BERGENS MUSEUM

Skrifter Nr 7

HYDROGRAPHICAL AND BIOLOGICAL INVESTIGATIONS

IN

NORWEGIAN FIORDS

By

O. NORDGAARD

THE PROTIST PLANKTON AND THE DIATOMS IN BOTTOM SAMPLES

BY

E. JØRGENSEN

WITH 21 PLATES AND 10 FIGURES IN THE TEXT

BERGEN
JOHN GRIEG
1905

B. Protistplankton.

By E. Jørgensen.

a. Plankton tables.

In the following tables r signifies rare, rr very rare (only one or very few specimens seen), r+ less rare, + frequent, +r less frequent, +c rather common, c common, cc very common, ccc in large quantities.

The method used for collection and examination only allows reliable conclusions as to the quality, not as to the quantity. From the signs used to indicate the more or less common occurrence it should, however, be evident which species are common or go to make up a considerable part of the plankton. It is, however, always to be remembered that the signs are only based upon a subjective judgment, not upon exact counting.

As a general characterization of the plankton — which for all stations, the sea off Vesteraalen (Yttersiden) perhaps excepted, is to be considered more or less unmixed coast plankton (neritic p.)—it may be stated that the Peridinæa in the winter season are predominant in quantity, together with Halosphæra, while the Diatomaceæ and likewise the Tintinnodea are of less frequent occurrence. This state is at once changed in the spring (about $^{1}/_{4}$ 1899, in 1900 $^{23}/_{3}$), when a few species of Diatomaceæ suddenly appear in large quantities. and remain for a considerable time at least more than one month, how long cannot be seen from the samples collected, as it was too early in the year, when the last samples were taken. During this time the other plankton is very much reduced in quantity, excepting Phæocystis, which species seems to have its optimum just in this period. The Peridinæa occur far less abundantly than earlier, not only in relation to the large masses of Diatomaceæ, but also absolutely.

This phenomenon, that might truly be named the inflow of Diatomaceæ, is a well known phase also in the development of the more southern coast plankton (see L. (= Literature, at the end of this essay) 1). Ostenfeld and Gran (L. 2 and 3) have also mentioned it, and try to explain the causes. It is an interesting fact that most of the leading species are identical, both in the northern and in the southern inflow of Diatomaceæ, on the extensive coast of Norway. Yet there are some few species characteristic of the northern, that seem to be entirely wanting in the southern, especially *Fragilaria oceanica*, partly accompanied by *F. cylindrus*, and *Chætoceros furcellatus* (besides some other, less predominant species).

As to quality the northern plankton is decidedly poorer than the southern, especially is this the case with the Tintinnodea.

Year 1899 Month	January														
Locality	Helligvær, 10 miles NW		Vestfjord I, between Helligvær and Værø		Moskenstrømmen		Reine, 8 miles SE	Stamsund, 8 miles SE		Henningsvær, 7 miles S		Yttersiden, 23 miles NW of Gaukværo		40 miles NW of Gaukværo	
Date	12/1	12/1	13/1	13/1	14/1	14/1	17/1	17/1	17/1	17/1	17/1	18/1	18/1	19/1	19/1
Depth (meters)	0—50	0—250	0—50	0—180	0—50	0—100	0—150	0—50	0—100	0—50	0—180	0—50	0—110	0—50	0—700
Salinity (‰)	33.39	33.39—35.11	33.50	33.50—34.57	33.39—33.46	33.39—33.46	33.39—34.40	33.33—33.39	33.33—33.74	33.39		33.50		34.38	34.38—34.38
Temperature (Cels.)	4.3—4.4	4.3—7.3	4.6—4.9	4.6—6.5	4.1—4.5	4.1—4.7	4.2—7.1	3.9—4.3	3.9—5.5	4.2		4.1—4.7		5.9—6.4	5.9—3.6
I. Bacillariales. *(Diatomaceæ.)*															
Rhizosolenia alata Brightw. *forma curvirostris* Gran.	rr														
Biddulphia mobiliensis Bail.	rr	..	r												
Chætoceros borealis Bail.	rr														
C. b. var. *solitaria* Cl.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
C. convolutus Castr.	..	..	rr												
C. atlanticus Cl.	r	..	r	rr	..	..	..	..	rr	r	..	rr	..	r	r+
C. decipiens Cl.	rr	..	rr	rr	..	rr	..	..	..	..	..	..	..	r	r
C. diadema (Ehrb.) Gran	rr														
C. curvisetus Cl.	r														
Actinocyclus Ehrenbergii Ralfs	+r	r	r+	r+	r+	+	r	r	r	r	r	r+	r+	r	r
Roperia tessellata (Rop.) Grun.	..	..	..	rr											
Coscinodiscus excentricus Ehrb.	r+	r	r	r	r	..	r+	r	r	..	..	..	r	r+	r
C. lineatus Ehrb.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
C. curvatulus Grun.	..	..	..	..	rr										
C. stellaris Rop.	rr	rr	..	..	rr	..	..	..	..	r	..	..	r	r	
C. radiatus Ehrb.	+	r	r	r	r+	+	+	r+	r+	+	r	r+	r+	r+	+
C. subbulliens Jørg. n. sp.	..	r	r	..	r	..	..	..	..	..	..	..	..	..	r
C. centralis Ehrb.	r+	+	r+	r+	r+	+	+	r+	+	r+	r	r+	r+	r	r+
C. concinnus W. Sm.	..	r													
C. nitidus Greg.	..	..	..	rr											
Hyalodiscus stelliger Bail.	r	r	..	r	r	..	r	r	r	..	r	r	r	r	r
Asteromphalus heptactis (Bréb.) Ralfs.	..	rr	..	rr	..	..	..	..	..	..	..	..	..	rr	rr
Thalassiothrix longissima Cl. et Grun.	..	rr	r	..	..	..	..	..	..	..	..	..	..	..	r
T. Frauenfeldii Grun.	r														
T. F. v. nitzschioides (Grun.) Jørg.	..	..	..	..	..	..	..	..	..	..	r				
Pleurosigma tenerum Jørg. n. sp.	..	..	..	..	..	..	..	..	..	r					
Euodia gibba Bail.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	rr
(The following are doubtful as planktonforms, likely fixed species or such from the ground).															
Paralia sulcata (Ehrb.) Cl.	..	..	..	..	..	..	r								
Actinoptychus undulatus (Bail.?) Ralfs	r+	r													
Surirella lata W. Sm.	..	rr	..	r											
Campylodiscus Thuretii Bréb.	..	r	..	..	rr	..	..	..	r						
II. Peridiniales. *(Dinoflagellata.)*															
Prorocentrum micans Ehrb.	..	.	..	..	..	..	..	..	..	..	rr				
Dinophysis acuta Ehrb., Jørg.	+	+	r	r	r	r	r	r	r	r	r+	r+	r+	r	r
D. norvegica Clap. et Lachm., Jørg.	rr	rr	r	rr	r	..	rr	.	..	rr	..	..	rr		
D. rotundata Clap. et Lachm.	r	..	rr	rr											
D. homunculus Stein	rr														

Year 1899. Month	January														
Locality	Helligvær, 10 miles NW		Vestfjord I, between Helligvær and Værø		Mosken-strømmen		Reine, 8 miles SE	Stamsund, 8 miles StE		Henningsvær, 7 miles S		Yttersiden, 23 miles NW of Gaukværø		40 miles NW of Gaukværø	
Date	12/1	12/1	13/1	13/1	14/1	11/1	17/1	17/1	17/1	17/1	17/1	18/1	18/1	19/1	19/1
Depth (meters)	0—50	0—250	0—50	0—180	0—50	0—100	0—150	0—50	0—100	0—50	0—180	0—50	0—110	0—50	0—700
Salinity (‰)	33.39	33.39—35.11	33.50	33.50—34.57	33.39—33.46	33.39—33.46	33.39—34.40	33.33—33.39	33.33—33.74	33.39		33.50		34.38	34.38—34.38
Temperature (Cels.)	4.3—4.4	4.3—7.3	4.6—4.9	4.6—6.5	4.1—4.5	4.1—4.7	4.2—7.1	3.9—4.3	3.9—5.5	4.2		4.1—4.7		5.9—6.4	5.9—3.6
Podolampas palmipes Stein	..	..	rr	rr											
Pyrophacus horologium Stein	rr	..	rr	rr	r	..	..	..	r	..	..	..	..	..	rr
Protoceratium reticulatum (Clap. et Lachm.) Bütschli.	r	..	r												
Diplopsalis lenticula Bergh	r	r+	r	r+	r	+	+	..	..	r+	r	r+	r+	..	+
Peridinium depressum Bail.	r	+	r	+c	r	r+	+	+c	+	r+	+	+	+	r	+
P. oceanicum Vanhöff	r	rr	..	..	..	..	r	..	r	..	rr				
P. divergens Ehrb. (*P. lenticulare* (Ehrb.) Jørg.)	c	c	c	c	c	+c	c	c	+c	c	c	c	+c	c	c
P. conicum (Gran) Ostenf. et Schm.	..	..	..	..	..	r+	..	..	..	..	..	..	..	..	+
P. pallidum Ostenf.	r	r	r	r+	r	r	r	r	r	r	+	r	r	r	r+
P. Steinii Jørg.	rr	r+	r	r+	..	rr	..	..	..	r	r+	r+	r	..	r
P. ovatum (Pouch.) Schütt.	..	r+	r	+c	r	..	r+	..	r	..	r+	r+	r+	r	r+
Ceratium tripos (O. F. Müll.) Nitzsch. (α *balticum* Schütt.)	cc	cc	cc	cc	cc	c	c	c	c	c	cc	c	c	+c	c
C. bucephalum Cl.	c	c	c	cc	c	c	c	cc	cc	c	c	cc	cc	c	c
C. macroceros Ehrb.	c	+c	+c	c	c	+	+c	c	c	c	c	+c	c	+c	+
C. intermedium (Jørg.)	c+	+c	c	cc	c	+c	+c	+c	c	c	+	c	+	+c	+
C. i. forma gracilis Pouch., Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
C. longipes (Bail.) Cl.	+	+c	+c	+c	c	+	+	+c	c	+c	c	c	+c	+	+
C. furca (Ehrb.) Duj.	c	c	c	+c	c	+c	c	+c	c	c	c	+c	c	+c	+
C. lineatum (Ehrb.) Cl.	r	..	r	..	..	..	..	r	r						
C. fusus (Ehrb.) Duj.	+	+	+	+	c	+	+	+	c	c	+c	c	+c	c	+
III. Pterospermataceæ.															
Pterosperma Möbii (Jørg.) Ostenf.	r+	r	r	r+	r	+	r	r+	r+	r	r	r+	r+	r	r
P. Vanhöffenii (Jørg.) Ostenf.	+	r+	r	r	..	r+	r+	r	+c	+	r+	+	r+	r	r+
P. dictyon (Jørg.) Ostenf.	+	+	+	+	+	c	+c	+	+c	+c	+	+	+	r	+
IV. Halosphæraceæ.															
Halosphæra viridis Schmitz (incl. *H. minor* Ostenf.)	cc	cc	cc	cc	cc	ccc	cc	cc	cc	cc	ccc	cc	cc	c	c
V. Silicoflagellata.															
Distephanus speculum (Ehrb.) Støhr	rr	..	..	r	..	..	rr								
Dictyocha fibula Ehrb.	r	rr	..	rr	..	..	r	rr	..	..	..	..	..	..	r
VI. Radiolaria.															
1. Spumellaria.															
Hexacontium pachydermum Jørg.	..	r	..	..	..	r	..	..	r						
Echinomma trinacrium Hck.	..	r+	..	r	..	..	..	..	..	..	..	..	..	..	+
E. leptodermum Jørg.	..	..	..	r	..	..	..	..	..	..	..	..	..	..	+
Drymyomma elegans Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r

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Date	12/1	12/1	13/1	13/1	14/1	14/1	17/1	17/1	17/1	17/1	17/1	18/1	18/1	19/1	19/1
Depth (meters)	0—50	0—250	0—50	0—180	0—50	0—100	0—150	0—50	0—100	0—50	0—180	0—50	0—110	0—50	0—700
Salinity (⁰/₀₀)	33.39	33.39—35.11	33.50	33.50—34.57	33.39—33.46	33.39—33.46	33.39—34.40	33.33—33.39	33.33—33.74	33.39		33.50		34.38	34.38—34.38
Temperature (Cels.)	4.3—4.4	4.3—7.3	4.6—4.9	4.6—6.5	4.1—4.5	4.1—4.7	4.2—7.1	3.9—4.3	3.9—5.5	4.2		4.1—4.7		5.9—6.4	5.9—3.6
Chromyomma boreale (Cl.) Jørg.	..	..	..	r	..	..	..	..	..	..	..	..	..	..	r+
Rhizoplegma boreale (Cl.) Jørg.	..	r	..	r	..	..	..	..	r+	..	r	..	..	..	+
Stylodictya tenuispina Jørg. n. sp.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
Spongodiscus favus Ehrb.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	rr
Lithelius minor Jørg.	..	..	..	r	..	..	..	..	..	..	..	..	..	..	+
Phorticium pylonium Hck.? Cl.	..	..	..	r	..	..	..	..	..	..	r				
Sorolarcus circumtextus Jørg.	..	..	..	r	..	..	..	..	..	..	r	..	..	..	r
2. *Nassellaria.*															
Plagiacantha arachnoides Clap. et Lachm.	..	r	r	r	r	..	r	..	r	r	..	..	..	..	r
Plectacantha oikiskos Jørg. n. sp.	..	rr	..	r	..	..	..	..	..	..	..	..	..	..	r
Campylacantha cladophora Jørg. n. sp.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
Phormacantha hystrix (Jørg.) Jørg.	..	r	..	r	..	..	..	..	r	..	r	..	..	..	r+
Peridium longispinum Jørg.	..	r	..	r	..	..	..	..	r	..	r	..	..	..	r
Protoscenium simplex (Cl.) Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	rr
Cladoscenium tricolpium (Hck.?) Jørg.	..	r	..	..	..	..	..	..	..	..	..	..	..	..	r+
Dictyophimus Clevei Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r+
Lithomelissa setosa (Cl.) Jørg.	r	r	..	r	..	r	..	..	r	..	r	..	r	..	r
L. hystrix Jørg.	..	..	..	r											
Acanthocorys umbellifera Hck.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
Dictyoceras acanthicum Jørg.	..	r	..	r	..	..	..	..	..	..	r	..	..	..	r
D. xiphephorum Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
Clathrocyclas craspedota (Jørg.) Jørg.	..	r	..	r	..	..	..	..	..	..	..	..	..	..	r
Androcyclas gamphonycha (Jørg.) Jørg.	..	..	..	r	..	..	..	..	..	..	r				
A. amblycephalis (Jørg.) Jørg.	..	..	..	r											
Stichocorys seriata Jørg. n. sp.	..	..	..	..	..	..	..	..	rr	..	..	..	..	..	r
Gonosphæra primordialis Jørg. n. sp.	..	..	r	..	..	..	..	..	..	..	r				
3. *Phæodaria (Tripylea).*															
Cannosphæra lepta Jørg.	..	..	..	..	..	..	..	..	..	..	r				
C. geometrica Borg.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	rr
Protocystis xiphodon (Hck.) Borg.	..	r	r	rr	..	..	..	..	..	..	r	..	..	..	r
P. Harstoni (Murray) Borg.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	rr
P. tridens (Hck.) Borg.	rr	r	..	r	..	..	..	..	..	..	..	r	r	..	r
Challengeron diodon Hck. (*C. heteracanthum* Jørg.)	..	r+	..	r	..	..	..	..	rr	..	..	..	..	r	rr
C. armatum Borg.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	rr
Medusetta arcifera Jørg.	..	..	..	..	..	..	..	..	..	..	rr				
Gazelletta pentapodium Jørg.	..	..	..	..	r										
VII. *Tintinnodea.*															
Tintinnus acuminatus Clap. et Lachm.	..	..	r	r	..	r	rr	..	rr	r	r	..	rr		
T. a. var undata Jørg.	rr	r													

Year 1899. Month	January														
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Date	12/1	12/1	13/1	13/1	14/1	14/1	17/1	17/1	17/1	17/1	17/1	18/1	18/1	19/1	19/1
Depth (meters)	0—50	0—250	0—50	0—180	0—50	0—100	0—150	0—50	0—100	0—50	0—180	0—50	0—110	0—50	0—700
Salinity (⁰/₀₀)	33.39	33.39—35.11	33.50	33.50—34.57	33.39—33.46	33.39—33.46	33.39—34.40	33.33—33.39	33.33—33.74	33.39		33.50		34.58	34.[illegible]—34.[illegible]
Temperature (Cels.)	4.3—4.4	4.3—7.3	4.6—4.9	4.6—6.5	4.1—4.5	4.1—4.7	4.2—7.1	3.9—4.3	3.9—5.5	4.2		4.1—4.7		5.9—6.4	5.9—3.6
Amphorella quadrilineata (Clap. et Lachm.) Jørg.	..	..	..	..	..	..	..	..	..	r					
A. Steenstrupii (Clap. et Lachm.) Dad.	..	..	r												
A. ampla Jørg.	..	..	..	..	..	..	..	..	..	..	rr				
Ptychocylis urnula (Clap. et Lachm.) Brandt α *major* Jørg.	rr	..	..	r+	r	..	..	r	..	..	..	..	..	..	..
P. u. v. minor Jørg.	..	r	r	r	r	r+	r	..	r+	r	r	r	r	r+	[illegible]
P. u. v. digitalis Auriv.	..	..	..	r											
Tintinnopsis nitida Brandt	rr	r	..	r+	r	r	..	..	..	..	..	..	rr	..	r
T. n. v. sinuata (Brandt)	..	..	..	..	..	r									
T. n. v. ovalis Jørg. n. var.	..	..	r	r	..	r	r	r	..	r					
Codonella lagenula (Clap. et Lachm.) Entz. v. *ovata* Jørg.	rr	..	..	..	r	..	rr	..	..	..	..	..	rr		
Cyttarocylis denticulata (Ehrb.) Fol. α *typica* Jørg.	r+	r	r	r+	+	+	+	r+	+	+	+	+	+	+	+
C. d. var. *cylindrica* Jørg.	..	..	..	r	..	r	..	..	..	r+	r+				
C. d. v. *gigantea* (Brandt) Cl.	r	r	..	+											
C. d. v. *elongata* Jørg.	..	..	..	r	..	r	..	..	r	r+	..	..	r	r	
C. d. v. *subrotundata* Jørg.	..	..	r												
Dictyocysta templum Hck.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
D. t. v. *disticha* Jørg.	rr	r	r	rr	..	..	..	..	..	rr	r	..	rr	r	r+
Undella caudata (Ostenf.) Cl.	rr	..	..	rr	..	..	..	..	..	..	..	..	rr	rr	r+

Year 1899. Month	January														
Locality	Senjen, 12 miles NWtW of Maanesodden			Tromsosundet	Kvænangen I, between Logø and Brynilen			Kvænangen II, between Spildern and Kvænangstinderne			Lyngen I, off Skibotten			Lyngen II, off Kaafjord	
Date	21/1	21/1	21/1	23/1	24/1	24/1	24/1	24/1	24/1	24/1	27/1	27/1	27/1	27/1	27/1
Depth (meters)	0—5	0—50	1—130	0—5	0—5	0—50	0—140	0—5	0—50	0—180	0—5	0—50	0—115	0—50	0—250
Salinity (‰)		33.13		33.53		34.08	34.08	33.87	33.87	33.87	33.87	33.87	33.87	33.82—34.08	33.82—33.82
Temperature (Cels.)		3.3—4.3		0.6		3.6—3.9	3.6—4.0		2.6	2.6—3.1	1.1	1.1	1.1	3.0—2.6	3.0—1.6
I. Bacillariales. *(Diatomaceæ.)*															
Biddulphia aurita (Lyngb.) Bréb.	..	..	..	r	..	..	..	..	..	..	..	rr			
Chætoceros borealis Bail.	..	..	..	..	..	..	..	..	..	r					
C. decipiens Cl.	..	..	..	..	..	r	r	..	..	..	r	r	r+	..	r+
Actinocyclus Ehrenbergii Ralfs	r	r	r	..	r	r+	r+	..	r	r	r	r	r	r	r
A. subtilis (Greg.) Ralfs	..	..	..	..	..	..	rr								
Roperia tessellata (Rop.) Grun.	..	..	rr												
Coscinodiscus excentricus Ehrb.	..	r	r	..	..	r	r	..	..	..	..	r			
C. decipiens Grun.	..	..	r	..	..	..	r								
C. curvatulus Grun.	..	..	r	..	..	..	rr	..	r	..	..	r	r+		
C. stellaris Rop.	..	..	..	..	..	r									
C. radiatus Ehrb.	r	r+	r+	r	..	r+	r+	r	r+	r+	r+	r	r+	r+	r+
C. subbulliens Jørg. n. sp.	..	..	r	..	..	..	r								
C. centralis Ehrb.	..	r	r+	r+	..	r	r	r+	r+	r+	c	+c	+c	r+	+c
C. concinnus W. Sm.	..	..	..	..	..	..	r	r	r	..	..	..	..	..	r+
C. nitidus Greg.	..	..	r												
Euodia gibba Bail.	..	..	rr												
Hyalodiscus stelliger Bail.	..	..	r	..	..	r	r								
H. subtilis Bail.	..	..	..	..	..	..	r								
Asteromphalus heptactis (Bréb.) Ralfs	..	..	rr												
Thalassiothrix longissima Cl. et Grun.	..	r	r												
T. Frauenfeldii Grun. v. *nitzschioides* (Grun.) Jørg.	..	..	r	..	..	..	..	..	r	..	..	r	r+		
Pleurosigma tenerum Jørg. n. sp.	..	..	..	..	..	..	..	..	..	..	+c	c	+c	r	r
Actinoptychus undulatus (Bail.?) Ralfs	..	..	r												
Campylodiscus Thuretii Bréb.	..	..	..	..	..	..	..	..	..	r					
C. angularis Greg.	..	..	..	..	..	..	r	..	..	..	..	r			
Rhabdonema arcuatum (Lyngb.) Kütz.	..	..	r+												
Pleurosigma naviculaceum Bréb.	..	..	..	..	..	..	rr								
II. Peridiniales. *(Dinoflagellatæ.)*															
Dinophysis acuta Ehrb., Jørg.	..	r	r	..	..	r	..	..	r	r	..	r	r	r	r
D. norvegica Clap. et Lachm., Jørg.	..	rr	..	..	..	..	..	..	..	..	..	r	rr	rr	
D. acuminata Clap. et Lachm., Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	rr
D. rotundata Clap. et Lachm.	..	..	..	..	..	..	..	..	..	..	..	rr	rr	..	rr
Pyrophacus horologium Stein	..	..	rr												
Gonyaulax spinifera (Clap. et Lachm.) Dies.	..	..	rr												
Diplopsalis lenticula Bergh	..	r	r	..	r	r+	+	+	r+	..	..	..	r	r	r+
Peridinium depressum Bail.	..	..	r	r+	..	+c	+c	c	+c	r+	r+	+c	+c	+	c
P. oceanicum Vanhøf.	..	r	..	..	..	..	r								
P. divergens Ehrb. (*P. lenticulare* (Ehrb.) Jørg.)	..	+c	+	+c	r	+c	c	c	c	+	+	c	c	+	c

Year 1899. Month	January														
Locality		Senjen, 12 miles NWtW of Maanesodden		Tromsø-sundet		Kvænangen I, between Løgø and Brynilen		Kvænangen II, between Spildern and Kvænangs-tinderne			Lyngen I, off Skibotten			Lyngen II, off Kaafjord	
Date	21/1	21/1	21/1	23/1	24/1	24/1	24/1	24/1	24/1	24/1	27/1	27/1	27/1	27/1	27/1
Depth (meters)	0—5	0—50	1—130	0—5	0—5	0—50	0—140	0—5	0—50	0—180	0—5	0—50	0—115	0—50	0—250
Salinity (0/00)		33.13		33.53		34.08	34.08	33.87	33.87	33.87	33.87	33.87	33.87	33.82—34.08	33.82—33.82
Temperature (Cels.)		3.3—4.3		0.6		3.6—3.9	3.6—4.0		2.6	2.6—3.1	1.1	1.1	1.1	3.0—2.6	3.0—1.0
Peridinium conicum (GRAN) OSTENF. et SCHM.	..	..	..	..	..	..	r	..	..	..	r	..	r	..	r
P. pallidum OSTENF.	..	r+	r	r	..	r	+	+	+	r+	r	+	+c	r+	r+
P. Steinii JØRG.	..	r	..	r	..	r	r	..	r	..	..	..	r	r	r+
P. ovatum (POUCH.) SCHÜTT.	..	r	r	..	..	+	+c	r	+	+	..	+c	+c	+	c
Ceratium tripos (O. F. MÜLL.) NITZSCH. (α *balticum* SCHÜTT.)	c	c	c	+	..	c	c	c	+c	+	..	r	+c	+c	c
C. bucephalum CL.	c	c	c	+c	r	c	c	c	c	c	c	+c	+c	c	c
C. macroceros EHRB.	..	c	+	+c	..	+c	+c	+	+	r+	+	+	+c	+	+c
C. intermedium (JØRG.)	..	+	+c	r+	r	+c	+c	c	+c	r+	r+	+	+	+c	c
C. longipes (BAIL.) CL.	..	c	+c	+	r	+c	+c	r	r	r	+c	+c	..	+	+c
C. furca (EHRB.) DUJ.	..	c	+c	+	..	+c	+	+	+	r+	r+	r	r+	r+	+
C. lineatum (EHRB.) CL.	..	..	..	..	..	..	..	..	..	..	..	r			
C. fusus (EHRB.) DUJ.	..	+c	+c	+	r	+c	+	c	+	+	+c	c	+c	+c	+c
III. Pterospermataceæ.															
Pterosperma Möbii (JØRG.) OSTENF.	..	r+	r+	..	..	r	r	..	r	r	..	..	..	r	r
P. Vanhöffeni (JØRG.) OSTENF.	..	r	r	r	..	r	r	..	..	..	..	..	r	r	r
P. dictyon (JØRG.) OSTENF.	r	+	r+	r	r	+	+	r	+	+	r	r+	r+	+	+c
IV. Halosphæraceæ.															
Halosphæra viridis SCHMITZ. (incl. *H. minor* OSTENF.)	c	cc	cc	c	+	c	c	cc	c	c	c	+	+	c	c
V. Silicoflagellata.															
Distephanus speculum (EHRB.) STÖHR.	..	..	..	..	..	..	r								
Dictyocha fibula EHRB.	..	..	r	..	..	..	r								
VI. Radiolaria.															
1. Spumellaria.															
Hexacontium enthacanthum JØRG.	..	..	..	..	..	..	..	..	r						
H. pachydermum JØRG.	..	..	r	..	..	..	r+								
Echinomma trinacrium HCK.	..	r	r	..	..	..	r+	..	..	..	..	..	..	..	r
E. leptodermum JØRG.	..	..	r	..	..	..	+								
Drymyomma elegans JØRG.	..	..	r												
Chromyomma boreale (CL.) JØRG.	..	r	r	..	..	..	r								
Rhizoplegma boreale (CL.) JØRG.	..	r+	r	..	..	..	+								
Phorticium pylonium HCK.?, CL.	..	..	..	..	..	..	r								
Lithelius minor JØRG.	..	r	r	..	..	..	r+								
L. spiralis HCK.	..	r													

Year 1899. Month	January														
Locality	Senjen, 12 miles NWtW of Maanesodden			Tromsøsundet	Kvænangen I, between Logø and Brynilen			Kvænangen II, between Spildern and Kvænangstinderne			Lyngen I, off Skibotten			Lyngen II, off Kaafjord	
Date	21/1	21/1	21/1	23/1	24/1	24/1	24/1	24/1	24/1	24/1	27/1	27/1	27/1	27/1	27/1
Depth (meters)	0—5	0—50	1—130	0—5	0—5	0—50	0—140	0—5	0—50	0—180	0—5	0—50	0—115	0—50	0—250
Salinity (‰)		33.13		33.53		34.08	34.08	33.87	33.87	33.87	33.87	33.87	33.87	33.82—34.08	33.82—33.82
Temperature (Cels.)		3.3—4.3		0.6		3.6—3.9	3.6—4.0		2.6	2.6—3.1	1.1	1.1	1.1	3.0—2.6	3.0—1.6
2. Acantharia.															
Radiosphæra anacanthica Jørg. n. sp.	..	..	..	..	..	..	..	..	r						
3. Nassellaria.															
Plagiacantha arachnoides Clap. et Lachm.	..	..	..	..	..	..	r	..	..	..	..	..	..	..	r
Plectacantha oikiskos Jørg. n. sp.	..	..	r	..	..	..	r+								
Campylacantha cladophora Jørg. n. sp.	..	..	rr	..	..	..	r								
Phormacantha hystrix (Jørg.) Jørg.	..	..	r	..	..	..	r+								
Peridium longispinum Jørg.	..	..	r	..	..	..	r								
P. minutum Cl.	..	r	r												
Cladoscenium tricolpium (Hck.?) Jørg.	..	..	r	..	..	..	r								
Dictyophimus Clerci Jørg.	..	..	r	..	..	..	r								
Lithomelissa setosa (Cl.) Jørg.	..	r	r+	..	..	..	r+	..	..	..	..	r			
L. hystrix Jørg.	..	..	..	..	..	..	r								
Acanthocorys umbellifera Hck.	..	r													
Dictyoceras acanthicum Jørg.	..	..	r												
D. xiphephorum Jørg.	..	..	..	..	..	..	rr								
Clathrocyclas craspedota (Jørg.) Jørg.	..	..	..	..	..	..	rr								
Stichocorys seriata (Jørg.) n. sp.	..	..	r	..	..	..	rr								
4. Phæodaria (Tripylea).															
Cannosphæra geometrica Borg.	..	.	..	..	..	..	rr								
Protocystis tridens (Hck.) Borg.	..	..	..	..	..	rr	r+	r	r	..	..	..	r+	r+	r
P. xiphodon (Hck.) Borg.	..	..	r	..	..	..	r								
Challengeron diodon Hck. (*C. heteracanthum* Jørg.)	..	r	..	..	..	..	r								
Medusetta arcifera Jørg.	..	..	rr												
Gazelletta pentapodium Jørg.	..	r													
VII. Tintinnodea.															
Tintinnus acuminatus Clap. et Lachm.	..	r	..	r	..	..	..	..	r	r+	..	r	r	..	rr
Ptychocylis urnula (Clap. et Lachm.) Brandt (α *major* Jørg.)	..	r													
P. u. v. *minor* Jørg.	..	r	..	..	..	..	r	..	..	..	..	..	r	r	
P. u. v. *subarctica* Jørg. n. var.	..	..	..	..	..	..	..	..	..	..	..	..	rr	..	rr
Tintinnopsis nitida Brandt	..	..	..	+	r	..	+	r	+	r+	r	+c	c	c	+c
T. n. v. *ovalis* Jørg. n. var.	..	..	..	..	..	r+	r+								
Cyttarocylis denticulata (Ehrb.) Fol. (α *typica* Jørg.)	r	r+	r+	r	r	+	r+	..	r	+	..	+c	+	+	+
C. d. v. *cylindrica* Jørg.	..	..	..	..	..	r+	..	r	..	+					
C. d. v. *gigantea* (Brandt) Cl.	..	..	..	..	..	..	..	..	..	..	..	..	..	r	
C. d. v. *robusta* Jørg.	..	..	..	..	..	..	r								
C. d. v. *elongata* Jørg.	..	..	r	..	..	r	..	..	..	r	..	..	r	r	
Dictyocysta templum Hck.	.	r													
D. t. v. *disticha* Jørg.	..	r	r	..	..	..	..	..	..	..	..	..	r		

Year 1899. Month	January										February						
Locality	Lyngen III, off Spokenes		Malangen, between Lysbotn and Stonnesbotn		Folstad, Ostnesfjord		Helle, Ostnesfjord		Holm, Svolvær		Henningsvær, 8 miles S t W	Vestfjord, 8 miles SSE of Henningsvær		Skroven, 4 miles S	Raftsundet, off the Troldfjord	Raftsundet, between Aarstenen and Ulvaag	
Date	25/1	25/1	29/1	29/1	31/1	31/1	31/1	31/1	31/1	31/1	1/2	1/2	1/2	1/2	3/2	3/2	3/2
Depth (meters)	0—50	0—200	0—100	0—300	0—50	0—135	0—50	0—150	0—50	0—150	0—100	0—50	0—200	0—300	0—50	0—100	0—260
Salinity (0/00)	32.60—33.87	32.60—33.94	33.92	33.92—34.52	33.25—33.58	33.25—34.52	33.25—33.44	33.25—34.59	33.25—33.37	33.25—34.59	34.08			33.42—35.03	33.30—33.42	33.37—34.40	33.?7—34.70
Temperature (Cels.)	1.8—3.4	1.8—2.9	2.8—2.9	2.8—5.5	2.5—4.3	2.5—6.8	2.1—3.8	2.1—6.7	2.1—3.3	2.1—6.8	6.2			3.3—6.1	2.9—3.4	2.7—6.2	2.7—6.6
I. Bacillariales. (Diatomaceæ).																	
Rhizosolenia semispina HENS.	..	..	..	rr													
Biddulphia mobiliensis BAIL.	..	..	..	..	..	..	..	..	..	..	..	..	..	rr			
Chætoceros borealis BAIL.	..	..	..	..	..	..	..	..	..	..	..	..	..	r			
C. atlanticus CL.	..	r	..	..	..	..	..	..	..	..	..	..	..	r			
C. decipiens CL.	..	..	r	..	r												
C. Schüttii CL.	r	..	..	r+													
Actinocyclus Ehrenbergii RALFS	r	r	r	r+	r	r	..	r	..	r	..	..	r	..	r		
A. Ralfsii (W. SM.) RALFS	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
Coscinodiscus excentricus EHRB.	..	..	..	..	..	..	..	..	..	..	..	..	..	r			
C. radiatus EHRB.	r—	r	r+	+	r	..	..	r	..	..	r	r	r+	..	..	..	+
C. centralis EHRB.	+	r+	+	+	r+	r+	..	r+	..	r	+	+	+	r+	r+	+	+
Hyalodiscus stelliger BAIL.	r	r	r	r	..	..	..	r	..	..	..	..	r	r	..	..	r
H. subtilis BAIL.	..	..	..	r													
Thalassiothrix longissima CL. et GRUN.	..	..	..	rr													
F. Frauenfeldii GRUN.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
T. F. v. nitzschioides (GRUN.) JØRG.	..	r	..	r													
Pleurosigma tenerum JØRG. n. sp.	r	r	..	r	r	r											
Surirella lata W. SM.	..	..	r	..	..	..	..	..	..	..	..	..	..	..	..	..	r
Campylodiscus Thuretii BRÉB.	..	..	..	r	..	..	..	..	..	..	..	..	..	r	..	r	r
C. angularis GREG.	..	..	..	r	..	..	..	..	..	..	..	..	..	..	..	..	r
Striatella unipunctata (LYNGB.) AG.	..	..	..	..	..	..	..	..	..	..	..	..	r				
Glyphodesmis Williamsonii (W. SM.) GRUN.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
II. Peridiniales. (Dinoflagellata).																	
Dinophysis acuta EHRB., JØRG.	r	r	..	r	..	..	..	..	..	..	r	..	..	..	..	r	r
D. norvegica CLAP. et LACHM. JØRG.	..	..	rr	..	..	..	..	..	..	..	..	..	..	..	..	r	r
D. rotundata CLAP. et LACHM.	..	rr															
Pyrophacus horologium STEIN	..	..	..	..	..	..	..	..	..	..	..	..	r				
Diplopsalis lenticula BERGH	..	r+	..	+	..	..	..	..	..	..	..	..	r+	..	..	r+	r
Peridinium depressum BAIL.	+	+	r+	+	+	+c	r+	+c	..	+	r+	+	c	+c	r	c	c
P. oceanicum VANHÖF.	..	..	r	r	..	..	..	..	..	r	..	..	r	r			
P. divergens EHRB. (*P. lenticulare* (EHRB.) JØRG.)	+	c	c	c	c	c	+	c	c	c	c	c	cc	cc	c	cc	cc
P. conicum (GRAN) OSTENF. et SCHM.	..	..	..	..	r	..	..	..	..	..	..	..	r				
P. pallidum OSTENF.	+	r+	+	+	..	r+	..	r+	..	..	r	..	+	..	r	r	+
P. Steinii JØRG.	..	..	..	r+	..	..	..	..	..	..	..	..	r	..	..	..	rr
P. ovatum (POUCH.) SCHÜTT	+c	..	+	+c	r	r	r	r+	..	r+	+	r	r+	r	..	r+	r
Ceratium tripos (O. F. MÜLL.) NITZSCH. (α *balticum* SCHÜTT)	c	c	c	c	c	c	c	c	c	c	c	c	c	c	+	c	c

Year 1899. Month	January										February						
Locality	Lyngen III, off Spokenes		Malangen, between Lysbotn and Stonnesbotn		Folstad, Østnesfjord		Helle, Østnesfjord		Hola, Svolvær		Henningsvær, 8 miles StW	Vestfjord, 8 miles SSE of Henningsvær		Skroven, 4 miles S	Raftsundet, off the Troldfjord	Raftsundet, between Aarstenen and Ulvaeg	
Date	27/1	27/1	29/1	2/1	31/1	31/1	31/1	31/1	31/1	31/1	1/2	1/2	1/2	1/2	3/2	3/2	3/2
Depth (meters)	0—50	0—200	0—100	0—300	0—50	0—135	0—50	0—150	0—50	0—150	0—100	0—50	0—200	0—300	0—50	0—100	0—260
Salinity (‰)	32.60—33.87	32.60—33.94	33.92	33.92—34.52	33.25—33.58	33.25—34.52	33.25—33.44	33.25—34.59	33.25—33.37	33.25—34.59	—34.08			33.42—35.03	33.30—33.42	33.37—34.40	33.37—34.70
Temperature (Cels.)	1.8—3.4	1.8—2.9	2.8—2.9	2.8—5.5	2.5—4.3	2.5—6.8	2.1—3.8	2.1—6.7	2.1—3.3	2.1—6.8	—6.2			3.3—6.4	2.9—3.4	2.7—6.2	2.7—6.6
C. bucephalum Cl.	c	c	cc	c	c	c	c	cc	c	c	c	c	cc	cc	+	cc	cc
C. macroceros Ehrb.	+	+c	+c	+c	+c	+c	+c	+	+c	+c	+c	+c	+	+	+	c	+
C. intermedium Jørg.	+	+c	c	c	+c	+c	+c	+c	c	+	c	c	c	+c	+	c	+c
C. longipes (Bail.) Cl.	c	+c	+	+	+c	+	+	+c	+c	+	+c	+	+c	+	..	+	+
C. furca (Ehrb.) Duj.	c	+	r+	+c	+	c	+	+c	+c	+	+c	+c	+c	r	r+	+c	r+
C. lineatum (Ehrb.) Cl.	..	..	..	r	..	..	..	..	..	..	..	..	..	..	..	..	r
C. fusus (Ehrb.) Duj.	+c	c	c	c	c	c	c	c	c	c	c	c	c	+	r+	+c	c
III. Pterospermataceæ.																	
Pterosperma Möbii (Jørg.) Ostenf.	r+	+	r	+	r	r	r	r	..	r	r+	..	r	..	..	r	r
P. Vanhöffenii (Jørg.) Ostenf.	+c	+c	+c	+c	..	..	..	r+	..	..	r	r	..	..	r	+	+
P. dictyon (Jørg.) Ostenf.	+c	+c	+	+c	..	r	r	+	..	..	r+	r	+	r	r	+	+
IV. Halosphæraceæ.																	
Halosphæra viridis Schmitz (incl. *H. minor* Ostenf.)	c	c	cc	cc	cc	c	cc	cc	cc	c	cc	ccc	ccc	cc	+	cc	c
V. Silicoflagellata.																	
Distephanus speculum (Ehrb.) Stöhr	..	..	..	..	..	..	..	..	..	..	..	..	..	r			
Dictyocha fibula Ehrb.	..	..	..	..	..	..	..	..	..	..	..	..	rr				
VI. Radiolaria.																	
1. Spumellaria.																	
Echinomma trinacrium Hck.	..	..	..	..	..	..	..	..	..	..	..	..	r	r			
C. leptodermum Jørg.	..	..	..	r	..	..	..	..	..	..	..	..	r	r			
Drymyomma elegans Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	r				
Chromyomma boreale (Cl.) Jørg.	..	..	..	r	..	..	..	..	..	..	..	..	r				
Rhizoplegma boreale (Cl.) Jørg.	..	..	..	r	..	..	..	..	..	..	r	..	r	r	..	..	r
Lithelius minor Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	r	r	..	..	r
Phorticium pylonium Hck.?, Cl.	..	..	..	..	..	..	..	..	..	..	..	..	r				
Sorolarcus circumtextus Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	..	r	..	..	r
2. Nassellaria.																	
Plagiacantha arachnoides Clap. et Lachm.	..	..	..	r	..	..	..	..	..	..	..	..	r	r			
Campylacantha cladophora Jørg. n. sp.	..	..	..	r	..	..	..	..	..	..	..	..	r	r			
Plectacantha oikiskos Jørg. n. sp.	..	..	..	r	..	..	..	..	..	..	..	..	r	r			
Phormacantha hystrix (Jørg.) Jørg.	..	..	..	r	..	..	..	..	..	..	..	..	r	r			
Gonosphæra primordialis Jørg. n. sp.	..	..	..	..	..	..	..	..	..	..	..	..	r	r			
Ceratospyris hyperborea Jørg. n. sp.	..	..	..	..	..	..	..	..	..	..	..	..	rr				

Year 1899. Month	January										February						
Locality	Lyngen III, off Spokenes		Malangen, between Lysbotn and Stonnesbotn		Folstad, Østnesfjord		Helle, Østnesfjord		Hola, Svolvaer		Henningsvaer, 8 miles StW	Vestfjord, 8 miles SSE of Henningsvaer		Skroven, 4 miles S	Raftsundet, off the Troldfjord	Raftsundet, between Aarstenen and Ulvaag	
Date	27/1	27/1	29/1	29/1	31/1	31/1	31/1	31/1	31/1	31/1	1/2	1/2	1/2	1/2	3/2	3/2	3/2
Depth (meters)	0–50	0–200	0–100	0–300	0–50	0–135	0–50	0–150	0–50	0–150	0–100	0–50	0–200	0–300	0–50	0–100	0–260
Salinity (‰)	32.60–33.87	32.60–33.94	33.92	33.92–34.52	33.25–33.58	33.25–34.52	33.26–33.44	33.25–34.59	33.25–33.37	33.25–34.59	34.08			33.42–35.03	33.30–33.42	33.37–34.40	33.37–34.70
Temperature (Cels.)	1.8–3.4	1.8–2.9	2.8–2.9	2.8–5.5	2.5–4.3	2.5–6.8	2.1–3.8	2.1–6.7	2.1–3.3	2.1–6.8	–6.2			3.3–6.4	2.9–3.1	2.7–6.2	2.7–6.6
Peridium longispinum Jørg.	..	..	..	r													
Eusccnium corynephorum Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
Cladoscenium tricolpium (Hck.?) Jørg.	..	..	..	..	..	..	..	r	..	..	..	..	r				
Helotholus histricosa Jørg. n. sp.	..	..	..	..	..	..	..	..	..	..	..	..	r	r	..	..	+
Dictyophimus Clerci Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	r	rr			
Lithomelissa setosa (Cl.) Jørg.	..	r	..	r	..	..	..	..	..	..	..	..	r	r	..	..	r
L. hystrix Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	rr	r	..	..	r
Acanthocorys umbellifera Hck.	..	..	..	r													
Dictyoceras xiphephorum Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	r				
Clathrocyclas craspedota (Jørg.) Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	r	r	..	..	r
Androcyclas gamphonycha (Jørg.) Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	r	r+	..	..	r
3. *Phæodaria (Tripylea).*																	
Cannosphæra geometrica Borg.	..	..	..	..	..	..	..	..	..	..	..	..	r	r			
Protocystis xiphodon (Hck.) Borg.	..	..	..	r	..	..	..	..	..	..	..	..	r	r	..	..	r
P. Harstoni (Murray) Borg.	..	..	..	..	..	..	..	..	..	..	..	..	..	r			
P. tridens (Hck.) Borg.	..	r															
Challengeron diodon Hck. (*C. heteracanthum* Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	r	r	..	..	r
Gazelletta pentapodium Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	r				
VII. Tintinnodea.																	
Tintinnus acuminatus Clap. et Lachm.	..	..	..	..	r	r	rr	r	..	..	..	..	r	..	r	r	
T. a. v. undata Jørg.	..	..	..	rr													
Amphorella ampla Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	rr				
Ptychocylis urnula (Clap. et Lachm.) Brandt α *major* Jørg.	..	..	..	r													
P. u. v. *minor* Jørg.	..	..	..	r	..	..	r	..	..	..	rr	r	r	r	r	r	
P. u. v. *subarctica* Jørg. n. var.	r	..	..	r													
Tintinnopsis nitida Brandt	+	+	+	+c													
Cyttarocylis denticulata (Ehrb.) Fol.	+	+	r	+	+	+	+c	c	+c	+	+	..	+c	r	r	+	+c
C. d. v. *cylindrica* Jørg.	..	..	..	r	r	+	..	+	..	+	..	..	..	..	..	+	+
C. d. v. *gigantea* (Brandt) Cl.	..	r															
C. d. v. *elongata* Jørg.	..	r	..	r+	r	r+	..	r+	..	r	r	..	r				
C. d. v. *subrotundata* Jørg.	..	r+	..	..	..	..	..	..	..	..	..	..	r	..	..	..	r
Dictyocysta templum Hck. *v. disticha* Jørg.	..	..	..	rr													
Undella caudata (Ostenf.) Cl.	..	..	.	..	..	..	..	..	..	..	..	..	..	..	..	..	rr

Year 1899. Month	February															
Locality	Skroven, 5 miles ESE	Tranodybet, between Trano and Lødingen			Ofoten I, between Havnes and Ramsund		Ofoten II, between Bogen and Ballangen		Rombaken I at the head,	Rombaken II. off Ytre Sildvik	Rombaken III, inside Öijord		Skjomen, at Elvegaard	Ofotenfjord, off Skarstad	Skroven, 5 miles SWtS	
Date	4/2	6/2	6/2	6/2	7/2	7/2	7/2	7/2	8/2	8/2	8/2	8/2	9/2	9/2	13/2	13/2
Depth (meters)	300—350	0—50	0—200	0—630	0—100	300—350	0—100	200—250	0—40	0—100	0—100	200—300	0—40	500—550	0—50	0—250
Salinity (0/00)	35.14	33.50	33.50—35.03	33.50—35.14	33.30—34.08	35.03	33.30—34.21	34.89—34.96	33.18—33.25	33.25—33.37	33.30—34.01	34.70—34.82	33.37—33.42	35.14	33.61—33.56	33.61—35.08
Temperature (Cels.)	6.4	2.5—2.8	2.5—6.4	2.5—6.3	1.7—5.7	6.3	1.5—5.4	6.2	0.2—0.5	0.2—0.6	1.4—4.8	6.0	1.9—2.0	6.3	2.1—3.0	6.6
I. Bacillariales. *(Diatomaceæ).*																
Rhizosolenia styliformis BRIGHTW.	r															
Biddulphia aurita (LYNGB.) BRÉB.	..	..	..	rr	..	..	..	..	rr	r						
B. mobiliensis BAIL.	rr															
Chætoceros borealis BAIL.	r	..	r													
C. convolutus CASTR.	..	..	..	..	..	..	rr	r	..	..	..	..	r			
C. decipiens CL.	..	..	..	..	..	..	r	r	r							
C. contortus SCHÜTT	r															
Ditylium Brightwellii (WEST) GRUN.	r	..	r													
Thalassiosira gravida CL.	..	..	..	..	..	..	..	..	..	rr						
Coscinosira polychorda (GRAN) GRAN	rr															
Actinocyclus Ehrenbergii RALFS	..	..	..	..	..	..	r	..	r	..	r	r	r	..	r	r+
Coscinodiscus excentricus EHRB.	+	..	..	..	..	r+	..	..	..	..	..	..	..	..	..	r
C. decipiens GRUN.	rr															
C. lineatus EHRB. var.	rr	..	..	..	..	..	..	..	r							
C. stellaris ROP.	rr															
C. radiatus EHRB.	+	r	r	r+	r+	r	r+	r	r	r+	r	..	r	..	r	r
C. centralis EHRB.	r+	r	+	r+	r+	..	r+	r	..	r	r	..	r	r	r	+
C. concinnus W. SM.	r															
C. subbulliens JØRG. n. sp.	..	..	..	..	r	..	..	..	..	..	..	..	..	r		
Hyalodiscus stelliger BAIL.	r	..	..	r	..	r	r									
Thalassiothrix longissima CL. et GRUN.	rr															
T. Frauenfeldi GRUN.	rr	..	..	..	..	..	..	..	r	r	..	..	..	..	..	r
T. F. v. *nitzschioides* (GRUN.) JØRG.	..	..	..	..	..	..	r									
T. F. v. *n. forma curvata* (CASTR.) JØRG.	..	..	..	..	..	r	..	..	r							
Asterionella Bleakeleyi W. SM.	r															
Auricula complexa (GREG.) DE T.	..	..	..	..	..	..	..	..	..	..	..	rr				
Pleurosigma tenerum JØRG. n. sp.	..	..	..	r	..	..	r+	r+	cc	c	+c	-	c	..	+	
Paralia sulcata (EHRB.) CL.	rr															
Actinoptychus undulatus (BAIL.?) RALFS	r	..	..	..	..	..	r									
Surirella lata W. SM.	..	..	..	..	..	..	..	r	..	..	..	..	..	..	..	r
Campylodiscus Thuretii BRÉB.	r	..	..	..	..	..	r	r	r+	r	r					
C. angularis GREG.	..	..	..	..	..	..	r	r	+	r						
Rhabdonema arcuatum (LYNGB.) KÜTZ.	..	..	..	..	..	..	..	..	..	..	..	..	..	r		
II. Peridiniales. *(Dinoflagellata).*																
Dinophysis acuta EHRB., JØRG.	r	..	r	..	r	r	r+	..	r	r	r+	+	r	..	..	r
D. norvegica CLAP. et LACHM., JØRG.	r	..	..	..	..	..	..	..	..	..	..	..	r			
D. rotundata CLAP. et LACHM.	..	..	..	..	..	..	rr	..	..	..	..	..	rr			

Year 1899. Month	Februar[illegible]															
Locality	Skroven, 5 miles ESE	Trandybet between Tran and Lødingen			Ofoten I. [illegible] Ra[illegible]		Ofoten II between Bogen and Ballangen		Rombaken I [illegible]	Rombaken II at [illegible]	Rombaken III [illegible]		Skrova [illegible] at Elvegaard	Ofotenfjord off Skjomen[illegible]	Skroven 5 miles SW	
Date	4/2	6/2	6/2	6/2	7/2	7/2	7/2	7/2	8/2	8/2	8/2	8/2	9/2	9/2	13/2	13/2
Depth (meters)	300–350	0–50	0–200	0–630	0–100	300–350	0–100	200–250	0–40	0–100	0–100	200–300	0–40	500–550	0–50	0–250
Salinity (‰)	35.11	33.[illegible]	33.50–35.[illegible]	33.50–35.14	33.[illegible]–34.[illegible]	35.0[illegible]	33.[illegible]–34.21	34.[illegible]–34.[illegible]	33.[illegible]–33.[illegible]	33.[illegible]–33.[illegible]	33.[illegible]–34.[illegible]	34.7[illegible]–34.[illegible]	33.[illegible]–33.[illegible]	35.14	33.61–33.56	33.61–35.08
Temperature (Cels.)	6.4	2.5–2.8	2.5–6.4	2.5–6.3	1.7–5.7	6.3	1.[illegible]–5.4	6.2	0.2–0.[illegible]	0.2–0.[illegible]	1.4–4.8	6.[illegible]	1.9–2.[illegible]	6.[illegible]	2.1–3.6	6.6
Pyrophacus horologium Stein	..	..	..	..	..	..	r	r								
Diplopsalis lenticula Bergh	..	r	+	r	..	..	+	r	r	r	r	..	r	r	..	r
Peridinium depressum Bail.	+	+c	cc	+c	+c	+c	r	cc	c	r+	+	+c	r+	+	r+	+
P. oceanicum Vanhöf.	..	..	r													
P. divergens Ehrb. (*P. lenticula* (Ehrb.) Jørg.)	c	c	c	+c	c	c	c	c	c	c	+	+c	+c	+c	r	c
P. conicum (Gran) Ostenf. et Schm.	r	..	..	..	..	r	r									
P. pallidum Ostenf.	r	r	r+	+	+	+	+	+c	+	+	+	r+	r+	r	..	r
P. Steinii Jørg.	..	..	r	r	..	..	+	r	..	..	r+	..	r			
P. ovatum (Pouch.) Schütt.	+	..	r	r	+	+c	+c	c	+c	..	r+	+	..	..	..	r
Ceratium tripos (O. F. Müll.) Nitzsch. (α *balticum* Schütt)	c	c	c	+c	+c	+c	c	c	c	+c	c	r	+	+	+c	c
C. bucephalum Cl.	+	cc	cc	c	c	c	c	c	c	c	c	–	c	+	+c	c
C. macroceros Ehrb.	c	+	c	+	+	+	c	+	+	+	+c	..	r	r	+	r
C. intermedium (Jørg.)	c	c	c	+c	r+	+	+	+	r+	..	+	..	..	+	+	+
C. longipes (Bail.) Cl.	+	+c	+c	+	c	+c	c	c	cc	cc	cc	+	c	+c	+c	+c
C. furca (Ehrb.) Duj.	r	+	+c	r	r+	+	+c	+	+	r	+	..	r	..	+	r
C. lineatum (Ehrb.) Cl.	r															
C. fusus (Ehrb.) Duj.	+c	c	c	+c	r+	+	c	c	r	c	c	..	c	+c	c	c
III. Pterospermataceæ.																
Pterosperma Möbii (Jørg.) Ostenf.	..	r	r	..	r	..	r	..	r	r	r	..	..	..	..	r
P. Vanhöffeni (Jørg.) Ostenf.	r	r	..	..	r	r	r	r	r	r		r	r	..	r	
P. dictyon (Jørg.) Ostenf.	+	r+	r+	r+	+	..	+c	r	+c	+c	c	r	r	r	r	r+
IV. Halosphæraceæ.																
Halosphæra viridis Schmitz (incl. *H. minor* Ostenf.)	c	c	cc	c	cc	+c	c	c	c	c	cc	c	+c	c	c	cc
V. Silicoflagellata.																
Distephanus speculum (Ehrb.) Støhr	r															
Dictyocha fibula Ehrb.	r	..	..	..	..	..	r									
VI. Radiolaria.																
1. Spumellaria.																
Hexacontium enthacanthum Jørg.	r	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
H. pachydermum Jørg.	r	..	..	..	..	..	..	..	..	..	..	..	..	r		
Echinomma trinacrium Hck.	..	..	..	..	..	..	r	r	..	..	..	..	..	r	..	r
E. leptodermum Jørg.	r	..	..	r+	..	..	r	..	r							
Drymyomma elegans Jørg.	r															
Chromyomma boreale (Cl.) Jørg.	..	..	..	r	..	..	..	..	..		..	..	..	r	..	r

Year 1899. Month	February															
Locality	Skroven, 5 miles ESE	Tranødybet, between Tranø and Lødingen			Ofoten I, between Havnes and Ramsund		Ofoten II, between Bogen and Ballangen		Rombaken I, at the head	Rombaken II, off Ytre Sildvik	Rombaken III, inside Oifjord		Skjomen, at Elvegaard	Ofotenfjord, off Skarstad	Skroven, 5 miles SWtS	
Date	4/2	6/2	6/2	6/2	7/2	7/2	7/2	7/2	8/2	8/2	8/2	8/2	9/2	9/2	13/2	13/2
Depth (meters)	300—350	0—50	0—200	0—630	0—100	300—350	0—100	200—250	0—40	0—100	0—100	200—300	0—40	500—550	0—50	0—250
Salinity (⁰/₀₀)	35.14	33.50	33.50—35.03	33.50—35.14	33.30—34.08	35.03	33.30—34.21	34.89—34.96	33.18—33.25	33.25—33.37	33.30—34.01	34.70—34.82	33.37—33.42	35.14	33.61—33.56	33.61—35.08
Temperature (Cels.)	6.4	2.5—2.8	2.5—6.4	2.5—6.3	1.7—5.7	6.3	1.5—5.4	6.2	0.2—0.5	0.2—0.6	1.4—4.8	6.0	1.9—2.0	6.3	2.1—3.0	6.6
Rhizoplegma boreale (CL.) JØRG.	r	..	r	r+	..	..	r	r	r	r	..	..	r			
Lithelius minor JØRG.	r	..	..	r	..	..	..	..	..	..	..	..	..	..	..	r
Phorticium pylonium HCK.? CL.	..	..	..	..	..	..	r									
Sorolarcus circumtextus JØRG.	r															
2. Nassellaria.																
Plagiacantha arachnoides CLAP. et LACHM.	r	..	..	r	..	..	r	r	..	r						
Campylacantha cladophora JØRG. n. sp.	r	..	..	r	..	..	r	r	..	..	..	..	..	..	..	r
Plectacantha oikiskos JØRG. n. sp.	r	..	..	..	..	..	r	r								
Phormacantha hystrix (JØRG.) JØRG.	r	..	..	r	..	..	r	r	..	..	..	..	..	..	..	r
Gonosphæra primordialis JØRG. n. sp.	r	..	..	..	..	..	..	r	..	..	..	..	r			
Peridium longispinum JØRG.	..	..	..	..	..	..	..	r								
Cladoscenium tricolpium (HCK.)? JØRG.	r															
Helotholus histricosa JØRG. n. sp.	r	..	..	r+	..	..	r+	r	r	..	..	..	..	r	..	r
Dictyophimus Clevei JØRG.	..	..	..	..	..	..	rr									
Lithomelissa setosa (CL.) JØRG.	r	..	r	r	..	r	r	r+	..	..	..	..	..	..	..	r
Dictyoceras xiphephorum JØRG.	..	..	..	r	..	..	r									
Clathrocyclas craspedota (JØRG.) JØRG.	r	..	..	r	..	r	r	r	..	r	..	..	..	r	..	r
Androcyclas gamphonycha (JØRG.) JØRG.	r+	..	+	+c	..	r	r	r	r	r	..	..	..	r+	..	r
A. amblycephalis (JØRG.) JØRG.	r	..	..	..	..	..	r	r	r	r	..	..	..	r		
Stichocorys seriata (JØRG.) JØRG.	..	..	..	r+	..	..	..	..	..	..	..	..	..	r		
3. Phæodaria (Tripylea).																
Protocystis xiphodon (HCK.) BORG.	r	..	..	r	..	..	..	r	..	..	..	..	..	..	..	r
P. Harstoni (MURRAY) BORG.	r	..	..	+	..	r	..	..	..	..	..	..	..	r		
P. tridens (HCK.) BORG.	r	..	..	..	..	..	r+	r								
Challengeron diodon HCK. (*C. heteracanthum* JØRG.)	r	..	r	r+	..	r	..	r	..	..	..	r	..	r	..	r
Medusetta arcifera JØRG.	..	..	..	..	..	..	..	r								
VII. Tintinnodea.																
Tintinnus acuminatus CLAP. et LACHM.	..	..	..	..	rr	..	..	rr	..	r	..	..	r	..	..	rr
Leprotintinnus pellucidus (CL.) JØRG.	..	..	..	..	..	..	..	..	rr							
Ptychocylis urnula (CLAP. et LACHM.) BRANDT α major JØRG.	..	..	..	..	..	..	r									
P. u. v. *minor* JØRG.	..	..	..	r	..	r	r	r	r	r	r	+	r	r	..	r
P. u. v. *digitalis* AURIV.	..	..	..	..	..	..	r	r	r	r						
P. u. v. *subarctica* JØRG. n. var.	..	..	rr													
Tintinnopsis nitida BRANDT	..	..	..	..	r	..	rr	..	+c	+c	..	..	r+	..	r	r
Cyttarocylis denticulata (EHRB.) FOL	..	r	+r	r	r+	r	+c	+c	r	c	+c	r+	r	..	r	r
C. d. v. *elongata* JØRG.	..	..	..	..	..	..	..	..	..	+c	..	..	..	r		
C. d. v. *subrotundata* JØRG.	..	..	..	..	..	r	..	r	..	r						
C. d. v. *subedentata* JØRG. n. var.	..	..	..	..	..	..	+c	+c	+c	+c	+c					
Undella caudata (OSTENF.) CL.	..	..	..	..	..	..	r	..	r	..	r+	r	r	r		

Year 1899. Month	February											March				
Locality	Strommen I, at Henningsvær	Strommen II, at Henningsvær	Mouth of the Raftsund	Øxsund, between Hammerø and Lundø			Sagfjord I. inside Furunesvaagen		Sagfjord II. outside F.	Henningsvær I. 4 miles SSW	Henningsvær III. 16 miles SSW	Evenstad I. 7 miles SE of Lofotodden	Evenstad II. 10 miles SE of Lofotodden	Kirkfjord I. inside Vorfjorden	Reine I. 11 miles SE	
Date	13/2	13/2	16/2	17/2	17/2	17/2	18/2	18/2	18/2	21/2	21/2	1/3	1/3	3/3	4/3	4/3
Depth (meters)	0—80	0—30	0—275	0—100	250—350	550—620	0—50	0—200	0—300	0—85	0—250	0—50	0—200	0—100	0—50	0—150
Salinity (‰)	33.56—33.74	33.56—34.42		33.23—34.19	34.94—35.08	35.08	33.48—34.16	33.48—34.89		33.52—34.02	33.52—35.03	34.06—34.21	33.80—34.97	33.16—33.48	33.54—33.61	33.54—34.70
Temperature (Cels.)	2.2—3.4	1.7		1.1—6.4	6.6—6.5	6.3	2.7—6.1	2.7—6.4		2.6—4.2	2.6—6.6	3.9—4.3	2.8—6.6	2.0—2.7	2.1—2.5	2.1—6.7
I. Bacillariales. *(Diatomaceæ).*																
Biddulphia aurita (LYNGB.) BRÉB.	..	..	..	..	..	..	..	..	..	..	..	..	r+			
B. mobiliensis BAIL.	..	..	..	..	..	..	..	..	..	..	r					
Chætoceros borealis BAIL	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
C. atlanticus CL.	..	..	..	rr	..	..	..	..	..	..	rr					
C. decipiens CL.	..	..	..	..	..	..	r	r								
C. debilis CL.	..	..	..	..	..	..	..	..	..	..	..	..	rr			
Thalassiosira gravida CL.	..	..	..	..	..	..	..	..	..	..	..	..	r			
Coscinosira polychorda (GRAN) GRAN	..	..	..	..	..	..	r	r	..	..	..	..	r			
Actinocyclus Ehrenbergi RALFS	r	..	..	r	..	..	r	r	..	..	r	r	+c	r	r+	r+
Roperia tessellata (ROP.) GRUN.	..	..	..	..	..	..	..	..	..	..	r					
Coscinodiscus excentricus EHRB.	..	r	..	r	..	r	r	r	..	..	r	..	r	..	..	r
C. lineatus EHRB. var.	..	..	..	..	..	..	..	..	..	..	r					
C. stellaris ROP.	..	..	..	..	..	..	..	..	..	..	rr	..	r			
C. radiatus EHRB.	..	..	r	..	..	..	..	..	..	r	r+	+	+c	+	+c	c
C. subbulliens JØRG. n. sp.	..	..	..	..	..	..	..	..	..	..	..	..	r+			
C. centralis EHRB.	r	r	r	r	r	..	r	r	r	r+	r+	+	+c	c	+	
C. concinnus W. SM.	..	..	..	r												
Hyalodiscus stelliger BAIL.	..	..	..	..	..	r	..	..	r	..	r	..	r	r		
Thalassiothrix longissima CL. et GRUN.	r	..	..	r												
T. Frauenfeldii GRUN. v. *nitzschioides* (GRUN.) JØRG.	..	..	..	..	..	..	r	r								
Pleurosigma tenerum JØRG. n. sp.	..	..	..	r	..	..	r	r								
Actinoptychus undulatus (BAIL.?) RALFS	..	..	..	..	..	..	..	..	..	..	..	..	r			
Surirella lata W. SM.	..	..	..	..	..	r	..	..	..	..	..	..	r			
Campylodiscus Thuretii BRÉB.	r	..	r	r	..	..	..	..	..	..	..	..	..	r		
C. angularis GREG.	..	..	r	..	..	..	..	..	r							
Grammatophora oceanica EHRB.	..	..	..	..	..	..	..	..	..	..	..	..	r			
Rhabdonema arcuatum (LYNGB.) KÜTZ.	..	..	..	..	..	..	..	..	..	..	r					
Auliscus sculptus (W. SM.) RALFS	..	..	r													
II. Peridiniales. *(Dinoflagellata).*																
Dinophysis acuta EHRB., JØRG.	..	..	..	r	..	..	r	r	r	..	r	r	r			
D. norvegica CLAP. et LACHM., JØRG.	..	..	..	..	..	..	r	..	..	..	..	..	r	r		
D. rotundata CLAP. et LACHM.	..	..	..	..	..	..	r	r								
D. r. v. *lævis* (CLAP. et LACHM.) JØRG.	..	..	..	..	..	..	r									
Diplopsalis lenticula BERGH	r	..	r	+	..	..	r	+	..	..	r					
Peridinium depressum BAIL.	r+	rr	+	c	+	+	+	c	c	..	c	r+	r	+	r	+c
P. oceanicum VANHÖF.	..	rr	..	r	..	..	r	r	r	..	r					
P. divergens EHRB. (*P. lenticulare* (EHRB.) JØRG.)	+	r+	c	cc	+	+	cc	c	cc	c	c	c	c	+	c	c

Year 1899. Month	February											March				
Locality	Strømmen I, at Henningsvær	Strømmen II, at Henningsvær	Mouth of the Raftsund	Øxsund, between Hammerø and Lundø			Sagfjord I, inside Finnesvegen		Sagfjord II outside F.	Henningsvær I, 4 miles SSW	Henningsvær III, 16 miles SSW	Evenstad I, 7 miles SE of Lofotodden	Evenstad II, 10 miles SE of Lofotodden	Kirkfjord I, inside Vorfjorden	Reine I, 11 miles SE	
Date	13/2	13/2	16/2	17/2	17/2	17/2	18/2	18/2	18/2	21/2	21/2	1/3	1/3	3/3	4/3	4/3
Depth (meters)	0—80	0—30	0—275	0—100	250—350	550—620	0—50	0—200	0—300	0—85	0—250	0—50	0—200	0—100	0—50	0—150
Salinity (‰)	33.56—33.74	33.56—33.42		33.23—34.19	34.94—35.08	35.08	33.48—34.16	33.48—34.89		33.52—34.02	33.52—35.03	34.06—34.21	33.80—34.97	33.16—33.48	33.54—33.61	33.54—34.70
Temperature (Cels.)	2.2—3.4	1.7		1.1—6.4	6.6—6.5	6.3	2.7—6.1	2.7—6.4		2.6—4.2	2.6—6.6	3.9—4.3	2.8—6.6	2.0—2.7	2.1—2.5	2.1—6.7
Peridinium conicum (GRAN) OSTENF. et SCHM.	..	..	..	..	..	..	..	..	..	..	r					
P. pallidum OSTENF.	..	..	r	+	..	..	r	+c	+	..	r	..	r	..	..	r
P. Steinii JØRG.	r	..	r	+	..	..	rr	+r	r	..	..	..	r			
P. ovatum (POUCH.) SCHÜTT.	r	r	r	+	..	..	r	r+	r	..	r+	..	r			
Ceratium tripos (O. F. MÜLL.) NITZSCH. (α *balticum* SCHÜTT.)	c	+c	c	c	..	..	+	r	+	c	cc	c	c	c	c	c
C. bucephalum (CL.) CL.	c	c	c	c	..	..	+	r	+	c	c	c	c	c	c	c
C. macroceros (EHRB.) CL.	+c	+	r	+c	..	..	+	+	+	+	c	c	c	c	+	c
C. intermedium (JØRG.) JØRG.	+	+r	r	c	..	..	+	r	+	+c	+	c	c	+c	c	c
C. longipes (BAIL.) CL.	+c	c	c	c	..	..	r+	r	+	c	c	c	c	c	c	c
C. arcticum (EHRB.) CL.	..	r														
C. furca (EHRB.) DUJ.	+	+	+c	+c	+	..	c	+	+	+	cc	+c	c	+c	+c	c
C. lineatum (EHRB.) CL.	..	..	r													
C. fusus (EHRB.) DUJ.	c	c	c	c	+	..	c	c	c	c	+c	c	c	c	c	c
III. Pterospermataceæ.																
Pterosperma Möbii (JØRG.) OSTENF.	r+	r	r	r	..	..	r	..	..	r	..	r	r+	r+	r	r
P. Vanhöffeni (JØRG.) OSTENF.	r+	r+	r	r	..	..	r	r	..	r+	..	..	+	r+	r+	+
P. dictyon (JØRG.) OSTENF.	r+	+	+	r+	..	..	r	r	r	r+	..	r+	+	c	c	c
IV. Halosphæraceæ.																
Halosphæra viridis SCHMITZ. (incl. *H. minor* OSTENF.)	cc	cc	c	c	+	..	—	+	+c	cc	cc	+	c	c	cc	c
V. Silicoflagellata.																
Dictyocha fibula EHRB.	..	..	..	..	..	..	..	..	..	..	..	..	r			
VI. Radiolaria.																
1. Spumellaria.																
Hexacontium enthacanthum JØRG.	..	..	..	..	..	..	..	..	..	..	r					
H. pachydermum JØRG.	..	..	..	..	..	r										
Echinomma trinacrium HCK.	..	..	..	..	..	..	rr	..	..	..	r					
E. leptodermum JØRG.	..	..	r	..	r	r	..	..	..	..	r	r	r			
Chromyomma boreale (CL.) JØRG.	..	..	..	..	..	r										
Rhizoplegma boreale (CL.) JØRG.	..	..	..	..	..	r	..	..	r	..	r	..	r			
Lithelius minor JØRG.	..	..	..	..	..	..	..	..	r	..	r	..	r			
Phorticium pylonium HCK.?, CL.	..	..	..	..	r	r	..	..	..	..	..	..	r			

Year 1899. Month	February											March				
Locality	Strømmen I, at Henningsvær	Strømmen II, at Henningsvær	Mouth of the Raftsund	Øxsund, between Hammerø and Lundø			Sagfjord I, inside Furunesveggen		Sagfjord II, outside F.	Henningsvær I, 4 miles SSW	Henningsvær III, 16 miles SSW	Evenstad I, 7 miles SE of Lofotodden	Evenstad II, 10 miles SE of Lofotodden	Kirkfjord I, inside Vorfjorden	Reine I, 11 miles SE	
Date	13/2	13/2	16/2	17/2	17/2	17/2	18/2	18/2	18/2	21/2	21/2	1/3	1/3	3/3	4/3	4/3
Depth (meters)	0—80	0—30	0—275	0—100	250—350	550—620	0—50	0—200	0—300	0—85	0—250	0—50	0—200	0—100	0—50	0—150
Salinity (‰)	33.56—33.74	33.56—33.42		33.23—34.19	34.94—35.08	35.08	33.48—34.16	33.48—34.89		33.52—34.02	33.52—35.03	34.06—34.21	33.80—34.97	33.16—33.48	33.54—33.61	33.54—34.70
Temperature (Cels.)	2.2—3.4	1.7		1.1—6.4	6.6—6.5	6.3	2.7—6.1	2.7—6.4		2.6—4.2	2.6—6.6	3.9—4.3	2.8—6.6	2.0—2.7	2.1—2.5	2.1—6.7
2. Acantharia.																
Radiosphæra anacanthica JØRG. n. sp.	..	..	..	..	..	..	..	..	..	..	..	r				
3. Nassellaria.																
Plagiacantha arachnoides CLAP. et LACHM.	..	..	..	r	..	..	..	..	..	..	r					
Campylacantha cladophora JØRG. n. sp.	..	..	..	..	r	r	..	..	r							
Plectacantha oikiskos JØRG. n. sp.	..	..	..	..	..	r	..	..	..	..	rr					
Phormacantha hystrix (JØRG.) JØRG.	..	..	..	..	r	r	..	..	r	..	r	.	r			
Gonosphæra primordialis JØRG. n. sp.	..	..	..	..	r	r	..	..	..	..	r					
Peridium longispinum JØRG.	..	..	..	..	..	r										
Cladoscenium tricolpium (HCK.?) JØRG.	..	..	..	r	r	..	..	..	..	..	rr					
Helotholus histricosa JØRG. n. sp.	..	..	r	..	r	r	..	..	r	..	r					
Dictyophimus Clevei JØRG.	..	..	..	..	r											
D. histricosus JØRG. n. sp.	..	..	..	..	..	..	..	..	..	..	rr					
Lithomelissa setosa (CL.) JØRG.	..	..	..	r	r	..	r	r	r	r	rr	..	r			
Dictyoceras acanthicum JØRG.	..	..	..	r	..	..	..	..	..	..	r					
Clathrocyclas craspedota (JØRG.) JØRG.	..	..	..	r	r	..	..	..	r	..	r					
Androcyclas gamphonycha (JØRG.) JØRG.	..	..	..	r	r	r+	..	..	r							
A. amblycephalis (JØRG.) JØRG.	..	.	..	..	..	r										
Stichocorys seriata (JØRG.) JØRG.	..	..	..	..	r											
4. Phæodaria (Tripylea).																
Cannosphæra lepta JØRG.	..	..	..	..	..	..	..	..	..	..	rr					
Protocystis xiphodon (HCK.) BORG.	..	..	..	..	r	r	..	..	r	..	rr					
P. Harstoni (MURRAY) BORG.	..	..	..	..	..	r										
P. tridens (HCK.) BORG.	r	..	..	r	r											
Challengeron diodon HCK. (*C. heteracanthum* JØRG.)	..	..	r	..	r	..	rr	..	..	..	r	..	r			
VII. Tintinnodea.																
Tintinnus acuminatus CLAP. et LACHM.	..	..	..	..	..	..	r	r								
Ptychocylis urnula (CLAP. et LACHM.) BRANDT v. *minor* JØRG.	r	r	..	r	r	..	..	..	..	..	..	..	r	r	r	
Tintinnopsis nitida BRANDT	r	..	..	..	..	..	r	r	r	..	..	..	..	r		
Codonella lagenula (CLAP. et LACHM.) *Entz.* v. *ovata* JØRG.	r															
Cyttarocylis denticulata (EHRB.) FOL.	..	r+	+	+	+	r	r	r	r	..	r	r	r	r	r	r
C. d. α *typica* JØRG.	r															
C. d. v. *cylindrica* JØRG.	r+															
C. d. v. *elongata* JØRG.	..	..	..	..	..	r										
C. d. v. *subrotundata* Jørg.	r	..	..	..	..	..	..	..	r	..	..	..	..	r		
Dictyocysta templum HCK. v. *disticha* JØRG.	..	..	..	..	..	..	..	..	..	..	..	..	..	r		
Undella caudata (OSTENF.) CL.	..	..	..	..	..	..	r	r	r							

Year 1899 Month	March														
Locality	Ure I, 9½ miles SSE	Henningsvær I, 6 miles SWtW½W	Raftsund	Risværflaket, outside the Øgsfjord	Kanstadfjord III, inside the ridge	Øgsfjord I, at the head	Øgsfjord II, at Halvorsø	Tranødybet, between Tranø and Lødingen				Henningsvær II, 6 miles StE½E	Værø, 7 miles StW of Maahornet	Røsthavet, 60 miles NW of Røst	
Date	6/3	6/3	10/3	10/3	11/3	14/3	14/3	16/3	16/3	16/3	16/3	20/3	21/3	22/3	22/3
Depth (meters)	0—200	0—140	0—45	0—50	0—90	0—90	0—200	0	0—50	300—200	600—500	0—280	0—170	0—100	0—900
Salinity (‰)	—34.97	33.54—34.53	33.21—33.59	33.21—33.35	—33.48	32.54—33.10	32.95—33.33	33.41	33.41—33.84	35.00	35.00	33.67—35.06	34.10—35.06	35.00—35.31	35.00—35.00
Temperature (Cels.)	2.6—6.8	2.1—6.2	2.3—3.1	1.2—1.3	—1.6	2.1—2.1	1.3—1.4	1.4	1.4—3.0	6.5	6.5	1.7—6.55	3.2—6.8	5.05—6.4	5.05—1.1
I. Bacillariales. *(Diatomaceæ).*															
Chætoceros borealis Bail.	..	..	..	..	r	..	rr	r	r	..	..	+	r+		
C. densus (Cl.) Cl.	..	..	..	..	..	..	..	..	..	..	..	r	r		
C. atlanticus Cl.	..	..	..	..	..	..	.	r	r	..	..	r	r	r	r
C. decipiens Cl.	..	..	..	..	..	..	rr	..	r	..	..	r	r		
C. contortus Schütt	..	..	..	..	..	..	..	..	..	..	r				
Ditylium Brightwellii (West.) Grun.	..	..	..	..	..	..	..	..	..	..	..	rr	..	r	r
Actinocyclus Ehrenbergii Ralfs	+	r+	r	..	r	r	..	..	r	r	..	r+	+	r	r+
Coscinodiscus excentricus Ehrb.	..	r+	..	..	..	..	..	..	..	..	..	r+	r	..	r
C. curvatulus Grun.	..	..	..	..	..	..	..	..	..	..	..	rr			
C. stellaris Rop.	..	..	..	..	..	..	..	..	..	..	..	r			
C. radiatus Ehrb.	c	+c	..	..	r+	r	r	..	r+	..	..	+c	c	c	+c
C. subbulliens Jørg.	..	..	..	..	..	..	..	..	..	..	..	r	r	..	r+
C. centralis Ehrb.	+c	+c	r	r	+	..	r	+	c	..	..	c	c	c	+c
Euodia gibba Bail.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	rr
Hyalodiscus stelliger Bail.	..	r	..	..	..	..	r	..	..	..	..	..	r	..	r
Thalassiothrix Frauenfeldii Grun. v. *nitzschioides* (Grun.) Jørg.	..	..	..	..	..	..	r								
Pleurosigma tenerum Jørg. n. sp.	..	..	r	..	r	r	+								
Paralia sulcata (Ehrb.) Cl.	.	..	..	..	..	r	..	..	..	..	..	..	..	r	
Actinoptychus undulatus (Bail.?) Ralfs	..	..	..	..	..	..	..	..	..	..	..	r	r	r	r
Campylodiscus Thuretii Bréb.	..	..	..	..	..	r	r+								
C. angularis Greg.	..	..	..	..	..	r	r								
Rhabdonema minutum Kütz.	..	..	..	..	r										
Striatella unipunctata (Lyngb.) Ag.	..	..	..	..	..	..	r								
Auliscus sculptus (W. Sm.) Ralfs	..	..	r												
II. Peridiniales. *(Dinoflagellata).*															
Dinophysis acuta Ehrb., Jørg.	r	r	..	..	r	..	..	..	..	r	..	r	+	r	r
D. norvegica Clap. et Lachm., Jørg.	r	..	..	..	..	..	..	..	..	..	..	..	r		
D. rotundata Clap. et Lachm.	..	..	..	..	..	..	..	..	rr						
Pyrophacus horologium Stein	..	..	..	..	..	..	..	..	..	..	..	rr	r		
Gonyaulax spinifera (Clap. et Lachm.) Dies.	..	..	..	..	..	r									
Diplopsalis lenticula Bergh	+r	r	..	r	+	r+	r+	..	..	..	..	+	+	r	r
Peridinium depressum Bail.	+	+c	r	+	+r	+	+	+	c	+	+	+c	c	r+	+
P. oceanicum Vanhöf.	rr														
Peridinium divergens Ehrb. (*P. lenticulare* (Ehrb.) Jørg.)	c	c	c	c	c	c	c	c	c	+	+	c	c	c	+
P. conicum (Gran) Ostenf. et Schm.	rr	..	..	..	..	..	..	..	..	r					

Year 1899. Month	March														
Locality	Ure I, 9½ miles SSE	Henningsvær I, 6 miles SWtW½W	Raftsund	Risværflaket, outside the Øgsfjord	Kanstadfjord III, inside the ridge	Øgsfjord I, at the head	Øgsfjord II, at Halvorsø	Tranødybet, between Tranø and Lødingen				Henningsvær II, 6 miles StE½E	Være, 7 miles StW of Maahornet	Rosthavet, 60 miles NW of Røst	
Date	6/3	6/3	10/3	10/3	11/3	14/3	14/3	16/3	16/3	16/3	16/3	20/3	21/3	22/3	22/3
Depth (meters)	0—200	0—140	0—45	0—50	0—90	0—90	0—200	0	0—50	300—200	600—500	0—280	0—170	0—100	0—900
Salinity (⁰/₀₀)	—34.97	33.54—34.53	33.21—33.59	33.21—33.35	—33.48	32.54—33.10	32.95—33.33	33.41	33.41—33.84	35.00	35.00	33.67—35.06	34.10—35.06	35.00—35.31	35.00—35.00
Temperature (Cels.)	2.6—6.8	2.1—6.2	2.3—3.1	1.2—1.3	—1.6	2.1—2.1	1.3—1.4	1.4	1.4—3.0	6.5	6.5	1.7—6.55	3.2—6.8	5.05—6.4	5.05—1.1
P. pallidum OSTENF.	r	+	..	r+	—	..	..	..	r+	..	..	r+	r		
P. Steinii JØRG.	..	r	r	r	r	rr									
P. ovatum (POUCH.) SCHÜTT.	r	r+	r	..	r	..	..	..	+	..	..	r	r		
Ceratium tripos (O. F. MÜLL.) NITZSCH. (α *balticum* SCHÜTT.)	c	c	+	+	c	+	+	+r	c	..	r	c	cc	cc	c
C. bucephalum CL.	c	c	+	+	c	+	+	c	c	r	+	c	c	c	+
C. macroceros EHRB.	c	+c	r	r	+	+	+	+	+c	..	+	c	c	+c	+
C. intermedium (JØRG.)	c	c	..	..	c	..	r	..	..	r	+	r	c	c	r
C. longipes (BAIL.) CL.	c	+	+	+	c	+c	+c	c	c	r	..	cc	cc	+c	
C. arcticum (EHRB.) CL.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	+r
C. furca (EHRB.) DUJ.	c	r+	r	+c	+c	r+	r	r+	r	..	r	+	c	cc	+
C. lineatum (EHRB.) CL.	..	r													
C. fusus (EHRB.) DUJ.	c	c	+	c	c	+	+	+	+c	r+	+	+	c	+c	+
III. Pterospermataceæ.															
Pterosperma Möbii (JØRG.) OSTENF.	+r	r	r	r+	r	r	+	r	..	..	..	r+			
P. Vanhöffeni (JØRG.) OSTENF.	c+	+	+	r+	+	+	+	+	+	..	..	+c	r	+	+
P. dictyon (JØRG.) OSTENF.	c	+	c	+	+	c	c	+c	c	..	..	c			
IV. Halosphæraceæ.															
Halosphæra viridis SCHMITZ (incl. *H. minor* OSTENF.)	cc	cc	c	+	+	c	c	c	ccc	+	+	..	r	r	
V. Silicoflagellata.															
Distephanus speculum (EHRB.) STØHR	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
Dictyocha fibula EHRB.	..	..	..	..	..	..	..	..	..	..	..	..	r	..	r
VI. Radiolaria.															
1. Spumellaria.															
Hexacontium enthacanthum JØRG.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
H. pachydermum JØRG.	..	..	..	..	..	..	..	..	..	..	..	r			
Echinomma leptodermum JØRG.	..	..	..	..	..	..	..	..	..	..	..	r	..	..	r
Chromyomma boreale (CL.) JØRG.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
Rhizoplegma boreale (CL.) JØRG.	..	..	..	..	..	..	..	..	..	..	..	r	..	r	r
Stylodictya validispina JØRG. n. sp.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
S. aculeata JØRG. n. sp.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
S. tenuispina JØRG. n. sp.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
Spongodiscus favus EHRB.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
Lithelius minor JØRG.	..	..	..	..	..	..	..	..	..	..	..	r	..	..	r
Phorticium pylonium HCK.? CL.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r

Year 1899. Month	March														
Locality	Ure I, 9½ miles SSE	Henningsvær I, 6 miles SWtW½W	Raftsund	Risværflaket, outside the Øgsfjord	Kanstadfjord III, inside the ridge	Øgsfjord I, at the head	Øgsfjord II, at Halvorsø	Tranødybet, between Tranø and Lødingen				Henningsvær II, 6 miles StE½E	Værø, 7 miles StW of Maahornet	Røsthavet, 60 miles NW of Røst	
Date	6/3	6/3	10/3	10/3	11/3	14/3	14/3	16/3	16/3	16/3	16/3	20/3	21/3	22/3	22/3
Depth (meters)	0—200	0—140	0—45	0—50	0—90	0—90	0—200	0	0—50	300—200	600—500	0—280	0—170	0—100	0—900
Salinity (‰)	—34.97	33.54—34.53	33.21—33.59	33.21—33.35	—33.48	32.54—33.10	32.95—33.33	33.41	33.41—33.84	35.00	35.00	33.67—35.06	34.10—35.06	35.00—35.31	35.00—35.00
Temperature (Cels.)	2.6—6.8	2.1—6.2	2.3—3.1	1.2—1.3	—1.6	2.1—2.1	1.3—1.4	1.4	1.4—3.0	6.5	6.5	1.7—6.55	3.2—6.8	5.05—6.4	5.05—1.1
2. Nassellaria.															
Plagiacantha arachnoides Clap. et Lachm.	..	..	..	..	..	..	..	..	..	..	..	r	..	..	r
Campylacantha cladophora Jørg. n. sp.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
Plectacantha oikiskos Jørg. n. sp.	..	..	..	..	..	..	..	..	..	..	..	r			
Phormacantha hystrix (Jørg.) Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
Dictyocircus clathratus Jørg. n. sp.	..	..	..	..	..	..	..	..	..	..	..	rr			
Peridium longispinum Jørg.	rr	..	..	..	..	..	..	..	..	..	..	r	..	..	r
Eusccnium corynephorum Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
Cladoscenium tricolpium (Hck.?) Jørg.	..	..	..	..	..	..	..	..	..	..	..	r	..	r	r
Helotholus histricosa Jørg. n. sp.	..	..	..	..	..	..	..	..	..	..	..	r			
Dictyophimus Clevei Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
Lithomelissa setosa (Cl.) Jørg.	..	..	..	..	..	..	..	..	..	..	..	r	..	..	r
L. hystrix Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
Dictyoceras xiphephorum Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
Clathrocyclas craspedota (Jørg.) Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
Androcyclas gamphonycha (Jørg.) Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
A. amblycephalis (Jørg.) Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
Stichocorys seriata (Jørg.) Jørg.	..	..	..	..	..	..	..	..	..	..	..	r	..	..	r
3. Phæodaria (Tripylea).															
Protocystis xiphodon (Hck.) Borg.	..	r	..	..	..	..	..	..	..	..	..	..	..	..	r
P. Harstoni (Murray) Borg.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
P. tridens (Hck.) Borg.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
Challengeron diodon Hck. (*C. heteracanthum* Jørg.)	..	..	..	..	..	..	..	..	..	..	..	r			
Gazelletta pentapodium Jørg.	..	..	..	..	..	..	..	..	..	..	..	r+			
Cadium melo (Cl.) Borg.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	r
VII. Tintinnodea.															
Tintinnus acuminatus Clap. et Lachm.	..	..	..	..	..	rr	..	..	..	..	..	..	r		
Leprotintinnus pellucidus (Cl.) Jørg.	..	..	..	..	..	rr									
Ptychocylis urnula (Clap. et Lachm.) Brandt α *major* Jørg.	..	..	..	..	..	r									
P. u. v. minor Jørg.	..	..	..	..	..	..	r	..	..	r	..	r+	r+	..	r
P. u. v. digitalis Auriv.	..	..	..	..	..	..	..	..	r	..	..	rr			
Tintinnopsis nitida Brandt	..	..		..	r	..	r								
Cyttarocylis denticulata (Ehrb.) Fol.	r	r	..	r	r+	c	c	r	..	+	r	r	r	r	r+
C. d. v. cylindrica Jørg.	..	..	..	..	..	+	+								
C. d. v. gigantea (Brandt) Cl.	..	..	..	..	..	r									
C. d. v. elongata Jørg.	..	..	r	..	..	..	r								
C. d. v. subrotundata Jørg.	..	r	..	..	..	+c	+								
C. d. v. subedentata Jørg. n. var.	..	..	..	..	..	+c	c								
Dictyocysta templum Hck. v. *disticha* Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	rr

Year 1899. Month.	March						April							
Locality	Rost I. outside R.	Tysfjord I, inside Skarberget		Tysfjord II. inside the Tysfjord church		Tysfjord I	Lille Molla	Folstad. Ostnesfjord	Helle. Ostnesfjord	Brettesnes II	Skroven		Hola, at Svolvær	Stene in Bo (Vesteraalen)
Date	24/3	28/3	28/3	29/3	29/3	29/3	1/4	4/4	4/4	4/4	4/4	4/4	4/4	10/4
Depth (meters)	0—120	0—100	0—700	0—100	0—400	300—200	0	0—3	0—3	0—3	0—3	0—150	0—3	0
Salinity (‰)	34.42—34.60	33.58—34.54	33.58—35.11	33.65—34.54	33.65—35.11			33.32	33.28	33.65	33.72	33.72—34.92	33.72	33.63
Temperature (Cels.)	3.1—4.25	0.75—5.5	0.75—6.3	1.55—5.75	1.55—6.3			÷0.4	0.5	1.1	1.1	1.1—6.5	0.8	1.05
I. Bacillariales. *(Diatomaceæ).*														
Bacterosira fragilis (GRAN) GRAN	..	..	..	..	..	..	..	+	+c	+c	..	r	+	+
Rhizosolenia obtusa HENS.	..	..	..	..	..	..	..	..	..	..	..	..	..	rr
Biddulphia aurita (LYNGB.) BREB.	r	..	..	..	..	..	r	r	r	r	rr	r	r	r
Chætoceros borealis BAIL.	..	..	..	..	..	..	..	..	..	..	rr	r		
C. densus (CL.) CL.	r	r	r	r	r									
C. danicus CL.	..	..	..	..	..	..	..	..	r					
C. convolutus CASTR.	r	..	..	..	..	..	+	r	r	+c	+c	+c	c	
C. atlanticus CL.	r	..	..	..	..	..	r	..	..	rr				
C. decipiens CL.	r	..	r	..	..	..	r	r	..	r+	r	r+	+	
C. teres CL.	..	..	..	..	..	..	..	r	r	r+	..	..	..	r
C. laciniosus SCHÜTT	..	..	..	..	..	..	..	..	r+	..	r			
C. breris SCHÜTT	..	..	..	..	..	..	..	..	r+					
C. Willei GRAN	..	..	..	..	..	..	..	..	..	..	..	..	..	r
C. diadema (EHRB.) GRAN	..	..	..	..	..	..	..	r+	c	+	r+	r	r	+
C. debilis CL.	..	..	..	..	..	..	..	+	..	r	..	..	..	+
C. socialis LAUD.	..	..	..	..	..	..	+	cc	cc	cc	cc	+	cc	cc
C. furcellatus BAIL.	..	..	..	..	..	..	r	+	..	..	..	..	..	c
Ditylium Brightwellii (WEST) GRUN.	r	..	r											
Sceletonema costatum (GREV.) CL.	r	..	..	..	..	..	r+	cc	c	+c	c	+	c	+
Thalassiosira Nordenskjöldii CL.	..	..	..	..	..	..	+c	+	c	c	+c	..	+c	cc
T. gravida CL.	..	..	..	..	..	..	..	r	..	r	..	..	r	+
T. hyalina (GRUN.) GRAN	..	..	..	..	..	..	..	c	+c	c	c	+c	c	c
T. gelatinosa HENS	..	..	..	..	..	..	r+	r+	r	r	..	+	+	
Porosira glacialis (GRUN.)	..	..	..	..	..	..	..	..	..	r	..	..	..	+r
Coscinosira polychorda (GRAN) GRAN	..	..	..	..	..	..	..	r	..	r	..	r	r	
Actinocyclus Ehrenbergii RALFS	+c	r	..	..	..	..	..	..	..	..	..	r		
Coscinodiscus excentricus EHRB.	r													
C. curvatulus GRUN.	..	..	..	..	..	..	..	..	..	..	..	r		
C. stellaris ROP.	r													
C. radiatus EHRB.	r	r	r											
C. subbulliens JØRG.	..	..	..	..	r	..	..	..	..	..	..	r	r	
C. oculus iridis EHRB.	..	..	..	..	..	..	r	..	..	..	..	..	r	
C. centralis EHRB.	c	r	+	..	r	..	r	..	..	r	..	+		
C. concinnus W. SM.	..	..	..	..	..	..	..	..	..	r	..	..	r	
Euodia gibba BAIL.	rr													
Hyalodiscus stelliger BAIL.	..	..	r											
Nitzschia seriata CL.	..	..	..	..	..	..	+c	+	+	+c	c	+c	c	+
N. lanceolata W. SM.	..	..	..	..	..	..	r	..	r	..	..	r	r	
N. delicatissima CL.	..	..	..	..	..	..	..	..	..	..	+c	r	r	
N. longissima (BRÉB.) RALFS.	..	..	..	..	..	..	..	r	rr					
Thalassiothrix Frauenfeldii GRUN.	..	..	..	r	..	..	..	..	..	+c	+	r	..	r

Year 1899. Month	March						April							
Locality	Røst I, outside R.	Tysfjord I, inside Skarberget		Tysfjord II, inside the Tysfjord church		Tysfjord I	Lille Molla	Følstad, Østnesfjord	Helle, Østnesfjord	Brettesnes II	Skroven		Hola, at Svolvær	Stene in Bø (Vesteraalen)
Date	24/3	28/3	28/3	29/3	29/3	29/3	1/4	4/4	4/4	4/4	4/4	4/4	4/4	10/4
Depth (meters)	0—120	0—100	0—700	0—100	0—400	300—200	0	0—3	0—3	0—3	0—3	0—150	0—3	0
Salinity (‰)	34.42—34.60	33.58—34.54	33.58—35.11	33.65—34.54	33.65—35.11			33.32	33.28	33.65	33.72	33.72—34.92	33.72	33.63
Temperature (Cels.)	3.1—4.25	0.75—5.5	0.75—6.3	1.55—5.75	1.55—6.3			÷0.4	0.5	1.1	1.1	1.1—6.5	0.8	1.05
Thalassiothrix Frauenfeldii v. nitzschioides (Grun.) Jørg.	r	..	..	..	..	..	+c	c	+	..	..	..	+	
Fragilaria oceanica Cl.	rr	..	..	..	..	..	c	c	cc	cc	cc	c	cc	c
F. cylindrus Grun.	..	..	..	..	..	..	cc	c	c	cc	cc	c	cc	c
Navicula septentrionalis Oestr.	..	..	..	..	..	..	..	..	..	r+	..	r	+	r
N. Vanhöffeni Gran	..	..	..	..	..	..	r+	r	+	r	r	+c	r	
N. pelagica Cl	..	..	..	..	..	..	..	..	..	..	r	r	r	
N. directa W. Sm.	..	..	..	..	..	..	r+	..	+	..	..	r+	r	r
N. kariana Grun.	..	..	..	..	..	..	..	r	r	+c	r+	..	r	
Actinoptychus undulatus (Bail?) Ralfs	..	..	r											
Auliscus sculptus (W. Sm.) Ralfs	..	..	..	..	..	..	..	..	..	..	..	r		
Campylodiscus angularis Greg.	..	..	..	..	rr									
Grammatophora oceanica Ehrb.	..	..	..	..	..	..	..	..	..	..	..	r		
Rhabdonema minutum Kütz.	..	..	..	..	..	..	r							
Nitzschia spathulata Bréb.	..	..	..	..	..	..	..	..	..	..	r			
N. bilobata W. Sm.	..	..	..	..	..	..	..	..	..	..	..	..	r	
N. Closterium W. Sm.	..	..	..	..	..	..	..	..	r					
Glyphodesmis Williamsonii (W. Sm.) Grun.	..	..	..	..	rr									
Cocconeis scutellum Ehrb.	..	..	..	..	..	..	r	r	r	..	..	..	r	
C. costata Greg.	..	..	..	..	..	..	r	..	..	..	..	..	r	
Pleurosigma Normanni Ralfs.	..	..	..	..	..	..	r							r
P. fasciola W. Sm.	..	..	..	..	..	..	..	..	..	..	..	..	..	
Schizonema Grevillei Ag.	..	..	..	..	..	..	r							
Pinnularia quadratarca A. Schm.	..	..	..	..	..	..	..	..	..	..	..	r		
II. Peridiniales. (*Dinoflagellata*).														
Dinophysis acuta Ehrb., Jørg.	rr	r	..	..	rr	..	..	r						
Diplopsalis lenticula Bergh	rr	r	r+											
Peridinium depressum Bail.	r+	+	c	r	+	..	r	..	..	r	..	r+		
P. oceanicum Vanhöf.	..	..	r											
P. divergens Ehrb. (*P. lenticulare* (Ehrb.) Jørg.)	r	+c	cc	+c	c	r+	r	..	..	..	..	rr		
P. pallidum Ostenf.	rr	r	r+	r										
P. Steinii Jørg.	..	..	rr											
P. ovatum (Pouch.) Schütt.	..	..	..	..	..	..	..	..	..	rr				
Ceratium tripos (O. F. Müll.) Nitzsch. (α *balticum* Schütt)	c	c	c	r	r	..	r	..	..	r	..	r+		
C. bucephalum (Cl.) Cl.	+c	r+	r+	..	+	..	..	..	..	..	..	r		
C. macroceros (Ehrb.) Cl.	c	r	r	..	r	..	..	..	..	..	..	rr		
C. intermedium (Jørg.)	r+	+	r	r	r									
C. longipes (Bail.) Cl.	+	c	c	c	c	r	r	r	..	r+	..	+		
C. furca (Ehrb.) Duj.	+	+	+	r	r	..	r	..	..	..	..	rr		
C. fusus (Ehrb.) Duj.	c	c	+c	+	+	..	..	..	..	rr	..	r		

