Foraminifera of the Eptahorion Formation (early Oligocene) of the Mesohellenic Basin, northern Greece

ROBERTO BARBIERI
Agip SpA,
SGEL Servizio Studi Geologici
P.O. Box 12069,
20120 Milano, Italy

ABSTRACT
Planktonic and benthic foraminifera from the type area of the early Oligocene Eptahorion Formation (Mesohellenic Basin, northern Greece) have been ranged and partly described and figured. Altogether, about 130 taxa were identified. According to the current age assignments, the formation is attributable to Blow's Zones P20 and P21. The record of benthic palaeoecologic indices has thrown light on bathymetric history of the formation. The deposition of the whole sequence, after the initial transgressive phase, occurred in a marine, relatively deep environment. Palaeontologic evidence indicates few changes, ranging from the epibathyal to the outer neritic bathymetric domain. J. Micropalaeontol., 11 (1): 73-84, June 1992.

INTRODUCTION
The Oligocene-Miocene succession of the Mesohellenic Basin has received little attention in terms of detailed biostratigraphic investigations. As recently described and named by Ori et al. (1990) during their regional study of the area, the Oligocene and early Miocene rocks of the northern Mesohellenic Basin are wholly represented by four main units, from the base to the top they are the Eptahorion Formation, the Taliaros Formation, the Voion Formation and the Pendalofos Formation. A detailed examination of the biostratigraphy and palaeoecology of the first unit by means of foraminifera is the subject of this study.

PREVIOUS STRATIGRAPHIC WORK
Brunn (1956) described in detail the formation (“Marnes d’Eptahorion”) in its type area, around the village of Eptahorion. He referred the unit to the Stampian on the basis of the recovery of stratigraphically significant molluscan fauna. Desprairies (1979) described the stratigraphy and sedimentology of the formation (“Formation d’Eptahorion”) accepting the age of the unit according to the biostratigraphic data of Brunn. He again correlated the formation with the “Marnes de l’Arakhtos” and the “Gres d’Anemorakhi”, of the Internal Ionian Zone (western tectonic zone of the Hellenids), without defining their chronostratigraphic limits or stratigraphic rank. In the Ionian Zone, Bizon & Bizon (in IGRS-IFP, 1966) described poorly fossiliferous, flysch deposits lithologically and chronologically comparable to those of the Mesohellenic Basin. In recent years, papers dealing with the biostratigraphic evolution of the Mesohellenic Oligocene have been published by Soliman & Zygojannis (1979a and b, 1980). The basic material of their study were some sections cropping out in the southern area of the Oligocene basin (Meteora region). Data from the north (Eptahorion area) are limited to some planktonic and benthic foraminiferal lists obtained from unknown stratigraphic locations. Listed planktonic species are Globigerina ampliapertura, G. angulisuturalis, G. ciperoensis, G. sellii and Globorotalia opima. Marginal marine facies (neritic and littoral) referred to the Eptahorion Formation are described from the Grevena Basin and the northern part of the Thessalia Basin, both located southeast of the type area and chronologically assigned to the late Oligocene (Steininger et al. 1985). More recently, Ori et al. (1990) discussed in detail the Oligocene-early Miocene stratigraphy of the northern Mesohellenic Basin. The biostratigraphic and palaeoenvironmental framework was based on foraminiferal data and on relationships between lithofacies and biofacies.

AREA OF INVESTIGATION, LITHOLOGY AND DEFINITION
The Eptahorion Formation extends over a large geographic area in north-western Greece. It typically outcrops in the area around the village of Eptahorion, western Macedonia, in a series of well exposed hillsides. The extent of the formation in the study area is shown in Fig. 1.

The formation unconformably overlies the ophiolites of the Subpelagonian Zone. The contact of the formation with the overlying Taliaros Formation (late Oligocene), mainly sandstones and arenaceous shales, is marked by an unconformity. In its type area the unit consists of a generalized fining upward sequence, more than 1100 meters thick (Ori et al., 1990), with mainly arenaceous conglomerates at the base totally devoid of macro and microfossils. The formation grades upward into sandstones interbedded with silty marls and shales with relatively rich foraminiferal contents. The fine-grained interbeds in the lowest part of the formation contain a few mollusc and ostracod-rich horizons.

