

## 20. RADIOLARIA FROM THE NORTHEASTERN ATLANTIC OCEAN DSDP LEG 48

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### ABSTRACT

This cruise collected sequences of radiolarian samples through the middle and early Eocene, which provide useful standards of comparison for other North Atlantic assemblages of this age. Two new species are described — *Pterocodon lex* and *Lamptonium obelix*. A few Neogene, Paleocene, and Cretaceous samples yielded identifiable radiolarians.

### INTRODUCTION

During Leg 48 *Glomar Challenger* carried no radiolarian paleontologist, and therefore the samples (many of them from core catchers), on which this chapter was based, were taken and sent to us by members of the shipboard party.

Samples from the following sites yielded radiolarians:

- Site 400 - 47°22.90'N, 09°11.90'W; water depth 4399 meters
- Site 401 - 47°25.65'N, 08°48.62'W; water depth 2495 meters
- Site 402 - 47°52.48'N, 08°50.44'W; water depth 2339.5 meters
- Site 403 - 56°08.13'N, 23°17.64'W; water depth 2301 meters
- Site 404 - 56°03.13'N, 23°14.95'W; water depth 2306 meters
- Site 405 - 55°20.18'N, 22°03.49'W; water depth 2958 meters

For the sites at which there are considerable numbers of samples with radiolarians adequate for stratigraphic interpretation, species present in each sample are tabulated (Tables 1 and 2). For other sites, a paragraph describes the occurrences in general terms. Table 3 is a list of radiolarian events (earliest and latest occurrences of taxa) arranged stratigraphically, from which is derived the summary range chart of Figure 2. In Figure 3, Eocene sections from Leg 48 are correlated with one another and with a low-latitude section cored on DSDP Leg 10. There is no systematic section, its place being taken by a species list which includes, however, descriptions of two new taxa.

### OCCURRENCES OF RADIOLARIANS

The following paragraphs briefly describe the radiolarian occurrences, Figure 1 summarizes this information in the framework of age assignments given in the Initial Core Description for Leg 48, and zonal assignments for the Eocene samples are indicated in Section 3 on stratigraphic correlation.

#### Hole 400A

Radiolarians of generally poor preservation occur in varying abundance in the Cretaceous to middle Eocene, and the Oligocene through Miocene parts of the section.

Assemblages in the late Miocene samples are too sparse and corroded to be useful for stratigraphic or taxonomic interpretation, with the slight exception of 400A-24, CC, which contains orosphaerid fragments (rare), actinommids (rare), pyloniids (rare), sphyrids (rare), *Eucyrtidium* spp. (rare), *Stichocorys delmontensis* (rare), *Carpocanistrum* sp(p). (rare), *Anthocyrtidium* sp. (rare), *Lamprocyclas* sp. (rare), *Lithomitra lineata* group (rare), and *Siphocampe corbula* (rare).

The middle Miocene core catcher sample of Core 29 does not contribute to our taxonomic understanding, but it contains orosphaerid fragments (common), actinommids (rare), *Cyrtocapsella japonica* (rare), pterocorythid fragments (very rare), artostrobiid fragments (very rare).

Radiolarians in early Miocene and Oligocene samples through 400A-45,CC are too sparse and corroded to provide new taxonomic insight, but some stratigraphic hints are provided by the few forms indicated in Table 1.

Although the radiolarians in 400A-46,CC are poorly preserved, they are certainly sufficient for interpretation as late Eocene rather than the early Oligocene indicated in the Initial Core Description. Species occurrences are shown in Table 2, and the correlation with other Eocene samples shown in Figure 3.

The radiolarians in middle and early Eocene samples from 400A-47,CC through 400A-53,CC are not well pre-

TABLE 1  
Radiolarian Occurrences in Hole 400A

Sample (Interval in cm)	Taxa																				
	Orosphaerids	Actinommids	Phacodiscids	Spongodiscids	Sphyrids	Theoperids	Carpocanistrum	Pterocorythids	Artostrobiids	Cannobotrythids	<i>Tepka perforata</i>	<i>Cyclampterium leptetrum</i>	<i>Cyrtocapsella cornuta</i>	<i>Cyrtocapsella japonica</i>	<i>Cyrtocapsella tetrapera</i>	<i>Eucyrtidium diaphanes</i>	<i>Eucyrtidium</i> sp.(p).	<i>Calocycletta</i> sp.	<i>Artostrobium miralense</i>	<i>Lithomitra lineata</i> group	
38-2, 5	C	F	-	-	F	R	F	-	-	-	-	R	-	-	-	-	-	-	-	-	-
39-2, 86-90	C	F	-	-	F	F	F	R	R	+	-	+	R	R	-	-	-	-	-	-	-
40-1, 30-32	R	F	+	-	F	C	F	F	R	+	-	-	-	-	C	-	R	-	-	R	+
40-2, 116-118	F	F	+	-	F	C	F	R	R	-	+	-	F	-	F	+	R	R	+	+	+
43-5, 43-45	R	F	+	R	F	R	F	R	-	+	-	-	-	-	-	-	-	-	-	-	-
44, CC	+	R	+	R	R	R	R	R	+	-	-	-	-	-	-	-	-	-	-	-	-
45, CC	R	R	+	R	R	R	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: Abundances are indicated as C (common), F (few), R (rare), + (very rare), and - (searched for but not found).





TABLE 3  
Eocene Radiolarian Events at Sites 400, 401, 402, and 405

Events	400A	401	402A	405
Tm <i>Lophocyrtis jacchia</i>		Above -2,CC M (94)		
Tm <i>Lychnocanoma amphitrite</i>	Above -46,CC G (512)	Above -2,CC G (94)	Above -1-7 M (146)	
Bm <i>Dorcadospyrus atechus</i>		-2,CC -3,CC P (94-104)		
Tm <i>Tristylospyrus tricerus</i>		-3,CC -4,CC P (104-113)		
Tm <i>Sethocyrtis triconiscus</i>	Above -46,CC M (512)			
Tm <i>Amphymenium splendarmatum</i>	Above -46,CC P (512)			
Tm <i>Periphaena decora</i>	Above -46,CC M (512)	Above -4,CC M (113)		
Tm <i>Theocampe pirum</i>	Above -46,CC M (512)	-3,CC -4,CC M (104-113)	Above -5-4 M (133)	
Tm <i>Theocampe mongolfieri</i>	Above -46,CC G (512)	Above -4,CC G (113)		
Tm <i>Podocyrtis helenae</i>		Above -4,CC M (113)		
Tm <i>Lithapium mitra</i>	Above -46,CC G (512)	Above -4,CC G (113)	Above -1-7 P (146)	
Tm <i>Eusyringium fistuligerum</i>	Above -46,CC M (512)	Above -4,CC G (113)	Above -1-7 G (146)	
Tm <i>Calocyclus hispida</i>	Above -46,CC G (512)	Above -4,CC G (113)	Above -1-7 M (146)	
Tm <i>Lychnocanoma bellum</i>	Above -46,CC G (512)	Above -4,CC G (113)	Above -1-7 G (146)	
Tm <i>Podocyrtis papalis</i>	Above -46,CC G (512)	Above -4,CC G (113)	Above -4-4 G (170)	
Tm <i>Calocyclus turris</i>	Above -46,CC G (512)	Above -4,CC M (113)	Above -1-7 M (146)	
Tm <i>Theocotyle ficus</i>	Above -46,CC P (512)	Above -4,CC P (113)		
Tm <i>Phormocyrtis striata striata</i>	Above -46,CC P (512)	Above -4,CC M (113)	Above -1-7 G (146)	Above -12-3 G (106)
Tm <i>Dictyophimus craticula</i>	Above -46,CC M (512)	-4,CC -5,CC P (113-123)		
Bm <i>Cyclampterium milowi</i>		-4,CC -5,CC M (113-123)		
Tm <i>Thyrsocyrtis triacantha</i>		-4,CC -5,CC M (113-123)		
Bm <i>Lophocyrtis jacchia</i>		-4,CC -5,CC G (113-123)		
Tm <i>Lithocyelia ocellus group</i>	Above -46,CC G (512)	-4,CC -5,CC M (113-123)	Above -1-7 M (146)	

TABLE 3 - Continued

Events	400A	401	402A	405
Bm <i>Lithocyelia aristotelis group</i>		4,CC -5,CC M (113-123)		
Tm <i>Lithocyrtis vespertilio</i>	Above -46,CC M (512)	-4,CC -5,CC (113-123)		
Tm <i>Podocyrtis mitra</i>	Above -46,CC M (512)	-4,CC -5,CC P (113-123)		Above -4-4 M (170)
Tm <i>Podocyrtis trachodes</i>		-4,CC -5,CC P (113-123)		
Tm <i>Lophocyrtis biaurita</i>	Above -46,CC G (512)	-4,CC -5,CC M (113-123)		Above -12-3 G (106)
Tm <i>Spongatractus pachystylus</i>	Above -46,CC M (512)	-4,CC -5,CC P (113-123)		
Tm <i>Lithocyrtis archaea</i>	Above -46,CC P (512)	-4,CC -6,CC P (113-132)		
Tm <i>Lamptonium obelix</i>	Above -46,CC P (512)	-5,CC -6,CC P (123-132)		
Tm <i>Eusyringium lagena</i>	Above -46,CC G (512)	-6,CC -7-6 M (132-141)		
Bm <i>Sethocyrtis triconiscus</i>	-47,CC -48-2 M (521-525)	-4,CC -6,CC P (113-132)		
Bm <i>Theocampe pirum</i>	-47,CC -48-2 M (521-525)	-4,CC -5,CC P (113-123)		
Tm <i>Spongodiscus rhabdostylus</i>	-47,CC -48-2 P (521-525)	-4,CC -5,CC P (113-123)		
Tm <i>Lithapium anoectum</i>	-47,CC -48-2 P (521-525)	-5,CC -6,CC M (123-132)		-2-1 -3-7 M (147-166)
Bm <i>Calocyclus turris</i>	-47,CC -48-2 M (521-525)	-4,CC -5,CC M (113-123)		Below -4-4 M (170)
Tm <i>Lithapium plegmacantha</i>		-5,CC -6,CC P (123-132)		
Bm <i>Podocyrtis trachodes</i>		-5,CC -6,CC P (123-132)		
Bm <i>Lithapium mitra</i>	-47,CC -48-2 M (521-525)	-6,CC -7-6 M (132-140)		Below -4-4 G (170)
Bm <i>Podocyrtis helenae</i>		-6,CC -7-6 P (132-140)		
Bm <i>Podocyrtis mitra</i>	-47,CC -48-2 M (521-525)	-6,CC -7-6 M (132-140)		Below -4-4 M (170)
Tm <i>Podocyrtis ampla ampla</i>				-2-1 -3-7 P (147-165)
Tm <i>Periphaena tripyramis triangula</i>	-48-2 -49,CC M (525-540)	-4,CC -5,CC P (113-123)		
Bm <i>Podocyrtis ampla ampla</i>				-3-7 -4-4 P (165-170)
Bm <i>Eusyringium fistuligerum</i>	-48-2 -49,CC G (525-540)	-6,CC -7-6 G (132-140)		Below -4-4 M (170)

