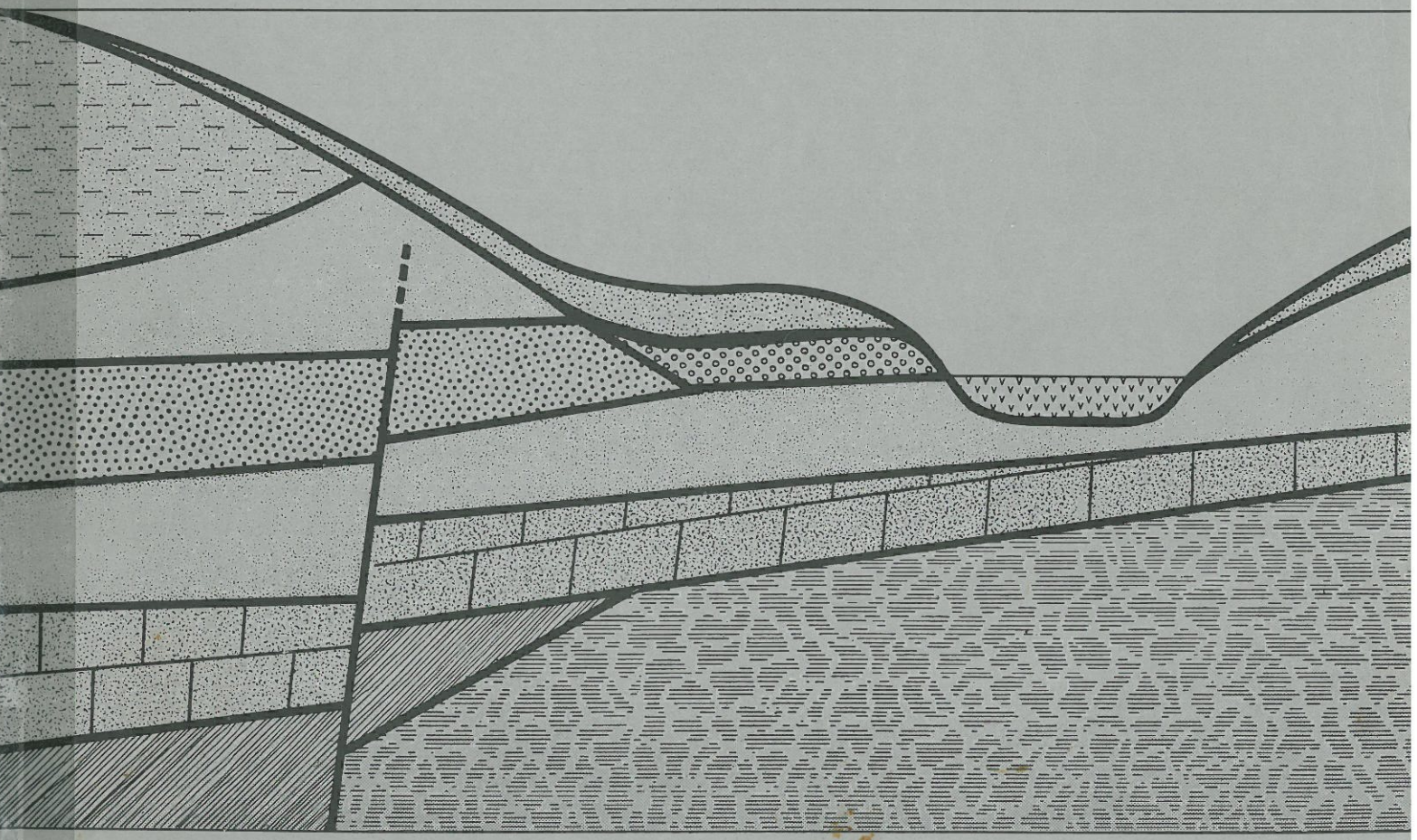
Aardkundige MEDEDELINGEN

Rijks Geologische Dienst
D. 120.
2
Haarlem

Volume 2



LEUVEN UNIVERSITY PRESS
1983

Rijks Geologische Dienst
Haarlem

Aardkundige
MEDEDELINGEN

Volume 2

LEUVEN UNIVERSITY PRESS

1983

Editorial Board : F. Geukens, F. Gullentops, H. Hooyberghs,
P.M. Vermeersch and D.E. Vogel

Gepubliceerd met de steun van de Universitaire Stichting van België

© 1983 by Leuven University Press / Presses Universitaires de Louvain / Universitaire Pers Leuven,
Krakenstraat 3 - B-3000 Leuven / Louvain (Belgium)

ISSN 0250-7803

All rights reserved, including the right to translate or to reproduce this book or parts thereof in any form.

D / 1983 / 1869 / 8

CONTRIBUTION TO THE STUDY OF PLANKTONIC FORAMINIFERA IN THE BELGIAN TERTIARY

H.J.F. HOOYBERGHS

IUGS UNESCO 124

CONTENTS

I. INTRODUCTION

Planktonic foraminifera have been used all over the world to define the relative age of Upper Mesozoïc (Cretaceous) and Cenozoïc sediments. The worldwide distribution of the planktonic foraminifera in marine environments and their rapid evolution in time explain the interest of many micropaleontologists in these guide fossils. Especially during the last few decades, the number of publications concerning detailed biostratigraphical investigations and worldwide correlations based on planktonic foraminifera has increased rapidly. In a euphoric interest in these guide fossils, an exaggerated splitting has been justified in order to obtain a more and more detailed biostratigraphical subdivision in the, often local, areas investigated.
The very large number of publications has given rise to confusion and mistakes in the systematic classification of the planktonic foraminifera. More recent publications by specialists in planktonic foraminifera however have made important contributions to the clearing up of some confusion. Recently, new techniques such as the use of the electron microscopy to illustrate the different taxa more objectively, have contributed to a better systematic description and classification of the planktonic foraminifera. Nevertheless, different problems still occur in e.g. the understanding of the phylogenetic relationships of different taxa. The same species of planktonic foraminifera may occur in different lithological facies. This does not mean that we can exclude ecological influence in this distribution of planktonic foraminifera. Studies of Recent populations of planktonic foraminifera have cleared up some of the ecological factors controlling the composition of populations.

In order to understand the significance of paleoassociations, it is necessary to keep in mind the possible influence of different ecological factors controlling the occurrence and the population communities of planktonic foraminifera. Recent populations of planktonic foraminifera occur at different depths in the seas. In different areas, the prefered depth depends on variations of water temperature and density. BOLTOVSKOY (1973) however did not establish day- and night frequency changes of planktonic foraminifera in the Atlantic Ocean. Upwards (day) and downwards (night) movement of planktonic foraminifera in the oceans have been previously explained by the O_2 production of symbiotic algae during the day. Planktonic foraminifera occur less frequently in the uppermost part of the watermass. Generally, they prefer a depth of at least 6m.
BOLTOVSKOY (1973) still found high frequencies of planktonic foraminifera at a depth of 405m. The largest individuals occur mostly at greather depths, which can be possibly explained by the retarded reproduction and a continuying vegetative growth. In the upper part of the ocean water, juvenile specimens dominate.

Planktonic foraminifera preferebly occur in oceanic water. This could be explained by the fact that they drift in the open ocean, where the water currents are stronger than above the continental shelf. It follows that the total population and the diversity of the assemblages are more restricted above the continental shelf than in the open ocean. Further, the sea water above the continental shelf is strongly influenced by changing temperature, turbidity and changing salinity. Those changing ecological conditions are not the same everywhere. Thus in tropical areas, the runn-off of fresh water is less important and the salinity of the seawater changes less. The geographical distribution of Recent planktonic foraminifera is influenced by the water temperature. The diversity of the populations diminishes from the tropics to the polar areas. The tropical associations are more variable and contain morphologically more complex and more highly evoluated species. In polar areas, the populations are restricted to species of especially the less complex genus *Globigerina*. In cooler waters, the reproduction and the growth are retarded. It follows that different provinces with characteristic associations of planktonic foraminifera can be defined. This provincialism is distinctly influenced by the temperature. It is possible however that the relationship between temperature and diversity of the populations has changed in time.

Often, the coiling direction of some planktonic foraminifera changes in response to certain conditions. BOLLI (1950-1951) demonstrated that the changing of dominant coiling direction in Cretaceous planktonic foraminifera is time- or evolutionary - related and thus of stratigraphical importance. In other examples, the changing of dominant coiling directions is controlled by ecological conditions such as the water temperature.
More studies on Recent planktonic foraminiferal associations are necessary to ascertain the possible influence of other ecological factors on the associations of the planktonic foraminifera. The present work deals with the occurrence of planktonic foraminifera in the Tertiary of Belgium. Until now, little use has been made of this microfossils to date the sediments in the North Sea Basin. In the often shallow marine sediments, planktonic foraminifera are relatively scarce.
Using CCl_4, it is however possible to obtain sufficient individuals quickly. Sometimes, the planktonic foraminifera, recorded from certain shallow deposits are indeed rather small and not very typical. In some stratigraphical intervals, the diversity of planktonic foraminifera is restricted, which can be explained by the above discussed provincialism. The aim of this work is to show that in the Tertiary of the North Sea Province, planktonic foraminifera occur in a sufficient diversity and frequency and that they can be used for biostratigraphical and interregional correlations.
It is not possible to study the whole Tertiary of Belgium in great detail within this contribution. However, accurate information about the occurrence and distribution of the described taxa is given.
For sieving the residus of the samples, we used a 74 micron sieve. The samples, treated in this contribution have been selected from several hundred samples that have been investigated. Several other deposits, not treated in this contribution, have been studied. Preference is given here to the more open marine deposits in the Tertiary of Belgium.

II. LITHOSTRATIGRAPHIC DEPOSITS STUDIED IN THIS CONTRIBUTION

1. Calcarenite of Ciply.

The lower part of the Calcarenite of Ciply ("Tuffeau de Ciply") is still exposed in the quarry St. André at Ciply, Mons Basin. It is a fine-grained calcareous sediment, white-yellow in colour, often slightly endourated. It is rich in flint pebbles and macrofossils, especially Bryozoa.
At the base, a thin conglomerate occurs, containing phosphatic nodules and fossils, reworked from the underlying Cretaceous : the Malagne Conglomerate. The Calcarenite of Ciply is transgressive. It covers discordantly the Cretaceous Chalks.

2. Calcarenite of Geulhem.

In NE Belgium, the hardground at the top of the Tuffaceous Chalk of Maastricht (Cretaceous), is discordantly covered by the Calcarenite of Geulhem. It is a coarse-grained, white to yellow calcarenite. In the lower part, it is glauconiferous. The calcarenite of Geulhem is exposed south of the fault of Hees.

3. Bunde Limestone.

In the trench of the Albert Canal, north of the fault of Hees, a coarse calcarenite, 3m thick, and yellowish to white in colour, is developed : the Bunde Limestone. It is exposed at the eastern side of the Albert Canal at Vroenhoven.

4. Calcarenite of Mechelen-aan-de-Maas.

This deposit is found in the Mechelen-aan-de-Maas well. It is developed between -272 and -297m. It contains a grey-sandy calcarenite, endourated, and rich in molluscs. Lignite fragments occur. In its lower part, the Calcarenite of Mechelen-aan-de-Maas is clayey.

5. Landen Formation, "Tuffeau de Lincent" Member.

This is a fine grained calcarenite, yellowish to gray-white in colour. At the base, it is extremely rich in glauconite (0,5m). The "Tuffeau de Lincent" is rich in calcareous fossils remains and contains spicula of Porifera.
Quartz grains occur very rarely. In the neostratotype at Wansin, yellowish to brownish calcarenites alterate with thin marly layers. In different layers, the calcarenite is hardened.

6. Ieper Formation.

In the type area, the Ieper Formation is subdivied into two Members : the Flanders Clay and the overlying Mons-en-Pévèle Sands. The Ieper Formation is studied in the well at Mol, where it is developed between -346 and -443m. The basal layer contains a compact silty clay, dark green in colour. The clay in the well at Mol is silty to plastic. Silty to sandy layers occur especially in the upper part of the Flanders Clay. Phosphatic and marly concretions and sandstone beds have been observed. A few levels contain macrofossils (*Lingula, Ditrupa*). In the upper part, *Nummulites planulatus* is found.

7. Brussels Formation.

The Brussels Sands are coarse-grained, glauconiferous sands, with cross lamination. They are decalcified especially at the borders of the area where they mainly occur. This area is limited by the Senne - Grote Gete and Sambre rivers. In the middle part of this areas however, the Brussels Sands are medium grained, white to yellowish in colour and very calcariferous. It is a more homogeneous and less glauconiferous sand. Calcareous sandstone beds occur at different levels.

8. Lede Formation.

The basal layer of the Lede Sands contains coarse-grained sands, with well rounded quartz grains. Higher up, the Lede Sands become fine-grained to silty. They are very fossiliferous and slightly glauconiferous. Characteristic sandstone beds occur. *Nummulites variolarius* is observed in the fine glauconitic and calcareous sand, developed in the upper part of the Lede Sands in the well at Mol (-318m).

9. Asse Formation.

a) Wemmel Sands Member (Mol, -316 to -310m).

At the base of the Wemmel Sands in the well at Mol, a thin bed with coarse quartz grains is developed. The fine glauconitic green-coloured sands are rich in *Nummulites wemmellensis* and *Amusium corneum*. In the upper part, the Wemmel Sands become clayey, indicating a gradual transition into the Asse Clay.

b) Asse Clay Member.

The Asse Clay (-310 to -302m at Mol) is a compact sandy clay, very rich in glauconite. It contains *Chondrites* individuals. In the upper part, the Asse Clay becomes more and more sandy and passes gradually into a fine glauconitic compact sand.

10. Rupel Formation.

a) Berg Sands Member.

Those are fine grained white-yellowish fossiliferous sands. Small flint pebbles and phosphatic concretions occur.

b) Boom Clay Member.

The Boom Clay Member has been studied in quarries at St. Niklaas, Tielrode and Terhagen, and in the well at Mol.
A remarkable lithological feature in the Boom Clay is the alternation of compact clayey and silty bands. The banded structure can easily be distinguished by the colour differences. In dried outcrops, the silty levels are white-grey in colour and the clay bands are rather black. In moisture sections, the silty bands are darker than the clay levels, which is due to the greather water content of the silty bands. In the lower part of the Boom Clay (St. Niklaas, Tielrode), the silty bands are dominantly developed (2m thick at St. Niklaas). Higher up, the silty levels are 20 to 40cm thick. The thickness of the clay beds varies from 30cm to 2m. The black colour of the Boom Clay in the upper part at e.g. Terhagen ("Putte Clay") is remarkable. In the Terhagen section, a red-coloured silt layer can be observed. Very characteristic of the Boom Clay are the calcariferous septaria beds. They have been numbered (S_1 to S_8) in different outcrops.

11. Voort Formation.

In East Belgium, the Boom Clay becomes more and more sandy. In wells in Limburg and in the Kempen, a fine- to medium-grained sand covers the Boom Clay : the Voort Sands. Those sands are slightly clayey, glauconiferous and brown-gray to green-black in colour. Phosphatic concretions occur. The Voort Sands are fossiliferous.

12. Berchem Formation.

a) Edegem Sands Member.

Those sands are relatively fine-grained, very glauconiferous and slightly clayey. Macrofossils occur diffused in the sediment. At the base, a thin gravel bed is developed : the Burcht gravel. It contains small rounded flint pebbles, fossil remains, fish teeth and fragments of septaria, reworked from the Boom Clay.

b) Antwerpen Sands Member.

The Antwerpen Sands are medium-grained, glauconiferous sands, slightly clayey. Typical are the different subhorizontal bands with molluscs (*Pectunculus*). Less regularly, there occur calcareous sandstone concretions, clay noduls and phosphatic concretions.

13. Bolderberg Formation.

Houthalen Sands Member.

The Houthalen Sands are dark, glauconitic and lignitiferous sands. They are fossiliferous. Fossil horizonts occur mainly at the base of the Houthalen Sands, but also higher. A basal gravel is developed in the Houthalen area.

14. Diest Formation.

Deurne Sands Member.

The Deurne Sands are rather coarse grained, very slightly clayey sands, glauconiferous and green-grey in colour. Some levels are bioturbated. The basal gravel is a thin bed with flint pebbles, quartz grains and phosphatic noduls with scare fish teeth and bone fragments : the Rivierenhof gravel.

III. PREVIOUS WORK ON PLANKTONIC FORAMINIFERA RECORDED FROM TERTIARY DEPOSITS IN BELGIUM

Different authors note the presence of planktonic foraminifera in the Tertiary of Belgium.

A. PALEOCENE

1. "Tuffeau de Ciply".

LOEBLICH & TAPPAN (1957) mention the occurrence of *Globigerina daubjergensis, Globigerina triloculinoides* in the Calcarenite of Ciply.
HOFKER (1960, 1962a) and MOORKENS (1968) record also *Globorotalia pseudobulloides*.
EL NAGGAR (1969) notes the presence of *Globorotalia uncinata* and of *Globorotalia inconstans* in this deposit.
MEIJER (1969) observes *Globigerina daubjergensis, Globorotalia pseudobulloides* and *Globorotalia compressa*.
The "Tuffeau de Ciply" is situated in the Middle to Upper Danian.

2. "Calcaire de Mons".

From the Mons Limestone of the "Puits Goffint", EL NAGGAR (1967) records *G. edita*. In the Givry well 318, he also mentions the presence of *Globigerina edita, G. kozlowskii, G. triloculinoides, Globorotalia angulata angulata, G. angulata conicotruncata, G. inconstans, G. pseudobulloides* and *G. quadrata*.

3. Calcarenite of Geulhem.

HOFKER (1962b) and MOORKENS (1971) record *Globigerina kozlowskii* from the Calcarenite of Geulhem at Houthem, at the Albert Canal and in the interval between -291m to -277m in the Mechelen-aan-de-Maas well. In this well, EL NAGGAR (1967) observes also *Globigerina daubjergensis, G. triloculinoides, G. kozlowskii, Globorotalia compressa, G. pseudobulloides, G. quadrata, G. inconstans* and *G. kilabiyaensis*.

4. Gelinden Marls.

EL NAGGAR (1967) describes the following association of planktonic foraminifera from the type Heersian : *Globorotalia pseudobulloides, G. perclora, G. inconstans (= trinidadensis), G. imitata, G. quadrata, G. emilei (G. uncinata uncinata), G. tribulosa, Globigerina edita (= spiralis)* and *G. triloculinoides*. The Gelinden Marls are situated in the Middle Paleocene *G. angulata* Zone.

5. "Tuffeau de Lincent".

EL NAGGAR (1967) notes the presence of the following taxa in the "Tuffeau de Lincent" : *Globorotalia angulata angulata, G. angulata conicotruncata, G. imitata, G. pseudobulloides, G. quadrata, G. tribulosa, Globigerina triloculinoides* and *"G. eocaenica"*. The "Tuffeau de Lincent" is situated in the Upper Paleocene Landenian (= *Globorotalia velascoensis* Zone).

EL NAGGAR (1967a - 1967b - 1969) proposes a threefold subdivision of the Paleocene :
- Upper Paleocene = Landenian = *Globorotalia velascoensis* Zone
- Middle Paleocene = Montian = *Globorotalia angulata/Globorotalia inconstans* Zone
- Lower Paleocene = Danian = *Globigerina daubjergensis/Globorotalia compressa* Zone

The Calcarenite of Ciply corresponds to the Lower Paleocene *Globigerina daubjergensis/Globorotalia compressa* Zone. The Heersian represents the Middle Paleocene *Globorotalia angulata/Globorotalia inconstans* Zone. According to EL NAGGAR, the Montian is a lateral time equivalent of the Heersian. The Landenian belongs to the Upper Paleocene *Globorotalia velascoensis* Zone. The presence of the *Globorotalia angulata/Globorotalia inconstans* Zone in the Montian is not confirmed by MOORKENS (1972 - 35). He notes the presence of *Globigerina triloculinoides, Globo-*

rotalia aff. *varianta*, *Globorotalia pseudobulloides*, *Globorotalia* cf. *imitata*, *Globorotalia* cf. *compressa* and specimens of the *Globigerina daubjergensis/Globigerina kozlowskii* group.

B. EOCENE

BRÖNNIMANN & al. (1968 - 7) record some planktonic foraminifera from the Clay of Flanders, Panisel Formation, Brussels Sands, Lede Sands and Wemmel Sands.

1. Clay of Flanders.

MOORKENS (1969 - 33) notes that the base of the Iepresian can be situated near to the *Globorotalia velascoensis* Zone (P5)/*Globorotalia subbotina* Zone (P6) boundary.

2. Mons-en-Pévèle Sands.

BERGGREN (1969 - 8) states that the Mons-en-Pévèle Sands correspond to the *Globorotalia formosa formosa* Zone (P7).
DROOGER (1969 - 8) records a single specimens of *Globorotalia cerroazulensis* from a depth of -167,5m in the Kallo well.

C. OLIGOCENE

DROOGER & BATJES (1959 - 9) and HOFKER (1963 - 15) describe some planktonic foraminifera from Oligocene and Miocene deposits in the North Sea Basin.

- At -131m in the Kallo well, DROOGER (1969 - 8), observes *Cassigerinella chipolensis*, suggesting an Oligocene age of this level.
- According to BERGGREN (1969 - 3) and HOOYBERGHS (1976 - 16) the Boom Clay yields P18 (*Globigerina tapuriensis* Zone) and P19 (*Globigerina sellii/Pseudohastigerina barbadoensis* Zone).

D. MIOCENE

HOOYBERGHS & DE MEUTER (1972 - 17) record different taxa of planktonic foraminifera from Miocene deposits in Belgium. An accurate biostratigraphic zonation, based on a more detailed distribution of planktonic foraminifera, however has still to be worked out.
It is evident that the Edegem Sands yield some species, reworked from the underlying Boom Clay. So far only one single specimen of *Globigerinoides (Globigerinoides primordius)* is recorded from the Edegem Sands.
The Houthalen Sands yield *Globigerinoides primordius* and *Globigerinoides altiaperturus*. *Globigerinoides altiaperturus* and *Globigerinoides trilobus* occur in the Zonderschot Sands (HOOYBERGHS, 1980). The biostratigraphic subdivision of the Antwerpen Sands has to be worked out in more detail.

E. MIO - PLIOCENE

The planktonic foraminiferal population in the Upper Miocene and Pliocene becomes boreal.
DE MEUTER & LAGA (1970 - 20) record dominantly detrally coiled *Globigerina pachyderma* specimens from the Deurne Sands and dominantly sinistrally coiled specimens from the Kattendijk Sands. The stratigraphic level of the change in coiling direction coincides with the admitted Mio - Pliocene boundary.

IV. DISCUSSION ON THE OCCURENCE OF PLANKTONIC FORAMINIFERA IN THE STUDIED SECTIONS

This contribution, dealing with the possibility to use planktonic foraminifera in the Tertiary Belgium, allows us to characterize locally different marine deposits, to correlate them in most cases with the international standard zonation for planktonic foraminifera and to indicate some general evolutionary trends in the occurrence of the planktonic foraminifera.

The detailed occurrence of planktonic foraminifera in the studied deposits is given in tables 1-10.
The general distribution of planktonic foraminifera in the Belgian Tertiary is given in tables 11 and 12.

A. PALEOCENE

1. "Tuffeau de Ciply" (Carrière St. André).

At the end of the Cretaceous, the morphological highly evoluated planktonic fauna (f.i. keeled *Globotruncana*'s) disappear completely. A total planktonic faunal renewal took place at the base of the Tertiary. In the "Tuffeau de Ciply", the planktonic foraminiferal association is restricted to some simple *Globigerina*'s and *Globorotalia*'s. This morphological simple association, characterized by species as *Globorotalia compressa*, *Globorotalia pseudobulloides*, *Globorotalia inconstans*, *Globigerina daubjergensis*, *Globigerina kozlowskii* and *Globigerina triloculinoides* occurs however all over the world, without distinct influence of provincialism or endemism and is useful for international correlation. At this level however, the planktonic fauna is already stabilized after the complete extinction at the end of the Cretaceous. In the standard zonation for planktonic foraminifera, *G. inconstans*, *G. quadrilocula*, *G. kozlowskii* and *G. triloculinoides* appear at the base or within Zone P1b. *G. imitata* and *G. spiralis* appear near to the base of Zone P2. As pointed out before, the "Tuffeau de Ciply" can be correlated with the Middle to Upper Danian, Lower Paleocene.

2. Calcarenite of Geulhem and Bunde Limestone (Vroenhoven).

The Calcarenite of Geulhem and the Bunde Limestone yield a tertiary planktonic foraminiferal fauna which ressembles that of the "Tuffeau de Ciply". Higher evoluated species as keeled *Globorotalia*'s do not yet occur in these deposits. Since the Calcarenite of Geulhem is succeeded by the Bunde Limestone, this Bunde Limestone is slightly younger than the Calcarenite of Geulhem. Chronostratigraphically, both deposits can be situated in the Middle - Upper Danian.

3. Calcarenite of Mechelen-aan-de-Maas (Mechelen-aan-de-Maas well, depth -290,5m).

The presence of *Globorotalia angulata*, associated with *Globigerina kozlowskii* at a depth of 290,5m in the Mechelen-aan-de-Maas well, indicates a Middle Paleocene ("Heersian" of EL NAGGAR) age of this level. In the standard zonation, both species occur together in Zone P3.

4. "Tuffeau de Lincent" (sample B114, Lincent)

The "Tuffeau de Lincent" yields a planktonic foraminiferal fauna which is distinctly younger. The presence of f.i. *Globigerina velascoensis*, *G. aequiensis*, *G. esnaensis*, *G. soldadoensis* indicates an Upper Paleocene (Landenian) age. Keeled *Globorotalia*'s, occurring in more temperate regions in this time interval have not yet been observed in the Belgian Upper Paleocene.

B. EOCENE

1. Ieper Formation (Mol borehole -396m to -345m).

In the well at Mol, planktonic foraminifera occur from a depth of 395,4m in the Ieper Formation. The increasing occurrence of morphological highly evoluated taxa (conical *Globorotalia*'s) is important. The planktonic foraminiferal association becomes more and more diversified. Different species are important for local and interregional correlation. The Ieper Formation is rich in *G. pentacamerata*. The abundant occurrence of *G. patagonica* in the interval -390,75m to -375,50m and the high frequency of *Guembelitria triseriata* at a depth of 354,45m are remarkable.
In the standard zonation for planktonic foraminifera, *G. aequa* occurs to the P8a - P8b boundary. *G. wilcoxcensis, G. gracilis* and *G. esnehensis* range to the top of Subzone P8b. *G. soldadoensis* and *G. strabocella* still occur in Zone P9. *G. broedermanni, G. pentacamerata* and *G. lensiformis* appear at the base of Zone P8a. *G. senni* occurs from within Zone P8a. *G. formosa* is restricted to the P8a/P8b interval.
The present association, recorded especially from the interval between -395,5m and -382,5m in the well at Mol allows us to correlate at least this part of the Ieper Formation with Zone P8 (P8a - P8b) in the standard zonation of planktonic foraminifera.

2. Brussels Formation (Mol borehole -345m to -335,65m).

Only a few species of planktonic foraminifera are recorded from the Brussels Sands at a depth of 336,80m in the well at Mol. However, the high frequency of *Pseudohastigerina* is remarkable. *P. sharkriverensis* and *Globorotalia bulbrooki* appear in the standard zonation for planktonic foraminifera in Zone P9. *Globigerinita turgida* appears in Zone P10. These taxa disappear in Zone P12. The occurrence of *Globorotalia pseudomayeri*, which disappear in Zone P10 is important. This information allows us to situate the present level with stratigraphically important taxa within Zone P10, in which *G. turgida* and *G. pseudomayeri* occur together.

3. Lede Formation (Mol borehole -335,65m to -317,70m).

In the Lede Formation, *G. turgida* and *G. pseudomayeri* occur still together. *Pseudohastigerina* however still dominates the population. *G. bulbrooki*, disappearing at the top of Zone P11, is also recorded from the Lede Formation. The occurrences of *G. lensiformis*, disappearing within Zone P10 in the standard zonation, and of *G. frontosa* ranging in the P10 - P11 interval are important.
The Lede Sands can be correlated with the higher part of Zone P10 in the standard zonation of planktonic foraminifera.

4. Asse Formation (Mol borehole -315,40m to -310,20m).

In the Asse Formation, *Pseudohastigerina* remains the most importantly occurring genus of the planktonic fauna. The occurrence of *Globigerinita echinata* which characterizes this Formation is very important for this deposit. In the standard zonation of planktonic foraminifera, this species appears at the base of Zone P12.

In the Lower Eocene and lower part of the Middle Eocene deposits in Belgium, the planktonic foraminiferal fauna is diversified and comprises different species useful for local and interregional correlation. In the higher part of the Middle Eocene and in the Upper Eocene however, the influence of provincialism becomes important : planktonic foraminifera occur less frequently and the fauna is less rich in taxa. Genera as f.i. *Hantkenina* and *Porticulasphaera* have not yet been observed. Restricted depth of the deposits and lowering of the temperature can probably explain the decreasing occurrence of planktonic foraminifera.

C. OLIGOCENE

1. Rupel Formation.

- Berg Sands Member

(Mol borehole -279,80m to 273,10m).

Very typical in the Berg Sands, as studied in the well at Mol, is the occurrence of *Globigerina danvillensis*. This species, which is locally very useful for characterizing the association in this interval, has a less restricted stratigraphical range in the standard zonation of planktonic foraminifera (Zone P14 to Zone P17). It is clear however that the level with *G. danvillensis* indicates here an early Oligocene age (P17), which is confirmed by nannoplankton analysis of those samples (NP21).

- Boom Clay Member

(Mol borehole -273,10m to -160m, outcrops at St. Niklaas, Tielrode and Terhagen).

An important enrichment of the planktonic foraminiferal population is observed in the Boom Clay.
The lower part of the Boom Clay is characterized by the occurrence of *Globigerina*'s as f.i. *G. tapuriensis, G. eocaena, G. gortanii, G. ampliapertura, G. yeguaensis, G. linaperta* and some *Globorotalia*'s as f.i. *G. clemenciae* and *G. gemma*. *Chiloguembelina* and *Pseudohastigerina* also occur. This *G. tapuriensis* Zone is observed in the well at Mol (-266m to -252,2m), in the St. Niklaas and Tielrode quarries and in the lower part of the Terhagen quarry (samples 32-3).
A second interval in the Boom Clay is characterized by the sudden appearence of frequently occurring *Globigerina fariasi* (samples 4-19) in the Terhagen quarry and interval -252,8m to -248m in the well at Mol.
Other specimens as *G. ouachitaensis, G. officinalis* and specimens of the *G. praebulloides* group also occur frequently. *Globorotalia opima opima* appears. *Globigerina angustiumbilicata* evolves into *G. anguliofficinalis*. *G. sellii* occurs rarely.
Higher up in the Boom Clay, planktonic foraminifera occur relatively less frequently. The distinct appearence of *Globigerina angiporoides* is typical. In the uppermost part of the Boom Clay in the Terhagen section and in the well at Mol, *Globorotalia obesa* is observed and *Globoquadrina* and *Globigerina angulisuturalis* appear.
In comparing the occurrence of planktonic foraminifera in the Boom Clay with the distribution in the standard zonation, we can conclude that the Boom Clay in the sections studied covers the interval P18 - P19 - P20 - P21. The P20 - P21 boundary is marked by the appearence of *Globoquadrina* and *G. angulisuturalis*, which occur in the uppermost part of the studied sections.

2. Voort Formation (Helchteren borehole -143m to -104m).

The association in the Voort Sands in the well at Houthalen is characterized by the presence of *Globigerina angulisuturalis* and *Globorotalia kugleri*.
Other taxa appearing first in the Voort Sands are *Globorotalia siakensis* and *Globigerina euapertura*. *G. pseudokugleri* and *Globoquadrina* also occur. The Voort Sands can be situated in the Upper Oligocene P22 Zone.

The planktonic foraminiferal fauna in the Oligocene is characterized by the presence of morphological simple *Globigerina*'s and *Globorotalia*'s which however occur worldwide. Influence or provincialism or endemism is rather restricted. It is remarkable however that typical specimens of *Globorotalia opima opima* occur rather rarely.

D. MIOCENE

1. Berchem Formation.

- Edegem Sands Member (outcrop Terhagen).

The fauna recorded from the Edegem Sands at Terhagen ressembles that of the Voort Sands in the occurrence of species as *Globorotalia kugleri, G. pseudokugleri, G. siakensis* and *Globigerina euapertura*. From the Edegem Sands however, a single specimen of *Globigerinoides primordius* is recorded. A new species, *Globigerina edegem-*

ensis, characterizes this deposit. The occurrence of *Globorotalia kugleri* and *Globigerinoides primordius* allows us to situate the Edegem Sands at Terhagen in the N4 (Aquitanian) in the standard zonation for planktonic foraminifera.

- Antwerpen Sands Member (AK section, Antwerp).

The lower part of the Antwerpen Sands in the AK section yields only scarce planktonic foraminifera. The occurrence of a few species, however, allows us to characterize also this part of the Antwerpen Sands. *Globigerinoides trilobus*, appearing within Zone N6 in the standard zonation, occurs together with *G. altiaperturus* and *G. quadrilobatus*. *Globigerinita stainforthi* is recorded only from this lower part of the Antwerpen Sands, which can be situated in the Burdigalian (probably Zone N6).
In the upper part of the Antwerpen Sands, the planktonic fauna is more diversified. Important species as *Globorotalia mayeri*, *Globigerina* cf. *druryi*, *Praeorbulina transitorius* and *Orbulina universa* appear. Since the *Orbulina* datum can be situated in the upper part of the Antwerpen Sands, it is evident that this part of the Antwerpen Sands is distinctly younger than the basal beds of the Antwerpen Sands. The Antwerpen Sands range from the Burdigalian to at least the Lower Langhian (Zone N9).

2. Bolderberg Formation (Helchteren borehole -104m to -70m).

The Houthalen Sands Member of the Bolderberg Formation have been studied in the well at Helchteren. Especially the lower part of the deposit contains planktonic foraminifera. It is characterized by the presence of *Globigerinoides altiaperturus*, *G. primordius* and *G. quadrilobatus*. Higher up, *G. trilobus trilobus* appears. *Globorotalia pseudoobesa* and *Globigerinopsis aguasayensis* have been found only in the Houthalen Sands.
In the standard zonation, the appearance of *G. trilobus trilobus* is situated in the lower part of Zone N6. The interval studied in the Houthalen Sands covers the Zone P5 (?) - Zone P6 (Burdigalian).

3. Diest Formation.

In the Deurne Sands, the planktonic foraminiferal fauna becomes boreal. The diversity of the population is very restricted : only specimens as *Globigerina pachyderma*, *G. bulloides* and *G. eggeri* occur.

V. ACKNOWLEDGEMENTS

Many thanks are due to Prof. Geukens, Prof. J. Bouckaert and Prof. Bultynck for the permission fo finish this work on planktonic foraminifera. Thanks are due to Mr. Delmer and Mr. Laga of the "Belgische Geologische Dienst" for delivering samples from different deposits treated in this contribution and to Dr. De Meuter for providing us with samples especially from the Neogene deposits. Thanks are also due to Prof. King for the critical reading of the manuscript. The author thanks the "Komitee voor Electronenmicroscopie, Katholieke Universiteit Leuven", who enabled him to make the photographs of the specimens and the "Universitaire Stichting" for the finantial support.

VI. SYSTEMATICS

Order *FORAMINIFERIDA* EICHWALD, 1830
Suborder *ROTALIINA* DELAGE & HEROUARD, 1896
Superfamily *GLOBIGERINACEA* CARPENTER, PARKER & JONES, 1862
Family *HETEROHELICIDAE* CUSHMAN, 1927
Subfamily *GUEMBELITRIINAE* MONTANARO GALLITELLI, 1957
Genus *Guembelitria* CUSHMAN, 1933

Guembelitria triseriata (TERQUEM, 1882)

+ 1882 *Textillaria triseriata* Terquem-TERQUEM, p.145, pl.15, fig.10 (Fide ELLIS & MESSINA)
1949 *Gümbelitria stavensis* n.sp.-BANDY, p.124, pl.24, fig.5
1970 *Guembelitria triseriata* (TERQUEM)-LE CALVEZ, p.171, pl.36, fig.6

Type locality : Vaudancourt, Parish Basin.
Type level : Middle Eocene, upper part of the "Calcaire grossier".
Description : Test small, elongate. Chambers triserially arranged, globular, increasing gradually in size. Aperture small, semicircular, at the base of the last chamber, bordered by a lip. Wall calcareous, perforate. Surface pitted.
Remarks : This small species is characterized by the elongated test and by the globular, triserially arranged chambers. In some specimens however, the chambers become slightly compressed and the length/width proportion of the test varies.

Subfamily *HETEROHELICINAE* CUSHMAN, 1927
Genus *Chiloguembelina* LOEBLICH & TAPPAN, 1927

Chiloguembelina crinita (GLAESSNER, 1937)
Pl.I, figs.1-2

+ 1937 *Gümbelina crinita* Glaessner-GLAESSNER, p.383, pl.4, fig.34
1957 *Chiloguembelina crinita* (Glaessner)-BECKMANN, p.89, pl.21, fig.4, text-fig.14(1-4)

Type locality : Oilfield Ilskaja, south of Bahnlinie Krasnodor-Novorossiisk, 40km SW of Krasnodor, NW Caucasus, U.S.S.R.
Type level : Paleocene.
Description : Test biserial. Equatorial periphery subtriangular. Axial periphery rounded. About 10-15 chambers, ovoid, increasing rapidly in size. Especially the later chambers become relatively large. Aperture semicircular, bordered by a distinct lip, interiomarginal. Wall calcareous, perforate. Surface spinose to longitudinally striated.
Remarks : *C. crinita* differs from *C. midwayensis* (CUSHMAN, 1940) in the more globular chambers, increasing more rapidly in size.

Chiloguembelina cubensis (PALMER, 1934)
Pl.I, figs.3-4

+ 1934 *Gümbelina cubensis* Palmer-PALMER, p.74, text-figs.1-6 (Fide ELLIS & MESSINA)
1957 *Chiloguembelina cubensis* (Palmer)-BECKMAN, p.89, pl.21, fig.21, text-fig.14 (5-8)
1972 *Chiloguembelina cubensis* (PALMER)-HOOYBERGHS & DE MEUTER, p. , pl.1, fig.1
1977 *Chiloguembelina cubensis* (Palmer)-POORE & BRABB, p.255

Type locality : Palmer station 1163, water well, 5km southeast of Cartagena, Santa Clara Province.
Type level : Lower Oligocene.
Description : Test elongate. Adult specimens with about 14 inflated chambers, biserially arranged, increasing rapidly in size. Periphery weakly lobate to distinctly lobate in specimens with strongly inflated chambers in the later part of the test. Sutures oblique to horizontal, straight to weakly curved.

Aperture lowly arched to nearly semicircular, may be asymmetrical, bordered by a thin lip. Wall calcareous, finely perforate. Surface smooth to hispid or longitudinally striated.

Remarks : Some variation is observed in the inflated character of the chambers. In some specimens, especially with strongly inflated chambers, the width of the test increases less regularly. Generally, the maximum width of the test is situated however at the apertural extremity.

Chiloguembelina midwayensis (CUSHMAN, 1940)
Pl.I, figs.5-6

+ 1940 *Gümbelina midwayensis* Cushman, n.sp. - CUSHMAN, p.65, pl.11, fig.15
1957 *Chiloguembelina midwayensis* (Cushman)-BECKMANN, p.90, pl.21, fig.1, text-fig.14(24-27)

Type locality : Sample taken 39-40 feet above water level, on U.S. highway 80, south of Sucarnoochee Creek, 1 1/2 mile southwest of Livingstone, Sumter County, Alabama.

Type level : Eocene, Midway group, upper bed, chalk overlying *Ostrea pulaskensis* bed, at the base of the Midway.

Description : Test biserial. Equatorial periphery weakly lobate, subtriangular. Axial periphery rounded. About 10-14 inflated chambers, increasing moderately in size, compressed laterally. The later chambers increase however relatively quicker or slower in size than the chambers in the early part of the test. Intercameral sutures slightly curved, distinct, depressed. Aperture moderately high, broad, asymetrically arched. Wall calcareous, perforate. Surface spinose to longitudinally striated.

Remarks : The aperture of this species is typically asymmetrically arched. The increase in chamber size varies. The chambers become compressed.

Chiloguembelina victoriana BECKMANN, 1957
Pl.I, figs.7-8

+ 1957 *Chiloguembelina victoriana* Beckmann, new species-BECKMANN, p.91, pl.21, figs.19-20, text-fig.15(46-48)

Type locality : Branch of Point-à-Pierre Road, between Joga Grant Street and Jarvis Street, San Fernando, Trinidad, 90 feet east of southern end of Joga Street (coordinates N : 239020 links, E : 363330 links).

Type level : *Globorotalia cocoaensis* Zone, Upper Eocene, San Fernando Formation.

Description : Test biserial, elongate. Equatorial periphery weakly lobate, subtriangular in outline. Axial periphery rounded. About 14 chambers, broader than high, slightly inflated, distinctly compressed. Intercameral sutures straight, depressed, oblique to nearly horizontal in the later part of the test. Aperture semicircular, bordered by a thin lip. Wall calcareous, perforate. Surface smooth.

Remarks : *C. victoriana* is distinguished by the less inflated, more compressed chambers and by the smooth surface.

Family *HANTKENINIDAE* CUSHMAN, 1927
Subfamily *HASTIGERININAE* BOLLI, LOEBLICH & TAPPAN, 1957
Genus *Hastigerina* THOMSON, 1876

Hastigerina siphonifera (D'ORBIGNY, 1839)
Pl.I, figs.21-22

+ 1839 *Globigerina siphonifera* d'Orbigny-D'ORBIGNY, p.83, pl.4, figs.15-18 (Fide ELLIS & MESSINA)
1960 *Hastigerina (Hastigerina) siphonifera* (D'ORBIGNY)-BANNER & BLOW, p.22, text-figs.2a-3b
1969 *Hastigerina (Hastigerina) siphonifera siphonifera* (D'ORBIGNY)-BLOW, p.375

Type locality : Not designated.

Type level : Recent.

Description : Initial part of the test trochospiral. Test in adult stage planispirally coiled. Equatorial periphery distinctly lobate. Axial periphery broadly rounded. Five to 6 globular chambers in the last whorl, increasing moderately in size. Intercameral sutures nearly radial, depressed. Aperture an equatorial arched opening, bordered by a rim. Wall calcareous, perforated. Surface finely pitted or hispid.

Remarks : *Hastigerina siphonifera* evolves from *Globorotalia obesa* BOLLI, 1957, the test becoming gradually planispirally coiled. In *Hastigerina praesiphonifera* BLOW, 1969, only the last few chambers are already planispirally coiled. It is considered as the evolutionary link between *G. obesa* and *H. siphonifera*.

Genus *Pseudohastigerina* BANNER & BLOW, 1959

Pseudohastigerina barbadoensis (BLOW, 1969)
Pl.I, figs.9-12

+ 1969 *Pseudohastigerina barbadoensis* n.sp.-BLOW, p.409, pl.53, figs.7-9 ; pl.54, figs.1-3
1972 *Pseudohastigerina barbadoensis* BLOW-HOOYBERGHS & DE MEUTER, p.11, pl.1, fig.2

Type locality : North of San Fernando, Trinidad B.W.I..

Type level : Sample Cb1964, lowest part of the Cipero Formation : Zone P19.

Description : Test small, subcircular in outline, moderately compressed laterally. Periphery rounded to weakly acute. About 17 chambers, planispirally coiled, little embracing, 7 1/2 slightly inflated chambers in the last whorl, increasing slowly but regularly in size. Intercameral sutures slightly curved, shallowly depressed. Aperture moderately lowly arched, bordered by a distinct imperforate lip. Umbilicus wide. Wall calcareous, relatively coarsely perforate. Surface smooth.

Remarks : *P. barbadoensis* differs from *P. naguewichiensis* (MYATLIUK, 1950) in the more appressed and more embracing chambers, separated by less deeply incised intercameral sutures and by having a smooth instead of hispid surface. In some specimens, the last chamber becomes strongly compressed laterally. Sometimes, the last chamber is slightly reduced in size. Relict apertures are visible only in a few, well developed specimens.

Pseudohastigerina micra (COLE, 1927)
Pl.I, figs.16-19

+ 1927 *Nonion micrus* Cole-COLE, p.22, pl.5, fig. 12 (Fide ELLIS & MESSINA)
p 1957 *Hastigerina micra* (Cole)-BOLLI, p.161, pl.35, fig.2a-b
1967 *Pseudohastigerina micra* (Cole)-BERGGREN, OLSSON & REYMENT, p.275, text-fig.9
1969 *Pseudohastigerina micra* (COLE)-BLOW, p.376, pl.53, figs.1,4-6
1979 *Pseudohastigerina micra* (Cole)-BLOW, p.1185, pl.166, fig.11 ; pl.198, figs. 8,9 ; pl.253, figs.1-9

Type locality : Cliff outcropping twelve kilometers east of the village of Potrero in the state of Vera Cruz, Mexico.

Type level : Eocene. Probably Upper Claiborne, Gurayabal Formation.

Description : Test planispiral, may be trochospiral in the initial part. Biumbilicate. Equatorial periphery slightly lobate, axial periphery rounded. Six to eight chambers in the last whorl, inflated, globular to ovate in the later part of the test, increasing rapidly in size. Intercameral sutures curved, depressed. Aperture a broad equatorial arch, bordered by a lip. Wall finely perforate. Surface smooth.

Remarks : The chambers in the last whorl of *P. micra* become gradually ovate and less inflated than in *P. wilcoxensis* (CUSHMAN & PONTON, 1932).

Pseudohastigerina naguewichensis (MYATLIUK, 1950)
Pl.I, figs.13-15

+ 1950 *Globigerinella naguaewichiensis* MYATLIUK-MYATLIUK, p.281, pl.4, fig.4a-b (Fide ELLIS & MESSINA)
1969 *Pseudohastigerina naguaewichiensis* (MYATLIUK)-BLOW, p.377, pl.53, figs.2-3
1979 *Pseudohastigerina naguewichiensis naguewichiensis* (Myatliuk)-BLOW, p.1189, pl.246, figs.1,3,4

Type locality : Holotype from along the Chechua

River, North Carpathians, U.S.S.R.

Type level : Oligocene, Kosmach series.

Description : Test small, planispirally coiled, laterally compressed. Periphery rounded, lobate. About 6 inflated subglobular chambers in the last whorl, increasing regularly but not rapidly in size. Sutures straight, deeply depressed. Aperture lowly arched, bordered by a distinct imperforate lip. Umbilicus large. Wall calcareous, finely perforate. Surface hispid.

Remarks : The small test of *P. naguewichiensis* is characterized by the 6 inflated chambers in the last whorl, by the deeply depressed sutures and by the hispid surface.

Pseudohastigerina sharkriverensis
BERGGREN & OLSSON, 1967
Pl.I, figs.16-19

+ 1967 *Pseudohastigerina sharkriverensis* n.sp.-BERGGREN, OLSSON & REYMENT, p.280, pl.1, figs.7-11, text-figs.7-8

1979 *Pseudohastigerina sharviverensis* Berggren & Olsson-BLOW, p.1191, pl.252, figs.5-10

Type locality : Deal Beach, New Yersey.

Type level : Shark River Formation, Early Middle Eocene.

Description : Test planispiral, involute, biumbilicate, fairly large. Equatorial periphery moderately lobate, subquadrate in outline. Axial periphery rounded. Five to six chambers in the last whorl, compressed, subspherical to ovoid. Increasing regularly in size initially. The last 3 or 2 chambers however increase relatively more rapidly in size. Chambers moderately embracing. Intercameral sutures radial, moderately depressed. Aperture a low, symmetrical equatorial arch, bordered by a narrow lip. The primary aperture often becomes subdivied in large specimens by the ultimate chamber, attaching the axial periphery. Wall calcareous, finely perforate. Surface smooth.

Remarks : The large test of *P. sharkriverensis* is typically subquadrate in equatorial outline. The last 3 or 4 chambers become relatively very large and the primary aperture is often subdivied in two lateral openings by the ultimate chamber attaching the axial periphery. The intercameral sutures are radial.

Pseudohastigerina wilcoxensis (CUSHMAN & PONTON, 1932)
Pl.I, figs.23-25

+ 1932 *Nonion wilcoxensis* Cushman & Ponton-CUSHMAN & PONTON, p.64, pl.8, fig. 11a-b (Fide ELLIS & MESSINA)

p 1967 *Pseudohastigerina wilcoxensis* (Cushman & Ponton)-BERGGREN, OLSSON & REYMENT, p. 278, text-fig.2, nrs.a-c, g-i, j-l, s-v ; text-fig.3, nrs.2, 3a-c, 4a-c, 5a-c ; text-fig.4, nrs.2a-5c

1979 *Pseudohastigerina wilcoxensis* (Cushman & Ponton)-BLOW, p.1193, pl.159, figs.8,9 ; pl.161, figs.10,11 ; pl.252, figs.1-4

Type locality : Railroad cur, 1 mile N of Ozark, Alabama, U.S.A.

Type level : Wilcox age, Eocene.

Description : Test planispiral, involute, biumbilicate. Equatorial periphery lobate, ovoid in outline. Axial periphery broadly rounded. Five to six subglobular chambers in the last whorl, increasing rapidly in size. Intercameral sutures nearly radial, depressed. Aperture a large, equatorial arch. Wall calcareous, perforate. Surface : smooth.

Remarks : According to BLOW (1979), *P. wilcoxensis* evolves from *G. (T.) chapmanni* PARR, 1938 sensu BERGGREN & all., 1967, which is axially compressed.

Family *GLOBOROTALIIDAE* CUSHMAN, 1927
Subfamily *GLOBOROTALIINAE* CUSHMAN, 1927
Genus *Globorotalia* CUSHMAN, 1927

Globorotalia (Acarinina) broedermanni
CUSHMAN & BERMUDEZ, 1949
Pl.2, figs.1-6

+ 1949 *Globorotalia (Truncarotalia) broedermanni* Cushman & Bermudez, n.sp. - CUSHMAN & BERMUDEZ, p.40, pl.7, figs.22-24

1957 *Globorotalia broedermanni* Cushman & Bermudez-BOLLI, p.167, pl.37, figs.13a-c

1979 *Globorotalia (A.) broedermanni broedermanni* Cushman & Bermudez-BLOW, p.911, pl.130, figs.7-9 ; pl.135, fig.4 ; pl. 142, figs.1-3 ; pl.148, figs.1-3 ; pl. 153, figs.7-8 ; pl.179, figs.3-5

Type locality : 5km south of Capdevilla, Habana Province, Cuba.

Type level : Lower Eocene, Capdevilla Formation.

Description : Test low trochospiral, biconvex. Equatorial periphery nearly circular. Axial periphery rounded to subangular. Chambers arranged in 2 1/2 whorls. About five subangular to subglobular chambers in the last whorl, increasing slowly in size. Dorsal intercameral sutures slightly curved, slightly depressed. Ventral intercameral sutures radial, slightly depressed. Aperture lowly arched, umbilical-extraumbilical in position. Umbilicus narrow. Wall coarsely perforate. Surface spinose.

Remarks : *G. (A.) broedermanni broedermanni* differs from *G. (A.) broedermanni anapetes* BLOW, 1979, into which it evolves, in the smaller umbilicus, in the more extended aperture, in the more tightly coiled test, which is more biconvex. *G. broedermanni broedermanni* descends from *G. (A.) lodoensis* MALLORY, 1959.

Globorotalia (Acarinina) bullbrooki
Bolli
Pl.2, figs.7-11

? 1925 *Pulvinulina crassata* Cushman var. *densa*-CUSHMAN, p.301

+ 1957 *Globorotalia bullbrooki* Bolli, new species-BOLLI, p.167, pl.38, figs.4a-5c

1977 *Acarinina densa* (Cushman)-BERGGREN, p. 259

1979 *Globorotalia (A.) bullbrooki*-BLOW, p. 915, pl.149, figs.8,9 ; pl.155, figs. 1-8 ; pl.171, figs.1-3, 7-9

Type locality : Holotype from outcrop on left side of right brach of Nariva River, about 450 feet from its junction, Central Range, Trinidad (coordinates N : 314350 links, E : 487360 links).

Type level : *Hantkenina arogonensis* Zone, Navet Formation.

Description : Test low trochospiral. Spiral side flattened. Umbilical side strongly convex. Equatorial periphery smoothly rounded, slightly lobate. Axial periphery subangular. 12 to 15 chambers, arranged in 2 1/2 whorls. 4 to 4 1/2 chambers in the last whorl, increasing fairly rapidly in size.
In dorsal aspect, the chambers are rounded, in ventral view moderately closely appressed and embracing. Dorsal intercameral sutures oblique to slightly curved, depressed. Ventral intercameral sutures radial, depressed. Umbilicus narrow, deep. Aperture lowly arched, umbilical-extraumbilical in position. Wall calcareous, perforate. Surface spinose.

Remarks : *Globorotalia (A.) bullbrooki* may be related to *Globorotalia (A.) crassata* var. *densa* (Cushman), but BLOW (1979) pointed out that the holotype of *G. crassata* var. *densa* is probably lost. *G. (A.) bullbrooki* differs from *G. (A.) decepta* (MARTIN, 1943) in that the chambers are not laterally angulate.

Globorotalia (Acarinina) colomi
(BERMUDEZ, 1961)
Pl.2, figs.12-18

+ 1961 *Globigerina colomi* Bermudez-BERMUDEZ, p.1167, pl.2, figs.6a-c

Type locality : Holotype from a section along the avenida de los Presidentes, Loma Principe, Vedado, Havana, Cuba.

Type level : Lower Eocene, Universidad Formation.

