VERSLAGEN EN TECHNISCHE GEGEVENS

Instituut voor Taxonomische Zoölogie (Zoölogisch Museum)

Universiteit van Amsterdam

No. 48

Annotated species list of the Mollusca, Tintinnida, Amphisolenia (Dinoflagellata) and Radiolaria collected in pump samples by the Amsterdam Mid North Atlantic Plankton Expedition, 1980 - 1983 (PROJ. 101A)

S. VAN DER SPOEL

1987

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INTRODUCTION

The mid North Atlantic between 24°N and 55°N along 30°W and between 20°W and 30°W along approx. 25°N, investigated by the AMNAPE cruises in the four seasons, spring (1980), summer (1983) autumn (1981) and winter (1982), is dominated by Temperate waters with a northern and southern branch of the North Atlantic Drift, Subtropical Sargasso Sea waters in the south and Subarctic waters in the north (Van der Spoel, 1981, 1986; Van der Spoel & Meerding 1983; Pafort- van Iersel, 1985). The present study gives the relation of the microplankton distribution in the upper 5m of the water column with the hydrography and seasons.

MATERIAL AND METHODS

The radiolarians from the 1980 cruise are studied by F.Goessens, those from the 1981 cruise by A.Kleyne, those from the 1982 cruise by M.van Zanen and those from the 1983 cruise by P.J.van der Paverd. For the molluscs, *Amphisolenia* and tintinnids all slides from all samples have been investigated by the author, for the radiolarians representative subsamples were used.

The actual numbers counted in the slides can not be compared as the duration of filtering, the number of slides per sample and the aliquote used from the samples are different from haul to haul. For this reason the numbers are converted with the formula given below which provide a value (V) which can be used in comparing the collections of different samples, stations and cruises.

$$V=Ln[(\Sigma N \times 30):T.Al.P + 1]$$

The time of filtering (T), the fraction of the sample mounted (Al), the ratio of counted versus total slide (P) and the total of counted specimens of one sample (ΣN) are used in this formula while Ln is applied to surpress the great differences in numbers usually found.

The locality data are given for 1980 by Van der Spoel & Goessens (1986) and for 1981-1983 in table I, the geographic position of the stations is given in the figures 1, 20, 21, 22.

SPECIES LIST

The localities are only given below in degrees north when taken along the N-S transect, and with degrees north and west when taken not close to the N-S section of the transect.

*)AMNAPE proj.101A, rep. no.32, supported by the Netherlands Ministry of Education and Sciences

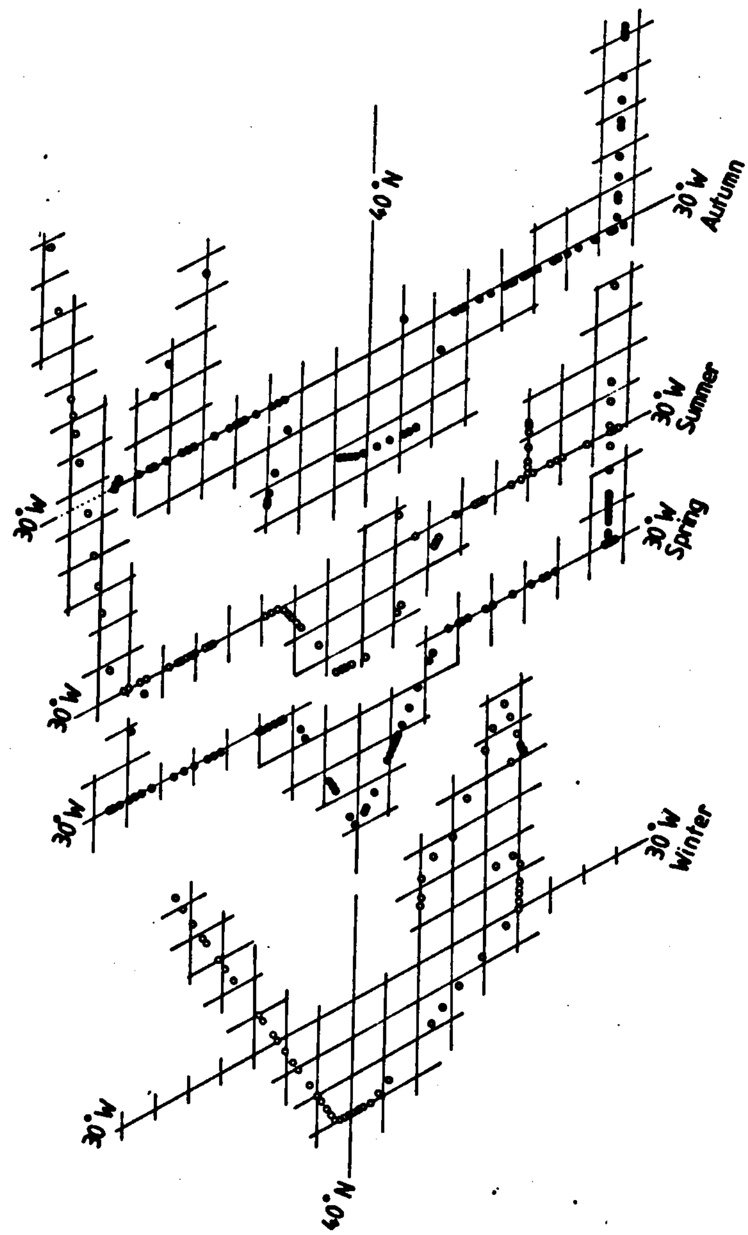


Figure 1 Diagramatic representation in perspective of the surface samples made during the spring (A) the summer (B) the autumn (C) and the winter (D) cruise.

MOLLUSCA
PTEROPODA

In the pump samples larvae of Mollusca are frequently present. Some larvae could not be identified to species level, Gymnosomata, *Limacina*, *Creseis*, Prosobranchia and Lamellibranchia are therefore treated as groups. Though in the Gymnosomata different protoconchae were found representing probably *Clione*, *Pneumodermopsis* and *Pneumoderma* they were too rare for detailed study. They are found in all seasons though the records for higher latitudes are only from the summer season. Rarely found pteropod larvae are: *Cuvierina columnella*, *Styliola subula*, *Cavolinia gibbosa*, *Diacria trispinosa*, *Hyalocylis striata* and *Diacria danae*.

Fam. Limacinidae

Limacina inflata(D'Orbigny,1836) (Pl.I fig.3).

Limacina retroversa(Fleminger,1823).

Among the opercula counted, Heteropoda (Atlantidae), Pteropoda (Limacinidae and a few

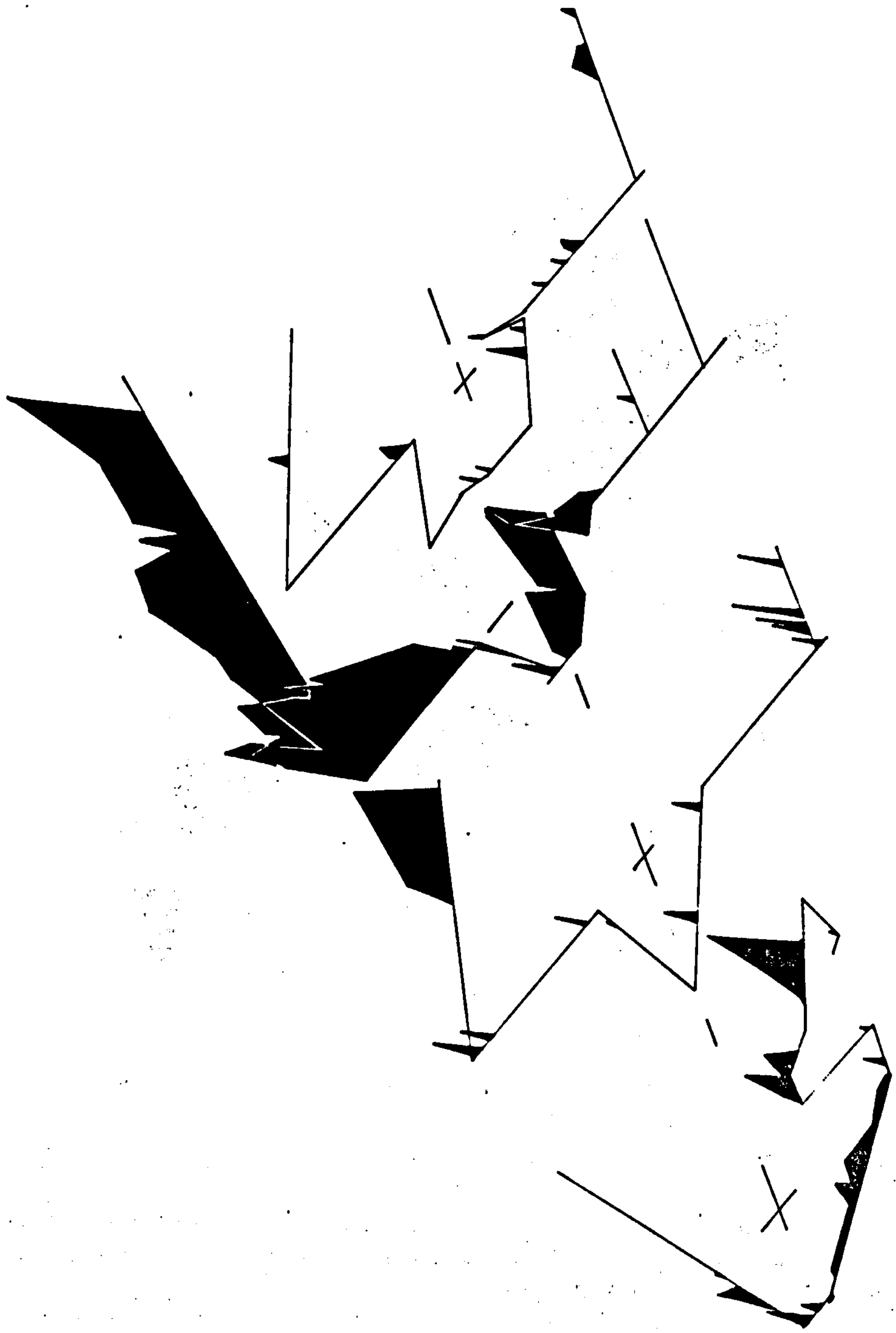


Figure 2 Abundance of molluscan opercula plotted along the cruises as given in fig. 1, vertical axis is *Ln* of standard numbers.

Peraclididae) and Prosobranchia will have been present. As the majority of the opercula clearly belong to *Limacina retroversa* and *L. inflata* no attempt is made to identify the species if that would have been possible with the present knowledge of operculum taxonomy. The opercula show nearly the same pattern (fig.2) as that of the Limacinidae. The abundance of Limacinidae shows two maxima viz. one in early spring south of 40°N and one in summer north of 40°N (fig.3). The southern maximum is due to reproduction of *L. inflata*, the northern one to reproduction of *L. retroversa* The separation in time and space between the two species is evident.

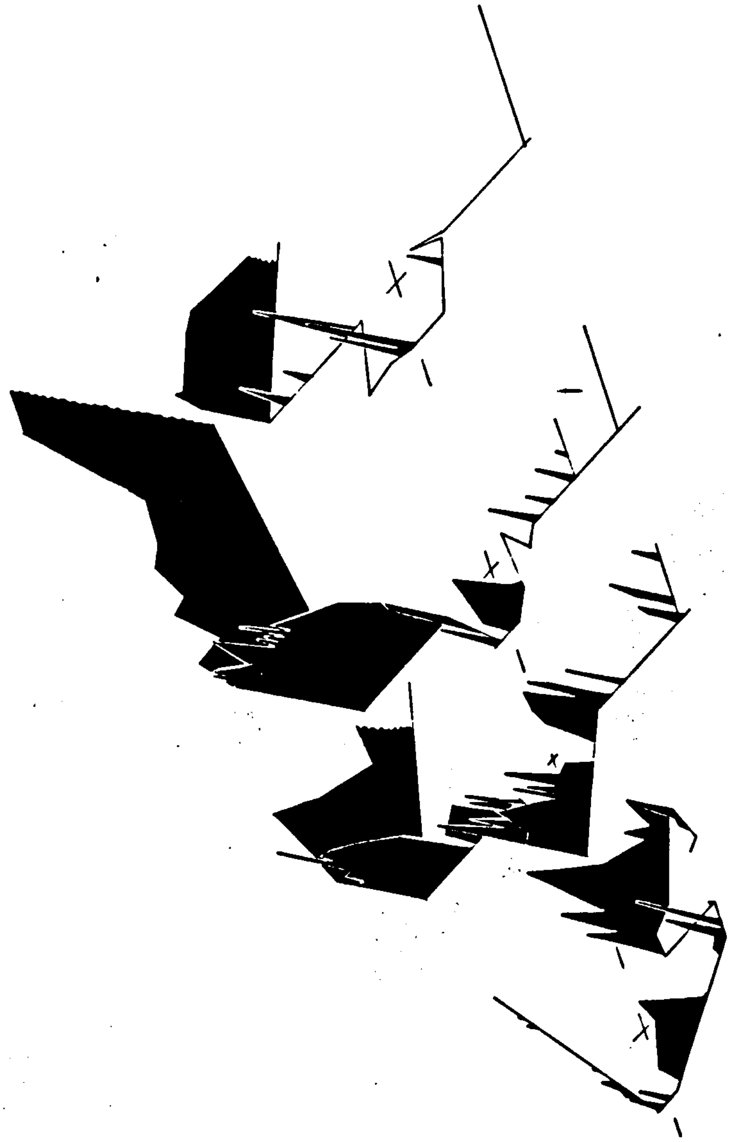


Figure 3 Abundance of *Limacina* larvae plotted along the cruises as given in fig. 1, vertical axis is *Ln* of standard numbers.

Fam. Cavoliniidae

Diacria danae Van der Spoel, 1968 (Pl.I fig. 15) is found at 45°N in summer.

Diacria trispinosa (De Blainville, 1821) (Pl.I fig. 13) is found in spring at 38°N, in summer at 48°N, 49°N and 45°N.

Cavolinia gibbosa (D'Orbigny, 1836) (Pl.I fig. 4) is found in winter at 36°N 27°W and in summer at 38°N.

Clio pyramidata forma *lanceolata* (Lesueur, 1813) (Pl.I fig. 10).

Clio pyramidata forma *pyramidata* Linnaeus, 1767 (Pl.I fig. 14). The larvae of *Clio pyramidata* show two maxima but their separation is far less well marked than in the Limacinidae. The reproduction maximum in spring (April) changes gradually into the June maximum more to the south (fig. 4). The taxa here concerned are *C. pyramidata* forma *lanceolata* in the south and *C. pyramidata* forma *pyramidata* in the north and from this diagram it is clear that there is no geographic isolation for reproduction.

Creseis (Pl.I fig. 8) mostly *Creseis acicula* (Rang, 1828) (Pl.I fig. 7) shows three maxima, one at 40°N (autumn) one north of 40°N (late summer) and one south of 40°N (early summer) (fig. 5). The warm water population reproduces in spring to early summer, the cold water population in late summer while an autumn maximum of reproduction may be related to the North Atlantic Drift waters.

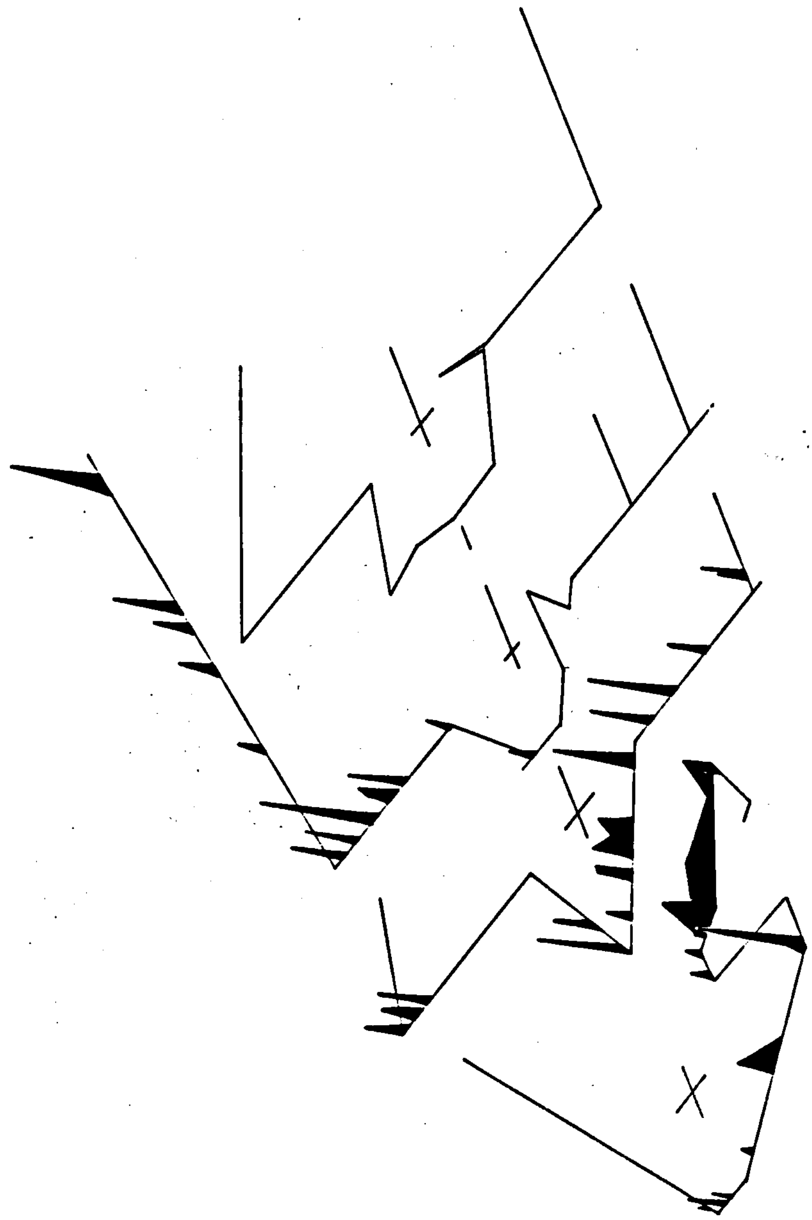


Figure 4 Abundance of *Clio* larvae plotted along the cruises as given in fig.1, vertical axis is *Ln* of standard numbers.

Creseis virgula (Rang, 1828) (Pl.I figs 6, 9) is found at 36°N 25°W in winter.

Cuvierina columnella (Rang, 1827) (Pl.I fig.5) is found at 40°N in winter.

Hyalocylis striata (Rang, 1828) occurs in spring at 24°N.

Styliola subula (Quoy & Gaimard, 1827) (Pl.I figs 11,16) occurs in winter at 35°N, 36°N 27°W, 36°N 25°W, 34°N 21°W.

Fam. Clionidae

Clione (Pl.I fig.12) in winter at 40°N.

Fam. Pneumodermatidae

Pneumoderma (Pl.I fig.2).

Pneumodermopsis (Pl.I fig.1). Gymnosomata are found in spring at 24°N 28°W, in summer at 57°N 16°W, 57°N 14°W, 49°N, 41°N, 40°N, in autumn at 41°N, 25°N 26°W and in winter at 34°N, 34°N 21°W, 30°N 20°W.

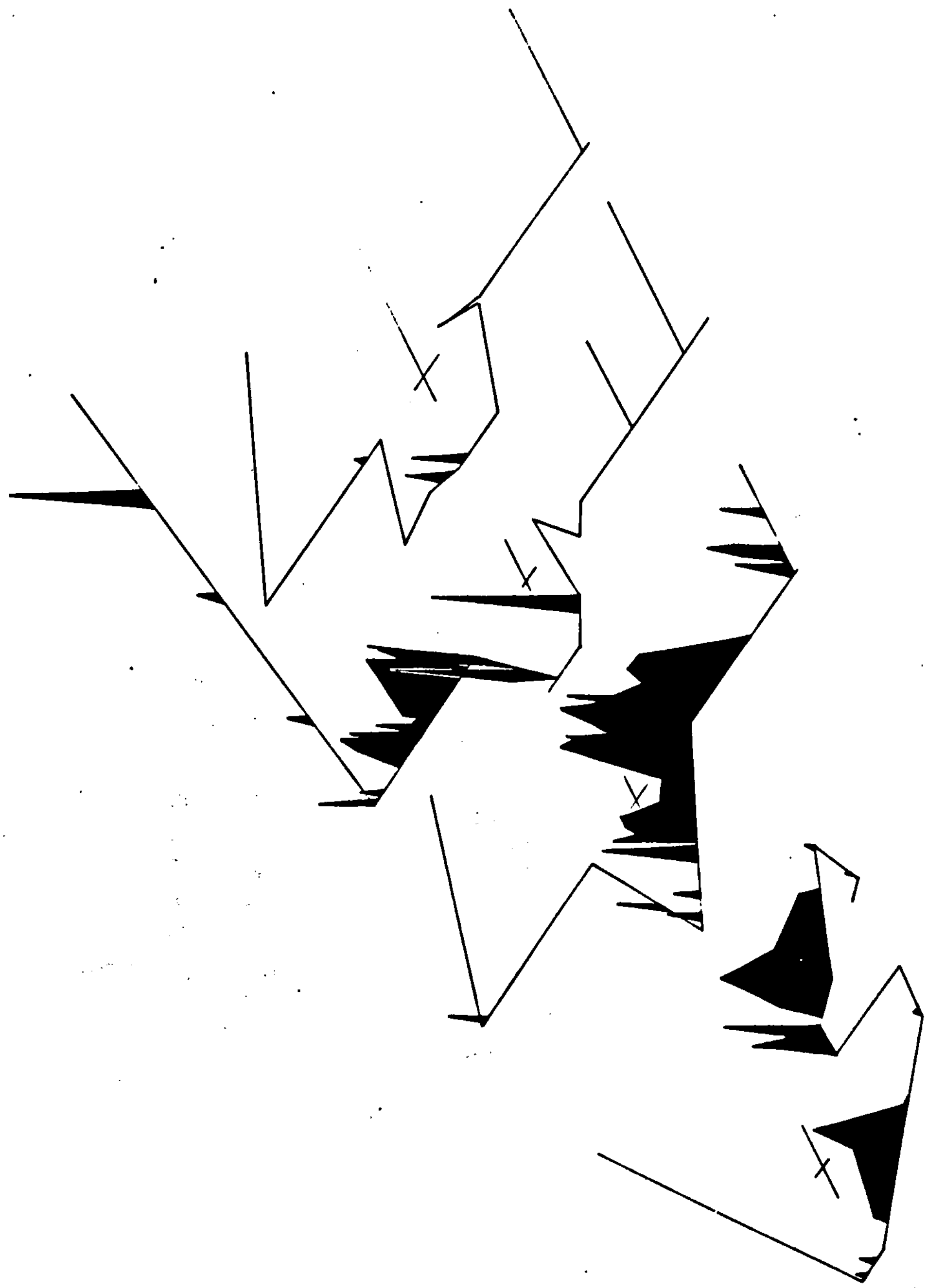


Figure 5 Abundance of *Creseis* plotted along the cruises as given in fig. 1, vertical axis is *Ln* of standard numbers.

PROSOBRANCHIA

Fam. Heteropoda

Among the Prosobranchia larvae frequently Heteropoda larvae are found. In winter and spring these Heteropoda do not occur north of 38°N. In summer they occur up to 53°N and in autumn they are rare, always dominated by other Prosobranchia . Prosobranchia (non Heteropoda) larvae are present in all seasons and at all localities (fig.6). In the northern section of the transect and near the Azores it will be chiefly offspring of nearby littoral populations. In spring the waters south of the Azores yielded high numbers of Prosobranchia larvae while in summer north of 45°N the offspring of northern littoral species is encountered

LAMELLIBRANCHIA

For the Lamellibranchia larvae (Pl.I figs 17, 18) the same tendency is found as described for the littoral Prosobranchia. In spring and summer the larvae of the northern

Figure 6 Abundance of Prosobranchia larvae plotted along the cruises as given in fig. 1, vertical axis is *Ln* of standard numbers.

populations are found in the north-eastern part of the transect and in summer around the Azores also a high abundance of Lamellibranchia is found (fig.7). In contrast to the Prosobranchia no Lamellibranchia are found in autumn and at most latitudes not in winter. The Lamellibranchia larvae are considered to be the offspring of littoral species (Thiede, 1974).

The abundancy data for opercula, *Limacina, Clio,* Lamellibranchiata, *Creseis* and Prosobranchia put together diagrammatically in figure 8 show clearly the different patterns; the southern populations (*L. inflata, C.p. lanceolata, Creseis*) are showing a maximum earlier than the northern populations do.

TINTINNIDA

The identification of the Tintinnida gave much problems as species are ill defined and frequently of dubious validity. For *Parafavella* and *Ptychocylis* Davis (1978, 1981)

Figure 7 Abundance of Lamellibranchia larvae plotted along the cruises as given in fig. 1, vertical axis is *Ln* of standard numbers.

demonstrated that species distinguished on the basis of the lorica are doubtfull or impossible. Going through large samples of *Dictyocysta* and *Codonella* I got the same impression for these genera.

The percentage of unidentified specimens per sample varies between 0% and 70%. Only a few of the problematic specimens are mentioned or figured in case they may be of interest to other studies.

Fam. Codonellidae

Marshall (1969) recognized six species of *Codonella* for the area of which *C. amphorella* is easily distinguished, the other five all merge over into each other gradually, as is shown in plate II. In a few samples *C. nationalis* seems to be present and in another few *C. apicata* seems distinct, but in the majority of the material no proper distinctions could be made on the basis of the lorica so that all these specimens are refered to as *C. galea*.

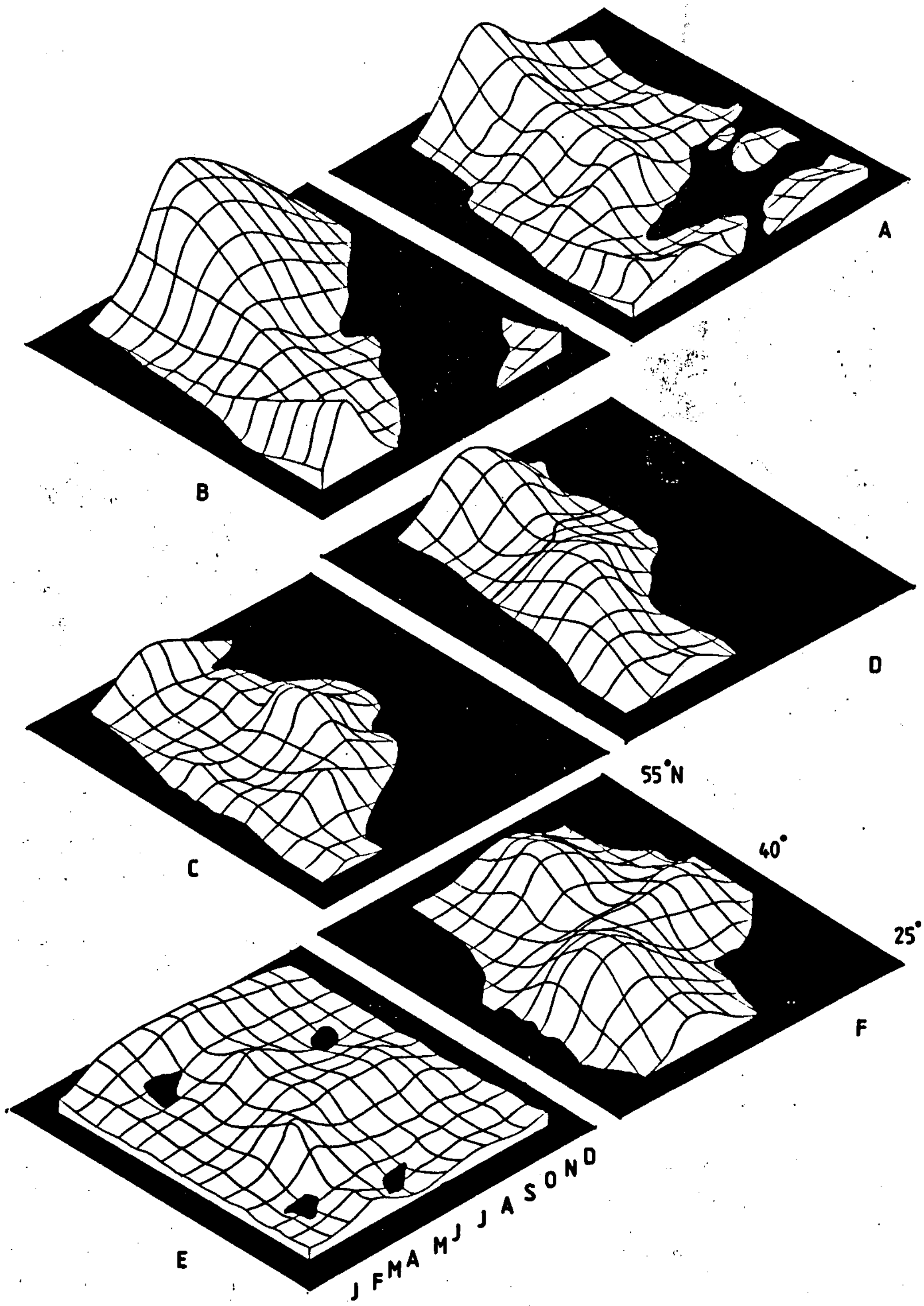


Figure 8 Block diagram of the abundance of opercula (A), *Limacina* larvae (B), Lamellibranchia larvae (C), *Clio pyramidata* forma *pyramidata* and forma *lanceolata* (D), Prosobranchia (E) and *Creseis* (F), against the month of the year, and the N-S transect between 25°N-55°N.

Codonaria cistellula (Fol,1884)(Pl.III fig.1) is regularly found in autumn and winter but rarely in spring and summer (fig.9).

Codonaria lata (Kofoid & Campbell,1929) is not found in the prepared slides but was photographed from a sample taken simultaneously with St.77 tr.2 at 48°N 28°W (Plate IV fig.5)

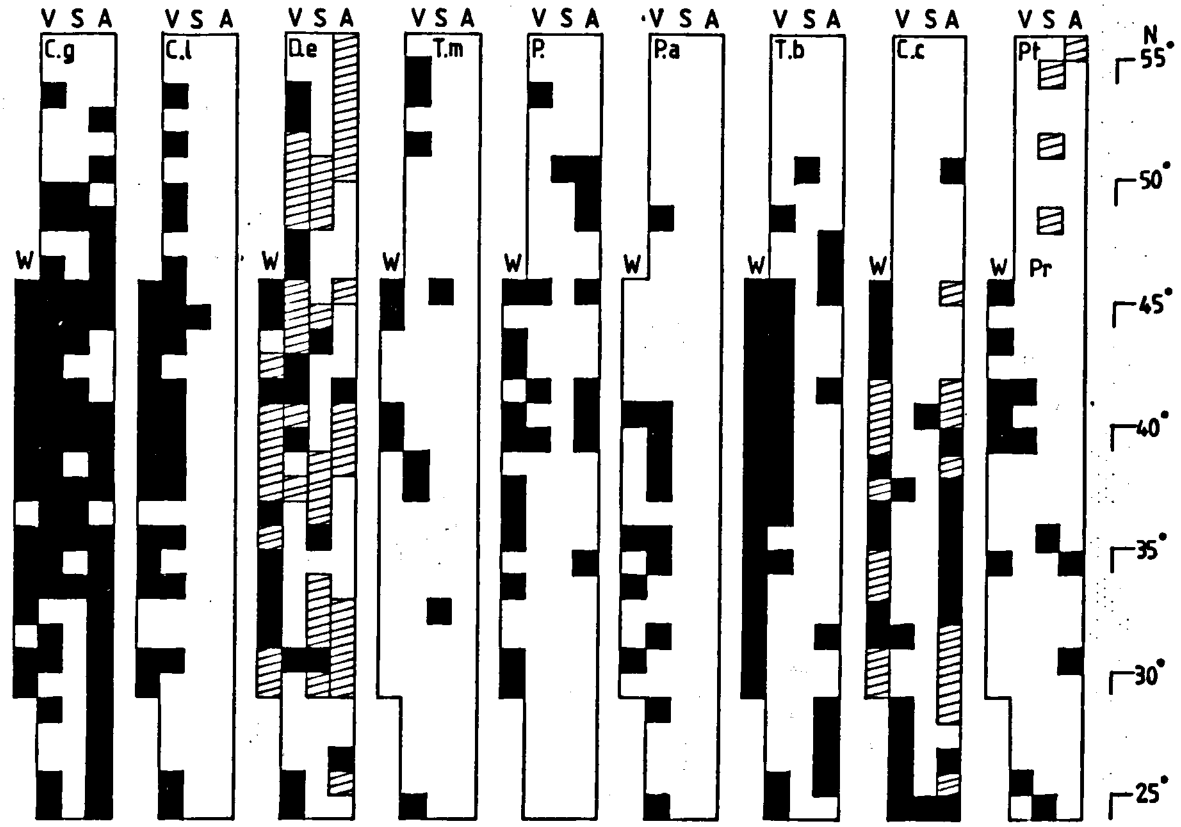


Figure 9 N-S range in four seasons (w=winter, v=spring, s=summer, a=autumn) for *Codonella galea* (C.p.), *Codonellopsis lagunula* (C.l.), *Dictyocysta elegans* (D.e.) var. *lepida* (black and hatched) and var. *speciosa* (hatched), *Tintinnopsis beroida* (T.m.) mainly represented by *"T.minuta"*, *Petalotriche* (P), *Poroecus appendiculatus* (P.a.), *Tintinnus bursa* (T.b.), *Codonaria cistellula* (C.c. black and hatched) and *C.oceanica* (C.c. hatched), *Ptychocylius* (Pt. hatched) and *Proplectella* (Pr.hatched).

Codonaria mucronata (Kofoid & Campbell,1929) (Pl.III fig.3) is only collected in winter between 34°N and 45°N.

Codonaria oceanica (Brandt,1906) (Pl.III fig.4) is clearly related to *C.cistellula* and 59% of the samples with the present species also contained *C.cistellula*. In shape and size both species go over into each other smoothly. *C.oceanica* is like *C.cistellula* abundant in autumn and winter but it is completely absent in spring and autumn (fig.10).

Codonella amphorella Biedermann,1893 (Pl.V figs 11,12) collected only in autumn between 30°N and 45°N, is always very distinct by its bowl shape and peduncle.

Codonella galea Haeckel,1873 (Pl.II figs 1-9, Pl.V figs 14,17) is considered a polymorphic species. *Codonella apicata* Kofoid & Campbell,1929, *Codonella elongata* Kofoid & Campbell,1929, *Codonella nationalis* Brandt,1906 and *Codonella perforata* Entz,1884 are considered morphs within the present species (cf.Balech,1959). The variability in this species is very large as shown in plate II. Besides the shape and size variability, specimens with different wall-development are found in clusters. Populations of specimens entirely covered with coccoliths (Pl.II,figs 1-3,7), of specimens only covered in the middle of the bowl with coccoliths (Pl.II figs 4-6), of specimens without attached material, of specimens with thin outerwalls and alveoli still visible (Pl.II figs 8-9) and of very small specimens (Pl.V fig 17) are found. The distribution of most of these types show no special pattern, only the naked specimens seems to be restricted south of 30°N in winter while they penetrate northwards in the following seasons to reach 56°N in autumn. Probably this pattern of naked specimens is more dependent on coccolith distribution than

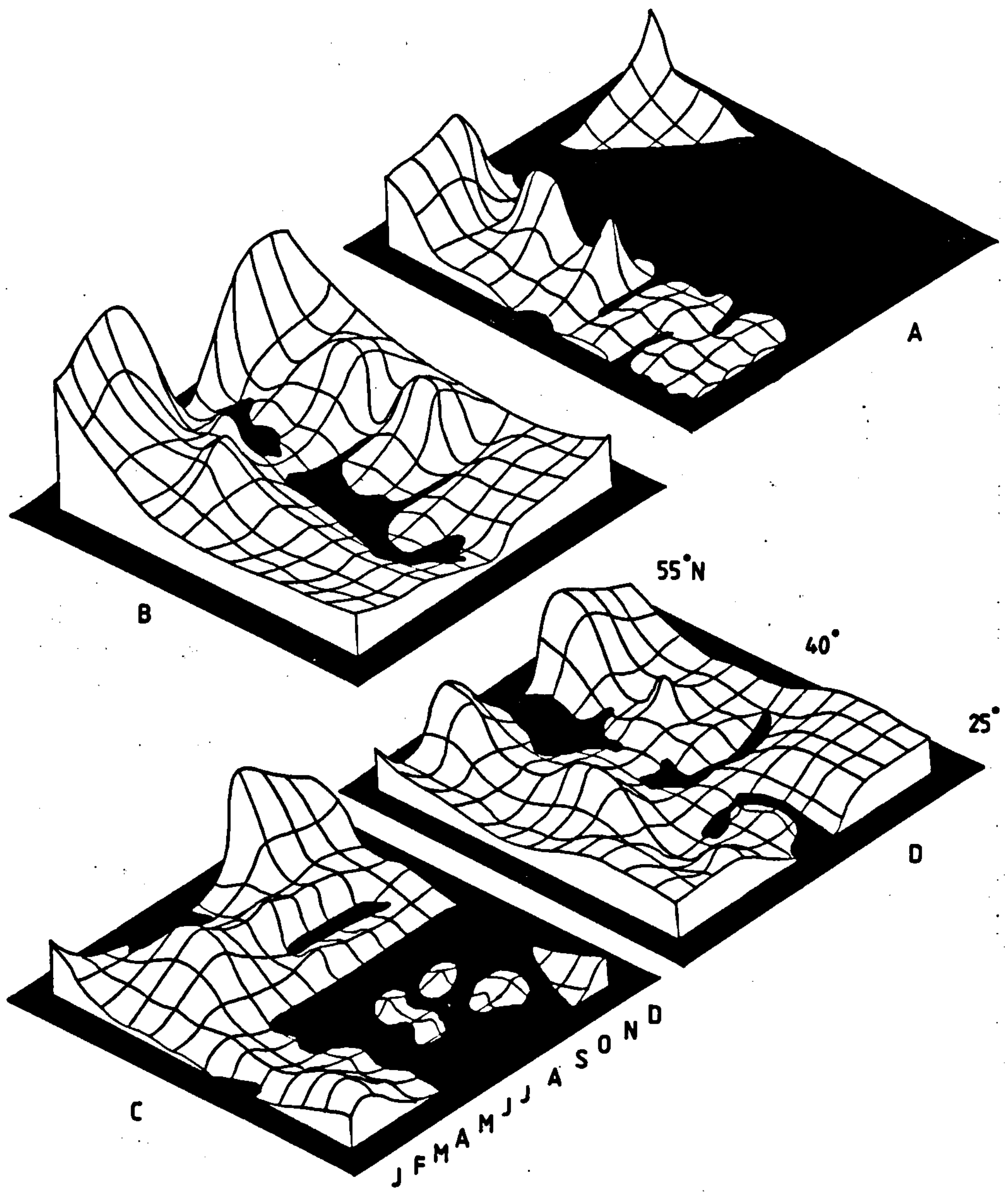


Figure 10 Block diagram of the abundance of *Codonellopsis lagunula* (A), Tintinnidae (B) *Dictyocysta elegans* s.l(C) and *Codonella galea* (D) against the month of the year and the N-S transect between 25°N-55°N.

on typical characters in *C.galea*, which would implicate that coccolith abundance decreases north of 30°N through the year to reach a minimum in autumn. The temperature preference of *C.galea* is 10°-25°C. (fig.11.B).

Codonella spec. (Pl.V, fig.16) is collected at 47°N 23°W in autumn by one specimen so that further identification is impossible.

The genus *Tintinnopsis* is composed of vagely limited species, numerous species are here synonymised, based on resuls published by Davis (1978), Balech (1959) and Hargraves (1981)

Tintinnopsis beroidea Stein,1867 (Pl.VI figs.13, 18, 20) is considered a polymorphic species to which belong *Tintinnopsis baltica* Brandt,1906 (pl.VI, fig.1), *Tintinnopsis minuta* Wailes,1925 (Pl.VI figs 10,11), *Tintinnopsis parva* Merkle, 1909 (Pl.VI fig.8), *Tintinnopsis parvula* Jörgensen, 1912 (Pl.V fig.15) and *Tintinnopsis rapa* Meunier, 1910 (Pl.V fig.13). This neritic species contributes largely to the high abundance of Tintinnids along the W-E leg of the cruises over the NW European shelf (fig12). *T.beroidea* for example is only present in large numbers from 45°N 5°W to 54°N 29°W in spring and at 55°N 0°W in summer, which agrees with the seasonal cycle of *Tintinnopsis* spp, in the North Sea given by Lindley (1975). In autumn the present species is completely absent.

Tintinnopsis levigata Kofoid & Campbell, 1929 (Pl.VI figs 3,17) is found north of Scotland at 58°N and near the Azores at 37°N in summer and at 38°N in winter.

Tintinnopsis nitida Brandt, 1896 (Pl.VI fig.6) is found at 37°N in summer.

Tintinnopsis plagiostoma Daday, 1887 (Pl.VI figs 14,19) is found at 51°N 20°W in winter and at 52°N 19°W in spring.

Tintinnopsis rotundata Jørgensen, 1899 (Pl.VI fig.16) is found at 29°N in summer.

Tintinnopsis sacculus Brandt, 1906 (Pl.VI fig.15) is absent in summer and rare in spring at 49°N 6°W but more numerous in autumn at 38°N 34°W and 25°N 26°W and in winter at 45°N, 40°N and 30°N.

Tintinnopsis turbo Meunier, 1919 (Pl.VI fig.12) is only found at 37°N in spring.

Figure 11 Diagram of the temperature preference of *Codonellopsis lagunula* (A) and *Codonella galea* (B) based on actual numbers collected during the four seasons, temperature along x axis, numbers of specimens along y axis [for B see other page].

Figure 11A

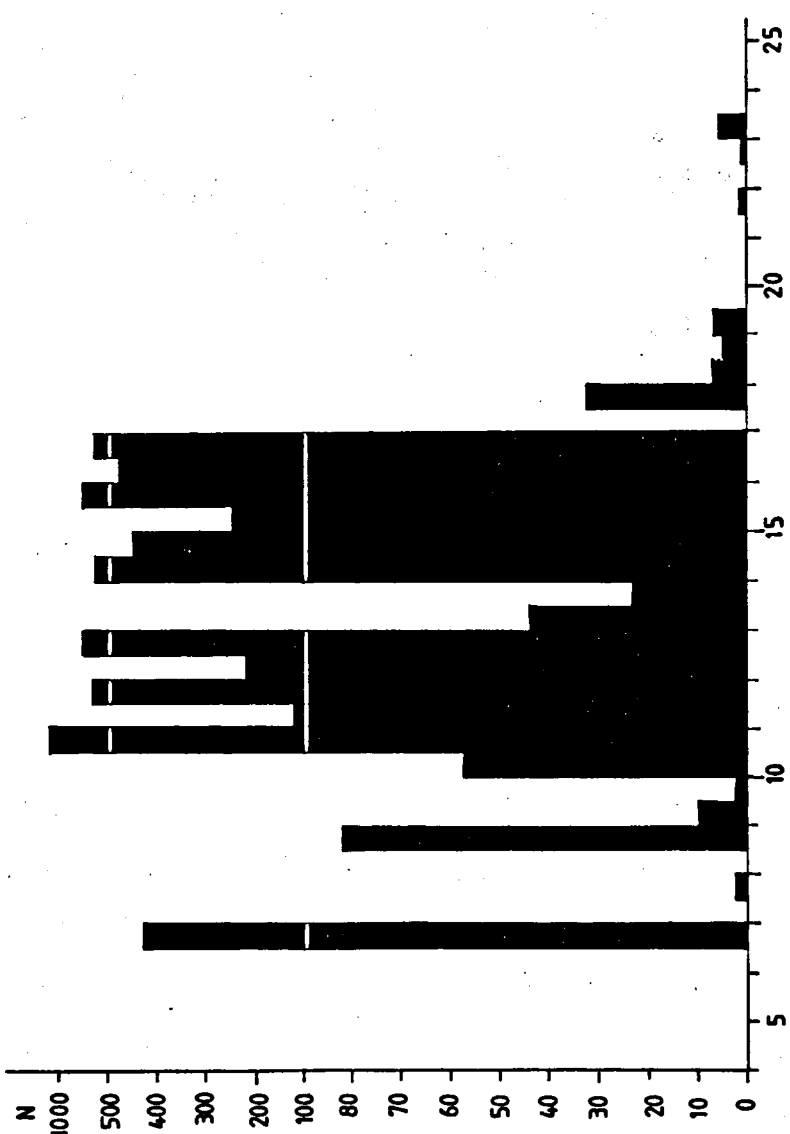
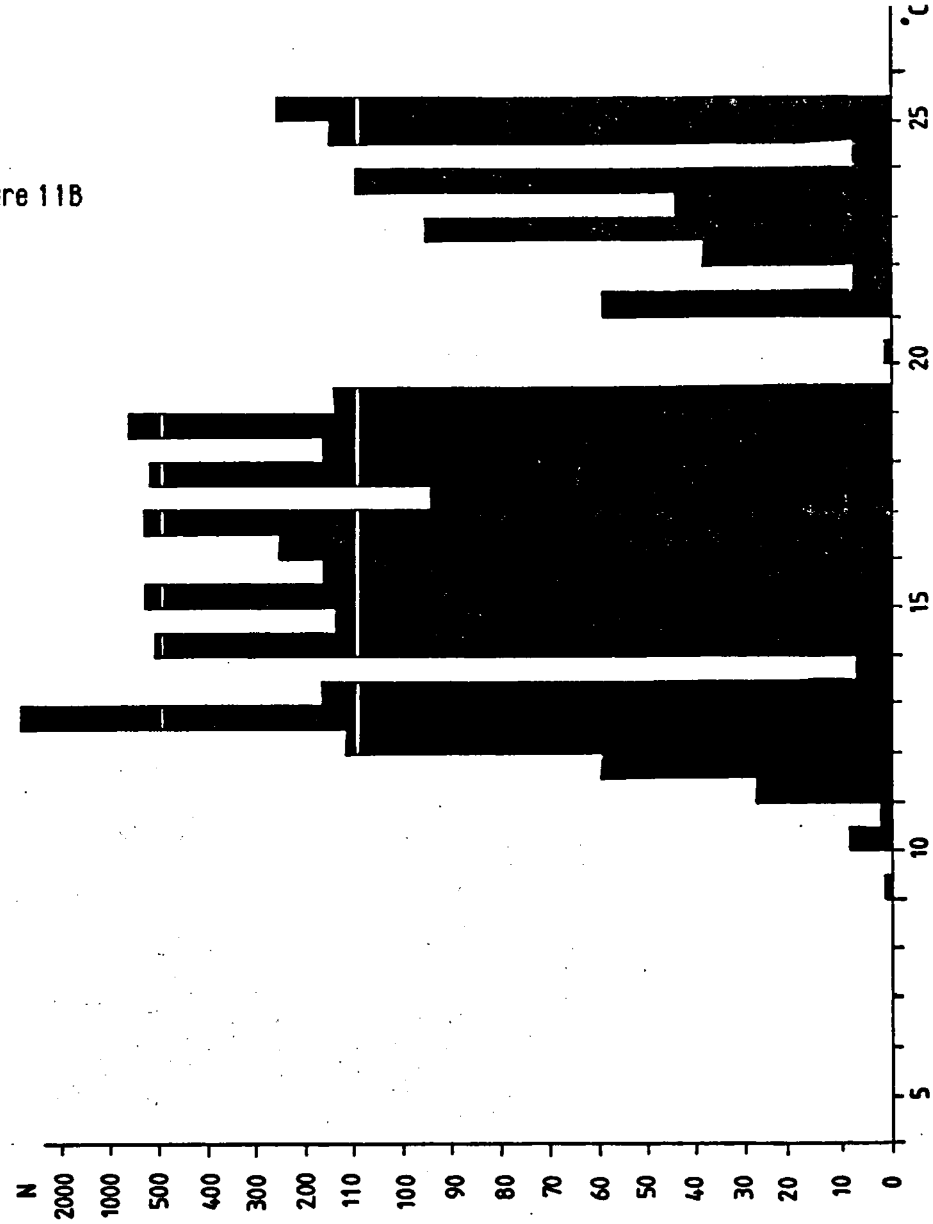


Figure 11B



Tintinnopsis undella Meunier,1910 (Pl.VII fig.8) is not present in the prepared slides but was collected in a sample taken simultaneously with St.86 at approx.32°N in summer.

