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THE DIATOMS IN FOUR POSTGLACIAL DEPOSITS IN GREENLAND

BY

NIELS FOGED

WITH 1 FIGURE AND 10 TABLES IN THE TEXT,
AND 16 PLATES

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Abstract

Diatoms have been determined and counted in 4 series of samples through postglacial deposits in Greenland covering from 2 to more than 9 millennia. Interpretations of the ecological conditions and changes in the investigated lakes and bogs are presented.

3 new taxa: *Neidium iridis* (EHR.) CLEVE fo. *elliptica* nov. fo., *Neidium iridis* (EHR.) CLEVE var. *porsildii* nov. var. and *Eunotia faba* (EHR.) GRUN. var. *rhomboidea* nov. var., besides one transfer: *Pinnularia viridis* (NITZSCH) EHR. fo. *cuneata* (E. ØSTRUP, A. CLEVE) nov. comb. are described.

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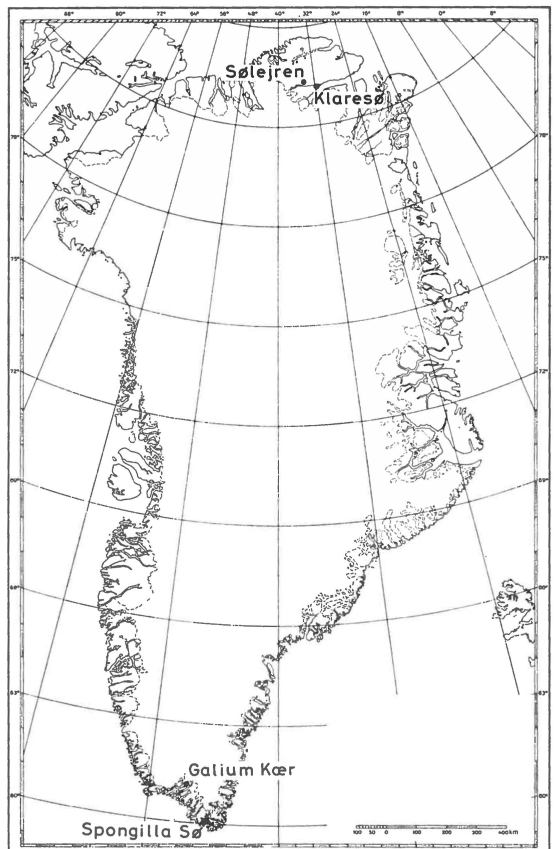
Sølejren
Klaresø
Galium Kær
Spongilla Sø
Reproduceret med tilladelse (A.67/71) af Geodætisk Institut

Fig. 1.

INTRODUCTION

Diatom analyses of samples from cores through lakes and bogs is an old and useful method in quaternary geology, but so far it has not been used intensively in material from Greenland. However, during expeditions in the years from 1963 to 1970 B. FREDSKILD cored postglacial sediments in lakes, and took out samples from open profiles in bogs. Series of samples from four sites were placed at my disposal. Three of the series cover the whole period from the local late-glacial time to the present day, while the fourth only cover the last $1\,^1/_2$ millennium.

Each of the sites will be treated separately. Besides notes on the species depicted in the plates the treatises will include discussion on their ecology and their distribution in time and space. When possible, the correlation between the ecological conditions during the sedimentation and the composition of the diatom spectra, will be discussed.

I offer my best thanks to BENT FREDSKILD for his placing the material at my disposal and also for fruitful discussions in course of time about the development of the Greenland flora after the Ice Age. Furthermore I thank MAX MØLLER, the diatomologist, for continued valuable collaboration and for photos of diatoms from E. ØSTRUPS's collection, which he during many years has been carefully studying.

A. KLARESØ, NORTH GREENLAND

A core from the lake Klaresø
(82°10′ N, 30°34′ W)

Description of the core

South of Jørgen Brønlund Fjord, Peary Land, North Greenland, huge marine silt-clay beds have been deposited since the last glaciation. In a kettle-hole 44.6 m a.s.l. the lake Klaresø was isolated from the fiord due to the uplift of the land around 5000 years ago, and the marine sediment in the kettle-hole was covered by 102 cm of limnic sediment. The diatoms in a core covering the whole limnic facies besides the upper 11.5 cm of the marine facies have been analyzed.

The following layers are found in the core:

0–22 cm below the lake bottom: Sandy-clayey lime gyttja, fairly loose, with some few fragments of the moss *Calliergon trifarium*, decreasing in number upwards.
22–56 cm: Sandy-clayey lime gyttja, rich in *Calliergon.*
56–92 cm: Sandy-clayey lime gyttja, jellied.
92–102 cm: Sandy clay-gyttja rich in lime.
102–? cm: Marine clay with few shells of *Astarte borealis.*

Further details about the lake including a pollen diagram and a number of C^{14} datings are given in B. FREDSKILD, 1969.

The marine clay (cf. table 1)

6 samples (Nos. 5, 5a, 6, 6a, 7 and 7a).

38 diatom species are stated. 18 of the forms are polyhalobous. 7 are mesohalobous, 2 halophilous, 9 indifferent and 2 halophobous.

The distribution of the species and the number of valves occurring in each sample by counting up to 100 are given in table 1.

A diatom flora like this indicates clearly that the sediment is deposited in an environment with a content of salt near that of the open ocean. The difference between the occurrence of the two groups, the polyhalobous (the proper marine forms) and the mesohalobous (the brackishwater

Table 1

Marine series (nos 5–7 a)						
Sample no......	5	5a	6	6a	7	7a
Depth below the bottom, cm.....	113.5	111.5	109.5	107.5	105.5	103.5
1. Polyhalobous						
Amphora angusta (GREG.) CLEVE					+	
– – var. *ventralis* GREG.					+	
– *proteus* GREG.		2	5	1	26	93
Caloneis consimilis A. SCHMIDT					2	
Cocconeis scutellum EHR.			1			
Diploneis bomboides (A. S.) var. *media* GRUN.		+				
– *crabro* EHR.	1	+				
– *smithi* (BRÉB.) CLEVE	1	15	3	3		1
– *subcincta* (A. S.) CLEVE	10	19		1		
Navicula cancellata DONK.			1			
– *granulata* BRÉB.	(+)					
Nitzschia apiculata (GREG.) GRUN.					3	
Pinnularia quadratarea A. SCHMIDT	9	7			5	
– – var. *soderlundii* CLEVE	6	1	3		3	
Trachyneis aspera EHR.	5	2	3	(+)		+
– – var. *elliptica* HENDEY	16	1				
– – var. *intermedia* GRUN.	8					
– *oblonga* BAILEY	2					
2. Mesohalobous						
Coscinodiscus lacustris GRUN. var. *septentrionalis* GRUN.					+	
Diploneis interrupta (KÜTZ.) CLEVE	1			4	1	+
Hantzschia virgata (ROPER) GRUN. var. *capitellata* HUST.				1		
Navicula digitoradiata (GREG.) A. SCHMIDT	8	5	48	11	45	2
Nitzschia sigma (KÜTZ.) W. SMITH	13	9	1	7	1	1
Scoliopleura tumida (BRÉB.) RABH.	9	37	26	8	12	3
Synedra tabulata (AG.) KÜTZ.			+			
3. Halophilous						
Nitzschia dubia W. SMITH				+		
– *hungarica* GRUN.	+		+	+		
4. Indifferent						
Ceratoneis arcus KÜTZ. var. *linearis* HOLMBOE				+		
Cymbella microcephala GRUN.				1		
Fragilaria pinnata (EHR.) GRUN.	1		6			
Hantzschia amphioxys (EHR.) GRUN. var. *maior* GRUN.				(+)		
Navicula cryptocephala KÜTZ.			3	62		
– *mutica* KÜTZ. fo.*cohnii* (HILSE) GRUN					+	
Nitzschia denticula GRUN.				1		
– *stagnorum* EHR.	6	2				
Stephanodiscus niagarae EHR.					2	

(continued)

Table 1 (continued)

Marine series (nos 5–7a)							
	Sample no.	5	5a	6	6a	7	7a
	Depth below the bottom, cm.....	113.5	111.5	109.5	107.5	105.5	103.5
5. Halophobous							
Anomoeoneis serians (BRÉB.) CLEVE var. *brachysira* (BRÉB.) HUST. fo. *thermalis* (GRUN.) HUST..........		1					
Frustulia rhomboides (EHR.) DE TONI var. *saxonica* (RABH.) DE TONI		3					
Summary of table 1:							
1. Polyhalobous	number of valves (259) 43.2 %......	58	47	16	5	39	94
	number of species (18).............	10	9	6	4	7	3
2. Mesohalobous	number of valves (253) 42.2 %......	31	51	75	31	59	6
	number of species (7)..............	4	3	4	5	5	4
3. Halophilous	number of valves (+)						
	number of species (2)..............	1		1	2		
4. Indifferent	number of valves (84) 14 %	7	2	9	64	2	
	number of species (9)..............	2	1	2	5	2	
5. Halophobous	number of valves (4) 0.5 %.........	4					
	number of species (2)..............	2					
	number of species total (38)	19	13	13	16	14	7

forms), is not particularly great. The number of valves is almost the same in the two groups. The difference between the numbers of species seems rather great (18 and 7), but in both groups only 4(5) species and their varieties are of importance.

The polyhalobous *Amphora proteus* is the most frequent species (127 valves of a total of 600). It absolutely dominates the uppermost sample (No. 7a). The two mesohalobous species *Navicula digitoradiata* and *Scoliopleura tumida* approach it as regards number of valves (119 and 95 respectively), but these are distributed over the whole section. On the present basis the question: open sea or lagoon during the period of sedimentation of Nos 5–7a, can hardly be replied with absolute certainty.

The diatom flora of a lagoon is characterized especially by the mesohalobous species, the real brackishwater forms. The mesohalobous diatom species are the most tolerant of oscillation of the osmotic pressure. For some time they are able to survive transgression of saltwater as well as flood of fresh water, while both the polyhalobous and the oligohalobous species usually are rather sensitive to variations of the salt content of the environment.

In the littoral flora of the sea we therefore frequently find the marked euryhaline mesohalobous species together with the often extremely stenohaline polyhalobous species. In the lagoon the mesohalobous species dominate, and polyhalobous species washed in at high tide and the freshwater forms brought by freshwater tributaries occur secondarily.

Owing to the predominance of the polyhalobous forms in the material here and because the three most common mesohalobous species (and almost the only ones present), *Navicula digitoradiata*, *Nitzschia sigma* and *Scoliopleura tumida* are known to occur as littoral forms in the open sea as well as in lagoons, I conclude there is a probability that a rather open connection with the sea has existed and that a proper lagoon stage seems to be out of question.

Moreover it is noteworthy that no centric polyhalobous species are shown though many of them have highly resistent valves. All the polyhalobous species found usually appear as littoral epiphytic or epilithic forms.

Through an investigation of a postglacial deposit in the South-western Norway (N. Foged, 1970) a transgression is shown, during which the ocean for a short time penetrated a coast barrier and then marked the diatom flora of the sediment by polyhalobous and mesohalobous species until the lagoon once more was barred from the ocean owing to the continued upheaval, and subsequently was entirely characterized by the oligohalobous forms, precisely as in the present core.

In the sediment from the mentioned lagoon stage the centric polyhalobous diatoms constituted a considerable part of the valve material (up to 36 % of the valves counted). *Melosira sulcata* was the most frequent species with 29 % of the valves counted. This species, very common in northern seas and usually as littoral form, is strange enough not found in the material from Peary Land.

Only 2 valves (not listed in table 1) of the centric genus *Thalassiosira* the species of which all of them are halophytes, are found.

Likewise 2 valves of *Stephanodiscus niagarae* occur, which is rather euryhaline and found in pure fresh water as well as in more haline localities. Besides some valves occur in No. 7 of the centric *Coscinodiscus lacustris* var. *septentrionalis*, also rather euryhaline and to be found under the same conditions as the above mentioned.

The two last mentioned species are not previously shown in Greenland. The number of halobion-indifferent species is not large (9), and the number of valves of these is also small (84), especially when you bear in mind that 65 of these valves belong to one species *Navicula cryptocephala* and that 62 of those were found in a single sample. It is a matter of chance not seldom met with while analyzing diatoms; but it does not alter the given estimate.

The indifferent species (and the still more rarely occurring halophobous ones) have had no chance of surviving in the environment where the clay was deposited. All of them are brought from freshwater localities or added in other way. In brackishwater or marine deposits you will in fact always find freshwater species, the valves of which probably often are transported very far by sea-currents. At the investigations of deep-sea cores from the Atlantic Ocean R. W. KOLBE (1964) thus found freshwater diatoms in all samples and in a highly astonishing number of species (a total of 60 different forms).

The freshwater sediment (cf. table 2)

35 samples (Nos 8, 8a . . . . . 24a, 25).

