23. QUATERNARY RADIOLARIANS FROM THE MOUTH OF THE GULF OF CALIFORNIA, DEEP SEA DRILLING PROJECT LEG 65[1]

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INTRODUCTION

I recovered well-preserved radiolarian assemblages from the Quaternary sediments drilled at all four sites at the mouth of the Gulf of California during Leg 65 (Fig. 1). The sites, with positions and water depths averaged for all hole locations per site, are

Site 482—22°47.4′N, 107°59.6′W; water depth, 3022 meters.

Site 483—22°53.0′N, 108°44.8′W; water depth, 3070 meters.

Site 484—23°11.2′N, 108°23.6′W; water depth, 2887 meters.

Site 485—22°44.9′N, 107°54.2′W; water depth, 2981 meters.

The nearly 200 taxa I identified are listed alphabetically in the systematic reference list. The only reliable radiolarian biostratigraphic datum determined for the Quaternary sedimentary section is the highest occurrence of *Axoprunum angelinum* (Hays) at Sites 483, 484, and 485.

THE RADIOLARIAN ASSEMBLAGE

With some additions, the species identified from Leg 65 are the same I described in earlier studies of Holocene sediments from the Gulf of California (Benson, 1964, 1966). The major differences between the Holocene and older assemblages are in the relative abundances of individual species. I could not determine whether these differences in abundance reflect environmental conditions, preservation, or both.

Holocene Radiolarians from the Gulf of California

In an earlier study (Benson, 1966), I found radiolarians in the Recent sediments at 26 of 28 stations distributed throughout the Gulf of California (Fig. 2). At the time, I concluded that the Holocene assemblage was derived primarily from equatorial Pacific waters. From an examination of recent literature on the distribution of modern radiolarians, particularly in the eastern Pacific but also in high as well as intermediate and low latitudes (Riedel, 1958; Nigrini, 1967, 1968, 1970; Casey, 1971, 1977; Ling et al., 1971; Kling, 1973, 1977; Molina-Cruz, 1977; Nigrini and Moore, 1979), I conclude that the assemblage is primarily tropical to subtropical but with contributions of cooler water species from the California Current System.

Table 1 lists the dominant members of the Holocene assemblage in the Gulf, as determined by averaging the percentages for each species at each station. The quantitative methods used in my earlier research to obtain the percentages are as follows. I first scanned all strewn slides prepared from the HCl-insoluble, clay-free residues of sediments from the 28 sampling stations in order to determine the occurrence or nonoccurrence of each species. Next, I counted 500 tests for each station, preliminary counts of 1000 having shown no significant differences from the 500 count in relative frequencies of each species at a station. The slide with the greatest concentration of tests was chosen for purposes of counting. In order to include as many variations in test density as possible on the slide, I made a diagonal traverse across the 22 mm × 44 mm area under the cover glass. Six of the 28 stations yielded total populations of less than 500. The counts for each species at each station were converted into percentages.

Species that show cooler water affinities and that are probably, at least in part, from the California Current System include *Hexacontium enthacanthum, Stylochlamydium venustum, Lithomelissa hystrix, Larcopyle bütschlii, Lithelius minor, Pterocorys minythorax, Heliotholus histricosa* group, *Actinosphaera cristata*(?), and *Theocalyptra davisiana* s.l. The influence of the California Current System is evident in Bé's (1977) map of the major faunal provinces of living planktonic foraminifers. The current carries a higher latitude (Transition Zone) assemblage southward along the west coast of Baja California. The intrusion of the cool water current into subtropical and tropical waters causes three faunal provinces to converge at a point offshore from southern Baja California, namely, the Transition Zone, Subtropical Faunal Province, and Tropical Faunal Province. Likewise, the Holocene radiolarian assemblage within and at the mouth of the Gulf of California represents a mixing of species from similar latitudinally defined radiolarian provinces.

I did take into consideration the commingling in the sediments of tests of species occupying overlying water masses which are vertically separated or distinct from one another. For example, Kling (1977) attributes the decrease in abundance of *Theocalyptra davisiana davisiana*, which occupies the temperate and polar regions of most oceans, from common in a core from the Santa Monica Basin to rare in one from the Santa Barbara Basin, to the fact that this species is restricted to the subsill depths of the Santa Monica Basin. The sill depth of the Santa Barbara Basin is 260 meters shallower. Petru-

[1] Lewis, B. T. R., Robinson, P., et al., *Init. Repts. DSDP*, 65: Washington (U.S. Govt. Printing Office).

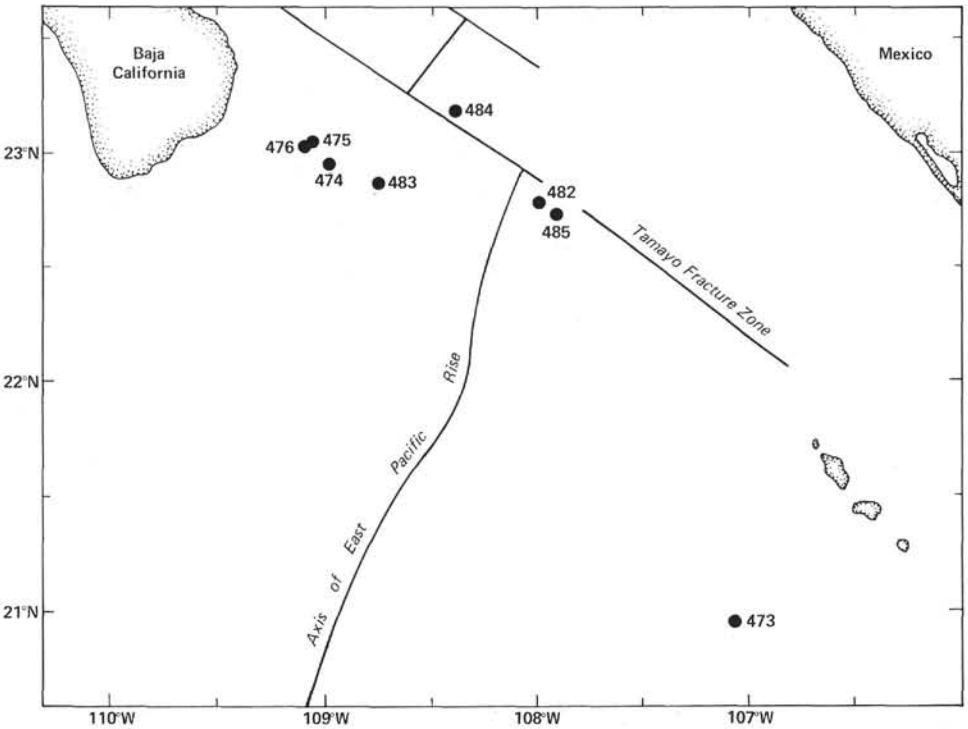

Figure 1. DSDP drilling sites at the mouth of the Gulf of California. Site 473 was drilled on Leg 63, Sites 474 through 476 were drilled on Leg 64, and Sites 482 through 485 were drilled on Leg 65.

shevskaya and Björklund (1974) also note that this species (their *Diplocyclas davisiana*) is associated with deep water, being common in deep water and rare in shallow water sediments of the Norwegian-Greenland seas. In the Gulf of California, *T. davisiana* s.l. (mostly *T. davisiana davisiana* but also *T. davisiana cornutoides* in smaller numbers) is more abundant in the deeper water sediments. *T. davisiana davisiana* is also a quantitatively important member of the Quaternary assemblage at Leg 65 sites, which are in relatively deep water. Figure 3 illustrates the strong correlation ($r = 0.90$) between water depth and the relative percentage of this species in each Holocene sample from the gulf (Benson, 1966) and in presumably Holocene samples from Sites 482, 483, and 485. *Theocalyptra davisiana* s.l. is probably representative of faunas living in submerged, colder water masses that contribute to the overall assemblage in the sediments of the Gulf of California.

The Quaternary Assemblage at Leg 65 Sites

Tables 2 through 5 list the abundance and degree of preservation of radiolarians in samples examined from Leg 65 sites. Data are shown graphically in Figure 4.

The overall assemblage is approximately the same at all four sites, dominant species being among the spumellines *Tetrapyle octacantha* group, *Phorticium pylonium* group, *Actinosphaera cristata*(?), *Hexacontium enthacanthum, Druppatractus variabilis, Thecosphaera* spp., *Lithelius minor, Lithelius*(?) sp., and several spongodiscids; among the nassellines *Theocalyptra davisiana davisiana, Botryostrobus auritus-australis* group, *B. aquilonaris*, and *Lamprocyclas maritalis martialis*. In samples with abundant radiolarians, more than 100 species are present. The number of nasselline species generally exceeds that of spumelline species, but the number of spumelline tests exceeds the number of nasselline tests.

In addition to those already noted, many other species are persistent and quantitatively important in the Quaternary section. Spumellines include *Acrosphaera murrayana, Actinomma antarcticum, A. leptodermum, A. medianum, Hexacontium heteracantha, Druppatractus irregularis, Amphisphaera cristata, Xiphatractus cronos, X. pluto, Ommatartus tetrathalamus, Amphirhopalum ypsilon, Dictyocoryne profunda, D. truncatum, Euchitonia elegans, Euchitonia* sp. cf. *E. furcata, Hymeniastrum euclidis, Stylochlamydium asteriscus* group, and *S. venustum* group. Nassellines include *Liriospyris reticulata, Lithomelissa monoceras, Dictyophimus crisiae, Carpocanistrum* sp. A, *C. petalospyris* group, *Cornutella profunda, Lamprocyclas maritalis polypora, Anthocyrtidium ophirense, Theocorythium trachelium trachelium, Lamprocyrtis nigriniae, L.*(?) *hannai, Pterocorys minythorax, Theocalyptra davisiana cornutoides, Eucyrtidium hexagonatum, Siphocampe lineata* group, and *Phormostichoartus corbula*.

I found no significant changes in the assemblage with depth at any site. As in the case of the Holocene assemblage, the mouth of the Gulf of California was apparently a region where species from both lower and higher latitudes mixed during the Pleistocene. There was no domination by a strictly cold water assemblage, at least not for sufficient time to have left a record which could be detected with the sample spacing used in this study. Statistical analysis of data from more closely spaced samples at each site may reveal more subtle

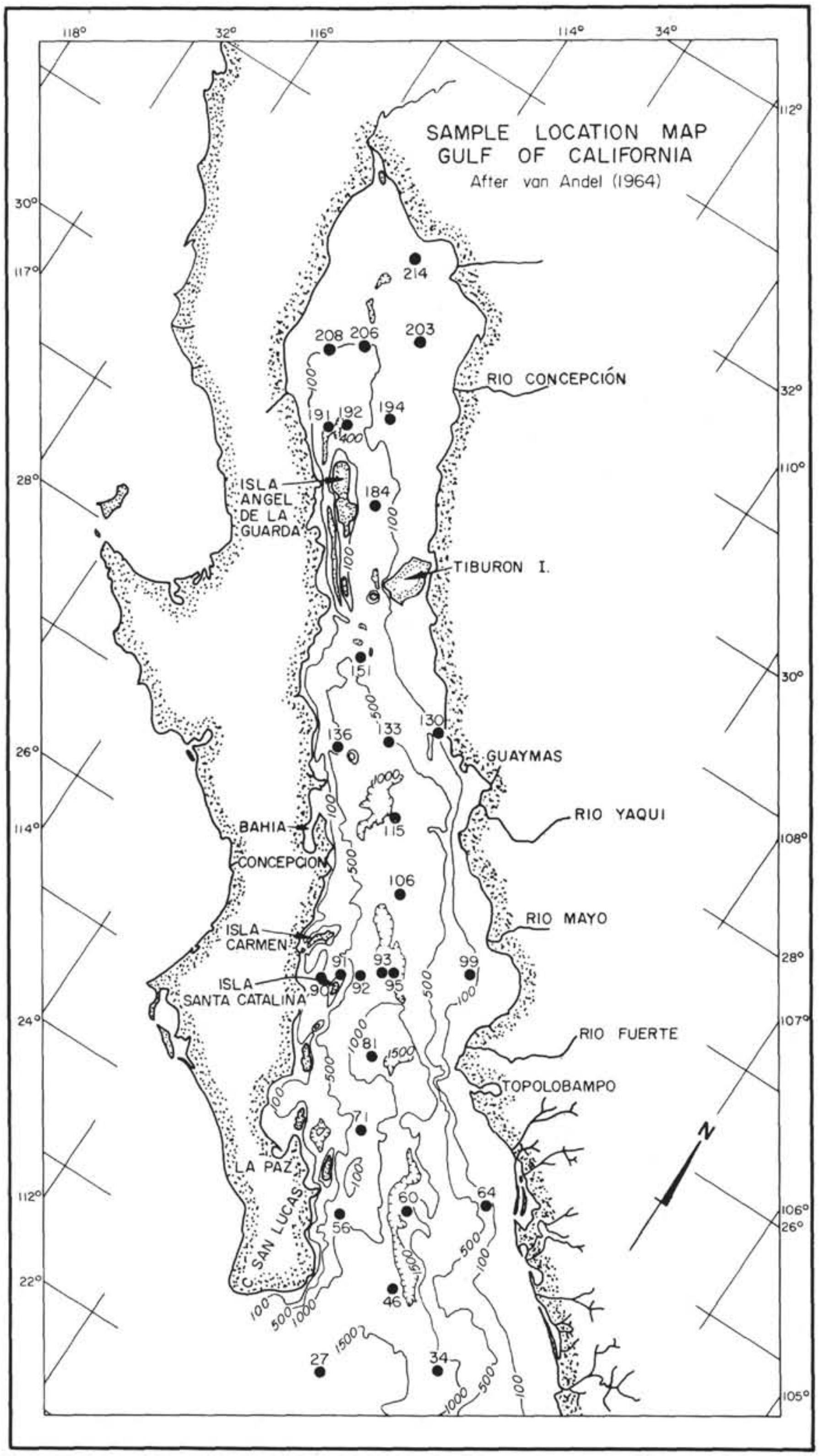

Figure 2. Sample location map, Gulf of California (from Benson, 1966). Numbers refer to cores collected by G. A. Rusnak during the *Vermilion Sea Expedition* in 1959. (Depth contours in fathoms.)

Table 1. Relative abundances of dominant Holocene radiolarians in the Gulf of California (after Benson, 1966).

Taxon	Av. % Per Station (26 stations)	Stations Where Present (out of 26)
Tetrapyle octacantha group	6.8	26
Phorticium pylonium group	6.1	26
Druppatractus variabilis	4.6	25
Hexacontium enthacanthum	3.9	25
Eucyrtidium hexagonatum	3.8	26
Stylochlamydium venustum/S. asteriscus	3.8	26
Lithomelissa hystrix	2.7	23
Spirocyrtis scalaris/S. subscalaris	2.4	25
Larcopyle butschlii	2.3	24
Lithelius minor	2.1	25
Hexapyle dodecantha	1.8	26
Ommatartus tetrathalamus	1.7	26
Pterocorys minythorax/P. zancleus	1.7	21
Euchitonia sp. cf. *E. furcata*	1.6	26
Lithomelissa monoceras	1.5	25
Druppatractus irregularis	1.5	23
Plectacantha oikiskos	1.4	16
Helotholus histricosa group	1.4	22
Pseudocubus obeliscus	1.4	23
Actinosphaera cristata(?)	1.2	25
Pterocanium bicorne(?)	1.2	23
Theocalyptra davisiana s. l.	1.0	18
Spongodiscus biconcavus	1.0	26
Theopilium tricostatum	1.0	23
Actinomma antaracticum	0.9	19
Hexacontium laevigatum	0.8	23
Plagiacantha(?) *panarium*	0.8	17
Anomalacantha dentata	0.7	20

changes related to fluctuations of sea surface temperature during the Pleistocene.

Throughout the Pleistocene section, the planktonic foraminiferal data show the same lack of domination by species from any one of the three major modern faunal provinces which converge at a point off southern Baja California (Bé, 1977). Using my shipboard identifications, I constructed Table 6, which shows that in those samples from Site 483 with common to abundant foraminifers, the dominant species represent all three provinces. Throughout the Pleistocene, the California Current System was active at least as far south as the mouth of the Gulf of California, transporting large populations of such higher latitude species as *Globigerina bulloides* and *Globoquadrina pachyderma* to a subtropical to tropical region dominated by *G. dutertrei, Globigerinoides ruber, G. sacculifer, Globorotalia menardii*, and *Pulleniatina obliquiloculata*.

BIOSTRATIGRAPHY

Quaternary Radiolarian Zonations and Datum Levels

In the study of Leg 65 samples, I attempted to apply Quaternary radiolarian zonations and datum levels used in both equatorial (Nigrini, 1971; Dinkelman, 1973; Johnson and Knoll, 1975) and higher latitude studies (Hays, 1970; Kling, 1973). The absence or scarcity of the marker species *Pterocanium prismatium, Theocorythium vetulum, Anthocyrtidium angulare, Collosphaera tuberosa*, and *Buccinosphaera invaginata* precluded use of Nigrini's (1971) fourfold zonation of the Quaternary in equatorial Pacific sediments. The highest occurrence of *Axoprunum angelium* (= *Stylatractus universus*) is the only datum level I determined with any confidence. Sediments containing radiolarians above this level could be assigned to Kling's (1973) *Artostrobium miralestense* (= *Botryostrobus aquilonaris*) Zone and those below to his *Axoprunum angelinum* Zone (= *S. universus* Zone of Hays, 1970). Because of the absence of such marker species as *Eucyrtidium matuyamai* and *Lamprocyrtis heteroporos*, I could determine neither the base of the latter zone nor the presence of the underlying *E. matuyamai* Zone as defined by Hays (1970) or Kling (1973).

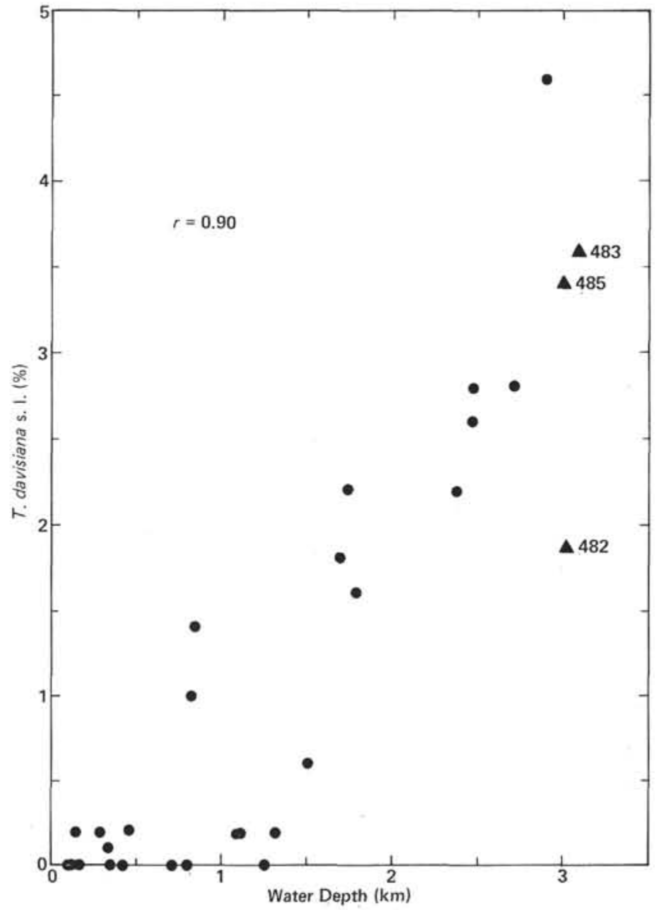

Figure 3. Relative percentage of *Theocalyptra davisiana* s.l. in Holocene radiolarian assemblages vs. water depth in the Gulf of California. (Closed circles = sampling stations of Benson (1966); closed triangles = Leg 65 sites; *r*—correlation coefficient.)

The need to determine rates of sediment accumulation at DSDP sites forces biostratigraphers to emphasize the importance of the ages in years of significant paleontological datum levels discovered in the sedimentary sections cored. Table 7 summarizes the estimated ages for several levels in the Quaternary. The reader should consult the references given in the table in order to assess the validity of the ages.

Data from Leg 65 support Hays and Shackleton's (1976) conclusion that the extinction level of *A. angelinum* (= *S. universus*) was globally synchronous at about 0.41 ± 0.005 Ma. At Sites 483, 484, and 485, this

Table 2. Radiolarians at Site 482.

Sample (interval in cm)	Depth below Seafloor (m)	Abundance	Preservation	Taxa						
				Buccinosphaera invaginata	*Stylacontarium acquilonium*	*Collosphaera tuberosa*	*Axoprunum angelinum*	*Lamprocyrtis neoheteroporos*	*Anthocyrtidium angulare*	*Theocorythium vetulum*
482A-1-1, 80-82	0.81	F	G							
482A-1-2, 80-82	2.31	C	G							
482A-1-3, 80-82	3.81	C	G							
482-1,CC	4.00	R	G							
482A-1-4, 80-82	5.31	A	G							
482A-1,CC	6.00	A	G							
482A-2-1, 80-82	6.81	F	G							
482A-2-2, 80-82	8.31	C	G							
482A-2-3, 80-82	9.81	A	G							
482A-2-4, 80-82	11.31	R	G							
482A-2-5, 80-82	12.81	F	G							
482A-2-6, 80-82	14.31	F	G							
482A-2,CC	15.50	F	G							
482A-3-1, 80-84	16.30	F	G							
482A-3,CC	16.95	F	G							
482A-4-1, 80-82	25.81	F/C	G							
482A-4-2, 80-82	27.31	F	G							
482A-4-3, 80-82	28.81	R	G							
482A-4-4, 60-62	30.11	F	G							
482A-4-5, 88-90	31.90	R	G							
482A-4-6, 80-82	33.31	R	G							
482A-4,CC	33.50	A	G							
482A-5-1, 80-82	35.31	A	G							
482A-5-2, 60-62	36.61	C	G							
482A-5-3, 80-82	38.31	C	G							
482A-5-4, 80-82	39.81	R	G							
482A-5-5, 25-26	40.81	B								
482A-5-5, 80-82	41.31	F	M							
482A-5-6, 60-62	42.61	A	G							
482A-5-7, 38-40	43.89	F/C	G							
482A-5,CC	44.00	F	G							
482B-1-1, 80-82	44.81	R	G							
482B-1-2, 80-82	46.31	R	G							
482B-1-3, 120-122	48.21	F	G							
482B-1-4, 90-92	49.41	C	G							
482B-1-5, 124-126	51.25	R	G							
482B-1-6, 80-82	52.31	R	G							
482B-1,CC	53.50	F	G							
482B-2-1, 85-87	54.36	R	G							
482B-2-2, 80-82	55.81	R	G							
482B-2-3, 80-82	57.31	R	G							
482B-2-4, 80-82	58.81	R	G							
482B-2-5, 80-82	60.31	F/C	G							
482B-2,CC (4-6)	60.73	F	G							
482B-3,CC (5-7)	63.10	C	G							
482C-3-1, 79-81	64.30	F	G							
482C-3-2, 79-81	65.80	R	G							
482C-3-3, 79-81	67.30	A	G							
482C-3-4, 79-81	68.80	A	G							
482C-3-5, 79-81	70.30	F	G							
482C-3-6, 79-81	71.80	F	G							
482C-3-7, 29-31	72.80	F	G							
482C-4-1, 79-81	73.80	A	G							
482C-4-2, 79-81	75.30	A	G							
482C-4-3, 79-81	76.80	A	G							
482B-4,CC (25-27)	76.83	F	G							?
482C-4-4, 79-81	78.30	R	G							
482C-4-5, 79-81	79.80	R	G							
482C-4-6, 79-81	81.30	R	G/M							
482C-4-7, 39-41	82.40	R	G							
482C-5-1, 60-62	83.10	F/C	G							
482D-2-3, 128-130	84.29	R	G							
482C-5-2, 79-81	84.80	C	G							
482C-5-3, 79-81	86.30	F	G							
482B-5,CC (10-12)	86.48	C	G							
482C-5-4, 79-81	87.80	R	G							
482C-5-5, 79-81	89.30	F	G							
482C-5-6, 79-81	90.80	R	G							
482C-5-7, 79-81	92.00	R/F	G							
482C-5,CC (8-10)	92.00	R/F	G							
482B-6-1, 80-82	92.31	R/F	G							
482B-6-2, 92-94	93.93	R	G							
482B-6-3, 80-82	95.31	F	G							
482B-6-4, 80-82	96.81	R	G							
482B-6-5, 80-82	98.31	R	G							
482B-6-6, 80-82	99.80	R	G							
482B-6,CC (18-20)	100.70	C	G							
482B-7-1, 80-82	101.81	R	G							
482B-7-2, 80-82	103.31	B								
482B-7,CC (3-5)	103.60	B								
482B-8-1, 80-82	111.31	B								
482D-5,CC (24-26)	111.70	B								
482C-6-1, 70-72	111.71	B								
482B-8-2, 80-82	112.80	B								
482C-6-2, 70-72	113.21	B								
482B-8-3, 35-37	113.86	B								
482B-8-3, 56-58	114.07	B								
482B-8-3, 80-82	114.31	B								
482F-2-1, 82-84	114.33	F	G							
482C-6-3, 70-72	114.71	B								
482B-8-4, 80-82	115.81	B								
482C-6-4, 70-72	116.71	B								
482B-8-5, 63-65	117.10	B								
482B-8,CC (3-5)	117.38	B								
482F-2,CC (33-35)	117.46	A	G							
482C-6-5, 70-72	117.71	B								
482C-6-6, 13-15	118.64	B								
482C-6-6, 24-26	118.75	B								
482B-9-1, 80-82	120.81	B								
482B-9-2, 80-82	122.31	B								
482B-9-3, 80-82	123.81	B								
482F-3-2, 0-1	124.50	B								
482B-9-4, 85-87	125.36	A	G							
482B-9-5, 80-82	126.81	B								
482B-9-6, 85-87	128.36	B								
482B-9,CC (20-22)	128.96	B								
482B-10-1, 80-82	130.31	R	G							
482C-8-1, 30-32	130.31	B								
482B-10-2, 80-82	131.81	F	G							
482C-9-1, 12-16	132.14	B								
482B-10-3, 80-82	133.31	R	G							
482B-10-4, 80-82	134.81	R	G							
482B-10-5, 80-82	136.31	B								
482B-10-6, 80-82	137.81	R	G							
482B-19-1, 49-51	193.50	B								
482B-24-1, 21-24	224.72	R	G							

