

17. CENOZOIC RADIOLARIA FROM THE CARIBBEAN, DEEP SEA DRILLING PROJECT, LEG 15

William R. Riedel and Annika Sanfilippo, Scripps Institution of Oceanography, La Jolla, California

INTRODUCTION

Of the sites occupied during Leg 15 of the Deep Sea Drilling Project, the following ones yielded significant numbers of radiolarians:

Site 146 – 15°06.99'N, 69°22.67'W; water depth 3949 meters

Site 149 – 15°06.25'N, 69°21.85'W; water depth 3972 meters

Site 150 – 14°30.69'N, 69°21.35'W; water depth 4545 meters

Site 151 – 15°01.02'N, 73°24.58'W; water depth 2029 meters

Site 152 – 15°52.72'N, 74°36.47'W; water depth 3899 meters

Site 153 – 13°58.33'N, 72°26.08'W; water depth 3932 meters

In preparing this report on the Leg 15 radiolarians, we have concentrated principally on the Cenozoic occurrences and have not had sufficient time to treat the Cretaceous assemblages. For the Cenozoic occurrences we present tabulations of species abundances in all of the assemblages examined, a list of radiolarian events (earliest and latest occurrences of taxa) arranged stratigraphically, and a summary range chart. The form of presentation of these results follows closely that used in the radiolarian reports for DSDP Legs 7 and 10 (Riedel and Sanfilippo, 1971; Sanfilippo and Riedel, 1973) with the exception that the present report contains no systematic section, its place being taken by a species list and footnotes to the tables.

OCCURRENCES OF RADIOLARIANS

The following paragraphs briefly describe the radiolarian occurrences, and Figure 1 summarizes this information in relation to the occurrences of calcareous microfossils. These results support the conclusion reached on the basis of information from DSDP Legs 1, 4, and 10 (Sanfilippo and Riedel, 1973, Figure 1-3) that Caribbean sediments younger than Early or Middle Miocene generally lack siliceous microfossils, whereas older strata commonly contain them.

Site 146

Radiolarians are not present in Core 1 (at 96-105 m below the sea floor). In Core 2 (at 254-263 m) they are abundant and moderately well preserved—those from the upper half of the core belong in the *Lychnocanoma elongata* Zone and those from the lower part in the *Dorcadospyris ateuchus* Zone, but because the core is disturbed the transition between these zones cannot be investigated in detail.

In Cores 3 to 10 (from 406 to approximately 470 m), radiolarians vary from rare to common, and they are moderately well to poorly preserved (partially dissolved,

some silicified, and some perhaps zeolitized). Core 4 evidently belongs in the *Buryella clinata* Zone, Core 7 in the *Bekoma bidarfensis* Zone, and Core 10 in that part of the Paleocene left unzoned in the Leg 10 Initial Report—the intervening cores containing radiolarians inadequate for correlation.

In Core 11 (476 to approximately 480 m) the radiolarians have what is commonly regarded as a "Cretaceous aspect", but they might equally well be early Paleocene since no well-dated assemblages of that age are known. A few specimens are illustrated (Plate 4, Figure 7-12).

Practically all samples from Cores 12 to 41 (from 485 to approximately 740 m) contain rare, moderately well preserved (partially dissolved) radiolarians representing a small number of taxa. Many samples (particularly those from sandy layers) from cores below Core 14 contain, in addition, common to abundant poorly preserved (usually silicified) radiolarians representing large numbers of taxa. These results, together with the fact that an orderly sequence of foraminiferal faunas is found in the cores, suggest that the sparse, better preserved radiolarians are autochthonous, and that the floods of poorly preserved specimens were introduced by some mechanism such as turbidity currents, which carried material not significantly older than that being deposited at this site. This explanation requires a pattern of paleoecological conditions such that the water column at this site was inhabited by a restricted radiolarian assemblage, while at the presumably not-far-distant source of the transported component a much more diverse fauna flourished.

Site 149

Very rare, well preserved radiolarians are present in Core 2 (at 1-10 m below the sediment surface), and below that they are absent through Core 21 (at 176-185 m). Core 22 (at 185-195 m) has very rare, poorly preserved fragments (badly dissolved) which are insufficient for a zonal assignment. In Cores 23 through 30 (at 195 to approximately 263 m), radiolarians are few to common and moderately preserved (somewhat dissolved). Cores 31 through 42 (at 270 to approximately 376 m) contain abundant, well preserved radiolarians, and in Core 43 (at 381 to approximately 382 m) they are few to common, somewhat dissolved.

Core 23 (at 195-203 m) is in the *Lychnocanoma elongata* Zone, and below that the zonal boundaries are as follows:

Base of the *Lychnocanoma elongata* Zone in the lower part of Core 26 (at approximately 227 m).

Base of the *Dorcadospyris ateuchus* Zone in the lower part of Core 28 or the upper part of Core 29 (at approximately 250 m).

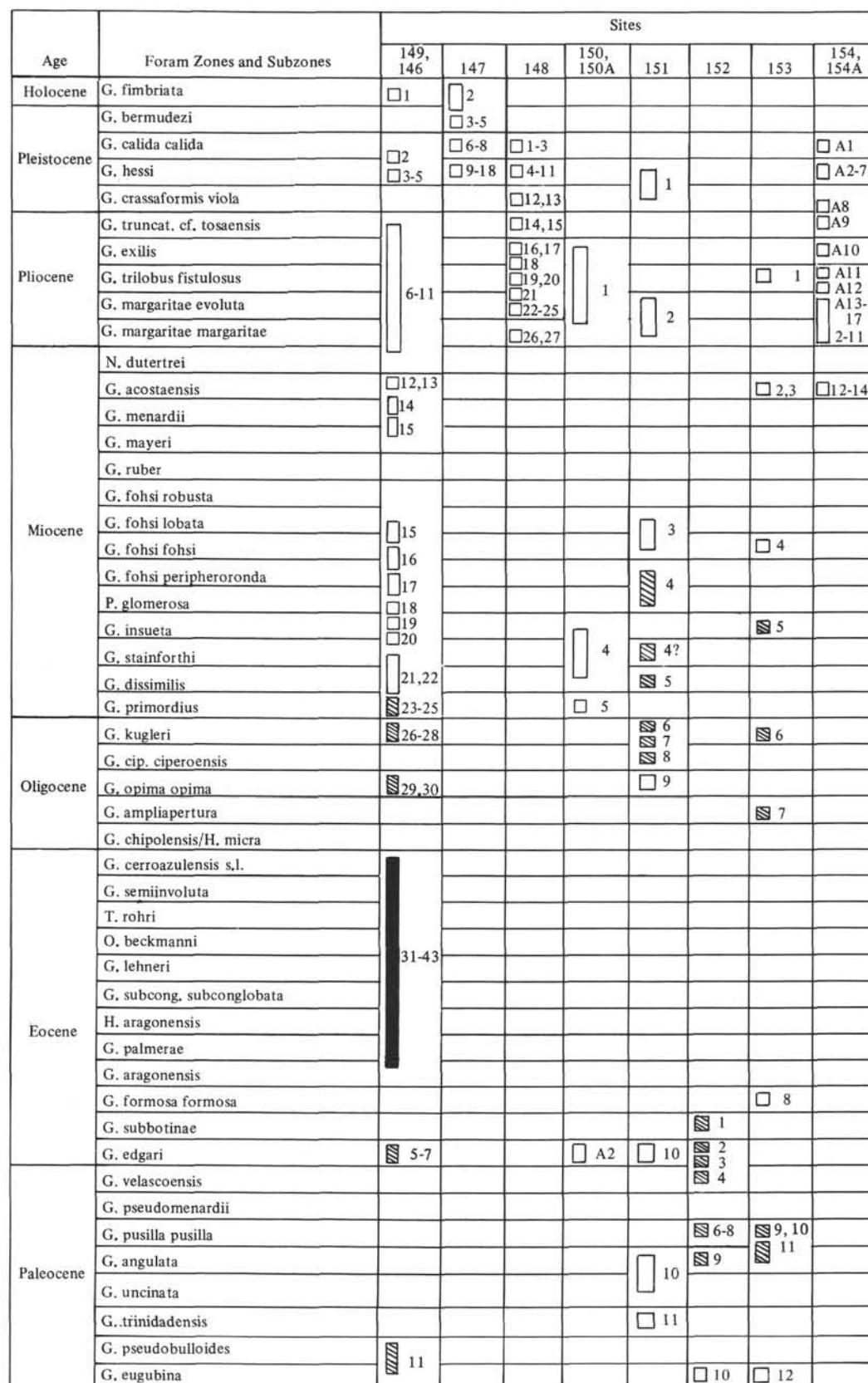


Figure 1. Cenozoic sediments cored on Leg 15 in the Caribbean. Cores are represented by numbered rectangles. Empty rectangles represent calcareous cores lacking siliceous microfossils, hachuring indicates siliceous microfossils occurring in calcareous sediments, and filled rectangles represent cores with many siliceous and very few or no calcareous microfossils.

Base of the *Theocyrtis tuberosa* Zone between Cores 30 and 31 (at approximately 270 m).

The radiolarian assemblages in Cores 31 and 32 contain a high proportion of reworked specimens, so that it is difficult to recognize the bases of the *Thrysocyrtis bromia* and *Podocyrtis goetheana* Zones.

Base of the *Podocyrtis chalara* Zone is probably in the lower part of Core 32 (at approximately 283 m).

Base of the *Podocyrtis mitra* Zone between the bottom of Core 36 and the lower part of Core 37 (at approximately 317-330 m).

Base of the *Podocyrtis ampla* Zone between Cores 38 and 39 (at 337-344 m).

Base of the *Thrysocyrtis triancantha* Zone is between Cores 42 and 43 (at approximately 376-381 m).

Base of the *Theocampe mongolfieri* Zone is below (and evidently not far below) the bottom of Core 43 (at approximately 390 m).

Site 150

Apart from a few "ghosts" of poorly preserved (probably zeolitized) skeletons in the catcher sample of Core 4 (from 95 to approximately 100 m below the sediment surface), no radiolarians were found in Cores 1 through 5 (from 49 to 114 m). The catcher sample from Core 2 of Hole 150A (from 119-120 m) contains rare, moderately preserved radiolarians (some dissolved, some infilled) which may be Paleocene in age. The cherts of Cores 6 through 8 (from 127 to approximately 142 m) contain few to common, poorly preserved (silicified, dissolved, and altered) radiolarians of Cretaceous age. Soupy material from Core 7 contains few Cretaceous forms (Plate 4, Figures 13-15) and abundant, moderately well preserved radiolarians of the *Buryella clinata* Zone (Early Eocene)—the latter evidently caved from higher in the hole. A small piece of gray mud from the catcher of Core 8 contains a few, moderately preserved (some dissolved and some infilled) Cretaceous skeletons. Radiolarians are rare, moderately well preserved in Section 1 of Core 9 (at approximately 150 m), absent in Core 10 (at 159 to approximately 160 m), and common and poorly preserved (somewhat dissolved and silicified) in Core 12 (at 177-180 m).

Site 151

No radiolarians are present in Cores 1 through 3 (from 61 to 190 m below the sea floor). Core 4 (at 237 to approximately 240 m) contains abundant, moderately well preserved (somewhat dissolved) radiolarians, those in the top of the core belonging to the *Dorcadospyris alata* Zone, and those lower in the core belonging to the *Calocycletta virginis* Zone—the *Calocycletta costata* Zone being either missing or included in the unsampled 40 cm below 151-4-1(28-30 cm). Radiolarians are also abundant and moderately well preserved in Core 5 (at 302 to approximately 305 m), most of the core belonging in the *C. virginis* Zone and its base in the *Lychnocanoma elongata* Zone. Cores 6 through 8 (at 311 to approximately 330 m) contain abundant, well preserved assemblages of the *Dorcadospyris ateuchus* Zone. The samples examined from Cores 7 and 8 contain a few reworked, Middle Eocene forms. Core 9 (at

339 to approximately 341 m) contains rare, poorly preserved (somewhat dissolved) radiolarians including *Pterocodon ampla* as well as some apparently younger forms. No radiolarians were found in Cores 10 through 12 (at 348-376 m).

Site 152

Radiolarians are abundant and well preserved in Core 1 (at 153 to approximately 156 m below the sediment surface). They are rare to common, poorly to well preserved, in Cores 2 through 9 (from 162 to approximately 230 m). Core 1 and the upper part of Core 2 (to approximately 165 m) evidently belong in the *Bekoma bidarfensis* Zone (though the zonal marker is absent); the remainder of Core 2, Core 3, and the upper part of Core 4 (to approximately 185 m) belong either in the *B. bidarfensis* Zone or in the underlying "unzoned interval" of the Leg 10 Initial Report; and the radiolarian samples below this (through Core 9) are apparently in that "unzoned interval."

No radiolarians are present in Core 10 (at approximately 239 m). In the Cretaceous Cores 12 to 22 (from 257 to approximately 466 m) they are generally absent or present as rare to few, poorly preserved (silicified) specimens.

Site 153

Cores 1 through 4 (to 309 m below the sediment surface) are barren of radiolarians. The lower part of Core 5 and Core 6 (from approximately 408 to 415 m) contain common, moderately to well preserved (somewhat dissolved) radiolarians of the *Calocycletta virginis* Zone. Core 7 (at 499 to approximately 501 m) contains abundant, moderately to well preserved radiolarians of the *Theocyrtis tuberosa* Zone, with some reworked Middle Eocene forms.

Cores 9 to 11 (from 586 to approximately 604 m) contain rare to few, poorly to moderately preserved (somewhat dissolved) radiolarians corresponding to the Paleocene unzoned interval of the Leg 10 Initial Report. The Cretaceous Cores 12 to 18 (from 609 to approximately 754 m) contain no radiolarians.

SPECIES OCCURRENCES AND BIOSTRATIGRAPHIC RESULTS

In Tables 1 to 8, which present the information on abundances of radiolarians in each sample examined from Sites 146, 149, 151, 152, and 153, the following abbreviations are used: A (abundant), C (common), R (rare), + (very rare), ? (doubtful identification), ! (believed to be reworked from older sediments, or caved from younger), - (looked for, and not found), and X (not found, but absence may be due to some secondary factor such as solution, excessive sieving of the assemblage, etc.)

The results from Site 150 are not suitable for tabulation and are as follows.

Radiolarians From Site 150

The catcher sample from Core 150-2A contains rare, moderately preserved radiolarians, and that from Core 150-7 contains rare, poorly preserved radiolarians—neither of these assemblages being sufficient to merit tabulating.

TABLE 1
Radiolarians from Site 146 (Upper Section)

Radiolarian Zones	Samples	Abundance	Preservation	Cannartus prismaticus	Cannartus tubarius	Lithocyclus angusta	Lithocyclus aristotelis group	Lithocyclus ocellus group	Doredospyris ateuchus	Doredospyris forcipata	Doredospyris papilio	Doredospyris praeforcipata	Trityllospyris triceros	Artophormis gracilis	Cyclampterium (?) leptetrum	Cyclampterium (?) milowii	Cyclampterium (?) pegetrum	Cyrtocapsella tetrapera	Lychnocanoma elongata	Thecocrys spongococonum	Thysocyrtis rhizodon	Carpocanopsis cingulata	Thecocrys annosa	Thecocrys tuberosa	Thecampe mongolfieri	Tepka perforata
Lychnocanoma elongata	2-1, Middle	A	M	R				R	R	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	2-2(128-130)	A	M	R	+!			R	R	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	2-3(142-146)	A	M	R	+ —			R	R	+	—	R														
	2-4(58-60)	A	M	R	—			R	R	+	+	F														
	2-4(118-120)	A	M	R	+ —			R	R	+	+															
Doredospyris ateuchus	2-5(10-12)	A	M	R	—	+!	R	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	2-5(80-82)	A	M	R	—		R	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	2-6(5-7)	A	M	R	+ —			R	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	2-6(68-70)	A	G	R	R			R	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	2-6(127-129)	A	M	R	R			R	R	—	R	—	—	—	—	—	—	—	—	—	—	—	—	—		
	2(CC)	A	M	+ —	R			R	R	—	R	—	—	—	—	—	—	—	—	—	—	—	—	—		

^aIn these samples, specimens of *Doredospyris papilio* are outnumbered by specimens of the ancestral form, in which the two strong feet diverge at 180° or less.

^bSamples below this level contain specimens (Plate 1, Figure 1) similar in structure to *Lychnocanoma elongata*, except that the feet are three in number and somewhat shorter, less robust and straighter than in that species. In rare specimens, one of the feet appears to have atrophied and the other two to be situated approximately 150° apart.

The soupy, fluid sediment from Core 150-7 contains common, well preserved radiolarians of the *Buryella clinata* Zone, evidently caved from higher in the hole. Species present, and their abundances, are

- Amphisphaera minor* (R)
- Astrophaerin* sp. E (R)
- Axoprunum pierinae* group (R)
- Stylosphaera coronata coronata* (F)
- Thecosphaerella larnacium* (F)
- Thecosphaerella ptomatus* (F)
- Thecosphaerella rotunda* (R)
- Helostylus* sp(p) (R)
- Amphicraspedum murrayanum* (+)
- Amphicraspedum prolixum* (R)
- Amphicraspedum prolixum* group (R)
- Spongodiscus quartus quartus* (R)
- Stylo trochus nitidus* (+)
- Dendrospyris fragoides* (R)
- Dictyospyris discus* (R)
- Giraffospyris lata* (R)
- Rhabdolithis pipa* (+)
- Buryella clinata* (R)
- Buryella tetradicia* (F)
- Calocyclus castum* (R)
- Lamptonium fabaeforme chaunothorax* (R)
- Lamptonium fabaeforme fabaeforme* (R)
- Lamptonium pennatum* (R)
- Lithochytris archaea* (F) (Plate 5, Figure 1)
- Lychnocanoma babylonis* group (F)
- Phormocyrtis cubensis* (R)
- Phormocyrtis striata exquisita* (F)
- Phormocyrtis striata striata* (F)
- Phormocyrtis turgida* (+)
- Pterocodon tenellus* (R)
- Thecocrys (?) phyzella* (R)
- Thecocyste alpha* (R)
- Thysocyrtis hirsuta hirsuta* (R)
- Thysocyrtis hirsuta tensa* (+)

Podocyrtis papalis (F)

Amphiternis sp. cf. *Stichomitira alamedaensis* (R)

A few apparently Cretaceous specimens (e.g., Plate 4, Figures 13-15) occur together with this Early Eocene assemblage.

Table 9 presents a stratigraphically arranged listing of earliest and latest occurrences of radiolarian taxa in a format similar to that used in our report on radiolarians from Leg 10 (Sanfilippo and Riedel, 1973). The order of the listing is based as far as practicable on Leg 15 results, but with some account being taken of data from earlier legs. In the column with the names of taxa, T indicates the top of the range of a taxon, B its bottom, and an arrow an evolutionary transition. The abbreviations e, m, and m-e indicate evolutionary, morphotypic, and morphotypic-evolutionary limits, respectively. In the body of the table are given the pairs of core-sections between which an event occurred, followed by the depth in meters below the sediment surface in parentheses. The degree of reliability (for purposes of correlation) of each event at each site is indicated by the letters P, M, and G (for poor, moderate, and good).

Some parts of this list of radiolarian events are well supported by Leg 15 data, but the following are not. Events indicated as occurring above the top of Core 151-4 are arranged in the order indicated in our Leg 10 report (which depended partly on results from earlier legs). Between core-sections 149-30(CC) and 149-32-2, the order of events in the Leg 15 material is obscured by extensive reworking, and therefore the order indicated in the Leg 10 report is followed. There is a considerable period of time between Cores 149-43 and 152-1, insufficiently represented in the Leg 15 material, and here again the Leg 10 order is followed. And as can be seen from the tabulations of occurrences of species in the lower cores from Sites 146 and 152, there is little reliable evidence for the stratigraphic order of the events indicated as occurring below Core 152-4—these are here listed only tentatively, pending recovery of better material of this age.