The nethermost sample (No. 8) was deposited immediately after the isolation of the lake from the sea and the uppermost (No. 25) is placed 102 cm above No. 8.

In table 2 all shown diatom forms are given in $^0/_0$ of valves counted. They are all known from recent localities and most of them are still to be found alive in North Greenland.

Farthest to the right in table 2 any occurrence in the recent Klaresø is given according to N. FOGED, 1955.

Diatoms are found in all samples. In the lower ones (from No. 8 till No. 20), consisting of the stratum from 0 cm (the beginning of the isolation) till 75 cm above, only very few diatom species occur, and they are all freshwater diatoms.

Absolutely dominating in all the samples from the freshwater section is *Fragilaria pinnata*. In the mentioned lower samples poor in diatom species this generally makes a total of between 99 $^0/_0$ and 100 $^0/_0$ of all valves counted. In the two nethermost samples (Nos 8 and 8a) the closely related *Fragilaria construens* however represents respectively 10 $^0/_0$ and 25 $^0/_0$.

In the upper samples Nos 20a–25 (including the section from 75 cm till 102 cm) a somewhat richer diatom flora is found, in which *Fragilaria pinnata* still is dominating, and in all samples the number of species is very moderate.

The two species *Navicula radiosa* and *Nitzschia denticula* are found in most of the freshwater samples (in 25 and 31 respectively), but they are never particularly frequent. Their maximum frequency they have in the uppermost samples from the section. Thus *Navicula radiosa* reaches 1.0 $^0/_0$ in No. 23, whereas *Nitzschia denticula* attains 2.6 $^0/_0$ in No. 25.

In the freshwater samples from the nethermost No. 8 up to No. 21a, no species except *Fragilaria pinnata* and *F. construens* is found with a frequency greater than 1.0 $^0/_0$. In the samples No. 23 up to No. 25 the following species are found to a number of valves of between 1.0 $^0/_0$ and 2.6 $^0/_0$: *Achnanthes flexella*, *A. minutissima*, *Amphora ovalis* var. *libyca*, *Cocconeis placentula* var. *euglypta*, *Cymbella perpusilla*, *Fragilaria lapponica*, *F. construens* var. *venter*, *Navicula tuscula*, *N. radiosa*, *N. simplex*, *N. vulpina*, *Nitzschia denticula*, *N. perminuta* and *Pinnularia gracillima*.

It is hardly possible on the basis of the here demonstrated diatom flora to make a statement on variations in the milieu during the sedimentation of the freshwater samples.

It is difficult to understand that *Fragilaria pinnata* is so frequent in all samples, not only compared to other species, but also absolutely. All the sediment samples contain very considerable amounts of valves of this species. It is halobion-indifferent and extremely widespread in freshwater localities, postglacial as well as recent. It occurs in freshwater with a rather varied pH, but is usually considered to be alkaliphilous. In material from the northern Norway (the Varanger Peninsula, N. Foged, 1968), where it was found in 74 localities, it occurs in 1 locality with pH less than 5.4, in 15 localities with pH between 5.5 and 6.4, in 47 localities with pH between 6.5 and 7.4 and 11 localities with pH greater than 7.5. The conclusion must be, that it is rather pH-indifferent (circumneutral).

In the danish peninsula Djursland, Jutland, the species occurs very frequently in springs with alkaline reaction (N. Foged, 1951). In a postglacial core from the lake Grane Langsø in Jutland it is found with a number of valves of 44.0 $^0/_0$ and 51.8 $^0/_0$ in the nethermost samples of the core, where the reaction no doubt was alkaline during the sedimentation (N. Foged, 1969). In western Greenland the species is common both in the usually alkaline localities in the basalt area and in the often neutral or faintly acid localities in the gneiss area (N. Foged, 1958). In the recent lake Klaresø, Peary Land, the reaction of which is alkaline, the species is rather common, but not particularly outstanding.

Thus the conclusion as regards pH during the sedimentation of the here analyzed material is that alkaline reaction was predominant during the whole period.

The paucity of species may indicate a rather small content of nutritious matter accessible to microphytes, possibly absence of one or more necessary nutrients. In the recent lake Klaresø, as above mentioned alkaline, the content of nutritive salts is very low. In an analysis of the water from the lake (13/12 1963 by the chemical laboratory of the Danish Geological Survey) the content of nitrate is stated to be zero. The much predominant part of anions is bicarbonate and sulphate with 220 and 145 mg/l respectively. The cations magnesium and calcium occur with 67 and 26 mg/l respectively. These conditions hardly favour a development of plants, particularly not if necessary nutrients only are

Table

	Marine series (number of valves)															
Sample no. ...	5	5a	6	6a	7	7a	8	8a	9	9a	10	10a	11	11a	12	12a
Depth below lake bottom, cm...	113.5	111.5	109.5	107.5	105.5	103.5	101	99	96	93	90	87	84	81	78	75
Achnanthes																
coarctata (BRÉB.) GRUN.																
flexella (KÜTZ.) BRUN																
– var. *alpestris* BRUN																
kryophila BOYE PETERSEN																
lapponica HUST.																
linearis (W. SMITH) GRUN.																
minutissima KÜTZ.																
– var. *cryptocephala* GRUN.																
sublaevis HUST.																
Amphora																
angusta (GREG.) CLEVE					+											
– var. *ventralis* GREG.					+											
ovalis KÜTZ.							+	+								
– var. *libyca* (EHR.) CLEVE							+									
proteus GREG.		2	5	1	26	93										
veneta KÜTZ.																
Anomoeoneis																
exilis (KÜTZ.) CLEVE																
– fo. *lanceolata* A. MAYER																
serians (BRÉB.) CLEVE var. *brachysira* HUST. fo. *thermalis* (GRUN.) HUST.	1															
zellensis (GRUN.) CLEVE fo. *difficilis* (GRUN.) HUST.																
Caloneis																
bacillum (GRUN.) CLEVE																
consimilis A. SCHMIDT					+											
schumanniana (GRUN.) CLEVE																
silicula (EHR.) CLEVE																
– var. *tumida* HUST.																
Ceratoneis																
arcus KÜTZ.																
– var. *linearis* HOLMBOE				1												
Cocconeis																
placentula EHR.																
– var. *euglypta* (EHR.) CLEVE																
– var. *klinoraphis* EHR.																
scutellum EHR.			1													
Coscinodiscus																
lacustris GRUN. var. *septentrionalis* GRUN.					+											
Cyclotella																
antiqua M. SMITH																

Freshwater series (%/₀ of valves counted)																									Klaresø, recent
13	13a	14	14a	15	15a	16	16a	17	17a	18	18a	19	19a	20	20a	21	21a	22	22a	23	23a	24	24a	25	
72	69	66	63	60	57	54	51	48	45	42	39	36	33	30	27	24	21	18	15	12	9	6	3	0	
																		+							
			+	+									+	+	+	+	+	+	+	+	0.4	0.6	1.0	1.0	+
																			+		0.4	+		0.2	+
					+								+			+	+		+	+	0.8	+	0.8	+	+
																+	+	+	+	+	+	+		+	+
					+														+	+	+				
									+							+	+	+	+	+	2.6	1.0		0.6	+
						+								+	+				+				0.4		
																			+			+	+		
																						0.2	+	0.2	
			+	+	+	+			+					+	+	+	+	+	+	+	0.8	1.6	0.4	1.6	+
															+		+	+				+		+	+
															+			+	+	+		+	+	+	+
						+				+			+								+				
						+														+					
																								+	+
																			+	+	0.4	+	+	0.2	(+)
																+			+	+	+	+	+		+
																								+	
																+		+							+
			+			+												+							
																+	+								+
													+			+	+	+	+	2.2	1.0	0.8	2.4	2.6	+
																				+	+		+	0.2	
		+	+	+	+	+			+	+	+		+	+	+	+	+	+	+	+	+	0.6	+	0.4	+

(continued)

Table

	Marine series (number of valves)															
Sample no. ...	5	5a	6	6a	7	7a	8	8a	9	9a	10	10a	11	11a	12	12a
Depth below lake bottom, cm...	113.5	111.5	109.5	107.5	105.5	103.5	101	99	96	93	90	87	84	81	78	75
Cymbella																
affinis KÜTZ.																
amphicephala NAEGELI																
angustata (W. SMITH) CLEVE																
aspera (EHR.) CLEVE																
broenlundensis FOGED																
cesatii (RABENH.) GRUN.																
cistula (HEMPR.) GRUN. var. *gracilis* HUST.																
– var. *maculata* (KÜTZ.) v. HEURCK																
gauemanni MEISTER																
holmenii FOGED																
gracilis (RABENH.) CLEVE.........									+							
hebridica (GREG.) GRUN.																
hybrida GRUN.																
incrassata FOGED																
laevis NAEGELI																
lanceolata (EHR.) v. HEURCK									+							+
lata GRUN.																
latens KRASSKE																
leptoceros (EHR.) GRUN.																
– var. *rostrata* HUST.																
lapponica GRUN.																
microcephala GRUN.				1												
norvegica GRUN.																
obtusa GREG.																
perpusilla A. CLEVE.............																
similis KRASSKE................																
tumidula GRUN.																
turgida (GREG.) CLEVE																
variabilis AG. ?. KÜTZ.) V. H. var. *botellus* LAGST. (Syn.: *C. cymbiformis* (AG. ?. KÜTZ.) V. H......																
ventricosa KÜTZ.																
Denticula																
tenuis KÜTZ. var. *crassula* (NAEG.) HUST.														+		
Diatoma																
elongatum (LYNGB.) AG. var. *tenuis* (AG.) V. H.																

continued)

Freshwater series (% of valves counted)																								Klaresø, recent
13a	14	14a	15	15a	16	16a	17	17a	18	18a	19	19a	20	20a	21	21a	22	22a	23	23a	24	24a	25	
69	66	63	60	57	54	51	48	45	42	39	36	33	30	27	24	21	18	15	12	9	6	3	0	
			+	+	+				+				+	+	+	+	+	+	+	+	0.2		+	
																						+		+
								+						+	+	+	+	+	+	0.2	0.4	0.8	0.6	+
			+												+									+
														+	+	+	+	+	+	+	0.4	0.2	0.4	+
					+									+	+	+		+	+	0.2	+		+	+
																	+							+
																					+	+		
																						+	0.2	
																	+							
					+								+	+										
																			+					+
																	+	+		0.2	+	+	+	+
													+		+									+
																				+				+
					+		+																	
	+																							
		+	+									+	+	+	+	+	+	+	+	0.2	+	+	0.2	+
															+					0.4	0.4		+	+
											+	+	+	+	+		+	+	+	+		+	+	+
+																								
					+										+	+		+	+			+		+
	+			+							+	+	+	+	+	+	+	+	+	0.4	+	0.6	0.2	+
	+	+		+	+						+	+	+	+	+	+	+	+	+	0.4	0.4	0.2	0.2	+
															+		+	+	+	2.0	1.2	0.8	0.4	
															+			+	+	0.4	+			+
																	+	+						
					+			+					+		+			+	+					+
		+			+					+				+	+	+	+	+	+	0.4	0.4	0.2		+
																	+	+	+	+		+	+	+
	+		+	+		+				+	+	+	+	+	+	+	+	+	+	+	0.2	+	+	+
								+					+		+	+			+	+			+	+

(continued)

Table

	Marine series (number of valves)															
Sample no. ...	5	5a	6	6a	7	7a	8	8a	9	9a	10	10a	11	11a	12	12a
Depth below lake bottom, cm...	113.5	111.5	109.5	107.5	105.5	103.5	101	99	96	93	90	87	84	81	78	75
Diploneis																
bomboides (A. S.) CLEVE var. *media* GRUN.		+														
crabro EHR.	1	+														
interrupta (KÜTZ.) CLEVE	1			4	1	+										
smithi (BRÉB.) CLEVE	1	15	3	3		1										
subcincta (A. S.) CLEVE	10	19		1												
Epithemia																
sorex KÜTZ.																
zebra (EHR.) KÜTZ.																
Eunotia																
arcus EHR.																
lunaris (EHR.) GRUN.																
praerupta EHR.																
tenella (GRUN.) HUST.																
veneris (KÜTZ.) O. MÜLLER																
Fragilaria																
capucina DESMAZ.																
– var. *mesolepta* RABENH.																
construens (EHR.) GRUN.							10	25	+	+	+	+	+	+	+	+
– var. *venter* (EHR.) GRUN.																
crotonensis KITTON																
intermedia GRUN.																
lapponica GRUN.																
pinnata EHR.	1		6				90	75	99	99	99	99	99	98	99	99
virescens RALFS																
Frustulia																
rhomboides (EHR.) DE TONI var. *saxonica* (RABENH.) DE TONI	3											+				
Gomphonema																
angustatum (KÜTZ.) RABENH.																
intricatum KÜTZ.																
lagerheimi A. CLEVE																
lanceolatum EHR.																
longiceps EHR.																
parvulum KÜTZ.																
Gyrosigma sp.																
spencerii (W. SMITH) CLEVE				+	+											
Hantzschia																
amphioxys (EHR.) GRUN. var. *maior* GRUN.				+												
virgata (ROPER) GRUN. var. *capitellata* HUST.				1												

