

FORAMINIFERA FROM THE CRETACEOUS OF
SOUTHERN LIMBURG, XXXII.

ON SOME AGGLUTINATED FORAMINIFERA.

by J. HOFKER

The *TEXTULARIA-FAUJASI*-series in the
Maestrichtian Tuff chalk and Paleocene
of Holland.

In the year 1861 (1862) Reuss described several species of *Textularia* from the Maestrichtian tuff chalk: *Text. conulus* Reuss, *T. globifera* and *T. faujasi* Reuss. From these three species *T. globifera* is a *Gümbelina*, possibly; *T. conulus* was described by Reuss for a species from the Pläner Mergel (Turonian) and is quite different from any species found in the Maestrichtian tuff chalk; Reuss (1860) mentions this species also from the Uppersenonian of Hilgenberg, Hamm, Edelbachgraben, Gosau. So it would seem that this species is found from the Lower Upper Cretaceous through the whole Upper Cretaceous; but this is not known from any bentonic form of Foraminifera; specimens from the Upper Cretaceous, Maestrichtian, differ from those of the Turonian, not only in minor features. There are no specimens in the Maestrichtian chalk tuff identical with the first description by Reuss, nor with his first figures. The third species, new in 1861 (1862) is *Textularia faujasi* Reuss, given by him as common in the chalk tuff. Reuss' description runs:

„Gemein. Sie ähnelt der *Text. baudouiana* d'Orb., unterscheidet sich aber leicht durch den elliptischen Querschnitt und die breit gerundeten Seitenränder. Das 1-1,22 mm lange Gehäuse ist verkehrt-keilförmig, unten zugespitzt, oben abgestützt, nicht sehr stark zusammengedrückt, mit besonders im oberen Theile breitgerundeten Rändern und ziemlich breit-elliptischem Querschnitt. Jederseits 10-12 fast quere Kammern, deren untere sehr klein, mit sehr schmalen, meist bogenförmigen Rändern; die letzten Kammern auf der oberen Fläche wenig gewölbt. Die Mündung eine enge verlängerte Spalte. Die Schalen mit sehr feinen Rauigkeiten.“

This description is suitable for the most common form of textularid species, especially those from the Lower Md, of which level Reuss apparently had most of his material.

In the year 1931 Hofker described and

figured several Textularidae from the Maestrichtian chalk tuff; he tried with an analysis of the three species described by Reuss, to identify the types found in his material, he gave a detailed study of what he believed to have been identified by Reuss as *Textularia conulus*, and believed that the three species of Reuss as found in the Maestrichtian tuff chalk were three generations of one single species. Moreover he found a larger, longer species which might be a *Gaudryina*. Hofker laid stress on the fact that two forms seemed to exist in his *Textularia conulus*, one with flattened end-chambers, the other with more inflated end-chambers.

In 1949 Hofker described more in details the form, given in 1931 as *Gaudryina* spec.; he identified that species with Reuss' *Textularia faujasi*, since Reuss' figure gives a form with more chambers than found in Hofker's *conulus*. Hofker's descriptions are much more detailed, but the determination is wrong.

In 1950 Visser mentions from the Maestrichtian tuff chalk *Textularia agglutinans* d'Orbigny. *Textularia conulus* Reuss, *Textularia* cf. *foeda* Reuss, *Textularia subconica* Franke, and *Textularia* sp.; moreover *Gaudryina laevigata* Franke and *Gaudryina rugosa* d'Orbigny.

Gaudryina rugosa d'Orbigny is a typical species from the Campanian, never refound in the Upper Maestrichtian. The figures given by Visser show a small form which has been described by Cushman (1937) as *faujasi* (Reuss). *Gaudryina laevigata* Franke is a common form from the lower Upper Cretaceous, never refound in the Maestrichtian.

