Gersonde, R., Hodell, D.A., and Blum, P. (Eds.)
Proceedings of the Ocean Drilling Program, Scientific Results Volume 177

10. Data Report: Relative Abundance and Stratigraphic Ranges of Selected Diatoms from Miocene Sections at ODP Sites 689, 690, 1088, and 1092 (Atlantic Sector of the Southern Ocean)[1]

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INTRODUCTION

During Leg 177, a total of 4000 m of sediment cores was recovered at seven sites arrayed along a north-south transect from 41° to 53°S, crossing each of the frontal boundaries of the Antarctic Circumpolar Current (ACC). At most sites, multiple holes were drilled to ensure complete recovery of the stratigraphic section. A complete description of the Leg 177 sediments recovered and shipboard analyses performed is given in the Leg 177 *Initial Reports* volume (Gersonde, Hodell, Blum, et al., 1999). One scientific objective of Leg 177 was the improvement of the Cenozoic biostratigraphic zonations for siliceous microfossils and their direct correlation to the geomagnetic polarity record. Studies of diatom biostratigraphy have been completed by Censarek and Gersonde (2002) and Zielinski and Gersonde (2002). These studies improve previous stratigraphic zonations of the Miocene, Pliocene, and Pleistocene. Both studies revealed latitude-dependent differences in the stratigraphic ranges of biostratigraphic marker species related to the paleoceanographic development of surface water masses within the ACC during the Neogene and Pleistocene. As a consequence of the latitudinal differentiation of diatom occurrences and stratigraphic ranges, specific zonations for application in the northern and southern realm of the Southern Ocean have been proposed. Here we present the relative

[1]Censarek, B., and Gersonde, R., 2003. Data report: Relative abundance and stratigraphic ranges of selected diatoms from Miocene sections at ODP Sites 689, 690, 1088, and 1092 (Atlantic sector of the Southern Ocean). *In* Gersonde, R., Hodell, D.A., and Blum, P. (Eds.), *Proc. ODP, Sci. Results,* 177, 1–14 [Online]. Available from World Wide Web: <http://www-odp.tamu.edu/publications/177_SR/VOLUME/CHAPTERS/SR177_10.PDF>. [Cited YYYY-MM-DD]
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Initial receipt: 29 January 2002
Acceptance: 6 August 2002
Web publication: 5 February 2003
Ms 177SR-119

abundance pattern and the ranges of stratigraphically useful diatoms obtained from middle and late Miocene sections of Ocean Drilling Program (ODP) Leg 177 Sites 1088 and 1092 (Tables T1, T2), located in the northern Subantarctic Zone and the northern Polar Front Zone of the Antarctic Circumpolar Current (ACC) (Shipboard Scientific Party, 1999b, 1999c) and from ODP Leg 113 Sites 689 and 690 (Tables T3, T4) recovered on Maud Rise close to the Antarctic continent (Shipboard Scientific Party, 1988a, 1988b). This set of data is the base of the diatom stratigraphic interpretation presented in Censarek and Gersonde (2002). The study of the Sites 689 and 690 represents a reevaluation of a diatom biostratigraphic zonation initially proposed by Gersonde and Burckle (1990). Censarek and Gersonde (2002) considered revisions in diatom taxonomy and based their study on diatom counts, whereas the study of Gersonde and Burckle (1990) relies on abundance estimates only.

T1. Diatom species and abundance, Site 1088, p. 5.

T2. Diatom species and abundance, Site 1092, p. 9.

T3. Diatom species and abundance, Hole 689B, p. 10.

T4. Diatom species and abundance, Hole 690B, p. 11.

METHODS

Samples for the biostratigraphic investigations were taken during Leg 113 (January–March 1987) and Leg 177 (December 1997–February 1998) aboard the *JOIDES Resolution* and postcruise in the Lamont-Doherty Earth Observatory and Bremen ODP core repositories. The sample spacing in Holes 689B and 690B results in a maximum resolution up to 150 k.y. For the Leg 177 Sites 1088 and 1092, where two and four holes, respectively, were drilled, a resolution up to 50 k.y. is reached.

For quantitative and qualitative diatom study, microscope slides with randomly distributed microfossils were used. The cleaning of raw material and the preparation of permanent mounts for light microscopy followed the standard technique developed at the Alfred Wegener Institute (Gersonde and Zielinski, 2000). The mounting resin is Mountex (nd = 1.67), except for samples from Site 1088, where Meltmount (nd = 1.662) was used. Up to 400 diatom specimens were counted per sample using a Zeiss Axioskop microscope with apochromatic optics at a magnification of 1000×. The counting followed the concepts proposed by Schrader and Gersonde (1978). The diatom preservation was classified "good" when lightly silicified forms are present and no alteration of frustules could be observed, "moderate" when lightly silicified diatoms are still present but with some alteration, and "poor" if only strongly silicified and often fragmented diatoms could be observed. For stratigraphic purposes, absolute valve counts were converted to abundance classes following the ODP style outlined in Shipboard Scientific Party (1999a):

D = dominant (>60% of total assemblage).
A = abundant (>30%–60%).
C = common (>15%–30%).
F = few (3%–15%).
R = rare (<3%).
T = trace (species encountered only sporadically).
X = present (species observed, but not included in species count).