(continued)

Freshwater series (%/₀ of valves counted)																									Klaresø, recent
13	13a	14	14a	15	15a	16	16a	17	17a	18	18a	19	19a	20	20a	21	21a	22	22a	23	23a	24	24a	25	
72	69	66	63	60	57	54	51	48	45	42	39	36	33	30	27	24	21	18	15	12	9	6	3	0	
																			+		+	+	+	+	+
				+												+									
		+	+	+	+	+						+	+	+	+	+	+	+	+	+	+	0.2	0.2	+	+
+																						+			
		+	+																						+
							+										+								
						+																			
													+	+					+	+					+
																	+								
+	+	+	+	+	+	+	+			+	+	+	+	+	+	+	+	+	3.6	3.0	1.0	0.8	0.6		+
																	+	+	1.0	0.8	1.6		0.4		+
																+									
																				+					
																		1.8	2.0	2.0	0.4	0.4			
99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	90	90	90	90	90	90	90	+
										+															
							+					+		+		+			+	+					
					+				+										+						+
																+									
																				+					+
						+																			
									+																
																		+	+						
																						+			+

(continued)

Table

	Marine series (number of valves)															
Sample no. ...	5	5a	6	6a	7	7a	8	8a	9	9a	10	10a	11	11a	12	12a
Depth below lake bottom, cm...	113.5	111.5	109.5	107.5	105.5	103.5	101	99	96	93	90	87	84	81	78	75
Meridion																
circulare (GREV.) AG.																
Navicula																
avenacea BRÉB.							+	+								
bacillum EHR.																
bryophila BOYE PETERSEN																
cancellata DONK.			1													
cincta (EHR.) KÜTZ.																
cryptocephala KÜTZ.			3	62				+								
– var. *intermedia* GRUN.																
– var. *veneta* (KÜTZ.) GRUN.																
cuspidata KÜTZ. var. *ambigua* (EHR.) CLEVE																
digitoradiata (GREG.) A. S.	8	5	48	11	45	2										
gracilis EHR.																
granulata BRÉB.	+															
halophila (GRUN.) CLEVE																
mutica KÜTZ. fo. *cohnii* (HILSE) GRUN					+											
oblonga KÜTZ.																
pusilla W. SMITH						+										
radiosa KÜTZ.								+		+			+	+	+	
rostellata KÜTZ.																
simplex KRASSKE																
subrotundata HUST.																
tuscula (EHR.) GRUN.															+	
viridula KÜTZ.																
vulpina KÜTZ.					+						+					
wittrockii (LAGST.) A. CLEVE-EULER																
sp.																-
Neidium																
distincte-punctatum HUST.																
iridis (EHR.) CLEVE																
– fo. *vernalis* REICHELT																
Nitzschia																
apiculata (GREG.) GRUN.					3											
denticula GRUN.				1			+			+	+		+	+	+	-
dubia W. SMITH				+												
fonticola GRUN.																
frustulum (KÜTZ.) GRUN.							+	+								
– var. *perpusilla* (RABENH.) GRUN.								+								
hungarica GRUN.	+		+	+												
linearis W. SMITH																

continued)

Freshwater series (% of valves counted)																									Klaresø, recent
13	13a	14	14a	15	15a	16	16a	17	17a	18	18a	19	19a	20	20a	21	21a	22	22a	23	23a	24	24a	25	
72	69	66	63	60	57	54	51	48	45	42	39	36	33	30	27	24	21	18	15	12	9	6	3	0	
										+						+	+				+			+	+
													+	+			+	+							
																							+	+	+
																			+	+	+	+			+
															+	+	+	0.8	0.8	0.8	0.4	0.8	0.8		+
			+												+				+				0.4	+	+
				+															+	+				+	+
									+									+	+	0.8	0.2	0.4	0.2	0.2	+
						+									+	+	+	+	+			0.2	+	0.2	+
																					+				
															+	+					0.4	0.4			+
																									+
		+															+								
		+															+								
		+	+	+	+	+	+		+		+		+	+	+	+	+	0.6	0.6	1.0	0.4	0.8	0.2	0.4	+
																								+	
						+								+	+	+	+	1.6	1.2	1.2	1.2	0.4	2.6	2.6	
																				+					
			+		+	+			+					+	+	+	+		0.4	0.8	0.6	0.8	0.4	1.0	+
																								+	
+	+	+	+	+	+	+				+		+	+	+	+		+	+	+	0.6	1.0	0.8	0.8	0.4	+
				+			+										+								
															+		+		+	+		+	0.2	0.2	+
																	+	+	+	+	+	0.4	+	0.2	+
																								+	
	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	1.2	1.6	1.8	2.0	2.6	+
																		+							+
																	+	+		+					+
									+					+	+				+		0.4				+
																			+	+		+		+	+

(continued)

Table

	Marine series (number of valves)															
Sample no. ...	5	5a	6	6a	7	7a	8	8a	9	9a	10	10a	11	11a	12	12a
Depth below lake bottom, cm...	113.5	111.5	109.5	107.5	105.5	103.3	101	99	96	93	90	87	84	81	78	75
Nitzschia																
palea (KÜTZ.) W. SMITH																
perminuta GRUN.																
sigma (KÜTZ.) W. SMITH	3	9	1	7	1	1										
stagnorum RABENH.	6	2														
sp.	1															
Pinnularia																
divergentissima (GRUN.) CLEVE var. *wulffii* BOYE PETERSEN																
gibba EHR. var. *linearis* HUST.																
gracillima GREG.																+
interrupta W. SMITH																
– fo. *minor* BOYE PETERSEN																
microstauron (EHR.) CLEVE																
– var. *brébissonii* (KÜTZ.) HUST....																
quadratarea A. SCHMIDT	9	7			5											
– var. *soderlundii* CLEVE	6	1	3		3											
stomatophora GRUN.																
undulata GREG.																
Scoliopleura																
tumida (BRÉB.) RABENH.	9	37	26	8	12	3										
Stauroneis																
anceps EHR.																
– fo. *gracilis* RABENH.																
Surirella																
sp.		+														
Synedra																
tabulata (AG.) KÜTZ.			+													
ulna (NITZSCH) KÜTZ.																
Stephanodiscus																
niagarae EHR.					2											
Tabellaria																
fenestrata (LYNGBYE) KÜTZ.																
flocculosa (ROTH) KÜTZ.																
Trachyneis																
aspera EHR.	5	2	3	+		+						(+)				
– var. *elliptica* HENDEY	16	1														
– var. *intermedia* GRUN.	8															
oblonga BAILEY	2															
Thalassiosira sp?	1			+												

continued)

Freshwater series (% of valves counted)																									Klaresø, recent
13	13a	14	14a	15	15a	16	16a	17	17a	18	18a	19	19a	20	20a	21	21a	22	22a	23	23a	24	24a	25	
72	69	66	63	60	57	54	51	48	45	42	39	36	33	30	27	24	21	18	15	12	9	6	3	0	
														+											+
																						+	1.0		
																				+					
																							+		
			+			+			+					+	+	+	+	+	+	1.0	2.1	0.6	0.8	+	+
																	+								+
																	+			+					+
					+									+	+										+
													+		+	+	+	+	+	+	0.6	0.6	0.4	0.4	+
													+												
																	+								+
																		+	+	+	+	0.2	+	+	+
															+										
+									+																+
																									(+)
																	+								+
						+						+		+			+			+	+			+	+

available in quantities near the minimum requirement and perhaps in wrong proportions.

On basis of the diatom flora it is impossible to evaluate the climatic development during the period of sedimentation.

Notes on Plates A I–V

Amphora angusta (GREG.) CLEVE. (H. & M. PERAGALLO, 1897–1908, p. 231, 50:37).
Plate A V, fig. 13: 41×6 μ. No. 7.

Amphora ovalis KÜTZ. var. *libyca* (EHR.) CLEVE. (F. HUSTEDT, 1930, p. 342. A. SCHMIDT's Atlas, 1874–1959, 26: 102–111).
Plate A V, fig. 1: 40×10 μ. 13 striae in 10 μ. No. 24.

Amphora proteus GREG. (H. & M. PERAGALLO, 1897–1908, p. 200, 44: 24–27).
Plate A V, fig. 2: 39×8 μ. 14 striae in 10 μ. No. 7.
Plate A V, fig. 3: 44×9 μ. 12 striae in 10 μ. No. 7.
Plate A V, fig. 4: 28×8 μ. 12–13 striae in 10 μ. No. 7.
V: 2 resembles *A. ovalis* KÜTZ. var. *libyca* (EHR.) CLEVE by having a hyaline sigma in the middle of the valve at the dorsal side, but as it only occurs in the marine series together with typical valves (V: 3,4) of *A. proteus* it probably shall be identified with the species.

Caloneis schumanniana (GRUN.) CLEVE. (F. HUSTEDT, 1930, p. 239, fig. 369).
Plate A I, fig. 8: 36×6 μ. 20–22 striae in 10 μ. No. 7.
Plate A I, fig. 9: 27×8 μ. 18 striae in 10 μ. No. 7.

Cocconeis placentula EHR. (F. HUSTEDT, 1930–66, II, p. 347, figs. 802a, b).
Plate A I, fig. 11: 22.5×14 μ. 18 striae in 10 μ. No. 24.
Plate A I, fig. 12: 26×14 μ. 22 striae in 10 μ. No. 24.

Cocconeis placentula var. *klinoraphis* GEITLER. (F. HUSTEDT, 1930–66, II, p. 348, fig. 803).
Plate A I, fig. 13: 21×15 μ. No. 24.

Coscinodiscus lacustris GRUN. var. *septentrionalis* GRUN. (F. HUSTEDT, 1930–66, I, p. 432, fig. 235c).
Plate A I, fig. 3: diam.: 26 μ. No. 25.
This variety can hardly be separated from var. *hyperborea* GRUN. as the differences stated in the literature are extremely inexact and as transitional forms between them obviously occur.
Both forms are only known from Scandinavian haline localities (particularly from Yoldia- and Littorina-sediments in the Baltic area).

Cyclotella antiqua W. Smith (F. Hustedt, 1930–66, I, p. 349, fig. 180).
Plate A I, fig. 2: diam.: 20 μ. No. 25.
Plate A I, fig. 4: diam.: 20 μ. No. 25.
Plate A I, fig. 5: diam.: 16 μ. No. 24.

Cymbella cistula (Hempr.) Grun. (F. Hustedt, 1930, p. 363, fig. 676a).
Plate A V, fig. 14: 64×12 μ. Dorsal 7–8, ventral 8–9 striae in 10 μ. No. 22.
A form narrower and more slender than usually. Resembles *C. cistula* (Hempr.) Kirschner as given by C. S. Boyer (1916, 18: 4) from North America, and *C. cistula* (Hempr.) Kirschner as given by H. Okuno (1952, 16: 1) from Japanese kieselguhr.

Cymbella cymbiformis (Ag.? Kütz.) Van Heurck. (F. Hustedt, 1930, p. 362, fig. 672).
Plate A V, fig. 8: 26×7 μ. Dorsal 9, ventral 11 striae in 10 μ. No. 24.

Cymbella leptoceros (Ehr.?) Grun, (F. Hustedt, 1930, p. 353, fig. 643).
Plate A V, fig. 5: 54×14.5 μ. 11–12 striae in 10 μ. No. 24.
Plate A V, fig. 6: 26×11 μ. Dorsal 12, ventral 14 striae in 10 μ. No. 22.
Plate A V, fig. 7: 31×11 μ. 13–14 striae in 10 μ. No. 21.
While fig. 7 is a typical specimen, fig. 6 has a somewhat narrower axial area than usually and with its faintly extended apices it seems to be a transitional form between the species and var. *rostrata* Hust. V: 5 deviates somewhat from the typical form. Possibly it is an "Erstlingszelle".

Cymbella norvegica Grun. (F. Hustedt, 1930, p. 359, fig. 664).
Plate A V, fig. 9: 37×7 μ. Dorsal 14, ventral 16 striae in 10 μ. No. 24.

Diploneis bomboides (A. Schmidt) Cleve var. *media* Grun. (F. Hustedt, 1930–66, II, p. 697, fig. 1080).
Plate A II, fig. 1: 66×24 μ. 7–8 striae in 10 μ. No. 5.
According to F. Hustedt, 1930–66, II, p. 698 var. *media* is connected with the species by gradual transitional forms and "kann nur in der Grenzvariation beibehalten werden". In the literature up till now (from Sweden and U.S.A.) the form is always named *D. entomon* Cleve in the few finds stated. Thus also *A.* Cleve-Euler, 1953, III, fig. 632b, who—without going into particulars concerning source or locality—brings a photograph from Chr. Brockmann, 1944 almost identical with II: 1.

