

## 14. DEEP SEA DRILLING PROJECT, LEG 2 FORAMINIFERA FROM SELECTED SAMPLES

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### BIOSTRATIGRAPHIC SUMMARY OF AVAILABLE SAMPLES

Note: This summary only gives the biostratigraphic summary as based on the actual samples examined. This work does not include data observed by others on a more complete coverage of core-samples from the various holes.

#### Hole 9 (lat. 32° 46.4'N, long 59° 11.7'W)

Core	Depth Below Sea Bed Feet	Depth Below Sea Bed Meters	Age Determination
5	103 to 133	31.4 to 40.5	Section 1: No determination. Section 2: Zone N.22; Pleistocene. Section 3: No determination. Section 4: Zone N.22; Pleistocene. Section 5: No determination.
7	638 to 668	194.5 to 203.6	Sections 1, 2, 3 and 4: No determinations.
8	668 to 698	203.6 to 212.6	Sections 2 and 4: No determinations.
9	989 to 1019	301.5 to 310.6	Section 2: No determination.

#### Hole 10 (lat. 32° 51.73'N, long 52° 12.92'W)

Core	Depth Below Sea Bed Feet	Depth Below Sea Bed Meters	Age Determination
1	98 to 128	29.9 to 39.0	Sections 1 and 2: Zone N.19; Lower to middle Pliocene
2	133 to 158	40.2 to 48.2	Sections 2, 3, and 4: No determinations.
3	158 to 188	48.2 to 57.3	Sections 1, 2, 3 and 4: No determinations.
5	234 to 264	71.3 to 80.4	Section 2: Zone N.2 (=P.21), Zone P.19; middle to late Oligocene.

Core	Depth Below Sea Bed		Age Determination
	Feet	Meters	
			Section 3: Zone N.1 (=P.20), Zone P.18; Oligocene. Section 4: Zone P.19, Zone P.18; Oligocene. Section 5: No determination.
7	294 to 328	89.5 to 100	Section 1: Eocene Sections 2, 3, and 4: Eocene, probably late Middle Eocene.
9	578 to 608	176.2 to 185.3	Sections 1, 2, and 3: No planktonic foraminiferal determination.
10	955 to 980	291.2 to 298.8	Sections 1, 2, 3, 4 and 5: (= <i>Abathomphalus mayaroensis</i> Zone, sensu Bolli, 1957); Late Maestrichtian.
11	1239 to 1269	377.7 to 386.8	Sections 2, 3 and 4: (? <i>Globotruncana lapparenti tricarinata</i> Zone, sensu Bolli, 1957); earlier Maestrichtian.
12	1269 to 1299	386.8 to 395.9	Sections 2, 3 and 4: latest Campanian.
13	1299 to 1329	395.9 to 405.0	Sections 2, 3 and 4: later Campanian.
14	1329 to 1359	405.0 to 414.1	Sections 2 and 3: <i>Globotruncana calcarata</i> "Zone"; middle to later parts Campanian.
15	1359 to 1389	414.1 to 423.2	Sections 1 and 2: <i>Globotruncana elevata stuartiformis</i> Zone; early to middle Campanian.
16	1389 to 1419	423.2 to 432.3	Sections 1, 2 and 3: <i>Globotruncana elevata stuartiformis</i> Zone; early to middle Campanian.
17	1419 to 1449	432.3 to 441.4	Sections 2 and 3: <i>G. elevata stuartiformis</i> Zone; early to middle Campanian.
18	1449 to 1479	441.4 to 450.5	Sections 1, 2, 3, 4 and 5: <i>G. elevata stuartiformis</i> Zone; early to middle Campanian.

**Hole 11 (lat. 29° 56.58'N, long 44° 44.80'W)**

Core	Depth Below Sea Bed		Age Determination
	Feet	Meters	
1	46 to 76	14.0 to 23.2	Sections 1, 2 and 3: Zone N.22; Pleistocene.

Core	Depth Below Sea Bed		Age Determination
	Feet	Meters	
	Section 4: Heterogeneous; Zone N.22 Pleistocene mixed with Zone N.19/Zone N.18, Pliocene, and mixed with late Cretaceous.		

