24. RADIOLARIA FROM LEG 17 OF THE DEEP SEA DRILLING PROJECT

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INTRODUCTION

Radiolaria were found at all sites drilled on Leg 17 and were useful in determining the stratigraphic age of samples from the Cenozoic part of the recovered sections. At Sites 164 and 168 they provided the sole means of reliable zonation for much of the Cenozoic section.

Most sites show a significant part of both the Upper Neogene and Lower Paleogene to be either totally missing, nonfossiliferous, or containing abundant reworked microfossils. Only on the Magellan Rise (Site 167) was a nearly continuous Cenozoic section found. Even here the lowermost Paleogene is devoid of radiolarians.

Because of the prevalent breaks in the fossiliferous record, the recovered Cenozoic sections leave much to be desired in terms of providing the means to improve radiolarian stratigraphy. On the other hand, the Upper Jurassic and Cretaceous material, though it is spotty and poorly preserved, is significantly better than anything else thus far recovered from the deep sea. These samples offer an excellent opportunity to develop a fuller knowledge of the changes in radiolarian faunas during the late Mesozoic. Thus, the greatest effort has been directed toward compiling and synthesizing the Cretaceous stratigraphy of Radiolaria from Leg 17.

Although the Mesozoic material sampled on Leg 17 is extensive in comparison to that reported by previous legs, the very limited percent of core recovery and the highly altered state of the Cretaceous radiolarian tests precludes all but the most tentative taxonomy and stratigraphy. It is hoped, however, that this report will provide both a useful stratigraphic guide to similar poorly preserved assemblages and a framework on which more detailed stratigraphy and taxonomy may be developed.

ABUNDANCE AND PRESERVATION

Cenozoic Samples

Paleocene sediments containing siliceous microfossils were not recovered and only scant specimens were found in samples from the upper part of the Lower Eocene. These latter samples were all located in the easternmost sites: 164, 165, and 171. At Site 171, species of Early Eocene age were found only as reworked specimens in Oligocene sediments. No in situ Lower Eocene sediments were recovered at this site.

Where present, Middle and Upper Eocene radiolarians were abundant and moderately to well preserved. However, dissolution of the silica, the occurrence of chert, and the accompanying poor core recovery caused some Middle Eocene zones not to be found. The *Theocampe mongolfieri, Podocyrtis ampla,* and *Podocyrtis chalara* zones were recovered only once in the seven sites drilled: the *Podocyrtis mitra* Zone was identified only twice.

As at the other sites in the tropical Pacific, the siliceous microfossils from Lower Oligocene sediments are abundant, well preserved, and commonly include numerous diatoms. The Upper Oligocene was recovered at most sites and contained common, moderately well preserved radiolarians.

The Lower Miocene is the youngest material consistently recovered in all sites. The radiolarian assemblages tend to be somewhat sparse and severely corroded except in Sites 166 and 167, where they are common and moderately well preserved. These two sites have the only reasonably complete. Neogene sections with moderately well preserved assemblages; but even here, missing zones, reworking, and poor preservation are commonly recognized in the Upper Miocene and Pliocene parts of the sections.

A thin layer of Quaternary sediments was detected at most sites and may simply have been missed by the first core at other sites. Preservation of the Quaternary assemblage was good only at Sites 165 and 166.

Mesozoic (Cretaceous and Jurassic)

Jurassic and Lower Cretaceous materials were recovered only at Site 167. A detailed discussion of the diagenetic alteration of these sediments and preservation of the microfossils appears in the Chapter by Schlanger et al., in this volume.

The radiolarian tests in the Lower Cretaceous are all recrystallized quartz. In some samples they appear only as internal casts. Radiolaria are not preserved throughout the sediment. They tend to be commonly found only in cherts and near the upper and lower boundaries of what appear to be silicified ash layers.

In the Upper Cretaceous, samples containing common to abundant, moderately well preserved assemblages were found in the Cenomanian of Sites 164, 166, 167, and 170; in the Coniacian of Site 171; and in the Santonian/Campanian of Sites 164 and 170. The remaining samples contained either no radiolarians or only rare, poorly preserved forms. The oldest opaline tests are found in the Upper Albian/Cenomanian section of Site 166, and the most well-preserved material is found in the Campanian/Santonian part of the section sampled at Site 164.

Very poorly preserved radiolarians, or indications of missing intervals, are commonly found in the Valanginian/Hauterivian, (Site 167 only), the Turonian-Coniacian (all sites) and in the Middle Campanian-Maastrichtian (extending in all sites through the Danian and Paleocene).

CENOZOIC STRATIGRAPHY

The stratigraphy used is based on that originally developed by Riedel and Sanfilippo (1970) with the additions of Moore, 1971, and Sanfilippo and Riedel, 1973. The development of the taxonomy and stratigraphy of the

Lower Eocene-Paleocene assemblages (Foreman, 1973; Sanfilippo and Riedel, 1973) proved to be a workable and extremely valuable new tool and aided greatly in interpreting the material recovered at Sites 164, 165, and 171.

The stratigraphy of the Upper Eocene is still open to question. As pointed out by Dinkelman (Leg XVI report), there is little indication that the *Thyrsocyrtis tetracantha* and *T. bromia* zones as defined by Riedel and Sanfilippo (1971) are useful. Early forms of both species seem to occur at approximately the same time. There have been few, if any, demonstrably complete Upper Eocene sections yet recovered; thus, a rezoning of this part of the section seems premature. The material recovered from the equatorial Pacific does seem to indicate that the first appearance of *Cycladaphora turris* occurs in the lower part of the Upper Eocene, and that it is followed by the appearance of *Dorcadospyris triceros* and then the Eocene form of *Theocyrtis tuberosa.*

The first appearance of *Lophocyrtis* (?) *jacchia* occurs in the upper part of the Upper Eocene and is closely followed by the last appearance of some of the typically Upper Eocene species such as *Thyrsocyrtis tetracantha, T. bromia,* and *Cycladophora turris.* Once these suggested first and last appearances are verified and properly tied into the stratigraphies of calcareous organisms, they may prove useful in a more detailed subdivision of the Upper Eocene.

In their Middle to Upper Miocene zonation, Riedel and Sanfilippo (1971) abandoned the use of the *Cannartus laticonus* Zone, the base of which is defined by the last appearance of *Dorcadospyris alata.* Their present usage places the *Cannartus petterssoni* Zone directly over the *Dorcadospyris alata* Zone. Because the author prefers a more restrictive definition of *Cannartus petterssoni* (see taxonomy section), a gap is usually found between the last occurrence of *Dorcadospyris alata* and the first appearance of what is typically illustrated as *Cannartus petterssoni.* This gap, by the original definition, is the *Cannartus laticonus* Zone. Therefore, because of stratigraphic usefulness, the restrictive definition of *C. petterssoni* and the retention of the *C. laticonus* zone is felt to be warranted.

CRETACEOUS STRATIGRAPHY

Very little exists in the literature that was of aid in determining the age of samples based solely on the radiolarian fauna. Thus, the radiolarians have been of limited use in the Jurassic and Cretaceous sections sampled by the Deep Sea Drilling Project. Their usefulness is further impaired by assemblages that are very poorly preserved and by samples in which downworking due to the drilling process and reworking due to sedimentary processes add additional complications. Stratigraphic studies that do exist usually either (a) cover only a very limited age range, (b) deal with species that rarely preserve well, or (c) are of such a vintage that the age information provided is open to question.

The Jurassic and Cretaceous materials recovered on Leg 17 are commonly neither well preserved nor abundant. The core recovery is at best spotty, and some parts of the sections are virtually devoid of identifiable species. Nevertheless, samples from nearly every Cretaceous stage were recovered, and the age of most of these samples is established by the contained calcareous microfossils (see Douglas and Roth, this volume). Thus, this material provides a rare opportunity to attempt a comprehensive stratigraphy and zonation of Cretaceous radiolarians. With the exception of Site 164, the ages indicated in the site reports are based solely on the calcareous fossils. From these ages a radiolarian stratigraphy was developed and used to estimate the age of samples from Site 164.

The stratigraphy presented in Figure 1 indicates both the range of individual species as determined in the samples of Leg 17 (solid lines in Figure 1) and where available, the occurrences noted in the literature (dotted lines in Figure 1). These two sources usually agree. Where they do not, the difference may lie in (a) misidentification, (b) limited stratigraphic coverage of earlier works, or (c) inaccurate age determination of samples reported in earlier works.

The great change in the Lower and Upper Cretaceous assemblages is striking. Only about one third of the species that are found in the Lower Cretaceous interval survive past the Cenomanian in the Upper Cretaceous. Although these extinctions are probably real, the great flood of first appearances in the Upper Albian to Cenomanian are, at least in part, due to improved preservation and to the greater quantity of fossiliferous material that was recovered from the Upper Cretaceous.

CRETACEOUS ZONATION

The zonation proposed is based primarily on the first appearance of species which are easily identified even in the very poorly preserved material. The Lower Cretaceous zones are found only in the material recovered from Site 167. Recovery of the Cretaceous material was very poor at this site and radiolarian tests were almost always filled and replaced by microcrystalline quartz. Radiolaria were not found in parts of the Berriasian, Valanginian/Hauterivian, and Upper Albian/Lower Cenomanian. Material of Early Aptian age was not found.

Recovery of Upper Cretaceous sediments was accomplished at several sites; however, material of Coniacian age was particularly sparse and that of Campanian to Maastrichtian age rarely contained identifiable radiolarians.

With the weaknesses noted above, it is clear that this zonation can only be tentative. It is felt, however, that the seven zones proposed will provide both a useful stratigraphic tool and the basis for more detailed future work.

Zone RK 1

Base: First appearance of *Lithocampe mediodilatata.*
Top: Coincides with base of Zone RK2.
Inclusion: First appearance of *Spongosaturnalis dicranacanthos, S. amissus,* and *Stichocapsa cribrata.*
Approximate age range: ? Late Tithonian-Early Berriasian.

Zone RK2

Base: First appearance of *Stichocapsa rotunda,* which is approximately coincident with the first appearance of *Lithomitra excellens* and *Sethamphora* (?) *pulchra* and

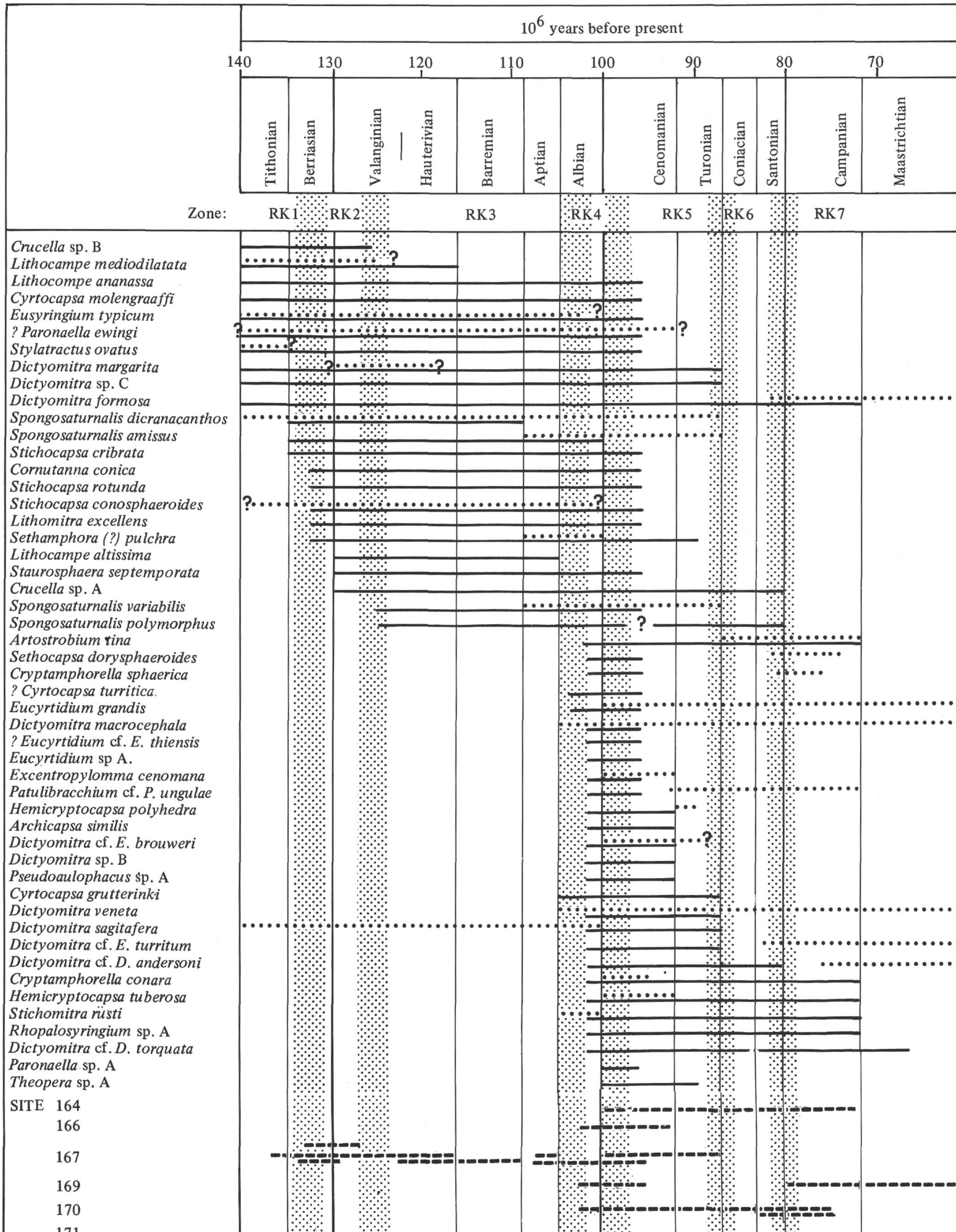

Figure 1. *Cretaceous Radiolaria species identified in Leg 17 material. Observed stratigraphic range shown as a solid line. Dotted lines indicate stratigraphic occurrences reported in previous studies. Approximate boundaries for proposed zones are shown as vertical bands of shading. Heavy dashed lines opposite Site numbers indicate age of samples studied (based on calcareous fossils, Douglas, Roth, this volume).*

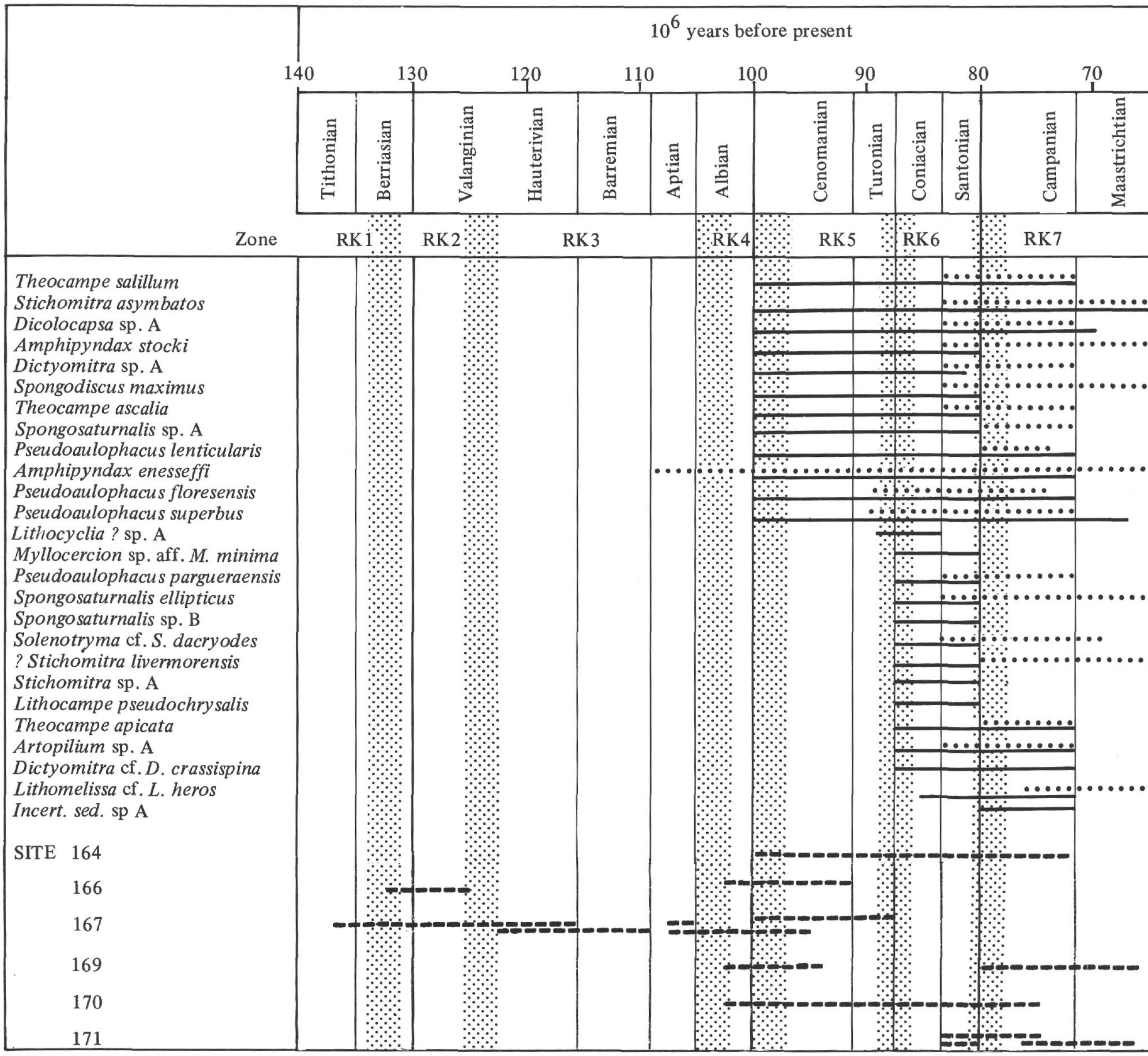

Figure 1. *(Continued).*

slightly precedes the first appearance of *Stichocapsa conosphaeroides* and *Cornutanna conica.*

Top: Coincides with the base of Zone RK3.

Inclusion: First appearance of *Crucella* sp. A, *Staurosphaera septemporata* and *Lithocampe altissima,* and the last appearance of *Crucella* sp. B.

Approximate age range: Late Berriasian/Early Valanginian-Late Valanginian.

Zone RK3

Base: First appearance of *Spongosaturnalis variabilis,* which is approximately coincident with the first appearance of *S. polymorphus.*

Top: Coincident with the base of Zone RK4.

Inclusion: Last occurrence of *Lithocampe mediodilatata, Spongostaturnalis dicranacanthos,* and *Lithocampe altissima.*

Approximate age range: Hauterivian-Early Albian.

Zone RK4

Base: First appearance of *Dictyomitra macrocephala.*

Top: Coincident with the base of Zone RK5.

Inclusion: Apparent first appearance of several species (see range chart); however, exact order of appearances are uncertain because of poor core recovery and great differences in the preservation of the fauna at various sites.

Approximate age range: Late Albian-Early Cenomanian.

Zone RK5

Base: First appearance of *Pseudoaulophacus superbus*.
Top: Coincident with the base of RK6.
Inclusion: Apparent first appearances of several species which have been reported in other Upper Cretaceous sections; (see range chart). Poor core recovery and great differences in the preservation of the assemblages cause the exact order of appearances to be uncertain.
Approximate age range: Cenomanian-Turonian.

Zone RK6

Base: First appearance of *Artopilium* sp. A.
Top: Coincident with the base of RK7.
Inclusion: Apparent first appearances of several species which have been reported in other Upper Cretaceous sections (see range chart). Poor core recovery and great differences in the preservation of the fauna cause the exact order of appearances to be undertain.
Approximate age range: Coniacian-Santonian.

Zone RK7

Base: First appearance of *Incert. sed.* sp. A.
Top: Undefined in Leg 17 material because of the poor preservation of material in this part of the sections, but taken to be coincident with the base of the Paleocene.
Inclusion: Many of the species found in Zones RK5 and RK6 were observed to have, or were reported in earlier papers to have, their last appearance within the interval spanned by this zone.
Approximate age range: Campanian-Danian.

SITE REPORTS

Site 164

Radiolarians in the first core contain elements from Eocene, Oligocene, and Miocene faunas. The youngest specimens present (*Calocycletta virginis* and *Cannartus mammiferus*) are from the *Calocycletta virginis* Zone of the Lower Miocene. However, preservation is poor. Therefore, the possiblity exists that the sediments are somewhat younger and that the more delicate Late Miocene, Pliocene, or Quaternary forms have been destroyed by solution. The second and third cores are from the Lower Oligocene (*Theocyrtis tuberosa* Zone), but again, many reworked Eocene forms are also present. Cores 4 and 5 contain moderately well preserved Radiolaria from the *Theocampe mongolfieri* Zone (lower Middle Eocene). The Upper Eocene and most of the Middle Eocene were not sampled; however, a few species characteristic of the Upper Eocene were mixed into Cores 4 and 5 during drilling. Their presence indicates that some fossiliferous material from the Upper Eocene exists at this site, but was not recovered. Core 6 is from the Lower Eocene.

Below Core 6, the fauna is very poorly preserved. However, Section 7-4 does contain a few extremely corroded forms that appear to belong to the Cretaceous. After the nearly barren sediments of Cores 7, 8, and 9, Cores 10 through 15 contain several identifiable species which have been previously reported from Campanian to Santonian sediments. The radiolarians of Core 12 are the best preserved in this group. Below Core 16, the radiolarians are again very poorly preserved and in Core 20, totally dissolved. Cores 21 through 23 have a very sparse and poorly preserved fauna which may be Cenomanian to Turonian in age. Core 26 contains a few highly altered and unidentifiable specimens.

There are few calcareous organisms preserved; therefore, there is stratigraphic control on the Cretaceous section other than that provided by the radiolarians. By comparing the radiolarian assemblage found at this site with those found at other sites of Leg 17, approximate age assignments can be made. Cores 7 and 8 compare with Site 169, Cores 2 through 4; Site 170, Cores 9 and 10; and Site 171, Core 21 and are thought to be of Campanian age. Cores 10 through 16 compare with Site 170, Core 11 and Site 171, Core 24 and are thought to be of Coniacian to Santonian age. Cores 17 through 19 compare with Site 170, Cores 12 and 13 and are thought to be of Cenomanian to Turonian age.

Site 165

Core 1 of Hole 165 contains a thin layer of Quaternary (Sample 1-1, 8-9 cm) overlying Lower Miocene sediments in Section 2 (*Lychnocanium bipes* Zone). The second core recovered a highly mixed assemblage (Quaternary to Eocene in age) which probably resulted from the caving of the hole.

Although started at the same depth as the bottom of Core 165-1, the first core of 165A is from the next lower faunal zone (*Dorcadospyris papilio*) and is below the Oligocene-Miocene boundary. Cores 165A-2 and -3 are also from this zone.

Following an uncored interval from 33 to 71 meters below the sea floor, Cores 4 and 5 sampled the *Theocyrtis annosa* and *T. tuberosa* zones. The boundary between these two zones lies within Section 5-5. After another uncored interval from 89 to 127 meters, Cores 6, 7, 8, and 9 were taken continuously. Cores 6 and 7 contain the lower part of the *Theocyrtis tuberosa* Zone (from the Lower Oligocene). The base of this zone is found in Section 7-5 and may be used as an approximation of the Eocene-Oligocene boundary. The core catcher of Core 7 and Section 8-1 contain the upper Eocene *Thyrsocyrtis bromia* Zone along with much reworked Middle to Upper Eocene material. The *Podocyrtis goetheana* Zone is found in Section 8-2 and continues through Core 9. This zone spans the Middle to Upper Eocene boundary.

Another uncored interval (163 to 201 m) follows Core 9. Cores 10 through 15 were taken continuously and contain three zones from the Middle Eocene: *Podocyrtis mitra* (10-1 to 11-3), *P. ampla* (11-5 to 12 CC), and *Thyrsocyrtis triacantha* (13-1 to 14 CC). Several pieces of chert and one small piece of siliceous limestone were recovered in Core 15. The radiolarian assemblage from the limestone is Early Eocene in age (*Buryella clinata* Zone). The absence of the *Theocampe mongolfieri* and *Phormocyrtis striata striata* zones suggests that a hiatus spanning the Lower to Middle Eocene boundary exists between Cores 14 and 15.

The section was spot cored below Core 15 to basement. A few poorly preserved Radiolaria are found in Cores 17,

TABLE 1
Radiolarians at Site 164

Part 1 – Site 164: Zone	Core, Section, Interval (cm)	Abundance	Preservation	Contamination	*Cannartus mammiferus*	*Dorcadospyris forcipata*	*Calocycletta virginis*	*Theocyrtis annosa*	*Dorcadospyris ateuchus*	*Dorcadospyris triceros*	*Theocyrtis tuberosa*	*Artophormis gracilis*	*Dorcadospyris pseudopapilio*	*Lithocyclia angustum*	*Dorcadospyris circulus*	*Dorcadospyris quadripes*	*Dorcadospyris spinosa*	*Cycladophora hispida*	*Lithochytris vespertilio*	*Theocotyle ficus*	*Podocyrtis diamesa*	*Theocotyle venezuelensis*	*Triactus tripyramis triangula*	*Lamptonium fabaeforme chaunothorax*	*Podocyrtis sinuosa*	*Thyrsocyrtis hirsuta hirsuta*	*Lamptonium fabaeforme fabaeforme*	*Podocyrtis papalis*	*Theocotyle crypto cryptocephala*	*Theocorys anaclasta*	*Lamptonium fabaeforme constrictum*	*Triactus tripyramis tripyramis*	*Lithochytris archaea*	*Thyrsocyrtis rhizodon*	*Buryella clinata*	*Theocorys anapographa*	*Theocotyle cryptocephala nigriniae*	*Podocyrtis aphorma*	*Thyrsocyrtis triacantha*	*Theocampe mongolfieri*	*Sethochytris babylonus* gr.	*Thyrsocyrtis hirsuta robusta*	*Phormocyrtis striata*
C. virginis	1, CC	F	P	R	R	F	F																																				
Theocyrtis tuberosa	2-2, 35-40	A	M	R				R	R	F	F	F			R	F	R																										
	2, CC	C	P	R					F				R		C																												
	3-1, 45-47	A	M	R					R	F	F	F	F	R	R	F																											
	3, CC	C	P	R											C	?	?																										
Theocampe mongolfieri	4-1, 88-90	A	G															F	F	F		F	R	F	C	F				F				R	R	F	R	R		C	F	F	R
	4, CC	C	M	R														F	F	R	?	F	F	R	F	F	R	F		F			R	F	R	R	R	R	R	F	F	C	R
	5, CC	A	G	R/D														R	R	F	F	F	R	R	F	F	R	F		F	R	R	R	F	F	R	R	R	R	R	F	F	F

Part 2 – Site 164: Zone	Core, Section, Interval (cm)	Abundance	Preservation	Contamination	*Heliostylus* sp.	*Buryella tetradica*	*Stylosphaera goruna*	*Thecosphaera larnacium*	*Giraffospyris lata*	*Astrosphaerin* sp. E	*Amphicraspedum murrayanum*	*Amphicraspedum prolixum*	*Lamptonium pennatum*	*Stylotrochus nitidus*	*Phormocyrtis striata exquisita*	*Phormocyrtis striata striata*	*Podocyrtis papalis*	*Theocotyle alpha*	*Phormocyrtis cubensis*	*Buryella clinata*	*Theocampe urceolus*	*Lamptonium fabaeforme fabaeforme*	*Theocotyle cryptocephala nigrinae*	*Thyrsocyrtis hirsuta hirsuta*	*Calocycloma hispida*	*Periphaera decora*	*Lithochytris archaea*	*Spongatractus balbis*	*Rhabdolithis pipa*	*Stylotrochus quad. quadribrachiatus*
Buryella clinata	6-1, 52-54	A	G	D	R	R	R	R	R	R	R	R	R	R	C	R	C	C	F	R	R	R	R	C	R	R	F	R	R	R
	6, CC	R	P	D							R							R	R					R			R			

18, 20, 21, 22, and 25. All appear to be from the Upper Cretaceous.

Preservation of the radiolarian faunas is only moderate in the Miocene and Oligocene parts of the section. However, the Eocene section is almost pure radiolarian ooze and contains abundant, well-preserved assemblages. Reworking of older Radiolaria is common in the Quaternary, Miocene and Oligocene sediments. It is less common, but still present in Lower Oligocene and Eocene sediments.

In addition to this reworking and to the previously mentioned hiatuses, the skewed size distributions of the radiolarian assemblage in several cores suggests that much of the "pelagic" sediment at this site has been strongly affected by bottom currents. Examples of winnowed sediments are found in samples from 165A-7-5 and 11-5 which contain a preponderance of very delicate radiolarians and diatoms and in 8-6 which contains mostly large, robust forms.

Diatoms were not studied as a group; however, their particular abundance was noted at two intervals: (a) the Quaternary, 165-1-1, 8-9 cm (*Ethmodiscus rex* ooze); and (b) the Lower Oligocene, 165A-6, -7.

Site 166

Radiolaria are abundant and moderately well preserved through most of the Tertiary section at this site. The first five cores were taken continuously from the sea floor. They contain stratigraphic breaks between the Quaternary and Pliocene (*Pterocanium prismatium* Zone missing) and in the Upper Miocene (*Ommatartus penultimus* and *O. antepenultimus* zones missing). The single surface core at Hole 166A shows the same stratigraphic sequence as Cores 1 and 2 of Hole 166.

