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SOME SPUMELLARIAN RADIOLARIA FROM THE JAVA, PHILIPPINE, AND MARIANA TRENCHES

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ABSTRACT—Eight species belonging to five genera of patagium-bearing and morphologically closely related spumellarian Radiolaria were found in three sediment cores from the Java, Philippine, and Mariana Trenches in the Indo-Pacific region. These various forms are illustrated and discussed with special emphasis on their intraspecific variation in the degree of patagium development or preservation.

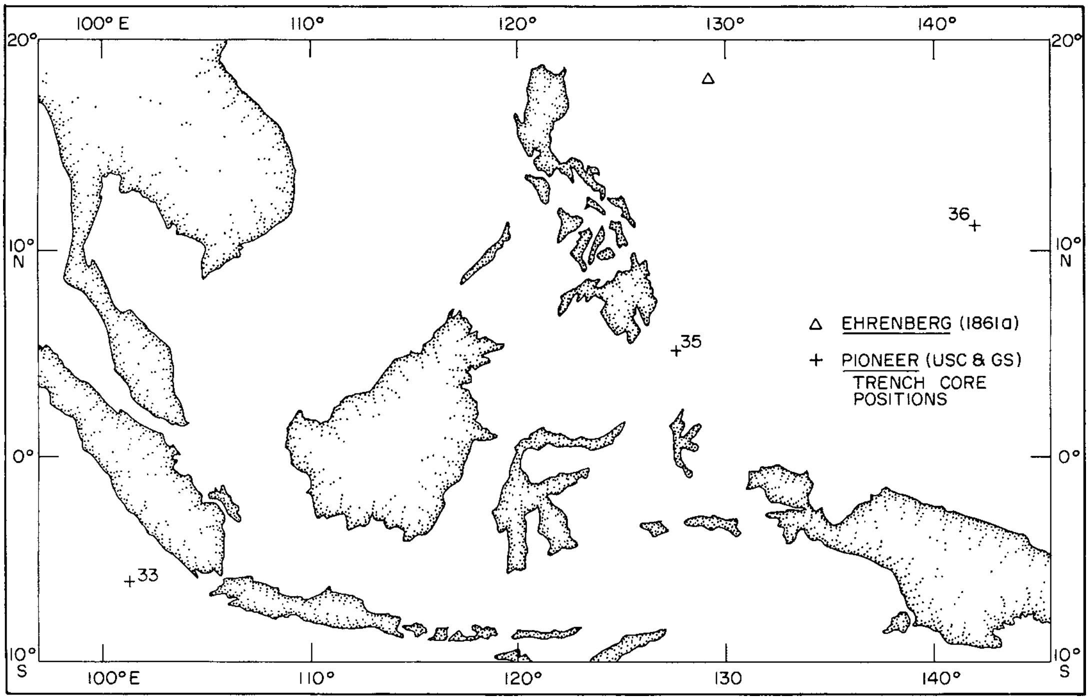
INTRODUCTION

IN 1964, while returning from the International Indian Ocean Expedition, the USC&GS *Pioneer* collected sediment cores from three trenches in the Indo-Pacific region (Text-fig. 1). The core locations are (names approved by the United States Board on Geographic Names):

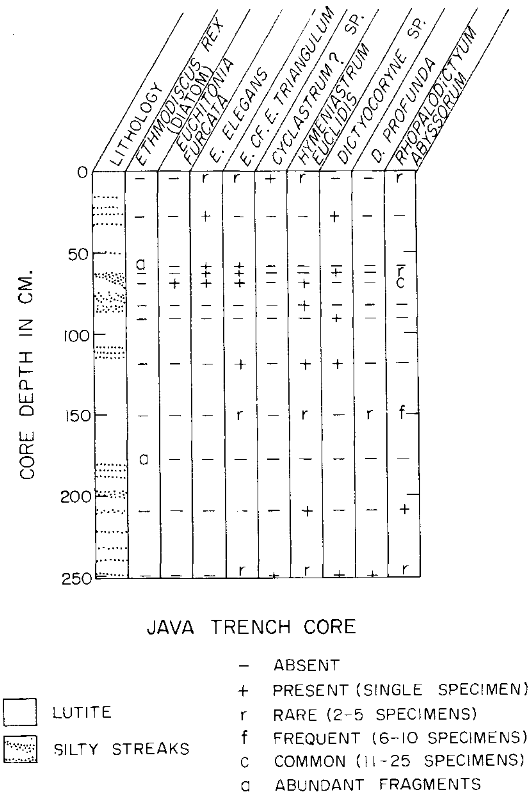
Java Trench, lat 6°00′ S., long 101°17′ E.; water depth, 3,380 m.
Philippine Trench, lat 5°25′ N., long 127°40′ E.; water depth, 8,010 m.
Mariana Trench, lat 11°18′ N., long 141°57′ E.; water depth, 10,170 m.

During the preliminary examination of the core samples, the presence of uncommonly rich radiolarian faunas and abundant fragments of a diatom, *Ethmodiscus rex* (Rattray) Hendey, were noticed. Some Radiolaria in the assemblage possess highly diversified degrees of patagium.

In a previous paper, Ling (1966) pointed out an inconsistent degree of patagium found in some spumellarian Radiolaria genera and discussed in detail its relationship to ontogenetic development and taxonomy. At that time, his observation was based only on the radiolarian assemblage in bottom sediments from the northeast Pacific Ocean. The finding of a similar feature in



TEXT-FIG. 1—Geographic locations of three trench cores from the Indo-Pacific region: 33, Java Trench; 35, Mindanao Trench; 36, Mariana Trench; Δ—Ehrenberg (1861*a*), location of Enhreberg's sample from the Philippine Sea.



TEXT-FIG. 2—Distribution of some Radiolaria in the Java Trench core.

the samples from the Indo-Pacific region furnishes additional evidence that such variation in degree of patagium seems to be neither a rare phenomenon nor biogeographically significant. In the present investigation, only those patagium-bearing Radiolaria and the forms that are morphologically closely related are treated.