MATERIAL AND METHODS
One continuous section, almost totally exposed within the area of investigation, with minor portions covered by vegetation, was measured (Fig. 2). Planktonic and benthic foraminifera were studied from 38 samples collected in the sediments...
exposed along the road in the hillsides that run westward from the village of Eptahorion (Fig. 1). Samples were collected at intervals of about 50-100 metres within the lower portion of the section, and at intervals of 5-20 metres in the middle and upper parts.

Samples were crushed and disaggregated by hydrogen peroxide solution (30%) or dimethylbenzilammonium chloride solution (10%), from at least one hour to 24 hours, and washed with distilled water through a 200 mesh sieve.

AGE AND ZONE ASSIGNMENTS

Zones are assigned using both the classic zonal scheme established by Blow (1969) and that more recently proposed by Bolli & Saunders (1985). The last two authors mainly used the Oligocene zonal definitions as originally defined by Bolli (1957).

Zones recognized are defined as follows: *Globorotalia opima opima* Zone represents a taxon-range zone and it is therefore defined by the range of the zonal marker (Bolli and Saunders, 1985). Zone P21 has its base defined by the first occurrence of *Globigerina angulisuturalis* (Blow, 1969). Thus, according to the original definition, the lower part of the *G.opima opima* Zone, which corresponds to the interval immediately below the first occurrence of *G. angulisuturalis*, belongs to Zone P20.

PLANKTONIC FORAMINIFERA

A total of 33 planktonic taxa were identified, some of them having stratigraphic significance. Their distribution and abundance is shown in Fig. 3. Samples collected from the lower part of the section, a total of about 300 metres, are totally devoid of planktonic species. Almost all the fossiliferous samples investigated contain deformed or crushed specimens, occasionally pyritized. Within some intervals planktonic specimens are rare and poorly preserved (e.g. from samples 31 to 34). But the interval including the boundary between Zones P20 and P21 (from samples 8 to 18) yielded relatively diverse and well preserved assemblages. The four main genera representing most of the recorded taxa are *Catapsydrax*, *Globigerina*, *Globoquadrina* and *Paragloborotalia*.

The generalized morphologic affinity within the planktonic foraminiferal population is due to a peculiar characteristic of the Oligocene assemblages, namely a worldwide dominance by small pentacamerate globigerinids and small to large tetracamerate globigerinids (discussed in detail by Stainforth, 1975 and Stainforth & Lamb, 1981). The relatively low diversity between temperate and tropical areas in the Oligocene oceanic plankton assemblages (Kennett, 1978; Sancetta, 1979) is well known.

According to the stratigraphic ranges of the planktonic foraminifera provided by Baumann (1970), Blow (1969), Bolli (1966), Bolli & Saunders (1985), Stainforth et al (1975) and Stainforth & Lamb (1981), the assemblages of the Eptahorion Formation range from the upper part of Zone P20 to Zone P21 of Blow's zonal scheme. With respect to this relatively short stratigraphic interval, most of the recorded taxa are long ranging.

The first occurrence of *Globigerina angulisuturalis* provides an excellent worldwide datum used by a number of authors to define the base of their *Globorotalia opima* Zone (e.g. Baumann, 1970; Stainforth & Lamb, 1981). The boundary between Zone P20 and P21 is placed in the present section with sample 10, on the basis of the appearance of *G.angulisuturalis*. The first record of *Paragloborotalia opima* occurs in the same sample and is believed to be non evolutionary. There is no trace, indeed, of any overlapping range between *Globigerina ampliaperta* and *P.opima*, which would correspond to the lowest interval of *Globorotalia opima opima* taxon-range Zone. The concurrence of the above two taxa is widely reported in the literature, both in low latitude (Blow, 1969; Stainforth et al. (1975) and in the Tethys area (Baumann, 1970; Molina, 1979). Nevertheless, this point is still puzzling and several authors reject the assumed overlap (Beckmann et al. 1981; Bolli and Saunders, 1985).

