8. RADIOLARIA FROM DEEP SEA DRILLING PROJECT LEG 89[1]

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ABSTRACT

Radiolarian faunas from Leg 89 are scarce and poorly preserved. Upper Cretaceous assemblages are reworked. The oldest and lowest assemblage recognized was of the *Archaeospongoprunum cortinaensis* Zone in Hole 585. The biochronology of two levels in Hole 462A are revised as follows: the lowest assemblage of species useful for biochronology is of the *Cecrops septemporatus* Zone (early Hauterivian); the age of a higher sample is late Tithonian–early Berriasian, indicating reworking of older sediment into the Nauru Basin.

INTRODUCTION

The locations of the drill sites occupied during DSDP Leg 89 are; Site 585: 13°29.00′N, 156°48.91′E, water depth 6109 m; Site 462, Hole 462A (reentry into cone set in 1978 during Leg 61): 7°14.50′N, 165°01.90′E, water depth 5177 m.

At Site 585, Holes 585 and 585A were each drilled as single bit holes in the East Mariana Basin, and at Site 462, Hole 462A was drilled as a deep reentry into the Nauru Basin, west of the Ralik Chain of the Marshall Islands. Site 586 cores, recovered during Leg 89 by hydraulic piston corer (HPC) on the northeastern upper slope of the Ontong-Java Plateau (00°29.84′S, 158°28.89′E, water depth 2207 m), are being studied by the Leg 90 scientific staff. Generally the two sites studied in this chapter provided poorly preserved radiolarians.

DISTRIBUTION AND BIOCHRONOLOGY OF RADIOLARIANS

Site 585, Hole 585

Of the 140 samples studied from Hole 585 only 24 (17%) provided biochronologically useful assemblages, 73 (52%) were barren, and 43 (31%) were too poorly preserved to be useful. Table 1 shows the absence or poorly preserved presence of radiolarian fauna from Hole 585.

In the Cenozoic section, only wash core 585A-H1, 38–42 cm provided a well-preserved radiolarian fauna. The following major morphotypes were identified:

Buryella clinata, Foreman, 1973
Calocyclas turris, Ehrenberg, 1873
Calocycloma castum (Haeckel, 1887)
Dictyoprora mongolfieri (Ehrenberg, 1854)
Eusyringium fistuligerum (Ehrenberg, 1873)
Lithocyclia ocellus (Ehrenberg, 1854)
Lithochytris vespertilio, Ehrenberg, 1873
Lophocyrtis biaurita (Ehrenberg, 1873)

Table 1. Hole 585 samples in which radiolarians are absent or too poorly preserved to be biostratigraphically useful.

