

40. CALCAREOUS NANNOPLANKTON RANGES, DEEP SEA DRILLING PROJECT LEG 23

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Following are range charts of calcareous nannoplankton for the Leg 23 sites (Tables 1-12). Each chart contains a list of observed taxa, calcareous nannofossil zones, and age determinations as obtained from investigations conducted on smear slides prepared from cored sediments.

Chart symbols represent relative abundance of taxa and preservation.

1) Relative abundance symbols are listed as follows:

X = Abundant—more than one specimen/field of view @ 1000X.

O = Common—one specimen per one to ten fields of view @ 1000X.

● = Rare—less than one specimen per ten fields of view @ 1000X.

Note: Listed samples for which no species are indicated were examined and found to be barren of distinguishable calcareous nannoplankton.

2) Preservation characteristics are denoted by the following:

E—excellent preservation.

M—moderately preserved.

P—poorly preserved.

Zonations and age determinations are based on Cenozoic calcareous nannofossil studies published by numerous workers including Akers, 1965; Bramlette and Wilcoxon, 1967; Hay et al., 1967; Boudreaux and Hay, 1969; Gartner, 1969; Martini, 1970; Martini and Worsley, 1970; Roth, 1970; Bukry, 1971; Haq, 1971; Berggren, 1971; McIntyre, 1970; Ellis, Lohman and Wray, 1972; and Wilcoxon, 1972.

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TABLE 1
Distribution of Calcareous Nannoplankton, Site 219

Age	Zone	Core, Section, Sample Interval (cm)	Preservation	Sample	Pleistocene		Pliocene		Miocene		Early		
					Late	Early	Late	Early	Late	Middle		Early	
Pleistocene	Late	1-1, 107-108	E	<i>Emiliana huxleyi</i>									
		1-2, 75-76	E	<i>G. oceanica</i>	X	X	X	X	X	X	X	X	X
		1-4, 76-77	E	<i>G. oceanica</i>	X	X	X	X	X	X	X	X	X
		1, CC	E	<i>G. oceanica</i>									
		2-3, 77-78	E	<i>G. oceanica</i>	X	X	X	X	X	X	X	X	X
		2, CC	E	<i>G. oceanica</i>									
	Early	3-2, 77-78	E	<i>P. lacunosa</i>									
		3, CC	E	<i>P. lacunosa</i>									
		4-4, 76-77	E	<i>P. lacunosa</i>									
		4-5, 80-81	E	<i>P. lacunosa</i>									
		4, CC	E	<i>P. lacunosa</i>									
		5-3, 79-80	E	<i>P. lacunosa</i>									
Pliocene	Late	5, CC	E	<i>D. surcutatus</i>									
		6-2, 79-80	E	<i>D. surcutatus</i>									
		6-3, 79-80	E	<i>D. surcutatus</i>									
		6-6, 79-80	E	<i>D. surcutatus</i>									
		6, CC	E	<i>D. surcutatus</i>									
		7-2, 79-80	E	<i>D. surcutatus</i>									
		7-3, 79-80	E	<i>D. surcutatus</i>									
		7-4, 79-80	E	<i>D. surcutatus</i>									
		7-5, 79-80	E	<i>D. surcutatus</i>									
		7-6, 79-80	E	<i>D. surcutatus</i>									
		7, CC	E	<i>D. surcutatus</i>									
		8-2, 83-84	E	<i>D. surcutatus</i>									
	8-3, 75-76	E	<i>D. surcutatus</i>										
	8-4, 75-76	E	<i>D. surcutatus</i>										
	8-5, 75-76	E	<i>D. surcutatus</i>										
	Early	8-6, 75-76	E	<i>D. surcutatus</i>									
		8, CC	E	<i>D. surcutatus</i>									
		9-1, 75-76	E	<i>D. surcutatus</i>									
		9-2, 75-76	E	<i>D. surcutatus</i>									
		9-3, 75-76	E	<i>D. surcutatus</i>									
		9-4, 75-76	E	<i>D. surcutatus</i>									
		9-5, 75-76	E	<i>D. surcutatus</i>									
		9-6, 75-76	E	<i>D. surcutatus</i>									
		9, CC	E	<i>D. surcutatus</i>									
10-1, 75-76		E	<i>D. surcutatus</i>										
10-2, 75-76		E	<i>D. surcutatus</i>										
Miocene		Late	10-3, 75-76	E	<i>D. surcutatus</i>								
	10-4, 75-76		E	<i>D. surcutatus</i>									
	10-5, 75-76		E	<i>D. surcutatus</i>									
	10, CC		E	<i>D. surcutatus</i>									
	11-1, 75-76		E	<i>D. surcutatus</i>									
	11-2, 75-76		E	<i>D. surcutatus</i>									
	Middle	11-3, 75-76	E	<i>D. surcutatus</i>									
		11-4, 75-76	E	<i>D. surcutatus</i>									
		11-5, 75-76	E	<i>D. surcutatus</i>									
		11-6, 75-76	E	<i>D. surcutatus</i>									
		12-1, 75-76	E	<i>D. surcutatus</i>									
		12, CC	E	<i>D. surcutatus</i>									
Early	Late	13-1, 79-80	E	<i>D. surcutatus</i>									
		13, CC	E	<i>D. surcutatus</i>									
		14-1, 79-80	E	<i>D. surcutatus</i>									
		14-2, 79-80	E	<i>D. surcutatus</i>									
		14-3, 79-80	E	<i>D. surcutatus</i>									
		14-4, 79-80	E	<i>D. surcutatus</i>									
	Middle	14-5, 79-80	E	<i>D. surcutatus</i>									
		14, CC	E	<i>D. surcutatus</i>									
		13-1, 79-80	E	<i>S. heteromorphus</i>									
		13, CC	E	<i>S. heteromorphus</i>									
		14-1, 79-80	E	<i>S. heteromorphus</i>									
		14-2, 79-80	E	<i>S. heteromorphus</i>									
Early	Late	14-3, 79-80	E	<i>H. amplipera</i>									
		14-4, 79-80	E	<i>H. amplipera</i>									
		14-5, 79-80	E	<i>H. amplipera</i>									
		14, CC	E	<i>H. amplipera</i>									
		13-1, 79-80	E	<i>H. amplipera</i>									
		13, CC	E	<i>H. amplipera</i>									
	Middle	14-1, 79-80	E	<i>H. amplipera</i>									
		14-2, 79-80	E	<i>H. amplipera</i>									
		14-3, 79-80	E	<i>H. amplipera</i>									
		14-4, 79-80	E	<i>H. amplipera</i>									
		14-5, 79-80	E	<i>H. amplipera</i>									
		14, CC	E	<i>H. amplipera</i>									

