

12. LATE EARLY CRETACEOUS RADIOLARIA FROM DEEP SEA DRILLING PROJECT LEG 62¹

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Dedicated to Helen Foreman

ABSTRACT

Well-preserved Mesozoic radiolarian faunas have been recovered at four sites of Deep Sea Drilling Project Leg 62. Late Early Cretaceous assemblages, which occur always with foraminifers or calcareous nannoplankton, allow the description of 21 new species, the introduction of a new zone scheme, and calibration of the radiolarian zones with the geochronological scale.

INTRODUCTION

The locations of the drill sites occupied during DSDP Leg 62 are as follows (Fig. 1):

Site 463: 21°21.01'N, 174°40.07'E, water depth 2525 meters,

Site 464: 39°51.64'N, 173°53.33'E, water depth 4637 meters,

Site 465: 33°49.23'N, 178°55.14'E, water depth 2161 meters,

Site 466: 34°11.46'N, 179°15.34'E, water depth 2665 meters.

Sites 464, 465, and 466 were drilled on Hess Rise; Site 463 was drilled on the Mid-Pacific Mountains.

The long sequence of well-preserved late Early Cretaceous radiolarians (always with calcareous fossils) at Site 463 is of considerable significance and is the basis for most of this report. Figure 2 shows the biostratigraphic synthesis based on foraminifers and calcareous nannoplankton. Cenozoic radiolarians, often poorly preserved, were not studied for this paper.

DISTRIBUTION OF RADIOLARIANS AT EACH SITE

Site 463 (Table 1)

Three intervals can be defined in the sedimentary sequence at Site 463 on the basis of radiolarian occurrences and preservation:

1) In Cores 1 to 56, radiolarians are nearly absent, except in Cores 52, 53, and 56 (middle to late Albian), which yielded a poorly preserved fauna.

2) In Cores 57 through 74, radiolarians are confined to certain layers. The tests are usually recrystallized, and many internal molds of iron oxide or pyrite (with or without the original skeleton) were observed. In general, down to Core 63 the internal molds are iron oxide, and below they are pyrite.

3) In Cores 75 to 92, mostly well-preserved radiolarians occur consistently throughout the section. Internal molds of pyrite were also observed in this interval.

Site 464 (Table 2)

At Site 464 Cenozoic radiolarians were abundant and generally well preserved in the first five Cores, whereas Cretaceous radiolarians, although occasionally common, are badly preserved. Only core-catcher samples from Cores 13, 15 and 16 contain identifiable radiolarians.

Site 465 (Table 3)

At this Site only the first two cores of Hole 465 (up to 2-2-120) contained common to rare, and poorly preserved Cenozoic radiolarians. The Cenozoic section of Hole 465A is entirely barren. Cretaceous radiolarians occur only at two levels: a sparse and poorly preserved upper Santonian fauna in 465A-21,CC (not studied in this paper); and an abundant and well-preserved upper Albian fauna in 465A-29-1, 43-44 cm.

Site 466 (Table 4)

At Site 466, two distinct radiolarian assemblages were recovered: a Pliocene to Quaternary sequence in the upper 61 meters, and a Cretaceous sequence in the lower 85 meters.

Cores 29 to 34 contain an upper Albian fauna, usually sparse and moderately well preserved, but abundant and well preserved in Core 34.

Table 5 shows those samples in which no Early Cretaceous radiolarians were found.

LATE EARLY CRETACEOUS ZONATION

Several researchers recently contributed to a better knowledge of Early Cretaceous radiolarian stratigraphy (Foreman, 1973b, 1975; Moore, 1973; Riedel and Sanfilippo, 1974; Pessagno, 1977b).

We have followed in this paper the works of Riedel and Sanfilippo (1974) and Foreman (1975). Correlation

¹ Initial Reports of the Deep Sea Drilling Project, Volume 62.

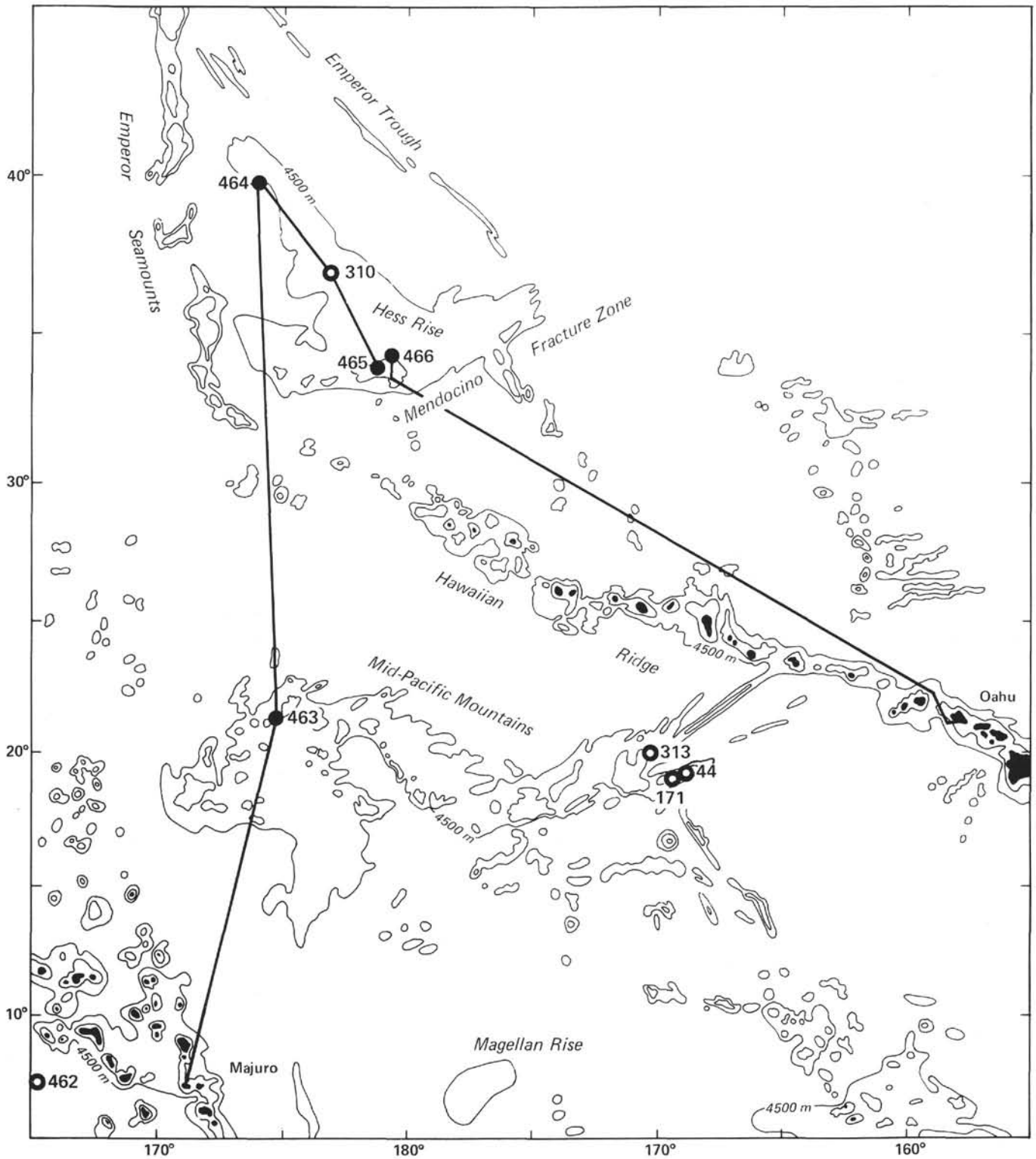


Figure 1. Location of sites drilled on DSDP Leg 62 (solid circles), and previous sites (open circles).

with Pessagno's (1977b) zonation of the Lower Cretaceous of California was more difficult.

Three new zones are proposed to replace the *Eucyrtis tenuis* Zone of Foreman (1975) (part of the *Stichocapsa tenuis* Zone of Riedel and Sanfilippo, 1974): the *Dibo-*

lachras tythopora Zone, the *Crolanium pythiae* Zone, and the *Archicapsa similis* Zone.

The top of each zone is defined by the base of the overlying zone. Figures 3 and 4 show the relationships between species ranges and zone boundaries.

Stage	Site 463		Site 464		Site 465 (Hole 465A)		Site 466	
	Core and Section	Sub-bottom Depth (m)	Core and Section	Sub-bottom Depth (m)	Core and Section	Sub-bottom Depth (m)	Core and Section	Sub-bottom Depth (m)
Lower Cenomanian	43-1 45-1	378 404.5	11-1 17-1	89 146	26-1 27,CC	276.5 295.5	(Hiatus)	
Upper Albian	46-1 52,CC	404.5 461.5	17-1 24-1	146 222	28-1 40-1	295.5 411.7	29-1 35,CC	255 312
Middle Albian	53-1 55-1	461.5 481.5	25,CC 26,CC	222 241			(Trachyte)	
Lower Albian	55-1 59,CC	481.5 528	27-1 34,CC	241 308.5				
Upper Aptian	60-1 65-2	528 558	(Basalt)					
Lower Aptian	65,CC 78-1	558 699						
Upper Barremian	79-1 92-1	699 822.5						

Figure 2. Age assignments of Leg 62 cores, based on synthesis of data on calcareous-nannoplankton and foraminifer assemblages (after Čepek and Boersma, this volume).

Obesacapsula somphedia Zone (Foreman, 1975)

The base is defined by the earliest morphotypic appearance of *Obesacapsula somphedia* (Foreman, 1975).

Events within the zone include the earliest appearances of *Stichocapsa zamoraensis*, *Orbiculiforma char-tonae*, *Histiastrium aster*, *Parvicingula? tekschaensis*, *Rhopalosyringium majuroensis*, and *Theocapsomma ancus*; and the latest occurrences of *Theocorys antiqua*; and the entire ranges of *Pseudodictyomitra pseudo-macrocephala*, *Holocryptocanium barbui*, *Mita magnifica*, and *Excentropylomma cenomana*.

Acaeniotyle umbilicata Zone (Foreman, 1975)

The base is defined by the extinction of *Sphaerostylus lanceola*, which may be approximately synchronous with the extinction of *Archaeodictyomitra lacrimula*, *Dicroa* sp. A, *Sethocapsa orca*, and *Triactoma hybum*. It may be desirable to redefine the base of this zone in terms of presence of species. However, in this study no suitable species could be found.

Events within the zone include the earliest appearance of *Theocorys antiqua* and the latest occurrence of *Archicapsa similis*.

Archicapsa similis Zone (Schaaf, new zone)

The base is defined by the earliest morphotypic appearance of *Archicapsa similis*, approximately synchronous with the latest occurrences of *Holocryptocapsa hindei*, *Pseudodictyomitra leptocnica*, and *Willieriedellum peterschmittae*.

Events within the zone include the latest occurrences of *Crolanium pythiae*, *Dibolachras tythopora*, and *Acanthocircus carinatus*.

Crolanium pythiae Zone (Schaaf, new zone)

The base is defined by the earliest morphotypic appearance of *Crolanium pythiae*, synchronous with the

latest occurrence of *Thanarla pulchra*, *Podobursa tricola*, and *Archaeodictyomitra apiara*.

Events within the zone include the latest occurrence of *Saitoum cepecki*, *Alievum helenae*, and *Sethocapsa uterculus*.

Dibolachras tythopora Zone (Schaaf, new zone)

The base is defined by the earliest morphotypic appearance of *Dibolachras tythopora*, approximately synchronous with the earliest appearance of *Acanthocircus carinatus*, *Archaeodictyomitra lacrimula*, and *Eucyrtis tenuis*.

Events within the zone include the latest occurrences of *Lithocampe chenodes*, *Cyrtocalpis operosa*, *Acanthocircus dicranacanthos*, and *Staurosphaera septem-porata*.

Staurosphaera septem-porata Zone (Riedel and Sanfilippo, 1974)

The base is defined by the earliest morphotypic appearance of *Staurosphaera septem-porata*, and the top by the latest occurrence of *Stichocapsa cribata*.

The *Dibolachras tythopora* Zone, *Crolanium pythiae* Zone, and *Archicapsa similis* Zone result from splitting of the *Eucyrtis tenuis* Zone of Riedel and Sanfilippo (1974; emend. Foreman, 1975). The Barremian/Aptian boundary coincides with the base of the *Archicapsa similis* Zone (Fig. 4). This correspondence is corroborated by the Geomagnetic Polarity Zone M1 and the base of the *Chiastozygus litterarius* Zone which begins in the uppermost Barremian (H. Thierstein, pers. comm.).

SYSTEMATICS

The following procedures were used in this work:

1) Spumellaria were subdivided according to the suprageneric classification of Riedel (1971), with the exception that the Porodiscidae were split from the Spongodiscidae (Petrushevskaya and Kozlova, 1972), and the Hagiastriidae were elevated to the family level (Pessagno, 1971).

Table 1. (Continued).

<i>Sphaeropyge thirencis</i>																				
<i>Spongocylia trachodes</i>																				
<i>Sethocapsa trechyostroca</i>																				
<i>Podobursa triacantha</i>																				
<i>Podobursa tricola</i>																				
<i>Homoeoparoneella tricuspidata</i>																				
<i>Tripocylia trigonum</i>																				
<i>Acanthocircus trizonalis</i>																				
<i>Conosphaera tuberosa</i>																				
<i>Dibolochras tythopora</i>																				
<i>Acaeniotyle umbilicata</i>																				
<i>Sethocapsa uterculus</i>																				
<i>Gongylothorax verbeeki</i>																				
<i>Xitus vermiculatus</i>																				
<i>Hemicrytocapsa vincentae</i>																				
<i>Archaeodicyomitra vulgaris</i>																				
<i>Acanthocircus</i> sp.																				
<i>Dicroa</i> sp. A																				
<i>Hexalonche</i> sp. group																				
<i>Higumastrea</i> sp.																				
<i>Lophophaena</i> sp.																				
<i>Neosciadocapsa</i> sp.																				
<i>Paronaella</i> sp.																				
<i>Solenotryma</i> sp.																				
<i>Spongobrachium</i> sp.																				
<i>Stylochlamyrum</i> sp. group																				
<i>Xitus</i> sp. A																				

Table 2. Occurrence and abundance of late Early Cretaceous radiolarians of Site 464 (symbols as in Table 1).

Sample	Abundance		Preservation																																		
	C	M	F	+	Spongodiscus americanus	Theocapsomma ancus	Theocorys antiqua	Histiastrium aster	Stichomitra asymbatos	Holocryptocanium barbuti	Pseudodictyomitra carpathica	Excentropylomma cenomana	Orbiculiforma chartonae	Spongodruxpa cocos	Cromyodruppa concentrica	Archaeospongoprimum cortinaensis	Spongopyle ecleptos	Pseudodictyomitra formosa	Spongosaturnalis horridus	Spongopyle insolita	Pseudodictyomitra lodogaensis	Mita magnifica	Rhopalosyringium majuroensis	Parellula planoconvexa	Pseudodictyomitra pseudomacrocephala	Hemicryptocapsa pseudopilula	Lithostrobos punctulatus	Spongodiscus renillaeformis	Theocampe sp. cf. T. salillum	Obesacapsula somphedia	Parvicingula tekschaensis	Arrostrobium tina	Theocampe vanderhoofi	Pseudodictyomitra vestalensis	Spongocapsula zamoraensis		
464-13, CC	C	M	F	+	F	F	—	R	?	—	R	—	R	—	R	+	R	—	—	R	—	—	—	—	—	—	—	R	—	R	R	R	R	R	R	R	R
15, CC	C	M	F	+	F	F	—	F	?	—	?	—	+	F	?	F	—	—	—	R	—	—	—	—	—	—	R	—	R	—	R	—	R	—	R	—	R
16, CC	C	M	F	+	F	F	—	F	+	—	R	—	R	—	R	+	R	—	—	R	—	—	—	—	—	—	R	—	R	—	R	—	R	—	R	—	R

Table 3. Occurrence and abundance of late Early Cretaceous radiolarians of Site 465 (Hole 465A) (symbols as in Table 1).

Sample	Abundance		Preservation																																		
	A	G	F	+	Spongodiscus americanus	Theocapsomma ancus	Theocorys antiqua	Histiastrium aster	Stichomitra asymbatos	Holocryptocanium barbuti	Pseudodictyomitra carpathica	Excentropylomma cenomana	Orbiculiforma chartonae	Spongodruxpa cocos	Cromyodruppa concentrica	Archaeospongoprimum cortinaensis	Spongopyle ecleptos	Pseudodictyomitra formosa	Spongosaturnalis horridus	Spongopyle insolita	Pseudodictyomitra lodogaensis	Mita magnifica	Rhopalosyringium majuroensis	Parellula planoconvexa	Pseudodictyomitra pseudomacrocephala	Hemicryptocapsa pseudopilula	Lithostrobos punctulatus	Spongodiscus renillaeformis	Theocampe sp. cf. T. salillum	Obesacapsula somphedia	Parvicingula tekschaensis	Arrostrobium tina	Theocampe sp. cf. T. salillum	Pseudodictyomitra vestalensis	Spongocapsula zamoraensis		
465A-29-1, 43-44 cm	A	G	F	+	F	F	—	F	?	—	F	R	F	F	R	C	F	R	—	R	F	E	C	F	F	—	R	F	R	F	C	F	—	R	R	F	F

Table 4. Occurrence and abundance of late Early Cretaceous radiolarians of Site 466 (symbols as in Table 1).

Sample	Abundance		Preservation																																			
	C <th>P <th>F <th>+</th> <th>Spongodiscus americanus</th> <th>Theocapsomma ancus</th> <th>Theocorys antiqua</th> <th>Histiastrium aster</th> <th>Stichomitra asymbatos</th> <th>Holocryptocanium barbuti</th> <th>Pseudodictyomitra carpathica</th> <th>Excentropylomma cenomana</th> <th>Orbiculiforma chartonae</th> <th>Spongodruxpa cocos</th> <th>Cromyodruppa concentrica</th> <th>Archaeospongoprimum cortinaensis</th> <th>Spongopyle ecleptos</th> <th>Pseudodictyomitra formosa</th> <th>Spongosaturnalis horridus</th> <th>Spongopyle insolita</th> <th>Pseudodictyomitra lodogaensis</th> <th>Mita magnifica</th> <th>Rhopalosyringium majuroensis</th> <th>Parellula planoconvexa</th> <th>Pseudodictyomitra pseudomacrocephala</th> <th>Hemicryptocapsa pseudopilula</th> <th>Lithostrobos punctulatus</th> <th>Spongodiscus renillaeformis</th> <th>Theocampe sp. cf. T. salillum</th> <th>Obesacapsula somphedia</th> <th>Parvicingula tekschaensis</th> <th>Arrostrobium tina</th> <th>Theocampe vanderhoofi</th> <th>Pseudodictyomitra vestalensis</th> <th>Spongocapsula zamoraensis</th> </th></th>	P <th>F <th>+</th> <th>Spongodiscus americanus</th> <th>Theocapsomma ancus</th> <th>Theocorys antiqua</th> <th>Histiastrium aster</th> <th>Stichomitra asymbatos</th> <th>Holocryptocanium barbuti</th> <th>Pseudodictyomitra carpathica</th> <th>Excentropylomma cenomana</th> <th>Orbiculiforma chartonae</th> <th>Spongodruxpa cocos</th> <th>Cromyodruppa concentrica</th> <th>Archaeospongoprimum cortinaensis</th> <th>Spongopyle ecleptos</th> <th>Pseudodictyomitra formosa</th> <th>Spongosaturnalis horridus</th> <th>Spongopyle insolita</th> <th>Pseudodictyomitra lodogaensis</th> <th>Mita magnifica</th> <th>Rhopalosyringium majuroensis</th> <th>Parellula planoconvexa</th> <th>Pseudodictyomitra pseudomacrocephala</th> <th>Hemicryptocapsa pseudopilula</th> <th>Lithostrobos punctulatus</th> <th>Spongodiscus renillaeformis</th> <th>Theocampe sp. cf. T. salillum</th> <th>Obesacapsula somphedia</th> <th>Parvicingula tekschaensis</th> <th>Arrostrobium tina</th> <th>Theocampe vanderhoofi</th> <th>Pseudodictyomitra vestalensis</th> <th>Spongocapsula zamoraensis</th> </th>	F <th>+</th> <th>Spongodiscus americanus</th> <th>Theocapsomma ancus</th> <th>Theocorys antiqua</th> <th>Histiastrium aster</th> <th>Stichomitra asymbatos</th> <th>Holocryptocanium barbuti</th> <th>Pseudodictyomitra carpathica</th> <th>Excentropylomma cenomana</th> <th>Orbiculiforma chartonae</th> <th>Spongodruxpa cocos</th> <th>Cromyodruppa concentrica</th> <th>Archaeospongoprimum cortinaensis</th> <th>Spongopyle ecleptos</th> <th>Pseudodictyomitra formosa</th> <th>Spongosaturnalis horridus</th> <th>Spongopyle insolita</th> <th>Pseudodictyomitra lodogaensis</th> <th>Mita magnifica</th> <th>Rhopalosyringium majuroensis</th> <th>Parellula planoconvexa</th> <th>Pseudodictyomitra pseudomacrocephala</th> <th>Hemicryptocapsa pseudopilula</th> <th>Lithostrobos punctulatus</th> <th>Spongodiscus renillaeformis</th> <th>Theocampe sp. cf. T. salillum</th> <th>Obesacapsula somphedia</th> <th>Parvicingula tekschaensis</th> <th>Arrostrobium tina</th> <th>Theocampe vanderhoofi</th> <th>Pseudodictyomitra vestalensis</th> <th>Spongocapsula zamoraensis</th>	+	Spongodiscus americanus	Theocapsomma ancus	Theocorys antiqua	Histiastrium aster	Stichomitra asymbatos	Holocryptocanium barbuti	Pseudodictyomitra carpathica	Excentropylomma cenomana	Orbiculiforma chartonae	Spongodruxpa cocos	Cromyodruppa concentrica	Archaeospongoprimum cortinaensis	Spongopyle ecleptos	Pseudodictyomitra formosa	Spongosaturnalis horridus	Spongopyle insolita	Pseudodictyomitra lodogaensis	Mita magnifica	Rhopalosyringium majuroensis	Parellula planoconvexa	Pseudodictyomitra pseudomacrocephala	Hemicryptocapsa pseudopilula	Lithostrobos punctulatus	Spongodiscus renillaeformis	Theocampe sp. cf. T. salillum	Obesacapsula somphedia	Parvicingula tekschaensis	Arrostrobium tina	Theocampe vanderhoofi	Pseudodictyomitra vestalensis	Spongocapsula zamoraensis			
466-29-1, 12-13	C	P	F	+	F	F	—	R	—	F	R	R	R	—	F	R	—	F	R	F	—	—	—	—	—	R	R	R	R	R	R	R	R	R	R	R	R	
29, CC	R	P	R	—	R	R	—	R	—	R	R	R	R	—	R	+	—	R	—	R	—	—	—	—	—	R	R	R	R	R	R	+	—	—	—	—	R	
30-1, 23-24	R	P	R	—	R	R	—	R	—	R	R	R	R	—	R	—	R	—	R	—	R	—	—	—	—	R	R	R	R	R	R	R	R	R	R	R	R	R
30-1, 35-36	C	PM	R	—	R	R	—	R	—	R	R	R	R	—	R	—	R	—	R	—	R	—	—	—	—	R	R	R	R	R	R	R	R	R	R	R	R	R
30-1, 57-58	R	P	R	—	R	R	—	R	—	R	R	R	R	—	R	—	R	—	R	—	R	—	—	—	—	R	R	R	R	R	R	R	R	R	R	R	R	R
31, CC	R	P	—	—	R	—	—	?	+	—	R	R	—	R	?	—	R	—	R	—	R	—	—	—	—	R	—	R	—	R	—	R	—	R	—	R	—	R
34-1, 8-10	F	PM	—	—	R	—	—	—	—	R	—	F	+	R	—	F	—	R	—	R	—	—	—	—	—	R	—	R	—	R	—	R	—	R	—	R	—	R
34-1, 20-21	F	PM	—	—	R	—	—	—	—	R	—	—	—	R	—	F	—	R	—	R	—	—	—	—	—	R	—	R	—	R	—	R	—	R	—	R	—	R
34-1, 96-97	R	PM	—	—	R	—	—	—	—	R	—	—	—	R	—	R	—	R	—	R	—	—	—	—	—	R	—	R	—	R	—	R	—	R	—	R	—	R
34-2, 16-17	A	G	—	—	F	F	R	—	F	—	C	R	—	F	C	R	—	R	—	C	R	F	—	C	—	R	F	C	R	F	—	R	—	R	—	R	—	F
34-2, 80-81	A	M	—	—	F	—	—	—	C	—	F	R	—	F	C	F	—	C	—	C	—	F	—	F	—	R	F	C	R	F	—	R	—	R	—	R	—	F
34, CC	A	G	—	—	F	—	—	—	R	—	F	—	—	F	C	F	—	C	—	F	—	F	—	F	—	R	F	C	R	F	—	R	—	R	—	R	—	F

2) Nassellaria were subdivided according to the suprageneric classification of Petrushevskaya (1971).

3) Unless otherwise indicated, we have rather uncritically followed the generic assignments applied by earlier authors, since shortage of

time has prevented examination of the relationships of type species of genera.

The outline is followed by an alphabetical listing of species encountered in this study. This replaces the traditional index.

Table 5. Samples in which late Early Cretaceous radiolarians were not found.

Site 463	Site 464	Site 465 (Hole 465A)	Site 466
up to 55 and	11-1, 66-67	26-1, 20-21	29-2, 20-21
55-1, 42-43	11-1, 82-83	26-1, 34-35	35-1, 21-22
55,CC	12-1, 22-23	26-1, 51-52	35-1, 57-58
57-1, 19-20	12-1, 81-82	26-1, 116-117	35,CC
57-1, 110-111	12-2, 12-14	27-1, 66-67	
57-2, 17-18	13-1, 12-14	27-1, 100-101	
58-1, 96-97	17,CC	27-2, 1-2	
58-3, 20-21	18,CC	27-2, 111-112	
58,CC	19,CC	27-2, 149-150	
59-1, 118-119	21-1, 3-4	27,CC	
59-3, 15-16	23-1, 48-49	28-1, 27-28	
59-3, 138-139	24,CC	28-1, 57-58	
59,CC	26-1, 90-91	28-1, 130-131	
60-1, 29-30	26,CC	28-2, 2-3	
60-1, 145-146	27-1, 30-31	28,CC	
60-2, 121-122	27,CC	29-2, 45-46	
60-3, 32-33	28,CC	30-1, 32-33	
60-3, 88-89	28-1, 30-31	31-1, 19-20	
60-4, 4-5	29,CC	33-1, 31-32	
61-1, 110-111	30-1, 27-29	33-2, 86-87	
62-3, 18-19	30-1, 46-47	34-1, 52-53	
62-3, 59-60	32-1, 18-19	34-2, 29-30	
63-1, 109-110	33-1, 30-31	35-1, 12-13	
63-2, 53-54	34,CC	36-1, 62-63	
64,CC		36-2, 34-35	
65-1, 11-12		37-1, 38-39	
65-2, 9-10		38-1, 33-34	
65-3, 8-9		38-2, 63-64	
65,CC		39-1, 32-33	
68-1, 21-22		40-1, 25-26	
69-1, 44-45		40-2, 60-61	
70-6, 21-22			
73-3, 112-113			
76-1, 69-70			

Outline of Classification

Subclass Radiolaria

Superorder Polycystina Ehrenberg, 1838, emend. Riedel, 1967a.

Order Spumellaria Ehrenberg, 1875

Family Litheliidae Haeckel, 1862

Cromyodruppa concentrica Lipman, 1960

Family Actinommidae Haeckel, 1862, emend. Riedel, 1971

Acaeniotyle diaphorogona Foreman, 1973

Acaeniotyle umbilicata (Rüst, 1898)

Archaeospongoprimum cortinaensis Pessagno, 1973

Archaeospongoprimum tehamaensis Pessagno, 1973

Conosphaera tuberosa Tan Sin Hok, 1927

Dicroa sp. A Foreman, 1975

Hexalonche (?) sp. group

Hexastylurus magnificus Squinabol, 1904

Pentaspheera longispina Squinabol, 1904

?*Sphaeropyle thirencis*, n. sp.

Sphaerostylus lanceola (Parona, 1890)

Staurosphaera septemporata Parona, 1890

Stylosphaera macrostyla Rüst, 1888

Triactoma hybum Foreman, 1975

?*Tripocyclia trigonum* Rüst, 1885

Subfamily Saturnalinae Deflandre, 1953

Acanthocircus carinatus Foreman, 1973

Acanthocircus dicranacanthos (Squinabol, 1914)

Acanthocircus trizonalis (Rüst, 1898)

Acanthocircus sp.

Spongosaturnalis horridus (Squinabol, 1903) group

Family Porodiscidae Haeckel, 1881, emend. Petrushevskaya and Kozlova, 1972

Cyclastrum infundibuliforme Rüst, 1898

Hexinastrum cretaceum Lipman, 1960

Histiastrum aster Lipman, 1952

Staurocyclia martini Rüst, 1898

Stephanastrum inflexum Rüst, 1898

Family Hagiastriidae Riedel, 1971, emend. Pessagno, 1971

Amphibrachium (?) *hastatum* Renz, 1974

Crucella sp. cf. *C. cachensis* Pessagno, 1971

Hagiastrum subacutum Rüst, 1885

Hagiastrum (?) *euganeum* (Squinabol, 1903)

Higumastra sp.

Homooparonaella tricuspida (Rüst, 1898)

Paronaella (?) *diamphidia* Foreman, 1973

Paronaella sp.

Family Pseudoaulophacidae Riedel, 1967a

Alievium antiquum Pessagno, 1972

Alievium helenae, n. sp.

Patellula planoconvexa (Pessagno, 1963)

Pseudoaulophacus (?) *excavatus* (Rüst, 1898)

Pseudoaulophacus (?) *sulcatus* (Rüst, 1898)

Family Spongodiscidae Haeckel, 1862, emend.

Petrushevskaya and Kozlova, 1972

Orbiculiforma chartonae n. sp.

Spongobrachium (?) sp.

Spongocyclia trachodes Renz, 1974

Spongodiscus americanus Kozlova, 1966

Spongodiscus misele, n. sp.

Spongodiscus renillaeformis Campbell and Clark, 1944

Spongodruppa cocos Rüst, 1898

Spongopyle ecleptos Renz, 1974

Spongopyle insolita Kozlova, 1966

Stylochlamyus (?) sp. group

Order Nassellaria Ehrenberg, 1875

Suborder Cyrtida Haeckel, 1862, emend. Petrushevskaya, 1971

Superfamily Eucyrtidioidea Ehrenberg, 1847, emend.

Petrushevskaya, 1971

Family Eucyrtidae Ehrenberg, 1847, emend.

Petrushevskaya, 1971

Archaeodictyomitra apiara (Rüst, 1885)

Archaeodictyomitra brouweri var. α (Tan Sin Hok, 1927)

Archaeodictyomitra lacrimula (Foreman, 1973)

Archaeodictyomitra nuda, n. sp.

Archaeodictyomitra pseudoscalaris (Tan Sin Hok, 1927)

Archaeodictyomitra puga, n. sp.

Archaeodictyomitra vulgaris Pessagno, 1977

Crolanium pythiae, n. sp.

Cyrtocapsa asseni var. α Tan Sin Hok, 1927

Cyrtocapsa grutterinki Tan Sin Hok, 1927

Cyrtocapsa houwi Tan Sin Hok, 1927

Cyrtocapsa molengraaffi Tan Sin Hok, 1927

?*Diacanthocapsa boersmae*, n. sp.

Dibolachras tythtopora Foreman, 1973

Dictyophimus gracilis Tan Sin Hok, 1927

Eucyrtidium thiensis Tan Sin Hok, 1927

Eucyrtis sp. cf. *E. bulbosa* Renz, 1974

Eucyrtis columbaria Renz, 1974

Eucyrtis elido, n. sp.

Eucyrtis molengraaffi (Tan Sin Hok, 1927)

Eucyrtis tenuis (Rüst, 1885)

?*Gongylothorax baumgartneri*, n. sp.

?*Gongylothorax verbeeki* (Tan Sin Hok, 1927)

Hsuum sp. cf. *H. obispoensis* Pessagno, 1977

Lithocampe chenodes Renz, 1974 group

Lithocampe pseudochrysalis var. α Tan Sin Hok, 1927

Lithomitra (?) *pseudopinguis* Tan Sin Hok, 1927

Lithostrobos punctulatus Pessagno, 1963

Mita magnifica Pessagno, 1977

Neosciadocapsa sp.

Obesacapsula somphedia (Foreman, 1973)

Parvingula sp. cf. *P. altissima* (Rüst, 1885)

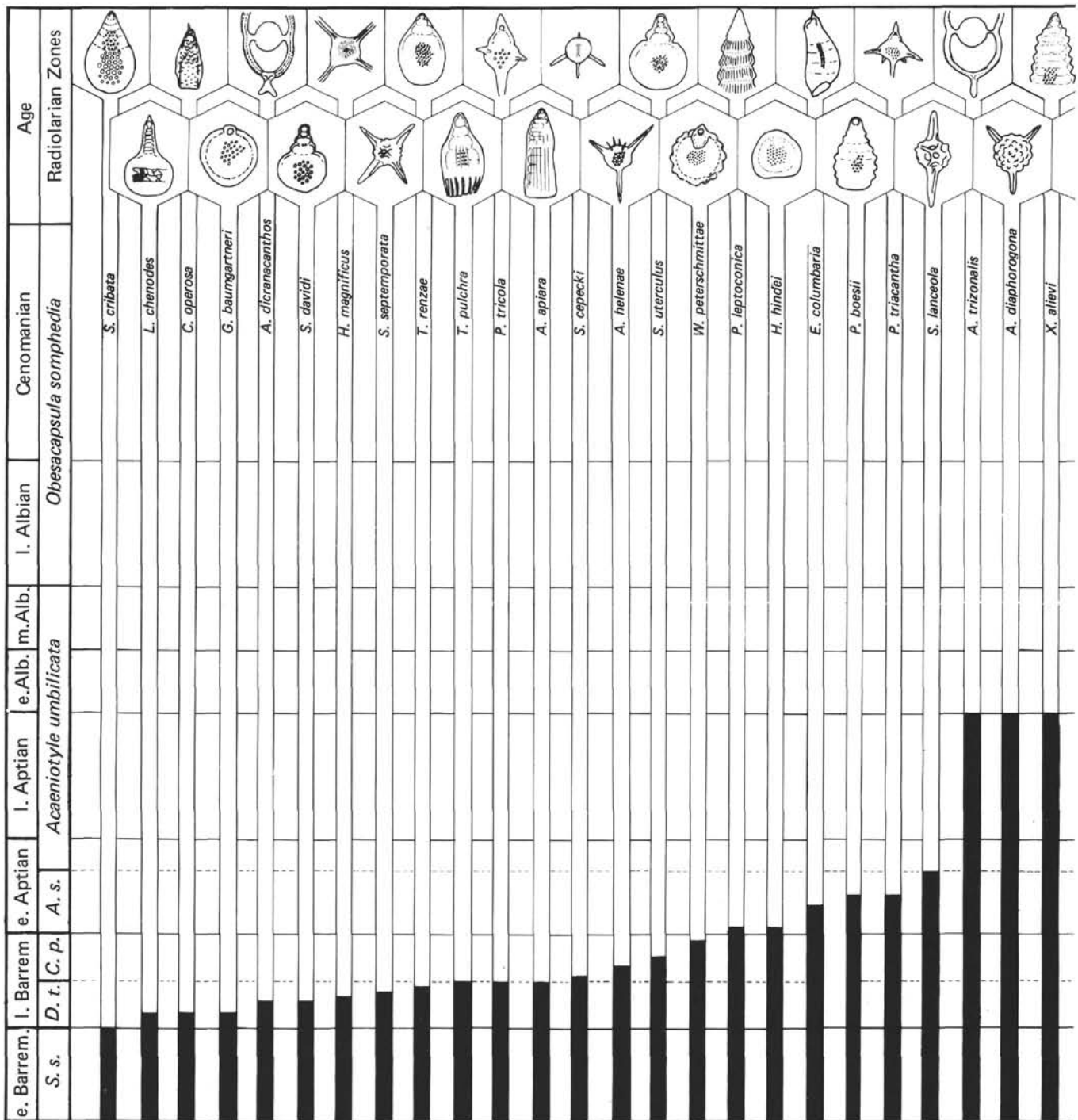


Figure 3. Range chart for late Early Cretaceous radiolarians.