Note: Abundances are indicated as: A (abundant), C (common), F (few), R (rare), and B (barren); blank space = species searched for but not found. Preservation is indicated as G (good), M (moderate), and P (poor).

level occurs between 1 and 10 meters above the top of calcareous nannofossil Zone NN19, as determined by J. Hattner aboard the *Glomar Challenger* (this volume). The top of this zone (*Pseudoemiliania lacunosa*) has recently been dated at 0.44 Ma by Gartner (1977). Johnson and Knoll (1975) claim that the highest occurrence of *A. angelinum* may be diachronous (Table 7), since it is significantly younger in two cores from the equatorial Pacific than in the North Pacific sediments

Table 3. Radiolarians at Site 483.[a]

Sample (interval in cm)	Depth below Seafloor (m)	Abundance	Preservation	Taxa: *Buccinosphaera invaginata*	*Stylacontarium acquilonium*	*Collosphaera tuberosa*	*Axoprunum angelinum*	*Lamprocyrtis neoheteroporos*	*Anthocyrtidium angulare*	*Theocorythium vetulum*
482-1,CC (13-15)	0.40	F	M/G							
483-2,CC (5-7)	5.60	A	G							
483-3-3, 100-102	14.51	C	G							
483-3-4, 23-25	15.24	C	G							
483-3-4, 100-102	16.01	C	G							
483-4-1, 100-102	21.01	A	G							
483-4,CC (0-3)	24.45	A	G							
483-5-1, 100-102	30.51	A	G							
483-5-2, 100-102	32.01	A	G							
483-5-3, 100-102	33.51	A	G				F			
483-5-4, 100-102	35.01	A	G				R			
483-5,CC (5-7)	37.10	A	G			R	F/C			
483-6-2, 28-31	40.80	A	G			R	F			
483-6,CC (16-18)	43.60	A	G				C			
483-7,CC (5-7)	55.61	C	M/G				C			
483-8-1, 70-72	58.71	R	G				R			
483-8-2, 70-72	60.21	F/C	G				R			
483-8-3, 70-72	61.71	R	G				R			
483-8-4, 70-72	63.21	F	G				C			
483-8,CC (11-13)	63.65	A	G				C	R		R
483-9-1, 74-76	68.25	A	G				C	R	R	?
483-9,CC (10-12)	77.14	C	G				A		cf.	
483-10,CC (19-21)	79.71	R	G							
483C-2-1, 80-82	86.81	R	G				R			
483C-2-3, 80-82	89.81	R	G				R			
483-11,CC 16-18	93.70	B								
483C-2-6, 80-82	94.31	B								
483C-3-1, 80-82	96.31	B								
483C-3,CC (5-6)	98.60	B								
483B-2-1, 70-72	101.70	B								
483-12,CC (4-6)	105.64	B								
483B-2-4, 70-72	106.21	B								
483B-2-6, 81-83	109.32	B								
483-13-3, 85-87	109.36	R	G							
483-17-1, 10-13	142.12	B								
483-18-2, 0-2	152.51	B								
483-18-2, 46-48	152.97	B								
483-18-2, 130-132	153.81	B								
483-18-3, 99-101	155.00	B								
483-18-3, 124-126	155.25	B								
483-18-4, 70-72	156.21	B								
483-26-1, 42-51	200.47	B								
483B-20-2, 71-95	210.83	B								
483B-20-2, 120-130	211.25	R	G							
483B-25-2, 6-8	232.57	B								

[a] See note, Table 2, for explanation of symbols.

Table 4. Radiolarians at Site 484.[a]

Sample (interval in cm)	Depth below Seafloor (m)	Abundance	Preservation	Taxa: *Buccinosphaera invaginata*	*Stylacontarium acquilonium*	*Collosphaera tuberosa*	*Axoprunum angelinum*	*Lamprocyrtis neoheteroporos*	*Anthocyrtidium angulare*	*Theocorythium vetulum*
484-1,CC (5-7)	4.97	A	G							
484A-1,CC (6-8)	7.60	A	G				?			
484A-3-1, 80-82	18.31	A	G				?			
484A-3,CC (0-2)	25.90	A	G							
484A-4,CC (9-11)	32.37	A	G							
484A-5-1, 80-82	37.31	A	G				?			
484A-5-2, 80-82	38.81	A	G				?			
484A-5-3, 80-82	40.31	F/C	G							
484A-5-4, 17-19	41.18	F	G							
484A-5-4, 80-82	41.81	C	G							
484A-5,CC (5-7)	42.86	A	G				R			
484A-6-5, 32-34	52.33	A	G				cf. F/C			

[a] See note, Table 2, for explanation of symbols.

studied by Hays (1970). In rather weak support of Johnson and Knoll's claim of diachroneity, single specimens of *Collosphaera tuberosa* occur 3.6 and 7.3 meters below the highest occurrence of *A. angelinum* in Hole 483 (Table 3). According to them, the first occurrence of *C. tuberosa* is dated at 0.37 ± 0.01 Ma in the two cores they studied.

Biostratigraphy of Leg 65 Sites

Tables 2–5 and Figure 4 summarize data from the Leg 65 holes for each site and are arranged according to subbottom depth. Marker species that I searched for are given in the tables. The datum for comparing all four sites in Figure 4 is the highest occurrence of *Axoprunum angelinum* at Sites 483, 484, and 485. All of the sedimentary section recovered at Site 482 was deposited above this datum.

One feature apparent in Figure 4 is that in the few meters or tens of meters of sediment immediately overlying the basement and in the sediments interbedded with the basalt layers at Sites 482, 483, and 485, radiolarians are generally absent or, if present, are rare but well preserved. Therefore, it does not appear that submarine volcanism had a direct effect on the preservation of radiolarian skeletons in these sediments.

In order to determine whether there is any pattern in the change in radiolarian abundance from rare or barren in the lower part to common and abundant in the upper part of the Pleistocene section in the region of the mouth of the Gulf of California, I have combined the data from Leg 65 with radiolarian data from Legs 63 and 64 in Table 8.

The faunal increase clearly occurred much earlier at sites northwest of the axis of the East Pacific Rise than at sites southeast of the axis (Fig. 1) and must have resulted, at least in part, from enhanced biological productivity in overlying waters. Perhaps upwelling or the influence of the California Current System was felt earlier at the northwestern sites during the opening of the Gulf than at the southeastern ones. Alternatively, more nearly oceanic conditions, but not necessarily upwelling, with concomitant increased contribution of radiolarian skeletons to the bottom sediments, would have prevailed earlier at the northwestern sites, which are farther from the Mexican mainland than the southeastern sites and were, therefore, less influenced by terrigenous sedimentation.

Site 482

None of the Quaternary-age radiolarian marker species (Table 7) was found in any of the samples from the drill holes at Site 482 (Table 2). All of the sediment at

Table 5. Radiolarians at Site 485.[a]

Sample (interval in cm)	Depth below Seafloor (m)	Abundance	Preservation	*Buccinosphaera invaginata*	*Stylacontarium acquilonium*	*Collosphaera tuberosa*	*Axoprunum angelinum*	*Lamprocyrtis neoheteroporos*	*Anthocyrtidium angulare*	*Theocorythium vetulum*
				Taxa						
485-1-2, 80-82	2.31	C	M							
485-2,CC (7-9)	7.83	C	M/G							
485-3,CC (7-9)	22.07	R	M/G							
485-4,CC (13-15)	25.84	A	G							
485-5-1, 80-82	32.31	R	G				?			
485-5-2, 80-82	33.81	R	G							
485-5-3, 80-82	35.31	R	G				R			
485-5-4, 80-82	36.81	R	G				R			
485-5,CC (5-7)	37.77	C	G				F	cf.		
485-6,CC (6-8)	50.58	C	G				F			
485A-1,CC (11-13)	60.10	R	G							
485A-2,CC (19-21)	65.10	F	G				R			
485A-3,CC (2-4)	73.22	A	G				C	R	cf.	
485A-4,CC (3-4)	80.15	R	G							
485A-5,CC (7-9)	93.70	B								
485A-6,CC (17-19)	102.30	B								
485A-7,CC (3-5)	109.70	R	G							
485A-8,CC (5-7)	120.24	B								
485A-9,CC (15-17)	129.88	B								
485A-10,CC (9-11)	139.60	B								
485A-11-2, 145-147	148.46	B								
485A-19-2, 10-12	189.61	B								
485A-19-2, 114-116	190.65	R	G							
485A-20-2, 13-15	194.14	B								
485A-22,CC (12-16)	210.00	B								
485A-26,CC	227.70	B								
485A-27,CC (15-17)	231.97	B								
485A-28,CC (15-19)	235.80	B								
485A-34-1, 9-11	277.10	R	M/G				R			
485A-34-1, 36-39	277.38	B								
485A-36-2, 130-150	297.90	B								
485A-37,CC (11-12)	306.00	B								
485A-38-1, 40-50	313.50	B								

[a] See note, Table 2, for explanation of symbols.

the site must have been deposited above the radiolarian datum level denoted by the highest occurrence of *Axoprunum angelinum* (0.41 Ma; Fig. 4). This interpretation is supported by the absence of evidence for the existence at Site 482 of calcareous nannofossil Zone NN19, which ended 0.44 Ma (Gartner, 1977).

Radiolarian skeletons are well preserved throughout the sedimentary section. As mentioned, above the faunal increase at about 102 meters sub-bottom, radiolarians are present in all samples. Fluctuations in abundance are partly related to reduction of their numbers through dilution by fine sand, silt, and foraminifers transported to the site by turbidity currents or some other mechanism. With few exceptions, only the more pelagic sediments have common to abundant radiolarians.

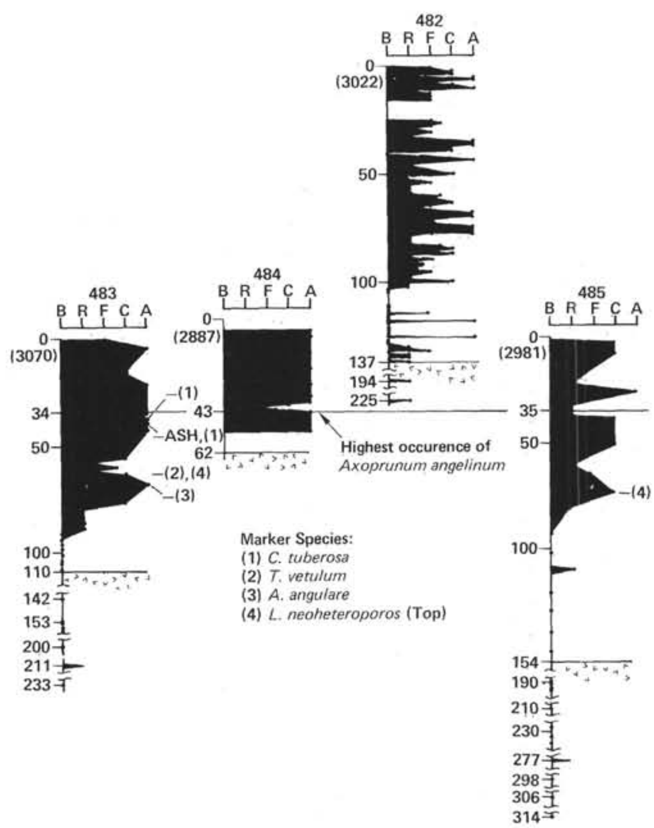

Figure 4. Leg 65 drill sites showing radiolarian occurrences and correlation using the highest occurrence of *Axoprunum angelinum* (= *Stylatractus universus*) as a datum. (Depth below mudline shown in meters on left of each column; water depth in parentheses. B, R, F, C, and A correspond to barren, rare, few, common, and abundant, respectively.)

Site 483

Above 80 meters sub-bottom, well-preserved radiolarians are generally common to abundant at Site 483 (Table 3). Below this depth and in the sediments interlayered with the basalts, they are rare or absent but still well preserved. In the lowest sample with common radiolarians, Sample 483-9,CC (10-12 cm), the dominant forms are thick-walled actinommids, including abundant *Axoprunum angelinum, Actinomma* spp., *Xiphatractus* spp., *Druppatractus* spp., and a few robust nasselline species, including *Theocalyptra davisiana davisiana, Botryostrobus aquilonaris, Carpocanarium papillosum, Plectopyramis dodecomma*, and *Cornutella profunda*. Although there is little indication of chemical attack, this concentration of robust skeletons may have resulted from the dissolution of less solution-resistant skeletons from an originally more diverse assemblage typical of the overlying sediments.

The highest occurrence of *Axoprunum angelinum* is in Sample 483-5-3, 100-102 cm (33.51 m sub-bottom). At this level, as well as at its highest occurrences at Sites 484 and 485, I observed several specimens in which the two polar spines were reduced or absent (Plate 1, Figs. 3

Table 6. Quaternary planktonic foraminifers at Site 483.[a]

Sample (interval in cm)	Depth below Seafloor (m)	Species Assemblages (after Bé, 1977)																					
		Tropical								Subtropical												Transition	
		Globorotalia menardii	*Pulleniatina obliquiloculata*	*Globigerinoides sacculifer*	*Globoquadrina hexagona*	*Candeina nitida*	"*Sphaeroidinella dehiscens*"	*Globorotalia theyeri*	*Globigerina digitata*	*Globoquadrina dutertrei*	*Globigerinoides ruber*	*Globorotalia scitula*	*Globigerina calida*	*Orbulina universa/O. suturalis*	*Globigerina falconensis*	*Hastigerina pelagica*	*Globigerinoides conglobatus*	*Globigerinita glutinata*	*Globigerinella aequilateralis*	*Globorotalia tumida*	*Globigerina bulloides*[b]	*Globoquadrina pachyderma* (dextral)[b]	*Globorotalia inflata*
483-1,CC (13–15)	0.40	C	R	C	F			R		A	C	R		F		R				F/C	C/A	C	
483-2,CC (5–7)	5.60	C	F/C	F/C	R		?			A	F/C			F	?					?	C/A	C	
483-3-3, 100–102	14.51	R	R							C	F			R							F	F	
483-3-4, 23–25	15.24	R	R	F					R	C	F	R		R		R					C	F/C	
483-3-4, 100–102	16.01	F	R	C				R/F	R	A	C/A	F		F		R					A	C	
483-4-1, 100–102	21.01			R						A	R	R		R							F	R	
483-4,CC (0–3)	24.45	F	R	C	R					A	F	R		C		R					C/A	C	
483-5-1, 100–102	30.51	R	C	C/A		R				A	C	F		C		R	R				A	C/A	
483-5-2, 100–102	32.01	R	R	F	R			R		A	F/C	R		R		R					C	C/A	
483-5-3, 100–102	33.51	R	C	C/A		R				A	C	F		C		R	R				A	C/A	
483-5,CC (5–7)	37.10	F		R	R		R			A	C/A	R		R	cf.			R			A	C	
483-6-2, 28–31	40.80	C	R	R	R					A	C			R						?	C/A	C/A	
483-6,CC (16–18)	43.60			R/F						A	C	R/F		F/C		R					A	C	
483-7,CC (5–7)	55.61	R	R	F				R		F/C	F/C			R		R					A	C/A	
483-8,CC (11–13)	63.65	C	F/C	R		R				A	C										C	F	R
483-9-1, 74–76	68.25	F	R	R	R		F			A	C	R	R	F	?		R	F			C	F	R
483-9,CC (10–12)	77.14	R	F	R						F	F/C						R			cf.	R	R	
483-10,CC (19–21)	79.71	R	R							R	R				?						R	R	
483C-2-1, 80–82	86.81	R	F	R						F	F			R								R	
483C-2-3, 80–82	89.81	F/C	F/C	R/F						F	F/C			R/F				R			F	F	R
483-11,CC (16–18)	93.70		R								R										R		
483C-2-6, 80–82	94.31	C	F	F			R			F	A	R		F		R					F	C	
483C-3-1, 80–82	96.31	R	R								R												
483B-2-1, 70–72	101.70																				R		
483-12,CC (4–6)	105.64	R	F	R	R					F	F	R		R				R	R		F		
483B-2-4, 70–72	106.21		F/C							F	F/C										R	R	
483B-2-6, 81–83	109.32	R	F	R						R	R			R							R		
483-13-3, 85–87	109.36											R									R		
483-17-1, 10–13	142.12				R					R													
483-18-2, 0–2	152.51		R							F	R/F										R	R	
483-18-2, 46–48	152.97																				R		
483-18-2, 130–132	153.81										R												
483-18-3, 99–101	155.01									R													
483-18-3, 124–126	155.25		R								R										R		
483-18-4, 70–72	156.21									R	R											?	
483-20-2, 71–95	210.83																						
483-20-2, 120–130	211.25																						

[a] See note, Table 2, for explanation of symbols.
[b] High latitude species which may originate from the California Current System.

and 4). *A. angelinum* is present in every sample down to the section which is barren of radiolarians.

Other Quaternary marker species that I noted include: (1) single occurrences of *Collosphaera tuberosa* in Samples 483-5,CC (5–7 cm) (Plate 1, Figs. 5–6) and 483-6-2, 16–18 cm, the latter being a sample of a volcanic ash layer; (2) rare occurrences of *Lamprocyrtis neoheteroporos* in Samples 483-8,CC (11–13 cm) (Plate 3, Figs. 4, 6) and 483-9-1, 74–76 cm; (3) one specimen identified as *Anthocyrtidium angulare* in Sample 483-9-1, 74–76 cm (Plate 3, Fig. 1), and (4) one specimen identified as *Theocorythium vetulum* in Sample 483-8,CC (11–13 cm) (Plate 3, Figs. 7–9). Because of the scarcity of these species, I did not assign any of the section at Site 483 to Nigrini's (1971) fourfold zonation of the Quaternary.

Site 484

Well-preserved radiolarians are abundant in nearly all of the samples examined from Site 484 (Table 4). The

Table 7. Estimated ages of Quaternary radiolarian datum levels.

Radiolarian Datum Level	Estimated Age (Ma)	References and Remarks
Transition: *Collosphaera* sp. A. to *Buccinosphaera invaginata*	0.21 ± 0.02	Johnson and Knoll (1975)
Top: *Stylacontarium acquilonium*	0.31	Hays (1970)
(= *Druppatractus acquilonius*)	0.4	Kling (1973)
Base: *Collosphaera tuberosa*	0.37 ± 0.01	Johnson and Knoll (1975)
Top: *Axoprunum angelinum*	0.32	Johnson and Knoll (1975)
(= *Stylatractus universus*)	0.41 ± 0.005	Hays and Shackleton (1976)
Top: *Lamprocyrtis neoheteroporos*	0.54	Johnson and Knoll's (1975) estimate based on Kling's (1973) data for DSDP Site 175
	0.76	Johnson and Knoll's (1975) estimate based on Kling's (1973) data for DSDP Site 173
	1.03	Johnson and Knoll (1975) for tropical Pacific
Base: *Collosphaera* sp. A.	0.61	Johnson and Knoll (1975)
Top: *Anthocyrtidium angulare*	0.94	Johnson and Knoll (1975)
Top: *Theocorythium vetulum*	0.94	By inference from Johnson and Knoll (1975) because top same as *A. angulare* (Nigrini, 1971)
Top: *Pterocanium prismatium*	1.70	Johnson and Knoll (1975)

Table 8. Radiolarian abundance changes at DSDP sites in the mouth of the Gulf of California.

Site	Depth to Basement (m)	Depth to Change from Rare to Barren Below to Common and Abundant Above (m)	Date of Faunal Increase Extrapolated from Estimated Rates of Sediment Accumulation (Ma)
Southeast of East Pacific Rise axis:			
473	287	29	0.5
482	137	102	<0.41
485	154	73–81	0.48–0.58
Northwest of East Pacific Rise axis:			
474	563	320	1.3
475	n/a	45–53	0.85–1.3
476	257	80	1.7
483	110	80	1.2

datum level represented by the highest occurrence of *Axoprunum angelinum* is at 42.86 meters sub-bottom (Sample 484A-5,CC [5–7 cm]). A few reworked specimens of this species were found above this depth in Samples 484A-1,CC (6–8 cm), 484A-3-1, 80–82 cm, 484A-5-1, 80–82 cm, and 484A-5-2, 80–82 cm. A few reworked calcareous nannofossils from Zone NN19 also were found in some of the upper cores (J. Hattner, personal communication). I did not find other Quaternary radiolarian marker species at Site 484.

Site 485

Radiolarians are common to abundant only in the upper 75–80 meters of the sediments at Site 485 (Table 5). Below this and in the sediments interbedded with the basalts, they are rare or absent. Wherever they are found, however, the radiolarians are well preserved.

Above 75–80 meters, the most abundant and diverse assemblages are from the more pelagic sediments characterized by the presence of *in situ*, lower bathyal to abyssal, benthic foraminifers. Radiolarians are generally few to rare in samples from fine-grained turbidites which lack the foraminiferal assemblages.

The highest occurrence of *Axoprunum angelinum* is in Sample 485-5-3, 80–82 cm (35.31 m sub-bottom), and it is present in almost all samples below this to a sub-bottom depth of about 80 meters (Table 5). The only other Quaternary marker species I observed is *Lamprocyrtis neoheteroporos* from Sample 485A-3,CC (2–4 cm) (Plate 3, Fig. 5).

SYSTEMATIC REFERENCE LIST

The purpose of this list is to provide recent bibliographic references plus notes, where applicable, to the radiolarian taxa present in Holocene sediments from the Gulf of California (Benson, 1964, 1966) and in Quaternary sediments recovered during Leg 65 at the mouth of the Gulf. Original references are generally not given. Most of the generic assignments are those of recent authors; otherwise, the original authors' genera or those of Campbell (1954) were used.

Except for those taxa identified in the text as dominant members of the Pleistocene and Holocene assemblages, all of the taxa listed are generally rare. Nearly all (95% or more) of the taxa present are accounted for in the list.

Acrobotrissa cribosa Popofsky
(Plate 9, Fig. 5)

Acrobotrissa cribosa Popofsky, 1913, p. 322, text-fig. 29; Benson, 1966, p. 342, pl. 23, fig. 15, text-fig. 22; Casey, 1971, pl. 23.2, figs. 3–4.

Acrobotrys sp. cf. *A. disolenia* Haeckel
(Plate 9, Figs. 6–7)

Cf. *Acrobotrys disolenia* Haeckel, 1887, p. 1114, pl. 96, fig. 10.
Acrobotrys cf. *disolenia* Haeckel, Benson, 1966, p. 339, pl. 23. figs. 13–14, text-fig. 21.

Acrosphaera murrayana Haeckel

Choenicosphaera murrayana Haeckel, Benson, 1964, pl. 1, fig. 6; 1966, p. 120, pl. 2, fig. 3.
Polysolenia murrayana (Haeckel), Nigrini, 1968, p. 52, pl. 1, figs. 1a–b.

Remarks. According to Johnson and Nigrini (1980), the correct generic name for collosphaerids with irregularly scattered spines is *Acrosphaera*, not *Polysolenia*.

Actinomma antarcticum (Haeckel)

Diploplegma banzare Riedel, Benson, 1966, p. 134, pl. 2, fig. 14, pl. 3, figs. 2–3 (not fig. 1).
Actinomma antarcticum (Haeckel), Nigrini, 1967, p. 26, pl. 2, figs. 1a–d.

Actinomma arcadophorum Haeckel

Actinomma arcadophorum Haeckel, Nigrini, 1967, p. 29, pl. 2, fig. 3; 1970, p. 167, pl. 1, fig. 11.

Actinomma leptodermum (Jörgensen)

Actinomma sp., Benson, 1964, pl. 1, fig. 15; 1966, p. 164, pl. 5, fig. 6 (not fig. 5).
Echinomma leptodermum Jörgensen, Kling, 1977, p. 215, pl. 2, fig. 16.
Actinomma leptodermum (Jörgensen), Nigrini and Moore, 1979, p. S35, pl. 3, fig. 7.

Actinomma medianum Nigrini

Diploplegma banzare Riedel, Benson, 1966, p. 134, pl. 3, fig. 1.
Actinomma medianum Nigrini, 1967, p. 27, pl. 2, figs. 2a–b; 1970, p. 167, pl. 1, fig. 10.

