

FORAMINIFERA FROM THE CRETACEOUS OF
LIMBURG, NETHERLANDS. XXXIII.ON SOME OTHER FORAMINIFERA FROM THE
MAESTRICHTIAN TUFF CHALK SHOWING EVIDENCE OF TERTIARY AGE OF THAT SEDIMENT.

by J. HOFKER

I. *GLOBIGERINA COMPRESSA*
Plummer.

Globigerina compressa Plummer has been described by Plummer from the Midway Formation of Alabama (University of Texas Bulletin, 2644, 1926, p. 135, pl. 8, fig. 11). She stresses the attention to the fact that no similar specimens are found in the Cretaceous underneath. The author could study topotypic specimens collected by Plummer (Midway, Tehuacana, Station 174-T-27). These specimens (fig. 1) fully agree with the original description by Plummer. Later investigators have, according to the compressed structure of the test, ranged this species in the genus *Globorotalia*, where, however, it does not belong. For real *Globorotalia* (genotype *Globorotalia tumida* (Brady)) have a compressed test, always provided with a typical poreless margin of the test. In all those cases in which that poreless margin is lacking, there is no case of *Globorotalia* (see Hofker, the structure of *Globorotalia*; Micropaleontology, 1956, p. 371—373, fig. 1—7). Careful study of topotypes of *Globigerina compressa* Plummer revealed that in this species the somewhat acute margin is covered with the fine pores found over the whole test, and that no poreless rim exists. So, the species cannot belong to the genus *Globorotalia*.

Totally identical specimens of *Globigerina compressa* Plummer were detected in hollow flints found in situ in the Upper Mb-layers underneath the typical Kunrade Chalk in the quarry Schunck near Kunrade, and in quite similar layers at the top of the Upper Mb in an outcrop at Ransdaal. The whole fauna of both localities is that found in the uppermost layers of the Mb in the Maestrichtian area (ENCI-quarry); only the amount of spongespicules in the area of Kunrade and Ransdaal is much larger than in the vicinity of Maestricht (sponges-facies of the Mb). Since above that same facies of the Mb in the quarry Schaesberg typical Mc is found, there is no question as to

the stratigraphic place of the formation: it is Upper Mb.

All over the world the appearance of real *Globigerina compressa* Plummer is considered as evidence for the Paleocene age of the sediment; even in a very recent publication, Loeblich and Tappan (Journal of Paleontology) 1957, pp. 1109-1137) distinguish a *compressa*-zone of the lower Paleocene of Amerika and elsewhere. Yet, the species is found in the Upper Mb of the Maestrichtian Chalk Tuff, as fig. 2 proves without any doubt.

2. *Pulsiphonina prima* (Plummer). Plummer described this small early form of the *Siphonina*-group from the Midway Formation of Alabama (fig. 3). Since then, this very typical species was found all over the world in sediments indicated as Paleocene or Danian. The author found typical specimens in the Danian of Denmark, in the fillings of the Poulingue de la Malogne below the Tuffeau de Ciply near Mons in Belgium, and a similar species has been described by Brotzen (1948, Sver. geol. Undersökning, p. 107, pl. 17, fig. 4) under the name of *Pulsiphonina elegans*; the author believes that it is identical with Plummer's form or only a local variety of it.

This species *Pulsiphonina prima* begins to appear in the uppermost Md of the Maestrichtian Tuff Chalk, is common in the Me (Fig. 4) and abundant in the Lower Paleocene, overlying this Me. Yet, the species is considered by many authors as typical for the Paleocene only.

3. *Gavelinopsis acuta* (Plummer). This species, described by Plummer as *Anomalina ammonoides* (Reuss) var. *acuta*, also from the Midway Formation of Alabama, could be studied by the author from the sample mentioned above in fine topotypic specimens (Fig. 5). The species without any doubt belongs to the genus *Gavelinopsis*, as sections revealed. The test is rounded, with about 12—15 chambers in the last formed whorl, with sub-acute margin, a distinct hyaline chalk knob covering the dorsal centre, a distinct flattened chalk bud filling the ventral umbilical hollow, surrounded by strongly built tena of the chambers which in older chambers have the shape of chalk knobs. Pores are found only at the ventral side. The species is considered all over the world as typical for Paleocene age, and Brotzen (1948) described it also from the Paleocene of Sweden.