Description : Test low trochospiral. Equatorial side flattened. Ventral side convex. Equatorial periphery slightly lobate. Axial periphery rounded. Five chambers in the last whorl, increasing gradually in size. Dorsal intercameral sutures curved, depressed. Ventral intercameral sutures nearly radial. Aperture lowly to fairly highly arched, umbilical-extraumbilical in position. Umbilicus small. Wall calcareous, finely perforate. Surface pitted.

Remarks : This species occurs commonly in the Middle Eocene Brussels Formation. The dorsal intercameral sutures of our specimens become distinctly recurved, and the chambers of the

last whorl tend to become compressed.

Globorotalia (Acarinina) danvillensis
HOWE & WALLACE, 1932
Pl.3, figs.11-19

+ 1932 *Globigerina danvillensis* Howe & Wallace-HOWE & WALLACE, p.74, pl.10, figs.9a-c (Fide ELLIS & MESSINA)

?p 1953 *Acarinina rugosoaculeata* Subbotina-SUBBOTINA, p.235, pl.25, figs.4a-c

1971 *Globigerina* cf. *danvillensis* HOWE & WALLACE-MARKS & VAN VESSEM, p.63, pl.8, figs.6a-7c ; pl.9, figs.1a-c

? 1979 *Globorotalia (Acarinina) rugosoaculeata* (Subbotina)-BLOW, p.958

Type locality : Danville Landing on the Ouachita River, Catahoula Parish, Louisiana, U.S.A.

Type level : Upper Eocene, Jackson, Upper Horizon (Bed 2), light yellow clay.

Description : Test small, low trochospiral. Spiral side flattened, umbilical side convex. Equatorial periphery lobate, axial periphery rounded. Four to five chambers in the last whorl, increasing fairly rapidly in size. In dorsal aspect, the chambers are longer tangentially than radially broad. Intercameral sutures radial, moderately depressed. Primary aperture lowly arched, asymmetrical, umbilical to umbilical-extraumbilical in position. Secondary sutural apertures may occur on spiral side. Umbilicus very small to almost closed. Wall calcareous, finely perforate. Surface spinose.

Remarks : This small species is very characteristic in Lower Oligocene deposits in NW-Europe. MARKS & VAN VESSEM (1971) recorded it from the Silberberg Formation in Germany (Lattorfian).

Globorotalia (Acarinina) esnaensis
(LE ROY, 1953)
Pl.2, fig.24 ; pl.3, figs.1-3

+ 1953 *Globigerina esnaensis* Le Roy-LE ROY, p. 31, pl.6, figs.8-10 (Fide ELLIS & MESSINA)

p 1957 *Globorotalia esnaensis* (Le Roy)-LOEBLICH & TAPPAN, p.189, pl.61, figs.1-2,9

1969 *Acarinina esnaensis* (Le Roy)-BERGGREN, pl.1, figs.12-17

1977 *Acarinina esnaensis* (Le Roy)-BERGGREN, p.249

Type locality : The Magfi section, in a conspicious escarpment 53km west and 37km north from the intersection of long. 29°E and lat. 27°N, 69km N65°E of the village of Qasr Farafra in the Farafra Oasis, and 400km S41°W of Cairo, Egypt.

Type level : Probably Lower Eocene but possibly Paleocene, base of the Esna Formation.

Description : Test trochospiral. Spiral side flattened. Umbilical side convex. Axial periphery lobate, subquadrate. Equatorial periphery rounded to slightly angular. Four chambers in the last whorl, increasing rapidly in size. Dorsal intercameral sutures oblique, depressed. Ventral intercameral sutures radial, depressed. Umbilicus small, deep. Aperture lowly arched, umbilical-extraumbilical in position. Wall calcareous, finely perforate. Surface finely spinose.

Remarks : The last chamber of *G. (A.) esnaensis* becomes slightly compressed, angular in axial view.

Globorotalia (Acarinina) pentacamerata
SUBBOTINA, 1947
Pl.3, figs.4-9

p+ 1947 *Globorotalia pentacamerata* Subbotina-SUBBOTINA, p.233, pl.23, fig.8 ; pl. 24, figs.1-6

1969 *Acarinina pentacamerata* (Subbotina)-BERGGREN, pl.1, figs.24-26

1977 *Acarinina pentacamerata* (Subbotina)-BERGGREN, p.254

1979 *Globorotalia (Acarinina) pentacamerata* Subbotina-BLOW, p.939, pl.135, fig.5

Type locality : Holotype from along the Kheu River, northern Caucasus, U.S.S.R.

Type level : Middle Eocene, "*Globorotalia crassaformis*" Zone.

Description : Test low trochospiral. Equatorial periphery slightly lobate, subcircular in outline. Axial periphery rounded. About 13 chambers, arranged in 2 1/2 whorls. Five closely appressed chambers in the last whorl, increasing moderately in size. Last chamber often reduced in size. Dorsal intercameral sutures weakly curved, depressed. Ventral intercameral sutures nearly radial, depressed. Umbilicus deep, open, moderately large. Aperture arched, umbilical-extraumbilical in position. Wall calcareous, finely perforate. Surface spinose.

Remarks : BERGGREN (1971) considers *Globigerina gravelli* BOLLI, 1957 as a junior synonym of *G. (A.) pentacamerata*. According to BLOW (1979) however, this species, with six chambers in the last whorl, is a junior synonym of *Globigerina (Muricoglobigerina) esnehensis* (MAKKADY, 1950).

Globorotalia (Acarinina) primitiva
(FINLAY, 1947)
Pl.3, fig.10

+ 1947 *Globoquadrina primitiva* Finlay-FINLAY, p.291, pl.8, figs.129-134

1979 *Globorotalia (Acarinina) primitiva* (Finlay)-BLOW, p.949, pl.143, figs.6-9 ; pl.249, figs.1-4

Type locality : Sample n°517B, Hampden, Otago Province, South Island, New Zealand.

Type level : Middle Eocene.

Description : Test low trochospiral. Dorsal side slightly convex. Ventral side strongly convex. Equatorial periphery lobate, subquadrate in outline. Axial periphery rounded. Three and a half chambers in the last whorl, slightly compressed, becoming longer tangentially than radially broad, increasing rapidly in size. Dorsal intercameral sutures curved, depressed. Ventral intercameral sutures radial, depressed. Aperture slit-like, asymmetrically arched, umbilical-extraumbilical in position. Wall calcareous, perforate. Surface spinose.

Remarks : *G. (A.) primitiva* ressembles *G. (A.) bullbrooki* but differs from it in the thighter coiled test, which is also smaller in size.

Globorotalia (Globorotalia) pseudoscitula GLAESSNER, 1937

+ 1937 *Globorotalia pseudoscitula* Glaessner-GLAESSNER, p.32, text-fig.3 (fide ELLIS & MESSINA)

1957 *Globorotalia renzi* Bolli-BOLLI, p.168, pl.38, figs.3a-c

1977 *Planorotalites pseudoscitula* Glaessner-BERGGREN, p.224

1979 *Globorotalia (Gl.) pseudoscitula* Glaessner-BLOW, p.897, pl.116, figs.8-10 ; pl.173, figs.1-8

Type locality : Ilskaja, NW-Caucasus, U.S.S.R.

Type level : Not designated. Levels given : Lower and Middle Eocene.

Description : Test low trochospiral, slightly biconvex. Equatorial periphery almost circular. Axial periphery acute with a faint keel. Chambers arranged in about 2 1/2 whorls. Six to seven chambers in the last whorl, increasing gradually in size, strongly compressed. Dorsal intercameral sutures curved, slightly depressed. Ventral intercameral sutures slightly depressed. Umbilicus very narrow, shallow. Aperture lowly curved, umbilical-extraumbilical in position, bordered by a lip. Wall finely perforate. Surface spinose to smooth or finely pitted in the last chamber.

Remarks : The peripheral keel is not well developed in our specimens. The convexity of the test varies slightly.

Globorotalia (Acarinina) strabocella
LOEBLICH & TAPPAN, 1957
pl.3, figs.20-24

+ 1957 *Globorotalia strabocella* Loeblich & Tappan, new species - LOEBLICH & TAPPAN, p.195, pl.61, figs.6a-c

1979 *Globorotalia (Acarinina) wilcoxensis strabocella* Loeblich & Tappan - BLOW, p.970, pl.114, figs.2-5 ; pl.129, fig. 4 ; pl.132, fig.6

Type locality : South valley wall of Shoal Creek, 5,5 miles southeast of Camden, along the Cam-

den - Fatama road, Wilcox County, southwest-central Alabama.

Type level : Lower Eocene, Ypresian, Nanafalia Formation.

Description : Test trochospiral. Spiral side moderately convex. Umbilical side distinctly convex. Equatorial periphery lobate. Axial periphery broadly rounded. Four chambers in the early whorls, increasing to 5 or 6 in the last whorl, inflated, compressed, with distinct umbilical shoulder, increasing gradually in size. Last chamber often reduced in size. Dorsal intercameral sutures slightly curved, depressed. Ventral intercameral sutures nearly radial, depressed. Umbilicus broad, open. Aperture lowly arched, umbilical-extraumbilical in position. Often with secondary sutural openings on the dorsal side of the test. Wall calcareous, finely perforate. Surface spinose.

Remarks : *G. (A.) strabocella* has a more broadly rounded, less truncate axial periphery than *Globorotalia (M.) apanthesma* Loeblich & Tappan, 1957. Some of our specimens show the secondary sutural openings on the dorsal side of the test.

Globorotalia (Acarinina) wilcoxensis
CUSHMAN & PONTON, 1932
Pl.3, figs.25-28

+ 1932 *Globorotalia wilcoxensis* Cushman & Ponton, n. sp.-CUSHMAN & PONTON, p.71, pl.9, figs.10a-c

1966 *Globorotalia wilcoxensis* Cushman & Ponton-EL NAGGAR, p.250

1971 *Globorotalia wilcoxensis* Cushman & Ponton-BERGGREN, p.250

Type locality : Railroad cut one mile N. of Ozark, Alabama, U.S.A.

Type level : Eocene, Wilcox age.

Description : Test very low trochospiral. Spiral side flattened to slightly concave. Umbilical side strongly convex. Equatorial periphery lobate. Axial periphery subrounded to acute in the later part of the test. About 10 chambers, arranged in 2 - 2 1/2 whorls. Four inflated chambers in the last whorl, slightly compressed laterally, increasing rapidly in size. Last chamber often reduced in size. Dorsal intercameral sutures slightly curved to subradial, depressed. Ventral intercameral sutures radial, depressed. Umbilicus narrow, deep, open. Aperture lowly arched, umbilical-extraumbilical in position, bordered by a narrow lip. Wall calcareous, perforate. Surface nodose, that of the last chamber less so.

Remarks : *G. (A.) wilcoxensis* is characterized by the plano-convex test with subrounded to subacute axial periphery. The chambers of the last whorl are slightly compressed laterally, ovoid. It differs from *Globorotalia (A.) strabocella* LOEBLICH & TAPPAN, 1957 in having less chambers in the last whorl and in having a tighter coiled test.

Globorotalia (Morozovella) aequa
(CUSHMAN & RENZ, 1942)
Pl.4, figs.1-5

+ 1942 *Globorotalia crassata* (Cushman) var. *aequa* Cushman & Renz-CUSHMAN & RENZ, p.12, pl.3, figs.3a-c

p 1957 *Globorotalia aequa* Cushman & Renz-LOEBLICH & TAPPAN, p.186, pl.59, figs.6a-c, pl.64, figs.4a-c

1960 *Globorotalia aequa* Cushman & Renz-BOLLI & CITA, p.17, pl.31, fig.51

1966 *Globorotalia aequa* Cushman & Renz-EL NAGGAR, p.190, pl.27, figs.6a-c

1966 *Globorotalia loeblichi* sp. nov.-EL NAGGAR, p.218, pl.23, figs.1a-c

1977 *Morozovella aequa* (Cushman & Renz)-BERGGREN, p.228

1979 *Globorotalia (Morozovella) aequa* Cushman & Renz-BLOW, p.975, pl.96, figs.4-9 ; pl.99, fig.5 ; pl.102, figs.6,9-10 ; pl.103, fig.1 ; pl.18 , figs.8-10 ; pl. 210, figs.1-6 ; pl.211, figs.1-5

Type locality : Sample K.2950 (from near the top of the limestone scarp at the south end of the island, fide Kugler, 1938, Venezuela, Minist. Fomento, Bol. Geol. y Mineria, tomo 2, nos.2-4, p.214 and maps), Soldado Rock, a small island in the Serpent's Mouth at the south end of the Gulf of Paria, between the southwest corner of Trinidad, B.W.I. (about 6 miles west of Cedros) and the delta of the Pedernales River, eastern Venezuela.

Type level : Eocene, Midway, Soldado Formation, Bed 3 of Maury, light yellowish indurated marl.

Description : Test very low trochospiral. Spiral side flattened to slightly convex. Umbilical side strongly convex. Equatorial periphery ovoid, distinctly lobate. Axial periphery acute, with a faint nodose keel. About 10-12 chambers, arranged in 3 whorls. Three and a half to four and a half chambers in the last whorl, increasing very rapidly in size. Last chamber relatively very large, about one third of the test. In dorsal aspect, the chambers of the last whorl are considerably longer tangentially than broad radially. Dorsal intercameral sutures strongly curved, slightly depressed. Ventral intercameral sutures radial, distinctly depressed. Umbilicus rectangular, narrow, open. Aperture lowly arched, umbilical-extraumbilical in position. Wall calcareous, perforate. Surface spinose or granulate, especially in the last chambers.

Remarks : *G. aequa* evolves from *Globorotalia (M.) angulata* WHITE, 1928 and it is the ancestor of *Globorotalia (M.) subbotinae* MOROZOVA, 1939. It is distinguished in having a strongly convex umbilical side, a narrow and deep umbilicus, a periphery with a faint nodose keel, a spinose surface and in having 3 1/2 to 4 1/2 chambers in the last whorl.

Globorotalia (Morozovella) angulata
(WHITE, 1928)
Pl.17, figs.14-15

+ 1928 *Globigerina angulata* (White)-WHITE, p.191, pl.27, fig.13 (Fide ELLIS & MESSINA)

1957 *Globorotalia angulata* (White)-BOLLI, p.74, pl.17, figs.7-9

p 1957 *Globorotalia angulata* (White)-LOEBLICH & TAPPAN, p.187, pl.50, figs.4a-c ; pl.64, figs.5a-c

1960 *Globorotalia angulata* (White)-BOLLI & CITA, p.18, pl.33, fig.8

1977 *Globorotalia (Morozovella) angulata* (White)-BERGGREN, p.230

1979 *Globorotalia (Morozovella) angulata angulata* (White)-BLOW, p.984, pl.86, fig.9 ; pl.87, fig.1

Type locality : Columbus station of the Tampico Monterey railroad line, Tampico embayment, Mexico.

Type level : Base to lower part of middle portion of lower Velasco Formation, Cretaceous (?).

Description : Test very low trochospiral. Spiral side flattened. Umbilical side distinctly convex. Equatorial periphery lobate. Axial periphery subacute to acute. About 15 chambers, arranged in 2 1/2 - 3 whorls. Five angular to subangular chambers in the last whorl, increasing fairly slowly in size. Wall calcareous, perforate. Surface finely spinose. Dorsal intercameral sutures strongly curved, slightly depressed. Ventral intercameral sutures radial, strongly depressed. Umbilicus fairly narrow, deep, open. Aperture slit-like, umbilical-extraumbilical in position, bordered by a faint lip. Wall calcareous, perforate. Surface finely spinose.

Remarks : *G. angulata* evolves from *Globorotalia (Acarinina) praecrassoria* (MOROZOVA, 1957), from which it differs in having subangular chambers and an acute axial periphery. It evolves into *Globorotalia (Morozovella) aequa* (Cushman & Renz, 1942).

Globorotalia (Morozovella) apanthesma
LOEBLICH & TAPPAN, 1957
Pl.17, figs.16-22

+p 1957 *Globorotalia apanthesma* Loeblich & Tappan, new species-LOEBLICH & TAPPAN, p. 187, pl.48, figs.1a-c ; pl.55, figs. 1a-c ; pl.59, figs.1a-c

1966 *Globorotalia angulata angulata* (White)-EL NAGGAR, p.197, pl.22, figs.1a-c

1966 *Globorotalia apanthesma* Loeblich & Tappan-EL NAGGAR, p.199, pl.21, figs.1a-c

1979 *Globorotalia (Morozovella) apanthesma* Loeblich & Tappan-BLOW, p.988, pl.251, fig.2

Type locality : Holotype from ten to thirteen feet above the base of an exposed section along

the west bank of the Potomac River, near the mouth of Aquia Creek, S10°E of Brent Point, in Stafford County, Virginia.

Type level : Upper Paleocene, Upper Landenian, Sparnacian, Aquia Formation.

Description : Test low trochospiral. Spiral side flattened, umbilical side strongly convex. Equatorial periphery lobate. Axial periphery subacute, truncate. Four to five inflated to angular chambers in the last whorl, increasing regularly in size, with distinct but not acute umbilical shoulder. Dorsal intercameral sutures strongly curved, slightly depressed. Ventral intercameral sutures radial, strongly depressed. Umbilicus broad, deep. Aperture a broad arch, umbilical-extraumbilical in position, bordered by a narrow lip. Often with adventitious dorsal sutural openings. Wall calcareous, rather coarsely perforate. Surface spinose, especially on the umbilical side of the test.

Remarks : *G. (M.) apanthesma* differs from *Globorotalia (M.) angulata* (WHITE, 1928) in having fewer chambers in the last whorl, which increase more rapidly in size and which are more angular and more inflated ventrally. Some of our specimens have secondary sutural openings on the dorsal side of the test.

Globorotalia (Morozovella) formosa
BOLLI, 1957
Pl.4, figs.6-15

+ 1957 *Globorotalia formosa formosa* Bolli new species, new subspecies-BOLLI, p.76, pl.18, figs.1-3
1977 *Morozovella formosa* (Bolli)-BERGGREN, p.242
1979 *Globorotalia (Morozovella) formosa* Bolli-BLOW, p.1000, pl.127, figs.3,4 ; pl. 134, figs.7,8 ; pl.138, figs.9,10 ; pl. 224, figs.3,4

Type locality : Holotype from Ravine Ampelu, Lizard Springs area, about 1 1/4 mile southeast of the road junction of the Rio Claro - Guayaguayare Road (8 3/4 M.P.) at the old Trinidad Central Oilfields Road leading to the abandoned Lizard Springs Oilfield, southeast Trinidad (coordinates N : 186505 links ; E : 556755 links), sample KWB 6972 (TLL 102301).

Type level : *Globorotalia formosa formosa*-Zone, upper Lizard Springs Formation, Trinidad B.W.I.

Description : Test very low trochospiral. Spiral side almost flat to slightly convex. Umbilical side strongly convex. Equatorial periphery slightly lobate, nearly circular. Axial periphery angular with distinct spinose keel. About 18 chambers, arranged in 3 whorls. Six to eight angular chambers in the last whorl, increasing slowly in size. Dorsal intercameral sutures recurved, raised and beaded, depressed. Ventral intercameral sutures nearly radial, depressed. Umbilicus fairly wide, deep, open. Aperture lowly arched, umbilical-extraumbilical in position, bordered by a faint lip. Wall calcareous, finely perforate. Surface finely to distinctly spinose.

Remarks : *G. formose* evolves from *Globorotalia (M.) gracilis* (BOLLI, 1957). The number of chambers in the last whorl increases.

Globorotalia (Morozovella) gracilis
(BOLLI, 1957)
Pl.4, figs.16-22

+ 1957 *Globorotalia formosa gracilis* Bolli, new species, new subspecies-BOLLI, p.75, pl.18, figs.4-6
p 1966 *Globorotalia bollii* sp. nov.-EL NAGGAR, p.202, pl.22, figs.6a-d
1977 *Morozovella gracilis* (Bolli)-BERGGREN, p.241
1979 *Globorotalia (Morozovella) subbotinae gracilis* Bolli-BLOW, p.1021, pl.111, figs.9,10 ; pl.112, fig.1 ; pl.115, figs.7-10 ; pl.120, figs.1-9 ; pl.121, figs.1-8 ; pl.223, figs.3,4 ; pl.249, figs.8-9

Type locality : Holotype (U.S.N.M. P5055) from Trinidad Leaseholds, Ltd., well Guayaguayare 159, Trinidad (coordinates N : 151361 links ; E : 554095 links), sample from core 3,707 - 13 feet (TLL 232994).

Type level : *Globorotalia rex*-Zone, Upper Lizard Springs Formation, Trinidad, B.W.I.

Description : Test very low trochospiral. Spiral side more flattened. Umbilical side distinctly convex. Equatorial periphery distinctly lobate. Axial periphery angular with a faint spinose keel. About 12 chambers, arranged in 2 1/2 - 3 whorls. Five to six angular chambers in the last whorl, increasing rapidly in size. Dorsal intercameral sutures slightly curved to oblique, depressed, pseudolimbate. Ventral intercameral sutures radial, distinctly depressed. Umbilicus fairly narrow, deep. Aperture lowly arched, umbilical-extraumbilical in position, but not reaching the periphery. Wall calcareous, perforate. Surface spinose.

Remarks : *G. gracilis* is characterized by its lobate periphery, the five to six angular chambers in the last whorl and by the spinose keel. It evolves into *Globorotalia (Morozovella) formosa* BOLLI, 1957 ; the number of chambers in the last whorl increases, the chambers become tangentially shorter and the dorsal intercameral sutures are less recurved.

Globorotalia (Morozovella) lensiformis
SUBBOTINA, 1953
Pl.2, figs.19-23

+ 1953 *Globorotalia lensiformis* Subbotina-SUBBOTINA, p.214, pl.18, figs.4a-c
1979 *Globorotalia (Morozovella) lensiformis* Subbotina-BLOW, p.1003, pl.125, figs. 6-9 ; pl.126, figs.1-3,5-6 ; pl.128, figs.1-9 ; pl.129, figs.1-3 ; pl.133, fig.7 ; pl.134, fig.1 ; pl.251, fig.5

Type locality : Nalchil, along the Kheu River, Northern Caucasus, U.S.S.R.

Type level : Lower-Middle Eocene, series F_1, zone of conical *Globorotalia*'s.

Description : Test low trochospiral. Equatorial periphery lobate, subcircular in outline. Axial periphery subacute to acute for the last chambers. Spiral side weakly convex to flattened. Umbilical side distinctly convex. Four to five chambers in the last whorl, increasing rapidly in size, tightly appressed. Dorsal intercameral sutures curved, depressed. Ventral intercameral sutures sigmoid to nearly radial, depressed. Umbilicus small, deep, open. Aperture lowly arched, umbilical-extraumbilical in position, bordered by a distinct lip. Wall calcareous, perforate. Surface spinose.

Remarks : *G. (M.) lensiformis* evolves from *G. (M.) dolabrata* JENKINS, 1965 : according to BLOW (1979), the chambers in the last whorl become more appressed and the last chamber becomes relatively smaller. The dorsal intercameral sutures become recurved.

Globorotalia (Morozovella) spinulosa
CUSHMAN, 1925
Pl.4, figs.23-26

+ 1927 *Globorotalia spinulosa* Cushman, s.sp.-CUSHMAN, p.114, pl.23, fig.4
1957 *Globorotalia lehneri* Cushman & Jarvis-BOLLI, p.169, pl.38, figs.10a-b,12
1977 *Morozovella crassata* (Cushman)-BERGGREN, p.246
1979 *Globorotalia (Morozovella) spinulosa spinulosa* Cushman-BLOW, p.1013, pl.182, figs.1-4 ; pl.185, figs.1-4 ; pl.197, figs.1-6 ; pl.229, figs.1-4 ; pl.240, figs.1-4

Type locality : Alazan clay, Rio Tousepan, crossing road from Palo Blanco to La Noria and along Rio Pentepec about 200 metres abote its mouth, Vera Cruz, Mexico.

Type level : Upper (?) Eocene.

Description : Test very low trochospiral. Spiral side slightly convex. Umbilical side distinctly convex. Equatorial periphery lobate. Axial periphery acute with a distinct, spinose keel. Four to five chambers in the last whorl, angular, inflated to distinctly compressed near to the periphery, increasing rapidly in size. Dorsal intercameral sutures curved, depressed. Ventral intercameral sutures radial, depressed. Umbilicus small to virtually closed by the lobe-like extention of the last chamber. Aperture lowly arched, umbilical-extraumbilical in position, bordered by a distinct lip. Wall

calcareous, perforate. Surface smooth to nodose.

Remarks : *Globorotalia (M.) spinulosa* differs from *Globorotalia (M.) lehneri* CUSHMAN & JARVIS, 1929 by the less convex dorsal side. Specimens with a large, open umbilicus are described as *Globorotalia (M.) spinulosa coronata* by BLOW (1979).

Globorotalia (Turborotalia) chapmani
PARR, 1938
Pl.4, figs.27-30

+ 1938 *Globorotalia chapmani* Parr-PARR, p.87, pl.3, figs.8-9 (Fide ELLIS & MESSINA)
1977 *Planorotalithes chapmani* Parr-BERGGREN, p.221
1979 *Globorotalia (Turborotalia) chapmani* Parr-BLOW, p.1059, pl.106, fig.1 ; pl. 116, figs.1-5

Type locality : King's Park Bore nr.1 at 755 feet, Mount's Bay Road, King's Park, Perth, Australia.

Type level : Eocene.

Description : Test very low trochospiral. Unequally biconvex. Equatorial periphery moderately lobate. Equatorial outline ovoid. Axial periphery slightly acute. About six slightly inflated chambers in the last whorl, increasing rapidly in size, embracing. Dorsal intercameral sutures curved, depressed. Ventral intercameral sutures radial, depressed. Umbilicus fairly wide, open. Aperture slit-like, umbilical-extraumbilical in position, bordered by a distinct apertural flap. Wall calcareous, finely perforate. Surface nodose in the early part, becoming smoother with increasing growth.

Remarks : The chambers in the last whorl of our specimen become typically radially elongate. *G. chapmani* differs from *Globorotalia (Turborotalia) compressa* (PLUMMER, 1926) by the less compressed chambers in the last whorl.

Globorotalia (Turborotalia) clemenciae
BERMUDEZ, 1961
Pl.6, figs.20-24

+ 1961 *Turborotalia clemenciae* Bermudez-BERMUDEZ, p.1321, pl.17, figs.10a-b
1965 *Globorotalia munda* Jenkins-JENKINS, p. 1121, fig.14, nrs.126-133 ; fig.15, nrs.152-166 (Fide ELLIS & MESSINA)
1969 *Globorotalia munda* JENKINS-BERGGREN, p. 147, pl.VI, figs.1-11
1971 *Globorotalia (T.) munda* Jenkins-JENKINS, p.123, pl.12, figs.328-335

Type locality : Holotype from the base of the green sands in the Earthquakes section, Sheet 127, Guide Ref. 242931, New Zealand.

Type level : *Globigerina angiporoides angiporoides*-Zone, Oligocene.

Description : Test small, lowly trochospiral. Periphery quadrilobate. Axial to periphery rounded. About 10 chambers, arranged in 2 (1/2) whorls. Four chambers in the last whorl, becoming slightly compressed, ovate. Dorsal intercameral sutures curved, depressed. Spiral suture depressed. Ventral intercameral sutures slightly curved to subradial, depressed. Umbilicus shallow. Aperture lowly arched, umbilical-extraumbilical in position, bordered by a thin lip. Wall calcareous, finely perforate. Surface smooth to finely postulate.

Remarks : Besides typical specimens with four chambers in the last whorl, individuals occur with 4 1/2 to 5 chambers in the last whorl. Consequently, the equatorial outline of the test varies considerably. Most of our specimens have a typical very flattened spiral side. JENKINS (1966) however noted a transition from *G. munda* to *G. juvenilis* BOLLI, 1957. The height of the test increases gradually in stratigraphical younger specimens.

Globorotalia (Turborotalia) compressa
(PLUMMER, 1926)
Pl.23, figs.15-17

+ 1926 *Globigerina compressa* Plummer-PLUMMER, p.135, pl.8, figs.11a-c
1957 *Globorotalia compressa* (Plummer)-LOEBLICH & TAPPAN, p.188, pl.40, figs.5a-c; pl.41, figs.5a-c ; pl.42, figs.5a-c ; pl.44, figs.9a-10c

1960 *Globorotalia compressa* (Plummer)-BOLLI & CITA, p.380, pl.34, figs.3a-c
1966 *Globorotalia compressa* (Plummer)-EL NAGGAR, p.203, pl.17, figs.1a-3c
1966 *Globorotalia kilabiyaensis* sp.nov.-EL NAGGAR, p.218, pl.17, figs.11a-c
1977 *Planorotalites compressa* (Plummer)-BERGGREN, p.218
1979 *Globorotalia (Turborotalia) compressa compressa* (Plummer)-BLOW, p.1062, pl. 75, figs.10,11 ; pl.78, figs.5-10 ; pl.233, figs.1-3 ; pl.248, figs.1-3 ; pl.254, figs.1-3 ; pl.257, figs.5-7

Type locality : Station 23, shallow ditch at road corner south-east of new Corsicana reservoir on the road to Mildred, Navarro County, Texas, U.S.A.

Type level : Lower part of upper Midway Formation, clay. Paleocene.

Description : Test very low trochospiral, compressed. Equatorial periphery lobate. Axial periphery subacute. Chambers moderately inflated, increasing fairly rapidly in size. Five chambers in the last whorl, ovate, becoming slightly compressed. Dorsal intercameral sutures curved to subradial in the final part of the test. Ventral intercameral sutures almost radial, depressed. Umbilicus narrow, deep. Aperture lowly arched, umbilical-extraumbilical in position, bordered by a narrow but distinct lip. Wall calcareous, finely perforate. Surface smooth.

Remarks : *G. compressa* differs from *Globorotalia (Turborotalia) pseudobulloides* (PLUMMER, 1926) by the more angular periphery margin. The chambers in the last whorl are more compressed.

Globorotalia (Turborotalia) continuosa
BLOW, 1959
Pl.5, figs.1-6

+ 1959 *Globorotalia opima continuosa* Blow, subsp. nov.-BLOW, p.218, pl.19, figs.125 a-c
1969 *Globorotalia (Turborotalia) continuosa* BLOW-BLOW, p.347, pl.3, figs.4-6

Type locality : Holotype from sample nr. RM19542, auger line near Pozón, eastern Falcón, Venezuela.

Type level : *Globorotalia mayeri* Zone, Middle Miocene.

Description : Test low trochospiral. Dorsal side flattened. Ventral side convex. Equatorial periphery weakly lobate, subquadrate to subcircular in outline. Axial periphery broadly rounded. Four subglobular chambers in the last whorl, increasing rapidly in size, embracing. Dorsal and ventral intercameral sutures nearly radial, depressed. Spiral suture depressed. Umbilicus narrow. Aperture asymmetrically arched, umbilical-extraumbilical in position, bordered by a distinct lip. Wall calcareous, coarsely perforate. Surface cancellate.

Remarks : *G. (T.) continuosa* differs from *Globorotalia (T.) siakensis* LE ROY, 1939, in having four chambers in the last whorl instead of five.

Globorotalia (Turborotalia) gemma
JENKINS
Pl.5, figs.7-15 ; pl.6, figs.5-9

1962 *Globorotalia (Turborotalia) postcretacea* Myatliuk-BLOW & BANNER, p.120, pl.XII/G-Y
+ 1966 *Globorotalia gemma* Jenkins-JENKINS, p. 1115, fig.11, nrs.97-103
1969 *Globorotalia (Turborotalia) gemma* JENKINS-BLOW, p.348, pl.34, fig.9
1979 *Globorotalia (Turborotalia) gemma* Jenkins-BLOW, p.1071, pl.34, fig.9 ; pl. 245, fig.8

Type locality : Sample F 9398 ; S.136/694, from 2 feet 6 inches above the bored surface in a calcareous glauconitic fine-grained sandstone, on the south bank and near the mouth of the Kakanui River, Grid Ref - 482554, New Zealand.

Type level : Lower Oligocene, London series, Whaingaroan Stage, *Globigerina brevis* Zone.

Description : Test very lowly trochospiral, small. Equatorial periphery lobate, subcircular to subovate in outline. Axial periphery rounded. About 10 globular chambers, arranged in 1 1/2 whorls. Four and a half to six chambers in the

last whorl, increasing slowly in size, becoming compressed laterally. Intercameral sutures weakly curved, depressed. Umbilicus small. Aperture very lowly arched, umbilical-extraumbilical in position, bordered by a lip. Wall calcareous finely perforate. Surface smooth.

Remarks : *G. gemma* ressembles well *Globigerina postcretacea* MYATLIUK 1950 in the size of the test and the chamber arrangement, but differs from it in the umbilical-extraumbilical instead of umbilical aperture. It differs from *Globorotalia permicra* BLOW & BANNER, 1962, in the slower increase in size of the chambers and in the lower arched aperture.

Globorotalia (Turborotalia) imitata
SUBBOTINA, 1953
Pl.5, figs.16-20

+ 1953 *Globorotalia imitata* Subbotina-SUBBOTINA, p.206, pl.16, figs.14a-16c
p 1957 *Globorotalia imitata* Subbotina-BOLLI, p. 190, pl.45, figs.6a-c
1977 *Planorotalites imitata* Subbotina-BERGGREN, p.223
1979 *Globorotalia (Turborotalia) imitata* Subbotina-BLOW, p.1078, pl.81, figs.8-9 ; pl.83, fig.1 ; pl.88, fig.5

Type locality : Along the Kuban River, Northern Caucasus, U.S.S.R.

Type level : Danian ? Elburgan horizon, zone of *Rotalia*-like *Globorotalia*'s.

Description : Test low trochospiral, small. Spiral side flattened to gently convex. Equatorial periphery lobate. Axial periphery rounded. Four to 5 chambers in the last whorl, increasing gradually in size, not closely appressed. Last chamber sometimes reduced in size. Intercameral sutures gently curved to radial, slightly depressed. Umbilicus small, shallow. Aperture lowly arched, umbilical-extraumbilical in position, bordered by a narrow lip. Wall calcareous, finely perforate. Surface smooth.

Remarks : The last chamber is typically subrounded to truncate in edge view. *G. imitata* resembles *Globorotalia (Turborotalia) compressa* (PLUMMER, 1926) but differs from it in the less acute periphery and in the almost flattened spiral side.

Globorotalia (Turborotalia) inconstans
(SUBBOTINA, 1953)
Pl.5, figs.21-25

+ 1953 *Globigerina inconstans* Subbotina-SUBBOTINA, p.58, pl.3, figs.1-2 (Fide ELLIS & MESSINA)
1957 *Globorotalia trinidadensis* Bolli, new species-BOLLI, p.73, pl.16, figs.19-21,22, 23
1977 *Subbotina inconstans* (Subbotina)-BERGGREN, p.217
1979 *Globorotalia (Turborotalia) inconstans* (Subbotina)-BLOW, p.1080, pl.71, figs. 6,7 ; pl.76, figs.3,6,7,10 ; pl.77, fig. 1 ; pl.81, fig.1 ; pl.83, fig.5 ; pl. 233, figs.4-5

Type locality : Along the Kuban River, Northern Caucasus, U.S.S.R.

Type level : Danian ? Upper part of the Elburgan horizon, zone of "*Rotalia*"-like *Globorotalia*'s, *Globigerina inconstans* subzone.

Description : Test very low trochospiral. Equatorial periphery moderately lobate. Axial periphery rounded. About 14 to 18 chambers, arranged in 2 to 2 1/2 whorls. Five to seven globular chambers in the last whorl, increasing slowly in size. Dorsal intercameral sutures radial, depressed. Umbilicus fairly wide, open. Aperture lowly arched, umbilical-extraumbilical in position, bordered by a distinct lip. Wall calcareous, finely perforate. Surface smooth to slightly rugose in the early chambers.

Remarks : *G. (T.) inconstans* differs from *G. (T.) pseudobulloides* (PLUMMER, 1926), from which it evolves, in having more chambers in the last whorl, resulting in a larger test. It evolves into *Globorotalia (Acarinina) praecursoria* MOROZOVA, 1957.

Globorotalia (Turborotalia) increbescens
(BANDY, 1949)
Pl.23, figs.18-20

+ 1949 *Globigerina increbescens* Bandy-BANDY, p. 120, pl.23, fig.3 (Fide ELLIS & MESSINA)
1969 *Globorotalia (Turborotalia) increbescens* (BANDY)-BLOW, p.349, pl.36, figs.5-6

Type locality : Locality 58, in the Creek bed on the south side, along the upper course of Little Stave Creek, about 150 feet upstreams from a falls and about 8675 feet upstreams from the base of the exposed section which begins at the intersection of the Creek with the Jackson fault near the northest corner of Sec. 30, T.7 N., R.2 E. about 2 1/2 miles north of the town of Jackson, Clarke County, Alabama.

Type level : Upper Eocene, upper part of the Jackson Formation, Zone B, bluish, glauconitic marl with phosphatic nodules, about five feet below the top of the Jackson.

Description : Test low trochospiral. Equatorial periphery moderately lobate. Axial periphery broadly rounded. Four subglobular chambers in the last whorl, increasing fairly rapidly in size, becoming slightly compressed laterally. Dorsal intercameral sutures slightly curved, depressed. Ventral intercameral sutures nearly radial, depressed. Aperture fairly highly arched, umbilical-extraumbilical in position, bordered by a thickened rim. Umbilicus fairly narrow. Wall calcareous, perforate. Surface pitted.

Remarks : According to BLOW (1969), *G. (T.) increbescens* evolves into *Globigerina ampliapertura* BOLLI, 1957. The aperture becomes intraumbilical in position.

Globorotalia (Turborotalia) kugleri
BOLLI, 1957
Pl.8, figs.6-7

+ 1957 *Globorotalia kugleri* Bolli, new species-BOLLI, p.118, pl.28, figs.5-6
1969 *Globorotalia (Turborotalia) kugleri* Bolli-BLOW, p.350, pl.38, figs.1-4

Type locality : Holotype from the sample KWK 8672 from the type locality area of the *Globorotalia (T.) kugleri* Zone, i.i. South Bank of San Fernando Bypass Road, approximately 240 feet northeast from the northend of road bridge across the Siparia railway line, coordinates N 225700 links, E 361900 links, S. Trinidad.

Type level : *Globorotalia kugleri* Zone, Upper Oligocene, Lower Miocene.

Description : Test small, very low trochospiral. Equatorial periphery slightly lobate, subcircular. Axial periphery rounded. About 18 chambers, arranged in 2 1/2 to 3 whorls. Six to eight chambers in the last whorl, increasing slowly in size. Dorsal intercameral sutures strongly curved, depressed. Spiral suture depressed. Ventral intercameral sutures nearly radial, depressed. Umbilicus narrow. Aperture lowly arched to slit-like, umbilical-extraumbilical in position, bordered by a lip. Wall calcareous, perforate. Surface finely pitted.

Remarks : *Globorotalia (T.) kugleri* is characterized by having six to eight chambers in the last whorl and strongly curved dorsal intercameral sutures. It evolves from *G. (T.) pseudokugleri* BLOW, 1969, which has radial dorsal intercameral sutures.

Globorotalia (Turborotalia) mayeri
CUSHMAN & ELLISOR, 1939
Pl.5, figs.26-30 ; pl.6, figs.1-4

+ 1939 *Globorotalia mayeri* Cushman & Ellisor, n. sp.-CUSHMAN & ELLISOR, p.11, pl.2, fig. 4a-c
1969 *Globorotalia (Turborotalia) mayeri* Cushman & Ellisor-BLOW, p.351, pl.3, figs. 7-9

Type locality : Core sample at a depth of 9,612 feet, from Humble Oil and Refining Compagny's nr.1 Ellender, Terrebone Parish, Louisiana, U.S.A.

Type level : Miocene.

Description : Test very low trochospiral. Spiral side flattened, umbilical side convex. Equatorial periphery lobate. Axial periphery broadly rounded. Five to six inflated, subglobular chambers in the last whorl, increasing regularly in size. Last chamber often reduced in size. Dorsal intercameral sutures moderately curved, depressed. Ventral intercameral sutures radial, depressed. Umbilicus fairly wide, deep. Aper-

ture large, fairly highly arched, umbilical-extraumbilical in position, bordered by a distinct lip. Wall calcareous, perforate. Surface smooth to pustulate.

Remarks : *G. (T.) mayeri* differs from *G. (T.) siakensis* LE ROY, 1939 in the curved dorsal intercameral sutures, which are less deeply incised. It differs from *G. (T.) peripheroronda* BLOW & BANNER, 1966 in the more inflated chambers, in the higher aperture and in the often pustulate surface.

Globorotalia (Turborotalia) obesa
BOLLI, 1957
Pl.6, figs.25-29

+ 1957 *Globorotalia obesa* Bolli, new species-BOLLI, p.119, pl.23, figs.2a-3
1969 *Globorotalia (Turborotalia) obesa* BOLLI-BLOW, p.352
1972 *Globorotalia obesa* BOLLI-HOOYBERGHS & DE MEUTER, p.13, pl.2, figs.1a-c

Type locality : Cipero type section, between 850 and 1,400 feet southwest of fixed point (= southernmost of a number of iron rails driven into the marls along the beach). Trinidad.

Type level : *Globorotalia fohsi robusta* Zone, Middle Miocene.

Description : Test low trochospiral. Equatorial periphery lobate. Axial periphery rounded. Dorsal side of the test flattened. About 10 chambers, arranged in 2 1/2 whorls. Four to 4 1/2 chambers in the last whorl, increasing rapidly in size, resulting in a more trapezoid equatorial outline of the test. Dorsal intercameral sutures weakly curved, depressed. Spiral suture depressed. Ventral intercameral sutures nearly radial, depressed. Umbilicus fairly wide, deep. Aperture lowly arched, umbilical-extraumbilical in position. Wall calcareous, perforate. Surface hispid.

Remarks : *G. obesa* evolves into *Hastigerina praesiphonifera* BLOW, 1969, in which the last chambers become planispirally coiled. This is observed in our material.

Globorotalia (Turborotalia) opima nana
BOLLI, 1957
Pl.7, figs.5-12

+ 1957 *Globorotalia opima nana* Bolli, new species, new subspecies-BOLLI, p.118, pl. 28, figs.3a-c
1957 *Globorotalia opima nana* Bolli-BOLLI, p. 169
1962 *Globorotalia (Turborotalia) opima nana* Bolli-BLOW & BANNER, p.119, pl.XIII, figs.Q-S
1969 *Globorotalia (Turborotalia) opima nana* BOLLI-BLOW, p.352, pl.39, fig.1
1972 *Globorotalia opima nana* BOLLI-HOOYBERGHS & DE MEUTER, p.13, pl.2, figs.1a,b,c

Type locality : Cipero type section, between 20 and 240 feet of fixed point, i.i. southern most of a number of iron rails driven into the marls along the beach, South Trinidad.

Type level : *Globorotalia opima opima* Zone, Oligocene. Sample JS20 (TTOC 193265).

Description : Test lowly trochospiral, small. Equatorial periphery weakly lobate, subcircular to subquadrate in outline. Axial periphery rounded. Spiral side flattened. About 10 to 12 spherical chambers, arranged in 2 1/2 to 3 whorls. Four to 4 1/2 chambers in the last whorl, strongly embracing. Dorsal and ventral intercameral sutures nearly radial, depressed. Spiral suture depressed. Umbilicus small, rather deep. Aperture slit-like, umbilical-extraumbilical in position, bordered by a distinct lip. Wall calcareous, perforate. Surface cancellate.

Remarks : *Globorotalia opima nana* differs from *Globorotalia opima opima* BOLLI, 1957 only by its smaller size. The last chamber of *Globorotalia opima nana* is often reduced in size. Some variation occurs in the height of the aperture.

Globorotalia (Turborotalia) opima opima
BOLLI, 1957
Pl.7, figs.1-4

+ 1957 *Globorotalia opima opima* Bolli, new species, new subspecies-BOLLI, p.117, pl. 28, figs.1a-2
1969 *Globorotalia (Turborotalia) opima opima* Bolli-BLOW, p.353, pl.39, fig.3
1969 *Globorotalia opima opima* BOLLI-BERGGREN, pl.8, figs.12-14

Type locality : Cipero type section, between 20 and 240 feet southwest of fixed point (= southernmost of a number of iron rails driven into the marls along the beach). S. Trinidad.

Type level : *Globorotalia opima opima* Zone, Oligocene.

Description : Test lowly trochospiral. Equatorial periphery rounded to subquadrate in outline, weakly lobate. Axial periphery broadly rounded. Spiral side flattened. About 12 globular chambers, arranged in 2 1/2 whorls. Four to 4 1/2 or 5 chambers in the last whorl, increasing rapidly in size, embracing. Last chamber often very inflated. Dorsal and ventral intercameral sutures nearly radial, depressed. Spiral suture depressed. Umbilicus small, rather deep. Aperture lowly arched, slit-like, umbilical-extraumbilical in position, bordered by a distinct lip. Wall calcareous, perforate, rather thick. Surface cancellate.

Remarks : This subspecies occurs very rare in the Boom Clay, however the few specimens have a very typical distinctly inflated last chamber.

? Globorotalia (Turborotalia) perclara
(LOEBLICH & TAPPAN, 1957)

?+ 1957 *Globorotalia perclara* Loeblich & Tappan, new species-LOEBLICH & TAPPAN, p.191, pl.40, fig.7 ; pl.41, fig.8 ; pl.42, fig.4 ; pl.45, fig.11 ; pl.46, fig.3 ; pl.47, fig.6 ; pl.50, fig.1 ; pl.54, figs.6-7 ; pl.57, figs.3-4 ; pl.60, fig.5
1974 *Turborotalia perclara* (Loeblich & Tappan)-MURRAY & WRIGHT, pl.140, figs.3-6

Remarks : Scare specimens from the Ieper Formation, characterized by 5 to 6 inflated chambers in the last whorl, increasing rapidly in size, are given here as *? Globorotalia (T.) perclara*. Some confusion however exists about the taxonomic validity of this species. The specimens, figured by LOEBLICH & TAPPAN (1957) probably represent different species.

Globorotalia (Turborotalia) permicra
BLOW & BANNER, 1962
Pl.7, figs.13-15 ; pl.8, fig.5

+ 1962 *Globorotalia (Turborotalia) permicra* Blow & Banner sp. nov.-BLOW & BANNER, p.120, pl.10, figs.N-P
1969 *Globorotalia (Turborotalia) permicra* BLOW & BANNER, p.378, pl.35, fig.9
1979 *Globorotalia (Turborotalia) permicra* Blow & Banner-BLOW, p.1089, pl.245, fig.4

Type locality : Sample FCRM 1922, Lindi area, Tanzania.

Type level : *Globigerina oligocaenica* Zone, Oligocene.

Description : Test lowly trochospiral. Equatorial periphery lobate, subovate. Axial periphery rounded. Five to six inflated chambers in the last whorl, increasing rapidly in size. Dorsal intercameral sutures curved, depressed. Ventral intercameral sutures weakly curved to subradial, depressed. Umbilicus small, deep. Aperture asymmetrically arched, umbilical-extraumbilical in position, bordered by a distinct lip. Wall calcareous, finely perforate. Surface smooth to hispid.

Remarks : The specimens have typically 5 to 6 inflated chambers in the last whorl.

Globorotalia (Turborotalia) praecentralis BLOW, 1979

+ 1979 *Globorotalia (Turborotalia) praecentralis* n.sp.-BLOW, p.1094, pl.135, figs.7-9 ; pl.136, figs.1-6 ; pl.233, fig.6

Type locality : D.S.D.P. Leg 6, Station 47/2, core 8, Section I, sample at 77-79 cms.

Type level : Zone P.8 (Subzone P.8b), Early Eocene.

Description : Test low trochospiral. Equatorial periphery slightly lobate, subcircular in out-

line. Axial periphery rounded, ovoid in outline. About 12 - 15 chambers, arranged in 2 1/2 whorls. Five chambers in the last whorl, embracing, becoming closely appressed. Dorsal intercameral sutures curved, depressed. Ventral intercameral radial to slightly sinuous, slightly depressed. Aperture lowly to moderately highly arched, umbilical-extraumbilical in position, bordered by a thickened rim. Umbilicus small, open, deep. Wall calcareous, coarsely perforate, especially in the earlier chambers of the last whorl. Surface cancellate.

Remarks : According to BLOW (1957) *G. (T.) praecentralis* evolves into *G. (T.) centralis* CUSHMAN & BERMUDEZ, 1937 : the chambers become less embracing and less closely appressed, the umbilicus is smaller and the aperture more lowly arched.

Globorotalia (Turborotalia) pseudobulloides (PLUMMER, 1926)
Pl.7, figs.20-26

+ 1926 *Globigerina pseudobulloides* Plummer-PLUMMER, p.133, pl.8, figs.9a-c (Fide ELLIS & MESSINA)
1957 *Globorotalia pseudobulloides* (Plummer)-BOLLI, p.73, pl.17, figs.19-21
p 1957 *Globorotalia pseudobulloides* (Plummer)-LOEBLICH & TAPPAN, p.192, pl.42, figs. 3a-c ; pl.44, figs.6a-c ; pl.45, figs. 1a-2c ; pl.46, figs.6a-c
1966 *Globorotalia pseudobulloides* (Plummer)-EL NAGGAR, p.224, pl.18, figs.3a-c
1979 *Globorotalia (T.) pseudobulloides* (Plummer)-BLOW, p.1096, pl.69, figs.2,3 ; pl.71, figs.4,5 ; pl.75, figs.2,3 ; pl. 248, figs.6-8 ; pl.255, figs.1-6

Type locality : Station 23, shallow ditch at road corner, southeast of new Corsicana reservoir on the road to Mildred, Navarro County, Texas, USA.

Type level : Paleocene - lower part of the upper Midway Formation clay.

Description : Test very low trochospiral. Spiral side flattened. Umbilical side convex. Equatorial periphery lobate. Axial periphery rounded. Twelfe to 15 chambers, arranged in 2 1/2 whorls. Five inflated chambers of the last whorl, increasing fairly rapidly in size, slightly embracing. Dorsal intercameral sutures curved, depressed. Ventral intercameral sutures radial, depressed. Umbilicus shallow, open. Aperture lowly arched, umbilical-extraumbilical in position, bordered by a distinct lip. Wall calcareous, finely perforate. Surface smooth.

Remarks : *Globorotalia varianta* (SUBBOTINA), as figured by LOEBLICH & TAPPAN (1957, pl.44, figs. 1a-2b) is the evolutionary link between *G. pseudobulloides* and *Globorotalia (T.) inconstans* (SUBBOTINA, 1953).

Globorotalia (Turborotalia) pseudokugleri BLOW, 1969
Pl.6, figs.10-19

1957 *Globorotalia* cf. *kugleri* Bolli-BOLLI, pl. 28, figs.7a-c
+ 1969 *Globorotalia (Turborotalia) pseudokugleri* n.sp.-BLOW, p.391, pl.10, figs.4-6 ; pl.39, figs.5-6

Type locality : Cipero Formation, S. Trinidad.

Type level : *Globorotalia kugleri* Zone, top of the Oligocene, base of the Miocene.

Description : Test low trochospiral. Equatorial periphery subcircular, weakly lobate. Axial periphery smoothly rounded. Dorsal side of the test weakly convex. About 15 to 16 chambers, arranged in 2 1/2 whorls. Six to seven globular chambers in the last whorl, increasing slowly in size, embracing. Dorsal and ventral intercameral sutures subradial, depressed. Spiral sutures depressed. Spiral sutures depressed. Aperture slit-like to lowly arched, umbilical-extraumbilical in position, bordered by a lip. Umbilicus small. Wall calcareous, coarsely perforate. Surface smooth in the final whorl.

Remarks : This species differs from *Globorotalia (Turborotalia) kugleri* BOLLI, 1957 into which it evolves, in the less flattened dorsal side and the radial instead of curved dorsal intercameral sutures.

Globorotalia (Turborotalia) pseudomayeri BOLLI, 1957
Pl.7, figs.27-30 ; pl.8, figs.1-4

+ 1957 *Globorotalia pseudomayeri* Bolli, new species-BOLLI, p.167, pl.37, figs.17a-c
1979 *Globorotalia (Turborotalia) pseudomayeri* Bolli-BLOW, p.1107, pl.248, fig.11

Type locality : Upper part of a small ravine between mileposts 12 1/4 and 12 1/2 of the Brasso-Tamana Road and the Navet River, Central Range, Trinidad, B.W.I.

Type level : Lower part of the Middle Eocene, Navet Formation, *Hantkenina aragonensis* Zone.

Description : Test low trochospiral. Equatorial periphery slightly lobate. Axial periphery rounded. About 12 chambers, arranged in 2 1/2 whorls. Four to five chambers in the last whorl, increasing fairly rapidly in size. The chambers of the last whorl show lobe-like ventral extentions towards the umbilicus. Dorsal intercameral sutures curved to nearly radial in the later part of the test. Ventral intercameral sutures radial, depressed. Umbilicus small. Aperture lowly arched, slit-like, umbilical-extraumbilical in position, bordered by a faint lip. Wall calcareous, perforate. Surface finely pitted to smooth.

Remarks : Our specimens show the typical lobe-like extensions towards the umbilicus. The umbilicus is small to virtually closed.

Globorotalia (Turborotalia) pseudoobesa SALVATORINI, 1967
Pl.7, figs.16-19 ; pl.21, fig.1

+ 1967 *Turborotalia pseudoobesa* Salvatorina-SALVATORINA, p.10, pl.2, figs.6-15 (Fide ELLIS & MESSINA)
1968 *Globorotalia gavalae* n.sp.-PERCONIG, p. 221, pl.6, figs.6-9

Type locality : Radicondoli, a few kilometers northeast of Monteguide (I.G.M. Map of Italy, folio 120, sheet IV-NO), Sienna Province, Italy.

Type level : Messinian, Upper Miocene.

Description : Test low trochospiral. Equatorial periphery lobate. Axial periphery broadly rounded. About 11 chambers, arranged in 2 1/2 whorls. Three and a half to four chambers in the last whorl, inflated, increasing moderately in size. Dorsal and ventral intercameral sutures weakly curved, depressed. Umbilicus deep, broad. Aperture arched, fairly large, umbilical-extraumbilical in position, bordered by a thin lip. Wall calcareous, finely perforate.