Actinomma sp.

Actinomma sp., Benson, 1964, pl. 1, fig. 16; 1966, p. 164, pl. 5, fig. 5.

Actinosphaera cristata (Haeckel)(?)

Cenosphaera cristata Haeckel?, Riedel, 1958, p. 223, pl. 1, figs. 1–2; Kling, 1977, p. 215, pl. 2, fig. 4.
Carposphaera acanthophora (Popofsky), Benson, 1964, pl. 1, fig. 1; 1966, p. 127, pl. 2, figs. 8–10.

Actinosphaera acanthophora (Popofsky), Dumitrică, 1972, p. 832, pl. 20, figs. 1–2.
Haliomma erinaceum Haeckel, Renz, 1976, p. 101, pl. 2, figs. 4a–b.

Remarks. Dumitrică (1972, p. 832) describes this species as having "a delicate primitive microsphere with large polygonal meshes which are connected to the cortical shell by a number of thread-like radial bars." Dumitrică (1972) assigned two such species to the genus *Actinosphaera* Hollande and Enjumet, and I have followed this practice for *Cenosphaera cristata* (Haeckel)(?).

Amphiplecta cylindrocephala **Dumitrică**
(Plate 8, Fig. 5)

Amphiplecta cf. *acrostoma* Haeckel, Benson, 1966, p. 464, pl. 32, figs. 1–2.
Amphiplecta cylindrocephala Dumitrică, 1972, p. 836, pl. 24, figs. 4–5.

Amphirhopalum virchowii **(Haeckel)**
(Plate 2, Figs. 1–3)

Amphirhopalum wirchowii (*sic*) (Haeckel), Dumitrică, 1972, p. 835, pl. 9, figs. 2, 4, pl. 11, fig. 6, pl. 21, figs. 2–13.

Remarks. Nigrini and Moore (1979, p. S76) note Dumitrică's minor spelling error. Both *A. ypsilon* and *A. virchowii* occur together in Leg 65 samples, although the latter is rare and is absent from Holocene sediments in the Gulf of California (Benson, 1966). The latest occurrence of *A. virchowii* in Leg 65 holes is in Sample 482A-4,CC (33.5 m subsea). All of the sediment at Site 482 is younger than the extinction datum for *Axoprunum angelinum;* therefore, *A. virchowii* ranges above this datum.

Amphirhopalum ypsilon **Haeckel**
(Plate 2, Figs. 4–7)

Amphicraspedum wyvilleanum Haeckel, Benson, 1964, pl. 1, figs. 27–28; 1966, p. 221, pl. 11, figs. 5–6.
Amphirhopalum ypsilon Haeckel, Nigrini, 1967, p. 35, pl. 3, figs. 3a–d; 1970, p. 168, pl. 2, fig. 2; 1971, p. 447, pl. 34.1, figs. 7a–c.

Remarks. Although I did not make counts of specimens, tests found lower in the Quaternary sections at Leg 65 sites generally have fewer chambers (three or four) on the forked arm before bifurcation (Plate 2, Figs. 4–6) than those found higher in the section (Plate 2, Fig. 7), a trend first noted by Nigrini (1971).

Amphisphaera cristata **Carnevale**
(Plate 4, Fig. 5)

Amphisphaera cf. *uranus* Haeckel, Benson, 1964, pl. 1, fig. 7; 1966, p. 136, pl. 3, figs. 4–5.
Amphisphaera cristata Carnevale, Dumitrică, 1972, p. 833, pl. 20, fig. 10.

Amphitholus acanthometra **Haeckel**

Amphitholus acanthometra Haeckel, 1887, p. 667; Benson, 1964, pl. 1, fig. 60; 1966, p. 258, pl. 17, figs. 4–7.

Anomalacantha dentata **(Mast)**

Anomalacantha dentata (Mast), Benson, 1966, p. 170, pl. 5, figs. 10–11.
Heteracantha dentata Mast, Nigrini, 1970, p. 167, pl. 1, fig. 9.

Anthocyrtidium angulare **Nigrini**
(Plate 3, Fig. 1)

Anthocyrtidium angulare Nigrini, 1971, p. 445, pl. 34.1, figs. 3a–b; Dinkelman, 1973, p. 788, pl. 10, fig. 5; Johnson and Knoll, 1975, p. 107, pl. 1, fig. 3.

Remarks. The specimen illustrated in Plate 3, Figure 1 is the only one found in Leg 65 samples that has the dimensions and true biretta-shaped thorax described for this species by Nigrini (1971). It differs from Nigrini's (1971, pl. 34.1, figs. 3a–b) illustration of the species in the larger size of the thoracic pores, but Nigrini does not mention pore size as an identifying characteristic. Several somewhat larger specimens, having a cylindrical to slightly in-turned thorax beneath a sharp change in contour and herein designated *Anthocyrtidium* sp. cf. *A. angulare* (Plate 3, Figs. 2–3), were found at about the same level (Sample 483-9-1, 74–76 cm) as *A. angulare* or lower. These specimens may be variant forms of *Anthocyrtidium ophirense*.

Anthocyrtidium ophirense **(Ehrenberg)**

Anthocyrtidium cineraria Haeckel, Benson, 1964, pl. 2, figs. 28–29; 1966, p. 472, pl. 32, figs. 6–9.
Anthocyrtidium ophirense (Ehrenberg), Nigrini, 1967, p. 56, pl. 6, fig. 3; 1970, p. 171, pl. 4, fig. 7; Molina-Cruz, 1977, p. 337, pl. 6, fig. 10.

Anthocyrtidium zanguebaricum **(Ehrenberg)**

Anthocyrtium oxycephalis (Haeckel), Benson, 1964, pl. 2, fig. 27; 1966, p. 468, pl. 32, figs. 3–5.
Anthocyrtidium zanguebaricum (Ehrenberg), Nigrini, 1967, p. 58, pl. 6, fig. 4; Molina-Cruz, 1977, p. 337, pl. 6, fig. 8.

Arachnocorys umbellifera **Haeckel**
(Plate 8, Fig. 6)

Arachnocorys umbellifera Haeckel, 1861, p. 837; 1862, p. 305, pl. 6, fig. 12; Benson, 1966, p. 375, pl. 24, figs. 20–21.

Axoprunum angelinum **(Campbell and Clark)**
(Plate 1, Figs. 1–4)

Stylatractus universus Hays, 1970, p. 215, pl. 1, figs. 1–2; Kling, 1971, p. 1086, pl. 1, fig. 7; Dinkelman, 1973, p. 765, pl. 10, figs. 6–7.
Axoprunum angelinum (Campbell and Clark), Kling, 1973, p. 634, pl. 1, figs. 13–16, pl. 6, figs. 14–18; Johnson and Knoll, 1975, p. 107, pl. 1, fig. 5.

Remarks. The highest occurrence of this species at Sites 483, 484, and 485 represents the only reliable radiolarian datum determined for Leg 65 drill holes. Many tests of this species at its highest occurrence in Leg 65 samples are characterized by the reduction (Plate 1, Fig. 3) or absence (Plate 1, Fig. 4) of the two polar spines.

Botryocyrtis quinaria **Ehrenberg**

Botryocyrtis cf. *caput-serpentis* Ehrenberg, Benson, 1966, p. 348, pl. 23, fig. 17, text-fig. 24.
Botryocyrtis quinaria Ehrenberg, Renz, 1974, p. 789, pl. 18, fig. 19.

Botryocyrtis scutum **(Harting)**

Botryopyle sp., Benson, 1964, pl. 2, fig. 64; 1966, p. 345, pl. 23, fig. 16, text-fig. 23.
Botryocyrtis scutum (Harting), Nigrini, 1967, p. 52, pl. 6, figs. 1a–c; Molina-Cruz, 1977, p. 338, pl. 6, fig. 14.
Botryocyrtis sp., Casey, 1971, pl. 23.3, fig. 1.

Botryostrobus aquilonaris **(Bailey)**

Siphocampium erucosum (Haeckel), Benson, 1964, pl. 2, fig. 63; 1966, p. 527, pl. 35, figs. 18–20.
Botryostrobus aquilonaris (Bailey), Nigrini, 1977, p. 246, pl. 1, fig. 1; Kling, 1979, p. 309, pl. 2, fig. 18.

Botryostrobus auritus-australis **(Ehrenberg) group**

Siphocampium cf. *seriatus* (Haeckel), Benson, 1964, pl. 2, fig. 62; 1966, p. 521, pl. 35, figs. 12–13.
Botryostrobus auritus-australis (Ehrenberg) group, Nigrini, 1977, p. 246, pl. 1, figs. 2–5; Kling, 1979, p. 309, pl. 2, fig. 17.

Buccinosphaera invaginata **Haeckel**

Buccinosphaera invaginata Haeckel, Nigrini, 1971, p. 445, pl. 34.1, fig. 2; Dinkelman, 1973, p. 764, pl. 10, fig. 3; Johnson and Knoll, 1975, p. 107, pl. 1, fig. 2; Knoll and Johnson, 1975, p. 63, pl. 1, figs. 3–6.

Remarks. Although I searched for this species in Leg 65 samples, I did not find it.

Callimitra emmae **Haeckel**

Callimitra emmae Haeckel, 1887, p. 1218, pl. 63, figs. 3–4; Benson, 1966, p. 390, pl. 25, fig. 12.
Callimitra sp., Renz, 1974, p. 789, pl. 18, fig. 5; 1976, p. 162, pl. 7, fig. 1.

Calocyclas monumentum **Haeckel**

Clathrocyclas(?) sp., Benson, 1966, p. 457, pl. 31, figs. 2–3.
Calocyclas monumentum Haeckel, Renz, 1974, p. 789, pl. 16, fig. 25; 1976, p. 128, pl. 5, fig. 1; Riedel and Sanfilippo, 1977, pl. 23, fig. 2.

Carpocanarium papillosum **(Ehrenberg) group**

Eucyrtidium papillosum Ehrenberg, 1872a, p. 310, 1872b, pl. 7, fig. 10.
Dictyocephalus mediterraneus Haeckel, 1887, p. 1307, pl 62, fig. 2; Benson, 1964, pl. 2, fig. 33; 1966, p. 439, pl. 29, fig. 13.
Dictyocephalus papillosus (Ehrenberg), Riedel, 1958, p. 236, pl. 3, fig. 10, text-fig. 8.
Dictyocryphalus papillosus (Ehrenberg), Nigrini, 1967, p. 63, pl. 6, fig. 6; Renz, 1976, p. 139, pl. 6, fig. 9; Molina-Cruz, 1977, p. 338, pl. 7, fig. 13.
Carpocanarium spp., Riedel and Sanfilippo, 1971, p. 1599, pl. 1I, figs. 18, 20, 22–25, pl. 2J, figs. 8, 9(?).
Carpocanarium papillosum (Ehrenberg), Renz, 1974, p. 789, pl. 17, fig. 21; Nigrini and Moore, 1979, p. N27, pl. 21, fig. 3.

Carpocanistrum **spp.**

Carpocanium petalospyris Haeckel, 1887, p. 1283, pl. 52, fig. 19; Benson, 1964, pl. 2, figs. 24–25; 1966, p. 434, pl. 29, figs. 9–10, fig. 25.
Carpocanium spp., Nigrini, 1970, p. 171, pl. 4, figs. 4–6.
Carpocanium sp., Casey, 1971, pl. 23.3, fig. 2; Molina-Cruz, 1977, p. 337, pl. 6, fig. 13 (not fig. 12).
Carpocanistrum spp., Riedel and Sanfilippo, 1971, p. 1596, pl. 1G, figs. 1–6, 8(?), 9, 10, 11(?), 12(?), 13; Dumitrică, 1972, p. 838, pl. 14, fig. 4, pl. 15, figs. 11–12, pl. 24, figs. 1, 3, 6; Renz, 1974, p. 789, pl. 17, fig. 17; 1976, p. 151, pl. 6, fig. 4.
Carpocaniidae, gen. et spp. indet., Kling, 1973, p. 638, pl. 5, figs. 1–5, 6(?).

Remarks. I agree with Nigrini's (1970, p. 171) discussion of this group.

Carpocanistrum(?) **sp.**

Unnamed, Benson, 1964, pl. 2, fig. 32.
Carpocanistrum sp., Riedel and Sanfilippo, 1971, p. 1596, pl. 1G, fig. 7.

Remarks. As noted by Riedel and Sanfilippo (1971, p. 1596), more detailed morphological studies will be required to determine whether or not forms with a more distinct cephalis are included in *Carpocanistrum*.

Carpocanistrum **sp. A, Nigrini**

Carpocanium sp., Benson, 1964, pl. 2, fig. 23; 1966, p. 438, pl. 29, figs. 11–12.
Carpocanium sp. A, Nigrini, 1968, p. 55, pl. 1, fig. 4; Molina-Cruz, 1977, p. 337, pl. 6, fig. 12 (not fig. 13).
Carpocanistrum sp. A, Nigrini and Moore, 1979, p. N25, pl. 21, fig. 2.

Cenosphaera coronata **Haeckel**

Cenosphaera coronata Haeckel, Molina-Cruz, 1977, p. 333, pl. 1, fig. 4; Nigrini and Moore, 1979, p. S39, pl. 4, fig. 1.

Cenosphaera(?) **sp. aff.** *C. perforata* **Haeckel**
(Plate 4, Fig. 4)

Aff. *Cenosphaera perforata* Haeckel, 1887, p. 66, pl. 26, fig. 10.
Cenosphaera aff. *perforata* Haeckel, Benson, 1966, p. 125, pl. 2, figs. 6–7.

Ceratospyris(?) **sp. cf.** *C.*(?) *borealis* **Bailey**

Eucoronis(?) sp., Benson, 1966, p. 306, pl. 21, figs. 9–10.
Acanthodesmiidae, gen. et sp. indet., Kling, 1973, pl. 2, figs. 8–13.
Cf. *Ceratospyris borealis* Bailey, Nigrini and Moore, 1979, p. N9, pl. 19, figs. 1a–d.

Remarks. The forms identified by Benson (1966) as *Eucoronis*(?) sp. bear a superficial resemblance to *Ceratospyris borealis* Bailey.

Circodiscus microporus **(Stöhr)**

Trematodiscus microporus Stöhr, 1880, p. 108, pl. 4, fig. 17.
Ommatodiscus pantanellii Carnevale, 1908, p. 24, pl. 4, fig. 6; Benson, 1964, pl. 1, fig. 39; 1966, p. 207, pl. 9, figs. 7–8, pl. 10, fig. 1, text-fig. 12.
Circodiscus microporus (Stöhr), Petrushevskaya and Kozlova, 1972, p. 526, pl. 19, figs. 1–7.
(?)*Xiphatractus* sp. cf. *X. circularis* (Clark and Campbell), Kling, 1973, p. 635, pl. 7, figs. 15–17 (not figs. 11–14).
Porodiscus microporus (Stöhr), Renz, 1974, p. 794, pl. 15, fig. 16; 1976, p. 109, pl. 3, fig. 15.

Cladococcus cervicornis **Haeckel**
(Plate 4, Fig. 1)

Cladococcus cervicornis Haeckel, 1862, p. 370, pl. 14, figs. 4–6.
Elaphococcus cervicornis (Haeckel), Benson, 1966, p. 172, pl. 6, fig. 1.
(?)*Cladococcus scoparius* Haeckel, Renz, 1974, p. 789, pl. 13, fig. 17; 1976, p. 101, pl. 2, fig. 5.

Cladococcus stalactites **Haeckel**
(Plate 4, Fig. 2)

Cladococcus stalactites Haeckel, 1887, p. 227, pl. 27, fig. 4; Benson, 1966, p. 173, pl. 6, figs. 2–3.
(?)*Cladococcus abietinus* Haeckel, Renz, 1974, p. 789, pl. 13, fig. 18.

Cladoscenium(?) **sp. cf.** *C.*(?) *tricolpum* **(Haeckel)**

Cf. *Cladoscenium tricolpum* Haeckel, Jörgensen, 1899, p. 78; 1905, p. 134, pl. 15, figs. 71–73.
Cladoscenium cf. *tricolpum* (Haeckel) Jörgensen, Benson, 1964, pl. 2, fig. 15; 1966, p. 387, pl. 25, figs. 10–11.

Clathrocanium **sp. cf.** *C. coronatum* **Popofsky**

Cf. *Clathrocanium coronatum* Popofsky, 1913, p. 342, pl. 33, fig. 1.
Clathrocanium cf. *coronatum* Popofsky, Benson, 1966, p. 394, pl. 26, figs. 1–2.
(?)*Clathrocanium ornatum* Popofsky, 1913, p. 343, pl. 33, fig. 2; Casey, 1971, pl. 23.3, fig. 3.
Clathrocanium sp., Renz, 1974, p. 789, pl. 18, fig. 3; 1976, p. 163, pl. 7, fig. 5.

Clathrocircus stapedius **Haeckel**
(Plate 7, Figs. 5–7)

Clathrocircus stapedius Haeckel, 1887, p. 962, pl. 92, fig. 8; Benson, 1966, p. 307, pl. 21, figs. 11–13, pl. 22, fig. 1(?) (not fig. 2); Goll, 1972, p. 963, pl. 51, fig. 3.
(?)*Triceraspyris damaecornis* Haeckel, Nigrini, 1967, p. 46, pl. 5, fig. 5.

Remarks. Nigrini's (1967, pl. 5, fig. 5) illustration of *Triceraspyris damaecornis* resembles Benson's (1966, pl. 21, fig. 11) *Clathrocircus stapedius* more closely than it does *Dendrospyris damaecornis* (Benson, 1966, pl. 22, fig. 2).

Clathrocorys murrayi **Haeckel**

Clathrocorys murrayi Haeckel, 1887, p. 1219, pl. 64, fig. 8; Benson, 1966, p. 391, pl. 25, figs. 13–15.
Clathrocorys sp., Renz, 1974, p. 789, pl. 18, fig. 4; 1976, p. 163, pl. 7, fig. 4.

Clathromitra pterophormis **Haeckel**
(Plate 9, Fig.8)

Clathromitra pterophormis Haeckel, 1887, p. 1219, pl. 57, fig. 8; Benson, 1966, p. 399, pl. 26, fig. 4.

Collosphaera(?) **sp.**
(Plate 4, Fig. 3)

Polysolenia? sp., Benson, 1966, p. 119, pl. 2, figs. 1–2.

Collosphaera **sp. A, Knoll and Johnson**

Collosphaera sp. A, Knoll and Johnson, 1975, p. 63, pl. 1, figs. 1–2, 7, pl. 2, figs. 4–6; Johnson and Knoll, 1975, p. 107, pl. 1, fig. 1.

Remarks. Although I searched for this species in Leg 65 samples, I did not find it.

Collosphaera tuberosa **Haeckel**
(Plate 1, Fig. 5-6)

Collosphaera tuberosa Haeckel, Nigrini, 1970, p. 166, pl. 1, fig. 1; 1971, p. 445, pl. 34.1, fig. 1; Dinkelman, 1973, p. 763, pl. 10, figs. 1-2; Johnson and Knoll, 1975, p. 107, pl. 1, fig. 4; Knoll and Johnson, 1975, p. 63, pl. 2, figs. 1-3; Molina-Cruz, 1977, p. 332, pl. 2, fig. 6.

Remarks. I found only one individual of this species in Sample 483-5,CC, 5-7 cm and one in Sample 483-6-2, 28-31 cm.

Cornutella profunda **Ehrenberg**

Cornutella profunda Ehrenberg, Riedel, 1958, p. 232, pl. 3, figs. 1-2; Benson, 1964, pl. 2, fig. 30; 1966, p. 430, pl. 29, figs. 7-8; Nigrini, 1967, p. 60, pl. 6, figs. 5a-c; Casey, 1971, pl. 23.1, fig. 9; Kling, 1973, p. 635, pl. 3, figs. 1-4, pl. 9, figs. 8-17; Renz, 1974, p. 790, pl. 17, figs. 24-25; 1976, p. 149, pl. 7, fig. 11; Kling, 1977, p. 215, pl. 1, fig. 19; 1979, p. 309, pl. 1, fig. 21.

Cubotholus regularis **Haeckel**

Cubotholus cf. *octoceras* Haeckel, 1887, p. 681; Benson, 1966, p. 260, pl. 17, fig. 8.
Cubotholus regularis Haeckel, Renz, 1976, p. 113, pl. 1, fig. 18.

Cypassis irregularis **Nigrini**

Spongoliva cf. *ellipsoides* Popofsky, Benson, 1966, p. 190, pl. 8, figs. 6-7.
Cypassis irregularis Nigrini, 1968, p. 53, pl. 1, figs. 2a-c; Kling, 1977, p. 215, pl. 2, fig. 5.

Dendrospyris damaecornis **(Haeckel)**

Clathrocircus stapedius Haeckel, Benson, 1966, p. 307, pl. 22, fig. 1(?), fig. 2.
Dendrospyris damaecornis (Haeckel), Goll, 1972, p. 963, pl. 50, figs. 1-4, pl. 51, figs. 1-2.

Remarks. Benson (1966, p. 308) observed a few tests identified as *Clathrocircus stapedius* that have a bilocular cephalis completely latticed except for the dorsal face. One of the illustrated specimens (Benson, 1966, pl. 22, fig. 2) resembles the closely related species (Goll, 1968, 1972) *Dendrospyris damaecornis* as illustrated by Goll (1972, pl. 51, figs. 1-2). The other specimen (Benson, 1966, pl. 22, fig. 1) may belong to either species.

Dendrospyris **sp. aff.** *D. binapteronis* **Goll**

Patagospyris? sp., Benson, 1966, p. 326, pl. 22, fig. 22, pl. 23, figs. 1-2.
Dendrospyris sp. aff. *D. binapteronis* Goll, Renz, 1974, p. 790, pl. 19, fig. 11.

Dictyocoryne profunda **Ehrenberg**

Hymeniastrum koellikeri Haeckel, Benson, 1964, pl. 1, fig. 32(?), fig. 34; 1966, p. 225, pl. 12, figs. 5-6 (not fig. 4).
Dictyocoryne profunda Ehrenberg, Ling and Anikouchine, 1967, p. 1489, pl. 191, fig. 6, pl. 192, fig. 6; Molina-Cruz, 1977, p. 334, pl. 4, fig. 4; Nigrini and Moore, 1979, p. S87, pl. 12, fig. 1.

Dictyocoryne **sp.**
(Plate 6, Fig. 2)

Hymeniastrum koellikeri Haeckel, Benson, 1966, p. 225, pl. 12, fig. 4 (not figs. 5-6).
Dictyocoryne sp., Ling and Anikouchine, 1967, p. 1489, pl. 191, figs. 4-5, pl. 192, figs. 4-5.

Remarks. Although Nigrini and Moore (1979, pp. S87-S89) tentatively place specimens with chalice-shaped arms, as figured by Benson (1966) and Ling and Anikouchine (1967), in synonymy with *D. truncatum*, I believe they may represent a separate species or subspecies and have, therefore, designated them as *Dictyocoryne* sp.

Dictyocoryne truncatum **(Ehrenberg)**
(Plate 6, Fig. 1)

Dictyocoryne cf. *truncatum* (Ehrenberg), Benson, 1964, pl. 1, fig. 47; 1966, p. 235, pl. 15, fig. 1.
Dictyocoryne truncatum (Ehrenberg), Nigrini and Moore, p. S89 (*partim.*), pl. 12, fig. 2a (not 2b).

Remarks. In deference to Nigrini and Moore's (1979, pp. S89-S90) opinion that *Euchitonia triangulum* (Ehrenberg), as figured by them (*op. cit.*, pl. 12, fig. 2b) and Ling and Anikouchine (1967, pls. 189 and 190, figs. 8-9), may belong to *Dictyocoryne truncatum*, I prefer to keep it as a separate species.

Dictyophimus crisiae **Ehrenberg**

Pterocorys? sp., Benson, 1964, pl. 2, fig. 20; 1966, p. 412, pl. 28, figs. 4-6.
Dictyophimus crisiae Ehrenberg, Nigrini, 1967, p. 66, pl. 6, figs. 7a-b; Kling, 1973, p. 636, pl. 4, figs. 11-15, pl. 10, figs. 18-20; Renz, 1974, p. 791, pl. 17, fig. 2.
Pterocorys hirundo Haeckel, Casey, 1971, pl. 23.1, figs. 6-7; Ling, Stadum, and Welch, 1971, p. 715, pl. 2, figs. 8-10; Molina-Cruz, 1977, p. 338, pl. 8, fig. 9.

Dictyophimus infabricatus **Nigrini**

Dictyophimus infabricatus Nigrini, 1968, p. 56, pl. 1, fig. 6, Kling, 1977, p. 215, pl. 2, fig. 8; 1979, p. 309, pl. 1, figs. 25-26; not Molina-Cruz, 1977, pl. 8, fig. 1.

Dictyophimus platycephalus **Haeckel**
(Plate 8, Fig. 7)

Dictyophimus platycephalus Haeckel, 1887, p. 1198, pl. 60, figs. 4-5; Benson, 1966, p. 385, pl. 25, figs. 7-9.
(?)*Dictyophimus tetracanthus* Popofsky, Renz, 1974, p. 791, pl. 18, fig. 11; 1976, p. 157, pl. 6, fig. 11.

