11. NOTES ON NEOGENE CALCAREOUS NANNOFOSSIL BIOSTRATIGRAPHY OF THE ONTONG JAVA PLATEAU AND SIZE VARIATIONS OF *RETICULOFENESTRA* COCCOLITHS¹

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ABSTRACT

A total of 35 calcareous nannofossil datums were found in the Neogene sediments recovered at five sites (Sites 803–807) on the Ontong Java Plateau in the equatorial Pacific during Ocean Drilling Program Leg 130. Among them, 12 datums in the Pleistocene–upper Pliocene sequences were correlated with magnetostratigraphy. Pliocene and Miocene calcareous nannofossil assemblages in 289 samples obtained from Holes 804C, 805B, 805C, and 806B were studied. *Reticulofenestra* coccolith size distribution patterns in these Pliocene-Miocene sediments were also revealed through the present investigation.

INTRODUCTION

Leg 130 of the Ocean Drilling Program (ODP) began at Apra, Guam, on 23 January 1990 and ended at the same harbor on 26 March 1990. Over 4800 m of core were recovered from 16 holes drilled at 5 sites along a depth transect on the Ontong Java Plateau (Fig. 1 and Table 1).

This report deals with the study of the calcareous nannofossils recovered from the Neogene sequences at the Ontong Java Plateau sites drilled during Leg 130 (Sites 803 through 807). Its main purposes are (1) to present the calcareous nannofossil datums in the Neogene sequences, (2) to discuss the basis for the biostratigraphic age assignments at all sites, and (3) to describe in detail the Pliocene and Miocene calcareous nannofossil assemblages in Holes 804C, 805B, 805C, and 806B.

In 1990, Young presented data on *Reticulofenestra* coccolith size distribution patterns in middle Miocene to Pliocene samples from the western Indian Ocean and the Red Sea. This data clearly showed a dramatic size reduction event occurring in the late Miocene nannofossil Zone NN10 of Martini's (1971) zonal scheme. Another main object of the present investigation is to present data on size variation of Pliocene-Miocene *Reticulofenestra* coccoliths at Sites 804, 805, and 806 as Young's report (1990).

METHODS

Standard smear slides were made for all samples using either ENTELLAN new or Eukitt as a mounting medium. The calcareous nannofossils were examined in the smear slides by standard light microscopy techniques (plane polarized light and/or cross polarized light at approximately 1500× magnification). For the Pliocene-Miocene samples only from Holes 804C, 805B, 805C, and 806B, counts of 200 specimens per sample were made in straight transects across the smear slides and were listed to determine the relative frequencies of occurrence of the species and their stratigraphic changes. The counts did not include *Florisphaera profunda*. After this examination, these slides were continuously scanned for the presence of other important species.

ZONES AND DATUMS

Zones

From the several calcareous nannofossil zonal schemes available for the subdivision of Cenozoic sediments (e.g., Martini, 1971; Okada and Bukry, 1980), I chose the scheme proposed by Martini (1971). His scheme does not represent the ultimate resolution that can be achieved in Cenozoic deep-sea sediments, because deep-sea biostratigraphy has developed rapidly over the past two decades and still continues to do so. However, this zonal scheme does provide a simple picture of biostratigraphic relationships in the cored sequences. I also think that the fact that most marine geologists are familiar with Martini's scheme also adds to its value as an initial framework for Leg 130 nannofossil biostratigraphy.

Datums

Table 2 summarizes the nannofossil datums considered in this report and their estimated ages. Among them, a total of 35 datums are useful for the Neogene sequences. As a matter of convenience, I will number these datums in descending order from 1 to 35. Some of these datums are used as boundary markers for of Martini's (1971) zonation. However, the others are not in Martini's zonal boundary definitions. These additional events represent a resource that creates a substantially improved biostratigraphic and biochronologic resolution, which becomes important, for example, in the reconstruction of Cenozoic sediment accumulation rates.

BIOSTRATIGRAPHIC SUMMARY

During Leg 130, a total of 16 holes were drilled at 5 sites (Sites 803–807) along a depth transect on the Ontong Java Plateau, equatorial Pacific Ocean (Fig. 1 and Table 1). Cenozoic sediments were recovered primarily by continuous advanced hydraulic piston coring (APC) and use of the extended core barrel (XCB) after the refusal of the APC. Very abundant and moderately preserved coccoliths and discoasters were found throughout the cores studied.

Pleistocene

With regard to Pleistocene sequences, I only tried to detect the calcareous nannofossil datums at all sites. The stratigraphic positions of these datums are tabulated in Tables 3–7. Pleistocene magneto- and biostratigraphic relationships for each site are shown in Figure 2. The magnetostratigraphy in this area is not well established and is still

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Figure 1. Bathymetric map (in meters) of the northwestern part of the Ontong Java Plateau (after Mammerickx and Smith, 1985) and locations of Leg 130 drill sites. Sites drilled on DSDP Leg 7 (Site 64), Leg 30 (Site 289), and Leg 89 (Site 586) are also provided for reference.

Table 1. Locations of Leg 130 holes studied.

Holes	Latitude	Longitude	Water depth (m)
803D	2°25.98'E	160°32.46'E	3412.2
804C	1*00.28'N	161°35.62'E	3861.1
805B	1*13.68'N	160°31.76'E	3186.8
805C	1*13.69'N	160°31.77'E	3187.7
806B	0°19.11'N	159°21.69'E	2519.9
807A	A 3°36.42'N 156°37.49'E		2803.8

tentative. Therefore, the relationship between the magnetostratigraphy and biostratigraphy is not clear. As is evident from Figure 2, however, Datum 4 FAD (first appearance datum) of *Gephyrocapsa parallela* is detected somewhere around the estimated Jaramillo Event and the Datum 11 FAD of *Gephyrocapsa caribbeanica* may be placed slightly above the estimated Olduvai Event.

Pliocene/Pleistocene Boundary

The paleontological investigation of the Vrica section in Italy, which is the boundary stratotype for the base of the Pleistocene series, was conducted by many workers. Among these various investigations, Sato et al. (1988) concluded as follows:

Because reworked discoasters are present throughout the Pliocene-Pleistocene sequence at the Vrica section, the position of LAD (last appearance datum) *Discoaster brouweri* (Datum 12 in this chapter) is not clear. Therefore, the most reliable and nearest datum to the Pliocene/Pleistocene boundary is the FAD of *Gephyrocapsa caribbeanica* (Datum 11 in this chapter). This datum is about 20 m above the Pliocene/Pleistocene boundary and about 30 m above the top of the Olduvai Event. One can conclude that it is better to use the FAD of *Gephyrocapsa caribbeanica* as the Pliocene/Pleistocene boundary marker instead of LAD *Discoaster brouweri*.

Based on this evidence, the Pliocene/Pleistocene boundary in the holes studied is placed slightly below Datum 11 (FAD *Gephyrocapsa caribbeanica*). As is obvious from Tables 3–7, for example, this boundary in Holes 804C, 805C, and 806B can be detected in Cores 130-804C-3H, 130-805C-4H, and 130-806B-5H, respectively.

Pliocene and Miocene

At the start, I detected the important calcareous nannofossil datums (Table 2) in the Pliocene and Miocene sequences at all sites. The stratigraphic positions of these datums are given in Tables 8–13 and illustrated in Figure 3. Then I described successively the sequential changes of the calcareous nannofossil assemblages at selected sites; that is, at the shallowest (Site 806), intermediate (Site 805), and deepest (Site 804) sites, based on two samples including core-catcher materials from each core. Occurrence tables were prepared for these selected sites (Tables 14–17). These tables show the number of coccoliths counted at random in each sample during the 200-specimen count; a plus sign (+) indicates the trace of a species in a sample, and a question mark (?) indicates the questionable presence of a species.

The overall sequential changes of nannofossil floras throughout the Pliocene-Miocene sequences at Sites 806, 805, and 804 are illustrated in Figure 4. The stratigraphic changes of relative abundances of *Coccolithus pelagicus* (and its related forms such as *C. miopelagicus*), *Cyclicargolithus floridanus, Discoaster* spp., *Sphenolithus* spp. and *Reticulofenestra* spp., which are dominant and important groups of the calcareous nannofossils at these selected sites are shown separately in Figures 5–9. As a matter of course, the pattern of floral changes at Sites 806, 805, and 804 are quite similar to each other.

Based on these floral changes, the Pliocene-Miocene sequence at the Ontong Java Plateau was divided into three parts: upper, middle, and lower. As evident from Figure 9, the upper part of the PlioceneMiocene sequence (NN18-NN10) is characterized by the remarkable dominance of Reticulofenestra specimens. It is noteworthy that the lower half of the upper part contains abundant sphenoliths (Fig. 8). At the boundary between the upper and the middle parts, the relative abundance of Reticulofenestra specimens decreases abruptly and becomes almost barren (Fig. 9); as a result, sphenoliths become dramatically dominant. Therefore, this horizon is characterized by the bloomlike abundance of small Sphenolithus abies (Fig. 8). In the middle part of the Neogene sequence (NN10-middle NN5/NN4), very abundant Reticulofenestra occurs again together with Coccolithus pelagicus and such related forms as C. miopelagicus (Figs. 5 and 9). In the lower half of the middle part, Cyclicargolithus floridanus and discoasters increase their relative abundances (Figs. 6 and 7). At the boundary between the middle and the lower parts, Reticulofenestra again becomes rare (Fig. 9); Cyclicargolithus floridanus and discoasters are abundant at this horizon (Figs 6 and 7). The lower part (middle NN5/NN4-NN1) is characterized by relatively diversified floras. However, the lower half of this part is characterized by fairly abundant Cyclicargolithus floridanus (Fig. 6).

The nannofossil assemblages at Sites 806, 805, and 804 are discussed in detail in what follows. Each calcareous nannofossil zone is considered separately, and biostratigraphic age assignments are discussed. As already mentioned above, nannofossil assemblages in Hole 806B are quite similar to those in Holes 804C, 805B, and 805C. Therefore, I will describe the nannofossil floras in these holes, stressing those in the longest core from Hole 806B drilled at the shallowest site on the Ontong Java Plateau.

Pliocene

Lowest NN19 Pseudoemiliania lacunosa Zone (Datums 11-12)

- Hole 806B: 35.5–42.39 mbsf; Samples 130-806B-5H-1, 26–27 cm, to -5H-6, 26–27 cm
- Hole 805C: 27.02–32.74 mbsf; Samples 130-805C-4H-1, 23–24 cm, to -4H-5, 23–24 cm
- Hole 804C: 16.67–18.85 mbsf; Samples 130-804C-3H-1, 90–91 cm, to -3H-3, 14–15 cm

In the present investigation only two samples from Holes 805C and 806B were available for the floral analysis. These samples contained neither *Gephyrocapsa caribbeanica* nor *Discoaster brouweri* and were assigned to the lowest NN19 Zone (latest Pliocene) (between Datum 11 FAD *G. caribbeanica* and Datum 12 LAD *D. brouweri*). The floras are characterized by very abundant small *Reticulofenestra* specimens and comparatively abundant *Calcidiscus leptoporus*. In Sample 130-805C-4H-5, 23–24 cm, small forms of *Gephyrocapsa* are abundant.

NN18 Discoaster brouweri Zone (Datums 12-13)

Hole 806B: 43.81–54.00 mbsf; Samples 130-806B-5H-7, 26–27 cm, to -6H-CC

- Hole 805C: 34.18-40.95 mbsf; Samples 130-805C-4H-6, 23-24 cm, to -5H-4, 23-24 cm
- Hole 804C: 19.22–25.30 mbsf; Samples 130-804C-3H-3, 52 cm, to -3H-CC

Based on the presence of *Discoaster brouweri* and the absence of *D. pentaradiatus*, the samples mentioned above were assigned to the late Pliocene NN18 Zone (between Datum 12 LAD *D. brouweri* and Datum 13 LAD *D. pentaradiatus*). In Samples 130-806B-5H-CC, 130-805C-4H-CC, and 130-804C-3H-CC, I also found *Discoaster triradiatus*. It is well known that the upper part of this zone is generally characterized by the abundant occurrence of this species (Takayama, 1969; Backman and Pestiaux, 1986; and others). In the holes studied, however, the acme of *D. triradiatus* was not recog-

Table 2. Calcareous nannofossil datums and their assigned age estimates.

Event	Species	Datum	Zone (top)	Age (Ma)	Reference
04	Emiliania huvlovi			0.09	1
FAD	Emiliania huxleyi	Datum 1	NINIOO	0.09	1
	Popudoamiliania lagunaga	Datum 0	NIN20	0.20	1
	Poticulofonastra apanoi	Datum 2	111119	0.40	
EAD	Conturoconos parallela	Datum 3		0.03	2
EAD	Beticulefonostro acanoi	Datum F		1.06	2
	Large Confurences	Datum 6		1.00	2
	Large Gephyrocapsa	Datum 7		1.10	2
EAD		Datum 7		1.19	2
	Calaidianua masiaturai	Datum 8		1.30	2 (0)
	Calcidiscus macinityrei	Datum 9		1.45 (1.57)	3 (2)
FAD	Gephyrocapsa oceanica	Datum 10		1.57	2
FAD	Gephyrocapsa caribbeanica	Datum 11		1.66	2
Pliocene/F	Pleistocene boundary			1.66	4, 5
LAD	Discoaster brouweri	Datum 12	NN18	1.89	з
LAD	Discoaster triradiatus			1.89	3
OA	Discoaster triradiatus	1495 JC 52000		2.07	6
LAD	Discoaster pentaradiatus	Datum 13	NN17	2.35	3
LAD	Discoaster surculus	Datum 14	NN16	2.41	З
LAD	Reticulofenestra ampla			2.62	2
LAD	Discoaster tamalis			2.65	3
LAD	Sphenolithus spp.	Datum 15		3.45	3
LAD	Reticulofenestra pseudoumbilica	Datum 16	NN15	3.56	3
LAD	Amaurolithus tricorniculatus		NN14	3.7	7
FAD	Discoaster asymmetricus		NN13	4.1	7
LAD	Amaurolithus primus			4.4	7
FAD	Ceratolithus rugosus	Datum 17	NN12	4.6	3
LAD	Ceratolithus acutus	Datum 18		4.6	3
FAD	Ceratolithus acutus	Datum 19		4.9 (4.85)	8
LAD	Triquetrorhabdulus rugosus	Datum 20		4.9	8
Miocene/F	Pliocene boundary			4.9	9
LAD	Discoaster quinqueramus	Datum 21	NN11	5.0	8
LAD	Amaurolithus amplificus			5.4	10
FAD	Amaurolithus amplificus			6.0	10
FAD	Amaurolithus primus			6.7	10
FAD	Discoaster quinqueramus	Datum 22	NN10	7.5	8
FAD	Discoaster berggrenii			8.2	7
LAD	Discoaster hamatus	Datum 23	NN9	8.7	8
LAD	Catinaster spp.	Datum 24		8.8	8
FAD	Discoaster neohamatus			9.0	8
FAD	Catinaster calyculus	Datum 25		10.0	7
FAD	Discoaster hamatus	Datum 26	NN8	10.5	8
FAD	Catinaster coalitus	Datum 27	NN7	11.1	8
FAD	Discoaster kugleri		NN6	12.2	8
LAD	Coronocyclus nitescens	Datum 28		12.8	10
LAD	Cyclicargolithus floridanus	Datum 29		13.1	8
LAD	Sphenolithus heteromorphus	Datum 30	NN5	13.6	8
LAD	Helicosphaera ampliaperta		NN4	16.0	7
TA	Discoaster deflandrei group			16.1	10
FAD	Sphenolithus heteromorphus	Datum 31		18.6	8
LAD	Sphenolithus belemnos	Datum 32	NN3	18.8	8
LAD	Triquetrorhabdulus carinatus	Datum 33	NN2	19.5	8
	Sphenolithus belemnos	Datum 34		20.0	8
FAD		Datum OF	NN1	23.6	8
FAD FAD	Discoaster druggii	Datum 35	14141		
FAD FAD TA	Discoaster druggii Sphenolithus delphix	Datum 35	, and t	23.6	11

Notes: FAD = first appearance datum, LAD = last appearance datum, OA = onset acme, and TA = termination acme. Zonal codes are those of Martini (1971). Age column references represent (1) Thierstein et al. (1977); (2) Sato et al. (1991), Sato and Takayama (1992); (3) Backman and Shackleton (1983); (4) Sato et al. (1988); (5) Rio et al. (in press); (6) Backman and Pestiaux (1986); (7) Berggren et al. (1985); (8) Backman et al. (1990); (9) Zijderveld et al. (1986); (10) Rio et al. (1990); (11) Fornaciari et al. (1990).



Figure 2. Quaternary magneto- and biostratigraphic relationships at each site of Leg 130. Refer to Table 2 for key to datum numbers.

nized. In Hole 805C, *Discoaster asymmetricus* and *D. blackstockae* are present. In this zone, *Reticulofenestra* is very dominant; it forms nearly 75% of the flora in all samples. In Hole 805C, a few specimens of *Reticulofenestra pseudoumbilica* were found (in Sample 130-805C-5H-3, 23–24 cm). However, it is considered to be reworked based on its state of preservation. Sporadic occurrences of *Ceratolithus rugosus* were also recognized.

NN17 Discoaster pentaradiatus Zone (Datums 13-14)

Hole 806B: 54.51–64.53 mbsf; Samples 130-806B-7H-1, 106– 107 cm, to -8H-1, 106–107 cm

Hole 805C: 42.42–43.89 mbsf; Samples 130-805C-5H-5, 23–24 cm, to -5H-6, 23–24 cm

Hole 804C: 29.01 mbsf; Sample 130-804C-4H-3, 90-91 cm

In the samples mentioned above, *Discoaster brouweri* and *D. pentaradiatus* co-occur. Small-sized *Reticulofenestra* specimens predominate. I observed the presence of *Reticulofenestra pseudoumbilica* in Sample 130-804C-4H-3, 90–91 cm. Judging from the state of the coccolith preservation, however, it is considered to be reworked. Sediments belonging to this zone (between Datum 13 LAD *D. pentaradiatus* and Datum 14 LAD *D. surculus*) are very thin at all sites.

NN16 Discoaster surculus Zone (Datums 14-16)

Hole 806B: 65.99–93.66 mbsf; Samples 130-806B-8H-2, 106–107 cm, to -11H-2, 26–27 cm

Holes 805B and 805C: 45.80–73.20 mbsf; Samples 130-805C-5H-CC to 130-805B-8H-CC

Hole 804C: 30.44–34.80 mbsf; Samples 130-804C-4H-4, 90–91 cm, to -4H-CC

In this zone, Discoaster surculus occurs for the first time. However, the upper part of this zone contains a few specimens of D. surculus. Consequently, it is difficult to detect the boundary between Zones NN17 and NN16 (Datum 14 LAD D. surculus). Samples from the lower part of this zone (such as Sample 130-806B-10H-CC, Samples 130-805B-8H-4, 23-24 cm, and -8H-CC, and Sample 130-804C-4H-CC) yield such diversified discoaster species as Discoaster asymmetricus, D. brouweri, D. challengeri, D. decorus, D. surculus, D. triradiatus, and D. variabilis. Throughout this zone, Discoaster tamalis is almost absent. Moreover, only a few questionable specimens of Reticulofenestra ampla were observed in Samples 130-806B-8H-3, 106-107 cm, and -8H-CC. Therefore, calcareous nannofossil events LAD R. ampla and LAD D. tamalis were not detected at the Ontong Java Plateau. In some samples from the lower part of this zone (e.g., Sample 130-805B-8H-CC), Gephyrocapsa aperta and small specimens of Gephyrocapsa were found. In Holes 806B and 805B, Datum 15 (LAD Sphenolithus spp.) was detected at the lowest part of Zone NN16, slightly above Datum 16 (LAD Reticulofenestra pseudoumbilica). As same as overlying zones, reticulofenestrid specimens are very abundant throughout this interval. Reticulofenestra peudoumbilica occurs in Samples 130-805C-6H-4, 23-24 cm, and -6H-CC, 130-805B-7H-CC, and 130-804C-4H-CC of this zone. Their numbers of specimen are limited; therefore, they are considered to be reworked.

Zone		Species	Age (Ma)	Core, section, interval (cm)	Depth (mbsf)
CN15	NN21	1. FAD Emiliania huxlevi	0.28	1H-1.90-91/1H-CC	0.89/2.50
CN14b	NN20	2. LAD Pseudoemiliania lacunosa	0.46	2H-1,15-16/2H-1,90-91	2.64/3.36
		3. LAD Reticulofenestra asanoi	0.83	2H-3,90-91/2H-4,15-16	6.23/6.95
		4. FAD Gephyrocapsa parallela.	0.90	2H-5,15-16/2H-5,90-91	8.38/9.10
		5. FAD Reticulofenestra asanoi	1.06	2H-6,15-16/2H-6,90-91	9.81/10.53
CN14a		6. LAD Large Gephyrocapsa	1.10	2H-6,90-91/2H-7,15-16	10.53/11.25
	NN19	7. LAD Helicosphaera sellii	1.19	3H-1,15-16/3H-1,90-91	12.14/12.87
		8. FAD Large Gephyrocapsa	1.36	3H-1,90-91/3H-2,15-16	12.87/13.59
		9. LAD Calcidiscus macintyrei	1.45	3H-1,90-91/3H-2,15-16	12.87/13.59
ONIAGE	-	10. FAD Gephyrocapsa oceanica	1.57	3H-2,15-16/3H-2,90-91	13.59/14.32
CN13D	-	11. FAD Gephyrocapsa caribbeanica	1.66	3H-2,90-91/3H-3,15-16	14.32/15.04
CN13a		12. LAD Discoaster brouweri	1.89	3H-4.15-16/3H-4.90-91	16.49/17.21
CN12d	NN18		1.00		

Table 3. Quaternary calcareous nannofossil datums, Hole 803D.

NN15 Reticulofenestra pseudoumbilica Zone–NN13 Ceratolithus rugosus Zone (Datums 16–17)

Hole 806B: 95.08–137.43 mbsf; Samples 130-806B-11H-3, 26–27 cm, to -15H-6, 26–27 cm

Hole 805B: 73.42–104.93 mbsf; Samples 130-805B-9H-1, 23–24 cm, to -12H-3, 23–24 cm

Hole 804C: 39.48–44.30 mbsf; Samples 130-804C-5H-4, 90–91 cm, to -5H-CC

Relatively abundant, very large-sized reticulofenestrid species, Reticulofenestra pseudoumbilica, and R. gelida occur in and below Zone NN15. As stated above, Reticulofenestra pseudoumbilica occurs in several samples of Zones NN18, NN17, and NN16. However, judging from the limited numbers of specimens and their preservation state, these Reticulofenestra pseudoumbilica are considered to be reworked. The interval from Zones NN15 through NN13 (between Datums 16 LAD R. pseudoumbilica and 17 FAD Ceratolithus rugosus) was not subdivided because members of Amaurolithus and Discoaster asymmetricus are rare or absent in this region. Therefore, I placed the above-mentioned samples tentatively in the NN15-NN13 zonal interval. As compared with the overlying zones, Reticulofenestra species decrease their numbers, but still they form more than 50% of the total flora in all samples (Fig. 9). Ceratolithus rugosus occurs almost throughout this zonal interval. Comparatively large-sized Discoaster variabilis is present in samples belonging to the upper part of this NN15-NN13 interval.

NN12 Amaurolithus tricorniculatus Zone (Datums 17-21)

Hole 806B: 138.87–161.60 mbsf; Samples 130-806B-15H-7, 26–27 cm, to -18H-3, 26–27 cm

Hole 805B: 106.43–120.92 mbsf; Samples 130-805B-12H-4, 23–24 cm, to -14H-1, 23–24 cm

Hole 804C: missing.

The above-mentioned samples are characterized by the absence of *Ceratolithus rugosus* and *Discoaster quinqueramus* and, therefore, are assigned to early Pliocene NN12 Zone (between Datum 17 FAD *C. rugosus* and Datum 21 LAD *D. quinqueramus*). In Hole 804C, this zone is completely missing; an early Pliocene hiatus is inferred at Site 804. As shown in Figure 8, some samples in this zone contain fairly abundant sphenoliths (e.g., in Samples 130-806B-16H-4, 26–27 cm, and -17H-CC). *Triquetrorhabdulus rugosus*, whose LAD defines Datum 20, was found as high as Samples 130-806B-17H-4, 26–27 cm, and 130-805B-13H-CC. It is remarkable that the interval ranging from Samples 130-806B-15H-CC through -16H-CC and Samples 130-805B-12H-4, 23–24 cm, through -13H-3, 123–124 cm, contain *Ceratolithus acutus*. Therefore, we can detect the important Datums 18 and 19 above and below these sample intervals, respectively.

Miocene

NN11 Discoaster quinqueramus Zone (Datums 21-22)

Hole 806B: 163.02–283.65 mbsf; Samples 130-806B-18H-4, 26–27 cm, to -31H-2, 24–25 cm

Hole 805B: 122.36–218.82 mbsf; Samples 130-805B-14H-2, 23–24 cm, to -24H-3, 23–24 cm

Hole 804C: 44.63–71.45 mbsf; Samples 130-804C-6H-1, 90–91 cm, to -8H-6, 90–91 cm

Judging from the existence of *Discoaster quinqueramus*, the above-mentioned samples were assigned to Zone NN11 (between Datums 21 LAD *D. quinqueramus* and 22 FAD *D. quinqueramus*). However, the characteristic central stem in this species is not so well developed in the oldest and youngest associations of this species, often making precise determination of its entry and exit levels difficult. The top of this zone (Datum 21) approximately indicates the position of the Miocene/Pliocene boundary. *Discoaster berggrenii* is also present throughout this interval. *Calcidiscus premacintyrei* occurs consistently in and below this zone, although the sporadic occurrences of this species were recognized in the overlying NN12 Zone. *Amaurolithus* speciments, and primary morphological characters are typically masked by substantial calcite growth. Therefore, the LAD and FAD of

Zo	ne	Species	Age (Ma)	Core, section, interval (cm)	Depth (mbsf)
CN15	NN21	1. FAD Emiliania huxlevi	0.28	1H-2.15-16/1H-2.52	1.65/2.20
CN14b	NN20	2. LAD Pseudoemiliania lacunosa	0.46	1H-3,127/1H-4,15-16	4.26/4.64
		3. LAD Reticulofenestra asanoi	0.83	2H-2,127/2H-3,15-16	8.93/9.29
		4. FAD Gephyrocapsa parallela.	0.90	2H-3,90-91/2H-3,127	10.00/10.36
		5. FAD Reticulofenestra asanoi	1.06	2H-4,127/2H-5,15-16	11.78/12.14
CN14a		6. LAD Large Gephyrocapsa	1.10	2H-5,52/2H-5,90-91	12.49/12.85
	NN19	7. LAD Helicosphaera sellii	1.19	2H-6,52/2H-6,90-91	13.92/14.28
		8. FAD Large Gephyrocapsa	1.36	2H-6,127/2H-7,15-16	14.63/14.99
		9. LAD Calcidiscus macintyrei	1.45	2H-7,65/2H-CC	15.34/15.80
Chitch	-	10. FAD Gephyrocapsa oceanica	1.57	3H-1,52/3H-1,90-91	16.31/16.67
CNI3D		11. FAD Gephyrocapsa caribbeanica	1.66	3H-1,52/3H-1,90-91	16.31/16.67
CN13a CN12d	NN18	12. LAD Discoaster brouweri	1.89	3H-3,14-15/3H-3,52	18.85/19.22

Table 4. Quaternary calcareous nannofossil datums, Hole 804C.

A. amplificus and the FAD of A. primus, which were expected in Zone NN11, cannot be recognized in this area. The lowest occurrence of Amaurolithus was observed in Sample 130-806B-26H-CC, which lies in the middle part of Zone NN11. In Holes 804C and 805B, Discoaster neohamatus occurs continuously in and below the lower part of this zone, but it is not clearly noticeable in Hole 806B.

NN10 Discoaster calcaris Zone (Datums 22-23)

- Hole 806B: 285.09–338.96 mbsf; Samples 130-806B-31H-3, 26–27 cm, to -36X-7, 26–27 cm
- Hole 805B: 220.27–266.43 mbsf; Samples 130-805B-24H-4, 23–24 cm, to -29X-3, 23–24 cm
- Hole 804C: 72.80–114.70 mbsf; Samples 130-804C-8H-CC to -13H-3, 90–91 cm

This zone is represented by the stratigraphic interval ranging from the FAD of *Discoaster quinqueramus* (Datum 21) down to the LAD of *D. hamatus* (Datum 23). Therefore, samples in this zone are characterized by the absence of *D. quinqueramus* and *D. hamatus*. In Hole 804C, however, Samples 130-804C-11H-CC, -12H-3, 90–91 cm, and -12H-CC contain *Discoaster hamatus*. Therefore, it seems that the base of Zone NN10 must be placed between Samples 130-804C-11H-3, 90–91 cm, and -11H-CC. However, I considered *D. hamatus* in these samples to be reworked because the number of its specimens is very limited and some of these samples also contain *Discoaster exilis* and forms similar to *Discoaster deflandrei*. As is evident from Figures 4 and 9, the similarity of the floral changes among these holes supports this conclusion.