The determination of a biostratigraphic datum was defined by the midpoint between two adjacent samples. Trace occurrences of species were not considered in defining datums. For all depth information of the

studied samples the meters composite depth (mcd) scale was used (see individual site chapters in Gersonde, Hodell, Blum, et al., 1999).

The presented range charts were also archived in the PANGAEA information system at the Alfred Wegener Institute for Polar and Marine Research, Bremerhaven (AWI) (**www.pangaea.de**).

ACKNOWLEDGMENTS

The present data set is based on samples provided by the Ocean Drilling Program (ODP). ODP is sponsored by the U.S. National Science Foundation and participating countries under the management of Joint Oceanographic Institutions. We thank Lorri Peters for editorial comments. This research was also supported by the Deutsche Forschungsgesellschaft (DFG grant Ge516/6). We are grateful to the technical assistance of U. Bock, T. Pollak, and R. Cordelair.

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Table T1. Stratigraphic occurrence and relative abundance of selected Miocene diatom species, Site 1088. (See **table notes.** Continued on next three pages.)

Zone (Northern Southern Ocean Diatom Zonation)	Core, section, interval (cm)	Depth (mcd)	Depth mbsf)	Preservation	*Actinocyclus curvatulus*	*Actinocyclus ellipticus*	*Actinocyclus fasciculatus*	*Actinocyclus ingens*	*Actinocyclus ingens* var. *nodus*	*Actinocyclus ingens* var. *ovalis*	*Actinoptychus senarius*	*Asteromphalus kennettii*	*Azpeitia tabularis*	*Cavitatus jouseanus*	*Chaetoceros* spp.	*Coscinodiscus marginatus*	*Coscinodiscus rhombicus*	*Crucidenticula nicobarica*	*Denticulopsis crassa*	*Denticulopsis dimorpha*	*Denticulopsis ovata*	*Denticulopsis praedimorpha*	*Denticulopsis simonsenii*	*Ethmodiscus* spp.	*Fragilaria* sp.	*Fragilariopsis arcula*	*Fragilariopsis aurica*	*Fragilariopsis cylindrica*	*Fragilariopsis donahuensis*	*Fragilariopsis fossilis*	*Fragilariopsis praecurta*	*Fragilariopsis reinholdii*	*Hemidiscus cuneiformis*	*Hemidiscus karstenii*	*Navicula* sp.	*Neobrunia mirabilis*	*Nitzschia denticuloides*	*Nitzschia grossepuncata*	*Paralia sulcata*
	177-1088B-																																					
	5H-1, 75–76	34.75	34.75	P									F			F														F									
	5H-1, 111–112	35.11	35.11	P									F																	C		F							
	5H-2, 0–1	35.50	35.50	G	T			F					F			F								X					R		F	T						R
T. inura	5H-2, 35–36	35.85	35.85	P	F								A											X								F						
	5H-2, 70–71	36.20	36.20	P												C													C		C							
	5H-2, 105–106	36.55	36.55	P									F											X					C		F	F						
	5H-2, 137–138	36.87	36.87	P									F			C								X	F		F		C									
	5H-3, 25–26	37.25	37.25	P									F												T				F									R
	5H-3, 60–61	37.60	37.60	P									F			F													C									
	5H-3, 130–131	38.30	38.30	P																																		
?	5H-4, 47–48	38.97	38.97	P	F			F					F			A								X					F						X			
	5H-5, 115–116	41.15	41.15	P																																		
	5H-6, 36–37	41.86	41.86	P	F								F													F		F		A		F						F
	5H-6, 70–71	42.20	42.20	P																																		
----------?----------	9H-5, 120–121	79.20	79.20	P																												R			X			
	10H-1, 40–41	81.90	81.90	P				D					R			R			T				R			R			R		R	R					
	10H-1, 130–131	82.80	82.80	P				D			R		R			R			R				R	X			R										
	10H-2, 70–71	83.70	83.70	P				D		R	R		R			R			T				F									T			X		
	10H-3, 10–11	84.60	84.60	P				D								R																R					
	10H-3, 100–101	85.50	85.50	M				D	R				R			R							F							F	R	T		R			
F. reinholdii	10H-4, 40–41	86.40	86.40	P	F			D								F			R				T					R				R			X		
	10H-4, 130–131	87.30	87.30	G				D								F			T							R		F	R	R		R					
	10H-5, 70–71	88.20	88.20	M				D								F									R	F				R		R					
	10H-6, 0–1	89.00	89.00	G				A					R			F										F	R	R		F	F	F	R				
	10H-6, 90–91	89.90	89.90	P				A		R						A								X						F		R					
A. ingens var. *ovalis*	10H-7, 27–28	90.77	90.77	G				C		C					R	R										R		R									
	11H-1, 31–32	91.31	91.31	P							C		R	R													R					F		R			R
	11H-1, 113–114	92.13	92.13	P				F								C																					
	11H-2, 46–47	92.96	92.96	P			F									C							F			F			F	C							
	11H-2, 130–131	93.80	93.80	P				F								C																					
----------?----------	11H-3, 70–71	94.70	94.70	P												F									R												
	12H-3, 47–48	104.24	104.24	P				A											C					X													
	12H-3, 140–141	104.90	104.90	M							R	F				F							R	X					R								
	12H-4, 80–81	105.80	105.80	G	R						R	R				R			F				F	X					R			R					
	12H-5, 20–21	106.70	106.70	M	R	R						C	R			A																F					

