1985, p. 195) again differ from the point of view expressed by Brönnimann *et al.* (1983), continuing to regard *Atlantiella* as a genus of the Trochamminellinae in its own right, and retained *Atlantiella* and *Pseudotrochammina* as valid taxa.

Further discussion of this problem is best made with reference to Loeblich and Tappan's (loc. cit.) texts on *Atlantiella* and *Pseudotrochammina* which are given below *in extenso*. In view of their differing interpretation of the same type material examined by us, we feel obliged to explain our disparate position in this matter. Loeblich and Tappan (1985, p. 195) wrote:

Atlantiella Saidova, 1981...

"Description. Test small, chambers subglobular, in low trochoid spire, about five per whorl, sutures radial to slightly curved; wall agglutinated, thin, surface rough; aperture areal, a curved extraumbilical slit, bordered by a distinct lip..."

Under "Remarks" they added:

"Regarded as a synonym of *Pseudotrochammina* by Brönnimann and others, 1983, *Atlantiella* differs in having an extraumbilical aperture rather than the aperture being symmetrically placed above the umbilicus".

Pseudotrochammina Frerichs, 1969...

"Test small, from 0.3 to 1.0 mm in diameter, with few subglobular chambers increasing rapidly in size, and commonly only there and one-half to four per whorl, sutures depressed; wall finely agglutinated and smoothly finished, or may have some larger included particles; aperture areal, a slit facing the umbilicus and bordered by a slight lip..."

This description of *Pseudotrochammina* is also followed by "Remarks" which, however, will not be quoted in full because they concern the relationship between *Pseudotrochammina* and *Ammoglobigerinoides*, already discussed above in comment 1, p. 88. Nothing more is added on the position of the apertural slit; only in the "Remarks" to *Atlantiella* are they more precise, stating that in *Pseudotrochammina* it is "symmetrically placed above the umbilicus". The position of the aperture is now crucial to the *Pseudotrochammina/Atlantiella* problem. As already mentioned above, Brönnimann had examined, prior to the publication of the trochamminacean classification paper (Brönnimann *et al.*, 1983) the type material of *Pseudotrochammina triloba* Frerichs and *Trochamminella atlantica* Parker. The aperture in both was interpreted as *asymmetric* in position and for this reason *Atlantiella* was suppressed. It is clear that another independent re-examination of the type material of the two species was necessary and to this end Whittaker borrowed the relevant specimens in 1986 from the U. S. National Museum with the following results.

Pseudotrochammina triloba Frerichs, 1969

Text-figs. 1 C, D, 3.3. b-d (holotype); 3.2 b-d

- 1969 *Pseudotrochammina triloba* Frerichs, 2, pl. 1, figs. 3 a-d (holotype), pl. 2, figs. 3 a, b (paratype).
 1969 *Pseudotrochammina mexicana* Frerichs, 2, pl. 1, figs 2 a-c (holotype), pl. 2, figs. 2 a, b (paratype).
 1971 *Conotrochammina* sp. A. Echols, 146, pl. 6, figs. 4 a-c (*mexicana*-type).
 1971 *Conotrochammina* sp. B. Echols, 146, pl. 6, figs. 5 a-c (*triloba*-type).

Material

Specimens examined were the holotype of *P. triloba*, U.S.N.M. registration no. 687467 (see camera lucida drawings, text-figs. 1 C, D, herein) and the holotype of *P. mexicana* Frerichs, U.S.N.M., reg. no, 687468.

Description of holotype of *P. triloba*

Test non-lepidoid; a free trochospire consisting of 8 axially somewhat compressed, but fairly inflated, subglobular chambers arranged in almost 2 whorls with 3 + chambers in the final whorl. Outline, in umbilical/spiral view, somewhat ovoid and slightly lobate with broadly rounded periphery in edge view. Spiral side low-convex, umbilical side low-concave with a small, almost closed triangular axial depression ("umbilicus"). Intercameral sutures well defined, a little incurved in first volution, then, in final volution straight and radial both on spiral and umbilical sides. Single areal aperture an elongate slit-like opening with everted border and rounded extremities situated near base of septal face, outside of "umbilicus" and asymmetrically situated in respect to axial depression or axis of enrolment. Surface of finely agglutinated wall smooth, rich in organic mat-

ter, but nor brilliant and, in vicinity of axial depression, a few larger agglutinated elements occur. Aperture also surrounded by smaller agglutinated fragments, with everted border made up of minute fragments.

Dimensions (holotype)

Maximum umbilical/spiral diameter 620 μm , minimum diameter 500 μm , axial height 380 μm . Aperture 135 μm long, 28 μm high.