Dictyophimus **sp. cf.** *D. tripus* **Haeckel**
(Plate 8, Fig. 4)

Cf. *Dictyophimus tripus* Haeckel, 1862, p. 306, pl. 6, fig. 1.
Dictyophimus cf. *tripus* Haeckel, Benson, 1966, p. 380, pl. 25, figs. 2-3, text-fig. 8C.

Disolenia quadrata **(Ehrenberg)**

Disolenia cf. *variabilis* (Haeckel), Benson, 1966, p. 123, pl. 2, fig. 5.
Disolenia quadrata (Ehrenberg), Nigrini, 1967, p. 19, pl. 1, fig. 5.

Doryconthidium **sp. cf.** *D. hexactis* **(Vinassa de Regny)**

Cf. *Dorylonchidium hexactis* Vinassa de Regny, 1900, p. 230, pl. 1, fig. 12.
Doryconthidium? sp., Benson, 1966, p. 146, pl. 3, fig. 12.
Actinommid 3 gen. and sp. indet., Renz, 1974, p. 787, pl. 14, fig. 9.

Druppatractus irregularis **Popofsky**

Druppotractus (sic) *irregularis* Popofsky, 1912, p. 114, figs. 24-26.
Druppatractus irregularis Popofsky, Benson, 1964, pl. 1, fig. 19; 1966, p. 180, pl. 7, figs. 7-11.

Druppatractus variabilis **Dumitrică**

Druppatractus cf. *pyriformis* (Bailey), Benson, 1964, pl. 1, fig. 20; 1966, p. 177, pl. 7, figs. 2-6.
Druppatractus variabilis Dumitrică, 1972, p. 833, pl. 6, fig. 4, pl. 20, figs. 6-7.

Echinomma delicatulum **(Dogiel)**

Actinomma cf. *hystrix* (Müller), Benson, 1966, p. 166, pl. 5, figs. 3-4.
Echinomma delicatum (Dogiel), Ling et al., 1971, p. 710, pl. 1, fig. 4; Molina-Cruz, 1977, p. 333, pl. 1, fig. 5.
Echinomma delicatulum (Dogiel), Kling, 1977, p. 215, pl. 2, fig. 9.

Eucecryphalus cervus **(Ehrenberg)**

Coracalyptra (sic) *cervus* (Ehrenberg), Benson, 1964, pl. 2, figs. 52–53; 1966, p. 447, pl. 30, figs. 3–5.
Corocalyptra cervus (Ehrenberg), Renz, 1974, p. 790, pl. 16, fig. 22; 1976, p. 129, pl. 5, fig. 2.
?*Eucecryphalis* (sic) *cervus* (Ehrenberg), Kling, 1977, p. 215, pl. 1, fig. 21.

Eucecryphalus **(?) sp.**
(Plate 9, Fig. 4)

Eucecryphalus sp., Benson, 1966, p. 450, pl. 30, figs. 6–7; Casey, 1971, pl. 23.2, figs. 14–15.

Euchitonia elegans **(Ehrenberg)**

Euchitonia elegans (Ehrenberg), Benson, 1964, pl. 1, fig. 31(?); 1966, p. 230, pl. 14, fig. 1, fig. 2(?); Nigrini, 1967, p. 39, pl. 4, figs. 2a–b; 1970, p. 169, pl. 2, fig. 6; Ling and Anikouchine, 1967, p. 1486, pls. 189 and 190, figs. 3–4; Molina-Cruz, 1977, p. 334, pl. 2, fig. 8; Nigrini and Moore, 1979, p. S83, pl. 11, figs. 1a–b.

Remarks. Although Nigrini and Moore (1979, p. S83) indicate that Benson's (1966) description (including dimensions) of this species is not consistent with theirs, *E. elegans*, along with *E. furcata*, is present in the Gulf of California and in Leg 65 samples. Benson's (1966, pl. 14, fig. 1) illustration of *E. elegans* is similar to other published illustrations of this species.

Euchitonia furcata **Ehrenberg**

Euchitonia furcata Ehrenberg, Ling and Anikouchine, 1967, p. 1484, pls. 189 and 190, figs. 1–2, 5–7; Nigrini, 1970, p. 169, pl. 2, fig. 5; Nigrini and Moore, 1979, p. S85, pl. 11, figs. 2a–b.
(?)*Euchitonia elegans* (Ehrenberg), Benson, 1964, pl. 1, fig. 31; 1966 (*partim.*), p. 230, pl. 14, fig. 2 (not fig. 1).
Euchitonia mülleri Haeckel, Nigrini, 1967, p. 37, pl. 4, figs. 1a–b.

Remarks. Benson's (1964, 1966) illustration of a test identified as *Euchitonia elegans*, with arms slightly expanded distally, may instead represent *E. furcata*.

Euchitonia **sp.**

Euchitonia mülleri Haeckel, Benson, 1964, pl. 1, fig. 30; 1966, p. 232, pl. 14, figs. 3–4.

Remarks. This species(?) is distinguished by: its large size; its circular central structure consisting of five to seven concentric, latticed, discoidal shells; its two similar arms which do not bend toward one another; and, in fully developed tests, a patagium with thickened margins, convex outward between the arms, presenting the appearance of a shield. It is clearly not the same as *E. mülleri* (= *E. furcata*) of Nigrini (1967); therefore, I have designated it as *Euchitonia* sp.

Euchitonia **sp. cf.** *E. furcata* **Ehrenberg**

Euchitonia cf. *furcata* Ehrenberg, Benson, 1964, pl. 1, figs. 29, 33; 1966, p. 228, pl. 13, figs. 4–5.

Remarks. This species differs from *Euchitonia furcata* in having shorter arms that are broader and thicker in relation to their length, in having a patagium that is of similar thickness throughout its extent, and in having a central structure consisting of three to five concentric, discoidal, latticed shells with somewhat irregular outlines.

Euchitonia **sp. cf.** *E. triangulum* **(Ehrenberg)**
(Plate 5, Figs. 4–5)

Euchitonia cf. *echinata* Haeckel, Benson, 1966, p. 226, pl. 12, fig. 7, pl. 13, figs. 1–3.
Euchitonia cf. *E. triangulum* (Ehrenberg), Ling and Anikouchine, 1967, p. 1487, pl. 189, figs. 8–9, pl. 190, figs 8–9.
Dictyocoryne truncatum (Ehrenberg), Nigrini and Moore, 1979, p. S89, pl. 12, fig. 2b (not 2a).

Remarks. This species is characterized by Benson (1966, p. 227) as being distinctly bilateral and having a circular central region consisting of five to eight concentric discoidal shells and an internal arm structure consisting of distinct, equally spaced, latticed rings, traceable from arm to arm. These features clearly distinguish this species from *Dictyocoryne truncatum*.

Eucyrtidium(?) *anomalum* **(Haeckel)**

Lithocampe anomala Haeckel, 1860, p. 839.
Eucyrtidium anomalum Haeckel, 1862, p. 323, pl. 7, figs. 11–13; Benson, 1964, pl. 2, fig. 56; 1966, p. 496, pl. 34, figs. 4–5; Renz, 1974, p. 791, pl. 16, fig. 20; 1976, p. 131, pl. 5, fig. 8.
Stichopterygium anomalum (Haeckel), Dumitrică, 1972, p. 838, pl. 27, fig. 11.

Remarks. This species is placed provisionally in the genus *Eucyrtidium*, although I observed no vertical tube on the cephalis. This feature is characteristic of *Eucyrtidium infundibulum*, *E. hexagonatum*, and *E.*(?) *hexastichum* (Benson, 1966, p. 505, text-fig. 26). Further study of *Eucyrtidium* and *Eucyrtidium*-like species seems warranted because of Dumitrică's (1972, p. 838) rationale for placing *E.*(?) *anomalum* in the genus *Stichopterygium*. See also the remarks under *E.*(?) *hexastichum*.

Eucyrtidium calvertense **Martin**

Eucyrtidium calvertense Martin, Hays, 1970, p. 213, pl. 1, fig. 6; Kling, 1971, p. 1088, pl. 1, fig. 3; 1973, p. 636, pl. 4, figs. 16, 18–19, pl. 11, figs. 1–5.

Eucyrtidium hexagonatum **Haeckel**

Eusyringium siphonostoma Haeckel, Benson, 1964, pl. 2, figs 55, 59–60; 1966, p. 498, pl. 34, figs. 6–9.
Eucyrtidium hexagonatum Haeckel, Nigrini, 1967, p. 83, pl. 8, figs. 4a–b; 1970, p. 171, pl. 4, fig. 2; Casey, 1971, pl. 23.3, fig. 5; Molina-Cruz, 1977, p. 336, pl. 7, figs. 4–5.

Remarks. Nigrini (1967, p. 83) did not mention the inconspicuous vertical tube on the cephalis, which is characteristic of this species as well as of *Eucyrtidium infundibulum* and *E.*(?) *hexastichum* in the Gulf of California (Benson, 1966, p. 505, text-fig. 26).

Eucyrtidium(?) *hexastichum* **(Haeckel) group**
(Plate 9, Figs. 9–11)

Lithostrobus hexastichus Haeckel, 1887, p. 1470, pl. 80, fig. 15; Benson, 1966, p. 506, pl. 34, figs. 13–16.
Stichopilium annulatum Popofsky, 1913, p. 403, pl. 37, figs. 2–3.
Eucyrtidium hexastichum (Haeckel), Renz, 1974, p. 792, pl. 16, fig. 6; 1976, p. 132, pl. 5, fig. 9.

Remarks. Members of this *Eucyrtidium*-like group are similar in shape to *E. hexagonatum* and *E. infundibulum* and possess the indistinct vertical tube. They differ by having pores aligned transversely, not longitudinally. Because these forms have a lateral cephalic vertical tube and pores arranged in transverse rows, they would qualify for inclusion in the subfamily Artostrobiinae Riedel of the family Artostrobiidae Riedel emend. Foreman (Nigrini, 1977, p. 243), except that they have only four instead of six collar pores.

In the Gulf of California two general forms of this group are present. One has larger pores arranged in three to five transverse rows per abdominal segment (Benson, 1966, pl. 34, figs. 13–14; this chapter, pl.9, fig. 10). The other has smaller pores arranged in eight to twelve rows per segment (Benson, 1966, pl. 34, figs. 15–16; this chapter, pl. 9, figs. 9, 11). The latter, as well as tests with pores of intermediate size, are less abundant in the Gulf sediments than are the former.

Eucyrtidium infundibulum **(Haeckel)**

Lithomitra infundibulum Haeckel, 1887, p. 1487, pl. 79, fig. 5; Benson, 1964, pl. 2, figs. 57–58; 1966, p. 502, pl. 34, figs. 10–12, text-fig. 26.

Remarks. Because of its similarity in shape to *Eucyrtidium hexagonatum* and the presence of an inconspicuous vertical tube on the cephalis, this species is placed in the genus *Eucyrtidium*.

Eucyrtidium matuyamai **Hays**

Eucyrtidium matuyamai Hays, 1970, p. 213, pl. 1, figs. 7–9; Kling, 1971, p. 1088, pl. 1, fig. 4; 1973, p. 636, pl. 4, fig. 17.

Remarks. I did not find this species in the Leg 65 drill hole samples examined.

Giraffospyris angulata **(Haeckel)**

Eucoronis nephrospyris Haeckel, Benson, 1964, pl. 2, fig. 6; 1966, p. 304, pl. 21, figs. 6–8.

Giraffospyris angulata (Haeckel), Goll, 1969, p. 331, pl. 59, figs. 4, 6-7, 9; Renz, 1974, p. 792, pl. 19, fig. 10; 1976, p. 167, pl. 8, fig. 5; Molina-Cruz, 1977, p. 336, pl. 6, fig. 7.

Heliodiscus asteriscus Haeckel

Heliodiscus asteriscus Haeckel, Benson, 1964, pl. 1, fig. 26; 1966, p. 200, pl. 9, fig. 3 (not fig. 4); Nigrini, 1967, p. 32, pl. 3, figs. 1a-b; 1970, p. 168, pl. 2, fig. 1.

Heliodiscus echiniscus Haeckel

Heliodiscus asteriscus Haeckel, Benson, 1966, p. 200, pl. 9, fig. 4 (not fig. 3).
Heliodiscus echiniscus Haeckel, Nigrini, 1967, p. 34, pl. 3, figs. 2a-b.

Heliosphaera radiata Popofsky

Heliosphaera radiata Popofsky, 1912, p. 98, fig. 10; Benson, 1964, pl. 1, fig. 14; 1966, p. 160, pl. 5, figs. 1-2.

Helotholus histricosa Jörgensen group
(Plate 8, Figs. 1-3)

Helotholus histricosa Jörgensen, Benson, 1966, p. 459, pl. 31, figs. 4-8; Kling, 1977, p. 215, pl. 2, fig. 6.

Remarks. Specimens from the Gulf that were identified as *Helotholus histricosa* Jörgensen are of two general types: (1) tests with a partially hidden cephalis and a discernible but indistinct collar stricture (Benson, 1966, pl. 31, figs. 4-5; this chapter, Plate 8, Fig. 2), and (2) tests with a completely hidden cephalis consisting of a broadly rounded cap-like structure with relatively large pores (Benson, 1966, pl. 31, figs. 6-8; this chapter, Plate 8, Figs. 1, 3).

Hexacontium enthacanthum Jörgensen

Hexacontium entacanthum (sic) Jörgensen, Benson, 1964, pl. 1, fig. 12; 1966, p. 149, pl. 3, figs. 13-14, pl. 4, figs. 1-3; Kling, 1977, p. 215, pl. 2, fig. 15.
(?)*Hexalonche anaximandri* Haeckel, Renz, 1976, p. 103, pl. 2, fig. 8.
Hexacontium encanthum (sic) (Jörgensen), Molina-Cruz, 1977, p. 333, pl. 2, fig. 5 (not fig. 3?).
Hexacontium enthacanthum Jörgensen, Nigrini and Moore, 1979, p. S45, pl. 5, figs. 1a-b.

Hexacontium heteracantha (Popofsky)

Hexalonche heteracantha Popofsky, 1912, p. 88, text-fig. 3.
Hexacontium cf. *heteracantha* (Popofsky), Benson, 1964, pl. 1, fig. 10; 1966, p. 156, pl. 4, figs. 6-7.
Actinomma sp. aff. *Hexacontium arachnoidale* Hollande and Enjumet, Petrushevskaya and Kozlova, 1972, p. 515, pl. 9, figs. 4-7.

Remarks. This species is nearly identical with *Hexacontium* sp. cf. *H. heracliti*, and the two may be conspecific. Because both species are undoubtedly cubosphaerids with a constant number of six mutually perpendicular radial beams extended as main spines, I do not agree with Bjørklund's (1977) placement of them in synonymy with *Actinomma haysi*, unless it can be demonstrated that *A. haysi* is basically a cubosphaerid but with a variable number of additional beams and spines.

Hexacontium laevigatum Haeckel

Hexacontium laevigatum Haeckel, Benson, 1964, pl. 1, figs. 9, 13; 1966, p. 153, pl. 4, figs. 4-5; Molina-Cruz, 1977, p. 333, pl. 2, fig. 7.

Hexacontium sp. cf. *H. heracliti* (Haeckel)
(Plate 4, Fig. 7)

Cf. *Hexalonche heracliti* Haeckel, 1887, p. 187, pl. 22, fig. 7.
Hexacontium cf. *hericliti* (sic) (Haeckel), Benson, 1966, p. 158, pl. 4, figs. 8-10.

Remarks. See those under *Hexacontium heteracantha*.

Hexapyle dodecantha Haeckel group
(Plate 6, Figs. 6-7)

Hexapyle dodecantha Haeckel, 1887, p. 569, pl. 48, fig. 16; Benson, 1964, pl. 1, fig. 41; 1966, p. 275, pl. 18, figs. 14-16, text-fig. 20.
Discopyle? sp., Benson, 1966, p. 271, pl. 18, figs. 11-13, text-fig. 19.
Hexapyle spp., Molina-Cruz, 1977, p. 335, pl. 2, figs. 9-10.

Remarks. Fully developed individuals with an outer ellipsoidal shell of smooth outline (Benson, 1966, pl. 18, figs. 12, 13, 16; this chapter, Plate 6, Fig. 6) may closely resemble fully developed individuals of *Phorticium pylonium* and *Larcopyle butschlii*.

Hexastylus triaxonius Haeckel
(Plate 4, Fig. 6)

Hexastylus triaxonius Haeckel, 1887, p. 175, pl. 21, fig. 2; Benson, 1966, p. 139, pl. 3, figs. 6-7.

Hymeniastrum euclidis Haeckel

Hymeniastrum euclidis (Haeckel) Popofsky, Benson, 1964, pl. 1, fig. 45; 1966, p. 222, pl. 12, figs. 1-3.
Hymeniastrum euclidis Haeckel, Nigrini, 1970, p. 168, pl. 2, fig. 4; Kling, 1977, p. 215, pl. 2, fig. 6.

Lamprocyclas maritalis maritalis Haeckel

Lamprocyclas maritalis Haeckel, Benson, 1964, pl. 2, figs. 41-42; 1966, p. 475, pl. 32, fig. 12, pl. 33, fig. 1(?).
Lamprocyclas maritalis maritalis Haeckel, Nigrini, 1967, p. 74, pl. 7, fig. 5; 1970, p. 171, pl. 4, fig. 9; Molina-Cruz, 1977, p. 337, pl. 6, figs. 8-9.

Remarks. *Lamprocyclas maritalis maritalis* was distinguished from *L. m. polypora* on the basis of having ten or fewer pores on the half equator of the abdomen, a thicker abdominal wall with pores set in polygonal frames, generally smaller abdominal dimensions, and, typically, a well-developed hyaline peristome with numerous toothlike spines. Some specimens with very broad abdomens (Benson, 1966, pl. 33, fig. 1) may belong to *L. m. ventricosa* (Nigrini, 1968). *L. m. maritalis* is the dominant member of this group in the samples examined.

Lamprocyclas maritalis Haeckel *polypora* Nigrini

Lamprocyclas maritalis Haeckel, Benson, 1966, p. 475, pl. 32, figs. 10-11, pl. 33, fig. 1(?).
Lamprocyclas maritalis Haeckel *polypora* Nigrini, 1967, p. 76, pl. 7, fig. 6; 1970, p. 171, pl. 4, fig. 8; Molina-Cruz, 1977, p. 337, pl. 6, fig. 6.

Lamprocyrtis(?) *hannai* (Campbell and Clark)

Lamprocyrtis(?) *hannai* (Campbell and Clark), Kling, 1973, p. 638, pl. 5, figs. 12-14, pl. 12, figs. 10-14.
Lamprocyclas junonis Haeckel, Molina-Cruz, 1977, p. 337, pl. 7, fig. 10.

Lamprocyrtis neoheteroporos Kling
(Plate 3, Figs. 4-6)

Lamprocyrtis neoheteroporos Kling, 1973, p. 639, pl. 5, figs. 17-18, pl. 15, figs. 4-5; Johnson and Knoll, 1975, p. 109, pl. 1, fig. 9; Riedel and Sanfilippo, 1978, p. 69, pl. 5, fig. 10.

Lamprocyrtis nigriniae (Caulet)

Conarachnium sp., Benson, 1964, pl. 2, fig. 31; 1966, p. 479, pl. 33, figs. 2-3.
Conarachnium? sp., Nigrini, 1968, p. 56, pl. 1, fig. 5a, 5b(?).
Lamprocyrtis haysi Kling, 1973, p. 639, pl. 5, figs. 15-16, pl. 15, figs. 1-3; Molina-Cruz, 1977, p. 337, pl. 6, fig. 9.
Lamprocyrtis nigriniae (Caulet) (= *L. haysi*, Kling, 1973), Kling, 1977, p. 217, pl. 1, fig. 17; Nigrini and Moore, 1979, p. N81, pl. 25, fig. 7.

Lampromitra quadricuspis Haeckel
(Plate 8, Fig. 8)

Lampromitra quadricuspis Haeckel, 1887, p. 1214, pl. 58, fig. 7; Benson, 1966, p. 455, pl. 30, fig. 11, pl. 31, fig. 1.

Larcopyle butschlii Dreyer group

Larcopyle butschlii Dreyer, 1889, p. 124, pl. 10, fig. 70; Benson, 1966, p. 280, pl. 19, figs. 3-5.

Larcopyle? sp., Benson, 1966, p. 279, pl. 19, figs. 1-2.
Larcopyle bütschlii Dreyer, 1889(?), Kling, 1977, p. 217, pl. 1, fig. 11.

Remarks. This group of ellipsoidal tests with regular outline is identified on the basis of its internal pylonid structure and the presence of a cluster of spines at one pole of the test.

Larcospira quadrangula Haeckel

Larcospira quadrangula Haeckel, Benson, 1966, p. 266, pl. 18, figs. 7-8; Nigrini, 1970, p. 169, pl. 2, fig. 9; Casey, 1971, pl. 23.3, fig. 8; Kling, 1977, p. 217, pl. 2, fig. 18; Molina-Cruz, 1977, p. 335, pl. 3, fig. 3.

Lipmanella dictyoceras (Haeckel)

Dictyoceras acanthicum Jörgensen, Benson, 1964, pl. 2, fig. 37; 1966, p. 417, pl. 28, figs. 8-10.
(?)*Lipmanella irregularis* (Cleve), Dumitrică, 1972, p. 840, pl. 25, fig. 2.
Lipmanella dicytoceras (Haeckel), Kling, 1973, p. 636, pl. 4, figs. 24-26; 1977, p. 217, pl. 2, fig. 2.
Lithopilium sphaerocephalum Popofsky, Renz, 1974, p. 794, pl. 16, fig. 12; 1976, p. 123, pl. 4, fig. 8.

Lipmanella tribranchiata Dumitrică
(Plate 9, Fig. 1)

Dictyoceras cf. *pyramidale* (Popofsky), Benson, 1966, p. 419, pl. 28, fig. 11.
Lipmanella tribranchiata Dumitrică, 1972, p. 840, pl. 25, figs. 3-5.

Liriospyris reticulata (Ehrenberg)

Amphispyris toxarium Haeckel, 1887, p. 1097, pl. 88, fig. 7; Benson, 1964, pl. 2, figs. 2-3; 1966, p. 293, pl. 20, figs. 2-7.
Amphispyris reticulata (Ehrenberg), Nigrini, 1967, p. 44, pl. 5, fig. 3.
Amphispyris costata Haeckel, Nigrini, 1967, p. 45, pl. 5, fig. 4.
Liriospyris reticulata (Ehrenberg), Goll, 1968, p. 1429, pl. 176, figs. 9, 11, 13; Molina-Cruz, 1977, p. 336, pl. 6, fig. 6.
Amphispyris costata-thorax Haeckel group, Casey, 1971, pl. 23.2, figs. 5-7.
Liriospyris sp., Renz, 1976, p. 167, pl. 8, fig. 14.
Liriospyris(?) *toxarium* A, Molina-Cruz, 1977, p. 336, pl. 6, figs. 1-3.
Liriospyris toxarium (Haeckel), Molina-Cruz, 1977, p. 336, pl. 6, figs. 4-5.

Litharachnium tentorium Haeckel

Litharachnium tentorium Haeckel, 1860, p. 836; 1862, p. 281, pl. 4, figs. 7-10; Benson, 1966, p. 427, pl. 29, figs. 5-6; Renz, 1974, p. 793, pl. 17, fig. 19; 1976, p. 150, pl. 7, fig. 6; Kling, 1979, p. 309, pl. 1, fig. 22.

Lithelius minor Jörgensen

Lithelius minor Jörgensen, 1899, p. 65, pl. 5, fig. 24; Benson, 1964, pl. 1, fig. 38; 1966, p. 262, pl. 17, figs. 9-10, pl. 18, figs. 1-4; Kling, 1977, p. 217, pl. 1, fig. 16.

Lithelius(?) sp.

Lithelius? sp., Benson, 1964, pl. 1, fig. 37; 1966, p. 265, pl. 18, figs. 5-6.
Spongurus(?) sp., Ling, Stadum, and Welch, 1971, p. 711, pl. 1, fig. 6; Kling, 1977, p. 217, pl. 2, fig. 3.
Spongurus sp., Molina-Cruz, 1977, p. 333, pl. 1, fig. 2.

Remarks. As noted by Benson (1966, p. 265), this species has an internal structure similar to that of *Lithelius minor*, i.e., four to five closely spaced, concentric, trizonal shells which appear as single or double spirals or as concentric shells, depending upon the orientation of the test. On the other hand, the genus *Spongurus* is more closely allied with species consisting of closely spaced, concentric ellipsoidal (not trizonal) shells such as *Spongocore puella* and *Spongurus* sp. cf. *S. elliptica*.

Lithomelissa hystrix Jörgensen

Lithomelissa hystrix Jörgensen, 1899, p. 83; 1905, p. 136, pl. 16, fig. 84; Benson, 1966, p. 363, pl. 24, figs. 6-8, 9(?).
Lithomelissa cf. *thoracites* Haeckel, Dumitrică, 1972, p. 837, pl. 21, figs. 14-15.
Arachnocorys(?) sp. cf. *A. pentacantha* Popofsky, Kling, 1977, p. 215, pl. 1, fig. 10.