**Hole 11A (lat. 29° 56.58'N, long 44° 44.80'W)**

Core	Depth Below Sea Bed		Age Determination
	Feet	Meters	
4	850 to 880	259.0 to 268.2	Sections 1 and 2: Heterogeneous; Pleistocene, Pliocene and Middle Miocene mixed. Sections 3 and 4: Zone N.13; Middle Miocene.

**Hole 12C (lat. 19° 41.73'N, long 26° 00.03'W)**

Core	Depth Below Sea Bed		Age Determination
	Feet	Meters	
1	0 to 30	0 to 9.1	Sections 1, 2, 3 and 4: Zone N.23; late Pleistocene/Holocene.
2R	47 to 77	14.3 to 23.5	Section 1: Zone N.22; Pleistocene. Section 2: Heterogeneous; Zone N.22 Pleistocene, mixed with Zones N.20/N.21; middle to late Pliocene. Sections 3 and 4: Zone N.22; Pleistocene.
4	107 to 137	32.6 to 41.8	Section 1: No determination. Section 2: ?Pliocene. Section 3: No determination.
5	137 to 167	41.8 to 50.9	Sections 2 and 3: No determinations.
6	167 to 197	50.9 to 60.1	Section 2: No determination.
7	197 to 227	60.1 to 69.2	Section 1: No determination.
8	227 to 257	69.2 to 78.4	Section 1: No determination.

Core	Depth Below Sea Bed		Age Determination
	Feet	Meters	
10	287 to 317	87.5 to 96.6	Section 1: No determination.
11	317 to 347	96.6 to 105.8	Section 1: No determination.

### FAUNAS OF SAMPLES EXAMINED

(Determinations by W. H. Blow)

#### Hole 9

Sample 2-9-5-1, 70-72 cm:  
No significant planktonic foraminifera.

Sample 2-9-5-2, 69-71 cm:  
Rather poor planktonic foraminiferal fauna with *Globorotalia* (*G.*) *tumida tumida*, *Sphaeroidinella dehiscens dehiscens*, *Globorotalia* (*T.*) *inflata*, *Globigerina oscitans*, *Globigerinoides conglobatus conglobatus*.  
Age: Probably Zone N.22; Pleistocene.

Sample 2-9-5-3, 69-71 cm:  
No planktonic foraminifera.

Sample 2-9-5-4, 69-71 cm:  
Fair planktonic foraminiferal fauna: *Globorotalia* (*G.*) *truncatulinoides truncatulinoides*, *G.* (*T.*) *tosaensis* (*s.l.*), *Globorotalia* (*T.*) *acostaensis humerosa*, *G.* (*T.*) *inflata*, *Pulleniatina obliquiloculata obliquiloculata*, *Globorotalia* (*T.*) *crassaformis* (*s.l.*), *Globigerinoides conglobatus conglobatus*.  
Age: Early Zone N.22; early Pleistocene.

Sample 2-9-5-5, 78-80 cm:  
No planktonic foraminifera.

Sample 2-9-7-1, 77-79 cm:  
No planktonic foraminifera.

Sample 2-9-7-2, 72-74 cm:  
No significant planktonic foraminifera.

Sample 2-9-7-3, 80-82 cm:  
No significant planktonic foraminifera.

Sample 2-9-7-4, 71-73 cm:  
No planktonic foraminifera.

Sample 2-9-8-2, 74-76 cm:  
No planktonic foraminifera.

Sample 2-9-8-4, 70-72 cm:  
Barren.

Sample 2-9-9-2, 85-87 cm:  
Barren.

#### Hole 10

Sample 2-10-1-1, 82-84 cm:  
Fairly rich but broken planktonic foraminiferal fauna with *Globorotalia* (*G.*) *cultrata menardii*, *G.* (*G.*) *crassula crassula*, *Globigerina conglomerata*, *Globoquadrina altispira altispira*, *G. altispira globosa*, *Globigerinoides conglobatus conglobatus*, *Sphaeroidinella dehiscens dehiscens*, *Orbulina* spp., *Globigerina decoraperta*, *Turborotalita* sp., *Globigerinita* sp. cf. *incrusta*, *Globigerina nepenthes* (rare).  
Age: Zone N.19; Lower to middle Pliocene.