Late Oligocene—Miocene taxa, such as "*Globorotalia*" *siakonis* and *Globoquadrina dechiscens praedechiscens*, whose appearance is usually placed within Zones P21/P22, are also present. These two species generally exhibit a close first occurrence, as confirmed by the Eptahorion assemblages, with partial overlap...
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Fig. 2. Stratigraphic columnar section of the Eptahorion Formation, northern Mesohellenic Basin.

of the P. opima range.

Finally, the P. opima appearance is here believed to be a "local late appearance", presumably due to sedimentary factors rather than to ecologic ones.

G. ampliapertura represents an excellent marker to identify in the broadest term the lower part of the Oligocene. In the studied material no specimens of this widespread taxon were recovered. Specimens figured as G. ampliapertura by Soliman & Zygojannis (1980, pl. 24, figs. 2-3) clearly differ from the Bolli's type figures; thus, they are devoid of the equivalent biostratigraphic meaning.

No main discrepancies within the planktonic foraminiferal distribution are noted, with the remarkable exception of Globorotalia tapuriensis. This rare taxon has been recorded in just two samples from Zone P21. It is seldom given because of the difficulty in keeping the subspecies separate from the closely related G. tripartita tripartita. Nevertheless, its distribution exhibits an extinction level which usually does not exceed Zone P20. Such shifting upward of the range of G. tapuriensis has already been described in the Hungarian Oligocene (Sztrakos, 1979). The range of the other significant species is similar, with minor differences, to those usually reported in the literature.

Despite the lack of foraminiferal records in the lower part of the section, one should be aware that there is no evidence for these beds in a zone older than P20. On the contrary, the early occurrence of taxa that typify Zones P20/P21, close to the G. angulisuturalis datum, provides some confidence in the attribution of the whole lower section to Zone P20.

There is no evidence, within the planktonic record, of any remarkable change in temperature. During the time interval of the deposition of formation planktonic foraminifera maintained their warm water characteristics. According to Keller (1983) a major cooling episode, related to an eustatic sea level drop (Haq et al. 1987) occurred at the P20/P21 boundary.

BENTHIC FORAMINIFERA

The marly and shaly samples collected in the Eptahorion section contain a generally diverse benthic foraminiferal fauna. These assemblages usually outnumber the planktonics, by 50% to more than 95%. The section may be divided into four palaeobathymetric zones where 92 taxa have been recorded and ranged (figure 4). A number of long ranging, frequently occurring species, such as Guttulina communis, most of the nodosariids and lenticulinids, have not been listed. Although benthic foraminifera are generally more preservable and resistant to mechanical breakage than planktonics (Douglas, 1973), the benthic assemblages constantly contain crushed and deformed specimens. The assemblages, as well as any single taxon, have limited biostratigraphic value, most of the common taxa exhibiting wide stratigraphic range.

Species reported worldwide from the Oligocene strata include Spiroplectammina clotho, Osangularia pteromphalia, U. cocoaensis group, U. eocaena, U. alazanensis, Planulina marialana, Bulimina palmerae, Anomalinitoides ammonophila, Baggina valvulinaformis, Almaena hieroglyphica, Heterolepa costata.

A few species, generally the rare ones, can be useful in dating sediments. The occurrence of Bolivina semistrata in the lower part of Zone P21 should be emphasized. This taxon seems to reach its stratigraphic top within the Rupelian (early Oligocene) in the northern Alps (Lindenberg, 1965; Hofmann, 1967). The uppermost beds of the formation show the appearance of Anomalinitoides maioricensis, which is restricted to the upper Oligocene and Miocene strata in northern Italy (Agip, 1982). The coarsely perforated Cibicidoides havaenensis
could exhibit significant stratigraphic value, Schnitker (1979) and Miller (1983) gave the range this species up to the late Oligocene in the Bay of Biscay (Zones P21/P22). During the Late Palaeogene, the deep-sea benthic foraminifera seem to exhibit a cosmopolitan distribution (Berggren & Phillips, 1971; Douglas, 1973; Proto Decima & Bolli, 1978; Thomas, 1985) with some remarkable worldwide faunal changes. The comparison of the studied assemblages with time equivalent Caribbean benthic population is difficult to account for reasonable limits in confidence of the taxonomic identification. Nevertheless, this comparison suggests some affinities: at least 15 stratigraphically significant species are common to both these provinces, they are Anomalinoides alazamensis, A. pseudogrosserugosus, Bulimina palmerae, B. rostrata (=B.alazamensis), Gyroidinoides subangulatus, Gyroidina soldani, Heterolepa costata, H.praecincta, Cibicidoides pseuoungerianus C.pachyderma, Planulina mariulana, P.renzi, Uvigerina havanensis, U.jacksonensis.