Lithomelissa laticeps Jörgensen
(Plate 9, Fig. 3)

Lithomelissa laticeps Jörgensen, 1905, p. 136, pl. 16, fig. 84; Benson, 1966, p. 369, pl. 24, figs. 14-15.

Lithomelissa monoceras Popofsky

Lithomelissa thoracites Haeckel, Benson, 1966, p. 366, pl. 24, fig. 13 (not figs. 10-12).
Lithomelissa monoceras Popofsky, Casey, 1971, p. 23.2, fig. 16; Renz, 1974, p. 794, pl. 18, fig. 14; 1976, p. 158, pl. 6, fig. 12.

Lithomelissa thoracites Haeckel
(Plate 9, Fig. 2)

Lithomelissa thoracites Haeckel, 1862, p. 301, pl. 6, figs. 2-8; Benson, 1964, pl. 2, fig. 17; 1966, p. 366, pl. 24, figs. 10-12 (not fig. 13).

Lithopera bacca Ehrenberg

Lithopera bacca Ehrenberg, Benson, 1966, p. 489, pl. 33, fig. 10-11; Nigrini, 1967, p. 54, pl. 6, fig. 2.

Lithostrobus sp. cf. *L. hexagonalis* Haeckel

Cf. *Lithostrobus hexagonalis* Haeckel, p. 1475, pl. 79, fig. 20; Nigrini, 1968, p. 58, pl. 1, fig. 10.
Lithostrobus cf. *hexagonalis* Haeckel, Benson, 1964, pl. 2, fig. 61; 1966, p. 508, pl. 35, figs. 1-2.

Lophocorys polyacantha Popofsky group

Lophocorys polyacantha Popofsky, 1913, p. 400, fig. 122; Benson, 1966, p. 494, pl. 34, figs. 1-3; Kling, 1979, p. 309, pl. 1, fig. 27.
(?)*Artopilium undulatum* Popofsky, 1913, p. 405, pl. 36, figs. 4-5; Renz, 1974, p. 788, pl. 16, fig. 13.
(?)*Stichopilium anocor* Renz, 1976, p. 124, pl. 5, fig. 10.

Remarks. This group is characterized by undulatory constrictions in the distally expanding abdomen and by a relatively large cephalis. Variations in members of this group are the number of abdominal constrictions, the size and shape of pores, and the degree of spininess of the cephalis (smooth surface to one with several scattered, thin, conical spines; with or without apical horn).

Lophophaena cylindrica (Cleve)

Acanthocorys variabilis Popofsky, Benson, 1964, pl. 2, fig. 14; 1966, p. 373, pl. 24, fig. 19.
Lophophaena cylindrica (Cleve), Renz, 1974, p. 794, pl. 18, fig. 6; 1976, p. 159, pl. 6, fig. 21.

Lophophaenoma sp. aff. *L. witjazii* Petrushevskaya

Lophophaena cf. *capito* Ehrenberg, Benson, 1964, pl. 2, fig. 16; 1966, p. 378, pl. 24, figs. 22-23, pl. 25, fig. 1.
Lophophaenoma sp. aff. *L. witjazii* Petrushevskaya, Renz, 1974, p. 794, pl. 18, fig. 13; 1976, p. 159, pl. 6, fig. 14.

Lophospyris pentagona (Ehrenberg) *hyperborea* (Jörgensen)

Ceratospyris polygona Haeckel, Benson, 1966, p. 321, pl. 22, figs. 17-18 (not figs. 15-16).
Lophospyris pentagona hyperborea (Jörgensen), Goll, 1976, p. 400, pl. 14, figs. 4-6, 8-9, 11-12, pl. 15.

Lophospyris pentagona pentagona (Ehrenberg)

Certospyris polygona Haeckel, Benson, 1964, pl. 2, fig. 10; 1966, p. 321, pl. 22, figs. 15-16 (not figs. 17-18).
Lophospyris pentagona pentagona (Ehrenberg), Goll, 1976, p. 398, pl. 10, pl. 11, figs. 1-3, 5.

Lophospyris pentagona (Ehrenberg) _quadriforis_ (Haeckel)

Ceratospyris cf. *pentagona* Ehrenberg, Benson, 1966, p. 324, pl. 22, figs. 19-21.
Lophospyris pentagona quadriforis (Haeckel), Goll, 1976, p. 398, pl. 13, pl. 14, figs. 1-3, 7, 10, 13.

Neosemantis distephanus (Haeckel)

Semantis distephanus Haeckel, 1887, p. 957, pl. 83, fig. 3.
Neosemantis distephanus Popofsky, 1913, p. 299, pl. 29, fig. 2.
Neosemantis distephanus (Haeckel) Popofsky, Benson, 1966, p. 291, pl. 19, fig. 18, pl. 20, fig. 1.
Neosemantis distephanus (Haeckel), Kling, 1979, p. 309, pl. 1, figs. 15-16.

Nephrospyris renilla Haeckel

Nephrodictyum renilla (Haeckel), Benson, 1966, p. 302, pl. 21, fig. 5.
Nephrospyris renilla Haeckel, Dumitrică, 1972, p. 841, pl. 28, fig. 11; Renz, 1974, p. 794, pl. 19, fig. 6; 1976, p. 176, pl. 8, fig. 18.

Octopyle stenozona Haeckel

Octopyle stenozona Haeckel, 1887, p. 652, pl. 9, fig. 11; Benson, 1964, pl. 1, fig. 53; 1966, p. 251, pl. 16, figs. 3-4; Molina-Cruz, 1977, p. 335, pl. 5, figs. 1-3.

Ommatartus tetrathalamus (Haeckel)

Zygocampe chrysalidium Haeckel, Benson, 1964, pl. 1, figs. 5, 22-25; 1966, p. 193, pl. 8, figs. 8-13, pl. 9, figs. 1-2, text-fig. 10.
Panartus tetrathalamus Haeckel, Nigrini, 1967, p. 30, pl. 2, figs. 4a-d.
Panartus tetrathalamus tetrathalamus Haeckel, Nigrini, 1970, p. 168, pl. 1, fig. 12.
Ommatartus tetrathalamus (Haeckel), Riedel and Sanfilippo, 1971, p. 1588, pl. 1C, figs. 5-7; Kling, 1977, p. 217, pl. 2, fig. 11.

Peridium longispinum Jörgensen(?)

Peridium sp., Benson, 1966, p. 362, pl. 24, figs. 4-5.
(?)*Peridium longispinum* Jörgensen, 1905, p. 135, pl. 15, figs. 75-79, pl. 16, fig. 80; Bjørklund *in* Aarseth et al., 1975, p. 58, fig. 14, Radiolarians-F.

Peridium spinipes Haeckel

Peridium longispinum Jörgensen, Benson, 1966, p. 359, pl. 23, fig. 27, pl. 24, figs. 1-3.
Peridium spinipes Haeckel, Casey, 1971, pl. 23.2, figs. 17-18.
Psilomelissa calvata Haeckel, Renz, 1974, p. 795, pl. 18, fig. 8; 1976, p. 160, pl. 6, fig. 15.

Peripyramis circumtexta Haeckel

Peripyramis circumtexta Haeckel, 1887, p. 1162, pl. 54, fig. 5; Riedel 1958, p. 231, pl. 2, figs. 8-9; Benson, 1966, p. 426, pl. 29, fig. 4; Kling, 1973, p. 637, pl. 2, figs. 15-19, pl. 9, figs. 1-3; Kling, 1979, p. 309, pl. 1, fig. 20.

Phormacantha hystrix Jörgensen
(Plate 7, Fig. 12)

Phormacantha hystrix Jörgensen, 1905, p. 132, pl. 14, figs. 59-63; Benson, 1966, p. 357, pl. 23, figs. 24-26.

Phormospyris stabilis (Goll) _capoi_ Goll

Rhodospyris sp., Benson, 1964, pl. 2, fig. 9; 1966, pl. 23, figs. 3-5.
Phormospyris stabilis capoi Goll, 1976, p. 392, pl. 5, figs. 1-2, pl. 6, pl. 7.

Phormospyris stabilis (Goll) _scaphipes_ (Haeckel)

Tristylospyris scaphipes Haeckel, Benson, 1964, pl. 2, figs. 7-8; 1966, p. 316, pl. 22, figs. 7-10, text-fig. 8A; Casey, 1971, pl. 23.2, figs. 19-20.
Tholospyris scaphipes (Haeckel), Goll, 1969, p. 328, pl. 58, figs. 1-8, 13, 14.
Phormospyris stabilis scaphipes (Haeckel), Goll, 1976, p. 394, pls. 8, 9.
Phormospyris scaphipes (Haeckel), Kling, 1979, p. 309, pl. 1, fig. 17.

Phormospyris stabilis stabilis (Goll)

Desmospyris anthocyrtoides (Bütschli), Benson, 1964, pl. 2, fig. 11; 1966, p. 332, pl. 23, figs. 6-8.
Phormospyris stabilis stabilis (Goll), Goll, 1976, p. 390, pl. 1, pl. 2, figs. 7-14.

Phormospyris tricostata Haeckel

Phormospyris tricostata Haeckel, 1887, p. 1087, pl. 83, fig. 15; Benson, 1964, pl. 2, fig. 12; 1966, p. 334, pl. 23, fig. 9.

Phormostichoartus corbula (Harting)

Siphocampium cf. *polyzona* Haeckel, Benson, 1964, pl. 2, fig. 49; 1966, p. 513, pl. 35, figs. 5-8, text-fig. 27.
Siphocampe corbula (Harting), Nigrini, 1967, p. 85, pl. 8, fig. 5, pl. 9, fig. 3; 1970, p. 172, pl. 4, fig. 11; Riedel and Sanfilippo, 1971, p. 1601, pl. 1H, figs. 18-25; Kling, 1973, p. 639, pl. 5, figs. 22-23, pl. 12, figs. 21-23(?); Molina-Cruz, 1977, p. 338, pl. 8, fig. 6.
Phormostichoartus corbula (Harting), Nigrini, 1977, p. 252, pl. 1, fig. 10; Kling, 1979, p. 309, pl. 2, fig. 20.

Phorticium pylonium Haeckel group
(Plate 7, Figs. 15-16)

Phorticium pylonium Haeckel, 1887, p. 709, pl. 49, fig. 10.
Phorticium pylonium (Haeckel?) Cleve, Riedel, 1958, p. 229, pl. 2, fig. 5; Benson, 1964, pl. 1, fig. 61; 1966, p. 252, pl. 16, figs. 5-9, pl. 17, figs. 1-3.
Pylospira octopyle Haeckel(?), Nigrini and Moore, 1979, p. S139, pl. 17, figs. 6a-c.

Remarks. This group differs from the *Tetrapyle octacantha* group in (1) the presence of more than three (as many as five) systems of dimensive girdles supported by numerous radial beams (20-30) not confined to the regions of the dimensive axes of the test, and (2) the presence, in fully-developed individuals, of an ellipsoidal outer shell of smooth outline (Benson, 1966, pl. 17, figs. 1-3; this chapter, Plate 7, Fig. 15) similar to the outer shell of *Hexapyle dodecantha* and *Larcopyle bütschlii*. This group is a difficult one to work with because in certain orientations individuals appear as a double spiral (Benson, 1964, pl. 1, fig. 61; 1966, pl. 16, figs. 5, 8) and in others as a concentric system of elliptical shells (Benson, 1966, pl. 16, fig. 9; this chapter, Plate 7, Fig. 16).

Plagiacantha(?) _panarium_ Dumitrică
(Plate 7, Figs. 10-11)

Plectacantha? sp., Benson, 1966, p. 356, pl. 23, figs. 21-23.
Plagiacantha(?) *panarium* Dumitrică, 1972, p. 835, pl. 22, figs. 1, 3, 5.

Plagonium sp. cf. _P. sphaerozoum_ Haeckel
(Plate 7, Figs. 1-2)

Cf. *Plagonium sphaerozoum* Haeckel, 1887, p. 916, pl. 91, fig. 6.
Plagonium cf. *sphaerozoum* Haeckel, Benson, 1966, p. 286, pl. 19, figs. 12-13.

Plectacantha oikiskos Jörgensen
(Plate 7, Figs. 13-14)

Plectacantha oikiskos Jörgensen, 1905, p. 131, pl. 13, figs. 50-57; Benson, 1964, pl. 2, fig. 14(?); 1966, p. 353, pl. 23, figs. 18-20.

Remarks. In the Gulf of California, this species(?) may represent tests of *Lithomelissa hystrix* with the thorax undeveloped.

Plectopyramis dodecomma Haeckel

Plectopyramis dodecomma Haeckel, 1887, p. 1258, pl. 54, fig. 6; Benson, 1964, pl. 2, fig. 26; 1966, p. 424, pl. 29, fig. 3.
Bathropyramis woodringi Campbell and Clark, Kling, 1973, p. 635, pl. 2, figs. 20-23, pl. 9, figs. 4, 5(?), 6, 7(?).
Peripyramis circumtexta Haeckel, Casey, 1971, pl. 23.1, fig. 11.

Cinclopyramis infundibulum Haeckel, Renz, 1974, p. 789, pl. 17, fig. 23; 1976, p. 149, pl. 7, fig. 12.

Remarks. The specimen identified as *Plectopyramis dodecomma* and illustrated by Nigrini and Moore (1979, pl. 21, fig. 5) appears to represent a different species for the following reasons: (1) the thorax flares distally, producing a more trumpet-like than conical shape, (2) the transverse bars of the thoracic meshwork are not continuous around the circumference, and (3) the thoracic surface has scattered spines. Their specimen is probably conspecific with one illustrated by Renz (1976, pl. 7, fig. 3) that she identified as *Bathropyramis* sp.

Pseudocubus obeliscus Haeckel
(Plate 7, Figs. 8-9)

Pseudocubus obeliscus Haeckel, 1887, p. 1010, pl. 94, fig. 11; Benson, 1966, p. 312, pl. 22, figs. 3-6.

Plectophora triacantha Popofsky, 1908, p. 262, pl. 29, fig. 1, pl. 30, fig. 1.

Obeliscus pseudocuboides Popofsky, 1913, p. 280, pl. 29, figs. 4-5.

Pseudodictyophimus gracilipes (Bailey)

Dictyophimus gracilipes Bailey, Benson, 1966, p. 382, pl. 25, figs. 4-6.

Pseudodictyophimus gracilipes (Bailey), Kling, 1977, p. 217, pl. 1, fig. 7; 1979, p. 309, pl. 1, figs. 23-24.

Psilomelissa(?) sp. cf. *P.*(?) *galeata* Ehrenberg

Psilomelissa galeata Ehrenberg(?), Popofsky, 1908, p. 304, pl. 33, fig. 6.

Lithomelissa cf. *galeata* (Ehrenberg)? Popofsky, Benson, 1964, pl. 2, fig. 34; 1966, p. 371, pl. 24, figs. 16-17, 18(?).

Remarks. This species appears to be related to *Lithomelissa* spp. but lacks the well-developed lateral spines of this genus.

Pterocanium bicorne Haeckel(?)

Pterocanium sp., Benson, 1964, pl. 2, fig. 21; 1966, p. 401, pl. 26, figs. 5-6; Casey, 1971, pl. 23.1, figs. 1-2; Nigrini and Moore, 1979, p. N49, pl. 23, figs. 6a-b.

(?)*Pterocanium bicorne* Haeckel, Renz, 1974, p. 795, pl. 17, fig. 6.

Dictyophimus infabricatus, Molina-Cruz, 1977, pl. 8, fig. 1.

Remarks. The assignment of this species to *Pterocanium bicorne* is questionable in light of Nigrini and Moore's (1979) reservations about applying Haeckel's species name before examining topotypic material.

Pterocanium grandiporus Nigrini

Pterocanium grandiporus Nigrini, 1968, p. 57, pl. 1, fig 7; Benson, 1964, pl. 2, fig. 39; Molina-Cruz, 1977, p. 336, pl. 6, fig. 11.

Pterocanium korotnevi (Dogiel)

Pterocanium korotnevi (Dogiel), Benson, 1964, pl. 2, fig. 18; Nigrini, 1970, p. 170, pl. 3, figs. 10-11; Ling, Stadum, and Welch, 1971, p. 714, pl. 2, fig. 4; Kling, 1973, p. 638, pl. 4, figs. 1-4.

Pterocanium praetextum (Ehrenberg) *eucolpum* Haeckel

Pterocanium prosperinae Ehrenberg, Benson, 1964, pl. 2, fig. 38(?); 1966, p. 405, pl. 27, figs. 3(?), 5 (not fig. 4).

Pterocanium praetextum (Ehrenberg) *eucolpum* Haeckel, Nigrini, 1967, p. 70, pl. 7, fig. 2; 1970, p. 170, pl. 3, fig. 8; Kling, 1979, p. 311, pl. 2, figs. 14a-b, 15a-b, 16.

Pterocanium praetextum praetextum (Ehrenberg)

Pterocanium praetextum (Ehrenberg), Benson, 1964, pl. 2, fig. 22; 1966, p. 408, pl. 27, fig. 6, pl. 28, fig. 1.

(?)*Pterocanium prosperinae* Ehrenberg, Benson, 1964, pl. 2, fig. 38; 1966, p. 405, pl. 27, fig. 3 (not figs 4, 5).

Pterocanium praetextum praetextum (Ehrenberg), Nigrini, 1967, p. 68, pl. 7, fig. 1; 1970, p. 170, pl. 3, fig. 7.

Pterocanium prismatium Riedel

Pterocanium prismatium Riedel, 1957, p. 87, pl. 3, figs. 4-5; Riedel and Sanfilippo, 1971, p. 1595, pl. 8, fig. 1; Nigrini, 1971, p. 447, pl. 34.1, fig. 4; Johnson and Knoll, 1975, p. 109, pl. 1, fig. 9.

Remarks. This useful stratigraphic marker for the top of the Pliocene was not found in sediments that may be of Pliocene age at Site 485.

Pterocanium sp. cf. *P. elegans* (Haeckel)

Cf. *Artopilium elegans* Haeckel, 1887, p. 1440, pl. 75, fig. 1.

Pterocanium cf. *elegans* (Haeckel), Benson, 1966, p. 403, pl. 27, figs. 1-2.

Eucyrtid 2 gen. and sp. indet., Renz, 1974, p. 791, pl. 17, fig. 1.

Pterocanium trilobum (Haeckel)

Pterocanium prosperinae Ehrenberg, Benson, 1964, pl. 2, fig. 19; 1966, p. 405, pl. 27, fig. 4 (not figs. 3, 5).

Lychnodictyum challengeri Haeckel, Benson, 1966, p. 410, pl. 28, figs. 2-3.

Pterocanium trilobum Haeckel, Nigrini, 1967, p. 71, pl. 7, figs. 3a-b; 1970, p. 170, pl. 3, fig. 9; Casey, 1971, pl. 23.3 fig. 14; Kling, 1973, p. 638, pl. 4, figs. 5-8; Molina-Cruz, 1977, p. 337, pl. 8, fig. 5.

Pterocorys hertwigii (Haeckel)

Phormocyrtis fastuosa (Ehrenberg), Benson, 1966, pl. 33, figs. 6-7.

Theoconus hertwigii (Haeckel), Nigrini, 1967, p. 73, pl. 7, figs. 4a-b; Molina-Cruz, 1977, p. 338, pl. 8, figs. 7-8.

Eucyrtidium hertwigii Haeckel, Casey, 1971, pl. 23.1, figs. 18-20.

Pterocorys hertwigii (Haeckel), Riedel and Sanfilippo, 1978, p. 72, pl. 9, fig. 2; Nigrini and Moore, 1979, p. N85, pl. 25, fig. 9.

Pterocorys killmari (Renz)

Pterocorys cf. *columba* Haeckel, Benson, 1964, pl. 2, fig. 35; 1966, p. 414, pl. 28, fig. 7.

Corocalyptra killmari Renz, 1974, p. 790, pl. 17, fig. 10; 1976, p. 118, pl. 4, fig. 11.

Remarks. Because its test is "more cylindrical, very different from other hat-shaped *Corocalyptra*" (Renz, 1976, p. 118), I have placed this species in the genus *Pterocorys* (cephalis, thorax, abdomen with three solid thoracic wings; without terminal feet, Campbell, 1954, p. 130).

Pterocorys minythorax (Nigrini)

Theoconus zancleus (Müller), Benson, 1964, pl. 2, figs. 50-51; 1966, p. 482, pl. 33, fig. 5 (not fig. 4); Casey, 1971, pl. 23.3, fig. 15.

Theoconus minythorax Nigrini, 1968, p. 57, pl. 1, fig. 8; Kling, 1977, p. 217, pl. 1, fig. 8.

Pterocorys zancleus (Müller), Casey, 1977, pl. 4, fig. 15.

Pterocorys zancleus (Müller)

Theoconus zancleus (Müller), Benson, 1966, p. 482, pl. 33, fig. 4 (not fig. 5).

(?)*Pterocorys clausus* (Popofsky), Kling, 1979, p. 311, pl. 2, fig. 22.

Pterocorys zancleus (Mueller), Nigrini and Moore, 1979, pl. 25, figs. 11a-b.

Pylonium sp.
(Plate 6, Fig. 5)

Pylonium sp., Benson, 1966, p. 250, pl. 16, fig. 2.

Saturnalis circularis Haeckel

Saturnalis circularis Haeckel, Nigrini, 1967, p. 25, pl. 1, fig. 9; Kling, 1973, p. 635, pl. 1, figs. 21-25, pl. 7, figs. 1-5.

Sethoconus(?) *dogieli* Petrushevskaya

Sethoconus(?) *dogieli* Petrushevskaya, Dumitrică, 1972, p. 837, pl. 23, figs. 1-2.

Lipmanella(?) *dogieli* (Petrushevskaya), Petrushevskaya and Kozlova, 1972, p. 542, pl. 37, fig. 10.

Sethophormis pentalactis Haeckel

Lampromitra cf. *coronata* Haeckel, Benson, 1966, p. 452, pl. 30, fig. 8 (not figs. 9-10).

Sethophormis pentalactis Haeckel, Renz, 1974, p. 795, pl. 18, figs. 18a-b; 1976, p. 165, pl. 7, fig. 7.

Sethophormis sp. aff. *S. pentalactis* Haeckel

Lampromitra cf. *coronata* Haeckel, Benson, 1966, p. 452, pl. 30, figs. 9-10 (not fig. 8).
Sethophormis sp. aff. *S. pentalactis* Haeckel, Renz, 1974, p. 795, pl. 18, fig. 22.

Siphocampe arachnea (Ehrenberg) group

Siphocampe arachnea (Ehrenberg) group, Nigrini, 1977, p. 255, pl. 3, figs. 7-8; Kling, 1979, p. 311, pl. 2, fig. 19.
Lithomitra lineata (Ehrenberg), Kling, 1977, p. 217, pl. 1, fig. 1.

Siphocampe lineata (Ehrenberg) group

Siphocampium cf. *cylindrica* Haeckel, Benson, 1964, pl. 2, fig. 48; 1966, p. 520, pl. 35, figs. 10-11.
Siphocampe lineata (Ehrenberg) group, Nigrini, 1977, p. 256, pl. 3, figs. 9-10.

Siphocampe nodosaria (Haeckel)

Siphocampe nodosaria (Haeckel), Nigrini, 1977, p. 256, pl. 3, fig. 11.

Siphocampe sp.

Siphocampium sp., Benson, 1964, pl. 2, fig. 47; 1966, p. 517, pl. 35, fig. 9.

Siphonosphaera polysiphonia Haeckel

Siphonosphaera cf. *socialis* Haeckel, Benson, 1966, p. 121, pl. 2, fig. 4.
Siphonosphaera polysiphonia Haeckel, Nigrini, 1967, p. 18, pl. 1, figs. 4a-b; 1970, p. 167, pl. 1, fig. 6; Kling, 1979, p. 311, pl. 1, fig. 1.

Sphaeropyle langii Dreyer

Sphaeropyle langii Dreyer, 1889, p. 89, pl. 9, fig. 54; Benson, 1966, p. 166, pl. 5, figs. 7-9; Kling, 1973, p. 634, pl. 1, figs. 5-10, pl. 13, figs. 6-8.
(?)*Prunopyle antarctica* Dreyer, 1889, p. 24, pl. 5, fig. 75; Riedel, 1958, p. 225, pl. 1, figs. 7-8.

Spirema sp.
(Plate 6, Figs. 3-4)

Spirema sp., Benson, 1966, p. 268, pl. 18, figs. 9-10.

Spirocyrtis gyroscalaris Nigrini

Siphocampium cf. *cornutella* Haeckel, Benson, 1966, p. 523, pl. 35, figs. 14-15 (not figs. 16-17).
Spirocyrtis gyroscalaris Nigrini, 1977, p. 258, pl. 2, figs. 10-11.

Spirocyrtis scalaris Haeckel

Siphocampium cf. *cornutella* Haeckel, Benson, 1966, p. 523, pl. 35, figs. 16-17 (not figs. 14-15).
Spirocyrtis scalaris Haeckel, Nigrini, 1967, p. 88, pl. 8, fig. 7, pl. 9, figs. 4; 1977, p. 259, pl. 2, figs. 12-13.