- Parvicingula boesii* (Parona, 1890)
- Parvicingula hsui* Pessagno, 1977
- Parvicingula malleola* (Aliev, 1961) group
- Parvicingula tekschaensis* (Aliev, 1967)
- Podubursa triacantha* (Fischli, 1916)
- Podubursa tricola* Foreman, 1973
- Pseudodictyomitra blabla*, n. sp.
- Pseudodictyomitra carpatica* (Lozyniak, 1969)
- Pseudodictyomitra formosa* (Squinabol, 1904)

- Pseudodictyomitra lanceloti*, n. sp.
- Pseudodictyomitra leptoconica* (Foreman, 1973) group
- Pseudodictyomitra lilyae* (Tan Sin Hok, 1927)
- Pseudodictyomitra lodogaensis* Pessagno, 1977
- Pseudodictyomitra vestalensis* Pessagno, 1977
- Pseudodictyomitra pseudomacrocephala* (Squinabol, 1903)

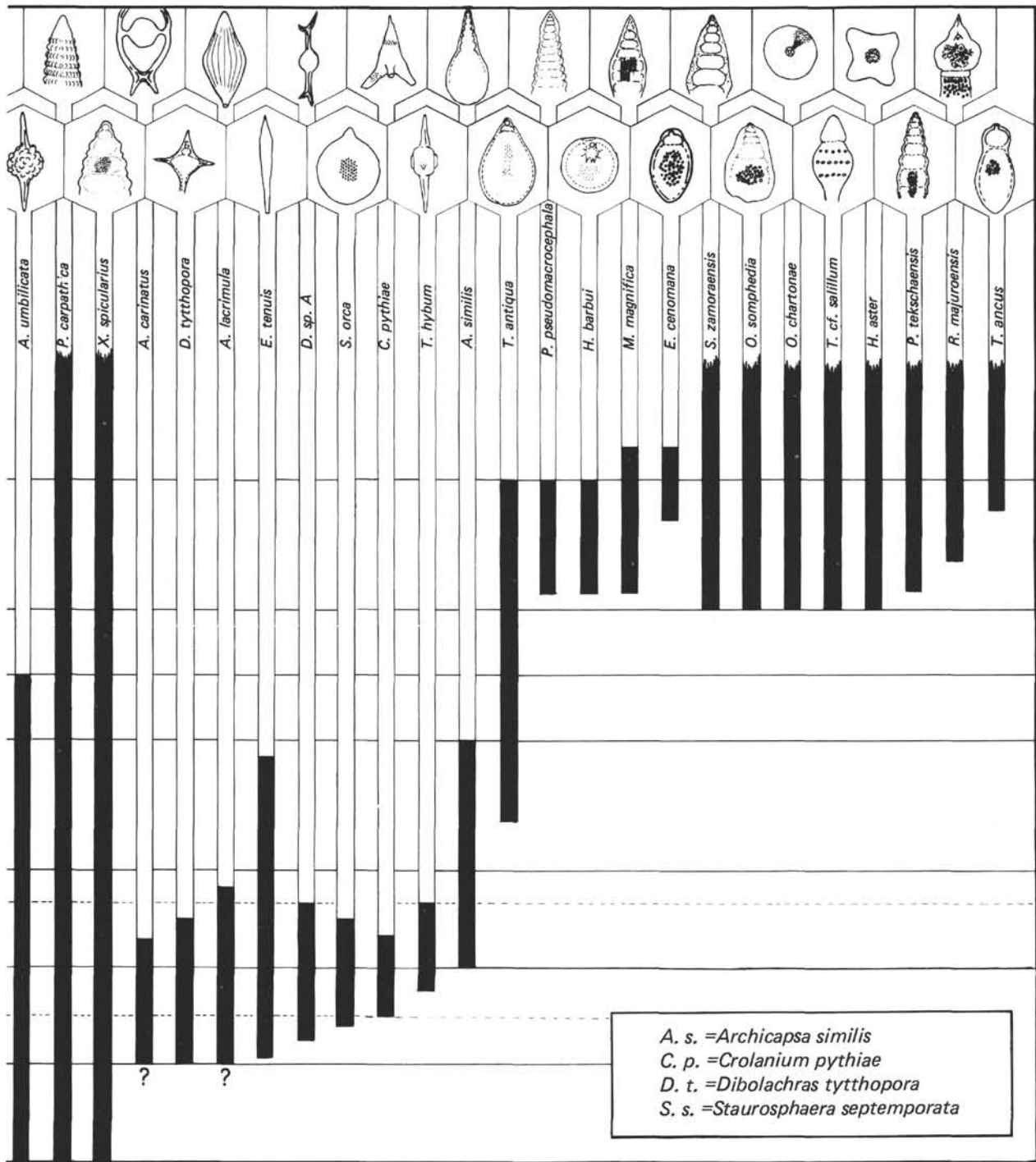


Figure 3. (Continued).

Saitoum cepeki, n. sp.
Sethocapsa orca Foreman, 1975
Sethocapsa trachyostraca Foreman, 1973
Sethocapsa uterculus (Parona, 1890)
Solenotryma sp.
Spongocapsula [?] *zamoraensis* Pessagno, 1976
Stichocapsa cribata Hinde, 1900
Stichocapsa decora Rüst, 1885
Stichocapsa sp. cf. *S. decora* Rüst, 1885

Stichocapsa pseudodecora Tan Sin Hok, 1927
Stichocapsa pseudopentacola Tan Sin Hok, 1927
Stichomitra asymbatos Foreman, 1968
Thanarla karpoffae, n. sp.
Thanarla pulchra (Squinabol, 1904)
Theocapsa laevis Tan Sin Hok, 1927
Theocapsomma ancus Foreman, 1968
Theocorys antiqua Squinabol, 1903

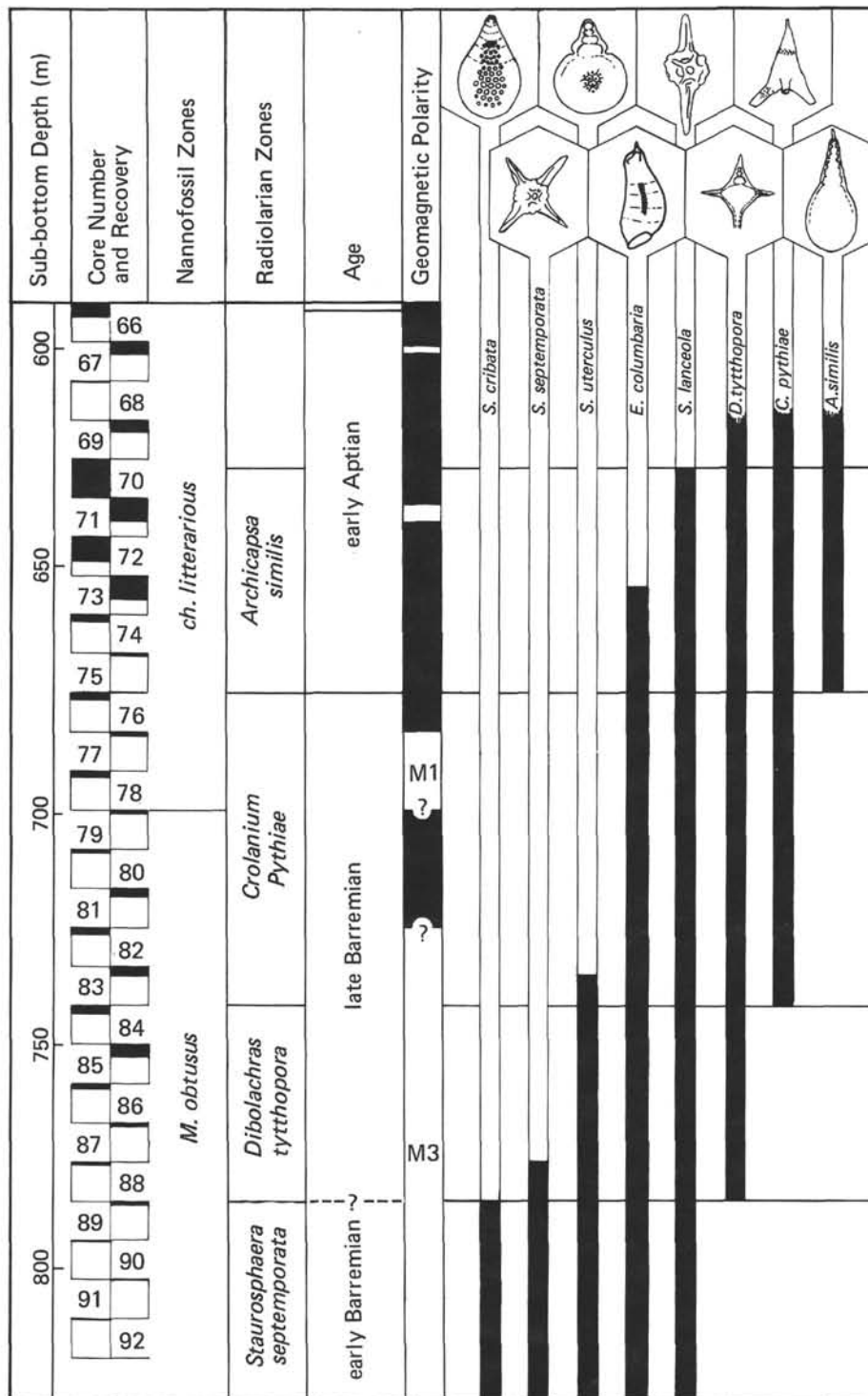


Figure 4. Relationship of the three new radiolarian zones to nannofossil zones and geomagnetic polarity.

Theocorys renzae, n. sp.
Tripolcapis ellyae Tan Sin Hok, 1927
Ultranapora durhami Pessagno, 1977
Ultranapora spinifera Pessagno, 1977
Xitus alievi (Foreman, 1973)
Xitus spicularius (Aliev, 1961)
Xitus sp. cf. *X. spicularius* (Aliev, 1961)
Xitus vermiculatus (Renz, 1974)
Xitus sp. A

Subfamily Artostrobiinae Riedel, 1967b
Artostrobium tina Foreman, 1971
Rhopalosyringium majuroensis n. sp.
Theocampe sp. cf. *T. salillum* Foreman 1971
Theocampe vanderhoofi Campbell and Clark, 1944
 Subfamily Plectopyramidinae Haecker, 1908, emend. Petrushevskaya, 1971
 ?*Cyrtocalpis operosa* Tan Sin Hok, 1927

- Subfamily Amphipyndacinae Riedel, 1967b, emend. Petrushevskaya, 1971
Amphipyndax mediocris (Tan Sin Hok, 1927)
Siphocampium davidi, n. sp.
Siphocampium macropora (Rüst, 1888)
Siphocampium ruteni (Tan Sin Hok, 1927)
- Family Williriedellidae Dumitrică, 1970
Cryptamphorella challengerii, n. sp.
Cryptamphorella conara (Foreman, 1968)
Cryptamphorella dumitricai, n. sp.
Excentropylomma cenomana Dumitrică, 1970
Hemicryptocapsa sp. cf. *H. cryptodon* (Dumitrică, 1970)
Hemicryptocapsa sp. cf. *H. prepolyhedra* Dumitrică, 1970
Hemicryptocapsa pseudopilula Tan Sin Hok, 1927
Hemicryptocapsa vincentae, n. sp.
Holocryptocanium barbui Dumitrică, 1970
Holocryptocapsa hindei Tan Sin Hok, 1927
Williriedellum carpathicum Dumitrică, 1970
Williriedellum gilkeyi Dumitrică, 1972
Williriedellum peterschmittae, n. sp.
- Superfamily Plagiacanthoidea Hertwig, 1879, emend. Petrushevskaya, 1971
- Family Plagiacanthidae Hertwig, 1879, emend. Petrushevskaya, 1971
- Subfamily Lophophaeninae Haeckel, 1881, emend. Petrushevskaya, 1971
Archicapsa similis Parona, 1890
Lophophaena sp.

Taxonomic Listing

Acaeniotyle diaphorogona Foreman, 1973 (Pl. 15, Fig. 2)

- Acaeniotyle diaphorogona* Foreman, 1973b, p. 258, pl. 2, figs 2-5; Foreman, 1975, p. 607, pl. 2F, figs. 1-5, pl. 3, figs. 1, 2.
Acaeniotyle tribulosa Foreman, 1973b, p. 258, pl. 2, fig. 8.
Acaeniotyle sp. aff. *A. diaphorogona* Foreman, 1973b, pl. 2, figs. 6, 7, pl. 16, fig. 16.

Acaeniotyle umbilicata (Rüst, 1898) (Pl. 6, Fig. 11; Pl. 15, Figs. 3a, b)

- Xiphosphaera umbilicata* Rüst, 1898, p. 7, pl. 1, fig. 9; Dumitrică, 1972, p. 832, pl. 1, fig. 1; Renz, 1974, p. 799, pl. 2, figs. 9-12, pl. 9, fig. 21.
Xiphosphaera tuberosa Tan Sin Hok, 1927, p. 35, pl. 5, fig. 8.
 Spumellariinid Pessagno, 1969, p. 610, pl. 4, fig. N.
Acaeniotyle umbilicata (Rüst) in Foreman, 1973b, p. 258, pl. 1, figs. 13, 14, 16; Foreman, 1975, p. 607, pl. 2E, figs. 14-17, pl. 3, fig. 3.

Acanthocircus carinatus Foreman, 1973 (Pl. 16, Fig. 2)

- Acanthocircus carinatus* Foreman, 1973b, p. 260, pl. 5, fig. 1, 2; Foreman, 1975, p. 610, pl. 2C, fig. 8, pl. 4, fig. 12; (not Riedel and Sanfilippo, 1974, p. 774, pl. 2, figs. 1-2).
Spongosaturnalis variabilis Squinabol in Moore, 1973, p. 824, pl. 6, figs. 1, 3 (not fig. 2).

Acanthocircus dicranacanthos (Squinabol, 1914) (Pl. 7, Fig. 1; Pl. 16, Fig. 3)

- Saturnalis dicranacanthos* Squinabol, 1914, p. 289, fig. 1, pl. 22, figs. 4, 6 (not figs. 5, 7), pl. 23, fig. 8.
Saturnalis novalensis Squinabol, 1914, p. 297, pl. 20, fig. 1, pl. 23, fig. 7.
Saturnulus sp. Fischli, 1916, p. 46, fig. 53.
Spongosaturnalis dicranacanthos (Squinabol) in Pessagno, 1969, p. 610, pl. 4, figs. A, B; Moore, 1973, p. 824, pl. 3, figs. 1, 3.
Acanthocircus dizionius (Rüst) in Foreman, 1973b, p. 260, pl. 4, figs. 4, 5; Riedel and Sanfilippo, 1974, pl. 2, figs. 4, 5 (not fig. 3).
Acanthocircus dicranacanthos (Squinabol) in Foreman, 1975, p. 610, pl. 2D, figs. 5, 6; Pessagno, 1977a, p. 73, pl. 3, fig. 5; Pessagno, 1977b, p. 31, pl. 2, fig. 6.

Acanthocircus trizonalis (Rüst, 1898) (Pl. 16, Fig. 1)

- Saturnulus trizonalis* Rüst, 1898, p. 9, pl. 2, fig. 4; Fischli, 1916, p. 46, fig. 52.
Saturnalis amissus Squinabol, 1914, p. 296, pl. 23, figs. 2-5.
Saturnalis ? aff. *amissus* Squinabol in Zhamoida, 1969, p. 19, fig. 9, p. 24.
Spongosaturnalis amissus (Squinabol) in Moore, 1973, p. 824, pl. 3, fig. 2.
Acanthocircus trizonalis (Rüst) (?) in Foreman, 1973b, p. 261, pl. 4, figs. 6-8.
Acanthocircus dizionius (Rüst) in Riedel and Sanfilippo, 1974, pl. 2, fig. 3 (not figs. 4, 5).

Acanthocircus sp. (Pl. 7, Fig. 7)

Remarks. Elliptical saturnalin ring with two blades on the outer margin and with a single flat spine at each end.

Alievium antiquum Pessagno, 1972 (Pl. 7, Fig. 10; Pl. 8, Fig. 2)

- Alievium antiquum* Pessagno, 1972, p. 298, pl. 24, figs. 1-4; Pessagno, 1977b, p. 29, pl. 3, figs. 14, 17, 21, 22.

Remarks. Some specimens have longer primary spines than those described by Pessagno (1972).

Alievium helenae Schaaf, n. sp. (Pl. 7, Fig. 9; Pl. 10, Figs. 2a, b)

- Alievium* sp. Foreman, 1973b, p. 262, pl. 9, figs. 1, 2; Foreman, 1975, p. 613, pl. 2D, figs. 7, 8, pl. 5, fig. 14.

- Alievium* sp. A Pessagno, 1977b, p. 29, pl. 3, figs. 10, 18.

Description. Test subspherical with three stout spines which are three-bladed, the three blades becoming much wider at their edges so as to be trefoil in section. Meshwork consisting of large equilateral triangular pore frames. Small secondary spines, circular in transverse section, arise from the nodes of the triangular meshwork.

Measurements. (Based on 11 specimens from Site 463, between core 89-1 and 90 CC.) Minimum diameter of skeleton 145 μm ; its maximum diameter (without spines) 195 μm , minimum length of spines 105 μm , their maximum length 210 μm .

Type locality. Mid-Pacific Mountains, Site 463 (see Site 463 chapter, this volume), Cores 89 and 90.

Type specimens. Holotype: 62-463-90, CC, slide no. 11; England finder no. L 38/3. paratypes: 62-463-89-1, 105-106 cm, SEM negative no. 781064; 62-463-90, CC, SEM negative no. 78980.

Remarks. This species differs from *A. superbum* by having a more globular test with fewer triangular pores covering its surface, by being circular in outline and by having three bladed spines trefoil in section. This species is named in memory of Helen P. Foreman, in honor of her contributions to the study of Mesozoic Radiolaria.

Amphibrachium? *hastatum* Renz, 1974 (Pl. 10, Fig. 4)

- Amphibrachium* (?) *hastatum* Renz, 1974, p. 788, pl. 1, figs. 1-6, pl. 9, fig. 1.

Amphipyndax mediocris (Tan Sin Hok, 1927) (Pl. 3, Fig. 11; Pl. 22, Figs. 7a, b)

- Dictyomitra mediocris* Tan Sin Hok, 1927, p. 55, pl. 10, fig. 82.
Stichocapsa stocki Campbell and Clark, 1944, p. 44, pl. 8, figs. 31-33.
Stichocapsa megaloccephalia Campbell and Clark, 1944, p. 44, pl. 8, figs. 26, 34.
Dictyomitra uralica Kozlova and Gorbovets, 1966, p. 116, pl. 6, figs. 6-7.
Amphipyndax stocki (Campbell and Clark) in Foreman, 1968, p. 78, pl. 81, figs. 12a-c; Foreman, 1973a, p. 430, pl. 13, fig. 5; Petrushevskaya and Kozlova, 1972, p. 545, pl. 8, figs. 16, 17; Moore, 1973, p. 827, pl. 11, fig. 6; Riedel and Sanfilippo, 1974, p. 775, pl. 11, figs. 1-3, pl. 15, fig. 11; Pessagno, 1975, p. 1016, pl. 3, figs. 4-8.
Amphipyndax mediocris (Tan Sin Hok) in Renz, 1974, p. 788, pl. 5, figs. 7-9, pl. 12, fig. 3.

Archaeodictyomitra apiara (Rüst, 1885)

(Pl. 18, Figs. 2a, b)

- Lithocampe apiarum* Rüst, 1885, p. 314, pl. 39, fig. 8.
Dictyomitra sp. ind. C. Hinde, 1900, p. 39, pl. 3, fig. 13.
Lithomitra excellens Tan Sin Hok, 1927, p. 56, pl. 11, fig. 85; Moore, 1973, pl. 827, pl. 4, figs. 3, 4.
Lithostrobos dignus Tan Sin Hok, 1927, p. 54, pl. 11, fig. 79.
Dictyomitra apiarum (Rüst) in Foreman, 1975, p. 613, pl. 2G, figs. 7-8.
Archaeodictyomitra apiara (Rüst) in Pessagno, 1977b, p. 41, pl. 6, figs. 6, 14.

Archaeodictyomitra brouweri var. α (Tan Sin Hok, 1927)

(Pl. 19, Figs. 3a, b)

- Eucyrtidium brouweri* var. α Tan Sin Hok, 1927, p. 58, pl. 11, fig. 93.
Dictyomitra sp. cf. *Eucyrtidium brouweri* Tan Sin Hok in Foreman, 1971, p. 1682, pl. 5, fig. 15; Moore, 1973, p. 830, pl. 14, figs. 7-9.
Dictyomitra brouweri var. α (Tan Sin Hok) in Renz, 1974, p. 790, pl. 8, figs. 14-16, pl. 11, fig. 26.

Archaeodictyomitra lacrimula (Foreman, 1973)

(Pl. 22, Figs. 3a, b)

- Dictyomitra* (?) *lacrimula* Foreman, 1973b, p. 263, pl. 10, fig. 11; Foreman, 1975, p. 614, pl. 2G, figs. 5, 6, pl. 6, fig. 1.
Cornutana conica Aliev in Moore, 1973, p. 830, pl. 14, figs. 1, 2, (not Aliev, 1965, pl. 6, fig. 1).

Remarks. I have not followed Pessagno (1977b, p. 45), who regarded *Dictyomitra* (?) *lacrimula* Foreman as a junior synonym of *Cornutana conica* Aliev and placed these two species in the genus *Thanarla*. *Archaeodictyomitra lacrimula* (Foreman) is less broad than *Cornutana conica* Aliev, and does not possess bladelike terminal feet as in the definition of Pessagno's genus *Thanarla*. As used here, the species has no intersegmental constrictions externally, is amphiconical, and has a very small aperture which is sometimes tubular.

Archaeodictyomitra nuda Schaaf, n. sp.

(Pl. 3, Fig. 6)

Description. Smooth, conical form with approximately eight widely separated transverse rows of small pores at the internal septa. The scanning electron microscope reveals low, rather irregular ribs on the surface.

Measurements. (Based on 8 specimens from Site 463, between 89-1 and 90,CC.) Length of the first six segments 155 to 190 μm , number of pores per half circumference of the fourth segment 12 to 14.

Type locality. Mid-Pacific Mountains, Site 463 (see Site 463 report, this volume), Cores 89 and 90.

Type specimens. Holotype: 62-463-90,CC, slide no. 7; England finder no. H 27/2. Paratypes: 62-463-90,CC, SEM negative no. 781098; 62-463-89-1, 94-95 cm, SEM negative no. 79066.

Remarks. This species differs from all others of the genus by the indistinct costae. *Nuda* (Latin, adj.), "naked."

Archaeodictyomitra pseudoscalaris (Tan Sin Hok, 1927)

(Pl. 4, Fig. 5; Pl. 21, Figs. 13a, b)

- Stichomitra pseudoscalaris* Tan Sin Hok, 1927, p. 56, pl. 11, fig. 84; (not Renz, 1974, pl. 8, figs. 5, 6, pl. 11, fig. 34).

Remarks. In some specimens, pores are less regularly arranged than in the original figure, and intersegmental structures are sometimes expressed in the external contour.

Archaeodictyomitra puga Schaaf, n. sp.

(Pl. 3, Fig. 7; Pl. 21, Figs. 11a, b)

- Dictyomitra* (?) sp. Dumitrică, 1973, pl. 4, fig. 7.

Description. Conical skeleton of usually 8 to 11 segments, and more or less pronouncedly undulating outline. At the wide levels of the shell are intersegmental septa, each of them associated with two transverse rows of pores. The pores of each row are longitudinally aligned, and alternate with costae which are continuous from segment to segment. Some specimens with no evident costae tend to have somewhat wider skeletons.

Measurements. (Based on 6 specimens from Site 463, between 89-1, 94-95 cm and 90,CC.) Length of the eight first segments 180 to

210 μm , number of pores per half circumference of the fifth segment 10 to 12.

Type locality. Mid-Pacific Mountains, Site 463 (see Site 463 report, this volume), Cores 89 and 90.

Type specimens. holotype: 62-463-89-1, 15-16 cm, slide no. 8; England finder no. D 40/1. Paratypes: 62-463-89-1, 94-95 cm, SEM negative nos. 78942 and 781154.

Remarks. This species is distinguished from all others of the genus by the two rows of pores at junctions between segments. *Puga*, name formed by an arbitrary combination of letters.

Archaeodictyomitra vulgaris Pessagno, 1977

(Pl. 4, Fig. 2)

- Dictyomitra* sp. Foreman, 1973b, pl. 10, fig. 8.
Archaeodictyomitra vulgaris Pessagno, 1977b, p. 44, pl. 6, fig. 15.

Archaeospongoprimum cortinaensis Pessagno, 1973

(Pl. 7, Fig. 11)

- Archaeospongoprimum cortinaensis* Pessagno, 1973, p. 60, pl. 9, figs. 4-6; Pessagno, 1976, p. 33, pl. 1, fig. 3.

Remarks. The preservation of our material does not permit recognition of the several species illustrated by Pessagno (1973). We group under *A. cortinaensis* the species with one polar spine in clockwise arrangement, and under *A. tehamaensis* the species which lack a spiral arrangement.

Archaeospongoprimum tehamaensis Pessagno, 1973

(Pl. 7, Figs. 3,5; Pl. 10, Figs. 7a, b)

- Archaeospongoprimum tehamaensis* Pessagno, 1973, p. 65, pl. 9, figs. 2-3; Pessagno, 1976, p. 33, pl. 1, fig. 1.
Archaeospongoprimum sp. A. Pessagno, 1977b, p. 30, pl. 2, fig. 2.

Archicapsa similis Parona, 1890

(Pl. 22, Figs. 4,5; Pl. 23, Fig. 7)

- Archicapsa similis* Parona, 1890, p. 163, pl. 5, fig. 4; Hinde, 1900, p. 28, pl. 3, fig. 22; Moore, 1973, p. 825, pl. 16, figs. 3-4.

Artostrobium tina Foreman, 1971

(Pl. 24, Figs. 6a, b)

- Artostrobium tina* Foreman, 1971, p. 1678, pl. 4, fig. 3; Moore, 1973, p. 826, pl. 8, fig. 6; Foreman, 1975, p. 613, pl. 1F, figs. 3-5, pl. 6, fig. 5.

Conosphaera tuberosa Tan Sin Hok, 1927

(Pl. 12, Figs. 5a, b)

- Conosphaera tuberosa* Tan Sin Hok, 1927, p. 36, pl. 6, fig. 10.
 ?*Conosphaera tuberosa* Tan Sin Hok in Renz, 1974, p. 789, pl. 2, figs. 6-8, pl. 17, fig. 17.

Crolanium pythiae Schaaf, n. sp.

(Pl. 20, Figs. 5a-c)

- Dictyomitra* (?) sp. Foreman, 1975, p. 615, pl. 2H, fig. 4.

Description. The shell is conical and consists of 10 to 12 uniform segments which increase gradually in length distally. Characteristic of this form are the three tubular feet which permit recognition even in poorly preserved material. Externally there is little or no segmental division, except for sometimes very slight constrictions. Pores are small, rounded, arranged randomly or in transverse rows.

Measurements. (Based on 9 specimens from Site 463, Cores 75 to 79.) Length 250 to 420 μm ; greatest width without the tubular feet 130 to 180 μm .

Type locality. Mid-Pacific Mountains, Site 463 (see Site 463 report, this volume), Cores 75 to 84.

Type specimens. Holotype: 62-463-75-1, 21-22 cm, slide no. 35; England finder no. D 36/1. Paratype: 62-463-84-1, 5-6 cm, slide no. 8; England finder no. C 49/4.

Remarks. *Crolanium pythiae* differs from all others of the genus in having three tubular projections instead of solid spines. This species, which is known only from DSDP Leg 20, 196-4-1, and DSDP Leg 32, 307-7-1, 75-77 cm, occurs through more than 130 meters. The shape of this radiolarian is reminiscent of the seat of the Pythia, a principal

personality in Greek mythology, Apollo's priestess in the panhellenic sanctuary of Delphi, and is therefore named *pythiae*.

***Cromyodruppa concentrica* Lipman, 1960**
(Pl. 13, Figs. 8a, b)

Cromyodruppa concentrica Lipman, 1960, p. 124, pl. 26, figs. 11-14.

***Crucella* sp. cf. *C. cachensis* Pessagno, 1971**
(Pl. 8, Fig. 3)

Crucella cachensis Pessagno, 1971, p. 53, pl. 9, figs. 1-3.

Remarks. This morphotype may be an ancestor of *C. cachensis*, and we take under this species all the forms with a central area markedly elevated.

***Cryptamphorella challengerii* Schaaf, n. sp.**
(Pl. 9, Figs. 6a, b)

Description. Shell inflated-pyriform, with cephalis and upper part of thorax forming a conical section, and abdomen sometimes irregular in outline. Cephalis relatively large, spherical. Thorax hemispherical, thin-walled, sometimes with small pores, and widely open, to a varying extent sunken into abdominal cavity. Abdominal wall moderate to thick with pores quincuncially arranged, varying in number and size (12-15 on half the equator).

Measurements. (Based on 21 specimens from Site 463, between 85-1, 142-143 cm and 88-1, 52-53 cm.) Diameter of shell 90 to 105 μ m; diameter of sutural pore 6 to 8 μ m.

Type locality. Mid-Pacific Mountains, Site 463 (see Site 463 report, this volume), Cores 85 to 88.

Type specimens. Holotype: 62-463-88-1, 52-53 cm, slide no. 5; England finder no. X 34/4. Paratype: 62-463-88-1, 52-53 cm, slide no. 3; England finder no. N 48/2.

Remarks. Differs from *Cryptamphorella dumitricai* Schaaf, n. sp. as indicated under that species. This species is named for the D/V *Glomar Challenger*, whose tenth anniversary was celebrated during Leg 62.

***Cryptamphorella conara* (Foreman, 1968)**
(Pl. 1, Figs. 6a, b; Pl. 9, Figs. 15a, b)

Hemicryptocapsa conara Foreman, 1968, p. 35, pl. 4, figs. 11a-b.

Cryptamphorella conara (Foreman) in Dumitrică, 1970, p. 80, pl. 11, figs. 66a-c; Dumitrică, 1972, p. 842, pl. 1, figs. 2-5.

***Cryptamphorella dumitricai* Schaaf, n. sp.**
(Pl. 1, Figs. 5a-c; Pl. 9, Figs. 5a,b, 13a, b)

Description. Shell spherical, with a small, free, poreless cephalis, without apical horn. Collar structure indistinct. Cephalo-thorax more or less depressed into abdominal cavity. Abdomen spherical, with wall moderate to thin, without aperture, but with a small, circular sutural pore always prominent. The top of the abdomen appears to be flat in optical section, but not as observed by the scanning electron microscope. Pores regular in size, with pentagonal or hexagonal frames.

Measurements. (Based on 9 specimens from Site 463, between 89-1, 94-95 cm, and 90, CC.) Diameter of shell 85 to 155 μ m; diameter of sutural pore 4 to 8 μ m.

Type locality. Mid-Pacific Mountains, Site 463 (see Site 463 report, this volume), Cores 89 and 90.

Type specimens. Holotype: 62-463-90, CC, slide no. 2; England finder no. X 43/2. Paratype: 62-463-89-1, 94-95 cm, SEM negative nos. 781126 to 781128.

Remarks. This species differs from *Cryptamphorella challengerii*, n. sp. by the prominent sutural pore and the apparently flat top of the abdomen. This species is named for Dr. Paulian Dumitrică, in honor of his contributions to the study of cryptocephalic and cryptothoracic Nassellaria.

***Cyclastrum infundibuliforme* Rüst, 1898**
(Pl. 14, Fig. 8)

Cyclastrum infundibuliforme Rüst, 1898, p. 28, pl. 9, fig. 5.

***Cyrtocalpis operosa* Tan Sin Hok, 1927**
(Pl. 27, Figs. 8a, b)

Cyrtocalpis operosa Tan Sin Hok, 1927, p. 40, pl. 7, fig. 27; Riedel and Sanfilippo, 1974, p. 778, pl. 4, figs. 1-3, pl. 14, fig. 10; Renz, 1974, p. 790, pl. 4, figs. 15, 16, pl. 12, fig. 8.

[?] *Cyrtocapsa asseni* var. α Tan Sin Hok, 1927
(Pl. 6, Fig. 9)

Cyrtocapsa asseni var. α Tan Sin Hok, 1927, p. 67, pl. 14, fig. 119.

***Cyrtocapsa grutterinki* Tan Sin Hok, 1927**
(Pl. 6, Figs. 6a, b)

Cyrtocapsa grutterinki Tan Sin Hok, 1927, p. 64, pl. 13, fig. 110.