Diploneis crabro Ehr. (F. Hustedt, 1930–66, II, p. 616, fig. 1028).
Plate A II, fig. 2: 54×20 μ. 7 striae in 10 μ. No. 5.
Plate A II, fig. 3: 46×18 μ. 8–9 striae in 10 μ. No. 5.

Diploneis smithii (BRÉB.) CLEVE. (F. HUSTEDT, 1930–66, II, p. 647, fig. 1051).
Plate A II, fig. 4: 83×35 μ. 7 striae in 10 μ. No. 5.
Plate A II, fig. 5: 45×23 μ. 10 striae in 10 μ. No. 5.

Eunotia arcus EHR. (F. HUSTEDT, 1930–66, II, p. 282, figs. 748a–c).
Plate A I, fig. 14: 54×8 μ. ca. 10 striae in 10 μ. No. 20.

Eunotia praerupta EHR. (F. HUSTEDT, 1930–66, II, p. 280, figs. 747A, a–e).
Plate A I, fig. 15: 48×8 μ. 9 striae in 10 μ. No. 14.

Fragilaria pinnata EHR. (F. HUSTEDT, 1930–66, II, p. 160, figs. 671a–i).
Plate A I, fig. 6: 19×4 μ. 9–10 striae in 10 μ. No. 21.
Plate A I, fig. 7: 9×4 μ. 10–12 striae in 10 μ. No. 21.

Navicula cuspidata KÜTZ. var. *ambigua* (EHR.) CLEVE. (F. HUSTEDT, 1930, p. 268, fig. 434).
Plate A IV, fig. 1: 84×22 μ. 16 striae in 10 μ. No. 25.

Navicula digitoradiata (GREG.) A. SCHMIDT. (F. HUSTEDT, 1930, p. 301, fig. 518).
Plate A III, fig. 5: 86×17 μ. 7 striae in 10 μ. No. 7.
Plate A III, fig. 6: 64×16 μ. 5–6 striae in 10 μ. No. 7.

Navicula radiosa KÜTZ. (F. HUSTEDT, 1930, p. 299, fig. 513).
Plate A III, fig. 7: 62×10.5 μ. 10 striae in 10 μ. No. 22.

Navicula simplex KRASSKE. (F. HUSTEDT, 1930, p. 296, fig. 500).
Plate A IV, fig. 2: 34×8 μ. 18–20 striae in 10 μ. No. 21.
Plate A IV, fig. 3: 48×9 μ. 18 striae in 10 μ. No. 24.
As regards the number of striae and their course (faintly radial in the middle of the valve and convergent towards the apices), the structure of the raphe, and the axial area, the pictured specimen A IV: 3 agrees completely with *N. simplex* KRASSKE. The only deviation from this is a faint somewhat irregular extension of the axial area in the middle of the valve together with the much larger dimensions of the valve. As it is found together with typical forms of the species (A IV: 2) it may be an "Erstlingszelle".

Navicula tuscula (EHR.) GRUN. (F. HUSTEDT, 1930, p. 308, fig. 552).
Plate A IV, fig. 4: 47×17 μ. 12 striae in 10 μ. No. 24.
Plate A IV, fig. 5: 50×18 μ. 10 striae in 10 μ. No. 24.
Plate A IV, fig. 6: 44×17 μ. 12 striae in 10 μ. No. 24.
Plate A IV, fig. 7: 52×18 μ. 10–11 striae in 10 μ. No. 21.
Plate A IV, fig. 8: 45×15 μ. 12 striae in 10 μ. No. 24.
5 varying forms of this widespread and variable but exceedingly characteristic species. As transitions between all the forms seem to

be present there is no particular reason to establish varieties and forms. A IV: 4–7 represent types common in many other localities recent as well as in interglacial sediments. A IV: 8 which has faintly constrict valves is the most outstanding type, which I till now only have seen in the present material.

Navicula vulpina KÜTZ. (F. HUSTEDT, 1930, p. 297, fig. 504).
Plate A III, fig. 8: 88×15 μ. 10 striae in 10 μ. No. 24.
Plate A IV, fig. 9: 84×15 μ. 10 striae in 10 μ. No. 24.

Neidium distincte-punctatum HUST. (F. HUSTEDT, 1930, p. 247, fig. 386).
Plate A III, fig. 1: 72×20 μ. 10 striae in 10 μ. No. 24.
Plate A III, fig. 2: 68×19 μ. ca. 11 striae in 10 μ. No. 24.
The pictured form corresponds fairly strictly with the species in N. FOGED, 1955 (p. 44, 5: 6) concerning shape, number of striae as well as dimensions of valves, as the specimens found in the present sediment also are much larger than the dimensions of the species given by F. HUSTEDT, 1930, p. 247. In F. HUSTEDT, 1946–50 (38: 32) a drawing of a somewhat damaged valve from a North German lake (sediment from a depth of 38 m) is brought. It agrees completely with the form from Peary Land stated by N. FOGED, 1955. I have also found the species in my own material from Spitzbergen and Alaska.

Neidium iridis (EHR.) CLEVE. (F. HUSTEDT, 1930, p. 245, fig. 379).
Plate A III, fig. 3: 90×22 μ. 14–15 striae in 10 μ. No. 24.

Nitzschia apiculata (GREG.) GRUN. (F. HUSTEDT, 1930, p. 401, fig. 765).
Plate A V, fig. 12: 45×5 μ. 11 keel puncta, 20–22 striae in 10 μ. No. 7.

Nitzschia denticula GRUN. (F. HUSTEDT, 1930, p. 407, fig. 780).
Plate A V, fig. 11: 43×6 μ. 8 keel puncta, 15 striae in 10 μ. No. 24.

Pinnularia quadratarea A. SCHMIDT. (H. & M. PERAGALLO, 1897–1908, p. 86, 11: 8, 9).
Plate A V, fig. 10: 92×9 μ. 10 striae in 10 μ. No. 7.

Scoliopleura tumida (BRÉB.) RABH. (H. & M. PERAGALLO, 1897–1910, p. 153, 28: 9, 10).
Plate A III, fig. 4: 98×22 μ. 12 striae in 10 μ. No. 7.

Stauroneis anceps EHR. (F. HUSTEDT, 1930–66, II, p. 771, fig. 1120a).
Plate A I, fig. 10: 49×12 μ. 18–20 striae in 10 μ. No. 24.

Stephanodiscus niagarae EHR. (A. SCHMIDT's Atlas, 1874–1959, 227: 1–9).
Plate A I, fig. 1: diam.: 70 μ. No. 7.
S. niagarae and *S. astraea* (EHR.) GRUN. may be difficult to distinguish and they often are confused.

A I: 1 has been compared with specimens from a slide from F. HUSTEDT's collection and seems to be identical with them.

S. niagarae is mentioned from several localities in North America and thus found in Alaska.

The find in the locality here seems to be the first mentioned in Greenland.

Trachyneis aspera (EHR.) CLEVE. (H. & M. PERAGALLO, 1897–1910, p. 150, 29: 1, 2).

Plate A II, fig. 6: 66×17 μ. 8 striae in 10 μ. No. 21.

B. SØLEJREN, NORTH GREENLAND

A profile in a bog at Sølejren
(82°13'N, 32°40'W)

Comments on the profile, samples and tables

14 samples from a small profile in a bog near Sølejren, at Nedre Midsommersø, Peary Land, North Greenland have been examined for content of diatoms.

The bog is hummocky with a peaty layer up to 25 cm thick covering the sandy subsoil. The seasonal thaw reaches a depth of 13–15 cm. The whole surface is covered by mosses, and among the higher plants *Carex stans* and *Salix arctica* are the dominating species, accompanied by i.a. *Eriophorum scheuchzeri*, *E. triste*, *Carex misandra*, *Juncus biglumis*, *J. triglumis* and *Arctagrostis latifolia*.

The peat growth started ca. 1500 years ago according to the C^{14} dating of the organic matter in the layer 23.5–28 cm below the present surface (K–1524: 1520±100 years B.P.).

Table 3 gives the depth of the samples and information about the sediment in the profile.

Table 3

Sample no.	cm	Sediment
13453	2	Recent and subrecent moss peat
13471	4	
13472	6½	Moss peat
13473	8½	Moss peat with swamp peat and willow twigs
13474	10¾	do. but darker and with many willow twigs
13475	13	Moss peat, clayey-sandy, with some swamp peat
13476	15½	
13477	17¾	Slightly clayey-sandy swamp peat with moss peat
13478	20	
13481	ca. 21	
13479	22½	Sandy moss peat with some swamp peat and willow twigs
13482	ca. 23	
13483	ca. 25	
13480	ca. 27	Clayey sand with only small content of moss peat, swamp peat and twigs

Table 4

Sample no. . . .	13480	13483	13482	13479	13481	13478	13477	13476	13475	13474	13473	13472	13471	13453
1. acidobiontic														
Eunotia papilio EHR.						1								
– *rhomboidea* HUST.														1
– *suecica* A. CLEVE									1					
2. acidophilous														
Achnanthes flexella (KÜTZ.) BRUN.			1	1	1	10		7	3					
Anomoeoneis zellensis (BRUN) CL. fo. *difficilis* (GRUN.) HUST.						1		3						
Cymbella gracilis (RABH.) CLEVE													1	
– *laevis* NAEGELI									2					
Eunotia bigibba KÜTZ.			1	1		1			1					
– *exigua* (BRÉB.) GRUN.						1			1					
– *monodon* EHR.					1	4		1	2	1				
– – var. *maior* (W. SM.) HUST.					4	6		1						
– *pectinalis* (KÜTZ.) RABH.		4	7	9	4	44	7	15	5			3		
– *praerupta* EHR.		1	1	2	9	18		3	5	4	1	3		1
Melosira roeseana RABH. . . .				1										
Neidium affine (EHR.) CLEVE				1			1		1					
– – var. *amphirhynchus* (EHR.) CL.				5		8			5					
– – var. *capitata* MÖLDER. .			2	1	2	11		6	16	1		1		
– *bisulcatum* (LAGERST.) CL.						1		1						
– *iridis* (EHR.) CLEVE						13		1	1					
– *knuthii* FOGED var. *heilprinensis* FOGED								1						
Pinnularia lata (BRÉB.) SMITH					1	1		1	1		1	9	1	
– *legumen* EHR.									1					
– *parva* (GREG.) CLEVE var. *lagerstedtii* CLEVE fo. *intermedia* J. B. PETERSEN . .									1					
Tabellaria fenestrata (LYNGBYE) KÜTZ.											1			
– *flocculosa* (ROTH) KÜTZ. . .											1			
3. indifferent (circumneutral)														
Achnanthes minutissima KÜTZ.				1										
Cyclotella antiqua W. SMITH						1								
Cymbella cuspidata KÜTZ. . .				1	1	1		1	1					

(continued)

Table 4 (continued)

Sample no. . . .	13480	13483	13482	13479	13481	13478	13477	13476	13475	13474	13473	13472	13571	13453
Cymbella heteropleura EHR. var. *minor* CLEVE				1										
- *lata* GRUN.						1			1					
- *microcephala* GRUN.				1										
- *norvegica* GRUN.					3				1					1
- *obtusa* GREG.					1									
- *ventricosa* KÜTZ.					2				3	1				
Eunotia arcus EHR.				1		2		1						
Navicula bacillum EHR.			3	8	44	65		2	5			1		
- *mutica* KÜTZ. var. *cohnii* (HILSE) GRUN.									1					
- *paludosa* HUST.														2
- *pupula* KÜTZ.						1								
- *radiosa* KÜTZ.			1	1	1	1			2	3			2	1
- *wittrockii* (LAGERST.) A. CLEVE-EULER						1			1					
Nitzschia palea (KÜTZ.) W. SM.				1					1					
Pinnularia borealis EHR.									2					
- *braunii* (GRUN.) CLEVE var. *amphicephala* (A. MAYER) HUST.														2
- *divergens* W. SMITH					2	2		20	23		1		7	16
- - var. *elliptica* W. SMITH						1		5	14				3	7
- *gracillima* GREG.		1	1	1	2	1		12	53				18	172
- *microstauron* (EHR.) CLEVE						1		1	4					3
- - var. *brébissonii* (KÜTZ.) HUST.							1	2	2					
- - - *fo.diminuta* GRUN.						3		1	6					
- *subsolaris* (GRUN.) CLEVE									1					
- *undulata* GREG.													1	21
Stauroneis anceps EHR.			1		3	11			1					
- - var. *sibirica* GRUN.				1	10	23	1	1						
- *javanica* (GRUN.) CLEVE			1	5	2	4	1	8	20		1	9	11	29
- *phoenicenteron* (NITZSCH) EHR.			2	1	9	23		3	10		7	1		
- *producta* GRUN.								1						
4. alkaliphilous														
Amphipleura pellucida KÜTZ.				1										
Amphora ovalis KÜTZ. var. *libyca* (EHR.) CLEVE				1		8			3	2				1
- - var. *pediculus* KÜTZ.									2					
Caloneis schumanniana (GRUN.) CLEVE									1					