Spongaster tetras Ehrenberg

Spongaster tetras Ehrenberg, Benson, 1964, pl. 1, fig. 46; 1966; p. 238, pl. 15, fig. 2; Riedel and Sanfilippo, 1971, p. 1589, pl. 1D, figs. 5-7; Casey, 1971, pl. 23.3, figs. 18-19.
Spongaster tetras tetras Ehrenberg, Nigrini, 1967, p. 41, pl. 5, figs. 1a-b; 1970, p. 169, pl. 2, fig. 7.

Spongocore puella Haeckel

Spongocore puella Haeckel, Benson, 1964, pl. 1, figs. 21, 43, 44; 1966, p. 187, pl. 8, figs. 1-3; Nigrini, 1970, p. 168, pl. 2, fig. 3; Casey, 1971, pl. 23.3, fig. 20; Kling, 1977, pl. 2, fig. 12.
Spongocore diplocylindrica Haeckel, Renz, 1976, p. 95, pl. 3, fig. 8.

Spongodiscus biconcavus (Haeckel)

Spongodiscus biconcavus (Haeckel), Popofsky, 1912, p. 143, pl. 6, fig. 2; Benson, 1964, pl. 1, fig. 42; 1966, p. 214, pl. 11, fig. 1, text-fig. 14.
Spongaster disymmetricus (Dogiel), Petrushevskaya and Kozlova, 1972, p. 528, pl. 21, fig. 14.
Spongodiscus sp. 3, Renz, 1974, p. 796, pl. 15, fig. 11.

Spongopyle osculosa Dreyer

Spongopyle osculosa Dreyer, Benson, 1966, p. 215, pl. 11, figs. 2-3, text-fig. 15; Casey, 1971, pl. 23.1, fig. 14; Kling, 1977, p. 217, pl. 1, fig. 4.

Spongosphaera streptacantha Haeckel

Spongosphaera streptacantha Haeckel, 1860, p. 840, 1862, p. 455, pl. 26, figs. 1-3; Benson, 1966, p. 175, pl. 6, fig. 4, pl. 7, fig. 1; Renz, 1976, p. 105, pl. 2, fig. 13.

Spongotrochus sp. cf. *S. glacialis* Popofsky
(Plate 5, Fig. 3)

Cf. *Spongotrochus glacialis* Popofsky, 1908, p. 228, pl. 26, fig. 8, pl. 27, fig. 1, pl. 28, fig. 2; Casey, 1971, pl 23.1, figs. 4-5.
Spongotrochus cf. *glacialis* Popofsky, Benson, 1966, p. 218, pl. 11, fig. 4, text-fig. 16.

Spongurus sp. cf. *S. elliptica* (Ehrenberg)

Cf. *Acanthosphaera elliptica* Ehrenberg, 1872a, p. 301; 1872b, pl. 7, fig. 4.
Spongurus cf. *elliptica* (Ehrenberg), Benson, 1966, p. 189, pl. 8, figs. 4-5; Nigrini and Moore, 1979, p. S63, pl. 8, fig. 2.

Stichopera pectinata Haeckel group

Cyrtopera laguncula Haeckel, Benson, 1966, p. 510, pl. 35, figs. 3-4; Casey, 1971, pl. 23.1, fig. 10.
Stichopera pectinata Haeckel group, Kling, 1973, p. 638, pl. 3, figs. 25-27, pl. 10, figs. 1-5; 1979, p. 311, pl. 1, fig. 19.

Stichopilium bicorne Haeckel

Stichopilium bicorne Haeckel, 1887, p. 1437, pl. 77, fig. 9; Benson, 1964, pl. 2, fig. 36; 1966, p. 422, pl. 29, figs. 1-2; Renz, 1976, p. 125, pl. 4, fig. 9; Molina-Cruz, 1977, p. 337, pl. 7, fig. 14; Kling, 1979, p. 311, pl. 2, figs. 11-12.
Corocalyptra sp. aff. *C. kruegeri* Popofsky, Renz, 1974, p. 790, pl. 16, fig. 11.

Stylacontarium acquilonium (Hays)

Druppatractus acquilonius Hays, 1970, p. 214, pl. 1, figs. 4-5.
Stylacontarium acquilonium (Hays), Kling, 1973, p. 634, pl. 1, figs. 17-20, pl. 14, figs. 1-4.

Remarks. Although I searched for *S. acquilonium* in each of the Leg 65 samples I examined, I found only specimens of *S. bispiculum;* these latter do not have an outer medullary shell of elliptical shape protruding at the connecting bars, characters which define *S. acquilonium* (Kling, 1973, p. 634).

Stylacontarium bispiculum Popofsky
(Plate 1, Figs. 7-10)

Stylacontarium bispiculum Popofsky, Kling, 1973, p. 634, pl. 15, figs. 11-14.

Remarks. As noted by Kling (1973, p. 634), this species differs from *S. acquilonium* (= *Druppatractus acquilonius*) primarily in having a spherical outer medullary shell. Based on this criterion, no specimens of *S. acquilonium* are present in Leg 65 samples, but *S. bispiculum* ranges throughout the Quaternary section cored.

Stylacontarium sp. cf. *S. bispiculum* Popofsky

Cf. *Stylacontarium bispiculum* Popofsky, 1912, p. 91, pl. 2, fig. 2.
Stylacontarium bispiculum Popofsky, Benson, 1964, pl. 1, figs. 8, 11; 1966, p. 141, pl. 3, figs. 8-11.

Remarks. Benson (1966) characterized this species as a cubosphaerid having a cortical shell with a subquadrate outline and compressed in one dimensive axis. It differs from Popofsky's species in having three-bladed rather than conical main spines and a thorny to spiny rather than smooth cortical shell. The latter characteristics agree well with Kling's (1973, pl. 15, figs. 13–14) illustrations of thin-walled specimens of *S. bispiculum*.

Stylochlamydium asteriscus Haeckel group

Ommatodiscus sp., Benson, 1964, pl. 1, fig. 35; 1966, p. 210, pl. 10, figs. 3, 5(?), 6.
Stylochlamydium sp. aff. *S. venustum* (Bailey), Renz, 1974, p. 798, pl. 15, fig. 17.
Stylochlamydium asteriscus Haeckel, Molina-Cruz, 1977, p. 335, pl. 4, fig. 6; Nigrini and Moore, 1979, p. S113, pl. 14, fig. 5.

Remarks. This group includes specimens with an opaque, biconvex central region (concentric discoidal shells), surrounded in a single plane by numerous concentric, equally spaced, regular, latticed rings covered by a porous sieve plate and with or without marginal spines. Nigrini and Moore (1979, p. S107) designate an incompletely developed test of *S. asteriscus* illustrated by Benson (1966, pl. 10, fig. 3) as *Porodiscus* sp. A.

Stylochlamydium venustum (Bailey) group

Ommatodiscus sp., Benson, 1964, pl. 1, fig. 40, fig. 36(?); 1966, p. 210, pl. 10, figs. 2, 4, 5(?), 7.
Stylochlamydium venustum (Bailey), Kling, 1977, p. 217, pl. 1, fig. 5.
Stylodictya sp. aff. *S. multispina* Haeckel, Renz, 1974, p. 798, pl. 15, fig. 12.

Remarks. This group includes specimens with an opaque, biconvex central region (concentric discoidal shells), surrounded in a single plane by generally irregular concentric rings which may be broken into concave outward segments near the periphery of the test. A porous sieve plate covers the rings on both sides of the test. Nigrini and Moore (1979, p. S109) identify an incompletely developed specimen of *S. venustum* illustrated by Benson (1966, pl. 10, fig. 4) as *Porodiscus*(?) sp. B.

Stylodictya validispina Jörgensen

Stylodictya validispina Jörgensen, Benson, 1964, pl. 1, fig. 35; 1966, p. 203, pl. 9, figs. 5–6, text-fig. 11; Kling, 1977, p. 217, pl. 2, fig. 1.
Xiphospira sp. cf. *X. circularis* (Clark and Campbell), Kling, 1973, p. 635, pl. 2, figs. 1–3, pl. 7, figs. 11–14 (not figs. 15–17).
Stylodictya multispina Haeckel, Renz, 1976, p. 111, pl. 3, fig. 13.

Tessarastrum straussi Haeckel

Tessarastrum straussi Haeckel, Renz, 1974, p. 798, pl. 15, fig. 15; 1976, p. 112, pl. 3, fig. 7.
Amphirhopalum cf. *Tessarastrum straussi* Haeckel, Johnson and Nigrini, 1980, p. 148, pl. 2, fig. 4(?), pl. 5, fig. 1, 2(?).

Remarks. The rarely occurring tests of this species in Leg 65 samples show no indication of cross arms (as illustrated by Johnson and Nigrini, 1980, pl. 5, fig. 1). Renz (1974, p. 798) noted that the cross arms were either rudimentary or lacking. Johnson and Nigrini (1980) suggest that the lateral arms are taxonomically unimportant; therefore, the species might be more properly placed in the genus *Amphirhopalum*.

Tetrapyle octacantha Müller group

Tetrapyle octacantha Müller, 1858, p. 33, pl. 2, figs. 12–13, pl. 3, figs. 1–12; Benson, 1964, pl. 1, figs. 48–52, 54–59; 1966, p. 245, pl. 15, figs. 3–10, pl. 16, fig. 1, text-fig. 18; Molina-Cruz, 1977, p. 335, pl. 5, figs. 5–7.
Tetrapyle sp. cf. *T. octacantha* Muller, Kling, 1977, p. 217, pl. 1, fig. 14.

Remarks. This group differs from the *Phorticium pylonium* group in (1) the presence of few, if any, radial beams, which are generally confined to the regions of the dimensive axes of the tests, and (2) the presence, in fully developed individuals, of no more than three systems of girdles, the third being irregular and joined to the second system by numerous short beams arising from the surface of the latter (Benson, 1964, pl. 1, fig. 48; 1966, pl. 16, fig. 1).

Thecosphaera spp.

Thecosphaera sp., Benson, 1964, pl. 1, figs. 2–4; 1966, p. 132, pl. 2, figs. 11–13.
(?)*Cenosphaera* spp., Nigrini and Moore, 1979, p. S43, pl. 4, figs. 3a–d.

Remarks. Because many of the specimens in the Gulf of California lack the two medullary shells whereas others with identical cortical shells have these, I have placed all such forms in the genus *Thecosphaera* (Benson, 1966, p. 133). Nigrini and Moore's (1979, pl. 4, figs. 3a–d) illustrations of *Cenosphaera* spp. are identical with the Gulf of California specimens and on further study may be found to contain two inner medullary shells.

This group may be subdivided on the basis of size and number of pores of the cortical shell.

Theocalyptra davisiana (Ehrenberg) *cornutoides* (Petrushevskaya)

Theocalyptra davisiana (Ehrenberg), Benson, 1966, p. 441, pl. 29, fig. 16 (not figs. 14–15); Kling, 1973, p. 441, pl. 3, figs. 5–8.
Cycladophora davisiana "var." *cornutoides* Petrushevskaya, Ling, Stadum, and Welch, 1971, p. 714, pl. 2, figs. 6–7.
(?)*Clathrocycloma davisiana* (Ehrenberg), Dumitrică, 1972, p. 837, pl. 24, fig. 7.
Theocalyptra davisiana (Ehrenberg) *cornutoides* (Petrushevskaya) Kling, 1977, p. 217, pl. 1, fig. 20; 1979, p. 311, pl. 2, fig. 3.

Theocalyptra davisiana davisiana (Ehrenberg)

Theocalyptra davisiana (Ehrenberg), Riedel, 1958, p. 239, pl. 4, figs. 2–3, text-fig. 10; Benson, 1964, pl. 2, figs. 45–46; 1966, p. 441, pl. 29, figs. 14–15 (not fig. 16); Kling, 1973, p. 638, pl. 3, figs. 9–12, 28.
Theocalyptra davisiana davisiana (Ehrenberg), Kling, 1977, p. 217, pl. 2, fig. 17.
Cycladophora davisiana (Ehrenberg), Molina-Cruz, 1977, p. 337, pl. 7, fig. 19.

Theocorys veneris Haeckel

Theocorys veneris Haeckel, 1887, p. 1415, pl. 69, fig. 5; Popofsky, 1913, p. 399, text-fig. 119; Benson, 1966, p. 492, pl. 33, figs. 12–13; Renz, 1976, p. 137, pl. 5, fig. 11; Kling, 1979, p. 313, pl. 2, fig. 9.

Theocorythium trachelium trachelium (Ehrenberg)

Calocyclas amicae Haeckel, Benson, 1964, pl. 2, fig. 43; 1966, p. 487, pl. 33, figs. 8–9.
Theocorythium trachelium trachelium (Ehrenberg), Nigrini, 1967, p. 79, pl. 8, fig. 2, pl. 9, fig. 2; 1970, p. 172, pl. 4, fig. 10; Molina-Cruz, 1977, pl. 8, fig. 4.

Theocorythium vetulum Nigrini
(Plate 3, Figs. 7–9)

Theocorythium vetulum Nigrini, 1971, p. 447, pl. 34.1, figs. 6a–b; Dinkelman, 1973, p. 788, pl. 10, figs. 11–12; Johnson and Knoll, 1975, p. 109, pl. 1, fig. 8.

Remarks. Although I searched for *T. vetulum* in Leg 65 samples, I identified only one specimen, in Sample 483-8,CC (11–13 cm). It belongs to the genus *Theocorythium* because it has paired cephalic lobes beneath the larger, unpaired lobe (Plate 3, Figs. 7, 9), and it has the dimensions of *T. vetulum* (abdominal breadth: 107 μm; abdominal length: 54 μm). C. Nigrini (personal communication) is not sure that the figured specimen is really *T. vetulum;* if it is, it is atypical.

Theopilium tricostatum Haeckel

Theopilium tricostatum Haeckel, 1887, p. 1332, pl. 70, fig. 6; Benson, 1964, pl. 2, fig. 40; 1966, p. 444, pl. 30, figs. 1–2.
Theocalyptra sp., Renz, 1974, p. 798, pl. 16, fig. 21; 1976, p. 137, pl. 5, fig. 13.

Tholospyris devexa Goll

Amphispyris aff. *zonarius* (Haeckel), Benson, 1966, p. 300, pl. 20, figs. 13–14, pl. 21, figs. 1–4.
Tholospyris devexa Goll, 1969, p. 326, pl. 57, figs. 9, 10, 13, 14.

Tholospyris kantiana (Haeckel)

Tricolospyris kantiana Haeckel, Benson, 1966, p. 366, pl. 23, figs. 10-12.
Tholospyris kantiana (Haeckel), Goll, 1969, p. 327, pl. 58, figs. 17-19, 23.
Liriospyris sp. 2, Renz, 1974, p. 793, pl. 19, fig. 4.

Tholospyris procera Goll

Amphispyris subquadrata Haeckel, Benson, 1964, pl. 2, figs. 1, 13; 1966, p. 297, pl. 20, figs. 8-12.
Tholospyris procera Goll, 1969, p. 328, pl. 59, figs. 8, 10-12.

Trissocyclid gen. and sp. indet.

Petalospyris cf. *ophirensis* Ehrenberg, Benson, 1966, p. 318, pl. 22, figs. 11-14.

Verticillata hexacantha Popofsky

Verticillata hexacantha Popofsky, 1913, p. 282, text-fig. 11; Benson, 1966, p. 397, pl. 26, fig. 3; Renz, 1974, p. 799, pl. 18, fig. 1; 1976, p. 161, pl. 6, fig. 5.

Xiphatractus cronos (Haeckel)
(Plate 4, Fig. 8)

Amphisphaera cronos Haeckel, 1887, p. 144, pl. 17, fig. 5.
Xiphatractus cronos (Haeckel), Benson, 1964, pl. 1, fig. 17; 1966, p. 182, pl. 7, figs. 12-13.
(?)*Stylosphaera lithatractus* Haeckel, Renz, 1976, p. 105, pl. 2, fig. 7.
Stylactractus spp., Nigrini and Moore, 1979, p. S55, pl. 7, figs. 1a-b.

Xiphatractus pluto (Haeckel)
(Plate 5, Figs. 1-2)

Amphisphaera pluto Haeckel, 1887, p. 144, pl. 17, figs. 7-8.
Xiphatractus pluto (Haeckel), Benson, 1964, pl. 1, fig. 18; 1966, p. 184, pl. 7, figs. 14-17.
(?)*Druppatractus* (?)sp., Dumitrică, 1972, p. 833, pl. 20, fig. 5.

Zygocircus productus (Hertwig)

Zygocircus productus (Hertwig), Benson, 1964, pl. 2, fig. 5; 1966, p. 288, pl. 19, figs. 14-15; Dumitrică, 1972, p. 840, pl. 27, figs. 7-10.
Zygocircus sp. aff. *Z. capulosus* Popofsky, Renz, 1974, p. 799, pl. 19, fig. 23; 1976, p. 170, pl. 8, fig. 2.

Zygocircus sp.
(Plate 7, Figs. 3-4)

Zygocircus sp., Benson, 1966, p. 290, pl. 19, figs. 16-17.

Sponge Spicules

Geodia phlegraei (Sollas)(?)

Spumellina *incertae sedis*, Forma B, Benson, 1966, p. 284, pl. 19, figs. 9-11.
(?)*Geodia phlegraei* (Sollas), Aarseth et al., 1975, p. 57, fig. 14. Sponge spicules-C.

Remarks. *Geodia phlegraei* is a sponge spicule.

Hataina ovata Huang

Spumellina *incertae sedis*, Forma A, Benson, 1966, p. 283, pl. 19, figs. 6-8.
Hataina ovata Huang, 1967, p. 178, pl. 17, figs. 1-6, pl. 18, figs. 1-4, pl. 19, figs. 1-6.

Remarks. This may be part of a sponge sketelon (W. R. Riedel, personal communication).

ACKNOWLEDGMENTS

I thank Cathy Nigrini, La Habra Heights, California, and Ted Moore, Jr., University of Rhode Island, for their reviews of the original manuscript.

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APPENDIX
Radiolarian Names

Acanthocorys variabilis
Acanthosphaera elliptica
Acrobotrissa cribosa (Plate 9, Fig. 5)
Acrobotyrs disolenia
A. sp. cf. *A. disolenia* (Plate 9, Fig. 6–7)
Acrosphaera murrayana
Actinomma antarctium
A. arcadophorum
A. haysi
A. hystrix
A. leptodermum
A. medianum
A. sp.
Actinosphaera cristata
Amphicraspedum wyvilleanum
Amphiplecta acrostoma
A. cylindrocephala (Plate 8, Fig. 5)
Amphirhopalum
A. virchowii (Plate 2, Figs. 1–3)
A. ypsilon (Plate 2, Figs. 4–7)
Amphisphaera cristata (Plate 4, Fig. 5)
A. cronos
A. pluto
A. uranus
Amphispyris costata
A. costata-thorax
A. reticulata
A. subquadrata
A. toxarium
A. zonarius
Amphitholus acanthometra
Anomalacantha dentata
Anthocyrtidium angulare (Plate 3, Fig. 1)
A. cineraria
A. ophirense
A. sp. cf. *A. angulare* (Plate 3, Figs. 2–3)
A. zanguebaricum
A. oxycephalis
Arachnocorys pentacantha
A. umbellifera (Plate 8, Fig. 6)
Artopilium elegans
A. undulatum
Axoprunum angelinum (Plate 1, Figs. 1–4)
Bathropyramis woodringi
Botryocyrtis caput-serpentis
B. quinaria
B. scutum
B. sp.
Botryopyle sp.
Botryostrobus aquilonaris
B. auritus-australis
Buccinosphaera invaginata
Callimitra emmae
C. sp.
Calocyclas amicae
C. monumentum
Carpocanarium papillosum
C. spp.
Carpocanistrum sp. A
C. spp.
C.(?) sp.
Carpocanium petalospyris
C. spp.
Carposphaera acanthophora
Cenosphaera coronata
C. cristata
C. perforata
C. spp.
C.(?) sp. aff. *C. perforata* (Plate 4, Fig 4)
Ceratospyris borealis
C. pentagona
C. polygona
Choenicosphaera murrayana
Cinclopyramis infundibulum
Circodiscus microporus
Cladococcus abietinus
C. cervicornis (Plate 4, Fig. 1)
C. scoparius
C. stalactites (Plate 4, Fig. 2)
Cladoscenium tricolpum
Clathrocanium coronatum
C. ornatum
C. sp.
Clathrocircus stapedius (Plate 7, Figs. 5–7)
Clathrocorys murrayi
C. sp.
Clathrocyclas? sp.
Clathrocycloma davisiana
Clathromitra pterophormis (Pl. 9, Fig. 8)
Collosphaera sp. A
C. tuberosa (Plate 1, Figs. 5–6)
C.(?) sp. (Plate 4, Fig. 3)
Conarachnium sp.
Cornutella profunda
Corocalyptra
C. cervus
C. killmari
C. kruegeri
Cubotholus octoceras
C. regularis
Cycladophora davisiana
Cypassis irregularis
Cyrtopera laguncula
Dendrospyris binapteronis
D. damaecornis
Desmospyris anthocyrtoides
Dictyocephalus mediterraneus
D. papillosus
Dictyoceras acanthicum
D. pyramidale
Dictyocoryne profunda
D. sp. (Plate 6, Fig. 2)
D. truncatum (Plate 6, Fig. 1)
Dictyocryphalus papillosus
Dictyophimus crisiae
D. gracilipes
D. infabricatus
D. platycephalus (Plate 8, Fig. 7)
D. sp. cf. *D. tripus* (Plate 8, Fig. 4)
D. tetracanthus
D. tripus
Diploplegma banzare
Discopyle(?) sp.
Disolenia quadrata
D. variabilis
Doryconthidium hexactis
D.(?) sp.
Druppatractus acquilonius
D. irregularis
D. pyriformis
D. variabilis
D.(?) sp.
Echinomma delicatulum
E. delicatum
E. leptodermum
Elaphococcus cervicornis
Eucecryphalus cervus
E.(?) sp. (Plate 9, Fig. 4)
Euchitonia echinata
E. elegans
E. furcata
E. mulleri
E. sp.
E. sp. cf. *E. triangulum* (Plate 5, Figs. 4–5)
E. triangulum
Eucoronis nephrospyris
E.(?) sp.

