

FORAMINIFERA FROM THE CRETACEOUS OF  
SOUTH-LIMBURG, NETHERLANDS XLVII.BULIMINAE OF THE MAESTRICHTIAN  
TUFF CHALK.

J. HOFKER

In his paper: „Foraminiferen der Oberkreide van Nordwestdeutschland und Holland" (Geol. Jahrb., Beih. 27, 1957) the author proved that many species of the genera *Praebulimina* (*Buliminella* does not occur in the Cretaceous) form good guide fossils for the stages of the Upper Cretaceous. All species studied from Cenomanian till Upper Maestrichtian proved to belong to the genus *Praebulimina*, with four chambers in a whorl. So even another striking thing was found for the North Western European area: the genus *Bulimina* (with three chambers in a whorl) does not exist in the Upper Cretaceous as well. (See for appearance of the species the diagram l.c. fig. 335, p. 270). The author found following appearances for species of *Praebulimina*, also occurring in the Gulpen Chalk.

*P. carseyae*, Lower Campanian-Maestrichtian;  
*P. cushmani*, Upper Campanian;  
*P. kickapooensis*, Maestrichtian;  
*P. laevis*, Maestrichtian;  
*P. parvula*, Maestrichtian;  
*P. rosenkrantzi*, Maestrichtian.

Visser (1950, Monograph on the Foraminifera of the type-locality of the Maestrichtian, Leidse Geol. Meded., vol. 16), mentions from the Maestrichtian Tuff Chalk following species:

*Bulimina intermedia* Reuss, known from Turoonian;  
*Bulimina parva* Franke, known from Campanian;  
*Bulimina reussi* Morrow, from Coniacian — Upper Campanian;  
*Bulimina stokesi* Cushman and Renz, known from Paleocene;

thus suggesting that several species, known from the Upper Cretaceous, also occur in the Maestrichtian Tuff Chalk. The author studied the preparations of the types of Visser's. He found:

*Bulimina intermedia* Reuss of Visser is *Praebulimina carseyae*, and only is found in the lowest Mb, very probably reworked from the Cr. 4, where it is common.

*Bulimina parva* Franke of Visser also is *Praebulimina carseyae*, only found in the lowest Mb, see above. The specimen prepared, however, was found in the Mc of Burgerwacht.

*Bulimina reussi* Morrow of Visser is *Bulimina stokesi* without any doubt.

*Bulimina stokesi* in reality is that species.

Moreover, several of the specimens in the preparations of Visser, labelled as *Bulimina reussi*, in reality are the first stages of development of *Arenobulimina cuskleyae* Jennings; this also is the case for two species mentioned by Visser as

*Buliminella imbricata* (Reuss);  
*Buliminella obtusa* (d'Orbigny).

for both preparations contain specimens of *A. cuskleyae* which is found during the whole Maestrichtian Tuff Chalk in a striking sequence of development. They are arenaceous forms, and thus do not belong to *Buliminella*.

So, none but one of the species, described by Visser as belonging to the Tuff Chalk fauna in reality are the species, she mentioned from that formation.

The only species mentioned by Visser from the Maestrichtian Tuff Chalk and approved by the author is *Bulimina stokesi*, a real *Bulimina*, abundant in the Mc and Md; Visser gives it from Md, and points to its occurrence in the „Upper Cretaceous" of Trinidad; it was described by Cushman and Renz from the Lizard Springs Formation of Trinidad, and nowadays we know for certain, that formation is Paleocene, and at its top Eocene.