Remarks : *G. (T.) pseudoobesa* differs from *G. (T.) obesa* BOLLI, 1957 in the less rapidly increasing chambers in the last whorl, resulting in a less trapezoïd equatorial outline, in the larger aperture and in the less hispid surface of the test. Some specimens have an aperture extending slightly on the spiral side of the test.

Globorotalia (Turborotalia) quadrilocula BLOW, 1979
Pl.8, figs.12-15

1957 *Globorotalia quadrata* (White)-BOLLI, p. 73, pl.17, figs.22-24 (not WHITE)
+ 1979 *Globorotalia (Turborotalia) quadrilocula* n.sp.-BLOW, p.1109, pl.75, fig.8 ; pl. 78, figs.2-4 ; pl.83, fig.3 ; pl.87, figs.7-8

Type locality : DSDP leg 6, Station 47/2. Core 10, Section I.

Type level : Zone P.3, Paleocene.

Description : Test low trochospiral. Dorsal side flattened. Spiral side convex. Equatorial periphery slightly lobate, subcircular in outline. Axial periphery rounded. About 11 - 12 chambers, arranged in 3 whorls. Four subglobular chambers in the last whorl, slightly compressed, embracing, increasing slowly in size. Dorsal and ventral intercameral sutures radial, depressed. Umbilicus small, deep. Primary aperture slit-like, umbilical-extraumbilical in position, bordered by a distinct apertureal flap. Wall calcareous, perforate. Surface cancellate.

Remarks : *Globorotalia (T.) quadrilocula* evolves from *Globorotalia (T.) pseudobulloides* PLUMMER,

1926. The number of chambers in the last whorl reduces from five to four.

Globorotalia (Turborotalia) scitula group
Pl.8, figs.16-20

Remarks : From the Antwerpen Sands Member of the Berchem Formation, a number of species are recorded which can be considered as representatives of the *Globorotalia scitula* group. In order to study them more in detail, it would be desirable to have more individuals of this *scitula* group. Actually, we prefer not to define those specimens on subspecific level.

Globorotalia (Turborotalia) siakensis (LE ROY, 1939)
Pl.8, figs.21-28

+ 1939 *Globigerina siakensis* Le Roy-LE ROY, p. 262, pl.4, figs.20-22 (Fide ELLIS & MESSINA)
1957 *Globorotalia mayeri* Cushman & Ellisor-BOLLI, p.118, pl.27, figs.4a-c
1959 *Globorotalia mayeri* Cushman & Ellisor-BLOW, p.214, pl.18, figs.116a-c
1969 *Globorotalia (Turborotalia) siakensis* LE ROY-BLOW, p.356, pl.10, figs.7-9 ; pl.34, figs.4-5
1972 *Globorotalia siakensis* (LE ROY)-HOOYBERGHS & DE MEUTER, p.15, pl.3, figs. 1a,b,c

Type locality : Locality HO-528, 5km N33°E from Kampong Alianton, Tapoeng Kiri area, Rokan-Tapanoeli Region, auger hole sample, depth 3m, Central Sumatra.
Type level : Neogene (Miocene ?).
Description : Test lowly trochospiral. Equatorial periphery ovate, lobate. Axial periphery broadly rounded. Spiral side flattened. Five to six subglobular chambers in the last whorl, increasing rapidly in size. Dorsal and ventral intercameral sutures radial, depressed. Spiral suture depressed. Umbilicus small, deep. Aperture lowly arched, umbilical-extraumbilical in position, bordered by a distinct lip. Wall calcareous, coarsely perforate.

Remarks : *G. (T.) siakensis* differs from *G. (T.) mayeri* CUSHMAN & ELLISOR, 1939, mainly by the radial dorsal and ventral intercameral sutures. The test of *G. (T.) siakensis* is often more elongated, due to the more rapidly increasing size of the chambers, the spiral side is more flattened and the aperture is lower.

Globorotalia (Turborotalia) sp.
Pl.23, figs.21-24

Remarks : A few specimens, recorded from the lower part of the Terhagen section, are described as *Globorotalia* sp.. They have four chambers in the last whorl. The dorsal side is flattened and the aperture is lowly arched to slit-like and umbilical-extraumbilical in position. The axial periphery is rounded. Those specimens differ from *Globorotalia (T.) clemenciae* BERMUDEZ, 1961, by having a thightly coiled, less lobate test.

Globorotalia (Turborotalia) zealandica HORNIBROOK, 1958
Pl.9, figs.1-8

+ 1958 *Globorotalia zealandica* Hornibrook-HORNIBROOK, p.667, figs.18,19,30 (Fide ELLIS & MESSINA)

Type locality : Pukeuri road cutting four miles north-northeast of Oamaru, New Zealand (N-Z, 1-mile map series grid ref.591743, sheet S137, 1943 edit.).
Type level : Awamoan Series, Upper Oligocene.
Description : Test low trochospiral. Dorsal side flattened. Ventral side distinctly convex. Equatorial periphery slightly lobate, subquadrate in outline. Axial periphery broadly rounded . Four inflated chambers in the last whorl, increasing regularly in size. In dorsal aspect, the chambers are tangentially elongated. Dorsal intercameral sutures curved, depressed. Ventral intercameral sutures nearly radial, depressed. Umbilicus small, deep. Aperture lowly arched, umbilical-extraumbilical in position, bordered by a distinct lip. Wall calcareous, perforate. Surface smooth to nodose.

Remarks : *Globorotalia (T.) zealandica* differs from *Globorotalia (T.) miozea* FINLAY, 1926, in having a broadly rounded axial periphery instead of an acute one. Some of our specimens have an abortive last chamber and 4 1/2 chambers in the last whorl. They resemble *G. (T.) zealandica incognita* WALTERS, 1965 or *G. (T.) zealandica miocenica* WALTERS, 1965. They have been included here.

Family *GLOBIGERINIDAE* CARPENTER, PARKER & JONES, 1862
Subfamily *GLOBIGERININAE* CARPENTER, PARKER & JONES, 1862
Genus *Globigerina* D'ORBIGNY, 1862

Globigerina ampliapertura BOLLI, 1957
Pl.9, figs.9-17

+ 1957 *Globigerina ampliapertura* Bolli, new species-BOLLI, p.108, pl.22, figs.5a-7b (not figs.4a-b)
1962 *Globigerina ampliapertura* Bolli-BLOW & BANNER, p.83, pl.$XI_{A-D'}$; pl.XVII_C ; fig.12b
1969 *Globigerina ampliapertura* BOLLI-BERGGREN, pl.II, figs.19-21 ; pl.IV, figs.4-6
1969 *Globigerina ampliapertura* BOLLI-BLOW, p. 315, pl.12, figs.6,9-10
1979 *Globigerina ampliapertura* Bolli-BLOW, p. 851, pl.247, fig.1

Type locality : Sample B0314A, from the left side brach of a gully, 800 feet northeast of north end of San Fernando railway station, 250 feet southeast of railway bridge.
Coordinates H : 237850 links, E : 357560 links, Trinidad.
Type level : *Globigerina ampliapertura* Zone, Oligocene.
Description : Test low trochospiral. Equatorial periphery weakly lobate. Axial periphery broadly rounded. Dorsal side of the test flattened to slightly convex. About 12 subspherical chambers, arranged in about 3 whorls. Four chambers in the last whorl, slightly compressed laterally, increasing fairly rapidly in size, moderately embracing. Dorsal intercameral sutures slightly curved, weakly depressed. Ventral intercameral sutures nearly radial, weakly depressed. Umbilicus small, shallow. Aperture high, asymmetrically arched, umbilical to slightly umbilical-extraumbilical in position, bordered by a thickened rim. Wall calcareous, perforate. Surface pitted.
Remarks : *G. ampliapertura* differs from *Globigerina eupertura* JENKINS 1960 in the more asymmetrically arched aperture, which tends to an umbilical-extraumbilical position.

Globigerina angiporoides HORNIBROOK, 1965
Pl.9, figs.18-24

1962 *Globigerina linaperta linaperta* Finlay-BLOW & BANNER, p.85, pl.XII, fig.H
+ 1965 *Globigerina angiporoides* Hornibrook-HORNIBROOK, p.835, tfs.1a-i ; p.837, tf.2 (Fide ELLIS & MESSINA)
1969 *Globigerina angiporoides* HORNIBROOK-BLOW, p.315, pl.12, figs.3-5,7
1970 *Globigerina angiporoides angiporoides* HORNIBROOK-BAUMANN, p.1182, pl.1, figs. 2a-c
1979 *Subbotina angiporoides angiporoides* (Hornibrook)-BLOW, p.1250, pl.244, fig.7

Type locality : Sample 5136/777, F6502, guid reference 480545, Sheet S136 (1943 edition), M.S.1 at north end of Campbells beach, All Day Bay, Kakanui, on the east coast of the South Island, New Zealand.
Type level : Uppermost Eocene or Lower Oligocene, lower part of the Whaingoroan Stage, in the top few feet of the MacDonald Limestone. In its typical form, with a thick apertural lip, occurs in the upper part of the range zone of *Globigerina ampliaperture* BOLLI.
Description : Test low trochospirally coiled. Equatorial outline subquadrilobate. Axial periphery broadly rounded. 3 1/2 chambers in the last whorl, strongly embracing, increasing rapidly in size. Last chambers often reduced in size, strongly embracing and sometimes tending to be elongated radially. Intercameral sutures

weakly curved slightly depressed. Aperture lowly arched to slit-like, bordered by a prominent lip. Umbilical in position. Umbilicus small, shallow. Wall calcareous, finely thick. Surface cancellate and punctate.

Remarks : The size of the last chambers varies from well developed to a bulla-like structure. The last whorl consist of 3 to 4 chambers. Consequently, the outline of the test varies from subcircular or slightly trilobate to quadrilobate. A few of our specimens have a radially elongated last chamber. The height of the aperture varies from lowly arched to slit-like. Most specimens have a very thick lip. The coiling of the tests is nearly at random. Some specimens have a dorsal sutural opening.

Globigerina angulioffícinalis
BLOW, 1969
Pl.10, figs.1-4

+ 1969 *Globigerina angulioffícinalis* n.sp.-BLOW, p.379, pl.11, figs.1-5
1975 *Globigerina angulioffícinalis* BLOW-DELTEIL & TOUMARKINE, pl.II, figs.13-14

Type locality : Type section of the Cipero Formation, north of San Fernando, Trinidad.

Type level : *Globigerina sellii/Pseudohastigerina barbadoensis* Zone (Zone P.19), Chattian.

Description : Test lowly trochospiral. Equatorial periphery subcircular to ovate in outline, lobate. Axial periphery rounded. About 11 moderately inflated chambers, arranged in 2 to 2 1/2 whorls. Four and a half chambers in the last whorl. Last chamber often reduced in size. Intercameral sutures weakly curved, distinctly depressed and becoming increasingly broader, U-shaped excavated. Aperture lowly and asymmetrically arched. Umbilicus small, deep. Wall calcareous, moderately coarsely perforate surface.

Remarks : *G. angulioffícinalis* is a transitional form between *G. officinalis* SUBBOTINA, 1953, with 4 chambers in the last whorl, and *Gl. angulisuturalis* BOLLI, 1957, with 5 chambers in the last whorl and with broad, U-shaped exavated intercameral sutures. The transition from *G. officinalis* to *Gl. angulioffícinalis* can be observed in our material. The number of chambers in the last whorl increases to 4 1/2 and the intercameral sutures become increasingly deeper and U-shaped excavated. Some of our specimens have a reduced last chamber.

Globigerina angulisuturalis
BOLLI, 1957
Pl.10, figs.8-9

+ 1957 *Globigerina ciperoensis angulisuturalis* Bolli, new subspecies-BOLLI, p.109, pl.22, fig.11
1969 *Globigerina angulisuturalis* Bolli-BLOW, p.316, pl.1, figs.4,5,6 ; pl.11, figs. 8,9 ; pl.12, figs.1,2

Type locality : Sample BO 306A (TTOC 215657), Cipéro type section, between 20 and 240 feet southwest from fixed point (= southernmost of a number of iron rails driver into the marls along the beach, 140 feet south southeast from the present south end of the sea wall). South Trinidad.

Type level : *Globorotalia opima opima*-Zone, Oligocene.

Description : Test low trochospiral. Equatorial periphery weakly lobate. Axial periphery rounded. Twelfe spherical chambers, arranged in 2 1/2 whorls. Four and a half to five chambers in the last whorl, increasing moderately in size. Dorsal intercameral sutures slightly curved, depressed. Spiral suture depressed. Ventral intercameral sutures nearly radial. Intercameral sutures distinctly U-shaped excavated. Umbilicus wide, deep. Aperture semicircular to slightly elongated, umbilical in position, bordered by a thickened rim. Wall calcareous, perforated. Surface finely pitted to rugose.

Remarks : *G. angulisuturalis* evolves from *Globigerina angulioffícinalis* BLOW, 1969. The deeply but narrowly depressed intercameral sutures of *G. angulioffícinalis* become distinctly U-shaped excavated in *G. angulisuturalis*, and the aperture becomes more symmetrical.

Globigerina angustiumbilicata
BOLLI, 1957
Pl.10, figs.10-16

+ 1957 *Globigerina ciperoensis angustiumbilicata* Bolli, new subspecies-BOLLI, p.109, pl.22, figs.12a-13c
1962 *Globigerina angustiumbilicata* Bolli-BLOW & BANNER, p.85, pl.IX_{x-z}, figs.(IV), 16(VI,VII)
1969 *Globigerina angustiumbilicata* BOLLI-BERGGREN, p.147, pl.VII, figs.1-3
1969 *Globigerina angustiumbilicata* BOLLI-BLOW, p.316
1970 *Globigerina ciperoensis angustiumbilicata* BOLLI-BAUMANN, p.1183, pl.2, fig.4
1977 *Globigerina angustiumbilicata* Bolli-POORE & BRABB, p.255, pl.8, fig.7

Type locality : Holotype from sample BO 306A (TTOC 215657) from the Cipero type section, between 20 and 240 feet southwest from the southernmost of a number of iron rails driven into the marls along the beach, South Trinidad.

Type level : *Globorotalia opima opima* Zone, Oligocene.

Description : Test lowly trochospiral. Equatorial periphery distinctly lobate. Axial periphery rounded. About 12 chambers, arranged in 2 1/2 whorls. Four and a half to five inflated chambers in the last whorl, increasing moderately to fairly rapidly in size. Dorsal intercameral sutures weakly curved, depressed. Spiral suture depressed. Ventral intercameral sutures subradial, depressed. Umbilicus small. Aperture lowly arched, umbilical in position. Wall calcareous, perforate. Surface hispid.

Remarks : *G. angustiumbilicata* differs from *G. ciperoensis* BOLLI, 1957, by the smaller umbilicus and by the lower arched aperture. Although the size of the aperture of *G. angustiumbilicata* varies slightly, no distinct transition to *G. ciperoensis* is observed in our material. As in the material of BOLLI (1957) from South Trinidad, the aperture of our specimens is sometimes asymmetrically arched, showing a tendency to a slightly umbilical-extraumbilical position. A few specimens have a slightly reduced last chamber, or even a final chamberlet, with less perforated wall and smoother surface.

Globigerina bacuana
KHALILOV, 1956
Pl.1, figs.28-30

+ 1956 *Globigerina bacuana* Khalilov-KHALILOV, p.235, pl.3, figs.4a-c (Fide ELLIS & MESSINA)
1966 *Globigerina bacuana* Khalilov-EL NAGGAR, p.159

Type locality : Holotype from northeastern Azerbaidzkan, U.S.S.R.

Type level : Not designated. Occurs in the Upper Paleocene and Lower Eocene.

Description : Test low to moderately high trochospiral. Spiral side flattened to weakly convex. Equatorial periphery lobate. Axial periphery rounded. Four subglobular chambers in the last whorl, increasing rapidly in size. Intercameral sutures nearly radial, depressed. Umbilicus small. Aperture small, lowly arched, tending to an extra-umbilical position, bordered by a lip. Wall calcareous, perforate. Surface pitted.

Remarks : *Globigerina bacuana* is characterized by the four subglobular chambers in the last whorl, increasing rapidly in size, by the small aperture, which tends to an extraumbilical position and by the pitted surface.

Globigerina bulloides apertura
CUSHMAN, 1918
Pl.10, figs.19-20

+ 1918 *Globigerina apertura* Cushman-CUSHMAN, p.57, pl.12, figs.8a-b (Fide ELLIS & MESSINA)
1959 *Globigerina apertura* Cushman-BLOW, p. 172, pl.8, figs.35a-b
1969 *Globigerina bulloides apertura* CUSHMAN-BLOW, p.317, pl.12, fig.8

Type locality : Suffolk, Virginia, U.S.A.

Type level : Yorktown Formation, Miocene.

Description : Test low to moderately high trocho-

spiral. Equatorial periphery lobate. Axial periphery broadly rounded. About 10 chambers, arranged in 2 1/2 whorls. Four inflated chambers in the last whorl, increasing moderately in size, slightly embracing. Dorsal intercameral sutures weakly curved, depressed. Spiral suture depressed. Ventral intercameral sutures nearly radial, depressed. Umbilicus wide. Aperture very large and highly arched, umbilical in position, bordered by a distinct lip. Wall calcareous, perforated. Surface cancellated.

Remarks : Our specimens have a typical very large aperture, which is bordered by a distinct lip. Specimens with an obliquely placed last chamber resemble *Globigerina riveroae* BOLLI & BERMUDEZ, 1965 which is considered as synonymous with *G. bulloides apertura*.

Globigerina bulloides bulloides
D'ORBIGNY, 1826
Pl.10, figs.17-18

+ 1826 *Globigerina bulloides* d'Orbigny-D'ORBIGNY, p.277
1960 *Globigerina bulloides* d'Orbigny-BLOW & BANNER, p.3, pl.1, figs.1-4
1969 *Globigerina bulloides bulloides* D'ORBIGNY-BLOW, p.316, pl.14, figs.1-2
1972 *Globigerina bulloides* D'ORBIGNY-HOOYBERGHS & DE MEUTER, p.18, pl.4, figs. 2a-c

Type locality : Rimini, Italy.
Type level : Recent.
Description : Test low trochospiral. Equatorial periphery lobate. Axial periphery rounded. About 10 chambers, arranged in 2 1/2 whorls. Four inflated chambers in the last whorl, increasing moderately in size, slightly embracing. Dorsal intercameral sutures curved, depressed. Spiral suture depressed. Ventral intercameral sutures nearly radial, depressed. Aperture highly arched, umbilical in position. The relict apertures of the previous chambers in the last whorl remain visible within the large and deep umbilical cavity. Wall calcareous, finely perforated. Surface cancellated.

Remarks : *G. bulloides bulloides* differs from *G. bulloides apertura* CUSHMAN, 1918 in the smaller aperture. Specimens resembling *Globigerina diplostomum* REUSS, 1850, with an aberrant final chambers, and *Globigerina quadrilatera* GALLOWAY & WISSLER, 1927, with a smaller test, have been included in *G. bulloides bulloides*.

Globigerina ciperoensis
BOLLI, 1957
Pl.10, figs.21-24 ; pl.11, figs.1-2

+ 1954 *Globigerina ciperoensis* Bolli, nov. spec.-BOLLI, p.1, text-figs.3-4a-b
1957 *Globigerina ciperoensis ciperoensis* Bolli-BOLLI, p.109, pl.22, figs.10a-b
1962 *Globigerina ouachitaensis ciperoensis* (Bolli)-BLOW & BANNER, p.90, pl.IX_{E-G}, fig.9 (i-iii)
1969 *Globigerina ouachitaensis ciperoensis* forma typica BOLLI-BLOW, p.320, pl.2, figs.4-6
1970 *Globigerina ciperoensis ciperoensis* BOLLI-BAUMANN, p.1183, pl.2, fig.5
1077 *Globigerina* aff. *G. ciperoensis* Bolli-POORE & BRABB, p.255, pl.8, fig.7

Type locality : Northern end of Cipero Coast, South of San Fernando, Trinidad, B.W.I..
Type level : *Globigerina ciperoensis* Zone, Oligocene.
Description : Test lowly to moderately highly trochospiral. Equatorial periphery rounded, slightly lobate. Axial periphery rounded. Eleven to 12 chambers, arranged in 2 1/2 whorls. Five inflated chambers in the last whorl, increasing regularly in size. Dorsal and ventral intercameral sutures weakly curved, depressed. Umbilicus large, deep. Aperture highly arched, umbilical in position. Wall calcareous, finely perforate. Surface spinose.

Remarks : *G. ciperoensis* is characterized by the five inflated chambers in the last whorl and by the large and deep umbilical cavity. It evolves from *Globigerina gnaucki* BLOW & BANNER, 1962 : the number of chambers in the last whorl increases from 4 1/2 to 5. *G. gnaucki* has an asymmetrically arched aperture, which becomes back symmetrical in typical *ciperoensis* specimens. A few specimens show a reduced fifth chamber in the last whorl.

Globigerina cryptomphala
GLAESSNER, 1937
Pl.11, figs.3-10

+ 1937 *Globigerina bulloides* d'Orbigny var. *cryptomphala* Glaessner-GLAESSNER, p. 29, 47, pl.1, figs.1a-b (Fide ELLIS & MESSINA)
p 1953 *Globigerina corpulenta subbotina* sp. n.-SUBBOTINA, p.76, pl.10, fig.3 (non pl. 9, figs.5-7, pl.10, figs.1,2,4)
1970 *Globigerina cryptomphala* GLAESSNER-BAUMANN, p.1184, pl.II, figs.3a-c

Type locality : Ilskaja, Northwest Kaukasus, U.S.S.R.
Type level : Upper Eocene.
Description : Test lowly trochospiral. Equatorial periphery lobate. Axial periphery rounded. About 13 chambers, arranged in 3 whorls. Five chambers in the last whorl, tightly coiled. Last chamber often reduced in size and turned towards the umbilicus. Four other chambers in the last whorl inflated, increasing regularly in size. Intercameral sutures curved, depressed. Aperture lowly arched. Umbilicus covered by the last chamber. Wall calcareous, finely perforate. Surface smooth.

Remarks : The last chamber of *G. cryptomphala* is typical turned towards the umbilicus. Some variation occurs in the height of the trochospire. BAUMANN (1970) noted a transition to *Globigerina gortanii praeturitillina* BLOW & BANNER, 1962, with a very highly coiled test.

Globigerina cf. *druryi*
AKERS, 1955
Pl.11, figs.11-15

+ 1955 *Globigerina druryi* Akers n. sp.-AKERS, p.645, pl.65, figs.1a-c
1969 *Globigerina druryi* AKERS-BLOW, p.318, pl.14, fig.4

Type locality : Core at 11,257 - 11,268 feet in Humble Oil and Refining Compagny Ellender nr.1 well, in sec. 23, T.195, R.19E, Lisette Field, Terrebone Parish, Louisiana.
Type level : Middle Miocene.
Description : A lot of specimens especially recorded from the Antwerpen Sands, ressemble *G. druryi* in the four subglobular chambers in the last whorl. The rather small umbilical aperture, bordered by a distinct lip and the slightly radially elongated test. The wall is coarsely perforate.

Globigerina edegemensis n. sp.
Pl.11, figs.18-20

Name : After Edegem, near to Antwerp.
Type locality : Clay pit De Beukelaar, Terhagen, Belgium.
Type level : Lower Miocene, Aquitanian. Edegem Sands Member of the Berchem Formation.
Description : Test low trochospiral. Spiral side slightly convex. Equatorial periphery lobate, subcircular in outline. Axial periphery broadly rounded, ovate in outline. Six globular chambers in the last whorl, increasing regularly in size. Dorsal intercameral sutures curved, depressed. Ventral intercameral sutures nearly radial, depressed. Umbilicus fairly large, deep, open. Aperture distinctly arched, umbilical in position. Wall calcareous perforate. Surface smooth to hispid.

Remarks : *Globigerina edegemensis* is characterized by the six globular chambers in the last whorl, increasing regularly in size. It probably evolves from *Globigerina ciperoensis* BOLLI, 1957. The number of chambers increases from four to five.

Globigerina eggeri
RHUMBLER, 1901
Pl.11, figs.16-17

+ 1901 *Globigerina eggeri* Rhumbler-RHUMBLER, p.19, fig.20
1960 *Globigerina eggeri* Rhumbler-BANNER & BLOW, p.11, pl.2, fig.4
1969 *Globigerina eggeri eggeri* RHUMBLER-BLOW, p.318, pl.15, figs.5,6

Type locality : Not designated.

Type level : Recent.

Description : Test moderately high trochospiral, fairly large. Equatorial periphery, subcircular, moderately lobate. Axial periphery rounded. About 14 chambers arranged in 2 1/2 whorls. Five to six chambers in the last whorl, inflated, moderately embracing. Dorsal and ventral intercameral sutures nearly radial, depressed. Spiral suture depressed. Umbilicus moderately broad, deep. Aperture fairly thick, coarsely perforated. Surface cancellated.

Remarks : *G. eggeri* differs from *Globigerina multiloba* ROMEO, 1965 in having fewer chambers in the last whorl.

Globigerina eocaena
GÜMBEL, 1868
Pl.11, figs.21-27

+ 1868 *Globigerina eocaena* Gümbel-GÜMBEL, p.662, pl.2, figs.109a-b (Fide ELLIS & MESSINA)
1969 *Globigerina eocaena* GÜMBEL-HAGN & LINDENBERG, p.236, pl.1, figs.1-6, text-figs. 3,6a
1970 *Globigerina eocaena* GÜMBEL-BAUMANN, p. 1184, pl.II, figs.7a-c
1977 *Globigerina eocaena* Gümbel-POORE & BRABB, p.255, pl.4, figs.10-12

Type locality : Not designated.

Type level : Lower Eocene.

Description : Test moderately high trochospiral. Equatorial periphery lobate. Axial periphery broadly rounded. About 12 inflated chambers, arranged in 3 whorls. Four chambers in the last whorl, increasing moderately rapidly in size. Last chamber often reduced in size. Dorsal intercameral sutures weakly curved to subradial in the last whorl, depressed. Spiral suture depressed. Ventral intercameral sutures subradial, depressed. Umbilicus small, deep, may be covered by bulla-like structure. Aperture lowly arched, elongate, umbilical to slightly umbilical-extraumbilical in position, bordered by a prominent lip. Wall calcareous, finely perforate. Surface smooth to cancellate.

Remarks : The definition of *G. eocaena* is revised by Hagn & Lindenberg (1969). LINDENBERG (1969) studied the large variability of the species. In our material the size of the aperture varies. Most specimens have a slightly reduced last chamber, but specimens with a bulla-like final chamberlet are not observed. The height of the trochospire varies from rather low to fairly high.

Globigerina euapertura
JENKINS, 1960
Pl.11, figs.28-30 ; pl.12, figs.1-2

+ 1960 *Globigerina euapertura* Jenkins, new species-JENKINS, p.351, pl.1, figs.8a-c
1969 *Globigerina euapertura* JENKINS-BLOW, p.319
1970 *Globigerina euapertura* JENKINS-BAUMANN, p.1185, pl.IV, figs.7a-b

Type locality : Oil shaft, about a mile northeast of Hales Entrance, Victoria, Australia.

Type level : Pre-*Globoquadrina dehiscens dehiscens* Zone, Oligocene.

Description : Test lowly trochospiral. Equatorial periphery, quadrilobate. Axial periphery broadly rounded. Dorsal side of the test weakly convex to flattened. Ventral side convex. About 11 to 13 inflated chambers, arranged in 2 1/2 whorls. Three and a half to four chambers in the last whorl, increasing moderately to fairly rapidly in size, becoming depressed, embracing. Dorsal intercameral sutures curved, slightly depressed. Spiral suture slightly depressed. Ventral intercameral sutures subradial, slightly depressed. Umbilicus small, shallow. Aperture lowly arched, symmetrical, broader than high, umbilical in position. Wall calcareous, perforate. Surface cancellate.

Remarks : *G. euapertura* differs from *G. ampliapertura* BOLLI 1957 in the more symmetrically arched aperture, restricted to the umbilical area.

Globigerina fariasi
BERMUDEZ, 1961
Pl.12, figs.3-11

+ 1961 *Globigerina fariasi* Bermudez-BERMUDEZ, p.1181, pl.3, figs.5a-c
1962 *Globigerina ouachitaensis gnaucki* Blow & Banner, subsp. nov.-BLOW & BANNER, p. 91, pl.IX_{L-M}
1969 *Globigerina ouachitaensis gnaucki* BLOW & BANNER-BLOW, p.320, pl.2, figs.1-3
1972 *Globigerina ouachitaensis gnaucki* BANNER & BLOW-HOOYBERGHS & DE MEUTER, p. 22, pl.6, figs.2a,b,c

Type locality : Lindi Area, Tanganyika, Tanzania.

Type level : Sample FCRM 1965, Oligocene.

Description : Test moderately highly trochospiral. Equatorial periphery lobate. Axial periphery broadly rounded. About 13 chambers, arranged in 2 1/2 whorls. 4 to 4 1/2 chambers in the last whorl, increasing rapidly in size. Dorsal intercameral sutures curved to nearly radial in the last whorl, depressed. Spiral suture depressed. Ventral intercameral sutures only weakly curved, depressed. Aperture asymmetrically arched, bordered by a distinct lip. Relict apertures visible into the broad and deep umbilical cavity. Wall calcareous, fairly thin, surface cancellate, hispid.

Remarks : *G. gnaucki* evolves from *G. ouachitaensis* HOWE & WALLACE, 1932. The numbers of chambers in the last whorl increase gradually from 4 to 4 1/2, the aperture becomes asymmetrically arched, tends to a more umbilical-extraumbilical position and, consequently, the umbilical cavity becomes larger.

Globigerina foliata
BOLLI, 1957

+ 1957 *Globigerina foliata* Bolli, new species-BOLLI, p.111, pl.24, figs.1a-c
1959 *Globigerina foliata* Bolli-BLOW, p.177, pl.10, figs.4a-c
1969 *Globigerina foliata* BOLLI-BLOW, p.319, pl.16, figs.2-3

Type locality : Cipero type section, between 850 and 1.400 feet southwest of fixed point (= southernmost of a number of iron rails driven into the marls along the beach). S. Trinidad.

Type level : *Globorotalia fohsi robusta* Zone, Middle Miocene.

Description : Test small, lowly trochospiral. Equatorial periphery distinctly lobate. Axial periphery rounded. About 10 chambers, arranged in 2 1/2 whorls. Four inflated chambers in the last whorl, increasing rapidly in size, slightly embracing. Dorsal intercameral sutures weakly curved, deeply depressed. Spiral suture depressed. Umbilicus small. Aperture medium to low, arched, umbilical in position, bordered by a lip. Wall calcareous, perforate. Surface pitted.

Remarks : The chambers of the last whorl in our specimens increase typically rapidly in size. The aperture is very lowly arched.

Globigerina galavisi
BERMUDEZ, 1961
Pl.12, figs.12-14

+ 1961 *Globigerina galavisi* Bermudez, sp. nov.-BERMUDEZ, p.1183, pl.4, fig.3
1969 *Globigerina galavisi* BERMUDEZ-BLOW, p.319, pl.5, figs.1-3 ; pl.16, figs.4,5
1979 *Dentoglobigerina galavisi* (Bermudez)-BLOW, p.1301, pl.177, figs.8-9 ; pl.186, figs. 8-9 ; pl.244, figs.1,2

Type locality : Sample from near to Frost Bridge, Mississippi, U.S.A.

Type level : Jackson Formation, Upper Eocene.

Description : Test lowly trochospiral. Equatorial periphery subquadrate, lobate. Axial periphery subovoid, broadly rounded. Spiral side flattened. About 2 to 3 whorls of inflated, moderately embracing chambers. 3 1/2 (to 4) subglobular chambers in the last whorl, becoming slightly depressed, ovoid in axial view. Dorsal intercameral sutures initially curved, less curved in the last whorl, depressed. Spiral suture depressed. Ventral intercameral sutures subradial, depressed. Aperture lowly arched, umbilical in position, bordered by a

flap-like lip. Umbilicus moderately broad, deep. Wall fairly thick, calcareous, coarsely perforate. Surface hispid to cancellate.

Globigerina globorotaloidea
COLOM, 1954
Pl.13, figs.1-2

+ 1954 *Globigerina globorotaloidea* Colom-COLOM, p.212, pl.17, figs.1-25
1972 *Globigerina globorotaloidea* Colom-HOOYBERGHS & DE MEUTER, p.24, pl.5, figs. 1a-c

Type locality : Orihuela, in the southern part of the Province of Alicante, southern Spain.
Type level : Middle Miocene, Vindobonian.
Description : Test low trochospiral. Equatorial periphery distinctly lobate. Axial periphery rounded. Five to six chambers in the last whorl, increasing rapidly in size. Last chamber often reduced in size. Dorsal intercameral sutures curved, depressed. Ventral intercameral sutures curved, deeply depressed. Umbilicus small. Aperture lowly to fairly highly arched, often tending to and umbilical-extraumbilical position, bordered by a lip. Wall calcareous, finely perforate. Surface hispid.
Remarks : Most of our specimens have five chambers in the last whorl. The size and the position of the aperture varies in response to the different shape and size of the last chamber.

Globigerina gortanii
(BORSETTI, 1959)
Pl.12, figs.15-17

+ 1959 *Catapsydrax gortanii* n.sp.-BORSETTI, p. 205, pl.XIII, figs.1a-d
1962 *Globigerina turritilina turritilina* Blow & Banner, subsp. nov.-BLOW & BANNER, p.98, pl.XIII_{D-G}
1969 *Globigerina gortanii gortanii* (BORSETTI)-BLOW, p.320, pl.17, fig.1
1979 *Globigerina gortanii gortanii* (Borsetti)-BLOW, p.851, pl.247, fig.5 ; pl.251, fig.9

Type locality : 1,5km west of Vigoleno, near to Piacenza, North Italy. Coordinates U.T.M. NQ70286314.
Type level : Lower Oligocene.
Description : Test high trochospiral. Equatorial periphery lobate. Axial periphery rounded, lobate. About 12 inflated chambers, arranged in three whorls. Four chambers in the last whorl, becoming depressed, ovoid, increasing rapidly in size, moderately embracing. Sutures slightly curved, depressed. Umbilicus deep, partially covered by a bulla-like, reduced final chamberlet. Aperture lowly arched, broader than high, umbilical to slightly umbilical-extraumbilical in position. Wall calcareous, perforate.
Remarks : *G. gortanii gortanii* evolves from *G. gortanii praeturritilina* BLOW & BANNER, 1962. Our specimens of *G. gortanii gortanii* have a typical reduced final chamberlet.

Globigerina labiacrassata
JENKINS, 1966
Pl.13, figs.3-4

+ 1966 *Globigerina labiacrassata* Jenkins-JENKINS, p.1102, fig.8, nrs.64-71 (Fide ELLIS & MESSINA)
1971 *Globigerina (Globigerina) labiacrassata* Jenkins-JENKINS, p.152, pl.16, figs. 474-484

Type locality : Kokoamu greensand, at the eartquakes section, Waitaki Valley, sheet 5127, Grid Ref. 242932, New Zealand.
Type level : *Globigerina angiporoides angiporoides* Zone, Oligocene.
Description : Test low, trochospiral. Equatorial periphery quadrilobate. Axial periphery rounded. About 12 spherical chambers, arranged in 3 whorls. Five chambers in the earlier whorls, reduced to four in the last whorl. Dorsal intercameral sutures weakly curved, depressed. Spiral suture depressed. Ventral intercameral sutures nearly radial, depressed. Umbilicus wide, deep. Aperture highly arched, umbilical in position, bordered by a thickened rim. Wall calcareous, coarsely perforated. Surface cancellated.

Remarks : *G. labiacrassata* occurs rarely in the Boom Clay. Our specimens have a typical highly arched aperture, bordered by a thickened rim.

Globigerina linaperta
FINLAY, 1939
Pl.13, figs.5-10

+ 1939 *Globigerina linaperta* Finlay-FINLAY, p. 135, figs.54-57 (Fide ELLIS & MESSINA)
1957a *Globigerina linaperta* Finlay-BOLLI, p. 70, pl.15, figs.15-17
1957b *Globigerina linaperta* Finlay-BOLLI, p. 163, pl.36, figs.5a-b
1969 *Globigerina linaperta* FINLAY-BLOW, p.320
1970 *Globigerina linaperta* Finlay-BAUMANN, p. 1186, pl.1, figs.3a-c
1979 *Subbotina linaperta* (Finlay)-BLOW, p.1276, pl.91, fig.8 ; pl.124, fig.9 ; pl.158, fig.8 ; pl.160, figs.6-8 ; pl.177, figs. 4-6 ; pl.240, figs.5,6, text-fig.N, fig. (iv)

Type locality : Locality 5179A, beach 1 mile north of Kokaho Creek, Hampden section, New Zealand.
Type level : Middle Eocene.
Description : Test lowly trochospiral, equatorial periphery trilobate, axial periphery rounded. 3 to 3 1/2 chambers in the last whorl, increasing rather slowly in size, becoming slightly flattened and compressed. Intercameral sutures slightly curved to nearly radial, depressed. Umbilicus narrow, virtually closed. Aperture lowly arched, umbilical to slightly umbilical-extraumbilical in position, bordered by a very distinct lip. Wall calcareous, perforate. Surface pitted.
Remarks : *Gl. linaperta* evolves from *Globigerina triloculinoides* PLUMMER, 1926. It is characterized by the 3 to 3 1/4 chambers in the last whorl and the prominent lip, bordering the nearly slit-like aperture. Some variation occurs in the relative size of the last chamber which becomes more or less laterally compressed.

Globigerina officinalis
SUBBOTINA, 1953
pl.13, figs.12-17

+ 1953 *Globigerina officinalis* Subbotina sp.n.-SUBBOTINA, p.105, pl.XI, figs.1a-c, 7a-c
p 1957 *Globigerina parva* Bolli, new species-BOLLI, p.108, pl.22, figs.14a-c (not pl.36, figs.7a-c)
1969 *Globigerina officinalis* SUBBOTINA-BERGGREN, pl.IV, figs.1-3
1969 *Globigerina officinalis* SUBBOTINA-BLOW, p.320, pl.1, figs.1-3
1970 *Globigerina officinalis* SUBBOTINA-BAUMANN, p.1186, pl.4, figs.3a-c
1972 *Globigerina officinalis* SUBBOTINA-HOOYBERGHS & DE MEUTER, p.21, pl.5, figs. 4a-c
1977 *Globigerina officinalis* Subbotina-POORE & BRABB, p.256

Type locality : N. Caucasus, near Nolchik, Khieu.
Type level : Foraminiferal layer, F_3 series (upper part), *Bolivina* Zone (Upper Eocene).
Description : Test moderately to highly trochospiral. Equatorial outline subquadrate, periphery lobate. Axial outline suboval, periphery rounded. Then to 12 subglobular chambers, arranged in 3 whorls. Last chamber generally reduced in size. Intercameral sutures nearly radial, depressed. Aperture lowly and asymmetrically arched, bordered by a thin lip. Umbilicus small, fairly deep. Wall calcareous, finely perforate. Surface cancellate.
Remarks : Our specimens have a typical slightly reduced last chamber.

Globigerina ouachitaensis
HOWE & WALLACE, 1932
Pl.13, figs.18-24

+ 1932 *Globigerina ouachitaensis* Howe & Wallace-HOWE & WALLACE, p.74, pl.10, figs.7a-b (Fide ELLIS & MESSINA)
p 1957 *Globigerina parva* Bolli, new species-BOLLI, p.164, pl.36, figs.7a-c (not p.22, figs.14a-c)
1959 *Globigerina bulloides* d'ORBIGNY-DROOGER & BATJES, p.175, pl.1, fig.3
1969 *Globigerina ouachitaensis* HOWE & WALLACE-BERGGREN, pl.III, figs.

1970 *Globigerina ouachitaensis* HOWE & WALLACE-BAUMANN, pl.V, figs.6a-c

1972 *Globigerina ouachitaensis ouachitaensis* HOWE & WALLACE-HOOYBERGHS & DE MEUTER, p.23, pl.6, figs.3a-c

Type locality : Danville bending on the Ouachita River, Catahoula Perish, Louisiana, U.S.A.

Type level : Jackson Formation, Upper Horizon (Bed 2), Upper Eocene.

Description : Test moderately highly trochospiral. Equatorial periphery distinctly lobate. Axial periphery broadly rounded. Four inflated chambers in the last whorl, increasing slowly in size. Last chamber often reduced in size. Dorsal intercameral sutures curved, depressed. Spiral suture depressed. Ventral intercameral sutures weakly curved, depressed. Aperture highly, symmetrically arched, bordered by apertural rim. Relict apertures of previous chambers visible within the large subquadrate umbilical cavity. Wall calcareous, finely perforate. Surface cancellate.

Remarks : *G. ouachitaensis* is characterized by the large subquadrate umbilical cavity, in which the relict apertures are visible. Transitional forms occur between *G. ouachitaensis* and *G. gnaucki* BLOW & BANNER, 1962. The chambers in the last whorl tend to increase more rapidly in size and the aperture becomes asymmetrically arched. Consequently, the umbilical cavity is less subquadrate in outline.

Globigerina pachyderma
(EHRENBERG, 1861)
Pl.14, figs.1-15

+ 1861 *Aristerospira pachyderma* Ehrenberg-EHRENBERG, p.303 (1873), pl.1, fig.4

1970 *Globigerina pachyderma* (Ehrenberg)-DE MEUTER & LAGA, p.179, pl.1, figs.1-6

1972 *Globigerina pachyderma* (EHRENBERG)-HOOYBERGHS & DE MEUTER, p.23, pl.6, figs. 4a-c

Type locality : Greenland, lat. 62°40'N, long. 20°W. Davis Strasse.

Type level : Recent.

Description : Test trochospiral. Equatorial periphery lobate. Axial periphery broadly rounded. Four to five globular chambers in the last whorl, increasing moderately in size. Last chamber often reduced in size. Dorsal intercameral sutures curved, depressed. Ventral intercameral sutures nearly radial, depressed. Umbilicus open, often covered by a bulla-like apertural flap. Aperture distinctly arched to nearly slit-like, tending to an umbilical-extraumbilical position. Wall calcareous, perforate. Surface hispid.

Remarks : *G. pachyderma* is highly variabel in the equatorial outline of the test, which varies from subquadrate to distinctly lobate in response to the number of chambers in the last whorl (4 to 5). The size of the bulla-like apertural flap of the last chamber varies. Specimens from the Deurne Sands are dominantly dextrally coiled.

Globigerina parabulloides
BLOW, 1959
Pl.14, figs.16-17

+ 1959 *Globigerina parabulloides* Blow, sp.nov.-BLOW, p.179, pl.10, figs.46a-c

1969 *Globigerina parabulloides* Blow-BLOW, p. 320, pl.18, figs.1-2

1972 *Globigerina parabulloides* BLOW-HOOYBERGHS & DE MEUTER, p.24, pl.7, figs.1a-c

Type locality : Holotype from auger line near the north to the south section of the Pozón El Mine Road between Carmen and Buena Vista near Pozón, eastern Falçon, Venezuela.

Type level : Miocene, Vindobonian or younger.

Description : Test low trochospiral. Equatorial periphery lobate, ovate in outline. Axial periphery broadly rounded. About 10 chambers, arranged in 2 1/2 whorls. Four subspherical chambers in the last whorl, increasing moderately rapidly in size. Dorsal intercameral sutures curved, depressed. Ventral intercameral sutures nearly radial, depressed. Umbilicus small, rather shallow. Aperture lowly arched, umbilical in position, bordered by a distinct lip. Wall calcareous, perforate. Surface hispid.

Globigerina patagonica
TODD & KNIKER, 1952

+ 1952 *Globigerina patagonica* Todd & Kniker-TODD & KNIKER, p.26, pl.4, fig.32 (Fide ELLIS & MESSINA)

1961 *Globigerina triloculinoides* (not PLUMMER, 1926)-KAASSCHIETER, p.235, pl.16, fig.7

1969 *Globigerina patagonica* TODD & KNIKER-BERGGREN, p.149, pl.1, figs.1-6

Type locality : Shaw sample 43, from an outcrop on the Rio Grande anticline on the southeast side of Otway Sound, Manallanes Province, Chile.

Type level : Upper Eocene, Agua Fresca Formation.

Description : Test low trochospiral. Equatorial periphery moderately lobate. Axial periphery broadly rounded. Three and a half to four chambers in the last whorl, increasing rapidly in size. Dorsal intercameral sutures curved, depressed. Ventral intercameral sutures nearly radial, depressed. Umbilicus shallow to moderately deep, open. Aperture a broad, symmetrical arch, umbilical in position, bordered by a lip. Wall calcareous, finely perforate. Surface cancellate.

Remarks : Specimens with a relatively large last chamber ressemble *Globigerina (S.) triloculinoides* PLUMMER, 1926. Individuals with an aperture which is rather asymmetrically placed with respect to the umbilicus ressemble *Globigerina (S.) frontosa* SUBBOTINA, 1953.

Globigerina praebulloides leroyi
BLOW & BANNER, 1962
Pl.14, figs.18-24

+ 1962 *Globigerina praebulloides leroyi* Blow & Banner subsp. nov.-BLOW & BANNER, p.93, pl.IX_{R-T}, fig.9(v)

p 1969 *Globigerina praebulloides* BLOW-BERGGREN, pl.VI, figs.19-21 (not figs.22-27)

1969 *Globigerina praebulloides leroyi* BLOW & BANNER-BLOW, p.391, pl.1, figs.7-9

1972 *Globigerina praebulloides leroyi* BLOW & BANNER-HOOYBERGHS & DE MEUTER, p.24, pl.7, figs.2a-c

Type locality : Sample FCRM 1965, Lindi Area, Tanzania.

Type level : *Globigerina oligocaenica* Zone, Oligocene.

Description : Test small, lowly trochospiral. Equatorial periphery lobate. Axial periphery oval, rounded. About 2 1/2 whorls of subglobular chambers. Four inflated chambers in the last whorl, increasing rapidly in size, partially embracing. Dorsal intercameral sutures initially curved, depressed. Spiral suture depressed. Ventral intercameral sutures weakly curved, depressed. Umbilicus small, deep. Aperture semicircular, umbilical in position, bordered by a distinct lip. Wall calcareous, finely perforate. Surface hispid.

Remarks : *G. praebulloides leroyi* is characterized by the small semicircular aperture, bordered by a distinct lip.
Some variation occurs in the number of chambers in the last whorl, which differs from 3 1/2 to 4 and in the increase in size of the chambers in the last whorl. Specimens with a relatively larger aperture, which becomes slightly asymmetrically arched, are difficult to distinguish from *G. praebulloides praebulloides* BLOW, 1959.

Globigerina praebulloides occlusa
BLOW & BANNER, 1962
Pl.14, figs.24-30

+ 1962 *Globigerina praebulloides occlusa* Blow & Banner subsp.nov.-BLOW & BANNER, p.93, pl.IX_{v-w}, fig.14 (i-ii)

1969 *Globigerina praebulloides occlusa* BLOW & BANNER-BLOW, p.321, pl.1, figs.10,11

1972 *Globigerina praebulloides occlusa* BLOW & BANNER-HOOYBERGHS & DE MEUTER, p.25, pl.7, figs.3a-c

Type locality : Sample FCRM 1922, Lindi Area, Tanzania.

Type level : *Globigerina oligocaenica* Zone, Middle Eocene.

Description : Test lowly trochospiral. Equatorial periphery lobate. Axial periphery rounded. About 2 1/2 whorls of subglobular chambers. Four inflated chambers in the last whorl, increasing rapidly in size. Dorsal intercameral

sutures initially curved, becoming nearly radial in the last whorl, depressed. Spiral suture depressed. Ventral intercameral sutures weakly curved, depressed. Umbilicus narrow. Aperture low, asymmetrically arched, without lip or rim. Wall calcareous, perforate. Surface hispid.

Remarks : The aperture of *G. praebulloides occlusa* laks a lip or rim. In most specimens, the aperture is distinctly asymmetrically arched. The size of the aperture varies considerably. The number of chambers in the last whorl varies from 3 1/2 to 4.

Globigerina praebulloides praebulloides
BLOW, 1959
Pl.15, figs.1-7

+ 1959 *Globigerina praebulloides* Blow, sp.nov.-BLOW, p.180, pl.8, figs.47a-c ; pl.9, fig.48
p 1969 *Globigerina praebulloides* BLOW-BERGGREN, pl.VI, figs.22-27
1969 *Globigerina praebulloides praebulloides* BLOW-BLOW, p.321, pl.2, figs.7,9
1970 *Globigerina praebulloides* BLOW-BAUMANN, p.1187, pl.V, figs.4a-c
1972 *Globigerina praebulloides praebulloides* BLOW-HOOYBERGHS & DE MEUTER, p.25, pl. 7, figs.4a-c

Type locality : Sample RM 19285, auger line near Pozón, eastern Falcon, Venezuela.

Type level : *Globigerinatella insueta/Globigerinoides bispherica* Subzone, Middle Miocene.

Description : Test lowly trochospiral. Equatorial periphery lobate. Axial periphery rounded. About 2 1/2 whorls of subglobular chambers. Four inflated chambers in the last whorl, increasing rapidly in size, slightly embracing. Dorsal intercameral sutures initially curved, becoming subradial in the last whorl, depressed. Spiral suture depressed. Ventral intercameral sutures weakly curved, depressed. Umbilicus moderately broad, deep. Aperture fairly high, asymmetrically arched, umbilical in position, bordered by a thin lip. Wall calcareous, perforate. Surface hispid.

Remarks : The relatively large, asymmetrically aperture of *G. praebulloides praebulloides* is typically bordered by a lip. It differs from *G. praebulloides leroyi* in the larger and asymmetrical aperture. Transitional forms between both taxa however occur. The specimens figured by BERGGREN (1969) in figs.22-24 of pl.VI, have a rather small, subcircular aperture and can be considered as *G. praebulloides leroyi*.

Globigerina praeturritilina
BLOW & BANNER, 1962
Pl.12, figs.18-24

+ 1962 *Globigerina turritilina praeturritilina* Blow & Banner, subsp. nov.-BLOW & BANNER, p.99, pl.XIII_{A-C}
1969 *Globigerina gortanii praeturritilina* BLOW & BANNER-BLOW, p.360, pl.17, fig.2
1970 *Globigerina gortanii praeturritilina* BLOW & BANNER-BAUMANN, p.1185, pl.IV, figs.9a-c
1977 *Globigerina praeturritilina* Blow & Banner-POORE & BRABB, p.256

Type locality : Sample FCRM 1645, Lindi Area, Tanzania.

Type level : *Globigerina oligocaenica* Zone, Oligocene.

Description : Test highly trochospiral. Equatorial periphery strongly lobate. Axial periphery rounded. About 12 inflated chambers, arranged in three whorls. Four chambers in the last whorl, becoming depressed, ovoid, increasing rapidly in size. Last chamber may be reduced in size. Intercameral sutures weakly curved to subradial, depressed. Umbilicus large, deep. Aperture symmetrically arched. Wall calcareous, perforate. Surface cancellate.

Remarks : Although the last chamber of *G. gortanii praeturritilina* may be slightly reduced in size, it does not tend to cover the umbilicus, as does the final chamberlet in *G. gortanii gortanii*. In *G. gortanii praeturritilina*, the chambers in the last whorl are more depressed, ovoid, than in *G. gortanii gortanii*.

Globigerina sellii
(BORSETTI, 1959)
Pl.15, figs.8-9

+ 1959 *Globoquadrina sellii* n.sp.-BORSETTI, p. 2091, pl.1, figs.3a-d
1962 *Globigerina oligocaenica* Blow & Banner, sp.nov.-BLOW & BANNER, p.88, pl.X_{G}L-N
1969 *Globigerina sellii* BORSETTI-BLOW, p.322, pl.19, figs.4-6

Type locality : Varani, coordinates HQ 70286314 (map of Vernasca (72)).

Type level : Lower Oligocene.

Description : Test low trochospiral. Equatorial periphery subcircular to subquadrate, weakly lobate. Axial periphery subconical, broadly rounded. Dorsal side weakly convex, ventral side strongly convex. About three whorls. Four chambers in the early whorls, reducing to three in the last whorl, moderately inflated, partially embracing, increasing rapidly in size. Last chamber reniform in ventral view. Dorsal intercameral sutures curved to subradial, depressed. Ventral intercameral sutures subradial, deeply depressed. Aperture moderately highly arched, bordered by a lip. Umbilicus small. Wall fairly thick, moderately coarsely perforate. Surface hispid.

Remarks : *G. sellii* evolves from *Globigerina tapuriensis* BLOW & BANNER, 1962. It occurs rarely in our material. *G. sellii* differs from *Globigerina tripartita* KOCH, 1926 in having more rapidly enlarging chambers.

Globigerina sp.
Pl.1, figs.26-27

Remarks : From the Boom Clay Member of the Rupel Formation, a few specimens are recorded with 3 chambers in the last whorl and a large semicircular aperture, umbilical in position. The chambers in the last whorl increase regularly in size and are strongly inflated. They are considered here as *Globigerina* sp.

Globigerina tapuriensis
BLOW & BANNER, 1962
Pl.15, figs.10-19

+ 1962 *Globigerina tripartita tapuriensis* Blow & Banner subsp. nov.-BLOW & BANNER, p.97, pl.X_{H-K}
1969 *Globigerina tapuriensis* BLOW & BANNER-BLOW, p.322, pl.16, figs.7,8

Type locality : Sample FCRM 1964, Lindi Area, Tanzania.

Type level : *Globigerina oligocaenica* Zone, Oligocene.