TABLE 3 - Continued

Events	400A	401	402A	405
Tm <i>Rhopalocanium ornatum</i>		-7-6 -8,CC P (140-151)		
Tm <i>Spongodiscus phrix</i>	-48-2 -49,CC P (525-540)	-7-6 -8,CC M (140-151)		
Tm <i>Podocyrtis diamesa</i>	-48-2 -49,CC M (525-540)	-8,CC -9-6 M (151-160)		
Tm <i>Podocyrtis dorus</i>	-48-2 -49,CC M (525-540)	-8,CC -9-6 M (151-160)		
Tm <i>Podocyrtis platypus</i>		-8,CC -9-6 M (151-160)		
Tm <i>Theocotyle cryptocephala conica</i>	-50,CC -51,CC P (550-559)	-8,CC -9-6 M (151-160)		
Bm <i>Spongodiscus phrix</i>	-49,CC -50,CC P (540-550)	Below -10,CC P (170)		
Tm <i>Lamptonium fabaeforme constrictum</i>	-50,CC -51,CC P (550-559)	-9-6 -10,CC M (160-170)		
Bm <i>Eusyringium lagena</i>	-50,CC -51,CC M (550-559)	-9-6 -10,CC P (160-170)		
Bm <i>Podocyrtis dorus</i>	-50,CC -51,CC M (550-559)	-9-6 -10,CC P (160-170)		
Bm <i>Theocampe mongolfieri</i>	-50,CC -51,CC M (550-559)	-9-6 -10,CC M (160-170)	Below -4-4 M (170)	Above -12-3 P (106)
Bm <i>Lithapium plegmacantha</i>		-9-6 -10,CC P (160-170)		
Bm <i>Thyrsoyrtis triacantha</i>	-49,CC -50,CC M (540-550)	Below -10,CC G (170)		
Bm <i>Spongatractus pachystylus</i>	-49,CC -50,CC M (540-550)	Below -10,CC M (170)		
Bm <i>Periphaena decora</i>	-50,CC -51,CC M (550-559)	Below -10,CC M (170)		
Tm <i>Theocotyle cryptocephala cryptocephala</i>	-50,CC -51,CC P (550-559)			
Bm <i>Lithapium anoectum</i>	-50,CC -51,CC M (550-559)	Below -10,CC M (170)	Below -4-4 M (170)	
Tm <i>Theocotyle cryptocephala nigrinae</i>	-50,CC -51,CC P (550-559)			
Bm <i>Lychnocanoma amphitrite</i>	-50,CC -51,CC M (550-559)	-8,CC -9-6 P (151-160)		
Bm <i>Lithocyclus ocellus group</i>	-50,CC -51,CC M (550-559)	Below -10,CC G (170)	Below -4-4 M (170)	
Bm <i>Lithochytris vespertilio</i>	-51,CC -52,CC G (559-569)	-9-6 -10,CC P (170)		

TABLE 3 - Continued

Events	400A	401	402A	405
Bm <i>Dictyophimus craticula</i>	-51,CC -52,CC P (559-569)	Below -10,CC M (170)		
Bm <i>Theocotyle cryptocephala nigrinae</i>	-51,CC -52,CC P (559-569)			
Bm <i>Theocotyle cryptocephala cryptocephala</i>	-51,CC -52,CC P (559-569)			
Bm <i>Theocotyle cryptocephala conica</i>	-51,CC -52,CC P (559-569)			
Bm <i>Calocyclus hispidus</i>	-51,CC -52,CC M (559-569)	Below -10,CC G (170)	Below -4-4 M (170)	
Bm <i>Lamptonium fabaeforme constrictum</i>	-51,CC -52,CC P (559-569)	Below -10,CC M (170)		
Bm <i>Periphaena tripyramis triangula</i>	-51,CC -52,CC P (559-569)			
Bm <i>Lithochytris archaea</i>	-51,CC -52,CC P (559-569)	Below -10,CC P (170)		
Bm <i>Theocotyle ficus</i>	-51,CC -52,CC M (559-569)	Below -10,CC M (170)		
Bm <i>Lychnocanoma bellum</i>	-52,CC -53,CC G (569-578)	Below -10,CC G (170)		
Bm <i>Spongodiscus rhabdostylus</i>	-52,CC -53,CC P (569-578)	Below -10,CC M (170)	Below -4-4 G (170)	
Bm <i>Lamptonium obelix</i>	Below -53,CC M (578)	-9-6 -10,CC P (160-170)		
Bm <i>Podocyrtis diamesa</i>	Below -53,CC M (578)	Below -10,CC G (170)		
Bm <i>Rhopalocanium ornatum</i>		Below -10,CC P (170)		
Bm <i>Podocyrtis platypus</i>		Below -10,CC M (170)		
Bm <i>Phormocyrtis striata striata</i>	Below -53,CC G (578)	Below -10,CC G (170)	Below -4-4 M (170)	Below -19-3 P (174)
Bm <i>Amphymenium splendiaratum</i>	Below -53,CC M (578)			
Bm <i>Pterocodon lex</i>				-15-6 -16-7 M (139-150)
Bm <i>Lophocyrtis biaurita</i>	Below -53,CC G (578)	Below -10,CC G (170)		Below -19-3 G (174)
Bm <i>Podocyrtis papalis</i>	Below -53,CC G (578)		Below -4-4 G (170)	

Note: The arrangement and abbreviations conform to those that we have used previously (Sanfilippo and Riedel, 1973, p. 479), except that the limits indicated are morphotypic and not evolutionary.

Age	Bay of Biscay			Holes			
	400A	401	402	402A	Rockall Plateau		
					403	404	405
Quaternary			Core 1 Few Good		Core 2 Rare Poor		
Pliocene					Cores 7-8 Few Moderate		
Late Miocene	Cores 20-25 Rare Very poor - moderate				Cores 11-22 Rare - few Very poor - good		
Middle Miocene	Core 29 Few Very poor						
Early Miocene	Cores 38-40 Few - common Very poor - poor						
Oligocene	Cores 43-46 Rare - common Very poor - poor						
Late Eocene		Cores 2-4 Few - common Moderate - good	Core 5 Few Moderate	Core 1 Few Moderate			
Middle Eocene	Cores 47-52 Few - common Poor	Cores 5-10 Common Moderate - good		Cores 2-4 Few - common Moderate			Cores 12-14 Common Moderate
Early Eocene	Core 53 Common Poor	Cores 11-12 Common Very poor				Cores 7-8 Few Poor	Core 15 Common Moderate
Paleocene	Core 59 Common Very poor	Core 14 Common Moderate					
Cretaceous	Cores 64-66, 72 Rare - common Very poor - moderate			Cores 11-14 Rare Very poor - poor			

Figure 1. Summary of radiolarian occurrences, with notations on abundance (rare, few, or common) and preservation (good, moderate, poor, or very poor).

late Miocene samples radiolarians are rare to few, usually moderately to well preserved.

Most of the radiolarians in the sparse assemblage at 403-2-4, 12-14 cm are similar to those recorded from Core 402-1, *Thecosphaera grecoi* (rare), *Heliodiscus asteriscus* (rare), *Eucyrtidium cienkowskii* (very rare), *Artostrobium miralestense* (rare), but two differences were noted. This more northerly assemblage yielded two specimens of a robust phacodiscid, and the majority of the artostrobiids here belong to *Artostrobium miralestense* rather than to the more delicate *Artostrobium auritum* group.

Samples 403-3-3, 88-90 cm and 403-22-6, 87-89 cm contain rare poorly preserved specimens insufficient for identification. In the assemblages from 403-7-2, 102-104 cm; 403-11-4, 117-119 cm; 403-12-7, 41-43 cm; 403-14-2, 68-70 cm; and 403-21-2, 144-148 cm orosphaerid fragments are rare, collosphaerids rare, actinommids common, artiscins very rare, phacodiscids rare, spongodiscids common, pyloniids, litheliids and spyrids rare, theoperids few to common, carpocaniids rare, pterocorythids rare to few, artostrobiids few to common, cannobotrythids rare. Ident-

tified forms in the above samples are: *Hexacontium hootsi* (rare), *Hexalonche heracliiti* (very rare), *Thecosphaera grecoi* (rare), *Heliodiscus asteriscus* (rare, not found in 403-7-2), *Eucyrtidium cienkowskii* group (very few), *Eucyrtidium punctatum* group (rare to few, not found in 403-7-2), *Stichocorys peregrina* (rare to few, not found in 403-7-2), *Pterocanium* spp. (rare), *Carpocanarium* spp. (rare, not found in 403-7-2), *Artostrobium auritum* group (rare to common), *Artostrobium miralestense* (rare), *Lithomitra lineata* group (rare to common), *Siphocampe corbula* (rare to few, none found in 403-11-3 and 403-12-7), *Botryopyle dictyocephalus* group (rare). *Haeckeliella inconstans* (rare), was found only in 403-14-2, 68-70 cm. *Lithomelissa campanulaeformis* (rare) was found only in 403-12-7, 41-43 cm. Sample 403-7-2, 102-104 cm contained, in addition, reworked *Cyrtocapsella japonica* (rare) and *C. tetrapera* (rare).