(continued)

Table 4 (continued)

Sample no. ...	13480	13483	13482	13479	13481	13478	13477	13476	13475	13474	13473	13472	13471	13453
Cocconeis placentula EHR. ..													+	
– – var. *euglypta* (EHR.) CL.				3	3				7	1	1			2
Cyclotella comta (EHR.) KÜTZ.				1										1
– *kützingiana* THWAITES ...				1	2				1					
– – var. *planetophora* FRICKE									1	1				
– – var. *radiosa* FRICKE....					1									
– *ocellata* PANT............				1					1				1	
Cymbella affinis KÜTZ......				4	3			1	4	3				
– *amphicephala* NAEGELI ...														1
– *cistula* (HEMPR.) GRUN. ..									1					
– *prostrata* (BERKELEY) CL.													1	
– *turgida* (GREG.) CLEVE ...									1	2				
Denticula tenuis KÜTZ. var. *crassula* (NAEGELI) HUST.						1		6	7				1	
Diploneis elliptica (KÜTZ.) CL......................				+								1		
Fragilaria construens (EHR.) GRUN..................									1					
– *intermedia* GRUN. var. *capitata*					3									
– *pinnata* EHR............					5				7				1	3
Gomphonema angustatum (KÜTZ.) RABH...........					2				2					2
– – var. *producta* GRUN....		2	1					11	44					
– – var. *undulata* GRUN....									1					1
– – var. *sarcophagus* (GREG.) GRUN..................								1						
– *constrictum* EHR. var. *capitata* (EHR.) CLEVE					1									
– *gracile* EHR.			1		1				1					
– *intricatum* KÜTZ.........	2		1	11	1				2	5			3	
– *lanceolatum* EHR.........				1					2	2				
Hantzschia amphioxys (EHR.) GRUN..................						1			1			1	9	59
– – var. *maior* GRUN.								1	8	2				32
– – var. *vivax* (HANTZSCH) GRUN..................														1
Mastogloia elliptica AG. var. *dansei* (THWAITES) GRUN.									1					
– *smithii* THWAITES var. *lacustris* GRUN............				1						4				
Melosira granulata (EHR.) RALFS			1	4	4	2			7	8		1	1	4
– – var. *angustissima* MÜL.				2	7				6	25				2
– *islandica* O. MÜLLER.....									1					
Meridion circulare AG......						1		4	84	1				

(continued)

Table 4 (continued)

Sample no. . . .	13480	13483	13482	13479	13481	13478	13477	13476	13475	13474	13473	13472	13471	13453
Navicula amphibola CLEVE .			1	1		32	1	8	23	3	1	3		
- *cryptocephala* KÜTZ. var. *intermedia* GRUN.									2					
Nitzschia amphibia GRUN. . .						1			1	1				
- *frustulum* KÜTZ.				2	5				4	6				
- *linearis* W. SMITH														1
Stauroneis acuta W. SMITH .						1								1
Synedra ulna (NITZSCH) EHR.			2	4	4	1	2	1	4	11		3	3	1
- - var. *danica* (KÜTZ.) GRUN.									+					
5. alkalibiontic														
Cymbella ehrenbergii KÜTZ. . .				1										1
- *leptoceros* (EHR.) ? GRUN. . .				3	5	4		3	1	2				
Epithemia argus KÜTZ.		1		1		1			1	3				
- *sorex* KÜTZ.			2	10	20	1	1	2	8	33	3		1	1
- *turgida* (EHR.) KÜTZ.					1		1		1	1				
- - var. *granulata* (EHR.) GRUN.										2				
- *zebra* (EHR.) KÜTZ.		1	3	17	8			11	11	33	2	2	4	1
- - var. *porcellus* (KÜTZ.) GRUN.				4	2				2	3			1	
- - var. *saxonica* (KÜTZ.) GRUN.				7	10				11	7	1			
Rhopalodia gibba (EHR.) O. MÜLLER			1	6	6				13	14	1		1	1
- - var. *ventricosa* (EHR.) GRUN.										1				
Stephanodiscus astraea (EHR.) GRUN.									2					2

The samples are poor in diatoms, some of them even very poor. All determinable valves found during the examination of the slides are counted and the number of valves in each sample is given in table 4, where the diatom forms found are stated. In this table the diatoms are placed according to their relation to pH. The "acid" species, *i.e.* the acidobiontic and the acidophilous, are listed first, the indifferent ones, the circumneutral, follow and at last the "alkaline" species, the alkaliphilous and the alkalibiontic, are given. In each group the order is alphabetical. A commented statement of the pH placing is found in the text (p. 46) of the passage on the diatoms in a profile from Galium Kær, South Greenland.

Table 5.

Sample no.....		13480	13483	13482	13479	13481	13478	13477	13476	13475	13474	13473	13472	13471	13453
acidobiontic +	valves		5	12	21	22	120	8	40	45	6	4	17	2	2
acidophilous	species		2	5	8	7	14	2	11	14	3	4	5	2	2
indifferent	valves		1	9	23	79	143	3	58	152	4	9	11	42	254
(circumneutral)	species		1	6	9	12	18	3	13	20	2	3	3	6	10
alkaliphilous +	valves	2	4	13	99	94	54	5	49	282	177	9	11	28	118
alkalibiontic	species	1	3	9	25	21	11	4	11	41	27	6	6	13	20

In the table you will find the nethermost sample from the profile farthest to the left and the uppermost farthest to the right.

In table 5 the number of valves and species from the 3 main pH-groups is given for each of the 14 samples.

The small number of species and valves in the samples Nos 13480, 13483, 13482, 13477, 13473 and 13472 hardly allows specific conclusions at all. From the diatom flora in the samples Nos. 13479, 13481, 13474, 13475 and 13453 which are more rich in species and valves, may be stated that the reaction in the bog during the sedimentation of them was predominantly alkaline.

In the samples Nos 13478 and 13476 from a depth respectively of 20 and $15^1/_2$ cm, the indifferent (circum-neutral) and the acidophilous groups together are considerably predominant concerning as well the number of valves as of species. Consequently it may be considered that the reaction of the bog during the sedimentation of these samples has changed against the neutral point or perhaps for some time to the acid side.

In the pollenanalyses, according to B. FREDSKILD, is stated that the content of *Cyperaceae* pollen in the pollensamples at a depth of 18, 20 and 21 cm resp. are higher (93–96 $^0/_0$ of the total pollen) than in any other sample in the profile. If this means that the production of plant material has been greater during the period in which the samples Nos 13478 and 13476 were deposited than before and afterwards, it may be possible that the vegetable matter, when dead, has changed the reaction of the water of the bog into neutral or faintly acid by humification. This may be the explanation of the somewhat deviating pH-spectrum of the two samples mentioned.

The occurrence of 6 forms (*i.e.* species and their varieties) of the genus *Cyclotella*, 3 of *Melosira* and 1 of *Stephanodiscus* is very noteworthy, primarily because valves of centric diatoms very seldom are found in bog deposits, but also because the freshwater species of these 3 genera usually indicate environments rather different as regards nutritious matter.

Moreover it is seen that in these samples only a single valve is found of *Cyclotella antiqua*, which normally is common in North European and North American cold regions, and no valve at all of *Melosira distans*, which also is very common in circumpolar localities. It remains to add that also in some Danish postglacial deposits (cores from the bottom of Grane Langsø and of Esrom Sø, N. Foged, 1969 and 1968) all 3 genera are represented.

In the freshwater samples in the core from the lake Klaresø some 30 km ESE of Sølejren only 2 centric forms were found, *Cyclotella antiqua* commonly and *Stephanodiscus niagarae* very rarely.

Moreover it is remarkable that the diatom flora here shown which grew in one of the most extremely high-arctic regions on earth, only contains a few of those species which formerly were named boreo-alpine forms, generally used as indicators of a cool, possibly arctic climate. With a few exceptions the species shown in this profile may be found under all climate conditions in freshwater localities with pH about 7 and a not inconsiderable content of nutritious matter.

Conclusions concerning the climate can not be drawn from the diatom flora shown.

Notes on Plates B I–III

Cyclotella antiqua W. Smith. (F. Hustedt, 1930–66, I, p. 349, fig. 180).
Plate B I, fig. 3: diam.: 14 μ. No. 13478.

Cyclotella kützingiana Thwaites. (F. Hustedt, 1930–66, I, p. 338, fig. 171a).
Plate B I, fig. 1: diam.: 24 μ. No. 13453.

Cyclotella ocellata Pant. (F. Hustedt, 1930–66, I, p. 340, fig. 173).
Plate B I, fig. 2: diam.: 14.5 μ. No. 13475.

Cymbella heteropleura Ehr. fo. *minor* Cleve. (A. Schmidt's Atlas 9: 51, 52. 374: 11, 12).
Plate B III, fig. 4: 66×17 μ. Dorsal: 10, ventral: 11–12 striae in 10 μ. No. 13453.

Cymbella lata Grun. (F. Hustedt, 1930, p. 355, fig. 649).
Plate B III, fig. 3: 56×22 μ. 11 striae in 10 μ. No. 13478.

Cymbella norvegica Grun. (F. Hustedt, 1942, p. 136, figs. 55–59).
Plate B III, fig. 2: 37×6.5 μ. 16 striae in 10 μ. No. 13475.

Cymbella obtusa Greg. (F. Hustedt, 1942, p. 138, figs. 60–63).
Plate B III, fig. 7: 41×7 μ. 12 striae in 10 μ. No. 13478.

Cymbella similis KRASSKE. (G. KRASSKE, 1932, p. 122, fig. 24).
Plate B III, fig. 1: 35×8.5 μ. No. 13453.

Cymbella ventricosa KÜTZ. (F. HUSTEDT, 1930, p. 359, fig. 661).
Plate B III, fig. 8: 23×6.5 μ. 12 striae in 10 μ. No. 13481.

Epithemia zebra (EHR.) KÜTZ. var. *saxonica* (KÜTZ.) GRUN. (F. HUSTEDT, 1930, p. 385, fig. 730).
Plate B III, fig. 6: 39×7.5 μ. No. 13481.

Eunotia monodon EHR. (F. HUSTEDT, 1930–66, II, p. 305, figs. 772a, b).
Plate B I, fig. 15: 104×13 μ. 10–11 striae in 10 μ. No. 13475.

Eunotia praerupta EHR. (F. HUSTEDT, 1930–66, II, p. 280, figs. 747a–e).
Plate B I, fig. 10: 31×11 μ. 10 striae in 10 μ. No. 13478.

Hantzschia amphioxys (EHR.) GRUN. (F. HUSTEDT, 1930, p. 394, fig. 747).
Plate B III, fig. 9: 80×10 μ. 6–7 keel puncta and 20 striae in 10 μ. No. 13453.
Plate B III, fig. 10: 67×10 μ. 6–7 keel puncta and 18 striae in 10 μ. No. 13453.
Plate B III, fig. 11: 66×7 μ. 6 keel puncta and 18–20 striae in 10 μ. No. 13453.
Plate B III, fig. 12: 80×10 μ. 7 keel puncta and 18 striae in 10 μ. No. 13453.
Plate B III, fig. 13: 78×9 μ. 5 keel puncta and 18–19 striae in 10 μ. No. 13453.

Hantzschia amphioxys var. *vivax* (HANTZSCH) GRUN. (F. HUSTEDT, 1930, p. 394, fig. 750).
Plate B III, fig. 14: 114×9 μ. 8 keel puncta and 18–19 striae in 10 μ. No. 13453.

Melosira granulata (EHR.) RABH. (F. HUSTEDT, 1930–66, I, p. 248, figs. 104a, b).
Plate B I, fig. 7: Valve 16×10 μ. No. 13475
Plate B I, fig. 8: Valve 10×10 μ. No. 13475.

Melosira islandica O. MÜLLER. (F. HUSTEDT, 1930–66, I, p. 252, fig. 106a).
Plate B I, fig. 4: Valve: 15×12 μ. No. 13474.

Melosira roeseana RABH. (F. HUSTEDT, 1930–66, I, p. 266, figs. 112a, b).
Plate B I, fig. 5: diam.: 11 μ. No. 13471.

Navicula amphibola CLEVE. (F. HUSTEDT, 1930, p. 309, fig. 554).
Plate B II, fig. 3: 56×21 μ. 8 striae, 10–11 puncta in 10 μ. No. 13478.

Navicula lundströmii CLEVE. (N. FOGED, 1955, p. 57, 7: 3).
Plate B II, fig. 4: 40×11.5 μ. 20–22 striae in 10 μ. No. 13453.
A brackish water species first shown in the Kara Sea (CLEVE, 1880).

As well recent as subfossil fairly widespread in the Baltic regions. Very seldom recent in Peary Land (N. FOGED, 1955, p. 57, 7: 3) and not yet shown in West Greenland. The shape of the valves varies dependent on the salinity in the same way as the valves of *Caloneis amphisbaena* (BORY) CLEVE.