It is noteworthy that the abundance of reticulofenestrid coccoliths drastically decreases in the upper part of this zone. Finally, they become almost barren in Samples 130-806B-33H-CC and 130-805B-26H-CC, which are in the middle of Zone NN10. On the other hand, in Hole 804C *Reticulofenestra* are very rare in Sample 130-804C-10H-CC. Therefore, this sample may be placed in the middle of Zone NN10. In contrast to *Reticulofenestra*, sphenoliths are very abundant at this horizon. In particular, Samples 130-806B-32H-4, 26–27 cm,

and -33H-4, 26-27 cm, Samples 130-805B-25H-CC, -26H-4, 23-24 cm, and -27H-4, 23-24 cm, and Sample 130-804C-9H-3, 90-91 cm, are characterized by bloomlike abundances of tiny specimens of Sphenolithus abies. The most striking changes in the calcareous nannofossil assemblages in Cenozoic sequences on the Ontong Java Plateau can be recognized in Samples 130-806B-34H-4, 26-27 cm, 130-805B-27H-4, 23-24 cm, and 130-804C-11H-3, 90-91 cm, in which Reticulofenestra again increases in the number of specimens (particularly very large-sized Reticulofenestra specimens) toward the bottom of these holes. In other words, only the lower part of Zone NN10 contains very large-sized (>7 µm in diameter of coccolith) Reticulofenestra specimens. This dramatic event in the size change of Reticulofenestra coccoliths takes place in the middle part of Zone NN10 not only in Holes 806B and 805B but also in Hole 804C. Coccolithus pelagicus is comparatively abundant in this zone. In addition, Coccolithus miopelagicus is present almost consistently in and below this zone, although its sporadic occurrences are recognized above this zone in Holes 805B and 804C (Fig. 5).

NN9 Discoaster hamatus Zone (Datums 23-26)

Hole 806B: 339.34–366.56 mbsf; Samples 130-806B-36X-CC to -39X-6, 26–27 cm

Hole 805B: 267.93–282.73 mbsf; Samples 130-805B-29X-4, 23–24 cm, to -31X-1, 23–24 cm

Hole 804C: 120.30–149.70 mbsf; Samples 130-804C-13H-CC to -17X-1, 90–91 cm

The samples mentioned above are characterized by continuous occurrences of *Discoaster hamatus*, whose total range defines Zone NN9 (between Datums 23 LAD *D. hamatus* and 26 FAD *D. hamatus*). In this zone, sphenoliths decrease in the number of their specimens and reticulofenestrid coccoliths become dominant again (Figs. 8 and 9). In this zone, Datums 24 (LAD *Catinaster* spp.) and 25 (FAD *Catinaster* calyculus) are easily detected. For example, *Catinaster* spp. is found below Sample 130-806B-37X-CC, and *C. calyculus* occurs only in Samples 130-806B-37X-CC through -39X-3, 26–27 cm. Therefore, Datums 24 and 25 are

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Zo	ne	Species	Age (Ma)	Core, section, interval (cm)	Depth (mbsf)
CN15	NN21	1. FAD Emiliania huxlevi	0.28	1H-2.23-24/1H-2.123-124	1.73/2.73
CN14b	NN20	2. LAD Pseudoemiliania lacunosa	0.46	1H-5,23-24/1H-5,123-124	6.23/7.23
		3. LAD Reticulofenestra asanoi	0.83	2H-5,23-24/2H-5,123-124	13.79/14.75
		4. FAD Gephyrocapsa parallela.	0.90	2H-7,23-24/2H-CC	16.68/17.30
	NN19	5. FAD Reticulofenestra asanoi	1.06	3H-1,123-124/3H-2,23-24	18.53/19.03
CN14a		6. LAD LargeGephyrocapsa	1.10	3H-2,23-24/3H-2,123-124	19.03/20.03
		7. LAD Helicosphaera sellii	1.19	3H-5,23-24/3H-5,123-124	23.53/24.53
		8. FAD Large Gephyrocapsa	1.36	3H-5,123-124/3H-6,23-24	24.53/25.03
		9. LAD Calcidiscus macintyrei	1.45	3H-5,123-124/3H-6,23-24	24.53/25.03
ONICOL		10. FAD Gephyrocapsa oceanica	1.57	3H-6,23-24/3H-6,123-124	25.03/26.03
CN13b		11. FAD Gephyrocapsa caribbeanica	1.66	3H-CC/4H-1,23-24	26.70/27.02
CN13a	NN18	12. LAD Discoaster brouweri	1.89	4H-5,23-24/4H-6,23-24	32.74/34.18

Table 5. Quaternary calcareous nannofossil datums, Hole 805C.

placed above Sample 130-806B-37X-CC and below Sample 130-806B-39X-3, 26–27 cm. In comparison with these datums, the FAD of *Discoaster neohamatus* is not clear. In Hole 804C, *D. neohamatus* is found in the upper four samples of this zone, and the FAD of *D. neohamatus* is most probably placed between Samples 130-804C-15X-2, 90–91 cm, and -15X-CC. In Hole 806B, however, *D. neo-hamatus* is found only in Sample 130-806B-36X-CC, which is the uppermost sample in Zone NN9. In Hole 805B, this datum looks like it can be placed in Zone NN10 between Samples 130-805B-28H-4, 23–24 cm, and -28H-CC. The large-sized specimen of a typical *Calcidiscus macintyrei* was found only in the upper part of this zone (e.g., above Sample 130-806B-37X-CC).

NN8 Catinaster coalitus Zone (Datums 26-27)

Hole 806B: 367.53–374.76 mbsf; Samples 130-806B-39X-CC to -40X-5, 26–27 cm

Hole 805B: 284.23–285.73 mbsf; Samples 130-805B-31X-2, 23–24 cm, to -31X-3, 23–24 cm

Hole 804C: 151.20 mbsf; Sample 130-804C-17X-2, 90-91 cm

This zone is characterized by the presence of *Catinaster coalitus* and the absence of *Discoaster hamatus* (between Datums 26 FAD *D. hamatus* and 27 FAD *C. coalitus*), and it is a very thin zone in all holes. In this zone, only three samples from Hole 806B and two samples from Hole 805B were examined; no sample was available from Hole 804C for the present faunal analysis.

NN7 Discoaster kugleri Zone–NN6 Discoaster exilis Zone (Datums 27–30)

- Hole 806B: 375.96–472.03 mbsf; Samples 130-806B-40X-CC to -50X-CC
- Hole 805B: 287.23–325.23 mbsf; Samples 130-805B-31X-4, 23–24 cm, to -35X-4, 23–24 cm
- Hole 804C: 152.70–176.30 mbsf; Samples 130-804C-17X-3, 90–91 cm, to -19X-CC

The NN7/NN6 boundary is defined by the FAD of *Discoaster kugleri*. Typical specimens of this species were recognized in Samples 130-806B-43X-4, 26–27 cm, 130-805B-33X-CC, and 130-804C-18X-3, 90–91 cm. Therefore, these samples were assigned to Zone NN7. Except for these samples, however, the nominate species *D. kugleri* was almost absent throughout the interval. Therefore, I tentatively placed the samples mentioned above in the NN7–NN6 zonal interval (between Datums 27 FAD *C. coalitus* and 30 LAD *Sphenolithus heteromorphus*).

In the same manner as in the overlying zones, this zonal interval contains very dominant *Reticulofenestra* specimens (Fig. 9). Furthermore, *Coccolithus pelagicus* and its related forms are also comparatively abundant (Fig. 5).

In this NN7–NN6 interval, two important datums were easily recognized in the holes studied: Datums 28 (LAD *Coronocyclus nitescens*) and 29 (LAD *Cyclicargolithus floridanus*). In Hole 806B, *Coronocyclus nitescens* and *Cyclicargolithus floridanus*). In Hole 806B, *Coronocyclus nitescens* and *Cyclicargolithus floridanus* were continuously found below Samples 130-806B-45X-CC and -50X-3, 26–27 cm, respectively. Therefore, Datums 28 and 29 were detected between Samples 130-806B-45X-3, 26–27 cm, and -45X-CC and between Samples 130-806B-49X-CC and 130-806B-50X-3, 26–27 cm, respectively. Similarly in Hole 805B, *C. nitescens* and *C. floridanus* occur continuously below Samples 130-805B-33X-CC and -34X-CC. On the other hand, although Datum 28 was placed between Samples 130-804C-18X-3, 90–91 cm, and -18X-CC, *C. floridanus* was not found throughout this interval, which suggests that the lower part of this zonal interval is missing.

Discoaster exilis occurs continuously throughout this interval, and Discoaster deflandrei was found in and below the lower part of this interval.

NN5 Sphenolithus heteromorphus Zone–NN4 Helicosphaera ampliaperta Zone (Datums 30–32)

Hole 806B: 473.56–579.30 mbsf; Samples 130-806B-51X-1, 26–27 cm, to -61X-CC

Zone		Species	Age (Ma)	Core, section, interval (cm)	Depth (mbsf)
CN15	NN21	1. FAD Emiliania huxlevi	0.28	1H-3.32-33/1H-3.103-104	3.32/4.03
CN14b	NN20	2. LAD Pseudoemiliania lacunosa	0.46	2H-2,26-27/2H-3,26-27	8.20/9.65
		3. LAD Reticulofenestra asanoi	0.83	3H-2,26-27/3H-2,106-107	17.67/18.43
		4. FAD Gephyrocapsa parallela.	0.90	3H-4,106-107/3H-5,26-27	21.29/21.95
	NN19	5. FAD Reticulofenestra asanoi	1.06	3H-6,106-107/3H-7,26-27	24.14/24.80
CN14a		6. LAD Large Gephyrocapsa	1.10	3H-CC/4H-1,107-108	25.50/26.05
		NN19	7. LAD Helicosphaera sellii	1.19	4H-4,26-27/4H-4,107-108
		8. FAD Large Gephyrocapsa	1.36	4H-5,26-27/4H-5,106-107	31.50/32.26
		9. LAD Calcidiscus macintyrei	1.45	4H-6,106-107/4H-7,26-27	33.70/34.37
		10. FAD Gephyrocapsa oceanica	1.57	4H-7,66-67/4H-CC	34.75/35.00
CN13b		11. FAD Gephyrocapsa caribbeanica	1.66	4H-CC/5H-1,26-27	35.00/35.25
CN13a			1.00	FIL 6 06 07/511 7 06 07	10 00/10 01
CN12d	NN18	12. LAD Discoaster brouweri	1.89	5H-0,20-27/5H-7,26-27	42.39/43.81

Table 6. Quaternary calcareous nannofossil datums, Hole 806B.

Hole 805B: 326.73–389.75 mbsf; Samples 130-805B-35X-5, 23–24 cm, to -42X-2, 25–26 cm

Hole 804C: 178.60–206.16 mbsf; Samples 130-804C-20X-1, 90–91 cm, to -22X-CC

The boundary between Zones NN6 and NN5 was easily detected by the LAD of *Sphenolithus heteromorphus* (Datum 30). *Helicosphaera ampliaperta*, whose last occurrence defines the top of Zone NN4, has not been found in any of the Leg 130 samples taken from the pertinent stratigraphic interval and must have been ecologically excluded from this region. It follows that the combination of Zones NN5 and NN4 results in a long biostratigraphic interval that straddles the lower/middle Miocene boundary. Therefore, I am forced to place the above-mentioned samples in the NN5–NN4 zonal interval (between Datums 30 LAD *S. heteromorphus* and 32 LAD *S. belemnos*).

Throughout this interval, *Coccolithus pelagicus* and *C. miopelagicus* are relatively abundant (Fig. 5). In Holes 806B and 805B, the upper part of this interval still contains abundant reticulofenestrid coccoliths. In addition, *Cyclicargolithus floridanus* becomes dominant, although the number of specimens decreases temporarily in the middle of this interval (Fig. 6).

Compared with the upper part of this interval, the flora in the lower part is more diversified. The main reason for this is the abrupt decrease in *Reticulofenestra* spp. As in Zone NN10, reticulofenestrid coccoliths are rare in the lower part of the NN5/NN4 zonal interval (Fig. 9). For example, *Reticulofenestra* spp. below Sample 130-806B-57X-4, 26–27 cm, in Hole 806B are rare; it is almost barren in Samples 130-806B-57X-4, 26–27 cm, -59X-4, 26–27 cm, and -60X-3, 26–27 cm. Similarly, *Reticulofenestra* spp. below Sample 130-805B-40X-CC in Hole 805B are rare. On the other hand, all samples belonging to this NN5–NN4 zonal interval from Hole 804C (except for uppermost Sample 130-804C-20X-3, 90–91 cm) contain a small number of specimens of reticulofenestrid coccoliths (Fig. 9C).

Sphenolithus heteromorphus occurs continuously down to Sample 130-806B-61X-4, 26–27 cm. Consequently, Datum 31 (FAD S. heteromorphus) was placed between Samples 130-806B-61X-4, 26–27 cm, and -61X-CC, which is slightly above the NN4/NN3 boundary. In Hole 805B, this datum corresponds with the NN4/NN3 boundary. In Hole 804C, a few specimens of *Sphenolithus belemnos* were found in Samples 130-804C-22X-2, 90–91 cm, and -22X-3, 90–91 cm. However, they occur together with *S. heteromorphus*. Therefore, I consider *S. belemnos* as reworked. *Sphenolithus* spp. is not bloomlike as in Zone NN10, but it is fairly abundant (Fig. 8).

Discoasters are also abundant throughout, although their relative abundances vary from horizon to horizon (Fig. 7). Most of them are Discoaster deflandrei, D. exilis, and D. variabilis. In addition to these species, many asteroliths are lumped under Discoaster spp. because these specimens cannot be identified at the species level by reason of their severe dissolution and/or secondary overgrowth with primary features largely destroyed. Bukry's (1973) end-of-acme concept of Discoaster deflandrei, which was quantified and redefined by Rio et al. (1990) recently as the decrease to <30% of D. deflandrei of the total discoaster assemblage, allows splitting of the NN5/NN4 zonal interval into two parts of approximately equal duration. In Holes 806B and 805B, Discoaster deflandrei is common in the lower part of this interval. For example, in Hole 806B, this species is dominant below Sample 130-806B-53X-CC. Therefore, the top of acme (TA) of Discoaster deflandrei seems to be placed between Samples 130-806B-53X-2, 26-27 cm, and -53X-CC. In Hole 805B, however, the TA of the Discoaster deflandrei group is not so clear as in Hole 806B. In Hole 804C, all samples that belong to this interval contain fairly abundant D. deflandrei, and these samples are most probably assigned to the lower part of this interval. Based on the floral changes mentioned above, I conclude that the upper part of the NN5-NN4 zonal interval in Hole 804C is missing.

NN3 Sphenolithus belemnos Zone (Datums 32-33)

Hole 806B: 579.56–588.56 mbsf; Samples 130-806B-62X-1, 26–27 cm, to -62X-7, 26–27 cm

Hole 805B: very thin or missing

Hole 804C: very thin or missing

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Zo	ne	Species	Age (Ma)	Core, section, interval (cm)	Depth (mbsf)
CN15	NN21	1. FAD Emiliania huxlevi	0.28	1H-4 8-10/1H-4 18-20	4 58/4 68
CN14b	NN20		0.20		4.00/4.00
		2. LAD Pseudoemiliania lacunosa	0.46	1H-CC,8-10/1H-CC	7.28/7.37
		3. LAD Reticulofenestra asanoi	0.83	2H-5,24-25/2H-5,104-105	13.39/14.16
		4. FAD Gephyrocapsa parallela.	0.90	2H-6,104-105/2H-7,24-25	15.60/16.27
		5. FAD Reticulofenestra asanoi	1.06	3H-1,104-105/3H-2,24-25	17.90/18.57
CN14a		6. LAD Large Gephyrocapsa	1.10	3H-2,24-25/3H-2,104-105	18.57/19.34
	NN19	7. LAD Helicosphaera sellii	1.19	3H-5,24-25/3H-5,104-105	22.88/23.65
		8. FAD Large Gephyrocapsa	1.36	3H-6,24-25/3H-6,104-105	24.32/25.09
		9. LAD Calcidiscus macintyrei	1.45	3H-7,24-25/3H-CC	25.76/26.40
Ohitah		10. FAD Gephyrocapsa oceanica	1.57	3H-7,24-25/3H-CC	25.76/26.40
CNI3D		11. FAD Gephyrocapsa caribbeanica	1.66	3H-CC/4H-1,24-25	26.40/26.24
CN13a					
CN12d	NN18	12. LAD Discoaster brouweri	1.89	4H-4,104-105/4H-5,24-25	31.70/32.37

Table 7. Quaternary calcareous nannofossil datums, Hole 807A.

This zone was recognized by the presence of *Sphenolithus belemnos* and the absence of *Triquetrorhabdulus carinatus*. In Hole 806B, the interval assigned to this zone (between Datums 32 LAD *S. belemnos* and 33 LAD *T. carinatus*) is thin, only about 9 m in thickness. The flora of only one sample from this hole (Sample 130-806B-62X-4, 26–27 cm) was examined. This flora is characterized by the occurrence of *Sphenolithus belemnos* together with abundant *Coccolithus pelagicus, Cyclicargolithus floridanus, Discoaster deflandrei*, and *Sphenolithus moriformis*. In Holes 804C and 805B, this zone is very thin or missing; an early Miocene hiatus is probably inferred at Sites 805 and 804.

NN2 Discoaster druggii Zone (Datums 33-35)

- Hole 806B: 589.00-627.50 mbsf; Samples 130-806B-62X-CC to -66X-CC
- Hole 805B: 391.23–426.73 mbsf; Samples 130-805B-42X-3, 23–24 cm, to -46X-1, 23–24 cm
- Hole 804C: 207.70–249.30 mbsf; Samples 130-804C-23X-1, 90–91 cm, to -27X-3, 90–91 cm

This zone is defined by the co-occurrence of *Triquetrorhabdulus* carinatus and Discoaster druggii (between Datums 33 LAD T. carinatus and 35 FAD D. druggii). However, in the holes studied, D. druggii was very rare and occurred sporadically throughout this zone. Therefore, it was very difficult to detect the base of this zone (Datum 35). In this investigation, I tentatively placed the NN2/NN1 boundary just below the deepest sample in which I found D. druggii in each hole. As is evident in Figure 4C, this zone of Hole 804C is summarized as follows: In the upper part of this zone, Reticulofenestra spp. becomes dominant again and Cyclicargolithus floridanus becomes rare. In the lower part of this zone, Reticulofenestra spp. decreases in the number of its specimens drastically and C. floridanus abruptly becomes dominant again.

On the other hand, in Holes 806B and 805B, *Reticulofenestra* spp. is rather dominant throughout this zone. Furthermore, it is continuously abundant down to the upper part of underlying Zone NN1 (Figs. 4A and 4B). Therefore, it is quite within the bounds of possibility that

the NN2/NN1 boundary (Datum 35) in Holes 806B and 805B can be placed at deeper levels in these holes. Samples 130-806B-62X-CC through -64X-1, 43–44 cm, contain *Sphenolithus belemnos;* therefore, these four samples belong to the interval between Datums 33 (LAD *Triquetrorhabdulus carinatus*) and 34 (FAD *Sphenolithus belemnos*). Datum 34 in Hole 805B was placed between Samples 130-805B-43X-3, 23–24 cm, and -43X-CC. As is obvious from Table 9, sediments in Hole 804C that correspond to the interval between these two datums are very thin. *Triquetrorhabdulus carinatus* occurs continuously throughout this zone in each hole; in particular, it is rather abundant in Hole 804C. Sporadic occurrences of this species in the overlying zones are considered to be reworked. It is noteworthy that samples below Datum 34 contain *Sphenolithus dissimilis*.

NN1 Triquetrorhabdulus carinatus Zone (below Datum 35)

- Hole 806B: below 627.76 mbsf; below Sample 130-806B-67X-1, 26-27 cm
- Hole 805B: below 428.23 mbsf; below Sample 130-805B-46X-2, 23-24 cm
- Hole 804C: 250.80–253.98 mbsf; Samples 130-804C-27X-4, 90–91 cm, to -27X-CC

The samples mentioned above contain neither Discoaster druggii nor Sphenolithus ciperoensis and are assigned to early Miocene Zone NN1 (below Datum 35 FAD D. druggii). As mentioned above, however, the NN2/NN1 boundary (Datum 35) is tentative. The absence of D. druggii in these sequences does not necessarily imply a position within Zone NN1 because of the problem of calcite overgrowth. The nannofossils in this zone are abundant but moderate to poorly preserved, monotonous assemblages composed mainly of abundant Discoaster deflandrei, Cyclicargolithus floridanus, and Sphenolithus moriformis. It is noteworthy, in particular, that Cyclicargolithus floridanus among these species is fairly abundant in the lower part of this zone in Holes 805B and 806B, whereas in Hole 804C this species is rich in the lower part of Zone NN2 (Fig. 6). It seems most probable that the NN2/NN1 boundary (Datum 35) in Holes 806B and 805B must

Zone		Species	Age (Ma)	Core, section, interval (cm)	Depth (mbsf)
CN13a	NN19	12. LAD Discoaster brouweri	1.89	3H-4,15-16/3H-4,90-91	16.49/17.21
CN12d		13. LAD Discoaster pentaradiatus	2.35	4H-2,15-16/4H-3,15-16	23.07/24.49
CN12c	NN17	14. LAD Discoaster surculus	2.41	4H-4,15-16/4H-5,15-16	25.92/27.34
CN12b CN12a	NN16	15. LAD Sphenolithus spp.	3.45	6H-2,15-16/6H-3,15-16	41.44/42.29
CN11b	NN15	16. LAD Reticulofenestra pseudoumbilica	3.56	6H-4,15-16,6H-5,15-16	43.14/43.99
CN11a	NN13	17. FAD Ceratolithus rugosus	4.6	7H-CC/8H-2,15-16	55.60/56.71
CN10b		18. LAD Ceratolithus acutus	4.6	8H-2,15-16/8H-3,15-16	57.18/58.61
	NN12	19. FAD Ceratolithus acutus	4.9	8H-CC/9H-1,15-16	65.10/65.25
CN10a	1	20. LAD Triquetrorhabdulus rugosus	4.9	8H-CC/9H-1,15-16	65.10/65.25
	NINICO	21. LAD Discoaster quinqueramus	5.0	9H-1,15-16/9H-2,15-16	65.25/66.70
CN9b CN8a	NN11	22. FAD Discoaster quinqueramus	7.5	16H-4,15-16/16H-5,15-16	136.22/137.70
	NN10	23. LAD Discoaster hamatus	8.7	19H-CC/20H-1,15-16	169.60/169.74
CN7b		24. LAD Catinaster spp.	8.8	20H-1,15-16/20H-2,15-16	169.74/171.17
	NN9	25. FAD Catinaster calyculus	10.0	21H-3,15-16/21H-4,15-16	182.07/183.49
CN7a		26. FAD Discoaster hamatus	10.5	21H-6,15-16/21H-7,15-16	186.32/187.74
CN6	NN8	27. FAD Catinaster coalitus	11.1	21H-6,15-16/21H-7,15-16	186.32/187.74
CN5b	NN7	28. LAD Coronocyclus nitescens	12.8	22H-CC/23H-1,15-16	198.10/198.24
0115-	NN6	29. LAD Cyclicargolithus floridanus	13.1	24H-6,15-16/24H-7,15-16	214.87/216.30
CN5a CN4		30. LAD Sphenolithus heteromorphus	13.6	25X-2,15-16/25X-3,15-16	218.75/220.25
CN3	NN5 NN4	31. FAD Sphenolithus heteromorphus	18.6	28X-1,12-13/28X-2,15-16	246.02/247.55
0110		32. LAD Sphenolithus belemnos	18.8	28X-1,12-13/28X-2,15-16	246.02/247.55
CN2	NN3	33. LAD Triquetrorhabdulus carinatus	19.5	28X-1,12-13/28X-2,15-16	246.02/247.55
-	NN2	34. FAD Sphenolithus belemnos	20.0	28X-CC/29X-1,15-16	252.80/255.65
CN1C CN1b	NN1	35. FAD Discoaster druggii	23.6	35X-3,13-14/35X-4,14-15	316.13/317.64

Table 8. Neogene calcareous nannofossil datums, Hole 803D.

be at deeper horizons. In Hole 804C, the two deepest samples (Samples 130-804C-28X-3, 86–87 cm, and -28X-CC) were assigned to the Oligocene because of the occurrence of *Sphenolithus ciperoensis*. Therefore, the Oligocene/Miocene boundary can be placed in the upper part of Core 130-804C-28X.

SIZE VARIATION OF RETICULOFENESTRA COCCOLITH

Observation

The genus *Reticulofenestra* is an elliptical placolith constructed of elements that are not imbricate or only slightly so, with a central area that is either open or spanned by many small laths that may form a reticulum. Therefore, this genus is recognized by its rim structure and central area. *Reticulofenestra* specimens occur in Eocene through Holocene sediments and dominate coccolith assemblages in the Neogene. These Neogene reticulofenestrid specimens have, however, no characteristic structures except for the size of the placolith diameter and the size of the central opening. Consequently, the nomenclatural taxonomy of *Reticulofenestra* is extremely confused. This serious problem has been discussed by Backman (1980), Pujos (1987), Driever (1988), Gallagher (1989), Young (1990), and others. In the present investigation, these reticulofenestrid coccoliths are identified tentatively to *R. gelida, R. haqii, R. minuta, R. minutula, R. pseudoumbilica,* and others mainly based on Young's (1990) taxonomic concept.

In 1990, *Reticulofenestra* size variations in the Neogene deep-sea sediments of the western Indian Ocean and the Red Sea were systematically observed by Young. He presented a surprisingly simple, consistent, and biostratigraphically useful pattern for the size variTable 9. Neogene calcareous nannofossil datums, Hole 804C.

NN19 NN18 NN17	12. LAD Discoaster brouweri	1.89		1
NN17			3H-3,14-15/3H-3,52	18.85/19.22
NN17	13. LAD Discoaster pentaradiatus	2.35	3H-CC/4H-3,90-91	25.30/29.01
	14. LAD Discoaster surculus	2.41	4H-3,90-91/4H-4,90-91	29.01/30.44
NN16	15. LAD Sphenolithus spp.	3.45	4H-CC/5H-4,90-91	34.80/39.48
NN15	16. LAD Reticulofenestra pseudoumbilica	3.56	4H-CC/5H-4,90-91	34.80/39.48
NN13	17. FAD Ceratolithus rugosus	4.6	5H-CC/6H-1,90-91	44.30/44.63
	18. LAD Ceratolithus acutus	4.6	not recognized	
NN12	19. FAD Ceratolithus acutus	4.9	not recognized	
	20. LAD Triquetrorhabdulus rugosus	4.9	5H-CC/6H-1,90-91	44.30/44.63
	21. LAD Discoaster quinqueramus	5.0	5H-CC/6H-1,90-91	44.30/44.63
	22. FAD Discoaster quinqueramus	7.5	8H-6,90-91/8H-CC	71.45/72.80
NN10	23. LAD Discoaster hamatus	8.7	13H-3,90-91/13H-CC	114.70/120.30
	24. LAD Catinaster spp.	8.8	13H-3,90-91/13H-CC	114.70/120.30
NN9	25. FAD Catinaster calyculus	10.0	15X-CC/16X-1,90-91	134.55/140.20
	26. FAD Discoaster hamatus	10.5	17X-1,90-91/17X-2,90-91	149.70/151.20
NN8	27. FAD Catinaster coalitus	11.1	17X-2,90-91/17X-3,90-91	151.20/152.70
NN7	28. LAD Coronocyclus nitescens	12.8	18X-4,90-91/18X-5,90-91	163.70/165.20
NN6	29. LAD Cyclicargolithus floridanus	13.1	19X-6,56-57/19X-CC	176.06/176.30
	30. LAD Sphenolithus heteromorphus	13.6	19X-CC/20X-1,90-91	176.30/178.60
NN5 NN4	31. FAD Sphenolithus heteromorphus	18.6	22X-CC/23X-1,90-91	206.16/207.70
	32. LAD Sphenolithus belemnos	18.8	22X-CC/23X-1,90-91	206.16/207.70
NN3	33. LAD Triquetrorhabdulus carinatus	19.5	22X-CC/23X-1,90-91	206.16/207.70
NN2	34. FAD Sphenolithus belemnos	20.0	23X-1,90-91/23X-2,90-91	207.70/209.20
NN1	35. FAD Discoaster druggii	23.6	27X-3,90-91/27X-4,90-91	249.30/250.80
	IN16 IN15 IN13 IN12 IN12 IN11 IN10 NN9 NN8 NN7 NN6 NN5 NN6 NN5 NN4 NN5 NN4 NN3 NN2 NN2	14. LAD Discoaster surculusIN1615. LAD Sphenolithus spp.IN1516. LAD Reticulofenestra pseudoumbilicaIN1317. FAD Ceratolithus rugosus18. LAD Ceratolithus acutusIN1219. FAD Ceratolithus acutus20. LAD Triquetrorhabdulus rugosus21. LAD Discoaster quinqueramusIN1023. LAD Discoaster quinqueramus24. LAD Catinaster spp.25. FAD Catinaster calyculus26. FAD Discoaster hamatus27. FAD Catinaster calyculus28. LAD Coronocyclus nitescensNN629. LAD Cyclicargolithus floridanus30. LAD Sphenolithus heteromorphus31. FAD Sphenolithus heteromorphusNN333. LAD Triquetrorhabdulus carinatusNN234. FAD Sphenolithus belemnosNN1NN1	14. LAD Discoaster surculus2.41IN1615. LAD Sphenolithus spp.3.45IN1615. LAD Reticulofenestra pseudoumbilica3.56IN1317. FAD Ceratolithus rugosus4.6IN1219. FAD Ceratolithus acutus4.6IN1219. FAD Ceratolithus acutus4.920. LAD Triquetrorhabdulus rugosus4.921. LAD Discoaster quinqueramus5.0IN1122. FAD Discoaster quinqueramus7.523. LAD Discoaster quinqueramus8.724. LAD Catinaster spp.8.825. FAD Catinaster calyculus10.026. FAD Discoaster hamatus10.527. FAD Catinaster coalitus11.1NN629. LAD Coronocyclus nitescens12.8NN631. FAD Sphenolithus heteromorphus13.6NN333. LAD Triquetrorhabdulus carinatus19.5NN234. FAD Sphenolithus belemnos18.8NN335. FAD Discoaster druggii23.6	14. LAD Discoaster surculus 2.41 4H-3,90-91/4H-4,90-91 IN16 15. LAD Sphenolithus spp. 3.45 4H-CC/5H-4,90-91 IN15 16. LAD Reticulotenestra pseudoumbilica 3.56 4H-CC/5H-4,90-91 IN15 17. FAD Ceratolithus rugosus 4.6 5H-CC/6H-1,90-91 18. LAD Ceratolithus acutus 4.6 not recognized VN12 19. FAD Ceratolithus acutus 4.9 not recognized 20. LAD Triquetrorhabdulus rugosus 4.9 5H-CC/6H-1,90-91 21. LAD Discoaster quinqueramus 5.0 5H-CC/6H-1,90-91 21. LAD Discoaster quinqueramus 7.5 8H-6,90-91/8H-CC VN10 23. LAD Discoaster hamatus 8.7 13H-3,90-91/13H-CC 23. LAD Discoaster hamatus 10.0 15X-CC/16X-1,90-91 24. LAD Catinaster calyculus 10.0 15X-CC/16X-1,90-91 25. FAD Catinaster coalitus 11.1 17X-1,90-91/17X-2,90-91 NN7 28. LAD Coronocyclus nitescens 12.8 18X-4,90-91/18X-5,90-91 NN6 29. LAD Cyclicargolithus floridanus 13.1 19X-656-57/19X-CC 30. LAD Sphenolithus

ations of reticulofenestrid coccoliths. In the present investigation, I have made similar systematic observations on the size variations of reticulofenestrid coccoliths not only in the middle Miocene to Pliocene but also throughout the Miocene to Pliocene sequences at Sites 804, 805, and 806 on the Ontong Java Plateau.