ACKNOWLEDGMENTS

The authors are indebted to Captain Harold J. Seaborg, Seattle Regional Office, U.S. Coast and Geodetic Survey, and Mr. Ted V. Ryan, Pacific Oceanographic Laboratory, Environmental Science Services Administration, Seattle, Washington, for their kind permission to use samples from the trench-sediment cores for the present study. Special thanks are due Mr. Frederick J. Collier, Smithsonian Institution, for kindly arranging the loan of Martin's (1904) type specimens, and to Mr. William R. Riedel, Scripps Institution of Oceanography, University of California at San Diego, and Dr. Catherine Anne Clark Nigrini, Department of Geology, Northwestern University, for their constructive advice and critical reading of the manuscript. The authors, however, bear the sole responsibility for the contents of the paper.

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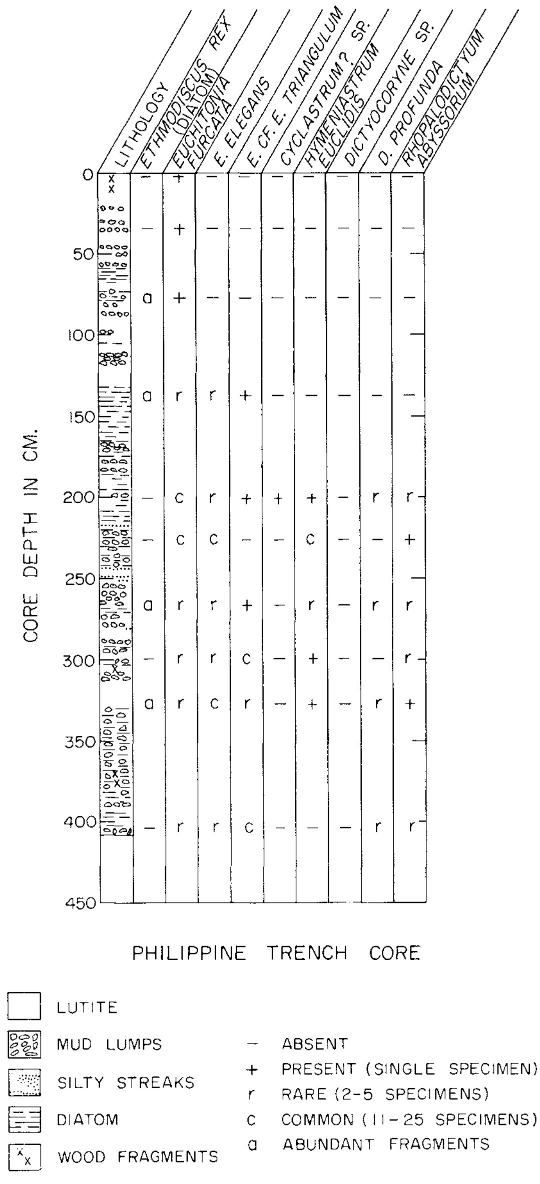


TEXT-FIG. 3—Distribution of some Radiolaria in the Philippine Trench core.

larian specimens deposited at the Museum of Paleontology, University of California, Berkeley, and at the United States National Museum, Washington, D.C.

This is Contribution no. 403 from the Department of Oceanography and Contribution no. 3 from the Joint Oceanographic Research Group, University of Washington, Seattle.

LITHOLOGY

The detailed account on the lithology of the core sediments has already been presented (Anikouchine & Ling, in press). Therefore, only a brief description is given here. The positions of the samples studied in these cores are shown in Text-figures 2 to 4.

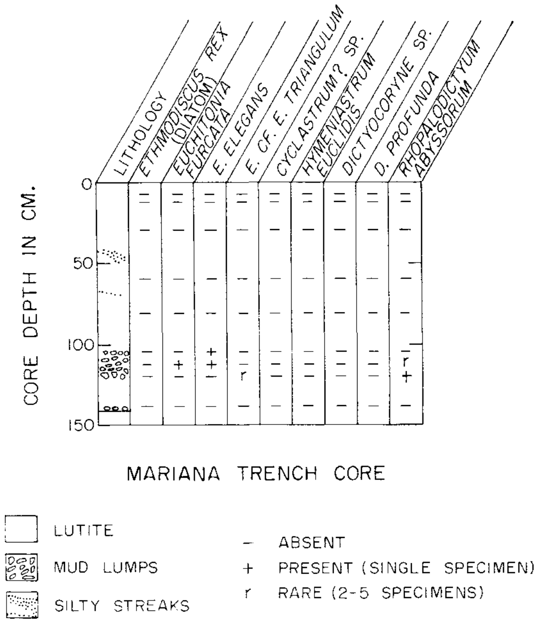
The Java Trench core contains olive-gray to greenish-gray clayey silt interbedded with silt layers about 1 cm. thick and consisting of finely divided mica. The silt layers are spaced about every 25 cm. throughout the core. Cross bedding was observed at several horizons in the core. The otherwise uniform clayey silt is streaked and banded olive brown, moderate yellowish brown, dark yellowish brown, and lighter and darker grayish green.

The Philippine Trench core also contains an alternating series of sediments. Dark greenish-gray clayey silt or uniform texture in layers 2 to 8 cm. thick are randomly intercalated with similarly colored irregular layers, lenses, and streaks of rough-textured clayey silt that is rich in diatom valves in most samples and rich in clay lumps in other samples. These layers and lenses range in thickness from 5 mm. to 13 cm. and are similarly variable in color. The core contains an abundance of carbonaceous smears, pyrite nodules, and wood fragments.

It is likely that both the Java and the Philippine Trench cores represent pelagic sedimentation punctuated with accumulations from turbidity flows. Silt-sized mica is the turbidity-flow contribution in the Java Trench, whereas in the Philippine Trench diatom valves and, to a lesser degree, terrestrial sediments and clay lumps are probably contributed by turbidity flows.

In contrast, the Mariana Trench core has a much more uniform composition of light and dark yellowish-brown clayey silt, except for some scattered intercalations of silty layers of a few millimeters thick and layers up to 40 cm. thick containing clay lumps. The clay lumps contain less silt than does the surrounding sediment and were probably introduced into the trench from areas outside. The mineralogy of the silty layers is that of a graywacke—rock fragments, quartz, feldspar, serpentine, biotite, and a variety of accessory minerals—and thus is indicative of sudden changes in sedimentation. The layers probably represent the winnowed remains of a quantity of sediment that was suddenly introduced to the ocean bottom from a continental source. In this sense, the three trench cores show that a similar mechanism of sedimentation operates in these trenches. The differences observed in the cores probably reflect closeness to source of sediment and nature of the provenance.