#### Hole 404

Early Eocene samples contain few radiolarians, poorly preserved. In the assemblages from Samples 404-7-2, 100-

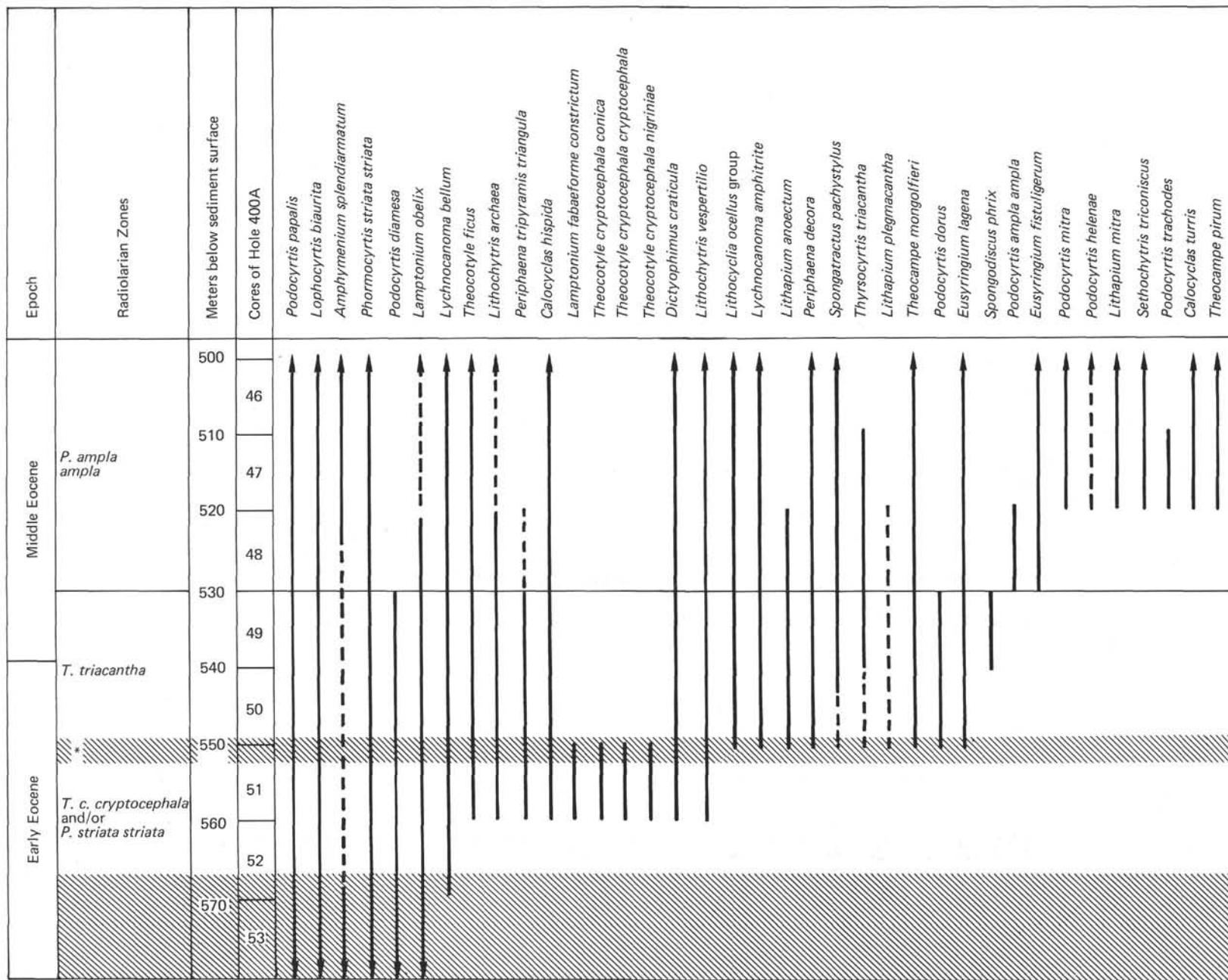


Figure 2. Range chart of Eocene species in the Leg 48 sequences. The vertical scale is provided by the cores of Hole 400A. Ranges are plotted as if there were no gaps between cores, and as if our single samples represented each entire core.

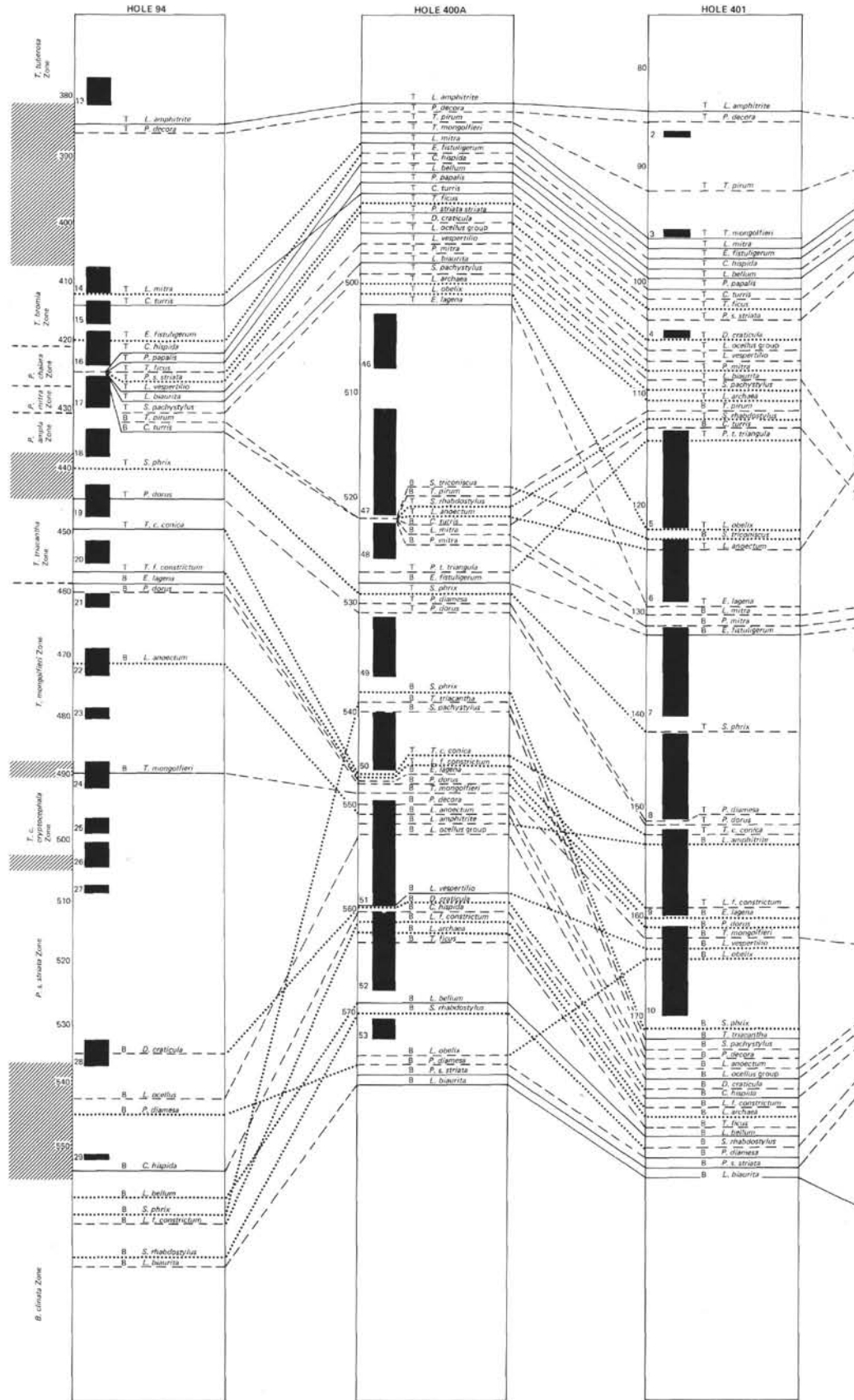


Figure 3. Radiolarian events available for correlation between Leg 48 holes, and with Hole 94 in the Gulf of Mexico (left-hand column). On the left of each column are shown depths below sediment surface in meters. Numbered black rectangles represent cores. Solid correlation lines are judged to be the most reliable, and dotted ones the least. The zonal boundaries at the left correspond to their positions in Hole 94.



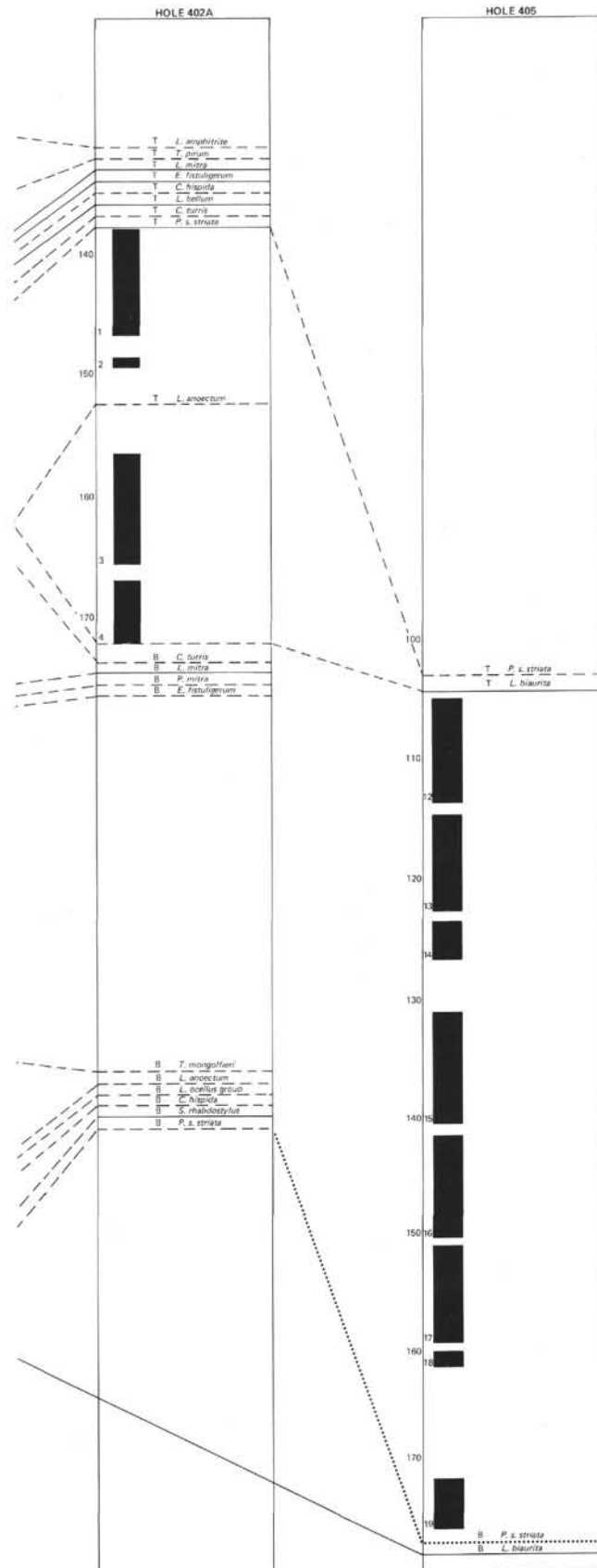


Figure 3. (Continued).