***Cyrtocapsa houwi* Tan Sin Hok, 1927**
(Pl. 22, Fig. 2)

Cyrtocapsa houwi Tan Sin Hok, 1927, p. 6, pl. 1, fig. 11.

***Diacanthocapsa boersmae* Schaaf, n. sp.**
(Pl. 9, Figs. 2a, b, 12a, b)

Description. Shell variably ovoid to amphiconical. Cephalis small, spherical. Thorax inflated-hemispherical, with thin wall and very few pores, partly sunken into abdomen, and with cavity not much smaller than abdominal cavity. Sutural pore in lumbar position has not been observed. Abdomen thick-walled, with widely separated small pores.

Measurements. (Based on 15 specimens from Site 463, between 88-1, 52-53 cm and 92-1, 0-1 cm.) Diameter of shell 60 to 70 μ m; diameter of cephalis 15 to 20 μ m.

Type locality. Mid-Pacific Mountains, Site 463 (see Site 463 report, this volume), Cores 88 to 92.

Type specimens. Holotype: 62-463-92-1, 0-1 cm, slide no. 2; England finder no. N 44/4. Paratypes: 62-463-85-1, 142-143 cm, slide no. 4; England finder no. K 45/2; 62-463-88-1, 52-53 cm, slide no. 5; England finder no. X 35/4.

Remarks. This species is smaller than described members of *Diacanthocapsa*, and has fewer pores on the thorax. This species is named for Anne Boersma, in honor of her contributions to the study of Cretaceous and Paleocene foraminifers.

***Dibolachras tythopora* Foreman, 1973**
(Pl. 5, Figs. 3a, b; Pl. 26, Figs. 1a, b, 4)

Dibolachras tythopora Foreman, 1973b, p. 265, pl. 11, fig. 4, pl. 16, fig. 15; Foreman, 1975, p. 617, pl. 2L, figs. 2, 3, pl. 6, fig. 16.

Remarks. Although the external contour of the fourth segment is rounded, its internal surface presents an angular contour, as shown by the internal mold in Plate 26, Figure 4.

***Dicroa* sp. A Foreman, 1975**
(Pl. 16, Fig. 8)

Dicroa sp. A Foreman, 1975, p. 609, pl. 2E, figs. 9-11, pl. 3, fig. 11.

***Dictyophimus gracilis* Tan Sin Hok, 1927**
(Pl. 5, Fig. 10)

Dictyophimus gracilis Tan Sin Hok, 1927, p. 42, pl. 7, fig. 33; Renz, 1974, p. 791, pl. 5, figs. 14-16, pl. 11, fig. 11.

Napora lospensis Pessagno, 1977a, p. 96, pl. 12, figs. 9-10.

***Eucyrtidium thiensis* Tan Sin Hok, 1927**
(Pl. 27, Figs. 6a, b)

Eucyrtidium thiensis Tan Sin Hok, 1927, p. 60, pl. 11, fig. 95.

Not *Eucyrtidium* sp. cf. *E. thiensis* Tan Sin Hok in Moore, 1973, p. 829, pl. 7, fig. 6; Renz, 1974, p. 792, pl. 11, fig. 23.

***Eucyrtis* sp. cf. *E. bulbosa* Renz, 1974**
(Pl. 26, Fig. 2)

Eucyrtis bulbosus Renz, 1974, p. 792, pl. 7, figs. 26-29, pl. 12, figs. 15a-b; not Foreman, 1975, pl. 2K, fig. 35.

Remarks. Forms encountered here conform well with Renz's description, but only some of the forms have the distal tube preserved.

Eucyrtis columbaria Renz, 1974

(Pl. 5, Figs. 1a, b; Pl. 27, Figs. 2a, b, 3a, b)

Eucyrtis columbarius Renz, 1974, p. 792, pl. 7, figs. 14-20, pl. 12, figs. 13a-c.

Eucyrtis columbaria Renz in Foreman, 1975, pl. 21, fig. 19.

Remarks. In well-preserved specimens, there are three horns, the long apical horn arising from one side of the cephalis, and two short subsidiary horns apparently from the thoracic wall near the collar structure.

Eucyrtis elido Schaaf, n. sp.

(Pl. 5, Fig. 6; Pl. 25, Figs. 3a, b)

Eucyrtis hanni (Tan Sin Hok) in Riedel and Sanfilippo, 1974, p. 779, pl. 5, figs. 9, 10; Renz, 1974, p. 792, pl. 7, fig. 24.

Description. Shell sub-spindle-shaped. Cephalis small and poreless, bearing a stout horn. The conical proximal segments increase gradually in width. The fifth and sixth segments are the widest. The two or three following (last) segments decrease in width, but not in length. Pores are small, rounded, staggered on the three first segments, larger and arranged randomly or in vague transverse rows on the other segments. The surface is spiny, with long, upward-directed spines proximally, and shorter, downward-directed spines distally.

Measurements. (Based on 13 specimens from Site 463, 90, CC.) Diameter of cephalis 8 to 15 μm ; greatest width 65 to 75 μm , length of the five first segments 130 to 160 μm .

Type locality. Mid-Pacific Mountains, Site 463 (see Site 463 report, this volume), Core 90.

Type specimens. Holotype: 62-463-90, CC, slide no. 10; England finder no. H 38/2. Paratype: 62-463-90, CC, slide no. 5; England finder no. L 40/3.

Remarks. This species is distinguished from *E. micropora* and *E. tenuis* by the size of its pores and the shape of the three last segments. It differs from *E. hanni* in not constricting so abruptly and in having a thinner wall. *Elido*, name formed by an arbitrary combination of letters.

Eucyrtis molengraaffi (Tan Sin Hok, 1927)

(Pl. 27, Fig. 5a, b)

Syringium molengraaffi Tan Sin Hok, 1927, p. 63, pl. 13, fig. 105.

Eucyrtis molengraaffi (Tan Sin Hok) in Renz, 1974, p. 792, pl. 7, figs. 1-4, pl. 11, fig. 32.

Eucyrtis tenuis (Rüst, 1885) s.l.

(Plate 25, Fig. 8)

Stichocapsa tenuis Rüst, 1885, p. 318, pl. 47, figs. 13-14; Riedel and Sanfilippo, 1974, pl. 9, figs. 13, 14.

Eucyrtis tenuis (Rüst) in Foreman, 1975, p. 615, pl. 21, figs. 7-9.

Archicapsa micropora Squinabol, 1903, p. 129, pl. 9, fig. 14.

Eusyringium sp. A Zhamoida in Zhamoida et al., 1968, pl. 1, fig. 8; Zhamoida, 1969, pl. 19, fig. 8; Zhamoida, 1972, p. 121, pl. 17, fig. 3.

Eucyrtis zhamoidai Foreman, 1973b, pl. 10, figs. 9, 10, pl. 16, fig. 1.

[?] *Eucyrtis zhamoidai* Foreman, 1973b, pl. 16, fig. 2.

Eucyrtis micropora (Squinabol) in Foreman, 1975, p. 615, pl. 21, figs. 2-5.

Remarks. Because the Leg 62 material is not sufficiently well preserved to permit the distinction of *Eucyrtis micropora* from *E. tenuis*, both forms are here recorded under the latter name in its broad sense.

?*Xcentropylomma cenomana* Dumitrică, 1970

(Pl. 24, Figs. 8a, b)

Xcentropylomma cenomana Dumitrică, 1970, p. 77, pl. 15, figs. 96a, b, 97, 98a, b.

Gongylothorax baumgartneri Schaaf, n. sp.

(Pl. 9, Figs. 1a, b)

Description. Subspherical form with cephalis protruding only very slightly. Cephalis small, thick-walled, within wall of thorax. Thorax

tending to be ovoid, pointed basally, with a small, indistinct mouth significantly larger than a pore. Thoracic wall thick, with smooth surface and rather large pores separated by bars approximately as wide as the pore diameters.

Measurements. (Based on 6 specimens from Site 463, between 90, CC and 92-1, 0-1 cm.) Diameter of shell 190 to 240 μm ; diameter of pores 6 to 10 μm .

Type locality. Mid-Pacific Mountains, Site 463 (see Site 463 report, this volume), Core 90.

Type specimens. Holotype: 62-463-90, CC, slide no. 2; England finder no. T 45/3. Paratype: 62-463-90, CC, slide no. 7; England finder no. X 24/2.

Remarks. This species is larger than the co-occurring three-segmented form *Holocryptocapsa* (?) sp. cf. *H. cryptodon* (Dumitrică, 1972) with which it occurs, and it has more pores and two segments. This species is named for Peter Baumgartner (Geological Institute, Basel) in honor of his contribution to the study of Late Jurassic-Early Cretaceous Radiolaria.

Gongylothorax verbeeki (Tan Sin Hok, 1927)

(Pl. 1, Figs. 1a, b; Pl. 9, Figs. 9a, b)

Dicolocapsa verbeeki Tan Sin Hok, 1927, p. 44, pl. 8, figs. 40, 41; (not Foreman, 1968, p. 20, figs. 8a-c; Dumitrică, 1970, p. 57, pl. 1, figs. 6a, b, pl. 2, figs. 7-10).

Gongylothorax favosus Dumitrică, 1970, p. 56, pl. 1, figs. 1a-c, 2.

Remarks. The form described by Dumitrică as *G. favosus* corresponds well with specimens of Tan Sin Hok's *Dicolocapsa verbeeki* in his sample 150 from Rotti. The names are therefore synonymized, and the form assigned to *G. verbeeki* by Dumitrică and by Foreman is thus left to be named by the next worker studying it. Specimens from Leg 62 vary in the degree of development of the hexagonal pore frames, and in that some have thorns at the junctions of the pore frames.

Hagiastrum? subacutum Rüst, 1885

(Pl. 11, Fig. 4)

Hagiastrum subacutum Rüst, 1885, p. 229, pl. 34, fig. 1.

Hagiastrum? euganeum (Squinabol, 1903)

(Pl. 11, Figs. 1a, b)

Stauralastrum euganeum Squinabol, 1903, p. 123, pl. 9, fig. 19.

Hemicryptocapsa? cf. H. cryptodon (Dumitrică, 1970)

(Pl. 9, Figs. 7a, b)

?*Hemicryptocapsa cryptodon* Dumitrică, 1970, p. 73, pl. 14, figs. 90, 91a-c.

Holocryptocapsa? sp. cf. H. cryptodon (Dumitrică) in Dumitrică, 1972, p. 841, pl. 2, figs. 3-6.

Hemicryptocapsa sp. cf. H. prepolyhedra Dumitrică, 1970

(Pl. 1, Fig. 4; Pl. 9, Figs. 8a, b)

[?] *Hemicryptocapsa prepolyhedra* Dumitrică, 1970, p. 71, pl. 13, figs. 80a-c, 81-83a-b, 84, pl. 20, fig. 131.

Remarks. This species is easily distinguishable from *Willriedellum peterschmitti*, n. sp. by the presence of a sutural pore.

Hemicryptocapsa pseudopilula Tan Sin Hok, 1927

(Pl. 2, Figs. 5a, b)

Hemicryptocapsa pseudopilula Tan Sin Hok, 1927, p. 51, pl. 9, fig. 69.

Hemicryptocapsa vincentae Schaaf, n. sp.

(Pl. 9, Figs. 10a, b)

Description. Small, inflated-pyriform shell with rough surface. Cephalis spherical, without pores. No distinct collar structure. Thorax hemispherical, wide open, partly sunken into abdominal cavity, with distinct apertural spines. Abdominal wall appears rather thick as a result of prominent polygonal frames around the widely spaced, circular pores.

Measurements. (Based on 5 specimens from Site 463, between 86, CC and 90, CC.) Diameter of shell 85 to 100 μm ; diameter of cephalis 15 to 25 μm .

Type locality. Mid-Pacific Mountains, Site 463 (see Site 463 report, this volume), Cores 86 to 90.

Type specimens. Holotype: 62-463-86, CC, slide no. 3; England finder no. R 56/3. Paratype: 62-463-90, CC, slide no. 7; England finder no. K 22/2.

Remarks. This species is smaller than *H. pseudopilula* Tan Sin Hok, and has fewer, more widely separated pores. This species is named for Edith Vincent, in honor of her contributions to the study of Cenozoic foraminifers.

Hexalonche? sp. group
(Pl. 12, Figs. 2, 4a, b)

Description. These species have been found only as internal moulds, except that a medullary shell remains in some specimens. The medullary shell has closely spaced pores, approximately 5 to 7 on half a circumference, and is joined to the cortical shell by 6 to 8 radial beams, which can sometimes be seen to be three-bladed. When they number six, they are arranged regularly in cubic axes. Some specimens show traces of the pores of the cortical shell, about 25 to 30 on half a circumference. Very likely, the beams extended as external spines on the original skeletons.

Measurements. Diameter of medullary shell 35 to 55 μm ; diameter of cortical shell 140 to 190 μm .

Remarks. Some specimens seem to show two phases of infilling. It is difficult to explain why these forms are found only as internal moulds. They could be reworked from older sediments, but then they would be accompanied by other, older species, which is not found to be the case. The only other forms in this assemblage filled with redeposited silica are some spongodiscids and occasional stichocytids.

Hexastylurus magnificus (Squinabol, 1904)
(Pl. 7, Fig. 2; Pl. 14, Figs. 1a, b)

Staurosphaera magnifica Squinabol, 1904, p. 191, pl. 3, fig. 1.

Remarks. The Leg 62 specimens certainly have six spines, and Squinabol's may also have had six. This species is therefore assigned to *Hexastylurus* Haeckel, which has an appropriate definition and also a type species (*Hexastylurus dictyotus* Haeckel, 1887), which is at least superficially similar.

Hexinastrum cretaceum Lipman, 1960
(Pl. 14, Fig. 6)

Hexinastrum cretaceum Lipman, 1960, p. 133, pl. 30, fig. 8.

Pentinastrum subbotinae Lipman, 1960, p. 132, figs. 8a-b, pl. 30, figs. 6-7.

Higumastra sp.

(Pl. 6, Fig. 12; Pl. 10, Figs. 5a, b)

Remarks. We follow in this work Baumgartner's (in press) genus conception.

Histiastrum aster Lipman, 1952
(Pl. 8, Fig. 1; Pl. 11, Fig. 5)

Histiastrum aster Lipman, 1952, p. 35, pl. 11, figs. 6-7; Lipman, 1962, p. 300, pl. 2, fig. 5; Kozlova and Gorbovets, 1966, p. 84, pl. 3, fig. 9.

Holocryptocanium barbui Dumitrică, 1970
(Pl. 2, Figs. 1a, b; Pl. 10, Figs. 6a, b)

Holocryptocanium barbui Dumitrică, 1970, p. 76, pl. 17, figs. 105-108a, b, pl. 21, fig. 136.

Holocryptocapsa hindei Tan Sin Hok, 1927
(Pl. 9, Figs. 4a, b, 14)

Holocryptocapsa hindei Tan Sin Hok, 1927, p. 53, pl. 10, fig. 75; Dumitrică, 1970, p. 74, pl. 15, figs. 100a-d.

Remarks. All specimens are markedly flattened basally, and some also apically. Thus, this species, is easily distinguished from other cryptocephalic forms.

Homoeoparonaella tricuspadata (Rüst, 1898)
(Pl. 14, Fig. 5)

Chitonastrum tricuspdatum Rüst, 1898, p. 29, pl. 9, fig. 8.

Hsuum sp. cf. *H. obispoensis* Pessagno, 1977
(Pl. 19, Fig. 4)

Hsuum obispoensis Pessagno, 1977a, p. 82, pl. 8, figs. 3-4; Pessagno, 1977b, p. 44, pl. 6, fig. 7.

Lithocampe chenodes Renz, 1974 group
(Pl. 5, Fig. 2; Pl. 25, Figs. 5a, b, 7)

Lithocampe chenodes Renz, 1974, p. 793, pl. 7, fig. 30, pl. 12, figs. 14a-d; Riedel and Sanfilippo, 1974, p. 779, pl. 6, figs. 5-7, pl. 13, fig. 1.

Remarks. The shape and the size of this species are very variable. Some specimens are very similar in shape to *Lithocampe mediodilatata* Rüst, 1885 (as described by Moore, 1973), but the number of rows of pores is larger. I propose and follow here a strict specific definition based on the number of rows of pores. *Lithocampe chenodes* has five or more rows of pores, whereas *Lithocampe mediodilatata* has only two rows of pores on each segment.

?*Lithocampe pseudochrysalis* var. α (Tan Sin Hok, 1927)
(Pl. 18, Figs. 4a, b)

Lithocampe pseudochrysalis var. α Tan Sin Hok, 1927, p. 64, pl. 13, fig. 108; Renz, 1974, p. 793, pl. 11, fig. 31.

Lithomitra? *pseudopinguis* Tan Sin Hok, 1927
(Pl. 19, Figs. 5a, b, 9a, b)

Lithomitra pseudopinguis Tan Sin Hok, 1927, p. 57, pl. 10, fig. 86; Renz, 1974, p. 794, pl. 7, figs. 5-7, pl. 11, fig. 30.

Remarks. As in Tan Sin Hok's material and illustrations, there are two morphotypes of *L. pseudopinguis*, one slender, with thin walls (Pl. 19, Figs. 5a, b), the other larger, with thick walls (Pl. 19, Figs. 9a, b).

Lithostrobos punctulatus Pessagno, 1963
(Pl. 21, Figs. 5a, b)

Lithostrobos punctulatus Pessagno, 1963, p. 210, pl. 1, fig. 1, pl. 5, fig. 5 (not fig. 4); Foreman, 1978, p. 747, pl. 4, fig. 11.

Lophophaena sp.
(Pl. 21, Figs. 6a, b)

Description. Three-lobed cephalis; very slight collar constriction; small pores, irregularly rounded and spaced.

Mita magnifica Pessagno, 1977
(Pl. 6, Fig. 10; Pl. 24, Figs. 3a, b, 13a, b)

Mita magnifica Pessagno, 1977b, p. 44, pl. 6, figs. 2, 5, 11, 13, 17, pl. 7, fig. 24, pl. 12, fig. 11.

Neosciadocapsa sp.
(Pl. 25, Figs. 4a, b)

Remarks. Only a few specimens of this genus are present in the bottom of the cored sediments at Site 463.

Obesacapsula somphedia (Foreman, 1973)
(Pl. 4, Figs. 6-9; Pl. 20, Figs. 1a, b, 2)

Dictyomitra somphedia Foreman, 1973b, p. 264, pl. 14, fig. 18; Foreman, 1975, p. 614, pl. 7, figs. 11-13.

Remarks. This species is very variable in shape and size.

Orbiculiforma chartonae Schaaf, n. sp.
(Pl. 8, Fig. 6; Pl. 13, Fig. 1)

Description. Circular, spongy, discoidal skeleton with pronouncedly differentiated center. The outer thickest zone of the disk is coarsely spongy; inwardly it is thinner and finer, with indistinct radial structure. At the center are two concentric lattice-spheres, the outer one appearing incomplete on the exposed surfaces.

Measurements. (Based on 7 specimens from Hole 465A, between 28-1 and 29-1.) Diameter of entire skeleton 360 to 450 μm ; diameter of outer spherical shell 50 to 80 μm .

Type locality. Hess Rise, Hole 465A (see Site 465 report, this volume), Cores 28 and 29.

Type specimens. Holotype: 62-465A-29-1, 43-44 cm, slide no. 1; England finder no. W 47/3. Paratypes: 62-465A-29-1, 43-44 cm, SEM negative no. 79339; 62-466-34-2, 16-17 cm, slide no. 1; England finder no. O 52/1.

Remarks. Distinguished from other members of the genus by the different mesh sizes of the outer and inner spongy zones, and by the very distinct central spheres. It is not clear whether any of Pessagno's species of *Orbiculiforma* have central spheres, because most of his illustrations are scanning electron micrographs. This species is named after Dominique Charton, to thank her for her care in preparing the illustrations and plates.

Paronaella? diamphidia Foreman, 1973
(Pl. 13, Fig. 4)

Paronaella(?) diamphidia Foreman, 1973b, p. 262, pl. 8, figs. 3-4; Foreman, 1975, p. 612, pl. 5, figs. 4-5.

Paronaella sp.
(Pl. 8, Fig. 7)

Remarks. The bad preservation of the end of the arms does not permit a specific designation.

Parvicingula sp. cf. *P. altissima* (Rüst, 1885)
(Pl. 18, Figs. 1a, b)

Lithocampe altissima Rüst, 1885, p. 315, pl. 15, fig. 2; Moore, 1973, pl. 3, fig. 7.

Parvicingula altissima (Rüst) in Pessagno, 1977a, p. 85, pl. 8, figs. 9-10.

Remarks. All the forms of this species recorded in Leg 62 are markedly smaller than in Rüst's description.

Parvicingula boesii (Parona, 1890)

(Pl. 3, Figs. 13a, b; Pl. 4, Fig. 13, Pl. 18, Figs. 6a, b)

Dictyomitra boesii Parona, 1890, p. 170, pl. 6, fig. 9; Riedel and Sanfilippo, 1974, p. 778, pl. 4, figs. 5-6; Foreman, 1975, p. 613, pl. 2H, figs. 10-11, pl. 7, fig. 9.

Lithocampe ananassa Rüst, 1885, p. 315, pl. 40, fig. 3; Moore, 1973, p. 828, pl. 4, figs. 7-9.

Amphipyndax (?) sp. Foreman, 1973b, p. 263, pl. 9, figs. 3-4.

Parvicingula boesii (Parona) in Pessagno, 1977b, p. 48, pl. 8, fig. 5.

Mirifusus boesii (Parona) in Foreman, 1978, p. 746, pl. 2, fig. 6.

Parvicingula hsui Pessagno, 1977

(Pl. 3, Fig. 4)

Parvicingula hsui Pessagno, 1977a, p. 85, pl. 8, figs. 15-16, pl. 9, figs. 1-5.

?*Parvicingula malleola* (Aliev, 1961) group

(Pl. 21, Figs. 2, 12)

Dictyomitra malleola Aliev, 1961, p. 62, pl. 2, figs. 5, 6, 7; Aliev, 1965, p. 48, pl. 8, figs. 4-6; ? Renz, 1974, p. 790, pl. 8, fig. 20, pl. 11, fig. 28.

Parvicingula? tekschaensis (Aliev, 1967)

(Pl. 3, Fig. 12; Pl. 20, Figs. 3a, b)

Dictyomitra tekschaensis Aliev, 1967, p. 29, fig. K.

Dictyomitra spp. cf. *D. tekschaensis* Foreman, 1975, p. 615, pl. 1H, fig. 1, pl. 2H, fig. 1.

Patellula planoconvexa (Pessagno, 1963)

(Pl. 8, Fig. 9)

Stylospongia planoconvexa Pessagno, 1963, p. 199, pl. 3, figs. 4-6, pl. 6, fig. 1.

Patellula planoconvexa (Pessagno) in Petrushevskaya and Kozlova, 1972, p. 527, pl. 3, fig. 13.

Pentasphaera longispina Squinabol, 1904

(Pl. 6, Fig. 14)

Pentasphaera longispina Squinabol, 1904, p. 193, pl. 5, fig. 1.

Podobursa triacantha (Fischli, 1916)

(Pl. 5, Fig. 11; Pl. 25, Figs. 1a, b)

Theosyringium acanthophorum Rüst var. *triacanthus* Fischli, 1916, p. 47, fig. 38.

Theosyringium acanthophorum Rüst var. *tetracanthus* Fischli, 1916, p. 47, fig. 39.

Theosyringium acanthophorum Rüst var. *polyacanthus* Fischli, 1916, p. 47, fig. 41.

Podobursa triacantha (Fischli) in Foreman, 1973b, p. 266, pl. 13, figs. 1-3; Foreman, 1975, p. 617, pl. 2L, figs. 4-6; Pessagno, 1977b, p. 57, pl. 11, fig. 6.

Podobursa sp. Riedel and Sanfilippo, 1974, pl. 13, fig. 7.

Podobursa tricola Foreman, 1973

(Pl. 6, Figs. 1a, b; Pl. 25, Figs. 2a, b)

Podobursa tricola Foreman, 1973b, p. 267, pl. 13, fig. 9, pl. 16, fig. 12; Foreman, 1975, p. 617, pl. 2L, figs. 7-8.

Pseudoaulophacus? excavatus (Rüst, 1898)

(Pl. 12, Fig. 6)

Stylotrochus excavatus Rüst, 1898, p. 35, pl. 12, fig. 4.

Pseudoaulophacus? sulcatus (Rüst, 1898)

(Pl. 14, Figs. 3a, b)

Astrocyclus sulcatus Rüst, 1898, p. 21, pl. 7, fig. 2.

Pseudodictyomitra blabla Schaaf, n. sp.

(Pl. 21, Figs. 1a, b)

Description. Conical shell of 6 to 7 segments, the last one inverted truncate-conical. Intersegmental structures pronounced, less marked externally. Each segment has a single row of pores distally, and all except the last two segments have external ribs on their lower halves.

Measurements. (Based on 8 specimens from Site 463, between 84-1, 5-6 cm and 86,CC.) Length of the six first segments 115 to 130 μm ; number of rows of pores per half circumference on the fifth segment 10 to 12.

Type locality. Mid-Pacific Mountains, Site 463 (see Site 463 report, this volume), Core 86.

Type specimens. Holotype: 62-463-86,CC, slide no. 4; England finder no. Y 31/4. Paratype: 62-463-86,CC, slide no. 2; England finder no. B 7/1.

Remarks. This species is distinguished by its small size, lack of ribs on the last two segments, and the tapered last segment. This form also occurs in Tan Sin Hok's (1927) samples 149 and 154, although he did not record it. *Blabla*, name formed by an arbitrary combination of letters.

Pseudodictyomitra carpatica (Loznyiak, 1969)

(Pl. 3, Figs. 1a-c, 2; Pl. 20, Figs. 4a, b)

Dictyomitra carpatica Loznyiak, 1969, p. 38, pl. 2, figs. 11-13.

Dictyomitra carpatica Loznyiak (?) in Foreman, 1973b, p. 263, pl. 10, figs. 1-3, pl. 16, fig. 5; Foreman, 1975, p. 614, pl. 2G, figs. 11-14, pl. 7, fig. 7 (not fig. 6).

Remarks. This species differs from *P. leptoconica* in that there are fewer costae (fewer than one per pore), and their crests are pronouncedly convex longitudinally.

Pseudodictyomitra formosa (Squinabol, 1904)

(Pl. 3, Fig. 9)

Dictyomitra formosa Squinabol, 1904, p. 232, pl. 10, fig. 4; Moore, 1973, p. 829, pl. 1, figs. 1-3 (not fig. 4); Pessagno, 1976, p. 51, pl. 8, figs. 10-12.

Pseudodictyomitra lancetoli Schaaf, n. sp.

(Pl. 18, Figs. 9a, b)

Description. Conical shell, tending to be cylindrical or contracted below about the eighth segment. Constrictions between the segments

pronounced, each associated with a transverse row of pores and a row of alternating dimples (perhaps closed pores) distal to them. Discontinuous costae are present on all segments except the first three or four and the last, which are smooth. Costae are pronounced, but narrow, separated by wide depressions, about half as numerous as the pores in their transverse rows.

Measurements. (Based on 5 specimens from Site 463, between 90,CC and 92-1, 0-1 cm.) Length of the 6 first segments 140 to 160 μm ; number of costae per half circumference 7 to 8.

Type locality. Mid-Pacific Mountains, Site 463 (see Site 463 report, this volume), Core 90.

Type specimens. Holotype: 62-463-89-1, 94-95 cm, slide no. 10; England finder no. X 43/2. Paratype: 62-463-90,CC, SEM negative no. 781109.

Remarks: *Pseudodictyomitra lanceloti* is distinguished from *P. carpatica* by the latter having wide costae, and more of them on a diameter. This species is named for Dr. Yves Lancelot, in honor of his contributions to the sedimentology of the North Pacific.

***Pseudodictyomitra leptocnica* (Foreman, 1973) group**

(Pl. 3, Fig. 3; Pl. 18, Figs. 3a, b)

Dictyomitra leptocnica Foreman, 1973b, p. 264, pl. 10, fig. 4, pl. 16, fig. 6.

Remarks. This name is here applied in a much wider sense than Foreman's, to include all forms having a single costa arising from the margin of each pore, on the proximal as well as on the distal segments. In this species (in contrast to *P. carpatica*), the longitudinal crests of the costae appear concave.

***Pseudodictyomitra lilyae* (Tan Sin Hok, 1927)**

(Pl. 3, Fig. 8; Pl. 18, Figs. 5a, b)

Dictyomitra lilyae Tan Sin Hok, 1927, p. 55, pl. 10, fig. 83; Riedel and Sanfilippo, 1974, pl. 4, figs. 7-9, pl. 12, fig. 13; Renz, 1974, p. 791, pl. 8, figs. 1-4, pl. 11, fig. 33.

Remarks. This rather small species of *Pseudodictyomitra* shows well the characteristic features: segments wider in their upper part, and coarse costae only on the proximal segments.

***Pseudodictyomitra lodogaensis* Pessagno, 1977**

(Pl. 3, Fig. 5)

Pseudodictyomitra lodogaensis Pessagno, 1977b, p. 50, pl. 8, figs. 4, 21, 28.

***Pseudodictyomitra vestalensis* Pessagno, 1977**

(Pl. 3, Fig. 10)

Pseudodictyomitra vestalensis Pessagno, 1977b, p. 51, pl. 8, figs. 7, 18, 24, pl. 12, fig. 9.

***Pseudodictyomitra pseudomacrocephala* (Squinabol, 1903)**

(Pl. 24, Figs. 1a, b)

Dictyomitra pseudomacrocephala Squinabol, 1903, p. 139, pl. 10, fig. 2; Cita, 1964, p. 143, pl. 12, figs. 8, 9; Petrushevskaya and Kozlova, 1972, p. 550, pl. 2, fig. 5; Foreman, 1975, p. 614, pl. 7, fig. 10; Pessagno, 1976, p. 53, pl. 3, figs. 2-3.

[?] *Dictyomitra sagitafera* Aliev, 1961, p. 25, pl. 1, figs. 1-3; Aliev, 1965, p. 55, pl. 10, figs. 2-4.

Dictyomitra malleola Aliev in Pessagno, 1969, p. 610, pl. 5, fig. A.

Dictyomitra macrocephala Squinabol in Moore, 1973, p. 829, pl. 9, figs. 8, 9; Riedel and Sanfilippo, 1974, pl. 4, figs. 10, 11, pl. 14, fig. 11.

Dictyomitra sp. Foreman, 1973, p. 264, pl. 14, fig. 16.

***Rhopalosyringium majuroensis* Schaaf, n. sp.**

(Pl. 6, Figs. 2, 3; Pl. 23, Fig. 5)

Rhopalosyringium sp. Foreman, 1971, p. 1682, pl. 3, fig. 9.

[?] *Rhopalosyringium* sp. A. Moore, 1973, p. 826, pl. 7, fig. 1.

Description. Shell of three segments: hemispherical cephalis, globose thorax, and very fragile cylindrical abdomen. The poreless cephalis, bearing a sturdy three-bladed horn, is rough. An upward-directed tube which does not protrude emerges on its basis. The thorax is thick-walled and has uniform circular pores in angular

frames. Lumbar stricture well-defined by a thick ring, with smooth abdomen narrower than thorax.

Measurements. (Based on 13 specimens from Hole 465A, Section 29-1.) Diameter of cephalis 45 to 60 μm ; diameter of thorax 95 to 120 μm ; diameter of abdomen 30 to 50 μm ; length of apical horn 36 to 65 μm .

Type locality. Hess Rise, Hole 465A (see Site 465 report, this volume), Section 29-1.

Type specimens. Holotype: 62-465A-29-1, 43-44 cm, slide no. 11; England finder no. H 38/3. Paratype: 62-465A-29-1, 43-44 cm, SEM negative no. 79325.

Remarks. This species differs from all other members of the genus by the angular pore frames of its thorax and the thick ring at the lumbar stricture. This species is named for Majuro Atoll (Marshall Islands), embarkation port of Leg 62.

***Saitoum cepeki* Schaaf, n. sp.**

(Pl. 6, Fig. 15; Pl. 21, Fig. 8)

Spyrid (?) gen. et sp. indet. Riedel and Sanfilippo, 1974, pl. 3, fig. 4, perhaps 5.

Description. Cephalis almost spherical, with three feet and an apical horn. Cephalic wall hyaline or with small pores. Feet not markedly longer than width of cephalis, circular in section or perhaps slightly bladed in some specimens. Vertical and apical bars free within cephalic cavity, the latter extending as a cylindrical apical horn.

Measurements. (Based on 15 specimens from Site 463, between 84,CC and 90,CC.) Height of cephalis 60 to 80 μm ; length of horn 10 to 15 μm ; length of feet 30 to 40 μm .

Type locality. Mid-Pacific Mountains, Site 463 (see Site 463 report, this volume), Core 90.

Type specimens. Holotype: 62-463-86,CC, slide no. 4; England finder no. K 43/3. Paratype: 62-463-87-1, 6-7 cm, slide no. 3; England finder, no. E 48/3.

Remarks. This species differs from *Saitoum pagei* Pessagno (1977, p. 98, pl. 12, figs. 11-14) in its less-porous cephalic wall, and smaller, less-bladed feet. Two of the specimens described by Riedel and Sanfilippo (1974) as "Spyrid (?) gen. et sp. indet." are identified with the present species. The cephalic wall tends to become more hyaline, and the feet smaller and more cylindrical. From late Jurassic to Early Cretaceous. This species is named for Dr. Pavel Čepék, in honor of his contributions to the study of Mesozoic nannoplankton.

***Sethocapsa orca* Foreman, 1975**

(Pl. 26, Figs. 3a, b)

Sethocapsa (?) *orca* Foreman, 1975, p. 617, pl. 2J, figs. 1-2, pl. 6, fig. 12.

Remarks. This is the only large *Sethocapsa* in the Leg 62 material.

***Sethocapsa trachyostraca* Foreman, 1973**

(Pl. 23, Figs. 1a, b)

Sethocapsa trachyostraca Foreman, 1973b, p. 268, pl. 12, fig. 4; Riedel and Sanfilippo, 1974, p. 780, pl. 9, figs. 5-7; Foreman, 1975, p. 617, pl. 2J, figs. 3-4.

Stichocapsa conosphaeroides Rüst in Moore, 1973, p. 827, pl. 4, figs. 5-6.

***Sethocapsa uterculus* (Parona, 1890)**

(Pl. 5, Figs. 8a, b; Pl. 26, Figs. 5a, b)

Theocapsa uterculus Parona, 1890, p. 168, pl. 5, fig. 17.

Sethocapsa spp. cf. *Theocapsa uterculus* Parona in Foreman, 1975, p. 617, pl. 21, figs. 21, 22.

