

16. PALEOCENE AND EOCENE PLANKTONIC FORAMINIFERA, LEG 11, DSDP

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During Leg 11, deposits with Paleocene and Eocene planktonic foraminifera were only recovered at Site 98 (Bahamas Islands, Northeast Providence Channel; 25° 22,95'N, 77° 18,68'W) and Site 108 (continental slope southeast of New York; 38° 48,27'N, 72° 39,21'W).

The planktonic foraminiferal assemblages of the site in the Bahamas are closely related to those from the Caribbean. The faunal succession established by Bolli (1957a,b, 1966) can be easily recognized. Minor modifications of this zonation are mainly due to taxonomic reasons (Beckmann *et al.*, 1969, Berggren, 1969, Krasheninnikov, 1965, and others).

The mid-Eocene planktonic foraminifera from Site 108 belong to the subtropical to temperate faunal province, but the zonal subdivision based on tropical assemblages can still be applied without difficulties.

SITE 98

Chart 1 shows the distribution of the stratigraphically significant planktonic foraminifera in the late Paleocene(?) to late Eocene deposits cored at Site 98 and also gives a general characterization of the examined samples.

The residues of Core 6 are dominated by generally very well-preserved planktonic foraminifera. Radiolarians are frequent in the lower part of the core and again present in large number at its top. Most of the residues are rich in excellently preserved sponge spicules. The presence of *Globigerapsis semiinvoluta* (Keijzer), *Globorotalia cocoaensis* Cushman, and *Hantkenina primitiva* Cushman and Jarvis in Core 6 indicates a late Eocene age. The ranges of *Globigerapsis semiinvoluta* (Keijzer), *Globigerapsis tropicalis* Banner and Blow, and *Globigerinatheka barri* Brönnimann do not reach into the upper part of the upper Eocene. Most of Core 6 is attributed to the *Globigerapsis semiinvoluta* Zone. In addition, the lowermost part of Core 6 contains *Truncorotaloides rohri* Brönnimann and Bermudez, *Globorotalia bullbrooki* Bolli, and *Globorotalia* sp. aff. *G. renzi* Bolli, and may therefore be placed in the uppermost middle Eocene.

The composition of the washed residues from Core 7 is rather uniform; planktonic foraminifera are dominant

throughout. Radiolarians occur only in small numbers, whereas sponge spicules become more frequent toward the base of the core.

The most characteristic foraminiferal species in Core 7 are *Globorotalia aragonensis* Nuttall, *Globorotalia spinuloinflata* (*sensu* Bolli, 1957), *Globigerina frontosa* Subbotina, and *Globorotalia pentacamerata* Subbotina. Core 7 is attributed entirely to the upper part of the lower Eocene, that is the *Globorotalia pentacamerata* Zone. This zone is roughly equivalent to the *Globorotalia palmerae* Zone of Bolli (1957b, 1966), and has been introduced by Soviet authors (e.g. Krasheninnikov, 1965). Noteworthy is the occurrence of *Globorotalia caucasica* Glaessner in the lowermost two samples of Core 7. This species is very characteristic for the upper part of the *Globorotalia aragonensis* Zone and for the lower part of the *Globorotalia pentacamerata* Zone. Until now, it has been recorded only very rarely from the western hemisphere.

The interval between 207 and 241 meters below sea bottom was cored continuously, but recovery was rather poor. The washed residues of Cores 8 and 9 are very rich in radiolarians and sponge spicules, whereas, these occur only in small numbers in the residues from Cores 10, 11 and 12. Redeposited rotaliids of near-shore origin are found in the lowermost two samples of Core 11.

Most of Core 8 is attributed to the early Eocene *Globorotalia formosa formosa* Zone based on the occurrence of such species as *Globorotalia aragonensis* Nuttall and *Globorotalia formosa formosa* Bolli. However, the latter species is always rare.

The planktonic foraminiferal assemblages of Cores 9, 10 and 11 are typical of the early Eocene *Globorotalia subbotinae* Zone. The most significant species are *Globorotalia subbotinae* Morozova, *Globorotalia formosa gracilis* Bolli, *Globorotalia marginodentata* Subbotina, *Globigerina nitida* Martin, and *Pseudohastigerina wilcoxensis* (Cushman and Ponton). As elsewhere, *Globorotalia lensiformis* Subbotina has its first occurrence in the upper part of the *Globorotalia subbotinae* Zone; that is, at the base of Core 10.