Remarks

P. mexicana is considered to be a mere variant of *P. triloba* with an extra chamber in the final whorl and, as first revising authors, we formally synonymise it with *P. triloba*. Although both species were described in the same paper (Frerichs, 1969) we regard *P. triloba* as having priority as Frerichs designated it type species of *Pseudotrochammina*. The asymmetry of the aperture in this species can be also particularly well seen in the paratypes of *P. triloba* (Frerichs, 1969, pl. 2, fig. 3 a) and *P. mexicana* (*loc. cit.*, p. 2, fig. 2 a) and in Echols' umbilical views of his *Conotrochammina* sp. A and B, which are conspecific with the present species. Based on the description above and on the various specimens placed here in synonymy with *P. triloba*, the following generic definition can be deduced for *Pseudotrochammina*:

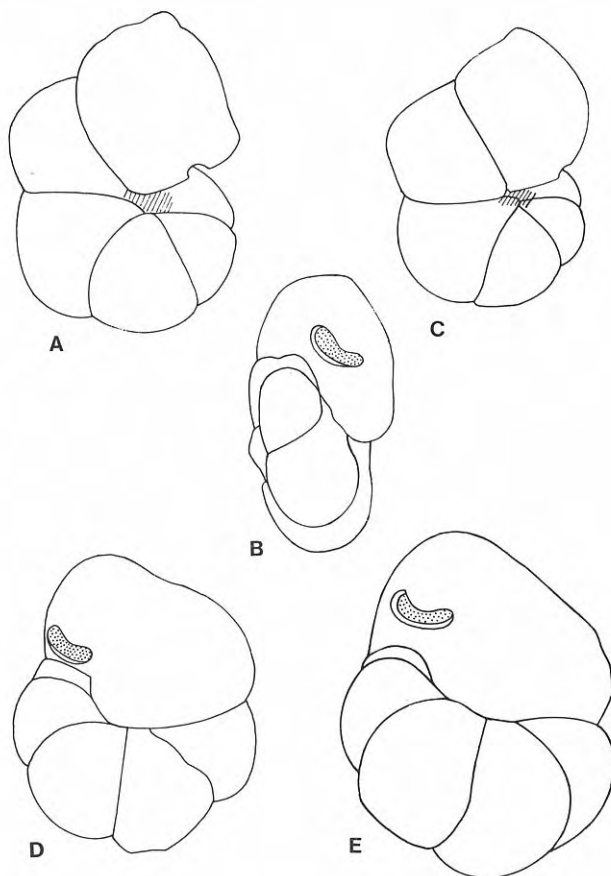


Figure 2

A, C *Pseudotrochammina atlantica* (Parker). holotype. Both figures umbilical views. A seen axially, C obliquely to the axis of enrolment. A 110 \times . C 95 \times .
B, D, E *Pseudotrochammina atlantica* (Parker). Hypotypes. B apertural, D and E umbilical views. D seen axially, E obliquely to the axis of enrolment. B, D 95 \times . E 115 \times .

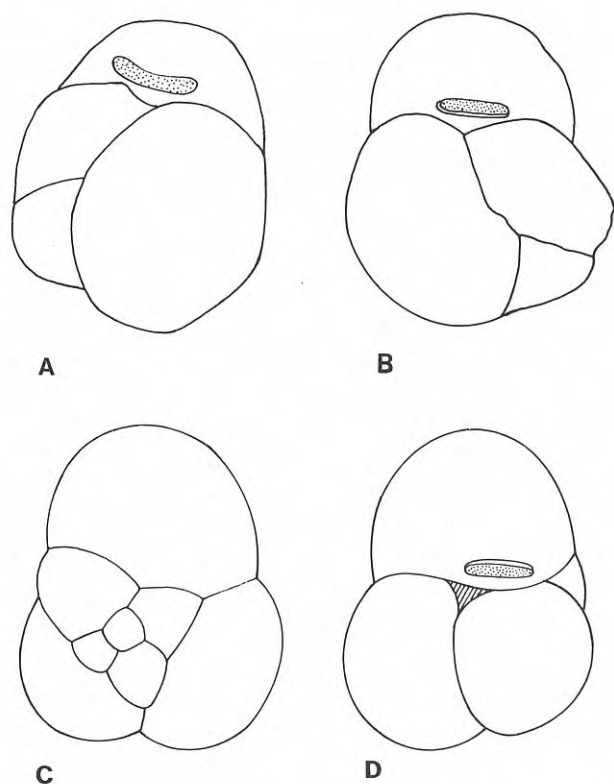


Figure 1

A, B *Ammoglobigerinoides dehiscens* Frerichs. Holotype. A spiral, B umbilical view. 40 \times .
C, D *Pseudotrochammina triloba* Frerichs. Holotype. C spiral, D umbilical view 65 \times .

Adult test free, low trochospire with fairly inflated chambers (non-lepidoid test); single areal aperture, an elongate slit with everted border and rounded extremities, on the umbilical side, close to, but outside (asymmetric) of the small axial depression ("umbilicus").

If this definition for *Pseudotrochammina* is compared with that of *Atlantiella* (based on "*Trochamminella*" *atlantica* Parker), then it is evident that they are identical in the essential points of growth form and apertural features; "*T.*" *atlantica* is therefore a *Pseudotrochammina*.

Pseudotrochammina atlantica (Parker, 1952)
Text-figs. 2 A, C (holotype), B, D, E (hypotype)

1952 *Trochamminella atlantica* Parker, 409, pl. 4, figs. 17 a, b (holotype), 18, 19 (paratypes).
1981 *Atlantiella atlantica* (Parker); Saidova, 23.