TABLE 2
Radiolarians from Site 146 (Lower Section)

^aThis assemblage includes a well preserved saturnalin with spiny ring and concentrically zoned cortical shell (Plate 1, Figure 2).

b Two noteworthy radiolarians of uncertain affinities, occurring in this assemblage, are illustrated in Plate 1, Figures 3, 4.

^cSome of the radiolarians in this assemblage are completely pyritized (Plate 1, Figures 5, 6).

TABLE 3
Radiolarians from Site 149 (Upper Section)

Radiolarian Zones	Samples	Abundance	Preservation	Cannartus mammifer	Cannartus prismaticus	Cannartus tubarius	Cannartus violina	Entapium regulare	Lithapium mitra	Lithapium plegma cantha	Spongatractus pachystylus	Stylosphaera coronata coronata	Thecosphaerella ptomatus	Thecosphaerella rotunda	Heliostylus sp(p)	Periphæna decora	Lithocydla angusta	Lithocydla aristotelis group	Lithocydla crux	Spongodiscus rhabdostylus	Lithielius hexaxylophorophorus	Dorcadospyris ateuchus	Dorcadospyris circulus	Dorcadospyris dentata	Dorcadospyris forcipata	Dorcadospyris papilio	Dorcadospyris praeforcipata	Dorcadospyris spinosa	Tritylospyris triceros	Artophormis barbadensis	Artophormis dominicensis	Artophormis gracilis	Calocyclus hispida	Calocyclus turris	Cyclampterium (?) milowi	Cyclampterium (?) pegetrum
Lychnocanoma elongata	23-3(50-52)	F	P	Cannartus mammifer																																
	23-5(95-97)	F	M	Cannartus prismaticus																																
	23(CC)	F	M	Cannartus tubarius																																
	24-1(67-69)	F	M	Cannartus violina																																
	24-1(146-148)	F	M	Entapium regulare																																
	24(CC)	C	M	R																																
	25-1(85-87)	C	M	R																																
	25-2(28-30)	C	M	R																																
	25-2(126-128)	C	M	R																																
	25-3(41-43)	C	M	R																																
Dorcadospyris ateuchus	25(CC)	C	M	R																																
	26-1(80-82)	C	M	R																																
	26-2(8-10)	C	M	R																																
	26-2(100-102)	C	M	R																																
	26-3(37-39)	F	M	R																																
	26-3(120-122)	F	M	R																																
	26(CC)	C	M	R																																
	27-2(30-32)	C	M	R																																
	27-2(113-115)	C	M	+ -																																
	27-3(40-42)	C	M	-																																
Lithocydla angusta	27-3(122-124)	C	M	+																																
	27(CC)	C	M	-																																
	28-1(144-146)	C	M	+																																
	28-2(45-47)	C	M	+																																
	28-2(125-127)	C	M	+																																
	28-3(38-40)	C	M																																	
	28-3(145-147)	C	M																																	
	28-4(38-40)	C	M	+																																
	28-4(119-121)	C	M																																	
	28(CC)	C	M	+																																
Thrysocystis bromia and/or Podocystis goetheana	29-1(55-57)	C	M	+																																
	29-1(112-114)	C	M	-																																
	29-2(38-40)	C	M	-																																
	29-2(100-102)	C	M	-																																
	29-3(50-52)	C	M	-																																
	29-3(130-132)	C	M																																	
	29(CC)	C	M																																	
	30-1(87-89)	C	G																																	
	30-1(144-146)	C	M																																	
	30-2(23-24)	C	M																																	
Thrysocystis bromia and/or Podocystis goetheana	30-2(138-140)	C	M	!	-	! !	! !	! !	! !	R	++ +!	! !	R	++ +!	! !	R	++ +!	! !	R	++ +!	! !	R	++ +!	! !	R	++ +!	! !	R	++ +!	! !						
	30(CC)	C	M	!	+!	-	-	-	-	R	R	-	R	+!	-	R	+!	-	R	+!	-	R	+!	-	R	+!	-	R	+!	-						
	31-1(18-20)	C	M	-	-	+!	-	-	-	R	R	R	-	R	-	R	-	R	-	R	-	R	-	-	+!	-	R	-	-							
	31-1(90-92)	C	M	-	-	-	-	-	-	R	R	R	-	R	-	R	-	R	-	R	-	R	-	-	-	-	R	-	-							
	31-2(13-15)	C	M	+	-	-	-	-	-	R	R	-	R	-	R	-	R	-	R	-	R	-	-	-	-	-	R	-	-							
	31-2(120-122)	C	M							R																										
	31(CC)	C	M							R																										
	32-1(137-139)	C	M							R																										
	32-2(39-41)	C	M							R																										
	32-2(110-112)	C	M							R																										
32-3(38-40)	32-3(38-40)	C	M							R																										
	32-3(110-112)	C	M							R																										
	32-4(18-20)	C	M							R																										
	32-4(70-72)	C	M							Rg																										
	32-4(70-72)	C	G							Rg																										
	32-4(126-128)	C	G							Rg																										
	32-4(126-128)	C	G							Rg																										

^aAbove the range of *Dorcadospyris circulus*, and in 149-28-4, 119-121 cm, assemblages include very rare to rare specimens of a rather similar form with a very small apical horn, and accessory spinules on the two joined feet (Plate 1, Figure 7).

^bBelow the range of *Dorcadospyris circulus*, assemblages contain very rare to rare (few in 149-29-1, 55-57 cm) specimens of a rather similar form with two feet joined but with the apical horn very small or absent, and no accessory spinules on the feet (Plate 1, Figures 9, 10).

^cThese samples contain specimens resembling *Thecocystis spongocoeruleum*, but with the abdominal wall being a simple lattice, not spongy (Plate 2, Figure 1).

^dIn these samples, typical *Dorcadospyris spinosa* is accompanied by specimens in which the two unjoined primary feet are very much smaller than the joined pair (Plate 2, Figure 2).

^eSpecimens of *Helostylus* sp(p). at and above this level have large pores on the cortical shell (Plate 2, Figure 3), while specimens from Cores 149-35 and below have small pores as illustrated by Sanfilippo and Riedel (1973, pl. 26, figs. 10-12; pl. 27, fig. 1).

TABLE 3 - *Continued*

Cyrtocapsella cornuta									
Cyrtocapsella elongata									
Cyrtocapsella japonica									
Cyrtocapsella tetraptera									
Dictyophinium craticula									
Eusyringium fistuligerum									
Lithochytris vespertilio									
Lophocyrtis (?) jachinia									
Lychnocanoma elongata									
Lychnocanoma amphitrite									
Lychnocanoma babylonis group									
Lychnocanoma bellum									
Rhopalocanum ornatum									
Sethochytris triconiscus									
Stichocyctis delmontensis									
Theocorys anapographa									
Theocorys spongocomum									
Thecotyle ficus									
Thysocyrtis bromia									
Thysocyrtis rhizodon									
Thysocyrtis tetricantha									
Thysocyrtis triacantha									
Carpocanistrum azyx									
Carpocanopsis bramlettei									
Carpocanopsis cingulata									
Calocyctetta robusta									
Calocyctetta virginis									
Podoocyrtis ampla									
Podoocyrtis chalara									
Podoocyrtis goetheana									
Podoocyrtis mitra									
Podoocyrtis papalis									
Podoocyrtis sinuosa									
Theocorys annosa									
Theocorys tuberosa									
Lithomitra dociilis									
Theocampae amphora group									
Theocampae armadillo group									
Theocampae mongolfieri									
Theocampae pирум									
Theocampae urecolus									
Acrobottys spp.									
Botryocysts spp.									
Botryocystis dictyocephalus group									
Botryopyle sp. A									
Centrobotrys gravida									
Centrobotrys petrushevskayae									
Centrobotrys thermophila									
Tepka perforata									

^fNear the lower limit of its range, *Carpocanistrum azyx* is distinguished from *Cryptopropra* sp. (Sanfilippo and Riedel, 1973, pl. 35, fig. 5) by its more numerous thoracic pores and more pronounced stricture at the base of the thorax. The cephalis is usually overgrown by the proximal thoracic wall, but specimens in which this is corroded show a simple, subspherical cephalis (Plate 2, Figure 4), in contrast to the original description.

^gOccurrences of these species in higher samples were not determined, because of extensive upward reworking of older radiolarians.

^hThese specimens of *Theocorys anapographa* are of the small type discussed in footnote 5 of Table 4.

ⁱBelow the range of the forms tabulated as members of the *Lithocyclia aristotelis* group occurs a form (Plate 2, Figures 5, 6) with the peripheral spongy zone divided into several arms terminating in spines, and the phacoid cortical shell so delicate that it is rarely preserved. This form may be ancestral to the *L. aristotelis* group, or an evolutionary offshoot near its origin. In the same samples occur members of the *L. ocellus* group with some structural similarity, in that the zone immediately beyond the cortical shell shows pronounced concentric zonation, and the structure beyond that is irregularly spongy (Plate 2, Figures 7, 8).

^jThe existence of a period of time between the latest occurrence of *Theocorytis tuberosa* and the earliest *T. annosa*, indicated in the tabulations of radiolarians at Sites 94 and 95 of DSDP Leg 10 (Sanfilippo and Riedel, in press) is confirmed by these results from Site 149. 711

TABLE 4
Radiolarians from Site 149 (Lower Section)

^aApproximately half of the specimens of *Lithelius hexaxyphophorus* in these assemblages have the cortical shell spongy, rather than a simple lattice (Plate 3, Figure 6).

b. The subspherical swollen part is exceptionally deeply pitted, so as to be radially channelled (Plate 3, Figures 7, 8).

^cThese assemblages contain rare specimens of a form (Plate 3, Figure 9) superficially resembling *Podocyrtis aphorma*, but stratigraphically well separated from the range of that earlier species.

TABLE 4 - *Continued*

^dSome of these specimens of *Podocyrtis mitra* are evidently reworked.

^eThese assemblages contain rare specimens of a small, hyaline, late form of *Theocorys anapographa* with very few pores (Plate 3, Figure 11).

^f*Podocyrtis* sp. A is illustrated on Plate 4, Figures 1-3.

^g*Podocyrtis* sp. B is illustrated on Plate 4, Figures 4-6.

TABLE 5
Radiolarians from Site 151

^aThese samples contain a species of *Tepka* in which the perforated plate is represented only by a series of radii surrounding the central ring (Plate 5, Figures 2, 3).

TABLE 6
Radiolarians from Site 152

Footnotes to Table 6.

^aThese assemblages include a form (Plate 5, Figure 4) bearing some resemblance to *Theocorys (?) phyzella*, but with the abdomen terminating irregularly rather than smoothly as in the type specimen.

^bSpecimens of *Burvella tetradiica* in these assemblages commonly have the fourth (downwardly tapering) segment subdivided rather than simple (Plate 5, Figure 5).

^cThis assemblage contains a form apparently ancestral to *Thryssocyrts rhizodon*, with lamellar triangular feet tending to be cleft distally (Plate 5, Figures 6, 7).

^dIn this sample was found a large spine of extraordinary structure, which may be part of an astrosphaerin. There is a three-bladed shaft giving rise, at one level, to four branches at right angles — some, at least, of these branches being looped terminally (Plate 5, Figure 8). An identical fragment (Plate 5, Figure 9) was found in a core of the same age (*Bekoma bidarfensis* Zone) collected by C. D. Hollister of Woods Hole Oceanographic Institution — Chain 100, Core 80, taken in the tropical Pacific at lat. $08^{\circ} 18.8' S$, long. $168^{\circ} 32.3' W$, in 4732 m of water.

^eRare specimens in this assemblage resemble *Lamptonium (?) incohatum*, but have a delicate abdomen of large meshes (Plate 5, Figure 10), foreshadowed in the original description of the species (Foreman, 1973).

TABLE 7
Radiolarians from Site 153 (Upper Portion)

Radiolarian Zones	Samples	Abundance	Preservation
Calocyctella virginis	153-5-1(62-68)	none	<i>Cannartus prismaticus</i>
	153-5-2(40-42)	none	<i>Peripheraena decora</i>
	153-5-3(92-95)	none	<i>Lithocyctlia angusta</i>
	153-5-4(52-56)	none	<i>Lithocyctlia aristotelis group</i>
	153-5-4(93-95)	none	<i>Lithocyctlia crux</i>
	153-5-4(127-129)	C M R	<i>Doradospyris aieuchus</i>
	153-5-4(141-143)	C M R	<i>Doradospyris circulus</i>
	153-5(CC)	C M	<i>Doradospyris forcipata</i>
	153-6-1(45-49)	F G R	<i>Doradospyris papilio</i>
	153-6-2(52-56)	A M	<i>Doradospyris pseudopapilio</i>
Theocyrtis tuberosa	153-6(CC)	C M R	<i>Doradospyris spinosa</i>
	153-7-1(131-135)	A M	<i>Trityllospyris tricerros</i>
	153-7(CC)	A G	<i>Artiphormis barbadensis</i>
			<i>Artiphormis gracilis</i>
			<i>Calocyctlas hispida</i>
			<i>Calocyctlas turturis</i>
			<i>Cyclamptierium (?) leptetrum</i>
			<i>Cyclamptierium (?) milowi</i>
			<i>Cyrtocapsella cornuta</i>
			<i>Cyrtocapsella tetrapera</i>
			<i>Eusyringium fistuligerum</i>
			<i>Lychnocanoma elongata</i>
			<i>Lychnocanoma amphitrite</i>
			<i>Stictocyrys delmontensis</i>
			<i>Theocyrtis spongocoicum</i>
			<i>Thysocyrtis bromia</i>
			<i>Thysocyrtis tetricantha</i>
			<i>Carpocanistrum aazyx</i>
			<i>Carpocanopsis bramlettei</i>
			<i>Carpocanopsis cingulata</i>
			<i>Carpocanopsis favosa</i>
			<i>Calocyctella virginitis</i>
			<i>Theocyrtis annosa</i>
			<i>Theocyrtis tuberosa</i>
			<i>Theo campe armadillo group</i>
			<i>Theo campe mogolfieri</i>
			<i>Theo campe pirum</i>
			<i>Centrobotrys gravida</i>
			<i>Centrobotrys petrushnevskiae</i>
			<i>Centrobotrys thermophila</i>
			+
			R
			+
			R
			+

^aThese assemblages contain specimens with shovel-shaped feet, as illustrated by Riedel and Sanfilippo (1970, pl. 14, fig. 11; 1971, pl. 8, fig. 12), and described as the new species *Calocyctella serrata* by Moore (1972).

This list of events differs slightly from those that we have presented previously, in that for some taxa both morphotypic and evolutionary limits are given (instead of only one of these). A "top" and a "bottom" is indicated for each included taxon, except for the following (listed in alphabetical order of species or subspecies) in which the evidence was insufficient.

"Tops" are not listed for -

Lynchocanoma sp. aff. *L. bellum*
Stylosphaera coronata coronata
Lithelius hexaxyphophorus
Stylosphaera coronata laevis
Centrobotrys petrushevskayae
Thecosphaerella ptomatus
Thecosphaerella rotunda
Diploplegma somphum
Carposphaera subbotinae

“Bottoms” are not listed for —

Lychnocanoma bellum
Spongodiscus quartus bosoculus
Theocotyle cryptocephala nigriniae

Figure 2 is a range-chart, in which most but not all of the taxa in Table 9 are included. The vertical scale here does not correspond with depths in any sediment column, but is such that a constant width is assigned to each of the planktonic foraminiferal zones shown in the biostratigraphic summary chapter. In Figure 2, the limits of ranges are plotted according to their observed positions in a sequence of selected Leg 15 cores—Cores 151-4 and 151-5, 149-23 to 149-30, 153-7, 149-31 to 149-43 and 152-1 to 152-9. Arrows indicate that ranges extend for an unknown distance beyond the plotted lines. The ranges plotted are for morphotypes, and evolutionary limits are not shown.

TABLE 8
Radiolarians from Site 153 (Lower Portion)

^aSpecimens of *Buryella tetrada* in this assemblage commonly have the fourth (downwardly tapering) segment divided rather than simple, as in Plate 5, Figure 5.

Some ranges do not correspond completely with the order given in Table 9, since information from other legs as well was taken into account in ordering that list of events.

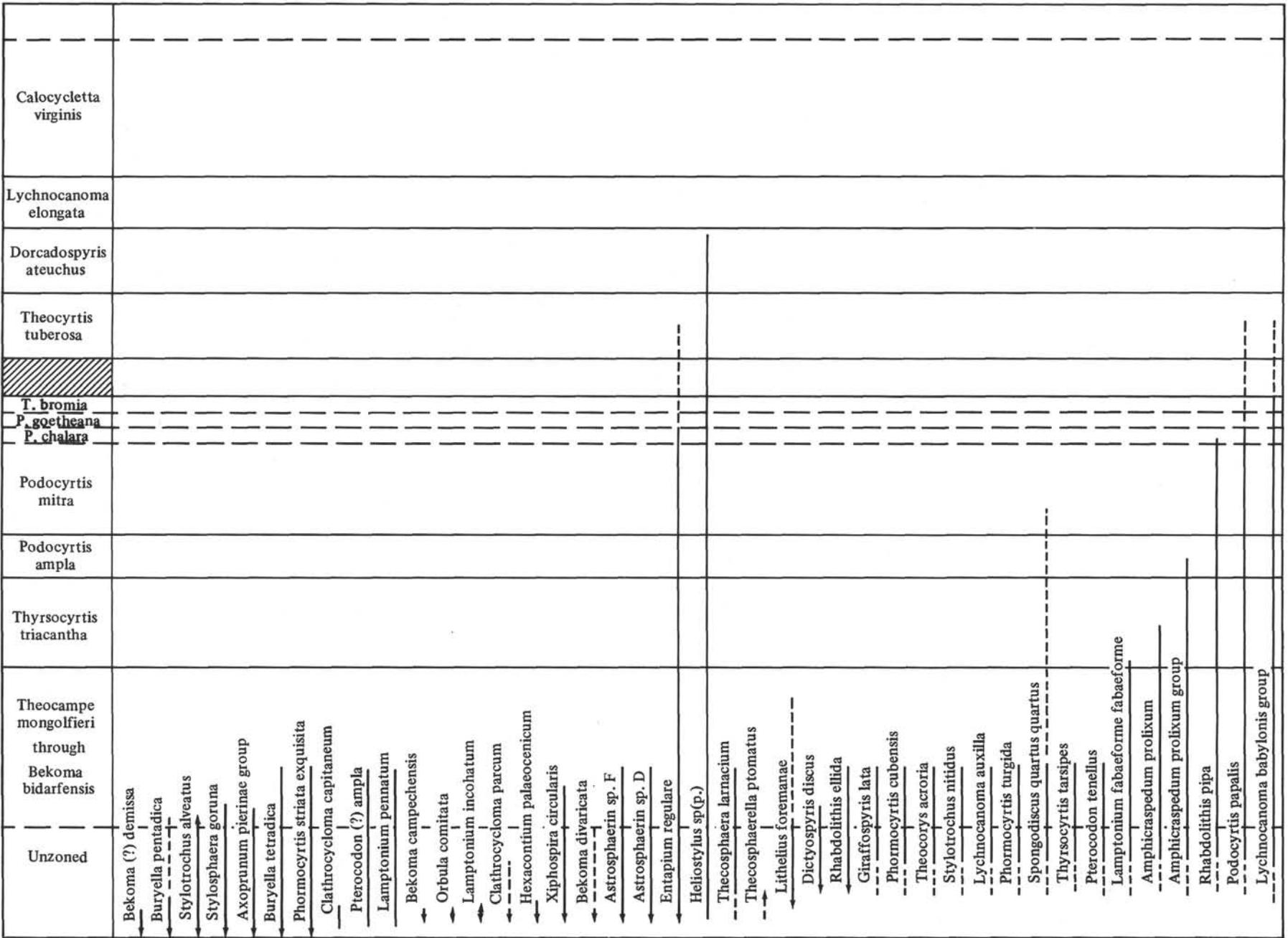


Figure 2. Range-chart of Leg 15 radiolarians.