Description : Test rather lowly trochospiral. Equatorial periphery subcircular to subrectangular, subquadrate, smoothy lobate. Axial periphery subovoid, broadly rounded. 11 inflated chambers, arranged in three whorls. Three chambers in the last whorl, little embracing, slightly depressed. Dorsal intercameral sutures initially curved, becoming subradial in the last whorl, depressed. Ventral intercameral sutures subradial, moderately deeply depressed. Umbilicus moderately broad, triangular, deep. Aperture symmetrical, fairly lowly arched, elongate, bordered by a thin lip. Apertural face of the last chamber slightly convex. Wall calcareous, fairly thick, moderately coarsely perforate. Surface hispid.

Remarks : *G. tapuriensis* differs from *G. tripartita* KOCH, 1926, by having less depressed chambers in the last whorl and a less convex apertural face of the last chamber.
A few specimens show a small secondary aperture in side view. They have been included here.

Globigerina tripartita
KOCH, 1926
Pl.15, figs.20-22

+ 1926 *Globigerina bulloides* d'Orbigny var. *tripartita* nov. var.-KOCH, p.746, text-figs.21a-b
1957 *Globigerina rohri* Bolli, new species-BOLLI, p.109, pl.23, figs.1a-4b
1969 *Globigerina tripartita* KOCH-BLOW, p.322, pl.16, fig.6

1970 *Globigerina tripartita* KOCH-BAUMANN, p. 1188, pl.IV, figs.1,2

Type locality : East Borneo.

Type level : Lower beds of "Globigerinen Mergel". Probably Eocene or Lower Oligocene.

Description : Test lowly trochospiral. Equatorial periphery weakly lobate, subcircular in outline. Axial periphery broadly rounded. About 11 inflated chambers, arranged in three whorls. Four chambers in the early whorls, reducing to (3 1/2 or) 3 in the last whorl. Chambers in the last whorl increasing rapidly in size, embracing. Last chamber often reduced in size. Particularly the last chamber of the final whorl is reduced in size and compressed. Dorsal intercameral sutures initially curved, becoming subradial in the last whorl, depressed. Spiral suture depressed. Intercameral sutures nearly radial, depressed. Umbilicus rather small, triangular, deep. Aperture lowly arched, umbilical in position, bordered by a thickened rim. Wall calcareous, fairly thick, coarsely perforate. Surface hispid, especially around the umbilicus.

Remarks : *G. tripartita* is characterized by having 3 chambers in the last whorl, becoming strongly compressed. It differs from *Globigerina venezuelana* HEDBERG, 1937, in having 3 instead of 4 chambers in the last whorl. BIZON (1967) included in *G. tripartita* specimens with globular, less depressed chambers in the last whorl. Those specimens are refered to *Globigerina tapuriensis* BLOW & BANNER, 1962.

Globigerina utilisindex
JENKINS & ORR, 1973
Pl.16, figs.18-23

+ 1973 *Globigerina utilisindex* n.sp.-JENKINS & ORR, p.133, pl.1, figs.1-6 ; pl.2, figs.1-9 ; pl.3, figs.1-3

Type locality : Holotype from the core catcher sample of core 51 from site 7713 of Deep Sea Drilling Project, leg 9 at lat. 00°28.90'N, long. 133°13.70'W.

Type level : Lower Oligocene, *Pseudohastigerina barbadoensis* Zone.

Description : Test low trochospiral. Equatorial periphery trilobate. Axial periphery rounded. Three to 3 1/2 globular chambers in the last whorl, increasing rapidly in size. Last chamber may be reduced in size. Intercameral sutures slightly recurved to radial, slightly depressed. Umbilicus shallow, open. Aperture a low arch, umbilical to slightly umbilical-extraumbilical in position. Wall calcareous, perforate. Surface cancellate.

Remarks : According to JENKINS (1973) the present species could be intermediate between *Globigerina (S.) linaperta* FINLAY, 1939 and *Globigerina angiporoides* HORNIBROOK, 1956.

Globigerina winkleri
BERMUDEZ, 1960
Pl.15, figs.23-28

+ 1960 *Globigerina winkleri* Bermudez, sp.nov.-BERMUDEZ, p.1208, pl.6, figs.4a-c

1969 *Globigerina winkleri* BERMUDEZ-BLOW, p. 328

Type locality : Pays-Bas road, San Fernando bay, Trinidad.

Type level : *Globigerinita dissimilis* Zone, Oligocene.

Description : Test high trochospiral. Equatorial periphery distinctly lobate. Axial periphery broadly rounded. About 12 to 14 chambers, arranged in 3 to 3 1/2 whorls, increasing regularly in size. Four globular chambers in the last whorl, slightly embracing. Additional final chamberlet, reduced in size. Aperture arched, umbilical in position. Wall calcareous, perforated. Surface cancellated.

Remarks : *G. winkleri* ressembles *Globigerina gortanii* (BORSETTI, 1959) in the highly coiled trochospire. In *G. winkleri* however, the chambers of the last whorl are more globular and less embracing. BLOW (1969) recognized a close relationship between *G. winkleri* and *G. galavisi* BERMUDEZ, 1961. The test of *G. galavisi* however has a more flattened spiral side and a distinct apertural flap. It lacks an aberrant final chamberlet.

Globigerina woodi connecta
JENKINS, 1964
Pl.16, figs.4-6

+ 1964 *Globigerina woodi* Jenkins, subsp. *connecta* Jenkins, new subspecies-JENKINS, p.72, text-figs.1a-c

Type locality : Holotype from sample H2/554, F 14851, from the Parengarenga section in north Auckland, Australia.

Type level : Holotype from the Lower Miocene, Otaian Stage.

Description : Test low trochospiral. Equatorial periphery trilobate. Axial periphery rounded. About 10 to 12 chambers, arranged in 2 to 3 whorls, increasing slowly in size. Three to 3 1/2 chambers in the last whorl distinctly embracing. Dorsal and ventral intercameral sutures weakly curved, slightly depressed. Umbilicus narrow. Aperture lowly arched, asymmetrically placed with respect to the umbilicus. Wall calcareous, perforate. Surface coarsely pitted.

Remarks : *Globigerina woodi connecta* differs from *Globigerina woodi woodi* JENKINS, 1960 in the more embracing chambers in the last whorl and in the lower aperture.

Globigerina woodi woodi
JENKINS, 1960
Pl.16, figs.1-3

+ 1960 *Globigerina woodi* Jenkins, new species-JENKINS, p.352, pl.2, figs.2a-c

1966 *Globigerina woodi woodi* Jenkins-JENKINS, p.6, pl.1, figs.18a-c

1972 *Globigerina woodi* JENKINS-HOOYBERGHS & DE MEUTER, p.27, pl.8, figs.4a-c

Type locality : Oil shaft, a mile northeast of Lakes Entrance township, Victoria.

Type level : *Globigerina woodi* Zone, Lower Oligocene.

Description : Test low trochospiral. Equatorial periphery quadrilobate to trilobate. Axial periphery broadly rounded. About 12 to 14 spherical chambers, arranged in 2 1/2 to 3 whorls. Three and a half to four chambers in the last whorl, increasing regularly in size. Dorsal and ventral intercameral sutures weakly curved, depressed. Spiral suture depressed. Umbilicus small. Aperture highly arched, umbilical in position, bordered by a small thickened rim. Wall calcareous, perforated. Surface cancellate.

Remarks : JENKINS (1960) noted that *G. woodi* evolves from the *Globigerina praebulloides* group : the size of the test increases and the surface becomes more and more cancellated. *G. woodi woodi* differs from *G. woodi connecta* JENKINS 1964 in having a highly arched aperture instead of a more slit-like one.

Globigerina yeguaensis
WEINZIERL & APPLIN, 1929
Pl.16, figs.7-17

+ 1929 *Globigerina yeguaensis* Weinzierl & Applin-WEINZIERL & APPLIN, p.408, pl.43, figs. 1a-b (Fide ELLIS & MESSINA)

1969 *Globigerina yeguaensis* WEINZIERL & APPLIN-BLOW, pl.3, figs.12-14

1979 *Dentoglobigerina yeguaensis* (Weinzierl & Applin)-BLOW, p.1313, pl.3, figs.12-14

Type locality : Rio Bavo Oil Co., Deussen B1, South Liberty, Liberty County, Texas, U.S.A.

Type level : Upper Claiborne Yegua, Upper Eocene.

Description : Test low trochospiral. Equatorial periphery distinctly lobate. Axial periphery broadly rounded. Dorsal side slightly convex. Ventral side convex. About 12 inflated chambers, arranged in 3 whorls. Three and a half to four chambers in the last whorl, increasing moderately to fairly rapidly in size, slightly embracing. Last chamber often reduced in size. Dorsal intercameral sutures slightly curved, depressed. Spiral suture depressed. Umbilicus narrow. Aperture lowly arched, umbilical to slightly umbilical-extraumbilical in position, bordered by a distinct lip. Wall calcareous, perforate. Surface pitted.

Remarks : *G. yeguaensis* differs from *Globigerina*

linaperta FINLAY, 1939 by the often greather number of chambers in the last whorl (4 instead of 3 1/2), which are less embracing. The equatorial outline of the test is highly variabel, due to the more or less rapidly enlarging chambers in the last whorl and to the varying degree of reduction of the last chamber.

Globigerina (Eoglobigerina) spiralis
(BOLLI, 1957)
Pl.17, figs.1-6

+ 1957 *Globigerina spiralis* Bolli, new species-BOLLI, p.70, pl.16, figs.16-18
1960 *Globigerina spiralis* Bolli-BOLLI & CITA, p.12, pl.32, fig.2
1977 *Subbotina spiralis* (Bolli)-BERGGREN, p. 216
1979 *Eoglobigerina spiralis* (Bolli)-BLOW, p. 1222, pl.79, figs.5-9

Type locality : Holotype (USNM P5030) from west side of railway track, south of the Point-à-Pierre railway station, about 500 feet from the level crossing of Station Road, Point-à-Pierre, Trinidad. Coordinates N : 259200 links ; E : 362900 links, sample KR 23575 (TLL 178894).

Type level : *Globorotalia uncinata* Zone, Lizard Springs Formation.

Description : Test moderately to high trochospiral. Spiral side distinctly convex. Equatorial periphery lobate. Axial periphery rounded. About 15 inflated chambers, arranged in 3 whorls. Five to six globular chambers in the last whorl, increasing moderately in size. Dorsal intercameral sutures distinctly curved, depressed. Ventral intercameral sutures radial, depressed. Umbilicus narrow, open. Aperture arched, umbilical in position, often tending to an umbilical-extraumbilical position, bordered by a distinct lip. Wall calcareous, perforated. Surface reticulate, with pore-pits and ridges.

Remarks : BERGGREN (1977) noted that *G. spiralis* evolves from *Globorotalia pseudobulloides* (PLUMMER, 1926) by way of forms closely related to *Globorotalia imitata* SUBBOTINA, 1953.
It evolves into *Globorotalia pusilla* BOLLI, 1957. The aperture tends to an umbilical-extraumbilical position and the dorsal intercameral sutures become strongly curved.

Globigerina (Globastica) daubjergensis
BRÖNNIMANN, 1952
Pl.17, figs.7-10

+ 1953 *Globigerina daubjergensis* n.sp.-BRÖNNIMANN, p.340, fig.1
p 1957 *Globigerina daubjergensis* Brönnimann-LOEBLICH & TAPPAN, p.184, pl.42, figs. 6a-c ; pl.44, figs.7-8c
1966 *Globigerina daubjergensis* Brönnimann-EL NAGGAR, p.161, pl.55, figs.3a-c
1971 *Globigerina daubjergensis* BRÖNNIMANN-MOORKENS, p.858, pl.3, figs.4a-b, figs.5a-b, figs.6a-d
1979 *Globastica daubjergensis* Brönnimann-BLOW, p.1235, pl.74, figs.7-9 ; pl. 256, figs.1-9 ; pl.257, figs.3,4

Type locality : Sample 38, from a quarry southwest of Stavnsbjerg farm, Daubjerg, west-central part of Viborg County, Jutland Peninsula, Denmark.

Type level : Uppermost Danian, Zone D.

Description : Test high trochospiral, very small. Dorsal side broadly conical. Ventral side globular. Equatorial periphery quadrate, lobate. Axial periphery rounded. About 16 chambers, arranged in 4 whorls. Four globular chambers in the last whorl, relatively large, increasing moderately rapidly in size. Dorsal intercameral sutures curved, to radial in the last whorl, depressed. Ventral intercameral sutures radial, depressed.
Umbilicus very small, almost closed. Aperture umbilical, small. Wall calcareous, finely perforate. Surface hispid.

Remarks : Some specimens have a bulla-like chamber with smoother surface.

Globigerina (Globastica) kozlowskii
BROTZEN & POZARYSKA, 1961
emend. MOORKENS, 1971
Pl.17, figs.11-13

p 1961 *Globigerina kozlowskii* n.sp.-BROTZEN & POZARYSKA, p.163, pl.3 ; pl.1, figs.2, 3,4,7,9,10,11,13 ; pl.2, figs.7,8,9,11, 12,13,14,15,16,17
1966 *Globigerina kozlowskii* Brotzen & Pozaryska-EL NAGGAR, p.168, pl.15, figs.1a-c,2
+ 1971 *Globigerina kozlowskii* BROTZEN & POZARYSKA-MOORKENS, p.859, pl.3, figs. 1a-d, figs.2a-c, fig.3
1979 *Globastica kozlowskii* (Brotzen & Pozaryska)-BLOW, p.1241

Type locality : Well at Pamietowa, Poland. Depth : -263,80m.

Type level : Paleocene.

Description : Test high trochospiral, relatively large. Dorsal side conical with a pointed initial part. Ventral side inflated. Equatorial periphery broadly ovoid, lobate. Axial periphery rounded. About 13 chambers, arranged in 2 1/2 to 3 whorls. Three to four rapidly increasing, globular chambers in the last whorl. Dorsal intercameral sutures curved, depressed. Ventral intercameral sutures nearly radial, strongly depressed. Umbilicus very small, shallow, nearly closed. Primary aperture umbilical, very small. Secondary sutural aperture on spiral side. Wall calcareous, finely perforated. Surface finely spinose.

Remarks : *G. kozlowskii* differs from *Globigerina (Globastica) daubjergensis* BRÖNNIMANN, 1952 in its smaller size and in the slightly less spinose surface. Some specimens have a bulla-like last chamber.

Globigerina (Muricoglobigerina) aquiensis
(LOEBLICH & TAPPAN, 1957)
Pl.17, figs.23-24 ; pl.18, figs.1-7

p+ 1957 *Globigerina aquiensis* Loeblich & Tappan-LOEBLICH & TAPPAN, p.180, pl.51, figs. 4a-c ; pl.56, figs.4a-6c
p 1957 *Globigerina spiralis* Bolli-LOEBLICH & TAPPAN, p.182, pl.49, figs.3a-c ; pl. 51, figs.8a-c
1966 *Globigerina aquiensis* Loeblich & Tappan-EL NAGGAR, p.157
1979 *Muricoglobigerina aquiensis* (Loeblich & Tappan)-BLOW, p.1123, pl.91, fig.3 ; pl.98, figs.4-5 ; pl.107, figs.6-7 ; pl.235, figs.4-5

Type locality : Holotype from 10 to 13 feet above the base of the exposure of the Aquia Formation, west bank of Potomac River, near mouth of Aquia Creek, S.10°E of Brent Point on U.S. Geological Survey Nanjemoy Md.-Va. Quadrangle 1:62-500, 1973 reprinted. Stafford County, Virginia.

Type level : Upper Paleocene, Landenian, Aquia Formation.

Description : Test moderately trochospiral. Equatorial periphery lobate. Axial periphery broadly rounded. Four subglobular, not closely appressed chambers in the last whorl, increasing moderately in size. Often with supplementary small, thin walled final chamber. Intercameral sutures slightly curved, depressed. Umbilicus small. Aperture fairly highly arched, umbilical in position, bordered by a narrow lip. Wall calcareous, perforate. Surface finely hispid.

Remarks : *G. (M.) aquiensis* differs from *G. (M.) chascanona* (LOEBLICH & TAPPAN, 1957) in the less high trochospiral test and less closely appressed chambers.

Globigerina (Muricoglobigerina) chascanona
LOEBLICH & TAPPAN, 1957
Pl.18, figs.8-12

p+ 1957 *Globigerina chascanona* Loeblich & Tappan, new species-LOEBLICH & TAPPAN, p.180, pl.49, figs.5a-c
1966 *Globigerina chascanona* Loeblich & Tappan-EL NAGGAR, p.160, pl.16, figs.4a-c
1979 *Muricoglobigerina chascanona* (Loeblich & Tappan)-BLOW, p.1126, pl.91, figs.1,2 ; pl.92, fig.3 ; pl.93, figs.7-9 ; pl.

101, figs.5,6 ; pl.235, figs.1-3

Type locality : Holotype from Nath bank of Shingle Run, a tributary to Crosswicks Creek, 1.0 mile north of New Egypt, Marmouth County, Hornestown Formation.

Type level : Upper Paleocene, Landenian, Hornestown Formation.

Description : Test high trochospiral. Equatorial periphery lobate, subquadrate to ovoid in outline. Axial periphery rounded. Inflated chambers, arranged in 3 to 3 1/2 whorls. Four to five chambers in the last whorl, closely appressed. Last chamber often reduced in size. Intercameral sutures slightly curved, depressed. Umbilicus small, deep. Aperture arched, umbilical-extraumbilical in position, bordered by a narrow lip. Wall calcareous, finely perforate. Surface spinose.

Remarks : Specimens with a less high trochospiral test and more appressed chambers in the last whorl are referable to *Globigerina (Muricoglobigerina) aquiensis* LOEBLICH & TAPPAN, 1957.

Globigerina (Muricoglobigerina) esnehensis
NAKKADY, 1950

+ 1950 *Globigerina cretacea* d'Orbigny var. *esnehensis* Nakkady-NAKKADY, p.689, pl.90, figs.14-16
1957 *Globigerina gravelli* Brönnimann-BOLLI, p.72, pl.16, figs.1-3
p 1957 *Globigerina mckannai* White-LOEBLICH & TAPPAN (not WHITE), p.181, pl.53, figs. 1a-c
1979 *Muricoglobigerina esnehensis* (Nakkady)-BLOW, p.1127, pl.109, figs.1-7

Type locality : Anglo Egyptian Oilfields Ltd., Sample Dar.230, from Abu Durba, in western Sinai, about 174km southeast of Suez, Egypt.

Type level : Lower Eocene, chalky limestone, just above the top of the Esna shale.

Description : Test low to moderately high trochospiral. Equatorial periphery lobate. Axial periphery broadly rounded to subangular. Five to six subglobular chambers in the last whorl, increasing slowly in size, becoming appressed. Dorsal intercameral sutures oblique to slightly curved. Ventral intercameral sutures radial, depressed. Umbilicus fairly wide, deep. Aperture distinctly arched, umbilical in position, bordered by a lip. Wall calcareous, perforate. Surface nodose.

Remarks : *G. esnehensis* differs from *G. (M.) mckannai* White, 1928, in the less tightly coiled test and in the less recurved intercameral sutures.

Globigerina (Muricoglobigerina) mckannai
WHITE, 1928
Pl.18, figs.13-17

+ 1928 *Globigerina mckannai* White-WHITE, p.194, pl.27, fig.16 ; p.194, pl.27, figs.16 a-c (Fide ELLIS & MESSINA)
p 1957 *Globigerina mckannai* White-LOEBLICH & TAPPAN, p.181, pl.4, fig.7 ; pl.53, fig.2 ; pl.57, figs.8a-c ; pl.62, figs. 5a-7c
1957 *Globorotalia mckannai* (White)-BOLLI, p. 79, pl.19, figs.14-16
1960 *Globigerina mckannai* White-BOLLI & CITA, p.383, pl.33, figs.6a-c
1966 *Globigerina alanwoodi* sp.nov.-EL NAGGAR, p.156, pl.16, figs.16a-c
1977 *Acarinina mckannai* (White)-BERGGREN, p. 253
1979 *Muricoglobigerina mckannai* (White)-BLOW, p.1129, pl.93, fig.5

Type locality : Columbus station of the Tampico Monterey railroad line, Tampico embayment, Mexico.

Type level : Upper Cretaceous (?).

Description : Test low trochospiral. Umbilical side distinctly convex. Equatorial periphery nearly circular, slightly lobate. Axial periphery rounded. About 17 chambers, arranged in three whorls. Five to 7 inflated chambers in the last whorl, increasing slowly but regularly in size, becoming slightly compressed laterally. Dorsal intercameral sutures slightly curved, depressed. Ventral intercameral sutures radial, strongly incised. Umbilicus wide, deep. Aperture lowly arched, umbilical to slightly umbilical-extraumbilical in position. Wall calcareous, perforate. Surface finely spinose.

Remarks : *G. alanwoodi* EL NAGGAR was characterized by the smooth surface. It is considered as synonymous with *G. mckannai*. The size of the umbilicus varies.

Globigerina (Muricoglobigerina) senni
(BECKMANN, 1953)
Pl.18, figs.18-19

+ 1953 *Sphaeroidinella senni* n.sp.-BECKMANN, p.394, pl.26, figs.2-4, text-fig.20
1979 *Muricoglobigerina senni* (Beckmann)-BLOW, p.1131, pl.131, figs.7-9 ; pl.142, fig.7 ; pl.146, figs.9-10 ; pl.165, fig.8 ; pl.236, figs.1-4

Type locality : A steep cliff on the left bank of the Upper Mount Hillaly River, in a section on the eastern slope of Mount Hillaly, central Barbados, B.W.I.

Type level : Uppermost Middle Eocene, Oceanic Formation, lower Mount Hillaly beds, in a greenish marl.

Description : Test low trochospiral. Equatorial periphery slightly lobate, subcircular. Axial periphery broadly rounded. About 2 1/2 whorls of globular to subglobular chambers. Three to four chambers in the last whorl, increasing slowly in size, tightly coiled. Dorsal intercameral sutures slightly curved, depressed. Ventral intercameral sutures nearly radial, depressed. Aperture low, umbilical. Umbilicus fairly narrow, deep. Wall calcareous, thick, coarsely perforate. Surface nodose, rugose on the umbilical shoulder.

Remarks : Our specimens have a typical thick wall and a reduced chamber. According to BLOW (1979), *G. senni* evolves into *Globigerapsis index* (FINLAY, 1939).

Globigerina (Muricoglobigerina) soldadoensis
BRÖNNIMANN, 1952
Pl.18, figs.20-24

+ 1952 *Globigerina soldadoensis* Brönnimann-BRÖNNIMANN, p.9, pl.1, figs.1-9
1957a *Globigerina soldadoensis* Brönnimann-BOLLI, p.71, pl.16, figs.7-9
1957b *Globigerina soldadoensis* Brönnimann-BOLLI, p.162, pl.35, fig.9
1957 *Globigerina* cf. *G. soldadoensis* Brönnimann-LOEBLICH & TAPPAN, p.182, pl.53, figs.4a-c
1977 *Acarinina soldadoensis* (Brönnimann)-BERGGREN, p.259
1979 *Muricoglobigerina soldadoensis soldadoensis* (Brönnimann)-BLOW, p.1120, pl. 98, figs.1-3 ; pl.107, figs.1-5 ; pl. 109, fig.8 ; pl.110, fig.1 ; pl.124, figs.1,3,5 ; pl.131, figs.1-3 ; pl. 235, fig.6

Type locality : Trinidad Leaseholds Ltd., sample nr.50506, from the ravine of the Ampelu River, a small tributary of the Ortoire River system, Lizard Springs area, southeastern Trinidad, B.W.I..

Type level : Paleocene, lower zone of Lizard Springs Formation ; dark, poorly bedded marl and calcareous clay.

Description : Test low trochospiral. Dorsal side flattened to weakly convex. Ventral side strongly convex. Equatorial periphery lobate, axial periphery subangular to broadly rounded. Subglobular, inflated chambers, arranged in 2 1/2 whorls. Four to 4 1/2 chambers in the last whorl, increasing slowly in size, becoming compressed laterally. Dorsal intercameral sutures slightly curved to oblique, depressed. Ventral intercameral sutures radial, depressed. Umbilicus fairly narrow to fairly wide. Aperture lowly arched, umbilical to slightly umbilical-extraumbilical in position, bordered by a rim. Wall calcareous, perforate. Surface with short spines or knobs, especially around the umbilicus. Surface of the last chamber smooth.

Remarks : *G. soldadoensis soldadoensis* differs from *Globigerina (Muricoglobigerina) soldadoensis angulosa* BOLLI, 1957, in the less angular and less laterally compressed later chambers. Specimens of the *angulosa* type occur rarely in our material.

Globigerina (Subbotina) haynesi
EL NAGGAR, 1966
Pl.19, figs.11-19

+ 1966 *Globigerina haynesi* sp.nov.-EL NAGGAR, p.165, pl.15, figs.5a-c

Type locality : Gebel Owaina section, Esna Idfu Region, Nile Valley, Egypt.

Type level : Sample nr.64, Upper Paleocene.

Description : Test relatively high trochospiral. Dorsal side convex. Equatorial periphery quadrate, lobate. Axial periphery rounded. About 13 chambers, arranged in 2 1/2 whorls, increasing moderately in size. Four subglobular chambers in the last whorl, strongly inflated, embracing. Dorsal intercameral sutures slightly curved, depressed. Ventral intercameral sutures nearly radial, depressed. Umbilicus small, shallow, open. Aperture lowly arched, elongate, umbilical in position, bordered by a narrow lip. Wall calcareous, perforate. Surface nodose.

Remarks : *G. haynesi* has a typical quadrate equatorial outline. The aperture is lowly arched, elongate. The dorsal side of the test is convex. The chambers are distinctly embracing.

Globigerina (Subbotina) frontosa
(SUBBOTINA, 1953)
Pl.19, figs.3-10

+ 1953 *Globigerina frontosa* Subbotina-SUBBOTINA, p.84, pl.12, figs.3a-7c (Fide ELLIS & MESSINA)

1957 *Globigerina boweri* Bolli, new species-BOLLI, p.163, pl.36, figs.1a-2b

1970 *Globorotalia cerroazulensis frontosa* (Subbotina)-TOUMARKINE & BOLLI, p.139, pl.1, figs.1-3

1979 *Subbotina frontosa ayalai* (Bermudez)-BLOW, p.1265, pl.158, fig.5

1979 *Subbotina frontosa boweri* (Bolli)-BLOW, p.1266, pl.175, figs.7-9 ; pl.179, fig. 9 ; pl.184, figs.8,9

1979 *Subbotina frontosa frontosa* (Subbotina)-BLOW, p.1263, pl.158, figs.6,7 ; pl. 160, fig.3 ; pl.162, figs.10,11 ; pl. 163, figs.1-3 ; pl.175, figs.4-6 ; pl. 238, figs.1-4 ; text-fig.H, fig.(i)

Type locality : Holotype from along the Kuban River, Northern Caucasus, U.S.S.R..

Type level : Holotype from the Middle Eocene, lower part of the *Acarinina* Zone, in green sandy marls and marly sandstone ("green series").

Description : Test low trochospiral. Equatorial periphery trilobate, ovoid in outline. Axial periphery broadly rounded. About 12 chambers, arranged in 2 1/2 whorls. Three and a half chambers in the last whorl, globular, increasing rapidly in size. Dorsal intercameral sutures weakly curved to radial in the later part of the test, depressed. Ventral intercameral sutures nearly radial, depressed. Umbilicus narrow. Aperture fairly highly arched, bordered by a lip, tending to an umbilical-extraumbilical position. Wall calcareous, perforate. Surface finely pitted.

Remarks : According to BLOW, 1979, distinction can be made between *G. (S.) frontosa frontosa* and *G. (S.) frontosa boweri* BOLLI, 1957, with a more thightly coiled test and with stronger appressed and embracing chambers, and between *G. (S.) frontosa frontosa* and *G. (S.) frontosa ayalai* BERMUDEZ, 1960, is which the apertural system is not expanded.

Globigerina (Subbotina) hornibrooki
BRÖNNIMANN, 1952
Pl.13, fig.11

+ 1952 *Globigerina hornibrooki* Brönnimann-BRÖNNIMANN, p.15, pl.2, figs.4-6 (Fide ELLIS & MESSINA)

1979 *Subbotina hornibrooki hornibrooki* (Brönnimann)-BLOW, p.1263, pl.101, figs.7-9 ; pl.124, figs.7-8 ; pl.142, fig.6 ; pl.160, fig.4

Type locality : Trinidad Leaseholds Ltd., sample nr.50506, from the ravine of the Ampelu River, a small tributary of the Ortaire River system, Lizard Springs area, southeastern Trinidad, B.W.I..

Type level : Lower Paleocene, lower zone of the Lizard Springs Formation.

Description : Test fairly high trochospiral. Equatorial periphery weakly lobate. Axial periphery rounded. Four inflated chambers in the last whorl, increasing rapidly in size, slightly embracing. Last chamber slightly reduced in size, radially depressed. Dorsal and ventral intercameral sutures weakly curved, slightly depressed. Umbilicus small, deep. Aperture a large arch, umbilical in position, bordered by a lip. Wall calcareous, finely perforate. Surface pitted, cancellate.

Remarks : *Globigerina hornibrooki* evolves from *Globigerina (S.) triangularis* (WHITE, 1928) : the umbilicus becomes smaller and the chambers increase more gradually but less rapidly in size and are more embracing.

Globigerina (Subbotina) inaequispira
SUBBOTINA, 1953

+ 1953 *Globigerina inaequispira* Subbotina-SUBBOTINA, p.69, pl.6, figs.1a-4c (Fide ELLIS & MESSINA)

1966 *Globigerina inaequispira* Subbotina-EL NAGGAR, p.167, pl.15, figs.8a-c

1979 *Subbotina inaequispira* (Subbotina)-BLOW, p.1272, pl.151, figs.5-7 ; pl.163, figs.4-10 ; pl.177, fig.3 ; pl.180, figs.1-7 ; pl.185, fig.9 ; pl.186, fig.1 ; pl.191, fig.7

Type locality : Holotype from along the Cuban River, Northern Caucasus, U.S.S.R..

Type level : Lower to Middle Eocene, zone of conical *Globorotalia*'s, in green sandy marls and marly sandstones ("green series").

Description : Test lowly trochospiral. Equatorial periphery trilobate, radially elongate. Axial periphery rounded. About 15 chambers, arranged in 3 whorls. Four inflated chambers in the last whorl, increasing rapidly in size. Last chamber very large, elongated radially. Dorsal and ventral intercameral sutures radial, strongly depressed. Umbilicus relatively wide, deep, open. Aperture a low arch, asymmetrically placed with respect to the centre of the umbilical depression, bordered by a thin lip. Wall calcareous, perforate. Surface finely pitted.

Remarks : *Globigerina inaequispira* is characterized by the trilobate test with rapidly increasing chambers in the last whorl. Especially the last chambers is relatively very large, resulting in a radially elongated test.

Globigerina (Subbotina) triloculinoides parva
EL NAGGAR, 1966
Pl.19, fig.20

+ 1966 *Globigerina triloculinoides parva* subsp. nov.-EL NAGGAR, p.182, pl.15, figs.4a-c

Type locality : Sample nr.53, about 66 meters above the base of the Gebel Owaina section (ca. lat.27°45'N, long.32°45.75'E), about 12km north of the Nile at Mahamid, Esna Idfu Region, Nile Valley, Upper Egypt.

Type level : Upper Paleocene, *Globorotalia velascoensis* Zone.

Description : Test small, low trochospiral. Dorsal side slightly convex. Ventral side moderately convex. Equatorial periphery moderately lobate, ovoid in outline. Axial periphery subrounded. About 12 chambers, arranged in 2 1/2 whorls. Three and a half chambers in the last whorl, increasing moderately in size, tangentially elongated, slightly compressed. Last chamber relatively large and distinctly compressed. Dorsal intercameral sutures curved to nearly radial in the last whorl, depressed. Ventral intercameral sutures nearly radial, strongly depressed. Umbilicus very small, narrow, open, partly covered by an umbilical extention of the last chamber. Aperture a lowly

arched opening, asymmetrically placed with respect to the umbilical cavity, bordered by a distinct porticus. Wall calcareous, perforate. Surface pitted, reticulate.

Remarks : *G. (S.) triloculinoides parva* is smaller than *G. (S.) triloculinoides triloculinoides* PLUMMER, 1926. The chambers are more embracing, increase less rapidly in size and become more compressed.

Globigerina (Subbotina) triloculinoides triloculinoides
PLUMMER, 1926
Pl.19, figs.21-26

+ 1926 *Globigerina triloculinoides* Plummer-PLUMMER, p.134, pl.8, figs.10a-b (Fide ELLIS & MESSINA)
p 1957 *Globigerina triloculinoides* Plummer-LOEBLICH & TAPPAN, p.183, pl.40, figs.4a-c ; pl.43, figs.9a-c ; pl.45, figs.3a-c ; pl.62, figs.3a-c,4
p 1957 *Globigerina inaequispira* Subbotina-LOEBLICH & TAPPAN, p.181, pl.52, figs.1a-c
1966 *Globigerina triloculinoides* Plummer-EL NAGGAR, p.178, pl.15, figs.7a-c
1979 *Subbotina triloculinoides triloculinoides* Plummer-BLOW, pl.174, fig.6 ; pl.80, fig.1 ; pl.98, fig.7 ; pl.238, figs.9-10 ; pl.255, fig.9 ; pl.257, fig.9, text-figs.M and N

Type locality : Station 23, shallow ditch at road corner southeast of New Corsicana reservoir on road to Mildred, Navarro county, Texas, U.S.A.

Type level : Lower part of Upper Midway Formation, Eocene.

Description : Test low trochospiral. Spiral side slightly convex, umbilical side distinctly convex. Equatorial periphery trilobate, ovoid in outline. Axial periphery broadly rounded. Three to 3 1/2 chambers in the last whorl, inflated, subglobular, increasing rapidly in size in the last whorl. Dorsal intercameral sutures curved, less so in the last chambers, depressed. Ventral intercameral sutures almost radial, depressed. Umbilicus narrow, shallow. Aperture a lowly arched opening, asymmetrically placed with respect to the umbilical cavity, bordered by a distinct porticus. Wall calcareous, finely perforate. Surface coarsely pitted, reticulate.

Remarks : *G. (S.) triloculinoides triloculinoides* is characterized by the low trochospiral test, trilobate in equatorial outline. The chambers in the last whorl are relatively large and inflated. The asymmetrically placed aperture is bordered by a distinct porticus.

Globigerina (Subbotina) velascoensis
CUSHMAN, 1925
Pl.19, figs.27-29

+ 1925 *Globigerina velascoensis* Cushman, n.sp.-CUSHMAN, p.19, pl.3, fig.6
1957 *Globigerina velascoensis* Cushman-BOLLI, p.71, pl.15, figs.9-11
1966 *Globigerina velascoensis* Cushman-EL NAGGAR, p.183, pl.16, figs.3a-d
1979 *Subbotina velascoensis* (Cushman) sensu Bolli-BLOW, p.1292, pl.98, fig.9

Type locality : Tamalte Arroyo, Hacienda El Limon, State of San Luis Potosi, Mexico.

Type level : Upper Cretaceous (?), Velasco Shale.

Description : Test low trochospiral. Spiral side flat, umbilical side convex. Equatorial periphery strongly lobate, subquadrate in outline. Axial periphery rounded. About 11 chambers, arranged in 2 1/2 whorls. Three and a half chambers in the last whorl, subglobular, becoming slightly radially depressed, increasing rapidly in size. Dorsal intercameral sutures curved, depressed. Ventral intercameral sutures radial, depressed. Umbilicus small, deep, partially covered by a porticus. Aperture lowly arched, bordered by a distinct lip, umbilical in position, often tending to an umbilical-extraumbilical position. Wall calcareous, perforate. Surface pitted.

Remarks : The chambers of the last whorl in this species become typically distinctly radially depressed. *G. (S.) velascoensis* evolves from *G. (S.) triangularis* (WHITE, 1928), from which it differs in the radially depressed chambers in the last whorl.

Genus *Globigerinoides* CUSHMAN, 1927

Globigerinoides altiaperturus
BOLLI, 1957
Pl.20, figs.1-6

+ 1957 *Globigerinoides triloba altiapertura* Bolli, new subspecies-BOLLI, p.113, pl.25, figs.5a-c, text-fig.21, nr.3
1969 *Globigerinoides quadrilobatus altiaperturus* BOLLI-BLOW, p.325
1972 *Globigerinoides quadrilobatus altiaperturus* BOLLI-HOOYBERGHS & DE MEUTER, p.28, pl.9, figs.2a-c

Type locality : Sample BO 267 from the type locality of the *Catapsydrax dissimilis* Zone : South bank of San Fernando Bypass Road, approximately 1,050 feet northeast from north end of road bridge across the Siparia railway line. Coordinates N : 226600 links ; E : 362200 links. Trinidad.

Type level : *Catapsydrax stainforthi* Zone, Lower Miocene.

Description : Test trochospiral. Equatorial periphery lobate. Axial periphery broadly rounded. About 12 spherical chambers, arranged in 3 1/2 whorls. Three chambers in the last whorl, increasing rapidly in size. Dorsal intercameral sutures slightly curved, depressed. Spiral suture depressed. Ventral intercameral sutures weakly curved to radial, depressed. Umbilicus narrow. Primary aperture highly arched, umbilical in position, bordered by a lip. At least two supplementary apertures on spiral side. Wall calcareous, perforated. Surface cancellated.

Remarks : Our specimens have typical highly arched apertures. *G. altiaperturus* differs from *Globigerinoides primordius* BLOW & BANNER, 1962 in the heigher apertures and in having more than one secondary aperture on spiral side.

Globigerinoides bollii
BLOW, 1959
Pl.20, figs.7-8

+ 1959 *Globigerinoides bollii* Blow, sp.nov.-BLOW, p.189, pl.10, figs.65a-c
1969 *Globigerinoides bollii* BLOW-BLOW, p.324, pl.20, figs.2-3
1972 *Globigerinoides bollii* BLOW-HOOYBERGHS & DE MEUTER, p.27, pl.9, figs.1a-c

Type locality : Sample RM 19697, auger line near Pozón, eastern Falcon, Venezuela.

Type level : *Globorotalia menardii/Globigerina nepenthes* Zone, Middle Miocene.

Description : Test low to fairly high trochospiral, small. Equatorial periphery lobate, subcircular to subovoid in outline. Axial periphery rounded. About 10 chambers, arranged in 2 1/2 whorls. Four subglobular chambers in the last whorl, increasing moderately in size, embracing. Dorsal intercameral sutures curved, depressed. Umbilicus small, shallow. Primary aperture small, semicircular, umbilical in position, bordered by a lip. One or two small secondary apertures on spiral side. Wall calcareous, perforated. Surface hispid.

Remarks : This small specimen occurs rarely in the Antwerpen Sands. The last chamber is sometimes reduced in size.

Globigerinoides primordius
BLOW & BANNER, 1962
Pl.20, figs.9-13

+ 1962 *Globigerinoides quadrilobatus primordius* Blow & Banner, subsp.nov.-BLOW & BANNER, p.115, pl.9, figs.Dd-Ef, fig.14 (iii-viii)
1969 *Globigerinoides quadrilobatus primordius* BLOW & BANNER-BLOW, p.325, pl.20, figs. 1,5,6
1972 *Globigerinoides quadrilobatus primordius* BLOW & BANNER-HOOYBERGHS & DE MEUTER, p.28, pl.9, figs.3a-c

Type locality : San Fernando Bypass Road, Trinidad.

Type level : *Globorotalia kugleri* Zone, Aquitanian.

Description : Test low trochospiral. Equatorial periphery lobate. Axial periphery broadly rounded. About 10 chambers, arranged in 2 1/2 whorls. Three and a half to four inflated

chambers in the last whorl, increasing moderately in size. Dorsal and ventral intercameral sutures weakly curved, depressed. Spiral suture depressed. Primary aperture lowly to moderately highly arched, umbilical in position, bordered by a thin rim. Only one secondary aperture on spiral side. Wall calcareous, perforated. Surface cancellated.

Remarks : According to BLOW & BANNER (1962), *G. primordius* evolves from the *Globigerina praebulloides* group. It is characterized by having a single secondary aperture on spiral side.

Globigerinoides quadrilobatus
BANNER & BLOW, 1960
Pl.20, figs.14-16

+ 1960 *Globigerinoides quadrilobatus* d'Orbigny-BANNER & BLOW, p.17, pl.4, figs.3a-b
1969 *Globigerinoides quadrilobatus quadrilobatus* (D'ORBIGNY)-BLOW, p.325
1972 *Globigerinoides quadrilobatus quadrilobatus* BANNER & BLOW-HOOYBERGHS & DE MEUTER, p.29, pl.9, figs.4a-c

Type locality : Near to Nusdorf, Vienna, Austria.
Type level : Miocene.
Description : Test low trochospiral. Equatorial periphery quadrilobate. Axial periphery broadly rounded. About 10 chambers, arranged in 2 1/2 whorls. Four subglobular chambers in the last whorl, increasing moderately in size, moderately embracing. Dorsal intercameral sutures curved, depressed. Spiral suture depressed. Ventral intercameral sutures weakly curved, depressed. Umbilicus small. Primary aperture moderately high, symmetrically arched. Lowly arched secondary apertures on spiral side. Wall calcareous, perforated. Surface cancellated.
Remarks : *G. quadrilobatus* is characterized by having 4 subglobular chambers in the last whorl and a quadrilobate outline. The height of the secondary apertures varies.

Globigerinoides sacculifer
(BRADY, 1877)
Pl.20, figs.17-20

+ 1877 *Globigerina sacculifer* Brady-BRADY, p. 535
1957 *Globigerinoides trilobus sacculifera* (Brady)-BOLLI, p.113, pl.25, figs.5a-c text-fig.21, nr.4
1960 *Globigerinoides sacculifera* (Brady)-BANNER & BLOW, p.21, pl.4, fig.1
1969 *Globigerinoides quadrilobatus sacculifer* (BRADY)-BLOW, p.326
1972 *Globigerinoides sacculifer subsacculifer* CITA, PREMOLI SILVA & ROSSI-HOOYBERGHS & DE MEUTER, p.29, pl.10, figs. 1a-c

Type locality : East side of New Ireland, lat. 4°S, long.150°E.
Type level : Recent (?).
Description : Test low trochospiral. Equatorial periphery lobate, subtriangular in outline. Axial periphery broadly rounded in the earlier chambers, sometimes narrowly rounded in the last chamber. Four chambers in the last whorl. The last chamber becomes radially elongated and sack-like. Dorsal intercameral sutures curved, depressed. Spiral suture depressed. Ventral intercameral sutures weakly curved to radial, depressed. Primary aperture asymmetrically arched, umbilical in position, bordered by a lip. Supplementary apertures on spiral side. Umbicus small, shallow. Wall calcareous, coarsely perforated. Surface cancellated.
Remarks : *G. sacculifer* is characterized by the sack-like radially elongated last chamber. Specimens with an axially slightly rounded last chamber (= *G. sacculifer subsacculifer*) have been included here in *G. sacculifer*.

Globigerinoides trilobus immaturus
LE ROY, 1939
Pl.20, figs.26-27

+ 1939 *Globigerinoides sacculiferus* (Brady) var. *immaturus* LE ROY-LE ROY, p.263, pl.3, figs.19-21 (Fide ELLIS & MESSINA)
1969 *Globigerinoides quadrilobatus immaturus* LE ROY-BLOW, p.325

Type locality : Locality HO 862A, 2,4km N30°E from Kampong (approximately between north latitudes 0°30' and 1°50' and east longitudes 99°40' and 101°30'), Indonesia, auger hole sample, depth 3 1/2 meters.
Type level : Neogene.
Description : Test lowly trochospiral. Equatorial periphery lobate, ovoid in outline. Axial periphery rounded. About 12 chambers, arranged in 2 1/2 whorls, increasing moderately in size. Four chambers in the last whorl, moderately embracing. Dorsal intercameral sutures curved, depressed. Spiral suture depressed. Ventral intercameral sutures slightly curved, depressed. Primary aperture elongate, slit-like, bordered by a thickened rim. Slit-like secondary apertures on spiral side. Wall calcareous, perforated. Surface cancellated.
Remarks : *G. trilobus immaturus* differs from *G. trilobus trilobus* (REUSS, 1850) in having four chambers in the last whorl instead of three.

Globigerinoides trilobus trilobus
(REUSS, 1850)
Pl.20, figs.22-25

+ 1850 *Globigerina triloba* Reuss-REUSS, p.374, pl.47, fig.11 (Fide ELLIS & MESSINA)
1956 *Globigerinoides triloba triloba* (Reuss)-BLOW, p.62, fig.1, nrs.1-3
1957 *Globigerinoides triloba triloba* (Reuss)-BOLLI, p.112, text-fig.21, nr.1, pl.25, fig.2
1965 *Globigerinoides quadrilobatus trilobus* (Reuss)-BANNER & BLOW, text-figs.12a-b
1969 *Globigerinoides quadrilobatus trilobus* (REUSS)-BLOW, p.326, pl.21, figs.4,7
1972 *Globigerinoides trilobus* (REUSS)-HOOYBERGHS & DE MEUTER, p.30, pl.10, figs. 2a-c

Type locality : Xieliczka, Poland.
Type level : Tortonian.
Description : Test low trochospiral. Equatorial periphery slightly lobate, ovoid to subquadrate in outline. Axial periphery broadly rounded. Three to 3 1/2 chambers in the last whorl, increasing rapidly in size, embracing. Dorsal intercameral sutures weakly curved, depressed. Spiral suture depressed. Ventral intercameral sutures weakly curved to radial, depressed. Umbilicus wide. Primary aperture lowly arched to slit-like, extending along the suture between the last and antepenultimate chambers, bordered by a thickened rim. Slit-like to lowly arched secondary apertures on spiral side. Wall calcareous, coarsely perforated. Surface cancellated.
Remarks : In *G. trilobus trilobus*, the apertures becomes slit-like. Some specimens have a very roughly cancellated surface.

Genus *Globigerinopsis* BOLLI, 1962

Globigerinopsis aguasayensis
Bolli, 1962
Pl.21, figs.2-3

+ 1962 *Globigerinopsis aguasayensis* Bolli-BOLLI, p.282, pl.1, figs.1-7 (Fide ELLIS & MESSINA)
1969 *Globigerinopsis aguasayensis* BOLLI-BLOW, p.375
1977 *Globigerinopsis aguasayensis* BOLLI-HOOYBERGHS & DE MEUTER, p.31, pl.10, figs. 3a-c

Type locality : Holotype from cuttings at depth of 13,390 feet in Sinclair Oil and Refining Compagny's Aguasay 3 well ; 22,75km southwest of the new Aguasay Village, Monagar, eastern Venezuela.
Type level : Miocene, Officina Formation.
Description : Test trochospiral. Equatorial periphery distinctly lobate. Axial periphery broadly rounded. About 12 chambers, arranged in three whorls. Four inflated chambers in the last whorl, increasing moderately in size, becoming slightly compressed laterally. Last chamber may be very large or reduced in size. Dorsal intercameral sutures curved, depressed. Ventral intercameral sutures nearly radial,

depressed. Umbilicus fairly wide and deep. Aperture distinctly arched, umbilical-extraumbilical in position, extending to the periphery and even to the spiral side in the later stage, bordered by a faint rim. Wall calcareous, perforate. Surface finely pitted.

Remarks : This typical species occurs in the Houthalen Sands Member of the Bolderberg Formation and is characterized by the aperture extending to the periphery or to the spiral side.

Genus *Globoquadrina* FINLAY, 1947

Globoquadrina altispira
(CUSHMAN & JARVIS, 1936)
Pl.21, figs.4-6

+ 1936 *Globigerina altispira* Cushman & Jarvis-CUSHMAN & JARVIS, p.5, pl.1, figs.13-14 (Fide ELLIS & MESSINA)
1957 *Globoquadrina altispira altispira* (Cushman & Jarvis)-BOLLI, p.111, pl.24, figs.7a-8b
1957 *Globoquadrina altispira globosa* Bolli, new subspecies-Bolli, p.111, pl.24, figs.9a-10c
1961 *Globoquadrina globularis* Bermudez, sp. nov.-BERMUDEZ, p.1311, pl.13, figs. 4-6

Type locality : Bowden marl, at milestone nr.71, east of Port Antonio, Jamaica.

Type level : Miocene.

Description : Test high to very high trochospiral. Equatorial periphery lobate. Axial periphery rounded. Twelve to sixteen chambers, arranged in 3 to 4 whorls. Four to six chambers in the last whorl, inflated to laterally compressed. Often with a small aberrant final chamber. Dorsal and ventral intercameral sutures weakly curved, depressed. Umbilicus large, deep. Aperture fairly highly arched, umbilical in position, often provided with a triangular tooth-like flap. Wall calcareous, finely perforate. Surface cancellate.

Remarks : Our scare specimens can be considered as the *globosa* and *globularis* type, having inflated chambers and a less highly coiled test. In *G. altispira altispira*, the test becomes higher trochospiral. The *globosa* type evolves from the *globularis* type by increasing number of chambers in the last whorl, without increasing height of the trochospire.

Globoquadrina baroemoenensis
(LE ROY, 1939)

+ 1939 *Globigerina baroemoenensis* Le Roy-LE ROY, p.39, pl.6, figs.1-2
1969 *Globoquadrina baroemoenensis* LE ROY-BLOW, p.340, pl.28, figs.4-8

Type locality : Locality HO-1514, 800 meters W - 40°W of Kampong Kassikan, Tapoeng Kiri area, Rokan - Tapanoeli Region.
(Approximately between north latitudes 0°30' and east longitudes 99°40' and 101°30'), Indonesia, auger hole sample, depth 6 meters.

Type level : Neogene (Miocene ?).

Description : Test low trochospiral. Equatorial periphery lobate, subquadrate in outline. Axial periphery broadly rounded. Dorsal side flattened. Ventral side convex. About 10 chambers, arranged in 2 1/2 whorls. Three and a half to four globular chambers in the last whorl, increasing rapidly in size. Last chamber distinctly compressed, resulting in an angular apertural face. Dorsal and ventral intercameral sutures subradial, depressed. Spiral suture depressed. Umbilicus fairly large, deep. Aperture arched, umbilical in position, provided with a triangular tooth-like flap. Wall calcareous, perforated. Surface cancellated.

Remarks : According to BLOW (1969), *G. baroemoenensis* evolves from *Globigerina galavisi* BERMUDEZ, 1961. The last chamber becomes more compressed, resulting in a more subquadrate equatorial outline of the test. The umbilicus becomes wider and the chambers in the last whorl are less embracing.

Globoquadrina dehiscens dehiscens
(CHAPMAN, PARR & COLLINS, 1934)
Pl.20, figs.7-8

+ 1934 *Globorotalia dehiscens dehiscens* Chapman, Parr & COLLINS-CHAPMAN, PARR & COLLINS, p.269, pl.11, figs.36a-c (Fide ELLIS & MESSINA)
1957 *Globoquadrina dehiscens* (Chapman, Parr & Collins)-BOLLI, p.111, figs.3a-b
1969 *Globoquadrina dehiscens dehiscens* (CHAPMAN, PARR & COLLINS)-BLOW, p.341, pl. 28, fig.1
1979 *Globoquadrina dehiscens dehiscens* (Chapman, Parr & Collins)-BLOW, p.1353

Type locality : Kackeraloite Creek, Port Phillip area, Victoria, Australia.

Type level : Tertiary.

Description : Test lowly trochospiral. Equatorial periphery subquadrate to subrounded in outline. Axial periphery subrectangular. Spiral side flattened to weakly convex. Four chambers in the last whorl, increasing regularly in size, strongly depressed laterally and radially compressed. Ultimate chamber with distinct umbilical shoulder. Dorsal intercameral sutures weakly curved, depressed. Spiral suture depressed. Ventral intercameral sutures nearly radial, depressed. Aperture lowly arched, umbilical-extraumbilical in position, provided with a triangular tooth-like flap, with tendency to cover the umbilicus. Umbilicus small, deep, quadrate in outline. Wall calcareous, rather thick, coarsely perforated. Surface cancellated.

Remarks : *G. dehiscens dehiscens* evolves from *G. dehiscens praedehiscens* BLOW & BANNER, 1962. It occurs rarely in the Antwerpen Sands.

Globoquadrina dehiscens praedehiscens
BLOW & BANNER, 1962
Pl.21, figs.9-10

1959 *Globoquadrina rohri* (Bolli)-BLOW, p.185, pl.11, figs.57a-c
+ 1962 *Globoquadrina dehiscens praedehiscens* Blow & Banner, subsp.nov.-BLOW & BANNER, p.116, pl.XV_{Q-S}
1969 *Globoqaudrina dehiscens praedehiscens* BLOW & BANNER-BLOW, p.341, pl.29, figs. 3-5

Type locality : South bank of San Fernando Bypass Road, approximately 240 feet southeast of the north end of road bridge across the Saipan railway line. Coordinates N : 225700 links ; E : 361900 links. Venezuela.

Type level : *Globorotalia kugleri* Zone, Aquitanian.

Description : Test low trochospiral. Equatorial periphery subcircular, weakly lobate. Axial periphery broadly rounded. About 3 whorls of moderately inflated chambers, partially embracing. Three and a half chambers in the last whorl. Last chamber compressed. Dorsal side of the test flattened. Dorsal intercameral sutures weakly curved in the last whorl, depressed. Spiral suture depressed. Ventral intercameral sutures weakly curved to radial, deeply but narrowly depressed. Umbilicus deep. Aperture lowly arched, umbilical to slightly umbilical-extraumbilical in position, bordered by a distinct flap-like, triangular lip. Wall calcareous, coarsely perforated. Surface cancellated.

Remarks : *G. dehiscens praedehiscens* differs from *G. dehiscens dehiscens* (CHAPMAN, PARR & COLLINS, 1934) in the smaller number of chambers in the last whorl (3 chambers ventrally visible), in the more rounded, less quadrate equatorial outline of the test and in the more umbilical position of the aperture. According to BLOW & BANNER (1962) it evolves from *Globigerina tripartita* KOCH, 1926.