Textularia agglutinans is a form which has been used for many forms, from Cretaceous to Recent; but none of the species found in the Maestrichtian tuff chalk agree with the original description by d'Orbigny. As already suggested, *Text. conulus* Reuss cannot be found in the Maestrichtian tuff chalk; so Reuss, Hofker and Visser must have been wrong in their interpretation. *Textularia foeda* Reuss has been interpreted by Cushman (1937) as a *Gaudryina*; it is found only in the Lower Upper Cretaceous both in Europe and America; it is not the species found for the first time in the Cr 4 of Holland and Belgium, and disappearing in the Lower Mb. It is the long slender form

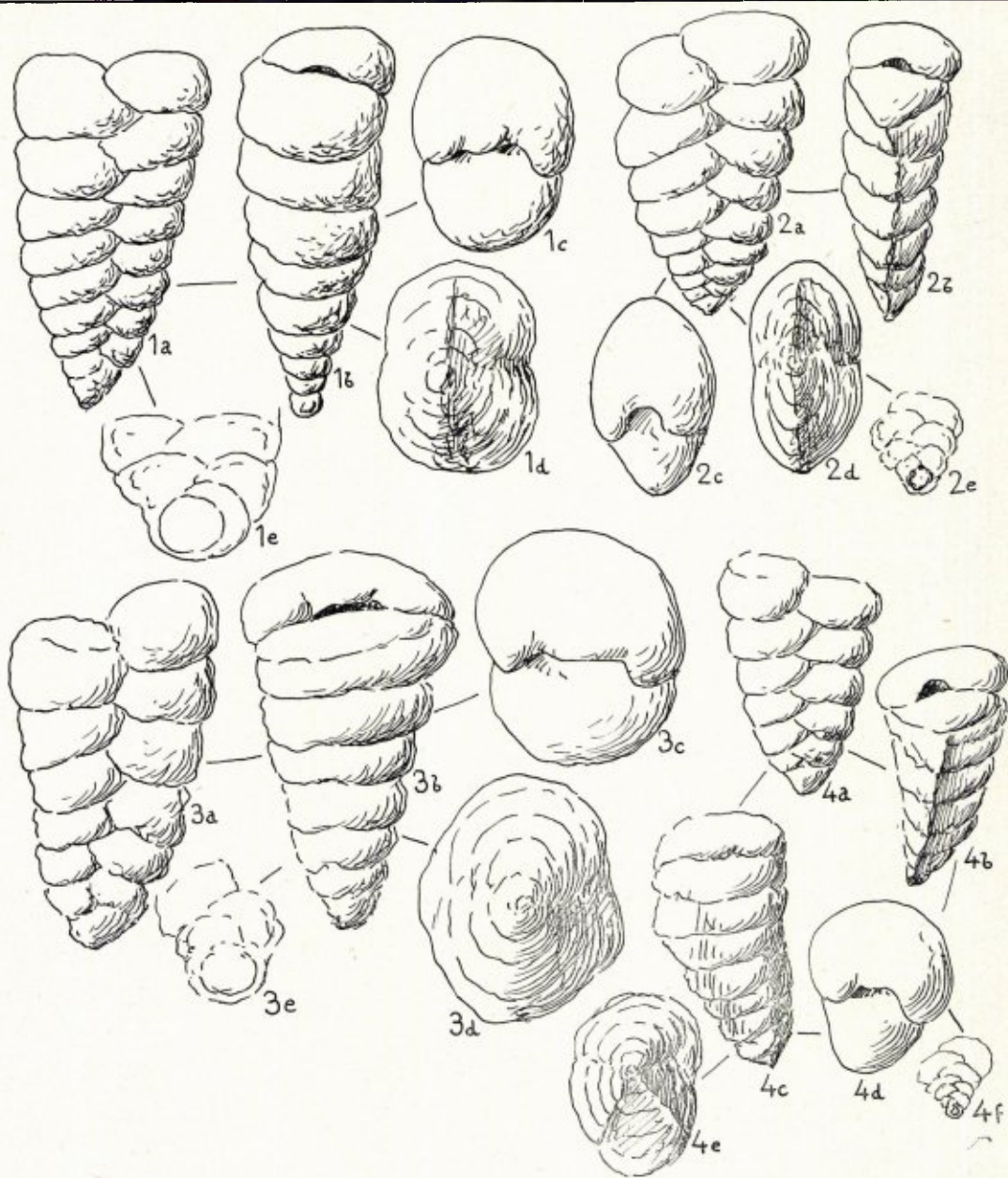


Fig. 1. *Gaudryina (Textularia) faujasi* (Reuss). Form under b, probably the A₂-generation, with rounded margin. a, broad side; b, narrow side; c, apertural face; d, initial face; all $\times 27$; e, initial part cleared up in oil, $\times 54$.

Fig. 2. *Gaudryina (Textularia) faujasi* (Reuss). Form under a, probably the A₁-generation, with acute margin. a, broad side; b, narrow side; c, apertural face; d, initial face; all $\times 27$; e, initial part cleared up in oil, $\times 54$.