B II: 4 seems to be an intermediate form between the species and fo. *frieseana* (GRUN.) CLEVE.

Navicula paludosa HUST. (F. HUSTEDT, 1957, p. 379; N. FOGED, 1964, p. 93, 10: 4, 5, 8, 9).
Plate B II, fig. 5: 23×6 μ. 15(16) striae in 10 μ.
Much discussed but very characteristic species. Recent as well in Peary Land as West Greenland.

Neidium iridis (EHR.) CLEVE. (F. HUSTEDT, 1930, p. 245, fig. 379).
Plate B I, fig. 11: 70×19 μ. 16–17 striae in 10 μ. No. 13475.
Plate B II, fig. 2: 68×18 μ. 15–16 striae in 10 μ. No. 13478.

Pinnularia divergens W. SMITH. (F. HUSTEDT, 1930, p. 323, fig. 589).
Plate B II, fig. 9: 78×14 μ. 8 striae in 10 μ. No. 13453.
Plate B II, fig. 10: 96×19 μ. 7–7.5 striae in 10 μ. No. 13453.
Plate B II, fig. 11: 96×19 μ. 8 striae in 10 μ. No. 13453.
Plate B II, fig. 12: 85×16 μ. 9 striae in 10 μ. No. 13453.

Pinnularia gracillima GREG. (F. HUSTEDT, 1930, p. 315, fig. 564).
Plate B II, fig. 6: 40×5 μ. 16–17 striae in 10 μ. No. 13453.
Plate B II, fig. 7: 41×5 μ. 17–18 striae in 10 μ. No. 13453.
Plate B I, fig. 9: 38×5 μ. 19–20 striae in 10 μ. No. 13453.

*Pinnularia lata (*BRÈB.*)* SMITH. (F. HUSTEDT, 1930, p. 324, fig. 575).
Plate B II, fig. 13: 58×12 μ. 5 striae in 10 μ. No. 13471.

Pinnularia microstauron (EHR.) CLEVE. (F. HUSTEDT, 1930, p. 320, fig. 582).
Plate B II, fig. 8: 45×7.5 μ. 12 striae in 10 μ. No. 13453.

Rhopalodia gibba (EHR.) O. MÜLLER. (F. HUSTEDT, 1930, p. 390, fig. 740).
Plate B III, fig. 5: 98×27 μ. Valve view. No. 13379.

Stauroneis dilatata (EHR.) CLEVE. (F. HUSTEDT, 1930–66, p. 776, fig. 1123).
Plate B I, fig. 12: 70×17 μ. 18 striae in 10 μ. No. 13478.
Rare in this material. Neither in Pearyland nor in West Greenland found recent. In Northern Europe stated to be rather widespread, but rare in fresh water.

Stauroneis javanica (GRUN.) CLEVE. (F. HUSTEDT, 1930–66, II, p. 813, fig. 1159).
Plate B I, fig. 13: 102×21 μ. 16–18 striae in 10 μ. No. 13453.
Plate B I, fig. 14: 116×22 μ. 17–18 striae in 10 μ. No. 13453.

Fairly common and widespread in the section here.

In N. FOGED, 1955, p. 46 some doubt is expressed concerning the correctness of the identification of this species in recent material from Peary Land. In the material here it is beyond doubt that as well *S. javanica* as *S. phoenicenteron* both of them occur rather frequently in typical specimens.

Stauroneis phoenicenteron (NITZSCH) EHR. var. *brunii* (PER. & HÉRIB.) M. VOIGT. (F. HUSTEDT, 1930–66, II, p. 769, fig. 1118d).
Plate B II, fig. 1: 105×30 μ. 14 striae in 10 μ. No. 13478.

Stephanodiscus astraea (EHR.) GRUN. (F. HUSTEDT, 1930–66, I, p. 368, figs. 193a–c).
Plate B I, fig. 6: diam.: 27 μ. No. 13453.

C. GALIUM KÆR, SOUTH GREENLAND

The former pond Galium Kær
(61°10′N, 45°31′W)

Comments on sediment, samples and tables

In a rounded, 35 m wide depression in the bedrock at the settlement Qagssiarssuk at the fiord Tunugdliarfik in South Greenland, a 2 m deep pond was formed after the retreat of the ice 7000 years ago. Quite recently the basin was filled with sediment and a little bog was formed. The present vegetation is dominated by *Carex canescens* and mosses, accompanied by *Agrostis scabra*, *Carex nigra*, *Eriophorum scheuchzeri* and *Galium brandegei*.

In 1969 B. FREDSKILD dug a 2×1 m hole through the gyttja layers down to the till at 2 m's depth and took out series of samples from the profile. 51 of these samples have been investigated for the content of diatoms.

Table 6 gives information about the depth of the samples, the sediment and the datings. If this table is compared with the list of species (Table 7), it can be seen at what time every single species immigrated to the former pond. For further details about the Galium Kær, including pollen diagram, see B. FREDSKILD, 1973.

It will hardly be possible to draw conclusions concerning the immigration into Greenland of the freshwater diatoms in the same way as it is possible in case of the higher plants. However increased investigations in different parts of the country and of varied environments should permit gradually to state the approximate time of immigration.

For the time present it seems that a considerable part of the circumpolar freshwater diatoms is present rather quickly, when the environment is favourable for the species in question. The investigation of the profile from the bog near Sølejren at the lake Nedre Midsommersø, Peary Land, North Greenland and the investigation here in South Greenland both indicate this. The environments in the two places were rather different as regards geology and the higher vegetation. So the diatom flora are not at all alike, but in both localities you will almost only find species, which are very widespread in arctic and northern

Table 6

Sample no.	cm below surface	Sediment	C^{14}years B.P.
1	2– 4	0–3 cm: The recent moss	
2	5– 6	3–13 cm: Swamp peat with seeds of	
3	7– 8	*Hippuris* and *Sparganium*	
4	9– 10		
5	11– 12		
6	13– 14	13–23/25 cm: Swamp peat with gyttja,	
7	15– 16	many *Hippuris* seeds. Lower limit	
8	17– 18	between the layers not quite horizontal	
9	19– 20		18–19 cm: 560±100
10	21– 22		
11	23– 24	23/25–75.5 cm: Fine gyttja with slight	
12	25– 26	content of swamp peat. Lots of	
13	27– 28	*Hippuris* seeds	
14	29– 30		
15	31– 32		
16	33– 34		32– 33 cm: 1160±100
17	35– 36		
18	37– 38		
19	42– 43		
20	47– 48		
21	52– 53		
22	57– 58		
23	62– 63		
24	67– 68		68– 69 cm: 2420±100
25	72– 73		
26	77– 78	75.5–95.5/98,5 cm: Fine gyttja with some	
27	82– 83	*Hippuris* seeds, single *Batrachinm* seeds	
28	87– 88	and remnants of characeous plants	
29	92– 93		
30	97– 98	95.5/98.5–103/106 cm: Slightly sandy,	
31	102–103	fine gyttja. Some remnants of characeous	101–102 cm: 4390±110
32	107–108	plants besides seeds of *Potamogeton*	
33	112–113	and *Myriophyllum*	
34	117–118		119–120 cm: 5350±120
35	122–123	103/106–155 cm: Slightly clayey, fine	
36	127–128	gyttja. Many *Potamogeton* seeds and	
37	132–133	remnants of characeous plants	
38	137–138		
39	142–143		
40	147–148		
41	152–153		
42	157–158	155–194/197 cm: Clayey, sandy fine	
43	162–163	gyttja with *Potamogeton* seeds and	160–161 cm: 6080±120
44	167–168	remnants of characeous plants	
45	172–173		
46	177–178		
47	182–183		
48	187–188		186–187 cm: 6800±110
49	189–190		
50	191–192		
51	193–194		
	194–	194/197–? cm: Till	196–197 cm: 7000±130

temperate areas especially in Europe. The freshwater diatom flora in arctic America and Siberia is still only little known, but investigations available from Europe on the diatom flora of postglacial freshwater deposits also indicate that the diatoms are present when the conditions are favourable.

While a rather great number of investigations of the spreading of fungus spores and pollen has been carried out during late years only very scarce observations concerning the spreading of diatoms are available. The opinion has been that the terrestrial and freshwater diatoms are spread by wind in the same way as fungus spores and pollen, because size and weight are of almost equal magnitude for the three groups, but reliable observations are first made during the recent years (vide *e.g.* Airborne microbes, Cambridge, 1967).

In K. Behre & G. H. Schwabe, 1970 positive proofs are given that the wind quickly and effectively spreads the diatoms. 1968 they performed collections of diatoms on the new volcanic island Surtsey, SW of Iceland, and found a total of 129 freshwater species (136 forms). Most of them have dimensions of 15–20 μ and very few have a length larger than 50 μ.

The authors consider air transport the absolutely most important and extremely dominating possibility of conveyance, not only of diatoms but also of other micro-organisms.

The transport by birds and other animals which previously often was supposed to contribute to the spreading of certain micro-organisms, in this case seems to be without any importance.

On the basis of the observations in Surtsey it may be maintained that terrestrial and freshwater diatoms by the wind quickly are spread so that new localities immediately are invaded by fit species.

The explanation of the astonishing frequent finds of freshwater diatoms in marine sediments even very far from a coast seems evident too. This is also the case of the infrequent occurrence of marine species in freshwater localities. The species from the sea have not the same occasion to be transported by air as terrestrial and freshwater forms, an air transport of which the drying up of the locality easily starts. You therefore cannot wonder that haline diatoms practically are absent in the sediment dealt with here. The only species shown which may originate from a neighbouring shore, is *Synedra pulchella*, only found in the nethermost samples (Nos 48–50) and exactly in the part of layers difficult to classify.

According to N. G. Maynard, 1968 marine organisms in airborne plancton nevertheless should have been caught up to 40 miles from the nearest coast.

Table

Sample no. ...	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	3
1. acidobiontic																
Anomoeoneis serians (BRÉB.) CL. var. *brachysira* (BRÉB.) HUST.																
Eunotia rhomboidea HUST.																
2. acidophilous																
Achnanthes marginulata GRUN.																
Cymbella gracilis (RABH.) CLEVE																
– *hybrida* GRUN.																
– *incerta* GRUN.																
Eunotia alpina (NAEG.) HUST.																
– *diodon* EHR.					+											
– *exigua* (BRÉB.) GRUN.																
– *monodon* EHR.	+	+	+	+	+	+										
– *pectinalis* (KÜTZ.) RABH. var. *minor* (KÜTZ.) RABH.	+	+	+		+			+								
– *praerupta* EHR.					+	+	+		+	+	+	+	+	+		
– *tenella* (GRUN.) HUST.																
– *triodon* EHR.																
Frustulia rhomboides (EHR.) DE TONI																
– – var. *saxonica* (RABH.) DE TONI																
Melosira distans (EHR.) DE TONI																
– – var. *lirata* (EHR.) BETHGE																
Navicula hassiaca KRASSKE																
Neidium affine (EHR.) CLEVE var. *amphirhynchus* (EHR.) CLEVE			+					+								
– *bisulcatum* (LAGERST.) CLEVE																
– *iridis* (EHR.) CLEVE								+						+		
– – var. *ampliata* (EHR.) CLEVE																
Pinnularia lata (BRÉB.) SMITH	+	+	+	+	+	+	+	+	+	+	+		+	+		
– *lagerstedtii* (CLEVE) HUST.		+	+		+											
– *undulata* GREG.																
Tabellaria flocculosa (ROTH) KÜTZ.			+											+		
3. indifferent (circumneutral)																
Achnanthes minutissima KÜTZ.											+					
Amphora triundulata ROSS													+			+
Cyclotella comta (EHR.) KÜTZ. var. *oligactis* (EHR.) GRUN.		+														
Cymbella angustata (W. SMITH) CLEVE																
– *cuspidata* KÜTZ.					+	+	+		+	+			+	+	+	+
– *heteropleura* EHR. var. *minor* CLEVE																
– *naviculiformis* AUERSWALD		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
– *norvegica* GRUN.											+					
– *obtusa* GREG.																
– *ventricosa* KÜTZ.	+	+	+	+	+	+	+	+	+		+			+	+	+
– – var. *groenlandica* FOGED																
Eunotia gracilis (EHR.) RABH.																
– *lunaris* (EHR.) GRUN.	+		+													
– – var. *subarcuata* (NAEG.) GRUN.				+												
Fragilaria virescens RALFS	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+

5	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
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(continued)