After the fifth core, short (10 m) sections were washed between each successive core. The samples of radiolarian ooze recovered are from the Middle Miocene (*Dorcadospyris alata* Zone), Lower Miocene (*Calocycletta virginis*

TABLE 1 – *Continued*

Part 3 – Site 164 Zone	Core, Section, Interval (cm)	Abundance	Preservation	Contamination	*Dictyomitra formosa*	*Dictyomitra* sp. A	*Dictyomitra* cf. *D. torquata*	*Theocampe ascalia*	*Dicolocapsa* sp. A	*Stichomitra asymbatos*	*Artostrobium tina*	*Amphipyndax enessefi*	*Theocampe salillum*	*Pseudoaulophacus floresensis*	*Pseudoaulophacus superbus*	*Pseudoaulophacus lenticularis*	*Spngodiscus pulcher*	*Theoperia* sp. A	*Rhopalosyringium* sp. A	*Lithocampe pseudochrysalis var a*	*Theocampe apicata*	*Crucella* sp. A	*Amphipyndax stocki*	*Spongosaturnalis* sp. A	*Dictyomitra* sp. cf. *D. andersoni*	*Hemicryptocapsa conara*	*Stichomitra* sp. A	? *Stichomitra livermorensis*	*Crucella* sp. A	*Theocampe apicata*	*Solenotryma* cf. *dacryodes*	*Lithomelissa* cf. *L. heros*	*Artopilium* sp. A	*Pseudoaulophacus pargueraensis*	*Spongosaturnalis polymorphus*	*Incert. sed.* sp. A
	7-1				Silica Dissolved																															
	7-4, 70-72	R	P									R	R	R																						R
Campanian (unzoned)	7-5, 118-120	R	P									R	R	R																						R
	7, CC	R	P	D/R								R	R	R																						R
	8-2, 99-101				Silica Dissolved																															
	8, CC	R	P	D																																R
	9, CC				Silica Dissolved																															
	10-3, 108-110				Silica Dissolved																															
	10, CC	R	P					R	R			R	R	R					R							R	R	R				R				
	11-1, 128-130	R	P		R	R	R	R	R			R	F	R	R	R	R		R							R	R	R	R			R		R		
	11, CC	R	P		R	?	?	R	R	R	R	F	F	R	R	R	R		R							R	R	R	R			R		R		
	12, CC	F	M		C	?	?	R	F	R	F	C	C	F	F	R	R		R	R						R	R	R	?			R	F	R	R	
Coniacian–Santonian (unzoned)	13-1, 64-66	F	M		C		R	R	F	R	F	C	C	F	F	R	R		R				R				R	?	R	R	R		F	R	R	
	13, CC	R	P		F		F	R	R	R	R	F	F	R	R	R	R		R		R		F				R	?	R	R	R	R	R	R	R	
	14-1, 24-26	F	M		F	R	R	R	F	R	F	F	C	F	F	R	R		R		R		F	R			R	?		F		F	F	R	R	
	14, CC	R	M		F	F	F	R	R	R	R	F	F	R	F	R	R		R		R		F	R			R	?		R		R	R	R	R	
	15-1, 118-120	R	M		F	F	R	R	R	R	R	F	F	R	F	R	R		R		R		R	?	R		R		R	R		R	R			
	15, CC	F	M		F	F	F	R	F	R	F	F	C	F	F	R	R		R		R		F	?	R		R	?	R	F		R	R			
	16-1, 141-143	F	M		C	F	R	R	F	R	F	F	C	F	F	R	R		R		R	R	F	?	R	R	R	R	R	R	R	F	R			
	16, CC	R	P		F	R	F	R	R	R	R	F	F	R	R	R	R		R		R		R	?	R	R	R	R	R	R	R	R	R			
	17-1, 130-132	R	M		F	F	R	R	R	R	F	F	F	R	R	R	R		R				R	R	R											
	17, CC	R	P		F	R	R	R	R	R	R	F	F	R	R	R	R		R				R	R	R											
Cenomanian – Turonian	18-1, 75-76	R	M		F	R	?	R		R	F		C	R	R	R	R	R	R																	
	18, CC	R	P		F	R	?	R		R	R		F	R	R	R	R	R	R																	
	19-2, 130-132	R	P		F	R	?	R	R	R	R	R	R	R	R	R			R											R						
	19, CC	R	P		F	R	?	R	R	R	R	R	R	R	R	R			R											R						
	20-1, 120-122				Silica Dissolved																															
	20, CC				Silica Dissolved																															
	21-1, 84-86				Silica Dissolved																															
	21-1, 132-134	R	P		R																															
?	21, CC	R	P		R																															
	23, CC	R	P																																	
	24-1, 84-86	R	P																																	
	25-1, 113-115	R	P																																	
	25, CC	R	P																																	
	26, CC	F	P																																	

TABLE 2
Radiolarians at Site 165

Part 1 – Hole 165 Zone	Core, Section, Interval (cm)	Abundance	Preservation	Contamination	*Ommatartus tetrathalamus*	*Pterocanium praetextum*	*Spongaster tetras*	*Theocyrtium trachelium*	*Artophormis gracilis*	*Dorcadospyris* sp.	*Theocyrtis tuberosa*	*Cannartus tubarius*	*Lychnocanium bipes*	*Dorcadospyris praeforcipata*	*Calocycletta robusta*	*Theocyrtis annosa*	*Cannartus prismaticus*	*Dorcadospyris ateuchus*	*Dorcadospyris papilio*	*Dorcadospyris riedeli*	*Dorcadospyris circulus*
Quaternary	1-1, 8-10	C	G	R	C	F	C	R													
	1-1, 70-72	F	P	R	Highly mixed Eocene to Middle Miocene																
Lychnocanium bipes	1-2, 130-132	C	M	R					R	F	R	?	C		F	R	F	F	?	R	
	1-3, 90-92	C	M	R						R	R	R	C	F	C	F	F	F	R	R	R
	1, CC	C	M	R									C	F	C	F	F	C	R	R	R
?	2-2, 81-83	A	G	D/R	C	R	F	R			R										
	2, CC	A	G	D/R	C	R	F	R			R										

and *Lychnocanium bipes* zones), Upper Oligocene (*Theocyrtis annosa* Zone) and in Cores 12 and 13, the Upper Eocene (*Thyrsocyrtis bromia* Zone).

Below Core 13 the section was again cored continuously. Radiolarian zones are missing in the Upper Eocene (*Thyrsocyrtis tetracantha* Zone) and Middle Eocene (*Podocyrtis chalara, P. mitra, P. ampla,* and *Theocampe mongolfieri* zones). Between Core 17 (in which the Middle Eocene *Thyrsocyrtis triacantha* Zone is found) and Core 22, samples contain sparse, very poorly preserved Radiolaria that are probably Cretaceous in age. In Core 22 the radiolarians are moderately well preserved. Based on the calcareous microfossils this sample and those below, it must be from the mid Cretaceous (Upper Albian to Cenomanian in age). From Cores 23 to 28 the radiolarian fauna is fairly diverse, although not well preserved.

Site 167

The first three cores at Site 167 sampled the Quaternary (unzoned) and the *Pterocanium prismatium* Zone of the uppermost Pliocene (in Section 3-6). Core 3 and the lowest part of Core 2 contain reworked Miocene and Eocene radiolarians. These are the only samples in which a significant amount of reworking was detected. From Cores 4 to 16 the section was spot cored. Except for the Middle Miocene *Cannartus petterssoni* Zone, all the radiolarian zones of the Middle and Lower Miocene and Upper Oligocene were sampled. Below Core 16 the section was continuously cored. Although most of the Upper and Middle Eocene zones were identified in these samples, core recovery was not good, and breaks in the stratigraphic record may exist.

Radiolaria were moderately well preserved in the Cenozoic section down to the Middle Eocene. The chert encountered in Core 33 marks the point at which the radiolarian fauna becomes sparse and poorly preserved. From Core 37 (containing the Middle Eocene *Thyrsocyrtis triacantha* Zone) down to Core 60, in the lower part of the Upper Cretaceous, the sediments contain almost no radiolarians. From Core 60 to basement, Radiolaria are generally sparse, however, they may be abundant in layers that are a few centimeters thick and are commonly found associated with small chert layers. Calcareous fossils indicate that this interval ranges in age from Late Turonian to Late Tithonian/Berriasian.

Where found in the lower part of the section, Radiolaria are usually recrystallized and filled with cryptocrystalline silica. Only in Core 78 are the poorly preserved fragments of radiolarians replaced by pyrite. Although recrystallization and replacement have obscured the internal structure of most specimens, surface ornamentation may be well preserved (particularly for specimens from Cores 60, 61, 87, and 88).

Site 168

The first (surface sediment) core taken at this site contained no radiolarians. The second core was also taken near the sediment surface and contains a radiolarian assemblage that is composed predominantly of Eocene species mixed with a few specimens that are from the Lower Miocene, *Calocycletta virginis* Zone. The absence of fine lattice work on individual specimens and the generally corroded nature of the assemblage suggests that younger, more delicate forms may have been completely dissolved and that Early Miocene is the maximum age for the sample.

Cores 3 and 4 (taken from 29 to 38 m) are badly disturbed and contain a highly mixed assemblage. The youngest radiolarians identified are from the *Theocyrtis annosa* Zone (Upper Oligocene); however, there are very few Oligocene specimens present and these may represent

TABLE 2 – *Continued*

Part 2 – Hole 165A

Zone	Core, Section, Interval (cm)	Abundance	Preservation	Contamination	*Cannartus tubarius*	*Calocycletta robusta*	*Dorcadospyris praeforcipata*	*Dorcadospyris ateuchus*	*Dorcadospyris papilio*	*Dorcadospyris riedeli*	*Calocycletta parva*	*Theocyrtis annosa*	*Cannartus prismaticus*	*Dorcadospyris circulus*	*Dorcadospyris quadripes*	*Lithocyclia crux*	*Dorcadospyris spinosa*	*Centrobotrys gravida*	*Dorcadospyris pseudopapilio*	*Lithocyclia angustum*	*Dorcadospyris triceros*	*Artophormis gracilis*	*Theocyrtis tuberosa*	*Artophormis barbadensis*	*Theocampe mongolfieri*	*Buryella clinata*	*Theocorys anapographa*	*Lithocyclia aristotelis* gr.	*Thyrsocyrtis rhizodon*
Dorcadospyris papilio	1-2, 126-128	C	M			F	F	F	R		R	C	F									F							
	1-4, 55-57	C	M	R	R	F	F	C	F	R		C	F									F							
	1, CC	C	M	R		F	F	C	R	?		C	F									F							
	2-1, 78-80	C	M	R		C	F	C	F		R	C	F									C							
	2-3, 80-82	C	M	R		R	R	F	R	R	F	C	F	R								C							
	2-5, 67-69	C	M	R			F	C	R		F	C	F									C							
	2, CC	C	M	R			R	C	F	R	R	F	F									F							
	3-2, 48-50	C	P	R				C	?			C		C								C							
	3-4, 136-138	C	M	R				C	R			F	R	C						R		C							
	3, CC	C	M	D/R			R	C	R	R	R	C	R	R						R		F							
Theocyrtis annosa	4, CC	C	M									F	R	R						R	F	F	R						
	5-2, 65-67	C	G	R								F	F	C						F	F	C							
	5-4, 52-54	C	M									R	R	F						F	F	C	C						
Theocyrtis tuberosa	5, CC	A	G	R										R			R			F	F	F	A						
	6-1, 93-95	A	G												F	F	?		R		F	C							
	6-3, 33-35	A	G													R	?	F	C	R	F	C	A						
	6-5, 29-31	A	G															C	C	R	F	F	G						
	6, CC	C	G	R														F	R	R	F	F	A						
	7-1, 19-21	C	G																	R	F	C	A						
	7-3, 52-54	C	G																	R	F	C	A						
Thyrsocyrtis bromia	7-5, 75-77	F	M	R																	R	F	F	R	F	R	R	R	R

cavings. A majority of the assemblages are from the Upper Eocene (*Thyrsocyrtis bromia* to *T. tetracantha* zones) and contain a considerable number of reworked Middle Eocene species. Similarly, the assemblage in Core 5 (47-56 m) is predominantly from the upper part of the Middle Eocene, *Podocyrtis chalara* Zone, but contains a few specimens that are Late Eocene and Oligocene age and many specimens reworked from the lower part of the Middle Eocene.

Site 169

Cores taken at Site 169 were from the Cretaceous part of the section and range in age from Maastrichtian to Late Albian (based on the calcareous fossils). Poorly preserved radiolarians are present in all cores except 5, 6, and 7; they are common in Cores 2, 8, 9, and 10. Core 8 contains the best preserved material. Based on this assemblage and the stratigraphy of the other microfossil groups, Core 8 is within that part of the section represented by Cores 64 and 66 at Site 167.

Site 170

The first two cores (1 and 2) were taken between 0 and 10 meters below the sea floor and contain only a few, very corroded Radiolaria. Rare Quaternary radiolarians are found in Core 1 along with several reworked Eocene species. The coarse fraction of Core 2 is composed mainly of zeolite crystals, but does contain partially dissolved specimens of *Dorcadospyris ateuchus*, which indicate a Late Oligocene to Early Miocene age. Cores 3 through 15 are from the Cretaceous part of the section and, based on the calcareous fossils, range in age from Maastrichtian to Late Albian. Radiolaria are absent in Cores 5 and 6 and are generally poorly preserved in the remaining cores. Only a few samples (Cores 9, 10, 13, and 15) contain common or moderately well preserved specimens.

Radiolarians similar to those in cores of Albian age at Site 167 are found in Section 7-2 and are thought to be reworked.

TABLE 2 – *Continued*

Part 3 – Hole 165A (Continued)

Zone	Core, Section, Interval (cm)	Abundance	Preservation	Contamination	*Artophormis gracilis*	*Lophocyrtis jacchia*	*Theocyrtis tuberosa*	*Thyrsocyrtis bromia*	*Dorcadospyris triceros*	*Cycladophora turris*	*Lithocyclia aristotelis* gr.	*Artophormis barbadiensis*	*Podocyrtis goetheana*	*Podocyrtis chalara*	*Sethochytris triconiscus*	*Podocyrtis trachodes*	*Podocyrtis mitra*	*Eusyringium fistuligerum*	*Lithapium anoectum*	*Lithapium plegmacantha*	*Podocyrtis ampla*	*Eusyringium lagena*	*Theocotyle venezuelensis*	***Triactis tripyramis tripyramis***	*Lamptonium fabaeforme fabaeforme*	*Lamptonium fabaeforme constrictum*	*Triactis tripyramis triangula*	*Podocyrtis aphorma*	*Theocorys anapographa*	*Thyrsocyrtis triacantha*	*Thyrsocyrtis rhizodon*	*Theocampe mongolfieri*	*Lithochytris vespertilio*	*Lithocyclia ocellus* gr.	*Podocyrtis papalis*	***Theocotyle ficus***	*Sethochytris babylonis* gr.	*Podocyrtis dianesa*	*Lamptonium fabaeforme chaunothorax*	*Phormocyrtis striata striata*	*Buryella clinata*	*Lithochytris archaea*	*Cycladophora hispida*	*Thyrsocyrtis hirsuta robusta*	*Thyrsocyrtis hirsuta hirsuta*	*Podocyrtis sinuosa*
Thyrsocyrtis bromia	7-6, 7-9	A	G	R	F	R	F		F	R	F		R					F												R	F	F			F		F						F			
	7, CC	A	G	D	F	F	C	R	F		F	R																		F		F			R		R						R			
	8-1, 68-70	A	G	R			A	R	R		F	R	R		R		R	C			R									C	F	C	R	R	F		F						F			
Podocyrtis goetheana	8-3, 14-16	A	G								F		R		R			F												A	F	F		R	F	R	R						F			
	8-5, 103-105	A	G								F		R		R			F												C	F	F	F	F	F	R	R						C			
	8, CC	A	G							R	F						R	F												C	R	F		F	C	R	R						R			
	9-1, 120-122	A	G								F		F				F	C												C	F	F		F	C	F	F						F			
	9-3, 120-122	A	G								F		R				R	F												C	F	F	R	F	C	F	F						F			
	9-5, 100-102	A	G								F		R				R	C												C	F	F	R	F	C	F	F						F			
	9, CC	A	G	R								R	R	R	R		F	C												C	F	F		C	F	R	R						C			
Podocyrtis mitra	10-1, 120-122	A	G	R											R	R	F	F		R	F				R					C	F	F	F	F	F	R	R	R					F			F
	10-3, 110-112	A	G	R											R	F	F	C			C									F	F	F	R	C	C	R	R	R					F	R		F
	10-5, 80-82	A	G												R	R	F	C			C	R								C	F	F	F	F	F	R	R	R					F			F
	10, CC	A	G													F	F	F			C									F	R	F	C	F	F	R	R	R					F	R		F
	11-1, 120-122	A	G													C	C	C			C									C	F	C	C	F	C	R	R	R					F			F
	11-3, 80-82	A	G													C	F	C			F									C	F	C	C	F	C	R	R						F			R
Podocyrtis ampla	11-5, 110-112	A	G															F			R								R	C	F	C	F	C	C	R	R						F			R
	11, CC	A	G															F	F	R	F	R							R	F	F	C	R	C	F	R	R						F		R	R
	12-1, 110-112	A	G																	F	C	R							F	C	F	C	C	C	C	R	R	F					F	R	R	F
	12-3, 140-142	A	G																	F	C	F							F	C	F	C	C	C	C	R	R						F			C
	12-5, 95-97	A	G																	F	C	F								C	F	C	C	C	C	R	R	R					F			C
	12, CC	A	G																	F	F	R								C	F	C	C	F	F	R	R	F					F			C
Thyrsocyrtis triacantha	13-1, 123-125	A	G																			R	F	R	R		R	F		F	C	C	F	F	R	R	F	F	R	F		R	F	C	F	F
	13-3, 70-72	A	G																						R		R	F		F	C	C	F	F	F	F	F	F	F	F	R		F	C	F	C
	13-5, 78-80	A	G																							R	R	F	R	F	F	C	F	R	C	F	F	F	F	R		R	F	C	F	C
	13, CC	A	M																											F	F	C	F		C	F	F	R	C	R	R		F	C		F
	14, CC	A	M																											R	F	C	F	F	F	F	F	R	F	R	F	F	F	C	R	C

Site 171

Radiolaria are poorly preserved in the spot samples from the Tertiary section (Cores 2 through 8). They are absent from Core 1. Core 2 is from the Middle Miocene (*Dorcadospyris alata* Zone). Core 3 contains only fragments of orosphaerid radiolarians that are probably Early Miocene in age. Cores 4, 5, and 6 sampled the three Oligocene zones (*Dorcadospyris papilio, Theocyrtis annosa,* and *T. tuberosa,* respectively). Cores 4 and 5 contain some reworked Eocene material and, in addition, Core 5 contains several species indicative of the Paleocene to Lower Eocene. Core 8 contains only a few well-preserved Radiolaria from the upper part of the Upper Eocene (*Thyrsocyrtis bromia* Zone); all of these may have been mixed downward during drilling into Middle Eocene sediments (as dated by calcareous fossils) which are devoid of radiolarians at this site.

In the Cretaceous section, Radiolaria are always rare and generally very poorly preserved. Most of their silica appears to have gone into the replacement of foraminifera. Cores 15 through 18 are from that part of the section with a high rate of sediment accumulation and contain only pyritized tests of radiolarians. Cores 20 to 23 are barren, but well-preserved radiolarians are found in Core 24 along with common sponge spicules, a few diatoms and plant fragments. Black (carbonized) fibers and chips of plant debris are also found in Cores 25 and 26. Sponge spicules are found down to Core 28, but no Radiolaria are found below Core 24.

TAXONOMY (CENOZOIC SPECIES)

Neither illustrative material nor lengthy reference lists are provided for the Cenozoic species. In most cases the original reference and one or two of the more recent references are all that are included. More complete references and illustrations of the species used may be found in Riedel and Sanfilippo (1970, 1971); Moore (1971, 1972); Sanfilippo and Riedel (1973); and Foreman (1973). Remarks and comments on the differences in the interpretation of various species and their stratigraphic ranges are included where pertinent.

TABLE 2 – *Continued*

Part 4 – Hole 165A (Continued)

Zone	Core, Section, Interval (cm)	Abundance	Preservation	Contamination	*Buryella tetradica*	*Theocosphaera larnacium*	*Phormocyrtis turgida*	*Heliostylus* sp.	*Buryella clinata*	*Lithochytris archaea*	*Calocycloma ampulla*	*Lamptonium pennatum*	*Ceratospyris articulata*	*Rhabdolithis pipa*	*Dictyomitra* spp.	*?Amphipyndax* spp.	*Pseudoaulophacus* spp.	*Theocampe salillum*
Buryella clinata	15, CC	F	P		R	R	R	F	F	R	R	R	R	R				
Upper Cretaceous (unzoned)	16, CC				Silica Dissolved													
	17-1, 140-142	R	P	D											R			
	17, CC			D														
	18-1, 82-84	R	P												R	R		
	18-3, 76-78	R	P	D											R			
	18, CC	R	P												R			
	19-1, 128-130			D	Silica Dissolved													
	19, CC			D	Silica Dissolved													
	20-1, 142-144	R	P												R			
	20, CC	R	P	D											R	R	R	
	21-1, 101-103				Silica Dissolved													
	21-3, 120-122	R	P												R	R		
	21, CC	R	P												R			
	22-3, 148-150	R	P	D											R	R		R
	22, CC				Silica Dissolved													
	25-1, 94-96	R	P												R	R		
	25, CC	R	P	D													R	

Order POLYCYSTINA Ehrenberg

Polycystina Ehrenberg 1838, emend. Riedel 1967b p. 291.

Suborder SPUMELLARIA Ehrenberg 1875

Family ACTINOMMIDAE Haeckel

Actinommidae Haeckel, 1862, emend. Riedel, 1967b p. 294.

"ASTROSPHAERINS"

"Astrosphaerins" as used in Sanfilippo and Riedel, 1973, p. 486.

Astrosphaerin sp E

Astrosphaerin sp. E. Sanfilippo and Riedel, 1973, p. 488, pl. 6, fig. 3-6; pl. 23, fig. 1.

Genus CANNARTUS (Haeckel)

Cannartus Haeckel, 1881, p. 462.
Cannartus Haeckel, emend. Riedel, 1971, p. 652.

Cannartus prismaticus (Haeckel)

Pipetella prismatica Haeckel, 1887, p. 305.
Cannartus prismaticus (Haeckel); Riedel and Sanfilippo, 1970, pl. 15, fig. 1.

Cannartus tubarius (Haeckel)

Pipettaria tubaria Haeckel, 1887, p. 339, pl. 39, fig. 15; Riedel, 1959, p. 289, pl. 1, fig. 2.
Cannartus tubarius (Haeckel); Riedel and Sanfilippo, 1970, pl. 15, fig. 2.

Cannartus violina Haeckel

Cannartus violina Haeckel, 1887, p. 358, pl. 39, fig. 10; Riedel, 1959, p. 290, pl. 1, fig. 3.

Cannartus mammiferus (Haeckel)

Cannartidium mammiferum Haeckel, 1887, p. 375, pl. 39, fig. 16.
Cannartus mammiferus (Haeckel); Riedel, 1959, p. 291, pl. 1, fig. 4.

Cannartus laticonus Riedel

Cannartus laticonus Riedel, 1959, p. 291, pl. 1, fig. 5.

Cannartus petterssoni Riedel and Sanfilippo

Cannartus petterssoni conditional manuscript name proposed in Riedel and Funnell, 1964, p. 310; Riedel and Sanfilippo, 1970, p. 520-521, pl. 14, fig. 3.

Remarks: As originally described by Riedel and Sanfilippo, this species has a "cortical shell rather thick walled, approximately

TABLE 3
Radiolarians at Hole 166A

Part 1 – 166A Zone	Core, Section, Interval (cm)	Abundance	Preservation	Contamination	*Pterocanium praetextum*	*Spongaster pentas*	*Pterocanium prismaticum*	*Spongaster tetras*	*Cannartus tetrathalamus*	*Stichocorys peregrina*	*Cannartus penultimus*	*Cannartus antepenultimus*
Quarternary	1-1, 6-8	C	G	R	F			C	C			
Spongaster pentas	1-1, 19-21	C	P	R		F	F	F	R	C		
	1-1, 95-97	C	M	R		F	F		F	A		
	1-2, 60-62	C	G	R				F	F	C		
Stichocorys peregrina	1-3, 40-42	C	M	R				R		C	F	
	1, CC	C	M	R					R	C	F	R

Part 2 – Hole 166 Zone	Core, Section, Interval (cm)	Abundance	Preservation	Contamination	*Pterocanium praetextum*	*Ommatartus tetrathalamus*	*Spongaster tetras*	*Spongaster pentas*	*Pterocanium prismaticum*	*Stichocorys peregrina*	*Ommatartus penultimus*	*Ommatartus antepenultimus*	*Ommatartus hughesi*	*Cannartus petterssoni*	*Calocycletta caepa*	*Stichocorys delmontensis*	*Cannartus laticonus*	*Stichocorys wolffii*	*Cyrtocapsella cornuta*
Quaternary	1, CC	C	G		C	C	C												
Spongaster pentas	2-1, 22-24	C	M	R	R	F	C	R	C	C									
	2-3, 108-110	C	G	R		F	F	F	R	A	F								
Stichocorys peregrina	2-5, 80-82	C	G	R		R	F	R		A	F								
	2-6, 78-80	C	G	R						A	F	R							
	2, CC	C	G	D/R		F		F	F	C	F	F							
	3-3, 80-82	C	M	D/R				F	R	C	F								
	3, CC	A	G	D/R		R	C	F	R	C	F	F	R	R					
Cannartus petterssoni	4-1, 70-72	C	G	R										F		C	C		
	4-3, 70-72	C	M	R										F	F	C	C	F	
	4-5, 40-42	C	M											F	C	C	C	F	
	4, CC	C	G	R										F	C	C	C	R	
	5-1, 75-77	C	G											F	C	C	C	F	
	5-3, 30-32	C	G	R										F	C	C	C	F	F
	5-5, 48-50													F	C	C	C	F	
	5, CC	C	G	R										R	C	C	C	F	F

TABLE 3 – *Continued*

Part 3 – Hole 166 (Continued) Zone	Core, Section, Interval (cm)	Abundance	Preservation	Contamination	*Dorcadospyris alata*	*Calocycletta costata*	*Cannartus laticonus*	*Cannartus mammiferus*	*Cannartus violina*	*Stichocorys delmontensis*	*Cyrtocapsella tetrapera*	*Calocycletta serrata*	*Cyrtocapsella cornuta*	*Dorcadospyris forcipata*	*Cannartus tubarius*	*Dorcadospyris riedeli*	*Calocycletta virginis*	*Stichocorys wolffii*	*Lychnocanium bipes*	*Dorcadospyris praeforcipata*	*Calocycletta robusta*	*Cannartus prismaticus*	*Dorcadospyris ateuchus*	*Calocycletta parva*	*Dorcadospyris circulus*	*Theocyrtis annosa*	*Artophormis gracilis*	*Lithocyclia angustum*	*Lithocyclia crux*	*Dorcadospyris quadripes*	*Centrobotrys gravida*	*Dorcadospyris pseudopapilio*	*Dorcadospyris triceros*	*Theocyrtis tuberosa*
Dorcadospyris alata	6, CC	C	M	R	R	F	F	F		F	F		C				C																	
Calocycletta virginis	7-1, 78-80	C	M	R				R	R	F			C	F	F		C	C				F												
	7-3, 98-100	C	M	R					?	C			C	F	F		C	C				R												
	7-5, 15-17	C	M						?	C	F		C	?	F		C		R			R												
	7, CC	C	M	R						F	F	R	C	?			C	C	F	R		F												
	8-1, 29-31	C	M										F	F			C		F	R		F												
Lychnocanium bipes	8-3, 19-21	C	M	R															C	F	F	C				C								
	8-5, 19-21	C	M	R											R	R			C	R		F	F			C	F							
	8, CC	C	M	R													C	F	C	F	R	C	R			F								
Theocyrtis annosa	9-3, 58-60	C	M	R																		F	F		F	C								
	9-5, 21-23	C	M	R																		F	F		F	C	C							
	9, CC	C	M	R																		F	C		F	C	F							
	10-2, 78-80	C	M																			C		F	F	C	C							R
	10-4, 19-21	C	M																			F	F	F	C	C	C	F						
	10, CC	C	M	R																						F	C	F	R				F	
Theocyrtis tuberosa	11, CC	A	M	D																							C	R	R	F	F	F	F	C

cylindrical (sometimes bulged at the equator) with pronounced protuberances surrounding each end of the cortical shell". As used by this author, the cortical shell of specimens must have both (a) protuberances at the ends of the cortical shell (only) and (b) an approximately cylindrical shape, with the exception allowed parenthetically in the original description. Forms that are transitional with *C. laticonus* and have protuberances at the ends of the cortical shell, but do not have a cylindrical shape, are included in *C. laticonus.* All specimens thus far illustrated as *C. petterssoni* fit the somewhat more restricted definition used by the present author. The justification for this usage is that the change of the location of the protuberances precedes and apparently occurs more slowly than the change in shape of the cortical shell. The more strict definition allows a finer, more definite stratigraphic line to be drawn.

Genus OMMATARTUS Haeckel

Ommatartus Haeckel, 1881, p. 463.

Ommatartus antepenultimus Riedel and Sanfilippo

Panarium antepenutimum, conditional manuscript name proposed by Riedel and Funnell, 1964, p. 311.
Ommatartus antepenultimus, Riedel and Sanfilippo, 1970, pl. 14, fig. 4.

Ommatartus hughesi (Campbell and Clark)

Ommatocampe hughesi Campbell and Clark, 1944a, p. 23, pl. 3, fig. 12.
Ommatartus hughesi (Clark and Campbell); Riedel and Sanfilippo, 1970, p. 521.

Ommatartus penultimus (Riedel)

Panarium penultimum Riedel, 1957, p. 76, pl. 1, fig. 1.
Ommatartus penultimus (Riedel); Riedel and Sanfilippo (sensu. stricto), 1970, p. 521.

Ommatartus tetrathalamus (Haeckel)

Panartus tetrathalamus Haeckel, 1887, p. 378, pl. 40, fig. 3; Nigrini, 1967, p. 30-32, pl. 2, figs, 4a-4d.

Genus LITHAPIUM Haeckel

Lithapium Haeckel, 1887, p. 303.

Lithapium (?) plegmacantha Riedel and Sanfilippo

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

Lithapium (?) anoectum Riedel and Sanfilippo

Lithapium (?) anoectum Riedel and Sanfilippo, 1970, pl. 4, figs. 4, 5.

Lithapium (?) mitra (Ehrenberg) (?)

(?) *Cornutella mitra* Ehrenberg, 1873, p. 221; 1875, pl. 2, fig. 8.
(?) *Cornutella circularis* Ehrenberg, 1873, p. 221; 1875, pl. 2, fig. 4.

TABLE 3 – *Continued*

Zone	Core, Section, Interval (cm)	Abundance	Preservation	Contamination	*Lophocyrtis jacchia*	*Artophormis barbadiensis*	*Thyrsocyrtis bromia*	*Thyrsocyrtis tetracantha*	*Dorcadospyris triceros*	*Theocyrtis tuberosa*	*Cycladophora turris*	*Lithocyclia aristoteles* gr.	*Lithapium mitra*	*Sethochytris babylonis* gr.	*Podocyrtis goetheana*	*Eusyringium fistuligerum*	*Theocampe mongolfieri*	*Cycladophora hispida*	*Podocyrtis mitra*	*Thyrsocyrtis triacantha*	*Podocyrtis papalis*	*Thyrsocyrtis rhizodon*	*Lithochytris vespertilio*	*Lithocyclia ocellus* gr.	*Theocotyle ficus*	*Podocyrtis chalara*	*Theocotyle venezuelensis*	*Podocyrtis diamesa*	*Podocyrtis sinuosa*	*Thyrsocyrtis hirsuta hirsuta*	*Thyrsocyrtis hirsuta robusta*
Part 4 – Hole 166 (Continued)																															
	12-1, 18-20	A	G		F	R			F	C		F																			
	12-3, 18-20	A	G		F				F	A		C		R						R	R										
	12-5, 18-20	A	G		R	R			F	A	R	C		R						R		R	R								
Thyrsocyrtis bromia	12, CC	A	G	R	F		R	R	F	C	C	C																			
	13-1, 19-21	A	G				R	F	F	C	F	C		F		F	F			R		R	R								
	13-3, 15-17	A	G				F	C	C	A	F	C				R	C			F											
	13-5, 18-20	A	G			R	F	F	F	C	F	C		R		F	F			C		F									
	13, CC	A	G			R	F	F	F	F	R	F				C		C		C	F	F									
	14-2, 18-20	A	G							F	R	F				C	F	C	F	C	F	F		F	F						
	14-4, 34-36	A	G									F		F	R	C	F	C	F	C	C	F		C	F						
	14, CC	A	G												F	C	F	F		C	F	F		C		C					
Podocyrtis goetheana	15, CC	A	G										R		F	C	C	F		C		F	R	C		F					
	16-2, 22-24	A	G									F	F	F	F	C	C	C		C	C	F		C	F						
	16-4, 30-32	A	M										F	R	F	C	C	C		C	C	F	R	F	R						
	16-6, 44-46	A	M											F	F	C	C	C	F	C	C	F		C	F						
	16, CC	A	M	R											F	C	A	F	F	C	F	F	R	C	R		R				
T. triacantha	17, CC	A	M	D																C	F	F	F	R	R	R	F	R	F	F	F

Lithapium (?) *mitra* (Ehrenberg); Riedel and Sanfilippo, 1970, pl. 4, figs. 6, 7.

Genus SPONGATRACTUS Haeckel

Spongatractus Haeckel, 1887, p. 350.

Spongatractus balbis Sanfilippo and Riedel

Spongatractus balbis Sanfilippo and Riedel, 1973, p. 518, pl. 2, figs. 1-3; pl. 25, figs. 1, 2.