Calocycletta virginis	
Lynchocanoma elongata	
Dorcadospyris ateuchus	
Theocyrtis tuberosa	
<i>T. bromia</i> <i>P. goetheana</i> <i>P. chalara</i>	
Podocyrtis mitra	
Podocyrtis ampla	
Thrysocyrtis triacantha	
Theocampe mongolfieri through Bekoma bidarfensis	<p>Lithomitra docilis</p> <p>Spongomelissa adunca</p> <p>Astrophaerin sp. E</p> <p>Amphicraspedum murrayanum</p> <p>Astrophaerin sp. C</p> <p>Spongodiscus quartus bosculus</p> <p>Stylosphaera coronata sabaca</p> <p>Phormocyrtis striata striata</p> <p>Theocorys (?) physella</p> <p>Theocotyle auctor</p> <p>Thrysocyrtis hirsuta robusta</p> <p>Lamptonium fabaeforme chaunothorax</p> <p>Theocotyle venezuelensis</p> <p>Spongodiscus phrix</p> <p>Theocotyle cryptocephala cryptocephala</p> <p>Lithochytris archaea</p> <p>Podocyrtis sinuosa</p> <p>Ceratospyris articulata</p> <p>Spongatractus balbis</p> <p>Amphymenium splendiarium</p> <p>Lophocyrtis biaurita</p> <p>Theocotyle ficus</p> <p>Spongatractus pachystylus</p> <p>Rhopalocanium ornatum</p> <p>Lithocyctlia ocellus group</p> <p>Calocyclas hispida</p> <p>Theocampe amphora group</p> <p>Theocampe urceolus</p> <p>Thrysocyrtis rhizodon</p> <p>Periphæna decora</p> <p>Theocampe mongolfieri</p> <p>Periphæna tripyramis tripyramis</p> <p>Theocotyle cryptocephala nigriæ</p> <p>Lamponium fabaeforme constrictum</p> <p>Thrysocyrtis hirsuta tensa</p> <p>Theocorys anacasta</p> <p>Podocyrtis platypus</p> <p>Podocyrtis diamesa</p> <p>Lithapium plegmacantha</p> <p>Periphæna tripyramis triangula</p> <p>Lithochytris vespertilio</p>
Unzoned	

Figure 2. (continued)

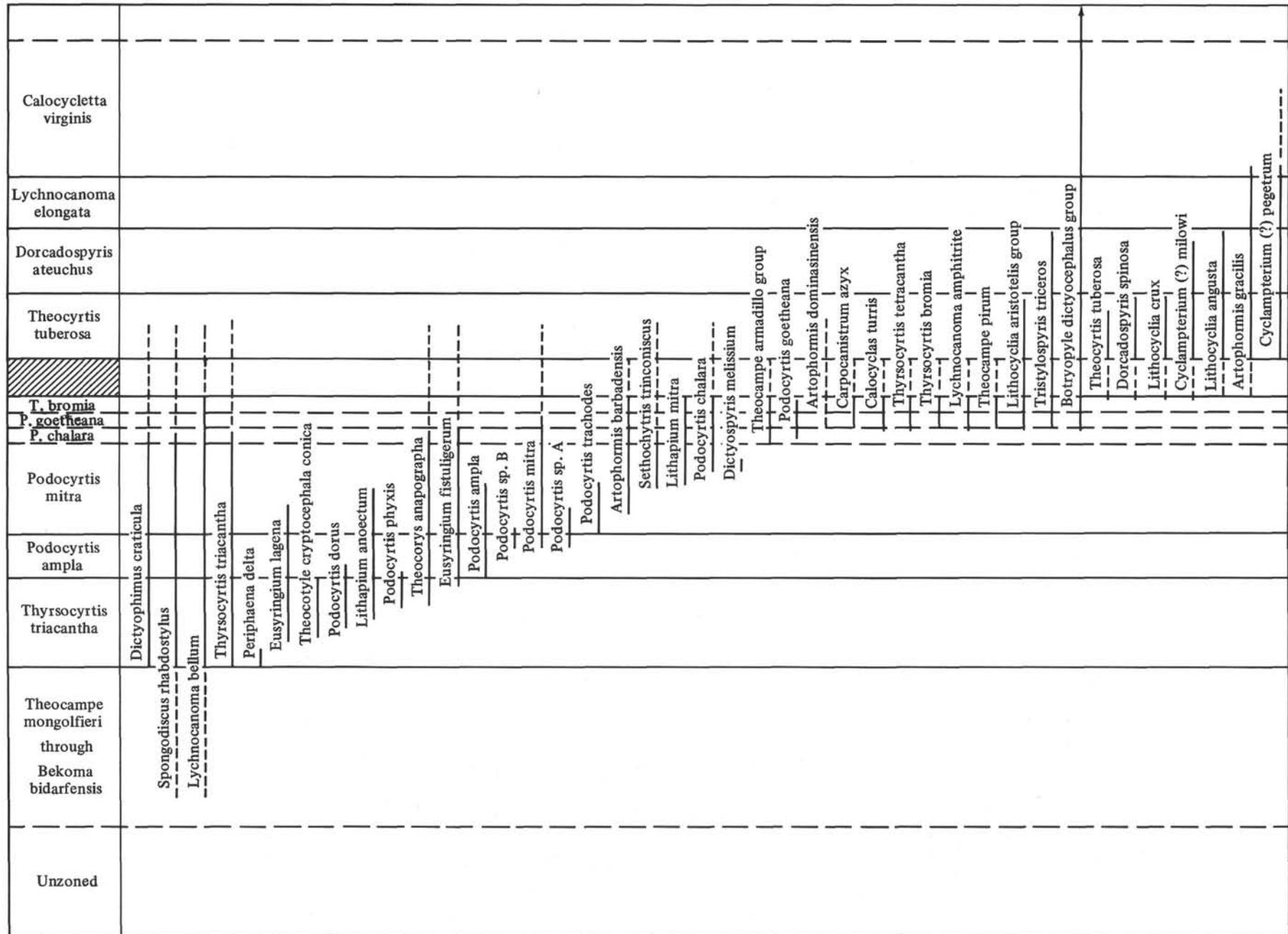


Figure 2. (continued)

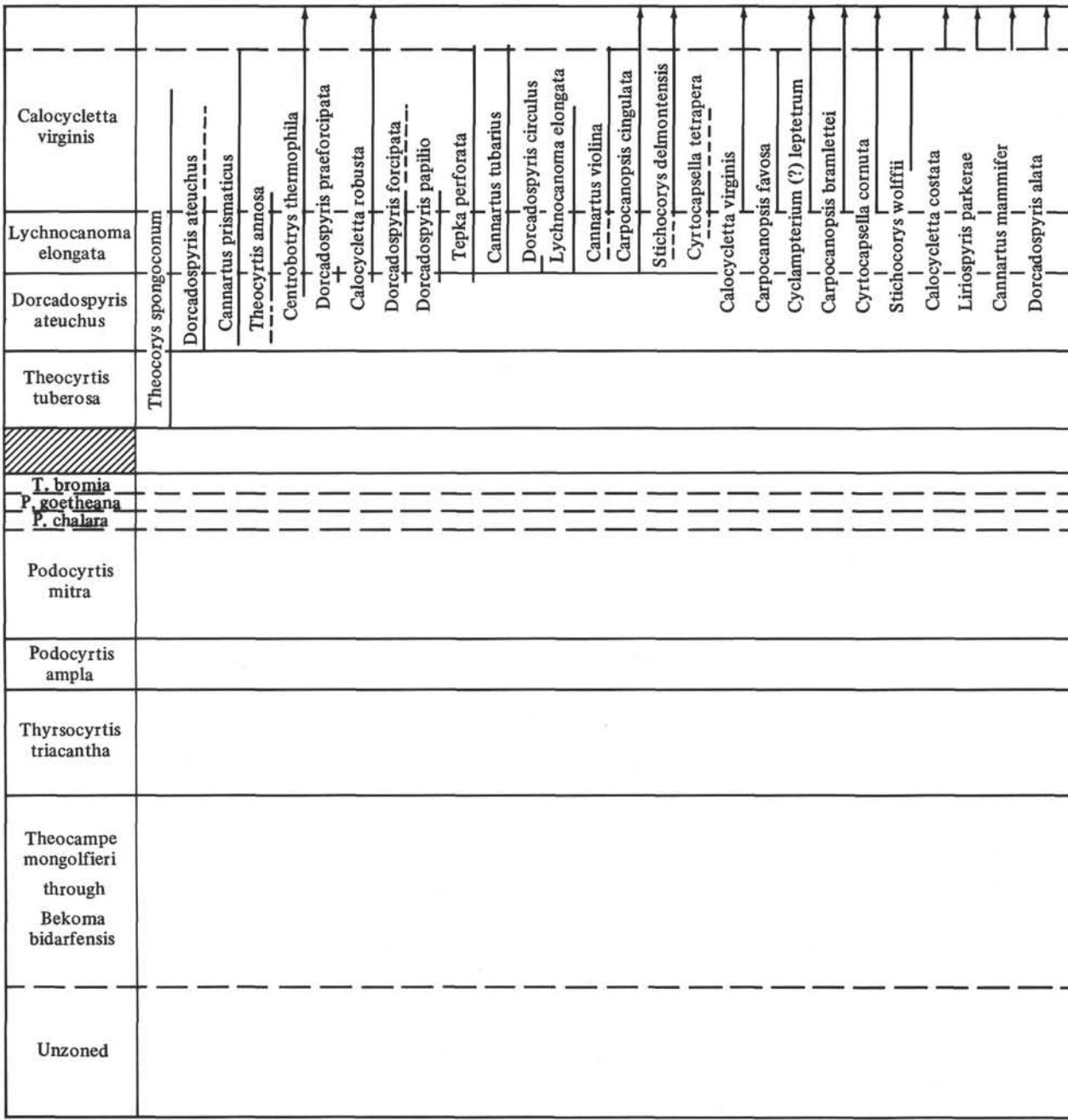


Figure 2. (continued)

TABLE 9
 Radiolarian Events at Sites 146, 149, 151, 152, and 153
 (For Explanation, See Text)

Events		146	149	151	152	153	Radiolarian Zones
Tm	<i>Stichocorys delmontensis</i>			Above 4-1 G (Above 238)			
Te	<i>Dorcadospyris alata</i>			Above 4-1 M (Above 238)			
Tm	<i>Cyrtocapsella cornuta</i>			Above 4-1 G (Above 238)			
Tm	<i>Carpocanopsis bramlettei</i>			Above 4-1 M (Above 238)			
Tm	<i>Cyclampterium (?) leptetrum</i>			Above 4-1 M (Above 238)		Above 5-4 P (Above 408)	
Tm	<i>Calocycletta virginis</i>			Above 4-1 G (Above 238)		?	
Tm	<i>Calocycletta costata</i>			Above 4-1 G (Above 238)			
Tm	<i>Calocycletta robusta</i>		Above 23-3 G (Above 199)	Above 4-1 M (Above 238)			
Tm	<i>Carpocanopsis cingulata</i>		24 (CC) 25-1 M (205-214)	Above 4-1 M (Above 238)		Above 5-4 G (Above 408)	
Tm	<i>Liriospyris parkerae</i>			Above 4-1 G (Above 238)			
Tm	<i>Tepka perforata</i>	Above 2-1 P (Above 255)	Above 23-3 G (Above 199)	Within 4-1 M (238)		Above 5-4 M (Above 408)	
Tm	<i>Cannartus violina</i>			Within 4-1 M (238)			
Tm	<i>Cannartus tubarius</i>	Above 2-3 P (Above 258)	Above 24-1 P (Above 204)	Within 4-1 M (238)			
<i>Cannartus tubarius</i> → <i>C. violina</i>			Above 24-1 P (Above 204)	Within 4-1 ? (238)			
Tm	<i>Stichocorys wolffii</i>			Within 4-1 G (238)			
Bm	<i>Dorcadospyris alata</i>			Within 4-1 M (238)			
Bm	<i>Liriospyris parkerae</i>			Within 4-1 G (238)			
Tm	<i>Carponcanopsis favosa</i>			Within 4-1 M (238)		Above 5-4 M (Above 408)	
Tm	<i>Cannartus prismaticus</i>	Above 2-1 M (Above 255)	Above 23 (CC) G (Above 203)	Within 4-1 M (238)		Above 5-4 M (Above 408)	

Dorcadospyris alata

Calocycletta costata

TABLE 9 - *Continued*

Events	146	149	151	152	153	Radiolarian Zones
Bm-e <i>Calocycletta costata</i>			Within 4-1 G (238)			
Tm <i>Theocorys spongoconum</i>	Above 2-1 P (Above 255)	Above 23-5 M (Above 202)	4-1 4-2 P (238-239)		Above 5-4 M (Above 408)	
Tm <i>Cyrtocapsella tetrapera</i>		Above 23-5 P (Above 202)	4-2 4 (CC) G (239-240)		Above 5-4 M (Above 408)	
Tm <i>Lychnocanoma elongata</i>	Above 2-1 G (Above 255)	Above 23-5 M (Above 202)	4 (CC) 5-1 G (240-303)		Above 5-4 M (Above 408)	
Bm-e <i>Stichocorys wolffii</i>			4 (CC) 5-2 G (240-304)			
Tm <i>Dorcadospyris ateuchus</i>	Above 2-1 M (Above 255)	Above 23 (CC) G (Above 203)	Within 5-2 G (304)		Above 5-4 M (Above 408)	
Tm <i>Dorcadospyris papilio</i>	Above 2-1 M (Above 255)	25-1 25-2 P (214-215)	Within 5-2 M (304)			
Tm <i>Cyclampterium (?) pegetrum</i>	Above 2-1 P (Above 255)	Above 23 (CC) M (Above 203)	Within 5-2 M (304)		Above 5-4 M (Above 408)	<i>Calocycletta virginis</i>
Cyclampterium (?) pegetrum → C. (?) leptetrum		Above 23 (CC) M (Above 203)	Within 5-2 G (304)			
Bm <i>Cyclampterium (?) leptetrum</i>			Within 5-2 G (304)		?	
Tm <i>Theocyrtis annosa</i>	Above 2-1 M (Above 255)	Above 23-5 G (Above 202)	Within 5-2 G (304)		5 (CC) 6-1 M (410-413)	
Tm <i>Buryella clinata</i>	Above 4 (CC) M (Above 413)					
Bm <i>Carpocanopsis bramlettei</i>			Within 5-2 M (304)			
Bm <i>Cyrtocapsella cornuta</i>			Within 5-2 G (304)			
Bm <i>Carpocanopsis favosa</i>			Within 5-2 M (304)		6-2 6 (CC) P (414-415)	
Bm <i>Cyrtocapsella tetrapera</i>		23-5 23 (CC) P (202-203)	Within 5-2 G (304)		6 (CC) 7-1 M (415-500)	
Bm <i>Calocycletta virginis</i>			Within 5-2 G (304)		6-1 7-1 G (413-500)	
Tm <i>Artophormis gracilis</i>	Above 2-3 P (Above 258)	Within 25-2 G (215)	Within 5-2 M (304)		6 (CC) 7-1 M (415-500)	
Bm <i>Stichocorys delmontensis</i>			5-2 6-1 G (304-312)		0	
Tm <i>Dorcadospyris circulus</i>		25 (CC) 26-1 M (218-224)				<i>Lychnocanoma elongata</i>

TABLE 9 – *Continued*

Events		146	149	151	152	153	Radiolarian Zones
Tm	Dorcadospyris forcipata	Above 2-2 P (Above 256)	25 (CC) 26-2 M (218-225)	Within 4-1 G (238)			<i>Lychnocanoma elongata</i>
Bm	Cannartus violina			5-2 6-1 M (304-312)			
Tm	Dorcadospyris praeforcipata	2-3 2-4 M (258-259)	Within 26-2 P (225)	5-2 6-1 P (304-312)			
Bm	Dorcadospyris circulus		26-3 26 (CC) M (226-227)				
Bm	Lychnocanoma elongata	Within 2-4 M (259)	26-3 26 (CC) M (226-227)	5-2 6-1 G (304-312)		6 (CC) 7-1 M (415-500)	
Bm	Carpocanopsis cingulata		26 (CC) 27-2 M (227-234)	5-2 6-1 M (304-312)		Below 6 (CC) M (Below 415)	
Bm	Tepka perforata	Within 2-4 P (259)	26 (CC) 27-2 M (227-234)	5-2 6-1 P (304-312)		Below 6 (CC) P (Below 415)	
Tm	Lithocyclus angusta	2-5 2-6 M (261-262)	26 (CC) 27-2 M (227-234)	6-2 6-3 M (313-314)		6 (CC) 7-1 M (415-500)	
Lithocyclus angusta → Cannartus prismaticus		2-6 2 (CC) M (262-263)	26 (CC) 27-2 G (227-234)	6-3 8 (CC) M (314-330)		6 (CC) 7-1 M (415-500)	
Bm	Dorcadospyris forcipata	Below 2 (CC) M (Below 263)	27-2 27-3 M (234-236)	7-1 7-2 M (321-322)			
Bm	Cannartus tubarius	Below 2-4 P (Below 259)	26 (CC) 27-2 P (227-234)	Below 8 (CC) P (Below 330)			<i>Dorcadospyris ateuchus</i>
Bm	Dorcadospyris papilio	2-6 2 (CC) P (262-263)	27-3 27 (CC) P (236-237)	Below 8-1 M (Below 329)			
Tm	Tristylospyris triceros	Below 2 (CC) (Below 263)	27-3 27 (CC) P (236-237)			6 (CC) 7-1 M (415-500)	
Bm	Calocycletta robusta		27-3 27 (CC) G (236-237)	Below 8 (CC) M (Below 330)			
Bm	Dorcadospyris praeforcipata	Below 2 (CC) M (Below 263)	27 (CC) 28-1 P (237-242)	7-1 7-2 P (321-322)			
Tm	Heliostylus sp (p)	Above 7-1 P (Above 441)	27 (CC) 28-1 P (237-242)		Above 1-2 G (Above 155)		
Tm	Cyclampterium (?) milowi		28-2 28-3 M (243-244)	8-1 8 (CC) P (329-330)		6 (CC) 7-1 M (415-500)	
Bm	Centrobotrys thermophila		28-4 28 (CC) P (245-246)				
Tristylospyris triceros → Dorcadospyris ateuchus			28-4 29-2 G (245-253)			6 (CC) 7-1 M (415-500)	
Bm	Theocyrtis annosa	Below 2 (CC) P (Below 263)	28 (CC) 29-1 M (246-252)	Below 8 (CC) G (Below 330)		6 (CC) 7-1 M (415-500)	<i>Theocyrtis tuberosa</i>