Fig. 3. Same form as in Fig. 1, all indications the same.

Fig. 4. *Gaudryina (Textularia) faujasi* (Reuss). Form under c, probably the B-generation, with triangular initial part; distinctly this part shows a narrower flat side and more rounded sides. a, broad side; b, sharp narrow side; c, more flattened narrow side; d, apertural side; e, initial face; all $\times 27$; f, initial part cleared up in oil, $\times 54$.

Fig. 1—4 from a hard ground (holes) somewhat 3 m above the base of the Md in the quarry Curfs, near Houthem.

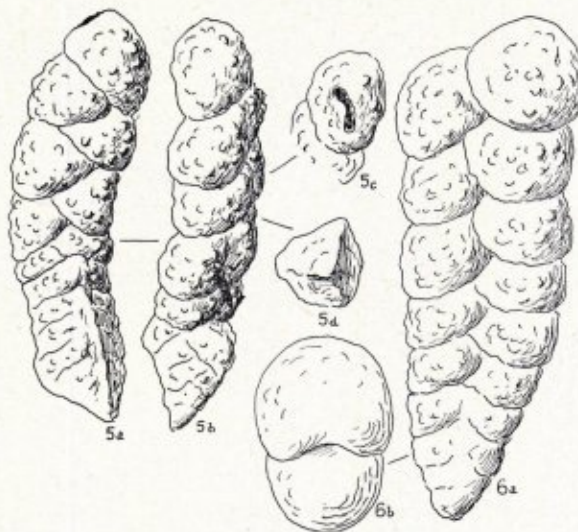


Fig. 5. *Bermudezina bentonensisformis* nov. spec. a, broad side, with the biserial part and the acute edge of the triserial part; b, narrow side of the biserial part and flat side of the triangular part; c, initial face with the areal aperture; d, initial face with the triangular pyramidal end; all $\times 40$. Specimen from a hole in the hard ground about 3 m above the base of the Md, quarry Curfs, near Houthem.

Fig. 6. *Textularia plummerae* (Lalicker). $\times 40$, from the Tuffeau de Ciply, quarry Liénard, near Ciply, South Western Belgium; a, broad side; b, apertural face.

described by Hofker as *Gaudryina* sp. in 1931 and *Text. faujasi* in the publication of 1949. It must obtain a new name, and is mentioned here as *Textularia agglutissima* Hofker. (Natuurhist. Maandbl. 1957, p. 149).

Textularia subconica Franke in the publication of Visser is a form with rounded periphery and flattened end-chambers, not uncommon in the material, especially in the Lower Md; the conical form, as described by Franke must be a form of *Marssonella oxyconica*, not uncommon in the Maestrichtian, but not at all identical with the *Textularia trochus* of Brady, as given by Franke. In any case, that name cannot be applied for a form with sharp angles, and so the determination by Visser is a wrong one.

So Visser's Monograph does not help us out of the difficulty. Her *Gaudryina laevigata* Franke is not the species of Franke, but is unknown to the author from the numerous samples from Mc-Md studied.

When we consider the species with biserial end-stage of the Lower Md, the level in which such species are most abundant, we find at least three forms.

a. A form beginning with a single proloculus, directly followed by the biserial arrangement of chambers. The periphery is somewhat lobulated especially at the apertural end, and the sutures much depressed, distinct. The periphery sharp, not rounded. The apertural face elongate, more or less oval, and the aperture a crescent-shaped slit at the suture. Wall finely agglutinate. Length 1,2—1,5 mm, greatest breadth at the apertural end 0,8—1,0 mm; thickness 0,5—0,6 mm. (Fig. 2).

b. A form beginning with a single proloculus, directly followed by the biserial arrangement of the chambers. Test not so triangular in shape as the forgoing species, last-formed part with nearly parallel sides. Periphery slightly lobulated, sutures distinct and depressed. Periphery rounded so that transverse section may even be nearly circular. Apertural face nearly circular, aperture a narrow crescent at the suture. Wall finely agglutinate. Proloculus often very large and then clearly distinguishable from the test itself. Last chambers somewhat more inflated. Length about 2 mm, largest breadth at the apertural end about 1 mm, thickness 0,75—1 mm. (Fig. 1, 3).

c. A form which begins with a triserial stage, or at least with a initial part which distinctly shows a triangular transverse section. This section is very peculiar, since it shows a flattened side, whereas at the opposite side the periphery is strongly rounded. Most specimens slightly twisted or curved, with the flattened side in the curve. The arrangement of the biserial chambers is not different from that of the other two forms described. The sutures are distinctly depressed. The apertural face shows a strongly rounded side and a more flattened side, as if the whole test has been attached with this flattened side. The aperture is a distinct crescent. The walls are finely agglutinate. Length about 0,8—1 mm; largest breadth at the apertural end 0,6—0,7 mm; thickness up to 0,4—0,7 mm. (Fig. 4).