Genus STYLOSPHAERA Ehrenberg

Stylosphaera Ehrenberg, 1847a, chart to p. 385.
Stylosphaera Ehrenberg, *in* Sanfilippo and Riedel, 1973, p. 519.

Stylosphaera goruna Sanfilippo and Riedel

Stylosphaura goruna Sanfilippo and Riedel, 1973, p. 521, pl. 1, figs. 20-22; pl. 25, figs. 9, 10.

Genus THECOSPHAERELLA Haeckel

Thecosphaerella Haeckel, 1887, p. 80.

Thecosphaerella larnacium Sanfilippo and Riedel

Thecosphaerella larnacium Sanfilippo and Riedel, 1973, p. 521; pl. 3, figs. 4-6; pl. 25, figs. 13, 14.

Family PHACODISCIDAE Haeckel, 1881

Genus HELIOSTYLUS Haeckel

Heliostylus Haeckel, 1881, p. 457.
Heliostylus Haeckel, *in* Sanfilippo and Riedel, 1973, p. 522.

Heliostylus sp.

Heliostylus sp. Sanfilippo and Riedel, 1973, p. 522; pl. 8, figs. 1-7; pl. 26, figs. 10-12; pl. 27, fig. 10.

Genus PERIPHAENA Ehrenberg

Periphaena Ehrenberg, 1873, p. 246.

Periphaena tripyramis tripyramis (Haeckel)

Triactis tripyramis Haeckel, 1887, p. 432, pl. 33, fig. 6.
Periphaena tripyramis tripyramis (Haeckel); Saniflippo and Riedel, 1973, p. 523, pl. 9, figs. 7-9.

Periphaena tripyramis triangula (Sutton)

Phacotriactis triangula Sutton, 1896, p. 61.
Triactis tripyramis triangula (Sutton); Riedel and Sanfilippo, 1970, p. 521, pl. 4, figs. 9, 10.
Periphaena tripyramis triangula (Sutton); Sanfilippo and Riedel, 1973, p. 523, pl. 9, figs. 10, 11.

TABLE 3 – *Continued*

Part 5 – Hole 166 (Continued) Zone	Core, Section, Interval (cm)	Abundance	Preservation	Contamination	*Dictyomitra spp. group*	*Amphipyndax spp. group*	*Cyrtocapsa grutterinki*	*Dictyomitra formosa*	*Dictyomitra margarita*	*Dictyomitra veneta*	*Dictyomitra sagitafera*	*Sethamphora pulchra*	*Dictyomitra macrocephala*	*? Eucyrtidium cf. E. thiensis*	*Dictyomitra? cf. Eucyrtidium turricum*	*Cyrtocapsa turritica*	*Dictyo.?sp. cf. Eucyrtidium brouweri*	*Spongosaturnalis polymorphus*	*Hemicryptocapsa polyhedra*	*Hemicryptocapsa tuberosa*	*Cryptoamphorella conara*	*Cryptoamphorella sphaerica*	*Rhopalosyringium sp. A*	*Excentropylomma cenomana*	*Lithocampe pseudochrysalis var a*	*? Pseudoaulophacus sp. A*
//////////	18, CC	R	P	D																						
Upper Albian–Cenomanian	19, CC	R	P	D	R	R																				
	20-1, 72-74				Silica Dissolved																					
	20-4, 18-20				Silica Dissolved																					
	20, CC			D	Silica Dissolved																					
	21, CC	R	P		R																					
	22, CC	F	M											R			F	R	F	F	R	R	R	R	R	R
	23-2, 53-55	F	P					F	R	R			R	R												
	23-2, 100-102	R	M						R	R			R	R												
	23, CC	F	P						R	R		F	R	R		R										
	24, CC	R	P	D																						
	25-1, 75-77	C	P						R	R	R	F	F	R	R											
	26, CC	F	P						R	R	?	R	?	R												
	27-1, 129-131	F	P						R	R	?	R														
	27, CC				Silica Dissolved																					
	28, CC	F	P				R	F	R	R	R	R														

Periphaena decora Ehrenberg

Periphaena decora Ehrenberg, 1873, p. 246; 1875, pl. 28, fig. 6; 1875, pl. 28, fig. 6.
Periphaena decora Ehrenberg, *in* Sanfilippo and Riedel, 1973, p. 523, pl. 8, figs. 8-10; pl. 27, figs. 2-5.

Family COCCODISCADAE Haeckel, 1862
Genus LITHOCYCLIA Ehrenberg

Lithocyclia Ehrenberg, 1847a, chart to pl. 385.

Lithocyclia crux, Moore

Lithocyclia crux, Moore, 1971, p. 737, pl. 6, fig. 4.

Lithocyclia angustum (Riedel)

Trigonactura angusta Riedel, 1959, p. 292, pl. 1, figs. 6.
Lithocyclia angustum (Riedel); Riedel and Sanfilippo, 1970, p. 13, figs. 1, 2.

Lithocyclia ocellus (Ehrenberg) group

Astromma aristotelis Ehrenberg, 1847b, p. 55, fig. 10.
Lithocyclia ocellus group as used by Riedel and Sanfilippo, 1970, p. 522, pl. 5, figs. 1, 2.

Lithocyclia aristotelis group

Lithocyclia aristotelis group as used by Riedel and Sanfilippo, 1970, p. 522.

Family SPONGODISCIDAE Haeckel

Spongodiscidae Haeckel, 1862, emend. Riedel, 1967b, p. 295.

Genus AMPHICRASPEDUM Haeckel

Amphicraspedum Haeckel, 1881, p. 460.

Amphicraspedum murrayanum Haeckel

Amphicraspedum murrayanum Haeckel, 1887, p. 523, pl. 44, fig. 10.
Amphicraspedum murrayanum Haeckel *in* Sanfilippo and Riedel, 1973, p. 524, pl. 10, figs. 3-6; pl. 28, fig. 1.

Amphicraspedum prolixum Sanfilippo and Riedel

Amphicraspedum prolixum Sanfilippo and Riedel, 1973, p. 524, pl. 10, figs. 7-11; pl. 28, figs. 3, 4.

Genus SPONGASTER Ehrenberg

Spongaster Ehrenberg, 1860, p. 833.

Spongaster tetras Ehrenberg

Spongaster tetras Ehrenberg, 1860, p. 833; Moore, 1971, pl. 13, fig. 4.

Spongaster pentas Riedel and Sanfilippo

Spongaster pentas Riedel and Sanfilippo, 1970, p. 523, pl. 15, fig. 3.

TABLE 4
Radiolarians at Site 167

Part 1 – Site 167

Zone	Core, Section, Interval (cm)	Abundance	Preservation	Contamination	*Ommatartus tetrathalamus*	*Pterocanium praetextum*	*Spongaster tetras*	*Theocyrtium trachelium*	*Druppatractus acquilonius ?*	*Stylatractus universus*	*Spongaster pentas*	*Pterocanium prismatium*	*Ommatartus antepenultimus*	*Ommatartus hughesi*	*Cannartus laticonus*	*Stichocorys delmontensis*	*Calocycletta caepa*	*Cyrtocapsella cornuta*	*Stichocorys wolffii*	*Dorcadospyris alata*	*Calocycletta costata*	*Cannartus mammiferus*	*Dorcadospyris dentata*	*Calocycletta virginis*	*Cannartus violina*	*Cannartus tubarius*	*Dorcadospyris praeforcipata*
Quaternary	1-3, 80-82	F	M		C	F	C	R																			
	1-5, 80-82	F	M		C	F	C	R																			
	1, CC	F	M		C	F	C	R																			
	2-2, 80-82	F	M	R	C	F	C		R	R																	
	2-4, 80-82	F	M	R	C	F	C	R	C	R																	
	2-6, 82-84	F	M	R	C	R	C	R	C	R																	
	2, CC	F	G	R	C	F	C		F	R	R																
	3-1, 80-82	F	M	R	C	R	C		F	R	R																
	3-3, 80-82	F	M	R	C	R	C		F	R	R																
	3-5, 80-82	F	P	R	C	R	C	R	F	R																	
Pterocanium prismatium	3-6, 80-82	F	M	R	C	F	C		F	R		R															
	3, CC	F	G	R	C	R	C		F	R		F															
Ommatartus antepen-ultimus	4-1, 80-82	C	M										F	C	F	C	C										
	4-3, 80-82	C	M	R									F	C	F	C	F										
	4-5, 80-82	C	G										C	C	F	C	F										
	4, CC	C	M										F	C	R	C	R										
Cannartus laticonus	5-2, 80-82	C	M												C	C	C	F	R								
	5-4, 110-112	C	M												C	C	C	F	R								
	5, CC	C	M												F	A	A	F	F								
Dorcadospyris alata	6-3, 110-112	C	M												F	C	F	F	F	F	A	F	R	C	R		
	6-6, 110-112	C	M	R											F	C	F	F	F	F	A	F	R	C	F		
	6, CC	C	M													C	C	C	F	F	C		R	C	R	R	
	7-1, 80-82	C	M													C		C	F	F	C	F		C	R	R	
	7-3, 100-102	C	M													C	F	F	C	F	C			C	R	R	
	7-5, 80-82	C	M													C	F	F	F	F	C	F	R	C	R	R	
Calocycletta costata	7, CC	C	M													C	F	F	C		C	R	F	C	F	F	

Genus STYLOTROCHUS Haeckel

Stylotrochus Haeckel, 1862, p. 462.

Stylotrochus nitidus Sanfilippo and Riedel

Stylotrochus nitidus Sanfilippo and Riedel, 1973, p. 525, pl. 14, figs. 9-14; pl. 30, figs. 7-10.

Stylotrochus quadribrachiatus quadribrachiatus Sanfilippo and Riedel

Stylotrochus quadribrachiatus quadribrachiatus Sanfilippo and Riedel, 1973, p. 526, pl. 14, figs. 1, 2; pl. 31, fig. 1.

Suborder NASSALLARIA Ehrenberg, 1875

Family ACANTHODESMIIDAE, Haeckel, 1862

Acanthodesmiidae Haeckel, 1862, emend. Riedel 1967b, p. 296.

Genus CERATOSPYRIS Ehrenberg

Ceratospyris Ehrenberg, 1847a, chart to p. 385.

Ceratospyris articulata Ehrenberg

Ceratospyris articulata Ehrenberg, 1873, p. 218, pl. 20, fig. 4.
Ceratospyris articulata, Ehrenberg, *in* Sanfilippo and Riedel, 1973, p. 526, pl. 15, figs. 1-3; pl. 31, figs. 8, 9.

Genus DORCADOSPYRIS Haeckel

TABLE 4 – *Continued*

Part 2 – Site 167 (Continued) Zone	Core, Section, Interval (cm)	Abundance	Preservation	Contamination	*Cannartus violina*	*Stichocorys delmontensis*	*Dorcadospyris simplex*	*Cyrtocapsella cornuta*	*Calocycletta virginis*	*Cyrtocapsella tetrapera*	*Calocycletta serrata*	*Cannartus cf. C. tubarius*	*Lychnocanium bipes*	*Calocycletta robusta*	*Dorcadospyris riedeli*	*Dorcadospyris praeforcipata*	*Dorcadospyris papilio*	*Calocycletta parva*	*Cannartus prismaticus*	*Theocyrtis annosa*	*Dorcadospyris circulus*	*Dorcadospyris ateuchus*	*Dorcadospyris spinosa*	*Dorcadospyris quadripes*	*Lithocyclia crux*	*Centrobotrys gravida*	*Dorcadospyris pseudopapilio*	*Artophormis gracilis*	*Lithocyclia angustum*	*Dorcadospyris triceros*	*Theocyrtis tuberosa*
Calocycletta virginis	8-1, 80-82	C	P		F	R	C	C	C	F	F		F						R			R									
	8, CC	C	P			R	F	C	C	C			F			R			R			R									
	9-1, 80-82	C	P					C	C	F			C			R			R			R									
	9-3, 80-82	C	M					C	C	F	R		F			F			F			F									
	9-5, 80-82	C	M					C	F	F	R		C			F			F			F									
	9, CC	C	P					F	F	F	F		C	R		F			F			F						R			
Lychnocanium bipes	10-3, 80-82	C	G									R	C	R		F			F	F		F									
	10-5, 80-82	C	M									R	C	C		F			F	C		R									
	10, CC	C	M									R	C	C		C			F	F		C									
Dorcadospyris papilio	11-1, 80-82	C	G											C		C	C		F	C		C						C			
	11-3, 80-82	C	M											C	F	C	F		F	C		C						C			
	11-5, 80-82	C	M											C	R	C	C		F	C		C						C			
	11, CC	C	G											C	F	F	R		F	C		F						C			
	12-1, 78-80	C	P											C		R	F	R	R	F		F						C			
	12-3, 80-82	C	M	R												R	R	R	R	F	R	F						F			
	12-5, 80-82	C	M	R													R	R	R	F	R	F						F	R		
	12, CC	C	M	R											R	F	R	F	F	C	F	R						C	R		
Theocyrtis annosa	13-1, 80-82	C	M													R			R	C	F	C						C	R		
	13-3, 80-82	C	M																F	C	F	C						C			
	13-5, 80-82	C	P																R	C	R	C						C			
	13, CC	C	M																R	C	R	F						C			
	14-1, 110-112	C	M	R															F	C	R	C						C	R	R	
	14-3, 80-82	C	M																F	C	C	C						C	R		
	14-5, 80-82	C	M																F	C	C	C						C	F		
	14, CC	C	M																C	C	F	F						C	F		
	15-1, 80-82	C	M																F	C	C	F						C	F	R	
	15-3, 80-82	C	M																F	C	C	C						C	R	R	
	15-5, 80-82	C	M																F	C	C	R						C	R	F	
	15, CC	C	M	R															F	C	F	F	R	R				C	F	R	
	16, CC	C	M																	F	?	C	R		R			C	F	F	
Theocyrtis tuberosa	17-5, 110-112	C	M																	F					R			C	F	F	
	17, CC	C	M																	F	?										
	18-2, 78-80	C	M																				R	R	R			C	F	C	C
	18, CC	C	M																			R	F	F	R			C	F	F	A
	19-2, 78-80	C	G																				R	F	F			C	R	F	A
	19, CC	A	M																				F	F	R			C	R	F	A
	20-2, 80-82	A	M																					R	R			C	R	F	A
	20, CC	C	G																				F	F	F			C	R	F	A
	21-1, 80-82	C	M																				R	R	R			C	R	F	A
	21-3, 80-82	C	M																					F	R			C	R	F	C
	21-5, 80-82	C	M																				?	F	R		R	C	R	F	A
	21, CC	C	G																				?	F	F		F	C	R	F	A
	22-1, 78-80	C	M																				?	R		C	C	C	R	F	A
	22, CC	A	G																					?	F	F	F	C	R	F	A
	23-3, 80-82	C	M																								?	C	R	F	C
	23-5, 80-82	A	M																								t	C	R	F	A
	23, CC	A	G																									F	R	C	A
	24-1, 80-82	C	G																									F	F	F	C
	24, CC	A	G																									F	R	C	A

TABLE 4 – *Continued*

Part 3 – Site 167 (Continued) Zone	Core, Section, Interval (cm)	Abundance	Preservation	Contamination	*Lophocyrtis jacchia*	*Lychnocanium bellum*	*Lithapium mitra*	*Dorcadospyris triceros*	*Artophormis barbadoensis*	*Lithocyclia aristotelis* gr.	*Thyrsocyrtis tetracantha*	*Cycladophora turris*	*Theocyrtis tuberosa*	*Thyrsocyrtis bromia*	*Lithocyclia ocellus* gr.	*Podocyrtis papalis*	*Podocyrtis mitra*	*Podocyrtis chalara*	*Sethochytris triconiscus*	*Eusyringium fistuligerium*	*Podocyrtis trachodes*	*Thyrsocyrtis rhizodon*	*Theocampe mongolfieri*	*Sethochytris babylonis* gr.	*Cycladophora hispida*	*Theocotyle ficus*	*Lithochytris vespertilio*	*Podocyrtis sinuosa*	*Theocorys anapographa*	*Thyrsocyrtis triacantha*	*Dictyomitra* spp.	*Dictyomitra formosa*	*Dictyomitra margarita*	*Cyrtocapsa grutterinki*	*Dictyomitra macrocephala*	*Dictyomitra veneta*	*Dictyomitra sagitafera*	*D. ? cf. Eucyrtidium turritum*	*? Eucyrtidium* sp. A	*Lithocyclia ?* sp. A	*Sethamphora pulchra*
Thyrsocyrtis bromia	25, CC	A	G		F	C		C	R	C			A																												
	26, CC	A	G		F	C		C		C			A																												
	27, CC	C	M		F	A		C		C			A																												
	28-2, 80-82	C	M		F			F		F	F	F	C	C								F	F	R						?											
	28-4, 80-82	C	M		R			F		F	F	C	C	F								F	F							?											
	28, CC	C	M	D	R	F		F	R	F	F	C	F	C								R	R							?											
	29, CC	C	M	D		F		F		F	R	F	C	C								R	R							?											
	30-1, 134-136	C	M				R	F	R	F	F	F	?	F	F	F						F	F							F											
	30, CC	A	G							C	R	R	?	F	F	F	R			F		F	F		F					C											
	31, CC	A	G							F	F	R	?		F	C				C		F	F	R	C					A											
? *Podocyrtis goetheana*	32-3, 80-82	A	G							R			?		F	C	C			F		F	C		F	R				C											
	32, CC	A	G							R					F	C	F			C		C	C	F	C	R				A											
Podocyrtis chalara	33-1, 87-89	C	M	D											F	F	F	R		C		C	C	R	C	R	R			C											
	33, CC	F	P	D											F	F	R	R	F	C		R	F	R	F		C			C											
	34, CC	F	P	D											R	F	C	C	R	F	R	F	F	F	F		R			C											
Podocyrtis mitra	35, CC	F	P	D																R	R			R	R		R			F											
Thyrsocyrtis triacantha	36, CC	R	P	D																		R	R	R	R	R	R	R	R	R											
	37, CC	R	P	D																										R											
	38, CC				Silica Dissolved																																				
?	39-1, 110-112				Silica Dissolved																																				
	39, CC				Silica Dissolved																																				
	40, CC				Silica Dissolved																																				
	41, CC	R	P																												R										
	42, CC			D	Silica Dissolved																																				
	43, CC			D	Silica Dissolved																																				
	44, CC				Silica Dissolved																																				
	45, CC				Silica Dissolved																																				
	46, CC				Silica Dissolved																																				
	47, CC				Silica Dissolved																																				
	48, CC				Silica Dissolved																																				
	49, CC				Silica Dissolved																																				
	50, CC				Silica Dissolved																																				
	51, CC				Silica Dissolved																																				
	52, CC				Silica Dissolved																																				
	53, CC				Silica Dissolved																																				
	54, CC				Silica Dissolved																																				
	55, CC				Silica Dissolved																																				
a	56, CC				Silica Dissolved																																				
	57, CC				Silica Dissolved																																				
	58, CC				Silica Dissolved																																				
	59, CC				Silica Dissolved																																				
U. Turonian	60-1, 80-82	R	P																													R	R	R	R			R			
	60-2, 119-121	R	P																													R	R		R	R					
	60-2, 128-130	A	P																													C	F	R	F	R	R	R			
	60, CC	R	P																															R						R	
U. Cenomanian-L. Turonian	61-1, 132-134	A	P																													C	F	R	F	R	R	R			R
L. Cenomanian	61-2, 4-5	R	P																													R	R		R						
	61-2, 104-106	A	P																													F	R	R	C	R	R	R			R
	61, CC	R	P																													R	R	R				R			
U. Albian-- L. Cenomanian	62-2, 136-138	A	P																													F	R	R	F	R	R	R	R		R
	62-3, 50-52	R	P																													F	R	R	R	R					
	62, CC	C	P																													C	F	R	R	R	R	R			

TABLE 4 – *Continued*

Part 4 – Site 167 (Continued) Ages[a]	Core, Section, Interval (cm)	Abundance	Preservation	Contamination	*Lithocyclia ?* sp. A	*Stichomitra rüsti*	*Cyrtocapsa turritica*	*Archicapsa similis*	*Cyrtocapsa grutterinki*	*Eucyrtidium grandis*	*Spongosaturnalis polymorphus*	*Spongosaturnalis variabilis*	*Staurosphaera septemporata*	*Lithocampe altissima*	*Lithocampe ananassa*	*Stichocapsa conosphaeroides*	*Stichocapsa rotunda*	*Lithomitra excellens*	*Sethamphora pulchra*	*Cornutella conica*	*Stichocapsa cribrata*	*Spongosaturnalis amissus*	*Spongosaturnalis dicranacanthos*	*Lithocampe mediodilatata*	*Stylatractus ovatus*	*Eusyringium typicum*	*? Paronaella ewingi*	*Cyrtocapsa molengraaffi*	*Dictyomitra margarita*	*Dictyomitra formosa*	*Crucella* sp. A	*Crucella* sp. B
U. Albian – L. Cenomanian	63, CC	R	P		R	R				R																						
	64-1, 142-144				Silica Dissolved																											
	64-5, 15-17	A	P				R	R	R		R									R		R				R	R	R	R	R	R	
	66, CC				Silica Dissolved																											
	67-3, 101-103	A	M						R	F	R	F	F		F	R	R	R	C	R	F	R			F	R	F	F	F	F		
	67-4, 55-56	A	M						R	R	R	R	F		F	R	R	F	C	R	F	R			F	R	F	F	F	F		
	67, CC	R	P						R						F					R									R	R		
L. Albian	68-1, 70-72	C	P								R	R	R			R	R	F	F	R	R	R			R	R	R	R	F	F		
	68, CC	R	P									R	R				R	R	R	R					R	R		R	R	R	R	
U. Aptian– L. Albian	69-1, 92-94	C	P								R	R	F		R	R	R	R	R	R	R	R					R	R̀	R	R	R	
	69-1, 148-150	C	P								R	R	F		R	R	R	R	F	R	R				R	R		R	F	F	R	
	69-3, 36-38	C	M								R	F	F		R	R	R	F	F	R	R	R			R	R	R	F	F	F	R	
	69-4, 58-60	C	P								R	R	R	?	R		R	R	F	R	R				R	R	R	R	R	R	R	
	69, CC	R	P								R	R	R		R	R	R	R	R	R						R		R	R	R	R	
Upper Aptian	70-1, 126-128	C	P									R	R	R	R	R	R	R	F	R	R	R			F	R	R	R	F	F	R	
	70-2, 36-40	A	M								R	R	F	R	F	R	R	F	C	F	R	R			F	R	R	F	F	F	R	
	70-4, 26-28	C	P								R		F	R	R	R	R	F	F	R	R	R			F	R	R	F	F	F	R	
	70-4, 140-142	C	M								R	R	F	R	R	R	R	F	F	R	R	R			R	R	R	F	C	F	R	
	70, CC	R	P										R		R			R	R	R									R	R	R	
	71-1, 106-107	R	P																													
	71, CC	R	P																	R								R	R	R		
Barremian	72-2, 48-50	C	M									R		R	R	R	R	F	C	F	R	R	R		F	R	R	R	R	R		
	72, CC	A	P									R		R	R	R	R	F	F	F	R		F	?	F	R	F	F	F	R		
Hauterivian	73-1, 137-139	C	P									R	R		R		R	R	R	F			R		R		R					
	73-2, 30-32	C	M								R	R	F	R	R	R	R	F	F	F	R	R	R	R	F	R	R	R	F	F		
	73, CC	A	P								R	R	F	R	R	R	R	F	F	F	R	R	F	R	F	R	R	R	F	F		
	74-2, 74-76	C	M								R	R	F	R	R	R	R	F	F	F	R	R	R	R	R	R	R	F	F	F	R	
	74, CC	R	P																	R								R				
	75-1, 116-118	C	P								R	R	R	R	R	F	R	R	F	R	R	R	F	R	R	R	R	R	F	F	R	
	75, CC	R	P																	R								R				
	76-1, 120-122	R	P																	R								R				
Valanginian – Hauterivian	76-2, 65-67	A	M										R	R	R	R	R	F	F	F	R	R	F	R	R	R	R	R	F	R	R	
	76, CC				Silica Dissolved																											
	77, CC	R	P	D																R								R				
	78, CC	R	P																	R								R				
	81, CC				Silica Dissolved																											
	82, CC	R	P													R			R	R								R	R	R		
	83, CC	R	P																	R								R				
	84, CC	R	M													R				F								R	R			
U. Berriasian L. Valanginian	87, CC	A	P													R	R	F	F	R	R	R	R	R	R	F	F	R	F	F		?
	88, CC	A	M												R	R	R	F	F	F	R	R	F	R	R	F	F	R	F	F		?
	89, CC	C	P												R		R	R	F		R	R	R	R	R	R	R	R	F	F		
	92-1, 76-78	R	P																		R				R		R	R	R	R		
	92, CC	R	P																									R	R			
Berriasian	93, 146-148				Silica Dissolved																											
	93-2, 22-24	C	M	D?											R						R	R	R	R	C	R	F	R	R	R		R
	93, CC	R	P																										R			
U. Tithonian Berriasian	94-1, 116-118	C	M												R									R	F	R	F	F	R	R		R
	94-2, 40-42	C	M												R									R	F	F	F	F	R	R		R

TABLE 5
Radiolarians at Site 168

Site 168: Zone	Core, Section, Interval (cm)	Abundance	Preservation	Contamination	*Dorcadospyris* spp.	*Orosphaerid* spp. gr.	*Calocycletta virginis*	*Cyrtocapsella tetrapera*	*Thyrsocyrtis bromia*	*Thyrsocyrtis tetracantha*	*Dorcadospyris triceros*	*Cycladophora turris*	*Cycladophora hispida*	*Lithocyclia aristoteles* gr.	*Theocyrtis tuberosa*	*Podocyrtis mitra*	*Eusyringium fistuligerum*	*Thyrsocyrtis triacantha*	*Thyrsocyrtis rhizodon*	*Theocampe mongolfieri*	*Lithochytris vespertilio*	*Lithocyclia ocellus*	*Podocyrtis papalis*	*Theocotyle ficus*	*Sethochytris babylonis* gr.	*Podocyrtis goetheana*	*Podocyrtis sinuosa*	*Thyrsocyrtis hirsuta hirsuta*	*Podocyrtis ampla*
C. virginis	2, CC	R	P	R	R	R	R	R		R			R			R		R		R	R	R				R	R	R	
Thyrsocyrtis bromia	3, CC	A	M	R/D	R	R			F	F	F	F	R	R	R	R	F	C	F	F	R		F				F	R	
	4-2, 50-52	A	M	R/D		R			F	C	C	F	F	R		R	F	C	C	F	R	R	C	R	F		F	F	R
	4, CC	A	M	R/D		R			F	C	C	F	F	R		R	F	C	F	F		R	C	R	F		F	R	
Podocyrtis mitra	5, CC	A	M	R/D					R	R	R		R	R		F	C	C	C	C	R	R	C		R		C		C

Dorcadospyris Haeckel, 1881, p. 441.
Dorcadospyris dentata Haeckel, 1887, p. 1040, pl. 85, fig. 6.
Dorcadospyris Haeckel, emend. Goll 1969, p. 335.

Remarks: Included in this genus are both those species which fit the emendation of Goll, 1969 and those which are obviously included within the evolutionary lineage of species with strongly developed feet.

Dorcadospyris praeforcipata Moore

Dorcadospyris praeforcipata Moore, 1971, p. 738, pl. 9, figs. 4-7.

Dorcadospyris pseudopapilio Moore

Dorcadospyris pseudopapilio Moore, 1971, p. 738, pl. 6, figs. 7, 8.

Dorcadospyris quadripes Moore

Dorcadospyris quadripes, Moore, 1971, p. 738-739, pl. 7, figs. 3-5.

Dorcadospyris riedeli Moore

Dorcadospyris riedeli, Moore, 1971, p. 739, pl. 9, figs. 1-3.

Dorcadospyris spinosa Moore

Dorcadospyris spinosa Moore, 1971, p. 739, pl. 7, figs. 1, 2.

Remarks: Forms of *D. spinosa* are found that are similar to the originally described species but without the spines and the primary feet. Intermediate specimens have been seen in which only part of the primary feet were ornamented with spines. At present it is thought that the forms without spines are intermediate between *D. quadripes* and *D. spinosa*. They are included in *D. spinosa*.

Dorcadospyris ateuchus (Ehrenberg)

Ceratospyris ateuchus Ehrenberg, 1873, p. 218.
Cantharospyris ateuchus (Ehrenberg); Riedel, 1959, p. 294, pl. 22, figs. 3-4.
Dorcadospyris ateuchus (Ehrenberg); Riedel and Sanfilippo, 1970, pl. 15, fig. 4.

Dorcadospyris circulus (Haeckel)

Gamospyris circulus Haeckel, 1887, p. 1042, pl. 83, fig. 19.
Dorcadospyris circulus (Haeckel); Moore, 1971, p. 739, pl. 8, figs. 3-5.

Dorcadospyris triceros (Ehrenberg)

Ceratospyris triceros Ehrenberg (1873, p. 220; 1875, pl. 21, fig. 5).
Tristylospyris triceros (Ehrenberg); Haeckel, 1887, p. 1033; Riedel, 1959, p. 292, pl. 1, figs. 7, 8.
Dorcadospyris triceros (Ehrenberg); Moore, 1971, p. 739, pl. 6, figs. 1-3.

Dorcadospyris papilio (Riedel)

Hexaspyris papilio Riedel, 1959, p. 294, pl. 2, figs. 1, 2.
Dorcadospyris papilio (Riedel) Riedel and Sanfilippo, 1970, p. 15, fig. 5.

Dorcadospyris simplex (Riedel)

Brachiospyris simplex Riedel, 1959, p. 293, pl. 1, fig. 10.
Dorcadospyris simplex (Riedel); Riedel and Sanfilippo, 1970, pl. 15, fig. 6.

Dorcadospyris forcipata (Haeckel)

Dipospyris forcipata Haeckel, 1887, p. 1037, pl. 85, fig. 1.
Dorcadospyris forcipata (Haeckel); Riedel and Sanfilippo, 1970, p. 523, pl. 15, fig. 7.

Dorcadospyris dentata Haeckel

Dorcadospyris dentata Haeckel, 1887, p. 1040, pl. 85, fig. 6; Riedel 1957a, p. 79, pl. 1, fig. 4.

Dorcadospyris alata (Riedel)

Brachiospyris alata Riedel, 1959, p. 293, pl. 1, figs. 5, 11, 12.
Dorcadospyris alata (Riedel); Riedel and Sanfilippo, 1970, pl. 14, fig. 5.

Genus GIRAFFOSPYRIS Haeckel

Giraffospyris Haeckel, 1881, p. 442; emend. Goll, 1969, p. 329.

Giraffospyris lata Goll

Giraffospyris lata Goll, 1969, p. 334, pl. 58, figs. 22, 24-26.
Giraffospyris lata Goll, *in* Sanfilippo and Riedel, 1973, p. 529, pl. 18, figs. 3-7; pl. 33, fig. 4.

TABLE 6
Radiolarians at Site 169

Part 1 – Site 169

Zone[a]	Core, Section, Interval (cm)	Abundance	Preservation	Contamination	*Dictyomitra formosa*	*Rhopalosyringium* sp. A	*Stichomitra* sp. A	*Lithomelissa* cf. *L. heros*	*Diclocapsa* sp. A	*Pseudoaulophacus superbus*	*Incert. sed.* sp. A	*Amphipyndax* spp.	? *Eucyrtidium* sp. A	*Dictyomitra* sp. cf. *D. andersoni*	*Stichomitra rusti*	*Pseudoaulophacus* sp. A	*Dictyomitra veneta*	*Sethamphora pulchra*	*Spongosaturnalis polymorphus*	*Cyrtocapsa turritica*	*Dictyomitra* ? cf. *Eucyrtidium turritum*	*Dictyomitra sagitafera*	*Cyrtocapsa grutterinki*	*Dictyomitra margarita*
Maastrichtian	1, CC	R	P			R	R					?												
Campanian	2, CC	C	P		R	F	R				R	?												
Campanian	3, CC	R	P		?			R	R	R	R	?												
	4, CC	R	P		?					?	R	?												
	6, CC				Silica Dissolved																			
	7, CC				Silica Dissolved																			
Lower Cenomanian	8, CC	C	P										?	?	F	R			R					
Lower Cenomanian	9, CC	C	P		R									R			R	R	R	R	R	F	R	R
Upper Albian	10, CC	C	P		?														R	R	R		R	?