TABLE 9 - *Continued*

Events		146	149	151	152	153	Radiolarian Zones
Bm	<i>Cannartus prismaticus</i>	Below 2 (CC) M (Below 263)	Within 29-1 (252) P	Below 8 (CC) M (Below 330)			Below 6 (CC) M (Below 415)
Tm	<i>Lithomitra docilis</i>		Within 29-2 (253) M		Above 3-5 M (Above 177)		
Bm	<i>Dorcadospyris ateuchus</i>	Below 2 (CC) M (Below 263)	29-2 29-3 M (253-254)	Below 8 (CC) M (Below 330)			6 (CC) 7-1 M (415-500)
<i>Cyclampterium (?) milowi</i> → <i>C. (?) pegetrum</i>			28-3 30-1 M (244-260)	Below 8 (CC) M (Below 330)			6 (CC) 7-1 M (415-500)
Tm	<i>Dorcadospyris spinosa</i>		29 (CC) 30-1 M (255-260)				Above 7-1 P (Above 500)
Tm	<i>Lithocyclia crux</i>		29 (CC) 30-1 M (255-260)				6 (CC) 7-1 P (415-500)
Bm	<i>Theocorys spongoconum</i>	Below 2 (CC) M (Below 263)	29 (CC) 30-1 P (255-260)	Below 8 (CC) M (Below 330)			Below 7 (CC) M (Below 501)
Tm	<i>Lithocyclia aristotelis group</i>		Within 30-1 M (260)				
Tm	<i>Theocyrtis tuberosa</i>		Within 30-2 M (261)				6 (CC) 7-1 M (415-500)
Bm	<i>Cyclampterium (?) pegetrum</i>	Below 2 (CC) P (Below 263)	30-1 30 (CC) P (260-262)	Below 8 (CC) M (Below 330)			Below 7 (CC) P (Below 501)
Bm	<i>Centrobotrys petrushevskayae</i>		30-2 30 (CC) G (261-262)	?			
Bm	<i>Lithocyclia crux</i>		30 (CC) 31-1 M (262-271)				Below 7 (CC) P (Below 501)
<i>Lithocyclia aristotelis group</i> → <i>L. angusta</i>			30-1 31-1 G (260-271)				
Tm	<i>Artophormis barbadensis</i>		30 (CC) 31-1 P (262-271)				Below 7 (CC) M (Below 501)
<i>Artophormis barbadensis</i> → <i>A. gracilis</i>			30 (CC) 31-1 G (262-271)				
Bm	<i>Dorcadospyris spinosa</i>		30 (CC) 31-1 M (262-271)				Below 7 (CC) P (Below 501)
Tm	<i>Theocampe amphora group</i>		30 (CC) 32-2 P (262-281)				
Tm	<i>Theocampe pirum</i>		30 (CC) 31-1 M (262-271)				Below 7 (CC) M (Below 501)
Tm	<i>Lychnocanoma babylonis group</i>	Above 7-1 M (Above 441)	30 (CC) 31-1 P (262-271)		Above 2-5 G (Above 167)		
Tm	<i>Theocampe mongolfieri</i>		30 (CC) 31-1 G (262-271)				6 (CC) 7-1 G (415-500)

*Theocyrtis tuberosa**Thysocyrtis bromia*

TABLE 9 - *Continued*

Events		146	149	151	152	153	Radiolarian Zones
Tm	Lophocyrtis jacchia		30 (CC) 31-1 M (262-271)				
Tm	Lychnocanoma amphitrite		30 (CC) 31-1 M (262-271)			Below 7 (CC) M (Below 501)	
Tm	Theocampe armadillo group		30 (CC) 31-1 M (262-271)			Below 7 (CC) M (Below 501)	
Tm	Peripheraena decora		30 (CC) 31-1 M (262-271)			5 (CC) 6-1 P (410-413)	
Bm	Artophormis gracilis	Below 2 (CC) M (Below 263)	30 (CC) 31-1 G (262-271)	Below 8 (CC) M (Below 330)		Below 7 (CC) M (Below 501)	
Bm	Cyclampterium (?) milowi		30 (CC) 31-1 M (262-271)	Below 8 (CC) P (Below 330)		Below 7 (CC) M (Below 501)	
Tm	Theocampe urceolus		30 (CC) 32-2 P (262-281)				
Bm	Theocyrtis tuberosa		30 (CC) 31-1 G (262-271)			Below 7 (CC) M (Below 501)	
Bm	Lithocyctia angusta	Below 2 (CC) G (Below 263)	30 (CC) 31-1 M (262-271)	Below 8 (CC) M (Below 330)		Below 7 (CC) M (Below 501)	
Tm	Thrysocyrtis bromia		30 (CC) 31-1 G (262-271)			Below 7 (CC) M (Below 501)	<i>Thrysocyrtis bromia</i>
Tm	Thrysocyrtis tetracantha		30 (CC) 31-1 M (262-271)			Below 7 (CC) M (Below 501)	
Tm	Calocyclas turris		30 (CC) 31-1 G (262-271)			Below 7 (CC) P (Below 501)	
Tm	Thrysocyrtis rhizodon		30 (CC) 31-1 M (262-271)				
Tm	Thrysocyrtis triacantha		30-2 32-2 P (261-281)				
Tm	Lychnocanoma bellum		30 (CC) 31-1 P (262-271)				
Tm	Podocyrtis chalara		30 (CC) 31 (CC) P (262-273)				
Tm	Eusyringium fistuligerum		30 (CC) 32-2 P (262-281)				
Tm	Calocyclas hispida		30 (CC) 32-2 P (262-281)				
Bm	Lophocyrtis jacchia		31 (CC) 21-1 P (273-280)				
Tm	Podocyrtis papalis	Above 4 (CC) P (Above 413)	30 (CC) 32-3 P (262-282)		Above 1-1 G (Above 154)		

TABLE 9 – *Continued*

Events		146	149	151	152	153	Radiolarian Zones
Tm	Lithocyclia ocellus group		30 (CC) 32-3 P (262-282)				
Tm	Sethochytris triconicus		30 (CC) 32-4 P (262-283)				
Tm	Carpocanistrum azyx		30 (CC) 31-1 M (262-271)			Below 7 (CC) M (Below 501)	
Tm	Spongodiscus rhabdostylus		30 (CC) 32-4 P (262-283)				
Tm	Entapium regulare	Above 7-1 P (Above 441)	30 (CC) 32-2 P (262-281)		Above 1-2 G (Above 155)		
Tm	Dictyophimus craticula		30 (CC) 32-4 P (262-283)				
Tm	Rhopalocanium ornatum		30 (CC) 32-4 P (262-283)				
Tm	Spongatractus pachystylus		30 (CC) 32-2 M (262-281)				
Tm	Theocorys anapographa		30 (CC) 32-4 P (262-283)				
Te	Lithapium mitra		31-1 31-2 M (271-272)				<i>Thrysocyrtis bromia</i>
Te	Podocyrtis goetheana		Within 31-2 P (272)				
Tm	Artophormis dominasinensis		30 (CC) 32-2 P (262-281)				
Tm	Podocyrtis mitra		30 (CC) 32-2 P (262-281)				
Bm	Botryopyle dictyocephalus group		32-3 32-4 M (282-283)	?			
Bm	Thrysocyrtis tetricantha		Within 32-4 M (283)				
Bm	Theocampe pirum		Within 32-4 M (283)				
Bm	Lychnocanoma amphitrite		Within 32-4 M (283)				
Bm	Lithocyclia aristotelis group		Within 32-4 P (283)				
Bm	Carpocanistrum azyx		Within 32-4 G (283)				
Bm	Thrysocyrtis bromia		Within 32-4 M (283)				

TABLE 9 – *Continued*

Events		146	149	151	152	153	Radiolarian Zones
Bm	Tristylospyris triceros		Within 32-4 (283)	M			Below 7 (CC) M (Below 501)
Bm	Calocyclus turris		Within 32-4 (283)	M			
Bm	Artophormis dominicanensis		Within 32-4 (283)	P			<i>Podocyrtis goetheana</i>
Tm	Theocotyle ficus	Above 4 (CC) (Above 413)	30 (CC) 32-4 (262-283)	P			
Tm	Lithochytris vespertilio		32 (CC) 33-1 (284-289)	P			
Bm	Podocyrtis goetheana		32 (CC) 33-1 (284-289)	M			
Tm	Rhabdolithis pipa		32 (CC) 33-1 (284-289)	M		Above 1-1 (Above 154)	<i>Podocyrtis chalara</i>
Podocyrtis mitra → P. chalara			32 (CC) 33-1 (284-289)	M			
Tm	Lophocyrtis biaurita		Within 33-1 (289)	M			
Bm	Theocampe armadillo group		33-1 33-2 (289-290)	M			
Tm	Dictyospyris melissium		34-1 34-2 (299-300)	P			
Bm	Dictyospyris melissium		Within 34-2 (300)	P			
Bm	Podocyrtis chalara		Within 34-3 (301)	P			
Te	Podocyrtis ampla		34 (CC) 35-1 (302-308)	G			<i>Podocyrtis mitra</i>
Tm	Podocyrtis trachodes		34 (CC) 35-1 (302-308)	G			
Tm	Amphymenium splendiaratum		34 (CC) 35-1 (302-308)	M			
Tm	Lithapium anoectum		Within 35-1 (308)	M			
Lithapium anoectum → L. mitra			35-1 35-2 (308-309)	M			
Bm	Lithapium mitra		35-1 35-2 (308-309)	M			
Bm	Sethochytris triconiscus		35-1 35-2 (308-309)	G			

TABLE 9 - *Continued*

Events		146	149	151	152	153	Radiolarian Zones
Tm	Spongotractus balbis		35-2 35-3 P (309-311)				
Tm	Spongodiscus quartus bosoculus	Above 6-1 P (Above 432)	Within 35-5 M (314)			Above 9 (CC) P (Above 588)	
Tm	Spongodiscus quartus quartus	Above 7-1 P (Above 441)			Above 1-1 M (Above 154)		
Tm	Ceratospyris articulata		35-5 35-6 M (314-315)				
Tm	Eusyringium lagena		35-6 35 (CC) M (315-316)				
Tm	Podocyrtis sp. A		35 (CC) 36-1 M (316-317)				<i>Podocyrtis mitra</i>
Bm	Artophormis barbadensis		Within 36-1 M (317)				
Tm	Peripheraena tripyramis triangula		36-1 36 (CC) P (317)				
Tm	Lithochytris archaea		36 (CC) 37-1 M (317-326)				
Bm	Podocyrtis trachodes		36 (CC) 37-1 M (317-326)				
Tm	Podocyrtis sinuosa		35 (CC) 36 (CC) M (316-317)				
Podocyrtis sinuosa → P. mitra			36 (CC) 37-2 G (317-327)				
Tm	Spongodiscus americanus	Above 7-1 M (Above 441)			Above 1-2 M (Above 155)	Above 10 (CC) P (Above 593)	
Tm	Lithapium plegmacantha		36 (CC) 37-1 G (317-326)				
Tm	Podocyrtis sp. B		36 (CC) 37-1 G (317-326)				
Tm	Phormocyrtis striata striata	Above 4 (CC) P (Above 413)	36 (CC) 37-2 P (317-327)				<i>Podocyrtis ampla</i>
Eusyringium lagena → E. fistuligerum			37-1 37-4 G (326-329)				
Bm	Podocyrtis sp. A.		Within 37-4 M (329)				
Bm	Podocyrtis mitra		37-4 37 (CC) G (329-330)				
Bm	Podocyrtis sp. B		37-4 37 (CC) M (329-330)				

TABLE 9 - *Continued*

Events		146	149	151	152	153	Radiolarian Zones
Tm	Amphicraspedum prolixum group	Above 6-1 P (Above 432)	37 (CC) 38-3 M (330-336)		Above 1-2 G (Above 155)		<i>Podocyrtis ampla</i>
Tm	Podocyrtis dorus		38-3 38 (CC) M (336-337)				
Tm	Podocyrtis diamesa		38-3 38 (CC) M (336-337)				
Tm	Theocotyle crypto. cryptocephala		38 (CC) 39-1 M (337-344)				
Tm	Spongodiscus phrix		38 (CC) 39-1 M (337-344)				
Tm	Podocyrtis phyxis		38 (CC) 39-1 M (337-344)				
Podocyrtis phyxis → P. ampla			38 (CC) 39-1 M (337-344)				
Bm	Podocyrtis ampla		38 (CC) 39-1 M (337-344)				
Tm	Theocotyle venezuelensis		38 (CC) 39-1 G (337-344)				
Tm	Theocotyle cryptocephala conica		38 (CC) 39-1 M (337-344)				
Bm	Eusyringium fistuligerum		39-1 39 (CC) M (344-345)				<i>Thrysocyrtis triacantha</i>
Podocyrtis diamesa → P. phyxis			39-1 40-1 M (344-353)				
Lithochytris archaea → L. vespertilio			37-1 42 (CC) M (326-376)				
Bm	Theocorys anapographa		Within 40-1 M (353)				
Bm	Podocyrtis phyxis		40-1 40-2 G (353-354)				
Bm	Lithapium anoectum		40 (CC) 41-1 M (355-363)				
Tm	Amphicraspedum prolixum	Above 6 (CC) P (Above 433)	40 (CC) 41-1 M (355-363)		Above 1-2 G (Above 155)		
Bm-e	Podocyrtis dorus		41-1 41-2 M (363-364)				
Tm	Theocorys anaclasta		41-5 41-6 M (367-368)				
Tm	Thrysocyrtis hirsuta tensa		Within 41-6 M (368)				

TABLE 9 - *Continued*

Events		146	149	151	152	153	Radiolarian Zones
Bm	Theocotyle cryptocephala conica		41-6 41 (CC) P (368-370)				<i>Thrysocyrtis triacantha</i>
Tm	Lamptonium fabae. constrictum		41-6 41 (CC) M (368-370)				
Tm	Lamptonium fabae. chaunothorax		41-6 41 (CC) G (368-370)				
Tm	Thrysocyrtis hirsuta robusta		41 (CC) 42-2 M (370-373)				
Bm	Eusyringium lagena		41 (CC) 42-2 M (370-373)				
Thrysocyrtis hirsuta tensa → T. triacantha			41 (CC) 42 (CC) G (370-376)				
Tm	Podocyrtis platypus		Within 42-2 M (373)				
Tm	Theocotyle crypto. nigriniae		42-2 42-3 P (373-374)				
Tm	Lamptonium fabae. fabaeforme	Above 7-1 P (Above 441)	42-3 42-4 P (374-375)		Above 1-2 G (Above 155)		
Tm	Periphaena tripyramis tripyramis		42-3 42-4 P (374-375)				
Tm	Periphaena delta		42-4 42 (CC) P (375-376)				<i>Theocampe mongolfieri</i>
Bm	Periphaena delta		42 (CC) 43-1 P (376-382)				
Bm	Periphaena tripyramis triangula		Below 42 (CC) M (Below 376)				
Bm	Spongodiscus rhabdostylus		Below 42 (CC) M (Below 376)				
Bm	Thrysocyrtis triacantha		42 (CC) 43-1 M (376-382)				
Bm-e	Thrysocyrtis hirsuta tensa		Below 42 (CC) G (Below 376)				
Bm-e	Podocyrtis diamesa		Below 43-1 M (Below 382)				
Bm	Periphaena tripyramis tripyramis		Below 42 (CC) M (Below 376)				
Bm	Lithapium plegmacantha		Below 42 (CC) M (Below 376)				
Bm	Stylosphaera coronata laevis		Below 42 (CC) M (Below 376)				

TABLE 9 – *Continued*

Events	146	149	151	152	153	Radiolarian Zones
Bm-e <i>Podocyrtis platypus</i>		42 (CC) 43-1 M (376-382)				<i>Theocampe mongolfieri</i>
Bm <i>Lamptonium fabae. constrictum</i>		42 (CC) 43-1 P (376-382)				
Bm <i>Theocorys anaclasta</i>		42 (CC) 43-1 P (376-382)				
Bm <i>Dictyophimus craticula</i>		42 (CC) 43-1 M (376-382)				
Bm <i>Lithochytris vespertilio</i>		42 (CC) 43-1 M (376-382)				
Bm <i>Theocampe mongolfieri</i>		Below 43-1 G (Below 382)			Below 7 (CC) G (Below 501)	
Bm <i>Podocyrtis sinuosa</i>		Below 43-1 G (Below 382)				
Bm <i>Thrysocyrtis hirsuta robusta</i>		Below 43-1 M (Below 382)				<i>Theocotyle cryptocephala cryptocephala</i>
Bm <i>Theocotyle crypto. cryptocephala</i>		Below 43-1 M (Below 382)				
Bm <i>Rhopalocanium ornatum</i>		Below 43-1 G (Below 382)				
Bm <i>Spongodiscus phrix</i>		Below 43-1 M (Below 382)				
Bm <i>Thrysocyrtis rhizodon</i>		Below 43-1 M (Below 382)				<i>Phormocyrtis striata striata</i>
Bm <i>Amphymenium splendiarmatum</i>		Below 43-1 P (Below 382)				
Bm <i>Phormocyrtis striata striata</i>	Within 7-1 M (441)	Below 43-1 M (Below 382)				
Bm <i>Theocampe amphora group</i>		Below 43-1 M (Below 382)				
Tm <i>Dorcadospyris confluens</i>				Above 1-2 M (Above 155)		<i>Buryella clinata</i>
Tm <i>Rhabdolithis ellida</i>				Above 1-2 M (Above 155)		
Bm <i>Lithocydia ocellus group</i>		Below 43-1 G (Below 382)				
Bm <i>Spongatractus pachystylus</i>		Below 43-1 M (Below 382)				
Bm <i>Lithelius hexaxyphophorus</i>		Below 43-1 M (Below 382)				

TABLE 9 - *Continued*

Events		146	149	151	152	153	Radiolarian Zones
Tm	Theocotyle auctor				Above 1-2 M (Above 155)		
Bm	Ceratospyris articulata		Below 43-1 M (Below 382)				
Bm	Spongatractus balbis		Below 43-1 M (Below 382)				
Bm	Peripheraena decora		Below 43-1 M (Below 382)			Below 7 (CC) M (Below 501)	
Bm	Theocotyle ficus	Below 4 (CC) P (Below 413)	Below 43-1 M (Below 382)				
Bm	Calocyclus hispida		Below 43-1 M (Below 382)				
Tm	Theocorys (?) phyzella	Above 7-1 P (Above 441)			Above 1-2 M (Above 155)		
Tm	Pterocodon tenellus	?			Above 1-1 M (Above 154)		<i>Buryella clinata</i>
Bm	Lithochytris archaea		Below 43-1 M (Below 382)				
Bm	Lophocyrtis biaurita		Below 43-1 M (Below 382)				
Bm	Theocampe urceolus		Below 43-1 M (Below 382)				
Tm	Astrosphaerin sp. C				Above 1-2 P (Above 155)		
Bm	Lamptonium fabae. chaunothorax		Below 43-1 M (Below 382)				
Bm	Theocotyle venezuelensis		Below 43-1 M (Below 382)				
Tm	Phormocyrtis striata exquisita	4 (CC) 6-1 M (413-432)			Above 1-1 G (Above 154)	Above 9 (CC) M (Above 588)	
Tm	Phormocyrtis turgida	Above 6-1 P (Above 432)			Above 1-1 M (Above 154)		
Tm	Buryella tetradica	4 (CC) 6-1 M (413-432)			Above 1-1 P (Above 154)	Above 9 (CC) G (Above 588)	
Tm	Lychnocanoma auxilla	Above 6 (CC) P (Above 433)			Above 1-2 M (Above 155)	Above 9 (CC) P (Above 588)	
Tm	Dendrospriris fragoides	Above 7-1 M (Above 441)			Above 1-1 G (Above 154)		
Tm	Stylotrochus nitidus	Above 7-1 M (Above 441)			Above 1-2 G (Above 155)		