### PALAEOBATHMETRY

The Eptahorion section has been divided into four zones based on foraminiferal abundance and palaeobathymetric inference (Fig. 4).

Samples from 1 to 5 identify the zone A. The interval is almost totally barren, a few unidentified foraminiferal specimens, crushed and spatized, were collected from sample 1. Molluscan and ostracod shells and fragments were collected from the same level of sample 5 (Colalongo, personal communication, recognized an oligotopic, brackish ostracod fauna). Abundant glauconite and pyrite are mineral accessories constituents. Despite the extremely poor fossil record, sedimentological evidence suggests a proximal deltaic, shallow water environment. (Desprairies, 1979; Ori et al, 1990).

Zone B ranges from samples 6 to 28 and includes the boundary between Blow’s Zones P20 and P21. Benthics are particularly abundant and diverse. The lower boundary of the zone B is based on the first, sudden foraminiferal recovery. The dominant taxa are Spiroplectammina carinata, Dorothis beloides, uvigerinids, Globocassidulina globosa/subglobosa group, Melonis affinis, Bulimina palmerae, Alamaea hieroglyphica, gyroidinoids. In most of these samples a significant number of costate uvigerinids is recorded, they include Uvigerina cocoaei group, U.galewasj and U. eocaena. This group, well known as an excellent bathymetric marker, is generally assigned to the upper epibathyal environment (Pflum & Frerichs, 1976; Pujo-Lamy, 1984; Boersma, 1986). Direct relationship between ornamentation and depth was suggested by Sztrakos (1983) on the basis of the Hungarian costate uvigerinids. The Eptahorion material contains comparable results: predominance of costate specimens within zone B and, by contrast, weakly costate specimens of shallower conditions, in the overlying zone C. It is probable that Uvigerina cocoaei subspecies (cocoaei and jacksonensis, undivided in this study) represent a cline (ecophenotypic variants). Together with the listed taxa, environmentally diagnostic species include Valvulineria palmaraeensis, Signilimita tenuis and Bulimina rostrata.

The prevailing palaeobathymetric interpretation of the benthic assemblages, suggests epibathyal conditions, with water depth not exceeding 500-700 meters. The very rare
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| Sample | Taxon |
|--------|-------|
| P20    | P21   |
|        | Biostratigraphic zones (BLOW, 1969) |
| Biostratigraphic zones (BLOW, 1969) |

Fig. 4. Stratigraphic ranges of benthic foraminifera from the Eptahorion Formation.
recovery of a number of taxa commonly widespread in the Oligocene bathyal strata, such as Globosira spp., Cyclammina spp., Melonis spp. and Cibicidoides havanaensis, confirm this interpretation. Assemblages comparable with those described from zone B are reported by Sztrakos (1979) from the epibathyal sediments of the Hungarian Oligocene.

Zone C extends from sample 28 to 37. It is assigned to the upper epibathyal toward outer neritic environment. This interval is characterized by a sharp decrease in the species number. Dominant taxa of the underlying zone A reoccurs here. Bathymetric index species include Melonis affinis, Bulrinina palmerae, B. prorata, Cibicidoides robertsonianus. The latter species, widely reported by authors as a lower epibathyal taxon, has its upper interval is characterized by a sharp decrease in the species number. Dominant taxa of the underlying zone are still present, but reduced in number. New taxa rarely occur and include Cucumella tenuistriata.

The recovery of Pararotalia sp., Uvigerina cocoaensis and Paragloborotalia opima, except for the lower portion, in which age-diagnostic foraminifera are virtually missing. An attribution to Zone P21 is, therefore, indirectly derived from the zonal attribution of the overlying strata. A finer delineation of the zonation is not possible from the data at hand. The first occurrence of Globigerina angulisuturalis in the middle part of the formation allows the recognition of Zone P21, providing a reliable worldwide correlation datum.