Globoquadrina larmeuri
AKERS, 1955
Pl.21, figs.11-13

+ 1955 *Globoquadrina larmeuri* Akers, n.sp.-AKERS, p.661, pl.65, figs.4a-c
1959 *Globoquadrina larmeuri* Akers-BLOW, p. 183, pl.11, figs.53a-c
1969 *Globoquadrina larmeuri larmeuri* AKERS-BLOW, p.241, pl.28, figs.5-6

Type locality : Holotype from the Shell Godchaux Sugar nr.1, section 97, Township 11 South, Range 7 East, St. John the Baptist Parish, Louisiana (core 9110-9112 feet).

Type level : *Operculinoides* Zone, Miocene.

Description : Test low trochospiral. Equatorial periphery lobate. Axial periphery broadly rounded. Spiral side flattened. Umbilical side convex. About 9 to 10 chambers, arranged in 2 1/2 whorls, increasing rapidly in size. Last chamber slightly compressed, resulting in a not sharply angular face. Dorsal intercameral sutures curved, depressed. Spiral suture depressed. Ventral intercameral sutures weakly curved, depressed. Aperture lowly arched, umbilical in position, with a slight tendency to an umbilical-extraumbilical position, provided with a tooth-like umbilical flap, covering the small umbilicus. Wall calcareous, perforate. Surface pustulate, especially around the umbilicus.

Remarks : Especially the last chamber of *G. larmeuri* is slightly depressed. Specimens with a very strongly depressed last chamber are known as *Globoquadrina larmeuri obesa* AKERS.

Genus *Globorotaloides* BOLLI, 1957

Globorotaloides suteri
BOLLI, 1957
Pl.21, figs.14-18

+ 1957 *Globorotaloides suteri* Bolli, new species-BOLLI, p.117, pl.27, figs.9a-13b
1969 *Globorotaloides suteri* BOLLI-BLOW, p.374
1970 *Globorotaloides suteri* BOLLI-BAUMANN, p. 1191, pl.1, figs.4a-c

Type locality : Holotype from sample BO 314A (TTOC 215658) from the type locality of the *Globigerina ampliapertura* Zone, i.i. in left side branch of a gully, 800 feet northeast of north end of San Fernando railway station, 250 feet southeast of railway bridge. Coordinates N : 237850 links ; E : 357560 links. South Trinidad.

Type level : *Globigerina ampliapertura* Zone, Oligocene.

Description : Test low trochospiral. Equatorial periphery lobate. Axial periphery rounded. About 11 to 14 chambers, arranged in 2 1/2 whorls. Four to five ovate or globular chambers in the last whorl, increasing rapidly in size. Dorsal intercameral sutures weakly curved, depressed. Spiral suture depressed. Ventral intercameral sutures subradial, depressed. Umbilicus small, covered by a bulla in the adult stage. Aperture slit-like or lowly arched, initially umbilical-extraumbilical in position, umbilical in position in the adult stage, covered by a bulla in the adult stage. Secondary infralaminal apertures. Wall calcareous, perforate. Surface cancellate.

Remarks : *G. suteri* differs from *Globorotaloides variabilis* BOLLI, 1957, by the more inflated chambers, by the less curved intercameral sutures, and by the fewer chambers.

Subfamily *SPHAEROIDINELLINAE* BANNER & BLOW, 1959

Genus *Sphaeroidinellopsis* BANNER & BLOW, 1959

Sphaeroidinellopsis sp.
Pl.21, figs.22-25

Remarks : From the Antwerpen Sands Member of the Berchem Formation, specimens are recorded showing a developing of a cortex covering the primary wall. However, this cortex is not typically or completely present.

Subfamily *ORBULININAE* SCHULTZE, 1854

Genus *Orbulina* D'ORBIGNY, 1839

Orbulina universa
D'ORBIGNY, 1839
Pl.21, figs.19-21

+ 1839 *Orbulina universa* d'Orbigny-D'ORBIGNY, p.2, pl.1, fig.1 (Fide ELLIS & MESSINA)
1969 *Orbulina universa* D'ORBIGNY-BLOW, p.304

Type locality : Not designated.

Type level : Recent.

Description : Test spherical. Globular last chamber, embracing the earlier trochospiral part of the test. Apertures multiple, subcircular openings irregularly distributed over the wall of the last chamber. Wall calcareous, finely perforated. Surface finely pitted to coarsely cancellated.

Remarks : *O. universa* occurs rarely in the upper part of the Antwerpen Sands.

Genus *Praeorbulina* OLSSON, 1964

Praeorbulina transitoria
(BLOW, 1956)
Pl.20, figs.28-30

+ 1956 *Globigerinoides transitoria* Blow, new species-BLOW, p.65, text-fig.2, nrs. 12-15
1957 *Porticulasphaera transitoria* (Blow)-BOLLI, p.115, pl.27, fig.2
1969 *Praeorbulina transitoria* (BLOW)-BLOW, p.334

Type locality : Holotype from sample nr.19280, T.L.L. cat. nr.130296, Pozón Formation, auger line near Pozón, eastern Falçon, Venezuela.

Type level : Middle part of *Siphogenerina transversa* Zone, Middle Miocene.

Description : Test low trochospiral. Equatorial periphery trilobate to nearly bilobate. Axial periphery broadly rounded. Chambers arranged in 3 1/2 to 3 whorls. Three spherical chambers in the last whorl, increasing rapidly in size. The penultimate chamber embraces the early part of the test for 40 to 60 percent. Dorsal intercameral sutures slightly curved, depressed. Spiral suture depressed. Primary aperture slit-like. Secondary sutural apertures on spiral side, slit-like. Wall calcareous, perforated. Surface cancellated.

Remarks : *P. transitoria* is characterized by the fact that the penultimate chamber embraces strongly the early part of the test.

Subfamily *CATAPSYDRACINAE* BOLLI, LOEBLICH & TAPPAN, 1957

Genus *Globigerinita* BRÖNNIMANN, 1951

Globigerinita dissimilis
(CUSHMAN & BERMUDEZ, 1937)
Pl.22, figs.3-5

+ 1937 *Globigerina dissimilis* Cushman & Bermudez, n.sp.-CUSHMAN & BERMUDEZ, p.25, pl.3, figs.4-6
p 1957 *Catapsydrax dissimilis* (Cushman & Bermudez)-BOLLI, LOEBLICH & TAPPAN, p.36, pl.7, figs.6a-c ; pl.7, figs.7a-b
1962 *Globigerinita dissimilis dissimilis* (Cushman & Bermudez)-BLOW & BANNER, p.106, pl.XIV, fig.D
1979 *Globigerinita dissimilis dissimilis* (Cushman & Bermudez)-BLOW, p.1328, pl.241, figs.2,3

Type locality : Bermudez station 31, 1km north of Arroyo Arenas, on road to Jaimanitas (water well), Havana Province, Cuba.

Type level : Eocene.

Description : Test low to moderately high trochospiral. Spiral side weakly convex. Umbilical side strongly convex. Equatorial periphery lobate, subcircular in outline. Axial periphery broadly rounded. About 12 spherical chambers, arranged in 3 whorls. Four chambers in the last whorl, increasing rapidly in size, becoming slightly compressed. Last chamber slightly reduced in size. Dorsal intercameral sutures subradial, depressed. Ventral intercameral sutures radial, depressed. Primary aperture umbilical, covered by a bulla with two infralaminal apertures. Wall calcareous, coarsely perforate. Surface pitted. Surface of the bulla smoother.

Remarks : *G. dissimilis* differs from *Globigerinita ciperoensis* BLOW & BANNER, 1962, in the less thick wall and in the less embracing chambers. *G. ciperoensis* usually has more infralaminal apertures.

Globigerinita echinata
(BOLLI, 1957)
Pl.22, figs.1-2

+ 1957 *Catapsydrax echinatus* Bolli, new species-BOLLI, p.165, pl.37, figs.2a-c ; pl.37, figs.3a-5b

p 1962 *Globigerinita africana* Blow & Banner, sp. nov.-BLOW & BANNER, p.105, text-figs. (ii) and (iii)

1979 *Globigerinita echinata echinata* (Bolli)-BLOW, p.1334, pl.240, fig.7

Type locality : Holotype from west of tank 127, north of the Avenue and 850 feet west of its junction with Bon Accord Road, Point-à-Pierre. Sample Hg 8581.

Type level : *Porticulasphaera mexicana* Zone, Navet Formation.

Description : Test moderately high trochospiral, small. Equatorial periphery lobate, subcircular to subquadrate in outline. Axial periphery rounded. About 10 to 11 subglobular chambers, arranged in 2 1/2 whorls. Four chambers in the last whorl, increasing fairly rapidly in size, becoming slightly compressed. Dorsal intercameral sutures slightly curved to radial, depressed. Ventral intercameral sutures radial, depressed. Umbilicus fairly narrow. Primary aperture covered by an umbilical bulla with infralaminal apertures. Wall calcareous, perforate. Surface hispid. Surface of the bulla smoother.

Remarks : BLOW (1979) distinguished *G. echinata echinata* from *G. echinata africana* BLOW & BANNER, 1962, with less appressed but more subangular chambers, separated by more deeply incised intercameral sutures.

Globigerinita martini
BLOW & BANNER, 1962
Pl.22, figs.10-15

+ 1962 *Globigerinita martini martini* Blow & Banner-BLOW & BANNER, p.110, pl.XIV, fig.0

1969 *Globigerinita martini martini* BLOW & BANNER-BLOW, p.328, pl.24, fig.5

1979 *Globigerinita martini martini* Blow & Banner-BLOW, p.1341, pl.245, figs.5-6

Type locality : Lindi area, Tanzania.

Type level : *Cribrohantkenina danvillensis* Zone, Upper Eocene.

Description : Test low trochospiral. Equatorial periphery lobate, subcircular to subtriangular in outline. Axial periphery broadly rounded, oval to slightly ovate in outline. About 12 chambers, arranged in 3 whorls. Three and a half to four inflated chambers in the last whorl, increasing regularly in size. Dorsal intercameral sutures initially curved, becoming subradial in the last whorl, depressed. Spiral suture depressed. Ventral intercameral sutures subradial, depressed. Umbilicus narrow, shallow, covered by an inflated but fairly small bulla with a single secondary aperture. Primary aperture a low intraumbilical arch, bordered by a thin rim. Wall of the primary chambers fairly coarsely perforated. Wall of the bulla thinner and more finely perforated. Surface hispid.

Remarks : *G. martini martini* differs from *G. martini scandretti* BLOW & BANNER, 1962 by the relatively smaller but more inflated bulla. In our material, both types occur, but it often was difficult to distinguish the two subspecies.

Globigerinita pera
(TODD, 1957)
Pl.22, figs.25-26

+ 1957 *Globigerina pera* Todd-TODD, p.301, pl. 70, figs.10-11 (Fide ELLIS & MESSINA)

1962 *Globigerinita pera* (Todd)-BLOW & BANNER, p.112, pl.XIV, figs.E-H

1969 *Globigerinita pera* (TODD)-BERGGREN, pl. 3, figs.1-3

1969 *Globigerinita pera* (TODD)-BLOW, p.329

1970 *Globigerinita pera* (TODD)-BAUMANN, p. 1190, pl.3, figs.8a-b

Type locality : Locality 5385, northeast-central Saipan, Mariana Islands.

Type level : Hagman Formation, Upper Eocene.

Description : Test fairly low trochospiral. Equatorial periphery lobate, subcircular to subquadrate in outline. Axial periphery rounded, oval. Four chambers in each whorl. Chambers in the last whorl increasing fairly rapidly in size, partially embracing, slightly compressed. Intercameral sutures weakly curved to subradial, depressed. Primary aperture arched, umbilical. Umbilicus broad, deep, covered by an inflated subquadrate to subrectangular bulla with a single aperture. Wall of primary chambers thick, uniformly and coarsely perforated. Surface cancellated. Wall of bulla slightly thinner, slightly less coarsely perforated. Surface of bulla smoother.

Remarks : Our specimens have a typical subrectangular bulla.

Globigerinita stainforthi
(BOLLI, LOEBLICH & TAPPAN, 1957)
Pl.22, figs.6-9

+ 1957 *Catapsydrax stainforthi* Bolli, Loeblich & Tappan, new species-BOLLI, LOEBLICH & TAPPAN, p.37, pl.7, figs.11a-c

1969 *Globigerinita stainforthi stainforthi* (Bolli, Loeblich & Tappan)-BLOW, p. 329, pl.25, figs.8-10

Type locality : Cipero Coast section, Trinidad, B.W.I..

Type level : Cipero Formation, *Catapsydrax stainforthi* Zone (Miocene).

Description : Test low to medium trochospiral. Equatorial periphery lobate. Axial periphery broadly rounded. Four to five subglobular chambers in the last whorl, increasing regularly in size. Last chamber may be reduced in size. Dorsal intercameral sutures nearly radial, depressed. Ventral intercameral sutures slightly curved, depressed. Primary aperture umbilical, covered by a bulla with small infralaminal secondary apertures over the intercameral sutures of the last whorl. Wall calcareous, distinctly perforate. Surface pitted.

Remarks : According to BLOW (1969) *G. stainforthi* can be distinguished from the phyllogenetically more primitive form *G. praestainforthi* BLOW, 1969, by the more complex bulla and the slightly lower trochospiral initial part of the test.

Globigerinita taroubaensis
(BRÖNNIMANN, 1952)
Pl.23, figs.2-7

+ 1952 *Globigerina taroubaensis* Brönnimann-BRÖNNIMANN, p.18, pl.2, figs.16-18 (Fide ELLIS & MESSINA)

1979 *Globigerinita taroubaensis* (Brönnimann)-BLOW, p.1346, pl.136, figs.8-9

Type locality : Trinidad Leaseholds Ltd., sample 59892 (from an outcrop of the east bank of Eastern Main Road, north end of the town of San Fernando, southwestern Trinidad (Trinidad Government Cadastral coordinates N : 238.700 links ; E : 363.090 links).

Type level : Lower Eocene, basal part of the Navet Formation, Ramdat Marl Member.

Description : Test trochospiral, rather small. Equatorial periphery slightly lobate. Axial periphery rounded. Four subglobular chambers in the last whorl, increasing rapidly in size, becoming slightly compressed. Dorsal intercameral sutures weakly curved, depressed. Ventral intercameral sutures nearly radial, depressed. Primary aperture covered by an aberrant bulla-like final chamberlet. Umbilicus small, covered by the final chamberlet. Wall calcareous, coarsely perforate. Surface rougly pitted.

Remarks : The surface of the accessory chamber is also rougly pitted. In some specimens, the infralaminal aperture tends to an umbilical-extraumbilical position.

Globigerinita turgida
(FINLAY, 1939)
Pl.23, figs.8-14

+ 1939 *Globigerina linaperta* Finlay var. *turgida* Finlay-FINLAY, p.125 (Fide ELLIS & MESSINA)

1979 *Globigerinita turgida* (Finlay)-BLOW, p. 1348, pl.179, figs.6-

Type locality : Locality 3310 (not defined). New Zealand.

Type level : Middle Eocene.

Description : Test trochospiral, biconvex.

Equatorial periphery quadrilobate. Axial periphery rounded. Four chambers in the last whorl, inflated, becoming embracing, increasing slowly in size. Intercameral sutures nearly radial, depressed. Umbilicus covered by an inflated bulla. Infralaminal apertures opening towards the antepenultimate chamber, bordered by a thickened lip. Wall calcareous, perforate. Surface cancellate. Surface of the bulla smoother.

Remarks : *Globigerinita turgida* differs from *Globigerinita taroubaensis* (BRÖNNIMANN, 1952) in the more inflated and more embracing chambers, increasing more rapidly in size. The umbilicus is less widely open. The bulla is more inflated.

Globigerinita unicava primitiva
BLOW & BANNER, 1962
Pl.22, figs.19-21

1957 *Catapsydrax unicavus* Bolli, Loeblich & Tappan-BOLLI, p.37, pl.7, figs.9a-c
+ 1962 *Globigerinita unicava primitiva* Blow & Banner, subsp.nov.-BLOW & BANNER, p. 114, pl.14, figs.Y-Z
1969 *Globigerinita unicava primitiva* BLOW & BANNER-BLOW, p.330, pl.25, figs.1,2

Type locality : Lindi area, sample FCRM 1645, Tanzania.

Type level : *Globigerapsis semiinvoluta* Zone, Upper Eocene.

Description : Test low trochospiral. Equatorial periphery lobate, subcircular to subquadrate in outline. Axial periphery rounded, suboval. Five chambers in the previous whorls, reduced to four in the last whorl, subglobular, increasing fairly rapidly in size, partially embracing, depressed.
Intercameral sutures weakly curved to subradial, depressed. Umbilicus broad. Primary aperture lowly arched, umbilical, covered by an inflated, subtriangular bulla. Wall calcareous, moderately coarsely perforated. Surface punctated. Wall of the bulla thinner, more finely perforated. Surface of the bulla smoother.

Remarks : The umbilical cavity of our specimens is covered by a subtriangular to subquadrate bulla, which is more inflated than in *G. unicava unicava* (BOLLI, LOEBLICH & TAPPAN, 1957).

Globigerinita unicava unicava
(BOLLI, LOEBLICH & TAPPAN, 1957)
Pl.22, figs.22-24

+ 1957 *Catapsydrax unicavus* Bolli, Loeblich & Tappan, new species-BOLLI, LOEBLICH & TAPPAN, p.37, pl.7, figs.9a-c
1957 *Catapsydrax unicavus* Bolli, Loeblich & Tappan-BOLLI, p.116, pl.37, figs.7a-b
1962 *Globigerinita unicava unicava* (Bolli, Loeblich & Tappan)-BLOW & BANNER, p. 113, pl.XIV, figs.M,N
1969 *Globigerinita unicava unicava* (BOLLI, LOEBLICH & TAPPAN)-BLOW, p.330, pl.24, figs.8,9
1970 *Globigerinita unicava* (BOLLI, LOEBLICH & TAPPAN)-BAUMANN, p.1190, pl.4, figs. 6a-c

Type locality : Cipero type section, between 60 feet northeast and 20 feet southwest of fixed point, i.i. the southernmost of a number of iron rails driven into the marls along the beach, 140 feet south southeast from the south end of the sea wall, South Trinidad.

Type level : *Globigerina ciperoensis* Zone, Oligocene.

Description : Test low trochospiral. Equatorial periphery weakly lobate, subcircular to subquadrate in outline. Axial periphery rounded, suboval. Five chambers in the previous whorls, reduced to four in the last whorl, subglobular, increasing fairly rapidly in size. Intercameral sutures weakly curved, subradial, depressed. Umbilicus broad. Primary aperture lowly arched, umbilical, covered by a weakly inflated, subquadrate bulla, with a single narrow secondary aperture. Wall calcareous, moderately coarsely perforated. Surface punctated. Wall of the bulla thinner, more finely perforated. Surface of the bulla smoother.

Remarks : *G. unicava unicava* is characterized by the subquadrate weakly inflated bulla, with a single secondary aperture.

VII. REFERENCES

AKERS, W.H. 1955 : Some planktonic foraminifera of the American Gulf and suggested correlations with the Carribean Tertiary. - Journ. Paleont., 29, 4, 647-664, 4 figs., 1 pl..

BANDY, O.L. 1949 : Eocene and Oligocene foraminifera from Little Steve Cree, Clarke County, Alabama. - Bull. Amer. Paleontol., 32(131), p.120 (Fide ELLIS & MESSINA).

BANNER, F.T. & BLOW, W.H. 1960 : The taxonomy, morphology and affinities of the genera included in the subfamily *Hastigerininae*. - Micropal., 6, 1, 19-31, 2 figs., 6 pl..

BAUMANN, P. 1970 : Mikropaläontologische und stratigraphische Untersuchungen der Obereozän-Oligozänen Scaglia im Zentralen Apennin. - Eclogae Geol. Helv., 63, 3, 1133-1211, 27 figs., 7 pl..

BECKMANN, J.P. 1953 : Die Foraminiferen der Oceanic Formation (Eocaen-Oligocaen) von Barbados, Kleine Antillen. - Eclogae Geol. Helv., 46, 2, 301-414, 29 figs., 15 pl..

BECKMANN, J.P. 1957 : *Chiloguembelina* LOEBLICH & TAPPAN and related Foraminifera from the Lower Tertiary of Trinidad, B.W.I.. - In "Studies in Foraminifera", Bull. U.S. Nat. Mus., nr.215, 83-96, 4 text-figs., 8 pl..

BERGGREN, W.A. 1969 : Paleogene biostratigraphy and planktonic foraminifera of Northern Europe.- Proc. I° Intern. Conf. Planktonic Microfossils, Geneva, 1967, I., 121-168, 7 figs., 2 tab., 8 pl..

BERGGREN, W.A. 1977 : Atlas of Paleogene planktonic foraminifera. Some species of the genera *Subbotina, Planoratalites, Morozovella, Acarinina* and *Truncorotaloides*. - In : A.T.S. RAMSAY (ed.), Oceanic Micropal., 1, 205-300.

BERGGREN, W. ; OLSSON, R.K. & REYMENT, R.A. 1967 : Origin and development of the foraminiferal genus *Pseudohastigerina* BANNER & BLOW, - Micropal., 13(3), 265-288.

BERMUDEZ, P.J. 1961 : Contribution al estudio de los *Globigerinidae* de la region Caribe-Antillana (Paleoceno-Reciente). - III° Congr. Geol. Venez., Caracas, 1959, Mem., III, 1119-1393, 20 pl..

BLOW, W.H. 1956 : Origin and evolution of the foraminiferal genus *Orbulina* d'Orbigny. - Micropal., 2, 1, 57-70, 4 figs..

BLOW, W.H. 1959 : Age, correlation and biostratigraphy of the Upper Tocuyo (San Lorenzo) and Pozón Formations, eastern Falçon, Venezuela. - Bull. Amer. Paleont., 39(178), 67-251, 3 tab., 19 pl., 4 maps.

BLOW, W.H. 1969 : Late Middle Eocene to Recent planktonic foraminiferal biostratigraphy.-Proc. First Internat. Conf. Plankt. Microfossils, Geneva, 1967, I, 199-422, 43 figs., 54 pl..

BLOW, W.H. 1979 : The Caenozoic *Globigerinidae*, Part I, II, 1-752.

BLOW, W.H. & BANNER, F.T. 1962 : The Mid-Tertiary (Upper Eocene to Aquitanian) *Globigerinaceae*. - In : EAMES, BANNER, BLOW & CLARKE : Fundamentals of Mid-Tertiary stratigraphical correlations. Cambridge, Univ. Press., 61-151, 14 figs., 10 pl..

BOLLI, H.M. 1954 : Note on *Globigerina concinna* Reuss, 1850. - Contr. Cushman Found. Foram. Res., 5, 1, 1-3, 8 figs..

BOLLI, H.M. 1957a : Planktonic Foraminifera from the Oligocene-Miocene Cipero and Lengua Formations of Trinidad, B.W.I.. - In : Studies in Foraminifera, U.S. Nat. Mus., Bull., 215, 97-123, 5 figs., 8 pl..

BOLLI, H.M. 1957b : Planktonic Foraminifera from

the Eocene Navet and San Fernando Formations of Trinidad, B.W.I.. - In : Studies in Foraminifera, U.S. Nat. Mus., Bull. 215, 155-172, 2 figs., 5 pl..

BOLLI, H.M. 1962 : *Globigerinopsis*, a new genus of the foraminiferal family *Globigerinidae*. - Eclogae Geol. Helv., Basel, 55, 1, 282, (Fide ELLIS & MESSINA).

BOLLI, H.M. & CITA, M.B. 1960 : Upper Cretaceous and Lower Tertiary planktonic foraminifera from the Paderno d'Adda section, northern Italy. - Int. Geol. Congress, 21, Norden, Reports, Sect. 5, 150-161.

BOLLI, H.M. ; LOEBLICH, A.R. & TAPPAN, H. 1957 : Planktonic foraminiferal families *Hantkeninidae, Orbulinidae, Globorotaliidae* and *Globotruncanidae*. - U.S. Nat. Mus., Bull., 215, 3-60.

BOLTOVSKOY 1973 : Daily vertical migration and absolute abundance of living planktonic foraminifera. - Journ. Foram. Res., 3, 2, 89-94.

BORSETTI, A.M. 1959 : Tre nuovi Foraminiferi planktonici dell'Oligocene Piacentino. - Mus. Geol., Bologna, Giorn. Geol., 27(2a), 205-212.

BRADY 1877 : Supplementary note on the *Foraminifera* of the Chalk (?) of the New Britain Group.- Geol. Mag., n. ser., 2, 4, 535, (Fide ELLIS & MESSINA).

BRÖNNIMANN, P. 1952 : Trinidad Paleocene and Lower Eocene *Globigerinidae*. - Bull. Amer. Paleont., 34(143), 1-34, (Fide ELLIS & MESSINA).

BRÖNNIMANN, P. 1953 : Note on planktonic foraminifera from Danian localities of Jutland, Denmark. - Eclogae Geol. Helv., 45 (1952), 2, 339-341, 29 figs., 16 pl..

BRÖNNIMANN, P. ; CURRY, D. ; POMEROL, C. & SZÖTS, E. 1968 : Contribution à la connaissance des foraminifères planctoniques de l'Eocène (incluant le Paléogène) du Bassin Anglo-Franco-Belge.- Colloque sur l'Eocène, Mém. B.R.G.M., 58, 101-108, 1 tab..

BROTZEN, F. & POZARYSKA, K. 1961 : Foraminifères du Paléocène et de l'Eocène inférieur en Pologne septentrionale ; remarques paléogéographique. - Rév. Micropal., 4(3), 155-166.

CALVEZ, Y., LE 1970 : Contribution à l'étude des foraminifères paléogènes du Bassin de Paris.- Cahiers de Paléontologie, C.N.R.S., 326 p., 48 pl..

CHAPMAN, F. ; PARR, W.J. & COLLINS, A.C. 1934 : Tertiary *Foraminifera* of Victoria, Australia. The Balcombian deposits of Port Phillip. - Part III, Linn. Soc. London, Journ., Zool., 38, 262, 569, (Fide ELLIS & MESSINA).

COLE, W.S. 1927 : A foraminiferal fauna from the Guayabal Formation in Mexico. - Bull. Amer. Pal., 14, 51, 22 p., 5 pl., 12 figs., Itheca, N.Y., U.S.A., (Fide ELLIS & MESSINA).

COLOM, G. 1954 : Estudio de las biozonas con foraminiferos del Terciario de Alicante. - Inst. Geol. Min. Espana, Bol., 66, 222 p., 17 pl., figs.1-25, (Fide ELLIS & MESSINA).

CUSHMAN, J.A. 1918 : Some Miocene foraminifera of the coastal plain of the United States. - U.S. Geol. Surv., Bull., 676, p.57, (Fide ELLIS & MESSINA).

CUSHMAN, J.A. 1925 : An Eocene fauna from the Moctezuma River, Mexico. - Amer. Assoc. Petrol. Geol., Bull. 7(2), 298-303.

CUSHMAN, J.A. 1927 : An outline of a re-classification of the foraminifera. - Cushman Lab. Foram. Res., Contrib. 3(1), 1-105.

CUSHMAN, J.A. 1940 : Midway Foraminifera from submarine cores of the eastern coast of North America. - Contr. Cushman Lab. Foram. Res., 15, 49-76.

CUSHMAN, J.A. & BERMUDEZ, P.J. 1937 : Further new species of foraminifera from the Eocene of Cuba. - Contrib. Cushman Lab. Foram. Res., Sharon, Mass., U.S.A., 13(1), 1-28, 2 pl..

CUSHMAN, J.A. & BERMUDEZ, P.J. 1949 : Additional new species of Eocene foraminifera from Cuba.- Cushman Lab. Foram. Res., Contrib., 13(4), 106-110.

CUSHMAN, J.A. & ELLISOR, A.C. 1939 : New species of Foraminifera from the Oligocene and Miocene.- Contrib. Cush. Lab. Foram. Res., 15, 1, 1-27, 4 pl..

CUSHMAN, J.A. & JARVIS, P.W. 1936 : Three new foraminifera from the Miocene, Bowden marl of Jamaica. - Contr. Cushman Lab. Foram. Res., Sharon, Mass., U.S.A., 12, 1-166, 5, pl.1, figs. 13-14, (Fide ELLIS & MESSINA).

CUSHMAN, J.A. & PONTON, G.M. 1932 : The Foraminifera of the Upper, Middle and part of the Lower Miocene of Florida. - Florida Geol. Survey, 9, 64, pl.8, fig.11, (Fide ELLIS & MESSINA).

CUSHMAN, J.A. & RENZ, H.H. 1942 : The foraminifera of the Upper, Middle and part of the Lower Miocene of Florida. - Florida St. Geol. Survey, Bull.9, 1-147.

DELTEIL, J.P. & TOUMARKINE, M. 1975 : Precisions sur la Tertiaire allochtone du Telloronais oriental. - Eclogae Geol. Helv., 68, 1, 65-78.

DROOGER, C.W. 1969 : Microfauna close to the Eocene-Oligocene boundary in the boring at Kallo, near Antwerp. - Mém. Expl. Carte Géol. Minières de la Belgique, 11, 9-19, 5 pl..

DROOGER, C.W. & BATJES, D.A.J. 1959 : Planktonic foraminifera in the Oligocene and Miocene of the North Sea Basin. - Kon. Ned. Akad. Wet. Amsterdam, Proc., Ser. B., 62, 3.

EHRENBERG, C.G. 1861 : Uber die Tiefgrundverhältnisse des Oceans am Eingange der Davisstrasse und bei Island. - K. Preuss. Akad. Wiss. Berlin, Monatsber., 275-315.

ELLIS & MESSINA : Catalogue of Foraminifera. - American Museum of Natural History.

FINLAY, H.J. 1939 : New Zealand foraminifera : the occurrence of *Rzehakina, Hantkenina, Rotaliatina* and *Zeavrigerina*. - Roy. Soc. N.Z., Proc., 68(4), 534-543, (Fide ELLIS & MESSINA).

GLAESSNER, M.F. 1937 : Studien über Foraminiferen us der Kreide und dem Tertiär des Kaukasus. - Probl. Paleontol., Moscow Univ., Lab. Paleontol., 2-3, 349-410, 5 pl..

GÜMBEL, C.W. 1868 : Beiträge zur Foraminiferenfauna der Nordalpinen, ältern Eocangebilde oder der Kressenberger Nummulitenschichten. - K. bayer. Akad. Wiss., Abh., II, Class., 10(2), 579-730, (Fide ELLIS & MESSINA).

HOFKER, J. 1960 : Foraminifera from the Cretaceous of South-Limburg, Netherlands, XLVIII. *Globigerina daubjergensis* Brönnimann and the age of Ma and Lower Paleocene above the Upper Ma in the quarry Curfs, near Houthem and the age of the Cr_4 below the Ma. - Natuurhistorisch Maandblad, 49(3-4), 34-41, 4 pl..

HOFKER, J. 1962a : Foraminifera from the Cretaceous of South-Limburg. (Type Maastrichtian) with the Dansk Kalk of Denmark (Type Danian) ; the stratigraphic position of the type Montian, and the planktonic foraminiferal fauna break. - Journ. Paleont., 36(5), 1051-1089, 23 text-figs..

HOFKER, J. 1962b : Foraminifera from the Cretaceous of South-Limburg, Netherlands, LXI, *Globigerina kozlowskii* BROTZEN & POZARYSKA in the "Post Maestrichtian" of the quarry Curfs near Houthem and the Albert Canal in Belgium. - Natuurhistorisch Maandblad, 51(9), 129-130.

HOFKER, J. 1963 : Einige planktonische Foraminiferen aus dem borealen europaischen Oligozän.- N. Jb. Geol. Paläont. Abh., 118, 2, 197-206, 3 pl..

HOOYBERGHS, H.J.F. 1976 : Remarks on the Eocene/Oligocene boundary with some preliminary results of the study of Eocene/Oligocene planktonic foraminifera in Belgium. - Bull. Soc. belge Géol., Paléont., Hydrol., 85(3), 117-126, 1 fig., 2 pl..

HOOYBERGHS, H.J.F. & MEUTER, F.J.C., DE 1972 : Biostratigraphy and interregional correlation of the "Miocene" deposits of Northern Belgium based on planktonic foraminifera. The Oligocene/Miocene boundary on the southern edge of the North Sea Basin. - Med. Kon. Acad. Wetenschappen, Lett. en Sch. Kunsten van België, Kl. der Wetensch., jg. XXXIV, 1972, 3, 47 p., 5 text-figs., 11 pl., 1 tab..

HORNIBROOK, H., de B. 1958 : New Zealand foraminifera : key species in stratigraphy, nr.6. -

N.Z.J. Geol. Geophys., 1(4), 653-676, (Fide ELLIS & MESSINA).

HORNIBROOK, H., de B. 1965 : *Globigerina angiporoides* n. sp. from the Upper Eocene and Lower Oligocene of New Zealand and the status of *Globigerina angipora* STAECHE, 1865. - N.Z.J. Geol. Geophys., 8(6), 834-838, (Fide ELLIS & MESSINA).

HOWE, H.V. 1939 : Louisiana Cook Mountain Eocene Foraminifera. - Louisiana Dept. Conservation, Geol. Survey, Geol. Bull., New Orleans, La., U.S.A., 14, 85, pl.12, figs.20-22, (Fide ELLIS & MESSINA).

HOWE, H.V. & WALLACE, W.E. 1932 : Foraminifera of the Jackson Eocene at Danville Landing on the Ouachita, Catahoula Parish, Louisiana. - Louisiana Dept. Conservation, Geol. Bull., 2, 74, New Orleans, U.S.A., (Fide ELLIS & MESSINA).

JENKINS, D.G. 1960 : Planktonic foraminifera from the Lakes Entrance oil shaft, Victoria, Australia. - Micropal., 6(4), 345-371.

JENKINS, D.G. 1964 : A new foraminiferal subspecies from the Australian Lower Miocene. - Micropal., 10, 1, 72, 1 text-fig..

JENKINS, D.G. 1965 : Planktonic foraminiferal zones and new taxa from the Danian to Lower Miocene of New Zealand. - N.Z.J. Geol. Geophys., 8(12), 1121, (Fide ELLIS & MESSINA).

JENKINS, D.G. 1966 : Planktonic foraminiferal zones and new taxa from the Danian to Lower Miocene of New Zealand. - New Zealand Journ. Geol. Geophys., 8, 6, 1096-1102, 1104, 1106, (Fide ELLIS & MESSINA).

JENKINS, D.G. 1971 : New Zealand Cenozoic Planktonic Foraminifera. - New Zealand Geol. Survey, Bull., 42, 1-278, 23 pl., 30 col., 56 tab..

JENKINS, D.G. & ORR, W. 1973 : *Globigerina utilisindex* n. sp. from the Upper Eocene - Oligocene of the eastern equatorial Pacific. - Journ. Foram. Res., 3, 3, 133-136, 3 pls..

KHALILOV, D.M. 1956 : The pelagic foraminiferal fauna of the Paleogene deposits of Azerbaijan.- Akad. Nauk. Azerbaij. S.S.R., Inst. Geol., Trudy, 17, 234-255, (In Russian), (Fide ELLIS & MESSINA).

KOCH, R. 1926 : Mitteltertiäre Foraminiferen aus Bulongau, Ost Borneo. - Eclogae Geol. Helv., 29, 3, 722-751, 26 figs..

LE ROY, L.W. 1939 : Some small *Foraminifera, Ostracoda* and *Otoliths* from the Neogene ("Miocene") of the Rokan-Tapanoeli area, Central Sumatra. - Natuurk. Tijdschr. Nederl.-Indies, 99, 6, 262, (Fide ELLIS & MESSINA).

LE ROY, L.W. 1953 : Biostratigraphy of the Maqfi section, Egypt. - Geol. Soc. Amer. Mem., 54, 31, pl.6, figs.8-10, (Fide ELLIS & MESSINA).

LOEBLICH, A.R. & TAPPAN, H. 1957 : Planktonic foraminifera of Paleocene and Early Eocene age from the Gulf and Atlantic Coastal Plains. - U.S. Nat. Mus., Bull.215, 173-197, pl.40-46.

MARKS, P. & VESSEM, E.J., VAN 1971 : Foraminifera from the Silberberg Formation ("Lower Oligocene") at Silberberg, near Helmstadt (Germany).- Paläont., 2, 45 1/2, 53-68, 2 figs., 2 pl..

MEIJER, M. 1969 : Les foraminifères planctoniques du Tuffeau de Ciply (Stratotype) ; leurs signification bio- et chronostratigraphique. - Proc. I° Intern. Conf. Plankt. Microfossils, Geneva, 1967, II, 414-419, 1 pl..

MEUTER, F.J.C., DE & LAGA, P.G.H. 1970 : Coiling ratios and other variations of *Globigerina pachyderma* (EHRENBERG, 1861) and the stratigraphic significance in the Neogene deposits of the Antwerpen area (Belgium). - Bull. Soc. belge Géol., Paléont., Hydrol., 79, (2), 175-184, 2 figs., 1 pl..

MOORKENS, T. 1968 : Quelques foraminifères planctoniques de l'Yprésien de la Belgique et du Nord de la France. - Colloque sur l'Eocène, Mém. B.R.G.M., 58, 109-129, 1 tab., 1 carte, 1 pl..

MOORKENS, T. 1971 : Some late Cretaceous and early Tertiary planktonic foraminifera from the Maastrichtian type area. - Proc. II° Plankt. Conf. Roma, 1970, II, 847-878, 1 fig., 5 pl..

MOORKENS, T. 1972 : Foraminiferen uit het stratotype van het Montien en uit de onderliggende lagen van de boring te Obourg (met een overzicht van de stratigrafie van het Paleoceen in België). - Natuurwet. Tijdschr., 54(4-5), 117-127, 3 figs..

MYATLIUK, E.V. 1950 : Stratigraphy of the eysch sediments of the North Carpathian Mountains in the light of the foraminiferal faunas. - Leningrad Vses. Neft. Nauch., Issled. Geol. Razved Inst. (VNIGRI), Mikrof. USSR, Trudy, Geol. s.b. 4, (51), 225-288, (In Russian), (Fide ELLIS & MESSINA).

NAGGAR, Z.R., EL 1966 : Upper Cretaceous-Lower Tertiary foraminifera in the Esna-Idfer Region, Nile Valley, Egypt. - Bull. Brit. Mus. (Nat. Hist.), suppl.2, 291 p., 18 text-figs., 23 pls..

NAGGAR, Z.R., EL 1967a : The occurrence of *Globorotalia inconstans* (SUBBOTINA) in the type Heersian of Belgium, and the position of the Heersian in Paleocene Stratigraphy. - Revue de Micropal., 10(2), 97-106.

NAGGAR, Z.R., EL 1967b : Remarques sur les divisions du Paléocène ; résultats d'étude dans les localités types en Europe occidentale. - Revue de Micropal., 10(3), 215-216.

NAGGAR, Z.R., EL 1969 : New suggestions for the division and correlation of Paleocene strata by the use of planktonic foraminifera. - Proc. I° Intern. Conf. Plankt. Microfossils, Geneva, 1967, II, 182-201, 1 chart.

NAKKADY, S.E. 1950 : A new foraminiferal fauna from the Esna Shales and Upper Cretaceous chalk of Egypt. - J. Paleont., 24(6), 675-692.

ORBIGNY, A., D' 1826 : Tableau de la Classe des Céphalopodes. - Ann. Scienc. Nat., ser.1, 7, 96-314, 8 pl..

ORBIGNY, A., D' 1839 : Voyage dans l'Amérique Méridionale. - Foraminifères, 5, 5, 2-83, (Fide ELLIS & MESSINA).

PALMER, D.K. 1934 : The foraminiferal genus *Gümbelina* in the Tertiary of Cuba. - Mem. Soc. Cubana, Hist. Nat., 8, 74, (Fide ELLIS & MESSINA).

PARR, W.J. 1938 : Upper Eocene foraminifera from deep borings in King's Park, Perth, Western Australia. - Roy. soc. Western Australia, Jour., Pert, Australia, 24, 8, 87, pl.3, figs.8-9, (Fide ELLIS & MESSINA).

PERCOMIB 1968 : Nuove specie di foraminiferi planctonici della sezione di Carmana (Andalusia, Spagna). - C.M.N.S., Proc. IV° Session, Bologna, 1967, Giorn. Geol., ser.2, 35, 3, 219-232, 2 pl..

PLUMMER, H.J. 1926 : Foraminifera of the Midway Formation in Texas. - Texas Univ. Bull. (Bur. Econ. Geol.), nr.2644, 235 (Fide ELLIS & MESSINA).

POORE, R.A. & BRABB, E.E. 1977 : Eocene and Oligocene planktonic foraminifera from the Upper Butano sandstone and type San Lorenzo Formation, Santa Cruz Mountains, California. - Jour. Foram. Res., 7, 4, 249-272, pls.1-8.

REUSS, A.E. 1850 : Neue Foraminiferen aus den Schichten des Österreichischen Tertiärbeckens. K. Akad. Wiss. Wien, Math. Nat. Cl. Denkschr., 1, 374, (Fide ELLIS & MESSINA).

RHUMBLER, L. 1901 : In : Brandt, K. : Foraminifera. Nordisches Plankton Kiel, Deutschland. - Lipsius & Tischer, 1901, Lief, 1, 14, 19, fig. 20, (Fide ELLIS & MESSINA).

SALVATORINI, G. 1967 : Alcune nuova specie di Foraminiferi del Miocene superiori della taxana Marittima. - Attr. Soc. Tosc. Sc. Nat., 73, ser.A, 10, (Fide ELLIS & MESSINA).

SUBBOTINA, N.N. 1947 : Foraminifera of the Danian and Paléogène inférieur et du Crétacé supérieur du Caucase du nord d'après la faune de foraminifères. - Neft. Geol., Razved. Inst., Trudy, ser.A, 96, 32 p., (In Russian).

SUBBOTINA, N.N. 1953 : *Globigerinidae, Hantkeninidae* and *Globorotaliidae*. - Vses. Neft. Nauchno-Issled, Geol. Razved. Inst. (VHIGRI), Mikrof., SSSR, Trudy, Geol., s.b. 76, 1-296, (In Russian).

TERQUEM, O. 1882 : Les foraminifères de l'Eocène des environs de Paris. - Soc. Géol. France, Mém. Paris, France, sér.3, 2, 3, 145, pl.15, fig.10, (Fide ELLIS & MESSINA).

TODD, R. 1957 : Smaller *Foraminifera*. - In : Geology of Saipan, Mariana Islands, Part 3 : Paleontology, U.S. Geol. Surv., Prof. Paper, 280-H, 301, (Fide ELLIS & MESSINA).

TODD, R. & KNIKER, H.T. 1952 : An Eocene foraminiferal fauna from the Agua Fresca shale of Magallane Province, southernmost Chile. - Cush. Found. Foram. Res., Spec. Public., 1, 26, pl.4, fig.32, (Fide ELLIS & MESSINA).

TOUMARKINE, M. & BOLLI, H.M. 1970 : Evolution de *Globorotalia cerroazulensis* (Cole) dans l'Eocène moyen et supérieur de Possagno (Italie). - Revue de Micropal., 13(3), 131-145.

WEINZIERL, L.L. & APPLIN, E.R. 1929 : The claiborne formation on the coastal domes. - Journ. Paleont., 3, 408, pl.43, figs.1a-b, (Fide ELLIS & MESSINA).

WHITE, M.P. 1928 : Some index foraminifera of the Tampica embayment area of Mexico. - J. Paleont., 2(3), 194, pl.27, figs.16a-c, (Fide ELLIS & MESSINA).

Manuscript received 15/09/1981

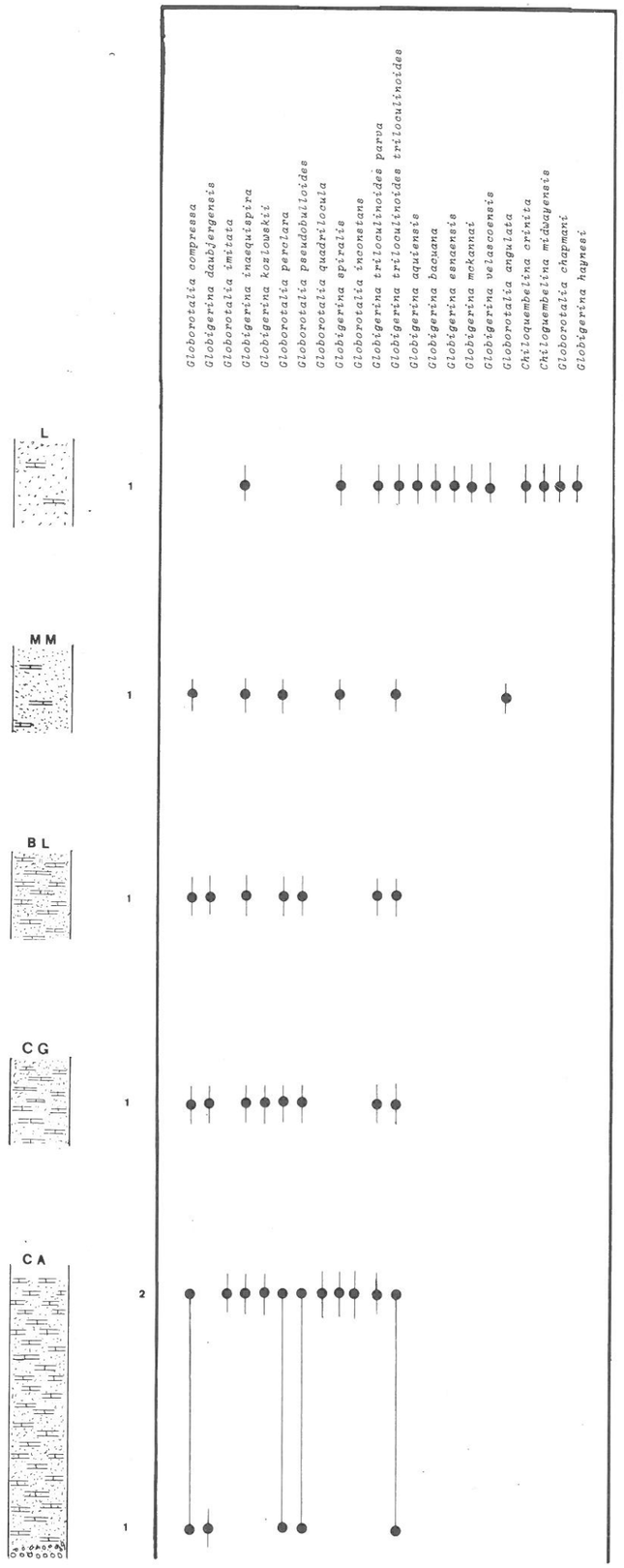


Table 1 : Occurrence of planktonic foraminifera in the "Tuffeau de Ciply" (CA), in the calcarenite of Geulhem (CG), in the Bunde limestone (BL), in the calcarenite of Mechelen aan de Maas (MM) and in the "tuffeau de Lincent".

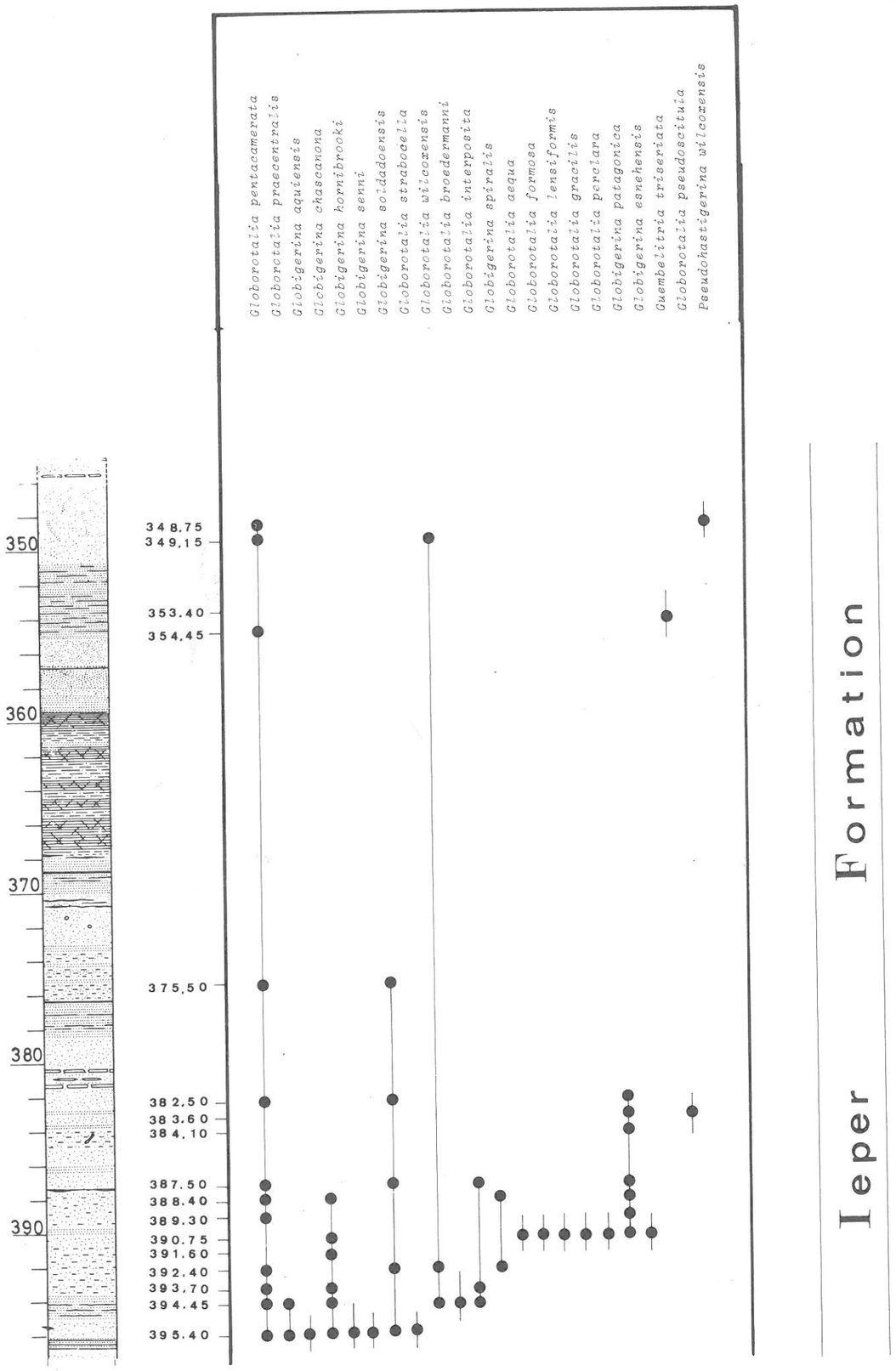


Table 2 : Distribution of planktonic foraminifera in the Ieper Formation at Mol.