Tintinnopsis urnula Meunier,1910 (Pl.VI fig.2) was found only at 52°N 19°W in spring.

Tintinnopsis vasculum Meunier,1919 (Pl.VI figs 5, 7, 9) was found only once in summer at 37°N and in spring at five localities viz.: 53°N 22°W, 55°N 29°W , 24°N 28°W, 51°N 12°W, 52°N 19°W.

Tintinnopsis ventricosoides Meunier,1910 (Pl.VIII, fig.4) is found in all seasons but most frequently in spring at 49°N 5°W, 50°N 3°W, 51°N 12°W, 52°N 17°W, 38°N 35°W, 24°N 28°W, 25°N 28°W. In summer it was found at 24°N, in autumn at 50°N and 30°N and in winter at 40°N, 44°N and 45°N.

Fam. Cyttarocylididae

Cyttarocylis acutiformis (Kofoid & Campbell,1929) (Pl.IX figs 2, 4) occurred at 41°N and 24°N 28°W in spring and at 30°N 27°W and 30°N 21°W in winter.

Cyttarocylis eucecryphalus (Haeckel,1887) (Pl.IX fig.1) is very variable and though *C. longa* Kofoid & Campbell,1929 and *C. brandti* Kofoid & Campbell,1929 may be

Figure 12 Abundance of Tintinnida plotted along the cruises as given in fig.1, vertical axis is *Ln* of standard numbers.

recognized as different forms they are not treated separately. *C.plagiostoma* (Daday,1887) (Pl.IX fig.3) seems a developmental stage of the present species (cf.Balech,1959). The *C.eucecryphalus* complex is found in the winter period at 45°N 28°W; frequent, nearly continuous, along the N-S transect from 29°N to 45°N and at 33°N 19°W, 31°N 18°W, 30°N 18°W, 30°N 19°W. In spring the complex is found only at 45°N, 44°N and 38°N, in summer it is absent from the samples and in autumn it occurs again at 45°N, 40°N, 38°N, 37°N, 31°-38°N, 25°N 26°W and at 25°N 28°W.

Three specimens from St. 19 tr.16 (Pl.IX fig.5), St.27 tr.27 and St.40 tr.17 (Pl.IX fig.6) are not incorporated in the complex. The one from St. 19 tr.16 resembles *C.recta* Kofoid & Campbell,1929.

Cyttarocylis edentata Brandt,1986 was collected in a proof trawl near 55°N and photographed (Pl.IV fig.1)

Fam. Codonellopsidae

Codonellopsis contorta Kofoid & Campbell, 1929 (Pl.VIII fig.6). The distinction between *C.contorta, C.lagunula* and *C.pusilla* (Cleve, 1900) is very difficult especially when the collar shows different degree of development. The grouping of *C.lagunula* by Marshall (1969) with *Codonella* is probably induced by the occurrence of collar-less specimens. In the present material specimens with small, without and with normally developed collars, are brought under *C.lagunula* (see below). There are a few specimens in which the spiral striation of the collar is clearly seen, they are brought under the present species found at 30°N 19°W in winter and at 24°N in summer but not in the other seasons.

Codonellopsis americana Kofoid & Campbell, 1929 (Pl.III figs 7-9) is considered to form a taxon separated from the former one by its size and shape. It is found at 30°N, 32°N and 33°N in winter at 39°N 36°W in spring and at 26°N, 32°N, 45°N, 26°N 32°W and 26°N 29°W in autumn.

Codonellopsis lagunula (Claparède & Lachmann, 1858) (Pl.III figs 10-15) is very common in winter and spring but rare in summer and absent in autumn (fig.9). This cycle corresponds with the seasonal cycles described by Lindley (1975) for adjacent areas. The temperature preference of this species is 6°-19°C (fig.11.A).

Codonellopsis inornata (Brandt, 1906) Though the difference with *C.americana* is not always clear this species is considered to occur at 52°N in autumn and at 40°N and 31°N 27°W in winter.

Codonellopsis orthoceros (Haeckel, 1873) (Pl.X figs 1-6). *C. parva* Kofoid & Campbell, 1929 and *C. minor* (Brandt, 1906) are considered synonymous with the present species (cf.Balech, 1959). Most records are from the winter cruise showing a nearly continuous occurrence from 29°N to 45°N, in spring the species is only reported from 37°N and in autumn specimens are found at 38°N, 37°N and at 25°N 26°W.

Stenosomella avellana (Meunier, 1919) (Pl.VIII fig.5) was collected twice in winter at 40°N and 42°N.

Stenosomella nivalis (Meunier, 1910)(Pl.VIII figs 3,9) is found in all four seasons. It is most widely distributed in summer, viz.: at 57°N 16°W, 41°N, 37°N, 35°N; in autumn it is found at 45°N and 35°N; in winter at 40°N and 42°N and in spring at 50°N 30°W.

Stenosomella oliva (Meunier, 1910)(Pl.VIII fig.7) was collected at 39°N in winter and at 35°N in summer.

Stenosomella steini (Jörgensen, 1912)(Pl.VIII fig.2) is present at 39°N, 40°N and 50°N in autumn and at 35°N in summer.

Stenosomella ventricosa (Claparède & Lachmann, 1858)(Pl.VIII, figs 1) is found at 50°N in autumn ; at 47°N 23°W, 45°N, 40°N, 39°N and 34°N 21°W in winter and at 56°N 0°W, 48°N, 41°N, 35°N, 34°N, 33°N , 29°N and at 24°N in summer. Though Lindley (1975) stated that *Stenosomella* is a neritic genus, no indication for this is found in the present material, though in the neritic stations large numbers of unidentified tintinnids (Pl.XIII, figs 15-16) are present which may belong to *Stenosomella*.

Fam. Dictyocystidae

According to Marshall (1969) *Dictyocysta* is represented in the area investigated by eleven species. Of these *D.dilatata* Brandt, 1906 and *D. magna* Campbell, 1929 are not found in the present material. *D.mitra* is distinguished but many specimens show characters of *D.fenestrata* Kofoid & Campbell, 1925 previously recorded from the Peruvian Current and New Zealand waters (Burns, 1983), still they all are considered to belong to *D.mitra*. The species: *D.duplex* Brandt, 1906, *D.elegans* Ehrenberg, 1854, *D.lepida, D. nidulus* Kofoid & Campbell, 1929, *D.reticulata* and *D.speciosa* are considered to form one compex not to be distinguished into different species on the basis of the lorica. Variability even in one population (cf.Pl.XI) is obscuring the species separation as proposed be e.g. Marshall (1969). A distinction between a collar with one and a collar with two rows of windows seems possible the more as this difference seems to be correlated with slight differences in bowl shape. viz. without and with a shoulder. As a

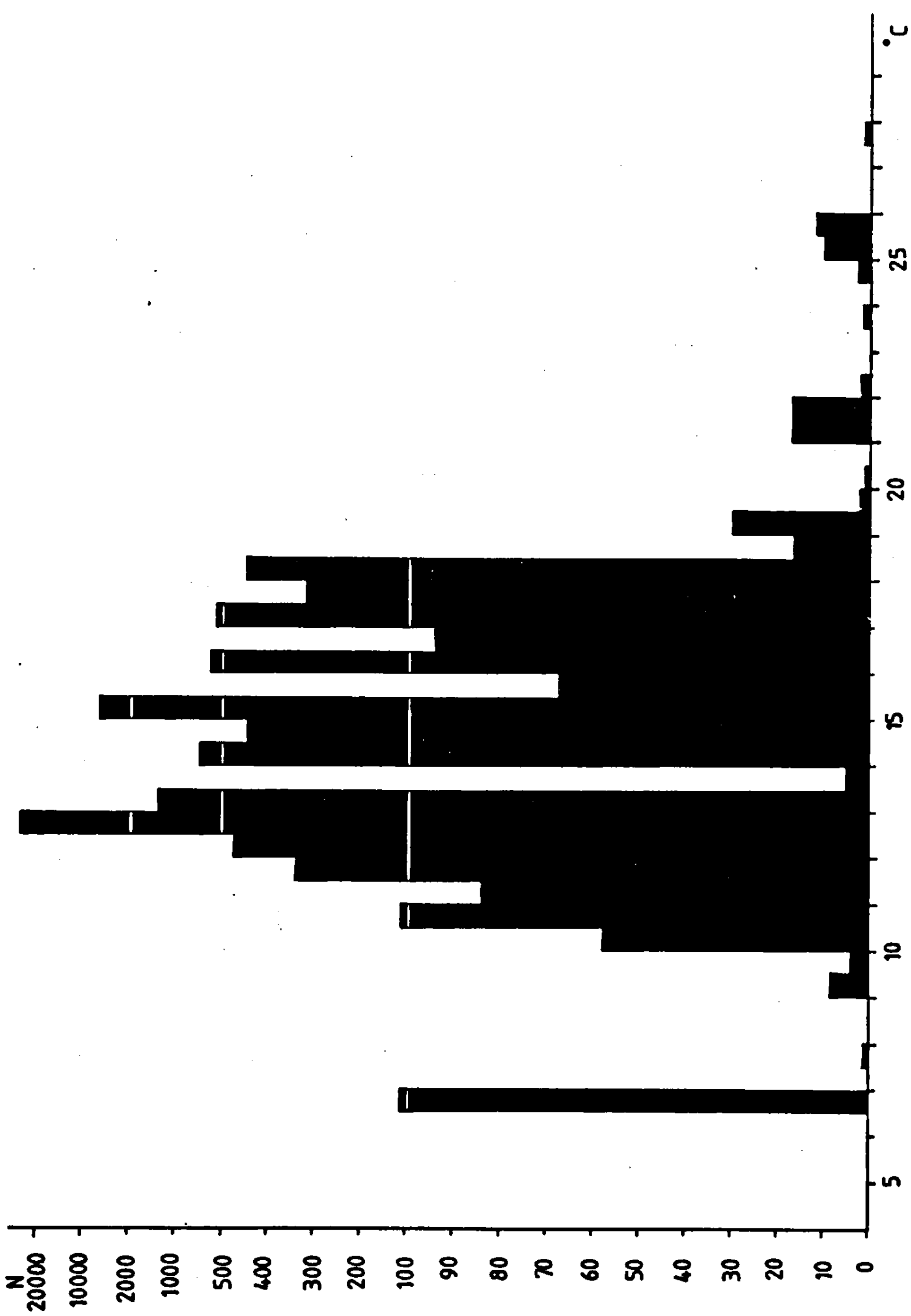


Figure 13 Temperature preference of *Dictyocysta elegans* based on actual numbers collected during the four seasons, temperature along x axis, numbers of specimens along y axis

consequence *D. elegans* var. *lepida* with one row of windows and *D. elegans* var. *speciosa* with two are separated. *D. muelleri* Imhof, 1886 and *D. minor* Jørgensen, 1924 are considered synonymous as they represent different stages of incrustation only.

Dictyocysta fundlandica Ehrenberg, 1854 (Pl.V fig.5) is only found in spring at 45°N, 40°N, 39°N, 37°N.

Dictyocysta muelleri Imhof, 1886 (Pl.V figs 4,6) is found in spring at 39°N and in winter at 40°N, 30°N, 36°N, 25°N.

Dictyocysta mitra Haeckel, 1873 (= *Dictyocysta dilatata* Brandt, 1906) (Pl.V, figs 1-3) is found in all seasons: in winter at 39°N, 33°N, 29°N, in spring at 44°N, 40°N, 39°N, in summer at 50°N, 32°N, 30°N, 29°N and in autumn at 31°N.

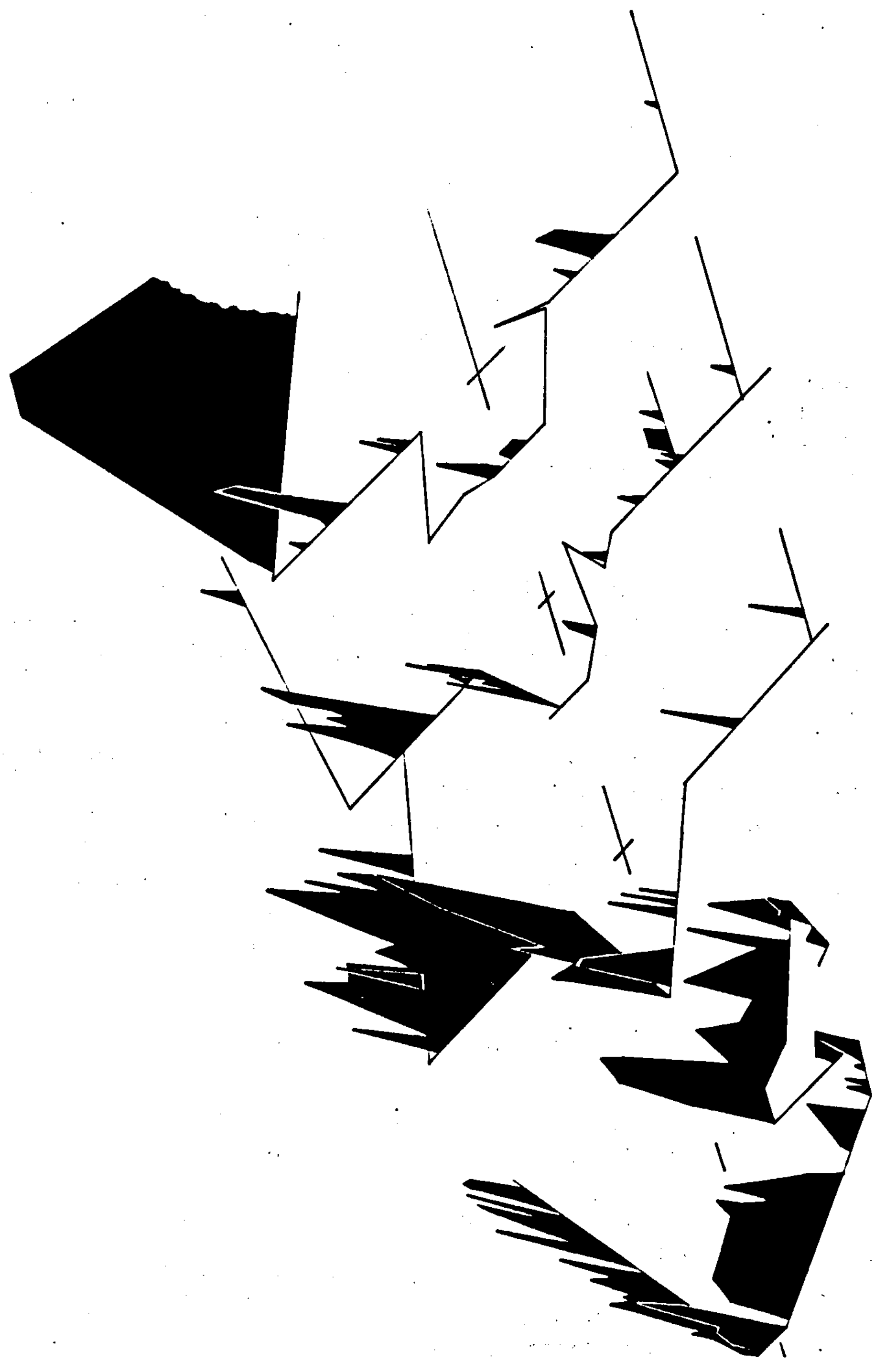


Figure 14 Abundance of *Dictyocysta elegans* var. *lepida* and *D. elegans* var. *speciosa* plotted along the cruises as given in fig. 1, vertical axis is *Ln* of standard numbers.

Dictyocysta elegans Ehrenberg, 1854 var. *lepida* Ehrenberg, 1854 (= *Dictyocysta reticulata* Kofoid & Campbell, 1929 = *Dictyocysta lepida* Ehrenberg, 1854)(Pl.V figs 7-10, Pl.XI figs 3-5,10).

Dictyocysta elegans Ehrenberg, 1854 var. *speciosa* Kofoid & Campbell, 1929 (Pl.XI figs 1,2,9,11). Both forms of this species are found in all seasons though var. *lepida* seems more frequent in winter and spring while var. *speciosa* is more frequent in summer and autumn (fig. 9) The species occurs at temperatures of 6.5°-28°C but is most frequently found with temperatures of 10°-19,5°C (fig. 13). In winter the species is found along the whole N-S transect but in spring, summer and especially in autumn it seems to withdraw north of 44°N (fig. 14).

Fam. Coxliellidae

Climatocylis elongata Kofoid & Campbell, 1929 (Pl.VIII fig. 18) is found only once at 39°N in spring.

Metacylis (Pl.XII). Ten specimens were collected in the winter season at St. 64 tr.1, 37°N (1 spec., Pl.XII fig.3), St.64 tr.8, 33°N (2 spec.), St.65 tr.8, 30°N (1 spec., Pl.XII fig.1), St.65 tr.9, 30°N (5 spec., Pl.XII, figs.4-5) and at St. 66 tr.7, 30°N (1 spec., Pl.XII fig. 2). These specimens could not be assigned to a described species. The lorica length is 75-100µ. The oral egde is smooth, a spiral band of 3-4 whorls starts at one half to one third of the lorica length. Aboral end close. Wall hyaline without clear structure, probably trilaminate, no agglomerated particles. The edge of the spiral band is smooth except the specimen of St.65 tr.8 in which it is clearly dentate. Transversal striae or folds especially in the oral part of the lorica. Spiral structure and wall structure resembles that in the genus *Metacylis*.

Fam. Favelidae

cf. *Favella azorica* (Cleve, 1900) was found at 52°N in autumn.

Poroecus apiculatus (Cleve, 1900)(Pl.VIII figs 13-14) is found only in winter and spring south of 50°N (fig.9) though its temperature range is 16°-24°C (fig.15).

Fam. Ptychocylididae

Ptychocylis minor Jörgensen, 1899 (Pl.XVII fig. 11). The species of *Ptychocylis* occur rarely in summer and autumn and always north of 42°N. They are always allopatric in the samples which may support the idea that the three species are good species (cf.Davis, 1981). The temperature range for the genus is 9.5°-13°C (fig.15) making it a real cold water genus, which is also seen in the distribution pattern (fig.9).

Ptychocylis ostenfeldi Kofoid & Campbell, 1929 (Pl.XVII fig.12).

Ptychocylis urnula (Claparède & Lachmann, 1858)(Pl.IV fig.2, Pl.XVII fig.13).

Fam. Petalotrichidae

Ascampbeliella acuta (Kofoid & Campbell, 1929) (Pl.VIII fig.12) is found only in spring at 39°N.

Ascampbeliella spec. (Pl.VIII figs 10-11). These specimens, from 41°N, 48°N and 50°N 03°W are not brought to a species as they share characters of both *A. acuta* and *A. obscura* (Brandt, 1906).

Petalotriche ampulla (Fol, 1881)(Pl.XIII fig.1). This species is taken together with the following two in this study as there are no significant differences in distribution and temperature preference. Probably they all belong to one species. *Petalotriche* occurs in all seasons between 30°N and 54°N but in spring and especially in summer the southern limit of the range shifts to the north to 39°N and 49°N resp. The temperature range of the genus is 6.5°-24.5°C. When the number of specimens are given with temperature (fig.16) the influence of swarms at 14°C, 17.5°C and at 21°C is clear. When the number of positive samples is given (fig.16) a more normal distribution is seen with an optimum near 15°C and a standard deviation of 3.5; this diagram gives no essentially different information than the one based on specimens.

Petalotriche major Jørgensen, 1924 (Pl. XIII figs 2-4, 6).

Petalotriche serrata Kofoid & Campbell, 1929, (Pl.XIII fig.5).

Fam. Rhabdonellidae

The species of the genus *Rhabdonella* and in general of the whole family are warm water species.

Rhabdonella striata (Biedermann, 1893)(Pl.XIV fig.5) is found only once at 24°N 28°W in spring.

Rhabdonella amor (Cleve, 1900)(Pl.VIII fig.17, Pl.XV fig.11) is collected only in spring at 40°N, 39°N, 25°N 28°W.

Rhabdonella brandti Kofoid & Campbell, 1929 (Pl.XV figs 7,13) occurs at 24°N

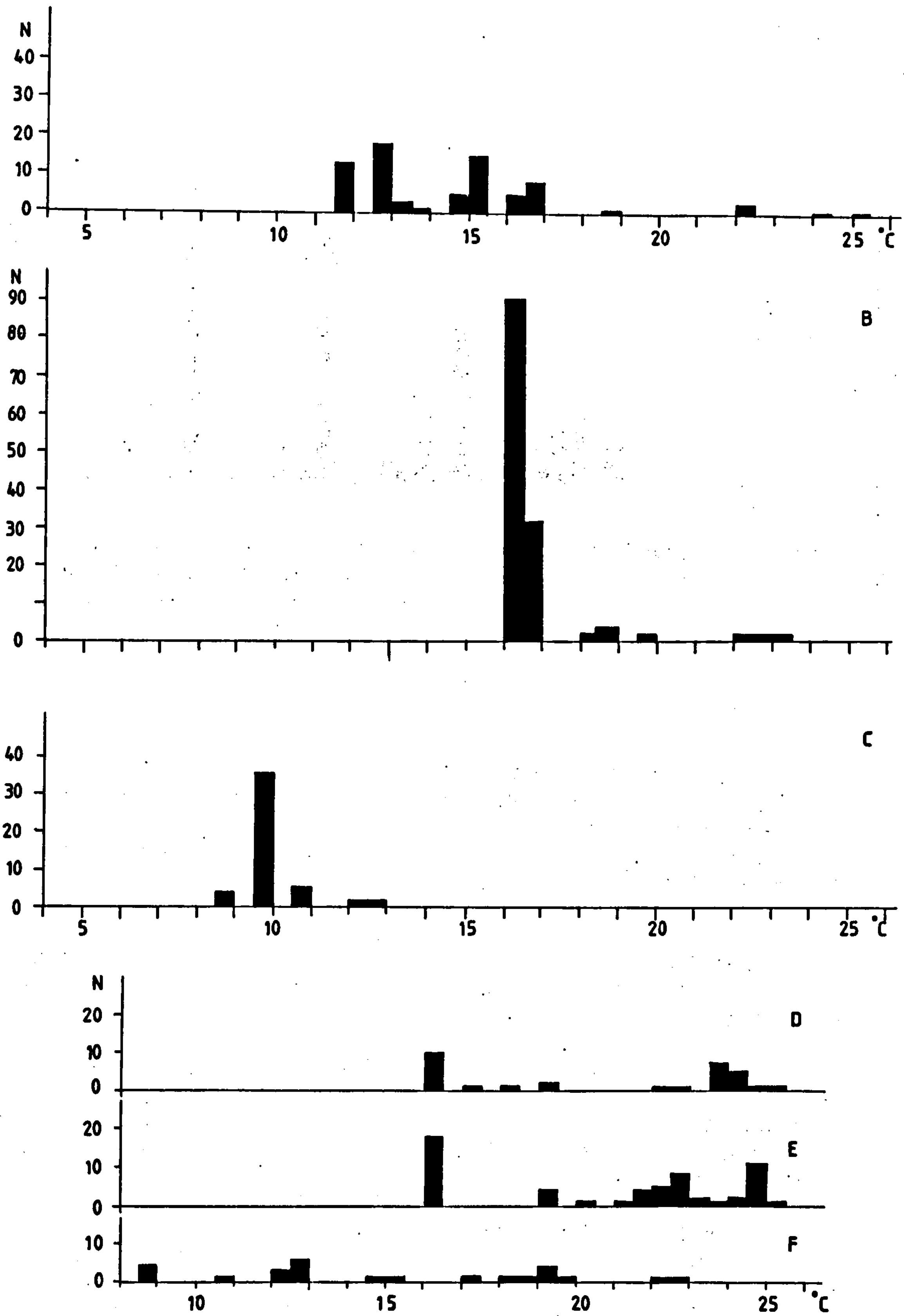


Figure 15 Temperature preference of the genera *Proplectella* (A), *Poroecus* (B), *Ptychocylis* (C), *Epiplocyloides* (D), *Epiplocylis* (E) and *Stenosomella* (F), based on actual numbers collected during the four seasons, temperature along x, axis numbers of specimens along y axis

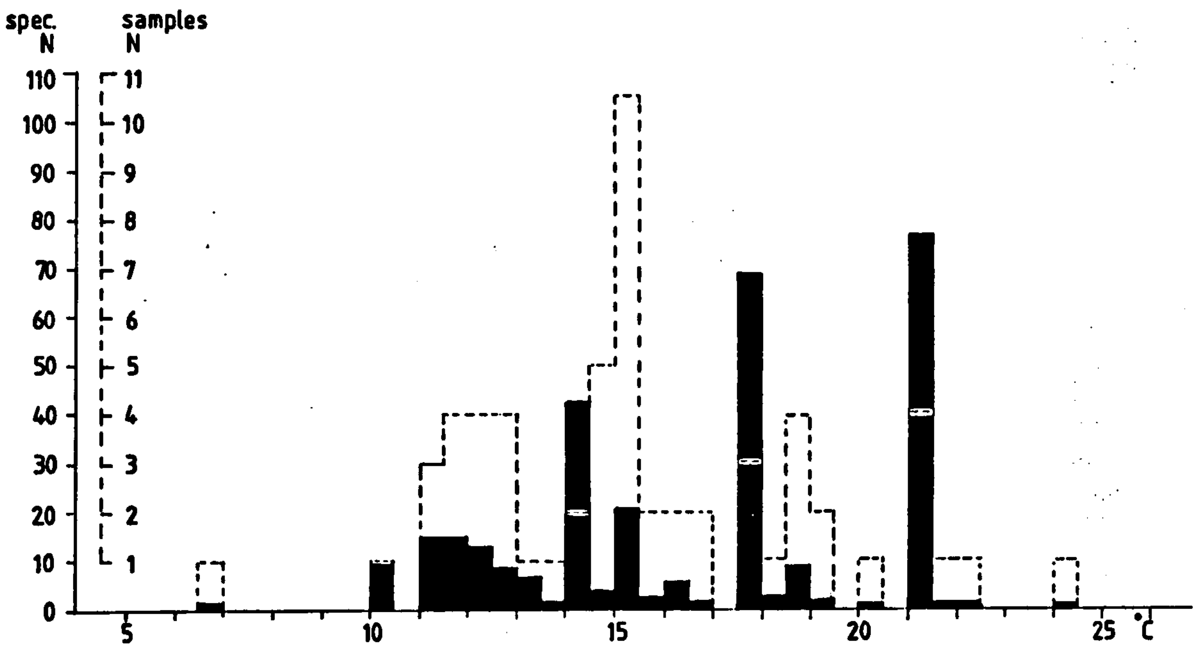


Figure 16 Diagram for the temperature preference of *Petalotricha* based on the actual number of specimens as well as on the number of positive samples (dotted graph) collected during the four seasons, x axis temperature in °C, y axis number of specimens

28°W and in autumn at 33°N and at 39°N.

Rhabdonella spec. (Pl.XV fig.14). Fragments of specimens resembling this genus are found at 48°N, 46°N and 37°N in spring.

Rhabdonellopsis longicaulis Kofoid & Campbell,1929 (Pl.XIV fig.2) is found only in spring at 24°N 28°W, 25°N 28°W and at 39°N.

Fam. Epiplocylididae

Epiplocylis acuminata (Daday,1887)(Pl.XVI fig.3) is found in spring at 40°N, 39°N, 24°N 28°W, 25°N 28°W, 25°N 27°W, in summer at 24°N , 32°N and in autumn at 26°N 22°W.

Epiplocylis blanda Jörgensen,1924 (Pl.XVI figs 7,12) is found in spring at 24°N 28°W, 25°N 28°W,25°N 27°W in summer at 34°N and in autumn at 37°N, 33°-31°N and at 25°N 26°W.

Epiplocylis constricta Kofoid & Campbell,1929 (Pl.XVI figs 1,4) is found in spring at 25°N 27°W and in summer at 33°N.

Epiplocylis undella (Ostenfeld & Schmidt,1901) (Pl.XVI figs 10,13)is present in spring at 25°N 28°W, 24°N, 30°N, in autumn at 26°N, 27°N, 31°N, 41°N.

Epiplocylis spec. *A* (Pl.XIV fig.3)found at 25°N 28°W in spring resembles this genus but cannot be brought to a species if it is not an aberrant *E.blanda*

Epiplocylis spec. *B* (Pl.XVI fig.11). This specimen is found in winter at 33°N. It resembles most *E.blanda* but the reticulum with rounded meshes and the absence of longitudinal striae distinguishes it from that species. Another difference is that all species of *Epiplocylis* are found south of 41°N and not in the winter season, the season in which the present specimen was collected.

Epiplocyloides acuta (Kofoid & Campbell,1929) (Pl.XVI figs 8-9) is found in winter and summer both at 29°N.

Epiplocyloides brandti (Kofoid & Campbell,1929) (Pl.XVI figs 2,6) is found in spring at 39°N and 25°N 28°W and in autumn at 45°N, 38°N, 26°N 24°W, 27°N 20°W and 26°N 20°W.

Epiplocyloides reticulata (Ostenfeld & Schmidt, 1901)(Pl.XVI fig.5) is found only in autumn at 25°N and 26°N 23°W.

Fam. Xystonellidae

Parafavella denticulata (Ehrenberg,1840) [= *Parafavella cylindrica* (Jørgensen,1899),= *Parafavella edentatata* (Brandt, 1906), = *Paraflavella subedentata* (Jörgensen, 1905), = *Parafavella subrotuntata* (Jørgensen ,1924) (cf.Davis, 1987)] (Pl.XIV fig.6) is found in winter at 34°N and 33°N 19°W, and in summer at 52°N, 58°N 4°W.

cf. *Parundella aculeata* Jørgensen, 1924 (Pl.XV figs 2-4). Specimens resembling this species occur in spring at 39°N, 49°N, 50°N, 53°N 22°W, in summer at 58°N 4°W and in winter at 40°N and 45°N.

Xystonella treforti (Daday,1887)(Pl.XIV fig.1) is only found in spring at 25°N 27°W and 24°N 28°W, 25°N 24°W.

Xystonella lohmanni (Brandt,1906)(Pl.XIV figs 7-8) is found only in one sample in large numbers in spring at 39°N.

Xystonellopsis cymatica (Brandt,1906)(Pl.XV fig.5) is only found together with the preceding species and may very well be a juvenile of *X.lohmanni* which is twice as long as the present specimen.

Xystonella spec. (Pl.XIV fig. 4) is found at 25°N 28°W in spring.

Fam. Undellidae

Undella hyalina Daday,1887 occursin winter at 40°N and in summer at 24°N. Some doubtfull specimens (Pl.XVII fig.6) are collected in autumn at 28°N and 26°N 23°W.

Undellopsis marsupialis (Brandt,1906)(Pl.XVII fig.5) was only collected in summer at 56°N and 49°N.

Proplectella claparedei (Entz,1885) [= *Proplectella angustior* (Jörgensen, 1924)(Pl.XVII fig.4) *Proplectella fastigata* (Jörgensen, 1924)(Pl.XVII figs 1,7)= *Proplectella globosa* (Brandt,1906)= *Proplectella ovata* (Jörgensen,1924)(Pl.XVII fig.2)= *Proplectella tenuis* Kofoid & Campbell,1929 (cf.Balech,1959)](Pl.XVII fig.3). The differences between species in this genus seem so arbitrary that all except *P.parva* are synonymized. This complex is found only south of 48°N (fig.9) in winter, summer and spring. During winter its occurrence is nearly continuous between 34°N and 48°N and it is most abundant in this season.

Proplectella parva Kofoid & Campbell,1929 (Pl.VII fig.13, Pl.XVII figs 8-10) is not found in summer but in contrast to the *P.claparedei* complex it is present in autumn (fig.9)

cf. *Proplectella parva* (Pl.VII figs 6,7,10). Specimens very close to this species are found in spring at 25°N 27°W, 24°N 28°W, in autumn at 28°N, 31°N and in winter at 33°N and 40°N.

Fam. Tintinnidae

Dadayiella bulbosa (Brandt,1906) is found in spring at 39°N and in autumn at 35°N, 26°N 22°W, 26°N 23°W and frequently in summer at 24°N, 27°N, 29°N, 30°N, 33°N, 34°N and 35°N.

Dadayiella ganymedes (Entz,1884)(= *Dadayiella jorgenseni* Kofoid & Campbell,1929)(Pl.XV fig.6) is only found in spring at 39°N and 41°N

Eutintinnus lusus-undae (Entz,1885)(Pl.XVIII fig.3). Representatives of this genus are probably to be identified as: *Eutintinnus elongatus* (Jørgensen,1924), *Eutintinnus fraknoi* (Daday,1887)(Pl.XVIII figs 4,6) and *Eutintinnus tubulosa* (Ostenfeld,1899) but in the present study they are considered together. This complex is frequently found in spring between 25°N and 38°N with one record at 49°N while one record excists from 40°N in summer.

Salpingella acuminata (Claparede & Lachmann, 1858)(Pl.XV fig 9) is found only in spring at 35°N. Also at 35°N and at 38°N, but not in the same samples specimens are found which resemble the present species strongly (Pl.XVIII fig.5).

Salpingella gracilis Kofoid & Campbell, 1929 (Pl.XIX fig.3) is found in winter at 34°N and 40°N and in summer at 38°N, 24°N.

Steenstrupiella steenstrupi (Claparède & Lachmann, 1858) (Pl.XVIII figs 1-2) is abundant in spring at 34°N, 38°-40°N, 43°-44°N and it is found in summer at 30°N.

Tintinnus bursa (Cleve, 1900) (Pl.VII figs 9, 11, 12) occurs in winter and spring frequently south of 50°N. In summer there is only one record at 50°N and in autumn it occurs south of 50°N regularly.

Tintinnus spec. (Pl.VII figs 1-4) specimens resembling the present genus are collected at 30°N, 34°N, 39°N, 40°N, 42°N in winter and at 41°N in autumn.

Amphorides gaarderae Marshall, 1969 (Pl.VII fig.5) is found in winter near 42°N.

DINOFLAGELLATA

Amphisolenia

Of the genus *Amphisolenia* ten taxa were found of which the following five were rare:

A. bifurcata Murray & Whiting, 1899, is found in winter at 38°N, 37°N, 34°N, 33°N, 30°N, 33°N 18°W, 30°N 19°W; temp. range 16.2-19.0°C (Pl.XIX fig.4),

A. extensa Kofoid, 1907 is found in winter at 31°N 27°W,

A. globifera Stein, 1883 is found in winter at 40°N 25°W, 39°N, 34°N, 29°N, 30°N; temp. range 14.9-19.4°C (Pl.XIX fig.1),

A. schroederi Kofoid, 1907 is found in winter at 30°N,

A. thrimax Schüttt, 1893 is found in winter at 31°N 18°W.

A. bidentata Schröder, 1900 was the most abundant species. Variability in this species made it difficult if not impossible to separate it from *A. bispinosa* Kofoid, 1907. *A. symmetrica* Kofoid, 1907, *A. palaeotheroides* Kofoid, 1907 and *A. astragalus* Kofoid & Michener, 1899 (Pl.XIX fog.2) seem also to be morphs only of *A bidentata*, so these five taxa are treated together.

A. bidentata and *A. astragalus* are still separated in the temperature frequency diagram of figure 17, two clusters of specimens are found for both species, viz.: one between 12° and 20°C with a maximum near 17°C and one between 20 and 26°C with a maximum near 24°C. This figure gives actual collected specimens per 0.5°C interval, a correction for fishing effort at different temperatures does not change the character of the curve. The smallest cluster (20°-26°) is composed of specimens collected between 41°N and 24°N during the autumn cruise. The specimens composing this cluster do not differ in any respect from the specimens of the other cluster. Probably there is an autumn population living at temperatures between 20° and 26°C and a winter-spring population living at temperatures between 13° and 20°C. From fig.18 it is evident that there is no summer population in the upper 5 meters of the water collumn.

There are no size differences between these two populations the only size difference found is a small irregular decrease in length from north to south; in spring the average per sample decreases with 20%, in autumn and winter this percentage is 12% and 16% respectively. The size frequency for *A bidentata* s.l. is single topped.

RADIOLARIA

Fam. Sphaerozoidae

Rhaphidozoum neapolitanum (Brandt, 1881)(Pl.XX fig.1) occurs in spring at 33°N.

Sphaerozoum punctatum (Meyen, 1834)(Pl.XX fig.2-3) is found in autumn at 46°-45°N, 41°N, 38°N, 35°N, 29°-28°N, 24°N, in winter at 45°N, 39°N, in spring at 49°N 6°W, 50°N 3°W, 53°N, 46°-43°N, 41°-35°N, 33°N, 28°N, 24°N, and in summer from 53°N continuously to 25°N.

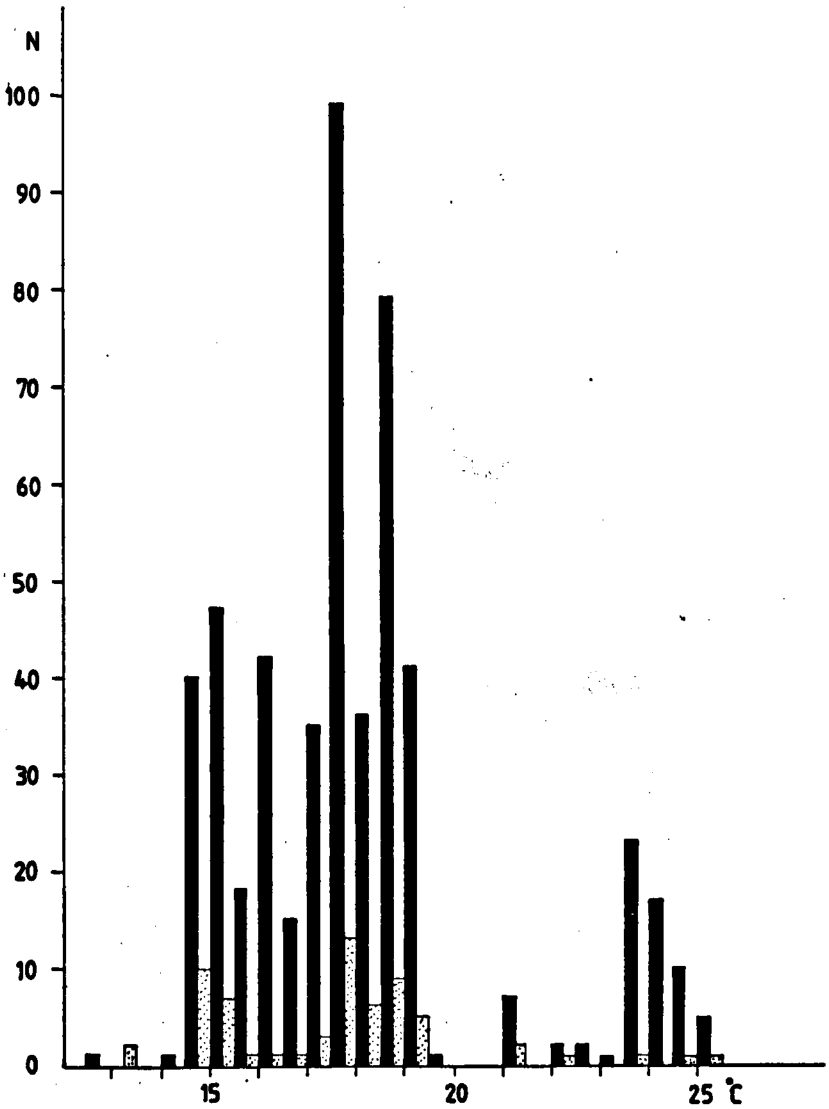


Figure 17 Diagram for the temperature preference of *Amphisolenia bidentata* (black), and *A.astragalus* (dotted) based on the actual numbers collected during the four seasons, x axis temperature in °C, y axis number of specimens

Sphaerozoum verticillatum Haeckel,1887 occurs in winter at 39°N 35°W and in summer at 33°N, 29°N.

Fam. Collosphaeridae

Acrosphaera lappacea (Haeckel,1887)(= *Polysolenia lappacea*: Nigrini & Moore,1971:15)(Pl.XX figs 4-5, Pl.XXI figs 1-2) occurs in autumn at 53°N 27°W, 50°N, 46°-37°N, 29°N,25°N 28°W, in spring at 37°N, 34°-32°N, and in summer at 55°-45°N, 40°-33°N, 29°N, 25°N. In autumn also a variety (var *A* Pl.XXI fig.3) is encountered in some samples.

Acrosphaera murrayana (Haeckel,1862)(Pl.XXI figs 4-5) is found in autumn at 50°N, 41°N and 35°N, in winter at 30°N, 30°N 28°W, in spring at 28°N, 24°N, 24°N 28°W, and in summer at 50°N.

Acrosphaera spinosa (Haeckel,1862) form *A* Boltovskoy & Riedel,1980 (this form is taken together with form *B* Boltovskoy & Riedel,1980 as separation is vaque)(Pl.XXII figs.1-3) is found in autumn at 52°N, 50°-45°N, 39°-37°N, and in summer from 55°N to 31°N and at 25°N.

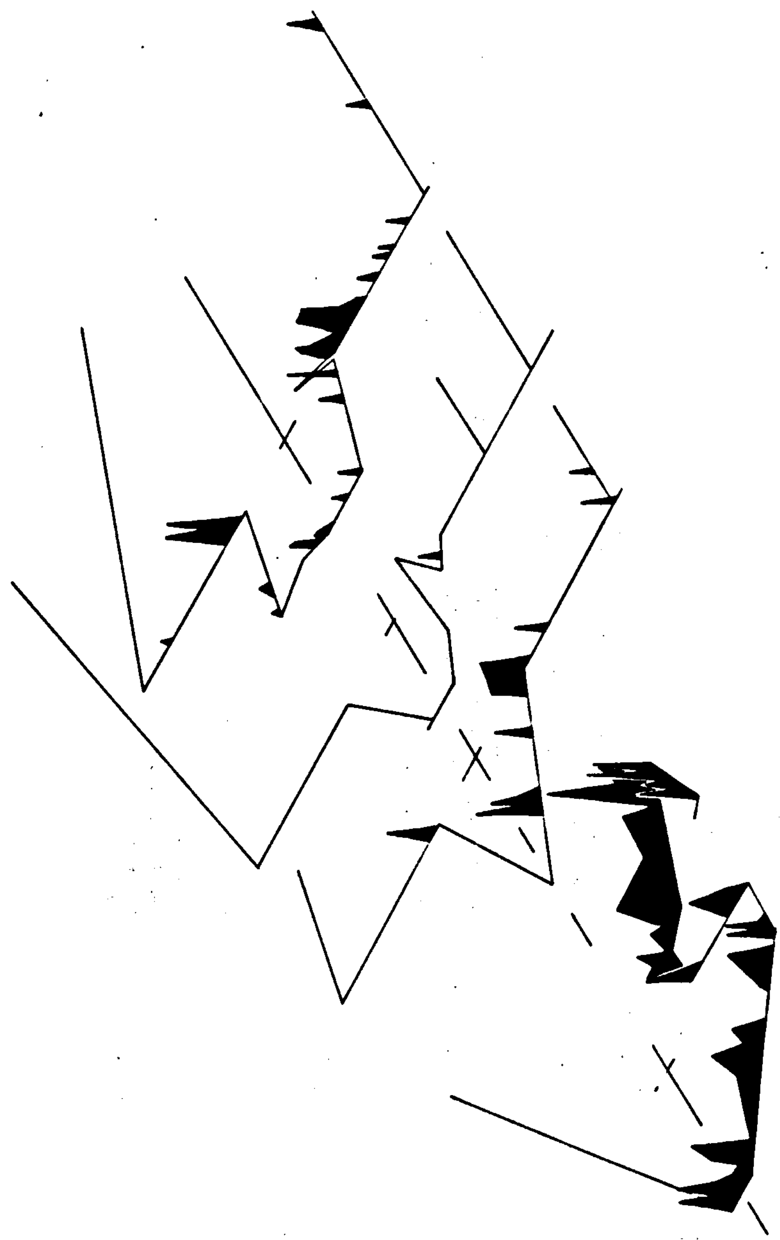


Figure 18 Abundance of *Amphisolenia bidentata* and *A.astragalus* plotted along the cruises as given in fig.1, vertical axis is *Ln* of standard numbers.