Sample 2-10-1-2, 95-97 cm:  
As above.

Age: Zone N.19; Lower to middle Pliocene.

Sample 2-10-2-2, 72-74 cm:  
No planktonic foraminifera.

Sample 2-10-2-3, 73-75 cm:  
No planktonic foraminifera.

Sample 2-10-2-4, 69-71 cm:  
No planktonic foraminifera.

Sample 2-10-3-1, 73-75 cm:  
No planktonic foraminifera.

Sample 2-10-3-2, 69-71 cm:  
No planktonic foraminifera.

Sample 2-10-3-3, 69-71 cm:  
No significant planktonic foraminifera.

Sample 2-10-3-4, 66-68 cm:  
No planktonic foraminifera.

Sample 2-10-5-1, 145-147 cm:  
No planktonic foraminifera.

Sample 2-10-5-2, 65-67 cm:  
Poor planktonic foraminiferal fauna with *Globigerina prasaepis*, *G.* cf. *sellii*, *Globigerinita unicava* (*s.l.*), *Globorotaloides* cf. *suteri*.

Age: Within interval Zone N.2 (=P.21), Zone P.19, middle to late Oligocene.

Sample 2-10-5-3, 74-76 cm:

Rather poor planktonic foraminiferal fauna with *Globorotalia* (*T.*) *gemma*, *G.* (*T.*) *permicra*, *Globigerina prasaepis*, *Globigerinita unicava primitiva*, *Globigerinita dissimilis dissimilis*, *Globorotaloides suteri*.

Age: Within interval Zone N.1 (=P.20), Zone P.18, Oligocene.

Sample 2-10-5-4, 71-73 cm:

Poor planktonic foraminiferal fauna with *Globigerina prasaepis*, *G. tapuriensis*, *Globigerinita unicava primitiva*.

Age: Within interval Zone P.19; Zone P.18, Oligocene.

Sample 2-10-5-5, 70-72 cm:

No significant planktonic foraminifera.

Sample 2-10-7-1, 93-95 cm:

Very poor planktonic foraminiferal fauna *Globigerina senni*, *Globigerina linaperta*, *Globigerina galavisi*.

Age: No zonal determination; Eocene.

Sample 2-10-7-2, 74-76 cm:

Poor planktonic foraminiferal fauna with *Globigerinita unicava primitiva*, *Globigerina* cf. *galavisi*, *G. senni*.

Age: No zonal determinative; Eocene, probably later part of Middle Eocene.

Sample 2-10-7-3, 69-71 cm:

As above.

Age: As above.

Sample 2-10-7-4, 82-84 cm:

As above.

Age: As above.

Sample 2-10-9-1, 74-76 cm:

Rich radiolarian assemblage, no planktonic foraminifera.

Age: No planktonic foraminiferal zonation possible.

Sample 2-10-9-2, 74-76 cm:

As above.

Age: As above.

Sample 2-10-9-3, 74-76 cm:

As above.

Age: As above.

Sample 2-10-10-1, 133-135 cm:

Very rich planktonic foraminiferal fauna with *Pseudotextularia diformis*, *Racemiguembelina fructicosa*, *Pseudotextularia elegans*, *Pseudoguembelina excolata*, *Planoglobulina acervulinoides*, *Heterohelix* spp., *Globotruncana stuarti*, *Globotruncana contusa*, *Globotruncana conica*, *Globotruncana arca*, *Globotruncana aegyptica*, *Praeglobotruncana havanensis*, *Praeglobotruncana*

*petaloidea*, *Rugoglobigerina rugosa*, *R. hexacamerata*, *Planomalina* (*Globigerinelloides*) *messinae*.

Age: *Abathomphalus mayaroensis* Zone of Bolli, 1957; late Maestrichtian, latest Cretaceous.

Sample 2-10-10-2, 83-85 cm:

Very rich planktonic foraminiferal fauna, as above.

Age: As above.