The sizes of all reticulofenestrid coccoliths (except for *Dictyococcites productus*) encountered during counts of 200 calcareous nannofossil specimens in each sample were measured under an ordinary light microscope using an eyepiece graticule. After measurements were taken, all reticulofenestrid coccoliths were classified into the following four groups:

Very large reticulofenestrid coccoliths: larger than 7 μm Large reticulofenestrid coccoliths: 7–5 μm

Small reticulofenestrid coccoliths: $5-3 \ \mu m$ Very small reticulofenestrid coccoliths: smaller than $3 \ \mu m$

The relative abundances of each group in Holes 806B, 805C, 805B, and 804C with geological ages are shown in Figure 9.

As is evident from this figure, roughly speaking, the relative abundance of reticulofenestrid coccoliths gradually decreases toward the bottom of each core. For example, in Hole 806B they form nearly 80% in the upper part of the hole, but only a few percent of the flora are present or are barren altogether at the base of the hole. The general decrease in the relative abundance is interrupted by remarkable and abrupt drops in abundances of reticulofenestrid coccoliths at two horizons. To state this differently, *Reticulofenestra* specimens are abundant in three stratigraphic intervals in the Pliocene-Miocene se-

Zo	ne	Species	Age (Ma)	Core, section, interval (cm)	Depth (mbsf)
CN13a	NN19	12. LAD Discoaster brouweri	1.89	4H-5,23-24/4H-6,23-24	32.74/34.18
CN12d	NN18	13. LAD Discoaster pentaradiatus	2.35	5H-4,23-24/5H-5,23-24	40.95/42.42
CN12c	NN17	14. LAD Discoaster surculus	2.41	5H-6,23-24/5H-CC	43.89/45.80
CN12b CN12a	NN16	15. LAD Sphenolithus spp.	3.45		
CN11b	NN15	16. LAD Reticulofenestra pseudoumbilica	3.56		
CN11a	NN13	17. FAD Ceratolithus rugosus	4.6		
CN10b		18. LAD Ceratolithus acutus	4.6		
	NN12	19. FAD Ceratolithus acutus	4.9		
CN10a	1	20. LAD Triquetrorhabdulus rugosus	4.9		
		21. LAD Discoaster quinqueramus	5.0		
CN9b CN8a	NN11	22. FAD Discoaster quinqueramus	7.5		
	NN10	23. LAD Discoaster hamatus	8.7		
CN7b	101210	24. LAD Catinaster spp.	8.8		
	NN9	25. FAD Catinaster calyculus	10.0		
CN7a		26. FAD Discoaster hamatus	10.5		
CN6	NN8	27. FAD Catinaster coalitus	11.1		
CN5b	NN7	28. LAD Coronocyclus nitescens	12.8		
-	NN6	29. LAD Cyclicargolithus floridanus	13.1		
CN5a		30. LAD Sphenolithus heteromorphus	13.6		
CN3	NN5	31. FAD Sphenolithus heteromorphus	18.6		
		32. LAD Sphenolithus belemnos	18.8		
CN2	NN3	33. LAD Triquetrorhabdulus carinatus	19.5		
	NN2	34. FAD Sphenolithus belemnos	20.0		
CN1c CN1b	NN1	35. FAD Discoaster druggii	23.6		

Table 10. Neogene calcareous nannofossil datums, Hole 805C.

quence. For convenience, I will designate these intervals as Intervals A, B, and C, in descending order. The characteristics of these intervals in Holes 806B, 805C, and 805B are as follows (Figs. 9 and 10):

Interval A: lowest NN19-middle NN10 Hole 806B: down to Sample 130-806B-32H-CC Hole 805B: down to Sample 130-805B-25H-CC

In this interval the relative abundances of reticulofenestrid coccoliths gradually decrease downward. In Holes 806B and 805B, its highest abundances are 88.5% (in Sample 130-806B-8H-CC) and 90% (in Sample 130-805C-6H-CC) of the total floras recognized in Zone NN16. This interval is particularly characterized by the abundant occurrence of very small *Reticulofenestra* (<3 μ m in diameter). Based on the relative abundances of these very small reticulofenestrid coccoliths, this interval has been subdivided into upper (A_1) and lower (A_2) intervals as follows:

Interval A₁: lowest NN19–upper NN12 Hole 806B: down to Sample 130-806B-15H-CC Hole 805B: down to Sample 130-805B-12H-4, 23–24 cm

This interval is characterized by the consistently predominant occurrence of very small reticulofenestrid specimens. It accounts for consistently more than 24.5% of the total flora: its average relative abundances are 59.3% and 48.2% in Holes 806B and 805B, respectively. Only in the lower part of Interval A₁ (below Samples 130-806B-11H-4, 26–27 cm, and 130-805B-9H-4, 23–24 cm), very large

Table 11. Neogene calcareous nannofossil datums, Hole 805B.

Zo	ne	Species	Age (Ma)	Core, section, interval (cm)	Depth (mbsf)
CN13a	NN19	12. LAD Discoaster brouweri	1.89		
CN12d	NN18	13. LAD Discoaster pentaradiatus	2.35		
CN12c	NN17	14. LAD Discoaster surculus	2.41		
CN12b CN12a	NN16	15. LAD Sphenolithus spp.	3.45	8H-4,23-24/8H-5,23-24	68.27/69.72
CN11b	NN15	16. LAD Reticulofenestra pseudoumbilica	3.56	8H-CC/9H-1,23-24	73.20/73.42
CN11a	NN13	17. FAD Ceratolithus rugosus	4.6	12H-3,23-24/12H-4,23-24	104.93/106.43
CN10b		18. LAD Ceratolithus acutus	4.6	12H-2,23-24/12H-3,23-24	103.43/104.93
	NN12	19. FAD Ceratolithus acutus	4.9	13H-3,123-124/13H-4,123-124	115.26/116.70
CN10a		20. LAD Triquetrorhabdulus rugosus	4.9	13H-4,123-124/13H-5,123-124	116.70/118.15
		21. LAD Discoaster quinqueramus	5.0	14H-1,23-24/14H-2,23-24	120.92/122.36
CN9b CN8a	NN11	22. FAD Discoaster quinqueramus	7.5	24H-3,23-24/24H-4,23-24	218.82/220.27
	NN10	23. LAD Discoaster hamatus	8.7	29X-3,23-24/29X-4,23-24	266.43/267.93
CN7b		24. LAD Catinaster spp.	8.8	29X-3,23-24/29X-4,23-24	266.43/267.93
	NN9	25. FAD Catinaster calyculus	10.0	30X-5,23-24/30X-6,23-24	279.13/280.63
CN7a		26. FAD Discoaster hamatus	10.5	31X-1,23-24/31X-2,23-24	282.73/284.23
CN6	NN8	27. FAD Catinaster coalitus	11.1	31X-3,23-24/31X-4,23-24	285.73/287.23
CN5b	NN7	28. LAD Coronocyclus nitescens	12.8	33X-6,23-24/33X-CC	309.13/310.37
0.11	NN6	29. LAD Cyclicargolithus floridanus	13.1	34X-4,23-24/34X-5,23-24	315.73/317.23
CN5a CN4		30. LAD Sphenolithus heteromorphus	13.6	35X-4,23-24/35X-5,23-24	325.23/326.73
CN3	NN5	31. FAD Sphenolithus heteromorphus	18.6	41X-CC/42X-1,23-24	385.77/388.23
1758/2		32. LAD Sphenolithus belemnos	18.8	42X-2,25-26/42X-3,23-24	389.75/391.23
CN2	NN3	33. LAD Triquetrorhabdulus carinatus	19.5	42X-2,25-26/42X-3,23-24	389.75/391.23
	NN2	34. FAD Sphenolithus belemnos	20.0	43X-5,23-24/43X-6,23-24	403.93/405.43
CN1c CN1b	NN1	35. FAD Discoaster druggii	23.6	46X-1,23-24/46X-2,23-24	426.73/428.23

reticulofenestrid coccoliths (>7 μ m in diameter) are found. The top of this lower part provides for the top of Zone NN15.

Interval A_2 : middle NN12–upper NN10 Hole 806B: Samples 130-806B-16H-4, 26–27 cm, to -32H-CC Hole 805B: Samples 130-805B-12H-CC to -25H-CC

Generally speaking, this interval also contains abundant, very small reticulofenestrid coccoliths. Compared with Interval A_1 , however, their relative abundances increase and decrease frequently, and average abundances are 47.5% in Hole 806B and 46.1% in Hole 805B, which are not so high as in Interval A_1 . The lower part of this interval (below Samples 130-806B-26H-4, 26–27 cm, and 130-805B-20H-CC) contains no more very large reticulofenestrid coccoliths (Fig. 10A).

Between Intervals A and B: middle NN10 Hole 806B: Samples 130-806B-33H-4, 26–27 cm, to -33H-CC Hole 805B: Samples 130-805B-26H-4, 23–24 cm, to -26H-CC

The first remarkable and abrupt drop in the relative abundance of reticulofenestrid coccoliths that divides Intervals A and B occurs in the late Miocene (in Zone NN10). At this horizon, reticulofenestrid coccolith forms account for only about 1% of the total flora; instead of *Reticulofenestra* spp., the flora is characterized by bloomlike, high abundances of small sphenoliths (*Sphenolithus abies*). A remarkable upward size reduction event in the reticulofenestrid coccolith population takes place at this horizon.

Interval B: lower NN10-middle NN5/NN4 Hole 806B: Samples 130-806B-34H-4, 26-27 cm, to -56X-CC

ne	Species	Age (Ma)	Core, section, interval (cm)	Depth (mbsf)
NN19	12. LAD Discoaster brouweri	1.89	5H-6,26-27/5H-7,26-27	42.34/43.81
NN 18	13. LAD Discoaster pentaradiatus	2.35	6H-CC/7H-1,106-107	54.00/54.51
NN17	14. LAD Discoaster surculus	2.41	8H-1,106-107/8H-2,106-107	64.53/65.99
NN16	15. LAD Sphenolithus spp.	3.45	10H-3,26-27/10H-4,26-27	85.66/87.11
NN15	16. LAD Reticulofenestra pseudoumbilica	3.56	11H-2,26-27/11H-3,26-27	93.66/95.08
NN13	17. FAD Ceratolithus rugosus	4.6	15H-6,26-27/15H-7,26-27	137.43/138.87
	18. LAD Ceratolithus acutus	4.6	15H-6,26-27/15H-7,26-27	137.43/138.87
NN12	19. FAD Ceratolithus acutus	4.9	17H-2,26-27/17H-3,26-27	150.69/152.13
	20. LAD Triquetrorhabdulus rugosus	4.9	17H-3,26-27/17H-4,26-27	152.13/153.56
	21. LAD Discoaster quinqueramus	5.0	18H-3,26-27/18H-4,26-27	161.60/163.02
NN11	22. FAD Discoaster quinqueramus	7.5	31H-2,24-25/31H-3,26-27	283.65/285.09
NN10	23. LAD Discoaster hamatus	8.7	36X-7,26-27/36X-CC	338.96/339.34
22272	24. LAD Catinaster spp.	8.8	37X-4,26-27/37X-5,26-27	344.16/345.66
NN9	25. FAD Catinaster calyculus	10.0	39X-3,26-27/39X-4,26-27	362.06/363.56
61252127	26. FAD Discoaster hamatus	10.5	39X-6,26-27/39X-CC	366.56/367.53
NN8	27. FAD Catinaster coalitus	11.1	40X-5,26-27/40X-CC	374.76/375.96
NN7	28. LAD Coronocyclus nitescens	12.8	45X-6,26-27/45X-CC	424.66/426.27
NN6	29. LAD Cyclicargolithus floridanus	13.1	49X-CC/50X-1,26-27	463.60/463.86
	30. LAD Sphenolithus heteromorphus	13.6	50X-CC/51X-1,26-27	472.03/473.56
NN5 NN4	31. FAD Sphenolithus heteromorphus	18.6	61X-7,26-27/61X-CC	578.86/579.30
	32. LAD Sphenolithus belemnos	18.8	61X-CC/62X-1,26-27	579.30/579.56
NN3	33. LAD Triquetrorhabdulus carinatus	19.5	62X-7,26-27/62X-CC	588.56/589.00
NN2	34. FAD Sphenolithus belemnos	20.0	64X-2,30-31/64X-CC	600.40/601.63
NN1	35. FAD Discoaster druggii	23.6	66X-CC/67X-1,26-27	627.50/627.76
	NN19 NN18 NN17 NN16 NN15 NN13 NN12 NN12 NN11 NN10 NN9 NN9 NN9 NN9 NN9 NN9 NN9 NN9 NN9 NN	neSpeciesNN19 NN1812. LAD Discoaster brouweriNN18 NN1713. LAD Discoaster pentaradiatusNN17 14. LAD Discoaster surculusNN16 15. LAD Sphenolithus spp.NN16 16. LAD Reticulofenestra pseudoumbilicaNN15 NN13NN15 NN1317. FAD Ceratolithus rugosus18. LAD Ceratolithus acutusNN12 19. FAD Ceratolithus acutus20. LAD Triquetrorhabdulus rugosus21. LAD Discoaster quinqueramusNN11 22. FAD Discoaster quinqueramusNN10 23. LAD Discoaster hamatusNN10 24. LAD Catinaster calyculus25. FAD Catinaster calyculus26. FAD Discoaster hamatusNN8 27. FAD Catinaster coalitusNN7 N8 29. LAD Cyclicargolithus floridanus30. LAD Sphenolithus heteromorphus31. FAD Sphenolithus heteromorphusNN3 33. LAD Triquetrorhabdulus carinatusNN2 34. FAD Sphenolithus belemnosNN2 35. FAD Discoaster druggii	neSpeciesAge (Ma)NN19 NN1812. LAD Discoaster brouweri1.89NN18 NN1813. LAD Discoaster pentaradiatus2.35NN1714. LAD Discoaster surculus2.41NN1615. LAD Sphenolithus spp.3.45I15. LAD Sphenolithus spp.3.45NN15 NN1316. LAD Reticulofenestra pseudoumbilica3.56NN15 NN1317. FAD Ceratolithus rugosus4.6I18. LAD Ceratolithus acutus4.6NN1219. FAD Ceratolithus acutus4.920. LAD Triquetrorhabdulus rugosus4.921. LAD Discoaster quinqueramus5.0NN1022. FAD Discoaster quinqueramus7.5NN1023. LAD Discoaster quinqueramus10.5NN825. FAD Catinaster calyculus10.026. FAD Discoaster hamatus10.5NN827. FAD Catinaster calyculus11.1NN728. LAD Coronocyclus nitescens12.8NN629. LAD Cyclicargolithus floridanus13.1NN631. FAD Sphenolithus heteromorphus18.6NN333. LAD Triquetrorhabdulus carinatus19.5NN234. FAD Sphenolithus belemnos18.8NN335. FAD Discoaster druggii23.6	neAge (Ma)Core, section, interval (cm)NN19 NN1812. LAD Discoaster brouweri1.895H-6,26-27/5H-7,26-27NN18 NN1713. LAD Discoaster pentaradiatus2.356H-CC/7H-1,106-107NN1614. LAD Discoaster surculus2.418H-1,106-107/8H-2,106-107NN1615. LAD Sphenolithus spp.3.4510H-3,26-27/10H-4,26-27NN1615. LAD Reticulofenestra pseudoumbilica3.5611H-2,26-27/11H-3,26-27NN1117. FAD Ceratolithus rugosus4.615H-6,26-27/15H-7,26-27NN1219. FAD Ceratolithus acutus4.917H-3,26-27/17H-3,26-27NN1220. LAD Triquetrorhabdulus rugosus4.917H-3,26-27/17H-3,26-27NN1122. FAD Discoaster quinqueramus5.0018H-3,26-27/13H-3,26-27NN1022. FAD Discoaster quinqueramus5.0018H-3,26-27/38X-CCNN1022. FAD Discoaster quinqueramus8.736X-7,26-27/38X-CCNN1024. LAD Catinaster caljculus10.039X-3,26-27/39X-42,6-27NN1028. LAD Coronocyclus nitescens10.539X-6,26-27/45X-CCNN627. FAD Catinaster coalitus11.140X-5,26-27/45X-CCNN629. LAD Cyclicargolithus floridanus13.149X-CC/50X-1,26-27NN531. FAD Sphenolithus belemnos18.861X-7,26-27/61X-CCNN531. LAD Triquetrorhabdulus carinatus19.562X-7,26-27/61X-CCNN639. LAD Sphenolithus belemnos18.861X-CC/2X-1,26-27NN633. LAD Triquetrorhabdulus carinatus19.56

Table 12. Neogene calcareous nannofossil datums, Hole 806B.

Hole 805B: Samples 130-805B-27H-4, 23–24 cm, to -40X-3, 23–24 cm

In this interval, reticulofenestrid coccoliths are again abundant. Based on the occurrences of very large and very small reticulofenestrid coccoliths, this interval is divided into three parts: Intervals B_1 , B_2 , and B_3 in descending order.

Interval B1: lower NN10-upper NN7/NN6

- Hole 806B: Samples 130-806B-34H-4, 26–27 cm, to -44X-4, 26–27 cm
- Hole 805B: Samples 130-805B-27H-4, 23-24 cm, to -32X-3, 23-24 cm

Interval B₁ is characterized by the fairly abundant occurrence of reticulofenestrid coccoliths. However, very small specimens of *Reticulofenestra* are almost absent (Fig. 10B).

Interval B2: middle and lower NN7/NN6 Hole 806B: Samples 130-806B-44X-CC to -50X-CC Hole 805B: Samples 130-805B-32X-CC to -35X-3, 23–24 cm

In this interval, very large and very small reticulofenestrid specimens are present, although their relative abundances compared to the total flora are not high (Fig. 10).

Interval B3: upper and middle NN5/NN4

Table 13. Neogene ca	lcareous nannofossil	datums,	Hole	807A.
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Zo	ne	Species	Age (Ma)	Core, section, interval (cm)	Depth (mbsf)
CN13a CN13d	NN19	12. LAD Discoaster brouweri	1.89	4H-4,104-105/4H-5,24-25	31.70/32.37
CN120	NNIO	13. LAD Discoaster pentaradiatus	2.35	5H-3,104-105/5H-4,104-105	39.80/41.24
CN12c	NN17	14. LAD Discoaster surculus	2.41	5H-4,104-105/5H-5,104-105	41.24/42.69
CN12b CN12a	NN16	15. LAD Sphenolithus spp.	3.45	8H-6,24-25/8H-7,24-25	71.79/73.23
CN11b	NN15	16. LAD Reticulofenestra pseudoumbilica	3.56	9H-3,104-105/9H-4,24-25	77.86/78.54
CN11a	NN13	17. FAD Ceratolithus rugosus	4.6	12H-CC/13H-1,24-25	111.90/112.14
CN10b		18. LAD Ceratolithus acutus	4.6	12H-CC/13H-1,24-25	111.90/112.14
	NN12	19. FAD Ceratolithus acutus	4.9	13H-CC/14H-1,23-24	121.40/121.62
CN10a		20. LAD Triquetrorhabdulus rugosus	4.9	14H-1,23-24/14H-2,23-24	121.62/123.07
	NINIZZ	21. LAD Discoaster quinqueramus	5.0	14H-6,23-24/14H-7,23-24	128.86/130.31
CN9b CN8a	NNTT	22. FAD Discoaster quinqueramus	7.5	26H-2,24-25/26H-3,24-25	237.07/238.51
	NN10	23. LAD Discoaster hamatus	8.7	30X-3,24-25/30X-4,24-25	277.04/278.54
CN7b		24. LAD Catinaster spp.	8.8	30X-5,24-25/30X-6,24-25	280.04/281.54
01174	NN9	25. FAD Catinaster calyculus	10.0	32X-2,24-25/32X-3,24-25	294.44/295.94
CN/a	-	26. FAD Discoaster hamatus	10.5	32X-CC/33X-1,24-25	300.72/302.54
CN6	NNB	27. FAD Catinaster coalitus	11.1	33X-3,24-25/33X-4,24-25	305.54/307.04
CN5b	NN7	28. LAD Coronocyclus nitescens	12.8	36X-3,24-25/36X-4,24-25	334.14/335.64
0115	NN6	29. LAD Cyclicargolithus floridanus	13.1	40X-2,24-25/40X-3,24-25	371.44/372.94
CN5a CN4		30. LAD Sphenolithus heteromorphus	13.6	40X-7,24-25/40X-CC	378.94/379.32
CN3	NN5 NN4	31. FAD Sphenolithus heteromorphus	18.6	49X-4,24-25/49X-5,24-25	461.54/463.04
		32. LAD Sphenolithus belemnos	18.8	49X-5,24-25/49X-CC	463.04/464.73
CN2	NN3	33. LAD Triquetrorhabdulus carinatus	19.5	50X-6,24-25/50X-7,24-25	474.14/475.64
	NN2	34. FAD Sphenolithus belemnos	20.0	50X-CC/51X-1,24-25	475.85/476.34
CN1c CN1b	NN1	35. FAD Discoaster druggii	23.6	61X-6,24-25/61X-CC	580.04/581.14

Hole 806B: Sample 130-806B-51X-4, 26–27 cm, to -56X-CC Hole 806B: Sample 130-805B-35X-CC to -40X-3, 23–24 cm

Interval B_3 is clearly distinguished from Interval B_2 by the almost absence of very large specimens of *Reticulofenestra*. Therefore, it is clear that another dramatic change in *Reticulofenestra* coccolith size occurs between Intervals B_2 and B_3 ; that is, a size increase event (Fig. 10A). As very small reticulofenestrid specimens are present but rare and occasional in this interval (Fig. 10B), the most dominant specimens are between 5 and 3 μ m in diameter.

Between Intervals B and C: lower NN5/NN4-upper NN2 Hole 806B: Samples 130-806B-57X-4, 26-27 cm, to -62X-CC Hole 805B: Samples 130-805B-40X-CC to -42X-CC

The second abrupt drop in the relative abundance of reticulofenestrid coccoliths that divides Intervals B and C takes place in the early Miocene (in the lower NN5/NN4 zonal interval down to the upper NN2 Zone). The reduction in the reticulofenestrid coccolith abundance at this horizon, however, is not so remarkable as at the first one. *Reticulofenestra* specimens form about 8% of the total floras in Holes 806B and 805B. Instead of *Reticulofenestra* spp., discoasters and *Cyclicargolithus floridanus* are dominant at this horizon.

Interval C: middle NN2-upper NN1 Hole 806B: Samples 130-806B-63X-4, 26-27 cm, to -70X-CC



Figure 3. Neogene biostratigraphic relationships at each site of Leg 130. Refer to Table 2 for key to datum numbers.

Hole 805B: Samples 130-805B-43X-3, 23-24 cm, to -47X-CC

In this interval, *Reticulofenestra* again becomes abundant. The relative abundances, however, are not high compare with Intervals A and B. Maximum abundances are 55.5% and 58% in Holes 806B and 805B, respectively. Only middle-sized specimens (7–3 μ m in diameter) are abundant.

Below Interval C: lower NN1 Hole 806B: below Sample 130-806B-71X-2, 26–27 cm Hole 805B: below Sample 130-805B-48X-3, 23–24 cm

Below Interval C, reticulofenestrid coccoliths are very rare. On the contrary, *Cyclicargolithus floridanus* becomes dominant and takes the place of reticulofenestrid coccoliths.

Remarks

Because of this investigation, a clear pattern was revealed with a dramatic size reduction event occurring in the late Miocene calcareous nannofossil zone NN10 of Martini's (1971) zonal scheme in the equatorial Pacific. Moreover it became clear that *Reticulofenestra* specimens are very rare or almost absent at this event. One noteworthy characteristic of the assemblage at this event is the bloomlike, high abundance of small sphenoliths (*Sphenolithus abies*).

According to Young (1990), calcareous nannofossil assemblages in the interval above this size reduction event are characterized by the absence of reticulofenestrid specimens >5 μ m in diameter. Young calls this interval the "small *Reticulofenestra* interval." I also recognized this "small *Reticulofenestra* interval" in the sections studied, which corresponds exactly to my lower interval A₂ (Fig. 10).

In this investigation, another dramatic size change in the *Reticulofenestra* coccoliths (size increase event) was recognized between Intervals B_2 and B_3 , which corresponds to the NN6/NN5 boundary.

PRINCIPAL CONCLUSIONS

Thirty genera and 103 species of calcareous nannofossils were identified during this investigation. A total of 35 calcareous nannofossil datums were detected in the Neogene sequences on the Ontong Java Plateau. Among them, 12 datums in the Pleistocene were tentatively correlated with magnetostratigraphy.

Reticulofenestra coccolith size distribution patterns throughout the Pliocene-Miocene sequences were clarified. In these sequences, *Reticulofenestra* specimens were dominant in three stratigraphic intervals, which were termed Intervals A, B, and C in descending order. Based on *Reticulofenestra* size distribution patterns, Intervals A and B were subdivided. A dramatic size reduction event in *Reticulofenestra* specimens that occurred in late Miocene sediments in the western Indian Ocean and the Red Sea was also confirmed in the equatorial Pacific between Intervals A and B. Young's (1990) "small *Reticulofenestra* interval" corresponds exactly to lower Interval A₂ in the present investigation. A dramatic size increase event of *Reticulofenestra* specimens was recognized between Intervals B₂ and B₃, which corresponds to the NN6/NN5 boundary.

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APPENDIX

During this investigation, 30 genera and 103 species were recognized. No new species are described in this report, so no taxonomic discussion and systematic description are included. The species names considered in this report are listed alphabetically below.

