17. NANNOFOSSIL BIOSTRATIGRAPHY OF THE SOUTHWEST PACIFIC DEEP SEA DRILLING PROJECT, LEG 30

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INTRODUCTION

Calcareous nannofossils occur in 225 of the 230 sedimentary cores recovered at five sites during Leg 30 of the Deep Sea Drilling Project; locations of sites are shown in Figure 1. Only light microscopy was used to study the nannofossil assemblages. The biostratigraphic assessments of the holes are deduced from the study of their nannofossil contents are summarized in Table 1. Species checklists are compiled for Sites 285, 286, 287, and the Cenozoic of Sites 288 and 289 and presented in Tables 2, 3, 4, 5, and 6. Unconformities revealed by this study are documented and graphically summarized in Tables 7 and 8.

NANNOFOSSIL ZONES

The nannofossil biostratigraphic schemes in current use are based (a) on the bases and tops of ranges of selected species (e.g., Gartner, 1974) and (b) with the addition of variations in the abundance of a given species (e.g., Bukry, 1973).

The ease with which nannofossils can be reworked presents a special problem. In many cases, there is a pronounced gap in known stratigraphic ranges between apparently autochthonous and apparently allochthonous specimens; differences in preservation among specimens with similar response to dissolution provide further clues; mixing of near-shore elements into oceanic sediments can indicate the same thing. However, in the Pliocene and upper Miocene of Leg 30, routine biostratigraphic analysis has led to inconsistencies and confusion. The reason seems to be short upward reworking without the usual, more or less clear evidence for mixing. This is discussed for the relevant sites in the appropriate chapters. Site 289 is an exception; only minor reworking was noticed.

Accordingly, the practice of lumping zones defined by "extinctions" into zonal intervals based on initial appearances (up-sequence) is followed. Also, the defining events for zones used here are initial appearances wherever possible rather than "extinctions," because initial appearances are not obscured by reworking. Thus, the general approach in this cored material is precisely opposite to the approach used for subsurface material (other than core) where downhole contamination occurs.

The nannofossil zonation used for Leg 30 material is indicated below. Reworking, poor preservation, and/or unconformities hinder the recognition of the total extent of some zones. Data for constructing the zones are derived from all available sources, special attention being paid to the works of Bukry (1973) a, b, d, Gartner (1974), and Roth (1973). Only two events are "new" in the sense that they have not, to the author's knowledge, been used previously to define biostratigraphic units. Zones are listed down-section but defined up-section, i.e., lower boundary then upper boundary.

Emiliania huxleyi/Gephyrocapsa oceanica **Zonal Interval (age: Pleistocene-Holocene)**

The interval from the base range of *Gephyrocapsa oceanica* to top of section. The interval is equivalent to the combined *Emiliania huxleyi* and *Gephyrocapsa oceanica* zones used by Bukry (1973d). *E. huxleyi* is usually difficult to identify under the light microscope, and correlation based on its base range is likely to be unreliable.

Gephyrocapsa caribbeanica **Zone (age: Early Pleistocene)**

The interval from the base range of *Gephyrocapsa caribbeanica* to the base range of *Gephyrocapsa oceanica*. The zone is equivalent to the *G. caribbeanica* Subzone of Bukry (1973d). Distinction between *G. oceanica* and *G. caribbeanica* was based on taxonomic discussion by Bukry (1973b).

Pseudoemiliania lacunosa **Zone (age: Early Pleistocene)**

The range of *Pseudoemiliania lacunosa* between the top range of *Discoaster brouweri* (below) and the base range of *Gephyrocapsa caribbeanica* (above). This characterization is a poor one since it relies on the absence of two index species. The top range of *Cyclococcolithina macintyrei* occurs near the top of the zone.

The zone correlates with the lower part of the *Pseudoemiliania lacunosa* Zone proposed by Gartner (1969) and with the *Emiliania annula Subzone of Bukry (1973d). The lower boundary of the zone approximates the Pliocene/Pleistocene boundary. In cases of intense reworking, recognition of this event becomes impossible, and recognition of the Pliocene/Pleistocene boundary is consequently hindered. However, the zone is a short interval of about 0.2 m.y. (see Bukry, 1973b) and therefore the base range of Gephyrocapsa caribbeanica* may be used as a guide for locating tentatively the Pliocene/Pleistocene boundary.

Discoaster brouweri **Zone (age: Late Pliocene)**

The interval from the top range of *"Discoaster" pentaradiatus* to the top range of *Discoaster brouweri*. The zone is correlative with the *Cyclococcolithina macintyrei* Subzone of Bukry (1973d).

"Discoaster" pentaradiatus **Zone (age: Late Pliocene)**

The interval from the top range of *Discoaster tamalis* to the top range of *"Discoaster" pentaradiatus*.

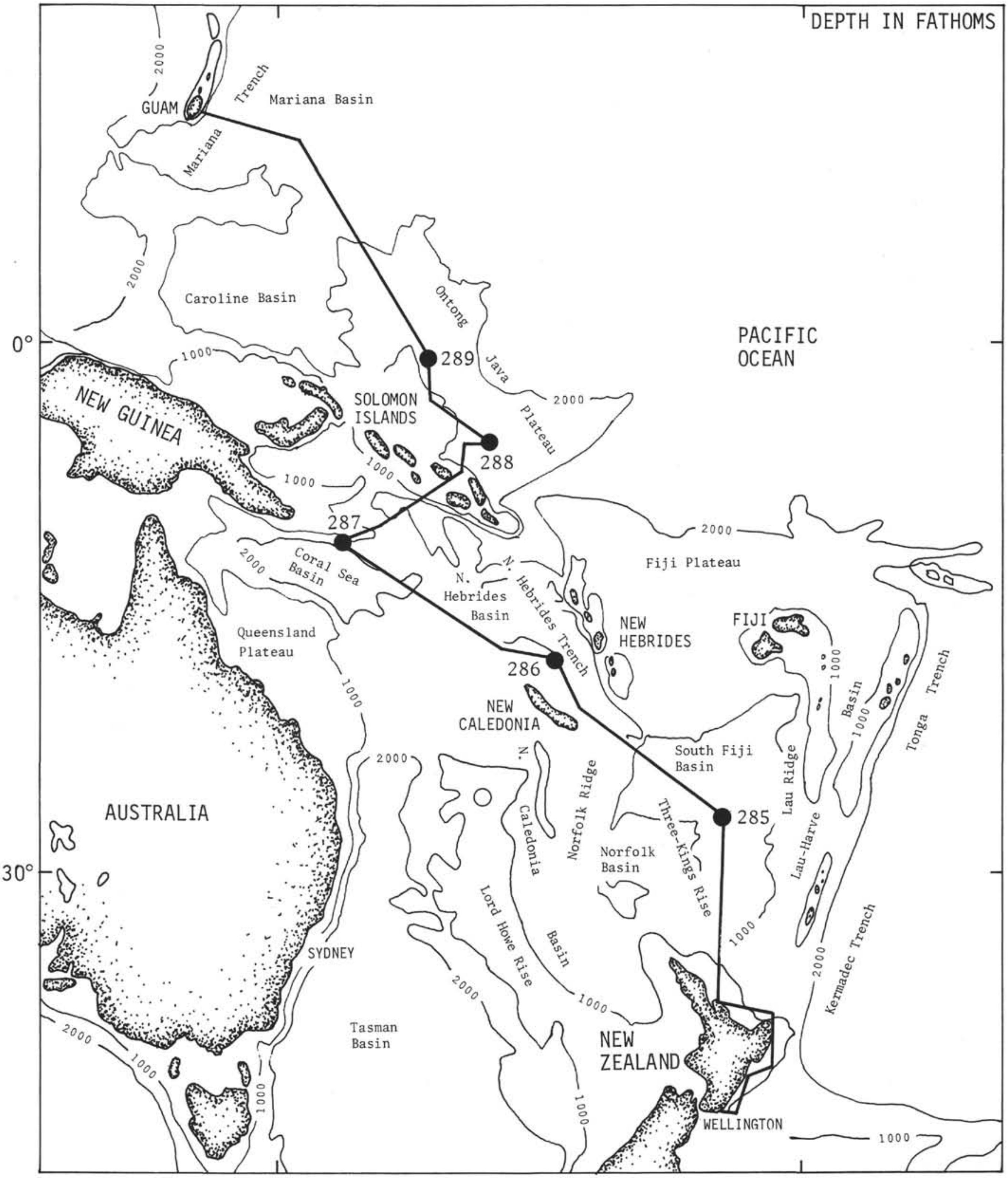

Figure 1. *Location of sites drilled during Leg 30.*

TABLE 1
Biostratigraphic Assessments of Leg 30 Cores From Southwest Pacific Region

Series or Subseries	Nannofossil Zones/Subzones		South Fiji Basin 285	South Fiji Basin 285A	New Hebrides 286	Coral Sea Basin 287	Ontong-Java Plateau 288	Ontong-Java Plateau 288A	Ontong-Java Plateau 288B	Ontong-Java Plateau 288C	Ontong-Java Plateau 289
Holocene Pleistocene	*Emiliania huxleyi-Gephyrocapsa oceanica*				1-1, 110-111 cm 2-4, 32-33 cm	1-2, 130-131 cm 4, CC	1-1, 30-31 cm 2-2, 24-25 cm				1-1, 30-31 cm 2-6, 30-31 cm
Holocene Pleistocene	*Gephyrocapsa caribbeanica*		2-1		2-5, 125-126 cm 2, CC	5-3, 120-121 cm 6-1, 120-121 cm	2-2, 50 cm 2-5, 30-31 cm				2, CC 4-3, 110-111 cm
Holocene Pleistocene	*Pseudoemiliania lacunosa*				? 3-1 3-3	6-2, 130-131 cm	2, CC				4-4, 30-31 cm 4-6, 30-31 cm
Pliocene Upper	*Discoaster brouweri*				3-4, 95-96 cm 3-5, 2 cm						4, CC 7-2, 35-36 cm
Pliocene Upper	"*Discoaster*" *pentaradiatus*				3-5, 120-121 cm 3, CC	to	to				7-2, 120-121 cm 7-6, 30-31 cm
Pliocene Upper	*Discoaster tamalis*					8-1, 10-11 cm	5, CC				7, CC 10-3, 30-31 cm
Pliocene Lower	*Reticulofenestra pseudoumbilica*		0								10-4, 30-31 cm 13, CC
Pliocene Lower	*Ceratolithus rugosus*		2-2		4-1, 120-121 cm 4, CC						14-1, 30-31 cm 15, CC
Pliocene Lower	*Ceratolithus tricorniculatus*	*Ceratolithus acutus*									16-1, 120-121 cm 16-4, 30-31 cm
Miocene Upper	*Ceratolithus tricorniculatus*	*Triquetrorhabdulus rugosus*									16-5, 30-31 cm 17-3, 120-121 cm
Miocene Upper	*Discoaster quinqueramus*		2-3, 77-78 cm 3-1, 36-37 cm				6-1, 120-121 cm 6-6, 30-31 cm				17-4, 120-121 cm 25-1, 120-121 cm
Miocene Upper	*Discoaster berggrenii*										27-3, 120-121 cm
Miocene Upper	*Discoaster neohamatus*		3-2, 51-52 cm 4, CC				6-6, 120-121 cm 7-1, 132-133 cm			1, CC	27-4, 30-31 cm 33-4, 120-121 cm
Miocene Middle	*Discoaster hamatus*	*Catinaster calyculus*	5-1, 30-31 cm 5, CC		Almost barren		7-2, 120-121 cm 8-1, 118-119 cm				33-5, 30-31 cm 35-4, 120-121 cm
Miocene Middle	*Discoaster hamatus*	*Helicopontosphaera kamptneri*				Barren					35, CC 36 CC
Miocene Middle	*Catinaster coalitus*										37-1, 30-31 cm 37-6, 35-36 cm
Miocene Middle	*Discoaster exilis*			1-1, 124-125 cm 5-5, 9-10 cm	(greatest part of Core 5 is probably of Miocene age)		8, CC 10-1, 94-95 cm		1, CC		37-6, 120-121 cm 47-4, 30-31 cm
Miocene Middle	*Sphenolithus heteromorphus*	Upper		5, CC 7-6, 130 cm			10-2, 123-124 cm				47-5, 30-31 cm 53-3, 120-121 cm
Miocene Lower	*Sphenolithus heteromorphus*	Lower					11, CC				53-4, 120-121 cm 57, CC
Miocene Lower	*Sphenolithus belemnos*										58-1, 30-31 cm 60, CC
Miocene Lower	*Triquetrorhabdulus carinatus*	*Discoaster druggii*						1-1, 39-40 cm 1, CC			61-1, 30-31 cm
Miocene Lower	*Triquetrorhabdulus carinatus*	*Discoaster deflandrei*						2-1, 134-135 cm 2, CC			to
Oligocene	*Triquetrorhabdulus carinatus*	*Cyclicargolithus abisectus*									78, CC
Oligocene	*Sphenolithus ciperoensis*				5, CC 6, CC	10-2, 4-5 cm 10-4, 30-31 cm					79-1, 60-61 cm 85, CC
Oligocene	*Sphenolithus distentus*				7-1, 120-121 cm 7-6, 120-121 cm	10-4, 120-121 cm 11-0, 24-25 cm		3-1, 110-111 cm 4 CC			86-2, 120-121 cm 91, CC
Oligocene	*Sphenolithus predistentus*				7, CC			5-1, 81-82 cm 6-1, 74-76 cm			92-1, 120-121 cm 100-1, 50-51 cm
Oligocene	*Reticulofenestra hillae*				7, CC 8, CC			6-1, 115-116 cm			100-1, 122-123 cm 100, CC
Oligocene	*Cyclococcolithina formosa*				9-1, 55-56 cm 9-5, 45-46 cm						101-1, 64-66 cm 102-1, 112-113 cm
Eocene Upper	*Discoaster barbadiensis*	Upper			9-5, 65-66 cm 10-4, 25-26 cm						102, CC 104, CC
Eocene Upper	*Discoaster barbadiensis*	Lower			10-4, 135-136 cm 17-1, 15-16 cm						105, CC 108-1, 74-75 cm
Eocene Middle	*Discoaster saipanensis*				17-2, 97-98 cm						108, CC 110-1, 107-108 cm
Eocene Middle	*Cyclicargolithus reticulatus*				32-1, 30-31 cm						110, CC 112, CC
Eocene Middle	*Reticulofenestra umbilica*				32-2, 43-44 cm 33, CC						
Eocene Middle	*Chiasmolithus gigas*					11-0, 29-30 cm 11, CC					113-1, 117-118 cm
Eocene Middle	*Nannotetrina fulgens*					12-1, 100-101 cm 13, CC		Core 7			
Eocene Middle	*Discoaster sublodoensis*	*Rhabdosphaera inflata*				14-1, 100-101 cm 14, CC		Unrecovered			
Eocene Lower	*Discoaster sublodoensis*	*Discoasteroides kuepperi*				15-1, 100-101 cm 15, CC					
Eocene Lower	*Discoaster lodoensis*										114-1, 148-150 cm 115-1, 55-56 cm
Eocene Lower	*Tribrachiatus orthostylus*					16-1					- - - - - - - -
Eocene Lower	*Discoaster diastypus*										?115, CC
Paleocene	*Discoaster multiradiatus*										116-1, 140-143 cm 119, CC
Paleocene	*Discoaster nobilis*										
Paleocene	*Discoaster mohleri*										120-1, 80-81 cm 120-1, 148-150 cm
Paleocene	*Heliolithus kleinpellii*							8-1, 102-103 cm 8-2, 102-103 cm			120, CC
Paleocene	*Fasciculithus tympaniformis*										121-1, 125-126,cm 121-2, 62-63 cm
Paleocene	*Cyclococcolithina robusta*							8-2, 122-123 cm			
Paleocene	*Cruciplacolithus tenuis*							8-2, 138-139 cm 8, CC			122-1 (top)
Maestrichtian	*Micula mura*							9-1, 21-22 cm			122, CC
Maestrichtian	*Lithraphidites quadratus*							9-2, 100-102 cm 10-1, 29-30 cm			126-1, 135-136 cm 126 (bottom)
Campanian	*Tetralithus trifidus*							10-1, 113-114 cm 11-2, 29-30 cm			127-1, 131-132 cm 129, CC
Campanian	*Broinsonia parca*							?11-2, 80-81 cm			130, CC
Campanian	*Eiffellithus augustus*							11-2, 100-102 cm 12-1, 122-125 cm			131-1, 1-2 cm 131-1, 30-31 cm
Santonian	*Gartnerago obliquum*										
Coniacian	*Marthasterites furcatus*							12, CC 15-2, 129-130 cm			
Turonian	*Micula decussata*							15, CC to			
////// Albian	////// *Eiffellithus turriseiffeli*							28-1, 65-66 cm			
Aptian								29, CC 30-1			131-1, 149-150 cm 132-2, 68-70 cm

TABLE 2
Checklist of Calcareous Nannofossils Recovered at Site 285

Sample (Interval in cm)	*Catinaster calyculus*	*Catinaster coalitus*	*Ceratolithus acutus*	*Ceratolithus amplificus*	*Ceratolithus cristatus*	*Ceratolithus primus*	*Ceratolithus rugosus*	*Ceratolithus tricorniculatus*	*Coccolithus eipelagicus*	*Coccolithus miopelagicus*	*Coccolithus pelagicus*	*Coronocyclus sp.*	*Cyclicargolithus abisectus*	*Cyclicargolithus floridanus*	*Cyclococcolithina leptopora*	*Cyclococcolithina macintyrei*	*Cyclococcolithina rotula*	*Discoaster asymmetricus*	*Discoaster aulakos*	*Discoaster bellus*	*Discoaster berggrenii*	*Discoaster broweri*	*Discoaster bollii*	*Discoaster calcaris*	*Discoaster challengeri*	*Discoaster deflandrei*	*Discoaster dilatus*	*Discoaster druggii*	*Discoaster exilis*	*Discoaster hamatus*	*Discoaster icarus*	*Discoaster intercalaris*	*Discoaster kugleri*	*Discoaster loeblichii*	*Discoaster moorei*	*Discoaster neohamatus*	*Discoaster neorectus*	*Discoaster nephados*
2-1, 102-103			+		cf.	+	+	+			cf.					+		+				+			+	+			+			+						+
2-1, 115	+			+		+	+	+			+			+	+	+		+				+				+			+			+				+		+
2-1, 145-146			+	+	cf.	+	+	+			+			+	+							+			+			+	+									
2-2, 76-77			+	+		+	+	+			+	+	+		+	+		+			+	+			+	+			+			+					+	+
2-3, 33-34				+		+		+			+				+	+		+			+								+			+					+	
2-3, 77-78				+		+		+			+				+	+						+																
2-3, 86-87			aff.	+		+	cf.	+			+				+	+				+		+			+				+									
2-4, 24-25				aff.		+		+			+				+	+		+		+	+	+							+								+	
2-4, 59-60				+		+									+						+	+														+		
2-5, 30-31				+		+			+						+						+	+							+			+		+				
2-5, 99-100	+	cf.					cf.											+			+	+										+					+	
2-5, 142	+										+					+		+		+	+	+					+			+								
2, CC	+					+					+				+	+		+		+	+	+		+					+	cf.		+		+		+	+	
3-1, 36-37	+					+			+	+	+				+	+		+		+	cf.			+			+			+			+			+		
3-1, 66-67	+										+					+				+		+																
3-1, 100-101																+				+	cf.	+					+									+		
3-1, 131-133	+										+					+		+		+	cf.	+		+					+	cf.								
3-1, 140-141	+										+				+	+		+		+					+					+		+				+		
3-2, 51-52											+				+	+		+				+					+					+				+		
3-3, 60-61											+				+	+						+		+			+									+		
3-3, 120-121											+				+	+		+						+	+		+					+					+	
3-4, 80-82											+				+	+						+														+		
3-4, 125-126											+				+	+	+	+		+		+		+														
3-5, 8-9													+		+							+					+									+		
3-5, 115-116											+				+	+	+			+	cf.			+			+	+	+					+		+		
3-6, 47-48															+			+		+		+					+									+		
3-6, 106-108															+	+				+		+					+	+	+	+	+	+			+	+		
3, CC															+	+		+		+	cf.	+		+	+		+			+	+				+	+		+
4-1, 45-46	+										+											+		+														
4-1, 145-146									+							+						+																
4-2, 10-11	+								+						+	+	+	+				+	+	+	+				+									
4-2, 40-41	+														+	+						+		+						+								
4-3, 35-36	+								+	+					+	+		+				+		+					+	+		+				+		
4-3, 120-121									+						+	+						+		+														
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4-5, 30-31															+	+		+				+		+	+			+	+	+						+		
4-5, 120-121																+		+				+		+								+			+			
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4-6, 120-121																+						+																
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5-1, 30-31	+	+														+		+				+	+	+	+				+	+					ff.			
5-1, 120-121	+														+	+						+	+	+					+	+		+	+		+			+
5-2, 30-31	+										cf.				+	+						+	+	+					+	+								+
5-2, 120-121	+										cf.				+							+	+						+	+								+
5-3, 30-31	+									+	cf.				+	+							+	+	+					+								+
5-3, 135-136	+	+																					+		+				+	+								
5-4, 30-31	+																						+		+				+	+		+						
5-4, 120-121	+																					+	+		+				+	+		+			+			
5-5, 30-31	+										cf.						+					+	+		+				+	+		+			+			
5-5, 120-121	+										cf.				+	+					+	+	+		+					+								+

TABLE 2 – *Continued*

Discoaster pansus	"Discoaster" pentaradiatus	Discoaster perclarus	Discoaster prepentaradiatus	Discoaster pseudovariabilis	"Discoaster" quadramus	Discoaster quinqueramus	Discoaster rutellus	Discoaster signus	Discoaster surculus	Discoaster tamalis	Discoaster trinidanensis	Discoaster triradiatus	Discoaster variabilis	Discolithina japonica	Discolithina multipora	Discolithina plana	Hayaster perplexus	Helicopontosphaera granulata	Helicopontosphaera intermedia	Helicopontosphaera kamptneri	Helicopontosphaera obliqua	Helicopontosphaera recta	Helicopontosphaera romba	Holodiscolithus macroporus	Lithostromation perdurum	Minylitha convallis	Oolitholithus antillarum	Reticulofenestra pseudoumbilica	Reticulofenestra scissura	Reticulofenestra sp.	Rhabdosphaera sp.	Scyphosphaera apsteinii	Scyphosphaera globulata	Scyphosphaera pulcherrima	Scyphosphaera recurvata	Sphenolithus abies	Sphenolithus heteromorphus	Sphenolithus neoabies	Sphenolithus moriformis	Triquetrorhabdulus carinatus	Triquetrorhabdulus milowii	Triquetrorhabdulus rugosus
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		+						+					+															+		+										+		
													+															+		+												+
												+	+															+		+												
		+											+															+		+												
+								+					+		+					+								+		+	+											+

TABLE 2 – *Continued*

Sample (Interval in cm)	*Catinaster calyculus*	*Catinaster coalitus*	*Ceratolithus acutus*	*Ceratolithus amplificus*	*Ceratolithus cristatus*	*Ceratolithus primus*	*Ceratolithus rugosus*	*Ceratolithus tricorniculatus*	*Coccolithus eipelagicus*	*Coccolithus miopelagicus*	*Coccolithus pelagicus*	*Coronocyclus sp.*	*Cyclicargolithus abisectus*	*Cyclicargolithus floridanus*	*Cyclococcolithina leptopora*	*Cyclococcolithina macintyrei*	*Cyclococcolithina rotula*	*Discoaster asymmetricus*	*Discoaster aulakos*	*Discoaster bellus*	*Discoaster berggrenii*	*Discoaster broweri*	*Discoaster bollii*	*Discoaster calcaris*	*Discoaster challengeri*	*Discoaster deflandrei*	*Discoaster dilatus*	*Discoaster druggii*	*Discoaster exilis*	*Discoaster hamatus*	*Discoaster icarus*	*Discoaster intercalaris*	*Discoaster kugleri*	*Discoaster loeblichii*	*Discoaster moorei*	*Discoaster neohamatus*	*Discoaster neorectus*	*Discoaster nephados*
5-6, 45-46	+	+									cf.				+	+	+					+	+		+					+								+
5-6, 130-131	+	+									cf.				+	+						+	+		+					+					+			+
5, CC	+	+													+	+						+	+		+				+	+					+			+
1A-1, 124-125									+						+	+																+						
1A-1, 138-139															+										cf.				+			cf.	cf.					
1A-2, 30-31											cf.			+		+													+			+			+			
1A-3, 25-26																+																						
1A-3, 130-131															+	+													+									
1A-4, 10-11																	cf.																					
1A-6, 66-67									+							+	cf.																					
1A, CC									+		cf.				+	+												+	+			+	+					+
2A-1, 99-101															+																							
2A, CC									+						+	+													+									
3A-1, 110-111									+							+							cf.						+									
3A-2, 85-86									+																													
3A, CC													+		+	+							cf.		+								+					
4A-1, 108-110									+		cf.				+	+								+					+									
4A-2, 124-125									+		cf.			+		+													+									
4A, CC									+					+	+	+										+		cf.	+									
5A-1, 110-112																										cf.												
5A-2, 45-46														+	+																							
5A-3, 82-83									+																													
5A-4, 117-118									+		cf.		+	+	+	+													+									
5A-5, 9-10											cf.		+	+	+																							
5A-5, 106-107										+	cf.		+	+	+	+			+			+																
5A, CC									+		cf.		+	+	+	+																						
6A-1, 21-22										+			+	+		+																						
6A-3, 25-26																																						
6A-5, 129-131																																						
6A, CC									+				+	+	+	+										+												+
7A-3, 137-138									+					+		+										+												
7A-4, 10-11									+				+	+	+	+										+												
7A-6, 46-47											cf.			+	+				+							+			+									
7A-6, 130-131													+			+																						

Discoaster tamalis **Zone (age: Late Pliocene)**

The total range of *Discoaster tamalis.*

The lower upper Pliocene boundary is tentatively drawn at the base of this zone (discussion in Bukry, 1973d).