Radiolarians absent		Radiolarians too poorly preserved	
Sample (core-section, interval in cm)		Sample (core-section, interval in cm)	
1-1, 4–5	30,CC	3-1, 27–28	52-2, 116–118
1-1, 140–141	31-3, 146–147	12-1, 65–66	54-2, 62–64
1-2, 40–41	31-4, 5–6	13-1, 22–23	54-3, 6–7
1-2, 144–145	32-1, 100–103	13-1, 88–89	55-1, 82–83
1-3, 70–71	32-2, 135–137	17-1, 13–14	55-2, 34–35
1-4, 60–61	33-1, 108–109	20-1, 39–40	55-4, 44–45
1-5, 30–31	39-2, 39–41	20-2, 108–109	
1,CC	40-1, 3–4	27-3, 22–23	
3-1, 108–111	41,CC	27-3, 126–127	
6-1, 86–87	42-2, 63–64	28-3, 16–17	
6-2, 79–80	43-2, 57–59	28-3, 138–139	
7-1, 17–18	43-4, 61–62	28,CC	
8-1, 75–76	44-2, 100–102	29-1, 34–35	
8-2, 106–107	44-3, 140–142	29-2, 5–6	
12-2, 34–35	44-4, 108–110	30-1, 1–2	
14-2, 94–95	45-1, 73–75	31-1, 108–109	
15-1, 22–23	45-2, 40–42	32-3, 72–74	
15-1, 74–75	45-2, 130–132	34-1, 140–142	
15-2, 4–5	45-4, 9-11	34-2, 84–96	
16-1, 35–36	45,CC	35-1, 30–32	
16-1, 93–94	46-1, 44–46	35-1, 128–130	
17-2, 47–48	47-2, 31–33	36-1, 36–38	
17-2, 69–70	48-1, 146–147	38-1, 42–44	
18-1, 119–120	48-2, 90–91	39-1, 10–12	
18-1, 143–144	49-3, 19–21	42-3, 30–32	
18-2, 28–32	49-4, 43–45	44-1, 89–91	
19-1, 12–14	50-1, 113–114	45-3, 50–52	
19-1, 53–55	50-2, 6–7	46-2, 96–98	
20-3, 73–74	50-3, 30–32	46-3, 7–9	
20-4, 34–35	50-4, 30–31	46-3, 15–17	
27-1, 82–83	51-3, 28–30	49-1, 118–120	
27-4, 59–60	51-4, 62–64	49-2, 146–148	
27,CC	52-1, 147–148	49-5, 40–42	
28-1, 16–17	53-2, 102–104	49-6, 14–15	
28-2, 29–30	55-2, 82–83	49-6, 49–51	
24-4, 8–9	55-4, 109–110	51-2, 37–38	
28-4, 121–122		52-1, 128–130	

Phormocyrtis striata exquisita (Kozlova *in* Kozlova and Gorbovets, 1966)
Podocyrtis (Lampterium) chalara, Riedel and Sanfilippo, 1970
Podocyrtis (Lampterium) mitra, Ehrenberg, 1854
Rhabdolithis pipa, Ehrenberg, 1854

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These fauna extend from the late early Eocene to the lowest early Oligocene and can be interpreted as a mixing of predominantly two assemblages: the upper part of the *Buryella clinata* Interval-chronozone, and the upper part of the *Thyrsocyrtis bromia* Interval-chronozone. These two assemblages represent 95% of the specimens mixed into a lower Miocene assemblage (*Lychnocanoma elongata* Interval-chronozone).

Mesozoic radiolarian assemblages are characterized by two main features: (1) the tests are always recrystallized to quartz, and some are replaced by zeolites; and (2) most of the assemblages are oligospecific.

Based on the specific diversity and on the variable size of tests, only five levels (Samples 585-17-2, 35–36 cm; 585-26-1, 23–25 cm; 585-34-2, 27–29 cm; 585-36-1, 73–74 cm; and 585-48,CC) seem to be autochthonous. If we consider the morphology and the size of the tests, all other samples seem to be allochthonous. The samples show spherical radiolarian morphology (Spumellarians and essentially Cryptocephalic Nasselarians) and very good size sorting: the smallest specimens occur in clays, larger specimens in silts, and the largest specimens in the coarse fractions.

Figure 1 shows the Mesozoic species occurrences. The following zones were recognized:

Amphipyndax tylotus Zone (Foreman, 1977) in Core 17
Amphipyndax pseudoconulus Zone (Foreman, 1977) in Cores 25 to 28
Theocampe urna Zone (Riedel and Sanfilippo, 1974) in Core 29
Alievium superbum Zone (Schaaf, 1984) in Core 31
Obesacapsula somphedia Zone (Schaaf, 1984) in Cores 32 to 34
Pseudodictyomitra pseudomacrocephala Zone (Schaaf, 1984) in Core 38
Spongocapsula zamoraensis Zone (Schaaf, 1984) in Cores 46 to 48
Archaeospongoprunum cortinaensis Zone (Schaaf, 1984) in Cores 52 to 54

Site 585, Hole 585A

From Hole 585A, 20 samples (42%) were barren, 17 samples (36%) provided faunas too poorly preserved to be useful, and 10 samples (21%) can be used for biochronologic resolution. Table 2 shows the Hole 585A samples lacking radiolarian fauna or containing fauna too poorly preserved to be biostratigraphically useful.