Table T1 (continued).

Zone (Northern Southern Ocean Diatom Zonation)	Core, section, interval (cm)	Depth (mcd)	Depth mbsf)	Preservation	*Proboscia barboi*	*Diploneis bombus*	*Rhizosolenia hebetata*	*Rhizosolenia antennata*	*Rocella gelida*	*Rouxia isopolica*	*Rouxia naviculoides*	*Thalassionema nitzschioides*	*Thalassionema nitzschioides* var. *capitulatum*	*Thalassionema nitzschioides* var. *inflatum*	*Thalassionema nitzschioides* var. *parvum*	*Thalassiosira inura*	*Thalassiosira fasciculata*	*Thalassiosira oliverana* var. *sparsa*	*Thalassiosira sancetta*	*Thalassiosira torokina*	*Thalassiothrix longissima*	*Thalassiothrix miocenica*
	177-1088B-																					
	5H-1, 75–76	34.75	34.75	P			C					A								A		
	5H-1, 111–112	35.11	35.11	P			F					F				R				A	F	
	5H-2, 0–1	35.50	35.50	G								F				R	R			A	R	
T. inura	5H-2, 35–36	35.85	35.85	P	F		C		F											C		
	5H-2, 70–71	36.20	36.20	P			C															
	5H-2, 105–106	36.55	36.55	P												F				A	F	
	5H-2, 137–138	36.87	36.87	P			R								F	R					F	
	5H-3, 25–26	37.25	37.25	P											D					F	R	
	5H-3, 60–61	37.60	37.60	P			C	F				C			F							
	5H-3, 130–131	38.30	38.30	P										D								
?	5H-4, 47–48	38.97	38.97	P			F						F	F						F	F	
	5H-5, 115–116	41.15	41.15	P		D																
	5H-6, 36–37	41.86	41.86	P			F														F	
	5H-6, 70–71	42.20	42.20	P		D																
----------?----------	9H-5, 120–121	79.20	79.20	P			D															
	10H-1, 40–41	81.90	81.90	P	R		R				R									R		
	10H-1, 130–131	82.80	82.80	P		R	R			R											R	
	10H-2, 70–71	83.70	83.70	P			R	R												R	R	
	10H-3, 10–11	84.60	84.60	P		R														R		
	10H-3, 100–101	85.50	85.50	M	R	R	F			R	R	R						R			R	
F. reinholdii	10H-4, 40–41	86.40	86.40	P			F	R					R							R		
	10H-4, 130–131	87.30	87.30	G	R		F	R		R					R						F	
	10H-5, 70–71	88.20	88.20	M			R					F			F						F	R
	10H-6, 0–1	89.00	89.00	G	R		R	R		R		F			F			R			F	F
	10H-6, 90–91	89.90	89.90	P	R		F											F			R	
A. ingens var. *ovalis*	10H-7, 27–28	90.77	90.77	G	F		F			R	R	R						R			C	
	11H-1, 31–32	91.31	91.31	P			A			F			F								F	
	11H-1, 113–114	92.13	92.13	P	F		A														F	
	11H-2, 46–47	92.96	92.96	P			C														C	
	11H-2, 130–131	93.80	93.80	P	A		C														F	
----------?----------	11H-3, 70–71	94.70	94.70	P			D														F	
	12H-3, 47–48	104.24	104.24	P			C														F	
	12H-3, 140–141	104.90	104.90	M	F		A								F						C	
	12H-4, 80–81	105.80	105.80	G	R	R	F						A						R		F	
	12H-5, 20–21	106.70	106.70	M	R		R	R													R	

Table T1 (continued).