The *D. brouweri, "D." pentaradiatus,* and *D. tamalis* zones are based on the sequential disappearance downsection of the nominate species and in case of reworking, their differentiation becomes impossible. Therefore, these zones, together with the *P. lacunosa* Zone are lumped into the *Discoaster triradiatus/Pseudoemiliania lacunosa* zonal interval delimited by the base ranges of *Discoaster tamalis* and barred *Gephyrocapsa* species *(G. caribbeanica).* This interval corresponds roughly to the upper Pliocene.

Reticulofenestra pseudoumbilica **Zone (age: Early Pliocene)**

The interval from the last occurrence of nonbirefringent ceratoliths *(Ceratolithus tricorniculatus* and *C. primus)* to the base range of *Discoaster tamalis.*

The upper boundary as originally defined by the last occurrence of *R. pseudoumbilica* (Gartner, 1969), is rather difficult to determine because *R. pseudoumbilica* becomes quite rare and is usually represented by small specimens (Gartner, 1974 and own observation). Bukry (1973d) reinforces the recognition of this boundary by the disappearance of representatives of *Sphenolithus. Discoaster tamalis* first appears shortly before the disappearance of *R. pseudoumbilica* and *Sphenolithus* spp.

TABLE 2 – *Continued*

Discoaster pansus	*"Discoaster" pentaradiatus*	*Discoaster perclarus*	*Discoaster prepentaradiatus*	*Discoaster pseudovariabilis*	*"Discoaster" quadramus*	*Discoaster quinqueramus*	*Discoaster rutellus*	*Discoaster signus*	*Discoaster surculus*	*Discoaster tamalis*	*Discoaster trinidanensis*	*Discoaster triradiatus*	*Discoaster variabilis*	*Discolithina japonica*	*Discolithina multipora*	*Discolithina plana*	*Hayaster perplexus*	*Helicopontosphaera granulata*	*Helicopontosphaera intermedia*	*Helicopontosphaera kamptneri*	*Helicopontosphaera obliqua*	*Helicopontosphaera recta*	*Helicopontosphaera romba*	*Holodiscolithus macroporus*	*Lithostromation perdurum*	*Minylitha convallis*	*Oolitholithus antillarum*	*Reticulofenestra pseudoumbilica*	*Reticulofenestra scissura*	*Reticulofenestra sp.*	*Rhabdosphaera sp.*	*Scyphosphaera apsteinii*	*Scyphosphaera globulata*	*Scyphosphaera pulcherrima*	*Scyphosphaera recurvata*	*Sphenolithus abies*	*Sphenolithus heteromorphus*	*Sphenolithus neoabies*	*Sphenolithus moriformis*	*Triquetrorhabdulus carinatus*	*Triquetrorhabdulus milowii*	*Triquetrorhabdulus rugosus*
								+				+	+		+					+								+		+												+
		+						+				+	+		+					+				+				+		+	+											+
													+															+		+						+		+				+
													+		+					+								+		+	+							+	+			
					+								+															+		+												
											+		+		+					+								+		+									+			+
													+							+								+		+								+				
													+		+													+		+						+						
													+															+														
		+											+										cf.					+		+						+						
		+											+		+					+	aff.			+				+		+	+					+			+			+
		+											cf.		+													+		+												+
		cf.											+		+					+								+		+						+						
																				+								+		+								+				
																				+								+		+								+				
													+		+					+			+					+		+		+			aff.	+						
													+			+				+								+		+						+		+	+			+
													+		+					+								+		+						+		+	+			
															+					+								+											+			
																												+														
															+					+			+					+											+			
																												+														
															+					+								+		+									+			
										+						+				+				+				+		+									+			+
													+							+				+				+		+						+			+			+
													+		+					+								+		+						+	+		+			
													+			+				+								+									+					
																								+				+														
																												+														
																				+								+									+		+			
																				+								+									+		+			
																				+								+									+		+			
													cf.			+				+								+								+	+					
																+				+								+														

The base range of *D. tamalis* is used here instead of the top ranges of *R. pseudoumbilica* and *Sphenolithus* spp. to avoid the biostratigraphic hazard caused by reworking.

Ceratolithus rugosus **Zone (age: Early Pliocene)**

The interval from the base range of *Ceratolithus rugosus* to the last occurrence of nonbirefringent ceratoliths.

This zone is equivalent to the *C. rugosus* Subzone of Bukry (1973d).

Ceratolithus tricorniculatus **Zone (age: Miocene-Pliocene)**

The interval from the top range of *Discoaster quinqueramus* to the base range of *Ceratolithus rugosus*.

The base and top ranges of *Ceratolithus acutus* and *Triquetrorhabdulus rugosus*, respectively, are near the base of the *C. tricorniculatus* Zone almost at the same level. Bukry (1973b, d) uses these criteria to subdivide an interval equivalent to the *C. tricorniculatus* Zone into the *Triquetrorhabdulus rugosus* and *Ceratolithus acutus* subzones and considers the boundary separating these subzones as the Pliocene/Miocene boundary.

Discoaster quinqueramus **Zone (age: Late Miocene)**

The interval with the concurrent occurrence of *Ceratolithus primus* and *Discoaster quinquarmus*.

This zone is equivalent to the *Ceratolithus primus* Subzone of Bukry (1973d) and to the *D. quinqueramus* Zone of Gartner (1974).

TABLE 3A
Checklist of Calcareous Nannofossils Recovered at Site 286

Sample (Interval in cm) \ Species	*Braarudosphaera bigelowi*	*Bramletteius serraculoides*	*Campylosphaera dela*	*Ceratolithus acutus*	*Ceratolithus cristatus*	*Ceratolithus primus*	*Ceratolithus rugosus*	*Ceratolithus tricorniculatus*	*Chiasmolithus altus*	*Chiasmolithus grandis*	*Chiasmolithus oamaruensis*	*Chiasmolithus titus*	*Clathrolithus ellipticus*	*Clathrolithus minutus*	*Coccolithus cribellum*	*Coccolithus eopelagicus*	*Coccolithus miopelagicus*	*Coccolithus pelagicus*	*Corannulus germanicus*	*Coronocyclus serratus*
1-1, 110-111					+															
1-2, 10-11					+															
1-3, 140-141					+													+		
1-4, 105-106					+															
1-5, 31-32					+															
1, CC					+															
2-1, 129-130					+															
2-2, 55-56																				
2-3, 30-31					+															
2-3, 80-81					+													+		
2-4, 32-33																				
2-4, 82-83																		+		
2-4, 105-107					+		+													
2-5, 125-126				+																
2-6, 30-31					+															
2, CC					+															
3-1																				
3-2, 30-31																				
3-3, 30-31																				
3-4, 95-96					+													+		
3-5, 2					+											+				
3-5, 120-121					+													+		
3, CC																				
4-1, 120-121					+		+	+								+				
4, CC						+	+	+												
5-1, 140-141																				
5-2, 30-31																				
5-3, 30-31																				
5-4, 13-14															+					
5-5, 30-31																				
5-5, 120-121																		+		
5, CC																+				
6-1															+					
6-2, 15-16																				
6-3, 30-31																				
6-4, 30-31																+				
6-4, 121-122																				
6-5, 35-36																+				+
6, CC																+				
7-1, 120-121																+		+		
7-2, 115-116																+				
7-3, 35-36																+	+			

Sample (Interval in cm) \ Species	*Cruciplacolithus staurion*	*Cyclicargolithus abisectus*	*Cyclicargolithus floridanus*	*Cyclicargolithus reticulatus*	*Cyclococcolithina formosa*	*Cyclococcolithina leptopora*	*Cyclococcolithina macintyrei*	*Cyclococcolithina protoannula*	*Discoaster asymmetricus*	*Discoaster barbadiensis*	*Discoaster berggrenii*	*Discoaster bifax*	*Discoaster binodosus*	*Discoaster brouweri*	*Discoaster deflandrei*	*Discoaster distinctus*	*Discoaster druggii*	*Discoaster elegans*	*Discoaster gartnerii*	*Discoaster neohamatus*
1-1, 110-111			+				+													
1-2, 10-11		+				+	+							+						
1-3, 140-141						+														
1-4, 105-106																				
1-5, 31-32						+														
1, CC						+	+													
2-1, 129-130		+				+	+													
2-2, 55-56							+													
2-3, 30-31						+														
2-3, 80-81			+				+							+						
2-4, 32-33						+														
2-4, 82-83							+							+						
2-4, 105-107		+					+							+						
2-5, 125-126						+	+													
2-6, 30-31							+							+						
2, CC							+													
3-1																				
3-2, 30-31																				
3-3, 30-31																				
3-4, 95-96						+	+							+						
3-5, 2						+								+						
3-5, 120-121						+	+							+			+			
3, CC						+	+		+					+						
4-1, 120-121						+	+							+						
4, CC		+					+							+						
5-1, 140-141																				
5-2, 30-31																				
5-3, 30-31																				
5-4, 13-14		+									cf.									cf.
5-5, 30-31																				
5-5, 120-121		+																		
5, CC		+	+																	
6-1		+	+																	
6-2, 15-16		+	+																	
6-3, 30-31			+												+					
6-4, 30-31		+	+												+					
6-4, 121-122		+													+					
6-5, 35-36		+	+																	
6, CC		+	+																	
7-1, 120-121		+																		
7-2, 115-116			+												+					
7-3, 35-36		+	+												+					

Sample (Interval in cm) \ Species	*Discoaster nodifer*	*Discoaster ornatus*	*"Discoaster" pentaradiatus*	*Discoaster quinqueramus*	*Discoaster saipanensis*	*Discoaster saundersii*	*Discoaster stradnerii*	*Discoaster sublodoensis*	*Discoaster surculus*	*Discoaster tamalis*	*Discoaster tani*	*Discoaster trinidadensis*	*Discoaster variabilis*	*Discolithina multipora*	*Discolithina plana*
1-1, 110-111															
1-2, 10-11			+										+		
1-3, 140-141															
1-4, 105-106															
1-5, 31-32															
1, CC															
2-1, 129-130															
2-2, 55-56															
2-3, 30-31															
2-3, 80-81			+												
2-4, 32-33															
2-4, 82-83			+												
2-4, 105-107			+						+	+			+		
2-5, 125-126															
2-6, 30-31				+					+						
2, CC															
3-1															
3-2, 30-31															
3-3, 30-31															
3-4, 95-96															
3-5, 2															
3-5, 120-121			+						+						
3, CC			+						+	+				+	
4-1, 120-121			+						+				+		
4, CC			+						+						
5-1, 140-141															
5-2, 30-31															
5-3, 30-31															
5-4, 13-14													+		
5-5, 30-31															
5-5, 120-121															
5, CC												+			
6-1						+									
6-2, 15-16						+									
6-3, 30-31															
6-4, 30-31															
6-4, 121-122															
6-5, 35-36						+									
6, CC						+						+			
7-1, 120-121											+				
7-2, 115-116	+										+				
7-3, 35-36	+					+					+				

7-4, 30-31						+		+	+																	
7-5, 35-36						+		+	+							+				+						
7-5, 120-121					+	+		+	+							+									+	
7-6, 120-121		cf.			+	+		+	+											+						
7, CC					+	+		cf.	+							+				+						
8-1, 30-31		+			+	+	+	cf.	+							+				+					+	
8-2, 120-121		+			+	+			+							+				+						cf.
8-3, 30-31	+	+			+	+			+							+									+	
8, CC	+	+			+	+		cf.	+							+									+	
9-1, 55-56	+	+		+	+	+			+		+						+		+	+						
9-2, 8-9	+				+	+			+		+						+		+	+						
9-2, 45-46	+				+	+			+		+					+	+		+	+					+	
9-2, 125-126					+	+			+		+					+				+					+	
9-3, 8-9					+	+			+		+					+				+						
9-3, 85-86	+				+	+			+		+					+	+		+							
9-4, 8-9	+	cf.			+	+			+		+					+	+		+	+					+	
9-4, 30-31					+	+					+						+			+						
9-4, 85-86											+						+			+					+	
9-5, 8-9						+			+		+						+			+						
9-5, 45-46						+					+						+			+						
9-5, 65-66						+			+		+									+		+			+	
9-5, 110-111											+						+								+	
9, CC	+					+				?	+	+	+				+		+	+	+	+			+	
10-1, 67-68																						+				
10-1, 125-126																				+		+				
10-2, 35-36																						+				
10-2, 125-126																	+					+				
10-3, 30-31											+		+									+			+	
10-3, 120-121													+							+		+			+	
10-4, 25-26				+									+							+		+			+	
10-4, 135-136										+	+		+							+		+		+	+	
10, CC									+	+	+		+									+			+	
11-1, 80-81							+			+	+		+							+		+				
11-1, 120-121						+					+		+				+			+		+			+	
11, CC						+			+	+	+		+									+				
12-2, 31-32																		+				+				
12-2, 120-121																		+		+		+				
12, CC						+				+	+							+				+			+	
13-1, 140-141						+					+							+				+				
13-2, 29-30													+					+				+				
13-2, 119-120						+				+	+						+	+	+	+		+			+	
13, CC						+				+	+											+			+	
14-1, 105-106																	+	+				+				
14-2, 30-31																										
14-2, 120-121						+							+									+			+	
14, CC						+				+	+		+							+		+	+		+	+
15-1, 80-81						+					+		+					+		+		+			+	
15, CC																		+				+				
16-1, 90-91						+				+	+											+			+	
16-2, 7-8										+								+		+		+				
16, CC						+				+	+		+	+			+			+		+			+	
17-1, 15-16						+	+				+			+			+		+	+		+				
17-1, 110-111						+				+				+			+			+		+				
17-2, 61-62						+				+	+							+				+				
17-2, 97-98			+			+				+	+							+				+				
17-2, 133-134						+				+	+		+					+				+				
17-3, 36-37										+	+							+				+				
17-3, 120-121										+								+				+				

TABLE 3A – *Continued*

Sample (Interval in cm)	*Braarudosphaera bigelowi*	*Bramletteius serraculoides*	*Campylosphaera dela*	*Ceratolithus acutus*	*Ceratolithus cristatus*	*Ceratolithus primus*	*Ceratolithus rugosus*	*Ceratolithus tricorniculatus*	*Chiasmolithus altus*	*Chiasmolithus grandis*	*Chiasmolithus oamaruensis*	*Chiasmolithus titus*	*Clathrolithus ellipticus*	*Clathrolithus minutus*	*Coccolithus cribellum*	*Coccolithus eopelagicus*	*Coccolithus miopelagicus*	*Coccolithus pelagicus*	*Corannulus germanicus*	*Coronocyclus serratus*
17-4, 43-44										+						+				
17-4, 106-108		+	+							+						+				
17-4, 132-133										+						+				
17-5, 59-60	+									+			+	+		+			+	
17-5, 120-121																				
18-1, 109-110																				
18-2, 112-113																				
18, CC										+						+				
19-1, 95-96																+				
19, CC										+						+				
20-1, 136-138																+				
20-2, 130-131																+				
20, CC										+						+				
21-1, 97-98																				
21-2, 141-142																+				
21, CC		+								+						+				
22-1, 128-129																+				
22-2, 64-71										+						+				
22-3, 118-119																				
22, CC										+						+				
23-1, 127-128																				
23-2, 27-28										+						+				
23-2, 124-125																				
23, CC			+							+						+				
24-1, 131-132																				
24-2, 121-123			+													+				
24, CC										+						+				
25-1, 149-150			+							+						+				
25-2, 140-141										+										
25-3, 114-115										+		+								
25-4, 56-57																				
25, CC																+				
26-1, 131-132										+						+				
26-2, 78-80			+							+		+								
26-3, 119-120										+						+				
26-4, 27-28										+		+				+				
26, CC														+		+				
27-2, 36-40			+							+		+				+				

Sample (Interval in cm)	*Cruciplacolithus staurion*	*Cyclicargolithus abisectus*	*Cyclicargolithus floridanus*	*Cyclicargolithus reticulatus*	*Cyclococcolithina formosa*	*Cyclococcolithina leptopora*	*Cyclococcolithina macintyrei*	*Cyclococcolithina protoannula*	*Discoaster asymmetricus*	*Discoaster barbadiensis*	*Discoaster berggrenii*	*Discoaster bifax*	*Discoaster binodosus*	*Discoaster brouweri*	*Discoaster deflandrei*	*Discoaster distinctus*	*Discoaster druggii*	*Discoaster elegans*	*Discoaster gartnerii*	*Discoaster neohamatus*
17-4, 43-44				+	+													+		
17-4, 106-108			+	+	+													+	+	
17-4, 132-133				+	+													+	+	
17-5, 59-60			+	+	+							+				+		+	+	
17-5, 120-121				+						+								+		
18-1, 109-110				+																
18-2, 112-113				+																
18, CC			+	+	+								+							
19-1, 95-96			+	+	+					+										
19, CC			+	+	+					+										
20-1, 136-138										+										
20-2, 130-131										+										
20, CC			+		+					+										
21-1, 97-98					+					+										
21-2, 141-142				+	+					+										
21, CC				+						+										
22-1, 128-129					+															
22-2, 64-71			+	+	+			+		+										
22-3, 118-119				+																
22, CC			+	+	+					+										
23-1, 127-128																				
23-2, 27-28			+	+	+															
23-2, 124-125					+					+										
23, CC			+	+	+			+		+										
24-1, 131-132				+						+										
24-2, 121-123				+	+					+										
24, CC			+	+	+					+										
25-1, 149-150					+					+										
25-2, 140-141				+	+					+										
25-3, 114-115			+	+	+					+										
25-4, 56-57			+		+					+										
25, CC					+					+										
26-1, 131-132																				
26-2, 78-80				+	+					+										
26-3, 119-120	+			+	+					+										
26-4, 27-28			+	+	+															
26, CC			+	+	+					+										
27-2, 36-40			+		+					+										

Sample (Interval in cm)	*Discoaster nodifer*	*Discoaster ornatus*	*"Discoaster" pentaradiatus*	*Discoaster quinqueramus*	*Discoaster saipanensis*	*Discoaster saundersii*	*Discoaster stradnerii*	*Discoaster sublodoensis*	*Discoaster surculus*	*Discoaster tamalis*	*Discoaster tani*	*Discoaster trinidadensis*	*Discoaster variabilis*	*Discolithina multipora*	*Discolithina plana*
17-4, 43-44	+				+										
17-4, 106-108	+				+										
17-4, 132-133					+										
17-5, 59-60	+				+									+	
17-5, 120-121	+				+										
18-1, 109-110	+				+										
18-2, 112-113															
18, CC	+				+										
19-1, 95-96	+	+			+										
19, CC	+	+			+										
20-1, 136-138	+				+										
20-2, 130-131					+										
20, CC	+				+									+	
21-1, 97-98					+										
21-2, 141-142					+										
21, CC															
22-1, 128-129					+						+				
22-2, 64-71											+				
22-3, 118-119	+				+										
22, CC		+													
23-1, 127-128															
23-2, 27-28					+										
23-2, 124-125											+				
23, CC		+													
24-1, 131-132					+										
24-2, 121-123					+										
24, CC					+										
25-1, 149-150	+				+						+				
25-2, 140-141					+						+				
25-3, 114-115					+										
25-4, 56-57					+										
25, CC															
26-1, 131-132															
26-2, 78-80					+										
26-3, 119-120					+										
26-4, 27-28															
26, CC					+										
27-2, 36-40					+									+	

	A	B	C	D	E	F	G	H	I	J	K	L	M
27, CC	+	+			+	+	+		+	+	+	+	+
28-1, 108-109													
28-2, 118-119	+	+			+		+						
28, CC	+		+		+		+						
29-1, 133-136	+												
29-2, 101-103	+				+		+	+			+		
29-3, 135-135													
29-4, 135-137	+												
29-5, 132-133	+		+		+		+				+		
29, CC	+		+		+		+				+		
30-1, 77-79													
30, CC	+						+	+	+		+	+	+
31-1, 121-123					+		+				+		
31-2, 26-27	+						+		+		+	+	
31-2, 113-114			+		+		+		+		+		
31, CC	+						+				+	+	
32-1, 30-31	+		+		+		+	+	+		+	+	
32-2, 43-44	+		+			+	+		+		+		
32-2, 110-111													
33-1, 110-111					+								
33-2, 131-132									+				
33, CC				+	+		+				+		
34-1, 119-120													
34-2, 145-146													
34, CC													
35-1, 80-81													
35, CC													

Discoaster berggrenii **Zone (age: Late Miocene)**

The interval from the base range of *Discoaster berggrenii* to the base range of *Ceratolithus primus*. The zone is equivalent to the *D. berggrenii* Subzone of Bukry (1973d).

Discoaster neohamatus **Zone (age: Late Miocene)**

The interval from the top range of *Discoaster hamatus* to the base range of *Discoaster berggrenii*. Obviously, the zone is a gap interval relying on the absence of two index species. In case of upward displacement of *Discoaster hamatus*, the base range of *Minylitha convallis* is taken to approximate the extinction of *D. hamatus*. The lower boundary of the *D. neohamatus* Zone is considered to approximate the middle upper Miocene boundary (e.g., Bukry, 1973d).

Discoaster hamatus **Zone (age: Middle Miocene)**

The total range of *Discoaster hamatus*. Following Bukry (1973d) the base range of *Catinaster calyculus* within this zone is used to distinguish between an upper *Catinaster calyculus* Subzone and a lower *Helicopontosphaera kamptneri* Subzone.

Catinaster coalitus **Zone (age: Middle Miocene)**

The short interval from the base range of *Catinaster coalitus* to the base range of *Discoaster hamatus*.

Discoaster exilis **Zone (age: Middle Miocene)**

The interval from the top range of *Sphenolithus heteromorphus* to the base range of *Catinaster coalitus*. The interval is a gap zone, however, it is characterized by the presence of *Triquetrorhabdulus rugosus* and *Sphenolithus abies*.

Sphenolithus heteromorphus **Zone (age: Early to Middle Miocene)**

The total range of *Sphenolithus heteromorphus*.

The zone correlates with the *S. heteromorphus* Zone of Gartner (1974). Bukry (1973d) uses the end acme horizon of *Discoaster deflandrei* to subdivide an interval equivalent to the *S. heteromorphus* Zone into two zones. This practice is followed here, but only to differentiate between a lower an an upper part of the zone.

Sphenolithus belemnos **Zone (age: Early Miocene)**

The interval from the base range of *Sphenolithus belemnos* to the base range of *Sphenolithus heteromorphus*. The zone corresponds roughly to the total range of the nominate species.

Triquetrorhabdulus carinatus **Zone (age: Oligocene-Miocene)**

The interval from the top range of *Sphenolithus ciperoensis* to the base range of *Sphenolithus belemnos*. The zone is equivalent to the *T. carinatus* Zone of Bukry (1973d). Criteria for subdividing this zone into three subzones are given in Bukry (1973d) and have been used here. The Oligocene/Miocene boundary lies within this zone.