Acrosphaeraa spinosa (Haeckel,1862) form *C* Boltovskoy & Riedel,1980 occurs in autumn at 55°N, 46-45°N, 41°-40°N, 38°-37°N, 29°N, 26°N 20°W, 27°N 20°W, in spring at 53°N, 46°-43°N, 41°-37°N, 35°-33°N, 24°N, 24°N 28°W, 24°N 27°W, and in summer at 44°N, 40°N, 35°N, 28°N. In spring an evident N-S clinal size variation in this species is found as shown below. In summer this cline is less steep and the correlation coefficient, which was 0.84 in spring, is only 0.63. In autumn no clinal size variation is found at all.

Position N°	Diamater range in mm	Average diameter in mm	Number of specimens
45		150	1
43	95-125	110	2
42	95-135	117.5	5
40	100-117.5	108.3	6
39		105	1
	87.5-125	105.6	12
34	85-1	98.4	10

Acrosphaera cyrtodon (Popofsky,1908) is found in summer at 29°N.

Collosphaera huxleyi Müller,1855 (Pl.XXII figs 4,6-8) is found in autumn at 52°N 26°W, 55°N, 49°N, 47°-45°N, 41°-37°N, 35°-34°N, 29°-28°N, 26°N, 26°N 23°W, 27°N 20°W in winter at 39°N, 30°N, 30°N 28°W, in spring at 45°N, 41°-40°N, 38°-36°N, 24°N, 24°N 28°W, 25°N 28°W, and in summer at 56°N 13°W, 54°N, 50°-49°N, 46°N, 44°-33°N, 31°N, 28°N, 24°N. In spring this species shows a N-S clinal size variation as shown in the table below; in summer this variation has disappeared, and in autumn a reverse clinal variation seems to be present with larger specimens in the south.

Position N°	Diameter range in mm	Average diameter in mm	Number of specimens
48		100	1
42	70- 95	85.3	4
40	85-175	118.3	6
38		75	1
25	70- 72.5	71.3	2
25(28°W)	55- 75	64.1	10

Collosphaera macropora Popofski,1917 (Pl.XXII fig.5) occurs in winter at 40°N, 30°N, 30°N 28°W, in spring at 33°N, 32°N, and in summer at 33°N, 29°N, 25°N.

Collosphaera spec. *A* (Pl.XXIII fgigs 1-7) is found in spring at 24°N, 24°N 28°W, and in summer at 56°N 21°W, 51°N, 46°N, 44°N, 39°N, 33°N.

Collosphaera tuberosa Haeckel,1862 occurs in autumn at 41°N, 29°-28°N, and in summer at 46°N, 41°N, 35°-24°N.

Solenosphaera zanguebarica (Ehrenberg ,1872) *zanguebarica* (Ehrenberg,1872)(= *Trisolenia zanguebarica* Ehrengerb,1872,= *Disolenia quadrata* Ehrenberg,1872 pl.10 fig.20, Nigrini & Moore,1971:S3) is found in summer at 35°N.

Solenosphaera zanguebarica (Ehrenberg ,1872) *auriculata* (Haeckel,1887)(= *Otosphaera auriculata* Haeckel, 1872)(Pl.XXIII figs 8-9).

Solenosphaera zanguebarica (Ehrenberg ,1872) *nigrimoora* Nom.nov. (= *Otosphaera aauriculata* Nigrini & Moore,1979: S7 Pl.1 fig.4)(Pl.XXIII figs 10-13) occurs in autumn at 52°N 26°W, 47°N, 45°N, 41°N, 38°-37°N, in spring at 34°N, 28°N, 24°N, 24°N 28°W, 25°N 28°W.

Solenosphaera zanguebarica (Ehrenberg ,1872) *pyriformis* Brandt,1905 (= *Collosphaera pyriformis* Haeckel,1887:96 (Pl.XXIV figs 1-2) is found in autumn at 45°N, 41°N, 38°-37°N, 34°N, 29°N, 26°N 20°W. Specimens with large and specimens with small pores occured mixed together. In winter it occured at 52°N 19°W, 48°N 23°W, 30°N.

Solenosphaera chierchiae Brandt,1905 is found in summer at 45°N, 34°N.

Siphonosphaera socialis Haeckel,1887 (Pl.XXIV fig.3) is found in winter at 30°N, 30°N 28°W, in spring at 41°N, 39°-38°N, 35°-32°N, 30°N, and in summer at 46°-44°N, 39°N, 35°N, 26°N.

Siphonosphaera tenera / tubulosa (Müller,1858) complex [= *S. tenera* Brandt, 1885(Pl.XXIV fig.4)= *S. tubulosa* Müller,1885 (Pl.XXIV figs 5-7)] occurs in autumn at

Position N°	Diameter range in mm	Average diameter in mm	Number of specimens
45	75.0-82.5	77.5	5
43	72.5-80.0	77.0	5
42	52.5-77.5	67.0	10
40		57.5	1
38	52.5-72.5	60.3	8
36		50.0	1
34	50.0-70.0	65.3	16
32	47.5-65.0	55.8	3
28	47.5-62.5	53.4	6
25	50.0-57.5	54.2	3

Siphonosphaera cyathina Haeckel,1887 is found in autumn at 45°N, 39°-38°N, 28°N.

Siphonosphaera compacta(Brandt,1905) is found in summer at 50°- 45°N, 41°N, 35°N, 32°N, 29°N, 24°N.

Siphonosphaera martensi Brandt. 1905 is found in summer at 46°N, 44°N, 33°N.

Fam. Actinommidae

Acanthosphaera spec. *A* (Pl.XXIV fig.9) is found in spring at 45°N

Acanthosphaera spec. *B* probably a growth stage of *Heliomma* spec. *A* (see below) occurs in autumn at 45°N 35°W, in winter at 48°N 23°W, 46°N 25°W, 42°N, 39°N, and in summer at 36°N.

Acanthosphaera spec. *C* (=cf. *Cladococcus* spec.)(Pl.XXV fig.1) occurs in autumn at 46°N 33°W.

Acanthosphaera spec. *D*, a type with smaller spines than spec. *C*, is found in summer at 36°N.

Acanthosphaera coriaca Boltovskoy & Riedel,1980 (Pl.XXIV fig.10) occurs in winter at 39°N 35°W.

Drymyomma elegans Jørgensen,1899 is found in winter at 40°N 35°W.

Actinomma leptodermum (Jørgensen,1900)(Pl.XXV fig.2) is found in winter at 48°N 23°W, 44°N, 30°N, and in spring at 52°N 17°W.

Actinomma sol Cleve,1900 (Pl.XXV fig.3) is found in winter at 48°N 23°W, and in spring at 53°N 24°N.

Actinomma spec. *A* (Pl.XXVI fig.1) is found in autumn at 47°-46°N, and in spring at 51°N 12°W.

Actinomma acradophorum Haeckel,1887 (Pl.XXVI fig.2). Three developmental stages are distinguished in this species there is a tendency of the younger forms to occur more to the south. It is found in autumn at 50°-45°N, 41°N, 38°N, 33°N, 29°N, 26°N 20°W, 27°N 20°W, and in winter at 46°N 25°W, 39°N 35°W.

Echinomma popofskyi Petrushevskaya,1967 (Pl.XXVI fig.3) occurs in winter at 39°N 35°W.

Ommatartus tetrathalamus (Haeckel,1887)(Pl.XXVI figs 4-11). Seven developmental stages as given in the figures are found in this species of which the older ones tend to occur more to the south of 38°N. It is found in autumn at 52°N, 50°N, 46°-45°N, 41°N, 39°-37°N, 35°-33°N, 29°-28°N, 26°N, 24°N, 25°N 28°W, 26°N 20°W, 27°N 20°W, and in summer at 50°-49°N, 37°N, 32°N, 29°-24°N.

Heliomma spec. *A* (Pl.XXVII figs 1-2)occurs in spring at 45°N.

Heliomma erinaceum Haeckel,1862 (= *H.capillaceum* Haeckel,1887: 236, = *H.acanthophora* Popofski,1912: 101) occurs in autumn at 45°N, 29°N.

Hexacontium enthacanthum Jørgensen,1899 (Pl.XXVII fig.3) occurs in autumn at 52°N, 50°N, 47°N, 45°N, 38°N. Three developmental stages are distinguished, the youngest stages are found at the northern localities of the species. It occurs in winter at 52°N 19°W, 44°N, 40°N, 32°N, in spring at 53°N, 45°N, 37°N, and in summer at 57°N

16°W, 56°N 21°W, 54°N, 51°-49°N.

Hexacontium hostile Cleve,1900 (Pl.XXVIII fig.1) is found in winter at 44°N, 40°N, and in spring at 45°N.

Hexacontium armatum Cleve,1900 occurs in summer at 50°N.

Hexadoras spec. *A* related to *Rhizoplegma boreale* (Cleve,1899) cf Campbell,1954, is found in spring at 35°N.

Prunulum coccymelium Haeckel,1887 is found in spring at 31°-30°N.

Rhizospongus spec. *A* (=cf. *Diplospongus dendrophorus* Mast, 1900)(Pl.XXVIIII fig.2) occurs in autumn at 52°N, 50°N, 45°N, 41°N, 24°N, and in spring at 39°N.

Staurolonche spec. *A* (cf.Campbell,1954:D56)(Pl.XXVIII fig.4) occurs in spring at 53N.

Stylotractus spec. *A* (= *Stylotractus* spec. / Petrushevskaya, 1972)(Pl.XXVIII fig.3) occurs in spring at 37°N, 24°N 28°W.

Heliosphaera spec. is found in autumn at 41°N, 38°-37°N, 24°N, and in winter at 48°N, 23°W, 39°N.

Spongosphaera streptacantha Haeckel,1862 is found in summer at 37°-34°N.

Plegmosphaera leptoplegma Haeckel,1887 is found in autumn at 46°N, 40°N.

Plegmosphaera pachyplegma Haeckel,1887 is found in summer at 35°N.

Rhizosphaera cf. *paradoxa* in Popofski,1912:111, is found in summer at 50°N, 46°N, 35°N, 25°N.

Spongoplegma cf. *rugosa* Hollande & Enjumet, 1960 is found in in summer at 44°N, 32°-31°N.

Fam. Phacodiscidae

Sethodiscus macrococcus Haeckel,1887 (Pl.XXIX figs 2-3, Pl.XXXIV fig.4) occurs in autumn at 45°-44°N, 41°-40°N, 37°-38°N, 35°N, 29°N, in winter at 30°N, and in summer at 36°-35°N, 30°N.

Fam. Litheliidae

Lithelius spec. is found in spring at 54°N 26°W.

Lithelius minor Jørgensen,1899 is found in summer at 55°-54°N.

Tholospira spec. *A* (cf.Popofski,1908, Pl.28)(Pl.XXIX fig.6) occurs in winter at 52°N 19°W, 48°N 23°W, 46°N 25°W, 45°-44°N, 42°N, 40°-39°N, 35°N, 30°N, and in spring at 38°-37°N, 33°N.

Tholospira spec. *B* (= *Triodiscus variabilis* Popofski,1908, = *Tholospira* spec. Petrushevskaya,1968) (Pl.XXIX figs 4-5,7) occurs in winter at 39°N, 30°N 28°W, in spring at 53°N, 46°-43°N, 41°-40°N, 38°-37°N, 35°N, 33°N, 31°-30°N, 28°N, 24°N 28°W, and specimens probably belomnging to this species are found in autumn north of 30°N.

Tholospira cervicornis Haeckel,1887 (Pl.XXX figs 1-3). Four developmentals stages, occurring usually together in the samples, are distinguished. The species is found in autumn at 52°N 26°W, 52°N, 50°-49°N, 47°-45°N, 41°N, 39°-37°N, 33°-35°N, 29°N, 26°N 20°W, in winter at 52°N 19°W, 45°N, 40°-39°N, 30°N 28°W, and in summer at 45°N, 36°-33°N.

Tholospiora spec. *C* is found in autumn at 52°N 26°W, 55°N, 52°N, 50°-49°N, 45°N, 41°N, 37°N, 34°N, 29°N, and in winter at 44°N.

Larcopyle buetschlii Dreyer,1889 is found in summer at 51°N.

Spirema haliomma (Ehrenberg,1886) is found inin summer at 55°-50°N.

Phorticium clevei (Jørgensen,1900)(Pl.XXXI figs 1-7). Four developmental stages are distinguished. It is found in autumn at 52°N 26°W, 55°-54°N, 52°N, 50°N, 48°N, in winter at 52°N 19°W, 48°N 23°W, 42°N, 39°N, 35°N, 30°N, in spring at 52°N 17°W, 53°N 22°W, 53°N 24°W, 53°-51°N, 49°N, 40°N and in summer at 57°N 13°W, 57°N 16°W, 56°N 21°W, 55°-51°N.

Phorticium polynium (Haeckel,1887) is found in summer at 54°-50°N.

Lacrospira minor (Jørgensen,1899) occurs in winter at 44°N, 39°N, 35°N, 32°N.

Fam. Pyloniidae

Tetrapyle spec. *A* (resembles *T.quadriloba* Ehrenberg,1860 and the next species)(Pl.XXXI fig.8, Pl.XXXII fig.1) is found in winter at 40°N, 35°N, 30°N 28°W, and in spring at 33°N, 24°N.

Tetrapyle octacantha Müller,1858 (Pl.XXXII figs 2-4)is found in autumn at 50°-49°N, 45°N, 41°-37°N ,35°-33°N, 29°N, 28°N, 25°N 28°W, 26°N 20°W, 27°N 20°W, in winter at 39°N, 34°N, and in summer at 53°-46°N, 35°-33°N.

Octopyle stenozona Haeckel,1887 (Pl.XXXII fig.5, Pl.XXXIII fig.1) is found in autumn at 46°-37°N, 35°N, 29°N, 26°N.

Hexapyle dodecantha Haeckel,1887 occurs in summer at 53°N.

Fam. Spongodiscidae

Amphirhopalum ypsilon Haeckel,1887 is found in autumn at 52°N 26°W, 50°-49°N, 46°-45°N, 29°N, 24°N, 25°N 28°W, 26°N 23°W, 27°N 20°W, in winter at 39°N, 35°-34°N, 30°N, 30°N 28°W, and in spring at 53°N, 37°-35°N, 24°N.

Stylodicta multispina Haeckel,1868 (= *S.valdispina* Jørgensen, 1905)(Pl.XXXIII figs 2-3) is found in autumn at 52°N 26°W, 55°N, 48°N, 45°-44°N, 41°N, 38°N, 35°-34°N, 28°N, 24°N, 26°N 20°W, in winter at 48°N 23°W, 45°-44°N, 42°N, 40°-39°N, 35°-34°N, 32°N, 30°N 28°W, in spring at 51°N 12°W, 53°N 24°W, 55°N, 51°N, 45°-43°N, 38°-37°N and in summer at 35°N.

Stylospongia spec. *A* (= *Spongotrochus glacialis* Popofski,1908, = *Stylospopngia* spec. *I* Campbell,1954)(Pl.XXXIII fig.4, Pl.XXXIV fig.1) is found in autumn at 52°N 26°W, 55°N, 52°N, 41°N, 38°N, 35°N, in winter at 48°N 23°W, 40°N, in spring at 53°N 24°W, 53°N 51°N, 46°N, 44°N and in summer at 57°N 16°W, 44°N.

Stylospongia spec. *B* (cf. *Spongodiscus setosus* Petrushevskaya, 1967: 36) (Pl.XXXIV fig.3)is found in winter at 30°N 28°W.

Spongocore chrysalis Haeckel,1887 (Pl.XXXIV fig.2) is found in winter at 40°N 35°W.

Spongodiscus resurgens Ehrenberg,1854 occurs in winter at 46°N 25°W, 45°N, 42°N, 39°N, 30°N and in winter at 46°N, 25°N, 45°N, 42°N, 39°N, 30°N.

Six juvenile types of Spongodiscidae are treated here separately

juv. spec. *1* in autumn at 52°N, 47°N, 45°-44°N, 39°N, 37°N, 35°-34°N, 29°N, 26°N, 24°N, 25°N 28°W, 26°N 23°W, 26°N 20°W, 27°N 20°W.

juv. spec. *2* is found in autumn at 52°N, 44°N, 41°-39°N, 37°N, 35°-34°N,29°-28°N,26°N 20°W, in winter at 52°N 19°W.

juv. spec. *3* is found in autumn at 50°N,46°-45°N, 41°N, 35°-34°N,29°N,24°N.

juv. spec. *4* is found in autumn at 55°N, 50°N, 48°N, 45°-44°N, 40°N, 38°-37°N, 25°N 28°W, 26°N 20°W.

juv. spec. *5* in autumn at 52°N, 47°N, 45°N 35°-34°N, 24°N, 26°N 23°W, 27°N 20°W.

juv. spec. *6* is found in autumn at 55°N, 52°N, 49°N, 46°N.

Stylochlamidium asteriscus Haeckel,1887 (Pl.XXXV fig.1) is found in autumn at 52°N 26°W, 55°-54°N, 52°N, 50°N, 45°N, 35°N and in summer at 56°N 21°W, 54°-45°N.

Spongaster tetras Ehrenberg, 1860 var. *irregularis* Nigrini, 1967 is found in autumn at 37°N, 35°N, 24°N.

Monaxonium perforatum Popofski,1912, (Pl.XXXV figs 2-3, 5) is found in autumn at 45°N, 41°N, 38°-37°N, 35°N, 24°N.

Porodiscus micromma (Harting,1863) occurs in summer at 54°N, 50°N.

Fam. Acanthodesmiidae

Acanthodesmia acanthopora (Popofski,1913) occurs in spring at 33°N, 31°N.

Acanthodesmia vinculata (Müller,1857)(Pl.XXXV figs 4, 6) is found in autumn at 41°N, 38°-37°N, 29°-28°N, 26°N, 26°N 20°W.

Acanthodesmia cf. *micropora* (Popofsky,1908) occurs in summer at 33°N.

Lithocircus primordialis (Haeckel,1887)occurs in spring at 24°N 28°W.

Lophospyris pentagona pentagona (Ehrenberg,1872)(Pl.XXXV figs 7-8) is found in autumn at 50°N, in winter at 48°N 23°W, 40°N, 34°N, in spring at 51°-50°N, 45°N, 41°N, 37°N, and in summer at 57°N 16°W, 51°-50°N.

Lophospyris pentagona quadriforis (Haeckel,1887) is found in spring at 35°N.

Phormospyris stabilis capoi Goll,1976 (Pl.XXXV figs 9-12) is found in autumn at 52°N 26°W, in winter at 45°N, 40°N, and in spring at 53°N 24°W, 45°-44°N, 37°N, 30°N.

Zygocircus capulosus Popofski,1913 (Pl.XXXVI fifs 1-2) is found in autumn at 52°N, 50°N, 47°N, 35°N, 29°N, 24°N, in winter at 44°N, 30°N 28°W, and in spring at 40°N,37°W.

Zygocircus productus (Hertwig,1879) (Pl.XXXVI fig.3) is found in spring at 45°N, 24°N 28°W.

Zygocircus rhombus (Haeckel,1887)(Pl.XXXVI fig.4) is found in spring at 45°N, 37°N, 35°N, 33°N.

Zygocircus spec. *A* (resembles *Z.capulosus* and *Z. piscicaudatus* Popofski,1913) (Pl.XXXVI figs 5-6) occurs in spring at 43°N, 37°N.

Zygocurcus spec. *B* (Pl.XXXVI figs 7-9) occurs in spring at 35°-34°N, 32°N, 28°N.

Liriospyris reticulata (Ehrenberg,1872)(Pl.XXXVII fig.1) is found in autumn at 52°N, 41°-40°N, 38°-37°N, 35°-34°N, 29°N, 26°N, 25°N 28°W, 26°N 23°W.

Neosemanis distephanus (Haeckel,1887) occurs in autumn at 52°N.

Fam. Plagoniidae

Arachnocorallium calvata (Haeckel,1887)(Pl.XXXVII figs 2-6) occurs in autumn at 54°N, 52°N, 47°N, 45°N, in winter at 52°N 19°W, 48°N 23°W, 46°N 25°W, 45°N, 42°N, 40°-39°N, 35°N, 30°N, in spring at 53°N 24°W, 52°N, 48°N, 45°N, 37°N, 34°N, and in summer at 33°N.

Arachnocorys circumtexta Haeckel,1860 (Pl.XXXVII fig.7) ocurs in winter at 52°N 19°W, 48°N 23°W, 45°-44°N, 42°N, 40°-39°N, 35°N, 30°N, in spring at 52°N 19°W, 51°N.

Arachnocorys umbelifera Haeckel,1862 (Pl.XXXVIII fig.1) is found at 44°N in winter.

Arachnocorys penthacantha (Popofski,1913) (Pl.XXXVIII fig.2) is found at 46°N 25°W, 42°N 33°W in winter and at 56°N 21°W, 54°-53°N in summer.

Dimelissa thoracites (Haeckel,1862)(Pl.XXXVIII fig.3) is found in winter at 52°N 19°W, 44°N, 42°N, 39°N, 35°N, and in spring at 43°N.

Phormacantha hystrix (Jørgensen,1899)(Pl.XXXVIII fig.5-10) is found in autumn at 50°-49°N, 47°N, 45°N, in winter at 52°N 19°W, 48°N 23°W, 46°N 25°W, 45°-44°N, 42°N, 40°-39°N, 30°N 28°W, in spring at 51°N 12°W, 51°N 13°W, 52°N 17°W, 51°N, 49°-48°N, 46°-43°N, 41°N, and in summer at 54°N, 50°-49°N, 29°N.

Amphiplecta acrostoma Haeckel,1887 (Pl.XXXVIII fig. 4) is found in winter at 52°N 19°W.

Plagiacantha arachnoides (Claparede,1855)(Pl.XXXIX fig.1) occurs in spring at 53°N, and in summer at 57°N 13°W, 57°N 16°W, 56°N 21°W, 55°-53°N.

Lamprotripus spec. (Pl.XXXIX fig.2) is found at 39°N 35°W in winter.

Plectacantha oikiskos Jørgensen,1899 (Pl.XXXX fig.1) occurs in winter at 52°N 19°W, 48°N 23°W, 46°N 25°W, 42°N in spring at 51°N, 45°N, 43°N, 40°N, and in summer at 57°N 13°W, 57°N 16°W, 56°N 21°W, 55°-53°N.

Plectacantha spec.*A* (cf.*P.* spec. Popofsky,1913:223)(Pl.XXXX fig.2-3) occurs in spring at 51°N 12°W.

Plectacantha spec. (resembles *P.oikiskos*) occurs in autumn at 41°N.

Plectophora triacantha Popofski,1908 (Pl.XXXX fig.4) in winter at 35°N, and in spring at 38°N, 34°N.

Lampromitra cornata Haeckel,1887 occurs in winter at 39N.

Pseudocubus obeliscus Haeckel,1887 (Pl.XXXX fig.5-6) occurs in autumn at 52°N 26°W, 37°N in winter at 52°N 19°W, 48°N 23°W, 44°N, 35°N, in spring at 40°N, 34°N.

Pseudocubus octostylus Haeckel,1887 occurs in winter at 48°N 23°W.,

Promelissa phalacra Haeckel,1887 (Pl.XXXX fig.7) occurs in winter at 30°N

Lophophaena hispida Ehrenberg,1872 occurs in autumn at 29°N, 24°N, 25°N 28°W, and in summer at 24°N.

Lophophaena cylindrica (Cleve,1900) occurs in autumn at 38°N.

Euscenium spec. *A* (juveniles resembling *E.tricolpum* Haeckel,1887 and *E.eucolpum* Haeckel,1887)(Pl.XXXX fig.8) occurs in autumn at 52°N, 50°N.

Trisulcus borealis (Ehrenberg,1872)(= *Lithomelissa borealis* (Haeckel, 1872) in Petrushevskaya,1968)(Pl.XXXX figs 9-11, Pl.XXXXI figs 1-4) occurs in autumn at 54°N 52°N, 50°N, 47°N, in winter at 52°N 19°W, 48°N 23°W, 46°N 25°W, 45°-44°N, 42°N, 40°-39°N, 35°N, 30°N 28°W, and in spring at 51°N 11°W, 51°N 12°W, 53°N 24°W, 54°-52°N, 50-49°N, 45°-43°N, 41°N, 37°N.

Trisulcus testudus Petroshevskaya,1971 (Pl.XXXXI fig.5) is found in autumn at 46°N.

Fam. Carpocaniidae

Carpocanium amphora (Haeckel,1862)(Pl.XXXXI figs 6-7) occurs in autumn at 35°-34°N, 29°-28°N, 26°N, in winter at 48°N 23°W, 39°N, 35°N, 32°N, in spring at 37°-35°N, 33°N, 28°N 24°W, and in summer at 25°N.

Fam. Theoperidae

Dictyophimus gracilipes Bailey,1856 (Pl.XXXXI figs 8-16, Pl.XXXXII figs 1-2) occurs in winter at 52°N 19°W, 48°N in 23°W, 46°N 25°W, 45°-44°N, 42°N, 40°-39°N, in spring at 52°N 19°W, 54°-53°N, 51°-48°N, 46°-44°N, 41°N, 38°N and in summer at 51°N.

Dictyophimus cf. *bicornis* (Ehrenberg,1861)(Pl.XXXXII figs 3-5) occurs in spring at 54°N, 51°N, 49°N.

Cornutella profunda Ehrenberg, 1838 (= *C.distenta* Ehrenberg,1872, = *C.longiseta* Ehrenberg,1872, = *C.verrucosa* Ehrenberg,1872)(Pl.XXXXIII fig.1) occurs in winter at 52°N 19°W, 44°N, 40°-39°N.

Eucyrtidium spec.*A*(= *E.* spec. *a* Petrushevskaya,1971)(Pl.XXXXII fig.6) occurs in autumn at 49°-45°N, 41°N, 38°N, 34°-33°N, 24°N, 26°N 20°W, 27°N 20°W, in winter at 46°N 25°W, 45°-44°N, 42°N, 40°-39°N, and in spring at 48°N, 37°N, 28°N, 24°N.

Eucyrtidium acuminatum (Ehrenberg) emnd. Nigrini,1967, ocurs in summer at 34°N, 29°N.

Eucyrtidium anomalum (Haeckel,1860) occurs in spring at 26°N.

Litharachnium tentorium Haeckel,1862 (Pl.XXXXII fig.7) occurs in winter at 39°N, and in spring at 44°N.

Pterocanium praetextum (Ehrenberg,1872)(Pl.XXXXII fig.8) occurs in autumn at 46°N, 41°N, 38°-37°N, 35°-33°N, 29°-28°N, 26°N, 24°N, 25°N 28°W, 26°N 20°W, 27°N 20°W, in winter at 40°N, 30°N, 32°N, and in spring at 43°N.

Theocorys veneris Haeckel,1887 (Pl.XXXXII fig.9) occurs in spring at 41°N.

Lipmannella bombus (Haeckel,1887)(Pl.XXXXIII fig.3) occurs in autumn at 45°N,38°N,35°-34°N, 29°N, 24°N, 26°N 20°W.

Lipmannella vichowii (Haeckel,1862) occurs in summer at 50°N.

Fam Pterocoryidae

Pterocorys zancleus (Müller,1855)(Pl.XXXXIII fig.5) occurs in autumn at 45°N 38°N, 35°-33°N, 29°-28°N, 26°N, 24°N, 25°N 28°W, 26°N 20°W, 27°N 20°W, in winter at 48°N 23°W, 44°N, in spring at 43°N, 33°N, 25°N 28°W, and in summer at 51°N.

Pterocorys hertwegi (Haeckel,1886) occurs in summer at 36°N.

Pterocorys macroceras (Popofski,1913)(Pl.XXXXIII fig.4) occurs in winter at 39°N

Theocorythium trachelium (Ehrenberg,1872)(Pl.XXXXIII fig.6-8) occurs in autumn at 52°N 26°W, 52°N, 50°N, 47°-45°N, 41°N, 38°N, 27°N 20°W, in winter at 48°N 23°W, 46°N 25°W, 45°N, 42°N, 40°N, 34°N, and in spring at 54°N 26°W, 51°N, 45°-43°N, 41°N.

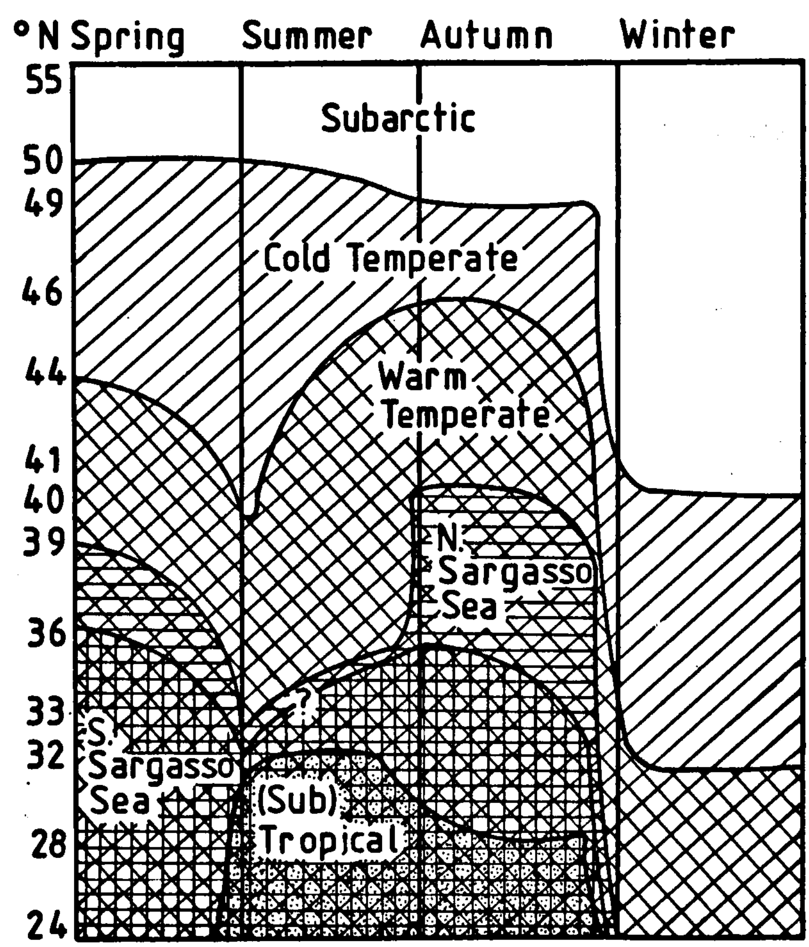
Theocorythium trachelium (Ehrenberg,1872) var. *dianae* (Haeckel) occurs in summer at 53°-50°N.

Theocyrtis turris Clebe,1900 (Pl.XXXXIV fig.1) occurs in winter at 52°N 19°W, 48°N 23°W, 44°N, 30°N, 30°N 28°W, and in spring at 45°N.

Fam. Artostrobiidae

Botryostrobus auritus (Ehrenberg,1844)(Pl.XXXXIV figs 4-6) is found in winter at 52°N 19°W, 48°N 23°W, 46°N 25°W, 44°N, 42°N, and in spring at 52°N 19°w, 45°-44°N.

Spirocyrtis cornutella (Haeckel,1887) occurs in autumn at 29°N.



Cannobotryidae

Amphimelissa setosa (Cleve,1900)(Pl.XXXXIV fig.2) occurs in spring at 52°N 19°W, 43°N.

Bisphaerocephalina armata Petrushevskaya,1965 (Pl.XXXXIV fig.3) is found in winter at 52°N 19°W, 48°N 23°W, 46°N 25°W, 44°N, and in spring at 45°-44°N.

Saccospyris spec.*A* (cf.Petrushevskaya,1971, Pl.78 fig.3) occurs in autumn at 29°N, 24°N, 25°N 28°W, and in spring at 24°N 28°W.

Fam. Challengeridae

Protocyrtis xiphodon var. *A* (Pl.XXXXIV fig.8) occurs in spring at 38°N, 37°N.

Protocyrtis xiphodon var. *B* (Pl.XXXXIV fig.7) occurs in spring at 51°N 13°W,52°N 17°W,53°N 24°W.

An evident correlation of radiolarian distribution with watermasses was not possible with the present material. For each season a subdivision in radiolarian faunas is made (see diagram above). The faunas of the upper 5 meters shift in geographic position with the seasons, in summer when the fauna is dominated by tropical and subtropical elements from southern latitudes the influence of the Sargasso Sea elements is relatively small in the investigated area. In autumn this southern fauna is represent around 27°N. Very remarkable is also that in winter the subarctic fauna penetrates into the whole area characterized by complete vertical winter-mixing downto 41°N. The distribution of individual species (fig.19) reflects of course also the seasonal shifts, though some show a coldwater preference (*Hexacontium enthacanthum* fig.19,G; *Trisulcus borealis* fig.19, I; *Theocorythium trachelium* fig.19, J; *Phormacantha hystrix* fig.19,L) or a warmwater preference (*Carpocanium amphora* fig.19,K). It are especially these species with preferences that were used to separate the radiolarian faunas.

ACKNOWLEDGEMENTS

The author is indepted to the commanders and crew of HMS "TYDEMAN" for their enthusiastic help during the collecting cruises. Mr A.F.De Fluiter is acknowledged for the preparation of the microscopical slides. The students F.Goessens, A.Kleyne ,M.van Zanen and P.J.van der Paverd are kindly acknowledged for identifying the Radiolaria and for preparing illustrations (Pl.XX-XXXIV).

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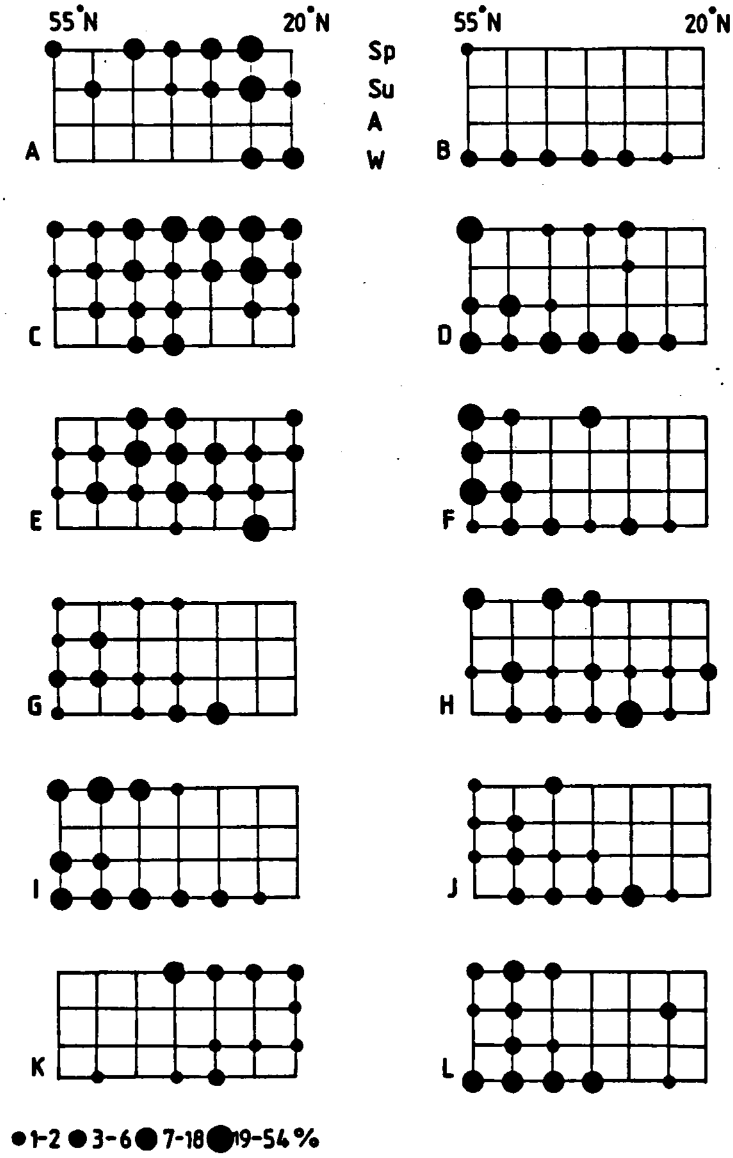


Figure 19 The average percentual abundance of radiolarian species in 5° latitude intervals along the N-S transect during the four seasons (Sp=spring, Su=summer, A=autumn, W=winter). A- *Siphonosphaera tuberosa*, B- *Arachnocorallium circumtextum*, C- *Sphaerozoum punctatum*, D- *Arachnocorys calvata*, *E-Collosphaera huxleyi*, F- *Phorticium clevei*, G- *Hexacanthium enthacanthum*, H- *Stylodycta multispina*, I *Trisulcus borealis*, J- *Theocorythium trachelium*, K- *Carpocanium amphora*, L- *Phormacantha hystrix*.

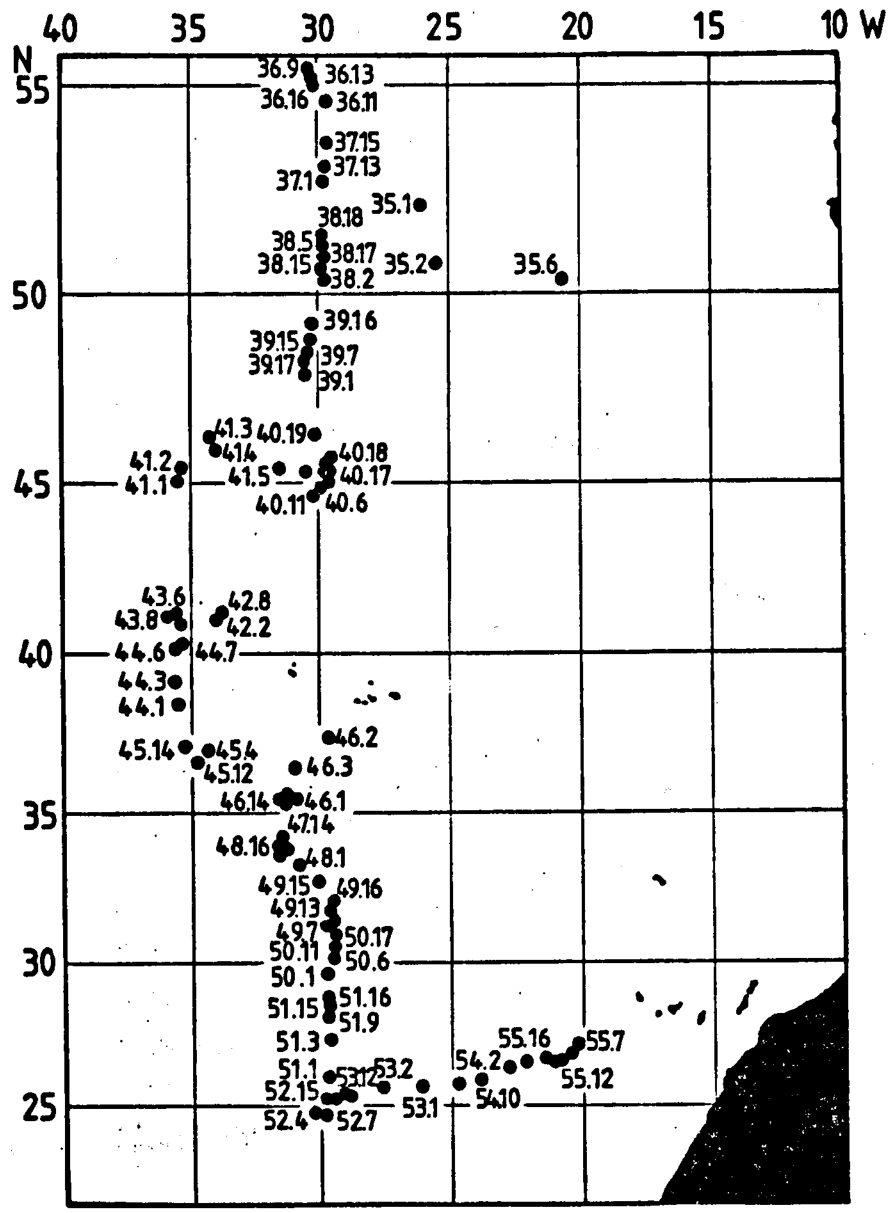


Figure 20 Position of stations and plankton pump samples in 1981

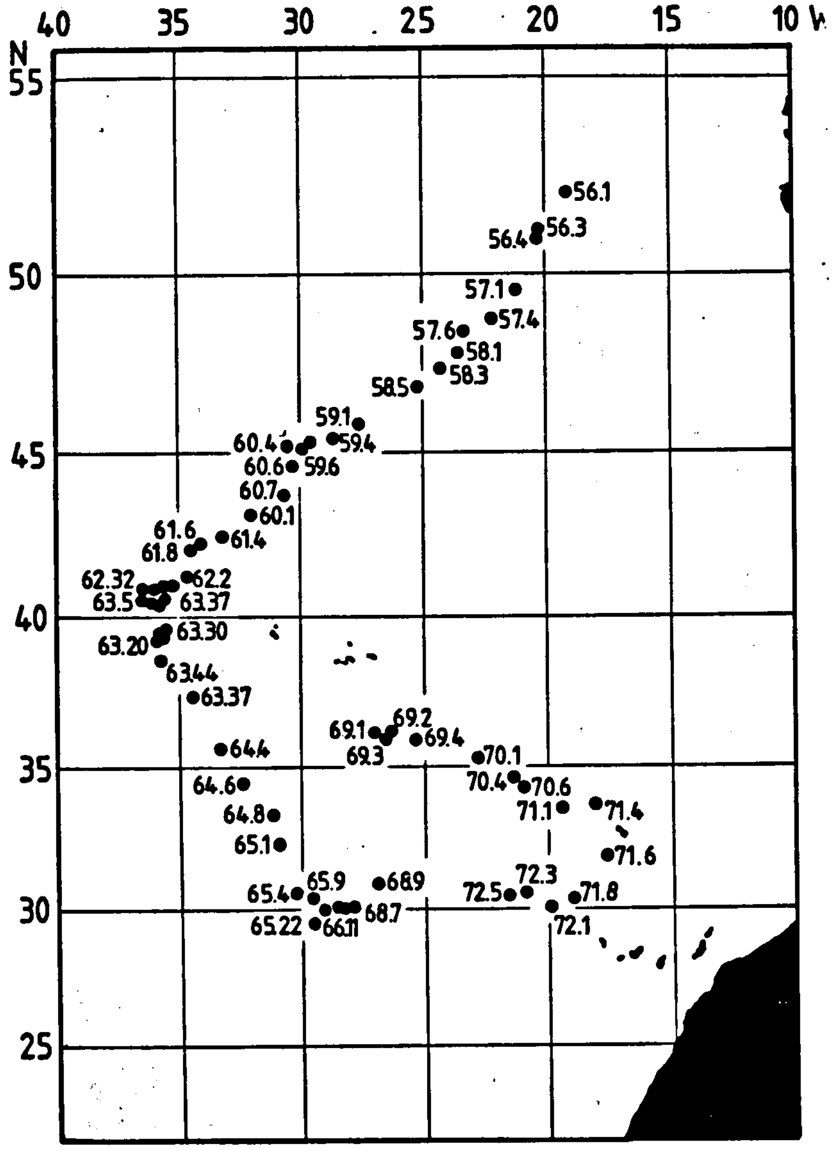


Figure 21 Position of stations and plankton pump samples in 1982

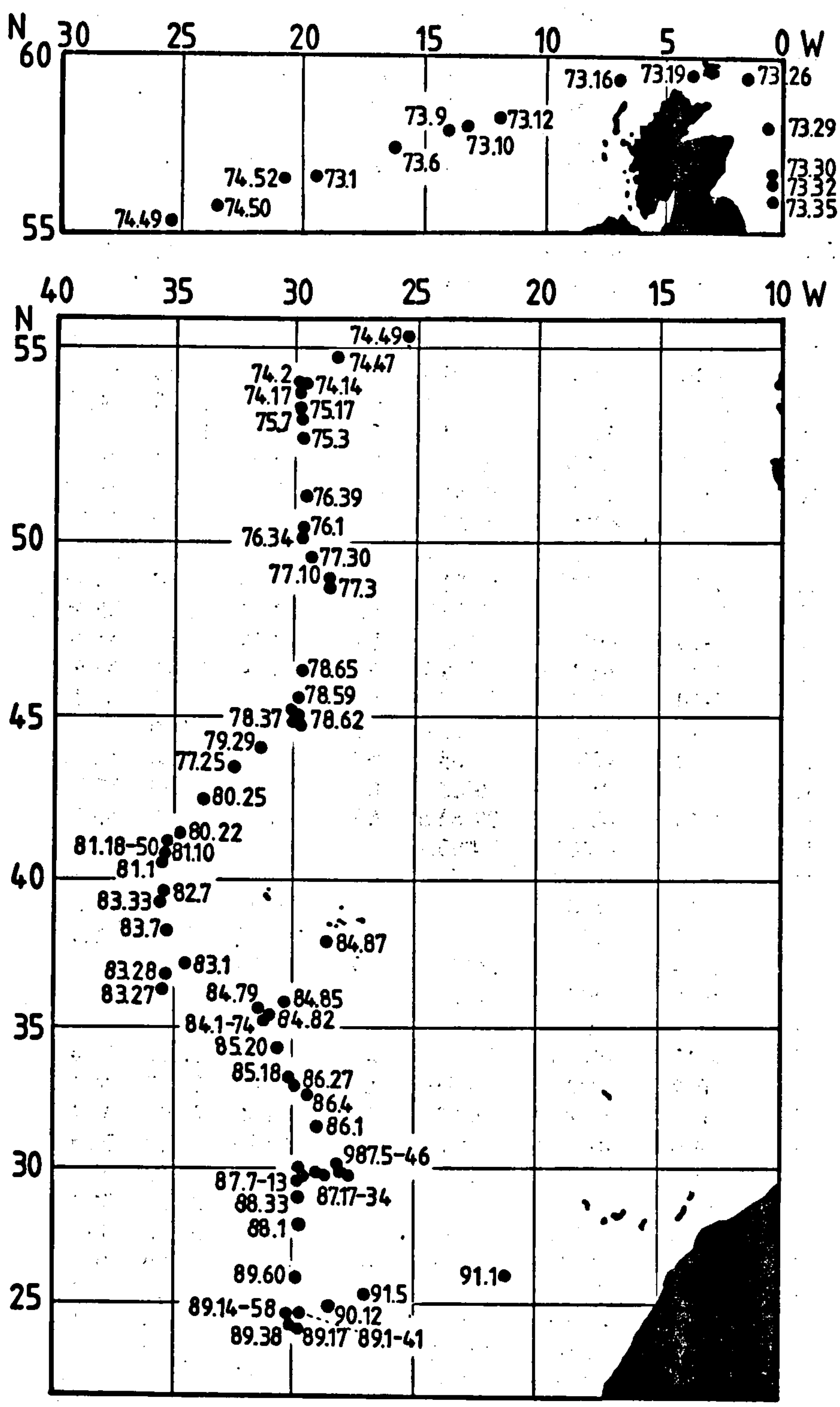


Figure 22A & B Position of stations and plankton pump samples in 1983.