Year 1899. Month	March						April							
Locality	Rost I, outside R.	Tysfjord I, inside Skarberget		Tysfjord II, inside the Tysfjord church		Tysfjord I	Lille Molla	Folstad, Ostnesfjord	Helle, Ostnesfjord	Brettesnes II	Skroven		Hola, at Svolvær	Stene in Bo (Vesteraalen)
Date	24/3	28/3	28/3	29/3	29/3	29/3	1/4	4/4	4/4	4/4	4/4	4/4	4/4	10/4
Depth (meters)	0–120	0—100	0–700	0–100	0–400	300—200	0	0—3	0—3	0–3	0–3	0–150	0–3	0
Salinity (⁰/₀₀)	34.42—34.60	33.58—34.54	33.58—35.11	33.65—34.54	33.65—35.11			33.32	33.28	33.65	33.72	33.72—34.92	33.72	33.63
Temperature (Cels.)	[illegible].1—4.25	0.75—5.5	0.75—6.3	1.55—5.75	1.55—6.3			÷0.4	0.5	1.1	1.1	1.1—6.5	0.8	1.05
III. Pterospermataceæ.														
Pterosperma Möbii (JØRG.) OSTENF.	..	..	..	..	..	..	..	..	..	r				
P. Vanhöffeni (JØRG.) OSTENF.	r+	..	..	..	..	..	r	..	..	r				
P. dictyon (JØRG.) OSTENF.	+	r	r+	r	..	..	r	..	..	r	..	r		
IV. Halosphæraceæ.														
Halosphæra viridis SCHMITZ (incl. *H. minor* OSTENF.)	..	c	c	..	..	r	cc	..	..	+c	..	r+	..	r
V. Flagellata.														
Phæocystis Poucheti (HAR.) LAGERH.	..	..	..	..	..	..	..	..	cc	cc	cc	c	cc	cc
VI. Silicoflagellata.														
Distephanus speculum (EHRB.) STØHR	..	..	..	..	..	..	r	r	r	r	r	rr	r	r
Gymnaster pentasterias (EHRB.) SCHÜTT.	..	..	..	..	..	..	r							
VII. Radiolaria.														
1. Spumellaria.														
Hexacontium enthacanthum JØRG.	..	..	r+	..	r									
H. pachydermum JØRG.	..	..	r	..	r									
Echinomma trinacrium HCK.	..	..	r	..	..	..	..	..	..	..	..	r		
E. leptodermum JØRG.	..	..	+	..	..	..	..	..	..	..	..	r		
Drymyomma elegans JØRG.	..	..	r											
Chromyomma boreale (CL.) JØRG.	r	..	+	..	r+	r								
Rhizoplegma boreale (CL.) JØRG.	..	..	+	..	..	..	..	..	..	..	..	r		
Lithelius minor JØRG.	..	..	r											
Phorticium pylonium HCK.?, CL.	..	..	r	..	..	..	..	..	..	..	..	r		
Sorolarcus circumtextus JØRG.	..	..	r	..	..	..	..	..	..	..	..	r		
2. Nassellaria.														
Plagiacantha arachnoides CLAP. et LACHM.	..	..	..	..	r	..	..	..	..	r				
Campylacantha cladophora JØRG. n. sp.	..	..	r											
Plectacantha oikiskos JØRG. n. sp.	..	..	r	..	..	..	..	..	..	..	..	r		
Phormacantha hystrix (JØRG.) JØRG.	..	..	r											
Gonosphæra primordialis JØRG. n. sp.	..	..	r											
Peridium longispinum JØRG.	..	..	r	..	..	..	..	..	..	..	..	r		
Euscenium corynephorum JØRG.	..	..	r											
Cladoscenium tricolpium (HCK.?) JØRG.	.	..	r											

Year 1899. Month	March						April							
Locality	Rost I, outside R.	Tysfjord I, inside Skarberget		Tysfjord II, inside the Tysfjord church		Tysfjord I	Lille Molla	Folstad, Østnesfjord	Helle, Østnesfjord	Brettesnes II	Skroven		Hola, at Svolvær	Stene in Bo (Vesteraalen)
Date	24/3	28/3	28/3	29/3	29/3	29/3	1/4	4/4	4/4	4/4	4/4	4/4	4/4	10/4
Depth (meters)	0—120	0—100	0—700	0—100	0—400	300—200	0	0—3	0—3	0—3	0 3	0—150	0—3	0
Salinity ($^0/_{00}$)	34.42—34.60	33.58—34.54	33.58—35.11	33.65—34.54	33.65—35.11			33.32	33.28	33.65	33.72	33.72—34.92	33.72	33.63
Temperature (Cels.)	3.1—4.25	0.75—5.5	0.75—6.3	1.55—5.75	1.55—6.3			÷0.4	0.5	1.1	1.1	1.1—6.5	0.8	1.05
Helotholus histricosa Jørg. n. sp.	..	..	r	..	..	r	..	..	..	..	..	r		
Litharachnium tentorium Hck.	..	..	..	..	..	..	..	..	..	..	..	r		
Dictyophimus Clevei Jørg.	..	..	r	..	..	..	..	..	..	..	..	r		
Lithomelissa setosa (Cl.) Jørg.	..	..	r	..	..	..	r	..	..	..	..	r		
L. hystrix Jørg.	..	..	r											
Dictyoceras acanthicum Jørg.	..	..	r											
D. xiphephorum Jørg.	..	..	..	..	..	..	..	..	..	..	..	r		
Clathrocyclas craspedota (Jørg.) Jørg.	..	..	r+	..	r									
Androcyclas gamphonycha (Jørg.) Jørg.	..	..	r+	..	..	..	..	..	..	..	..	r		
A. amblycephalis (Jørg.) Jørg.	..	..	..	..	r									
Stichocorys seriata (Jørg.) Jørg.	..	..	r											
3. *Phæodaria (Tripylea).*														
Cannosphaera lepta Jørg.	..	..	..	..	..	..	..	..	..	..	..	r		
Protocystis xiphodon (Hck.) Borg.	..	..	r											
P. Harstoni (Murray) Borg.	r	..	r											
P. tridens (Hck.) Borg.	..	..	..	..	..	..	..	..	..	..	..	r		
Challengeron diodon Hck. (*C. heteracanthum* Jørg.)	..	..	r											
VIII. Tintinnodea.														
Ptychocylis urnula (Clap. et Lachm.) Brandt	..	..	r	..	rr									
Cyttarocylis denticulata (Ehrb.) Fol.	..	..	r	r	+	..	r							
C. d. v. *elongata* Jørg.	..	..	r											
C. d. v. *subrotundata* Jørg.	..	..	..	..	r									
C. d. v. *subedentata* Jørg.	..	..	..	..	..	..	..	..	..	rr				
Undella caudata Ostenf.	..	..	r	..	rr									

Year 1899. Month	April													
Locality	Gaukvaerø II. Vesteraalen		Malangen, off Stonnesbotn		Stonnesbotn	Senjen [illegible]	Malangen		Kvænangen between Spildern and Kvænangstinderne	Jøkelfjord I. at the head		Jøkelfjord III. off the Tverfjord	Kvænangen between Spildern and the northern mainland	
Date	11/4	11/4	12/4	12/4	13/4	13/4	14/4	14/4	19/4	20/4	20/4	20/4	21/4	21/4
Depth (meters)	0—3	0—250	0—100	0—380	0—3	0—80	0—3	380—300	0—50	0	0—100	0—90	0—100	200—300
Salinity (‰)	34.17	34.17—34.86	33.96—34.35	33.96—34.67		34.60—34.97	34.17	(31.67)	34.21	34.21	34.21—34.29	34.29—34.35	34.35—34.35	34.60—34.49
Temperature (Cels.)	2.85	2.85—5.2	1.6—2.15	1.6—4.1		3.35—5.3	1.7	(4.1)	0.75	0.85	0.85—1.0	0.80—1.4	1.65—1.2	1.95—2.2
I. Bacillariales. (Diatomaceæ).														
Bacterosira fragilis (Gran) Gran	+	+c	+	+	r	r	+	+	c	+	r	c	..	c
Corethron hystrix Hens	..	..	..	..	..	rr								
Rhizosolenia alata Brightw.	..	..	..	..	..	r								
R. Shrubsoli Cl.	..	..	r											
R. setigera Brightw.	..	..	..	..	..	..	..	r						
Biddulphia aurita (Lyngb.) Bréb.	r	+	..	r	.	r	..	..	+c	+	r	+c	..	+c
Chætoceros borealis Bail.	..	..	..	..	..	..	..	..	r	r	..	r	..	r
C. densus (Cl.) Cl.	..	..	..	..	..	..	..	..	r					
C. convolutus Castr	r+	+	r	r	..	+	..	r	..	r	..	r	..	r
C. atlanticus Cl.	..	..	..	..	..	r	..	+	r					
C. decipiens Cl.	r+	+	..	r	..	r	rr	r	r+	+	..	+	..	r
C. teres Cl.	r	..	.	r	..	..	..	..	r					
C. contortus Schütt	..	..	r	r+	..	..	..	..	..	..	..	..	..	r
C. similis Cl.	r	..	..	..	..	r								
C. laciniosus Schütt	..	..	r	r	..	..	..	..	..	..	..	..	..	r
C. Willei Gran	..	..	..	..	..	..	..	..	..	..	..	..	..	r
C. diadema (Ehrb.) Gran	..	r+	+c	+c	+c	r	+	+	+	r	..	..	..	+
C. debilis Cl.	..	r	cc	c	c	r	c	..	..	..	..	..	..	r
C. socialis Laud.	cc	cc	cc	cc	cc	..	cc	..	..	..	..	c	..	cc
C. furcellatus Bail.	cc	cc	cc	c	c	c	cc	c	r	r	..	+	..	+c
Ditylum Brightwellii (West) Grun.	..	..	..	..	..	r								
Sceletonema costatum (Grev.) Cl.	+c	+	..	r+	r+	r	..	..	r	..	..	r	..	+
Thalassiosira Nordenskjöldii Cl.	cc	+c	+	+c	c	c	c	c	+	..	..	r	+	+c
T. gravida Cl.	+	+	+	+	c	+c	+	c	c	c	..	+	+	+c
T. hyalina (Grun.) Gran	c	cc	c	c	c	cc	+c	c	c	+	..	c	c	cc
T. gelatinosa Hens.	..	..	..	+	..	r	..	..	..	..	..	+c	..	+
Coscinosira polychorda (Gran) Gran	r	+	+c	..	+	+	+c	+	..	..	..	r	..	c
Porosira glacialis (Grun.)	+	+c	cc	cc	c	c	cc	cc	c	+	..	+c	c	c
Actinocyclus Ehrenbergii Ralfs	..	..	..	r	..	r	..	r						
Coscinodiscus excentricus Ehrb.	..	r	..	r	..	r								
C. curvatulus Grun.	r													
C. radiatus Ehrb.	..	r+	..	+	..	c	..	+c						
C. subbulliens Jørg. n. sp.	r	..	..	r										
C. centralis Ehrb.	..	+	..	+	..	+	..	+	+	..	+	..	..	r
C. concinnus W. Sm.	.	..	r	r+	..	..	..	r	c	..	..	—		
C. bioculatus Grun.	.	..	r+	r+	+									
Hyalodiscus stelliger Bail.	..	..	..	r	..	..	..	r						
Nitzschia seriata Cl.	c	c	c	c	+c	+	+	+c	c	r		+	..	c
N. delicatissima Cl.	..	r+	r+	+										
N. longissima (Bréb.) Ralfs	..	..	..	r										

Year 1899. Month	April													
Locality	Gaukværø II, Vesteraalen		Malangen, off Stønnesbotn		Stønnesbotn	Senjenhavet	Malangen		Kvænangen I, between Spildern and Kvænangstinderne	Jøkelfjord I, at the head		Jøkelfjord III, off the Tverfjord	Kvænangen, between Spildern and the northern mainland	
Date	11/4	11/4	12/4	12/4	13/4	13/4	14/4	14/4	19/4	20/4	20/4	20/4	21/4	21/4
Depth (meters)	0—3	0—250	0—100	0—380	0—3	0—80	0—3	380—300	0—50	0	0—100	0—90	0—100	200—300
Salinity (‰)	34.17	34.17—34.86	33.96—34.35	33.96—34.67		34.60—34.97	34.17	(34.67)	34.21	34.21	34.21—34.29	34.29—34.35	34.35—34.35	34.60—34.49
Temperature (Cels.)	2.85	2.85—5.2	1.6—2.15	1.6—4.1		3.35—5.3	1.7	(4.1)	0.75	0.85	0.85—1.0	0.80—1.4	1.05—1.2	1.95—2.2
Thalassiothrix Frauenfeldii GRUN.	+	+	+	+	+	r+	r+	c	r	r	..	..	..	r
T. F. v. *nitzschioides* (GRUN.) JØRG. *f. curvata* (CASTR.) JØRG.	..	..	..	+	..	..	..	..	..	..	..	r		
Fragilaria oceanica CL.	cc	cc	c	c	+c	cc	c	c	c	c	c	cc	cc	cc
F. cylindrus GRUN.	cc	+	+	+c	+c	c	r	..	..	..	..	+	..	+
Achnanthes tæniata GRUN.	..	..	..	r	..	r	..	..	r	..	..	..	..	r
Navicula septentrionalis (OESTR.) CL.	+c	+c	+	r	r+	+c	r	+	r+	..	..	r		
N. Vanhöffeni GRAN	r+	r	..	..	..	..	..	..	..	r	..	..	..	r+
N. pelagica CL.	..	r	r	r	..	..	..	..	..	..	..	r	..	r
N. kariana GRUN.	..	r	+	r+	r+	..	r	..	r	r	..	r		
N. directa W. SM.	..	..	..	r										
Actinoptychus undulatus (BAIL.?) RALFS	..	..	..	..	..	..	..	r						
Nitzschia Closterium W. SM.	..	..	r	..	r	..	..	..	..	..	..	..	..	r
Grammatophora oceanica EHRB.	..	..	..	r										
Rhabdonema arcuatum (LYNGB.) KÜTZ.	r													
Pleurosigma fasciola W. SM.	..	..	..	..	..	..	..	..	r	..	..	r	..	r
II. Peridiniales. *(Dinoflagellata).*														
Dinophysis acuta EHRB., JØRG.	..	..	..	..	..	r								
Gonyaulax spinifera (CLAP. et LACHM.) DIES.	..	..	..	..	..	r								
Peridinium depressum BAIL.	r	..	..	..	..	..	..	..	rr					
P. divergens EHRB. (*P. lenticulare* (EHRB.) JØRG.)	..	..	..	..	..	..	..	..	..	..	r			
P. pallidum OSTENF.	..	r	r	..	..	r	..	r	r	..	r	..	..	r
P. globulus STEIN	..	r												
P. ovatum (POUCH.) SCHÜTT	..	..	..	..	..	r	..	r	r					
P. Steinii JØRG.	..	..	..	..	..	r								
Ceratium tripos (O. F. MÜLL.) NITZSCH. (α *balticum* SCHÜTT)	..	r	..	..	..	r	..	r+	r	r	..	..	..	r
C. bucephalum (CL.) CL.	..	r	..	..	..	r	..	r+	r					
C. macroceros EHRB. (CL.)	..	r	..	..	..	r	..	r						
C. longipes (BAIL.) CL.	..	r	..	..	..	+	..	+	r	..	r			
C. furca (EHRB.) DUJ.	..	r	..	..	..	r	..	r+						
C. fusus (EHRB.) DUJ.	..	r	..	..	..	r	..	r	r	..	..	..	..	r
III. Pterospermataceæ.														
Pterosperma Möbii (JØRG.) OSTENF.	..	..	..	..	..	..	..	..	..	r	r			
P. Vanhöffeni (JØRG.) OSTENF.	..	r	..	..	..	..	..	r	..	r				
P. dictyon (JØRG.) OSTENF.	..	..	..	..	..	..	..	r	..	r	+	r		
IV. Halosphæraceæ.														
Halosphæra viridis SCHMITZ (incl. *H. minor* OSTENF.)	..	..	..	..	r	..	..	..	+	..	r	r		

Year 1899. Month	April													
Locality	Gaukværø II. Vesteraalen		Malangen, off Stonnes-botn		Stonnesbotn	[illegible]	Malangen		Kvænangen I. between Spildern and Kvænangsbotn	Jøkelfjord I. at the head		Jøkelfjord III. off the Tverfjord	Kvænangen, between Spildern and the northern mainland	
Date	11/4	11/4	12/4	12/4	13/4	13/4	14/4	14/4	19/4	20/4	20/4	20/4	21/4	21/4
Depth (meters)	0—3	0—250	0—100	0—380	0—3	0—80	0—3	380—300	0—50	0	0—100	0—90	0—100	200—300
Salinity (‰)	34.17	34.17—34.84	33.96—34.35	33.96—34.67		31.60—34.97	34.17	(34.67)	34.21	34.21	34.21—34.29	34.29—34.55	34.55 34.55	34.60—34.49
Temperature (Cels.)	2.85	2.85—5.2	1.6 2.15	1.6 4.1		3.35—5.3	1.7	(4.1)	0.75	0.85	0.85 1.0	0.85—1.4	1.05 1.2	0.95—2.2
V. Flagellata.														
Phæocystis Poucheti (Har.) Lagerh.	cc	cc	cc	..	..	+	..	..	..	+c	..	+	..	..
VI. Silicoflagellata.														
Distephanus speculum (Ehrb.) Stöhr	r+	..	r+	r	r+	r	rr	..	..	..	..	..	r	r
Dictyocha fibula Ehrb.	rr	..	..	r	..	..	..	r						
VII. Radiolaria.														
1. Spumellaria.														
Echinomma leptodermum Jørg.	..	..	..	..	..	..	..	r						
2. Nassellaria.														
Campylacantha cladophora Jørg. n. sp.	..	..	..	..	..	..	..	r						
Phormacantha hystrix (Jørg.) Jørg.	..	..	..	r										
Peridium longispinum Jørg.	..	..	..	r	..	..	..	r						
Lithomelissa setosa (Cl.) Jørg.	..	..	..	..	..	..	..	r						
VIII. Tintinnodea.														
Tintinnus acuminatus Clap. et Lachm.	..	..	..	..	..	rr	..	..	..	r	r			
Tintinnopsis nitida Brandt	..	..	..	..	..	..	..	..	..	..	r	r		
Cyttarocylis denticulata (Ehrb.) Fol. v. *subedentata* Jørg n. var.	..	r	..	..	..	r	..	r						

Year 1899. Month	April								May				
Locality	Hammerfest harbour	Troldfjord, at Rolfsø	Ingolhavet		Breisund	Repvaag harbour	Porsangerfjord		Vardø	Lyngen I, off Skibotten	Lyngen II, off the Kaafjord	Lyngen III, between Gamvik and Ulo	Holm, Svolvær
Date	22/4	23/4	24/4	24/4	25/4	26/4	27/4	27/4	1/5	3/5	3/5	3/5	5/5
Depth (meters)	0—8	0—6	0—100	0—300	0—3	0—10	0—75	200—100	0—200	0—100	0—250	0—300	0—150
Salinity (‰)			34.86—35.18	34.86—35.24	34.54		34.60—34.67	34.48—34.60	34.72—34.65	34.17—34.30	34.17—34.47	34.17—34.84	33.73—34.84
Temperature (Cels.)			3.2—3.8	3.2—3.45	1.7		1.05—1.0	0.20—0.95	2.0—2.25	1.7—2.3	1.1—2.85	1.35—3.6	2.65—6.15
I. Bacillariales. *(Diatomaceæ).*													
Bacterosira fragilis (GRAN) GRAN	+	c	r+	r	c	r+	..	r	r	r	+c	+	
Rhizosolenia alata BRIGHTW.	..	..	..	r	..	..	..	..	r+				
R. obtusa HENS.	..	..	..	..	..	..	r	r					
R. semispina HENS.	..	..	..	r	..	..	..	..	r				
Biddulphia aurita (LYNGB.) BRÉB.	r	r	..	r+	r	r	r	+	+	cc	cc	c	
Eucampia groenlandica CL.	..	..	..	r									
Chætoceros borealis BAIL.	..	..	..	..	..	..	..	..	..	..	..	rr	r
C. criophilus CASTR.	..	..	..	r									
C. convolutus CASTR.	..	..	r	r	..	..	r	r	+	+	r	r	r+
C. atlanticus CL.	..	r	r	r	..	r	..	r	r+	..	..	rr	
C. decipiens CL.	+	r	r	r	r	r	r	..	r+	+	+	+	
C. teres CL.	r	r	r	r	r	r	..	r	r	..	r	r+	
C. contortus SCHÜTT	+	r	+c	+c	r	r+	+	+	+c	..	..	+	
C. constrictus GRAN	..	..	..	r	..	..	..	..	r				
C. laciniosus SCHÜTT	r	r	r	r	+c	+	r+	+					
C. diadema (EHRB.) GRAN	c	+	r+	r+	c	+c	+	+c	c	+c	+	c	
C. scolopendra CL.	..	..	..	rr	..	..	r						
C. debilis CL.	r	+	+	+	+	+c	c	+c	+	+	c		
C. socialis LAUD.	ccc	c	cc	cc	ccc	cc	c	c	c	cc	c	c	
C. furcellatus BAIL.	cc	+c	c	c	cc	c	c	c	c	cc	c	cc	
Ditylium Brightwellii (WEST.) GRUN.	..	..	..	rr									
Sceletonema costatum (GREV.) CL.	+c	+c	+c	+c	+	+c	c	+c	c	r	r	r	
Thalassiosira Nordenskjöldii CL.	c	cc	c	cc	c	c	c	c	cc	r	+c	cc	
T. gravida CL.	c	c	c	c	c	c	c	c	c	cc	cc	c	
T. hyalina (GRUN.) GRAN	c	c	c	c	c	+c	cc	cc	cc	+c	+	+	r
T. gelatinosa HENS.	r	r+	+	+	+	r	+	+	c	r	..	r	r
Coscinosira polychorda (GRAN) GRAN	+	+	+c	+c	c	+	+c	+c	c	c	+c	r	
Porosira glacialis (GRUN.)	c	c	+c	c	c	c	+	+	+	cc	cc	c	
Actinocyclus Ehrenbergii RALFS	..	..	..	r									
Coscinodiscus radiatus EHRB.	..	..	..	r	..	..	..	..	..	..	..	..	+
C. centralis EHRB.	..	..	..	..	..	..	..	..	r				
C. concinnus W. SM.	..	r	r	r	..	..	..	r	..	r	r		
C. bioculatus GRUN.	..	..	r	..	r	..	..	..	..	+			
Nitzschia seriata CL.	+	+c	+	+	c	+	+c	+c	+	c	c	c	
N. delicatissima CL.	..	..	c	c	r	+c	+	+	c				
N. frigida GRUN.	r	..	..	..	..	..	r						
N. longissima (BRÉB.) RALFS	..	..	r	..	..	..	r	r	r	..	..	r	
Thalassiothrix longissima CL. et GRUN.	..	..	..	..	..	rr	..	..	r				
T. Frauenfeldii GRUN.	+	+	+	+	+	+c	+	+	c	+	+c	+	
Fragilaria oceanica CL.	cc	cc	cc	cc	cc	c	c	c	cc	c	c	c	r
F. cylindrus GRUN.	r	r	..	c	c	r+	r	r	..	r	r	r	

Year 1899. Month	April								May				
Locality	Hammerfest harbour	Troldfjord, at Rolfsø	Ingøhavet	Ingøhavet	Breisund	Repvaag harbour	Porsangerfjord	Porsangerfjord	Vardø	Lyngen I. off Skibotten	Lyngen II. off the Kaafjord	Lyngen III. between Gamvik and Ula	Hola, Svolvær
Date	22/4	23/4	24/4	24/4	25/4	26/4	27/4	27/4	1/5	3/5	3/5	3/5	5/5
Depth (meters)	0–8	0–6	0–100	0–300	0–3	0–10	0–75	200–100	0–200	0–100	0–250	0–300	0–150
Salinity (0/00)			34.86–35.18	34.86[illegible]–35.24	34.54		34.60–34.67	34.48–34.60	34.72–34.65	34.17–34.[illegible]	34.17–34.47	34.17–34.84	33.73–34.84
Temperature (Cels.)			3.2–3.8	3.2–3.45	1.7		1.05–1.0	0.20–0.95	2.0–2.25	1.7–2.[illegible]	1.1–2.85	1.[illegible]–3.6	2.65–6.15
Achnanthes tæniata GRUN.	r	r	..	..	..	r							
Pleurosigma tenerum JORG. n. sp.	r	r	..	..	..	r	..	r	r	r	..	r	
Navicula septentrionalis OESTR.	r+	+	r	r+	+	r	..	..	..	r			
N. Vanhöffeni GRAN	..	..	..	..	..	..	+	+	+	..	..	..	r
N. pelagica CL.	..	..	..	..	r								
N. kariana GRUN.	r	+	r	+	+	+	r+	+	r	..	..	+	
Actinoptychus undulatus (BAIL.?) RALFS	..	..	..	r									
Pleurosigma fasciola W. SM. (incl. *P. tenuirostris* GRUN.)	r	r	r	..	r	r	r						
Rhoicosigma arcticum CL.	..	r											
II. Peridiniales. (Dinoflagellata).													
Dinophysis acuta EHRB., JØRG.	..	..	..	..	..	rr							
D. norvegica CLAP. et LACHM., JØRG.	..	..	..	..	..	..	..	..	..	..	..	..	r
D. rotundata CLAP. et LACHM.	..	..	..	..	..	..	..	..	..	..	..	..	r
Peridinium depressum BAIL.	..	..	..	..	..	..	..	..	r	..	..	..	r
P. divergens EHRB. (*P. lenticulare* (EHRB.) JØRG.)	..	..	..	..	..	..	..	..	..	..	..	..	r
P. pallidum OSTENF.	..	r	..	..	..	..	..	r	r+	..	..	..	r+
P. ovatum (POUCH.) SCHÜTT.	..	..	..	rr	..	..	..	..	r	..	r	..	r
P. Steinii JØRG.	..	..	..	r	..	r	..	..	r				
Ceratium bucephalum (CL.) CL.	..	..	..	..	..	..	..	..	rr				
C. tripos (O. F. MÜLL.) NITZSCH. (α *balticum* SCHÜTT.)	..	..	r										
C. macroceros (EHRB.) CL.	..	..	..	r	..	..	..	..	..	..	..	rr	
C. longipes (BAIL.) CL.	..	..	..	..	..	..	..	..	..	..	..	..	+
C. furca (EHRB.) DUJ.	..	..	..	..	..	..	..	..	..	..	..	..	r+
C. fusus (EHRB.) DUJ.	rr	..	r	..	..	..	..	..	rr	..	..	..	r
III. Pterospermataceæ.													
Pterosperma Vanhöffeni (JØRG.) OSTENF.	..	..	..	rr									
P. dictyon (JØRG.) OSTENF.	..	..	..	..	..	..	..	..	..	rr			
IV. Halosphæraceæ.													
Halosphæra viridis SCHMITZ (incl. *H. minor* OSTENF.)	..	..	..	..	..	..	..	..	+	..	..	..	r
V. Flagellata.													
Phæocystis Foucheti (HAR.) LAGERH.	r	..	c	c	c	ccc	c	..	..	+			

Year 1899. Month	April								May				
Locality	Hammerfest harbour	Troldfjord, at Rolfsø	Ingøhavet		Breisund	Repvaag harbour	Porsanger-fjord		Vardø	Lyngen I, off Skibotten	Lyngen II, off the Kaafjord	Lyngen III, between Gamvik and Ulø	Hola, Svolvær
Date	22/4	23/4	24/4	24/4	25/4	26/4	27/4	27/4	1/5	3/5	3/5	3/5	5/5
Depth (meters)	0—8	0—6	0—100	0—300	0—3	0—10	0—75	200—100	0—200	0—100	0—250	0—300	0—150
Salinity (⁰/₀₀)			34.86—35.18	34.86—35.24	34.54		34.60—34.67	34.48—34.60	34.72—34.65	34.17—34.30	34.17—34.47	34.17—34.84	33.73—34.84
Temperature (Cels.)			3.2—3.8	3.2—3.45	1.7		1.05—1.0	0.20—0.95	2.0—2.25	1.7—2.3	1.1—2.85	1.35—3.6	2.65—6.15
VI. Silicoflagellata.													
Distephanus speculum (EHRB.) STØHR	r	r	r	r	..	r	r	..	r+	r	..	..	r
D. s. v. *octonaria* JØRG.	..	..	..	..	..	r							
VII. Tintinnodea.													
Ptychocylis urnula (CLAP. et LACHM.) BRANDT v. *minor* JØRG.	..	..	..	..	..	..	..	..	..	..	..	..	r
P. u. v. *digitalis* AURIV.	..	..	..	..	..	..	..	..	..	..	..	..	r
Tintinnopsis nitida BRANDT	..	r	..	..	..	..	..	r					
Cyttarocylis norvegica (DAD.) JØRG.	..	..	..	..	..	..	..	..	..	..	..	..	+
C. denticulata (EHRB.) FOL.	..	..	..	..	..	..	..	..	..	..	..	..	r

Year 1900. Month	March														April
Locality	Hola, Svolvær		Skroven, 1 mile SSE		Henningsvær, $2\frac{3}{4}$ miles off	Balstad I		Reine	Tranødybet	Østnesfjord I. at the head	Østnesfjord III, off Helle	Balstad	Reine	Vestfjord	Skjerstadfjord II
Date	20/3	20/3	20/3	20/3	20/3	21/3	21/3	21/3	22/3	23/3	23/3	26/3	27/3	30/3	2/4
Depth (meters)	0—50	0—140	0—50	0—400	0—200	0—50	0—200	0—110	0—600	0—25	0—130	0—130	0—150	0—25	0—180
Salinity (0/00)	34.02—34.14	34.02—34.65	34.14—34.21	34.14—35.15	34.14—34.91	34.11—34.21	34.11—35.18	34.09—34.21	34.09—35.10	33.92—33.95	33.92—?	34.09—34.52	34.16—34.83		33.73—33.99
Temperature (Cels.)	2.85—2.95	2.85—5.4	2.75—2.85	2.75—6.35	2.85—6.6	3.05—2.9	3.05—6.6	2.95—4.2	2.7—6.3	2.1—2.35	2.35—4.4	2.8—4	2.55—6.3		2.5—3.35
I. Bacillariales. *(Diatomaceæ).*															
Bacterosira fragilis (GRAN) GRAN	..	..	..	..	..	..	..	..	..	..	..	..	..	r	
Corethron hystrix HENS.	rr	..	..	..	r	..	..	..	..	..	..	r			
Rhizosolenia alata BRIGHTW.	..	..	..	..	..	..	..	..	..	..	..	..	..	rr	
R. Shrubsolii CL.	..	..	..	..	..	r									
Biddulphia aurita (LYNGB.) BRÉB.	r	r	..	r	..	..	r	..	..	c	r+	..	..	+c	r
Chætoceros borealis BAIL.	r+	r	..	..	..	r+	r	..	..	..	..	..	r		
C. densus CL.	r	r	..	..	..	..	..	..	..	..	r				
C. densus v. *rudis* CL.	r														
C. danicus CL.	r														
C. convolutus CASTR.	+	+	+	+c	+c	c	+c	c	r	r	c	c	c	r	r+
C. atlanticus CL.	r	r+	r	r	r	r+	r+	r+	..	..	r	..	r+		
C. decipiens CL.	+c	+c	r+	c	+	+	+c	+c	c	+	c	+c	+c	..	r
C. contortus SCHÜTT	r	..	..	..	..	..	..	..	..	..	r				
C. similis CL.	rr														
C. laciniosus SCHÜTT	..	..	..	..	..	..	..	..	..	..	..	..	..	..	+
C. Willei GRAN	..	r													
C. diadema (EHRB.) GRAN	r	+	..	..	r	..	..	..	..	+	+	..	..	r	c
C. currisetus CL.	..	..	..	..	..	r									
C. debilis CL.	..	r	..	r											
C. socialis LAUD.	+	+	..	..	..	..	..	..	..	cc	cc	..	..	cc	cc
C. furcellatus BAIL.	r	r+	..	..	..	..	..	..	..	c	+	..	..	c	
Ditylium Brightwellii (WEST) GRUN.	r	..	..	..	..	rr	rr	r	..	..	..	..	r		
Sceletonema costatum (GREV.) CL.	r	r	..	..	..	..	r	..	..	c	c	..	+	+	
Thalassiosira Nordenskjöldii CL.	..	..	..	..	..	..	..	..	..	c	r+	..	..	ccc	
T. gravida CL.	rr	r+	..	..	..	..	..	..	..	c	c	..	..	c	
T. hyalina (GRUN.) GRAN	..	..	..	..	..	..	..	..	..	cc	cc	..	..	cc	+
T. gelatinosa HENS	..	..	..	..	..	..	..	..	..	r	r	..	..	c	
Coscinosira polychorda (GRAN) GRAN	..	r	..	..	..	..	..	..	..	c	r				
Porosira glacialis (GRUN.)	+	c													
Actinocyclus Ehrenbergi RALFS	r	r	..	r	..	+	+	+	r+	..	r	r+	r+	..	+
Coscinodiscus excentricus EHRB.	..	..	..	..	r+	r	+	..	..	r	..	r	r		
C. stellaris ROP.	..	rr													
C. radiatus EHRB.	+c	r+	r	r	+	+c	r+	+	+	..	r	+	+		
C. subbulliens JØRG. n. sp.	..	..	..	..	r	..	..	..	r						
C. centralis EHRB.	r	r	..	r	+	r+	r	r+	r+	..	r	r+	+	..	+
C. concinnus W. SM.	..	..	..	..	..	..	..	..	..	r					
C. bioculatus GRUN.	..	..	..	..	..	..	..	..	..	..	+				
Euodia gibba BAIL.	..	r													
Hyalodiscus stelliger BAIL.	..	r	..	..	r	..	r	..	r	..	..	r			
Nitzschia seriata CL.	..	..	..	..	..	..	..	..	..	c	+c	..	..	c	r
N. delicatissima CL.	..	r													

Year 1900. Month	March														April
Locality	Hola, Svolvær		Skrova, 1 mile SSE		Henningsvær, 2 3/4 miles off	Balstad I		Reine		Tranødybet	Østnesfjord I, at the head	Østnesfjord III, off Helle	Balstad	Reine	Vestfjord	Skjerstadfjord II
Date	20/3	20/3	20/3	20/3	20/3	21/3	21/3	21/3	22/3	23/3	23/3	26/3	27/3	30/3	2/4
Depth (meters)	0—50	0—140	0—50	0—400	0—200	0—50	0—200	0—110	0—600	0—25	0—130	0—130	0—150	0—25	0—180
Salinity (‰)	34.02—34.14	34.02—34.65	34.14—34.21	34.14—35.15	34.14—34.91	34.11—34.21	34.11—35.18	34.09—34.21	34.09—35.10	33.92—33.95	33.92—?	34.09—34.52	34.16—34.83		33.73—33.99
Temperature (Cels.)	2.85—2.95	2.85—5.4	2.75—2.85	2.75—6.35	2.85—6.6	3.05—2.9	3.05—6.6	2.95—4.2	2.7—6.3	2.1—2.35	2.35—4.4	2.8—4	2.55—6.3		2.5—3.35
Nitzschia recta Hantzsch	..	..	..	..	..	..	..	..	..	r+					
N. hybrida Grun.	..	..	..	..	..	..	..	..	..	..	..	..	..	r	
N. frigida Grun.	..	..	..	..	..	..	..	..	..	r	..	..	..	r	
N. longissima (Bréb.) Ralfs	..	..	..	..	..	..	..	..	..	..	..	..	..	r+	
Thalassiothrix nitzschioides Grun.	+c	c	..	r	..	r	r	r	r	c	cc	+c	c	..	c
Fragilaria oceanica Cl.	r+	+	..	r	..	..	..	..	..	cc	cc	..	..	cc	c
F. cylindrus Grun.	r+	..	..	..	..	..	..	..	..	cc	cc	+c	..	c	c
Achnanthes tæniata Grun.	..	r	..	..	..	..	..	..	..	..	r+				
Pleurosigma Stuxbergi Cl.	r	r	..	r+	..	r	..	+	r	..	c	..	r	+	
P. fasciola W. Sm. (incl. *P. tenuirostris* Grun.)	..	..	..	..	..	..	..	..	..	..	..	..	..	r	
Navicula Vanhöffeni Gran	r	..	..	..	..	..	..	..	..	c	r+	..	..	r	r
N. directa W. Sm.	..	..	..	..	..	..	..	..	..	+c	r				
N. kariana Grun.	r	..	..	..	..	..	..	..	..	+c	r	..	..	c	
Amphiprora (Tropidoneis) parallela Jørg. n. sp.	..	r	..	..	..	..	..	..	..	r	r	..	..	r	
Actinoptychus undulatus (Bail?) Ralfs	..	rr	..	r											
Auliscus sculptus (W. Sm.) Ralfs	..	rr													
Campylodiscus Thuretii Bréb.	..	rr	..	r	..	..	r	..	r+	..	..	..	..	..	r
C. angularis Greg.	..	r	..	r											
Surirella lata W. Sm.	..	..	..	..	r										
Glyphodesmis Williamsoni (W. Sm.) Grun.	..	..	..	..	..	..	..	..	..	..	..	..	rr		
Rhabdonema arcuatum (Lyngb.) Kütz.	..	..	..	..	..	..	r	..	..	r					
Cocconeis scutellum Ehrb.	..	..	..	..	..	..	..	..	..	r					
Rhoicosigma arcticum Cl.	..	..	..	..	..	..	..	..	..	..	..	..	..	r	
II. *Peridiniales.* *(Dinoflagellata).*															
Dinophysis acuta Ehrb., Jørg.	r+	r	r	r	r	r	r	r	r	..	..	r	r		
D. norvegica Clap. et Lachm., Jørg.	r	r	..	r	r	r	r	r	rr	..	..	..	r		
D. rotundata Clap. et Lachm.	..	..	..	..	rr	..	..	r	r						
Podolampas palmipes Stein	..	..	..	..	..	..	..	..	rr						
Protoceratium reticulatum (Clap. et Lachm.) Bütschli	..	..	..	..	..	..	..	..	..	..	..	..	..	..	rr
Gonyaulax spinifera (Clap. et Lachm.) Dies.	r+	..	..	..	..	r									
Diplopsalis lenticula Bergh	r	r	r	..	..	r	r								
Peridinium depressum Bail.	r+	+c	r+	c	c	+	+c	+c	+	..	+	+	c	..	r
P. divergens Ehrb. (*P. lenticulare* (Ehrb.) Jørg.)	r	r+	r	r+	r	r	c	+	+	..	+c	..	+c		
P. conicum (Gran) Ostenf. et Schm.	r	r	..	r	..	..	r	..	..	..	..	..	..	..	r
P. pallidum Ostenf.	r	r	r	r+	r+	r+	+	+	r+	..	..	r	..	..	r
P. Steinii Jørg.	..	r	..	..	..	..	..	rr	r						
P. ovatum (Pouch.) Schütt	+	r+	r+	+	+	r+	r+	r	r	..	r	r+	+	rr	+
Ceratium tripos (O. F. Müll.) Nitzsch. (α *balticum* Schütt)	r	+	+c	+	c	c	c	c	+	r	+c	c	+c	..	r
C. bucephalum (Cl.) Cl.	r+	r	+	+	c	c	c	c	r	..	..	c	c	rr	
C. b. v. *heterocampta* Jørg.	r	..	r	..	..	+	+	r+	..	..	..	r	+		

Year 1900. Month	March														April
Locality	Hola, Svolvær		Skroven, 1 mile SSE		Henningsvær, 2¾ miles off	Balstad I		Reine	Tranodybet	Østnesfjord I, at the head	Østnesfjord III, off Helle	Balstad	Reine	Vestfjord	Skjerstadfjord II
Date	20/3	20/3	20/3	20/3	20/3	21/3	21/3	21/3	22/3	23/3	23/3	26/3	27/3	30/3	2/4
Depth (meters)	0—50	0—140	0—50	0—400	0—200	0—50	0—200	0—110	0—600	0—25	0—130	0—130	0—150	0—25	0—180
Salinity (‰)	34.02—34.14	34.02—34.65	34.14—34.21	34.14—35.15	34.14—34.91	34.11—34.21	34.11—35.18	34.09—34.21	34.09—35.10	33.92—33.95	33.92—?	34.09—34.52	34.16—34.83		33.73—33.99
Temperature (Cels.)	2.85—2.95	2.85—5.4	2.75—2.85	2.75—6.35	2.85—6.6	3.05—2.9	3.05—6.6	2.95—4.2	2.7—6.3	2.1—2.35	2.35—4.4	2.8—4	2.55—6.3		2.5—3.35
Ceratium macroceros (EHRB.) CL.	r+	+c	c	c	c	c	c	c	+c	rr	r	c	c	..	r
C. intermedium (JØRG.)	r	r	r	r	..	r	+c	r	r	..	..	r			
C. longipes (BAIL.) CL.	c	c	c	c	cc	c	cc	+c	cc	..	c	c	c	rr	r
C. furca (EHRB.) DUJ.	+	+c	r	..	+	+	+	+	r	..	r	-	+c		
C. lineatum (EHRB.) CL.	..	..	..	..	..	..	r	..	..	..	..	r	..	rr	
C. fusus (EHRB.) DUJ.	+c	c	c	+c	c	c	c	c	c	..	c	c	c	..	r
III. Pterospermataceæ.															
Pterosperma Möbii (JØRG.) OSTENF.	r	r	..	r	r	+	r	r+	r	..	..	r	..	..	r
P. Vanhöffeni (JØRG.) OSTENF.	+	+	..	..	r	c+	c	+	r	..	..	+c	+c		
P. dictyon (JØRG.) OSTENF.	r	r	r	r+	+	+	+	+	+	..	r	r+	r	..	r
IV. Halosphæraceæ.															
Halosphæra viridis SCHMITZ (incl. *H. minor* OSTENF.)	+	+	c	+c	+	c	+	+c	r+	..	..	+c	+		
V. Flagellata.															
Phæocystis Poucheti (HAR.) LAGERH.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	+c
VI. Silicoflagellata.															
Distephanus speculum (EHRB.) STØHR	r	r	..	..	..	..	..	..	..	r	+c	..	..	rr	
Dictyocha fibula EHRB.	r	r	..	r	..	r	r	r	r	..	..	r			
VII. Radiolaria.															
1. Spumellaria.															
Hexacontium enthacanthum JØRG.	..	..	..	..	..	..	..	..	r						
H. pachydermum JØRG.	..	r	..	r	..	..	..	..	r						
Echinomma leptodermum JØRG.	..	.	..	..	..	..	..	..	r	..	..	..	.	..	r
Chromyomma boreale (CL.) JØRG.	..	..	..	r	..	..	..	..	r						
Rhizoplegma boreale (CL.) JØRG.	..	r	rr	r	r	..	r	..	r	..	..	..	..		r
Lithelius minor JØRG.	..	..	..	r	..	..	r	..	r						
Phorticium pylonium HCK.?, CL.	..	..	..	..	..	..	r	..	..	..	..	..	..	..	r
2. Acantharia.															
Radiosphæra anacanthica JØRG. n. sp.	..	..	..	..	..	..	r								

Year 1900. Month	March														April
Locality	Hola, Svolvær		Skroven, 1 mile SSE		Henningsvær, 2¾ miles off	Balstad I		Reine	Tranødybet	Østnesfjord I, at the head	Østnesfjord III, off Helle	Balstad	Reine	Vestfjord	Skjerstadfjord II
Date	20/3	20/3	20/3	20/3	20/3	21/3	21/3	21/3	22/3	23/3	23/3	26/3	27/3	30/3	2/4
Depth (meters)	0—50	0—140	0—50	0—400	0—200	0—50	0—200	0—110	0—600	0—25	0—130	0—130	0—150	0—25	0—180
Salinity (‰)	34.02—34.14	34.02—34.65	34.14—34.21	34.14—35.15	34.14—34.91	34.11—34.21	34.11—35.18	34.09—34.21	34.09—35.10	33.92—33.95	33.92—?	34.09—34.52	34.16—34.83		33.73—33.99
Temperature (Cels.)	2.85—2.95	2.85—5.4	2.75—2.85	2.75—6.35	2.85—6.6	3.05—2.9	3.05—6.6	2.95—4.2	2.7—6.3	2.1—2.35	2.35—4.4	2.8—4	2.55—6.3		2.5—3.35
3. Nassellaria.															
Plagiacantha arachnoides Clap. et Lachm.	r	r	..	r	..	..	..	..	r						
Campylacanth cladophora Jørg. n. sp.	..	..	..	..	..	..	r								
Plectacantha oikiskos Jørg. n. sp.	r	r	..	..	..	..	r	..	..	..	..	..	..	..	r
Phormacantha hystrix (Jørg.) Jørg.	..	r	..	..	..	..	r	..	r	..	..	..	..	..	r
Gonosphæra primordialis Jørg. n. sp.	..	r	..	r	..	..	r	..	r						
Peridium longispinum Jørg.	r	r	..	r	..	..	r	r							
Cladoscenium tricolpium (Hck.?) Jørg.	..	..	..	r	..	..	r								
Lithomelissa setosa (Cl.) Jørg.	r	r	..	r	r	r	r	r	..	..	..	..	r	..	r
Dictyoceras acanthicum Jørg.	..	..	..	..	r										
Clathrocyclas craspedota (Jørg.) Jørg.	..	r	..	r	r	..	r								
Androcyclas gamphonycha (Jørg.) Jørg.	..	..	..	+	..	..	r	..	+						
A. amblycephalis (Jørg.) Jørg.	..	r+	..	r	r	.	r	..	+						
Stichocorys seriata (Jørg.) Jørg.	..	rr	..	r	..	..	r								
4. Phæodaria (Tripylea).															
Cannosphæra lepta Jørg.	..	r	..	r+	+	r	+	r	r+	..	..	r	r+		
Protocystis xiphodon (Hck.) Borg.	..	..	..	r											
P. Harstoni (Murray) Borg.	..	..	..	r											
P. tridens (Hck.) Borg.	r	r	..	r	r	..	r	r	r	..	..	..	r		
Challengeron diodon Hck. (*C. heteracanthum* Jørg.)	..	..	..	r	r	..	r								
Medusetta arcifera Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	r		
VIII. Tintinnodea.															
Tintinnus acuminatus Clap. et Lachm.	..	..	r	..	..	..	..	r	..	..	..	r	r		
Ptychocylis urnula (Clap. et Lachm.) Brandt v. *minor* Jørg.	..	r	..	..	r	r	..	r							
Tintinnopsis nitida Brandt	r+	r	..	..	r	r	r	r	..	..	..	..	r	rr	r
T. campanula (Ehrb.) Dad.	..	..	..	..	..	..	..	..	rr	..	..	..	..	..	r
Codonella lagenula (Clap. et Lachm.) Entz. v. *ovata* Jørg.	..	..	..	..	..	..	..	..	rr						
C. ventricosa (Clap. et Lachm.) Fol.	..	..	..	..	..	..	..	..	rr						
Cyttarocylis denticulata (Ehrb.) Fol.	r+	..	+c	c	c	+c	c	c	+c	..	+c	r	..	..	r
C. d. α *typica* Jørg.	..	c	..	..	..	..	..	..	..	..	..	..	+c		
C. d. v. *elongata* Jørg.	..	r													
C. d. v. *subedentata* Jørg. n. var.	..	r	..	..	..	..	..	r							
C. serrata (Möb.) Brandt	..	..	..	..	..	..	..	..	rr						
Dictyocysta templum Hck. v. *disticha* Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	r		
Undella caudata (Ostenf.) Cl.	..	..	..	..	..	..	r	rr	rr	..	..	r			

Year 1900. Month	April														
Locality	Skjerstad-fjord IV	Skjerstad-fjord V	Skjerstad-fjord VII	Skjerstad-fjord XII		Midværfjord	Seivaagen, Saltenfjord	Saltenfjord II		Foldenfjord	Foldenfjord I			Vestfjord between Flado and Skroven	
Date	2/4	2/4	2/4	4/4	4/4	5/4	5/4	5/4	5/4	6/4	6/4	6/4	6/4	7/4	7/4
Depth (meters)	0—330	0—420	0—480	0—50	0—500	0—25	0—20	0—50	0—330	0—530	0—100	300—200	500—400	0—50	0—315
Salinity (‰)	34.04	33.85—34.04	—33.99	33.73—33.85	33.73—34.09			34.11	34.11—35.13		34.11—34.39	34.94—34.88	35.00—35.12	34.07—34.19	34.07—35.12
Temperature (Cels.)	3.2—3.15	2.4—3.15	—3.15	2.3—3.45	2.3—3.05			3.2—3.1	3.2—6.65		3.2—4.15	6.6	6.55	2.85—3.6	2.85—6.5
I. Bacillariales. *(Diatomaceæ).*															
Bacterosira fragilis (GRAN) GRAN	..	..	..	r	r	..	r	r							
Rhizosolenia alata BRIGHTW.	..	..	..	..	..	..	..	r	..	..	r				
Biddulphia aurita (LYNGB.) BRÉB.	r	r+	..	+	+c	+	r	+c	+c	r	r+	..	r	r	
B. mobiliensis BAIL.	..	..	..	..	..	..	..	..	..	..	..	..	r		
Chætoceros borealis BAIL.	..	..	..	..	r	..	..	..	..	..	r	..	..	r	r
C. densus CL. v. *rudis* CL.	..	r	..	..	..	..	..	..	..	..	..	..	..	r	
C. danicus CL.	..	..	..	..	..	..	..	rr	rr						
C. convolutus CASTR.	r	+	..	+c	r	r	r	r	r	+	c	+	r	c	c
C. atlanticus CL.	..	..	r	..	..	..	..	..	r	+c	..	..	r		
C. decipiens CL.	r+	+	+	+c	r	+	..	r	r+	+	+c	r	r	c	c
C. teres CL.	..	..	..	r	..	..	r	r	r+	r	..	..	..	r	r
C. contortus SCHÜTT	r	..	r	..	r	..	..	..	..	..	r				
C. laciniosus SCHÜTT	..	r	..	..	r	..	..	r+	..	..	r				
C. brevis SCHÜTT	..	..	..	..	..	..	..	..	..	..	r				
C. Willei GRAN	..	..	..	..	..	..	..	..	..	..	..	..	..	r	
C. diadema (EHRB.) GRAN	+c	c	+c	c	+c	+	+	+c	r	..	+c	..	..	+	+c
C. debilis CL.	..	..	..	+	+	+	+	r+	+c	+	c	+	..	+	
C. socialis LAUD.	cc	cc	c	ccc	cc	cc	cc	cc	cc	+	cc	+	r+	c	
C. furcellatus BAIL.	..	+	..	c	+	+c	c	..	..	..	+	..	r	+	+
Ditylium Brightwellii (WEST) GRUN.	..	r	..	..	..	..	..	r	r						
Sceletonema costatum (GREV.) CL.	..	..	r	..	r	..	+	+c	c	..	+c	..	r	+c	+
Thalassiosira Nordenskjöldii CL.	..	..	..	r	r	r	c	cc	cc	r	cc	c	+	+	
T. gravida CL.	..	r	..	+	+	..	+	+c	c	..	+c	r	r	c	
T. hyalina (GRUN.) GRAN	r	+	r+	..	r	..	r	c	+c	..	+	..	..	+c	+
T. gelatinosa HENS.	r	r+	..	+c	+	..	c	r	+c	r	+	..	..	r	
Coscinosira polychorda (GRAN) GRAN	r	..	r	c	c	+	+	+	+c	..	+c	..	..	r	
Porosira glacialis (GRUN.)	r	..	r	+	r	..	r	+c	c	r	+	+	..	r	r
Actinocyclus Ehrenbergi RALFS	..	r+	..	..	..	..	..	..	r	r	..	+	r		
A. suboccellatus (GRUN.) RATTR.	r	r	..	r	r	..	..	..	r						
Coscinodiscus excentricus EHRB.	r	..	..	..	r	..	..	..	+	r	..	r	r		
C. lineatus EHRB.	..	..	..	..	..	..	..	..	..	r					
C. curvatulus GRUN.	+	r	..	+	+	+c	..	r	r	r	r+	..	..	r	r
C. stellaris ROP.	..	..	..	..	..	..	..	..	r	..	..	..	r		
C. radiatus EHRB.	r	+	..	..	r+	..	..	r+	r	r	r	r+	+	..	r
C. subbulliens JØRG. n. sp.	..	..	..	r	r	r+	..	..	..	..	r				
C. centralis EHRB.	c	+c	+	..	+	r	..	..	r	r	r+	r			
C. concinnus W. SM.	r	..	r	r	r	r	..	r							
C. bioculatus GRUN.	+	..	..	r+	r	..	r	r	r	..	r	r	..	+	
Hyalodiscus stelliger BAIL.	..	..	..	..	..	..	..	..	r	..	..	r	r		
Nitzschia seriata CL.	r	+	+c	+c	+	+	r	c	c	..	+	..	..	r	

Year 1900. Month	April														
Locality	Skjerstadfjord IV	Skjerstadfjord V	Skjerstadfjord VII	Skjerstadfjord XII		Midværfjord	Seivaagen, Saltenfjord	Saltenfjord II		Foldenfjord	Foldenfjord I			Vestfjord, between Flado and Skroven	
Date	2/4	2/4	2/4	4/4	4/4	5/4	5/4	5/4	5/4	6/4	6/4	6/4	6/4	7/4	7/4
Depth (meters)	0—330	0—420	0—480	0—50	0—500	0—25	0—20	0—50	0—330	0—530	0—100	300—200	500—400	0—50	0—315
Salinity (‰)	34.04	33.85—34.04	33.99	33.73—33.85	33.73—34.09			34.11	34.11—35.13		34.11—34.39	34.94—34.88	35.00—35.12	34.07—34.19	34.07—35.12
Temperature* (Cels.)	3.2—3.15	2.4—3.15	—3.15	2.3—3.45	2.3—3.05			3.2—3.1	3.2—6.65		3.2—4.15	6.6	6.55	2.85—3.6	2.85—6.5
Nitzschia delicatissima Cl.	..	..	..	..	..	..	..	..	..	..	..	..	..	cc	
N. frigida Grun.	..	r	..	r	r	..	..	r	..	..	..	..	..	r	
N. hybrida Grun.	r	r	..	r+	r	r	..	..	r	..	r				
N. recta Hantzsch.	..	..	..	r	..	..	r	r	..	..	r				
N. longissima (Bréb.) Ralfs.	..	..	..	..	..	..	r								
Thalassiothrix nitzschioides Grun.	c	c	c	c	c	..	r	c	c	+	c	+	..	c	+
T. n. Grun. *f. currata* (Castr.) Jørg.	..	..	r	..	+										
Fragilaria oceanica Cl.	c	cc	cc	c	cc	[illegible]	cc	cc	cc	c	c	r	r	cc	c
F. cylindrus Grun.	cc	cc	cc	cc	cc	c	cc	c	+c	..	+	..	..	cc	c
F. islandica Grun.	r	r	..	..	..	r	..	..	r						
Achnanthes tæniata Grun.	r+	r+	r	+	r	r	+	r	r	..	..	..	..	r	r
Pleurosigma Stuxbergi Cl.	..	..	..	..	..	r	r	r	..	..	r	r			
P. fasciola W. Sm. (incl. *P. tenuirostris* Grun.)	..	..	..	..	..	..	r	r	r						
Navicula Vanhöffeni Gran	..	..	..	r	..	..	r	r	r	r	r+	..	..	r	r
N. pelagica Cl.	..	r	..	..	..	..	..	..	rr						
N. directa W. Sm.	r	..	..	r	r	r	..	r	r						
N. kariana Grun.	r	.	r	+	+	..	r	r+	r	..	r	..	..	+	
Amphiprora (Tropidoneis) parallela Jørg. n. sp.	r	..	..	..	r	..	r	r	..	..	r				
Actinoptychus undulatus (Bail.?) Ralfs	..	..	..	..	r	..	..	..	..	..	..	..	r		
Campylodiscus Thuretii Bréb.	..	r	..	..	..	..	r								
Surirella lata W. Sm.	..	..	..	..	..	..	..	..	r						
Rhabdonema arcuatum (Lyngb.) Kütz.	..	r													
Bacillaria socialis Greg.	..	..	..	..	..	r									
Pleurosigma angulatum W. Sm.	r	..	r												
P. Normanni Ralfs	..	..	..	..	..	..	..	..	..	..	r				
Rhoicosigma arcticum Cl.	..	..	..	..	r										
II. Peridiniales. (Dinoflagellata).															
Dinophysis acuta Ehrb., Jørg.	..	..	..	..	..	..	..	..	..	..	..	r	r		
D. norvegica Clap. et Lachm., Jørg.	..	..	..	r	..	..	..	r	r	..	..	..	r		
D. acuminata Clap. et Lachm., Jørg.	..	..	..	..	r										
D. rotundata Clap. et Lachm.	r	r	r	r	r										
Podolampas palmipes Stein	..	..	..	..	..	..	..	..	..	r					
Oxytoxum diploconus Stein	..	rr													
Pyrophacus horologium Stein	..	..	..	..	..	..	..	..	..	..	..	..	r		
Protoceratium reticulatum (Clap. et Lachm.) Bütschli.	r	r	..	..	+	..	..	r	r						
Gonyaulax spinifera (Clap. et Lachm.) Dies.	..	..	..	..	r										
G. polyedra Stein.	..	[illegible]													
Peridinium depressum Bail.	+	[illegible]	[illegible]	..	[illegible]	r	r	r	r	r	r	r	..	r	r
P. divergens Ehrb. (*P. lenticulare* (Ehrb.) Jørg.)	+	..	[illegible]	..	r	..	..	..	..	r	r	r	r		
P. conicum (Gran) Ostenf. et Schm.	r	[illegible]	..	..	+	r	..	..	..	..	r				

Year 1900. Month	April														
Locality	Skjerstadfjord IV	Skjerstadfjord V	Skjerstadfjord VII	Skjerstadfjord XII		M[illegible]fjord	S[illegible] Saltenfjord	Saltenfjord II		F[illegible]		Foldenfjord I		Vestfjord between [illegible]	
Date	2/4	2/4	2/4	4/4	4/4	5/4	5/4	5/4	5/4	6/4	6/4	6/4	6/4	7/4	7/4
Depth (meters)	0–330	0–420	0–480	0–50	0–500	0–25	0–20	0–50	0–330	0–530	0–100	300–200	500–100	0–50	0–315
Salinity (‰)	34.04	33.85–34.04	33.99	33.73–33.85	33.73–34.09			34.11	34.11–35.13		34.11–34.[illegible]	34.[illegible]–34.88	35.00–35.[illegible]	34.07–34.19	34.[illegible]–35.1[illegible]
Temperature (Cels.)	3.2–3.15	2.4–3.15	3.15	2.[illegible]–3.45	2.3–3.05			3.2–3.1	3.2–6.65		3.2–4.[illegible]	6.[illegible]	6.[illegible]	2.8–3.6	2.[illegible]–6
Peridinium pentagonum GRAN	..	r													
P. pallidum OSTENF.	r	r	r	r	r	r	..	r	r	r	r	..	r		
P. ovatum (POUCH.) SCHÜTT	r	+	..	r	+c	..	..	r	r	r	+	r	r	r	
Ceratium tripos (O. F. MÜLL.) NITZSCH. (α *balticum* SCHÜTT)	r	r	r	..	r	..	r	r	r	r	r	r	r	r	r
C. bucephalum (CL.) CL.	r	r	..	..	r	..	..	r	r	+	r	r	r	r	
C. b. v. *heterocampta* JØRG.	r	r													
Ceratium macroceros EHRB. (CL.)	r	r	..	..	r	..	r	r	r	r	+	+	r	r	r
C. intermedium (JØRG.)	r	..	..	..	..	..	..	..	r						
C. longipes (BAIL.) CL.	r	..	..	..	..	..	..	..	r	r	r +	..	r	·	r
C. furca (EHRB.) DUJ.	..	+	r	..	r +	..	r	..	r	r	r				
C. fusus (EHRB.) DUJ.	c	+ c	r	r	r	+	r	r	r	r	·	..	r	r	r
III. Pterospermataceæ.															
Pterosperma Möbii (JØRG.) OSTENF.	..	r	..	..	..	..	..	r	r	..	r	r			
P. Vanhöffeni (JØRG.) OSTENF.	..	..	..	..	..	..	..	..	r						
P. dictyon (JØRG.) OSTENF.	..	..	..	..	r	..	r	..	r	..	r				
IV. Halosphæraceæ.															
Halosphæra viridis SCHMITZ (incl. *H. minor* OSTENF.)	..	+ c	..	..	..	..	r	..	r	c	c	..	..	..	[illegible]
V. Flagellata.															
Phæocystis Poucheti (HAR.) LAGERH.	..	+ c	..	c	..	..	..	..	r	..	..	..	..	c [illegible]	c
VI. Silicoflagellata.															
Distephanus speculum (EHRB.) STÖHR	r	r	..	r	r	r	r	+	c	..	r	..	..	c	
Dictyocha fibula EHRB.	..	..	..	..	r	..	..	..	r						
VII. Radiolaria.															
1. Spumellaria.															
Hexacontium enthacanthum JØRG.	..	..	..	..	.	.	..	.				..	r		
H. pachydermum JØRG.	..		..	.	.	r	.			.	.	r	r		
Echinomma leptodermum JØRG.	..		.		..	..	..		r		.	r	r		
Rhizoplegma boreale (CL.) JØRG.	r	r	.	.	..	r	r		r	.	.	r	r		
Lithelius minor JØRG.	..	.	..	.	.		r				.	r	r		
2. Acantharia.															
Radiosphæra anacanthica JØRG. n. sp.	r	r	.		r	r	r	.	.	..		.	r		

Year 1900. Month	April														
Locality	Skjerstad-fjord IV	Skjerstad-fjord V	Skjerstad-fjord VII	Skjerstad-fjord XII		Midværfjord	Seivaagen, Saltenfjord	Saltenfjord II		Foldenfjord	Foldenfjord I			Vestfjord, between Fladø and Skroven	
Date	2/4	2/4	2/4	4/4	4/4	5/4	5/4	5/4	5/4	6/4	6/4	6/4	6/4	7/4	7/4
Depth (meters)	0—330	0—420	0—480	0—50	0—500	0—25	0—20	0—50	0—330	0—530	0—100	300—200	500—400	0—50	0—315
Salinity ($^0/_{00}$)	34.04	33.85—34.04	—33.99	33.73—33.85	33.73—34.09			34.11	34.11—35.13		34.11—34.39	34.94—34.88	35.00—35.12	34.07—34.19	34.07—35.12
Temperature (Cels.)	3.2—3.15	2.4—3.15	—3.15	2.3—3.45	2.3—3.05			3.2—3.1	3.2—6.65		3.2—4.15	6.6	6.55	2.85—3.6	2.85—6.5
3. Nassellaria.															
Plagiacantha arachnoides Clap. et Lachm.	..	..	..	..	r										
Campylacantha cladophora Jørg. n. sp.	..	..	..	..	..	..	..	..	r	..	..	r			
Plectacantha oikiskos Jørg. n. sp.	..	..	..	..	..	..	.	..	r	..	..	..	r		
Phormacantha hystrix (Jørg.) Jørg.	..	r	..	..	..	..	..	..	..	..	..	r			
Gonosphæra primordialis Jørg. n. sp.	..	..	..	..	..	..	..	..	..	..	..	..	r		
Peridium longispinum Jørg.	..	r	..	..	r	..	..	r	r	..	..	r	r		
Cladoscenium tricolpium (Hck.?) Jørg.	..	..	..	..	..	..	..	..	r	..	..	..	r		
Lithomelissa setosa (Cl.) Jørg.	r	r	..	r	r	..	..	r	r	..	r	r	r		
L. s. v. *belonophora* Jørg.	..	r													
Litharachnium tentorium Hck.	..	..	..	..	..	..	..	..	..	..	..	rr			
Dictyoceras acanthicum Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	r		
Clathrocyclas craspedota (Jørg.) Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	r		
Androcyclas gamphonycha (Jørg.) Jørg.	..	..	..	..	..	..	..	..	..	..	.	..	r	..	r
A. amblycephalis (Jørg.) Jørg.	..	..	..	..	..	..	..	..	..	..	..	..	r		
4. Phæodaria (Tripylea).															
Cannosphæra lepta Jørg.	..	r	..	..	..	..	..	..	..	..	r				
Protocystis tridens (Hck.) Borg.	r	r	..	..	r	..	..	..	..	..	r	..	+		
Challengeron diodon Hck. (*C. heteracanthum* Jørg.)	..	..	..	.	..	..	..	..	..	r	r	..	r		
VIII. Tintinnodea.															
Tintinnus acuminatus Clap. et Lachm.	r	..	..	..	r										
Leprotintinnus pellucidus (Cl.) Jørg.	r														
Ptychocylis urnula (Clap. et Lachm.) Brandt v. *subarctica* Jørg. n. var.	..	..	..	..	..	r									
Tintinnopsis nitida Brandt	r	r	..	r	+c	..	r	r	r	..	r				
Cyttarocylis denticulata (Ehrb.) Fol.	..	..	r+	..	r	r	r	..	r	+c	r	+c	+c	..	r
C. d. v. *subedentata* Jørg. n. var.	r	r													
Undella caudata (Ostenf.) Cl.	..	r	..	..	r	..	..	..	r	r	..	..	r		

b. Remarks on the Plankton.

As mentioned in the introduction (p. 49), an evolution of large masses of diatoms in the plankton takes place early in the spring. This very conspicuous phenomenon I have called, the inflow of diatoms. (Ostenfeld: diatomébölgen, the wave of diatoms; Gran: Diatomeen-wolke.)

To explain „the large wave of diatoms, which every spring rolls over the North Atlantic", Ostenfeld (L. 112, p. 65) supposes that the currents have been in close proximity to the shore, for he considers that the evolution of the diatoms is enhanced, when such is the case; although he does not give his reasons for so thinking. As, however, this explanation will not do for all cases, he mentions that the same quickening force, as that of the shore, is found in the boundary lines „where different currents glide past each other."

Gran, in his latest work, has examined into the same phenomenon, more in detail. On the whole, he appears to agree with Ostenfeld, at any rate in so much as that the boundaries of currents and also coast water are necessary for production in large quantities, but he goes a step further and suggests a case for the effects observed.

He applies the theory recently advanced by Brandt, and considers that the explanation is to be found, either in the fact that in the open sea „there is a constant state of famine, as the supply of nourishment principally comes from the coasts; or else that there is a more active decomposition of nitrogeneous elements in the warmer waters of the Atlantic".

As to which of these causes is the more decisive, Gran does not give any definite opinion. But he seems most to incline to the famine hypothesis, for, from this starting point, he shows how the boundaries of the different currents must act in the same way as coast lines, by reason of the nourishing matter, which they bring with them, from the rivers of Siberia and the arctic coasts.

In connection with the foregoing, I will give a brief account of the opinions I have formed after my examination of the coast plankton; I will at the outset mention that I have had little or no personal experience of ocean plankton.

I also long since came to the conclusion that it is probable that the evolution of the large quantities of diatoms depends upon the mixing of the waters. On the whole, I am of the same opinion as Gran, as expressed in the quotation first given from his book. I must, however, make exception to the famine hypothesis, which appears to me to give altogether too hopeless a view respecting pelagic animal life.

When Gran, however, considers the resting spores (endocysts) left behind in the shallow coast water as the real explanation of the phenomenon, my experience makes it impossible for me to agree with him; in spite of the great attractiveness which at first attaches to this hypothesis. As is so often the case, so here, the same conclusions are often arrived at from widely differing hypotheses.

After Gran's theory the neritic diatoms with resting spores (in contradiction to the oceanic, which have none) leave behind these spores in the coast water after a short period of vegetation. When now the spores sprout, in the following spring they cause the production of the large masses of diatoms.

What I most object to is, that if this theory be correct there would be good reason to conclude that the „inflow of diatoms" is a local phenomenon, at any rate in the fiords. One ought then to be able to conclude that the plankton which flourishes in one fiord would be considerably different from what is to be seen in another and distant one.

It would, moreover, be reasonable that the large evolution would occur in one fiord essentially earlier or later than in adjacent ones, according to the different local conditions, which might tend either to hasten or hinder the development of diatoms.

But everyone who has carefully examined the make-up of the plankton at the time mentioned will have particularly noticed that, taken as a whole, there is a remarkable uniformity in the plankton.

Of course, there are variations, but these appear to be caused more by differences in time than place.

It should, however, here be remembered, that the plankton during „the inflow" is very rich also as to quality, and contains — especially that of the northern inflow — so many forms difficult to determine (small and with thin walls imperfectly silicated) that it must still be considered too little known.

In spite of the large number of species, and notwithstanding that there doubtless are still many unknown ones, it seems to me that there is such remarkably great uniformity that it is difficult to think of the phenomenon as a local one.

As mentioned at the commencement, however, there is some difference between the southern and northern inflow; and this difference would seem to be constant in the case of a few species. It is highly probable that there is a much greater difference in the quality than can now be seen; for, as before mentioned, the number is large of those species which it is difficult to determine. If, however, considerations be confined to the predominant species, it will be found that there are some which have hitherto only been found in the northern, and not in the southern plankton. For instance, Gran long since emphasized the fact that *Chætoceros furcellatus* „is entirely absent south of Stadt, and *C. cinctus* takes its place."

It is also remarkable that the phenomenon occurs simultaneously at different places. If the inflow is seen in one fiord, it will also as a rule be found everywhere in the district. It is indeed quite difficult to decide whether it has come from the south or the north, that is to say, whether the inflow is at the same time observable in places to the south, and not in places to the north, or vice versa.

Here let me call attention to the rapidity with which the inflow sets in — for this I consider to be an especially noteworthy and important circumstance. There is no clearly defined time when the change takes place in the plankton and the inflow is prepared for, but it all happens, so to say, with a bound.

The species which form the bulk of the inflow are, — as previously stated by Cleve and Gran — for the most part quite different ones from those which are generally found in the plankton, and most of them are arctic forms. This — in addition to several other circumstances — is the reason why Cleve has supposed that there is a current of arctic water along the coast of Norway, right away down to Skagerak and Kattegat.

According to Gran's theory, the foreign arctic forms must be considered to come from the resting spores which have been deposited, and so must not be looked upon as foreign, but as species which now on our coasts have an unusually short period of vegetation in the spring, remaining otherwise in rest at the bottom as spores.

It will clearly be seen, from the tables of the species which have been found in the plankton here dealt with, that a large number of foreign species occur during the period of the inflow, partly being decidedly high arctic, at any rate as far as their distribution is now known. Of such species, I would particularly mention *Thalassiosira hyalina*, *Fragilaria cylindrus*, „*Navicula*" *Vanhöffeni*, *Coscinodiscus bioculatus*, *Pleurosigma Stuxbergi*, *Nitzschia frigida* and *Chætoceros furcellatus*.

These two things — the great uniformity and the foreign character — taken in connection with each other seem to me most naturally to give rise to the supposition that those species, which form the bulk of the plankton at the time when the masses of diatoms appear, are brought in from the ocean by arctic water, and that they are — perhaps by mixing with the waters of the Atlantic — brought into better conditions of existence and therefore multiply by division. This way of generation will of itself — that is to say when such division is not only the exception — easily lead to production en masse, as one has good opportunities of seeing during the development of diatoms, when artificially cultivated.

What constitutes the improved conditions of existence, is another question, and there is no reason for me to deal with this matter here, as I have no observations to fall back upon, but there cannot be very many factors to take into consideration. Gran supposes that the rich supply of nourishment is its cause (cfr. the foregoing.)

In this connection, I will only observe that from his standpoint Gran explains that the reason why the development of the large masses stops of itself, and why the masses disappear, is that the nourishing matter has been quickly used up. According to my experience light plays an important part in the culture of diatoms, their development being greatly assisted by a certain degree of light, while a somewhat greater degree has precisely the opposite effect. One might, therefore, perhaps find a reason in this fact for the disappearance of the masses, in as much as long periods of sunshine might destroy the assimilating powers of the chromatophores.

It is highly probable that the phenomenon is due to both these causes.

This disappearance of the masses of diatoms may, however, be local, and be caused by the rushing in of other water (cfr. the concluding remarks on the Baltic current.)

I have called the phenomenon the inflow[1]) of diatoms, partly because it conveys the immediate impression of an inflow from outside, and partly because I really consider that it is caused by the bringing in of foreign forms. It is, however, only necessary to consider that the germs for the evolution of the masses of diatoms are thus brought in, whether it be light, temperature, nourishing matter, or most likely all three factors combined, which further their development.

As already mentioned, the southern inflow appears always to contain some species which are not found in the northern, so it would seem likely that the western coast of Norway partly receives water from another quarter than the northern coast. Gran apparently considers Stadt to be the boundary line for some of the characteristic species.

This, I think, makes it clear, that it is of some importance to try to discover whether there is really any variation or not year after year in the species found in the inflow of diatoms. On the whole, it seems to me that the great difference of, and changes in the interpretation of the plankton at least show that it has not yet been sufficiently studied to make any quite reliable basis for hydrographical conclusions.

As is the case with the majority of biological phenomena, the development and changes in plankton are of such a complicated character that a knowledge of many factors which work together, and which as yet we are partly quite unacquainted with, is necessary, so that to get a clearer conception and better knowledge of the many remarkable phenomena, which are to be found in our coast plankton alone, will give enough work for many years.

Before I leave this subject, I think I ought to better explain my position with regard to the hypothesis of resting spores, which at first sight, it must be confessed, seems to give an attractive explanation of many phenomena.

When Gran considers the neritic species to be characterized by resting spores, in contradiction to the oceanic species which have none, this distinction seems to me in a sense to follow of itself, but contains no proof of the „over summering", by resting spores on the bottom. I look upon these spores as a means by which the individual diatom attempts to escape from unfavourable surroundings, as the specific weight increases. So far, I agree with Gran. His supposition that they often sink to the bottom is doubtless also correct in very many cases, in fact I think this is finally most often their fate in the coast water. But I think it is just as certain, in the majority of cases, that the individual to begin with is only forced into underlying water of a greater specific weight. What its further fate will be, depends entirely upon circumstances. If it thrives, it will live on, and possibly multiply. If, however, it does not thrive, the final result will be that it reaches the bottom. Then, as a rule, it will be altogether played out, at the most, it might be included in a preparation of bottom material.

In an earlier paper (L. 92) I have suggested that the thickening of the horns in certain *Chætoceræ* (e. g. *C. convolutus*, *C. contortus* and many others) might be a biological phenomenon corresponding to the formation of resting spores, although the latter are undeniably more effective.

In his last work, Gran also mentions (L. 70, p. 129—130) numerous dead cells and resting spores from a deep water sample (The Stor Fiord, Søndmøre, stat. 3. 200—530 m.), these consisting partly of species which had disappeared from the surface. How these could — even if they remained alive — again come up from such great depths, is really difficult to explain, unless too arbitrary suppositions be resorted to. Besides, the greater depth, implies little light, but light is an absolute condition of vital importance for the diatoms. The fact that bottom samples from deeper than 50 m.s show a very poor diatom life, is very instructive in this connection; while a very rich diatom flora may be found at lesser depths. At depths of under 100 m.s the bottom flora of diatoms consist only of empty valves of pelagic species plus some other matter, also a few diatom valves, which has been washed down from the shore and here too resting spores are found in varying

[1]) It is useful in the remarks on the species to have a special name to designate this period.

quantities. Such has at any rate been my experience. On the other hand I have never seen any large number of resting spores in shallow water.

If they survived the summer here, one ought in the succeeding year to find quantities of the same species which were numerous in the preceding one; and consequently a considerable uniformity year after year. But, according to my explanation, one would expect greater variation.

The oceanic species live under conditions which are subject to but little change. The changes which do take place, occur as a rule slowly and gradually, so that at length a point is reached when it is a question of whether or not.

If, on the other hand, an oceanic species comes into coast water, or into a boundary district between two currents a formation of resting spores might take place, if the species in question had the requisite power. But in such cases, GRAN does not consider it to be an oceanic species (but a neritic one). In this way, one, of course, gets as clearly defined a distinction, between oceanic and neritic species, as can be wished for; but such a distinction is at any rate highly artificial and seems to me to be of little use, if GRAN's interpretation of the resting spores is not correct. Besides, I think that the most important question is, whether a given species can propagate and thrive in the open sea, and this may be the case even if it is possessed of the power of forming resting spores. According to my opinion with regard to them, it might in some cases just be the coast water which is an hindrance, and the oceanic water which is furthering.

At any rate, it ought first of all to be clearly proved that the resting spores are deposited in large quantities at the bottom of shallow water, and this should not be a very difficult matter. Deep water can scarcely be taken into account, nor yet those spores which have been washed further down than about 50 m.s beneath the surface, to mention a figure which would seem to suit. There must, I take it, be great quantities of resting spores present to explain the sudden appearance of large masses of diatoms.

My experience — as mentioned above — goes to prove that it is just only in deep water that large quantities of resting spores are found, and here, as explained above, one must expect to find them. I have not, however, by direct experiments, become convinced that essential quantities of them do not occur at the bottom of shallow water, and I will, therefore, in this connection, mention that it is quite likely that the usual method of preparing bottom samples gives a negative result, even if they do contain such spores.

When I above threw out the suggestion, that the heavier spores serve to force the individual into deeper water, I do not wish to be understood to mean that their special or only purpose is to make the individual diatom heavier. It is also reasonable to suppose that the formation of resting spores may be a reaction to plasmolysis, caused by salter water. This thought, would, it seems to me, explain certain phenomena of the plankton, although I will not now at present venture to say that this reason is the more decisive. I have not yet sufficiently studied this subject (the formation of resting spores).

As it is always unsatisfactory to attack a given hypothesis — especially one such as this of resting spores which seems to rejoice in numerous adherents — unless another be offered in its stead, I will now mention how I consider the inflow of diatoms occurs.

If I have understood hydrographers correctly, there is, on the surface during the winter months, a tongue of salt water, which flows northwards, fairly parallel to the coast of Norway from the passage between the Færoe Islands and Shetland. This tongue seems to be comparatively narrow, especially a little to the north or north east of the passage, and it expands northwards, until at its most northerly end — in the neighbourhood of Bären Eiland — it divides into two or more arms.

On the right of this tongue of ocean water, there is the coast water off the coast of Norway; on its left, there is the arctic water (nearest to the Faeroe Islands it is the East Icelandic Polar Current). This (easterly) tongue of ocean water is displaced and forced in different directions by the water from the arctic regions, now nearer to the coast of Norway, then in the contrary direction; and it varies in its distribution northwards (or is mixed in different proportions with the arctic water).

In the spring months, there appears to be a rich diatom plankton just in the boundary line between this arctic water and that of the Atlantic. This phenomenon may partly be caused by a purely mechanical crowding where the velocity of the current is lowest; but it is also very likely that the somewhat higher temperature of the mixed water may promote the evolution of the diatoms.

In GRAN's last work (L. 70. p. 158, 160) one learns from the expedition of S/S Heimdal, in May 1901, that there was found in the southern section of the „Gulf Stream" (the previously mentioned tongue of ocean water from Faeroe—Shetland northwards) a rich diatom plankton on both sides of the stream, especially on the western towards the Icelandic polar current. Traces of a similar state of things were found in the second section, much more northerly, but it was here little noticeable (at that time of year).

GRAN himself mentions that on the western boundary of the Gulf Stream, a rich neritic plankton consisting of diatoms was found, and this he considers to have been brought hither by the current, probably from the Faeroe Islands. He also mentions that the same state of things has several times previously been noticed at about the same place and time. With regard to the northern section, he hints at an exceedingly long transport of the same neritic forms northwards to the corresponding boundary line there.

In this connection, it would be of importance to know whether such an evolution of masses of diatoms takes place in other places on the boundaries between the atlantic and arctic waters, (at a time which is favourable to the development of diatoms, probably excluding the winter months of December, January and February, and perhaps partly also March) or if this production en masse is confined to those places where coast water is present. It is quite likely that the latter is the case, but one can hardly say that it has, as yet, been clearly proved.

If such mass development should be found in the boundaries as a whole, one of the principal reasons would disappear for considering as neritic such arctic diatoms as have been found repeatedly in large numbers in samples of plankton which have been taken far from the coasts.

As the tongue of ocean water above mentioned is narrow and varies in its situation and expanse, it is reasonable to conclude that, occasionally during the spring months, the arctic waters wash over it, and become in this way transferred to the coast of Norway.

To judge from the occurence of the diatom inflow, this would seem to happen regularly at the end of March. (In 1898 particularly early, namely in the middle of the month, or perhaps still earlier.)

By assistance of Mr. Nordgaard I have been aware that such a washingover by the arctic waters across the Gulf Stream has really been observed by the Swedish hydrographers (Petterson, L. 119), and that just in the year 1898 the East Icelandic Polar Current by a broad zone went across the Gulf Stream towards the Norwegian coast. The Swedish hydrographers also suppose the arctic water to force its way beneath the surface all into the Skagerak and Kattegat, and Cleve thus explains the appearance there of arctic planktonforms. They appear here earlier in the year than at the Norwegian coast.

When the arctic water reaches the coast, we find at once the masses of diatoms, which have already been developed on the boundaries.

As the preceding remarks will show, the southern inflow of diatoms, according to my opinion, is especially due to the East Icelandic Polar Current, which under favourable circumstances advances in the direction of somewhere near the Sogne Fiord. (As previously mentioned, Gran makes Stadt the limit for some of the arctic diatoms, which in this connection are of special importance). It is possible that a similar washingover occurs regularly (by a very broad wave?) further north on the coast of Lofoten (to the south or north). Here, at certain times, a tongue of arctic water also seems to be pushing its way across the Gulf Stream.

I think it very possible that the specific northern forms in the northern diatom inflow may, in this way, be brought in with water from about the latitude of Jan Mayen. It is, however, also quite likely that it is the previously mentioned tongue of arctic water, transversing the Gulf Stream at its narrowest part, which alone gives rise to both the northern and southern inflow.

If such be the case, one might expect that the southern one would expand southwards, and the northern northwards. There would still be nothing to prevent the slight differences in their components, as the northern part of the current could bring with it the specific northern forms, if from land, then from Jan Mayen or perhaps East Greenland.

The abundant material for observation which Cleve has collected in his splendid work on the distribution of plankton organisms in the Atlantic, (L. 40), makes it possible for one to get a view of the distribution of the species. The specific northern forms may, in accordance with the information there given, be supposed to come from East Greenland or Jan Mayen.

If the northern diatom inflow be due to the rushing in of a northern tongue of arctic water at Lofoten or thereabout (probably in a wide expanse) one might expect the inflow from here to stretch southwards on the one side, and in a north easterly direction on the other. There was indeed, in the plankton examined, a reason for the suggestion that the diatom inflow extended in an easterly direction in the most northern part of Norway.

Following close upon the inflow of diatoms, there is, on the south west coast of Norway in the neighbourhood of Bergen, a very sudden transition to much fresher water, containing a rich and peculiar plankton of *peridineæ*, which quickly takes the place of the masses of diatoms. (Cf. E. Jørgensen L. 91)

This is due, as far as I know, to the Baltic current which now rushes in and sweeps the masses of diatoms out from the coast and northwards. Therefore, it is reasonable that the characteristic northern species cannot penetrate so far as to the latitude of Bergen.

In the above mentioned southern section of the Gulf Stream, during the expedition of S/S Heimdal in 1901, there were also masses of diatoms on the boundary towards the oceanic water in May, just at the time when the Baltic current has swept away the diatom masses from the coast near Bergen.

There is a certain correspondence between the characteristic northern forms in the northern diatom inflow and the species which from Grunow's and Cleve's works are known from the Kara Sea and the north coast of Siberia. This might mean some kind of connection between these seas, and one might easily be tempted to conclude that water from the north coast of Siberia finds its way to the north coast of Norway.

In Gran's last work, a plankton sample is mentioned as taken during the expedition of S/S Heimdal in 1900 in the Barents Sea, west of Waigatch, and which contained several of the peculiar forms found in the northern diatom inflow.

Gran has kindly placed this sample at my disposition, and after a thorough examination of it, I can affirm, that it contains a large number of our northern plankton diatoms. On the other hand, there are also so many foreign elements that it is scarcely likely that water from this district flows to our coast during the period of the diatom inflow. On the contrary, everything (also the date $^{31}/_{5}$) suggests that the masses of diatoms from the coast of Norway (or the same inflow which gives rise to the northern inflow with us) extend further eastwards (perhaps to the Kara Sea).

The species found in plankton, and their distribution (principally in the nearest seas) and remarks on the new or critical forms.

I. Bacillariales.

(Diatomaceæ).

The suggestions which have hitherto been made as to a natural classification of diatomaceæ are all more or less unsatisfactory. In the following pages, I have principally availed myself of the system used in Van Heurck's „Traite des Diatomacées" (L. 89); but in the larger groups I have made some changes which I have found to be necessary.

A more complete list of literature will be found in my previous paper (E. Jørgensen: Protophyten und Protozoen aus der norwegischen Westküste) (L. 91). Here I have only more completely cited the literature for the forms which are not referred to there.

I a. Centricæ Schütt.

1. Coscinodisceæ.

Under the heading „distribution", I have used the ordinary expressions „oceanic" and „neritic" forms (= sea and coast forms). As long as one (for diatomaceæ) does not know anything definite about any rest period at the bottom, these expressions are far preferable to „holo"- and „meroplanktonic".

In accordance with my opinion as stated above respecting the inflow of diatoms in the spring I consider a large part of our plankton species to be brought in from outside.

There are others which occur all the year round on our coasts, although these of course also follow with the various currents.

Such species are noted as native, or sometimes as „stationary", on our coasts.

So as not to differ more than necessary from the expressions commonly used, I have called boreal those coast forms which are stationary on our northern coasts, as well as those which, according to my opinion, come to us from the northern, but not exactly the arctic, districts. (This expression — boreal — was first used by Cleve, and later by both Gran and Ostenfeld with a similar meaning). Moreover, I have, as Gran has done, widened this expression to include certain oceanic forms, which are found in the northern Atlantic outside the arctic water proper. After my view, such forms will for the most part be those which thrive in the boundary lines between the arctic water and that of the Atlantic, and which are well able to bear the latter (up to a certain degree of salinity and temperature).

That it is often difficult to decide whether arctic and boreal (I would prefer to call the latter subarctic) forms are neritic or oceanic, is something which is a necessary result of my opinion that they thrive well and may give rise to evolution en masse in the boundaries between the arctic and Atlantic waters. It is this fact which has also been referred to by some authors when saying, that these boundaries to some extent play the same part as the coasts.

Coscinodiscus Ehrb.

It will be seen, from the various plankton tables which have been published, that this difficult genus has given rise to much confusion. The names which are used in many cases evidently mean quite different species. As there, however, in our latitude, does not appear to be very many species in the plankton, it ought to be possible to arrive at comparative clearness concerning them. It is probable that in reality there are many more species than have up to the present been found; but there are only a few which occur frequently.

I will here give a brief survey of the species which I have mentioned in the plankton tables.

Key to the species of Coscinodiscus.

Valve flat or nearly so (sometimes suddenly descending at a narrow zone of the outmost margin).

  Marginal apiculi present (always distinct).

    The characteristic structure of *C. curvatulus*: valve by (somewhat curved) radii divided into a considerable number of sectors; markings (areoles) in each sector in rows parallel to the one limiting radius (or somewhat convergent towards the border) . . . . *C. curvatulus.*

    The characteristic structure of *C. lineatus*: markings arranged in more or less straight rows (in 5 or 6 directions) across the valve . . . . *C. lineatus.* (et var.)

    The characteristic structure of *C. excentricus*: markings in 7 fasciculi, forming distinct secondary curves, concave towards the border . . . . . *C. excentricus.*

    Fine radiating structure with more or less distinct and numerous fasciculi . . . . *C. bioculatus.*

  No marginal apiculi.

    Structure of the valve rather coarse, more or less distinctly radiate (only near the border with more or less visible fasciculi, consisting of rows converging towards the border, sometimes apparently inordinate); markings near the border suddenly much smaller . . . . *C. radiatus.*

Valve decidedly convex (in *C. decipiens* with high broad marginal zone, then flat).

  Valve without close markings all over the surface, only with distant puncta. *C. nitidus.*

  Valve with close (more or less distinctly polygonal) markings.

    Fine structure (fasciculi); around the centre of the valve a conspicuous star consisting of about 5 coarse marks . . . . *C. stellaris.*

    Structure similar to that of *C. excentricus*, but with more quickly diminishing markings and long marginal apiculi . . . . *C. decipiens.* (= *Thalassiosira gelatinosa*).

    Structure radiate, with more or less branched radii. No coarse marks; marginal apiculi (when present) short and small.

      2 comparatively large (short linear) asymmetrical and numerous small marginal apiculi (which are often very inconspicuous or apparently wanting).

        Fine structure. Smooth central space or large central rosette of several times larger areoles. Valve thin . . . . . *C. concinnus.*

        Coarser structure. At the centre a definite central rosette of doubly large areoles. More strongly siliceous . . . . . *C. centralis.*

      No marginal apiculi.

        Valve very thick. Coarse structure; areoles of very varying size on one and the same valve, from ²/₃ of the radius somewhat smaller. Comparatively broad, coarsely striated, border *C. subbulliens.*

C. excentricus Ehrb.

The form which occurs in the plankton from the northern coasts of Norway, is the typical one which is figured in Schmidt's atlas, (L. 128), pl. 58, f. 49.

Distribution: Appears to be a northern temperate oceanic form. On the west coast of Norway it is found all the year round, but only occasionally in somewhat greater number. The same seems to be true of the northern coasts, at any rate in the months February—May. Otherwise widely distributed along the coasts of the Atlantic, the North Sea and Skagerak right up to Greenland and Jan Mayen. Has, according to more or less reliable statements, a much wider distribution and is perhaps cosmopolitan.

C. lineatus Ehrb.

The easily recognizable form which is figured by Van Heurck (Synopsis, L. 88) t. 131, f. 3, I hardly think occurs on our coasts. But rarely one finds a form with fine structure and more or less straight secondary curves, which I have entered in the plankton tables under the name of *C. lineatus* var. I am, however, partly inclined to think that the specimens I have observed may be forms of *Coscinosira polychorda* Gran. Cfr. remarks concerning this species.

Distribution: The genuine *C. lineatus* Ehrb. is perhaps only found fossil and in the warmer seas.

C. decipiens Grun.

Vide *Thalassiosira gelatinosa.*

C. curvatulus Grun.

Rare on the coasts of Norway, occasionally more frequent in the northern coast plankton.

Distribution: Occurs in many forms, which taken as a whole have a wide distribution. It seems to be frequent on the arctic coasts. (Greenland, Jan Mayen and Franz Joseph's Land). Is perhaps an arctic and boreal oceanic form.

C. stellaris Rop.

Rare on the northern coasts of Norway. Does not appear to belong to the diatom inflow, and is mostly found singly in deep water samples.

Distribution: Rare on the coasts of the Atlantic and the arms of the sea in connection with it. On the west coast of Norway most abundant in the winter. Also known from the Mediterranean. The appearance of *C. stellaris* in the north, suggests that this species is a temperate Atlantic one (and probably oceanic.)

Note. *C. symbolophorus* Grun. (L. 83, p. 82, pl. 4, f. 3—6) is a very nearly related species with considerably coarser structure and different distribution. According to Rattray (L. 124, p. 493) transitional forms to *C. stellaris* occur. *C. symbolophorus* is an arctic and antarctic species (also known from several fossil deposits), which occurs on the west coast of Norway during the inflow of diatoms together with arctic species. In the northern plankton I have also seen it once: $^{6}/_{4}$ 1900, Foldenfjord, 0—100 m.

C. bioculatus Grun.

Grun. L. 83, p. 55, pl. 3, f. 30. Cleve L. 26, p. 10, t. 2, f. 13. *Thalassiosira bioculata* (Grun.) Ostenfeld L. 116, p. 504, f. 120, 121 (?).

This beautiful species, which does not seem to have been found before on the Scandinavian coasts, occurred in several of the samples, especially in 1900, sometimes rather numerous. It is only found during the inflow of diatoms in the spring months.

It is probable that this is the same species which is mentioned by Ostenfeld from the Faeroe Islands (l. c.), and which he has found in chains similar to those of *Thalassiosira*, for which reason he refers the species to this genus as a new subgenus, *Coscinolauderia.*

I have not followed Ostenfeld's example, partly because the genus *Thalassiosira* is getting to be rather heterogeneous and unnatural on account of the newer elements which have been added to it, so that there will soon be nothing left as a reliable distinguishing feature except the mucilaginous thread; partly too because I have not met with any such chains in my material, in which the species, however, never occurred in any important quantity. Perhaps we may be speaking of two different species, although Ostenfeld's figure considerably resembles our species. (The only thing which seems foreign to it, as far as I can see, is the apiculi which are closer and smaller than in our form, and also the lower cells, as I have only seen high ones).

Distribution: Arctic and boreal, according to Cleve (arctic) neritic species, known from the coast of North Siberia, ice near Novaja Zemlja, Greenland, the Faeroe Islands (April—May rare, Aug.—Sept. 1902 numerous, according to Ostenfeld, l. c., who also mentions it from several places in the N. Atlantic).

Note. *Coscinodiscus polyacanthus* Grun. (L 48, pl. 7, f. 127) is a little known and somewhat doubtful species, which occurs on the North Siberian coast and at Franz Joseph's Land. In a sample from Fölstad, $^{4}/_{4}$ 1899, 0—3 m., I found very sparingly a species, which in every respect seems to agree with authentic specimens of *C. polyacanthus* from Jamal (Swedish expedition to Jenessey 1875, slides in possession of the Riksmusæum, Stockholm). (Cfr. under *Coscinosira polychorda*).

C. polyacanthus Grun. var. *intermedia* Grun. (l. c. p. 81, pl. 3, f. 25) is probably another species, if it does not belong to *C. curvatulus* (it has, like this species, interfascicular apiculi). Specimens quite answering to the figure and description of Grunow were found sparingly in a sample from Skjerstadfjord XII, $^{4}/_{4}$ 1900, 0—500 m. Known from Cape Wankarema.

C. radiatus Ehrb.

Exceedingly variable. There are, however, certain distinctive marks by which all forms belonging to this species can be recognized. Gran (L. 70, p. 166) has already well characterized this form: low („coinshaped") cells, flat valve, markings near the border suddenly very small.

The larger forms have a distinct central rosette and often areoles, which increase in size nearly up to the border, and are then *C. oculus iridis*, Ehrb., as this very much disputed species has been described by Grunow and Rattray. From these forms (cfr. Schmidt's atlas, (L. 128) pl. 63, f. 6., which form, however, has larger marginal areoles than usual) there seems to be every transition to the ordinary *C. radiatus* without the central rosette and with markings which are of about the same size nearly up to the border. Grunow (L. 83, p. 25) also observes that *C radiatus* passes into *C. oculus iridis*, but it must be mentioned that he seems to give little or no weight to the convexity of the valve (when this is not particularly conspicuous), and therefore he classes together forms which are alike in structure only, while they, in other respects, can hardly be considered to belong together.

When thus GRUNOW further remarks that there is the most complete transition between *C. asteromphalus* and *C. oculus iridis* and further to *C. radiatus*, and when on the other hand he looks upon *C. centralis* as a variety of *C. asteromphalus*, he has surely gone too far.

On the other hand, there are thick walled, small, coarsely structured forms, which have quite a different appearance to the ordinary *C. radiatus*, and yet which must also be entered under this species. Such forms are *C. devius* A. SCHM. (L. 128) pl. 60, f. 1—4 = *C. radiatus f. minor* A. SCHM. (L. 127, pl. 3, f. 34.)

I have, strange to say, never yet seen any really good drawing of this characteristic species. As it is, however, — as indeed is the case with all species of *Coscinodiscus* — very difficult to figure properly, I must at present give up the thought of giving any figure of it.

CLEVE's meaning with regard to *C. radiatus* is not quite clear to me, as he (L. 40, p. 321) refers to SCHMIDT's atlas pl. 60, f. 9, which does not appear to be at all a characteristic figure of *C. radiatus*, as this species is looked upon by GRAN and myself. CLEVE refers too to GRUNOW's remarks in Diatomeen from Franz Josef's Land (L. 83, cfr. above) and mentions in Phytoplankton (L. 27, p. 23) that *C. radiatus* is scarcely more than a little form of *C. oculus iridis*. CLEVE's opinion of the latter species does not, however, coincide with GRUNOW's and RATTRAY's. For further particulars see *C. subbulliens*.

Rather common. More abundant in deep water samples than on the surface.

Distribution: Rather common all the year round on the coasts of Norway, both the western and northern. Also widely distributed on the European coasts of the Atlantic and its arms, right up to the arctic coasts (Greenland, Jan Mayen, Spitzbergen and Franz Joseph's Land.)

C. centralis EHRB., RATTR.

(Pl. VI, fig. 1).

RATTR. L. 124, p. 555.

This species is very easily recognized, but has been confused with *C. oculus iridis* and *C. concinnus*. It is sometimes not so easy to distinguish it from the latter species, and it is possible that one will not be able with certainty to keep them separate; but the difference from *C. oculus iridis* in (GRUNOW's meaning) as well as from *C. radiatus* is very considerable.

The characteristic marks of the species are the following:

Valve considerably convex (pl. VI, f. 1). Structure radiate with dichotomously branched radii and rather coarse structure (though finer than that of *C. radiatus*). The markings from a rather large central rosette of even size to ²/₃ radius, then gradually somewhat smaller (not suddenly small near the border). Near the margin numerous fine apiculi (in a single row) and with about 120°s space between them. Besides two much larger, short linear, unsymmetrical, marginal ones.