The authors should like to emphasize the following concerning the presence of ooze of the diatom *Ethmodiscus rex* (Rattray) Hendey in these three trench cores—for further discussion of this subject, see Anikouchine & Ling, in press: First, the three studied cores are located within or approximately within the biogeographic distribution region of this diatom (Semina, 1959, fig. 1), yet the diatom is completely absent from the top or the uppermost samples of the cores. Second, the distribution of this diatom ooze in the cores is quite erratic; the ooze is frequently found in the middle part of Philippine Trench sediments, between depths of 75 and 328 cm. from the sediment surface, but is rare in Java Trench samples and is completely absent from the Mariana Trench subsurface section.



TEXT-FIG. 4—Distribution of some Radiolaria in the Mariana Trench core.

SYSTEMATIC PALEONTOLOGY

After the grain-size analysis was made, it was found that most of the radiolarian specimens are quite free from detritus or organic substances.

Thus, no further chemical treatment was necessary. The specimens were picked up under a low-power stereomicroscope and both single-specimen and strewn slides were made with Canada balsam.

In the tables of measurements, the location of the illustrated specimen is recorded in the following way: The first two numerals in the codes, (for example, 33–250) refer to the cores and correspond to the suffix of the core serial numbers (for example, PI-442-64-33) assigned at the Pacific Oceanographic Laboratory. The number 33 signifies the Java, 35 the Philippine, and 36 the Mariana Trench cores. The following numerals indicate the position of the sample in the core, that is, the depth in centimeters below the surface sediments. If the specimen is in a strewn slide, its location is next recorded with the aid of the England finder (Riedel & Foreman, 1961). During the present investigation, the finder was always placed on the mechanical stage of a Zeiss photomicroscope in such a way that grid A 1 was located at the upper left-hand corner. Text-figure 5 illustrates the measurements (W, W′, L, L′) made on the specimens. All the slides will be deposited permanently in the Micropaleontology Collection at the Department of Oceanography, University of Washington, Seattle, Washington.

Genus EUCHITONIA Ehrenberg, 1861
EUCHITONIA FURCATA Ehrenberg
Pls. 189, 190, figs. 1–2,5–7

Euchitonia furcata EHRENBERG, 1861*a*, p. 767; ——, 1861*b*, *ibid*., p. 823; 1873*a*, p. 308; ——; 1873*b*, p. 288–289, Pl. 6 (III), fig. 6; HAECKEL, 1887, p. 532–533.

*Euchitonia müller*i HAECKEL, 1862, p. 508–510, Pl. 30, figs. 5–10; STÖHR, 1880, p. 110, Pl. 5, fig. 5; HAECKEL, 1887, p. 533; CLEVE, 1901 (incl. *E. ypsiloides*), p. 11; COCCO, 1905, p. 11–12 [questionable]; POPOFSKY, 1912, p. 137–138, Text-fig. 54 only [52 and 53 questionable]; CLARK, p. 81–85, Pl. 4, figs. 1a,b.

Euchitonia aequipondata POPOFSKY, 1912, p. 139–140, Pl. 7, figs. 3,4.

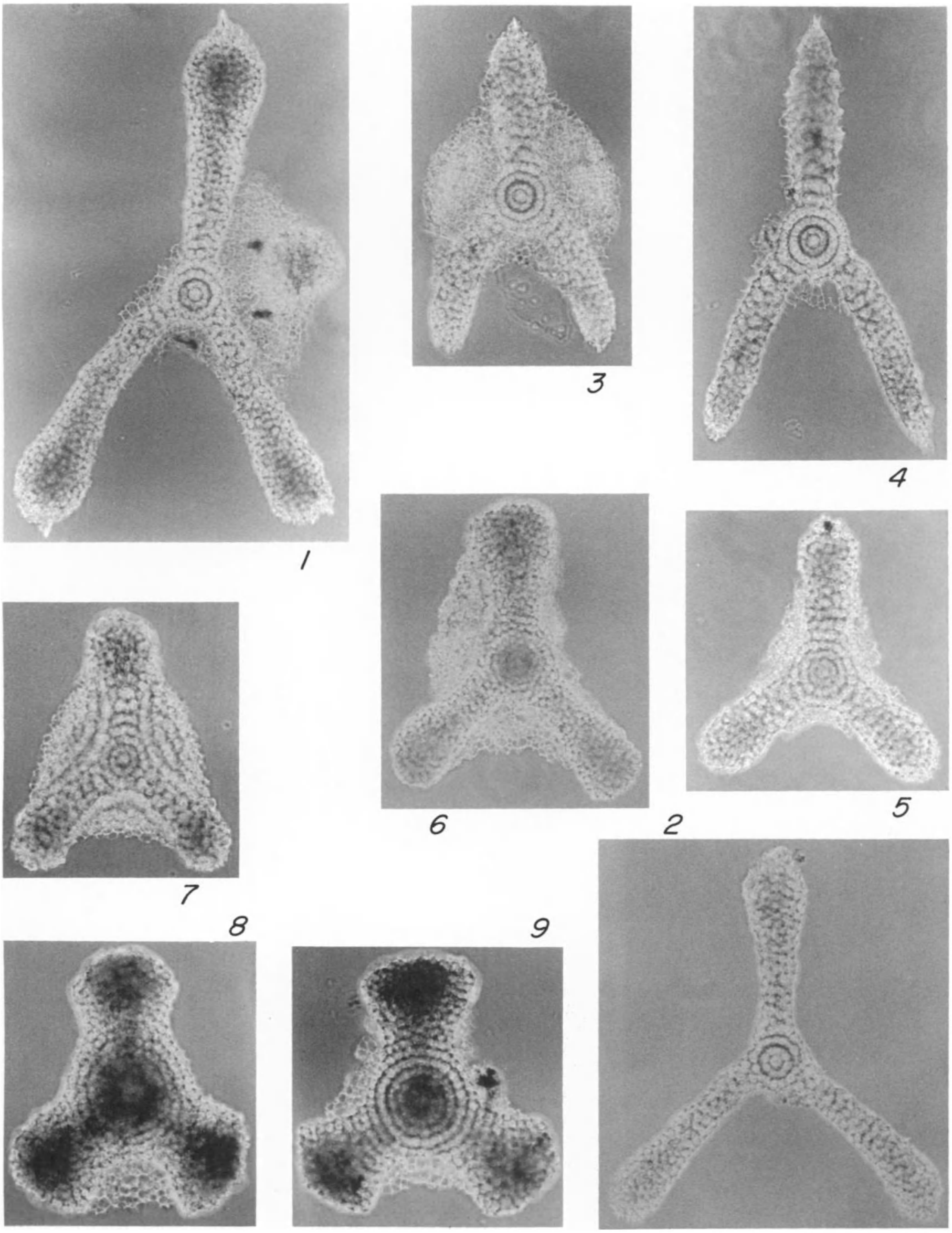
not *Astromma yelvertoni* Macdonald, HAECKEL, 1887, p. clxxix (see discussion).