The latter species seems to have been described and figured by Cushman as *Gaudryina faujasi* (Reuss). (1937, 39, pl. 5, 17—20). Species a) is the one, mentioned by

Visser as *T. subconica*; species b) is her *T. conulus*, and *T. faujasi* of the description of Reuss (1862). To the author it seems that these species form a single one, with three distinct generations, from which b) seems to be the A_2 -form. The *Gaudryina*-like form may be the micropheric one. In any case it must be named *Textularia* or *Gaudryina faujasi* (Reuss), since it is the most common form. Reuss' other two mentioned names probably from Lower Md are, as already stated, quite different forms.

There are several other species in the Maestrichtian tuff chalk with biserial end-stage and agglutination. There is „*Dorothia pupa* (Reuss)“ with very fine whitish agglutination in the Cr 4, and the Lower Mb; it is identical with *Dorothia bulletta* (Carsey) from the Navarro. Then there is the elongate species with rough agglutination, *Textularia agglutissima* Hofker, found in the Cr 4 and Lower Mb also; there is *Marssonella oxycona* (Reuss) in a form which slightly differs from the typical form of the Campanian and Lower Maestrichtian, and may be identical or closely allied to *Marssonella indentata* (Cushman and Jarvis) from the Velasco; it occurs in the Cr 4 and Lower Mb. Then there is a typical *Spiroplectamina* with a short series of coiled initial chambers and very sharp angles; the species seems to be identical with that described by Brotzen (1948) as *Spiroplectamina laevis* (Roemer). It might be allied to *Sp. jarvisi* (Cushman) from the Lizard Springs Formation.

All these forms seem to have a limited range in the Maestrichtian tuff chalk; they here can be used as time-markers.

Gaudryina faujasi also is found in the layers above the Md, viz., when present, in the Lower Paleocene, and in the Tuffeau de Ciply. In the Calcaire de Mons (marine Montian) it seems to extinguish though it is found here also; in the Lower Paleocene a second species appears which seems to be a *Textularia* throughout in all its generations, with a much more slender shape: *Textularia plummerae* (Lalicker) (Fig. 6), also known from the Paleocene of the Gulf Coastal Region of America. It was found in the Tuffeau de Ciply and the tropical Calcaire de Mons near Mons, Belgium, and in the similar formations in Southern Limburg (drill-

holes of Bunde, drill-holes and mine-shafts around Geleen, etc.).

There is a possibility that *Textularia midwayana* Lalicker is identical with *Textularia (Gaudryina) faujasi* (Reuss), as formed in the Lower Paleocene.

In the Lower Mb, in a very restricted zone, numerous specimens of *Gaudryina supracretacea* Hofker occur; it also is found, but more rarely, in the Cr 4; it never occurs in the Mc or Md. Since it is common in the uppermost layers of the Hemmoor-Basbeck Cretaceous in Germany, as well as in the *Pseudotextularia* zone in Maasbühl I and in Denmark, it seems to be a typical marker for this uppermost Maestrichtian. It may be closely allied to *Gaudryina soldadoensis* Cushman and Renz from the Soldado-Formation of Trinidad, and also is found in the Danian of Denmark.

When the supposition of three generations in *Gaudryina faujasi* is right, this would suggest that several forms of what has been called *Textularia* derived from *Gaudryina*, since the B-generation in many known cases maintains as even possible the more primitive form. That has been already suggested by several authors. This supposition is stressed by the fact that in the Mb, where the species seems to begin, at least in Holland and Belgium, only two generations occur, the *Gaudryina*-generation and the *Textularia*-generation with acute margin, the A_1 -generation; in the Mc and Md up to into the Me, all three generations are found commonly, and the A_2 -generation, the *Textularia*-form with rounded margin, more and more dominates; in the Lower Paleocene and the Montian up into the Calcaire de Mons (where the species becomes more and more rare) the A_2 -generation is the only generation found, so that here the species has become a real *Textularia* (and is apogamic before extinction).