Varies considerably in delicacy of structure and so often closely resembles *C. concinnus*, in common with which species it has the 2 characteristic unsymmetrical marginal and the numerous small submarginal apiculi. These latter may be indistinct, and sometimes (but rarely) not to be found at all, especially when the structure is rather coarse.

CLEVE, who also occasionally mentions *C. centralis* as occurring in the plankton, seems to regard this species as a less distinct form, as a transition between *C. concinnus* and *C. oculus iridis*. As a type for the latter species he quotes (L. 40, p. 319) *C. asteromphalus var. hybrida* GRUN. Franz Joseph's Land (L. 83) t. 3, f. 9. This may perhaps show that CLEVE considers those forms of *C. centralis* which are without distinct marginal apiculi and are of a coarser structure to be *C. oculis iridis*.

In the important work before mentioned on the distribution of species of plankton in the Atlantic (L. 40), the name *C. centralis* is omitted, the coarser forms probably being reckoned as *C. oculus iridis*, and the finer, with marginal apiculi, as *C. concinnus*.

With respect to difference from *C. concinnus*, reference is made to this species, where the structure is more particularly mentioned. Moreover, there appears as a rule to be great differences between the two species in the living plankton; *C. concinnus* developes cells, which are high with very thin walls and consequently very easily altered in shape, and with a strongly convex marginal zone, while *C. centralis* has rather low, thickwalled, firm cells, more flatly ascending towards the centre.

As before mentioned, it sometimes — but only seldom, judging from my experience — seems to be difficult to discern between *C. concinnus* and *C. centralis*, and GRAN (L. 70, p. 167) seems to suppose that the difference depends upon variation in salinity and temperature. My impression is, that they are two comparatively young species, but that they have already sufficiently distinguishing characteristics to enable them to be dealt with as specifically different forms.

This species and the *C. radiatus* are the most frequent of this genus with us.

Distribution: Appears to be widely distributed along the northern European coasts of the Atlantic and its arms. Rather common on the coasts of Norway, both on the west and north. Occurs right up to the arctic coasts but appears chiefly to be a temperate species.

C. concinnus W. SM.

The characteristic form of the living cell is illustrated by OSTENFELD (L. 116, p. 566). Its structure is always very fine, much finer than usual in *C. centralis*. The central rosette has very large areoles.

As a distinguishing feature from *C. centralis* the areoles in the central rosette are several times larger than the others, those in *C. centralis* being only twice as large, or sometimes but very little larger. I am, however, not sure if this difference is always to be found. Besides, the areoles in *C. concinnus* are „little marked" (cfr. GRAN L. 70, p. 168) with comparatively broad hyaline spaces between them, and from the marginal apiculi there are similar rather broad, hyaline stripes radiating inwards at some length on the valve. These hyaline radii give the valve a highly characteristic appearance, which *C. centralis* does not possess.

Distribution: On the whole, the same as that of *C. centralis*, but seems to be still more extended. Seems to be rare on the arctic coasts. On the west coast of Norway frequent in spring and autumn, especially in the spring inflow. On the northern coasts of Norway rare, at any rate in the months January—May.

C. subbulliens n. sp.
(Pl. VI, fig. 2.)

Form: — The valve is clearly convex, with an evenly rising marginal zone. Seen from the side, its contour is almost straight with an angle of between 30 and 40°. The central part (to $^1/_2$ or $^3/_5$ of the radius) almost flat or often somewhat depressed.

Margin: — Clearly defined, broad and sharp, with coarse stripes.

Structure: — No central space. Generally either without or only with a slight indication of central rosette, consisting of a few larger polygons, without any regular arrangement in rosette shape. On larger specimens, a more distinct rosette with five larger areoles, having their narrower ends directed inwards.

The majority of the areoles increase slowly in size from the centre (outside the few larger central areoles) to $^1/_2$—$^3/_5$ of the radius where they are largest. From here they suddenly become much smaller (although not very small) and are about of equal size right out to the margin. All over the valve — both in the central part and further out — smaller areoles are strewn between the larger ones, and this often strongly resembles the structure of *C. bulliens* A. Schm. (hence its name).

Markings polygonal, thick walled with very plain „papillæ". Structure irregularly dichotomously radiate: From the centre numerous radii diverge, generally 2 or more being parallel. In the spaces between such rows of rays, new radii spring out, the first areole often being small. Where the cells have reached their greatest breadth, two new rows often spring out. Here and there, close to the margin, short new rows again fill up the intermediate spaces.

Size: — Rather small, considerably smaller than *C. centralis*, about equal to a little *C. radiatus* in size. Diameter usually 50—100 μ.

The living cell is of medium height, higher than in *C. radiatus* and generally much lower than in *C. concinnus*.

The central areoles, when they are found to be well developed, are 3 × 4 μ.

The areoles outside the central rose 4 on 10 μ, the largest 3,5 μ broad, 2—2,5 μ at the border. Here and there much smaller areoles, 1,5—2 μ.

At the border $5^1/_2$—6 stripes on 10 μ (corresponding to the same number of areoles). The margin 3 μ broad (the areoles being nearly cubic-cylindrical).

This species, which, judging from my experience, is well defined and easily recognisable, resembles the *C. radiatus* most nearly, and may, unless great care be taken, be confused with it; the convex valve and the absence of the very small areoles near the margin will, however, at once show the decided difference.

This species is also Gran's *C. oculus iridis* after his interpretation of this species in Plankton des norwegischen Nordmeeres (L. 70, p. 168), as I have had an opportunity of being convinced of, on comparing some of his plankton samples.

Cleve's *C. oculus iridis* appears to consist in a great measure of this species, judging from his plankton lists, but as he — as above mentioned — refers to Grunow's figure of *C. asteromphalus var. hybrida*, which is hardly specifically different from what Grunow considers to be *C. centralis* Ehrb., it seems to me that Cleve's species must consist of forms which are specifically different from each other.

Grunow's *C. centralis*, which he considers a variety of *C. asteromphalus*, is not so well characterized as Rattray's *C. centralis*, but must, I think, be reckoned as belonging to that species. Grunow's *C. asteromphalus* also belongs to it, answering as it does quite well to the coarser forms of *C. centralis* (Rattr.) having, as a rule, indistinct marginal apiculi. Grunow expressly mentions (L. 83, p. 27) the convexity, while *C. subbulliens* has a gradually descending marginal zone and therefore is less noticeably convex towards the margin.

Ostenfeld, again, considers *C. oculus iridis* not to be specifically different from *C. radiatus* and therefore does not enter it separately from the Faeroe Islands (L. 116, p. 566).

Other authors on plankton have, in their lists, given very various names from districts where, at any rate, partly the same species are likely to occur, from which it will be seen that there is a considerable difference of opinion with regard to *C. oculus iridis*, *C. asteromphalus*, *C. radiatus* and *C. concinnus* (*C. centralis* is not generally mentioned).

As the species here mentioned as *C. subbulliens* does not correspond well to *C. oculus iridis*, as one has reason to believe this species was originally looked upon — large, with large central rosette and thus differing from *C. radiatus* — and as there is such a great difference of opinion with regard to the correct meaning of this name, I have thought it best to determine the characteristics of the species, and to use a new name for this form, which is easily recognized. I have not been able, in spite of careful comparisons, to identify it with certainty with any of the species hitherto described. Of names which might be taken into consideration, I will particularly mention *C. heteroporus* and *C. obscurus*. The latter, especially, has many points of similarity with my species, but it does not seem possible, however, from the figures which have been given, to consider them as being identical.

On the other hand, there are certain forms which have been referred to *C. radiatus*, which surely belong to my species. I will for instance, specially mention tab. 60, f. 14 in Schmidt's atlas (*C. obversus* Rattr.) which fairly well answers to many forms which do not specifically differ from my *C. subbulliens*. As I, however, principally base the right of specific rank upon the peculiar convexity of the valve, (in side view), I cannot, for the sake of perfect clearness, very well use Rattray's name, which represents a species, which is but little known.

It is not to be expected that there can be absolute agreement as to the use of Ehrenberg's names *C. oculus iridis*, *C. centralis*, *C. radiatus* and many other. But one might perhaps more easily agree as to the meaning of the original name, *C. radiatus*, which is already by most authors used as I do here, excepting that, to some extent, other species are also occasionally included therein. If the name *C. radiatus* Ehrb. be retained, there can hardly be any reason for not attaching to it the meaning above mentioned. It is quite another matter, that there are perhaps those who mean that there still are included in this species others, which in the future will have to be culled out.

Further, there can hardly be different opinions with regard to Rattray's *C. centralis*, unless that some may consider the limits of his species to be too confined, while others may find those of mine to be too wide. At present, it appears by many — as above mentioned — to be looked upon as belonging to *C. concinnus* W. Sm., and I have previously also been of this opinion.

On the other hand, I think that *C. oculus iridis* must be sacrificed (as a species), while *C. subbulliens*, which is certainly different to both *C. radiatus* and *C. centralis* may be rescued from chaos.

The two prominent authors GRUNOW and RATTRAY, who have given extensive and thorough monographs on the difficult genus *Coscinodiscus*, have in their exceedingly exact description of the differences in the structure of the valve omitted other important distinctive features, especially the shape of the valve in side view. Both of them, especially RATTRAY, indeed often particularly refer to the convexity, but not by any means in every instance, and they often include forms which correspond in structure, but differ considerably in convexity, in the same species. This circumstance, unfortunately, makes GRUNOW's work, which in other respects is so exceedingly thorough, somewhat incomplete and wanting in clearness.

As far as my experience goes, the convexity of the valve is precisely a very certain distinctive feature, and comparatively easy to apply to living species in the plankton. It is even, as far as I can see, the only guiding thread which will serve to lead us out of an otherwise hopeless and interminable maze. Only it must always be remembered that this — just as is the case with regard to structure — is only one distinctive feature, and may lead to the same unnatural piecemealing which the structure has caused; but that both distinctive features in conjunction can give good results.

What I have, in one instance, in the tables called *C. oculus iridis*, is the above mentioned coarser forms of *C. centralis*.

Distribution: Appears to be an arctic and boreal oceanic species, which is rare with us. It is found scattered at several places on our northern coast, especially in deep water.

Appears to extend along the northern, especially the arctic coasts of the Atlantic (Jan Mayen and Spitzbergen, in E. JÖRGENSEN L. 92 named *C. oculus iridis*) and in the districts where the arctic and Atlantic waters mix.

C. nitidus GREG.

GREG. L. 74, p. 499, pl. 10, f. 45. A. SCHM. L. 127, p. 94, pl. 3, f. 32, L. 128, pl. 58, f. 18.

Only found singly in two of the samples, from the Vest Fiord I, 0—50 m., $^{17}/_{1}$ 1899, and from Senjen $^{21}/_{1}$, 0—130 m.

Probably only come in by chance and really a bottom form, as it is frequent in bottom samples. (Cfr. under that heading.)

Euodia BAIL. (*Hemidiscus* WALLICH.)

E. gibba BAIL.

BAIL. in PRITCH. L. 123, p. 852, pl. 8, f. 22. *Hemidiscus cuneiformis* WALLICH L. 137, p. 42, pl. 2, f. 3—4.

Very rare with us, in deep water, probably come in with Atlantic water. Hitherto hardly found so far north.

Distribution: Chiefly a subtropical and southern temperate Atlantic form, according to CLEVE (L. 40, p. 330) rare north of 50° northern latitude.

Known both from the European and American side of the Atlantic.

Actinocyclus EHRB.

A. Ehrenbergi RALFS.

Frequent in the plankton.

This species is difficult to distinguish from those closely related to it, and seems to vary considerably.

Distribution: Seems to occur all the year round on the west coast of Norway, and probably also on the north coast, here at any rate in the months January—May. Otherwise widely distributed around the European coasts of the North Atlantic and its arms. Occurs exceptionally right up to Greenland, but is not an arctic form. Seems to have a much wider distribution, judging from the statements in *De Toni*. (L. 50).

A. Ralfsi (W. SM.) RALFS.

This species seems to be much rarer on our coasts, both on the west and north, than the preceding one.

Reference should be made to the chapters on bottom samples, where it occurs somewhat more frequently. It is, however, certainly a genuine plankton form, and not a bottom form.

Distribution: Seems to have a more southerly distribution than the foregoing species. Like the latter, it has also been found at Greenland.

A. subtilis (GREG.) RALFS.

RALFS in PRITCHARD L. 123, p. 835. VAN HEURCK Synopsis (L. 88), p. 216, pl. 124, f. 7. *Eupodiscus subtilis* GREG. L. 74, p. 501, pl. 11, f. 50.

Very rare. Occurred very scarce in the plankton from Kvænangen $^{24}/_{1}$ 1899, 0—140 m.

Distribution: Known from the coasts of England, Spain, The Mediterranean, The Azores and The Pacific Ocean.

Note. *A. sparsus* (GREG.) RATTR. seems to occur in the plankton from the northern and western coasts of Norway; but as it is difficult to discern between this species and *A. Ehrenbergi*, I have not included it in my tables. Besides, another form occurs, which certainly is specifically different from *A. Ehrenbergi*, and is perhaps the same as the genuine *Eupodiscus crassus* W. SM. Earlier, I took it to be *A. crassus* VII. but have later become somewhat uncertain respecting this species, whose description (by DE TONI and RATTRAY) does not agree well with VAN HEURCK's drawing. In spite of considerable labour, I have not yet been able to come to any definite conclusion, so that I have not tabulated this form either.

For further particulars, reference should be made to the chapter on bottom samples.

A. subocellatus (GRUN.) RATTR.

RATTR. L. 125, p. 145. *Coscinodiscus curvatulus* var. *subocellata* GRUN. L. 83, p. 83, pl. 4, f. 15. *Actinocyclus curvatulus* JAN. in A. SCHMIDT L. 128, pl. 57, f. 31.

This beautiful diatom is very like *Coscinodiscus curvatulus* and is probably often mistaken for it. Possibly, therefore, it is not quite so rare as it seems to be.

Hitherto only found in a few plankton samples of 1900 (The Skjerstad Fiord, $^{2}/_{4}$, IV, V and XII; The Salten Fiord $^{5}/_{4}$).

Distribution: Certainly not sufficiently known. Judging from the available accounts, only found fossil and at various places in the Ant-arctic regions.

2. *Melosireæ.*

Thalassiosira Cl.

T. Nordenskiöldi Cl.

Occurs in great quantities in April (from the end of March into the month of May) during the inflow of diatoms, both along the western and northern coasts.

Distribution: Arctic and boreal species, occurs in the winter tolerably far south along the European coasts of the Atlantic and its arms (at least as far as The English Channel). On the west coast of Norway and at the Færöes in quantities in the months of March—May, strangely enough in both localities in August with a less marked secondary maximum.

T. gravida Cl.
(Pl. VI, fig. 4).

Like the preceding species in almost every respect. Occurs often together with it. Endocysts frequent in April.

Distribution: On the whole the same as *T. Nordenskiöldi*, but perhaps less decidedly arctic.

T. hyalina (Grun.) Gran.
(Pl. VI. fig. 5).

Gran L. 65, p. 4. *T. Clevei* Gran L. 64, p. 29, pl. 4, f. 60—62. *C. hyalinus* Grun. L. 48, p. 113, pl. 7, f. 128; L. 83, pl. 3, f. 28. Vix *Coscinodiscus kryophilus* Grun. L. 83, pl. 3, f. 21.

Gran remarks (L. 65 p. 4), that he had at first suspected his new species, *T. Clevei*, to be identical with Grunow's *Coscinodiscus kryophilus*, but that he had not then seen the structure of the valve. Later, by the help of material from the Karajak Fiord (Greenland) he felt sure that the species were identical. As, however, Cleve (cfr. Gran) calls attention to the identity of *C. hyalinus* Grun. in Arctic Diatoms (L. 48) with *T. Clevei*, Gran has altered the name.

That *Thalassiosira Clevei* Gran and *Coscinodiscus hyalinus* Grun. are identical, is quite certain. The only objection, which might be made to this, was, that in Grunow's figure of *Coscinodiscus hyalinus* no asymmetrical marginal apiculus is to be seen. By the kind permission of the Riksmusæum in Stockholm I have been enabled to compare the slides (of mud from the Kara Sea) in which Grunow found *C. hyalinus*, and I can affirm that there is always a well marked asymmetrical marginal apiculus, larger than the others. That this is not to be seen in Grunow's figure is evidently (as is also the reason in the case of *Porosira glacialis* and others) because it may so easily be mistaken for a foreign body (dirt) which is only there as a matter of chance. (The preparations referred to were, in fact, rather dirty.)

The specimens of *C. hyalinus* from the Kara Sea altogether plainly showed that this species is identical with the one which occurs on the northern coasts of Norway in the Spring.

On the contrary, it seems to me to be open to considerable doubt as to whether *C. hyalinus* Grun. and *C. kryophilus* Grun. are identical. It is quite strange that Grunow, in an exceedingly careful and exact monograph on the family in question, should illustrate and mention these species as different ones without hinting at any connection between them. Certainly he considered the asymmetrical apiculus to be characteristic of the one species only, *C. kryophilus*: but there is, nevertheless, a great difference in the figures, both with regard to structure and the marginal apiculi. These latter are particularly small in *C. kryophilus*, while in *C. hyalinus* they are very plain and comparatively large. The structure too of *C. kryophilus* is considerably coarser than that of *C. hyalinus*, even if one does not put too much weight on the fasciculi, which in the figure of *C. kryophilus* are very clear and regular, while in *C. hyalinus* they are indefinite.

In material from Cape Wankarema (Vega Expedition) — which material was also kindly lent to me by the Riksmusæum, Stockholm — I really found a Coscinodiscus which seemed in every respect to correspond to *C. kryophilus*. It had just that characteristic form of the asymmetrical apiculus, which is figured by Grunow, and also the very small marginal apiculi, which are much less conspicuous in comparison to the asymmetrical apiculus than is the case in *C. hyalinus*. (Pl. VI, f. 6, a, b.)

Distribution: On the arctic coasts of Greenland, Franz Joseph's Land and Jan Mayen. On the northern coasts of Norway, here only observed during the time of the inflow of diatoms, when the species occurs in large quantities. Towards the south, it has been found at Ona in Romsdal (in the Spring, not rare; cfr. Gran L. 70, p. 170).

Seems not to occur with us in the months of June—February. If it does not then — as Gran supposes — „over-summer" at the bottom by the help of resting spores, it must — if it is actually found wanting in the other months of the year than just the Spring ones — every year be brought in from outside.

T. decipiens Grun.
(Pl. VI, fig. 3).

Coscinodiscus decipiens Grun. in Van Heurck L. 88, pl. 91, f. 10 (from Lamlash Bay). A. Schmidt L. 126, pl. 3, f. 38. *Thalassiosira gelatinosa* Hensen L. 87, p. 87. *Orthosira angulata* Greg. L. 74, p. 498, pl. 10, f. 43 and 43 b.

As it seems to me beyond doubt that Grunow's *Cosc. decipiens* is the same species as Hensen's *Thalassiosira gelatinosa* (as this species is understood by Cleve and others), I have found it necessary to alter the name, the more so as Hensen's description is very incomplete.

I have not had any opportunity of making comparisons with Grunow's work (Algen und Diatomaceen aus dem Kaspischen Meere in Dr. O. Schneider: — Naturwiss. Beitr. z. Kenntniss d. Kaukasusländer, Dresden 1878); but as Grunow himself figures a specimen from Lamlash Bay in Van Heurck's Synopsis, I have thought that I could keep to this figure, which undoubtedly represents the same species which Cleve, and others after him, has called *T. gelatinosa* Hens. Grunow remarks that the species is identical with *Orthosira angulata* Greg.

Gregory's description (L. 74, p. 498) does very well too for our species, less the drawing. It is interesting that Gregory has found the species occurring in chains. His opinion, viz. that these chains are constructed similarly to those of *Melosira* (where the links touch each other), may no doubt be accounted for by the fact that the long marginal apiculi in a side view may so easily produce the same image as the cells.

In the plankton from the northern coasts of Norway, this species appears to vary considerably. Two principal series of forms occur, the one with numerous marginal spines and a not very plain excentric structure, but plain fasciculi; the other with fewer marginal spines and plainer excentric secondary curves. The figures referred to above belong to the latter form. There appears, however, to be so much variety, both in the number of the spines and their distance from each other, and in the number of the fasciculi, that it does not seem adviseable to look upon the two series of forms as being specifically different.

As the species does not always appear to be rightly understood, I have added a few remarks on its structure.

Around a central areole there are, as in *C. excentricus*, 7 areoles forming, in conjunction with the central areole, an indistinct central rosette. From here the areoles decrease in size quickly and evenly right out to the margin. The secondary curves near the margin are nearly straight, often nearly to $^2/_5$ of the radius reckoned from the margin inwards, but further in, towards the centre, decidedly concave outwards, as in *C. excentricus*. The valve is decidedly convex on account of the high and abrupt marginal zone, and is thus easily discerned from *C. excentricus*, which is nearly quite flat. Besides *Thalassiosira decipiens* always has the very long, bent marginal spines. An odd, asymmetrical, spine is always present.

In side view the chains may very easily be taken for *T. Nordenskiöldi*, whose structure, however, is altogether different.

Only observed during the inflow of diatoms, at which time it was abundant and frequently (especially in 1900) in large quantities.

Distribution: Seems to be the same as that of *Thalassiosira Nordenskiöldi* and *T. gravida*, and is often met with in their company. Yet, the secondary maximum in August is wanting (on the west coast of Norway and the Faeröes), and the species is, on the whole, very rare except at the time of the Spring inflow.

Coscinosira Gran.

C. polychorda (Gran) Gran.

As I have mentioned in an earlier paper, (L. 92, p. 24), this species may easily be confused with *Coscinodiscus lineatus*, as the characteristic transverse processus are often difficult to discover, and it seems possible that thy may be altogether wanting. The most frequent form with 6 fasciculi corresponding to 6 transverse processus will, thus, on the whole, have the same structure as *Cosc. lineatus*, only much finer. The specimens which I have tabulated as *Cosc. lineatus var.* from a few places, are perhaps such forms of *Coscinosira polychorda* where the transverse processus are wanting.

Marginal apiculi, granules and various other processus on the valves of diatoms seem to be rather inconstant, or at any rate very varying, which probably is owing to their being more or less incompletely silicated.

Very rare, except at the time of the inflow of diatoms, when it is abundant.

Distribution: On the whole, the same as *Thalassiosira Nordenskiöldi* and *T. gravida*. It appears to occur all the year round on the west coast of Norway, where it has, at any rate, been found in most months; but it is common only during the inflow in the Spring.

Porosira n. gen.

Structure of the valve is in the only known species very fine, in other respects as *Podosira hormoïdes*. Over the whole surface, thickest along the margin, scattered pores which probably are the perforations of more or less plain short, hollow spines. Such are seen near the margin after destruction of the organic matter by burning.

Inside the margin at one spot on the surface, a large, strong, odd (asymmetrical) spine. The connective zone is apparently formed of numerous rings, which, owing to their delicacy, are rather indistinct.

Forms chains, of two or a few links, in which the latter are joined together by a short, and very thick, central mucilaginous band, in which one may with some difficulty discover fine threads. The band seems almost to be structureless and is as good as invisible in water, but is easily seen on colouring with various dyes e. g. methylene blue and gentian violet.

Chromatophores, on the whole, the same as in Coscinodiscus, polygonally roundish discs scattered along the valves and the connective zone.

It seems to me to be somewhat unnatural, like Gran, to refer the following species to the genus *Lauderia*. I think it would be best to limit that genus to those species only which form stiff chains of links which touch each other). On the other hand, the difference between this species and *Thalassiosira* is so great that it should scarcely be considered as belonging to this genus either, notwithstanding that the chains, generally speaking, are similarly formed. There is too, according to my opinion, another important difference in the structure of these genera, which I hope to be able to explain more fully on a later occasion.

The genus *Podosira* forms stipitated chains (of 2 or a few individuals). Perhaps it will, however, prove not to be possible to carry out a systematic classification based upon such principles, although it would seem to be an important consideration, in a natural system, whether a chain colony is swimming freely about (plantonic) or is fettered. On the other hand it may perhaps be found that several species of Coscinodiscus with scattered dots on the surface will find a more natural place in my proposed genus *Porosira*.

P. glacialis (Grun.)

(Pl. VI, fig. 7).

Podosira hormoides var. *glacialis* Grun. L. 83, p. 56, pl. 5, f. 32. *P. glacialis* (Grun.) Cl. L. 27, p. 24. *Lauderia glacialis* (Grun.) Gran L. 68, p. 111.

Out of the pores of the valve extend fine threads, which are only seen with difficulty, in a very thick, short mucilaginous cylinder, which connects both valves. Probably similar threads extend without this cylinder.

There are also near the margin, long fine, mucilaginous threads which extend obliquely outwards and downwards, and probably serve as a floating apparatus. Precisely similar threads are found in Thalassiosira gravida, whose structure is remarkably like that of the above species.

Very scarce except during the inflow of diatoms, but then very frequent and often in great quantities, especially in 1899.

Distribution: Yet unsufficiently known, but probably, on the whole, the same as *Thalassiosira Nordenskiöldi*. Also found in the Kara Sea. Numerous in the year 1900 during the inflow of diatoms in the Spring on the west coast of Norway.

Sceletonema *costatum* (Greg.) Cl.

Distribution: Very frequent on the west coast of Norway, often in large quantities. Occurs all the year round, but varies very much in quantity. On the north coast April—May; here too there are very great variations in quantity. Also more or less frequent on the northern European coasts of the Atlantic and its arms. Known too from a few places on the tropical coasts (Bengal, Java, Hongkong, The West Indies) and from Japan.

Paralia *sulcata* (Ehrb.) Cl.

Hardly a true plankton form, at any rate not with us. Is very frequent in bottom samples (cfr. the corresponding chapter) from Nordland and Finmarken. The few specimens which have been found in plankton samples, especially from deep water near the bottom, have probably come there quite by accident. The numerous valves which are found in bottom samples, cannot be considered to come from plankton, for then one would expect to find the species, at any rate occasionally, numerous in plankton samples, which is, however, as far as my experience goes, never the case, at least with us. Nothing is proved either by the presence of a few solitary individuals in samples taken far from the bottom, as such individuals may have been brought there with algæ which have been torn away or — when they are found in diatom slides — may have been swallowed by crustacea or similar small animals.

Distribution: Frequent on the northern coasts of the Atlantic (on the American side from the coast of Central America) right up to Greenland and Franz Joseph's Land. Mentioned as occurring (February 1903) now and then in abundance in surface samples from the English Channel (L. 18).

Hyalodiscus Ehrb.

H. scoticus (Kütz.) Grun.

No true plankton form. Frequent in bottom samples (cfr. the corresponding chapter).

H. subtilis Bail.

Bail. L. 8, p. 10. f. 12.

In a plankton sample from Malangen $^{29}/_{1}$ 1899, 0—300 m., a few single specimens were found which seemed to belong to this species.

Hardly any true plankton form.

H. stelliger Bail.

Doubtful as a true plankton form. Neither is it frequent in bottom samples. Perhaps come in with algæ.

Distribution: The northern European coasts of the Atlantic and its arms.

On the west coast of Norway found all the year round in plankton, but always in small quantities. Mentioned from the English Channel in surface samples, occasionally numerous (especially in February 1903), often together with *Paralia sulcata*.

3. *Eupodisceæ.*

Roperia Grun. in Van Heurck.
(L. 88. pl. 118).

R. tessellata (Rop.) Grun.

Grun. l. c. pl. 118, f. 6—7. *Eupodiscus tessellatus* Rop. L. 126, p. 19, pl. 3, f. 1 a, b. *Actinocyclus tessellatus* Ralfs in Pritch. (L. 123) p. 835.

Peculiar structure (cfr. Van Heurck's Synopsis). It seems, however, that it may well be included, at any rate as a subgenus, in the genus *Actinocyclus*.

This beautiful species occurs only singly and rarely in the plankton, in deep water samples in 1899: — $^{13}/_{1}$ The Vest Fiord I, 0—180 m.; $^{21}/_{1}$ Senjen, 0—130 m.; $^{21}/_{2}$ Henningsvær, 0—250 m.

Distribution: Occurs, according to Cleve, on the coasts of Scotland. Scarcely a litoral, but certainly a true plankton form. Also known from the coasts of France and England. It has most likely been overlooked, and is probably more frequent than the few places mentioned would indicate. Also occurs on the west coast of Norway, but seldom (Feb. 1899). I have also seen it in oceanic plankton samples outside the north west coast of Norway (S/S Michael Sars 1901).

Judging from its occurrence with us, it gives the impression of being a temperate, Atlantic, oceanic species.

Auliscus Ehrb.
L. 54, p. 270.

A. sculptus (W. Sm.) Ralfs.

Ralfs in Pritch. (L. 123), p. 845, pl. 6, f. 3. Van Heurck L. 88, pl. 117, f. 1—2. *Eupodiscus sculptus* W. Sm. L. 134, I, p. 25, pl. 4, f. 39.

No true plankton form. Frequent in bottom samples, both from the northern and western coasts of Norway. (Cfr. the corresponding chapter.)

4. *Asterolampreæ.*

Actinoptychus undulatus (Bail.?) Ralfs.

I am not sure if this species really is a true plankton form. It occurs especially in deep water samples and always very scarcely. It is not numerous in bottom samples either.

Distribution: Has a wide distribution on the northern European coasts of the Atlantic and its arms, and is found right up to Greenland. Is not considered by Cleve and Ostenfeld to be a genuine plankton form.

Is mentioned (L. 18, IV) as occasionally frequent in surface samples from the English Channel (Feb. 1903). In the same samples, other doubtful plankton forms, such as *Paralia sulcata* and *Hyalodiscus stelliger*, also occur more or less frequent.

Asteromphalus *heptactis* (Bréb.) Ralfs.

Very rare: January 1899, especially in deep water samples.

Distribution: With us a southern, oceanic species, which is very rare both on the west and north coast, and especially (only?) occurs in the winter months. According to Cleve (L. 40, p. 284) widely distributed in the temperate part of the Atlantic.

5. *Biddulphieæ.*

Biddulphia Gray.

B. aurita (Lyngb.) Bréb.

Occurs very rarely in January and February, but much more frequently during the period of the diatom inflow. and then occasionally in larger quantities.

Distribution: On the northern coasts of the Atlantic and its arms, right up to the arctic regions. (Greenland). Arctic and boreal species, on the west coast of Norway and off the Faeröes only found in the months of Spring.

B. mobiliensis Bail.

Very rare and only singly.

Distribution: Appears to be a southern form, which is not found all the year round on the coasts of Norway. On the west coast, it is most frequent in February and November. According to Cleve, in large quantities on the coast of the British Isles.

February 1903 in abundance in the English Channel (L. 18, IV).

Eucampia *groenlandica* Cl.
(Pl. VI, fig. 8).

Only found twice: Brettesnes, $^{4}/_{4}$ 1899, 0—3 m., Ingöhavet $^{24}/_{4}$ 1890, 0—300 m.

Distribution: Arctic coast: Baffins Bay, Davis Strait, Greenland. Also found, single specimens, on the coasts of Bohuslän (Sweden) and Scotland.

6. *Chætocereæ.*

Detonula *confervacea* (Cl.) Gran.

Lauderia confervacea Cl. L. 26, p. 11, pl. II, f. 21. *Detonula confervacea* Gran L. 68, p. 113.

Specimens, which seemed to belong to this species, were seen singly in one of the samples: — Fölstad $^{4}/_{4}$ 1899, in a surface sample (0—3 m.).

Distribution: Baffin's Bay. A closely related species, *D. cystifera* Gran l. c. p. 113, pl. 9, f. 15—20, has been found in the Lim Fiord in Denmark, in the winter.

Bacterosira Gran.
L. 68, p. 114.

B. fragilis (Gran) Gran l. c.

Lauderia fragilis Gran L. 65, p. 115, pl. 1, f. 12—14.

Occurs only during the inflow of diatoms in the spring months. Very frequent from the beginning of April, often in great quantities.

Distribution: Does not occur on the west coast of Norway. Decidedly arctic species. Found earlier by Gran on the coast of Nordland and Finmark (April 1901.) Also known from Greenland, the sea west of Novaja Semlja (S/S Heimdal, May 1900, cfr. Gran L. 70, p. 170), several places on the north and west coasts of Iceland and Greenland (May and June 1898, cfr. Cleve L. 40, p. 331) and right up to Spitzbergen and the sea between Spitzbergen and Iceland (May and July 1899; cfr. Cl. l. c.)

Ditylium *Brightwelli* (West.) Grun.

Rare and scarce.

Distribution: According to Cleve (L. 40, p. 325) very frequent in the English Channel, the North Sea and Skagerack, only scarce in the Atlantic. Can hardly be considered as native on the west coast of Norway, but is found here in small numbers in most months of the year. Numerous in February 1903 (scarce in May of the same year, L. 18, IV). Probably comes to us from the more southern coasts.

Rhizosolenia Ehrb.

R. alata Brightw.

Very rare and only scarce.

Distribution: Widely distributed in the southern and northern temperate districts of the Atlantic. (Cf. Cleve L. 40, p. 337). In the English Channel occasionally frequent in February 1903 (L. 18, IV). Hardly to be considered native on the west coast of Norway, but found in small numbers in nearly all the months of the year. Comes to us as a southern oceanic form. Also known from Mediterranean, the Indian and the Pacific Ocean.

R. styliformis Brightw.

Only once found: — Skroven $^{4}/_{2}$ 1899, in a deep water sample, scarce.

Distribution: Widely distributed from the warmer districts of the Atlantic right up to Greenland and Spitzbergen. On the west coast of Norway most frequent in the summer months. The same at the Faeroe Islands. Comes to us as a southern oceanic form. Also known from the Mediterranean, the Indian Ocean and the Pacific Ocean.

R. Shrubsoli Cl.

Only found scarce in two samples: — $^{12}/_{4}$ 1899 Malangen 0—100 m., and $^{21}/_{3}$ 1900 Balstad, 0—50 m.

Distribution: Distributed over the temperate European coasts of the Atlantic. Occurs on the west coast of Norway and at the Faeroe Islands all the year round, most frequent in the summer months. According to Gran (L. 70, p. 173) at Ona (Romsdalen), occasionally, from May to October. It would thus appear to be stationary on the west coast of Norway, but not on the north coast. Quite exceptionally found northwards right up to Greenland. Also known from the Mediterranean, the Indian Ocean and Japan (cf. Cleve L. 40, p. 348).

R. semispina Hens.

Very rare and only singly.

Distribution: Occurs as an oceanic form in large numbers in the arctic waters and in the boundaries of the arctic and Atlantic waters. Not frequent on the coast of the Faeroe Isles, nor on the west coast of Norway, where it is, nevertheless, found in most months, most frequent in November (1898). According to Cleve, also known from Hudson's Bay.

R. setigera Brightw.

Only once found: — 14/4 1899 Malangen, in a deep water sample.

Distribution: Neritic species, scarcely to be considered native to the Norwegian coasts. Known from the coasts of France, England and Scotland, as well as from the Skagerack and the west coast of Norway. Gives the impression of being brought to the latter from the southern coasts in the autumn, but also occurs in the winter and spring months, but always in small numbers. Has therefore probably also a (smaller) northern area of distribution. (Is reckoned by Cleve to be a southern and northern neritic species).

Corethron *hystrix* Hens.

Very rare and only scarce.

Distribution: Comes to us as a southern oceanic form. On the west coast of Norway also very rare (1898). Rare too near the Faeroe Isles. Distributed in the Northern temperate Atlantic up to Iceland and East Greenland.

Chætoceros Ehrb.

C. borealis Bail.

Occurs in numerous samples, but always in small numbers.

Distribution: Arctic and northern temperate, oceanic form, which often occurs in very large numbers in arctic waters and in the boundaries between these and the Atlantic. On the west coast of Norway, 1898, more or less frequent in most months, especially in May—July. A similar state of things was found at the Faeroe Isles.

C. densus Cl.

Does not seem to be frequent. Is, however, perhaps often mistaken for other forms.

Distribution: Appears to be a southern form.

C. densus Cl. var. **rudis** Cl.

The form entered in the tables for 1900 under this name is uncertain. Although in side view as well as by its unusually coarse and coarsely dentate awns recalling the illustration of *Chaetoceros borealis* var. *rudis* in Cleve's Phytoplankton (L. 27) pl. 1, f. 5, it differs in some other points; neither do I know the shape of the terminal awns nor their direction in Cleve's species.

It is, at any rate, very improbable that my species is the same as *C. coarctatus* Laud., which Cleve (L. 40, p. 308) mentions as being the right name for the form which he previously called *C. borealis* var. *rudis*.

C. danicus Cl.

Very rare and only scarce. Only found in a few samples: 4/4 1899, Helle, 0—3 m., 20/3 1900, Höla, 0—50 m. and the Salten Fiord, 5/4 1900.

Distribution: The northern European coasts of the Atlantic and its arms as far as the Baltic. On the west coast of Norway it is found most months, but most frequently in the summer.

C. criophilus Castr.

Cfr. E. Jørgensen L. 92.

Only once found: 24/4 1899, in the sea off Ingö.

Distribution: Appears to be a decidedly arctic species, which often occurs in very large quantities in the arctic waters and in their boundary towards the Atlantic. Its distribution is, however, not sufficiently known, as it has been confused with the following species.

C. convolutus Castr.

Cfr. E. Jørgensen L. 92.

Frequent during the inflow of diatoms in spring, often rather numerous. Otherwise scarce.

Distribution: Appears to be an arctic and boreal species, which often occurs in large quantities in the arctic waters and their boundary towards the Atlantic (Jan Mayen 1897). On the west coast of Norway found all the year round, but always in small numbers. It may be possible that this species is neritic rather than oceanic. Frequent in May 1903 in the English Channel (L. 18, IV).

C. atlanticus Cl.

Frequent, but only as an exception somewhat numerous, generally only scarce.

Distribution: Arctic and boreal oceanic form, often occurring in very large quantities in the arctic waters and their boundary towards the Atlantic. (Cfr. E. Jørgensen L. 92). On the west coast of Norway found in most months, but, as a rule, scarce. Common off the Faeröes in spring.

C. decipiens Cl.

Frequent during the diatom inflow in spring, otherwise rare and scarce. Decidedly more frequent in the samples of 1900 than in those of 1899.

Distribution: Arctic and boreal oceanic form which seems to bear the change from the arctic to the Atlantic waters particularly well. Often occurs in abundance in the boundary waters. On the west coast of Norway, rather common, reaching its maximum in April (1898). This also the case at the Faeroe Islands. Also very abundant on the west coast of Norway in the months July—September (1898).

C. teres Cl.

Frequent in the samples, but always in small numbers.

Distribution: Arctic (oceanic?) and boreal form, which only as an exception appears to be found more numerous. On the west coast of Norway very scarce, though found in most months. Near the Faeroe Islands frequent in the months March—June, at other times rare. At Ona (cfr. Gran L. 70, p. 178) from March to July, most frequent in April.

My opinion is that this is an oceanic species rather than a neritic one, and is hardly native on our coasts. (Has been repeatedly found with endocysts, therefore, according to Gran, neritic, but a form which may often drift far out into the open sea).

C. contortus Schütt

Generally speaking rare and scarce, only occasionally numerous during the diatom inflow in the spring of 1899.

Distribution: More or less frequent on the northern European coasts of the Atlantic and its arms. On the west coast of Norway frequent, often numerous; most likely here native.

C. similis Cl.

Very scarce (in three samples) and only singly.

Distribution: On the west coast of Norway somewhat frequent, especially at the beginning of the diatom inflow (March 1898). Does not occur in all the months of the year here neither. Off the Faeroe Islands not rare in the months of Aug.—September 1902, otherwise only once in March 1901 (cfr. Ostenfeld L. 116, p. 573). According to Gran L. 70, p. 179 on the north east coast of Iceland, scarce. Otherwise found more or less scarce on the coasts of the North Sea and Skagerack.

According to Gran, this species is neritic (endocysts being found). My opinion is that it is probably neritic, but not likely to prove native with us.

C. constrictus Gran.

Very rare and scarce, only found twice: $^{24}/_{4}$ 1899, in the sea off Ingö, 0—300 m.; $^{1}/_{5}$ 1899. Vardö, 0—200 m.

Distribution: Occurs on the northern coasts of the Atlantic on the American side, off Iceland, the Faeroe Islands, Great Britain and the coasts of the North Sea. On the west coast of Norway found in 1898 nearly all the year through, most numerous in April and November. Does not appear to be native on the northern coasts of Norway.

C. laciniosus Schütt.

On the whole rather rare and scarce, although occasionally more frequent in the month of May 1899.

Distribution: Northern temperate coast form. On the west coast of Norway frequent; occurs during most months, but seldom numerous. Rare round the Faeroe Islands. At Ona in Romsdalen March—October, reaching its maximum in May. (Cfr. Gran L. 70, p. 178).

C. brevis Schütt.

Cfr. E. Jorgensen L. 91, p. 12 and Ostenfeld L. 114, p. 295.

Very rare and scarce, only found in two samples: $^{4}/_{4}$ 1899, Helle, 0—3 m.; $^{6}/_{4}$ 1900, the Folden Fiord I, 0—100 m.

Distribution: Not sufficiently known, as this species has been confused with the foregoing one. Rare on the west coast of Norway, and generally found singly; noticed in the months of August, November and December. In the English Channel in May 1903, scarce. Does not appear to be native on the northern coasts of Norway.

C. Schüttii Cl.

Very rare and scarce, only found in two samples: Lyngen, $^{27}/_{1}$ 1899, 0—50 m.; Malangen $^{29}/_{1}$ 1899, 0—300 m.

Distribution: Southern form, distributed along the coasts of the North Sea. Rather rare on the west coast of Norway, (1898: August—September, November—December). Often found in the open sea. Round the Faeroe Islands, both in an easterly and westerly direction, at considerable distance out, in quantities in May 1903 (L. 18, IV). Seems to come to us as a southern oceanic form.

C. Willei Gran

Rare and scarce, only found in a few samples. Most likely the same form which is mentioned by Ostenfeld from the Faeroe Islands (L. 116, p. 573) as an intermediate form between *C. Schüttii* and *C. Willei*.

Distribution. Frequent on the west coast of Norway and probably native here. Distributed along the coasts of the North Sea, and extends farther northwards than the foregoing species. Does not, however, appear to be native to the northern coasts of Norway.

C. diadema (Ehrb.) Gran.

Common and in great quantities during the diatom inflow in spring; at other times rare and singly. Often found with endocysts.

It is possible that there are, in this species, still included specifically different forms.

Distribution: Arctic and boreal coast form. Rare round the Faeroe Islands. Found in most months of the year, but as a rule not numerous, on the west coast of Norway. Very frequent at Ona, in Romsdalen, in March—April, less so in June—July. (Gran L. 70, p. 179).

C. furcellatus Bail.

In large quantities during the diatom inflow in the spring of 1899, less abundant in the samples of 1900. May easily be confused with other species, when its characteristic endocysts are wanting. In 1900 they were mostly absent.

Distribution: Arctic coast form, widely distributed from the coasts of Iceland right up to the arctic regions, both on the American and European side. Wanting on the west coast of Norway and round the Faeroe Islands. Frequent in March—April at Ona (Gran L. 70, p. 180).

C. curvisetus Cl.

Very rare and scarce, only found in two of the samples, Helligvær, $^{12}/_{4}$ 1899, 0—50 m., and Balstad, $^{21}/_{5}$ 1900, 0—50 m.

Distribution: Southern coast form from the temperate, European coasts of the Atlantic, northwards to Skagerack, the North Sea and the west coast of Norway. On the latter coast, frequent in nearly every month of 1898, most numerous during the summer. Ona: March, July—August, occasionally (Gran L. 70, p. 179).

Very seldom noticed as far north as Spitzbergen. Not mentioned from the Faeroe Islands.

C. debilis Cl.

Frequent during the diatom inflow in spring, often in large quantities; at other times very scarce.

Distribution: Distributed along the northern European coasts of the Atlantic, the North Sea and Skagerack. On the west coast of Norway and round the Faeroe Islands very frequent, with maximum twice a year, in the spring months and in August. Also found near Greenland.

C. socialis Laud.

In large quantities during the diatom inflow in spring. Endocysts very frequent.

Distribution: Arctic coast form. Occurs in quantities also on the west coast of Norway during the diatom inflow in spring. Only occasionally round the Faeroe Islands.

I b. Pennatæ.

7. *Synedreæ*.

Thalassiothrix Cl. et Grun.

T. longissima Cl. et Grun.

In 1899 rare and scarce, in 1900 not observed.

Distribution: Oceanic species, distributed over the northern part of the Atlantic from the American to the European side, right up to Spitzbergen. On the west coast of Norway in 1898 found during most months of the year, but always scarce. Very rare round the Faeroe Islands.

T. nitzschioides Grun.
(Pl. VI, fig. 11).

Grun. in VH. Syn. (L. 88), pl. 43, f. 7—10.

(In the tables *T. Frauenfeldii* and *T. Fr.* var. *nitzschioides*).

This species is certainly the same as the one which, in nearly all plankton tables, is called *T. Frauenfeldii*. Strangely enough, Cleve refers (L. 40, p. 356 & 357) to VH. Synopsis pl. 37, f. 11—12 and, for „the variety" *javanica* Grun., f. 13. The species which corresponds to figures 11 and 12, and which I know from the Indian Ocean, is, however, very different from the one which is so frequently seen in the coast plankton in our latitudes. The „variety" *javanica* Grun. does correspond better with regard to the closeness of the puncta, but, in other respects, differs so much that it can hardly be considered to be the same as our common plankton species. On the other hand, it is also in structure so different from what is taken to be the main species that it cannot be united with it unless, (as perhaps is the case, although I have never seen any mention of such) there are a number of intermediate forms.

But our plankton species, as far as I can see, corresponds in every respect to *Thalassiothrix? nitzschioides* Grun. It is true that this species does not answer well to the characteristics of the genus *Thalassiothrix*, but is yet so different in important points from the genus Synedra that I think it should better be referred as a subgenus *Thalassionema* (Grun.) to *Thalassiothrix* rather than be retained in the genus Synedra.

I have earlier thought, from the description given by *De Toni* of the structure of these forms (L. 50, p. 672—673), that all three (*T. Frauenfeldii*, *T. javanica* and *T. nitzschioides*) should be considered as one species (cfr. E. Jorgensen L. 91, p. 22), but have since not found, after my own experience, any definite reason for so doing.

More or less frequent, especially during the diatom inflow in the spring of 1900, but never noticed in such large quantities as in more southerly samples.

Distribution: This species is certainly neritic, but the genuine *T. Frauenfeldii* is probably oceanic. Is widely distributed along the coasts of the northern Atlantic and its arms, northwards as far as Greenland. On the west coast of Norway common, in large quantities in the spring.

Fragilaria Lyngb.

F. oceanica Cl.

Cl. L. 22, p. 22, pl. 4, f. 25 a, b. Gran L. 65, p. 8, pl. 1, f. 6—9.

In large quantities during the diatom inflow, at other times absent. Strange to say it appears all at once in large quantities.

Distribution: Arctic coast form. According to Cleve also found in Hudson's Bay. Is not found so far south as Bergen, on the west coast of Norway. At Ona frequent in March—April, according to Gran (L. 70, p. 180).

F. cylindrus Grun.
(Plate VI, fig. 9).

Grun. L. 83, p. 55, pl. 2, f. 13. Gran L. 65, p. 8, pl. 1, f. 4—5.

Occurs together with the preceding species in large quantities in spring.

Distribution: On the coast of North Siberia, Frantz Joseph's Land and Greenland; in quantities in May in Davis Strait (Cleve L. 26). Probably a neritic arctic species. Not mentioned before from Norway. In the Barents Sea, 71° 48′ n. lat., 49° 38′ e. long. $^{31}/_{5}$ 1900, numerous together with the preceding species.

F. islandica Grun.
(Pl. VI, fig. 10).

Grunow in VH. L. 88, pl. 45, f. 37.

In some few samples from 1900 during the diatom inflow in spring a species was observed, which I think is identical with the one above mentioned. It occurred sparingly, but in rather long chains. I have not, however, succeeded in seing it in valvar view.

Distribution: Jan Mayen (l. c.) By Cleve also once observed numerous in the North Sea (L. 27, p. 3), together with northern neritic species.

8. *Plagiogrammeæ*.

Glyphodesmis *Williamsonii* (W. Sm.) Grun.

Hardly a genuine plancton form. Here, as on the west coast of Norway, probably brought in by (or torn off from) species of fixed algæ (sea—weed).

9. *Tabellarieæ*.

Grammatophora Ehrb.

G. islandica Ehrb. and *G. oceanica* Ehrb.

Not genuine plankton forms, only torn off from algae, or carried on with them.

Rhabdonema Kütz.

R. minutum Kütz., ***R. arcuatum*** (Lyngb.) Kütz. and ***R. adriaticum*** Kütz.

Not genuine plankton forms, most likely by accident brought along from fixed algae.

Striatella *unipunctata* (Lyngb.) Ag.

Very rare and scarce. The Vest Fiord ¹/₂ 1899, 0–200 m., the Ögs Fiord II, ¹⁴/₃ 1899, 0—200 m., and the Skjerstad Fiord V, ²/₄ 1900, 0—420 m.

Hardly a genuine plankton form, by chance brought in from fixed algae.

Distribution: Widely distributed along the temperate coasts of the Atlantic. Also mentioned from Finmark, where it, however, to judge from the bottom samples, appears to be rare.

10. *Nitzschieæ.*

Bacillaria *socialis* Greg.

Greg. L. 75, p. 80, pl. 1, f. 45. VII. Synopsis (L. 88), pl. 61, f. 8.

(Wrongly entered in the tables as *B. paradoxa).*

Not a genuine plankton form. Only very sparsely and quite exceptionally noticed in the plankton. Frequent in the bottom samples.

Distribution: The coasts of the Atlantic from Portugal to the arctic regions (Sea of Kara). Also mentioned from the Baltic and the Antilles.

Nitzschia Hass.

N. seriata Cl. (including ***N. fraudulenta*** Cl.)

Only found during the inflow of diatoms in spring, then almost always frequent, and often numerous.

Distribution: Arctic and boreal species. It seems to be a neritic species, which may perhaps be native to our west coast where it is found more or less abundantly during most months (of 1898), often in quantities, most numerous in May—June. Off the Faeroe Islands generally very sparsely, but numerous in June 1898. Also known from Greenland, Spitzbergen and the Barents Sea (S S Heimdal 1900, ²¹/₅, 71° 48′ n., 49° 38′ east, sparsely). Cfr. Cleve L. 40, p. 335, where he mentions the species as being specially distributed between Scotland, Iceland and Greenland. He also (l. c.) mentions that *var. fraudulenta* is known from the Mediterranean. It is therefore probable that there are two species; the one, *N. fraudulenta* Cl. having a southern distribution and being probably oceanic, while the other is neritic and arctic.

N. delicatissima Cl.

Cl. L. 27, p. 24, pl. 2, f. 22.

This species is so small, more particularly so narrow, that it must be supposed as a rule to go through the net. In the plankton material at my disposal it has certainly in the majority of cases been retained by the colonies of *Phæocystis.*

Like the preceding, only found during the inflow of diatoms in spring, then frequent, and in all probability much more so than would appear from the tables.

Distribution. Probably, like the preceding species, really an arctic, neritic species, which, however, seems to thrive in the water mixed with the warmer Atlantic. Also, like the preceding species, found off the Faeroe Islands. Known too from Spitzbergen and Skagerack where it occurs in winter. At Ona (cfr. Gran L. 70, p. 181) frequent in June—July 1900.

N. hybrida Grun.
(Pl. VI, fig. 12).

Cl. and Grun. L. 48, p. 79, pl. 5, f. 95. VII. Synopsis (L. 88) pl. 60, f. 4—5.

I have included, under this heading, a number of forms which frequently occurred during the inflow of diatoms in the spring of 1899 and 1900, although generally only in small numbers. They are not in every instance entered in the tables, and are considerably more frequent than would appear from them. Seems to be a genuine plankton form. I have illustrated some of these forms (Pl. VI, fig. 12). Figure 12 a represents those which are most frequent, but they are most often less distinctly constricted in the middle, often of an even breadth.

Striæ I have only seen on the one illustrated by fig. 12 c (about 27 on 10 μ) which differs considerably from the ordinary form, also in the number of puncta on its keel (13 on 10 μ).

The closely allied species *N. (hybrida var.?) pellucida* Grun. has the puncta on the keel somewhat closer (13—14 on 10 μ) but in other respects it answers better to the forms which I have observed.

Grunow mentions (l. c.) that there are a number of intermediate forms, which it is difficult to define, between *N. bilobata* and *N. hybrida.* All my forms have the keel puncta more widely separated in the middle; they are often comparatively long and there is a decided trace of a central nodule. The keel appears to be very eccentric — I have, however, only in a couple of instances seen the species in valvar view, cfr. fig. 12 d — so that there seems to be a connection with the forms which are related to *N. dubia* W. Sm.

Seems to be a genuine plankton form. It is (with us) only slightly siliceous and often occurs in pairs, quite rarely also in short chains of several links.

Distribution: Arctic and boreal coast form. Known from Greenland, Spitzbergen, the Barents Sea, (S S Heimdal 1900, ³¹/₅, 71° 48′ n., 49° 38 east, in small numbers, the same form as with us) and the Kara Sea. Cfr. De Toni (L. 50, p. 513) who mentions it as occurring also on the coasts of Great Britain.

N. bilobata W. Sm.

W. Sm. L. 134, p. 42, pl. 15, f. 113. VII. Synopsis p. 175, pl. 60, f. 1.

Occurs very seldom and only singly. Hardly a true plankton form.

Distribution: Widely distributed on the temperate European coasts of the Atlantic.

N. frigida Grun.

Cl. and Grun. L. 48, p. 94, pl. 5, f. 101.

Rather rare and always in small numbers, there is a form which corresponds to the illustration mentioned where there is given a front view of this species. Besides typical forms, others also occur which are hardly any broader in the middle.

I have not seen this species in valvar view. It seems unlikely that my species should have the characteristic form of valve as illustrated by Oestrup, L. 138, pl. 8, f. 99 a—e.

Distribution: Arctic, neritic form, known from Greenland, the Barents Sea and the Kara Sea.

N. arctica Cl.
(Pl. VI, fig. 15).

Cl. L. 26, p. 21, pl. 1, f. 21, 22.

Rather frequent, but always in small numbers, there occurs a species which it has been difficult to determine with certainty. It was noticed both in 1899 and 1900, but only during the inflow of diatoms, and is only entered in the tables for 1900, under the name of *N. recta* Hantzsch, which is, however, a wrong one. I thought afterwards that it might perhaps be a straight form of the high arctic species *N. lævissima* Grun., but finally held to the designation *N. arctica* Cl.

I have also here observed a number of forms which are more like each other than the corresponding ones of *N. hybrida.*

The keel is very eccentric, the puncta very little lengthened in width, $7^1/_2$—10 on 10 μ, the two in the middle being more widely separated and there is a trace of a central nodule. The valve is narrow lanceolate, acuminate.

The cell in side view is long and narrow, linear, somewhat broader in the middle, with truncate ends. The connective zone longitudinally striated.

Varies much in length, 60—100 μ, the cell is 7—12 μ broad in side view, the valve 4—5 μ broad.

Strangely enough no striæ were to be seen. All the specimens I examined were, however, thin walled.

Seems to be with us a true plankton form.

Distribution: On the north east coast of Siberia (Cape Wankarema) and Davis Strait. Probably an arctic coast form.

N. angularis W. Sm.
(Pl. VI, fig. 14).

W. Sm. L. 134, pl. 13, f. 117. VH. L. 88, p. 177, pl. 62, f. 11—14.

Not a true plankton form. Cfr. the chapter on bottom samples.

Rare and scarce during the diatom inflow a little form occurred (Pl. VI, fig. 14, a, b), which answers well to *N. angularis var. kariana* Grun. (L. 48, p. 89, pl. 5, f. 100). Length 36—54 μ.

(Lille Molla, $^1/_4$ 1899; Seivaagen, $^5/_4$ 1900).

N. spathulata Bréb.

Bréb. in W. Sm. L. 134, I, p. 40, pl. 31, f. 268. VH. Synopsis (L. 88), p. 177, pl. 62, f. 7—8.

Very rare and only singly.

Not a genuine plankton form. Occasionally found in bottom samples. (Cfr. the corresponding chapter).

N. lanceolata W. Sm.

W. Sm. L. 134, I, p. 40, pl. 14, f. 118. VH. Synopsis (L. 88), pl. 68, f. 1—4.

Like the preceding species.

Pl. VI, fig. 13 represents a very small form, which answers very well to *N. lanceolata var. pygmaea* Cl. L. 45, p. 481; L. 26, p. 22, pl. 1, f. 19, 20.

Length 30 μ, breadth 4 μ. The keel puncta are small and close together, about 14 on 10 μ, the two middle ones more widely separated, with a trace of a central nodule between them.

This form which occurred $^1/_4$ 1899 Lille Molla can, however, hardly belong to *N. lanceolata* on account of the keel puncta being so close together and also because of the distinct trace of a central nodule. Cleve mentions this form from Cape Wankarema and Davis Strait.

N. longissima (Bréb.) Ralfs

Rare and occurs only in small numbers.

N. closterium (Ehrb.) W. Sm.

Of very rare occurrence in the samples.

It does not seem possible always with certainty to distinguish between this species and *N. longissima.*

Hardly a genuine plankton form.

Distribution: Common temperate coast form, widely distributed on the coasts of Europe.

N. Mitchelliana Greenl.

Greenleaf L. 73, p. 107.

Only noticed a couple of times.

Not a genuine plankton form.

11. *Surirelleæ.*

Surirella Turp.

S. fastuosa Ehrb. and **S. lata** W. Sm.

are not genuine plankton forms. Cfr. the chapter on bottom samples.

Campylodiscus Ehrb.

C. Thuretii Bréb. and **C. angularis** Greg.

occur frequently in plankton samples and now and then not in small numbers, but they must, nevertheless, without doubt be looked upon as being accidentally brought in, as they are rather common in bottom samples.

C. Ralfsii W. Sm. is also rather often found in plankton samples.

12. *Cocconeideæ.*

Cocconeis Ehrb.

C. scutellum Ehrb., **C. pinnata** Greg. and **C. costata** Greg.

occur only seldom and singly in plankton samples, and are probably accidentally brought in from fixed algae.

(Refer to bottom samples).

13. *Achnantheæ.*

Achnanthes sp.

Wrongly entered in the tables as *A. tæniata* Grun.

A. tæniata Gran L. 65, p. 9. pl. 1, f. 10?, non Grun. L. 48, p. 22, pl. 1, f. 5.

In long, very compact chains, which strongly remind one of *Fragilaria oceanica* and also show a similar comparatively coarse striation in side view.

I have only once succeeded in seeing the valve from above, and then it was very evident that the species must be another than Grunow's, the distinct striation being also a proof of this.

A. tæniata in the various publications on plankton seem to be different species, and one of them is probably the same as the one I have found. As I have not clearly seen the other valve, I will not venture to settle the species more definitely.

The genuine *Achnanthes tæniata* Grun. is, however, quite another species. By the kindness of the Riksmuseum in Stockholm, I have been enabled to examine the original preparations of bottom mud from the Kara Sea (cfr. Grunow l. c.). I have also had an opportunity of finding the species in some of the mud collected, and in this way I have become convinced that the species really does — as mentioned by Cleve — form long, compact chains (Pl. VIII, fig. 27).

Grunow's illustration, which is very correct, very considerably resembles *Navicula Vanhöffeni* Gran.

There are, doubtless, here very closely related species, but they form probably two, perhaps even three, quite distinct series. In this case, as so often, a remarkably large quantity of species is found in the arctic diatom plankton.

There are at least here four *Achnanthes* species which must be kept distinct. First we have Grunow's *Achnanthes tæniata*, which is comparatively thick-walled and strongly siliceous, and can therefore, hardly be the same as that which Oestrup mentions and illustrates (L. 139, pl. 2, f. 15) his being exceedingly thin-walled. Then we have the closely allied species *A. (tæniata var.?) hyperborea* Grun. L. 83, p. 50, pl. 1, f. 4, 5. As far as I can see, this is the same species as I have illustrated pl. VIII, f. 28, from 71° 48′ n. lat., 49° 38′ e. long. 31/5 1900 (Barents Sea, S/S Heimdal, a sample kindly given me by Dr. Gran).

To these must be added the form which I have found in our northern coast plankton and Oestrup's from Greenland.

Rather rare, but occurs in very long chains, only found during the inflow of diatoms in spring.

Distribution: *A. tæniata* is an arctic, neritic species (Greenland, Spitzbergen and Kara Sea), which also appears to occur occasionally in large numbers in the Baltic Sea.

14. *Naviculeæ.*

Navicula Bory.

N. directa Ralfs.

A. Schm. L. 128, pl. 47, f. 1—5.

Rather frequent during the inflow of diatoms in spring; but seldom occurs in any quantity. Is most likely a genuine plankton form.

Distribution. Widely distributed in various forms on the coasts of the Atlantic, right up to the arctic regions. Also on the west coast of Norway (spring, 1900).

N. kariana Grun.
(Pl. VII, fig. 21).

Cl. and Grun. L. 18, p. 39, pl. 2, f. 14.

Under this name, a species is entered in the tables which occurred frequently both in 1899 and 1900, but only at the time of the inflow of diatoms, and seldom numerous.

It is very thin walled, and most likely is a genuine plankton form. It has the usual two chromatophores, one on each side of the connective zone, symmetrically situated.

This form does not, however, answer well to the principal species and the illustration referred to, but very much better to *N. frigida* Grun. L. 83, p. 51, pl. 1, f. 25, which Cleve (L. 25) considers to be a variety of *N. kariana*.

The form which I have observed is, at any rate, closely allied to *N. kariana.* The same form occurred in the sample before mentioned from Barents Sea, S/S Heimdal, 1900, (cfr. under following species) in which the more thick-walled forms answered very exactly to *N. frigida.* Such a form is illustrated in pl. VII, fig. 21.

Distribution: *N. kariana* seems to be an arctic, and boreal neritic form, which also occurs in the North Atlantic. It is known from Greenland, Jan Mayen and the Kara Sea. The same form, which was found in the plankton from the northern coasts, also occurred in the spring 1900 on the west coast of Norway.

I have a few times noticed delicate chains of a diatom which is probably a *Navicula*, and very likely the species just mentioned (*N. frigida*). The chains were much twisted. (Pl. VII, fig. 21 f).

N. Vanhöffeni Gran.
(Pl. VII, fig. 22).

N. septentrionalis Cl. L. 40, non Oestr.

Frequent during the inflow of diatoms in spring, occasionally in large numbers. Otherwise absent.

I should think it rather certain that this species is not a genuine *Navicula.* As I cannot, however, at present find any better place for it, I have entered it under its usual name. In the tables, I tried at first to distinguish between *N. septentrionalis* and *N. Vanhöffeni*, as these are ordinarily understood, but I had to give it up later, and this is the case in the tables for 1900.

At any rate, there is only one species in the plankton under consideration. It is narrow boatshaped; but as the connective zone is very slightly siliceous, it does not stand being treated with acids (but very well being ignited on cover-glass) and it is, therefore, very difficult to get a valvar view of it.

As Gran (l. c.) mentions two species and under *N. septentrionalis* remarks that it may easily be recognized in side view by the plain stauros, it seems to me that the central nodule here suggests the possibility of a stauros, which perhaps does not exist. Gran does not illustrate any central nodule in side view in his figures of *N. Vanhöffeni* (f. 32 b). This nodule is, however, plainly to be seen on specimens in my material, which in every respect (when seen as chains) answer so remarkably well to *N. Vanhöffeni* that I have not the least doubt that they really belong to this species. With regard to the spaces between the links of the chains, they are, to be sure, most often seen in specimens, preserved in formaline, when they have not been ignited on cover-glass; but they may be wanting and sometimes be also very distinct in one and the same chain. It appears to me, however, that they become smaller and may even disappear altogether during the process of igniting. They are, however, also often wanting in specimens preserved in formaline.

It has not hitherto been possible to see any definite structure. Cleve, who considers this species to be identical with Östrup's *N. septentrionalis*, has also mentioned that he has not been able to dissolve the structure. I have examined numerous specimens, most of them in side view, and have noticed a narrow linear stauroslike marking, which, however, was very indistinct, but I have not been able to discover anything further.

Rather frequent during the diatom inflow in the spring, sometimes numerous; otherwise wanting.

Distribution: Arctic coast form, known from Greenland and the Barents Sea (Heimdal 1900, cfr. Gran L. 70, p. 182). According to Gran (l. c.) *N. Vanhöffeni* was very frequent in the Siger Fiord in Vesteraalen $^{12}/_{4}$ 1901. Not observed on the west coast of Norway. According to Cleve (L. 40, p. 333) also found in the Baltic.

N. pelagica Cl.
(Pl. VII. fig. 23).

Cl. L. 26, p. 11, pl. 1, f. 9.

Was not so very rare in the plankton 1899. Only found in 1900 in one of the samples: The Salten Fiord, $^{5}/_{4}$, 0—330 m.

I have never succeeded in finding this species in material preserved in alcohol or formaline. I only know it from slides, where it has been ignited on cover-glass, and have never seen it in valvar view. It answers fully to Cleve's description and illustration, so that there can hardly be room for any doubt as to its being correctly determined.

The peculiar „hairs" are, according to my opinion, fragments of the complex connecting zone and probably appear only after being ignited on cover-glass (or treated with acids, which, however, seems to destroy the cells). Is certainly very closely related to *N. Vanhöffeni.*

Distribution: Arctic species, probably, like the foregoing, a coast form. Hitherto only known from Baffin's Bay, Davis Strait and the Barents Sea (S/S Heimdal $^{31}/_{5}$ 1900, r).

Stauroneis *septentrionalis* Grun.
(Pl. VII, fig. 24).

Grunow L. 83, p. 53, pl. 1, f. 48. *Navicula septentrionalis* Oestr. L. 139, p. 317, non Cl. L. 40; nec Cl. L. 48, p. 3, De Toni L. 50, p. 126, A. Schmidt L. 128, pl. 6, f. 37. *Libellus? septentrionalis* Oestr. L. 138, p. 439, pl. 8, f. 97.

This species does not occur in our northern plankton. As before mentioned, the species which Cleve several times (e. g. L. 40) mentions as *Navicula septentrionalis* Oestr., is identical with *N. Vanhöffeni* Gran, at any rate, in part. Judging from his remark on the contents of the cell (L. 65, p. 9) it would seem that Gran also considers a form which is closely related to *N. Vanhöffeni* to be *N. septentrionalis* Oestr., as he describes the contents of the cell in both cases as being the same. *Stauroneis septentrionalis* Grun. has, however, quite another inner construction (v. below).

As mentioned under the foregoing species, I earlier also considered a form to be *Navicula septentrionalis*, which I afterwards found impossible to definitely distinguish from *N. Vanhöffeni*. Preparations ignited on cover-glass (not treated with acids) always answer well to the description of *N. septentrionalis*, as the central nodule then becomes very distinct, and the spaces between the cells — as before mentioned — generally disappear.

A careful examination of the ends of the valve — cfr. pl. VII, fig. 22 and 24 — will show that there is, however, here a question of two very different species, for Oestrup's illustration never, in this respect, corresponds to the appearance of *N. Vanhöffeni*, as I have had ample opportunity of seing in numerous preparations of the latter.

It is easily explained that Oestrup's species might be confused with *N. Vanhöffeni*, as he — although very much in doubt, as he has himself observed — refers the species to the genus *Libellus*. Soon after he changes the name of the genus, probably because Cleve in the meanwhile (L. 26) has referred it to *Navicula*. Oestrup neither illustrates nor mentions the connecting zone as being complex. As, however, the almost simultaneously discovered *N. Vanhöffeni* has a distinct complex connective zone, and was also found to occur as a pelagic species in long chains, it was very easy to confound these two species.

For the first time I was aware that a species exists, which answers very precisely to Oestrup's drawing, by the previously mentioned plankton sample from the Barents Sea (S/S Heimdal, $^{31}/_{5}$ 1900). Gran mentions this sample in his last work (L. 70, p. 147) and enters both *N. Vanhöffeni* and *N. septentrionalis* Oestr. from this place. There was, however, in this sample, a larger species with the same characteristic chromatophores as in *N. Vanhöffeni* and also with a distinct stauros, which was easily seen in water. As far as I can see, this must be a new species, which I have described below.

That the species represented on pl. VII, f. 24, is the same as *Stauroneis septentrionalis* Grun., I see no reason to doubt, the more so as they were both found in the same waters. (Grunow's species was found on the ice on the west of Novaja Semlja). The species seems to have a partiality for the neighbourhood of ice.

As it has not previously been found as a pelagic species in chains, I adjoin the following short description.

Valve linear, more or less distinctly cuneate towards the ends, which are either broad and rounded or almost square. Length 22—27 μ, width 4—$5^{1}/_{2}$ μ.

There is a distinct central stauros, which does not reach right out to the sides of the valve, bounded by two lines, which are parallel nearly out to the edge, where they are clearly divergent. Between them near the margin are 1—2 short, coarse striæ, similarly radiating. The rest of the valve is transversely striated; the striæ, however, are only seen with difficulty, with the exception of those which are more widely separated in the middle. Forms long, firm chains where the cells lie very close to each other, also at the corners. On being ignited on cover-glass the chains break and the ends of the cells become slightly separated from each other. (Cfr. pl. VII, f. 24.)

Contents of the cell: As far as can be seen from the preserved specimens, from the central protoplasm mass in which the nucleus lies extend upper and lower arms (probably 4 in all, 2 upper on either side and two lower). Whether these unite to form the usual chromatophores which are found on the connecting zone in the genus *Navicula*, I have not been able to decide. But the remarkable contents of the cells of *N. Vanhöffeni* are at any rate not found here.

Achnanthes hyperborea Grun. is a puzzlingly similar species. Grunow mentions too that *Stauroneis septentrionalis* might perhaps be the lower valve of an *Achnanthes*. It appears, however, that he, both in this instance and with regard to *Achnanthes tæniata*, at once came to the correct conclusion.

As before mentioned, *Achnanthes hyperborea* was also found in the sample from the Barents Sea, but only in small numbers. Judging from my experience, it would seem possible that there is yet another species, answering to *N. septentrionalis* Oestr., to be found in the bewildering wealth of species in the arctic, neritic, diatom plankton. As, however, the difference between Oestrup's species and *Stauroneis septentrionalis* seems to be so slight, I have thought it best at any rate for the present, to consider them to be synonymous.

Stauroneis Grani Jörg. n. sp.

(Pl. VII, fig. 25).

Forms chains in which the cells touch each other except towards the ends, where the cell in side view appears to be narrowed off uniformly (outlines arched).

On being ignited on cover-glass, the connection is still further severed, so that the cells only touch each other in their middle half (more or less). The ends are sharply bent so that the cells of the chains in material preserved in alcohol look as if the ends were cut off in a straight line by a sharp knife.

There is a small central stauros, bounded by two parallel lines. No other structure was seen on the valve.

The connecting zone complex as that of *Navicula Vanhöffeni*. As in the latter species, the connecting complex membranes are seen between the ends of the cells. They are, however, as a rule rather indistinct.

The contents of the cell are generally speaking the same as in *Navicula Vanhöffeni*, with which species *Stauroneis Grani* is very nearly related.

Length 54—57 μ.

I have not been able to identify this species with any of those hitherto known. It may perhaps be the same as that which Gran L. 70, p. 147, mentions from the Barents Sea, $^{31}/_{5}$ 1900, as *Navicula septentrionalis*. It does not, however, appear to be identical with the one which he mentions from Greenland L. 65, p. 9, as the above species is considerably larger.

Moreover, the only species with which, according to my opinion, it would be possible to unite it, would be *Stauroneis pellucida* Cl., which species is mentioned by Cleve from Cape Wankarema (L. 45, pl. 35, f. 10). Cleve's illustration, however, resembles it very little; the species is though, according to Oestrup (L. 138, p. 440) exceedingly variable.

Occurred singly in one sample: Porsangerfjord, $^{27}/_{4}$ 1899, 0—75 m.

Distribution: Hitherto otherwise only known from the Barents Sea, 71° 48′ n. lat., 49° 38′ e. long. (S S Heimdal $^{31}/_{5}$ 1900). I have also seen a short chain from the Kara Sea (the Swedish Jenissei expedition, 1875). In this slide, there was also a short chain of the species which I have entered as *Stauroneis septentrionalis* Grun.

Schizonema *Grevillei* Ag.

Only by accident brought in with higher algae. Common among bottom algae on the west coast of Norway.

Pleurosigma W. Sm.

P. angulatum (Quek.) W. Sm. and ***P. Normanni*** Ralfs (= *P. affine* Grun.)

Not genuine plankton forms, only accidentally brought in.

The latter species is very frequent in bottom samples.

Also occur now and then singly in the plankton *P. formosum* W. Sm. and *P. balticum* (Ehrb.) W. Sm.

P. tenerum Jörg. n. sp.

(Pl. VII, fig. 17).

P. Stuxbergi Cl. L 48, p. 54. pl. 4, f. 74 (?).

Under this name, a species is entered in the tables which certainly is a genuine plankton form, as in some of the samples (Rombaken $^{8}/_{2}$ and Skjomen $^{9}/_{2}$ 1899) it was quite common, and occasionally occurred in large quantities. It was also now and then found during the inflow of diatoms in the spring, especially in 1900, but then always in small numbers.

The species corresponds so well, in all important points, with *P. Stuxbergi* Cl. and Grun., that I have been in doubt as to whether or not it should be entered under that name. Finally I came to the conclusion that I ought to do so, as will be seen on reference to the tables for 1900.

There were, however, chiefly three things which made me provisionally enter it as a separate species. First, because it is one of the few species of *Pleurosigma* which is really planktonic; secondly, it is very thin walled and is easily deformed when ignited (a fact not mentioned with regard to *P. Stuxbergi*) and finally, Cleve classifies his species under the division *Rhoicosigma* (L. 24, p. 41), while I was convinced by examination of preserved material that, seen in side view, it is not bent.

When ignited on cover-glass, it loses — as already mentioned — its shape, and I have often seen specimens which, after being treated in this way, give the impression of being a *Rhoicosigma*.

Distribution of *P. Stuxbergii:* Greenland, Frantz Joseph's Land, Kara Sea. Probably an arctic coast form.

P. delicatulum W. Sm.

(Pl. VII, fig. 18).

Very like *P. karianum* Grun. L. 48, p. 50, pl. 3, f. 69, which is referred as a variety to *P. delicatulum* W. Sm. by Grunow with some doubt, and to *P. elongatum* W. Sm. by Cleve. It is also very like *P. fallax* Grun.) Perag., which is considered a variety of *P. elongatum* both by Cleve and Grunow. These forms, however, all differ from the one observed by me by the transverse striæ being closer than the oblique ones, while the contrary is rather the case in my form.

Very rare: $^{4}/_{4}$ 1899 Fölstad, 0—3 m. Very closely allied forms also occur, but always very sparsely (and only during the diatom inflow).

P. tenuissimum W. Sm. var. **hyperborea** Grun.
(Pl. VII, fig. 19).

Grun. L. 48, p. 58, pl. 4., f. 77.

Answers well to Grunow's illustration and description, but is also very like *P. Spenceri* W. Sm. *var. borealis* Grun. l. c. p. 60, pl. 4, f. 79.

Very scarce and rare: Lille Molla, 1/4 1899, near the surface; Fölstad 4/4 1899, 0—3 m.

Distribution: The Kara Sea.

P. fasciola (Ehrb.) W. Sm. and **P. tenuirostre** Grun.

Both these species, the latter of which is considered to be a form of the former both by Cleve and others, occur occasionally during the spring diatom inflow, but always very sparsely. It is doubtful if these species really are plankton forms. *P. tenuirostre* seems to be the more frequent.

Strange to say, I once saw oblique striæ very close to each other (but only in one direction), closer than the transverse striæ, about 27 on 10 μ. The transverse striæ were only discernible near the raphe, about 20 on 10 μ. Longitudinal lines were only to be seen at the ends, somewhat wavy (Pl. VII, f. 20).

Generally speaking, striæ were not seen in the specimens (which were thin walled), so that I cannot decide whether the difference mentioned between *P. fasciola* and *P. tenuirostris* holds good with us or not. At any rate, the shape of the latter species is very characteristic.

Distribution: *P. fasciola* is widely distributed on the European coasts. *P. tenuirostris* is an arctic form, known from Greenland and the Kara Sea.

P. naviculaceum Bréb.

Not a genuine plankton form. Refer to bottom samples.

Rhoicosigma ***arcticum*** Cl.

Rare and scarce. Hardly a genuine plankton form. Seems to be a frequent bottom form on the west coast of Norway, and probably also on the north coast. Refer to bottom samples.

Auricula ***complexa*** (Greg.) De T.

Only once found, singly: Rombaken 8/2 1899, 0—40 m.

Distribution: The coasts of Great Britain. Rare on the west coast of Norway. Also mentioned from Barbadoes.

II. Peridiniales.

1. *Prorocentraceae* Stein.

Prorocentrum ***micans*** Ehrb.

Only once found, very scarce: Henningsvær, 17/1 1899, 0—180 m. On account of its small size it goes through the net.

Distribution: Probably a coast form from the temperate European coasts of the Atlantic and its arms. Known from the North Sea, (from the English Channel, not rare, May 1903 L. 18, IV), Skagerack, the Baltic and the west coast of Norway, here rather scarce. Probably brought to us from southern coasts.

Dinophysis Ehrb.

D. acuta Ehrb., Jörg.

Jörg. L. 91, p. 28, pl. I, f. 2.

Rather common in the samples, but always rather scarce.

Distribution: Seems to be a northern, but not an arctic, form, which is frequent both in the open sea and on the coasts. Known from the waters between Norway, Scotland, Iceland and Greenland as well as from the North Sea, Skagerack and the Baltic. It appears to be stationary on the west coast of Norway and near the Faeroe Islands and Iceland, probably also on the northern coasts of Norway, where it has been found at several places by Gran in the summer and autumn months. (Cfr. Gran L. 67).

D. norvegica Clap. et Lachm., Jörg.

Jörg. L. 91, p. 29, pl. 1, f. 3—6.

Occurs in many of the samples, but always in small numbers.

Distribution: Not sufficiently known. The species, however, appears mostly to have the same distribution as *D. acuta*. Seems to be a northern form. Known from the North Sea (from The English Channel, r May 1903), Skagerack and Cattegat, Scotland, Jan Mayen and the west coast of Norway, where it is found, but only sparsely, during nearly all the months of the year.

D. acuminata Clap. et Lachm., Jörg.

Jörg. L. 91, p. 30, pl. I, f. 7—9. *D. Vanhöffeni* Ostenf.

Very rare and scarce.

Distribution: Not sufficiently known. Seems to be a northern form, but scarcely native with us. Rather frequent on the west coast of Norway in the summer and autumn (of 1898), but generally scarce. Also known from Greenland, Iceland, the Faeroe Islands (very rare) and the Baltic Sea (Levander).

Perhaps it comes to our west coast from Iceland.

D. rotundata Clap. et Lachm.

D. Michaelis auct. p. p.

Rare and scarce. Found in small numbers by Gran (L. 67) at several places on the northern coast of Norway in the months of July—October 1898—99.

Distribution: Seems to be a northern, oceanic form. Known from the North Sea (southwards to the English Channel, r in February and May 1903), Skagerack and also mentioned from the Baltic. On the west coast of Norway in the months of April—December 1898, always in small numbers.

D. homunculus Stein.

Stein L. 135, pl. 21, f. 1—8.

Only found in one of the samples (two individuals). Helligvær 12/1 1899, 0—50 m.

Distribution: Widely distributed in the warmer parts of the temperate Atlantic, and only occasionally and exceptionally carried as far north as Lofoten.

Does not occur on the west coast of Norway.

Podolampas *palmipes* Stein.

Very rare and only singly: The Vest Fiord I, $^{13}/_{1}$ 1899 0—50 m. and 0—180 m.), Tranödybet $^{22}/_{3}$ 1900, 0—600 m. and The Folden Fiord $^{6}/_{4}$ 1900, 0—530 m. With us a form which is only accidentally and exceptionally brought in from the south.

Distribution: Oceanic form, widely distributed in the tropical and temperate parts of the Atlantic, northwards in the summer (cfr. Cleve L. 40, p. 276) right up to near Iceland. On the west coast of Norway very rare and only singly. Seems to be cosmopolitan in all the warmer seas, as it is also mentioned from the Mediterranean, the Red Sea, the Indian Ocean and the Pacific Ocean.

Oxytoxum *diploconus* Stein.

Only one specimen found (therefore determination not fully reliable): The Skjerstad Fiord V, $^{2}/_{4}$ 1900, 0—420 m.

Like the foregoing, an accidental southern form.

Distribution: Southern oceanic form, from the warmer parts of the temperate Atlantic. On the west coast of Norway also only once found in 1898.

Pyrophacus *horologium* Stein.

Rare and scarce; found, however, in several samples. Seems to be entirely absent during the spring diatom inflow; then it was only found in one deepwater sample from one of the fiords: The Folden Fiord $^{6}/_{4}$ 1900, 500—400 m.

Distribution: Southern form, according to Cleve, properly a tropical oceanic form. Probably has a wide distribution in the warmer temperate waters of the Atlantic. As it is easily overlooked, its distribution is hardly yet quite sufficiently known.

Its comparative frequency on the coasts of Norway might suggest either that it is able to thrive well in the coast waters at our latitudes, or that there are two different species of which the one is a tropical oceanic one not occurring with us.

Gonyaulax *spinifera* (Dies.) Clap. et Lachm.

Very rare and scarce, only found in some few of the samples: The Ögs Fiord, $^{14}/_{3}$ 1899, 0—90 m., in the sea off Senjen $^{13}/_{4}$ 1899, 0—80 m., Höla $^{20}/_{3}$ 1900, 0—50 m.; Balstad I, $^{21}/_{3}$ 1900, 0—50 m.; The Skjerstad Fiord XII, 0—500 m.

Distribution: Is considered by Cleve to be a neritic species.

There seems to be, judging from Cleve's accounts (L. 40, p. 249), two different species, a boreal or arctic species and a more southerly one, which is probably oceanic. Its occurrence on our northern coasts also suggests that our species is oceanic.

Gran (L. 67) mentions *Gonyaulax spinifera* as occurring in small numbers in the Eids Fiord (Nordland) in the months of July—September 1898—99.

Two species occur also on the west coast of Norway (cfr. E. Jörgensen L. 91, p. 34). The lesser of these is also found in the Baltic.

Protoceratium *reticulatum* (Clap. et Lachm.) Butschli.

Very rare and generally in small numbers. As it is, however, so small that it is not retained by the net, it is probably found more frequently than appears.

Was found in 1900 principally in deep water samples.

Distribution: Not sufficiently known. Is considered by Cleve (L. 40, p. 277) to be a neritic northern or arctic form. It is found most frequently on the American side. On the west coast of Norway in 1898, generally very scarce.

Diplopsalis *lenticula* Bergh.

Rather frequent, especially in tolerably deep water, often rather numerous. Seems to be altogether absent during the spring diatom inflow. Gran (L. 67) found it at several places on the northern coast of Norway in the months of July—October 1898—99, but generally in very small numbers.

Distribution: According to Cleve, a southern oceanic species, widely distributed in the warmer parts of the temperate Atlantic. Also known from the North Sea (from The English Channel, Feb. and May 1903) and the Cattegat. Rather frequent on the west coast of Norway (1898).

Peridinium Ehrb.

P. depressum Bail.

Very frequent, often in quantities. Much scarcer during the spring diatom inflow. Gran found it at Bodö and in the Eids Fiord in the months of July—October 1898—99 frequently.

Distribution: Seems to be an arctic and boreal neritic species, which is stationary both on the north and west coast of Norway. Widely distributed in the colder part of the northern Atlantic, chiefly on the coasts, from the American side, to Greenland, Iceland, (Faeroe Islands, the North Sea), Norway and right up to Spitz-bergen and Novaja Semlja.

P. oceanicum Vanhöf.

Surely a good species.

Was not so rare in 1899, but always in small numbers. Not noticed in 1900. Absent during the spring diatom inflow.

Distribution: Southern oceanic species which, according to Cleve is widely distributed in the warmer part of the temperate Atlantic, and penetrates northwards right up to Greenland. Very rare and scarce round the Faeroe Islands and on the west coast of Norway. Also known from the Red Sea and the Indian Ocean.

P. divergens Ehrb.

P. lenticulare (Ehrb.) Jörg. L. 91, p. 37.

As this species is now in most works on plankton mentioned under the name of *P. divergens* Ehrb., I have, at any rate provisionally, found that I ought to use this name instead of the more explicit one, *P. lenticulare*. I hope in a later work to be able to give a more detailed description of the species of *Peridinæa* which occur on the coasts of Norway, but as this work is, as yet, only in its beginning, I have tried as far as possible to use the accepted names, even if I do not always agree with them.

Common, often in quantities, except during the spring diatom inflow, when it is rather rare and scarce. Gran found it at several places on the northern coasts of Norway in the months of July—October 1898—99.

Distribution: According to Cleve, this is a southern, oceanic form, widely distributed in the warmer part of the temperate Atlantic, northwards to Iceland, Scotland, the North Sea, Skagerack, Cattegat, the west coast of Norway and (sometimes) right up to Spitzbergen.

It is stationary on the whole of the coast of Norway, and especially on the west coast frequent in the summer and autumn.

P. conicum (Gran) Ostenf. et Schm.

Ostenf. et Schm. L. 117, p. 174. Gran L. 70, p. 189, f. 14. *P. divergens var. conica* Gran L. 67, p. 47. *P. lenticulare v. Michaelis* (Ehrb.) Jörg. L. 91, p. 37.

Undoubtedly a good species.

Occurs in rather a large number of the samples, but quite exceptionally in any quantity. Gran found it in the Eids Fiord (Nordland) in rather small numbers in the months of July—August and October 1898—99.

Distribution: Gran (L. 70, p. 190) considers it to be a temperate Atlantic oceanic form, which also seems to agree to my material. On the west coast of Norway it is found all the year round, but generally only in small numbers. Found in the English Channel (February and May 1903), off Scotland, in the North Sea, the Skagerack and Cattegat and the Baltic, as well off Beeren Eiland (very sparsely).

P. pentagonum Gran.

Gran L. 70, p. 191, f. 15.

I know this form very well from the west coast of Norway, where it occasionally is abundant, but I have been in some doubt as to whether it should be looked upon as a young, undeveloped form or a special species.

Occurs rarely and in small numbers, but is possibly overlooked.

Distribution: Not sufficiently known. Gran is probably right in considering it to be a northern form. In 1898, it was occasionally abundant on the west coast of Norway.

P. pallidum Ostenf.

Ostenf. L. 111, p. 60; L. 116, p. 581, 582, f. 130, 131.

P. pellucidum (Bergh) Jörg. L. 91, p. 38. Gran L. 70, p. 186.

I agree with Ostenfeld in considering this species to be different from the following one but not with respect to the use of the name *P. pellucidum* (Bergh). As it is, however, excellently described by Ostenfeld (l. c.), it will be most practicable for the present to use the names he does.

Rather frequent, but generally in small numbers. Found by Gran at many places on the northern coast of Norway in the months of July—October 1898—99, but only in small numbers.

Distribution: Arctic and boreal (properly neritic?) species, known from the North Sea (from The English Channel, frequent in May 1903), Skagerack and Cattegat, the west coast of Norway, Scotland, the Faeroe Islands, Iceland, Greenland, Jan Mayen and Spitzbergen. Stationary on the west coast of Norway, especially numerous in the summer months.

P. pellucidum Ostenf.

Ostenf. L. 116, p. 58, f. 129.

There are several species which are more or less allied, which may easily be confused with this form. Besides, on account of its minuteness, it easily passes through the net, and is therefore not specially tabulated.

It was, however, only occasionally found in the samples.

Distribution: Seems to be an arctic and northern temperate (boreal) species, which is by Ostenfeld considered to be neritic. According to Cleve L. 40, p. 268, it has been found at many places on the American side up to Greenland and Spitzbergen. Occurs also on the west coast of Norway (in April and May 1901).

P. pedunculatum Schütt.
(Pl. VIII, fig. 29).

Shape: In dorsal view the upper half is broadly conical, with a rather long cylindrical apical tube. The lower half is broadly conical, the outlines showing a shallow sinus on each side and at the lowest part. In side view the upper half is still conical, the outlines of the lower being rounded, and then evenly narrowed, most clearly on the posterior side, towards a broad, rounded lower part. The dorsal half is larger and more prominent than the ventral. The excurrent basal spines are somewhat nearer the ventral side.

Girdle: The girdle in side view is almost in right angle to the longitudinal axis. On the ventral side the left end lies lower than the right, about as much as a piece equal to the height of the girdle. Definite radial rays (thickenings).

Basal spines: The basal spines are directed somewhat forwardly (towards the ventral side), especially the left one. Both broadly alated, the ventral wing being all at once broader towards the base, so that its contour turns almost at right angles to the direction of the spine (as is the case in Podolampas palmipes). In this way, in certain positions, the species appears to have a short, broad winged „foot" between the two others.

Contents of cell: The same in colour as in *P. pallidum*.

Dimensions: Width 47 μ, height 51 μ. Basal spines 17 μ prominent.

As yet, I have only seen few specimens of this species. Neither am I sure that it is identical to Schütt's, so that I have given a description, which, however, should only be taken as a preliminary one.

The peculiar suddenly broadened wings at the base of the ventral side of the basal spines are only seen with difficulty, but the one which belongs to the left spine is easily seen when the species lies on its ventral side with the apical tube down (and the spines up). As far as I have been able to see this wing on the left spine is directed out towards the right, on the right one, on the contrary, but little to the left, almost forwardly (ventrally).

The long apical tube has a very characteristic form in Schütt's figure. This form is also found in my specimens, but is due to seams, not to the actual contour.

It may be a question as to whether my specimens belong to *P. tristylum* Stein, a species which I do not know, but which, at any rate, cannot be identical to *P. pellucidum* Bergh, as mentioned by Bütschli (L. 19). *P. tristylum v. ovata* Schröd. is undoubtedly another species.

Very rare and very scarce; occurred together with oceanic and southern forms in Tranödybet 22/3 1900, 0—600 m. The same form is very rare on the west coast of Norway: The By Fiord of Bergen 30/1 1901, 0—400 m.; The Oster Fiord, 3/9 1901, 25—50 m., 100—200 m. I have also seen it from the Stor Fiord in Sondmore (S/S Michael Sars 1900, st. 3, 100—30 m.).

P. pedunculatum is, according to Cleve, a southern temperate, oceanic species, distributed in the Atlantic from rather far south northwards to the neighbourhood of Iceland (rarely).

P. Steinii Jörg.

Jörg. L. 91, p. 38. *P. Michaelis* Stein L. 135, p. 9, f. 9—14, non Ehrb. Cl. L. 40, p. 263.

Occurs in quite a large number of the samples, but always sparsely. The species seems to be absent during the spring diatom inflow. According to Gran (L. 67) in small numbers in the Eids Fiord and Ofoten in the months July—August 1899.

In the tables it is reckoned together with another smaller form, which is probably specifically different from the genuine *P. Steinii*, and seems to have a more northern distribution.

Distribution: Southern oceanic form, which, according to Cleve, is widely distributed in the warmer (eastern) part of the temperate Atlantic, northwards to Greenland, Iceland and towards Spitzbergen. Very scarce round the Faeroe Islands. Also rare on the west coast of Norway, where there occurs (at least) two different species.

P. ovatum (Pouch.) Schütt.

Frequent, often numerous. Found by Gran on the northern coasts of Norway, rather numerous at several places in the months of July—September 1898—99.

Distribution: Seems to be an arctic and northern temperate (boreal), chiefly neritic (?) species, which is known from the coasts of Western Europe, the North Sea, Skagerack, Cattegat, the Baltic, the west coast of Norway, the Faeroe Islands, Iceland, Greenland and Spitzbergen. Stationary on the coasts of Norway, being especially common on the west coast in the months of April and May.

Ceratium Schrank.

As most of the easily recognized forms of *C. tripos* are now, by almost all plankton investigators, mentioned as distinct species, I have thought it best to do so too, as far as possible. I am, however, inclined to think that by so doing we get a basis which is rather uncertain. On the other hand, it seems that one really goes too far when one considers all „forms“ of *Ceratium tripos* (e. g. balticum and macroceros) as one species. As, however, the so-called species are very difficult to characterize well (naturally), the result will be that there will be numerous species, and one gets into a hopeless chaos, as we have already seen in the case of one author. According to my opinion, therefore, the only practical solution will be to set up as few „species“ as possible, but to classify the divergent forms as „varieties“. It will, I think, for the sake of clearness, also be necessary to arrange the varieties in groups, as more new forms are appearing.

C. tripos (O. F. Müll.) Nitzsch.

C. t. α balticum Schütt.

Common and generally in large quantities; during the spring diatom inflow, however, very much scarcer than at other times. Found by Gran at several places on the north coast in the months of July—October 1898—99, usually numerous.

Distribution: According to Cleve, widely distributed in the warmer part of the temperate Atlantic, from whence it extends northwards. Very frequent on the coasts of the North Sea, Skagerack and Norway; as an exception, as far north as Spitzbergen. Stationary on the coasts of Norway.

The form which is found in the Baltic is, according to Ostenfeld, L. 116, p. 583, 584, f. 132, 133, 134, somewhat different to the North-Atlantic one.

C. bucephalum (Cl.) Cl.

Cl. L. 40, p. 211. *C. tripos var bucephalus* Cl. L. 46, p. 302, f. 5. *C. t. arcuatum* (Gourr.) Jörg. L. 91, p. 44, pl. 2, f. 11, non *C. arcuatum* Gourr. L. 63, p. 25, pl. 2, f. 42.

Seems to be a well characterized and little varying form, which without difficulty can be considered as a separate species. Occurs together with the preceding, and almost exactly corresponds to it in frequency.

Distribution: In all important respects, like the preceding species; but appears to be more westerly. Seems to be absent round the Faeroe Islands, and is much less frequent on the west coast of Norway than the preceding species.

C. bucephalum (Cl.) Cl. *var. heterocampta* Jörg.

C. tripos ε arcuatum forma heterocampta Jörg. L. 91, p. 44, pl. 2, f. 12. *C. tripos var. arietinum* Cl. L. 36, p. 13, pl. 7, f. 3.

Not noticed in the samples from 1899; in several samples from 1900 and occasionally rather numerous.

Distribution: Southern oceanic species, according to Cleve (L. 40, p. 209) widely distributed in the warmer part of the Atlantic and also known from the Indian Ocean. Frequent on the west coast of Norway in 1898 in the months of September—December; singly in February.

C. macroceros (Ehrb.) Cl.

Frequent and numerous (less so during the spring diatom inflow), but much scarcer than the two foregoing species. Found on the northern coast together with them during the summer and autumn 1898—99 by Gran.

Distribution: In the Atlantic, in all important respects like *C. bucephalum*. Has not been found either round the Faeroe Islands. All the year through on the west coast of Norway, but much less frequent than *C. tripos* (maximum in summer). Occasionally noticed at Spitzbergen (in the warmer waters). Also known from the Indian Ocean.

C. intermedium (Jörg.)

C. macroceros forma intermedia Jörg. L. 91, p. 42, pl. 1, f. 10. *C. tripos var. scotica* Ostenf. L. 111, p. 57, non Schütt. *C. horridum* Gran L. 70, p. 194, non *C. tripos var. horrida* Cl. L. 46, p. 302, f. 4.

There is already a considerable accumulation of names (and corresponding confusion?) in connection with this form, which will be difficult to keep separate from the foregoing, as it, as mentioned in a previous paper (Jörgensen L. 91, p. 42), varies considerably.

I cannot help discussing here once more, whether the names above mentioned are justifiable, as the last change of name will easily give rise to a state of chronic confusion.

I believe everyone except perhaps Ostenfeld, agrees that Schütt's name ought not to be used. Even if the illustration referred to by Ostenfeld be taken as the principal figure (Schütt L. 130, p. 70, f. 35, IV), it must not be overlooked that Schütt has in the same work at another place (p. 28, f. 20, IV c) illustrated the foregoing species as *v. scotica*. It was this circumstance which made me decide to keep my own name instead of the one already published by Ostenfeld.

Also Cleve (L. 40, p. 301) and Bruno Schröder (L. 129, p. 15) look upon Schütt's var. scotica as I do.

There must either be a printer's mistake in one or other of Schütt's two illustrations, or the name *scotica* must be used in reference to a large series of forms.

In L. 112, p. 56, Ostenfeld enters *Cerat. tripos v. horrida* Cl. as a form under *C. t. v.* „*scotica* Schütt". He remarks that its straight (not curved) apical horn brings it close to this variety, and that the presence or absence of spines is a very varying and unreliable character.

With this latter remark, I agree entirely (cfr. L. 91, p. 42 under *C. t. m. f. intermedia*). Judging from my experience, it seems that *var. horrida* Cl. can hardly be kept distinct as a variety, and it will be seen (L. 40, p. 227) that Cleve too has come to the same conclusion. But Ostenfeld's reference to the straight apical horn, must arise from some mistake (which I confess I find it difficult to explain), as Cleve's figure (L. 46, f. 4) clearly shows the curved horn which is typical for *C. longipes* Bail. (= *C. t. v. tergestina* Schütt, cfr. under *C. longipes*).

All the forms illustrated by Ostenfeld, L. 116, p. 585, f. 136—139, belong to my *C. intermedium*, as was my earlier interpretation of this form as a variety (l. c. where the forms are of equal value to the varieties in this paper, and the varieties equal to the species here). *C. intermedium* in the tables is also taken in this meaning, and includes all Ostenfeld's forms.

Strange enough, the same mistake is also repeated by Gran (L. 70, p. 195) matters being brought to a head by the use of the name *C. horridum* for the whole series of forms.

Cleve (L. 40, p. 225), on the contrary, enters *var. horrida* under *C. t. var. longipes* Bail.