Above the palaeoecological Zone A, signalling probable inadequate conditions of depth and salinity for foraminiferal life, there is no evidence of marked or dramatic bathymetric changes. The minor differences recorded range within the lower epibathyal-outer neritic interval.

**SYSTEMATIC DESCRIPTIONS**

Order **Foraminiferida** Richwald, 1830

Superfamily **Globigerinacea** Carpenter, Parker & Jones, 1862

Family **Globigerinidae** Carpenter, Parker & Jones, 1862

Genus **Catapsydrax** Bolli, Loeblich & Tappan, 1957

**Catapsydrax dissimilis** (Cushman & Bermudez, 1937) 1937 Globigerina dissimilis Cushman & Bermudez; p. 25, pl. 3, figs 4-6.

**Catapsydrax perus** (Todd, 1957) (Pl. 1, fig. 10)

1957 Globigerina pera Todd: p. 301, pl. 70, figs. 10-11.

**Catapsydrax unicavus** Bolli, Loeblich and Tappan, 1957 1957 Catapsydrax unicavus Bolli, Loeblich and Tappan: p. 37, pl. 7, fig. 9.

Genus **Globigerina** d'Orbigny, 1826

**Globigerina angulisuturalis** Blow, 1969 1969 Globigerina ciperoensis angulisuturalis Blow: pp. 379-380, pl. 11, figs. 1-5.

**Globigerina angulisuturalis** Bolli, 1957 (Pl. 2, fig. 1)

1957 Globigerina ciperoensis angulisuturalis Bolli: p. 109, pl. 22, fig. 11.

**Explanation of Plate 1**

(all figures are x115)

Figs. 1-3. *Globoquadrina cartieri* (Chaproniere). Ventral, peripheral and dorsal views. Zone P21.

Figs. 4-6. *Globoquadrina eaquttera* (Jenkins). Ventral, peripheral and dorsal views. Zone P20.

Figs. 7-9. *Globoquadrina* sp. *cf. siakensis* (Le Roy). Ventral, peripheral and dorsal views. Zone P20.

Fig. 10. *Catapsydrax perus* (Todd). Ventral view. Zone P20.

Fig. 11. *Globoquadrina praedehiscens* Blow & Banner. Ventral view. Zone P21.
Globigerina ciperoensis Bolli, 1954
1954 Globigerina ciperoensis ciperoensis Bolli: pp. 1-3, figs. 3-4.

Globigerina corpulenta Subbotina, 1953
(Pl. 2, figs. 10-11)
1953 Globigerina corpulenta Subbotina: p. 76, pl. 9, figs. 5-7.

Globigerina cryptomphala Glaessner, 1937
1937 Globigerina bulloides d'Orbigny var. cryptomphala Glaessner: p. 29, pl. 1, fig. 1.

“Globigerina” euapertura Jenkins, 1960
(Pl. 1, figs. 4-6)
1960 Globigerina euapertura Jenkins: p. 351, pl. 1, fig. 8.
Remarks. The species represents a conspicuous element within the Eptahorion microfauna, with typical and abundant specimens. According to Chapronière (1981) “Globigerina” praeapetus Blow is a junior synonym of G. euapertura.

Globigerina gortanii (Borsetti, 1959)
(Pl. 2, fig. 6)
1959 Catapsydrax gortanii Borsetti: p. 205, pl. 1, fig. 1.
Remarks. Few specimens referable to Globigerina praeturrurilina Blow & Banner (plate 2, fig. 5), occurring in the lower part of the section, are located under the heading of G. gortanii.

Globigerina obesa (Bolli, 1957)
1957 Globorotalia obesa Bolli: p. 119, pl. 29, figs. 2-3.

Globigerina officinalis Subbotina, 1953
(Pl. 2, fig. 9)
1953 Globigerina officinalis Subbotina: p. 78, pl. 11, figs. 1-7.