Amaurolithus amplificus (Bukry and Percival) Gartner and Bukry, 1975 Amaurolithus delicatus Gartner and Bukry, 1975 Amaurolithus primus (Bukry and Percival) Gartner and Bukry, 1975 Amaurolithus tricorniculatus (Gartner) Gartner and Bukry, 1975 Calcidiscus leptoporus (Murray and Blackman) Loeblich and Tappan, 1978 Calcidiscus macintyrei (Bukry and Bramlette) Loeblich and Tappan, 1978 Calcidiscus premacintyrei Theodoridis, 1984 Catinaster altus (Müller) Perch-Nielsen, 1984 Catinaster calyculus Martini and Bramlette, 1963 Catinaster coalitus Martini and Bramlette, 1963 Ceratolithus acutus Gartner and Bukry, 1974 Ceratolithus cristatus Kamptner, 1950 Ceratolithus rugosus Bukry and Bramlette, 1968 Ceratolithus simplex Bukry, 1979 Ceratolithus telesmus Norris, 1965 Coccolithus crassipons Bouché, 1962 Coccolithus eopelagicus (Bramlette and Riedel) Bramlette and Sullivan, 1961 Coccolithus miopelagicus Bukry, 1971 Coccolithus pelagicus (Wallich) Schiller, 1930 Coccolithus streckerii Takayama and Sato, 1987 Coronocyclus nitescens (Kamptner) Bramlette and Wilcoxon, 1967 Cyclicargolithus floridanus (Roth and Hay) Bukry, 1971 Cyclolithella annula (Cohen) McIntyre and Bé, 1967 Dictyococcites productus (Kamptner) Backman, 1980 Discoaster adamanteus Bramlette and Wilcoxon, 1967 Discoaster asymmetricus Gartner, 1969 Discoaster bellus Bukry and Percival, 1971 Discoaster berggrenii Bukry, 1971 Discoaster blackstockae Bukry, 1973 Discoaster bollii Martini and Bramlette, 1963 Discoaster braarudii Bukry, 1971 Discoaster brouweri Tan Sin Hok, 1927 Discoaster calcaris Gartner, 1967 Discoaster challengeri Bramlette and Riedel, 1954 Discoaster decorus (Bukry) Bukry, 1973 Discoaster deflandrei Bramlette and Riedel, 1954 Discoaster druggii Bramlette and Wilcoxon, 1967 Discoaster exilis Martini and Bramlette, 1963 Discoaster formosus Martini and Worsley, 1971 Discoaster hamatus Martini and Bramlette, 1963 Discoaster intercalaris Bukry, 1971 Discoaster kugleri Martini and Bramlette, 1963 Discoaster loeblichii Bukry, 1971 Discoaster moorei Bukry, 1971

Discoaster neohamatus Bukry and Bramlette, 1969 Discoaster neorectus Bukry, 1971 Discoaster pansus (Bukry and Percival) Bukry, 1973 Discoaster pentaradiatus Tan Sin Hok, 1927 Discoaster prepentaradiatus Bukry and Percival, 1971 Discoaster pseudovariabilis Martini and Worsley, 1971 Discoaster quadramus Bukry, 1973 Discoaster quinqueramus Gartner, 1969 Discoaster surculus Martini and Bramlette, 1963 Discoaster tamalis Kamptner, 1967 Discoaster triradiatus Tan Sin Hok, 1927 Discoaster tristellifer Bukry, 1976 Discoaster variabilis Martini and Bramlette, 1963 Discolithina japonica Takayama, 1967 Ericsonia obruta Perch-Nielsen, 1971 Gephyrocapsa aperta Kamptner, 1963 Gephyrocapsa sinuosa Hay and Beaudry, 1973 Hayaster perplexus (Bramlette and Riedel) Bukry, 1973 Helicosphaera carteri (Wallich) Kamptner, 1954 Helicosphaera euphratis Haq, 1966 Helicosphaera granulata Bukry and Percival, 1971 Helicosphaera hvalina Gaarder, 1970 Helicosphaera intermedia Martini, 1965 Helicosphaera neogranulata Gartner, 1977 Helicosphaera recta Hag, 1966 Helicosphaera sellii Bukry and Bramlette, 1969 Helicosphaera wallichii (Lohmann) Boudreaux and Hay, 1969 Oolithotus fragilis (Lohmann) Martini and Müller, 1972 Orthorhabdus serratus Bramlette and Wilcoxon, 1967 Pontosphaera spp. Pseudoemiliania lacunosa (Kamptner) Gartner, 1969 Reticulofenestra ampla Sato, Kameo and Takayama, 1991 Reticulofenestra asanoi Sato and Takayama, 1992 Reticulofenestra gelida (Geitzenauer) Backman, 1978 Reticulofenestra haqii Backman, 1978 Reticulofenestra minuta Roth, 1970 Reticulofenestra minutula (Gartner) Haq and Berggren, 1978 Reticulofenestra pseudoumbilica (Gartner) Gartner, 1969 Rhabdosphaera claviger Murray and Blackman, 1898 Rhabdosphaera stylifer Lohmann, 1902 Scapholithus fossilis Deflandre, 1954 Scyphosphaera spp. Solidopons petrae Theodoridis, 1984 Sphenolithus abies Deflandre, 1954 Sphenolithus belemnos Bramlette and Wilcoxon, 1967 Sphenolithus ciperoensis Bramlette and Wilcoxon, 1967 Sphenolithus compactus Backman, 1980 Sphenolithus conicus Bukry, 1971 Sphenolithus delphix Bukry, 1973 Sphenolithus dissimilis Bukry and Percival, 1971 Sphenolithus distentus (Martini) Bramlette and Wilcoxon, 1967 Sphenolithus grandis Haq and Berggren, 1978 Sphenolithus heteromorphus Deflandre, 1953 Sphenolithus moriformis (Brönnimann and Stradner) Bramlette and Wilcoxon, 1967 Syracosphaera pulchra Lohmann, 1902 Tetralithides symeonidesii Theodoridis, 1984 Triquetrorhabdulus carinatus Martini, 1965 Triquetrorhabdulus milowii Bukry, 1971 Triquetrorhabdulus rugosus Bramlette and Wilcoxon, 1967 Umbilicosphaera sibogae (Weber-van Bosse) Gaarder, 1970

Zygrhablithus bijugatus (Deflandre) Deflandre, 1959

Table 14. Calcareous nannofossil occurrences, Hole 806B.

Core	5H	5H	6H	6H	7H	7H	8H	8H	9H	9H	10H	10H	11H
Section	4	œ	4	CC .	3	œ	3	00	4	00	4	30	4
Interval (cm)	26-27	_	26-27		106-107		106-107		26-27		26-27		26-27
Zone (Matini, 1971)	NN19		NN18		N	117				NN16			NN15-13
Amaurolithus amplificus													
Amaurolithus delicatus													
Amaurolithus primus			1										
Amaurolithus tricomiculatus		<u></u>					-		1				
Calcidiscus leptoporus	26	25	15	16	13	11	5	8	13	8	13	20	14
Calcidiscus macintyrei	+	+	+	+	+	1	+	?	1	+	1	1	2
Calcidiscus premacintyrei													
Catinaster calyculus					· · · · · · · · · · · · · · · · · · ·		1.1.1.1					1	
Catinaster coalitus													
Ceratolithus acutus													
Ceratolithus rugosus		+		?		+				+			+
Coccolithus crassipons		+	+	+	+		+	+					1
Coccolithus miopelagicus		_				_		+					
Coccolithus pelagicus	+	3	+	2	+	+	+						
Coccolithus streckerii			+				?						
Coronocyclus nitescens													
Cyclicargolithus floridanus													
Cyclolithella annula			1		?	5	+	5	5	3	9	2	4
Dictyococcites productus	2		4		2	1	2			1	1		
Discoaster adamanteus												-	
Discoaster asymmetricus					3		+	?	?	?		+	+
Discoaster bellus		1.0											
Discoaster berggrenii													
Discoaster blackstockae													
Discoaster bollii													8
Discoaster brouweri		+	9	8	5	2	9	1	+	3	+	+	+
Discoaster calcaris													
Discoaster challengeri													+
Discoaster decorus										+	+		
Discoaster deflandrei		- 20-		1								8	
Discoaster druggii		1.000										-	
Discoaster exilis													
Discoaster formosus													
Discoaster hamatus												-	
Discoaster kunleri				-									
Discoaster loeblichii													
Discoastar peopamatus													
Discoaster neorestus	-								-				
Discoaster nangis													
Discoastor pantamiliatus													
Discoaster pentaradiatus				-	+	+	+	+		+	+	+	+
Discoaster prepentaradiatus								-		-			
Discoaster quinqueramus						0							2
Discoaster surculus		_	I				+	+	+	+	+	+	
Discoaster thradiatus		+					+	(1	
Discoaster vanabilis										-			+
Discoaster spp.													
Discolitnina japonica		+			1		*			-			
Encsonia obruta								-					
Gepnyrocapsa aperta	4		3	1				1					1
Gephyrocapsa sinuosa		1	2										
small Gephyrocapsa	8	2					1			2			4
Hayaster perplexus						+	+	+	+	+	+	?	
Helicosphaera carteri	+	2	2	1	2	1	+	1	2	3	2	+	1
Helicosphaera euphratis		1.3	1							-		i	
Helicosphaera granulata		1											
Helicosphaera hyalina												1	
Helicosphaera intermedia													
Helicosphaera neogranulata				?			?			1	· · · · · · · · · · · · · · · · · · ·	?	?
Helicosphaera sellii	5	+	2	2	1	?	+	?		?			?
Helicosphaera wallichii		+	+	1	1	+	?	+	+	?		?	?
Oolithotus fragilis	1	1	5		1	1	4	5	2	8	4	8	1
Pontosphaera spp.		+	+	+	?	?	?		+	+	+	?	
Pseudoemiliania lacunosa	8	8	3	2	1	2	1	+	7	+	?	1	2
Reticulofenestra ampla							?	?					
Reticulofenestra asanoi	1	+	2		?			?		?	1	3	
Reticulofenestra gelida													1
Reticulofenestra haqii						1	6	2		1	2		
Reticulofenestra minuta	86	74	132	108	158	116	160	164	154	109	99	77	95
Reticulofenestra minutula	46	72	15	47	14	48	8	11	20	57	63	62	60
Reticulofenestra pseudoumbilica													4
Rhabdosphaera daviger				1	?								
Rhabodsphaera stylifer												?	
Scapholithus fossilis											+		
Scyphosphaera spp.							+		+		+		
Sphenolithus abies							?				+	12	4
Sphenolithus belemnos													
Sphenolithus compactus													
Sphenolithus conicus													
Sphenolithus delphix													
Sphenolithus dissimilis											-		
Sphenolithus grandis													
Sphenolithus heteromomhus			-										
Sphenolithus moriformie											1		
Syracoenhaera putebra	2	1		100		2	2						
Tatralithidae evmoonidaali	2		+	+	+	2	3			1			1
Toguetrethebdue		1	,	+	+	1			-1			1	1
Triguetromabdus cannatus			-										
Tradetornabdus milowii					-					-			
Inquetromabdus rugosus													
umbilicosphaera sibogae	11	9	5	<u>11</u>	2	2	1	2	1	3	5	11	6

Note: + = trace and ? = present but questionable.

	4411	1011	1011	1011	1011		1 444	4511	1511	1011	4.011	4711	1711	1011	1011	1011
Core	11H	12H	12H	13H	13H	14H	14H	15H	15H	IOM	10H	1/H	1/1	101		1911
Section	u u	4		4	u	4	u u	4	1 a	4	100	4	u	4	1 w	4
Interval (cm)		26-27		25-26	L	26-27		26-27		26-27		26-27		26-27		26-27
Zone (Matini, 1971)					NN15-NN	13					NN1	2			NN11	
Amaurolithus amplificus																
Amaurolithus delicatus							6 - CS		-					4		+
Amaurolithus primus													1		· · · · · · · · · · · · · · · · · · ·	
Amaurolithus tricomiculatus				?			+									
Calcidiscus leptoporus	18	16	2	7	23	6	18	6	16	7	8	8	17	4	8	9
Calcidiscus macintymi	2	2	+	1	4	3	1	1			2	1	2	2	2	3
Calcidiecue promacinturai						-				-	1	1			1	2
Catinastar calvadus									-	-				-		
Calination carycolds													+			
Caunaster coainus																
Ceratolithus acutus							-		+	+	+					
Ceratolithus rugosus	?		+	+	+	+	+	+					-			
Coccolithus crassipons															+	
Coccolithus miopelagicus																
Coccolithus pelagicus										1	3			+	+	+
Coccolithus streckerii									-		?				+	?
Coronocyclus nitescens		-					2		?	2						?
Cyclicargolithus floridanus										-			1			
Cyclolitholia annula	11		1021	5	7	7	2	4	2	2	1940	4	2	1	1	3
Dictroscolitos productus				4	1	2	6		2	2		2	2	2	2	-
Dictyococcitos productus	-			4	<u> </u>	6		0	5	3	0	6	5	6	-	
Discoasier adamanteus	-	-			-				-	-	-			-		
Discoaster asymmetricus	1	1		+	1		+	1		1	1	1				-
Discoaster bellus																
Discoaster berggrenii														+	+	+
Discoaster blackstockae							1		-			-	-	-	-	
Discoaster bollii									-				-		1	
Discoaster brouweri	1	2	+	+	2	+	?	?	+	5	1		1	+	+	+
Discoaster calcaris											+					
Discoaster challengeri	?								+							?
Discoaster decorus													1			
Discoaster deflandrei																
Discoaster druggij																
Discoaster exilis			-													
Discoaster formosus																
Discoaster hamatus								-							-	
Discosster kunder									-							
Discoaster looblichii																
Disconster pershametra														-		
Discoaster neonamatus		-					-	-	-		-				-	
Discoaster neorectus								1	1		1					
Discoaster pansus														-	-	-
Discoaster pentaradiatus	?	1	?	?	?	+	?	+	?				?	1	?	?
Discoaster prepentaradiatus																
Discoaster quinqueramus				-									-	+	+	5
Discoaster surculus	?		+	+	+	+	+	+	+		1	+	1	+	+	+
Discoaster triradiatus	?			?	?	+		?	+		?				+	
Discoaster variabilis	1	?	?	?	?		1			?				C 10	+	+
Discoaster spp.		2								1				4	14	1
Discolithina Japonica						-							-		100	
Edesonia obruta				_						<u> </u>						
Caphymcapes aparts	2							2								
Caphyrocapsa aperta	2							1		<u> </u>					-	
amal Cashumaanm														-	-	-
Have the semilarity						-				-					2	2
Hayaster perpiexus		1.000	+	+	+	+	+			+		+		+	- 1	1
Helicosphaera carteri	2	3	+	5	1	+	1	2	1	4	1	+	1	3	1	1
Helicosphaera euphratis																
Helicosphaera granulata															1	2
Helicosphaera hyalina											-					
Helicosphaera intermedia										?	?		1	1	100	
Helicosphaera neogranulata					1			?	?	1		?	1	1		
Helicosphaera sellii	?	?	?	?	2									1 1)
Helicosphaera wallichii	2			2	1		2		2	2	2		2	2	2	1
Oolithotus fragilis	3	4							1	-		-		-		
Pontosphaera spo					2	1	2	2		2	1	2	2	2		1
Pseudoemiliania laci nosa		2	2					-								
Baticulofenestra ampla							-						-	-		-
Paticulateneetra sesnal				-							2		-			-
Paticulateneetre calida	0	0	-		0	-	-		-	-	4			2	-	-
Detectorenestra gerida	3	4	+	-	8	3		2	5	4	6	3	+	2	+	4
Patieutofonestra nadii	70	0.5	140	100	1	15	5	1	8	25	41	23	1/	13	19	1
Reuculotenestra minuta	/8	95	169	129	100	133	112	154	106	17	14	34	23	16	109	55
Reductionestra minutula	30	5	5	6	11	10	21	2	29	32	40	55	49	51	29	50
neuculotenestra pseudoumbilica	5	6		5	13	7	18	8	8	17	27	14	2	5	1	3
Hnabdosphaera daviger							-									
Rhabodsphaera stylifer					?	?										
Scapholithus fossilis											+					
Scyphosphaera spp.						+		+		2	1	?	+	1	+	
Sphenolithus ables	38	47	19	27	27	13	12	13	20	69	28	54	79	91	26	53
Sphenolithus belemnos																
Sphenolithus compactus									_							
Sphenolithus conicus			-													
Sphenolithus delphix				-					-			-		-		
Sphenolithus dissimilie													-	-		
Sphenolithus grandie						-		-		-			-			0
Sphanolithus balaramamhun									_							
Sphanolithus mediamia	0									10				-		
Sumoonnhoom ridahm	r	-		4			-		1	10	5		1	3		1
Syracosphaena pulchna	1.57			+			7	+	+	?				-		
Tenandia symeonidesii	+	2		3	+		1	+			5	3	+	1	1	+
Inquetromabdus carinatus		1											-			
Inquetromabdus milowii																
Inquetromabdus rugosus												+	+	1	+	+
Umbilicosphaera sibogae	4	12	2	2	1.		2	1		?	5	?				
Miscellaneous		1		1									1			1

T. TAKAYAMA

Core	19H	20H	20H	21H	21H	22H	22H	23H	23H	24H	24H	25H	25H	26H	26H	27H
Section	00	4	00	4	œ	4	00	4	00	4	œ	4	CC	4	00	4
Interval (cm)		26-27		26-27		26-27		26-27		26-27		26-27		26-27		26-27
Zone (Matini, 1971)				2					NN	111				· · · · · · · · · · · · · · · · · · ·		
Amaurolithus amplificus			?			+		+			· · · · ·					
Amaurolithus delicatus													+			
Amaurolithus primus				1	S	+								+	+	
Amaurolithus tricomiculatus					2											
Calcidiscus leptoporus	5	2	12	8	10	29	14	20	10	14	8	12	10	15	12	15
Calcidiscus macintyrei	+	1	?	?	?	t	3	1	5		3	1	+		+	+
Calcidiscus premacintyrei	+	2	?	1	+	4	2	4	2	1	+	1	3	1	1	+
Catinaster calyculus																
Catinaster coalitus				s==== 3	1 1 2								5			
Ceratolithus acutus								-						-		
Ceratolithus rugosus	-															
Coccolithus crassipons																
Coccolithus miopelagicus																
Coccolithus pelagicus	+	+	+		1	2	3	5	5	4	2	7	1	2	7	1
Coccolithus streckeni		+							?						1	
Coronocyclus nitescens						?					?	?				?
Cyclicargolithus floridanus																
Cyclolithella annula	5	?	3	+	3	6	3	6	4	2	+	+	+	1	1	2
Dictyococcites productus	-		4		1				1	3	1	1	2	4		2
Discoaster adamanteus				-												?
Discoaster asymmetricus		?					+	+	+	+			+	?	-	?
Discoaster bellus													1	+	7	7
Discoaster berggrenii	+	-	?	1	+	+	2	+	1	+	+	1	-	+		7
Discoaster Diackstockae													7			
Discoaster boili																
Discoaster prouweri	+	+	+	+	+	+	1	2	1	1	+	+	1	+		+
Discoaster calcaris			1.1								-					
Discoaster challengen		+	+					1				+				
Discoaster defordation	-									-						
Discoaster dellandrei				-												
Discoaster druggli			-							-		-	-	-	2	
Discoaster formation			-												(
Discoaster hamatus			-										-			
Disconster kurder				<u> </u>												
Discoaster kopishi	-								_							
Discoaster nechamet is				2		2				2						
Discoaster neometus	2			1		2						2				+
Discoaster nansus								2								
Discoaster pentaradiatus		2														
Discoaster prepentaradiatus			*	*				-					*	-		
Discoaster quinqueramus				1	-	1	1		-	1	-	1		1	1	
Discoaster surculus		1	-			+	3	1			+		2	1	+	+
Discoaster triradiatus				2	2	+		2	2			*				
Discoaster variabilis	+	+				+	1	+	1			+			+	+
Discoaster spp.		3		1							1		1		1	
Discolithina japonica		-	1													
Ericsonia obruta																
Genhymcansa anerta					-											
Gephyrocapsa sinuosa		-									1.1			-		
small Gephyrocapsa																
Hayaster perplexus	1	+	?	+	+	+		1	+	+		+	+	+	+	+
Helicosphaera carteri	1				-		2	1			*	1		1		+
Helicosphaera euphratis					-											
Helicosphaera granulata	1	1	1	+	1	+	2		+	1	1	+	1	+	+	+
Helicosphaera hvalina																
Helicosphaera intermedia																
Helicosphaera neogranulata											1					
Helicosphaera sellii																
Helicosphaera wallichii	1		-	2					?			?		?		
Oolithotus fragilis																
Pontosphaera spp.	+	+	+	+	+				1	+	+		+			+
Pseudoemiliania lacunosa																
Reticulofenestra ampla										1						
Reticulofenestra asanoi	()	2000								2	1.2	1		10		
Reticulofenestra gelida	10	3	+	5	1	16	20	13	29	13	14	10	8	6	7	1
Reticulofenestra haqii	17	7	4	9	6	10	11	9	26	21	18	11	17	17	27	38
Reticulofenestra minuta	50	53	108	72	91	35	13	39	40	52	94	61	71	62	23	37
Reticulofenestra minutula	33	54	29	22	3	19	20	12	7	7	2	12	17	21	52	32
Reticulofenestra pseudoumbilica	3	4	2	13	5	10	19	21	11	9	1	11	12	6	9	2
Rhabdosphaera daviger																
Rhabodsphaera stylifer																
Scapholithus fossilis														-		
Scyphosphaera spp.	+	+	+	+	+	+	2	+	1	1	+		+	+	+	+
sphenolithus ables	73	69	34	63	72	57	68	53	49	62	54	58	53	58	52	62
sphenolithus belemnos																
Sphenolithus compactus			1	2	3	4	2	3	1	5		4		1	3	4
Sphenolithus conicus																
Sphenolithus delphix										()						
Sphenolithus dissimilis	· · · · · ·															
sphenolithus grandis																
Sphenolithus heteromorphus																
Sphenolithus moriformis			1			+	1						1	+	?	+
Syracosphaera pulchra																
Tetralithides symeonidesii		+		1	1	1			+	2	+			1		1
Inquetromabdus carinatus																
I riquetromabdus milowii																
Inquetromabdus rugosus	+	+	+	+	1	1	2	1	2	+	1	4	1	1	+	1
Umbilicosphaera sibogae																
MISCORADOOLIS			1		1.1	4	7 1	7	3	1		4		1	2	2

													0.011	0.00	0.011	OFV
Core	27H	28H	28H	29H	29H	30H	30H	31H	31H	32H	32H	33H	33H	34H	34H	35X
Section	20	4	<u> </u>	4	00	4	20	4	000	4	<u> </u>	4	<u> </u>	4	<u> </u>	3
Interval (cm)		26-27		26-27		26-27		26-27	1	26-27		26-27		26-27		26-27
Zone (Matini, 1971)				NN1	1							N	N10	11 - 12 - 10 - 10 - 1		
Amaumlithus amplificus	1	1		1					1	1		1				
Amourolitico dell'actua				-											-	-
Amauronous dencatus																
Amaurolithus primus																
Amaurolithus tricomiculatus																
Calcidiscus Ientononus	17	3	12	9	12	12	11	29	21	13	35	28	40	28	21	7
Calaidianus maainturai			1.	-	1	14		2.0		10	0	20	40			2
Calcidiscus macintyrei	1	+	+	2	1	+	3	+	+	1	2	3	4	0	1	2
Calcidiscus premacintyrei	1	+	+	+	+	1	4	+	6	2	9	5	4	4	2	
Catinaster calvculus																
Catingster coalities																
Catinaster coalitus																
Ceratolithus acutus			1									1				
Ceratolithus rugosus		3	E									1				
Cassality a crassinone																
Coccollerus crasaporis									-		-		-	-		
Coccolithus miopelagicus					?			1	?		2	2		2		
Coccolithus pelagicus	1	3	+	5	8	5	6	12	8	4	8	10	31	19	19	10
Coccolithus strockarii	2	-		2	2		2		-		-		2	2		-
ooccontrate and choin	-	-			-		- T				-					
Coronocyclus nitescens	1	1		1	1								+		+	
Cyclicargolithus floridanus																
Cyclolithella annula	2	+	2	2	2	2	1	3		2	1	4	4	2	+	?
Dichicagogilag production	1	E	-						0	4	2					
Dictyococcites productus	1	5				1			3		4					
Discoaster adamanteus				1								1	1			
Discoaster asymmetricus					+		?			?						
Discoaster bellus	2	2				2	2	2	2	1	2	2	1	2	2	+
Disessates hemanali												· ·	· · ·		-	
Discoaster perggrenii		+	+	+	+	+	+	1								
Discoaster blackstockae							-			1		1				
Discoaster bollii																
Disconstar brauwari						100	22.22							10	4	
Discoaster Diouwen	+	+	+	+	1	+	+	4	+	1	+	+	4	10		
Discoaster calcaris										?				1	+	
Discoaster challengeri	2		+				+			+		1	+			
Disconstor doconus		-									-					
																<u> </u>
Discoaster deflandrei									?							
Discoaster druggii																
Discoaster exilis	-								-	-						
Discouter family											-					<u> </u>
Discoaster tornosus		-									2				-	
Discoaster hamatus										· · · · · · ·					?	
Discoaster kugleri																
Dissonator la shlishii										-			-	-		
Discoastor looblichii										+						
Discoaster neohamatus	3	· · · · · ·	1	?	+	+		2	2	?	2		2	1	+	+
Discoaster neorectus	+							2		2		2	2	2	2	2
Disconstar papa ja									2							
Discoaster pansus									1		-					
Discoaster pentaradiatus	+					+			+			+	?			
Discoaster prepentaradiatus	· · · · · · · · · · · · · · · · · · ·														+	1
Dissonator minmus mouse	-	2	2					-								
Discoaster duriduerantus	+	1	1		1	+	+			-						
Discoaster surculus	+	+			+		?			?						
Discoaster triradiatus	2				2			2		2						
Disconstar variabilia						0		7	-							5
Discouster variabilis	.+	+	+	+	1	2		1	+	1	+	+	1	+	+	
Discoaster spp.													5	3		
Discolithina japonica																
Ericeonia obruta	1	2									2	1				
Elicoolia oblota	-										6					
Gephyrocapsa aperta																
Gephyrocapsa sinuosa		· · · · ·														
small Gonhymcansa		2							1							
								-							10.00	
Hayaster perpiexus				+				+	+	-	-	+	1		+	
Helicosphaera carteri	1	1	+	+	2	+	2	+	+	1	+	3	+	+	1	+
Halicomhaara aunhmtie							-									
Helicospitatia ouprilass																
Helicosphaera granulata	+	+	1	+	+	1	- 1	4	3	2	2	7	2	2	+	2
Helicosphaera hyalina	1	1								1	1.51					
Holicosphaem intermedia		-		2												
I tollooophidora internedia	-			1												
Helicosphaera neogranulata																
Helicosphaera sellii																
Helicosphaera wallichii		1 - 2	2	2						· · · · · · · · · · · · · · · · · · ·	1					
Oplitholus fragilie																-
a la		-														
Pontosphaera spp.	+	+						1				+	2			-
Pseudoemiliania lacunosa																
Reticulotenestra amola			-													
Deligidations the annual	-							-								
nauculoienesua asanoi																
Reticulofenestra gelida				1	1	1		1						7	18	79
Reticulofenestra hagii	40	40	54	63	41	54	30	28	39	7	5			+	4	3
Reliculofenestre minute	4.0	70	70	47	10		0.7			47	10			-		
Patienter a minuta	40	70	/0	47	15	38	27	33	34	1/	49	3	<u>1</u>	2		
Heuculotenestra minutula	37	12	20	15	13	9	9	2	2	5				+	1	
Reticulofenestra pseudoumbilica	1							1	1				+	2	10	25
Bhabdosphaera davisor							-							-		
ni labuoopi labia Gavigoi																
Hnabodsphaera stylifer																
Scapholithus fossilis																
Scynbosnhaam ann																-
ochhioshiasia spp.	+	+	+	+	+	1	+	1		2	+	1		1	+	
Sphenolithus ables	52	63	39	53	99	70	99	60	65	122	73	117	83	95	94	42
Sphenolithus belemnos																
Sobonolithus compacture				2	2		-	6	-					1	7	
ophonomical compactus			1	3	2	2	2	8			4	6	4	4		0
Sphenolithus conicus																
Sphenolithus delphix																-
Sphenolithus dissimilie																
						_										-
Sprienolithus grandis									J							
Sphenolithus heteromorphus																
Sobonolithus monitormia								-	10	10			-		17	10
Spherrolinius momormis			+			2	- 4	2	18	15	+	0	3	4	17	13
Syracosphaera pulchra									0				(_	
Tetralithides symeonidesii			+	+							2					
Triquetromedure				-		_		-			-					
inqueromabuus cannatus																
Triquetrorhabdus milowii								1							?	?
Triquetrorhabdus rugosus	+	+	+	+	+	+	1	3	*	1	1	2	4	3	1	1
I Imhilicoephaam aibama			- C						-			-		-		
onanioophaona sibogae	-															-
MISCOERIDOUS				I	1	1		1		4			4	2	3	4