Table

Sample no. ...	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	3
Fragilaria virescens var. *elliptica* KRASSKE																
Gomphonema lagerheimii A. CLEVE							+						+	+		
Navicula explanata HUST.														+		
– *mutica* KÜTZ.					+			+						+		
– *paludosa* HUST.						+				+	+			+		
– *pseudoscutiformis* HUST.		+	+		+	+	+	+		+			+	+	+	+
– *pupula* KÜTZ.		+			+		+							+	+	
– – fo. *capitata* HUST.						+	+	+					+	+	+	+
– – fo. *rectangularis* (GREG.) GRUN.	+	+	+	+	+											
– *pusilla* W. SMITH						+							+			
– *radiosa* KÜTZ.		+			+	+	+	+	+	+	+	+	+	+	+	+
– *wittrockii* (LAGERST.) A. CLEVE	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Nitzschia ignorata KRASSKE			+													
Pinnularia borealis EHR.		+	+	+	+		+	+	+	+	+	+	+	+		+
– *braunii* (GRUN.) CLEVE var. *amphicephala* (A. MAYER) HUST.														+	+	
– *gibba* EHR.	+		+			+										
– – var. *linearis* HUST.			+	+	+		+									
– – var. *parva* (EHR.) GRUN.		+		+	+			+	+					+		
– *gentilis* (DONK.) CLEVE					+	+			+		+	+	+	+	+	+
– *intermedia* LAGERST.							+			+						
– *interrupta* W. SMITH	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
– *krookei* GRUN.	+	+	+	+	+		+	+						+		
– *maior* KÜTZ.		+			+		+							+		+
– *mesolepta* (EHR.) W. SMITH	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+
– *microstauron* (EHR.) CLEVE		+		+			+			+						+
– – var. *biundulata* O. MÜLLER															+	
– – var. *brébissonii* (KÜTZ.) HUST.		+							+							
– *molaris* GRUN.																
– *nodosa* EHR.		+	+	+	+			+	+	+	+	+	+	+	+	+
– *obscura* KRASSKE																
– *pulchra* ÖSTRUP					+	+	+	+								+
– *viridis* (NITZSCH) EHR.	+	+	+		+	+	+	+		+	+	+	+	+	+	+
– – var. *sudetica* (HILSE) HUST.	+	+			+		+	+								
– *wijkensis* FOGED										+						
Stauroneis anceps EHR.	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+
– – fo. *gracilis* (EHR.) CLEVE			+													
– – var. *hyalina* BRUN & PERAG.									+					+	+	+
– *javanica* (GRUN.) CLEVE									+	+				+		
– *legumen* EHR.				+			+	+	+							
– *phoenicenteron* EHR.	+	+		+	+	+	+	+	+	+	+		+	+	+	+
– – var. *brunii* (PER. & HÉRIB.) V. VOIGT																
– *producta* GRUN.		+	+													
– *prominula* (GRUN.) HUST.																
Synedra pulchella KÜTZ.		+	+	+												
– *rumpens* KÜTZ. var. *familiaris* (KÜTZ.) GRUN.			+		+			+					+	+		
4. alkaliphilous																
Amphora ovalis KÜTZ.										+		+				
– – var. *libyca* (EHR.) CLEVE								+	+	+	+	+	+	+	+	+

continued)

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Table

Sample no. ...	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	3
Caloneis schumanniana (GRUN.) CLEVE																
– – var. *biconstricta* GRUN.										+						+
– *silicula* (EHR.) CLEVE		+					+				+				+	+
– – var. *truncatula* GRUN.	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+
Cocconeis placentula EHR.		+	+		+	+	+	+	+	+	+	+	+	+	+	+
– – var. *klinoraphis* GEITLER										+	+			+		+
Cymbella turgida (GREG.) CLEVE					+		+	+	+	+		+	+	+		+
Diploneis ovalis (HILSE) CLEVE								+	+		+		+	+		
Fragilaria construens (EHR.) GRUN.					+			+	+					+	+	
– – var. *binodis* (EHR.) GRUN.					+	+	+	+	+	+	+	+	+	+	+	+
– *leptostauron* (EHR.) HUST.																
– *pinnata* EHR.					+		+		+	+	+	+	+	+	+	+
Gomphonema acuminatum EHR.	+	+	+			+	+	+	+	+			+		+	+
– – var. *brébissonii* (KÜTZ.) CLEVE							+			+	+	+				
– – var. *coronata* (EHR.) W. SMITH		+			+		+	+				+	+			+
– *angustata* (KÜTZ.) RABH.				+	+	+	+	+	+	+	+	+	+	+	+	+
– – var. *producta* GRUN.									+			+				
– *constrictum* EHR.					+	+	+		+	+	+		+	+	+	+
– – var. *capitata* (EHR.) CLEVE								+	+	+				+	+	+
– *gracile* EHR.									+	+		+				
– *longiceps* EHR.					+			+					+	+		
– *parvulum* KÜTZ.	+	+	+	+	+	+								+		+
Hantzschia amphioxys (EHR.) GRUN.			+		+					+		+	+			
– – var. *maior* GRUN.	+	+			+	+	+	+	+	+	+	+	+	+	+	+
Meridion circulare AGARDH																
Navicula amphibola CLEVE							+	+	+	+	+		+			+
– *cincta* (EHR.) KÜTZ.								+		+		+	+	+	+	
– *clementis* (GREG.) S. A.					+	+	+		+	+	+	+	+	+	+	+
– *digitoradiata* (GREG.) A. S. var. *elliptica* ÖSTRUP									+		+					+
– *cryptocephala* KÜTZ.					+			+	+				+	+		+
– *cuspidata* KÜTZ.					+	+		+	+				+	+	+	
– *hungarica* GRUN. var. *capitata* (EHR.) CLEVE															+	+
– *rhynchocephala* KÜTZ.		+	+		+	+	+	+	+	+	+	+	+	+	+	+
Nitzschia frustulum KÜTZ.									+		+		+	+		
– – var. *perpusilla* (RABH.) GRUN.																+
– *hantzschiana* RABH.																
Stauroneis acuta W. SMITH																+
Synedra ulna (NITZSCH) EHR.					+					+				+		+
– – var. *aequalis* (KÜTZ.) HUST.				+				+	+		+		+			
– – var. *biceps* (KÜTZ.) SCHÖNF.						+	+	+								
5. alkalibiontic																
Epithemia turgida (EHR.) KÜTZ. var. *granulata* (EHR.) GRUN.															+	
– *zebra* (EHR.) KÜTZ.					+			+	+		+	+	+	+		
– – var. *porcellus* (KÜTZ.) GRUN.						+	+	+	+	+	+	+	+	+	+	+
– – var. *saxonica* (KÜTZ.) GRUN.					+	+	+	+	+	+		+	+	+	+	+
Navicula clementioides HUST.								+								
Rhopalodia gibba (EHR.) O. MÜLLER									+							
Stephanodiscus astraea (EHR.) GRUN.																

continued)

5	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
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All diatom species found in the samples are given in table 7, except a few rare forms identified at a later examination of the slides, but none of them may alter the general impression by the table.

In Galium Kær, for the time being, pH seems to be the only factor of environment which influences the difference between the flora of the respective levels of the profile. So the species are placed in relation to that. First the most "acid" forms, which are the acidobiontic and the acidophilous, are given, then those forms the optimum of which is about the neutral point, the indifferent (better called the circumneutral) and at last the "alkaline" species, the alkaliphilous and the alkalibiontic, are listed.

Within each group the species are given in alphabetical order. To the freshwater diatoms pH always is the most decisive factor concerning the distribution of the species, and it is also the factor best known, although reliable material still is rather moderate.

In B. J. CHOLNOKY, 1968 you will find the most comprehensive and valuable material based on a very large number of chemical analyses. As most of CHOLNOKY's investigations have taken place in South African localities, and as the chemical composition of the fresh waters in South Africa seems to deviate fairly much from European and North American localities investigated so far, his conclusions can hardly always without further proof be applied to our part of the world.

The pH relation given by F. HUSTEDT, 1957 seems to be very reliable as regards most of the species, as these statements in many cases are based on fairly certain chemical analyses. In N. FOGED, 1968 a great material from the Varanger Peninsula, North Norway, is given, the diatom flora of which proved extraordinarily rich in species. Although these pH-statements only are single observations from each individual locality, and just colorimetric, I consider them to show the tendency. Because of the great number of localities the possibility of a probable placing of the species not infrequent in the area therefore should be good.

The placing in table 7 is made according to the above mentioned papers. In some cases this means that species have been transferred from their former usual placing to another pH-group. Thus this applies to *Neidium affine* and *N. affine* var. *amphirhynchus* which F. HUSTEDT, 1957, p. 315 considers to be alkaliphilous. B. J. CHOLNOKY, 1968, p. 322 says that they like other *Neidium* species have their pH-optimum below 7. As this observation is supported by N. FOGED, 1968 all *Neidium* species are here placed as acidophilous.

Hantzschia amphioxys and its varieties previously as a rule were stated to be indifferent (circumneutral). B. J. CHOLNOKY, 1968, p. 325 says: "Ihr pH Bereich wird durch die floristischen Funde völlig falsch angegeben", and he states pH-optimum to be "über 7". On the basis of my own observations in many different localities I must adopt it and place them among the alkaliphilous.

Navicula wittrockii has been considered indifferent. B. J. CHOLNOKY, 1968, p. 327, says that the pH-optimum of this species "liegt sicher ziemlich niedrig, wahrscheinlich unter 7", and so it here is classed with the acidophilous group, as I consider it to be in agreement with my own observations.

From table 7 it also is seen that a single acidophilous species (*Eunotia praerupta*) is found in the whole profile, and that *Pinnularia lata*, similarly reckoned among the acidophilous, mainly is found in the "alkaline" part of the profile. The placing of these forms consequently has to be investigated more closely. This applies also to the alkaliphilous species *Caloneis silicula* and *C. silicula* var. *truncatula*, *Cymbella turgida*, *Gomphonema angustata*, *G. longiceps*, *G. parvulum* and *Navicula cuspidata*.

After this an observation of table 7 will show that the pH-environment in the locality here fairly suddenly has changed its character about 4000 C^{14} years ago, between the samples No. 30 (at a depth of 97–98 cm) and No. 29 (at a depth of 92–93 cm). The older layers below must have been deposited in a fairly alkaline environment. In the samples Nos. 30–45 the alkalibiontic genus *Epithemia* is heavily represented whereas it is not at all found later on in the profile. As the genus is found commonly in Southwest Greenland its disappearance from the locality can only be explained by the change of pH that took place about 4000 B.P. All *Epithemia* valves are so big and robust that a disappearance by chance, for instance by dissolution, hardly can be a possibility. It may also be seen that before then the alkaliphilous species occur more compactly than in the samples deposited later on.

The indifferent (circumneutral) forms are evenly spread all over the profile.

The number of acidophilous forms is conspicuously increasing from sample No. 30 and upwards in the profile, and with exception of the above mentioned *Eunotia praerupta* and *Pinnularia lata* they practically are not present in the lower samples (Nos 30–45).

Thus a change of pH in the mentioned direction can clearly be perceived on the basis of the diatom flora. Then the question is why the change took place. In the period after the disappearance of the ice from the locality, a gradually filling up of the shallow pond, the result of the configuration of the ground, seems to have taken place. The material is partly poured into the pond from the low surroundings by melt water and rain (no tributary and no outlet to be found), partly it resulted from the fairly rich vegetation within the pond. This may be seen from the pollen diagram in B. FREDSKILD's treatise.

The most remarkable change in the higher flora of the pond contemporary with the change of the diatom flora about 4000 B.P. is that *Isoëtes setacea* ssp. *muricata* suddenly disappears and hence—likewise suddenly—*Hippuris* appears and quickly reaches high pollen values.

As no certain knowledge about the possibly different pH-relations of these two plants is available, they cannot solve the problem.

The suddenness with which *Betula* contemporarily occurs (likewise according to B. FREDSKILD) may however answer the question. The large number of *Betula* pollen to be found about the time of change may indicate a vigorous *Betula* vegetation in the surroundings of the pond. Consequently a great production of leaves by gradual slow putrefaction gives an acid humus-layer from which acid melt and rain water pour into the pond.

The very lowest samples (Nos 48–51) deviate somewhat from the incidentally so beautiful pH-picture. This can hardly be explained on the present basis. Concerning table 7 it is remarkable that some genera and species common in recent samples from Southwest Greenland either are absolutely absent or extremely infrequent. So you will find practically no valves of the three centric genera: *Cyclotella*, *Melosira* and *Stephanodiscus*. In recent material from Greenland only very few valves of *Stephanodiscus* species are found up to now, whereas some *Cyclotella* species are fairly common and the acidophilous *Melosira distans* and its varieties are very common. You also wonder that the acidophilous species, moreover very frequent in Greenland, *Eunotia rhomboidea*, *Frustulia rhomboides* and its varieties, and the *Tabellaria* species are infrequent in the profile here. This is also true of the genus *Achnanthes* and others, abundantly represented in recent material.

Notes on Plates C I–V

Amphora ovalis KÜTZ. var. *libyca* (EHR.) CLEVE. (F. HUSTEDT, 1930, p. 342, fig. 628).
Plate C V, fig. 1: 40×19 μ. 14(–15) striae in 10 μ. No. 27.