The planktonic foraminiferal assemblages of Core 12 are intermediate between the early Eocene *Globorotalia subbotinae* Zone and the late Paleocene *Globorotalia velascoensis* Zone. They probably correspond to the interval which was distinguished by Berggren (1969) as *Globorotalia velascoensis*/*Globorotalia subbotinae* Concurrent-range Subzone. Transitional forms between *Globorotalia chapmani* Parr and *Pseudohastigerina wilcoxensis* (Cushman and Ponton) are observed in the lower and middle parts of Core 12 (Berggren, Olsson, and Reymont, 1967).

SITE 108

The distribution of the more significant planktonic foraminifera and a general characterization of the examined samples is given on Chart 2. The sampling may not be representative for the entire cored interval between 39 and 75 meters below bottom, since only 7.4 meters were recovered.

All microfaunas are dominated by well-preserved radiolarians which account generally for 70 to 80 per cent of the total microfauna. The preservation of the foraminiferal fauna varies between good and poor. Benthonic species constitute between 5 and 25 per cent (exceptionally 50 per cent) of the total foraminiferal fauna. They are closely related to those of the Gulf Coast Claiborne Formation. Ostracodes occur only as scattered specimens and always in very small numbers.

The presence of rare specimens of *Orbulinoides beckmanni* (Saito) in Sections 4 and 5 as well as in the core catcher of Core 1 allows this interval to be attributed to the *Orbulinoides beckmanni* Zone of the upper part of the middle Eocene. No positive evidence to place the upper part of Core 1 into the next higher *Truncorotaloides rohri* Zone can be given, since the absence of *Orbulinoides beckmanni* (Saito) in this interval could be explained by loose sampling or ecological arguments. A late Eocene age for this part of Core 1 can be excluded by the presence of *Truncorotaloides rohri* Brönnimann and Bermudez, *Globorotalia spinulosa* Cushman (*sensu* Bolli, 1957b), and *Globorotalia spinuloinflata* (Bandy) (*sensu* Bolli, 1957b).

The foraminiferal fauna from the core catcher of Core 2 is similar to the faunas of Core 1. However, the co-existence of *Pseudohastigerina wilcoxensis* (Cushman and Ponton), *Pseudohastigerina micra* (Cole), and forms transitional between these two species, is generally observed in the lower part of the middle Eocene (*Globorotalia lehneri* Zone or *Globigerapsis kugleri* Zone). Such forms occur frequently at the base of Core 2, which is therefore placed in the lower part of the middle Eocene.

DISTRIBUTION OF PLANKTONIC FORAMINIFERA IN THE EOCENE - SITE 108, LEG XI

AGE	MIDDLE EOCENE		
	Orbulinoides	beckmanni	Globorotalia lehneri?
Fish teeth			
Fragments of brachiopods			
Sponge spicules			
Ostracodes			
Hankia dubia			
Hankia globosa			
Hankia sp. aff. H. maxima			
Pseudohastigerina micra			
Pseudohastigerina wilcoxensis			
Orbulinoides beckmanni			
Globigerinella kugleri			
Globigerinella index			
Corpydax sp.			
Corpydax unicus			
Truncorotaloides rostratus			
Truncorotaloides rohri			
"Globigerinoides" rubiformis			
"Globigerinoides" higginsi			
Globorotalia spinuloinflata (<i>sensu</i> Bolli, 1957)			
Globorotalia spinulosa (<i>sensu</i> Bolli, 1957)			
Globorotalia renzi			
Globorotalia pseudocf. renzi			
Globorotalia bulbosita			
Globorotalia boliviana			
Globigerina spp. ex gr. G. eocena			
Globigerina spp. ex gr. G. frequentis			
Globigerina lamii			
Globigerina linaperta			
Globigerina frontosa			
preservation of foraminifera	poor	fair	excellent
percentage of planktonic foraminifera in total foraminiferal fauna	0%	100%	0%
percentage of radiolaria in total microfauna	100%	0%	100%
frequency of microfauna	abundant	common	very poor
cored interval (m. subbottom)	57m - 39m		75-57
recovery (m.)	6.5m		0.7m
barrel	1	2	2
section	1	2	2
interval (in cm.)	1 65-67	2 16-18	2 130-132
	3 06-08	4 50-52	5 48-50
	1 core catcher		1 core catcher

Noteworthy is the scarcity at Site 108 of representatives of the genus *Hantkenina*, and the absence of such forms as *Globorotalia centralis* Cushman and Bermudez and *Globorotalia lehneri* Cushman and Jarvis. This indicates that the planktonic foraminiferal assemblages belong to the subtropical to temperate climatic belt.

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