Sample (hole-core-section, interval in cm)	Abundance	Preservation	*Theocampe apicata*	*Myllocercion acineton*	*Siphocampe bassilis*	*Clathropyrgus bumastus*	*Excentropyloma cenomana*	*Orbiculiforma chartonae*	*Theocapsomma comys*	*Archaeospongoprunum cortinaensis*	*Thanarla elegantissima*	*Pseudoaulophacus floresensis*	*Dictyomitra formosa*	*Alievium gallowayi*	*Mita gracilis*	*Theocampe ixys*	*Dictyomitra koslovae*	*Pseudoaulophacus lenticulatus*	*Archaeodictyomitra lamellicostata*	*Hemicryptocapsa polyhedra*	*Amphipyndax pseudoconulus*	*Pseudodictyomitra pseudomacrocephala*	*Wildeus punctulatus*	*Theocampe salillum*	*Obesacapsula somphedia*	*Protostichocapsa stocki*	*Alievium superbum*	*Theocampe tina*	*Amphipyndax tylotus*	*Theocampe urna*	*Thanarla veneta*	*Spongocapsula zamoraensis*	Zone
585-17-2, 35–36	F	M	F	–	?	–			F			F		R		?	F	–	R		–		R	R					R			*A. tylotus* Zone
585-25,CC	F	M	F		R	–			–			F		–		R	–	–	R		–		R	–					–			
585-26-1, 23–25	A	M	?	–	–	R			–			–		–		–		R	–		F		?	R					–			
585-26-1, 27–28	C	M	F	–	–	–				–		–				–		F	–		–		–	R								*A. pseudoconulus* Zone
585-26-1, 55–56	R	M	–	R		–				–								R			R		–	–		–						
585-28-1, 149–150	C	P	–	R						F					–			–			R			–		–		–				
585-29-1, 84–85	C	P		–						F					–			–			–		R		R	–	R		R			
585-29-1, 143–144	C	P		–			–			F					?						–		–		R	–	R		R			
585-29-2, 15–16	C	P					–			F			–		R								–		F	R	–		–			*T. urna* Zone
585-29-2, 110–111	C	P					R			–			–		R							–			–	R	R		R			
585-31-2, 52–54	F	M					R	–		R			R		–					–		–			–	R	–	R	–			*A. superbum* Zone
585-31-2, 93–94	C	P					–	–		R			R		–					–		R			–	–	R	–	–			
585-32-2, 26–28	C	P					?	R		–			–		R					R		–			R	–	–	–				
585-32-3, 42–44	C	P					–	–		F			–		–					R		R			–		–					
585-34-2, 36–38	A	P					–	F		R					R					–		F			F							–	*O. somphedia* Zone
585-34-2, 77–79	C	P					R	F		–					–					R		R			R						–	–	
585-34-2, 94–96	C	P					–	R		F	–				F					–		R			R					–	R	
585-38-1, 142–144	F	P					–	–		R	–				R					–		R			–					R	F	*P. pseudomacrocephala* Zone
585-46-1, 96–98	C	P						–		R	R				–							–			–					R	–	
585-46-2, 6–8	C	P								R	–				–							–								–	R	
585-48,CC	C	P								?	F																					R	*S. zamoraensis* Zone
585-52-1, 28–30	F	P								R	R																					–	
585-54-3, 36–37	F	P								R	–																					–	*A. cortinaensis* Zone

(A = abundant; C = common; F = few; R = rare; – = looked for but not found; ? = uncertain identity; M = moderate; P = poor)

Figure 1. Occurrence and abundance of Hole 585 Cretaceous radiolarians.