TABLE 3B
Checklist of Calcareous Nannofossils Recovered at Site 268

Sample (Interval in cm) \ Species	*Ericsonia cava*	*Ericsonia subdisticha*	*Gephyrocapsa caribbeanica*	*Gephyrocapsa oceanica*	*Gephyrocapsa producta*	*Hayaster perplexus*	*Helicopontosphaera compacta*	*Helicopontosphaera heezenii*	*Helicopontosphaera intermedia*	*Helicopontosphaera kamptneri*	*Helicopontosphaera lophata*	*Helicopontosphaera papillata*	*Helicopontosphaera reticulata*	*Helicopontosphaera sellii*	*Helicopontosphaera seminulum*	*Helicopontosphaera wilcoxonii*	*Isthmolithus recurvus*	*Lanternithus minutus*	*Markalius inversus*	*Oolitholithus antillarum*	*Pemma basquense*	*Pemme papillatum*	*Pseudoemiliania lacunosa*	*Reticulofenestra dictyoda*	*Reticulofenestra hampdenensis*	*Reticulofenestra hillae*	*Reticulofenestra oamaruensis*	*Reticulofenestra pseudoumbilica*	*Reticulofenestra samodurovi*	*Reticulofenestra scissura*	*Reticulofenestra scrippsae*	*Reticulofenestra umbilica*	*Rhabdosphaera clavigera*	*Rhabdosphaera morionum*	*Rhabdosphaera spinula*	*Scyphosphaera* spp.	*Sphenolithus abies*	*Sphenolithus conicus*	*Sphenolithus ciperoensis*	*Sphenolithus distentus*	*Sphenolithus furcatolithoides*	*Sphenolithus heteromorphus*	*Sphenolithus obtusus*	*Sphenolithus moriformis*	*Sphenolithus neoabies*	*Sphenolithus predistentus*	*Sphenolithus pseudoradians*	*Sphenolithus radians*	*Sphenolithus spiniger*	*Striatococcolithus pacificanus*	*Syracosphaera labrosa*	*Syracosphaera wechesensis*	*Triquetrorhabdulus carinatus*	*Triquetrorhabdulus inversus*	*Zygrhablithus bijugatus*
1-1, 110-111			+	+	+					+				+																			+																						
1-2, 10-11			+	+	+									+																																									
1-3, 140-141				+						+				cf.														+									+																		
1-4, 105-106				+										+																																									
1-5, 31-32				+						+				+																																									
1, CC			+	+	+					+				+									+										+				+																		
2-1, 129-130			+	+																			+														+																		
2-2, 55-56			+	+																			+																																
2-3, 30-31			+																				+														+			+															
2-3, 80-81			+																				+																																
2-4, 32-33			+	+						+													+														+																+		
2-4, 82-83										+				+									+					+					+																						
1-4, 105-107			+			+				+				+									+					+					+											+											
2-5, 125-126			+																				+																																
2-6, 30-31										+													+																																
2, CC			+																				+																																
3-1																																																							
3-2, 30-31																																																							
3-3, 30-31																																																							
3-4, 95-96																							+																																
3-5, 2																																																							
3-5, 120-121																							+																																
3, CC										+				+						+								+					cf.			+																			
4-1, 120-121										+																		+		+																									
4, CC										+																		+								+	+					+			+										
5-1, 140-141																																																							
5-2, 30-31																																																							
5-3, 30-31																																																							
5-4, 13-14																														+																									
5-5, 30-31																																																							
5-5, 120-121																																												+											
5, CC						+																						+											+	+				+		+									
6-1																														+								+	+							+							+		+
6-2, 15-16																														+								+															+		
6-3, 30-31																																												+									+		+
6-4, 30-31																														+								+	+														+		
6-4, 121-122																														+									+					+									+		
6-5, 35-36																														+														+									+		
6, CC																														+									+	+				+									+		
7-1, 120-121																														+										+				+		+									
7-2, 115-116																														+	+									+				+		+									
7-3, 35-36							+																							+										+				+		+									
7-4, 30-31																														+										+				+		+									

7-5, 35-36	+		+													+				+	+	+					
7-5, 120-121	+															+	+			+	+	+					
7-6, 120-121	+		cf.													+	+			+	+	+	+				
7, CC	+												+			+	+	+			+	+	+				
8-1, 30-31	+		cf.													+	+	+		+	+	+					
8-2, 120-121		+				+						+	+			+	+	+		aff.	+	+					+
8-3, 30-31	+												+			+	+	+		aff.	+	+					
8, CC	+		+									+	+			+	+	+		aff.	+	+	+				+
9-1, 55-56	+	+	+		+	+	aff.		+	+		+	+			+	+	+			+	+	+				
9-2, 8-9		+	+			+	aff.		+				+			+	+	+			+	+				+	
9-2, 45-46	+	+	+		+	+	+	+	+			+	+			+	+	+	+		+	+					
9-2, 125-126	+	+	+	+	+	+			+				+			+	+	+	+		+	+					
9-3, 8-9			cf.						+							+	+	+			+	+	+				
9-3, 85-86			+			+			+				+			+	+	+			+	+					+
9-4, 8-9	+	+	cf.						+							+	+	+			+	+					
9-4, 30-31			cf.													+	+	+			+	+					
9-4, 85-86									+							+		+			+	+					
9-5, 8-9									+							+	+	+			+	+					
9-5, 45-46									+			+	+			+	+	+				+					+
9-5, 65-66									+			+				+	+	+			+	+					
9-5, 110-111									+							+	+	+			+	+					
9, CC			cf.						+					+		+	+	+				+	+				+
10-1, 67-68																+	+	+									
10-1, 125-126	+								+				+			+	+	+									
10-2, 35-36																+	+	+									
10-2, 125-126															+	+		+									
10-3, 30-31	+								+				+		+	+	+	+									
10-3, 120-121															+	+		+									
10-4, 25-26									+				+			+		+									
10-4, 135-136	+								+						+	+	+	+									
10, CC									+							+	+	+									
11-1, 80-81									+							+	+	+									
11-1, 120-121	+		+										+			+		+			+						
11, CC																+	+	+			+	+					
12-2, 31-32									+							+	+										
12-2, 120-121	+															+		+						+			
12, CC																+	+	+									
13-1, 140-141																+	+	+									
13-2, 29-30																		+									
13-2, 119-120	+		+		+											+	+	+			+		+		+		
13, CC																+	+	+			+			+			
14-1, 105-106																+		+									
14-2, 20-21	+										+					+	+	+			+						
14-2, 120-121	+															+	+	+			+						
14, CC	+		+		+							+				+	+	+			+			+			
15-1, 80-81											+					+	+	+			+						
15, CC	+															+		+									
16-1, 90-91									+							+	+	+			+						
16-2, 7-8									+							+	+	+									
16, CC									+							+	+	+			+	+					
17-1, 15-16			cf.		+				+							+	+	+			+						
17-1, 110-111																		+									
17-2, 61-62																		+									
17-2, 97-98																+	+	+			+						
17-2, 133-134																+	+	+			+						
17-3, 36-37																+	+	+				+					
17-3, 120-121																		+									

TABLE 3B – *Continued*

Sample (Interval in cm) \ Species	*Ericsonia cava*	*Ericsonia subdisticha*	*Gephyrocapsa caribbeanica*	*Gephyrocapsa oceanica*	*Gephyrocapsa producta*	*Hayaster perplexus*	*Helicopontosphaera compacta*	*Helicopontosphaera heezenii*	*Helicopontosphaera intermedia*	*Helicopontosphaera kamptneri*	*Helicopontosphaera lophata*	*Helicopontosphaera papillata*	*Helicopontosphaera reticulata*	*Helicopontosphaera sellii*	*Helicopontosphaera seminulum*	*Helicopontosphaera wilcoxonii*	*Isthmolithus recurvus*	*Lanternithus minutus*	*Markalius inversus*	*Oolitholithus antillarum*
17-4, 43-44	+											+								
17-4, 106-108							+	+					+							
17-4, 132-133	+						+					+								
17-5, 59-60							+	+			+		cf.		ff.			+		
17-5, 120-121																				
18-1, 109-110																				
18-2, 112-113																				
18, CC	+							+												
19-1, 95-96	+												+							
19, CC																				
20-1, 136-138							+													
20-2, 130-131																				
20, CC																		+		
21-1, 97-98																				
21-2, 141-142	+																			
21, CC																				
22-1, 128-129	+																			
22-2, 64-71																				
22-3, 118-119																				
22, CC																				
23-1, 127-128																				
23-2, 27-28																				
23-2, 124-125																				
23, CC								+											+	
24-1, 131-132	+																			
24-2, 121-123	+																			
24, CC								+												
25-1, 149-150	+																			
25-2, 140-141	+																			
25-3, 114-115																				
25-4, 56-57																				
25, CC																				
26-1, 131-132																				
26-2, 78-80	+																			
26-3, 119-120	+						+													
26-4, 27-28							+	+												
26, CC																				
27-2, 36-40	+						+	+			+	+								

Sample (Interval in cm) \ Species	*Pemma basquense*	*Pemma papillatum*	*Pseudoemiliania lacunosa*	*Reticulofenestra dictyoda*	*Reticulofenestra hampdenensis*	*Reticulofenestra hillae*	*Reticulofenestra oamaruensis*	*Reticulofenestra pseudoumbilica*	*Reticulofenestra samodurovi*	*Reticulofenestra scissura*	*Reticulofenstra scrippsae*	*Reticulofenestra umbilica*	*Rhabdosphaera clavigera*	*Rhabdosphaera morionum*	*Rhabdosphaera spinula*	*Scyphosphaera* spp.	*Sphenolithus abies*	*Sphenolithus conicus*	*Sphenolithus ciperoensis*	*Sphenolithus distentus*
17-4, 43-44										+		+								
17-4, 106-108										+	+	+								
17-4, 132-133										+	+	+								
17-5, 59-60	+	+								+	+	+		+						
17-5, 120-121										+	+	+								
18-1, 109-110				+						+	+	+								
18-2, 112-113										+		+								
18, CC										+	+	+								
19-1, 95-96				+						+	+	+								
19, CC										+	+	+								
20-1, 136-138				+						+	+	+								
20-2, 130-131				+						+	+									
20, CC										+	+	+								
21-1, 97-98				+						+	+									
21-2, 141-142										+	+	+								
21, CC											+	+								
22-1, 128-129				+						+	+	+								
22-2, 64-71										+	+	+								
22-3, 118-119				+						+	+	+								
22, CC											+	+								
23-1, 127-128																				
23-2, 27-28										+	+	+								
23-2, 124-125											+	+								
23, CC										+		+								
24-1, 131-132				+						+	+	+								
24-2, 121-123				+						+	+	+								
24, CC											+	+								
25-1, 149-150				+						+	+	+								
25-2, 140-141				+						+	+	+								
25-3, 114-115				+						+	+	+								
25-4, 56-57									+	+	+	+								
25, CC											+	+								
26-1, 131-132											+									
26-2, 78-80				+						+	+	+								
26-3, 119-120				+						+	+	+								
26-4, 27-28		+							+		+	+								
26, CC										+	+	+								
27-2, 36-40									+		+	+								

Sample (Interval in cm) \ Species	*Sphenolithus furcatolithoides*	*Sphenolithus heteromorphus*	*Sphenolithus obtusus*	*Sphenolithus moriformis*	*Sphenolithus neoabies*	*Sphenolithus predistentus*	*Sphenolithus pseudoradians*	*Sphenolithus radians*	*Sphenolithus spiniger*	*Striatococcolithus pacificanus*	*Suracosphaera labrosa*	*Syracosphaera wechesensis*	*Triquetrorhabdulus carinatus*	*Triquetrorhabdulus inversus*	*Zyghablithus bijugatus*
17-4, 43-44				+											
17-4, 106-108				+											+
17-4, 132-133				+											
17-5, 59-60				+		+	+								+
17-5, 120-121															+
18-1, 109-110															
18-2, 112-113															
18, CC				+											
19-1, 95-96														+	
19, CC			+	+				+							
20-1, 136-138				+								+			
20-2, 130-131				+											
20, CC			+	+											
21-1, 97-98				+											
21-2, 141-142				+											
21, CC				+											
22-1, 128-129				+											
22-2, 64-71				+											
22-3, 118-119				+											
22, CC															
23-1, 127-128															
23-2, 27-28				+								+			+
23-2, 124-125															
23, CC			+					+						+	+
24-1, 131-132				+											
24-2, 121-123				+											+
24, CC			+					+							
25-1, 149-150				+											
25-2, 140-141				+											
25-3, 114-115				+											
25-4, 56-57															
25, CC															
26-1, 131-132															
26-2, 78-80				+											
26-3, 119-120				+				+							+
26-4, 27-28				+											
26, CC			+												
27-2, 36-40				+											

27, CC		+	+	+			+	+	+				+	+	
28-1, 108-109															
28-2, 118-119							+								
28, CC							+	+							
29-1, 133-136							+		+						
29-2, 101-103			+	+			+	+	+					+	+
29-3, 135-135															
29-4, 135-137							+	+	+						
29-5, 132-133							+	+							+
29, CC							+	+	+						+
30-1, 77-79															
30, CC	+	+	+		+	+	+				+				+
31-1, 121-123							+								+
31-2, 26-27				+							+				+
31-2, 113-114				+			+				+				+
31, CC							+				+				
32-1, 30-31		+	+	+											+
32-2, 43-44			+	+	+	+	+				+	+			+
32-2, 110-111															
33-1, 110-111							+			+					
33-2, 131-132							+			+					
33, CC			+	+	+		+			+					+

Sphenolithus ciperoensis **Zone (age: Late Oligocene)**

The total range of the nominate species.

Sphenolithus distentus **Zone (age: Late Oligocene)**

The interval from the evolutionary base of *Sphenolithus distentus* (phyletic emergence from its ancestor *Sphenolithus predistentus* to the evolutionary base of *Sphenolithus ciperoensis* (phyletic emergence from *distentus*). The zone correlates with the *S. distentus* of Bukry (1973d).

Sphenolithus predistentus **Zone (age: Early Oligocene)**

The interval from the top range of *Reticulofenestra umbilica* or its late sibling *R. hillae* to the evolutionary base of *Sphenolithus distentus*.

Reticulofenestra hillae **Zone (age: Early Oligocene)**

The interval from the top range of *Cyclococcolithina formosa* to the top range of *Reticulofenestra hillae* or *R. umbilica*.

Cyclococcolithina formosa **Zone (age: Early Oligocene)**

The interval from the top range of *Discoaster barbadiensis* or *D. saipanensis* to the range of *Cyclococcolithina formosa*.

Discoaster barbadiensis **Zone (age: Late Eocene)**

The interval from the top range of *Chiasmolithus grandis* to the top range of *Discoaster barbadiensis* or *D. saipanensis*.

The top range of *Cyclicargolithus reticulatus* is within this zone. The event proved to be useful in the biostratigraphy of the southern margin of Australia. On this evidence, a differentiation between a lower and upper *D. barbadiensis* Zone is achieved (e.g., Site 286).

This zone correlates with the combined *Chiasmolithus oamaruensis* and *Isthmolithus recurvus* zones usually recognized in extratropical near-shore facies, e.g., southern margin of Australia.

The Eocene/Oligocene boundary is tentatively placed at the top of the *D. barbadiensis* Zone.

Discoaster saipanensis **Zone (age: Middle Eocene)**

The interval from the top range of *Chiasmolithus solitus* to the top range of *Chiasmolithus grandis*.

The top range of *C. grandis* is taken as the middle/upper Eocene boundary.

Cyclicargolithus reticulatus **Zone (age: Middle Eocene)**

The interval from the base range of *Cyclicargolithus reticulatus* to the top range of *Chiasmolithus solitus*.

Reticulofenestra umbilica **Zone (age: Middle Eocene)**

The interval from the base range of *Reticulofenestra umbilica* to the base range of *Cyclicargolithus reticulatus*.

Chiasmolithus gigas **Zone (age: Middle Eocene)**

The interval from the base range of *Chiasmolithus gigas* to the base range of *Reticulofenestra umbilica*. This zone is equivalent to the combined *C. gigas* and *Coccolithus staurion* subzones of Bukry (1973d).

TABLE 4
Checklist of Calcareous Nannofossils Recovered at Site 287

Sample (Interval in cm) \ Species	*Braarudosphaera bigelowi*	*Braarudosphaera discula*	*Campylosphaera dela*	*Campylosphaera eodela*	*Ceratolithus cristatus*	*Ceratolithus rugosus*	*Chiasmolithus consuetus*	*Chiasmolithus expansus*	*Chiasmolithus gigas*	*Chiasmolithus grandis*	*Chiasmolithus solitus*	*Coccolithus cribellum*	*Coccolithus eopelagicus*	*Coccolithus magnicrassus*	*Coronocyclus serratus*
8-1, 10-11					+	+									
8-1, 120-121															
10-1, 120-121															
10-2, 4-5													+		
10-2, 70-71													+		
10-2, 120-121												+	+		
10-3, 8-9												+	+		
10-3, 120-121													+		
10-4, 30-31													+		+
10-4, 120-121													+		+
10, CC													+		+
11-0													+		+
11-0		+						+	+	+	+	+	+		
11-1, 30-31									+	+	+	+	+		
11-1, 120-121									+	+					
11-2, 30-31								+	+	+					
11-2, 120-121									+	+					
11-3, 30-31									+	+					
11-3, 120-121									+	+	+				
11-4, 30-31	+		+						+	+	+				
11-4, 109-110			+							+	+				
11-5, 30-31										+					
11-5, 118-119			+					+		+					
11-6, 1-3								+	+	+	+				
11, CC									+	+	+		+		
12-1, 100-101		+						+		+	+				
12-2, 30-31			+							+					
12-2, 120-121										+	+				
12-3, 30-31								+		+	+		+		
12-3, 120-121			+						cf.	+	+	cf.			
12-4, 30-31			+						cf.	+	+		+		
12-4, 120-121										+	+				
12-5, 30-31									cf.	+	+				
12-5, 120-121										+	+				
12, CC										+	+				
13-1, 145-146										+	+		+		
13-2, 30-31										+	+				
13-2, 120-121								+		+	+				
13-3, 30-31										+	+				
13-3, 120-121										+	+		+		
13, CC										+	+		+		
14-1, 100-101										+	+				
14-2, 30-31			+							+	+		+		
14-2, 120-121										+	+		+		
14-3, 30-31										+	+		+	+	
14-3, 120-121										+	+				
14, CC			+							+	+			+	
15-1, 100-101										+	+		+	+	
15-2, 30-31			+				+			+	+			+	
15-2, 120-121			+							+	+			+	
15, CC										+	+		+		
16-1				+			+			+					

Sample (Interval in cm) \ Species	*Cruciplacolithus staurion*	*Cyclicargolithus abisectus*	*Cyclicargolithus floridanus*	*Cyclicargolithus gammation*	*Cyclicargolithus pseudogammation*	*Cyclococcolithina formosa*	*Cyclococcolithina leptopora*	*Cyclococcolithina macintyrei*	*Cyclococcolithina protoannula*	*Discoaster asymmetricus*	*Discoaster barbadiensis*	*Discoaster berggrenii*	*Discoaster binodosus*	*Discoaster brouweri*	*Discoaster decorus*
8-1, 10-11		+					+	+		+		+		+	+
8-1, 120-121									BARREN						
10-1, 120-121		?	?												
10-2, 4-5		+	+												
10-2, 70-71		+	+												
10-2, 120-121		+	+												
10-3, 8-9		+	+												
10-3, 120-121		+	+												
10-4, 30-31		+	+												
10-4, 120-121		+	+												
10, CC		+	+												
11-0		+	+												
11-0					+	+					+				
11-1, 30-31					+	+			+		+				
11-1, 120-121	+				+	+					+				
11-2, 30-31	+				+	+					+				
11-2, 120-121					+	+					+				
11-3, 30-31	+				+	+			+		+				
11-3, 120-121						+			+		+				
11-4, 30-31						+					+				
11-4, 109-110	+					+					+				
11-5, 30-31	+					+			+		+				
11-5, 118-119	+					+					+				
11-6, 1-3	+					+			+		+				
11, CC					+	+			+		+				
12-1, 100-101	+					+					+				
12-2, 30-31	+				+	+			+		+				
12-2, 120-121	+					+			+		+				
12-3, 30-31	+					+			+		+				
12-3, 120-121	+					+					+				
12-4, 30-31						+			+		+				
12-4, 120-121						+					+				
12-5, 30-31	+					+			+		+				
12-5, 120-121						+					+				
12, CC						+			+		+				
13-1, 145-146						+					+				
13-2, 30-31					+	+					+				
13-2, 120-121					+	+			+		+				
13-3, 30-31	+					+			+		+				
13-3, 120-121						+			+		+				
13, CC	+					+					+				
14-1, 100-101						+			+		+				
14-2, 30-31						+					+				
14-2, 120-121						+					+				
14-3, 30-31			cf.			+			+		+				
14-3, 120-121					+	+					+				
14, CC						+					+				
15-1, 100-101					+	+			+		+				
15-2, 30-31					+	+					+				
15-2, 120-121				+		+					+				
15, CC						+					+				
16-1											+		+		

Sample (Interval in cm) \ Species	*Discoaster deflandrei*	*Discoaster diastypus*	*Discoaster distinctus*	*Discoaster gemmifer*	*Discoaster lodoensis*	*Discoaster mirus*	*Discoaster multiradiatus*	*Discoaster nobilis*	*Discoaster nodifer*	*Discoaster nonradiatus*	*Discoaster ornatus*	*"Discoaster" pentaradiatus*	*Discoaster saipanensis*	*Discoaster sublodoensis*	*Discoaster surculus*	*Discoaster tamalis*	*Discoaster tani*	*Discoaster wemmelensis*
8-1, 10-11												+			+	+		
8-1, 120-121																		
10-1, 120-121	?																	
10-2, 4-5																		
10-2, 70-71																		
10-2, 120-121	+																	
10-3, 8-9	+																	
10-3, 120-121																		
10-4, 30-31																		
10-4, 120-121	+																	
10, CC	+																	
11-0	+								+									
11-0						+							+				+	
11-1, 30-31	F		+			+					+		+				+	
11-1, 120-121									+									
11-2, 30-31					cf.	+							+				+	
11-2, 120-121					+	+					+		+				+	
11-3, 30-31													+				+	
11-3, 120-121	aff.					+							+				+	
11-4, 30-31	aff.			+		+							+				+	
11-4, 109-110			+			+							+				+	
11-5, 30-31				+									+				+	
11-5, 118-119	+			cf.						+							+	
11-6, 1-3	+			+									+				+	
11, CC													+					
12-1, 100-101				cf.					+				+					
12-2, 30-31				+					+				+	+			+	+
12-2, 120-121				cf.									+				+	
12-3, 30-31				+														+
12-3, 120-121				+									+				+	
12-4, 30-31				+									+				+	
12-4, 120-121						+											+	
12-5, 30-31						+								+			+	
12-5, 120-121						+							+	+			+	
12, CC						+				+	+			+				
13-1, 145-146													+				+	
13-2, 30-31					+	+								+			+	+
13-2, 120-121						+							+	+			+	
13-3, 30-31	+				+	+				+			+				+	
13-3, 120-121													+	+			+	
13, CC						+				+				+			+	+
14-1, 100-101						+							+	+			+	
14-2, 30-31						+				+	+			+				
14-2, 120-121														+				
14-3, 30-31						+				+			+	+				
14-3, 120-121						+								+			cf.	
14, CC						+					+			+				
15-1, 100-101						+								+				
15-2, 30-31			+		+	+			+	+				+				
15-2, 120-121						+								+				
15, CC					+	+								+				
16-1		+					+	+										

Nannotetrina fulgens **Zone (age: Middle Eocene)**

The interval from the base range of *Nannotetrina fulgens* to the base range of *Chiasmolithus gigas*. The zone is equivalent to the *Discoaster strictus* Subzone of Bukry (1973d).

Discoaster sublodoensis **Zone (age: Early to Middle Eocene)**

The interval from the base range of *Discoaster sublodoensis* to the base range of *Nannotetrina fulgens*.

Following Bukry (1973d), this zone is subdivided into the *Rhabdosphaera inflata* and *Discoasteroides kuepperi* subzones on the initial appearance of *R. inflata*. Where recognized this event locates the middle/lower Eocene boundary.

Discoaster lodoensis **Zone (age: Early Eocene)**

The interval from the top of abundant *Tribrachiatus orthostylus* to the base range of *Discoaster sublodoensis*. The older event is the extinction of *T. orthostylus* of

TABLE 4 – *Continued*

Discoasteroides kuepperi	*Discoasteroides megastypus*	*Discolithina japonica*	*Ellipsolithus lajollaensis*	*Ellipsolithus macellus*	*Ericsonia cava*	*Hayaster perplexus*	*Helicopontosphaera kamptneri*	*Helicopontosphaera lophota*	*Helicopontosphaera sellii*	*Helicopontosphaera seminulum*	*Holodiscolithus macroporus*	*Markalius astroporus*	*Markalius inversus*	*Micrantholithus crenulatus*	*Nannotetrina acanthodes*	*Nannotetrina calatha*	*Nannotetrina cristata*	*Nannotetrina fulgens*	*Nannotetrina pappii*	*Pseudoemiliania lacunosa*	*Reticulofenestra dictyoda*	*Reticulofenestra samodurovi*	*Reticulofenestra scissura*	*Reticulofenestra scrippsae*	*Rhabdosphaera inflata*	*Rhabdosphaera procera*	*Scapholithus fossilis*	*Sphenolithus abies*	*Sphenolithus ciperoensis*	*Sphenolithus distentus*	*Sphenolithus furcatolithoides*	*Sphenolithus moriformis*	*Sphenolithus neoabies*	*Sphenolithus predistentus*	*Sphenolithus pseudoradians*	*Sphenolithus radians*	*Striatococcolithus pacificanus*	*Thoracosphaera prolata*	*Toweius craticulatus*	*Toweius eminens*	*Tribrachiatus orthostylus*	*Triquetrorhabdulus carinatus*	*Triquetrorhabdulus inversus*	*Zygolithus dubius*	*Zygolithus protenus*	*Zygrhablithus bijugatus*	*Zygrhablithus crassus*
		+				+	+		+		+									+			+			+	+	+				+	+									+					
																									Barren				?													?					
					+																								+			+														+	
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																+					+															+							+			+	
	+			+								+																								+			+	+	+						

several authors, but observations support Bukry's (1973d) suggestion that the event is rather a sharp drop in abundance.

Tribrachiatus orthostylus **Zone (age: Early Eocene)**

The interval from the base range of *Discoaster lodoensis* to the top abundance of *Tribrachiatus orthostylus.*

Discoaster diastypus **Zone (age: Early Eocene)**

The interval from the base of *Discoaster diastypus* to the base range of *Discoaster lodoensis.*

The base of this zone is taken as the Eocene/Paleocene boundary.

Discoaster multiradiatus **Zone (age: Late Paleocene)**

The interval from the base range of *Discoaster multiradiatus* to the base range of *Discoaster diastypus.*

Discoaster nobilis **Zone (age: Middle Paleocene)**

The interval from the base range of *Discoaster nobilis* to the base range of *Discoaster multiradiatus*. This zone has not been identified in Leg 30 material.