102 cm; 404-8-1, 128-131 cm; and 404-8-2, 52-54 cm, actinommids are common, spongodiscids few, phacodiscids few, sphyrids moderately rare, theoperids rare, artostrobiids rare, and plagoniids rare.

#### Hole 405

In the eight samples examined from early and middle Eocene cores, radiolarians are common, and moderately preserved; their occurrences are shown in Table 2.

### STRATIGRAPHIC CORRELATION OF EOCENE SEQUENCES

In Table 3, an attempt is made to arrange the earliest and latest occurrences of radiolarian taxa in stratigraphic order, with a minimum number of inconsistencies. The resulting range chart is shown in Figure 2, and the correlation diagram in Figure 3. Not all of the species included in Table 2 yielded data sufficiently useful to permit their incorporation in the events list, the range chart, or the correlation diagram.

In this initial investigation of the Leg 48 material we have concentrated on species useful for correlation in lower latitudes, with the consequence that some interesting forms that might be useful in higher latitudes have not been treated. The degree to which these North Atlantic sequences can be correlated with the low-latitude radiolarian zonation is indicated by the left-hand column of Figure 3, showing radiolarian events in the order of their occurrence at DSDP Site 94 in the Gulf of Mexico (Sanfilippo and Riedel, 1973). The boundaries between radiolarian zones are drawn to be consistent with definitions of zonal boundaries as revised by Riedel and Sanfilippo (in press).

As might be expected, correlations over this large latitudinal distance are tenuous, as they are to some extent between the sequences of widely spaced samples submitted. The *Thyrsoyrtis bromia* Zone seems to be represented by Cores 401-2 and -3. Core 401-4 may belong either in the *Podocyrtis chalara* Zone or *P. mitra* Zone. The *Podocyrtis ampla* Zone may include Cores 400A-46 to -48, 401-5 to -7 or -8, and 402A-1 through -4. The *Thyrsoyrtis triacantha* Zone seems to be represented by Cores 400A-49 and -50, and 401-9 and possibly -8. The *Theocampe mongolfieri* Zone was not recognized. Cores 400A-51, and possibly -52 and -53, and 401-10, apparently belong in the *Theocotyle cryptocephala cryptocephala* Zone or the *Phormocyrtis striata striata* Zone. It has not been possible to recognize any of these zones in the cores from Site 405.

### SPECIES LIST

The purpose of this list is to provide bibliographic references to the taxa mentioned in this chapter, and to serve as a taxonomic index. We have rather uncritically followed the generic assignments applied by earlier authors, since shortage of time has prevented our examining the relationships of type species of genera. Type specimens of new species will be deposited in the U.S. National Museum of Natural History.

#### *Amphicraspedum prolixum* Sanfilippo and Riedel

*Amphicraspedum prolixum* Sanfilippo and Riedel, 1973, p. 524, pl. 10, fig. 7-11; pl. 28, fig. 3, 4.  
This chapter: Table 2.

#### *Amphipyndax stocki* (Campbell and Clark)

*Stichocapsa* (?) *stocki* Campbell and Clark, 1944b, p. 44, pl. 8, fig. 31-33.  
*Amphipyndax stocki* (Campbell and Clark), Foreman, 1968, p. 78, pl. 8, fig. 12a-c.  
This chapter: Site 400A text.

#### *Amphiternis clava* (Ehrenberg)

*Lithocampe* ? *clava* Ehrenberg, 1873, p. 238; 1875, p. 76, pl. 4, fig. 2.  
*Amphiternis clava* (Ehrenberg), Foreman, 1973a, p. 430, pl. 7, fig. 16, 17; pl. 9, fig. 2, 7.  
This chapter: Table 2.

#### *Amphymenium splendarmatum* Clark and Campbell

*Amphymenium splendarmatum* Clark and Campbell, 1942, p. 46, pl. 1, fig. 12, 14.  
This chapter: Tables 2, 3; Figure 2.

#### *Artophormis barbadensis* (Ehrenberg)

*Calocyclus barbadensis* Ehrenberg, 1873, p. 217; 1875, p. 66, pl. 18, fig. 8.  
*Artophormis barbadensis* (Ehrenberg), Haeckel, 1887, p. 1459.  
*Artophormis barbadensis* (Ehrenberg), Riedel and Sanfilippo, 1970, p. 532, pl. 13, fig. 5.  
This chapter: Table 2.

#### *Artostrobium auritum* (Ehrenberg) group

*Lithocampe aurita* Ehrenberg, 1844, p. 84; 1854, pl. 22, fig. 25.  
*Artostrobium auritum* (Ehrenberg) group, Riedel and Sanfilippo, 1971, p. 1599, pl. 1H, fig. 5-8.  
This chapter: Site 402 text, 403 text.

#### *Artostrobium miralestense* (Campbell and Clark)

*Dictyocephalus miralestensis* Campbell and Clark, 1944a, p. 45, pl. 6, fig. 12-14.  
*Artostrobium miralestense* (Campbell and Clark), Riedel and Sanfilippo, 1971, p. 1599, pl. 1H, fig. 9-17; pl. 2I, fig. 9, 10; pl. 3E, fig. 12.  
This chapter: Site 403 text; Table 1.

#### *Bekoma bidartensis* Riedel and Sanfilippo

*Bekoma bidartensis* Riedel and Sanfilippo, 1971, p. 1592, pl. 7, fig. 1-7.  
*Bekoma bidartensis* Riedel and Sanfilippo, Foreman, 1973a, p. 432, pl. 3, fig. 20, 21; pl. 10, fig. 6.  
This chapter: Site 401 text.

#### *Bekoma campechensis* Foreman

*Bekoma campechensis* Foreman, 1973a, p. 432, pl. 3, fig. 24; pl. 10, fig. 1, 2, 4.  
This chapter: Site 401 text.

#### *Bekoma divaricata* Foreman

*Bekoma divaricata* Foreman, 1973a, p. 433, pl. 3, fig. 23; pl. 10, fig. 3, 4.  
This chapter: Site 401 text.

#### *Botryopyle dictyocephalus* Haeckel group

*Botryopyle dictyocephalus* Haeckel, 1887, p. 1113, pl. 96, fig. 6.  
*Botryopyle dictyocephalus* Haeckel group, Riedel and Sanfilippo, 1971, p. 1602, pl. 2J, fig. 20, 21; pl. 3F, fig. 13.  
This chapter: Site 403 text.

#### *Buryella tetradica* Foreman

*Buryella tetradica* Foreman, 1973a, p. 433, pl. 8, fig. 4, 5; pl. 9, fig. 13, 14.  
This chapter: Site 401 text.

#### *Calocyclus hispida* (Ehrenberg)

*Anthocyrtis hispida* Ehrenberg, 1873, p. 216; 1875, pl. 8, fig. 2.  
*Cycladophora hispida* (Ehrenberg), Riedel and Sanfilippo, 1970, p. 529, pl. 10, fig. 9.  
*Calocyclus hispida* (Ehrenberg), Foreman, 1973a, p. 434, pl. 1, fig. 12-15; pl. 9, fig. 18.  
This chapter: Tables 2, 3; Figures 2, 3.

**Calocyclus turris Ehrenberg**

- Calocyclus turris* Ehrenberg, 1873, p. 218; 1875, p. 66, pl. 18, fig. 7.  
*Cycladophora turris* (Ehrenberg), Riedel and Sanfilippo, 1970, p. 529, pl. 13, fig. 3, 4.  
*Calocyclus turris* Ehrenberg, Foreman, 1973a, p. 434.  
 This chapter: Tables 2, 3; Figures 2, 3.

**Carpocanistrum (?) azyx Sanfilippo and Riedel**

- Carpocanistrum (?) azyx* Sanfilippo and Riedel, 1973, p. 530, pl. 35, fig. 9.  
 This chapter: Table 2.

**Ceratospyrus articulata Ehrenberg**

- Ceratospyrus articulata* Ehrenberg, 1873, p. 218; 1875, pl. 20, fig. 4.  
*Ceratospyrus articulata* Ehrenberg, Sanfilippo and Riedel, 1973, p. 526, pl. 15, fig. 1-3; pl. 31, fig. 8, 9.  
 This chapter: Table 2.

**Cyclampterium leptetrum Sanfilippo and Riedel**

- Cyclampterium ? leptetrum* Sanfilippo and Riedel, 1970, p. 456, pl. 2, fig. 11, 12.  
 This chapter: Table 1.

**Cyclampterium milowi Riedel and Sanfilippo**

- Cyclampterium (?) milowi* Riedel and Sanfilippo, 1971, p. 1593, pl. 3B, fig. 3; pl. 7, fig. 8, 9.  
 This chapter: Tables 2, 3.

**Cyrtocapsella cornuta Haeckel**

- Cyrtocapsa (Cyrtocapsella) cornuta* Haeckel, 1887, p. 1513, pl. 78, fig. 9.  
*Cyrtocapsella cornuta* Haeckel, Sanfilippo and Riedel, 1970, p. 453, pl. 1, fig. 19, 20.  
 This chapter: Table 1.

**Cyrtocapsella japonica (Nakaseko)**

- Eusyringium japonicum* Nakaseko, 1963, p. 193, pl. 4, fig. 1-3.  
*Cyrtocapsella japonica* (Nakaseko), Sanfilippo and Riedel, 1970, p. 452, pl. 1, fig. 13-15.  
 This chapter: Site 400A text, 403 text; Table 1.