Is the series in question to be considered as one species — which, as mentioned above, will perhaps not be realisable — I cannot see but that the name *C. intermedium* must be resumed.

Cleve (L. 40, p. 225) evidently considers the forms in question to belong under *C. macroceros* (in agreement with my previous opinion).

On the whole, very frequent, almost precisely corresponding in frequency to *C. macroceros*, though sometimes a little scarcer. Very scarce during the spring diatom inflow, altogether absent in 1899.

Distribution: Appears in all important respects to be the same as that of *C. macroceros*. In the Norwegian Ocean, however, not noticed (by me, at any rate) so far north. Frequent on the west coast of Norway.

C. longipes (Bail.) Cl.

C. tripos v. tergestina Schütt. Incl. *C. tripos v. horrida* Cl., non *C. horridum* Gran.

As mentioned in an earlier work (L. 91, p. 43) Bailey's *Peridinium longipes* seems to answer best to Cleve's *C. tripos v. horrida*. This variety is quite typical in the Arctic Sea, but at lower latitudes appears to pass entirely into *C. tripos v. tergestina*. From this circumstance, I cannot either see any reason why Bailey's name for the whole series of forms should not be used as in fact it now is by almost all authors on plankton.

This form also varies so much that it will be difficult to limit it. Cleve still enters it in L. 40, p. 225 as *C. t. var. longipes*.

Very frequent, often in large numbers, more frequent than *C. macroceros* and *intermedium*, about the same as *C. tripos;* in February—March and during the diatom inflow more frequent than the latter species. Also found by Gran, rather numerous, in the months of July—October 1898—99 at several places on the north coast.

Distribution: Northern temperate form, which is especially found in the coldest part of the northern Atlantic and in the confines towards the arctic waters, as well as in the north eastern arms, the North Sea (frequent in the English Channel in Feb. 1903, less so in May), Skagerack, Cattegat and the Baltic. Frequent between Greenland, Iceland, the Faeroe Islands, Scotland and the coast of Norway to Spitzbergen (cfr. Cl. L. 40, p. 225) and Jan Mayen. In these northern waters the form *horrida* Cl. appears to be most frequent. Common on the west coast of Norway, especially in the spring months after the diatom inflow (April—June 1898).

C. arcticum (Ehrb.) Cl.

Very rare, only found in two samples:

Strömmen II, (Henningsvær) $^{13}/_{2}$ 1899, 0—30 m., r; Sea off Röst (Vesteraalen) $^{22}/_{3}$ 1899, +.

Distribution: Arctic species, neritic and oceanic, especially frequent at Spitzbergen and Greenland and in the boundaries between the arctic and Atlantic waters (cfr. Gran L. 70, p. 50—52 and L. 69, p. 10).

Occurs in the sea between Norway and Jan Mayen, but only occasionally comes near the coast, mostly in deep water. According to L. 18, IV singly in the North Sea and off Scotland, May 1903. Absent round the Faeroe Islands. It is also wanting on the west coast of Norway (only on one occasion observed off the north western coast, as far down as the Sönd Fiord.

C. furca (Ehrb.) Duj.

Very frequent, usually rather numerous (the frequency varies considerably from r to c), much scarcer during the spring diatom inflow. Found frequently at several places on the north coast in the months of July—October 1898—99 by Gran.

Distribution: Temperate oceanic form, extending from the warmer part of the Atlantic, the North Sea, Skagerack, Cattegat, the Baltic, the west coast of Norway, Scotland, Iceland to the most northern part, (not in the arctic waters). Common on the west coast of Norway, often in quantities in late autumn. Rather scarce off the Faeroe Islands. Also known from the Pacific Ocean, the Indian Ocean and the Red Sea.

C. lineatum (Ehrb.) Cl.

Is undoubtedly a good species.

Rare and scarce, almost entirely absent during the diatom inflow in the spring.

Distribution: Oceanic form, principally distributed in the warmer part of the temperate Atlantic, northwards (in the autumn, according to Cleve) to Iceland and Greenland. Very rare round the Faeroe Islands. Often rather frequent on the west coast of Norway. Also known from the Red Sea and the Indian Ocean. In the north eastern Atlantic found as far as the sea between Tromsö and Jan Mayen (Jörgensen L. 92, p. 36, rr).

C. fusus (Ehrb.) Duj.

Very frequent and often in quantities, only less numerous during the spring diatom inflow. Found by Gran frequently at several places on the north coast in the months of July—October 1898—99.

Distribution: Temperate, oceanic form, widely distributed from the southern part of the temperate Atlantic to the North Sea, (rather frequent in the English Channel in the months of February and May 1903) Skagerack, Cattegat, the Baltic, the west coast of Norway, Scotland, the Faeroe Islands, Iceland and right up to Bären Eiland and Spitzbergen (1900). Rather common round the Faeroe Islands. Numerous on the west coast of Norway, especially in late autumn.

III. Pterospermataceae.

Pterosperma Pouch.

These remarkable organisms are probably, as Cleve and others have suggested, resting stages. As far as I know, no one has up to the present found anything to indicate where they really belong.

With us, there are others (occurring sparsely) besides the three mentioned below, but I have not entered them.

P. Möbii (Jörg.) Ostenf.

Ostenf. L. 117, p. 151. *Pterosphæra Möbii* Jörgensen L. 91, p. 48.

Rather frequent, but generally sparsely.

Distribution: Not sufficiently known. Seems to be a temperate Atlantic form. Very rare round the Faeroe Islands. Also rare on the west coast of Norway.

P. Vanhöffenii (Jörg.) Ostenf.

Ostenf. L. 117, p. 151. *Pterosphæra V.* Jörgensen l. c.

Rather more frequent than the foregoing, and often rather numerous.

Distribution: Like the foregoing. Seems to be an oceanic form. Very rare on the west coast of Norway 1898.

P. dictyon (Jörg.) Ostenf.

Ostenf. l. c. *Pterosphæra dictyon* Jörg. l. c. As a rule the most frequent form, though often occurring in smaller quantities than the foregoing one.

Distribution: Like the foregoing species, but perhaps rather a neritic form. Frequent on the west coast of Norway, very rare round the Faeroe Islands.

IV. Halosphæraceae.

Halosphæra *viridis* Schmitz.

Incl. *H. minor* Ostenf.

In his last work (Gran (L. 70, p. 12—16) has subjected this species to a thorough, comprehensive treatment. I agree, on the whole, with his conclusions, as they — as far as I am able to judge — correspond very well to my own observations. I am also on account of his statements convinced that the large, inner body previously referred to by me (L. 91, p. 16) and which I with some doubt took to be the nucleus, is only an accidental formation, caused by imperfect preservation and treatment (plasmolysis).

Unfortunately, I have not later had any opportunity of examining the moving spores, as the large quantities of *Halosphæra* which were met with near Bergen in 1898 have not since reappeared (as far as I know).

Common, often in quantities, scarce during the spring diatom inflow, especially in 1899.

Distribution: Temperate and tropical oceanic species, widely distributed in the warmer part of the Atlantic and especially (cfr. Gran l. c.) in the eastern part of the Gulf Stream from the Faeroe Shetland channel to the far north of Norway and right up to Bären Eiland.

According to Cleve also west of America, in the Mediterranean and the Indian Ocean.

V. Flagellata.

Phaeocystis *Poucheti* (Har.) Lagerh.

Only noticed during the diatom inflow, then often in large quantities, although very variable with regard to frequency.

Distribution: Arctic, oceanic (?) and boreal, neritic species, which developes in masses in the mixing-belt between the arctic waters and those of the Atlantic.

Known from Greenland, Iceland, the Faeroe Islands (very frequent during a few months of the year), the North Sea, (numerous in the English Channel in May 1903), Skagerack and Cattegat. On the west coast of Norway in large masses in the months of March—May 1898.

VI. Silicoflagellata.

Gymnaster *pentasterias* (Ehrb.) Schütt.

Is this really a dinoflagellate as Schütt means? Occurs fairly often in bottom samples and certainly is due to a plankton form. Also occasionally found in slides from plankton preparations; but as this organism is so minute, it cannot be expected that it should be retained by the net.

I have never succeeded in seing anything but the siliceous skeleton, notwithstanding that the species on our west coast does not seem to be so very rare.

Distribution: Very imperfectly known. Cl. L. 40, p. 250 mentions it from two places near the American coast.

Distephanus *speculum* (Ehrb.) Stöhr.

Generally speaking, rare and only singly; more frequent, occasionally numerous, during the diatom inflow in spring.

Is so small that it easily goes through the net. Its comparative frequent occurrence during the diatom inflow may be partly caused by its being retained by the diatom masses, but at any rate plainly proves that at this period, it is of frequent occurrence in the plankton.

Distribution: Judging from its distribution, it appears to be partly of southern origin, coming rather sparsely (?) to the north Atlantic as a southern oceanic species, partly too of northern origin, coming from the northern or arctic coasts. According to Cleve, distributed over the temperate northern Atlantic; also known from the English Channel (February and May 1903, occasionally numerous), the North Sea, Skagerack, the Baltic, the west coast of Norway, the sea between Norway and Jan Mayen (in arctic waters, frequent, cfr. Jörgensen L. 92, p. 36), Greenland, Jan Mayen and the sea towards Spitzbergen.

Dictyocha *fibula* Ehrb.

Cleve (L. 40. p. 154) considers it to be doubtful whether this genus belongs to the *Silicoflagellata* or to the *Radiolaria*.

Rare and scarce. Occurs mostly in deep water samples.

Distribution: Temperate oceanic form. Occurs in the Atlantic, The English Channel, the North Sea, Skagerack, Cattegat, the Baltic and the west coast of Norway, everywhere in small numbers.

VII. Radiolaria.

VII a. Spumellaria.

The small number of species which have been observed all belong to the deep water fauna, and usually occur rarely and sparsely. They all appear to be confined to the warmer, salter Alantic waters, and are perhaps all of them temperate oceanic. As a rule, they are only found at places on the outer coast near the sea, single specimens, however, have been found farther in at deep places in the fiords, and these have probably been brought in by the water from the sea.

During the period of the spring diatom inflow, they appear to be absent except in the inner fiord depths, where they may still be found in a few scattered specimens.

Concerning the distribution cfr. farther below under *Nassellaria*.

Key to the genera of Spumellaria.

- Spherical shells, with (about) 6 radial main spines in pairs perpendicular on each other .... *Heracontium*.
  - (Spongy outer shell which lengthens out as pyramidal scaffolds along the main spines ..... *Rhizoplegma boreale*).
- Spherical shells, with several (more than 6) main spines.
  - 3 spherical shells, with broad 3-edged main spines and similar or smaller simple byspines on the outer shell .. *Echinomma*.
  - 3 spherical shells, with narrow branching byspines on the outer shell .... *Drymyomma elegans*.
  - 4 spherical shells, with delicate outer shell, which is pierced by broad 3-edged main spines and similar or smaller byspines from the next one..... *Chromyechinus borealis*.
  - Spongy outer shell, which lengthens out along the main spines as interwoven pyramids.... *Rhizoplegma boreale*.
- Circular discs, with porous plates above and below .... *Stylodictya*.
- Biconvex, spongy lens................. *Spongodiscus favus*.
- Outer shell imperfectly closed, with concentric belts and large openings; inside, a double inner shell .... *Phorticium pylonium*.
- Outer shell with broad porous plates, which coil themselves into a double spiral round an inner shell; numerous, long, narrow, subulate spines..................... *Larcospira minor*.
- Shell of irregular construction with strong, long protruding radial main spines (about 12)........................ *Streblacantha circumte ta*.

1. Cubosphærida Hck.

Very sparsely represented (unless one includes *Rhizoplegma boreale*).

Hexacontium *enthacantum* Jörg. and *H. pachydermum* Jörg.

Jörgensen L. 91, p. 52—54, pl. II, f. 14.

These species, which I at first thought very different, agree so remarkably in some respects, that now I consider it by no means unlikely that *H. enthacanthum* is a young state of *H. pachydermum*. The points of agreement are chiefly in the second shell and in all probability also in the inner one, which is, however, more difficult to examine carefully, as it cannot be seen well unless the outer shells are removed. It is however difficult to obtain this without destroying the inner shell.

The points of disagreement are in the outer ball and are so evident in most instances that it will hardly be recommendable, at any rate at present, to consider the two species as identical. The outermost shell does, nevertheless, appear to vary considerably, both in diameter, the thickness of its wall and its pores, while the middle one varies remarkably little.

I have in exceptional cases found specimens of *H. enthacanthum*, where there were signs of byspines on the outermost shell (they are easily broken off), but have however, never met with any instance of doubt as to whether a given specimen was *H. enthacanthum* or *H. pachydermum*, when only the outer shell was present.

Whether there may possibly be several species or not, I have not been able to decide, as both those above mentioned occur too rarely in my material. Yet, I have the impression that it is only a question of different forms, not of different species.

When the outside shell is wanting — I look upon such forms as young specimens — I am, however, quite unable, at present, at any rate, to decide whether the specimen belongs to the one or the other of the species above mentioned. (Cfr. pl. VIII, f. 32, a, b).

H. enthacanthum Jörg.

(Pl. VIII. f. 30).

I will only add a few remarks to the detailed description given l. c. (Jörgensen L. 91, p. 52).

This species differs from the following in having a delicate outer shell with comparatively narrow walls between the pores and no byspines.

As in the following species, the pores on the outer shell are different in size, from 6—10 μ, most of them being 8 μ, although they are not strikingly unlike.

The pores of the middle shell in both species are also alike, there is a slight variation in the size of them on the same shell, they average 4—5 μ (seldom as little as 3 or as much as 7). The pores on the two outer shells are about equal in number on the radius. But the inmost shell differs considerably in this respect, the pores here being comparatively much larger and consequently much fewer in number.

On young specimens, where only the two inner shells are developed, one may often see transverse processus on the radial spines where the outer shell is found later on, these processus forming the intermediate walls of those pores in the outer shell which are situated nearest to the main spines. On still younger specimens, however, these processus are also wanting.

Such forms (cfr. pl. VIII, f. 32) may easily be mistaken for species of the genus *Hexalonche*. If one considers the coincidence in dimensions and construction of the inner shells of *Hexacontium enthacanthum* and *H. pachydermum*, it would, however, seem most reasonable to look upon them as being forms of these species.

The outer shell varies in its development from very thin to moderately thick. The pores on the thicker shells seem to be rounder and to have wider walls, which are more plainly widened out in the corners.

I have very rarely seen specimens with a trace of byspines (conically heightened parts) in the corners between the pores. These traces of byspines appear, however, to denote that the limit in the direction of *H. pachydermum* is not certain. The common name ought in this case to be *H. pachydermum*, which would then represent the grown form.

The number of the main spines is usually 6, and sometimes 7, but very seldom more. These spines are usually about equal in breadth inside as well as outside the outer ball.

Ocean forms, of which I have seen a few, seem to diverge somewhat (both in this and the following species). The specimen illustrated pl. VIII f. 30 for instance, had a rather strong outer shell with main spines, which, as is the case with *H. pachydermum*, were considerably narrower inside the shell than outside. The inmost shell too was more solid than usual, and had comparatively more pores and with stronger walls (cfr. fig. 30 b.).

The dimensions of outer and middle shells on 7 individuals (the 6 from the west coast of Norway):

Outer shell	wanting	wanting	wanting	62 μ	78	73	90
Middle shell	34	33	32	32	33	34	34

Thus it will be seen that the diameter of the middle shell varies remarkably little, while that of the outer one varies considerably.

Rare, in deep water samples, always in small numbers.

Distribution: Temperate oceanic form, which with us is only found in deep water, especially at a depth of 300 m. or more. Somewhat more frequent on the west coast of Norway. Also known from scattered spots in the sea beyond the coast of Norway and from the Faeroe and Shetland Isles northwards.

H. pachydermum Jörg.

(Pl. VIII. f. 31).

The byspines on the outer shell vary considerably in length. They are found in all corners where the pores meet, so that each pore is surrounded by several byspines (generally 5 or 6).

The pores on the outer shell are more or less round, the intermediate walls being on the whole broader than in the preceding species, answering to the development of the outer shell which is altogether stronger in this species. This shell is especially thick.

The length of the main spines varies considerably.

The byspines on the middle shell are little conspicuous, and may be easily overlooked (as in the case of the preceding species).

The innermost shell is here seen less clearly than in *H. enthacanthum*, unless the thick outer shell be removed. One may, therefore, easily mistake this species for a *Hexalonche*, by overlooking the inside ball. I have, however, repeatedly convinced myself on breaking the outer shells, that it is always present. Its construction is the same as in the preceding species.

No important difference in dimensions between this species and the preceding one seems to be found, and this is a very important factor when considering the question as to whether these supposed species are specifically different, or only constitute different forms of one and the same species. Here too the outer shell varies in size, but the middle and inmost ones are remarkably uniform in this respect and resemble those of *H. enthacanthum*.

The ocean forms, however, appear to diverge essentially. I have not had an opportunity, though, of studying them more thoroughly in richer material, so that I cannot yet give a definite opinion as to the probability of separating new species. This, however, does not seem unlikely.

For such a strongly developed ocean form from the sea beyond Söndmöre (in February 1901, S.S Michael Sars, a sample kindly given me by Dr. Gran) was found:

Strong, long main spines (most of them broken off). Numerous byspines (4—6 round each pore), long, needle shaped, 40 μ long (nearly $^4/_5$ of the radius of the outer shell). Outer shell very thickwalled (6—7 μ thick), pores almost even, = 8 μ, very broadwalled, round, a little broader than the walls. 7 main spines, much narower between the outer shells than outside the outmost one. The diameter of the three balls 108 μ, 39, 19.

Occurred like the preceding species rather rarely and sparsely in deep water samples, though perhaps somewhat more frequently. As a rule it is found in deep water samples from such outer places where the sea water has easy access. During the spring diatom inflow, it seems generally to be absent, except at greater depths in the inner fiords, where scattered specimens occur. This also seems to be the case, on the whole, with regard to the other *Spumellaria*.

Distribution: Chiefly the same as in the preceding species, often together with it.

VII A. 2. Astrosphærida Hck.

Echinomma *leptodermum* Jörg.
(Pl. VIII, f. 33).

Jörgensen L. 91, p. 57.

This species is at once recognized by having more numerous and shorter radial spines, larger and more uneven pores on its outside shell, as well as by its irregular (deformed) middle shell. It is also in other respects very different from the two preceding species.

The outer ball thinwalled (the walls broader than they are thick). The pores polygonally roundish oval, very uneven in size, 7—25 μ, with intermediate walls (2—4 μ broad), which are much broader towards the corners (lumen rounded off).

The middle shell moderately thick (the intermediate walls being as thick as they are wide, about $1^1/_2$ μ), rather angular and irregular, a little larger than in *Hexacontium enthacanthum;* diameter about 40 μ. The pores somewhat uneven, roundish, 4—7 μ. The intermediate walls solid, not particularly broader in the corners.

It is difficult to see the inmost shell, which possesses solid beams (about equal in thickness to those of the middle shell), but rather few polygonal, mostly pentagonal or hexagonal pores, about 8 μ. The diameter of the inmost shell about 15 μ (or a little more).

About 15 main spines, about equally broad inside as outside of the outmost shell, not long. They seldom protrude farther than to a length equal to the distance between the two outer shells, often less, and vary in development. Between the two inner shells, the radial spines are very narrow and in fact hardly wider than the beams of the inmost shell.

The byspines on the outside shell are in appearance like the main spines, but not radially lengthened inwards, with a wide base on the outer shell (like the main spines) and very unevenly developed in size, although generally protruding less than the main spines. Variable in number; although, as a rule, not many, far from being developed in all the corners, only here and there.

The number of the main spines is variable, often only about 10, though oftenest about 15. They are 3-edged as in *Hexacontium pachydermum.*

The nearest relation to this species is, without doubt, *E. trinacrium* Hck., which species, however, to judge from Hæckel's illustration and description (L. 84, p. 441, pl. 24, f. 6—8) is well distinguished by the construction of the inside ball, as well as by several other, less important, characteristics (as the number of the pores and spines).

As in *Hexacontium pachydermum* and *H. enthacanthum*, there are forms without outer shells, but there is generally a trace of these in transverse processus on the main spines. These may, however, also be entirely absent. Such forms, of which one is illustrated on pl. VIII f. 33 c, might equally well be reckoned as belonging to the genus *Actinomma* (without byspines on the third shell), respectively *Haliomma* (with only two shells), if their dimensions and other characteristics were not completely corresponding to the above species. Cfr. Jörgensen l. c. p. 58.

This species also varies a good deal. When the outside shell is thin-walled, the pores and intermediate walls are of a more uneven size. The byspines are in such cases slightly developed or (as yet) wanting.

It is likely that these divergences may be accounted for by a difference in age. A more important difference is the number of main spines, which seems to be able to vary from 10 to 16.

Comparatively frequent, though, like all radiolaria with us, always present in small numbers. It occurs, however, decidedly more frequently and in larger numbers than the two *Hexacontium* species.

Distribution: The same as that of *Hexacontium enthacanthum* and *H. pachydermum.* Frequent also on the west coast of Norway and in the Norwegian Sea.

E. trinacrium Hck.

The forms which I have tabulated under this name are somewhat uncertain. They are distinguished from the foregoing species by a strong, rather thick outer shell, more numerous and stronger byspines, as well as by a different construction of the inmost shell, which is in most respects like the middle one.

There is nevertheless on the one side a considerable agreement with *Chromyechinus borealis,* only that the outside shell (the fourth) is wanting, on the other side a considerable resemblance to younger forms of *Drymyomma elegans,* where the characteristic branched byspines are still wanting or are branchless needles. To this must be added that different forms of *E. leptodermum* may also have rather strong outer shells and more numerous spines.

As a rule, though, the forms of *Chromyechinus borealis* may easily be recognized by the transverse processus on the radial spines, which here, as in *E. leptodermum* and *Hexacontium enthacanthum* suggest the beginnings of the still undeveloped outer shell. The forms of *Drymyomma elegans* have characteristic long slender main spines and narrow byspines. Yet, I am not sure if there be not still another species, most nearly answering to *E. trinacrium,* but with long, narrow principal spines and byspines, the latter always being branchless.

It is difficult to examine the inmost shell. I have not yet succeeded in ascertaining with certainty whether such a firmly constructed inner shell with which *E. trinacrium* is depicted by Haeckel (L. 84, pl. 24, f. 6—8) is also characteristic of *Chromyechinus borealis* and *Drymyomma elegans.* I have, however, seen such a shell.

As I have already suggested in a previous paper (Jörgensen L. 91, p. 57) it is not impossible that what I have called *E. trinacrium* may be certain young forms of *Chromyechinus borealis,* where the above mentioned transverse processus on the radial spines are wanting. On the other hand, it is just as likely that there may be with us another species differing from both *Drymyomma elegans* and *Echinomma trinacrium,* to which the supposed intermediate forms belong. This species would be comparatively frequent on the northern coasts of Norway.

Until this is made evident, it will be best to keep to the species which are always easily recognized, *viz. Echinomma leptodermum, Chromyechinus borealis* and *Drymyomma elegans.*

Occurs in the plankton like the foregoing species.

Drymyomma *elegans* Jörg.
(Pl. VIII, f. 34).

Jörgensen L. 91, p. 58.

This species, when fully developed, is very easily recognized by its branched byspines on the outside shell.

The outside shell is strongly developed, thick walled, diameter ± 85 μ. The pores are roundish with broad intermediate walls, unevenly developed, though not so much so as in *Chromyechinus borealis*, on an average about the same size or perhaps most of them a little smaller.

The two inner shells seem in all important respects to answer to those of the following species, *Chromyechinus borealis*. Still, I must call attention to the fact that I have had very little chance of examining them more thoroughly, as the species occurs so sparsely.

The number of the main spines seems to vary (?) from about 15 up to about 20. The largest are beautifully developed, long, slender and always branchless, a few of the smaller ones seem, on the contrary, occasionally to have a single needle shaped side branch, like the corresponding one in *Chromyechinus borealis*.

Of byspines there are some resembling the main spines, only smaller and especially narrower. From these 3-edged spines there seems to be every transition to numerous narrow needle shaped ones without distinct edges.

Most of the byspines, especially the narrow ones, carry in their upper halves from 1—4 obliquely diverging narrow branches, some of these again carrying a similar, but shorter, side branch.

There seems to be a regular transition from the more delicate radial spines to the more strongly developed, 3-edged and branchless, byspines.

It is, however, as above mentioned, probably not quite certain that the previously mentioned *Echinomma*-forms with long, slender main spines and byspines, should all be included in this species. These forms occur, with us, much more frequently than the fully developed *Drymyomma elegans*.

Rare and scarce, only found at a few places in 1899: Sea off Gaukværö, $^{19}/_{1}$, 0—700 m., Senjen, $^{21}/_{1}$, 0—130 m., the Vest Fiord, $^{1}/_{2}$, 0—200 m., Skroven, $^{4}/_{2}$, 350—300 m., the Tys Fiord I, $^{28}/_{3}$, 0—700 m.

Distribution: Very rare also on the west coast of Norway, only in deep water. Also known from the Norwegian Ocean off Söndmöre and from the Vest Fiord, Feb. 1901. (Cfr. Gran L. 70, p. 150—151).

Chromyechinus *borealis* (Cl.)
(Pl. VIII, f. 35; pl. IX, fig. 36—37).

Actinomma boreale Cl. L. 30, p. 26, pl. 1, f. 5 c (vix a, b).
Chromyomma boreale (Cl.) Jörg. L. 91, p. 59.

This remarkable species is easily recognized by its four shells, of which the outside one is exceedingly delicate and very differently developed. This outside shell is very often wanting, but there are usually — as before mentioned — indications of it in the transverse processus on the radial spines.

On the outside shell there are — but only rarely in the material which I have examined — narrow byspines, few in number, which most often form more or less obliquely (not straightly radially) protruding extensions of the walls between the pores. They may also sometimes be seen as bristle-shaped branches extending obliquely out from the main spines. They are thus not radial byspines, although they have undoubtedly the same biological value as these.

On account of these spines, it will, I think, be most correct to enter the species as a *Chromyechinus*, especially as, on the shell next to the outside one, there are both main spines and byspines (both having the same appearance) in the same sense as in *Echinomma trinacrium*.

It is quite remarkable to what variations this species is subjected, even in the matter of dimensions. I have found the following dimensions on the three outer shells, for 6 specimens:

Outside shell	96 μ	114	100	118	121	116
Next to the outside one	77	83	83	83	89	86
Next to the inside one..	34	35	37	36	40	36

It will be seen that the dimensions of the shell next to the inmost one differ only a little from the corresponding ones in *Hexacontium enthacanthum*, *H. pachydermum* and *Echinomma leptodermum* (as well as in *E. trinacrium* and *Drymyomma elegans*). The third shell too corresponds, on the whole, well to the third one in the species mentioned.

This is a very interesting phenomenon, seeming to indicate a development of all these forms from a common, comparatively young, principal form, the balls being probably formed centrifugally, at any rate, after the second. It may, on the other hand, perhaps be the case that the less developed inmost shell is formed later, centripetally. I mean that I have seen traces which lead me to conclude that its connection with the second ball is not merely a prolongation of the radial spines.

In this species, it seems to be possible to distinguish between two series of forms, which in their extreme forms are so different that one would not hesitate to class them as distinct species, if there were not so many variations within each series that as yet it does not seem able to fix any certain limit. It is not unlikely that really here exist several closely allied species.

The one series of forms (cfr. pl. VIII, f. 35) has shorter broader spines, not very different in development, on the whole very similar to those of *Echinomma trinacrium* Hck. The outer shell is very delicate, closed.

The other series has longer, more slender spines, varying considerably in size. The outer shell is of firmer construction, and always seems to be open on one side (not complete). Here the radial spines and the byspines are particularly long, and this circumstance together with the large hole in the outer shell causes a foreign appearance, something like in certain species belonging to the *Nassellaria* and *Phaeodaria* groups.

On strongly developed forms of this second series, there are also sometimes seen „false" byspines, as described above, at any rate in the form of side branches on the largest radial spines on the open side of the outer shell.

On those forms too where the outer ball is closed, there often seems, however, to be a comparatively strong development of the spines on one side of the shell.

The pores on the outside shell vary considerably in size and shape, both on one and the same individual and on different ones. They range from quite tiny, circular shaped, to large, longish holes.

Also the width of the intermediate walls between the pores is very variable; on the other hand, their thickness is never great.

The shell next to the outside one is always strong, thick-walled, with very uneven pores, roundish and oblong, most of them being 10—16 μ, although sometimes considerably smaller or larger.

The ball next to the inside one answers in all important respects to the corresponding one in *Echinomma leptodermum*.

The inmost shell is difficult to see. Its diameter is abouth 16 μ. I have not succeeded in getting it out uninjured when breaking the outer balls, so that I cannot give a good drawing of it.

Cleve's *Actinomma borealis* is undoubtedly the same as this species. He seems, however, to go too far in his opinion of the variations in the radiolaria. as will be seen on reference to his illustrations fig.s a and b (l. c., pl. 1, f. 5 a and 5 b). He looks upon them as young forms of the same species which he illustrates in fig. 5 c. I think that f. 5 b = *Echinomma leptodermum*, f. 5 a is probably the same species (too few main spines depicted on the illustration?) without a developed outer shell.

Rather frequent, both on the north, and west coast, though rarely at all somewhat numerous. As is the case with the other *Spumellaria* with us only found in deep water.

Distribution: The same as that of *Echinomma leptodermum*. Found by Cleve in deep water samples from the sea west and south of Spitzbergen (L. 30, p. 26). Also known from a few places in the North Ocean as well as (cfr. Cleve L. 40, p. 136) a couple on the American side of the Atlantic, near the surface.

Rhizoplegma ***boreale*** (Cl.) Jörg.
(Pl. IX, f. 38, pl. X. f. 38 e—f.).

Hexadoras borealis Cl. L. 30, p. 30, pl. 2, f. 4, a, b, c.
Rhizoplegma boreale (Cl.) Jörg. L. 91, p. 61.

Easily recognized by the characteristic interwoven pyramids around the main spines (pl. IX, f. 38 b).

Haeckel depicts similar pyramids for *Rhizoplegma lychnosphæra* (L 86, pl. 11, f. 5).

The inside shell is irregular, not quite round; sometimes resembling a cube in shape, sometimes it is more like an octahedron. The pores are uneven, irregular, polygonal, averaging about 10 μ.

The intermediate walls between the pores are not broad, differently developed, but never having the distinct broader corners which correspond to the rounded lumen of the pore. A few small, short, needle-shaped byspines are found here and there on the beams, but not regularly in the corners.

The main spines are long and strong, often 8 in number (according to Haeckel's system answering to an inner cube), although also often only 6 (answering to an octahedron) or 7. A larger number may sometimes be found (cfr. pl. X, f. 38, e—f.) The main spines have 3 strongly developed edges which narrow off toowards both ends. On these edges there are transverse branches diverging at right angles and these, together with the corresponding ones on the other edges of the same spine, form a very variable number of verticils of threes.

The spongy, loose and very irregularly constructed network, which forms the outer shell, arises from the lowest 2—3 verticils on the main spines, but has the appearance of being lengthened out a good way up along the radial spines, on account of the thin connecting beams, which unite the different verticils parallel to the direction of the spine (fig. 38, a, b).

Also on the outside of the outer spongy shell (network), there are some few scattered short and fine, needle-shaped byspines.

The ocean forms seem generally to have 6 radial spines.

There seems to be a slight difference between the regular forms which have 6 radial spines, and those which are more frequently found in the coast water and which have about 8. The former seem to have a smaller inner shell with distinct byspines. I have, however, not discovered any definite difference so as to make it necessary to divide them into two or more species.

Young forms (cfr. pl. X, f. 38, e—f. and Cl. l. c. pl. 2, f. 4 a) are rather unrecognizable, as both the interwoven pyramids and the spongy outer shell are absent.

The construction of this species resembles greatly that of *Rhizoplegma radicatum* Hck. and *R. lychnosphæra* Hck. The inner, fine, transverse branches on the radial spines in the space between the outer, spongy shell and the inner shell are, however, wanting. These transverse branches are by Haeckel the characteristic of the subgenus *Rhizoplegmidium*.

According to Haeckel's system, it might perhaps be a question as to whether or not our species should be classed as belonging to the genus *Lychnosphæra*, because of the byspines on the inner shell. As these, however, are small and few in number, and perhaps not even always present, this would not be recommendable, and still more so as such a distinction between the genera seems to be unnatural.

Haeckel's genus *Hexadoras* has radial spines without side branches, for which reason I still mean that the above species finds a more natural place among the closely allied forms of the genus *Rhizoplegma*, notwithstanding that there undoubtedly often occur forms with 6 main spines.

Belongs to the most common radiolaria with us and is not rare in deep water samples, although never numerous.

Distribution: On the west coast of Norway rather frequent, although rare in fully developed condition. Known from the sea west and south of Spitzbergen (Cl. L. 30, p. 30) and from a few places in the Norwegian Ocean.

VII A. 3. Porodiscida Hck.

Stylodictya Ehrb., Hck.

Species of this genus seem only to occur quite exceptionally with us. I have only seen a very few individuals, which appear, however, to belong to species hitherto unknown. All have more or less distinct circular, inner rings, not spiral-shaped, and belong, therefore, to Haeckel's subgenus *Stylodictyon*.

In deciding a species, it is of great importance to examine the shape of the disc in side view.

I have only included in my list those species in which I am acquainted with this shape.

S. tenuispina Jörg. n. sp.
(Pl. X, f. 39).

Shape of the shell in side view: Almost linear, though somewhat thicker in the middle and slightly narrowed towards the ends.

which are rounded off. A small portion of the central part of the shell is strongly convex, forming a protruding ball shaped cap on either side (pl. X, f. 39 c).

System of Rings: From an inner little spherical shell 4 radial rods extend in the form of a cross to the 1st ring, which forms an irregular quadrangle with rounded corners. The radial rods pass through the middle of the sides. Beyond this ring there are, on the specimen illustrated, 6—7 rings, each joined to the one next outside by a continually increasing number of radial rods. It is likely that the number of the rings increases as time goes on. The inner rings are still somewhat angular, the outer, however, more regular. The outmost ones seem, however, again to show irregularity, which perhaps, disappears with age.

Pores: The strongly convex central part, which corresponds fairly well to the 1st ring, has unusually large, roundish, hexagonal pores, which are much broader than the separating walls. The rest of the pores are exceptionally small and uneven in size, most of them being narrower than the intermediate spaces, or of the same width as these, very little larger outwards, 2—3 on the space between two rings.

Radial spines: Around the disc (in the imperfectly developed individual, cfr. the illustration) a few very narrow, needle-shaped radial spines protrude, apparently in no definite order. Numerous radial rods are to be found between the outer rings; some go through two or more, others again only connecting two rings.

Byspines: Very small, almost punctiform, short byspines, largest and closest together on the convex central part, the others being only scattered over the disc.

Dimensions: Diameter of 1st ring 30 μ, of 2nd 42, of 3rd 59, of 4th 78, of 5th 98, of 6th 120, of 7th 144, 8th ring irregular and as yet incomplete. The rings are thus somewhat broader outwards. The large pores on the central part 5—6 μ, the small ones only $1^1/_2$—3—4 μ. The few piercing radial spines only protrude as far as a distance equal to the breadth of the rings. The disc is 37 μ thick at the convex central part, outside this 30 μ, only about half as thick at the margin.

The specimen which is illustrated seems to me to suggest that the few piercing radial spines are in reality radial rods which penetrate several rings, similarly to those which are seen here and there farther in between the rings. In this case, it is hardly correct to consider them as the radial spines characteristic of the genus *Stylodictya*. The above species might just as well, for that matter, be classed as belonging to the genus *Porodiscus* (without marginal spines); but as one cannot be sure whether there may not be radial spines on the outside ring in the fully developed individual, I have retained the species under the genus *Stylodictya*, where it would at once be placed after a less critical examination. It is certainly also closely related to the following species.

In structure it is very like *Porodiscus orbiculatus* Hck. (L. 80, p. 492, pl. 29, f. 1), which, however, wants the very characteristic, coarsely porous, central part. This has the appearance of a spherical shell with a diameter greater than the breadth of the disc, with a smaller sphere in the middle (this sphere is the innermost shell) and with equatorial rings outside.

Only twice noticed in 1899: In the sea off Gaukværö, $^{19}/_1$, 0—700 m.; in the sea off Röst, $^{22}/_3$, 0—900 m. This makes it very probable that it is an oceanic, deep water species, which only exceptionally comes to our coasts.

S. *validispina* Jörg. n. sp.
(Pl. X, f. 40).

The structure is, on the whole, the same as in the foregoing species. The strange, peculiar, strongly convex central part is, however, wanting (the disc is homogeneous) and the margin is furnished with numerous strong spines which are almost regularly distributed.

Shape of the shell in side view: Broadly linear (the disc is of almost even thickness) but little narrower at the margin than in the middle, with sharp or obtuse corners, not clearly rounded off at the ends, but almost square. There are short spines scattered on the central part.

The system of rings: From the innermost little shell 4 radial rods extend in the shape of a cross to the first ring, as in the preceding species. The ring itself is also here an irregular quadrangle with rounded corners. Outside this ring, there are three others, connected to each other by radial rods whose number increases outwards. In the prolongation of the 4 primary radial rods (from the inmost shell) may be seen, more or less clearly, some similar ones which are rather crookedly placed, and these conjoin to form 4, more or less definite, zigzag rods, which go through the whole system of rings. On the outside ring there are numerous (21) equatorial, narrowly conical, marginal spines.

Pores: The pores in the centre are very small, punctiform, very scattered with wide intermediate spaces, gradually larger outwards, on the two outer rings about 2 on the space between the rings, uneven in size, up to 4 μ or a little larger. Between the pores on the central part very small, punctiform byspines are scattered, which may easily be overlooked.

Radial spines: Numerous, narrowly conical (subulate), strong radial spines of different lengths, the longest being little more than $^1/_2$ of the radius of the disc. Some project out from the ring next to the outside one, several too from the one next to the inmost one, and yet a few from the innermost one.

Byspines: A few scattered ones, very short and very small, needle shaped, extend from the central part of the disc.

Dimensions: The diameter of the inner shell 14 μ, of the first ring 34, of the second 60, of the third 84, of the fourth 102. In thickness 24 μ.

The specimen illustrated appears to be almost fully developed. Probably only the small portion of the outer ring which is not seen in the illustration, is all that is wanting.

This species exhibits a certain amount of agreement with *S. stellata* Bail. (L. 9, p. 6, pl. 1, f. 20), which has, however, fewer and broader spines, and also differs in other respects.

Only once found: Sea off Röst, $^{22}/_3$ 1899, 0—900 m. (together with the preceding and the following species).

S. *aculeata* Jörg. n. sp.
(Pl. X, f. 41).

This species corresponds well in structure to the foregoing one, but differs in a marked degree with regard to its radial spines, which are particularly numerous, and are more irregularly placed, not all lying at the same level, that of the disc, but pointing obliquely beyond and beneath it.

Shape of the shell in side view: Broadly linear, with rounded corners and ends. From the centre to near the margin, there are small scattered punctiform byspines.

System of rings: On the whole like the preceding, only the rings are more irregular in shape and width.

Outside the fourth ring there seems to be traceable the beginning of a 5th which is as yet not formed.

Pores: On the whole like those of the preceding. Very large pores here and there on the edge of the disc, which would probably have formed several smaller ones later on. The byspines are very scattered, fewer in number than in the preceding species, but distributed over a larger part of the disc.

Radial spines: The rings are united similarly to those in the preceding species, but the number of radial spines around the disc is larger, more than 30. The spines are narrower and more irregularly developed, some being a little bent, turned outwards and obliquely upwards, not all at the same level, equatorial, but distributed over the broad, rounded margin of the disc. The length of the spines is about the same as in the preceding species.

Byspines: Very similar to those of the preceding species, but more scattered and distributed over the whole of the disc nearly out to the margin.

Dimensions: The diameter of the inmost shell 12 μ, of the first ring about 38, of the second 54, of the third 85, of the fourth 110. Pores uneven, most of them being 2—4 μ. The spines protrude as much as to 30 μ. The disc is 28 μ in thickness.

This form appears to differ considerably from the other species on account of the irregularly placed marginal spines. The specimen illustrated is probably not quite fully developed.

Note. *Stylodictya aspera* Jörg. (L. 91, p. 61) is a fourth species.

VII A. 4. Spongodiscida Hck.

Spongodiscus *favus* Ehrb.

Ehrb. L. 53, p. 301. Hck. L. 86, p. 577.

A species, which on the whole corresponds fairly well to the description given by Haeckel of this species, was twice found together with *Stylodictya tenuispina* (cfr. under this heading).

No inner rings were seen. The disc was shaped like a little thick, biconvex, lens. Towards the margin there were fine radial spines here and there, some of these were a little protruding; but the disc did not appear here to be fully developed. The pores towards the margin much larger than in the middle. Diameter 180 μ.

Distribution: According to Haeckel, the North Atlantic, Greenland, Faeröe Channel (Murray), surface.

VII A. 5—7. Irregular Spumellaria.

The three forms mentioned below of irregular Spumellaria are difficult to trace and explain, and have given me a great deal of work and taken a lot of time. For each form I have briefly mentioned the results I at last arrived at; but there is still a good deal of work left before a full light with regard to their structure can be claimed.

VII A. 5. Pylonida Hck.

Phorticium *pylonium* (Hck.?) Cl.

(Pl. X, f. 42, a—d; pl. XI, f. 42, e—f., f. 43—45).

Cl. L. 30, p. 31, pl. 3, f. 2 a, b, c. Hck. L. 86, p. 709, pl. 49, f. 10? *Tetrapylonium Clerei* Jörg. L. 91, p. 64.

This species was first classed as *Phorticium pylonium* Hck. by Cleve, l. c. Judging from his illustrations, the innermost shell was not noticed, which would allow of the species being classed as *Phorticium pylonium,* a form which is probably little known.

As I, however, found such an innermost shell, and apparently 3 systems of girdles, I concluded that I should refer the species to the genus *Tetrapylonium,* as *T. Clerei* Jörg. n. nomen. Cleve has, in a later work accepted this name and remarks that the species is not identical to *Phorticium pylonium* Hck., probably because he has also seen the innermost shell.

After much fruitless labour. I at last succeeded — as far as I can see — in getting a glear idea, in all important points, of the structure of this interesting species, and I have found it to be as described below. As will be seen, it is quite different from that of the genus *Tetrapylonium* and — as far as I can see — of all the others mentioned by Haeckel. This would necessitate a new genus, if there were not a possibility that the species is, after all, identical to Haeckel's *Phorticium pylonium.*

The genus *Phorticium* is too vaguely described by Haeckel to be recognized, either after the description he gives or his illustration. As, however, Haeckel speaks of *P. pylonium* as a very frequent species of very varying appearance, there may be, as already suggested, a possibility of my species, after all, being found to be the *P. pylonium.*

The structure is principally as follows (cfr. pl. X, f. 42*): On the most perfectly developed specimens there is on the very outside a largest, lateral girdle, a broad oval or almost a rectangle in shape, with rounded corners. (Cf. Cl. l. c. fig. 2 a). Generally, only the sides of this girdle, nearest to the transverse girdle, are present. This outmost lateral girdle is seen in profile in a dorsal view, looking perpendicularly towards its level (when the belt itself it seen from the narrow side). Cleve's fig. 2 a gives such a dorsal view.

Right in the middle of this girdle and placed perpendicularly on it, dividing it into two equal parts, we find a second girdle developed where it must be shortest, namely, on a plane parallel to the shortest side of the rectangle. This is the transverse girdle (the designations correspond to Haeckel's). It is seen from the front in the dorsal figure (pl. X, f. 42, a, b) and from above in the apical one (pl. X, f. 42 c, d). In the lateral figure (pl. XI, f. 42, e, f) the sidepieces of the girdle are seen from the front; they coincide with the corresponding parts of the lateral girdle.

Across this girdle a new one is similarly developed at the shortest distance, perpendicular to both the former ones. This is the sagittal girdle. It is seen in profile in the lateral figure (the sagittal section) and from above right against its wide side on the apical one (the transverse section).

Again, perpendicular to this sagittal girdle and to the preceding one, and also where the distance is least, yet another girdle is similarly developed, thus forming an inner lateral one parallel to the outermost one, which is the largest.

In this way the girdles continue inwards, until there are 3 lateral, 3 transverse and 3 sagittal ones. In the dorsal view (the lateral section) there will, therefore, be seen 2 concentric, somewhat oval, inner shells encircled by a broad cross girdle and a lateral girdle, which is still broader and more or less completely developed and is seen in profile (f. 42 a, b.) In the lateral view (on the sagittal section) will also be seen two inner shells, both oblong-rectangular. The innermost one is connected with the next one, by a more or less clearly discernible girdle, the inner lateral girdle. Inside the innermost one, there are traces of yet another smaller one. Outside the outermost one, will be seen the more or less complete broad lateral girdle (f. 42, e. f.) In the apical view (the transverse section) may also be seen two inner shells, almost square with curved sides. The middle one is joined to the outer transverse girdle by another girdle which is not very broad — the sagittal girdle. Round the figure the transverse girdle is seen in profile (f. 42 c, d; the endpieces of the lateral girdle are here undeveloped).

It must not be understood that the girdles are developed from the outside inwards, in the order in which I have described them. On the contrary, it is probable here too that the formation of the skeleton is centrifugal, the innermost portion, perhaps, excepted.

The most important difference between the structure of this species and that of *Tetrapylonium* HCK. is that in this latter genus (according to HCK.) 3 separate trizonal shells are developed one outside the other. In the form here described, on the other hand, it will be more or less arbitrary to distinguish between several shells on account of the connecting belts which in themselves constitute a clear structural plan.

There is, too, a number of radial spines, which are especially definite and strongly developed in two diagonal planes, and here form 8 protruding spines at the corners, as in *Octopyle octostyle* and several similar forms.

There are also others, apparently irregularly scattered, which support the outside lateral girdle.

Finally, a rather large number of byspines occur on the outer part of the shell, short, needle shaped and with a broader base.

The pores are uneven, somewhat larger on the outer lateral girdle, roundish, oblong and polygonal; with strong separating walls, when they are fully developed. On the transverse girdle, the pores are smaller, roundish, very uneven, with wide separating walls.

The girdles are all rather irregularly developed, not symmetrical. Neither are the radial spines symmetrically placed.

As already mentioned, it cannot be seen from HAECKEL's description, what is the actual structure of the genus *Phorticium*. I have, therefore, refrained from proposing any new name, until HAECKEL's species *Phorticium pylonium* is more clearly defined.

To the form here described belong also the majority of *Octopyle octostyle* HCK. *f. minor* JÖRG. l. c. p. 64. These forms are less developed than *Tetrapylonium Clevei*, but seem, generally speaking, to belong to the same species. To the same forms too, the *Phorticium pylonium* illustrated by HAECKEL would appear to belong.

It is, however, quite likely, that at least two species are confused here.

Rather frequent, but always in small numbers and in deep water samples.

Distribution: Not unfrequent on the west coast of Norway, also in deep water samples. CLEVE has found it in samples from deep water from the sea west and south of Spitzbergen, as well as in surface samples from the American side of the North Atlantic. Also known from a few places in the Norwegian Ocean.

HAECKEL designates *Phorticium pylonium* as cosmopolitan (Mediterranean, Atlantic, Pacific etc. „surface and in various depths".)

VII A. 6. Lithelida. HCK.

Larcospira *minor* (JÖRG.)

Lithelius minor JÖRG. L. 91, p. 65, pl. 5, f. 24.

This species has a very different appearance, according to the position in which it is seen.

In one position it has an appearance corresponding to the illustration referred to, and which caused me to consider it as a *Lithelius* with a double spiral.

On being rolled under the microscope it has, in another position, the appearance of 3 distinct (concentric) shells, one outside the other, the innermost being somewhat oblong, the other two rounder.

In this last position, an indefinite contour of an inner, smaller shell is seen in the innermost one.

From which one may probably conclude that the innermost of the three shells is double, *Larnacilla*-shaped or trizonal (according to HAECKEL's designations). I have not, however, succeeded in seeing this clearly.

Form this shell there extends, on both sides, a transverse girdle, which winds itself into a spiral about the largest axis of the inner shell, the longitudinal or principal axis (after HAECKEL). These two spirals give rise to the appearance of a *Lithelius* with a double spiral, when looked at from above (transverse section, after HAECKEL apical view).

In a certain, a little oblique, position one gets again a more or less indefinite impression of a single spiral.

In each spiral there is only a little more than one turn.

Pores somewhat uneven, not large.

Numerous, long, narrow, needleshaped radial spines. (Cfr. also JÖRGENSEN l. c.).

One of the most frequent radiolaria in the north, sometimes also rather numerous, especially in ocean samples.

Distribution: Also rather frequent on the west coast. Known too from a few places in the Norwegian Ocean, where it occurs together with southern forms.

Note. What is in one instance in the tables entered as *Lithelius spiralis* HCK. is very uncertain, and it is probably only a form of *Larcospira minor*, which, as already mentioned, in certain positions gives the appearance of a single spiral. The same is the case with regard to *L. spiralis* JÖRG. L. 91, p. 66.

VII A. 7. Streblonida HCK.

Streblacantha *circumtexta* (JÖRG.)

(Pl. XI and XII, f. 46).

Sorolarcus circumtextus JÖRG. L. 91, p. 65.

This is also a very difficult form to define, and I have not yet succeeded in getting a clear insight into its structure. It can, however, not belong to the genus *Sorolarcus* HCK., as I at first thought.

There appear to be about 12 strong radial spines, of the same shape as those of *Phorticium pylonium* Cl., but protruding much further. They are more or less round, not three edged.

The outline of the shell in most positions is a broad oval, in a few, almost round. Some optical sections show inner spirals, then a double spiral as in *Larcospira minor*, other sections show at least 3 shells one outside the other, perhaps with several chambers (only indistinctly seen).

On the smaller and simplerer forms (cfr. Pl. XI, f. 46, c, d; pl. XII, f. 46 k. l), which I have taken to be specimens in an early stage of development, a single central chamber and spiral twists, which appear to form a snail spiral, may be seen.

On the whole it seems to me at present, that this species may best be placed in the genus *Streblacantha* Hck., though it may prove not to belong to this genus either.

The outer shell shows a more or less irregular structure and very uneven pores, from rather small to large ones and large holes. On the outside of larger (more developed) forms there are also more or less well developed byspines, very various as regards length and development, from small subulate ones with a rather wide base, to long, narrow needles. When more developed, these byspines are more or less connected through fine branches to an outer, spongy case immediately outside the outer shell. This spongy case is, however, rarely much developed, and seems then to be confined to — or at any rate most developed at — the one end of the shell. Cfr. also Jörgensen l. c.

Rare, and generally only singly, the small, younger individuals rather more frequent: The Vest Fiord I, $^{13}/_{1}$, 0—180 m.; Henningsvær, $^{17}/_{1}$, 0—180 m.; the sea off Gaukværö, $^{19}/_{1}$, 0—700 m.; Skroven, $^{1}/_{2}$, 0—300 m., $^{4}/_{2}$, 350—300 m., $^{4}/_{4}$. 0—150 m.; The Raftsund, $^{3}/_{2}$, 0—260 m.: The Tys Fiord I, $^{28}/_{3}$, 0—700 m.

VII B. Acantharia.

Of this group there were only exceptionally small forms with skeletons which seemed to be quite in the wrong place and were, on the whole, very imperfectly developed.

Acanthonia echinoides too, which is frequent on the coasts of Norway during the summer, was entirely absent.

I have only entered a peculiar form without any skeleton, which does not seem, up to the present, to have been met with anywhere else.

Radiosphæra n. gen.

I have several times, but only in conserved material, come across an organism which appears to be a skeleton-less radiolaria of the division *Acantharia*. It possesses, namely, the peculiar plasma products which Haeckel calls myophrisca, and which he describes as characteristic of this group.

For this species. I have had to coin a new name and have called the genus *Radiosphæra*.

R. anacanthica Jörg. n. sp.
(Pl. XVII, fig. 105, 106).

Central capsule spherical, filled with numerous small and large balls (alveoli?) the majority, small. Spines and skeleton wanting. Regularly distributed outside the central capsule, there are several bundles of myophrisca, probably 20 in number. They are short, linear, rather glossy, and are about even in size. In every bunch 6—8 of these bodies. These bunches (or bundles) lie in the outer part of the calymma which forms a structureless mass of slime (jelly), which is only visible on being coloured.

The diameter of the central capsule is 65—70 µ.

Rare and scarce, is, however, easily overlooked: $^{24}/_{1}$ 1899, Kvænangen, 0—50 m.; $^{1}/_{3}$ Evenstad I, 0—50 m.; $^{21}/_{3}$ 1900 Balstad I, 0—200 m.; $^{2}/_{4}$ the Skjerstad Fiord IV, 0—300 m. and the Skjerstad Fiord V, 0—420 m.; $^{4}/_{4}$ the Skjerstad Fiord XII, 0—500 m.; $^{6}/_{4}$ the Folden Fiord I, 500—400 m.

From the above, the species would seem to be oceanic, uncertain whether it is temperate or boreal.

VII C. Nassellaria.

Of this division there was a comparatively large number of forms in the plankton examined and also on the west coast of Norway; and, among these, there were a good many which, on account of their slightly developed skeletons, were at a low point of evolution. These proportionately simple forms are very interesting, in as much as they seem to be able to furnish valuable information with regard to the original structural type for the corresponding divisions, as well as with regard to the phylogeny of the whole class.

Haeckel's splendid work on *Radiolaria* (L. 86) is on the whole admirable for its clearness and the ingeniousness with which apparently unimportant details are fitted together to make up a wonderful and consistently worked out system. If it had not been for this immortal work of Haeckel's, the immense material, which the Challenger and other expeditions provided, would have waited long before it could have been made useful to science to any great extent. There may be differences of opinion as to the justification or appropriateness of the genera and families erected by Haeckel; it is impossible, however, not to admire the immense amount of valuable observations which are so plainly and clearly set forth in his extentive work.

As far as *Nassellaria* are concerned, Haeckel's system does not seem to be quite successful; but this division is, as he himself mentions several times, particularly difficult, and can hardly be dealt with satisfactorily in any other way than by starting from the simplest forms. These simple forms are, however, small and inconspicuous and may therefore easily be ignored for the beautiful and wonderful forms of which there are so many illustrations in Haeckel's famous work.

It is just for these simple forms that it seems to be impossible to use Haeckel's classification. After much groping and many fruitless attempts to arrange the Nassellaria, which I have found in my material, according to Haeckel's system, I have at length felt compelled to get out of the difficulty by erecting several new genera.

Unfortunately the Nassellaria in my material — as is the case with Radiolaria on the whole — never occur in any important numbers, but often only singly. I am, however, more and more convinced that certain simple structural conditions, which seem to have been partly overlooked, partly considered to be of little importance by Haeckel, who does not use them in his classification, recur as the ground plan of a large number, probably the majority, if not all, of forms of *Nassellaria*.

Moreover, I have been enabled, by kind assistance from different quarters, to obtain some richer radiolaria samples — most of them, unfortunately, of fossile species —, which, although I have not yet by far been able to work them through, as far as I can see, show that my opinion of the structure of this division of *Nassellaria* is on the whole correct. I hope in the future in a more detailed work to be able to give more exact reasons for my opinion, and try to apply it consistently to the more important genera of *Nassellaria*.

My remark, that HAECKEL had to some extent ignored certain primary skeleton parts, which I consider to be the principal type for all the forms which I have examined, may give rise to some misunderstanding. HAECKEL several times draws special attention to the „basal tripodium" as a ground plan, from which a large number, perhaps all, of the forms may be developed. This triradial groundplan also lies at the bottom of certain classifications in his system. According to my opinion, there is something wanting here — of which more further on — which is of great importance. Thus I found, quite at the beginning of my work with *Nassellaria* (JÖRGENSEN L. 91) that CLAPARÈDE's genus *Plagiacantha* was of different structure than HAECKEL (and CLAPARÈDE) had described, and, unfortunately, proved to have the same structure which HAECKEL describes as characteristic for other genera (*Plagonidium* HCK., *Plagiocarpa* HCK., *Periplecta* HCK.).

This peculiar structure is, however, not confined to radiolaria belonging to the genera mentioned, but is common to the whole division, with variations in development in different directions (see below).

This circumstance of itself makes it impossible to retain HAECKEL's genera in their original definition.

Whoever has tried to use HAECKEL's system of classification of *Nassellaria* for other divisions, as, for instance, the large one *Cyrtoidea*, must certainly have found that the genera and divisions of his system are, at any rate in part, unsatisfactory and prove not to be so well limited as to be of practical service. In several instances, certain secondary structural conditions of comparative insignificance are taken to be a basis for division, as also, in not a few cases, accidental and passing stages of development are used as distinctive characteristics. Especially in several of the *Cyrtoidea* in my material there are — and must be according to my opinion — real radial apophyses, which are not found in the corresponding genera according to HAECKEL, so that they would have to be classified under quite different divisions in his system.

On this account, I have been obliged to start new genera here too.

It seems to me that taken as a whole, HAECKEL's system as regards the *Nassellaria*, — at any rate, large portions thereof — must be entirely reconstructed. It will then be possible to retain a large number of HEACKEL's genera, but with different definitions.

HAECKEL mentions several times that the *Nassellaria* can monophyletically be traced from an original ground form, but that great difficulties are met with when one tries to put this into practice. He states that „the basal tripodium" or a sagittal ring or a cephalis may be looked upon as such a ground form. He seems, however, to consider the tripodium as the most natural starting point, as there are traces of such a tripodium to be met with in the ring species and *Cyrtoidea* („cortinar feet" in *Cortina* and *Cortiniscus*, „cortinar septum" in several *Cyrtoidea*).

This tripodium corresponds best also to my ideas.

As a foundation for the detailed description which follows, I have had to coin various designations which are most easily explained together when giving a comparative treaty of the whole group. Then too, I will explain my ideas with regard to the relation one to another, and the origin, of the genera found in the material under examination.

Phylogeny of the genera mentioned.

As an original ground form, I take one which is similar to *Plagonidium* HCK. (and *Plagiocarpa* HCK.) and which has four spines, extending in twos divergently from the ends of a short central rod. The plane through two of them, the sagittal plane, is perpendicular to the plane through the other two.

With a change of direction, an apical spine, A, and 3 basal ones will soon appear. These basal spines are one of them dorsal, D (fig. I) and two lateral, L_r (right) and L_l (left).

This seems to be a natural form for the skeleton, considering the position of the central capsule. (Cfr. below, concerning the position of balance in the water).

These 4 primary spines are, as stated in my previous paper (L. 91), the same as constantly occur in the *Nassellaria* which I mentioned. There they were called: Der primäre Mittelstachel (= D), der Vorderstachel (= L_l) and der Hinterstachel (= L_r). My reason now for changing the names is that the designations used will continually recur in the special descriptions, which it would not be at all easy to understand unless I gave these spines their special names, so that it was important to choose suitable ones, and such as agree as far as possible with the designations used by HAECKEL, whereever these latter could be retained.

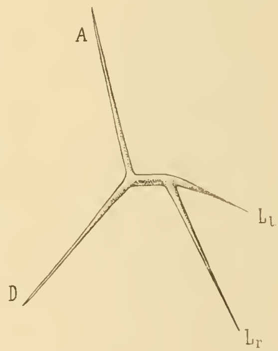


Fig. I. The ground form: lateral view, perspectively. Schematically, as the following figures.

If the skeleton be placed so that the central rod is horizontal and seen from the ventral end, the sagittal plane being vertical and the apical spine directed upwards, then the primary dorsal, basal spine D will be directed backwards and downwards, the apical spine A somewhat backwards and upwards, the left, lateral spine L_l (from the ventral end of the central rod) downwards, forwards and to the left, and the right, lateral spine L_r downwards, forwards and to the right (fig. II and fig. III).

Now there arises a verticil of 3 branches on each main spine, and so we have the *Plagiacantha* type, as it is found in the species *P. arachnoides* CLAP. (not the genus *Plagiacantha* HCK.).

The apical spine is here rather small and has (generally?) only two branches.

My reason for considering the apical spine, nevertheless, as belonging to the primary skeleton, is that I have never come across any form in which it was wanting. Its comparatively weak development, in many cases, may therefore be due to retrogression. At any rate, it would have to be looked upon as a spine which appears at a very early stage of development, so that, in the case in question, it will only be immaterial whether it is considered as being formed at the same time as the 3 basal ones, or as having

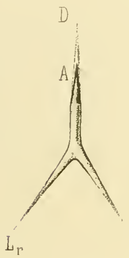


Fig. II. The ground form: apical view.

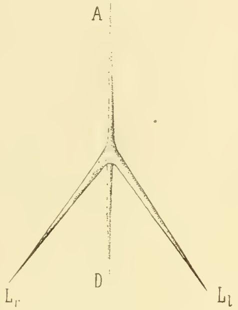


Fig. III. The same: ventral view.

been formed later. In other words, Haeckel's basal tripodium may be a more original form; but the ground form with 4 spines which I have chosen as a starting point, is the common type for all the forms which I have found.

This primary verticil of branches is found, more or less distinct, in a series of forms, which appear, therefore, to originate, more or less directly, from the *Plagiacantha* type.

There is a peculiarity with regard to the verticil, which plays an important part when examining the skeletons, as it makes it easier to trace the corresponding parts and makes clear the relation between certain forms.

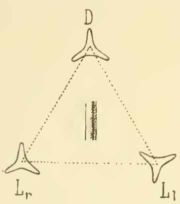


Fig. IV. The Plagiacantha type; transverse section of the basal spines.

The branches of the dorsal spine, D, are placed one dorsally, two ventral-laterally. (Here we only regard the projections of the branches on a plane perpendicular to the direction of the main spines. The actual direction of the branches is determined too by that of the main spines, so that it will be, respectively, dorsally upwards and ventral-laterally downwards.)

On the right lateral spine, the direction is almost corresponding, that is with one branch outwards (away from the central rod, cfr. fig. IV), while the verticil of the left lateral spine is turned so as to take the position as denoted on fig. IV. The edges have also the same position, where they occur, as well as the secondary spines.

In this way, the plasmatic body will be more perfectly protected, than would be the case if all three verticils were in the regular positions.

A development in two directions now takes place. There appears a 5th. important, spine, the ventral sagittal one (in my previous paper. Jörgensen L. 91, designated as „der secundäre Mittelstachel"), and the primary connecting arches appear.

The ventral sagittal spine extends from the common starting point for the two lateral spines (the ventral end of the central rod) and is also basal (directed downwards and forwards). On those skeletons which are less richly developed, it is easy to recognize it as a less strongly developed spine of later origin.

The primary arches are developed between those primary branches of the basal spines which are nearest each other, and are, therefore, three in number: (1) The left lateral arch, B_l, fig. V, between the left branch of the dorsal spine, d_l, and the inner branch, l_{li}, of the left lateral main spine; (2) the ventral arch, B_v, between l_{li} and the left branch, l_{rl}, of the right lateral main spine, and (3) the right, lateral arch, B_r, between the dorsal branch, l_{rd}, of the right lateral main spine and the right branch of the dorsal one, d_r.

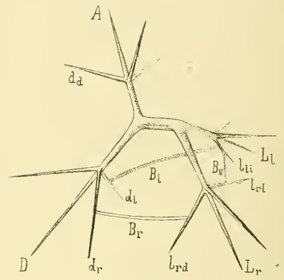


Fig. V. The Plectacantha type; lateral view, perspectively.

Thus, the ventral arch and the left, lateral arch run together to a point on l_{li}, and consequently have a corner in common which is suspended under the left, lateral main spine.

If one now supposes the formation of a more complete network through the addition of secondary meshes and spines, in basal direction, on the sides of the pyramids, one has, in all important respects, *Plectacantha oikiskos*.

On the other hand there is — as above mentioned — development in another direction, the ventral sagittal spine, V, being formed.

A simple form which belongs here is *Campylacantha cladophora*. In its most simple state (young forms?) it consists of the 5 spines D, L_r, L_l, A and V (cfr. fig. VI and fig. VII). The most fully developed individuals seem besides to have two secondary lateral spines, directed lateral-dorsally and basally, l_r and l_l, extending from the base of the apical spine. (These spines, l, are perhaps only

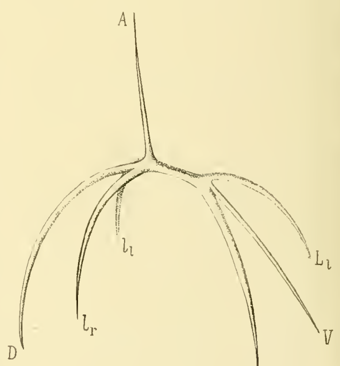


Fig. VI. The Campylacantha type: lateral view, perspectively.

lateral branches of the dorsal main spine, which does not, however, quite correspond to their direction. (Cfr. further under *Campylacantha cladophora*).

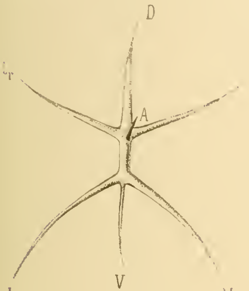


Fig. VII. The Campylacantha type: apical view.

In *Campylacantha*, the primary verticil of branches is wanting. Instead of this, secondary branches (spines) are developed on the 3 edges of the main spines. It seems, therefore, most natural to derive *Campylacantha* from the common ground form, as a parallel form to *Plagiacantha*. It is, however, also possible that the verticil of branches is transformed into the scattered, strong spines on the edges, as this primary verticil appears to occur on the apical spine (?).

The two basal sagittal spines, D and V, are in *Campylacantha* strongly bent towards each other. Let us suppose that these two spines unite at the points, and we should have a sagittal ring.

It would be interesting if the ring forms (*Stephoidea* Hck.) as a whole could be derived in a similar way; but I am as yet unable to judge if this be so, as my personal acquaintance with these forms is too deficient. In the material under examination, only one of these forms occurred, *Dictyocircus clathratus*, and even that was very sparsely represented. It seems, however, to me that this form most naturally may be derived in the manner mentioned. Such a derivation seems to be natural for the division *Semantida* Hck. I think, however, that the whole division *Stephoidea* Hck. requires a thorough revision.

By help of the secondary lateral spines l, (cfr. fig. VI and fig. VII) it seems that *Dictyocircus clathratus* may be quite naturally derived from *Campylacantha cladophora*. (Cfr. further under *Dictyocircus*). In this way too the long, protruding free spine, the apical one A, which is not seen in Haeckel's ring forms, is explained.

We also find a clear and easy transition from *Dictyocircus* to *Ceratospyris hyperborea*, additional meshes appearing on both sides of the ring. The transition here is so evident that — as mentioned under *Ceratospyris* — there may be some reason to suppose that *Dictyocircus* is but a young form of *Ceratospyris*.

That the network in *Dictyocircus* develops into the two lateral domes of *Ceratospyris*, seems quite natural. Several of the most important meshes are directed obliquely outwards from the ring (cf. under *Dictyocircus*). The additional growth therefore at first causes the network to be widened laterally. Later, byspines will be formed on the sides, and these will converge towards the open central space, for the direction of the byspines is generally such as to cover unprotected places. Thus the network of the sides converges and the shell is finally closed.

My opinion, therefore, is that the ring in *Dictyocircus* is basal, not apical, as in similar forms according to Haeckel's interpretation.

In the second series, there is after *Plectacantha* the development of a ventral sagittal spine. I think I have seen a form which would belong here, very similar to *Plectacantha oikiskos*, but having a ventral sagittal spine; but, as the study of the stucture of these forms has taken a great deal of time, I have been obliged, for the present, to give up the thought of attaining definite clearness with respect to the limits for the different species. It would also have proved impossible to distinguish with certainty between young forms of different species and genera, unless the most important structural conditions had first been settled.

From the *Plectacantha* type, there is a further development to *Phormacantha hystrix*, a ventral, sagittal spine as well as several arches being developed. These arches are apical, extending from the apical spine to the three basal ones or to the primary basal arches. I have not found time to study the course of these apical arches more closely; but there regularly appears to be one from the dorsal branch of the apical spine (d_{d}, fig. V) to the dorsal branch of the dorsal main spine, one from the right branch of the apical spine to the right lateral arch, B_{l}, as well as one from the left branch of the apical spine (here the apical spine has the primary verticil of branches) to the left lateral arch, B_{l}.

Besides these, there are also secondary apical arches outside the primary ones, distally, or between them.

It is interesting to note that *Phormacantha hystrix* shows the same course for the primary branches and the primary arches as *Plectacantha oikiskos*. Only in the case of *Phormacantha*, the formation of arches has reached a further stage and the tips of the branches have mostly disappeared (the branches have become parts of the arches). Similarly, the outer branches of the primary verticil of the lateral main spines are retrograded and on well developed individuals transformed into short spines. The ventral, sagittal spine is bent more downwards than the lateral ones, these being directed more forwards and the apical one more backwards. Thus is formed an interesting type, which in one respect exhibits a remarkable likeness to the *Cladoscenium* type, while it is, on the other hand, difficult to separate with certainty from Haeckel's group *Monocyrtida*.

The spine which Haeckel, in Cladoscenium and the whole group *Monocyrtida*, calls the apical spine (apical horn) is the same which I have called the dorsal, basal spine, D. Closer consideration will prove that this opinion is justified (cfr. under *Phormacantha*, *Cladoscenium*, *Peridium* and *Lithomelissa*). Similarly to the foregoing ought, therefore, *Cladoscenium* and *Monocyrtida*, as well as the other *Cyrtoidea*, to be placed in the contrary position with the „*cephalis*" (Hck.) downwards, and not as Haeckel has done, with the *cephalis* upwards and the „*thorax*" and the „*abdomen*" downwards. One would get the same relationship between the groups if one retained Haeckel's method of placing them for *Cyrtoidea*, but turned the preceding ones over so that the three spines (Haeckel's „basal tripodium") turned upwards, and one — according to the above designation the apical one — downwards. In this way, the network in *Plectacantha* and *Phormacantha* should be considered as apical, not basal.

If, however, one goes in the natural order from the simple forms, without a network or with a very incomplete one, to such ones as the *Cyrtoidea*, it seems most natural to consider the three spines — as above — to be basal, not apical.

On the whole, perhaps this is the right place to say a few words about the natural position of balance in the water.

Haeckel considers those forms which have a marked principal axis to be „monostatic“, supposes that they swim in one definite position of balance. As the skeletons of *Nassellaria* with their substantial spines and net walls must be considered decidedly heavier than water, their plasmatic parts are most probably lighter, in order that the form may be able to float in smooth water, when no selfmotion is supposed.

It is another matter, whether it follows from this that these forms are monostatic, as Haeckel supposes. It seems, however, natural to conclude that the plasmatic parts support the skeleton and not the reverse, so that it would appear most likely that the central capsule is situated under, not over „the tripodium“ (in those forms which have an imperfect skeleton).

If, however, the centre of gravity of the plasmatic parts is under „the tripod“, it is not impossible that the centre of gravity of the tripodium, by which, naturally, the basal position is determined, may coincide with that of the plasmatic parts, and thus the balance in the water be indifferent.

One would think that such a position of balance would provide important advantages and would safeguard against a separation of the central capsule from the plasmatic parts of the skeleton. There are, moreover, several details concerning the different *Nassellaria* skeletons which seem to suggest that the centre of gravity of the skeleton is very near that of the plasmatic parts. Thus the substantial „tophorn“ (Hck.) which is found in numerous forms of *Cyrtoidea* may be mentioned as an instance of this. It is especially this solid tophorn which makes it appear not improbable that the centre of gravity of the skeleton, if it does not coincide with that of the plasmatic parts, even might well be nearer the *cephalis*, so that the form when thoroughly balanced would swim with the *cephalis* and the tophorn downwards.

In this connection, it is an interesting fact that the central capsule in several *Cyrtoidea* — e. g. *Clathrocyclas*, *Corocalyptra*, *Dictyophimus* (cfr. Haeckel, L. 86, pl. 60, 61) is lobed, and has a small part in the *cephalis*, while four long, widened bags extend through a large part of the *thorax*. If these bags are lighter than water, their natural position in the heavier skeleton will be upwards (although the species, of course, would also swim steadily with the *cephalis* upwards, if only the centre of gravity of the skeleton lies under that of the plasmatic parts).

Here I will not omit to add that this peculiar condition of the central capsule in *Cyrtoidea* suggests an original placement in the *cephalis*, while later on it has got its greatest volume in the *thorax*. This again points decidedly to the probability that those forms which have an imperfect skeleton are to be considered as *Monocyrtida* with an imperfectly developed *cephalis* (and no *thorax*).

The apical arches and their secondary arches in *Phormacantha* form a continuation of the net work up over the sides of the apical spine A, thus causing an enclosed dorsal spine, i. e. a „*columella*“ (Hck.), as in *Euscenium* Hck. and *Cladoscenium* Hck. The *columella* is as yet only partially embodied in the skeleton. At the same time a further development of the opposite part takes place, a rather complete wall being formed outside the ventral arch, below the ventral sagittal spine, if this is considered as directed downwards. Probably this is to prevent that the centre of gravity of the skeleton shall be moved to one side.

The genus *Cladoscenium*, as it is represented by *C. tricolpium*, with an almost central *columella* and even development of the skeleton all around it, may quite plainly be derived from an interesting, simple form, *Protoscenium*, which can again be traced back to the *Plagiacantha* type. We may imagine the original type with the four main spines developed evenly, and having the primary verticil of branches on each of them placed in regular order. (Cfr. fig. VIII). If one now imagines 4 basal arches formed between the nearest branches of the dorsal spine, D, on the one side, and each of the lateral spines, L, on the other (cfr. the lines . . . . on the figure), 2 similar arches between the nearest branches of the apical spine, A, on the one side, and the dorsal spine on the other (cfr. the lines — — — — on the figure) and finally 3 arches between the nearest branches of the apical spine and the lateral ones, (cfr. the lines —· —· — on the figure) one has the *Protoscenium* type. Here there is an almost central *columella*, which naturally presents itself as an „apical spine“ in contradistinction to the other three, which are all about equally developed and want the outer branch in the primary verticil, while in the *columella* all three branches are well developed.

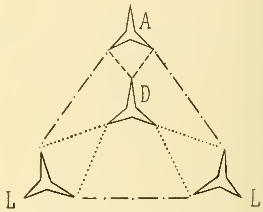


Fig. VIII. The *Protoscenium*-type: oblique apical view.

The *columella*, however, also here corresponds to the dorsal spine in the foregoing species. This will also be seen if we regard the natural position of the central capsule, between D, L_r and L_l.

From *Protoscenium simplex* to *Cladoscenium tricolpium*, we have again a very plain transition. The branches of the primary spines lose their tips and become parts of the arches (as in *Phormacantha*). The three branches from the spine D are the verticil on the apical spine (after Haeckel). A ventral sagittal spine is also developed, and in this way, perhaps, a counterbalance is formed to the net work at the spine A.

From the *Plectacantha* type a series of forms may again be traced. The net work closes at the base (cfr. corresponding process in *Ceratospyris*) and we have the genus *Peridium*, which always seems too to have the ventral, sagittal spine which often is, however, but weakly developed. One can here, partly because of the meshes round the dorsal spine, more especially because of the characteristic peculiarity in the position of the ventral and left lateral arch, (suspended from a common, basal, primary branch from the left lateral spine, cfr. *Plectacantha*) be convinced that Haeckel's „apical spine“ corresponds to the basal dorsal spine, D, in the genera with imperfect skeleton. One finds also in *Peridium* several of the characteristic peculiarities of *Plectacantha oikiskos*, e. g. the larger, secondary meshes with their conspicuous byspines.

If the connection with *Plectacantha oikiskos* may be taken as certain — there is, perhaps, an intermediate form, the one already mentioned which resembles *Plectacantha oikiskos*, but has a ventral sagittal spine — the connection between *Peridium* and *Cyrtoidea* is at any rate quite as certain. Here, however, as mentioned above, the „*cephalis*“ corresponds to the basal network of the simpler forms. One can plainly see in young *Cyrtoidea*, where it is principally the *cephalis*, which is fully formed, how the *thorax* is developed between the outward pointing byspines on the primary and secondary arches of the *cephalis*.

In *Lithomelissa setosa*, which can quite naturally be derived from *Peridium*, the spine A runs inside the *thorax*, which it then pierces in a direction obliquely downwards. In this way it undoubtedly takes an important part in the formation of the *thorax*, partly with branches, partly with arches to the other primary spines. The spine D runs nearly in the *cephalis* wall, obliquely upwards, as an apical horn — „tophorn" (Hck.) — which is but little conspicuous, while the spines L_r and L_l pierce the *thorax* in, or a little below, the „neck". The ventral sagittal spine protrudes obliquely from the region of the neck as a lower „frontal horn" (Hck., in contradistinction to the „apical spine" as a „higher occipital horn").

The peculiar swellings seen in the region of the neck in *Lithomelissa setosa* and similar forms, will find a natural explanation through the above mentioned process of formation of the *thorax*, and this also gives an explanation of the indistinct outer boundary between the *cephalis* and the *thorax*. The proper boundary is to be found near the primary arches, where it is defined by internal lists („cortinar septum" as Hck. mentions in some species). These are not in the same plane, just as in *Plectacantha* and *Peridium*. As the secondary spines on the left and right lateral arch through additional secondary arches now form the adjoining part of the *thorax*, two crimpings on the sides about the spine D will be caused at the boundary between the *cephalis* and *thorax*.

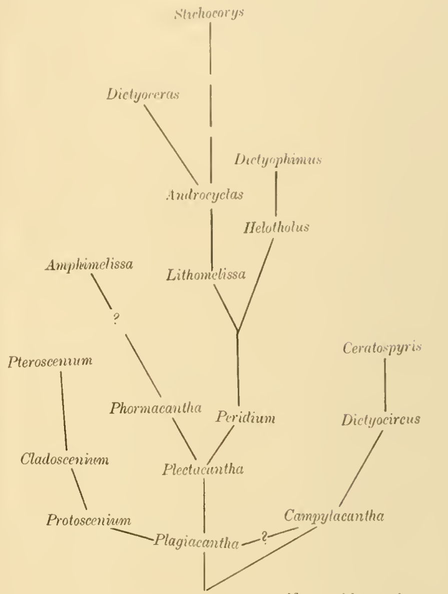
In *Cyrtoidea* there is also developed an inner spine, which extends from the central rod through the *thorax*. It appears to be very variously developed, and is sometimes branched. It always seems to extend from the ventral end of the central rod, at the same point which is also the starting point for the primary, lateral spines and the ventral sagittal one, and it extends in a direction contrary to the *cephalis*. Its object seems to be to protect the large opening, which is the weak point, or perhaps it is to act as a support for the lobes of the central capsule. As a rudimentary spine, it can be traced right back to *Phormacantha*.

The more richly developed the *Cyrtoidea* forms become, the more it seems that the original spines and arches are retrograded. The four primary spines, as well as the ventral, sagittal spine can, however, be clearly recognized in every instance, as far as my experience goes. In the genera *Helotholus*, *Androcyclas* and *Clathrocyclas*, perhaps also *Stichocorys*, 3 of these spines, A, L_r and L_l, are found as simple, protruding spikes. In the genus *Androcyclas* the spine D forms the large, substantial „tophorn" (Hck.). Similarly in *Clathrocyclas*, where the other „tophorn" is formed by the protruding ventral sagittal spine.

The consecutive links of the many linked *Cyrtoidea* are formed out from the *cephalis* as may easily be proved in young individuals. Such forms as *Lithomelissa* will, therefore, when young resemble *Peridium*, *Clathrocyclas* and *Androcyclas* and be similar to *Dicyrtida* (instead of *Tricyrtida*) etc.

The genus *Amphimelissa* (*Botryopyle setosa* Cl.) seems to have a structure which is considerably different to that of *Lithomelissa*, with a fuller development of the primary skeleton parts of the *cephalis*. If I have understood it rightly, it would seem that its *thorax* is formed from the *cephalis* by secondary spines on the secondary arches, that is with the starting point higher up on the *cephalis*, while the *thorax* of *Lithomelissa* and similar genera are chiefly formed from the primary arches and their byspines. The result is therefore, that *Amphimelissa* has a broader *cephalis*, which is more enclosed, or even entirely so, and which does not distinctly appear to be separated from the *thorax*. (Cfr. further under *Amphimelissa*).

The genealogical tree for the forms which occur in my material will, after the foregoing, be as follows:



⤫ = groundform with 4 primary spines

In the following pages, I have for practical reasons preferred to retain (at any rate preliminarily) Haeckel's method of placing the *Cyrtoidea*, where therefore the „apical spine" is the spine D, and the „dorsal one" the spine A, while further the right and left lateral spines change places. Where, however, letters are used, I have applied them as above.

With regard to the distribution of the species of *Nassellaria* which I have observed, I will add a few remarks, and these will also, as a whole, be applicable to the above mentioned species of the division *Spumellaria*.

It is difficult, from the material treated, to come to any reliable conclusion as to whence the various species really come, and this indeed is the case with most of the plankton species which occur in my material. We know very little indeed about the distribution of these *radiolaria*, for the majority of the species found are either quite new or had only previously been known from the west coast of Norway. But, fortunately, Cleve has also observed some of the species in question (especially from the sea near Spitzbergen), so that the distribution of just these species can be rather more completely stated. It has also been of great service to me that Dr. Hjort and Dr. Gran have kindly favoured me with a number of plankton samples for examination which were taken on S S Michael Sars' expedition in the Norwegian Ocean. I have, however, not yet been able to find time to work through the whole of this material, which, having been collected from settled places in the most important currents, will supply valuable information with respect to the dependence of the *radiolaria* on temperature and salinity. Unfortunately, there are no samples from deeper water.

It may, nevertheless, be concluded with certainty that all the species here mentioned of the divisions *Spumellaria* and *Nassellaria* are oceanic species. There may, however, be differences of opinion as to whether they are northern or southern forms. Cleve states (L. 40) that some species which belong here (from the Northern Atlantic) must be considered to be derived from the Northern Pacific by way of the Northern Arctic basin. He comes to this conclusion partly because several of these species have been found in the northern part of the Pacific, and partly because they do not occur in samples taken farther south than 40° n. lat.

Gran (L. 70, p. 149—154) considers these species to be of southern origin.

As far as I can gather, Cleve's statements are generally based upon examinations only of surface samples. My impression is that the majority of these *radiolaria* come from the northern part of the Atlantic, where they appear to occur in the mixed Atlantic waters. In the deeper waters of the Norwegian Ocean, there are, perhaps large numbers of these northern species. In a deep water sample from the sea between the Faeroe and Shetland Isles, which was taken by Mr. Clark and kindly placed at my disposition for examination, I found a comparatively large number of those species which occur on the coasts of Norway, and some of these species were numerous.

It appears to be certain that ocean water of between 34 and 35 ‰ salinity contains many species of these *radiolaria*. Perhaps here too they occur for the most part in the deeper layers.

On the other hand, there appears also to be species (of those mentioned in this paper belonging to *Spumellaria* and *Nassellaria*) which belong to the salter, warmer waters of the Atlantic, but their number is comparatively small.

Key to the genera of Nassellaria.[1])

- Shells with plainly latticed cephalis and thorax, or more joints.
  - More than 3 joints; rather narrow shell with no or inconspicuous spines .... *Stichocorys.*
  - 3 joints (cephalis, thorax and abdomen).
    - Thorax with 3 long protruding spines, each with a broad base; no broad tophorn .... *Dictyoceras.*
    - Thorax with 3 to 4 slender and short spines which may easily be overlooked.
      - 2 diverging, 3-edged tophorns; broad thorax; short, expanded, brim-shaped abdomen........ *Clathrocyclas.*
      - 1 conspicuous, 3-edged tophorn; thorax narrower, not brim-shaped........ *Androcyclas.*
  - 2 joints (only cephalis and thorax).
    - Cephalis rudimentary; large thorax .... *Litharachnium.*
    - Thorax little developed with narrow spines which form 6 or more „basal feet" .... *Acanthocorys.*
    - Thorax with piercing, 3-edged spines or with 3 regular basal feet .... *Dictyophimus.*
    - Thorax with piercing, slender spines without conspicuous edges.
      - Thorax broad and low, campanulate; cephalis with numerous spines........ *Helotholus.*
      - Thorax narrow and high.
        - Cephalis very broad, not plainly constricted from the thorax ..... *Amphimelissa.*
        - Cephalis narrower than the thorax, easy to distinguish ..... *Lithomelissa.*
- Only cephalis, plainly latticed.
  - Cephalis with a sagittal ring (bilocular) *Ceratospyris.*
  - No sagittal ring.
    - 5 long, 3-edged spines, one of them forming a nearly central columella with an inner verticil of 3 branches and protruding above as a tophorn .... *Cladoscenium.*
    - The same, but the columella wanting the inner verticil of branches .... *Euscenium.*
    - No broad, 3-edged spines.
      - No columella .... *Peridium.*
      - (Incompletely latticed shell with indistinct, marginal columella .... *Phormacantha*).
- More or less incomplete skeletons, not plainly latticed.
  - A strong sagittal ring with spines and some few meshes .... *Dictyocircus.*
  - No sagittal ring.
    - The ventral sagittal spine is present.
      - Rather well developed network (at last with numerous slender arches and spines at the outside) *Phormacantha.*
      - No network, only strong, bent spines with numerous scattered branches .. *Campylacantha.*
      - (5 strong, straight, 3-edged spines........... *Euscenium*).
    - The ventral sagittal spine is wanting.
      - A very incomplete cephalis with very few, large meshes and nearly central columella .... *Protoscenium.*
      - No columella.

[1]) Only to help in the determination.

Only two pentagons with a side in common and the opposite corners connected through a polygonal beam; long spines in the corners	*Gonosphæra.*
More or less developed network, forming a conical cephalis, open below	*Plectacantha.*
Only the 4 main spines with a verticil of 3 branches on each of them; no or but few connecting arches developed	*Plagiacantha.*

VII C. 1. Plectoidea Hck. (Plagonida and Plectanida).

Plagiacantha *arachnoides* Clap.

Jørgensen L. 91, p. 72.

In a previous paper (Jörgensen l. c.), I have in detail described the structure of this species and shown that, from this structure, it would have to be classed as belonging to Haeckel's genus *Plagiocarpa* or — the form which is furnished with connecting beams — to *Periplecta* Hck. At the same time too is mentioned that this structure — as it is explained in the foregoing pages here — is the ground type for a large series of forms.

It is likely that still other species are included in the above name. Haeckel's *Plectophora arachnoides* can, however, not be distinguished from *Plagiacantha arachnoides*.

In the present material, this species was found only rarely and in small numbers, generally in deep water samples, up to 50 m., only exceptionally near the surface. Almost entirely absent during the diatom inflow.

Distribution: According to Cleve (L. 40, p. 180) a northern form, belonging to Tricho- and Chætoplankton. Frequent on the west coast of Norway, seems also there to be absent during the diatom inflow. In August 1903, numerous between the Faeroe and Shetland Isles and in the sea north of them, near the surface (L. 18, 1903—1904, nr. 1).

The species would thus seem to belong to the northern part of the Atlantic, and especially to be abundant in the North Sea and north of Great Britain during the summer months.

Campylacantha n. gen.

Has the four primary spines, D, L_r, L_l and A, as well as the ventral, sagittal one, V. The dorsal, sagittal one, D, is bent strongly downwards. The lateral, basal spines, L_r and L_l, are also bent downwards, being as usual directed half forwards and half sideways (so as to be ventral lateral). The ventral, sagittal spine is rather thin, almost straight, bent strongly downwards and converges distinctly towards the dorsal, basal spine, D.

The principal difference between this and the previous genus lies in the ventral, sagittal spine.

The primary verticil of branches (cfr. the introductory remarks under *Nassellaria*) appears only on the apical spine, which is without any other branches.

C. cladophora Jörg. n. sp.
(Pl. XII, fig. 47).

The sagittal, basal spine is best developed, very strong, long, strongly bent, gradually narrowing off into a long fine point, like all the stronger main spines and branches three-edged. One edge is dorsal, the others lateral. On these three edges, there are strong, expanded, narrow pointed branches, several in a row along the same edge, rather scattered and not clearly forming verticils when compared to the branches on the other edges. The branches become shorter towards the end of the main spines. The larger branches are in their turn furnished with similar squarrose branches.

The basal, lateral spines are also strongly developed, although not quite so much so as the sagittal, dorsal one, in other respects corresponding precisely in form and arrangement of branches.

The apical spine is much less developed, having only a verticil of three branches on the corresponding place to the verticil of *Plagiacantha*, outside this being thin and unbranched.

The ventral, sagittal spine is thin and unbranched, almost straight, pointing obliquely downwards between the lateral spines and being somewhat shorter than these.

In addition, in well developed forms, there appears to be two strong, lateral arched branches extending from the basal, dorsal spine at the base of the apical spine. These arched branches form a pair of secondary, lateral spines, l_r and l_l, in form and arrangement of branches corresponding to the primary, lateral spines, only less developed. In those individuals where a smaller numbers of secondary spines were developed, they were not visible. But it must be remarked that the species is very brittle, so that the branches are easily broken off.

This species is especially interesting, as it seems to show the evolution of the ring species. Cfr. above and under the following species.

Rare, always in small numbers, only in deep water samples. Seems to be boreal oceanic.

Distribution: Otherwise only observed on the west coast of Norway: The Oster Fiord, very scarse, in deep water.

VII C. 2. Stephoidea Hck. (Stephanida and Semantida).

Dictyocircus n. gen.
(Cfr. pl. XIII, f. 48).

A strong, sagittal ring, one side, the dorsal, being less bent than the other, the ventral. (This peculiarity of the ring species is also mentioned by Haeckel). This ring is in the following description supposed to be placed downwards, not upwards as by Haeckel.

On the dorsal side of the ring, there is a long spine, pointing obliquely backwards and upwards, the apical spine, A, in the plane of the ring. On both sides of this apical spine, there are two large, pentagonal meshes, diverging at right angle on each side, both in the same plane perpendicular to the plane of the ring. These are the right and left transverse meshes, a_r and a_l. These meshes are again both in a dorsal and ventral direction joined to two similar pairs of meshes, the dorsal lateral meshes, f_r and f_l, situated in a dorsal direction from the transverse meshes, and the ventral, lateral meshes, b_r, and b_l. These lateral meshes point obliquely outwards from the plane of the ring. They are thus not in pairs in the same plane, but the plane of the right one forms an angle with that of the left one, both being turned from a position perpendicular to the plane of the ring in a direction away from the centre (fig. IX).

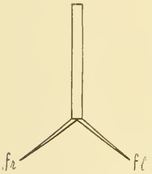


Fig. IX. *Dictyocircus*: Ring and meshes f, apical view (schematically).

In a ventral direction from the pair of meshes b, 3—4 more or less complete pairs of meshes follow, c to e: in a dorsal direction, however, there are only three protruding spines, g, the middle one being in the plane of the ring, the other two pointing obliquely outwards and downwards. Similar protruding spines are found at several points (cfr. the description of the species).

Although I am but imperfectly acquainted with this form, having only seen a couple of individuals, I have endeavoured to trace its structure as complety as possible, as it is a very interesting form, which seems to be well suited to throw light upon the connection between the ring forms of *Nassellaria* and the group *Plectoidea* Hck. on the one hand and the group *Zygospyrida* Hck. on the other.

The connection with the latter seems to me to be quite evident, leaving scarcely no doubt that such forms as *Ceratospyris* are evolved from a ring like *Dictyocircus* with a further development of meshes on both sides outside those described, until there is on either side formed a closed network. The conspicuous narrowing in *Ceratospyris* at the sagittal ring corresponds very beautifully to the right and left meshes which extend forwards from the ring, e. g. in the pair of meshes b and f.

The connection with the group *Plectoidea* is less clear. On this point, however, the genus *Campylacantha* seems to furnish valuable information. As above mentioned, I consider the sagittal ring to be formed by the connection of the dorsal and ventral sagittal spines (or of meeting branches). Further, I consider the branches h_r, h_l between the meshes a and b to correspond to the ventral, lateral spines in *Campylacantha*, and the branches i_r, i_l between the meshes a and f to correspond to the dorsal, lateral ones. In this way too, the large transverse meshes a, diverging at right angles, situated between the dorsal and ventral lateral spines in *Campylacantha*, are explained, as well as the centrifugally directed pair of meshes b and f, formed by the partly forward pointing ventral, lateral spines, and the partly backward pointing dorsal, lateral ones.

D. clathratus Jörg. n. sp.
(Pl. XIII, fig. 48).

To the description above, I will add the following, which applies to the individual illustrated:

After the pair of meshes a and b, there follows in the same direction (ventrally) two strong, but smaller meshes, c, one on each side. In the corner between b_l and c_l there is a secondary, smaller mesh. After c_l there follows yet another mesh, d_l, while the corresponding one on the right side is wanting, but there is a trace of it in the shape of a protruding spine. (This mesh is probably developed in elder individuals). Then comes a pair of strong, obliquely diverging spines, k, and then two similar ones, g, with an intermediate one in the plane of the ring, which spine might be considered to be the protruding point of the primary dorsal (basal, sagittal) spine. Following this bundle of three spines there are, in the same direction, the two large meshes f, which again stretch up to the pair of meshes a.

On the stronger branches, there are several protruding spines, which generally point obliquely outwards from the plane of the sagittal ring, in a direction away from the centre. Besides these, there are three spines protruding in the plane of the ring, the apical spine, the protruding, dorsal, basal, sagittal one at g, and the protruding, ventral, sagittal one between the meshes b and c (broken off on the specimen illustrated).

In addition to these, we have some secondary spines, as for instance the conspicuous twins on the outer side of a_l. The two meshes b_r and b_l are connected by an arched (ventral) beam which is bent outwards, and carries in the middle a rather strong, secondary spine pointing outwards.

The sagittal ring and all the stronger branches and spines are three edged.

The diameter of the ring is about 50 μ.

The individual described was probably not fully developed. Judging from the many surprises which have met me with regard to imperfectly developed *radiolaria*, I cannot but remark that it is perhaps not altogether impossible that the *Dictyocircus clathratus*, here described, is a young form of *Ceratospyris* or a similar species of the group *Zygospyrida*.

This species does not answer well to Haeckel's system, so I have been obliged to classify it as a separate genus. It would have had to be classed as belonging to the group *Semantida* Hck. in which there are species which in structure in important respects undoubtedly agree very well with the species here described. It especially answers well to the genera *Semantidium* Hck. and *Semantiscus* Hck., both of these having the three large pairs of meshes corresponding to a, b and f. These genera have, however, not the long apical spine.

Very rare and only singly: Henningsvær, 20/3 1899, 0—280 m.

VII C. 3. Zygospyrida Hck.

Ceratospyris Hck.

I do not consider this genus to be well characterized by Haeckel; but it is, at any rate, easily recognized.

In the material examined, I have only found one species belonging to it.

C. hyperborea Jörg. n. sp.
(Pl. XIII, fig. 49).

I have only seen very few individuals of this species. Its structure seems to be of precisely the same type as that of *Dictyo-*

circus clathratus, only that, on both sides of the sagittal ring, there is a further development of the net work, which has become two complete domes, one on each side.

The primary pores (nearest the sagittal ring) are polygonal, the others being irregular roundish and oblong and varying considerably in size. The separating walls are strong, with here and there narrow, protruding points which form obliquely diverging narrow spines. There is also a rather plentiful number of similar byspines.

All the spines are little prominent, to 1/4—1/2 of the diameter of the sagittal ring.

The species does not appear to be identical to any of HAECKEL's.

Very rare and only singly: The Vest Fiord 1/2 1899, 0—200 m.

Distribution: In the warm, salt waters of the Atlantic beyond Søndmøre (S/S Michael Sars, 2/2 1901, between stations 4 and 5, in the surface; cfr. GRAN, L. 70, p. 149), very sparsely; the Oster Fiord near Bergen, at a great depth, here too only singly.

VII C. 4. Monocyrtida HCK.

The genera *Plectacantha* and *Phormacantha*, as also the genus *Protoscenium*, should properly be referred to the group *Plectoidea* HCK. (in account of their more or less incomplete skeletons), but is placed here in order not to break their natural connection with the following genera.

Plectacantha n. gen.
(Pl. XIII, f. 50—58).

Has the four primary spines, the sagittal, dorsal, basal one, D, the two ventral, lateral, basal ones L_r and L_l, as well as the sagittal, apical one A. Besides there are, between these, three primary arches developed, one ventral, B_v, between the ventral, lateral spines, and two lateral B_r and B_l, between the dorsal, basal spine and the right and left lateral one. In this way, 3 large, pentagonal meshes are formed, the primary ventral mesh, the primary right lateral and the primary left lateral meshes.

As mentioned above in the general remarks on the *Nassellaria* group, the ventral mesh and the left, lateral one have as a side in common a short branch which descends from the under side of the left, lateral spine, while, on the other side, the right, lateral mesh and the ventral mesh reach immediately up to the right, lateral spine.

There is no ventral, sagittal spine extending from the common starting point for the two ventral, lateral main spines.

In addition to these primary spines and arches, secondary ones are also more or less developed, and form a comparatively rich network, which is, however, open, or very imperfectly closed beneath.

P. oikiskos JÖRG. n. nomen.
(Pl. XIII, figs. 50—57).

Periplecta intricata (CL.) JÖRG. L. 91, p. 73.
Peridium (?) *intricatum* CL. L. 30, pl. 2, f. 8 a, b?
Peridium (?) *larum* CL. l. c. pl. 2, f. 9 a, b?

The primary verticil of branches of the apical spine has (generally?) only two branches, pointing upwards and outwards in the angle between the dorsal, basal spine and the lateral ones. These two branches together with the protruding middle stem form three undivided spikes, about equal in length.

The left, lateral spine, L_l, has the primary verticil complete. Of these three branches, however, the inside one (l_{li} in fig. V, p. 124) is — as previously mentioned — transformed into a short, strong arch, pointing downwards, at the end of which the left, lateral arch and the primary, ventral one meet. The two other branches form with the protruding middle stem, three, diverging, long, single spikes, pointing obliquely outwards and to the sides. By these three long, protruding spikes, the left, lateral spine may always be easily recognized.