TABLE 5A
Checklist of Calcareous Nannofossils Recovered at Site 288

Sample (Interval in cm) \ Species	*Braarudosphaera bigelowi*	*Bramletteius serraculoides*	*Catinaster calyculus*	*Catinaster coalitus*	*Ceratolithus amplificus*	*Ceratolithus cristatus*	*Ceratolithus primus*	*Ceratolithus rugosus*	*Ceratolithus tricorniculatus*	*Chiasmolithus consuetus*	*Chiasmolithus danicus*	*Chiasmolithus titus*	*Coccolithus cribellum*	*Coccolithus eopelagicus*	*Coccolithus miopelagicus*	*Coccolithus pelagicus*	*Coronocyclus serratus*	*Cruciplacolithus tenuis*	*Cyclicargolithus abisectus*	*Cyclicargolithus floridanus*	*Cyclicargolithus reticulatus*	*Cyclococcolithina formosa*	*Cyclococcolithina leptopora*	*Cyclococcolithina macintyrei*	*Cyclococcolithina robusta*	*Discoaster asymmetricus*	*Discoaster barbadiensis*	*Discoaster bellus*	*Discoaster berggrenii*	*Discoaster bollii*	*Discoaster braarudii*	*Discoaster brouweri*	*Discoaster calcaris*	*Discoaster decorus*	*Discoaster deflandrei*	*Discoaster druggii*	*Discoaster exilis*	*Discoaster hamatus*	*Discoaster lidzi*	*Discoaster moorei*	*Discoaster neohamatus*	*Discoaster neorectus*	*Discoaster pansus*	*"Discoaster" pentaradiatus*	*Discoaster prepentaradiatus*	*Discoaster quinqueramus*	*Discoaster saipanensis*	*Discoaster signus*	*Discoaster surculus*	*Discoaster tamalis*	*Discoaster tani*
1-1, 30-31						+		cf.															+																												
1-2, 30-31						+		cf.															+																												
1, CC						+		cf.															+																												
2-1, 143-144						+		cf.															+																												
2-2, 30-31																							+																												
2-3, 30-31																							+	+					+															+		+			+		
2-3, 77-79																+							+	+					+			+												+		+			+		
2-4, 30-31																																																			
2-5, 30-31						+		+								+							+	+				+				+												+					+		
2, CC					+			+								+							+	+				+	+			+		+	+		+				+			+		+			+	+	
3-1, 50-51							+	+	+							+							+	+		+		+	+			+						+						+		+			+	+	
3-2, 8-9						+		+								+							+	+		+						+												+						+	
3-3, 8-9								+								+							+	+		+		+	+			+												+		+			+	+	
3-4, 20-21					+		+																+	+				+	+			+									+	+		+		+			+		
3-5, 20-21					+		+									+							+	+					+			+									+	+		+		+			+	+	
3-6, 30-31					+		+	+	+							+							+	+				+	+			+										+		+		+			+	+	
3, CC						+		+								+							+	+		+						+		+			+			+				+		+			+	+	
4-1, 70-71								+								+							+	+		+						+		+								+		+		+			+	+	
4-2, 30-31						+		+								+							+	+								+												+					+		
4-2, 120-121					+			+								+							+	+					+			+		+								+		+		+			+		
4, CC						+		+															+	+		+						+		+										+		+			+	+	
5-1, 30-31						+										+							+	+								+																			
5-2, 30-31						+										+							+									+			+																
5-3, 30-31						+										+							+	+								+			+																
5-4, 30-31						+		+								+				+			+	+								+			+																
5-5, 30-31						+		+								+							+	+		+						+			+	+															
5-6, 30-31								+								+							+									+			+																
5, CC						+		+															+	+								+											+	+							
6-1, 120-121					+		+																+	+					+													+				+			+		
6-2, 30-31			+																										+												+					+			+		
6-3, 30-31							+		+							+							+	+		+		+	+					+							+	+	+	+		+			+		
6-4, 30-31									+							+							+	+		+			+		+			?							+	+		+		+			+		
6-5, 30-31							+		+							+							+	+				+	+			+									+	+		+		+			+		
6-6, 30-31			+				+									+							+	+				+	+		+						+			+	+	+	+	+		+			+		
6, CC																							+	+		+															+	+	+	+		+					
7-1, 132-133																+							+	+		+		+												+	+	+	+	+		+					
7-2, 120-121			+																				+	+				+		+			+				+	+		+	+	+	+		+				+		

7, CC			+																				+					+		+		+	+				+	+		+	+	+	+	+	+				+		
8-1, 33-34			+																				+	+				+										+													
8-1, 118-119			+	+											+								+	+				+										+			+		+								
8, CC															+								+	+													+						cf.					+			
9-1, 31-32																							+																	+								+			
9-1, 105-106															+																	+			+	+	+														
9, CC															+								+													+															
10-1, 94-95															+		+						+								+				+																
10-2, 22-23															+		+			+											+																				
10-2, 123-124														+						+															+		+														
10, CC														+					+	+															+																
11-1, 79-80															+		+		+	+															+	+															
11-2, 38-39		+												+	+				+	+			+												+	+	+														
11, CC															+		+		+	+															+	+	+														
1A-1, 39-40															+				+	+															+	+															
1A-2, 25-26															+		+			+															+	+			+												
1A-3, 47-48														+	+					+															+	+			+												
1A, CC														+	+		+			+															+	+			+												
2A-1, 134-135															+				+	+															+	?			+												
2A-2, 67-68														+	+					+															+																
2A-2, 131-132															+				+	+															+																
2A, CC														+	+				+	+																															
3A-1, 110-111														+					+																																
3A-2, 25-26														+					+	+															+																
3A-2, 124-125														+					+	+															+																aff.
3A, CC														+					+	+																															
4A-1, 100-101														+			+		+	+																															
4A-2, 5-6																																																			
4A-2, 100-101														+					+	+																															
4A, CC														+						+																															
5A-1, 80-82														+						+															+																+
5A-1, 124-129														+						+															+																+
5A, CC														+					?	+															+																+
6A-1, 9-10														+						+															+																+
6A-1, 74-76													+	+						+															+																
6A-1, 115-116														+						+															+																+
6A-2, 96-99	+	+										+		+						+	+	+					+								+												aff.				+
8A-1, 102-104										+								+							+																										
8A-1, 131-132																		+							+																										
8A-2, 13-14										+								+							+																										
8A-2, 30-31										+								+							+																										
8A-2, 102-103											+							+							+																										
8A-2, 122-123											+							+																																	
8A-2, 134-135										?	?																																								
8A-2, 138-139																		+																																	
8A, CC																		+																																	

TABLE 5B
Checklist of Calcareous Nannofossils Recovered at Site 288.

Sample (Interval in cm) \ Species	*Discoaster trinidadensis*	*Discoaster triradiatus*	*Discoaster variabilis*	*Discoasteroides* sp.	*Ellipsolithus* cf. *macellus*	*Emiliania huxleyi*	*Ericsonia cava*	*Fasciculithus* cf. *involutus*	*Fasciculithus* cf. *tympaniformis*	*Gephyrocapsa caribbeanica*	*Gephyrocapsa lumina*	*Gephyrocapsa oceanica*	*Gephyrocapsa producta*	*Hayaster perplexus*	*Helicopontosphaera compacta*	*Helicopontosphaera granulata*	*Helicopontosphaera kamptneri*	*Helicopontosphaera sellii*	*Heliolithus kleinpellii*	*Heliolithus* sp.
1-1, 30-31						+				+		+					+	+		
1-2, 30-31						+				+		+					+	+		
1, CC						+				+		+					+	+		
2-1, 143-144										+		+					+	+		
2-2, 30-31																	+	+		
2-3, 30-31												cf.								
2-3, 77-79										+							+			
2-4, 30-31																				
2-5, 30-31		+	+							+	+						+	+		
2, CC		+	+							?	?					+	+	+		
3-1, 50-51		+	+											+			+	+		
3-2, 8-9		+	+											+			+	+		
3-3, 8-9		+												+			+			
3-4, 20-21		+												+			+			
3-5, 20-21		+	+											+			+			
3-6, 30-31		+	+											+			+	+		
3, CC		+	+											+			+	+		
4-1, 70-71		+	+											+			+			
4-2, 30-31			+							+				+			+	+		
4-2, 120-121		+	+										+				+	+		
4, CC											+						+			
5-1, 30-31			+										+	+			+	+		
5-2, 30-31		+															+	+		
5-3, 30-31																	+	+		
5-4, 30-31																	+	+		
5-5, 30-31		+	+														+	+		
5-6, 30-31			+															+		
5, CC																	+	+		
6-1, 120-121		+	+													+	+			
6-2, 30-31																				
6-3, 30-31		+	+														+			
6-4, 30-31		+	+														+			
6-5, 30-31		+	+														+			
6-6, 30-31		+	+											+		+				
6, CC														+						
7-1, 132-133		+	+											+		+	+			
7-2, 120-121		+	+																	
7, CC		+	+														+			

Sample (Interval in cm) \ Species	*Heliolithus concinnus*	*Markalius astroporus*	*Minylitha convallis*	*Oolitholithus antillarum*	*Orthorhabdus serratus*	*Pseudoemiliania lacunosa*	*Reticulofenestra pseudoumbilica*	*Reticulofenestra scissura*	*Reticulofenestra scrippsae*	*Reticulofenestra* sp.	*Reticulofenestra umbilica*	*Rhabdosphaera clavigera*	*Scapholithus fossilis*	*Scyphosphaera apsteinii*	*Scyphosphaera globulata*	*Scyphosphaera intermedia*	*Sphenolithus abies*	*Sphenolithus* aff. *ciperoensis*	*Sphenolithus conicus*	*Sphenolithus* cf. *delphix*
1-1, 30-31													+							
1-2, 30-31													+							
1, CC												+								
2-1, 143-144						+														
2-2, 30-31						+							+							
2-3, 30-31						+	+										+			
2-3, 77-79						+	+										+			
2-4, 30-31																				
2-5, 30-31				+		+	+							+	+		+			
2, CC			+	+		+	+						+	+	+		+			
3-1, 50-51				+			+							+			+			
3-2, 8-9				+		+								+						
3-3, 8-9							+							+			+			
3-4, 20-21			+				+							+			+			
3-5, 20-21			+				+							+			+			
3-6, 30-31				+			+							+	+		+			
3, CC						+	+							+			+			
4-1, 70-71				+		+	+							+	+		+			
4-2, 30-31						+	+													
4-2, 120-121						+	+							+	+		+			
4, CC						+	+							+						
5-1, 30-31				+		+								+						
5-2, 30-31						+														
5-3, 30-31						+											+			
5-4, 30-31						+								+						
5-5, 30-31				+		+														
5-6, 30-31						+								+			+			
5, CC						+	+					+			+					
6-1, 120-121																				
6-2, 30-31																				
6-3, 30-31			+				+										+		+	
6-4, 30-31			+														+			
6-5, 30-31							+										+			
6-6, 30-31			+				+										+			
6, CC			+																	
7-1, 132-133			+														+			
7-2, 120-121																				
7, CC			+				+										+			

Sample (Interval in cm) \ Species	*Sphenolithus distentus*	*Sphenolithus heteromorphus*	*Sphenolithus moriformis*	*Sphenolithus neoabies*	*Sphenolithus predistentus*	*Sphenolithus pseudoradians*	*Thoracosphaera heimi*	*Thoracosphaera saxea*	*Triquetrorhabdulus carinatus*	*Triquetrorhabdulus milowii*	*Triquetrorhabdulus rugosus*	*Zygodiscus sigmoides*	*Zygrhablithus bijugatus*	*Zygrhablithus crassus*
1-1, 30-31							+	+						
1-2, 30-31							+	+						
1, CC								+						
2-1, 143-144								+						
2-2, 30-31							+	+						
2-3, 30-31				+										
2-3, 77-79											+			
2-4, 30-31														
2-5, 30-31		+	+	+										
2, CC			+	+							+			
3-1, 50-51			+	+							+			
3-2, 8-9														
3-3, 8-9			+	+							+			
3-4, 20-21			+	+							+			
3-5, 20-21			+	+							+			
3-6, 30-31			+	+							+			
3, CC			+	+							+			
4-1, 70-71			+								+			
4-2, 30-31			+											
4-2, 120-121			+	+							+			
4, CC											+			
5-1, 30-31														
5-2, 30-31														
5-3, 30-31														
5-4, 30-31			+											
5-5, 30-31														
5-6, 30-31		+												
5, CC				+				+						
6-1, 120-121											+			
6-2, 30-31											+			
6-3, 30-31			+	+							+			
6-4, 30-31				+							+			
6-5, 30-31			+	+							+			
6-6, 30-31											+			
6, CC											+			
7-1, 132-133				+							+			
7-2, 120-121											+			
7, CC											+			

8-1, 33-34			+																																+		
8-1, 118-119			+						+		+							+					+							+					+		
8, CC			+			+					+							+					+						+					+	+		
9-1, 31-32		+	+			+					+							+					+							+				+	+		
9-1, 105-106		+	+			+					+							+					+							+					+		
9, CC																	+	+					+						+								
10-1, 94-95			+			+						+					+	+				+	+												+		
10-2, 22-23			+								+							+					+										+		+		
10-2, 123-124						+					+							+					+					+	+								
10, CC	+																		+				+		+			+	+				+				
11-1, 79-80						+																							+				+				
11-2, 38-39	+																	+	+										+				+				
11, CC			+																+									+					+				
1A-1, 39-40			+			+																	+		+	+			+		+		+				
1A-2, 25-26			+																										+				+				
1A-3, 47-48			+																										+		+		+				
1A, CC	+		+																						+								+				
2A-1, 134-135			+			+																							+				+				
2A-2, 67-68																									+	+			+				+				
2A-2, 131-132						+																			+				+				+				
2A, CC	+																								+	+			+				+				
3A-1, 110-111																								+			+		+		+	+	+				
3A-2, 25-26																													+		+		+				+
3A-2, 124-125						+																		+			+		+		+						
3A, CC	+																										+		+		+						
4A-1, 100-101																											+		+		+						+
4A-2, 5-6																																					
4A-2, 100-101																											+		+		+						
4A, CC																											+		+		+						
5A-1, 80-82						+																					aff.		+		+	+					+
5A-1, 124-129										+									+								?		+		+	+					
5A, CC										+									+	+							?		+		+	+					+
6A-1, 9-10						+													+	+									+		+						
6A-1, 74-76																			+	+									+		+						
6A-1, 115-116						+													+	+	+								+		+						
6A-2, 96-99										+									+	+	+								+		+	+					
8A-1, 102-104						+									+																					+	
8A-1, 131-132																																				+	
8A-2, 13-14				+	+	+	+						+	+	+																					+	
8A-2, 30-31							+	+					cf.	+																						+	
8A-2, 102-103													cf.	+																							
8A-2, 122-123															+																						
8A-2, 134-135								?						+																							
8A-2, 138-139																																					
8A, CC																+																					

TABLE 6A
Checklist of Cenozoic Calcareous Nannofossils Recovered at Site 289

Sample (Interval in cm) \ Species	*Bramletteius serraculoides*	*Catinaster calyculus*	*Catinaster coalitus*	*Ceratolithus acutus*	*Ceratolithus amplificus*	*Ceratolithus bizzarus*	*Ceratolithus cristatus*	*Ceratolithus primus*	*Ceratolithus rugosus*	*Chiasmolithus bidens*	*Chiasmolithus californicus*	*Chiasmolithus gigas*	*Chiasmolithus grandis*	*Chiamolithus solitus*	*Coccolithus bisulcus*	*Coccolithus cribellum*	*Coccolithus eopelagicus*	*Coccolithus magnicrassus*	*Coccolithus miopelagicus*	*Coccolithus pelagicus*	*Coronocyclus serratus*	*Cruciplacolithus tenuis*	*Cyclicargolithus abisectus*	*Cyclicargolithus floridanus*	*Cyclicargolithus reticulatus*	*Cyclococcolithina formosa*	*Cyclococcolithina gammation*	*Cyclococcolithina leptopora*	*Cyclococcolithina macintyrei*	*Cyclococcolithina protoannula*	*Cyclococcolithina robusta*	*Discoaster aster*	*Discoaster asymmetricus*	*Discoaster barbadiensis*	*Discoaster bellus*	*Discoaster berggrenii*	*Discoaster brouweri*	*Discoaster calcaris*	*Discoaster challengeri*	*Discoaster decorus*	*Discoaster deflandrei*	*Discoaster diastypus*	*Discoaster druggii*	*Discoaster exilis*	*Discoaster formosus*	*Discoaster hamatus*	*Discoaster kugleri*	*Discoaster lidzi*	*Discoaster lodoensis*	*Discoaster mohleri*	*Discoaster multiradiatus*	*Discoaster neohamatus*	*Discoaster neorectus*	*Discoaster nobilis*	*Discoaster nodifer*	*Discoaster ornatus*	*Discoaster pansus*	*"Discoaster" pentaradiatus*	*Discoaster prepentaradiatus*	*Discoaster quinqueramus*	*Discoaster rutellus*
1-1, 30-31							+																					+																																	
1-2, 30-31							+																					+																																	
1-3, 30-31							+																					+																																	
1-4, 30-31																												+																																	
1-5, 30-31							+																					+																																	
1-6, 30-31																																																													
1, CC							+																					+																																	
2-1, 30-31							+																					+																																	
2-2, 25-26							+																					+																																	
2-3, 30-31							+																					+																																	
2-4, 30-31							+																					+																																	
2-5, 30-31																												+																																	
2-6, 30-31																												+																																	
2-6, 120-121																												+	+																																
2, CC							+		cf.											+								+																																	
3-1, 30-31							+													+								+																																	
3-2, 30-31							+													+								+																																	
3-3, 30-31																												+																																	
3-4, 30-31																												+																																	
3-5, 30-31																												+																																	
3-6, 30-31							+																																																						
3, CC							+																					+																																	
4-1, 120-121																												+																																	
4-2, 30-31																												+																																	
4-3, 30-31																												+																																	
4-3, 110-111																												+	+																																
4-4, 30-31							+		+																			+	+																																
4-5, 30-31							+		+																			+	+																																
4-6, 30-31							+		+											+								+	+								+																								
4-6, 120-121									+											+								+	+																																
4, CC																				+								+	+								+																								
5-1, 30-31							+													+								+									+																								
5-2, 30-31							+		+											+								+	+								+																								
5-3, 30-31							+													+								+	+								+																								
5-4, 30-31									+											+								+	+								+																								
5-5, 30-31									cf.											+								+	+								+																								
5-6, 30-31									+											+									+				+				+																								
5, CC							+													+									+								+																					?			
6-1, 40-41							+													+									+								+																								
6-2, 30-31																				+								+	+								+																								
6-3, 30-31							+		+											+								+									+																								
6-4, 30-31									+											+								+	+								+																								
6-5, 30-31									+											+								+	+				+				+																								
6-6, 25-26									+											+								+	+								+																					?			
6, CC																				+								+	+								+																								

7-1, 30-31							+	+	+	+		+						
7-2, 35-36						+	+	+	+	+		+					?	
7-2, 120-121						+	+	+	+	+		+					+	+
7-3, 30-31						+	+	+	+	+		+					+	
7-4, 30-31						+	+	+	+			+					+	
7-5, 30-31							+	+	+	+		+					+	
7-6, 30-31						+	+	+	+	+		+					+	
7, CC				+		+	+	+	+	+		+					+	+
8-1, 35-36						+	+	+	+	+		+		+			+	+
8-1, 120-121						+	+		+	+	+	+		+			+	+
8-2, 30-31				+			+	+	+	+				+			+	
8-3, 30-31							+	+		+		+		+			+	
8-4, 30-31						+		+	+	+				+				
8-5, 30-31				+				+	+	+		+		+			+	
8-6, 30-31								+	+	+		+		+			+	
8, CC								+	+	+		+		+			+	
9-1, 120-121						+		+	+	+		+					+	
9-2, 30-31								+		+		+		+			+	
9-3, 30-31						+		+	+	+		+		+			+	
9-4, 30-31						+		+	+	+		+		+			+	
9-5, 30-31						+		+		+		+					+	
9-6, 30-31						+			+	+		+		+			+	
9, CC								+	+			+					+	
10-1, 65-66						+		+	+	+		+	+	+			+	
10-1, 120-121						+		+	+	+		+		+			+	
10-2, 30-31						+		+	+	+		+	+	+			+	
10-2, 120-121								+	+			+		+			+	
10-3, 30-31						+		+	+	+		+		+			+	
10-4, 30-31						+		+	+	+		+	+				+	
10-5, 30-31						+		+	+	+		+	+				+	
10, CC						+		+	+	+							+	
11-1, 30-31						+		+	+	+		+					+	
11-2, 30-31						+		+	+				+				+	
11-3, 20-21						+		+	+	+		+					+	
11-4, 30-31						+		+	+	+		+	+				+	
11-5, 30-31						+		+	+	+		+	+	+			+	
11, CC						+		+	+			+					+	
12-2, 30-31						+		+				+					+	
12-3, 30-31					cf.	+		+	+	+		+	+	cf.			+	
12-4, 30-31						+			+	+		+					+	
12-5, 30-31						+	cf.	+	+			+	+		cf.		+	
12-6, 30-31								+				+					+	
12, CC				+		+			+			+					+	
31-1, 120-121								+	+	+	cf.	+					+	
13-2, 30-31						+		+	+	+		+					+	
13-3, 30-31						+		+	+			+					+	
13-4, 30-31						+		+	+	+		+					+	
13, CC						+		+	+	+		+					+	
14-1, 30-31		+	+		+	+		+	+	+		+					+	
14-2, 35-36						+		+	+			+				cf.	+	
14-3, 30-31						+	+	+	+			+					+	
14-4, 30-31						+		+	+	+		+					+	
14-5, 30-31						+		+	+	+		+					+	
14-6, 30-31	cf.					+		+	+	+								
14, CC	cf.					+		+	+			+					+	

TABLE 6A – *Continued*

Sample (Interval in cm) \ Species	*Bramletteius serraculoides*	*Catinaster calyculus*	*Catinaster coalitus*	*Ceratolithus acutus*	*Ceratolithus amplificus*	*Ceratolithus bizzarus*	*Ceratolithus cristatus*	*Ceratolithus primus*	*Ceratolithus rugosus*	*Chiasmolithus bidens*	*Chiasmolithus californicus*	*Chiasmolithus gigas*	*Chiasmolithus grandis*	*Chiasmolithus solitus*	*Coccolithus bisulcus*	*Coccolithus cribellum*	*Coccolithus eopelagicus*	*Coccolithus magnicrassus*	*Coccolithus miopelagicus*	*Coccolithus pelagicus*
15-1, 120-121									+											+
15-2, 30-31				cf.					+											+
15-3, 30-31									+											+
15-4, 30-31				cf.					+											+
15, CC					+				+											
16-1, 120-121																				+
16-2, 35-36																				+
16-3, 30-31				cf.																+
16-4, 30-31								+												+
16-5, 30-31								+												+
16-5, 120-212																				
16-6, 25-26								+												+
16, CC					+	+														+
17-1, 30-31																				+
17-1, 120-121																				
17-2, 35-36																				+
17-2, 120-121																				+
17-3, 30-31																				+
17-3, 120-121																				+
17-4, 120-121																				
17-5, 120-121																				
17-6, 30-31																				+
17, CC																				+
18-1, 120-121					+															+
18-2, 120-121					+															+
18-3, 120-121																				+
18-4, 120-121								+												+
18-5, 120-121																				+
18, CC																				+
19-1, 50-51																				+
19-2, 35-36																				
19-3, 30-31																				
19-4, 30-31					+			+												+
19, CC																				+
20-1, 30-31																				+
20-2, 35-36																				
20-3, 30-31					+															
20-4, 30-31																				+
20-5, 30-31					+															+
20-6, 30-31								+												+
20, CC					+															+
21-1, 40-42																				+
21-2, 35-36																				+
21, CC																				+
22-1, 135-136																				

Sample (Interval in cm) \ Species	*Coronocyclus serratus*	*Cruciplacolithus tenuis*	*Cyclicargolithus abisectus*	*Cyclicargolithus floridanus*	*Cyclicargolithus reticulatus*	*Cyclococcolithina formosa*	*Cyclococcolithina gammation*	*Cyclococcolithina leptopora*	*Cyclococcolithina macintyrei*	*Cyclococcolithina protoannula*	*Cyclococcolithina robusta*	*Discoaster aster*	*Discoaster asymmetricus*	*Discoaster barbadiensis*	*Discoaster bellus*	*Discoaster berggrenii*	*Discoaster brouweri*	*Discoaster calcaris*	*Discoaster challengeri*	*Discoaster decorus*
15-1, 120-121									+								+			
15-2, 30-31								+	+				+				+			
15-3, 30-31								+	+								+			
15-4, 30-31								+	+								+			
15, CC								+	+								+			
16-1, 120-121								+	+				+				+		+	
16-2, 35-36								+	+				+				+			
16-3, 30-31								+	+								+			
16-4, 30-31									+								+			
16-5, 30-31								+	+								+			
16-5, 120-212								+									+			
16-6, 25-26								+	+				+					+		
16, CC								+	+				+				+			
17-1, 30-31								+	+								+			
17-1, 120-121								+	+				+				+			
17-2, 35-36								+	+								+			
17-2, 120-121								+	+								+			
17-3, 30-31								+	+				+							
17-3, 120-121								+					+			+	+			
17-4, 120-121								+								+	+			
17-5, 120-121															cf.					
17-6, 30-31								+	+								+			
17, CC								+	+							+				
18-1, 120-121								+					+			+				
18-2, 120-121								+								+	+			
18-3, 120-121								+								+	+			
18-4, 120-121								+	+								+			
18-5, 120-121								+	+								+			+
18, CC								+	+								+	+		
19-1, 50-51								+	+									+		
19-2, 35-36								+	+											
19-3, 30-31								+					+				+			
19-4, 30-31								+	+				+			+	+			
19, CC									+				+							
20-1, 30-31									+				+							
20-2, 35-36								+	+				+				+			
20-3, 30-31																				
20-4, 30-31								+	+				+			+	+			
20-5, 30-31								+	+							+				
20-6, 30-31								+	+											
20, CC								+	+							+				
21-1, 40-42								+	+								+			
21-2, 35-36								+	+						+	+				
21, CC									+							+				
22-1, 135-136								+	+											

Sample (Interval in cm) \ Species	*Discoaster deflandrei*	*Discoaster diastypus*	*Discoaster druggii*	*Discoaster exilis*	*Discoaster formosus*	*Discoaster hamatus*	*Discoaster kugleri*	*Discoaster lidzi*	*Discoaster lodoensis*	*Discoaster mohleri*	*Discoaster multiradiatus*	*Discoaster neohamatus*	*Discoaster neorectus*	*Discoaster nobilis*	*Discoaster nodifer*	*Discoaster ornatus*	*Discoaster pansus*	*"Discoaster" pentaradiatus*	*Discoaster prepentaradiatus*	*Discoaster quinqueramus*	*Discoaster rutellus*
15-1, 120-121																		+			
15-2, 30-31																		+			
15-3, 30-31																					
15-4, 30-31																		+			
15, CC																		+			
16-1, 120-121																		+			
16-2, 35-36																					
16-3, 30-31																					
16-4, 30-31																		+			
16-5, 30-31																		+			
16-5, 120-212																					
16-6, 25-26																		+			
16, CC																		+			
17-1, 30-31																		+		cf.	
17-1, 120-121					cf.													+		+	
17-2, 35-36																					
17-2, 120-121					cf.													+		cf.	
17-3, 30-31																		+			
17-3, 120-121																		+		cf.	
17-4, 120-121																				+	
17-5, 120-121																				+	
17-6, 30-31																		+			
17, CC																				+	
18-1, 120-121																		+		+	
18-2, 120-121																				+	
18-3, 120-121																		+		+	
18-4, 120-121												+								+	
18-5, 120-121												+								+	
18, CC																				+	
19-1, 50-51												+									
19-2, 35-36												+						+		+	
19-3, 30-31																				+	
19-4, 30-31																		+		+	
19, CC																				+	
20-1, 30-31																				+	
20-2, 35-36																		+		+	
20-3, 30-31																		+		+	
20-4, 30-31																		+		+	
20-5, 30-31																				+	
20-6, 30-31																		+			
20, CC																				+	
21-1, 40-42																				+	
21-2, 35-36																				+	
21, CC												+								+	
22-1, 135-136																				+	