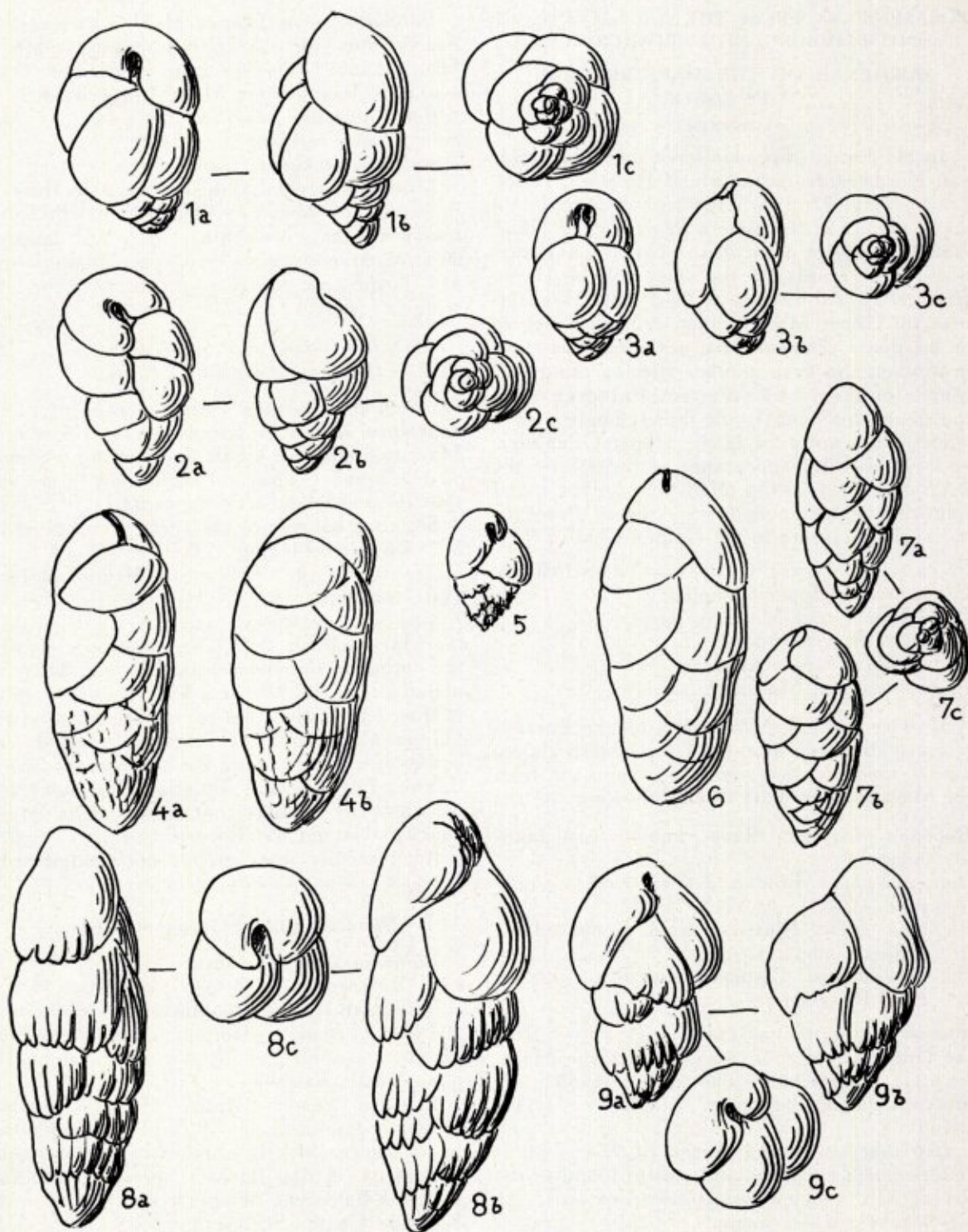
But there are other species, not mentioned by Visser. I will review them here.

*Bulimina stokesi* Cushman et Renz.

*Bulimina stokesi* Cushman et Renz, 1946, C. L. F. R., spec. publ. 18, p. 37, pl. 6, fig. 14.

The small species is characterised by the high last formed chambers, forming at about one third of the test, and the distinct ridges along the more initial chambers.