Sample 2-10-10-3, 76-78 cm:

Very rich planktonic foraminiferal fauna with *Abathomphalus mayaroensis*, *A. intermedia*, *Pseudotextularia elegans*, *P. diformis*, *Pseudoguembelina excolata*, *Planoglobulina acervulinoides*, *Racemiguembelina fructicosa*, *Heterohelix* spp., *Globotruncana arca*, *Globotruncana* cf. *aegyptica*, *Praeglobotruncana havanensis*, *Praeglobotruncana petaloidea*, *Globotruncana stuarti*, *Rugoglobigerina hexacamerata*, *R. rugosa*, *Planomalina* (*Globigerinelloides*) spp.

Age: *A. mayaroensis* Zone of Bolli, 1957; late Maestrichtian, late Cretaceous.

Sample 2-10-10-4, 84-86 cm:

As above.

Age: As above.

Sample 2-10-10-5, 78-80 cm:

As above.

Age: As above.

Sample 2-10-11-2, 74-76 cm:

Very rich planktonic foraminiferal fauna with *Globotruncana linneiana*, *Globotruncana fornicata*, *Globotruncana gagnebini*, *Globotruncana elevata stuartiformis*, *Globotruncana stuarti*, *Globotruncana* cf. *gansseri*, *Globotruncana arca*, *Praeglobotruncana havanensis*, *Praeglobotruncana petaloidea*, *Pseudoguembelina* cf. *excolata*, *Pseudotextularia elegans*, *P. cf. diformis*, *Heterohelix* sp., *Schackoina* sp., *Planomalina* (*Globigerinelloides*) spp., *Rugoglobigerina hexacamerata*, *Rugoglobigerina rugosa*.

Age: ?equivalent to later part of *Globotruncana laparenti tricarinata* Zone of Bolli, 1957; earlier Maestrichtian.

Sample 2-10-11-3, 80-82 cm:

As above.

Age: As above.

Sample 2-10-11-4, 75-77 cm:

Very rich planktonic foraminiferal fauna with *Globotruncana linneiana*, *Globotruncana* cf. *gagnebini*, *Globotruncana fornicata*, *Globotruncana elevata stuartiformis*, *Globotruncana stuarti*, *Globotruncana arca*, *Pseudoguembelina* spp., *Pseudotextularia elegans*, *Heterohelix* spp., *Planomalina* (*Globigerinelloides*) spp., *Praeglobotruncana havanensis*, *Praeglobotruncana* cf. *petaloidea*, *Rugoglobigerina* spp.

Age: ?equivalent to part of the *Globotruncana lap-parenti tricarinata* Zone, of Bolli, 1957; early Maestrichtian.

Sample 2-10-12-2, 73-75 cm:

*Globotruncana ventricosa*, *Globotruncana linneiana*, *Globotruncana fornicata*, *Globotruncana elevata stuartiformis*, *Globotruncana stuarti*, *Globotruncana arca*, *Pseudoguembelina* spp., *Pseudotextularia* spp. (including *P. elegans*), *Heterohelix* spp., *Rugoglobigerina* spp., *Praeglobotruncana havanensis*, *Hedbergella* spp.

Age: Latest Campanian.

Sample 2-10-12-3, 74-76 cm:

As above.

Age: As above.

Sample 2-10-12-4, 81-83 cm:

Rich planktonic foraminiferal fauna with *Globotruncana rosetta*, *Globotruncana sublaevigata*, *Globotruncana elevata stuartiformis*, *Globotruncana linneiana* (group) *Globotruncana ventricosa*, *Globotruncana fornicata*, *Pseudotextularia* cf. *elegans*, *Pseudoguembelina* spp., *Rugoglobigerina* spp., *Heterohelix* spp., *Praeglobotruncana havanensis*.

Age: Late Campanian.

Sample 2-10-13-2, 91-93 cm:

Rather poor planktonic foraminiferal fauna with *Globotruncana rosetta*, *Globotruncana sublaevigata*, *Globotruncana fornicata*, *Globotruncana linneiana* (group), *Planomalina* (*Globigerinelloides*), *Hedbergella* spp., *Praeglobotruncana havanensis*.