TABLE 9 - *Continued*

Events		146	149	151	152	153	Radiolarian Zones
Tm	Theocorys acroria	Above 7-1 P (Above 441)			Above 1-2 M (Above 155)		
Tm	Phormocyrtis cubensis	Above 7-1 M (Above 441)			Above 1-1 G (Above 154)		
Tm	Giraffospyris lata	Above 7-1 M (Above 441)			Above 1-1 G (Above 154)		
Tm	Thecosphaera larnacium	Above 7-1 P (Above 441)			Above 1-2 M (Above 155)		
Tm	Spongomelissa adunca	Above 7-1 P (Above 441)			Above 1-2 M (Above 155)		
Bm	Buryella clinata	Below 4 (CC) M (Below 413)					
Tm	Thrysocyrtis tarsipes	Above 7-1 P (Above 441)			Above 1-2 M (Above 155)		
Tm	Lamptonium pennatum	Above (Above 441)			Above (Above 155)		
Tm	Pterocodon (?) ampla (?)	Above 7-1 P (Above 441)			Above 1-2 M (Above 155)		
Tm	Amphisphaera minor	Above 7-1 P (Above 441)			Above 1-2 M (Above 155)		
Tm	Astrophaerin sp. E	Above 10-2 P (Above 469)			Above 1-2 M (Above 155)		
Tm	Astrophaerin sp. D	Above 10-2 P (Above 469)			Above 1-2 P (Above 155)		
Tm	Stylosphaera coronata sabaca	Above 7-1 P (Above 441)			1-2 2-4 M (155-166)		
Tm	Axoprunum pierinae group	Above 4 (CC) M (Above 413)			Above 2-4 M (Above 166)		
Tm	Dictyospyris discus	Above 7-1 P (Above 441)			Above 2-4 M (Above 166)		
Tm	Stylosphaera goruna	Above 7-1 P (Above 441)			Within 2-4 P (166)	Above 9 (CC) M (Above 588)	
Bm	Theocorys (?) phyzella	Below 7 (CC) P (Below 442)			2-4 2-5 P (166-167)		
Bm	Theocotyle auctor				2-4 2-5 M (166-167)		
Tm	Stylotrochus alveatus	Above 7-1 M (Above 441)			Above 2-5 M (Above 167)	Above 9 (CC) M (Above 588)	
Bm	Dorcadospyrus confluens				2-4 2 (CC) M (166-168)		

Bekoma bidarfensis

TABLE 9 - *Continued*

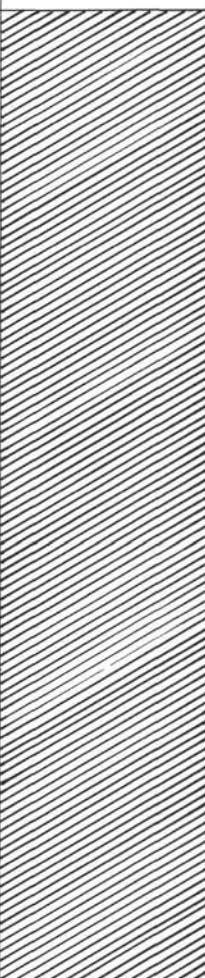
Events		146	149	151	152	153	Radiolarian Zones
Bm	<i>Stylosphaera coronata sabaca</i>	Below 7-1 P (Below 441)			3-4 3-5 M (176-177)		<i>Bekoma bidarfensis</i>
Tm	<i>Xiphospira circularis</i>	Above 7-1 M (Above 441)			Above 3-5 G (Above 177)		
Tm	<i>Amphicraspedum murrayanum</i>	Above 7-1 P (Above 441)			Above 3-5 P (Above 177)		
Tm	<i>Astrosphearin sp. F</i>	Above 10-2 P (Above 469)			Above 3-5 M (Above 177)		
Bm	<i>Amphicraspedum murrayanum</i>	Below 7-1 P (Below 441)			Below 3-5 P (Below 177)		
Bm	<i>Astrosphearin sp. C</i>				Below 3-5 M (Below 177)		
Bm	<i>Spongomelissa adunca</i>	Below 7-1 P (Below 441)			Below 3 (CC) M (Below 178)		
Bm	<i>Astrosphearin sp. E</i>	Below 10-2 P (Below 469)			Below 3 (CC) M (Below 178)		
Tm	<i>Lithelius foremanae</i>	Above 7-1 P (Above 441)			Above 4-2 M (Above 184)		
<i>Lamptonium pennatum</i> → <i>L. fabae. fabaeforme</i>					1-2 4 (CC) M (155-186)		
Bm	<i>Lamptonium fabae. fabaeforme</i>	Below 7-1 P (Below 441)	42-4 42 (CC) P (375-376)		4-2 4 (CC) G (184-186)		
Bm	<i>Lychnocanoma sp. aff. L. bellum</i>				4-2 6-5 M (184-207)		
Bm	<i>Lithomitra docilis</i>		Below 42 (CC) M (Below 376)		4-2 6-5 M (184-207)		
Tm	<i>Clathrocycloma parcum</i>				4-2 6-5 M (184-207)		
Bm	<i>Thrysocyrtis tarsipes</i>	Below 7-1 P (Below 441)			4-2 6-5 P (184-207)		
Bm	<i>Pterocodon tenellus</i>	?			4-2 6-5 M (184-207)		
Bm	<i>Dictyospyris discus</i>	Below 7-1 P (Below 441)			Below 4-2 G (Below 184)		
Bm	<i>Rhabdolithis pipa</i>		Below 42 (CC) M (Below 376)		Below 4-2 M (Below 184)		
Bm	<i>Rhabdolithis ellida</i>				Below 4-2 M (Below 184)		
Bm	<i>Carpospheara subbotinae</i>				Below 4-2 P (Below 184)		

TABLE 9 – *Continued*

Events		146	149	151	152	153	Radiolarian Zones
Bm	<i>Phormocyrtis turgida</i>	Within 7-1 (441)	P		4 (CC) 6-5 M (186-207)		
Bm	<i>Podocyrtis papalis</i>	Below 7-1 (Below 441)	41-4 41-6 M (366-368)		4 (CC) 6-5 G (186-207)		
Bm	<i>Theocorys acoria</i>	Below 7-1 M (Below 441)			4 (CC) 6-5 M (186-207)		
Bm	<i>Lychnocanoma auxilla</i>	Below 7-1 M (Below 441)			4 (CC) 6-5 M (186-207)	Below 9 (CC) P (Below 588)	
Tm	<i>Buryella pentadica</i>	7-1 7 (CC) P (441-442)			4 (CC) 6-5 G (186-207)	Above 9 (CC) G (Above 588)	
Bm	<i>Phormocyrtis cubensis</i>	Below 7-1 P (Below 441)			4 (CC) 6-5 M (186-207)		
Bm	<i>Stylo trochus nitidus</i>	Below 7-1 M (Below 441)			4 (CC) 6-5 M (186-207)		
Bm	<i>Spongodiscus quartus quartus</i>	Below 7-1 M (Below 441)			4 (CC) 6-5 M (186-207)		
Bm	<i>Lychnocanoma babylonis group</i>	Below 7 (CC) M (Below 442)	Below 43-1 M (Below 382)		4 (CC) 6-5 G (186-207)		
Bm	<i>Dendrospyris fragoides</i>	Below 7-1 M (Below 441)			Below 4 (CC) G (Below 186)		
Bm	<i>Giraffospyris lata</i>	Below 7-1 M (Below 441)			Below 4 (CC) M (Below 186)		Unzoned
Bm	<i>Amphicraspedum prolixum</i>	Below 7-1 P (Below 441)	Below 43-1 G (Below 382)		Below 4 (CC) M (Below 186)		
Bm	<i>Amphicraspedum prolixum group</i>	Below 7-1 M (Below 441)	Below 43-1 G (Below 382)		Below 4 (CC) M (Below 186)		
Tm	<i>Clathrocycloma capitaneum</i>	9-2 10-2 P (460-469)			Within 6-5 M (207)		
Tm	<i>Bekoma campechensis</i>				6-5 7-3 P (207-214)		
Tm	<i>Bekoma (?) demissa</i>	Above 10-2 (Above 469)			6-5 7-3 M (207-214)		
Tm	<i>Bekoma divaricata</i>	Above 7-1 P (Above 441)			6-5 7-3 P (207-214)		
Tm	<i>Hexacontium palaeocenicum</i>	Above 7-1 P (Above 441)			6-5 7-4 M (207-215)		
Bm	<i>Thecosphaera larnacium</i>	Below 7-1 P (Below 441)			6-5 7-4 P (207-215)		
Bm	<i>Thecosphaerella ptomatus</i>		Below 43-1 M (Below 382)		6-5 7-4 P (207-215)		

TABLE 9 - *Continued*

Events		146	149	151	152	153	Radiolarian Zones
Bm	Lithelius foremanae	Below 7-1 M (Below 441)			Below 6-5 M (Below 207)		
Bm	Bekoma divaricata	Below 7-1 P (Below 441)			Below 7-3 P (Below 214)		
Bm	Astrosphaerin sp. D	Below 10-2 G (Below 469)			Below 7-3 P (Below 214)		
Bm	Astrosphaerin sp. F	Below 10-2 M (Below 469)			Below 7-3 M (Below 214)		
Tm	Lamptonium incohatum	Above 9-2 P (Above 460)			?	Above 11-1 M (Above 601)	
Bm	Xiphospira circularis	Below 7-1 M (Below 441)			Below 7-4 M (Below 215)		
Bm	Hexacontium palaeocenicum	Below 7-1 P (Below 441)			Below 7-4 P (Below 215)		
Bm	Entapium regulare	Below 7-1 P (Below 441)	Below 43-1 G (Below 382)		Below 7-4 M (Below 215)		
Bm	Bekoma campechensis				Below 7-4 P (Below 215)		
Bm	Clathrocycloma parcum				Below 7-4 P (Below 215)		
Bm	Lamptonium incohatum	Below 10-2 P (Below 469)			?	Below 11 (CC) M (Below 604)	
Bm	Thecosphaerella rotunda	Below 7-1 P (Below 441)	Below 42 (CC) M (Below 376)		Below 7 (CC) M (Below 216)		
Bm	Amphisphaera minor	Below 10-2 M (Below 469)			Below 7 (CC) M (Below 216)		
Bm	Heliostylus sp (p)	Below 10-2 M (Below 469)	42 (CC) 43-1 P (376-382)		Below 7 (CC) M (Below 216)		
Bm	Diploplegma somphum				Below 7 (CC) P (Below 216)		
Bm	Pterocodon (?) ampla (?)	Below 7-1 M (Below 441)			Within 8-1 P (220)		
Bm	Clathrocycloma capitaneum	Below 10-2 P (Below 469)			Within 8-1 M (220)		
Bm	Lamptonium pennatum	Below 10-2 G (Below 469)			Within 8-1 M (220)		
Bm	Spongodiscus americanus	Below 7-1 M (Below 441)	Below 43-1 P (Below 382)		Below 8 (CC) G (Below 221)	Below 10 (CC) P (Below 593)	
Bm	Phormocyrtis striata exquisita	9-2 10-2 M (460-469)			Below 8 (CC) G (Below 221)	Below 11-2 M (Below 602)	

Unzoned

TABLE 9 - *Continued*

Events		146	149	151	152	153	Radiolarian Zones
Bm	<i>Buryella pentadica</i>	Below 9-2 P (Below 460)			Below 8 (CC) G (Below 221)	Below 11 (CC) M (Below 604)	Unzoned
Bm	<i>Bekoma (?) demissa</i>	10-2 10 (CC) P (469)			Below 8 (CC) M (Below 221)		
Bm	<i>Stylotrochus alveatus</i>	Below 10-2 M (Below 469)			Below 8 (CC) G (Below 221)	Below 11-2 M (Below 602)	
Bm	<i>Stylosphaera coronata coronata</i>	Below 10-2 G (Below 469)	Below 43-1 G (Below 382)		Below 8 (CC) G (Below 221)	Below 11-2 G (Below 602)	
Bm	<i>Stylosphaera goruna</i>	Below 10-2 M (Below 469)			Below 8 (CC) G (Below 221)	Below 11-2 M (Below 602)	
Bm	<i>Axoprunum pierinae group</i>	Below 10-2 M (Below 469)			Below 8 (CC) M (Below 221)		
Bm	<i>Buryella tetradiica</i>	Below 10-2 G (Below 469)			Below 8 (CC) G (Below 221)	Below 11 (CC) M (Below 604)	

Species List

The purpose of this list is to provide bibliographic references to the taxa mentioned in this chapter. If the published literature contains several different concepts of the limits of a species, the reference cited conforms to the concept as applied here. The list also serves as an index, since it directs the reader to the references to each taxon within this chapter.

Acrobotrys spp. Riedel and Sanfilippo, 1971, p. 1601, pl. 1J, figs. 12-16; pl. 2J, figs. 13-15; pl. 3F, fig. 8.

This chapter: Tab. 3, 5.

Amphicraspedum murrayanum Haeckel — Sanfilippo and Riedel, 1973.

This chapter: Tab. 2, 4, 6, 9; Site 150 list; Text-fig. 2.

Amphicraspedum prolixum group Sanfilippo and Riedel, 1973.

This chapter: Tab. 2, 4, 6, 9; Site 150 list; Text-fig. 2.

Amphicraspedum prolixum Sanfilippo and Riedel, 1973.

This chapter: Tab. 2, 4, 6, 9; Site 150 list; Text-fig. 2.

Amphisphaera minor (Clark and Campbell) — Sanfilippo and Riedel, 1973.

This chapter: Tab. 2, 6, 9; Site 150 list.

Amphiternis clava (Ehrenberg) — Foreman, 1973.

This chapter: Tab. 2, 4.

Amphiternis sp. cf. *Stichomitra alamedaensis* (Campbell and Clark) — Foreman, 1973.

This chapter: Tab. 2; Site 150 list.

Amphymenium splendiaratum Clark and Campbell, 1942, p. 46, pl. 1, figs. 12, 14.

This chapter: Tab. 4, 9; Text-fig. 2.

Anthocystoma sp. Riedel and Sanfilippo, 1970, p. 524, pl. 6, figs. 2-4.

This chapter: Pl. 3, fig. 5.

Artophormis barbadensis (Ehrenberg) — Riedel and Sanfilippo, 1970, p. 532, pl. 13, fig. 5.

This chapter: Tab. 3, 7, 9; Text-fig. 2.

Artophormis dominasinensis (Ehrenberg) — Riedel and Sanfilippo, 1971, p. 1592, pl. 6, fig. 6.

This chapter: Tab. 3, 9; Text-fig. 2.

Artophormis gracilis Riedel, 1959, p. 300, pl. 2, figs. 12, 13.

This chapter: Tab. 1, 3, 5, 7, 9; Text-fig. 2.

Astrophaerin sp. A Sanfilippo and Riedel, 1973.

This chapter: Tab. 6.

Astrophaerin sp. B Sanfilippo and Riedel, 1973.

This chapter: Tab. 6.

Astrophaerin sp. C Sanfilippo and Riedel, 1973.

This chapter: Tab. 6, 9; Text-fig. 2.

Astrophaerin sp. D. Sanfilippo and Riedel, 1973.

This chapter: Tab. 2, 6, 9; Text-fig. 2.

Astrophaerin sp. E. Sanfilippo and Riedel, 1973.

This chapter: Tab. 2, 6, 9; Site 150 list; Text-fig. 2.

Astrophaerin sp. F Sanfilippo and Riedel, 1973.

This chapter: Tab. 2, 6, 9; Text-fig. 2.

Astrophaerin (?) sp.

This chapter: Footnote to Tab. 6; Pl. 5, figs. 8, 9.

Axoprunum pierinae (Clark and Campbell) group — Sanfilippo and Riedel, 1973.

This chapter: Tab. 2, 6, 9; Site 150 list; Text-fig. 2.

Bekoma bidarfensis Riedel and Sanfilippo — Foreman, 1973.

This chapter: Tab. 2, 6.

Bekoma campechensis Foreman, 1973.

This chapter: Tab. 2, 6, 9; Text-fig. 2.

Bekoma (?) demissa Foreman, 1973.

This chapter: Tab. 2, 6, 9; Text-fig. 2.

Bekoma divaricata Foreman, 1973.

This chapter: Tab. 2, 6, 9; Text-fig. 2.

Botryocyrtis spp. Riedel and Sanfilippo, 1971, p. 1602, pl. 1J, figs. 1-11; pl. 2J, figs. 10-12; pl. 3F, fig. 7.

This chapter: Tab. 3, 5.

Botryopyle dictyocephalus Haeckel group — Riedel and Sanfilippo, 1971, p. 1602, pl. 1J, figs. 21-26; pl. 2J, figs. 16-18; pl. 3F, figs. 9-12.

This chapter: Tab. 3, 5, 9; Text-fig. 2.

Botryopyle sp. A Riedel and Sanfilippo, 1971, p. 1602, pl. 2J, figs. 20, 21; pl. 3F, fig. 13.

This chapter: Tab. 3.

Buryella clinata Foreman, 1973.

This chapter: Tab. 2, 4, 6, 9; Site 150 list.

Buryella pentadica Foreman, 1973.

This chapter: Tab. 2, 6, 8, 9; Text-fig. 2.

Buryella tetradiica Foreman, 1973.

This chapter: Tab. 2, 6 (with footnote), 8 (with footnote), 9; Site 150 list; Pl. 5, fig. 5; Text-fig. 2.

Calocyclas hispida (Ehrenberg) — Foreman, 1973.

This chapter: Tab. 2-7, 9; Text-fig. 2.