Quite similar changes in the reproduction-scheme have been stated in several other Foraminifera already, as in *Bolivina incrassata* (Hofker, 1957 b, p. 242, fig. 302).

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BERMUDEZINA BENTONENSIFORMIS
nov. spec. (Fig. 5).

In some samples of the Lower Md, and furthermore rarely in the whole Md, a small *Gaudryina*-like species was detected with characters which very much resemble those of *Gaudryina bentonensis* (Carman) but differs by the terminal aperture in full-grown specimens and also resembles *Bermudezina* but for the aperture which is not protruding into a short neck and not rounded but elongate. Yet the author believes that this remarkable species forms one of the oldest species of *Bermudezina*.

Description. Test 0,48—1,45 mm, consisting in a distinct triangular part and an elongate biserial one. Sutures of the triangular part indistinct, those of the biserial part depressed. Biserial part never broader than the triangular one. Test finely agglutinate, somewhat rough. End-chamber with terminal aperture, transversely placed in the direction of the biseriality of the test, a narrow slit, in some cases with a very slight lip. Breadth of test in the largest specimens 0,37 mm, thickness of test 0,27 mm. The triangular part at its apertural end slightly broader than the biserial part.

The species has been figured by Visser (A. M. Visser, Leidse Geol. Med., vol. 16, p. 220, pl. 1, fig. 9) as *Plectina ruthenica* (Reuss). She mentions it from the Ma into the Md. But the specimens in the Ma and the Mb, resembling outwardly the species described here, in reality are *Orbignyna frankei* (Brotzen); the specimen figured by Visser was found in the Lower Md, and the biserial arrangement of the chambers, together with its triangular initial part in the figure, is

nothing but the new species mentioned here. *Plectina* does not have a triangular part, and *Orbignyna* does not have a biserial part. Moreover *Plectina ruthenica* is found only in the Campanian.

The new species has also been figured by Cushman (1937 Lab. for For. Res., spec. Publ. 7, pl. 6, fig. 21) under the name of *Gaudryina bentonensis* (Carman) from the Benton, Upper Cretaceous(?) of Wyoming. The terminal slit-like aperture, not mentioned in the description of *G. bentonensis*, is clearly figured in his fig. 21b.

Identical specimens were described by Cushman and Renz from the Lizard Springs Formation of Trinidad (Cushman Lab. For. Res., spec. Publ. 18, 1946) as *Gaudryina bentonensis* (Carman) p. 21, pl. 2, fig. 19. The Lizard Springs Formation contains many species which are also found in the M-complex of Southern Limburg (several Agglutinantia, many Lagenidae, *Bulimina stokesi*, several Gyroidinoides, *Allomorphina halli*, many pelagic forms, several Gavelinellidae). The Lizard Springs formation nowadays is considered to be of Dano-Paleocene age.

BOEKBESPREKING.

Libellentabel door Jan Beukema. Uitgave van de Nederl. Jeudbond voor Natuurstudie. Uitgeverij N.J.N., Ambonstraat 1 B, Groningen, 1957.

De uitgeverij van de N.J.N. is wel zeer actief. Na de vele reeds verschenen tabellen over verschillende onderwerpen verschijnt nu de derde druk van de *Libellentabel*. In vergelijking met de vorige druk, die door Kees Lems werd verzorgd, zijn vele wijzingen aangebracht. Ik kan ze niet allemaal opnoemen. Zo zijn er meer kenmerken voor de geslachten en soorten opgenomen om de betrouwbaarheid van de determinaties te verhogen. Het aantal figuren is bijna verdubbeld en vele figuren zijn verduidelijkt.

Voor beginners is het prettig, dat een afzonderlijk hoofdstuk is gewijd aan de beschrijving van de uitwendige kenmerken. Men is dan direct thuis in de terminologie. Het hoofdstuk over het leven van de libellen is herschreven. Wij kunnen de jeugdige biologen van harte gelukwensen met deze uitgave.

K.

Gallenboek door Prof. Dr. W. M. Docters van Leeuwen. Tweede druk, 1957.

Dit werk is eveneens een uitgave van het zeer actieve bestuur van de K.N.N.V., die dit werk met