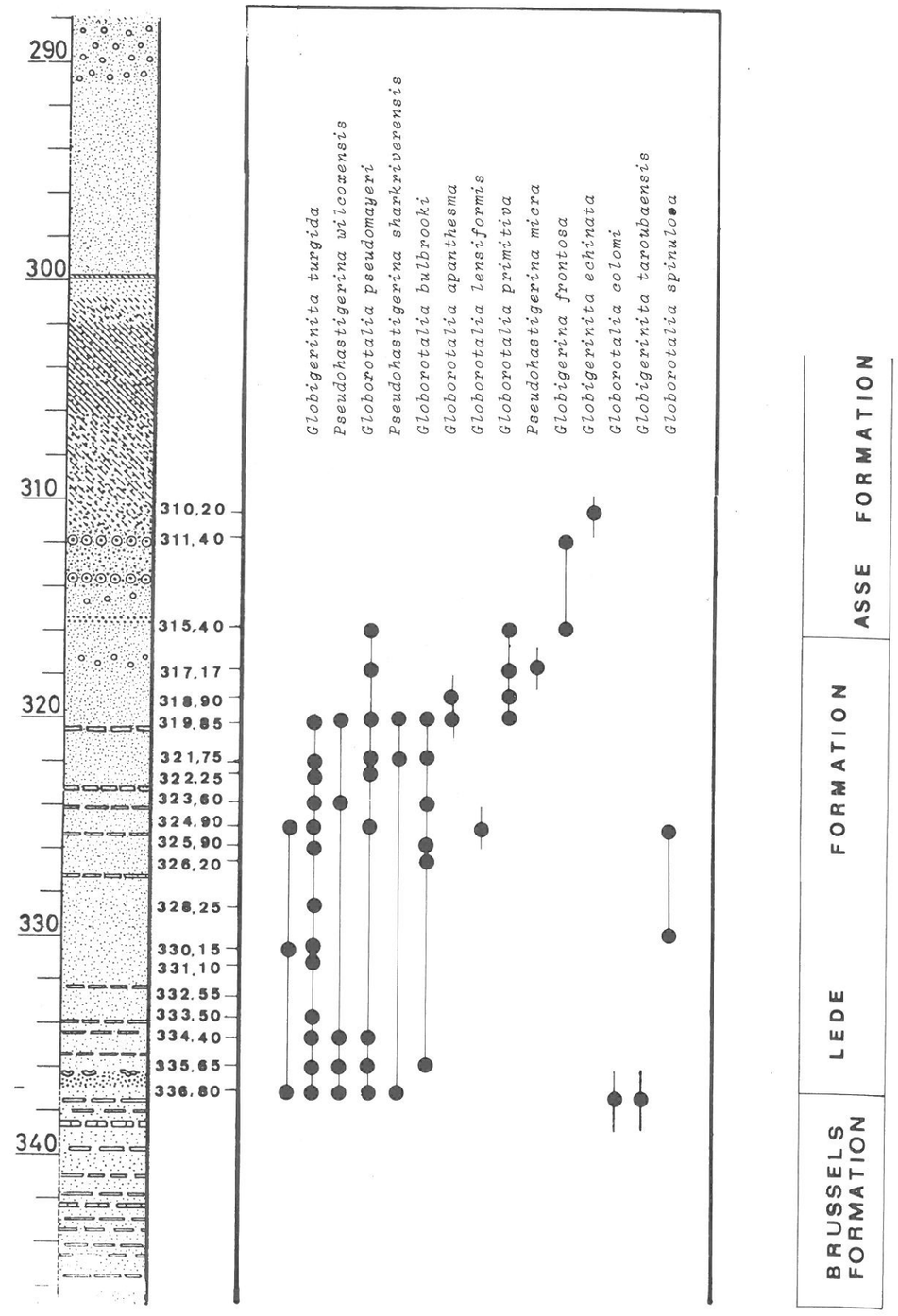
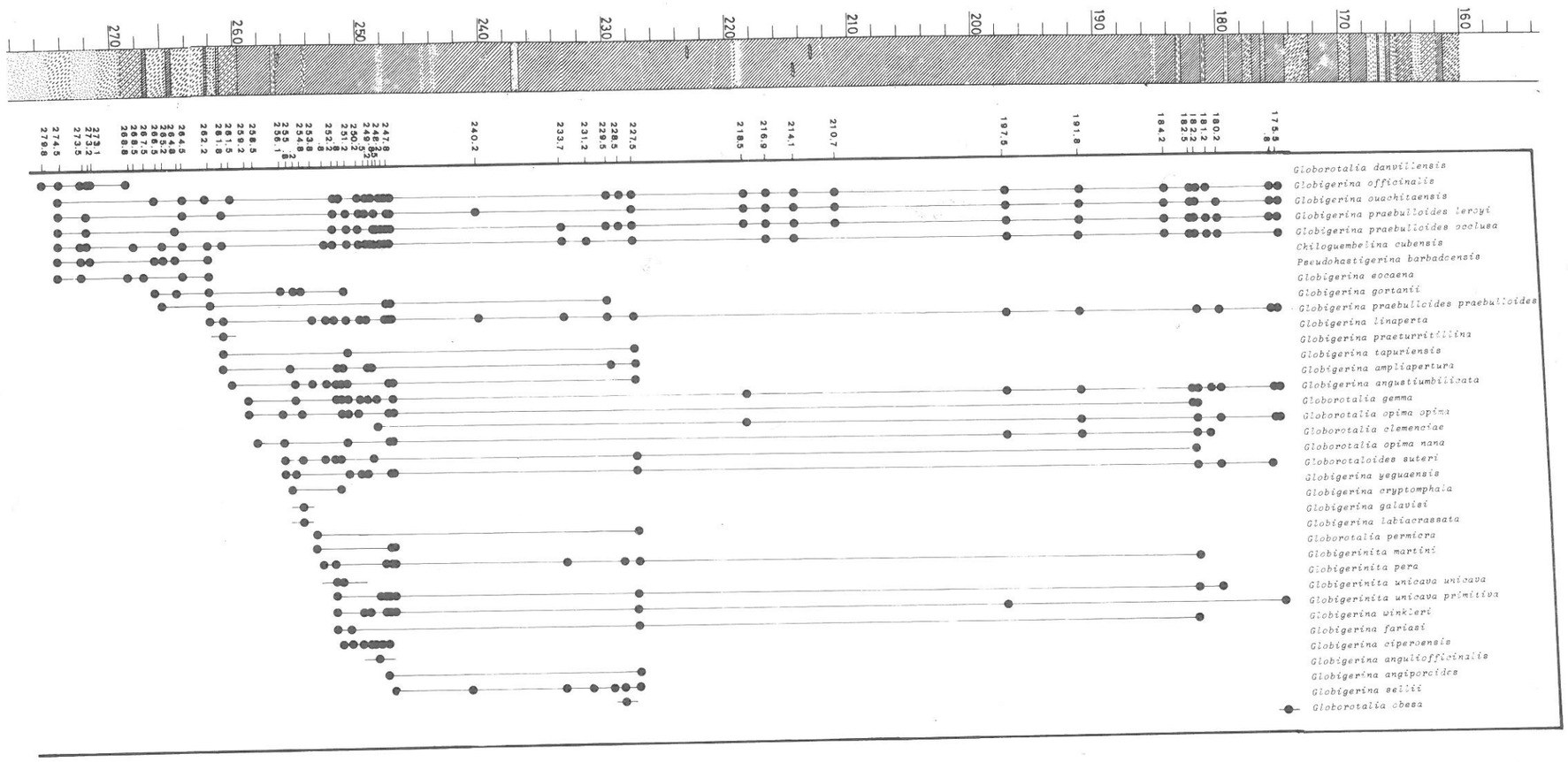
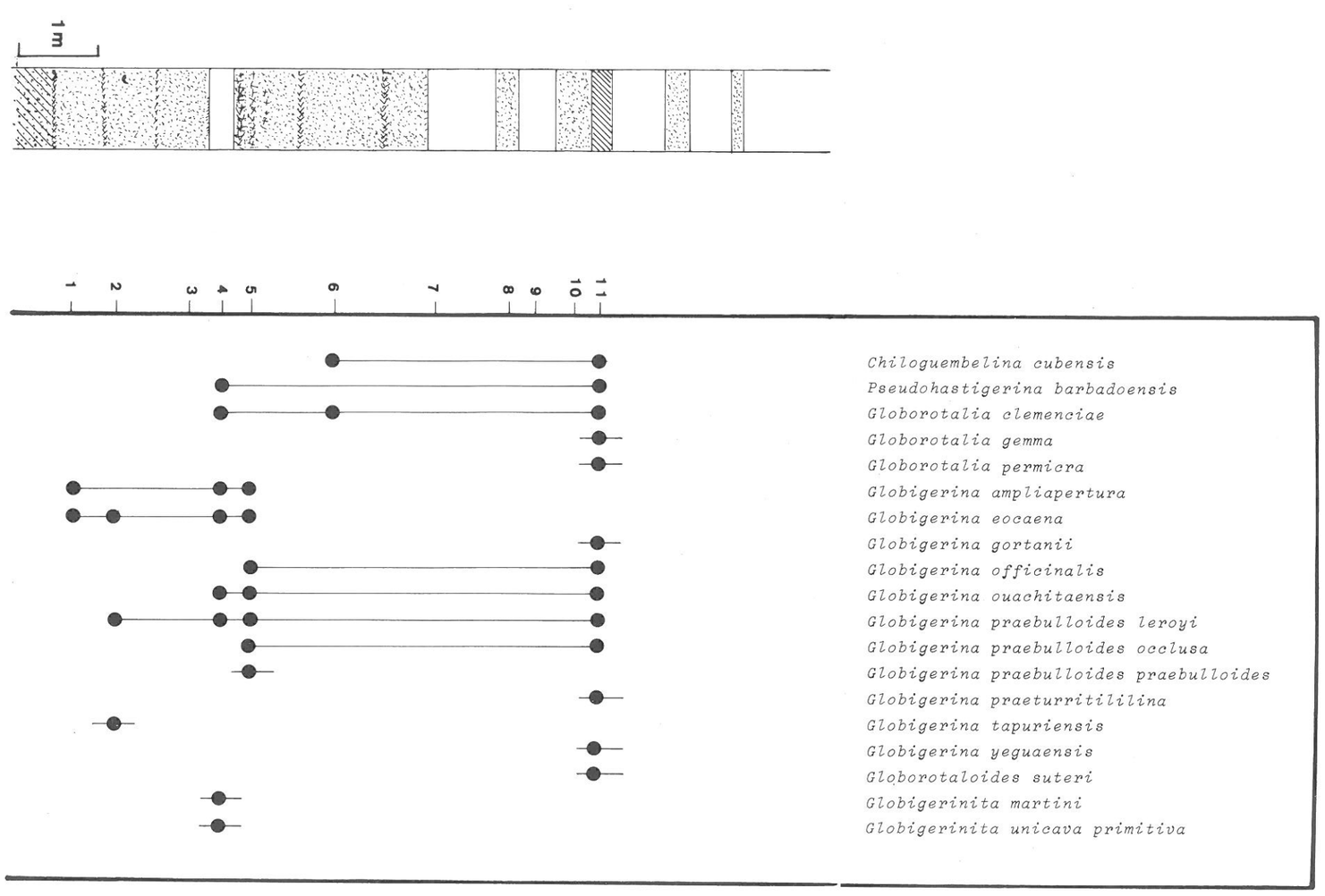


Table 3 : Distribution of planktonic foraminifera in the Brussels, Lede and Asse Fromations at Mol.



BERG SANDS | BOOM CLAY **Rupel Formation**

Table 4 : Distribution of planktonic foraminifera in the Rupel Formation at Mol.



BOOM CLAY

Table 5 : Distribution of planktonic foraminifera in the Boom Clay at St. Niklaas.

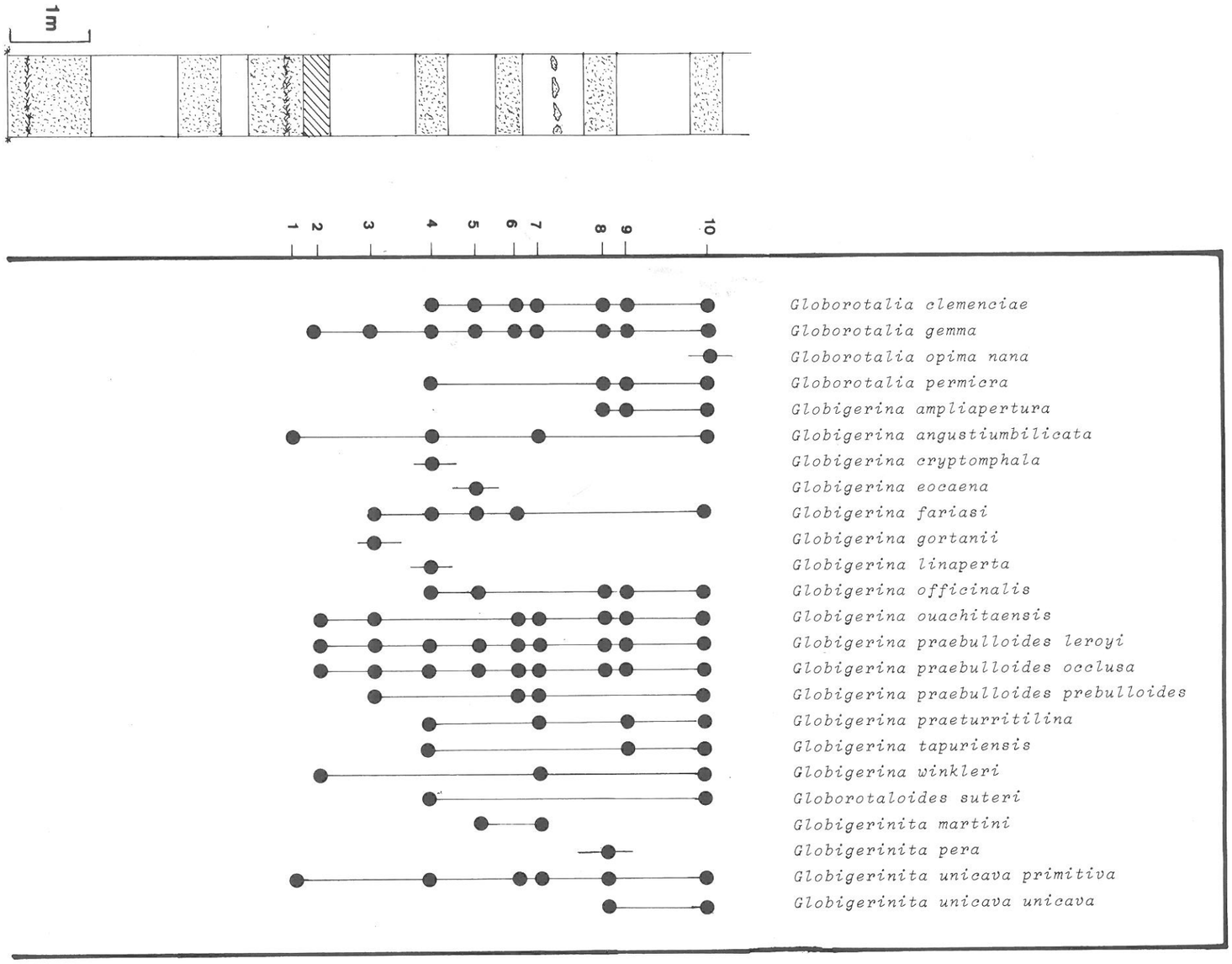


Table 6 : Distribution of planktonic foraminifera in the Boom Clay at Tielrode.

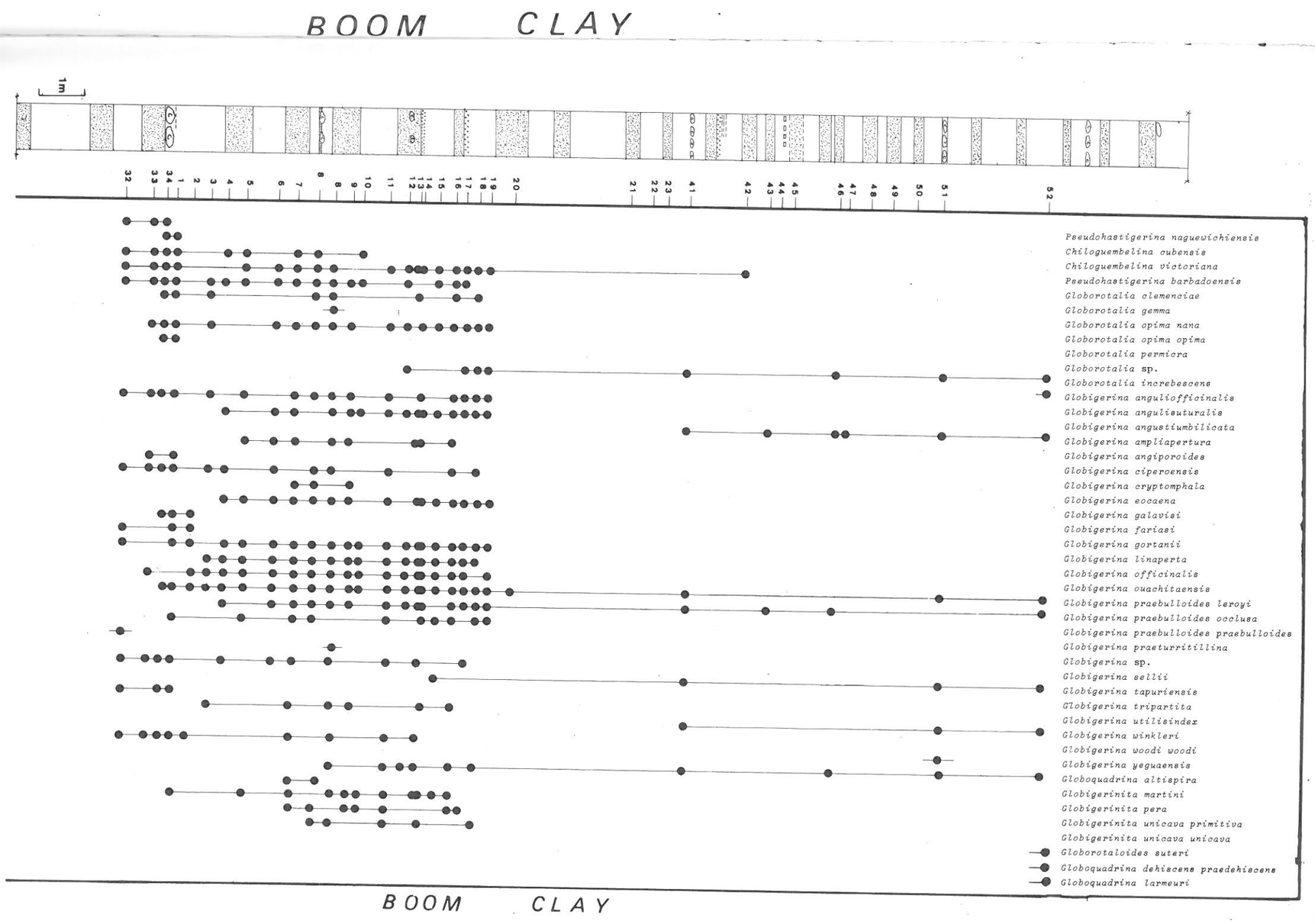


Table 7 : Distribution of planktonic foraminifera in the Boom Clay at Terhagen.

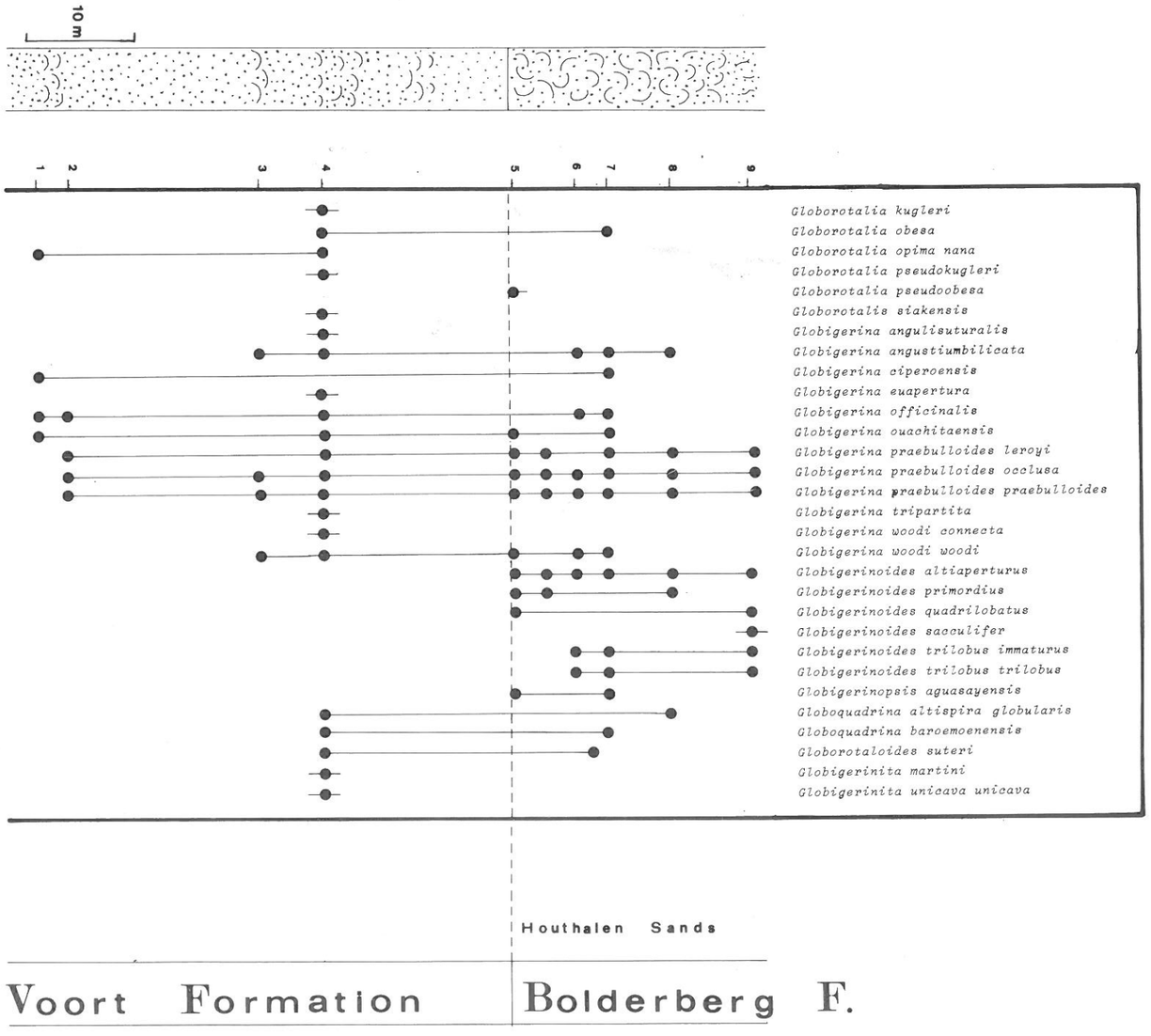


Table 8 : Distribution of planktonic foraminifera in the well at Helchteren.

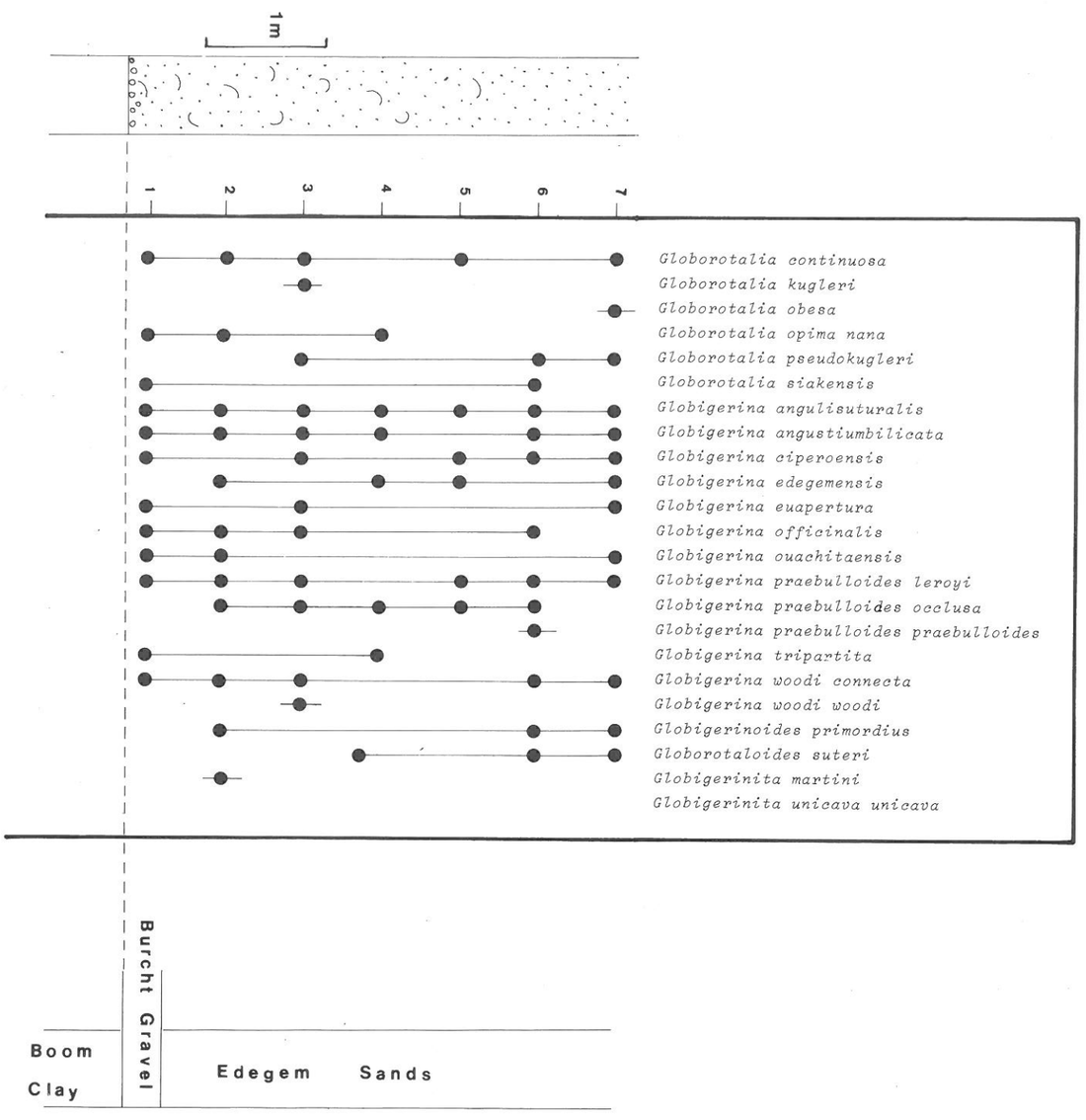


Table 9 : Distribution of planktonic foraminifera in the Edegem Sands at Terhagen.

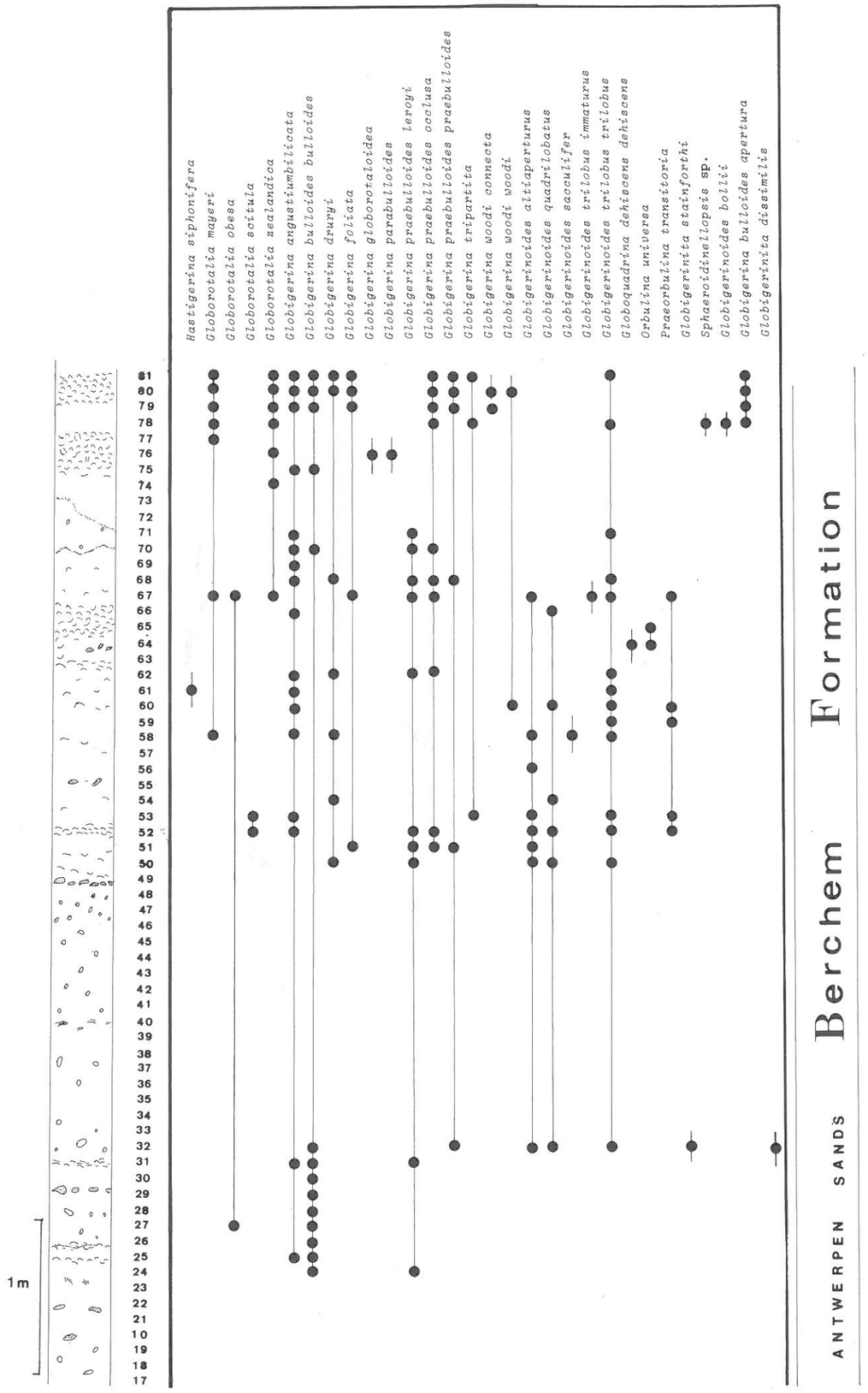


Table 10 : Distribution of planktonic foraminifera in the AK section.

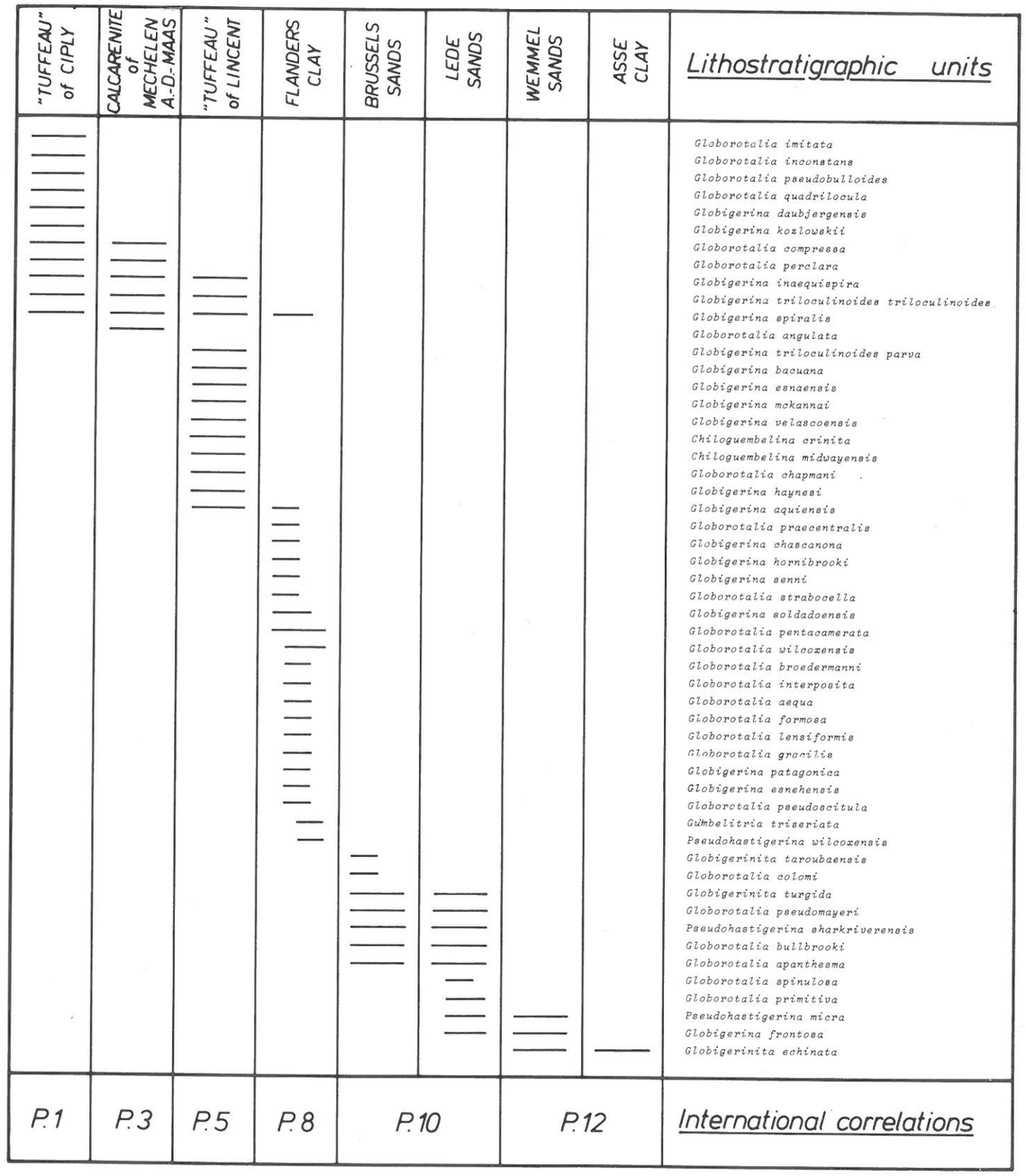


Table 11

BERG SANDS	BOOM CLAY	VOORT SANDS	EDEGEM SANDS	HOUTHALEN SANDS	ANTWERPEN SANDS	DEURNE SANDS	Lithostratigraphic units
—	—	—	—	—			*Globorotalia danvillensis*
—	—	—	—	—			*Globigerina officinalis*
—	—	—	—	—			*Globigerina ouachitaensis*
—	—	—	—	—	—		*Globigerina praebulloides leroyi*
—	—	—	—	—	—		*Globigerina praebulloides occlusa*
—	—						*Chiloguembelina cubensis*
—	—						*Pseudohastigerina barbadoensis*
	—						*Pseudohastigerina naguewichiensis*
	—						*Globorotalia increbescens*
	—						*Globigerina eocaena*
	—						*Globigerina gortanii*
	—	—	—	—	—		*Globigerina praebulloides praebulloides*
	—						*Globigerina linaperta*
	—						*Globigerina galavisi*
	—						*Globigerina praeturritillina*
	—						*Globigerina tapuriensis*
	—						*Globigerina ampliapertura*
	—	—	—	—	—		*Globigerina angustiumbilicata*
	—						*Globorotalia gemma*
	—						*Globorotalia opima opima*
	—						*Globorotalia clemenciae*
	—	—	—				*Globorotalia opima nana*
	—		—	—			*Globorotaloides suteri*
	—						*Globigerina yeguaensis*
	—						*Globigerina cryptomphala*
	—						*Globigerina labiacrassata*
	—						*Globorotalia permicra*
	—						*Globigerinita martini*
	—						*Globigerinita pera*
	—	—	—				*Globigerinita unicava unicava*
	—						*Globigerinita unicava primitiva*
	—						*Globigerina winkleri*
	—						*Globigerina fariasis*
	—	—	—	—			*Globigerina ciperoensis*
	—						*Globigerina angulisofficinalis*
	—						*Globigerina angiporoides*
	—						*Globigerina sellii*
	—						*Globigerina utilisindex*
	—			—	—		*Globigerina woodi woodi*
	—	—		—			*Globoquadrina baroemoenensis*
	—	—		—			*Globoquadrina altispira*
	—	—	—	—	—		*Globorotalia obesa*
	—	—	—				*Globigerina angulisuturalis*
		—	—				*Globorotalia kugleri*
		—	—				*Globorotalia pseudokugleri*
		—	—				*Globorotalia siakensis*
		—	—				*Globigerina euapertura*
		—	—		—		*Globigerina tripartita*
		—	—		—		*Globigerina woodi connecta*
			—				*Globorotalia continuosa*
			—				*Globigerina edegemensis*
			—	—			*Globigerinoides primordius*
				—			*Globorotalia pseudoobesa*
				—			*Globigerinopsis aguasayensis*
				—	—		*Globigerinoides altiaperturus*
				—	—		*Globigerinoides quadrilobatus*
				—	—		*Globigerinoides sacculifer*
				—	—		*Globigerinoides trilobus trilobus*
				—	—		*Globigerinoides trilobus immaturus*
					—	—	*Globigerina bulloides*
					—		*Praeorbulina transitoria*
					—		*Globigerinita stainforthi*
					—		*Globoquadrina dehiscens*
					—		*Hastigerina siphonifera*
					—		*Globorotalia mayeri*
					—		*Globorotalia scitula*
					—		*Globorotalia zealandica*
					—		*Globigerina druryi*
					—		*Globigerina foliata*
					—		*Globigerina globorotaloidea*
					—		*Globigerina parabulloides*
					—		*Orbulina universa*
					—		*Sphaeroidinellopsis*
						—	*Globigerina pachyderma*
						—	*Globigerina eggeri*
P.17	P.18 P.19 P.20 P.21	P.22	N.4	N.6 N.5	N.9 N.6		International correlations

Table 12

VIII. PLANCHES

PLATE 1

1 - 2 : *Chiloguembelina crinita* (GLAESSNER, 1939). "Tuffeau de Lincent".

1) 30/5/600/78	X 85
2) 29/5/600/78	X 80

3 - 4 : *Chiloguembelina cubensis* (PALMER, 1934). Rupel Formation, Boom Clay.

3) 27/52/600/78	X 120
4) 28/52/600/78	X 125

5 - 6 : *Chiloguembelina midwayensis* (CUSHMAN, 1940). "Tuffeau de Lincent".

5) 24/3/600/79	X 100
6) 11/4/600/79	X 105

7 - 8 : *Chiloguembelina victoriana* (BECKMANN, 1957). Rupel Formation, Boom Clay.

7) 29/52/600/78	X 200
8) 10/62/600/78	X 155

9 - 12 : *Pseudohastigerina barbadoensis* BLOW, 1969. Rupel Formation, Boom Clay.

9) 7/69/600/78	X 115
10) 7/75/600/78	X 115
11) 1/53/600/78	X 115
12) 8/73/600/78	X 115

13 - 15 : *Pseudohastigerina naguewichiensis* (MYATLIUK, 1950). Rupel Formation, Boom Clay.

13) 5/69/600/78	X 105
14) 6/71/600/78	X 105
15) 5/75/600/78	X 105

16 - 19 : *Pseudohastigerina micra* (COLE, 1927). Lede Formation.

16) 5/5/600/79	X 110
17) EF/1	X 110
18) EF/2	X 110
19) EF/3	X 110

20 : *Pseudohastigerina sharkriverensis* BERGGREN & OLSSON, 1967. Brussels Formation.

20) 15/5/600/78	X 130

21 - 22 : *Hastigerina siphonifera* (D'ORBIGNY, 1839). Berchem Formation, Antwerpen Sands.

21) 7/2/600/79	X 115
22) 16/7/600/79	X 115

23 - 25 : *Pseudohastigerina wilcoxensis* (CUSHMAN & PONTON, 1932). Brussels Formation.

23) 27/17/600/78	X 115
24) 15/16/600/78	X 180
25) 17/5/600/78	X 150

26 - 27 : *Globigerina* sp.. Rupel Formation, Boom Clay.

26) 12/21/600/78	X 110
27) 13/16/600/78	X 110

28 - 30 : *Globigerina bacuana* KHALILOV, 1956. "Tuffeau de Lincent".

28) 15/28/600/78	X 125
29) 27/13/600/78	X 125
30) 5/28/600/78	X 125

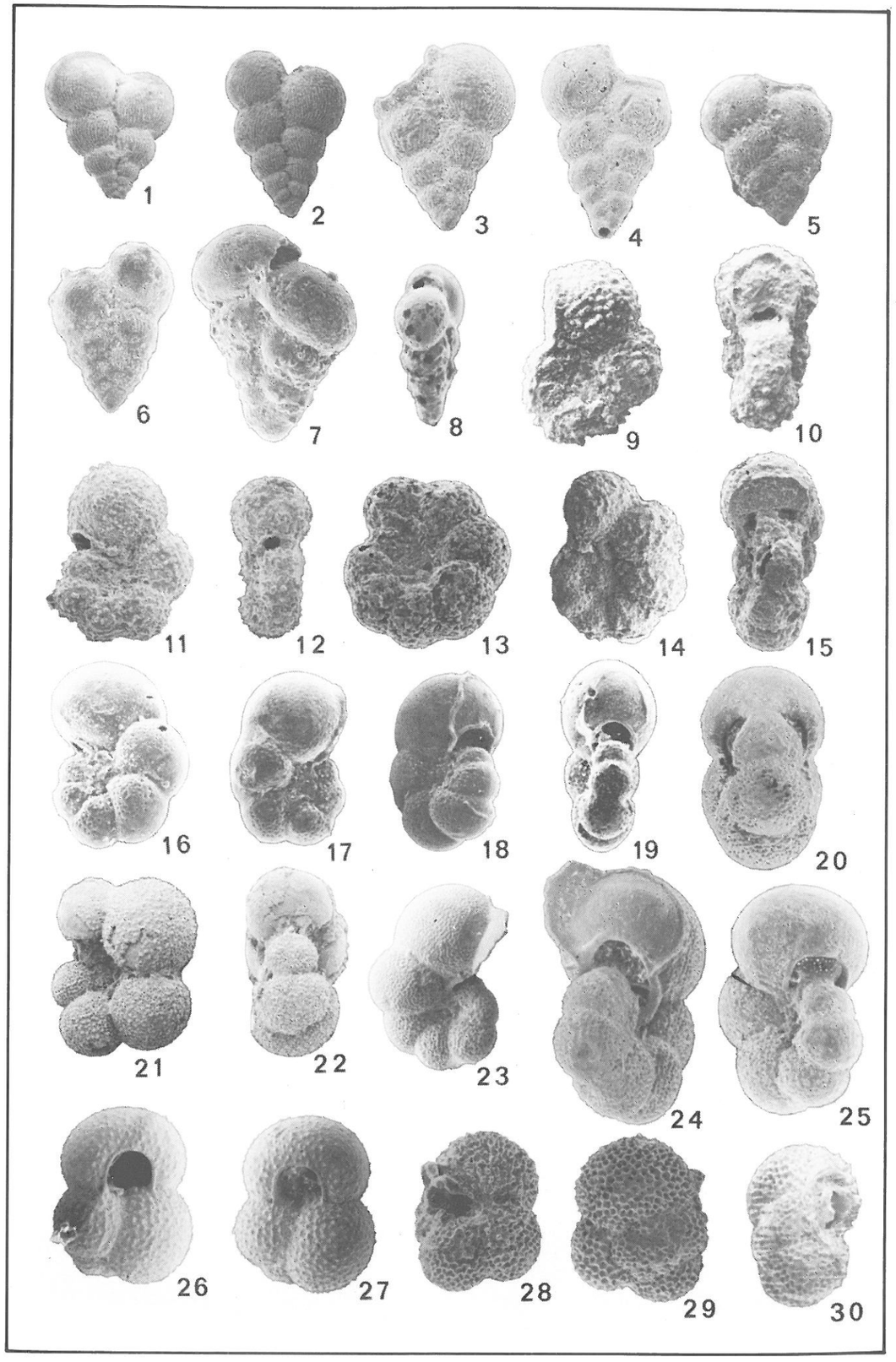


PLATE 2

1 - 6 : *Globorotalia (Acarinina) broedermanni* CUSHMAN & BERMUDEZ, 1949. Ieper Formation.

1) 19/27/600/78	X 115
2) 12/14/600/78	X 140
3) 20/1/600/79	X 125
4) 27/6/600/79	X 125
5) 17/4/600/79	X 125
6) EF/4	X 125

7 - 11 : *Globorotalia (Acarinina) bullbrooki* BOLLI, 1957. Brussels Formation.

7) 10/9/600/79	X 140
8) 11/14/600/78	X 130
9) 24/9/600/78	X 130
10) 18/6/600/78	X 150
11) 32/14/600/78	X 160

12 - 18 : *Globorotalia (Acarinina) colomi* (BERMUDEZ, 1961). Brussels Formation.

12) EF/5	X 130
13) 23/6/600/79	X 130
14) EF/6	X 130
15) 25/6/600/79	X 150
16) EF/7	X 140
17) 24/6/600/79	X 140
18) EF/8	X 110

19 - 23 : *Globorotalia (Morozovella) lensiformis* SUBBOTINA, 1953. Ieper Formation.

19) 22/8/600/79	X 120
20) EF/9	X 140
21) 15/1/600/79	X 120
22) 21/6/600/79	X 120
23) EF/10	X 130

24 : *Globorotalia (Acarinina) esnaensis* LE ROY, 1953. "Tuffeau de Lincent".

24) 31/8/600/79	X 140

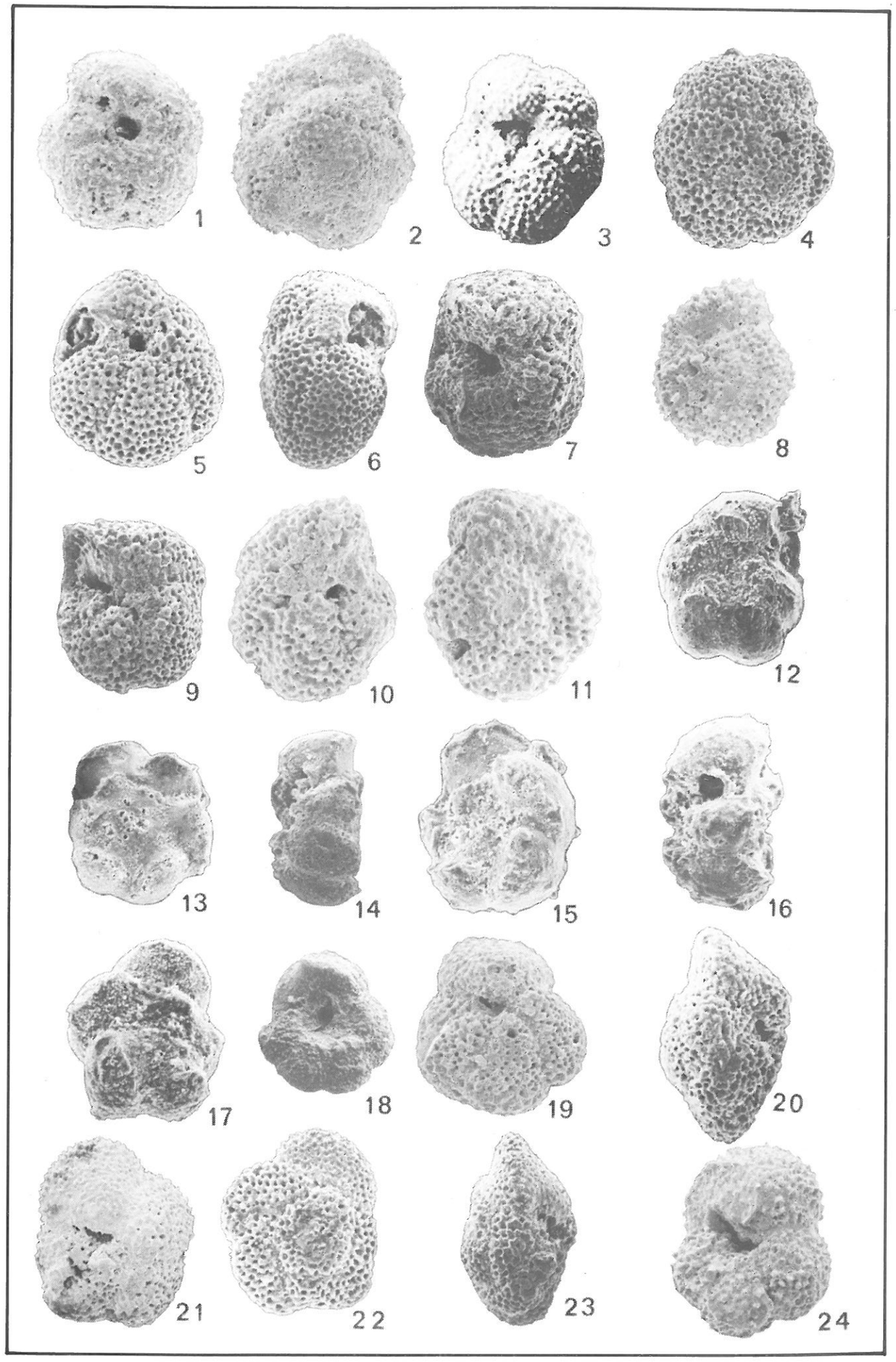


PLATE 3

1 - 3 : *Globorotalia (Acarinina) esnaensis* LE ROY, 1953. "Tuffeau de Lincent".

1) 7/9/600/79	X 150
2) 8/9/600/79	X 140
3) 11/16/600/7	X 140

4 - 9 : *Globorotalia (Acarinina) pentacamerata* SUBBOTINA, 1947.
Lede Formation.

4) EF/11	X 150

Ieper Formation.

5) 23/4/600/79	X 125
6) EF/12	X 135
7) 3/27/600/78	X 75
8) 2/22/600/78	X 105
9) 26/16/600/78	X 105

10 : *Globorotalia (Acarinina) primitiva* MOROZOVA, 1961. Lede Formation.

10) 6/27/600/78	X 135

11 - 19 : *Globorotalia (Acarinina) danvillensis* HOWE & WALLACE, 1932.
Rupel Formation, Berg Sands.

11) 14/2/600/78	X 230
12) 14/16/600/78	X 215
13) 26/17/600/78	X 210
14) 21/4/600/79	X 210
15) EF/13	X 200
16) 20/4/600/79	X 215
17) EF/14	X 215
18) 22/4/600/79	X 200
19) EF/15	X 200

20 - 24 : *Globorotalia (Acarinina) strabocella* LOEBLICH & TAPPAN, 1957.
Ieper Formation.

20) 32/27/600/78	X 100
21) 23/6/600/78	X 115
22) 14/18/600/78	X 115
23) 1/15/600/78	X 100
24) 2/15/600/78	X 110

25 - 28 : *Globorotalia (Acarinina) wilcoxensis* CUSHMAN & PONTON, 1932.
Ieper Formation.

25) 16/1/600/79	X 115
26) EF/15	X 125
27) 33/1/600/79	X 115
28) 8/7/600/79	X 135

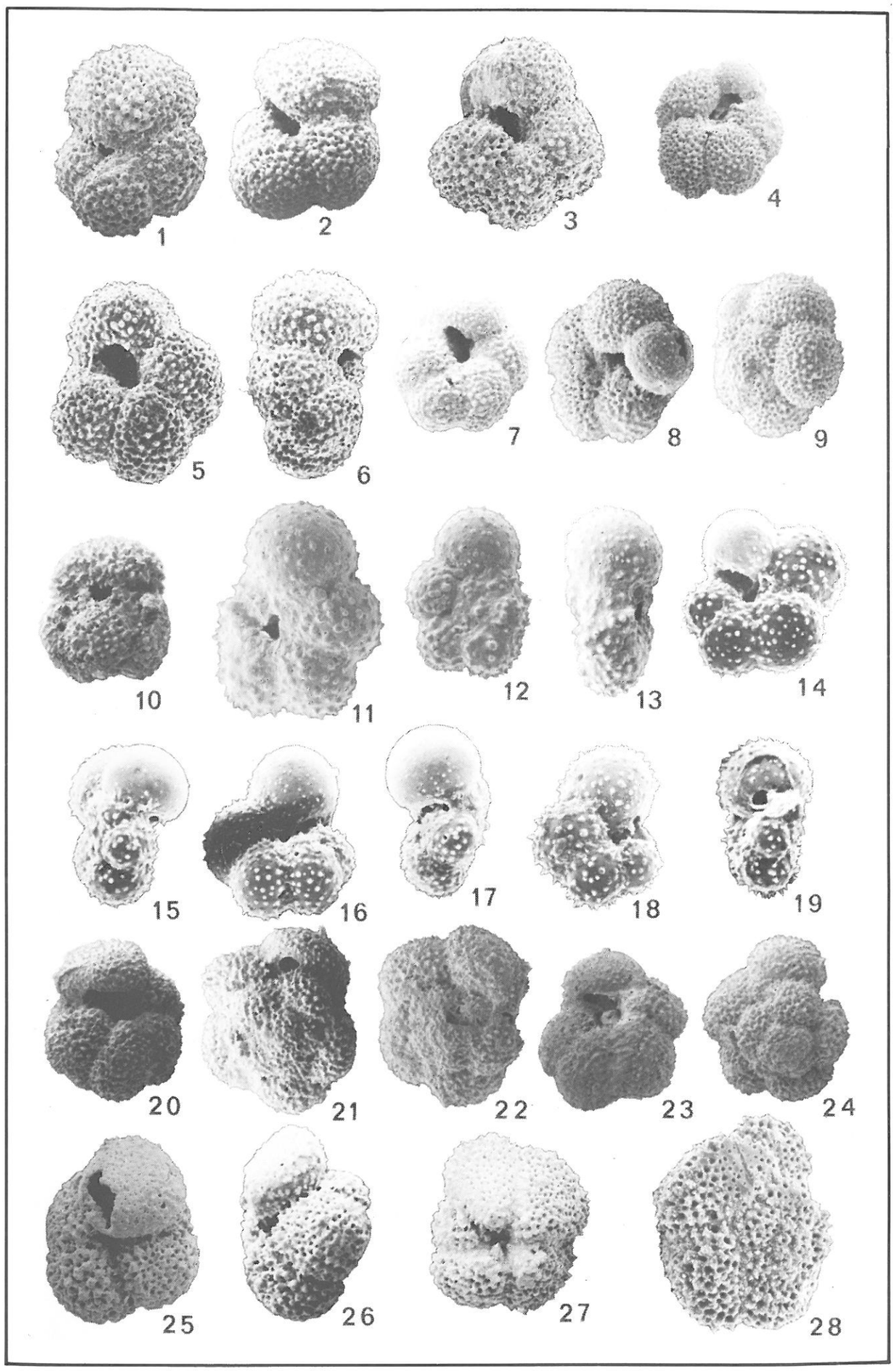


PLATE 4

1 - 5 : *Globorotalia (Morozovella) aequa* CUSHMAN & RENZ, 1942. Ieper Formation.

1) 27/27/600/78	X 115
2) 21/14/600/78	X 100
3) 31/9/600/78	X 155
4) 31/9/600/78	X 135
5) 31/9/600/78	X 140

6 - 15 : *Globorotalia (Morozovella) formosa* BOLLI, 1957. Ieper Formation.

6) 10/1/600/79	X 115
7) 16/6/600/79	X 105
8) 11/9/600/79	X 90
9) 12/9/600/79	X 115
10) EF/17	X 125
11) 13/1/600/79	X 100
12) EF/18	X 125
13) 12/1/600/79	X 105
14) EF/19	X 115
15) EF/20	X 115

16 - 22 : *Globorotalia (Morozovella) gracilis* BOLLI, 1957. Ieper Formation.

16) 2/6/600/78	X 150
17) 17/14/600/78	X 125
18) EF/21	X 125
19) 8/9/600/79	X 125
20) 29/27/600/78	X 85
21) 29/14/600/78	X 105
22) 8/10/600/78	X 120

23 - 26 : *Globorotalia (Morozovella) spinulosa* CUSHMAN, 1927. Lede Formation.

23) 18/4/600/79	X 105
24) EF/22	X 125
25) EF/23	X 115
26) 20/6/600/79	X 90

27 - 30 : *Globorotalia (Turborotalia) chapmani* PARR, 1938. "Tuffeau de Lincent".