***Siphocampium? davidi* Schaaf, n. sp.**

(Pl. 5, Fig. 7; Pl. 27, Figs. 10a, b)

Description. Four-segmented form in which the upper three segments form a rather narrow cone and the fourth is greatly inflated and closed. The cephalis, with a poreless wall, is divided into an upper and a lower chamber, as in *Amphipyndax*. Some specimens have a short apical horn. Distinct collar and lumbar strictures. Thorax and abdomen with slightly roughened surface, and small pores aligned transversely. Terminal segment with much larger pores regularly quincuncially arranged and hexagonally framed, and thorny surface.

Measurements. (Based on 14 specimens from Site 463, between 84,CC and 90,CC.) Diameter of cephalis 20 to 22 μm ; diameter of fourth segment 90 to 110 μm ; number of pores per half circumference on the fourth segment 11 to 13.

Type locality. Mid-Pacific Mountains, Site 463 (see Site 463 report, this volume), Core 90.

Type specimens. Holotype: 62-463-90,CC, slide no. 6; England finder no. E 29/1. Paratype: 62-463-90,CC, slide no. 9; England finder no. M 36/2.

Remarks. This species is distinguished from *Cyrtocapsa asseni* Tan Sin Hok (of which I have examined topotypic material) by the distinctive two-chambered cephalis. Its relationship to *Sethocapsa* spp. of Foreman (1975, p. 617, pl. 21, figs. 10–12, 14) is uncertain because of the poor preservation of the cephalis in that form. It is uncertain whether this species is related to the type species of *Siphocampium* (*Siphocampium accrescens*, Rüst, 1885), but Rüst's form does have a cephalis sufficiently elongated to accommodate two chambers, and that name is used to avoid or postpone the necessity of establishing a new genus. It seems inadvisable at present to extend the concept of *Amphipyndax* to include closed forms. This species is named for Professor Louis David (Département des Sciences de la Terre, Lyon) in honor of his contributions to the study of bryozoans, and to my paleontological vocation.

Siphocampium macropora (Rüst, 1888)

(Pl. 27, Figs. 14a, b)

? *Dicolocapsa macropora* Rüst, 1888, p. 208, pl. 27, fig. 25

Siphocampium ruttenei (Tan Sin Hok, 1927)

(Pl. 6, Fig. 5; Pl. 27, Figs. 11a, b)

Stichocapsa ruttenei Tan Sin Hok, 1927, p. 71, pl. 15, fig. 133.

? *Stichocapsa* sp. aff. *S. ruttenei* Tan Sin Hok in Renz, 1974, p. 797, pl. 11, fig. 6.

Remarks. The two-chambered cephalis relates this species to the type species of *Siphocampium* (see remarks under *Siphocampium davidi* n. sp.).

Sonelotryma sp.

(Pl. 21, Figs. 7a, b)

? *Tricolocapsa parvipora* Tan Sin Hok in Renz, 1974, pl. 11, fig. 3 (not pl. 6, figs. 8–12).

Sphaeropyle thirencis Schaaf, n. sp.

(Pl. 17, Figs. 6a, b)

Description. Three concentric, latticed, spherical shells, connected by approximately 20 radial beams, half of which perhaps extend beyond the surface as short cylindrical spines. A latticed cone, of about the same size as the spherical part, begins at the second shell and extends well beyond the cortical shell.

Measurements. (Based on 4 specimens from Site 463, between 85-1 and 90,CC.) Diameters of the three spheres 10 to 15 μm , 25 to 34 μm , 72 to 85 μm ; length of free part of cone 45 to 60 μm , its width distally 75 to 92 μm .

Type locality. Mid-Pacific Mountains, Site 463 (see Site 463 report, this volume), Core 89.

Type specimens. Holotype: 62-463-89-1, 15–16 cm, slide no. 7; England finder no. C 45/1. Paratype: 62-463-90,CC, slide no. 14; England finder no. M 17/3.

Remarks. This species differs from all others of the genus by the latticed cone. *Thirencis*, name formed by an arbitrary combination of letters.

Sphaerostylus lanceola (Parona, 1890) group

(Pl. 7, Fig. 6; Pl. 16, Figs. 5a, b)

Stylosphaera lanceola Parona, 1890, p. 150, pl. 1, fig. 19.

Stylosphaera sp. Parona, 1890, p. 150, pl. 1, fig. 18; Zhamoida in Dundo and Zhamoida, 1963, pl. 1, fig. 9; Kling, 1971, p. 1089, pl. 10, fig. 3.

Lithatractus sp. Parona and Rovereto, 1895, p. 175, fig. 27 (not fig. 28).

Xiphostylus felsinae Neviani, 1900, p. 649, pl. 9, fig. 7.

Stylatractus ovatus Hinde, 1900, p. 19, pl. 4, figs. 29, 31–33, 36, Moore, 1973, p. 823, pl. 2, fig. 1.

Stylatractus paronae Hinde, 1900, p. 18, pl. 4, fig. 34.

Stylosphaera squinaboli Tan Sin Hok, 1927, p. 35, pl. 6, figs. 9a–d. Radiolarian (gen. and sp. indet.) Turner, 1965, p. 394, pl. 52, figs. 14, 15.

Spumellariinid Pessagno, 1969, p. 610, pl. 4, fig. D.

Sphaerostylus lanceola (Parona) group in Foreman, 1973b, p. 258, pl. 1, figs. 7–11; Foreman, 1975, p. 609, pl. 2E, figs. 3–6.

Sphaerostylus lanceola (Parona) in Riedel and Sanfilippo, 1974, pl. 1, figs. 1–3.

Pantanellium corriganensis Pessagno, 1977b, p. 33, pl. 3, figs. 5, 6.

Spongobrachium? sp.

(Pl. 12, Fig. 3)

Description. Discoidal spongy form, subcircular to elliptical in outline, with a distinct central latticed sphere.

Measurements. Total diameter 120 to 190 μm ; diameter of internal sphere 45 to 55 μm .

Remarks. It is unlikely that this form is related to the type species of *Spongobrachium* (*Spongodiscus ellipticus* Haeckel, 1862), but no more suitable generic name is available, and it would be premature to define a new genus.

Spongocapsula? *zamoraensis* Pessagno, 1976

(Pl. 24, Figs. 2a, b)

Stichomitra (?) *zamoraensis* Pessagno, 1976, p. 54, pl. 3, figs. 7–9.

Spongocapsula zamoraensis Pessagno, 1977b, p. 53, pl. 9, figs. 5, 16.

Remarks. Cephalis and thorax are small and not spongy.

Spongocyelia trachodes Renz, 1974

(Pl. 12, Fig. 8)

Spongocyelia trachodes Renz, 1974, p. 796, pl. 4, figs. 1–4, pl. 10, fig. 13 (not fig. 7).

Spongodiscus americanus Kozlova, 1966

(Pl. 8, Fig. 10)

Spongodiscus americanus Kozlova and Gorbovets, 1966, p. 88, pl. 14, figs. 1–2.

not *Spongodiscus* sp. cf. *S. americanus* Kozlova in Renz, 1974, p. 796, pl. 3, fig. 12, pl. 10, fig. 6.

Remarks. The Cretaceous species is smaller than the original Cenozoic holotype.

Spongodiscus misele Schaaf, n. sp.

(Pl. 17, Figs. 3a, b)

Description. Spongy, approximately discoidal form, a part of which shows concentric and radial structure near one edge. From this part radiate several spines, two of which commonly are bladed, much more prominent than the others. No indication of a pylome. Many specimens are incomplete in the part away from the spines.

Measurements. (Based on 4 specimens from Site 463, between 70-2 and 73-1.) Total diameter of almost complete specimens 280 to 320 μm ; length of large spines 80 to 120 μm .

Type locality. Mid-Pacific Mountains, Site 463 (see Site 463 report, this volume), Core 73.

Type specimens. Holotype: 62-463-73-1, 18–19 cm, slide no. 4; England finder no. U 34/1. Paratype: 62-463-75-1, 21–22 cm, slide no. 34; England finder no. X 36/3.

Remarks. This species differs from all others of the genus by the pronounced eccentricity of the part with concentric and radial structure. *Misele*, name formed by an arbitrary combination of letters.

Spongodiscus renillaeformis Campbell and Clark, 1944

(Pl. 8, Figs. 4, 5, 8; Pl. 13, Fig. 9; Pl. 15, Fig. 1)

Spongodiscus renillaeformis Campbell and Clark, 1944, p. 18, pl. 6, figs. 5, 6, 8, 10.

Spongodiscus impressus Lipman in Kozlova and Gorbovets, 1966, p. 87, pl. 4, figs. 8, 9.

Remarks. We take under this name all the spongy discoidal tests with an elevated central area and a truncated outline.

?*Spongodruppa cocos* Rüst, 1898

(Pl. 6, Fig. 13; Pl. 15, Figs. 4a, b)

Spongodruppa cocos Rüst, 1898, p. 19, pl. 6, fig. 5***Spongopyle ecleptos* Renz, 1974**

(Pl. 17, Figs. 2a, b, 9)

Spongopyle ecleptos Renz, 1974, p. 796, pl. 3, figs. 2-6, pl. 10, fig. 14.**Remarks.** This name is here used in a much broader sense than by Renz (1974), to include also forms with round or three-bladed spines around the disk.***Spongopyle insolita* Kozlova, 1966, group**

(Pl. 17, Figs. 7, 8)

Spongopyle insolita Kozlova and Gorbovets, 1966, p. 91, pl. 4, figs. 11a-b; Riedel and Sanfilippo, 1974, p. 780, pl. 2, figs. 7, 8, 11 (not figs. 9, 10), pl. 14, fig. 4.**Remarks.** There is a tendency for the size of the skeleton and the amount of spongy material to decrease from the Barremian to the Cenomanian.***Spongosaturnalis horridus* (Squinabol, 1903) group**

(Pl. 16, Fig. 4)

Acanthocircus horridus Squinabol, 1903, p. 125, pl. 9, fig. 3.*Saturnalis polymorphus* Squinabol, 1914 (invalid name), p. 293.*Spongosaturnalis polymorphus* (Squinabol) in Moore, 1973, p. 824, pl. 6, figs. 4, 6.*Spongosaturnalis horridus* (Squinabol) in Foreman, 1975, p. 610, pl. 2C, fig. 1, pl. 4, fig. 3.*Spongosaturnalis* (?) spp. Foreman, 1975, p. 612, pl. 1C, figs. 3-10, pl. 2C, figs. 2-6.**Remarks.** Because members of this genus are not common nor well preserved in the Leg 62 material, this species-group name is used for all forms with about 10 to 15 external spines.***Staurocyclia martini* (Rüst, 1898)**

(Pl. 11, Figs. 2a, b)

Staurocyclia martini Rüst, 1898, p. 21, pl. 6, fig. 11.**Remarks.** Specimens observed here agree well with the descriptions of Rüst, except for the three-bladed arms.***Staurosphaera septemporata* Parona, 1890**

(Pl. 7, Figs. 8a, b; Pl. 16, Figs. 10a, b)

Staurosphaera septemporata Parona, 1890, p. 151, pl. 2, figs. 4, 5; Cita and Pasquare, 1959, p. 398, fig. 3, no. 7; Moore, 1973, p. 824, pl. 2, fig. 2, Foreman, 1973, p. 259, pl. 3, fig. 4; Riedel and Sanfilippo, 1974, p. 780, pl. 1, figs. 6-8; Foreman, 1975, p. 609, pl. 2E, fig. 7, pl. 3, fig. 6.*Cecrops septemporatus* (Parona) in Pessagno, 1977b, p. 33, pl. 3, fig. 11.**?*Stephanastrum inflexum* Rüst, 1898**

(Pl. 14, Figs. 4a, b)

Stephanastrum inflexum Rüst, 1898, p. 32, pl. 11, fig. 2.***Stichocapsa cribata* Hinde, 1900**

(Pl. 6, Fig. 4; Pl. 25, Fig. 6)

Stichocapsa cribata Hinde, 1900, p. 43, pl. 4, fig. 39; Moore, 1973, p. 827, pl. 4, figs. 1-2.***Stichocapsa decora* Rüst, 1885**

(Pl. 27, Figs. 13a, b)

Stichocapsa decora Rüst, 1885, p. 319, pl. 17, fig. 3.***Stichocapsa* sp. cf. *S. decora* Rüst, 1885**

(Pl. 27, Figs. 12a, b)

Stichocapsa decora Rüst, 1885, p. 319, pl. 17, fig. 3.**Remarks.** This form is very similar in shape and in size to *Stichocapsa decora*, but the last post-abdominal segment bears small pores.***Stichocapsa pseudodecora* Tan Sin Hok, 1927**

(Pl. 27, Figs. 7a, b)

Stichocapsa pseudodecora Tan Sin Hok, 1927, p. 72, pl. 16, fig. 137, (not Renz, 1974, pl. 11, fig. 29).***Stichocapsa pseudopentacola* Tan Sin Hok, 1927**

(Pl. 27, Figs. 4a, b)

Stichocapsa pseudopentacola Tan Sin Hok, 1927, p. 72, pl. 16, fig. 136.***Stichomitra asymbatos* Foreman, 1968**

(Pl. 22, Figs. 6a, b)

Stichomitra asymbatos Foreman, 1968, p. 73, pl. 8, figs. 10a-c; Riedel and Sanfilippo, 1974, p. 780, pl. 10, figs. 1-4 (not figs. 5-7), pl. 15, fig. 5; Foreman, 1978, p. 748, pl. 4, fig. 15.***Stylochlamyium*? sp. group**

(Pl. 12, Fig. 1; Pl. 16, Figs. 6a, b)

Description. A coarsely spiral disk, with a prominent central sphere in some specimens, surrounded by an irregular spongy zone. In most specimens, the original skeleton seems to have been filled and replaced, and in this process the coarser skeletal elements may have been preferentially emphasized. It is now difficult to reconstruct the original distribution of the skeletal elements and the spaces between them.**Measurements.** Diameter of spiral portion 280 to 340 μ m.**Remarks.** It is unlikely that these forms are related to the type species of *Stylochlamyium*, and that name is used as a matter of temporary convenience. They are probably related to the forms recorded by Renz (1974, pl. 10, fig. 7) as species of *Spongocyclia*.***Stylosphaera macrostyla* Rüst, 1888**

(Pl. 14, Fig. 2)

Stylosphaera macrostyla Rüst, 1888, p. 193, pl. 22, fig. 12.***Thanarla karpoffae* Schaaf, n. sp.**

(Pl. 21, Fig. 3)

Description. Four upper segments forming a conical section with indistinct external strictures, and a fifth forming a subcylindrical lower section. The four first segments have a thick wall and are commonly preserved, while the thin-walled fifth segment is rarely seen. Surface ornamented by continuous ribs separating single rows of pores which are rather regularly spaced on the third and fourth segments, and less regular and sometimes longitudinally elongated on the fifth. Terminal feet not observed.**Measurements.** (Based on 5 specimens from Site 463, between 89-1 and 90,CC.) Length of the four upper segments 120 to 140 μ m; diameter of fifth segment 50 to 65 μ m; 5 to 6 rows of pores at fourth segment.**Type locality.** Mid-Pacific Mountains, Site 463 (see Site 463 report, this volume), 90,CC.**Type specimens.** Holotype: 62-463-90,CC, slide no. 10; England finder no. U 26/0. Paratype: 62-463-90,CC, slide no. 7; England finder no. B 35/2.**Remarks.** Distinguished from other members of the genus by the pronounced difference between the fourth and the fifth segments. This species is named for Anne-Marie Karpoff (Institut de Géologie, Strasbourg), in honor of her contributions to the study of the geochemistry of marine sediments.***Thanarla pulchra* (Squinabol, 1904)**

(Pl. 4, Fig. 10; Pl. 19, Figs. 7a, b)

Sethamphora pulchra Squinabol, 1904, p. 213, pl. 5, fig. 8; Moore, 1973, p. 826, pl. 3, figs. 5, 6 (not fig. 4); Riedel and Sanfilippo, 1974, pl. 13, fig. 5.*Dictyomitra pulchra* (Squinabol) in Dumitrică, 1975, p. 87, text-fig. 2, fig. 7.*Thanarla pulchra* (Squinabol) in Pessagno, 1977b, p. 46, pl. 7, figs. 7, 21, 26.**Remarks.** No specimens were found with the external change in contour characteristic of *Thanarla elegantissima* (Cita, 1964).

Theocampe sp. cf. *T. salillum* Foreman, 1971
(Pl. 24, Fig. 7)

Theocampe salillum Foreman, 1971, p. 1678, pl. 4, fig. 5; Moore, 1973, p. 826, pl. 11, figs. 1, 2; Foreman, 1973, pl. 15, fig. 12; Foreman, 1975, p. 613, pl. 1F, fig. 8, pl. 6, fig. 4.

Theocampe vanderhoofi Campbell and Clark, 1944
(Pl. 24, Figs. 5a, b, 11a, b)

Theocampe vanderhoofi Campbell and Clark, 1944, p. 34, pl. 7, fig. 19.

Theocapsa laevis Tan Sin Hok, 1927
(Pl. 27, Fig. 9)

Theocapsa laevis Tan Sin Hok, 1927, p. 46, pl. 8, fig. 49.

Theocapsomma ancus Foreman, 1968
(Pl. 24, Figs. 4, 9a, b)

Theocapsomma ancus Foreman, 1968, p. 32, pl. 4, fig. 3.
Diacanthopocapsa cf. *ancus* (Foreman) in Dumitrică, 1970, p. 64, pl. 6, figs. 35a-b, pl. 7, fig. 40, pl. 20, fig. 125.

Theocorys antiqua Squinabol, 1903
(Pl. 24, Figs. 10a, b)

Theocorys antiqua Squinabol, 1903, p. 135, pl. 8, fig. 25.
Theocorys sp. aff. *T. antiqua* Squinabol in Renz, 1974, p. 798, pl. 6, figs. 4-7, pl. 11, fig. 4.

Theocorys renzae Schaaf n. sp.
(Pl. 5, Figs. 13a-c; Pl. 27, Figs. 1a, b)

Description. Four-segmented form with small cephalis, without apical horn, poreless. Small thorax and abdomen truncate-conical in shape. Post-abdominal segment very inflated, subspherical to ellipsoidal. Very contracted aperture with protruding rim. Small pores regularly disposed in intersecting diagonal rows.

Measurements. (Based on 7 specimens from Site 463, between 89-1, 105-107 cm and 90,CC.) Height of shell 140 to 190 μm ; diameter of cephalis 10 to 15 μm ; height of thorax 10 to 13 μm ; height of abdomen 18 to 22 μm ; breadth of post-abdominal segment 100 to 130 μm .

Type locality. Mid-Pacific Mountains, Site 463 (see Site 463 report, this volume), Cores 89 and 90.

Type specimens. Holotype: 62-463-90,CC, slide no. 9; England finder no. W 44/4. Paratype: 62-463-89-1, 105-106 cm; SEM negative nos. 781061, 781062, 781158.

Remarks. This species differs from *T. antiqua* Squinabol in having smaller pores not aligned in longitudinal rows, and a four-segmented shell. This species is named for Dr. G. W. Renz-Killmar, in honor of her contributions to the study of Mesozoic and Cenozoic Radiolaria.

Triactoma hybum Foreman, 1975
(Pl. 12, Fig. 7)

Triactoma sp. cf. *T. echoides* Foreman, 1973b, pl. 3, fig. 2 (not fig. 3).

Triactoma hybum Foreman, 1975, p. 609, pl. 2F, figs. 6, 7, pl. 3, figs. 7, 9.

Tripocalpis ellyae Tan Sin Hok, 1927
(Pl. 23, Figs. 6a, b)

Tripocalpis ellyae Tan Sin Hok, 1927, p. 38, pl. 7, fig. 18; (not Renz, 1974, pl. 5, figs. 18, 19, pl. 11, fig. 10).

? *Tripocyclia trigonum* Rüst, 1885
(Pl. 13, Fig. 3)

Tripocyclia trigonum Rüst, 1885, p. 293, pl. 30, fig. 3.

Ultranapora durhami Pessagno, 1977
(Pl. 23, Figs. 8a, b)

Ultranapora durhami Pessagno, 1977b, p. 39, pl. 5, figs. 1-3, 13, 14, 19, pl. 12, fig. 4.

Tripocalpis ellyae Tan Sin Hok in Renz 1974, p. 798, pl. 5, figs. 18-19, pl. 11, fig. 10.

Ultranapora spinifera Pessagno, 1977
(Pl. 25, Figs. 9a, b)

Tripilidium (?) *deudrocanthos* Squinabol in Pessagno, 1976, p. 55, pl. 3, fig. 1.

Ultranapora spinifera Pessagno, 1977b, p. 39, pl. 5, figs. 5, 11, 12, pl. 12, fig. 7.

Williriedellum carpathicum Dumitrică, 1970
(Pl. 1, Figs. 2a, b)

Williriedellum carpathicum Dumitrică, 1970, p. 70, pl. 9, figs. 56a-b, 57-59, pl. 10, fig. 61.

Remarks. This rare species is larger than Dumitrică's original holotype.

Williriedellum gilkeyi Dumitrică, 1972
(Pl. 2, Figs. 6a-c)

Williriedellum (?) *gilkeyi* Dumitrică, 1972, p. 841, pl. 3, figs. 4, 6, pl. 4, figs. 1, 2.

Remarks. The lack of thoracic apophyses confirms the doubtful generic assignment of Dumitrică's species. The less closely packed pores are perhaps the attribute of an ancestor form, linking *W. crystallinum* Dumitrică, from the upper Callovian-Oxfordian, and *W. gilkeyi*, from the Albian of Leg 13.

Williriedellum peterschmittae Schaaf, n. sp.
(Pl. 1, Figs. 3a, b; Pl. 9, Figs. 3a, b)

Hemicryptocapsa (?) *nodosa* (Tan Sin Hok) in Dumitrică, 1972, p. 841, pl. 1, fig. 6, pl. 2, figs. 1, 2.

Description. Nodose, spherical form with protruding cephalis. Small, apically pointed but hornless cephalis, with a few small pores. Thorax more than hemispherical within abdominal wall and cavity, with a large aperture and no spine. Abdomen thick-walled, with a small mouth surrounded by a distinct peristome. Abdominal wall pronouncedly tuberculate, with small pores regularly arranged over the entire surface; on each node, one central pore is surrounded by six others.

Measurements. (Based on 23 specimens from Site 463, between 84,CC and 90,CC.) Diameter of shell 120 to 145 μm ; diameter of cephalis 8 to 12 μm ; number of abdominal nodes per half circumference 8 to 10.

Type locality. Mid-Pacific Mountains, Site 463 (see Site 463 report, this volume), 90,CC.

Type specimens. Holotype: 62-463-89-1, 105-106 cm, slide no. 3; England finder no. H 35/2. Paratypes: 62-463-90,CC, slide no. 7; England finder no. B 35/4; 62-463-90,CC, SEM negative nos. 781055, 781056.

Remarks. This species differs from *Tricolocapsa nodosa* Tan Sin Hok, with which it occurs in Rotti's sample 149, by the more-regular abdominal pores and the sunken thorax. This species is named for Irène Peterschmitt, to thank her for her care in taking the scanning electron micrographs.

Xitus alievi (Foreman, 1973)
(Pl. 5, Figs. 4a, b; Pl. 19, Figs. 1a, b, 8a, b)

Dictyomitra alievi Foreman, 1973b, p. 263, pl. 9, fig. 10, pl. 16, fig. 4; Foreman, 1975, p. 613, pl. 2H, figs. 8, 9, pl. 7, fig. 2.

Xitus plenus Pessagno, 1977b, p. 55, pl. 9, figs. 15, 21, 22, 26, pl. 12, fig. 15.

Remarks. This species is distinguished from *Xitus spicularius* by its narrower segments, fewer transverse rows of pores per segment, and, in the scanning electron micrographs, by a lacy rather than tuberculate surface. Upward in the section the wall becomes thinner.

Xitus spicularius (Aliev, 1961)
(Pl. 4, Fig. 11; Pl. 5, Figs. 12a, b; Pl. 19, Figs. 2a, b)

Dictyomitra spicularia Aliev, 1961, p. 34, pl. 2, figs. 1, 2; Aliev, 1965, p. 39, pl. 6, fig. 9.

Dictyomitra sp. cf. *D. spicularia* Aliev in Foreman, 1973b, p. 264, pl. 9, figs. 8, 9.

Xitus spicularius (Aliev) in Pessagno, 1977b, p. 56, pl. 9, fig. 7, pl. 10, fig. 5.

Remarks. For characters distinguishing this species from *X. alievi*, see under that name. Upward in the section, the shape tends to become more cylindrical.

Xitus sp. cf. *X. spicularius* (Aliev, 1961)

(Pl. 4, Fig. 12)

Remarks. This species differs from *X. spicularius* by having a slender test and less-massive tubercules.

Xitus vermiculatus (Renz, 1974)

(Pl. 19, Figs. 6a, b)

Eucyrtidium vermiculatum Renz, 1974, p. 792, pl. 8, figs. 17-19, pl. 11, fig. 22.

Xitus spineus Pessagno, 1977b, p. 56, pl. 10, figs. 3, 12, 16, 20, pl. 12, fig. 13.

Remarks. *Xitus vermiculatus* differs from *X. alievi* by the less-nodose surface, five irregular rows of pores (rather than three), and thinner wall. It differs from *Stichomitra asymbatos* Foreman by the small apical spine and the irregular rows of pores.

Xitus sp. A.

(Pl. 5, Figs. 9a, b; Pl. 18, Figs. 7a, b)

Remarks. This form, very similar to *X. alievi*, is narrower and more cylindrical, with a larger, round cephalis.

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PLATES

Plates 1 to 8 are scanning electron micrographs; Plate 9 to 27 are transmitted-light micrographs. The magnifications are standardized $\times 200$ where possible to allow visual comparisons. Plates 1 and 2 (cryptothoracic and cryptocephalic Nassellaria) are magnified $\times 350$, and some large Spumellaria $\times 100$; these are marked with an asterisk.

Usually there are two illustrations of each specimen, one focused on the silhouette, the other on the surface of the test.

In the explanations of the figures, the sample numbers and slide designations indicate preparations in my collection at the Institut de Géologie, Strasbourg (or, in the case of type specimens, preparations to be deposited in the Département des Sciences de la Terre, 15-43 Bd. du 11 novembre, 69621 Villeurbanne, France), and designations in the form "E.F. M 27/3" indicate England finder positions of the illustrated specimens on the slides.

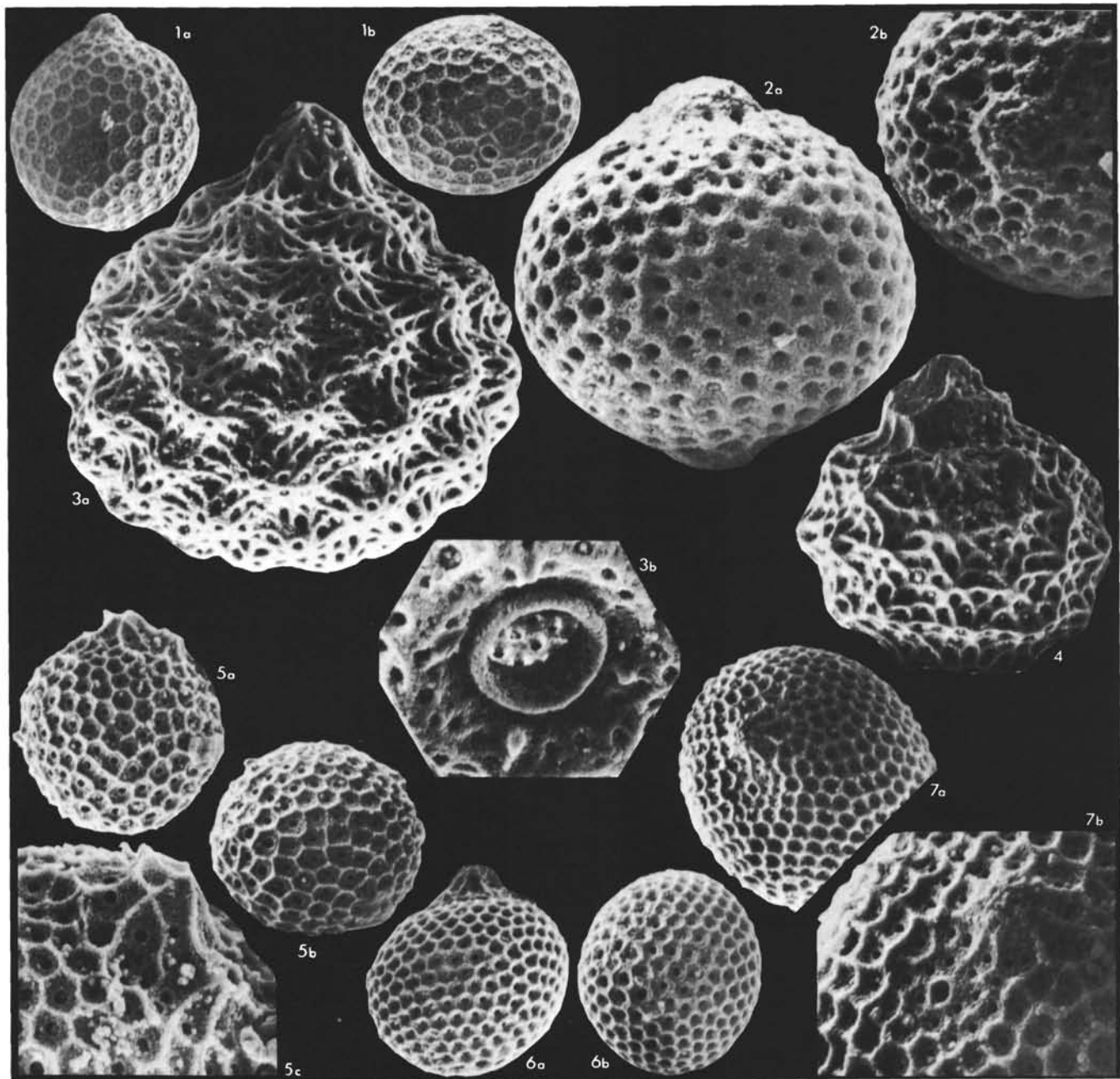


Plate 1. Photomicrographs.

Figures 1a, b. *Gongylothorax verbeeki* (Tan Sin Hok) ($\times 350$). Fig. 1a. Lateral view. Fig. 1b. Antapical view showing strongly constricted aperture. Sample 463-90,CC; SEM 781117 and 781118.

Figures 2a, b. *Williriedellum carpathicum* Dumitrică ($\times 350$). Fig. 2a. Lateral view. Fig. 2b. Apical view, showing the complex sutural pore. Sample 463-89-1, 94-95 cm; SEM 781131 and 781132.

Figures 3a, b. *Williriedellum peterschmittae*, n. sp. Fig. 3a. Lateral view ($\times 350$). Fig. 3b. Antapical view showing the aperture ($\times 700$). Paratype. Sample 463-90,CC; SEM 781055 and 781056.

Figure 4. *Hemicryptocapsa* sp. cf. *H. prepolyhedra* Dumitrică ($\times 350$). Sample 463-89-1, 105-106 cm; SEM 781074.

Figures 5a-c. *Cryptamphorella dumitricai*, n. sp. Fig. 5a. Lateral view, showing the small circular sutural pore always prominent ($\times 350$). Fig. 5b. Antapical view showing abdomen without aperture ($\times 350$). Fig. 5c. Details of cephalis and sutural pore ($\times 700$). Paratype. Sample 463-89-1, 94-95 cm; SEM 781126 to 781128.

Figures 6a, b. *Cryptamphorella conara* (Foreman) ($\times 350$). Fig. 6a. Lateral view. Fig. 6b. Antapical view showing the absence of aperture. Sample 463-89-1, 94-95 cm; SEM 781142 and 781143.

Figures 7a, b. *Cryptothoracic Nassellaria*, gen. and sp. indet. ($\times 350$ and $\times 700$). Sample 463-90,CC; SEM 781114 and 781115.

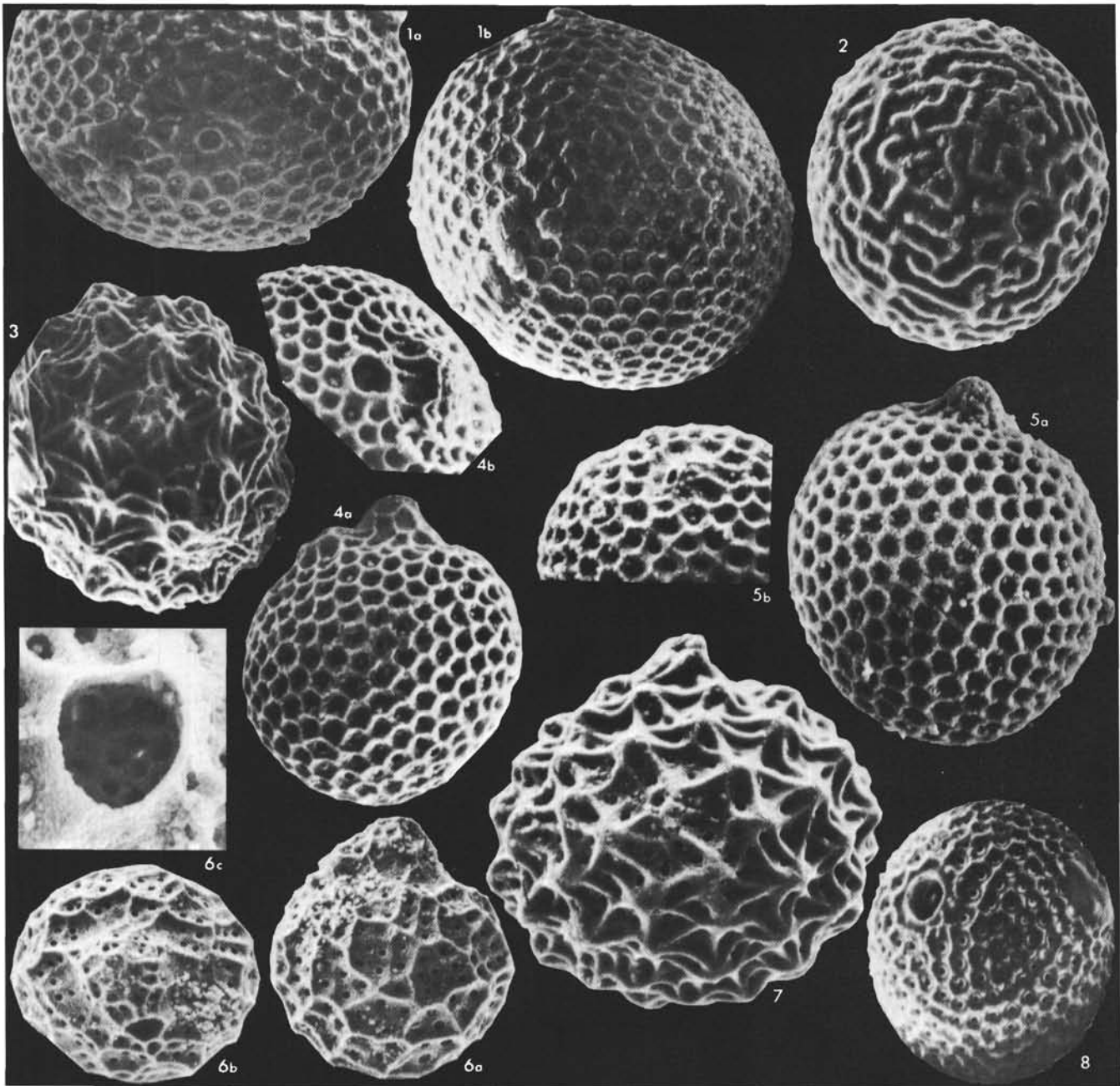


Plate 2. Photomicrographs.