- Calocyclas turris* Ehrenberg – (as *Cycladophora turris*) Riedel and Sanfilippo, 1970, p. 529, pl. 13, figs. 3, 4.
This chapter: Tab. 3, 7, 9; Text-fig. 2.
- Calocycletta costata* (Riedel) – Riedel and Sanfilippo, 1970, p. 535, pl. 14, fig. 12.
This chapter: Tab. 5, 9; Text-fig. 2.
- Calocycletta robusta* Moore, 1971, p. 743, pl. 10, figs. 5, 6.
This chapter: Tab. 3, 5, 9; Text-fig. 2.
- Calocycletta serrata* Moore, 1972, p. 148, pl. 2, figs. 1-3.
This chapter: Footnote to Tab. 7.
- Calocycletta virginis* Haeckel – Riedel and Sanfilippo, 1970, p. 535, pl. 14, fig. 10.
This chapter: Tab. 3, 5, 7 (with footnote), 9; Text-fig. 2.
- Calocycloma castum* (Haeckel) – Foreman, 1973.
This chapter: Site 150 list.
- Cannartus mammifer* (Haeckel) – Riedel, 1959, p. 291, pl. 1, fig. 4.
This chapter: Tab. 3, 5; Text-fig. 2.
- Cannartus prismaticus* (Haeckel) – Riedel and Sanfilippo, 1971, p. 1588, pl. 2C, figs. 11-13; pl. 4, fig. 5.
This chapter: Tab. 1, 3, 5, 7, 9; Text-fig. 2.
- Cannartus tubarius* (Haeckel) – Riedel and Sanfilippo, 1971, p. 1588, pl. 2C, figs. 8-10.
This chapter: Tab. 1, 3, 5, 9; Text-fig. 2.
- Cannartus violina* Haeckel – Riedel, 1959, p. 290, pl. 1, fig. 3.
This chapter: Tab. 3, 5, 9; Text-fig. 2.
- Carpocanistrum (?) azyx* Sanfilippo and Riedel, 1973.
This chapter: Tab. 3 (with footnote), 4, 7, 9; Pl. 2, fig. 4, Text-fig. 2.
- Carpocanopsis bramlettei* Riedel and Sanfilippo, 1971, p. 1597, pl. 2G, figs. 8-14; pl. 8, fig. 7.
This chapter: Tab. 3, 5, 7, 9; Text-fig. 2.
- Carpocanopsis cingulata* Riedel and Sanfilippo, 1971, p. 1597, pl. 2G, figs. 17-21; pl. 8, fig. 8.
This chapter: Tab. 1, 3, 5, 7, 9; Text-fig. 2.
- Carpocanopsis favosa* (Haeckel) – Riedel and Sanfilippo, 1971, p. 1597, pl. 2G, figs. 15, 16; pl. 8, figs. 9-11.
This chapter: Tab. 5, 7, 9; Text-fig. 2.
- Carpophæra subbotinæ* (Borisenko) – Sanfilippo and Riedel, 1973.
This chapter: Tab. 6, 9.
- Centrobotrys gravida* Moore, 1971, p. 744, pl. 5, fig. 8.
This chapter: Tab. 3, 5, 7.
- Centrobotrys petrushevskaya* Sanfilippo and Riedel, 1973.
This chapter: Tab. 3, 5, 7, 9.
- Centrobotrys thermophila* Petrushevskaya – Nigrini, 1967, p. 49, text-fig. 26, pl. 5, fig. 7.
This chapter: Tab. 3, 5, 7, 9; Text-fig. 2.
- Ceratospyris articulata* Ehrenberg – Sanfilippo and Riedel, 1973.
This chapter: Tab. 4, 9; Text-fig. 2.
- Clathrocycloma capitaneum* Foreman, 1973.
This chapter: Tab. 2, 6, 9; Text-fig. 2.
- Clathrocycloma parcum* Foreman, 1973.
This chapter: Tab. 4, 6, 9; Text-fig. 2.
- Coccodiscid* cf. *Lithocyclia aristotelis* group.
This chapter: Pl. 2, figs. 5, 6.
- Cryptoprora* sp. Sanfilippo and Riedel, 1973, pl. 35, fig. 5.
This chapter: Footnote to Tab. 3.
- Cyclampterium (?) leptetrum* Sanfilippo and Riedel, 1970, p. 456, pl. 2, figs. 11, 12.
This chapter: Tab. 1, 5, 7, 9; Text-fig. 2.
- Cyclampterium (?) milowi* Riedel and Sanfilippo – Sanfilippo and Riedel in Sanfilippo et al., in press.
This chapter: Tab. 1, 3, 5, 7, 9; Text-fig. 2.
- Cyclampterium (?) pegetrum* Sanfilippo and Riedel – Sanfilippo and Riedel in Sanfilippo et al., in press.
This chapter: Tab. 1, 3, 5, 7, 9; Text-fig. 2.
- Cyclampterium (?) tanythorax* Sanfilippo and Riedel, 1970, p. 457, pl. 2, figs. 13, 14.
This chapter: Tab. 5.
- Cyrtocapsella cornuta* Haeckel – Sanfilippo and Riedel, 1970, p. 453, pl. 1, figs. 19, 20.
This chapter: Tab. 3, 5, 7, 9; Text-fig. 2.
- Cyrtocapsella elongata* (Nakaseko) – Sanfilippo and Riedel, 1970, p. 452, pl. 1, figs. 11, 12.
This chapter: Tab. 3, 5.
- Cyrtocapsella japonica* (Nakaseko) – Sanfilippo and Riedel, 1970, p. 452, pl. 1, figs. 13-15.
This chapter: Tab. 3.
- Cyrtocapsella tetrapera* Haeckel – Sanfilippo and Riedel, 1970, p. 453, pl. 1, figs. 16-18.
This chapter: Tab. 1, 3, 5, 7, 9; Text-fig. 2.
- Dendrosypris fragoides* Sanfilippo and Riedel, 1973.
This chapter: Tab. 2, 6, 9; Site 150 list.
- Dictyophimus craticula* Ehrenberg – Sanfilippo and Riedel, 1973.
This chapter: Tab. 3, 4, 9; Text-fig. 2.
- Dictyospyris discus* Sanfilippo and Riedel, 1973.
This chapter: Tab. 2, 6, 9; Site 150 list; Text-fig. 2.
- Dictyospyris melissium* Sanfilippo and Riedel, 1973.
This chapter: Tab. 4, 9; Text-fig. 2.
- Diploplegma somphum* Sanfilippo and Riedel, 1973.
This chapter: Tab. 6, 9.
- Dorcadospyris alata* (Riedel) – Riedel and Sanfilippo, 1970, p. 523, pl. 14, fig. 5.
This chapter: Tab. 5, 9; Text-fig. 2.
- Dorcadospyris ateuchus* (Ehrenberg) – Riedel and Sanfilippo, 1971, p. 1590, pl. 2D, fig. 6; pl. 3A, figs. 9, 10.
This chapter: Tab. 1, 3, 5, 7, 9; Text-fig. 2.
- Dorcadospyris circulus* (Haeckel) – Moore, 1971, p. 739, pl. 8, figs. 3-5.
This chapter: Tab. 3 (with footnotes), 5, 7, 9; Pl. 1, fig. 8; Text-fig. 2.
- Dorcadospyris confluens* (Ehrenberg) – Sanfilippo and Riedel, 1973.
This chapter: Tab. 6, 9.
- Dorcadospyris dentata* Haeckel – Riedel, 1957, p. 79, pl. 1, fig. 4.
This chapter: Tab. 3, 5.
- Dorcadospyris forcipata* (Haeckel) – Riedel and Sanfilippo, 1970, p. 523, pl. 15, fig. 7.
This chapter: Tab. 1, 3, 5, 7, 9; Text-fig. 2.
- Dorcadospyris papilio* (Riedel) – Riedel and Sanfilippo, 1970, p. 523, pl. 15, fig. 5.
This chapter: Tab. 1 (with footnotes), 3, 5, 7, 9; Text-fig. 2.
- Dorcadospyris praeforcipata* Moore, 1971, p. 738, pl. 9, figs. 4-7.
This chapter: Tab. 1, 3, 5, 9; Text-fig. 2.
- Dorcadospyris pseudopapilio* Moore, 1971, p. 738, pl. 6, figs. 7, 8.
This chapter: Tab. 5, 7.
- Dorcadospyris spinosa* Moore, 1971, p. 739, pl. 7, figs. 1, 2.
This chapter: Tab. 3 (with footnote), 7, 9; Pl. 2, fig. 2; Text-fig. 2.
- Entapium regulare* Sanfilippo and Riedel, 1973.
This chapter: Tab. 2, 3, 4, 6, 9; Text-fig. 2.
- Eusyringium fistuligerum* (Ehrenberg) – Foreman, 1973.
This chapter: Tab. 3, 4, 7, 9; Text-fig. 2.
- Eusyringium lagena* (Ehrenberg) – Foreman, 1973.
This chapter: Tab. 4, 9; Text-fig. 2.
- Giraffospyris lata* Goll – Sanfilippo and Riedel, 1973.
This chapter: Tab. 2, 6, 9; Site 150 list; Text-fig. 2.
- Heliostylus* sp(p). Sanfilippo and Riedel, 1973.
This chapter: Tab. 2, 3 (with footnote), 4, 6, 9; Site 150 list; Pl. 2, fig. 3; Text-fig. 2.
- Hexacontium palaeocenicum* Sanfilippo and Riedel, 1973.
This chapter: Tab. 2, 6, 9; Text-fig. 2.
- Lamptonium (?) columbus* Foreman, 1973.
This chapter: Tab. 2.
- Lamptonium (?) fabaeforme* (?) *chaunothorax* Riedel and Sanfilippo, 1970, p. 524, pl. 5, figs. 8, 9.
This chapter: Tab. 4, 9; Site 150 list; Text-fig. 2.
- Lamptonium fabaeforme* (?) *constrictum* Riedel and Sanfilippo – Foreman, 1973.
This chapter: Tab. 4, 9; Text-fig. 2.
- Lamptonium fabaeforme* *fabaeforme* (Krasheninnikov) (?) – Foreman, 1973.
This chapter: Tab. 2, 4, 6, 9; Site 150 list; Text-fig. 2.
- Lamptonium* (?) *incohatum* Foreman, 1973.
This chapter: Tab. 2, 6 (with footnote), 8, 9; cf. pl. 5, fig. 10; Text-fig. 2.
- Lamptonium pennatum* Foreman, 1973.
This chapter: Tab. 2, 6, 9; Site 150 list; Text-fig. 2.
- Lamptonium sanfilippoae* Foreman, 1973.
This chapter: Tab. 6.

- Liriospyris parkerae* Riedel and Sanfilippo, 1971, p. 1590, pl. 2C, fig. 15; pl. 5, fig. 4.
This chapter: Tab. 5, 9; Text-fig. 2.
- Liriospyris stauropora* (Haeckel) — Goll, 1968, p. 1431, pl. 175, figs. 1-3, 7; text-fig. 9.
This chapter: Tab. 5.
- Lithapium anoectum* Riedel and Sanfilippo — Sanfilippo and Riedel, 1973.
This chapter: Tab. 4, 9; Text-fig. 2.
- Lithapium mitra* (Ehrenberg) (?) — Riedel and Sanfilippo, 1970, p. 520, pl. 4, figs. 6, 7.
This chapter: Tab. 3, 4, 9; Text-fig. 2.
- Lithapium plegmacantha* Riedel and Sanfilippo — Sanfilippo and Riedel, 1973.
This chapter: Tab. 3, 4, 9; Text-fig. 2.
- Lithelius foremanae* Sanfilippo and Riedel, 1973.
This chapter: Tab. 2, 6, 9; Text-fig. 2.
- Lithelius hexaxyphophorus* (Clark and Campbell) — Sanfilippo and Riedel, 1973.
This chapter: Tab. 3, 4, 9; Text-fig. 2.
- Lithochytris archaea* Riedel and Sanfilippo — Foreman, 1973.
This chapter: Tab. 4, 6, 9; Site 150 list; Pl. 5, fig. 1; Text-fig. 2.
- Lithochytris vespertilio* Ehrenberg — Riedel and Sanfilippo, 1970, p. 528, pl. 9, figs. 8, 9.
This chapter: Tab. 3, 4, 6, 9; Text-fig. 2.
- Lithocyclia angusta* (Riedel) — Riedel and Sanfilippo, 1970, p. 522, pl. 13, figs. 1, 2.
This chapter: Tab. 1, 3, 5, 7, 9; Text-fig. 2.
- Lithocyclia aristotelis* (Ehrenberg) group — Riedel and Sanfilippo, 1970, p. 522.
This chapter: Tab. 1, 3 (with footnote), 4, 7, 9; Text-fig. 2.
- Lithocyclia crux* Moore, 1971, p. 737, pl. 6, fig. 4.
This chapter: Tab. 3, 7, 9; Text-fig. 2.
- Lithocyclia ocellus* Ehrenberg group — Riedel and Sanfilippo, 1970, p. 522, pl. 5, figs. 1, 2.
This chapter: Tab. 1, 3, 4, 5, 9; Pl. 2, figs. 7, 8; Text-fig. 2.
- Lithomitira docilis* Foreman, 1973.
This chapter: Tab. 3, 4, 6, 9; Text-fig. 2.
- Lithopera renzae* Sanfilippo and Riedel, 1970, p. 454, pl. 1, figs. 21-23, 27.
This chapter: Tab. 5.
- Lophocyrtis biaurita* (Ehrenberg) — Foreman, 1973.
This chapter: Tab. 4, 9; Text-fig. 2.
- Lophocyrtis* (?) *jacchia* (Ehrenberg) — Riedel and Sanfilippo, 1971, p. 1594, pl. 3C, figs. 4, 5; pl. 7, fig. 16.
This chapter: Tab. 3, 9.
- Lychnocanoma amphitrite* Foreman, 1973.
This chapter: Tab. 3, 7, 9; Text-fig. 2.
- Lychnocanoma anacolum* Foreman, 1973.
This chapter: Tab. 2
- Lychnocanoma auxilla* Foreman, 1973.
This chapter: Tab. 2, 4, 6, 8, 9; Text-fig. 2.
- Lychnocanoma babylonis* (Clark and Campbell) group — Foreman, 1973.
This chapter: Tab. 2, 3, 4, 6, 8, 9; Site 150 list; Text-fig. 2.
- Lychnocanoma bellum* (Clark and Campbell) — Foreman, 1973.
This chapter: Tab. 3, 4, 9; Text-fig. 2.
- Lychnocanoma* sp. aff. *L. bellum* (Campbell and Clark) — Foreman, 1973.
This chapter: Tab. 6, 8, 9.
- Lychnocanoma elongata* (Vinassa) — Sanfilippo and Riedel in Sanfilippo et al., in press (= *Lychnocanium bipes* Riedel, 1959, p. 294, pl. 2, figs. 5, 6).
This chapter: Tab. 1 (with footnote), 3, 5, 7, 9; Text-fig. 2.
- Lychnocanoma* sp. aff. *L. elongata* (Vinassa).
This chapter: Footnote to Tab. 1; Pl. 1, fig. 1.
- Orbula comitata* Foreman, 1973.
This chapter: Tab. 6; Text-fig. 2.
- Orbula discipulus* Foreman, 1973.
This chapter: Tab. 2.
- Orbula ducale* Foreman, 1973.
This chapter: Tab. 2.
- Peripheraena decora* Ehrenberg — Sanfilippo and Riedel, 1973.
This chapter: Tab. 3, 4, 6, 7, 9; Text-fig. 2.
- Peripheraena delta* Sanfilippo and Riedel, 1973.
This chapter: Tab. 2, 4, 6, 9; Text-fig. 2.
- Peripheraena tripyramis triangula* (Sutton) — Riedel and Sanfilippo, 1970, p. 521, pl. 4, figs. 9, 10.
This chapter: Tab. 4, 9; Text-fig. 2.
- Peripheraena tripyramis tripyramis* (Haeckel) — Sanfilippo and Riedel, 1973.
This chapter: Tab. 4, 9; Text-fig. 2.
- Phormocyrtis cubensis* (Riedel and Sanfilippo) — Foreman, 1973.
This chapter: Tab. 2, 6, 9; Site 150 list; Text-fig. 2.
- Phormocyrtis striata exquisita* (Kozlova) — Foreman, 1973.
This chapter: Tab. 2, 6, 8, 9; Site 150 list; Text-fig. 2.
- Phormocyrtis striata striata* Brandt-Foreman, 1973.
This chapter: Tab. 2, 4, 6, 9; Site 150 list; Text-fig. 2.
- Phormocyrtis turgida* (Krasheninnikov) — Foreman, 1973.
This chapter: Tab. 2, 6, 9; Site 150 list; Text-fig. 2.
- Podocyrtis ampla* Ehrenberg — Riedel and Sanfilippo, 1970, p. 533, pl. 12, figs. 7, 8.
This chapter: Tab. 3, 4, 9; Text-fig. 2.
- Podocyrtis aphorma* Riedel and Sanfilippo, 1970, p. 534, pl. 11, fig. 2.
This chapter: Tab. 4 (with footnote); cf. Pl. 3, fig. 9.
- Podocyrtis chalara* Riedel and Sanfilippo, 1970, p. 535, pl. 12, figs. 2, 3.
This chapter: Tab. 2-4, 9; Text-fig. 2.
- Podocyrtis diamesa* Riedel and Sanfilippo — Sanfilippo and Riedel, 1973.
This chapter: Tab. 4, 9; Text-fig. 2.
- Podocyrtis dorus* Sanfilippo and Riedel, 1973.
This chapter: Tab. 4, 9; Text-fig. 2.
- Podocyrtis goetheana* (Haeckel) — Riedel and Sanfilippo, 1970, p. 535.
This chapter: Tab. 3, 4, 9; Text-fig. 2.
- Podocyrtis mitra* Ehrenberg — Riedel and Sanfilippo, 1970, p. 534, pl. 11, figs. 5, 6.
This chapter: Tab. 3, 4 (with footnote), 9; Pl. 3, fig. 1; Text-fig. 2.
- Podocyrtis papalis* Ehrenberg — Sanfilippo and Riedel, 1973.
This chapter: Tab. 2-6, 8, 9; Site 150 list; Text-fig. 2.
- Podocyrtis phyxis* Sanfilippo and Riedel, 1973.
This chapter: Tab. 4, 9; Text-fig. 2.
- Podocyrtis platypus* Sanfilippo and Riedel, 1973.
This chapter: Tab. 4, 9; Text-fig. 2.
- Podocyrtis sinuosa* Ehrenberg ? — Riedel and Sanfilippo, 1970, p. 534, pl. 11, figs. 3, 4.
This chapter: Tab. 3-5, 9; Text-fig. 2.
- Podocyrtis trachodes* Riedel and Sanfilippo, 1970, p. 535, pl. 11, fig. 7; pl. 12, fig. 1.
This chapter: Tab. 4, 9; Text-fig. 2.
- Podocyrtis* sp. A
This chapter: Tab. 4 (with footnote), 9; Pl. 4, figs. 1-3; Text-fig. 2.
- Podocyrtis* sp. B
This chapter: Tab. 4 (with footnote), 9; Pl. 4, figs. 4-6; Text-fig. 2.
- Psychospyris grandis* Riedel and Sanfilippo, 1971, p. 1591, pl. 6, figs. 3-5.
This chapter: Tab. 5.
- Psychospyris intermedia* Riedel and Sanfilippo, 1971, p. 1591, pl. 5, fig. 11, pl. 6, figs. 1, 2.
This chapter: Tab. 5.
- Psychospyris parva* Riedel and Sanfilippo, 1971, p. 1591, pl. 5, figs. 8-10.
This chapter: Tab. 5.
- Pterocodon* (?) *ampla* (Brandt) (?) — Foreman, 1973.
This chapter: Tab. 2, 6, 9; Text-fig. 2.
- Pterocodon* (?) *tenellus* Foreman, 1973.
This chapter: Tab. 2, 6, 9; Site 150 list; Text-fig. 2.
- Rhabdolithis ellida* Sanfilippo and Riedel, 1973.
This chapter: Tab. 6, 9; Text-fig. 2.
- Rhabdolithis pipa* Ehrenberg — Sanfilippo and Riedel, 1973.
This chapter: Tab. 4 (with footnote), 6, 9; Site 150 list; Pl. 3, figs. 7, 8; Text-fig. 2.
- Rhopalocanium ornatum* Ehrenberg — Foreman, 1973.
This chapter: Tab. 3, 4, 9; Text-fig. 2.
- Saturnalin.
This chapter: Footnote to Tab. 2, Pl. 1, fig. 2.