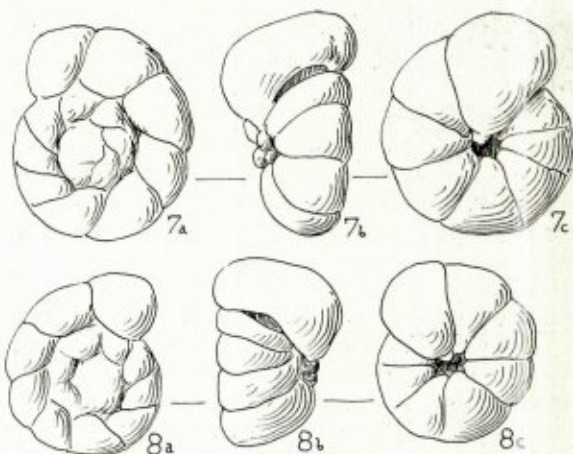
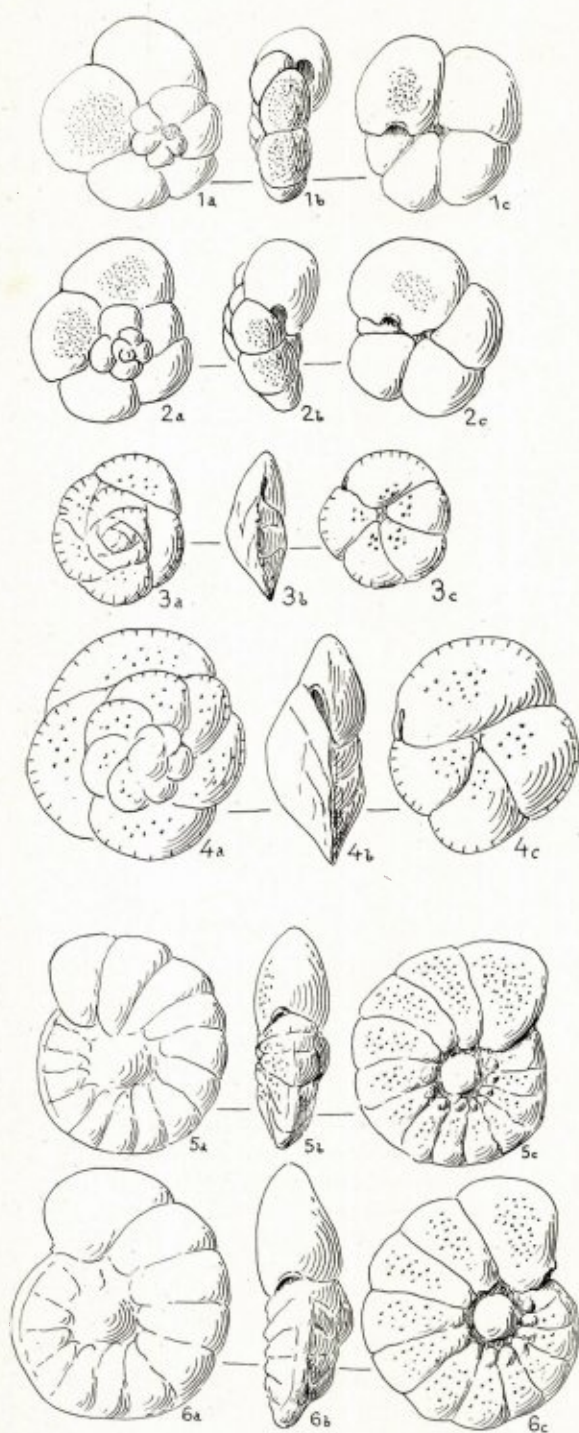


Fig. 1. *Globigerina compressa* Plummer. $\times 85$. Plummer Station 174—T—27, Midway-Formation, Tehuacana, Alabama. a, dorsal side; b, apertural face; c, ventral side.

Fig. 2. *Globigerina compressa* Plummer. $\times 85$. Sample K 39, Ransdaal, Karstraat, in hollow flints. Sponges-facies of the Upper Mb. Same indications.

Fig. 3. *Pulsiphonina prima* (Plummer). $\times 85$. Plummer Station 174—T—27, Midway-Formation, Tehuacana, Alabama. a, dorsal side; b, apertural face; c, ventral side.

Fig. 4. *Pulsiphonina prima* (Plummer). $\times 85$. Sample 739 A, quarry Curfs, Me. a, dorsal side; b, apertural face; c, ventral side.

Fig. 5. *Gavelinopsis acuta* (Plummer). $\times 70$. Plummer Station 174—T—27, Midway-Formation, Tehuacana, Alabama. a, dorsal side; b, apertural face; c, ventral side.

Fig. 6. *Gavelinopsis acuta* (Plummer). $\times 70$. Sample K 39, Ransdaal, Karstraat, in hollow flints. Sponges-facies of the Upper Mb. Same indications.

Fig. 7. *Gyroidinoides subangulata* (Plummer). $\times 85$. Plummer Station 174—T—27, Midway-Formation, Tehuacana, Alabama. a, dorsal side; b, apertural face; c, ventral side.

Fig. 8. *Gyroidinoides subangulata* (Plummer). $\times 85$. Sample 629, in hollow flints, Canal Albert, Belgium, lowest Mb. Same indications.