**Cyrtocapsella tetrapera Haeckel**

- Cyrtocapsa (Cyrtocapsella) tetrapera* Haeckel, 1887, p. 1512, pl. 78, fig. 5.  
*Cyrtocapsella tetrapera* Haeckel, Sanfilippo and Riedel, 1970, p. 453, pl. 1, fig. 16-18.  
 This chapter: Site 403 text; Table 1.

**Dictyophimus craticula Ehrenberg**

- Dictyophimus craticula* Ehrenberg, 1873, p. 223; 1875, pl. 5, fig. 4, 5.  
*Dictyophimus craticula* Ehrenberg, Sanfilippo and Riedel, 1973, p. 529, pl. 19, fig. 1; pl. 33, fig. 11.  
 This chapter: Tables 2, 3; Figures 2, 3.

**Dorcadospyrus ateuchus (Ehrenberg)**

- Ceratospyrus ateuchus* Ehrenberg, 1873, p. 218; 1875, pl. 21, fig. 4.  
*Dorcadospyrus ateuchus* (Ehrenberg), Riedel and Sanfilippo, 1970, p. 523, pl. 15, fig. 4.  
 This chapter: Tables 2, 3.

**Eucyrtidium cienkowskii Haeckel group**

- cf. *Eucyrtidium cienkowskii* Haeckel, 1887, p. 1493, pl. 80, fig. 9.  
*Eucyrtidium cienkowskii* Haeckel group, Riedel and Sanfilippo in Sanfilippo et al., 1973, p. 221, pl. 5, fig. 5, 6.  
 This chapter: Site 402 text, 403 text.

**Eucyrtidium diaphanes Sanfilippo and Riedel**

- Calocyclus coronata* Carnevale, 1908, p. 33, pl. 4, fig. 24 (not *Eucyrtidium coronatum* Ehrenberg, 1873).  
*Eucyrtidium diaphanes* Sanfilippo and Riedel, in Sanfilippo et al., 1973 p. 221, pl. 5, fig. 12-14 (new name).  
 This chapter: Table 1.

**Eucyrtidium punctatum (Ehrenberg) group**

- cf. *Lithocampe punctata* Ehrenberg, 1844, p. 84.  
*Eucyrtidium punctatum* (Ehrenberg) group, Riedel and Sanfilippo, in Sanfilippo et al., 1973, p. 221, pl. 5, fig. 15, 16.  
 This chapter: Site 403 text.

**Eusyringium fistuligerum (Ehrenberg)**

- Eucyrtidium fistuligerum* Ehrenberg, 1873, p. 229; 1875, p. 70, pl. 9, fig. 3.  
*Eusyringium fistuligerum* (Ehrenberg), Riedel, 1957, p. 94, pl. 4, fig. 8.  
*Eusyringium fistuligerum* (Ehrenberg), Foreman 1973b, p. 435, pl. 11, fig. 6.  
 This chapter: Tables 2, 3; Figures 2, 3.

**Eusyringium lagena (Ehrenberg)**

- Lithopora lagena* Ehrenberg, 1873, p. 241, pl. 3, fig. 4.  
*Eusyringium lagena* (Ehrenberg) (?), Riedel and Sanfilippo, 1970, p. 527, pl. 8, fig. 5-7.  
*Eusyringium lagena* (Ehrenberg) (?), Foreman, 1973a, p. 435, pl. 11, fig. 4, 5.  
 This chapter: Tables 2, 3; Figures 2, 3.

**Haeckeliella inconstans Dumitrica**

- Haeckeliella inconstans* Dumitrica, 1973, p. 833, pl. 7, fig. 1, 2; pl. 18, fig. 7-22.  
 This chapter: Site 403 text.

**Heliodiscus asteriscus Haeckel**

- Heliodiscus asteriscus* Haeckel, 1887, p. 445, pl. 33, fig. 8.  
 This chapter: Site 403 text.

**Hexacantium hootsi Campbell and Clark**

- Hexacantium hootsi* Campbell and Clark, 1944a, p. 14, pl. 2, fig. 5.  
 This chapter: Site 402 text, 403 text.

**Hexalonche heracliti Haeckel**

- Hexalonche heracliti* Haeckel, 1887, p. 187, pl. 22, fig. 7.  
 This chapter: Site 403 text.

**Lamptonium fabaeforme constrictum Riedel and Sanfilippo**

- Lamptonium (?) fabaeforme (?) constrictum* Riedel and Sanfilippo, 1970, p. 523, pl. 5, fig. 7.  
 This chapter: Tables 2, 3; Figures 2, 3.

**Lamptonium fabaeforme chaunothorax Riedel and Sanfilippo**

- Lamptonium fabaeforme (?) chaunothorax* Riedel and Sanfilippo, 1970, p. 524, pl. 5, fig. 8, 9.  
 This chapter: Table 2.

**Lamptonium obelix Sanfilippo and Riedel, new species**

(Plate 1, Figures 1, 2)

**Description:** Shell inflated-ellipsoidal, not obviously three segmented. Thorax subspherical, with thick wall, rather smooth surface, and quincuncially arranged pores, comprising the bulk of the shell. Cephalis subspherical, not expressed in external contour, completely enclosed in the thick shell wall extending from the thorax to merge with the thick base of the apparently bladed apical horn. Abdomen truncate-conical, in some specimens much reduced, with narrow mouth, and pores less regular in size and arrangement than those of thorax. Lumbar stricture not pronounced externally. From near the base of the thorax, three short, stout-bladed wings project downward.

Measurements (based on 20 specimens from DSDP Samples 400A-52,CC; 400A-53,CC; and 401-6,CC). Length overall, excluding horn, 155-290  $\mu\text{m}$ ; cephalis and thorax, 105-165  $\mu\text{m}$ ; greatest width of thorax 125-185  $\mu\text{m}$ .

**Remarks:** This species is larger and more robust than *Lamptonium pennatum*, and its wings are situated more distally on the thorax. It shows some similarity to the form illustrated as *Theocorys* sp. aff. *Theocorys spongoconum* by Foreman (1973, pl. 11, fig. 14), but her illustration shows no horn nor wings.

We name it for the large companion of the Gallic hero Asterix. This chapter: Tables 2, 3; Figures 2, 3; Plate 1, Figures 1, 2.

**Lamptonium pennatum Foreman**

*Lamptonium pennatum* Foreman, 1973a, p. 436, pl. 6, figs. 3-5, pl. 11, fig. 13.

This chapter: Table 2; Plate 1, Figures 3, 4.

**Lithapium anoectum Riedel and Sanfilippo**

*Lithapium anoectum* Riedel and Sanfilippo, 1970, p. 520, pl. 4, fig. 4, 5.

This chapter: Tables 2, 3; Figures 2, 3.

**Lithapium mitra (Ehrenberg)**

*Cornutella mitra* Ehrenberg, 1873, p. 221; 1875, pl. 2, fig. 8.

*Lithapium (?) mitra* (Ehrenberg) (?), Riedel and Sanfilippo, 1970, p. 520, pl. 4, fig. 6, 7.

This chapter: Tables 2, 3; Figures 2, 3.

**Lithapium plegmacantha Riedel and Sanfilippo**

*Lithapium (?) plegmacantha* Riedel and Sanfilippo 1970, p. 520, pl. 4, fig. 2, 3.

*Lithapium plegmacantha* Riedel and Sanfilippo, Sanfilippo and Riedel, 1973, p. 516, pl. 3, fig. 1, 2, pl. 24, fig. 8, 9.

This chapter: Tables 2, 3; Figure 2.

**Lithochytris archaea Riedel and Sanfilippo**

*Lithochytris archaea* Riedel and Sanfilippo, 1970, p. 528, pl. 9, fig. 7.

*Lithochytris archaea* Riedel and Sanfilippo, Foreman, 1973a, p. 436, pl. 2, fig. 4, 5.

This chapter: Tables 2, 3; Figures 2, 3.

**Lithochytris vespertilio Ehrenberg**

*Lithochytris vespertilio* Ehrenberg, 1873, p. 239; 1875, pl. 4, fig. 10.

*Lithochytris vespertilio* Ehrenberg, Riedel and Sanfilippo, 1970, p. 528, pl. 9, fig. 8, 9.

This chapter: Tables 2, 3; Figures 2, 3.

**Lithocyclus aristotelis (Ehrenberg) group**

*Astromma aristotelis* Ehrenberg, 1847, p. 55, fig. 10.

*Lithocyclus aristotelis* (Ehrenberg) group, Riedel and Sanfilippo, 1970, p. 522; 1971, p. 1588, pl. 3A, fig. 4, 5.

This chapter: Tables 2, 3.

**Lithocyclus ocellus Ehrenberg group**

*Lithocyclus ocellus* Ehrenberg, 1854, pl. 36, fig. 30; 1873, p. 240.

*Lithocyclus ocellus* Ehrenberg group, Riedel and Sanfilippo, 1970, p. 522, pl. 5, fig. 1, 2.

*Lithocyclus ocellus* Ehrenberg group, Sanfilippo and Riedel, 1973, p. 523, pl. 10, fig. 1, 2.

This chapter: Tables 2, 3; Figures 2, 3.

**Lithomelissa campanulaeformis Campbell and Clark**

*Lithomelissa campanulaeformis* Campbell and Clark, 1944a, p. 41, pl. 6, fig. 1.

This chapter: Site 403 text.

**Lithomitra lineata (Ehrenberg) group**

*Lithocampe lineata* Ehrenberg, 1838, p. 130 (partim); 1854, pl. 22, fig. 26; pl. 36, fig. 16.

*Lithomitra lineata* (Ehrenberg) group, Riedel and Sanfilippo, 1971, p. 1600, pl. 11, fig. 1-11; pl. 21, fig. 14-16; pl. 3E, fig. 14.

This chapter: Site 400A text; Site 403 text; Table 1.

**Lophocyrtis biaurita (Ehrenberg)**

*Eucyrtidium biaurita* Ehrenberg, 1873, p. 226; 1875, p. 70, pl. 10, fig. 7, 8.

*Lophocyrtis biaurita* (Ehrenberg), Haeckel, 1887, p. 1411.

*Lophocyrtis biaurita* (Ehrenberg), Foreman, 1973a, p. 442, pl. 8, fig. 23-26.

This chapter: Tables 2, 3; Figures 2, 3.

**Lophocyrtis jacchia (Ehrenberg)**

*Thyrsoyrtis jacchia* Ehrenberg, 1873, p. 261; 1875, pl. 12, fig. 7.