T. TAKAYAMA

Com	35X	36X	36X	37X	37X	38X	38X	39X	39X	40X	40X	41X	41X	42X	42X	43X
Section	CC CC	4	CC C	3	00	2	00	3	C C	3	CC C	3	00	4	CC C	4
Interval (cm)		26-27		26-27		26-27		26-27		26-27		26-27		26-27		28-27
Zone (Matini 1971)	NN10	20 21		20 21		NNG		2021		NNR		20 21		NN7-NN6		
Amaurolithus amolificus	14110		-			- Inite			-					11117-11110	· · · · ·	
Amountitue delicatus				-					-					-		
Amaurolithus admus												-		-	-	
Amauralithus trisomiculature			-							-						
Calaidiague lantanan a	-	10		10	0.0	20	0.1	17	0.0	4	7	7	2	14	10	7
Calcidiscus reproportas	4	12	5	10	20	29	21	17	23	4	1	/	0	14	10	
Calcidiscus macintyrei	3	3	4	8	16	9	0	5	10	8	11	8	0	3	5	2
Calcidiscus premadintyrei	+	+	3	5	1	5	2	1	2	+	2			6	1	2
Cabhaster calyculus					+	+	1	+	-				-		-	
Catinaster coalitus			-		7		+	+	+	1						
Ceratolithus acutus																
Ceratolithus rugosus										-		-		-	-	
Coccolithus crassipons										-				-		
Coccolithus miopelagicus	?	11	?	1	2	1	2	9	1	1	6	1	1	+	+	1
Coccolithus pelagicus	11	14	6	4	20	9	7	23	9	12	67	50	22	12	15	24
Coccolithus streckerii			?					?		1		2			+	+
Coronocyclus nitescens					?		1	1	?	+	1					
Cyclicargolithus floridanus									-							
Cyclolithella annula	1		2	?	2	+	?	?	+			?		+	7	+
Dictyococcites productus										+	1		1	4	2	
Discoaster adamanteus					1		(?		
Discoaster asymmetricus																
Discoaster bellus			?	1	4	4	2	4	?							
Discoaster berggrenii																
Discoaster blackstockae																
Discoaster bollii							-				?					
Discoaster brouweri	?				1	+	?		?		1					
Discoaster calcaris	+	3	1	1					?							
Discoaster challengeri			2					+	+	1	1					
Discoaster decorus			-					-					-			
Discoaster deflandrei								*	1				-	2	2	2
Discoaster druggii																
Discoaster avilis					1				1	1	1		1	2	2	1
Discoastar formoeue												-				
Discoaster hamatus		2		2									-			
Discoaster hamatus			+	3	+	-		+								
Discoaster Kugien																2
Discoaster loeblichi																
Discoaster neohamatus	1	1	3						?					-		
Discoaster neorectus			-													
Discoaster pansus			?							-	-			2		
Discoaster pentaradiatus							_								-	
Discoaster prepentaradiatus	1		+			?		1		1	1	?	?	1		
Discoaster quinqueramus																
Discoaster surculus				?				?	1		-			-		-
Discoaster triradiatus							7							-		
Discoaster variabilis	+	2	3	1	3	1	+	2	4	4	5	+	6	1	2	3
Discoaster spp.	3	8		5	2		1		5	1	4	1	3			
Discolithina japonica								-							10	
Ericsonia obruta									10	2						
Gephyrocapsa aperta																
Gephyrocapsa sinuosa																
small Gephyrocapsa											1		-			
Havaster perplexus	+		+	2	+	+	1	+	1	+	1	+		+	0	2
Helicospheers certeri							1	2	2				1.1	2	1	1
Helicosphaera europratie								1		-		-				
Helicombasm granulata	12.5						-			100				2	2	
Helicosphaera granutata	+	+		- 1	4		+		-	+		+	4	2		+
Helicosphaem intermedia										<u> </u>						
Helicosphaera internecia										<u> </u>						
Helicosphaera neogranulata																
Heilcosphaera seili									-							
Colition for all a		_								+						
Controllus tragilis																
Pontosphaera spp.		+	-		+				1	+ +				-		
Patiendafanaatea			-	-											-	
Potecuolenestra ampia								-								
neuculotenestra asanoi			40.5	115				117	46.5	1.00		107		0.5	7.5	
Heuculotenestra gelida	82	84	103	102	71	109	110	105	102	104	50	105	94	89	/2	84
neuculotenestra hagii	8	1	13	2	1		7	2	3	13	8	5	14	32	32	8
Heuculotenestra minuta			1				1		-		1			2	1	1
neuculotenestra minutula		1	7		1	1	3	2	1	4	1	?	1	10	1	2
Henculotenestra pseudoumbilica	10	11	9	10	9	11	24	13	18	21	12	6	13	20	25	48
Rhabdosphaera daviger													_			
Hnabodsphaera stylifer	(-		_									
Scapholithus fossilis																
Scyphosphaera spp.			+		1		+	1	+			1				
Sphenolithus abies	54	27	17	20	18	12	4	4	2	4	5	6	12	15	12	6
Sphenolithus belemnos	· · · · · · · · · · · · · · · · · · ·										4				-	
Sphenolithus compactus	7	6	9	4	7	1		1	2	3	4	3	4	5	1	1
Sphenolithus conicus																
Sphenolithus delphix																
Sphenolithus dissimilis																
Sphenolithus grandis														1.1.1.1	1	
Sphenolithus heteromorphus																
Sphenolithus moriformis	8	1	8	7	1	4	2	6	2	5	5	1	3	3	1	1
Syracosphaera pulchra			-			-	-	-					-			
Tetralithides symeonidesii			+										+			
Triquetrorhabdus carinatus													-			
Triquetrorhabdus milowii		1			1				4				_			
Triquetrothabdus nuceus	1	4	2	5	2	2	4		2	4	9		5	1		3
Limbilicospheom elhome			2		- 2	4			2	4	3		9			3
Missellapsour	-	10								-		-		-		
1110-010100-05	0	10	1	2	0	1 1	2	1	5	0	2	2	0	4	3	

-	7.634	
Core	43X	44X
Section	20	4
Interval (cm)		28.27
interval (city)		20-21
Zone (Matini, 1971)		
Amaumlithus amplificus		
Anadiona ampinicas		
Amaurolithus delicatus		
Amaurolithus primus		
runautonineo printao		
Amaurolithus tricomiculatus		
Calcidiscus lentoporus	2	19
Guicidiacda inproportas	-	10
Calcidiscus macintyrei	4	2
Calcidiacue promacintural	2	
Calcioiscus premacinyrei	1	+
Catinaster calyculus		
Cationates exalities		
Catinaster coantus		
Ceratolithus acutus		
Constalithus numerus		
Ceratonarius indoaria		
Coccolithus crassipons		
O a seallithe as an include a local series		
Coccolitrius miopelagicus	1	4
Coccolithus pelagicus	22	27
C		
Coccolinus streckeri		+
Compocyclus pitescens		2
Cyclicargolithus fiondanus		
Cyclolithalla annula		4
Dictyococcites productus		
Disconstar adamantaus	2	
Diesouora adamantari		
Discoaster asymmetricus		
Discogeter bellus		
Discousion Donus		
Discoaster berggrenii		
Disconstar blackstockan		
Discussion Diackstockate		
Discoaster bollii		
Disconstar braund		
Discoaster prouwen		
Discoaster calcaris		
Discontor challenged		2
Discoaster challengen		1
Discoaster decorus		
Discourse de la contrat	6	6
Discoaster defiandrei	3	1
Discoaster druggii		
Discousier didgei		
Discoaster exilis	1	7
Disconstar formosus		
Discousion formosta		
Discoaster hamatus		
Disconstar kurdari	2	
Discoastal Rugian	r	
Discoaster loeblichii		
Disconstar peopamatus		
Discoustor ristriariatio		
Discoaster neorectus		
Disconstar papers		
Discoaster parisus		
Discoaster pentaradiatus		
Disconstar proportaradia hus		
Disconster prepentaradiatus		
Discoaster guingueramus		
Disconstant surgedure		
Discoaster surculus		
Discoaster triradiatus		
Discoaster variabilis	1	3
Discoaster spn	1	3
Directure opp.		-
Discolithina japonica		
Ericeopia obruta		
Encsonia obruta		
Gephyrocapsa aperta		
Canhumannan ainunan		
Gepnyrocapsa sinuosa		
small Gephyrocapsa		
Linux ates a smilesous	1000	
Hayaster perpiexus	+	1
Helicospheers carted		2
rieicospilaela calteri		
Helicosphaera euphratis		
Helicombeem aronulate		2
Helicosphaeta granulata	+	3
Helicosphaera hyalina		
Hellesenheem intermedia		
Helicosphaera Internedia		
Helicosphaera neogranulata		
Helissenheem celli		
Helicosphaeta selli		
Helicosphaera wallichii		
Onlithotus femallie		
Collarotus fragilis		
Pontosphaera spp.		1
Pseudoomiliania la ormana		
a accinosa		
Heticulofenestra ampla		
Reticulofonestra aconci		
Reticulofenestra gelida	93	61
Reficulofonestra bacil	20	27
neucuorenestra fiaqu	20	21
Reticulofenestra minuta	1	
Reticulofoneetra minutula	7	10
meacuotonosua minutula	/	10
Reticulofenestra pseudoumbilica	28	21
Phabdombsom deulass		
ruiabdosphaeta claviger		
Rhabodsphaera stylifer		
Capphalithus fac-ilia		
Scapholithus tossills		
Scyphosphaera spp		+
a thread and a short		
Sphenolithus ables	3	3
Sphenolithus belemnos		
Sphenolithus compactus	1	1 1
Sphenolithus copicus		
opinitionalius conicus		
Sphenolithus delphix		
Cohonolithus dissimilie		
oprioriona da samina		
Sphenolithus grandis		
Sebenalithus between mhur		
ophanoimus neteromorphus		
Sphenolithus moriformis	2	6
Cura saanhaam sudahas		
Syracospinaera puicnia		
Tetralithides symeonidesii		2
Tiguetradiation		
inquetromabous cannatus		
Triguetrorhabdus milowii		
Trimintrathabeter	~	1.4
Triquetrorhabdus rugosus	2	1
Triquetrorhabdus rugosus Umbilicosphaera sibogae	2	1
Triquetrorhabdus rugosus Umbilicosphaera sibogae	2	1

T. TAKAYAMA

Core
Section
oocuon
Interval (cm)
Zone (Matini 1971)
2010 (Mauni, 10/1)
Amaurolithus amplificus
Amautolithus delicatus
Anadrona doneardo
Amaurolithus primus
Amourolithus tricomiculatus
All a la
Calcidiscus leptoporus
Calcidiacus macintural
Calcioiscus macinyrui
Calcidiscus premacintyrei
Catingetor calvoulue
Caunaster carycolus
Catinaster coalitus
Constalitions another
Ceratolinius acutus
Ceratolithus rugosus
Caseslithus see doors
Coccollinus crassipons
Coccolithus miopelagicus
Coccolithus pelagicus
Coccolithus streckerii
o o o o o o o o o o o o o o o o o o o
Coronocyclus nitescens
Cyclicargolithus flotidanus
cyclical goligida nondanda
Cyclolithella annula
Distriction and interesting
Dictyococcitos producius
Discoaster adamanteus
Discoutes an annable is
Discoaster asymmetricus
Discoaster bellus
Discoutes have seen
Discoaster berggrenii
Discoaster blackstockag
Blassester ball
Discoaster bolili
Discoaster brouweri
Discoaster calcaris
Discoaster challengeri
Ciacodastal citillianigali
Discoaster decorus
Disconstar deflandral
macdaster denandret
Discoaster druggii
Disconstar avilla
CUSCORSTOL OXIUS
Discoaster formosus
Discoaster hamatus
Discoaster kunleri
Discoaster loeblichii
Discoaster peopamatus
Discoaster neorectus
Disconstar papers
Discoaster parteus
Discoaster pentaradiatus
Disconstar, prepertare distus
Discoaster prepentaradiatus
Discoaster guingueramus
Discontraction
Discoaster surculus
Disconstor triradiatus
Discoaster variabilis
Disconstar enn
Discoaster spp.
Discolithina japonica
Edeconia obsute
Encsonia obruta
Geobyrocapsa aperta
Carbon and allowing
Gepnyrocapsa sinuosa
small Geohyrocaosa
Hayaster perplexus
Lielieseebe end as deal
Helicosphaera carteri
Helicosphaera carteri Helicosphaera euphratis
Helicosphaera carteri Helicosphaera euphratis
Helicosphaera carteri Helicosphaera euphratis Helicosphaera granulata
Helicosphaera carteri Helicosphaera euphratis Helicosphaera granulata Helicosphaera hvalina
Helicosphaera carteri Helicosphaera euphratis Helicosphaera granulata Helicosphaera hyalina
Helicosphaera carteri Helicosphaera euphratis Helicosphaera granulata Helicosphaera hyalina Helicosphaera intermedia
Helicosphaera carteri Helicosphaera euphratis Helicosphaera granulata Helicosphaera hyalina Helicosphaera intermedia
Helicosphaera carteri Helicosphaera euphratis Helicosphaera granulata Helicosphaera hyalina Helicosphaera intermedia Helicosphaera neogranulata
Helicosphaera carteri Helicosphaera granufata Helicosphaera granufata Helicosphaera hyalina Helicosphaera intermedia Helicosphaera neogranulata Helicosphaera selili
Helicosphaera carteri Helicosphaera suphratis Helicosphaera granulata Helicosphaera hyalina Helicosphaera intermedia Helicosphaera neogranulata Helicosphaera sellii Helicosphaera sullidvii
Helicosphaera carteri Helicosphaera granufata Helicosphaera granufata Helicosphaera hyalina Helicosphaera intermedia Helicosphaera neogranufata Helicosphaera selli Helicosphaera selli
Helicosphaera carteri Helicosphaera ouphratis Helicosphaera ouphratis Helicosphaera hysiina Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera selli Helicosphaera wallichi Oolithotus fragilis
Helicosphaera carteri Helicosphaera granufata Helicosphaera granufata Helicosphaera hyalina Helicosphaera intermedia Helicosphaera neogranufata Helicosphaera selli Helicosphaera wallichi Oolithotus fragilis Pontosphaera spo.
Helicosphaera carteri Helicosphaera granulata Helicosphaera granulata Helicosphaera hysiina Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera selli Helicosphaera selli Helicosphaera selli Pontosphaera spp. Desudaendica La secco
Helicosphaera carteri Helicosphaera granufata Helicosphaera granufata Helicosphaera hyalina Helicosphaera intermedia Helicosphaera neogranufata Helicosphaera selli Helicosphaera wallichi Oolithotus fragilis Pontosphaera spp. Pseudoemiliania tacunosa
Helicosphaera carteri Helicosphaera granulata Helicosphaera granulata Helicosphaera hyalina Helicosphaera intermedia Helicosphaera neogranulata Helicosphaera selli Helicosphaera selli Helicosphaera selli Pontosphaera spp. Peeudoemiliania Iscunosa Reticulofenestra amola
Helicosphaera carteri Helicosphaera suphratis Helicosphaera suphratis Helicosphaera intermedia Helicosphaera intermedia Helicosphaera intermedia Helicosphaera selli Helicosphaera wallichi Oolithotus fragilis Pontosphaera spp. Pesudoemilania lacunosa Reticulofenestra ampla
Helicosphaera carteri Helicosphaera granulata Helicosphaera granulata Helicosphaera hyalina Helicosphaera intermedia Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera solli Helicosphaera solli Pontosphaera sp. Peeudoemiliania lacunosa Reticulofenestra asnoi
Helicosphaera carteri Helicosphaera euphratis Helicosphaera euphratis Helicosphaera intermedia Helicosphaera intermedia Helicosphaera neogranulata Helicosphaera selli Helicosphaera wallichi Oolithotus fragilis Pontosphaera spp. Peeudoemiliaria (acunosa Reticulofenestra ampla Reticulofenestra angla
Helicosphaera carteri Helicosphaera granulata Helicosphaera granulata Helicosphaera intermedia Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera solli Helicosphaera solli Pontosphaera spi. Poeudoemiliania Iscunosa Reticulofenestra anola Reticulofenestra gelida
Helicosphaera carteri Helicosphaera euphratis Helicosphaera euphratis Helicosphaera hyalina Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera selli Helicosphaera selli Helicosphaera selli Oolithotus fragilis Pontosphaera spp. Peeudoemiliania tacunosa Reticulofenestra armola Reticulofenestra agelida Reticulofenestra gelida
Helicosphaera carten Helicosphaera suphratis Helicosphaera suphratis Helicosphaera intermedia Helicosphaera intermedia Helicosphaera neogranulata Helicosphaera wallichi Oolithotus fragilis Pontosphaera spp. Peeudoemiliania tacunosa Reticulofenestra ampia Reticulofenestra asenoi Reticulofenestra agolida Reticulofenestra agolida
Helicosphaera carteri Helicosphaera granulata Helicosphaera granulata Helicosphaera hyalina Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera selli Helicosphaera selli Helicosphaera selli Pontosphaera spp. Pseudoemiliania tacunosa Reticulofenestra ampia Reticulofenestra asanoi Reticulofenestra seanoi Reticulofenestra pida Reticulofenestra minuta
Helicosphaera carten Helicosphaera suphratis Helicosphaera suphratis Helicosphaera nyafina Helicosphaera intermedia Helicosphaera intermedia Helicosphaera selli Helicosphaera wallichi Oolithotus fragilis Pontosphaera spp. Pesudoemiliania lacunosa Reticulofenestra ampla Reticulofenestra asnoi Reticulofenestra galida Reticulofenestra palida Reticulofenestra aminuta Reticulofenestra minuta
Helicosphaera carteri Helicosphaera granulata Helicosphaera granulata Helicosphaera hyalina Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera selli Helicosphaera selli Pontosphaera selli Pontosphaera spp. Peeudoemiliania lacunosa Reticulofenestra ampia Reticulofenestra asanoi Reticulofenestra seanoi Reticulofenestra minuta Reticulofenestra minuta
Helicosphaera carteri Helicosphaera euphratis Helicosphaera euphratis Helicosphaera negranulata Helicosphaera intermedia Helicosphaera neogranulata Helicosphaera selli Helicosphaera wallichi Oolithotus fragilis Pontosphaera spp. Peeudoemiliaria (acunosa Reticulofenestra ampla Reticulofenestra ampla Reticulofenestra pelida Reticulofenestra haqi Reticulofenestra haqi Reticulofenestra minuta Reticulofenestra minuta Reticulofenestra minuta
Helicosphaera carteri Helicosphaera granulata Helicosphaera granulata Helicosphaera intermedia Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera solili Pontosphaera solili Pontosphaera solili Pontosphaera spp. Peeudoemiliania lacunosa Reticulofenestra angla Reticulofenestra angla Reticulofenestra angli Reticulofenestra minuta Reticulofenestra minuta Reticulofenestra pseudoumbilicia Reticulofenestra pseudoumbilicia
Helicosphaera carteri Helicosphaera euphratis Helicosphaera euphratis Helicosphaera neogranulata Helicosphaera intermedia Helicosphaera neogranulata Helicosphaera selli Helicosphaera selli Helicosphaera selli Oolithotus fragilis Pontosphaera sp. Peeudoemiliaria lacunosa Reticulofenestra ampla Reticulofenestra ampla Reticulofenestra peudoa Reticulofenestra finutta Reticulofenestra minutta Reticulofenestra minutta Reticulofenestra minutta Reticulofenestra minutta Reticulofenestra peudoambilica Rhabdosphaera actifier
Helicosphaera carten Helicosphaera suphratis Helicosphaera suphratis Helicosphaera nyafina Helicosphaera intermedia Helicosphaera neogranuiata Helicosphaera selli Helicosphaera waliichi Oolithotus fragilis Pontosphaera ayola Reticulofenestra ampia Reticulofenestra asnoi Reticulofenestra asnoi Reticulofenestra asnoi Reticulofenestra asnoi Reticulofenestra angila Reticulofenestra minuta Reticulofenestra minuta Reticulofenestra minuta Reticulofenestra minuta Reticulofenestra minuta Reticulofenestra minuta
Helicosphaera carteri Helicosphaera euphratis Helicosphaera euphratis Helicosphaera nyafina Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera selli Helicosphaera selli Helicosphaera selli Helicosphaera selli Oolithotus fragilis Pontosphaera spil Pontosphaera ampla Reticulofenestra ampla Reticulofenestra pelida Reticulofenestra pelida Reticulofenestra minuta Reticulofenestra minuta Reticulofenestra minuta Reticulofenestra minuta Reticulofenestra peudoumbilica Rhabodsphaera dsviger Rhabodsphaera dsviger
Helicosphaera carteri Helicosphaera euphratis Helicosphaera euphratis Helicosphaera neugranulata Helicosphaera intermedia Helicosphaera intermedia Helicosphaera selli Helicosphaera selli Helicosphaera selli Pontosphaera spp. Peeudoemiliania tacunosa Reticulofenestra ampla Reticulofenestra ampla Reticulofenestra ampla Reticulofenestra haqii Reticulofenestra haqii Reticulofenestra haqii Reticulofenestra haqii Reticulofenestra haqii Reticulofenestra minuta Reticulofenestra minuta Reticulofenestra minuta Reticulofenestra minuta Reticulofenestra deviger Rhabodsphaera styffer Scapholithus fossilis
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Com	50Y	60Y	60Y	61V	61Y	VC3	Yea	K SS	637	64Y	64Y	65¥	85Y	66X	BBX	67X
Rection	00	2	00	01A	00	021	021	034	054	1	040	2	000	4	m	1
Suction	u.	3	u	4	u	4	u	4	u	1	u	3	<u>.</u>	4	<u> </u>	00.07
Interval (cm)		26-27		26-27		26-27		26-27		43-44		26-27		26-27		26-27
Zone (Matini, 1971)			NN5-NN4			NN3						NN2				NN1
Amaurolithus amplificus							S	1.1								
Amaurolithus delicatus																
Amauralitius primus														<u> </u>		
Amaurolitrus primus																
Amaurolithus tricomiculatus																
Calcidiscus leptoporus	2	1	6	4	1		1		1	1	2	4	4		1	1
Calcidiscus macintyrei	1	1				+	+			1	+	+			2	+
Calcidiscus promacintyrai							2	1								
Cotinector schedup							6									
Caunaster caryculus			<u> </u>													
Catinaster coalitus															-	
Ceratolithus acutus	5						()			1			1			
Ceratolithus rugosus												1				
Coccolithus crassipons																
Cosselitive misselegicus	0	6		0	17		7	0	10	0	0	7	44	5	3	5
Coccolitutus mioperagicus	0	0	0	0	17	0	/	0	10	0	0					
Coccolithus pelagicus	16	33	39	14	28	41	38	36	17	31	25	27	34	12	/	5
Coccolithus streckerii			1					+				-				
Coronocyclus nitescens	+	1	+	+	1	3	1	1	2	2	1	4	2	1	2	+
Cyclicargolithus floridanus	27	58	39	26	28	45	58	58	70	64	26	12	30	19	14	23
Cyclelifielle appude	1	2	2			2	0	1	2			1				-
		1	2		+		2	1	1							
Dictyococcites productus		-	-				1			1		-	-			
Discoaster adamanteus	1		?	2	1		· · · · · · · · · · · · · · · · · · ·	1	?		2	?			2	1
Discoaster asymmetricus																
Discoaster bellus																
Dissesstar homempii		-								-						
Discoaster beiggreini				-				-		-						
Discoaster Diackstockae	-	-	-				-	-		-	-	1	-	-		
Discoaster bolli																
Discoaster brouweri																
Discoaster calcaris							-	-								
Disconstar challenger		-								-		-		-		
Discoaster challengen		-						-								
Discoaster decorus										-						
Discoaster deflandrei	32	24	16	60	54	43	19	24	16	31	25	17	26	24	12	25
Discoaster druggii				2			2	+				+		+	+	
Discoaster exilis								-					-			
Dissession formanus						-	-					-				
Discoaster formosus		-				-	-	-		-		-				
Discoaster hamatus																
Discoaster kugleri																
Discoaster loeblichii	1															
Discoaster peopamatus	-	-														
Discostor noonannatas			-					-								
Discoaster neorectus																
Discoaster pansus						G	6					N				
Discoaster pentaradiatus																
Discoaster prepentaradiatus									-			-	1.1			
Disesseter minmus mile		-	-													
Discoaster quinqueramus																
Discoaster surculus																
Discoaster triradiatus																
Discoaster variabilis	1	7	2	4	1	4	3	2	2	2	2		2			1
Disconstar epp	4	1	1	2				~	1	1	-	-	-			
Discussion spp.	4								-							
Discolithina japonica			-													
Ericsonia obruta	?	1					2			2	6	3	2	- 4	4	÷
Gephyrocapsa aperta																
Gephyrocapsa sinuosa							2 5					V				
small Genhymcansa																
amai Gephyrocapaa		-	-		C STUD		-			-	-		-	1000		
Hayaster perpiexus	+	+	4	1	+	+	+	+		2	2	1		+	1	
Helicosphaera carteri			+								1	+				
Helicosphaera euphratis																
Helicompany granulate												-				
Holicospriaera granulata	+	+	+	+	+					+		+				
Helicosphaera nyalina		-	-	-	-					-		-				
Helicosphaera Intermedia				1												
Helicosphaera neogranulata						l										
Helicosphaera selli																
Helicosphaem wallichii								-								
			-			-		-			_	-				
Compound magnits		-			-							-		-		-
Pontosphaera spp.				+			_									-
Pseudoemiliania lacunosa																
Reticulofenestra ampla																
Reticulofenestra asanoi																-
Reticulofenester colide	E		14	-			4	10	10	7	90	9.0	00	50	0.0	20
Defended a genda	5	4	14	1	0		4	13	19	- /	38	30	33	52	28	20
Heuculotenestra haqii	1		4	9	4	11		11	13	1	6	34	17	29	63	45
Reticulofenestra minuta	1		5	3	(1				4		1		2	9
Reticulofenestra minutula	2		4	16	4	2	1	5	2			12	2	14	6	3
Baticulofenestra negudoumbilica	0	2	19	1		7	15	1.0	11	7	p	6	7		10	
Deaddorohaana daulaan	-	2	10				15	10	11		0	0	1	-	12	
niabdoapriaera daviger																
Hnabodsphaera stylifer																
Scapholithus fossilis																
Scyphosphaera spp.		+	+		1.1.1											
Sphenolithus ables						-					-					
Cabaaatittaa balas					1	-				1	2		-			
Sphenolithus belemnos		-				7	5	3	5	9						
Sphenolithus compactus	1	1	1	1	6	1					1	5	3	1	3	3
Sphenolithus conicus									2			+				
Sphenolithus delphix									-							
Cohanalitius desimilie		-									-	6		-		-
Sprienolitrus dissimilis											5	6	9	7	4	7
sphenolithus grandis																
Sphenolithus heteromorphus	14	10	11	6												
Sphenolithus moriformis	73	46	30	37	40	23	29	17	27	15	26	17	9	24	23	35
Syracosphaera nutches						20	20	.,	-1		20		-	-7		
Totralibidae			-										-			-
i ou allundes symeonidesii							1				1					(
Inquetromabdus carinatus			?				4	1	3	7	4	4	1	3	10	9
Triquetrorhabdus milowii								1		1						3
Triquetrorhabdus rugosus	2	3	+	2	3	2										+
Umbilicosphaera sibogao						-										
Microllancouro			-		-	-										-
macenarieous		1 1	2	1	1	5	6	3	3	5	4	11	6	4	1	2