[a]Zonation based on foraminifera (R. Douglas, this volume) and calcareous nannoplankton (P. Roth, this volume)

Part 2 – Site 169 (Continued)

Zone[a]	Core, Section, Interval (cm)	Abundance	Preservation	Contamination	*Dictyomitra* sp. (pagoda)	*Rhopalosyringium* sp.	*Stichomitra* sp. (truncated cone)	*Lithomelissa* sp.	*Theoperid* sp. (watermelon)	*Pseudoaulophacus superbus*	? *Peterocanium* sp. (shroud)	*Amphipyndax* sp.	? *Eusyringium* sp (bell bottom)	*Dictyomitra* sp. (thin)	*Trisphaera* cf. *T. rugosa*	*Stichomitra* sp. No. 3	*Pseudoaulophacus puntahensis*	*Dictyomitra malleola*	*Dictyomitra* sp. (2-stage)	*Saturnalid* sp. (multispine)	*Dictyomitra* sp. (giant)	*Dictyomitra* sp. (long and thin)	*Dictyomitra sagitafera*	*Cyrtocapsa* sp. (thorny bit)	*Dictyomitra margarita*
Maastrichtian	1, CC	R	P			R	R					?													
Campanian	2, CC	C	P		R	F	R				R	?													
Campanian	3, CC	R	P		?			R	R	R	R	?													
	4, CC	R	P		?					?	R	?													
	6, CC				Silica Dissolved																				
	7, CC				Silica Dissolved																				
Lower Cenomanian	8, CC	C	P										?	?	F	F	R			R					
Lower Cenomanian	9, CC	C	P		R													R	R	R	R	R	F	R	R
Upper Albian	10, CC	C	P		?															R	R	R		R	?

[a]Zonation based on foraminifera (R. Douglas, this volume) and calcareous nannoplankton (P. Roth, this volume)

TABLE 7
Radiolarians at Site 170

Part 1 – Site 170

Zone[a]	Core, Section, Interval (cm)	Abundance	Preservation	Contamination	*Ommatartus tetrathalamus*	*Dorcadospyris triceros*	*Cycladophora hispida*	*Podocyrtis mitra*	*Theocampe mongolfieri*	*Dorcadospyris ateuchus*	*Dictyomitra* spp.	*Amphipyndax* spp.	*Incert. sed.* sp. A	*Pseudoaulophacus floresensis*	*Dicolocapsa* sp. A	*Theocampe apicata*	*Pseudoaulophacus lenticularis*	*Hemicryptocapsa tuberosa*	*Amphipyndax enessefti*	*Spongosaturninus ellipticus*	*Spongosaturnalis* sp. A	*Actopilium* sp. A	*Dictyomitra* cf. *D. crassispina*	*Theocampe salillum*	*Pseudoaulophacus superbus*	*Stichomitra asymbatos*	*Crucella* sp. A	*Cryptamphorella conara*	*Dictyomitra* sp. cf. *D. andersoni*	*Spongosaturnalis* sp. B	*Stichomitra riisti*	*Rhopalosyringium* sp. A	*Dictyomitra* cf. *D. torquata*	*Dictyomitra formosa*	*Artostrobium tina*	? *Eucyrtidium* sp. A	*Sethamphora pulchra*	*Dictyomitra sagitafera*	*Dictyomitra macrocephala*	*Spongosaturnalis polymorphus*	*Cyrtocapsa grutterinki*	? *Cyrtocapsa turricata*
Quaternary	1, CC	R	P	R	R	F	R	F	F																																	
U. Olig.-L. Miocene	2-2, 80-82				Silica Dissolved																																					
	2-4, 80-82				Silica Dissolved																																					
	2, CC	R	P							R																																
Maastrictian	3, CC	R	P																																							
	4, CC	F	P								F	F																														
	5, CC				Silica Dissolved																																					
	6, CC				Silica Dissolved																																					
L.-M. Campanian	7-2, 80-82	F	P	R									?	?	?		?	?	R			?			?						?	?	?	F	F							
	7, CC	R	P										?	?	?		?	?	R			?			?						?	?	?	R	F							
	8, CC	R	P										?	?	?		?	?	R			?		?	?	R					?	R	R	F	F							
Campanian	9, CC	C	P										R	?	R		R	R	F			R		R	R	F		?			R	R	R	F	F							
	10, CC	C	P										R	R	R	R	R	R	F		R	F	R	R	R	F		R			?	R	R	F	F							
Coniacian Santonian	11, CC	F	P																R	R	R	R	R	R	R	?	R	R	?		R	R	R	R	R							
Turonian	12, CC	R	P																					R	R	?		?	?		R	R	R	?	?							
Cenomanian	13, CC	F	M																					R	R	R	R	R	R		?	R	R	R	R	R						
	14, CC	R	P																									?	?		?	?	?	?	?	?						
U. Albian	15-1, 110-112				Silica Dissolved																																					
	15-2, 132-133	C	M																							R	R	R		R	R	R	R		R	F	R	R	R	R	R
	15, CC	F	P																								R	R		R	R	R	R	R	R	R	R	R	R	R	

[a]Zonation based on foraminifera (R. Douglas, this volume) and calcareous nannofossils (P. Roth, this volume)

TABLE 8
Radiolarians at Site 171

Zone (Part 1 – Site 171)	Core, Section, Interval (cm)	Abundance	Preservation	Contamination	*Cannartus mammiferus*	*Dorcadospyris dentata*	*Calocycletta virginis*	*Stichocorys delmontensis*	*Calocycletta caepa*	*Cyrtocapsella cornuta*	*Dorcadospyris alata*	*Calocycletta costata*	*Stichocorys wolffii*	*Cannartus tubarius*	*Theocyrtis annosa*	*Cannartus prismaticus*	*Calocycletta parva*	*Calocycletta robusta*	*Dorcadospyris papilio*	*Dorcadospyris riedeli*	*Dorcadospyris circulus*	*Dorcadospyris ateuchus*	*Lithocyclia angustum*	*Dorcadospyris quadripes*	*Dorcadospyris pseudopapilio*	*Artophormis gracilis*	*Sethochytris babylonis* gr.	*Theocyrtis tuberosa*	*Dorcadospyris triceros*	*Lophocyrtis jacchia*	*Thyrsocyrtis triacantha*	*Thyrsocyrtis rhizodon*	*Theocampe mongolfieri*	*Podocyrtis papalis*
	1-4, 80-82				Silica Dissolved																													
	1, CC				Silica Dissolved																													
Dorcadospyris alata	2-2, 80-82	C	M	R/D	R	R	F	F	?	C	C	C	F																					
	2, CC	C	P	R				C	F	C	F	A	C	R																				
U. Oligocene – L. Miocene	3-2, 80-82				Silica Dissolved																													
	3-4, 80-82				Silica Dissolved																													
	3, CC	R	P																															
?	4-2, 80-82	R	P	R																														
Dorcadospyris papilio	4-4, 80-82	F	P	R											R	R	R			R		C	R						F					
	4-6, 80-82	F	P	R														R	R	R	R	R	R											
	4, CC	F	M	R															R	R	F	C												
Theocyrtis annosa	5-2, 80-82	F	P	R																?		F												
	5-4, 80-82	F	P	R																R	C													
	5-6, 80-82	R	P	R																		R												
	5, CC	F	P	R/D																	C	F	R						R					
Theocyrtis tuberosa	6-2, 80-82	F	P																			C	R	R				C	F					
	6, CC	C	P																					?	R	R		R	C					
Thyrsocyrtis bromia	8-4, 80-82	R	M	D																							R	R	F	F				
	8, CC	R	M	D																								R	C	R	F	R	R	R

Genus RHABDOLITHIS Ehrenberg

Rhabdolithis Ehrenberg, 1847b, p. 50, 51.

Rhabdolithis pipa Ehrenberg

Rhabdolithis pipa Ehrenberg, 1854, pl. 36, fig. 59; 1875, p. 159, pl. 1, fig. 27.
Rhabdolithis pipa Ehrenberg, *in* Sanfilippo and Riedel, 1973, p. 529, pl. 18, figs. 12-16; pl. 33, figs. 9, 10.

Family THEOPERIDAE Haeckel

Theoperidae Haeckel, 1881, emend. Riedel, 1967b, p. 296.

Genus ARTOPHORMIS Haeckel

Artophormis Haeckel, 1881, p. 438.

Artophormis barbadensis (Ehrenberg)

Calocyclas barbadensis Ehrenberg, 1873, p. 217; 1875, pl. 18, fig. 8.
Artophormis barbadensis (Ehrenberg) Riedel and Sanfilippo, 1970, p. 532, pl. 13, fig. 5.

Artophormis gracilis Riedel

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

Genus BURYELLA Foreman

Buryella Foreman, 1973, p. 433.

Buryella clinata Foreman

Buryella clinata Foreman, 1973, p. 433, pl. 8, figs. 1-3; pl. 9, fig. 19.

Buryella tetradica Foreman

Buryella tetradica Foreman, 1973, p. 433, pl. 8, figs. 4-5; pl. 9, figs. 13, 14.

Genus CALOCYCLOMA Haeckel

Calocycloma Haeckel, 1887, p. 1384.

Calocycloma ampulla (Ehrenberg)

Eucyrtidium ampulla Ehrenberg, 1854, pl. 36, fig. 15; 1873, p. 225.
Calocycloma ampulla Riedel and Sanfilippo, 1970, p. 524, pl. 6, fig. 1.

Genus CYCLADOPHORA Ehrenberg

Calocyclas Ehrenberg, 1847b, chart to p. 54.
Cycladophora Ehrenberg, 1847a, chart to p. 385.

TABLE 8 – *Continued*

Part 2 – Site 171 (Continued) Age[a]	Core, Section, Interval (cm)	Abundance	Preservation	Contamination	*Dictyomitra* spp.	*Amphipyndax* spp.	*Stichomitra* spp.	*Rhopalosyringium* sp. A	*Pseudoaulophacus* spp.	*Lithomelissa* cf. *L. heros*	*Dictyomitra formosa*	*Dictyomitra* cf. *D. torquata*	*Pseudoaulophacus superbus*	*Amphipyndax enessefi*	*Dicolocapsa* sp. A	*Incert sed.* sp. A	*Artostrobium tina*	*Theocampe salillum*	*Hemicryptocapsa tuberosa*	*Pseudoaulophacus lenticularis*	*Pseudoaulophacus floresensis*	*Spongodiscus pulcher*	*Lithocyclia* sp. A
	9-3, 80-82	R	P		R	R																	
	9-5, 110-112	R	P		R	R				R													
	9, CC				Silica Dissolved																		
	10, CC	R	P		R																		
	11-4, 80-82	R	P		R	R				R													
	11, CC	R	P		R		R			R													
	12, CC				Silica Dissolved																		
	13, CC				Silica Dissolved																		
Lower-Middle Maastrichtian	15-3, 80-82	F	P		R	R		R		R													
	15-5, 80-82	R	P		R																		
	15, CC	F	P		F	F		R	R	R													
	16-3, 110-112	R	P			R																	
	16, CC	R	P		R	R				R													
	17-2, 80-82	R	P		R	R				R													
	17, CC				Silica Dissolved																		
	18, CC	R	P		R																		
	19-4, 80-82	R	P			R		R			R	R	R		R								
	19, CC	R	P					R			R	R	R	?	R								
	20, CC				Silica Dissolved																		
Upper Campanian	21-3, 0-2				Silica Dissolved																		
	21, CC	R	P					R			R	?	?	?	?	R							
	22-1, 110-112																						
	22-2, 140-142																						
	22, CC																						
	23-5, 80-82																						
	23, CC																						
Coniacian	24-1, 100-102																						
	24, CC	F	G					R			R	R	R	R			F	F	F	R	R	R	R
	25-2, 80-82																						
	25-4, 80-82																						
	25-5, 101-103																						
	26-2, 33-35																						
	26-3, 72-74																						
	26, CC																						
	27, CC																						
	28, CC			D																			
	29-2, 80-82																						
	29-4, 80-82																						
	29, CC																						
	31, CC																						
	32, CC																						
	33, CC			D																			

Cycladophora hispida (Ehrenberg)

Anthocyrtis hispida Ehrenberg, 1873, p. 216; 1875, pl. 8, fig. 2.
Cycladophora hispida (Ehrenberg); Riedel and Sanfilippo, 1970, pl. 10, fig. 9.

Cycladophora turris Ehrenberg

Calocyclas turris Ehrenberg, 1873, p. 218; 1875. pl. 18. fig. 7.
Cycladophora stiligera Ehrenberg, 1873, p. 223; 1875, pl. 18, fig. 3.
Cycladophora turris Ehrenberg; Riedel and Sanfilippo, 1970, p. 529, pl. 13, figs. 3, 4.

Genus CYRTOCAPSELLA Haeckel

Cyrtocapsella Haeckel, 1887, p. 1512.

Cyrtocapsella tetrapera Haeckel

Cyrtocapsa tetrapera Haeckel, 1887, p. 1512, pl. 78, fig. 5.
Cyrtocapsella tetrapera, Riedel and Sanfilippo, 1970, p. 530-531, pl. 14, fig. 7.

Cyrtocapsella cornuta Haeckel

Cyrtocapsa cornuta Haeckel, 1887, p. 1513, pl. 78, fig. 9.
Cyrtocapsella cornuta Riedel and Sanfilippo, 1970, p. 531, pl. 14, fig. 8.

Genus EUSYRINGIUM Haeckel

Eusyringium Haeckel, 1881, p. 437.

Eusyringium lagena (Ehrenberg) (?)

[?] *Lithopera lagena* Ehrenberg, 1873, p. 241; 1875, pl. 3, fig. 4.
Eusyringium lagena (Ehrenberg) (?); Riedel and Sanfilippo, 1970, p. 527.

Eusyringium fistuligerum (Ehrenberg)

[?] *Eucyrtidium tubulus* Ehrenberg, 1854, pl. 36, fig. 19; 1873, p. 233; 1875, pl. 9, fig. 6.
Eucyrtidium fistuligerum Ehrenberg, 1873, p. 229; 1875, pl. 9, fig. 3.
Eusyringium fistuligerum (Ehrenberg) Haeckel, 1887, p. 1497; Riedel and Sanfilippo, 1970, p. 527 pl. 8, figs. 8, 9.

Genus LAMPTONIUM Haeckel

Lamptonium Haeckel, 1887, p. 1378.

Lamptonium (?) fabaeforme fabaeforme (Krasheninnikov)(?)

[?] *Cyrtocalpis fabaeformis* Krasheninnikov, 1960, p. 296, pl. 3, fig. 11.
Lamptonium (?) *fabaeforme fabaeforme* (Krasheninnikov)(?); Riedel and Sanfilippo, 1970, pl. 5, fig. 6.

Lamptonium (?) fabaeforme (?) constrictum Riedel and Sanfilippo

Lamptonium (?) *fabaeforme* (?) *constrictum* Riedel and Sanfilippo, 1970, pl. 4, fig. 7.

Lamptonium (?) fabaeforme (?) chaunothorax Riedel and Sanfilippo

Lamptonium (?) *fabaeforme* (?) *chaunothorax* Riedel and Sanfilippo, 1970, pl. 5, figs. 8, 9.

Lamptonium pennatum Foreman

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

Genus LITHOCHYTRIS Ehrenberg

Lithochytris Ehrenberg, 1847a chart to p. 385.

Lithochytris archea, Riedel and Sanfilippo

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

Lithochytris vespertilio Ehrenberg

Lithochytris vespertilio Ehrenberg, 1873, p. 239; 1875, pl. 4, fig. 10.
Lithochytris cheopsis Clark and Campbell, 1942, p. 81, pl. 9, fig. 37.
Lithochytris vespertilio Ehrenberg; Riedel and Sanfilippo, 1970, pl. 9, figs. 8, 9.

Genus LOPHOCYRTIS Haeckel

Lophocyrtis Haeckel, 1887, p. 1410.

Lophocyrtis (?) jacchia (Ehrenberg)

Thyrsocyrtis jacchia, Ehrenberg, 1873, p. 261; 1875, pl. 12, fig. 7.
Lophocyrtis (?) *jacchia* (Ehrenberg); Riedel and Sanfilippo, 1970, p. 529-530.

Genus LYCHNOCANIUM Ehrenberg

Lychnocanium Ehrenberg, 1847a, chart to p. 385.

Lychnocanium bipes Riedel

Lychnocanium bipes, Riedel, 1959, p. 294, pl. 2, figs. 5, 6.

Genus PHORMOCYRTIS Haeckel

Phormocyrtis Haeckel, 1887, p. 1368.

Phormocyrtis cubensis (Riedel and Sanfilippo)

Eucyrtidium cubense Riedel and Sanfilippo, 1971, pl.7, figs. 10,11.
Phormocyrtis cubensis (Riedel and Sanfilippo); Foreman, 1973, p. 438, pl. 7, figs. 11, 12, 14.

Phormocyrtis striata striata Brandt

Phormocyrtis striata Brandt, 1935, *in* Wetzel, 1935, p. 55, pl. 9, fig. 12.
Phormocyrtis striata striata Brandt, *in* Foreman, 1973, p. 438, pl. 7, figs. 5, 6, 9.

Phormocyrtis striata exquisita (Kozlova)

Podocyrtis exquisita Kozlova, *in* Kozlova and Gorbovetz, 1966, p. 106, pl. 17, fig. 2.
Podocyrtis striata exquisita (Kozlova); Foreman, 1973, p. 438, pl. 7, figs. 1-4, 7, 8; pl. 12, fig. 5.

Phormocyrtis turgida (Krasheninnikov)

Lithocampe turgida Krasheninnikov, 1960, p. 301, pl. 3, fig. 17.
Phormocyrtis turgida (Krasheninnikov); Foreman, 1973, p. 438, pl. 7, fig. 10; pl. 12, fig. 6.

Genus PTEROCANIUM Ehrenberg

Pterocanium Ehrenberg, 1847a, chart to p. 385.

Pterocanium prismatium, Riedel

Pterocanium prismatium Riedel, 1957, p. 87, pl. 3, figs. 4, 5; emend. Riedel and Sanfilippo, 1970, p. 529.

Pterocanium praetextum (Ehrenberg)

Lychnocanium praetextum Ehrenberg, 1872, p. 316.
Pterocanium praetextum (Ehrenberg); Haeckel, 1887, p. 1330; Riedel, 1957, p. 86, pl. 3, figs. 1-3.

Genus SETHOCHYTRIS Haeckel

Sethochytris Haeckel, 1881, p. 433.

Sethochytris babylonis (Clark and Campbell) group

Dictyophimus babylonis Clark and Campbell, 1942, p. 67, pl. 9, figs. 32, 36.
Lychnocanium lucerna Ehrenberg, 1847b, fig. 5; 1854, pl. 36, fig 6; 1873, p. 244.
Sethochytris babylonis (Clark and Campbell) group as used by Riedel and Sanfilippo, 1970.

Sethochytris triconiscus Haeckel (?)

Sethochytris triconiscus Haeckel, 1887, p. 1239, pl. 57, fig. 13; Riedel and Sanfilippo, 1970, pl. 9, fig. 6.

Genus STICHOCORYS Haeckel

Stichocorys Haeckel, 1881, p. 438.

Stichocorys wolffii Haeckel

Stichocorys wolffii Haeckel, 1887, p. 1479, pl. 80, fig. 10; Riedel, 1957, p. 92, pl. 4, figs. 6, 7.

Stichocorys delmontensis (Campbell and Clark)

Eucyrtidium delmontense Campbell and Clark, 1944a, p. 56, pl. 7., figs. 19, 20; Riedel, 1952, p. 8, pl. 1, fig. 5; Riedel 1957, p. 93.
Stichocorys delmontensis (Campbell and Clark); Riedel and Sanfilippo, 1970. p. 530 pl. 14, fig. 6.

Stichocorys peregrina (Riedel)

Eucyrtidium elongatum peregrinum Riedel, 1953, p. 812, pl. 85, fig. 2.
Stichocorys peregrina (Riedel); Riedel and Sanfilippo, 1970, p. 530.

Genus THEOCORYS Haeckel

Theocorys Haeckel, 1881, p. 434.

Theocorys anaclasta Riedel and Sanfilippo

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

Theocorys anapographa Riedel and Sanfilippo

Clathrocyclas sp. Nigrini, 1970, p. 403, pl. 2, fig. 3.
Theocorys anapographa Riedel and Sanfilippo, 1970, p. 530, pl. 10, fig. 4.

Genus THEOCOTYLE Riedel and Sanfilippo

Theocotyle Riedel and Sanfilippo, 1970, p. 524.

Theocotyle alpha Foreman

Theocotyle (Theocotylissa) alpha Foreman, 1973, p. 441, pl. 4, fig. 13-15; pl. 12, fig. 16.

Theocotyle cryptocephala cryptocephala (Ehrenberg) (?)

Eucyrtidium cryptocephalum Ehrenberg, 1873, p. 227; 1875, pl. 11, fig. 11.
Theocotyle cryptocephalum (Ehrenberg) (?) Riedel and Sanfilippo, 1970, pl. 6, figs. 7, 8.

Theocotyle cryptocephala (?) nigrinae Riedel and Sanfilippo

Theocotyle cryptochephala (?) *nigrinae* Riedel and Sanfilippo, 1970, pl. 6, figs. 5, 6.

Theocotyle venezuelensis Riedel and Sanfilippo

Theocotyle venezuelensis Riedel and Sanfilippo, 1970, pl. 6, figs. 9, 10; pl. 7, figs. 1, 2.

Theocotyle (?) ficus (Ehrenberg)

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

Genus THYRSOCYRTIS Ehrenberg

Thyrsocyrtis Ehrenberg, 1847b, chart to p. 54.
Podocyrtidium Haeckel, 1887, p. 1337. Type species (designated by Campbell, 1954, p. 130) *Podocyrtis tripodiscus* Haeckel (1887), p. 1338, pl. 72, fig. 4.
Thyrsocyrtis Ehrenberg as used by Riedel and Sanfilippo, 1970, p. 525.

Thyrsocyrtis rhizodon Ehrenberg

Thyrsocyrtis rhizodon Ehrenberg, 1873, p. 262; 1875, pl. 12, fig. 1; Riedel and Sanfilippo, 1970, pl. 7, figs. 6, 7.

Thyrsocyrtis bromia Ehrenberg

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

Thyrsocyrtis hirsuta hirsuta (Krasheninnikov)

Podocyrtis hirsutus Krasheninnikov, 1960, p. 300, pl. 3, fig. 16.
Thyrsocyrtis hirsuta hirsuta Riedel and Sanfilippo, 1970, pl. 7, figs. 8, 9.

Thyrsocyrtis hirsuta robusta Riedel and Sanfilippo

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

Thyrsocyrtis triacantha (Ehrenberg)

[?] *Podocyrtis cothurnata* Ehrenberg, 1854, pl. 36, fig. 21; 1873, p. 250; 1875, pl. 14, fig. 1.
Podocyrtis triacantha Ehrenberg, 1873, p. 254; 1875, pl. 13, fig. 4.
Thyrsocyrtis triacantha (Ehrenberg); Riedel and Sanfilippo, 1970, pl. 8, figs. 2, 3.

Thyrsocyrtis tetracantha (Ehrenberg)

Podocyrtis tetracantha Ehrenberg, 1873, p. 254; 1875, pl. 13, fig. 2.
Thyrsocyrtis tetracantha (Ehrenberg); Riedel and Sanfilippo, 1970, p. 527.

Family PTEROCORYIDAE Haeckel

Genus CALOCYCLETTA Haeckel

Calocycletta Haeckel, 1887, p. 1381.

Calocycletta caepa Moore

Calocyletta caepa Moore, 1972, p. 150, pl. 2, figs. 4-7.

Calocycletta costata (Riedel)

Calocyclas costata Riedel, 1959, p. 296, pl. 2, fig. 9.
Calocycletta costata (Riedel), Riedel and Sanfilippo, 1970, p. 535, pl. 14, fig. 12.

Calocycletta robusta Moore

Calocycletta robusta Moore, 1971, p. 743-744, pl. 10, figs. 5, 6; 1972, p. 147, pl. 1, fig. 6.

Calocycletta serrata Moore

Calocycletta serrata Moore, 1972, p. 148, 150, pl. 2, figs. 1-3.

Calocycletta virginis (Haeckel)

Calocyclas virginis Haeckel, 1887, p. 1381, pl. 74, fig. 4; Riedel, 1959, p. 295, pl. 2, fig. 8.
Calocycletta virginis (Haeckel); Riedel and Sanfilippo, 1970, p. 535, pl. 14, fig. 10.

Genus PODOCYRTIS Ehrenberg

Podocyrtis Ehrenberg, 1847a, chart to p. 385.

Subgenus PODOCYRTIS Ehrenberg

Podocyrtis (Podocyrtidium) Haeckel, 1887, p. 1344; *Podocyrtis (Podocyrtis) in* Campbell, 1954, p. 130.

Podocyrtis (Podocyrtis) papalis Ehrenberg

Podocyrtis papalis, Ehrenberg, 1847b, fig. 2; 1854, pl. 36, fig. 23; 1873, p. 251.
Podocyrtis fasciata Clark and Campbell, 1942, p. 80, pl. 7, figs. 29, 33.
Podocyrtis (Podocyrtis) papalis Riedel and Sanfilippo, 1970, p. 533, pl. 11, fig. 1.

Podocyrtis (Podocyrtis) diamesa Riedel and Sanfilippo

Podocyrtis (Podocyrtis) diamesa Riedel and Sanfilippo, 1970, p. 533, pl. 12, figs. 4-6.

Podocyrtis (Podocyrtis) ampla Ehrenberg

Podocyrtis (?) *ampla* Ehrenberg, 1873, p. 248; 1875, pl. 16, fig. 7.
Podocyrtis (Podocyrtis) ampla Ehrenberg; Riedel and Sanfilippo, 1970, p. 533-4, pl. 12, figs. 7, 8.

Subgenus LAMPTERIUM Haeckel

Lampterium Haeckel, 1881, p. 434.
Lampterium Haeckel; Riedel and Sanfilippo, 1970, p. 534.

Podocyrtis (Lampterium) aphorma Riedel and Sanfilippo

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

Podocyrtis (Lampterium) sinuosa Enrenberg (?)

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

Podocyrtis (Lampterium) mitra Ehrenberg

Podocyrtis mitra Ehrenberg, 1854, pl. 36, fig. B20; 1873, p. 251; [*non* Ehrenberg, 1875, pl. 15, fig. 4].
Podocyrtis (Lampterium) mitra Ehrenberg; Riedel and Sanfilippo, 1970, p. 534-535, pl. 11, figs. 5, 6.

Podocyrtis (Lampterium) trachodes Riedel and Sanfilippo

Podocyrtis (Lampterium) trachodes Riedel and Sanfilippo, 1970, p. 535 pl. 11, fig. 7; pl. 12, fig. 1.

Podocyrtis (Lampterium) chalara Riedel and Sanfilippo

[?] *Podocyrtis* (?) sp. Bury, 1862, pl. 12, fig. 2.
Podocyrtis (Lampterium) chalara Riedel and Sanfilippo, 1970, p. 535, pl. 12, figs. 2, 3.

Podocyrtis (Lampterium) goetheana (Haeckel)

Cycladophora goetheana Haeckel, 1887, p. 1376, pl. 65, fig. 5.
Podocyrtis (Lampterium) goetheana (Haeckel); Riedel and Sanfilippo, 1970, p. 535, pl. 65, fig. 5.

Genus THEOCYRTIS Haeckel

Theocyrtis Haeckel, 1887, p. 1405.

Theocyrtis tuberosa Riedel

Theocyrtis tuberosa Riedel, 1959, p. 298, pl. 2, figs. 10, 11.

Theocyrtis annosa (Riedel)

Phormocyrtis annosa Riedel, 1959, p. 295, pl. 2, fig. 7.
Theocyrtis annosa (Riedel); Riedel and Sanfilippo, 1970, p. 535, pl. 15, fig. 9.

Family ARTOSTROBIIDAE Riedel

Artostrobiidae Riedel, 1967a, p. 148-149.

Genus THEOCAMPE Haeckel

Theocampe Haeckel, 1887, p. 1422.

Theocampe mongolfieri (Ehrenberg)

Eucyrtidium mongolfieri Ehrenberg, 1854, pl. 36, fig. 18B; 1873, p. 230; 1873, pl. 10, fig. 3.
Sethamphora mongolfieri (Ehrenberg), Haeckel, 1887, p. 1251.
Theocampe mongolfieri (Ehrenberg), Burma, 1959, p. 329.

Theocampe urceolus (Haeckel)

Dictyocephalus urceolus Haeckel, 1887, p. 1305.
Theocampe urceolus (Haeckel); Foreman, 1973, p. 432, pl. 8, figs. 14-17; pl. 9, figs. 6, 7.

Family CANNOBOTRYIDAE

Cannobotryidae Haeckel, 1881, emend. Riedel, 1967b, p. 296.

Genus ACROBOTRYS Haeckel

Acrobotrys Haeckel, 1881, p. 440.

Acrobotrys tritubus Riedel

Acrobotrys tritubus Riedel, 1957, p. 80, pl. 1, fig. 5.

Genus CENTROBOTRYS Petrushevskaya

Centrobotrys Petrushevskaya, 1965, p. 113.

Centrobotrys gravida Moore

Centrobotrys gravida Moore, 1971, p. 744, pl. 5, fig. 8.

TAXONOMY (CRETACEOUS SPECIES)

The taxonomy of the Cretaceous species is based almost entirely on the work of previous authors. For the Late Cretaceous species the works of Foreman (1966, 1968, 1971, 1973); Pessagno (1963, 1969, 1971) and Dumitrica (1970) were particularly useful. For the Early Cretaceous the works of Pessagno (1969, 1971) are among the most recent studies; however, several late nineteenth century and early twentieth century studies (e.g. Rust, 1885, 1898; Squinabol 1903, 1904, 1914; Hinde 1900) provide many of the identifications. Because of changes in taxonomic classification occurring since these studies were published, many of the family and generic names may be in question. In addition, many synonymies are suspected to exist in these early papers; however, without studying the original material, it would be difficult to establish the synonymies with certainty. For this report the earliest, well illustrated form is referenced. In most cases the original generic and specific name is used.

Specimens which are not clearly assignable to a previously described species are given a genus name and either designated as a species (or group of species) by a letter, or compared with a very similar species. Poorly preserved and recrystallized specimens are described in as much detail as possible; however, these descriptions are included as remarks and are not intended to limit or strictly define the species.

Suborder SPUMELLARIA Ehrenberg, 1875

Family ACTINOMMIDAE Haeckel, 1862, emend. Riedel, 1967b

Subfamily ACTINOMMINAE Haeckel, 1862 emend

Genus STYLATRACTUS Haeckel, 1887

Stylatractus ovatus Hinde
(Plate 2, Figure 1)

Stylatractus ovatus Hinde, 1900, p. 19, pl. 4, figs. 31, 32, 33, 36.
Stylosphaera squinaboli Tan Sin Hok, 1927, p. 9, pl. 6, fig. 9a.
Spumellariinid, Pessagno, 1969, p. 610, pl. 4, fig. D.