Pump sample list for 1981

Stat.	Trawl	Date	Position North	South	Duration in min.	Time Start	Surface Temp.°C	Salinity
35	1	9-10	52°56.3	26°45.0	60	12.33	12.60	35.27
35	2	9-10	51°54.6	25°09.3	60	19.00	12.80	35.29
35	6	10-10	50°56.4	21°26.7	69	13.07	14.20	35.47
36	1	8-10	54°54.8	29°58.3	64	7.31	10.80	34.82
36	9	8-10	55°05.2	30°06.7	63	12.30	10.70	34.85
36	13	8-10	55°11.6	30°08.2	60	20.00	10.60	34.87
36	16	9-10	55°01.4	29°46.0	60	0.00	10.80	34.86
37	1	7-10	52°52.2	29°55.1	60	12.00	11.50	34.71
37	13	7-10	52°56.4	29°38.7	60	20.09	11.50	34.73
37	15	8-10	53°20.1	29°38.1	60	0.00	11.20	34.68
38	2	6-10	50°47.3	29°59.8	64	8.39	13.80	35.02
38	5	6-10	50°59.0	29°55.1	63	12.26	12.90	34.85
38	15	6-10	50°49.7	29°37.8	75	20.00	14.10	35.16
38	17	7-10	50°54.9	29°31.3	60	0.30	12.80	35.10
38	18	7-10	52°00.8	29°41.6	67	7.07	13.00	35.27
39	1	5-10	47°37.1	30°33.8	60	0.10	16.00	35.69
39	7	5-10	47°52.2	30°32.0	98	7.47	15.50	35.26
39	11	5-10	47°45.0	30°21.0	61	12.09	15.40	35.27
39	15	5-10	48°06.3	30°08.8	60	20.00	16.00	35.36
39	16	6-10	49°01.4	30°03.0	60	0.00	15.60	35.40
40	2	2-10	45°15.4	30°19.7	65	13.24	17.70	35.80
40	6	2-10	45°01.7	29°55.0	60	20.00	17.70	35.81
40	11	3-10	44°59.9	30°05.8	60	0.00	17.60	35.77
40	14	3-10	45°08.1	29°58.2	60	7.22	17.60	35.77
40	15	3-10	45°17.0	29°53.0	60	12.20	17.70	35.77
40	16	3-10	45°12.9	29°53.5	60	23.30	17.60	35.77
40	17	4-10	45°01.2	29°56.1	60	7.27	17.30	35.80
40	18	4-10	45°34.9	29°59.7	60	12.06	16.60	35.73
40	19	4-10	46°53.2	30°09.0	80	20.00	16.00	35.68
41	1	1-10	45°05.6	35°35.2	60	8.10	17.90	35.85
41	2	1-10	45°37.4	35°08.6	110	13.50	17.90	35.76
41	3	1-10	46°17.3	34°26.7	60	20.10	16.40	35.11
41	4	1-10	46°05.8	33°43.7	60	23.30	15.50	35.07
41	5	2-10	45°33.7	31°25.1	60	9.06	17.90	35.83
42	2	30-9	41°37.0	34°33.9	60	7.00	20.30	36.10
42	8	30-9	41°44.4	34°20.7	60	13.00	21.00	36.17
43	4	29-9	41°06.6	35°40.8	60	12.15	21.20	35.89
43	6	29-9	41°12.1	35°43.9	60	20.00	21.20	36.10
43	8	29-9	41°12.4	35°44.7	60	23.30	21.20	36.12
44	1	28-9	38°34.2	35°37.8	60	7.00	22.10	36.20
44	3	28-9	39°31.6	35°43.4	87	12.15	22.00	36.11
44	6	28-9	40°06.5	35°39.5	60	20.00	21.50	36.03
44	7	28-9	40°30.4	35°34.8	60	23.40	21.40	36.03
45	4	27-9	37°08.6	34°54.7	60	13.25	22.90	36.18
45	12	27-9	37°05.5	35°06.7	60	20.04	23.10	36.26
45	14	28-9	37°13.7	35°14.3	60	0.00	23.00	36.27
46	1	24-9	35°13.7	30°59.8	63	12.06	24.20	36.32
46	2	26-9	38°21.0	29°17.9	80	12.00	21.90	36.07
46	3	26-9	37°55.4	31°27.2	75	20.15	22.40	36.15
47	5	23-9	35°07.5	31°32.2	60	20.20	24.10	36.29
47	8	24-9	35°07.4	31°20.3	60	0.15	23.90	36.33
47	14	24-9	35°07.4	31°07.2	60	7.02	23.90	36.32
48	1	22-9	33°46.0	30°51.2	60	20.05	24.10	36.60
48	4	23-9	34°09.3	31°20.6	60	0.10	24.00	36.56
48	9	23-9	34°12.1	31°04.2	60	7.08	24.00	36.63

Pump sample list for 1981(continued)

Stat.	Trawl	Date	Position North	South	Duration in min.	Time Start	Surface Temp.°C	Salinity
48	14	23-9	34°11.5	31°11.0	60	12.00	24.00	36.66
48	16	23-9	34°18.0	31°13.5	30	13.50	24.30	36.65
49	4	21-9	31°42.9	29°43.2	60	20.00	24.90	36.67
49	7	22-9	31°44.9	29°34.3	60	0.00	24.90	36.60
49	13	22-9	31°53.7	29°23.3	60	7.12	24.80	36.62
49	14	22-9	32°41.5	29°49.7	60	12.09	24.50	36.54
49	15	22-9	33°19.2	30°15.9	30	16.05	23.80	36.56
50	1	20-9	29°46.5	29°50.1	60	12.10	25.40	37.12
50	6	20-9	30°06.6	29°45.7	60	20.00	25.20	37.14
50	11	21-9	30°12.3	29°40.0	86	1.00	25.50	37.15
50	17	21-9	31°05.9	29°46.0	70	12.04	25.00	36.75
51	1	19-9	26°38.2	29°53.3	61	7.18	24.70	37.34
51	3	19-9	27°32.7	29°51.9	60	12.04	25.10	37.20
51	9	19-9	28°05.2	29°52.1	60	20.00	25.20	37.23
51	15	20-9	28°17.5	29°53.2	60	3.45	25.10	37.26
51	16	20-9	28°43.6	29°52.2	60	6.58	25.10	37.11
52	4	18-9	24°52.9	30°01.1	62	7.08	25.20	37.53
52	7	18-9	24°56.9	29°54.8	75	12.05	25.30	37.54
52	15	18-9	25°04.2	29°58.5	60	20.03	25.30	37.56
52	16	18-9	25°04.3	29°52.3	60	23.14	25.20	37.54
53	1	17-9	25°36.5	26°34.3	60	7.15	24.60	37.32
53	2	17-9	25°23.1	27°37.7	60	12.00	25.00	37.32
53	12	17-9	25°09.8	28°31.9	60	20.00	25.10	37.63
53	14	17-9	25°07.8	28°42.2	65	23.00	25.10	37.61
54	1	16-9	26°35.0	22°15.1	60	7.05	24.30	36.92
54	2	16-9	26°22.6	23°21.3	62	12.08	24.50	36.77
54	10	16-9	26°09.7	23°26.3	62	19.25	24.40	37.25
54	12	17-9	26°02.0	23°57.5	60	24.00	24.40	37.23
55	7	15-9	27°07.0	20°06.6	20	7.55	23.50	36.84
55	8	15-9	27°05.2	20°10.4	60	9.40	23.50	36.82
55	9	15-9	27°02.4	20°18.0	40	12.05	23.60	36.85
55	12	15-9	26°59.5	20°26.0	60	17.00	23.70	36.86
55	16	15-9	26°56.2	20°37.2	60	21.30	23.70	36.77

all samples are filtered with 50 µ directly on tap

Pump sample list for 1982

Stat.	Trawl	Date	Position North	South	Duration in min.	Time Start	Surface Temp.°C	Salinity	
56	1	6-2	52°09.3	19°37.3	30	13.12	10.00	35.31	
56	2	6-2	52°09.1	19°37.7	141	13.14	10.00	35.31	*
56	3	6-2	51°31.5	20°10.4	30	18.00	11.20	35.46	
56	4	6-2	51°29.6	20°10.3	187	18.03	11.30	35.46	*
57	1	7-2	49°37.3	21°01.2	29	6.02	11.80	35.54	
57	2	7-2	49°37.1	21°01.6	140	6.04	11.70	35.54	*
57	3	7-2	48°57.0	22°12.6	35	12.00	11.80	35.55	
57	4	7-2	48°56.5	22°13.5	116	12.04	11.80	35.55	*
57	5	7-2	48°17.9	23°22.6	29	18.01	11.90	35.57	
57	6	7-2	48°17.8	23°22.6	114	18.02	11.90	35.57	*
58	1	8-2	47°36.5	23°28.3	30	5.57	12.00	35.57	
58	2	8-2	47°36.4	23°28.4	120	6.00	11.90	35.57	*
58	3	8-2	47°16.0	23°57.2	31	11.59	12.00	35.60	

Pump sample list for 1982(continued)

Stat.	Trawl	Date	Position North	South	Duration in min.	Time Start	Surface Temp.°C	Salinity	
58	4	8-2	47°16.1	23°56.9	123	11.57	12.00	35.60	*
58	5	8-2	46°49.1	25°05.2	30	18.00	12.30	35.64	
58	6	8-2	46°48.9	25°05.6	362	18.02	12.30	35.64	*
59	1	9-2	45°45.8	27°45.4	30	6.09	12.70	35.69	
59	2	9-2	45°45.7	27°45.8	346	6.11	12.70	35.69	*
59	3	9-2	45°26.5	28°54.8	30	12.00	12.60	35.66	
59	4	9-2	45°26.3	28°55.6	354	12.04	12.60	35.67	*
59	5	9-2	45°07.2	29°48.7	31	18.01	12.90	35.71	
59	6	9-2	45°07.0	29°48.0	356	18.03	12.90	35.70	*
60	1	10-2	45°00.1	29°47.6	28	0.02	12.90	35.71	
60	2	10-2	45°00.1	29°47.4	450	0.00	12.90	35.71	*
60	3	10-2	45°04.4	30°04.1	30	7.30	12.80	35.72	
60	4	10-2	45°04.1	30°04.2	265	7.35	12.80	35.73	*
60	5	10-2	44°42.9	30°38.5	30	12.01	12.70	35.73	
60	6	10-2	44°43.0	30°38.3	356	12.00	12.80	35.73	*
60	7	10-2	43°59.9	31°43.9	350	18.13	13.20	35.81	*
61	1	11-2	43°15.2	32°45.1	30	0.00	13.80	35.92	
61	2	11-2	43°14.6	32°45.9	356	0.00	13.80	35.93	*
61	3	11-2	42°40.5	33°37.6	30	6.00	14.30	36.02	
61	4	11-2	42°40.3	33°38.0	356	6.05	14.30	36.02	*
61	5	11-2	42°15.1	34°13.9	28	12.02	13.70	35.91	
61	6	11-2	42°15.0	34°14.0	352	12.05	13.70	35.90	*
61	7	11-2	42°00.8	34°22.6	364	18.02	14.20	36.01	
61	8	11-2	42°00.8	34°22.6	359	18.01	14.20	36.00	*
62	1	12-2	41°36.9	34°47.0	30	0.06	14.60	36.08	
62	2	12-2	41°37.0	34°46.9	354	0.05	14.60	36.08	*
62	3	12-2	41°12.6	35°37.3	30	6.00	14.70	36.05	
62	4	12-2	41°12.5	35°37.6	362	6.01	14.70	36.05	*
62	5	12-2	40°59.4	35°45.8	50	12.00	14.90	36.08	
62	6	12-2	40°59.4	35°45.7	357	12.03	14.90	36.08	*
62	9	12-2	40°55.1	35°39.9	31	17.59	15.00	35.94	
62	10	12-2	40°55.1	35°39.9	360	18.01	15.00	35.93	*
62	14	13-2	40°47.1	35°42.6	31	0.00	15.00	36.12	
62	15	13-2	40°47.1	35°42.7	363	0.02	15.00	36.13	*
62	20	13-2	40°41.7	35°47.4	30	6.05	15.30	36.14	
62	21	13-2	40°41.7	35°47.4	357	6.05	15.30	36.14	*
62	26	13-2	40°54.6	35°36.6	84	11.59	15.30	36.14	
62	28	13-2	40°54.6	35°36.6	426	12.03	15.20	36.14	*
62	29	13-2	40°48.7	35°36.0	293	19.10	15.00	36.10	*
62	30	14-2	40°55.8	35°40.1	29	0.01	15.20	36.10	
62	31	14-2	40°55.8	35°40.2	356	0.04	15.10	36.10	*
62	32	14-2	40°54.5	35°36.3	30	5.55	15.10	36.09	
62	33	14-2	40°54.2	35°35.4	365	6.00	15.10	36.10	*
62	35	14-2	40°56.8	35°35.1	30	12.05	14.80	36.07	
62	36	14-2	40°56.7	35°35.3	351	12.10	14.90	36.06	*
62	41	14-2	40°57.6	35°31.7	60	18.00	14.90	36.05	
62	42	14-2	40°57.6	35°31.7	362	18.02	14.90	36.05	*
63	1	15-2	40°58.4	35°44.2	358	0.04	15.20	36.08	*
63	2	15-2	40°40.0	35°47.8	30	6.00	14.90	36.08	
63	3	15-2	40°39.8	35°48.7	362	6.05	14.90	36.08	*
63	4	15-2	40°15.3	35°57.0	31	12.09	15.20	36.05	
63	5	15-2	40°15.5	35°57.0	350	12.08	15.20	36.05	*
63	10	15-2	39°45.9	35°54.5	30	18.00	15.10	36.10	
63	11	15-2	39°45.9	35°54.5	370	17.59	15.10	36.10	*
63	12	15-2	39°44.8	35°52.8	37	18.36	15.10	36.08	

Pump sample list for 1982(continued)

Stat.	Trawl	Date	Position North	South	Duration in min.	Time Start	Surface Temp.°C	Salinity	
63	16	16-2	39°39.2	35°43.9	28	0.08	15.00	36.07	
63	17	16-2	39°40.3	35°45.2	335	0.30	15.00	36.07	*
63	18	16-2	39°48.7	35°51.9	31	6.05	14.90	36.08	
63	19	16-2	39°48.7	35°51.9	361	6.04	14.90	36.08	*
63	20	16-2	39°51.2	36°06.7	30	12.05	14.90	36.09	
63	21	16-2	39°51.3	36°07.0	350	12.10	14.90	36.08	*
63	22	16-2	39°53.4	35°43.6	30	18.04	15.20	36.09	
63	23	16-2	39°53.4	35°44.2	364	18.01	15.20	36.10	*
63	25	17-2	39°46.9	35°48.8	31	0.14	15.00	36.12	
63	26	17-2	39°46.9	35°48.6	368	0.16	15.00	36.11	*
63	29	17-2	39°32.8	35°41.5	43	6.21	15.10	36.12	
63	30	17-2	39°32.7	35°41.4	337	6.25	15.10	36.11	*
63	33	17-2	39°24.2	35°34.0	41	12.04	15.50	36.09	
63	34	17-2	39°24.3	35°34.0	367	12.03	15.50	36.11	*
63	35	17-2	38°25.1	35°57.6	30	18.05	16.10	36.18	
63	36	17-2	38°24.1	35°56.9	350	18.10	16.10	36.18	*
63	37	15-2	40°58.4	35°44.2	30	0.03	15.20	36.08	
64	1	18-2	37°09.3	34°07.6	30	0.04	16.50	36.30	
64	2	18-2	37°09.3	34°07.6	366	0.04	16.50	36.30	*
64	3	18-2	35°50.4	33°22.6	30	6.06	16.60	36.10	
64	4	18-2	35°49.2	33°22.1	354	6.11	16.00	36.08	*
64	5	18-2	34°35.1	32°44.8	31	12.04	16.50	36.12	
64	6	18-2	34°34.6	32°44.5	345	12.06	16.50	36.12	*
64	7	18-2	33°23.9	31°59.3	30	17.37	17.50	36.23	
64	8	18-2	33°20.5	31°57.3	369	17.51	17.90	36.16	*
65	1	19-2	32°01.1	31°01.9	30	0.00	18.20	35.48	
65	2	19-2	32°01.1	31°01.9	364	0.00	18.20	36.50	*
65	3	19-2	30°43.6	30°08.8	30	6.01	18.50	36.51	
65	4	19-2	30°43.0	30°08.3	361	6.04	18.50	36.48	*
65	8	19-2	30°04.5	29°46.4	30	12.06	18.70	36.64	
65	9	19-2	30°04.4	29°46.4	348	12.12	18.60	36.64	*
65	16	19-2	29°57.4	29°46.4	30	18.00	19.40	36.71	
65	17	19-2	29°57.3	29°46.4	357	18.05	19.30	36.71	*
65	21	20-2	29°59.4	29°34.6	30	0.00	18.80	36.71	
65	22	20-2	29°59.4	29°34.4	420	0.03	18.80	36.72	*
66	6	20-2	30°00.8	29°20.2	33	7.01	19.10	36.76	
66	7	20-2	30°00.8	29°20.1	304	7.04	19.10	36.76	*
66	10	20-2	30°02.4	29°10.2	30	12.03	19.40	36.81	
66	11	20-2	30°02.4	29°10.6	358	12.12	19.40	36.81	*
67	2	20-2	30°00.3	28°40.5	30	18.10	19.40	36.78	
67	3	20-2	30°00.3	28°40.5	360	18.10	19.40	36.78	*
68	2	21-2	30°02.3	28°13.0	30	0.10	19.10	36.77	
68	3	21-2	30°02.3	28°13.0	422	0.10	19.10	36.77	*
68	6	21-2	30°20.8	27°51.4	57	7.11	19.00	36.79	
68	7	21-2	30°21.3	27°51.3	307	7.13	19.00	36.79	*
68	8	21-2	31°39.7	27°43.5	110	12.25	18.30	36.60	
68	9	21-2	31°40.2	27°43.5		12.27	18.40	36.62	*
69	1	22-2	36°36.0	27°53.4	30	12.02	15.70	36.06	
69	2	22-2	36°36.0	27°53.2	363	12.03	15.70	36.05	*
69	3	22-2	36°33.4	27°46.0		12.35	15.70	36.11	
69	4	22-2	36°06.2	25°33.1	27	18.04	17.00	36.31	
70	1	23-2	35°04.7	23°00.3	30	7.25	16.30	36.33	
70	2	23-2	35°04.7	23°00.3	278	7.25	16.30	36.33	*
70	3	23-2	34°35.6	21°55.0	30	12.00	17.10	36.36	
70	4	23-2	34°35.3	21°54.5	356	12.02	17.10	36.37	*

Pump sample list for 1982(continued)

Stat.	Trawl	Date	Position North	South	Duration in min.	Time Start	Surface Temp.°C	Salinity	
70	5	23-2	34°15.9	21°10.7	35	18.00	17.50	36.32	
70	6	23-2	34°16.1	21°11.0	369	17.59	17.50	36.32	*
71	1	24-2	33°39.1	19°39.5	29	0.06	18.00	36.66	
71	2	24-2	33°38.9	19°39.0	357	0.08	18.00	36.65	*
71	3	24-2	33°02.1	18°12.0	28	6.02	17.60	36.51	
71	4	24-2	33°01.5	18°10.5	354	6.08	17.60	36.51	*
71	5	24-2	31°48.9	18°30.9	44	12.00	18.10	36.65	
71	6	24-2	31°48.5	18°31.1	367	12.02	18.10	36.66	*
71	7	24-2	30°33.7	19°05.8	29	18.07	18.50	36.69	
71	8	24-2	30°33.4	19°05.9	353	18.09	18.50	36.70	*
72	1	25-2	30°12.2	20°07.3	30	0.01	18.60	36.71	
72	2	25-2	30°12.3	20°07.5	360	0.02	18.60	36.71	*
72	3	25-2	30°39.4	21°38.2	30	6.01	18.70	36.71	
72	4	25-2	30°39.5	21°38.4	361	6.02	18.70	36.71	*
72	5	25-2	30°45.2	21°55.4		7.14	18.70	36.71	
72	6	25-2	30°46.3	22°03.0	63	12.02	18.80	36.73	
72	7	25-2	30°45.9	22°03.6		13.34	19.00	36.58	*

* filtered with 50µ dierectly on tap on deck wash system

Pump sample list for 1983

Stat.	Trawl	Date	Position North	South	Duration in min.	Time Start	Surface Temp.°C	Salinity	
73	1	20-6	56°43.4	19°28.8	30	16.46	10.20	35.16	**
73	2	20-6	56°43.4	19°28.8	30	16.46	10.20	35.16	***
73	6	21-6	57°02.0	16°45.4	30	0.00	10.50	35.25	**
73	7	21-6	57°02.1	16°44.7	30	0.02	10.50	35.24	***
73	8	21-6	57°28.9	14°16.1	30	6.24	10.40	35.13	**
73	9	21-6	57°29.1	14°14.9	30	6.27	10.40	34.99	***
73	10	21-6	57°32.0	13°57.4	30	7.11	10.40	35.05	**
73	11	21-6	57°32.0	13°57.4	30	7.11	10.40	35.05	***
73	12	21-6	57°43.4	12°28.5	30	10.53	10.90	35.31	**
73	13	21-6	57°43.4	12°28.5	30	10.53	10.90	35.31	***
73	14	21-6			30	18.47			**
73	15	21-6			30	18.47			***
73	16	22-6	58°30.4	7°07.5	30	0.07	11.10		**
73	17	22-6	58°30.4	7°06.7	30	0.09	11.20		***
73	18	22-6	58°43.8	4°34.6	30	6.01	9.60		**
73	19	22-6	58°43.8	4°34.4	29	6.02	9.60		***
73	26	22-6	58°28.4	2°26.4	30	11.02	10.40	34.71	**
73	27	22-6	58°28.4	2°26.6	30	11.03	10.40	34.71	***
73	28	22-6	57°30.3	1°11.0	30	16.48	10.80	34.70	**
73	29	22-6	57°30.3	1°11.0	30	16.50	10.80	34.70	***
73	30	22-6	56°57.0	0°23.8	30	20.06	11.20	34.69	**
73	31	22-6	56°57.0	0°23.8	30	20.06	11.20	34.69	***
73	32	23-6	56°12.5	0°29.2	30	00.0	11.60		**
73	33	23-6	56°12.5	0°29.2	30	00.3	11.60		***
73	34	23-6	55°11.8	0°15.5	30	6.00	11.80		**
73	35	23-6	55°11.8	0°15.5	30	6.02	11.80		***
73	36	23-6				16.49			**
73	37	23-6				16.50			***
74	2	18-6	54°23.7	29°59.7	30	19.56	8.70	34.80	*
74	3	18-6	54°23.8	29°59.7	30	19.59	8.70	34.82	**
74	8	18-6	54°23.6	29°56.5	30	23.55	8.70	34.90	**

Pump sample list for 1983(continued)

Stat.	Trawl	Date	Position North	South	Duration in min.	Time Start	Surface Temp.°C	Salinity	
74	9	18-6	54°23.5	29°56.4	30	23.57	8.70	34.93	***
74	13	19-6	54°24.1	29°48.6	30	6.05	8.60	34.90	**
74	14	19-6	54°24.2	29°48.6	30	6.08	8.60	34.93	***
74	17	19-6	54°21.9	29°44.5	30	10.46	8.50	34.84	**
74	18	19-6	54°21.9	29°44.4	30	10.49	8.50	34.86	***
74	46	19-6	54°42.3	28°07.8	41	16.43	9.30	34.99	**
74	47	19-6	54°42.3	28°07.8	41	16.43	9.30	34.99	***
74	48	19-6	55°23.9	25°37.0	30	23.59	10.20	35.21	**
74	49	20-6	55°54.2	25°35.9	30	0.02	10.10	35.22	***
74	50	20-6	55°52.9	23°26.0	30	6.00	9.90	35.16	**
74	51	20-6	55°52.9	23°26.0	30	6.00	9.90	35.16	***
74	52	20-6	56°17.2	21°40.5	28	10.46	10.70	35.26	**
74	53	20-6	56°18.0	21°36.3		10.58	10.80	35.28	***
75	2	18-6	52°58.2	29°52.9	30	8.45	12.20	34.70	**
75	3	18-6	52°58.4	29°52.7	30	8.50	12.20	34.70	***
75	7	18-6	53°02.5	29°52.0	30	10.49	12.20	34.71	**
75	8	18-6	53°02.6	29°52.1	30	10.51	12.20	34.71	***
75	16	18-6	54°07.5	29°56.4	30	17.28	8.60	34.78	**
75	17	18-6	54°07.5	29°56.4	30	17.28	8.60	34.78	***
76	1	16-6	50°26.5	29°39.8	15	19.35	12.80	35.14	*
76	2	16-6	50°26.4	29°39.6	15	19.39	12.80	35.15	**
76	22	16-6	50°19.6	29°34.9	28	23.56	13.20	35.23	**
76	23	16-6	50°19.6	29°34.9	28	23.57	13.20	35.21	***
76	24	17-6	50°03.1	29°37.2	30	7.15	13.30	35.25	**
76	25	17-6	50°03.0	29°37.2	30	7.19	13.30	35.24	***
76	27	17-6	50°20.5	29°27.5	30	10.15	13.10	35.44	
76	28	17-6	50°19.9	29°25.0	30	10.45	13.20	35.46	**
76	29	17-6	50°19.8	29°24.7	30	10.48	13.20	35.43	**
76	33	17-6	50°28.0	29°29.5	30	16.48	12.50	35.14	**
76	34	17-6	50°28.0	29°29.5	30	16.50	12.50	35.17	***
76	38	17-6	51°13.8	29°26.5	30	23.34	12.20	34.91	**
76	39	17-6	51°14.0	29°26.6	30	23.35	12.20	34.91	***
77	2	16-6	48°58.2	28°59.3	30	6.03	12.70	35.20	***
77	3	16-6	48°58.3	28°59.3	30	6.06	12.70	35.23	**
77	6	16-6	49°00.8	28°59.7	30	7.12	12.50	35.16	
77	9	16-6	49°02.6	28°59.1	30	10.46	12.50	35.20	**
77	10	16-6	49°02.6	28°59.2	30	10.49	12.50	35.21	***
77	29	16-6	49°55.4	29°26.4	30	16.45	13.50	35.40	**
77	30	16-6	49°56.1	29°26.5	30	16.48	13.40	35.37	***
78	2	14-6	44°59.4	30°00.3	30	6.00	15.60	36.00	**
78	3	14-6	44°59.4	30°02.9	31	6.01	15.60	36.00	***
78	12	14-6	44°57.6	29°54.2	30	12.48	15.60	35.72	**
78	13	14-6	44°57.7	29°54.2	30	12.51	15.60	35.73	***
78	37	14-6	45°00.8	29°57.1	25	17.06	15.70	35.50	**
78	38	14-6	45°00.9	29°57.2	25	17.09	15.70	35.52	***
78	40	14-6	45°02.6	30°05.7	30	20.05	15.90	35.76	*
78	41	14-6	45°02.6	30°05.8	30	20.07	15.90	35.72	**
78	51	15-6	44°57.1	30°03.8	30	0.47	15.70	35.47	**
78	52	15-6	44°57.1	30°03.7	29	0.49	15.70	35.46	***
78	58	15-6	45°00.4	29°55.4	30	6.05	15.50	35.55	**
78	59	15-6	45°00.5	29°55.8	30	6.15	15.50	35.57	***
78	61	15-6	45°25.8	29°52.1	30	12.22	15.80	35.85	**
78	62	15-6	45°26.5	29°51.9	30	12.25	15.80	35.85	***
78	64	15-6	46°23.5	29°37.4	30	16.54	15.10	35.46	**
78	65	15-6	46°23.5	29°37.4	30	16.54	15.10	35.46	***

Pump sample list for 1983(continued)

Stat.	Trawl	Date	Position North	South	Duration in min.	Time Start	Surface Temp.°C	Salinity	
79	20	13-6	43°26.4	32°25.3	42	14.00	16.60	35.69	**
79	21	13-6	43°26.4	32°25.2	41	14.01	16.60	35.70	***
79	24	13-6	43°29.2	32°15.1	30	16.49	16.70	35.62	**
79	25	13-6	43°29.3	32°15.1	30	16.51	16.70	35.60	***
79	28	14-6	44°13.3	31°15.3	30	0.00	15.70	35.78	**
79	29	14-6	44°13.6	31°14.9	30	0.02	15.70	35.76	***
80	22	13-6	41°40.8	34°47.1	30	0.00	17.00	35.62	**
80	23	13-6	41°40.9	34°47.1	30	0.02	17.00	35.73	***
80	24	13-6	42°30.5	33°43.2	30	6.29	16.90	35.87	**
80	25	13-6	42°30.8	33°43.0	30	6.31	16.90	35.87	***
81	1	11-6	40°31.4	35°30.8	30	16.45	18.70	36.14	**
81	2	11-6	40°31.8	35°30.8	30	16.47	18.70	36.14	***
81	5	11-6	40°54.4	35°30.7	30	18.50	18.90	36.16	**
81	9	12-6	41°02.9	35°29.2	37	0.45	18.30	36.43	**
81	10	12-6	41°02.9	35°29.2		0.45	18.30	36.43	***
81	18	12-6	40°58.6	35°27.7	32	6.19	17.90	36.12	**
81	19	12-6	40°58.6	35°27.8	31	6.21	17.90	36.13	***
81	23	12-6	40°59.4	35°27.6	42	11.07	17.90	36.24	**
81	24	12-6	40°59.4	35°27.6	41	11.10	17.90	36.23	***
81	33	12-6	40°59.1	35°26.2	30	12.44	17.90	36.18	*
81	34	12-6	40°59.0	35°26.1	30	12.47	18.00	36.18	**
81	49	12-6	41°13.7	35°18.0	30	16.47	18.30	36.02	**
81	50	12-6	41°14.2	35°17.4	30	16.50	18.30	36.01	***
82	6	11-6	39°49.3	35°34.1	30	10.46	19.00	36.39	**
82	7	11-6	39°49.4	35°34.2	30	10.48	19.00	36.39	**
83	1	10-6	37°15.1	34°31.9	30	8.01	18.80	35.89	**
83	2	10-6	37°15.0	34°32.2	30	8.02	18.80	35.84	***
83	3	10-6	37°03.0	35°18.6	31	10.56	19.40	36.21	**
83	4	10-6	37°02.7	35°19.6	30	11.00	19.50	36.20	***
83	5	10-6	37°01.8	35°23.1	30	12.04	19.60	36.25	
83	6	10-6	37°01.9	35°22.4	30	12.38	19.70	36.27	*
83	7	10-6	37°01.9	35°22.3	31	12.39	19.70	36.28	**
83	27	10-6	36°48.8	35°32.0	30	16.45	20.00	36.31	**
83	28	10-6	36°58.9	35°32.1	30	16.48	20.00	36.31	***
83	30	11-6	38°12.4	35°31.9	30	0.02	19.20	36.32	**
83	31	11-6	38°12.4	35°31.9	30	0.02	19.20	36.32	***
83	32	11-6	39°31.9	35°29.8	30	6.13	18.50	36.29	**
83	33	11-6	39°32.3	35°29.9	30	6.15	18.50	36.29	***
84	1	5-6	35°04.7	31°25.8	30	10.31	18.50	36.57	**
84	2	5-6	35°04.8	31°25.9	30	10.33	18.60	36.57	***
84	5	5-6	35°06.1	31°27.6	30	14.07	18.80	36.57	
84	26	5-6	35°09.9	31°31.4	30	16.51	18.90	36.54	**
84	27	5-6	35°09.9	31°31.4	30	16.50	18.90	36.54	***
84	33	6-6	35°12.3	31°25.6	39	0.10	18.80	36.52	**
84	34	6-6	35°12.3	31°25.6	39	0.11	18.80	36.52	***
84	38	6-6	35°11.4	31°30.5	30	6.01	18.60	36.44	**
84	39	6-6	35°11.4	31°30.4	30	6.03	18.60	36.43	***
84	43	6-6	35°10.9	31°29.6	47	9.18	18.60	36.47	*
84	44	6-6	35°10.9	31°29.6	47	9.18	18.60	36.47	**
84	46	6-6	35°11.2	31°34.2	30	11.05	18.50	36.43	**
84	47	6-6	35°11.2	31°34.2	30	11.07	18.50	36.43	***
84	48	6-6	35°10.4	31°33.9	30	16.45	18.70	36.44	**
84	49	6-6	35°10.7	31°34.0	30	16.47	18.70	36.43	***
84	73	7-6	35°08.8	31°24.3	43	0.15	18.70	36.44	**
84	74	7-6	35°08.8	31°24.3	43	0.15	18.70	36.44	***

Pump sample list for 1983(continued)

Stat.	Trawl	Date	Position North	South	Duration in min.	Time Start	Surface Temp.°C	Salinity	
84	78	7-6	35°10.5	31°36.1	30	6.24	18.70	36.28	**
84	79	7-6	35°10.5	31°36.1	30	6.26	18.70	36.28	***
84	82	7-6	35°47.6	31°56.0	30	10.45	18.70	36.20	**
84	83	7-6	35°47.9	31°05.3	30	10.47	18.70	36.20	***
84	84	7-6	36°28.0	30°31.0	30	16.45	19.90	36.19	**
84	85	7-6	36°28.0	30°31.0	30	16.47	20.00	36.20	***
84	86	8-6	38°12.3	28°51.8	30	6.29	16.90	36.24	**
84	87	8-6	38°12.6	28°51.6	30	6.31	16.90	36.24	***
85	16	5-6	33°32.6	30°13.0	35	0.16	19.40	36.67	**
85	17	5-6	33°32.6	30°13.0	35	0.17	19.40	36.69	***
85	18	5-6	33°33.5	30°13.6	35	0.55	18.20	36.69	
85	19	5-6	34°19.6	30°51.0	28	6.16	19.00	36.60	**
85	20	5-6	34°19.8	30°51.1	27	6.17	19.00	36.60	***
86	1	3-6	31°24.6	28°52.9	36	23.59	20.20	36.79	**
86	2	4-6	31°24.8	28°53.0	36	0.00	20.20	36.79	***
86	4	4-6	32°48.4	29°49.2	33	8.19	20.10	36.77	**
86	5	4-6	32°48.4	29°49.2	33	8.19	20.10	36.77	***
86	6	4-6	32°49.9	29°50.4	28	9.03	20.00	36.77	
86	24	4-6	32°57.8	29°56.8	28	15.32	19.70	36.72	*
86	25	4-6	32°57.8	29°56.9	27	15.33	19.70	36.72	**
86	26	4-6	33°06.8	30°01.1	30	16.45	19.80	36.59	**
86	27	4-6	33°07.0	30°01.2	30	16.46	19.80	36.58	***
87	7	2-6	29°59.2	29°41.8	42	0.14	21.20	36.85	**
87	8	2-6	29°59.1	29°41.8	42	0.15	21.20	36.85	***
87	9	2-6	29°58.4	29°38.9	47	1.32	20.90	36.84	
87	12	2-6	29°59.0	29°30.6	37	6.13	20.90	36.85	**
87	13	2-6	29°59.0	29°30.6	37	6.13	20.90	36.85	***
87	17	2-6	30°00.4	29°21.3	30	10.45	21.00	36.88	**
87	18	2-6	30°00.5	29°21.2	30	10.47	21.00	36.88	***
87	28	2-6	30°02.0	29°15.2	32	13.58	21.40	36.88	**
87	29	2-6	30°02.0	29°15.1	31	13.59	21.40	36.88	***
87	33	2-6	30°01.3	29°07.1	30	16.45	21.80	36.87	**
87	34	2-6	30°01.3	29°07.1	31	16.45	21.80	36.87	***
987	5	3-6	29°58.9	28°06.5	30	0.00	21.50	36.91	**
987	10	3-6	29°58.9	27°50.1	42	6.18	21.40	36.89	**
987	11	3-6	29°58.9	27°50.1	41	6.19	21.40	36.90	***
987	27	3-6	29°58.5	27°45.1	30	11.02	21.20	36.76	**
987	28	3-6	29°58.5	27°45.1	31	11.01	21.20	36.81	***
987	44	3-6	30°13.4	27°57.1	30	17.02	21.40	36.81	**
987	45	3-6	30°13.6	27°57.2	30	17.03	21.50	36.81	***
987	46	3-6	29°58.9	28°06.5	30	0.02	21.50	36.91	***
88	1	1-6	27°40.7	29°54.4	30	0.17	22.20	36.92	**
88	2	1-6	27°41.3	29°54.4	30	0.20	22.10	36.90	***
88	3	1-6	27°58.5	29°52.7	41	1.40	21.80	36.88	
88	7	1-6	28°33.2	29°50.4	52	7.27	21.90	37.05	**
88	8	1-6	28°33.2	29°50.4	55	7.28	22.00	37.05	***
88	11	1-6	28°34.3	29°51.7	30	10.45	22.10	37.06	**
88	12	1-6	28°34.3	29°51.7	30	10.46	22.10	37.05	***
88	33	1-6	29°23.5	29°48.8	30	16.49	22.70	37.01	**
88	34	1-6	29°23.0	29°48.8	30	16.47	22.50	37.00	***
89	1	30-5	24°51.0	29°41.1	38	3.11	22.40	37.23	**
89	2	30-5	24°50.8	29°44.0	30	3.23	22.40	37.22	***
89	5	30-5	24°50.0	29°57.5	35	5.57	22.40	37.29	
89	6	30-5	24°49.8	29°59.4	34	6.38	22.50	37.30	**
89	7	30-5	24°49.8	29°59.1	34	6.38	22.50	37.30	***

Pump sample list for 1983(continued)

Stat.	Trawl	Date	Position North	South	Duration in min.	Time Start	Surface Temp.°C	Salinity	
89	14	30-5	24°49.6	30°05.0	30	10.56	22.60	37.29	**
89	15	30-5	24°49.6	30°05.1	31	10.57	22.60	37.29	***
89	17	30-5	24°49.0	29°58.5	32	14.12	22.70	37.29	•
89	18	30-5	24°49.0	29°58.5	33	14.14	22.70	37.30	••
89	30	30-5	24°53.1	30°03.2	30	19.37	22.60	37.29	**
89	31	30-5	24°53.1	30°03.2	31	19.38	22.60	37.30	***
89	37	31-5	24°47.5	30°01.6	25	0.11	22.60	37.28	**
89	38	31-5	24°47.5	30°01.6	26	0.11	22.60	37.28	***
89	40	31-5	24°51.9	29°57.4	26	6.04	22.30	37.27	**
89	41	31-5	24°51.9	29°57.1	28	6.04	22.30	37.27	***
89	55	31-5	24°51.8	30°02.9	30	10.45	22.50	37.29	**
89	56	31-5	24°52.0	30°02.9	30	10.4	22.50	37.29	***
89	58	31-5	24°53.0	30°02.9	30	11.17	22.50	37.28	
89	59	31-5	26°02.5	29°58.1	30	16.45	22.70	37.09	**
89	60	31-5	26°03.0	29°58.1	30	16.47	22.60	37.09	***
90	9	29-5	24°52.2	28°32.2	32	16.03	21.70	37.27	
90	11	29-5	24°51.4	28°35.2	30	16.44	21.70	37.27	**
90	12	29-5	24°51.4	28°35.3	29	16.48	21.70	37.27	***
91	1	28-5	26°26.8	22°42.5	12	13.12	20.20	37.21	**
91	4	29-5	25°04.6	27°53.7	30	10.55	21.60	37.39	**
91	5	29-5	25°04.6	27°53.7	30	10.55	21.60	37.39	***

** filtered in filter house with 50µ in lab. 2
*** filtered in filter house with 50µ with deck wah system
• filtered. in filter house with 10µ in lab. 2
•• filtered in filter house with 10µ with deck wah system

PLATES

Plate I

Fig.1	cf. *Pneumodermopsis* St.70 tr.4
Fig.2	cf. *Pneumoderma* St.69 tr.5
Fig.3	cf *Limacina inflata* St.69 tr.5
Fig.4	*Cavolinia gibbosa* St.69 tr.2
Fig.5	*Cuvierina columnella* St.62 tr.9
Fig.6	*Creseis virgula* St.69 tr.5
Fig.7	*Cresies acicula* St.71 tr.2
Fig.8	*Creseis* spec. St.69 tr.5
Fig.9	*Creseis virgula* St.69 tr.5
Fig.10	*Clio pyramidata lanceolata* St.69 tr.5
Fig.11	*Styliola subula* St. 69 tr.5
Fig.12	*Clione* St.73 tr.8
Fig.13	*Diacria trispinosa* St.19 tr.12
Fig.14	*Clio pyramidata pyramidata* St.10 tr.16
Fig.15	cf. *Diacria danae* juv. St.78 tr.37
Fig.16	*Styliola subula* St.64 tr.4
Fig.17	Lamellibranchia St. 8 tr.1
Fig.18	Lamellibranchia St.69 tr.5

Plate II

Codonella galea showing the variablity in the species

Figs. 1,2,3,7	St.35 tr.6
Figs. 4,5,6	St.65 tr.4
Figs. 8,9	St.40 tr.14

Plate III

Fig.1	*Codonaria cistellula* St.40 tr.15, 94 µ
Fig.2	*Codonaria* spec. St.56 tr.4, 44µ.
Fig.3	*Cononaria mucronata* St.69 tr.5, 104µ
Fig.4	*Codonaria oceanica* St.68 tr.2, 80µ
Fig.5	*Codonaria cistellula* St.62 tr.42 87µ
Fig.6	*Codonella perforata* St.40 tr.11 94µ
Fig.7	*Codonellopsis americana* St.17 tr.9 98 µ
Fig.8	*Codonellopsis americana* St.51 tr.1 65µ
Fig.9	*Codonellopsis americana* St.40 tr.6 87µ
Fig.10	*Codonellopsis lagunula* St.18 tr.14 38µ
Fig.11	*Codonellopsis lagunula* St.17 tr.4 34µ
Fig.12	*Codonellopsis lagunula* St.15 tr.3 37µ
Fig.13	*Codonellopsis lagunula* St.15 tr.3 46µ
Fig.14	*Codonellopsis lagunula* St.15 tr.3 36µ
Fig.15	*Codonellopsis lagunula* St.16 tr.8 33µ

Plate IV

Fig.1	*Cyttarocylis edentata* near 55°N, drawn after microphotograph.
Fig.2	*Ptychocylis urnula* St.77 tr.2., drawn after microphotograph.
Fig.3	*Dictyocysta speciosa* St.77 tr.2, drawn after microphotograph.
Fig.4	*Dictyocysta lepida lepida* St.60 tr.44, drawn after microphotograph.
Fig.5	*Codonella lata* St.77 [tr.2.], drawn after microphotograph.