22-2, 120-121	+	+		+		+	+			+				+	cf.	+	+	
22-3, 120-121		+					+	?		+							+	
22-4, 120-121		+					+			+							+	
22, CC				+		+	+		+	+				+	+	+	+	
23-1, 120-121		+																
23-2, 120-121		+					+									+	+	
23-3, 30-31		+		+		+	+										+	
23-3, 120-121																+	+	
23-4, 30-31		+		+			+								+		+	
23-5, 30-31		+														+	+	
23-6, 120-121		+													+		+	
23, CC				+		+	+			+					+	+	+	
24-1, 120-121																		
24-2, 35-36		+					+											
24-3, 30-31				+			+										+	
24-4, 30-31		+		+			+										+	
24-5, 30-31		+																
24-6, 30-31																		
24, CC		+		+		+			+	+				+	+		+	
25-1, 120-121		+								+					+		+	
25-2, 30-31										+							+	
25-3, 120-121				+			+										+	
25-4, 30-31				+							+					+	+	
25-5, 120-121																		
25, CC				+		+	+			+	+			+	+			
26-1, 30-31				+		+	+			+	+						cf.	
26-2, 35-36				+			+			+				+				
26-3, 30-31				+		+	+			+	+							
26-4, 30-31				+		+	+			+	+						+	
26-5, 30-31				+		+	+	cf.		+	+							
26-6, 30-31				+		+	+			+	+					+		+
26, CC				+		+	+				+			+		+		
27-1, 45-46				+		+	+			+	+				+	+		
27-2, 30-31				+		+	+			+	+							
27-3, 120-121				+		+	+		+	+	+							
27-4, 30-31				+		+	+			aff.	+					+		
27-4, 120-121				+			+			aff.	+			+		+		
27-5, 30-31				+		+	+			aff.	+				+	+		
27-6, 30-31				+		+	+			aff.	+				aff.	+		
27, CC				+		+	+	cf.		aff.	+			+			aff.	+
28-1, 30-31				+		+	+			aff.	+				+	+		
28-2, 30-31				+		+	+			aff.	+				+		aff.	
28-3, 30-31				+		+	+			aff.	+				+	+		+
28-4, 30-31				+		+	+			aff.	+						+	+
28-5, 30-31				+		+	+			aff.	+						+	+
28-6, 30-31				+		+	+		+		+			+	+		cf.	
28, CC				+		+	+		+		+				+			
29-1				+		+		+	+		+							+
29-2, 35-36				+		+	+				+			+	+			
29-3, 120-121				+		+	+		+		+			+	+			
29, CC				+		+	+							+				
30-1, 120-121				+		+	+	+	+					+	+			
30-2, 120-121				+		+	+	+	+		+					+		
30-3, 120-121				+		+			+		+					+	aff.	
30, CC						+	+		+						+			

TABLE 6A – *Continued*

Sample (Interval in cm) \ Species	*Bramletteius serraculoides*	*Catinaster calyculus*	*Catinaster coalitus*	*Ceratolithus acutus*	*Ceratolithus amplificus*	*Ceratolithus bizzarus*	*Ceratolithus cristatus*	*Ceratolithus primus*	*Ceratolithus rugosus*	*Chiasmolithus bidens*	*Chiasmolithus californicus*	*Chiasmolithus gigas*	*Chiasmolithus grandis*	*Chiasmolithus solitus*	*Coccolithus bisulcus*	*Coccolithus cribellum*	*Coccolithus eopelagicus*	*Coccolithus magnicrassus*	*Coccolithus miopelagicus*	*Coccolithus pelagicus*	*Coronocyclus serratus*	*Cruciplacolithus tenuis*	*Cyclicargolithus abisectus*	*Cyclicargolithus floridanus*	*Cyclicargolithus reticulatus*	*Cyclococcolithina formosa*	*Cyclococcolithina gammation*	*Cyclococcolithina leptopora*	*Cyclococcolithina macintyrei*	*Cyclococcolithina protoannula*	*Cyclococcolithina robusta*	*Discoaster aster*	*Discoaster asymmetricus*	*Discoaster barbadiensis*	*Discoaster bellus*	*Discoaster berggrenii*	*Discoaster brouweri*	*Discoaster calcaris*	*Discoaster challengeri*	*Discoaster decorus*	*Discoaster deflandrei*	*Discoaster diastypus*	*Discoaster druggii*	*Discoaster exilis*	*Discoaster formosus*	*Discoaster hamatus*	*Discoaster kugleri*	*Discoaster lidzi*	*Discoaster lodoensis*	*Discoaster mohleri*	*Discoaster multiradiatus*	*Discoaster neohamatus*	*Discoaster neorectus*	*Discoaster nobilis*	*Discoaster nodifer*	*Discoaster ornatus*	*Discoaster pansus*	*"Discoaster" pentaradiatus*	*Discoaster prepentaradiatus*	*Discoaster quinqueramus*	*Discoaster rutellus*
31-1, 55-56																				+								+	+				+		+		+																+								+
31-2, 30-31																				+								+	+						+						+											+	?								
31-3, 30-31																				+								+	+						+																	+	?								
31-4, 30-31																				+								+	+						+																	+						+			
31-5, 30-31																				+								+	+				cf.		+																	+	+								
31-6, 30-31																				+								+	+												+											+	?								
31, CC																			+	+								+							+																	+	+								
32-1, 50-51																				+								+	+																							+	+								
32-2, 30-31																				+								+	+						+																	+									
32-3, 30-31																				+								+	+						+																	+	+								
32-4, 30-31																												+	+								+															+					cf.				
32-5, 30-31																												+	+								+															+	?				cf.				
32, CC																												+																								+	+					+			
33-1, 30-31																				+								+	+																	+						+					+				
33-2, 35-36																				+								+	+						+		+															+	+								
33-3, 80-81																				+								+	+								+															+	?				+				
33-4, 120-121																				+								+	+						+																	+									
33-5, 30-31																				+									+						+											+						+									
33-5, 120-121																				+																																						+			
33-6, 30-31																				+								+	+						+											+						+	+								
33, CC																				+								+	+																							+						cf.			
34-1, 120-121		+																											+																	+						+									
34-2, 120-121																												+	+						+											cf.						+					+				
34-3, 120-121																												+	+						+											+						+	?								
34-4, 120-121		+	cf.																+									+																		+															
34-5, 120-121																												+	+						+		+									+						+					+				
34-6, 120-121																																																													
34, CC		+																	+									+							+		+									+															
35-1, 120-121		+																										+																		+															
35-2, 30-31																												+	+						+											+											?				
35-3, 120-121																												+	+						+											+						+					+				
35-4, 120-121		+	+																									+	+						+											+											+				
35, CC			+																										+						+											+											?				
36-1, 30-31		cf.	cf.																									+	+						+											+															
36-2, 30-31		cf.	cf.																									+	+						+									+		+											+				
36-3, 30-31		cf.	+																									+	+						+											+						cf.					+				
36-4, 30-31		cf.																										+	+						+											+															
36-5, 30-31		cf.	cf.																									+	+						+											+											+				
36-6, 30-31		cf.	cf.																									+	+						+											+															
36, CC			+																									+							+			+								+	+					cf.									
37-1, 30-31			+																									+																+			+														
37-2, 120-121			+																+									+	+							cf.								+																	
37-3, 120-121			+																									+	+															+																	
37-4, 120-121			+																+									+	+															+			cf.														
37-5, 120-121																			+										+																																

37-6, 35-36	+					+	+										
37-6, 120-121						+			ff.								
37, CC				+		+	+										
38-1, 30-31						+	+						+	cf.	cf.		
38-1, 120-121						+	+				+						
38-2, 30-31						+	+							+			
38-2, 120-121	?			+		+	+										
38-3, 30-31				+		+	+						+	+		cf.	
38-4, 30-31				+		+	+							+			
38-5, 30-31				+		+	+						+	+			
38-6, 30-31				+		+							+	+			
38, CC				+		+								cf.			
39-1, 30-31				+		+	+							cf.			
39-2, 30-31				+		+	+						+				
39-3, 30-31				+										cf.			
39-4, 35-36				+		+	+							cf.			
39-5, 30-31				+		+	+							cf.			
39-6, 30-31						+	+						+	cf.			
39, CC				+		+							+				
40-1, 30-31				+		+	+					+	+	cf.			
40-2, 40-41				+			+					+	+	cf.			
40-3, 30-31				+		+	+					+	+	+			
40-4, 30-31				+		+	+					+	+	cf.			
40-5, 30-31				+		+	+					+	+	cf.			
40-6, 30-31				+		+	+					+	+	cf.			
40, CC				+		+							+				
41-1, 50-51				+		+	+					+	+				
41-2, 120-121				+		+	+					+	cf.				
41, CC				+	+	+											
42-1, 30-31				+		+	+										
42-2, 30-31				+		+						+	+	cf.			
42-3, 30-31				+		+	+						+	+			
42-4, 30-31				+		+	+				+	+	+				
42-5, 30-31				+		+	+				+	+	+				
42-6, 30-31				+		+						+	+				
42, CC				+													
43-1, 30-31				+	+	+	+				+		+				
43-2, 35-36				+		+					+	+	+				
43-3, 30-31				+	+	+					+	+	+				
43-4, 35-36				+	+	+					+	+	+				
43-5, 30-31				+	+	+					+	+	+				
43-6, 40-41				+	+	+	+		+		+	cf.	+				
43, CC				+		+							+				
44-1, 30-31				+	+		+				+		+				
44-2, 30-31				+		+					+		+				
44-3, 30-31				+		+					+	cf.	+				
44-4, 30-31				+		+	+				+	cf.	+				
44-5, 30-31				+		+					+	+	+				
44-6, 30-31				+		+					+		+				
44, CC				+			+										
45-1, 30-31				+		+					+	+	+				
45-2, 30-31				+		+					+	+	+				
45-3, 30-31				+			+				+	+	+				
45-4, 30-31				+		+				cf.	+	+	+				
45-5, 30-31				+	+	+	+				+	+	+				

TABLE 6A – Continued

Sample (Interval in cm) \ Species	*Bramletteius serraculoides*	*Catinaster calyculus*	*Catinaster coalitus*	*Ceratolithus acutus*	*Ceratolithus amplificus*	*Ceratolithus bizzarus*	*Ceratolithus cristatus*	*Ceratolithus primus*	*Ceratolithus rugosus*	*Chiasmolithus bidens*	*Chiasmolithus californicus*	*Chiasmolithus gigas*	*Chiasmolithus grandis*	*Chiasmolithus solitus*	*Coccolithus bisulcus*	*Coccolithus cribellum*	*Coccolithus eopelagicus*	*Coccolithus magnicrassus*	*Coccolithus miopelagicus*	*Coccolithus pelagicus*	*Coronocyclus serratus*	*Cruciplacolithus tenuis*	*Cyclicargolithus abisectus*	*Cyclicargolithus floridanus*	*Cyclicargolithus reticulatus*	*Cyclococcolithina formosa*	*Cyclococcolithina gammation*	*Cyclococcolithina leptopora*	*Cyclococcolithina macintyrei*	*Cyclococcolithina protoannula*	*Cyclococcolithina robusta*	*Discoaster aster*	*Discoaster asymmetricus*	*Discoaster barbadiensis*	*Discoaster bellus*	*Discoaster berggrenii*	*Discoaster brouweri*	*Discoaster calcaris*	*Discoaster challengeri*	*Discoaster decorus*	*Discoaster deflandrei*	*Discoaster diastypus*	*Discoaster druggii*	*Discoaster exilis*	*Discoaster formosus*	*Discoaster hamatus*	*Discoaster kugleri*	*Discoaster lidzi*	*Discoaster lodoensis*	*Discoaster mohleri*	*Discoaster multiradiatus*	*Discoaster neohamatus*	*Discoaster neorectus*	*Discoaster nobilis*	*Discoaster nodifer*	*Discoaster ornatus*	*Discoaster pansus*	*Discoaster pentaradiatus*	*Discoaster prepentaradiatus*	*Discoaster quinqueramus*	*Discoaster rutellus*
45-6, 30-31																			+		+							+	+												+		+	+																	
45, CC																			+		+																						+																		
46-1, 120-121																			+		+							+	+										cf.		+			+																	
46-2, 120-121																			+					+					+												+																				
46, CC																			+																								+																		
47-1, 30-31																			+									+	+												+		+	+																	
47-2, 50-51																			+					+																	+		+	cf.																	
47-3, 30-31																			+					+				+													+		+	+																	
47-4, 35-36																			+					+				+	+												+		+	+																	
47-5, 30-31																			+				cf.	+					+												+		+	+																	
47-6, 30-31																			+				cf.	+					+												+		+	+																	
47, CC																			+		+			+																	+		+	+																	
48-1, 30-31																			+				cf.	+					+												+		+	+																	
48-2, 30-31																			+																						+			+																	
48-3, 30-31																			+		+			+																	+			+																	
48-4, 30-31																			+		+			+															+		+			+																	
48-5, 30-31																			+		+			+				+													+			+																	
48-6, 30-31																			+					+																	+			+	cf.																
48, CC																			+					+																	+			+	+																
49-1, 120-121																			+		+			+																	+			+																	
49-2, 35-36																			+		+			+																	+		+	+																	
49-3, 30-31																			+		+			+																	+		+	+																	
49-4, 30-31																			+					+																	+		+	+	cf.																
49-5, 30-31																			+					+																	+		+	+																	
49-6, 30-31																			+		+			+				+	+												+		+	+	+																
49, CC																			+									+													+		+	+																	
50-1, 30-31																			+		+			+					+										cf.		+			+	cf.																
50-2, 30-31																			+		+			+					+										+		+			+																	
50-3, 30-31																			+		+			+					+												+			+	cf.																
50-4, 30-31																			+					+																	+		+	+																	
50-5, 30-31																			+					+																	+		+	+																	
50-6, 30-31																			+		+			+				+	+												+		+	+																	
50, CC																			+					+				+													+		+	+	+																
51-1, 50-51																			+					+					+												+		+	+	cf.																
51-2, 30-31																			+										+												+		+	+																	
51-3, 30-31																			+		+		cf.	+					+										cf.		+			+																	
51-4, 30-31																			+		+		+	+					+												+		+	+	+																
51-5, 30-31																			+		+			+				+	+												+		+	+																	
51-6, 30-31																			+					+					+										+		+		+	+																	
51, CC																			+					+				+													+		+																		
52-1, 30-31																			+				+	+					+												+		+	+																	
52-2, 30-31																			+					+				+													+			+	+																
52-3, 30-31																			+					+					+												+		+	+	+																
52-4, 30-31																			+				+	+				+													+		+	+																	
52-5, 30-31																			+		+		+	+																	+		+	cf.																	

52-6, 30-31				+			+					+	+	+	cf.			
52, CC				+			+					+		+				
53-1, 120-121				+	+		+					+		+				
53-2, 119-120				+	+		+					+	+	+				
53-3, 120-121				+			+					+	+	+				
53-4, 120-121				+			+					+	+	+				
53, CC				+			+	+				+	+	+				
54-1, 120-121				+			+	+				+	+	+				
54-2, 120-121				+	+		+	+	+			+	+	+				
54-3, 120-121				+	+		+	+	+			+	+	+				
54-4, 120-121				+	+		+	+				+	+	+	cf.			
54, CC				+	+		+	+				+		+				
55-1, 30-31				+			+		+			+		+				
55-2, 30-31				+	+		+					+						
55-3, 30-31				+	+		+					+						
55-4, 30-31				+			+					+						
55-5, 30-31				+			+					+		+				
55-6, 30-31				+			+					+						
55, CC				+			+				ff.	+						
56-1, 120-121				+			+					+						
56-2, 120-121				+	+		+		+			+						
56-3, 120-121				+	+		+					+						
56-4, 120-121				+	+		+					+		+				
56, CC					+		+					+						
57-1, 30-31				+	+		+	+				+						
57-2, 30-31					+	+	+	+				+						
57-3, 35-36					+		+					+		+				
57-4, 30-31					+	+	+					+						
57-5, 30-31					+		+					+						
57-6, 30-31							+					+		+				
57, CC				+	+	+	+					+						
58-1, 30-31				+	+		+					+						
58-2, 30-31				+	+		+		+			+						
58-3, 30-31				+	+		+		+			+						
58-4, 30-31						+	+					+						
58-5, 30-31				+	+	+	+					+						
58-6, 30-31				+		+	+					+						
58, CC					+		+					+						
59-1, 115-116				+	+	+	+					+	+					
59-2, 120-121				+	+	+	+					+	+					
59, CC					+	+	+					+						
60-1, 120-121					+	+	+					+	+					
60-2, 30-31					+	+	+					+	+					
60-3, 30-31							+	+				+						
60-4, 30-31				+		+	+					+						
60-5, 30-31				+		+	+					+						
60-6, 30-31						+	+					+						
60-6, 120-121				+	+	+	+					+						
60, CC				+			+					+						
61-1, 30-31						+	+					+	+					
61-2, 30-31				+	+		+					+	+					
61-3, 30-31				+	+	+	+					+	+					
61-4, 30-31							+					+	+					
61-5, 30-31				+	+		+	cf.				+	+					
61-6, 30-31				+	+		+	cf.				+	+					

TABLE 6A – *Continued*

Sample (Interval in cm) \ Species	*Bramletteius serraculoides*	*Catinaster calyculus*	*Catinaster coalitus*	*Ceratolithus acutus*	*Ceratolithus amplificus*	*Ceratolithus bizzarus*	*Ceratolithus cristatus*	*Ceratolithus primus*	*Ceratolithus rugosus*	*Chiasmolithus bidens*	*Chiasmolithus californicus*	*Chiasmolithus gigas*	*Chiasmolithus grandis*	*Chiasmolithus solitus*	*Coccolithus bisulcus*	*Coccolithus cribellum*	*Coccolithus eopelagicus*	*Coccolithus magnicrassus*	*Coccolithus miopelagicus*	*Coccolithus pelagicus*	*Coronocyclus serratus*	*Cruciplacolithus tenuis*	*Cyclicargolithus abisectus*	*Cyclicargolithus floridanus*	*Cyclicargolithus reticulatus*	*Cyclococcolithina formosa*	*Cyclococcolithina gammation*	*Cyclococcolithina leptopora*	*Cyclococcolithina macintyrei*	*Cyclococcolithina protoannula*	*Cyclococcolithina robusta*	*Discoaster aster*	*Discoaster asymmetricus*	*Discoaster barbadiensis*	*Discoaster bellus*	*Discoaster berggrenii*	*Discoaster brouweri*	*Discoaster calcaris*	*Discoaster challengeri*	*Discoaster decorus*	*Discoaster deflandrei*	*Discoaster diastypus*	*Discoaster druggii*	*Discoaster exilis*	*Discoaster formosus*	*Discoaster hamatus*	*Discoaster kugleri*	*Discoaster lidzi*	*Discoaster lodoensis*	*Discoaster mohleri*	*Discoaster multiradiatus*	*Discoaster neohamatus*	*Discoaster neorectus*	*Discoaster nobilis*	*Discoaster nodifer*	*Discoaster ornatus*	*Discoaster pansus*	*Discoaster pentaradiatus*	*Discoaster prepentaradiatus*	*Discoaster quinqueramus*	*Discoaster rutellus*
61, CC																			+				+	+																	+		+																		
62-1, 120-121																					+		+	+																	+																				
62-2, 120-121																							+	+																	+																				
62, CC																					+			+																	+		+																		
63-1, 33-35																			+				+	+				cf.													+																				
63-2, 120-121																			+				+	+																	+																				
63, CC																							+	+																	+																				
64-1, 119-120																			+				+	+				cf.													+																				
64-2, 115-116																			+				+	+																	+																				
64-3, 120-121																			+		+		+	+																	+							+													
64, CC																			+				+	+																	+																				
65-1, 65-66																					+		+	+				cf.													+																				
65-2, 27-28																					+		+	+																	+																				
65-3, 25-28																			+		+			+																	+							+													
65, CC																								+																	+																				
66-1, 120-121																			+					+																	+																				
66-2, 120-121																							+	+					+												+																				
66-3, 118-119																			+		+		+	+				+													+		+																		
66, CC																			+				+	+				cf.													+																				
67-1, 30-31																			+				+	+					+												+		+																		
67-2, 30-31																							+	+				+													+		+																		
67-3, 30-31																							+	+																	+		+																		
67-4, 30-31																							+	+																	+		+																		
67-5, 30-31																			+				+	+					+												+		+																		
67-6, 30-31																							+	+																	+		+																		
67, CC																			+		+		+	+																	+																				
68-1, 120-121																			+		+		+	+																	+		+																		
68-2, 120-121																					+		+	+																	+		?																		
68-3, 30-31																					+		+	+																	+		+																		
68-4, 30-31																			+				+	+																	+		+																		
68-5, 30-31																			+				+	+				+													+		?																		
68-6, 30-31																			+				+	+					cf.												+		?																		
68, CC																			+		+		+	+				cf.													+																				
69-1, 120-121																					+		+	+																	+																				
69-2, 120-121																					+		+	+																	+																				
69-3, 120-121																							+	+																	+		+					+													
69-4, 120-121																							+	+																	+		+					+													
69-5, 114-115																					+		+	+																	+							+													
69, CC																	+				+		+	+																	+																				
70-1, 30-31																					+		+	+																	+		+																		
70-2, 30-31																							+	+																	+		+					+													
70-3, 30-31																							+	+																	+		+																		
70-4, 30-31																					+		+	+																	+																				
70-5, 30-31																	+				+		+	+																	+		+																		
70-6, 30-31																	+				+		+	+																	+																				
70, CC																	+						+	+																	+																				

71-1, 118-119					+	+	+	+				+	+			
71-2, 120-121						+	+	+				+	+			
71-3, 120-121						+	+	+				+	+			
71-5, 120-121						+	+	+				+	+			
71, CC					+	+	+	+				+				
72-1, 120-121					+		+	+				+	+			
72-2, 30-31					+		+	+				+	+			
72-3, 30-31					+		+	+				+	+	+		
72-4, 30-31					+		+	+				+				
72-5, 30-31					+		+	+				+				
72-6, 30-31					+		+	+				+				
72, CC							+	+				+				
73-1, 120-121					+		+	+				+				
73-2, 25-26					+		+	+				+				
73-3, 30-31					+		+	+				+				
73-4, 35-36					+		+	+				+				
73-5, 30-31					+		+	+				+				
73-5, 120-121					+		+	+				+				
73, CC					+		+	+	cf.			+				
74-1, 30-31					+		+	+				+				
74-2, 30-31					+		+	+				+				
74-3, 30-31					+		+	+				+				
74-4, 35-36					+		+	+				+				
74-5, 30-31					+		+	+				+				
74-6, 30-31					+		+	+				+				
74, CC					+		+	+				+				
75-1, 133-134					+		+	+				+				
75-2, 36-37					+		+	+				+				
75-3, 30-31							+	+				+				
75-4, 30-31							+	+				+				
75, CC					+		+	+				+				
76-1, 125-126				?	+		+	+				+				
76-2, 120-121					+		+	+				+				
76-3, 120-121					+		+	+				+				
76-4, 120-121					+		+	+				+				
76-5, 120-121					+		+	+				+				
76, CC					+		+	+				+				
77-1, 120-121				+			+	+				+				
77, CC				+			+	+				+				
78-1, 120-121							+	+				+				
78-2, 120-121							+	+				+				
78-3, 120-121					+		+	+				+				
78, CC					+		+	+				+				
79-1, 60-61							+	+				+				
79-2, 30-31				+	+		+	+				+				
79-3, 120-121				+	+		+	+				+				
79, CC							+	+				+				
80-2, 30-31				+			+	+				+				
80-2, 115-116					+		+	+				+				
80-3, 120-121				+			+	+				+				
80-4, 120-121				+	+		+	+				+				
80, CC				+	+		+	+				+				
81-1, 134-136				+	+		+	+				+				

TABLE 6A – *Continued*

Sample (Interval in cm) \ Species	*Bramletteius serraculoides*	*Catinaster calyculus*	*Catinaster coalitus*	*Ceratolithus acutus*	*Ceratolithus amplificus*	*Ceratolithus bizzarus*	*Ceratolithus cristatus*	*Ceratolithus primus*	*Ceratolithus rugosus*	*Chiasmolithus bidens*	*Chiasmolithus californicus*	*Chiasmolithus gigas*	*Chiasmolithus grandis*	*Chiasmolithus solitus*	*Coccolithus bisulcus*	*Coccolithus cribellum*	*Coccolithus eopelagicus*	*Coccolithus magnicrassus*	*Coccolithus miopelagicus*	*Coccolithus pelagicus*	*Coronocyclus serratus*	*Cruciplacolithus tenuis*	*Cyclicargolithus abisectus*	*Cyclicargolithus floridanus*	*Cyclicargolithus reticulatus*	*Cyclococcolithina formosa*	*Cyclococcolithina gammation*	*Cyclococcolithina leptopora*	*Cyclococcolithina macintyrei*	*Cyclococcolithina protoannula*	*Cyclococcolithina robusta*	*Discoaster aster*	*Discoaster asymmetricus*	*Discoaster barbadiensis*	*Discoaster bellus*	*Discoaster berggrenii*	*Discoaster brouweri*	*Discoaster calcaris*	*Discoaster challengeri*	*Discoaster decorus*	*Discoaster deflandrei*	*Discoaster diastypus*	*Discoaster druggii*	*Discoaster exilis*	*Discoaster formosus*	*Discoaster hamatus*	*Discoaster kugleri*	*Discoaster lidzi*	*Discoaster lodoensis*	*Discoaster mohleri*	*Discoaster multiradiatus*	*Discoaster neohamatus*	*Discoaster neorectus*	*Discoaster nobilis*	*Discoaster nodifer*	*Discoaster ornatus*	*Discoaster pansus*	*Discoaster pentaradiatus*	*Discoaster prepentaradiatus*	*Discoaster quinqueramus*	*Discoaster rutellus*
81-2, 125-126																	+						+	+																	+																				
81, CC																	+						+	+																	+																				
82-1, 30-31																	+						+	+																	+																				
82-2, 30-31																	+						+	+																	+																				
82-2, 120-121																	+						+	+																	+																				
82-3, 30-31																	+						+	+																	+																				
82-3, 120-121																	+						+	+																	+																				
82, CC																							+	+																	+																				
83-1, 112-113																	+						+	+																	+																				
83-2, 120-121																	+						+	+																	+																				
83, CC																	+						+	+																	+																				
84-1, 124-125																	+						+	cf.																																						
84-2, 39-40																	+						+																		+																				
84-2, 101-102																	+				+		+																		+																				
84, CC																	+						+	+																	+																				
85-1, 28-29																	+						+	+																																						
85-1, 119-122																	+				+		+	+																	+																				
85, CC																	+						+	+																	+																				
86-2, 120-121																	+						+	+																																						
86-3, 120-121																	+						+	cf.																	+																				
86-4, 120-121																+	+						+	cf.																																						
86-5, 120-121																	+						+																		+																				
86-6, 120-121																	+						+																		+																				
86, CC																	+							+																	+																				
87-2, 40-41																	+							+																	+																				
87-2, 120-121																	+						+	+																	+																				
87, CC																	+							+																	+																				
88-1, 134-135																	+				+		+	+																	+																				
88-2, 125-126																	+						+	+																	+																				
88-3, 114-116																	+						+	+																	+																				
88, CC																	+							+																	+																				
89-1, 120-121																	+						+	+																	+																				
89-2, 120-121																	+																								+																				
89-3, 120-121																	+						+	+																	+																				
89-4, 120-121																+	+							+																																						
89, CC																	+							+																	+																				
90-1, 120-121																	+																								+																				
90-2, 130-131																	+						+	+																	+																				
90-3, 126-127																	+						+	+																	+																				
90, CC																	+							+																	+																				
91-1, 120-121																	+						+	+																	+																				
91-2, 120-121																							+	+																	+																				
91-3, 120-121																	+						+	+																	+																				
91-4, 120-121																							+																		+																				
91-5, 120-121																	+						+	+																	+																				