Remarks: This species is distinguished by its beaded polar spines and few (7 on one side) hexagonally arranged pores. These large pores are separated by thick bars and give the test surface a very rough appearance. Aside from the number of spines and stratigraphic range, there is little difference between this species and *Staurosphaera septemporata*.

Occurrences: Upper Jurassic (Pessagno, 1969). Leg 17: Site 167, Cores 67-94. Upper Jurassic-Lower Cretaceous (U. Albian/L. Cenomanian).

Subfamily SATURNALINAE Deflandre, 1953

Genus SPONGOSATURNALIS Campbell and Clark, 1944b

The following species are tentatively placed within the genus *Spongosaturnalis*. No complete specimens were found; thus, the assignment is based on their original descriptions and illustrations, on the figured specimens of *S. dicranacanthos* in Pessagno (1969) and on the morphological similarity of the various species.

Spongosaturnalis amissus (Squinabol)
(Plate 3, Figure 2)

Saturnalis amissus Squinabol, 1914, p. 296, pl. 23, figs. 2, 3, 4, 5.

Remarks: Fragments of this species appear to be distinct, not broken forms of *S. dicranacanthos*.

Occurrences: Middle Cretaceous (Squinabol, 1914). Leg 17: Site 167, Cores 64-93, Lower Cretaceous (Berriasian-Albian).

Spongosaturnalis dicranacanthos (Squinabol)
(Plate 3, Figures 1 and 3)

Saturnalis dicranacanthos Squinabol, 1914, p. 289, pl. 22, figs. 4, 5, 6, 7.

Spongosaturnalis dicranacanthos (Squinabol) Pessagno, 1969, p. 610, pl. 4, fig. B.

Remarks: The heavy forked spine at the ends of the elliptical ring distinguishes this species. Note the side view of this spine (Plate 3, Figure 1).

Occurrences: Middle Cretaceous (Squinabol, 1914); upper Jurassic (Pessagno, 1969).
Leg 17: Site 167, Cores 72-93, Lower Cretaceous (Berriasian-Barremian).

Spongosaturnalis polymorphus (Squinabol)
(Plate 6, Figures 4 and 6)

Saturnalis polymorphus Squinabol, 1914, p. 293, pl. 24, figs. 2-7.

Remarks: There may be more than one species grouped under this name. Specimens were usually present only as fragments and were always poorly preserved. In general, they conformed to Squinabol's description; however, some specimens had fewer than 12 lateral marginal spines.

Occurrences: Middle Cretaceous (Squinabol, 1914).
Leg 17: Site 164, Cores 12-14; Site 166, Core 22; Site 167, Cores 66-75; Site 169, Cores 8-10; Site 170, Core 15. Cretaceous (Hauterivian-Upper Albian/L. Cenomanian and Coniacian-Santonian of Site 164 only).

Spongosaturnalis variabilis (Squinabol)
(Plate 6, Figures 1-3)

Saturnalis variabilis Squinabol, 1914, p. 291, pl. 22, figs. 8-9.

Remarks: Twin, divergent marginal spines located at the ends of the elliptical ring distinguish this species. The older specimens (Plate 6, Figures 1, 3) appear more delicate and closer to Squinabol's description than the later forms (Plate 6, Figure 2).

Occurrences: Middle Cretaceous (Squinabol, 1914).
Leg 17: Site 167, Cores 67-75. Lower Cretaceous (Hauterivian-Upper Albian/Lower Cenomanian).

Spongosaturnalis sp. A
(Plate 13, Figures 7-8)

Saturnalin, gen. et sp. indet. Kling, 1971, pl. 6, fig. 1.

Remarks: This species has two pairs of divergent lateral marginal spines located near the point at which the polar spines join the saturnalin ring. The ring is subcircular with marked changes in curvature occurring at the spines.

Occurrences: Campanian (Kling, 1971).
Leg 17: Site 164, Cores 14, ?15, ?16, 17; Site 170, Core 11. Upper Cretaceous (Cenomanian/Turonian-Coniacian/Santonian).

Spongosaturnalis sp. B
(Plate 6, Figure 5)

Remarks: There are numerous (14) lateral marginal spines as well as spiny protrusions on the inner margin of the saturnalin ring of this species. These protrusions are similar to those observed by Foreman (1971, pl. 1, figs. 7, 8) on specimens which are otherwise obviously different. Foreman's specimens were estimated to be of Santonian-Campanian age.

Occurrence: Leg 17; Site 170, Core 11. Upper Cretaceous (Coniacian/Santonian).

Spongosaturninus ellipticus Campbell and Clark
(Plate 13, Figure 4)

Spongosaturninus ellipticus Campbell and Clark, 1944b, p. 8, pl. 1, figs. 8, 9, 12, 14, 16.

Spongosaturnalis? sp. aff. *Spongosaturnalis latuformis* Campbell and Clark, *in* Petrushevskaya and Kozlova, 1972, p. 521, pl. 4, fig. 5.

Remarks: The small size of the saturnalin ring relative to the end spines is consistent with the original description of this species.

Occurrences: Upper Cretaceous (Campbell and Clark, 1944b); Upper Cretaceous (Maastrichtian) (Petrushevskaya and Kozlova, 1972).
Leg 17: Site 170, Core 11. Upper Cretaceous (Coniacian/Santonian).

Family STAUROSPHAERIDA Haeckel, 1881, emend. Campbell, 1954

Genus STAUROSPHAERA Haeckel, 1881

Staurosphaera septemporata Parona
(Plate 2, Figure 2)

Staurosphaera septemporata Parona, 1890, p. 151, pl. 2, figs. 4, 5.

Remarks: The four, bladed spines of this species and the presence of seven large, hexagonally arranged pores distinguish this species (see *Stylatractus ovatus*).

Occurrence: Leg 17: Site 167, Core 60; Site 171, Core 24. Upper Cretaceous (U. Turonian-Coniacian).

Family COCCODISCIDAE Haeckel, 1862

Subfamily COCCODISCINAE Haeckel, 1862

Genus LITHOCYCLIA Ehrenberg, sens. str., 1847a

Lithocyclia ? sp. A
(Plate 18, Figures 5 and 6)

Remarks: A spongy disc is concentrically ringed and surrounds a spherical central shell which has small, hexagonally arranged pores. The spongy disc may contain radiating spines (Plate 18, Figure 5); these spines do not extend into the central shell. One medullary shell is observed, supported by four, approximately perpendicular spines that are in the plane of the spongy disc. This species resembles *Lithocyclia ocellus* of Middle to Late Eocene Age.

Occurrence: Leg 17: Site 167, Core 60; Site 171, Core 24. Upper Cretaceous (U. Turonian-Coniacian).

Family PSEUDOAULOPHACIDAE Riedel, 1967a

Genus PSEUDOAULOPHACUS Pessagno, 1963

Pseudoaulophacus floresensis Pessagno
(Plate 12, Figures 2 and 3)

Pseudoaulophacus floresensis Pessagno, 1963, p. 200, pl. 4, fig. 6.

Pseudoaulophacus floresensis, Pessagno; *in* Foreman, 1971, p. 1675, pl. 2, fig. 6.

Occurrences: Middle Turonian of California, Santonian-Campanian of Cuba, Low Campanian of Puerto Rico (Foreman, 1971).
Leg 17: Site 164, Cores 7-9; Site 170, Cores ?7-?9, 10; Site 171, Core 24. Upper Cretaceous (Cenomanian/Turonian-Campanian).

Pseudoaulophacus lenticularis (White)
(Plate 12, Figure 1)

Baculogypsina (?) *lenticulata* White, 1928, p. 306, pl. 41, fig. 9, 11.

Pseudoaulophacus lenticularis (White) Pessagno, 1963, p. 202, pl. 2, figs. 9, 10.

Occurrences: Lower Campanian (Pessagno, 1963).
Leg 17: Site 164, Cores 11-19; Site 170, Cores ?7, ?8, 9-10; Site 171, Core 24. Upper Cretaceous, (Cenomanian/Turonian-Santonian/Campanian).

Pseudoaulophacus pargueraensis Pessagno
(Plate 12, Figures 6-7)

Pseudoaulophacus pargueraensis Pessagno, 1963, p. 204, pl. 6, figs. 4, 5.
Pseudoaulophacus pargueraensis Pessagno, *in* Foreman, 1971, p. 1675, pl. 2, fig. 7.
Occurrences: Santonian-Campanian of Cuba; low Campanian of Puerto Rico (Foreman, 1971).
Leg 17: Site 164, Cores 11-14. Upper Cretaceous (Coniacian/Santonian).

Pseudoaulophacus superbus (Squinabol)
(Plate 12, Figures 4-5)

Theodiscus superbus Squinabol, 1914, p. 271, pl. 20, fig. 4.
Pseudoaulophacus superbus (Squinabol) Foreman, 1971, p. 1675, pl. 2, fig. 5.
Occurrences: Cenomanian of Italy; Middle Turonian-Upper Campanian of California; Santonian-Campanian of Caribbean region; Campanian of DSDP Leg 4, 24A-1-1, and DSDP Leg 6, 59.2-5-CC. (Foreman, 1971).
Leg 17; Site 164, Cores 11-19; Site 169, Cores 2-4; Site 170, Cores ?7-?8, 9-11; Site 171, Cores 19, ?21, 24. Upper Cretaceous (Cenomanian/Turonian-Lower-Middle Maastrichtian).

Pseudoaulophacus sp. A
(Plate 17, Figure 9)

Remarks: The very strong, bladed spine and triangular pores distinguish this form. It was found only as fragments; therefore the number of spines and overall outline of the species is unknown. The contours of the fragments suggest more of a circular than a triangular outline of the disc.
Occurrence: Leg 17: Site 166, Core 22. Mid Cretaceous (Upper Albian/Cenomanian).

Family HAGIASTRIDAE Riedel, 1971 emend.

Genus PATULIBRACCHIUM Pessagno, 1971

Patulibracchium cf. P. ungulae Pessagno
(Plate 15, Figure 3)

Patulibracchium ungulae Pessagno, 1971, p. 44, pl. 7, fig. 3.
Pseudoaulophacid ? gen. et sp. indet. Foreman, 1971, p. 1675, pl. 2, fig. 8.
Remarks: The preservation of these forms do not permit their definite assignment to *P. ungulae;* however, the flaring ends of the rays terminating in spines, the pore structure, and the general morphology are similar to that of specimens illustrated by Pessagno (1971) and Foreman (1971).
Occurrences: Turonian-Coniacian (Pessagno, 1971); Lower Santonian-Upper Campanian (Foreman, 1971).
Leg 17: Site 167, Core 64; Site 170, Core 15. Mid Cretaceous (Upper Albian-Lower Cenomanian).

Genus PARONAELLA Pessagno, 1971

Paronaella Pessagno, 1971, p. 46-47.
Genus range: ?Upper Jurassic-Upper Cretaceous (Pessagno, 1971).

Paronaella ewingi Pessagno
(Plate 15, Figure 5)

Paronaella ewingi Pessagno, 1971, p. 47, pl. 19, figs. 2-5.
Remarks: Although usually fragmented, the observed forms consistently bore the strong linearity of the pore frames, the extremely elongate rays, and the spiny ellipsoidal tips that are mentioned in the original description of the species.
Occurrences: Upper Jurassic-Upper Cretaceous; Tithonian site 5A (Pessagno, 1971).
Leg 17: Site 167, Cores 64-94. Upper Jurassic-Lower Cretaceous (Upper Tithonian-Upper Albian/Lower Cenomanian).

Paronaella sp. A
(Plate 15, Figure 4)

Remarks: This rather corroded form has three rays of approximately uniform width and equal length. The rays terminate in three to four spines. It may be referrable to *Paronaella* or *Halesium* (pore structure is obscured).
Occurrence: Leg 17: Site 169, Core 9. Mid Cretaceous (Lower Cenomanian).

Subfamily HAGIASTRINAE Riedel, 1971, emend.

Genus CRUCELLA Pessagno, 1971

Crucella Pessagno, 1971, p. 52-53.
Genus range: Late Jurassic-Late Cretaceous (Pessagno, 1971)

Crucella sp. A
(Plate 15, Figures 1 and 2)

Remarks: Due to the poor preservation of most of the samples, it is difficult to separate the genus *Crucella* into individual species. The forms included under species A are those having rays that are approximately perpendicular and elliptical in cross section.
Occurrences: Leg 17: Site 164, Core 16; Site 167, Cores 64-76; Site 170, Cores 11-15. Cretaceous (Valanginian/Hauterivian-Coniacian/Santonian).

Crucella sp. B

Crucella sp., Pessagno, 1971, pl. 19, fig. 7.
Remarks: A few, very poorly preserved specimens that closely corresponded to the form figured by Pessagno (1971) were found in the oldest section sampled. The specimens are large (about 300μ across) with four spongy rays that are triangular in cross section. The inter-ray angle may be less than 90°.
Occurrence: Leg 17: Site 167, Cores ?87-?88, 93-94, Upper Jurassic-Lower Cretaceous (Tithonian/Berriasian-U. Berriasian/L.Valangian).

Family SPONGODISCIDAE Haeckel, 1862

Subfamily SPONGODISCINAE Haeckel, 1862

Genus SPONGODISCUS Ehrenberg, 1854

Spongodiscus maximum Squinabol, 1904
(Plate 18, Figures 1-4)

Spongodiscus maximum Squinabol, 1904, p. 205, pl. 6, fig. 4.
Spongotrochus (?) sp. Petrushevskaya and Kozlova, 1972, p. 528, pl. 5, fig. 11.
Remarks: In considering Squinabol's breif description and rather poor illustration of this species, there is some question as to whether or not it should be more properly assigned to the genus *Spongotrochus*. The description, size, shape, and stratigraphic occurrence of Squinabol's specimens are in general agreement with those of Leg 17. The rather poor state of preservation of the observed specimens make it impossible to determine whether or not the internal spines extended past the original outer margin of the shell. There is evidence that the spines radiate outward in all directions, but are more clearly visible in the equatorial plane.
Occurrence: Senonian (Squinabol, 1904) Maastrichtian, DSDP Leg 14, 144-3-CC (Petrushevskaya and Kozlova, 1972).
Leg 17: Site 164, Cores 11-18; Site 170, Core ?11; Site 171, Core 24. Upper Cretaceous (Cenomanian/Turonian-Coniacian/Santonian).

Order NASSELLARIA Ehrenberg, 1875

Suborder CYRTIDA Haeckel, 1862

Superfamily PLAGIACANTHOIDEA Hertwig, 1879, emend. Petrushevskaya, 1971a

Family ARCHIOCORYTHIDAE, Haeckel, 1887

Subfamily ARCHICAPSINAE Haeckel, 1881

Genus ARCHICAPSA Haeckel, 1881

Archcapsa similis Parona
(Plate 16, Figures 3, 4)

Archicapsa similis Parona, 1890, p. 163, pl. 5, fig. 4.
Archicapsa similis Parona, *in* Hinde, 1900, p. 28, pl. 3, fig. 22.

Remarks: The occurrence of this species is very rare in Leg 17 material; however, its large size, great similarity to the specimens figured by Parona (1890) and Hinde (1900), and limited occurrence suggest that it may be stratigraphically useful. The very large size of the species is distinctive. Although the observed specimens are too poorly preserved to distinguish details of the morphology beyond the general shape, large hexagonally arranged circular pores are visible on the surface of the shell (Plate 16, Figure 4).

Occurrence: Leg 17: Site 167, Core 64. Mid Cretaceous (Upper Albian-Lower Cenomanian).

Family LOPHOPHAENIDAE Haeckel, 1881, emend. Petrushevskaya, 1971a

Genus LITHOMELISSA Ehrenberg, 1847b

Lithomelissa cf. L. heros Campbell and Clark
(Plate 11, Figure 11)

Lithomelissa heros Campbell and Clark, 1944b, p. 25, pl. 7, fig. 23.
? *Lithomelissa heros* Campbell and Clark emend. foreman, 1968, p. 25, pl. 3, figs. 5a, b.

Remarks: Specimens are consistantly poorly preserved, but fit the description of *Lithomelissa* and are similar to *L. heros*. Their occurrence in Leg 17 material, however, ranges lower than previously observed for *L. heros*.

Occurrences: ? Upper Campanian-Upper Maastrichtian of California (Foreman, 1968) Leg 17: Site 164, Cores 10-15, Site 169, Core 3. Upper Cretaceous (? Coniacian-Campanian).

Subfamily ADELOCYRTIDINAE

Campbell, 1954, nom. nov.
[pro *Sethocapsida* Haeckel, 1881]

Genus SETHOCAPSA Haeckel, 1881

Sethocapsa dorysphaeroids Neviani
(Plate 16, Figures 1-2)

Sethocapsa dorysphaeroides Neviani, 1900, p. 660, pl. 10, fig. 14.

Remarks: The morphology of the poorly preserved specimens found in Leg 17 material closely match the illustration of Neviani. The relatively large size, rare occurrence, and pore structure resemble *Archicapsa similis.*

Occurrence: Leg 17: Site 167, Core 64. Mid Cretaceous (Upper Albian-Lower Cenomanian).

Genus DICOLOCAPSA Haeckel, 1881

Dicolocapsa sp. A.
(Plate 11, Figure 10)

Theoperid, gen. and sp. indet., Foreman, 1971, p. 1676, pl. 3, fig. 1.

Remarks: The cephalis is almost imbedded in the thorax of this form. The thorax is a prolate sphere with a very restricted mouth and a varying number of longitudinal ridges (not costal), that give it the appearance of a small melon. Pores are very small, irregular to hexagonally arranged, and appear to be concentrated between the ridges.

Occurrences: Lower Santonian of Trinidad; Santonian-Campanian of Cuba; Campanian of DSDP Leg 4, 24A-1-1 and DSDP Leg 6, 52.2-5-CC (Foreman, Leg 17: Site 164, Cores 10-19; Site 169, Core 3; Site 170, Cores 9-10; Site 171, Core 19. Upper Cretaceous (Cenomanian-Lower Maastrichtian).

Superfamily EUCYRTIDIOIDEA Ehrenberg, 1847b

Family CARPOCANIIDAE HAECKEL, 1881

Subfamily CARPOCANIINAE Haeckel, 1881

Genus MYLLOCERCION Foreman, 1968

Myllocercion sp. aff. M. minima Petrushevskaya and Kozlova
(Plate 17, Figure 8)

Myylocercion sp. aff. M. minima (Dumitrica) Petrushevskaya and Kozlova, 1972, p. 535, pl. 2, figs. 19-20.
?*Diacanthocapsa minima* Dumitrica, 1970, p. 62, pl. 15 figs. 92, 93, 95.

Remarks: This species is rarely observed; however, it is noted that in Leg 17 material it is found somewhat lower in the section than previously reported.

Occurrences: Campanian (Petrushevskaya and Kozlova, 1972). Leg 17: Site 164, Core 16. Upper Cretaceous (Coniacian-Santonian).

Genus SETHAMPHORA Haeckel, 1887

Sethamphora pulchra Squinabol
(Plate 3, Figures 4-6)

Sethamphora pulchra Squinabol, 1904, p. 213, pl. 5, fig. 8.
Lithocampe eegantissima Cita, 1965, pl. 12, fig. 2.
Cryptocephalus; sp. Riedel and Schlocker, 1956, p. 358, Fig 2.

Remarks: This species is common in samples from the Lower Cretaceous and is recognizable even in poorly preserved assemblages. It is distinguished by the "two-stage" contour of the multi-segmented shell. The lower stage is cylindrical to slightly inflated. Above the stage the shell is sharply constricted, and in the conical upper stage gradually tapers to a point. Longitudinal ridges extending over both stages are sometimes visible.

Occurrences: Senonian (Squinabol, 1904); Aptial-Albian (Cita, 1965). Leg 17; Site 166, Cores 23, 25-28; Site 167, Cores 61, 62, 67-89; Site 169, Core 9. Lower mid Cretaceous (U. Berriasian/L. Valanginian-U. Cenomanian/L. Turonian).

Family ARTOSTROBIIDAE Riedel, 1967b

Genus ARTOSTROBIUM Haeckel, 1887, emend. Foreman, 1966

Artostrobium tina Foreman
(Plate 8, Figure 6)

Artostrobium tina Foreman, 1971, p. 1678, pl. 4, fig. 3.

Occurrences: Santonian-Campanian of Cuba; Low Santonian of Trinidad; Campanian of Germany; ? Campanian of DSDP Leg 4, 24A-1-1, and DSDP Leg 6, 59.2-5-CC. (Foreman, 1971).
Leg 17: Site 164, Cores 11-19: Site 170, Cores 7-13, 15; Site 171, Core 24 Upper Cretaceous (?Albian-Campanian).

Genus RHOPALOSYRINGIUM Campbell and Clark, 1944b, emend. Foreman, 1968

Rhopalosyringium Campbell and Clark, 1944b, p. 30.
Rhopalosyringium Campbell and Clark, 1944b, emend. Foreman, 1968, p. 54.

Rhopalosyringium sp. A.
(Plate 7, Figure 1)

Remarks: Several poorly preserved specimens of this genus were found in samples from Sites 164 and 166. They are typified by their rather delicate, bladed apical horn, broad bilobate cephalis, and heavy, rough thorax with irregularly spaced pores. Thorax is inflated and cylindrical in shape. Abdomen is cylindrical, tapering distally with sub-circular, and irregularly spaced pores.

Occurrences: Leg 17; Site 164, Cores 10-19.
Site 166, Site 169, Cores 1,2; Core 22; Site 170, Core 8-13, 15. Upper Cretaceous (U. Albian-Maastrichtian).

Genus THEOCAMPE Haeckel, 1887, emend. Burma, 1959

Theocampe apicata Foreman
(Plate 11, Figure 9)

Theocampe apicata Foreman, 1971, p. 1679, pl. 4, fig. 6.

Remarks: Campanian of DSDP Leg 6, 59.2-5-CC; Campanian of Germany, (Foreman, 1971).
Leg 17: Site 164, Cores 13-16; Site 170, Core 10 Upper Cretaceous Coniacian/Santonian-Santonian/Campanian.

Theocampe ascalia Foreman
(Plate 17, Figure 6)

Theocampe ascalia Foreman, 1971, p. 1678, pl. 4, fig. 4.

Occurrences: Lower Santonian of Trinidad; Santonian-Campanian of Cuba; ? Campanian of DSDP Leg 4, 24A-1-1 and DSDP Leg 6, 59.2-5-CC (Foreman 1971).
Leg 17: Site 164, Cores 10-19; Site 171, Core 24. Upper Cretaceous (Cenomanian/Turonian-Coniacian/Santonian).

Theocampe salillum Foreman
(Plate 11, Figures 1-2)

Theocampe salillum Foreman, 1971, p. 1678, pl. 4, fig. 5.
Occurrences: Low Santonian of Trinidad; Santonian-Campanian of Cuba; Campanian of Germany; ? Campanian of DSDP Leg 4, 24A-1-1 and DSDP Leg 6, 59-2-5-CC (Foreman, 1971).
Leg 17: Site 164, Cores 7, 10-19; Site 165, Cores 22; Site 170, Cores 9-13; Site 171, Core 24. Upper Cretaceous (Cenomanian-Campanian).

Genus SOLENOTRYMA Foreman, 1968

Solenotryma of S. dacryodes Foreman
(Plate 11, Figure 8)

Solenotryma dacryodes Foreman, 1968, p. 33, pl. 4, fig. 7.
Occurrences: Santonian-Campanian of South Atlantic; ? Upper Campanian-Lower Maastrichtian of California (Foreman, 1968).
Leg 17: Site 164, Cores 13, 16. (Coniacian/Santonian).

Subfamily ARTOSTROBIINAE Riedel, 1967a

Genus LITHOMITRA Bütschli, 1882

Lithomitra excellens Tan Sin Hok

Lithomitra excellens Tan Sin Hok, 1927, p. 56, pl. 11, fig. 85.
Remarks: Generally cylindrical in shape through most of its length, the first four segments taper sharply to form the conical top of the shell. The terminal segment is distinctly smaller in diameter than those above it.
Occurrence: Leg 17: Site 167, Cores 67-76, 87-89. Lower Cretaceous (U. Berriasian/L. Valanginian-U. Albian/L. Cenomanian).

Family THEOPERIDAE Haeckel, 1881, emend. Riedel, 1967b

Genus THEOPERA Haeckel, 1887

Theopera sp. A.
(Plate 17, Figure 4)

Remarks: This rare species had a round cephalis with a small apical horn. Thorax is inflated with collar and lumbar strictures distinct. Abdomen is elongated, slightly inflated, and sharply tapering distally. Surface of abdomen is rough, with very small irregularly spaced pores.
Occurrence: Leg 17: Site 164, Core 18 Upper Cretaceous (Cenomanian/Turonian).

Family WILLIRIEDELLIDAE Dumitrica, 1970

Genus CRYPTAMPHORELLA Dumitrica, 1970

Cryptamphorella conara (Foreman)
(Plate 7, Figures 4-5)

Hemicryptocapsa conara Foreman, 1968, p. 35, pl. 4, figs. 11a-b.
Cryptamphorella conara (Foreman) Dumitrica, 1970, p. 80, pl. 11, figs. 66a-c.
Occurrences: Cenomanian (Dumitrica, 1970).
Leg 17: Site 164, Cores 10-16; Site 166, Core 22; Site 170, Cores 10-11, 13, 15. Upper Cretaceous (U. Albian-Santonian/Campanian).

Cryptamphorella sphaerica White
(Plate 17, Figure 5)

Baculogyspina (?) *sphaerica* White 1928, p. 306, pl. 41, figs. 12-13.
Hemicryptocapsa regularis Tan Sin Hok, 1927, p. 51, pl. 9, fig. 68.
Cryptamphorella sphaerica (White) Dumitrica, 1970, p. 82, pl. 12, fig. 73.
Occurrences: Lower Campanian (Dumitrica, 1970); Turonian-Lower Senonian (Tan Sin Hok, 1927).
Leg 17: Site 166, Core 22. Upper Cretaceous (U. Albian/Cenomanian).

Genus HEMICRYPTOCAPSA Tan Sin Hok, 1927, emend. Dumitrica, 1970

Hemicryptocapsa polyhedra Dumitrica
(Plate 8, Figures 1-2)

Hemicryptocapsa polyhedra Dumitrica, 1970, p. 72, pl. 14, fig. 85.
Occurrences: Lower (?) Turonian (Dumitrica, 1970).
Leg 17: Site 166, Core 22. Upper Cretaceous (U. Albian/Cenomanian).

Hemicryptocapsa tuberosa Dumitrica
(Plate 7, Figures 2-3)

Hemicryptocapsa tuberosa Dumitrica, 1970, p. 71, pl. 12, fig. 78a.
Occurrences: Cenomanian (Dumitrica, 1970).
Leg 17: Site 164, Core 12: Site 166, Core 22; Site 170, Cores 9-10. Upper Cretaceous (U. Albian/Cenomanian-Santonian/Campanian).

Genus EXCENTROPYLOMMA Dumitrica, 1970

Excentropylomma cenomana Dumitrica
(Plate 8, Figure 3)

Excentropylomma cenomana Dumitrica, 1970, p. 77, pl. 14, fig. 97.
Occurrences: Cenomanian (Dumitrica, 1970).
Leg 17: Site 166, Core 22. Mid Cretaceous (U. Albian/Cenomanian).

Family AMPHIPYNDACIDAE Riedel, 1967a

Genus AMPHIPYNDAX Foreman, 1966
(Plate 11, Figure 5)

Amphipyndax enesseffi Foreman, 1966, p. 356, figs. 10-11.
Occurrences: Maastrichtian-Danian of California; Cenomanian-Danian of California currents; Campanian of South Dakota; Upper Campanian of Germany; Campanian of Puerto Rico; Santonian-Campanian of Cuba; Upper Cretaceous of Alaska; Aptian-Cenomanian or Turonian of Australia; Cenomanian of Italy (Foreman, 1966).
Leg 17: Site 164, Core 7, 10-17, 19; Site 170, Cores 7-11; Site 171, Core 24. Upper Cretaceous (Cenomanian/Turonian-Campanian).

Amphipyndax stocki (Campbell and Clark)
(Plate 11, Figure 6)

Stichocapsa stocki Campbell and Clark, 1944b, p. 44, pl. 8, figs. 31-33.
Stichocapsa megalocephala Campbell and Clark, 1944b, p. 44, pl. 8, figs. 26, 34.
?*Dictyomitra uralica* Kozlova and Gorbovetz, 1966, p. 116, pl. 6, figs. 6-7.
Amphipyndax stocki Campbell and Clark, Foreman, 1968, p. 78, pl. 8, figs. 12- a-c.
Occurrences: Campanian (Kozlova and Gorbovetz, 1966). Campanian-Danian of California; Santonian of Trinidad; Santonian-Campanian of Cuba (Foreman, 1968).
Leg 17: Site 164, Cores 13-17; Site 171, Core 24. Upper Cretaceous (Cenomanian/Turonian-Coniacian/Santonian).

Family EUCYRTIDIIDAE Ehrenberg, 1847b, emend. Petruskevaskaya, 1971a

Genus STICHOCAPSA Haeckel, 1881
(Plate 4, Figures 5-6)

Stichocapsa conosphaeroides Rüst, 1898, p. 66, pl. 19, fig. 3.
Remarks: The large spherical terminal segment has a marked tuberous surface with circular, hexogaonally arranged pores.
Occurrences: Lower Cretaceous or Upper Jurassic (Rüst, 1898).
Leg 17; 167, Cores 67-88. Lower Cretaceous (U. Berriasian/ L. Valanginian-U. Albian/L. Cenomanian).

Stichocapsa cribrata Hinde
(Plate 4, Figures 1-2)

Stichocapsa cribrata Hinde, 1900, p. 43, pl. 4, fig. 39.
Remarks: Either the highly segmented nature of the shell or the arrangement of the pores give these poorly preserved specimens an almost spongy appearance. A faint longitudinal alignment (segments?) is seen in some specimens.
Occurrence: Let 17: Site 167, Cores 67-93. Lower Cretaceous (Berriasian-U. Albian/L. Canomanian).

Stichocapsa rotunda Hinde
(Plate 5, Figures 1-4)

Stichocapsa rotunda Hinde 1900, p. 41, pl. 3, fig. 24.
Remarks: This very large form has a clear (poreless) conical upper portion. Rather than having distinct segments the test is constricted and inflated in an almost wave-like contour, with two to four constrictions below the clear, conical first segment.

Occurrence: Leg 17: Site 167, Cores 67-89. Lower Cretaceous (U. Berriasian/L. Valanginian-U. Albian/L. Cenomanian).

Genus STICHOMITRA Cayeux, 1897

Stichomitra asymbatos Foreman
(Plate 11, Figures 3-4)

Stichomitra asymbatos, Foreman, 1968, p. 73, pl. 8, fig. 10.

Occurrences: Upper Maastrichtian; Santonian-Danian; Campanian-Danian of California; Campanian-Maastrichtian of South Atlantic (Foreman, 1968). Leg 17; Site 164, Core 11-19; Site 170, Core 8-10, 13. Upper Cretaceous (Cenomanian-Campanian).

?Stichomitra livermorensis (Campbell and Clark)
(Plate 17, Figure 7)

Artocapsa livermorensis Campbell and Clark, 1944b, p. 45, pl. 8, figs. 10, 19, 21, 27.

?Stichomitra livermorensis (Campbell and Clark) Foreman, 1968, p. 76, pl. 8, figs. 2a, b.

Occurrences: Upper Campanian-Lower Maastrichtian of California; Campanian-Maastrichtian of South Atlantic (Foreman, 1968). Leg 17: Site 164, Cores 10-12, 16. Upper Cretaceous (Coniacian/Santonian).

Stichomitra rüsti Aliev
(Plate 7, Figures 7-9)

Stichomitra rusti, Aliev, 1965, p. 58, pl. 10, fig. 7.