*Lophocyrtis (?) jacchia* (Ehrenberg), Riedel and Sanfilippo, 1970, p. 530.

This chapter: Tables 2, 3.

**Lychnocanoma amphitrite Foreman**

*Lychnocanoma amphitrite* Foreman, 1973a, p. 437, pl. 11, fig. 10.

**Remarks:** In identifying specimens as belonging to this species, we have depended heavily on the size of the thorax (at least 150 $\mu$  wide), in accordance with the original description. Rare specimens lack an abdomen.

This chapter: Tables 2, 3; Figures 2, 3; Plate 1, Figures 5, 6.

**Lychnocanoma bellum (Clark and Campbell)**

*Lychnocanum bellum* Clark and Campbell, 1942, p. 72, pl. 9, fig. 35, 39.

*Lychnocanoma bellum* (Clark and Campbell), Foreman, 1973a, p. 437, pl. 1, fig. 17; pl. 11, fig. 9.

This chapter: Tables 2, 3; Figures 2, 3.

**Periphaena decora Ehrenberg**

*Periphaena decora* Ehrenberg, 1873, p. 246; 1875, pl. 28, fig. 6.

*Periphaena decora* Ehrenberg, Sanfilippo and Riedel, 1973, p. 523, pl. 8, fig. 8-10; pl. 27, fig. 2-5.

This chapter: Tables 2, 3; Figures 2, 3.

**Periphaena delta Sanfilippo and Riedel**

*Periphaena delta* Sanfilippo and Riedel, 1973, p. 523, pl. 8, fig. 11, 12; pl. 27, fig. 6, 7.

This chapter: Table 2.

**Periphaena tripyramis triangula (Sutton)**

*Phacotriactus triangula* Sutton, 1896, p. 61.

*Triactus tripyramis triangula* (Sutton), Riedel and Sanfilippo, 1970, p. 521, pl. 4, fig. 9, 10.

*Periphaena tripyramis triangula* (Sutton), Sanfilippo and Riedel, 1973, p. 523, pl. 9, fig. 10, 11.

This chapter: Tables 2, 3; Figures 2, 3.

**Periphaena tripyramis tripyramis (Haeckel)**

*Triactus tripyramis* Haeckel, 1887, p. 432, pl. 33, fig. 6.

*Periphaena tripyramis tripyramis* (Haeckel), Sanfilippo and Riedel, 1973, p. 523, pl. 9, fig. 7-9.

This chapter: Table 2.

**Phormocyrtis striata exquisita (Kozlova)**

*Podocyrtis exquisita* Kozlova, in Kozlova and Gorbovets, 1966, p. 106, pl. 17, fig. 2.

*Phormocyrtis striata exquisita* (Kozlova), Foreman, 1973a, p. 438, pl. 7, fig. 1-4, 7, 8; pl. 12, fig. 5.

This chapter: Table 2.

**Phormocyrtis striata striata Brandt**

*Phormocyrtis striata* Brandt, in Wetzel, 1935, p. 55, pl. 9, fig. 12.

*Phormocyrtis striata* Brandt, Riedel and Sanfilippo, 1970, p. 532, pl. 10, fig. 7.

*Phormocyrtis striata striata* Brandt, Foreman, 1973a, p. 438, pl. 7, fig. 5, 6, 9.

This chapter: Tables 2, 3; Figures 2, 3.

**Podocyrtis ampla ampla Ehrenberg**

*Podocyrtis ampla* Ehrenberg, 1873, p. 248; 1875, pl. 16, fig. 7.

*Podocyrtis ampla* Ehrenberg, Riedel and Sanfilippo, 1970, p. 533, pl. 12, fig. 7, 8.

This chapter: Tables 2, 3; Figure 2.

**Podocyrtis ampla fasciolata Nigrini**

*Podocyrtis ampla fasciolata* Nigrini, 1974, p. 1069, pl. 1K, fig. 1, 2; pl. 4, fig. 2, 3.

This chapter: Table 2.

**Podocyrtis aphorma Riedel and Sanfilippo**

*Podocyrtis aphorma* Riedel and Sanfilippo, 1970, p. 534, pl. 11, fig. 2.

This chapter: Table 2.

**Podocyrtis chalara Riedel and Sanfilippo**

*Podocyrtis chalara* Riedel and Sanfilippo, 1970, p. 535, pl. 12, fig. 2, 3.

This chapter: Table 2.

**Podocyrtis diamesa Riedel and Sanfilippo**

- Podocyrtis diamesa* Riedel and Sanfilippo, 1970, p. 533, pl. 12, fig. 4-6.  
*Podocyrtis diamesa* Riedel and Sanfilippo, Sanfilippo and Riedel, 1973, p. 531, pl. 20, fig. 9, 10; pl. 35, fig. 10, 11.  
 This chapter: Tables 2, 3; Figures 2, 3.

**Podocyrtis dorus Sanfilippo and Riedel**

- Podocyrtis dorus* Sanfilippo and Riedel, 1973, p. 531, pl. 35, fig. 12-14.  
 This chapter: Tables 2, 3; Figures 2, 3.

**Podocyrtis goetheana (Haeckel)**

- Cycladophora goetheana* Haeckel, 1887, p. 1376, pl. 65, fig. 5.  
*Podocyrtis goetheana* (Haeckel), Riedel and Sanfilippo, 1970, p. 535.  
 This chapter: Table 2.

**Podocyrtis helenae Nigrini**

- Podocyrtis* sp. B Riedel and Sanfilippo, 1973, p. 739, pl. 4, fig. 4-6.  
*Podocyrtis helenae* Nigrini, 1974, p. 1070, pl. 1L, fig. 9-11; pl. 4, fig. 4, 5.  
 This chapter: Tables 2, 3; Figure 2.

**Podocyrtis mitra Ehrenberg**

- Podocyrtis mitra* Ehrenberg, 1854, pl. 36, fig. B20.  
*Podocyrtis mitra* Ehrenberg, Riedel and Sanfilippo, 1970, p. 534, pl. 11, fig. 5, 6.  
 This chapter: Tables 2, 3; Figures 2, 3.

**Podocyrtis papalis Ehrenberg**

- Podocyrtis papalis* Ehrenberg, 1847, fig. 2; 1854, pl. 36, fig. 23; 1873, p. 251.  
*Podocyrtis papalis* Ehrenberg, Sanfilippo and Riedel, 1973, p. 531, pl. 20, fig. 11-14; pl. 36, fig. 2, 3.  
 This chapter: Tables 2, 3; Figures 2, 3.

**Podocyrtis phyxis Sanfilippo and Riedel**

- Podocyrtis phyxis* Sanfilippo and Riedel, 1973, p. 531.  
 This chapter: Table 2.

**Podocyrtis platypus Sanfilippo and Riedel**

- Podocyrtis platypus* Sanfilippo and Riedel, 1973, p. 531, pl. 21, fig. 1-3; pl. 36, fig. 4, 5.  
 This chapter: Tables 2, 3.

**Podocyrtis sinuosa Ehrenberg**

- [?] *Podocyrtis sinuosa* Ehrenberg, 1873, p. 253; 1875, pl. 15, fig. 5.  
*Podocyrtis sinuosa* Ehrenberg (?), Riedel and Sanfilippo, 1970, p. 534, pl. 11, fig. 3, 4.  
 This chapter: Table 2.

**Podocyrtis trachodes Riedel and Sanfilippo**

- Podocyrtis trachodes* Riedel and Sanfilippo, 1970, p. 535, pl. 11, fig. 7; pl. 12, fig. 1.  
 This chapter: Tables 2, 3; Figure 2.

**Pterocodon ampla (Brandt)**

- [?] *Theocyrtis ampla* Brandt, in Wetzel, 1935, p. 56, pl. 9, fig. 13-15.  
*Pterocodon ampla* (Brandt), Foreman 1973a, p. 438, pl. 5, fig. 3-5.  
 This chapter: Table 2; Plate 1, Figures 7, 8.

**Pterocodon lex Sanfilippo and Riedel, new species**  
(Plate 1, Figures 9, 10)

**Description:** Shell subcylindrical, of three segments, with slightly rough surface and ragged distal margin. Cephalis sub-hemispherical, with few pores, bearing a relatively long cylindro-conical horn. Collar stricture generally distinct. Thorax sub-hemispherical, with pores arranged approximately quincuncially. Lumbar stricture slightly, if at all, expressed externally, but marked internally by a distinct ring. Abdomen sub-cylindrical, with a few transverse rows of quincuncially arranged pores.

Measurements (based on 25 specimens from DSDP Samples 405-16-7, 62-64 cm; 405-17-6, 108-110 cm; and 405-19-3, 135-136 cm). Length overall, excluding horn, 75-100  $\mu\text{m}$ ; cephalis and thorax 45-80  $\mu\text{m}$ ; greatest width of thorax, 55-85  $\mu\text{m}$ .

**Remarks:** This form is in many respects similar to *Pterocodon* (?) *ampla* Brandt (?) of Foreman (1973a, p. 438, pl. 5, fig. 3-5), but we do not synonymize them because her specimens have a substantially longer cephalis plus thorax and total length. *Pterocodon lex* is much smaller than the original specimens of *Pterocodon ampla* Brant, and is also much smaller than *Theocorys unicum* Lipman (in Lipman et al., 1960, p. 97, pl. 12, fig. 11) with which Foreman compared her specimens. As pointed out by Foreman, assignment to the genus *Pterocodon* is unsatisfactory, but we are unaware of a more appropriate genus, and reluctant to create a new one until more is known of the relationships of the species.

The name of the species is an arbitrary combination of letters, to be regarded as a feminine noun in apposition.

This chapter: Tables 2, 3; Plate 1, Figures 9, 10.

**Rhopalocanium ornatum Ehrenberg**

- Rhopalocanium ornatum* Ehrenberg, 1847, fig. 3; 1854, pl. 36, fig. 9; 1873, p. 256; 1875, p. 82, pl. 17, fig. 8.  
*Rhopalocanium ornatum* Ehrenberg, Foreman, 1973a, p. 439, pl. 2, fig. 8-10; pl. 12, fig. 3.  
 This chapter: Tables 2, 3.