Table 2. Hole 585A samples in which radiolarians are absent or too poorly preserved to be biostratigraphically useful.

Radiolarians absent		Radiolarians too poorly preserved	
Sample (core-section, interval in cm)		Sample (core-section, interval in cm)	
H1-1, 4–6	2-1, 76–78	3-1, 38–39	9-1, 45–47
H1-1, 51–52	2-1, 111–117	3-1, 40–41	9-1, 140–141
H1-2, 6–7	H2-1, 12–14	3-2, 2–3	10-1, 36–38
H1-2, 96–98	11-2, 56–57	3,CC (4–5)	H4-1, 3–4
H1,CC (12–13)	11-4, 126–127	5,CC (1–2)	H4-1, 18–20
1-1, 14–16	13-3, 72–73	6-1, 113–115	H4-1, 118–120
1-1, 124–126	13-3, 100–102	7-1, 48–49	11-1, 9–11
1-2, 8–10	16,CC (9–11)	7-3, 127–128	18-6, 17–18
1,CC (10–11)	18-2, 81–82	8-1, 129–131	20-1, 58–59
2-1, 7–9	18-4, 80–81	8,CC (4–6)	

Three intervals can be defined on the basis of radiolarian occurrences and preservation: (1) in Core 585A-H1 to Sample 585A-3-1, 40–41 cm, Cenozoic radiolarians are nearly absent; (2) in Samples 585A-3-2, 2–3 cm to 585A-H4-1, 79–80 cm, Upper Cretaceous radiolarians are confined to sandy layers and the tests are always recrystallized; (3) in Cores 585A-11 to 585A-22, radiolarians are absent except in Cores 585A-18 and 585A-20, which yielded a fauna too sparse and poorly preserved to be biochronologically useful.

Figure 2 shows the Mesozoic species occurrences. The following Zones were recognized:

Amphipyndax tylotus Zone (Foreman, 1977) in Cores 3 to 5

Alievium superbum Zone (Schaaf, 1984) in Cores 7 to 8

Rhopalosyringium majuroensis Zone (Schaaf, 1984) in Core 9

Obesacapsula somphedia Zone (Schaaf, 1984) in Core 10

Figure 3 illustrates the correspondence of the zonation used in this chapter to that used in both the Site Reports and the Introduction and Explanatory Notes (this volume).

Site 462, Hole 462A (reentry)

In Hole 462A, three samples were examined: Sample 462A-99-1, 113–114 cm, in the sedimentary bed; small chips occurring in Core 108; and chips and clays in the core catcher of Core 109. In these samples, radiolarians are very rare and poorly preserved. In Core 108 they are replaced by zeolites. Only *Holocryptocapsa hindei* was positively identified in Sample 462A-99-1, 113–114 cm. This species has a range from the latest Jurassic to the earliest Aptian.

Biostratigraphic Revision of Leg 61 Samples 462A-80-1, 16–17 cm and 462A-46-1, 1–3 cm

During the last few years a number of studies of Mesozoic radiolarian stratigraphy (Moore, 1973; Riedel and Sanfilippo, 1974; Foreman, 1975, 1977; Pessagno, 1977a, b; Baumgartner et al., 1980; Schaaf, 1981, 1984; Taketani, 1982; and Baumgartner, 1985) permit a reexamination of the biochronology reported for Leg 61.