Remarks: This is one of the few species in which the test was observed in both its opaline and completely replaced state. The long, thin nature of the test and the inflated, rough texture of individual segments are noted in even the replaced specimens.

Occurrences: Albian (Aliev, 1965). Leg 17: Site 167, Core 64; Site 169, Core 7; Site 170, Cores 9, 11, 12, 15; Site 171, Core 24. Mid to Upper Cretaceous (U. Albian-Santonian/Campanian).

Stichomitra sp. A
(Plate 17, Figure 1)

Remarks: The cephalis is small with a short apical horn; the thorax is slightly inflated. Subsequent segments (four or more) are in the shape of a truncated cone with the base of each segment larger than that of the one above and slightly overhanging the following segment.

Occurrence: Leg 17; Site 164, Cores 10-16. Upper Cretaceous (Coniacian/Santonian).

Genus LITHOCAMPE Ehrenberg, 1838
(Plate 3, Figure 7)

Lithocampe altissima Rüst, 1885, p. 315, pl. 40, fig. 2.

Remarks: Numerous segments (14-17) were observed in specimens from Site 167. The first few form the conical top of the shell. Below this each successive segment is only slightly larger than the one above it.

Occurrence: Leg 17; Site 167, Cores 70-76. Lower Cretaceous (Valanginian/Hauterivian-U. Aptian).

Lithocampe ananassa Rüst
(Plate 4, Figure 7-9)

Lithocampe ananassa Rüst, 1885, p. 315, pl. 40, fig. 3.

Remarks: The spindle shape of the test and the prominent latitudinal ridges marking each segment distinguish this species. Each of the 10 to 12 segments contain three rows of circular pores, hexagonally arranged. The cephalis is small and round. No apical horn was observed.

Occurrence: Leg 17: Site 167, Cores 67-94. Upper Jurassic-Lower Cretaceous (U. Tithonian/Berriasian-U. Albian/L. Cenomanian).

Lithocampe mediodilatata Rüst
(Plate 2, Figures 5-6)

Lithocampe mediodilatata Rüst, 1885, p. 316, pl. 40, fig. 9.

"Lithocampe" mediodilatata Rüst ? *in* Pessagno, 1969, p. 610, pl. 4, figs. G-H.

Remarks: The upper, conical part of the very large test is formed by approximately four segments. Below this upper section, the tests swell to a very large prolate sphere circled by many (16-18) prominent latitudinal ribs that are apparently formed of solid silica. Each band is separated by a double row of triangular to rounded pores. The pores are not hexagonally arranged, but appear like the trusswork of a bridge, with pores longitudinally aligned across the latitudinal ribs or bands.

Occurrences: Late Jurassic (Pessagno, 1969) Jurassic-Cretaceous (Rüst, 1885). Leg 17: Site 167, Cores 73-94. Upper Jurassic-Lower Cretaceous (U. Tithonian/Berriasian-Hauterivian).

Lithocampe pseudochrysalis var α Tan Sin Hok
(Plate 8, Figures 4-5)

Lithocampe pseudochrysalis var α Tan Sin Hok, 1927, p. 64, pl. 13, fig. 108.

Remarks: This rare species is distinguished by its rather thick shell and inflated cylindrical segments which contain three to four latitudinal rows of circular, hexagonally arranged pores. Successive segments are larger in diameter up to the fifth segment; subsequent chambers are somewhat smaller.

Occurrence: Leg 17: Site 164, Core 12, Upper Cretaceous (Coniacian/Santonian).

Genus CYRTOCAPSA Haeckel, 1881

Cyrtocapsa grutterinki Tan Sin Hok
(Plate 2, Figures 3-4)

Cyrtocapsa grutterinki Tan Sin Hok, 1927, p. 64-65, pl. 13, figs. 110-111.

Remarks: The irregular spines and rough texture of the spherical segment and relatively small and sharply tapering upper portion of the test distinguish this species.

Occurrence: Leg 17: Site 166, Core 28; Site 167, Cores 60-67; Site 169, Core 9; Site 170, Core 15. Mid Cretaceous (U. Albian-Turonian).

Cyrtocapsa molengraaffi Tan Sin Hok

Crytocapsa molengraaffi Tan Sin Hok, 1927, p. 66, pl. 14, figs. 114-116.

Remarks: The small, sub-spherical fifth (terminal) segment and generally conical shape of the upper portion of the shell distinguish the species in Leg 17 material. The upper four segments are cylindrical, inflated, with marked strictures. The segments increase in diameter and thickness from top to bottom.

Occurrence: Leg 17: Site 167, Cores 64-94. Upper Jurassic-Lower Cretaceous (U. Tithonian/Berriasian-U. Albian/L. Cenomanian).

Cyrtocapsa turritica Aliev
(Plate 10, Figures 1-3)

Cyrtocapsa turritica Aliev, 1968, p. 31, pl. 1, fig. 7.

Remarks: The test of this species is large and of the same general shape (a very elongated teardrop). The large circular pores in the lower half of the shell are strongly longitudinally aligned. Faint longitudinal ridges are seen in some specimens. The upper part of the shell tapers sharply and smoothly with no distinct structures marking the segments.

Occurrences: Middle Albian (Aliev, 1968). Leg 17: Site 169, Cores 9-10, Site 170, Core 15. Mid Cretaceous (U. Albian-L. Cenomanian).

Genus EUCYRITIDIUM Ehrenberg, 1847a

Eucyritidium grandis (Campbell and Clark)
(Plate 8, Figures 7-8)

Cyrtophormis (*Acanthocyrtis*) *grandis* Campbell and Clark, 1944b, p. 38, pl. 8, figs. 18, 39.

Remarks: Although the illustrations and general description of Campbell and Clark match this species the observed range is quite different.

Occurrences: Upper Cretaceous (Campbell and Clark, 1944b). Leg 17: Site 167, Cores 63, 67. Mid Cretaceous (U. Albian/L. Cenomanian).

?Eucyrtidium cf. E. thiensis Tan Sin Hok
(Plate 7, Figure 6)

Eucyrtidium thiensis Tan Sin Hok, 1927, p. 60, pl. 11, fig. 95.
Remarks: Specimens having six segments were observed. The cephalis is small and indistinct. Subsequent segments are gradually wider and thicker, until the sixth segment is subspherical. The test is smooth externally with some indication of weak longitudinal ridges. Internally, each segment is constricted at the join with the adjoining segments. Pores are small, circular, and widely spaced in a hexagonal pattern. The observed specimens had ragged terminations; thus, additional segments may be present in well-preserved forms.
Occurrence: Leg 17: Site 166, Cores 22, 23. Mid Cretaceous (U. Albian/L. Cenomanian).

? Eucyrtidium sp. A
(Plate 10, Figure 7)

Remarks: This unusual form was found only in a poorly preserved state. It is apparently composed of approximately six segments. The cephalis may bear an apical horn. The following three segments are conical, truncated and inflated. Individual segments are indistinct. The fifth segment is spherical and bears spines in the equatorial region. The sixth segment is cylindrical, flaring slightly and bearing spines distally.
Occurrence: Leg 17: Site 167, Core 62; Site 170, Core 15. Mid Cretaceous (U. Albian/L. Cenomanian).

Genus EUSYRINGIUM Haeckel, 1881

Eusyringium typicum Rüst
(Plate 1, Figures 5-7)

Eusyringium typicum Rüst, 1898, p. 60, pl. 17, fig. 7.
Remarks: Poor preservation precludes the description of this species in terms of individual segments. It has an upper, sharply tapering section with a stout apical horn. The middle section is spherical and bears four equatorial spines that are four-bladed and project outwards at right angles to the test. The bottom section tapers sharply distally. It is similar to the top section in thickness, but is longer and contains pores that are somewhat larger than those found on the remainder of the test.
Occurrences: Lower Cretaceous or Upper Jurassic (Rüst, 1989). Leg 17: Site 167, Cores 64-94. Upper Jurassic-Lower Cretaceous (U. Tithonian/Berrisian-U. Albian/L. Cenomanian).

Genus DICTYOMITRA Zittel, 1876, sensu Foreman, 1968

Dictyomitra formosa Squinabol
(Plate 1, Figures 1-4)

Dictyomitra formosa Squinabol, 1904, p. 232, pl. 10, fig. 4.
Remarks: This is a large, thick shelled species, with strong costae, approximately 10 segments and a single row of large pores just above the basal stricture of each segment. Segments are truncated cones which tend to show a greater flare below the fifth segment. It is surmised that almost every investigator of Cretaceous radiolarians has variously figured and named this species which is both common and long-ranging. It gives the author great pleasure to be among the very few to reference the excellent illustrations and descriptions of a previous worker (even though he should have probably referenced even earlier workers).
Occurrences: Senonian (Squinabol, 1904). Leg 17: Site 164, Cores 11-19, 21; Site 166, Cores 23, 28; Site 167, Cores 60-94; Site 169, Cores 2, 9. Upper Jurassic-Upper Cretaceous (U. Tithonian/Berriasian-Campanian).

Dictyomitra macrocephala Squinabol
(Plate 9, Figures 8-9)

Dictyomitra macrocephala Squinabol, 1904, p. 230, pl. 9, fig. 10.
Dictyomitra malleola Aliev, *in* Pessagno, 1969, p. 610, pl. 5, fig. A.
Remarks: The large (apparently solid) triangular cephalis and the thin conical segments distinguish this species. It is robust and preserves well.
Occurrences: Senonian (Squinabol, 1904); Albian (Pessagno, 1969). Leg 17: Site 166, Cores 23, 25; Site 167, Cores 60-62; Site 170, Core 15. Mid Cretaceous (U. Albian/L. Cenomanian).

Dictyomitra margarita Aliev
(Plate 13, Figures 5-6)

Dictyomitra margarita Aliev, 1961, p. 55, pl. 1, figs. 3-4.
Remarks: The simple, unornamented, smooth contours of the shell distinguish this species. The segments are cylindrical to conical (truncated) with little tendency towards inflation. The seventh segment usually marks the maximum diameter of the shell.
Occurrences: Valanginian-Lower Cretaceous (Aliev, 1961). Leg 17: Site 166, Cores 23-28; Site 167, Cores 60-94; Site 169, Core 9. Upper Jurassic-Upper Cretaceous (U. Tithonian/Berriasian-U. Turonian).

Dictyomitra sagitafera Aliev
(Plate 8, Figure 9)

Dictyomitra sagitafera Aliev, 1965, p. 55, pl. 10, figs. 2, 3, 4.
Remarks: The constriction below what appears to be the fourth segment (in the poorly preserved specimen from Leg 17) and the slightly inflated cylindrical shape of the segments distinguish this species.
Occurrences: Lower Cretaceous (Aliev, 1965). Leg 17: Site 166, Cores 25, 28; Site 167, Cores 60-62; Site 169, Core 9; Site 170, Core 15. Mid Cretaceous (U. Albian-U. Turonian).

Dictyomitra veneta (Squinabol)
(Plate 9, Figure 7)

Phormocyrtis veneta Squinabol, 1903, p. 134, pl. 9, fig. 30.
Dictyomitra veneta (Squinabol), Petrushevskaya and Kozlova, 1972, p. 550, pl. 2, fig. 2.
Remarks: In many ways this species appears to be a diminutive form of *D. sagitafera.* However, a constriction below the third segment rather than the fourth, as in *D. sagitafera,* gives the upper section a more broadly conical shape. Subsequent cylindrical segments are rarely inflated. The shell usually has a smooth contour for the remaining three to four segments.
Occurrences: Albian-Maastrichtian (Petrushevskaya and Kozlova, 1972). Leg 17: Site 166, Cores 23, 25-28; Site 167, Cores 60-62; Site 169, Core 9. Mid Cretaceous (U. Albian-Turonian).

Dictyomitra cf. D. crassispina (Squinabol)
(Plate 9, Figure 6)

Diplostrobus crassispina Squinabol, 1903, p. 140, pl. 8, fig. 37.
Dictyomitra cf. *crassispina* (Squinabol) Foreman, 1968, p. 67, pl. 7, figs. 7a, b.
Occurrences: ?Upper Campanian-Upper Maastrichtian of California (Foreman, 1968). Leg 17: Site 170, Cores 10-11. Upper Cretaceous (Coniacian/Santonian-Santonian/Campanian).

Dictyomitra sp. cf. D. andersoni (Campbell and Clark)
(Plate 9, Figure 5)

Lithocampe (Lithocampanula) andersoni Campbell and Clark, 1944b, p. 42, pl. 8, fig. 25.
Dictyomitra andersoni (Campbell and Clark) Foreman, 1968, p. 68, pl. 7, figs. 6a-d.
Dictyomitra andersoni (Campbell and Clark) emend. Foreman, 1968, *in* Foreman, 1971, p. 1677, pl. 3, fig. 8.
Remarks: Very long, multisegmented forms are frequently found in the Upper Cretaceous, but definite assignment to a particular species is difficult because of the poor preservation.
Occurrences: ?Upper Campanian-Upper Maastrichtian of California (Foreman, 1968, 1971). Leg 17: Site 164, Cores 15-17; Site 167, Core 62; Site 169, Core 9; Site 170, Cores 13, 15. Mid-Upper Cretaceous (U. Albian/L. Cenomanian-Coniacian/Santonian).

Dictyomitra cf. D. torquata Foreman
(Plate 9, Figures 1-4)

Dictyomitra torquata Foreman, 1971, p. 1676, pl. 3, fig. 4.
Remarks: The thin, but broadly inflated fourth segment separates the smooth conical outline of the upper three segments from the flaring conical segments below. In some specimens the fifth segment is nearly cylindrical in shape. The base of the lower segments usually overhang the segment below. A single row of pores is located near the base of each segment. The pores are longitudinally aligned and separated by costae. Total segments observed: 7-10.
Occurrences: Santonian-Campanian of Cuba; Lower Campanian of Puerto Rico; Campanian of Germany; ?Campanian of DSDP Leg

4, 24A-1-1 and DSDP Leg 6, 59.2-5-CC. (Foreman, 1971). Leg 17; Site 164, Cores 11, 13-17; Site 167, ?Core 62; Site 170, Cores 8-13, 15; Site 171, Cores 19, 24. Mid-Upper Cretaceous (U. Albian-M. Maastrichtian).

Dictyomitra sp. cf. Eucyrtidium brouweri Tan Sin Hok
(Plate 14, Figures 7-9)

Eucyrtidium brouweri Tan Sin Hok, 1927, p. 57-58, pl. 11, figs. 90, 91.
Dictyomitra sp. cf. *Eucyrtidium brouweri* Tan Sin Hok, *in* Foreman, 1971, p. 1682, pl. 5, Fig. 15.

Occurrences: Cenomanian ? Turonian (Foreman, 1971). Leg 17: Site 166, Core 22. Mid Cretaceous (U. Albian/Cenomanian).

Dictyomitra? cf. Eucyrtidium turritum Squinabol
(Plate 10, Figures 4-6)

Eucyrtidium turritum Squinabol, 1904, p. 234, pl. 10, fig. 9.

Remarks: The very thin, multi-segmented upper part of the test is usually broken free of the lower part of the test in the Leg 17 samples. The upper part is made up of 8 to 10 cylindrical segments. The structure of the lower part of the test is spongy and indistinct.

Occurrences: Senonian (Squinabol, 1904). Leg 17: Site 166, Core 25; Site 167, Cores 60-62; Site 169, Cores 9-10. Mid Cretaceous (U. Albian-U. Turonian).

Dictyomitra sp. A.
(Plate 17, Figures 2, 3)

Dictyomitra sp. Foreman, 1971, p. 1677, pl. 3, fig. 5.

Remarks: The first three (possibly four) segments form the conical upper section of test. The base of the third usually flares out and is wider than the top of the next segment. Remaining segments are cylindrical and slightly inflated. A single latitudinal row of small pores is located in the lower part of each segment. Pores are longitudinally aligned and separated by costae.

Occurrences: Santonian-Campanian of Cuba; Campanian of Germany; ?Campanian of DSDP Leg 6, 59.2-5-CC (Foreman, 1971). Leg 17: Site 164, Cores 11-19. Upper Cretaceous (Cenomanian/Turonian-Coniacian/Santonian).

Dictyomitra sp. B.
(Plate 14, Figures 5-6)

Remarks: This small, very robust species is distinguished by the smooth, rounded external outline and the sharp, internal structure at the top and base of each cylindrical segment; by the single row of circular pores at the base of each segment; and by the small, somewhat irregularly arranged circular pores found over the surface of the fifth (widest) segment.

Occurrence: Leg 17: Site 166, Core 22. Mid Cretaceous (Upper Albian/Cenomanian).

Dictyomitra sp. C.
(Plate 14, Figures 3-4)

Remarks: The very poor state of preservation of all observed specimens make it impossible to discern the details of the structure of this species. It has an overall conical outline and appears to be made up of 7 to 11 segments. The surface of the shell is covered with numerous knobby protrusions.

Occurrence: Leg 17: Site 167, Cores 60-94. Upper Jurassic-Mid-Cretaceous (U. Tithonian/Berriasian-U. Turonian).

Family PLECTOPYRAMIDIDAE Haecker, 1908, emend. Petrushevskaya, 1971a

Genus CORNUTELLA Ehrenberg, 1838, emend. Petrushevskaya, 1971b

Cornutanna conica Aliev
(Plate 14, Figures 1-2)

Cornutanna conica Aliev, 1965, p. 34, pl. 6, fig. 1.

Occurrences: Albian (Aliev, 1965). Leg 17: Site 166, Core 23; Site 167, Cores 64-88. Lower Cretaceous, (U. Berriasian/L. Valanginian-U. Albian/L. Cenomanian).

Genus ARTOPILIUM Haeckel, 1881

Artopilium Haeckel, 1881, p. 1436, 1439-1440.

Artopilium sp. A.
(Plate 11, Figure 7)

Theoperids, gen. et spp. indet. Kling, 1971, pl. 8, figs. 7-8.
Theoperidae gen. et. sp. indet. Foreman, 1971, p. 1676, pl. 3, fig. 3.

Remarks: This unusual, three segmented form has been found in several Pacific locations. It has a small spherical cephalis and a short apical horn. The thorax and abdomen are subspherical. The abdomen has three lateral circular openings 120° apart and somewhat smaller in diameter than the mouth. Each of these three openings and the mouth are covered by a conical meshwork. The cephalis appears poreless; the thorax contains a few very small pores; the abdomen and meshwork contain circular hexagonally arranged pores.

Occurrences: Santonian-Campanian of Cuba; ?Campanian of DSDP Leg 6, 59.2-5-CC (Foreman, 1971). Leg 17: Site 164, Cores 12-16; Site 170, Core 9-11. Upper Cretaceous (Coniacian/Santonian-Santonian/Campanian).

Incert. sed. sp. A
(Plate 13, Figures 1-3)

Remarks: This form was observed only in the upper parts of the Cretaceous section in which few silicious microfossils remained intact. There is no indication of a caphalis or other segments. A short spine and broadly conical shape form the upper part of what appears to be a test. Irregular ribs of varying thickness and spacing radiate from the base of the spine and extend downward from the conical upper portion.

Occurrence: Leg 17: Site 164, Cores 7-8; Site 169, Cores 2-4; Site 170, Cores 9-10; Site 171, Core 21. Upper Cretaceous (Campanian).

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PLATE 1

Magnification X226

Figure 1	*Dictyomitra formosa*; Sample 166-23-CC.
Figure 2	*Dictyomitra formosa*; Sample 170-11-CC.
Figure 3	*Dictyomitra formosa*; Sample 170-10-CC.
Figure 4	*Dictyomitra formosa*; Sample 167-67-3, 101-103 cm.
Figure 5	*Eusyringium typicum*; Sample 167-76-2, 65-67 cm.
Figures 6, 7	*Eusyringium typicum*; Sample 167-72-2, 48-50 cm.

PLATE 1

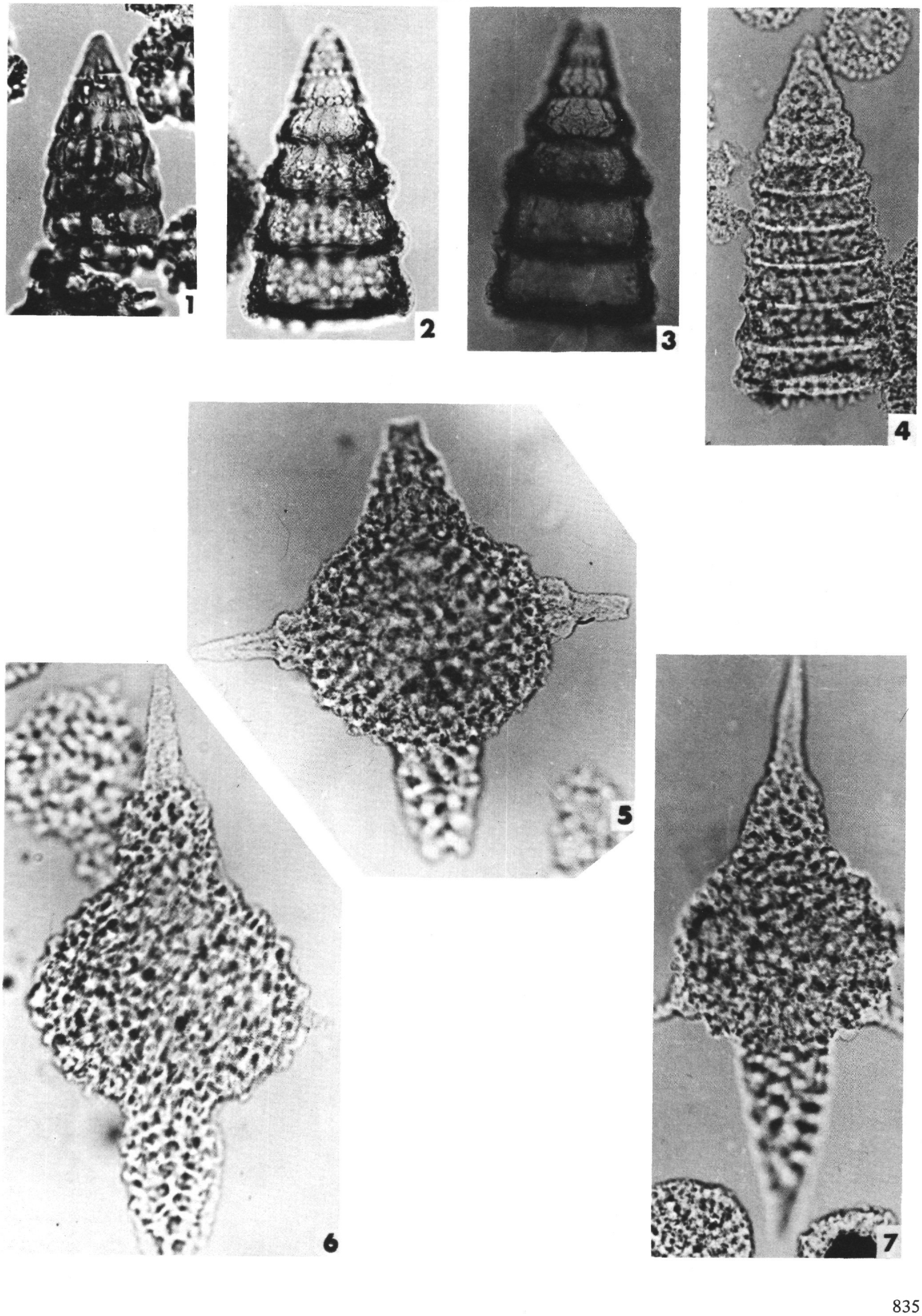

PLATE 2

Figure 1	*Stylatractus ovatus*; Sample 167-67-3, 101-103 cm; X 226.
Figure 2	*Staurosphaera septemporata*; Sample 167-75-1, 116-118; X226.
Figure 3	*Crytocapsa grutterinki*; Sample 167-62-2, 136-138 cm; X226.
Figure 4	*Cyrtocapsa grutterinki*; Sample 170-15-CC; X226.
Figure 5	*Lithocampe mediodilatata*; Sample 167-88-CC; X171.
Figure 6	*Lithocampe mediodilatata*; Sample 167-88-CC; X226.

PLATE 2

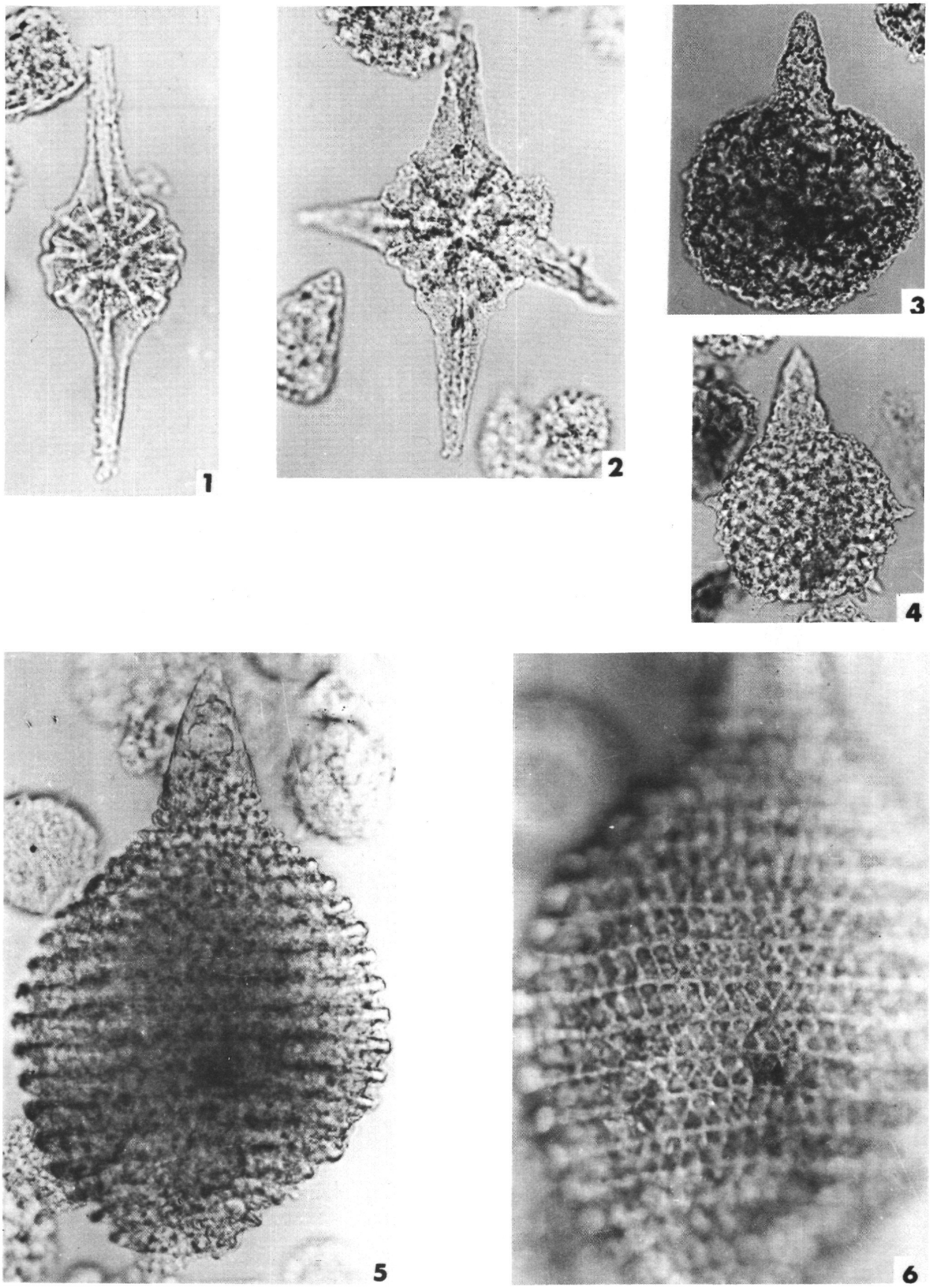

PLATE 3

Figure 1	*Spongosaturnalis dicranacanthos* (side view); Sample 167-74-2, 74-76 cm; X171.
Figure 2	*Spongosaturnalis amissus*; Sample 167-64-5, 15-17 cm; X226.
Figure 3	*Spongosaturnalis dicranacanthos*; Sample 167-75-1, 116-118; X226.
Figure 4	*Sethamphora pulchra*; Sample 170-15-CC; X226.
Figure 5	*Sethamphora pulchra*; Sample 167-61-1, 132-134 cm; X226.
Figure 6	*Sethamphora pulchra*; Sample 167-76-2, 65-67 cm; X226.
Figure 7	*Lithocampe altissima*; Sample 167-74-2, 74-76 cm; X226.

PLATE 3

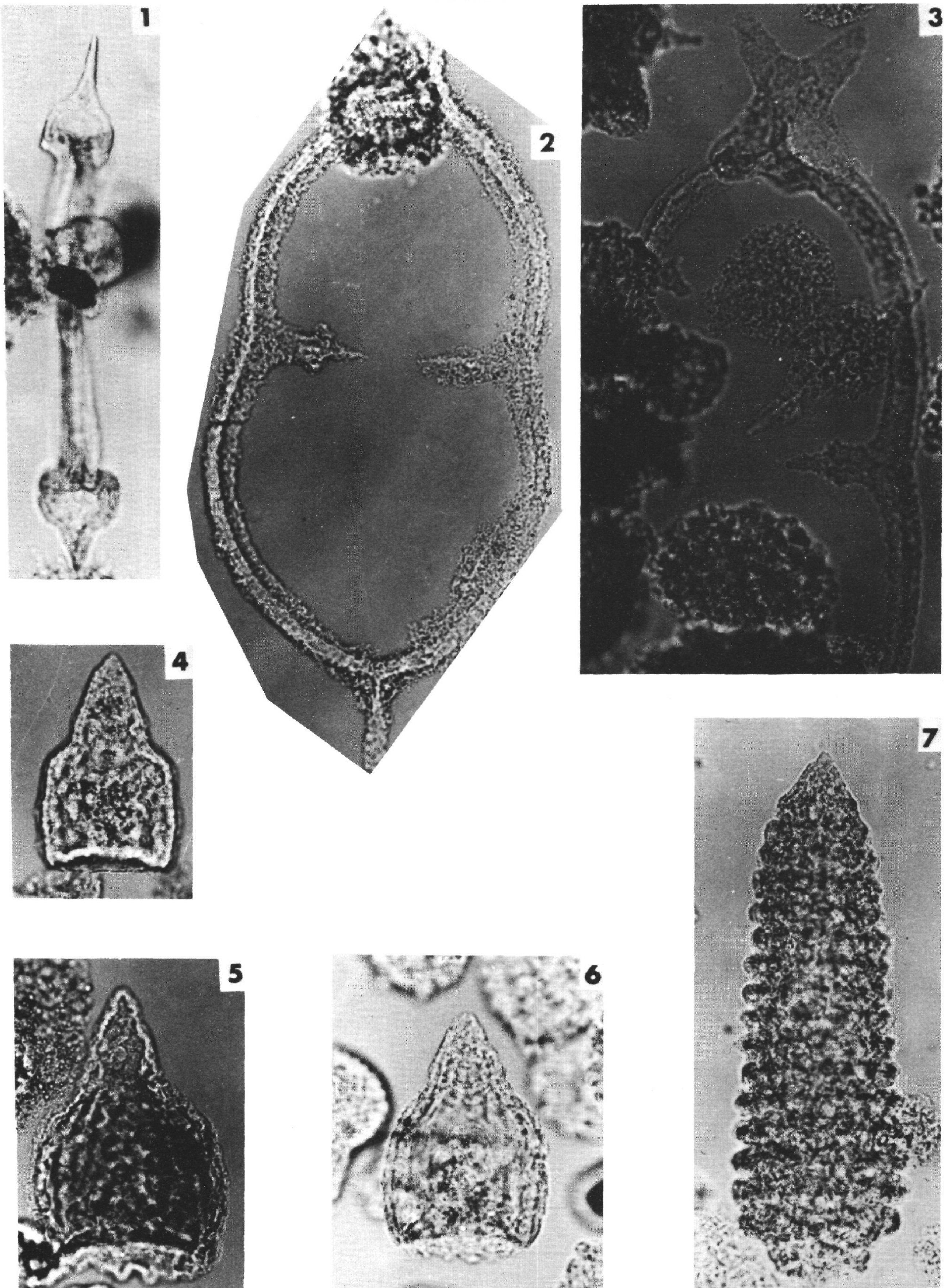

PLATE 4
Magnification X226

Figure 1	*Stichocapsa cribrata*; Sample 167-70-2, 36-40 cm.
Figure 2	*Stichocapsa cribrata*; Sample 167-67-3, 101-103 cm.
Figure 3	*Lithomitra excellens*; Sample 167-76-2, 65-67 cm.
Figure 4	*Lithomitra excellens*; Sample 167-67-3, 101-103 cm.
Figures 5, 6	*Stichocapsa conosphaeroides*; Sample 167-67-3, 101-103 cm.
Figure 7	*Lithocampe ananassa*; Sample 167-76-2, 65-67 cm.
Figure 8	*Lithocampe ananassa*; Sample 167-67-3, 101-103 cm.
Figure 9	*Lithocampe ananassa*; Sample 167-88-CC.