Absolutely identical specimens were found, often abundantly, from the lowest Mb on (Fig. 6), through the whole Mb, the Mc, more rarely in the Md, in scattered specimens in the Me and in the overlying Lower Paleocene. They form together a series of evolution, with distinct increase of the diameter of the pores. The species also is very common in the whole Kunrade Chalk, from the bottom to the top of it.

4. *Gyroidinoides subangulata* (Plummer).

This remarkable species has been described by Plummer under the name of *Rotalia soldanii* (d'Orbigny) var. *subangulata* from the Midway Formation of Alabama. The author could study topotypic material (Fig. 7). The species is characterised by the nearly flat dorsal side which shows a distinctly depressed last part of the spiral suture, distinctly depressed sutures between the chambers always bent backward, a distinct umbilical hollow at the ventral side, often slightly covered by the tenon of the last formed chamber wall, and always with 9—10 chambers in the last formed whorl. The specimens are found in the lowest part of the Mb (Fig. 8) where Ma is not formed (Canal Albert), in the Ma where it is found, more scattered during the whole Mb up to the top of it, rarely in the Mc, somewhat more commonly in the Md, commonly in the Me and in the overlying Paleocene. It is found also in the whole Kunrade Chalk.

These four instances of species typical for Paleocene and also found in the Maestrichtian Chalk Tuff, together with the many planctonic species with tertiary features already mentioned in former papers, moreover the occurrence in the highest Cr 4, Ma and lowest Mb of typical *Siphogenerinoides eleganta* (Plummer) and *Praebulimina quadrata* (Plummer), strongly point to a Paleocene age of these formations. There are many other species also suggesting that age; the four mentioned here only are given as instances.

DE TOEKOMST VAN DE CHAMPIGNONTEELT IN DE ZUID-LIMBURGSE GROTTEN. II.

De vorige maal heb ik u verteld, dat de champignons in de Zuid-Limburgse grotten tot nu toe op heuvelbedden op de grond gekweekt werden. Kunstmatige verwarming en ventilatie werden hierbij weinig toegepast. Deze werkwijze vroeg niet veel investering aan installaties. Alhoewel men na de ruilverkaveling er meer toe overging om in de kwekerijen ontluchtingschachten te boren, was de ventilatie bij gebrek aan elektriciteit, dus zonder ventilatoren, niet voldoende.

Vooraf tijdens de zomermaanden is het voor een grottenkweker moeilijk om ventilatie in zijn

kwekerij te krijgen. De luchtschachten „trekken” dan niet. De mindere trek begint al zodra de buiten-temperatuur ongeveer gelijk is aan de grot-temperatuur; de trek is dan uitsluitend afhankelijk van de wind. De wind zuigt of perst op openingen, die in verhouding tot het enorme luchtvolume in de grot uiterst klein zijn. Door de slechte ventilatie blijven schadelijke gassen in de kwekerij hangen. Hierdoor treden misvormingen op en groeien de champignons bijna niet meer.

Deze — en de in het vorige artikel reeds genoemde bezwaren — zullen de oorzaak zijn, dat de oude teeltmethode in de grotten binnen afzienbare tijd gedoemd zal zijn te verdwijnen. De opbrengsten per ton mest zijn te laag.

Naast al deze bezwaren hebben de grotten ook wel duidelijk aanwijsbare voordelen. Zo heeft men een constante (wel is waar lage) temperatuur van 10° C. en een hoge luchtvochtigheid in de gangen. Verder een groot bufferend vermogen van de mergel ten opzichte van temperatuur en luchtvochtigheid; schommelingen worden vrijwel geheel opgevangen. Als men daarbij dan nog bedenkt, dat de St. Pietersberg alleen al een 20 ha gang bezit, die min of meer geschikt zijn als champignonkwekerij, dan is het zeker verantwoord om te trachten deze goedkope ruimten geschikter te maken voor de teelt. Als dit lukt, kunnen hier een groot aantal gezinnen een bestaan vinden.

Uit een publikatie van het Instituut voor Tuinbouwtechniek (I.T.T.) te Wageningen van juli 1955 bleek, dat er in Frankrijk grotten-telers zijn, die de bovengrondse kweekmethode in hun grotten toepassen. Bij een bezoek aan deze Franse kwekers later in dat jaar werd het duidelijk, dat deze methode ook in de St. Pietersberg mogelijk moest zijn. De omstandigheden zijn hier echter niet gelijk aan die van de Franse grotten, waar de gangen breder zijn, de deklaag (het pakket grond en mergel boven de grot) veel dunner en de omgevingstemperatuur (gemiddelde jaartemperatuur, die de constante grot-temperatuur bepaalt) hoger. De vraag deed zich nu voor hoe hier te werk gegaan moest worden en welke installaties niet te duur — en toch geschikt zouden zijn. Bij de eerste besprekingen met het I.T.T. en de afdeling Verwarming van de Shell-voorlichtingsdienst kwam al spoedig naar voren dat een geruime tijd van proefneming nodig zou zijn.