Age: Campanian.

Sample 2-10-13-3, 74-76 cm:

As above.

Age: As above.

Sample 2-10-13-4, 88-90 cm:

Rich planktonic foraminiferal fauna with *Globotruncana rosetta*, *Globotruncana* cf. *sublaevigata*, *Praeglobotruncana havanensis*, *Globotruncana entreresa*, *Globotruncana* cf. *arca*, *Globotruncana fornicata*, *Globotruncana linneiana*, *Globotruncana elevata stuartiformis*, *Pseudotextularia elegans*, *Heterohelix* sp., *Pseudoguembelina* spp.

Age: Campanian (probably upper part).

Sample 2-10-14-2, 75-77 cm:

As above.

Age: As above.

Sample 2-10-14-3, 75-77 cm:

Very rich planktonic foraminiferal fauna with *Globotruncana calcarata*, *Globotruncana rosetta*, *Globotruncana ventricosa*, *Globotruncana* cf. *arca*, *Globotruncana fornicata*, *Globotruncana linneiana* (group),

*Globotruncana elevata stuartiformis*, *Globotruncana stuarti*, *Globotruncana sublaevigata*, *Praeglobotruncana havanensis*, *Pseudotextularia elegans*, *Pseudoguembelina* spp. (including *costulata*), *Heterohelix* spp., *Rugoglobigerina* spp.

Age: *G. calcarata* "Zone", middle to upper part Campanian; Campanian.

Sample 2-10-15-1, 134-136 cm:

Fairly rich planktonic foraminiferal fauna with *Globotruncana rosetta*, *Globotruncana caliciformis*, *Globotruncana linneiana* (group), *Globotruncana* cf. *ventricosa*, *Globotruncana* cf. *arca*, *Globotruncana fornicata*, *Globotruncana elevata stuartiformis*, *Praeglobotruncana havanensis*, *Pseudotextularia* spp., *Rugoglobigerina* spp., *Schackoina* spp. (includes *S. tappanae* and *S. multispinata*).

Age: ?*G. elevata stuartiformis* Zone; Campanian.

Sample 2-10-15-2, 75-77 cm:

As above.

Age: As above.

Sample 2-10-16-1, 104-106 cm:

As above.

Age: As above.

Sample 2-10-16-2, 65-67 cm:

As above.

Age: As above.

Sample 2-10-16-3, 29-31 cm:

As above.

Age: As above.

Sample 2-10-17-2, 52-55 cm:

Rich planktonic foraminiferal fauna *Globotruncana rosetta*, *Globotruncana caliciformis*, *Globotruncana linneiana* (group), *Globotruncana* cf. *arca*, *Globotruncana elevata stuartiformis*, *Globotruncana* cf. *stuarti*, *Globotruncana elevata elevata*, *Globotruncana fornicata*, *Praeglobotruncana havanensis*, *Heterohelix* spp., *Schackoina* spp.

Age: *Globotruncana elevata stuartiformis* Zone, lower to middle Campanian; Campanian.

Sample 2-10-17-3, 75-77 cm:

As above.

Age: As above.

Sample 2-10-18-1, 76-78 cm:

As above.

Age: As above.

Sample 2-10-18-2, 73-75 cm:

As above.

Age: As above.

Sample 2-10-18-3, 72-74 cm:

As above.

Age: As above.

Sample 2-10-18-4, 75-77 cm:

As above.

Age: As above.

Sample 2-10-18-5, 76-78 cm:

As above.

Age: *G. elevata stuartiformis* Zone, lower to middle Campanian; Campanian.

Note: The lowest available sample from the hole at Site 10, i.e., Core 18, Section 5, Sampled at 76-78 cm. still shows a lower to middle Campanian fauna and it seems likely that the lowest Campanian beds were not penetrated above the basement basalts.