T. TAKAYAMA

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Core	67X	68X	68X	69X	69X	70X	70X	71X	71X	72X	72X	73X	73X
Section	20	1	00	2	00	2	00	2	00	2	œ	4	œ
Interval (cm)		26.27		26.27		26.07		28.27		26.27		26.27	
interval (citi)		20-21		20-21		20-27		20-21	L	20.21		20.21	
Zone (Matini, 1971)						- 1º			N	N1			
Amaurolithus amplificus							1						
Amouralithus deligatus												-	
Amaurone lus dencatus	-											-	
Amaurolithus primus									1				1
Amaurolithus tricomiculatus		· · · · · · · · · · · · · · · · · · ·											
Ostaldarus lantan and						-	-	-		1.	0	-	-
Calcidiscus ieptoporus	4		5	1	-	2		2	1	+	3		
Calcidiscus macintyrei	+					3	1	1	+	+			1
Calaidiaa to promo ainhurai					2			-		4	24.5		
Calcidiscus premacintyrer					1			4			+		L
Catinaster calyculus													
Cationator coalities							-			-			
Calinaster coalitus						-						-	<u> </u>
Ceratolithus acutus													
Ceratolithus moosus													
								-				++	L
Coccolinus crassipons													L
Coccolithus miopelagicus	+	6	2	1	3	2	1	9	5	3	4	1 1	+
Coscolithur polaciour	0	10	20	00	10	7		0	15	4		2	
Coccollinus pelagicus	0	10	32	22	10	1	14	0	15	4	0	2	0
Coccolithus streckerii			1	?	L	1						?	· · · · · · · · · · · · · · · · · · ·
Coronocyclus nitescens	2				1			0.42	2	1	1.1		
Continent and the second		10			10	-	100			1.1.1	110	110	1.10
cyclicargolithus fiondarius	38	48	53	32	42	80	122	115	110	141	140	149	140
Cyclolithella annula					1	-							
Dictrococcites productus													
Dicty ococcitos productus			-					-		-		-	-
Discoaster adamanteus	2		1					?		2		1	?
Discoaster asymmetricus													
Disconstant hallow				-									· · · · ·
Disconstel pelicis					L								L
Discoaster berggrenii								1				11	1
Discoaster blackstockae				1	1 1								
				1 1				<u> </u>				+	L
Discoaster Dolili				L								L	1
Discoaster brouweri		1.											
Discovertor colondo													
Discoaster calcalis			-					-					
Discoaster challengeri													
Discoaster decorre				1									
						-						-	
Discoaster deflandrei	20	26	26	15	1	24	6	3	19	15	5	15	12
Discoaster drugoii			1										
Discounter unuggin				t					-			++	
Discoaster exilis										1.			-
Discoaster formosus													
Disconstant hometric			7					-					
Discoaster namatus													
Discoaster kugleri													
Disconstar is shiishii					-			-					
Discoaster loeplicht				-									
Discoaster neohamatus				1									
Discoaster peorectus													
Discoustor modificitus												++	
Discoaster pansus													
Discoaster pentaradiatus													2
Discoutor permittante										-			
Discoaster prepentaradiatus			2										
Discoaster guingueramus													
Discounter quandus											-		
Discoaster surculus													
					-								
Discoaster triradiatus						1							
Discoaster triradiatus											0	-	
Discoaster triradiatus Discoaster variabilis	?	1	+		?	2		7	3	?	?	?	1
Discoaster triradiatus Discoaster variabilis Discoaster spp.	7	1	+		?	2		?	3	?	?	?	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discoalithina inponica	2	1	+		?	2		?	3	?	?	?	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discolithina japonica	?	1	+		?	2		?	3	?	?	?	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discolithina japonica Ericsonia obruta	?	1	+	1	?	2		?	3	?	?	?	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discolithina japonica Ericsonia obruta Geotymocasa aparta	?	1	+	1	?	2		?	3	?	?	?	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discolithina japonica Ericsonia obruta Gephyrocapsa aperta	?	1	+	1	?	2		?	3	?	?	?	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discolithina japonica Ericsonia obruta Gephyrocapsa aperta Gephyrocapsa sinuosa	?	1	+	1	?	2		?	3	2	?	?	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discolittima japonica Ericsonia obruta Gephyrocapsa aperta Gephyrocapsa sinuosa small Gephyrocapsa	?	*	+	1	?	2		?	3	2	?	?	1
Discoaster triradiatus Discoaster spp. Discoaster spp. Discolithina japonica Ericsonia obruta Gephyrocapsa aperta Gophyrocapsa sinuosa small Gophyrocapsa Hausetor nomborus	2	*	+	1	?	1		?	3	2	? 5	? 4	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discoititrina japorica Ericsonia obruta Gophyrocapsa sinuosa small Gophyrocapsa Hayaster perpiexus	2	+	+	1	?	2		?	3	2	?	2	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discolithina japonica Ericsonia obruta Gephyrocapsa aperta Gephyrocapsa sinuosa small Gephyrocapsa Hayaster perplexus Haljoschaera carteri	? 2 1	+	+	1	?	1		?	3	?	? 5	?	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discoititrina japorica Ericsonia obruta Gophyrocapsa sinuosa small Gophyrocapsa Hayaster porpioxus Helicosphaera cartori Helicosphaera cartori	2	*	1	1	?	1		7	3	?	? 5	?	1
Discoaster viriadiatus Discoaster variabilis Discoaster spp. Discolithina japonica Ericsonia obruta Gephyrocapsa aperta Gephyrocapsa sinuosa small Gephyrocapsa Hayaster perplexus Helicosphaera carteri Helicosphaera euphratis	? 2 1	+	+	1	?	1		7	3	?	? 5	2	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discoititrina japorica Ericsonia obruta Gophyrocapsa sinuosa small Gophyrocapsa mall Gophyrocapsa Helicosphaera carteri Helicosphaera granulata	?	+	1	1	?	1	+	?	3	?	? 5	?	1
Discoaster viriadiatus Discoaster variabilis Discoaster spp. Discolithina japonica Ericsonia obruta Gephyrocapsa aperta Gephyrocapsa sinuosa small Gephyrocapsa Hayaster perplexus Helicosphaera carteri Helicosphaera granulata Helicosphaera pyaina	?	*	1	1	?	1	+	7	3	?	? 5	?	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discoititrina japorica Ericsonia obruta Gophyrocapsa sinuosa small Gophyrocapsa amall Gophyrocapsa Helicosphaera carteri Helicosphaera granufata Helicosphaera granufata Helicosphaera hyaina	? 2 1	+	+	1	? 1 + +	1	*	7	3	?	?	?	1
Discoaster triradiatus Discoaster spp. Discoaster spp. Discolithina japonica Ericsonia obruta Gephyrocapsa aporta Gephyrocapsa sinuosa small Gephyrocapsa Hayaster perplexus Halicosphaera carteri Helicosphaera carteri Helicosphaera granulata Helicosphaera intormedia	?	*	+	1	?	2	*	7	3	?	?	?	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discoititrina japorica Ericsonia obruta Gophyrocapsa aperta Gophyrocapsa sinuosa small Gophyrocapsa Helicosphaera exprimatis Helicosphaera granufata Helicosphaera granufata Helicosphaera intormedia Helicosphaera neogranufata	? 2 1 ?	+	+	1	?	2	*	7	3	?	?	?	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discolithina japonica Ericsonia obruta Gephyrocapsa aperta Gephyrocapsa sinuosa small Gephyrocapsa Hayaster pepiexus Halicosphaera carteri Helicosphaera euphratis Helicosphaera intormedia Helicosphaera intormedia Helicosphaera norgranutata Helicosphaera norgranutata	?	*	+	1	?	2	*	?	3	?	? 5	?	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discotitivina japorica Ericsonia obruta Gephyrocapsa aperta Gephyrocapsa sinuosa small Gephyrocapsa Helicosphaera carteri Helicosphaera granulata Helicosphaera granulata Helicosphaera intormedia Helicosphaera neogranulata Helicosphaera neogranulata	? 2 1 ?	+	*	1	?	2	*	7	3	?	? 5	?	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discolittina japonica Ericsonia obruta Gephyrocapsa aporta Gephyrocapsa sinuosa small Gephyrocapsa Hayaster perplexus Halicosphaera carteri Helicosphaera carteri Helicosphaera intermedia Helicosphaera intermedia Helicosphaera seliä Helicosphaera seliä	?	*	+	1	?	2	*	?	3	?	?	? 4 1	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discoititrina japorica Ericsonia obruta Gephyrocapsa aperta Gephyrocapsa sinuosa small Gephyrocapsa mall Gephyrocapsa Helicosphaera cartori Helicosphaera granulata Helicosphaera granulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera seliii Helicosphaera waliichii Oolithotus framiis	?	*	+	1	?	2	*	?	3	?	? 5	?	1
Discoaster viradiatus Discoaster variabilis Discoaster spp. Discolittina japonica Ericsonia obruta Gephyrocapsa aporta Gephyrocapsa aporta Gephyrocapsa sinuosa small Gephyrocapsa Hayaster perplexus Halicosphaera carteri Helicosphaera carteri Helicosphaera argranufata Helicosphaera intermedia Helicosphaera neoli Helicosphaera selii Helicosphaera selii Helicosphaera malichii Oolithotus fragiiis	?	*	+	1	?	2	*	?	3	?	?	?	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discoitivina japorica Ericsonia obruta Gephyrocapes aperta Gephyrocapes aperta Gephyrocapes anuosa small Gephyrocapes Helicosphaera carteri Helicosphaera granulata Helicosphaera granulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera seliii Helicosphaera seliii Helicosphaera seliii Helicosphaera seliii Pontosphaera sep.	?	*	*	1	?	2	*	?	3 ? + ?	?	?	?	1
Discoaster viradiatus Discoaster variabilis Discoaster spp. Discolithina japonica Ericsonia obruta Gephyrocapsa aporta Gephyrocapsa sinuosa small Gephyrocapsa Hayaster perplexus Halicosphaera carteri Helicosphaera carteri Helicosphaera euphratis Helicosphaera argranufata Helicosphaera intermedia Helicosphaera seliä Helicosphaera seliä Helicosphaera seliä Helicosphaera seliä Helicosphaera spa. Pontosphaera spp. Peeudoemiliania lacunosa	?	*	+	1	?	2	*	?	3 ? + ?	?	?	? 4 1	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discoititrina japonica Ericsonia obruta Gephyrocapea aperta Gephyrocapea aperta Gephyrocapea small Gephyrocapea mall Gephyrocapea Helicosphaera cartori Helicosphaera granulata Helicosphaera megranulata Helicosphaera neogranulata Helicosphaera selii Helicosphaera selii Helicosphaera selii Helicosphaera selii Helicosphaera selii Helicosphaera selii Helicosphaera selii Helicosphaera selii Helicosphaera spp. Pesudoomiliania lacunosa Beticulofineeta avovia	?	+	*	1	? 1 *	2	*	?	3 ? + ?	?	?	?	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discoaliter spp. Discoititrina japorica Ericsonia obruta Gophyrocapsa aperta Gophyrocapsa sinuosa small Gophyrocapsa Hayaster perpixus Helicosphaera carteri Helicosphaera carteri Helicosphaera granufata Helicosphaera intermodia Helicosphaera neogranufata Helicosphaera neogranufata Helicosphaera selli Helicosphaera selli Helicosphaera selli Helicosphaera selli Helicosphaera spe. Pesudoomilaria lacunosa Refeudofenestra ampla	?	*	*	1	?	2	*	?	3 ? + ?	? +	?	? 4 1	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discotitivina japonica Ericsonia obruta Gephyrocapea aperta Gephyrocapea aperta Gephyrocapea sinuosa small Gephyrocapea Helicosphaera cartori Helicosphaera granulata Helicosphaera megranulata Helicosphaera neogranulata Helicosphaera selii Helicosphaera selii Helicospha	?	+	+ 1	1	? 1 * *	2	*	?	3 ? + ?	? 	?	? 4 1	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discoittivina japorica Ericsonia obruta Gephyrocapsa aperta Gephyrocapsa sinuosa small Gephyrocapsa Helicosphaera serteri Helicosphaera carteri Helicosphaera carteri Helicosphaera granulata Helicosphaera intormedia Helicosphaera neogranulata Helicosphaera selli Helicosphaera selli Bediculofenestra ampia Reticulofenestra canida	? 2 1 ? 28	1	+	1	?	2	*	?	3	?	? 5	? 4 1	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discositir spp. Discositir spp. Discositir spp. Ericsonia obruta Gephyrocapsa aperta Gephyrocapsa sinuosa amall Gephyrocapsa Helicosphaera euphratis Helicosphaera euphratis Helicosphaera regranulata Helicosphaera intornecia Helicosphaera neogranulata Helicosphaera selii Helicosphaera selii Helicosphaera selii Helicosphaera spp. Pesudoemilania lacuosa Reticulofenestra asnoi Reticulofenestra asnoi Reticulofenestra asnoi	? 2 1 ? ?	1	+	1	? 1 + + 	2	*	? 1 1 ?	3 ? + ?	?	?	?	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discoittivina japorica Ericsonia obruta Gephyrocapsa aperta Gephyrocapsa sinuosa amall Gephyrocapsa mall Gephyrocapsa Helicosphaera carteri Helicosphaera granulata Helicosphaera granulata Helicosphaera intormedia Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera selli Helicosphaera selli Resculofenestra sanoi	? 2 1 ? ? 28 29	1 +	+ 1 28 21	1	? 1 + + 	2 1 1 + 7 12	+	? 1 1 ? ?	3	?	? 5	? 4 1	1
Discoaster viradiatus Discoaster variabilis Discoaster spp. Discolithina japonica Ericsonia obruta Gephyrocapsa aperta Gephyrocapsa sinuosa small Gephyrocapsa Helicosphaera euphratis Helicosphaera euphratis Helicosphaera granulata Helicosphaera intormedia Helicosphaera neogranulata Helicosphaera solii Helicosphaera selii Helicosphaera selii Helicosphaera solii Helicosphaera solii Pontosphaera spp. Peoudoemilaria lacunosa Reticulofenestra agelida Reticulofenestra agelida Reticulofenestra agelida Reticulofenestra miuta	? 2 1 ? ? ? 28 28 29 9	1 + 	+ 1 28 21 3	47	? 1 + + - 	2 1 1 * 7 12	+	? 1 1 ? ?	3 ? + ?	? + 	?	?	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discoittivina japorica Ericsonia obruta Gephyrocapsa aperta Gephyrocapsa sinuosa small Gephyrocapsa mall Gephyrocapsa Helicosphaera actori Helicosphaera cartori Helicosphaera granulata Helicosphaera meogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera selli Helicosphaera selli Roticulofenestra ampla Reticulofenestra gelida Reticulofenestra ninuta	? 2 1 ? ? 28 28 29 9	1 + 	+ 1 28 21 3	1 1 47 23 1	? 1 + + 	2 1 1 + 7 12	+	? 1 1 ? ?	3	?	? 5 4 1 3 1	? 4 1	1
Discoaster viradiatus Discoaster variabilis Discoaster spp. Discolithina japonica Ericsonia obruta Gephyrocapsa aperta Gephyrocapsa aperta Gephyrocapsa sinuosa small Gephyrocapsa Helicosphaera euphratis Helicosphaera euphratis Helicosphaera granulata Helicosphaera intornodia Helicosphaera neogranulata Helicosphaera solii Helicosphaera solii Helicosphaera solii Helicosphaera solii Helicosphaera solii Helicosphaera solii Helicosphaera solii Helicosphaera solii Helicosphaera solii Helicosphaera solii Relicodorniaria lacunosa Reticulofenestra ampia Reticulofenestra agelida Reticulofenestra minuta	? 2 1 ? 2 8 28 29 9 3	1 + 	+ 1 28 21 3 4	1 1 47 23 1	? 1 + + - 	2 1 1 * 7 12	+ + 4 10 3	? 1 1 1 ?	3 ? + ?	? 2 +	? 5 4	? 4 1 1	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discoittivina japorica Ericsonia obruta Gophyrocapsa aperta Gophyrocapsa sinuosa amall Gophyrocapsa Mall Gophyrocapsa Helicosphaera carteri Helicosphaera carteri Helicosphaera granulata Helicosphaera granulata Helicosphaera mogranulata Helicosphaera nogranulata Helicosphaera nogranulata Helicosphaera nogranulata Helicosphaera nogranulata Helicosphaera nogranulata Helicosphaera selii Helicosphaera selii Pontosphaera spp. Paeudoemiliania lacunosa Reticulofenestra appia Reticulofenestra apida Reticulofenestra anjuta Reticulofenestra minutua Reticulofenestra minutua	? 2 1 ? ? 28 29 9 3 1	1 + 	* 1 28 21 3 4 2	1 1 47 23 1 4	? 1 + + - 	2 1 1 + 7 12	+ 4 10 3	? 1 1 7 3 2	3	?	? 5 + 1 3 1	? 4 1 1	1
Discoaster viradiatus Discoaster variabilis Discoaster spp. Discolithina japonica Ericsonia obruta Gephyrocapes aperta Gephyrocapes aperta Gephyrocapes aperta Helicosphaera eutori Helicosphaera eutoriata Helicosphaera eutoriata Helicosphaera granulata Helicosphaera intornedia Helicosphaera neogranulata Helicosphaera solii Helicosphaera solii Reliculofenestra asnoi Reticulofenestra gelida Reticulofenestra minuta Reticulofenestra minuta Reticulofenestra minuta	? 2 1 ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?	1 + 	+ 1 28 21 3 4 2	1 1 47 23 1 4	? 1 + + + - 	2 1 1 + 7 12	+ 4 10 3	? 1 1 1 ?	3 ? +	? 2 +	? 5 * 1 3 1	? 4 1 1	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discoittivina japorica Ericsonia obruta Gephyrocapsa aperta Gephyrocapsa sinuosa small Gephyrocapsa mall Gephyrocapsa Helicosphaera carteri Helicosphaera carteri Helicosphaera granulata Helicosphaera granulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera selii Pontosphaera selii Pontosphaera spa. Peeudoomiliania lacunosa Reticulofenestra amjula Reticulofenestra anjula Reticulofenestra anjula	? 2 1 ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?	1 + 38 10 3 2	+ 1 28 21 3 4 2	1 1 47 23 1 4	? 1 + + - 	2 1 1 + 7 12	+ 4 10 3	? 1 1 ? ?	3	? 2 +	? 5 * 1 3 1	? 4 1 1	1
Discoaster viradiatus Discoaster variabilis Discoaster spp. Discolithina japonica Ericsonia obruta Gephyrocapes aporta Gephyrocapes aporta Gephyrocapes aporta Helicosphaera cartori Helicosphaera cartori Helicosphaera cartori Helicosphaera granulata Helicosphaera granulata Helicosphaera intornodia Helicosphaera neogranulata Helicosphaera solii Helicosphaera solii Reliculofenestra asnoi Reticulofenestra gelida Reticulofenestra minuta Reticulofenestra minuta Reticulofenestra minuta Reticulofenestra minuta Reticulofenestra minuta Reticulofenestra minuta Reticulofenestra minuta Reticulofenestra minuta	? 2 1 ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?	1 + 	+ 1 28 21 3 4 2	1 47 23 1 4	? 1 + + + - - - - - - - - - - - - - - - -	2 1 1 + 7 12	+ 4 10 3	? 1 1 1 ?	3 ? + 1	? 2 +	? 5 * 1 3 1	? 4 1 1	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discoittivina japorica Ericsonia obruta Gophyrocapsa aporta Gophyrocapsa sinuosa small Gophyrocapsa mall Gophyrocapsa Helicosphaera carteri Helicosphaera carteri Helicosphaera granulata Helicosphaera granulata Helicosphaera meogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera seliä Pontosphaera spi. Peeudoomilania lacunosa Reticulofenestra asnoi Reticulofenestra asnoi Reticulofenestra minuta Reticulofenestra minuta Reticulofenestra minuta Reticulofenestra minuta Reticulofenestra minuta Reticulofenestra daviger Rhabdosphaera daviger	? 2 1 ? ? 2 8 29 9 3 1	1 + 	+ 1 28 21 3 4 2	1 1 47 23 1 4	? 1 + + - 	2 1 1 + 7 12	+ 4 10 3	? 1 1 ? ?	3	? 2 +	? 5 * 1 3 1	? 4 1 1	1
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Discoaster triradiatus Discoaster variabilis Discoaster spp. Discoittivina japorica Ericsonia obruta Gephyrocapsa aperta Gephyrocapsa sinuosa amali Gephyrocapsa mali Gephyrocapsa Helicosphaera carteri Helicosphaera quentatis Helicosphaera granulata Helicosphaera meogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera selli Helicosphaera selli Roticulofenestra ampla Reticulofenestra minuta Reticulofenestra minuta Reticulofenestra minuta Reticulofenestra minuta Reticulofenestra peudoumbilica Rhabodsphaera stylfer Scaphonilitus comacus Sphenolitus conacus Sphenolitus grandis Sphenolitus grandis Sphenolitus grandis Sphenolitus eremarus Sphenolitus eremarus Sphenolitus erema puchra Tetralitudes symoonidesii Melicosphaera subies	? 2 1 ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?	1 + 	* 1 28 21 3 4 2 2 3 7 7 9 9	1 1 47 23 1 4 4 4 4 23 1 1 4 4 27	? 1 + + 2 1 3 3 3 3 11 11 25	2 1 1 + 7 12 12 2 15 28	+ 4 10 3 11 18 8 +	? 1 1 1 ? ? 3 2 2 1 1 6 6 23 19	3 ? + ? 1 1 5 14 17	? 2 * *	? 5 + 1 3 1 1 5 ? 13 5	? 4 1 1 1 1 1 1 1 1 1 1 1 1 2	1 1 1 1
Discoaster viradiatus Discoaster variabilis Discoaster spp. Discoittivina japorica Ericsonia obruta Gephyrocapsa aperta Gephyrocapsa sinuosa amall Gephyrocapsa mall Gephyrocapsa Helicosphaera carteri Helicosphaera carteri Helicosphaera granulata Helicosphaera granulata Helicosphaera granulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera seliä Pontosphaera spp. Peeudoomilania lacunosa Reticulofenestra ampia Reticulofenestra ampia Reticulofenestra angia Reticulofenestra minutua Reticulofenestra minutua Reticulofenestra minutua Reticulofenestra peudoumbilica Rhabdosphaera daviger Rhabdosphaera syp. Sphenolithus omactus Sphenolithus compactus Sphenolithus delphix Sphenolithus grandis Sphenolithus grandis Sphenolithus grandis Sphenolithus meteromorphus Sphenolithus meteromorphus Sphenolithus minisia Syna symenidesii Tiquetrothebdus carinatus	? 2 1 ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?	1 + - - - - - - - - - - - - -	+ 1 28 21 3 4 2 3 4 2 3 4 2 3 4 2 1 3 4 2 1 3 4 2 1 3 4 2 1 3 4 2 1 3 4 2 1 3 4 2 1 3 4 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 47 23 1 1 4 4 1 4 1 4 27 1	? 1 + + + 2 1 4 1 3 3 3 3 111 2 5 2	2 1 1 + 7 12 7 12 2 2 15 28 3	+ 4 10 3 11 18 8 + 2	? 1 1 1 ? ? 3 2	3 ? + ? 1 1 5 14 17 2	? 2 + 	? 5 4 1 3 1 1 5 7 13 5 2	? 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discoittivina japorica Ericsonia obruta Gephyrocapsa aperta Gephyrocapsa sinuosa amall Gephyrocapsa amall Gephyrocapsa Helicosphaera cartori Helicosphaera cartori Helicosphaera granulata Helicosphaera meogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera selli Helicosphaera selli Roticulofenestra gelida Roticulofenestra peudoumbilica Roticulofenestra minutua Roticulofenestra minutua Roticulofenestra peudoumbilica Sphenolitus compactus Sphenolitus cornactus Sphenolitus grandis Sphenolitus grandis Sphenolitus grandis Sphenolitus peranophus Sphenolitus cornacus Sphenolitus cornacus Sphenolitus cornacus Sphenolitus cornacus Sphenolitus cornacus Sphenolitus cornacus Sphenolitus cornacus Sphenolitus cornacus Sphenolitus cornacus Sphenolitus delphix Sphenolitus cornacus Sphenolitus dissimilis Sphenolitus dissimilis Sphenolitus dissimilis Sphenolitus heteromorphus Sphenolitus fraguerothabus riliowii	? 2 1 ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?	1 + 	+ 1 28 21 3 4 2 2 3 7 7 9 9	1 1 47 23 1 4 4 4 23 1 1 4 4 27 1 1	? 1 + + 2 21 4 1 3 3 3 3 2 5 2	2 1 1 + 7 12 12 2 15 28 3	+ 4 10 3 11 18 8 + 2	? 1 1 1 ? ? 3 2 1	3 ? + ? 1 1 5 14 17 2	? 2 + 	? 5 + 1 3 1 1 5 ? 13 5 2	? 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 + 6 8 8 8 3 1
Discoaster viradiatus Discoaster variabilis Discoaster spp. Discoittivina japorica Ericsonia obruta Gephyrocapsa aperta Gephyrocapsa sinuosa amall Gephyrocapsa mall Gephyrocapsa Helicosphaera carteri Helicosphaera carteri Helicosphaera granulata Helicosphaera granulata Helicosphaera granulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera seliä Pontosphaera seliä Pontosphaera spp. Pseudoomilania lacunosa Reticulofenestra ampia Reticulofenestra anoji Reticulofenestra annuta Reticulofenestra minutua Reticulofenestra minutua Reticulofenestra minutua Reticulofenestra pseudoumbilica Rhabdosphaera daviger Rhabdosphaera stylfer Sophonolithus onacus Sphenolithus compactus Sphenolithus delphix Sphenolithus grandis Sphenolithus grandis Sphenolithus milis Sphenolithus milis	? 2 1 ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?	1 + - - - - - - - - - - - - -	+ 1 28 21 3 4 2 3 4 2 3 4 2 1 3 4 2 1 3 4 2 1 3 4 2 1 3 4 2 1 3 4 2 1 3 4 2 1 3 4 2 1 3 4 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 47 23 1 1 4 4 1 4 27 1 1	? 1 + + + 2 1 4 1 3 3 3 3 111 2 5 2	2 1 1 + 7 12 7 12 2 2 15 28 3	+ 4 10 3 11 18 8 + 2	? 1 1 1 ? ? 3 2 3 2 1 1 6 6 23 2 19 2	3 ? + ? 1 1 5 14 17 2	? 2 + 	? 5 4 1 3 1 1 1 5 7 13 5 2	? 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1
Discoaster triradiatus Discoaster variabilis Discoaster spp. Discoittivina japorica Ericsonia obruta Gephyrocapsa aporta Gephyrocapsa sinuosa amall Gephyrocapsa mall Gephyrocapsa Helicosphaera actori Helicosphaera cartori Helicosphaera granulata Helicosphaera morgranulata Helicosphaera intormodia Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera solii Helicosphaera solii Helicosphaera solii Helicosphaera solii Helicosphaera solii Helicosphaera solii Helicosphaera solii Reticulofenestra ampia Reticulofenestra apola Reticulofenestra apola Reticulofenestra apola Reticulofenestra apola Reticulofenestra atviger Rhabodsphaera stvifer Sophonolithus belemnos Sphenolithus delphix Sphenolithus delphix Sphenolithus delphix Sphenolithus delphix Sphenolithus grandis Sphenolithus delphix Sphenolithus delphix Sphenolithus sera pula Sphenolithus delphix Sphenolithus delphix	? 2 1 ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?	1 + 	* 1 28 21 3 4 2 2 3 7 7 9 9 + +	1 1 47 23 1 4 4 4 14 8 8 27 1 1	? 1 + + 2 1 3 3 3 2 5 2	2 1 1 + 7 12 2 2 15 28 3	+ 4 10 3 11 18 8 + 2	? 1 1 1 ? ? 3 2 2 1 6 23 19 2	3 ? + ? 1 1 5 14 17 2	? 2 + 	? 5 + 1 3 1 1 5 7 13 5 2	? 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 +
Discoaster viradiatus Discoaster variabilis Discoaster spp. Discoittivina japorica Ericsonia obruta Gephyrocapsa aperta Gephyrocapsa sinuosa emall Gephyrocapsa mall Gephyrocapsa Helicosphaera cartori Helicosphaera cartori Helicosphaera granulata Helicosphaera granulata Helicosphaera granulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera neogranulata Helicosphaera selii Helicosphaera selii Pontosphaera selii Pontosphaera spp. Peeudoomiliania lacunosa Reticulofenestra ampia Reticulofenestra anoji Reticulofenestra anoji Reticulofenestra minutua Reticulofenestra minutua Reticulofenestra pseudoumbilica Rhabdosphaera daviger Rhabdosphaera sylifer Scaphoilitus elseis Syphenolitus compactus Sphenolitus compactus Sphenolitus grandis Sphenolitus grandis Sphenolitus grandis Sphenolitus minutura Retaritides symooridesii Tiquetrorhabdus raijosu	? 2 1 ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?	1 + 	+ 1 28 21 3 4 2 2 3 4 2 3 4 2 9 9 + +	1 1 47 23 1 1 4 4 14 8 8 27 1 1	? 1 + + + 2 1 4 1 3 3 3 3 11 2 5 2	2 1 1 + 7 12 7 12 2 15 28 3	+ + 10 3 11 18 8 + 2	? 1 1 1 ? ? 3 2 2	3 ? + ? 1 1 5 14 17 2	? 2 + 	? 5 4 1 3 1 1 5 ? 13 5 2	? 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 +

Table 14 (continued).

Core	75X	76X	76X
Section	00	2	00
Interval (cm)		18-19	-
Zone (Matini, 1971)		NN1	
Amaurolithus amplificus			
Amaurolithus delicatus			
Amaurolithus primus			
Amaurolithus tricomiculatus			
Calcidiscus leptoporus			2
Calcidiscus macintyrei			
Calcidiscus premacintyrei			
Catinaster calyculus	·		
Catinaster coalitus			
Ceratolithus acutus			
Ceratolithus rugosus	_		
Coccolithus crassipons	1		
Coccolithus miopelagicus	4	3	4
Coccolithus pelagicus	4	5	5
Coccolithus streckerii			
Coronocyclus nitescens	1		
Cyclicargolithus floridanus	122	123	107
Cyclolithelia annula			
Dictyococcites productus			
Discoaster adamanteus			
Discoaster asymmetricus			_
Discoaster bellus			
Discoaster berggrenii			
Discoaster Diackstockae		-	
Discoaster bolli	-		
Discoastor prouwon	<u> </u>		
Discoaster aballement			
Discoaster challengen			-
Discoaster defender		10	•
Discoaster denardie	21	10	3
Discoaster druggil		++	
Discoastor formation			
Discoaster formosus		+ +	
Discoaster kurleri			
Discoaster looblichii			
Discoaster nechamatus			
Discoaster neoractus			_
Discoaster neorectus			
Discoastor pantamentatus			_
Discoaster prenentaradiatus			
Discoastor guing loganus		<u> </u>	
Discoaster surculus			
Discoaster triradiatus		<u> </u>	
Discoaster variabilis	2	2	
Discoaster spp	6		
Discolithina japonica			
Ericsonia obruta	3	1	
Gephyrocapsa aperta			
Gephyrocapsa sinuosa			
small Gephyrocapsa			
Hayaster perplexus			
Helicosphaera carteri			
Helicosphaera euphratis			
Helicosphaera granulata	1		
Helicosphaera hyalina			
Helicosphaera intermedia			
Helicosphaera neogranulata	1		
Helicosphaera selli			
Helicosphaera wallichii			
Oolithotus fragilis			
Pontosphaera spp.			
Pseudoemiliania lacunosa			
Reticulofenestra ampla			
Reticulofenestra asanoi			
Reticulofenestra golida	3	3	
Reticulofenestra hagii		1	1
Reticulofenestra minuta			
Reticulofenestra minutula			
Reticulofenestra pseudoumbilica			
Rhabdosphaera daviger			
Rhabodsphaera stylifer			
Scapholithus fossilis			
Scyphosphaera spp.			
Sphenolithus abies			
Sphenolithus belemnos			
Sphenolithus compactus	1	3	2
spnenolithus conicus			
Sphenolithus delphix		2	2
Sphenolithus dissimilis	6	4	6
Sphenolithus grandis			-
Sphenolithus heteromorphus			
Sphenolithus moriformis	25	3	3
Syracosphaera pulchra	_		_
retralithides symeonidesii			
Triquetrorhabdus carinatus	3	43	62
Inquetromabdus milowii	4	1	3
Inquetromabdus rugosus		7	
Umbnicosphaera sibogae			_
Miscellaneous			_

Table 15. Calcareous nannofossil occurrences, Hole 805C.