Plate V

Fig.1 *Dictyocysta mitra* St.87 tr.28 , 64 µ
Fig.2 *Dictyocysta mitra* St.17 tr.9 , 81 µ
Fig.3 *Dictyocysta mitra (=dilatata)* St.18 tr.14 ,72 µ
Fig.4 *Dictyocysta muelleri* St.18 tr.12 , 57 µ
Fig.5 *Dictyocysta fundlandica* St.17 tr.9 , 59 µ
Fig.6 *Dictyocysta muelleri* St.69 tr.4 , 56 µ
Fig.7 *Dictyocysta elegans lepida* St.14 tr.19 , 78 µ
Fig.8 *Dictyocysta elegans lepida* St.9 tr.3 ,55 µ
Fig.9 *Dictyocysta elegans lepida* St.17 tr. 9, 76 µ
Fig.10 *Dictyocysta elegans lepida* St.14 tr.19 ,74 µ
Fig.11 *Codonella amphorella* St.61 tr.7 ,100 µ
Fig.12 *Codonella amphorella* St. 69 tr.2 , 98 µ
Fig.13 *Tintinopsis beroidea(=rapa)* St.64 tr.4, 75µ
Fig.14 *Codonella galea* St.27 tr.14 , 74 µ
Fig.15 *Tintinnopsis beroidea(= parvula)* St.86 tr.24 , 52 µ
Fig.16 *Codonella* spec. St.58 tr.1 , 43 µ
Fig.17 *Codonella galea* St.58 tr.4 , 55 µ

Plate VI

Fig.1 *Tintinnopsis beroidea(= balthica)* St.78 tr.40 ,108 µ
Fig.2 *Tintinnopsis urnula* St.9 tr.7 ,111 µ
Fig.3 *Tintinnopsis levigata* St. 73 tr.19 ,40 µ
Fig.4 *Tintinnopsis* spec. St. 65 tr.9 , 80µ
Fig.5 *Tintinnopsis vasculum* St.83 tr.5 ,78 µ
Fig.6 *Tintinnopsis nitida* St.83 tr.1 , 62µ
Fig.7 *Tintinnopsis vasculum* St.83 tr.5 , 65µ
Fig.8 *Tintinnopsis beroidea(=parva)* St.60 tr.21 ,51 µ
Fig.9 *Tintinnopsis vasculum* St.27 tr.14 ,87 µ
Fig.10 *Tintinnopsis beroidea(= minuta)* St.71 tr.11 , 30µ
Fig.11 *Tintinnopsis beroidea(= minuta)* St.71 tr.11 ,32 µ
Fig.12 *Tintinnopsis turbo* St.19 tr.23 ,94 µ
Fig.13 *Tintinnopsis beroidea* St.72 tr.7 ,80 µ
Fig.14 *Tintinnopsis plagiostoma* St.9 tr.7 ,96 µ
Fig.15 *Tintinnopsis sacculus* St.63 tr.1 , 100µ
Fig.16 *Tintinnopsis rotundata* St.87 tr.9 , 70µ
Fig.17 *Tintinnopsis levigata* St.83 tr.6 ,43 µ
Fig.18 *Tintinnopsis beroidea* St.27 tr.14 ,81 µ
Fig.19 *Tintinnopsis plagiostoma* St.56 tr.4 ,51 µ
Fig.20 *Tintinnopsis beroidea* St.64 tr.4 , 51µ

Plate VII

Fig.1	.*Tintinnus* spec. St.64 tr.5 ,175 µ
Fig.2	*Tintinnus* spec. St. 65 tr.5 ,182 µ
Fig.3	*Tintinnus* spec. St.63 tr.12 ,124 µ
Fig.4	*Tintinnus* spec. St.64 tr.5 , 165µ
Fig.5	*Amphorides gaarderae* St.61 tr.5, 81, µ
Fig.6	cf. *Proplectella parva* St.51 tr.16 ,47 µ
Fig.7	cf. *Proplectella parva* St.27 tr.14 ,52 µ
Fig.8	*Tintinnopsis undella* St.86 ,110 µ
Fig.9	*Tintinnus bursa* St.64 tr.5 ,64 µ
Fig.10	cf. *Proplectella parva* St.27 tr. ,32 µ
Fig.11	*Tintinnus bursa* St.27 tr.1 ,57 µ
Fig.12	*Tintinnus bursa* St.21 tr.11 , 58µ
Fig.13	*Proplectella parva* St.64 tr.8 ,74 µ

Plate VIII

Fig.1	*Stenosomella ventricosa* St.81 tr.10 ,94 µ
Fig.2	*Stenosomella steini* St.84 tr.43 , 87 µ
Fig.3	*Stenosomella nivalis* St.63 tr.3 ,44 µ
Fig.4	*Tintinnopsis ventricosoides* St.89 tr.37 ,66 µ
Fig.5	*Stenosomella avellana* St.61 tr.7 , 58 µ
Fig.6	*Codonellopsis contracta* St.89 tr.14 ,43 µ
Fig.7	*Stenosomella oliva* St.84 tr.5 ,38 µ
Fig.8	*Condellopsis* spec. St.15 tr.3 ,41 µ
Fig.9	*Stenosomella nivalis* St.61 tr.7 , 32 µ
Fig.10	*Ascampbiella* spec. St.8 tr. 4, 52 µ
Fig.11	*Ascampbiella* spec. St.16 tr.8 , 52 µ
Fig.12	*Ascampbiella acuta* St.18 tr.12 , 45 µ
Fig.13	*Poroecus apiculatus* St.19 tr.24 ,36 µ
Fig.14	*Poroecus apiculatus* St.17 tr.9 ,162 µ
Fig.15	cf. *Stenosomella* St.27 tr.30 ,86 µ
Fig.16	cf. *Stenosomella* St.8 tr.30 , 98 µ
Fig.17	*Rhabdonella amor* St.18 tr.12 , 60 µ
Fig.18	*Climatocylis elongata* St.18 tr.12 ,99

Plate IX

Fig.1	*Cyttarocylis eucecryphalus(= longa)* St.62 tr.14, 130 µ
Fig.2	*Cyttarocylis acutiformis* St.72 tr.1, 210 µ
Fig.3	*Cyttarocylis eucecryphalus(=plagiostoma)* St. 63 tr.3, 130 µ
Fig.4	*Cyttarocylis acutiformis* St.68 tr.7, 188 µ
Fig.5	*Cyttarocylis cf recta* St.19 tr.16, 108 µ
Fig.6	*Cyttarocylis* spec. St.40 tr.17, 123 µ

Plate X

Fig.1	*Codonellopsis orthoceros* St.26 tr.6, 180µ
Fig.2	*Codonellopsis orthoceros* St.63 tr.21, 166µ
Fig.3	*Codonellopsis orthoceros* St.64 tr.5, 195µ
Fig.4	*Codonellopsis orthoceros* St.64 tr.4, 170µ
Fig.5	*Codonellopsis orthoceros* St.64 tr.4, 232µ
Fig.6	*Codonellopsis orthoceros* St.45 tr.14, 181µ

Plate XI

Dictyocysta elegans St.35 tr.6 showing the variability in one population

Figs. 1, 2, 9, 11 *D.e. speciosa*

Figs. 3, 4, 5, 10 *D.e. lepida*.

Figs. 6,7, 8 intermediates.

Plate XII

Fig.1 *Metacylis* spec. St.65 tr.8, 100µ

Fig.2 *Metacylis* spec. St.66 tr.7, 75µ

Fig.3 *Metacylis* spec. St.64 tr.1, 96µ

Fig.4 *Metacylis* spec. St.65 tr.9, 75µ

Fig.5 *Metacylis* spec. St.65 tr.9, 75µ

Plate XIII

Fig.1 *Petalotricha ampulla* St.43 tr.4 , 127 µ

Fig.2 *Petalotricha major* St.63 tr.10 , 140 µ

Fig.3 *Petalotricha major* St.58 tr.1 , 138 µ

Fig.4 *Petalotricha major* St.43 tr. 4,120 µ

Fig.5 *Petalotricha serrata* St.43 tr.4 ,130 µ

Fig.6 *Petalotricha major* St.14 tr.7,123 µ

PLate XIV

Fig.1 *Xystonella treforti* St.27 tr.31, 335 µ

Fig.2 *Rhabdonellopsis longicaulis* St.27 tr.22, 314 µ

Fig.3 *Epiplocylis* spec. *A* St.27 tr.29, 108 µ

Fig.4 *Xystonella* spec. St.27 tr.27, 213 µ

Fig.5 *Rhabdonella striata* St.27 tr.22, 203µ

Fig.6 *Parafavella denticulata* St.73 tr. 18, 134 µ

Fig.7 *Xystonella lohmanni* St.18 tr.12, 282 µ

Fig.8 *Xystonella lohmanni* St.18 tr.12, 227 µ

Plate XV

Fig.1 *Rhabdonella conica* St.18 tr. 12,326 µ

Fig.2 cf. *Parundella aculeata* St.59 tr. 5, 116µ

Fig.3 cf. *Parundella aculeata* St. 12 tr.2, 156µ

Fig.4 cf. *Parundella aculeata* St.62 tr.26, 174 µ

Fig.5 *Xystonellopsis cymatica* St.18 tr.12, 145µ

Fig.6 *Dadayiella ganymedes* St.18 tr.12, 116 µ

Fig.7 *Rhabdonella brandti* St.89 tr.30, 12 µ

Fig.8 *Rhabdonella elegans* St.49 tr.15, 101 µ

Fig.9 *Salpingella acuminata* St.83 tr.30, 707µ

Fig.10 *Dadayiella bulbosa* St.88 tr. 1, 143 µ

Fig.11 *Rhabdonella amor* St.27 tr.30 ,96 µ

Fig.12 *Rhabdonella elegans* St27 tr.15,120 µ

Fig.13 *Rhabdonella brandti* St.27 tr. 1, 113µ

Fig.14 cf. *Rhabdonella* spec. St. 13 tr.13,141µ

Plate XVI

Fig. 1	*Epiplocylis constricta* St.27 tr.33, 68µ
Fig. 2	*Epiplocyloides brandti* St.54 tr. 12, 58 µ
Fig.3	*Epiplocylis acuminata* St.89 tr.30, 66µ
Fig.4	*Epiplocylis constricta* St.27 tr. 33,72 µ
Fig.5	*Epiplocyloides reticulata* St.52 tr.15, 63 µ
Fig.6	*Epiplocyloides brandti* St.17 tr.9, 65 µ
Fig.7	*Epiplocylis blanda* St.85 tr.19, 116 µ
Fig.8	*Epiplocyloides acuta* St.65 tr.17, 108 µ
Fig. 9	*Epiplocyloides acuta* St.987 tr.10, 120 µ
Fig.10	*Epiplocylis undella* St.51 tr.1, 108 µ
Fig.11	*Epiplocylis* spec. *B* St.64 tr.8, 103 µ
Fig.12	*Epiplocylis blanda* St.27 tr.33, 101 µ
Fig.13	*Epiplocylis undella* St.27 tr.34, 87µ, with frontal and lateral view of reticulum

Plate XVII

Fig.1	*Proplectella fastigata* St.70 tr.3, 66µ
Fig.2	*Proplectella ovata* St.70 tr.1, 66µ
Fig.3	*Proplectella claparedei* St.59 tr.5, 79µ
Fig.4	*Proplectella angustior* St.59 tr.5,73µ
Fig.5	*Undellopsis marsupialis* St.74 tr.52, 98 µ
Fig.6	*Undella* spec. St.51 tr.16,108 µ
Fig.7	*Proplectella fastigata* St.58 tr.1, 65µ
Fig.8	*Proplectella parva* St.18 tr.12, 65 µ
Fig.9	*Proplectella parva* St.18 tr.12, 65µ
Fig.10	*Proplectella parva* St.27 tr.34, 65 µ
Fig.11	*Ptychocylis minor* St.72 tr.8, 85 µ
Fig.12	*Ptychocylis ostenfeldi* St.36 tr.13, 118 µ
Fig.13	*Ptychocylis urnula* St.73 tr. 6, 110 µ

Plate XVIII

Fig.1.	*Steenstrupiella steenstrupi* St.18 tr.12 ,134 µ
Fig.2.	*Steenstrupiella steenstrupi* St.14 tr.19 ,140 µ
Fig.3.	*Eutintinnus lususundae* St.81 tr.5 ,247 µ
Fig.4.	*Eutintinnus lususundae* St.19 tr.8 , 363µ
Fig.5	cf. *Salpingella acuminata* St.19 tr.12 ,160 µ
Fig.6.	*Eutintinnus lususundae* St.17 tr.9 , 400µ

Plate XIX

Fig.1	a) *Amphisolenia globifera* St.14 tr.14 b) the same upper and lower end in detail.
Fig.2	*Amphisolenia astragalus*
Fig.3	*Salpingella gracilis* St.62, tr.42, 300µ
Fig.4	*Amphisolenia bifurcata*

Plate XX

Fig.1	*Rhaphidozoum neapolitanum* St.21 tr.12
Fig.2-3	*Sphaerozoum punctatum* St.10 tr.15, 120µ
Fig.4	*Acrosphaera lappacea* St.19 tr.21,185µ
Fig.5	*Acrosphaera lappacea* St.40 tr.17, 98µ

Plate XXI

Fig.1-2 *Acrosphaera lappacea* St.21 tr.11, 101-110μ
Fig.3 *Acrosphaera lappacea* var *A* St.45 tr.4, 128μ
Fig.4 *Acrosphaera murrayana* St.42 tr.2, 69μ
Fig.5 *Acrosphaera murrayana* St.25 tr.11, 103μ

Plate XXII

Fig.1 *Acrosphaera spinosa* St.41 tr.2, 165μ
Fig.2 *Acrosphaera spinosa* form *A* St.46 tr.2, 203μ
Fig.3 *Acrosphaera spinosa* form *B* St.45 tr.4, 163μ
Fig.4 *Collosphaera huxleyi* St.19 tr.12, 82μ
Fig.5 *Collosphaera macropora* St.22 tr.10, 74μ
Fig.6 *Collosphaera huxleyi* St.45 tr.4 , 95μ
Fig.7 *Collosphaera huxleyi* St.17 tr.7, 97μ
Fig.8 *Collosphaera huxleyi* St.16 tr.8, 96μ

Plate XXIII

Fig.1-4 *Collosphaera* spec.*A* St.27 tr.19, resp. 84, 82, 84, 86μ
Fig.5 *Collosphaera* spec.*A* St.44 tr.3, 70μ
Fig.6-7 *Collosphaera* spec.*A* St.46 tr.2, 74, 85μ
Fig.8 *Solenosphaera zanguebarica auriculata* St.44 tr.1, 75μ
Fig.9 *Solenosphaera zanguebarica auriculata* St.45 tr.4, 96μ
Fig.10-13 *Solenosphaera zanguebarica nigrimoora* St.22 and St.27, 85, 150, 110, 129μ

Plate XXIV

Fig.1 *Solenosphaera zanguebarica pyriformis* St.51 tr.1, 102μ
Fig.2 *Solenosphaera zanguebarica pyriformis* St.48 tr.14, 101μ
Fig.3 *Siphonosphaera socialis* St.19 tr.3, 86μ
Fig.4 *Siphonosphaera tenera* St.26 tr.3, 80μ
Fig.5-7 *Siphonosphaera tubulosa* types, St.16 tr.8,St.17 tr.7,67,56, 72μ
Fig.8 *Siphonosphaera* spec. St.41 tr.1, 78μ
Fig.9 *Acanthosphaera* spec. *A* St.9 tr.3 , 54μ
Fig.10 *Acanthosphaera corloca* St.63 tr.33 , 60μ

Plate XXV

Fig.1 *Acanthosphaera* spec. *C* St.18 tr 12(=*Cladococcus*), 66μ
Fig.2 *Actinomma leptodermum* St.9 tr.6, 83μ
Fig.3 *Actinomma sol* St.9 tr.22, 125μ

Plate XXVI

Fig.1 *Actinomma* spec.*A* St. 40 tr.19, 36μ
Fig.2 *Actinomma acradophorum* St. 40 tr.19, 65μ
Fig.3 *Echinomma popofski* St.63 tr.33, 125μ
Fig.4-11 *Ommatartus tetrathalamus* fig.4: St.45 tr.14, 28μ; fig.5: St.38 tr.15, 62μ; fig.6: St.44 tr.1, 68μ; fig.7: St.48 tr.14, 92μ; fig.8: St.38 tr.15, 163μ; fig.9: St.48 tr.14,140μ; fig.10: St.48 tr.14, 180μ; fig.11: St.48 tr.144, 30μ

Plate XXVII

Fig.1-2 *Haliomma* spec. *A* St.14 tr.7., 111, 42μ
Fig.3-4 *Hexacontium enthacantum*, 50, 105μ

Plate XXVIII

Fig.1	*Hexacontium hostile* St.14 tr.7, 107µ
Fig.2	*Rhizosphongus* spec. *A* St.19 tr.21, fragm.
Fig.3	*Stylotractus* spec *A* St.19 tr.21, 50µ
Fig.4	*Staurolonche* spec. *A* St.11 tr.16, 111µ
Fig. 5	*Spongosphaera* spec. St.42 tr.2, 17µ

Plate XXIX

Fig 1	*Spongosphaera* spec. St.38 tr.2, 160µ
Fig.2-3	*Sethodiscus macrococcus* St.45 tr. 12, 49, 91µ
Fig. 4-5,7	*Tholospira* spec. *B*, ±65µ
Fig.6	*Tholospira* spec. *A*, ±60µ

Plate XXX

Fig.1	*Tholospira cervicornis* St.35 tr.1, 72µ
Fig.2	*Tholospira cervicornis* St.37 tr.1, 36µ
Fig.3	*Tholospira cervicornis* St.44 tr.3, 137µ

Plate XXXI

Fig.1-4	*Phorticium clevei* St.37 tr.13 and St.36 tr 1, 50, 33, 56, 136µ
Fig.5-7	*Phorticium clevei* St.9, 94, 186, 193µ
Fig.8	*Tetrapyle* spec. *A*, 74µ

Plate XXXII

Fig.1	*Tetrapyle* spec. *A* spring cruise, 105µ
Fig.2	*Tetrapyle octacantha* St. 44 tr.3, 72µ
Fig.3	*Tetrapyle octacantha* St. 40 tr.6 , 36µ
Fig.4	*Tetrapyle octacantha* St. 45 tr.12, 50µ
Fig.5	*Octopyle stenozona* St.19 tr.27, 143µ

Plate XXXIII

Fig.1	*Octopyle stenozona* St. 45 tr.12, 56µ
Fig.2-3	*Stylodicta multispina*, 100, 190µ
Fig.4	*Stylospongia* spec. *A* St.37 tr.13, 114µ

Plate XXXIV

Fig.1	*Stylospongia* spec. *A*, 143µ
Fig.2	*Spongocore chrysalis* St.62 tr.26
Fig.3	*Stylospongia* spec. *B* St.68 tr.2, 125µ
Fig.4	*Sethodiscus macrococcus* St.40 tr.15, 82 µ

Plate XXXV

Fig.1	*Stylochlamidium asteriscus* St.35 tr.1, 300µ.
Fig.2	*Monaxonium perforatum* St. 42 tr.2, 29µ
Fig.3	*Monaxonium perforatum* St. 45 tr.14, 72µ
Fig.4	*Acanthodesmia vinculata* St.43 tr.8, 69µ
Fig.5	*Monaxonium perforata* St. 45 tr 12, 150µ
Fig.6	*Acanthodesmia vinculata* St.43 tr.8, 62µ
Fig.7-8	*Lophospyris pentagona pentagona*, 72-85µ
Fig.9-11	*Phormospyris stabilis capoi*
Fig.12	*Phormospyrus stabilis capoi* St.35 tr.1, 60µ

Plate XXXVI

Fig.1-2	*Zygocircus capulosus* St.17 tr.19, 90, 66µ
Fig.3	*Zygocircus productus* St.14 tr.19, 77µ
Fig.4	*Zygocircus rhombus*, 37µ
Fig.5-6	*Zygocircus* spec. *A* St.15 , 75-80µ
Fig.7	*Zygocircus* spec. *B* St. 44 tr.3, 72µ
Fig.8-9	*Zygocircus* spec. *B* St.22 tr.10, 90µ

Plate XXXVII

Fig.1	*Liriospyris reticulata* St. 45 tr 14, 82µ
Fig.2-5	*Arachnocorallium calvata* St.9 up to St.21, 86,100, 64, 57µ
Fig.6	*Arachnocorallium calvata* St. 37 tr. 13, 49µ
Fig7	*Arachnocorys circumtexta* St. 11 tr. 16 , 120µ

Plate XXXVIII

Fig.1	*Arachnocorys umbellifera* St.60 tr.5, 75µ
Fig.2	*Arachnocorys penthacantha* St.58 tr.5, 82µ
Fig.3	*Dimelissa thoracites* St. 15 tr 3, 100µ
Fig.4	*Amphiplectella acrostoma* St.56 tr.1, 63µ
Fig.5-10	*Phromacantha hystrix* resp.9, 50, 60, 58, 57, 50µ

Plate XXXIX

Fig.1	*Plagiacantha arachnoides* St.11 tr.8, 110µ
Fig.2	*Lamprotripus* spec. St. 63 tr.33, 175µ

Plate XXXX

Fig.1	*Plectacantha oikiskos* St.17 tr.9, 50µ
Fig 2	*Plectacantha* spec. *A* St.9 tr.3,
Fig.3	*Plectacantha* spec. *A* St.42 tr.2, 36µ
Fig.4	*Plectophora triacantha* St.9 tr.15, 64µ
Fig.5-6	*Pseudocubus obeliscus* St.17 tr.21, 50µ
Fig.7	*Promelissa phalacra* St.66 tr.10
Fig.8	*Euscenium* spec. *A* St.37 tr.1, 39µ
Fig.9-11	*Trisulcus borealis* St.9-St.19, 40-79µ

Plate XXXXI

Fig.1-4	*Trisulcus borealis* St.9-St.19, 40-79µ
Fig.5	*Trisulcus testudus* St.40 tr.19, 52µ
Fig.6-7 .	*Carpocanium amphora*
Fig.8-16	*Dictyophimus gracilipes*

Plate XXXXII

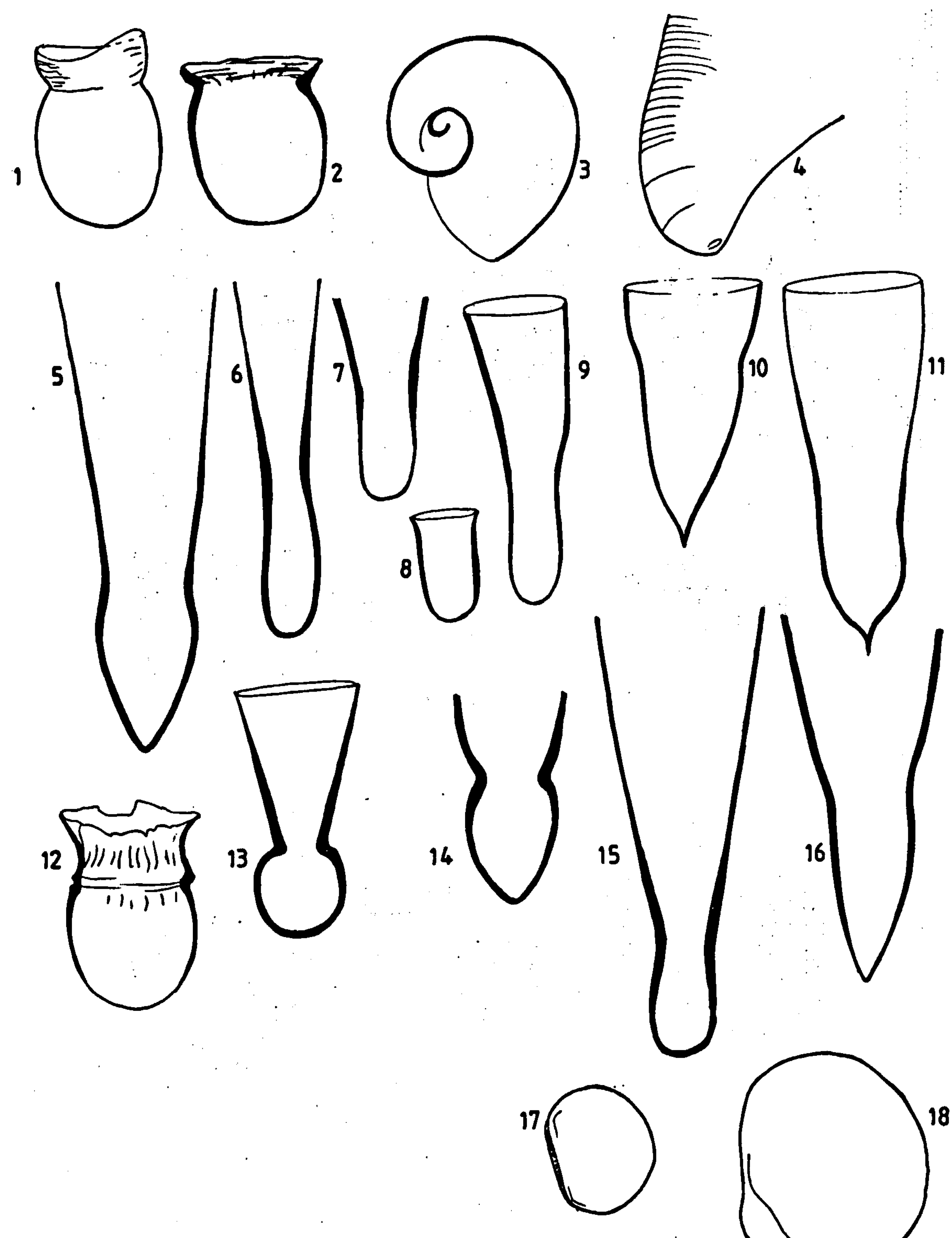
Fig.1-2	*Dictyophimus gracilipes* 30µ
Fig.3-5	*Dictyophimus bicornis* St,10, 75µ
Fig.6	*Eucuritidiunm* spec., 84µ
Fig.7	*Lithorachnium tentorium* St.14 tr.,19, 62µ
Fig.8	*Pterocanium preatextum* St.40 tr.19, 65µ
Fig.9	*Theocorys veneris* St. 16 tr. 7, 60µ

Plate XXXXIII

Fig.1	*Cornutella profunda* 100µ
Fig.2	Unidentified Theoperidae found at stat. 19, 21, 27, ±46µ
Fig.3	*Lipmanella bombus* St.44 tr.1, 26µ
Fig.4	*Pterocorys macroceras* St.63 tr.33, 120µ
Fig.5	*Pterocorys zancleus* St. 27 tr.30, 84µ
Fig.6	*Theocarythium trachelium* St. 16 tr.7, 138µ
Fig.7	*Theocarythium trachelium* St. 11 tr.16, 60µ
Fig.8	*Theocarythium trachelium* St. 35 tr.1, 180µ

Plate XXXXIV

Fig.1	*Theocytris turris* St. 13 tr 23, 100µ
Fig.2	*Amphimelissa setosa* St. 9 tr.7, 67µ
Fig.3	*Bisphaerocephalina armata* St.14 tr.14, 80µ
Fig.4-6	*Botryostrobus auritus* St.9-14, 60-100µ
Fig.7	*Procystus xiphodon* var *B* St.9 tr.4, 180µ
Fig.8	*Procystus xiphodon* var *A* St.19 tr.19, 165µ



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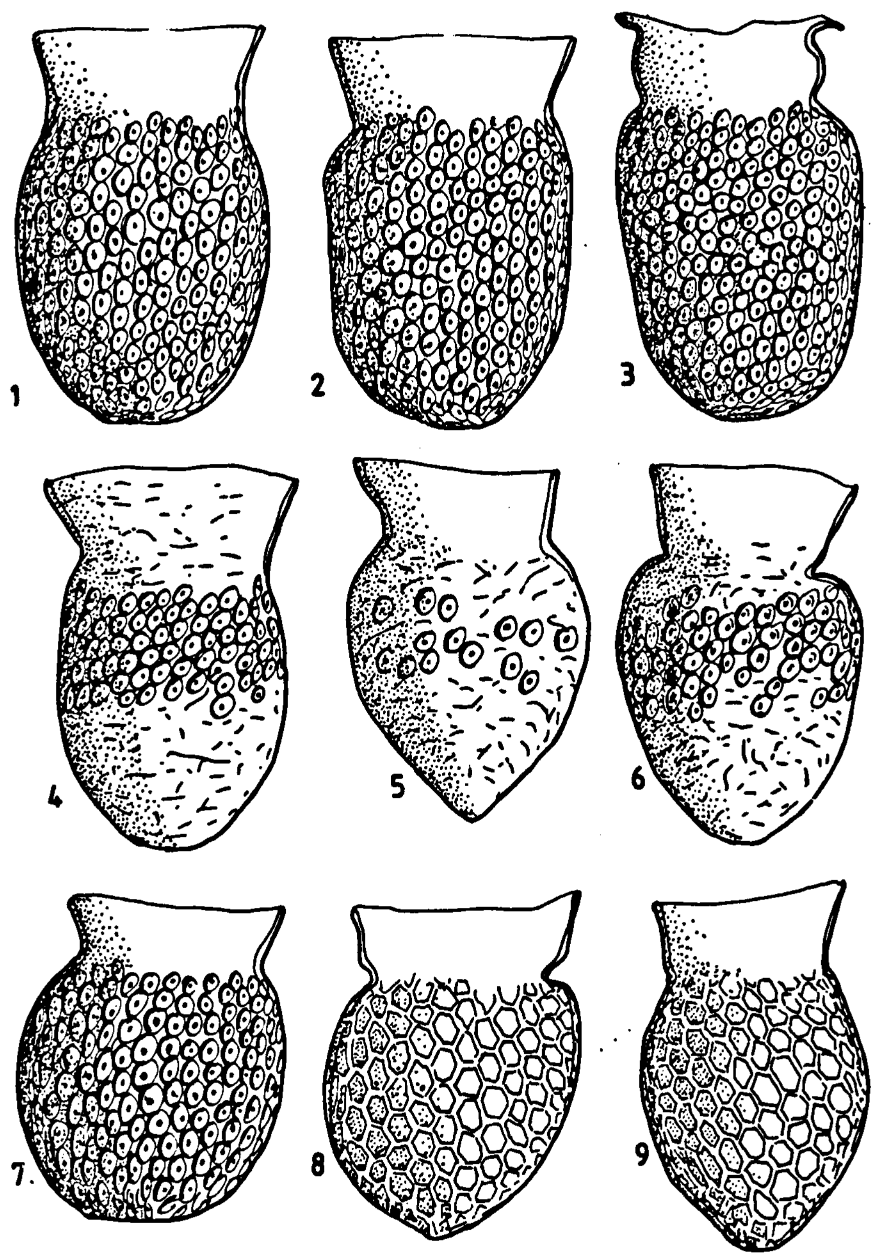

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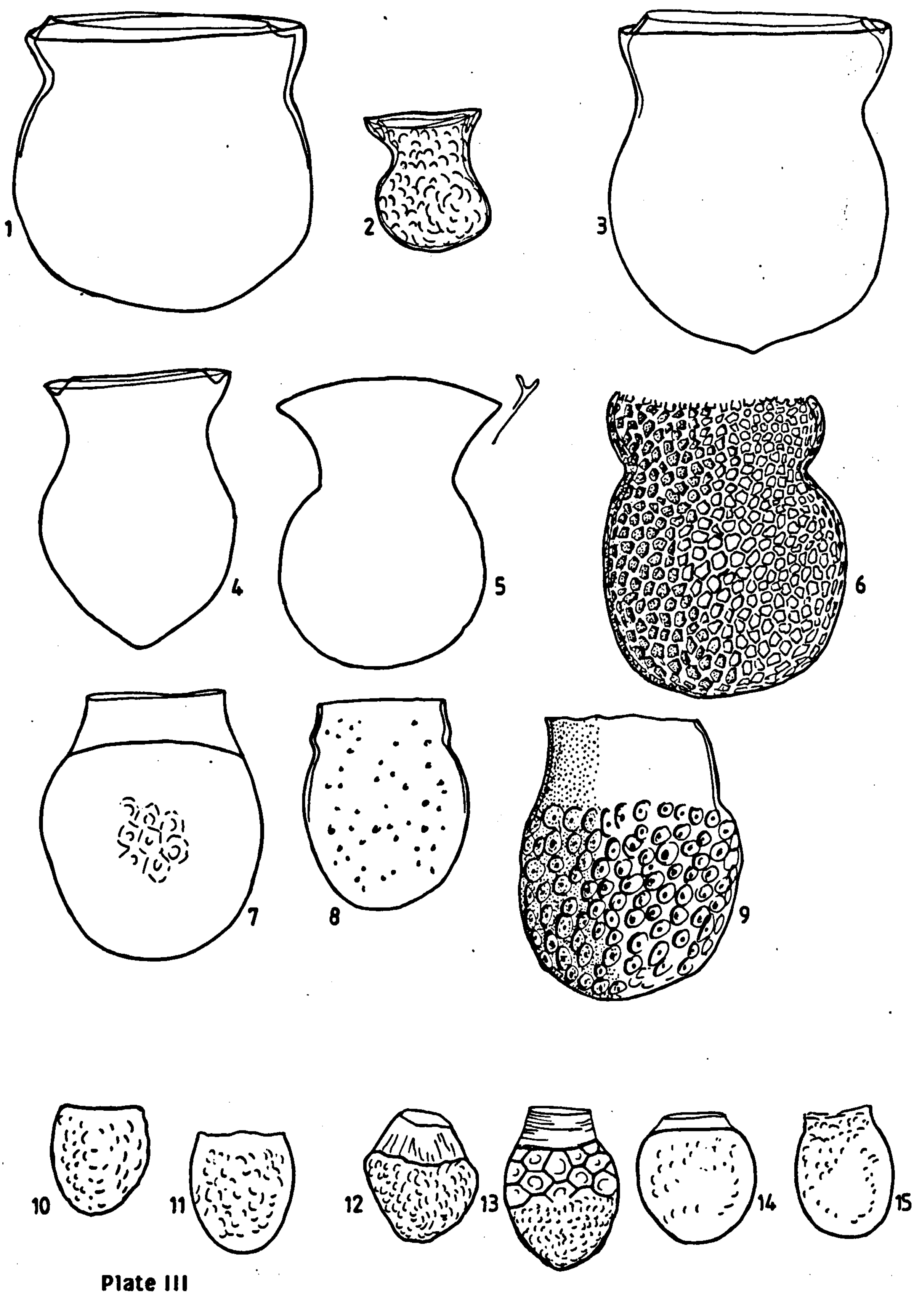

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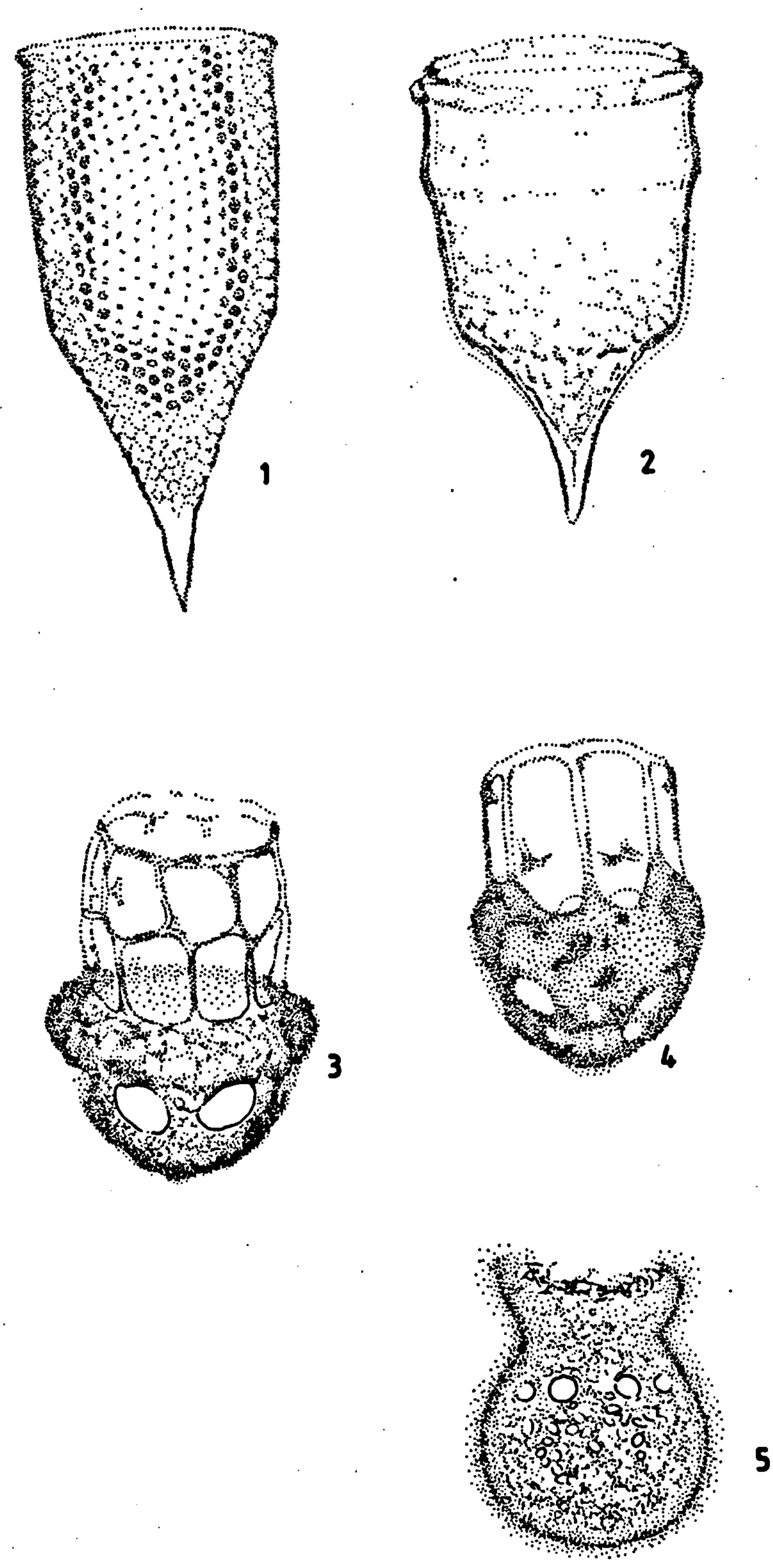

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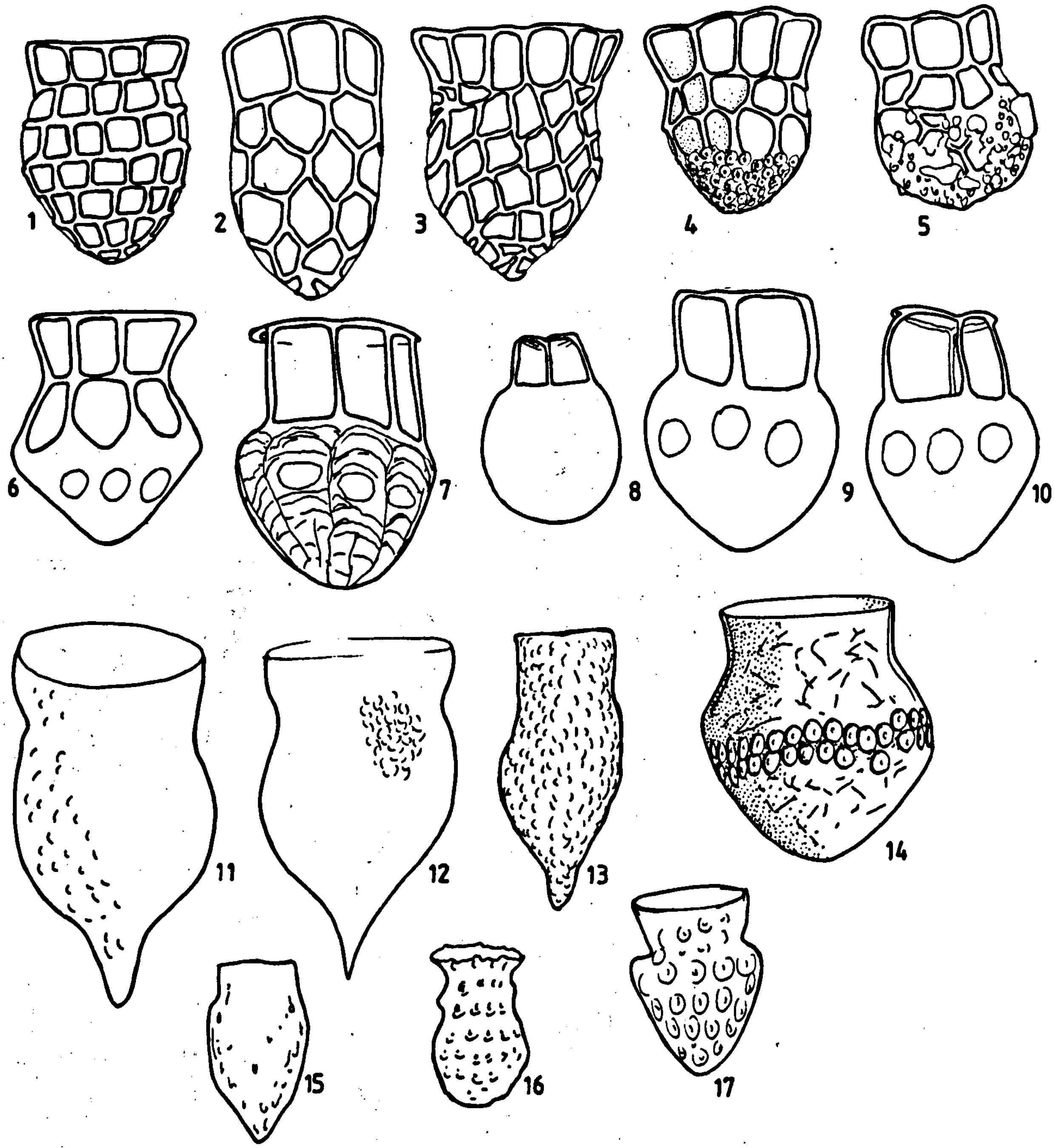

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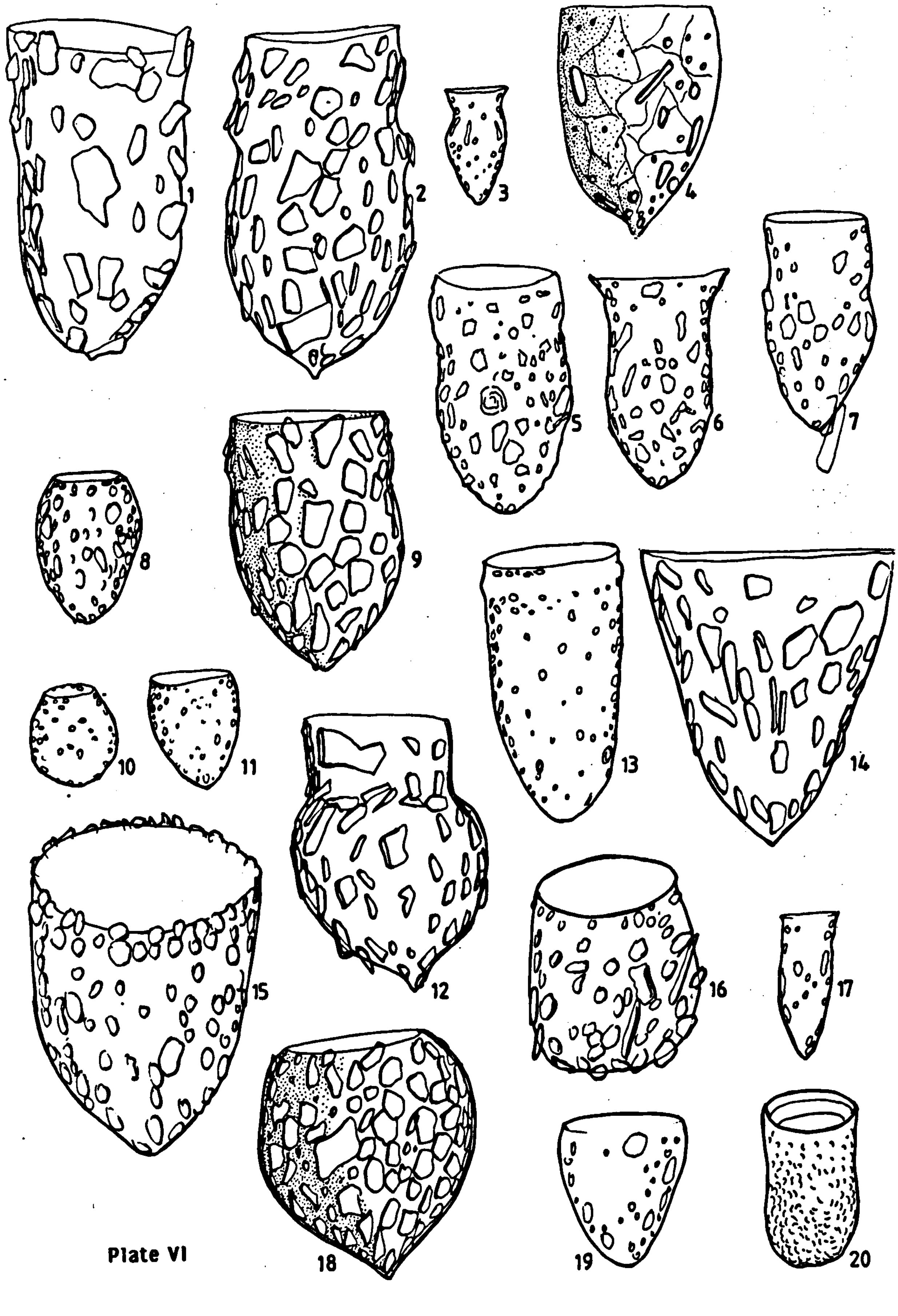