**Sethochyrtis triconiscus Haeckel**

- [?] *Sethochyrtis triconiscus* Haeckel, 1887, p. 1239, pl. 57, fig. 13.  
*Sethochyrtis triconiscus* Haeckel (?), Riedel and Sanfilippo, 1970, p. 528, pl. 9, fig. 6.  
 This chapter: Tables 2, 3; Figures 2, 3.

**Siphocampe corbula (Harting)**

- Lithocampe corbula* Harting, 1863, p. 12, pl. 1, fig. 21.  
*Siphocampe corbula* (Harting), Nigrini, 1967, p. 85, pl. 8, fig. 5; pl. 9, fig. 3.  
 This chapter: Hole 400A text, 403 text.

**Sphaerostylus lanceola (Parona)**

- Stylosphaera lanceola* Parona, 1890, p. 150, pl. 1, fig. 19.  
*Sphaerostylus lanceola* (Parona) group, Foreman, 1973b, p. 258, pl. 1, fig. 7-11.  
 This chapter: Hole 400A text.

**Spongatractus balbis Sanfilippo and Riedel**

- Spongatractus balbis* Sanfilippo and Riedel, 1973, p. 518, pl. 2, fig. 1-3; pl. 25, fig. 1-2.  
 This chapter: Table 2.

**Spongatractus pachystylus (Ehrenberg)**

- Spongasphaera pachystyla* Ehrenberg, 1873, p. 256; 1875, pl. 26, fig. 3.  
*Spongatractus pachystylus* (Ehrenberg), Haeckel, 1887, p. 350.  
*Spongatractus pachystylus* (Ehrenberg), Sanfilippo and Riedel, 1973, p. 519, pl. 2, fig. 4-6; pl. 25, fig. 3.  
 This chapter: Tables 2, 3; Figures 2, 3.

**Spongodiscus quartus bosoculus Sanfilippo and Riedel**

- Spongodiscus quartus bosoculus* Sanfilippo and Riedel, 1973, p. 525, pl. 12, fig. 8-10; pl. 29, fig. 7.  
 This chapter: Table 2.

**Spongodiscus phrix Sanfilippo and Riedel**

- Spongodiscus phrix* Sanfilippo and Riedel, 1973, p. 525, pl. 12, fig. 1, 2; pl. 29, fig. 2.  
 This chapter: Tables 2, 3; Figures 2, 3.

**Spongodiscus rhabdostylus (Ehrenberg)**

- Spongosphaera rhabdostyla* Ehrenberg, 1873, p. 256; 1875, pl. 26, fig. 1, 2.  
*Spongodiscus rhabdostylus* (Ehrenberg), Sanfilippo and Riedel, 1973, p. 525, pl. 13, fig. 1-3; pl. 30, fig. 1, 2.  
 This chapter: Tables 2, 3; Figure 3.

**Spongopyle insolita Kozlova group**

- Spongopyle insolita* Kozlova, in Kozlova and Gorbovets, 1966, p. 91, pl. 4, fig. 11a, b.  
*Spongopyle insolita* Kozlova group, Riedel and Sanfilippo, 1974, p. 780, pl. 2, fig. 7-11; pl. 14, fig. 4.  
 This chapter: Hole 400A text.

**Stichocorys delmontensis (Campbell and Clark)**

*Eucyrtidium delmontense* Campbell and Clark, 1944a, p. 56, pl. 7, fig. 19, 20.

*Stichocorys delmontensis* (Campbell and Clark), Sanfilippo and Riedel, 1970, p. 451, pl. 1, fig. 9; Riedel and Sanfilippo, 1971, p. 1595, pl. 1F, fig. 5-7; pl. 2E, fig. 10, 11.

*Stichocorys delmontensis* (Campbell and Clark), Westberg and Riedel, in press.

This chapter: Hole 401A, Site 403 text.

**Stichocorys peregrina (Riedel)**

*Eucyrtidium elongatum peregrinum* Riedel, 1953, p. 812, pl. 85, fig. 2.

*Stichocorys peregrina* (Riedel), Riedel and Sanfilippo, 1970, p. 530.

*Stichocorys peregrina* (Riedel), Westberg and Riedel, in press.

This chapter: Site 403 text.

**Stichomitra asymbatos Foreman group**

*Stichomitra asymbatos* Foreman, 1968, p. 73, pl. 8, fig. 10a-c.

*Stichomitra asymbatos* Foreman group, Riedel and Sanfilippo, 1974, p. 780, pl. 10, fig. 1-7; pl. 15, fig. 5.

This chapter: Hole 400A text.

**Stylosphaera coronata sabaca Sanfilippo and Riedel**

*Stylosphaera coronata sabaca* Sanfilippo and Riedel, 1973, p. 521, pl. 1, fig. 18; pl. 25, fig. 7, 8.

This chapter: Table 2.

**Tepka perforata Sanfilippo and Riedel**

*Tepka perforata* Sanfilippo and Riedel, in Sanfilippo et al., 1973, p. 228, pl. 6, fig. 18-20.

This chapter: Table 1.

**Thecosphaera grecoi Vinassa**

*Thecosphaera grecoi* Vinassa, 1900, p. 568, pl. 1, fig. 8.

This chapter: Site 403 text.

**Theocampe amphora (Haeckel) group**

*Dictyocephalus amphora* Haeckel, 1887, p. 1305, pl. 62, fig. 4.

*Theocampe amphora* (Haeckel) group, Foreman 1973a, p. 431, pl. 8, fig. 7, 9-13; pl. 9, fig. 8, 9.

This chapter: Table 2.

**Theocampe armadillo (Ehrenberg) group**

*Eucyrtidium armadillo* Ehrenberg, 1873, p. 225; 1875, p. 70, pl. 9, fig. 10.

*Theocampe armadillo* (Ehrenberg) group, Riedel and Sanfilippo, 1971, p. 1601, pl. 3E, fig. 3-6.

This chapter: Table 2.

**Theocampe mongolfieri (Ehrenberg)**

*Eucyrtidium mongolfieri* Ehrenberg, 1854, pl. 36, fig. 18.

*Theocampe mongolfieri* (Ehrenberg), Burma, 1959, p. 329.

*Theocampe mongolfieri* (Ehrenberg), Riedel and Sanfilippo, 1970, p. 536, pl. 12, fig. 9.

*Theocampe mongolfieri* (Ehrenberg), Foreman, 1973, p. 432, pl. 8, fig. 6, pl. 9, fig. 17.

This chapter: Tables 2, 3; Figures 2, 3.

**Theocampe pirum (Ehrenberg)**

*Eucyrtidium pirum* Ehrenberg, 1873, p. 232; 1875, p. 72, pl. 10, fig. 14.

*Theocampe pirum* (Ehrenberg), Riedel and Sanfilippo, 1971, p. 1601, pl. 3E, fig. 10, 11.

This chapter: Tables 2, 3; Figures 2, 3.

**Theocampe urceolus (Haeckel)**

*Dictyocephalus urceolus* Haeckel, 1887, p. 1305.

*Theocampe urceolus* (Haeckel), Foreman, 1973a, p. 432, pl. 8, fig. 14-17; pl. 9, fig. 6, 7.

This chapter: Table 2.

**Theocorys anaclasta Riedel and Sanfilippo**

*Theocorys anaclasta* Riedel and Sanfilippo, 1970, p. 530, pl. 10, fig. 2, 3.

This chapter: Table 2.

**Theocorys anapographa Riedel and Sanfilippo**

*Theocorys anapographa* Riedel and Sanfilippo, 1970, p. 530, pl. 10, fig. 4.

This chapter: Table 2.

**Theocorys antiqua Squinabol**

*Theocorys antiqua* Squinabol, 1903, p. 135, pl. 8, fig. 25.

This chapter: Hole 400A text.

**Theocorys physzella Foreman**

*Theocorys (?) physzella* Foreman, 1973a, p. 440, pl. 5, fig. 8; pl. 12, fig. 1.

This chapter: Table 2.

**Theocotyle auctor Foreman**

*Theocotyle auctor* Foreman, 1973a, p. 441, pl. 4, fig. 8-10, pl. 12, fig. 13.

This chapter: Table 2.

**Theocotyle cryptocephala conica Foreman**

*Theocotyle cryptocephala conica* Foreman, 1973a, p. 448, pl. 4, fig. 11; pl. 12, fig. 19, 20.

This chapter: Tables 2, 3; Figures 2, 3.

**Theocotyle cryptocephala cryptocephala (Ehrenberg)**

[?] *Eucyrtidium cryptocephalum* Ehrenberg, 1873, p. 227; 1875, p. 70, pl. 11, fig. 11.

*Theocotyle cryptocephala cryptocephala* (Ehrenberg) (?), Riedel and Sanfilippo, 1970, p. 525, pl. 6, fig. 7, 8.

This chapter: Tables 2, 3.

**Theocotyle cryptocephala nigrinae Riedel and Sanfilippo**

*Theocotyle cryptocephala (?) nigrinae* Riedel and Sanfilippo, 1970, p. 525, pl. 6, fig. 5, 6.

*Theocotyle cryptocephala (?) nigrinae* Riedel and Sanfilippo, Foreman, 1973a, p. 440, pl. 4, fig. 1-5; pl. 12, fig. 17.

This chapter: Tables 2, 3.

**Theocotyle ficus (Ehrenberg)**

*Eucyrtidium ficus* Ehrenberg, 1873, p. 228; 1875, p. 70, pl. 11, fig. 19.

*Theocotyle ficus* (Ehrenberg), Foreman, 1973a, p. 441, pl. 4, fig. 16-20.

This chapter: Tables 2, 3; Figures 2, 3.

**Theocotyle venezuelensis Riedel and Sanfilippo**

*Theocotyle venezuelensis* Riedel and Sanfilippo, 1970, p. 525, pl. 6, fig. 9, 10; pl. 7, fig. 1, 2.

This chapter: Table 2.

**Thyrsocyrtis bromia Ehrenberg**

*Thyrsocyrtis bromia* Ehrenberg, 1873, p. 260; 1875, p. 84, pl. 12, fig. 2.

*Thyrsocyrtis bromia* Ehrenberg, Riedel and Sanfilippo, 1970, p. 526; 1971, pl. 8, fig. 6.

This chapter: Table 2.

**Thyrsocyrtis hirsuta hirsuta (Krasheninnikov)**

*Podocyrtis hirsutus* Krasheninnikov, 1960, p. 300, pl. 3, fig. 16.