It occurs from the Upper Mb on, is common in many samples of the Mc, and often abundant in the Lower Md. It is typical in quite similar specimens in the Lizard Springs formation, which is Paleocene of age; it also occurs in the Kunrade Chalk (Schunck).



*Bulimina microcostata* Cushman et Parker.

*Bulimina microcostata* Cushman et Parker, C. L. F. R., vol. 22, vol. 1936, p. 39, pl. 7, fig. 2.

Another relatively small, and slender species, with the last formed chambers forming about a third of the test. The chambers are very slightly inflated, the sutures distinct. The wall of the lower part of the test with very fine longitudinal costae, the upper part smooth.

This species is known from the Paleocene and Eocene, and occurs rarely in the uppermost Cr 4, rarely in the Mc and Md, and in the Kunrade Chalk.

*Bulimina navarroensis* Cushman et Parker.

*Bulimina reussi* var. *navarroensis* Cushman et Parker, C. L. F. R., vol. 11, p. 100, pl. 15, fig. 11.

A small *Bulimina*, but often in the earlier whorls with 4 chambers, forming thus a transition to *Praebulimina*, with only slightly inflated chambers and smooth surface.

This species is known from the Navarro and the Lizard Springs formation of Trinidad. It often is common in the Kunrade Chalk and the Mc—Md, was also found in the uppermost Mb. It may be identical with *Bulimina* (*Praebulimina*) *parvula* Brotzen.

*Bulimina midwayensis* Cushman et Parker.

*Bulimina arkadelphiana* Cushman et Parker var. *midwayensis*, C. L. F. R., vol. 12, p. 42, pl. 7, figs. 9, 10.

Fig. 1. *Praebulimina parvula* (Brotzen), or *P. navarroensis* (Cushman et Parker). Mc, Neercanne.  $\times 64$ .

Fig. 2. *Praebulimina carseyae* (Plummer). Lower Md, quarry Curfs, Houthem.  $\times 64$ .

Fig. 3. *Bulimina navarroensis* Cushman et Parker. Upper Md, quarry Curfs, Houthem.  $\times 64$ .

Fig. 4. *Bulimina aspero-aculeata* Brotzen. Sample Hofker 195, Gerendal, Lower Mb.  $\times 64$ .

Fig. 5. *Bulimina midwayensis* Cushman et Parker. Sample Hofker 68, way Rooth- Cadier, Mb.  $\times 64$ .

Fig. 6. *Praebulimina quadrata* (Plummer). Sample Hofker 709, Blankenberg, Lower Mb.  $\times 64$ .

Fig. 7. *Bulimina paleocenica* Brotzen. Mine Oranje Nassau I, G. B. 23, pile 4,700 m W. of shaft I. Kunrade Chalk,  $\times 136$ .

Fig. 8. *Bulimina microcostata* Cushman et Parker. Mine shaft Maurits III, depth 218 m. Kunrade Chalk.  $\times 64$ .

Fig. 9. *Bulimina stokesi* Cushman et Renz. Quarry Curfs, hollow in hard ground 3 m above base of quarry. Lower Md.  $\times 136$ .

The small test somewhat resembles *B. stokesi*, but at the initial side of most of the chambers distinct short spines are formed.

The species occurs from the Upper Mb on, and often is more common in the Upper Md. It is known from the *Pseudotextularia*-zone, but also from the Midway Formation and the Lizard Springs Formation of Trinidad. It is common in the Lower Paleocene above the Tuff Chalk, and was mentioned from the same level in Sweden by Brotzen.

*Praebulimina quadrata* (Plummer)

*Bulimina* (*Ellipsobulimina*) *quadrata* Plummer, Texas Univ. Bull., 1927, No. 2644, p. 72, pl. 4, fig. 4, 5.

*Praebulimina quadrata* (Plummer), Hofker, 1957, Natuurhist. Maandbl., No. 46, p. 101—103, figures.