91, CC			+		+					+	
92-1, 120-121		+	+		+					+	
92, CC			+							+	
93-1, 120-121				+	+					+	
93-2, 120-121			+	+	+					+	
93-3, 120-121			+	+	+					+	
93, CC			+		+						
94-1, 130-131			+	+	+						
94-2, 120-121			+		+					+	
94-3, 120-121			+	+	+					+	
94-4, 130-131			+	+	+					+	
94, CC											
95-1, 136-137		+	+	+	+					+	
95-2, 115-116			+	+	+					+	
95, CC			+	+	+					cf.	
96-1, 100-102			+		+					+	
96, CC			+	+	+					+	
97-1, 119-120			+	+	+					+	
97-2, 133-134			+	+	cf.					+	
97-3, 79-80		+	+	cf.	+						
97-4, 114-115			+	+	+					+	
97, CC											
98-2, 30-31		+	+	+	+					+	
98-2, 120-121			+	+	+					+	
98-3, 120-121			+	+	+					+	
98-4, 120-121			+		+					+	
98, CC			+	+	+					+	
99-1, 120-121			+	+	+					+	
99-2, 120-121			+	+	+					+	
99-3, 120-121			+	ff.	+					+	
99-4, 115-116			+	ff.	+					+	
99-5, 120-121			+	ff.	+					+	
99, CC			+	ff.	+					+	
100-1, 50-51			+	ff.	+					+	
100-1, 122-123		+	+	ff.	+					+	
100, CC				ff.	+					+	
101-1, 65-66		+	+	ff.	+		+			+	+
101-1, 120-121			+		+					+	
101-2, 35-36			+		+		+				
101-2, 117-118	+		+		+		+				
101, CC	+	+	+		+		+			+	
102-1, 112-113	+		+		+		+			?	
102, CC	+		+		+		+		+	?	+
103-1, 130-131	+		+		+		+	+	+		
103, CC	+				+		+		+		
104-1, 149	+		+				+	+	+	+	+
104, CC	+		+		+		+		+		
105, CC	+				+	+	+		+	+	
106-1, 120-121	+		+		+	+	+		+	+	
106-2, 115-116	+		+		+	+	+		+	+	
106-3, 120-121	+		+		+	+	+		+	+	
106-4, 120-121	+		+		+	+	+	+	+		
106-5, 120-121	+		+		+	+	+		+	+	
106, CC	+		+		+	+	+	+	+	+	
107-1, 140-141	+		+		+		+			+	

TABLE 6A – *Continued*

Species / Sample (Interval in cm)	*Bramletteius serraculoides*	*Catinaster calyculus*	*Catinaster coalitus*	*Ceratolithus acutus*	*Ceratolithus amplificus*	*Ceratolithus bizzarus*	*Ceratolithus cristatus*	*Ceratolithus primus*	*Ceratolithus rugosus*	*Chiasmolithus bidens*	*Chiasmolithus californicus*	*Chiasmolithus gigas*	*Chiasmolithus grandis*	*Chiasmolithus solitus*	*Coccolithus bisulcus*	*Coccolithus cribellum*	*Coccolithus eopelagicus*	*Coccolithus magnicrassus*	*Coccolithus miopelagicus*	*Coccolithus pelagicus*	*Coronocyclus serratus*	*Cruciplacolithus tenuis*	*Cyclicargolithus abisectus*	*Cyclicargolithus floridanus*	*Cyclicargolithus reticulatus*	*Cyclococcolithina formosa*	*Cyclococcolithina gammation*	*Cyclococcolithina leptopora*	*Cyclococcolithina macintyrei*	*Cyclococcolithina protoannula*	*Cyclococcolithina robusta*	*Discoaster aster*	*Discoaster asymmetricus*	*Discoaster barbadiensis*	*Discoaster bellus*	*Discoaster berggrenii*	*Discoaster brouweri*	*Discoaster calcaris*	*Discoaster challengeri*	*Discoaster decorus*	*Discoaster deflandrei*	*Discoaster diastypus*	*Discoaster druggii*	*Discoaster exilis*	*Discoaster formosus*	*Discoaster hamatus*	*Discoaster kugleri*	*Discoaster lidzi*	*Discoaster lodoensis*	*Discoaster mohleri*	*Discoaster multiradiatus*	*Discoaster neohamatus*	*Discoaster noerectus*	*Discoaster nobilis*	*Discoaster nodifer*	*Discoaster ornatus*	*Discoaster pansus*	*Discoaster pentaradiatus*	*Discoaster prepentaradiatus*	*Discoaster quinqueramus*	*Discoaster rutellus*
107-2, 60-61	+																+							+	+	+								+																											
107, CC	+																+							+	+	+						+		+																											
108-1, 74-75	+																+							+	+	+								+																											
108, CC	+												+				+							+	+	+								+																						+					
109, CC													+				+							+		+								+																					+						
110-1, 107-108													+				+									+								+																											
110, CC														+			+							+		+								+							+															+					
111-1, 70-71														+			+							+		+								+																											
111-2, 37-38														+			+							+		+								+																											
111-3, 39													+	+			+							+		+								+																											
111, CC													+	+			+									+								+							+																				
112, CC	+												+				+							+	+	+				+				+																											
113-1, 117-118												+	+					+								+								+																						cf.					
114-1, 148-150																		+								+	+							+															+												
115-1, 55-56																		+																																											
115, CC																		+								+								cf.								+												cf.							
116-1, 140-143										+	+																																								+										
117, CC										cf.	+																															cf.									+			+							
118-1, 70-72															+																+																				+										
118, CC											+				+							+									+																				+										
119, CC										cf.	+				+							+									+																			+	+										
120-1, 80-81																						+																												+											
120-1, 80-81															+																																														
120-1, 148-150																						+																												+											

Discoaster mohleri **Zone (age: Middle Paleocene)**

The interval from the base range of *Discoaster mohleri* to the base range of *Discoaster nobilis*.

Heliolithus kleinpellii **Zone (age: Middle Paleocene)**

The interval from the base range of *Heliolithus kleinpellii* to the base range of *Discoaster mohleri*.

Fasciculithus tympaniformis **Zone (age: Middle Paleocene)**

The interval from the base range of *Fasciculithus tympaniformis* to the base range of *Heliolithus kleinpellii*. This Zone has not been identified among Leg 30 material.

Cyclococcolithina robusta **Zone (age: Early to Middle Paleocene)**

The interval from the base range of *Cyclococcolithina robusta* to the base range of *Fasciculithus tympaniformis*.

Cruciplacolithus tenuis **Zone (age: Early Paleocene)**

The interval from the base range of *Cruciplacolithus tenuis* to the base range of *Cyclococcolithina robusta*. *C. tenuis* develops distinct advanced forms in the upper part of this zone.

The Cretaceous/Tertiary boundary is placed between the *Micula mura* and the *C. tenuis* zones.

Micula mura **Zone (age: Late Maestrichtian)**

The interval from the base range of *Micula mura* to the base range of *Cruciplacolithus tenuis*.

Lithraphidites quadratus **Zone (age: Middle Maestrichtian)**

The interval from the top range of *Tetralithus trifidus* to the base range of *Micula mura*.

Tetralithus trifidus **Zone (age: Campanian-Maestrichtian)**

The total range of *Tetralithus trifidus*.

Broinsonia parca **Zone (age: Campanian)**

The interval from the top range of *Eiffellithus augustus* to the base range of *Tetralithus trifidus*. Apparently, this zone is a comparatively short interval.

Eiffellithus augustus **Zone (age: Campanian)**

The interval from the base range of *Broinsonia parca* to the top range of *Eiffellithus augustus*.

Gartnerago obliquun **Zone (age: Santonian)**

The interval from the top range of *Marthasterites furcatus* to the base range of *Broinsonia parca*. This zone has not been identified in Leg 30 material.

Marthasterites furcatus **Zone (age: Santonian to Coniacian)**

The total range of *Marthasterites frucatus*.

Micula decussata **Zone (age: Late Turonian)**

The interval from the base range of *Micula decussata* to the base range of *Marthasterites furcatus*.

Zonation of the remaining part of the Upper Cretaceous has not been attempted and only the *Eiffellithus turriseiffeli* Zone from the Lower Cretaceous has been identified among Leg 30 material.

Eiffellithus turriseiffeli **Zone (age: Late Albian)**

The lower boundary is recognized by the base range of the nominate species and the upper boundary by the base range of *Chiastozygus cuneatus* (see Roth, 1973).

UNCONFORMITIES IN THE SOUTHWEST PACIFIC

Discussion

The biostratigraphic recognition of unconformities is related primarily to the resolution of the fossils used and depends largely on the sampling intervals. Accordingly, disturbance in the biostratigraphic sequence (reworking and/or contamination); inherent deficiency in the zonal scheme (e.g., provincialism of some zonal forms); poor preservation and induced diversity limitations (selective dissolution and diagenesis); and long gaps in sampling (especially if these involve thin biostratigraphic units) may result in uncertain perception of unconformities. Deep-sea coring is not always continuous and recovery is variable; the location of biostratigraphic boundaries between spaced cores or within a poorly recovered core might indicate a reduced accumulation rate rather than an actual break.

The hiatuses or suspected hiatuses detected during routine biostratigraphic investigation are documented below. Coeval hiatuses at two sites from Leg 21 are mentioned also. The data for the Cenozoic are summarized graphically in Tables 7 and 8.

Pliocene-Quaternary

Paleontologic and lithologic evidence indicate the occurrence of two hiatuses within the calcareous oozes of Core 288-2; the hiatuses are apparently of small magnitude. The younger hiatus (intra-Pleistocene) is within Section 2 and probably represented by a sediment color change at 50 cm; derived elements occur at and below this level; *Gephyrocapsa oceanica* has its initial appearance in Sample 288-2-2, 24-26 cm. An abrupt foraminferal change exists at the same level and a disconformity is inferred. The older hiatus (Pliocene-Pleistocene) is within Section 5 and is partly obscured by the presence of reworked forms above and below it. However, *Gephyrocapsa caribbeanica* occurs rarely in Sample 288-2-5, 30-31 cm above a glass ash band (located between 35 and 45 cm) which probably represents the hiatus.

A doubtful hiatus may be placed between the upper Pliocene Sample 288-5, CC and the upper Miocene Section 288-6-1; coring gap (9.5 m) between these cores is the main cause of doubt. However, rates of sedimentation at Site 289 during the Pliocene were sufficiently high to support the suggestion of a hiatus.

In Hole 285, the top two sections of Core 2 are dated as early Pliocene (a maximum age) and Section 3 is placed tentatively in the upper Miocene *Discoaster quinqueramus* Zone; reworking hinders precise zonal

TABLE 6B

Checklist of Cenozoic Calcareous Nannofossils Recovered at Site 289

Sample (Interval in cm) \ Species	Discoaster saipanensis	Discoaster surculus	Discoaster tamalis	Discoaster tani	Discoaster trinidadensis	Discoaster triradiatus	Discoaster variabilis	Discoasteroides kuepperi	Discolithina japonica	Discolithina plana	Ellipsolithus macellus	Emiliania huxleyi	Ericsonia cava	Fasciculithus involutus	Fasciculithus tympaniformis	Gephyrocapsa caribbeanica	Gephyrocapsa lumina	Gephyrocapsa oceanica	Gephyrocapsa omega	Gephyrocapsa producta	Hayaster perplexus	Helicopontosphaera compacta	Helicopontosphaera granulata	Helicopontosphaera heezenii	Helicopontosphaera kamptneri
1-1, 30-31									+			+				+		+	+						+
1-2, 30-31									+			+				+			+						
1-3, 30-31												+				+			cf.						+
1-4, 30-31												+				+			cf.						+
1-5, 30-31												+				+		+							+
1-6, 30-31												+						+	cf.						+
1, CC																+		+		+					
2-1, 30-31																+				+					+
2-2, 25-26																+		+							+
2-3, 30-31									+							+		+	+						+
2-4, 30-31																+		+							+
2-5, 30-31																+		+							
2-6, 30-31									+							+	+	+							+
2-6, 120-121									+								+								+
2, CC									+							+	+	cf.	+	+					+
3-1, 30-31																									+
3-2, 30-31																									+
3-3, 30-31																									+
3-4, 30-31																+									+
3-5, 30-31																+									+
3-6, 30-31																									+
3, CC																+									+
4-1, 120-121																+				+					+
4-2, 30-31																		cf.							+
4-3, 30-31																+									+
4-3, 110-111																+									+
4-4, 30-31																									+
4-5, 30-31																									+
4-6, 30-31							+														+				+
4-6, 120-121																									+
4, CC																					+				+
5-1, 30-31						+																			+
5-2, 30-31						+																			+
5-3, 30-31																									+
5-4, 30-31																									+
5-5, 30-31						+															+				+
5-6, 30-31																									
5, CC																					+				
6-1, 40-41						+																			+
6-2, 30-31						+																			
6-3, 30-31						+																			+
6-4, 30-31																					+				
6-5, 30-31																									+
6-6, 25-26																									+
6, CC						+																			+
7-1, 30-31						+																			+
7-2, 35-36																					+				+
7-2, 120-121						+															+				+
7-3, 30-31																					+				+
7-4, 30-31																					+				+
7-5, 30-31						+															+				+
7-6, 30-31		+				+																			+
7, CC		+	+			+															+				+
8-1, 35-36		+				+																			+
8-1, 120-121		+	+			+																			+

Sample (Interval in cm) \ Species	Helicopontosphaera lophata	Helicopontosphaera parallela	Helicopontosphaera recta	Helicopontosphaera sellii	Helicopontosphaera seminulum	Heliolithus cantabriae	Heliolithus kleinpellii	Heliolithus riedelii	Markalius astroporus	Markalius inversus	Minylitha convallis	Oolithothus antillarum	Orthorhabdus serratus	Pseudoemiliania lacunosa	Reticulofenestra dictyoda	Reticulofenestra pseudoumbilica	Reticulofenestra samodurovi	Reticulofenestra scissura	Reticulofenestra scrippsae	Reticulofenestra spp.	Reticulofenestra umbilica	Rhabdosphaera clavigera	Rhabdosphaera procera	Scyphosphaera spp.	Sphenolithus abies
1-1, 30-31				+																					
1-2, 30-31				+																					
1-3, 30-31				+																					
1-4, 30-31																						+			
1-5, 30-31																									
1-6, 30-31																									
1, CC														+										+	
2-1, 30-31				+																					
2-2, 25-26																									
2-3, 30-31																									
2-4, 30-31				+										+											
2-5, 30-31				+																					
2-6, 30-31				+										+											
2-6, 120-121				+										+											
2, CC				+										+											
3-1, 30-31				+										+											
3-2, 30-31				+										+											
3-3, 30-31				+										+											
3-4, 30-31														+											
3-5, 30-31				+																					
3-6, 30-31				+										+		cf.									
3, CC				+										+											
4-1, 120-121				+																		+			
4-2, 30-31				+																					
4-3, 30-31				+										+											
4-3, 110-111				+																					
4-4, 30-31				+										+											
4-5, 30-31				+										+											
4-6, 30-31				+								+													
4-6, 120-121				+								+													
4, CC				+								+													
5-1, 30-31				+								+													
5-2, 30-31				+								+													
5-3, 30-31				+								+		+											
5-4, 30-31				+																					
5-5, 30-31												+		+											
5-6, 30-31				+								+													
5, CC				+										+								+		+	
6-1, 40-41														+											
6-2, 30-31				+								+													
6-3, 30-31				+																					
6-4, 30-31				+																					
6-5, 30-31												+										+			
6-6, 25-26				+										+								+			
6, CC				+								+													
7-1, 30-31				+								+													
7-2, 35-36				+								+				cf.						cf.			
7-2, 120-121				+								+										cf.			
7-3, 30-31				+								+													
7-4, 30-31				+								+													
7-5, 30-31				+								+													
7-6, 30-31				+										+											
7, CC				+																					
8-1, 35-36				+								+													
8-1, 120-121				+								+													

Sample (Interval in cm) \ Species	Sphenolithus anarrhopus	Sphenolithus belemnos	Sphenolithus ciperoensis	Sphenolithus conicus	Sphenolithus delphix	Sphenolithus distentus	Sphenolithus heteromorphus	Sphenolithus moriformis	Sphenolithus neoabies	Sphenolithus predistentus	Sphenolithus pseudoradians	Sphenolithus radians	Thoracosphaera heimi	Thoracosphaera operculata	Thoracosphaera saxea	Toweius eminens	Toweius pertusus	Triquetrorhabdulus carinatus	Triquetrorhabdulus inversus	Triquetrorhabdulus milowii	Triquetrorhabdulus rugosus	Zygrhablithus bijugatus	Zygrhablithus crassus
1-1, 30-31													+										
1-2, 30-31													+		+								
1-3, 30-31															+								
1-4, 30-31																							
1-5, 30-31															+								
1-6, 30-31													+		+								
1, CC																							
2-1, 30-31													+		+								
2-2, 25-26													+										
2-3, 30-31															+								
2-4, 30-31													+		+								
2-5, 30-31													+		+								
2-6, 30-31													+										
2-6, 120-121													+										
2, CC													+		+								
3-1, 30-31													+		+								
3-2, 30-31															+								
3-3, 30-31													+		+								
3-4, 30-31													+	+									
3-5, 30-31													+	+									
3-6, 30-31													+		+								
3, CC																							
4-1, 120-121																							
4-2, 30-31													+		+								
4-3, 30-31													+		+								
4-3, 110-111													+		+								
4-4, 30-31														+	+								
4-5, 30-31															+								
4-6, 30-31															+								
4-6, 120-121																							
4, CC															+								
5-1, 30-31															+								
5-2, 30-31															+								
5-3, 30-31																							
5-4, 30-31															+								
5-5, 30-31																							
5-6, 30-31													+		+								
5, CC																							
6-1, 40-41																							
6-2, 30-31													+										
6-3, 30-31													+										
6-4, 30-31													+	+	+								
6-5, 30-31																							
6-6, 25-26															+								
6, CC																							
7-1, 30-31															+								
7-2, 35-36															+								
7-2, 120-121															+								
7-3, 30-31															+								
7-4, 30-31															+								
7-5, 30-31													+		+								
7-6, 30-31													+		+								
7, CC													+		+								
8-1, 35-36													+		+								
8-1, 120-121															+								

8-2, 30-31		+	+				+	+												
8-3, 30-31			+			+	+	+		+										
8-4, 30-31		+	+				+	+		+	+									
8-5, 30-31			+	+				+		+										
8-6, 30-31	+	+	+					+		+										
8. CC	+	+						+		+										
9-1, 120-121			+			+		+		+										
9-2, 30-31		+	+				+	+		+										
9-3, 30-31	+	+	+			+	+	+		+	+									
9-4, 30-31	+	+	+	+		+	+	+		+		cf.								
9-5, 30-31		+	+	+			+	+		+										
9-6, 30-31	+	+	+			+	+	+	+		+				+					
9, CC		+				+	+	+												
10-1, 65-66	+	+				+	+	+		+										
10-1, 120-121	+			+		+					+									
10-2, 30-31	+	+		+		+		+		+						+	cf.			
10-2, 120-121	+		+			+	+	+		+		+				+		+	+	+
10-3, 30-31	+	+		+	+	+				+	+					+		+	+	+
10-4, 30-31	+			+		+	+	+		+						+	+			
10-5, 30-31			+	+		+	+	+		+					+	+	+			
10, CC	+		+	+		+				+	+		+		+	+				
11-1, 30-31	+		+	+			+	+		+		+				+	+			
11-2, 30-31			+	+		+	+			+		+			+	+	+			
11-3, 20-21			+	+			+	+		+		+				+	+			
11-4, 30-31			+			+		+		+		+			+	+	+			
11-5, 30-31			+	+			+			+		+			+	+	+			
11, CC						+	+					+	+		+	+	+			
12-2, 30-31	+		+	+		+	+			+		+			+	+	+			
12-3, 30-31	+		+	+		+	+			+		+			+	+	+			
12-4, 30-31			+	+			+	+		+		+			+	+	+			
12-5, 30-31			+	+			+	+		+		+				+	+			
12-6, 30-31	+			+		+	+	+		+		+		+	+	+	+			
12, CC						+	+					+	+		+	+	+			
13-1, 120-121			+	+			+	+				+			+	+	+			
13-2, 30-31			+				+	+		+		+		+	+	+	+			
13-3, 30-31	+						+	+				+		+	+	+	+			
13-4, 30-31	+		+	+		+	+			+		+		+	+	+	+			
13, CC	+		+	+		+	+			+		+	+	+	+	+	+			
14-1, 30-31	+		+				+			+		+	+	+	+	+	+			
14-2, 35-36	+		+				+					+		+	+	+	+			
14-3, 30-31	+					+	+					+	+		+	+	+			
14-4, 30-31	+		+				+	+		+		+		+	+	+	+			
14-5, 30-31	+		+	+		+	+			+		+		+	+	+	+			
14-6, 30-31	+			+		+	+								+	+	+			
14, CC	+						+			+		+	+	+	+	+	+			

TABLE 6B – *Continued*

Sample (Interval in cm) \ Species	*Discoaster saipanensis*	*Discoaster surculus*	*Discoaster tamalis*	*Discoaster tani*	*Discoaster trinidadensis*	*Discoaster triradiatus*	*Discoaster variabilis*	*Discoasteroides kuepperi*	*Discolithina japonica*	*Discolithina plana*	*Ellipsolithus macellus*	*Emiliania huxleyi*	*Ericsonia cava*	*Fasciculithus involutus*	*Fasciculithus tympaniformis*	*Gephyrocapsa caribbeanica*	*Gephyrocapsa lumina*	*Gephyrocapsa oceanica*	*Gephyrocapsa omega*	*Gephyrocapsa producta*	*Hayaster perplexus*	*Helicopontosphaera compacta*	*Helicopontosphaera granulata*	*Helicopontosphaera heezenii*	*Helicopontosphaera kamptneri*	*Helicopontosphaera lophota*	*Helicopontosphaera parallela*	*Helicopontosphaera recta*	*Helicopontosphaera sellii*	*Helicopontosphaera seminulum*	*Heliolithus cantabriae*	*Heliolithus kleinpellii*	*Heliolithus riedelii*	*Markalius astroporus*	*Markalius inversus*	*Minylitha convallis*	*Oolithothus antillarum*	*Orthorhabdus serratus*	*Pseudoemiliania lacunosa*	*Reticulofenestra dictyoda*	*Reticulofenestra pseudoumbilica*	*Reticulofenestra samodurovi*	*Reticulofenestra scissura*	*Reticulofenestra scrippsae*	*Reticulofenestra spp.*	*Reticulofenestra umbilica*	*Rhabdosphaera clavigera*	*Rhabdosphaera procera*	*Scyphosphaera spp.*	*Sphenolithus abies*	*Sphenolithus anarrhopus*	*Sphenolithus belemnos*	*Sphenolithus ciperoensis*	*Sphenolithus conicus*	*Sphenolithus delphix*	*Sphenolithus distentus*	*Sphenolithus heteromorphus*	*Sphenolithus moriformis*	*Sphenolithus neoabies*	*Sphenolithus predistentus*	*Sphenolithus pseudoradians*	*Sphenolithus radians*	*Thoracosphaera heimi*	*Thoracosphaera operculata*	*Thoracosphaera saxea*	*Toweius eminens*	*Toweius pertusus*	*Triquetrorhabdulus carinatus*	*Triquetrorhabdulus inversus*	*Triquetrorhabdulus milowii*	*Triquetrorhabdulus rugosus*	*Zygrhablithus bijugatus*	*Xygrhablithus crassus*
15-1, 120-121		+				+															+				+												+				+							+	+	+								+	+															
15-2, 30-31		+																																			+				+							+	+	+								+	+															
15-3, 30-31																									+												+				+							+		+									+															
15-4, 30-31		+																							+												+											+	+	+									+															
15, CC		+																																							+						+		+	+									+														+
16-1, 120-121		+				+	+														+				+												+				+								+	+									+												?		
16-2, 35-36		+				+	+																		+												+				+								+	+									+														+
16-3, 30-31		+																			+				+												+				+								+	+									+														
16-4, 30-31		+																							+																+								+	+								+	+												?		+
16-5, 30-31		+					+																																		+								+	+									+												+		
16-5, 120-212		+																			+																				+								+																							+		
16-6, 25-26		+				+	+																		+																+							+	+	+								+	+												+		
16, CC		+					+														+				+																+							+	+	+									+												+		+
17-1, 30-31		+					+														+				+																+							+	+	+									+												+		
17-1, 120-121		+				+	+														+				+																+								+	+								+	+												+		
17-2, 35-36		+					+																		+																+									+									+												+		
17-2, 120-121		+																			+																				+								+										+												+		
17-3, 30-31		+																							+																+								+	+									+												+		
17-3, 120-121		+																			+				+												+				+								+									+	+												+		
17-4, 120-121		+					+																		+																+								+	+								+	+												+		
17-5, 120-121																									+																																														+		
17-6, 30-31		+					+														+				+																+								+	+									+														
17, CC		+					+																																		+						+			+									+												+		
18-1, 120-121		+																			+				aff.																								+										+												+		
18-2, 120-121		+					+																		aff.																+								+	+									+												+		
18-3, 120-121		+																							+																								+										+												+		
18-4, 120-121		+				+															+																				+							+	+	+									+												+		
18-5, 120-121		+				+															+		aff.																		+									+								+	+												+		
18, CC		+					+																		+																+								+	+									+												+		
19-1, 50-51		+				+															+				+																+								+	+									+												+		
19-2, 35-36						+	+														+				+																+							+	+	+									+												+		
19-3, 30-31		+																							+																+							+	+	+									+												+		
19-4, 30-31		+																							+																+							+	+	+									+												+		
19, CC		+				+																																			+							+	+	+									+														
20-1, 30-31		+				+																																			+							+	+	+									+														
20-2, 35-36		+				+	cf.														+				+																+								+	+									+												+		
20-3, 30-31		+					+																		+																+								+	+									+												+		
20-4, 30-31		+				+	+																		+																+							+	+	+									+												+		
20-5, 30-31		+				+																			+																+								+	+									+												+		
20-6, 30-31		+				+																			+																+								+	+								+	+												+		
20, CC		+																			+																				+								+	+									+														+
21-1, 40-42		+				+																			+																+								+	+								+	+												+		
21-2, 35-36						+																			+																+								+	+								+	+												+		
21, CC		+																							cf.																+								+	+									+												+		
22-1, 135-136		+					cf.																		+																+							+	+	+								+	+												+		
22-2, 120-121		+					cf.														+				+																+								+	+								+	+														
22-3, 120-121		+																																							?								+	+								+													+		
22-4, 120-121						+																																																																	+		
22, CC		+					+																		+																+								+	+									+												+		
23-1, 120-121		+																																																																							
23-2, 120-121		+																							+																+																	+													+		
22-2, 120-121		+																							+																+								+	+								+													+		
22-3, 120-121		+																			+				+																																														+		
22-4, 120-121		+																							+																								+	+								+	+												+		
22, CC																					+																																																		+		
23-1, 120-121		+																																																																							
23-2, 120-121		+																							+																+								+	+								+	+														