27) 15/8/600/79	X 140
28) EF/24	X 140
29) 16/8/600/78	X 120
30) EF/25	X 125

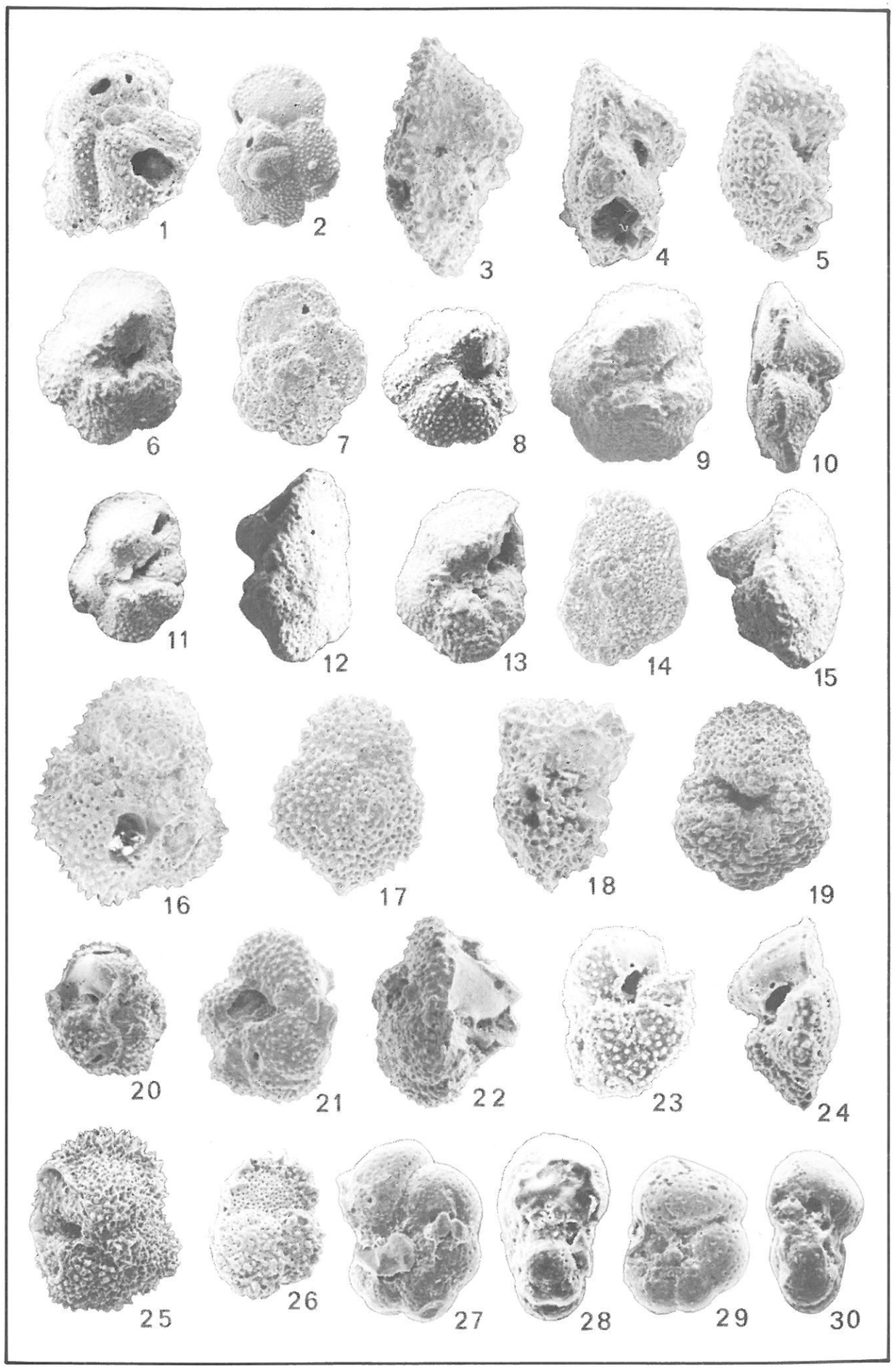


PLATE 5

1 - 6 : *Globorotalia (Turborotalia) continuosa* BLOW, 1959. Berchem Formation, Edegem Sands.

1) 10/60/600/78	X 175
2) 13/71/600/78	X 170
3) 10/75/600/78	X 175
4) 12/69/600/78	X 150
5) 12/75/600/78	X 160
6) 17/71/600/78	X 160

7 - 15 : *Globorotalia (Turborotalia) gemma* JENKINS, 1965. Rupel Formation, Boom Clay.

7) 33/51/600/78	X 135
8) 30/65/600/78	X 160
9) 7/73/600/78	X 150
10) 1/52/600/78	X 135
11) 28/63/600/78	X 125
12) 28/65/600/78	X 125
13) 32/76/600/78	X 130
14) 27/67/600/78	X 135
15) 28/67/600/78	X 160

16 - 20 : *Globorotalia (Turborotalia) imitata* SUBBOTINA, 1953. "Tuffeau de Ciply".

16) 18/3/600/79	X 115
17) EF/26	X 115
18) 20/3/600/79	X 125
19) EF/27	X 125
20) 19/3/600/79	X 125

21 - 25 : *Globorotalia (Turborotalia) inconstans* SUBBOTINA, 1953. "Tuffeau de Ciply".

21) 27/28/600/78	X 90
22) 26/28/600/78	X 85
23) 21/28/600/78	X 85
24) 9/27/600/78	X 115
25) 23/28/600/78	X 125

26 - 30 : *Globorotalia (Turborotalia) mayeri* CUSHMAN & ELLISOR, 1939. Berchem Formation, Antwerpen Sands.

26) 9/76/600/78	X 115
27) 8/8/600/79	X 100
28) 8/79/600/78	X 85
29) 1/77/600/78	X 115
30) 29/77/600/78	X 115

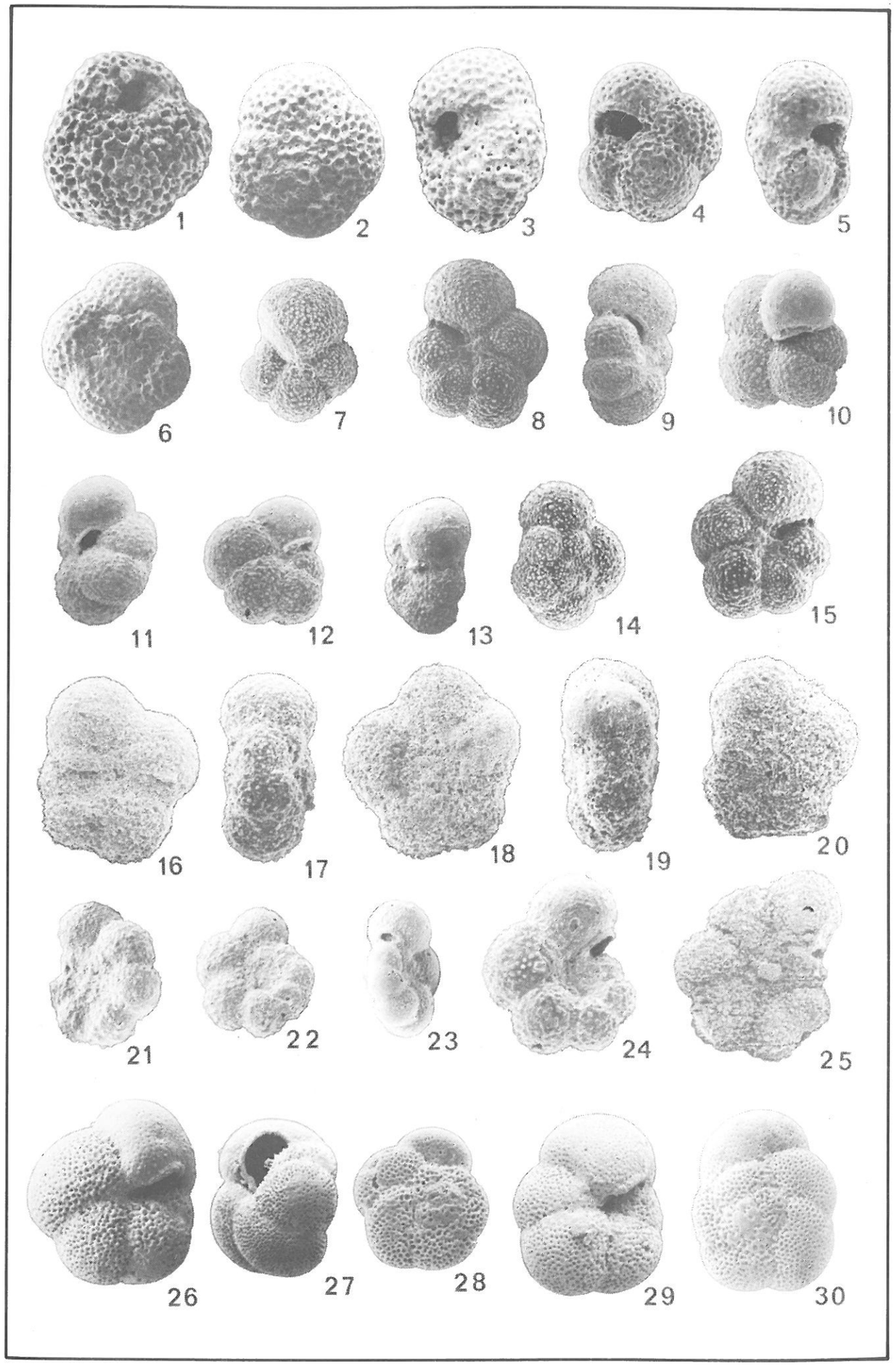


PLATE 6

1 - 4 : *Globorotalia (Turborotalia) mayeri* CUSHMAN & ELLISOR. Berchem Formation, Antwerpen Sands.

1) 4/77/600/78	X 115
2) 32/77/600/78	X 115
3) 5/77/600/78	X 125
4) 33/77/600/78	X 115

5 - 9 : *Globorotalia (Turborotalia) gemma* JENKINS, 1965. Rupel Formations, Boom Clay.

5) 24/68/600/78	X 135
6) 23/74/600/78	X 160
7) 31/70/600/78	X 150
8) 13/66/600/78	X 135
9) 12/68/600/78	X 135

10 - 19 : *Globorotalia (Turborotalia) pseudokugleri* BLOW, 1969. Rupel Formation, Boom Clay.

10) 27/68/600/78	X 180
11) 34/70/600/78	X 180
12) 25/74/600/78	X 175
13) 23/68/600/78	X 160
14) 15/68/600/78	X 155
15) 29/74/600/78	X 150
16) 22/68/600/78	X 185
17) 23/74/600/78	X 175
18) 32/70/600/78	X 160
19) 7/57/600/78	X 190

20 - 24 : *Globorotalia (Turborotalia) clemenciae* BERMUDEZ, 1961. Rupel Formation, Boom Clay.

20) 20/52/600/78	X 175
21) 1/62/600/78	X 130
22) 21/52/600/78	X 185
23) 26/54/600/78	X 150
24) 22/52/600/78	X 150

25 - 29 : *Globorotalia (Turborotalia) obesa* BOLLI, 1957. Bolderberg Formation, Houthalen Sands.

25) 7/77/600/78	X 175
26) 35/77/600/78	X 185
27) 9/77/600/78	X 130
28) 20/68/600/78	X 175
29) 27/70/600/78	X 175

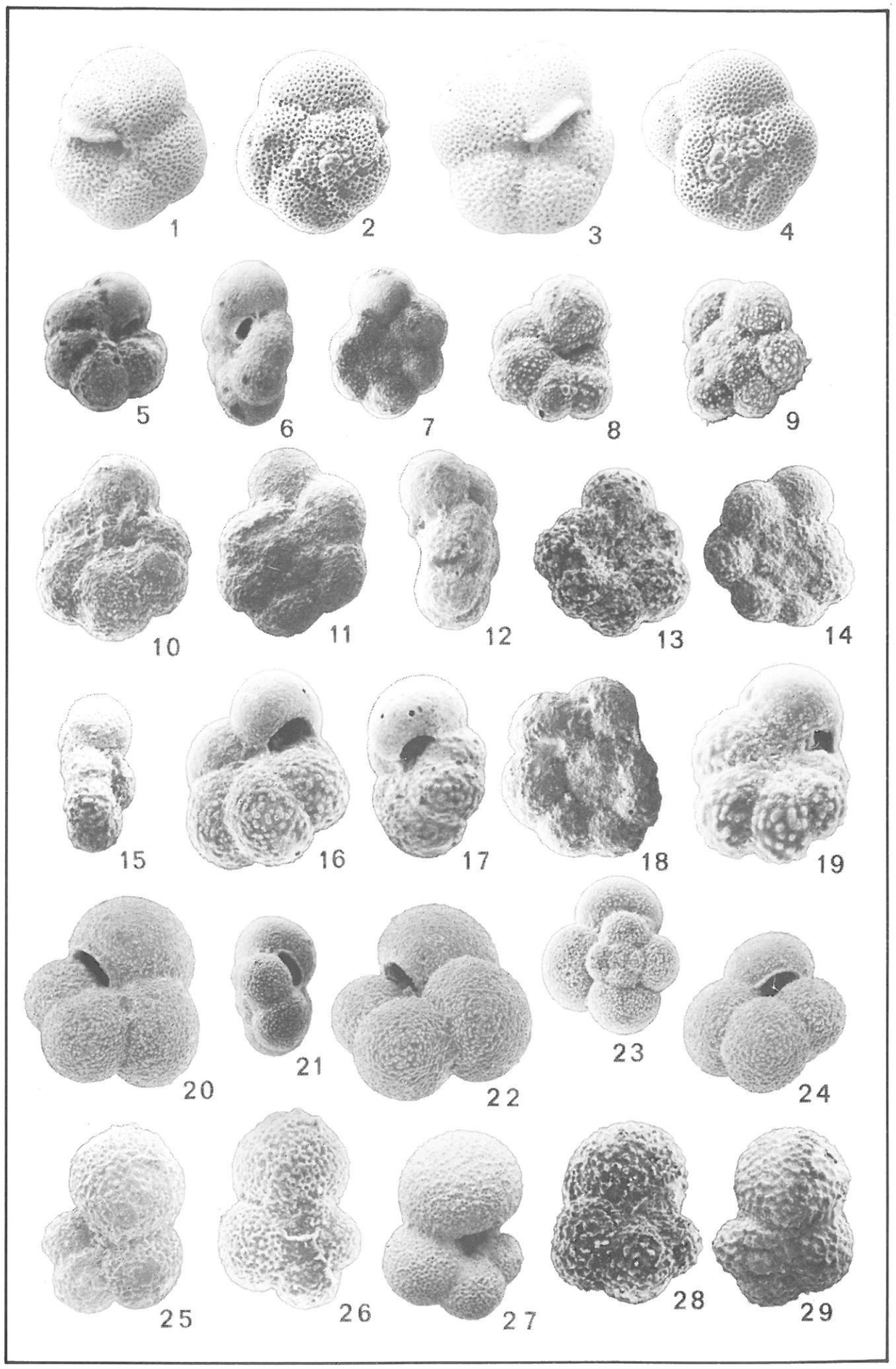


PLATE 7

1 - 4 : *Globorotalia (Turborotalia) opima opima* BOLLI, 1957. Rupel Formation, Boom Clay.

1) 14/15/600/79	X 115
2) 21/15/600/79	X 115
3) 10/77/600/78	X 130
4) 37/77/600/78	X 125

5 - 12 : *Globorotalia (Turborotalia) opima nana* BOLLI, 1957. Rupel Formation, Boom Clay.

5) 24/52/600/78	X 135
6) 3/55/600/78	X 110
7) 25/52/600/78	X 110
8) 6/62/600/78	X 150
9) 4/55/600/78	X 110
10) 26/52/600/78	X 120
11) 7/62/600/78	X 150
12) 5/55/600/78	X 110

13 - 15 : *Globorotalia (Turborotalia) permicra* BLOW & BANNER, 1962. Rupel Formation, Boom Clay.

13) 8/66/600/78	X 140
14) 19/73/600/78	X 140
15) 9/68/600/78	X 140

16 - 19 : *Globorotalia (Turborotalia) pseudoobesa* (SALVATORINI, 1967). Bolderberg Formation, Houthalen Sands.

16) 6/2/600/79	X 110
17) 14/7/600/79	X 100
18) 14/2/600/79	X 105
19) 4/8/600/79	X 90

20 - 26 : *Globorotalia (Turborotalia) pseudobulloides* (PLUMMER, 1926). "Tuffeau de Ciply".

20) 30/26/600/78	X 150
21) 16/3/600/79	X 175
22) EF/28	X 160
23) 4/4/600/79	X 160
24) 15/3/600/79	X 160
25) EF/29	X 185
26) 3/4/600/79	X 170

27 - 30 : *Globorotalia (Turborotalia) pseudomayeri* BOLLI, 1957. Brussels Formation.

27) 8/7/600/78	X 150
28) 20/15/600/78	X 150
29) 5/7/600/78	X 150
30) 6/7/600/78	X 135

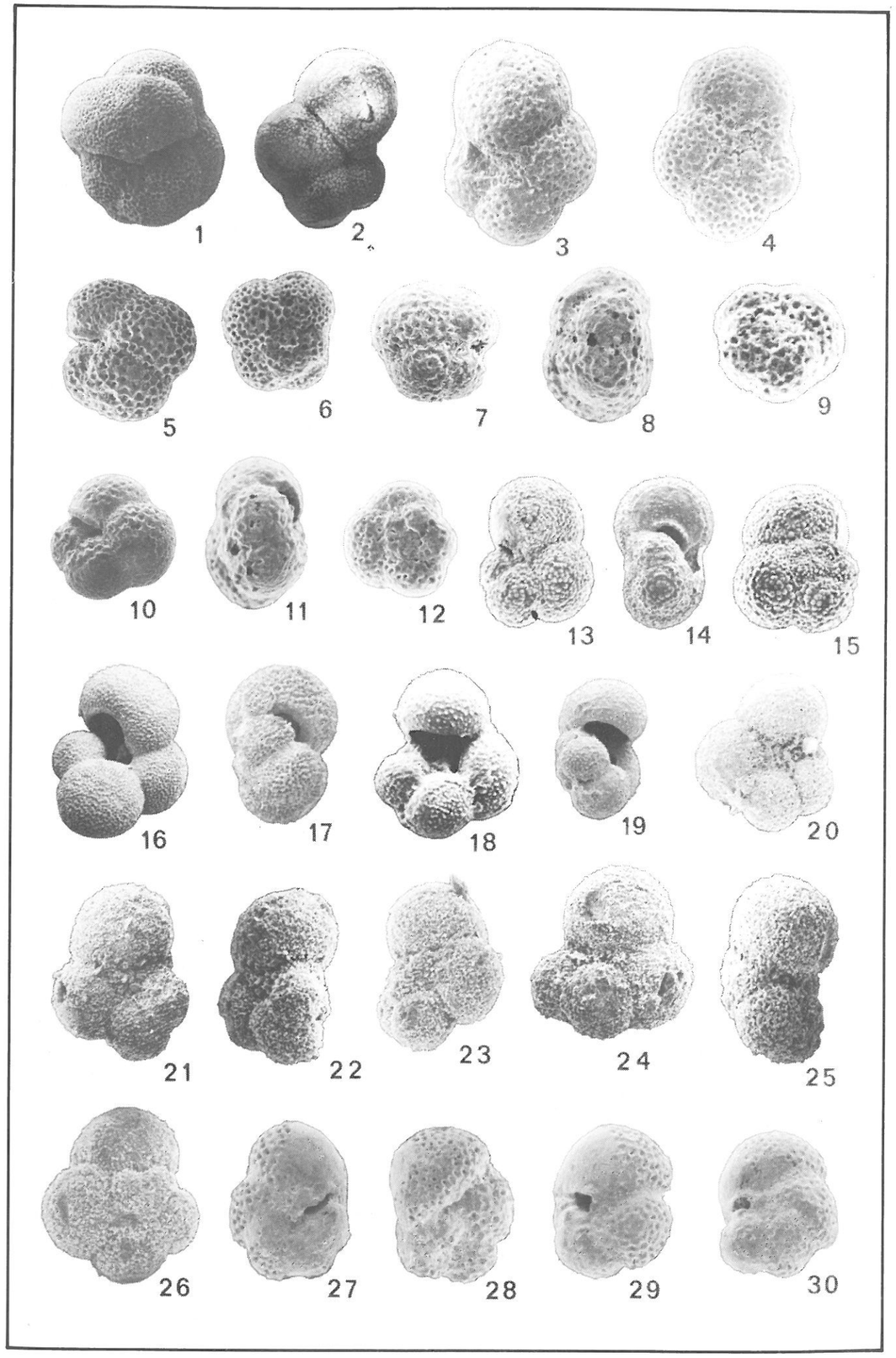


PLATE 8

1 - 4 : *Globorotalia (Turborotalia) pseudomayeri* BOLLI, 1957. Brussels Formation.

1) 2/11/600/78	X 185
2) 19/15/600/78	X 150
3) 7/7/600/78	X 160
4) 1/11/600/78	X 190

5 : *Globorotalia (Turborotalia) permicra* BLOW & BANNER, 1962. Rupel Formation, Boom Clay.

5) EF/30	X 185

6 - 7 : *Globorotalia (Turborotalia) kugleri* BOLLI, 1957. Berchem Formation, Edegem Sands.

6) 16/66/600/78	X 180
7) 15/68/600/78	X 170

8 - 11 : *Globorotalia (Turborotalia) perclara* LOEBLICH & TAPPAN, 1957. "Tuffeau de Ciply".

8) 27/9/600/78	X 225
9) EF/31	X 175
10) EF/32	X 185
11) 13/18/600/78	X 185

12 - 15 : *Globorotalia (Turborotalia) quadrilocula* BLOW, 1979. "Tuffeau de Ciply".

12) 13/28/600/78	X 160
13) 6/14/600/78	X 160
14) 14/27/600/78	X 150
15) 7/14/600/78	X 135

16 - 20 : *Globorotalia scitula* group. Berchem Formation, Antwerpen Sands.

16) 10/8/600/79	X 150
17) EF/33	X 155
18) 12/8/600/78	X 135
19) EF/34	X 135
20) EF/35	X 135

21 - 28 : *Globorotalia (Turborotalia) siakensis* LE ROY, 1939. Berchem Formation, Edegem Sands.

21) 14/53/600/78	X 160
22) 28/62/600/78	X 150
23) 28/55/600/78	X 150
24) 15/53/600/78	X 150
25) 29/55/600/78	X 140
26) 29/55/600/78	X 140
27) 16/53/600/78	X 150
28) 17/53/600/78	X 150

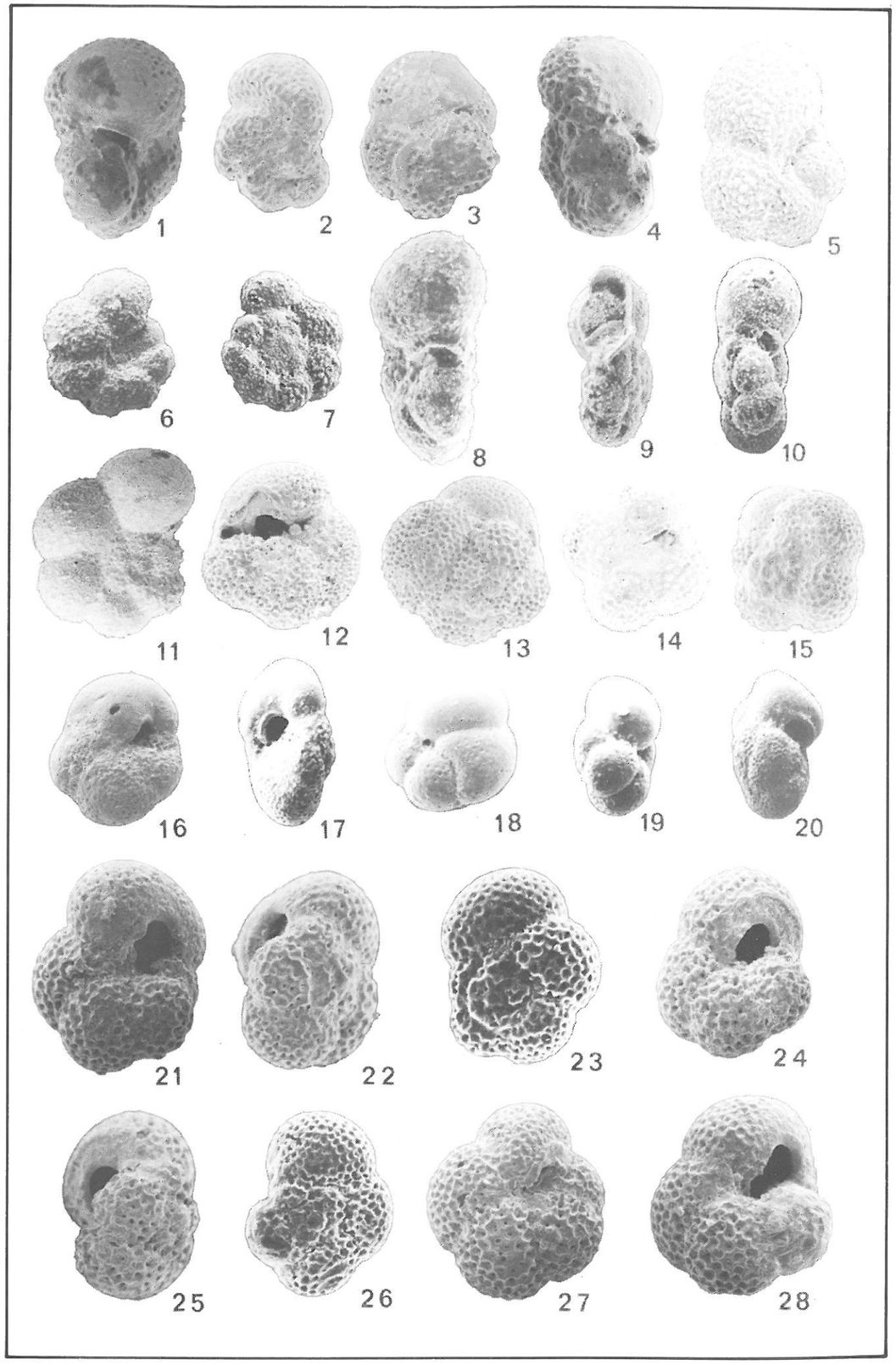


PLATE 9

1 - 8 : *Globorotalia (Turborotalia) zealandica* HORNIBROOK, 1958. Berchem Formation, Antwerpen Sands.

1) 6/3/600/79	X 155
2) 5/3/600/79	X 150
3) 7/3/600/79	X 175
4) 2/77/600/78	X 140
5) 4/76/600/78	X 145
6) 6/79/600/78	X 140
7) 6/76/600/78	X 140
8) 2/79/600/78	X 150

9 - 17 : *Globigerina ampliapertura* BOLLI, 1957. Rupel Formation, Boom Clay.

9) 3/53/600/78	X 130
10) 18/55/600/78	X 125
11) 5/53/600/78	X 130
12) 4/53/600/78	X 150
13) 19/55/600/78	X 120
14) 18/62/600/78	X 130
15) 6/53/600/78	X 120
16) 20/62/600/78	X 140
17) 21/55/600/78	X 130

18 - 25 : *Globigerina angiporoides* HORNIBROOK, 1965. Rupel Formation, Boom Clay.

18) 21/26/600/78	X 115
19) 5/17/600/78	X 130
20) 27/15/600/78	X 115
21) 12/53/600/78	X 150
22) 11/53/600/78	X 110
23) 24/55/600/78	X 120
24) 9/53/600/78	X 165
25) 26/15/600/78	X 105

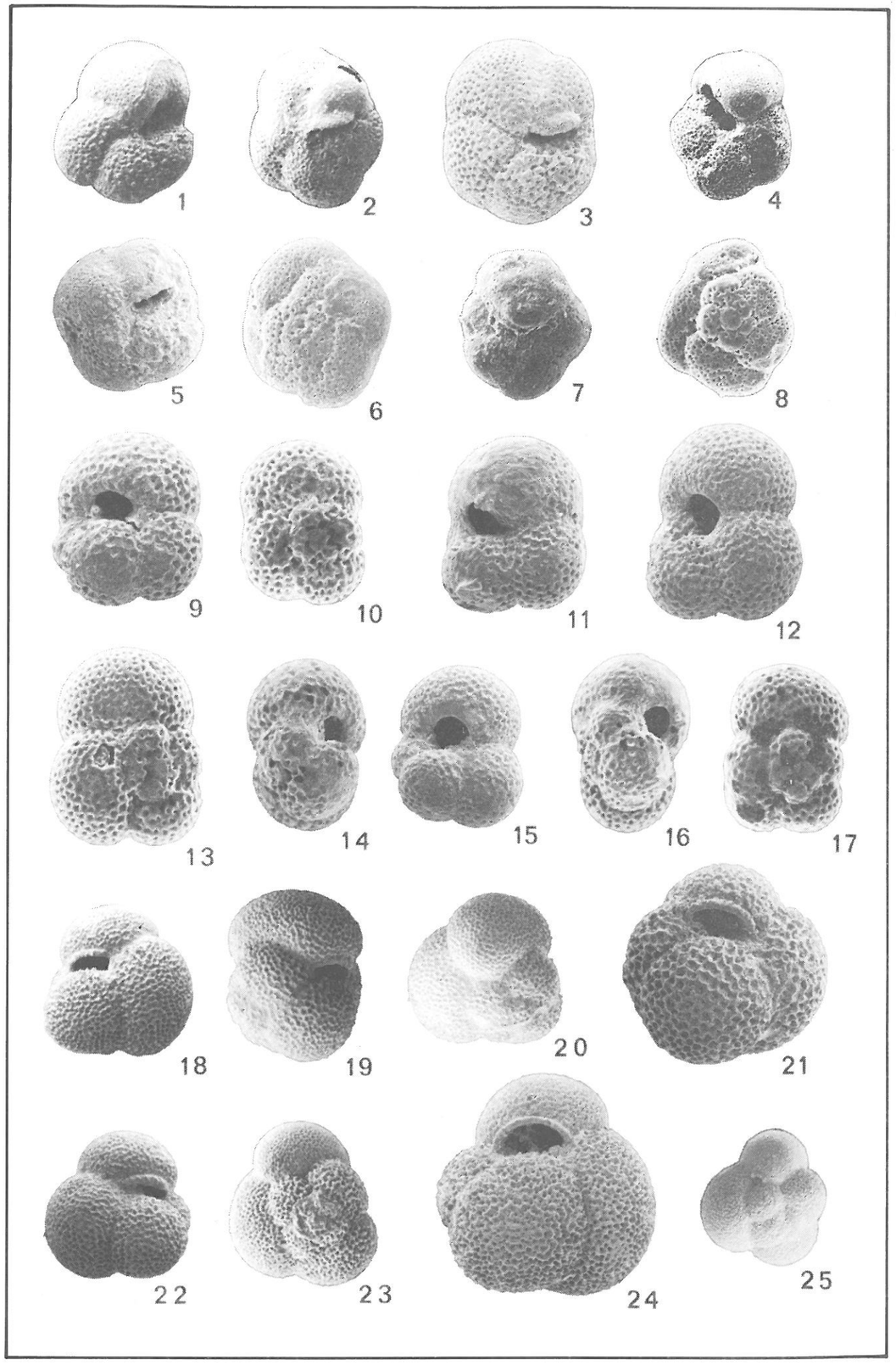


PLATE 10

1 - 4 : *Globigerina anguliofficinalis* BLOW, 1969. Rupel Formation, Boom Clay.

1) 32/52/600/78	X 110
2) EF/36	X 130
3) 30/52/600/78	X 140
4) 6/59/600/78	X 130

5 - 7 : *Globigerina anguliofficinalis* BLOW, 1969. It shows the transition to *Globigerina angulisuturalis* BOLLI, 1957. Rupel Formation, Boom Clay.

5) 3/57/600/78	X 130
6) 13/55/600/78	X 145
7) 11/55/600/78	X 130

8 - 9 : *Globigerina angulisuturalis* BOLLI, 1957. Voort Formation.

8) 19/15/600/79	X 130
9) 22/15/600/79	X 150

10 - 16 : *Globigerina angustiumbilicata* BOLLI, 1957. Rupel Formation, Boom Clay.

10) 12/77/600/78	X 175
11) 2/78/600/78	X 170
12) 11/77/600/78	X 155
13) 31/55/600/78	X 150
14) 33/55/600/78	X 150
15) 7/59/600/78	X 135
16) 20/71/600/78	X 150

17 - 18 : *Globigerina bulloides bulloides* D'ORBIGNY, 1926. Berchem Formation, Antwerpen Sands.

17) 21/2/600/79	X 115
18) 25/2/600/79	X 115

19 - 20 : *Globigerina bulloides apertura* CUSHMAN, 1918. Berchem Formation, Antwerpen Sands.

19) 18/75/600/78	X 90
20) 19/75/600/78	X 90

21 - 24 : *Globigerina ciperoensis* BOLLI, 1957. Rupel Formation, Boom Clay.

21) 3/57/600/78	X 105
22) 15/72/600/78	X 100
23) 1/63/600/78	X 100
24) 1/57/600/78	X 115

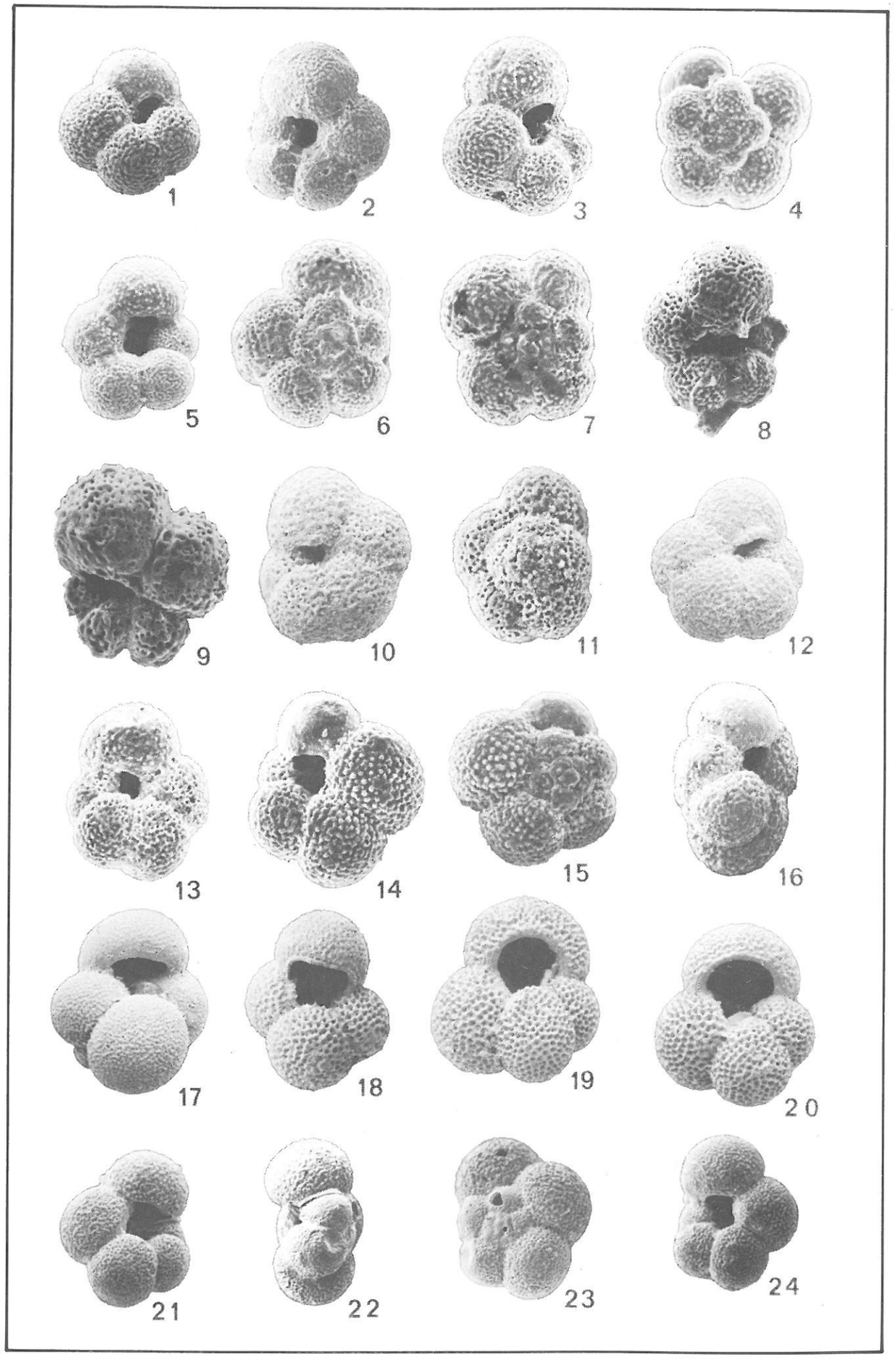


PLATE 11

1 - 2 : *Globigerina ciperoensis* BOLLI, 1957. Rupel Formation, Boom Clay.

1) 20/56/600/78	X 125
2) 12/72/600/78	X 135

3 - 10 : *Globigerina cryptomphala* GLAESSNER, 1937. Rupel Formation, Boom Clay.

3) 12/65/600/78	X 150
4) 9/67/600/78	X 175
5) 22/72/600/78	X 150
6) 31/51/600/78	X 130
7) 30/57/600/78	X 135
8) 19/20/600/78	X 180
9) 8/17/600/78	X 185
10) 30/15/600/78	X 175

11 - 15 : *Globigerina druryi* AKERS, 1955. Berchem Formation, Antwerpen Sands.

11) 11/77/600/78	X 100
12) 21/76/600/78	X 105
13) 22/76/600/78	X 120
14) 22/79/600/78	X 135
15) 24/2/600/79	X 90

16 - 17 : *Globigerina eggeri* RHUMBLER, 1901. Diest Formation, Deurne Sands.

16) 16/76/600/78	X 115
17) 16/79/600/78	X 110

18 - 20 : *Globigerina edegemensis* n.sp.. Berchem Formation, Edegem Sands.

18) EF/37	X 120
19) 28/70/600/78	X 120
20) 22/74/600/78	X 110

21 - 27 : *Globigerina eocaena* GÜMBEL, 1968. Rupel Formation, Boom Clay.

21) 20/21/600/78	X 150
22) 8/52/600/78	X 130
23) 1/59/600/78	X 150
24) 9/52/600/78	X 140
25) 7/65/600/78	X 150
26) 35/58/600/78	X 120
27) 30/76/600/78	X 150

28 - 30 : *Globigerina euapertura* JENKINS, 1960. Berchem Formation, Edegem Sands.

28) 8/53/600/78	X 135
29) 22/62/600/78	X 135
30) 22/55/600/78	X 135

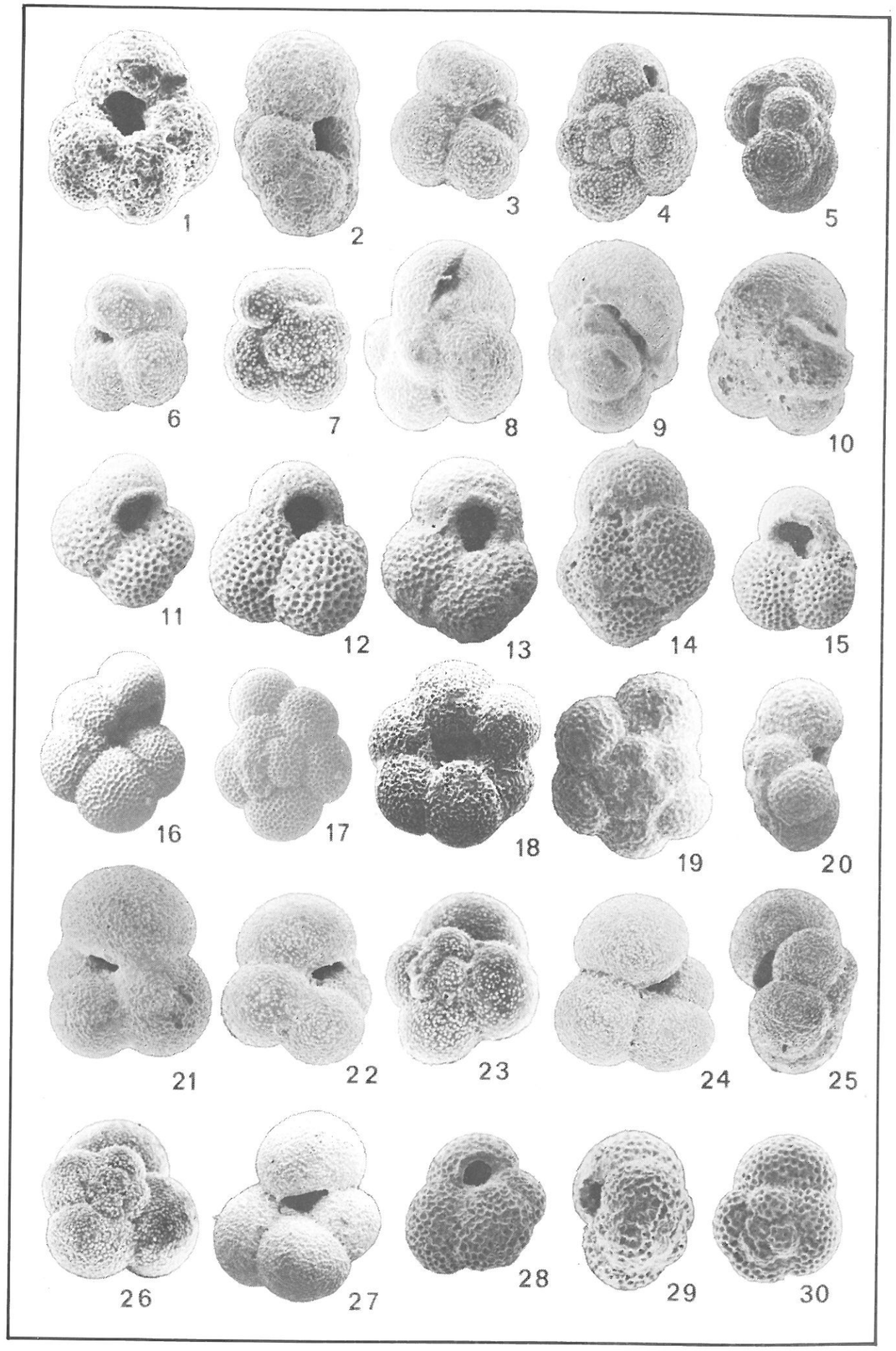


PLATE 12

1 - 2 : *Globigerina euapertura* JENKINS, 1960. Berchem Formation, Edegem Sands.

1) 7/53/600/78	X 130
2) 23/55/600/78	X 150

3 - 11 : *Globigerina fariasi* BERMUDEZ, 1961. Rupel Formation, Boom Clay.

3) 26/76/600/78	X 115
4) 26/51/600/78	X 115
5) 27/51/600/78	X 115
6) 20/63/600/78	X 135
7) 24/57/600/78	X 105
8) 27/57/600/78	X 125
9) 30/51/600/78	X 140
10) 23/63/600/78	X 115
11) 25/76/600/78	X 95

12 - 14 : *Globigerina galavisi* BERMUDEZ, 1961. Rupel Formation, Boom Clay.

12) 24/51/600/78	X 125
13) 18/63/600/78	X 150
14) 22/57/600/78	X 145

15 - 17 : *Globigerina gortanii* (BORSETTI, 1959). Rupel Formation, Boom Clay.

15) EF/38	X 205
16) 2/73/600/78	X 170
17) 18/21/600/78	X 150

18 - 24 : *Globigerina praeturritillina* BLOW & BANNER, 1962. Rupel Formation, Boom Clay.

18) 15/56/600/78	X 175
19) 7/72/600/78	X 160
20) 25/59/600/78	X 160
21) 17/21/600/78	X 135
22) 17/16/600/78	X 135
23) 5/52/600/78	X 160
24) 24/59/600/78	X 150

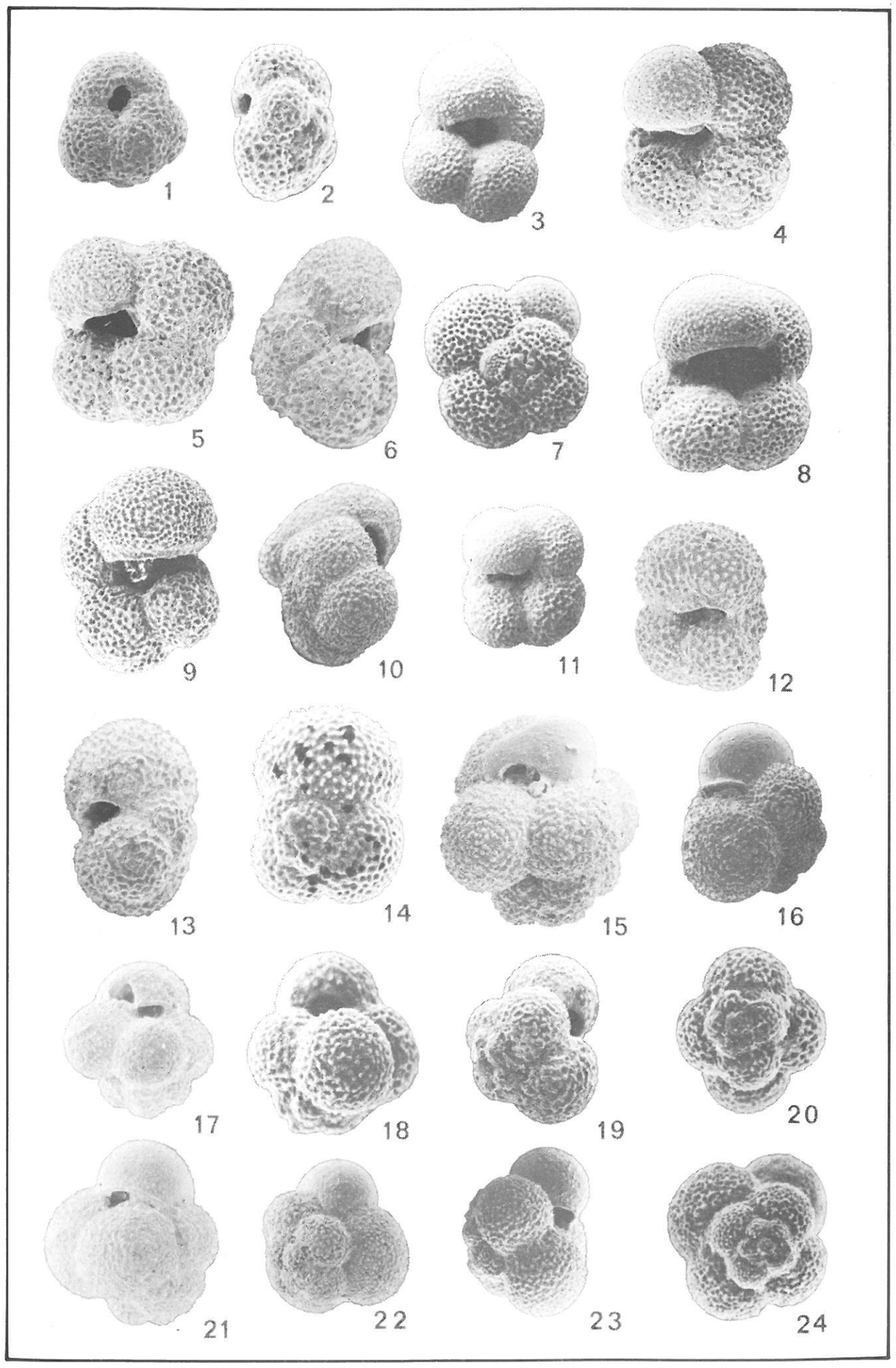


PLATE 13

1 - 2 : *Globigerina globorotaloidea* COLOM, 1954. Berchem Formation, Antwerpen Sands.

1) 10/76/600/78	X 150
2) 10/79/600/78	X 160

3 - 4 : *Globigerina labiacrassata* JENKINS, 1966. Rupel Formation, Boom Clay.

3) 13/20/600/78	X 125
4) 2/17/600/78	X 115

5 - 10 : *Globigerina linaperta* FINLAY, 1939. Rupel Formation, Boom Clay.

5) 5/57/600/78	X 165
6) 17/72/600/78	X 165
7) 3/63/600/78	X 170
8) 4/57/600/78	X 185
9) 16/72/600/78	X 180
10) 2/63/600/78	X 185

11 : *Globigerina (Subbotina) hornibrooki* BRONNIMANN, 1952. Ieper Formation.

11) EF/39	X 160

12 - 17 : *Globigerina officinalis* BOLLI, 1957. Rupel Formation, Boom Clay.

12) EF/40	X 150
13) 23/21/600/78	X 175
14) 15/51/600/78	X 175
15) 14/51/600/78	X 160
16) 12/57/600/78	X 160
17) 13/57/600/78	X 135

18 - 24 : *Globigerina ouachitaensis* HOWE & WALLACE, 1932. Rupel Formation, Boom Clay.

18) 17/77/600/78	X 115
19) 18/56/600/78	X 115
20) 10/72/600/78	X 115
21) 17/56/600/78	X 105
22) 9/72/600/78	X 105
23) 27/59/600/78	X 90
24) 16/77/600/78	X 115

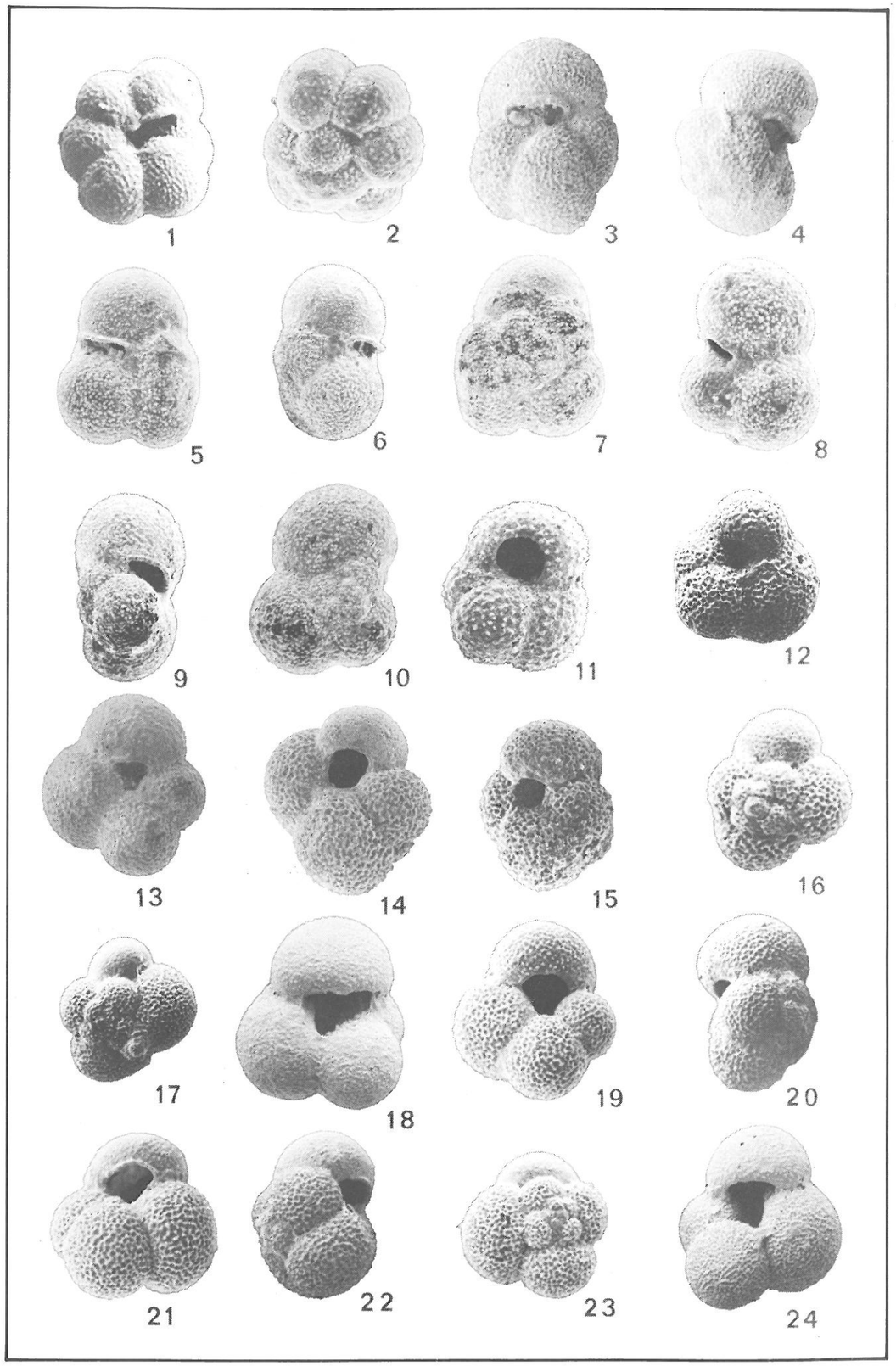


PLATE 14

1 - 15 : *Globigerina pachyderma* (EHRENBERG, 1861). Diest Formation, Deurne Sands.

1) 23/77/600/78	X 100
2) 13/78/600/78	X 100
3) 22/77/600/78	X 100
4) 12/78/600/78	X 100
5) 19/76/600/78	X 100
6) 18/79/600/78	X 100
7) 24/77/600/78	X 90
8) 14/78/600/78	X 95
9) 25/77/600/78	X 125
10) 15/78/600/78	X 115
11) 17/76/600/78	X 110
12) 17/79/600/78	X 110
13) 18/76/600/78	X 105
14) 15/76/600/78	X 125
15) 15/79/600/78	X 115

16 - 17 : *Globigerina parabulloides* BLOW, 1959. Berchem Formation, Antwerpen Sands.

16) 19/8/600/79	X 105
17) 1/79/600/78	X 90

18 - 23 : *Globigerina praebulloides leroyi* BLOW, 1969. Rupel Formation, Boom Clay.