PLATE 4

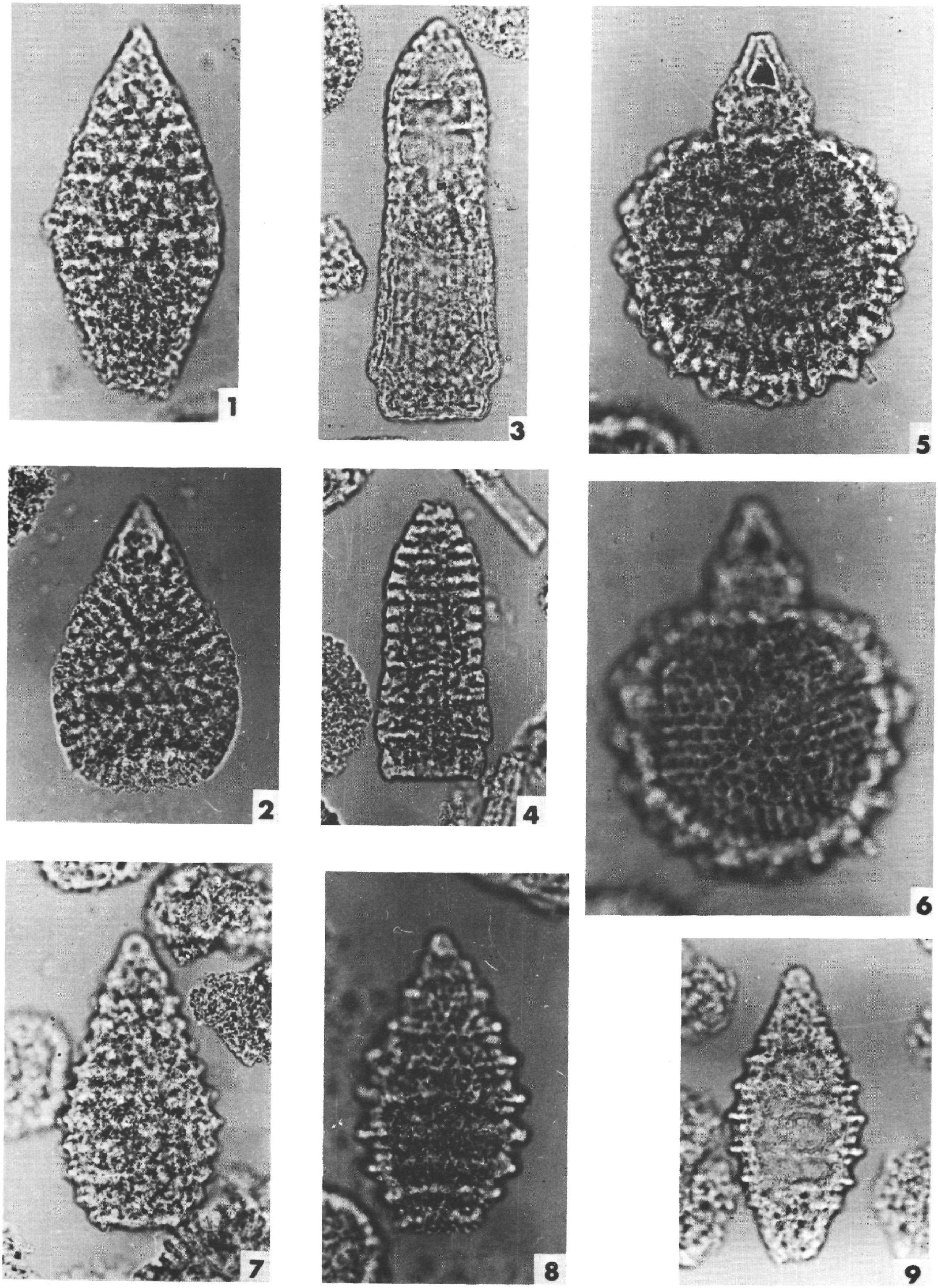

PLATE 5

Figure 1	*Stichocapsa rotunda*; Sample 167-76-2, 65-67 cm; ×90.
Figure 2	*Stichocapsa rotunda*; Sample 167-73-2, 30-32 cm; ×171.
Figure 3	*Stichocapsa rotunda*; Sample 167-76-2, 65-67 cm; ×171.
Figure 4	*Stichocapsa rotunda*; Sample 167-76-2, 65-67 cm; ×226.

PLATE 5

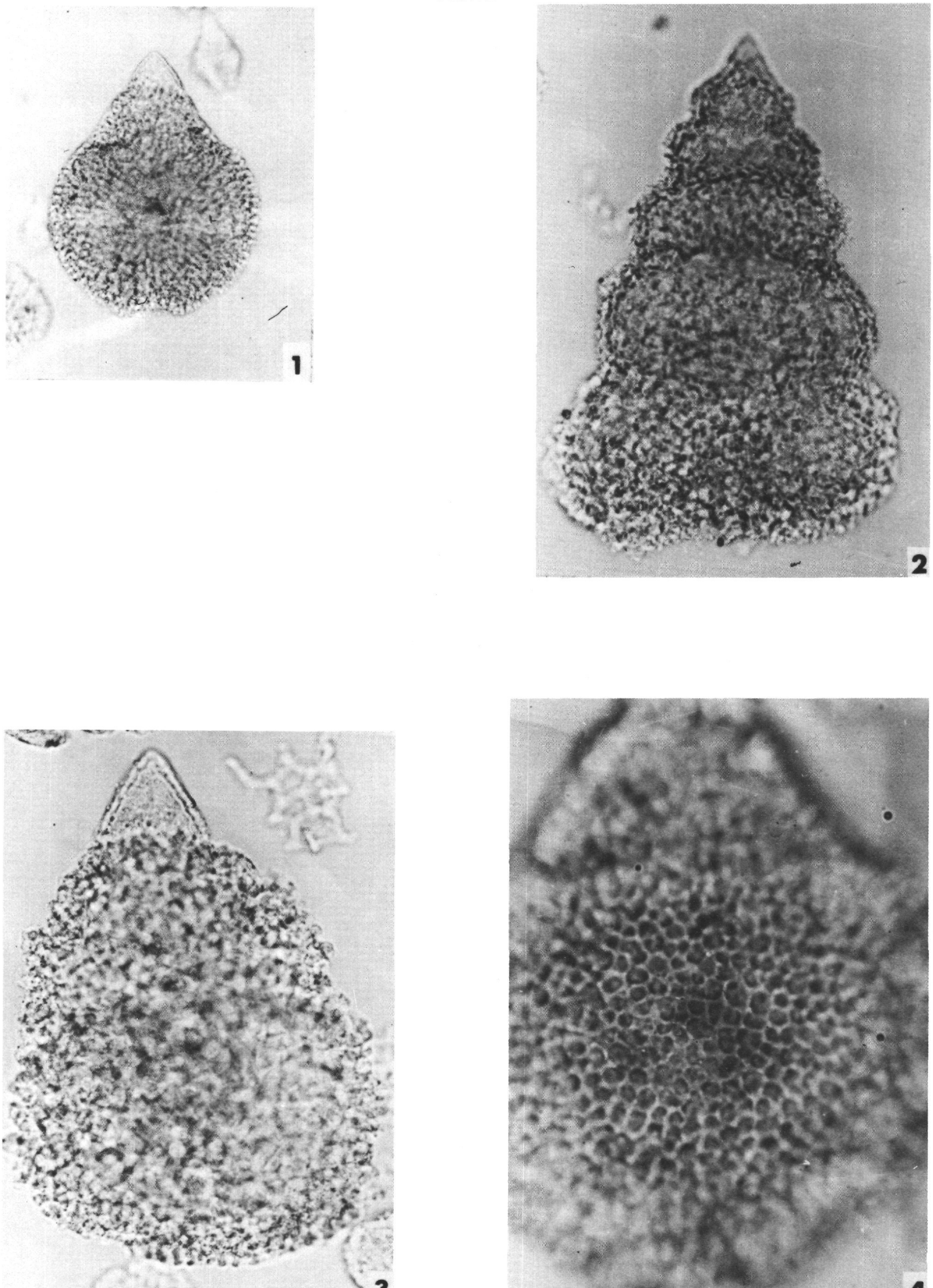

PLATE 6
Magnification X226

Figure 1	*Spongosaturnalis variabilis*; Sample 167-67-3, 101-103 cm.
Figure 2	*Spongosaturnalis variabilis*; Sample 167-73-2, 30-32 cm.
Figure 3	*Spongosaturnalis variabilis*; Sample 167-67-3, 101-103 cm.
Figure 4	*Spongosaturnalis polymorphus*; Sample 167-74-2, 74-76 cm.
Figure 5	*Spongosaturnalis* sp. B.; Sample 170-11-CC.
Figure 6	*Spongosaturnalis polymorphus*; Sample 167-64-5, 15-17 cm.

PLATE 6

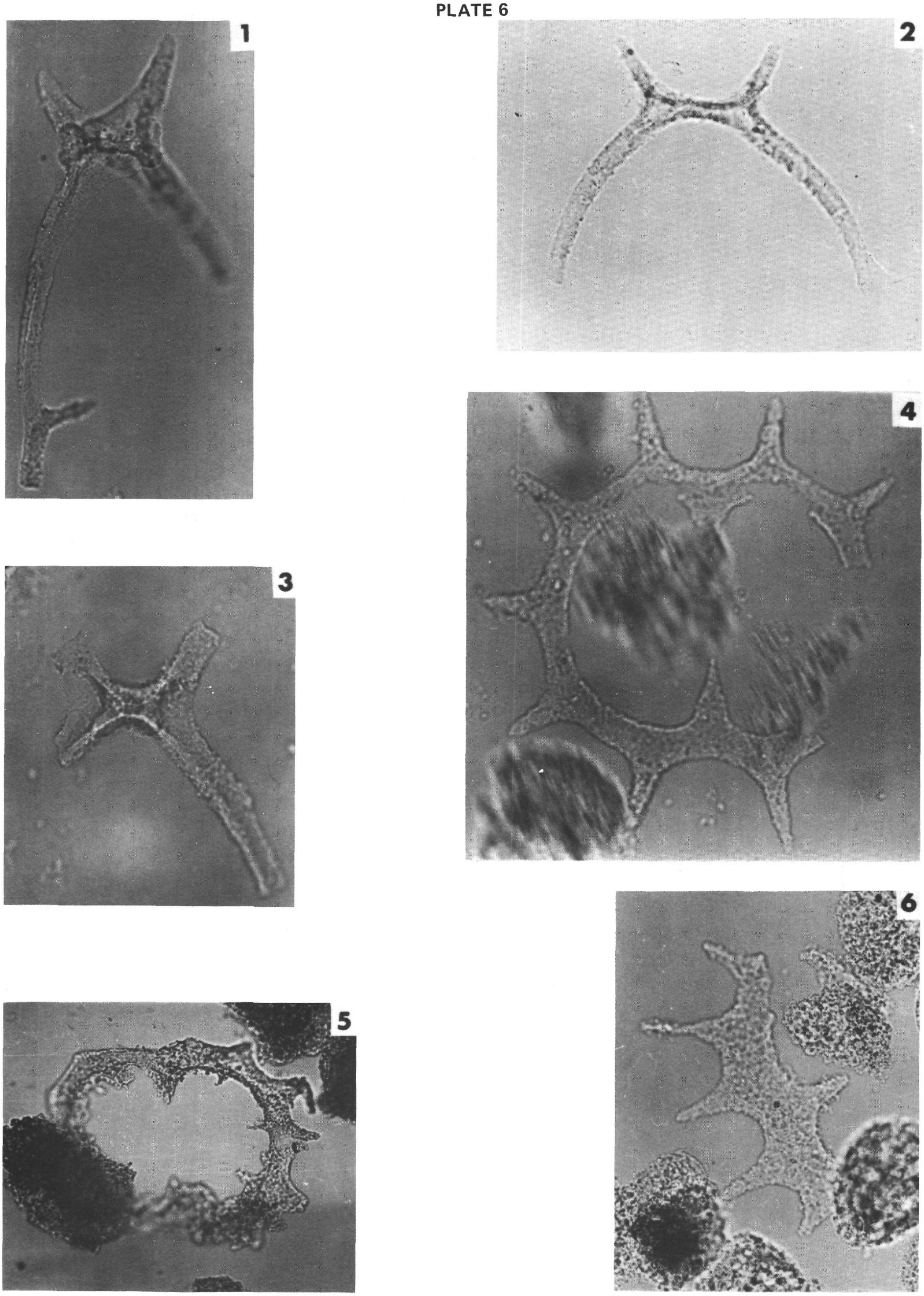

PLATE 7
Magnification ×226

Figure 1	*Rhopalosyringium* sp. A; Sample 164-12-CC.
Figure 2	*Hemicryptocapsa tuberosa*; Sample 164-12-CC.
Figure 3	*Hemicryptocapsa tuberosa*; Sample 170-9-CC.
Figures 4, 5	*Cryptamphorella conara* (Specimen in Figure 5 is tilted back slightly); Sample 170-13-CC.
Figure 6	?*Eucyrtidium* cf. *E. thiensis*; Sample 166-22-CC.
Figure 7	*Stichomitra rüsti*; Sample 170-15-CC.
Figure 8	*Stichomitra rüsti*; Sample 171-24-CC.
Figure 9	*Stichomitra rüsti*; Sample 169-9-CC.

PLATE 7

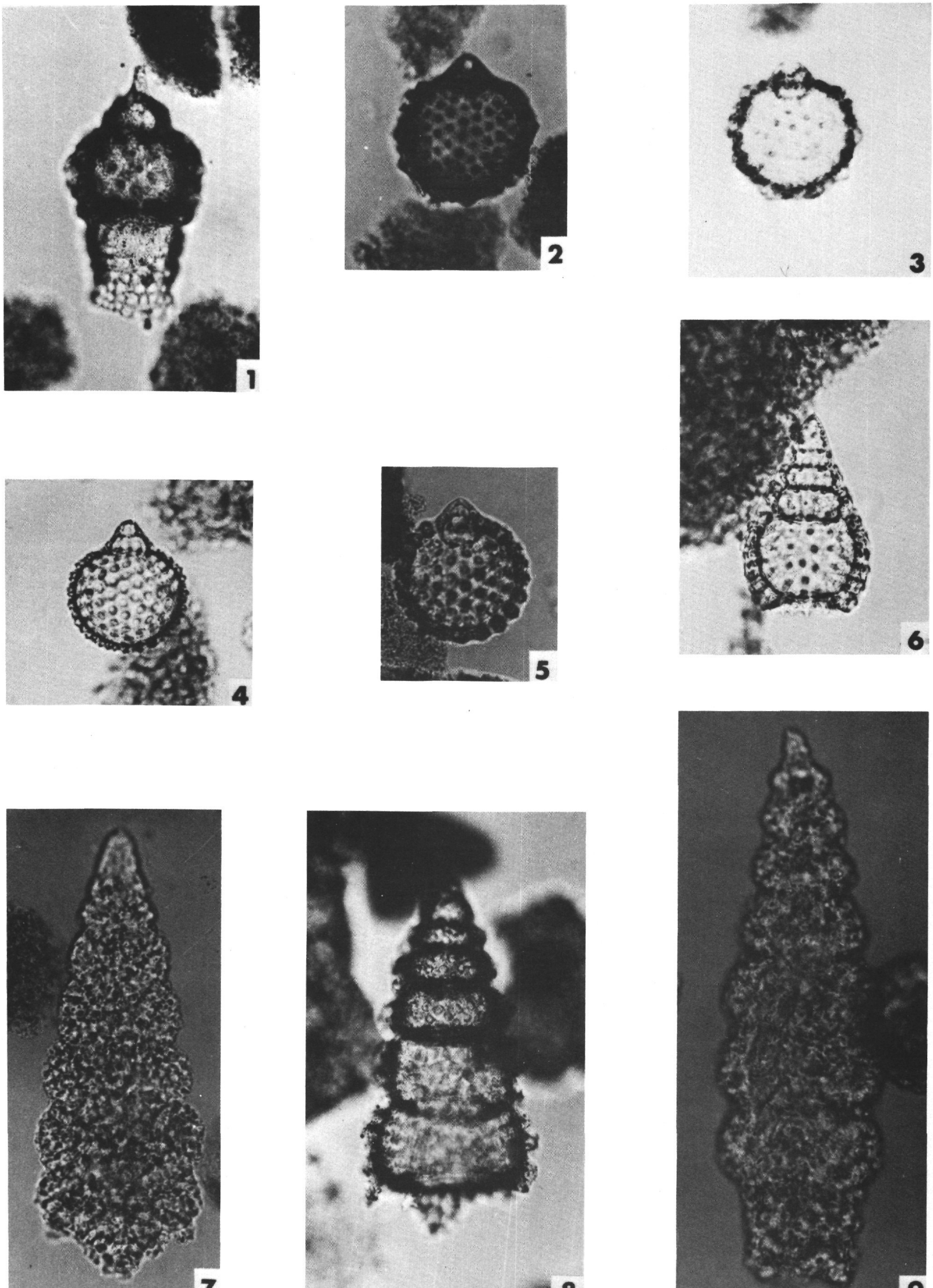

PLATE 8
Magnification X226

Figures 1, 2	*Hemicryptocapsa polyhedra*; Sample 166-22-CC.
Figure 3	*Excentropylomma cenomana*; Sample 166-22-CC.
Figure 4	*Lithocampe pseudochrysalis*, var α; Sample 164-12-CC.
Figure 5	*Lithocampe pseudochrysalis*, var α; Sample 166-22-CC.
Figure 6	*Artostrobium tina*; Sample 164-16-1, 141-143 cm.
Figures 7, 8	*Eucyrtidium grandis*; Sample 167-67-3, 101-103 cm.
Figure 9	*Dictyomitra sagitafera*; Sample 170-15-CC.

PLATE 8

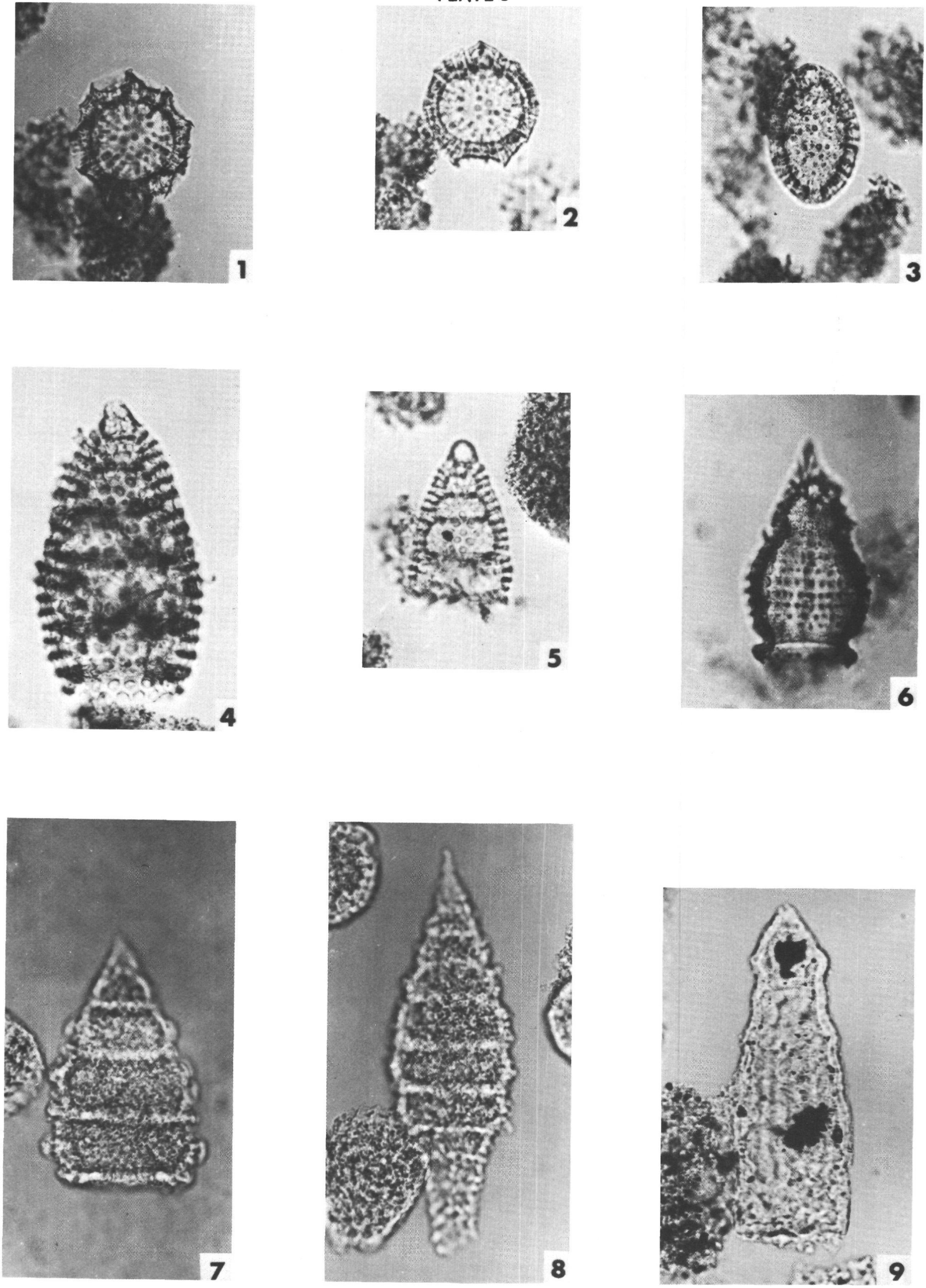

PLATE 9
Magnification ×226

Figure 1	*Dictyomitra* cf. *D. torquata*; Sample 164-13-1, 64-66 cm.
Figure 2	*Dictyomitra* cf. *D. torquata*; Sample 170-10-CC.
Figure 3	*Dictyomitra* cf. *D. torquata*; Sample 164-13-1, 64-66 cm.
Figure 4	*Dictyomitra* cf. *D. torquata*; Sample 170-15-CC.
Figure 5	*Dictyomitra* cf. *D. andersoni*; Sample 170-15-CC.
Figure 6	*Dictyomitra* cf. *D. crassispina*; Sample 170-11-CC.
Figure 7	*Dictyomitra veneta*; Sample 169-9-CC.
Figure 8	*Dictyomitra macrocephala*; Sample 167-62-2, 136-138 cm.
Figure 9	*Dictyomitra macrocephala*; Sample 167-60-2, 128-130 cm.

PLATE 9

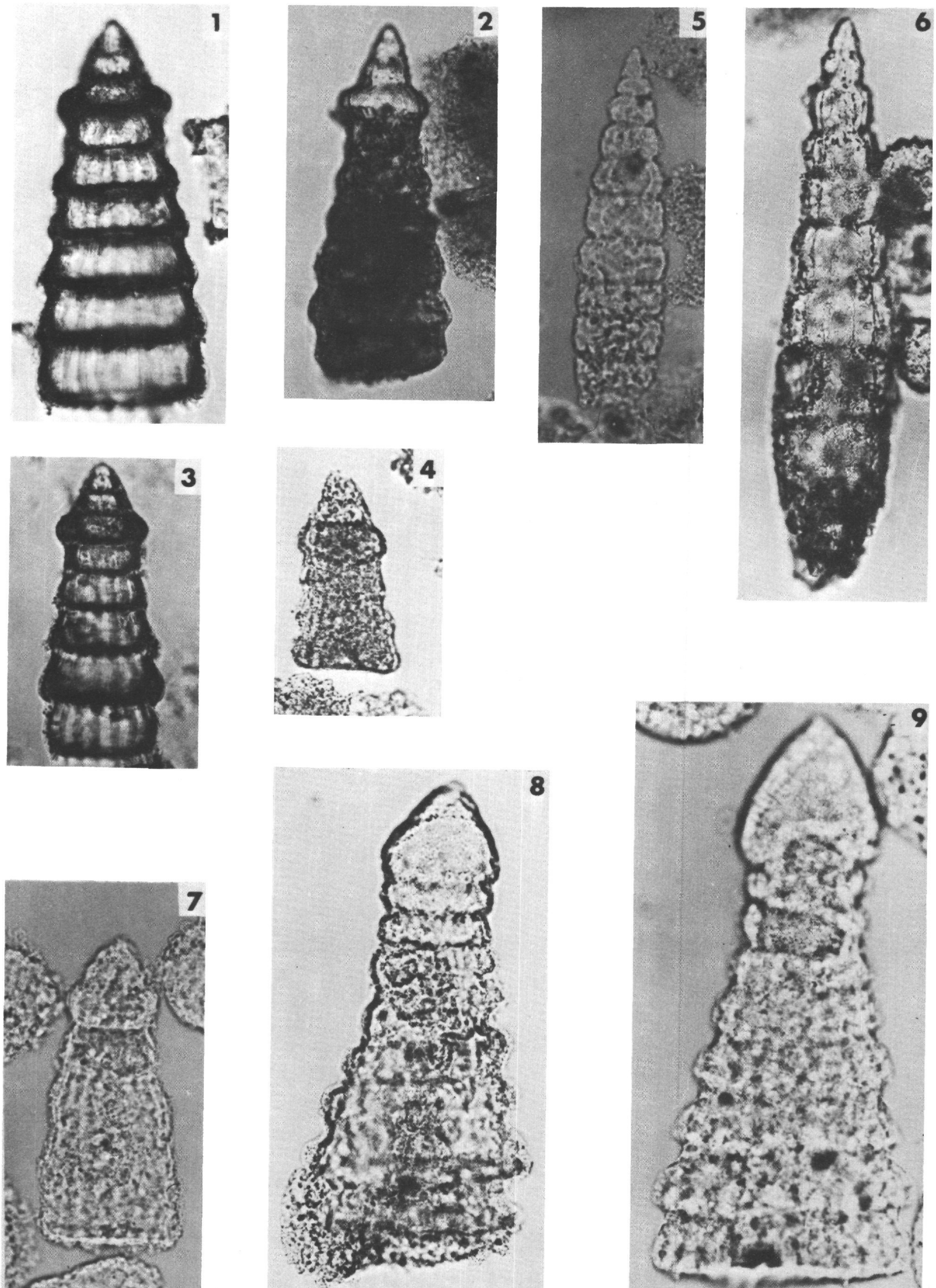

PLATE 10
Magnification X226

Figures 1, 2	*Cyrtocapsa turritica*; Sample 170-15-CC.
Figure 3	*Cyrtocapsa turritica*; Sample 169-9-CC.
Figure 4	*Dictyomitra* ? cf. *Eucyrtidium turritum*; Sample 166-25-1, 75-77 cm.
Figure 5	*Dictyomitra* ? cf. *Eucyrtidium turritum*; Sample 167-62-2, 136-138 cm.
Figure 6	*Dictyomitra* ? cf. *Eucyrtidium turritum*; Sample 167-61-1, 132-134 cm.
Figure 7	*Eucyrtidium* ? sp. A; Sample 170-15-CC.

PLATE 10

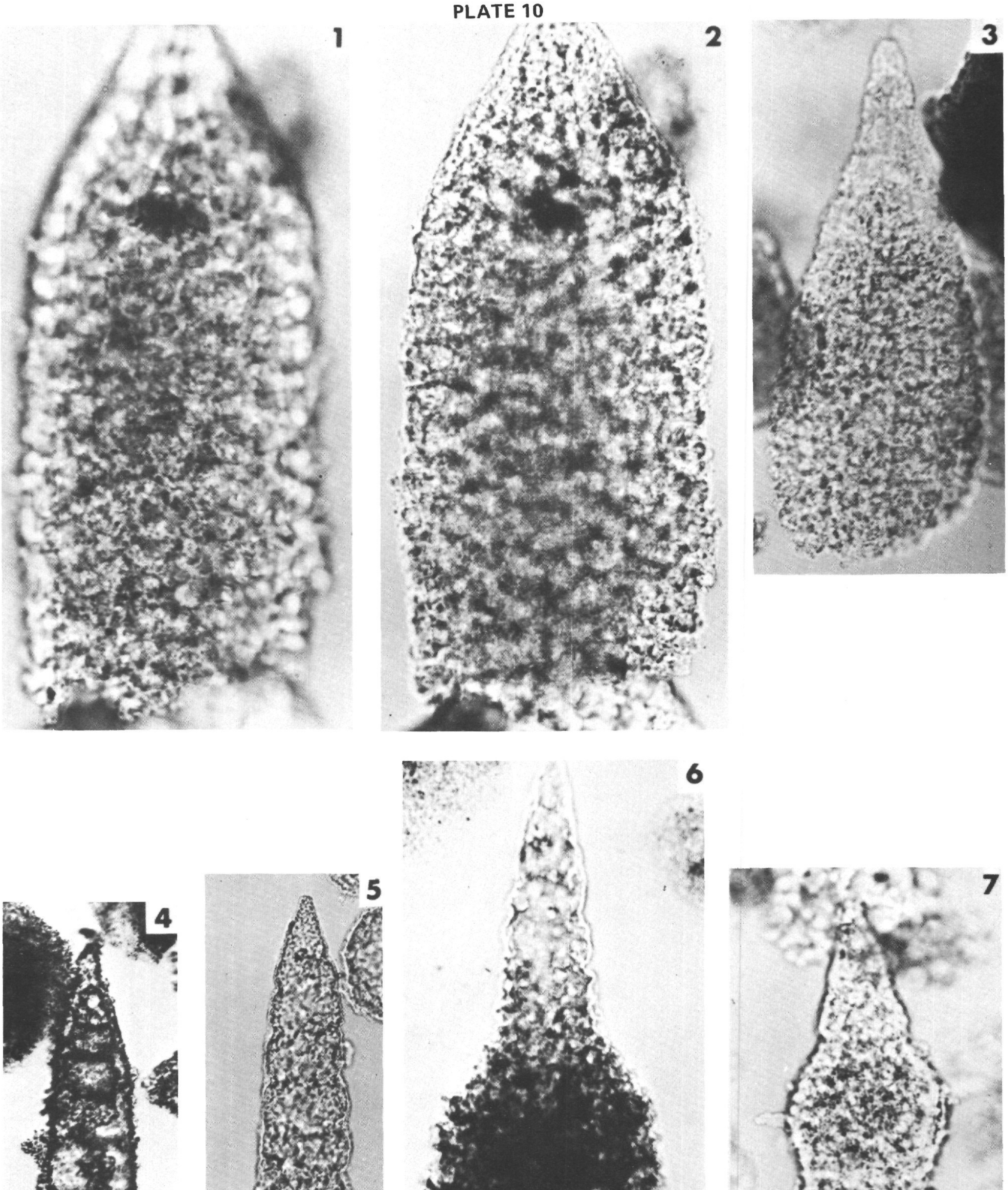

PLATE 11
Magnification X226

Figure 1	*Theocampe salillum*; Sample 164-14-1, 24-26 cm.
Figure 2	*Theocampe salillum*; Sample 164-12-CC
Figure 3	*Stichomitra asymbatos*; Sample 170-13-1, 64-66 cm.
Figure 4	*Stichomitra asymbatos*; Sample 164-12-CC.
Figure 5	*Amphipyndax enesseffi*; Sample 164-12-CC.
Figure 6	*Amphipyndax stocki*; Sample 164-17-1, 130-132 cm.
Figure 7	*Artopilium* sp. A; Sample 164-16-1, 141-143 cm.
Figure 8	*Solenotryma* cf. *S. dacryodes*; Sample 164-16-1, 141-143 cm.
Figure 9	*Theocampe apicata*; Sample 164-16-1, 141-143 cm.
Figure 10	*Dicolocapsa* sp. A.; Sample 164-12-CC.
Figure 11	*Lithomelissa* cf. *L. heros*; Sample 164-12-CC.