## Hole 11

Sample 2-11-1-1, 76-78 cm:

Rich planktonic foraminiferal assemblage with *Sphaeroidinella dehiscens dehiscens*, *Globorotalia (G.) truncatulinoides truncatulinoides*, *G. (G.) crassula viola*, *G. (Turborotalia) crassaformis ronda*, *G. (T.) acostaensis pseudopima*, *G. (T.) inflata*, *Globigerinoides conglobatus conglobatus*, *G. ruber*, *G. quadrilobatus* (s.l.), *Globigerina falconensis*, *G. quadrilatera*, *G. eggeri*, *eggeri*, *Pulleniatina obliquiloculata obliquiloculata* etc.

Age: Zone N.22; lower to middle Pleistocene.

Sample 2-11-1-2, 75-76 cm:

Rich planktonic foraminiferal fauna with *Globorotalia (G.) truncatulinoides truncatulinoides*, *G. (G.) truncatulinoides pachytheca*, *G. (G.) crassula viola*, *G. (Turborotalia) crassaformis crassaformis*, *G. (T.) crassaformis ronda*, *G. (T.) inflata*, *G. (T.) acostaensis pseudopima*, *G. (T.) acostaensis humerosa*, *G. (T.) scitula scitula*, *Globigerina falconensis*, *G. quadrilatera*, *Orbulina* spp., *Hastigerina siphonifera siphonifera*, *Pulleniatina obliquiloculata obliquiloculata*, *Sphaeroidinella dehiscens dehiscens*, *Globigerinoides elongatus*, *G. ruber*, *G. quadrilobatus sacculifera*, *G. conglobatus conglobatus*, *Turborotalita* spp.

Age: Zone N.22; lower to middle Pleistocene.

Sample 2-11-1-3, 75-76 cm:

Rich planktonic foraminiferal assemblage with *Globorotalia (G.) truncatulinoides truncatulinoides*, *G. (G.) truncatulinoides pachytheca*, *G. (G.) cultrata exilis*, *G. (G.) ungulata*, *G. (Turborotalia) tosaensis tosaensis*, *G. (T.) tosaensis tenuitheca*, *G. (T.) crassaformis ronda*, *G. (T.) acostaensis pseudopima*, *G. (T.) inflata*, *Globigerina decoraperta*, *G. falconensis*, *G. quadrilatera*, *Globigerinoides elongatus*, *G. quadrilobatus* (s.l.), *G. ruber*, *G. conglobatus conglobatus*, *G. cf. bollii*, *Hastigerina siphonifera siphonifera*, *Orbulina* spp.

Age: Early Zone N.22; Lower Pleistocene.

Sample 2-11-1-4, 76-77 cm:

Rich heterogeneous planktonic foraminiferal assemblage with *Globotruncana* spp., *Globorotalia (G.) truncatulinoides* (s.l.), *G. (T.) tosaensis* (s.l.), *G. (G.) crassula crassula*, *G. (G.) crassula viola*, *G. (T.) acostaensis pseudopima*, *G. (T.) inflata*, *Globoquadrina altispira globosa*, *G. dehiscens dehiscens*, *Pulleniatina obliquiloculata praecursor*, *P. primalis*, *Globigerina eggeri eggeri*, *G. falconensis*, *G. nepenthes*, *G. quadrilatera*, *Sphaeroidinella dehiscens dehiscens*, *Sphaeroidinellopsis seminulina seminulina*, *Globorotalia (T.) subscitula*, *Globigerinoides ruber*, *G. conglobatus conglobatus*, *Orbulina* spp. etc.

Age: Heterogeneous sample. Zone N.22/Zone N.21 mixed with Zone N.19/Zone N.18; associated with Upper Cretaceous.

Note: Dr. M. B. Cita reports Zone N.18 and Zone N.19 determinations for older horizons in Section 4 of this Core 1.