not *Euchitonia mülleri* Haeckel, BACHMANN AND OTHERS, 1963, p. 136, Pl. 11, fig. 62.

Discussion.—The reason for considering *E. muelleri* to be a senior synonym of *E. furcata* is that *E. furcata* is the first and only nominal

EXPLANATION OF PLATE 189
All figures ca. ×159 unless otherwise indicated; bright field.

FIGS. *1,2*—*Euchitonia furcata* Ehrenberg. *1*, Sample 35–328; *2*, sample 35–267.
3,4—*E. elegans* Ehrenberg. *3*, Sample 33–2; *4*, sample 35–328.
5–7—*E. furcata* Ehrenberg. *5*, Sample 35–138; *6*, sample 35–405 (033/1); *7*, sample 35–328 (S40/0).
8,9—*E.* cf. *E. trianglulum* (Ehrenberg) *8*, Sample 35–300 (J34/0); *9*, sample 35–300 (Q36/0), ×200.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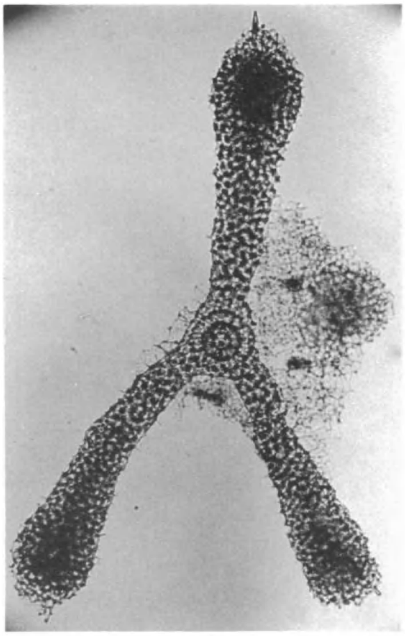
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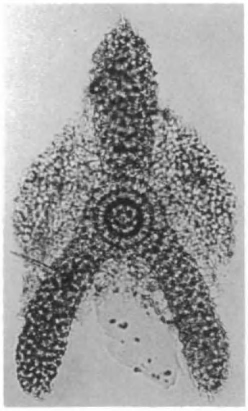
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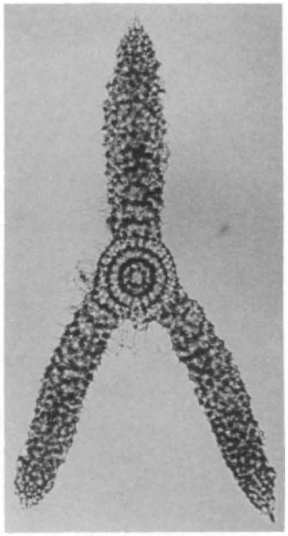
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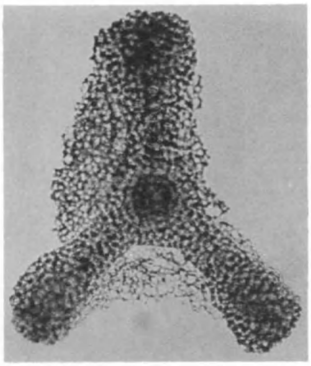
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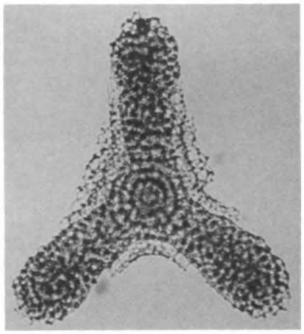
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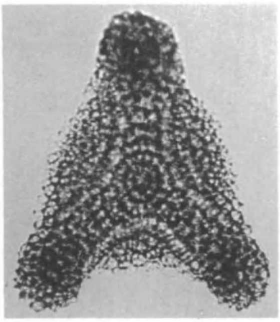
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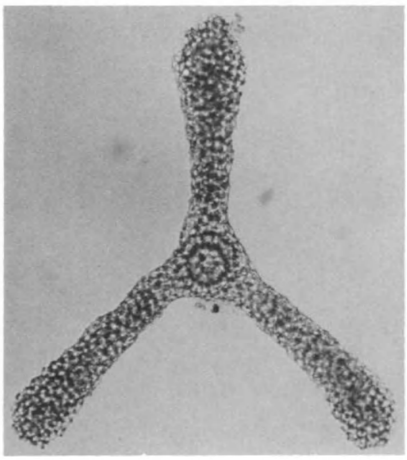

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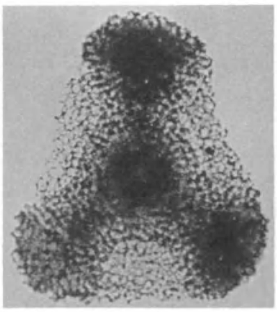