The right, lateral spine has only retained one branch of the verticil in its original form, the other two being branches for the two corresponding, primary arches, one belonging to the ventral arch, the other to the right, lateral one. There are consequently here two long, simple spikes, about equal in length, the outer branch in the primary verticil and the protruding, middle stem.

The dorsal, basal spine has only one simple branch of the verticil, pointing outwards and upwards (d_d in fig. V, p. 124), the two others being strong, arched branches, diverging nearly at right angle on both sides.

One of these branches forms the right, the other the left lateral arch. The middle stem of the basal spine is here branched, there being one or two similar secondary arches outside the primary, lateral ones. The dorsal, basal spine, therefore, only shows one simple, protruding spike. A similar, smaller byspine is generally to be found farther out.

The dorsal spine is the longest and strongest, the apical one is shortest and weakest.

Outside the primary meshes, secondary ones are developed more or less richly, varying considerably in size. These unite to form a „network" which is generally rather imperfect, but would seem, on older individuals, to be made more complete by the addition of connecting beams across the larger, secondary meshes, so that these meshes finally are smaller in size and more in number. Generally speaking, the network is conically expanded downwards, and seems, in the case of older individuals, finally to be imperfectly closed beneath by the development of a few, fine, long, transverse beams. In the material examined specimens with such nearly closed network were always rare.

Of the more important byspines and secondary meshes, I will only mention the following which seem always to be present, and may serve to help in identifying the species. Under the protruding right lateral spine a large, secondary, pentagonal mesh will be found. The left, lateral arch has a strong byspine in the middle, pointing outwards and upwards, and under it, there is a large, secondary mesh. On both sides of the dorsal spine, outside the primary, lateral arches, on the left side will be found two secondary meshes, and on the right side one; the latter being the largest, but it is perhaps later on divided into two.

Moreover, on all the stronger arches, there is a more or less rich development of byspines, pointing outwards and upwards, sometimes twins, directed upwards-outwards and downwards-outwards.

The beams are thin in young individuals, especially at the outer secondary meshes; they are much stronger on older individuals.

The length of the basal, dorsal spine is ± 55 μ.

Cfr. Jörgensen l. c.

I considered this species first to belong to the genus *Periplecta* Hck.; but as I later on found that what with Haeckel characterises this genus is also characteristic of all closely related genera, as I am acquainted with them from plankton samples (not drawings), I have been obliged to change the name of the genus.

I at first considered this species to be Cleve's *Peridium intricatum*, and this may be correct, but it cannot be proved to be so from Cleve's illustration nor from his description. As it is, moreover, quite as probable that Cleve's *Peridium* (?) *laxum* also belongs to this species, I consider it best to retain the manuscript name I originally had given the species before Cleve's work was published.

Not rare, but always in small number.

Distribution: Not rare on the west coast of Norway, always scarce. Probably boreal oceanic.

P. trichoides Jörg. n. sp.
(Pl. XIII, f. 58).

Peridium (?) *laxum* Cl. L. 30, pl. 2, f. 9 a, b?

I have only an imperfect knowledge of this species, as I have only seen a few specimens, and at first took these to belong to the preceding species.

It has the same primary spines and primary arches; but there appears to be the important difference that the ventral, primary arch and the left, lateral arch both extend to the left, lateral spine, not to a common basal branch from the latter. On the other hand, there is a strong, secondary arch between the left, lateral one and the nearest side of the primary, ventral one.

In outer appearance, this species is very different from the foregoing one. Instead of the numerous secondary meshes, long connecting arches are developed, which form together a longish, ovate, very imperfect network of long, fine arches. The largest and strongest of these run between the two lateral arches and form a very large, ovate mesh, pointing downwards. On its sides, especially in a ventral direction, similar large meshes are developed, bounded by fine arch branches, which run from the primary arches to the said large, secondary one, or between secondary arches. On these arch branches, very fine spines are scattered, these probably later on being developed into arch branches between the secondary arches. It is likely that a network wil appear which is imperfectly closed beneath by basal, secondary arches, on elder individuals.

On the primary, basal spines, short byspines are also found on the pieces inside the primary arches.

This species is undoubtedly different from the foregoing. It is not certain whether it should be reckoned as belonging to the same genus; but it wants, as does the foregoing one, the ventral, sagittal spine.

Very rare and scarce, though certainly to some extent overlooked: $^{19}/_{1}$ 1899, 40 miles N. W. of Gaukværø, 0—700 m.

Distribution: Also on the west coast of Norway, but only occasionally and in small numbers.

Phormacantha n. gen.

Has the same four primary spines and the same three primary arches as *Plectacantha*. There is, however, also a ventral, sagittal spine, which is less strongly developed than the others („der secundäre Mittelstachel“, Jörgensen L. 91, p. 77). The network, as in *Plectacantha*, is at a late stage and only imperfectly closed beneath.

P. hystrix (Jörg.)
(Pl. XIV, figs. 59—63).

Peridium hystrix Jörg. L. 91, p. 76.

The primary spines and primary arches as in *Plectacantha oikiskos*. The ventral arch and the left, lateral one also here run together to a strong, basal arch branch from the left, lateral main spine.

Outside the ventral, sagittal spine, there is an extended network of numerous, secondary meshes, which both below and on the sides are connected by fine transverse beams to a corresponding one on the sides of the dorsal sagittal spine. In this way a network is formed, which is imperfectly closed beneath.

There are numerous byspines. Between these and the larger beams more or less numerous and mostly thin, arch-shaped, connecting beams are extended, which are in their turn here and there connected by similar, arched, fine beams, which at a later stage of development are provided with numerous, fine spines. These are, possibly, later, at any rate to some extent, developed to similar fine connecting arches, which more or less completely envelope the network.

The development of the arches is here further advanced than in *Plectacantha oikiskos*. From the three branches of the apical spine, arch branches extend, the apical arches, one to the dorsal, basal spine, and two to the primary, lateral arches. These apical arches may at the corners, as well towards the apical spine, as towards the dorsal one and the primary arches, be enveloped by similar arches.

Cfr. also Jörgensen l. c. p. 77.

At a younger stage, this species strongly resembles *Plectacantha oikiskos*. The ventral, sagittal spine, however, makes it easy to distinguish between them. At an older stage, they are so different that they can hardly be confounded.

It is likely that there is more than one species which belongs here.

This form is very interesting, clearly being a connecting one between the groups *Plectoidea* and *Monocyrtida*. I formerly considered it to belong to the genus *Peridium*, and there is hardly any great or important difference in the structure of the genera *Peridium* and *Phormacantha*. It seems, however, most practicable to separate the imperfectly latticed forms from those which have a regularly developed lattice work which is closed beneath.

On the other hand, this genus — as more fully explained in the introductory remarks to *Nassellaria* — forms clearly a transition to the genera *Euscenium* Hck. and *Cladoscenium* Hck. When the apical arches are further developed, an enclosed spine will result, a „columella“.

The larger forms have a „network“, which is about 70 μ in height.

Rather frequent, though never numerous, in deep water samples.

Distribution: The same as that of *Plectacantha oikiskos*.

Gonosphæra Jörg. n. gen.

The very peculiar, little species which belongs here, seems to be constructed in the following way:

There are two rather regular pentagons, having one side in common. Their planes form an angle of about 120°. At the four corners there are long spines, pointing obliquely outwards in different directions. Between the fifth corners, one in each pentagon, opposite to their common side, there is a three-jointed connecting arch, bent outwards from both the pentagons. This arch carries in the two corners which do not lie in the original pentagons (but farthest away from them), two long, diverging spines.

G. primordialis Jörg. n. sp.
(Pl. XIV, figs. 64—68).

I will add a few remarks to the description already given of the genus. In most positions, this species will have the appearance of a more or less distinct pentagon, with long spines at the corners, and also a connecting arch with three similar spines. Looking straight towards one of the two pentagons (with a side in common), the connecting arch with its spines, will look like two long spines, connected by a short cross beam.

I cannot say where this species really belongs, but judging from the skeleton and the position of the central capsule, it would seem to belong to the *Nassellaria*. I have, however, only once seen the plasmatic parts. The species does not seem to be so very rare, but is easily overlooked on account of its small size.

Found in rather many samples from deep water, always in small numbers.

Distribution: Also on the west coast of Norway. Probably boreal oceanic.

Protoscenium n. gen.
Pl. XV, fig. 69.

With regard to this interesting form, reference should be made to the introduction to the group *Nassellaria*. In the following, it is placed as *Cladoscenium* and the species belonging to the *Cyrtoidea* group, with the spine D upwards and the spine A downwards. The expression, „the apical spine" therefore here has the same meaning as with Haeckel, but is the same as the spine D in the foregoing.

Further, in the following L_r denotes „the left", L_l „the right" lateral spine, cfr. above.

The usual four, primary spines are present, all about equally developed, the apical one (D), however, perhaps best. The basal spines form a very flat pyramid; they are most distinctly directed downwards at the free ends.

The primary verticil with three branches on each main spine is well developed, on each of the three basal ones, however, the downwards pointing (outwards pointing) branch is wanting, while the two others everywhere point regularly upwards and outwards. On the apical spine (D) all three branches are well developed and lie about parallel to the basal spines. All the main spines have also a protruding middle stem, which is about equal in length to the primary branches.

Between sets of two of those primary branches which are nearest and belonging to different main spines, a strong, connecting arch is developed near their ends. Of such arches, there are altogether 9, 3 basal and 6 apical ones.

Of the three basal ones, one runs in a ventral direction, between the ventral branches of the lateral spines, the two others laterally, between the dorsal branches of the lateral spines and the corresponding branches of the dorsal spine (A). From the dorsal branch of the apical spine two apical arches extend to the right and left branch of the dorsal spine, and in the same way, two apical arches from the apical spine's (D) right lateral branch to the two branches of the right, lateral spine, and two apical arches from the left, lateral branch of the apical spine to the two branches of the left, lateral spine.

These arches all meet in twos the branches at the same point, at a short distance from their end. There may also be found a weaker, secondary arch branch extending from the same points of the primary branches, but connecting together in twos the branches of the same main spine, or connecting these branches with the protruding middle stem. In this way, a network which is, on the whole, very open, is formed of very large meshes and thin beams with 9 short spikes protruding from a regular verticil of three branches (the 6 spikes being basal, the 3 apical) and 4 longer simple spikes (3 basal, 1 apical).

This is an interesting species which, as proved in the introductory remarks, may be considered to be the original type for the genera *Euscenium* Hck. and *Cladoscenium* Hck., with a nearly central columella.

P. simplex (Cl.)
(Pl. XV, fig. 69).

Plectanium simplex Cl. L. 30, pl. 3, fig. 3.

Cfr. the description of the genus and the introductory remarks.

Each of the primary branches of the main spines has, as already mentioned, near their end, a verticil of 3 branches, of which the two are the connecting arches mentioned above, the third being a short spine about equal in length to the free end of the branch. This spine may — as above mentioned — be connected with one of the approximate corresponding ones, or with the protruding part of the main spine, by exceedingly fine arches.

Here and there on the outer arches fine byspines are found, which are perhaps partly developed into such hair-like connecting arches.

The species is no *Plectanium* in Haeckel's sense. Cleve draws the apical spine as protruding from the common starting point of the basal spines, and has, probably for this reason, classed the species as belonging to Hck.'s genus *Plectanium*.

I have seen only a few individuals of this species; but I have, nevertheless, no doubt that its characteristic structure in all important points is as above described. Older individuals have, perhaps, a more richly developed network of added, secondary arches.

Rare and only singly: $^{19}/_{1}$ 1899, 40 miles N. W. of Gaukværo, 0—700 m. Is, however, easily overlooked.

Distribution: Only noticed by Cleve from two places: 78° n., 3° w., deep sea haul; 56° n., 36° w. Probably also boreal oceanic.

Euscenium corynephorum Jörg.
(Pl. XV, fig. 70).

Jörg. L. 91, p. 77.

Has the four primary spines, about equally developed, and the ventral, sagittal one.

The main spines are broad, three-edged, broadest in the outer half. On each edge there are from 3 to 5, or more, strong, slender pointed branches (spines), more or less distinctly scattered in comparison to those on the other edges of the same spine, only rarely here and there in distinct verticils.

Between the neighbouring branches of the different main spines, rather long and fine connecting beams extend, these being in their turn again connected by numerous similar ones. Thus a more or less perfect net is formed which is best developed between the apical spine (D) and the ventral, sagittal one. This network forms a rather imperfect lattice shell with meshes, very uneven in shape and size, from small, triangular and trapezoidal to very large, polygonal openings. Also the inner branches (spines) on the same main spine are connected, partly with the main spine itself, partly with each other, also by fine connecting beams, parallel to the direction of the main spine (as in the spines of *Rhizoplegma boreale*).

The meshes of the lattice shell strongly recall those of *Cladoscenium tricolpium*. Very often (in young individuals) so little of the network is developed that it would not be justifiable to consider the species as a *Euscenium*, if one did not occasionally find a well developed latice shell. Cfr. Jörgensen l. c.

This species is very different from *Cladoscenium tricolpium*, and without doubt is more closely allied to those forms which have an imperfect lattice shell (*Plectoidea* Hck.). It might be classed as belonging to the genus *Periplecta* Hck., if it were not for the distinct, ventral, sagittal spine. (This spine was previously overlooked, and for this reason is not mentioned in my earlier description of the species l. c. p. 77). I prefer at present to let it remain in the genus *Euscenium*, rather than to start a new genus, as the genus *Euscenium* Hck. certainly requires revision.

Cladoscenium ***tricolpium*** (Hck.) Jörg.

(Pl. XV, figs. 71—73).

Euscenium tricolpium Hck. L. 86, p. 1147, pl. 53, f. 12. *Cladoscenium tricolpium*, Jörg. L. 91, p. 78.

Here again we have the four primary spines and the ventral sagittal one. The almost central columella corresponds to the basal, dorsal spine, D, in *Plectacantha oikiskos* and *Phormacantha hystrix*. On the other hand, the connection with *Protoscenium simplex* is evident.

From two, somewhat upwards pointing, branches from each of the left and right lateral spine four arches extend upwards and unite in twos (those from the same main spine) to form a strong apical arch. These are the corresponding arches in *Protoscenium simplex*, where they connect the branches of the lateral spines with the corresponding two branches of the apical one (D). The tips of these branches have disappeared in *Cladoscenium*, and the arches pass gradually into the branches. The two corresponding ones in the dorsal spine (A) are also found; but one of them is not particularly conspicuous as there are several similar secondary arches.

The lattice shell (cfr. Jörgensen l. c. p. 78) is particularly perfect between the apical spine (D) and the ventral, sagittal one.

There are, where the main spines protrude, rather large, triangular meshes formed by connecting beams between the larger arches of the shell and the spines, two at the dorsal spine (A) and the left, lateral spine (L_l), three at the apical spine (D). It is only in older individuals that the long, fine downhanging spines are formed on the basal arches (i. e. the arches between the basal spines, A, L_r and L_l).

There does not seem to be anything of importance to prevent us from considering this species to be identical to *Euscenium tricolpium* Hck. It is true that, in Haeckel's illustration, the distinct, ventral, sagittal spine is not present. There are, however, so many details in the illustration, which answer remarkably well to this species that it is highly probable that they are identical. The reason why Haeckel refers the species to the genus *Euscenium*, is that he considers the shell to be closed by the strong apical arches, (which are conspicuous in certain sightings of the microscope) while it really extends farther up along the apical spine, to the three connecting beams above mentioned.

My opinion therefore is still that the species is a *Cladoscenium*. Haeckel mentions the completely corresponding upper arches in *Cladoscenium pectinatum* Hck. (L. 86, p. 1150, pl. 98, f. 2), as a second verticil of branches of the columella.

Frequent, always in small numbers, in deep water, up to 100 m.

Distribution: Not rare on the west coast of Norway, here too sparse, and only in deep water samples. Was found in surface samples from the warmer and salter Atlantic waters 2/2 1901, in the sea beyond Søndmøre, 13/2 off Lofoten and 5/3 off Finmarken (cfr. Gran L. 70, pp. 150, 151, 154). Mentioned by Haeckel from a great depth in the Central Pacific. Cleve has found the species at a great depth west of Spitzbergen and at some places in the northern and north western parts of the Atlantic. Cleve (L. 40, p. 161) remarks that the species, though often found together with Styliplankton (temperate oceanic), does not, however, appear to be a Styliplankton form. Cleve considers it likely, either that it comes from the northern polar basin, or from the Northern Pacific. Cfr. above, p. 128.

Cladoscenium limbatum Jørg. n. sp.

(Pl. XV, fig. 74.)

Resembles to some extent the foregoing species, and is, on the whole, of the same structure, but, is nevertheless, quite different through the following special characteristics:

The main spines are more broadly three-edged, each edge having 2 to 4 diverging spines, which nearest to the shell are often prolongated to arch-shaped fine, supporting branches, between the shell and the main spine. Such arches are only seen from the one or two innermost branches (spines) and most clearly on the upper side of the main spines. Outside the basal arches, perhaps only between the lateral spines, a brim-shaped continuation of the lattice shell is developed. This brim continues a little way forwards along the sides of the main spines.

There is a verticil of branches high up on the columella, as in the foregoing species, but these branches are here almost straight on the distance between the columella and the shell.

The network of the lattice shell is much more perfect than in the foregoing species, most of the meshes being small and more or less distinctly square.

There is a trace of lattice wings from the top horn to the basal spines, and for this reason the species, perhaps, should most correctly be referred to the genus *Pteroscenium* Hck.

The cephalis is 52 μ in height, the width between the lateral spines 56 μ. The right, lateral spine is 68 μ in length outside the shell, the tophorn 50 μ. The stronger, primary arches seem here to become less conspicuous with growing age, so as to make the network more even in development. Finally the pores seem to disappear, being closed by thin plates, so that they are transformed into windows, not openings.

Only two specimens observed: $^{19}/_{1}$ 1899, 40 miles NW of Gaukværo, 0—700 m.

Peridium Hck.

Has the four primary spines as well as the ventral, sagittal one.

I have previously (Jørgensen L. 91, p. 75) expressed the opinion that the genus *Peridium* ought most naturally to be placed upside down, with the arched dome (cephalis) downwards and the opening, which is partly closed by lattice work from the basal spines, upwards. It is still my opinion that this is most correct after the analogy with *Campylacantha, Plectacantha* and *Phormacantha*. Here it may be clearly proved that the apical spine in Haeckel's sense corresponds to the dorsal, basal spine D in the genera mentioned. While I, at the same time, considered the genera *Euscenium* and *Cladoscenium* to have apical network in contradistinction to *Peridium* and the group *Plectoidea* Hck. with a basal one, I have later on come to the conclusion, after closer examination, that such a difference does not exist. I have therefore retained Haeckel's method of placing so as not to bring *Peridium* in opposition to the other genera of the group *Cyrtoidea* Hck., for which I prefer from practical reasons, at any rate for the present, to retain Haeckel's method.

P. longispinum Jørg.

(Pl. XV, figs. 75—79; pl. XVI, fig. 80.)

Jørgensen L. 91, p. 75.

I am for the present not quite sure whether or not there are at least two different species included under this name. What makes it still more difficult is that young forms of *Dicyrtida* often have the appearance of a *Peridium*, so that it is necessary to be very careful in the determination.

On older, well developed forms there is a cephalis which is broadest above the middle, then quickly rounded off upwards and conically narrowed downwards. The lattice shell is well developed and closed all round. The pores vary considerably in size, from very small and round to large, oblong and polygonal.

The main spines protrude far out. The very long and very narrow points seem only to occur in younger individuals. Large byspines, strongly bent outwards, are found on the right and left lateral arches. Besides, there are smaller, straight byspines scattered over all the surface of the shell, stronger and fewer in number at the basal opening, numerous and fine, narrow, needle-shaped on the upper side of the cephalis.

Younger individuals (if these do belong to the same species) with larger, more irregular pores, thinner beams, less perfectly developed lattice shell and long and narrow main spines. The cephalis in such forms is generally rounder, and often broader than it is high.

Here again we find the characteristic course of the primary arches, as mentioned under *Plectacantha oikiskos*. The larger secondary meshes and spines, which are mentioned at the same place, are also present here.

Rather rare, in deep water samples, up to 50 m.

Distribution: Also on the west coast of Norway, rare. Occurred too in two surface samples from the warmer, salter Atlantic waters, $^{2}/_{2}$ 1901, off Søndmøre, and $^{5}/_{3}$ off Lofoten (cfr. above, under *Cladoscenium tricolpium).*

P. minutum Cl.

Cleve L. 30, p. 31, pl. 3, f. 1 a, b, c.

The forms which I have referred to this species, occurred rarely in my material. They may at once be distinguished from the preceding species on account of the absence of the numerous, fine byspines on the upper part of the cephalis.

VII C. 5. Dicyrtida Hck.

Lithomelissa Ehrb.

The four primary spines, A, D, L_r, and L_l, are present, as well as the ventral, sagittal one.

The apical spine, D, runs in the wall of the cephalis, and protrudes like a needle-shaped tophorn, the lower part being inside the lattice shell. The dorsal, basal spine, A, protrudes obliquely like a simple spike (needle), rather far down on the thorax. On the inside, it is propped up against the shell by arch-shaped supporting beams (corresponding to the apical arches in *Phormacantha hystrix).* The lateral spines pierce the thorax in its upper part and protrude each of them as (one or?) two spikes.

The ventral, sagittal spine protrudes near the region of the neck (between cephalis and thorax), and is, in *Lithomelissa setosa,* connected to the right lateral spine, L_r, by an inner, little lattice-plate, whilst it is farther distant from the left, lateral spine. In other words, it divides the angle between the lateral spines into two very uneven parts, one small one to the right, and a larger one to the left. By this feature, young forms of *Lithomelissa setosa* are easily recognized, even if only the cephalis be developed.

The primary arches between D, L_r, and L_l are well developed, and protrude on the inside like three archshaped ledges, running upwards. By means of outwards and downwards bent byspines from these primary arches, together with branches and arches from the dorsal spine, A, and the lateral ones, the thorax is developed. In the upper part of the thorax, there are, therefore, formed three, more or less distinct swellings, a right one, below the primary, right, lateral arch, a left one, below the left, lateral arch, and a ventral one, below the primary, ventral arch.

Here too, as in all the forms of *Cyrtoidea* occurring in my material, there is an inner axial spine, pointing downwards vertically from the ventral end of the central rod, thus having the same starting point as the ventral, sagittal spine.

L. setosa Jørg.

(Pl. XVI, figs. 81—83; pl. XVIII, fig. 108).

Jørgensen L. 91, p. 91, non *Botryopyle setosa* Cl. L. 30, p. 27, pl. 1, f. 10.

Compare above the description of the genus and of the structure of the species in the introduction to the group *Nassellaria*. Cfr. too Jørg. l. c. where a detailed description will be found.

Of byspines, there are usually too strongly developed one on the right, lateral arch, protruding in the form of simple spikes in the upper part of the thorax, one or two similar ones on the left, lateral arch, and a couple on the cephalis.

The spikes, which are seen in varying numbers and differently developed on the lower margin of the thorax are — at any rate most often — only temporary formations. They disappear later on, as the development of the thorax progresses, the meshes being formed between these spines. Is is possible that var. *belonophora* Jørg. l. c., pl. 4, f. 22, is the fully developed form, and that its marginal spines are therefore permanent.

Frequent, mostly in deep water samples, sometimes — but rarely — in the surface. Rarely at all numerous.

Distribution: Belongs to the most frequent *Radiolaria* on the west coast of Norway.

L. laticeps Jørg. n. sp.
(Pl. XVI, fig. 84).

As yet, I am only imperfectly acquainted with this species which seems related to *L. thoracites* Hck. and *L. mediterranea* J. Müll. It differs from the preceding one in having a larger cephalis, which is broader and more obtuse, and by the want of byspines. Neither does there appear to be any other protruding spines than the principal ones, with perhaps a couple of branches.

The thorax has no marginal byspines beneath. The pores here on the lower margin are larger and the walls thinner, so that probably the individual illustrated is not yet fully developed.

Very rare and only singly: Sea off Røst, $^{22}/_{3}$ 1899, 0—900 m.

Distribution: I have seen it in a deep water sample from the sea between the Færø and Shetland Isles (cfr. above, p. 128).

L. hystrix Jørg.
(Pl. XVI, fig. 85).

Jørgensen L. 91, p. 83.

Cephalis not very high, finally, by the development of secondary, outer arches in the region of the neck, a broad semisphere, which is half of it sunk into the thorax.

The thorax is above campanulate, below cylindrical, with two distinct, lateral indentations in the upper part.

In the region of the neck in younger individuals, there are large holes, which later on are, to some extent, closed, by the development of outer arches between the lower part of the cephalis and the upper part of the thorax. The pores outside this region of the neck are roundish, of very varying size, being smallest on the upper part of the cephalis.

On the whole, there appears to be the same spines as in *L. setosa,* but fewer really protruding ones from the inner skeleton. The thorax here too appears to be similarly formed to that of *L. setosa,* from strong, obliquely downwards pointing byspines on the primary arches. A number of such obliquely protruding byspines are also seen in this species in the region of the neck. In addition, there are also numerous, needle-shaped byspines on the cephalis and the upper part of the thorax, and these, on a broad part of the shell, between the cephalis and thorax, develope fine, connecting beams, covering the large neck openings.

The region of the neck will here, in this way, be surrounded by a covering which causes the cephalis finally to be half (or wholly?) sunk into the thorax. This outer covering is chiefly formed from byspines on secondary arches.

Cephalis 22 μ broad, thorax 45—50 μ broad. The height of the thorax in the forms occurring in my material 34—40 μ. In these forms, which most probably were not fully developed, the brim of the thorax was provided beneath with short irregular spines, which no doubt are the walls of meshes in process of development.

It is a question whether this species should not be more correctly separated from the genus *Lithomelissa.* But as I have not as yet had an opportunity of studying the inner skeleton more carefully, I will, for the present, retain it in the genus in which I originally placed it.

Very rare and occurs only sparsely: $^{19}/_{1}$, 1899. 40 miles NW of Gaukværo, 0—700 m.; $^{28}/_{3}$ 1899, the Tys Fiord I, 0—700 m.

Distribution: Also very rare on the west coast of Norway.

Amphimelissa Jørg. n. gen.

This genus in outward appearance is similar to *Lithomelissa,* but its structure is principally different. It has the most important spines of the *Campylacantha* type, namely the four primary ones, A, D, L_r and L_l, one ventral, sagittal spine, and two strong lateral, dorsal ones, rising from the base of the spine D, which here, as in *Lithomelissa,* appears as a protruding, apical spine. The primary arches too are strongly developed, the ventral arch, namely, as well as the right and left lateral arches (cfr. *Plectacantha*) all as arches inside the cephalis. To these come a couple of strong arches from the dorsal, lateral spines to the primary, lateral arches, also situated inside the cephalis, near its sides.

These strong inner arches are all connected outwards with the lattice shell, by means of strong, supporting beams which, for the most part, protrude on the exterior, as fine, long spikes.

This peculiar form is only distantly related to the others in my material. In structure it is unmistakably similar to *Phormacantha hystrix:* but there are, nevertheless, as far as I have hitherto been able to see, important differences in the structural type. The distinctly enclosed columella (the spine D) is characteristic; it shows, from the dorsal side, two basal, obliquely downwards pointing side branches, the dorsal, lateral spines, and higher up two obliquely upwards pointing ones, the usual primary branches of the spine D. Probably the two strong arches from the dorsal, lateral spines to the right and left, primary, lateral arches correspond to the comparatively strong apical arches, which in *Phormacantha hystrix* extend from the primary branches of the apical spine A to the lateral arches. In this case, the dorsal, lateral spines might be considered to be, centrally displaced, primary branches of the spine A, and this answers to their direction.

The genus *Amphimelissa* then has an inner, incompletely latticed cephalis, surrounded by a lattice shell, which immediately continues downwards as a thorax.

The rather intricate course of these inner arches and skeleton parts here, as in the genera *Lithomelissa* and *Acanthocorys,* is difficult to trace in its details, as the outer lattice shell generally conceals them. So there are in this genus, as in the other two above mentioned, several structural details which require closer investigation. So much is, however, certain, that no satisfactory, natural system of classification for the *Cyrtoidea* group can be formed, unless the necessary consideration is paid to these inner skeleton parts.

The genus *Amphimelissa* ought undoubtedly to be kept distinct from the peculiar, irregular forms which form Haeckel's division *Botryodea.*

A. setosa (Cl.) Jørg. n. nom.
(Pl. XVIII, fig. 109).

Botryopyle setosa Cl. L. 30, p. 27, pl. 1, fig. 10 a, b.

The transverse section is a short oval, with the longitudinal axis in the direction of the central rod (sagittally). There are three large swellings on the upper part of the shell (the „cephalis"), a dorsal one, between the spines A and D, and two lateral ones on each side extending forwards to the ventral side.

I earlier confounded this species with *Lithomelissa setosa* and it is entered in the tables under this name. It seems however, on the whole, to be very rare. It is interesting that it seems to occur during the spring diatom inflow.

Malangen, $^{29}/_1$ 1899, 0—300 m., Lille Molla, $^{1}/_4$ 1899, in the surface.

Distribution: Rare on the west coast of Norway. Mentioned by Cleve from places in the northern and western Atlantic, as far as to the west of Spitzbergen, here at great depths (76°—78° N, 15° E—3° W, deep sea hauls from 325 m. and more, Aug. and Sept. 1898; 71°—72° N, 21—22° W, hauls from 180 m. and more, July 1899; 45° N, 49° W, high salinity and temperature, January 1899).

Acanthocorys *umbellifera* Hck. (?)
(Pl. XVIII, fig. 107).

Haeckel L. 84, p. 305, pl. 6, fig. 12.

Under this name I have entered a form which has the appearance of a species of the division *Dicyrtida*, but is certainly not fully developed. It is remarkable, as also Haeckel's illustration, for a rather large cephalis and a short, broad thorax. The spines in the thorax, protruding from the free brim like long, fine spikes are characteristic. Some of these spines are weaker than the others and are branches of them. The cephalis is well supplied with long, needleshaped byspines. There is also a similar apical spine, which here, as in *Lithomelissa*, is the spine D and runs in the wall of the cephalis, thus not forming any inner columella.

My species differs from Haeckel's only in the want of byspines on the thorax.

This species occurred very rarely and sparsely in the material from the northern coasts of Norway: $^{19}/_1$ 1899, 40 miles NW of Gaukværo, 0—700 m.; $^{29}/_1$ 1899, Malangen, 0—300 m.

Distribution: More frequent on the west coast of Norway, numerous in the Oster Fiord, near Bergen, at a great depth (up to 600 m.), $^{13}/_6$ 1900.

Cleve mentions the species from a few places in the Atlantic, west of Ireland and more to the south, as well as from several places far north, to the north west point of Spitzbergen. In these northern places, the species was only found in deep water. Haeckel mentions it from the Azores and the Mediterranean. Hence Cleve considers the species to belong to Styliplankton. It seems, however, judging from the places mentioned where it has been found, to have about the same distribution as *Plectacantha*, and is probably boreal oceanic.

It is, however, quite possible that Haeckel's is a distinct species.

Helotholus Jørg. n. gen.

The four primary spines with the ventral, sagittal one. All five protrude as single spikes, the dorsal one, A, down on the thorax, the ventral, sagittal one in the neck stricture, the one marked D, on the cephalis as an apical spine.

The lower part of this latter spine is inside the wall of the cephalis, while it a little higher up runs in the very wall. It is therefore no genuine columella.

There is also an axial spine, as in the other species here mentioned of the *Cyrtoidea* group. This axial spine starts as usual from the ventral end of the central rod, in the interior of the lattice shell, a little below the neck stricture, and is in elder individuals of *Helotholus histricosa* divided in two.

The thorax is broadly campanulate, nearly semispherical.

H. histricosa Jørg. n. sp.
(Pl. XVI, figs. 86—88).

The ventral sagittal spine about equal in strength to the others and is directed a little upwards. The primary, lateral spines are nearly horizontal, bent slightly downwards; they protrude at the neck stricture, rather far up. The dorsal spine, A, is directed downwards and pierces the thorax rather far down.

Only the dorsal spine, A, runs for a short distance in the very wall of the thorax, the others pierce only the wall.

The cephalis is semispherical, or a little higher, in cross section circular. The thorax is broadly campanulate.

The pores are irregular in shape and size, most of them being roundish or oblong, smallest on the cephalis (1—16 μ), largest on the thorax, especially down below on young individuals. Here the brim of the thorax is furnished with numerous, irregularly placed, short spines, which are not true byspines, but only the walls of meshes which are not yet developed.

On the cephalis and thorax, narrow needle shaped byspines are scattered, the longest being about equal in length to the diameter of the cephalis.

I have not seen any individuals which could be supposed to be fully developed.

The species does not answer well to any of Haeckel's genera. From the genus *Lithomelissa*, as I have understood it in the species *L. setosa*, there are such important differences that it does not seem reasonable to place these two forms in the same genus. It might rather be united with the following species. I have not, however, done so, more especially as the definition of Haeckel's genus *Dictyophimus* requires that there should be three thoracic ribs which are lengthened out to „basal feet", and this definition may at a pinch be made to apply to the two following species, but not at all to *Helotholus histricosa*.

Rather rare, sparse, in deep water samples.

Distribution: Seems also to be a boreal, oceanic species.

Dictyophimus Ehrb., Hck.

This genus is by Haeckel made to include rather highly differentiated forms, which probably ought to be kept distinct from the species which I have here referred to it. There does not, however, appear to be any great disadvantage in placing them here preliminarily.

From these two species, the genus should be defined as follows:

The four primary spines are present, as well as the ventral, sagittal one. The three basal ones (L_r, L_l and A) extend from the central rod to the upper part of the thorax, a little below the neck, hence running for a little way in the thoracic wall, and then protruding either as thoracic „feet" (*D. histricosus*), or leaving the thorax above its free brim.

The thorax is broadly campanulate or conical.

D. Clevei Jörg.

D. gracilipes Cl. L. 30, p. 29, pl. 2, f. 2. vix Bail. *D. Clevei* Jörg. L. 91, p. 80, pl. 5, f. 26.

The protruding part of all five spines of uniform breadth, much broader than the inside part, with three distinct edges. In young specimens, the three basal spines extend from the lower part of the thorax. They are partly running in the thorax, but on older individuals always appear to protrude above the free brim.

The irregular, small spines on the free brim of the thorax are here, as in the preceding species, only temporary formations, which later on become intermediate walls between new meshes.

In the passage from the cephalis to the thorax, there are three distinct swellings, two lateral, outside the primary, lateral arches (B_r and B_l), as well as a ventral one between the primary, lateral spines.

The thorax is wide, flatly campanulate.

Dictyophimus gracilipes Bail. (L. 9, p. 4, pl. 1, f. 8) does not appear from the description to be this species („triquetrous; three acute ridges prolonged into long acute basal spines").

Rare, in deep water samples.

Distribution: Rare on the west coast of Norway. Cleve mentions *D. gracilipes* from a few places in the northern part of the Atlantic up to the north west point of Spitzbergen, at the most northern places only in deep water. Bailey's species was found in the Northern Pacific and Kamtschatka.

Probably boreal oceanic.

D. histricosus Jörg. n. sp.
(Pl. XVI, fig. 89).

Cephalis semispherical, thorax pyramidal.

The basal spines extend from the central rod (under the neck stricture) to the thorax and continue in the thoracic wall to the very margin below where they protrude as „basal feet". The apical spine, D, runs chiefly in the wall of the cephalis (as in the two preceding species) and above is prolongated to a tophorn, which is only very little different to the byspines in appearance. This is also the case with the ventral, sagittal spine, which runs obliquely upwards and out through the neck stricture.

All the main spines are narrow, not three-edged.

Cephalis and thorax rather plentifully provided with narrow, needle-shaped byspines, which are longest and most numerous on the cephalis. The longest are as long, or even a little longer, than the diameter of the cephalis.

The pores are uneven in shape and size, varying from quite small to 9 μ, not much smaller on the cephalis than on the thorax.

Here too the three swellings on the upper part of the thorax between the main spines (fig. 89 b) are to be found.

The width of the lattice shell is 85 μ, its height (not including the basal feet) 68 μ. The cephalis alone is 34 μ wide and 22 μ high.

Very rare and only singly: 19/1 1899, 40 miles NW of Gaukværo, 0—700 m.; Henningsvær, 21/2 1899, 0—250 m.

Distribution: Probably boreal oceanic.

Litharachnium Hck.

Rudimentary cephalis. In the neck stricture, which here is near the top of the lattice shell, the three primary meshes will be seen between the three primary, basal spines. These spines are here very much retrograded and have only the appearance of walls between the primary meshes. Both the apical spine, D, and the ventral, sagittal one are wanting. Refer for further details to Hck. L. 84, p. 1163.

Young forms of *Litharachnium tentorium* will appear as slender pyramids and thus correspond to the genus *Plectopyramis* Hck.

Haeckel mentions and illustrates the three primary meshes mentioned (his cortinar septum) but no cephalis. He too considers, however, the jointless lattice shell to be the thorax, as he definitely derives the genus from *Dicyrtida* by the loss of the cephalis.

My opinion therefore is that it would be most natural to refer all the genera belonging here to *Dicyrtida*, not to *Monocyrtida*. In this species (and probably in most cases) a rudimentary cephalis is also distinctly visible.

The genera which belong here according to Haeckel ought undoubtedly to be subjected to revision.

L. tentorium Hck.
(Pl. XVI, figs. 90—91).

Haeckel L. 84, p. 281, pl. 4, figs. 7—10, L. 86, p. 1163.

The upper part of the lattice shell is slenderly conical, widened out below to a broad brim which is at the outside edge bent again upwards, giving the appearance of the brim of a hat. At the top of the conical part, there is a tiny semispherical cephalis.

The pores in the upper part of the shell are small, round and scattered; farther down they are lattice windows (as in the genus *Plectopyramis* Hck.) and are more regularly arranged in horizontal rows. The shape gradually lengthens out horizontally, so that from being round they become rectangular with rounded corners. Only still farther down do the straight ribs in the wall of the lattice shell appear, and the pores now become regularly rectangular, and are arranged in distinct rows, both radially and tangentially. When the radial pores have attained a certain size, new straight longitudinal ribs appear in the wall of the lattice shell, pushed in between the old ones.

The number of principal ribs in the well developed specimen which is illustrated in fig. 90, was 32. Very numerous secondary ribs, their number increasing in proportion to the distance from the cephalis, were present between these 32. The diameter of the brim 340 μ, of the cephalis only 8—9 μ. The largest meshes (high up) 9 μ, in the brim about 6 μ.

Notwithstanding that there are really great differences in Haeckel's and my descriptions, it seems — on account of the remarkable correspondence in so many details with Haeckel's illustration — that my species and Haeckel's are after all identical.

This species answers perhaps best in structure to the many-jointed genera (division *Stichocyrtida*), and might be considered as such a many-jointed form, where the strictures and annular septa between the different joints have disappeared.

Very rare, only singly: Skroven, 4/4 1899, 0—150 m.; the Folden Fiord, 6/4 1900, 300—200 m.

Distribution: In the sea between Norway and the Faeroe

Isles (also mentioned from here by Cleve, L. 40). Found by Haeckel at Messina.

Seems to be a southern, temperate, oceanic form.

Androcyclas Jörg. n. gen.

The four primary spines and the ventral sagittal one are present. The apical spine, D, runs close to the cephalic wall, and finally protrudes as a marginal topsword, thick and large, and furnished with three broad edges. There is, consequently, no distinct columella.

The three basal spines, A, L_r and L_l protrude from the upper part of the thorax (the spine A lowest down) like fine needles, which pierce the wall, no part of them being enclosed in it as „thoracic ribs". The ventral, sagittal spine also protrudes like a similar needle in the region of the neck.

There is also a long, inner axial spine, which reaches as far down as to the upper part of the abdomen.

Cfr. the remarks about the region of the neck, under the description of the species.

I referred the following species previously to the genus *Pterocorys* Hck., but I now find it necessary to separate it from this genus which has strong side swords on the thorax.

On the other hand, there is probably no doubt that the genus *Theoconus* Hck. to some extent corresponds to my genus *Androcyclas*. Thus, *Theoconus joris* Hck. (L. 86, pl. 69, f. 4) is undoubtedly of quite the same structure as *Androcyclas gamphonycha*, the byspines on the abdomen of the latter only excepted. As, however, Haeckel's group *Theocyrtida*, to which *Theoconus* Hck. and *Theocalyptra* Hck. belong, is defined as *Tricyrtida* without radial apophyses, I have thought it most practical, to avoid confusion, temporarily to erect the new genus *Androcyclas*.

A. gamphonycha (Jörg.)
(Pl. XVII, figs. 92—97).

Pterocorys gamphonyxos Jörg. L. 91, p. 86.

P. theoconus Jörg. l. c. *P. amblycephalis* Jörg. l. c.

The region of the neck is very peculiar, not forming any distinct stricture between the cephalis and thorax, but a zone where these two joints gradually pass into each other. This region appears on the dorsal side to lie between two pair of branches from the apical spine, D, namely two dorsal, lateral spines below (corresponding to those in the genus *Amphimelissa*) and the primary, lateral arches above. These dorsal, lateral spines (from the base of the spine A and the spine D) lie near the hind wall of the cephalis. The lower part of the apical spine, D, is here a columella in the region of the neck, but lying near the cephalic wall.

The length of the abdomen varies considerably, probably according to age; this is also the case with the number of byspines. It is not unusual to find comparatively well developed forms which are apparently almost or entirely without the characteristic byspines, but which in other respects diverge so little from the typical forms that they can scarcely be considered to belong to any other species. Therefore I now think that *Pterocorys theoconus* must be looked upon as a form of this species.

The other, very short tophorn is very rarely seen distinctly and is probably a more or less accidental formation. Sometimes strong siliceous edgings are developed on the upper part of the cephalis, and these may be protruding and in certain positions look like a very broad, short spine.

According to my experience no limit either can be drawn between *Pterocorys gamphonyxos* and *P. amblycephalis*. The younger forms seem to answer best to the latter, which is in appearance so different to *P. gamphonyxos* that it is generally easy to keep them distinct. (This is done in the tables). The principal difference is that *P. amblycephalis* has a cephalis which is at the upper part abruptly cut off and, at the very top, often open. This opening is probably closed later on. The tophorn is generally shorter and more weakly developed and the abdomen short and broad, without distinct byspines, all characteristics which may be explained by supposing that *P. amblycephalis* is the younger stage of development. On inviduals which it seemed more correct to refer to *P. amblycephalis* than to *P. gamphonyxos*, I have also occasionally seen short and broad byspines in conjunction with a better development of the abdomen.

On the best developed specimens of *A. gamphonycha*, the abdomen is again narrowed below, the strongest set of spines being on that part which is broadest. The byspines are only slightly bent.

Frequent, in Tranodybet $^{6}/_{4}$ 1899, 0—630 m., numerous, otherwise rather sparse and generally only in deep water.

Distribution: On the west coast of Norway, in deep water, rare. Off the coast of Finmark $^{5}/_{3}$ 1901, in a surface sample (S/S Michael Sars cfr. Gran, L. 70, p. 154). Perhaps a temperate oceanic form.

Clathrocyclas craspedota (Jörg.) Jörg.
(Pl. XVII, figs. 98—100).

Theocalyptra craspedota Jörg. L. 91, p. 85.

The abdomen is a narrow, flat, projecting brim, on well developed specimens having two or three regular, circular rows of meshes, the inner row with small pores. The free side-walls of a ring of meshes under development will have the appearance of a regular circle of short, radial spines on the abdominal brim.

The same spines are present as in the preceding genus. The three basal spines protrude similarly as fine needles in the upper part of the thorax (the dorsal spine, A, farther down than the others). The apical spine, D, also here protrudes with a broad three-edged topsword directed upwards and somewhat backwards. The ventral, sagittal spine protrudes upwards and forwards (ventrally) with a similar, three-edged topsword, which is, however, a little smaller and points obliquely forwards.

Refer for further details to Jörgensen, l. c.

As the incompletely developed abdomen often exhibits a marginal brim of regular, short spines like those Haeckel draws for species of the genus *Clathrocyclas*, subgenus *Clathrocycloma* Hck. (L. 86, pls. 58, 59), I have thought it best to refer my species to this genus where it seems to have its natural place. In doing so, I also think that *Clathrocycloma* Hck. will be found to have the three basal spines protruding from the upper part of the thorax like fine needles.

If these needles are overlooked or absent, and no notice is taken of the spines on the brim of the abdomen, the species according to Haeckel's system will be a *Theocalyptra*.

Halicalyptra ? cornuta Bail. = *Theocalyptra c.* Haeckel is quite impossible to determine from the very imperfect illustration, given by Bailey. After this drawing it has only cephalis and thorax.

Frequent, though never numerous.

Distribution: On the west coast of Norway, very rare. In surface samples $^{2}/_{2}$ 1901, off Søndmøre, and $^{13}/_{2}$ off Lofoten (cfr. above under *Cladoscenium tricolpium*, p. 134).

If this species be Cleve's *Theocalyptra cornuta*, it has been found at great depths at some places in the North Atlantic right up to the north west coast of Spitzbergen, and at scattered places in the western part of the North Atlantic. Most probably boreal oceanic.

Dictyoceras Hck.

D. acanthicum Jörg.

(Pl. XVII, fig. 101 a; pl. XVIII, fig. 101 b).

Jörgensen L. 91, p. 84.

It appears very doubtful whether this species really is specifically different from the following one.

The only difference appears to be in the protruding basal spines, which in this species are little more strongly developed outside than inside the lattice shell, while they are transformed into three-edged swords in *D. xiphephorum*. I retain, however, *D. acanthicum* preliminarily as a separate species, as it is, generally speaking, easy to keep it distinct from *D. xiphephorum*. If they should prove to belong to the same species, *D. acanthicum* would be the younger stage.

Rather rare, always in deep water samples, sparse.

Distribution: On the west coast of Norway rare. In surface samples $^{13}/_{2}$ 1901, off Lofoten, and $^{5}/_{3}$ off Finmarken (S/S Michael Sars, cfr. above).

D. xiphephorum Jörg.

Jörgensen L. 91, p. 84, pl. V, f. 25.

Distribution: Like the preceding one. $^{2}/_{2}$ 1901, off Søndmøre, in the surface (S/S Michael Sars, cfr. above).

Stichocorys seriata (Jörg.)

(Pl. XVIII, figs. 102—104).

Eucyrtidium seriatum Jörg. in Gran L. 70, p. 150 (nomen nudum).

A many-jointed form. The uppermost joints are convex and increase in size so that the diameter of the fifth is from three to four times as great as that of the first. The lower part is more or less distinctly cylindrical. On the cephalis, there is a short broad tophorn. The pores below are roundish rectangular, in very distinct, regular, horizontal rows.

The number of the joints varies, probably according to age. Uppermost there is a low, semispherical (or broader) cephalis, then short joints, which increase evenly in width up to the fourth or fifth, which is usually the broadest. From the sixth joint, which is decidedly narrower, the width decreases, but very slowly, so that the lower part is almost cylindrical, only a little narrower below. I have not seen more than eight joints. These lower joints in the cylindrical part are not plainly divided off from each other.

The upper part of the shell is shaped like a high cone.

There is a short, broad, three-edged (?) tophorn protruding from an inner skeleton in the two upper joints.

It is not easy to see these inner skeleton parts which are, at all events, in a high degree retrograded, for it is a difficult matter to examine the shell from the open end, and the outer lattice shell in side view hides the short, primary spines. So I have not been able definitely to decide whether this genus has the same primary skeleton parts as the foregoing ones. Neither have I been sure if protruding basal spines exist in the two upper joints (the apical spine only excepted).

The shape of the cephalis in some positions of the lattice shell might suggest that also inner primary arches are to be found, and not only the primary spines.

It is doubtful whether there is a protruding ventral, sagittal spine.

On the other hand, a long, inner axial spine is plainly visible. It seems to consist of three or more long, parallel branches, which reach down through more than half the length of the lattice shell.

The central capsule also reaches far down through the shell.

The pores on the cephalis are small, round, widely apart and scattered. On the second joint, they are perhaps a little larger, on the third somewhat smaller again, and from here they are regularly placed in horizontal rows. From the fourth joint and downwards, the pores become more irregular in form and size, from quite small and round to rather large, roundish rectangular in shape, although generally speaking they are small and always in regular, horizontal rows. On the cylindrical lower part, they are also placed in more irregular vertical rows. The average size of the pores does not increase, at any rate noticeably, from the fourth joint d wnwards.

This species varies rather considerably. For instance, its greatest width may be either in the fourth or fifth joint, and there are often irregular contractions in the lower part. It is doubtful whether any of the individuals illustrated are fully developed. On the best developed specimen (fig. 102) the lower margin was regularly dentate. Often young individuals may be found consisting of only a few joints and entirely without the cylindrical lower part.

Height, up to 128 μ, greatest width 72 μ. Pores, up to 6 μ.

The species resembles the one illustrated by Cleve, L. 30, pl. 2, figs. 5 and 6, which he calls *Lithomitra australis* Ehrb. It is probable that the same basal spines are present in this species, protruding as fine needles, as in *Androcyclas gamphonycha* and *Clathrocyclas craspedota*. Even if these spines are present, Haeckel's name for the genus might in this case be retained without any great disadvantage.

Rather rare, always in small numbers and only in deep water samples.

Distribution: In surface samples, $^{2}/_{2}$ 1901, off Søndmøre, $^{13}/_{2}$ off Lofoten and $^{5}/_{3}$ off Finmark (cfr. above).

Most probably a boreal oceanic species.

VII D. Phaeodaria Hck. (Tripylea).

VII D. 1. Cannosphaerida Hck.

Cannosphæra Hck.

C. geometrica Borg.

Borgert L. 12, pl. 6, f. 6; L. 14, p. 25, f. 25.

This species is smaller, but more robust than the following.

Specimens which seem to belong here were found very sparsely in the plankton of 1899 from the following places:

In the sea 40 miles NW of Gaukværo, 19/1, 0—700 m.; Kvænangen 1. 24/1. 0—140 m.; the Vest Fiord 1/2, 0—200 m.; Skroven 1/2, 0—300 m. The species appears with us only to occur in deep water.

Distribution: Hitherto only found in the Irminger Sea, south west of Iceland, n. lat. 60° 3′, w. long. 27° (Borgert, l. c.). Certainly an oceanic form, perhaps from the northern part of the Gulf Stream.

C. lepta Jörg.
(Pl. XVIII, fig. 110).

Jörgensen, L. 91, p. 89.

Is a larger, weaker species. There is particularly great divergence in the radial beams, which in this species are generally thin threads, while in the foregoing one, they are strong, thick beams. The species varies, however, considerably. As a rule only broken species are found, as it is easily destroyed on being touched.

Was very rare and sparse in the samples of 1899, in 1900, on the contrary, not unusual. Generally only in deep water, yet up to 50 m.

Distribution: Previously only known from the west coast of Norway, but not rare here in 1898, though always in small numbers.

VII D. 2. Challengerida Hck.

Protocystis Wall. (*Challengeria* Murr.).

P. xiphodon (Hck.) Borg.

Challengeria xiphodon Hck. *Protocystis xiphodon* (Hck.) Borgert L. 14, p. 27—28, f. 28.

Rather frequent, but always sparse. Always in deep water samples.

Distribution: A temperate oceanic species, distributed from the tropical part of the Atlantic to the north coast of Iceland (Cleve, L. 40, p. 147). On the west coast of Norway, very rare (1898). In the North Sea at several places in deeper water in May and August 1903, especially in the northern opening towards the Norwegian Ocean (L. 18, 1903—1904, nr. 1). According to Borgert l. c. also known from the East and the West Greenland Current, the Labrador Current and the Mediterranean.

P. Harstoni (Murr.) Borg.

Borgert L. 14, p. 28, f. 30. *Challengeria Harstoni* Murr., cfr. Jörgensen L. 91, p. 90.

Rare and sparse, always in deep water.

Distribution: On the west coast of Norway also rare, in deep water. Also found in the northern part of the Gulf Stream at a few places, up to south and west of Spitzbergen, also in deep water.

Is probably an oceanic species, perhaps boreal, or at any rate belonging to the northern part of the Gulf Stream. Also found in the northern part of the Pacific, at great depths.

P. tridens (Hck.) Borg.

Borgert L. 14, p. 29, f. 32. *Challengeria tridens* Hck., cfr. Jörgensen L. 91, p. 90.

Frequent, though never numerous, as a rule only in deep water, up to 50 m.

Distribution: Frequent on the west coast of Norway, in August 1903 in large numbers in deep water off the coast of Bergen (L. 18, 1903—1904, nr. 1).

Also found many places in the North Sea and the northern part of the Gulf Stream, as far as south and west of Spitzbergen. According to Borgert l. c. also known from the East and the West Greenland Current and the Labrador Current. Probably a northern temperate oceanic form.

Challengeron *diodon* Hck.

Borgert L. 14, p. 30, f. 34. Cfr. Jørgensen L. 91, p. 91. *Challengeron heteracanthum* Jørg. l. c.

On more weakly developed (probably young) specimens, the characteristic byspines are wanting. It is therefore centainly most practical to do as Borgert has done and consider as one species, *Challengeron diodon, C. heteracanthum* and *C. Nathorsti* Cl.

Not particularly frequent and as a rule very sparse, always in deep water.

Distribution: On the west coast of Norway, frequent, but always sparse. Found at a few places in the North Sea (May 1903 at a great depth, according to L. 18) and the northern part of the Atlantic up to the west of Spitzbergen, in deep water. According to Borgert l. c. also found in the Labrador Current, the more southerly part of the Atlantic and in the Mediterranean. According to Haeckel, *Challengeron diodon* has been found in the south eastern part of the Pacific, at a great depth.

C. Channeri (Murr.) Hck.
(Pl. XVIII, fig. 111).

Challengeria Channeri Murray L. 106, p. 226, pl. A. fig. 12. *Challengeron Channeri* (Murr.) Hck. L. 86, p. 1658. Borgert L. 14, p. 32, f. 38.

I have only seen one individual which I have supposed to belong to this species. Its shell was circular in outline, strongly compressed, with 16 marginal spines, all more or less broken off. Also the teeth of the peristome were broken off.

Diameter, 165 μ.

In the sea 40 miles NW of Gaukværo, 19/1 1899. 0—700 m.

Distribution: In the sea south west of the Faeroe Isles, and the southern parts of the Atlantic (Borgert l. c.). On the American side of the Atlantic (48° n., 42° w. according to Cleve L. 40, p. 147, very rare). The Northern Pacific, at a great depth (Haeckel l. c.).

C. armatum Borg.
(Pl. XVIII, fig. 112).

Borgert L. 14, p. 33, f. 39. *C. Willemoesii* Hck. L. 86, p. 1659, pl. 99, f. 13?

Only one individual observed, this one also from the sea 40 miles NW of Gaukværø, 19/1 1899, 0—700 m. Unfortunately I missed this specimen before I had finished my examination and drawing of it.

Distribution: Northern branch of the Gulf Stream and the more southerly parts of the Atlantic, according to Borgert l. c. According to L. 18, 1903—1904, nr. 1, also west of the Faeroe Isles, August 1903, in deeper water, r.

VII D. 3. Medusettida Hck.

Medusetta *arcifera* Jørg.

Jørgensen L. 91, p. 93, pl. 4, f. 23.

Closely related to *M. parthenopæa* Borg. L. 13, p. 243, pl. 11, f. 5.

Very rare and only singly, 1899: Henningsvær $^{17}/_{1}$, 0—100 m.; Senjen $^{21}/_{1}$, 0—130 m; Ofoten II. $^{7}/_{2}$, 250—200 m.; Reine $^{27}/_{3}$, 0—150 m. Only in deep water.

Distribution: Further, only known from the west coast of Norway, where it is not so rare. Most probably a temperate form.

The closely allied species, *M. parthenopæa* Borg., is found at Naples.

Gazelletta *pentapodium* Jørg.

Jørgensen L. 91, p. 94.

Very rare and only singly, 1899: Moskenstrømmen $^{14}/_{1}$, 0—50 m.; Senjen $^{21}/_{1}$, 0—50 m.; the Vest Fiord $^{1}/_{2}$, 0—200 m.; Henningsvær $^{20}/_{3}$, 0—280 m.

Distribution: Same as the preceding.

VII D. 4. Cadiida Borg.

Cadium *melo* (Cl.) Borg.
(Pl. XVIII, fig. 113).

Borgert L. 14, p. 50, f. 58. *Beroetta melo* Cl. L. 30, p. 27, pl. 1, f. 8. Cfr. Jørgensen L. 91, p. 92.

Only one specimen noticed: Sea off Røst, 60 miles NW of Røst, $^{22}/_{3}$ 1899, 0—900 m.

Distribution: Seems to be an oceanic form from the northern part of the Atlantic. Only found alive in the By Fiord at Bergen (Jørgensen L. 91, p. 93), 0—200 m., rr, and at a great depth west of Spitzbergen (Cleve l. c.).

VIII. Tintinnodea.

Tintinnus *acuminatus* Clap. et Lachm.

Cfr. Jørgensen L. 90, p. 8, and pp. 42—43.

Frequent, but always in small numbers. Seems to be most frequent in rather deep water (which is warmer and has a higher degree of salinity).

Distribution: Seems to be an oceanic form from the Northern Atlantic, perhaps also neritic, temperate and boreal. According to Cleve (L. 40, p. 121) it has its „principal area of distribution in the Irminger Sea".

Var. undata Jørg. L. 91, p. 95.

Very sparse in three samples: Helligvær $^{12}/_{1}$ 1899, 0—50 m. and 0—250 m.; Malangen $^{29}/_{1}$ 1899, 0—300 m.

Leprotintinnus *pellucidus* (Cl.) Jørg.
(Pl. XVIII, fig. 114).

Jørgensen L. 92, p. 18. *Tintinnus pellucidus* Cl. L. 30, p. 24, pl. 1, f. 4. *Tintinnus bottnicus* Brandt L. 16, p. 53, pl. 3, f. 11, non Nordquist L. 110, p. 126, f. 5. *Leprotintinnus bottnicus* (Nordq.) Jørg. L. 90, p. 10.

Concerning Cleve's remark (L. 40, p. 123) as to the correctness of the genus name *Leprotintinnus*, reference should be made to Jørgensen L. 92, p. 19.

I have seen individuals with very few foreign bodies on their houses, but I have never seen perfectly smooth specimens. It is however very seldom that one meets with such well covered individuals as the one represented in figure 114.

Very rare and sparse, only found in three samples: Rombaken I, $^{8}/_{2}$ 1899, 0—40 m.; the Ogs Fiord I. $^{14}/_{3}$ 1899 0—90 m.; the Skjerstad Fiord IV, $^{2}/_{4}$ 1900, 0—330 m.

Distribution: On the west coast of Norway, very rare. Also found near Greenland, Spitzbergen and the Arctic Ocean north of Finland (August 1903, occasionally numerous, according to L. 18, 1903—1904, nr. 1). The species is, therefore, certainly a northern one, perhaps boreal oceanic and neritic arctic.

Amphorella Daday.

A. quadrilineata (Clap. et Lachm.) Jørg.

Cfr. Jørgensen L. 90, p. 12.

It is highly probable that Claparède's species, *Tintinnus amphora*, is the same one as is in the same work mentioned as *T. quadrilineatus*. The latter name must, however, be looked upon as the safer. It ought to be preferred if it were not for the complication caused by the use of the name *Tintinnus amphora (Amphorella amphora)* by Entz and Daday for the species here being considered, and by the use of the other name by Daday in another sense (= *A. Dadayi* Jørg.). Under these circumstances, it would, after all, perhaps be better to use the name *A. amphora* (Clap. et Lachm.) Entz, as Cleve does (L. 40, p. 99).

Only found in one sample, sparse: Henningsvær $^{17}/_{1}$ 1899, 0—50 m.

Distribution: On the west coast of Norway, rare and sparse. According to Cleve (L. 40, p. 99) widely distributed in the eastern part of the Atlantic from the tropical zone to Iceland. Also known from the Mediterranean. Is undoubtedly a southern (tropic and) temperate oceanic form.

A. Steenstrupii (Clap. et Lachm.) Dad.

Cfr. Jørgensen L. 90, p. 15.

Also only once found, in small numbers: The Vest Fiord I, $^{13}/_{1}$ 1899, 0—50 m.

Distribution: On the west coast of Norway, rather rare. Undoubtedly, a temperate, southern, oceanic form. According to Cleve (L. 40, p. 100) the species is widely distributed across the whole of the Atlantic, especially between 40° and 50° N. Also known from the Mediterranean.

A. ampla Jørg.

Jørgensen L. 90, p. 17, pl. 1, f. 4, a. b.

Very rare and scarce, only in 2 samples: Henningsvær $^{17}/_{1}$ 1899, 0—180 m.; the Vest Fiord, $^{1}/_{2}$ 1899, 0—200 m.

Distribution: Only known from the west coast of Norway, where it is very rare. Probably a temperate, oceanic species.

Tintinnopsis STEIN.

T. nitida BRANDT.

BRANDT L. 16, p. 58, pl. 3, f. 1.

Very frequent, often numerous. Seems to prefer water of a low salinity.

The species varies considerably. I have to some extent in the tables made a distinction for one form, viz. *var. ovalis,* which is, however, more frequent than would appear from them.

Distribution: Further, only known from the Karajak Fiord, Greenland. Most probably an arctic, neritic species.

Var. ovalis JØRG. n. var.
(Pl. XVIII, fig. 115).

The house is brimless, in the most distinguished form narrowed towards the mouth. The lower part is evenly rounded off. The greatest breadth of the house is a little above the middle.

A strong, compact covering of shining small particles on the house, as in the main species.

This variety is more frequent than appears from the tables, as it is mostly included under the principal species.

Often forms may be found which are intermediate between this one and the main species; such an one is illustrated by BRANDT l. c. As a rule, the principal species is very different in shape from the variety, through a trace of a brim at the mouth, an almost cylindrical upper part and a bluntly pointed lower part. Forms without any trace of a brim at the mouth are, however, of frequent occurrence.

The Norwegian species seems generally to be somewhat smaller than the Greenland one, about 70 μ in length.

Var. sinuata BRANDT.
(Pl. XVIII, fig. 116).

Tintinnopsis sinuata BRANDT L. 16, p. 58, pl. 3, fig. 2.

Considering that the species *Tintinnopsis nitida* varies exceedingly, I think that is hardly possible to look upon *T. sinuata* as a distinct species. In the course of development both the spreading brim at the mouth and the shape of the house vary considerably. We have as extremes, on the one hand, *var. ovalis,* without a brim, or with only a very indistinct one, and an evenly arched contour in side view; on the other, *var. sinuata,* with a distinct brim and a contour which is narrowed in the lower part and bluntly pointed (at the end square).

The individual illustrated, which must undoubtedly be reckoned as a *Tintinnopsis sinuata* BRANDT, is not so conspicuously different from *T. nitida* as BRANDT's figure, but the characteristics are plainly seen which are mentioned as separating between *T. sinuata* and *T. nitida.* Intermediate forms between the one illustrated and the principal form also occur.

Distribution: As the principal species. Individuals which decidedly belong here were only seen in one of the samples: Moskenstrømmen, $^{14}/_{1}$ 1899, 0—100 m.

T. campanula (EHRB.) DAD.

Cfr. JØRGENSEN L. 90, p. 21 and p. 42.

Only in two samples and only singly, 1900: Tranodybet $^{22}/_{3}$, 0—600 m. and the Skjærstad Fiord II $^{2}/_{4}$, 0—180 m.

Distribution: Frequent on the west coast of Norway, but seldom numerous. Also known from the Mediterranean, the North Sea, Skagerack, the Baltic and the Bermudas. In August 1903, numerous in the English Channel (L. 18, 1903—1904, nr. 1). According to CLEVE, it is hardly found in the open sea. Undoubtedly a temperate, neritic species.

Codonella HCK.

C. ventricosa (CLAP. et LACHM.) FOL.

Only once observed: Tranodybet $^{22}/_{3}$ 1900, 0—600 m., rr.

Distribution: Neritic species, northern temperate. Probably the southern form (from the Mediterranean) is different from the northern one.

C. lagenula (CLAP. et LACHM.) ENTZ. ***var. ovata*** JØRG.
(Pl. XVIII, fig. 117).

Is probably specifically different from the species which is considered to be the main one.

Rare and scarce.

Distribution: Frequent on the west coast of Norway, but always in small numbers. Most probably a temperate form. The principal species, which is very rare in the neighbourhood of Bergen, is, according to CLEVE (L. 40, p. 103) a tropical and southern temperate oceanic form.

Ptychocylis urnula (CLAP. et LACHM.) BRANDT.

Cfr. JØRGENSEN L. 90, p. 18.

The principal form (*α major* JØRG. l. c.) not frequent, always in small numbers.

Distribution: More frequent on the west coast of Norway. Neritic form, which appears to be less northerly than the following.

v. minor JØRG.

JØRGENSEN l. c., p. 19, pl. 1, f. 9.

Frequent, sometimes numerous.

Distribution: Most probably a northern temperate and boreal, neritic species. Is found all the year round, more or less numerous, on the west coast of Norway.

v. digitalis AURIV.

P. Drygalskii BRANDT L. 16, p. 59, pl. 3, f. 14. Cfr. JØRGENSEN L. 92, p. 17.

Very rare and scarce, 1899: The Vest Fiord I, $^{13}/_{1}$, 0—180 m.; Ofoten II, $^{7}/_{2}$, 0—100 m. and 250—200 m.; Rombaken, $^{8}/_{2}$, 0—40 m.; Rombaken II, $^{8}/_{2}$, 0—100 m.; Tranødybet, $^{16}/_{3}$, 0—50 m.; Henningsvær, $^{20}/_{3}$, 0—280 m.; Høla, Svolvær, $^{5}/_{5}$, 0—150 m.

Distribution: Seems to be an arctic neritic and (boreal?) oceanic form. Known from Greenland, the Labrador Current, Jan Mayen and the sea between Jan Mayen and Tromsø. The closely related *P. obtusa* BRANDT, which is considered by CLEVE also to include *P. Drygalskii*, is also an arctic form, which has been found at several places near Spitzbergen and Greenland.

v. subarctica Jørg. n. var.
(Pl. XVIII, fig. 118).

The house is broadest at the foremost thickened ring, which is very prominent. The width at the second ring is a little less, decreasing evenly and gradually to the third ring. Behind this, it becomes quickly rounded off nearly spherically (though slightly narrowed off conically nearest the last ring). The wall is very much thickened at the foremost ring. The distance between this and the next ring is equal to, or a little less than, the half of the distance between the two last (so that the two foremost rings are comparatively near each other).

Teeth small, about 36—40.

Length (of the individual illustrated) 96 μ, width of 1st ring 76 μ, of 2nd 71, of 3rd 56 μ.

The difference from *P. arctica* Brandt (L. 16, p. 60, pl. 3, f. 17) is only slight. My form is smaller and is rather different in appearance at the hinder part. The mouth is also quite different and the teeth much smaller. On the other hand, there is a remarkable agreement in the very prominent foremost ring and its distance from the second.

I dare not, at present, declare my form to be identical with Brandt's, with which I am as yet too imperfectly acquainted.

Very rare, only found sparsely in 6 samples: Lyngen I, 0—115 m., Lyngen II, 0—250 m., Lyngen III, 0—50 m., $^{27}/_{1}$ 1899; Malangen, $^{29}/_{1}$ 1899, 0—300 m.; Tranødybet, $^{6}/_{2}$ 1899, 0—200 m.; the Midvær Fiord $^{5}/_{4}$ 1900, 0—25 m.

Distribution: The very closely allied *P. arctica* has been found in Davis' Strait, the Labrador Current, near East Greenland and in the sea west of Nowaja Zemlja (Cleve L. 40, p. 118). Undoubtedly an arctic species, hardly native with us.

Cyttarocyclis Fol.

C. norvegica (Dad.) Jørg.

Cfr. Jørgensen L. 90, p. 28.

Only once found: Høla, Svolvær, $^{5}/_{5}$ 1899, rather numerous. Slips easily through the net.

Distribution: Rather rare, always in small numbers, on the west coast of Norway. This form and those closely allied to it, *C. gracilis* (Brandt) and *C. minuta* (Brandt), are known from West and East Greenland, the Labrador Current, Jan Mayen, Iceland, Baren Island and Spitzbergen. Arctic (and boreal?) species. Its distribution is probably insufficiently known, as it is so small that it only occasionally is retained by the net.

C. serrata (Mob.) Brandt.

Only once found: Tranødybet, $^{22}/_{3}$ 1900, 0—600 m., rr.

Distribution: Frequent on the west coast of Norway, in the summer and autumn. Also found in the summer on the north coasts of Norway (Tromsø, Aurivillius). According to Cleve (L. 40, p. 113) a southern neritic form, distributed from the Cape of Good Hope to Scotland.

C. denticulata (Ehrb.) Fol.

Cfr. Jørgensen L. 90, p. 31 and L. 92, p. 4 etc.

Many forms occurred, the most important of which are entered in the tables. As a whole, the species was very frequent, often numerous; only, at the period of the diatom inflow, very scarce or entirely absent in the outer districts.

Distribution: The majority of the numerous forms which belong here seem to be oceanic, arctic and boreal. The species is widely distributed over the northern part of the Atlantic, in the Arctic Ocean and on the arctic and northern temperate coasts. Frequent in the sea on the north coast of Scotland, August 1903 (L. 18, 1903—1904, nr. 1). According to Cleve (L. 40, p. 109) also in Behring Sea.

α **typica** Jørg.

Jørgensen L. 90, p. 31, pl. 2, f. 13, 15.

This form, which is the most frequent on the west coast of Norway, was not often found in the present material.

Distribution: Perhaps a neritic, northern temperate form. Most frequent in the summer and autumn on the west coast of Norway.

var. gigantea (Brandt) Cleve.

Rare and scarce.

Distribution: Possibly a boreal (and arctic?) oceanic form. Known from the northern part of the Atlantic to Greenland and Spitzbergen. Also mentioned from the Labrador Current.

var. robusta Jørg.

Jørgensen L. 92, p. 13, pl. 3, f. 22.

Only once found: Kvænangen, $^{24}/_{1}$ 1899, 0—140 m.

Distribution: Only found in the sea between Norway (Tromsø) and Jan Mayen, in small numbers. Possibly boreal. Perhaps *var. gigantea* (Brandt) p.p. also belongs here.

var. subrotundata Jørg.

Jørgensen L. 90, p. 34, pl. 2, figs. 20, 21.

Rare and scarce.

Distribution: Not so rare on the west coast of Norway in the summer (1898). Possibly a neritic, northern temperate species.

var. cylindrica Jørg.

Jørgensen L. 90, p. 33, pl. 2, figs. 17, 18.

Rather rare, never numerous.

Distribution: Not rare on the west coast of Norway in the summer and autumn. Possibly neritic, northern temperate species.

var. elongata Jørg.

Jørgensen L. 92, p. 14, pl. 3, figs. 23, 24.

Rather rare, almost always in small numbers.

Distribution: Known from the sea between Tromsø and Jan Mayen (numerous, 1898). Seems to be a boreal, oceanic form.

var. subedentata Jørg. n. var.
(Pl. XVIII, figs. 119, 120; pl. XIV, fig. 121).

The house as usual somewhat dilated a little below the mouth, and then slightly, or imperceptibly, narrowing. In the lowest $^1/_4$ rather quickly narrowing to a rather short tip. The side contour here shows a long, rather even arch. Teeth rather small, about 35—38, may also be wanting. Areoles as usual hexagonal, thin-walled, medium sized (about $2^1/_2$ on 10 μ).

This variety is reckoned together with *α typica* in the tables for the first half of the year 1899. Its place is between that form and *var. obtusangula* (Ostenf.) Jørg. and *C. edentata* Brandt, most near the two latter; it is, however, so different from them that it ought not to be considered right away the same as *var. obtusangula*.

The length of the tail tip as usual varies considerably. The relation between length and breadth generally lies between 2.5 and 3 (the tail tip excluded).

Fig. 119 is a smaller, more divergent form.

Numerous and frequent, as a whole, in the present material, the most frequent form of the species. Occurred also, though in small numbers, during the diatom inflow. It is more frequent than appears from the tables, as it was not entered separately from the first, but is included under „*Cyttarocylis denticulata*".

Undella *caudata* (Ostenf.) Cl.

Tintinnus caudatus Ostenfeld L. 113, p. 437 (601). *Undella pellucida* Jørg. L. 90, p. 41, pl. 1, figs. 7, 8.

Rather frequent, but always in small numbers.

Distribution: Temperate, oceanic species, according to Cleve (L. 40, p. 124) distributed far southwards in the warmer part of the Atlantic. Rare on the west coast of Norway.

Dictyocysta *templum* Hck.

The principal species, with a single row of large windows around the mouth of the house, very rare: Senjen $^{21}/_{1}$ 1899, 0—50 m., r.

var. disticha Jørg.

Jørgensen L. 90, p. 40.

With two rows of windows.

More frequent, in a good number of samples, but always scarce.

Distribution: Cleve's *D. elegans* Ehrb. which also includes the two forms mentioned, is widely distributed from the warmer part of the Atlantic to beyond Iceland (Cleve L. 40, p. 114). According to Cleve, also known from the Mediterranean, the Red Sea and the Indian Ocean. Rare on the west coast of Norway.

Errata et Addenda.

Pag. 96, col. 2, line 28, for ***T. decipiens*** Grun. read: ***T. decipiens*** (Grun.).

Pag. 105, col. 1, after line 2 add (Plate VII, fig. 26).

Pag. 108, col. 1, before **II. Peridiniales** add:

Tropidoneis ***parallela*** Jørg. n. sp.
(Plate VII, fig. 16).

In the plankton tables *Amphiprora parallela* n. sp.

Shape of the cell in side view: Linear, or slightly oblong, not constricted in the middle, narrowing off a little towards the rounded ends. Central nodule rather indistinct; terminal nodules, however, very conspicuous.

Valve: Linear-lanceolate, ends subrostrate (truncate). Median line straight, central. Central nodule small, terminal nodules close to the ends.

The median part of the valve seems to form a rather high, linear keel, about so broad as $^1/_3$ of the valve.

Structure: Fine transverse striæ, not distinctly punctate, 17 on 10 µ.

Dimensions: Length of the valve 67—70 µ, breadth 12 µ. Breadth of the cell (frustule) 18 µ.

This species resembles *Amphoropsis recta* Grun. (Van Heurck L. 89, p. 266, fig. 55) and *Amphiprora plicata* var.? *subplicata* Grun. (L. 48, p. 65, pl. V, fig. 88). It differs from both in having the frustules quite inconstricted in the middle. On the contrary, the cell is often somewhat broader (higher) here. Besides, I have never seen an asymmetrical valve, like that characteristic of *Amphoropsis recta*. I have, however, only once succeeded in getting a valvar view of it (fig. 16 b), as in the preparations it is nearly always found lying on its side.

Cleve refers (L. 24, p. 28) *Amphiprora plicata* var.? *subplicata* Grun. as a variety to *Amphoropsis recta* (*Tropidoneis recta* Cl.) without mentioning the shape of the valve.

The above species seems to be a true plankton form. It has very thin (slightly siliceous) valves which easily are deformed on being ignited on the cover-glass. It generally occurs solitary or by twos, very seldom forming a short chain of some few individuals.

On the whole rare and sparse, only observed during the diatom inflow in 1900: Høla, Svolvær, $^{20}/_3$, 0—140 m.; Ostnesfjord I and III, $^{23}/_3$, 0—25 and 0—130 m.; the Vestfjord, $^{30}/_3$, 0—25 m.; the Skjerstadfjord IV, $^2/_4$, 0—330 m., and XII, 0—500 m.; the Seivaagen, $^5/_4$, 0—20 m.; the Saltenfjord II, $^5/_4$, 0—50 m.; the Foldenfjord I, $^6/_4$, 0—100 m. Also in Barent's Sea, 71° 48′ n., 49° 38′ e., S/S Heimdal $^{31}/_5$ 1900.

Undoubtedly an arctic species.

Page 100, add:

C. scolopendra Cl.

As endocysts, resembling those of *C. cinctus*, are found, the older name for the latter species, *C. incurvus* Bail., cannot be used.

Very rare and sparse: Sea off Ingø, $^{24}/_4$ 1899, 0—300 m.; the Porsangerfjord, $^{27}/_4$ 1899, 0—75 m.

Distribution: More frequent on the west coast of Norway. According to Cleve a northern (boreal) neritic species. Only once (in October 1900) found near the Færø Isles. (Ostenfeld).

Page 105, after ***Naviculeæ*** add:

Pinnularia quadratarea (A. Schm.) Cl.

Cl. L. 25. p. 95. *Navicula quadratarea* A. Schm. L. 127, p. 90, pl. II, f. 26. *N. pinnularia* Cl. L. 28, p. 224, pl. IV, fs. 1—2.

Occurs only accidentally. No true planktonform, but rather frequent in bottom samples from both the west and the north coast of Norway.

Page 99, before *R. styliformis,* add:

R. obtusa Hens.

Hensen L. 87, p. 86, pl. V, f. 41. *R. alata var. truncata* Gran L. 64, p. 6, pl. IV, f. 67.

Not always easy to distinguish from *R. alata* (cfr. Ostenfeld L. 116, p. 569).

Very rare and sparse, only in 3 samples: Stene in Bø, $^{10}/_4$ 1899, 0 m.; the Porsangerfjord, $^{27}/_4$ 1899, 0—75 m. and 200—100 m.

Distribution: According to Cleve, Gran and Ostenfeld a boreal oceanic species, occasionally numerous round the Færøes, Iceland and in the Norwegian Ocean, up to the north of Spitzbergen. Is wanting on the west coast of Norway (1898). In large numbers in arctic water between Tromso and Jan Mayen 1897, also numerous round Jan Mayen 1897—1898, and near Spitzbergen 1899—1900 (Jørgensen L. 92). Seems to me to be an arctic (oceanic) rather than a boreal species.

Page 104, col. 1, line 10, for Pl. VI read Pl. VII.

Page 105, col. 1, line 2, add: (Plate VII, fig. 26).

Page 109, col. 1, line 36, for (Dies.) Clap. et Lachm. read (Clap. et Lachm.) Dies.

Pag. 119, col. 1, line 49, for 80 read 86.

For Midværfjord everywhere read Misværfjord.

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b. Diatoms in Bottom Samples from Lofoten and Vesteraalen.

By
E. Jørgensen.

In the following pages an account is given of the diatoms contained in some bottom samples from the following localities in Lofoten and Vesteraalen:

Moskenstrømmen, 0—180 m. (together with plankton),
Stamsund, 0—150 m. (together with plankton),
Svolvær harbour, 10—15 m.,
The Østnes Fiord, 10—20 m.,
Brettesnes—Skroven, 350—400 m.,
Mouth of the Raftsund, 250—300 m.,
Stene in Bo, 10 m.,
Gaukværo, 0—180 m. (together with plankton).

Two of these, the samples from Brettesnes—Skroven and from Raftsund, were poor and consisted perhaps only of dead specimens, a good many of which naturally originate from the plankton. The samples from Moskenstrømmen, Stamsund and Gaukværø were taken together with plankton.

The working through of bottom samples is a very troublesome and lengthy task, when it is done as it should be. As there was, however, not time enough to investigate the samples in the manner I consider the right one, and as — on the other hand — it was of some importance, to be able rightly to interprete the plankton, to gain a preliminary knowledge of the bottom flora, I have contented myself with the method usually adopted, and have studied the species from the valves in slides. For this purpose the material — together with a richer one from the west coast of Norway — has been prepared as slides by Mr. Thum of Leipzig, in his well-known perfect way.

For this reason, it has not been possible to discern between living (recent) and fossil species.

The species occurring in the plankton are in detail dealt with in another chapter of this work (pp. 90—108). Nevertheless, to avoid arbitrariness, I have not omitted the plankton species, but have in such cases mentioned them as originating from the plankton.

List of the species observed.

I. Centricæ Schütt.

1. *Coscinodisceæ.*

Coscinodiscus Ehrb.

C. nitidus Greg.

Cf. above p. 95.

Somewhat rare: Moskenstrømmen r, Stamsund r, Raftsund r, Stene r, Gaukværo r.

Distribution: Western Europe; Balearic Islands, Greenland and Finmark (Cleve). Warmer coasts of America, Asia and Australia.

C. appollinis Ehrb. (1844).
Ehrb. Mikrogeologie pl. 35 A, XXII, f. 4.

var. compacta Rattr. Rev. of Coscinod. p. 579.
C. scintillans (Grev.) A. Schmidt Nords. Diat. p. 91, pl. 3, f. 33.

Differs from the main species (= *C. scintillans* Grev.) in having the puncta distinctly smaller towards the margin, more numerous radial rows, the shortened ones being longer than usual. Probably is a separate species.

Rare: Moskenstrømmen +, Stamsund r, Svolvær r, Stene r.

Cosc. nitidus A. Schm. Nords. Diat. pl. III, f. 32 does not show the irregular distribution of the puncta that is characteristic of the preceding species. This form occurs in my material together with the one figured l. c. f. 33 and has a similar radiate structure, only much coarser.

Distribution: The variety is only known from Solsvik (west of Bergen, Norway). The main species, which has not been found by us, occurs in the antarctic regions.

C. concavus Ehrb.? Greg.
Greg. Diat. of Clyde 1857. p. 500, pl. X, f. 47. Ehrb. Mikrogeol., pl. 21, f. 4 non pl. 18. f. 38.

Hardly belongs to the genus *Coscinodiscus*. Rattray l. c. p. 470 remarks that the girdle aspect of this species answers to *Endictya oceanica* Ehrb. (cfr. Mikrogeologie pl. 35 A, XXVIII figs. 6, 7; A. Schmidt Atlas pl. 65, figs. 10—15).

Very rare: Gaukværø r. Diameter 86 μ; 2 areoles on 10 μ; border sharply defined, nearly 3 μ broad.

Distribution: Western Europe; Balearic Islands, Black Sea. Sea of Kara (Cleve). Warmer coasts of America and Asia.

C. leptopus Grun.
Van Heurck Synops. pl. 131, figs. 5—6.

Rare: Raftsund r. Diameter 55 μ; 5 areoles on 10 μ. Remarkable for the minute areoles on the border, like those in the genuine *C. lineatus* Ehrb. It differs on the whole from the latter species only in possessing the pseudonodule.

Coscinosira polychorda Gran and the variety of *Coscinodiscus lineatus* mentioned below have a much finer structure and less regularly straight rows of areoles.

Distribution: Mediterranean. Southern Atlantic, Pacific Ocean, Indian Ocean.

C. lineatus Ehrb., ***var.***

Cf. above p. 92.

Rare: Stamsund. r. Finer structure than in the genuine *C. lineatus*. Small; 7½—8 areoles on 10 μ. Border narrow, striate, 15 striæ on 10 μ. Areoles near the border somewhat smaller. Secondary rows somewhat flexuose.

In the sample from Svolvær a very similar specimen was found, only with a little finer structure and marginal spines. This specimen agrees completely with *Coscinosira polychorda* Gran, but wants the peculiar transverse processus of the latter species.

Such forms, which are perhaps solitary cells of *Coscinosira*, may easily be mistaken for *C. lineatus*.

Distribution: The main species is cosmopolitan. Cleve and Ostrup mention *C. lineatus* from several arctic localities: Finmark, Baren Eiland, Greenland, Spitzbergen, Kara. I should, however, think that the species has been confounded with *Coscinosira polychorda*, at any rate to some extent.

C. excentricus Ehrb.

Cf. above p. 92.

Frequent: Moskenstrommen r, Stamsund +, Gaukværø r +. Derived undoubtedly from the plankton.

Distribution: Cosmopolitan.

C. Kützingii A. Schm.

A. Schm. Atlas, pl. 57, f. 17. *C. marginatus* A. Schm. Nords. Diat. pl. 3, f. 35.

As Grunow remarks, this species is intermediate between *C. excentricus* and the difficult group of *C. subtilis*.

Very rare: Raftsund r, Stamsund r.

Distribution: North Sea. Arctic and antarctic regions (Grun.). Not mentioned by Cleve as arctic. Very nearly related forms are found near Greenland (*C. adumbratus* Ostr.) and Jan Mayen (1898, E. Jørgensen).

C. Rothii (Ehrb.?) Grun.

Grun. Diat. Franz Jos. Land, p. 29, pl. III (C), figs. 20 a, b, 22. *C. symmetricus* A. Schm. Atlas pl. 57, figs. 25—27, non Grev. *Heterostephania Rothii* Ehrb. α *octonaria* Mikrogeologie 35 A. XIII B, fig. 4 a.

Belongs to the difficult group of *C. subtilis* Ehrb., as well as the following species and a good many more, which probably will not bear a more thorough examination.

Structure plainly fasciculate, with numerous fasciculi separated by radial lines made conspicuous by the marked inner ends of the beginnings of new rows. Small marginal apiculi in the middle of the fasciculi, one in each. Valve almost flat (occasionally undulated according to Grunow).

Very rare: Stamsund r, Raftsund r, Brettesnes—Skroven r. Probably a plankton form.

Distribution: Belgium, Scotland; Caspian Sea. Warmer regions of America and Asia. Southern Seas.

C. Normanni Greg.

Greg. Quart. Journ. Micr. Sc. 1859, p. 80, pl. 6, fig. 3. *C. „normanicus"* Van Heurck Synops. pl. 131, 1. *C. fasciculatus* A. Schm. Nords. Diat. pl. III, figs. 41, 42: Atlas pl. 57, figs. 9, 10.

Very closely related to the preceding species. Differs in having a distinctly convex valve, finer structure (though variable in this respect), more numerous and narrow fasciculi and less distinct marginal apiculi.

It is perhaps not quite certain that this species is identical with *C. Normanni* Greg.; the name *C. fasciculatus* A. Schm. (1874) must however be abolished on account of *C. fasciculatus* O'Meara (1867).

This species seems to me to answer tolerably well to *C. punctulatus* Greg. In specimens with fine structure the fasciculi are only seen with difficulty, while the clear, scattered dots mentioned by Gregory l. c. are conspicuous. If this should prove correct, the *C. Normanni* Greg. is perhaps the same as *C. Rothii* Grun.

Rather frequent: Stamsund r +, Svolvær r +, Brettesnes—Skroven r, Ostnesfiord r +, Stene r. Probably a plankton species (living or fossil).

Distribution: Western Europe. America. Arafura Sea.

C. curvatulus Grun.

Cf. above p. 92.

Derived undoubtedly from the plankton.

Very rare: Stene r r.

Distribution: Arctic regions; Northern European coasts; Balearic Islands. America and Africa.

C. stellaris Rop.

Cf. above p. 92.

Derived undoubtedly from the plankton.

Very rare: Gaukværø r. When the conspicuous star is wanting, the species is difficult to determine.

var. *symbolophorus* (Grun.).

C. symbolophorus Grun. Diat. Franz Jos. Land, p. 82, pl. IV (D), figs. 3—6.

Differs from the main species in having much coarser structure.

Very rare: Moskenstrommen r, Raftsund r. Like the main species planktonic.

Distribution: The main species occurs in Western Europe, the Mediterranean and the antarctic regions, the variety in the arctic and antarctic regions.

C. concinnus W. Sm.

Cf. above p. 93.

Derived undoubtedly from the plankton.

Very rare: Gaukværø, rr; Stene, r.

Distribution: Cosmopolitan.

C. centralis Ehrb., Rattr.

Cf. above p. 93.

Derived probably from the plankton.

Not unfrequent: Moskenstrommen r, Stamsund r, Raftsund r, Stene r.

Distribution: Cosmopolitan.

C. subbullicus Jørg.

C. oculus iridis auct. scand., p. p.

Cf. above p. 94.

Probably derived from the plankton.

Rare: Moskenstrømmen r, Raftsund r, Gaukværø r +.

Distribution: Arctic regions.

C. borealis Bail.

Bail. Americ. Journ. Sc. 1856, p. 3. A. Schm. Atlas, pl. 63, f. 11.

Very rare: Raftsund, rr. Diameter 135 μ. Coarse structure; areoles increasing towards the border, at the centre 3½, near the border 2 on 10 μ; the largest ones only little larger than those at the very margin. Large and very conspicuous „papillæ" (poroides).

Border sharply defined, dark, striate. The disc somewhat convex towards the border.

The specimen found only differs from SCHMIDT's figure in wanting the „central space“. Instead of this space, which is, however, not mentioned by RATTRAY l. c., a large areole was present.

Distribution: Pacific Ocean, especially in the northern region (Kamtschatka Sea, BAILEY). Cape Wankarema (CLEVE).

C. decrescens GRUN.

GRUN. Diat. Franz Jos. Land, p. 28. A. SCHMIDT Atlas, pl. 61, figs. 7—9. RATTRAY l. c. p. 77.

Perhaps a plankton form, occurring with us like *C. subbulliens*. Coarse structure, conspicuous „papillæ“. Recognizable through the rapid decreasing of the areoles outside of $^1/_2$ radius.

Rare: Moskenstrommen r+, Stamsund r. Diameter 92 μ or less; largest areoles somewhat outside of $^1/_2$ radius, 2 on 10 μ, at the centre smaller, on the border much smaller. Border broad, sharply defined, striate, with 5—6 striæ on 10 μ. Central space generally absent (answering to *var. repleta* GRUN. l. c.), sometimes present.

Distribution: Færoe Channel, Franz Josef's Land, Japan, Macassar Straits, Florida.

C. radiatus EHRB.

Cf. above p. 92.

Probably derived from the plankton.

Rather frequent: Moskenstrommen c, Stamsund r+, Svolvær r, Ostnesfiord r, Gaukværo +, Stene r.

Distribution: Cosmopolitan.

var. *minor* A. SCHM.

A. SCHM. Nords. Diat. p. 94, pl. 3, f. 4. *C. devius* A. SCHM. Atlas, pl. 60 figs. 1—4.

Stamsund r, Svolvær r, Gaukværø r, Stene r.

var. *oculus iridis* (EHRB., RATTR.).

Flat. A conspicuous central rosette and often a small „central space“. Areoles largest at or beyond $^1/_2$ radius, hexagonal, with large „papilla“, towards the border rapidly decreasing, at the very margin small. Largest areoles 3 on 10 μ.

This form, which answers very well to *Coscinodiscus oculus iridis* EHRB. Mikrogeologie pl. 19, fig. 2, is certainly not specifically distinct from *C. radiatus*, intermediate forms being rather frequent.

Moskenstrommen r, Gaukværo r. Occurred also in other samples.

C. nodulifer JAN.

JANISCH. in A. SCHMIDT Atlas, pl. 59. f. 21.

Flat. A small, but conspicuous nodule near the centre. Areoles hexagonal, increasing from the centre to $^3/_4$ radius, here 3 on 10 μ; towards the margin rapidly decreasing, at the border 5—6 on 10 μ. Border sharply defined, striate, with 6—6$^1/_2$ striæ on 10 μ.

Answers very well to the figure referred to.

Rare: Raftsund +, Brettesnes—Skroven r.

Distribution: This southern species is found near the Balearic Islands and in the warmer regions of the Atlantic, Pacific and Indian Oceans.

It is very remarkable that this species occurs so far north. It is probably a plankton form, most likely a fossil one.

Actinocyclus EHRB.

A. alienus GRUN.

GRUN. in VAN HEURCK Synopsis, pl. 125, f. 12 (*var. arcticus*).

Very rare: Brettesnes—Skroven r; Stene r. In structure *Coscinodiscus*-like, as GRUNOW states intermediate between *C. curvatulus* and *C. radiatus*. Central space circular, conspicuous, only with a few irregularly scattered puncta. Numerous fasciculi (over 20) with interfascicular radii, which are more or less plainly ziczac bent, especially towards the centre. Towards the margin, the fasciculi are not separated from each other, but form an even radiately structured marginal part. Very small and inconspicuous marginal apiculi. Border narrow, indistinctly striate.

Diameter 61—66 μ; rows of areoles 15 on 10 μ, at the margin closer. Ocellus marginal, evident.

Distribution: Cape Wankarema. Also mentioned from a few places of the North Atlantic and Arctic Seas.

A. Ehrenbergi RALFS.

Cf. above p. 95.

Probably derived from the plankton.

Not unfrequent: Stamsund r, Svolvær r, Gaukværo r, Stene +.

Distribution: Cosmopolitan.

A. Ralfsii (W. SM.) RALFS.

Cf. above p. 95.

More frequent in the bottom samples than in the plankton (from which however must not be concluded that it is a bottom form): Stamsund r, Svolvær r+, Ostnesfiord r, Gaukværo r+, Stene r.

Distribution: Western Europe, Greenland (OSTRUP). Warmer Seas.

A. sparsus (GREG.) RATTR.

RATTR. Revis. Actinoc. 1890, p. 170. *Eupodiscus sparsus* GREG. Trans. Micr. Soc. 1857. p. 81, pl., fig. 47.

The description by RATTRAY does not answer well to the figure referred to. According to this figure, it seems chiefly to differ from *A. Ehrenbergi* in being more sparsely granulated towards the centre, so that only the interfascicular radii reach the central space. It is, however, doubtful whether it can really be kept distinct from the preceding species. Also *A. moniliformis* RALFS seems to be a species very closely related to *A. Ehrenbergi*.

Specimens which seem to belong here were found in the sample from Gaukværo, r.

A. crassus V. H.

VAN HEURCK Synopsis p. 215, pl. 124, figs. 6, 8.

VAN HEURCK's figure shows interfasciculate radii, though not so evident as those of *A. Ehrenbergi*. Smaller and coarser forms of the latter species is puzzlingly similar to *A. crassus*. It is on the whole doubtful, whether these two species always can be distinguished from each other.

A more essential difference than in the structure of the valve is found in the form of the cell (frustule). *A. crassus* has high cells, usually higher than broad, with thick walls, also in the connecting zone; here there is also a conspicuous difference in width between the two valves. *A. Ehrenbergii*, however, forms low cells, broader — often much so — than high, and the two valves have nearly the same diameter.

The valve of *A. crassus* is flat from the centre to some distance from the border, where there is a high and steep marginal zone.

Somewhat rare: Stamsund r, Raftsund r, Gaukværo r, Stene r. Occurs also in the plankton samples.

Distribution: Western Europe. After all, it is most probably identical with *Eupodiscus crassus* W. Sm. (Cf. Van Heurck l. c. and Traité d. Diat. p. 524).

Note. In the sample from Stene, several broken valves with a rather large disc occurred, somewhat similar to *Xanthiopyxis? umbonata* Grev., cf. Van Heurck Traité d. Diat. p. 512, fig. 263, which cannot, however, be referred to the genus *Xanthiopyxis* Ehrb., a doubtful genus including what are probably resting spores of *Chætoceros* (cf. Schütt. in Engler and Prantl., Natürl. Pflanzenfamil., Theil I, Abth. 1 b, p. 148). Structure rather fine, similar to that of *Coscinodiscus;* valve rather convex, with numerous large, slender, conical spines, as in the figure referred to. Undoubtedly a fossil species.

2. *Melosireæ.*

Coscinosira *polychorda* (Gran) Gran.

Cf. above p. 97.

Derived from the plankton.

Very rare: Stamsund r, Gaukværo r.

Distribution: Cf. above p. 97. As stated before (p. 196) this species seems also to occur singly, and is then easily mistaken for *Coscinodiscus lineatus.* At any rate, forms occur in which the peculiar transverse processus at the semiradius are wanting.

Thalassiosira Cl.

T. gravida Cl.

Cf. above p. 96.

In bottom samples the strong resting spores (endocysts) of this species occur, though seldom (much more so than would probably be the case, if this species generally „oversummers" on the bottom).

Rare: Stamsund r +, Svolvær r.

Distribution: Cf. above p. 96.

T. decipiens (Grun.) Jorg.

Cf. above p. 96.

Undoubtedly derived from the plankton.

Rare: Stamsund r, Svolvær r, Gaukværo r +.

Distribution (of *Coscinodiscus decipiens* (Grun.): Caspian Sea. Great Britain and Ireland. West coast of Norway.

Melosira Ag.

M. granulata (Ehrb). Ralfs.

Van Heurck Synopsis p. 200. pl. 87, figs. 10—12.

Fresh water species.

Very rare: Gaukværø, rr.

Distribution: Frequent in fresh water, especially in Western Europe. Franz Josef's Land.

M. Roeseana Rabenh.

Van Heurck Synopsis p. 199, pl. 89. figs. 1—6.

Fresh water species.

Very rare: Ostnesfjord, rr.

Distribution: Common fresh water species. Greenland (Ostrup).

M. Borreri Grev.

Grev. in Hook. Brit. Fl. II, p. 401. Van Heurck Synops. p. 198, pl. 85, figs. 5—8.

Very rare: Svolvær, rr (*var.* ad *hispid.* Castr.).

Distribution: Frequent on the coasts of Europe. Greenland (Cl.).

Paralia *sulcata* (Ehrb.) Cl.

Cleve Diat. Arct. Sea 1873, p. 7. *Gallionella sulcata* Ehrb., Mikrogeologie pl. 18, 1.

Common: Moskenstrommen +, Stamsund c, Svolvær c, Raftsund r +, Brettesnes—Skroven r, Ostnesfjord c, Gaukværø cc, Stene c.

Distribution: Frequent on the coasts of Europe and America. Arctic regions.

forma coronata (Ehrb.) Grun.

Van Heurck Synopsis pl. 91, f. 18. *Gallionella coronata* Ehrb., Mikrogeologie pl. 38, XXII. fig. 5.

Rare: Svolvær r, Stene r.

Cyclotella Kütz.

C. striata (Kütz.) Grun.

Grun. in Cleve et Grunow Arct. Diat. 1880, p. 119. Van Heurck Synopsis p. 213, pl. 92, figs. 6—10. *Coscinodiscus striatus* Kütz.

Rare: Stamsund r, Raftsund r, Stene r.

Distribution: Frequent in brackish water. Western Europe. Baltic Sea. Warmer parts of Asia and Africa.

C. comta (Ehrb.) Kütz.

Kütz. Spec. Algar. p. 21. Van Heurck Synops. p. 211, pl. 92, figs. 16—22.