Core	4H	4H	5H	5H	6H	6H
Section	5	00	3	00	4	00
Interval (cm)	23-24		23-24		23-24	
Zone (Martini, 1971)	NN19	N	V18		NN16	
Calcidiscus leptoporus	21	13	25	27	9	9
Calcidiscus macintyrei	1	2	1	+	+	+
Ceratolithus rugosus		+	+	+		+
Ceratolithus simplex			+	+		+
Ceratolithus telesmus			+			
Coccolithus crassipons						
Coccolithus pelagicus	+	1	1	+	4	1
Coccolithus streckerii		1	+	1	+	
Cyclolithella annula	2		+	1	6	+
Dictyococcites productus	5	4	7	2		
Discoaster asymmetricus			+	+	2	+
Discoaster blackstockae		1	+		+	
Discoaster brouweri		2	4	2	19	3
Discoaster challengeri				-		+
Discoaster pentaradiatus				1	3	+
Discoaster surculus				+	+	+
Discoaster triradiatus		+			1	+
Gephyrocapsa aperta				1		
small Gephyrocapsa	30	2		2		1
Hayaspter perplexus		+				
Helicosphaera carteri	+	2	2	+	2	2
Helicosphaera neogranulata	+	+	+	+		+
Helicosphaera sellii	+	+	1	1	•	+
Helicosphaera wallichii	+	+	+	+	+	
Oolithotus fragilis	1		1		+	1
Pontosphaera spp.						
Pseudoemiliania lacunosa	2	10	8	1	1	3
Reticulofenestra asanoi		+	1			
Reticulofenestra hagii			2		12	20
Reticulofenestra minuta	113	118	97	123	91	82
Reticulofenestra minutula	16	44	40	34	43	78
Reticulofenestra pseudoumbilica			+		+	+
Rhabdosphaera claviger		+	1			
Scyphosphaera spp.					1	+
Syracosphaera pulchra	+		+	2	1	+
Tetralithides symeonidesii	3		+		+	
Triquetrorhabdulus rugosus					+	
Umbilicosphaera sibogae	5	2	4	1	2	
Miscellaneous	1		5	1	3	

Note: + = trace.

Table 16. Calcareous nannofossil occurrences, Hole 805B.

Core	7H	8H	BH	9H	9H	10H	10H	11H	11H	12H	12H	13H	13H
Section	00	4	00	4	00	4	00	3	00	4	œ	3	30
Interval (cm)	1	23-24		23-24		123-124	1	23-24		23-24		123-124	
Zone (Martini 1971)		NN16				NN	15-NN13					NN12	
Amaurolithus amplificus						T	1					1	
Amaurolithus delicatus	-		-				-						
Amaurolithus primus	-					-		-					
Ameurolithus tricorpiculatus									141	-			
Calcidia cur lentenonus	12	16	24	22	15	12	28	12	8	11	13	18	7
Calcidiacus masinhusi	- 16	3	1	2	15	1		3	10		2	10	8
Calcidiscus macintyrei		3	1	2	+	· '		3	10	+		3	0
Calcidiscus premacintyrei	-	1		1000		-				-			
Cathaster altus				+			-			-			
Cathaster calyculus	-							-					
Cathaster coalitus	-						-						
Ceratolithus acutus						-				+	+	+	
Ceratolithus rugosus		+	+	+	+	7	+	+	+	-			
Coccolithus eopelagicus													
Coccolithus miopelagicus				<u> </u>									
Coccolithus pelagicus								1	1	?	3	+	1
Coccolithus streckerii	_										+		
Coronocyclus nitescens									?	?			
Cydicargolithus floridanus			1			-					1		-
Cyclolithella annula	10	12	2	3	+	5	2	+	2	3	4	3	+
Dictyococcites productus	1					3	1			4	1	2	4
Discoaster adamanteus													
Discoaster asymmetricus	+	+	1	+	?		+	?	?		+	?	
Discoaster bellus													
Discoaster berggrenii									?				
Discoaster blackstockae							?						
Discoaster braarudii					-		-				12		
Discoaster brouweri	16	4	6	+	1	1	2	2	1	+	+	+	+
Discoaster calcaris		-	-										
Discoaster challengeri			2				2				2		+
Discoaster decorus		+	- t			-							
Discoaster deflandrei				_		1							
Discoaster daugoli				_									
Disconstar avilia													
Discouster extris	_												
Discoaster formosus													
Discoaster hamatus										-	-		
Discoaster intercalaris											7		
Discoaster kugleri									·				
Discoaster loeblichii						-							_
Discoaster moorei													
Discoaster neohamatus													
Discoaster neorectus						?		?	?				-
Discoaster pansus													
Discoaster pentaradiatus		+	2	+	+	+	1	+	+	+	+	+	+
Discoaster prepentaradiatus													
Discoaster pseudovariabilis													ē
Discoaster guadramus	_				+								
Discoaster guingueramus	_												
Discoaster surculus	+	+	+		4	+		+	2	+	. +	3	+
Discoaster tamalis	+		-		-				-	1			-
Discoaster triradiatus												2	
Discoaster tristellifer							+						
Discoaster variabilis		2		2					2	-		2	1
Disconstar son	1	1											
Ericconia obruta													
Carburacence aporte	_		12										
mall Caphyrocapsa	1		2										
Hounstot pomlovus			4										
Heliceenhaam aartari					+ 6	+	+	+	2	1			
Halissephases are white	+	+	+		0	+		3	4	2	0		
Helieessheera granulata			-							1	1	*	+
Holicosphaera Intermedia													
neicosphaera neogranulata	- 1	7			1	7	1	1	1				
rrencosphaera seili	7	7	+	+	+	7		7	-				
neilcosphaera wailchii			1	. 1			1	7	2			+	1
Compotus fragilis		1	+				+						
rontosphaera spp.	+	+	+		+	7		+	+	_	+	+	+
rseudoemiliania lacunosa	+	2	4	1	?	1							
Heticulofenestra asanoi							+				?		
Reticulofenestra gelida		+		8	3	+	5	11	21	11	13	3	11
Reticulofenestra haqii	10	3	1	2	2	1		4	10	28	33	26	44
Reticulofenestra minuta	82	69	76	86	126	133	117	107	49	74	10	6	7
Reticulofenestra minutula	65	86	52	50	3	16	12	27	25	18	60	60	55
Reticulofenestra pseudoumbilica	+			13	12	+	2	14	42	10	37	9	36
Scapholithus fossilis					8 - S			+	1		-		
Scyphosphaera spp.			+	+	+			+	+	+	1	1	+
Solidopons petrae													-
Sphenolithus ables			6	9	35	23	30	14	24	39	21	64	22
Sphenolithus belemnos				-				-	-				
Sphenolithus compactue													
Sphenolithus conjours													
Schonolithus delabis													
Sphenolithus delphix													
Sprienostrus dissimilis									-				
spnenolithus grandis					1								
sphenolithus heteromorphus													
Sphenolithus moriformis													
Syracosphaera pulchra	+	+		_		?			+				
Tetralithides symeonidesii			1	+	+	4	1	1	1			2	?
Triquetrorhabdus carinatus												1	
Triquetrorhabdus milowii					1								
Triquetrorhabdus rugosus							?		?				+
Umbilicosphaera sibogae	1	1	8	?					1				-
Miscellaneous		2								1		2	2

Note: + = trace and ? = present but questionable.

0	1.01		4511	4611	1011		47911	4701	1011	1011	1011	104	2011	0011	214	214
Cole	14H	14H	15H	15H	16H	16H	17H	1/H	18H	18H	191	191	20H	201	2111	2111
Section	4	00	4	00	4	<u> </u>	4	<u> </u>	4	00	3	<u>ac</u>	4	<u>ac</u>	4	<u></u>
Interval (cm)	23-24		23-24	1	23-24		23-24		23-24		23-24		23-24		23-24	
Zone (Martini, 1971)									NN	111						
Amaurolithus amplificus					2											
Amouralithus delicatus	-				2							-				
Amadioitatus delicatus	-				r											
Amaurolithus primus	-							?								
Amaurolithus tricorniculatus																
Calcidiscus leptoporus	24	6	12	14	3	40	20	9	31	12	16	10	13	10	22	10
Calcidiacus macinhutai	6	3	9	2	2	2	5	1	3		1		2	4	3	
Calcidiscus macintyrei	0	3	3	1	1	2	0		3	+		+				- T
Calcidiscus premacintyrei	+	+		+	1.	2	6	1	1	+	+	+	3	+	+	2
Catinaster altus																
Catinaster calvoulus																
Collegates anality	1									-						
Caunaster coantus	-														-	
Ceratolithus acutus			-	-												
Ceratolithus rugosus								1								
Coccolithus eonelacious				-			-									
Case littles as least as land	-								0		-					-
Coccolitius miopelagicus									1						+	
Coccolithus pelagicus	+	3		1	+	4	4	+	1	1	+	4	1	18	+	3
Coccolithus streckerii	2	2						?					2			+
Coronocyclus nitescens		2					2									
	-	4 - 2						-								
Cydicargolithus fioridanus				1				-			-	-				
Cyclolithelia annula	3	1	3	1	2	5	2	3	3	+	+	+	6	?	1	2
Dictyococcites productus	2			+		1		3	1		3	2		1	6	6
Disconstar adamentaris					-						-	1				
Discoutor adamanduo	0			-							-					
Discoaster asymmetricus	1				+			1			+	1			-	
Discoaster bellus										?	?		?		?	
Discoaster berggrenii	+	+	+	+	1	+	+	2	+	?	+	+	+	2	+	+
Discoaster blackstockes																
Discoastor broometi															-	
Discoustor plaarudi							-				-	-		-	-	
Discoaster brouweri	+	+	+	+	1	+	2	+		+	?	1	?	3	2	1
Discoaster calcaris																?
Discoaster challenged		2			2						1					1
Discoustor chanoligon				+							-	-				
Discoaster decorus	-									_					-	
Discoaster deflandrei							·									
Discoaster druggii																
Disconstar avilia			-	-	2											1
Discoustor oxins					f											
Discoaster formosus								1				-				
Discoaster hamatus																
Disconstor intercalaris			2	2												
Discousion interculario																
Discoaster kuglen													-			
Discoaster loeblichii		?													+	?
Discoaster moorei																
Disconstat packamatus							2				2	2		2		
Discoustor moonamatus					- T.		1		+					1.	*	
Discoaster neorectus							?	1 2				7			7	
Discoaster pansus	?				+		1									
Discoaster pentaradiatus		- CA.S.					2	1				2				
Discouter permanantes fates																
Discoaster prepentaradiatus																
Discoaster pseudovariabilis				1999 - Barris											· · · · · · · · · · · · · · · · · · ·	
Discoaster guadramus				2												
Disconstor quinquoremus	3	1		1	+	1420	2	22		141	1	1		1		1
Discoustor quinquorantas					-	+	-	*	+			+	+		*	
Discoaster surculus	+	+	+	+	· + ·	1	1	+	+			7	+	1	+	+
Discoaster tamalis				5					-		1					
Discoaster triradiatus	+	_		+	1	2					2	0		2	2	
Disconstor tristallifor																
Discounter installing		-				-						-				
Discoaster vanabilis	+	+	+	+	7	7	?			+		+	+	1	+	1
Discoaster spp.	2		1	1			3	1				1		3	· · · · · · · · · · · · · · · · · · ·	1
Ericsonia obruta																
Conhumannes anorta																
Gophyrocapsa apona				1							· · · · · · · · · · · · · · · · · · ·					
small Gephyrocapsa																-
Hayaster perplexus	+	+	+	1	+		+	+	+		+	+	+		+	+
Helicosphaera carteri	1	1	+	4	1		1	+	+		+	+	+	+	+	1
Holloosphaere grapulate	2	2							2				1	4	4	
rivicospilatra grandiata	L.	-	-	*			- 4	- E.								•
Helicosphaera intermedia																
Helicosphaera neogranulata			1												1	
Helicosphaera sellii																
Helicosphaera wallichii	2	2	2	2	+		2									2
Oplithatus fragilic				*			4									-
Controtus tragilis															-	
Pontosphaera spp.	+	+		+	+			+	2	+	+				1	-
Pseudoemiliania lacunosa																
Reticulofenestra asanci	2															
Baticulofenestra collida	F	2	e	2	2	17	10	11	10	7	11	12		2		
nauculotenesua genda	0	0	0	4	4	17	10	1.1	10	/	11	13	-	4		
Heticulofenestra haqii	25	11	27	11	5	6	15	27	14	11	13	18	38	35	46	49
Reticulofenestra minuta	25	40	86	76	113	49	11	72	61	87	68	33	29	11	24	45
Beticulofenestra minutula	93	69	34	65	32	7	19	23	11	8	17	15	36	50	32	43
Poteniofonostro assudeurs hilles		5			~~	10	.0	20		5		07	10	0		
noucoloreneura pseudoumbilica	3	0	1	1	+	16	6	4	D	0	6	21	15	2	0	
Scapholithus fossilis			1				1			1						
Scyphosphaera spp.	+		+		+	1	+	1		+		+	2	1	+	+
Solidopons petree					10-0											
Cohon of thus a block		FA	0.7									7.0	-			
ophenoimus abies	8	53	27	26	36	49	81	42	53	68	64	73	51	52	51	35
Sphenolithus belemnos											1				1. I I I I I I I I I I I I I I I I I I I	
Sphenolithus compactus																
Sphanolithus conjune		-												-	-	
oprenoitulus conicus																
Sphenolithus delphix				2				1	1		-					
Sphenolithus dissimilis											-					
Sphenolithus grandis		1				2			2							
Sphanalithus hatermantur				-		1										
option of the second option op																
Sphenolithus moriformis		1												2		
Syracosphaera pulchra																
Tetralithidas symeonidasii	+				100	57.1	1	-						12	1	
Transferbalde			-		-		1	*						*		
inquetromabous cannatus																
I figuetrorhabdus milowii											1		-		S	
Triquetrorhabdus rugosus	+	+	?	+	+	+	4	+	1	+	+	2	2	2	1	+
Umbilicosphaera elhonee																
and the second se					-						-				-	

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Com	224	2214	224	224	2414	244	264	264	261	261	2714	274	281	2814	207	207
Core	2211	2211	231	231	2411	290	2011	201	201	201	2/11	2/11	2011	2011	284	28A
Section	4	<u></u>	4	<u>ac</u>	4	œ	4	<u>ac</u>	4	<u></u>	4	00	4	<u></u>	3	<u>u</u>
interval (cm)	23-24		23-24		23-24		23-24		23-24		23-24		23-24		23-24	
Zone (Martini, 1971)		1	NN11			17		1			NN10		2			NN9
Amaurolithus amplificus					-											
Ameurolithus delicatus										-						
Amouralithus admus			1		1 1				1	-				-		
Amauroliulus primus													-			
Amaurolithus tricomiculatus			-		-					-						
Calcidiscus leptoporus	8	7	12	15	20	31	26	30	32	12	31	15	15	9	11	8
Calcidiscus macintyrei	+	1	+	+	2	3	4	+	3	4	5	1	2	12	11	9
Calcidiscus premacintyrei	2	1	2		1	7	+	3	4	5	1	+	+	3	+	2
Cotionetor altur																
Catnaster altus		-	-		-				-							
Catinaster calyculus		7			7											2
Catinaster coalitus																+
Ceratolithus acutus	-									1.1				1. J.		
Ceratolithus rugosus	()								1	1000				2000		
Coccolithus copolacious					-									1		
Coccolititus soperagreus						-	-							-		
Coccolithus miopelagicus		1	7	+	1	+	7	1		4	1			2	3	1
Coccolithus palagicus	+	1	2	2	2	11	14	3	15	10	4	14	30	19	49	1
Coccolithus streckerii		1			2			2		?	+		?	+	?	+
Coronocyclus nitescens			2	+				+		?				0		
Cyclicargolithus floridanus																
Custoff allo secondo		-														
Cyclolinella annula	+	1	+	1	+	1	5	2	4	4	3		1	1		
Dictyococcites productus					-	2		1								
Discoaster adamanteus																
Discoaster asymmetricus		?												1		
Discoaster bellus				2		1	2	2	2	12	1					2
Disconstar homesmil		1	525	-			-							-		
Discoaster berggrenii		+	+		1											
Discoaster blackstockae																
Discoaster braarudi										1						
Discoaster brouweri	?	+	+		1	1	1	+	+	12	1					3
Discoaster calcaria						2				2		2	2			
Discosstar challen and			34			0		_							1	
Discoustor challengen						f							-		- 1	
Discoaster decorus			-											-		
Discoaster deflandrei														?		
Discoaster druggii	·															
Discoaster exilis			2									2		1		
Disconstar formasur			-		-				-	-						
Discoaster iomosus					-								-			
Discoaster hamatus							1									+
Discoaster intercalaris																
Discoaster kugleri																
Discoaster loeblichii		2				2		-						1 1		
Discoutor recondin									-							
Discoaster moorei			-								-		-			
Discoaster neohamatus	+	?	7	+	+	2	1	+	7	3	+	2	+			
Discoaster neorectus				?	2		?	+		1	+					
Discoaster pansus																
Discoaster centerediatus		2				2		-	-		2					
Disconstar propertandiatus							2	2				1969	2	2		
Discoaster prepentaradiatus							1	1				+	1	1		
Discoaster pseudovariabilis																
Discoaster quadramus									1	-						
Discoaster guingueramus	+		2	+												
Discoaster surculus	+	2	+		+											
Disconstar tamalis													-			
Discounter trimming																
Discoaster Inradiatus	-				1	1						1				
Discoaster tristellifer																
Discoaster variabilis	+	+		1	+	+	+	+	3	+	1	+	+	6	7	2
Discoaster spp.		2			2	3	1	2	+	5		2		5		1
Eticsonia obruta	<u> </u>						2	2								
Geoburgeones acorto																
Gephyrocapsa aperta	-															
small Gephyrocapsa																
Hayaster perplexus	1	+	+		+	+	+		+	2	2			+	+	
Helicosphaera carteri	+	+	1	+	+	3	2	1	2	1	+	1			1	
Helicosphaera granulata	+	+	2	1	1	1	3	2	1	3	1	4	+	+	1	+
Helicosphaera intermedia							-		<u> </u>				-			
Helicomhean													-			
noncosphaera neogranulata				-				-					-			
rieicosphaera sellii					-								-			
Helicosphaera wallichii			?													
Oolithotus fragilis																
Pontosphaera spp.										1	1	+				
Pseudoamiliania lacunosa													-			-
Delaulafanastra																
neuculoienestra asanor															-	10.5
Heticulofenestra gelida			1	+		1					6	85	104	103	82	150
Reticulofenestra hagii	67	50	78	29	39	39	2		-		1	1	4	7	13	2
Reticulofenestra minuta	51	62	11	92	79	37	31	28	5		2			1		
Reticulofenestra minutula	25	25	16	7	10	8	1	1			3			2		
Beticulofenestra proudoumbilion											2	16	8	10	R	12
neucliorenestra pseudoumbilica											3	10	ø	19	0	12
scapholithus lossilis																
Scyphosphaera spp.	+		+	+	6	+	+	+	+	1	+	+	+			
Solidopons petrae	(1			
Sphenolithus abies	45	50	77	52	40	37	AP	111	114	9.6	125	40	30	3	5	4
Sphanolithus balance	40				40				114			40				-
Ophone little			-				-			-						
Sphenolithus compactus							3	3	7	1	4	6	2	1		
Sphenolithus conicus																
Sphenolithus delphix																
Sphenolithus dissimilis	1															
Sphenolithus grante				-												
Cabaselithus hat																
opnenolithus neteromorphus																
Sphenolithus moriformis					?	10	8	9	6	9	1	8	1	1	1	1
Syracosphaera pulchra								5 - S								
Tetralithides symeonidesii					+	+										
Triquetrorhabdus carinatus							-		4							
Triguetorhebdus carinatus				-					4							
Inqueromabous milowii																
Triquetromabdus rugosus	+	+	+	+	1	2	1	+		7	1	1	2	5	4	1
Umbilicosphaera sibogae																
Miscellaneous					1			1			2	2	2	1	5	4

Core	30X	30X	31X	31X	32X	32X	33X	33X	34X	34X	35X	35X	36X	36X	37X	37X
Section	3	20	3	30	3	00	3	00	3	00	3	00	3	00	3	00
Interval (cm)	23-24		23-24	1	23-24		23-24		23-24		23-24		22-23		22-23	
Zone (Martini 1971)		NN9	NNA				and the second second	NN7-NN6						NN5-N	14	
Amoutolithus amplificus		1	1440		_		· · · · ·	1117-1110	-	1		-		1010 10		-
Amadronalus ampinicus													-			
Amaurolithus delicatus				1			-					_				
Amaurolithus primus																
Amaurolithus tricomiculatus				- C		2	0	1							1	
Calcidiscus leptoporus	9	10	17	6	2	19	6	10	12	3	5	10		9	4	2
Calaidianus masiahusi	10	7		1.0		10		10								1
Calcidiscus macintyrei	12	1	0	10	11	4	3	3	0	1	1	+	+	+	-	1
Calcidiscus premacintyrei		3	1	+	+		+	4	4	+	1	+	2	2	8	14
Catinaster altus																
Catinaster calvculus	2	-														
Catingstar applitur							-			-		-		-		
Caunaster coantre	+		+													
Ceratolithus acutus																
Ceratolithus rugosus																
Coccolithus eopelacicus			1								2	-				
Casselithus misselesieus		4		7		0	~		10	07			2	0	6	2
Coccollarus miopelagicus	1	1	4	/	4	2	/	/	19	21	0	0	0	0	0	6
Coccolithus pelagicus	24	2	18	38	25	12	27	24	23	63	14	10	4	29	20	17
Coccolithus streckerii			1	2	+	1	?	+	+	1	1	+	+	+	1	1
Coronocyclus nitescens		· · · · · ·	2		2	1	· · · · · · · · · · · · · · · · · · ·					+	+	+	1	2
Cual corpolitions float donus											2		2	0	20	26
Cyclicargolithus nondanus							-			1	2	4	3	8	39	30
Cyclolithella annula	+	1	1	1	+	2		2		2	?	+	?	?	10	3
Dictyococcites productus						1	1		5	1	4	5		1	1	1
Discoaster adamanteus						1			2		1		2			1
Disconstar asympatricus			-									-		-		
Disconter hellur											-	-		-	-	
Discoaster Dellus	3											-				-
Discoaster berggrenii																
Discoaster blackstockae			1									- 1			C ==	
Discoaster braarudi			1			2						-				
Disconstat broused		-			-	0	-	-		-		-				
Discoaster Drouwen	1		-			?									1	-
Discoaster calcaris	+	?	1			+										
Discoaster challengeri	?	?	?			1.75.55					1	· · · · · · · · · · · · · · · · · · ·		1	1	
Discoaster deconus				-			-									
Disconstar dellander											100					1.2
Discoaster denandrei						1	1	3	1	2	+	3	1	11	3	+
Discoaster druggii														?	1	1
Discoaster exilis	?	+	+		+	1	3	1	+	?	?	?	?	2	+	2
Discoaster formosus		-						-								
Discoutor formotics	10100	1 12 0														
Discoaster namatus		+														
Discoaster intercalaris																
Discoaster kugleri		(()		_		2	2		2 21	0					
Discoaster loeblichii																
Disconstar means!										-					1	
Discoaster moorei																
Discoaster neohamatus	?		-	?						-						
Discoaster neorectus												- · · · · · · · · · · · · · · · · · · ·				
Discoaster paneus																
Discouter partout																
Discoaster pentaradiatus																
Discoaster prepentaradiatus															2	
Discoaster pseudovariabilis		+					1			() () () () () () () () () ()	6				2	
Disconstat guadramus																
Discoastar quadramus																
Discoaster quinqueramus																
Discoaster surculus		?												· · · · · · · · · · · · · · · · · · ·		-
Discoaster temalis						2						1				
Discouter trindictor			0									-				
Discoastor tinadiatus			1									-				
Discoaster tristellifer																
Discoaster variabilis	3	2	2	3	13	3	7	?	8	4	1	8	3	6	?	1
Discoaster spp.					1	1	4	2	2		1	4		3	1	4
Erice onle obrute								-								
Enconia obroa																
Gephyrocapsa aperta																
small Gephyrocapsa			1 C C C								5 T			1		
Hayaster perplexus	1	3	+	+	+	+	+	1	3	+	+	+	+		2	1
Helicospheere certer						4				3	3		R	3	1	
Idelianenhaara arraulata			-						-	0	0	~			-	-
mencosphaera granulata	+	1	1	1	.+	- 4	3	<u>ाः</u>	3	4	6	2	4	2	3	2
Helicosphaera intermedia						1.3				1	<u> </u>			3		
Helicosphaera neogranulata			1.1.1			1			1.0							
Helicosphaera sellii																
Helicosphaera wallichii										-				-		
Collitation fracilia							-					-				
Controlus fragilie																
Pontosphaera spp.		-				1.1.1.1		+		1		1	+			
Pseudoemiliania lacunosa																
Reticulofenestra esenci																
Patigulatanastra antida	107	107	101	101	100							10		10	10	
Prostanoiona genda	127	121	101	101	106	5/	83	60	0/	50	01	18	36	10	18	0
Hesculotenestra haqii		3	8	2	8	24	2	40	8	6	21	89	83	32	9	17
Reticulofenestra minuta						1			1		13	9	2	7		2
Reticulofenestra minutula		1	8			3	6	12	5	5	9	2	5	12	21	26
Beticulofenestre previdente biller	11	0.0	00	10	0		2.0	16	0.0	0.0	07		24	0.0	10	11
Cost of the state	11	20	66	12	9	33	30	19	23	23	3/		24	23	10	
scapholithus tossilis						2.2	1			3						
Scyphosphaera spp.			+		+	+		1	+		+		+	+		
Solidopons petrae												-				
Schenolithus abies	2	2	2	9	10	4	1	F			F	F	2			2
Cakes allibus hal	4	6	6	0	10	4	4	0	. 4		0	0	4			3
Sprienolititus belemnos						1.1								1		
Sphenolithus compactus		5	2		2	+			5	1	2	2	2	3	2	5
Sphenolithus conicus							-						1	1 22 1	2	2
Sphenolithus delphix												-			-	
Cohonelithur dia bull						1	-					_				
Sprionolithus dissimilis							-					_				
Sphenolithus grandis																
Sphenolithus heteromorphus				_								3	5	8	19	26
Sphenolithus moriformis	1		3		2	3	1		3		8	2	R	14	0	ß
Ourseenshaam audataa			5		6	9			0		0	6	0	14	0	
Syracosphaera puichra																
Tetralithides symeonidesii															+	1
Triquetrorhabdus carinatus		1000									2				1	
Triguetrorhabdus milowii														1	-	
Triquetrothebotus sussesus	F		1	1		2				F	2		2	2		
indevelopmentations indoens	3	3		-	4	6	0	+	4	0	1	4	3	2	+	1
Umbilicosphaera sibogae																
Miscellaneous	1	4	1		3	18	1	3	5		1	6	6	8		3