23-3, 30-31															
23-3, 120-121															
23-4, 30-31								+	+	+	+	+	+		
23-5, 30-31								+	cf.	+	+	+	+		
23-6, 120-121															
23, CC															
24-1, 120-121	+		+			+			+	+	+				+
24-2, 35-36	+														+
24-3, 30-31	+									+					+
24-4, 30-31	+	+		+					cf.	+	+	+	+		+
24-5, 30-31	+					+			cf.	+	+		+		+
24-6, 30-31										+					+
24, CC	+		+			+				+	+	+			+
25-1, 120-121	+		+			+				+	+	+	+		+
25-2, 30-31	+					+						+			+
25-3, 120-121		+	+		+	+				+	+		+		+
25-4, 30-31	+		+	+		+				+	+	+	+		
25-5, 120-121	+		+			+	?				+		+		+
25, CC	+		+			+				+	+		+		+
26-1, 30-31						+					+	+	+		+
26-2, 35-36	+		+				+				+		+		+
26-3, 30-31				+		+	+				+		+		+
26-4, 30-31			+	+		+	+			+	+		+	+	+
26-5, 30-31	+		+			+	+			+	+		+		+
26-6, 30-31	+			+		+	+			+	+		+		+
26, CC			+			+	+				+		+		+
27-1, 45-46				+		+	+			+	+		+		+
27-2, 30-31	+	+	+				+			+	+		+		+
27-3, 120-121			+	+		+	+				+		+		+
27-4, 30-31	+		+			+					+	+	+	+	+
27-4, 120-121	+		+			+	+			+	+		+		+
27-5, 30-31			+			+	+			+	+		+	+	+
27-6, 30-31	+					+	+			+	+		+	+	+
27, CC	+		+			+	+			+	+		+	+	+
28-1, 30-31	+		+		aff.					+	+		+		+
28-2, 30-31			+	+		+	+				+		+	+	+
28-3, 30-31	+		+			+	+				+		+	+	+
28-4, 30-31			+			+	+				+		+		+
28-5, 30-31			+		+					+	+	+	+		+
28-6, 30-31			+			+	+			+	+		+	+	+
28, CC	+		+	+		+	+				+		+		+
29-1	+		+			+	+			+	+		+	+	+
29-2, 35-36					aff.					+	+	+	+	+	
29-3, 120-121															
29, CC															
30-1, 120-121															
30-2, 120-121															
30-3, 120-121															
30, CC															

TABLE 6B – *Continued*

Species / Sample (Interval in cm)	*Discoaster saipanensis*	*Discoaster surculus*	*Discoaster tamalis*	*Discoaster tani*	*Discoaster trinidadensis*	*Discoaster triradiatus*	*Discoaster variabilis*	*Discoasteroides kuepperi*	*Discolithina japonica*	*Discolithina plana*	*Ellipsolithus macellus*	*Emiliania huxleyi*	*Ericsonia cava*	*Fasciculithus involutus*	*Fasciculithus tympaniformis*	*Gephyrocapsa caribbeanica*	*Gephyrocapsa lumina*	*Gephyrocapsa oceanica*	*Gephyrocapsa omega*	*Gephyrocapsa producta*	*Hayaster perplexus*	*Helicopontosphaera compacta*	*Helicopontosphaera granulata*	*Helicopontosphaera heezenii*	*Helicopontosphaera kamptneri*	*Helicopontosphaera lophota*	*Helicopontosphaera parallela*	*Helicopontosphaera recta*	*Helicopontosphaera sellii*	*Helicopontosphaera seminulum*	*Heliolithus cantabriae*	*Heliolithus kleinpellii*	*Heliolithus riedelii*	*Markalius astroporus*	*Markalius inversus*	*Minylitha convallis*	*Oolithotus antillarum*	*Orthorhabdus serratus*	*Pseudoemiliania lacunosa*	*Reticulofenestra dictyoda*	*Reticulofenestra pseudoumbilica*	*Reticulofenestra samodurovi*	*Reticulofenestra scissura*	*Reticulofenestra scrippsae*	*Reticulofenestra* spp.	*Reticulofenestra umbilica*	*Rhabdosphaera clavigera*	*Rhabdosphaera procera*	*Scyphosphaera* spp.	*Sphenolithus abies*	*Sphenolithus anarrhopus*	*Sphenolithus belemnos*	*Sphenolithus ciperoensis*	*Sphenolithus conicus*	*Sphenolithus delphix*	*Sphenolithus distentus*	*Sphenolithus heteromorphus*	*Sphenolithus moriformis*	*Sphenolithus neoabies*	*Sphenolithus predistentus*	*Sphenolithus pseudoradians*	*Sphenolithus radians*	*Thoracosphaera heimi*	*Thoracosphaera operculata*	*Thoracosphaera saxea*	*Toweius eminens*	*Toweius pertusus*	*Triquetrorhabdulus carinatus*	*Triquetrorhabdulus inversus*	*Triquetrorhabdulus milowii*	*Triquetrorhabdulus rugosus*	*Zygrhablithus bijugatus*	*Zygrhablithus crassus*
31-1, 55-56							+														+				+											+					+									+									+					+							+		
31-2, 30-31						+																			+											+														+									+					+							+		
31-3, 30-31						+																			+											+														+								+	+					+							+		
31-4, 30-31							+																		+											+					+								+	+								+	+					+							+		
31-5, 30-31						+	+																		+											+					+									+									+					+							+		
31-6, 30-31																									+											+					+									+									+												+		
31, CC																									+											+					+									+									+														
32-1, 50-51							+																		+											+					+				+					+								+	+					+							+		
32-2, 30-31																									+											+					+									+								+	+					+							+		
32-3, 30-31						+															+				+											+					+				+					+								+	+												+		
32-4, 30-31							+																		+											+					+				+					+								+	+					+							+		
32-5, 30-31							+																		+											+					+				+					+									+					+							+		
32, CC																							aff.																		+									+								+	+														
33-1, 30-31						+																			+											+					+				+					+									+												+		
33-2, 35-36																									+																+				+																										+		
33-3, 80-81							+																													+					+				+					+									+												+		
33-4, 120-121							+																													+					+				+																										+		
33-5, 30-31							+																																																																	+		
33-5, 120-121							+																																																																	+		
33-6, 30-31																									+																+				+																										+		
33, CC		?																					cf.																		+				+					+									+												+		
34-1, 120-121																									+																+				+																										+		
34-2, 120-121						+	+																		+																+				+														+												+		
34-3, 120-121						+							+																							?					+				+					+									+												+		
34-4, 120-121							+						+																												+				+																										+		
34-5, 120-121						+	+						+																																+					+									+												+		
34-6, 120-121																																													+																										+		
34, CC													+												cf.																+				+					+								+													+		
35-1, 120-121							+														+																								+																										+		
35-2, 30-31							+																																		+				+					+														+							+		
35-3, 120-121							+						+																												+				+					+									+					+							+		
35-4, 120-121							+																																		+				+					+									+					+							+		
35, CC																									+																+				+																										+		
36-1, 30-31							+						+																												+				+					+								+	+					+							+		
36-2, 30-31					+		+						+								+																				+				+					+								+	+					+							+		
36-3, 30-31							+						+								+																				+				+					+								+	+					+							+		
36-4, 30-31							+						+								+				+																+				+					+								+	+												+		
36-5, 30-31							?						+																												+				+				+	+									+					+							+		
36-6, 30-31							+																																		+				+					+								+	+					+							+		
36, CC													+								+																				+				+					+								+													+		
37-1, 30-31													+																												+				+					+								+													+		
37-2, 120-121							+						+								+																				+				+				+	+								+	+					+							+		
37-2, 120-121																																									+				+													+													+		
37-4, 120-121													+																												+				+					+								+	+												+		
37-5, 120-121																									+																+				+																										+		
37-6, 35-36													+																												+				+																										+		
37-6, 120-121													+								+																				+				+																										+		
37, CC							+						+																												+				+																										+		
38-1, 30-31													+																												+				+					+																					+		
38-1, 120-121							+														+		+																						+																										+		
38-2, 30-31																																													+																										+		
38-2, 120-121							+																cf.																						+																										+		
38-3, 30-31							cf.						+																												+				+					+									+												+		
38-4, 30-31							cf.						+										+																		+				+					+									+											+	+		
38-5, 30-31							cf.						+																												+				+					+									+												+		
38-6, 30-31							cf.						+																												+				+				+	+								+	+					+						+	+		
38, CC							cf.																																		+				+													+													+		

39-1, 30-31		cf.				+		+	+		+		+	+		+
39-2, 30-31		cf.	+					+	+		+		+			+
39-3, 30-31		+	+					+	+		+		+			+
39-4, 35-36		+	+					+	+		+		+			+
39-5, 30-31		+	+					+	+		+		+			+
39-6, 30-31			+					+	+		+		+			+
39, CC			+					+	+	+		+				+
40-1, 30-31			+	+	ff.	+		+	+		+		+	+		+
40-2, 40-41			+					+	+		+		+			+
40-3, 30-31			+			+		+	+		+		+			+
40-4, 30-31			+					+	+		+		+	+		+
40-5, 30-31			+	+				+	+		+		+			+
40-6, 30-31			+					+	+		+		+	+		+
40, CC					ff.			+	+			+				+
41-1, 50-51			+					+	+		+		+	+		+
41-2, 120-121			+			+		+	+		+	+	+	+		+
41, CC								+	+	+						+
42-1, 30-31			+			+		+	+		+		+	+		+
42-2, 30-31			+	+	+			+	+	+	+	+	+	+		+
42-3, 30-31			+					+	+	+	+		+	+		+
42-4, 30-31			+			+		+	+		+		+	+		+
42-5, 30-31				+				+	+			+	+	+		+
42-6, 30-31			+					+	+							+
42, CC	cf.		+		aff.			+	+			+				+
43-1, 30-31				+		+	+	+	+		+		+	+		+
43-2, 35-36			+	+			+	+	+		+	+	+	+		+
43-3, 30-31			+				+	+	+		+	+	+			+
43-4, 35-36			+			+	+	+	+		+	+	+			+
43-5, 30-31			+			+	+	+	+		+	+	+			+
43-6, 40-41							+	+	+	+	+		+			?
43, CC			+			+		+	+							
44-1, 30-31			+				+	+	+		+	+	+			+
44-2, 30-31					+		+	+	+		+	+	+		+	
44-3, 30-31			+		+	+	+	+	+		+	+	+	+	+	
44-4, 30-31			+			+	cf.	+	+		+		+		?	
44-5, 30-31			+				+	+	+		+	+	+			
44-6, 30-31			+				+	+	+		+		+		aff.	
44, CC			+					+								
45-1, 30-31			+			+	+	+	+		+		+	+		
45-2, 30-31			+	+			+	+	+		+	+	+		aff.	
45-3, 30-31			+			+	[illegible]	+	+		+	+	+	+	aff.	
45-4, 30-31			+	+			+	+	+		+	+	+		aff.	
45-5, 30-31			+				+	+	+	+	+	+	+		aff.	

TABLE 6B – *Continued*

Sample (Interval in cm) \ Species	*Discoaster saipanensis*	*Discoaster surculus*	*Discoaster tamalis*	*Discoaster tani*	*Discoaster trinidadensis*	*Discoaster triradiatus*	*Discoaster variabilis*	*Discoasteroides kuepperi*	*Discolithina japonica*	*Discolithina plana*	*Ellipsolithus macellus*	*Emiliania huxleyi*	*Ericsonia cava*	*Fasciculithus involutus*	*Fasciculithus tympaniformis*	*Gephyrocapsa caribbeanica*	*Gephyrocapsa lamina*	*Gephyrocapsa oceanica*	*Gephyrocapsa omega*	*Gephyrocapsa producta*	*Hayaster perplexus*	*Helicopontosphaera compacta*	*Helicopontosphaera granulata*	*Helicopontosphaera heezenii*	*Helicopontosphaera kampineri*
45-6, 30-31													+								+				+
45, CC																									
46-1, 120-121													+												+
46-2, 120-121													+								+				+
46, CC																									
47-1, 30-31																									+
47-2, 50-51													+												+
47-3, 30-31													+								+				+
47-4, 35-36							+																		+
47-5, 30-31							cf.						+								+				+
47-6, 30-31																									+
47, CC																									+
48-1, 30-31																					+				+
48-2, 30-31							+																		
48-3, 30-31																					+				
48-4, 30-31																					+				
48-5, 30-31																									
48-6, 30-31																					+				+
48, CC					+								+												
49-1, 120-121																					+				+
49-2, 35-36																									+
49-3, 30-31													+												
49-4, 30-31													+								+				+
49-5, 30-31																									
49-6, 30-31																									+
49, CC																									
50-1, 30-31													+								+				+
50-2, 30-31													+								+		cf.		+
50-3, 30-31							+						+								+				+
50-4, 30-31							+						+												+
50-5, 30-31							cf.						+								+				+
50-6, 30-31																									+
50, CC					+								+												+
51-1, 50-51																					+				+
51-2, 30-31							+						+								+				+
51-3, 30-31													+								+				+
51-4, 30-31													+								+				
51-5, 30-31							+						+												+
51-6, 30-31							+						+								+				
51, CC																									
52-1, 30-31																					+				
52-2, 30-31													+								+				+
52-3, 30-31													+								+				+
52-4, 30-31																					+				+
52-5, 30-31																					+				
52-6, 30-31													+								+				
52, CC					+								+								+				
53-1, 120-121													+								+				+
53-2, 110-120													+												
53-3, 120-121													+								+				+
53-4, 120-121													+												+
53, CC					+								+										+		+
54-1, 120-121													+								+				+
54-2, 120-121																					+				+
54-3, 120-121													+								+				
54-4, 120-121							cf.																		
54, CC					+								+												

Sample (Interval in cm) \ Species	*Helicopontosphaera lophata*	*Helicopontosphaera parallela*	*Helicopontosphaera recta*	*Helicopontosphaera sellii*	*Helicopontosphaera seminulum*	*Heliolithus cantabriae*	*Heliolithus kleinpellii*	*Heliolithus riedelii*	*Markalius astroporus*	*Markalius inversus*	*Minylitha convallis*	*Oolithotus antillarum*	*Orthorhabdus serratus*	*Pseudoemiliania lacunosa*	*Reticulofenestra dictyoda*	*Reticulofenestra psuedoumbilica*	*Reticulofenestra samodurovi*	*Reticulofenestra scissura*	*Reticulofenestra scrippsae*	*Reticulofenestra* spp.	*Reticulofenestra umbilica*	*Rhabdosphaera clavigera*	*Rhabdosphaera procera*	*Scyphosphaera* spp.	*Sphenolithus abies*
45-6, 30-31																+				+					+
45, CC																+									
46-1, 120-121																+									+
46-2, 120-121																+				+					+
46, CC																									
47-1, 30-31																+				+					+
47-2, 50-51																+								+	+
47-3, 30-31																+				+					+
47-4, 35-36																+									+
47-5, 30-31													cf.			+								+	+
47-6, 30-31																cf.									
47, CC																cf.									
48-1, 30-31																+									
48-2, 30-31																+								+	
48-3, 30-31																+								+	+
48-4, 30-31																+								+	+
48-5, 30-31																+								+	+
48-6, 30-31																+									
48, CC																+									
49-1, 120-121																+									+
49-2, 35-36																+									
49-3, 30-31																+								+	+
49-4, 30-31																+								+	
49-5, 30-31													cf.			+									
49-6, 30-31													cf.			+									
49, CC																+									
50-1, 30-31													cf.			+								+	+
50-2, 30-31																+								+	
50-3, 30-31																+									+
50-4, 30-31																								+	+
50-5, 30-31																									
50-6, 30-31																									+
50, CC																+									
51-1, 50-51																cf.									+
51-2, 30-31																cf.									+
51-3, 30-31																								+	+
51-4, 30-31																								+	
51-5, 30-31																								+	
51-6, 30-31																								+	+
51, CC																									
52-1, 30-31																									
52-2, 30-31																									
52-3, 30-31																									
52-4, 30-31																									
52-5, 30-31																									+
52-6, 30-31																									
52, CC																cf.									
53-1, 120-121																+									
53-2, 110-120																									
53-3, 120-121																									
53-4, 120-121																cf.									
53, CC																+									
54-1, 120-121																+									
54-2, 120-121																+									+
54-3, 120-121																cf.									
54-4, 120-121																+									
54, CC																									

Sample (Interval in cm) \ Species	*Sphenolithus anarrhopus*	*Sphenolithus belemnos*	*Sphenolithus ciperoensis*	*Sphenolithus conicus*	*Sphenolithus delphix*	*Sphenolithus distentus*	*Sphenolithus heteromorphus*	*Sphenolithus moriformis*	*Sphenolithus neoabies*	*Sphenolithus predistentus*	*Sphenolithus pseudoradians*	*Sphenolithus radians*	*Thoracosphaera heimi*	*Thoracosphaera operculata*	*Thoracosphaera saxea*	*Toweius eminens*	*Toweius pertusus*	*Triquetrorhabdulus carinatus*	*Triquetrorhabdulus inversus*	*Triquetrorhabdulus milowii*	*Triquetrorhabdulus rugosus*	*Zygrhablithus bijugatus*	*Zygrhablithus crassus*
45-6, 30-31									+					+									
45, CC																							
46-1, 120-121								+	+					+									
46-2, 120-121								+	+														
46, CC																							
47-1, 30-31								+	+														
47-2, 50-51									+					+									
47-3, 30-31								+	+					+									
47-4, 35-36								+	+														
47-5, 30-31				+			+	+	+					+									
47-6, 30-31							+	+															
47, CC							+	+															
48-1, 30-31							+							+				aff.					
48-2, 30-31							+	+						+									
48-3, 30-31							+	+	+					+									
48-4, 30-31							+	+	+					+									
48-5, 30-31							+	+						+									
48-6, 30-31							+	+						+									
48, CC							+	+															
49-1, 120-121							+	+						+									
49-2, 35-36				+			+	+						+									
49-3, 30-31							+	+															
49-4, 30-31							+	+						+									
49-5, 30-31							+	+						+									
49-6, 30-31							+							+									
49, CC							+																
50-1, 30-31							+																
50-2, 30-31							+	+						+									
50-3, 30-31							+	+						+									
50-4, 30-31							+	+															
50-5, 30-31							+																
50-6, 30-31							+							+									
50, CC							+	+															
51-1, 50-51							+	+															
51-2, 30-31							+	+															
51-3, 30-31							+	+															
51-4, 30-31							+	+						+									
51-5, 30-31							+	+															
51-6, 30-31							+	+															
51, CC							+	+															
52-1, 30-31							+	+															
52-2, 30-31							+	+						+									
52-3, 30-31							+	+						+									
52-4, 30-31							+	+															
52-5, 30-31							+	+						+									
52-6, 30-31							+	+															
52, CC							+																
53-1, 120-121							+	+						+									
53-2, 110-120							+	+						+									
53-3, 120-121							+	+						+									
53-4, 120-121							+							+									
53, CC							+																
54-1, 120-121							+																
54-2, 120-121							+	+															
54-3, 120-121							+	+						+									
54-4, 120-121							+							+									
54, CC							+																

55-1, 30-31			+	+					cf.						+	+		+	
55-2, 30-31			+						cf.						+	+			
55-3, 30-31			+	+					+						+	+		+	
55-4, 30-31			+	+					+						+	+			
55-5, 30-31			+	+											+	+		+	
55-6, 30-31	+		+	+											+	+			
55, CC	+														+	+			
56-1, 120-121			+	+					+						+	+		+	
56-2, 120-121			+	+											+	+		+	
56-3, 120-121			+												+				
56-4, 120-121			+	+					+						+	+		+	
56, CC			+			aff.	+		cf.						+	+			
57-1, 30-31		+	+		cf.	aff.									+	+		+	
57-2, 30-31									cf.						+	+			
57-3, 35-36			+												+	+			
57-4, 30-31			+							+					+	+			
57-5, 30-31			+												+	+		+	
57-6, 30-31			+	+											+	+		+	
57, CC	+								+						+	+			
58-1, 30-31		cf.	+						cf.							+			
58-2, 30-31			+	+			+		+			+				+		+	
58-3, 30-31									cf.			+				+		+	
58-4, 30-31			+						+			+				+		+	
58-5, 30-31			+						+			+				+			
58-6, 30-31			+						+			+				+			
58, CC			+									+				+			
59-1, 115-116			+						cf.			+				+		+	?
59-2, 120-121			+									+				+		+	
59, CC									cf.			+				+			
60-1, 120-121												+				+			+
60-2, 30-31			+						+			+				+			?
60-3, 30-31						+			+		+	+		+		+			?
60-4, 30-31												+		+		+			+
60-5, 30-31			+						cf.		+	+		+		+			+
60-6, 30-31			+			+					+	+		+		+			+
60-6, 120-121									+		+	+		+		+			+
60, CC												+		+		+			+
61-1, 30-31						+						cf.		+		+			
61-2, 30-31			+			+		cf.	cf.			cf.	+	+		+	+		+
61-3, 30-31			+						cf.		+	cf.	+			+			?
61-4, 30-31			+					cf.	cf.			cf.				+			
61-5, 30-31			+			+		cf.					aff.			+			+
61-6, 30-31								cf.					aff.			+			

TABLE 6B – *Continued*

Sample (Interval in cm) \ Species	*Discoaster saipanensis*	*Discoaster surculus*	*Discoaster tamalis*	*Discoaster tani*	*Discoaster trinidadensis*	*Discoaster triradiatus*	*Discoaster variabilis*	*Discoasteroides kuepperi*	*Discolithina japonica*	*Discolithina plana*	*Ellipsolithus macellus*	*Emiliania huxleyi*	*Ericsonia cava*	*Fasciculithus involutus*	*Fasciculithus tympaniformis*	*Gephyrocapsa caribbeanica*	*Gephyrocapsa lumina*	*Gephyrocapsa oceanica*	*Gephyrocapsa omega*	*Gephyrocapsa producta*	*Hayaster perplexus*	*Helicopontosphaera compacta*	*Helicopontosphaera granulata*	*Helicopontosphaera heezenii*	*Helicopontosphaera kamptneri*	*Helicopontosphaera lophata*	*Helicopontosphaera parallela*	*Helicopontosphaera recta*	*Helicopontosphaera sellii*	*Helicopontosphaera seminulum*	*Heliolithus cantabriae*	*Heliolithus kleinpellii*	*Heliolithus riedelii*	*Markalius astroporus*	*Markalius inversus*	*Minylitha convallis*	*Oolithotus antillarum*	*Orthorhabdus serratus*	*Pseudoemiliania lacunosa*	*Reticulofenestra dictyoda*	*Reticulofenestra pseudoumbilica*	*Reticulofenestra samodurovi*	*Reticulofenestra scissura*	*Reticulofenestra scrippsae*	*Reticulofenestra* spp.	*Reticulofenestra umbilica*	*Rhabdosphaera clavigera*	*Rhabdosphaera procera*	*Scyphosphaera* spp.	*Sphenolithus abies*	*Sphenolithus anarrhopus*	*Sphenolithus belemnos*	*Sphenolithus ciperoensis*	*Sphenolithus conicus*	*Sphenolithus delphix*	*Sphenolithus distentus*	*Sphenolithus heteromorphus*	*Sphenolithus moriformis*	*Sphenolithus neoabies*	*Sphenolithus predistentus*	*Sphenolithus pseudoradians*	*Sphenolithus radians*	*Thoracosphaera heimi*	*Thoracosphaera operculata*	*Thoracosphaera saxea*	*Toweius eminens*	*Toweius pertusus*	*Triquetrorhabdulus carinatus*	*Triquetrorhabdulus inversus*	*Triquetrorhabdulus milowii*	*Triquetrorhabdulus rugosus*	*Zygrhablithus bijugatus*	*Zygrhablithus crassus*
61, CC					+																				+																cf.																	+															
62-1, 120-121													+																									cf.																					+										+					
62-2, 120-121																																																							cf.			+															
62, CC																																																										+										+					
63-1, 33-35																																																										+										+					
63-2, 120-121													+																																													+										+					
63, CC					cf.																																																					+										+					
64-1, 119-120																																																										+						+				+					
64-2, 115-116													+																																													+										+					
64-3, 120-121																																																										+										+					
64, CC													+																																													+										+					
65-1, 65-66													+																																													+						+				+					
65-2, 27-28													+																																													+															
65-3, 25-28																																																										+															
65, CC																									cf.																																	+															
66-1, 120-121					+								+								+																																					+															
66-2, 120-121																																																						aff.				+						+									
66-3, 118-119													+																																													+						+									
66, CC													+												+																													+				+															
67-1, 30-31																									cf.																																	+															
67-2, 30-31													+												cf.																																	+						+									
67-3, 30-31																												aff.																										aff.				+															
67-4, 30-31													+																																													+															
67-5, 30-31													+																																													+															
67-6, 30-31																																																										+															
67, CC													+																																													+															
68-1, 120-121					+								+														cf.																															+										+					
68-2, 120-121																																																										+															
68-3, 30-31													+																																													+															
68-4, 30-31																					+																																					+															
68-5, 30-31													+								+						aff.	aff.																														+										+					
68-6, 30-31													+																																													+															
68, CC													+																																													+				?												
69-1, 120-121													+																																													+															
69-2, 120-121													+																																													+										+					
69-3, 120-121													+																																													+						+									
69-4, 120-121																																																										+										+					
69-5, 114-115																																																										+										+					
69, CC																																					cf.																					+						+									
70-1, 30-31																																																										+															
70-2, 30-31																																																										+															
70-3, 30-31													+																																													+				cf.		+									
70-4, 30-31													+																																													+															
70-5, 30-31													+								+																																	?				+															
70-6, 30-31																																																										+						+									
70, CC																																																										+															
71-1, 118-119													+																																													+															
71-2, 120-121																					+																																					+															
71-3, 120-121													+								+																																	+				+															
71-5, 120-121													+								+																																	+				+															
71, CC													+														F																															+		?													
72-1, 120-121													+																																													+															
72-2, 30-31													+																																													+						+									
72-3, 30-31																					+																																					+															
72-4, 30-31													+																																													+															
72-5, 30-31																																																										+															
72-6, 30-31													+																																													+															