Zone (Northern Southern Ocean Diatom Zonation)	Core, section, interval (cm)	Depth (mcd)	Depth mbsf)	Preservation	*Actinocyclus curvatulus*	*Actinocyclus ellipticus*	*Actinocyclus fasciculatus*	*Actinocyclus ingens*	*Actinocyclus ingens var. nodus*	*Actinocyclus ingens var. ovalis*	*Actinoptychus senarius*	*Asteromphalus kennettii*	*Azpeitia tabularis*	*Cavitatus jouseanus*	*Chaetoceros* spp.	*Coscinodiscus marginatus*	*Coscinodiscus rhombicus*	*Crucidenticula nicobarica*	*Denticulopsis crassa*	*Denticulopsis dimorpha*	*Denticulopsis ovata*	*Denticulopsis praedimorpha*	*Denticulopsis simonsenii*	*Ethmodiscus* spp.	*Fragilaria* sp.	*Fragilariopsis arcula*	*Fragilariopsis aurica*	*Fragilariopsis cylindrica*	*Fragilariopsis donahuensis*	*Fragilariopsis fossilis*	*Fragilariopsis praecurta*	*Fragilariopsis reinholdii*	*Hemidiscus cuneiformis*	*Hemidiscus karstenii*	*Navicula* sp.	*Neobrunia mirabilis*	*Nitzschia denticuloides*	*Nitzschia grossepuncata*	*Paralia sulcata*
	12H-5, 111–112	107.61	107.61	P				F				C				F									F							F					
A. kennettii	12H-6, 47–48	108.47	108.47	M		R		R				C				F			R	R			F		R							F		R			
	12H-6, 140–141	109.40	109.40	M			R					F				F							F						R								
	12H-7, 38–39	109.88	109.88	P		R																																
	13H-1, 90–91	110.90	110.90	P												A													C								
	177-1088C-																																					
	3H-2, 20–21	133.64	131.78	P				A				F	F											X	F													
	3H-3, 20–21	135.14	133.28	P				D															R	X													
	3H-3, 95–96	135.89	134.03	P				D																														
	3H-4, 20–21	136.64	134.78	P				D																X														
	3H-4, 93–94	137.37	135.51	G				D	F				R										F	X														
	3H-5, 20–21	138.14	136.28	G		R		A	R				T			F			T	R			F										R					
	3H-5, 95–96	138.89	137.03	P				D																X					R								
	3H-6, 19–20	139.63	137.77	P	R			D																X														
	3H-6, 95–96	140.39	138.53	P				C																														
	4H-1, 25–26	141.69	139.83	M		T		D					R			R																						
D. ovata	4H-1, 100–101	142.44	140.58	P	R			D									R						R	X														
	4H-2, 25–26	143.19	141.33	P				D																X														
	4H-3, 25–26	144.69	142.83	P				D									R				R																	
	4H-4, 20–21	146.14	144.28	M				A					F			F	T				R		F		R													
	8X-4, 95–96	179.19	177.33	P				C					R			F		F		A	F				R													
	8X-5, 18–19	179.92	178.06	P				C								F					F														F	F		
	8X-5, 95–96	180.69	178.83	P				A					F								A	R		X														
	8X-6, 18–19	181.42	179.56	P				F					F			F		R			A	F		R		R									R				
D. dimorpha–	9X-5, 95–96	190.29	188.43	P				A					A											X														
D. simonsenii	9X-6, 20–21	191.04	189.18	P				A	F				F									F	F	X	F													
----------?----------	9X-6, 95–96	191.79	189.93	P				D															F		F													
	10X-1, 20–21	193.14	191.28	M				A	F				F			R						F	R												R			
	10X-1, 95–96	193.89	192.03	P				A	F				R	F		R							R		R										R			
D. simonsenii	11X-2, 48–50	205.00	206.38	P				F	F					R									R														

Notes: Preservation: G = good, M = moderate, P = poor. Abundance: D = dominant, A = abundant, C = common, F = few, R = rare, T = trace, X = present.

Table T1 (continued).