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Core	38X	38X	39X	39X	40X	40X	41X	41X	42X	42X	43X	43X	44X	44X	45X
Section	3	œ	3	00	3	C	3	00	3	00	3	00	3	00	3
Interval (cm)	29.24		29.24		29.24		23.24		23.24		23.24		23.24		23.24
	20-24		20-24		20-24		20-24		20-24	-	20-24		10-24		20-24
Zone (Martini, 19/1)			-		NN5-NN4							r	NN2		-
Amaurolithus amplificus															
Amaurolithus delicatus															
Amaurolithus primus											1.2.2.	1			
Amaurolithus tricorniculatus															
Calcidiacus Iantonosus	1	2	2	16	7	11		10	3		1	-	1		2
Calcidiscus leptopolius		2	3	10	1		0	10							
Calcidiscus macintyrei	2	1	1	3				1	+					+	1
Calcidiscus premacintyrei	4	4	3	10	6	14	12	8	5	2	1	1	3	4	1
Catinaster altus				4											
Catinaster calvculus															
Catingster coalitie				-	-		-	-					-		
Caultaster Coantas					-							-			-
Ceratolithus acutus					-				-						
Ceratolithus rugosus															
Coccolithus eopelagicus															
Coccolithus miopelagicus	10	5	3	7	4	7	6	1	2	1	8	3	6	+	3
Coccolithus palacicus	16	27	13	17	0	1.8	3	10	20	20	14	25	22	20	4
Cascalithus standard	10		10	1.1	-	10	-	1.5			14				-
Coccolititus streckerii							-								-
Coronocyclus nitescens	3		+	1	2		2	+	2	+	+	5	2	1	5
Cyclicargolithus floridanus	7	2	9	18	12	12	39	58	70	90	73	5	18	8	9
Cyclolithelia annula	?	2				2	J					2	2	3	1
Dictvococcites productus			1		3						S	1			
Disconstar adamantaus		1			-	2							1	2	1
Discousier adamaneus						E -									
Discoaster asymmetricus				-	-				-			-	-		-
Discoaster bellus											_				
Discoaster berggrenii															
Discoaster blackstockae												1	-		1
Discoaster brearudi			1		1		1		1			1			
Disconstar braunad				-	-				-		-	-			-
Discouster brouwen									-						
Discoaster calcaris															
Discoaster challengeri												C			
Discoaster decorus						-									
Discoaster defendral	3	8	12	0	2	12	0	10	11	12	17	21	10	ρ	7
Disconstor daugeli	0	0	10	0	2	14		10	1 .	14				0	
Discoaster druggli	3	4	3	1	7	2	1	1	1		+	1	1		
Discoastor exilis	16	17	14	1	2		1					+			
Discoaster formosus		1	1	2			3	1.1							
Discoaster hamatus															
Disconstar intercelaria					-		-								
Discounter Indicatante											-				
Discoaster kuglen							-								
Discoaster loeblichii				1	-										
Discoaster moorei												?			
Discoaster neohamatus			-												
Disconstat neorachus					-						-				
Discusion nuorocaus					-		-								
Discoaster pansus			-		-										-
Discoaster pentaradiatus													1 m		
Discoaster prepentaradiatus															1
Discoaster pseudovariabilis										-	1.1				
Disconstat aundramus				-											
Discoustor quadrantus					-										
Discoaster quinqueramus															
Discoaster surculus				1											
Discoaster tamalis										-					
Discoaster triradiatus											N				
Discoaster tristellifer								_							
Disconstat undabilie	6	10	5		2	2	2		5			8	1		
Discoustor variabilis	0	12	0	0	1	2	2		5	4		0			
Discoaster spp.	8	14	11	2	1	2	8	2	1						
Ericsonia obruta		2		1	1	2		3	2	1	1	3	?	13	6
Gephyrocapsa aperta			1												
small Genhurocanse									-						C
Heurester normania							0		-		100 100 10			-	
hayaster perpiexus		3	1	+	+		6		3	+	+				
riencosphaera carteri	+	. 1	+	1											a
Helicosphaera granulata	2	1	1	1	2	2		1							1
Helicosphaera intermedia				1			1				6				
Helicospheera neogranulata								-			100				
Helicosobaera sellii		-							1						
Halicosphaats wellight					t		-								
Colline to the test of tes											-				
Controtus tragilis															
Pontosphaera spp.									1		1	100		1.0	
Pseudoemiliania lacunosa															
Reticulofenestra asanoi															-
Poticulofonestra cellida	20		0			0		14	1		20	55	51	60	5.0
Defectorentestra gelica	20	4	4	0	0	0		14	4	3	30	00	01	00	00
nesculorenestra haqii	1	15	15	20	88	4	6	7			8	12	39	23	29
Reticulofenestra minuta	1			3	2									6	6
Reticulofenestra minutula	41	12	31	18	25	2	9	3			2	1	3	12	12
Reticulofenestra pseudoumbilica	7	8	3	3		3	1	1	5	4	3	10	7	10	13
Scapholithur fossilis	-	-	- ×		<u> </u>				-	-	-				
Caugh as has to shire					1			_							-
scyphosphaera spp.				+		()									
Solidopons petrae				1											
Sphenolithus ables	3	2	2	1	3		6	0		1		1		1	
Sphenolithus belemnos									10	16	8				-
Sphendithus compactus	1	F	6	F		10	P	0	10	11	10	15	9	7	12
Ophonolithus compactus		0	0	0		10	0	4	12	11	10	10	0		14
sprienolitrus conicus	2	3	18	3	3	4		_		2					
Sphenolithus delphix		1								1					
Sphenolithus dissimilis									1			11	11	3	6
Sphenolithus grandis															
Sohenolithus beteromorphus	31	26	22	28	10	33	32	21							
Cohenelithus made		10		20	10	0.0	02	0.0	0.0	0.5	15			0.0	15
opnenolitrus moniformis	4	10	11	8	3	30	27	23	32	25	15	14	9	20	15
Syracosphaera pulchra					<u> </u>										
Tetralithides symeonidesii	2			6	4	8	6	15	2	1		1			1
Triquetrorhabdus carinatus		3				1		+	4	3	1	6	7	?	3
Triguetrorhabdus milowii		-	2	2	2				1	-					1
Triquetrothebdus measure	5	e	F	-		1	2			2		4	2	1	2
Industringoous Indosus	Ð	0	0	1		1	3		4	3	4	1	3	1	2
umpilicosphaera sibogae															
Miscelleneous		1	1	2	3	7	8	3	1 1	1	2		2		3

Core	45X	46X	46X	47X	47X	48X	48X	49X	49X	50X	50X
Section	00	3	00	1	00	3	00	3	œ	3	00
Interval (cm)		23-24		20-21		23-24		22-23		23-24	
Zone (Martini, 1971)					-		NN1				
Amaurolithus amplificus					1						
Ameurolithus delicatus											
Amaurolithus primus											
Amaurolithus tricorniculatus											
Calcidiscus leptoporus		4		3	4	+	1	7	3	1	+
Calcidiscus macintyrei		+	1			1	+	2		+	+
Calcidiscus premacintyrei	3	3	5	6							
Catinastor altus								-			
Catinaster calyculus											
Catinaster coalitus											
Ceratolithus acutus	1		-				1.2				
Ceratolithus rugosus								1 4	-		
Coccolithus eopelagicus		1	1								
Coccolithus miopelagicus	14	6	10	7	2	6	2	6	1	8	3
Coccolithus pelagicus	10	5	18	15	27	33	3	4	9	6	6
Coccolithus streckerii		-		+					-	+	
Coronocyclus nitescens	2	+		1	+		+	1		+	100
Cyclicargolithus floridanus	27	41	35	46	30	92	113	105	111	146	123
Cyclolithella annula	1		1		2	?			-	-	
Dictyococcites productus	-									-	
Discoaster adamanteus				-		1					
Discoaster asymmetricus											
Discoaster bergeren	-							-			
Discoastar blackstaskas									-		
Discoaster braen 4						-					
Discoaster brouweri									3/1		
Disconster calcaris								-	-		
Discoaster challengeri											
Discoaster decorus											
Discoaster deflandrei	19	11	26	18	18	28	30	20	13	13	25
Discoaster druggii	+										
Discoaster exilis	+				+		?	0			
Discoaster formosus											
Discoaster hamatus	1										
Discoaster intercalaris							-				
Discoaster kugleri											
Discoaster loeblichii											
Discoaster moorei		-									()
Discoaster neohamatus											
Discoaster neorectus											
Discoaster pansus											
Discoaster pentaradiatus											
Discoaster prepentaradiatus											
Discoaster pseudovariabilis											
Discoaster quadramus											
Discoaster quinqueramus											
Discoaster surculus											
Discoastor tamalis											
Discoaster triradiatus											
Discoaster tristellifer							-				
Discoaster variabilis	4	?	4		3	3	2	?	2		
Discoaster spp.	1							-		-	
Ericsonia obruta	5	4	3	10	1		+	1	10	3	+
Gephyrocapsa aperta								1		-	
small Gephyrocapsa											
Helicospheets certer	10	+	+	+					+	·+)	
Helicosphaera anoulata							0	0			
Helicosobaera intermedia							2	4			
Helicosobaeta neogranulata								-			
Helicosphaera sellii											
Helicosphaera walichii											
Oolithotus fragilis											
Pontosphaera spp.		1	+				+				
Pseudoemiliania lacunosa					-				-20		
Reticulofenestra asanci			1				1.00	· · · · · · · · · · · · · · · · · · ·			
Reticulofenestra gelida	27	37	31	39	35						
Reticulofenestra hagii	13	22	15	17	30			12	1		
Reticulofenestra minuta		4	1	1				5	1		1 1
Reticulofenestra minutula	9		1	12	2	1	200	9			
Reticulofenestra pseudoumbilica	9	5	3	10	1						
Scapholithus fossilis											
Scyphosphaera spp.	-						1.1.1	1			1
Solidopons petrae											
Sphenolithus abies											
Sphenolithus belemnos											
Sphenolithus compactus	14	8	4		11	14	5	5	2	2	1
Sphenolithus conicus						?	1	1		?	
Sphenolithus delphix								+	?		?
Sphenolithus dissimilis	3	+	6	1	8	5	5	15	21	6	8
Sphenolithus grandis							1		_		
Sphenolithus heteromorphus							1.1				
Sphenolithus moriformis	18	32	17	8	24	13	38	12	15	9	11
Syracosphaera pulchra											
Tetralithides symeonidesii	1										
Triquetrorhabdus carinatus	17	15	17	6	1	3	?	3	8	2	19
I nquetrorhabdus milowii			1		1				?	2	1
Inquetromabdus rugosus	2		+	?							
Umplicosphaera sibogaé											-
Miscellaneous		1	1	1					2	2	2

Table 17. Calcareous nannofossil occurrences, Hole 804C.

Com	3H	4H	4H	5H	5H	6H	6H	7H	7H	BH	8H	9H	9H	10H	10H	11H	11H
Section	00	3	m	4	00	3	00	4	~	3	00	3	00	3	00	3	m.
Intensal (cm)		00.01		90.01		90.01		00-01	~	00.01		00.01		00.01		90.01	
Zone (Madia) 1071)	hilling	AIAI17	NINITE	AINISE	AINI10	30-31		AIAI1		90-91	_	00.01		NINITO		100.01	
Zone (Martini, 1971)	NN18	NN17	NNIB	NN15	NN13	-		ININT	1	-				NINTO			-
Amaurolithus primus		-	-			7	-										
Calcidiscus leptoporus	20	13	13	27	17	12	25	16	12	17	26	26	36	22	48	8	21
Calcidiscus macintyrei	+	5	+	2	2	3	5	1	1	1	+	4	2	1	11	1	9
Calcidiscus premacintyrei						1	3	4	+	1	3	5	12	9	5	1	2
Catinaster calyculus														1			+
Catinaster coalitus						100						()			()		
Ceratolithus cristatus	+		+			1											
Ceratolithus rugosus	+	+		2	+												
Coccolithus crassinons	+	+												-			
Coccolithus eopelagique		-			-		-		-			-					
Coccolithus mionelegique	-			-	-			2	2	+	4	2	1		2	4	7
Concelithus pelagious			-	2		7	7	-	2	11	P		11	E	24	1.0	14
Coccolitius peragicus		+	+	(/	/	Ŧ	2	- 11	0	0			2	10	14
Coccolutus sueckeni	-		-					-			+				1	0	
Coronocyclus nitescens	_								?					1		7	
Cyclicargolithus floridanus																	
Cyclolithella annula	?	?	+	?	1	+	1	1	3	+	5	1	3	4	4	5	+
Dictyococcites productus	5		2	1	-	2	3		1	1	1	1	2	2	-		-
Discoaster adamanteus						1.000					?					?	
Discoaster asymmetricus	?	+	1	?		?	?		?			?	?		?	?	
Discoaster bellus											?	?	?	1	1	1	+
Discoaster berggrenii						?	+	+	+	+	?	?					
Discoaster blackstockae	-		1.000	2	1		-				+						
Discoaster bollii	-										-						
Discoaster braan di	-		-													3	
Discoaster brouwari		4	5		2				142	2		1	3	- 1	12	R	A
Disconstar calcane	5	-+	3	5	3	0	*	-	-	6	-	2	5	2	10		1
Disconstar challen				-				-		-	-	1	2	1		1	
Disconstant deserve	-	-	+	1	1	- 1	+	1	+	-	1	+	(-	+		+
Discouster decorus	-	-	-	-			-			-				-			
Discoaster deliandrei	-			(_				-		
Discoaster druggi		_	-				_		_							-	
Liscoaster exilis															-		
Discoaster hamatus																	+
Discoaster kugleri	-		-			_		-			S			-		-	
Discoaster loeblichii											+						
Discoaster neohamatus									+	1	?	+	+	+	2	1	+
Discoaster neorectus						?	+	+		+	?			?	2		
Discoaster pansus				?	?			?	+	+	+	1	+	+	?	?	?
Discoaster pentaradiatus	1	1	+	4	3			+	+		+	+	+	?	+		
Discoaster prepentaradiatus			1. 2.			_										+	1
Discoaster pseudovariabilis			_														
Discoaster quadramus						+											
Discoaster quinqueramus				+		+	+	+	+	2	?						
Discoaster surculus	?	?	+	+	?	3	1	+	+	+	1.1	+	+		?	+	?
Discoaster tamalis			2	-	-	_											
Discoaster triradiatus	+	+	+	+	2	2	+			2		2			1	2	+
Discoaster tristellifer				-													
Disconstar variabilie		-	1	2	1	14	1	+	4	1	-	3	+	+	6	A	4
Disconstar con	-	-		2				- T	· ·					T	2	2	
Ericeania abaita				2	- 1			-								6	- 1
Leventer contra		-		-					-	-	100	2		5		-	_
Hayaster perpexus	+			- 1	-			Ŧ	-		+			121		- 1	
Helicosphaera carten	+		+		+	_ 1	1	+	+	1	2	+	1	+	1	+	1
Helicosphaera granulata							?	+	+	+	+	+	3	3	2	1	1
Helicosphaera neogranulata			+														
Helicosphaera recta								1			-						
Helicosphaera sellii	1	+	?	?													
Helicosphaera wallichii	+		?														
Pontosphaera spp.							+	+									
Pseudoemiliania lacunosa	5		+			?											
Reticulofenestra asanoi	3	2	?		1												
Reticulofenestra gelida				3	15	22	16	1								75	81
Reticulofenestra hagli		1			4	39	10	65	26	36	20	2	1	3		5	5
Reticulofenestra minuta	150	66	159	130	113	38	71	12	84	72	32	41	46	49	3		1
Reticulofenestra minutula	10	106	17	5	15	43	10	37	33	28	21	4	1			2	4
Reticulofenestra pseudoumbilica		+	+	11	12	10	9	4	2					+		11	16
Scyphosphaera spp.							+	+		1	1	?	+	1	?		+
Sphenolithus ables			?	7	10	11	37	58	35	24	81	103	76	92	60	48	22
Sphenolithus belemnos																	
Sphenolithus cipercensis																	
Sohenolithus compactus																6	3
Sohenolithus conicus													-			-	-
Sohapolithus dalohiy	-	-		-		-		-	-	-			-				
Sphenolithus dissimilie						-											
Sobenolithus distentue						-			-				-			-	
Cohenalithus heterometric							-										
Sphenolithus modernic		_	-					-		-			-	-		-	
Sphenolithus montomis	-	-							+	+	1	1	1	2	1	1	+
Syracosphaera pulchra	1	2		-	_	-		-		-							
renantnides symeonidesii		+		1				+		-	+	+					
The state of the second s	1																-
Triquetrorhabdus carinatus	1																
Triquetrorhabdus carinatus Triquetrorhabdus milowii																	
Triquetrorhabdus carinatus Triquetrorhabdus milowii Triquetrorhabdus rugosus					?	+	+	1	+	1	1	+	1	1	2	2	2
Triquetrorhabdus carinatus Triquetrorhabdus milowii Triquetrorhabdus rugosus Umbilicosphaera sibogae			2		?	+	+	1	+	1	1	+	1	1	2	2	2
Triquetrorhabdus carinatus Triquetrorhabdus milowii Triquetrorhabdus rugosus Umbilicosphaera sibogae Zygrhablithus bijugatus			2		?	+	+	1	+	1	1	+	1	1	2	2	2

NEOGENE CALCAREOUS NANNOFOSSIL BIOSTRATIGRAPHY

Com	12H	12H	134	13H	144	14¥	15Y	15Y	167	167	178	17¥	18¥	18X	19%	19X	20X	20X	21X	21X	22X	22X
Section	2	00	2	m	2	00	2	m	10A	00	2	m	2	00	3	m	3	00	2	m	2	3
Interval (cm)	00.01		00.01	w	2	- u	00.01	u.	00.01	- uu	00.01		00.01		00.01		90.01		01.02		90.91	90.91
Tana (Madia) 1071)	90-91	LINIAG	30-31		80-81		90-91	10	90-91		80-81	-	90-91	17 MINIO	90-91		90-91		91-92	NE NIN	30-31	50-51
		NNTO	-				NI	49		-	-		NI	AL-ININO		-	-		N	IND-INIA	*	-
Amaurolithus primus							-		-		-		-			-			-	-		-
Calcidiscus leptoporus	9	20	12	15	21	6	7	18	6	4	6	4	6	4	1	5	5	3	3	2	3	1
Calcidiscus macintyrei	7	8	16	5	4	12	9	17	15	3	10	7	14	4	1	5		+	2		1	1
Calcidiscus premacintyrei	1	2	1	+	1	4		2				1			1		1		1	5		+
Catinaster calyculus		+		+	+	+		1														
Catinaster coalitus	+	+				+			3	2			1		6	1						
Ceratolithus cristatus																						
Ceratolithus nucesus																	-					
Consolithus amosioans				-				-					-				-					_
Coccolithus crassipons							_															
Coccolithus eopelagicus																				_		
Coccolithus miopelagicus	3	1	?	1	5	4	8	1	9	3	3	11	3	5	15	11	14	17	9	6	2	7
Coccolithus pelagicus	19	11	21	13	4	5	19	9	14	7	18	15	7	12	16	29	32	20	38	20	25	23
Coccolithus streckerii		?	?	?	?	1			?			1			+			?				
Coronocyclus nitescens		1			+							2		+	+	+	1	+	2	+	1	3
Cyclica molithus floridanus									-				-		-		31	13	33	32	88	102
Ovelelithelle appule				-	1	2			2	-	2	2	1.00		2	2	2	2	1			
Cycloliu Iona ariricia	- T	+	T			3			r.		4	1	-	-		6	1	<u> </u>	-			
Dictyococcites productus			-								2	1	-		-	1				-	-	-
Discoaster adamanteus					1						_		?	?			?	1			?	
Discoaster asymmetricus																						
Discoaster bellus	1	1	1	1	2	1	?	2	?		?				1					1		
Discoaster berggrenii															1							
Discoaster blackstockae			-								200	-			1	1						
Discoaster bollij	-		-						2				-			_						
Disconstar broandii	2		4				2		- F.	-			4	2						-		
Discossion braanudii	1		-	-			2				-		1	-			-					
Liscoaster Drouweri	1	1	?	4	1	1	8						7	?	1				-			
Discoaster calcaris	?	+		+	+	1	16	+	1	2		1										
Discoaster challengeri	2	2	+	2	2	3	1	2	2	1	+	1	1	_	1	1						
Discoaster decorus															199	-						
Discoaster deflandrei	2	2							+		+	Ŧ	1	4	3	1	16	23	6	13	25	17
Discoaster druggij																1		2	1	3	2	+
Disconstar aville	2	2			2					10	-		0	2		4	2	2	11	2	1	
Discousier exilis	4	<u> </u>		1	1	1				10	1		0	3			0	<u> </u>		1		
Discoaster namatus	+	+		5	3	2	+	5	2	5							-		-	-		
Discoaster kugleri							1.1			1		?	2			1			-			
Discoaster loeblichii																						
Discoaster neohamatus	1	+	+	2	3	+	1									l						
Discoaster neorectus													-									
Discoaster pansus	2			2		2		2	2		2		-	-	-		-					
Disconstar pantaradiatus	1.0	_		. 1		1.			10		1	-								-		_
Discoaster pentaradiatus	-	-	-	-					-		-		-		-	-	-	-	-	-		
Discoaster prepentaradiatus	7	7	1	?	+	7	+	+	?		?	+			-		-					_
Discoaster pseudovariabilis						?				1									-			
Discoaster quadramus												1		1								
Discoaster quinqueramus						1																
Discoaster surculus	2		-				?					+	-	1		1						
Discoaster tamalis						-																
Discoaster triradiatus	2	2				2		2			-								-			
Disconstar triatellites		1				1										-	-			-		-
Discoaster tristeriller		-																				
Liscoaster vanabilis	4	1	2	1	3	4	6	4	3	6	4	+	9	7	5	3	17	13	13	18	13	1
Discoaster spp.	3	2	4	1	4	2	9	1		11	2	10.01	7	2	3		5		27	1		1
Ericsonia obruta			1.1					12			-21 - 21		-	1		(<u> </u>					1	?
Hayaster perplexus	L			2								+							+	1	1	
Helicosphaera carteri	1			1	1	+						1										
Helicosphaera granulata	1	1		+	3	2			-	-	3	1	-	1	+	1	2	1	-			
Halissenhaam pasampulate						-			-		-				-		-	-	1	-		-
Helicospitaeta neograficiata														_						-		-
Helicosphaera recta					-			-								-						-
Helicosphaera sellii	-								-				-		1.1	-						
Helicosphaera wallichii																						
Pontosphaera spp.						+					1						+					
Pseudoemiliania lacunosa																						
Reticulofenestra asanoi								-							1000							
Reticulofenestra gelida	91	110	47	101	87	123	77	97	100	99	85	43	80	116	103	78	20	7	12	10		6
Beticulofenestra bacil	12	2	F	1	2	2	2	1	2		24	57	2	1	2	19	10	1	10	1		
Paticulatanestra minute	14	3		-		4	6		6		24	51	6		3	13	10		10	-		-
Patieulalanasta minuta		-		-	-						3	1				2	-			-		
neuculorenestra minutula	2	3	4	1	5				2	1	8	4	1	C	2	8	5		3	1		
Reticulofenestra pseudoumbilica	33	16	44	13	14	12	25	33	27	28	35	45	50	33	28	18	7	7	3	5	1	1
Scyphosphaera spp.	+	+		1	1		1.1	-			1200				1				S	(C) (1)		
Sphenolithus ables	2	5	31	12	19	5	5	3			2	1		1	6	9	4	3	3	1		
Sphenolithus belemnos																					2	1
Schenolithus cinemensis																	-				-	
Sobepolithue compactus		2	-		F	-							-	2		F						
Cohenelithus compactus		2	+	6	5	1		2	+		4	1		1	1	5	1	_		6	3	Э
Sphenoiltrus conicus														0				1	1	1	+	
Sphenolithus delphix				-						3	1.1	100		F _ 11			1					
Sphenolithus dissimilis						_				2										2	1	
Sphenolithus distentus																						
Sphenolithus heteromorphus											-					-	15	43	7	39	2	+
Sobapolithus montomie			5	1	7	1						~		2	0		10	45		24	21	20
Sureasanhaam pidate		-	3	4	1			+	+	1	1	2	+	4	9	1	12	40	1	20	- 21	20
Tata littlidae and pulcha						_				1	_				-							
revalitnides symeonidesii															_	1.1	1	+	-	+		-
Triquetrorhabdus carinatus																					2	4
Triquetrorhabdus milowii																				1		
Triquetromabdus rugosus	3	4	4	2	1	3	5	2	4	6	5	2	2	6	1	2	1	2	8	2	2	4
Umbilicosphaera sibogae								-			-	-	-	-	-	-		-	-	-		
Zvorhablitbus bijugatus		_						-	-				-	_				-		-		-
arginauninus bijugatus	-				-	-															-	-
Miscellaneous				4		1			1	2	1			· · · · · ·					1	4	3	

		1	1										
Core	22X	23X	23X	24X	24X	25X	25X	26X	26X	27X	27X	28X	28X
Section	00	3	œ	2	œ	3	00	3	00	3	<u>ac</u>	3	<u>ac</u>
Zone (Martini 1971)	NN5-4	20-21		90-91		94-95 N	N2	90-91		90-91	NN1	OLIGO	CENE
Amaurolithus primus	11110-4											0000	
Calcidiscus leptoporus		1		2	1		1	4	2	1			
Calcidiscus macintyrei	?		2	1			2	2					1
Calcidiscus premacintyrei		3	3	4	2	1	1	2	3	9			
Catinaster coalitus	-	-			1		-						
Ceratolithus cristatus													
Ceratolithus rugosus													
Coccolithus crassipons		-											-
Coccolithus eopelagicus	5	2			-	2	2	5	2	-	+	2	2
Coccolithus pelagicus	15	11	11	2	14	15	34	11	5	4	22	17	29
Coccolithus streckeril													
Coronocyclus nitescens	3	+				5	+	+	2	+		1	
Cyclicargolithus floridanus	55	51	8	20	23	29	50	114	105	120	49	79	83
Cyclolithella annula Distriggiographica productus		-			-	-				1			
Discoaster adamenteus										2			1
Discoaster asymmetricus													
Discoaster bellus											5 - J.		
Discoaster berggrenil		-					<u> </u>						
Discoaster blackstockae	-		-	-		-		-					
Discoaster braanidii						-						-	
Discoaster brouweri					-						-		
Discoaster calcaris											1.57		- 31
Discoaster challengeri													
Discoaster decorus				N		·							
Discoaster deflandrei	65	60	18	10	4	19	7	9	4	4	27	29	8
Discoaster exilis	2	5	1		+		1	1	+	+			
Discoaster hamatus							-	-	-		-		
Discoaster kugleri													
Discoaster loeblichii													
Discoaster neohamatus													
Discoaster neorectus								-		-			
Discoaster pentaradiatus	-				_		_						
Discoaster prepentaradiatus													
Discoaster pseudovariabilis													
Discoaster quadramus	-				_							-	
Discoaster quinqueramus						-	-						
Discoaster tamalis					_								
Discoaster triradiatus													
Discoaster tristellifer													
Discoaster variabilis	2	6	1	_	2	3	1	-			5	-	
Discoaster spp.	2	13	1	-	0	1	9	1	4	2	2	3	2
Havaster perplexus			1	- 4	+	3	3			6		-	
Helicosphaera carteri													
Helicosphaera granulata													
Helicosphaera neogranulata		-										-	-
Helicosphaera recta		-				-							-/
Helicosphaera wallichii													
Pontosphaera spp.				1									
Pseudoemiliania lacunosa					2						100		
Reticulofenestra asanoi		_		-					-			_	
Reticulofenestra gelida		2	41	41	41	31	31	4	8	5		2	3
Reticulofenestra minuta			20	28	5	17	14	4	4	-	1		-
Reticulofenestra minutula	1		16	2	6	7				+			1
Reticulofenestra pseudoumbilica	2	3	7	6	4	12	6		1				4
Scyphosphaera spp.													
sphenolithus ables		1	3	3	1							-	
Sphenolithus cipercensis						-						1	2
Sphenolithus compactus	4	3	20	14	16	16	20	12	7	5	1	3	9
Sphenolithus conicus			-										
Sphenolithus delphix					-	1	_		2	+		-	
Sphenolithus dissimilis	5	1	4	1	6	7	7	3	+	2	3	19	2
Schenolithus beteromorphus	0				-	-						-	1
Sphenolithus moriformis	22	8	21	19	23	19	13	12	5	3	6	7	32
Syracosphaera pulchra													
Tetralithides symeonidesii	+												
Inquetrorhabdus carinatus	1	23	4	9	13	10	4	13	46	43	84	34	22
Inquetromabdus milowii	4	1		6	1		1	1	1			-	
Imbilicosphaera sibogae	~	-	-	-									
Zygrhablithus bijugatus													+
liecollenaoue	2	4	5	11	6	1	2	-	1				



Figure 4. Sequential changes of composition of flora in Holes 806B (A), 805B and 805C (B), and 804C (C).



Figure 4 (continued).



Figure 5. Sequential changes of relative abundance of *Coccolithus pelagicus* and *C. miopelagicus* in Holes 806B (A), 805B and 805C (B), and 804C (C).



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Figure 5 (continued).



Figure 6. Sequential changes of relative abundance of *Cyclicargolithus floridanus* in Holes 806B (A), 805B and 805C (B), and 804C (C).



Figure 6 (continued).



Figure 7. Sequential changes of relative abundance of discoasters in Holes 806B (A), 805B and 805C (B), and 804C (C).



Figure 7 (continued).



Figure 8. Sequential changes of relative abundance of *Sphenolithus* spp. in Holes 806B (A), 805B and 805C (B), and 804C (C).



Figure 8 (continued).



Figure 9. Sequential changes of relative abundance of *Reticulofenestra* and its coccolith size variation in Holes 806B (A), 805B and 805C (B), and 804C (C).

Τ. ΤΑΚΑΥΑΜΑ



Depth (mbsf)

Figure 9 (continued).



Figure 10. Sequential changes of relative abundance of very large reticulofenestrid coccolith (A) and very small reticulofenestrid coccolith (B) in Hole 806B.