72, CC						F						+			
73-1, 120-121			+								+	+			
73-2, 25-26			+								+	+			
73-3, 30-31												+			
73-4, 35-36			+									+			
73-5, 30-31			+									+			
73-5, 120-121												+			
73, CC												+			
74-1, 30-31												+	+		
74-2, 30-31												+			
74-3, 30-31			+									+			
74-4, 35-36			+									+			
74-5, 30-31			+									+			
74-6, 30-31			+									+			
74, CC			+								+ +	+			
75-1, 133-134											F	+	+		
75-2, 36-37											F	+	+		
75-3, 30-31											F	+			
75-4, 30-31												+			
75, CC												+			
76-1, 125-126			+								aff.	+ +			
76-2, 120-121			+								aff.	+			
76-3, 120-121			+								aff.	+			
76-4, 120-121			+								aff.	+			
76-5, 120-121											aff.	+			
76, CC			+									+ ?			
77-1, 120-121	+	+	+									+ ?			
77, CC			+									+			
78-1, 120-121	cf.		+								aff.	+			
78-2, 120-121			+								aff.	+			
78-3, 120-121											aff.	+			
78, CC			+									+			
79-1, 60-61			+								+	+	+		
79-2, 30-31									+		+	+			
79-3, 120-121			+								aff.	+			
79, CC											+	+			
80-2, 30-31											+	+			
80-2, 115-116											+ aff.	+			
80-3, 120-121			+								+	+			
80-4, 120-121			+								+	+			
80, CC												+			
81-1, 134-136			+									+			

TABLE 6B – *Continued*

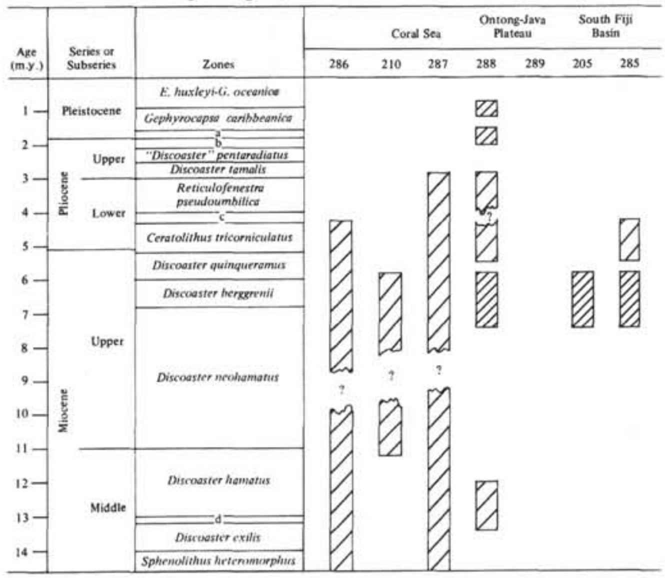
Sample (Interval in cm) / Species	*Discoaster saipanensis*	*Discoaster surculus*	*Discoaster tamalis*	*Discoaster tani*	*Discoaster trinidadensis*	*Discoaster triradiatus*	*Discoaster variabilis*	*Discoasteroides kuepperi*	*Discolithina japonica*	*Discolithina plana*	*Ellipsolithus macellus*	*Emiliania huxleyi*	*Ericsonia cava*	*Fasciculithus involutus*	*Fasciculithus tympaniformis*	*Gephyrocapsa caribbeanica*	*Gephyrocapsa lumina*	*Gephyrocapsa oceanica*	*Gephyrocapsa omega*	*Gephyrocapsa producta*	*Hayaster perplexus*	*Helicopontosphaera compacta*	*Helicopontosphaera granulata*	*Helicopontosphaera heezenii*	*Helicopontosphaera kamptneri*	*Helicopontosphaera lophata*	*Helicopontosphaera parallela*	*Helicopontosphaera recta*	*Helicopontosphaera sellii*	*Helicopontosphaera seminulum*	*Heliolithus cantabriae*	*Heliolithus kleinpellii*	*Heliolithus riedelii*	*Markalius astroporus*	*Markalius inversus*	*Minylitha convallis*	*Oolithotus antillarum*	*Orthorhabdus serratus*	*Pseudoemiliania lacunosa*	*Reticulofenestra dictyoda*	*Reticulofenestra pseudoumbilica*	*Reticulofenestra samodurovi*	*Reticulofenestra scissura*	*Reticulofenestra scrippsae*	*Reticulofenestra* spp.	*Reticulofenestra umbilica*	*Rhabdosphaera clavigera*	*Rhabdosphaera procera*	*Scyphosphaera* spp.	*Sphenolithus abies*	*Sphenolithus anarrhopus*	*Sphenolithus belemnos*	*Sphenolithus ciperoensis*	*Sphenolithus conicus*	*Sphenolithus delphix*	*Sphenolithus distentus*	*Sphenolithus heteromorphus*	*Sphenolithus moriformis*	*Sphenolithus neoabies*	*Sphenolithus predistentus*	*Sphenolithus pseudoradians*	*Sphenolithus radians*	*Thoracosphaera heimi*	*Thoracosphaera operculata*	*Thoracosphaera saxea*	*Toweius eminens*	*Toweius pertusus*	*Triquetrorhabdulus carinatus*	*Triquetrorhabdulus inversus*	*Triquetrorhabdulus milowii*	*Triquetrorhabdulus rugosus*	*Zygrhablithus bijugatus*	*Zygrhablithus crassus*
81-2, 125-126													+																																								+					+															
81, CC																																																					+					+															
82-1, 30-31													+																																								+	aff.				+						+									
82-2, 30-31													+																																													+															
82-2, 120-121													+																																								+					+															
82-3, 30-31													+																																								+					+															
82-3, 120-121													+																																								+					+															
82, CC																											F																										+					+															
83-1, 112-113													+																																								+					+															
83-2, 120-121													+																																								+					+															
83, CC																																																										+															
84-1, 124-125													+																						+																		+	aff.				+											+					
84-2, 39-40													+																																								+					+															
84-2, 101-102													+																																								+					+											+					
84, CC													+																																								+			aff.		+															
85-1, 28-29													+																																								+			+		+		+													
85-1, 119-122													+																																											+		+		+													
85, CC													+																																								+			+		+		+													
86-2, 120-121													+																																								aff.			+		+		+													
86-3, 120-121													+															+																									aff.			+		+		+													
86-4, 120-121													+																																								aff.			+		+		+													
86-5, 120-121													+																																													+		+								+					
86-6, 120-121													+																															+												+		+		+													
86, CC													+																																								aff.			+		+		+													
87-2, 40-41													+																																								aff.			+		+		+													
87-2, 120-121													+															+																									aff.			+		+		+													
87, CC													+																																											+		+		+													
88-1, 134-135													+																																								aff.			+		+		+													
88-2, 125-126													+																																													+		+													
88-3, 114-116													+																																											+		+		+													
88, CC													+																																											+		+		+													
89-1, 120-121													+																																													+		+													
89-2, 120-121													+																																											+		+		+													
89-3, 120-121													+																																													+		+													
89-4, 120-121													+																																											+		+		+													
89, CC													+																																								aff.			+		+		+													
90-1, 120-121													+																																											+		+		+													
90-2, 130-131													+																																											+		+		+		+												
90-3, 126-127													+																																											+		+		+												+	
90, CC													+																																											+		+		+													
91-1, 120-121													+																															+														+		+													
91-2, 120-121													+																															+												+		+		+													
91-3, 120-121													+																															+												+		+		+													
91-4, 120-121													+									+																						+														+		+													
91-5, 120-121													+									+						+																												+		+		+													
91, CC													+																																											+		+		+	+												
92-1, 120-121													+																														+	+												aff.		+		+	+												
92, CC													+																																													+		+													
93-1, 120-121													+																														+	+														+		+												+	
93-2, 120-121													+																														+													aff.		+		+												+	
93-3, 120-121													+																																													+		+												+	
93, CC													+																														+															+		+													
94-1, 130-131													+									+																					+	+														+		+													
94-2, 120-121													+									+																						+														+		+												+	
94-3, 120-121													+									+																						+														+		+												+	
94-4, 130-131													+																																													+		+													
94, CC													+																																													+		+													

95-1, 136-137			+										+	+	+	+	+	
95-2, 115-116			+											+	+	+		
95, CC			+						+					+	+	+		
96-1, 100-102		cf.	+	+						+				+	+			
96, CC		+	+	+							+			+	+			
97-1, 119-120			+						+					+	+			
97-2, 133-134		+	+						+	+				+	+			
97-3, 79-80			+						+	+				+	+		+	
97-4, 114-115		+	+		+				+	+				+	+			
97, CC			+											+	+			
98-2, 30-31		+	+	+						+				+	+			
98-2, 120-121			+						+	+				+	+			
98-3, 120-121			+						+	+				+	+			
98-4, 120-121			+						+	+				+	+			
98, CC		+	+						+	+				+	+			
99-1, 120-121			+						+	+				+	+			
99-2, 120-121			+						+	+				+	+			
99-3, 120-121			+	+					+	+	+			+	+			
99-4, 115-116		+	+						+		+			+	+			
99-5, 120-121			+		+					+	+			+	+			
99, CC		+	+	+						+				+	+			
100-1, 50-51			+	+					+					+	+			
100-1, 122-123			+	+				+	+	+	+			+	+			
100, CC			+	+	+			+	+	+				+	+			
101-1, 65-66			+		+			+	+	+				+	+			
101-1, 120-121			+					+	+	+		+		+	+			
101-2, 35-36			+	+				+	+	+		+		+	+			
101-2, 117-118			+	+				+	+	+		+		+	+			
101, CC		+						+	+	+				+	+			
102-1, 112-113		+	+					+	+	+		+		+				
102, CC		+	+					+	+	+		+		+				
103-1, 130-131		+	+	+				+	+			+		+		+		
103, CC	+	+	+	+				+				+		+		+		
104-1, 149	+			+								+		+				+
104, CC	+	+	+					+				+				+		
105, CC	+	+	+	+	+				+	+		+		+				
106-1, 120-121	+	+	+	+	+		+		+	+				+		+		
106-2, 115-116	+		+	+					+	+		+		+				
106-3, 120-121		+	+						+	+		+		+				
106-4, 120-121	cf.	+	+	+			+		+	+				+				
106-5, 120-121			+				+		+	+		+		+				+
106, CC	cf.	+					+		+	+		+		+		+		
107-1, 140-141			+			+	+	+	+	+		+				+		

TABLE 6B – Continued

Species \ Sample (Interval in cm)	107-2, 60-61	107, CC	108-1, 74-75	108, CC	109, CC	110-1, 107-108	110, CC	111-1, 70-71	111-2, 37-38	111-3, 39	111, CC	112, CC	113-1, 117-118	114-1, 148-150	115-1, 55-56	115, CC	116-1, 140-143	117, CC	118-1, 70-72	118, CC	119, CC	120-1, 80-81	120-1, 80-81	120-1, 148-150
Discoaster saipanensis			+		+		+																	
Discoaster surculus																								
Discoaster tamalis																								
Discoaster tani		+		+	+										+									
Discoaster trinidadensis																								
Discoaster triradiatus																								
Discoaster variabilis																								
Discoasteroides kuepperi															+									
Discolithina japonica																								
Discolithina plana												+												
Ellipsolithus macellus																					+			+
Emiliania huxleyi																								
Ericsonia cava		+	+	+											+									
Fasciculithus involutus																			cf.	+	+	cf.		cf.
Fasciculithus tympaniformis																				+	+	+	cf.	+
Gephyrocapsa caribbeanica																								
Gephyrocapsa lumina																								
Gephyrocapsa oceanica																								
Gephyrocapsa omega																								
Gephyrocapsa producta																								
Hayaster perplexus																								
Helicopontosphaera compacta		+	+	+						+		+												
Helicopontosphaera granulata																								
Helicopontosphaera heezenii																								
Helicopontosphaera kamptneri																								
Helicopontosphaera lophota														+										
Helicopontosphaera parallela																								
Helicopontosphaera recta																								
Helicopontosphaera sellii																								
Helicopontosphaera seminulum																								
Heliolithus cantabriae																								
Heliolithus kleinpellii																				+	cf.			+
Heliolithus riedelii																				+	cf.	cf.		cf.
Markalius astroporus												+						+						
Markalius inversus		+		+																				
Minylitha convallis																								
Oolithotus antillarum																								
Orthorhabdus serratus																								
Pseudoemiliania lacunosa																								
Reticulofenestra hillae																								
Reticulofenestra pseudoumbilica																								
Reticulofenestra samodurovi											+		+											
Reticulofenestra scissura	+	+	+	+	+							+												
Reticulofenestra scrippsae	+	+	+	+								+												
Reticulofenestra spp.																								
Reticulofenestra umbilica	+	+		+	+	+	+				+	+												
Rhabdosphaera clavigera																								
Rhabdosphaera procera																								
Scyphosphaera spp.																								
Sphenolithus abies																								
Sphenolithus anarrhopus																					+			
Sphenolithus belemnos																								
Sphenolithus ciperoensis																								
Sphenolithus conicus																								
Sphenolithus delphix																								
Sphenolithus distentus																								
Sphenolithus heteromorphus																								
Sphenolithus moriformis	+	+	+	+	+	+	+		+	+	+					cf.	cf.	cf.						
Sphenolithus neoabies																								
Sphenolithus predistentus					+																			
Sphenolithus pseudoradians		+	+	+		+																		
Sphenolithus radians					+					+		+	+	+	+	+								
Thoracosphaera heimii																								
Thoracosphaera operculata																								
Thoracosphaera saxea																								
Toweius eminens																	+		+	+	+			
Toweius pertusus																		+	+	+	+		cf.	cf.
Triquetrorhabdulus carinatus																								
Triquetrorhabdulus inversus												+	+											
Triquetrorhabdulus milowii																								
Triquetrorhabdulus rugosus																								
Zygrhablithus bijugatus	+			+																				
Zygrhablithus crassus		+	+	+																				

TABLE 7
Upper Tertiary-Quaternary Hiatuses Detected by the Use of Nannofossils, Absolute Ages Slightly Modified After Bukry (1973d)



Note: ☐evidence good, ☐evidence reasonable, ☐evidence tenuous.

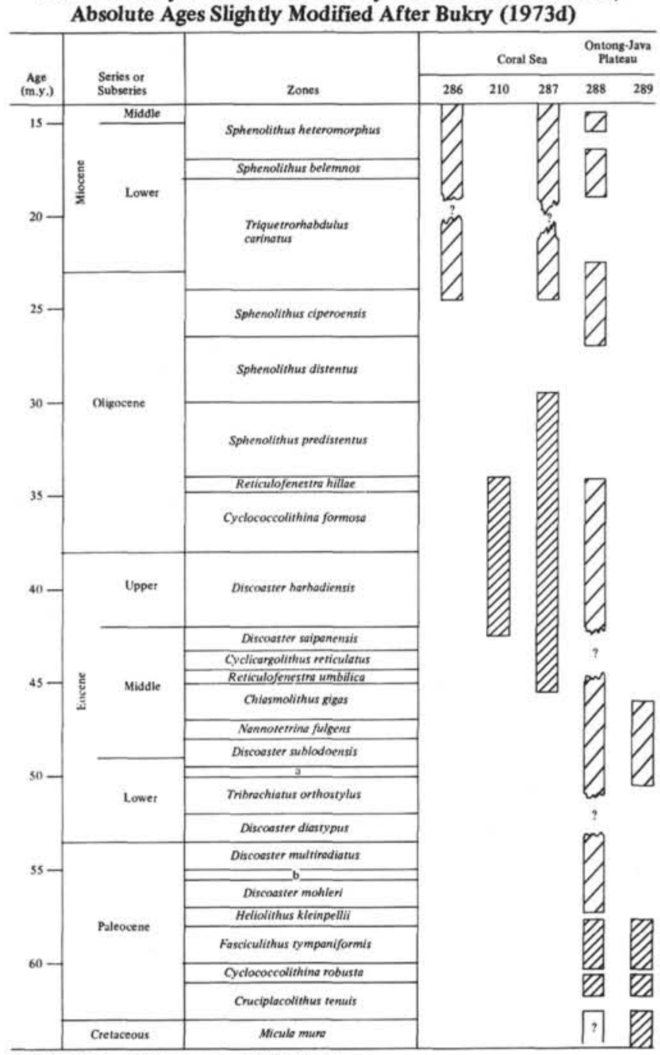
[a]*Pseudoemiliania lacunosa*

[b]*Discoaster brouweri*

[c]*Ceratolithus rugosus*

[d]*Catinaster coalitus*

TABLE 8
Lower Tertiary Hiatuses Detected by the Use of Nannofossils, Absolute Ages Slightly Modified After Bukry (1973d)



Note: ☐ evidence good, ☐evidence reasonable, ☐ evidence tenuous.

[a]*Discoaster lodoensis*

[b]*Discoaster nobilis*

allocations. A possible existence of a hiatus between Sections 2 and 3 cannot be ruled out since the sequence of the paleontological events is largely masked by reworking.

Miocene

The upper Miocene sediments in most of the southwest Pacific region either contain an unconformity or are relatively thin and almost totally barren of calcareous microplankton remains and virtually becoming absent. The unconformity is usually represented by the absence of the *Discoaster berggrenii* Zone.

In the South Fiji Basin, the two sites (205 and 285) preserve a hiatus between the upper Miocene *Discoaster quinqueramus* and *D. neohamatus* zones. Sample 205-4, CC contains, among the assemblage listed by Edwards (1973, Table 5), *D. quinqueramus, D. berggrenii,* and *Ceratolithus tricorniculatus* and therefore fits in the *D. quinqueramus* Zone (sensu this chapter). Section 205-5-1 belongs to the lower subzone of the *D. neohamatus* Zone according to Bukry (1973c). A hiatus between these cores is therefore inferred; a lithologic boundary at or near this level is recorded by Burns, Andrews, et al. (1973). A similar and almost identical hiatus is recorded at Site 285 (this volume) between the *D. quinqueramus* Zone (base, sample 285-3-1, 36-37 cm) and the *D. neohamatus* Zone (top, Sample 285-3-2, 51-52 cm). Surprisingly, the hiatus established at Site 285 is almost at the same level below the present sea floor as the one deduced at Site 205.

In the Coral Sea, there are indications suggesting a rather different history for the Miocene; hiatuses seem to be enlarged and/or deposition was essentially below the total nannofossil solution depth. Section 210-29-4 is placed in the *Ceratolithus primus* Subzone (Bukry, 1973c) which correlates with the *D. quinqueramus* Zone (sensu this chapter), and Section 210-30-1 is assigned to the *Discoaster hamatus* Zone (Edwards, 1973. It seems rather unlikely that the segment between these two cores (ca 12 m) contains, in addition to the long *D. neohamatus* Zone (ca 4.2 m.y.: Bukry, 1973b), the *D. berggrenii* Zone; a hiatus is therefore inferred. At Site 287, the sediments between the upper Pliocene Sample 287-8-1, 10-11 cm and the upper Oligocene Sample 287-16-2, 4-5 cm are essentially devoid of nannofossils; the whole Miocene is barren and unconformity is likely.

At Site 286, between the South Fiji Basin and the Coral Sea, the Miocene sediments are scarcely fossiliferous, exceptionally thin (maximum thickness: 19 m), and appear in the major part of Core 286-5; existence of a hiatus cannot be ruled out.

At Site 288 on the Ontong-Java Plateau, a hiatus similar to that recognized at the South Fiji Basin sites is established. The hiatus is represented by the absence of the *D. berggrenii* Zone between the *D. quinqueramus* Zone (Sample 288-6-6, 30-31 cm) and the *D. neohamatus* Zone (Sample 288-6-6, 120-121 cm).

Sample 288-8-1, 118-119 cm belongs to the *Catinaster calyculus* Subzone (*D. hamatus* Zone) and Sample 288-8, CC to the *Discoaster exilis* Zone; the relatively thin *Helicopontosphaera kamptneri* Subzone and *Catinaster coalitus* Zone were not identified. The poor recovery of Core 288-8 and to a lesser degree the short span of the unidentified biostratigraphic units make recognition of a hiatus largely uncertain. Within the *Sphenolithus heteromorphus* Zone, a hiatus probably exists on the evidence of a sharp drop in the abundance of *Discoaster deflandrei* between Samples 288-10, CC and 288-10-2, 123-124 cm; notwithstanding, this may indicate a biostratigraphic boundary (see Bukry, 1973d for the *S. heteromorphus-Helicophontosphaera ampliapertura* zonal boundary). Poor preservation of the nannofossils and poor recovery of Core 288-10 sediments cause uncertainty in establishing a hiatus. Similarly, two doubtful hiatuses may be contained in the noncoring gaps between 288-11, CC and 288A-1-1 and between 288A-2, CC and 288A-3-1. Core 288-11 belongs to the *S. heteromorphus* Zone and Core 288A-1 is placed in the *Discoaster druggii* Subzone (*Triquetrorhabdus carinatus* Zone). Core 288A-2 is assigned to the *Discoaster deflandrei* Subzone (*Triquetrorhabdus carinatus* Zone) and 288A-3 belongs to the *Sphenolithus distentus* Zone.

Eocene-Oligocene

The Eocene-Oligocene regional unconformity in the Coral Sea recognized at Site 210 (Burns, Andrew, et al., 1973) is recorded at Site 287. Sample 287-11-0, 24-25 cm belongs to the upper Oligocene *S. distentus* Zone and Sample 287-11-0, 29-30 cm is within the middle middle Eocene *Chiasmolithus gigas* Zone; a distinct lithologic break occurs in 287-11-0 at 27 cm. The hiatus at Site 287 is of greater magnitude than that recorded at Site 210 where it appears to be between the lower Oligocene Core 210-34 and the upper middle Eocene Core 35 (see Edwards, 1973).

A hiatus is suspected between the lower Oligocene Core 228A-6 and the Paleocene Core 288A-8; the fossils in Core 288A-6 are drastically mixed and no recovery was obtained for Core 288A-7. At Site 289, however, Eocene sediments were recovered and a hiatus is suspected within the lower Oligocene-upper Eocene Core 289-102. Another hiatus is detected between the middle Eocene *C. gigas* Zone Sample 289-113-1, 117-118 cm and the lower Eocene *Discoaster lodoensis* Zone Sample 289-114-1, 148-150 cm; samples investigated are limited by poor recovery. A doubtful hiatus may exist within the lower Eocene sediments of Site 289 (Core-115).

Paleocene

A hiatus is suspected between the *Discoaster multiradiatus* Zone Core 289-119, CC and the *Discoaster mohleri* Zone Core 120-1, 80-81 cm. Two intra-Paleocene hiatuses associated with increases in reworked forms, are recognized at Site 288. Sample 288A-8-2, 102-103 cm is placed tentatively in the *Heliolithus kleinpellii* Zone and Sample 2-8A-8-2, 138-139 cm is assigned to the *Cruciplacolithus tenuis* Zone. Sample 288A-8-2, 122-123 cm is high in the *Cyclococcolithina robusta* Zone indicating a position bracketed by two hiatuses. A similar situation is detected at Site 289. Two hiatuses separate the *C. robusta* Zone (Samples 289-121-1, 125-126 cm and 289-121-2, 62-63 cm from the overlying *H. kleinpellii* Zone Sample 289-120, CC and the underlying *C. tenuis* Zone Sample 289-121 (top).

Cretaceous

The Cretaceous-Tertiary boundary at Site 288 is in noncored segment, but it was recovered at Site 289; poor preservation of the nannofossils straddling the boundary (in Core 289-122) hinders elucidating its nature; however, a part of the Maestrichtian seems to be missing.

The Upper Cretaceous sediments at Site 288 probably contain two hiatuses. Between the *Tetralithus trifidus* Zone (base, Sample 288A-11-2, 29-30 cm and the *Eiffellithus augustus* Zone (top, Sample 288A-11-2, 100-102 cm) the *Broinsonia parca* Zone may occur in Sample 288A-11-2, 80-81 cm, suggesting however, an intra-Campanian hiatus.

The other possible hiatus is between the *E. augustus* Zone (base, 288A-12-1, 122-125 cm) and the *Marthasterites furcatus* Zone (top, 288A-12, CC) on account of the apparent absence of *Gartnerago obliquum* Zone; poor recovery of Core 288A-12 renders establishing a hiatus uncertain.

At Site 289, a drop in the diversity and quality of preservation of the nannofossils associated with the occurrence of barren levels occur in Section 289-131-1 separating the Campanian *E. augustus* Zone Sample 239-131-1, 2-4 cm from the probably Aptian Sample 289-131-2, 10-14 cm.

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