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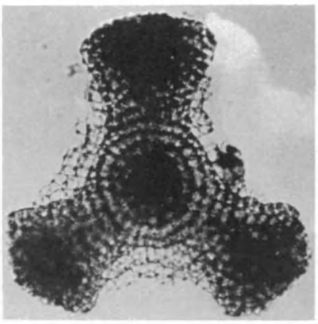
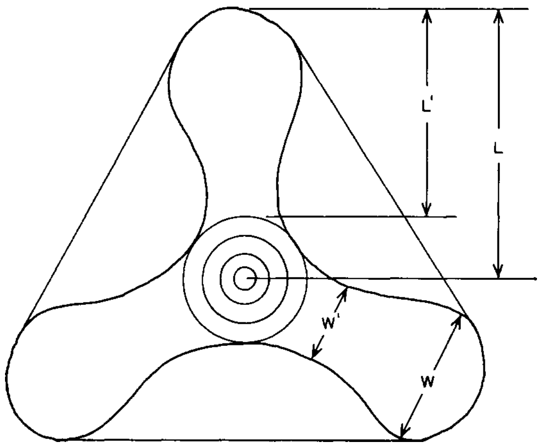


species of the present genus mentioned by Ehrenberg (1861*a*, p. 767) in a table and again in a table (1861*b*, p. 823) as part of an article in which he gave the generic diagnosis. In both citations, however, the name *E. furcata* was accompanied by two asterisks indicating a new genus. For new species, only one asterisk was given. (See Ehrenberg, 1858, p. 553.) It is true that the description and illustration of *E. furcata* were given by Ehrenberg (1873*a*, p. 308; 1873*b*, p. 288–289, Pl. 6 (III), fig. 6, respectively) later than those of *E. muelleri* by Haeckel (1862, p. 508–510, Pl. 30, figs. 5–10). Because only the species name was mentioned, however, and because the two asterisks were included, Ehrenberg's action is here presumed to constitute an indication as specified in Article 16 (a) (v) of the *International Code of Zoological Nomenclature* (Stoll and others, 1961). Therefore *E. furcata* is considered to be a valid name and consequently has priority over *E. muelleri*.

Campbell (1954, p. 86), in his compilation for the *Treatise on Invertebrate Paleontology*, designated *E. furcata* as the type of the genus and



TEXT-FIG. 5—Schematic diagram of patagium-bearing Radiolaria showing the measurements (in microns) made in this paper. W = the maximum width of the arm; W′ = the minimum width of the arm; L = the length of the arm, measured from the presumed geometrical center or center of the central structure to the distal end of the arm; L′ = the length of the arm.

EXPLANATION OF PLATE 190

All figures ca. ×159 unless otherwise indicated; phase contrast.

FIGS. *1–7*—The same as corresponding figures in Plate 189.

8,9—*E.* cf. *E. triangulum* (Ehrenberg). *8*, Sample 35–300 (N37/1), ×200; *9*, Sample 35–300 (Q36/0), ×200.

marked the date 1872 with an asterisk, indicating that the species was fixed by the original author on the date of the original publication. It is clear from the discussion above that the valid date of the present species should be 1861.

Macdonald (1871, p. 226, figs. 1,2) proposed and illustrated a new species, *Astromma yelvertoni*, but did not describe it. Haeckel (1887, p. clxxix) considered the species to be synonymous with his species, *E. muelleri*, but completely neglected to mention this in his *Challenger* text because he evaluated Macdonald's paper as one of six listed pieces of " . . . absolutely worthless literature, which contains either only long known facts or false statements, and may hence be entirely neglected with advantage." Whether or not Macdonald's publication is worthless is not the subject of the present discussion, however. Because all the angles between the arms of his figure 1 are the same, the specimen cannot be classified in the genus *Euchitonia*, as Haeckel presumed, according to the current classification.

Haeckel (1862, p. 508) once considered his *E. ypsiloides* (originally as *Histiastrum ypsiloides* Haeckel, 1861, p. 843) to be a synonym of *E. muelleri*, but in his *Challenger* report he then treated them as separate species. The description of *E. ypsiloides* is quite brief and no illustration is given; therefore, the authors could not reach any conclusion at this time, and the name of *E. ypsiloides* is not included in the synonymy above.

Numerous specimens of *E. furcata* recovered from the trench samples show a wide range of variations in the extent of patagium, the size of the specimen, and in the form of the arms, particularly at the distal end. For example, three specimens here illustrated (Pls. 189, 190, figs. 5–7) are considered as near typical for the present species, whereas another specimen (Pls. 189, 190, fig. 1) is comparable to Popofsky's new form, *E. aequipondata* (1912, p. 139–140; Pl. 7, figs. 3,4). Numerous transitional forms, however, are found between the two showing a continuous variation, and no clear separation is possible. Although we cannot completely support Clark's (1965, p. 85) view that "the three specimens described by Popofsky (1912) as *E. aequipondata* are apparently only *particularly well-developed examples* [italics ours] of *E. mülleri*" (*E. furcata* in this paper), we nevertheless agree here that it is best to consider Popofsky's species as *E. furcata*.

MEASUREMENTS IN MICRONS

Sample	W′	W	L	L′	Plate	fig.
35–328	33	75	265	190	189, 190	1
35–267	30	63	210	185	189, 190	2
35–138	38	60	150	120	189, 190	5
35–405 (033/1)	40	85	155	125	189, 190	6
35–328 (S40/0)	30	50	140	120	189, 190	7
Observed range	30–50	50–90	140–265	100–190	based on 20 specimens	

EUCHITONIA ELEGANS (Ehrenberg)
Pls. 189, 190, figs. 3,4

Pteractis elegans EHRENBERG, 1873a, p. 319; ——, 1873b, p. 298–299, Pl. 8, fig. 3.
Euchitonia elegans (Ehrenberg), HAECKEL, 1887, p. 535; CLEVE, 1901, p. 11; RIEDEL, 1952, p. 1–18 (particularly p. 11–12 and 14); CLARK, p. 85–88, Pl. 4, figs. 2a,b; fig. 18.
Non? Euchitonia elegans (Ehrenberg), POPOFSKY, 1912, p. 138–139, text-figs. 55–57, Pl. 7, fig. 2.