Globigerina ouachitaensis ouachitaensis Howe & Wallace, 1932
1932 Globigerina ouachitaensis Howe & Wallace: p. 74, pl. 10, fig. 7.

Globigerina ouachitaensis gnaucki Blow & Banner, 1962
1962 Globigerina ouachitaensis gnaucki Blow & Banner: p. 91, pl. 9, figs. L-N.
Remarks. Typical but rare specimens referable to this subspecies are recorded from several samples within the lower part of Zone P21.

Globigerina praebulloides leroyi Blow & Banner, 1962
1962 Globigerina praebulloides leroyi Blow & Banner: p. 93, pl. 9, figs. R-T.

Globigerina praebulloides occlusa Blow & Banner, 1962
1962 Globigerina praebulloides occlusa Blow & Banner: p. 93, pl. 9, figs. U-W.

Globigerina praebulloides praebulloides Blow, 1959
1959 Globigerina praebulloides Blow: p. 180, pl. 8, fig. 47.
Remarks. Although all the praebulloides subspecies are easily identifiable, the presence of intermediate specimens is common, and it makes their abundance higher than plotted in the distribution chart. They always represent a conspicuous element within the assemblage of small globigerinids.

Globigerina venezuelana Hedberg, 1937
1937 Globigerina venezuelana Hedberg: p. 681, pl. 92, fig. 7.

Globigerina sp. cf. woodi connecta Jenkins, 1964
1964 cf. Globigerina woodi connecta Jenkins: p. 72, fig. 1.
Remarks. Only one specimen of this taxon is recorded from the sample 28.

Genus Globoquadrina Finlay, 1947
Globoquadrina cartieri (Chapronière, 1981)
(Pl. 1, figs. 1-3)
1981 Subbotina cartieri Chapronière: pp. 114-116, figs. 5 A-E.
Remarks. Specimens referable to Globoquadrina cartieri occur from several samples, they strictly correspond to the type figures and extend the geographic distribution of the taxon to the Tethys area. G. cartieri and Globoquadrina pseudovenezuelana seem morphologically close, both taxa show typical tooth-like lip. Nevertheless, no stratigraphic overlap is recognized, the former being a prevailing late Oligocene taxon, while the latter ranging up to the early Oligocene.

Globoquadrina galavis (Bermudez, 1960)
1960 Globigerina galavis Bermudez: p. 1183, pl. 5, figs. 1-3.
Remarks. Blow (1969) reillustrated the holotype (pl. 16, figs 4, 5).

Globoquadrina praedehiscens Blow & Banner, 1962
(Pl. 1, fig. 11)
1962 Globoquadrina praedehiscens Blow and Banner: pp. 116-117, pl. 15, figs. Q, R, S.

Globoquadrina sp. cf. sp. 1 (Jenkins & Orr, 1972)
(Pl. 2, figs. 7-8)
1972 cf. Globigerina sp. 1 Jenkins & Orr: p. 1085, pl. 3, figs. 4-6 (not figs. 1-3).
Remarks. Several samples from the lower part of Zone P21

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**Explanation of Plate 2**

Fig. 1. Globigerina mangulisuturalis Bolli. Ventral view. Zone P21. (x115).

Fig. 2, 3. Panagloborotalia mopina (Bolli). Ventral and dorsal views. Zone P20. (x85).

Fig. 4, 5. Tenuitellina mangulisuturalica (Bolli). Ventral view. Zone P21. (x115).

Fig. 6, 7. Globigerina praeturrurilina Blow & Banner. Peripheral view. Zone P20. (x115).

Fig. 8. Globigerina gortanii (Borsetti). Peripheral view. Zone P21. (x85).

Figs. 7-8. Globoquadrina sp. cf. sp. 1 (Jenkins & Orr). Ventral views. Zone P21. (x115).

Fig. 9. Globigerina officinalis Subbotina. Ventral view (ultimate chamber missing). Zone P20. (x115).

Figs. 10-11. Globigerina corpulenta Subbotina. Ventral and dorsal view. Zone P21 (x85).
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yielded specimens well corresponding to those figured by Jenkins and Orr (1972). Both morphotypes are mainly characterized by the same sculpture of the test surface, the loosely coiling and the wide, low arched aperture. They are both from the same biostratigraphic level.