Zone (Northern Southern Ocean Diatom Zonation)	Core, section, interval (cm)	Depth (mcd)	Depth mbsf)	Preservation	*Proboscia barboi*	*Diploneis bombus*	*Rhizosolenia hebetata*	*Rhizosolenia antennata*	*Rocella gelida*	*Rouxia isopolica*	*Rouxia naviculoides*	*Thalassionema nitzschioides*	*Thalassionema nitzschioides* var. *capitulatum*	*Thalassionema nitzschioides* var. *inflatum*	*Thalassionema nitzschioides* var. *parvum*	*Thalassiosira inura*	*Thalassiosira fasciculata*	*Thalassiosira oliverana* var. *sparsa*	*Thalassiosira sancetta*	*Thalassiosira torokina*	*Thalassiothrix longissima*	*Thalassiothrix miocenica*
	12H-5, 111–112	107.61	107.61	P			C						F		F						F	
A. kennettii	12H-6, 47–48	108.47	108.47	M	F		A	F		R					F						R	
	12H-6, 140–141	109.40	109.40	M	R		A	F				R			F						F	R
	12H-7, 38–39	109.88	109.88	P			A			C												
	13H-1, 90–91	110.90	110.90	P			C															
	177-1088C- 3H-2, 20–21	133.64	131.78	P			C															
	3H-3, 20–21	135.14	133.28	P			F			R											R	
	3H-3, 95–96	135.89	134.03	P			F														F	
	3H-4, 20–21	136.64	134.78	P																		
	3H-4, 93–94	137.37	135.51	G	R	R	F					R			R						F	
	3H-5, 20–21	138.14	136.28	G			F								R				R		F	
	3H-5, 95–96	138.89	137.03	P			C				F										R	
	3H-6, 19–20	139.63	137.77	P	R																F	
	3H-6, 95–96	140.39	138.53	P			C		C												C	
	4H-1, 25–26	141.69	139.83	M	F		F														F	
D. ovata	4H-1, 100–101	142.44	140.58	P																		
	4H-2, 25–26	143.19	141.33	P			F														F	
	4H-3, 25–26	144.69	142.83	P			F															
	4H-4, 20–21	146.14	144.28	M	R		F													R	C	
	8X-4, 95–96	179.19	177.33	P			F														F	
	8X-5, 18–19	179.92	178.06	P	R		F															
	8X-5, 95–96	180.69	178.83	P	R																F	
	8X-6, 18–19	181.42	179.56	P			F														F	
D. dimorpha–	9X-5, 95–96	190.29	188.43	P	R																	
D. simonsenii	9X-6, 20–21	191.04	189.18	P									F								F	
----------?----------	9X-6, 95–96	191.79	189.93	P			F														F	
	10X-1, 20–21	193.14	191.28	M	C														R		F	
	10X-1, 95–96	193.89	192.03	P	F																F	
D. simonsenii	11X-2, 48–50	205.00	206.38	P																	R	

Table T2. Stratigraphic occurrence and relative abundance of selected Miocene diatom species, Site 1092. (This table is available in an **oversized format.**)

Table T3. Stratigraphic occurrence and relative abundance of selected Miocene diatom species, Hole 689B. (This table is available in an **oversized format.**)

Table T4. Stratigraphic occurrence and relative abundance of selected Miocene diatom species, Hole 690B. (See **table notes.** Continued on next three pages.)