Fresh water species.

Very rare: Gaukværø, rr.

Distribution: Western Europe.

Hyalodiscus Ehrb.

H. scoticus (Kütz.) Grun.

Grun. in Journ. Royal Micr. Soc. 1879, p. 690, pl. 21, f. 5. Van Heurck Synops. pl. 84, figs. 15—18. *Cyclotella s.* Kütz. Bacill. p. 50, pl. 1, figs. II, III.

Frequent: Stamsund r, Svolvær +, Gaukværø + c, Stene r +.

Distribution: Western Europe. Bosporus. Arctic regions.

H. subtilis Bail.
Bail. New Spec. p. 10, f. 12.

Perhaps only a form of the preceding species.

Very rare: Stamsund r, Stene r.

Distribution: Belgium. Scotland. Finmark (Cl.). America. Asia.

H. stelliger Bail.
New Spec. p. 10. Van Heurck Synops. p. 213, pl. 84, figs. 1—2.

Frequent: Moskenstrommen +, Stamsund r +, Svolvær r, Raftsund r, Brettesnes—Skroven r, Gaukværo r, Stene r.

Distribution: Western Europe. Virgin Isles. Spitsbergen (uncertain, Cl.).

Podosira ***hormoides*** (Mont.) Kütz.
Kütz. Bacill. p. 52, pl. 29, f. 84. A. Schmidt Nords. Diat. pl. 3, f. 40.
Melosira h. Mont. Fl. Boliv. 1839, p. 2.

Rare: Stamsund r, Svolvær r, Raftsund r.

Distribution: Coasts of the North Sea. Greenland. West coast of South America. Adriatic Sea.

3. *Eupodisceæ.*

Roperia ***tessellata*** (Rop.) Grun.

Cf. above p. 98.

Undoubtedly derived from the plankton.

Rare: Stamsund r +, Stene r r.

Distribution: Western coasts of Europe and Africa.

Auliscus ***sculptus*** (W. Sm.) Ralfs.
Ralfs in Pritch. Inf. p. 845, pl. 6, f. 3. *Eupodiscus s.* W. Sm. Brit. Diat. 1, p. 25, pl. 4, f. 39.

Common: Moskenstrømmen +, Svolvær c, Raftsund r, Brettesnes—Skroven r, Ostnesfjord r, Gaukværø c, Stene c.

Specimens occur which are very similar to *A. cœlatus* Bail. (A. Schm. Atlas pl. 32, figs. 14—15), but connected with *A. sculptus* by intermediate forms: Gaukværø +, Stene r.

Distribution: Coasts of the North Sea. Western Europe. Mediterranean. America. *A. cœlatus:* Warmer coasts of the Atlantic, Pacific and Indian Oceans.

Eupodiscus ***argus*** W. Sm.
W. Sm. Brit. Diat., p. 24. A. Schmidt Atlas, pl. 92, figs. 7—11; pl. 97, figs. 7—11. Van Heurck Synops. p. 209, pl. 117.

Very rare: Moskenstrommen, r r, only one broken valve.

Distribution: Frequent on the coasts of the North Sea and Western Europe. America.

Aulacodiscus Ehrb.

A. Kittonii Arnott.
Arnott in Pritch. Inf. p. 844, pl. 8, f. 24. A. Schmidt Atlas pl. 36, figs. 5—7.

Rare: Moskenstrommen +, Raftsund r, Brettesnes—Skroven r, Gaukværo r.

All specimens observed have 4 processus and no, or a very small or inconspicuous, „central space“.

It is very remarkable that this tropical species occurs in Lofoten. Very likely fossil. At present I have no opportunity of ascertaining whether the cells have really all been empty.

Distribution: Warmer coasts of the Pacific Ocean, especially frequent on the coasts of California.

A. Johnsonii Arnott.
Arnott in Pritch. Inf. p. 844. A. Schmidt Atlas pl. 36, figs. 1, 2.
A. Kittonii var. J. Rattr. Rev. of Aulacodisc. p. 376.

Very rare: Raftsund r, Brettesnes—Skroven r.

Differs from the preceding especially in having a conspicuous central space and processus of a different shape. *A. Kittonii* is, however, said to vary considerably.

Distribution: Tropical coasts of the Indian and Atlantic Oceans.

4. *Asterolampreæ.*

Actinoptychus Ehrb.

A. undulatus (Bail.?) Ralfs.

Cfr. above p. 98.

Frequent: Moskenstrømmen r +, Stamsund r +, Svolvær r, Raftsund r, Brettesnes—Skroven r, Gaukværø r, Stene r.

Distribution: Coasts of Western Europe and the North Sea. Arctic regions. Cape of Good Hope.

A. splendens (Ehrb.?) Shadb.
Shadb. in Pritch. Inf. p. 840. Van Heurck Synops. pl. 119, figs. 1—2, 4.
Halionyx splendens Ehrb. Abh. Berl. Ak. 1844?

Very rare: Moskenstrommen r, Gaukværo r r.

Distribution: Coasts of the North Sea and the Baltic (Greifswald).

Asteromphalus ***heptactis*** (Bréb.) Ralfs.

Cf. above p. 98.

Undoubtedly derived from the plankton.

Very rare: Moskenstrommen r r.

Distribution: Cf. above p. 98.

5. *Biddulphieæ.*

Biddulphia Gray, V. H. (including *Amphitetras* Ehrb., *Triceratium* Ehrb., *Cerataulus* Ehrb.).

B. pulchella Gray.
Gray Arrang. of Brit. Plants, 1. p. 294. Van Heurck Synops. p. 204, pl. 97, figs. 1—3.

Rare: Stamsund r, Raftsund r, Brettesnes—Skroven r, Stene r.

Distribution: Frequent on the western and southern coasts of Europe. America. Africa.

B. regina W. Sm.
W. Sm. Brit. Diat. II, p. 50, pl. 46, f. 323.

var.
B. regina A. Schm. Atlas pl. 119, f. 18 (from Balearic Isles).

The 3 median elevated parts of the valve hispid, not smooth as stated by W. Sm. both in his discription and figure.

Very rare: Stene, a single valve.

Distribution: Balearic Isles. The main species known from the coast of the isle of Skye.

B. aurita (Lyngb.) Bréb.

Cf. above p. 99.
Probably derived from the plankton.
Frequent: Stamsund +, Svolvær + c, Stene r +.
Distribution: Cf. above p. 99.

B. rhombus (Ehrb.) W. Sm.
W. Sm. Brit. Diat. II, p. 49, pl. 45, f. 320. *Denticella r.* Ehrb.

var. trigona Cl. Van Heurck Synops. pl. 99, f. 2.

Very rare: Svolvær r.
Distribution: Coasts of the North Sea and Western Europe. Finmark (Cleve).

B. turgida (Ehrb.) W. Sm.
W. Sm. Brit. Diat. II, p. 50, pl. 62, f. 38. Van Heurck Synops. pl. 104, figs. 1, 2. *Cerataulus t.* Ehrb.

Very rare: Svolvær r r.
Distribution: Coasts of the North Sea and Western Europe.

B. Smithii (Ralfs) V. H.
Van Heurck Synops. p. 207, pl. 105, figs. 1—2. A. Schmidt Atlas pl. 116, figs. 5—6. *Cerataulus S.* Ralfs in Pritch. p. 847.

Very rare: Moskenstrømmen rr, Svolvær r.
Distribution: Coasts of the North Sea and Western Europe. Spitsbergen? (Cleve).

B. antediluviana (Ehrb.) V. H.
Van Heurck Synops. pl. 109, figs. 4—5. *Amphitetras a.* Ehrb., Mikrogeol. pl. 21, f. 25 a—c.

Rather frequent: Moskenstrømmen +, Stamsund r, Raftsund r, Gaukværø r, Stene r.
Distribution: Common species, cosmopolitan; very rare, however, in arctic regions: Spitsbergen (rr, Cleve).

B. lata (Grev.).
Triceratium l. Grev. Trans. Micr. Soc. 1865, p. 103, pl. 9, f. 20. A. Schmidt Atlas, pl. 77, figs. 38—39. *Amphitetras l.* De Toni Syll. vol. II, sect. 3, p. 901.

Very rare: Raftsund r. Very similar to the figures referred to in Schmidt's Atlas. Side of the tetragone 67 μ. Marginal pearls 5 on 10 μ; the rows of striæ in the corners somewhat radiating, 10 on 10 μ.
Distribution: Tropical species, according to De Toni (l. c.) only known from Singapore and North Celebes.

B. favus (Ehrb.) V. H.
Van Heurck Synops. pl. 107, figs. 1—4. *Triceratium favus* Ehrb. A. Schmidt Atlas, pl. 82, f. 2.

Very rare: Raftsund, r r. Side of the triangle 92 μ; 2 areoles on 10 μ.
Distribution: Rather common species, cosmopolitan on tropical and temperate coasts. Spitsbergen (Cleve, „doubtful as an arctic species").

B. arctica (Brightw.).
Triceratium a. Brightw. Micr. Journ. 1853, p. 250, pl. 4. f. 11. A. Schmidt Atlas pl. 79, figs. 12—13.

Very rare: Stene r.

forma balæna (Ehrb.).
Zygoceros b. Ehrb. Mikrogeol. pl. 35 A, XXIII, f. 17. *Biddulphia b.* Brightw. Micr. Journ. VII (1859), p. 181, pl. 9, f. 15. Van Heurck Synops. pl. 112, f. 1.

Very rare: Stene r.
Distribution: Arctic regions. Vancouver; Cape of Good Hope (De Toni Syll. p. 921).

B. formosa (Brightw.).
Triceratium f. Brightw. Grun. in Cleve et Grun. Arkt. Diat. pp. 111—112. A. Schmidt Atlas, pl. 79 f. 2.

Very nearly related to the preceding species, from which it differs chiefly in having the centre of the valve irregularly punctate, not areolate, with scattered puncta smaller than the neighbouring areoles.
Very rare: Raftsund r.

forma balæna.

Answering to the *forma balæna* of the preceding species.
Very rare: Raftsund r.

B. alternans (Bail.) V. H.
Van Heurck Synops. p. 208, pl. 113, figs. 4—7. *Triceratium a.* Bail. Micr. Obs. p. 40, figs. 55—56.

Very rare: Stamsund r r.
Distribution: Western Europe. West Indies.

B. punctata (Brightw.) V. H.
Van Heurck Synops. pl. 109, f. 10 *(forma 3-gona)*. *Triceratium p.* Brightw. Micr. Journ. 1856, p. 275, pl. 17, f. 18, non *Biddulphia punctata* Grev. 1864.

Very rare: Gaukværø, rr. Irregularly punctate with puncta very different in size, shape and distance from each other, on an average 5 on 10 μ. Side of the triangle 40 μ.
Distribution: Tropical coasts of America, Africa and Asia. The nearly related *B. sculpta* (Shadb.) V. H., which by De Toni l. c. p. 944 is considered to belong to the same species, occurs in Western Europe, the Skagerack, and the Mediterranean.

B. nobilis (Witt.).
Triceratium n. Witt. Diat. Simbirsk 1885, p. 34, pl. 10, f. 3; pl. 11, figs. 4, 7. A. Schmidt Atlas pl. 150, f. 25. Non *Biddulphia nobilis* Brun 1889.

A specimen very similar to the figure referred to in Schmidt's Atlas (from Archangel) was found: Gaukværø r r; Stene r r. Large puncta, irregular in size and shape, intermingled with minute ones. Near the margin, larger areoles. In the centre, a conspicuous inward pointing spine is found. Side of the triangle 56 μ.
A nearly related species is *Triceratium Heibergii* Grun., V. H. Synops. pl. 112, figs. 9—11 (from Mors).
Distribution: Only known fossil from Simbirsk. Perhaps also fossil in my samples (as is probably also the case with some of the other species).

B. Weissei (Grun.)?
Triceratium Weissei Grun. in A. Schmidt Atlas pl. 95, f. 2.

A specimen very similar to the figure referred to (from Archangel) was found: Stene, r r (a single specimen). Rather coarse radiating structure of puncta (pearls); about 6 rows on 10 μ. Large circular central space without puncta, only one or two near the periphery. Side of the triangle 57 μ.

Might also belong to the genus *Trinacria*. I have not seen a side view of the valve.

Distribution: Only known fossil (Simbirsk, Archangel).

Isthmia Ag.

I. enervis Ehrb.
Ehrb. Inf. p. 209, pl. 16, f. 6. Van Heurck Synops. pl. 96 figs. 1—3.

Rather frequent: Moskenstrommen rr, Stamsund r, Svolvær r, Raftsund r, Brettesnes—Skroven r, Stene r. More frequent on algæ.

Distribution: Coast of Western Europe. Finmark; Spitsbergen (Cleve). West Indies; Honduras.

I. nervosa Kütz.
Kütz. Bacill. p. 137, pl. 19, f. 5. Van Heurck Traité d. Diat. 452. pl. 34, f. 891.

Very rare: Raftsund r.

Distribution: Western Europe. Denmark. Arctic regions. Honduras; San Francisko. Kerguelen.

6. *Chætocereæ.*

Bacteriastrum *varians* Laud.
Laud. Trans. Micr. Soc. 1863, XII, p. 8, pl. III, figs. 1—6.

Derived from the plankton.

Very rare: Stene r r.

Distribution: Neritic plankton species, from the western coasts of Europe. Warmer coasts of the Atlantic, Indian and Pacific Oceans. Rare off the west coast of Norway.

Chætoceros Ehrb.

C. atlanticus Cl.

Cf. above p. 100.

Derived from the plankton.

Very rare: Gaukværo r.

C. contortus Schütt.

Cf. above p. 101.

Thickened horns, most probably belonging to this species, is found now and then in the bottom samples, though seldom. Undoubtedly derived from the plankton.

C. diadema (Ehrb.) Schütt.

The characteristic resting spores of this species (*Syndendrium diadema* Ehrb.) occur rarely:

Stamsund r, Svolvær r, Gaukværo r. Derived from the plankton.

Distribution: Cfr. above p. 101. *Syndendrium diadema* Ehrb. also in Peru guano.

Stephanogonia Ehrb.

A specimen very similar to *S. actinoptychus* (Ehrb.) Grun. in Van Heurck Synops. p. 83₃, figs. 2—4 was found in the sample from Moskenstrømmen.

Nearly circular. Diameter 70 μ. 15 radii. On the smaller upper disc, a coarse spine seems to be found. In other respects corresponds very well to the figure referred to.

Stephanogonia polygona Ehrb. seems to be a similar form, perhaps the same. Both are probably resting spores (cfr. Schütt in Engler and Prantl, Natürl. Pflanzenf., Th. 1, Abth. 1 b, p. 147).

Distribution: Both species mentioned are known from „North America“ (Ehrenberg). The figure mentioned represents a fossil specimen from Nottingham deposit.

Pyxilla baltica Grun.
A. Schm. Nords. Diat. pl. 3, f. 25. Van Heurck Synops. pl. 83, f. 2.

According to the figure in Hensen (5ter Ber. Komm. Kiel, pl. V, f. 38 c) *Pyxilla baltica* must be the resting spore (endocyst) of *Rhizosolenia setigera* Brightw.

Undoubtedly derived from the plankton.

Very rare: *Rhizosolenia setigera* is a neritic plankton diatom from the coasts of Europe (Western E., Skagerak, Mediterranean). Pacific Ocean, Indian Ocean; north of South America. *Pyxilla baltica* is known from the Baltic, and fossil from Simbirsk.

II. Pennatæ Schütt.

7. *Synedreæ.*

Synedra.

a. ***Eusynedra*** V. H.

S. affinis Kütz.
Kütz. Bacill., p. 68, pl. 15, figs. 6, 11. Van Heurck Synops. pl. 41, f. 13.

var. tabulata (Kütz.) V. H.
V. H. Synops. pl. 41, f. 9 a. *Synedra t.* Kütz.

Very rare: Svolvær r, Ostnesfiord r.

Distribution: Frequent on the coasts of Europe. Arctic regions.

S. kamtschatica Grun.
Grun. in Cl. et grun. Arkt. Diat. p. 106, pl. VI.

var. intermedia Grun. l. c. f. 111.

Very rare: Stamsund r.

Distribution: Kamtschatka, Finmark, Spitsbergen, Greenland, Kara Sea, East Cape.

S. ulna (Nitzsch.) Ehrb.
Van Heurck Synopsis pl. 38, f. 7.

Fresh water species.

Very rare: Svolvær r.

Distribution: Common fresh water species.

b **Ardissonia** (De Not.) V. H.

S. crystallina (Ag.) Kütz.
Kütz. Bacill. p. 69, pl. 16, f. I. Van Heurck Synops. pl. 42, f. 10. *Diatoma c.* Ag. Consp., p. 52.

Not unfrequent: Stamsund r, Svolvær +, Gaukværo r, Stene r.

Distribution: Coasts of Western Europe. The Mediterranean. Finmark.

S. superba Kütz.
Kütz. Bacill. p. 69, pl. 15, f. 13. Van Heurck Traité d. Diat., p. 316, pl. 30, f. 834.

Very rare: Ostnesfiord r, Stene r.

Distribution: Coasts of Western Europe. The Mediterranean. Finmark (*var. minor* Grun.).

S. baculus Greg.
Greg. Trans. Micr. Soc. 1867, p. 88, pl. 1, f. 54. Van Heurck Synopsis pl. 42, f. 9.

Very rare: Svolvær r.

Distribution: Coasts of Scotland and Ireland.

c. **Toxarium** (Bail.) V. H.

S. undulata (Bail.) W. Sm.
W. Sm. Brit Diat. II, p. 97. Van Heurck Synops. p. 154, pl. 42, f. 2. *Toxarium undulatum* Bail. Notes on new sp. and loc. of Micr. Org. p. 15, figs. 24—25.

Not unfrequent: Stamsund r, Svolvær +, Ostnesfiord r +, Gaukværø r.

Distribution: Coasts of Europe and North America. Red Sea.

S. Hennedyana Greg.
Greg. Diat. of Clyde p. 532, pl. XIV, f. 108. Van Heurck Synops. pl. 42, f. 3.

Very rare: Stamsund r. 400 μ long.

Distribution: Coasts of Scotland and Belgium. The Mediterranean.

S. (hyperborea var.?) rostellata Grun.
Grun. Diat. Franz Jos. Land p. 54, pl. II, figs. 6 a—b.

A specimen very similar to the figure referred to was found: Gaukværø. 38 μ × 3 μ. Striæ very fine.

Distribution: Franz Josef's Land.

Thalassiothrix ***nitzschioides*** Grun.

Cf. above p. 102.

Derived from the plankton.

Very rare: Stamsund r, Gaukværø r.

Distribution: Cf. above p. 102.

Sceptroneis Ehrb.

S. marina (Greg.) Grun.
Grun. in Van Heurck Synops., pl. 37, f. 2. *Meridion marinum* Greg. Diat. of Clyde p. 497, pl. X, f. 41.

Not unfrequent: Stamsund r +, Raftsund r, Ostnesfiord r, Gaukværø r, Stene r.

Distribution: Coasts of the North Sea. Finmark. Balearic Isles.

S. kamtschatica Grun.?
Grun. in Van Heurck Synops. pl. 37, f. 6.

A species very similar to the figure mentioned occurred in the sample from Stene, r (several specimens). Usually broader than the preceding, somewhat variable in shape, at the broader end sometimes rounded, sometimes only obtuse. Valve distinctly costate with linear pseudoraphe; costæ somewhat radiating, 6—6$^{1}/_{2}$ on 10 μ. Length 38—40 μ, breadth 7—8 μ. Also similar to *Opephora pacifica* Grun. in V.H. Synops. pl. 44, f. 22.

Distribution: Kamtschatka. *Opephora pacifica*, perhaps the same species, in the North Pacific.

Rhaphoneis Ehrb.

R. nitida (Greg.) Grun.
Cocconeis n. Greg. Diat. of Clyde. p. 492, pl. IX, f. 26. Grun. Alg. Novara p. 99.

Rare: Stamsund r +.

Distribution: Coasts of the North Sea. The Mediterranean. Auckland.

8. *Plagiogrammeæ.*

Plagiogramma ***staurophorum*** (Greg.) Heib.
Heib. Consp. Diat. Dan. p. 55. *P. Gregorianum* Grev., Van Heurck Synops. p. 145, pl. 36, f. 2. *Denticula staurophora* Greg. Diat. of Clyde p. 496, pl. X, f. 37.

Frequent: Stamsund r, Svolvær r, Raftsund r, Ostnesfiord r, Gaukværø +, Stene +.

Distribution: Coasts of the North Sea and Western Europe. Finmark; Greenland. South America. Ceylon.

Dimeregramma Ralfs.

D. minus (Greg.) Ralfs.
Ralfs in Pritch. Inf. p. 790. Van Heurck Synops. pl. 36, f. 10, 11 a. *Denticula m.* Greg. Diat. of Clyde p. 496, pl. X, f. 35.

Somewhat rare: Stamsund r, Svolvær r, Gaukværø r, Stene r +.

var. nana (Greg.) V.H.
Van Heurck Traité p. 336, pl. 10, f. 393. *Denticula nana* Greg. l. c. f. 34.

Rare: Gaukværø r. Seems to be only a smaller form of the preceding species.

Distribution: Coasts of Western Europe. The Mediterranean.

D. fulvum (Greg.) Ralfs.
Ralfs l. c. *Denticula fulva* Greg. Diat. of Clyde, p. 496, pl. X, f. 38. Van Heurck Synops. pl. 36, f. 28.

Somewhat rare: Stamsund +, Gaukværø +, Stene r.

Distribution: Coasts of Western Europe. Sweden. The Mediterranean.

Glyphodesmis Grev.

G. Williamsonii (Greg.) Grun.

Cf. above p. 102.

Rather frequent: Moskenstrømmen r, Stamsund + c, Gaukværø r, Stene r.

Distribution: Coasts of the North Sea and Western Europe. The Mediterranean.

G. distans (GREG.) GRUN.
GRUN. in VAN HEURCK Synops. pl. 36, figs. 15—16. *Denticula d.* GREG. Diat. of Clyde p. 495, pl. X. f. 36.

Very rare: Stene r; Stamsund r.
Distribution: Coasts of Western Europe. Sweden. The Mediterranean.

9. Eunotieæ.

Eunotia EHRB.

Fresh water species.

E. arcus EHRB.
VAN HEURCK Synops. p. 141, pl. 34, f, 2.

Very rare: Stene r.
Distribution: Common fresh water species.

E. major (W. SM.) RABENH.
VAN HEURCK Synops. p. 142. pl. 34. f. 14.

Very rare: Ostnesfiord r.
Distribution: Fresh water species from Western Europe.

E. pectinalis (DILLW.?) RABENH.
VAN HEURCK Synops. p. 142, pl. 33, figs. 15—16.

Very rare: Svolvær r, Gaukværø r.
Distribution: Common fresh water species.

E. prærupta EHRB.
VAN HEURCK Sydops. p. 143, pl. 34, f. 19.

Very rare: Ostnesfiord r, Stene r.
Distribution: Northern Europe. America.

E. bidentula W. SM.
W. SM. Brit. Diat. II, p. 83.

Very rare: Gaukværø r r; Stamsund r r.
Distribution: Great Britain and Ireland.

E. triodon EHRB.
W. SM. Brit. Diat. I, p. 16, pl. 2. f. 18. VAN HEURCK Synops. pl. 33, f. 9.

Very rare: Gaukværø r; Stene r.
Distribution: Northern Europe. Switzerland. Cayenne.

Ceratoneis *arcus* (EHRB.) KÜTZ.
VAN HEURCK Traité d. Diat., p. 305. f. 69.

Fresh water species.
Very rare: Gaukværø, r.
Distribution: Common fresh water species, especially in alpine localities.

10. Meridioneæ.

Meridion *circulare* (GREV.) AG.
VAN HEURCK Synops. p. 161, pl. 51, figs. 10—12.

Fresh water species.
Very rare: Svolvær. Only two cells of a chain.
Distribution: Common fresh water species in temperate regions.

11. Tabellarieæ.

Tabellaria *flocculosa* (ROTH) KÜTZ.
VAN HEURCK Synops. p. 162, pl. 52, figs. 10—12.

Fresh water species.
Rare: Svolvær r, Gaukværø r, Stene r.
Distribution: Common fresh water species.

Striatella *unipunctata* (LYNGB.) AG.

Cf. above p. 103.
Very rare: Gaukværø r.
Distribution: Frequent on the coasts of Europe. Finmark. The Red Sea. Cape Horn.

Rhabdonema KÜTZ.

R. minutum KÜTZ.
KÜTZ. Bacill. p. 126, pl. 21, f. II, 4. VAN HEURCK Synops. p. 166, pl. 54, figs. 17—21.

Frequent: Stamsund r, Svolvær c. Raftsund r, Gaukværø r, Stene +.
Distribution: Frequent on the coasts of Europe, especially on the western and northern ones. Arctic regions. Cape of Good Hope.

R. arcuatum (LYNGB.) KÜTZ.
KÜTZ. l. c. p. 126. pl. 18, f. VI. VAN HEURCK Synops. p. 166, pl. 54, figs. 14—16. *Diatoma a.* LYNGB. Hydroph. p. 180, pl. 62.

Frequent: Svolvær + c, Raftsund r, Gaukværø r, Stene r +.
Distribution: Frequent on the coasts of Europe and North America. Arctic regions.

R. adriaticum KÜTZ.
KÜTZ. Bacill. p. 126, pl. 18, f. 7. VAN HEURCK Synops. p. 166, pl. 54, figs. 11—13. *Tessella catena* EHRB. Mikrogeol. pl. 22. f. 65.

Rare: Svolvær r, Raftsund r r, Stene r r.
Distribution: Frequent on the coasts of Europe and America. Finmark (r r CLEVE who remarks (Vegaexped. p. 484) that this species else is wanting in the arctic regions). Africa. Pacific Ocean.

Grammatophora EHRB.

G. islandica EHRB.
VAN HEURCK Synops. pl. 53. f. 7.

Not unfrequent: Stamsund r, Svolvær r, Raftsund r, Brettesnes—Skroven r, Stene r +.
Distribution: Northern and western coasts of Europe. North Pacific. Cape Horn.

G. serpentina RALFS.
RALFS in Ann. and Mag. XI, pl. IX f. 5. VAN HEURCK Synops. pl. 53, figs. 1—3.

Frequent: Moskenstrømmen r +, Stamsund r, Svolvær r, Raftsund r +, Brettesnes—Skroven r, Gaukværø r, Stene r.
Distribution: Frequent on the coasts of Europe. Ceylon. Cape Horn. Antarctic regions.

G. marina (Lyngb.) Kütz.

Kütz. Bacill. p. 128, pl. 17, f. XXIV. 1—6. Van Heurck Synops. p. 163, pl. 53, figs. 10—11. *Diatoma m.* Lyngb. Hydroph. p. 180, pl. 62 A.

Rare: Stamsund r.

Distribution: Frequent on the coasts of Europe. Africa. America. Ceylon.

G. oceanica Ehrb.

Ehrb. Mikrogeol. pl. 19, f. 36 a, pl. 18, f. 87 a.

Perhaps ought to be united with the preceding species.

Frequent: Stamsund r +, Svolvær + c, Ostnesfiord r +, Gaukværø r, Stene r.

var. macilenta (W. Sm.) Grun.

Grun. in Wien Verh. 1862. Van Heurck pl. 53, 2, f. 16. *G. macilenta* W. Sm. Brit. Diat. II. p. 43, pl. 61, f. 382.

Svolvær +, Stene r.

Distribution: Frequent on the coasts of Europe. Greenland. Cape Horn. Indian Ocean.

G. arctica Cl.

Cl. Diat. Spitsb. 1867, p. 664, pl. 23, f. 1. Van Heurck Synops. pl. 53, 2, f. 3. *G. africana* Ehrb. Mikrogeol. pl. 35 A, XX, figs. 1—2, (non l. c. pl. 18, f. 86 a, b).

Very rare: Stene r r.

Distribution: Arctic regions.

12. *Nitzschieæ.*

Bacillaria *socialis* Greg.

Cf. above p. 103.

Not unfrequent: Stamsund +, The Ostnes Fiord r, Gaukværø r.

Distribution: Coast of Western and Northern Europe. Arctic regions. West Indies.

Nitzschia Hass.

a. *Panduriformis* Grun.

N. panduriformis Greg.

Greg. Diat. of Clyde p. 529, pl. XIV, f. 102. Van Heurck Synops. p. 172, pl. 58, figs. 1—3.

Rare: Svolvær r, Stene r.

Distribution: Western coasts of Europe. Baltic. Adriatic Sea. Finmark. Spitsbergen. Indian Ocean. The Red Sea. Cape Horn.

N. constricta (Greg.) Grun.

Grun. in Cl. et Grun. Arct. Diat. 1880, p. 71. *Tryblionella c.* Greg. Micr. Journ. III, p. 40, pl. 1, f. 13.

Rare: Stamsund r, Svolvær r, Gaukværø r.

Distribution: Western Europe. The Mediterranean. Cape of Good Hope. Cape Horn. Ceylon.

b. *Tryblionella* (W. Sm.) Grun.

N. navicularis (Bréb.) Grun.

Grun. in Cl. and Grun. Arct. Diat. p. 67. Van Heurck Synops. p. 171, pl. 57, f. 1. *Surirella navicularis* Bréb. in Kütz. Spec. Alg. p. 36.

Very rare: Stene r.

Distribution: Coasts of the North Sea and Western Europe. Spitsbergen (uncertain, Cl.)

N. punctata (W. Sm.) Grun.

Grun. in Cl. et Grun. Arct. Diat. p. 69. Van Heurck Synops. p. 171. pl. 57, f. 2. *Trublionella p.* W. Sm. Brit. Diat. I, p. 36, pl. X, f. 76 a.

Rare: Stamsund r, Svolvær r, Stene r.

Distribution: Coasts of the North Sea and of Western Europe. The Baltic. The Mediterranean.

N. coarctata Grun.

Grun. l. c. p. 68. Van Heurck Synops. pl. 57, f. 4.

Several specimens which seem to belong here were found: Gaukværø r.

Distribution: The Mediterranean; Japan; Cape Horn.

N. (Tryblionella var.?) litoralis Grun.

Grun. in Cl. and Grun. Arct. Diat. p. 75. Van Heurck Synops. p. 172, pl. 59 figs. 1—3.

Very rare: Stamsund r.

Distribution: Frequent in fresh and brackish water.

c. *Apiculatæ* Grun.

N. apiculata (Greg.) Grun.

Grun. in Cl. et Grun. Arct. Diat. p. 73. *Tryblionella a.* Greg. Micr. Journ. V, p. 79, pl. 1, f. 43.

Very rare: Svolvær. r.

Distribution: Coasts of the North Sea and Western Europe. Finmark. Greenland.

N. acuminata (W. Sm.) Grun.

Grun. in Cl. et Grun. Arct. Diat. p. 73. Van Heurck Synops., p. 173, pl. 58, figs. 16—17. *Tryblionella a.* W. Sm. Brit. Diat. I, p. 36, pl. 10, f. 77.

Rare: Svolvær r, Stene r.

Distribution: Coasts of England. The Mediterranean.

N. marginulata Grun.

Grun. l. c. p.72.

var.? didyma Grun. l. c.

Van Heurck Synops. pl. 58, figs. 14—15.

Rare: Stamsund r, Svolvær r.

Distribution: Frequent on the coasts of Europe. Arctic regions. Indian Ocean. Pacific Ocean.

N. hungarica Grun.

Grun. in Wien Verh. 1862, p. 568, pl. 22, f. 13. Van Heurck Synops. p. 173, pl. 53, f. 19.

Species from brackish water.

Very rare: Svolvær, r.

Distribution: Frequent in fresh and brackish water.

d. ***Dubiæ*** Grun.

N. littorea Grun. (?)
Van Heurck Synops. pl. 59, f. 21. *N. thermalis v. littoralis* Grun. in Cl. et Grun. Arct. Diat. p. 78.

Very rare: Stamsund r. 113 μ long; 7 keel puncta on 10 μ. Similar to *N. hybrida*, but is longer and narrower, with more distant keel puncta and more excentric keel. Also Stene, rr.
Distribution: Newcastle. Lysekil (Sweden).

e. ***Bilobatæ*** Grun.

N. bilobata W. Sm.
W. Sm. Brit. Diat. I, p. 42, pl. 15, f. 113. Van Heurck Synops. p. 175, pl. 60, f. 1.

Very rare: Ostnesfiord, r.
Distribution: Frequent on the coasts of Europe (the most northern ones excepted). Pacific Ocean.

N. hybrida Grun.

Cf. above p. 103.
Perhaps derived from the plankton.
Very rare: Stamsund r.
Distribution: Cf. above p. 103.

N. Mitchelliana Greenl.

Cf. above p. 104.
Very rare: Ostnesfiord r, Stene r.
Distribution: North America. Arctic regions.

f. ***Insignes*** Grun.

N. insignis Greg.
Greg. Micr. Journ. V, p. 80, pl. 1, f. 46.

Not unfrequent: Stamsund r, Ostnesfiord r, Gaukværø r, Stene r.
Distribution: Coasts of Western and Northern Europe. Arctic regions. Adriatic Sea. Red Sea.

var. notabilis Grun.
Grun. in Cl. et Grun. Arct. Diat. p. 84. Van Heurck Synops. pl. 51, f. 5.

Very rare: Gaukværø r. 476 μ long; 9—10 striæ on 10 μ.
Distribution: The Mediterranean.

var. spathulifera Grun.
Van Heurck Synops. pl. 61, f. 3.

Very rare: Stamsund r.
Distribution: The Mediterranean. West Indies.

N. Smithii Ralfs.
Ralfs in Pritch. Inf. p. 781. Van Heurck Synops. pl. 61, f. 4.

Not unfrequent: Stamsund +, Stene r.
Distribution: Coasts of Western Europe. Adriatic Sea. Finmark (*var. marginifera* Grun.).

g. ***Spathulatæ*** Grun.

N. angularis W. Sm.
W. Sm. Brit. Diat. I, p. 40, pl. 13, f. 117. Van Heurck Synops. p. 177, pl. 62, figs. 11—14.

Rather frequent: Stamsund r, Svolvær +, Ostnesfiord r, Gaukværø +.
Distribution: Frequent on the western and northern coasts of Europe. The Mediterranean. Arctic regions. Ceylon. Cape Horn.

N. spathulata Bréb.
Bréb. in W. Sm. Brit. Diat. I, p. 40, pl. 31, f. 268. Van Heurck Synops. p. 177, pl. 62, figs. 7—8.

Somewhat rare: Stamsund r, Ostnesfiord, Gaukværø r.
Distribution: Frequent on the western and northern coasts of Europe. The Mediterranean. Arctic regions.

N. distans Greg.
Greg. Diat. of Clyde, p. 530, pl. XIV, f. 103. Van Heurck Synops. pl. 62, f. 10.

Rare: Stamsund r (several specimens); Ostnesfiord r.
Distribution: Coasts of the North Sea. The Mediterranean. Red Sea. Australia. Baffin's Bay and Davis' Strait, Cape Wankarema (Cl., varieties).

h. ***Sigmata*** Grun.

N. sigma (Kütz.) W. Sm.
W. Sm. Brit. Diat. I, p. 39, pl. 13, f. 108. *Synedra s.* Kütz. Bacill. p. 67, pl. 30, f. 114.

Frequent: Stamsund +, Svolvær +, Ostnesfiord +, Gaukværø r +, Stene r.
Distribution: Cosmopolitan.

i. ***Lanceolatæ*** Grun.

N. lanceolata W. Sm.
W. Sm. Brit. Diat. I, p. 40, pl. XIV, f. 118. Van Heurck Synops. p. 182, pl. 68, figs. 1—4.

I have two times seen the wavy longitudinal lines, described and illustrated by W. Smith. They were more distinct than the transverse striæ.
Very rare: Stamsund r, Gaukværø r, Stene r.
Distribution: Frequent on the coasts of Europe, the most northern ones only excepted. Indian Ocean.

k. ***Nitzchiella*** (Rabenh.) Grun.

N. longissima (Bréb.) Ralfs.

Cf. above p. 104.
Very rare: Gaukværø r.
Distribution: Coasts of the North Sea and Western Europe. The Mediterranean. West Indies. Indian Ocean.

13. *Surirelleæ.*

Campylodiscus Ehrb.

C. decorus Bréb.

C. decorus Bréb. Diat. Cherb. p. 13, f. 2. Van Heurck Synops. pl. 75, f. 3.

Not unfrequent: Moskenstrømmen r, Stamsund r, Østnesfiord r, Gaukværø r.

Distribution (including the nearly related *C. Ralfsii* W. Sm.): Frequent on the coasts of Europe. Greenland. Java. Pacific Ocean.

C. Ralfsii W. Sm.

W. Sm. Brit. Diat. I, p. 30, pl. 30, f. 257. A. Schm. Atlas pl. 14, figs. 2—3.

Differs from the preceding species in having a linear (not lanceolate) pseudoraphe. Smaller in size.

Very rare: Stene r, Stamsund r.

C. angularis Greg.

Greg. Diat. of Clyde p. 502, pl. XI, f. 53. A. Schmidt Atlas pl. 18, f. 7.

Frequent: Raftsund r, Brettesnes—Skroven r, Østnesfiord c, Stene r.

Distribution: Scotland. The Skagerak. Arctic regions.

C. Thuretii Bréb.

Bréb. Diat. Cherb. pl. 1, f. 3. Van Heurck Synops. p. 190, pl. 77, f. 1.

Frequent: Moskenstrømmen r, Stamsund +, Svolvær r +, Raftsund r, Brettesnes—Skroven r, Østnesfiord + c, Gaukværø + c, Stene r +.

Distribution: Frequent on the coasts of Europe. Arctic regions. Indian Ocean.

C. parvulus W. Sm.

W. Sm. in Brit. Diat. I, p. 30, pl. 6, f. 56. Van Heurck Synops. p. 191, pl. 77, f. 2.

Is by some authors considered to be a form of *C. Thuretii* Bréb. (cf. De Toni Syll. p. 622) by others to belong to *C. decorus* Bréb. (cf. Van Heurck Traité p. 376).

Very rare: Stene r.

Distribution: England. Belgium.

C. eximius Greg.

Greg. Diat. of Clyde p. 503, pl. XI, f. 54.

Very rare: Stene r r. Only a broken valve.

Distribution: Coasts of Western Europe. The Mediterranean. Red Sea. Indian Ocean.

Surirella Turp.

S. gemma Ehrb.

Ehrb. Abh. Berl. Akad. 1840, p. 76, pl. IV, f. 5. Van Heurck Synops. p. 187, pl. 74, figs. 1—3.

Very rare: Gaukværø r r.

Distribution: Frequent on the coasts of Europe. Spitsbergen.

S. ovalis Bréb.

Kütz. Bacill. p. 61, pl. 30, f. 64. Van Heurck Synops. p. 188, pl. 73, f. 3.

In fresh and brackish water.

Very rare: Gaukværø r.

var. ovata (Kütz.) V. H.

VH. Synops. p. 188, pl. 73, figs. 6—7. *Surirella ovata* Kütz. l. c. p. 62, pl. 7, figs. 1—4.

Very rare: Gaukværø r.

Distribution: Common species.

S. fastuosa Ehrb.

Ehrb. Abh. Berl. Ak. 1841, p. 19. Van Heurck Synops. p. 188, pl. 73, f. 18.

Rather frequent: Svolvær +, Raftsund r, Gaukværø r, Stene r +.

var. lata (W. Sm.) VH

Van Heurck Synops. p. 188, pl. 72, f. 17. *Surirella l.* W. Sm. Brit. Diat. I, p. 31, pl. 9, f. 61.

Frequent: Moskenstrømmen r +, Stamsund r, Svolvær r, Raftsund r, Brettesnes—Skroven r, Østnesfiord r, Gaukværø r, Stene r.

Distribution: Frequent on the coasts of Europe. Gulf of Mexico.

14. *Achnantheæ* Cl.

Achnanthes Bory.

A. longipes Ag.

Ag. Syst. p. 1. Van Heurck Synops. p. 129, pl. 26, figs. 13—16.

Very rare: Svolvær r.

Distribution: Frequent (on algæ) on the coasts of Europe. The Canary Isles.

A. brevipes Ag.

Ag. l. c. Van Heurck Synops. p. 129, pl. 26, figs. 10—12.

Rare: Stamsund r, Stene r, Østnesfiord r.

Distribution: Frequent on the coasts of Europe.

Eucocconeis Cl.

Valves ecostate, without marginal loculiferous rim. Both valves with narrow axial area, rather similar in structure.

E. pseudomarginata (Greg.) Cl.

Cl. Synops. Navic. Diat. II, p. 178. *Cocconeis p.* Greg. Diat. of Clyde p. 497, pl. IX, f. 27. *C. major* Greg. l. c. f. 28.

Rare: Stamsund r, Raftsund r, Østnesfiord r, Stene r.

Distribution: Coasts of the North Sea. Arctic regions. The Mediterranean. Red Sea. Indian Ocean. Galapagos Islands. Honduras.

Heteroneis Cl. (includ. *Disconeis* Cl. l. c. p. 180 and *Actinoneis* Cl. l. c. p. 185).

Valves very dissimilar, without marginal loculiferous rim. Upper valve costate, sometimes only striate, then with broad axial area.

H. Allmanniana (Greg.).

Pinnularia A. Greg. Diat. of Clyde p. 488, pl. IX, f. 21. *Cocconeis quarnerensis* A. Schm. Nords. Diat. pl. III, f. 16; Atlas pl. 192, figs. 20—24. *Rhaphoneis q.* Grun. Wien Verh. 1862, p. 381, pl. 7, f. 24. *Navicula ovulum* A. Schm. Nords. Diat. pl. II, f. 12. *Heteroneis q.* Cl. l. c. p. 184.

„Costæ apparently marginal, strong, about 20 in 0.001″, giving the appearance of a narrow marginal band of very strong costæ. Within this band, however, the valve, on close inspection, is found to be marked with similar but much fainter costæ nearly to the median line. The valve appears to be thicker near the margin than in the middle, and this perhaps is the reason why the costæ are so strong and conspicuous there.“ (Greg. l. c.

It seems to me that there can scarcely be any doubt that *Pinnularia Allmanniana* Greg. is synonymous to *Cocconeis quarnerensis* Grun. Size, shape and structure agree very well in both species.

There seems to be a marginal rim which has, however, only faint traces of loculi.

Rare: Stamsund r, Stene r.

Distribution: Coasts of the North Sea. Arctic regions. The Mediterranean.

H. norvegica (Grun.?)

Cocconeis norvegica Grun., Cl. Møll. Diat. no. 102 (upper valve, teste Cl.) A. Schm. Nords. Diat. pl. III ,f. 18, 1 (upper figure, „*Cocconeis sp.*“, upper valve).

Upper valve as illustrated l. c. by A. Schmidt. Instead of the median line (pseudoraphe), there is often a linear blank space, which sometimes (but rarely) is somewhat irregularly widened. The lower valve has a very delicate structure, consisting of close, somewhat radiating striæ, in the median part of the valve coarser and more conspicuous, about 15 on 10 μ, otherwise very faint, about 20 on 10 μ. Raphe strait, extending to the margin; the inner ends somewhat thickened, separated from each other. A rather broad hyaline border, but no loculiferous rim.

Cl. Synops. Navic. Diat. II, p. 180 mentions that he has found a frustule of *Cocconeis lyra* with an upper valve like that illustrated by A. Schm. l. c. (pl. III. f. 18, 1, upper figure). I have, however, found a frustule, showing this upper valve, in connection with a lower valve of the structure just described. There must therefore here be some mistake, if there are not two different species, with very similar upper valves.

There is a marginal rim, like a somewhat broad hyaline border, with only faint traces of loculi.

Rare: Stamsund r + (many specimens); Stene r.

Distribution: West coast of Norway (Solsvik near Bergen).

Cocconeis Ehrb., Cl.

Valves ecostate, with a marginal loculiferous rim, dissimilar in structure.

C. scutellum Ehrb.

Ehrb. Infus. p. 194, pl. 14, f. 8. Van Heurck Synops. p. 132, pl. 29, figs. 1—3.

According to Cleve exceedingly variable. It seems, however, that he has gone too far when referring so many different forms to this species, as he has done (l. c. pp. 170—171).

Not unfrequent, in different forms which only badly answer to the varieties described: Stamsund r, Svolvær r, Ostnesfiord r, Stene r.

Distribution: Cosmopolitan.

C. distans Greg., A. Schm.

Greg. Diat. of Clyde, p. 490, pl. IX, f. 23 (1857, non Micr. Journ. III, p. 39, pl. IV. f. 9, 1855 which Greg. l. c. p. 491 himself declares to be a var. of *C. scutellum* illustrated as *C. distans* by mistake). A. Schm. Nords. Diat. pl. III, figs. 22—23 (*forma minima* Perag.).

Small specimens, very well answering to the figures in A. Schm. l. c. (f. 23 entire frustule) occurred. They had no loculiferous rim, only a hyaline border. Lower valve with very faint and indistinct striæ.

There is, however, such a remarkable agreement with a form of *C. scutellum*, most probably the one, mentioned above, which at first was figured by Gregory as *C. distans*, that I do not feel quite sure if not these two forms after all belong together. The only difference seems to be the larger marginal areoles which are wanting in the true *C. distans*.

The variety of *C. scutellum* just mentioned differs remarkably from the common forms. There is a narrow marginal rim, but no loculi. Lower valve with straight raphe, stretching to the margin. Median pores somewhat separated from each other. Axial area indistinct except towards the central nodule, where it suddenly dilates into a small, round, central one. Striæ finely radiating, much curved towards the ends of the valve, most conspicuous near the margin, distinctly punctate, about 14 on 10 μ. A narrow striate border with striæ somewhat closer and less conspicuous than the marginal striæ of the valve, 15—16 one 10 μ. 38 μ × 29 μ.

Smaller specimens seem to pass insensibly into such forms, which A. Schm. has figured l. c.

Very rare: Stamsund r.

Distribution: Coasts of the North Sea. The Mediterranean. Indian Ocean. Central and Arctic America. Sea of Kara.

C. lyra A. Schm.

A. Schm. Nords. Diat. pl. III. f. 19 (right figure lower valve. left figure upper valve).

As mentioned above I think there must be some mistake, when Cl. mentions having seen a frustule of this species with the upper valve of the species above named *Heteroneis norvegica*. Though I have seen no entire frustule of *C. lyra*, I should think that A. Schm.'s illustrations to which I have referred, belong together, which also answers very well to the dimensions. I have repeatedly found this upper valve in connection with a loculiferous rim with 6 loculi on 10 μ. The species consequently is no *Disconeis* Cl., but belongs to *Cocconeis* or *Pleuroneis*.

The remarkable lower valve occurred sparsely in my material, but corresponded in size and shape precisely to the supposed upper valve. Its structure is puzzlingly similar to that of small forms of *Navicula lyra var. atlantica*. On one side of the valve between the furrows and the margin, there is, however, an indistinct blank line or furrow, parallel to the main furrows, which is absent in the *Navicula* mentioned.

Upper valve with transverse and longitudinal costæ, the latter a little closer than the former. Between the costæ there is, therefore, a single row of conspicuous areolæ.

Rare: Stamsund r (both valves); Stene r (upper valve only).

Distribution: West coast of Norway.

Pleuroneis Cl. l. c. p. 181.

Marginal loculiferous rim. Upper valve costate. Between the costæ double rows of small pearls.

P. costata (Greg.) Cl. l. c.
Cocconeis c. Greg. in Q. M. J. III. 1855, p. 39, pl. 4, f. 10. Van Heurck Synops. pl. 30, figs. 11—12.

Has a broad and well developed loculiferous rim.
Rare: Stamsund r, Ostnesfiord r, Stene r.
Distribution: Coasts of the North Sea. Arctic regions. The Mediterranean. Canada. Auckland.

P. pinnata (Greg.)
Cocconeis p. Greg. Micr. Journ. VII, p. 79, pl. 6, f. 1. Van Heurck Synops. pl. 30. figs. 6—7.

Lower valve: The raphe fine, straight, stretching to the ends of the valve, in the middle with clavate ends, somewhat separated from each other. Axial area not visible, central one very small, roundish. Striæ very faint, not distinctly seen on my specimens.

There is a marginal rim with rudimentary loculi which are less than half developed, but very well visible, 4 on 10 μ. A distinct hyaline border. This species seems on the whole to be closely related to *Pleuroneis costata* though undoubtedly a separate species.

P. britannica (Næg.) Cl.
Cl. l. c. p. 181. *Cocconeis b.* Kütz. Sp. Alg. p. 890. Van Heurck Synops. pl. 30, figs. 1—2.

Very rare: Stamsund r r.
Distribution: England. The Mediterranean. The Barbadoes.

Rhoicosphenia Grun.

R. curvata (Kütz.) Grun.
Grun. Alg. Novara p. 8. *Gomphonema c.* Kütz. 1833. *Gomphonema minutissima* Ehrb. Mikrogeologie pl. 35 A, XII, f. 5, non *G. minutissima* Grev. (earlier name, = *G. exiguum* Kütz.).

In fresh or brackish water. A coarser form (var. *marina* Van Heurck Synops. pl. 26, f. 4) marine.
Very rare: Svolvær r, Ostnesfiord r.
Distribution: Cosmopolitan in fresh and brackish water.

15. *Gomphonemeæ.*

Gomphonema Ag.

G. constrictum Ehrb.
Ehrb. Abh. Berl. Ak. 1830. Van Heurck Synops. p. 123, pl. 23, f. 6.

Very rare: Svolvær r.
Distribution: Common fresh water species.

G. exiguum Kütz.
Kütz. Bacill. p. 84, pl. 30, f. 58.

var. pachyclada (Bréb.) VH. Synops. pl. 25, figs. 31—32.
Gomphonema p. Bréb. Consid. p. 21.

Very rare: Stene r r.
Distribution: West coast of France. Arctic regions.

G. kamtschaticum Grun.
Grun. Casp. Sea Alg. p. 12. Van Heurck Synops. 25, f. 29.

Very rare: Svolvær, r r. Valve 45 × 8 μ, narrow, clavate, with rounded broader end. Axial area narrow, dilated to an oblong central area. Striæ little radiating, coarser outside the central area, about 15 on 10 μ, in the middle only 11.
Distribution: (Marine). Arctic America and Asia. Iceland.

16. *Naviculeæ.*

Auricula ***complexa*** (Greg.) De T.
De Toni Syll. p. 347. *Amphipora complexa* Greg. Diat. of Clyde p. 508, pl. XII, f. 62, Van Heurck Traité d. Diat. p. 267, pl. 29, f. 807.

Probably derived from the plankton.
Very rare: Ostnesfiord r.
Distribution: Cf. above p. 108.

Tropidoneis Cl.

T. maxima (Greg.) Cl.
Cl. Synops. Navic. Diat. I, p. 26. *Amphiprora m.* Greg. Diat. of Clyde p. 507 pl. XII, f. 61. Van Heurck Synops. p. 120, pl. 22, figs. 4—5.

Somewhat rare: Stamsund r, Svolvær r, the Ostnesfiord r, Stene r +, Gaukværø r.
Distribution: Coasts of the North Sea and Ireland. The Mediterranean. Finmark (var. *dubia* Cl. et Grun.). Indian Ocean.

T. lepidoptera (Greg.) Cl.
Cl. l. c. p. 25. *Amphiprora l.* Greg. Diat. of Clyde p. 505, pl. XII, f. 59 a, b (non c). Van Heurck Synops. p. 120, pl. 22, figs. 2—3.

Not unfrequent: Stamsund +, Svolvær r, the Ostnesfiord r, Stene r +, Gaukværø r.
Distribution: Coasts of the North Sea and Western Europe. Finmark. The Mediterranean. West Indies. Indian Ocean. Pacific Ocean.

Donkinia Ralfs.

D. recta (Donk.) Grun.
Grun. in Van Heurck Synops. p. 119, pl. 17, f. 9. *Pleurosigma r.* Donk. Micr. Journ. VI, p. 23, pl. 3, f. 6. *Gyrosigma r.* Cl. Synops. Navic. Diat. I, p. 119.

Very rare: Stamsund, r.
Distribution: Coasts of the North Sea and Western Europe. The Mediterranean. Florida. Pacific Ocean. Indian Ocean.

D. carinata (Donk.) Ralfs.
Ralfs in Pritch. Inf. p. 921. Van Heurck Traité d. Diat. p. 248, pl. 35, f. 912. *Pleurosigma c.* Donk. Micr. Journ. VI, p. 23, pl. 3, f. 5; Cl. l. c. p. 44.

Rare: The Ostnesfiord r, Stene r, Gaukværø r.
Distribution: Coasts of the North Sea and Ireland. Sea of Kara. Davis' Strait. Balearic Islands.

Pleurosigma W. Sm.

a. ***Eupleurosigma.*** Striæ in three directions (transverse and oblique).

P. nubecula W. Sm.
W. Sm. Brit. Diat. I. p. 64. pl. 21. f. 201.

var. subrecta Cl.
Cl. Synops. Navic. Diat. I. p. 35. *Pleurosigma s.* Cl. in Cl. et Grun. Arct. Diat. p. 53. pl. 3, f. 72.

Very rare: Stamsund, r. 254 μ × 21 μ; oblique striæ 18 on 10 μ, angle more than 60°. transverse striæ indistinct. Raphe central, almost straight. Somewhat broader in the middle, with obtuse ends.

Distribution (of the variety): Finmark. Greenland. Sea of Kara. Balearic Islands.

P. elongatum W. Sm.
W. Sm. Brit. Diat. I, pl. 20, f. 199. Peragallo Monogr. Pleuros. pl. II. figs. 20—21.

Very rare: The Ostnesfiord r.

Distribution: Coasts of the North Sea and Ireland. Baltic. Arctic regions. The Mediterranean. Caspian Sea. North America, east coast. Pacific Ocean. Indian Ocean.

P. rigidum W. Sm.
W. Sm. Brit. Diat. I. p. 64, pl. 20, f. 198. Peragallo l. c. pl. VI. figs. 4—6.

Very rare: Stamsund r, Gaukværø r.

Distribution: Coasts of the North Sea. The Mediterranean. Red Sea. Indian Ocean. Pacific Ocean. West Indies. Straits of Magellan.

P. Normanni Ralfs.
Ralfs in Pritch. Inf. p. 919 *P. affine* Grun. in Cl. et Grun. Arct. Diat. p. 51. Van Heurck Synops. pl. 18, f. 9.

Frequent: Stamsund r, Svolvær c, the Ostnesfiord + c, Stene c, Gaukværø +.

Distribution: Coasts of the North Sea. The Mediterranean. Spitsbergen. Davis' Strait. East coast of North America. Pacific Ocean. The Red Sea.

P. strigosum W. Sm.
W. Sm. Brit. Diat. I, p. 64, pl. 21. f. 203; pl. 23, f. 203. Perag. l. c. pl. V, figs. 1—2.

Very rare: Stamsund r, Svolvær r.

Distribution: Coasts of the North Sea. The Mediterranean. Indian Ocean. Africa. America.

P. formosum W. Sm.
W. Sm. Brit. Diat. I. p. 63. pl. 20, f. 195. Van Heurck Synops. p. 116, pl. 19. f. 4.

Rare: Stamsund r, Stene r, Gaukværø r.

Distribution: Coasts of the North Sea and Western Europe. The Mediterranean. The Red Sea. Indian Ocean. Pacific Ocean. West Indies.

P. speciosum W. Sm.
W. Sm. Brit. Diat. I, p. 63. pl. 20. f. 197. Perag. l. c. pl. II, figs. 13—16.

Very rare: Stene, r.

Distribution: Coasts of the North Sea. The Mediterranean. Indian Ocean. Pacific Ocean. West Indies.

b. ***Gyrosigma*** (Hass.).

P. attenuatum (Kütz.) W. Sm.
W. Sm. Brit. Diat. I. p. 68. pl. 22. f. 216.

var. scalprum Gaill. et Turp.
Gaill. et Turp. Mem. du Mus. XV. pl. X. XI. f. 3. *P. acuminatum* W. Sm. Brit. Diat. I, p. 66, pl. 21. f. 209.

Very rare: The Ostnesfiord. r.

Distribution (of the variety): North Sea, brackish and marine.

P. balticum (Ehrb.) W. Sm.
W. Sm. Brit. Diat. I, p. 66, pl. 22, f. 207. *Navicula b.* Ehrb. Abh. Berl. Ak. 1830. p. 114.

Very rare: Stamsund r, Svolvær r r.

Distribution: Cosmopolitan in warm and temperate regions.

Rhoicosigma Grun., Per.

R. arcticum Cl.
Cl. Diat. Arct. Sea p. 18. pl. III. f. 16. Peragallo Mon. Pleur. pl. X, figs. 16—17. *Gyrosigma a.* Cl. Synops. Navic. Diat. I. p. 119.

Frequent: Stamsund r, the Ostnesfiord + c, Gaukværø c.

Distribution: Scotland. West coast of Norway, frequent. Arctic regions.

Scoliotropis Cl.

S. latestriata (Bréb.) Cl.
Cl. Synops. Navic. Diat. I. p. 72. *Amphiprora l.* Bréb. in Kütz. Sp. Alg. p. 93. *Scoliopleura l.* Grun. in Van Heurck Synops. pl. 17. f. 12.

Very rare: Stamsund r, Stene r.

Distribution: Coasts of the North Sea and Western Europe. Caspian Sea. East coast of North America. West Indies. California.

Scoliopleura *tumida* (Bréb.) Rabenh.

Rabenh. Fl. Eur. Alg. p. 229. Van Heurck Synops. p. 112, pl. 17, figs. 11, 13. *Navicula t.* Bréb. in Kütz. Sp. Alg. p. 77; Cl. l. c. p. 155.

Very rare: Gaukværø, r.

Distribution: Coasts of the North Sea and Western Europe. Franz Josef's Land. Black Sea. Ceylon. Sidney.

Pseudoamphiprora Cl.

Cl. Synops. of Navic. Diat. I, p. 71.

According to Cleve the following species has 2 chromatophores peculiar in shape and position.

P. stauroptera (Bail.) Cl.
Cl. l. c. *Amphora stauroptera* Bail. Smiths. Contrib. VII. p. 8. figs. 14—15. *Amphiprora obtusa* Greg. Diat. of Clyde p. 506. pl. XII. f. 60 and f. 59 c („*Amphiprora lepidoptera*" Greg., non f. 59 a. b.). A. Schm. Nords. Diat. pl. III. f. 1.

Very rare: Stamsund r, the Ostnesfiord r.

Distribution: North Sea. Finmark. Sea of Kara. Nova Scotia. Sidney. (Cl. l. c.).

Caloneis Cl.

Cl. Synops. Navic. Diat. I, p. 46.

Valve striate; striæ parallel, except at the ends, crossed on each side of the raphe by one or more longitudinal lines. Connecting zone not complex.

C. liber (W. Sm.) Cl.

Cl. l. c. p. 54. *Navicula l.* W. Sm. Brit. Diat. I. p. 48, pl. 16, f. 133.

var. linearis (Grun.) VH.

VH. Synops. pl. 12, f. 35. *Navicula l.* Grun. Verh. 1860, p. 546. pl. 3, f. 2.

Frequent: Stamsund +, Svolvær + c, the Ostnesfiord r +, Raftsund r, Stene r +, Gaukværo +.

Distribution: Cosmopolitan.

var. maxima (Greg.)

Navicula m. Greg. Diat. of Clyde p. 487, pl. IX, f. 18. A. Schm. Nords. Diat. pl. II, f. 44.

Frequent: Stamsund + c, Stene r +.

Distribution: Coasts of the North Sea and Western Europe.

var. elongata (Grun.) Cl.

Cl. l. c. p. 55. *Navicula e.* Grun. in A. Schm. Nords. Diat. p. 91, pl. II, f. 42.

Very rare: Stamsund r.

Distribution: Coasts of the North Sea. Indian Ocean. Colon.

C. consimilis (A. Schm.) Cl.

Cl. l. c. p. 57. *Navicula c.* A. Schm. Nords. Diat. p. 91, pl. II, f. 46.

Very rare: Stamsund r.

Distribution: North Sea. Balearic Islands.

C. amphisbæna (Bory.) Cl.

Cl. l. c. p. 58. *Navicula a.* Bory Encycl. meth., t. 2. Van Heurck Synops. p. 102, pl. XI, f. 7.

Very rare: Stene, r.

Distribution: In brackish and fresh water, frequent especially in Northern and Western Europe. Caspian Sea.

C. brevis (Greg.) Cl.

Cl. l. c. p. 61. *Navicula b.* Greg. Diat. of Clyde, p. 478, pl. IX, f. 4. A. Schm. Nords. Diat. pl. II, f. 15.

Very rare: Stamsund r, the Ostnesfiord r, Stene rr.

Distribution: North Sea. Arctic regions.

C. blanda (A. Schm.) Cl.

Cl. l. c. p. 62. *Navicula b.* A. Schm. Nords. Diat. p. 90, pl. II, f. 27.

Very rare: Stamsund r r, the Ostnesfiord r.

Distribution: Coasts of the North Sea. Black Sea. Indian Ocean. Pacific Ocean.

C. musca (Greg.) Cl.

Cl. l. c. p. 65. *Navicula m.* Greg. Diat. of Clyde, p. 479, pl. IX, f. 6. A. Schm. Nords. Diat. p. 86, pl. I, f. 15.

Very rare: Stamsund r.

Distribution: Coasts of the North Sea. The Mediterranean. Indian and Pacific Oceans. West Indies.

Schizonema Ag.

S. Grevillei Ag.

Ag. Consp. p. 18. Van Heurck Synops. p. 110, pl. 16, f. 2.

Rare: Stamsund r, Svolvær r.

Distribution: Coasts of the North Sea and Western Europe, frequent. Arctic regions. West Indies. California. Kerguelen.

S. crucigerum W. Sm.

W. Sm. Brit. Diat. II. p. 74. pl. 56, fig. 354; pl. 57, f. 356. Van Heurck Synops. p. 110. pl. 16, f. 1.

Rare: Svolvær, r.

Distribution: Coasts of the North Sea and Western Europe. The Baltic.

Stauroneis Ehrb.

S. salina W. Sm.

W. Sm. Brit. Diat. I. p. 60, pl. 19, f. 188. Van Heurck Synops. p. 68, pl. X, f. 16.

Rare: Stamsund r, Stene r.

Distribution: Coasts of the North Sea. The Baltic. The Mediterranean. Black Sea.

S. Gregorii Ralfs.

Ralfs in Pritch. Inf. p. 913. Van Heurck Synops. p. 68, pl. A (suppl.), f. 4. *S. amphioxys* Greg. Micr. Journ. IV, p. 48, pl. V, f. 23.

Rare: Stamsund r, Gaukværo r.

Distribution: Coasts of the North Sea. Black Sea. Caspian Sea. East coast of North America. Sea of Kara.

S. phœnicenteron Ehrb.

Ehrb. Am. pl. II, 5, f. 1 etc. Van Heurck Synops. p. 67, pl. IV, f. 2I (*var. genuina* Cl. Synops. Navic. Diat. I. p. 149).

Very rare: Stene, r.

Distribution: Fresh water species, especially frequent in Northern and Western Europe. America. New Zealand.

Navicula Bory.

a. **Orthostichæ** Cl. Synops. Navic. Diat. I, p. 107.

Valves with small puncta, arranged in parallel transverse striæ and also forming straight longitudinal ones, crossing the former at right angles.

N. cuspidata Kütz.

Kütz. Bacill. p. 94, pl. III. figs. 24, 37. Van Heurck Synops. p. 100, pl. XII, f. 4.

Very rare: Stamsund r, the Ostnesfiord r.

Distribution: Common fresh water species.

b. **Punctatæ** Cl. l. c. II, p. 37.

Coarse puncta, arranged in transverse striæ (radiate at the ends) but not in straight longitudinal rows.

N. humerosa Bréb.

Bréb. in W. Sm. Brit. Diat. II, p. 93. Van Heurck Synops. p. 98, pl. XI, f. 20.

Very rare: Raftsund r.

Distribution: Coasts of the North Sea. Baltic. Arctic regions. The Mediterranean, Black Sea, Caspian Sea. The Red Sea; Indian Ocean. Sidney. Cameroon.

N. monilifera Cl.

Cl. l. c. p. 43. *N. granulata* Bréb. in Donk. Micr. Journ. VI, p. 17, pl. III, f. 19, non *N. granulata* Bail.

Very rare: The Ostnesfiord r.

var. heterosticha Cl.

Cl. l. c. *N. granulata* A. Schm. Atlas, pl. 6, figs. 15–16.

Very rare: Raftsund, r.

Distribution (of the main species): North Sea. Ceylon. Madagascar. The var. only known from Hungary, fossil.

N. latissima Greg.

Greg. Micr. Journ. IV, p. 40, pl. V, figs. 4, 4*. A. Schm. Nords. Diat. pl. I, f. 30.

Frequent: Moskenstrommen r +, Svolvær r, the Ostnesfiord r, Raftsund r, Stene r +.

Distribution: Coasts of the North Sea. Finmark. The Mediterranean. Black Sea. Indian Ocean. Pacific Ocean.

N. punctulata W. Sm.

W. Sm. Brit. Diat. I, p. 52, pl. 16, f. 151. Van Heurck Synops. p. 98, pl. 11, f. 16.

Very rare: Stamsund r.

Distribution: Coasts of the North Sea. Arctic regions. The Mediterranean. Caspian Sea. America. Indian Ocean.

N. fraudulenta A. Schm.

A. Schm. Atlas pl. 70, f. 60; Nords. Diat. pl. III, f. 18_2 (without name).

Rare: Stamsund r +. Many specimens.

Distribution: North Sea. Sebastopol.

c. ***Lineolatæ*** Cl. l. c. II. p. 10.

Radiate or parallel striæ, transversely lineate.

N. radiosa Kütz.

Kütz. Bacill. p. 91, pl. IV, f. 23. Van Heurck Synops. p. 83, pl. 7, f. 20, Incl. *Pinnularia acuta* W. Sm. Brit. Diat. I. p. 56, pl. XVIII, f. 173.

Rare: Stene, r.

Distribution: Frequent fresh water species, especially in Northern and Western Europe. Asia, Africa, America.

N. peregrina Ehrb.

Ehrb. Am. p. 133. pl. 1_1, figs. 5–6. A. Schm. Atlas pl. 47, figs. 57–60.

Very rare: Gaukværo, r.

Distribution: Brackish water. Coasts of the North Sea. Baltic. Adriatic Sea. Arctic regions. America. Pacific Ocean. Indian Ocean.

var. kefwingensis (Ehrb.) Cl.

Cl. l. c. p. 18. *Pinnularia k.* Ehrb. Berl. Ak. 1840, p. 20. *Navicula k.* A. Schm. Atlas pl. 47, figs. 61–62.

Very rare: Svolvær. 141 μ long.

Distribution: Brackish water: Scotland.

N. digito-radiata (Greg.) A. Schm.

A. Schm. Nords. Diat. p. 92, pl. III, f. 4. *Pinnularia d.* Greg. Micr. Journ. IV. pl. I, f. 32.

Frequent: Stamsund +, Svolvær r, the Ostnesfiord r, Stene r.

Distribution: Coasts of the North Sea. Arctic regions. Caspian Sea. New York.

N. directa W. Sm.

W. Sm. Brit. Diat. I, p. 56, pl. 18, f. 172. A. Schm. Atlas pl. 47, figs. 4–5 (*var. genuina* Cl. l. c. p. 27).

Rare: Stamsund r +, the Ostnesfiord r, Stene r.

Distribution: Coasts of the North Sea. Arctic regions. Yokohama.

var. remota Grun.

Grun. in Cl. et Grun. Arct. Diat. p. 39. A. Schm. Nords. Diat. pl. III, f. 2.

Somewhat rare: Stamsund +, the Ostnesfiord r, Gaukværo r.

Distribution: Coasts of the North Sea. Arctic regions. The Mediterranean. Red Sea. Central America.

var. subtilis (Greg.) Cl.

Cl. Vega p. 467. *Pinnularia s.* Greg. Diat. of Clyde, p. 488, pl. IX, f. 19.

Rare: Stene r, Gaukværø r.

Distribution: Scotland. Arctic regions.

N. finmarchica (Cl. et Grun.) Cl.

Cl. l. c. p. 28. *Stauroneis f.* Cl. et Grun. Arct. Diat. p. 47, pl. III, f. 63.

Very rare: Stene, r r. Very similar to the figure quoted, though wanting the fainter or blank lateral areas. Also very similar to *N. transitans forma minuta* Cl. Vega pl. 36, f. 37.

N. frigida Grun.

Grun. in Cl. et Grun. Arct. Diat. p. 39. Grun. Diat. Franz Jos. Land, p. 103, pl. I, f. 25. *Navicula kariana v. frigida* Cl. l. c. p. 28.

Probably derived from the plankton.

Rare: Stamsund, r +.

Distribution: Arctic regions. Cf. above p. 105.

N. cancellata Donk.

Donk. Brit. Diat. p. 55, pl. 8. figs. 4 a, b. A. Schm. Nords. Diat. pl. II, figs. 36–37.

Very variable, probably also including *N. zostereti* and *N. northumbrica*.

Very frequent: Moskenstrømmen +, Stamsund +, Svolvær +, the Ostnesfiord +, Raftsund r, Stene + c, Gaukværo c c.

Distribution: Coasts of the North Sea. Baltic. Arctic regions. The Mediterranean. Indian Ocean. Pacific Ocean. Kerguelen.

var. *Gregorii* (Ralfs.) Grun.

Grun. in Cl. and Grun. Arct. Diat. p. 37. *Navicula Gregorii* Ralfs in Pritch. Inf. p. 901. A. Schm. Nords. Diat. pl. II, f. 22.

Very rare: Stamsund r, Gaukværo r.

Distribution: Coasts of the North Sea. Baltic. Arctic regions. Pacific Ocean. Kerguelen.

N. northumbrica Donk.

Donk. Micr. Journ. I, p. 9, pl. I, f. 5. A. Schm. Atlas pl. 47, figs. 19—20.

Very rare: Stamsund r, Stene r r.

Distribution: North Sea.

N. zostereti Grun. (?)

Grun. in Wien. Verh. 1860 p. 528, pl. IV, f. 23. A. Schm. Atlas pl. 47, f. 43.

Rare: Stamsund r, Stene r, Gaukværø r.

Distribution: The Mediterranean. Indian Ocean. Pacific Ocean. Brazil.

N. fortis (Greg.) Donk.

Donk. Brit. Diat. p. 57, pl. 8, f. 8. *Pinnularia f.* Greg. Micr. Journ. IV, p. 47, pl. V, f. 19. A. Schm. Atlas pl. 46, figs. 37—39.

Perhaps only a coarse variety of *N. cancellata.*

Very rare: Stene, r.

Distribution: North Sea. Arctic regions (Spitsbergen, Finmark, Greenland).

N. rostellata (Greg.) A. Schm.

A. Schm. Nords. Diat., expl. ad pl. II („*N. rostellaria* Greg.?") *Pinnularia r.* Greg. Diat. of Clyde p. 488, pl. IX, f. 20.

Very rare: Stene, r. Probably the same species as the following one. There does, however, really exist a form answering to Gregory's figure, without a central transverse area.

Distribution: Coasts of the North Sea.

N. crucifera Grun.

A. Schm. Atlas pl. 46, figs. 50—53; Nords. Diat. pl. II, f. 31 („*rostellaria* Greg.?")

Must be reckoned as a variety to the preceding species (or vice versa).

Very rare: Stamsund r; Gaukværo r.

Distribution: Coasts of the North Sea. Baltic. The Mediterranean. Sumatra.

N. distans (W. Sm.) Cl.

Cl. l. c. p. 35. *Pinnularia d.* W. Sm. Brit. Diat. I, p. 56, pl. 18, f. 169.

Very rare: Raftsund r, Stene r.

Distribution: North Sea. Arctic regions.

N. compressicauda A. Schm.

A. Schm. Nords. Diat. p. 91, pl. II, f. 35; Atlas pl. 46, f. 62.

The peculiar aspect of the ends of the valve is due to the convexity. The valve is boatshaped with sharp stems, at the bottom of which the terminal nodules are situated. Thus they are rather distant from the very ends.

Rare: Stamsund r +.

Distribution: Coasts of the North Sea. Morocco. The Mediterranean.

N. superimposita A. Schm.

A. Schm. Nords. Diat. p. 90, pl. II, f. 34; Atlas pl. 46, f. 61.

In many respects answering to the preceding species, though undoubtedly distinct.

Very rare: Stamsund, r. Several specimens observed.

Distribution: West coast of Norway. Baltic. Morocco. China.

N. opima Grun.

N. fortis var.? opima Grun. Novara p. 100, pl. I A, f. 13. *N. opima* A. Schm. Atlas pl. 46, figs. 24—26.

Very rare: Stamsund, r.

Distribution: West coast of Norway. Baltic. Arctic regions. Barcelona.

d. ***Lævistriatæ*** Cl. l. c. p. 66.

Radiate striæ, not distinctly punctate nor lineolate. Valve more or less lanceolate.

N. palpebralis Bréb.

Bréb. in W. Sm. Brit. Diat. I. p. 50, pl. 31, f. 273. Van Heurck Synops. p. 96, pl. 11, f. 9.

Rare: Stamsund r +, Moskenstrommen r, Gaukværo r.

Distribution: Coasts of the North Sea. The Mediteranean. East coast of North America. Davis' Strait. Galapagos Islands.

var. *Barclayana* (Greg.) VH.

VH. Synops. p. 97, pl. 11, f. 12. *Navicula B.* Greg. Diat. of Clyde p. 480, pl. IX, f. 9.

Rare: Stamsund, r.

Distribution: Coasts of the North Sea. The Mediterranean.

var. *semiplena* (Greg.) Cl.

Cl. l. c. p. 70. *Pinnularia s.* Greg. Micr. Journ. VII, p. 84, pl. VI, f. 12.

Rare: Stamsund, r.

Distribution: Scotland. Finmark. Spitsbergen.

var. *angulosa* (Greg.) VH.

Van Herrck Synops. pl. 11, f. 10. *Navicula a.* Greg. Micr. Journ. IV, p. 42, pl. V, f. 8. A. Schmidt Nords. Diat. pl. II, f. 19.

Rather frequent: Stamsund +, Stene r, Gaukværo r +.

Distribution: Coasts of the North Sea and Western Europe. The Mediterranean.

var. *minor* Grun.

Grun. in Cl. et Grun. Arct. Diat. p. 30, pl. 1, f. 23. *Navicula m.* Greg. Diat. of Clyde p. 477, pl. IX, f. 1.

Rare: Stamsund r, Gaukværo r.

Distribution: Finmark. Belgium.

N. præsecta A. Schm.

A. Schm. Nords. Diat. pl. II, f. 20.

Recalls the *var. semiplena* of the preceding species (cf. Cl. l. c. p. 70), but has a much finer structure. Striæ 15 on 10 μ. An obscure line is to be seen between the central area and the margin. Perhaps a species of *Caloneis.*

Very rare: Stamsund r. 53 μ long.

Distribution: West coast of Norway. Bohuslän (Sweden).

e. ***Lyratæ*** Cl. l. c. p. 52.

N. prætexta Ehrb.

Ehrb. 1840, Mikrogeolog. pl. 19. f. 28 *(Pinnularia p.)*. Van Heurck Synops. p. 92, pl. IX, f. 13.

Not unfrequent: Moskenstrømmen +, Stamsund r, Svolvær r, Raftsund r, Stene r.

Distribution: Coasts of the North Sea. The Mediterranean. Red Sea. Indian Ocean. Pacific Ocean. Kerguelen. Cape Horn. America.

N. Hennedyi W. Sm.

W. Sm. Brit. Diat. II. p. 93. A. Schm. Nords. Diat. pl. I. f. 41.

Very variable.

Frequent: Stamsund c, the Ostnesfiord r, Brettesnes—Skroven r, Raftsund +, Stene r +.

Distribution: Coasts of the North Sea. Arctic regions. The Mediterranean. Red Sea. Indian Ocean. Pacific Ocean. Atlantic Ocean.

var. circumsecta Grun.

Grun. in A. Schm. Nords. Diat. p. 89, pl. I, figs. 36, 42 *(N. polysticta var. c.)*.

Frequent: Stamsund + c, Raftsund r, Stene +.

Distribution: Coasts of the North Sea. Finmark. The Mediterranean. Red Sea. Indian Ocean. America.

Besides, a fine variety from Stamsund, r, with short marginal striæ between the main ones.

N. spectabilis Greg.

Greg. Diat. of Clyde p. 481. pl. IX, f. 10. A. Schm. Atlas, pl. 3. figs. 20—21.

Though usually easily recognizable, this species is scarcely distinct from all forms of the very variable *N. lyra* (cfr. Cl. l. c. p. 60).

Not unfrequent: Moskenstrømmen r +, Stamsund r +, Svolvær r, Raftsund r, Stene r +.

An analogous variety to that of *N. Hennedyi*, with more numerous marginal striæ, occurs (Stene, r).

Distribution: Coasts of the North Sea. Greenland. The Mediterranean. Red Sea. Indian Ocean. Pacific Ocean. Cape Horn.

N. abrupta (Greg.) Donk.

Donk. Brit. Diat. p. 13. pl. II, f. 6. A. Schm. Nords. Diat. pl. I, f. 37. *N. lyra var. a.* Greg. Diat. of Clyde p. 486. pl. IX. figs. 14. 14 b.

Frequent: Moskenstrømmen r, Stamsund r, Svolvær + c, the Ostnesfiord c, Raftsund r, Stene +, Gaukværo + c.

Distribution: Coasts of the North Sea. Finmark. Spitsbergen. The Mediterranean. Black Sea. Red Sea. Indian Ocean. China.

N. clavata Greg.

Greg. Micr. Journ. IV, p. 46, pl. V, f. 17. A. Schm. Nords. Diat. pl. I. f. 33.

Characteristic form, though hardly specifically different from certain varieties of *N. lyra*.

Not unfrequent: Moskenstrømmen r, Stamsund r, Svolvær r, the Ostnesfiord r, Raftsund r +, Stene r.

Distribution: Coasts of the North Sea. The Mediterranean. Red Sea. Indian Ocean. Pacific Ocean. East coast of America.

N. lyra Ehrb.

Ehrb. Amer. p. 131. pl. I. I, f. 9. Van Heurck Synops. p. 93. pl. 10. f. 1. *N. lyra var. Ehrenbergii* Cl. l. c. p. 63.

Somewhat rare: Moskenstrømmen r, Stamsund r +, Svolvær +, the Ostnesfiord r, Stene r.

Distribution: Coasts of the North Sea. The Mediterranean. Red Sea. Indian Ocean. Pacific Ocean. America.

var. elliptica A. Schm.

A. Schm. Nords. Diat. pl. I. f. 39. Van Heurck Synops. pl. 10, f. 2.

Very frequent: Stamsund +, Svolvær +, Raftsund +, Brettesnes—Skroven r, Stene c, Gaukværo +.

Distribution: Coasts of the North Sea. The Mediterranean. Red Sea. Indian Ocean. Philippines.

var atlantica A. Schm.

A. Schm. Nords. Diat. pl. I, f. 34.

Very characteristic. Recalls sometimes *N. abrupta*, but always easy to distinguish from that species.

Rare: Stamsund r +, Moskenstrømmen r.

Distribution: Coasts of the North Sea.

N. forcipata Grev.

Grev. in Micr. Journ. VII, p. 83. pl. VI, figs. 10—11. A. Schm. Nords. Diat. pl. I, f. 45: pl. II, figs. 16, 18.

Frequent: Stamsund c, Raftsund r. Stene r, Gaukværo + c.

Distribution: Coasts of the North Sea, frequent. Greenland. The Mediterranean. Black Sea. Red Sea. Cape of Good Hope. Indian Ocean. Pacific Ocean. Florida.

var. versicolor (Grun.) Grun.

Grun. in V. H. Synops. pl. X, f. 6. *Navicula v.* Grun. in A. Schm. Nords. Diat. pl. II. f. 17.

A very well marked variety.

Rare: Stamsund. +.

Distribution: North Sea. The Mediterranean. Sumatra.

N. pygmæa Kütz.

Kütz. Sp. Alg. p. 77. Van Heurck Synops. p. 94. pl. 10. f. 7.

It is hardly possible to keep this species distinct from certain varieties of the preceding species (cfr. Cl. l. c. p. 66).

Very rare: Stamsund r, Stene r.

Distribution: Brackish water: Coasts of the North Sea. Baltic. Arctic regions. America.

Pinnularia Ehrb.

a. ***Capitatæ*** Cl. Synops. Navic. Diat. II, p. 75.

P. microstauron Ehrb.

A. Schm. Atlas pl. 44. f. 16.

Very rare: Raftsund, r.

Distribution: Fresh water species. Arctic regions. Northern Europe. North America.

P. nobilis Ehrb.

Ehrb. Berl. Ak. 1840, p. 214. A. Schm. Atlas pl. 43, f. 1.

Rare: Stene r; the Ostnesfiord r.

Distribution: Fresh water species, especially frequent in Northern and Western Europe.

b. ***Divergentes*** Cl. l. c. p. 77.

P. legumen Ehrb.

Ehrb. Mikrogeol. pl. II, 2, f. 12. *Navicula l.* A. Schm. Atlas pl. 44, figs. 44—47.

Very rare: The Ostnesfiord, r.

Distribution: Fresh water species, frequent especially in Northern and Western Europe. Africa. Asia. Australia. America.

P. divergens W. Sm.

W. Sm. Brit. Diat. I, p. 57, pl. 18, f. 177. *Navicula d.* A. Schm. Atlas pl. 44, f. 9.

Very rare: The Ostnesfiord, r.

Distribution: Fresh water species, frequent especially in Northern and Western Europe. Asia. Australia. America.

c. ***Distantes*** Cl. l. c. p. 80.

P. lata (Bréb.) W. Sm.

W. Sm. Brit. Diat. I, pl. 18, f. 167. *Frustulia lata* Bréb. Cons. p. 18.

Frequent: Svolvær r, Raftsund r, the Ostnesfiord r, Stene + c.

Distribution: Fresh water species. Arctic regions. Western Europe. Switzerland. Australia.

P. borealis Ehrb.

Ehrb. Am. pl. 1, 2, f. 6 *Navicula b.* A. Schm. Atlas pl. 45, figs. 15—21.

Very rare: Stamsund, r r.

Distribution: Frequent fresh water species, especially in arctic and alpine regions: Northern and Western Europe; Switzerland. Asia. Africa, America and Australia.

d. ***Marinæ*** Cl. l. c. p. 94.

P. quadratarea (A. Schm.) Cl.

A. Schm. Nords. Diat. p. 90, pl. 11, f. 26. *Navicula pinnularia* Cl. Svensk. N. Diat. p. 224, pl. IV, figs. 1—2 (earlier name).

Frequent: Stamsund +, Svolvær r, the Ostnesfiord r, Stene r +, Gaukværø + c.

Distribution: Coasts of the North Sea. Arctic regions, frequent. The Mediterranean. Australia.

P. claviculus (Greg.) Cl.

Cl. l. c. p. 96. *Navicula c.* Greg. Diat. of Clyde, p. 478, pl. IX, f. 5. A. Schm. Nords. Diat. pl. 11, f. 28.

Rare: Stamsund r +, Gaukværø r.

Distribution: Coasts of the North Sea. Sweden. Balearic Islands.

P. cruciformis Donk.

Donk. Micr. Journ. (n. s.) I, p. 10, pl. I, f. 7. A. Schm. Nords. Diat. pl. 11, f. 25

Rare: Stamsund r, Svolvær r, Gaukværø r.

Distribution: Coasts of the North Sea. Finmark. Baltic. West Indies. Cape Horn. Seychelles.

P. Trevelyana (Donk.) Rabenh.

Rabenh. Fl. Eur. Algar I, p. 210. *Navicula T.* Donk. Micr. Journ. I, 1861, p. 8, pl. 1, f. 2.

Rare: Stamsund r, Svolvær r, Stene r.

Distribution: Coasts of the North Sea. Florida. Japan.

Diploneis Ehrb., Cl. Synops. Navic. Diat. I, p. 76.

The material examined was especially rich in forms of this beautiful genus. For the sake of greater clearness, they are arranged in the two groups Didymæ and Ellipticæ, although these groups by some intermediate forms pass into each other.

a. ***Ellipticæ*** V. H. Synops.

D. hyalina (Donk.) Cl.

Cl. l. c. p. 80. *Navicula h.* Donk. Micr. Journ. I, p. 10, pl. 1, f. 6. A. Schm. Atlas pl. 70, figs. 1—5.

Very rare: Stamsund, r.

Distribution: Coasts of the North Sea. Finmark.

D. coffeæformis (A. Schm.) Cl.

Cl. l. c. p. 81. *Navicula c.* A. Schm. Nords. Diat. p. 88, pl. 1, f. 22; pl. 11, f. 13.

Perhaps a variety of the following species.

Rare: Stamsund, r +.

Distribution: Coasts of the North Sea. Naples. Macassar Straits.

D. suborbicularis (Greg.) Cl.

Cl. l. c. p. 81. *Navicula Smithii var. s.* Greg. Diat. of Clyde p. 487, pl. IX, f. 17.

Somewhat rare: Stamsund +, Svolvær r.

Distribution: Coasts of the North Sea. Davis' Strait. The Mediterranean. Caspian Sea. Indian Ocean. America.

D. eudoxia (A. Schm.)

Navicula e. A. Schm. Atlas pl. VIII, f. 40, pl. 70, f. 71. *N. mediterranea* A. Schm. Nords. Diat., pl. II, f. 10, non Kütz. *D. contigua var. eudoxia* Cl. l. c. p. 83.

This beautiful species is so easily recognizable and seems to be so well distinguished from the following that I prefer to keep them separate instead of referring both to *D. contigua*, as Cl. (l. c. p. 82) does.

Rare: Stamsund r +, Raftsund r.

Distribution: West coast of Norway. The Mediterranean. Red Sea. Indian Ocean. Galapagos Islands.

D. sejuncta (A. Schm.).

Navicula s. A. Schm. Nords. Diat. p. 87, pl. I, f. 18. *N. eugenia* A. Schm. Atlas pl. 8, figs. 44—45. *Diploneis contigua* (A. Schm.) *var eugenia* Cl. l. c. p. 83.

This species is certainly a *Diploneis*, not a *Caloneis* as Cl. l. c. supposes. A. Schm. (Nords.) compares it with *D. nitescens* and mentions it *(N. eugenia)* another time (Atlas l. c.) as a connecting link between *D. nitescens* and *D. eudoxia.*

Horns of the central nodule not plainly separated. Now and then, the division line is, however, seen. Costæ apparently lineate; the very faint longitudinal lines form a single row of alveoli between the costæ. Sometimes the valves are a little constricted in the middle.

I can find no essential difference between this form and *N. eugenia*. The costæ in the latter are stated to be 8—9 on 10 μ, in the former 12. The structure of *D. sejuncta* is, however, somewhat variable, and answers perhaps best to 10 costæ on 10 μ.

There is also a remarkable agreement in their occurrence, as both are mentioned from Campeachy Bay.

Very rare: Stamsund r +, here in rather large numbers.

Distribution (of *N. sejuncta* A. Schm.): West coast of Norway (Hvidingsø). Campeachy Bay.

Distribution of *N. eugenia* A. Schm.: Ceylon. Macassar Straits. Campeachy Bay.

D. notabilis (Grev.) Cl.

Cl. l. c. p. 93. *Navicula notabilis* Grev. Micr. Journ. XI, p. 18, f. 9.

var. expleta A. Schm.

A. Schm. Nords. Diat. pl. I, f. 20, pl. II, f. 11.

Rare: Stamsund r, Raftsund r, Stene r, Gaukværø r.

Distribution: Coasts of the North Sea. The Mediterranean. Black Sea. Red Sea. Indian Ocean. Pacific Ocean. West Indies. Brazil.

D. fusca (Greg.) Cl.

Cl. l. c. p. 93. *Navicula fusca* A. Schm. Atlas pl. 7, figs. 2—3 (*var. norvegica* Cl. l. c.).

This species is exceedingly variable and includes probably *D. hyperborea* and *D. æstiva*. Even the limit towards *D. Smithii* seems not to be reliable.

Frequent: Moskenstrømmen r, Stamsund +, Svolvær +, the Østnesfiord r, Raftsund r, Stene r, Gaukværø +.

var. Gregorii Cl. l. c. p. 94.

Navicula Smithii var f. Greg. Diat. of Clyde IX, f. 15.

Large, beautiful form. Differs from the main species in the same way as *D. major* Cl. from *D. Smithii*. Central nodule elongated; terminal nodules distant from the ends.

Very rare: Stamsund, r.

Distribution: Coasts of the North Sea. Naples.

D. hyperborea (Grun.) Cl.

Cl. l. c. p. 95. *Navicula hyperborea* Grun. Wien Verh. 1860 p. 531. pl. III. f. 16.

Furrows swelling round the central nodule.

Rare: Stene r, the Østnesfiord r, Stamsund r.

Distribution: Bohuslän (Sweden).

var. excisa A. Schm.

Navicula fusca v. excisa A. Schm. Nords. Diat. pl. II, f. 9.

Beautiful and characteristic form. Large, conspicuous pearls as in *D. fusca var. Gregorii*.

Rare: Stamsund, r +.

Distribution: West coast of Norway.

D. Smithii (Bréb.) Cl.

Cl. l. c. p. 96. *Navicula Smithii* Bréb. in W. Sm. Brit. Diat. II. p. 92. A. Schm. Atlas pl. 7, figs. 16—17.

Exceedingly variable, probably also including *D. major* and *D. borealis*.

Very frequent: Moskenstrømmen r, Stamsund c, the Østnesfiord r, Raftsund r, Stene c, Gaukværø c.

Distribution: Coasts of the North Sea. Baltic. Arctic regions. The Mediterranean. Indian Ocean. Pacific Ocean. Central America.

D. major Cl.

Cl. l. c. p. 96. *Navicula Smithii* A. Schm. Atlas, pl. VII, f. 19.

Beautiful form, but hardly anything other than a coarse variety of *D. Smithii*. It seems quite impossible to keep it distinct from large forms of the latter species, with coarser structure.

The central nodule is usually broadened, broader than the distance between the horns, while it, in *D. Smithii*, is of equal breadth. The terminal nodules are generally distant from the ends, while they in *D. Smithii* lie close to them. Both these characteristics are, however, unreliable. Thus forms occur, which, on account of the structure and the terminal nodules, should be referred to *D. major*, but on account of the form of the central nodule to *D. Smithii*, and vice versa.

Not unfrequent: Moskenstrømmen +, Stamsund r +, Stene r.

Distribution: Coasts of the North Sea. The Mediterranean. Indian Ocean. Pacific Ocean.

D. borealis (Grun.) Cl.

Cl. l. c. p. 96. *Navicula Smithii var. borealis* Grun. Diat. Franz Jos. Land p. 56, pl. I. f. 40.

Furrows swelling round the central nodule.

Frequent: Stamsund cc, Stene r, the Østnesfiord r, Gaukværø r.

My specimens differ somewhat from Grunow's figure, especially in the central nodule, which is not elongated. The double rows of pearls between the costæ are very delicate, but are now and then distinctly seen. Agree very well with the description in Grunow l. c.

Distribution: Sweden (Bohuslän). Arctic regions. Java.

D. litoralis (Donk.) Cl.

Cl. l. c. p. 94. *Navicula l.* Donk. Brit. Diat. p. 5. pl. I. f. 2. A. Schm. Nords. Diat. pl. I. figs. 24—25 („*var. subtilis*“).

Very rare: Stamsund, r.

Distribution: Coasts of the North Sea. Arctic regions. The Mediterranean. Indian and Pacific Oceans.

D. nitescens (Greg.) Cl.

Cl. l. c. p. 97. *Navicula Smithii var. nitescens* Greg. Diat. of Clyde p. 487, pl. IX, f. 16.

Somewhat rare: Stamsund +, Stene r, Gaukværø r.

Distribution: Coasts of the North Sea. The Mediterranean. Black Sea. Indian Ocean. Pacific Ocean. Central America.

b. ***Didymæ*** VH. Synops.

D. constricta (Grun.) Cl.

Cl. l. c. p. 83. *Navicula c.* Grun. in Wien Verh. 1860, p. 535, pl. III. f. 18. *N. Donkinii* A. Schm. Nords. Diat. pl. I. f. 12, pl. II, f. 8.

Coarser structure than in the following species, horns of the central nodule more divergent, and obtuse angles in the lateral contour. At a certain focus, a few very indistinct oblique longitudinal costæ are sometimes to be seen.

Not unfrequent: Stamsund + c, the Østnesfiord r, Stene r.

Distribution: Coasts of the North Sea. Finmark. Balearic Islands. Ceylon. Florida.

D. incurvata (GREG.) CL.

CL. l. c. p. 84. *Navicula i.* GREG. Micr. Journ. IV. p. 44. pl. V. f. 13. A. SCHM. Nords. Diat. pl. 1. figs. 10—11; pl. II, f. 6.

Frequent: Stamsund + c, Stene r +.

Distribution: Coasts of the North Sea. Finmark. America.

D. interrupta (KÜTZ.) CL.

CL. l. c. p. 84. *Navicula i.* KÜTZ. Bacill. p. 100, pl. 29. f. 93. A. SCHM. Nords. Diat. pl. 1, f. 8.

Somewhat rare: Stamsund r, the Ostnesfiord r, Raftsund r, Stene r.

Distribution: Brackish water. Coasts of the North Sea. Baltic. Arctic regions. The Mediterranean. Red Sea. Indian Ocean. Pacific Ocean. East coast of America.

D. lineata (DONK.) CL.

CL. l. c. p. 85. *Navicula l.* DONK. Micr. Journ. VI, p. 32, pl. III, f. 17. A. SCHM. Nords. Diat. pl. I, figs. 16—17.

Rare: Stamsund r, Stene r. Both forms illustrated by A. SCHM. l. c., occur.

Distribution: Coasts of the North Sea. The Mediterranean.

D. subcincta (A. SCHM.) CL.

CL. l. c. p. 86. *Navicula s.* A. SCHM. Nords. Diat. pl. II. f. 7.

Very variable. Structure coarse, coarser than in the preceding species.

Frequent: Svolvær r +, the Ostnesfiord r +, Raftsund r, Stene + c.

Distribution: Coasts of the North Sea. Arctic regions. The Mediterranean. Indian Ocean.

var. media (GRUN.)

Navicula bomboides var. media GRUN. Arct. Diat. p. 41, pl. III, f. 54; Diat. Franz Jos. Land pl. I, f. 39 *(N. subcincta). Diploneis entomon* CL. Synops. Navic. Diat. I, p. 87.

Two, or a few, broad, irregular longitudinal costæ, anastomosing through oblique ones.

This form is very remarkable. By CLEVE it has been referred to *D. entomon* (cf. under that species), by GRUNOW as a variety to *D. bomboides*. GRUN. has, however, noted the close relationship to *D. subcincta*. As this species is very variable as regards the development of longitudinal costæ, and often shows similar peculiarities as the present variety, I have thought it best to consider the latter a variety of *D. subcincta*, though it is, on the whole, so characteristic that it might very well be regarded as a separate species.

I also think I have seen forms distinctly transitional to *N. subcincta*. Such forms are, however, rare.

Not unfrequent: Stamsund r +, the Ostnesfiord r +, Raftsund r, Stene r.

Distribution: Arctic regions.

D. entomon.

Regarding the interpretation of this name CL. l. c. is not quite clear. His species seems to be = A. SCHM. Nords. Diat. pl. I, f. 14, a figure, on which the longitudinal costæ are very indistinct. CL. quotes, however, also A. SCHM. l. c. f. 13, a figure which undoubtedly represents another species. A. SCHM. himself remarks that these two figures cannot be referred to the same species, but that GRUNOW considers them to be *D. entomon* EHRB.

CLEVE's species is partly identical with *D. bomboides var. media* GRUN. (in CL. et GRUN. Arct. Diat. p. 41, pl. III, f. 54), a form, which, according to GRUNOW, is an intermediate one between *D. bomboides* and *subcincta*. This *var. media* I have referred to *D. subcincta* (cf. above). It is hardly essentially different from that form from Franz Jos.'s Land, which GRUN. illustrates (Diat. F. J. L. pl. I, f. 39) as *Navicula subcincta*. In this figure the irregular ramification of the longitudinal costæ is seen, producing two anastomosing ones.

The figures from A. SCHM. Atlas (pl. 13, figs. 48—49) referred to by CL. l. c. represent a species, which I have not seen, and which hardly occurs with us.

D. entomon of VAN HEURCK Traité p. 195, pl. 26. f. 732 is a different species, identical with A. SCHM. Nords. Diat. pl. I, f. 13. This figure seems, however, to represent a form of *D. constricta*. The furrows, especially, answer very well to the latter species. VAN HEURCK who is on the whole conservative on the question of species, also mentions the near relationship between *D. entomon* and *D. incurvata*, a species which again is very nearly connected with *D. constricta*.

When CLEVE l. c. remarks that *D. entomon* by intermediate forms passes into *D. splendida*, this also shows clearly that his species is different from that of A. SCHMIDT (f. 13) and VAN HEURCK.

The furrows of *D. entomon* CL. answer very well to those of *D. bomboides*, less so to those of *D. splendida*.

I have, however, never seen specimens where it was doubtful, whether they should be referred to *D. entomon* CL. (= *bomboides var. media* GRUN.) or *D. bomboides*.

D. entomon EHRB. Mikrogeologie pl. 33. XVII, f. 13 has the shape of *D. constricta*, but very narrow furrows. *D. entomon* EHRB. l. c. may be VAN HEURCK's species (A. SCHM. Nords. Diat. pl. I, f. 13); the specimen seems to lie somewhat obliquely, which may have caused the median constriction of the furrows.

D. splendida (GREG.) CL.

CL. l. c. p. 87. *Navicula s.* GREG. Micr. Journ. IV, p. 44. pl. V, f. 14. A. SCHM Nords. Diat. pl. I, figs. 3—4; pl. II, f. 2.