- Sethochytris triconiscus* Haeckel (?) — Riedel and Sanfilippo, 1970, p. 528, pl. 9, fig. 6.
This chapter: Tab. 3, 4, 9; Text-fig. 2.
- Spongactractus balbis* Sanfilippo and Riedel, 1973.
This chapter: Tab. 4, 9; Text-fig. 2.
- Spongactractus pachystylus* (Ehrenberg) — Sanfilippo and Riedel, 1973.
This chapter: Tab. 3, 4, 9; Text-fig. 2.
- Spongodiscus americanus* Kozlova — Sanfilippo and Riedel, 1973.
This chapter: Tab. 2, 4, 6, 8, 9.
- Spongodiscus cruciferus* Clark and Campbell — Sanfilippo and Riedel, 1973.
This chapter: Tab. 2.
- Spongodiscus phrix* Sanfilippo and Riedel, 1973.
This chapter: Tab. 4, 9; Text-fig. 2.
- Spongodiscus quartus bosoculus* Sanfilippo and Riedel, 1973.
This chapter: Tab. 2, 4, 6, 8, 9; Text-fig. 2.
- Spongodiscus quartus quartus* (Borisenko) — Sanfilippo and Riedel, 1973.
This chapter: Tab. 2, 6, 9; Site 150 list; Text-fig. 2.
- Spongodiscus rhabdostylus* (Ehrenberg) — Sanfilippo and Riedel, 1973.
This chapter: Tab. 3, 4, 9; Text-fig. 2.
- Spongomelissa adunca* Sanfilippo and Riedel, 1973.
This chapter: Tab. 2, 6, 9; Text-fig. 2.
- Stichocorys armata* (Haeckel) — Sanfilippo and Riedel, in Sanfilippo et al., in press.
This chapter: Tab. 5.
- Stichocorys delmontensis* (Campbell and Clark) — Sanfilippo and Riedel, 1970, p. 451, pl. 1, fig. 9.
This chapter: Tab. 3, 5, 7, 9; Text-fig. 2.
- Stichocorys diploconus* (Haeckel) — Sanfilippo and Riedel, 1970, p. 451, pl. 1, figs. 31, 32.
This chapter: Tab. 5.
- Stichocorys wolffii* Haeckel — Riedel, 1957, p. 92, pl. 4, figs. 6, 7.
This chapter: Tab. 5, 9; Text-fig. 2.
- Stylosphaera coronata coronata* Ehrenberg — Sanfilippo and Riedel, 1973.
This chapter: Tab. 2, 3, 4, 6, 8, 9; Site 150 list.
- Stylosphaera coronata laevis* Ehrenberg — Sanfilippo and Riedel, 1973.
This chapter: Tab. 3, 4, 6, 9.
- Stylosphaera coronata sabaca* Sanfilippo and Riedel, 1973.
This chapter: Tab. 2, 4, 6, 9; Text-fig. 2.
- Stylosphaera goruna* Sanfilippo and Riedel, 1973.
This chapter: Tab. 2, 4, 6, 8, 9; Text-fig. 2.
- Stylotrochus alveatus* Sanfilippo and Riedel, 1973.
This chapter: Tab. 2, 6, 8, 9; Text-fig. 2.
- Stylotrochus nitidus* Sanfilippo and Riedel, 1973.
This chapter: Tab. 2, 6, 9; Site 150 list; Text-fig. 2.
- Tepka perforata* Sanfilippo and Riedel, in Sanfilippo et al., in press.
This chapter: Tab. 1, 3, 5 (with footnote), 7, 9; Text-fig. 2.
- Tepka* sp.
This chapter: Footnote to Tab. 5; Pl. 5, figs. 2, 3.
- Thecosphaera larnaciun* Sanfilippo and Riedel, 1973.
This chapter: Tab. 2, 6, 9; Site 150 list; Text-fig. 2.
- Thecosphaerella* sp. cf. *T. agdaraensis* (Mamedov) — Sanfilippo and Riedel, 1973.
This chapter: Tab. 2.
- Thecosphaerella ptomatus* Sanfilippo and Riedel, 1973.
This chapter: Tab. 3, 4, 6, 9; Site 150 list; Text-fig. 2.
- Thecosphaerella rotunda* (Borisenko) — Sanfilippo and Riedel, 1973.
This chapter: Tab. 2, 3, 4, 6, 9; Site 150 list.
- Theocampe amphora* (Haeckel) group — Foreman, 1973.
This chapter: Tab. 3, 4, 9; Text-fig. 2.
- Theocampe armadillo* (Ehrenberg) group — Riedel and Sanfilippo, 1971, p. 1601, pl. 3E, figs. 3-6.
This chapter: Tab. 3, 4, 5, 7, 9; Text-fig. 2.
- Theocampe mongolfieri* (Ehrenberg) — Foreman, 1973.
This chapter: Tab. 1-5, 7, 9; Text-fig. 2.
- Theocampe pirum* (Ehrenberg) — Riedel and Sanfilippo, 1971, p. 1601, pl. 3E, figs. 10, 11.
This chapter: Tab. 3, 5, 7, 9; Text-fig. 2.
- Theocampe urceolus* (Haeckel) — Foreman, 1973.
This chapter: Tab. 3, 4, 9; Text-fig. 2.
- Theocorys acoria* Foreman, 1973.
This chapter: Tab. 2, 4, 6, 9; Text-fig. 2.
- Theocorys anaclasta* Riedel and Sanfilippo — Foreman, 1973.
This chapter: Tab. 4, 9; Text-fig. 2.
- Theocorys anapographa* Riedel and Sanfilippo — Foreman, 1973.
This chapter: Tab. 3 (with footnote), 4 (with footnote), 9; Pl. 3, figs. 10, 11; Text-fig. 2.
- Theocorys (?) phyzella* Foreman, 1973.
This chapter: Tab. 2, 6 (with footnote), 9; Site 150 list; Text-fig. 2.
- Theocorys (?) sp. cf. *T. (?) phyzella**
- This chapter: Footnote to Tab. 6; Pl. 5, fig. 4.
- Theocorys spongoconum* Kling — Foreman, 1973.
This chapter: Tab. 1, 3 (with footnote), 5, 7, 9; Pl. 2, fig. 1; Text-fig. 2.
- Theocotyle alpha* Foreman, 1973.
This chapter: Tab. 4; Site 150 list.
- Theocotyle auctor* Foreman, 1973.
This chapter: Tab. 4, 6, 9; Text-fig. 2.
- Theocotyle cryptoccephala* (?) *conica* Foreman, 1973.
This chapter: Tab. 4, 9; Text-fig. 2.
- Theocotyle cryptoccephala* *cryptocephala* (Ehrenberg) (?) — Foreman, 1973.
This chapter: Tab. 4, 9; Text-fig. 2.
- Theocotyle cryptoccephala* (?) *nigriniae* Riedel and Sanfilippo — Foreman, 1973.
This chapter: Tab. 4, 9; Text-fig. 2.
- Theocotyle ficus* (Ehrenberg) — Foreman, 1973.
This chapter: Tab. 2-4, 9; Text-fig. 2.
- Theocotyle venezuelensis* Riedel and Sanfilippo, 1970, p. 525, pl. 6, figs. 9, 10; pl. 7, figs. 1, 2.
This chapter: Tab. 4, 9; Text-fig. 2.
- Theocyrtis annosa* (Riedel) — Riedel and Sanfilippo, 1970, p. 535, pl. 15, fig. 9.
This chapter: Tab. 1, 3 (with footnote), 5, 7, 9; Text-fig. 2.
- Theocyrtis tuberosa* Riedel, 1959, p. 298, pl. 2, figs. 10, 11.
This chapter: Tab. 1, 3 (with footnote), 5, 7, 9; Text-fig. 2.
- Thrysocytis bromia* Ehrenberg — Riedel and Sanfilippo, 1971, p. 1596, pl. 8, fig. 6.
This chapter: Tab. 3, 7, 9; Text-fig. 2.
- Thrysocytis hirsuta hirsuta* (Krasheninnikov) — Foreman, 1973.
This chapter: Tab. 4; Site 150 list.
- Thrysocytis hirsuta robusta* Riedel and Sanfilippo — Foreman, 1973.
This chapter: Tab. 4, 9; Text-fig. 2.
- Thrysocytis hirsuta tensa* — Foreman, 1973.
This chapter: Tab. 4, 9; Site 150 list; Text-fig. 2.
- Thrysocytis rhizodon* Ehrenberg — Foreman, 1973.
This chapter: Tab. 1, 3, 4, 6 (with footnote), 9; Pl. 5, figs. 6, 7; Text-fig. 2.
- Thrysocytis* sp. aff. *T. rhizodon*.
This chapter: Footnote to Tab. 6; Pl. 5, figs. 6, 7.
- Thrysocytis tarsipes* Foreman, 1973.
This chapter: Tab. 2, 4, 6, 9; Text-fig. 2.
- Thrysocytis tetracantha* (Ehrenberg) — Riedel and Sanfilippo, 1971, p. 1596.
This chapter: Tab. 3, 7, 9; Text-fig. 2.
- Thrysocytis triacantha* (Ehrenberg) — Foreman, 1973.
This chapter: Tab. 3-5, 9; Text-fig. 2.
- Tristylospyris triceros* (Ehrenberg) — Haeckel, 1887, p. 1033.
This chapter: Tab. 1, 3, 5, 7, 9; Text-fig. 2.
- Xiphospira circularis* (Clark and Campbell) — Sanfilippo and Riedel, 1973.
This chapter: Tab. 2, 6, 9; Text-fig. 2.

ACKNOWLEDGMENTS

Financial support for this study was provided partly by NSF Grant No. GA-31284X and partly by the University of California. The onerous tasks of typing and proofreading were competently performed by M. A. Hanger and M. A. Neely. For access to samples from a core collected by Woods Hole Oceanographic Institution we are indebted to C. D. Hollister and Peter Lonsdale.

REFERENCES¹

- Clark, B. L. and Campbell, A. S., 1942. Eocene radiolarian faunas from the Mt. Diablo area, California. Geol. Soc. Am., Spec. Paper 39, 112 p.
- Foreman, H. P., 1973. Radiolaria of Leg 10 with systematics and ranges for the families Amphipyndacidae, Artostrobiidae, and Theoperidae. In Worzel, J. L., Bryant, W. et al., 1973. Initial Reports of the Deep Sea Drilling Project, Volume X. Washington (U. S. Government Printing Office).
- Goll, R. M., 1968. Classification and phylogeny of Cenozoic Trissocyklidae (Radiolaria) in the Pacific and Caribbean Basins. Part I. J. Paleontol. 42(6), 1409.
- Haeckel, E., 1887. Report on the Radiolaria collected by H. M. S. *Challenger* during the years 1873-76. Rept. Voyage Challenger, Zool. 18. 1803 p.
- Moore, T. C., Jr., 1971. Radiolaria. In Tracey, J. I., Jr., Sutton, G. H. et al., 1971. Initial Reports of the Deep Sea Drilling Project, Volume VIII. Washington (U. S. Government Printing Office). 727.
- _____, 1972. Mid-Tertiary evolution of the radiolarian genus *Calocycletta*. Micropaleontology. 18(2), 144.
- Nigrini, C., 1967. Radiolaria in pelagic sediments from the Indian and Atlantic Oceans. Bull. Scripps Inst. Oceanog. Univ. Calif. 11. 125 p.
- Riedel, W. R., 1957. Radiolaria: a preliminary stratigraphy. Rept. Swedish Deep-Sea Exped. 6 (3), 59.
- _____, 1959. Oligocene and Lower Miocene Radiolaria in tropical Pacific sediments. Micropaleontology. 5 (3), 285.
- Riedel, W. R. and Sanfilippo, A., 1970. Radiolaria, Leg 4, Deep Sea Drilling Project. In Bader, R. G., Gerard, R. D., et al., 1970. Initial Reports of the Deep Sea Drilling Project, Volume IV. Washington (U. S. Government Printing Office). 503.
- _____, 1971. Cenozoic Radiolaria from the western tropical Pacific, Leg 7. In Winterer, E. L., Riedel, W. R. et al., 1971. Initial Reports of the Deep Sea Drilling Project, Volume VII. Washington (U. S. Government Printing Office), 1529.
- Sanfilippo, A. and Riedel, W. R., 1970. Post-Eocene "closed" theoperid radiolarians. Micropaleontology. 16 (4), 446.
- _____, 1973. Cenozoic Radiolaria (exclusive of theoperids, artostrobiids, and amphipyndacids) from the Gulf of Mexico, DSDP Leg 10. In Worzel, J. L., Bryant, W. et al., 1973. Initial Reports of the Deep Sea Drilling Project, Volume X. Washington (U. S. Government Printing Office).
- Sanfilippo, A., Burckle, L. H., Martini, E. and Riedel, W. R., in press. Radiolarians, diatoms, silicoflagellates and calcareous nannofossils in the Mediterranean Neogene. Micropaleontology.

PLATES

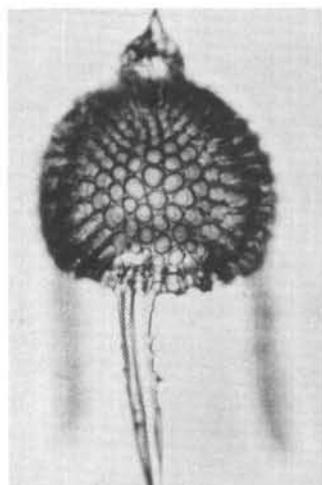
In the explanations to the figures, the sample numbers and slide designations (in the form "Ph.2", "S1.1", "Cse.2", etc.) indicate preparations in our collection at Scripps Institution of Oceanography, and designations in the form "R45/1" indicate England Finder positions of the illustrated specimens on the slides.

¹Note added in proof. Some items of information (complete pagination, plate numbers, etc.) have been deleted from these references by the editorial staff of the Deep Sea Drilling Project. Complete citations of some of the references, including the deleted items, may be found in the radiolarian chapters of Volumes VII and XIV of this series of Initial Reports.

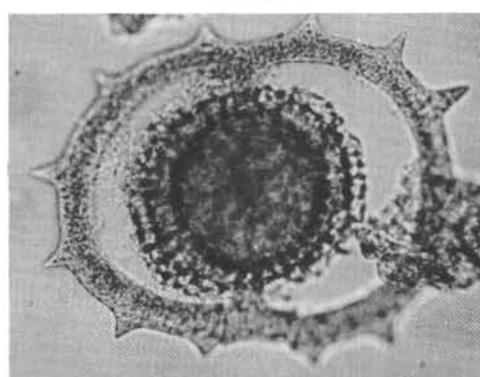
PLATE 1

- Figure 1 *Lychnocanoma* sp., ancestral to *L. elongata* (see footnote b to Table 1). 146-2-5 (80-82 cm), Ph.2, H29/4 (255X)
- Figure 2 Saturnalin gen. et. sp. indet. (see footnote a to Table 2). 146-7-1 (83-86 cm), S1.3, D12/1 (255X)
- Figures 3, 4 Radiolarians, gen. et sp. indet. (see footnote b to Table 2)
3: 146-10-2 (85-90 cm), S1.3A, L23/3 (255X)
4: same slide, P20/4 (150X)
- Figures 5, 6 Pyritized radiolarians (see footnote c to Table 2)
5: 146-10-2 (138-142 cm), S1.1, F41/4 (255X)
6: same slide, D27/3 (255X)
- Figure 7 *Dorcadospyris* sp. (see footnote a to Table 3)
149-25-2 (28-30 cm), Cse.2, U33/2 (150X)
- Figure 8 *Dorcadospyris circulus* 149-26-2 (100-102 cm), Cse.2, 016/0 (150X)
- Figures 9, 10 *Dorcadospyris* sp(p). (see footnote b to Table 3)
9: 149-28(CC), Cse.2, R45/0 (150X)
10: 149-28(CC), Cse.1, Q30/1 (150X)

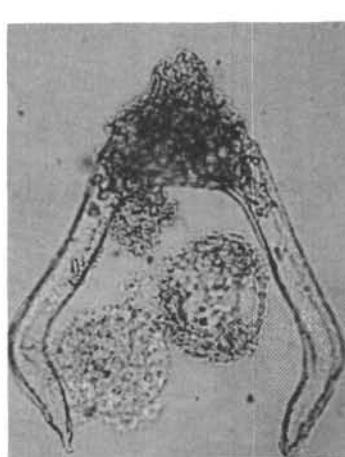
PLATE 1



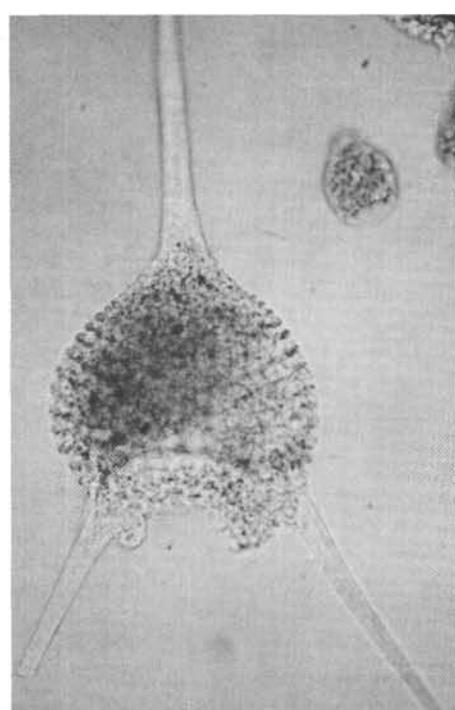
1



2



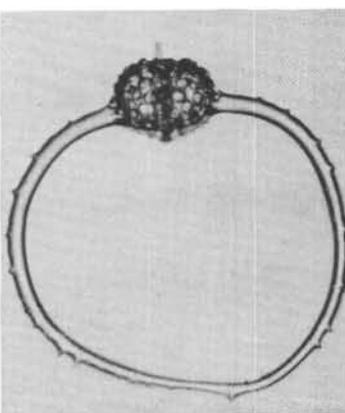
3



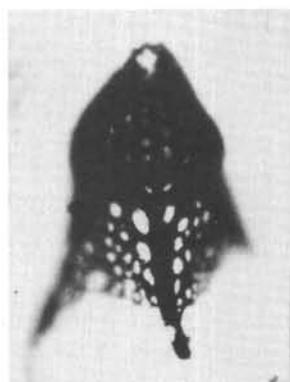
4



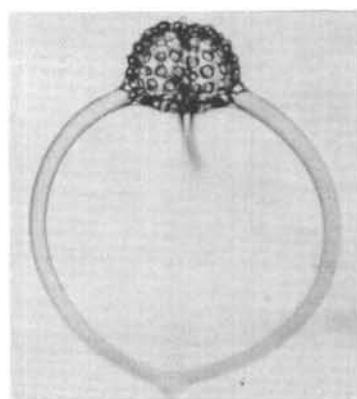
5



7



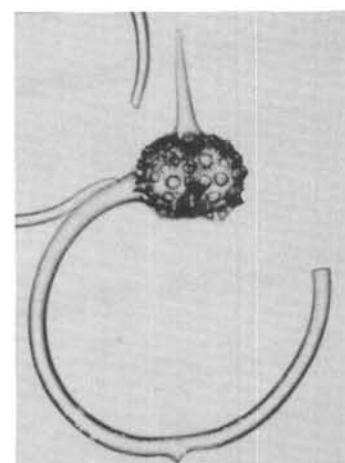
6



9



10

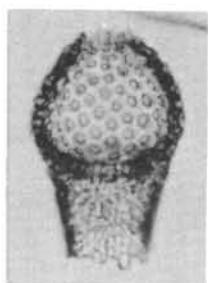


8

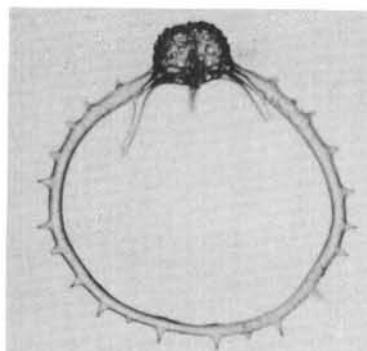
PLATE 2

- Figure 1 *Theocorys spongoconum* (see footnote c to Table 3)
149-29(CC), Ph.1, U42/3 (255X)
- Figure 2 *Dorcadospyris spinosa* (see footnote d to Table 3)
149-30-2 (23-24 cm), Cse, X38/1 (150X)
- Figure 3 *Heliostylus* sp. (see footnote e to Table 3) 149-30-1
(87-89 cm), S1.1, T44/0 (150X)
- Figure 4 *Carpocanistrum azyx* (see footnote f to Table 3)
149-32-3 (38-42 cm), S1.2, E35/4 (255X)
- Figures 5, 6 Coccodiscid gen. et sp. indet. with some similarity to
Lithocyclia aristotelis group (see footnote i to Table
3)
5: 149-33(CC), Cse.1, D34/1 (150X)
6: same slide, 048/0 (150X)
- Figures 7, 8 *Lithocyclia ocellus* group (see footnote i to Table 3)
7: 149-33(CC), Cse.1, N34/3 (150X)
8: same sample, Cse.2, D21/4 (150X)