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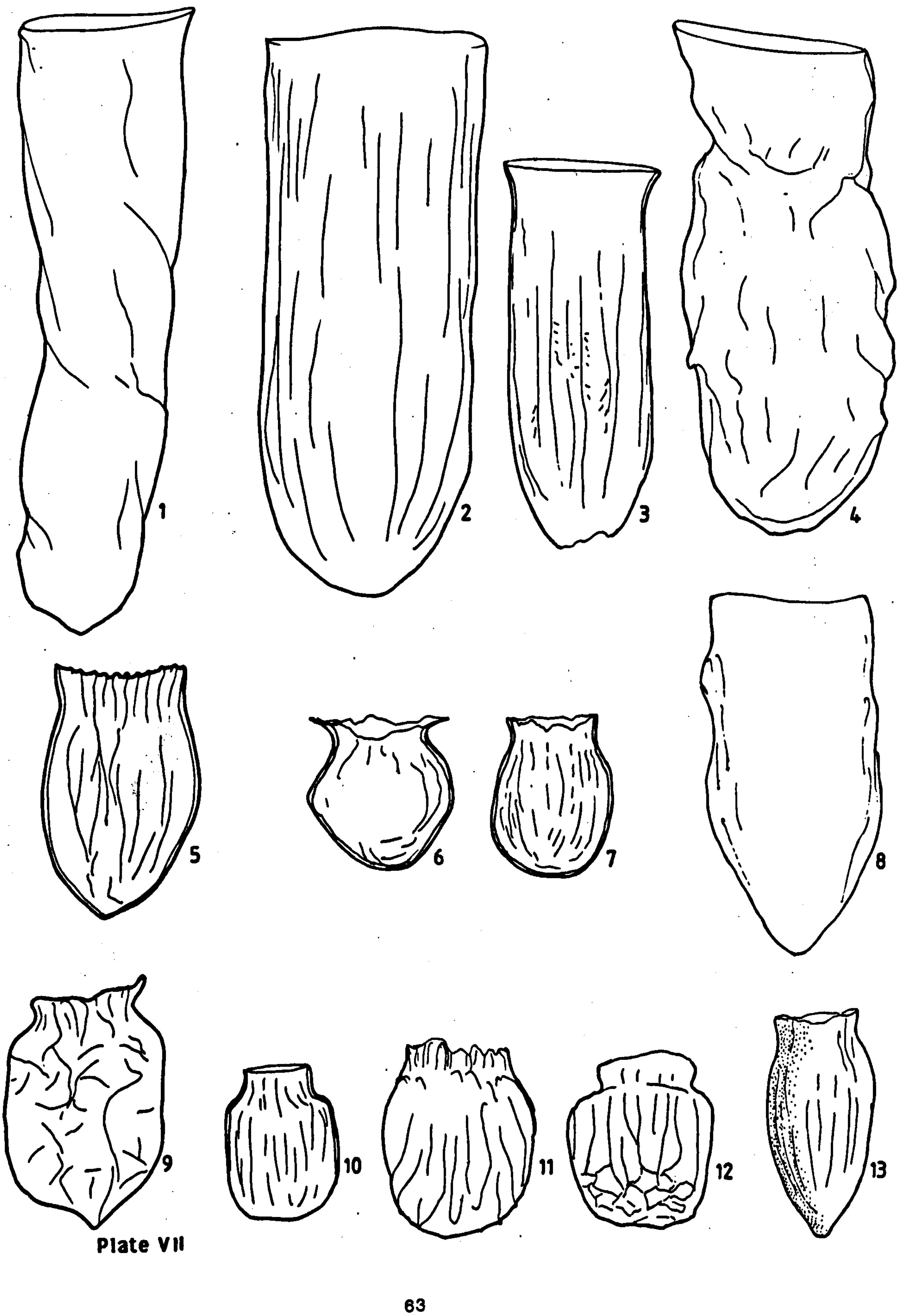

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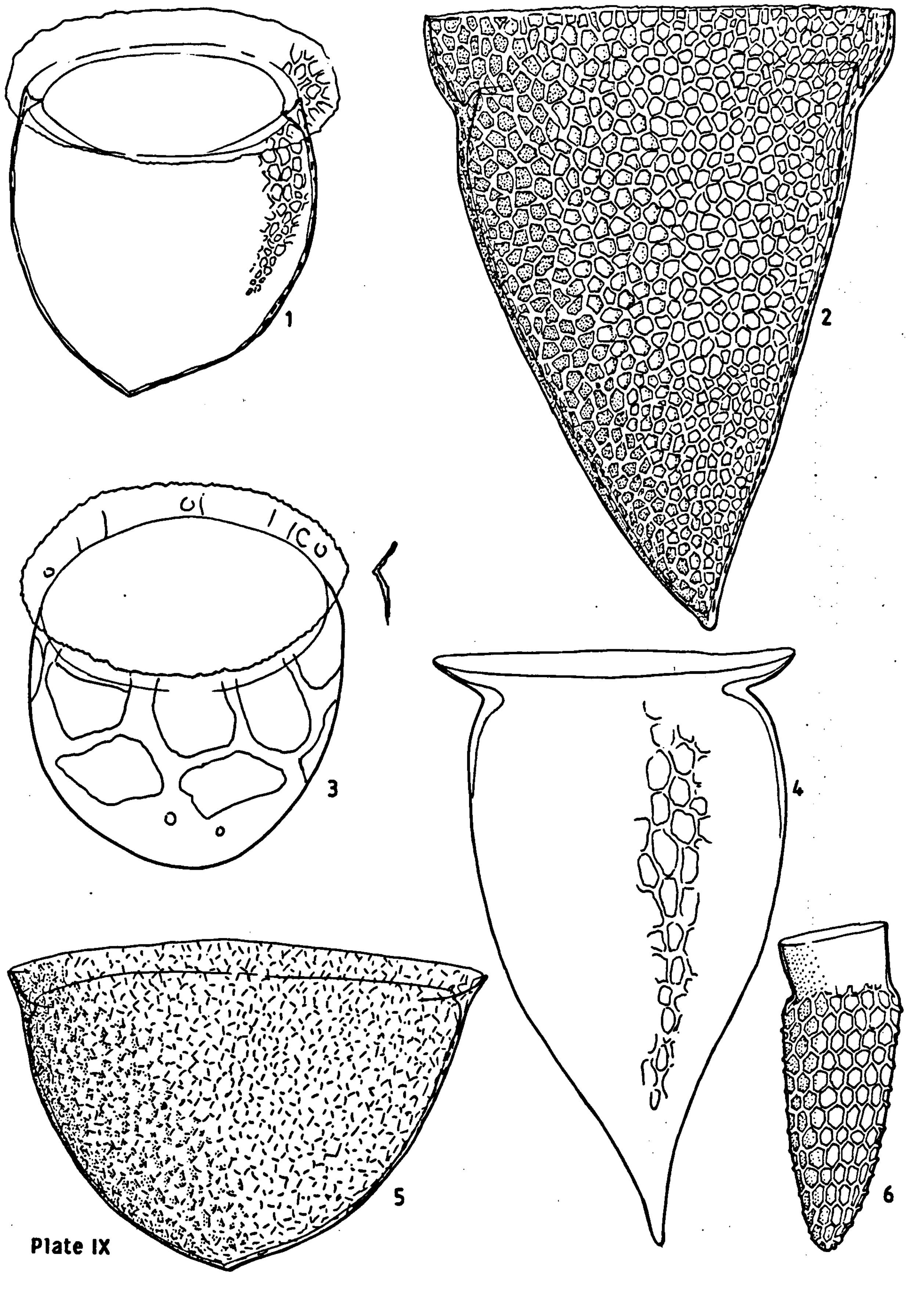

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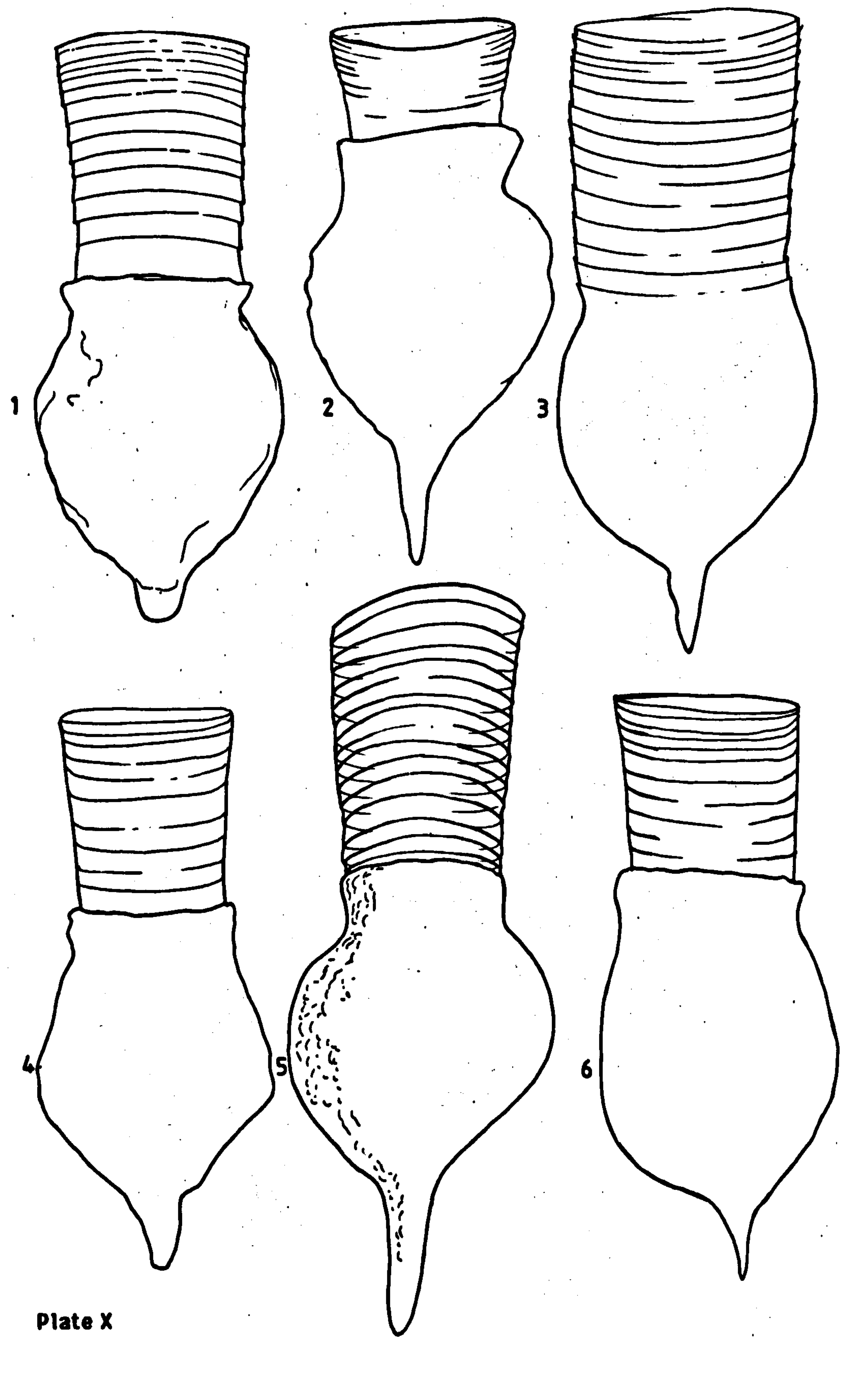

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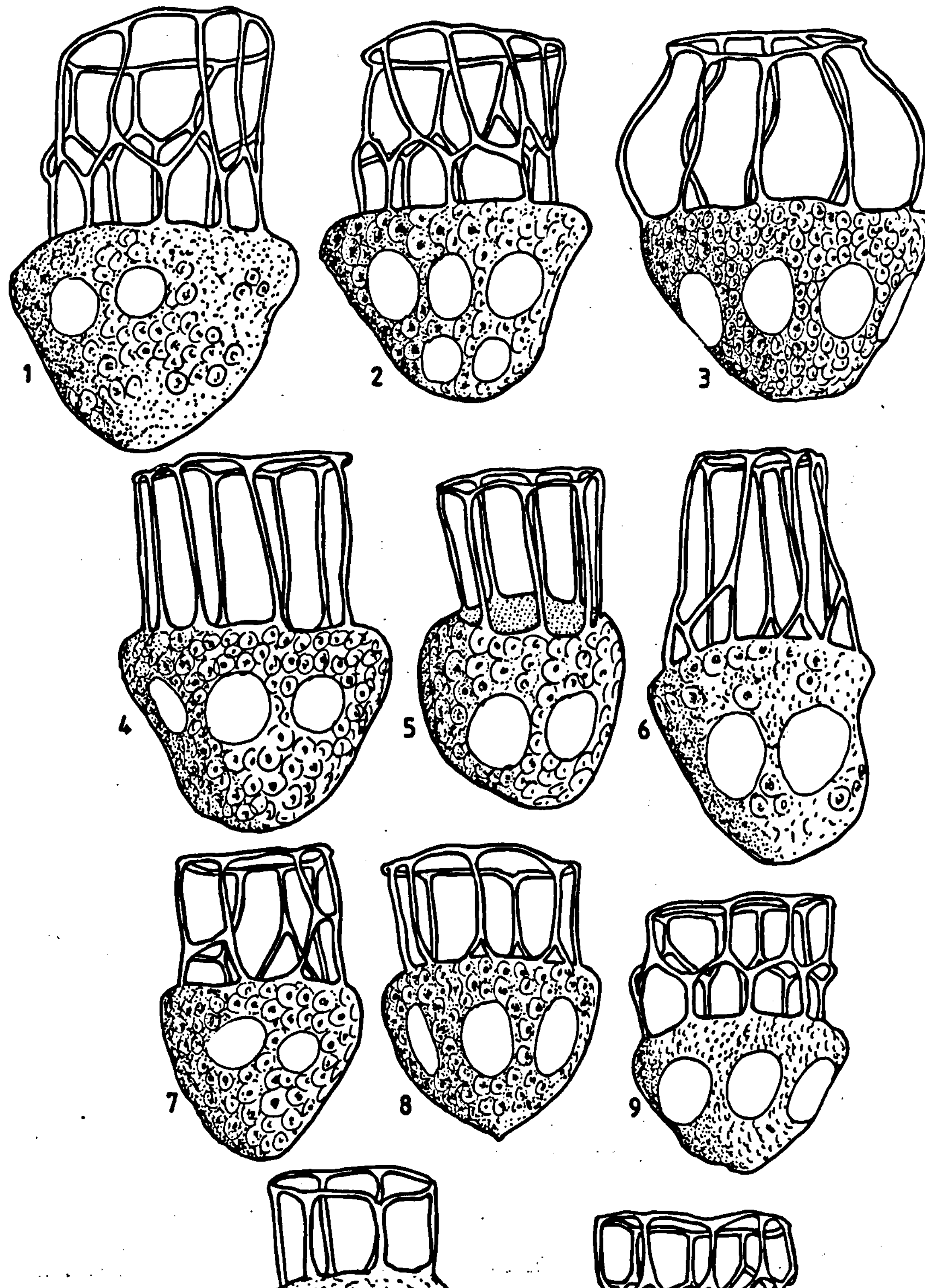

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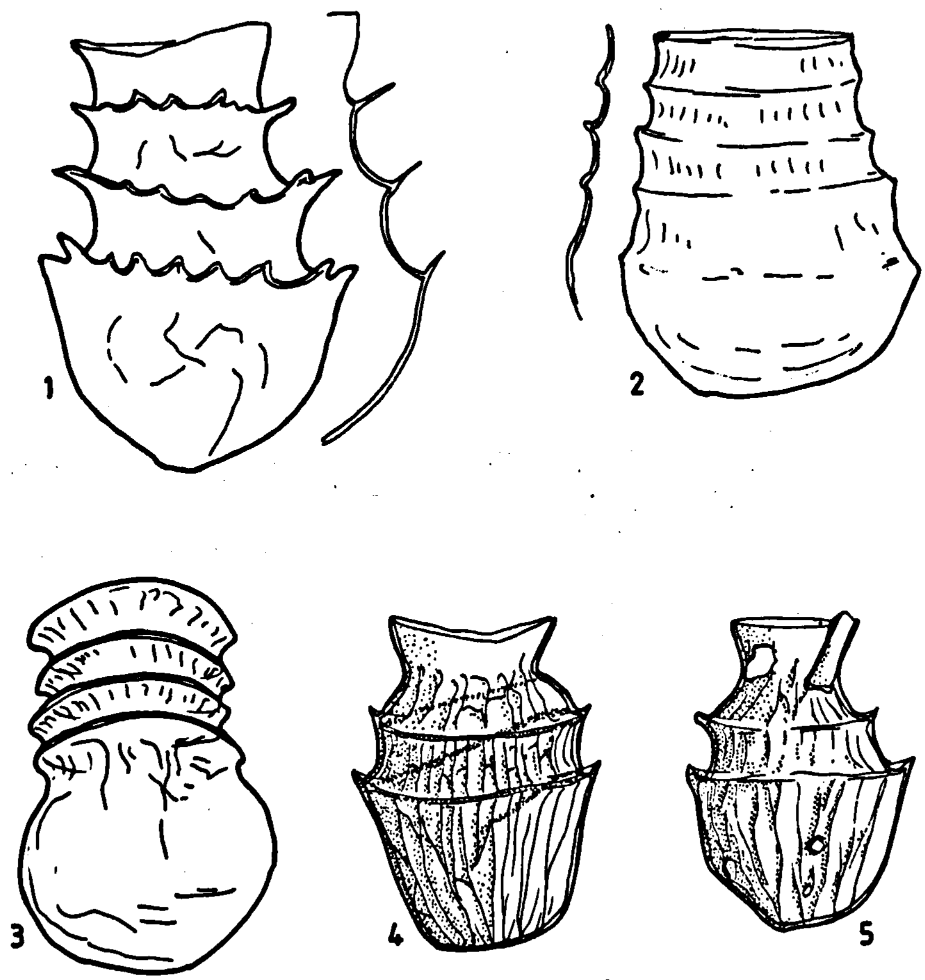

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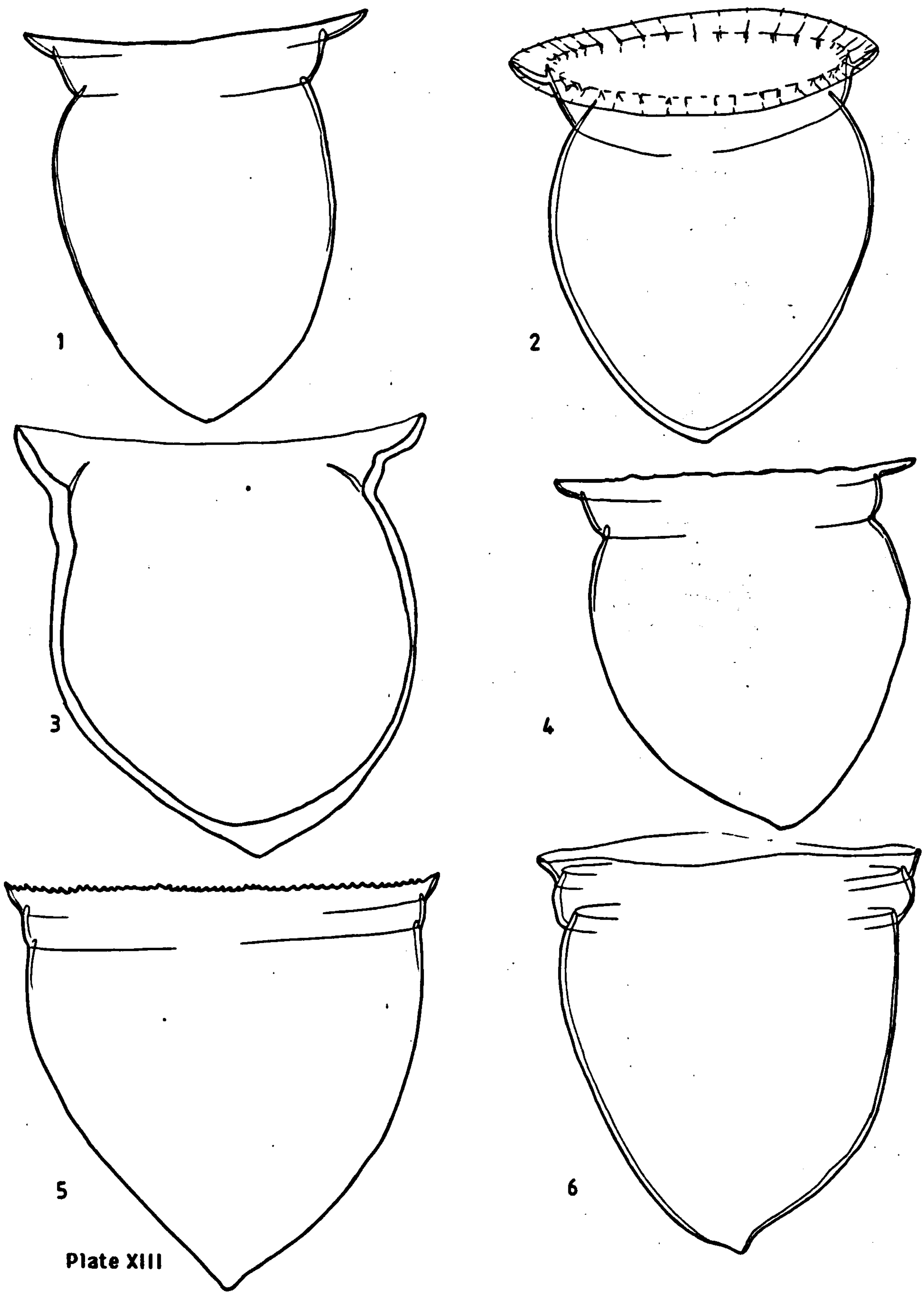

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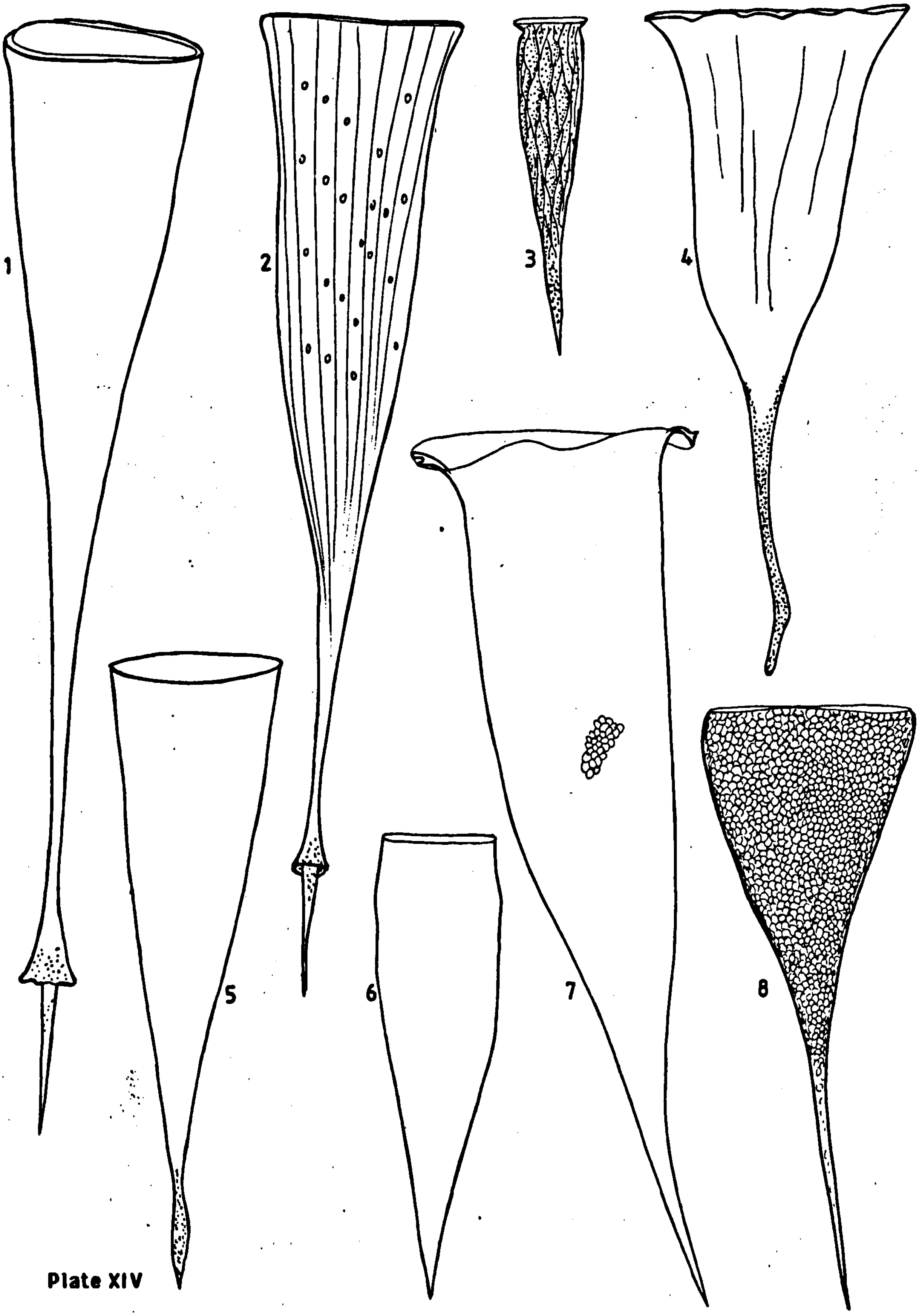

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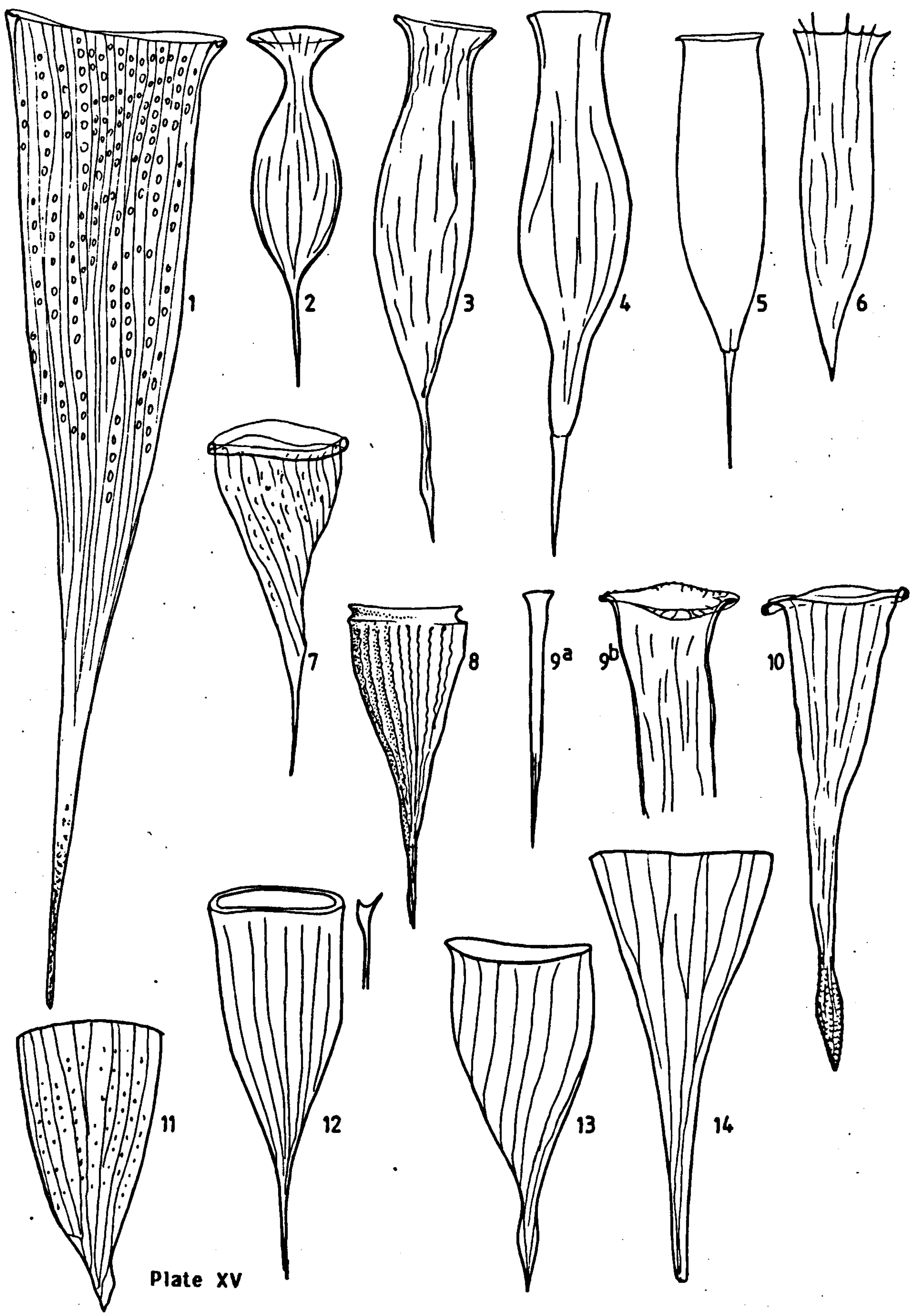

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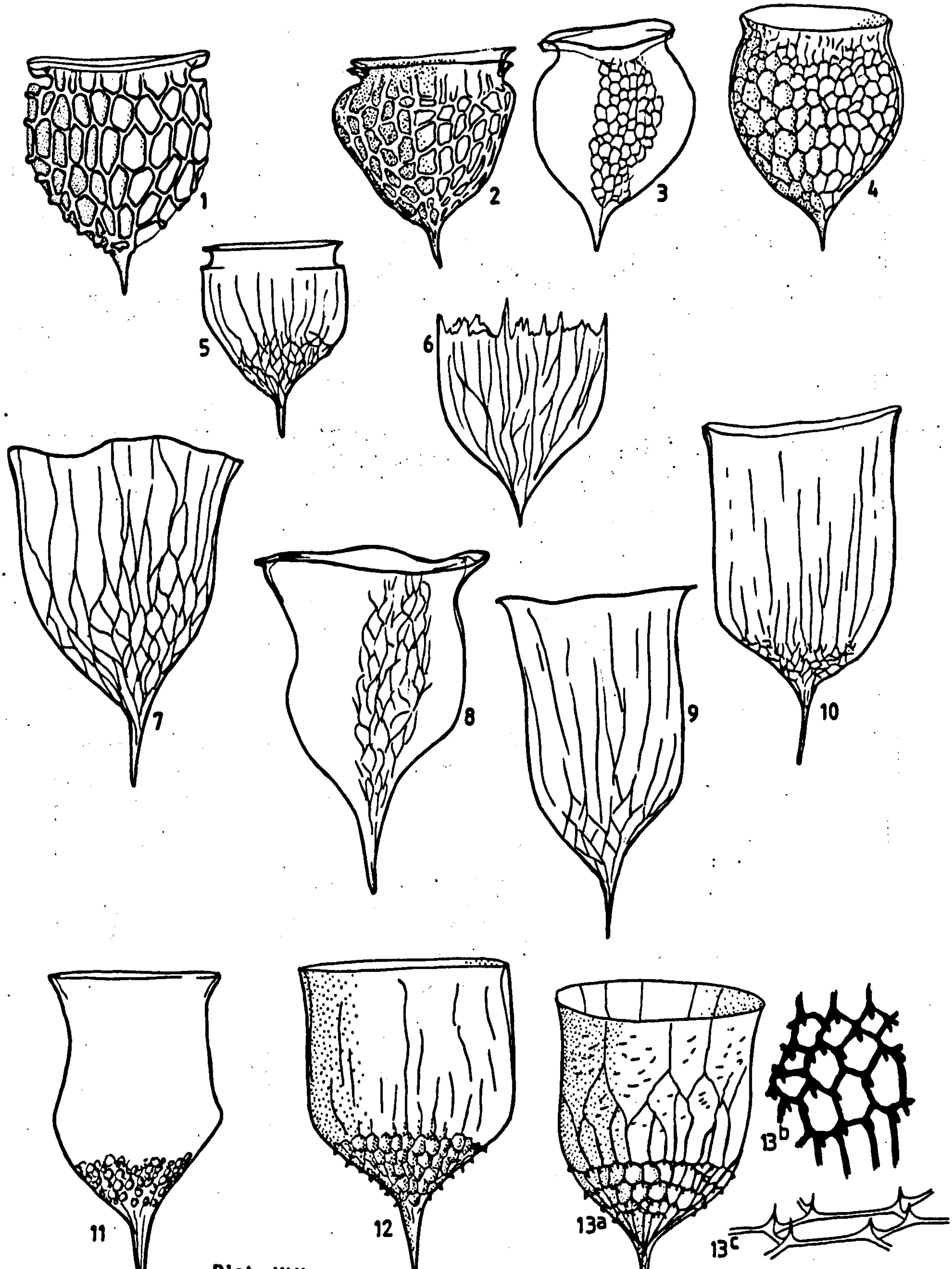

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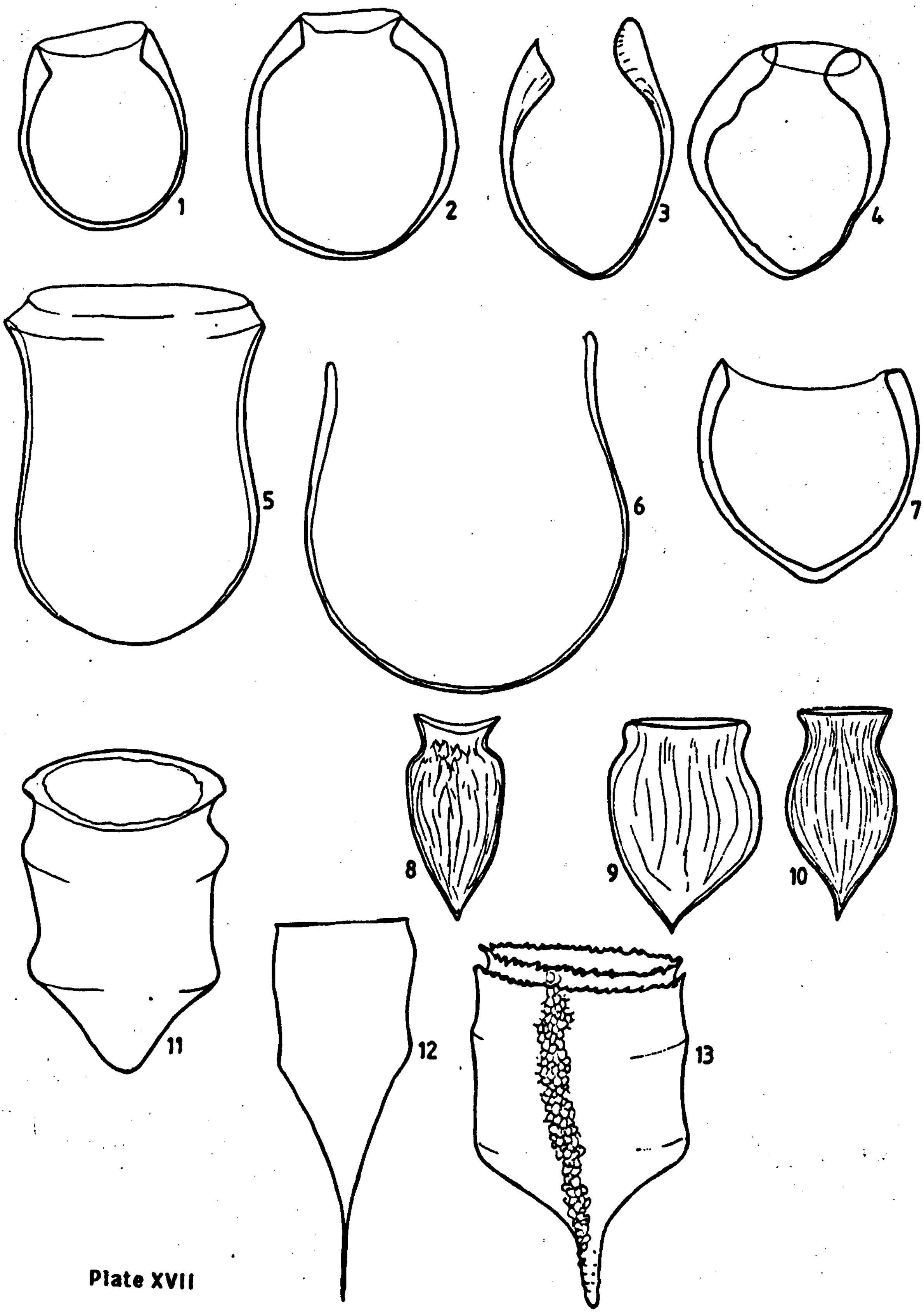
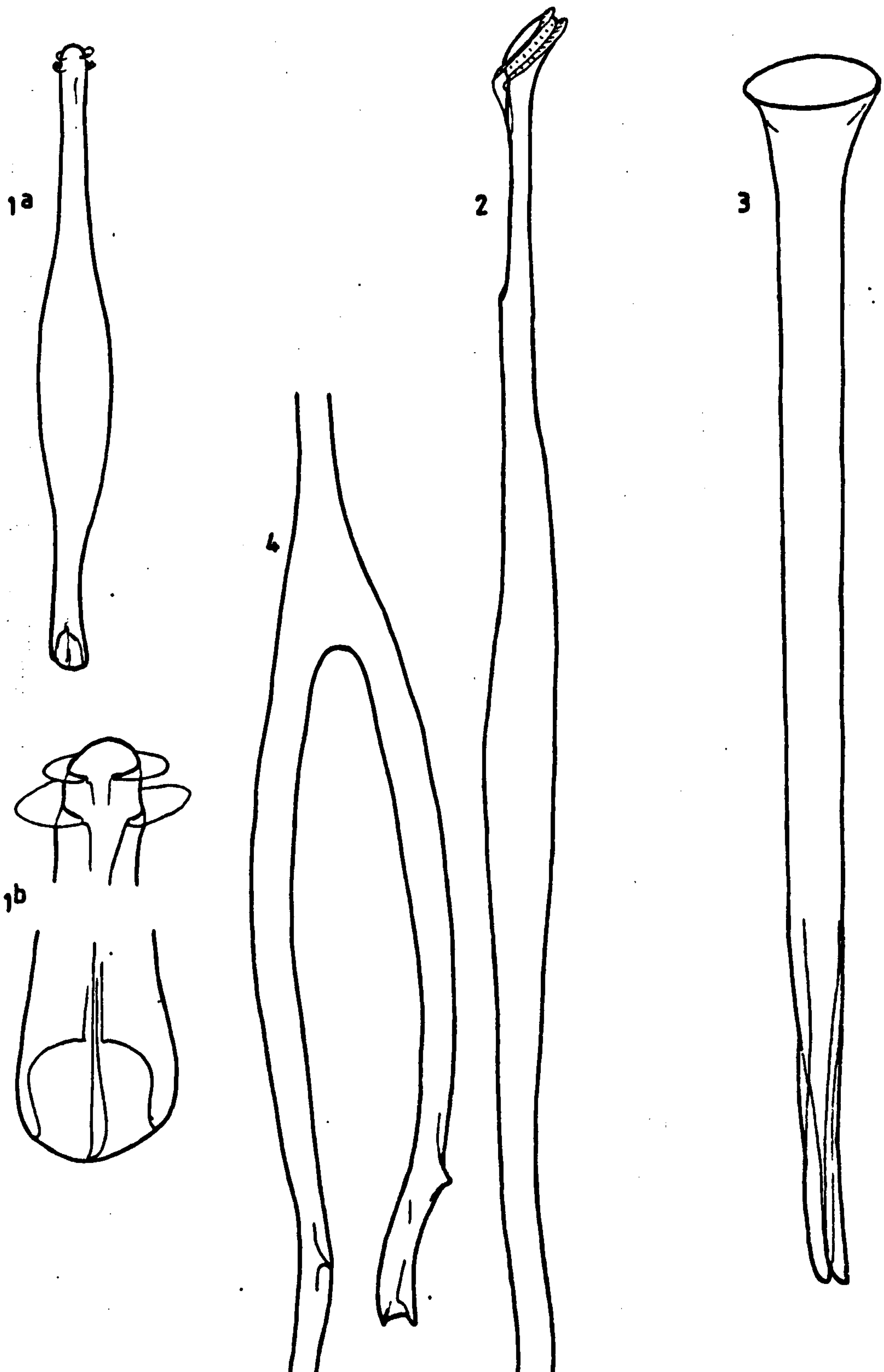


Plate XVII

Plate XVIII



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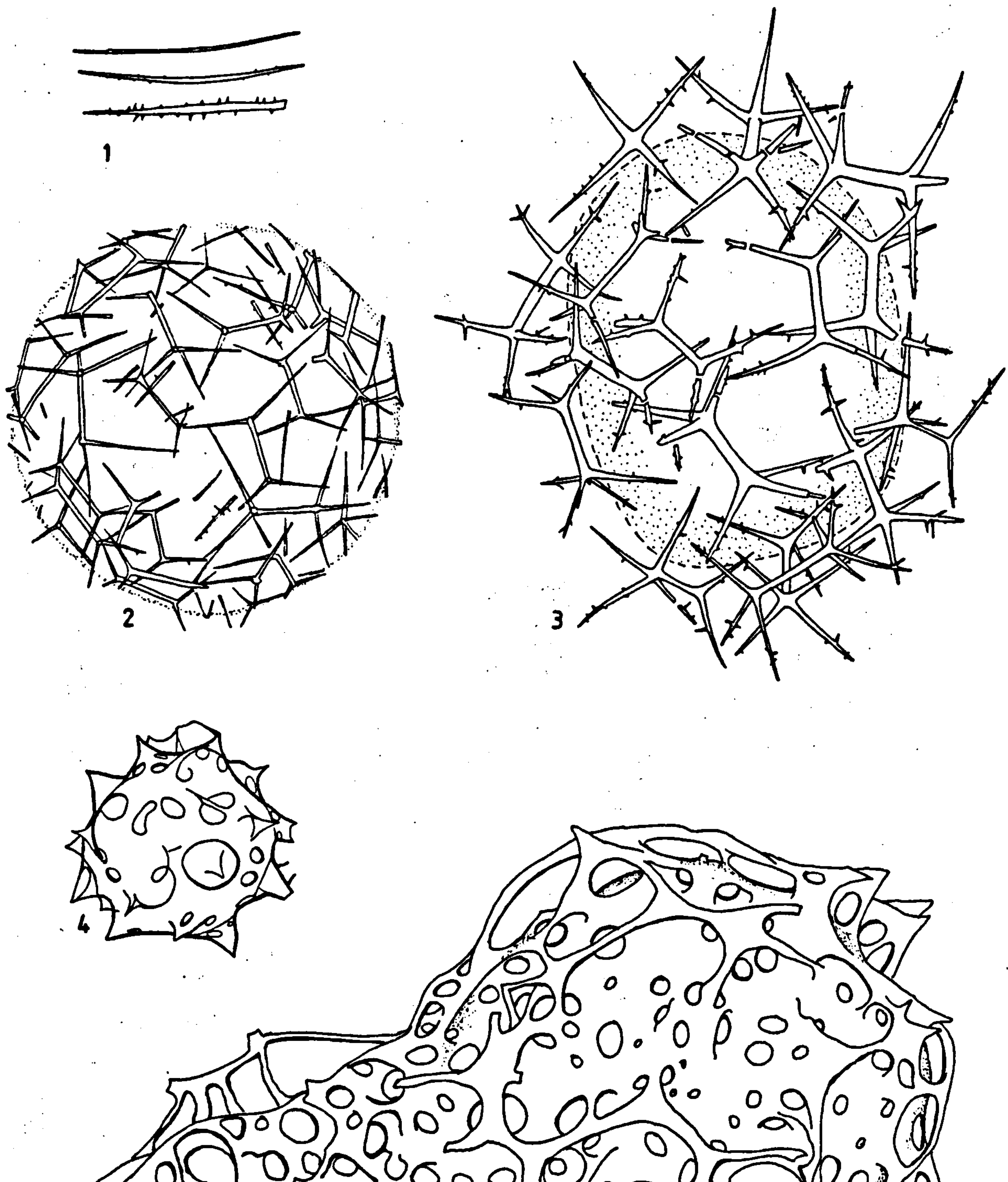

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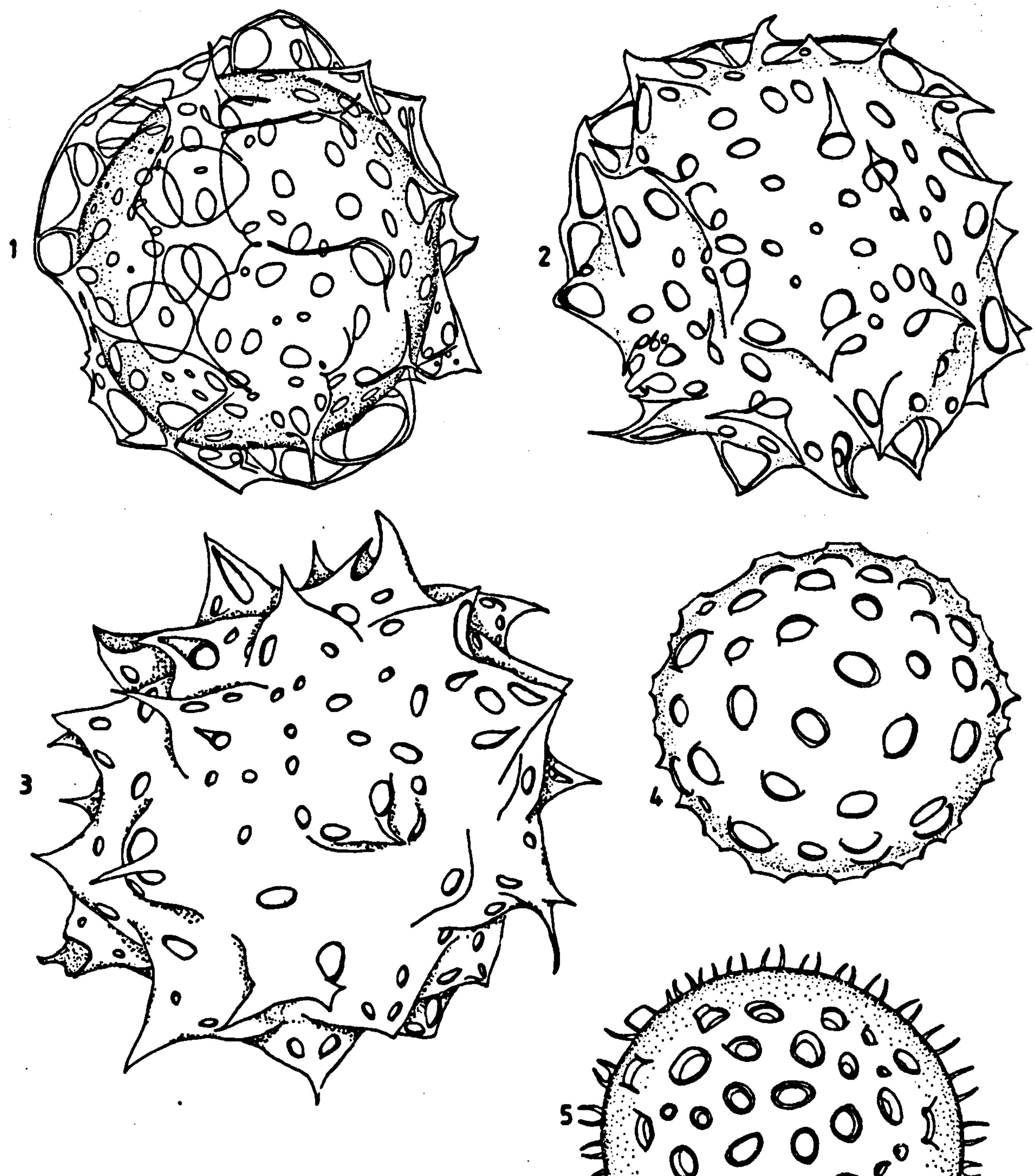