Note: For explanation of symbols used in table, see text.

TABLE 2
Distribution of Calcareous Nannoplankton, Site 220

Age	Zone	Core, Section, Sample Interval (cm)	Preservation	Sample	Eocene		Oligocene		Miocene		Pliocene		Pleistocene	
					Early	Middle	Middle	Late	Middle	Late	Early	Late	Early	Late
					<i>D. lodoensis</i>	<i>C. grandis</i>	<i>S. predistentus</i>	<i>S. ciproensis</i>	<i>D. hamatus</i>	<i>D. quinqueramus</i>	<i>C. coarctatus</i>	<i>P. lacunosa</i>		
		1-1, 90-91	E	<i>Emiliana huxleyi</i>										
		1-4, 70-71	E	<i>Gephyrocapsa oceanica</i>	X									
		1-5, 80-81	E	<i>Cyclococcolithus leptoporus</i>	O									
		1-5, 101-102	E	<i>Rhabdosphaera clavigera</i>										
		1, CC	E	<i>Scapholithus fossilus</i>										
		2-1, 70-71	E	<i>Syracosphaera histrica</i>										
		2-3, 65-66	E	<i>Pontosphaera scutellum</i>										
			E	<i>Pontosphaera discopora</i>										
			E	<i>Thoracosphaera heimi</i>										
			E	<i>Thoracosphaera saxea</i>										
			E	<i>Umbilicosphaera mirabilis</i>	X									
			E	<i>Helicopontosphaera kemptneri</i>	X									
			E	<i>Ceratolithus cristatus</i>										
			E	<i>Gephyrocapsa caribbeanica</i>										
			E	<i>Coccolithus doronicoides</i>	X									
			E	<i>Pseudoemiliana lacunosa</i>	X									
			E	<i>Syracosphaera pulchra</i>										
			E	<i>Scyphosphaera campanula</i>										
			E	<i>Oolithothus antillarum</i>										
			E	<i>Scyphosphaera apsteini</i>										
			E	<i>Coccolithus pelagicus</i>										
			E	<i>Cyclococcolithina macintyreii</i>										
			E	<i>Discoaster brouweri</i>										
			E	<i>Cyclolithella annula</i>										
			E	<i>Discoaster pentaradiatus</i>										
			E	<i>Discoaster surculus</i>										
			E	<i>Sphenolithus abies</i>										
			E	<i>Reticulofenestra pseudumbilica</i>										
			E	<i>Discoaster stellulus</i>										
			E	<i>Discoaster variabilis</i>										
			E	<i>Umbilicosphaera ericota</i>										
			E	<i>Discoaster challengerii</i>										
			E	<i>Discoaster asymmetricus</i>										
			E	<i>Scyphosphaera intermedia</i>										
			E	<i>Ceratolithus tricorniculatus</i>										
			E	<i>Ceratolithus rugosus</i>										
			E	<i>Triquetrorhabdulus rugosus</i>										
			E	<i>Discoaster quinqueramus</i>										
			E	<i>Discoaster hamatus</i>										
			E	<i>Catinaster coarctatus</i>										
			E	<i>Discoaster neohamatus</i>										
			E	<i>Discoaster calcaris</i>										
			E	<i>Discoaster dilatus</i>										
			E	<i>Discoaster perclarus</i>										
			E	<i>Coccolithus eopelagicus</i>										