PLATE 11

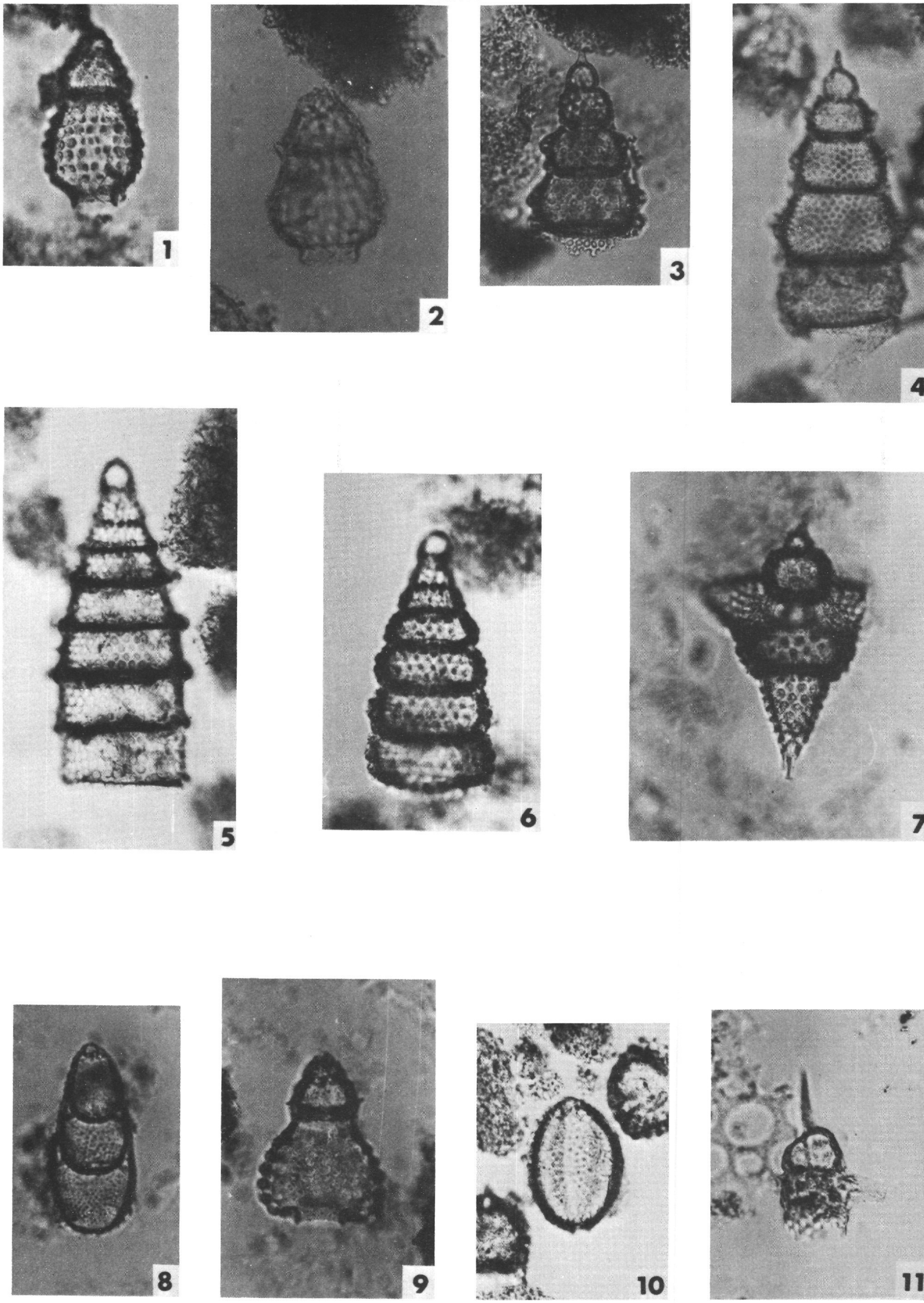

PLATE 12
Magnification X226

Figure 1	*Pseudoaulophacus lenticularis*; Sample 171-24-CC.
Figure 2	*Pseudoaulophacus floresensis*; Sample 161-24-CC.
Figure 3	*Pseudoaulophacus floresensis*; Sample 164-11-1, 128-130 cm.
Figure 4	*Pseudoaulophacus superbus*; Sample 164-12-CC.
Figure 5	*Pseudoaulophacus superbus*; Sample 170-9-CC.
Figure 6	*Pseudoaulophacus pargueraensis*; Sample 164-14-1, 24-26 cm.
Figure 7	*Pseudoaulophacus pargueraensis*; Sample 164-12-CC.

PLATE 12

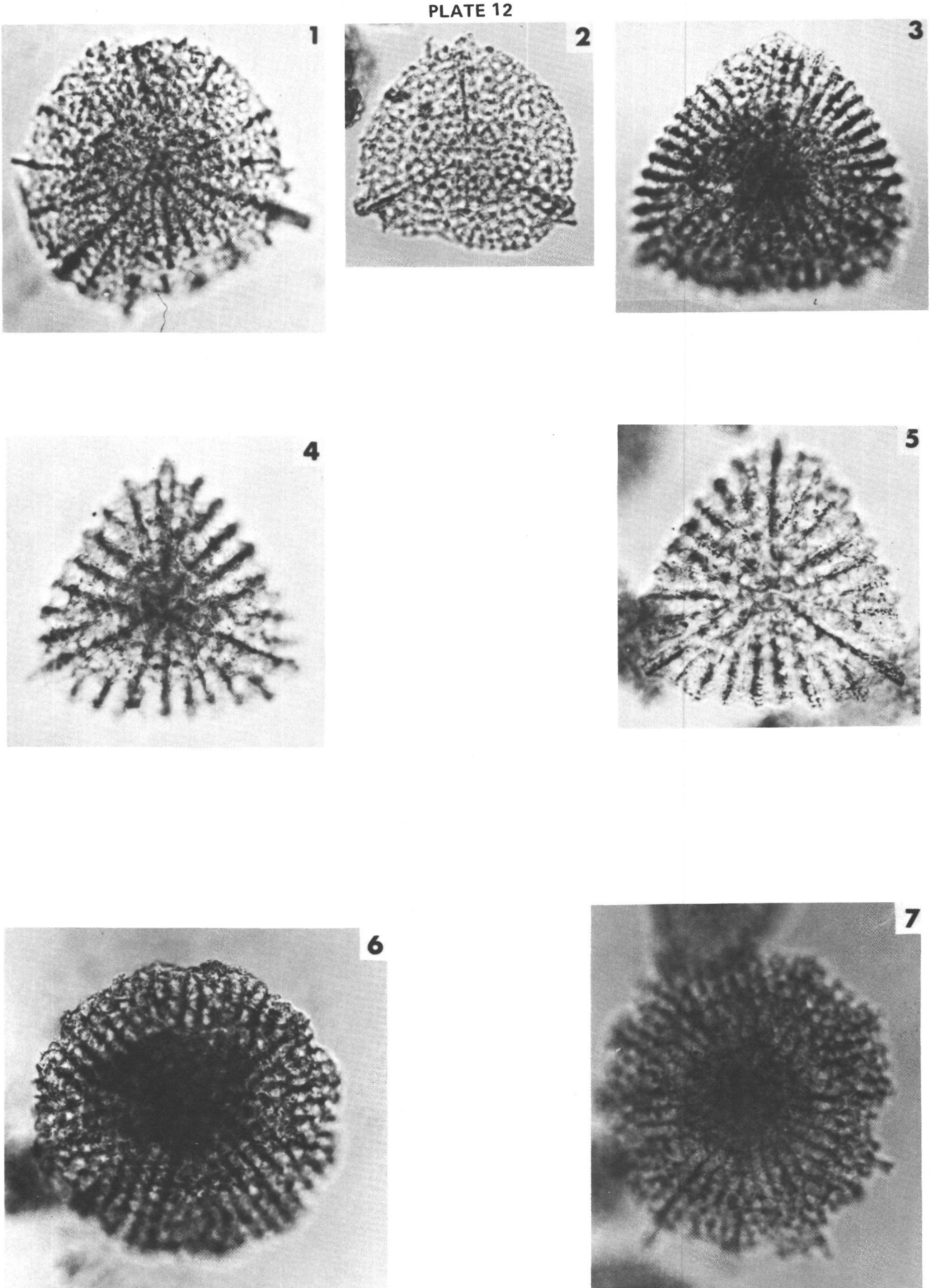

PLATE 13
Magnification X226

Figures 1, 2, 3	*Incert. sed.* sp. A; Sample 169-2-CC.
Figure 4	*Spongosaturninus* ? *ellipticus*; Sample 170-11-CC.
Figure 5	*Dictyomitra margarita*; Sample 167-75-1, 116-118 cm.
Figure 6	*Dictyomitra margarita*; Sample 167-67-3, 101-103 cm.
Figures 7, 8	*Spongosaturnalis* sp. A; Sample 170-11-CC.

PLATE 13

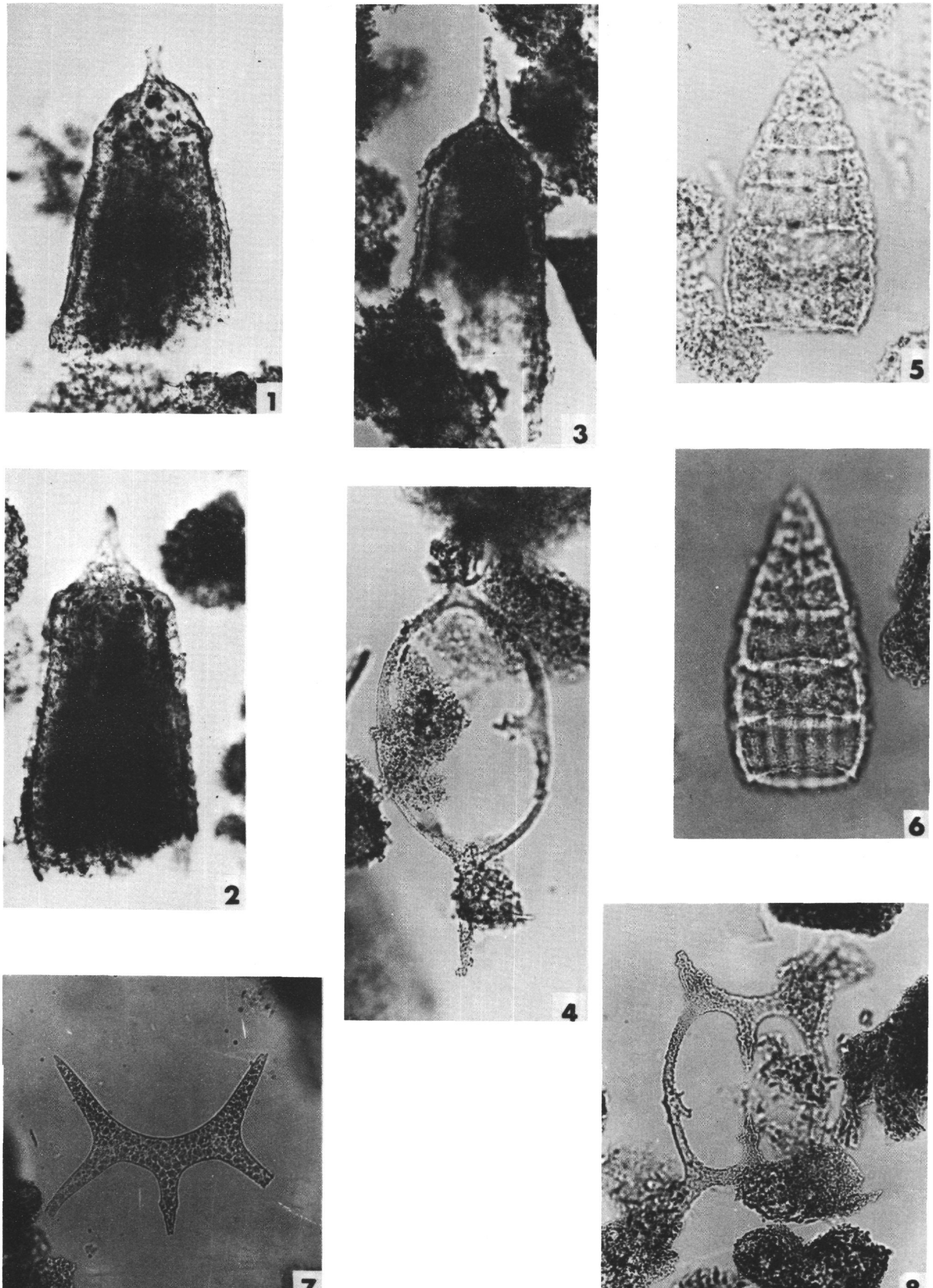

PLATE 14
Magnification X226

Figure 1	*Cornutanna conica*; Sample 167-67-3, 101-103 cm.
Figure 2	*Cornutanna conica*; Sample 167-69-1, 148-150 cm.
Figure 3	*Dictyomitra* sp. C; Sample 167-76-2, 65-67 cm.
Figure 4	*Dictyomitra* sp. C; Sample 167-67-3, 101-103 cm.
Figures 5, 6	*Dictyomitra* sp. B; Sample 166-22-CC.
Figures 7, 8, 9	*Dictyomitra* sp. cf. *Eucyrtidium brouweri*; Sample 166-22-CC.

PLATE 14

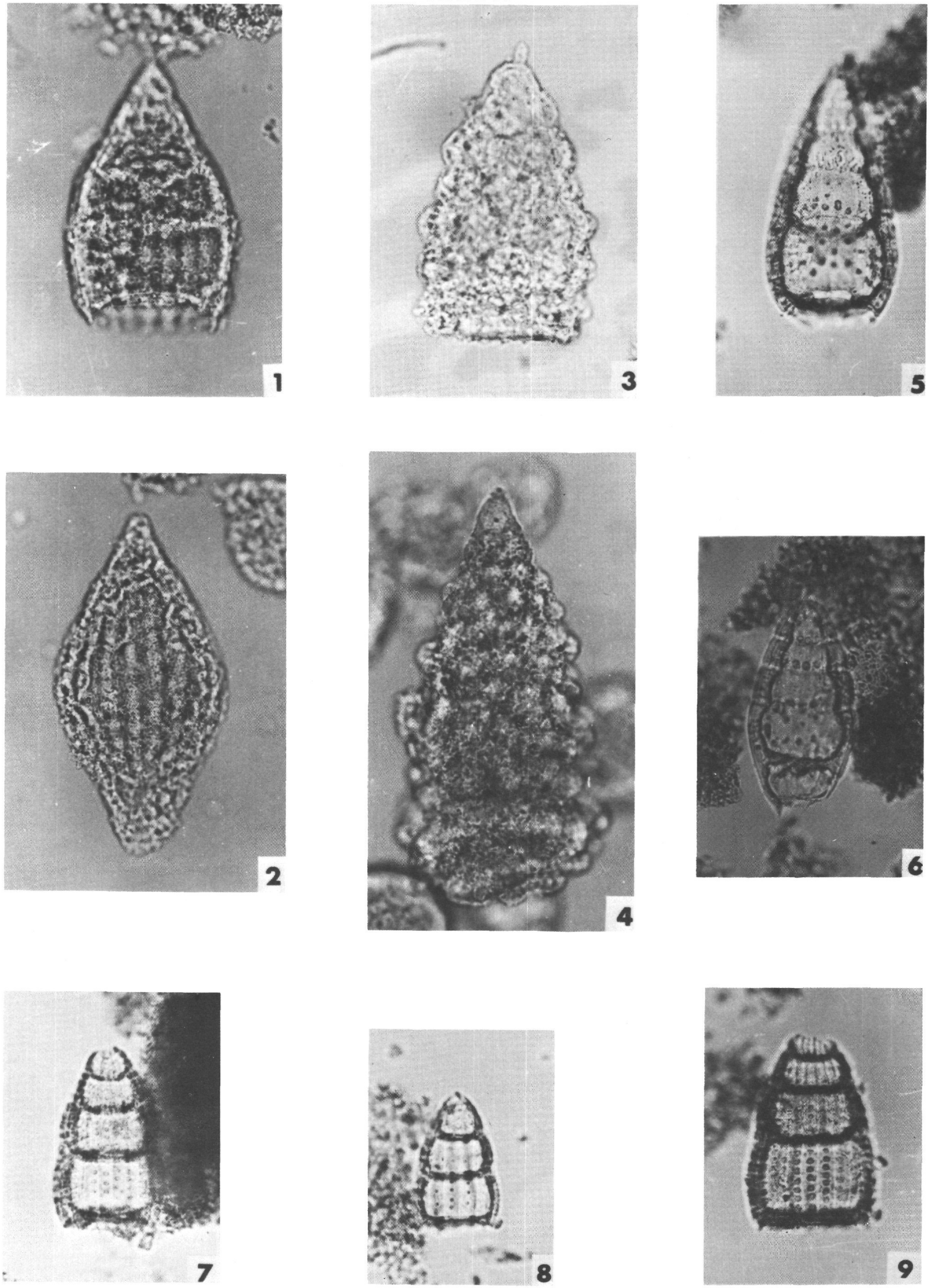

PLATE 15
Magnification X226

Figures 1, 2	*Crucella* sp. A; Sample 170-15-2, 132-134 cm.
Figure 3	*Patulibracchium* cf. *P. ungulae*; Sample 167-64-5, 15-17 cm.
Figure 4	*Paronaella* sp. A; Sample 169-9-CC.
Figure 5	*Paronaella* ? *ewingi*; Sample 167-64-5, 15-17 cm.

PLATE 15

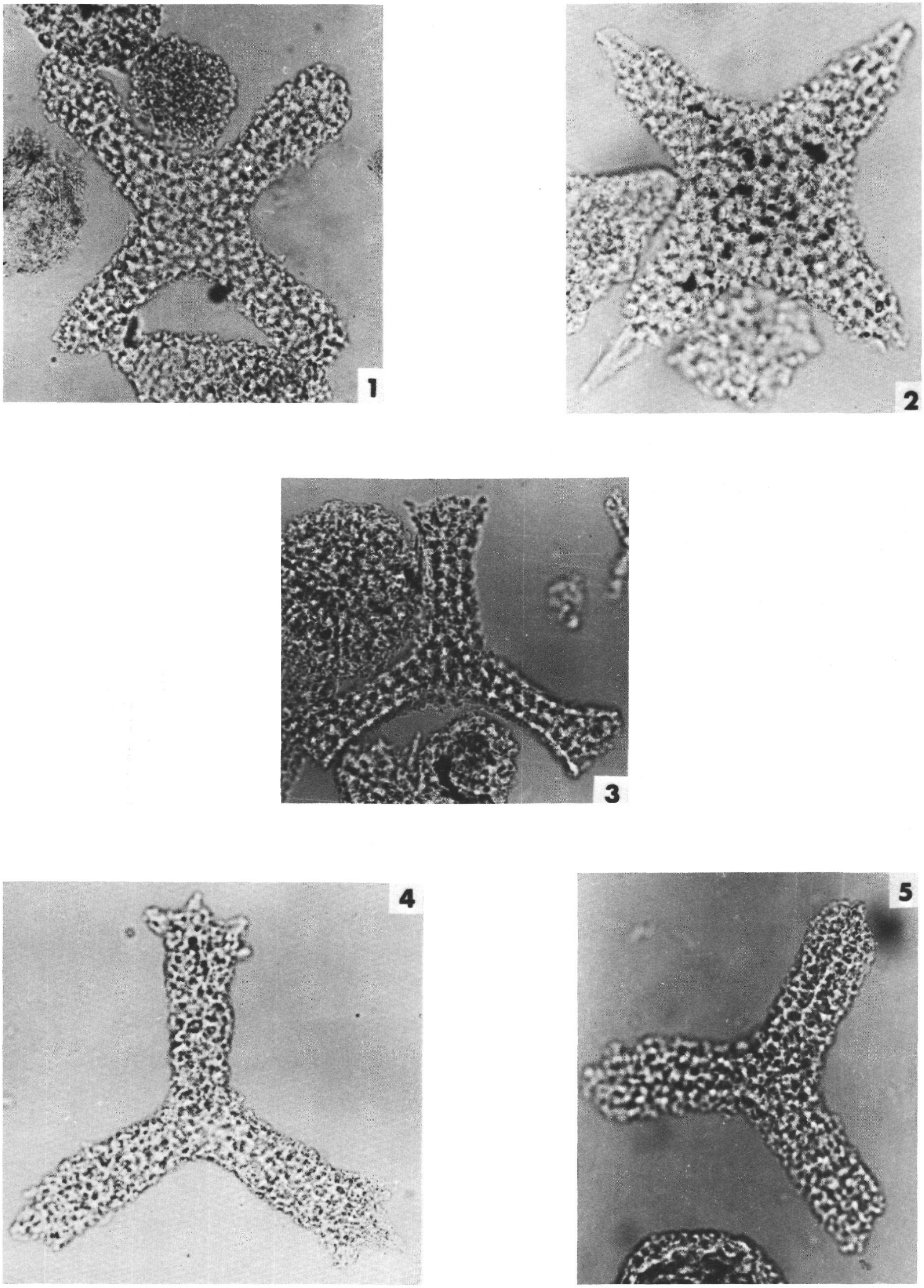

PLATE 16

Figure 1	*Sethocapsa dorysphaeroides*; Sample 167-64-5, 15-17 cm; X90.
Figure 2	*Sethocapsa dorysphaeroides*; Sample 167-64-5, 15-17 cm; X226.
Figure 3	*Archicapsa similis*; Sample 167-64-5, 15-17 cm; X115.
Figure 4	*Archicapsa similis*; Sample 167-64-5, 15-17 cm; X226.

PLATE 16

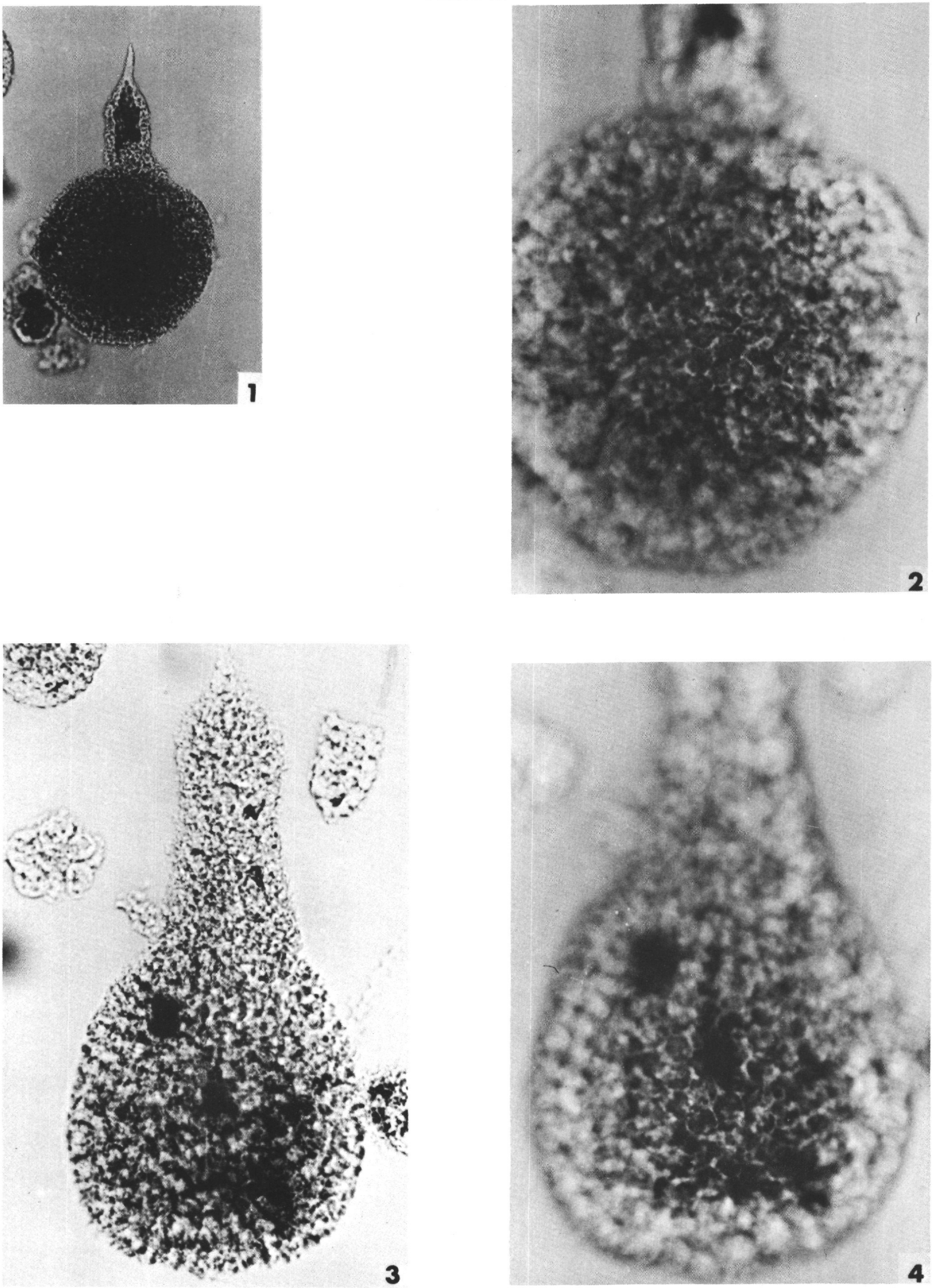

PLATE 17
Magnification X226

Figure 1	*Stichomitra* sp. A; Sample 164-16-1, 141-143 cm.
Figure 2	*Dictyomitra* sp. A; Sample 164-14-1, 24-26 cm.
Figure 3	*Dictyomitra* sp. A; Sample 164-15-CC.
Figure 4	*Theopera* sp. A; Sample 164-12-CC.
Figure 5	*Cryptamphorella sphaerica*; Sample 166-22-CC.
Figure 6	*Theocampe ascalia*; Sample 164-16-1, 141-143 cm.
Figure 7	*Stichomitra* ? *livermorensis*; Sample 164-16-1, 141-143 cm.
Figure 8	*Myllocercion* sp. aff. *M. minima*; Sample 164-16-1, 141-143 cm.
Figure 9	*Pseudoaulophacus* ? sp. A; Sample 166-22-CC.

PLATE 17

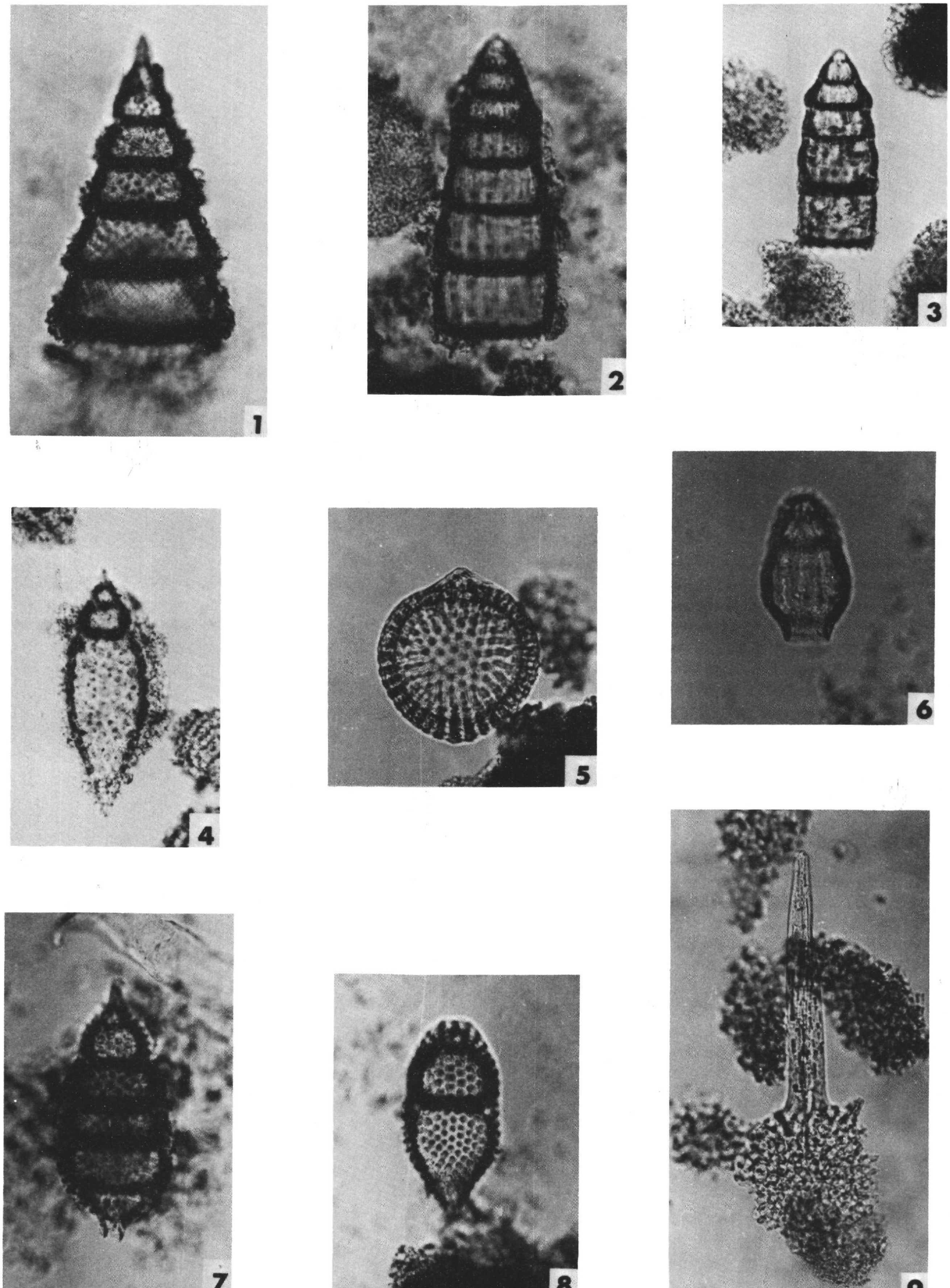

PLATE 18
Magnification X226

Figure 1	*Spongodiscus maximus*; Sample 164-12-CC.
Figure 2	*Spongodiscus maximus*; Sample 171-24-CC.
Figure 3	*Spongodiscus maximus*; Sample 164-12-CC.
Figure 4	*Spongodiscus maximus*; Sample 171-24-CC.
Figure 5	*Lithocyclia* ? sp. A; Sample 171-24-CC.
Figure 6	*Lithocyclia* ? sp. A; Sample 167-60-CC.

PLATE 18