Zone (Southern Southern Ocean Diatom Zonation)	Core, section, interval (cm)	Depth (mbsf)	Preservation	*Actinocyclus fasciculatus*	*Actinocyclus karstenii*	*Actinocyclus ingens*	*Actinocyclus ingens* var. *nodus*	*Actinocyclus ingens* var. *ovalis*	*Actinoptychus senarius*	*Asteromphalus kennettii*	*Asteromphalus oligocenicus*	*Azpeitia tabularis*	*Cavitatus jouseanus*	*Chaetoceros* spp.	*Corethron criophilum*	*Coscinodiscus marginatus*	*Coscinodiscus lewisianus*	*Crucidenticula kanayae*	*Crucidenticula nicobarica*	*Dactyliosolen antarctica*	*Denticulopsis crassa*	*Denticulopsis dimorpha*	*Denticulopsis maccollumii*	*Denticulopsis ovata*	*Denticulopsis praedimorpha*	*Denticulopsis simonsenii*	*Ethmodiscus* spp.	*Eucampia antarctica*	*Fragilariopsis arcula*	*Fragilariopsis aurica*	*Fragilariopsis claviceps*	*Fragilariopsis clementia*	*Fragilariopsis cylindrica*	*Fragilariopsis donahuensis*	*Fragilariopsis efferans*	*Fragilariopsis maleinterpretaria*	*Fragilariopsis praecurta*	*Fragilariopsis praeinterfrigidaria*	*Fragilariopsis pusilla*	*Mediaria splendida*	*Navicula* sp.	*Neobrunia mirabilis*	*Nitzschia denticuloides*
	113-690B-																																									
	3H-2, 27–28	13.47	G			R						F		F	R	R														F		R				R	F				
T. inura	3H-2, 115–116	14.35	M									F				F											X	R		C						F	C				
	3H-3, 27–28	14.97	G									R			R	C											X	T	R	F						F	F				
	3H-3, 73–75	15.43	M									C				C													R	F						R	F				
	3H-3, 115–116	15.85	M									R				F													R	A						F	C				
H. triangularus–	3H-4, 23–25	16.47	G			R		F				R			R	C												R		F		R		R		F	C				
F. aurica	3H-4, 73–75	16.97	M									D				F													R	F						F	C				
	3H-4, 115–116	17.35	P					R				F				C								R		R	X	R	F	F			R	R		F	C				
	3H-5, 27–28	17.97	G			R		T				T		T		F								R		R			C	F				R		C					
	3H-5, 73–75	18.43	P					R				D				F										R								R							
	3H-5, 115–116	18.85	P									D				F													R					T							
	3H-6, 23–25	19.47	P		R	F		R		F		R				F						R	F	C		F			R					R							
F. arcula	3H-6, 73–75	19.97	M			D						C				F							F	F					R												
	3H-6, 115–116	20.35	P			F		R				F				C						F	F	F		C			F												
	3H-7, 27–28	20.97	G		R	R				T		F				T						F	R	R		A			F	F	R			F			T			T		
	4H-1, 26–27	21.66	M			A				R		F				F						T	R	F		F			T		T			T							
	4H-1, 49–51	21.89	M			D						F										R	R	F		F			R		R			R							
A. kennettii–	4H-1, 115–116	22.55	G		R	A				R		F			T	F						R	R	F		C			R		R			R			R				
F. praecurta	4H-2, 28–29	23.18	G		T	C				R		R				F						R		C		C			F		T			F			R				
	4H-2, 115–116	24.05	G		R	F				R		F				F						R	T	F		A			R		T			R			F				
	4H-3, 26–27	24.66	M		T	R						R				F							R	D		R				T							R				
	4H-3, 115–116	25.55	M			T						R				R							R	D		R											R				
	4H-4, 27–28	26.17	M									R				R							F	D						R											
F. praecurta	4H-4, 115–116	27.05	P									R				T							F	D		R															
	4H-5, 26–27	27.66	M		R							R				T							F	D		R					T						R				
	4H-5, 115–116	28.55	P		T							R				T							R	D		R					T						F				
	4H-6, 27–28	29.17	P									T				T							R	D																	
D. dimorpha–	4H-6, 115–116	30.05	M			T						R				R								D	T	R					R										
D. ovata	5H-1, 28–29	31.38	M			R						R											F	A	A	R					R										
D. ovata–	5H-1, 116–117	32.26	M			R						F				R							C	F	A	R															R
N. denticuloides	5H-2, 28–29	32.88	M			R						R											R	C	D	T								R							R
	5H-2, 115–116	33.75	M			F						R				R							C		A	T								R							F
D. dimorpha	5H-3, 28–29	34.38	P			T						R				R					R		F		D										T						F
	5H-3, 115–116	35.25	M	R		F	F					R				F							F		A	F	X				R				R						F

Table T4 (continued).