## Hole 11A

Sample 2-11A-4-1, 0-10 cm:

Strongly heterogeneous planktonic foraminiferal fauna with *Globorotalia (G.) fohsi*, *G. (G.) fohsi forma robusta*, *G. (G.) truncatulinoides truncatulinoides*, *G. (G.) crassula crassula*, *G. (G.) crassula viola*, *G. (G.) crassula canomiozea*, *G. (G.) miozea miozea*, *G. (T.) tosaensis tosaensis*, *G. (T.) crassaformis ronda*, *G. (T.) acostaensis acostaensis*, *G. (T.) acostaensis humerosa*, *G. (T.) acostaensis pseudopima*, *G. (T.) siakensis*, *Globigerinoides quadrilobatus* (s.l.), *G. elongatus*, *G. conglobatus conglobatus*, *G. conglobatus canimarensis*, *G. obliquus extremus*, *Hastigerina siphonifera* (s.l.), *Pulleniatina obliquiloculata* (s.l.), *Sphaeroidinellopsis subdehiscens subdehiscens*, *S. seminulina kochi*, *Sphaeroidinella dehiscens dehiscens*, *Orbulina* spp., *Turborotalita* spp., *Globigerinita* spp., *Globoquadrina dehiscens dehiscens*, *Globoquadrina altispira altispira*, *Globigerina nepenthes* etc.

Age: Youngest horizon Zone N.22, oldest horizon ?Zone N.13, but probably many horizons represented in the assemblage; Pleistocene, Pliocene and Middle Miocene mixed.

Sample 2-11A-4-2, 0-10 cm:

As above.

Age: As above.

Sample 2-11A-4-3, 0-10 cm:

Rich homogeneous planktonic foraminiferal fauna with *Globorotalia (G.) fohsi*, *G. (G.) fohsi forma robusta*, *G. (G.) cultrata cultrata*, *G. (G.) praemenardii praemenardii*, *G. (G.) miozea miozea*, *G. (T.) siakensis*, *G. (T.) scitula scitula*, *Globoquadrina dehiscens dehiscens*, *G. dehiscens advena*, *G. larmeui larmeui*, *G. altispira altispira*, *G. altispira cf. globosa*, *Sphaeroidinellopsis seminulina seminulina*, *S. seminulina kochi*, *S.*

*subdehiscens subdehiscens*, *Globigerina druryi*, *G. praebulloides praebulloides*, *G. cf. foliata*, *Globigerina woodi*, *Globigerinoides bollii*, *G. quadrilobatus* (s.l.). Note: Some of the specimens of *G. druryi* are phylogenetically advanced and show the beginnings of transition to *G. nepenthes*.

Age: Zone N.13 (higher part); Middle Miocene.

Sample 2-11A-4-4, 39-49 cm:

Rich homogeneous planktonic foraminiferal fauna with *Globorotalia (G.) fohsi*, *G. (G.) fohsi forma robusta*, *G. (G.) miozea miozea*, *Sphaeroidinellopsis subdehiscens subdehiscens*, *S. seminulina seminulina*, *S. seminulina kochi*, *Globigerina druryi* (some specimens very phylogenetically advanced), *G. foliata*, *G. praebulloides praebulloides*, *G. juvenilis*, *G. bradyi*, *Globoquadrina altispira altispira*, *G. altispira globosa*, *G. dehiscens dehiscens*, *G. dehiscens advena*, *G. larmeui larmeui*, *Globigerinoides cf. parkerae*, *G. bollii*, *G. quadrilobatus* (s.l.), *Globorotalia (Turborotalia) siakensis*, *G. (T.) scitula scitula*.

Age: Zone N.13 (probably higher part); Middle Miocene.

### Hole 12C

Sample 2-12C-1-1, 145-150 cm:

Rich planktonic foraminiferal fauna with *Globorotalia (G.) truncatulinoides truncatulinoides*, *G. (G.) truncatulinoides pachytheca*, *G. (G.) tumida tumida*, *G. (G.) cultrata menardii*, *G. (Turborotalia) crassaformis crassaformis*, *G. (T.) crassaformis ronda*, *G. (T.) inflata*, *G. (T.) acostaensis pseudopima*, *Globigerina oscitans*, *G. eggeri eggeri*, *Globigerinoides ruber* (some red), *G. conglobatus conglobatus*, *G. quadrilobatus* (s.l.), *Sphaeroidinella dehiscens dehiscens* (including *excavata*), *Pulleniatina obliquiloculata finalis*.

Age: Zone N.23; late Pleistocene/Holocene.

Sample 2-12C-1-2, 145-150 cm:

As above.

Age: As above.

Sample 2-12C-1-3, 145-150 cm:

As above.

Age: As above.