For Sample 462A-80-1, 16–17 cm De Wever (1981) provided seven determinations; *Crucella* sp., *Sethocapsa* sp., *Archaeodictyomitra lacrimula, Eucyrtis micropora* (?), *Thanarla elegantissima, Thanarla* sp. aff. *T. conica*, and *Mirifusus mediodilatatus*. The two first determinations, identified only to genus, cannot be used. Two other species deserve little consideration: (1) *Eucyrtis micropora* (?), a species difficult to determine (Foreman, 1975) and not biochronologically useful (Baumgart-

Sample (hole-core-section, interval in cm)	Abundance	Preservation	*Theocampe apicata*	*Siphocampe bassilis*	*Clathropyrgus bumastus*	*Orbiculiforma chartonae*	*Theocapsomma comys*	*Archaeospongopronum cortinaensis*	*Pseudodulophacus floresensis*	*Alicvium gallowayi*	*Mita gracilis*	*Dictyomitra koslovae*	*Pseudoaulophacus lenticulatus*	*Archaedictyomitra lamellicostata*	*Rhopalosyringium majuroensis*	*Amphipyndax pseudoconulus*	*Theocampe sallilum*	*Obesacapsula somphedia*	*Protostichocapsa stocki*	*Alievium superbum*	*Theocampe tina*	*Amphipyndax tylotus*	*Theocampe urna*	Zone
585A-3-2, 2–3	F	P	–	R	–		F	–	–	R		R		–			R							*A. tylotus* Zone
585A-3,CC	R	M	R	–	–		R	–	R	–			–	–	R		–	–		–		–	R	
585A-5-1, 97–98	F	M	R	R	R		–	R	–	–			–	–	R		–	R		–		–	R	–
585A-7-1, 65–66	C	P	?	–	–	–	–	–	R		–		R	R		R	–		?	–	R	–	–	*A. superbum* Zone
585A-7-1, 83–84	F	M	R	–	–	–		?	R		–		–	–		–	–		R	–	–	–	R	
585A-7-3, 22–23	F	M	–			R		R			R		–	–	–				R	F	–		–	
585A-7-3, 41–42	C	P	–			R		R			–				–			–	R	–			–	
585A-8-3, 82–84	F	M				–		–			–				R			–	–	R				
585A-9-1, 95–96	F	M				R		–							R			F	R	–				*R. majuroensis* Zone
585A-10-1, 8–9	F	M				–		R							–			R		–				*O. somphedia* Zone

(A = abundant; C = common; F = few; R = rare; – = looked for but not found; ? = uncertain identity; M = moderate; P = poor)

Figure 2. Occurrence and abundance of Hole 585A Cretaceous radiolarians. (See Fig. 1 for explanation of symbols.)