Figures 1a, b. *Holocryptocanium barbui* Dumitrică ($\times 350$). Fig. 1a. Antapical view, showing the aperture. Fig. 1b. Lateral view, showing completely encased cephalo-thorax. Sample 466-34-2, 16-17 cm; SEM 781167 and 781168.

Figure 2. Cryptocephalic Nassellaria gen. and sp. indet. ($\times 350$). Sample 463-89-1, 94-95 cm; SEM 79057.

Figure 3. Cryptothoracic Nassellaria gen. and sp. indet. ($\times 350$). Sample 463-89-1, 105-106 cm; SEM 79231.

Figures 4a, b. *Cryptamphorella* sp. indet. ($\times 350$) Fig. 4a. Lateral view, showing the prominent sutural pore. Fig. 4b. Detail of sutural pore. Sample 463-89-1, 94-95 cm; SEM 781149 and 781151.

Figures 5a, b. *Hemicryptocapsa pseudopilula* Tan Sin Hok ($\times 350$). Fig. 5a. Lateral view. Fig. 5b. Antapical view, showing the strongly constricted aperture. Sample 466-34-2, 16-17 cm; SEM 79371 and 79372.

Figures 6a-c. *Williriedellum gilkeyi* Dumitrică. Fig. 6a. Lateral view ($\times 350$). Fig. 6b. Apical view ($\times 350$). Fig. 6c. Detail of sutural pore ($\times 1500$). Sample 463-89-1, 94-95 cm; SEM 781136, 781138, and 781139.

Figure 7. Cryptocephalic Nassellaria gen. and sp. indet. ($\times 350$). Sample 463-89-1, 94-95 cm; SEM 79051.

Figure 8. *Holocryptocanium* sp. ($\times 350$). Sample 463-89-1, 105-106 cm; SEM 79261.

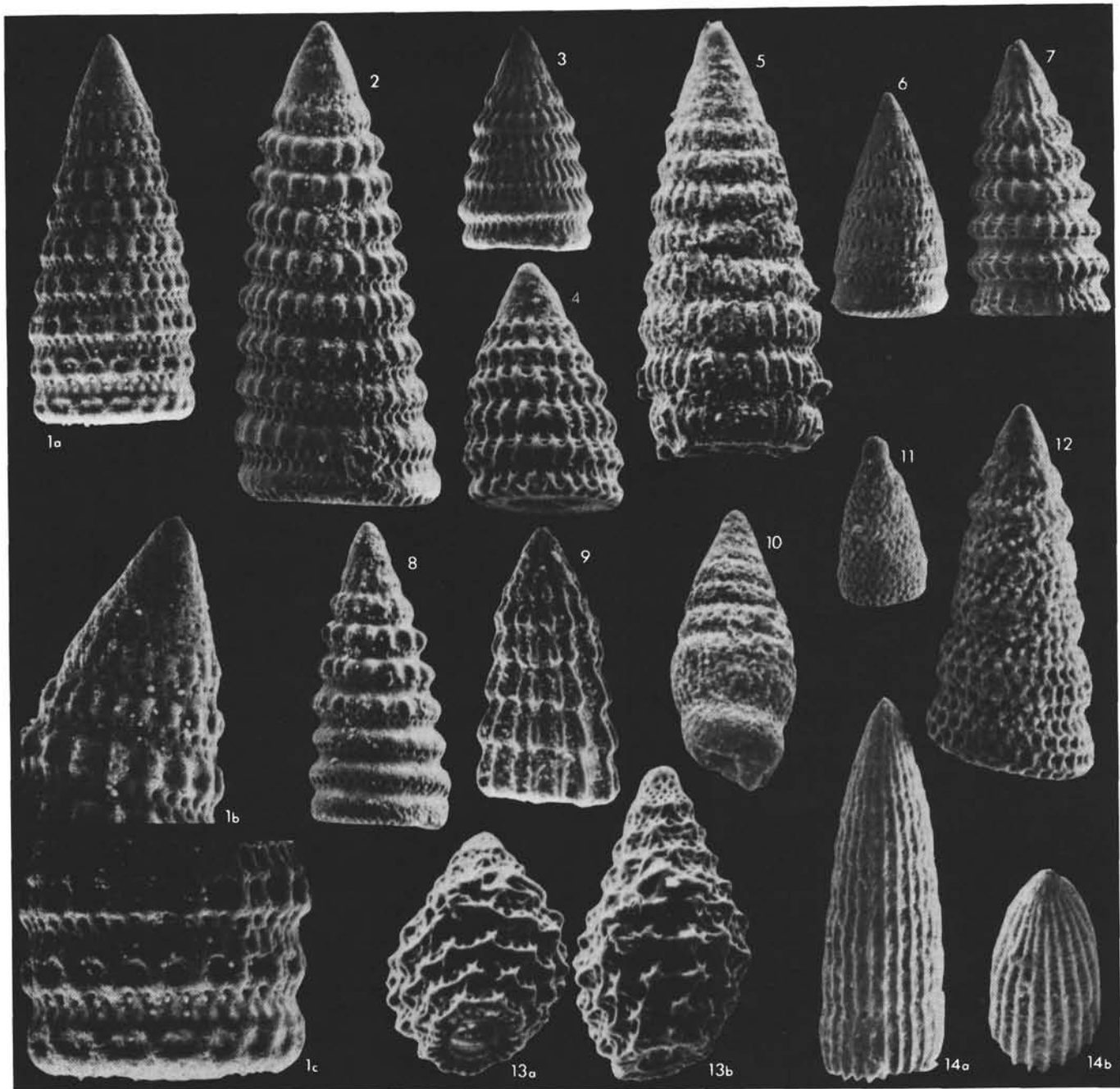


Plate 3. Photomicrographs.

- Figures 1a-c. *Pseudodictyomitra carpatica* (Loznyi) (Loznyi) (×200). Fig. 1a. Lateral view (×200). Fig. 1b. Cephalis texture, showing molds of nannoplankton (×350). Fig. 1c. The three last segments, showing the disposition of the costae and pores (×350). Sample 466-34-2, 16-17 cm; SEM 79362 to 79364.
- Figure 2. *Pseudodictyomitra carpatica* (Loznyi) (×200). Sample 463-89-1, 105-106 cm; SEM 781075.
- Figure 3. *Pseudodictyomitra leptocoica* (Foreman) (×200). Sample 463-90,CC, SEM 781120.
- Figure 4. *Parvicingula hsui* Pessagno (×200). Sample 463-89-1, 105-106 cm; SEM 79036.
- Figure 5. *Pseudodictyomitra lodogaensis* Pessagno (×200). Sample 465A-29-1, 43-44 cm; SEM 79306.
- Figure 6. *Archaeodictyomitra nuda*, n. sp. (×200). Paratype. Sample 463-90,CC; SEM 781098.

- Figure 7. *Archaeodictyomitra puga*, n. sp. (×200). Paratype. Sample 463-89-1, 94-95 cm; SEM 781154.
- Figure 8. *Pseudodictyomitra lilyae* (Tan Sin Hok) (×200). Sample 463-89-1, 94-95 cm; SEM 781134.
- Figure 9. *Pseudodictyomitra formosa* (Squinabol) (×200). Sample 466-34-2, 16-17 cm; SEM 79313.
- Figure 10. *Pseudodictyomitra vestalensis* Pessagno (×200). Sample 465A-29-1, 43-44 cm; SEM 79323.
- Figure 11. *Amphipyndax mediocris* (Tan Sin Hok) (×200). Sample 465A-29-1, 43-44 cm; SEM 79330.
- Figure 12. *Parvicingula? tekschaensis* (Aliev) (×200). Sample 466-34-2, 16-17 cm; SEM 79337.
- Figure 13a, b. *Parvicingula boesii* (Parona) (×200). Sample 463-89-1, 94-95 cm; SEM 79064 and 79065.
- Figures 14a, b. *Archaeodictyomitra* sp. (×200). Sample 466-34-2, 16-17 cm; SEM 79345 and 79366.

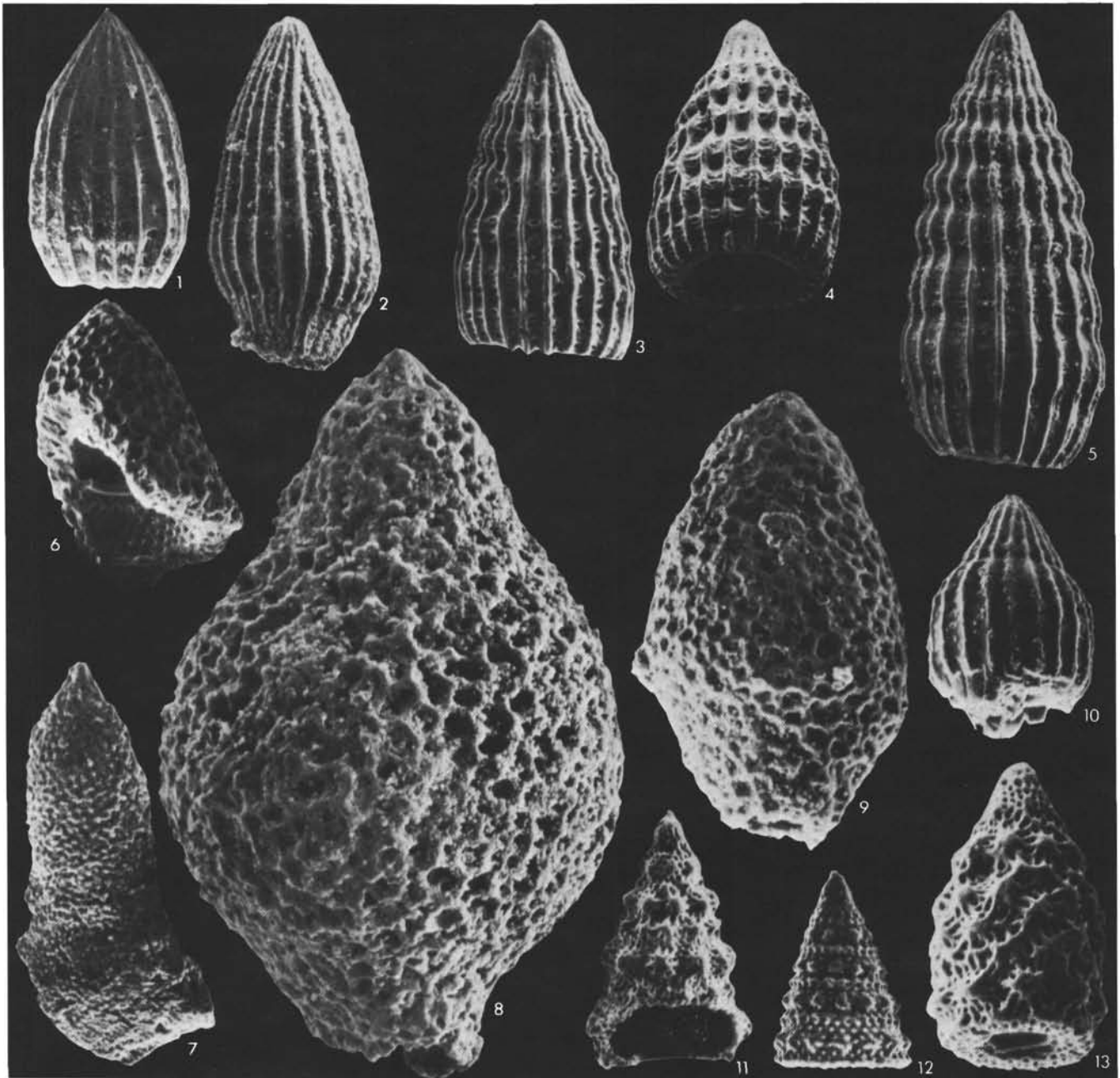


Plate 4. Photomicrographs.

Figure 1. *Archaeodictyomitra* sp. ($\times 200$). This species, very similar to *A. vulgaris*, has two rows of pores at each segment. Sample 463-90,CC; SEM 781109.

Figure 2. *Archaeodictyomitra vulgaris* Pessagno ($\times 200$). Sample 463-89-1, 105-106 cm; SEM 781079.

Figure 3. *Archaeodictyomitra* sp. cf. *A. puga* n. sp. ($\times 200$). Sample 463-89-1, 105-106 cm; SEM 781067.

Figure 4. *Archaeodictyomitra* sp. cf. *A. puga*, n. sp. ($\times 200$). This specimen has a less pronouncedly undulating outline than typical *A. puga* (see Pl. 3, Fig. 7). Sample 463-89-1, 105-106 cm; SEM 781068.

Figure 5. *Archaeodictyomitra pseudoscalaris* (Tan Sin Hok) ($\times 200$). Sample 463-89-1, 105-106 cm; SEM 781076.

Figure 6. *Obesacapsula somphedia* (Foreman) ($\times 200$). Details of cephalis and intersegmental structures. Sample 465A-29-1, 43-44 cm; SEM 79332.

Figure 7. *Obesacapsula somphedia* (Foreman) ($\times 200$). Atypical specimen, less inflated. Sample 465A-29-1, 43-44 cm; SEM 79310.

Figure 8. *Obesacapsula somphedia* (Foreman) ($\times 200$). Large, typical morphotype. Sample 465A-29-1, 43-44 cm; SEM 79308.

Figure 9. *Obesacapsula somphedia* (Foreman) ($\times 200$). Small morphotype. Sample 465A-29-1, 43-44 cm; SEM 79294.

Figure 10. *Thanarla pulchra* (Squinabol) ($\times 200$). Sample 463-89-1, 94-95 cm; SEM 781178.

Figure 11. *Xitus spicularius* (Aliev) ($\times 200$). Note the small broken spine and the great number of rows pores. Sample 463-89-1, 105-106 cm; SEM 79280.

Figure 12. *Xitus* sp. cf. *X. spicularius* (Aliev) ($\times 200$). Sample 463-89-1, 105-106 cm; SEM 79250.

Figure 13. *Parvicingula* sp. cf. *P. boesii* (Parona) ($\times 200$). The shape of the last segments from this morphotype is more cylindrical than the shape of the original species (see Pl. 3, Figs. 13a, b). Sample 463-89-1, 94-95 cm; SEM 79061.

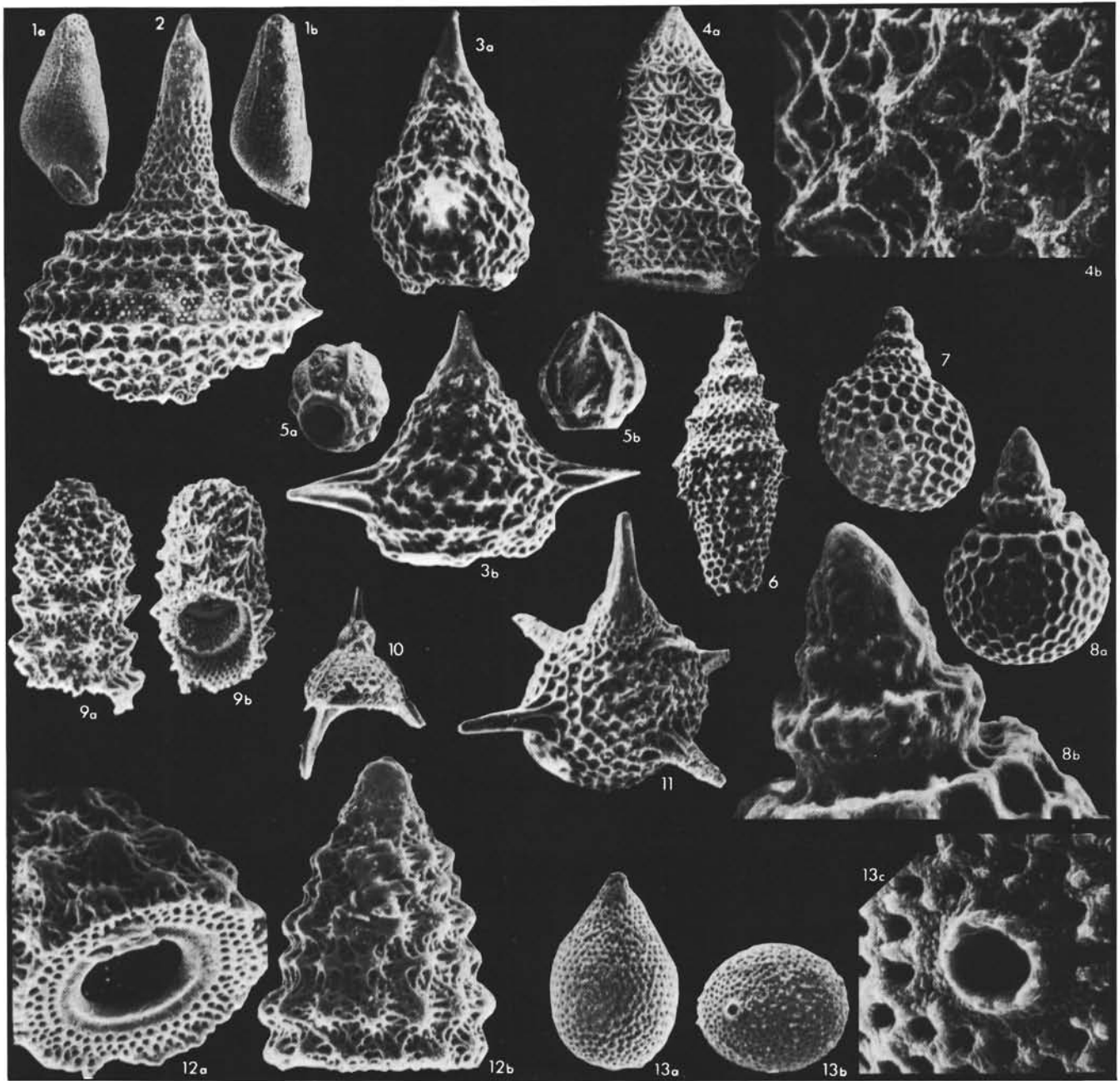


Plate 5. Photomicrographs.

Figures 1a, b. *Eucyrtis columbaria* Renz ($\times 200$). Sample 463-90,CC; SEM 781008 and 781009.

Figure 2. *Lithocampe chenodes* Renz ($\times 200$). Note the five rows of pores and the relative little size of the specimen. Sample 463-90,CC; SEM 781004.

Figures 3a, b. *Dibolachras tythopora* Foreman ($\times 200$). Sample 463-89-1, 94-95 cm; SEM 781174 and 781175.

Figures 4a, b. *Xitus alievi* (Foreman). Fig. 4a. Lateral view ($\times 200$). Fig. 4b. Details of the wall structure ($\times 750$). Sample 463-90,CC; SEM 78988 and 78990.

Figures 5a, b. Gen. and sp. indet. ($\times 200$). Sample 465A-29-1, 43-44 cm; SEM 79327 and 79328.

Figure 6. *Eucyrtis elido*, n. sp. ($\times 200$). Sample 463-90,CC; SEM 781002.

Figure 7. *Siphocampium? davidi*, n. sp. ($\times 200$). Sample 463-90,CC; SEM 781010.

Figures 8a, b. *Sethocapsa uterculus* (Parona) ($\times 200$). Fig. 8a. Lateral view. Fig. 8b. Details of cephalis ($\times 575$). Sample 463-89-1, 105-106 cm; SEM 79228 and 79229.

Figures 9a, b. *Xitus* sp. A ($\times 200$). Sample 463-89-1, 94-95 cm; SEM 781183 and 781184.

Figure 10. *Dictyophimus gracilis* Tan Sin Hok ($\times 200$). Sample 463-90,CC; SEM 781011.

Figure 11. *Podobursa triacantha* (Fischli) ($\times 200$). Sample 463-89-1, 105-106 cm; SEM 781066.

Figures 12 a, b. *Xitus spicularius* (Aliev) ($\times 200$). Fig. 12a. Detail of antapical part ($\times 350$). Fig. 12b. Lateral view ($\times 200$). Sample 463-89-1, 105-106 cm; SEM 781072 and 781166.

Figures 13a-c. *Theocorys renzae*, n. sp. ($\times 200$). Fig. 13a. Lateral view ($\times 200$). Fig. 13b. Antapical view, showing the constricted aperture ($\times 200$). Fig. 13c. Aperture ($\times 1500$). Paratype. Sample 463-89-1, 105-106 cm; SEM 781061, 781062, and 781158.

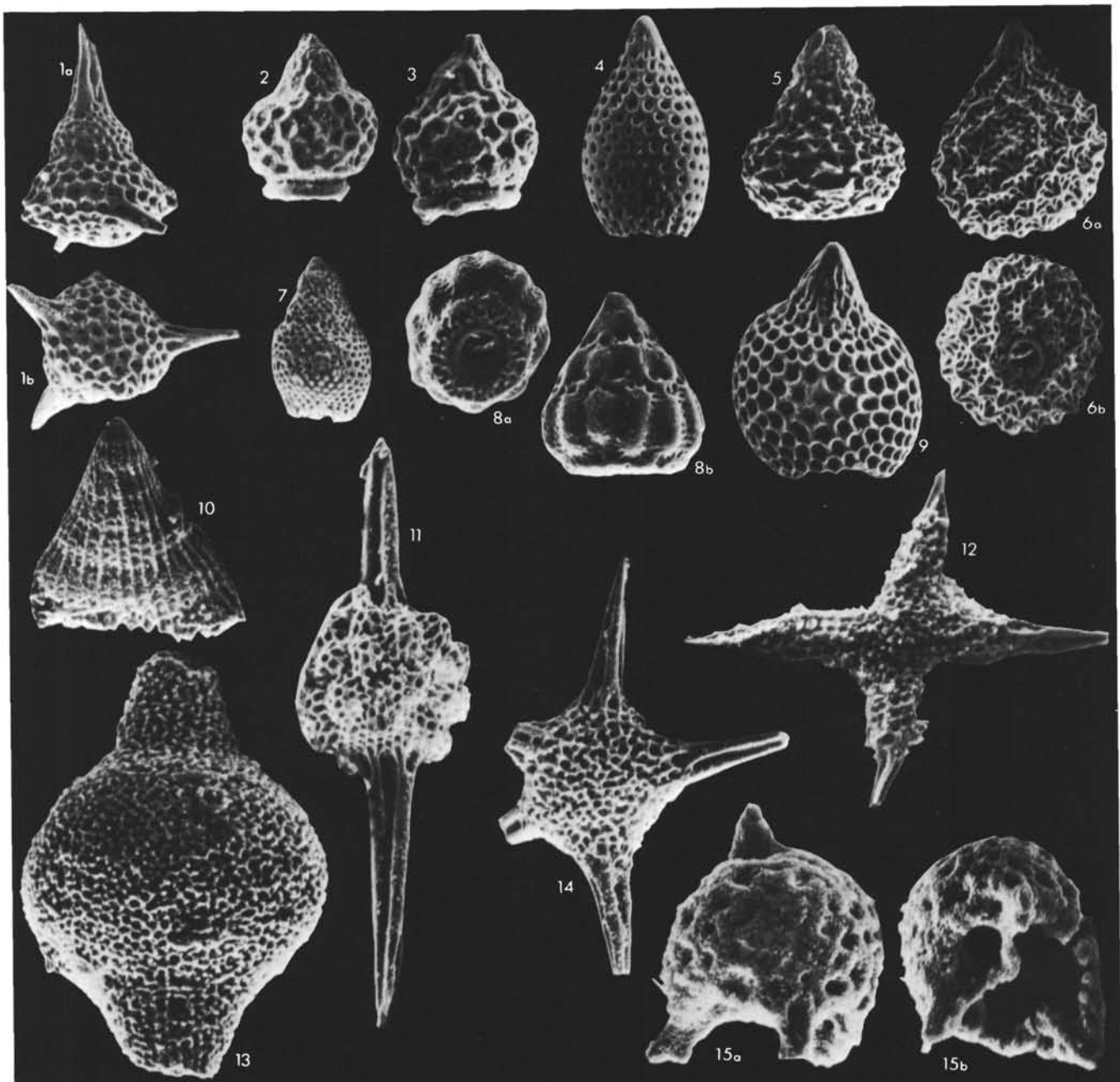


Plate 6. Photomicrographs.

Figures 1a, b. *Podobursa tricola* Foreman ($\times 200$). Fig. 1a. Lateral view, showing the small abdomen. Fig. 1b. Antapical view, with broken apertural tube. Sample 463-89-1, 94-95 cm; SEM 781129 and 781130.

Figure 2. *Rhopalosyringium majuroensis*, n. sp. ($\times 200$). Paratype. Sample 465A-29-1, 43-44 cm; SEM 79325.

Figure 3. *Rhopalosyringium majuroensis*, n. sp. ($\times 200$). Sample 465A-29-1, 43-44 cm; SEM 79304.

Figure 4. *Stichocapsa criбата* Hinde ($\times 200$). Sample 463-89-1, 105-106 cm; SEM 79227.

Figure 5. *Stichocapsa rutteni* Tan Sin Hok ($\times 200$). Sample 463-90, CC; SEM 781103.

Figures 6a, b. *Cyrtocapsa grutterinki* Tan Sin Hok ($\times 200$). Fig. 6a. Lateral view. Fig. 6b. Antapical view, showing the aperture. Sample 463-89-1, 105-106 cm; SEM 79269 and 79270.

Figure 7. Gen. and sp. indet. ($\times 200$). Sample 463-89-1, 105-106 cm; SEM 79277.

Figures 8a, b. Gen. and sp. indet. ($\times 200$). Sample 463-89-1, 105-106 cm; SEM 79241 and 79242.

Figure 9. ?*Cyrtocapsa asseni* var. α Tan Sin Hok ($\times 200$). Sample 463-89-1, 105-106 cm; SEM 79255.

Figure 10. ?*Mita magnifica* Pessagno ($\times 200$). Sample 466-34-2, 16-17 cm; SEM 79355.

Figure 11. *Acaeniotyle umbilicata* (Rüst) ($\times 200$). Sample 463-89-1, 105-106 cm; SEM 79273.

Figure 12. ?*Higumastra* sp. ($\times 200$). Sample 463-89-1, 105-106 cm; SEM 79033.

Figure 13. ?*Spongodrappa cocos* Rüst ($\times 200$). Sample 466-34-2, 16-17 cm; SEM 79380.

Figure 14. *Pentaspheera longispina* Squinabol ($\times 200$). Sample 463-89-1, 94-95 cm; SEM 781191.

Figures 15a, b. *Saitoum cepeki*, n. sp. ($\times 700$). Specimen with small pores. Sample 463-90, CC; SEM 781111 and 781112.

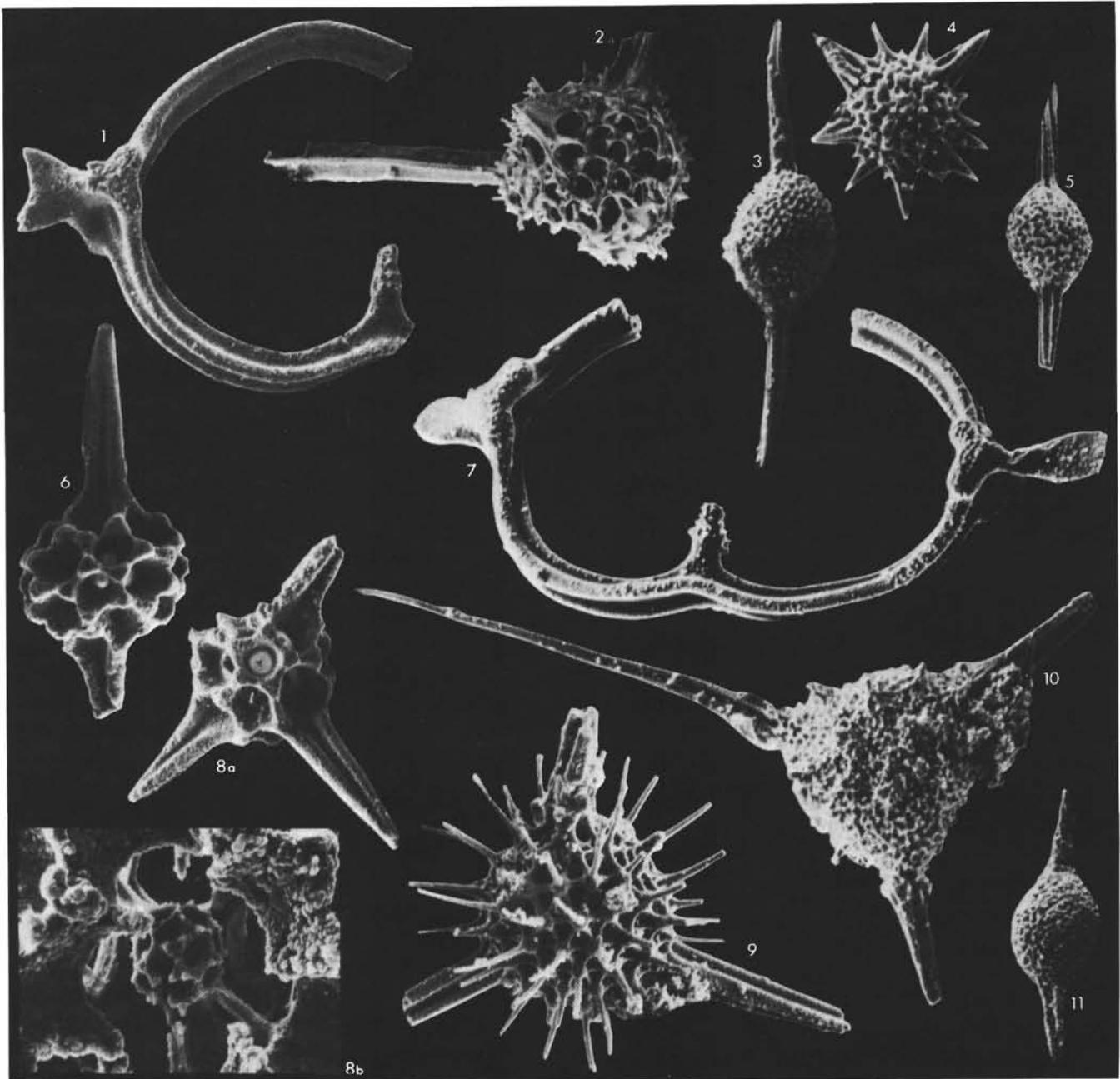


Plate 7. Photomicrographs.

Figure 1. *Acanthocircus dicranacanthos* (Squinabol) ($\times 200$). Sample 463-90, CC; SEM 78992.

Figure 2. *Hexastylurus magnificus* (Squinabol) ($\times 200$). Sample 463-89-1, 105-106 cm; SEM 79044.

Figure 3. *Archaeospongoprunum tehamaensis* Pessagno ($\times 200$). Sample 463-89-1, 105-106 cm; SEM 79045.

Figure 4. Gen. and sp. indet. ($\times 200$). Sample 463-89-1, 94-95 cm; SEM 79072.

Figure 5. *Archaeospongoprunum tehamaensis* Pessagno ($\times 200$). Note the pentaradiate and triradiate character of the polar spines. Sample 463-89-1, 105-106 cm; SEM 79278.

Figure 6. *Sphaerostylus lanceola* (Parona) ($\times 200$). Sample 463-89-1, 105-106 cm; SEM 79047.

Figure 7. *Acanthocircus* sp. ($\times 200$). Sample 463-89-1, 105-106 cm; SEM 79259.

Figures 8a, b. *Staurosphaera septemporata* Parona ($\times 200$). Fig. 8a. Lateral view. Fig. 8b. Details of the first medullary shell ($\times 700$). Sample 463-89-1, 105-106 cm; SEM 781077 and 781078.

Figure 9. *Alievium helenae*, n. sp. ($\times 200$). Paratype. Sample 463-89-1, 105-106 cm; SEM 781064.

Figure 10. *Alievium antiguum* Pessagno ($\times 200$). Sample 463-89-1, 94-95 cm; SEM 781169.

Figure 11. *Archaeospongoprunum cortinaensis* Pessagno ($\times 200$). Sample 465A-29-1, 43-44 cm; SEM 79341.