Note: For explanation of symbols used in table, see text.

Ac. doronicoides

Dp. brouweri

Rp. pseudombilica

Dp. asymmetricus

Sm. tribrachiatum

TABLE 4
Distribution of Calcareous Nannoplankton, Site 222

Sample	Core, Section, Sample Interval (cm)	Preservation	Age		Zone
			Pleistocene	Pliocene	
			Late	Early	
			<i>D. brouweri</i>	<i>R. pseudoumbilica</i>	?
<i>Emiliania huxleyi</i>	1-1, 80-81	E			
<i>Gephyrocapsa oceanica</i>	1-3, 79-80	E			
<i>Cyclcoccolithus leptopus</i>	1-4, 79-80	E			
<i>Syracosphaera pulchra</i>	1, CC	E			
<i>Ceratolithus cristatus</i>	2-1, 79-80	E			
<i>Umbilicosphaera mirabilis</i>	2, CC	E			
<i>Helicopontosphaera kamptneri</i>	3-1, 97-98	E			
<i>Coccolithus dornicoides</i>	3-2, 79-80	E			
<i>Thoracosphaera heimi</i>	3-3, 79-80	E			
<i>Pontosphaera scutellum</i>	3-4, 79-80	E			
<i>Pontosphaera discopora</i>	3, CC	E			
<i>Rhabdosphaera clavigera</i>	4-1, 82-83	E			
<i>Pseudoemiliania lacunosa</i>	4, CC	E			
<i>Coccolithus pelagicus</i>	5-1, 120-121	E			
<i>Discoaster brouweri</i>	5-2, 79-80	M			
<i>Cyclococcolithina macintyreii</i>	5-3, 79-80	E			
<i>Scyphosphaera intermedia</i>	5-4, 65-66	E			
<i>Scyphosphaera campanula</i>	5, CC	E			
<i>Discolithina millipuncta</i>	6-2, 63-64	E			
<i>Watznaueria barnesae</i>	6-3, 65-66	E			
<i>Deflandrius sp.</i>	6-4, 65-66	M			
<i>Discoaster pentaradiatus</i>	6, CC	M			
<i>Discoaster surculus</i>	7-2, 65-66	M			
<i>Umbilicosphaera cricota</i>	8-1, 115-116	M			
<i>Sphenolithus abies</i>	8-2, 79-80	M			
<i>Reticulofenestra pseudoumbilica</i>	8-3, 79-80	M			
<i>Discoaster variabilis</i>	8-5, 84-85	M			
<i>Discoaster asymmetricus</i>	8, CC	M			
<i>Discoaster challengeri</i>	9-2, 98-98	M			
<i>Discoaster stellulus</i>	9-3, 79-80	M			
<i>Ceratolithus rugosus</i>	9-4, 65-66	M			
<i>Ceratolithus tricorniculatus</i>	9, CC	M			
<i>Discoaster quinqueramus</i>	10, CC	E			
<i>Triquetrorhabdulus rugosus</i>	11-1, 131-132	E			
<i>Discoaster calcaris</i>	11-2, 65-66	E			
<i>Discoaster neohamatus</i>	11, CC	E			
	12-1, 65-66	M			
	12-2, 65-66	M			
	12, CC	E			
	13-2, 65-66	M			
	13-3, 65-66	M			
	13-4, 65-66	M			
	13, CC	M			
	14-2, 65-66	M			
	14-3, 65-66	M			
	14-4, 65-66	M			
	14, CC	M			
	15-2, 65-66	M			
	15, CC	M			
	16-1, 65-66	M			
	16, CC	M			
	17, CC	M			
	18-2, 65-66	M			
	18, CC	M			
	19-1, 89-90	M			
	19-2, 65-66	M			
	19-3, 78-79	M			