Discussion.—Ehrenberg described (1873a, p. 319) and illustrated (1873b, Pl. 8, fig. 3) the present species from a bottom sediment (18°03′N, 129°11′ E; depth, 6,040 m.) in the Philippine Sea. Although he added: "cfr. Monatsbericht 1860, p. 767." at the end of his original description, the name of this species was not found on the mentioned page nor on his faunal list in the paper, and it is our understanding that he referred only to the sample.

His original illustration (1873b) clearly shows that the distal end of each of the three arms narrows to a point, but actually only one arm, an odd one, possess a spine at its distal end. We, therefore, agree with Popofsky's (1912, p. 138) comments that Haeckel (1887, p. 535) misinterpreted Ehrenberg's original figure and stated that there are terminal spines at the end of the arms. However, judging from the illustration and particularly his Text-figure 57, which he considered as the only mature as well as the complete form, it is doubtful that the specimens Popofsky found actually belong to *E. elegans*.

The extent of patagium found in the trench samples ranges from considerably developed, but not as complete as Ehrenberg's specimen, to entirely absent.

MEASUREMENTS IN MICRONS

Sample	W′	W	L	L′	Plate	fig.
33–2	40	55	170	135	189, 190	3
35–328	40	50	210	175	189, 190	4
Observed range	33–40	35–55	165–265	115–230	Based on 25 specimens	

EUCHITONIA cf. E. TRIANGULUM (Ehrenberg)
Pls. 189, 190, figs. 8,9

Stylactis triangulum EHRENBERG, 1873a, p. 320; ——, 1873b, p. 298–299, Pl. 8, fig. 9; STÖHR, 1880, p. 113, Pl. 6, fig. 2.
Euchitonia triangulum (Ehrenberg), HAECKEL, 1887, p. 533.

Discussion.—As in the example of *E. elegans*, Ehrenberg (1873a, p. 320; 1873b, p. 298–299) twice indicated that the name of the species was proposed during the year of 1860. However, the search on this account is without success.

The original figure illustrated by Ehrenberg, based on a specimen from the Philippine Sea, has a nearly complete patagium, but the nature of the arms is completely obscured. Stöhr's (1880, Pl. 6, fig. 2) figure does not show the patagium, and he considered the specimen to be a broken one. Both figures, however, illustrate clearly that *E. triangulum* has a relatively large concentric central structure.

The specimens assigned here to this species, despite the stated discrepancies, seem to agree in general with the above-mentioned illustrations and with the description subsequently given by Haeckel (1887, p. 533).

The intraspecific variations observed during the present study are (1) the inconsistency in the extent of the patagium and (2) the shape of the arms, particularly the distal ends.

Dictyastrum angulatum by Ehrenberg (1861a, p. 767; 1873a, p. 306; 1873b, p. 288–289, Pl. 8, fig. 18), which Haeckel (1887, p. 589, 590) considered to be *Rhopalodictyum truncatum* of Ehrenberg (1862, p. 301), closely resembles the *E. triangulum*, except that all arms are equidistant and the surface is completely spongy.

Genus CYCLASTRUM Rüst, 1898
CYCLASTRUM? sp.
Pls. 191, 192, figs. 1–2

Discussion.—The genus *Cyclastrum* was established by Rüst (1898, p. 28, Pl. 9, fig. 5) from the Jurassic samples from Italy, *C. infundibuliforme* being both genotypic and monotypic. The generic characteristic given by him is: "Die Distalenden der drei Arme durch einen spongiösen Patagialgürtel verbunden."

It is important to point out that Campbell's (1954, p. 86) diagnosis for this genus is misleading, inasmuch as he described the genus as "like *Chitonastrum* but has patagium," whereas for *Chitonastrum* he indicated, "three distally *forked* [italics ours] arms; no patagium." It seems quite clear from the description and illustration given by Rüst that he never intended to include the forked-arms form in his genus.

The two illustrations here show a specimen having the complete patagium and a specimen having only a partial patagium located only in one of the three interbrachial areas. If the patagium is completely absent from them, they would be classified in different genera, such as *Dictyastrum* or *Rhopalastrum*, according to the current generally accepted scheme.

The concentric nature of the central structure is clearly shown in our samples, whereas such a feature was not mentioned nor illustrated by Rüst.

In view of these discussions and the fact that Rüst's genus is the closest to the forms that can be found, the authors tentatively assign them to *Cyclastrum*.

MEASUREMENTS IN MICRONS

Sample	W′	W	L	L′	Plate	fig.
35–300 (J34/0)	60	100	130	80	189	8
35–300 (N37/1)	60	80	110	75	190	8
35–300 (Q36/0)	50	90	110	70	189, 190	9
Observed range	50–60	80–110	110–140	70–95	based on 15 specimens	

MEASUREMENTS IN MICRONS

Sample	W′	W	L	L′	Plate	fig.
35–201 (R41/4)	40	95	220	190	191, 192	1
35–405 (K41/0)	35	100	200	165	191, 192	2

Genus HYMENIASTRUM Ehrenberg, 1847
HYMENIASTRUM EUCLIDIS Haeckel
Pls. 191, 192, fig. 3

Hymeniastrum euclidis HAECKEL, 1887, p. 531, fig. 13. CLEVE, 1901, p. 11; POPOFSKY, 1912, p. 136–137, Text-fig. 51.