**Globoquadrina tripartita tapuensis** (Blow & Banner, 1962) 1962 Globigerina tripartita tapuensis Blow & Banner: p.97, pl. 10, figs. H-K.

**Remarks.** The taxon occurs with rare specimens. *G. tapuensis* appears to have become extinct much earlier at low latitude areas (within Zones P19-P20 according to Jenkins & Orr, 1972; Bolli & Saunders, 1985) than in the studied material.

**Globoquadrina tripartita tripartita** (Kock, 1926) 1926 Globigerina bulloides var. tripartita Kock: p. 746, fig. 21.

**Globoquadrina sellii** Borsetti, 1959 1959 Globoquadrina sellii Borsetti: p. 209, pl. 1, fig. 3.

**Genus Globorotalia** Cushman, 1927

"G. *siakensis* Le Roy, 1939 1939 Globorotalia siakensis Le Roy: pp. 39-40, pl. 3, figs. 30-31.

**Remarks.** Kennett & Srivasan (1983) included this species in their new subgenus *Jenkinsella*, which represents a largely Neogene lineage including species such as "G." *mayeri* and "G." *acrostoma*. The taxon is also frequently assigned to the genus *Paragloborotalia* (Cifelli, 1982) a prevailing Palaeogene lineage, although this attribution remains somewhat controversial. Loeblich & Tappan (1987), for instance, regard *Jenkinsella* as a junior synonym of *Paragloborotalia*, perhaps without adequate considerations on the phylectic history of the two foraminiferal stocks.

"G. *siakensis*" **sp. cf. siakensis** Le Roy, 1939 (Pl. 1, figs. 7-9)

1939 cf. *Globorotalia siakensis* Le Roy: pp. 39-40, pl. 3, figs. 30-31.

**Remarks.** This taxon is present with scattered specimens throughout the section. It well corresponds with the specimens identified by Jenkins & Orr (1972) as *Globorotalia siakensis* (pl. 32, figs. 1-3). Compared to "G.* siakensis*, the Eptahorion specimens possess a reduced number of chambers in the last whorl, narrower umbilical area and less developed apertural arch.

**Genus Globorotaloides** Bolli, 1957

*Globorotaloides suteri* Bolli, 1957 1957 Globorotaloides suteri Bolli: p. 117, pl. 27, figs. 9-13.

**Genus Paragloborotalia** Cifelli, 1982

*Paragloborotalia nana* Bolli (1957) 1957 Globorotalia nana Bolli: p. 118, pl. 28, fig. 3.

*Paragloborotalia opima* (Bolli, 1957) (Plate 2, figs. 2, 3) 1957 *Globorotalia opima* Bolli: p. 117, pl. 28, figs. 1-2.

**Genus Tenuitella** Fleisher, 1974

*Tenuitella postcrataca* (Myatiuk, 1950) 1950 Globigerina postcrataca Myatiuk: p. 280, pl. 4, fig. 3.

**Remarks.** A single specimen of this taxon comes from sample 14. The species can be easily allocated to the genus *Tenuitella* by its small test and smooth wall surface, according to the original diagnosis of Fleisher (1974).

**Genus Tenuitellina** Li, 1987

*Tenuitellina angustiubilicata* (Bolli, 1957) (Pl. 2, fig. 4)

1957 Globigerina ciperoensis angustiubilicata Bolli: p. 109, pl. 22, figs. 12-13.

**Remarks.** The thin and pustulate wall surface and the intraumbilical aperture allow the assignment of the species to the genus *Tenuitellina*, recently described by Li (1987). He designated this taxon as type species of the new genus. In addition to the differences linked to the morphologic criteria, *T. angustiubilicata* differs from *G. angulisuturalis* (and from other taxa of the *ciperoensis* group) in the wall structure, being spinose in the latter species. From this evidence the species can be seen as giving rise from the tenuitellid plexus. Thus, it is clearly distinct from the *G. ciperoensis* phylogenetic history. Relationships between *T. angustiubilicata*, together with other tenuitellids, and the bullate Neogene *Globigerinita* were recently proposed (Fordham, 1986; Li, 1987).

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