Note: For explanation of symbols used in table, see text.

TABLE 8
Distribution of Calcareous Nannoplankton, Site 226

Age	Zone	Core, Section, Sample Interval (cm)	Preser- vation	Sample	<i>Gephyrocapsa oceanica</i>	<i>Syracosphaera hisirica</i>	<i>Ellipsodiscoaster lidzi</i>
Late Quaternary	?	1-3, 65-66			•		
		1, CC	P		•	•	•

Note: For explanation of symbols used in table, see text.

TABLE 10
Distribution of Calcareous Nannoplankton, Site 228

Age	Zone	Core Section, Sample Interval (cm)	Preservation	Sample	
Pliocene	Late	19.CC	M		
		20.1, 80-81	E		
		20.2, 79-80	E		
		20.3, 65-66	E		
		20.4, 79-80	E		
		20.CC	E		
	Early	21.1, 65-66	E		
		21.CC	E		
		22.CC	E		
		23.CC	E		
		24.1, 130-131	E		
		24.CC	M		
Pleistocene	Late	25.CC	E		
		26-2, 76-77	E		
		26.CC	E		
		27.3, 79-80	E		
		27.CC	E		
		28.CC	E		
	Early	29.CC	E		
		30.1, 71-72	M		
		30.2, 80-81	E		
		30.3, 80-81	M		
		30.4, 70-71	M		
		30.CC	E		
Pliocene	Late	31.CC	E		
		32.1, 122-123	M		
		32.2, 13-14	M		
		32.CC	M		
		33.1, 75-76	M		
		33.2, 78-79	E		
	Early	33.4, 85-86	E		
		33.CC	M		
		34.1, 90-91			
		34.2, 74-75			
		34.3, 81-82			
		34.CC			
Pliocene	Late	35.1, 145-146			
		35.2, 70-71			
		35.CC			
		36.CC			
		37.1, 32-33			
		37.1, 108-109			
	Early	37.1, 124-125			
		38.CC			
		39.CC			

Note: For explanation of symbols used in table, see text.

TABLE 12
Distribution of Calcareous Nannoplankton, Site 230

Age	Zone	Core, Section, Sample Interval (cm)	Preservation	Sample														
				<i>Emiliana huxleyi</i>	<i>Gephyrocapsa oceanica</i>	<i>Syracosphaera histrica</i>	<i>Helicopontosphaera kampfneri</i>	<i>Umbilicosphaera mirabilis</i>	<i>Oolithotus antillarum</i>	<i>Gephyrocapsa protohuxleyi</i>	<i>Thoracosphaera saxea</i>	<i>Cyclocolithus leptoporus</i>	<i>Thoracosphaera heimi</i>	<i>Braarudosphaera bigelowi</i>	<i>Rhabdosphaera tubifera</i>	<i>Scapholithus fossilis</i>	<i>Rhabdosphaera clavigera</i>	
Late Pleistocene	<i>G. oceanica</i>	1-1, 82-83	E	●	X	●	●	○	●	●	●	●						
		1-2, 65-66	E		X	●	●	○	●	●		●						
		1-3, 65-66	E		X		○	○	○		○							
		1, CC	E		X	○	○	○	○	○	○	●	○	○	●	●	●	●