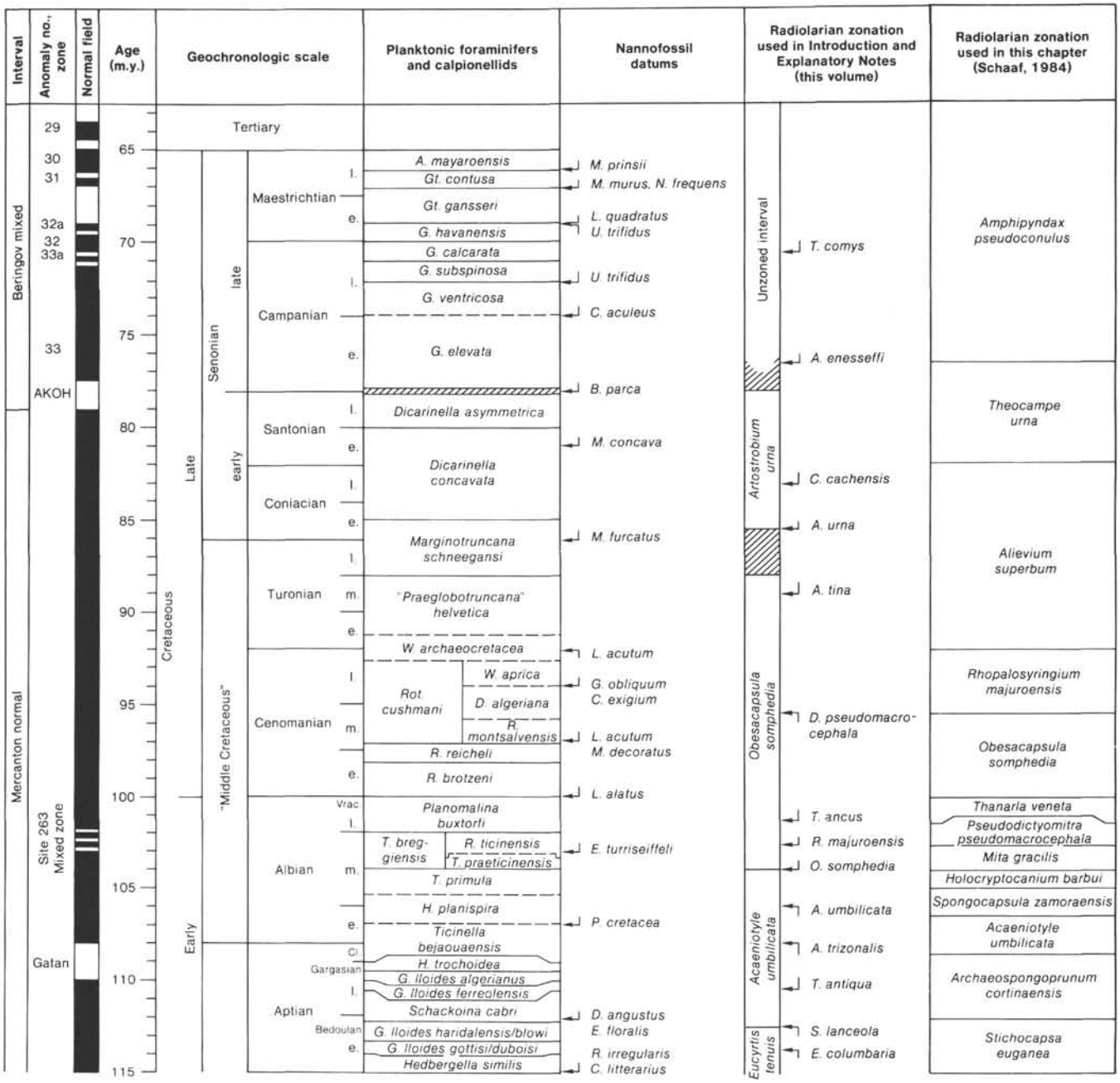

Figure 3. Relationship between the radiolarian zonation used in Site Reports and Introduction and Explanatory Notes (this volume) and the radiolarian zonation used in this chapter. (The same Cenozoic zonation is used in all cases.)

ner et al., 1980); and (2) *Thanarla* sp. aff. *T. conica*, a species poorly described by Aliev (1965), regarded as senior synonym of *Archaeodictyomitra lacrimula* by Pessagno (1977b), and with a range confined to the Valanginian. For these reasons, only three species are useful for biochronological revision: *Archaeodictyomitra lacrimula, Thanarla elegantissima*, and *Mirifusus mediodilatatus*.

The co-occurrence of *Mirifusus mediodilatatus* and *Archaeodictyomitra lacrimula* belongs to the upper part of the *Cecrops septemporatus* Zone (Schaaf, 1984). The age of this sample (462A-80-1, 16–17 cm) is therefore early Hauterivian. But we must emphasize the fact that ubiquitous and very common species have not been recorded in this assemblage (i.e., *Pantanellium lanceola, Pseudodictyomitra leptoconica, Cecrops septemporatus*, or *Acaeniotyle umbilicata*).

In Sample 462A-46-1, 1–3 cm, the presence of *Emiluvia pessagnoi, Emiluvia chica*, and *Emiluvia sedecimporata* indicated a late Tithonian–early Berriasian age. This older age in a stratigraphically younger level implies reworking. Thus it is possible that during the late Early Cretaceous an inverse differential erosion of older sediment provided reworked material for Site 462.