Sample 2-12C-1-4, 145-150 cm:

As above.

Age: As above.

Sample 2-12C-2R-1, 138 cm:

Rich planktonic foraminiferal fauna, but specimens often broken with *Globorotalia (G.) tumida tumida*, *G. (G.) cultrata viola*, *G. (G.) crassula crassula*, *G. (G.) truncatulinoides* (s.l.), *Globigerinoides ruber*, *G. elongatus*, *G. conglobatus conglobatus*, *Pulleniatina obliquiloculata obliquiloculata*, *Sphaeroidinella dehiscens*,

*dehiscens*, *Globigerina eggeri eggeri*.

Age: Zone N.22; Pleistocene.

Sample 2-12C-2R-2, 145-150 cm:

Heterogeneous rich assemblage of planktonic foraminifera with two distinctly different preservations *Globorotalia (G.) truncatulinoides* (s.l.), *G. (G.) tumida tumida*, *G. (G.) cultrata menardii*, *G. (G.) miocenica*, *G. (G.) crassula conomiozea*, *G. (G.) crassula viola*, *G. (T.) crassaformis crassaformis*, *G. (T.) crassaformis ronda*, *G. (T.) acostaensis pseudopima*, *G. (T.) acostaensis humerosa*, *Globigerinoides elongatus*, *G. conglobatus conglobatus*, *G. ruber* (some red), *G. quadrilobatus* (s.l.), *Globigerina eggeri eggeri*, *Pulleniatina obliquiloculata obliquiloculata*.

Age: Zone N.22; Pleistocene, mixed with middle to late Pliocene (?Zone N.20/Zone N.21).

Note: The bulk of the fauna is referable to the middle and/or later parts of the Pliocene and is referable to Zone N.20 and/or Zone N.21.

Sample 2-12C-2R-3, 145-150 cm:

Homogeneous planktonic foraminiferal fauna with *Globorotalia (G.) truncatulinoides truncatulinoides*, *G. (G.) tumida tumida*, *G. (G.) cultrata* (s.l.), *G. (G.) crassula conomiozea*, *G. (T.) acostaensis pseudopima*, *G. (T.) crassaformis ronda*, *G. (T.) inflata*, *G. (T.) crassaformis crassaformis*, *Globigerina eggeri eggeri*, *G. falconensis*, *G. oscitans*.

Age: Zone N.22; Pleistocene.

Sample 2-12C-2R-4, 145-150 cm:

Rich homogeneous planktonic foraminiferal fauna with *Globorotalia (G.) truncatulinoides truncatulinoides*, *G. (G.) truncatulinoides pachytheca*, *G. (G.) tumida tumida*, *G. (G.) cultrata menardii*, *G. (G.) crassula viola*, *G. (G.) crassula conomiozea*, *G. (T.) crassaformis ronda*, *G. (T.) crassaformis crassaformis*, *G. (T.) acostaensis humerosa*, *G. (T.) acostaensis pseudopima*, *Globigerinoides conglobatus conglobatus*, *G. ruber*, *G. quadrilobatus* (s.l.), *Globigerina eggeri eggeri*, *Pulleniatina obliquiloculata obliquiloculata* etc.

Age: Zone N.22; Pleistocene.

Sample 2-12C-4-1, 90-92 cm:

No significant planktonic foraminifera.

Sample 2-12C-4-2, 70-72 cm:

Completely broken and fragmentary planktonic foraminiferal fauna.

Age: Probably Pliocene.

Sample 2-12C-4-3, 75-77 cm:

No significant planktonic foraminifera.

Sample 2-12C-5-2, 72-74 cm:

Barren.

Sample 2-12C-5-3, 71-73 cm:  
No planktonic foraminifera.

Sample 2-12C-6-2, 72-74 cm:  
No planktonic foraminifera.

Sample 2-12C-7-1, 79-82 cm:  
Fish teeth only.

Sample 2-12C-8-1, 136-139 cm:  
Barren.

Sample 2-12C-10-1, 136-139 cm:  
No planktonic foraminifera.

Sample 2-12C-11-1, 124-126 cm:  
No planktonic foraminifera.