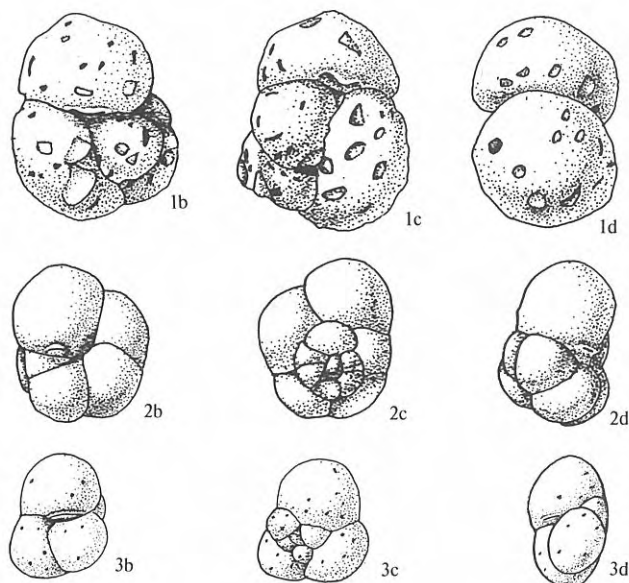


Figure 3

1b-1d *Ammoglobigerinoides dehiscens* Frerichs. Holotype. 30 ×.

2b-2d *Pseudotrochammina mexicana* Frerichs. Holotype. 60 ×.

3b-3d *Pseudotrochammina triloba* Frerichs. Holotype. 30 ×. Reproduction of Frerichs' original illustration (1969, pl.1, fig. 1b-1d, 2b-2d and 3b-3d).

Material

Specimens re-examined by Whittaker consist of the holotype of *P. atlantica* (Parker), U.S.N.M. registration no. 357670, from Melville Sound between Canada and Greenland; 6 hypotypes from U.S.N.M. slide no. 390392 from off Clavering Island, N.E. Greenland (depth 91.4-104.2 m) and 7 hypotypes from slide no 390391, lat 74°21'N, long. 16°30'W, depth 201.2 m, both ex Smith Collection. For camera lucida drawings of some of these specimens, see text-figs. 2 A-E.

The original description of *P. atlantica* has already been discussed above (p. 89). Therefore, only observations concerning the generic features of this species relating to the adult growth form and to the aperture will be added.

Holotype

Whittaker reported that the holotype is firmly glued with the spiral side to the slide, and, in view of the fragile wall it was not possible to loosen it and to turn it over or mount it in edge view. So, only the umbilical side, showing the narrow axial depression ("umbilicus") and a portion of the single areal slit-like aperture, is exposed. The slit is open, with everted border and round extremities, and is situated close to the lower margin of the septum, clearly asymmetric in respect to the axial depression

or the axis of enrolment. The final chamber is somewhat deformed peripherally by a small excrescence (see text-fig. 2 C).

Dimensions (holotype)

Maximum umbilical diameter 370 μm , minimum diameter 250 μm .

Hypotypes

The hypotypes are all very low trochospires of subcircular to oval outline, somewhat lobate, in umbilical/spiral view, and with broadly rounded periphery in edge view. The early enrolment may be almost flat spirally. In some of the specimens the adult chambers appear to be deformed. The early chambers are subglobular and the final ones, although still well inflated, are compressed in axial direction. The chambers increase only gradually in size in the course of growth. There are 5 or 6 chambers in the final whorl. The axial depression ("umbilicus") is small and closed. The single areal aperture is an elongate, open slit with everted border and rounded extremities. It is either straight or slightly incurved and situated near the lower margin of the septum, on the umbilical side, and distinctly outside of the axial depression or axis of enrolment (asymmetric) (see text-figs. 2 D, E).

Dimensions (hypotypes)

Maximum umbilical/spiral diameters range from 320 to 400 μm , axial height from 150 to 170 μm .

On the basis of Whittaker's re-examination of the holotype and hypotypes of *Trochamminella atlantica* Parker, her original species definition is confirmed in all respects. The genus definition, which was deduced from her species definition, does not need to be modified and is, as already stated, identical with that obtained for *Pseudotrochammina*.

GENERA INCLUDED IN THE SUBFAMILY TROCHAMMINELLINAE

At the time of writing, the following 3 genera are now included in the subfamily Trochamminellinae Brönnimann, Zaninetti and Whittaker, 1983:

Trochamminella Cushman, 1943, type-genus. Type-species *Trochamminella siphonifera* Cushman, 1943.

Ammoglobigerinoides Frerichs, 1969. Type-species *Ammoglobigerinoides dehiscens* Frerichs, 1969.

Pseudotrochammina Frerichs, 1969 (Junior synonym *Atlantiella* Saidova, 1981). Type-species *Pseudotrochammina triloba* Frerichs, 1969.

There are a number of new antarctic genera of the Trochamminellinae not included in this list. They will be proposed and defined in the paper by Brönnimann and Whittaker (1988, in press) on the "Discovery" material of the Heron-Allen and Earland Collection.

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