Eucyrtidium
E. anomalum
E. calvertense
E. hertwigii
E. hexagontum
E. hexastichum
E. infundibulum
E. matuyamai
E. papillosum
E.(?) *hexastichum* (Plate 9, Figs. 9-11)
Eusyringium siphonostoma
Giraffospyris angulata
Haliomma erinaceum
Heliodiscus asteriscus
H. echiniscus
Heliosphaera radiata
Helotholus histricosa (Plate 8, Fig. 1-3)
Heteracantha dentata
Hexacontium arachnoidale
H. enthacanthum
H. heracliti
H. heteracantha
H. laevigatum
H. sp. cf. *H. heracliti* (Plate 4, Fig. 7)
Hexalonche anaximandri
H. heracliti
H. heteracantha
Hexapyle dodecantha (Plate 6, Figs. 6-7)
H. spp.
Hexastylus triaxonius (Plate 4, Fig. 6)
Hymeniastrum euclidis
H. koellikeri
Lamprocyclas junonis
L. maritalis
L. maritalis maritalis
L. maritalis polypora
L. maritalis ventricosa
Lamprocyrtis haysi
L. neoheteroporos (Plate 3, Figs. 4-6)
L. nigriniae
L.(?) *hannai*
Lampromitra coronata
L. quadricuspis (Plate 8, Fig. 8)
Larcopyle butschlii
L.(?) sp.
Larcospira quadrangula
Lipmanella dictyoceras
L. irregularis
L. tribranchiata (Plate 9, Fig. 1)
L.(?) *dogieli*
Liriospyris reticulata
L. sp.
L. sp. 2
L. toxarium
L.(?) *toxarium* A
Litharachnium tentorium
Lithelius minor
L.(?) sp.
Lithocampe anomala
Lithomelissa galeata
L. hystrix
L. laticeps (Plate 9, Fig. 3)
L. monoceras
L. spp.
L. thoracites (Plate 9, Fig. 2)
Lithomitra infundibulum
L. lineata
Lithopera bacca
Lithopilium sphaerocephalum
Lithostrobus hexagonalis
L. hexastichus
Lophocorys polyacantha
Lophophaena capito
L. cylindrica
Lophophaenoma witjazii
Lophospyris pentagona hyperborea
L. pentagona pentagona
L. pentagona quadriforis
Lychnodictyum challengeri
Neosemantis distephanus
Nephrodictyum renilla
Nephrospyris renilla
Obeliscus pseudocuboides
Octopyle stenozona
Ommatartus tetrathalamus
Ommatodiscus pantanellii
O. sp.
Panartus tetrathalamus
P. tetrathalamus tetrathalamus
Patagospyris(?) sp.
Peridium longispinum
P. sp.
P. spinipes
Peripyramis circumtexta
Petalospyris ophirensis
Phormacantha hystrix (Plate 7, Fig. 12)
Phormocyrtis fastuosa
Phormospyris scaphipes
P. stabilis capoi
P. stabilis scaphipes
P. stabilis stabilis
P. tricostata
Phormostichoartus corbula
Phorticium pylonium (Plate 7, Figs. 15-16)
Plagiacantha(?) *panarium* (Plate 7, Figs. 10-11)
Plagonium sp. cf. *P. sphaerozoum* (Plate 7, Figs. 1-2)
P. sphaerozoum
Plectacantha oikiskos (Plate 7, Figs. 13-14)
P.(?) sp.
Plectophora triacantha
Plectopyramis dodecomma
Polysolenia murrayana
P.(?) sp.
Porodiscus microporus
P.(?) sp. B
Prunopyle antarctica
Pseudocubus obeliscus (Pl. 7, Figs. 8-9)
Pseudodictyophimus gracilipes
Psilomelissa calvata
P. galeata
Pterocanium bicorne
P. elegans
P. grandiporus
P. korotnevi
P. praetextum
P. praetextum eucolpum
P. praetextum praetextum
P. prismatium
P. prosperinae
P. sp.
P. trilobum
Pterocorys
P. clausus
P. columba
P. hertwigii
P. hirundo
P. killmari
P. minythorax
P.(?) sp.
P. zancleus
Pylonium sp. (Plate 6, Fig. 5)
Rhodospyris sp.
Saturnalis circularis
Semantis distephanus
Sethoconus(?) *dogieli*
Sethophormis pentalactis
Siphocampe arachnea
S. corbula
S. lineata
S. nodosaria

S. sp.
Siphocampium cornutella
S. cylindrica
S. erucosum
S. polyzona
S. seriatus
S. sp.
Siphonosphaera polysiphonia
S. socialis
Sphaeropyle langii
Spirema sp. (Plate 6, Figs. 3–4)
Spirocyrtis gyroscalaris
S. scalaris
Spongaster disymmetricus
S. tetras
S. tetras tetras
Spongocore diplocylindrica
S. puella
Spongodiscus biconcavus
S. sp. 3
Spongoliva ellipsoides
Spongopyle osculosa
Spongosphaera streptacantha
Spongotrochus glacialis
S. sp. cf. *S. glacialis* (Plate 5, Fig. 3)
Spongurus elliptica
S. sp.
Stichopera pectinata
Stichopilium bicorne
S. annulatum
S. anocor
Stichopterygium anomalum
Stylacontarium acquilonium
S. bispiculum (Plate 1, Figs. 7–10)
Stylatractus spp.
S. universus
Stylochlamydium asteriscus
S. venustum
Stylodictya multispina
S. validispina
Stylosphaera lithatractus
Tessarastrum straussi
Tetrapyle octacantha
Thecosphaera spp.
Theocalyptra davisiana
T. davisiana cornutoides
T. davisiana davisiana
T. sp
Theoconus hertwigii
T. minythorax
T. zancleus
Theocorys veneris
Theocorythium trachelium trachelium
T. vetulum (Plate 3, Figs. 7–9)
Theopilium triscostatum
Tholospyris devexa
T. kantiana
T. procera
T. scaphipes
Trematodiscus microporus
Triceraspyris damaecornis
Tricolospyris kantiana
Tristylospyris scaphipes
Verticillata hexacantha
Xiphatractus circularis
X. cronos (Plate 4, Fig. 8)
X. pluto (Plate 5, Figs. 1–2)
Xiphospira circularis
Zygocampe chrysalidium
Zygocircus capulosus
Z. productus
Z. sp. (Plate 7, Figs. 3–4)

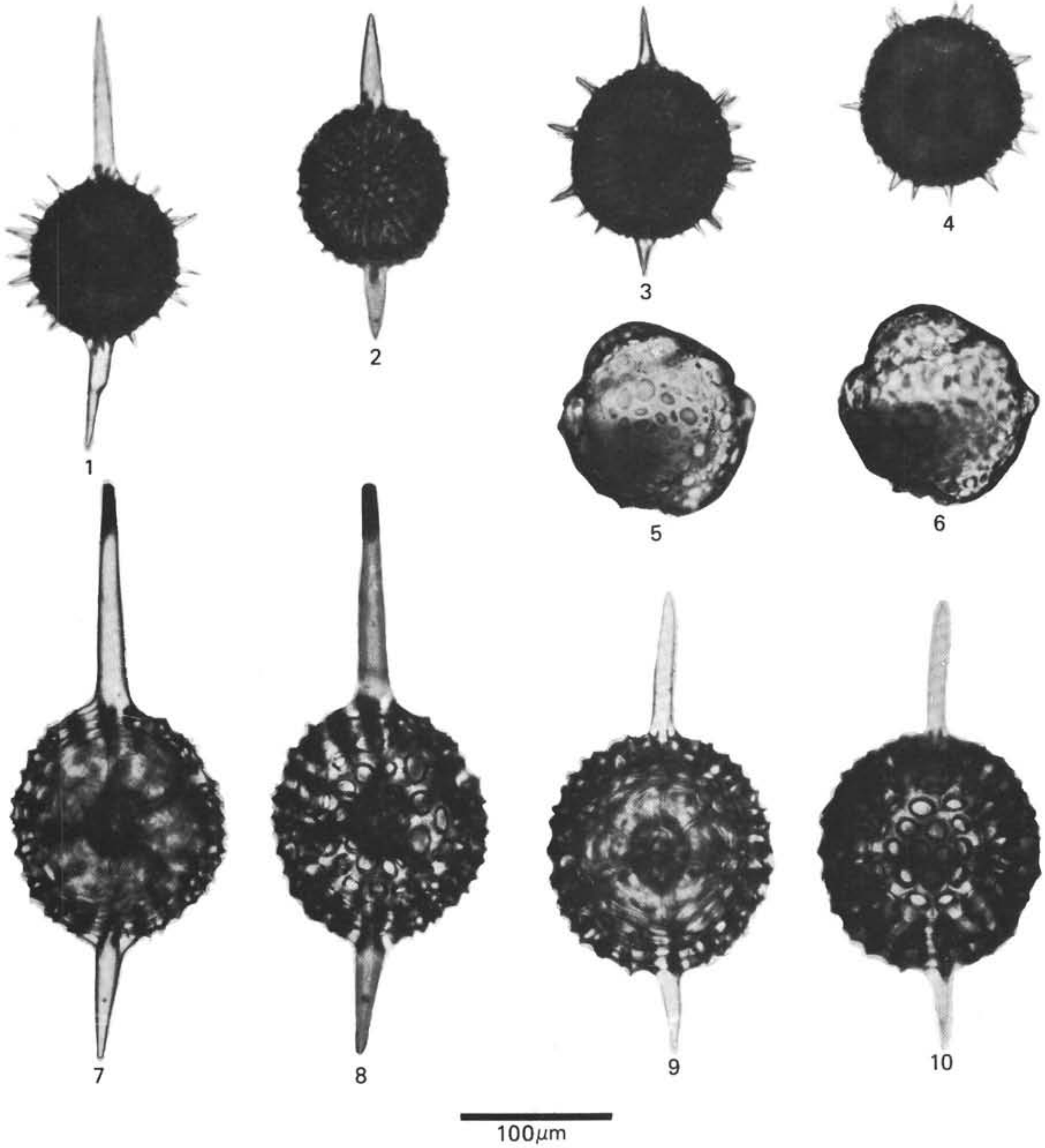

Plate 1. Radiolarians of Quaternary age from Leg 65 samples. (Scale bar equals 100 µm.) 1-4. *Axoprunum angelinum* (Campbell and Clark). 1. Sample 483-6,CC (16-18 cm), E43/2. 2. Sample 483-9,CC (10-12 cm), slide a, V13/4. 3, 4. Tests with polar spines reduced or lacking, typical of species at highest occurrence in Leg 65 samples, (3) Sample 484A-5,CC (5-7 cm), J20/2, (4) Sample 484A-5,CC (5-7 cm), X7/2. 5, 6. *Collosphaera tuberosa* Haeckel. Sample 483-5,CC (5-7 cm), slide a, Z24/4, (5) focus on upper surface, (6) focus on periphery. 7-10. *Stylacontarium bispiculum* Popofsky. Tests closely resembling *Stylacontarium acquilonium* (= *Druppatractus acquilonius* Hays) but having a spherical outer medullary shell rather than an ellipitical shell protruding at the connecting bars, (7, 8) Sample 483-9,CC (10-11 cm), slide a, X12/1, focus on medullary shell and on surface of cortical shell, respectively, (9, 10) Sample 482A-1,CC, H26/0, focus on medullary shell and on surface of cortical shell, respectively. Note: Species shown in Plates 1-3 are either biostratigraphic marker species, are related to these, or have potential utility in Quaternary radiolarian biostratigraphy. (Slide numbers are followed by England Finder coordinates.)

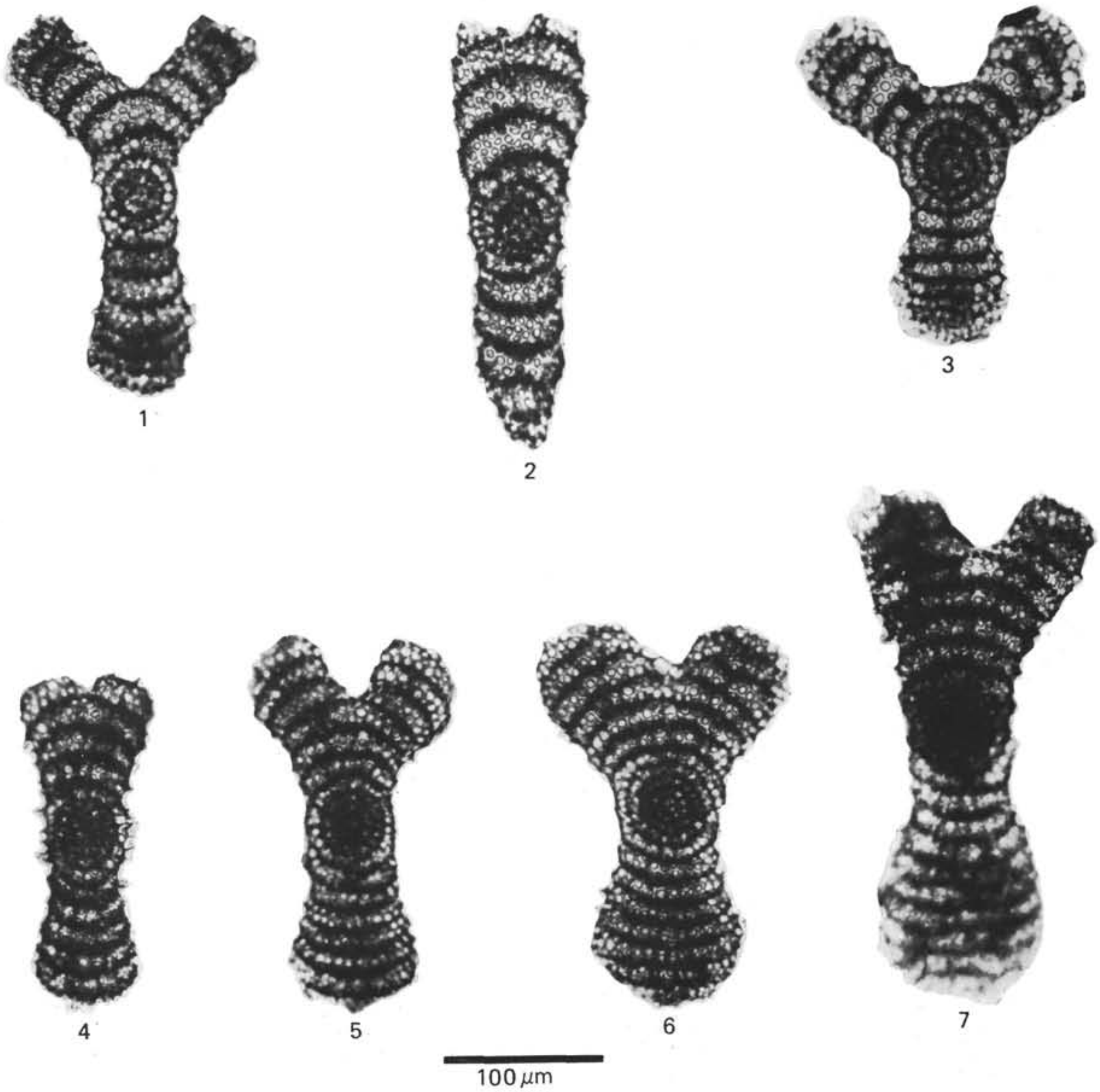

Plate 2. Radiolarians of Quaternary age from Leg 65 samples. (Scale bar equals 100 µm.) 1–3. *Amphirhopalum virchowii* (Haeckel), (1) Sample 483-6,CC (16–18 cm), R18/0, (2) Sample 482B-3,CC (5–7 cm), Y26/0, (3) Sample 485A-3,CC (2–4 cm), O35/1. 4–6. *Amphirhopalum ypsilon* Haeckel. Low occurrence forms showing three chambers on the forked arm before bifurcation, (4) Sample 482B-2,CC (4–6 cm), R7/3 (60.73 m sub-bottom), (5) Sample 485A-3,CC (2–4 cm), G17/0 (73.22 m sub-bottom). (6) Sample 485A-3,CC (2–4 cm), N19/4 (73.22 m sub-bottom). 7. *Amphirhopalum ypsilon* Haeckel. High occurrence form showing five chambers on the forked arm before bifurcation, Sample 482A-1,CC, H26/0 (4.00 m sub-bottom).

See Note, Plate 1. (Slide numbers are followed by England Finder coordinates.)

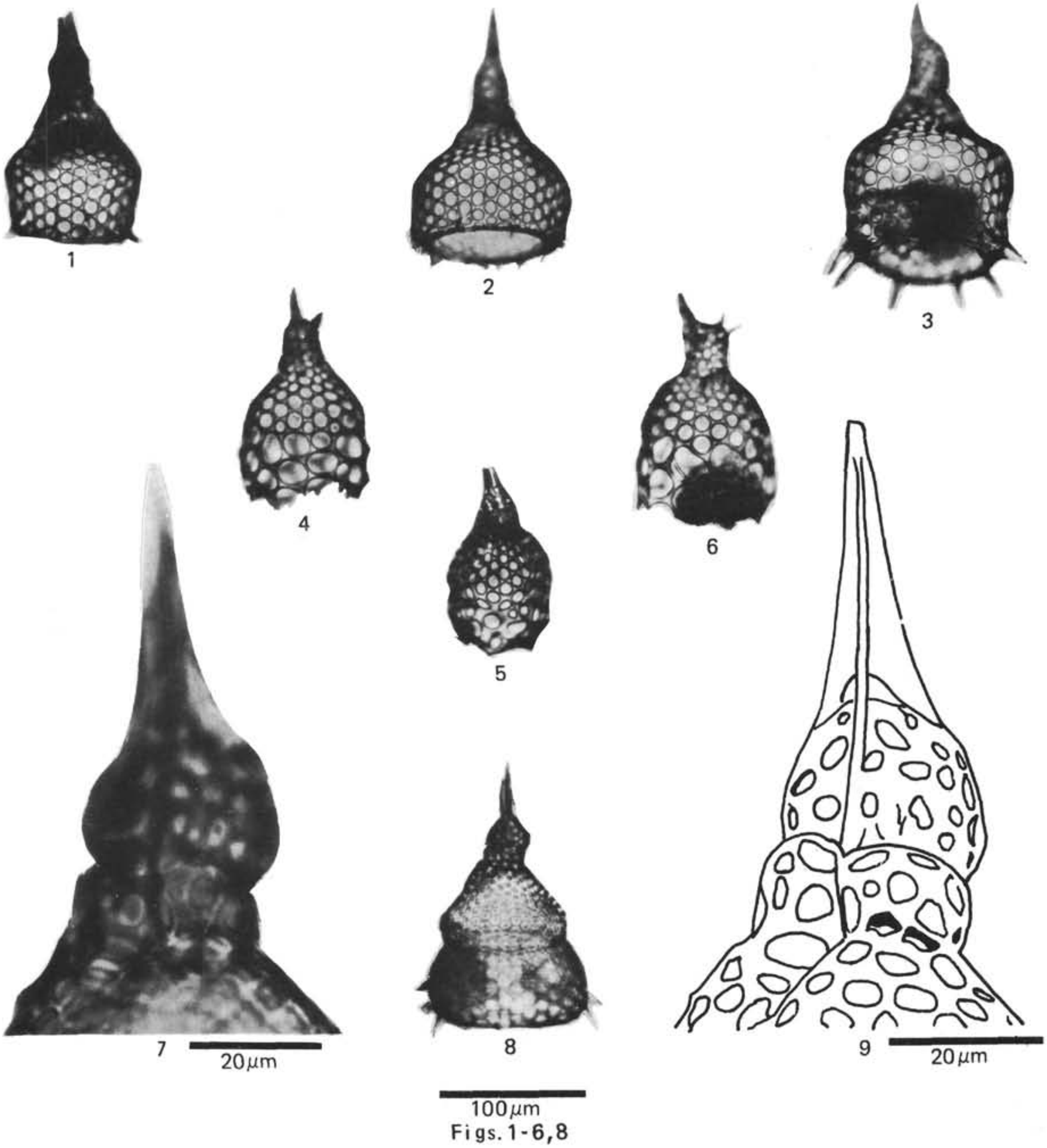

Plate 3. Radiolarians of Quaternary age from Leg 65 samples. (Scale bars equal 100 μm for Figs. 1-6, 8 and 20 μm for Figs. 7, 9.) 1. *Anthocyrtidium angulare* Haeckel. Sample 483-9-1, 74-76 cm, slide a, D17/2. 2-3. *Anthocyrtidium* sp. cf. *A. angulare* Haeckel, (2) Sample 483-9-1, 74-76 cm, slide b, O44/0, (3) Sample 483-9-1, 74-76 cm, slide b, M34/0. 4-6. *Lamprocyrtis neoheteroporos* Kling, (4) Sample 483-8,CC (11-13 cm), D40/1, (5) Sample 485A-3,CC (2-4 cm), T5/0, (6) Sample 483-8,CC (11-13 cm), E36/0. 7-9. *Theocorythium vetulum* Nigrini, all of same specimen, Sample 483-8,CC (11-13 cm), E32/0. Figures 7 and 9 illustrate the paired cephalic lobes directly beneath the larger unpaired lobe, a characteristic of the genus *Theocorythium*.

See Note, Plate 1. (Slide numbers are followed by England Finder coordinates.)

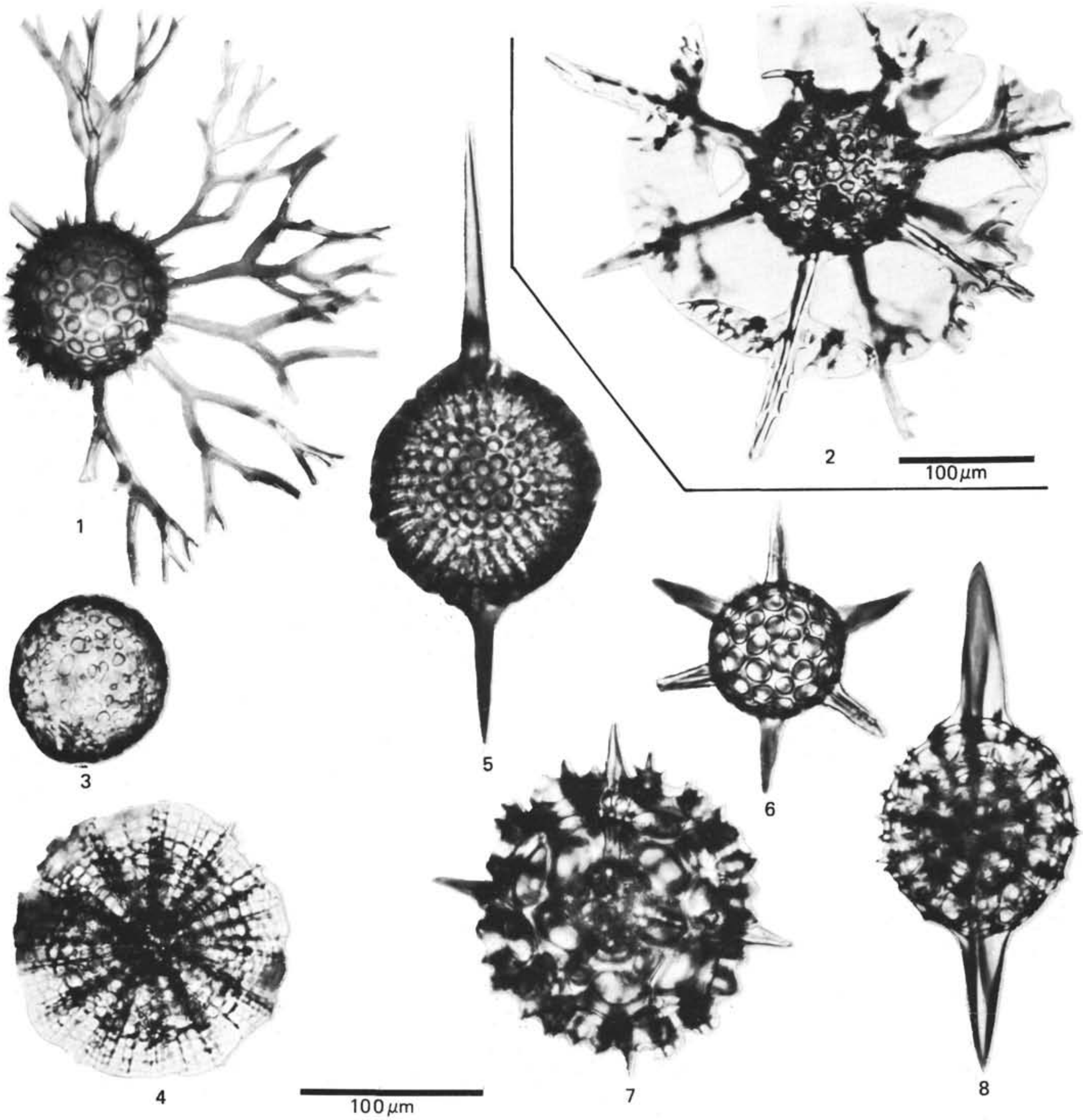

Plate 4. Radiolarians from Holocene sediments in the Gulf of California. (Scale bars equal 100 µm.) 1. *Cladococcus cervicornis* Haeckel. VS-R-133b, 1-3 cm, V17/2. Benson, 1966, pl. 6, fig. 1. 2. *Cladococcus stalactities* Haeckel. VS-R-136a, 1-3 cm, M6/3. Benson, 1966, pl. 6, fig. 2. 3. *Collosphaera*(?) sp. VS-R-60a, 3-5 cm, K12/1, Benson, 1966, pl. 2, fig. 1. 4. *Cenosphaera*(?) sp. aff. *C. perforata* Haeckel. VS-R-60a, 3-5 cm, S15/4. Benson, 1966, pl. 2, fig. 6. 5. *Amphisphaera cristata* Carnevale. VS-R-46a, 1-3 cm, M32/1. Benson, 1966, pl. 3, fig. 5. 6. *Hexastylus triaxonius* Haeckel. VS-R-71a, 1-3 cm, E32/3. Benson, 1966, pl. 3, fig. 6. 7. *Hexacontium* sp. cf. *H. heracliti* (Haeckel). VS-R-71a, 1-3 cm, J6/0. Benson, 1966, pl. 4, fig. 8. 8. *Xiphatractus cronos* (Haeckel). VS-R-56a, 1-3 cm, J55/1. Benson, 1966, pl. 7, fig. 12. Note: Plates 4 through 9 illustrate species from Holocene sediments in the Gulf of California that are part of the Quaternary-age assemblages from Leg 65 and that have not been illustrated previously by Benson (1964) or other contemporary radiolarian workers. The photographs are from Benson's (1966) plates. (Slide numbers are followed by England Finder coordinates. The numbers preceded by VS-R- refer to sampling stations in the Gulf of California [this chapter, Fig. 2].)