Zone (Southern Southern Ocean Diatom Zonation)	Core, section, interval (cm)	Depth (mbsf)	Preservation	*Nitzchia grossepuncata*	*Pleurosigma directum*	*Proboscia barboi*	*Raphidodiscus marylandicus*	*Rhizosolenia hebetata*	*Rhizosolenia antennata*	*Rouxia isopolica*	*Rouxia naviculoides*	*Rouxia peragalli*	*Rouxia* sp. 1 Gersonde	*Rouxia* sp. 2 Gersonde	*Thalassionema nitzschioides*	*Thalassionema nitzschioides* var. *capitulatum*	*Thalassionema nitzschioides* var. *inflatum*	*Thalassionema nitzschioides* var. *parvum*	*Thalassiosira convexa* var. *aspinosa*	*Thalassiosira inura*	*Thalassiosira fraga*	*Thalassiosira oestrupii*	*Thalassiosira oliverana* var. *sparsa*	*Thalassiosira praelineata*	*Thalassiosira spinosa*	*Thalassiosira spumellaroides*	*Thalassiosira yabei*	*Triceratium cinnamomeum*	*Thalassiothrix longissima*	*Thalassiothrix miocenica*
	113-690B-																													
	3H-2, 27–28	13.47	G			F		C		R	F	F			R		R			F		R						F	F
T. inura	3H-2, 115–116	14.35	M			F		F	R	R	R				F					R		R						R	
	3H-3, 27–28	14.97	G			C		F		R	R	F			R		R			R								R	T
	3H-3, 73–75	15.43	M			R				R	R						D											R	
	3H-3, 115–116	15.85	M			F		R	T		F				R		R											R	
H. triangularus–	3H-4, 23–25	16.47	G			F		R	R	F	R	R			F		R	R										R	R
F. aurica	3H-4, 73–75	16.97	M			F		R	R						R			R										R	
	3H-4, 115–116	17.35	P			F		F	R	R	R				R			R	F				R					F	R
	3H-5, 27–28	17.97	G			F		F	F	R	F	F			R		T	T	R				R					R	
	3H-5, 73–75	18.43	P			R		R			R						T		R									R	
	3H-5, 115–116	18.85	P			R		R									F											R	
	3H-6, 23–25	19.47	P			T		C	R																			R	
F. arcula	3H-6, 73–75	19.97	M			R		F	R																			R	R
	3H-6, 115–116	20.35	P					C			R																	R	
	3H-7, 27–28	20.97	G			R		F	R	F	R	R			R													R	
	4H-1, 26–27	21.66	M			T		F	T																			R	
	4H-1, 49–51	21.89	M					R	R																			R	
A. kennettii–	4H-1, 115–116	22.55	G					F	R	R																		R	
F. praecurta	4H-2, 28–29	23.18	G			R		R	F	R	R																T	R	
	4H-2, 115–116	24.05	G			R		F	R	F	F																	R	
	4H-3, 26–27	24.66	M			R		R	T		T														R		T		
	4H-3, 115–116	25.55	M			T		R	R																			T	
	4H-4, 27–28	26.17	M					R		T																	R	T	
F. praecurta	4H-4, 115–116	27.05	P			R		R	T																			T	T
	4H-5, 26–27	27.66	M			T		R																				T	
	4H-5, 115–116	28.55	P					T	R																			T	
	4H-6, 27–28	29.17	P																									T	
D. dimorpha–	4H-6, 115–116	30.05	M					T																				T	
D. ovata	5H-1, 28–29	31.38	M			R									T													T	
D. ovata–	5H-1, 116–117	32.26	M			R		R	R			R			R													R	R
N. denticuloides	5H-2, 28–29	32.88	M			T		R	T			R																T	
	5H-2, 115–116	33.75	M			R		R	R			R																R	
D. dimorpha	5H-3, 28–29	34.38	P			R		R				T																R	
	5H-3, 115–116	35.25	M			T		F	T			T			T													R	T

Table T4 (continued).

Zone (Southern Southern Ocean Diatom Zonation)	Core, section, interval (cm)	Depth (mbsf)	Preservation	*Actinocyclus fasciculatus*	*Actinocyclus karstenii*	*Actinocyclus ingens*	*Actinocyclus ingens* var. *nodus*	*Actinocyclus ingens* var. *ovalis*	*Actinoptychus senarius*	*Asteromphalus kennettii*	*Asteromphalus oligocenicus*	*Azpeitia tabularis*	*Cavitatus jouseanus*	*Chaetoceros* spp.	*Corethron criophilum*	*Coscinodiscus marginatus*	*Coscinodiscus lewisianus*	*Crucidenticula kanayae*	*Crucidenticula nicobarica*	*Dactyliosolen antarctica*	*Denticulopsis crassa*	*Denticulopsis dimorpha*	*Denticulopsis maccollumii*	*Denticulopsis ovata*	*Denticulopsis praedimorpha*	*Denticulopsis simonsenii*	*Ethmodiscus* spp.	*Eucampia antarctica*	*Fragilariopsis arcula*	*Fragilariopsis aurica*	*Fragilariopsis claviceps*	*Fragilariopsis clementia*	*Fragilariopsis cylindrica*	*Fragilariopsis donahuensis*	*Fragilariopsis efferans*	*Fragilariopsis maleinterpretaria*	*Fragilariopsis praecurta*	*Fragilariopsis praeinterfrigidaria*	*Fragilariopsis pusilla*	*Mediaria splendida*	*Navicula* sp.	*Neobrunia mirabilis*	*Nitzschia denticuloides*
	5H-4, 28–29	35.88	M			F	F					R		T		F			F						A	R									R						F
D. praedimorpha	5H-4, 115–116	36.75	G			F	F					F				F									D	F	X								R						F
	5H-5, 28–29	37.38	P			C	F					F				F			F						R	R	X														A
	5H-5, 115–116	38.25	G			C	C				T	F				R										F									R						F
N. denticuloides	5H-6, 28–29	38.90	M			C	F					F				F										C								R							C
D. simonsenii-	5H-6, 115–116	39.77	G			A	A					R				R			T							F									T						
N. grossepunctata	5H-7, 28–29	40.40	M			A	C					R				F			R							F	X							R	R	R				X	
	6H-1, 27–28	41.07	G			D	C				R		R			R			R				F													T					
A. ingens var. *nodus*	6H-1, 50–52	41.30	M			A	C				T	R	F			F			R				F													R					
	6H-1, 114–115	41.94	P			C	F		R				C			F			F				C													R					
	6H-2, 27–28	42.57	M			F			R			R	F			F		F					A													R					
N. grossepunctata	6H-2, 49–51	42.79	M			F						T	C			F		F	R				A				X									T					
	6H-2, 114–115	43.44	M			F						R	F			F		F	F	R			A				X									F					
D. maccollumii	6H-3, 27–28	44.07	G								R	T	R			F		R	R				F				X									D			R	R	
	6H-3, 49–51	44.29	M								R		R			F		F																		D			F		
	6H-3, 114–115	44.94	M										T			R				T																A			R		
C. kanayae	6H-4, 27–28	45.57	M						R		T		F			F	T										X									D			R		T	
	6H-4, 114–115	46.44	P								T		F			F	R	R									X									C			F			
	6H-5, 27–28	47.07	P								R		C			F		F									X									A			R		R	
	6H-5, 114–115	47.94	P										C			F																				F				R		
	6H-6, 27–28	48.57	P								T		D			R											X									T				R	T	
?	6H-6, 49–51	48.79	P								R		D			R											X									F						
	6H-6, 114–115	49.44	P										A			F																				F						
	6H-7, 27–28	50.07	P								F		A														X									F						