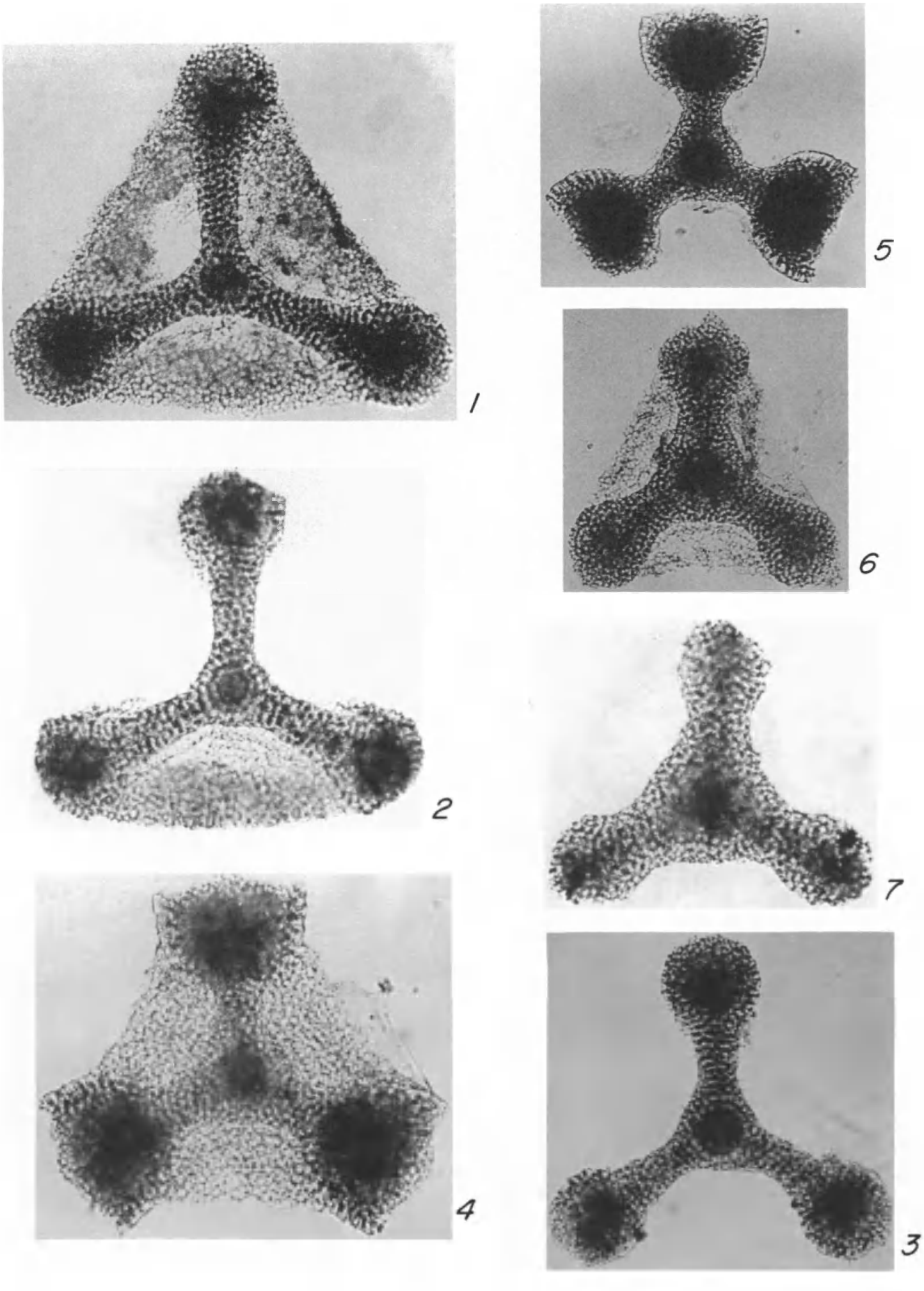
Discussion.—On the basis of the fauna from bottom sediments of the northeast Pacific Ocean, the degree of patagium shown in the specimen of the present species and its relation to taxonomy and ontogenetic considerations have been discussed by Ling (1966). The occurrence of similar phenomena in the trench core samples indicates that such variation actually occurs beyond any biogeographic limitation and quite possibly is a common phenomenon in these patagium-bearing Radiolaria.

MEASUREMENTS IN MICRONS

Sample	W′	W	L	L′	Plate	fig
35–227 (J36/0)	35	85	180	145	191, 192	3
Observed range	30–40	75–100	150–210	110–175	based on 10 specimens	

EXPLANATION OF PLATE 191
All figures ca. ×159 unless otherwise indicated; bright field.

FIGS. *1,2*—*Cyclastrum?* sp. *1*, Sample 35–201 (R41/1); *2*, sample 35–405 (K41/0).
3—*Hymeniastrum euclidis* Haeckel. Sample 35-227 (J36/0).
4,5—*Dictyocoryne* sp. *4*, Sample 33-29 (N39/3); *5*, sample 33-250.
6—*D. profunda* Ehrenberg. Sample 35-267.
7—*Rhopalodictyum abyssorum* Ehrenberg. Sample 36-120 (M42/0), ×200.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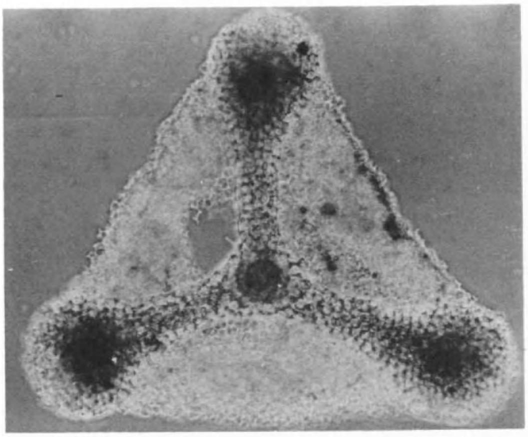
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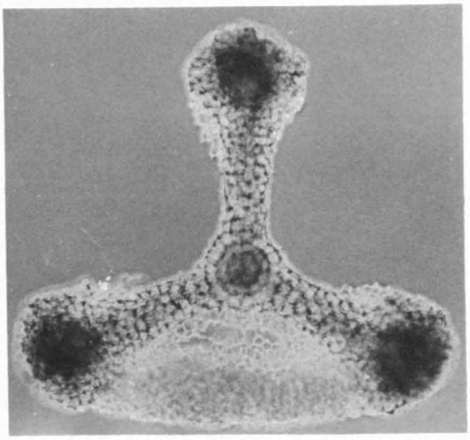
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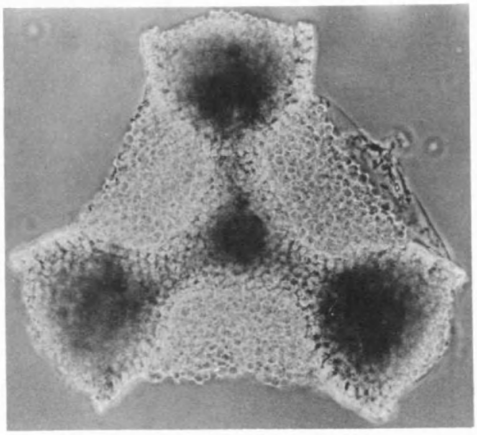
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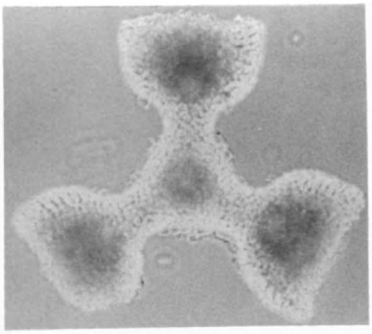
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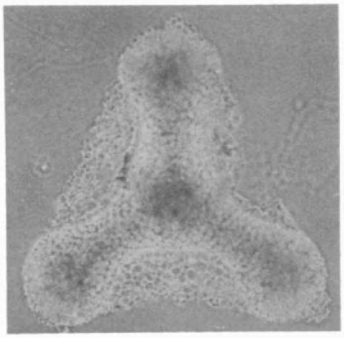
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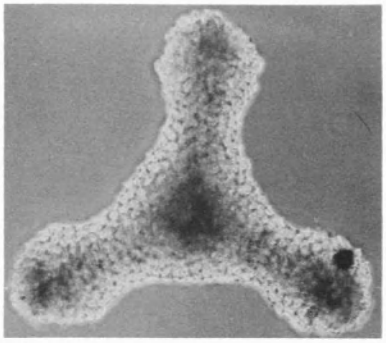
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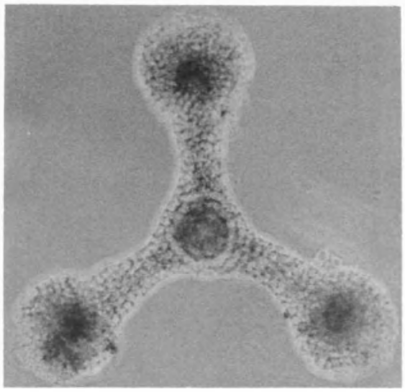
3