This beautiful species is very similar to *D. bomboides*, but the furrows do not swell in the middle and narrow evenly elliptically off towards the ends. The costæ, besides, distinctly cross the furrows at the sides of the central nodule (i. e., in the furrows are here distinct transverse costæ), while these furrows else are almost smooth. The median structure of the valve generally is a little coarser, the areoles here somewhat larger.

I have seen no distinct transition between *D. splendida* and the other species.

Somewhat rare: The Ostnesfiord r +, Raftsund r, Stene r +.

Distribution: Coasts of the North Sea. Arctic regions (Finmark, Baren Eiland, Spitsbergen, Greenland). Indian Ocean. Pacific Ocean. West Indies. Florida.

D. bomboides (A. SCHM.) CL.

CL. l. c. p. 88. *Navicula b.* A. SCHM. Nords. Diat. pl. I, f. 2.

Similar to the preceding species, but the furrows swell slightly round the central nodule, and the structure here is like that of the other parts of the valve. The furrows are also more protracted towards the ends, and not conspicuously crossed by transverse costæ at the sides of the central nodule.

Always easy to distinguish from the preceding species.

Frequent: Stamsund + c, Brettesnes Skroven r +, Raftsund r +, Stene r +.

Distribution: Coasts of the North Sea. Alexandria. Indian Ocean. Pacific Ocean. Central America.

D. didyma (Ehrb.) Ehrb.

Ehrb. Mikrogeolog. pl. 19. f. 32. *Pinnularia d.* Ehrb. Kreideth. p. 75. *Navicula didyma* A. Schm. Nords. Diat. pl. I, f. 7.

Not unfrequent: Moskenstrommen r, Svolvær r +, the Ostnesfiord r, Raftsund r, Stene r.

Distribution: Especially in brackish water. Coasts of the North Sea. Arctic regions. Baltic. Black Sea. Caspian Sea. Indian Ocean. Pacific Ocean. Cape Horn. West Indies.

D. bombus Ehrb.

Ehrb. Mikrogeol. pl. 19. f. 31. *Navicula b.* Greg. Diat. of Clyde, p. 484, pl. IX. f. 12. *N. gemma* A. Schm. Nords. Diat. pl. I. f. 1; pl. II, f. 1.

Frequent: Moskenstrømmen r +, Stamsund c, Svolvær +, the Ostnesfiord r, Raftsund r, Stene +, Gaukværø r +.

Distribution: Coasts of the North Sea and Western Europe. Finmark. The Mediterranean. Black Sea. Caspian Sea. Indian Ocean. Pacific Ocean. America.

D. chersonensis (Grun.) Cl.

Cl. l. c. p. 91. *Navicula c.* Grun. in A. Schm. Atlas pl. 12, f. 40; pl. 69, f. 21. *Navicula apis* (Donk.) A. Schm. Nords. Diat. pl. 1. f. 9.

Not unfrequent: Stamsund +, Svolvær r, Gaukværø r.

Distribution: Coasts of the North Sea. The Mediterranean. Indian Ocean. Pacific Ocean. West Indies. Florida.

D. crabro Ehrb.

Mikrogeol. pl. 19, figs. 29 a, b (non c). A. Schm. Nords. Diat. pl. I. figs. 5—6; pl. II, f. 4. *D. crabro var. multicostata* (Grun.) Cl. l. c. p. 102. *Navicula multicostata* Grun. Wien Verh. 1860, p. 524. pl. III. f. 13.

Rather frequent: Moskenstrømmen r, Stamsund +, the Ostnesfiord +, Raftsund r, Stene r, Gaukværø r +.

Distribution: Coasts of the North Sea and Western Europe. The Mediterranean. Red Sea. Indian Ocean. Pacific Ocean. West Indies.

var. pandura (Bréb.) VH.

Van Heurck Synops. pl. 9, f. 1. *Navicula pandura* Bréb. Diat. Cherb. f. 4. A. Schm. Nords. Diat. pl. II, f. 3.

Peculiar form with tongue-shaped segments.

Very rare: Gaukværo, r r.

Distribution: Coasts of the North Sea and Western Europe. The Mediterranean. Red Sea. Indian Ocean. Pacific Ocean. America.

Frustulia Ag.

F. rhomboides (Ehrb.) De Toni.

De Toni Syll. p. 277. *Navicula rhomboides* Ehrb. Amer. pl. 3, I, f. 15. *Vanheurckia r.* Bréb. Ann. Soc. phyt. Belg. I, p. 204. V. H. Synops. p. 112, pl. 17, figs. 1—2.

Very rare: Svolvær r, Brettesnes—Skroven r.

Distribution: Fresh water species, rather common.

Stenoneis ***inconspicua*** (Greg.) Cl.

Cl. Synops. Navic. Diat. I, p. 124. *Navicula? i.* Greg. Diat. of Clyde p. 478 pl. IX, f. 3. *N. fistula* A. Schm. Nords. Diat. pl. II, f. 29.

Frequent: Moskenstrommen r, Stamsund r, Gaukværø + c.

Distribution: Coasts of the North Sea. Bohuslän (Sweden). Balearic Islands. Arctic regions.

Trachyneis ***aspera*** (Ehrb.) Cl.

Cl. Synops. Navic. Diat. I, p. 191. *Stauroptera a.* Ehrb. Amer. pl. 1, figs. 1—2; Mikrogeol. pl. 35 A. XXIII. f. 13. *Navicula a.* Van Heurck Synops. pl. X. f. 13 (*var. genuina* Cl.).

Common: Moskenstrommen r, Stamsund + c, Svolvær +, the Ostnesfiord c, Raftsund r +, Stene c, Gaukværø +.

Distribution: Cosmopolitan.

Mastogloia Thw.

M. exigua Lewis.

Lewis Proc. Ac. Nat. Sc. Philad. 1861 p. 65. pl. II, f. 5. Van Heurck Synops. p. 70, pl. 4. figs. 25—26.

Very rare: Svolvær, r.

Distribution: Brackish and marine: Baltic. Belgium. Atlantic coast of America. Behring Island.

M. Smithii Thw.

W. Sm. Brit. Diat. II. p. 65. pl. 54. f. 341. Van Heurck Synops. p. 70, pl. 4. f. 13.

Very rare: Svolvær, r.

Distribution: In brackish water. Baltic. England. Saxony. Caspian Sea. Australia.

M. apiculata W. Sm.

W. Sm. Brit. Diat. II, p. 65. pl. 62. f. 387. A. Schm. Atlas pl. 185, f. 43; pl. 186. f. 23.

Very rare: Svolvær, r.

Distribution: Coasts of the North Sea and Western Europe. The Mediterranean. Black Sea. China.

17. *Cymbelleæ.*

Cymbella Ag.

C. cistula (Hempr.) Kirchn.

Van Heurck Synops. p. 64. pl. 2. figs. 12—13.

Very rare: Brettesnes—Skroven, r.

Distribution: Fresh water species, frequent in arctic, northern or alpine localities. Also in slightly brackish water.

C. cymbiformis (Ag.?) V. H.

Van Heurck Synops. p. 63, pl. II, figs. 11 a—c.

Very rare: Stamsund r, the Ostnesfiord r.

Distribution: Frequent fresh water species, especially from Northern and Western Europe. Arctic regions Asia, Africa, America and Australia.

Amphora Ehrb.

Amphora Cl. s. s.. Synops. Navic. Diat. II. p. 100.

Valves with transverse rows of coarse puncta, forming longitudinal lines, or strong transverse costæ, crossed by longitudinal ones. Connecting zone simple.

A. proteus Greg.

Greg. Diat. of Clyde p. 518, pl. XIII. f. 81. A. Schm. Atlas, pl. 27. f. 3.

Very variable.

Frequent: Stamsund +, Svolvær r, Raftsund r, Stene +, Gaukværø + c.

Distribution: Coasts of the North Sea. Arctic regions. The Mediterranean. Black Sea. The Atlantic, Indian and Pacific Oceans.

var. contigua Cl.

Cl. l. c. p. 103. A. Schm. Atlas, pl. 28. f. 4.

Perhaps a separate species.

Not unfrequent: Stamsund r, Svolvær r, the Ostnesfiord r.

Distribution (of *var. contigua* Cl.): North Sea. The Adriatic. Labuan. New Caledonia.

A. robusta Greg.

Greg. Diat. of Clyde p. 519, pl. XIII, f. 79.

Not unfrequent: Stamsund r, the Ostnesfiord +.

Distribution: Coasts of the North Sea. Spitsbergen. The Mediterranean. Macassar Strait. Pacific Ocean.

A. ovalis Kütz.

Kütz. Synops., figs. 5—6. Van Heurck Synops. p. 59, pl. 1, f. 1.

Very rare: Stamsund, r.

Distribution: Fresh or slightly brackish water. Frequent in Northern and Western Europe. Arctic regions.

b. ***Diplamphora*** Cl. l. c. p. 107.

Connecting zone complex, with more or less numerous longitudinal divisions and transverse striæ or costæ. Valves with transverse costæ, or rows of puncta, on the dorsal side with one or two longitudinal lines.

A. crassa Greg.

Greg. Micr. Journ. V, p. 72, pl. I, f. 35; Diatoms of Clyde p. 524, pl. XIV, f. 94. A. Schm. Atlas pl. 39. f. 30.

Rare: Stamsund r, Svolvær r, Stene r.

Distribution: Coasts of the North Sea. Arctic regions. The Mediterranean. Indian Ocean. China.

var. solsvigiensis Petit.

Petit Diat. Cap Horn, p. 120, pl. X, f. 15, p. p. A. Schm. Atlas pl. 48, f. 17.

Beautiful form.

Very rare: Stamsund, r. 111 × 18 μ; costæ $4^1/_2$ on 10 μ, lineate. Strong longitudinal line. The costæ answer to the fig. 18 in A. Schm. Atlas, the margin of the ventral side to fig. 17 (these figures thus correspond to different focussing).

A. Græffii Grun.

Grun. in A. Schm. Atlas pl. 25, fig. 40.

Very rare: Stamsund, r. 63 × 14 μ; striæ 17 on 10 μ, crossed on the dorsal side by a blank line. Ends little protracted. Axial area a little constricted in the middle.

Not unfrequent: Stamsund r +, Stene +, Gaukværø r.

Distribution: Naples. Indian Ocean. Pacific Ocean.

A. Grevilleana Greg.

Greg. Micr. Journ. V, p. 73, pl. I. f. 36. Diat. of Clyde p. 522, pl. 13, f. 89. A. Schm. Atlas pl. 25. f. 41. *A. fasciata* Greg. l. c. pl. 13. f. 90 (cfr. Cl. l. c.).

Rare: Stamsund r, Stene r.

Distribution: Coasts of the North Sea and Western Europe. Spitsbergen. The Mediterranean. Pacific Ocean. Central America.

A. sulcata Bréb.

Bréb. Diat. Cherb. f. 8. Greg. Diat. of Clyde p. 523. pl. XIII, figs. 92. 92 b. Cl. l. c. p. 112.

Very rare: Stamsund r, the Ostnesfiord r. 15 striæ on 10 μ. 74 μ long. Corresponds exactly to the figures and description in Gregory l. c. Also tolerably well answering to Cleve's species.

Distribution: West coast of Europe. Balearic Islands.

A. Mülleri A. Schm.

A. Schm. Atlas pl. 26, f. 31. *A. monilifera* Greg.? Diat. of Clyde, p. 511, pl. XII, f. 69.

Very rare: Stamsund, r. Valve 73 × 11 μ, with $7^1/_2$ striæ on 10 μ, obtuse. The ventral side as illustrated by A. Schm., rather narrow, towards the ends broader, then again narrowing. The raphe is not so distinctly bent as in the figure. On the broader part of the ventral side, inside the marginal striæ, there is a band of short striæ, as in *A. proteus*, separated from the marginal striæ by a blank line. Dorsal striæ, as in the figure mentioned, crossed by a broad blank, longitudinal line. Another sharp line is seen close to the dorsal margin.

Distribution: West coast of Norway (Hvidingsø).

A. alata Perag.

Perag. Diat. de Villefr. p. 41, pl. II, f. 11. Van Heurck Traité d. Diat. pl. 24, f. 677.

Very rare: Stamsund, r.

Distribution: West coast of Norway. Morocco. The Mediterranean. Macassar Straits. America.

A. binodis Greg.

Greg. Diat. of Clyde p. 510, pl. XII. f. 67. Cl. l. c. p. 124.

Very rare: Stamsund, r. 34 μ long. Completely answering to the illustration in Greg. l. c.

Distribution: Scotland. Balearic Islands.

c. ***Halamphora*** Cl. l. c. p. 117.

Connecting zone complex. Raphe close to the ventral margin. Transverse, punctate striæ, not crossed by any longitudinal line. Ends of the valve usually rostrate or capitate.

A. macilenta Greg.

Greg. Diat. of Clyde p. 510, pl. XII, f. 65. Cl. l. c. p. 121.

Answers best to *A. crygadensis* (Greg. l. c. p. 512, pl. XII, f. 71, which by Cleve l. c. — probably rightly — is considered a variety of *A. macilenta*. Frustule 48 × 19 μ, with rather narrow connecting zone. 11 striæ on 10 μ.

Very rare: Stamsund, r.

Distribution: Coasts of Sweden and Scotland. The Mediterranean. Macassar Straits.

A. eunotia Cl.

Cl. Diat. Arct. Sea. p. 21, pl. III, f. 17. *A. cymbifera var.* A. Schm. Atlas pl. 25, f. 35.

Very rare: Stamsund, r.

Similar to an *Amphora terroris*, with distinctly punctate transverse striæ. Valve 80 × 15 μ; its ends a little capitate-rostrate. Striæ $7\frac{1}{2}$ on 10 μ.

Distribution: Bohuslän (Sweden). Arctic regions. Indian Ocean.

A. costata W. Sm.

W. Sm. Brit. Diat. I. p. 20, pl. 30, f. 253. Greg. Diat. of Clyde p. 527, pl. XIV, f. 99. *A. inflata* Grun. in A. Schm. Atlas pl. 25, figs. 29—30.

Rare: Stamsund, r.

Frustule 34 × 16 μ, coarse structure; 9—10 striæ on 10 μ; many longitudinal division lines. Ends protracted.

Distribution: Coasts of the North Sea. Mediterranean. Sumatra. East coast of America. Galapagos Islands.

A. terroris Ehrb.

A. crebi Ehrb. Microgeol. pl. 35 A, f. 2. *A. cymbifera* Greg. Diat. of Clyde p. 526, pl. XIV, f. 97. A. Schm. Atlas pl. 26, f. 33; pl. 39, f. 18; pl. 25, figs. 17—19, 33—34, 36.

Not unfrequent: Stamsund +, the Ostnesfiord r, Gaukværo r.

Distribution: Coasts of the North Sea. Arctic regions. The Mediterranean. Macassar Straits. Gulf of Mexico.

d. **Oxyamphora** Cl. l. c. p. 125.

Complex connecting zone. Valves acute with the raphe close to the ventral margin. No dorsal longitudinal lines. Usually delicate structure of transverse or slightly radiate striæ with puncta arranged in undulating, longitudinal lines. Ventral side usually of still finer structure than the dorsal side. Often a stauros.

A. acuta Greg.

Greg. Diat. of Clyde p. 524, pl. 14, f. 93. A. Schm. Atlas pl. 26, figs. 19—20.

Not unfrequent: Stamsund r, the Ostnesfiord r, Raftsund r, Gaukværo r.

Distribution: Coasts of the North Sea. Arctic regions. The Mediterranean. China. Straits of Magellan.

A. groenlandica Cl.

Cl. l. c. p. 128, pl. IV, f. 1.

No stauros.

var.

Median striæ 12 on 10 μ, towards the ends of the valve somewhat closer. Puncta elongated, 10 on 10 μ.

Very rare: Stamsund, r.

Distribution of the main species: Davis' Strait.

A. ostrearia Bréb.

Bréb. in Kutz. Spec. p. 91. A. Schmidt Atlas pl. 26, f. 23. Van Heurck Synops. p. 55, pl. 1, f. 25 *(var. typica* Cl. l. c. p. 129).

Rare: Stamsund, r; Gaukværo, r.

Distribution: Coasts of the North Sea. Finmark. The Mediterranean. Indian Ocean. Pacific Ocean.

A. lævis Greg.

Greg. Diat. of Clyde p. 514, pl. XII, figs. 74 a—c. A. Schm. Atlas, pl. 26, f. 10.

Rare: Stamsund, r +.

Distribution: Coasts of the North Sea. Finmark. Balearic Islands. Java.

var. lævissima (Greg.) Cl.

Cl. l. c. p. 130. *Amphora lævissima* Greg. Diat. of Clyde, p. 513, pl. XII, f. 72. A. Schm. Atlas pl. 26, figs. 3, 13—14.

Rare: Stamsund r, Stene r.

Distribution: Coasts of the North Sea. Finmark. Sea of Kara.

e. **Amblyamphora** Cl. l. c. p. 130.

Connecting zone complex. Valves obtuse with the raphe diverging dorsally. No longitudinal lines. Fine puncta, arranged in transverse striæ. Structure not finer on the ventral part of the valve.

A. obtusa Greg.

Greg. Micr. Journ. V. p. 72, pl. I, f. 34. A. Schm. Atlas pl. 40, figs. 4—7, 11—13.

Very rare: Stamsund, r.

Distribution: Coasts of the North Sea. The Mediterranean. Black Sea. Red Sea. Indian Ocean. China. East coast of America.

A. spectabilis Greg.

Greg. Diat. of Clyde, p. 516, pl. XIII, figs. 80 a. c. A. Schm. Atlas pl. 40, figs. 18—23.

Not unfrequent: Stamsund +, Stene r, Gaukværø r.

Distribution: Coasts of the North Sea. The Mediterranean. Indian Ocean. Pacific Ocean. West Indies. Davis' Straits.

f. **Psammamphora** Cl. l. c. p. 132.

Connecting zone simple. Else as *Amblyamphora*.

A. ocellata Donk.

Donk. Micr. Journ. 1861 (n. s.) I, p. 11. pl. I, f. 11. Van Heurck Synops. p. 56, pl. 1, f. 26 *(var. typica* Cl. c. p. 133).

Somewhat rare: Stamsund r, Svolvær r, the Ostnesfiord r +, Gaukværo +.

Distribution: Coasts of the North Sea. Sweden. The Adriatic.

g. **Cymbamphora** Cl. l. c. p. 134.

Connecting zone simple. Valves of rather delicate structure. No longitudinal lines. Raphe close to the ventral margin.

A. augusta Greg.? Cl.

Cl. l. c. p. 135. Greg.? Diat. of Clyde p. 510, pl. XII, f. 66 *(var. typica* Cl.).

Rare: Stamsund, r. Hardly Gregory's species.

Distribution: Scotland. Arctic regions. East coast of North America. West Indies.

var. ventricosa (Greg.) Cl.

Cl. l. c. p. 135. *Amphora v.* Greg. Diat. of Clyde p. 511. pl. XII. f. 68.

Not unfrequent, Moskenstrømmen r, Stamsund r, the Ostnesfiord r +, Stene r, Gaukværø +.

Answers completely to Gregory's species, but is very variable.

Distribution: Coasts of the North Sea. Sweden. Arctic regions. The Mediterranean. Red Sea.

Epithemia Bréb.

E. turgida (Ehrb.) Kütz.

Kütz. Bacill., pl. 5. f. 14. Van Heurck Synops., pl. 31, figs. 1—2. *Navicula t.* Ehrb. 1830.

Fresh water species.

var. Westermanni (Ehrb.) Grun.

Grun. in Wien Verh. 1862, p. 325. Van Heurck Synops. p. 138, pl. 31, f. 8. *Navicula W.* Ehrb. 1833.

Very rare: Gaukværø, r; Moskenstrømmen, r.

Distribution: In brackish water. Coasts of the North Sea.

E. argus (Ehrb.) Kütz.

Kütz. Bacill. pl. 29, f. 55. Van Heurck Synops. pl. 31, figs. 15—17. *Eunotia argus* Ehrb., Mikrogeol. pl. XV A. f. 59.

Very rare: Brettesnes—Skroven r, Gaukværø r.

Distribution: Fresh water species; also in brackish water. Frequent, especially in Northern Europe and in alpine localities.

E. zebra (Ehrb.) Kütz.

Kütz. Bacill. pl. 5, f. 12; pl. 30, f. 5. Van Heurck Synops. pl. 31, figs. 9, 11—14. *Eunotia z.* Ehrb. Inf. p. 191. pl. 21. f. 19.

Very rare: Gaukværø r, Stene r.

Distribution: Common fresh water species.

E. musculus Kütz.

Kütz. Bacill. pl. 20, f. 6. Van Heurck Synops. pl. 32, figs. 14—15.

var. constricta (Bréb.) V. H.

Van Heurck Synops. p. 140; Traité d. Diat. p. 297, pl. 9, f. 360. *Epithemia c.* Bréb. in W. Sm. Brit. Diat. I, p. 14, pl. 30, f. 248.

Very rare: Svolvær r, Gaukværø r.

Distribution: Coasts of the North Sea and Western Europe. The Mediterranean.

E. gibberula Kütz.

Kütz. Bacill., pl. 30, f. 3. Van Heurck Traité d. Diat., p. 297, pl. 30, f. 825.

Rare: Svolvær, r.

var. producta Grun.

Van Heurck Synops. pl. 32, figs. 11—13.

Rare: Stamsund, r.

Distribution: Marine, also in brackish and fresh water (*var. producta* Grun.), frequent in Europe and America.

***Rhopalodia** gibba* (Ehrb.) Otto Müll. 1895.

Epithemia gibba Kütz. Bacill. p. 35. pl. 4, f. 22. Van Heurck Synops. p. 139, pl. 32. figs. 1—2.

var. ventricosa (Kütz.) Grun.

Grun. in Wien Verh. 1862, p. 327. *Epithemia ventricosa* Kütz. Bacill. pl. 30, f. 9.

Very rare: Gaukværø, r; the Ostnesfiord, r.

Distribution: Common fresh water species.

General remarks on the character of the bottom diatom flora.

The most striking facts regarding the distribution of the diatoms in the foregoing list of bottom species are, that the arctic forms are rare and that the flora, on the whole, has a much more pronounced southern character than would be expected from the geographical situation. This is in sharp contradistinction to the character of the diatom flora during „the diatom inflow" of plankton species in spring (cf. above p. 88), when the actual arctic species predominate.

Generally speaking, the bottom flora shows a remarkable agreement with that of the east coast of Scotland. It is especially striking that a great many of the species described by Gregory in Diatoms of the Clyde (1854) are common to these two regions, situated at a rather considerable distance from each other. On the other hand, these species also occur on the west coast of Norway, at any rate most of them. It may, consequently, be concluded that the characteristic western bottom flora of diatoms which inhabit the coasts of the North Sea extend to the north as far as to past the Vest-Fiord, probably, however, but little farther.

For the sake of clearness, I divide the species found into 6 groups:

I. The actual arctic species, only found in the arctic region.
II. Species with a western and arctic distribution.
III. Species with a very wide distribution, occurring from southern regions right up into the arctic one. Some of these species seem to be cosmopolitan. In Europe, the species belonging to this group are generally found from the Mediterranean to the arctic regions.
IV. Western species, especially known from the coasts of the North Sea, but not before mentioned from the arctic zone.
V. Species with a southern and western distribution, generally occurring from the Mediterranean — or still farther to the south — to the coasts of the North Sea.
VI. Species with only southern distribution, not before found so far north as on the coasts of the North Sea.

Most of the species observed belong to group III, and many of these species will probably later on be found to have a still wider distribution than is at present known. For such more or less decidedly cosmopolitan species, a thorough treatise on their varieties and forms is a very important and valuable work, indispensable when one wishes to obtain an accurate knowledge of the distribution of identical and closely related species. Notwithstanding the extensive material consisting of an immense number of facts and observations, often made with the utmost care and accuracy as to details in structure, we are still obliged to acknowledge with regret that our knowledge of the individual variations and real constancy of the various distinguishing characters is very deficient.

These species play an unimportant part with regard to the character of the flora. It is, however, an interesting fact that, apparently, so many species of diatoms are common to most seas of the world. Even if a good many of these widely distributed species, on a more thorough examination, should prove to consist of similar, but separate species, having different areas of distribution, there will still remain a great number of species which, in Europe, occur from the Mediterranean to the Arctic Sea. It must, however, be remembered that the valves of diatoms are almost of eternal duration and that thus fossil valves will enlarge the apparent area of distribution of the still living species.

Most of the species of this group III are probably recent ones, a great number of them being observed alive on the west coast near Bergen.

Next to group III it is group V, which contains the greatest number of species. Many of them have a predominating southern distribution, but occur, more or less frequently, as far north as the coasts of the North Sea. To this group belong the following (a few of which might perhaps rightly be reckoned to another group):

Coscinodiscus Rothii.
Biddulphia pulchella (a broken valve, Tromsø, Cl.).
B. regina (only exceptionally found as far north as Scotland).
B. favus (once found in Spitsbergen).
B. alternans.
B. punctata.
Synedra undulata.
S. Hennedyana.
Raphoneis nitida.
Dimeregramma minus.
D. fulvum.
Glyphodesmis distans.
Grammatophora serpentina.
Nitzschia punctata.
N. acuminata.
N. bilobata.
N. lanceolata (α).
Campylodiscus eximius.
Surirella fastuosa.
Achnanthes longipes.
Pleuroneis distans.
P. britannica.
Donkinia recta.
Pleurosigma rigidum.
P. formosum.
P. speciosum.
P. balticum.
Scoliotropis latestriata.
Caloneis consimilis.
C. blanda.
C. musca.
Stauroneis salina.
Navicula moniliformis.
N. latissima.
N. compressicauda.
N. superimposita.
N. palpebralis α, var. *Barclayana*, var. *angulosa.*
N. prætexta.
N. clavata.
N. forcipata var.
Pinnularia claviculus.
P. Trevelyana.
Diploneis coffeiformis.
D. lineata.
D. (contigua var.) *eudoxia.*
D. notabilis (var. *expleta*).
D. fusca var. *Gregorii.*
D. major.
D. nitescens.
D. sejuncta.
D. didyma.
D. chersonensis.
D. crabro et var. *pandura.*
Mastogloia apiculata.
Amphora proteus var. *contigua.*
A. macilenta.
A. costata.
A. binodis.
A. sulcata.
A. alata.
A. obtusa.
A. spectabilis.
A. ocellata.
Epithemia musculus.

Many of these species were for the first time described and illustrated in the work by Gregory above mentioned.

All these species have not previously been mentioned from the arctic zone. To this group should properly also most of those be reckoned which are previously known from the arctic zone, but only from the coast of Nordland („Finmarken").

Less numerous are the species of a mere western European distribution, group IV. Such species are, however, on the whole not numerous. Here belong the following species:

Coscinodiscus apollinis var. (west coast of Norway).
C. Normanni. C. fasciculatus A. Schm.
Actinocyclus crassus.
Actinoptychus splendens.
Biddulphia turgida.
Synedra baculus.
Nitzschia litorea.
N. navicularis (Spitsbergen?).
Campylodiscus parvulus.
Cocconeis lyra (west coast of Norway).
Pleurosigma attenuatum (?).
Caloneis liber.
Schizonema crucigerum (?).
Navicula northumbrica.
N. peregrina var. *kefvingensis.*
N. præsecta (west coast of Norway).
Diploneis hyperborea var. *excisa* (west coast of Norway).

These species, the first and the last ones only excepted, are common to Great Britain and Norway.

A closely related group is group II, including species with a predominating western area, though also occurring right up to the arctic zone. These are the following:

Coscinodiscus Kützingii.
Hyalodiscus scoticus.
Biddulphia rhombus.
B. Smithii.
Nitzschia apiculata.
Campylodiscus angularis.
Rhoicosigma arcticum.
Caloneis brevis.
Navicula directa et var. *subtilis.*
N. fortis.
N. distans.
N. palpebralis var. *semiplena.*
N. pygmæa.
Diploneis hyalina.
Amphora lævis.

The genuine arctic species, belonging to group I, are few:

Coscinodiscus borealis.
Actinocyclus alienus?
Biddulphia arctica.
Synedra kamtschaticum.
S. rostellata.
Grammatophora arctica.
Nitzschia Mitchelliana.
Gomphonema kamtschaticum.
Amphora groenlandica.
Diploneis entomon Cl. p. p. (= *D. subcincta* var. *media*).

All these species, except the last one, are besides very rare.

At last we have the remarkable group VI of only southern forms, partly only known from regions situated far to the south or even only from the tropical zone. Their distribution (as earlier known) extends northwards only as far as to the Mediterranean. To this group belong:

(Coscinodiscus leptopus verus).
C. nodulifer.
Aulacodiscus Kittoni.
A. Johnsonianus.
Biddulphia regina var.
B. lata.
Nitzschia (insignis var.) *spathulifera*
N. coarctata.
N. (Smithii var.) *notabilis.*
Amphora Græffii.

There may, however, be some doubt as to whether the forms observed of *Biddulphia lata* and *Amphora Græffii* are identical with those, which usually occur in southern regions. Moreover, *Coscinodiscus leptopus*, *Nitzschia spathulifera*, *N. coarctata*, *N. notabilis* and *Biddulphia regina* var. are all very rare and scarce. There remain, however, *Coscinodiscus nodulifer* and the two species of *Aulacodiscus*, all of which occur in comparatively large numbers, and in several samples. These species are easily recognizable, and have a pronounced tropical area of distribution.

Probably these species are all fossil, but I cannot at present with certainty decide this. *Coscinodiscus nodulifer* has most probably occurred as a plankton species.

All the species of groups IV, V and VI, a considerable number of species in all, have not before been known from the arctic zone.

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PLATE II.

Fig. 1—12. *Pleuromamma robusta*, DAHL. Skroven (Vestfiord). 0—300 m., $^{4}/_{2}$ 1899.
„ 1. Anterior antenna, right side, $^{83}/_{1}$.
„ 2. First joints of anterior antenna, left side, $^{83}/_{1}$.
„ 3. Posterior antenna, $^{83}/_{1}$.
„ 4. Mandible, $^{83}/_{1}$.
„ 5. Maxilla, $^{83}/_{1}$
„ 6. 1. Maxilliped, $^{83}/_{1}$.
„ 7. 2. Maxilliped, $^{83}/_{1}$.
„ 8. 2. pair of natatory legs, $^{83}/_{1}$.
„ 9. 3. pair of natatory legs, $^{83}/_{1}$.
„ 10. Rostrum, $^{83}/_{1}$.
„ 11. Abdomen, $^{27}/_{1}$.
„ 12. 5. pair of natatory legs, $^{83}/_{1}$.
„ 13. *Chiridius tenuispinus*, G. O. SARS, female, Ofotfjord, 300—350 m., $^{7}/_{2}$ 1899. Spine of the last segment of cephalothorax, $^{83}/_{1}$.
„ 14. *Chiridius armatus*, BOEBK, female, The Malang Fiord. 0—380 m., $^{14}/_{4}$ 1899. Spine of the last segment of cephalothorax, $^{83}/_{1}$.

PLATE III.

Fig. 1. *Flustra carbasea*, Ellis & Sol., Mehavn, 1894, $^{1}/_{1}$.
„ 2. *Flustra securifrons*, Pallas, Breisund (Finmarken), $^{1}/_{1}$.
„ 3. *Flustra membranaceo-truncata*, Smitt, Skjerstad Fiord, $^{1}/_{1}$.
„ 4. *Flustra membranaceo-truncata*, Smitt, Mehavn, $^{2}/_{1}$—$^{3}/_{1}$.
„ 5. *Flustra barleei*, Busk, Arnø (Vestfjord), 300—400 m., $^{1}/_{1}$.
„ 6. *Flustra barleei*, Busk, Røst II, 150 m., $^{25}/_{3}$ 1899, $^{1}/_{1}$.
„ 7. *Flustra abyssicola*, M. Sars, on a little stone, Balstad, 150 m., $^{1}/_{1}$.
„ 8. *Bugula murrayana*, Johnst., the typical form, from the „skjærgaard“ outside Bergen, $^{1}/_{1}$.
„ 9. *Schizoporella sinuosa*. Busk, Svolvær, 50—70 m., aperture of the zooecium, $^{83}/_{1}$.
„ 10. *Schizoporella sinuosa*, Busk, Digermulen, 100—150 m., operculum, $^{83}/_{1}$.
„ 11. *Membranipora minax*, Busk, Moskenstrømmen, mandible, $^{83}/_{1}$.
„ 12—14. *Eschara sincera*, Smitt, Nordkap, 1894.
„ 12. Mandible, $^{83}/_{1}$.
„ 13. Operculum, $^{83}/_{1}$.
„ 14. Zooecium, lateral view, r, rosetplate, h, hole, $^{17}/_{1}$.
„ 15. *Porella læris*, Flem., The Trondhjem Fiord, $^{1}/_{1}$.
„ 16. *Porella saccata*, Busk, Nordkap, $^{1}/_{1}$.
„ 17. *Escharopsis rosacea*, Busk, Moskenstrømmen, $^{1}/_{1}$.
„ 18. *Escharoides coccinea*, Abildgaard, Solsvik in the Bergen „skjærgaard“, mandible, $^{83}/_{1}$.
„ 19. *Escharoides jacksoni*, Waters, Kvænangen II, mandible, $^{83}/_{1}$.
„ 20. *Retepora wallichiana*, Busk, young colony, Balstad, $^{2}/_{1}$—$^{3}/_{1}$.
„ 21—24. *Cellepora nodulosa*, Lorenz.
„ 21. Colony from Mehavn (Finmarken), $^{2}/_{1}$—$^{3}/_{1}$.
„ 22. Colony from the Norwegian North Atl. Exp., St. 273, $^{1}/_{1}$.
„ 23. An operculum of a colony from the Jøkel Fiord III, 100 m., $^{83}/_{1}$.
„ 24. A mandible of a colony from the Jokel Fiord III, 100 m., $^{83}/_{1}$.
„ 25. *Cellepora incrassata*, Smitt, Hammerfest, $^{1}/_{1}$.
„ 26—29. *Cellepora ventricosa*, Lorenz.
„ 26. Colony from Breisund (Finmarken), 30—40 m., $^{1}/_{1}$.
„ 27. An operculum of the same colony, $^{83}/_{1}$
„ 28. Mandible of oral avicularium, $^{83}/_{1}$.
„ 29. Mandible of a spatulate avicularium, $^{83}/_{1}$.
„ 30. *Tubulipora liliacea*, Pallas, Solsvik in the Bergen „skjærgaard“, $^{2}/_{1}$—$^{3}/_{1}$.
„ 31. *Tubulipora* sp (? *penicillata*, Fabr.), Mehavn (Finmarken), $^{2}/_{1}$—$^{3}/_{1}$.
„ 32. *Idmonea atlantica*, Forb., Hustadviken, outside Romsdals amt, $^{1}/_{1}$.
„ 33. *Hornera lichenoides*, Pontop., the Porsanger Fiord, 200 m., $^{1}/_{1}$.
„ 34. *Domopora stellata*, Goldf., the Malangen Fiord, 100—200 m., $^{2}/_{1}$—$^{3}/_{1}$.
„ 35. *Alcyonidium disciforme*, Smitt, the Lyngen Fiord III, the border a little ruptured, $^{2}/_{1}$—$^{3}/_{1}$.
„ 36. *Bowerbankia imbricata*, Adams, The Norw. North Atl. Exp., st. 343, $^{1}/_{1}$.
„ 37—38. *Flustrella corniculata*, Smitt, Svolvær (Lofoten), $^{27}/_{1}$.
„ 37. Zooecia, $^{27}/_{1}$.
„ 38. Spine of the same colony, $^{27}/_{1}$.

PLATE IV.

Fig. 1—2. *Physophora borealis,* M. SARS, Moskenstrømmen, 0 m., 1/3 1899.
„ 1. Tentacular knob, 83/1.
„ 2. Older tentacular knob, 83/1.
„ 3—5. *Eschara moskensis,* n. sp., Moskenstrømmen II, 150 m.
„ 3. Zooecium, 52/1.
„ 4. Ooecium, 52/1.
„ 5. Operculum, 83/1.
„ 6—7. *Schizoporella candida,* SMITT, The Malangen Fiord, 100—200 m.
„ 6. Zooecium, 52/1.
„ 7. Operculum, 83/1.
„ 8—11. *Porella proboscidea,* HINCKS, The North Cape.
„ 8. Zooecium, lateral view. a. a = avicular aperture, r. p = rosette-plate, h = hole, 52/1.
„ 9. Mandible, 83/1.
„ 10. Operculum, 83/1.
„ 11. Oral aperture, the condyles are seen, 83/1.
„ 12. *Palmicellaria skenei* var. *tridens,* BUSK, Radøsund, a little north of Bergen, 100 m., operculum, 83/1.
„ 13. *Palmicellaria skenei* var. *bicornis,* BUSK, Jøkel Fiord III, 100 m., operculum, 83/1.
„ 14—15. *Monoporella spinulifera,* HINCKS, Hammerfest.
„ 14. Ooecium and oral aperture, 52/1.
„ 15. Zooecium, lateral view, 52/1.
„ 16—17. *Schizoporella reticulato-punctata,* HINCKS, The Porsanger Fiord, 200 m.
„ 16. Ooecium with the upper part of the zooecium, 52/1.
„ 17. Operculum, 83/1.
„ 18—20 b. *Porella propinqua,* SMITT, Nordkap (1894).
„ 18. Zooecia, lateral view, a. u, avicularian umbo, o, ooecium, r. p, rosette-plate, 52/1.
„ 19. The back side of the zoarium, 52/1.
„ 20 a. Operculum, 83/1.
„ 20 b. Ooecium, 83/1.
„ 21—23. *Porella princeps,* NORMAN, Mehavn (1894).
„ 21. Operculum, 83/1.
„ 22. Mandible, 83/1.
„ 23. The under side of the front wall of the zooecium, showing the avicularian chamber (a. c) and the lateral channels (c h), 52/1.
„ 24. *Smittina smitti,* KIRCHENP., The Øgs Fiord I, 100 m., ooecium and the upper part of the zooecium, 52/1.
„ 25—26. *Escharella labiata,* BOECK, Svolvær, on coal.
„ 25. Zooecium, lateral view, 83/1.
„ 26. Base of the ooecium, 83/1.
„ 27. Oral denticle of *Escharella immersa,* FLEM., Moskenstrømmen, 83/1.
„ 28. —:— — *ventricosa,* HASS., Hammerfest, 83/1.
„ 29. —:— — *laqueata,* NORM., Hammerfest, 83/1.
„ 30. —:— — *abyssicola,* NORM., The Bømmel Fiord, 83/1.
„ 31. —:— — *labiata,* BOECK, Svolvær, 83/1.
„ 32—35. *Eschara nordlandica,* n. sp., The Kvænang Fiord, 90 m.
„ 32. A young zooecium and ooecium, 52/1.
„ 33. Oral aperture of the zooecium, c, condylus, r, opercular rib, 83/1.
„ 34. Ooecium, 83/1.
„ 35. Operculum, 83/1.
„ 36—38. *Smittina majuscula,* SMITT, The Porsanger Fiord, 90 m.
„ 36. Zooecium and ooecium, 52/1.
„ 37. Operculum, 83/1.
„ 38. Mandible, 83/1.

PLATE V.

Fig. 1—2. *Schizoporella stormi*, n. sp., The North Cape (1894).
„ 1. Zooecia, $^{52}/_{1}$. The avicularia are not quite correct, as the mandibles are more pointed than in the figure.
„ 2. Operculum, o. r, opercular rib, $^{83}/_{1}$.
„ 3—4. *Schizoporella levinseni*, n. sp., Kvænangen II, 90 m.
„ 3. Zooecia, $^{52}/_{1}$.
„ 4. Operculum with the proximal margin of the oral aperture, $^{83}/_{1}$.
„ 5—7. *Porella glaciata*, Waters, Mehavn (1894).
„ 5. Zooecia, $^{52}/_{1}$.
„ 6. Operculum, $^{83}/_{1}$.
„ 7. Mandible, $^{260}/_{1}$.
„ 8—11. *Rhamphostomella scabra*, Fabr., The Porsanger Fiord, 70 m.
„ 8. Zooecium, $^{52}/_{1}$.
„ 9. Oooecium, $^{52}/_{1}$.
„ 10. The back side of the zoarium, $^{52}/_{1}$.
„ 11. Mandible, $^{83}/_{1}$.
„ 12—13. *Schizoporella hexagona*, n. sp., Kvænangen II, 90 m.
„ 12. Zooecia, $^{52}/_{1}$.
„ 13. Operculum, $^{83}/_{1}$.
„ 14—15. *Rhamphostomella plicata*, Smitt, Nordkyn (1894).
„ 14. Ooecium with the upper part of the zooecium, $^{83}/_{1}$. The two small denticles, one on each side of the large one, are not illustrated.
„ 15. Mandible, $^{83}/_{1}$.
„ 16—17. *Rhamphostomella radiatula*, Hincks, The North Cape (1894).
„ 16. Ooecium and oral aperture, $^{83}/_{1}$.
„ 17. Part of the frontal wall of the zooecium, $^{83}/_{1}$.
„ 18—20. *Rhamphostomella contigua*, Smitt, The Ostnes Fiord, 50—70 m.
„ 18. Zooecium, $^{52}/_{1}$.
„ 19. Operculum, $^{83}/_{1}$.
„ 20. Mandible, $^{83}/_{1}$.
„ 21—22. *Rhamphostomella costata*, Lorenz, Tromsø.
„ 21. Ooecium, $^{52}/_{1}$.
„ 22. Oral denticle, $^{83}/_{1}$.
„ 23—25. *Schizoporella unicornis*, Johnst., Glea (Røst).
„ 23. Zooecia, $^{52}/_{1}$.
„ 24. Operculum, $^{83}/_{1}$.
„ 25. Mandible, $^{83}/_{1}$.
„ 26. *Schizoporella linearis*, Hass., Bognøstrømmen (Bergen), 30—50 m., operculum, $^{83}/_{1}$.
„ 27. *Schizoporella unicornis*, Johnst., The Hjelte Fiord (Bergen), operculum, $^{83}/_{1}$.
„ 28—31. *Phylactella peristomata*, n. sp., Jøkel Fiord II, 80 m.
„ 28. Zooecium with marginal pores, p. a. c, pores to the avicularian chamber, $^{52}/_{1}$.
„ 29. Zooecia, s, shield beneath the oral aperture, $^{52}/_{1}$.
„ 30. Mandible, $^{260}/_{1}$.
„ 51. Oral denticle, $^{83}/_{1}$.
„ 32. *Schizoporella porifera*, Smitt, Napstrømmen (Lofoten), operculum, $^{83}/_{1}$.
„ 33—34. *Schizoporella lineata*, Nordg., Nordkyn (1894).
„ 33. Operculum, $^{83}/_{1}$.
„ 34. Oral aperture, $^{83}/_{1}$.
„ 35. *Smittina trispinosa*, Johnst., Balstad (Lofoten), operculum, $^{83}/_{1}$.

PLATE VI.

Fig. 1. *Coscinodiscus centralis* Ehrb., Rattr. Valve in side view, $^{450}/_{1}$.

„ 2. *C. subbulliens* Jørg. n. sp. Sample from Evenstad (near Helseggen, Lofoten) 11/4 1899, 0—200 m. Valve in side view. $^{450}/_{1}$.

„ 3. *Thalassiosira decipiens* (Grun.), $^{950}/_{1}$.

a. The Skjerstad Fiord V. 2/4 1900, 0—420 m. The odd, asymmetrical, spine is distinctly seen (as also in the figures b—e). The structure is very difficult to draw with a satisfactory result. There are some errors in the reproduction, especially in the median part of the valve. When, however, the drawings are compared with the description they will, I hope, nevertheless be of some use. The lines are meant to show the direction of the rows of areoles; some of these are also illustrated.

b. The Herlo Fiord near Bergen, 15/3 1898.

c. Følstad (the Østnes Fiord, Lofoten), 4/4 1899, 0—3 m. Only the spines are shown in the figure.

d. The Herlø Fiord. 15/3 1898. A valve in side view, showing the long, somewhat curved, marginal spines and the high marginal zone.

e. The Vest Fiord (Lofoten), 30/3 1900, 0—25 m. A cell (frustule) in side view. The common forms are generally lower.

f. *Orthosira angulata* Greg. Diat. of Clyde, pl. X, figs. 43 and 43 b, $^{400}/_{1}$.

„ 4. *Thalassiosira gravida* Cl. A piece of a chain, $^{450}/_{1}$, showing the mucilaginous threads after staining with methylene blue.

„ 5. *Th. hyalina* (Grun.) Gran.

a—c. Valves of different specimens from Folstad, 4/4 1899, 0—3 m., $^{950}/_{1}$. The very fine structure is not illustrated, but only the marginal spines, in b and c only that part of the valve where the odd, asymmetrical, spine is found. In the figure a the more coarsely punctate median part is also shown.

d. Gaukværø, 11/4 1899, 0—3 m. A chain, $^{660}/_{1}$, showing the long mucilaginous threads of which only the outermost are illustrated. The central connecting band is a little too thick in this figure.

„ 6. *Th. kryophila* (Grun.). Cape Wankarema (North Eastern Siberia, Vega Expedition; slide in the Riksmusæum, Stockholm).

a, b. Valves of two different specimens, $^{660}/_{1}$. Only a part of the border with marginal spines and the odd one are here shown.

„ 7. *Porosira glacialis* (Grun.). a, b, d from Stene in Bo (Vesteraalen), 10/4 1899.

a. 2 cells, connected by a thick mucilaginous band, $^{330}/_{1}$. Outside this band two isolated connecting threads are seen.

b. 2 cells with protoplasma and chromatophores (conserved in formaline). $^{330}/_{1}$.

c. A 3-jointed chain with very thick connecting bands, $^{450}/_{1}$. A specimen from the Arctic Sea 1898.

d. A 3-jointed chain, $^{660}/_{1}$, showing the long, diverging mucilaginous threads (after staining with methylene blue).

„ 8. *Eucampia groenlandica* Cl. Part of a chain, $^{660}/_{1}$. Brettesnes (Lofoten), 4/4 1899. The transverse lines are much finer than represented in the figure.

„ 9. *Fragilaria cylindrus* Grun. A valve of a small and short specimen, $^{950}/_{1}$. Lille Molla (near Raftsund), 1/4 1899.

„ 10. *F. islandica* Grun. The Skjerstad Fiord V. 2/4 1900, 0—400 m. A piece of a long chain after being ignited on cover glass; $^{950}/_{1}$. Breadth 51 μ; 16—18 striæ on 10 μ. Connecting zone striate.

„ 11. *Thalassiothrix nitzschioides* Grun. The Skjerstad Fiord V. 12/4 1900, 0—420 m.

a. A zigzag chain of 4 individuals, $^{450}/_{1}$.

b. 2 cells, one in side view, the other in valvar view. $^{950}/_{1}$. 52 μ long, 4 μ broad; 11 pearls on 10 μ. The undulations of the margin in the lower figure are due to an error in reproduction.

Fig. 12. *Nitzschia hybrida* Grun. b–e from Brettesnes, $^{4}/_{4}$ 1899. The striæ of the connecting zone are in reality much finer than in the figures.

a. The Skjerstad Fiord XII (outer part), $^{4}/_{4}$ 1900, 0—50 m.; $^{950}/_{1}$. 44 μ long, 8 μ broad; about 9 keel puncta on 10 μ. Transverse striæ (of the valve) were not visible.

b. *N. (hybrida var.?) pellucida* Grun.? One valve, in side view, $^{1475}/_{1}$. 38 μ long, about 10—11 keel puncta on 10 μ.

c, d. Cells in side view, c $^{660}/_{1}$, d $^{950}/_{1}$. In the figure d the keel puncta are a little too long. They were, however, somewhat, but only slightly, elongated.

e. 2 valves belonging to one cell, one of them in valvar view, showing a very excentric keel; $^{950}/_{1}$. The valve is, however, perhaps lying somewhat obliquely.

f. A twin cell of a different form, perhaps not belonging to *N. hybrida*: $^{950}/_{1}$. The Skjerstad Fiord XII, $^{4}/_{4}$ 1900, 0—50 m. 57 μ long, the breadth (of the cell) 7 μ; 12—14 keel puncta on 10 μ. About 27 striæ on 10 μ.

" 13. *N. lanceolata var. pygmæa* Cl. Valve (in valvar view), $^{950}/_{1}$. Lille Molla, $^{11}/_{4}$ 1899. 30 μ long, 4 μ broad. Keel puncta small, about 14 on 10 μ, in the middle of the valve wanting; there is a trace of a central nodule. Hardly belongs to *N. lanceolata* W. Sm.

" 14. *N. angularis var. kariana* Grun., $^{950}/_{1}$.

a. Cell in side view, from Seivaagen (Salten), $^{5}/_{4}$ 1900, 0—20 m. 54 μ long, 8 μ broad; 5—6 keel puncta on 10 μ, much closer at the ends, scarcely more distant in the middle. No transverse striæ were seen.

b. Valvar view. Lille Molla, $^{1}/_{4}$ 1899, 0 m. 36 μ long, 4 μ broad; $4^{1}/_{2}$ keel puncta on 10 μ. The longitudinal lines which accompany the keel, are badly reproduced.

PLATE VII.

Fig. 15. *Nitzschia arctica* Cl.

a. Cell in side view, $^{950}/_{1}$. The Ostnes Fiord I, $^{23}/_{3}$ 1900, 0—25 m. 80 μ long, 7 μ broad; 7—8 keel puncta on 10 μ. No distinct transverse striæ were seen. By an error in reproduction the margin appears to be a little undulated. The cell is, indeed, slightly broader in the middle, then evenly narrowed off to the ends, which are of even breadth.

The same species occurs in Cl. et Moll., nr. 318, from Cape Wankarema (slide in the Riksmuseum, Stockholm).

b. Cell in side view, $^{660}/_{1}$. Kvænangen, $^{21}/_{4}$ 1899, 300—200 m. 71 μ long, 8 μ broad; 8 keel puncta on 10 μ. The division lines of the connecting zone are here — as in the following figures — too plainly visible. They are in reality only seen with difficulty.

c. Cell in side view, $^{950}/_{1}$, from Brettesnes (Lofoten) $^{4}/_{4}$ 1899. The keel puncta of only one valve are illustrated. 61 μ long, 9 μ broad; about 10 keel puncta on 10 μ. Transverse striæ were not plainly visible. The connecting zone finely striate.

d. Cell in side view; $^{950}/_{1}$; a very large specimen. Følstad, $^{4}/_{4}$ 1899. 108 μ long, 12 μ broad; 9 and 10 keel puncta on 10 μ. On the left valve only the keel puncta of the median part are shown. The keel seemed to be very excentric. Transverse striæ indistinct.

e. A single valve, $^{950}/_{1}$. Lille Molla, $^{1}/_{4}$ 1899, 0 m. 96 μ long, 5 μ broad; $7^{1}/_{2}$ keel puncta on 10 μ. Striæ indistinct.

f. Valve in valvar view, $^{950}/_{1}$, from the same locality. 83 μ long, 4—$4^{1}/_{2}$ μ broad; 9 keel puncta on 10 μ. Striæ were not seen.

The specimens e—f are very similar to *N. lævissima* Grun., but seem to belong to the same species as a—d.

„ 16. *Tropidoneis parallela* Jørg. n. sp., $^{950}/_{1}$. a, b from 71° 48′ n., 49° 38′ e., S/S Heimdal, $^{31}/_{5}$ 1900.

a. Cell in side view. 70 μ long, 18 μ broad; about 16 striæ on 10 μ.

b. Valve (in valvar view). 67 μ × 12 μ, 15 striæ on 10 μ. Boatshaped, with a narrow, high, median part.

c. Twin cell, in side view. The Ostnes Fiord I, $^{23}/_{3}$ 1900, 0—25 m. The striæ are only shown on a portion of the valve, and ought to be somewhat closer.

„ 17. *Pleurosigma tenerum* Jørg. = *P. Stuxbergii* Cl.

a—c. 3 cells with protoplasmatic parts, from samples conserved in formaline; $^{270}/_{1}$. Rombaken (the Ofoten Fiord) $^{7}/_{2}$ 1899, 0—40 m. Lengths 290 μ, 340, 275; breadths 38 μ, 38, 40. The inner parts are badly reproduced. In the figure a the chromatophores should not be united above. In b the chromatophore of the right side has partly disappeared. The median longitudinal line of the figure c is the raphe.

d. Cell in valvar view, $^{500}/_{1}$. The Salten Fiord II, $^{5}/_{4}$ 1900, 0—50 m. The specimen has been ignited on cover-glass and has become somewhat deformed.

„ 18. *P. delicatulum* W. Sm., $^{500}/_{1}$. Følstad, $^{4}/_{4}$ 1899, 0—3 m. 222 μ × 26 μ. The 3 crossing lines to the right show the direction of the striæ. Very similar to *P. delicatulum var. kariana* Grun., but differs in having the transverse striæ rather less close than the oblique ones.

„ 19. *P. tenuissimum* W. Sm. *var. hyperborea* Grun. The contour of the valve is badly reproduced.

a. Lille Molla, $^{1}/_{4}$ 1899, 0 m.; $^{950}/_{1}$. 77 μ × 5 μ; transverse striæ 20—22 on 10 μ, longitudinal ones 24.

b. Følstad, $^{4}/_{4}$ 1899, 0—3 m.; $^{660}/_{1}$.

„ 20. *P. tenuirostre* Grun., $^{950}/_{1}$. The Folden Fiord I, $^{6}/_{4}$ 1900, 0—100 m. The specimen lies somewhat obliquely. Only one half of the valve is given in the figure. In this position, close oblique striæ were seen, 25—30 on 10 μ. At the ends, indistinct longitudinal lines, which were somewhat wavy, were seen.

Fig. 21. *Navicula frigida* GRUN.

a. Cell in valvar view, showing the usual chromatophores; $^{450}/_{1}$. Senjenhavet, $^{13}/_{4}$ 1899, 0—80 m. (sample preserved in formaline).

b. Cell with chromatophores; larger form; $^{450}/_{1}$. Barent's Sea 71° 48′ n., 49° 38′ e. (S/S Heimdal $^{31}/_{5}$ 1900; c—e from the same locality).

c. 2 cells of a small form, one in valvar view, with chromatophores, the other in side view, $^{450}/_{1}$. Valve 34 μ × 11 μ.

d. Typical *N. frigida* GRUN., $^{950}/_{1}$. The transverse striæ are only slightly oblique towards the ends, not by far so much as in the figure. The longitudinal lines are only put on a small part of the valve. 55 μ × 14 μ.

e. A large specimen, somewhat deformed by being ignited on cover-glass; $^{950}/_{1}$. 96 μ × 15 μ; 12 transverse striæ on 10 μ; distinct longitudinal lines, much closer. No distinct central area.

f. A twisted chain, probably not belonging to *N. frigida*. $^{450}/_{1}$. The Skjerstad Fiord II, $^{2}/_{4}$ 1900, 0—180 m. On account of the chromatophores it seems related to *N. Vanhöffeni* and is perhaps *N. pelagica*.

„ 22. *N. Vanhöffeni* GRAN.

a. A chain with protoplasmatic contents; $^{450}/_{1}$. Senjenhavet, $^{13}/_{4}$ 1899, 0—80 m.

b. 2 cells of a chain, in the process of selv-dividing; $^{450}/_{1}$. Barents Sea 71° 48′ n., 49° 38′ e., $^{31}/_{5}$ 1900 (f, g from the same locality).

c, d. Chains, after being ignited on cover-glass. $^{450}/_{1}$. The central nodules smaller and more indistinct than in the figure d; in c they have disappeared. The cell walls, also in e, should be much narrower. Malangen, $^{14}/_{4}$ 1899, 0—3 m.

e. Chain, ignited; $^{660}/_{1}$. Brettesnes, $^{14}/_{4}$ 1899. The central nodules smaller than in the figure; the division lines of the connecting zone very fine.

f. 2 valves with intermediate complex connecting zone, somewhat deformed (a short time treated with sulphuric and nitric acids, then ignited on cover-glass); $^{950}/_{1}$. Length 38 μ, breadth 6 μ (or a little more). In the middle something like a narrow transverse stauros was indistinctly seen. It might, however, also be due to indistinct striæ (the striæ otherwise being quite invisible).

g. Like f. The valve boatshaped, somewhat higher in the middle than at the ends. Length 24 μ, breadth 6 μ. On one valve the stauroslike figure in the middle is shown.

h. A narrow valve; $^{950}/_{1}$. Følstad, $^{4}/_{4}$ 1899, 0—3 m.

i. Cell in optical transverse section, with chromatophore. Barent's Sea, $^{31}/_{5}$ 1900.

„ 23. *N. pelagica* CL. A chain, after being ignited on cover-glass; $^{660}/_{1}$. Length of the cells 17 μ. Brettesnes, $^{4}/_{4}$ 1899.

„ 24. *Stauroneis septentrionalis* GRUN. Barent's Sea $^{31}/_{5}$ 1900 (cfr. above).

a. Valve; $^{950}/_{1}$. To the left the striæ in the middle part of the valve are represented.

b—g. Different valves; $^{950}/_{1}$. On several of them the striæ of the middle part are shown. Those towards the ends were only seen with difficulty.

h. A chain with protoplasmatic contents; $^{450}/_{1}$.

i. Another chain. In 3 of the cells the protoplasmatic contents are seen.

k. A chain, after being ignited on coverglass; $^{950}/_{1}$. The striæ towards the ends are not seen distinctly. On most of the cells only the more conspicuous median striæ are illustrated. All striæ much finer than in the figure.

„ 25. *S. Grani* JØRG. n. sp. Barent's Sea, $^{31}/_{5}$ 1900.

a. A chain with protoplasmatic contents; $^{450}/_{1}$. (Sample not well preserved).

b. A chain, after being ignited on cover-glass; $^{950}/_{1}$. Between the cells, a connecting zone with very fine division lines is seen.

„ 26. *Achnanthes sp.*, $^{450}/_{1}$. The Salten Fiord II, $^{5}/_{4}$ 1900, 0—50 m.

a. Lower valve with 3 cells of a chain, ignited. The structure of the valve is badly reproduced. The striation should be more regular, and only slightly radiate towards the ends.

b. Like a. The upper end nodule should not be distant from the end. The valve lies somewhat obliquely.

c. A chain ignited. Only the striæ of one valve is seen in the figure. The 3 left cells are represented in optical section.

PLATE VIII.

Fig. 27. *Achnanthes tæniata* GRUN.; $^{950}/_1$. Sea of Kara, bottom mud from a depth of 36 fathoms (Swedish Expedition to Jenissey 1875; sample from the Riksmusæum, Stockholm).

a. Part of a long chain, ignited on cover-glass (dry preparation). Breadth 24 μ.

b. Part of another chain, in styrax. Here it is more distinctly seen that only one valve is provided with a central nodule.

" 28. *A. hyperborea* GRUN. Barent's Sea, $^{31}/_5$ 1900.

a. Lower valve; $^{950}/_1$. In the middle part more distant and conspicuous striæ, the others, towards the ends, rather indistinct. Dry preparation. The valve appeared distinctly convex. Length 28 μ.

b. Lower valve, from the inner side; $^{950}/_1$. 28 μ × 6 μ.

c. Part of a chain of the same species (?), ignited on cover-glass; $^{660}/_1$. Length of the valve 30 μ.

" 29. *Peridinium pedunculatum* SCHÜTT, $^{450}/_1$. The Oster Fiord near Bergen, 1901.

a and d. Ventral view.

b and c. The same specimen, dorsal view.

e. The same, seen from the right side.

" 30. *Hexacontium enthacanthum* JØRG., $^{450}/_1$. Sea northwest of Vesteraalen, $^{23}/_2$ 1901, 0 m. (S/S Michael Sars).

a. Second shell with two radial spines and a portion of the outer shell. Only 2 byspines are figured.

b. The inmost shell.

" 31. *H. pachydermum* JØRG., $^{450}/_1$.

a. The Herlø Fiord (near Bergen), $^{12}/_5$ 1898. Only some of the byspines of the outer shell are figured.

b. Henningsvær, $^{6}/_3$ 1899.

" 32. *Hexacontium*; young specimen, as yet with only two shells; $^{450}/_1$. From the same locality as fig. 30.

a. Second shell with 4, as yet only thin, radial spines.

b. The same specimen in optical section, showing the two shells.

" 33. *Echinomma leptodermum* JØRG., $^{450}/_1$.

a. Kvænangen I, $^{24}/_1$ 1899, 0—140 m.

b. Sea off Rost, $^{22}/_3$ 1899. The outer shell is partly removed.

c. Helligvær, $^{12}/_1$ 1899, 0—250 m., without outer shell. The 3rd shell is indicated by transverse processus on the radial spines.

" 34. *Drymyomma elegans* JØRG., $^{450}/_1$. Skroven, $^{4}/_2$ 1899, 0—300 m.

a. Outer shell with main- and byspines.

b. The same specimen in optical section, showing the 3 shells.

" 35. *Chromyechinus borealis* (CL.), $^{450}/_1$. The Tys Fiord, $^{28}/_3$ 1899, 0—700 m.

a. The 3rd shell with main- and byspines. Around it the very delicate outer shell is seen (only incompletely illustrated). Also the shell next to the inmost one is indicated in the figure; it is more distinctly seen through a large (accidental) irregular hole in the 3rd shell.

b. The same specimen. Optical section, showing the 4 shells.

PLATE IX.

Fig. 36. *Chromyechinus borealis* (Cl.), $^{450}/_1$. The outer shell is only indicated by the transverse processus of the radial spines. Larger spines on one side of the shell. Kvænangen, $^{24}/_1$ 1899.

a. The 3rd shell, with spines.

b. Optical section, showing the three shells. Diameters 93 μ, 40 μ,? Pores very uneven, 10—25 μ, ± 6 μ,?

„ 37. *C. borealis* (Cl.), the larger form with byspines on the 4th shell; $^{450}/_1$.

a. Sea off Røst, $^{22}/_3$ 1899, 0—900 m. Optical section, showing the 4 shells. Diameters 132 μ, 89, 38, ± 17.

b. The same specimen. A portion of the 3rd shell with one larger and two smaller radial spines and pores, together with a portion of the 4th shell, with pores.

c. A form with well developed byspines on the 4th shell; optical section. The Vest Fiord. $^1/_2$ 1899, 0—200 m.

d. The same specimen. The portion of the 3rd shell, where the outmost shell is wanting; pores and spines.

e. The same. A portion of the 4th shell (very thinwalled) with pores, main spines and byspines (slender, oblique).

„ 38. *Rhizoplegma boreale* (Cl.) Jørg., $^{450}/_1$.

a. A well developed specimen. Sea off Røst, $^{22}/_3$ 1899, 0—900 m.

b. The same specimen. One of the main spines with surrounding network.

c. The same. The inner shell; the other parts in optical section.

d. Young specimen. From the sea between Norway and Iceland, due east of Iceland, 65° 43′ n., 3° 1′ w., $^{14}/_{12}$ 1903 (S S Michael Sars).

PLATE X.

Fig. 38. *Rhizoplegma boreale* (Cl.) Jørg., $^{450}/_{1}$.

e. Young specimen with 7 main spines. Diameter of the inner shell 28—30 μ. Sea 40 miles NW of Gaukværø, $^{19}/_{1}$ 1899, 0—700 m.

f. Young specimen, divergent form with 11 main spines. Henningsvær, $^{17}/_{1}$ 1899, 0—180 m.

„ 39. *Stylodictya tenuispina* Jørg. n. sp., $^{450}/_{1}$. Sea off Rost, $^{22}/_{3}$ 1899, 0—900 m.

a. In the figure the inner rings are seen, and the connecting inner radial beams which are, however, only shown on the space between the two outer rings. The coarse pores on the median part of the shell and some of the pores on the other portion are also depicted.

b. The same specimen, optical section, showing the rings and radial beams.

c. The same in side view, optical section. In the middle the rounded higher portion is seen. Punctiform byspines on both sides.

„ 40. *S. validispina* Jørg. n. sp., $^{450}/_{1}$. Sea off Røst, $^{22}/_{3}$ 1899, 0—900 m.

a. Optical section, showing the system of rings and the radial spines. The pores on the outside are shown on a portion of the valve.

b. The same specimen in side view; optical section.

„ 41. *S. aculeata* Jørg. n. sp., $^{450}/_{1}$. Sea off Røst, $^{22}/_{3}$ 1899, 0 – 900 m.

a. The disc from above, with pores and radial spines. The small dark puncta on the surface are the byspines. The inner rings are suggested.

b. The same specimen; optical section.

c. The same in side view; optical section.

„ 42. *Phorticium pylonium* (Hck.?) Cl., $^{450}/_{1}$. The Tys Fiord, $^{28}/_{3}$ 1899, 0—700 m.

*. Schematical figure, dorsal view, showing in perspective the 3 girdles, perpendicular to each other. The figure shows only one of these systems of girdles; in reality there are 3 of them. L = the lateral girdle, seen from the (narrow) side; T = the transverse girdle, S = the sagittal one. In the middle of the latter an inner lateral girdle is developed, parallel to the outer one (is not seen in the figure), in the middle of this inner lateral girdle, an inner transverse one, a. s. o. For the sake of clearness, the girdles are depicted narrow, and distinctly compressed.

a. Dorsal view, showing the pores and the outer spines (main- and byspines).

b. The same specimen, same view, optical section (lateral section). To the right and left the outer lateral girdle is seen, and parallel to this two inner ones.

c. Same specimen, apical view. When the figure is seen from the side, where the number (42 c) is printed, it answers to the fig. a, seen from above.

d. Same specimen, same view; optical section (= transverse one). The transverse girdle goes around the figure, and is seen from the (narrow) side. Across this girdle the outer sagittal one is seen, and in the inner, the second and third transverse ones.

PLATE XI.

Fig. 42. *Phorticium pylonium* (Hck.?) Cl., $^{450}/_1$. The Tys Fiord, $^{28}/_3$ 1899, 0—700 m.

e. The same specimen as fig. 42 a—d (pl. X); lateral view.

f. Same specimen, same view, optical section (= sagittal one). The outer sagittal girdle is seen from the side, and two similar inner ones.

„ 43. *Ph. pylonium* (Hck.?) Cl., *forma (?)*: $^{450}/_1$. From the same locality. In a certain position of the shell, this spiral is seen.

„ 44. *Ph. pylonium* (Hck.?) Cl., *forma (?)*: $^{450}/_1$. *Octopyle octostyle f. minor* Jørg. Sea off Røst, $^{22}/_3$ 1899, 0—900 m. Apical view.

„ 45. *Ph. pylonium* (Hck.?) Cl., *forma (?)*: $^{450}/_1$. *Octopyle octostyle f. minor* Jørg. From the same locality.

a. Dorsal view.

b, d. The same specimen; lateral view. The right and left sides correspond to the lower and upper ends of fig. a.

c. Same specimen; apical view.

„ 46. *Streblacantha circumtexta* (Jørg.), $^{450}/_1$. The Tys Fiord, $^{28}/_3$ 1899, 0—700 m.

a. There are more byspines than illustrated in the figure. Most of them are only seen with difficulty, except near the outlines.

b. Same specimen, same view, optical section.

c. Young specimen with 9 main spines.

d. The same in optical section.

f. The pores on a portion of the outer shell, of an older specimen.

e. Same specimen, showing a piercing main spine with the fine connecting beams between the byspines. Side view.

PLATE XII.

Fig. 46. *Streblacantha circumtexta* (Jørg.).

g. The same specimen as fig. 46 a (pl. XI), in another position; optical section, $^{450}/_{1}$.

h. $^{400}/_{1}$. From the same locality.

i. The same, in optical section.

l. Young specimen, $^{450}/_{1}$. The Vest Fiord I, $^{13}/_{1}$ 1899, 0—180 m.

k. The same, in optical section.

„ 47. *Campylacantha cladophora* Jørg. n. sp., $^{450}/_{1}$. The Tys Fiord I, $^{28}/_{3}$ 1899, 0—700 m. In this figure, and in the following of species of the group *Nassellaria*, the letters have the same signification as in the corresponding description given on pp. 122—140: A is the apical main spine, D the dorsal one, L_r the right lateral, L_l the left lateral main spine, V the ventral sagittal spine.

a. Oblique lateral view. The secondary lateral spines are not seen.

b. Oblique view, where one of these secondary lateral spines is distinctly seen.

c. Dorsal view, showing both these secondary spines.

PLATE XIII.

Fig. 48. *Dictyocircus clathratus* JØRG. n. sp. Henningsvær, $^{20}/_{3}$ 1899. a $^{500}/_{1}$, b—e $^{400}/_{1}$. As regards the signification of the letters, cfr. above p. 125 and p. 130.
- a. Dorsal view.
- b. Dorsal-lateral view.
- c. Sagittal view. Only the meshes f, the spines g and the right side of the spines k and meshes e are illustrated.
- d. Lateral view.
- e. Ventral view.

" 49. *Ceratospyris hyperborea* JØRG. n. sp., $^{450}/_{1}$. The Vest Fiord $^{1}/_{2}$ 1899, 0—200 m.

" 50. *Plectacantha oikiskos* JØRG., $^{450}/_{1}$. Ofoten II, $^{7}/_{2}$ 1899, 0—100 m. Apical view. Diameter of the network about 65 μ.

" 51. *P. oikiskos* JØRG., *var.*: $^{450}/_{1}$. Sea off Røst, $^{22}/_{3}$ 1899, 0—900 m. Very strong spines and arches.
- a. Ventral view; the primary ventral arch and the primary ventral mesh in front.
- b. The same specimen, apical view. Length of spine D 55 μ; greatest breadth of the beams 6 μ; largest mesh (the secondary mesh to the right of spine D) 22 × 15 μ.
- c. The same, lateral view; the left lateral arch and the left lateral mesh in front.
- d. The same, lateral view; the right lateral arch and the right lateral mesh in front.
- e. The same as the foregoing, but turned 90° upwards. The mesh beyond (and below) the right lateral mesh in front.

" 52. *P. oikiskos* JØRG., $^{380}/_{1}$. The Vest Fiord I, $^{13}/_{1}$ 1899, 0—180 m. Young specimen. Antapical view.

" 53. *P. oikiskos* JØRG., $^{400}/_{1}$. Henningsvær, $^{20}/_{3}$ 1899. 0—280 m. Lateral view; the right lateral arch and mesh in front.

" 54. The same, $^{450}/_{1}$. Dorsal view.

" 55. *P. oikiskos* JØRG., $^{380}/_{1}$. Helligvær, $^{12}/_{1}$ 1899, 0—250 m.
- a. Lateral view; the right lateral arch in front.
- b. The same, turned a little upwards and to the left.
- c. Lateral view; the right lateral main spine in front. The unclosed network is seen.
- d. Lateral view; the meshes under the right lateral spine in front.
- e. Antapical view.

" 56. *P. oikiskos* JØRG., $^{450}/_{1}$.
- a. Somewhat oblique antapical view. The Vest Fiord II, 0—200 m., $^{13}/_{1}$ 1899. Diameter of the network about 50 μ.
- b. Oblique antapical view. Sea off Aalesund, 61° 56′ n., 2° 40′ e., $^{10}/_{2}$ 1893, 0 m. (S/S Michael Sars). Diameter of the network about 60 μ.

" 57. *P. oikiskos* JØRG., $^{380}/_{1}$. A well developed specimen from Henningsvær, $^{20}/_{3}$ 1899, 0—280 m.
- a. Ventral view; the ventral arch and the network above, in front.
- b. The same, apical view.

" 58. *P. trichoides* JØRG. n. sp., $^{450}/_{1}$. Ventral-lateral view; the right lateral spine in front. Sea north of Shetland, 63° 36′ n., 0° 32′ e., $^{11}/_{2}$ 1903 (S/S Michael Sars).

PLATE XIV.

Fig. 59. *Phormacantha hystrix* (JØRG.) JØRG., $^{600}/_{1}$. The Vest Fiord I, $^{13}/_{1}$ 1899, 0—180 m. A well developed specimen.

a. Lateral view; placed as a species of *Monocyrtida* after HÆCKEL, with the „tophorn" upwards. The right lateral main spine, L_l, in front.

b. The same, dorsal view, showing the network round the (columella and) tophorn. The spine A is removed.

c. The same, ventral view, showing the ventral sagittal spine and the network above. The other main spines are only indicated.

„ 60. *Ph. hystrix* (JØRG.) JØRG., $^{450}/_{1}$. Ofoten II, $^{7}/_{2}$ 1899, 0—100 m. Lateral view, the right lateral arch (B_l) and mesh in front. A young specimen, perhaps belonging to a species intermediate between *Phormacantha hystrix* and *Plectacantha oikiskos*. Diameter of the network about 68 μ. Skeleton very light in weight.

„ 61. *Ph. hystrix* (JØRG.) JØRG., $^{380}/_{1}$. Helligvær, $^{12}/_{1}$ 1899, 0—250 m. A young specimen; dorsal view. Length of the spine L_r, 75 μ.

„ 62. *Ph. hystrix* (JØRG.) JØRG., $^{450}/_{1}$. Sea off Aalesund, 61° 56′ n., 2° 40′ e., $^{10}/_{2}$ 1903 (S/S Michael Sars). A young specimen; ventral view. The short branch from spine L_l to the point of connection between the ventral (B_v) and the one lateral arch (B_l) is distinctly seen.

„ 63. *Ph. hystrix* (JØRG.) JØRG., $^{450}/_{1}$. From the same locality. Lateral view. The short common branch, mentioned under fig. 62, is here in front, together with the right lateral arch (B_l) and the network above. The spine A is broken off.

„ 64. *Gonosphæra primordialis* JØRG. n. sp., $^{380}/_{1}$. The Oster Fiord (near Bergen), $^{13}/_{6}$ 1900, 200—400 m. Diameter of the ring 22 μ; length of the largest spine about 100 μ.

„ 65. *G. primordialis* JØRG., $^{380}/_{1}$. Ofoten II, $^{7}/_{2}$ 1899, 0—250 m. From a sample preserved in formaline.

„ 66. *G. primordialis*, JØRG., $^{450}/_{1}$. Skroven, $^{4}/_{2}$ 1899, 0—350 m. The connecting polygonal beam, with its two long, spreading spines, is seen below and to the left. Diameter of the ring 17 μ, length of the largest spine 90 μ.

„ 67. *G. primordialis* JØRG., $^{450}/_{1}$. From the same locality. The two pentagons are seen above, to the right and to the left (the arrows are perpendicular to their planes), the connecting polygonal beam below.

„ 68. *G. primordialis* JØRG., *var.*, $^{450}/_{1}$. Sea between Norway and Iceland, due east of Iceland, 65° 43′ n., 3° 1′ w., $^{14}/_{2}$ 1903, 100—0 m. (S/S Michael Sars). Diameter of the pentagons 22 μ; largest spines 50 μ long. Perhaps a different species.

„ 121. House of *Cyttarocylis denticulata* (EHRB.) FOL., *var. subedentata* JØRG. n. var.; $^{450}/_{1}$. The Ox Fiord, $^{14}/_{3}$ 1899, 0—90 m. Length 145 μ, breadth 51 μ; narrow end („tail tip") 17 μ long. Teeth 36—38. The areoles are only figured on a little portion of the surface and the wall.

PLATE XV.

Fig. 69. *Protoscenium simplex* (Cl.) Jørg., $^{660}/_1$. Sea north of Shetland 63° 36′ n., 0° 32′ e., $^{11}/_2$ 1903, 0 m. (S/S Michael Sars). Somewhat oblique, apical view. Diameter of the network 68 μ.

„ 70. *Euscenium corynephorum* Jørg., $^{450}/_1$. Raftsund. $^{3}/_2$ 1899. 0—260 m. Oblique antapical view. Diameter of the network about 100 μ; longest spines 120 μ.

„ 71. *Cladoscenium tricolpium* (Hck.) Jørg., $^{450}/_1$. A well developed specimen from the By Fiord (near Bergen), $^{21}/_2$ 1899, 0—50 m. Ventral-lateral view; the spine L_l in front. Network 58 μ high, 75 μ broad. Tophorn protruding 94 μ.

b. The same as a, optical section, showing the most important spines and arches.

„ 72. *C. tricolpium* (Hck.) Jørg., very young specimen; $^{380}/_1$. Helligvær, $^{12}/_1$ 1899, 0—250 m.
a. Oblique, apical view.
b. Lateral view; the spine L_l in front.

„ 73. *C. tricolpium* (Hck.) Jørg., young specimen; $^{380}/_1$. Fom the same locality. Apical view.

„ 74. *C. limbatum* Jørg. n. sp., $^{450}/_1$. Sea 40 miles NW of Gaukværø, $^{19}/_1$ 1899, 0—700 m. Lateral view. In the upper part, the outer network is removed.

„ 75. *Peridium longispinum* Jørg. Sea off Aalesund. 61° 56′ n., 2° 40′ e., $^{10}/_2$ 1903, 0 m. (S/S Michael Sars). A well developed specimen.
a. Ventral view; the „tophorn" downwards; $^{660}/_1$.
b. The same, lateral-ventral view; the spine L_r in front; $^{450}/_1$. Diameter of the network 32 μ.

„ 76. *P. longispinum* Jørg., $^{450}/_1$. The Vest Fiord II, $^{13}/_1$ 1899, 0—200 m. The typical form. Cephalis 42 μ high.
a. Lateral-ventral view.
b. Lateral view; the spine L_r in front.

c. Apical view; the very long ventral sagittal spine is seen.
d. The same, lower optical section, showing the meshes about the spines D and V.

„ 77. *P. longispinum* Jørg., $^{450}/_1$. Oxsund, $^{17}/_2$ 1899, 600 m. Not fully developed specimen; dorsal view. Diameter of the network 34 μ.

„ 78. *P. longispinum* Jørg., $^{380}/_1$. Helligvær, $^{12}/_1$ 1899, 0—250 m. Ventral view.

„ 79. *P. longispinum* Jørg., $^{380}/_1$. From the same locality. Lateral view. Cephalis 50 μ long. 42 μ broad.

PLATE XVI.

Fig. 80. *Peridium longispinum* Jørg., $^{450}/_1$. Senjen, $^{21}/_1$ 1899, 0—130 m. Fully developed specimen. Lateral view; the left lateral arch (B_r), with two strong byspines, in front.

„ 81. *Lithomelissa setosa* Jørg., $^{450}/_1$. Henningsvær, $^{17}/_1$ 1899, 0—180 m. Young specimen. Dorsal view; the spine A in front, somewhat to the left (directed downwards).

„ 82. *L. setosa* Jørg., $^{450}/_1$. Apical view.

„ 83. *L. setosa* Jørg., $^{450}/_1$. The Herlø Fiord (near Bergen), $^{24}/_5$ 1899. Almost fully developed specimen; lateral view.

„ 84. *L. laticeps* Jørg. n. sp., $^{450}/_1$. Sea off Røst, $^{22}/_3$ 1899, 0—900 m. Lateral view.
b. The same, optical section, showing the main spines.

„ 85. *L. hystrix* Jørg., $^{450}/_1$. Skroven, $^{1}/_2$ 1899, 0—300 m. 50 μ high and broad. Thorax 36 μ high; cephalis 14 μ high, 25 μ broad. Most of the spines broken off.

„ 86. *Helotholus histricosa* Jørg. n. sp., $^{450}/_1$. Oxsund, $^{17}/_2$ 1899, 0—300 m.
a. Inside the shell the long axial divided spine is seen.
b. Antapical view of the cephalis and the upper part of the thorax (neck stricture). 4 spines are seen.

„ 87. *H. histricosa* Jørg., $^{380}/_1$. From the same locality. Young specimen.
b. Portion of a broken shell, showing the protruding ventral, sagittal spine.

„ 88. *H. histricosa* Jørg., $^{450}/_1$. Ofoten II, $^{7}/_2$ 1899, 0—100 m. Apical view. Diameter of the thorax 94 μ, of the cephalis 27 μ. Pores very uneven, from 5 to 20 μ.

„ 89. *Dictyophimus histricosus* Jørg. n. sp., $^{450}/_1$. Sea off Røst, $^{22}/_3$ 1899, 0—900 m. Shell 68 μ high, 85 broad; cephalis 22 μ high, 34 broad. Pores uneven, from 9 μ to very small, not considerably smaller on the cephalis.
b. The same; optical section, showing 4 main spines. The three swellings, mentioned under *Lithomelissa setosa* (above p. 127) and other species, are distinctly seen.

„ 90. *Litharachnium tentorium* Hck. Sea north of Shetland, 63° 36′ n., 0° 32′ e., $^{11}/_2$ 1903 (S/S Michael Sars).
a. The entire shell of a fully developed specimen, $^{200}/_1$.
b. Upper (conical) part of the shell, $^{450}/_1$.
c—e. Pores and parts of the network, $^{660}/_1$; c from below the broken part of the shell, e the largest pores of the cone, above the beginning intermediate ribs, d farther down on the cone, where intermediate ribs appear.

„ 91. *L. tentorium* Hck., $^{450}/_1$. Skroven, $^{4}/_4$ 1899, 0—150 m. Young specimen.
a. Lateral view.
b. Apical view. The 3 primary meshes in the neck stricture are seen.
c. A portion of the network near the margin below.

PLATE XVII.

Fig. 92. *Androcyclas gamphonycha* (Jørg.) Jørg., $^{450}/_{1}$. The Herlø Fiord (near Bergen), $^{21}/_{6}$ 1898, 0—400 m. A well developed specimen with very strong and numerous byspines. Cephalis 38 μ (long) × 34 μ (broad); thorax 42.5 × 76; abdomen 110 × 110; tophorn 64 μ.

„ 93. *A. gamphonycha* (Jørg.) Jørg., $^{450}/_{1}$. Ofoten II, $^{7}/_{2}$ 1899, 0—100 m. Antapical view, showing the main spines (except the spine D), the „collar septum" (Hck.) and the outlines of the shell.

„ 94. *A. amblycephalis* (Jørg.) Jørg., $^{450}/_{1}$. Oxsund, $^{17}/_{2}$ 1899, 550—620 m. Shell 102 (long) × 90 μ.

„ 95. *A. amblycephalis* (Jørg.) Jørg., $^{450}/_{1}$. The Vest Fiord I, 0—180 m., $^{13}/_{1}$ 1899. Young specimen. Cephalis 27 μ broad, thorax 72 μ. Cephalis as yet open above; abdomen not yet developed, only indicated through some marginal spines below.

a. Lateral-ventral view; the spine L_r in front, a little to the right.

b. The same, lateral view. The inner septum, between thorax and abdomen, is seen.

„ 96. *A. amblycephalis* (Jørg.) Jørg., $^{450}/_{1}$.

„ 97. *A. amblycephalis* (Jørg.) Jørg. Apical view, showing the cephalis open above.

„ 98. *Clathrocyclas craspedota* (Jørg.) Jørg., $^{380}/_{1}$. Helligvær, $^{12}/_{1}$ 1899, 0—250 m. A well developed specimen; apical view. Greatest diameter of the abdomen 167 μ, of the thorax 133 μ, of the cephalis 42.

„ 99. *Cl. craspedota* (Jørg.) Jørg., $^{480}/_{1}$. From the same locality. Young specimen; abdomen as yet wanting.

a. Lateral view.

b. Apical view.

„ 100. *Cl. craspedota* (Jørg.) Jørg., $^{450}/_{1}$. Ofoten II, $^{7}/_{2}$ 1899, 0—250 m. Young specimen without abdomen. Cephalis 25 μ high × 42 μ broad below; the longest tophorn 127 μ.

a. Lateral view, showing the two strong tophorns.

b. Apical view.

c. Optical section in the region of the „neck"; apical view. The main spines, except spine D, are seen.

d. Optical section, lateral view, showing the two tophorns protruding from the inner skeleton.

„ 101. a. *Dictyoceras acanthicum* Jørg., $^{450}/_{1}$. Skroven, $^{4}/_{4}$ 1899, 0—150 m. Apical view, showing the „collar septum", the main spines (except spine D) and the outlines of the shell.

„ 105. *Radiosphæra anacanthica* Jørg. n. sp., $^{450}/_{1}$. The Skjerstad Fiord IV, 0—330 m., $^{2}/_{4}$ 1900. Diameter of the central capsule 68 μ. The calymma quite invisible in water.

„ 106. *R. anacanthica* Jørg., $^{450}/_{1}$. Kvænangen II, 0—50 m. The calymma made visible through staining with safranine.

PLATE XVIII.

Fig. 101. b. *Dictyoceras acanthicum* Jørg., $^{450}/_{1}$. The Herlø Fiord (near Bergen), $^{25}/_{4}$ 1898, 0—400 m. Cephalis 33 μ high × 31 broad; thorax 73 × 101; abdomen 38 × 126 μ. Pores of the cephalis 3.5 μ, of the thorax 4—7.5 μ, of the abdomen 6—10 μ.

„ 102. *Stichocorys seriata* (Jørg.) Jørg., $^{450}/_{1}$. Oxsund, $^{17}/_{2}$ 1899, 250—350 m. A well developed specimen.

„ 103. *St. seriata* (Jørg.) Jørg., $^{450}/_{1}$. Sea off Aalesund, 61° 56′ n., 2° 40′ e., $^{10}/_{2}$ 1903, 0 m. (S/S Michael Sars). A well developed specimen.

„ 104. *St. seriata* (Jørg.) Jørg., $^{450}/_{1}$. Sea north of Shetland, 63° 36′ n., 0° 32′ e., $^{11}/_{2}$ 1903, 0 m. (S/S Michael Sars). A well developed specimen. Length (tophorn not included) 128 μ, greatest breadth 72 μ. Largest pores 6 μ long. The pores on the upper part are omitted in the figure.

[Figs. 105—106, on pl. XVII.]

„ 107. *Acanthocorys umbellifera* Hck. (?), $^{550}/_{1}$. The Oster Fiord (near Bergen), $^{13}/_{6}$ 1900, 200—400 m.; Cephalis 54 μ high × 46 broad, thorax 38 × 96.

„ 108. *Lithomelissa setosa* Jørg., $^{660}/_{1}$. Kvænangen, $^{24}/_{1}$ 1899, 0—140 m.

a. Lateral view; the spine L_1 in front.

b. Ventral-apical view; the sagittal ventral spine in front upwards. The inner lattice plate between the spines V and L_1 is seen; also the axial spine, a. The specimen not fully developed.

„ 109. *Amphimelissa setosa* (Cl.) Jørg., $^{660}/_{1}$. Near Jan Mayen, S/S Michael Sars 1900, st. 19, $^{9}/_{8}$, 50—100 m. Young specimens (?).

a. Antapical view.

b. Another specimen; dorsal view.

„ 110. *Cannosphæra lepta* Jørg., $^{450}/_{1}$. The Herlø Fiord (near Bergen), $^{10}/_{5}$ 1898, 0—300 m. Some tangential and radial beams.

„ 111. *Challengeron Channeri* (Murr.) Hck., $^{200}/_{1}$. Sea, 40 miles NW of Gaukværø, $^{19}/_{1}$ 1899, 0—700 m. Peristome and radial spines broken off. The crossing lines in the middle indicate the structure of the shell.

„ 112. *Ch. armatum* Borg., $^{450}/_{1}$. From the same locality. Illustrated from a sketch, as the specimen was lost before a complete drawing could be finished.

„ 113. *Cadium melo* (Cl.) Borg., $^{450}/_{1}$. Sea off Røst, $^{22}/_{3}$ 1899, 0—900 m. 85 μ long × 60 μ broad.

„ 114. House of *Leprotintinnus pellucidus* (Cl.) Jørg., $^{450}/_{1}$. The Skjerstad Fiord IV, $^{2}/_{4}$ 1900, 0—300 m. Foreign bodies on the house much more numerous than usual.

„ 115. House of *Tintinnopsis nitida* Brandt, *var. ovalis* Jørg. n. var.; $^{600}/_{1}$. Moskenstrømmen, $^{14}/_{1}$ 1899, 0—100 m. Length 43 μ, greatest breadth 38 μ; breadth of the mouth 22 μ.

„ 116. House of *T. nitida* Brandt, *var. sinuata* (Brandt); $^{380}/_{1}$. Moskenstrømmen, $^{13}/_{1}$ 1899, 0—50 m. Length 83 μ, breadth of the mouth 58 μ, breadth in the middle 46 μ.

„ 117. *Codonella lagenula* (Clap. et Lachm.) Entz, *var. ovata* Jørg.; $^{500}/_{1}$. From the west coast, near Bergen.

„ 118. *Ptychocylis urnula* (Clap. et Lachm.) Brandt *var. subarctica* Jørg. n. var; $^{380}/_{1}$. Lyngen II, 0—250 m., $^{27}/_{1}$ 1899. The plicæ of the house only indicated near the mouth, where they are more conspicuous.

„ 119. *Cyttarocylis denticulata* (Ehrb.) Fol., *var. subedentata* Jørg. n. var.; $^{450}/_{1}$. Kvænangen I, $^{24}/_{1}$, 0—50 m. Length 111 μ, „tail tip" 12 μ; breadth of the mouth 49 μ. 36 teeth. Areoles omitted in the figure.

„ 120. *C. denticulata* (Ehrb.) Fol., *var. subedentata* Jørg.; $^{450}/_{1}$. The Ogs Fiord, $^{14}/_{3}$ 1899, 0—90 m. Length 145 μ, tail 34 μ; breadth 51 μ. 36 teeth. Areoles $2^1/_2$ on 10 μ, omitted in the figure.

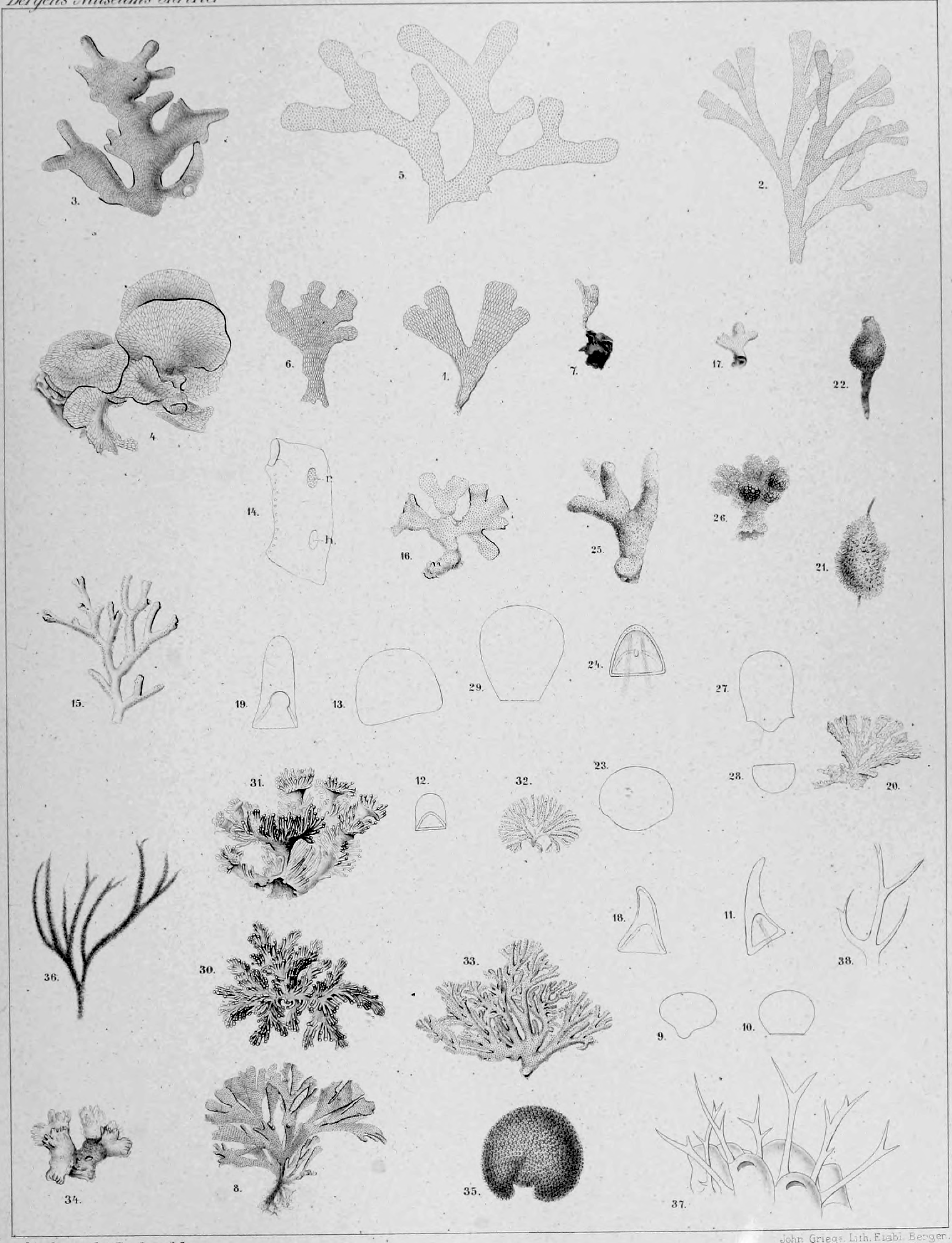
[Fig. 121 on pl. XIV].

Pl. I.

John Griegs Lith. Etabl. Bergen.

Nordgaard del.

John Griegs Lith. Etabl. Bergen.