Notes: Preservation: G = good, M = moderate, P = poor. Abundance: D = dominant, A = abundant, C = common, F = few, R = rare, T = trace, X = present.

Table T4 (continued).

Zone (Southern Southern Ocean Diatom Zonation)	Core, section, interval (cm)	Depth (mbsf)	Preservation	*Nitzchia grossepuncata*	*Pleurosigma directum*	*Proboscia barboi*	*Raphidodiscus marylandicus*	*Rhizosolenia hebetata*	*Rhizosolenia antennata*	*Rouxia isopolica*	*Rouxia naviculoides*	*Rouxia peragalli*	*Rouxia* sp. 1 Gersonde	*Rouxia* sp. 2 Gersonde	*Thalassionema nitzschioides*	*Thalassionema nitzschioides* var. *capitulatum*	*Thalassionema nitzschioides* var. *inflatum*	*Thalassionema nitzschioides* var. *parvum*	*Thalassiosira convexa* var. *aspinosa*	*Thalassiosira inura*	*Thalassiosira fraga*	*Thalassiosira oestrupii*	*Thalassiosira oliverana* var. *sparsa*	*Thalassiosira praelineata*	*Thalassiosira spinosa*	*Thalassiosira spumellaroides*	*Thalassiosira yabei*	*Triceratium cinnamomeum*	*Thalassiothrix longissima*	*Thalassiothrix miocenica*
	5H-4, 28–29	35.88	M			R		R				R			R														R	T
D. praedimorpha	5H-4, 115–116	36.75	G					F				T				R													R	
	5H-5, 28–29	37.38	P			R						R	F																F	
	5H-5, 115–116	38.25	G					R					F	R															R	
N. denticuloides	5H-6, 28–29	38.90	M	F		R		R					R																R	
D. simonsenii–	5H-6, 115–116	39.77	G	F		R		T					T	T																
N. grossepunctata	5H-7, 28–29	40.40	M	F		R						R	F	R															R	
	6H-1, 27–28	41.07	G	R		R						R													R				T	
A. ingens var. *nodus*	6H-1, 50–52	41.30	M	R		T						F				T									R				R	
	6H-1, 114–115	41.94	P	R		R										F									F				R	
	6H-2, 27–28	42.57	M	R		R		T																	R				T	
N. grossepunctata	6H-2, 49–51	42.79	M	R		R						T				R									T					
	6H-2, 114–115	43.44	M	R		R	F									F													R	
D. maccollumii	6H-3, 27–28	44.07	G			R	T					T	T	R		F									T					
	6H-3, 49–51	44.29	M									R				F									R				T	
	6H-3, 114–115	44.94	M		T									R	T	A									R					
C. kanayae	6H-4, 27–28	45.57	M			T	R							R		F					R				F				T	
	6H-4, 114–115	46.44	P			R		T				R		R							R				A			R		
	6H-5, 27–28	47.07	P									R				F					F				C					
	6H-5, 114–115	47.94	P									C				F					C				F					
	6H-6, 27–28	48.57	P			T															R				F	T			T	
?	6H-6, 49–51	48.79	P			R															R				F					
	6H-6, 114–115	49.44	P			F		R													F				F	F				
	6H-7, 27–28	50.07	P																						C	R				