Genus DICTYOCORYNE Ehrenberg, 1861
DICTYOCORYNE sp.
Pls. 191, 192, figs. 4,5

Discussion.—The rapidly expanded distal half and flatly truncated nature of the distal end, forming chalice-shaped arms, are quite characteristic and clearly distinguish this form from any other published species.

Rare specimens observed in the present study prevent this from being considered as new. A highly variable extent of patagium in this form is, nevertheless, clearly demonstrated. The form is found only in the Java Trench sediments.

MEASUREMENTS IN MICRONS

Sample	W′	W	L	Plate	fig.
33-29 (N39/3)	39	114	156	191, 192	4
33-250	38	120	144	191, 192	5

DICTYOCORYNE PROFUNDA Ehrenberg
Pls. 191, 192, fig. 6

Dictyocoryne profunda EHRENBERG, 1861a, p. 767; ——, 1873a, p. 307; ——, 1873b, p. 288–289, Pl. 7, fig. 23; HAECKEL, 1887, p. 592; MARTIN, 1904, p. 454, Pl. 80, figs. 11–13.

Discussion.—The type locality of this species is in sediment at a depth of 6,040 m. in the Philippine Sea. Ehrenberg (1861a, p. 767) found only one specimen in the sample. Two additional occurrences of this species were reported by Haeckel (1887, p. 592) from his *Challenger* samples: Station 198, 3,930 m. in the Celebes Sea, and Station 274, 3,200 m. in the eastern central Pacific Ocean.

Martin (1904, p. 454) noticed considerable intraspecific variation in the specimens and stated "it may be seen from the figures that the arms are not absolutely equidistant as they are supposed to always be in this genus."

Through the kind arrangement of Mr. Frederick J. Collier of the Smithsonian Institution we were allowed to examine Martin's presumed Miocene slides, deposited at the U.S. National Museum (USNM). Four specimens are identified by Martin as *D. profunda*, and among them three forms figured by him are found in the original marked area of the slides. In all cases, the measurements calculated from his figures are slightly smaller than those measured directly under the microscope. The reexamination presents the following results:

EXPLANATION OF PLATE 192
All figures and magnification the same as corresponding figures in Plate 191, except phase contrast.

Martin (1904) Pl. 80	USNM Colln. No. and position	Remarks
Figure 11	No. 649655 T38/0	The concentric pattern is present in the patagium of the specimen but is not illustrated in the figure.
Figure 12	No. 649656 N38/3	The concentric nature of the central structure is observed in the specimen but is quite obscure in the figure .
Figure 13	No. 649657 N38/0	As illustrated by Martin.
Not figured	No. 649673 N40/1	The patagium in this specimen is completely absent, and only a trace of the structure can be detected in interbrachial areas if observed carefully. The reason he did not figure the specimen is unknown.

Although Martin (1904) did not mention it in his text, his illustrations show clearly that different degrees of patagium are present in his Miocene materials. Furthermore, it seems quite clear that he already had recognized that, as a part of a continuous intraspecific variation, the patagium of this species could be completely absent.

In the trench core specimens, the extent of patagium observed ranges from nearly complete to entirely absent.

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MEASUREMENTS IN MICRONS

Sample	W′	W	L	Plate	fig.
35–267	45	85	150	191, 192	6
Observed range	35–50	80–120	130–150	based on 10 specimens	

Genus RHOPALODICTYUM Ehrenberg, 1861
RHOPALODICTYUM ABYSSORUM Ehrenberg
Pls. 191, 192, fig. 7

Rhopalodictyum abyssorum EHRENBERG, 1861a, p. 769; ——, 1873a, p. 319; ——, p. 298–299, Pl. 8, fig. 17; HAECKEL, 1887, p. 589.

Discussion.—There seems little doubt that forms illustrated here belong to the species described and illustrated by Ehrenberg (1873*a*, p. 319; 1873b, Pl. 8, fig. 17). He found two specimens in the sediments from the Philippine Sea.

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MEASUREMENTS IN MICRONS

Sample	W′	W	L	Plate	fig.
36–120 (M42/0)	50	65	130	191, 192	7
Observed range	40–50	65–80	115–145	based on 10 specimens	

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