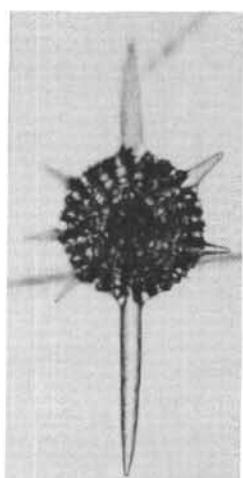
PLATE 2



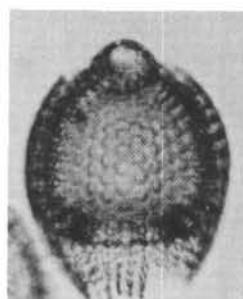
1



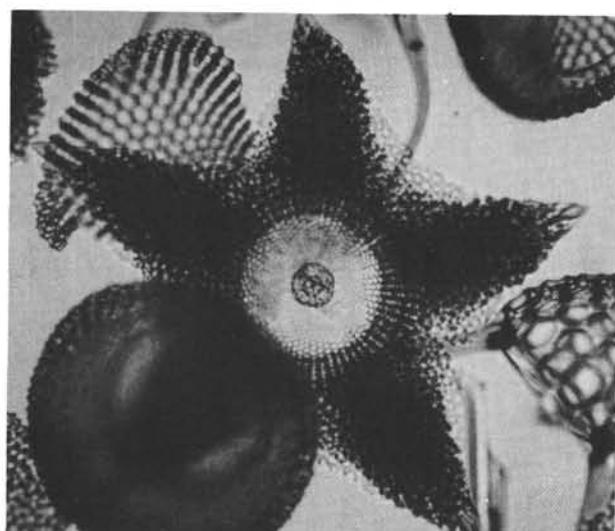
2



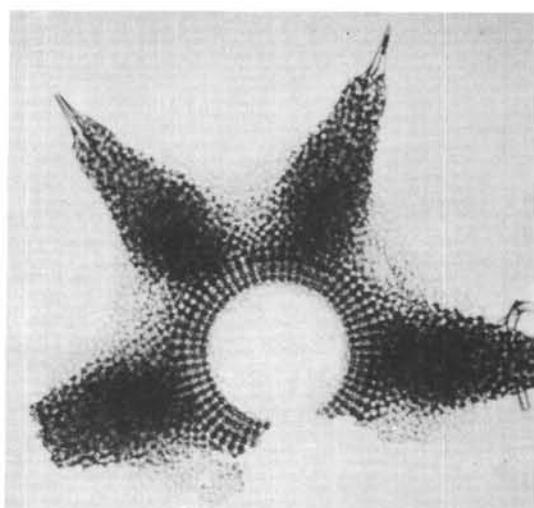
3



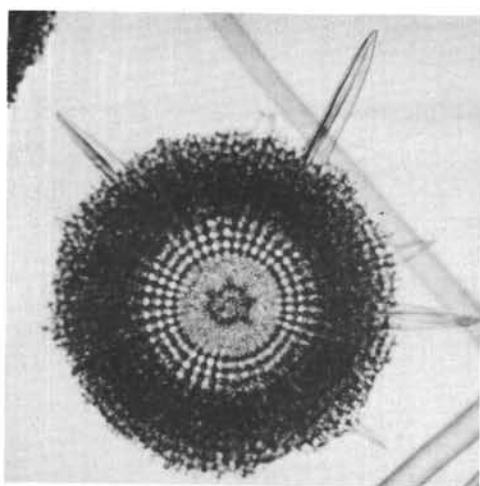
4



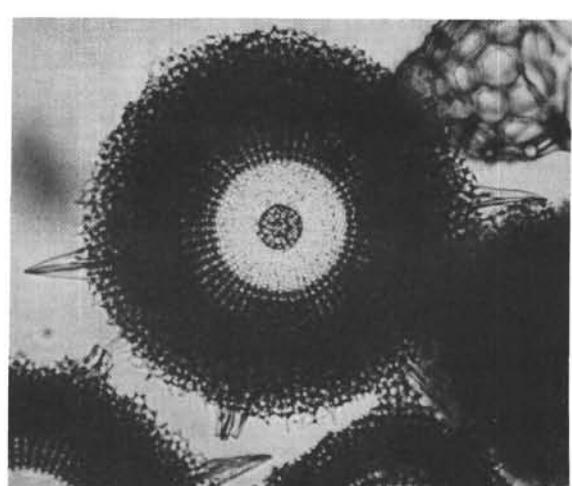
5



6



7

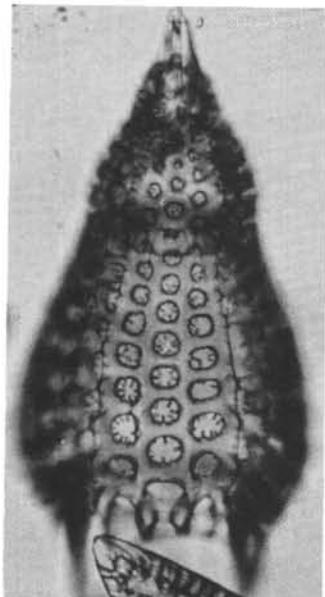


8

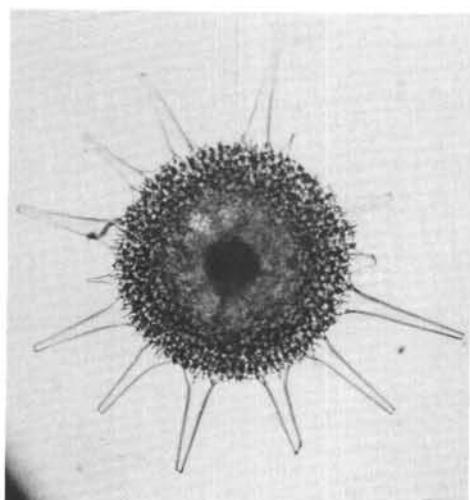
PLATE 3

- Figure 1 A well-preserved specimen of *Podocyrtis mitra* showing delicately subdivided pores. 149-35-2 (123-125 cm), Cse.1, J27/3 (255X)
- Figure 2 Coccodiscid gen. et sp. indet., found only in the lower part of Core 149-41. 149-41(CC), Cse.1, D8/0 (150X)
- Figures 3, 4 Many-rayed spongodiscids with pronounced marginal pyleome, occurring commonly in Cores 149-32 through 149-34.
3: 149-34(CC), Cse.2, V41/3
4: 149-34(CC), Cse.2, C10/0 (95X)
- Figure 5 *Anthocyrtoma* sp., resembling that illustrated by Riedel and Sanfilippo, 1970, Pl. 6, fig. 4, but showing a large tube-like or sack-like protuberance from the thoracic wall just above the lumbar stricture (right hand side of illustration). 149-38(CC), Cse.1, R41/4 (150X)
- Figure 6 *Lithelius hexaxyphophorus* (see footnote a to Table 4) 149-38(CC), Cse.1, N26/3 (150X)
- Figures 7, 8 *Rhabdolithis pipa* (see footnote b to Table 4)
7: 149-34-2 (18-20 cm), Cse.1, L32/0 (150X)
8: Detail, showing swollen part of *Rhabdolithis pipa*. 149-34-2 (18-20 cm), Cse.1, U40/4 (480X)
- Figure 9 Pterocorythid gen. et sp. indet., superficially similar to *Podocyrtis aphorma* (see footnote c to Table 4). 149-35-1 (104-106 cm), Cse.2, D40/0 (255X)
- Figures 10, 11 *Theocorys anapographa* (see footnote e to Table 4)
10: 149-32(CC), Ph.1, H15/1 (255X)
11: 149-32(CC), Ph.1, U41/2 (255X)

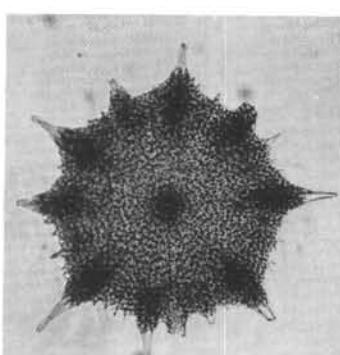
PLATE 3



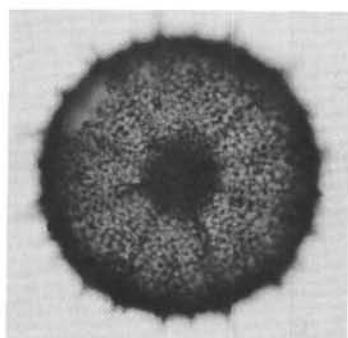
1



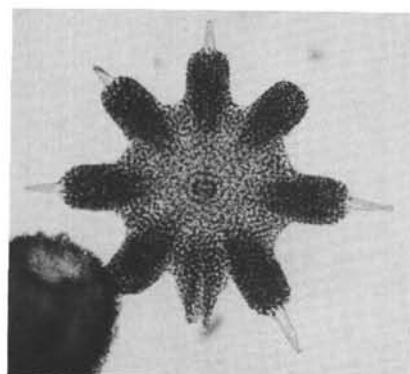
2



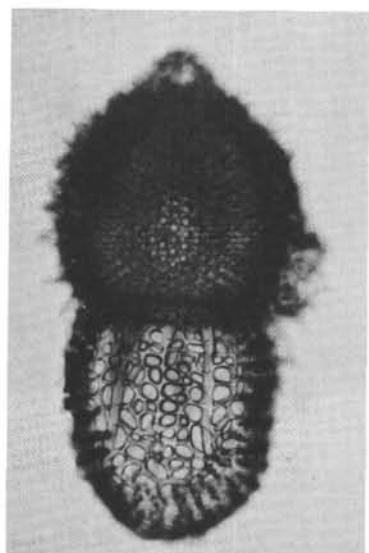
3



6



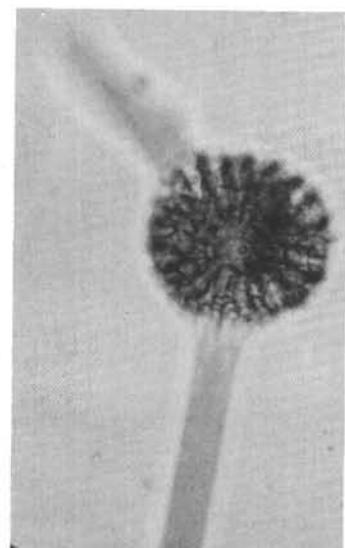
4



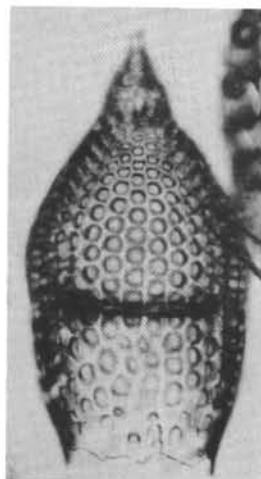
5



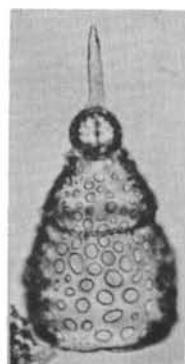
7



8



9



10



11

PLATE 4

- Figures 1-3 *Podocyrtis* sp. A (see footnote f to Table 4)
1: 149-37-3 (54-56 cm), Cse.2, F50/1 (255X)
2: 149-37-3 (54-56 cm), Cse.2, M12/2 (255X)
3: 149-37-4 (10-12 cm), Cse.2, P19/4 (255X)
- Figures 4-6 *Podocyrtis* sp. B (see footnote g to Table 4)
4: 149-37-3 (54-56 cm), Cse.2, Y45/4 (255X)
5: 149-37-4 (10-12 cm), Cse.1, S21/4 (255X)
6: 149-37-3 (54-56 cm), Cse.2, Q16/4 (255X)
- Figures 7-12 Unidentified, apparently Cretaceous radiolarians
7: 146-11-2 (27-37 cm), S1., R42/2 (150X)
8: 146-11-2 (27-37 cm), S1., V19/4 (255X)
9: 146-11-2 (27-37 cm), S1., N40/2 (255X)
10: 146-11-1 (85-100 cm), S1.1, L47/0 (165X)
11: 146-11-2 (27-37 cm), S1., U21/1 (255X)
12: 146-11-2 (27-37 cm), S1., N45/3 (255X)
- Figures 13-15 Unidentified Cretaceous radiolarians
13: 150-7-soup, S1.1, U44/2 (255X)
14: 150-7-soup, S1.2, 043/0 (255X)
15: 150-7-soup, S1.2, L36/2 (255X)

PLATE 4

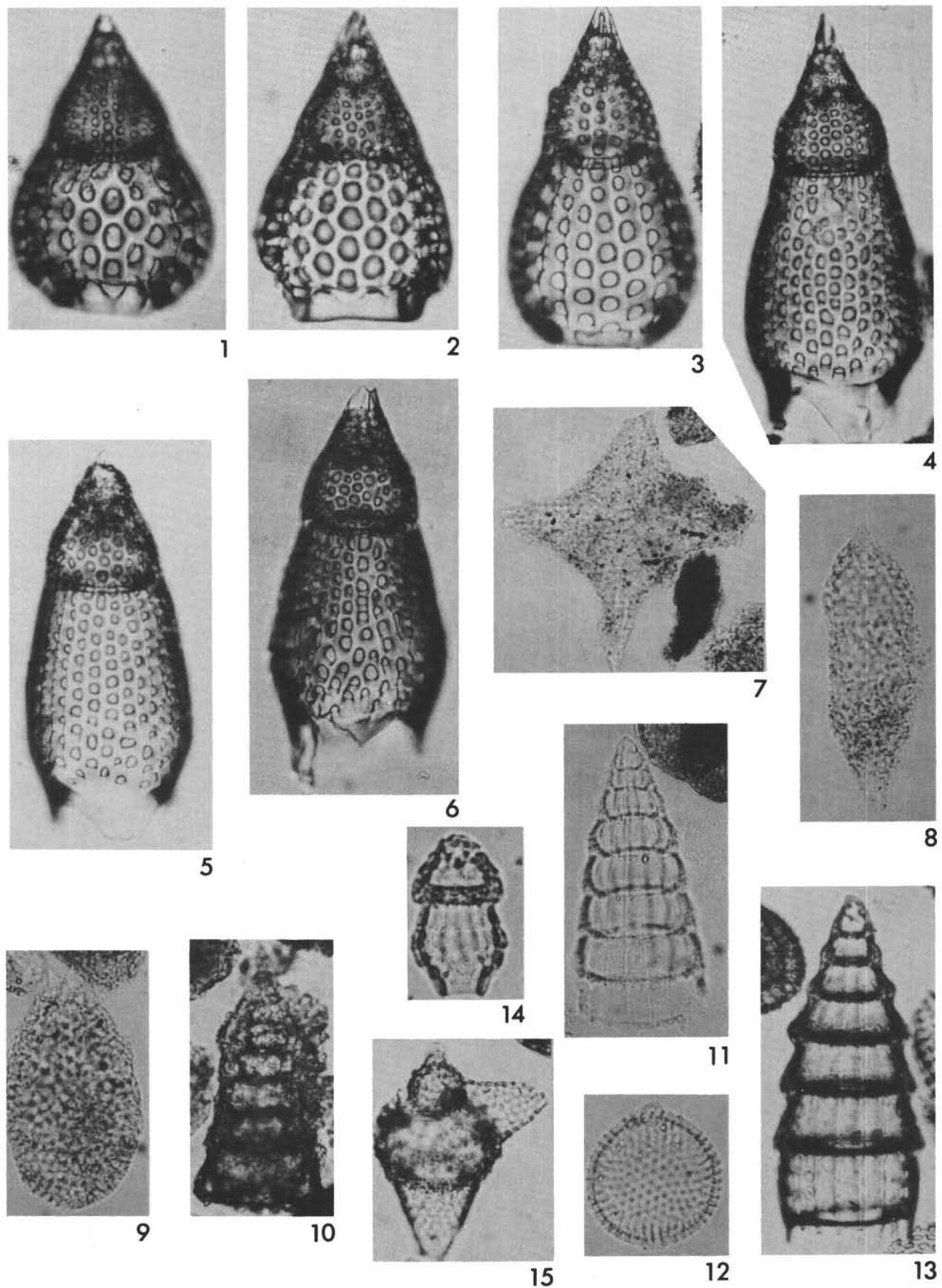
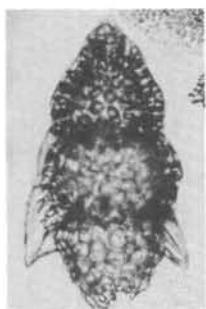


PLATE 5

- Figure 1 *Lithochytris archaea* 150-7-soup, S1.1, P13/4 (150X)
- Figures 2, 3 *Tepka* sp. (see footnote a to Table 5)
2: 151-6-1 (90-92 cm), S1.1, Q8/0 (255X)
3: 151-6-2 (77-80 cm), S1.1, 046/1 (255X)
- Figure 4 *Thecocrys* (?) cf. *T(?) physylla* (see footnote a to Table 6). 152-4-2 (85-87 cm), S1.2, Q26/3 (255X)
- Figure 5 *Buryella tetradica* with subdivided fourth segment (see footnote b to Table 6) 152-7-4 (145-147 cm), S1.2, V31/2 (255X)
- Figures 6, 7 Two views of the same specimen of a form believed to be ancestral to *Thrysocyrtis rhizodon* (see footnote c to Table 6). 152-1-1 (91-93 cm), Cse.1, K9/1 (255X)
- Figures 8, 9 Astrophaerin (?) spine with uniquely looped branches (see footnote d to Table 6)
8: 152-3-5 (133-135 cm), Cse.1, C21/0 (150X)
9: Temporary preparation made by Peter Lonsdale, from the core-catcher sample of Core 80 of Woods Hole Oceanographic Institution's expedition CHAIN 100 collected at lat. 08°18.8'S, long. 168°32.3'W, in 4732 meters of water.
- Figure 10 *Lamptonium* (?) *incohatum* (?) (see footnote e to Table 6). 152-7-3 (126-129 cm), Cse.2, W38/1 (150X)

PLATE 5



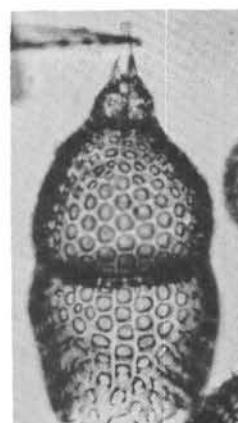
1



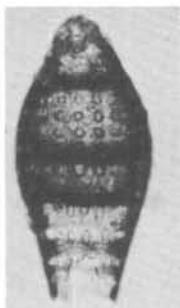
2



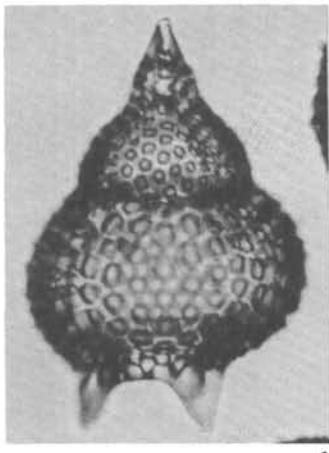
3



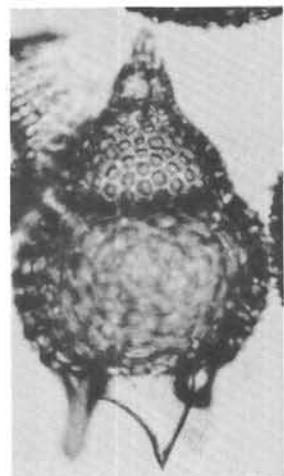
4



5



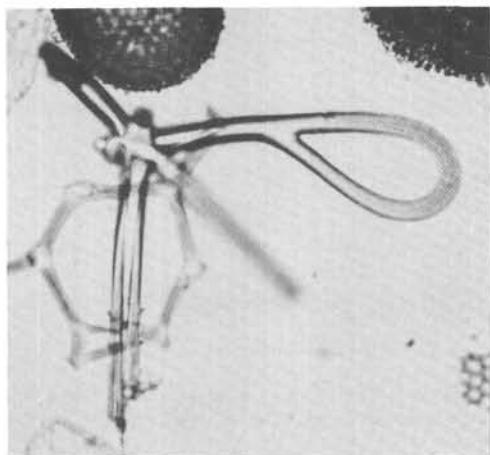
6



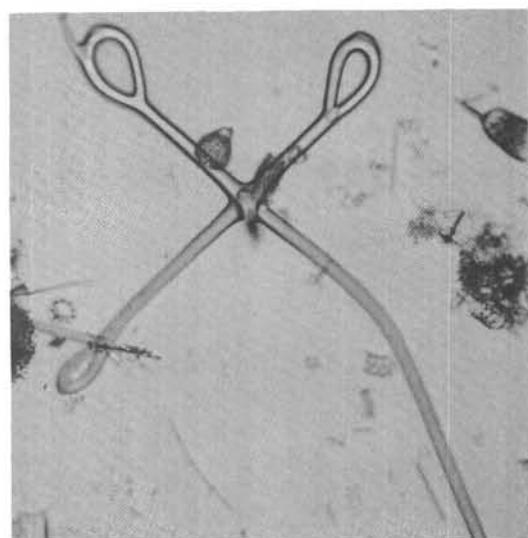
7



10



8



9