I described this species, which only occurs in the Schaesberg Chalk, lower part of the Mb, commonly. Many specimens show the areal end-aperture typical for this species.

It is known from the Paleocene of Texas and Alabama where it forms one of the guide-fossils.

*Bulimina* (*Reussella*) *paleocenica* Brotzen.

*Bulimina* (*Reussella*) *paleocenica* Brotzen, 1948, Sver. geol. Unders. C, 493, p. 61.

The small species is triangular in transverse section (*Reussella*), with rounded edges.

According to Brotzen this species occurs in the uppermost Danian and the Lower Paleocene of Sweden. It is not seldom found in the Kunrade Chalk.

*Reussella paleocenica* in quite similar specimens have been described by the author already from the Upper Maestrichtian of Basbeck (Geol. Jahrb., Beiheft 27, 1957, p. 211). But the specimens from the Kunrade Chalk, also found in the Md, are more alike the specimens described by Brotzen.

*Bulimina* spec.

A small, elongate *Bulimina* was found in the upper Mb of Ransdaal. The last formed chambers are elongate, forming a larger part of the test. Such specimens may point to *Bulimina thanetensis* Cushman et Parker, as described by Haynes (Contr. Cushman Found., vol. 5, 1954, p. 186).

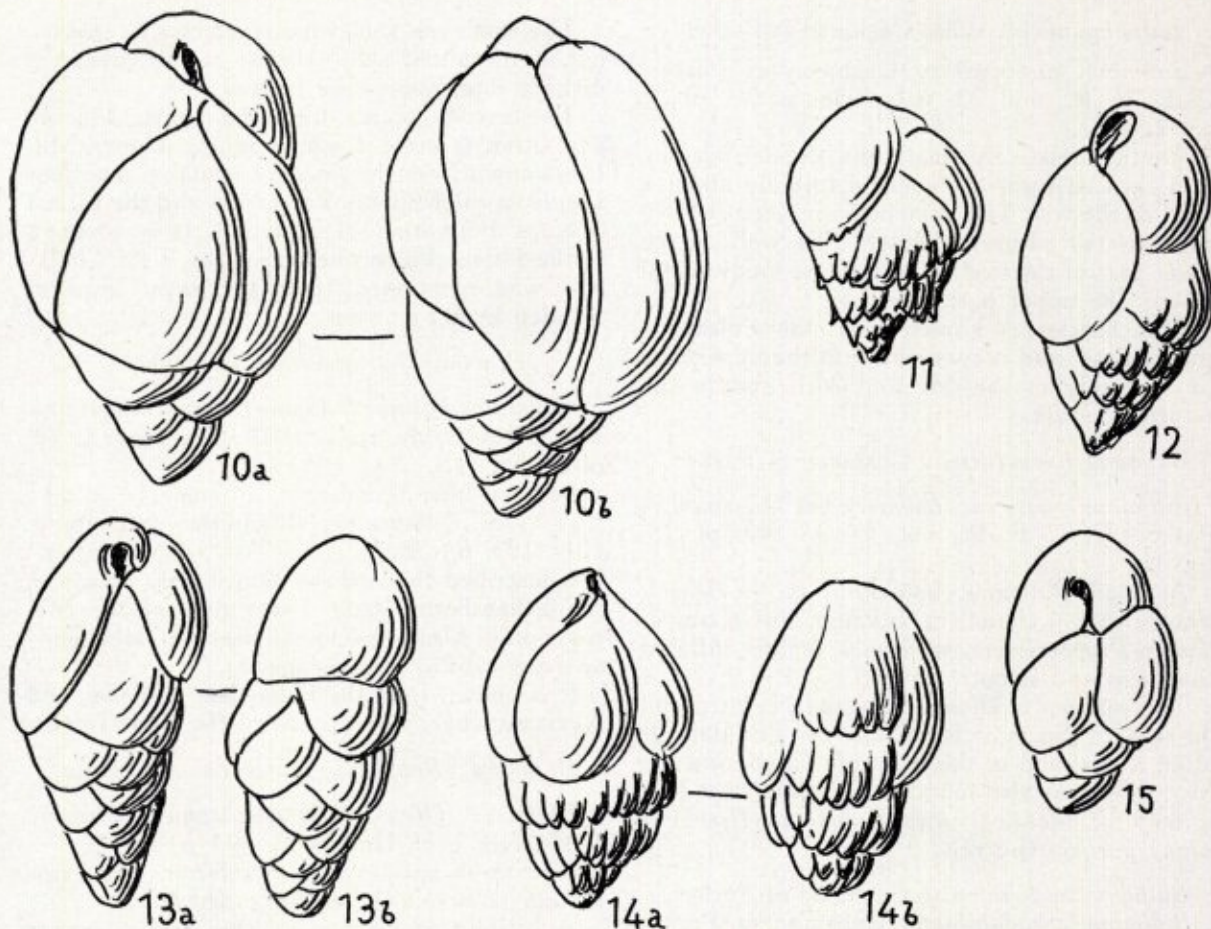


Fig. 10. *Praebulimina carseyae* (Plummer), Canal Albert, sample Calembert, B 24. Mc.  $\times 136$ .

Fig. 11. *Bulimina midwayensis* Cushman et Parker. Canal Albert, sample Calembert, B 18, Mc.  $\times 136$ .

Fig. 12. *Bulimina stokesi* Cushman et Renz. Canal Albert, sample Calembert, B 18, Mc.  $\times 136$ .

Fig. 13. *Bulimina* spec. Hollow flints at Karstraat, Ransdaal, Upper Mb.  $\times 136$ .