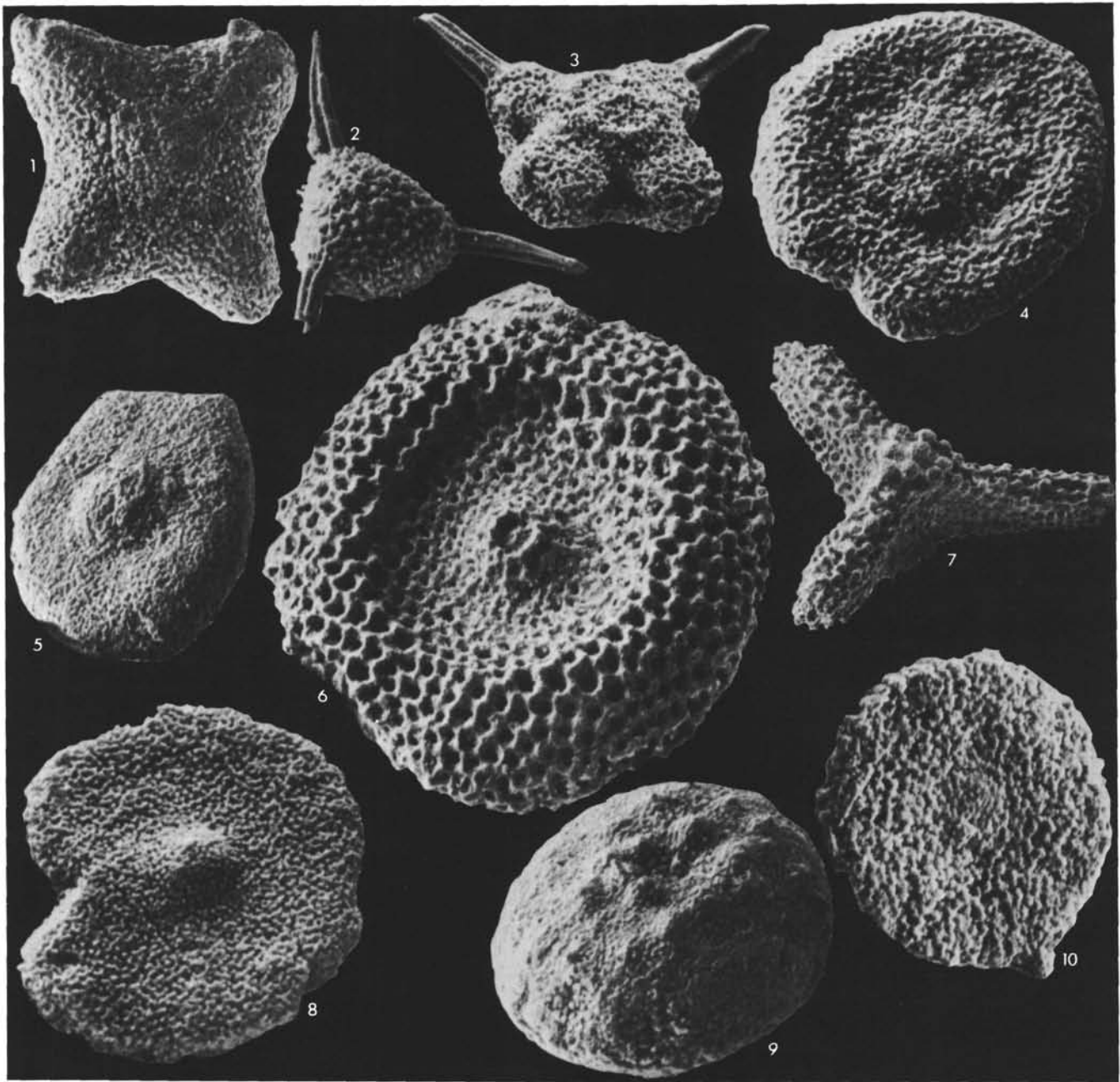


Plate 8. Photomicrographs.

Figure 1. *Histiastrum aster* Lipman ($\times 200$). Sample 465A-29-1, 43-44 cm; SEM 79309.

Figure 2. *Alievium antiquum* Pessagno ($\times 200$). Sample 463-89-1, 105-106 cm; SEM 79042.

Figure 3. *Crucella* sp. cf. *C. cachensis* Pessagno ($\times 200$). Sample 463-89-1, 94-95 cm; SEM 781181.

Figure 4. *?Spongodiscus renillaeformis* Campbell and Clark ($\times 200$). Sample 465A-29-1, 43-44 cm; SEM 79316.

Figure 5. *?Spongodiscus renillaeformis* Campbell and Clark ($\times 200$). Sample 465A-29-1, 43-44 cm; SEM 79342.

Figure 6. *Orbiculiforma chartonae*, n. sp. ($\times 200$). Paratype. Sample 465A-29-1, 43-44 cm; SEM 79339.

Figure 7. *Paronaella* sp. ($\times 200$). Sample 463-90, CC; SEM 781012.

Figure 8. *?Spongodiscus renillaeformis* Campbell and Clark ($\times 200$). Sample 466-34-2, 16-17 cm; SEM 79373.

Figure 9. *Patellula planoconvexa* (Pessagno) ($\times 200$). Sample 465A-29-1, 43-44 cm; SEM 79336.

Figure 10. *Spongodiscus americanus* Kozlova ($\times 200$). Sample 465A-29-1, 43-44 cm; SEM 79317.

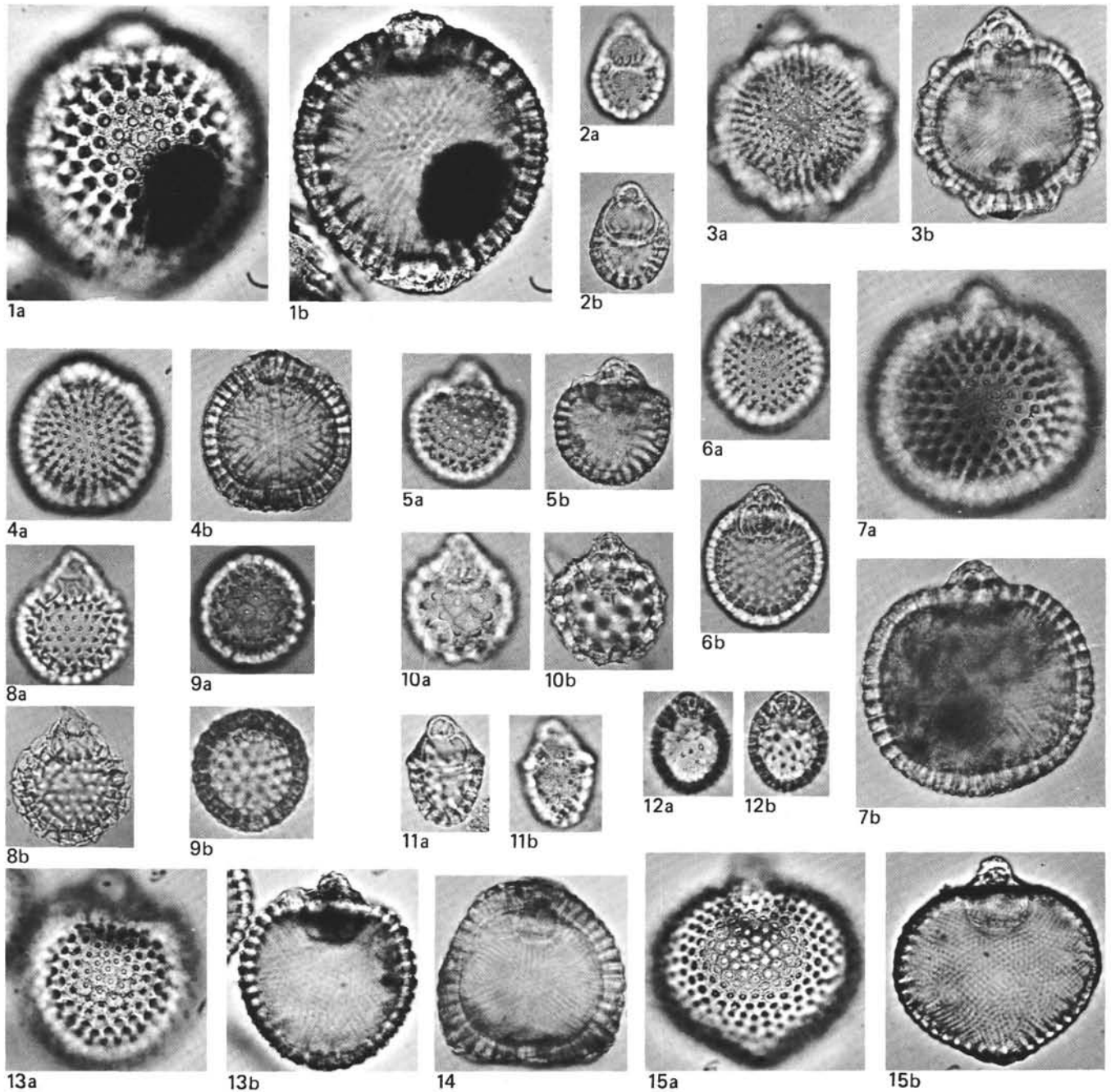


Plate 9. Photomicrographs.

Figures 1a, b. *Gongylothorax baumgartneri*, n. sp. Holotype. Sample 463-90, CC; slide 2; E.F. T 45/3.
 Figures 2a, b. *Diacanthocapsa boersmae*, n. sp. Holotype. Sample 463-92-1, 0-1 cm; slide 2; E.F. N 44/4.
 Figures 3a, b. *Williriedellum peterschmittae*, n. sp. Paratype. Sample 463-89-1, 105-106 cm; slide 3; E.F. H 35/2.
 Figures 4a, b. *Holocryptocapsa hindei* Tan Sin Hok. Sample 463-91, CC; slide 2; E.F. F 42/1.
 Figures 5a, b. *Cryptamphorella dumitricai*, n. sp. Sample 463-89-1, 105-106 cm; slide 6; E.F. R 30/2.
 Figures 6a, b. *Cryptamphorella challengerii*, n. sp. Holotype. Sample 463-88-1, 52-53 cm; slide 5; E.F. X 34/4.
 Figures 7a, b. *Hemicryptocapsa?* sp. cf. *H. cryptodon* Dumitrică. Sample 463-89-1, 105-106 cm; slide 2; E.F. H 50/2.

Figures 8a, b. *Hemicryptocapsa* sp. cf. *H. prepolyhedra* Dumitrică. Sample 463-86-1, 31-32 cm; slide 3; E.F. T 44/3.
 Figures 9a, b. *Gongylothorax verbeeki* (Tan Sin Hok). Sample 463-85-2, 20-21 cm; slide 2; E.F. O 37/1.
 Figures 10a, b. *Hemicryptocapsa vincentae*, n. sp. Holotype. Sample 463-86, CC; slide 3; E.F. R 56/3.
 Figures 11a, b. *Diacanthocapsa* sp. Sample 463-85-1, 142-143 cm; slide 4; E.F. K 45/2.
 Figures 12a, b. *Diacanthocapsa boersmae*, n. sp. Paratype. Sample 463-88-1, 52-53 cm; slide 5; E.F. X 35/4.
 Figures 13a, b. *Cryptamphorella dumitricai*, n. sp. Holotype. Sample 463-90, CC; slide 2; E.F. X 43/2.
 Figure 14. *Holocryptocapsa hindei* Tan Sin Hok. Sample 463-86-1, 31-32 cm; slide 4; E.F. W 29/4.
 Figures 15a, b. *Cryptamphorella conara* (Foreman). Sample 463-90, CC; slide 5; E.F. T 37/1.

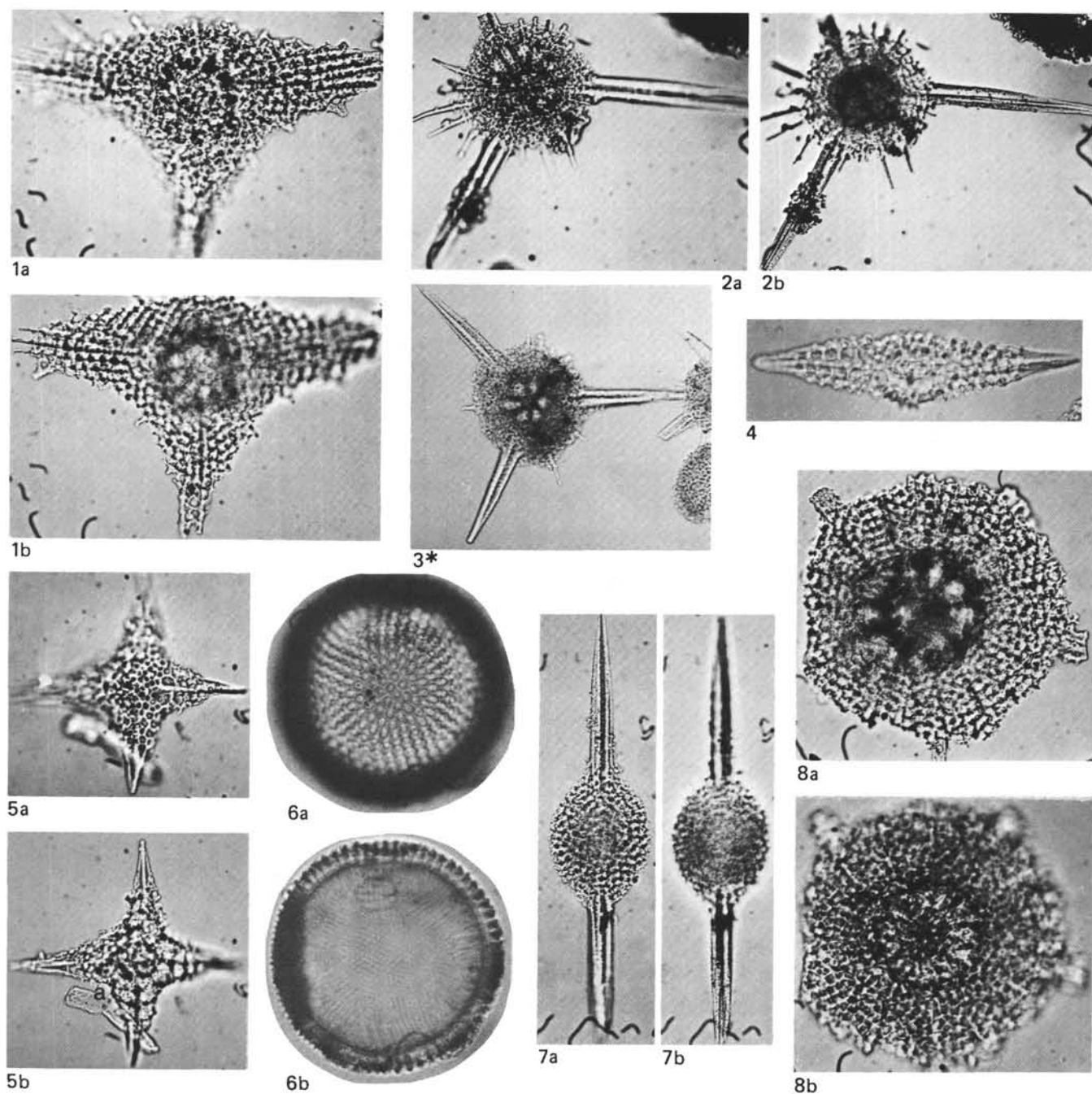


Plate 10. Photomicrographs.

Figures 1a, b. Gen. and sp. indet. Sample 463-90,CC; slide 11; E.F. B 3/1.

Figures 2a, b. *Alievium helenae*, n. sp. Holotype. Sample 463-90,CC; slide 11; E.F. L 38/3.

Figure 3. *Alievium* sp. ($\times 100$). Sample 463-89-1, 94-95 cm; slide 9; E.F. W 32/4.

Figure 4. *Amphibrachium?* *hastatum* Renz. Sample 463-87-1, 65-66 cm; slide 3; E.F. Q 44/2.

Figures 5a, b. *Higumastra* sp. Sample 463-90,CC; slide 11; E.F. Q 30/4.

Figures 6a, b. *Holocryptocanium barbui* Dumitrică. Sample 465A-29-1, 43-44 cm; slide 17; E.F. U 40/1.

Figures 7a, b. *Archaeospongoprunum tehamaensis* Pessagno. Sample 463-90,CC; slide 13; E.F. E 39/3.

Figures 8a, b. Gen. and sp. indet. Sample 463-90,CC; slide 14; E.F. U 40/4.

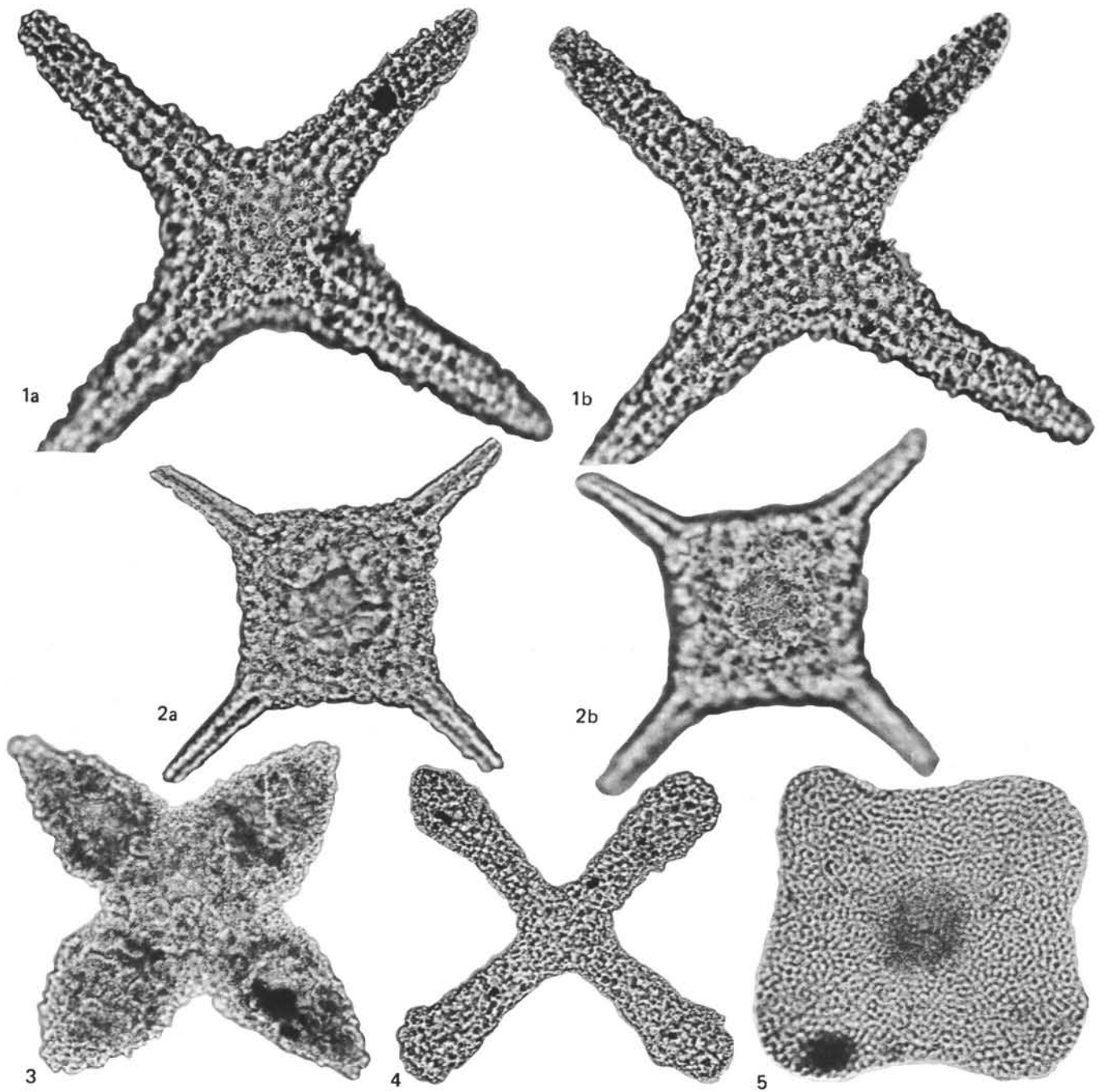


Plate 11. Photomicrographs.

Figures 1a, b. *Hagiastrum? euganeum* (Squinabol). Sample 463-75-1, 21-22 cm; slide 23; E.F. W 43/1.

Figures 2a, b. *Staurocyclia martini* Rüst. Sample 463-75-1, 21-22 cm; slide 23; E.F. G 50/3.

Figure 3. *Crucella* sp. indet. Sample 463-66-2, 27-28 cm; slide 4; E.F. U 54/1.

Figure 4. *Hagiastrum? subacutum* Rüst. Sample 463-75-1, 21-22 cm; slide 21; E.F. K 53/1.

Figure 5. *Histiastrium aster* Lipman. Sample 466-34-2, 16-17 cm; slide 13; E.F. S 46/3.

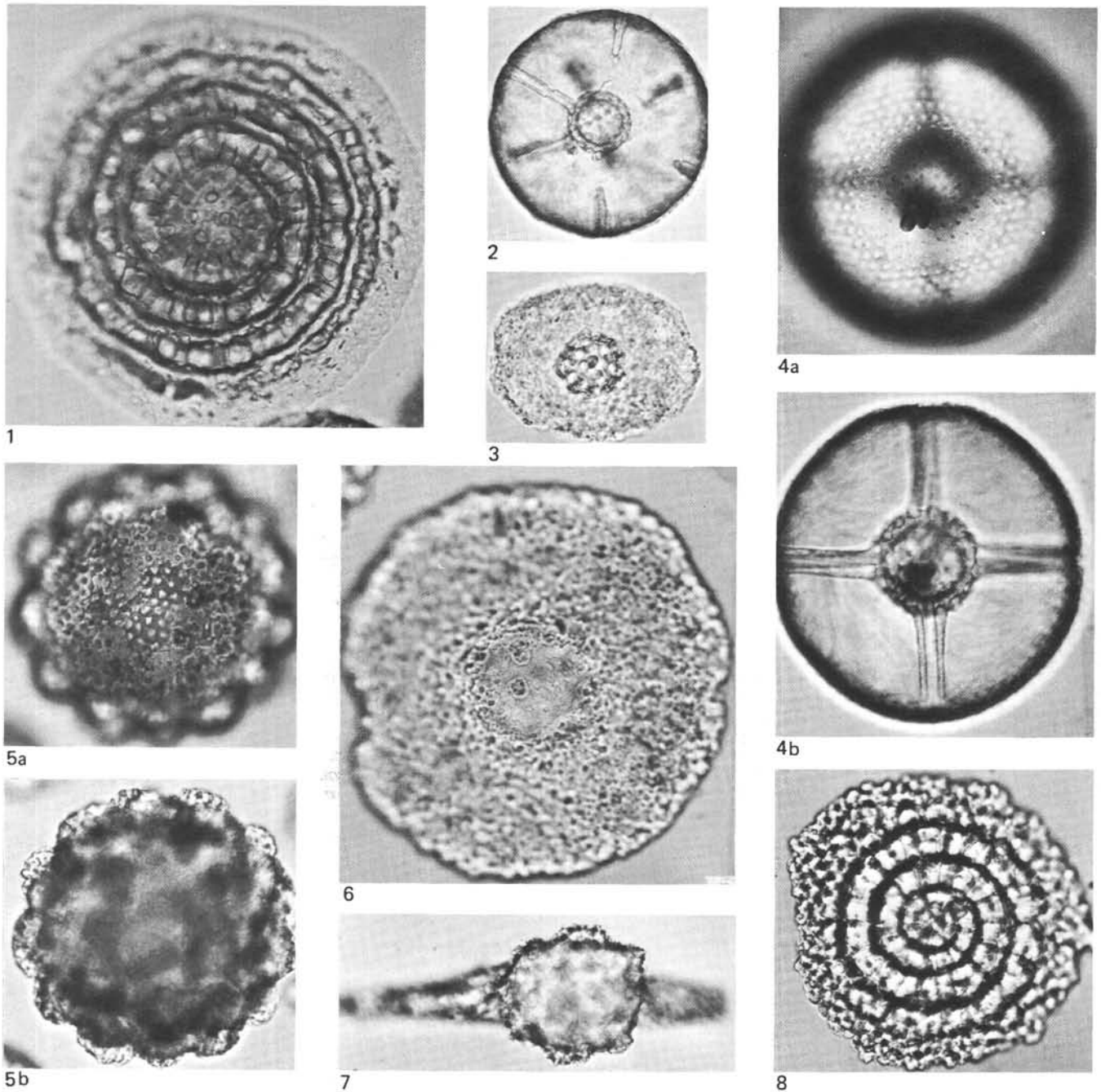


Plate 12. Photomicrographs.

Figure 1. *Stylochlamyrum?* sp. group. Sample 463-72-5, 20-21 cm; slide 2; E.F. M 44/4.

Figure 2. *Hexalonche?* sp. group. Sample 463-72,CC; slide 3; E.F. P 37/2.

Figure 3. *Spongobrachium?* sp. Sample 463-73-1, 18-19 cm; slide 3; E.F. J 49/1.

Figures 4a, b. *Hexalonche?* sp. group. Sample 463-76,CC; slide 4; E.F. S 46/3.

Figures 5a, b. *Conosphaera tuberosa* Tan Sin Hok. Sample 463-90,CC; slide 2; E.F. Q 29/1.

Figure 6. *Pseudoaulophacus? excavatus* (Rüst). Sample 463-84-1, 5-6 cm; slide 3; E.F. J 30/1.

Figure 7. *Triactoma hybum* Foreman. Sample 463-73-1, 18-19 cm; slide 3; E.F. W 53/1.

Figure 8. *Spongocyclia trachodes* Renz. Sample 463-82,CC; slide 7; E.F. K 44/2.

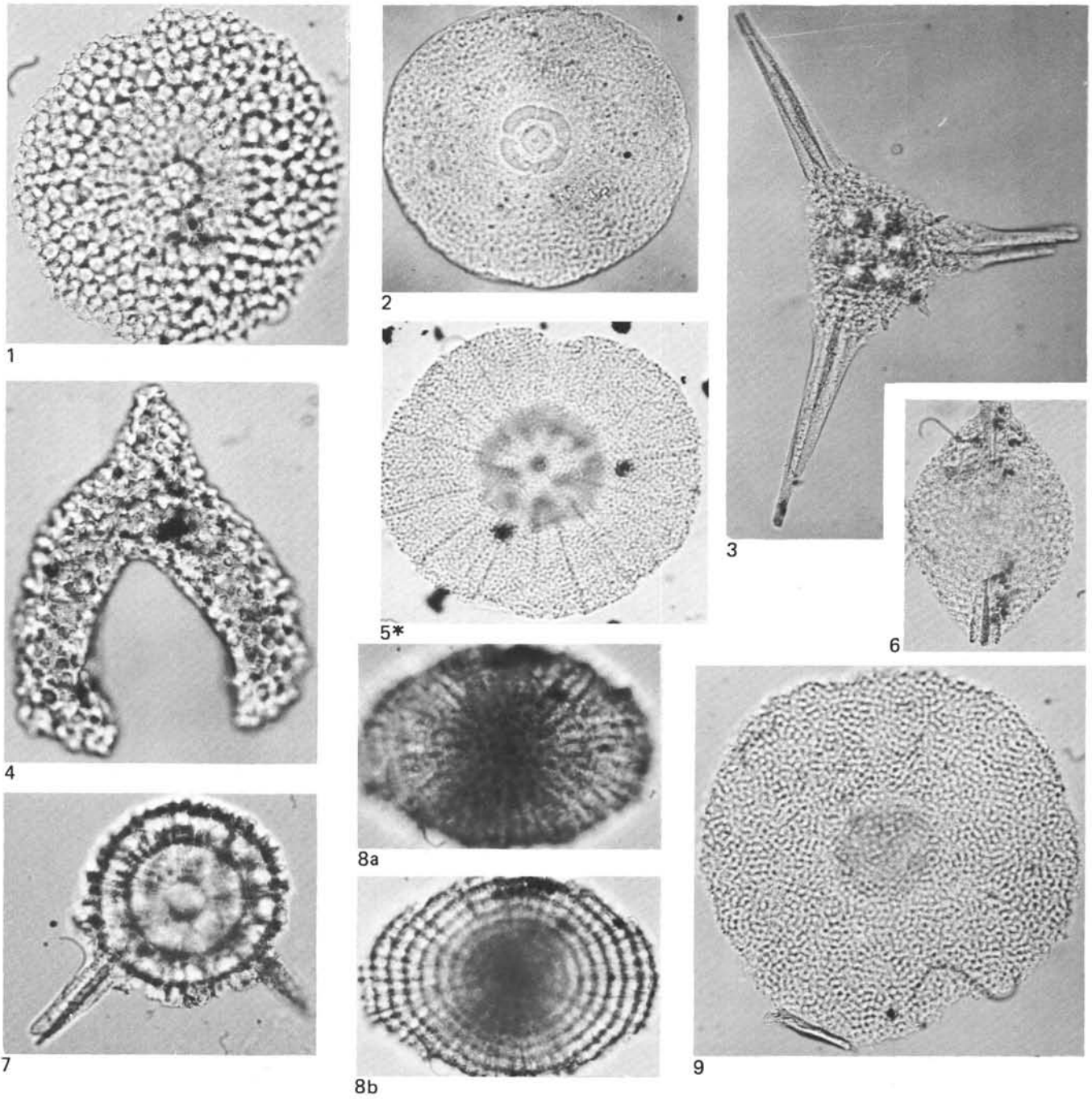


Plate 13. Photomicrographs.

- Figure 1. *Orbiculiforma chartonae*, n. sp. Paratype. Sample 466-34-2, 16-17 cm; slide 1; E.F. O 52/1.
 Figure 2. Gen. and sp. indet. Sample 463-72-3, 14-15 cm; slide 3; E.F. U 32/3.
 Figure 3. ?*Tripocyclia trigonum* Rüst. Sample 463-87-1, 65-66 cm; slide 4; E.F. S 38/1.
 Figure 4. *Paronaella?* *diamphidia* Foreman. Sample 463-84-1, 5-6 cm; slide 4; E.F. D 43/3.

- Figure 5. *Spongodiscus* sp. ($\times 100$). Sample 466-34-2, 80-81 cm; slide 1; E.F. W 47/3.
 Figure 6. Gen. and sp. indet. Sample 466-34-2, 80-81 cm; slide 2; E.F. L 31/4.
 Figure 7. Gen. and sp. indet. Sample 465A-29-1, 43-44 cm; slide 14; E.F. N 27/3.
 Figures 8a, b. *Cromyodruppa concentrica* Lipman. Sample 465A-29-1, 43-44 cm; slide 15; E.F. U 32/2.
 Figure 9. *Spongodiscus renillaeformis* Campbell and Clark. Sample 466-34-2, 16-17 cm; slide 1; E.F. C 39/2.

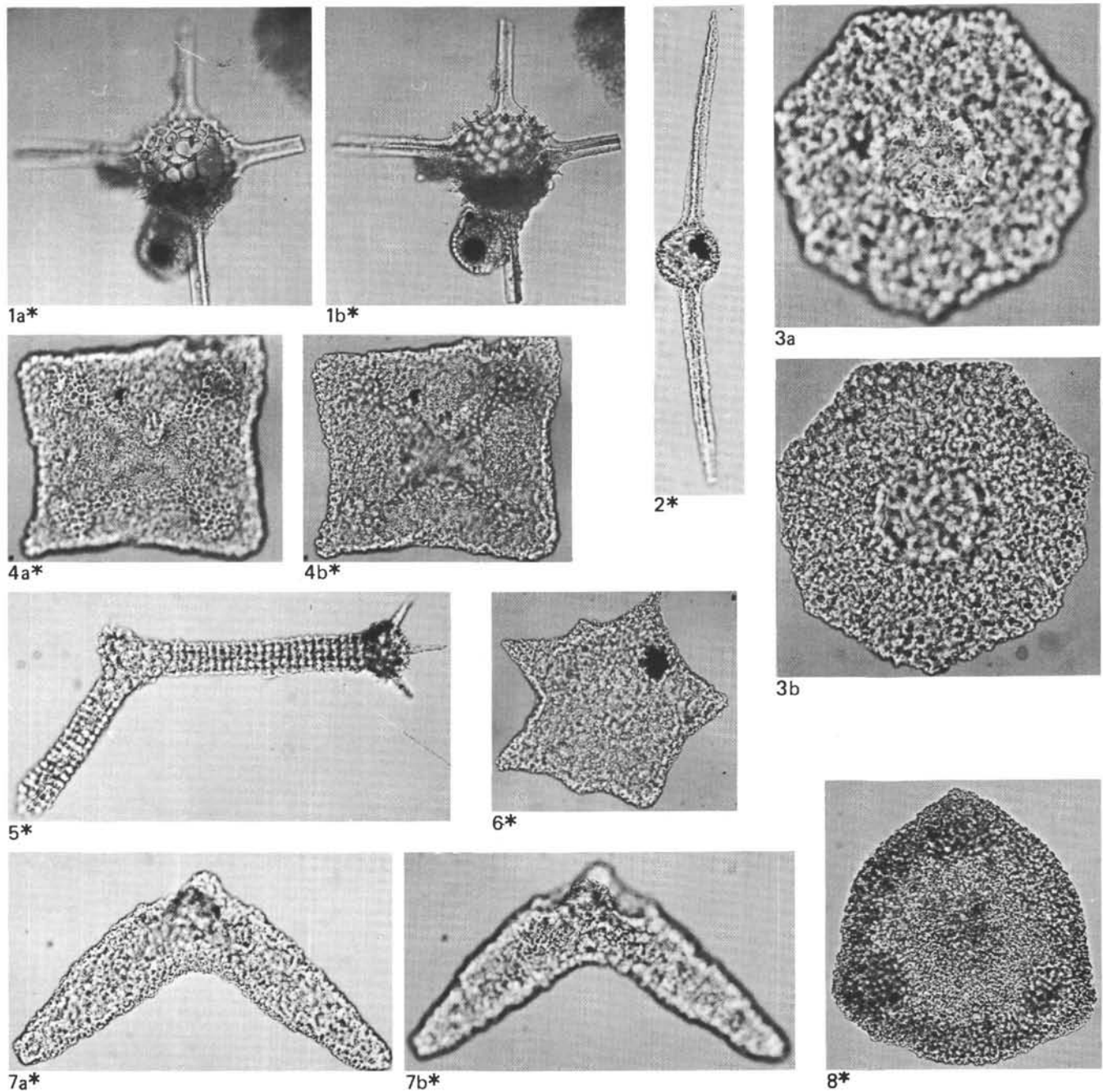


Plate 14. Photomicrographs.

Figures 1a, b. *Hexastylurus magnificus* (Squinabol) ($\times 100$). Sample 463-89-1, 94-95 cm; slide 7; E.F. K 28/2.

Figure 2. *Stylosphaera macrostyla* Rüst ($\times 100$). Sample 463-75-1, 21-22 cm; slide 26; E.F. O 29/1.

Figures 3a, b. *Pseudoaulophacus? sulcatus* (Rüst). Sample 463-75-1, 21-22 cm; slide 20; E.F. J 49/2.

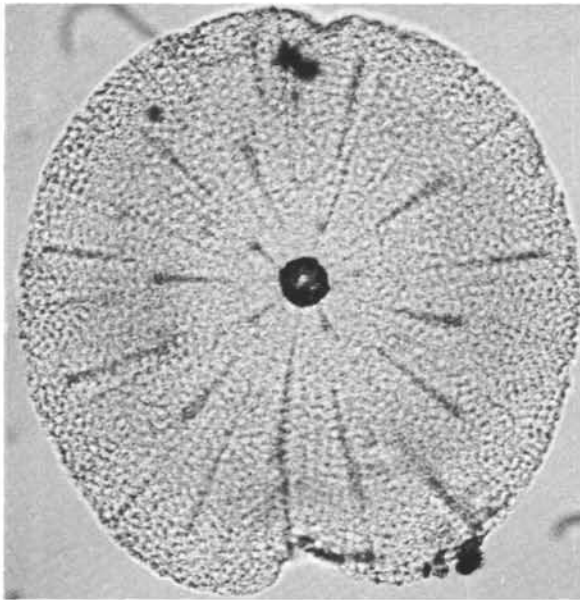
Figures 4a, b. ?*Stephanastrum inflexum* Rüst ($\times 100$). Sample 463-75-1, 21-22 cm; slide 15; E.F. V 34/1.