18) 23/51/600/78	X 135
19) 17/63/600/78	X 100
20) 21/57/600/78	X 105
21) 22/51/600/78	X 135
22) 16/63/600/78	X 105
23) 20/51/600/78	X 105

24 - 30 : *Globigerina praebulloides occlusa* BLOW, 1959. Rupel Formation, Booù Clay.

24) 21/51/600/78	X 100
25) 15/63/600/78	X 115
26) 18/51/600/78	X 105
27) 12/63/600/78	X 110
28) 16/57/600/78	X 105
29) 20/51/600/78	X 105
30) 19/51/600/78	X 100

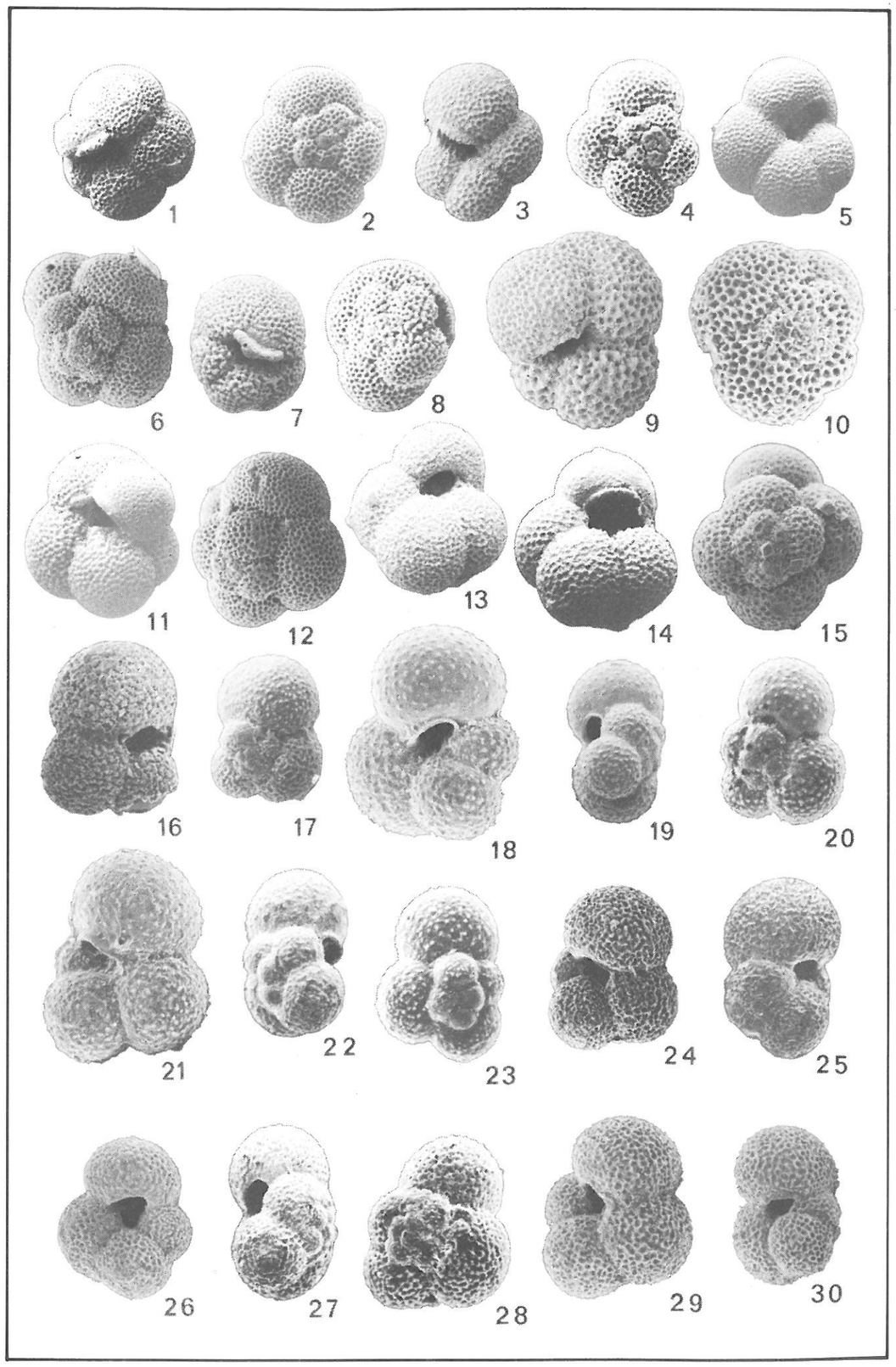


PLATE 15

1 - 7 : *Globigerina praebulloides praebulloides* BLOW, 1959. Rupel Formation, Boom Clay.

1) 16/75/600/78	X 160
2) 17/78/600/78	X 160
3) 17/51/600/78	X 155
4) 11/63/600/78	X 185
5) 15/57/600/78	X 170
6) 16/51/600/78	X 175
7) 10/63/600/78	X 160

8 - 9 : *Globigerina sellii* BORSETTI, 1959. Rupel Formation, Boom Clay.

8) 17/65/600/78	X 160
9) 15/67/600/78	X 150

10 - 19 : *Globigerina tapuriensis* BLOW & BANNER, 1962. Rupel Formation, Boom Clay.

10) 5/56/600/78	X 140
11) 23/71/600/78	X 145
12) 4/56/600/78	X 145
13) 14/59/600/78	X 135
14) 27/71/600/78	X 150
15) 3/56/600/78	X 140
16) 26/72/600/78	X 150
17) 13/59/600/78	X 140
18) 21/65/600/78	X 150
19) 2/66/600/78	X 125

20 - 22 : *Globigerina tripartita* KOCH, 1926. Rupel Formation, Boom Clay.

20) 10/57/600/78	X 115
21) 21/76/600/78	X 115
22) 6/63/600/78	X 105

23 - 28 : *Globigerina winkleri* BERMUDEZ, 1961. Rupel Formation, Boom Clay.

23) 27/65/600/78	X 150
24) 6/73/600/78	X 150
25) 23/67/600/78	X 115
26) 24/65/600/78	X 135
27) 23/67/600/78	X 125
28) 4/73/600/78	X 135

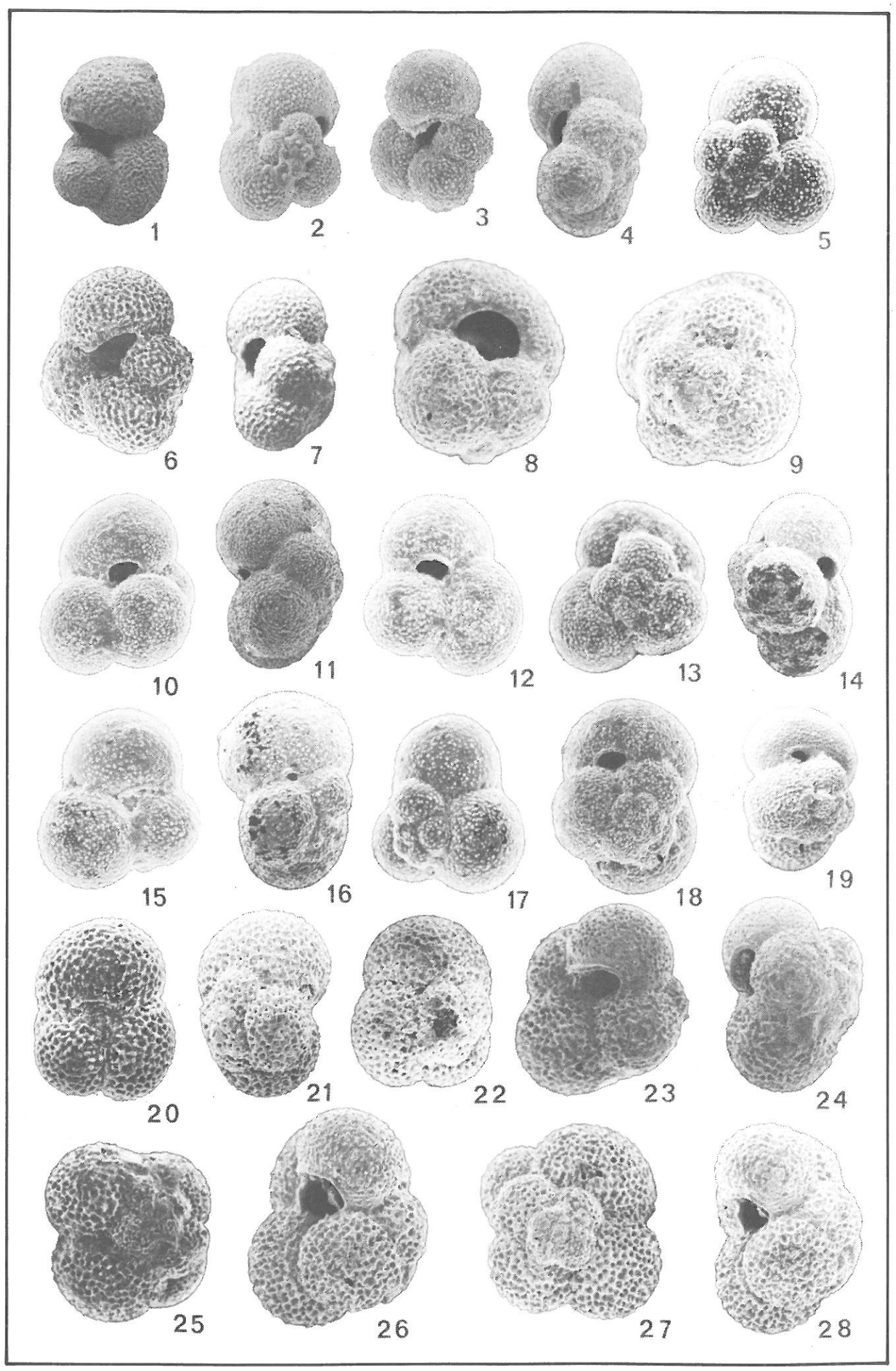


PLATE 16

1 - 3 : *Globigerina woodi woodi* JENKINS, 1966. Berchem Formation, Edegem Sands.

1) 19/68/600/78	X 145
2) 26/70/600/78	X 150
3) 20/74/600/78	X 150

4 - 6 : *Globigerina woodi connecta* JENKINS, 1964.

4) 18/68/600/78	X 175
5) 25/70/600/78	X 160
6) 19/74/600/78	X 160

7 - 17 : *Globigerina yeguaensis* WEINZIERL & APPLIN, 1929. Rupel Formation, Boom Clay.

7) 10/56/600/78	X 125
8)	X 125
9) 20/59/600/78	X 125
10) 8/56/600/78	X 125
11) 18/59/600/78	X 125
12) 1/72/600/78	X 125
13) 7/56/600/78	X 105
14) 19/59/600/78	X 115
15) 7/56/600/78	X 125
16) 30/71/600/78	X 125
17) 17/59/600/78	X 115

18 - 23 : *Globigerina utilisindex* JENKINS & ORR, 1973. Rupel Formation, Boom Clay.

18) 19/65/600/78	X 150
19) 17/67/600/78	X 145
20) 29/72/600/78	X 150
21) 20/65/600/78	X 135
22) 18/65/600/78	X 135
23) 28/72/600/78	X 160

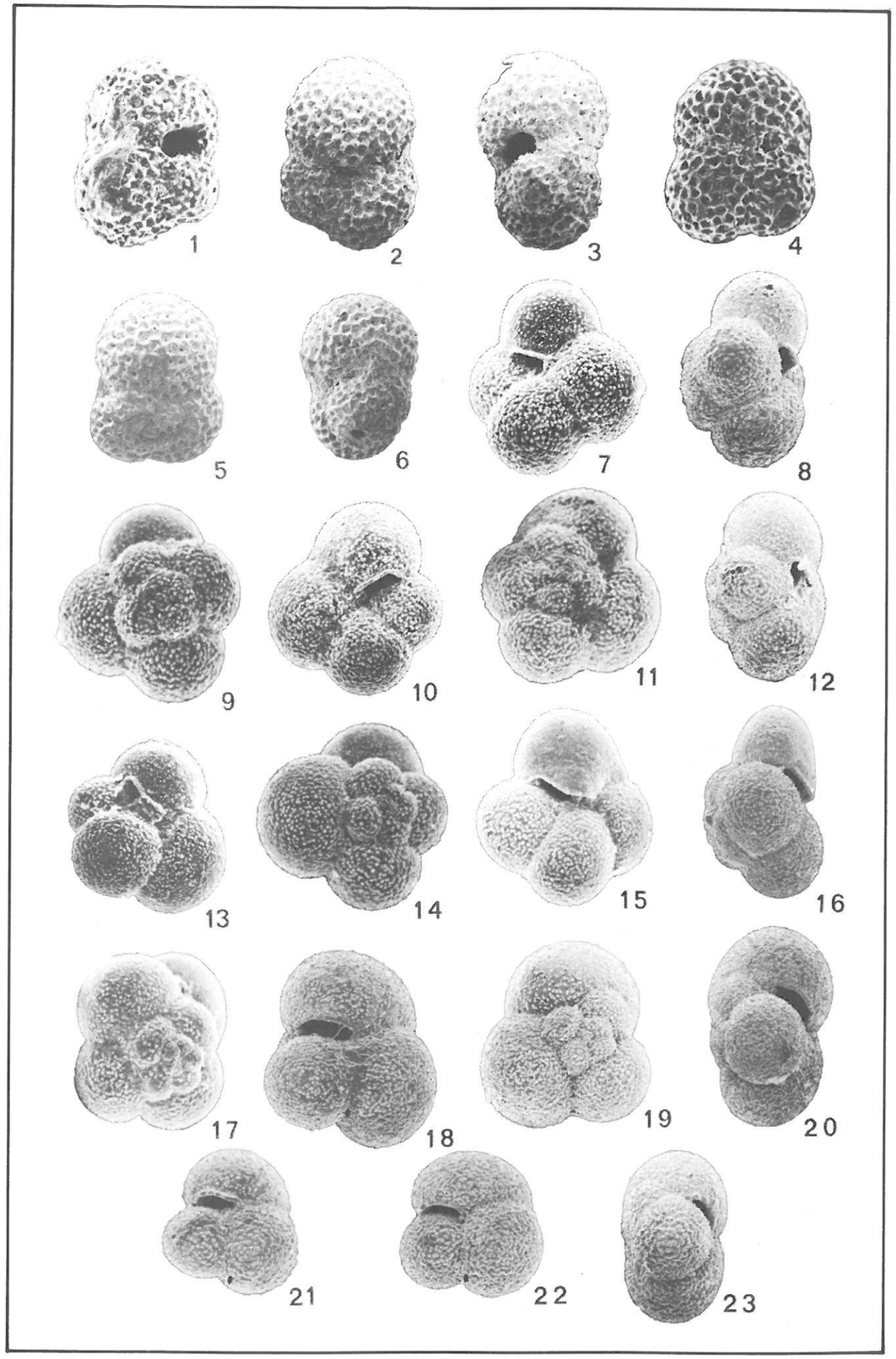


PLATE 17

1 - 6 : *Globigerina (Eoglobigerina) spiralis* BOLLI, 1957. "Tuffeau de Ciply".

1) EF/41	X 175

Ieper Formation.

2) EF/42	X 165
3) EF/43	X 135
4) 16/4/600/79	X 160
5) 5/14/600/78	X 175
6) 7/10/600/78	X 155

7 - 10 : *Globigerina (Globastica) daubjergensis* BRONNIMANN, 1953. "Tuffeau de Ciply".

7) 25/3/600/79	X 160
8) EF/44	X 160
9) 34/26/600/78	X 175
10) 22/28/600/78	X 160

11 - 13 : *Globigerina (Globastica) kozlowskii* BROTZEN & POZARYSKA, 1961. "Tuffeau de Ciply".

11) 8/3/600/79	X 165
12) 27/3/600/79	X 175
13) EF/45	X 185

14 - 15 : *Globorotalia (Morozovella) angulata* (WHITE, 1928). Calcarenite of Mechelen-aan-de-Maas.

14) EF/46	X 145
15) EF/47	X 145

16 - 22 : *Globorotalia (Morozovella) apanthesma* LOEBLICH & TAPPAN, 1957. Lede Formation.

16) 1/28/600/78	X 130
17) 18/10/600/78	X 150
18) 7/28/600/78	X 110
19) 20/10/600/78	X 160
20) 8/15/600/78	X 140
21) 21/10/600/78	X 140
22) 9/15/600/78	X 140

23 - 24 : *Globigerina (Muricoglobigerina) aquiensis* LOEBLICH & TAPPAN, 1957. Ieper Formation.

23) 20/6/600/78	X 150
24) 12/10/600/78	X 150

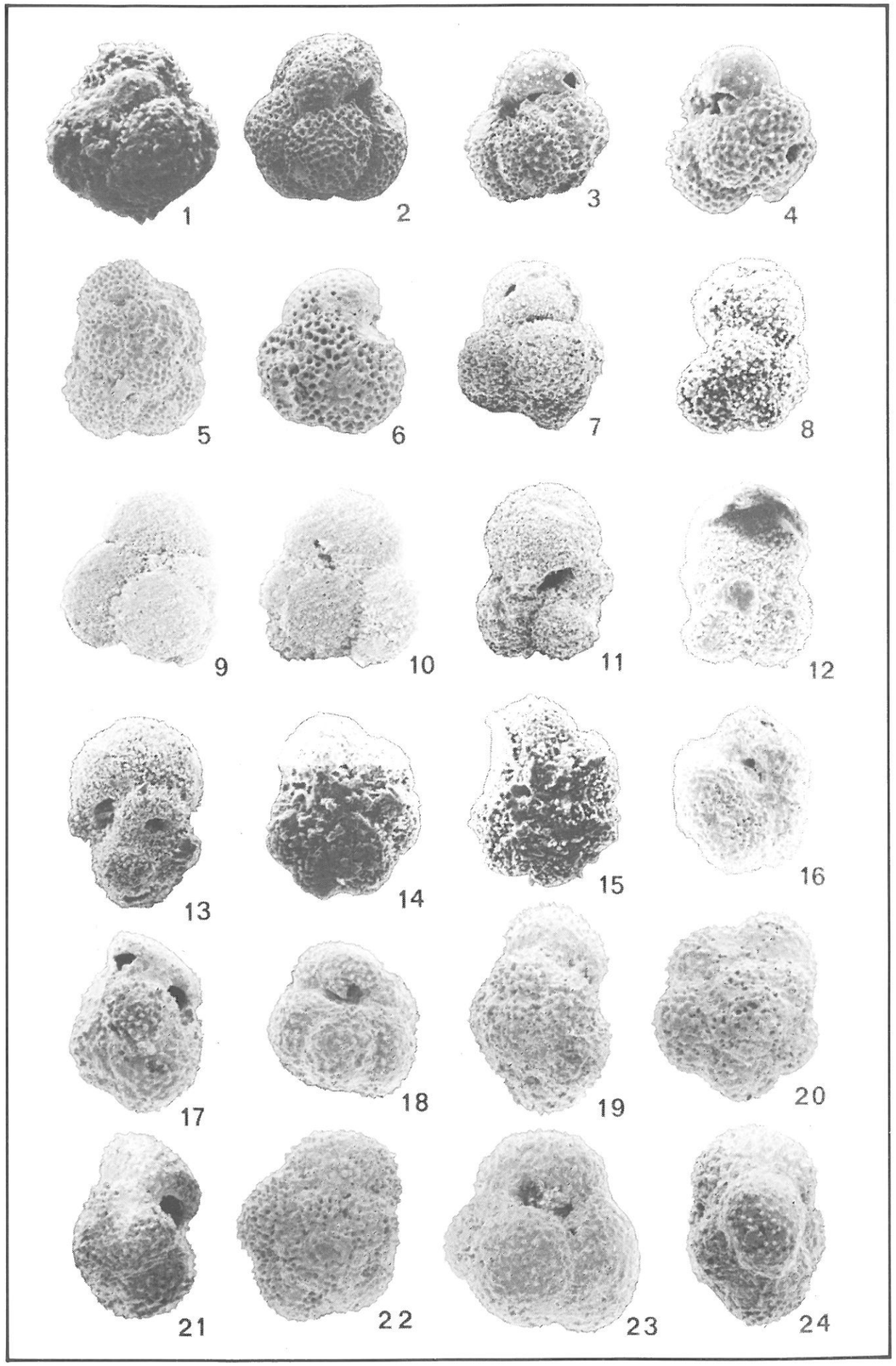


PLATE 18

1 - 7 : *Globigerina (Muricoglobigerina) aquiensis* LOEBLICH & TAPPAN, 1957. "Tuffeau de Lincent".

1) 11/5/600/78	X 155
2) 8/14/600/78	X 115
3) 19/9/600/78	X 125
4) EF/48	X 135
5) 33/14/600/78	X 150
6) 5/9/600/78	X 150
7) 21/13/600/78	X 150

8 - 12 : *Globigerina (Muricoglobigerina) chascanona* LOEBLICH & TAPPAN, 1957. Ieper Formation.

8) 12/6/600/78	X 170
9) 6/10/600/78	X 140
10) 27/14/600/78	X 130
11) 15/4/600/78	X 140
12) 24/14/600/78	X 140

13 - 17 : *Globigerina (Muricoglobigerina) mckannai* WHITE, 1928. "Tuffeau de Lincent".

13) 7/28/600/78	X 90
14) 17/13/600/78	X 100
15) 1/9/600/78	X 100
16) 19/12/600/78	X 105
17) 18/13/600/78	X 100

18 - 19 : *Globigerina (Muricoglobigerina) senni* (BECKMANN, 1953). Ieper Formation.

18) 4/27/600/78	X 160
19) 5/27/600/78	X 160

20 - 24 : *Globigerina (Muricoglobigerina) soldadoensis soldadoensis* BRONNIMANN, 1952. Ieper Formation.

20) EF/49	X 135
21) 22/13/600/78	X 145
22) 27/1/600/79	X 110
23) 1/7/600/79	X 110
24) 28/1/600/79	X 125

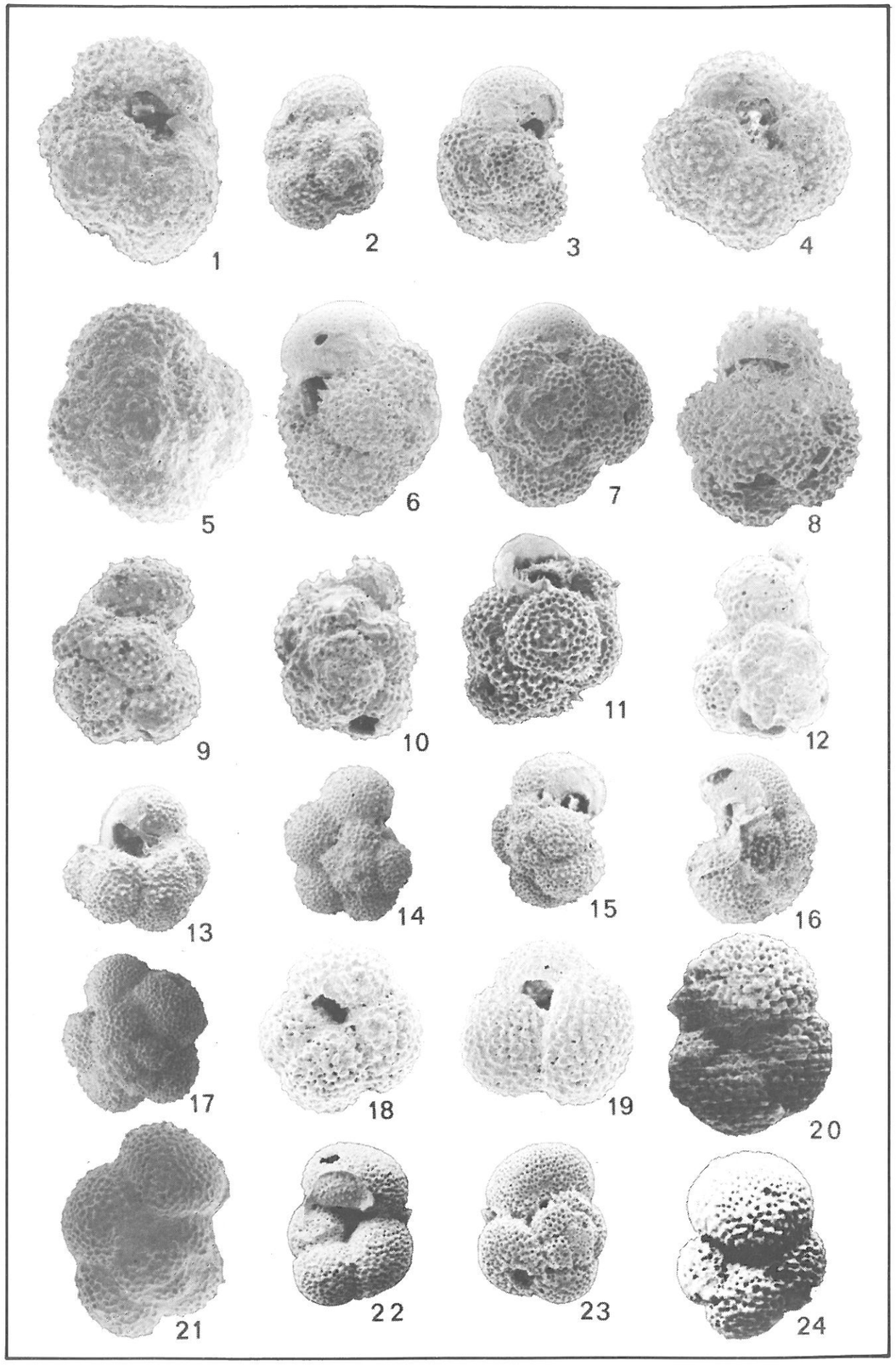


PLATE 19

1 - 2 : *Globigerina (Muricoglobigerina) soldadoensis angulosa* BOLLI, 1957. Ieper Formation.

1) 1/5/600/79	X 105
2) EF/50	X 125

3 - 5 : *Globigerina (Subbotina) frontosa boweri* BOLLI, 1957. Lede Formation.

3) 10/6/600/78	X 175
4) 4/10/600/78	X 150
5) 25/14/600/78	X 140

6 - 10 : *Globigerina (Subbotina) frontosa frontosa* SUBBOTINA, 1953. Lede Formation.

6) 26/1/600/79	X 160
7) 31/6/600/79	X 160
8) 25/1/600/79	X 185
9) 30/6/600/79	X 185
10) 24/1/600/79	X 175

11 - 19 : *Globigerina (Subbotina) haynesi* EL NAGGAR, 1966. "Tuffeau de Lincent".

11) 22/3/600/79	X 160
12) 9/4/600/79	X 160
13) EF/51	X 180
14) 21/3/600/79	X 155
15) 8/4/600/79	X 155
16) EF/52	X 180
17) 23/3/600/79	X 160
18) 10/4/600/79	X 155
19) EF/53	X 175

20 : *Globigerina (Subbotina) triloculinoides parva* EL NAGGAR, 1966. "Tuffeau de Lincent".

20) 27/8/600/79	X 150

21 - 26 : *Globigerina (Subbotina) triloculinoides triloculinoides* PLUMMER, 1926. "Tuffeau de Lincent".

21) 17/6/600/78	X 170
22) 10/10/600/78	X 175
23) 31/14/600/78	X 150
24) 11/6/600/78	X 200
25) 26/14/600/78	X 185
26) 26/14/600/78	X 175

27 - 29 : *Globigerina (Subbotina) velascoensis* CUSHMAN, 1925. "Tuffeau de Lincent".

27) 4/14/600/78	X 150
28) 17/9/600/78	X 180
29) 7/5/600/78	X 185

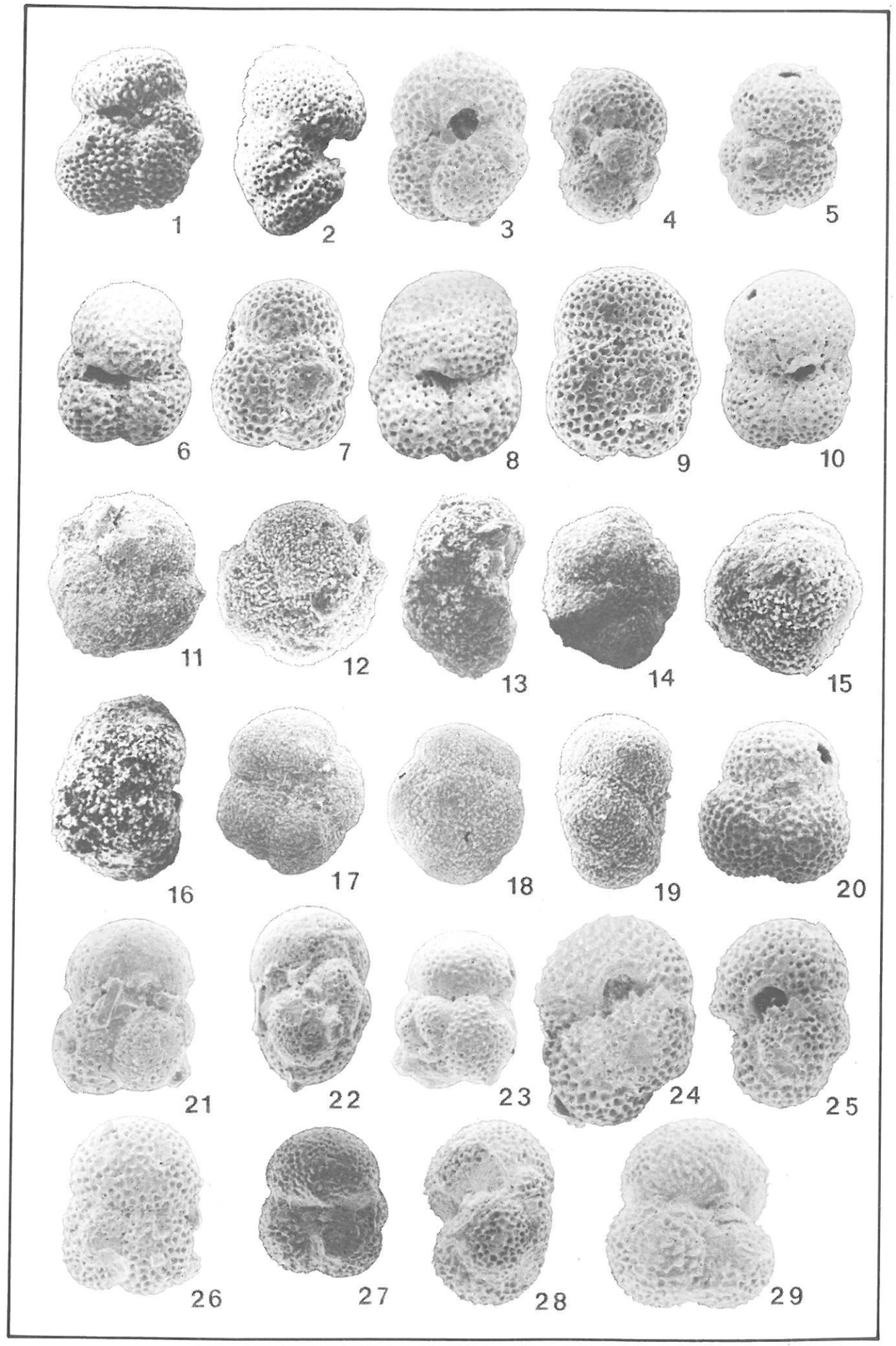


PLATE 20

1 - 6 : *Globigerinoides altiaperturus* BOLLI, 1957. Bolderberg Formation, Houthalen Sands.

1) 4/3/600/79	X 95
2) EF/52	X 80
3)	X 85
4) 6/8/600/79	X 85
5) EF/53	X 85
6) 14/7/600/79	X 80

7 - 8 : *Globigerinoides bollii* BLOW, 1959. Berchem Formation, Antwerpen Sands.

7) 21/75/600/78	X 150
8) 22/78/600/78	X 150

9 - 13 : *Globigerinoides primordius* BLOW & BANNER, 1962. Bolderberg Formation, Houthalen Sands.

9) 24/78/600/78	X 85
10) 23/75/600/78	X 85
11) 23/78/600/78	X 85
12) 22/75/600/78	X 80
13) 24/79/600/78	X 85

14 - 16 : *Globigerinoides quadrilobatus* (D'ORBIGNY, 1846). Berchem Formation, Antwerpen Sands.

14) 24/75/600/78	X 85
15) 25/78/600/78	X 85
16)	X 85

17 - 21 : *Globigerinoides sacculifer* (BRADY, 1877). Berchem Formation, Antwerpen Sands.

17) EF/54	X 80
18) 7/8/600/79	X 75
19) 23/76/600/78	X 85
20) 23/79/600/78	X 100
21) 26/75/600/78	X 90

22 - 25 : *Globigerinoides trilobus trilobus* (REUSS, 1850). Berchem Formation, Antwerpen Sands.

22) 5/2/600/79	X 95
23) 26/2/600/79	X 85
24) 29/75/600/78	X 95
25) 27/78/600/78	X 85

26 - 27 : *Globigerinoides trilobus immaturus* LE ROY, 1939. Berchem Formation, Antwerpen Sands.

26) 28/75/600/78	X 95
27) 27/75/600/78	X 85

28 - 30 : *Praeorbulina transitoria* (BLOW, 1956). Berchem Formation, Antwerpen Sands.

28) 3/2/600/79	X 90
29) 3/3/600/79	X 95
30) 1/3/600/79	X 75

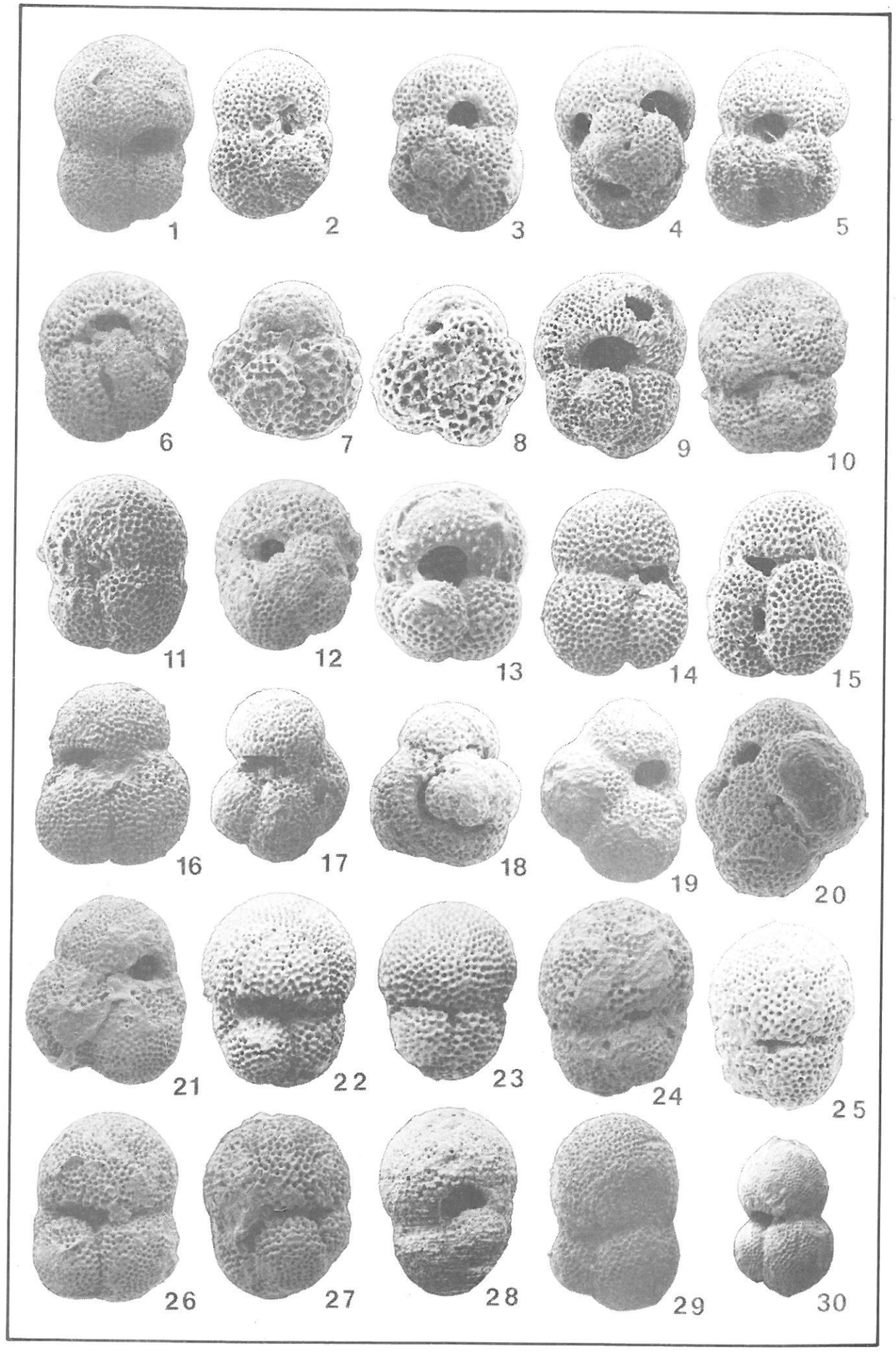


PLATE 21

1 : *Globorotalia (Turborotalia) pseudoobesa* SALVATORINI, 1967. Bolderberg Formation, Houthalen Sands.

1) 14/77/600/78	X 175

2 - 3 : *Globigerinopsis aguasayensis* BOLLI, 1962. Bolderberg Formation, Houthalen Sands.

2) 20/75/600/78	X 185
3) 28/78/600/78	X 160

4 - 6 : *Globoquadrina altispira* (CUSHMAN & JARVIS, 1936). Rupel Formation, Boom Clay.

4) EF/55	X 150
5) EF/56	X 150
6) 13/2/600/79	X 135

7 - 8 : *Globoquadrina dehiscens dehiscens* (CHAPMAN, PARR & COLLINS, 1934). Berchem Formation, Antwerpen Sands.

7) 5/76/600/78	X 150
8) 5/79/600/78	X 150

9 - 10 : *Globoquadrina dehiscens praedehiscens* BLOW & BANNER, 1962. Rupel Formation, Boom Clay.

9) 1/69/600/78	X 185
10) 1/75/600/78	X 175

11 - 13 : *Globoquadrina larmeuri* AKERS, 1955. Rupel Formation, Boom Clay.

11) 9/57/600/78	X 175
12) 20/72/600/78	X 175
13) 5/63/600/78	X 150

14 - 18 : *Globorotaloides suteri* BOLLI, 1957. Rupel Formation, Boom Clay.

14) 5/22/600/78	X 230
15) 8/18/600/78	X 300
16) 4/66/600/78	X 215
17) 15/73/600/78	X 180
18) 4/68/600/78	X 200

19 - 21 : *Orbulina universa* D'ORBIGNY, 1939. Berchem Formation, Antwerpen Sands.

19) 3/79/600/78	X 90
20) 2/76/600/78	X 90
21) 4/76/600/78	Detail of fig.20

22 - 25 : *Sphaeroidinellopsis* sp.. Berchem Formation, Antwerpen Sands.

22) 31/75/600/78	X 175
23) 29/78/600/78	X 175
24) 29/78/600/78	X 175
25) 30/78/600/78	X 175

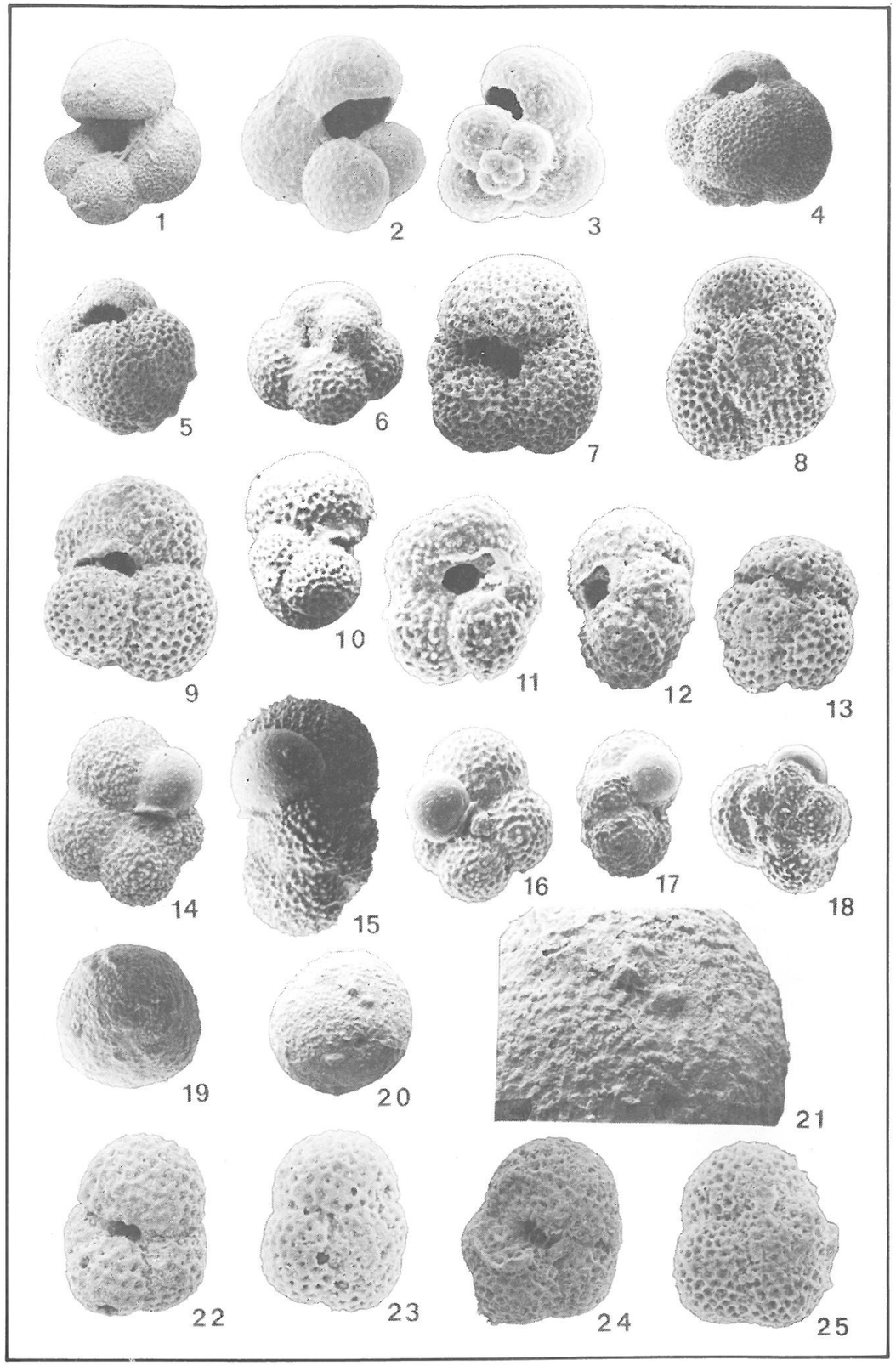


PLATE 22

1 - 2 : *Globigerinita echinata* (BOLLI, 1957). Asse Formation.

1) 7/5/600/79	X 180
2) 6/5/600/79	X 200

3 - 5 : *Globigerinita dissimilis* (CUSHMAN & BERMUDEZ, 1937). Berchem Formation, Antwerpen Sands.

3) EF/57	X 130
4) 20/76/600/78	X 130
5) 20/79/600/78	X 120

6 - 9 : *Globigerinita stainforthi* (BOLLI, 1957). Berchem Formation, Antwerpen Sands.

6) 11/76/600/78	X 150
7) 11/79/600/78	X 160
8) 12/76/600/78	X 170
9) 12/79/600/78	X 170

10 - 18 : *Globigerinita martini* BLOW & BANNER, 1962. Rupel Formation, Boom Clay.

10) EF/58	X 140
11) 15/52/600/78	X 130
12) 2/65/600/78	X 125
13) 4/52/600/78	X 115
14) 18/52/600/78	X 125
15) 16/52/600/78	X 95
16) 19/52/600/78	X 105
17) 30/63/600/78	X 125
18) 35/57/600/78	X 125

19 - 21 : *Globigerinita unicava primitiva* BLOW & BANNER, 1962. Rupel Formation, Boom Clay.

19) 14/52/600/78	X 140
20) 8/66/600/78	X 140
21) 7/68/600/78	X 150

22 - 24 : *Globigerinita unicava unicava* BOLLI, 1957. Rupel Formation, Boom Clay.

22) 7/66/600/78	X 150
23) 18/73/600/78	X 160
24) 8/68/600/78	X 125

25 - 26 : *Globigerinita pera* (TODD, 1957). Rupel Formation, Boom Clay.

25) 15/66/600/78	X 115
26) 14/68/600/78	X 115

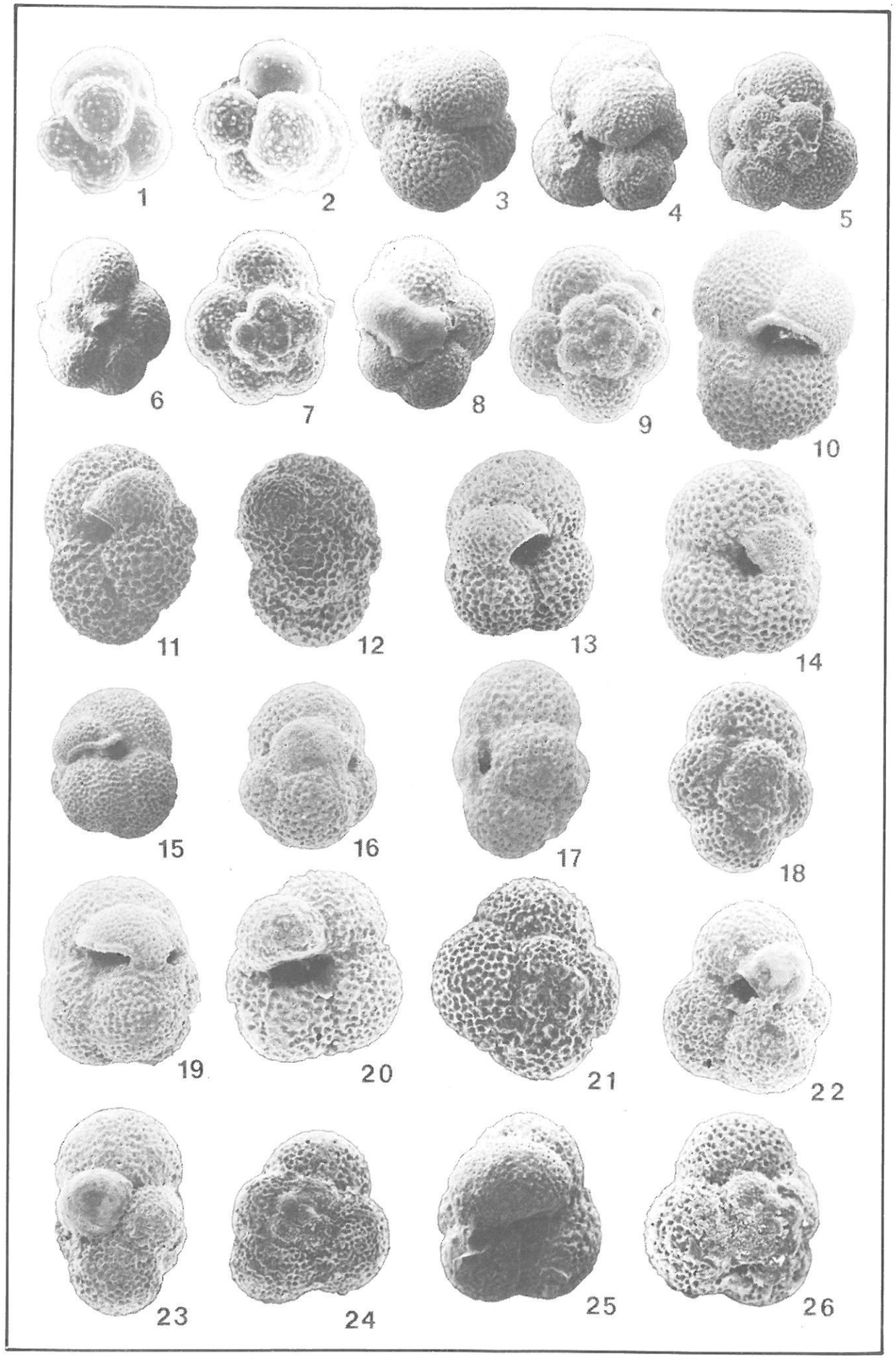


PLATE 23

1 : *Globigerinita pera* (TODD, 1957). Rupel Formation, Boom Clay.

1) 22/73/600/78	X 115

2 - 7 : *Globigerinita taroubaensis* (BRÖNNIMANN, 1952). Brussels Formation.

2) 7/1/600/79	X 175
3) 13/6/600/79	X 160
4) 5/1/600/79	X 160
5) 11/6/600/79	X 160
6) 4/1/600/79	X 175
7) 10/6/600/79	X 170

8 - 14 : *Globigerinita turgida* (FINLAY, 1939). Brussels Formation.

8) 6/1/600/79	X 180
9) 12/6/600/79	X 150
10) 9/1/600/79	X 160
11) 15/6/600/79	X 160
12) 8/1/600/79	X 175
13) 14/6/600/79	X 170
14) 2/1/600/79	X 175

15 - 17 : *Globorotalia (Turborotalia) compressa* (PLUMMER, 1926). "Tuffeau de Ciply".

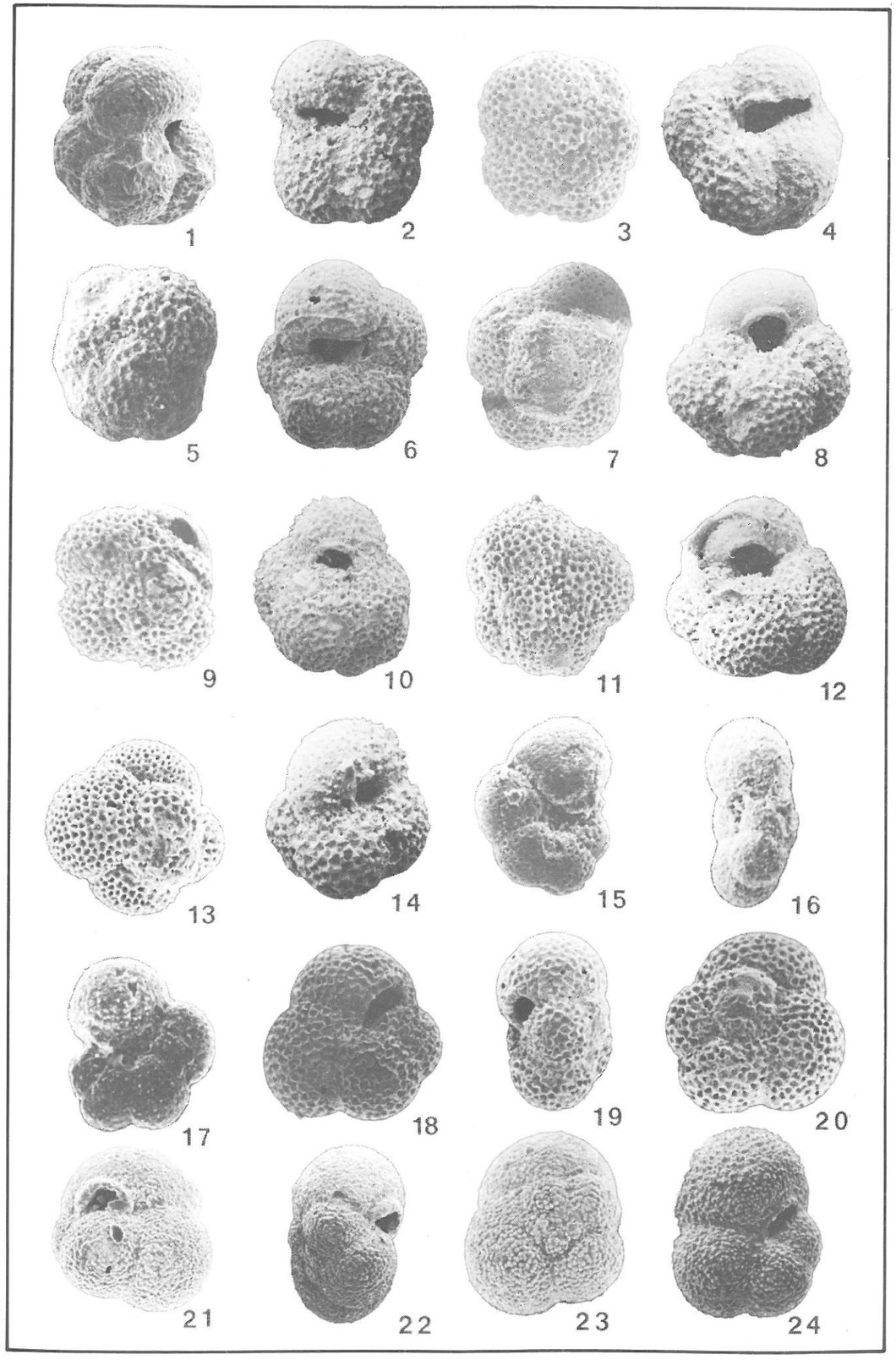
15) EF/59	X 175
16) EF/60	X 180
17) EF/61	X 160

18 - 20 : *Globorotalia (Turborotalia) increbescens* (BANDY, 1949). Rupel Formation, Boom Clay.

18) 34/65/600/78	X 160
19) 11/73/600/78	X 140
20) 32/67/600/78	X 165

21 - 24 : *Globorotalia (Turborotalia)* sp.. Rupel Formation, Boom Clay.

21) 16/65/600/78	X 170
22) 26/72/600/78	X 170
23) 14/67/600/78	X 170
24) 8/66/600/78	X 170



ISSN 0250 - 7803

Author's address :

Instituut voor Aardwetenschappen
Afdeling Historische Geologie
Redingenstraat 16 bis
B - 3000 LEUVEN