*Thyrsocyrtis hirsuta hirsuta* (Krasheninnikov), Riedel and Sanfilippo, 1970, p. 526, pl. 7, fig. 9.

*Thyrsocyrtis hirsuta hirsuta* (Krasheninnikov), Foreman, 1973a, p. 441, pl. 3, fig. 3-8; pl. 12, fig. 15.

This chapter: Table 2.

**Thyrsocyrtis hirsuta robusta Riedel and Sanfilippo**

*Thyrsocyrtis hirsuta robusta* Riedel and Sanfilippo, 1970, p. 526, pl. 8, fig. 1.

*Thyrsocyrtis hirsuta robusta* Riedel and Sanfilippo, Foreman, 1973a, p. 442, pl. 3, fig. 17.

This chapter: Table 2.

**Thyrsocyrtis hirsuta tensa Foreman**

*Thyrsocyrtis hirsuta tensa* Foreman, 1973a, p. 442, pl. 3, fig. 13-16; pl. 12, fig. 8.

This chapter: Table 2.

**Thyrsocyrtis rhizodon Ehrenberg**

*Thyrsocyrtis rhizodon* Ehrenberg, 1873, p. 262; 1875, p. 94, pl. 12, fig. 1.  
*Thyrsocyrtis rhizodon* Ehrenberg, Foreman, 1973a, p. 442, pl. 3, fig. 1, 2.  
 This chapter: Table 2.

**Thyrsocyrtis tetracantha (Ehrenberg)**

*Podocyrtis tetracantha* Ehrenberg, 1873, p. 254; 1875, p. 82, pl. 13, fig. 2.  
*Thyrsocyrtis tetracantha* (Ehrenberg), Riedel and Sanfilippo, 1970, p. 527.  
 This chapter: Table 2.

**Thyrsocyrtis triacantha (Ehrenberg)**

*Podocyrtis triacantha* Ehrenberg, 1873, p. 254; 1875, p. 82, pl. 13, fig. 4.  
*Thyrsocyrtis triacantha* (Ehrenberg), Riedel and Sanfilippo, 1970, p. 526, pl. 8, fig. 2, 3.  
*Thyrsocyrtis triacantha* (Ehrenberg), Foreman, 1973a, p. 442, pl. 12, fig. 9-11.  
 This chapter: Tables 2, 3; Figures 2, 3.

**Tristylopyris tricerus (Ehrenberg)**

*Ceratospyrus tricerus* Ehrenberg, 1873, p. 220; 1875, pl. 21, fig. 5.  
*Tristylopyris tricerus* (Ehrenberg), Haeckel, 1887, p. 1033.  
 This chapter: Tables 2, 3.

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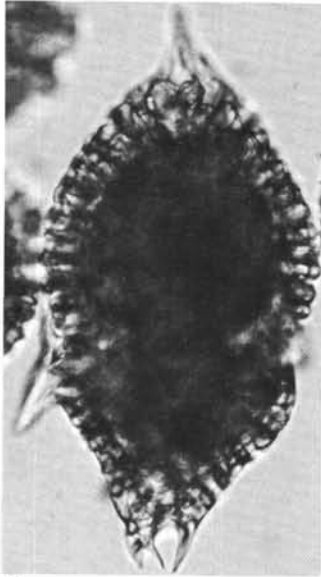


## PLATE 1

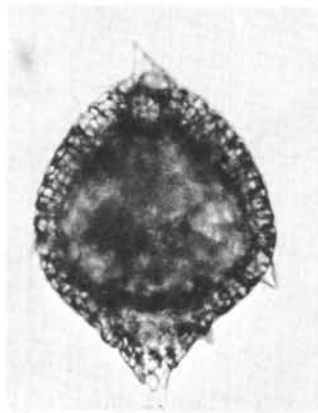
In the explanations to the figures, the sample numbers and slide designations (in the form "Ph.2," "Sl.2," "Cs.2," etc.) indicate preparations in our collection at Scripps Institution of Oceanography, and designations in the form "R45/1" indicate England Finder positions of the illustrated specimens on the slides (Riedel and Foreman, 1961).

- Figures 1, 2     *Lamptonium obelix* n. sp.  
 1. Holotype, DSDP 400A-52, CC, Ph. 1, Q28/0 (190×).  
 2. Sample 401-6, CC, Cs.2, 040/4 (190×).
- Figures 3, 4     *Lamptonium pennatum*.  
 3. Sample 405-13-6, 141-143 cm, Sl.3, K39/4 (280×).  
 4. Sample 405-12-3, 17-19 cm, Ph. 1, L19/2 (280×).
- Figures 5, 6     *Lychnocanoma amphitrite*.  
 5. Sample 401-5, CC, Cs.1, T50/4 (190×).  
 6. Sample 401-5, CC, Cs.1, T40/3 (190×).
- Figures 7, 8     *Pterocodon ampla*.  
 7. Sample 405-19-3, 135-136 cm, Ph. 1, W29/0 (280×).  
 8. Sample 405-18-1, 59-61 cm, Ph. 1, F14/4 (280×).
- Figures 9, 10     *Pterocodon lex* n. sp.  
 9. Holotype, Sample 405-17-6, 108-110 cm, F.1, Z43/3 (280×).  
 10. Sample 405-19-3, 135-136 cm, F.1, Q40/0 (280×).
- Figure 11     Unidentified theoperid similar to one occurring in the Coniacian-Santonian of Romania and Sample 258-12-2. Sample 400A-64-3, 76-78 cm, Sl.1, Z17/0 (280×).
- Figure 12     Unidentified theoperid similar to one occurring in the *Podocyrthis mitra* Zone at DSDP Site 237 (San filippo and Riedel, 1974, pl. 3, fig. 5, 6), with unrecorded occurrences in the *Thyrsocyrtis bromia* Zone of Sample 162-4-6, 35-37 cm, and Sample WRTR-55 from Barbados (Sanfilippo and Riedel, 1976, p. 155). Sample 401-4, CC, Ph. 2, G17/1 (280×).

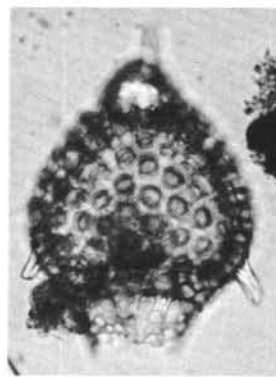
PLATE 1



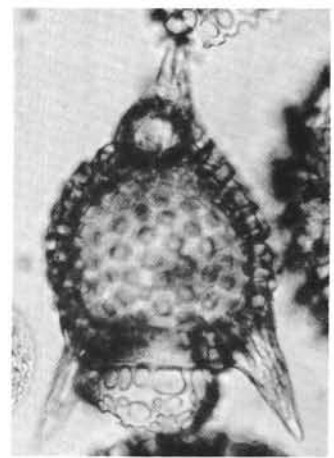
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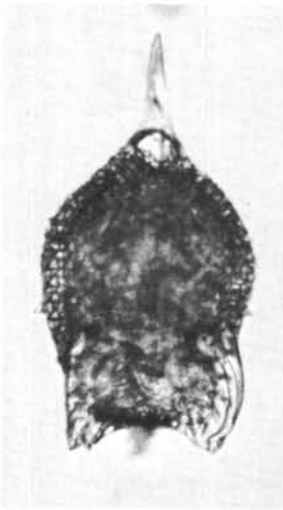
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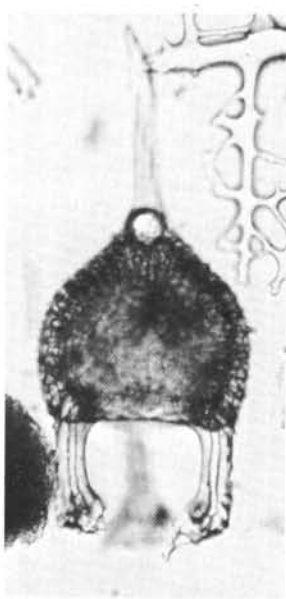
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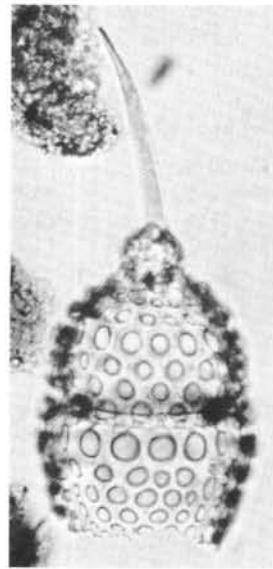
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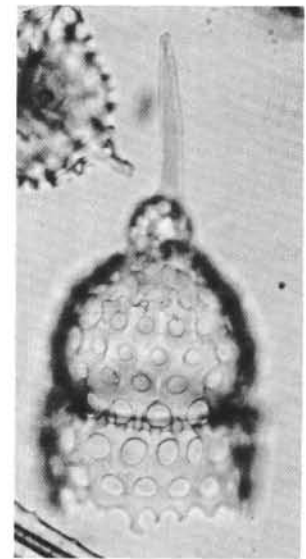
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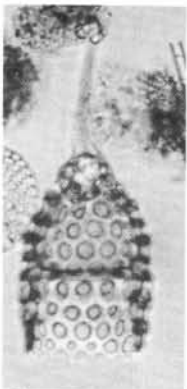
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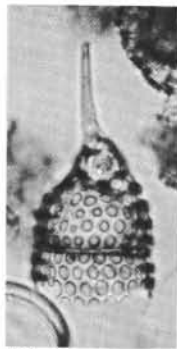
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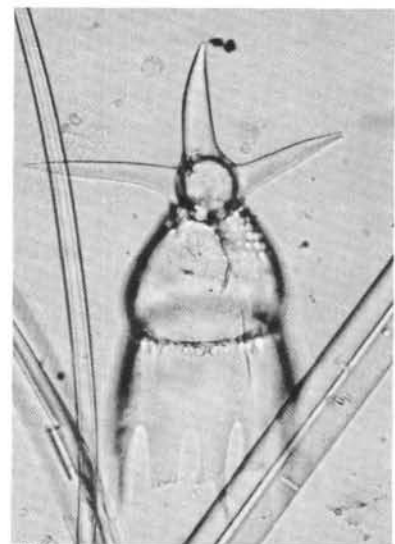
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12