Figure 5. *Homoeoparonaella tricuspidata* (Rüst) ($\times 100$). Sample 463-75-1, 21-22 cm; slide 26; E.F. S 29/1.

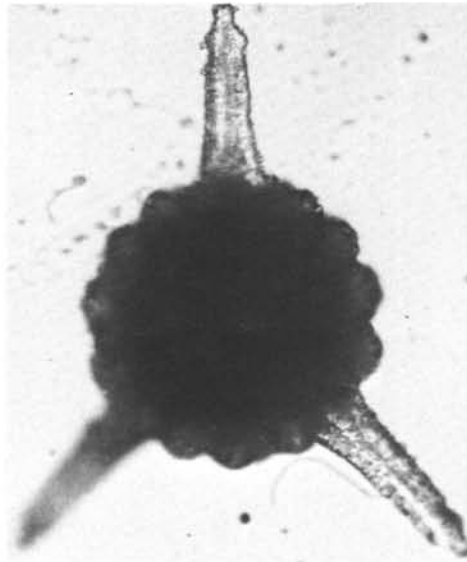
Figure 6. *Hexinastrum cretaceum* Lipman ($\times 100$). Sample 463-75-1, 21-22 cm; slide 15; E.F. S 31/3.

Figures 7a, b. Gen. and sp. indet. ($\times 100$). Sample 463-75-1, 21-22 cm; slide 19; E.F. F 29/1.

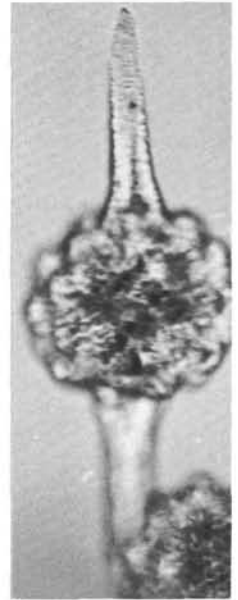
Figure 8. *Cyclastrum infundibuliforme* Rüst ($\times 100$). Sample 463-84-1, 5-6 cm; slide 6; E.F. J 38/4.



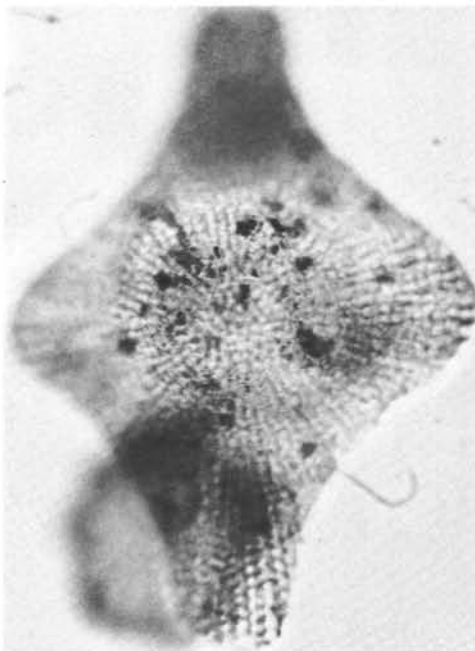
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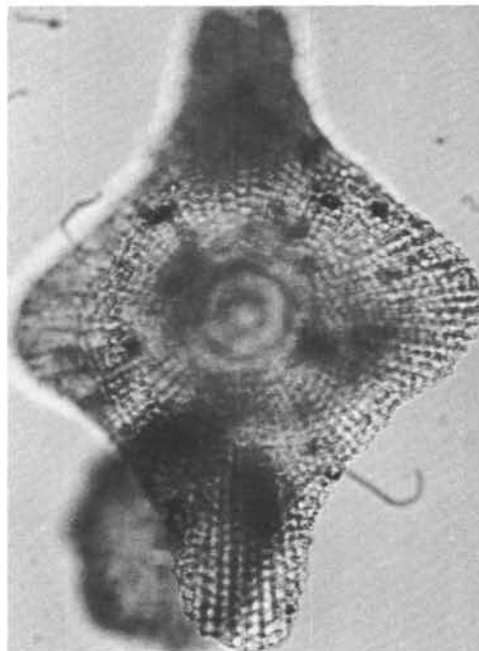
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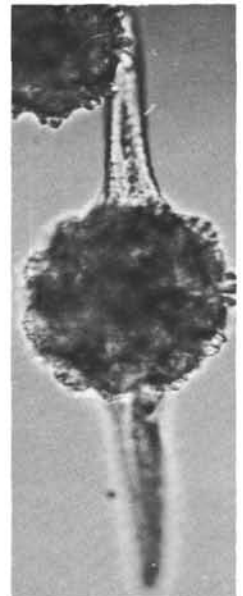
3a



4a



4b



3b

Plate 15. Photomicrographs.

Figure 1. *Spongodiscus renillaeformis* Campbell and Clark. Sample 466-34-2, 16-17 cm; slide 5; E.F. C 42/4.

Figure 2. *Acaeniotyle diaphorogona* Foreman. Sample 463-75-1, 21-22 cm; slide 35; E.F. T 47/3.

Figures 3a, b. *Acaeniotyle umbilicata* (Rüst). Sample 463-89-1, 23-24 cm; slide 4; E.F. J 34/3.

Figures 4a, b. *Spongodruppa cocos* Rüst. Sample 465A-29-1, 43-44 cm; slide 13; E.F. T 27/1.

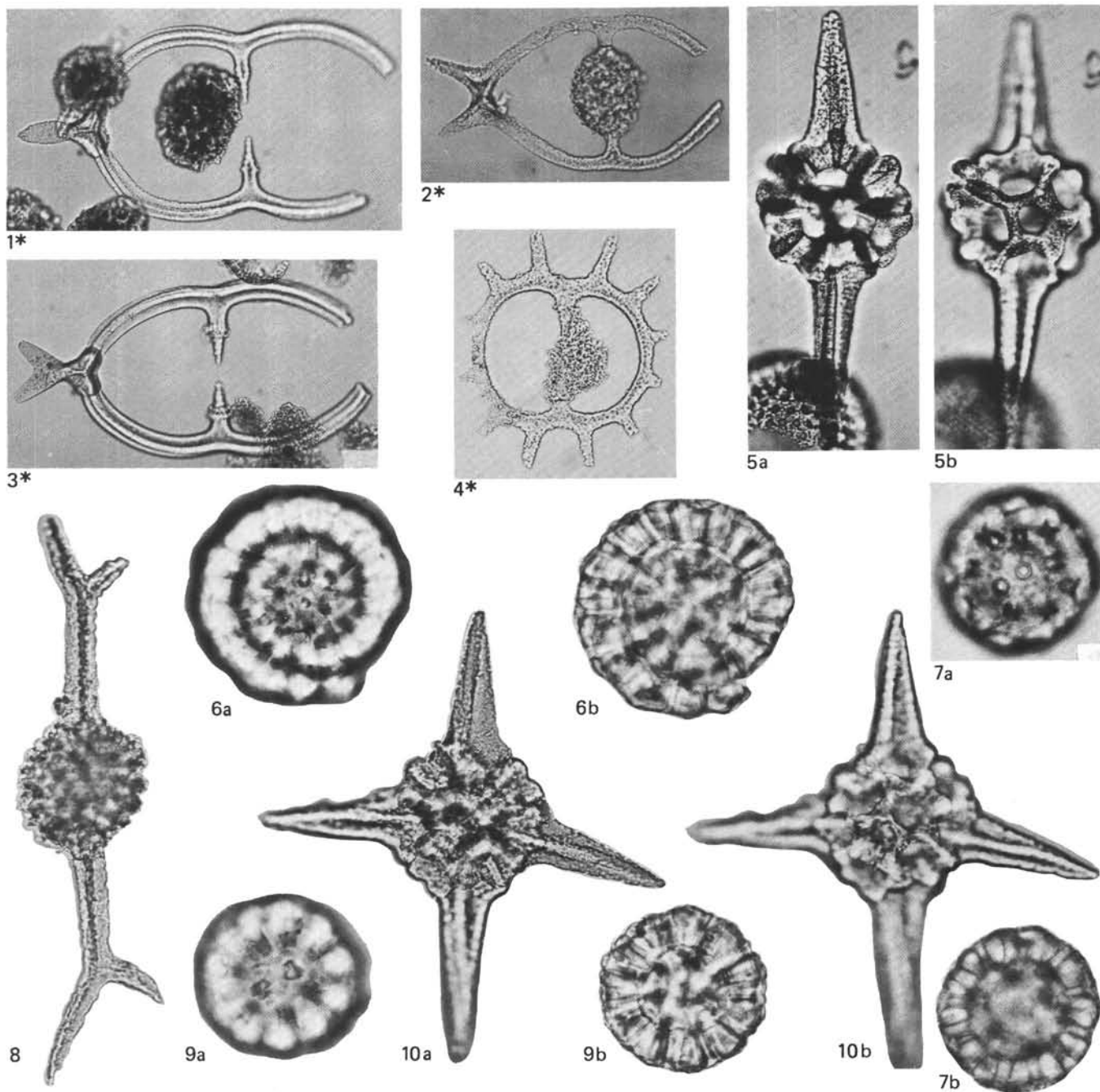


Plate 16. Photomicrographs.

Figure 1. *Acanthocircus trizonalis* (Rüst) ($\times 100$). Sample 463-89-1, 23-24 cm; slide 5; E.F. Q 50/3.
 Figure 2. *Acanthocircus carinatus* Foreman ($\times 100$). Sample 463-75-1, 21-22 cm; slide 1; E.F. C 18/2.
 Figure 3. *Acanthocircus dicranacanthos* (Squinabol) ($\times 100$). Sample 463-89-1, 105-106 cm; slide 5; E.F. Q 37/2.
 Figure 4. *Spongosaturnalis horridus* (Squinabol) group ($\times 100$). Sample 463-75-1, 21-22 cm; slide 2; E.F. O 2/1.
 Figures 5a, b. *Sphaerostylus lanceola* (Parona). Sample 463-90, CC; slide 9; E.F. K 35/4.

Figures 6a, b. *Stylochlamyium?* sp. group. Sample 463-83-1, 38-39 cm; slide 2; E.F. M 43/4.
 Figure 7a, b. Gen. and sp. indet. Sample 463-74-1, 110-111 cm; slide 4; E.F. K 50/4.
 Figure 8. *Dicroa* sp. A Foreman. Sample 463-75-1, 21-22 cm; slide 20; E.F. F 34/4.
 Figures 9a, b. Gen. and sp. indet. Sample 463-77-1, 60-61 cm; slide 4; E.F. H 31/1.
 Figures 10a, b. *Staurosphaera septemporata* Parona. Sample 463-89-1, 23-24 cm; slide 2; E.F. D 36/3.

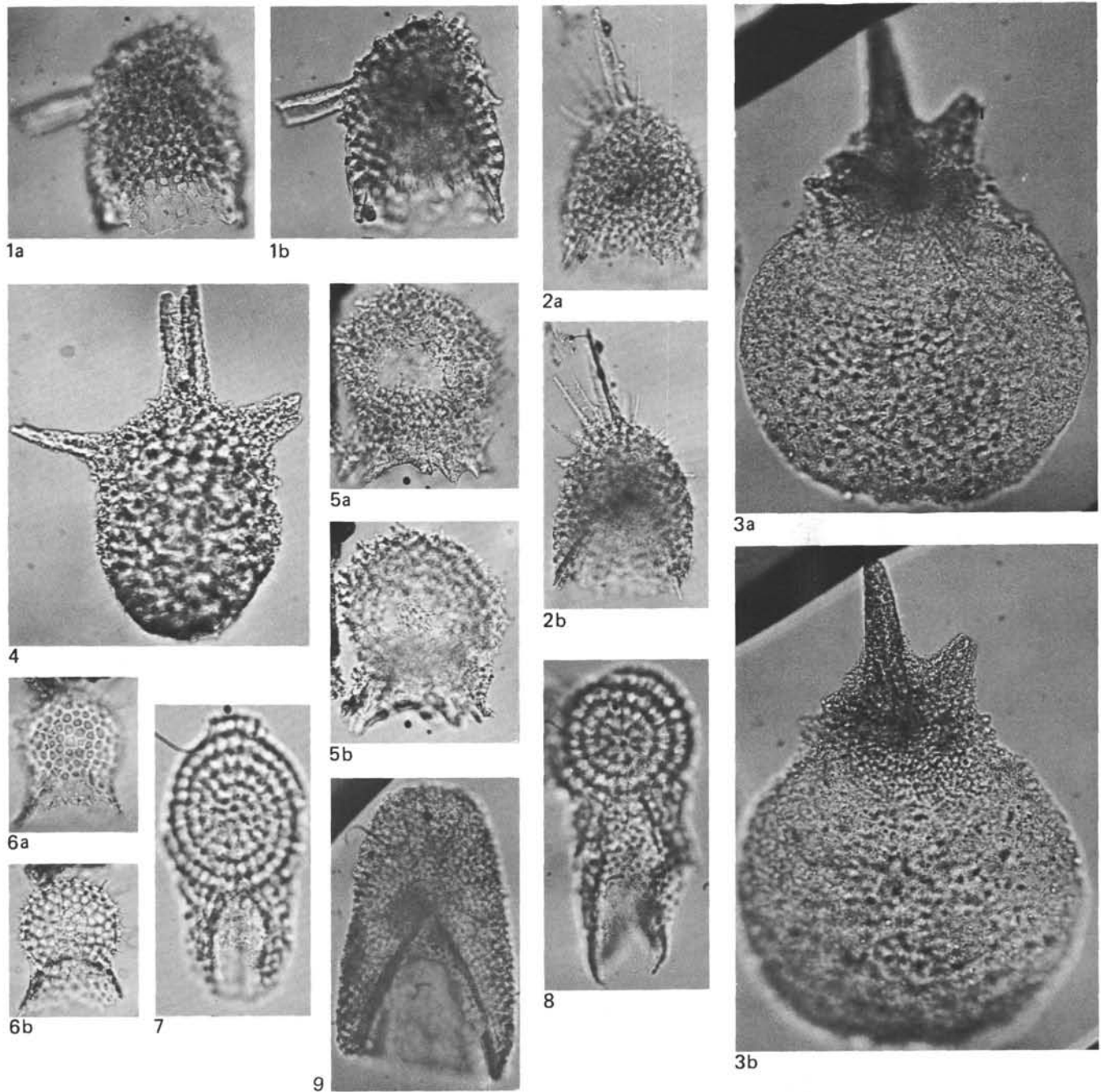


Plate 17. Photomicrographs.

Figures 1a, b. *Spongopyle* sp. Sample 463-89-1, 94-95 cm; slide 10; E.F. B 34/4.

Figures 2a, b. *Spongopyle ecleptos* Renz. Sample 463-91, CC; slide 1; E.F. Z 42/3.

Figures 3a, b. *Spongodiscus misele*, n. sp. Holotype. Sample 463-73-1, 18-19 cm; slide 4; E.F. U 34/1.

Figure 4. Gen. and sp. indet. Sample 463-75-1, 21-22 cm; slide 30; E.F. X 26/3.

Figures 5a, b. *Sphaeropyle* sp. aff. *S. thirencis*, n. sp. Sample 463-90, CC; slide 10; E.F. V 37/2.

Figures 6a, b. *Sphaeropyle thirencis*, n. sp. Holotype. Sample 463-89-1, 15-16 cm; slide 7; E.F. C 45/1.

Figure 7. *Spongopyle insolita* Kozlova. Spiral morphotype. Sample 466-34-2, 16-17 cm; slide 9; E.F. F 43/4.

Figure 8. *Spongopyle insolita* Kozlova. Concentric morphotype. Sample 466-34-2, 16-17 cm; slide 2; E.F. F 47/1.

Figure 9. *Spongopyle ecleptos* Renz. Sample 465A-29-1, 43-44 cm; slide 13; E.F. E 31/4.

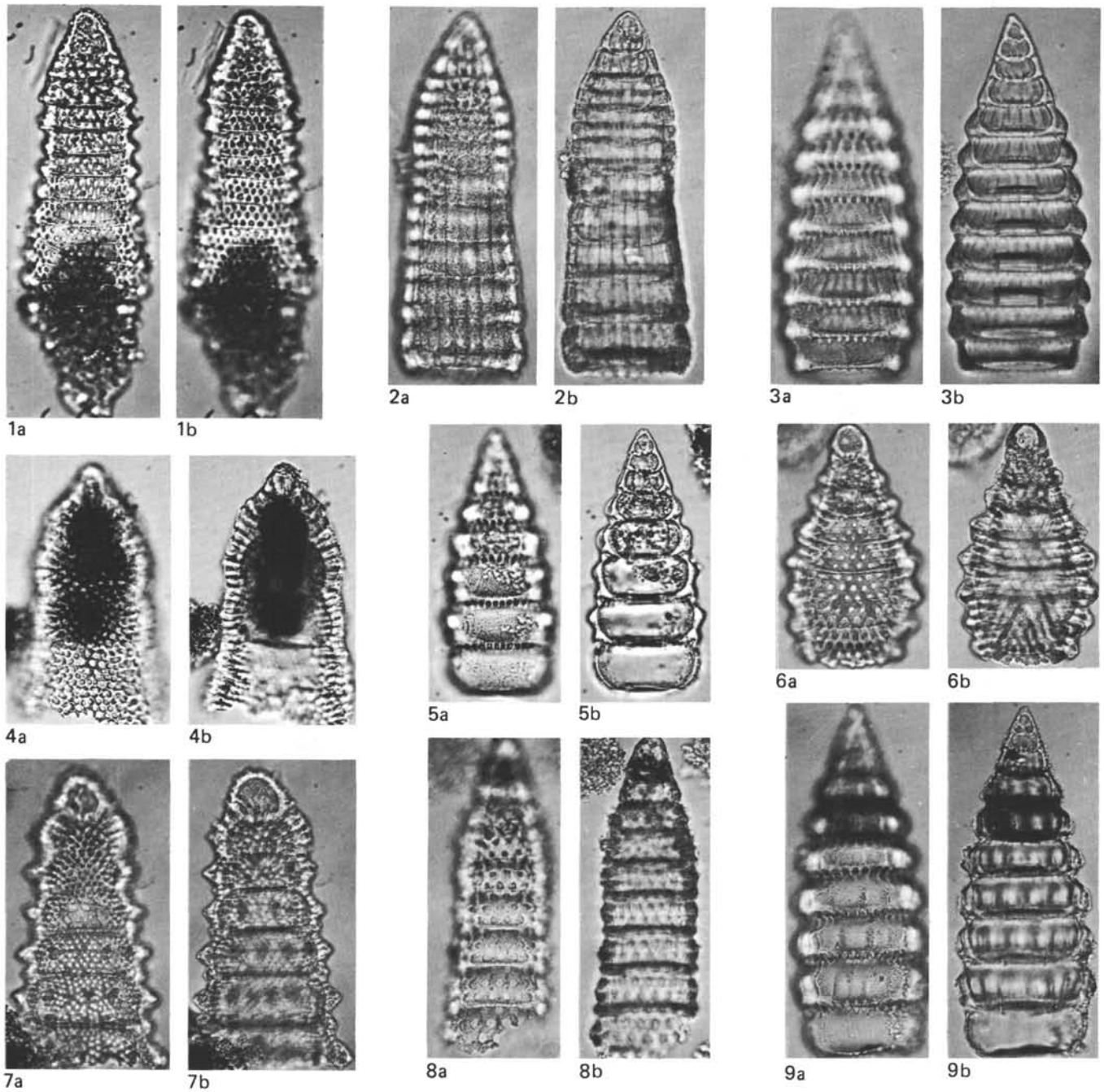


Plate 18. Photomicrographs.

Figures 1a, b. *Parvicingula* sp. cf. *P. altissima* (Rüst). Sample 463-90, CC; slide 10; E.F. 39/2.

Figures 2a, b. *Archaeodictyomitra apiara* (Rüst). Sample 463-89-1, 23-24 cm; slide 4; E.F. F 42/1.

Figures 3a, b. *Pseudodictyomitra leptaconica* (Foreman). Sample 463-92-1, 10-11 cm; slide 3; E.F. L 30/4.

Figures 4a, b. ?*Lithocampe pseudochrysalis* var. α (Tan Sin Hok). Sample 463-90, CC; slide 8; E.F. P 31/4.

Figures 5a, b. *Pseudodictyomitra lilyae* (Tan Sin Hok). Sample 463-90, CC; slide 8; E.F. P 38/4.

Figure 6a, b. *Parvicingula boesii* (Parona). Sample 463-89-1, 105-106 cm; slide 3; E.F. G 41/2.

Figures 7a, b. *Xitus* sp. A. Sample 463-90, CC; slide 20; E.F. T 47/3.

Figures 8a, b. Gen. and sp. indet. Sample 463-89-1, 94-95 cm; slide 8; E.F. U 44/2.

Figures 9a, b. *Pseudodictyomitra lanceleti*, n. sp. Holotype. Sample 463-89-1, 94-95 cm; slide 10; E.F. X 43/2.

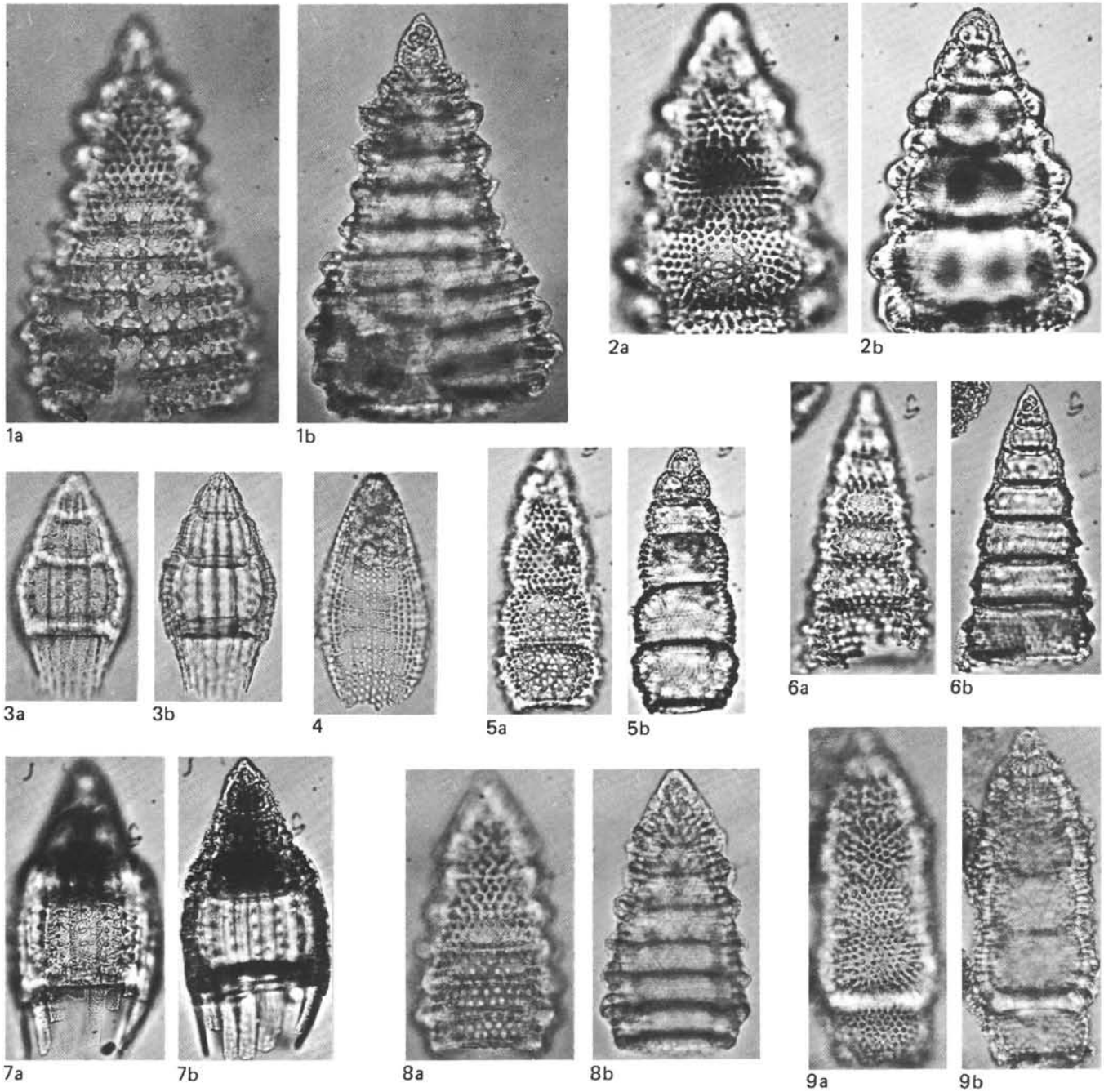


Plate 19. Photomicrographs.

Figures 1a, b. *Xitus alievi* (Foreman). Sample 463-90,CC; slide 20; E.F. 44/4.

Figures 2a, b. *Xitus spicularius* (Aliev). Sample 463-90,CC; slide 7; E.F. C 42/1.

Figures 3a, b. *Archaeodictyomitra brouweri* var. α (Tan Sin Hok). Sample 463-92-1, 10-11 cm; slide 3; E.F. M 27/2.

Figure 4. *Hsuum* sp. cf. *H. obispoensis* Pessagno. Sample 463-90,CC; slide 17; E.F. H 38/1.

Figures 5a, b. *Lithomitra? pseudopinguis* Tan Sin Hok. Sample 463-90,CC; slide 6; E.F. L 50/4.

Figures 6a, b. *Xitus vermiculatus* (Renz). Sample 463-90,CC; slide 5; E.F. E 46/4.

Figures 7a, b. *Thanarla pulchra* (Squinabol). Sample 463-90,CC; slide 4; E.F. C 48/4.

Figures 8a, b. *Xitus alievi* (Foreman). Some specimens like this have a thick wall on the three first segments. Sample 463-891, 23-24 cm; slide 5; E.F. F 35/4.

Figures 9a, b. *Lithomitra? pseudopinguis* Tan Sin Hok. Sample 463-89-1, 94-95 cm; slide 7; E.F. G 28/1.

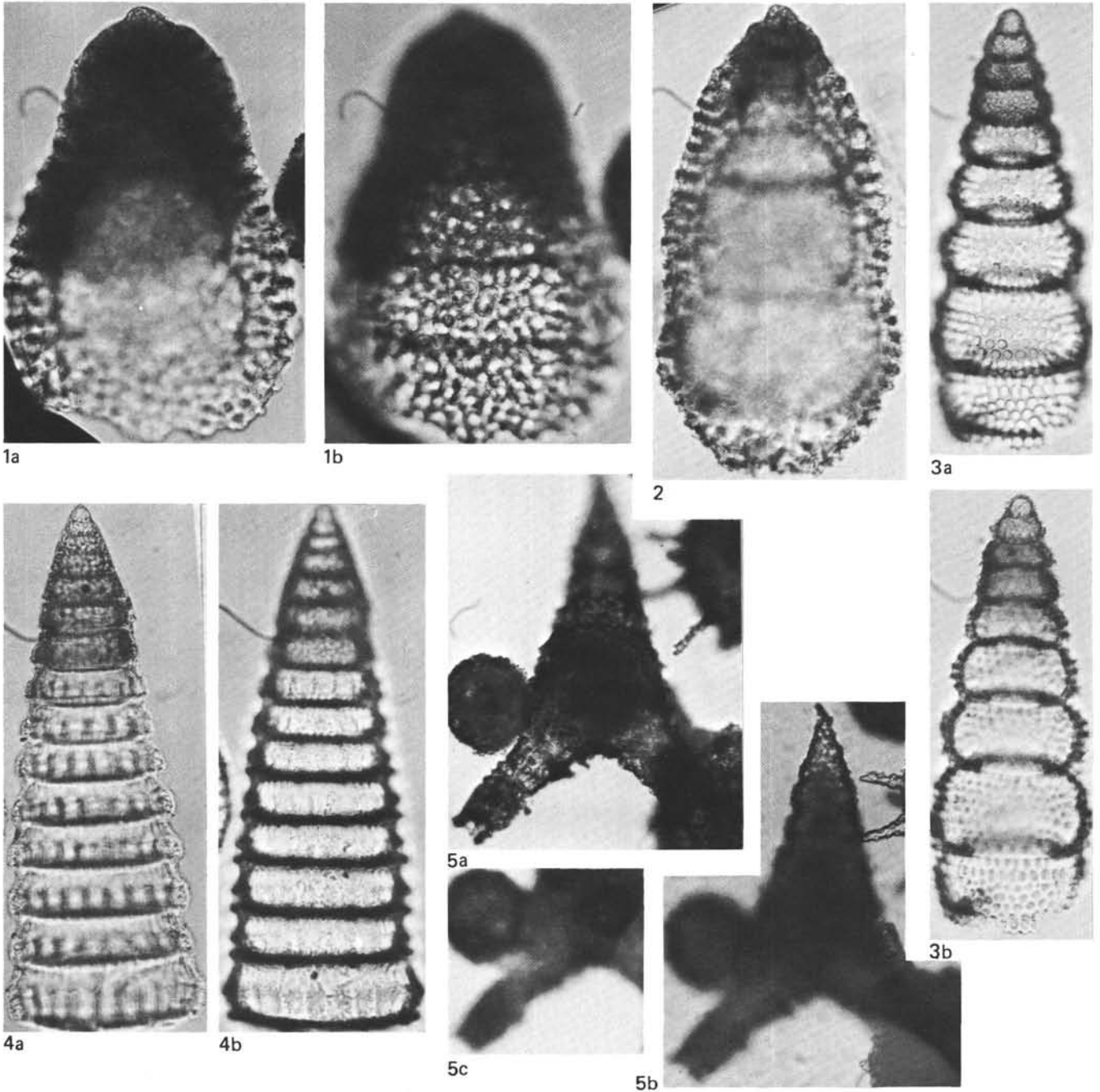


Plate 20. Photomicrographs.

Figures 1a, b. *Obesacapsula somphedia* (Foreman). Sample 465A-29-1, 43-44 cm; slide 1; E.F. T 27/3.

Figure 2. *Obesacapsula somphedia* (Foreman). Sample 465A-29-1; 43-44 cm; slide 1; E.F. T 34/2.

Figures 3a, b. *Parvicingula tekschaensis* (Aliiev). Sample 465A-29-1, 43-44 cm; slide 15; E.F. W 42/1.

Figures 4a, b. *Pseudodictyomitra carpatica* (Lozyniak). Sample 466-34-2, 16-17 cm; slide 10; E.F. D 47/2.

Figures 5a-c. *Crolanium pythiae*, n. sp. Sample 463-75-1, 21-22 cm; slide 35; E.F. D 36/1.

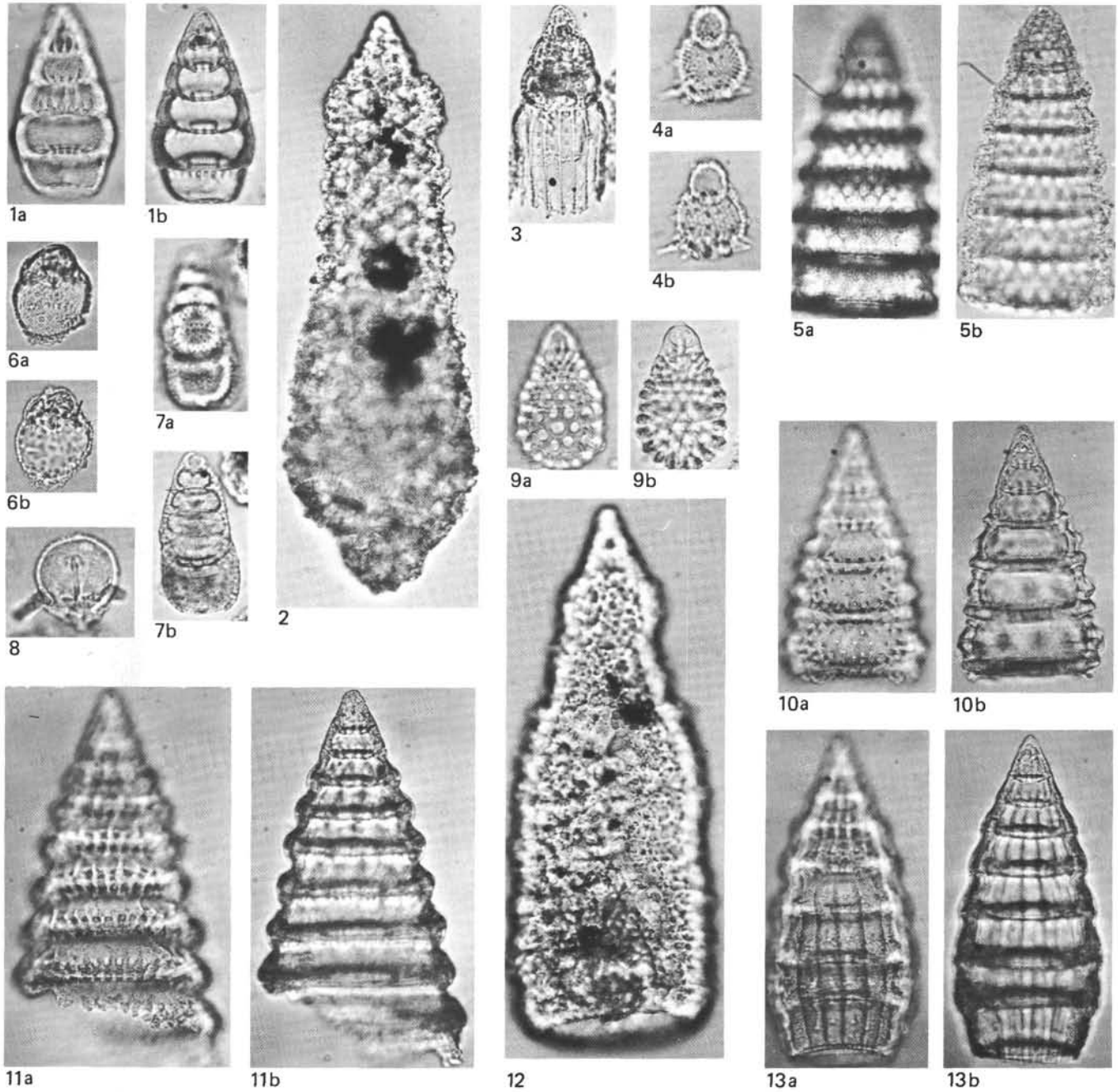


Plate 21. Photomicrographs.