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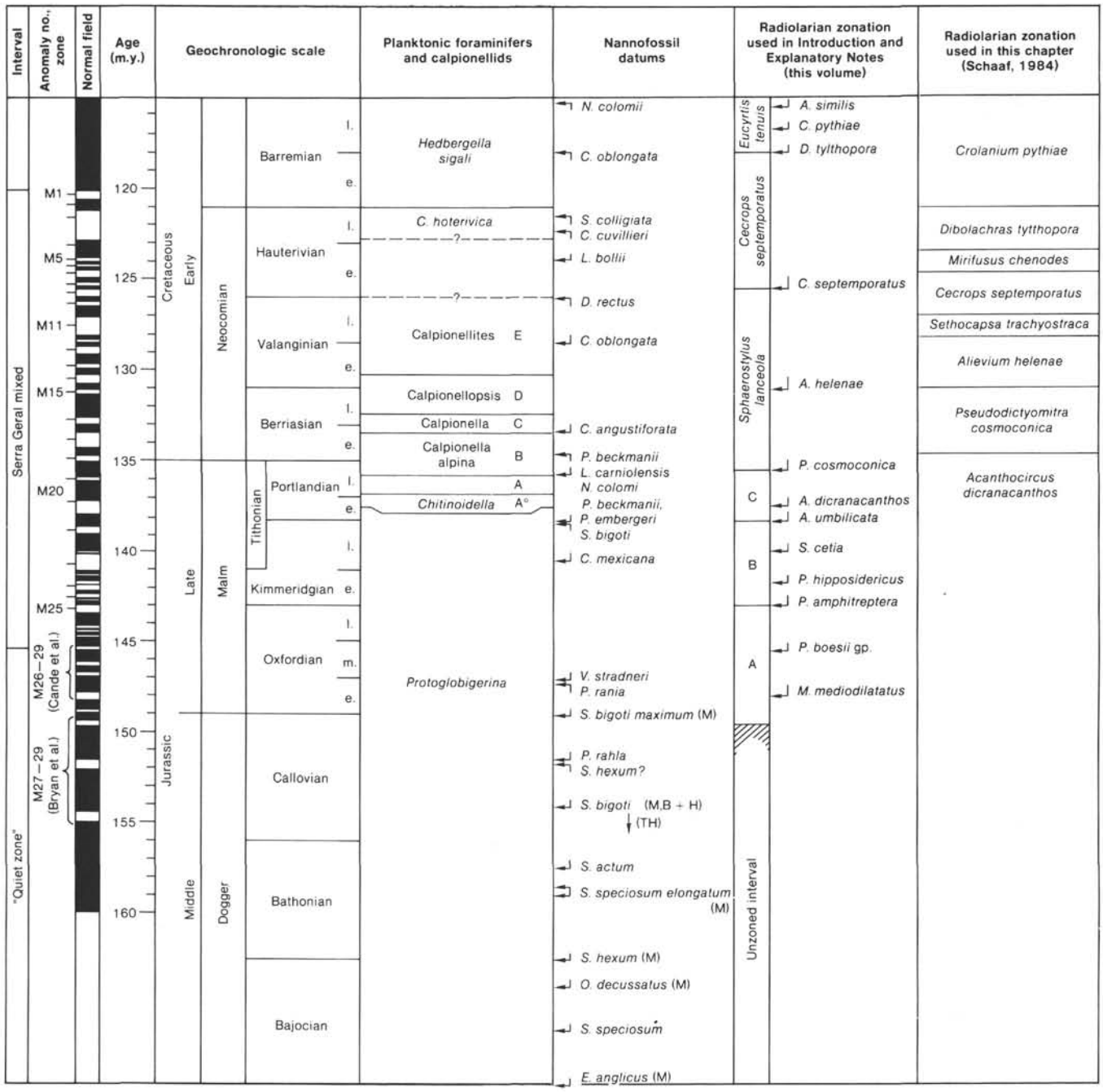

Figure 3 (continued).

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