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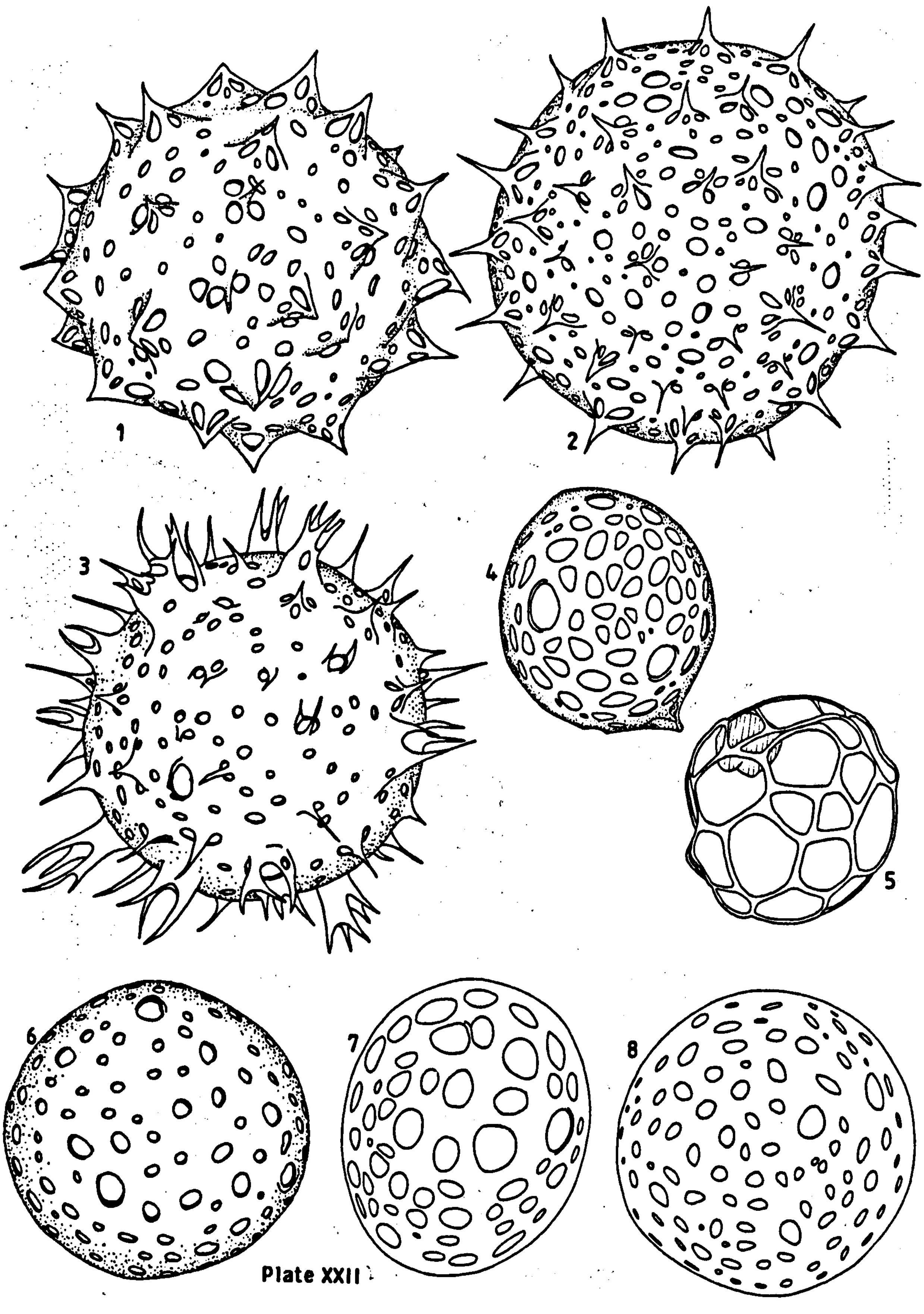

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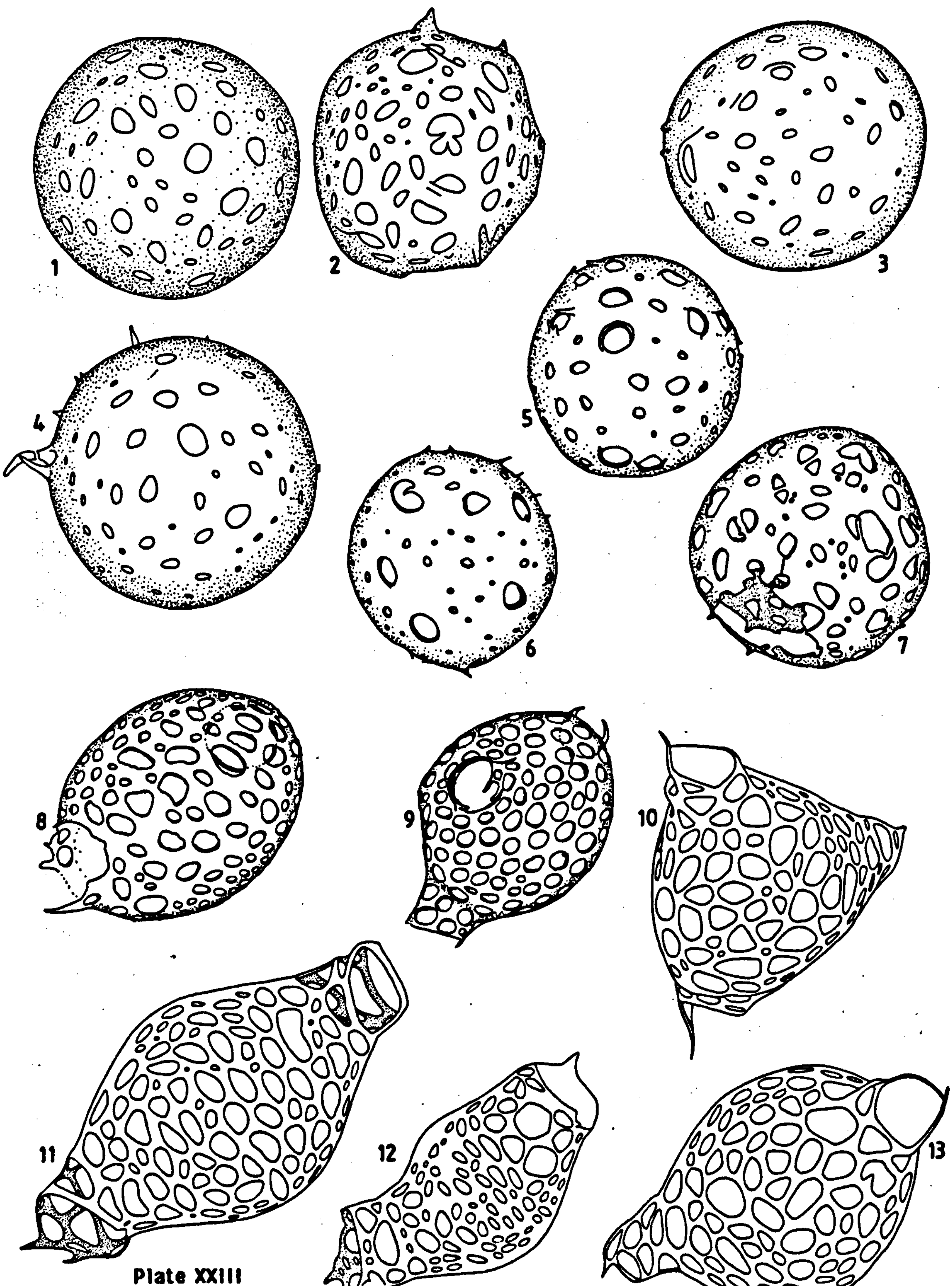

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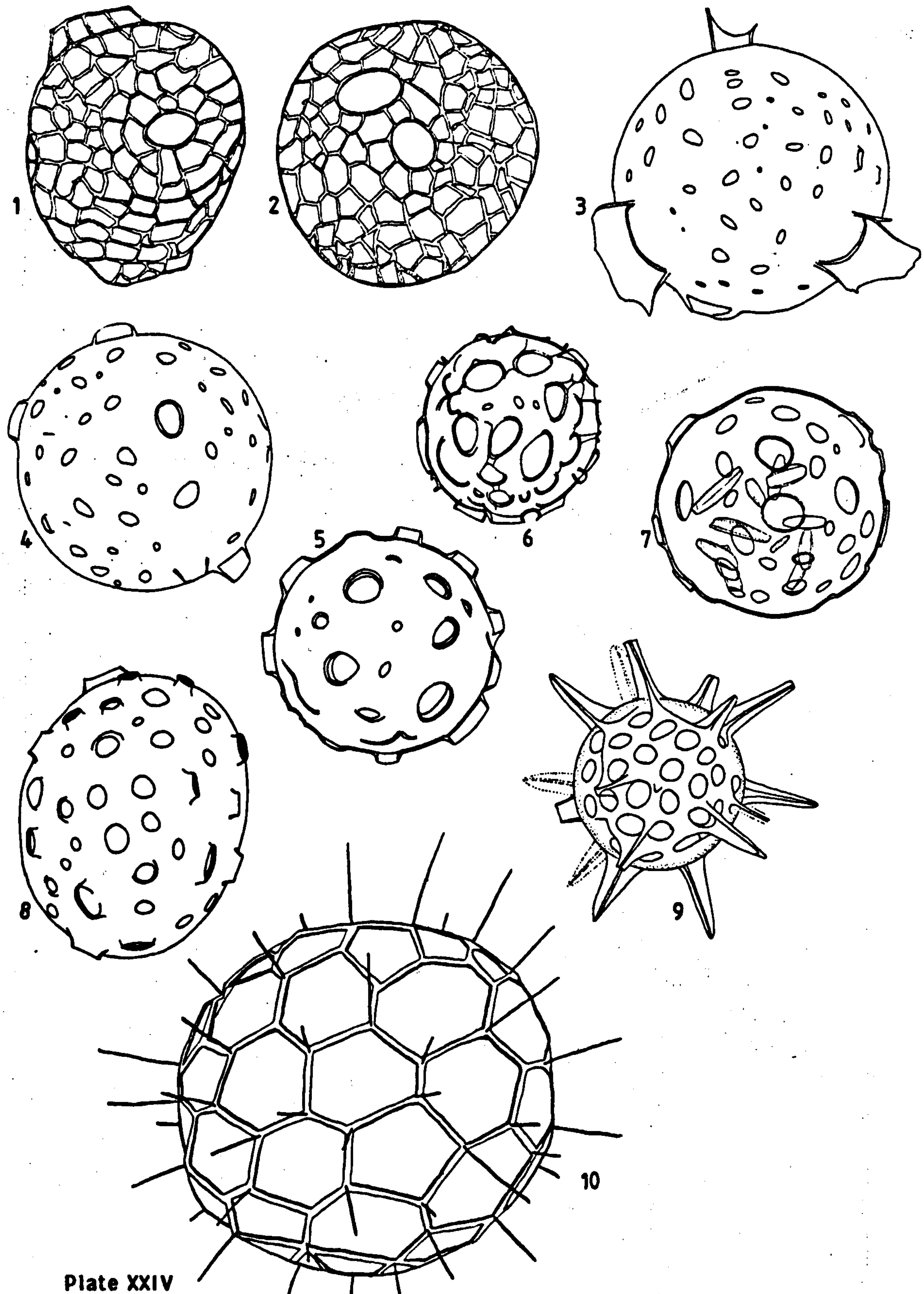

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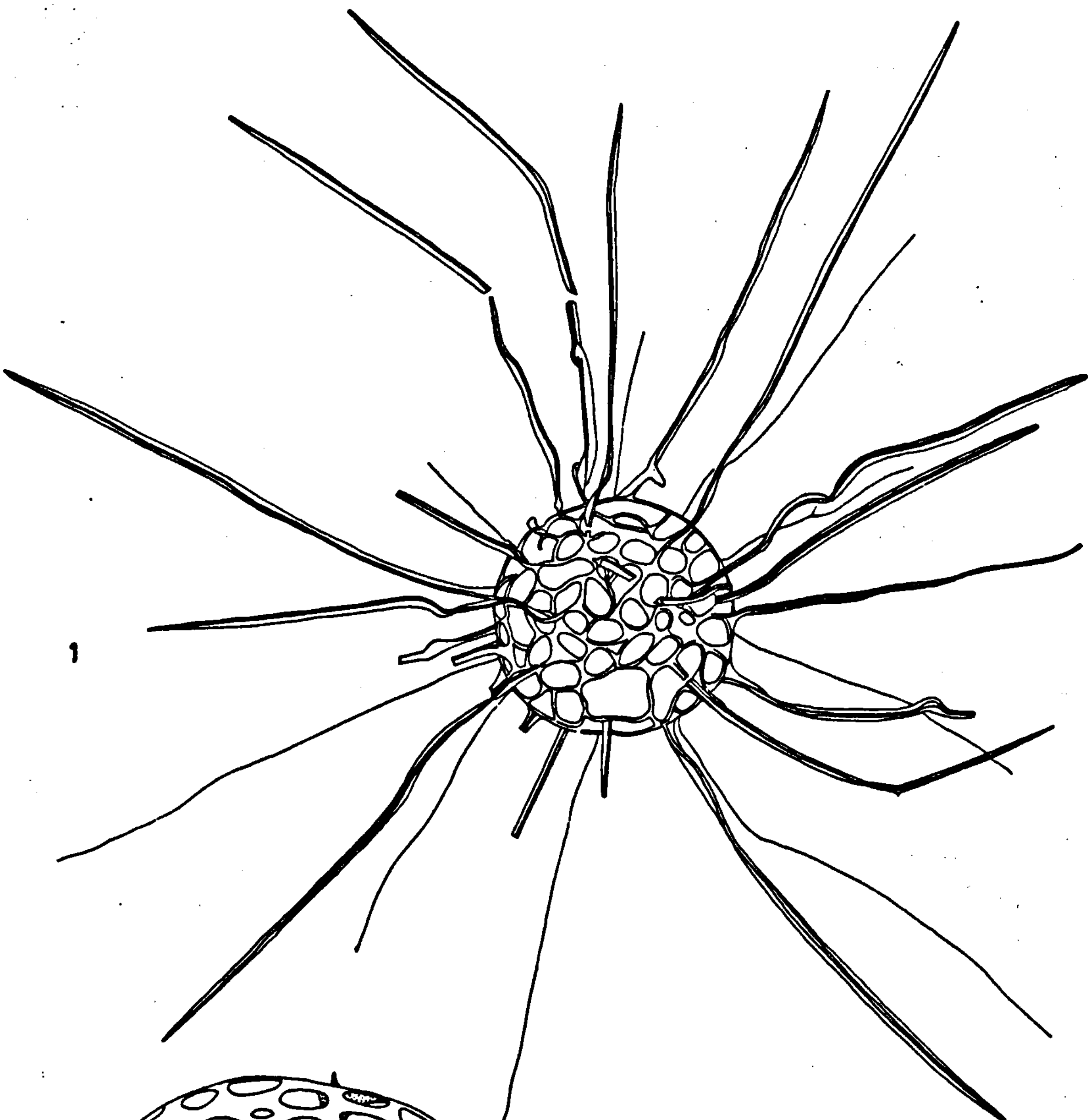

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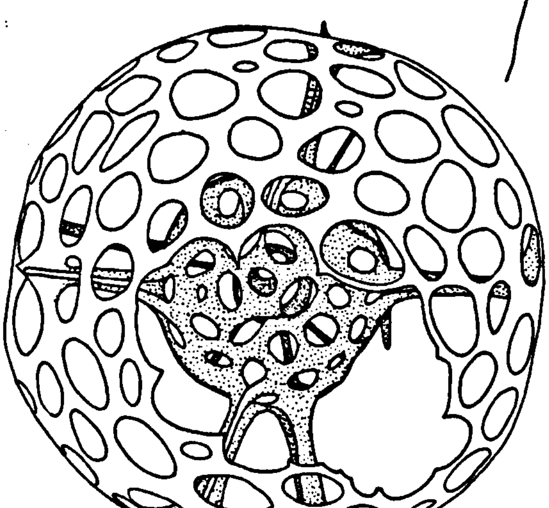

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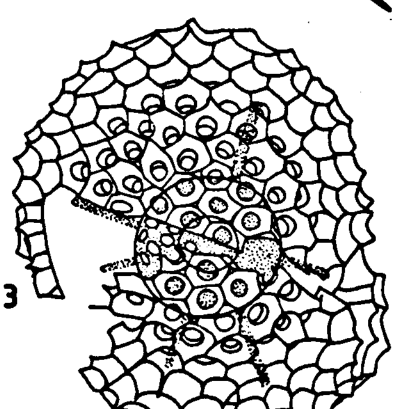

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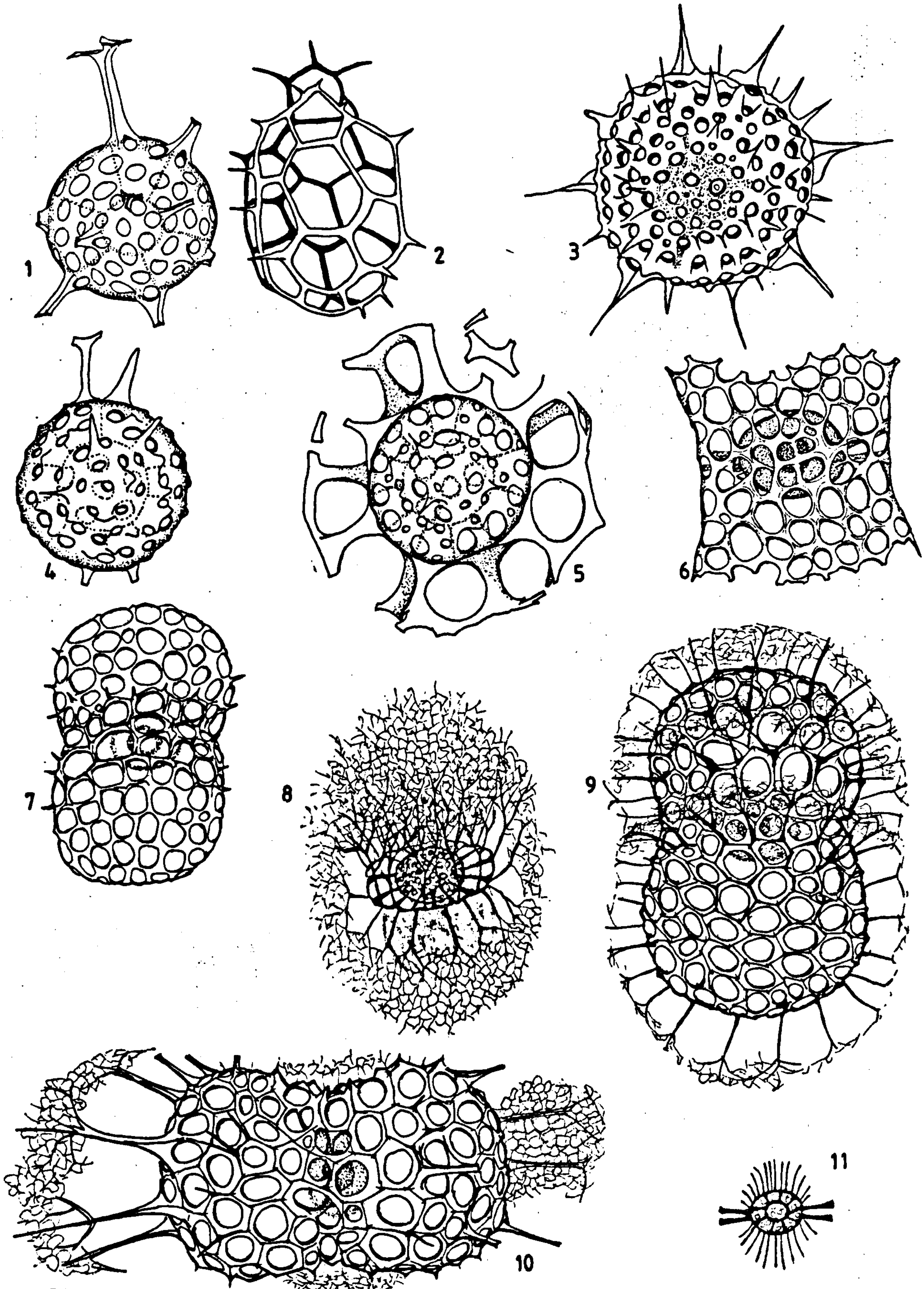

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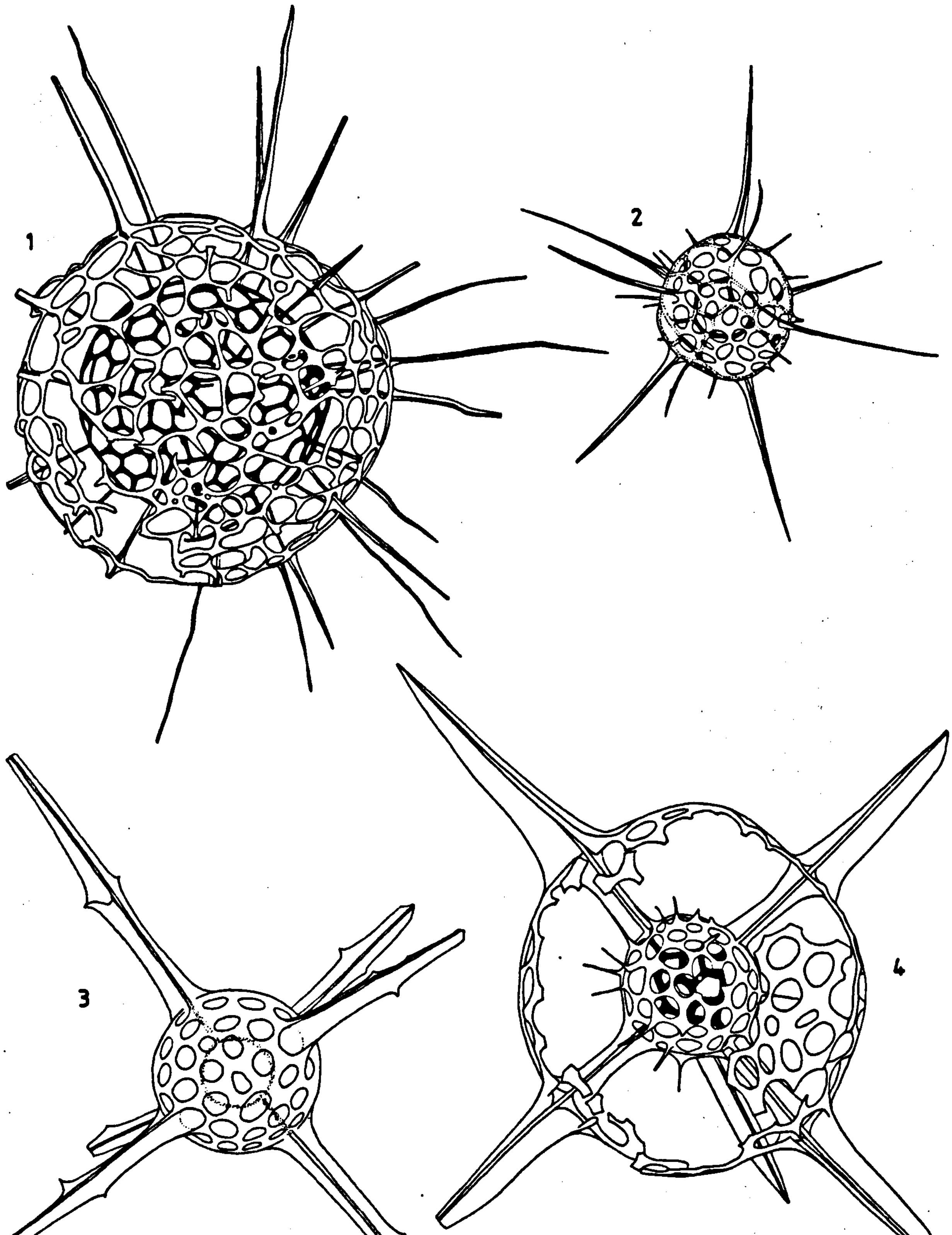

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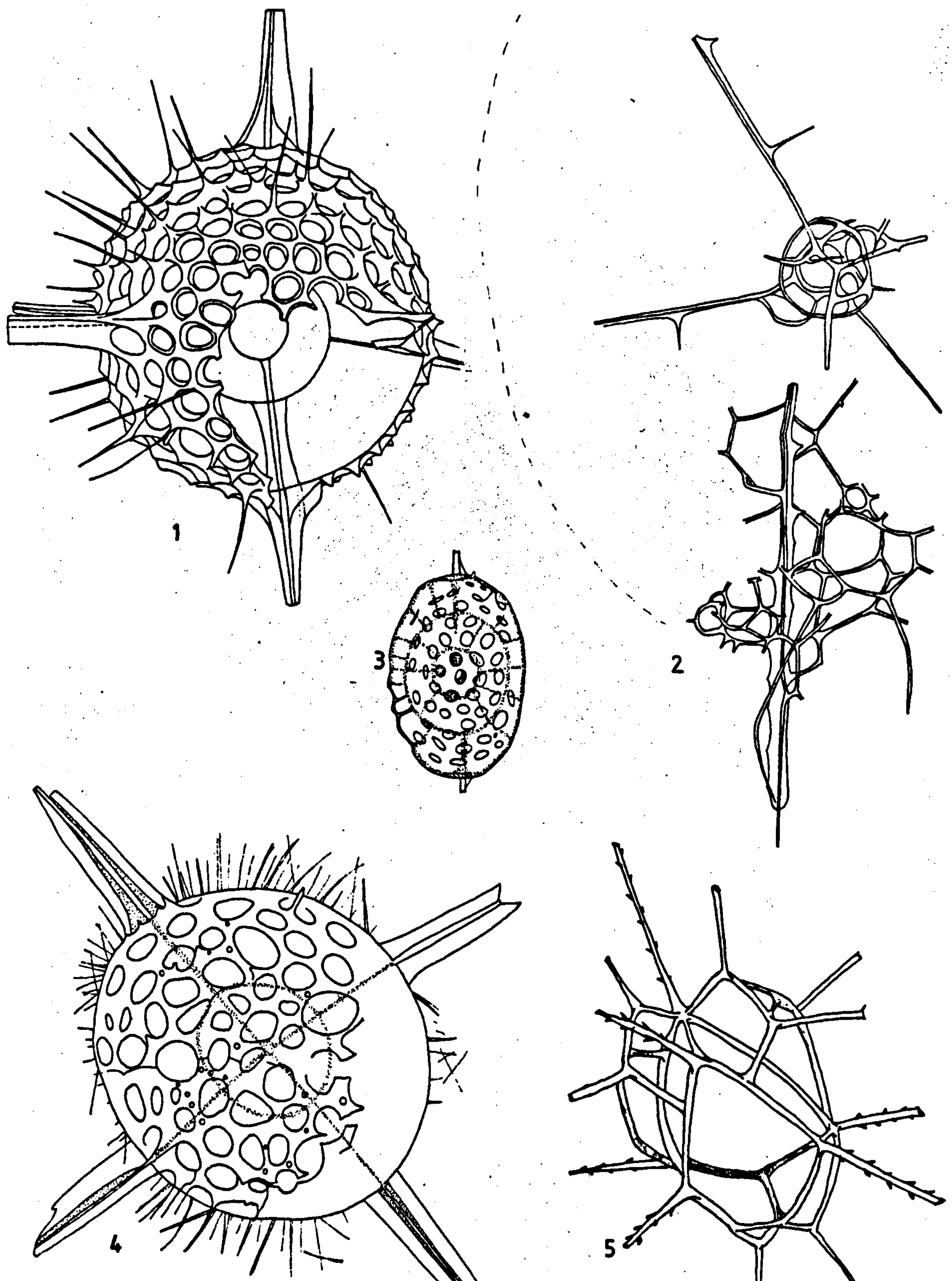

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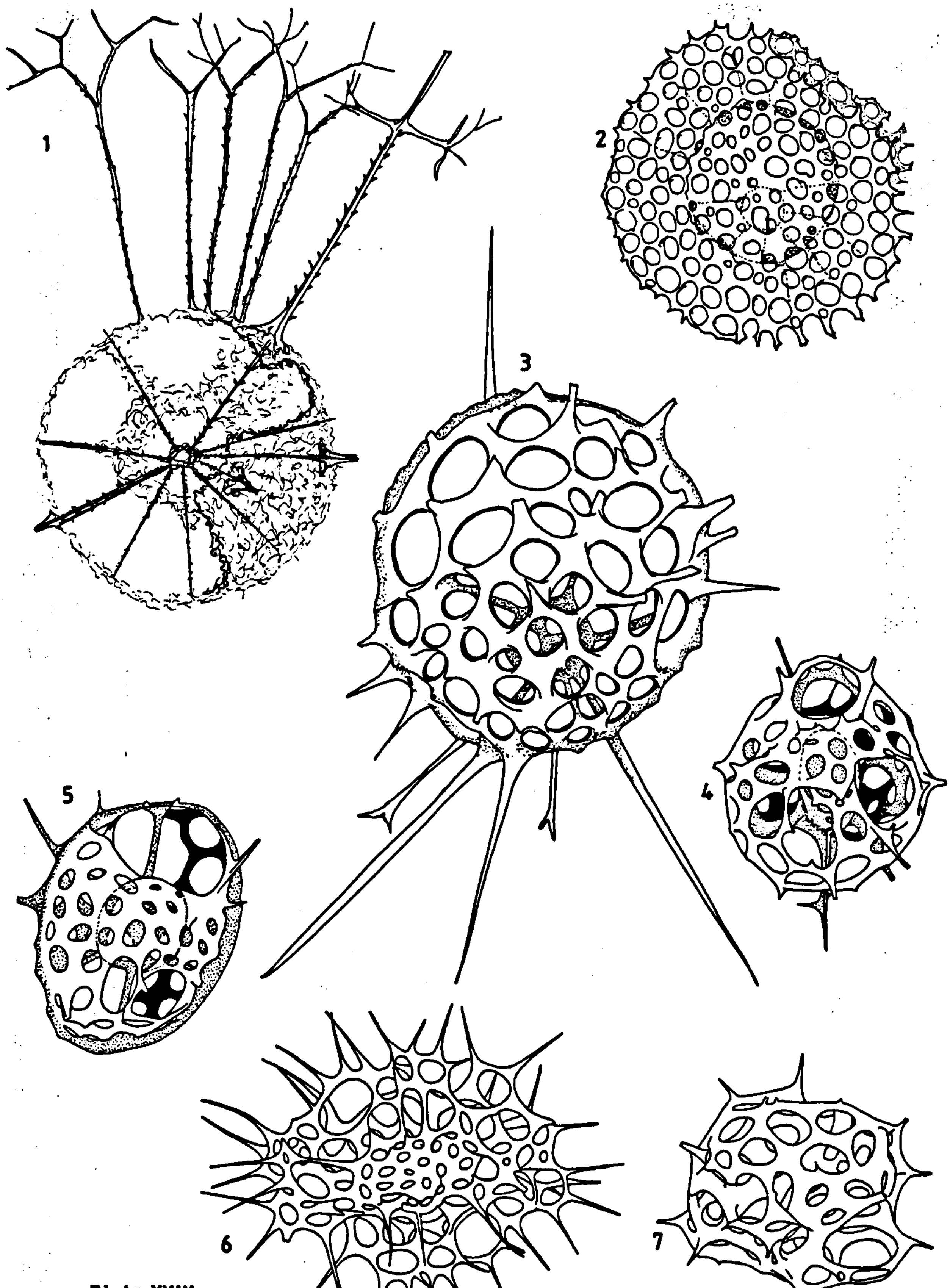

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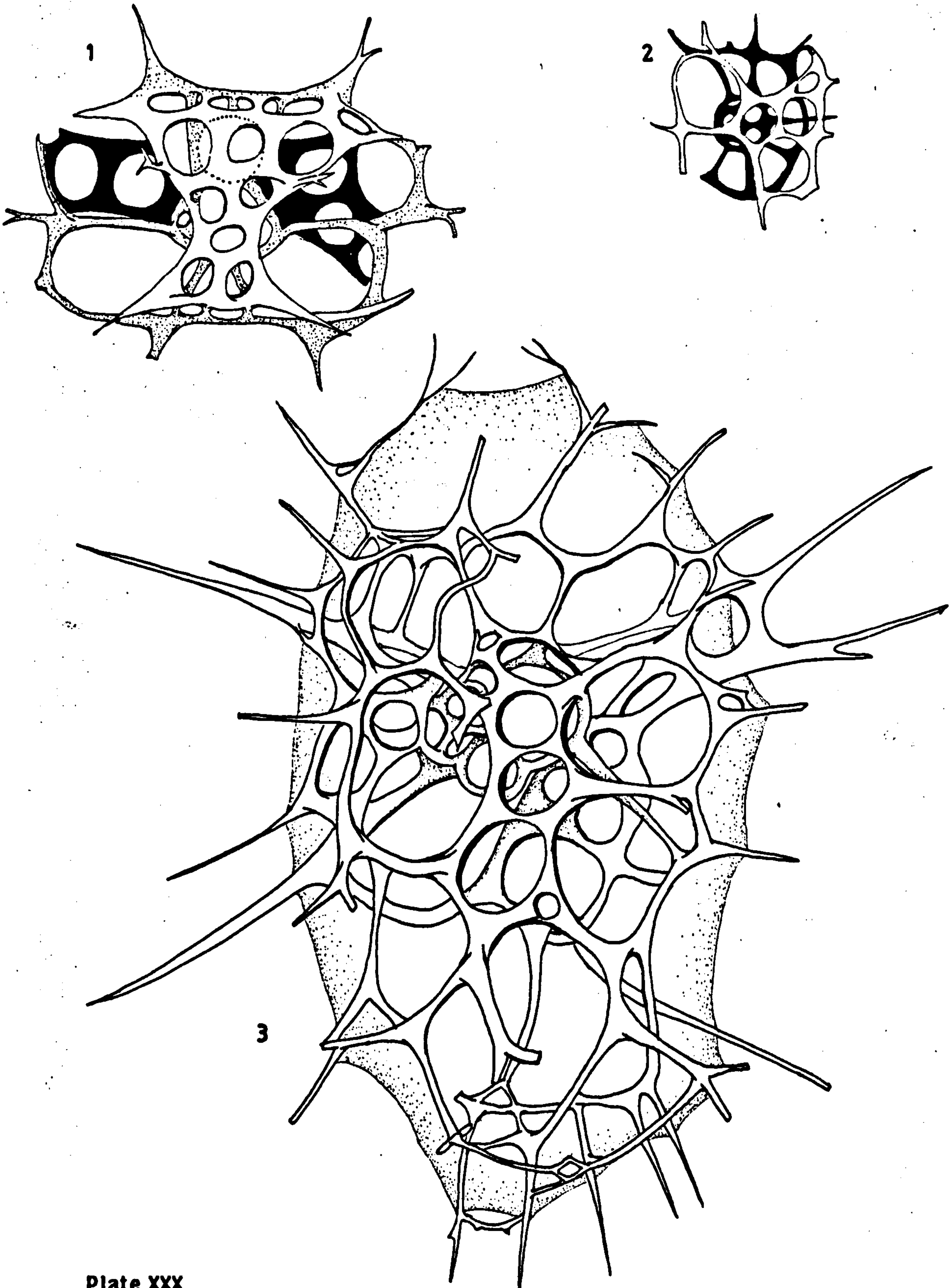

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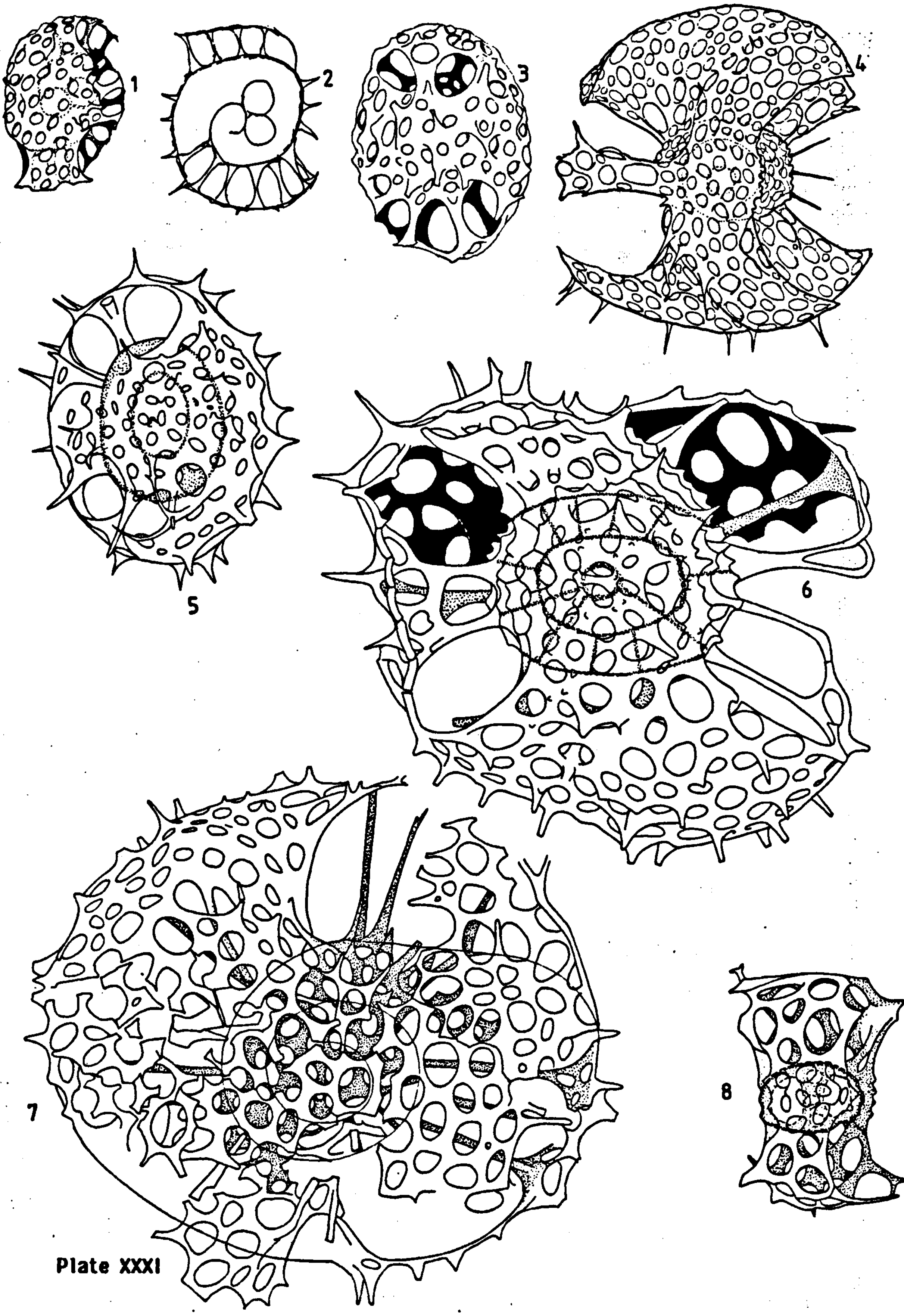

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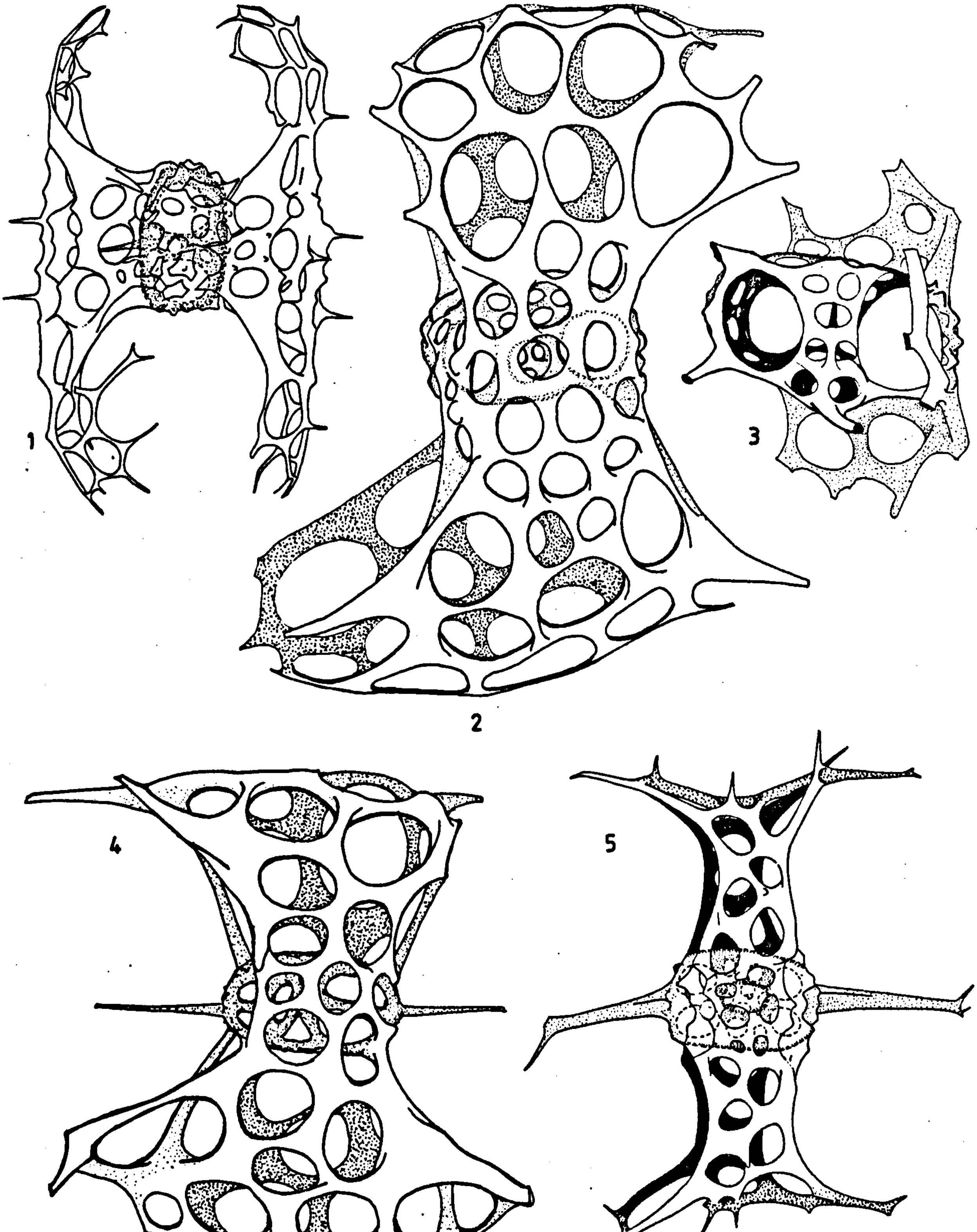