Fig. 14. *Bulimina stokesi* Cushman et Renz. Same sample, Upper Mb.  $\times 136$ .

*Bulimina aspero-aculeata* Brotzen.

*Bulimina aspero-aculeata* Brotzen, 1948, Sver. geol. Unders., 1948, p. 60.

Specimens which strongly point to Brotzen's species with its smooth sutures, parallel sides, seldom with initial spine, and fine longitudinal costae on the initial part, are common in the Lower Mb.

The species as described by Brotzen is found in the Paleocene of Sweden. But in several samples from Danish Danian, and also in samples from the highest Cr 4 in Holland, similar specimens occur.

When we look over these *Buliminae*, found in the Maestrichtian Tuff Chalk and the Kunrade Chalk, we met with the striking fact, that some of them also occur in the Lizard Springs Formation of Trinidad which, according to recent investigations (U.S. Nat. Mus., Bull. 215, 1957, p. 61—69), belongs to Paleocene age (though, according to Renz (Contr. Cushman Found., 1951, vol. 2, p. 15) *Orbignyana*, a Rudist, is found in that formation, just as in the Maestrichtian Tuff Chalk); or, they are found in the Paleocene of Sweden or in the Danian. Only one species, *Praebulimina carseyae*, also is known from the Maestrichtian; but these spe-

cimens always are rare, and only occur in the transgressional layers (hard grounds).

This result strongly points to a post-Cretaceous or Danian age of the Maestrichtian Tuff Chalk and its equivalent, the Kunrade Chalk, the more, since also many other groups of Foraminifera point in that direction. The list of *Buliminae*, as given by Visser, 1950, would point to quite different Cretaceous levels, from Santonian to Maestrichtian in the international sense.