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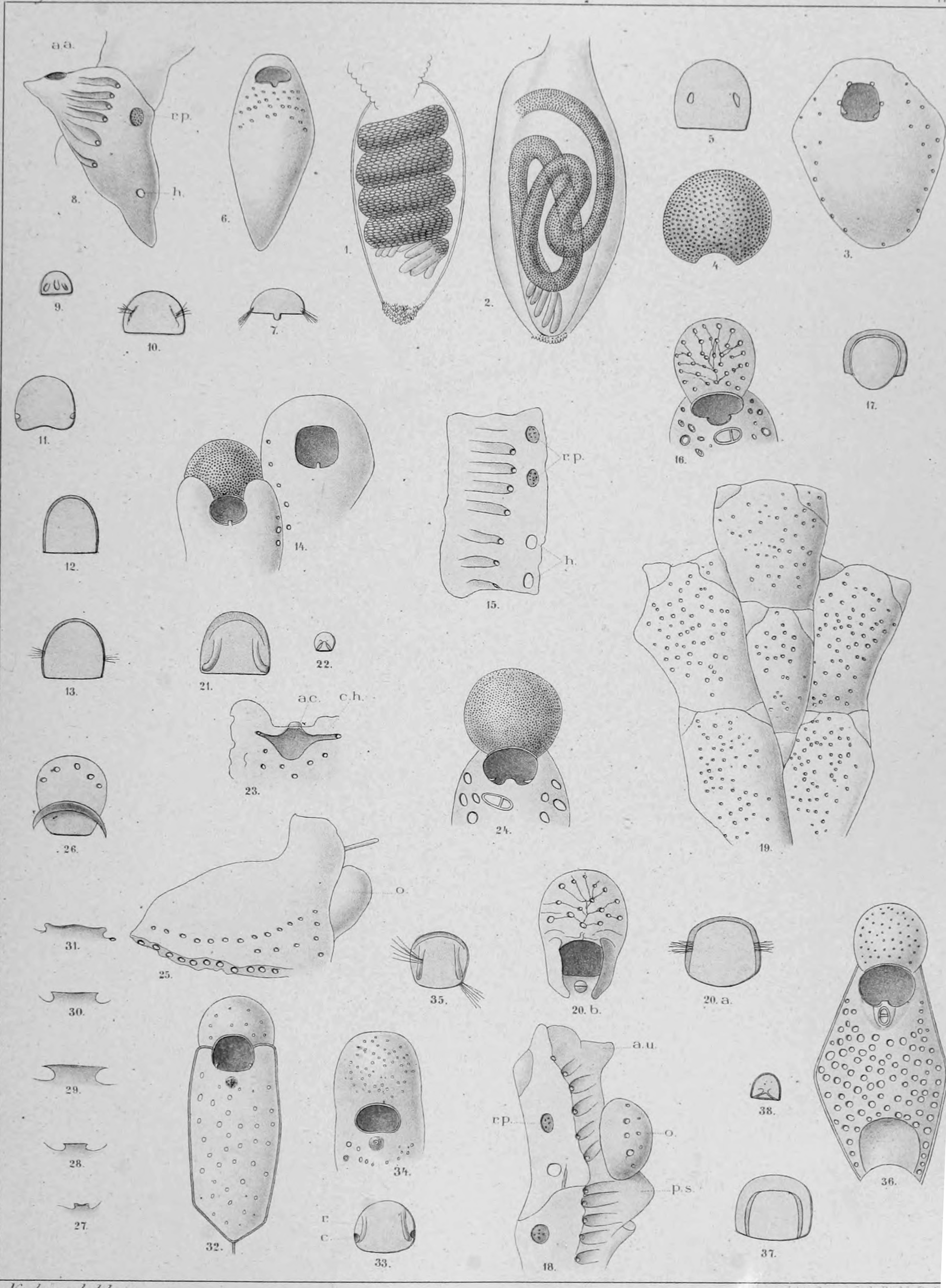
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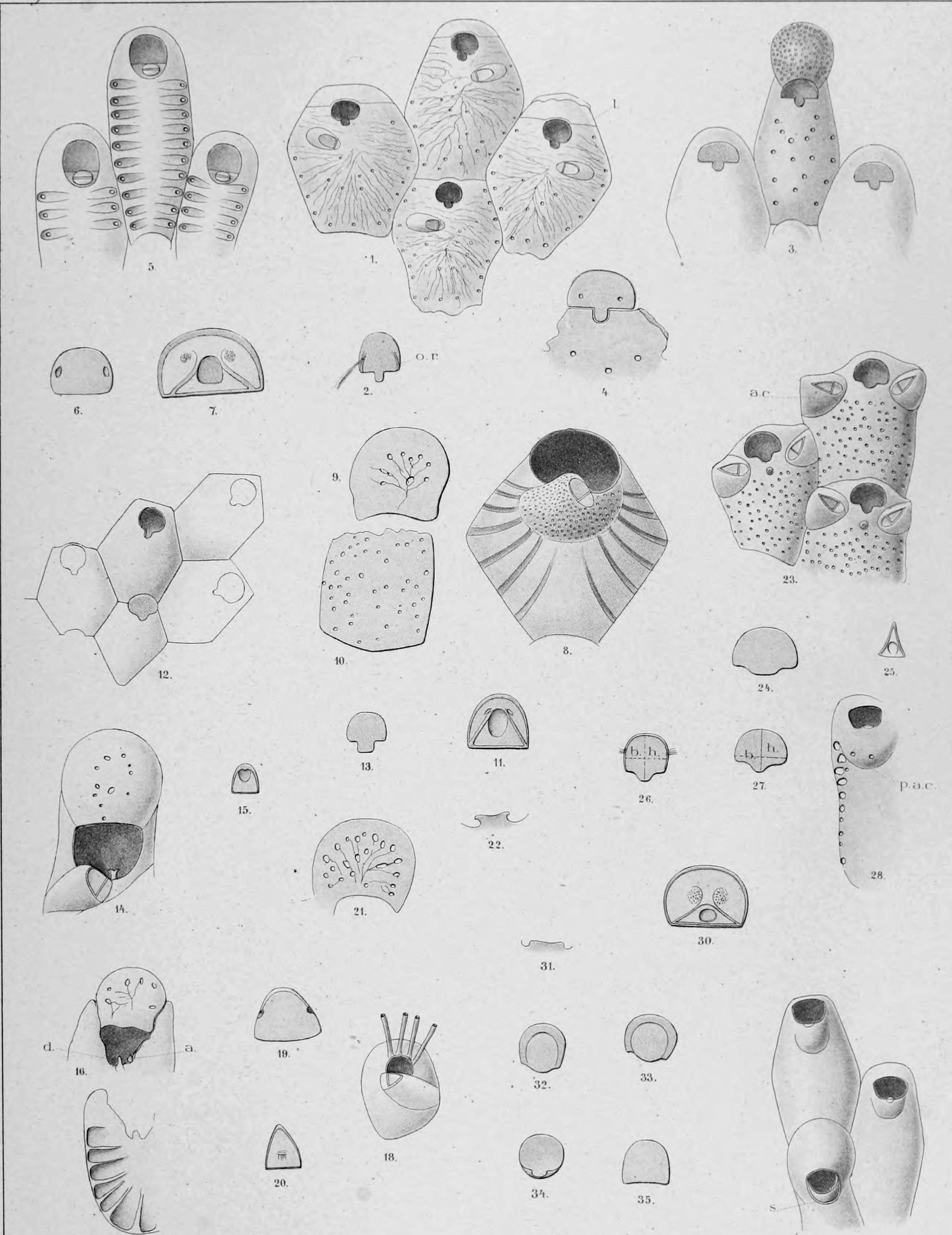

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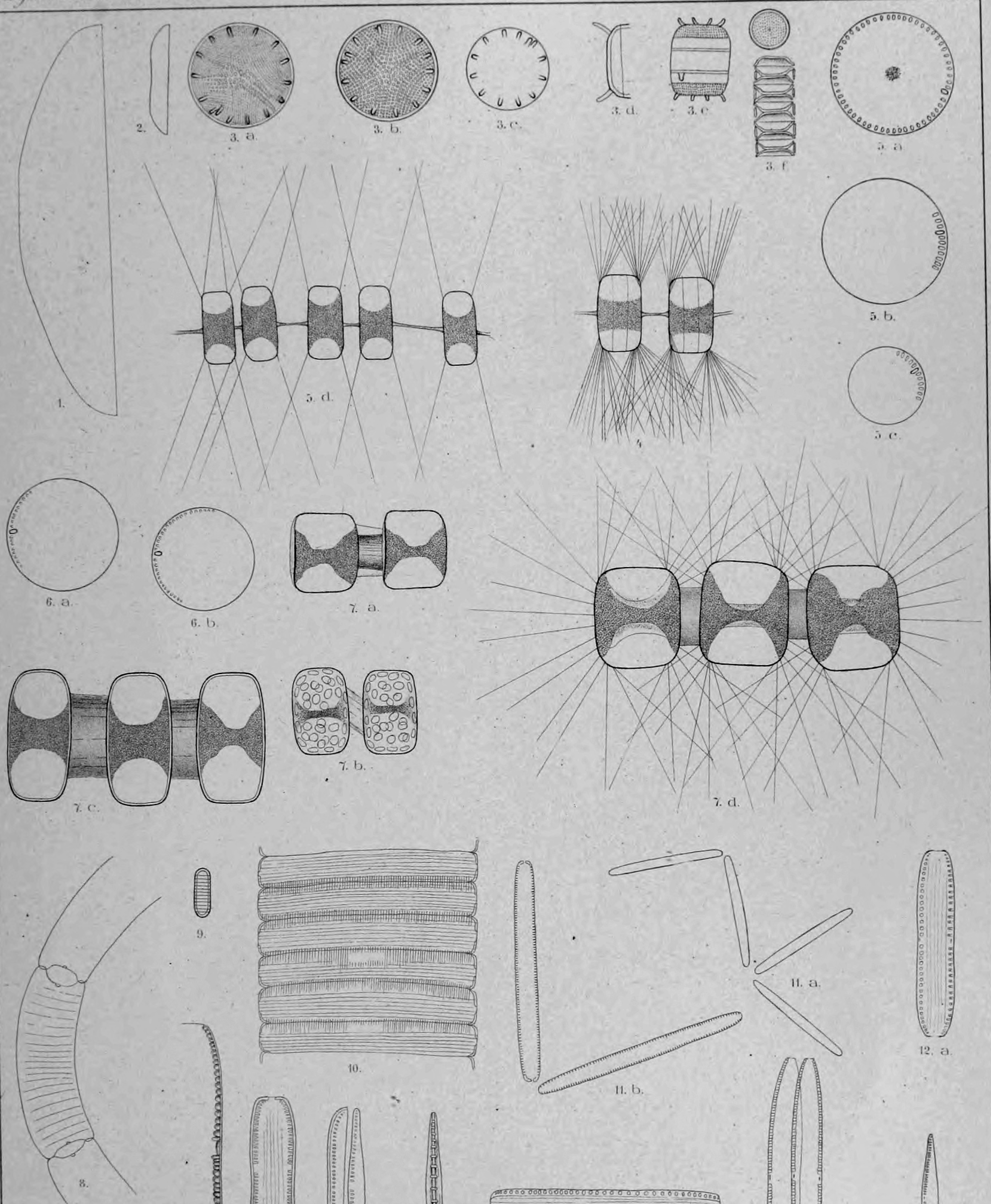
John Griegs Lith. Etabl. Bergen



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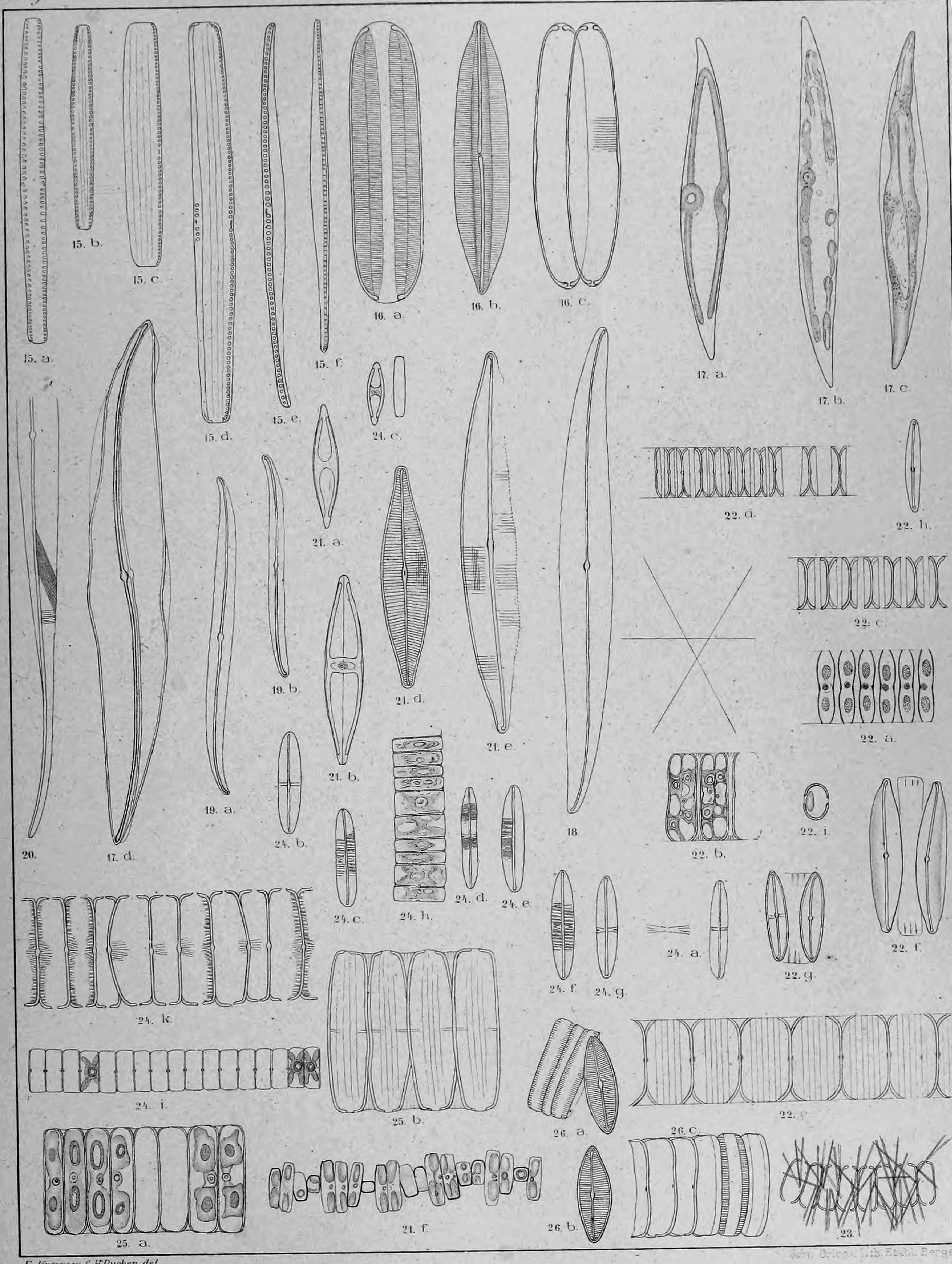

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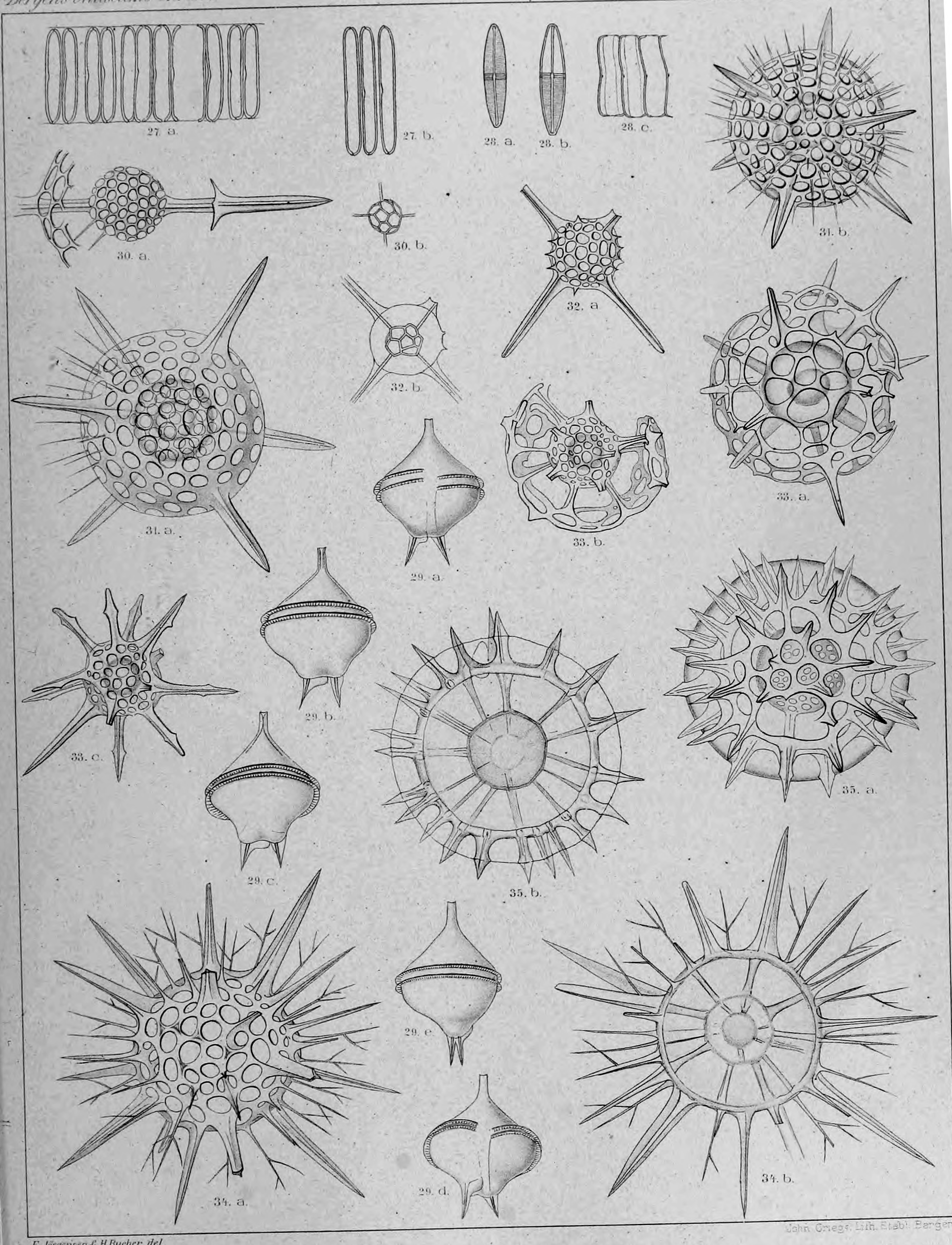

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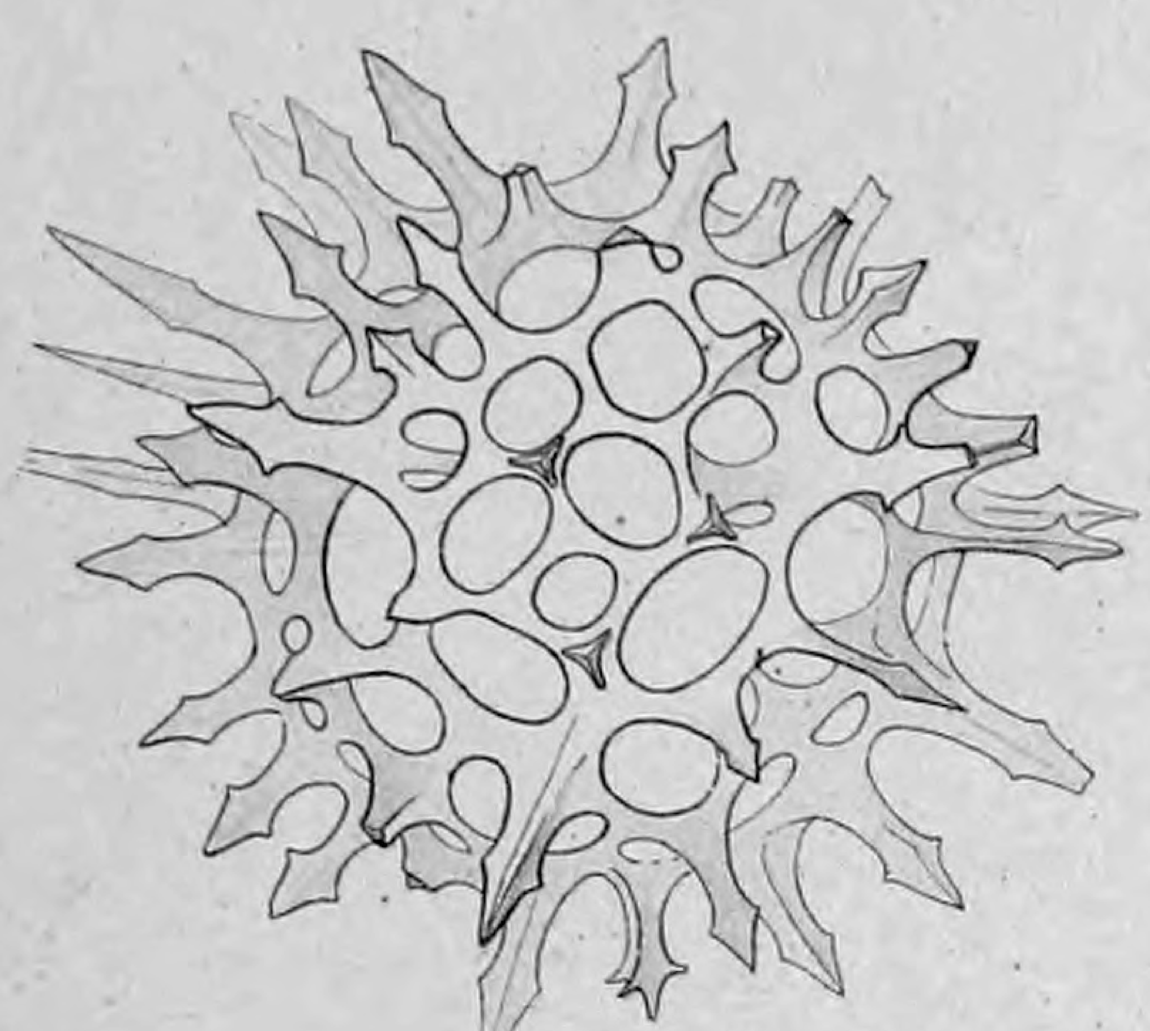
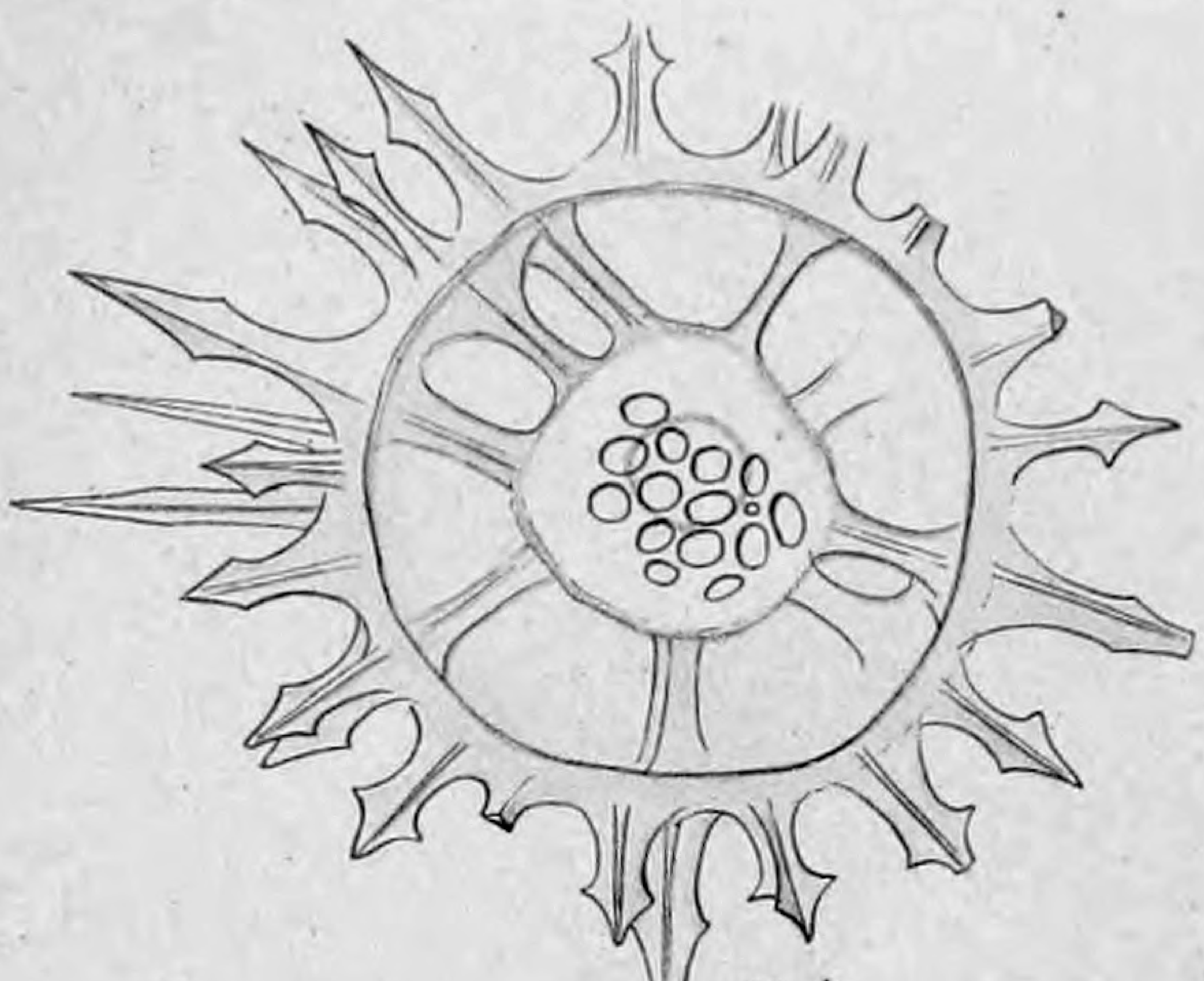
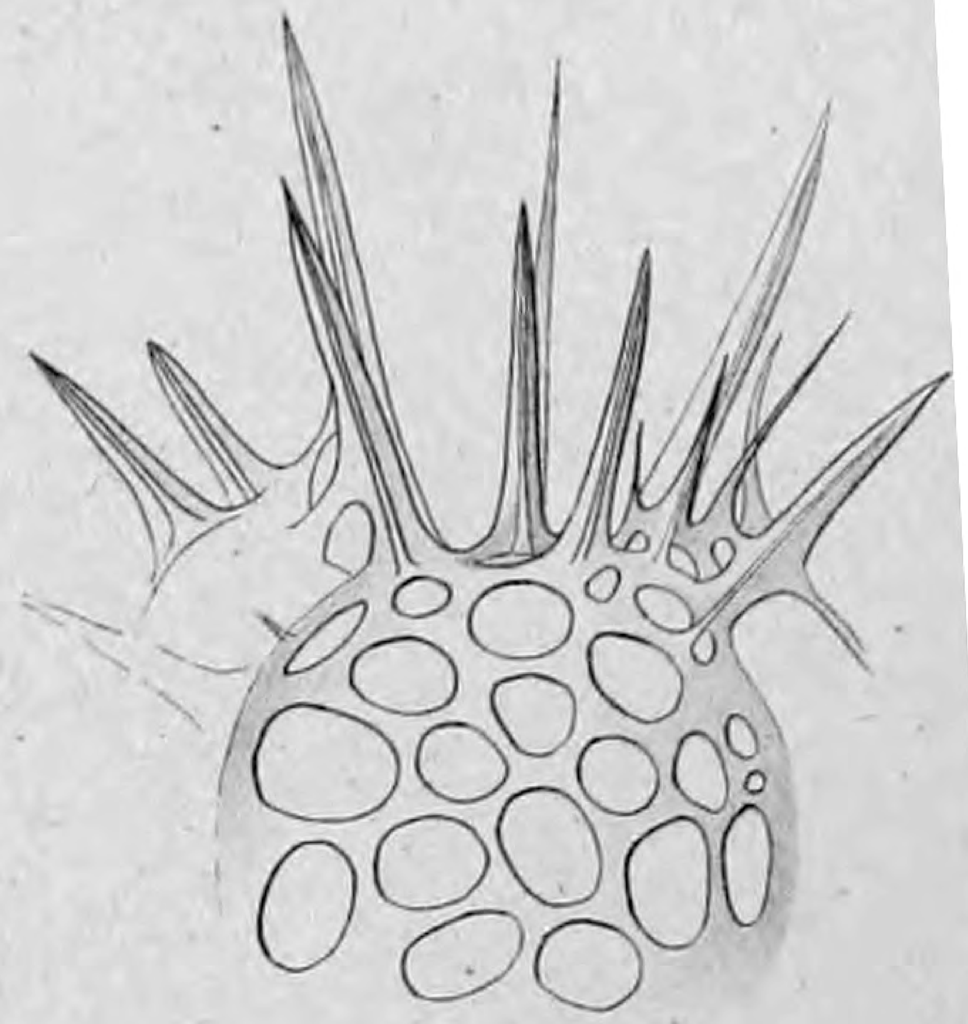


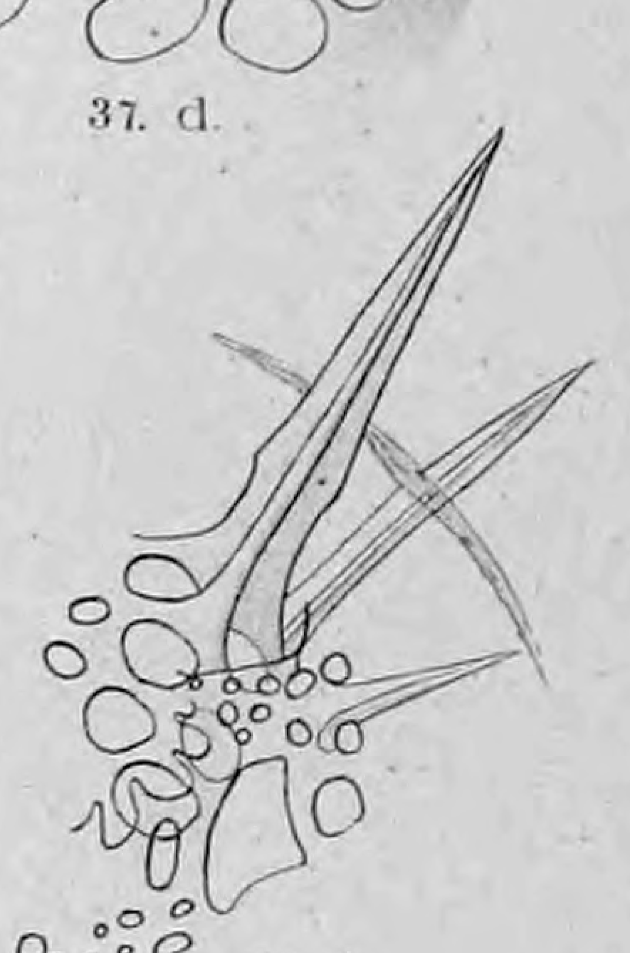
36. a.



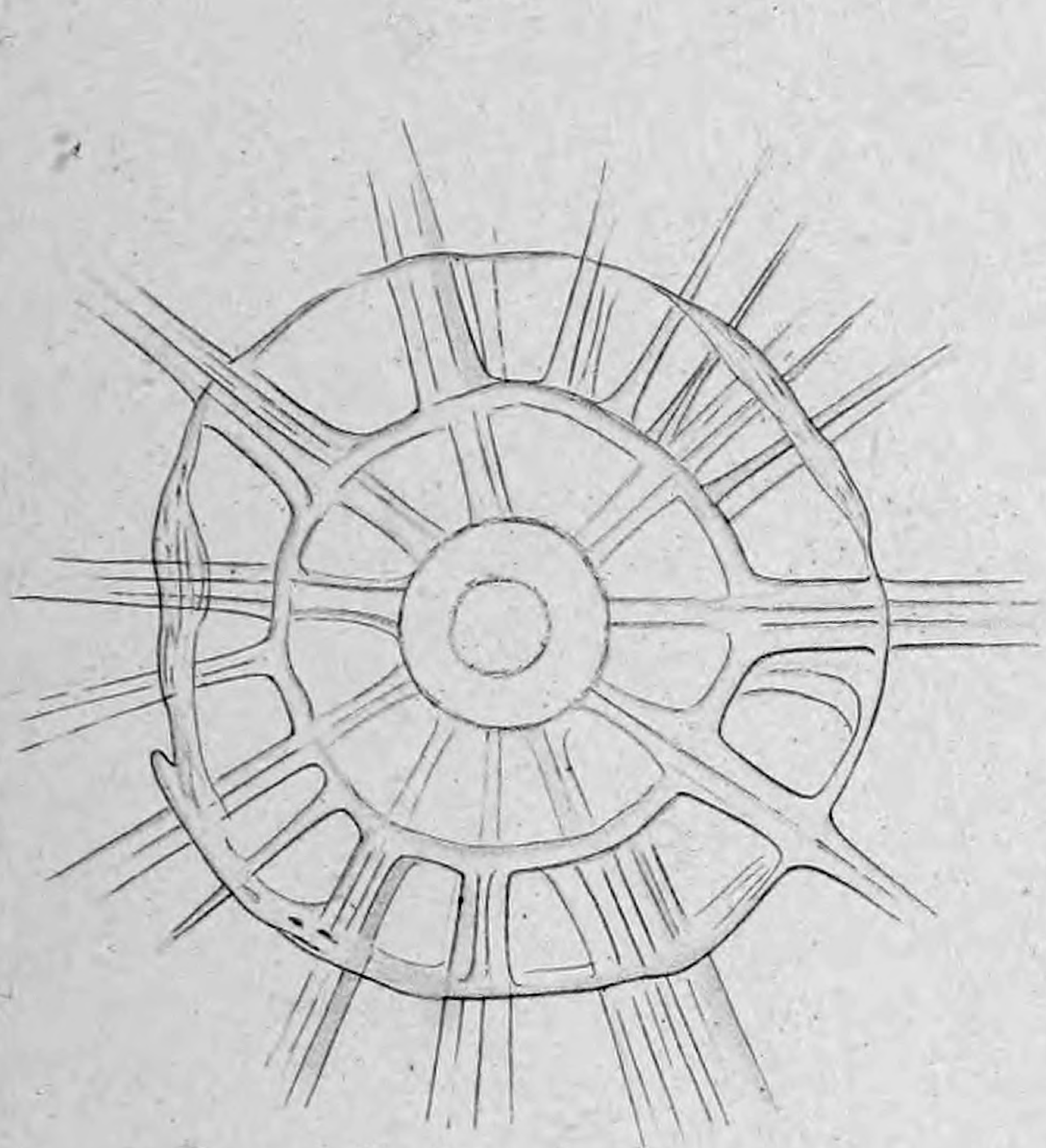
36. b.



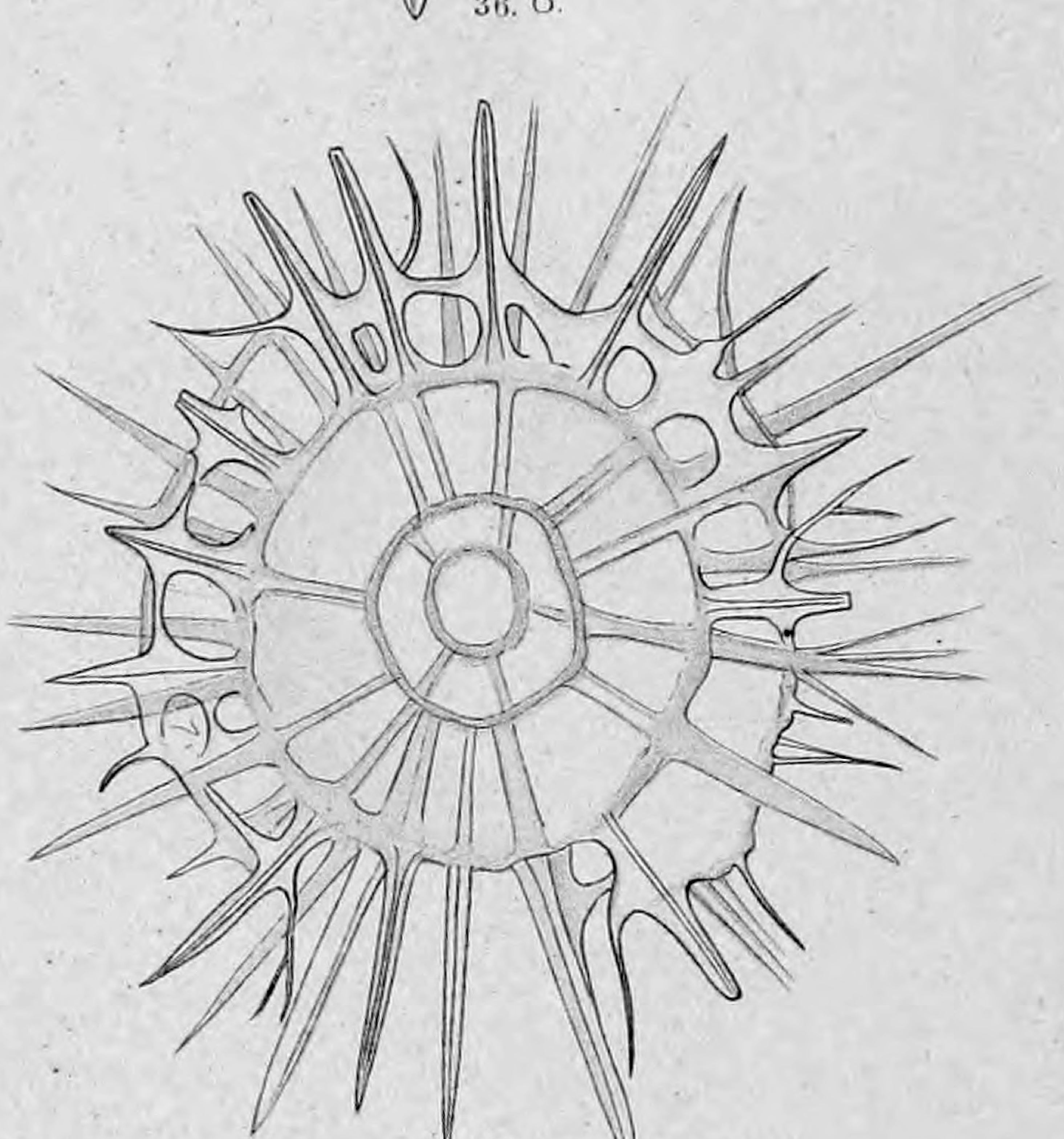
37. d.



37. b.

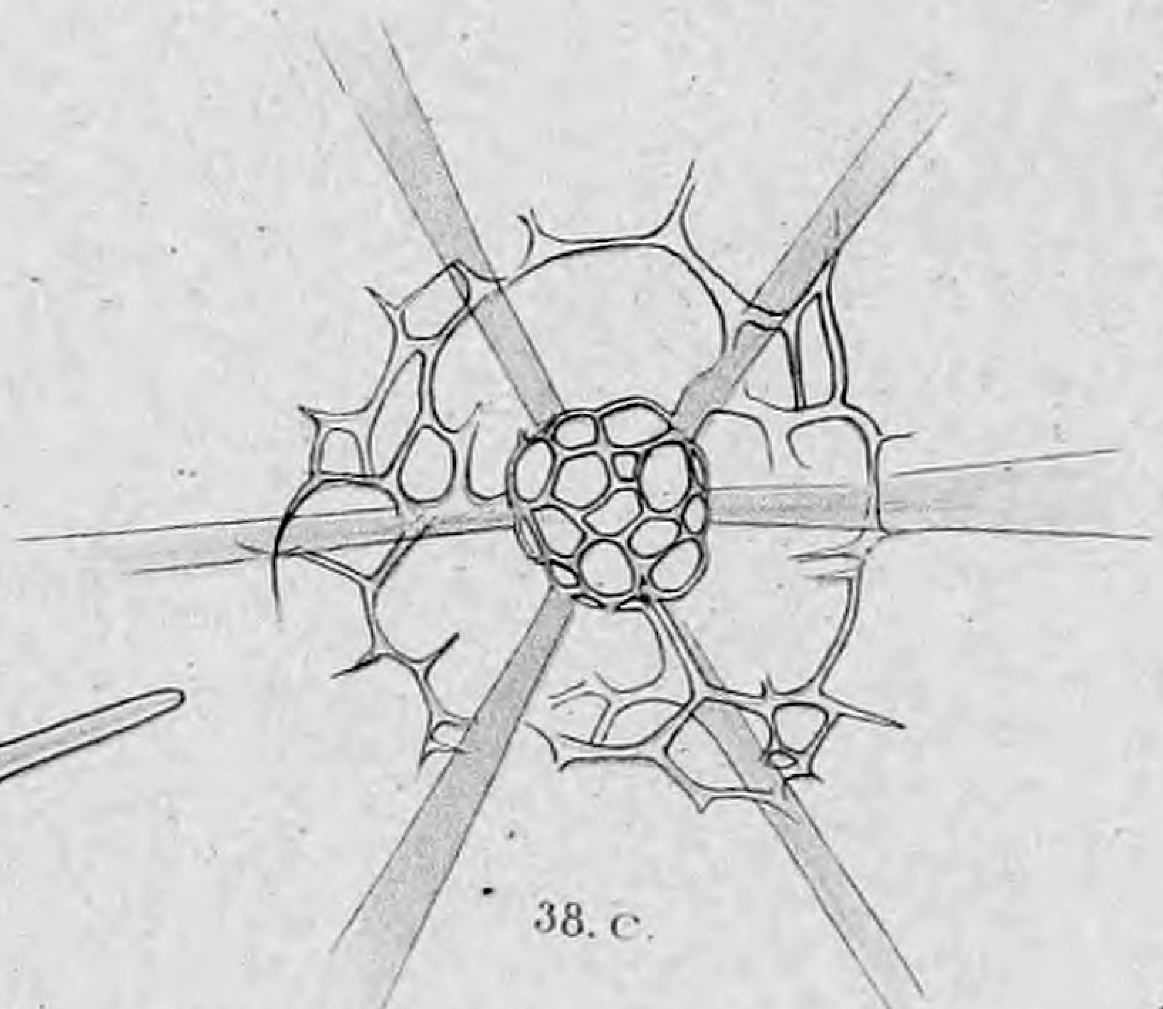


37. a.



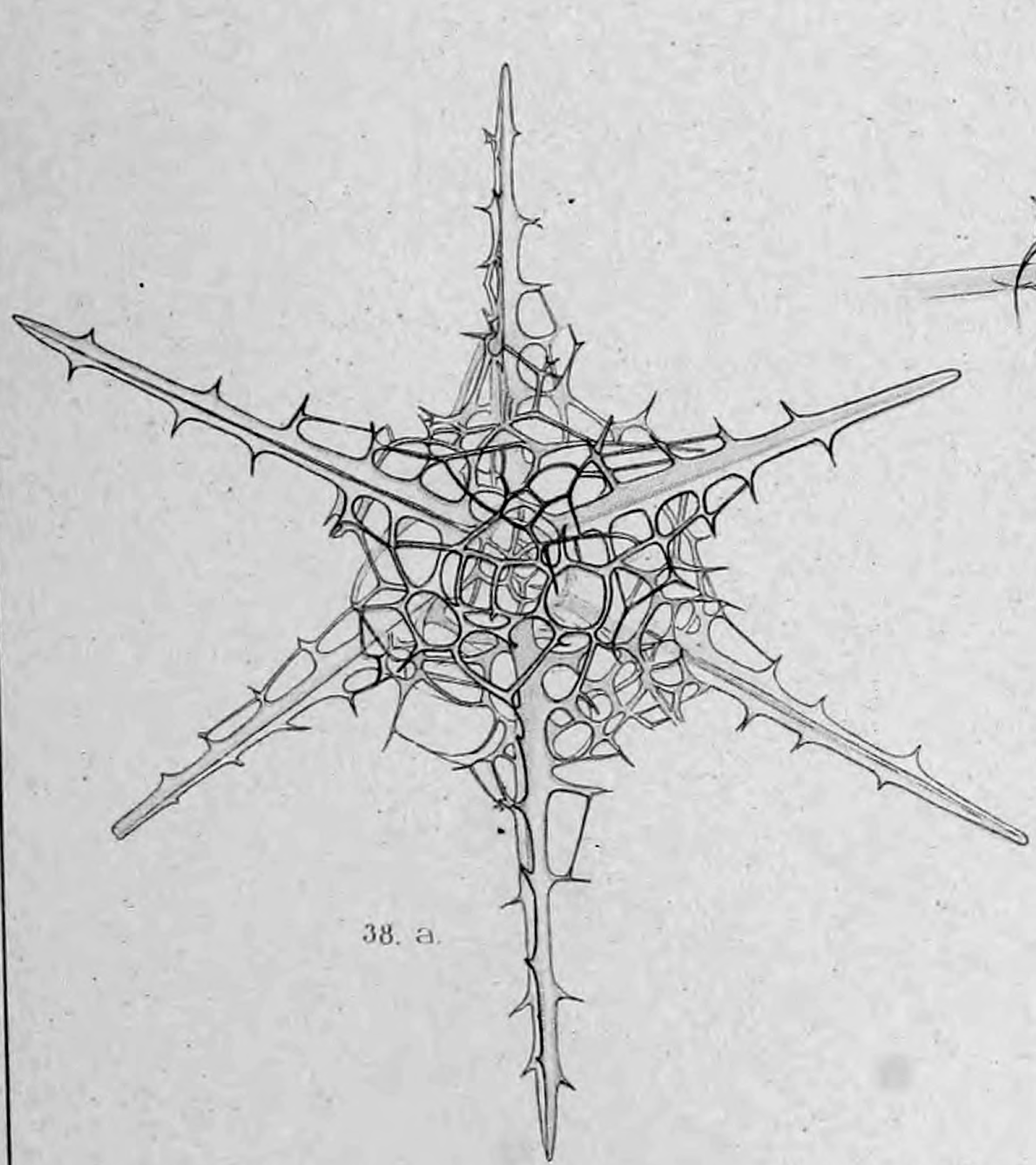
37. c.

37. e.

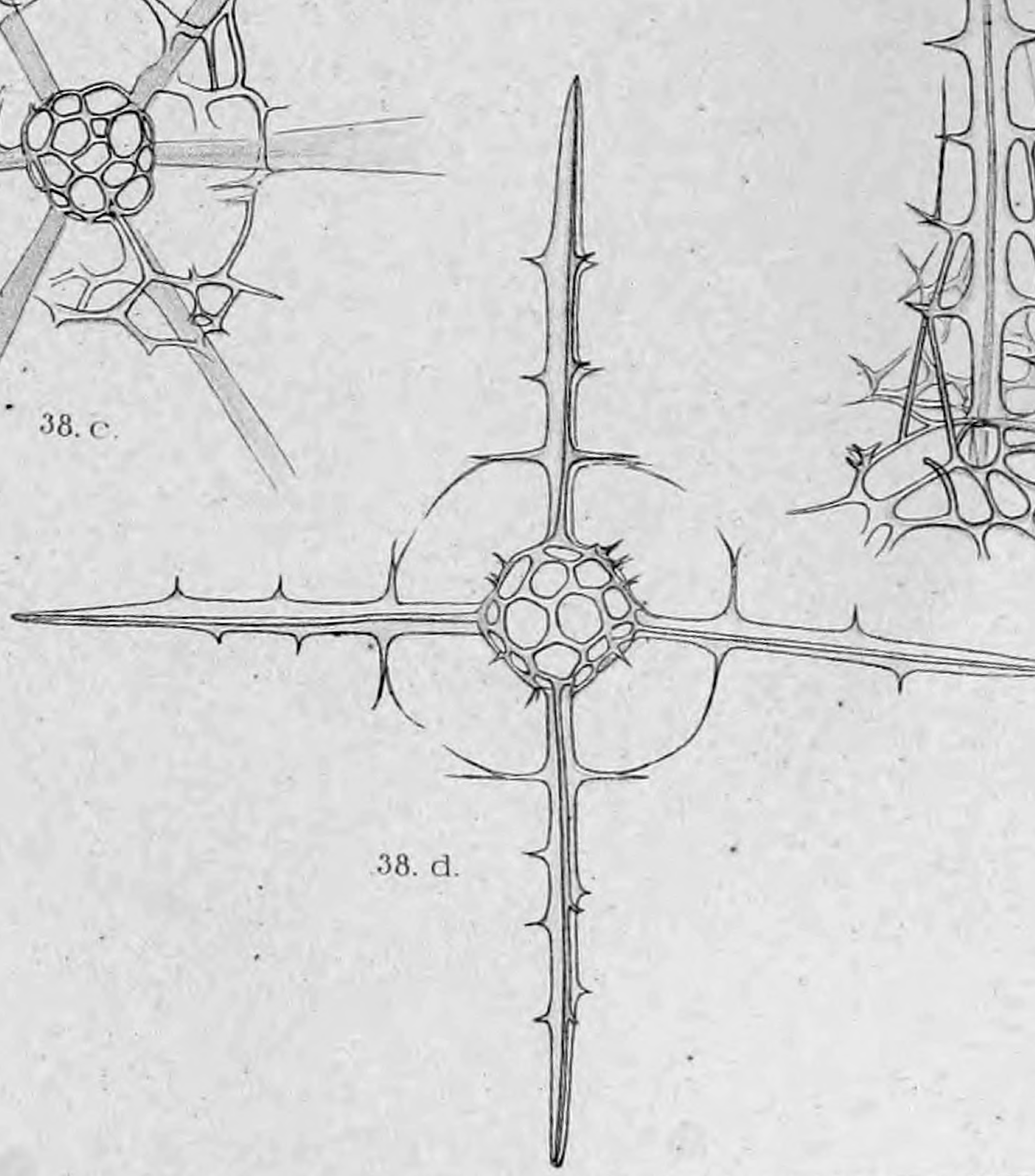


38. c.

38. b.



38. a.



38. d.

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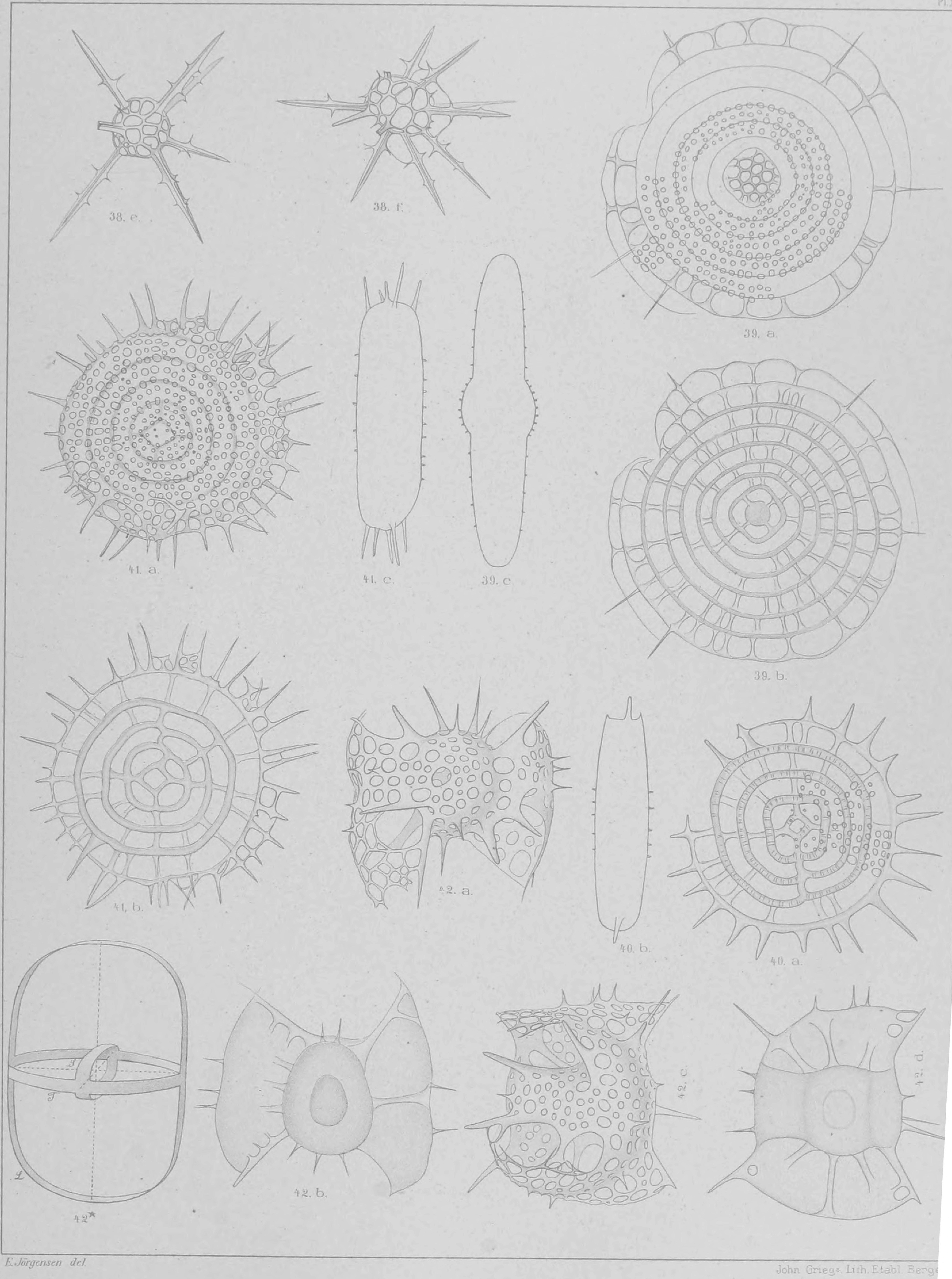

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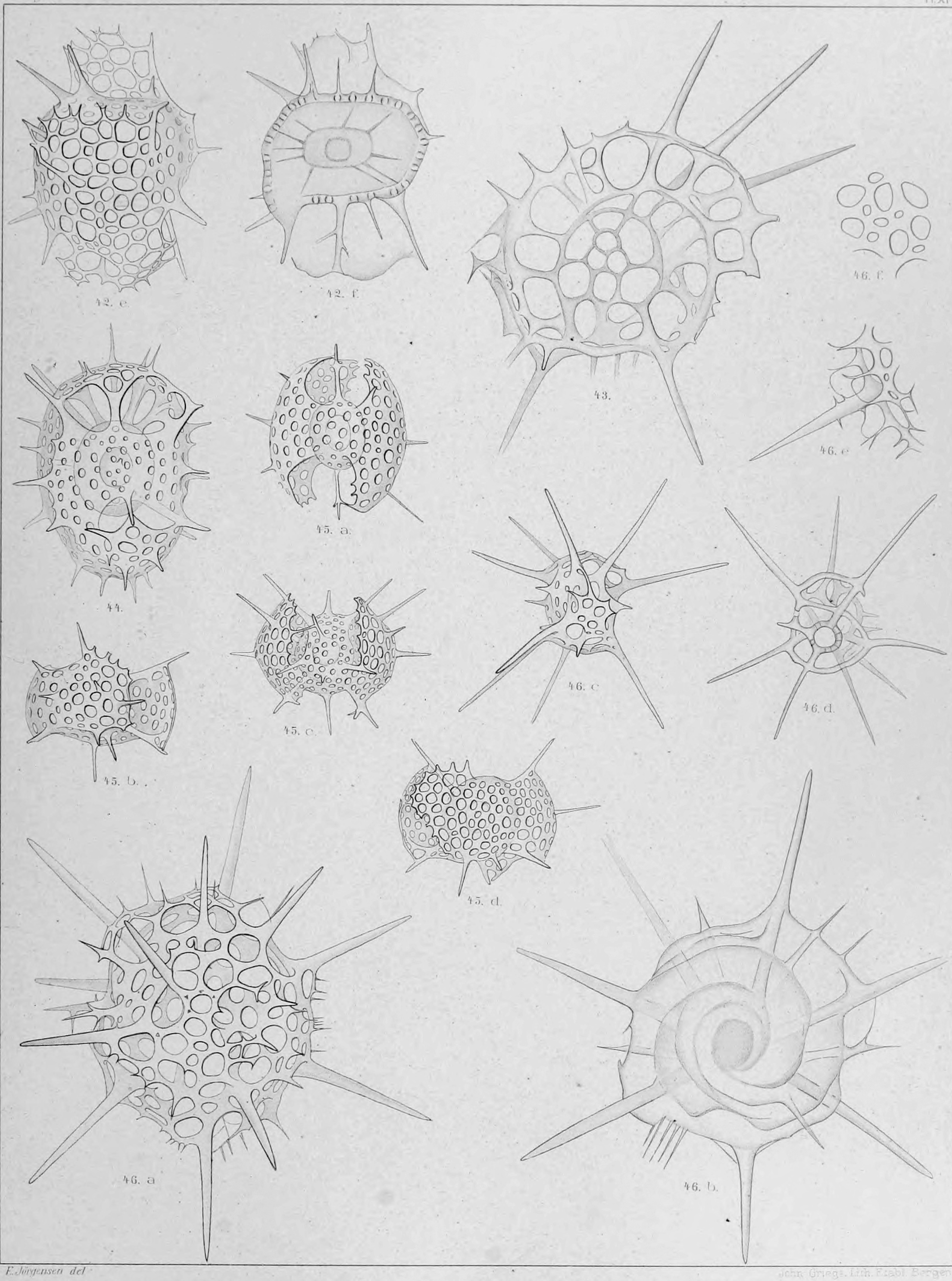
John Griegs Lith. Etabl. Berg



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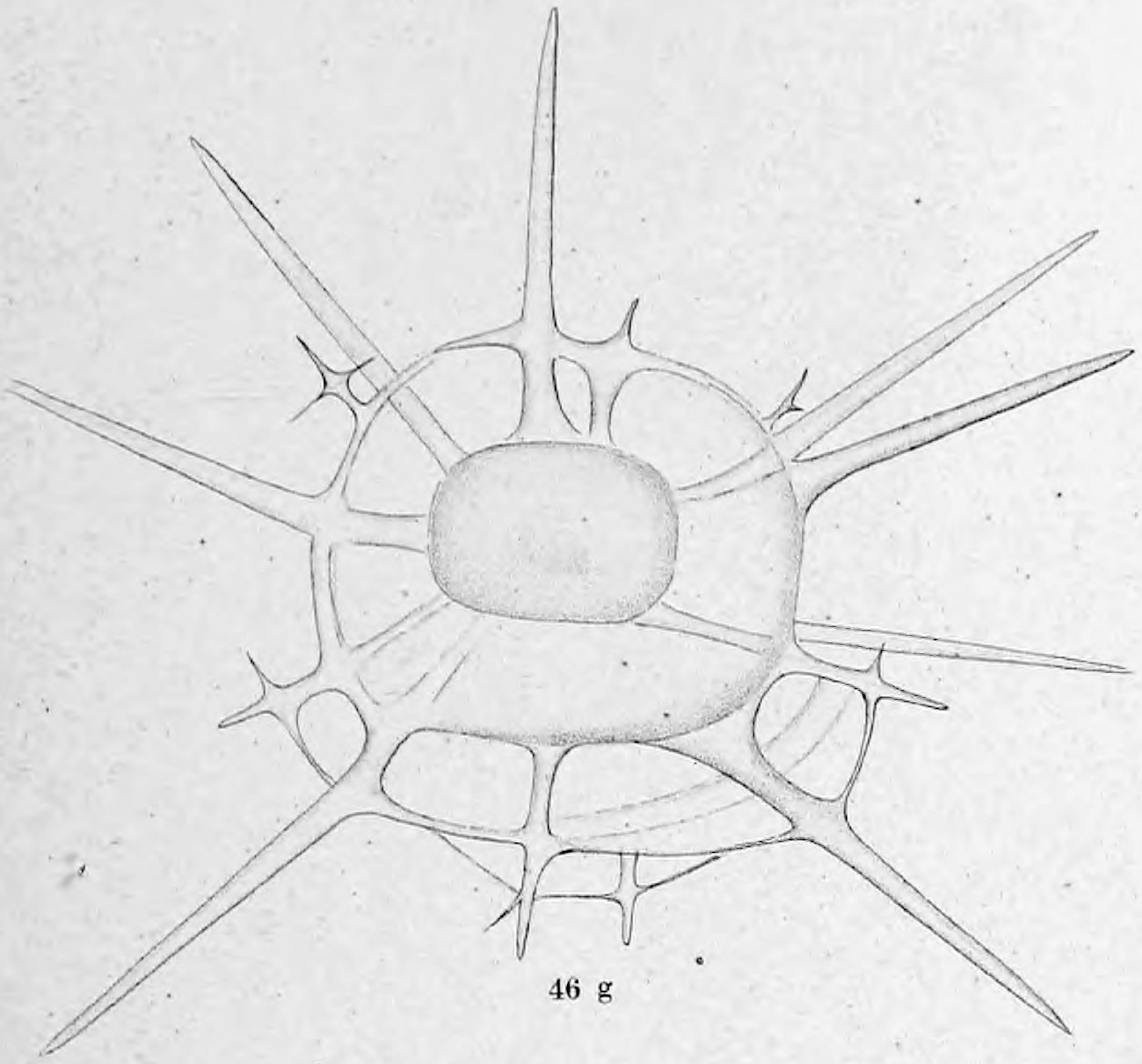
John Griegs Lith. Anst. Bergen.



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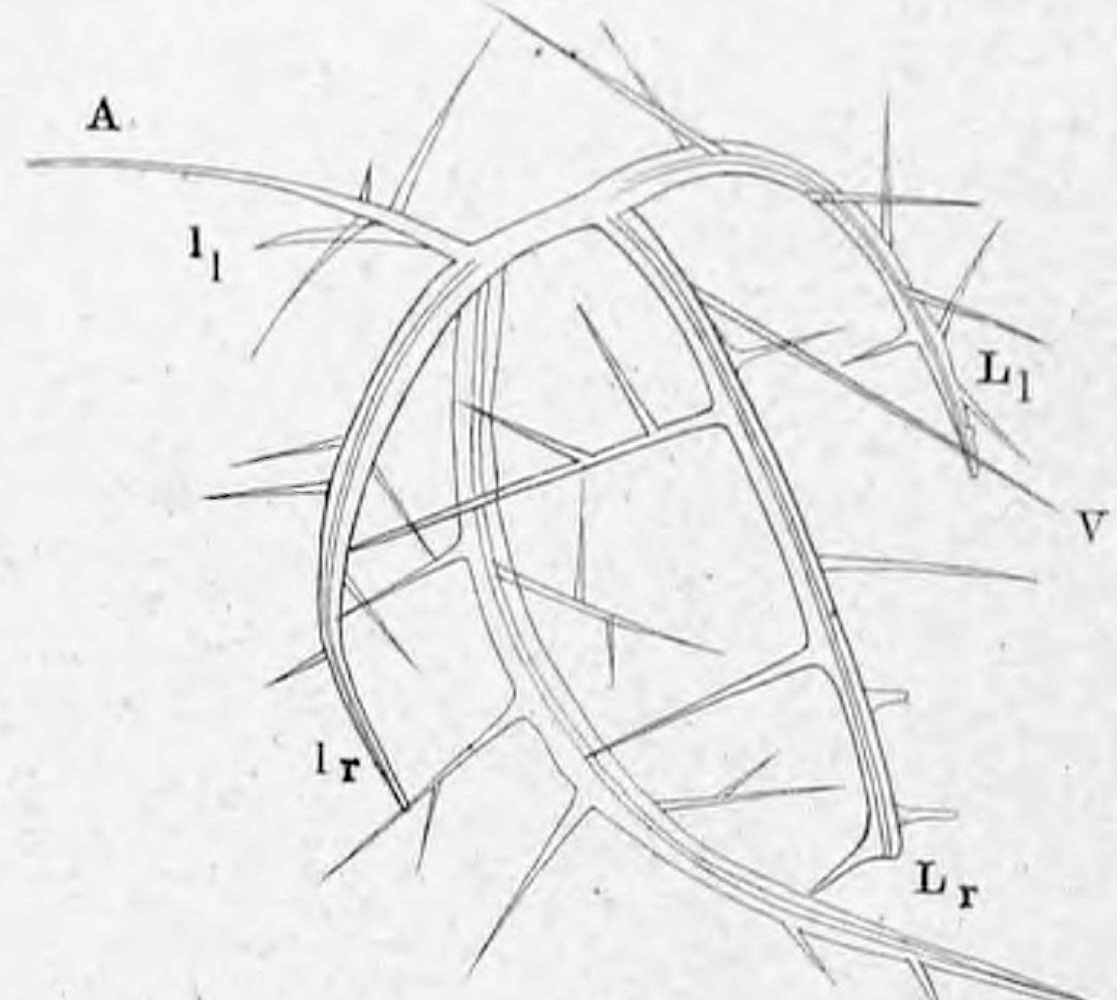

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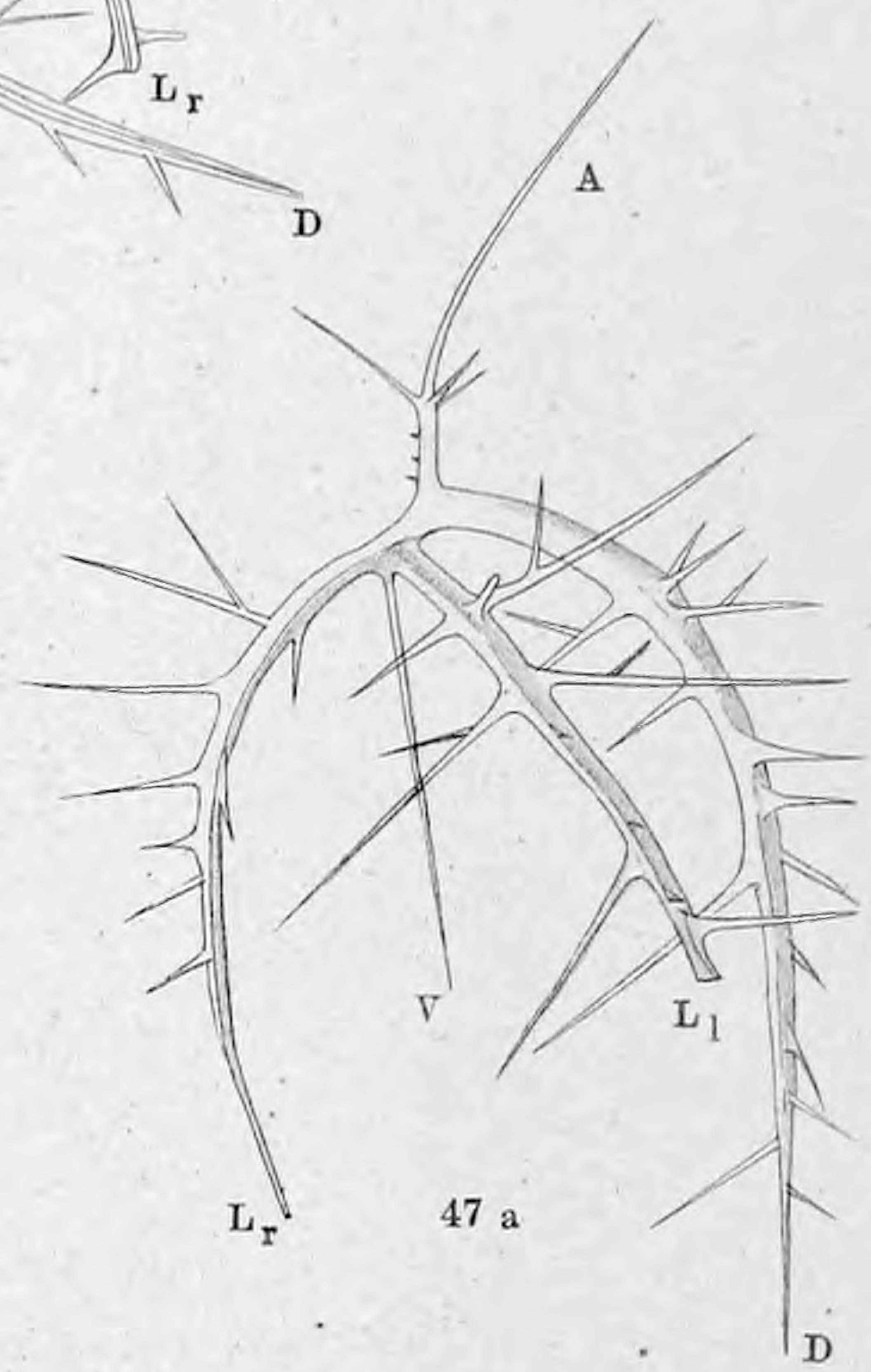

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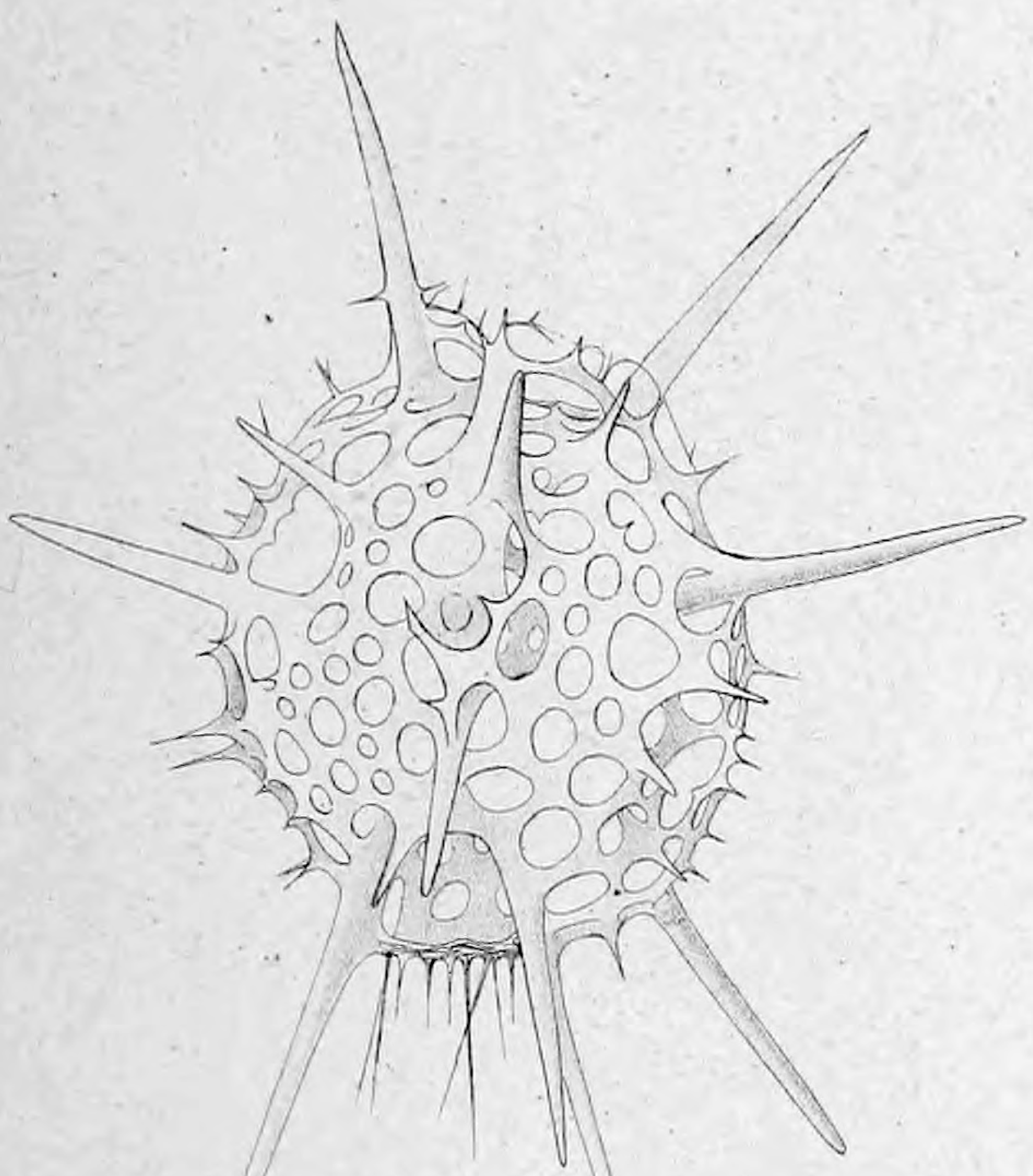

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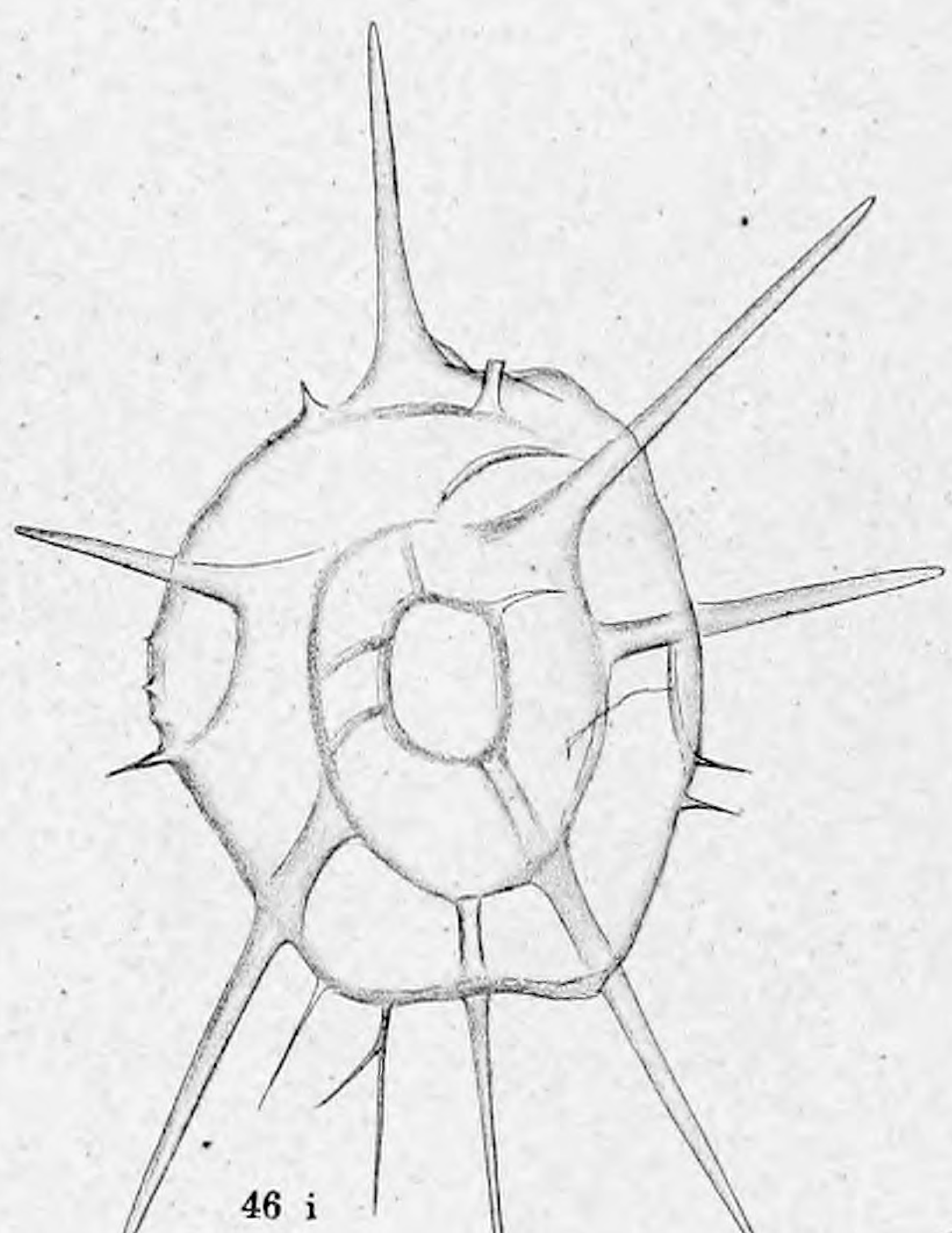

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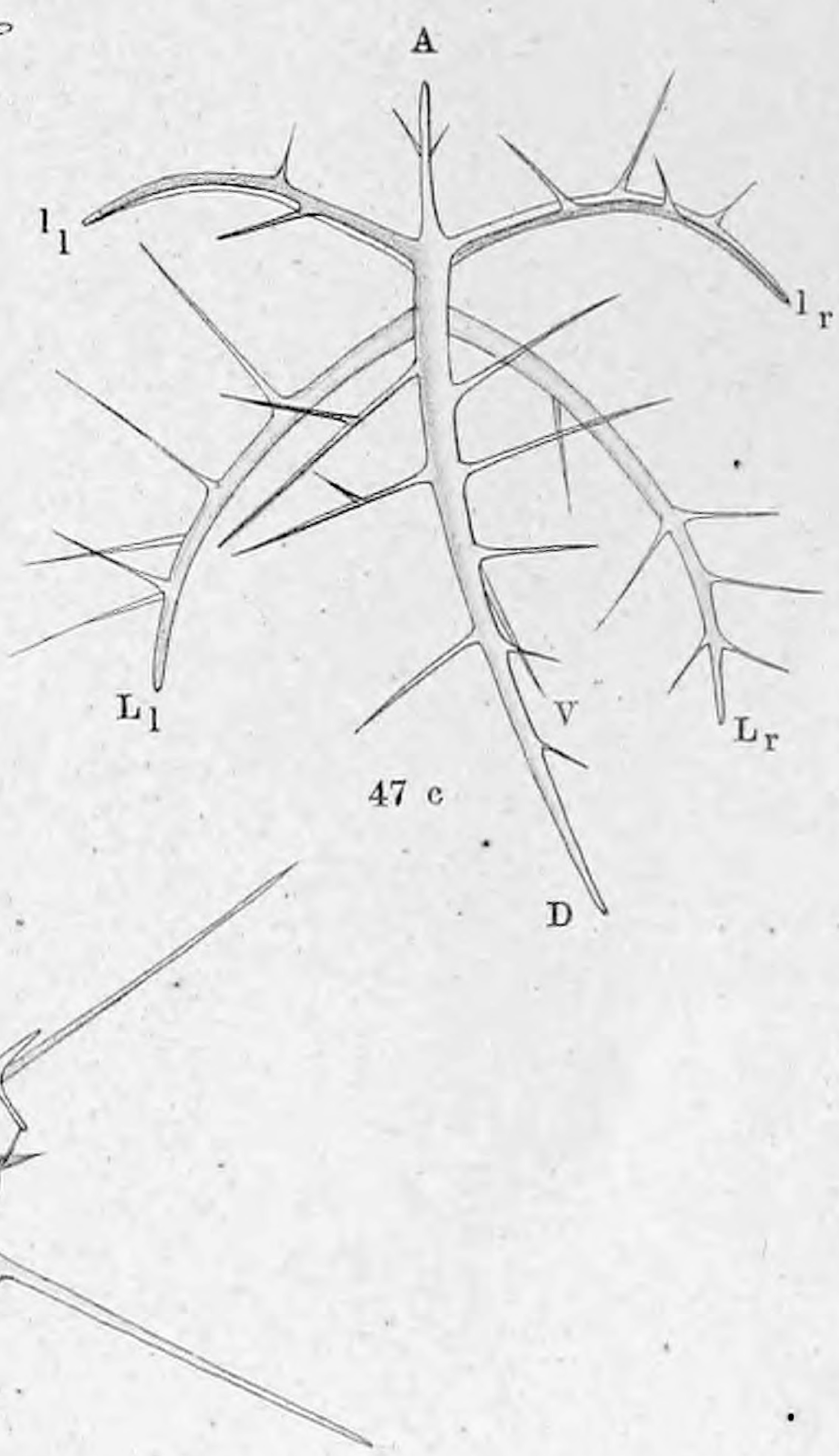

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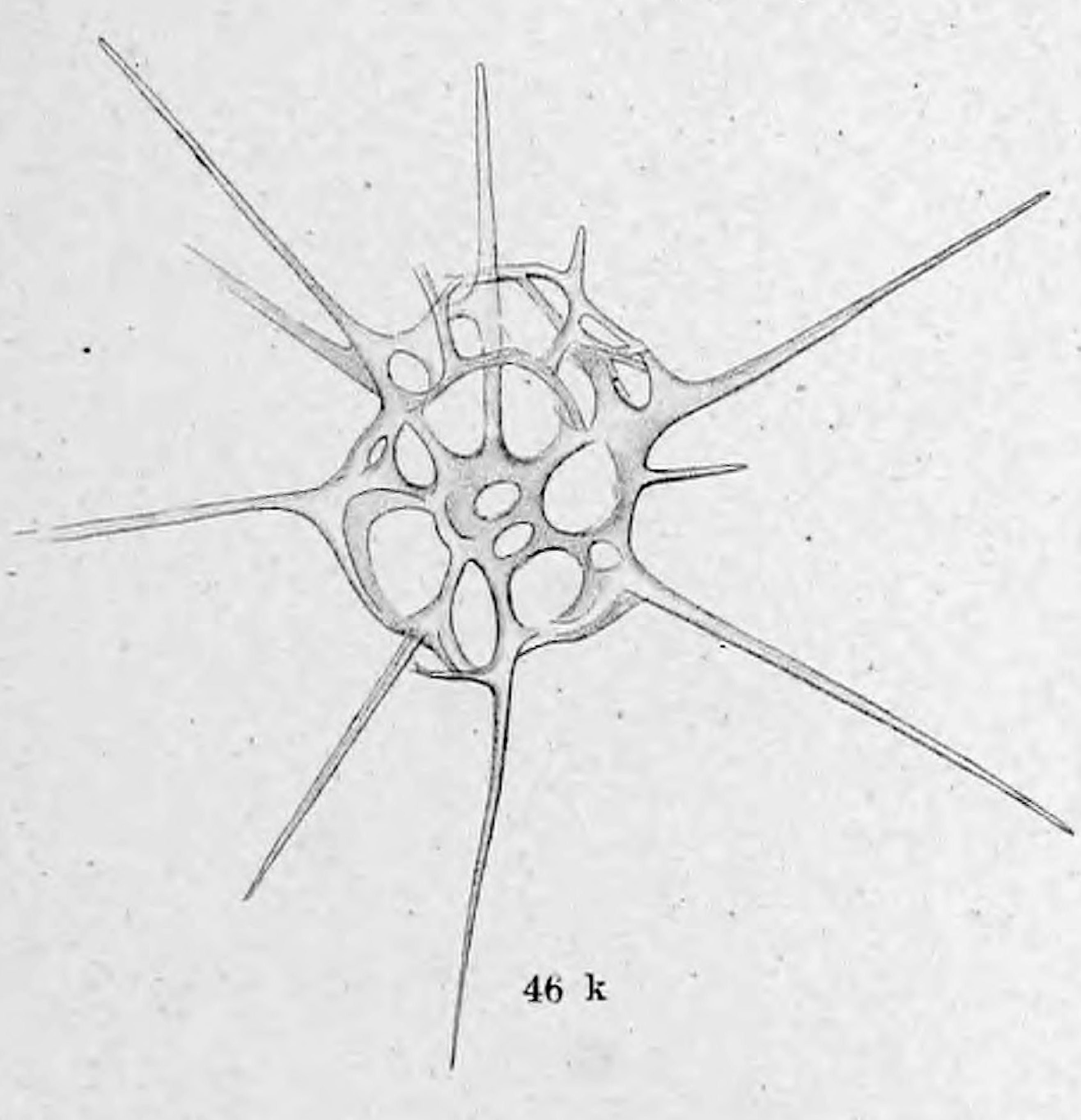

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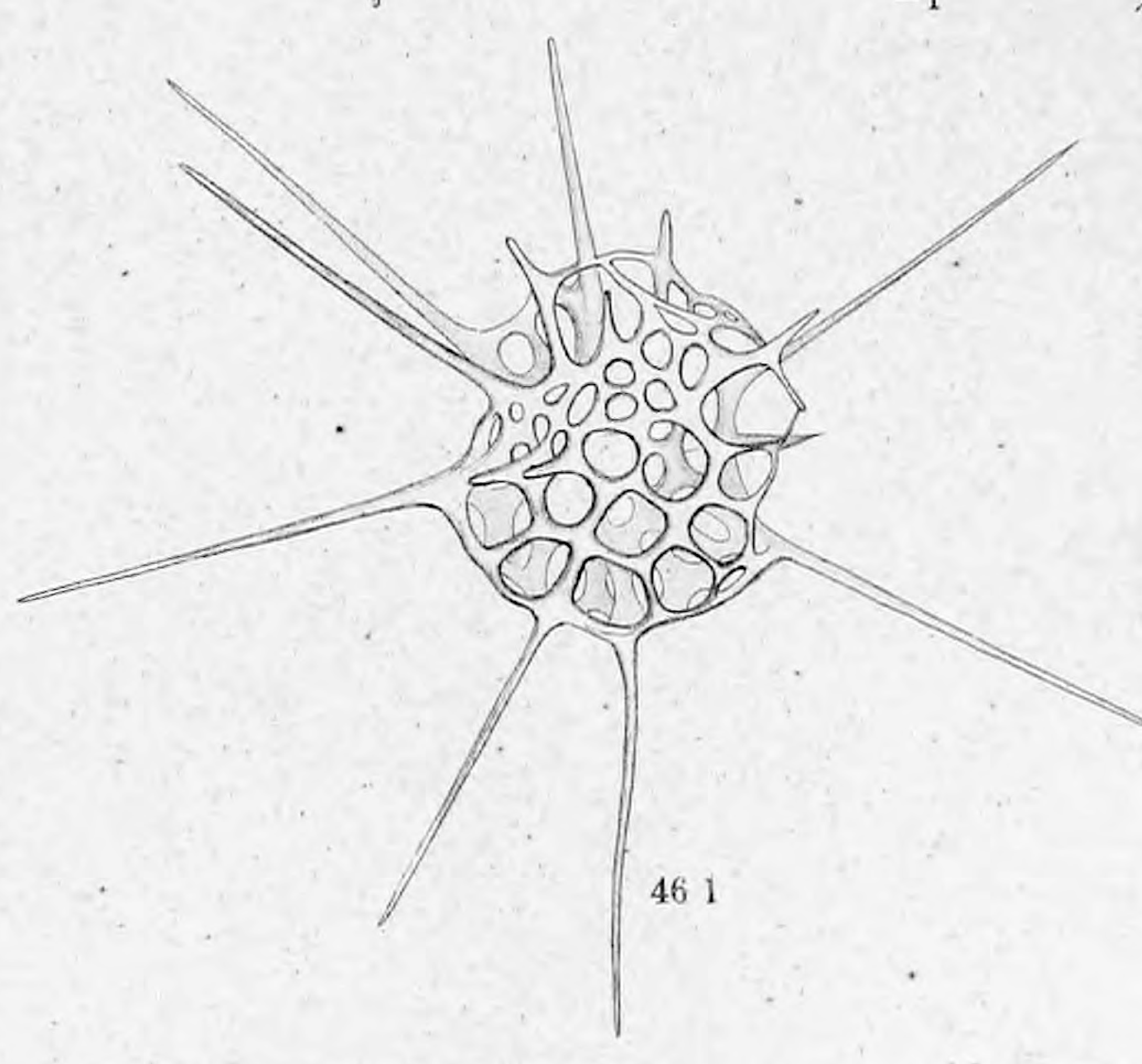


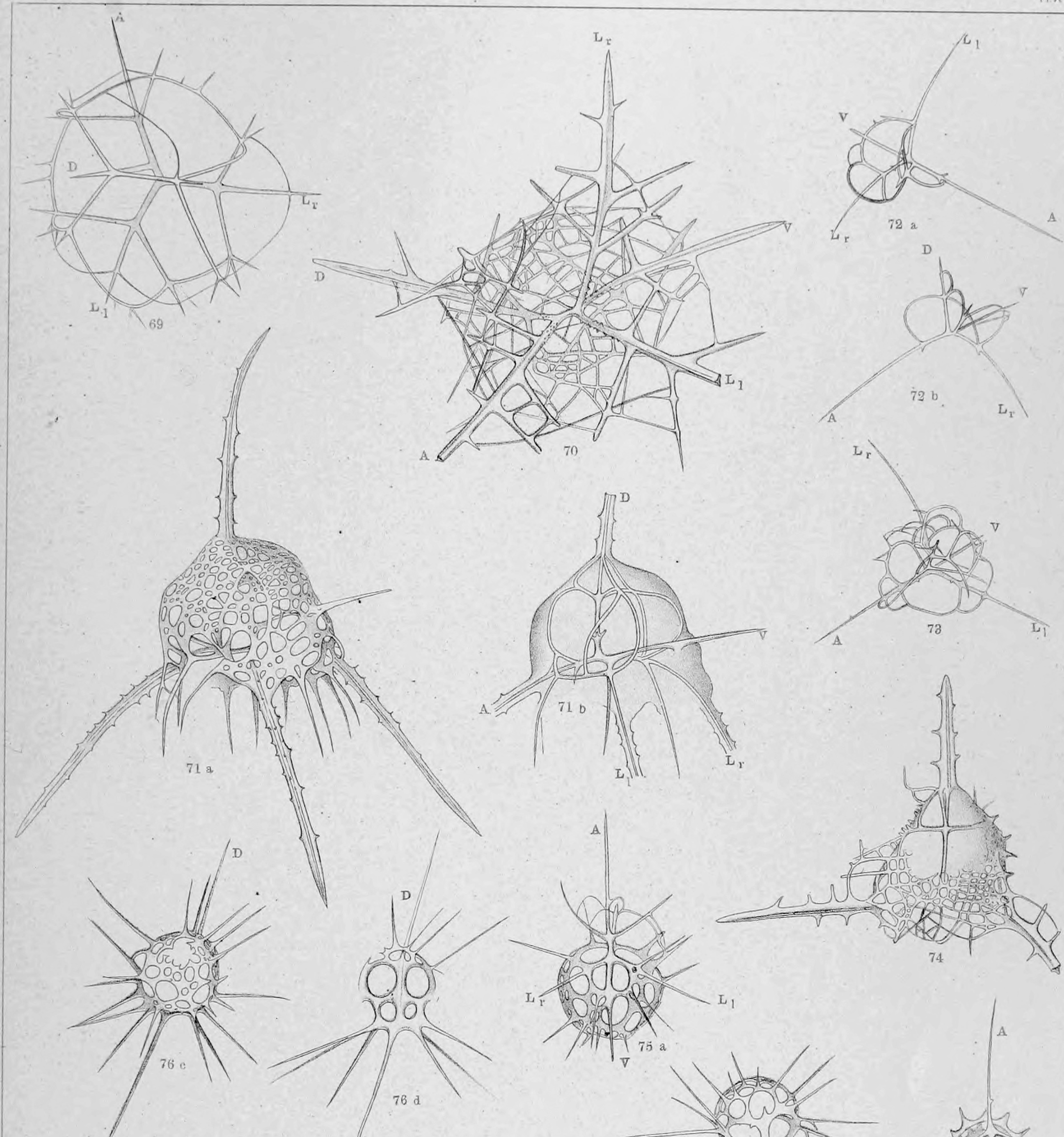
46 l

E. Jörgensen del.

John Griegs Lith.

E. Jörgensen del.

John Griegs Lith. Etabl. Bergen



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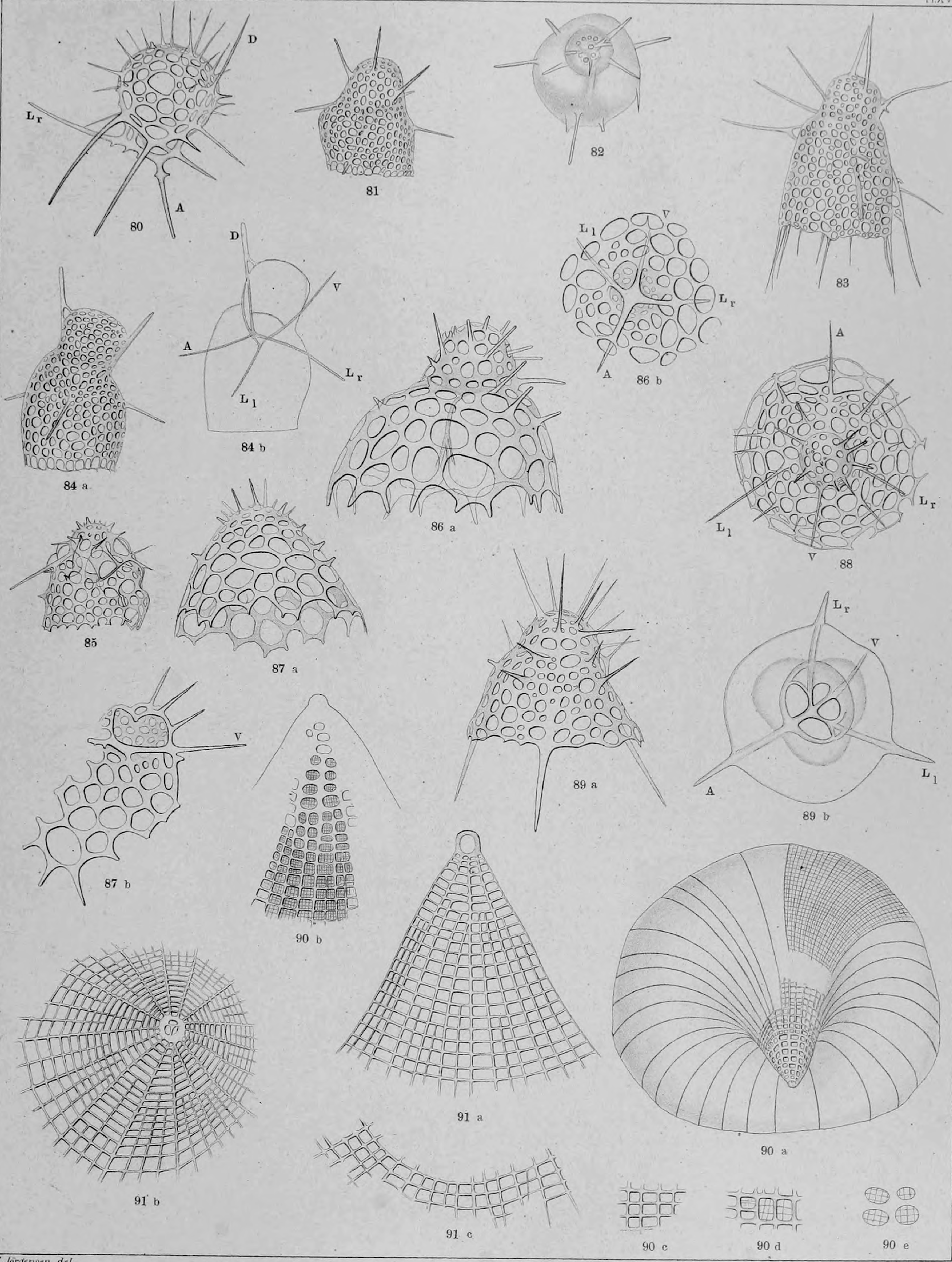
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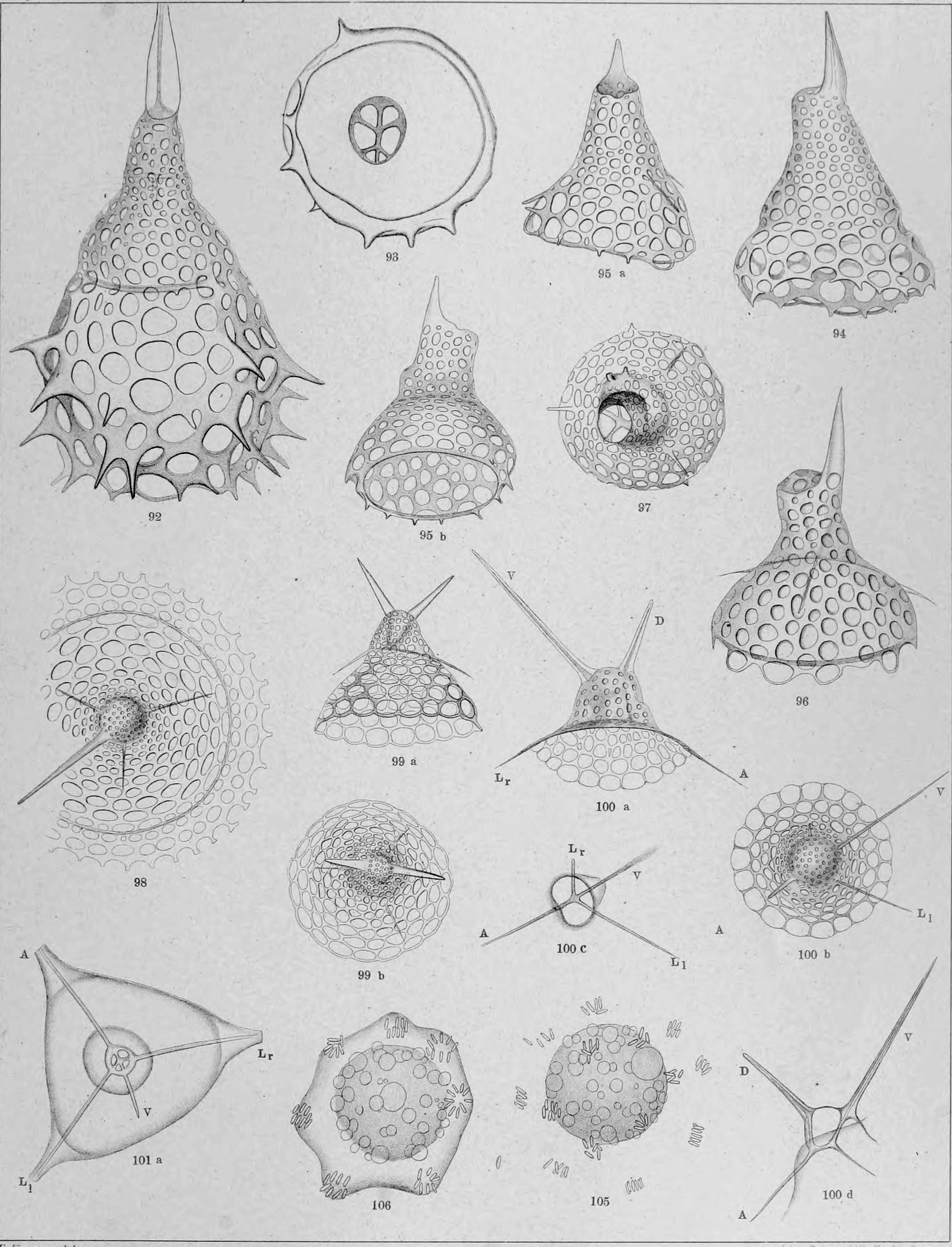
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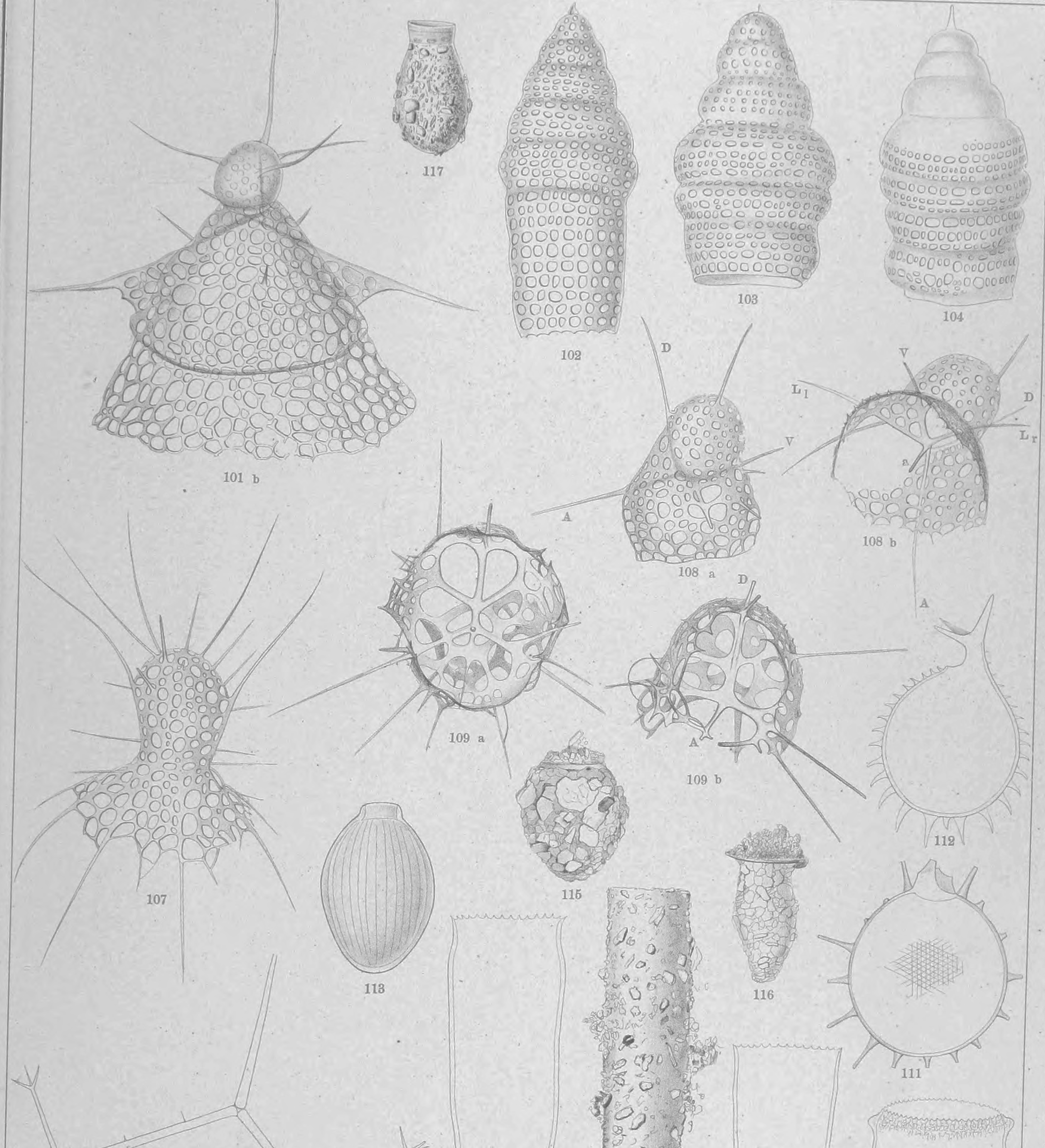

E. Jörgensen & H. Bucher del.

John Griegs Lith. Etabl. Bergen.