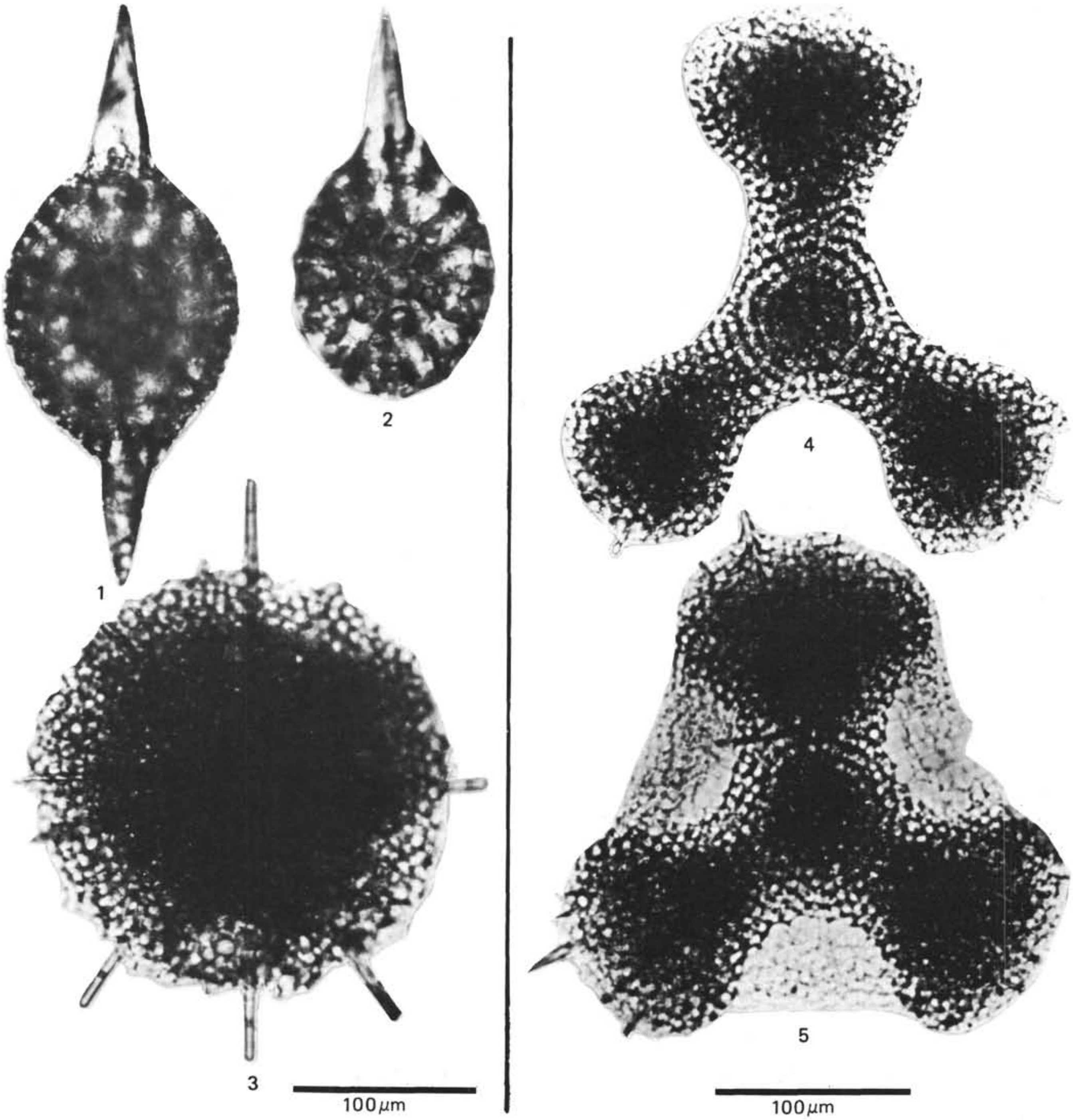

Plate 5. Radiolarians from Holocene sediments in the Gulf of California. (Scale bars equal 100 μm.) 1–2. *Xiphatractus pluto* (Haeckel), (1) VS-R-27b, 1-3 cm, D15/0. Benson, 1966, pl. 7, fig. 17, (2) VS-R-27b, 1-3 cm, D15/0. Focus on surface of cortical shell. Benson, 1966, pl. 7, fig. 16. 3. *Spongotrochus* sp. cf. *S. glacialis* Popofsky. VS-R-81a, 1-3 cm, S41/2. Benson, 1966, pl. 11, fig. 4. 4–5. *Euchitonia* sp. cf. *E. triangulum* (Ehrenberg), (4) VS-R-71a, 1-3 cm, J38/0. Benson, 1966, pl. 13, fig. 1, (5) VS-R-34a, 3-5 cm, S30/3. Benson, 1966, pl. 13, fig. 3. See Note, Plate 4.

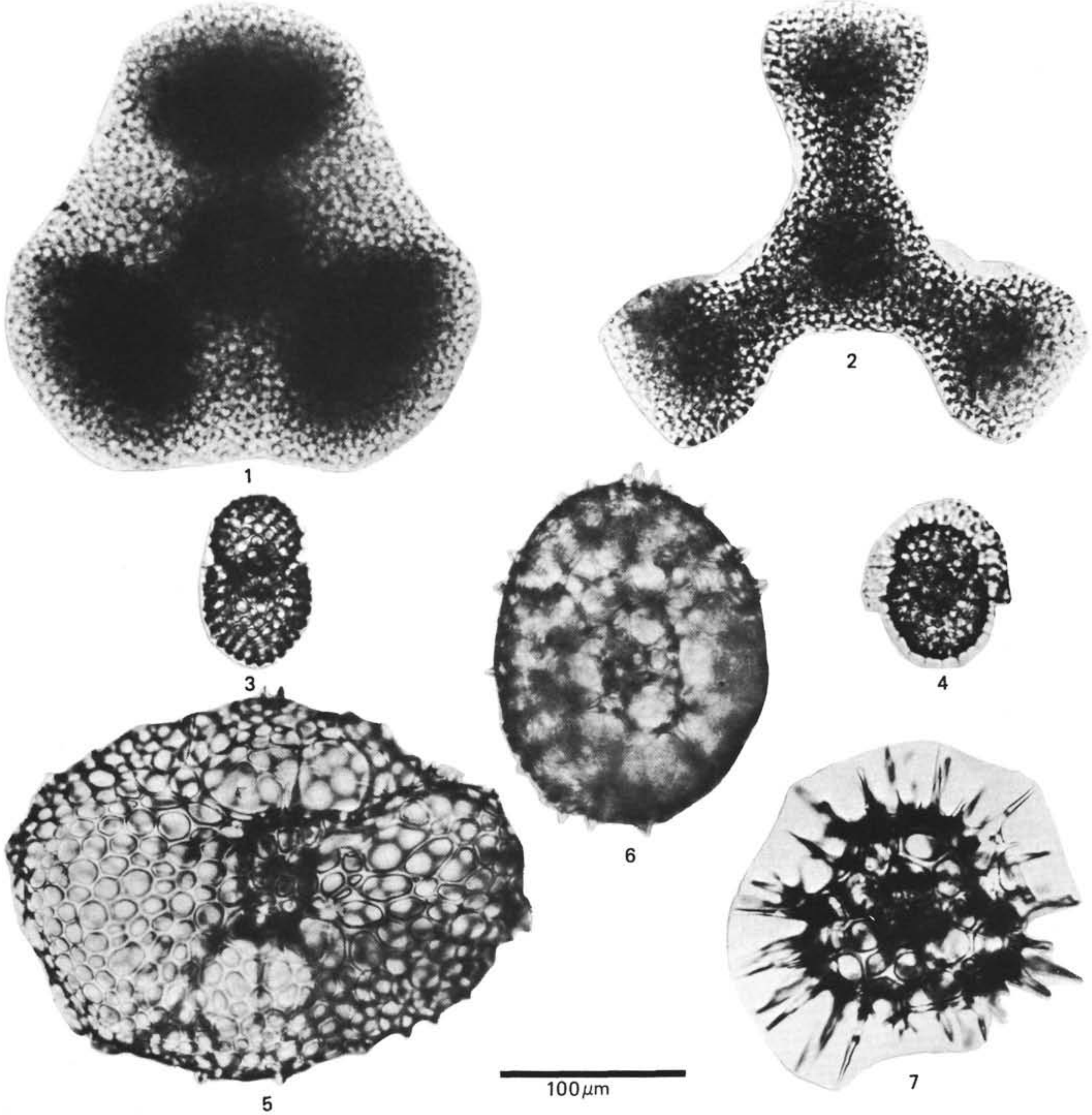

Plate 6. Radiolarians from Holocene sediments in the Gulf of California. (Scale bar equals 100 µm.) 1. *Dictyocoryne truncatum* (Ehrenberg). VS-R-56a, 1-3 cm, Q20/0. Benson, 1966, pl. 15, fig. 1. 2. *Dictyocoryne* sp. VS-R-27b, 1-3 cm, Z52/4. Benson, 1966, pl. 12, fig. 4. 3-4. *Spirema* sp., (3) VS-R-27b, 1-3 cm, K19/2. Benson, 1966, pl. 18, fig. 9, (4) VS-R-27b, 1-3 cm, R50/2. Benson, 1966, pl. 18, fig. 10. 5 *Pylonium* sp. VS-R-81a, 1-3 cm, X38/4. Benson, 1966, pl. 16, fig. 2. 6-7. *Hexapyle dodecantha* Haeckel group, (6) VS-R-184b, 1-3 cm, Y17/4. Benson, 1966, pl. 18, fig. 13, (7) VS-R-81a, 1-3 cm, Y51/2. Benson, 1966, pl. 18, fig. 15.
See Note, Plate 4.

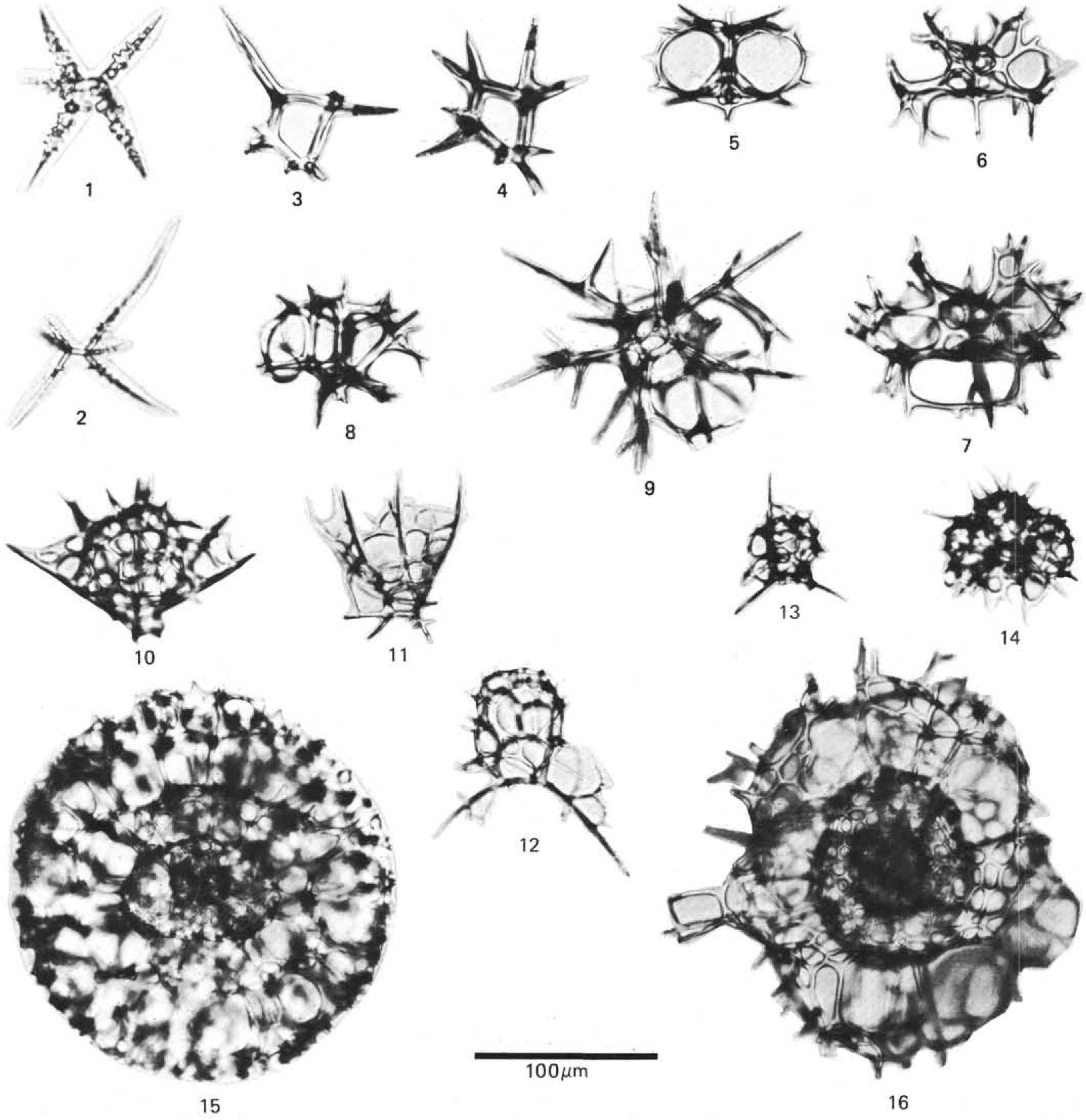

Plate 7. Radiolarians from Holocene sediments in the Gulf of California. (Scale bar equals 100 μm.) 1–2. *Plagonium* sp. cf. *P. sphaerozoum* Haeckel, (1) VS-R-151a, 1-3 cm, C44/0. Benson, 1966, pl. 19, fig. 13, (2) VS-R-93b, 1-3 cm, U11/4. Benson, 1966, pl. 19, fig. 12. 3–4. *Zygocircus* sp., (3) VS-R-93b, 1-3 cm, X17/4. Benson, 1966, pl. 19, fig. 16, (4) VS-R-133b, 1-3 cm, O36/0. Benson, 1966, pl. 19, fig. 17. 5–7. *Clathrocircus stapedius* Haeckel, (5) VS-R-81a, 1-3 cm, G20/1. Ventral view. Benson, 1966, pl. 21, fig. 11, (6) VS-R-81a, 1-3 cm, G19/4. Basal view showing collar pores. Benson, 1966, pl. 21, fig. 12, (7) VS-R-133b, 1-3 cm, E30/3. Apical view. Benson, 1966, pl. 21, fig. 13. 8–9. *Pseudocubus obeliscus* Haeckel, (8) VS-R-133b, 1-3 cm, D28/1. Left lateral view. Benson, 1966, pl. 22, fig. 6, (9) VS-R-133b, 1-3 cm, F43/0. Basal view, focus on collar ring. Benson, 1966, pl. 22, fig. 4. 10–11. *Plagiacantha*(?) *panarium* Dumitrica, (10) VS-R-81a, 1-3 cm, U34/0. Benson, 1966, pl. 23, fig. 21, (11) VS-R-151a, 1-3 cm, N16/0. Left lateral view. Benson, 1966, pl. 23, fig. 23. 12. *Phormacantha hystrix* Jorgensen. VS-R-81a, 1-3 cm, J52/4. Left lateral view. Benson, 1966, pl. 23, fig. 26. 13–14. *Plectacantha oikiskos* Jorgensen, (13) VS-R-191a, 1-3 cm, H20/3. Right lateral view. Benson, 1966, pl. 23, fig. 19, (14) VS-R-133b, 1-3 cm, M41/0. Right lateral view. Benson, 1966, pl. 23, fig. 20. 15–16. *Phorticium pylonium* Haeckel group, (15) VS-R-93b, 1-3 cm, Y22/1. Polar view. Benson, 1966, pl. 17, fig. 3, (16) VS-R-81a, 1-3 cm, K38/4. Frontal view. Benson, 1966, pl. 16, fig. 9.
See Note, Plate 4.

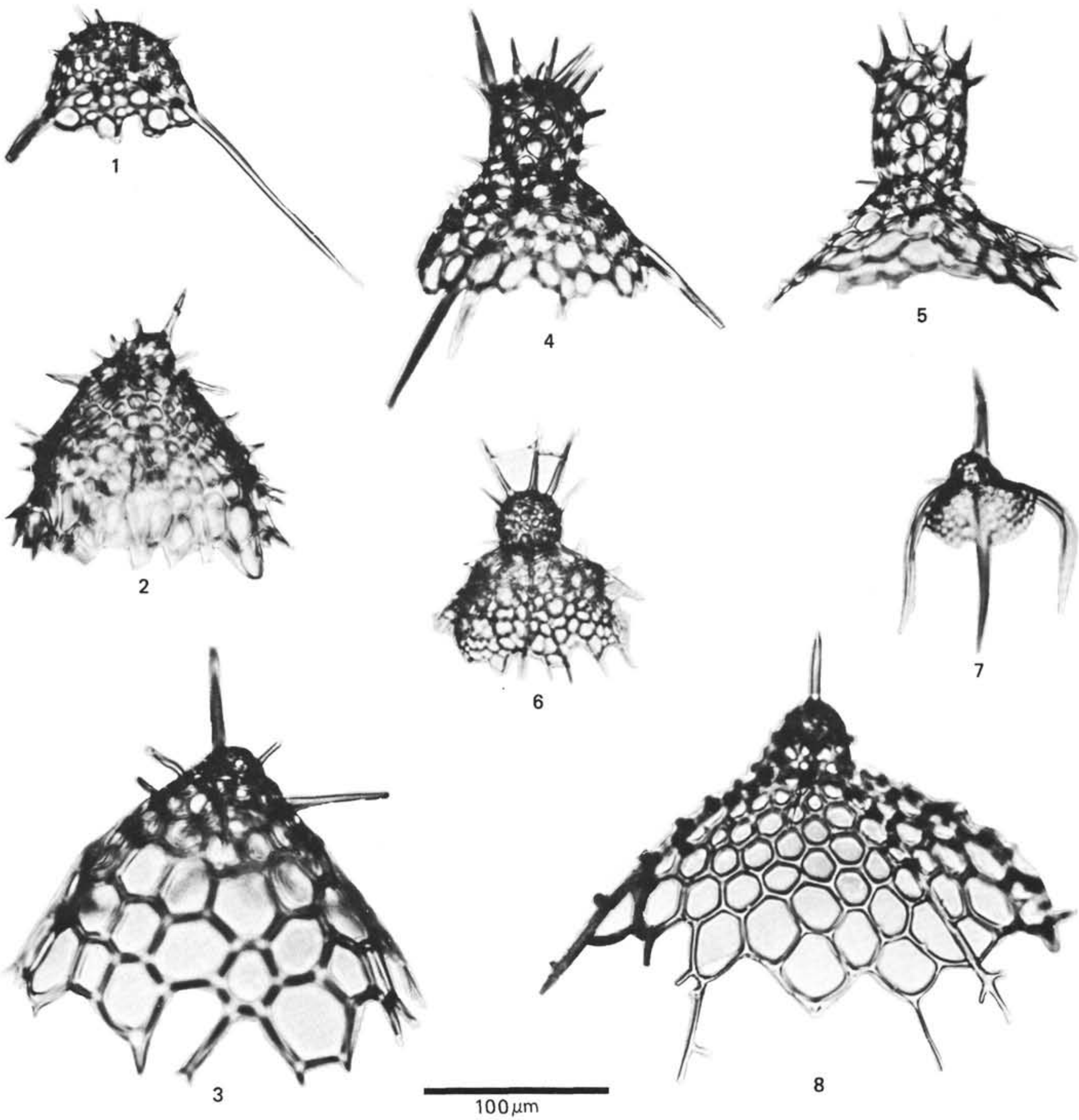

Plate 8. Radiolarians from Holocene sediments in the Gulf of California. (Scale bar equals 100 µm.) 1–3. *Helotholus histricosa* Jorgensen group, (1) VS-R-115a, 1–3 cm, S47/0. Left lateral view. Benson, 1966, pl. 31, fig. 6, (2) VS-R-151b, 1–3 cm, V31/4. Left lateral view. Benson, 1966, pl. 31, fig. 4, (3) VS-R-60a, 3–5 cm, E9/3. Right lateral view. Benson, 1966, pl. 31, fig. 8. 4. *Dictyophimus* sp. cf. *D. tripus* Haeckel. VS-R-81a, 1–3 cm, V49/1. Right lateral view. Benson, 1966, pl. 25, fig. 3. 5. *Amphiplecta cylindrocephala* Dumitrica. VS-R-60a, 3–5 cm, U9/0. Right lateral view. Benson, 1966, pl. 32, fig. 2. 6. *Arachnocorys umbellifera* Haeckel. VS-R-64a, 1–3 cm, Y20/4. Ventral view. Benson, 1966, pl. 24, fig. 21. 7. *Dictyophimus platycephalus* Haeckel. VS-R-60b, 3–5 cm, L23/0. Left lateral view. Benson, 1966, pl. 25, fig. 7. 8. *Lampromitra quadricuspis* Haeckel. VS-R-56a, 1–3 cm, D33/1. Ventral view, Benson, 1966, pl. 31, fig. 1.
See Note, Plate 4.

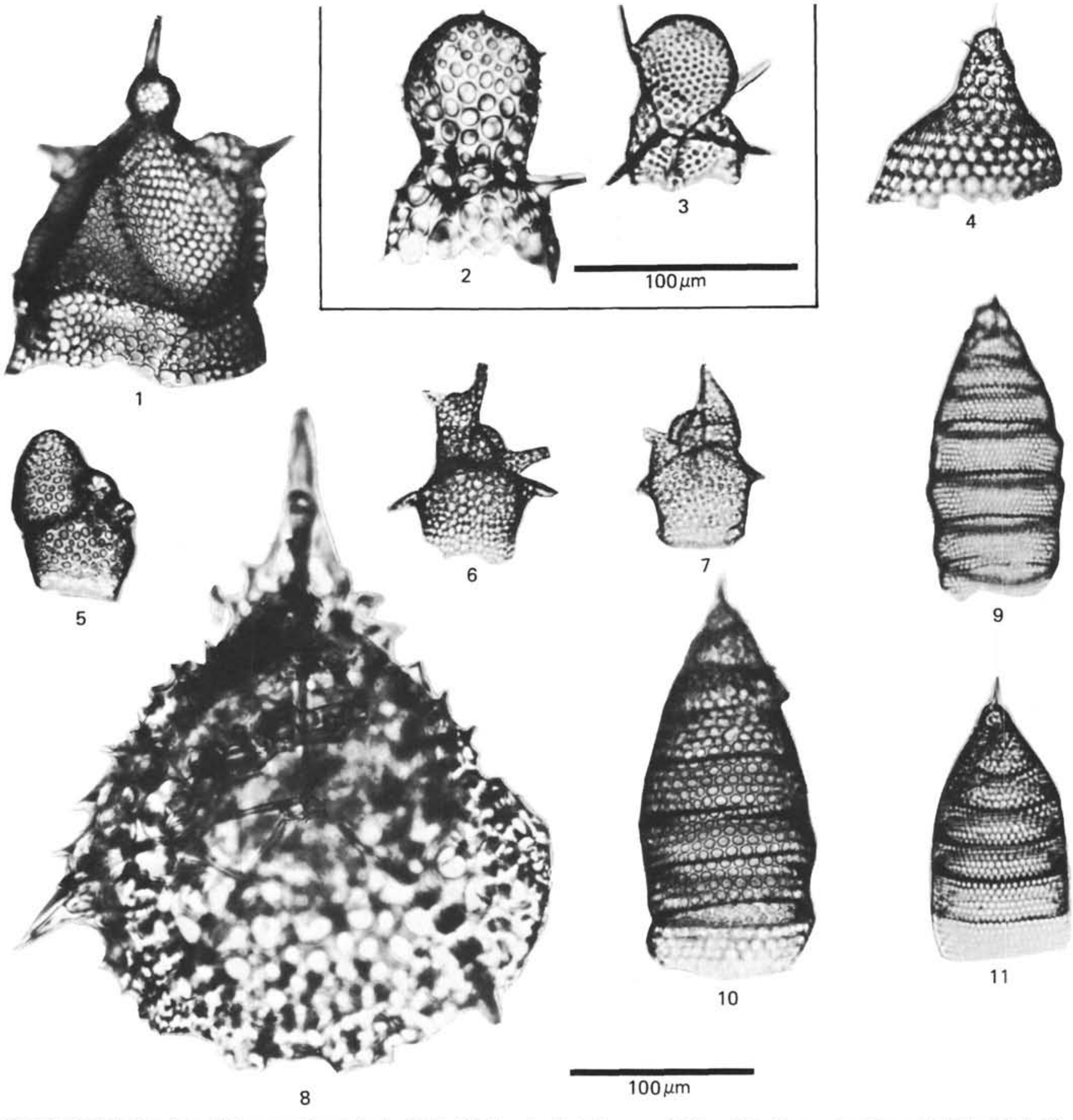

Plate 9. Radiolarians from Holocene sediments in the Gulf of California. (Scale bars equal 100 µm.) 1. *Lipmanella tribranchiata* Dumitrică. VS-R-81a, 1-3 cm, G41/1. Doroso-right lateral view. Benson, 1966, pl. 28, fig. 11. 2. *Lithomelissa thoracites* Haeckel. VS-R-92b, 1-3 cm, E23/0. Ventro-right lateral view. Benson, 1966, pl. 24, fig. 11. 3. *Lithomelissa laticeps* Jorgensen. VS-R-93b, 1-3 cm, Z46/0. Right lateral view. Benson, 1966, pl. 24, fig. 14. 4. *Eucecryphalus*(?) sp. VS-R-192b, 1-3 cm, U34/2. Left lateral view. Benson, 1966, pl. 30, fig. 6. 5. *Acrobotrissa cribosa* Popofsky. VS-R-60a, 3-5 cm, O39/4. Right lateral view. Benson, 1966, pl. 23, fig. 15. 6-7. *Acrobotrys* sp. cf. *A. disolenia* Haeckel, (6) VS-R-81a, 1-3 cm, G29/0. Right lateral view. Benson, 1966, pl. 23, fig. 14, (7) VS-R-93b, 1-3 cm, D46/2. Left lateral view. Benson, 1966, pl. 23, fig. 13. 8. *Clathromitra pterophormis* Haeckel. VS-R-56a, 1-3 cm, E19/2. Left lateral view from below, focus on basal tripodium. Benson, 1966, pl. 26, fig. 4. Figure 9-11. *Eucyrtidium*(?) *hexastichum* (Haeckel) group, (9) VS-R-92a, 1-3 cm, D20/0. Benson, 1966, pl. 34, fig. 16, (10) VS-R-60b, 3-5 cm, N45/0. Benson, 1966, pl. 34, fig. 13, (11) VS-R-60b, 3-5 cm, F43/1. Benson, 1966, pl. 34, fig. 15.
See Note, Plate 4.