## ADVENTIEVEN LANGS DE MAAS IN LIMBURG II

door

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In ons eerste artikel over dit onderwerp (Natuurhist. Maandbl. 47, no. 5-6, 1958, p. 67-70) beschreven wij, hoe door de lage waterstand van de Maas in het jaar 1955 de gelegenheid voor vele adventieven gunstig was, zich, zij het dan ook voor de meeste slechts tijdelijk, te vestigen op de droog gevallen plaatsen in grintgroeven, op zandige strandjes en tussen de rolstenen van grintbanken langs deze rivier. Aangemoedigd door de vele interessante vondsten, die wij in dat jaar deden, hebben wij daarna ieder jaar opnieuw de ons bekende plaatsen aan de oevers van de Maas bezocht, maar de jaren 1956, '57 en '58 stelden ons teleur. In deze drie zomers was de waterstand zo hoog, dat de adventieven geen gunstige plaatsen vonden om zich te ontwikkelen, zodat we slechts hier en daar een kleine aanvulling konden vinden op het grote assortiment, dat het jaar 1955 ons bracht (zie Natuurhist. Maandbl. 48, no. 7-8, 1959, p. 89).

Het voorjaar van 1959 was echter voor de ontwikkeling van adventieven zo gunstig, dat op 19 juni van dit jaar de eerste van ons, samen met de heer J. H. Kern, met hoog gespannen verwachtingen weer de tocht naar de Maasoevers ondernam. Wel was het mooiste terrein van 1955, de grintgroeve tussen Obbicht en Grevenbicht intussen, zoals wij reeds in 1958 schreven, door diep baggeren en afsluiting van de Maas verloren gegaan, maar de strandjes en grintbanken bij Meers leverden weer vele belangwekkende soorten op, terwijl op 20 juni een nieuw adventiefterrein, nl. een verlaten grintgroeve aan de Maas ten N. van Itteren

ontdekt werd, dat zeker niet onderdeel voor de grintgroeven tussen Obbicht en Grevenbicht in hun goede tijd.

De droogte en daarmee de lage stand van de Maas bleven zoals bekend de hele zomer en het najaar aanhouden, en het was daarom, dat wij in de eerste dagen van september nogmaals, nu met ons drieën (de schrijvers en de heer Kern) ons geluk gingen beproeven. Een kleine teleurstelling wachtte ons in zoverre, dat de strandjes en rolsteenbanken zodanig door de droogte hadden geleden, dat zich daar nog slechts enkele adventieven hadden kunnen handhaven. Het verlies werd echter ruimschoots gecompenseerd door de ontwikkeling van de flora in de diepe gaten in de grintgroeve te Itteren; de bodem was daar vochtig gebleven en de prachtige zomer had allerlei planten, zelfs soorten uit de subtropen, de kans gegeven om zich volledig te ontwikkelen. Het was soms moeilijk te geloven, dat we hier aan de oever van een Nederlandse rivier stonden.

In 1955 vonden wij overwegend planten uit het gebied van de Middellandse Zee; dit jaar was een deel van de adventiefflora afkomstig uit geheel andere gebieden, n.l. Australië en Zuid-Afrika. Dit bevestigde het vermoeden, reeds in ons eerste artikel uitgesproken, dat deze planten van de wolverwerkende industrieën hongerop aan de Maas of zijn zijrivieren, met name aan de Vesdre, afkomstig waren, want behalve het Middellandse Zeegebied leveren Australië en Zuid-Afrika een groot deel van de wol voor deze industrieën.

Om hierover zekerheid te krijgen hebben wij in gezelschap van Dr. A. Lawalrée van het Herbarium van de Rijksplantentuin te Brussel en de heer L. Renard uit Verviers op 19 en 20 september gebotaniseerd aan de oevers van de Vesdre in de omgeving van laatstgenoemde stad. Hierbij bleek ons, dat de overeenkomst van de woladventiefflora aan de Vesdre met de adventiefflora, die wij aan de Maas aantroffen, zeer groot is; zo groot, dat wij er niet meer in het minst aan twijfelen, dat een belangrijk deel van de door ons aan de Maas gevonden adventiefplanten afkomstig is van zaden en vruchten, die met afval van de wolfabrieken in het Vesdredal in deze rivier terechtkomen, en zo hun weg vinden naar de Nederlandse Maasoevers.

Op doorreis naar België hebben wij op 18 september ten derden male een bezoek gebracht