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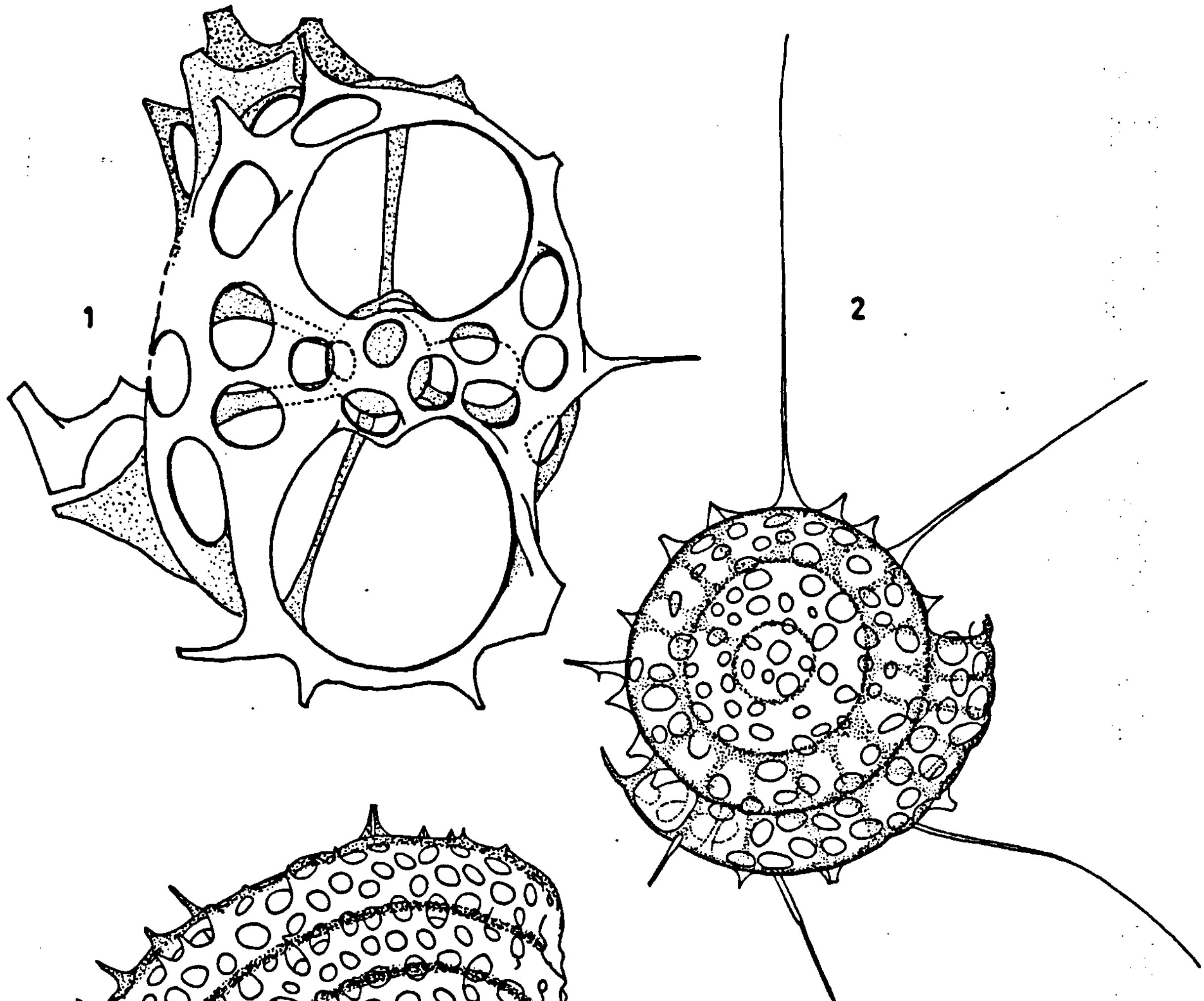

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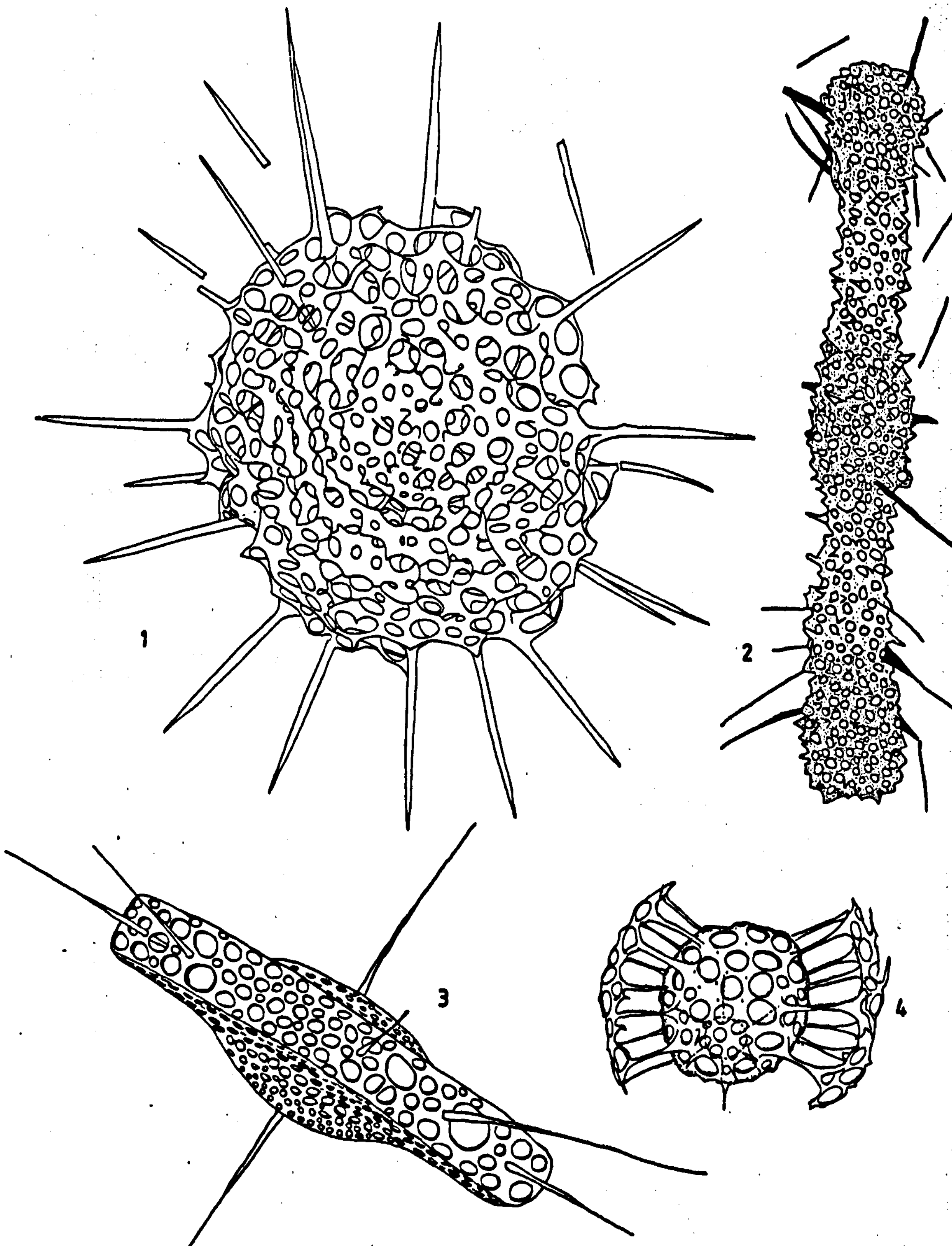

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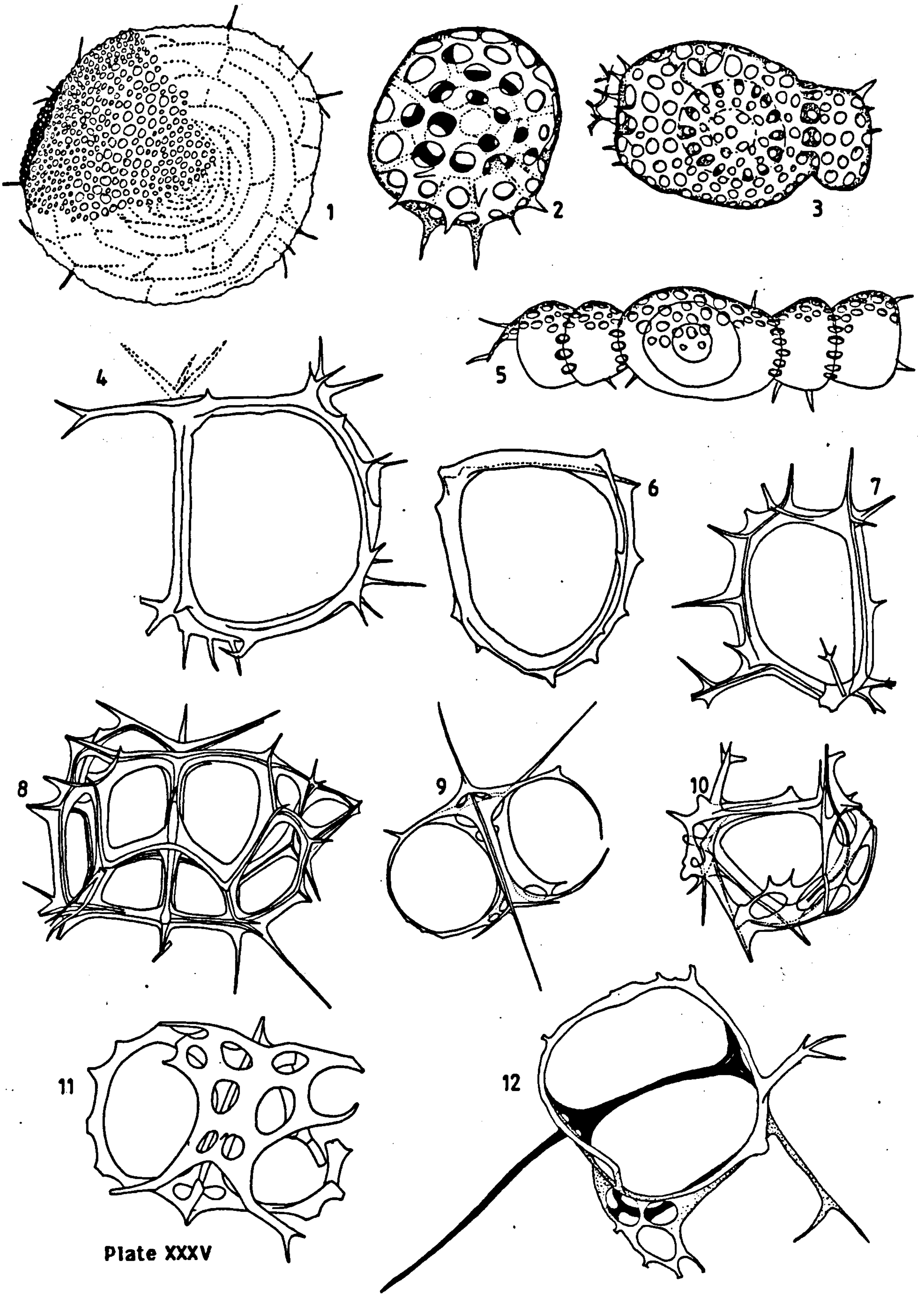

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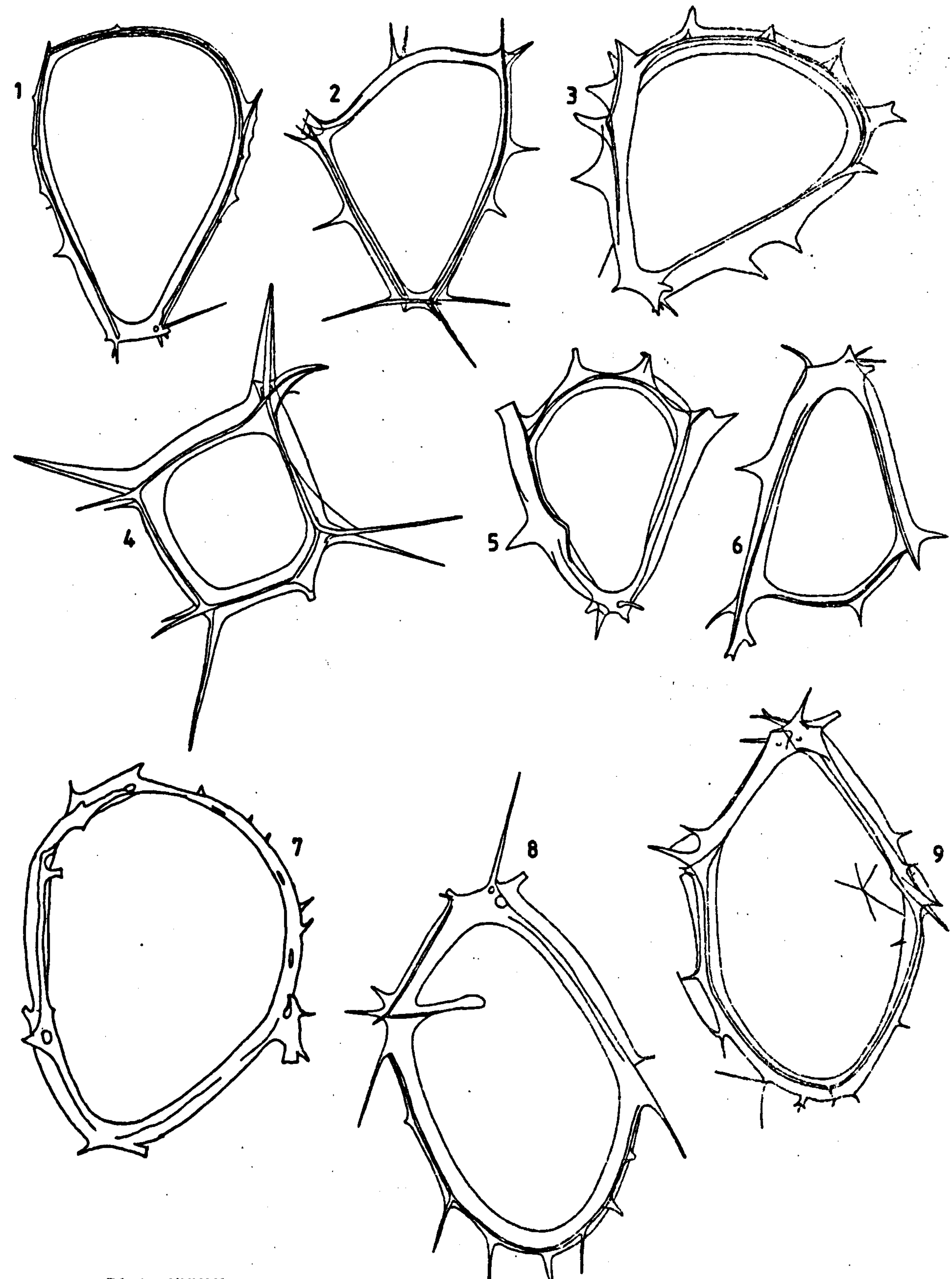

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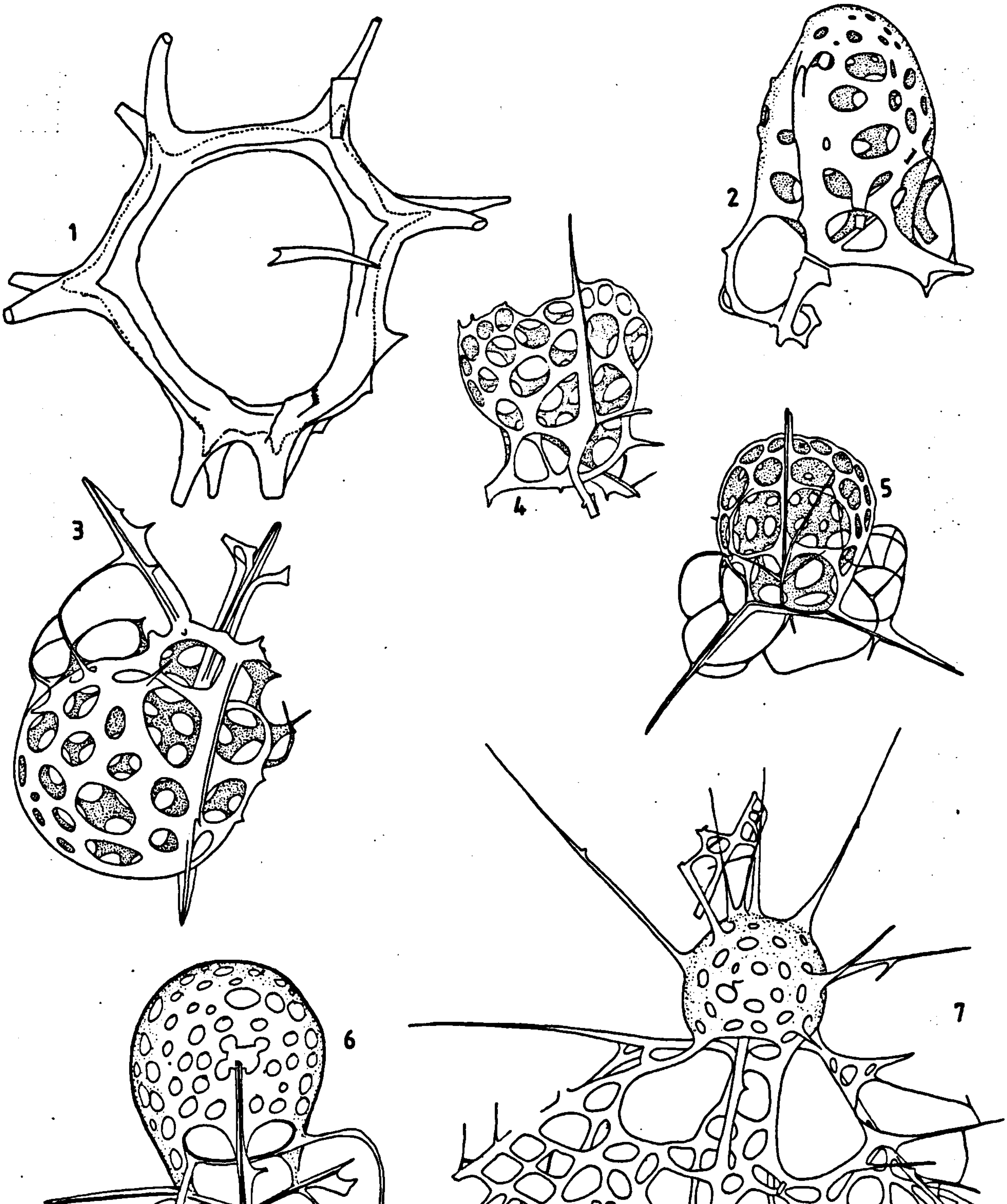

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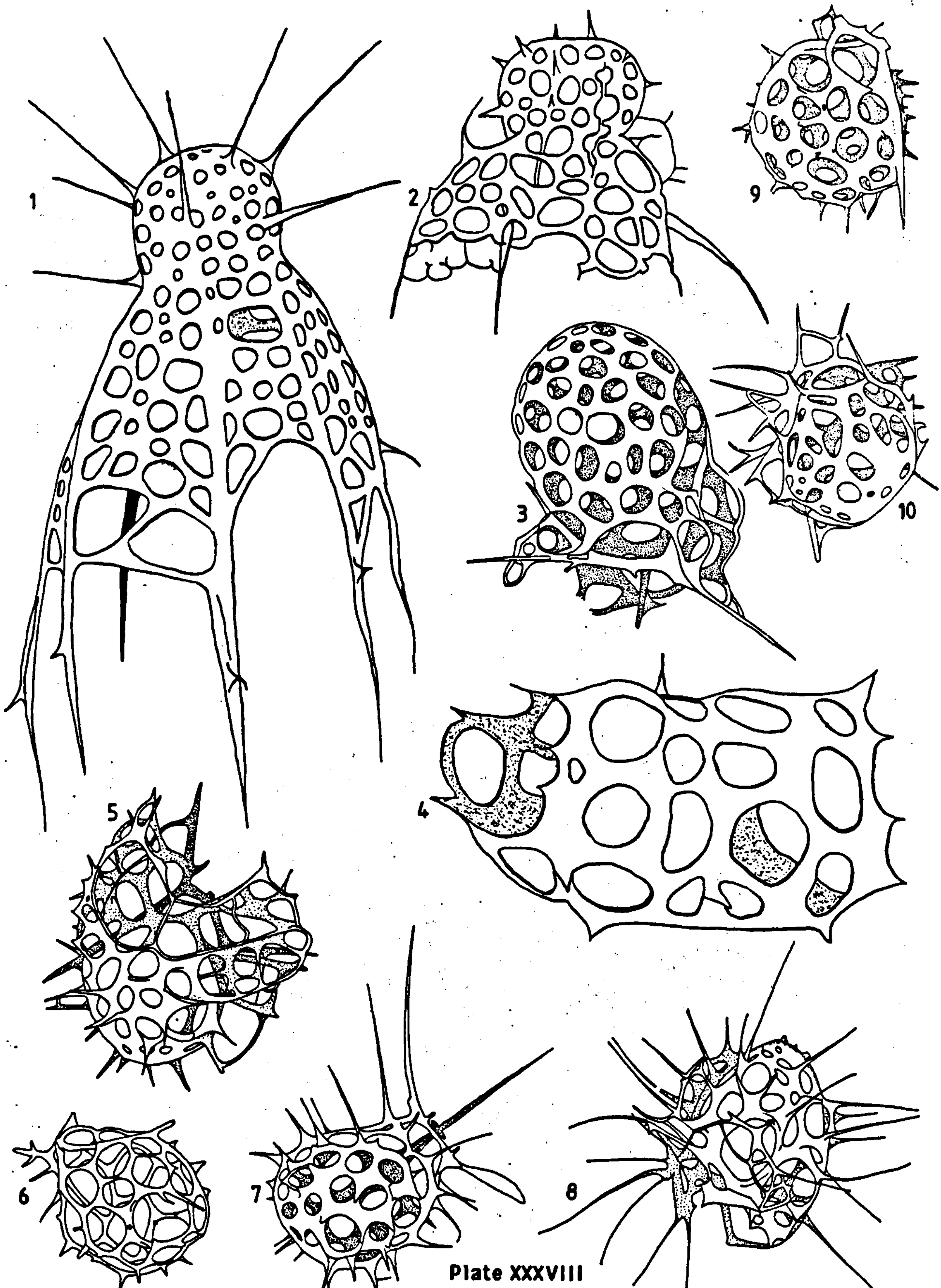

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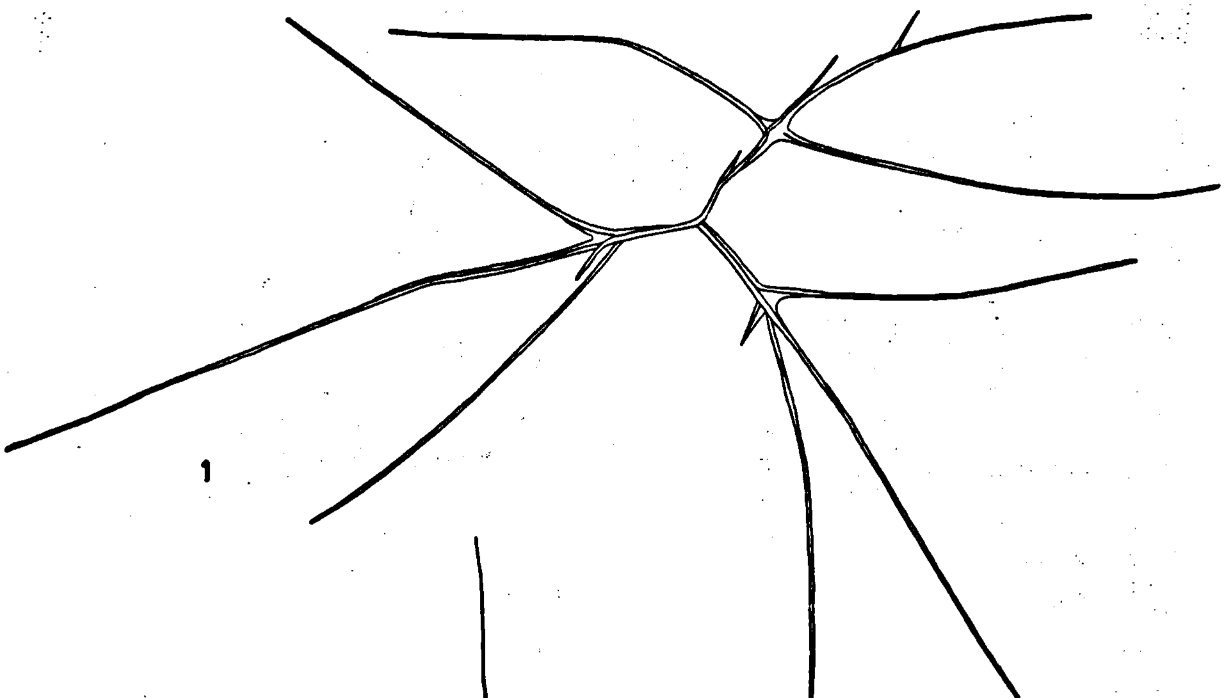

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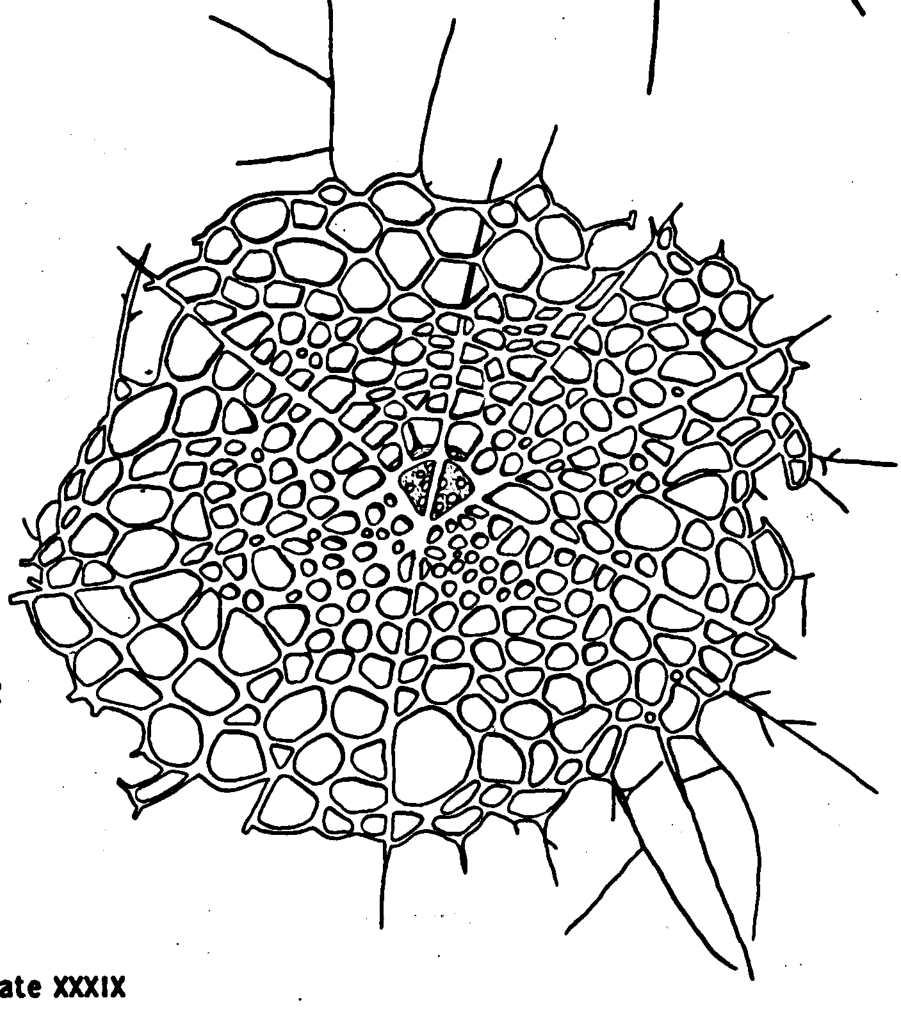

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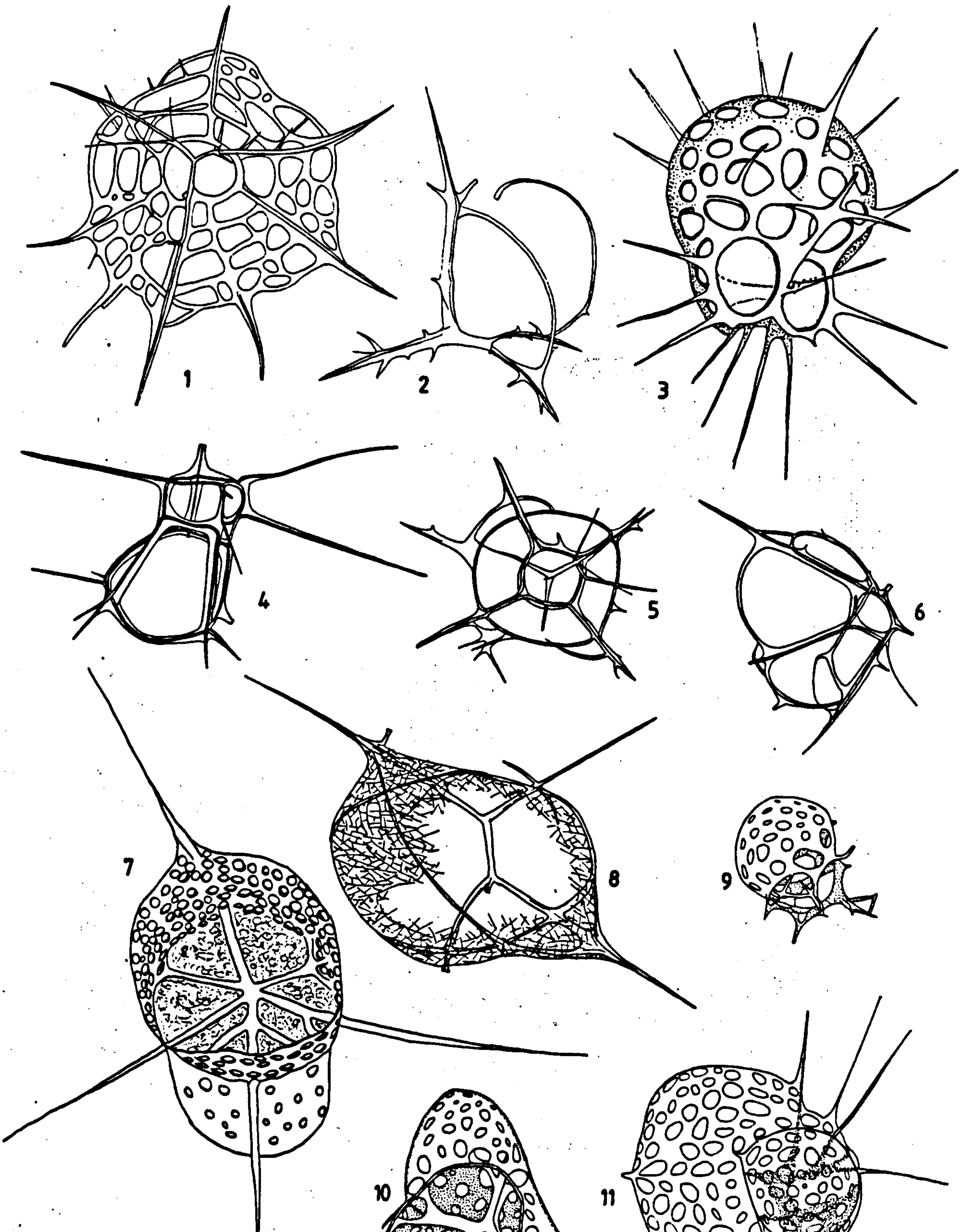

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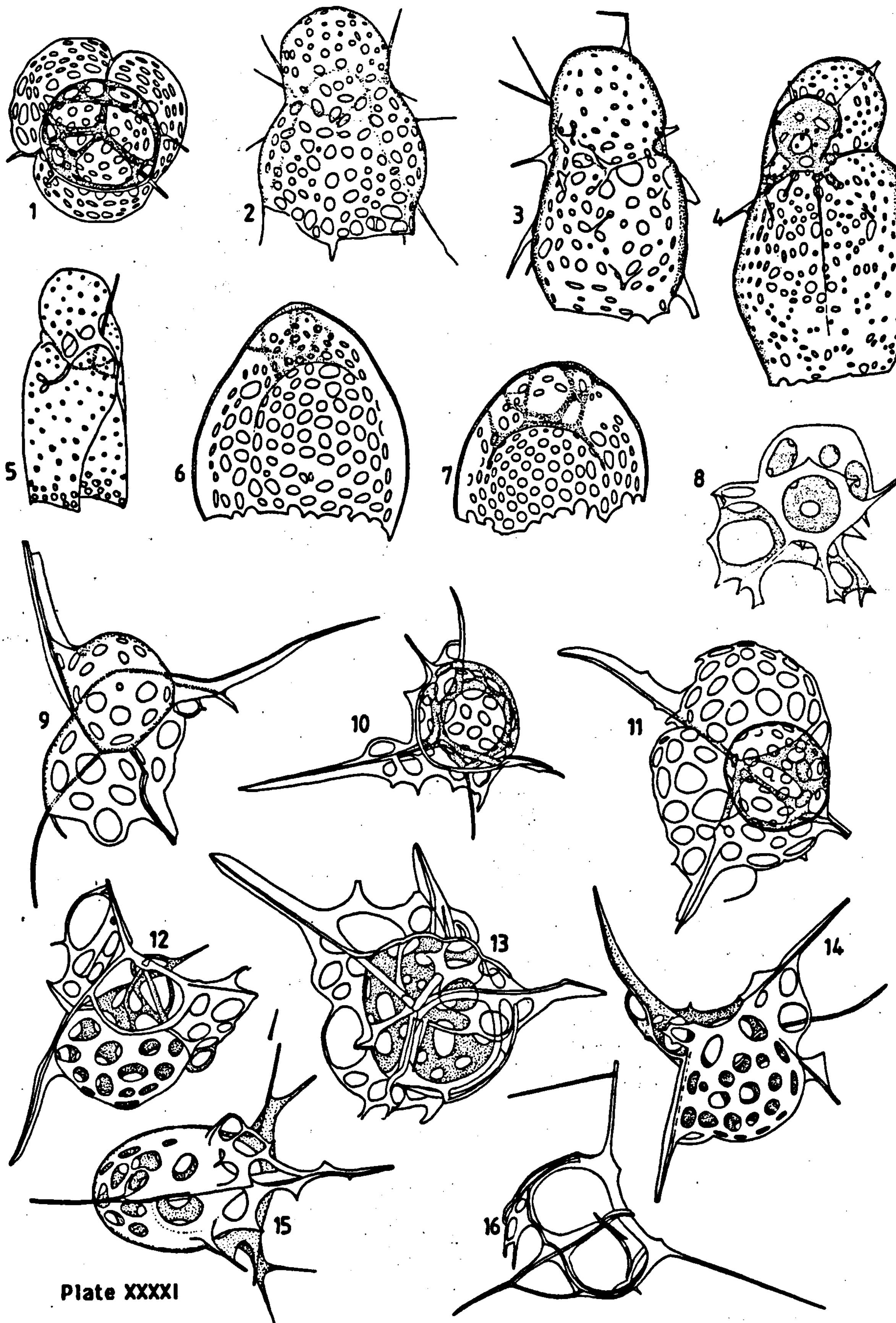

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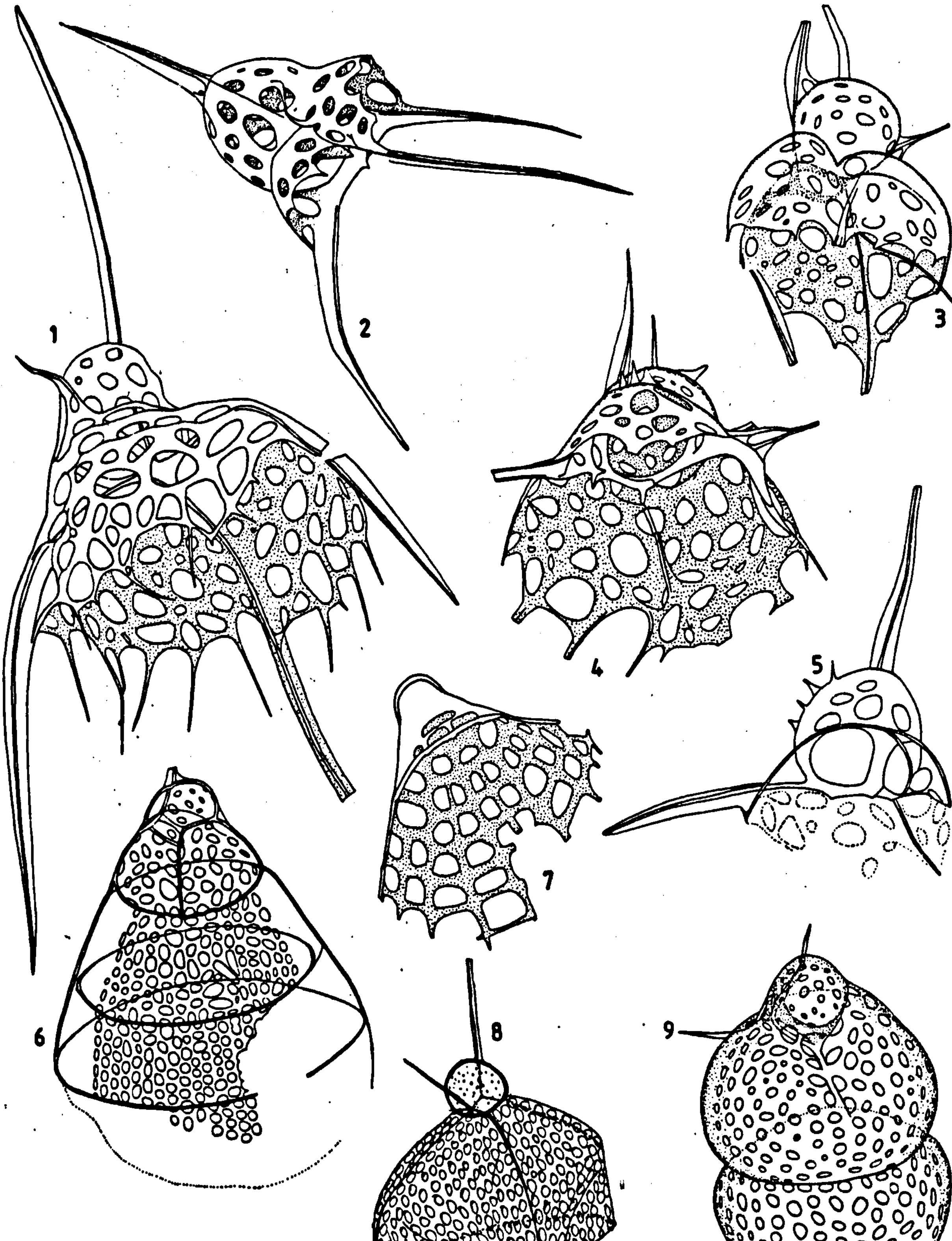

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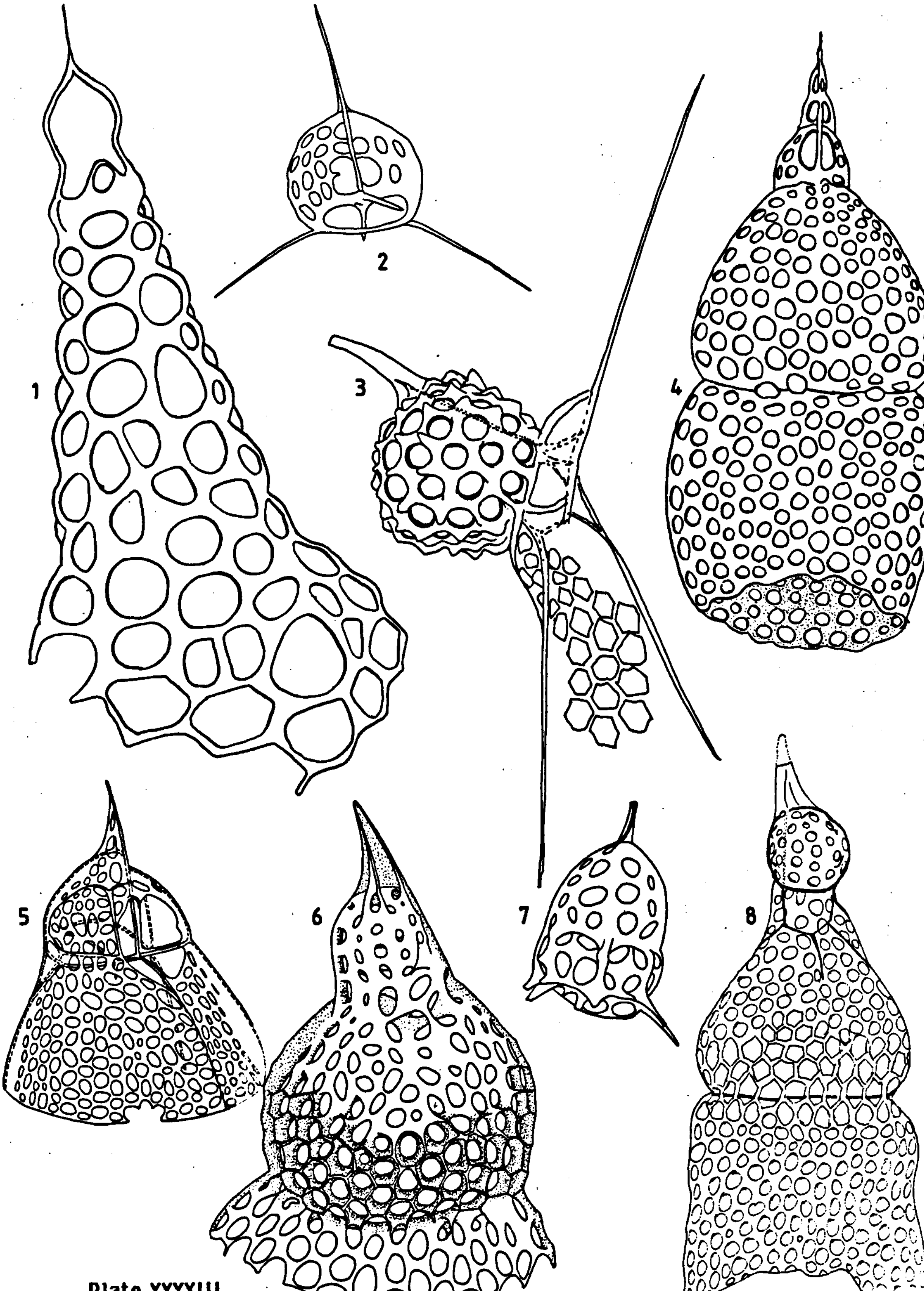

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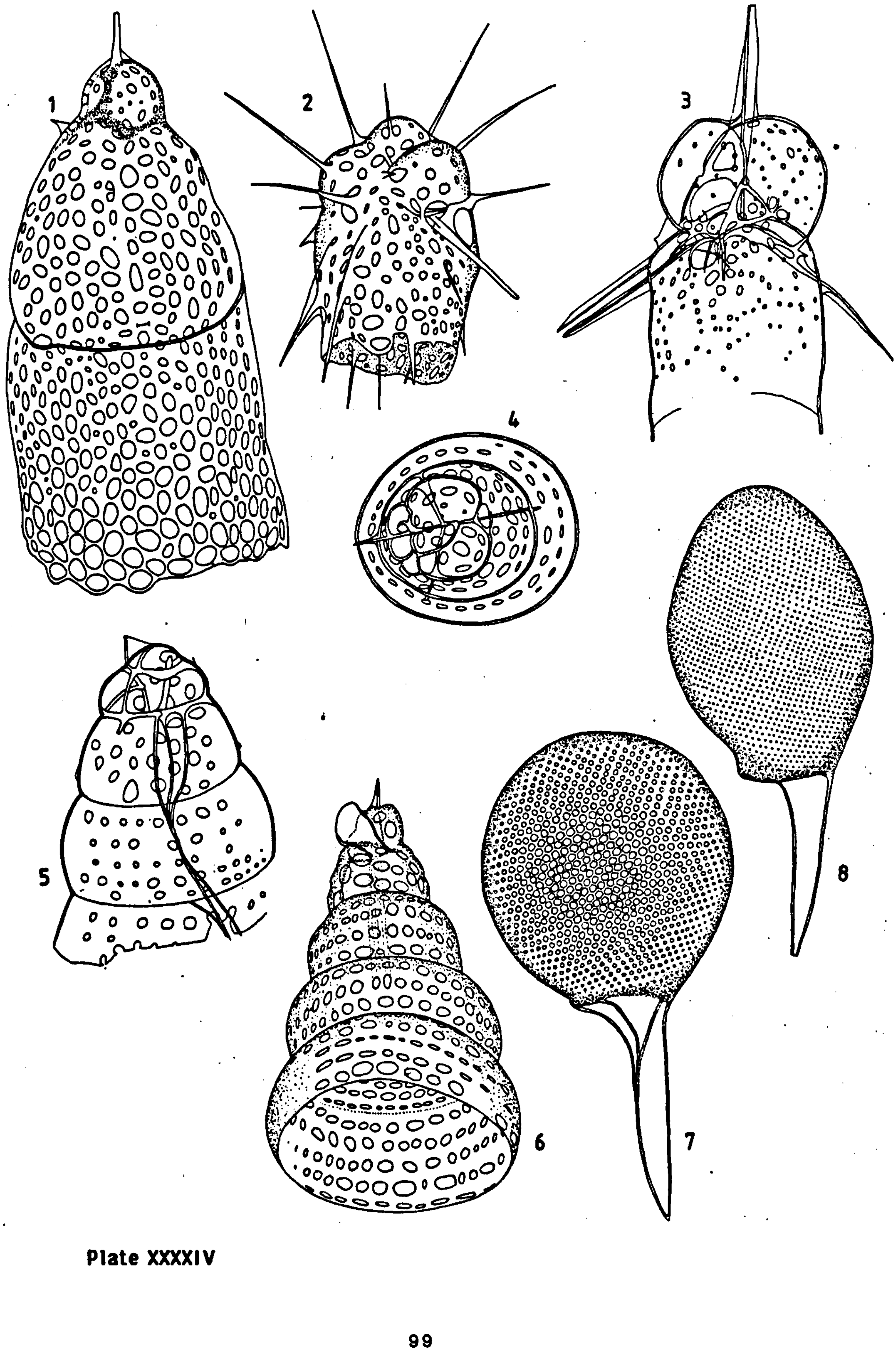

Plate XXXXIV