Figures 1a, b. *Pseudodictyomitra blabla*, n. sp. Holotype. Sample 463-86,CC; slide 4; E.F. Y 31/4.
 Figure 2. *?Parvicingula malleola* (Aliev). Sample 463-75-1, 21-22 cm; slide 19; E.F. K 39/4.
 Figure 3. *Thanarla karpoffae*, n. sp. Holotype. Sample 463-90,CC; slide 10; E.F. U 26/0.
 Figures 4a, b. Gen. and sp. indet. Sample 463-87-1, 65-66 cm; slide 2; E.F. 40/1.
 Figures 5a, b. *Lithostrosobus punctulatus* Pessagno. Sample 466-34-2, 80-81 cm; slide 3; E.F. U 39/0.
 Figures 6a, b. *Lophophaena* sp. Sample 463-85-1, 142-143 cm; slide 1; E.F. G 27/2.

Figures 7a, b. *Solenotryma* sp. Sample 463-82,CC; slide 2; E.F. W 39/3.
 Figure 8. *Saitoum cepeki*, n. sp. Holotype. Sample 463-86,CC; slide 4; E.F. K 43/3.
 Figures 9a, b. Gen. and sp. indet. Sample 463-88-1, 52-53 cm; slide 5; E.F. M 45/2.
 Figures 10a, b. *Xitus* sp. indet. Sample 463-86,CC; slide 5; E.F. O 35/1.
 Figures 11a, b. *Archaeodictyomitra puga*, n. sp. Holotype. Sample 463-89-1, 15-16 cm; slide 8; E.F. D 40/1.
 Figure 12. *Parvicingula malleola* (Aliev). Sample 463-75-1, 21-22 cm; slide 23; E.F. F 34/2.
 Figures 13a, b. *Archaeodictyomitra pseudoscalaris* (Tan Sin Hok). Sample 463-87-1, 65-66 cm; slide 5; E.F. L 37/3.

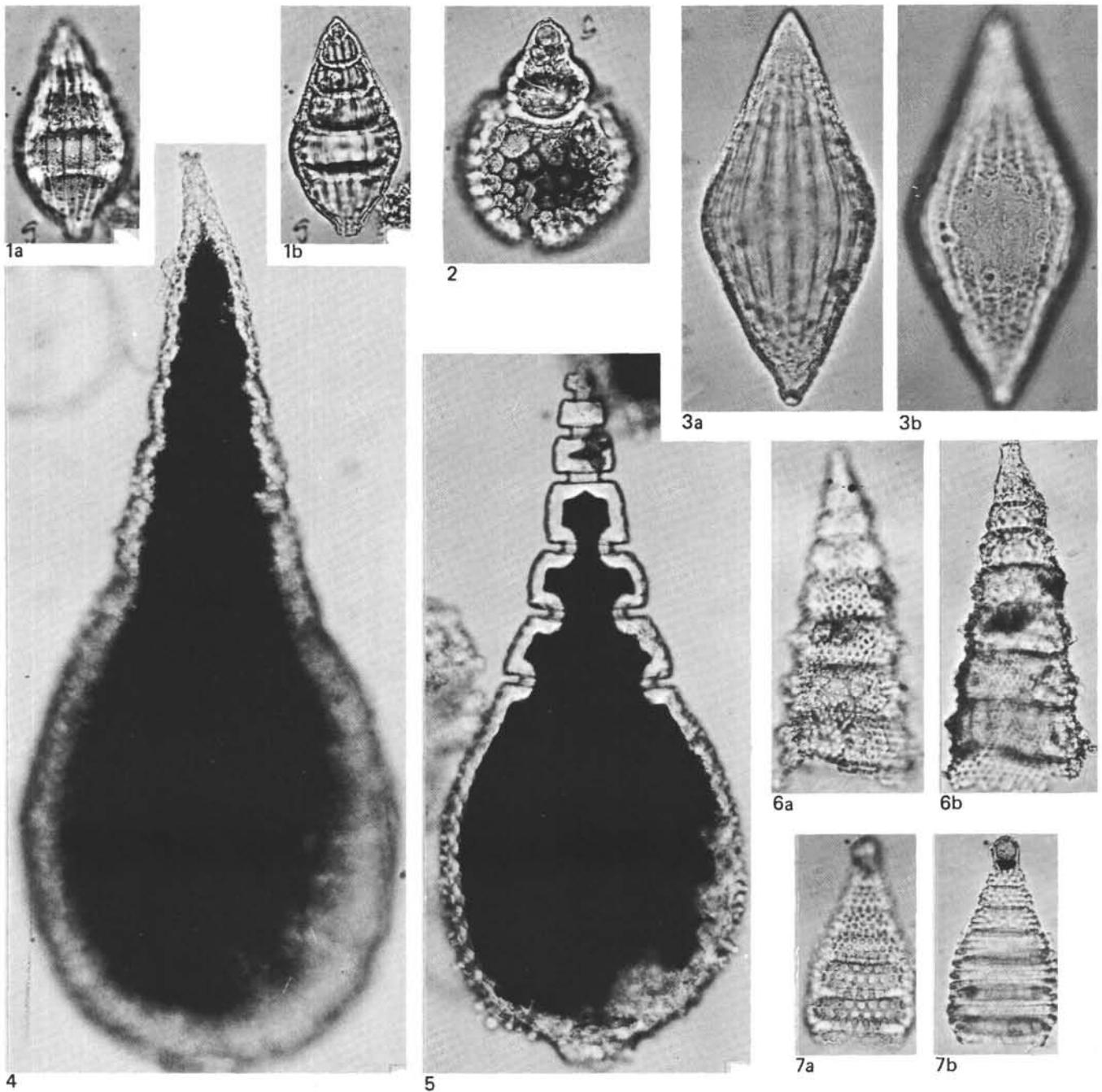


Plate 22. Photomicrographs.

Figures 1a, b. *Archaeodictyomitra* sp. Sample 463-90, CC; slide 5; E.F. Y 48/1.

Figure 2. *Cyrtocapsa houwi* Tan Sin Hok. Sample 463-90, CC; slide 7; E.F. V 41/1.

Figures 3a, b. *Archaeodictyomitra lacrimula* (Foreman). Sample 463-84-1, 5-6 cm; slide 9; E.F. O 35/3.

Figure 4. *Archicapsa similis* Parona. Sample 463-75-1, 21-22 cm; slide 13; E.F. E 8/3.

Figure 5. *Archicapsa similis* Parona. Sample 463-75-1, 21-22 cm; slide 9; E.F. D 24/3.

Figures 6a, b. *Stichomitra asymbatos* Foreman. Sample 463-89-1, 105-106 cm; slide 11; E.F. C 56/4.

Figures 7a, b. *Amphipyndax mediocris* (Tan Sin Hok). Sample 463-89-1, 94-95 cm; slide 6; E.F. C 26/3.

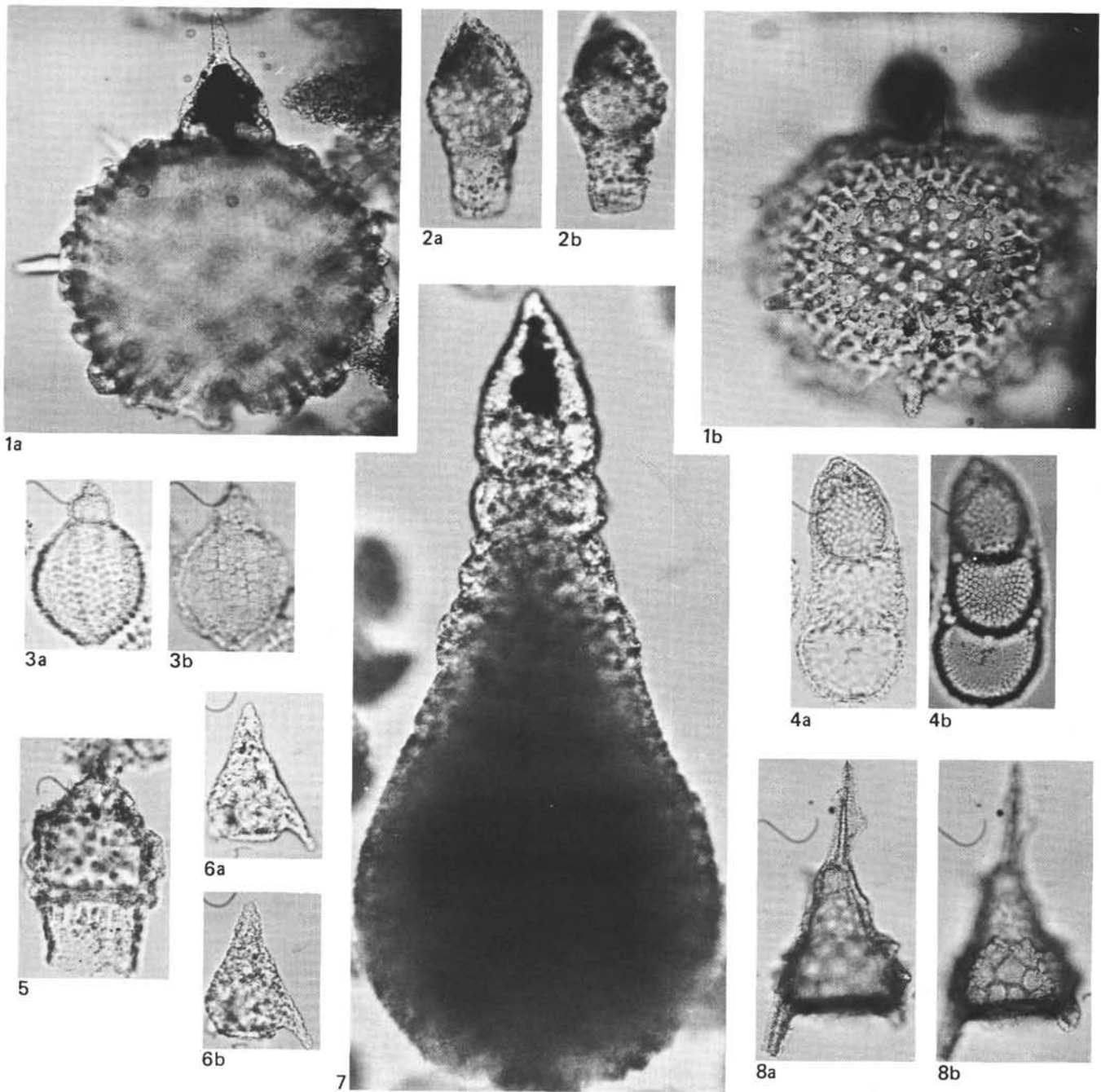


Plate 23. Photomicrographs.

Figures 1a, b. *Sethocapsa trachyostraca* Foreman. Sample 463-89-1, 94-95 cm; slide 5; E.F. K 31/1.

Figures 2a, b. *Rhopalosyringium* sp. indet. Sample 466-29-1, 43-44 cm; slide 3; E.F. G 47/4.

Figures 3a, b. Gen. and sp. indet. Sample 466-34-2, 16-17 cm; slide 3; E.F. H 49/3.

Figures 4a, b. *Solenotryma* sp. indet. Sample 466-34-2, 16-17 cm; slide 3; E.F. Y 46/2.

Figure 5. *Rhopalosyringium majuroensis*, n. sp. Sample 465A-29-1, 43-44 cm; slide 11; E.F. H 38/3.

Figure 6a, b. *Tripocalpis ellyae* Tan Sin Hok. Sample 463-89-1, 23-24 cm; slide 8; E.F. E 24/2.

Figure 7. *Archicapsa similis* Parona. Sample 463-62-1, 148-149 cm; slide 4; E.F. J 44/3.

Figures 8a, b. *Ultranapora durhami* Pessagno. Sample 466-29-1, 43-44 cm; slide 11; E.F. M 45/2.

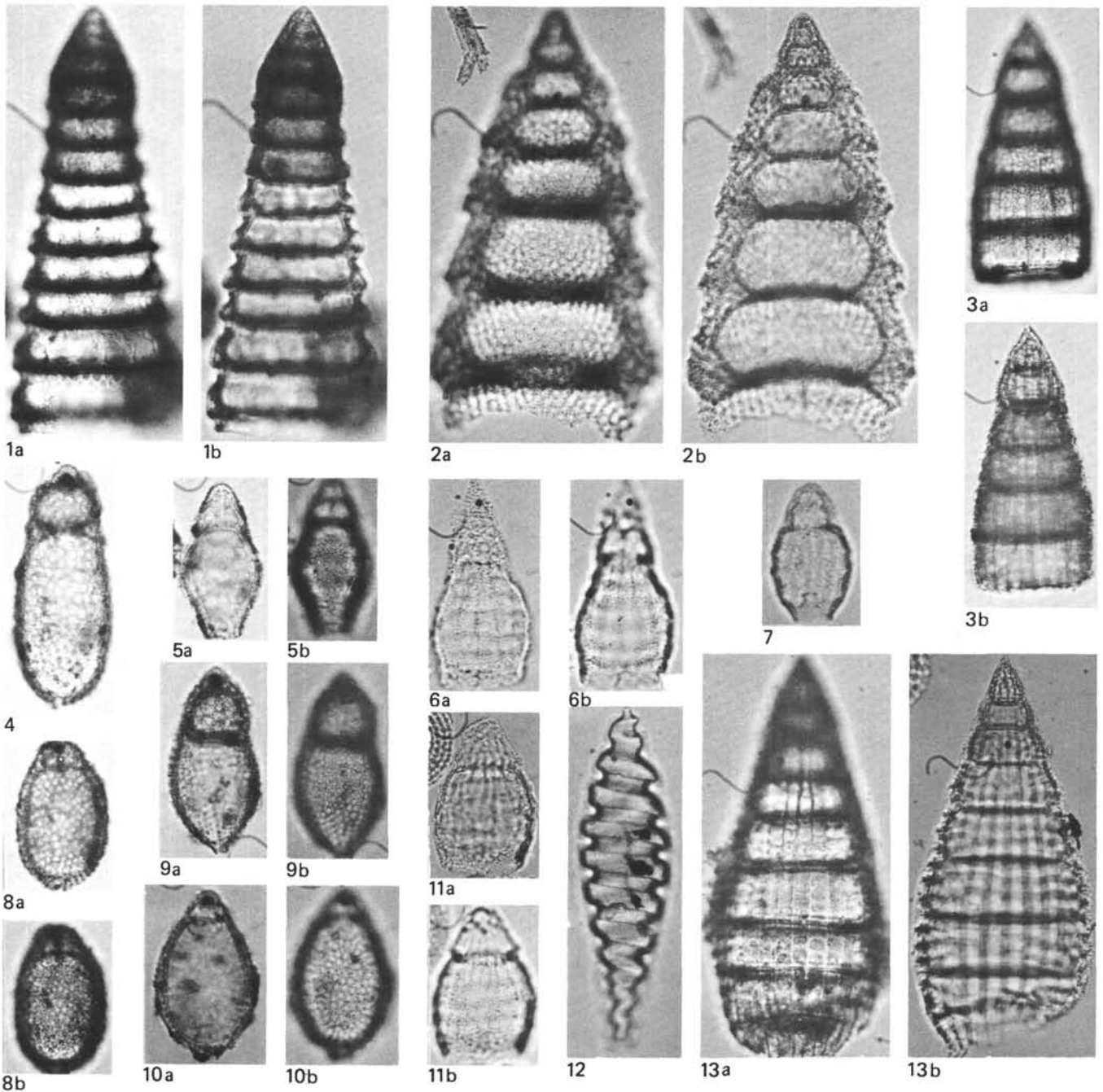


Plate 24. Photomicrographs.

Figures 1a, b. *Pseudodictyomitra pseudomacrocephala* (Squinabol). Sample 465A-29-1, 43-44 cm; slide 1; E.F. S 26/4.

Figures 2a, b. *Spongocapsula? zamoraensis* Pessagno. Sample 466-34-2, 80-81 cm; slide 4; E.F. U 34/3.

Figures 3a, b. *Mita* sp. cf. *M. magnifica* Pessagno. Sample 465A-29-1, 43-44 cm; slide 4; E.F. B 34/3.

Figure 4. *Theocapsomma ancus* Foreman. Sample 465A-29-1, 43-44 cm; slide 12; E.F. C 35/3.

Figures 5a, b. *Theocampe vanderhoofi* Campbell and Clark. Sample 465A-29-1, 43-44 cm; slide 3; E.F. G 51/3.

Figures 6a, b. *Artostrobium tina* Foreman. Sample 466-34-2, 16-17 cm; slide 6; E.F. X 34/2.

Figure 7. *Theocampe salillum* Foreman. Sample 466-34-2, 16-17 cm; slide 6; E.F. D 33/4.

Figures 8a, b. [?] *Excentropyllomma cenomana* Dumitrică. Sample 465A-29-1, 43-44 cm; slide 7; E.F. E 36/4.

Figures 9a, b. *Theocapsomma ancus* Foreman. Sample 465A-29-1, 43-44 cm; slide 6; E.F. S 43/1.

Figures 10a, b. *Theocorys antiqua* Squinabol. Sample 465A-29-1, 43-44 cm; slide 7; E.F. G 41/1.

Figures 11a, b. *Theocampe* sp. cf. *T. vanderhoofi* Campbell and Clark. Sample 466-34-2, 16-17 cm; slide 2; E.F. J 33/3.

Figure 12. *Eucrytis* sp. cf. *E. tenuis*. Note the spiral inner mold. Sample 463-72-5, 20-21 cm; slide 4; E.F. Q 38/4.

Figures 13a, b. *Mita magnifica* Pessagno. Sample 465A-29-1, 43-44 cm; slide 17; E.F. O 32/4.

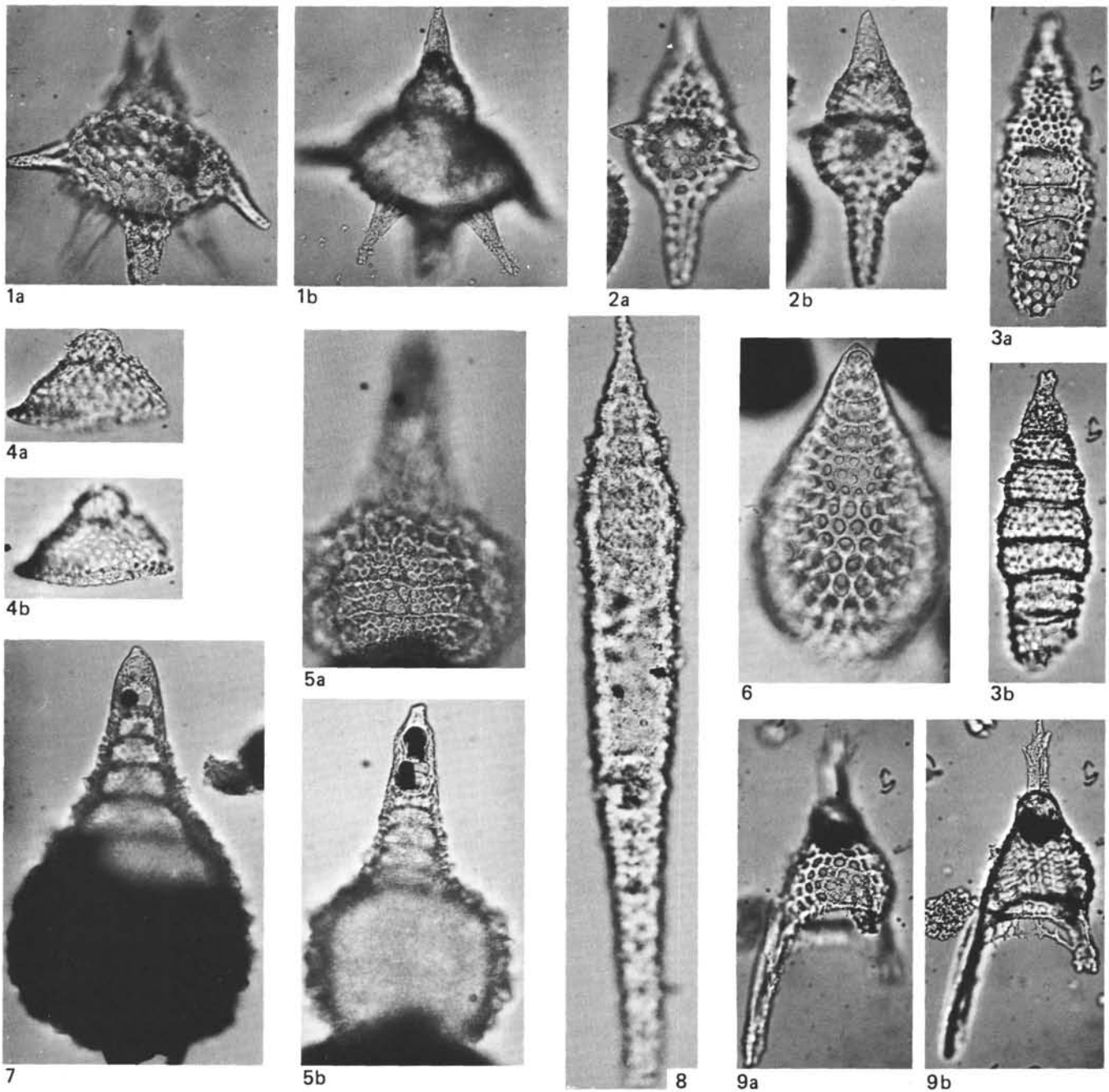


Plate 25. Photomicrographs.

Figures 1a, b. *Podobursa triacantha* (Fischli). Sample 463-89-1, 94-95 cm; slide 11; E.F. E 27/2.
 Figures 2a, b. *Podobursa tricola* Foreman. Sample 463-89-1, 105-106 cm; slide 8; E.F. C 43/2.
 Figures 3a, b. *Eucyrtis elido*, n. sp. Holotype. Sample 463-90,CC; slide 5; E.F. L 40/3.
 Figures 4a, b. *Neosciadocapsa* sp. Sample 463-90,CC; slide 11; E.F. R 41/3.

Figures 5a, b. *Lithocampe chenodes* Renz. Sample 463-89-1, 105-106 cm; slide 9; E.F. D 14/2.
 Figure 6. *Stichocapsa cribata* Hinde. Sample 463-89-1, 15-16 cm; slide 7; E.F. A 5/4.
 Figure 7. *Lithocampe chenodes* Renz. Sample 463-89-1, 94-95 cm; slide 8; E.F. D 39/1.
 Figure 8. *Eucyrtis tenuis* (Rüst). Sample 463-75-1, 21-22 cm; slide 26; E.F. H 29/4.
 Figures 9a, b. *Ultranapora spinifera* Pessagno. Sample 463-90,CC; slide 10; E.F. X 31/3.

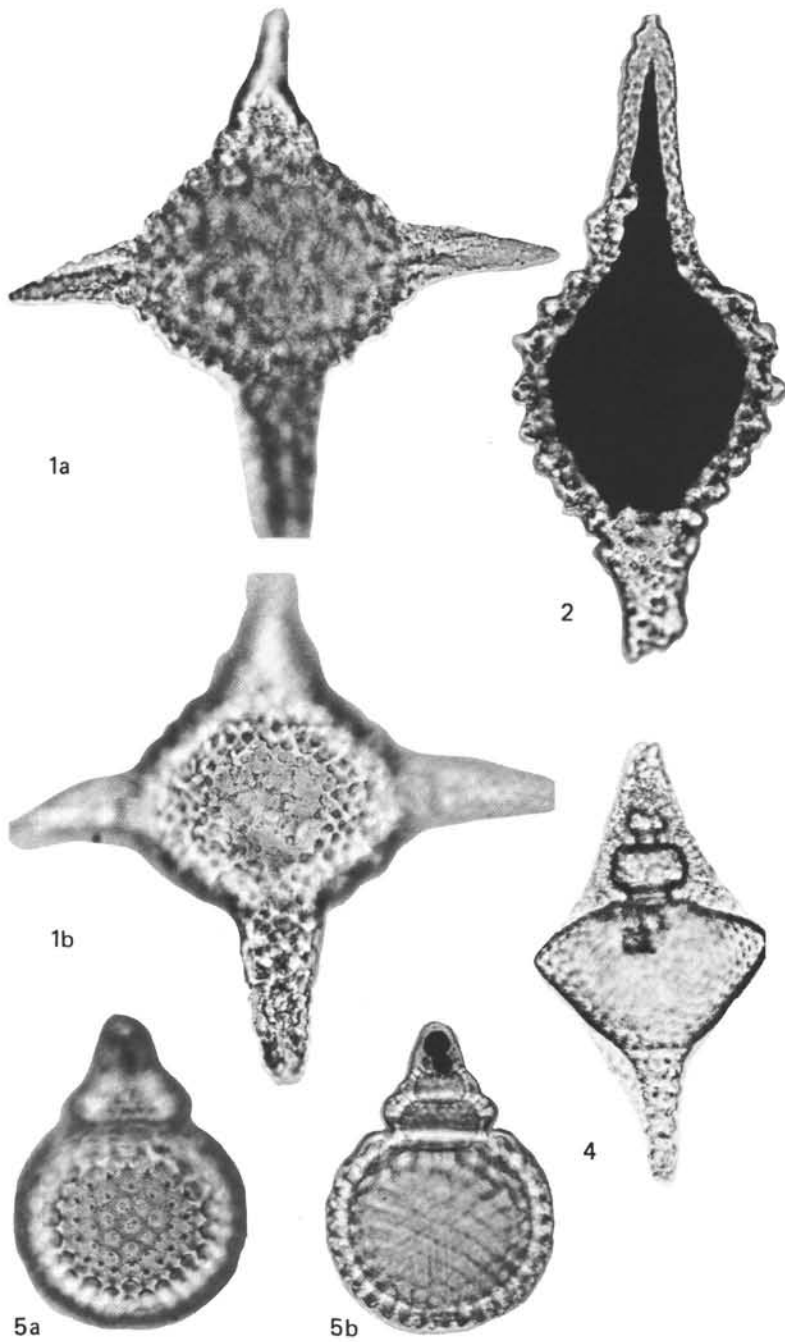
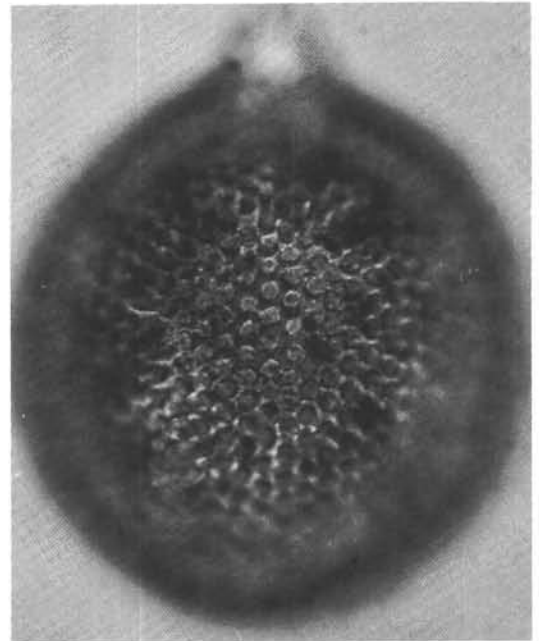


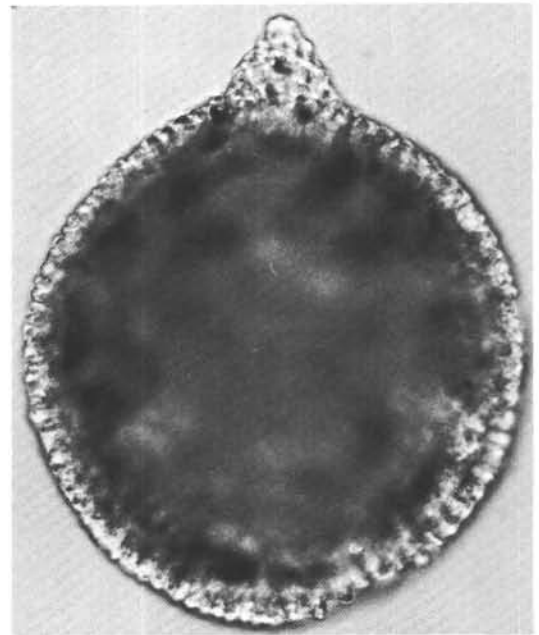
Plate 26. Photomicrographs.

Figures 1a, b. *Dibolachras tythopora* Foreman. Sample 463-75-1, 21-22 cm; slide 21; E.F. J 57/4.

Figure 2. *Eucyrtis* sp. cf. *E. bulbosa* Renz. Sample 463-75-1, 21-22 cm; slide 23; E.F. V 48/4.



3a



3b

Figures 3a, b. *Sethocapsa? orca* Foreman. Sample 463-84-1, 5-6 cm; slide 8; E.F. Q 47/3.

Figure 4. *Dibolachras tythopora* Foreman. Sample 463-73-1, 18-19 cm; slide 5; E.F. G 47/3.

Figures 5a, b. *Sethocapsa uterculus* (Parona). Sample 463-86-1, 31-32 cm; slide 5; E.F. X 43/1.

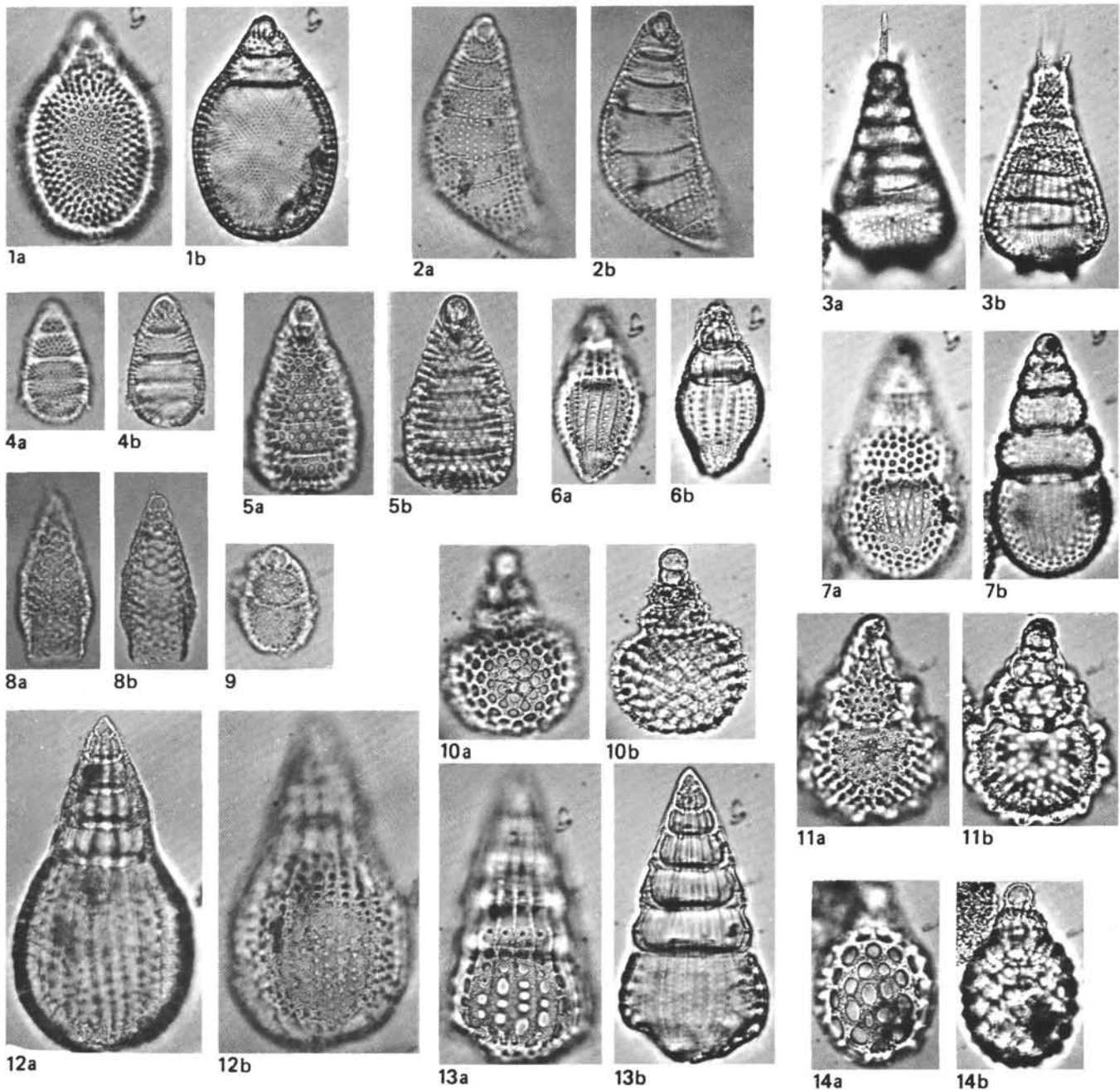


Plate 27. Photomicrographs.

Figures 1a, b. *Theocorys renzae*, n. sp. Holotype. Sample 463-90,CC; slide 9; E.F. W 44/4.

Figures 2a, b. *Eucyrtis columbaria* Renz. Lateral view. Sample 463-89-1, 150-106 cm; slide 11; E.F. G 59/1.

Figures 3a, b. *Eucyrtis columbaria* Renz. Back view, showing the long apical horn and the two short subsidiary horns. Sample 463-90, CC; slide 4; E.F. F 30/3.

Figures 4a, b. *Stichocapsa pseudopentacola* Tan Sin Hok. Sample 463-88-1, 52-53 cm; slide 5; E.F. L 34/3.

Figures 5a, b. *Eucyrtis molengraaffi* (Tan Sin Hok). Sample 463-89-1, 105-107 cm; slide 2; E.F. T 45/2.

Figures 6a, b. *Eucyrtidium thiensis* Tan Sin Hok. Sample 463-90,CC; slide 2; E.F. Q 46/3.

Figures 7a, b. *Stichocapsa pseudodecora* Tan Sin Hok. Sample 463-90,CC; slide 14; E.F. E 37/3.

Figures 8a, b. *Cyrtocalpis operosa* Tan Sin Hok. Sample 463-89-1, 105-106 cm; slide 2; E.F. O 48/2.

Figure 9. *Theocapsa laevis* Tan Sin Hok. Sample 463-87-1, 6-7 cm; slide 2; E.F. W 35/1.

Figures 10a, b. *Siphocampium davidi*, n. sp. Holotype. Sample 463-90,CC; slide 6; E.F. E 29/1.

Figures 11a, b. *Siphocampium rutteni* (Tan Sin Hok). Sample 463-90, CC; slide 8; E.F. S 35/2.

Figures 12a, b. *Stichocapsa* sp. cf. *S. decora* Rüst. Sample 463-89-1, 23-24 cm; slide 2; E.F. S 54/1.

Figures 13a, b. *Stichocapsa decora* Rüst. Sample 463-90,CC; slide 8; E.F. K 28/4.

Figures 14a, b. *Siphocampium macropora* (Rüst). Sample 463-90,CC; slide 12; E.F. P. 39/3.