Caloneis schumanniana (GRUN.) CLEVE var. *linearis* HUST. (A. CLEVE-EULER, 1955, IV, p. 61, fig. 1145h).
Plate C I, fig. 11: 35×7 μ. 20–22 striae in 10 μ. No. 42.

Caloneis silicula (EHR.) CLEVE. (F. HUSTEDT, 1930, p. 236, fig. 362).
Plate C I, fig. 7: 48×11 μ. 16 striae in 10 μ. No. 27.
Plate C I, fig. 8: 48×8.5 μ. ca. 20 striae in 10 μ. No. 21.
Plate C I, fig. 9: 59×10.5 μ. ca. 18 striae in 10 μ. No. 10. "Erstlingszelle".

Caloneis silicula var. *truncatula* GRUN. (F. HUSTEDT, 1930, p. 238, figs. 363, 364).
Plate C I, fig. 10: 34×7 μ. 18 striae in 10 μ. No. 21.

Cymbella cuspidata KÜTZ. (F. HUSTEDT, 1930, p. 357, fig. 650).
Plate C IV, fig. 17: 60×29 μ. 8 striae, 20 puncta in 10 μ. No. 21.

Cymbella ehrenbergii KÜTZ. (F. HUSTEDT, 1930, p. 356, fig. 656).
Plate C IV, fig. 15: 40×12.5 μ. 10 striae in 10 μ. No. 21.
Plate C IV, fig. 16: 60×15 μ. Dorsal 8–9, ventral 10 striae in 10 μ. No. 06.

Cymbella gracilis (RABH.) CLEVE. (F. HUSTEDT, 1930, p. 359, fig. 662).
Plate C V, fig. 6: 35×5 μ. 10 striae in 10 μ. No. 16.

Cymbella hybrida GRUN. (F. HUSTEDT, 1930, p. 357, fig. 662).
Plate C V, fig. 2: 32×7.5 μ. 16 striae in 10 μ. No. 11.
Plate C V, fig. 3: 38×8.5 μ. Dorsal 13–14, ventral 14–15 striae in 10 μ. No. 18.

Cymbella incerta GRUN. (F. HUSTEDT, 1930, p. 360, fig. 665).
Plate C V, fig. 5: 35×6.2 μ. 16(–17) striae in 10 μ.

Cymbella naviculiformis AUERSWALD. (F. HUSTEDT, 1930, p. 356, fig. 653).
Plate C IV, fig. 8: 34×8.5 μ. 12 striae in 10 μ. No. 21.
Plate C IV, fig. 14: 32×9 μ. 14 striae in 10 μ. No. 39.

Cymbella obtusa GREG. (F. HUSTEDT, 1942, p. 138, figs. 60–63).
Plate C V, fig. 4: 29×6 μ. ca. 18 striae in 10 μ. No. 07.

Cymbella ventricosa KÜTZ. var. *groenlandica* FOGED. (N. FOGED, 1953, p. 57, 10: 11–13).
Plate C V, fig. 7: 24×6 μ. 8 striae in 10 μ. No. 18.

Diploneis ovalis (HILSE) CLEVE. (F. HUSTEDT, 1930, p. 249, fig. 390).
Plate C I, fig. 13: 20×11 μ. 14–15 striae in 10 μ.
Plate C I, fig. 14: 35×14 μ. 14–15 striae in 10 μ. No. 39.

Epithemia turgida (EHR.) KÜTZ. var. *granulata* (EHR.) GRUN. (F. HUSTEDT, 1930, p. 387, fig. 734).
Plate C V, fig. 17: 82×11 μ. 10 striae and 3–4 septa in 10 μ. No. 37.

Epithemia zebra (EHR.) KÜTZ. var. *saxonica* (KÜTZ.) GRUN. (F. HUSTEDT, 1930, p. 385, fig. 730).
Plate C V, fig. 16: 46×11 μ. 12–14 striae, 2–3 septa in 10 μ. No. 39.

Eunotia diodon EHR. (F. HUSTEDT, 1930–66, II, p. 276, fig. 742).
Plate C I, fig. 3: 28×6(–7) μ. 14 striae in 10 μ. No. 07.

Eunotia monodon EHR. (F. HUSTEDT, 1930–66, II, p. 305, figs. 772a, b).
Plate C I, fig. 1: 54×12 μ. 8 striae, 24–26 puncta in 10 μ. No. 15.

Eunotia pectinalis (KÜTZ.) RABH. var. *minor* (KÜTZ.) RABH. (F. HUSTEDT, 1930–66, II, p. 288, figs. 763d–f).
Plate C I, fig. 4: 41×5 μ. 14 striae in 10 μ. No. 07.

Eunotia praerupta EHR. (F. HUSTEDT, 1930–66, II, p. 280, figs. 747A: a–e).
Plate C I, fig. 2: 56×16.5 μ. 8 striae in 10 μ. No. 47.

Gomphonema acuminatum EHR. var. *brébissonii* (KÜTZ.) CLEVE. (F. HUSTEDT, 1930, p. 370, fig. 685).
Plate C V, fig. 10: 43×8 μ. 9(–10) striae in 10 μ. No. 21.

Gomphonema acuminatum var. *coronata* (EHR.) W. SMITH. (F. HUSTEDT, 1930, p. 370, fig. 684).
Plate C V, fig. 11: 43×10 μ. 14 striae in 10 μ. No. 36.
Plate C V, fig. 12: 54×10 μ. 9 striae in 10 μ. No. 51.

Gomphonema angustatum (KÜTZ.) RABH. var. *producta* GRUN. (F. HUSTEDT, 1930, p. 373, fig. 693).
Plate C V, fig. 9: 30×6 μ. 10 striae in 10 μ. No. 39.

Gomphonema constrictum EHR. var. *capitata* (EHR.) CLEVE. (F. HUSTEDT, 1930, p. 377, fig. 715).
Plate C V, fig. 13: 54×13 μ. 9 striae in 10 μ. No. 30.
Plate C V, fig. 14: 35×11 μ. 12 striae in 10 μ. No. 38.
Plate C V, fig. 15: 20×8.5 μ. 13–14 striae in 10 μ. No. 30.

Hantzschia amphioxys (EHR.) GRUN. (F. HUSTEDT, 1930, p. 394, fig. 747).
Plate C V, fig. 18: 64×11 μ. 6 keel puncta and 12 striae in 10 μ. No. 47.
Plate C V, fig. 19: 61×8 μ. 5–6 keel puncta and 16–18 striae in 10 μ. No. 26.
Plate C V, fig. 20: 62×10 μ. 7 keel puncta and 17–18 striae in 10 μ. No. 38.

Navicula amphibola CLEVE. (F. HUSTEDT, 1930, p. 309, fig. 554).
Plate C I, fig. 12: 56×23 μ. 8 striae, 16 puncta in 10 μ. No. 39.

Navicula cincta (EHR.) KÜTZ. var. *heufleri* GRUN. (F. HUSTEDT, 1930, p. 298, fig. 511).
Plate C II, fig. 12: 38×7.5 μ. 10 striae in 10 μ. No. 38.

Navicula clementis (GREG.) A. SCHMIDT. (N. FOGED, 1953, p. 45, 6: 11).
Plate C II, fig. 14: 24×9 μ. 13–14 striae in 10 μ. No. 30.

Navicula clementioides HUST. (F. HUSTEDT, 1944, p. 285, 8: 19, 20).
Plate C II, fig. 15: 31×11 μ. 8–9 striae in 10 μ. No. 44.

Navicula cuspidata KÜTZ. (F. HUSTEDT, 1930, p. 268, fig. 483).
Plate C II, fig. 6: 65×17 μ. 13 striae in 10 μ. No. 12.

Navicula mutica KÜTZ. fo. *cohnii* (HILSE) GRUN. (F. HUSTEDT, 1930–66, III, p. 583, figs. 1592g–m).
Plate C II, fig. 16: 21×8 μ. 16–17 striae in 10 μ. No. 38.
Plate C II, fig. 17: 26×10 μ. 16 striae in 10 μ. No. 38.

Navicula similis KRASSKE. (F. HUSTEDT, 1930, p. 303, fig. 528).
Plate C II, fig. 13: 13×7 μ. 15–16 striae in 10 μ. No. 30.
Note the annulate end striae.

Navicula wittrockii (LAGERST.) A. CLEVE-EULER. (F. HUSTEDT, 1930–66, III, p. 583, figs. 1292g–m).
Plate C II, fig. 10: 32×10 μ. 16 striae in 10 μ. No. 39.
Plate C II, fig. 11: 38×10 μ. 16 striae in 10 μ. No. 37.

Neidium affine (EHR.) CLEVE. (F. HUSTEDT, 1930, p. 242, fig. 376).
Plate C II, fig. 4: 55×13 μ. 22–24 striae in 10 μ. No. 20.
Plate C II, fig. 7: 37×9 μ. 22–24 striae in 10 μ. No. 25.
Plate C II, fig. 8: 29×9 μ. 22–24 striae in 10 μ. No. 10.

Neidium affine var. *longiceps* (GREG.) CLEVE. (F. HUSTEDT, 1930, p. 244, fig. 378).
Plate C II, fig. 9: 23×5.5 μ. 26–28 striae in 10 μ. No. 12.

Neidium bisulcatum (LAGERST.) CLEVE. (F. HUSTEDT, 1930, p. 242, fig. 374).
Plate C II, fig. 5: 56×8 μ. 26–28 striae in 10 μ. No. 12.

Neidium iridis (EHR.) CLEVE. (F. HUSTEDT, 1930, p. 245, fig. 379).
Plate C II, fig. 1: 65×22.5 μ. 14–15 striae and 14 puncta in 10 μ. No. 02.
Plate C II, fig. 2: 70×23 μ. 16 striae in 10 μ. No. 09.

Neidium iridis fo. *elliptica* nov. fo. Plate C II, fig. 3.
Valvis ellipticis et apicibus late rotundatis non protractis a typo differt.
Deviates from the type by having elliptical valves and broadly rounded, not extented apices.
Plate C II, fig. 3: 50×21 μ. 15 striae and 16–17 puncta in 10 μ. No. 16.
Illustration slide: Greenland No. 16/33–34/1970. FOGED Coll., Odense.
Type locality: Peat bog, Qagssiarssuk, Greenland.

Pinnularia borealis EHR. (F. HUSTEDT, 1930, p. 326, fig. 587).
Plate C III, fig. 7: 41×11 μ. 4 striae in 10 μ. No. 44.
Plate C III, fig. 8: 48×10–11 μ. 4 striae in 10 μ. No. 24.
Plate C III, fig. 9: 35×9.5 μ. 5–6 striae in 10 μ. No. 18.

Pinnularia gentilis (DONK.) CLEVE. (F. HUSTEDT, 1930, p. 335, fig. 618).
Plate C III, fig. 2: 150×22 μ. 7 striae in 10 μ. No. 35.
Plate C III, fig. 3: 117×20 μ. 7 striae in 10 μ. No. 41.

Pinnularia gibba EHR. (F. HUSTEDT, 1930, p. 327, fig. 600).
Plate C III, fig. 10: 90×12 μ. 8 striae in 10 μ. No. 21.

Pinnularia intermedia LAGERST. (J. B. PETERSEN, 1928, p. 403, fig. 24).
Plate C III, fig. 13: 30×6 μ. 8 striae in 10 μ. No. 45.
Plate C III, fig. 14: 37×7.5 μ. 8 striae in 10 μ. No. 29.

Pinnularia interrupta W. SMITH (F. HUSTEDT, 1930, p. 317, fig. 573).
Plate C IV, fig. 3: 52×11.5 μ. 10 striae in 10 μ. No. 38.

Pinnularia krookei GRUN. (F. HUSTEDT, 1930, p. 319, fig. 580).
Plate C IV, fig. 13: 20×6μ. 18(–20) striae in 10 μ. No. 47.

Pinnularia lagerstedtii (CLEVE) HUST. (F. HUSTEDT, 1934, p. 390). Syn.: *P. parva* (GREG.) CLEVE var. *minuta* ØSTRUP (J. B. PETERSEN, 1928, p. 408, fig. 29).
Plate C III, fig. 11: 27×6 μ. 10 striae in 10 μ. No. 50.
Plate C III, fig. 12: 20×5.2 μ. 8 striae in 10 μ. No. 47.

Pinnularia lata (BRÉB.) SMITH. (F. HUSTEDT, 1930, p. 324, fig. 595).
Plate C III, fig. 6: 99×28 μ. 3 striae in 10 μ. No. 44.

Pinnularia microstauron (EHR.) CLEVE. (F. HUSTEDT, 1930, p. 320, fig. 582).
Plate C IV, fig. 5: 53×9.3 μ. 10 striae in 10 μ. No. 18.
Plate C IV, fig. 9: 40×8 μ. 9 striae in 10 μ. No. 09.
Plate C IV, fig. 10: 34×6 μ. 12 striae in 10 μ. No. 09.

Pinnularia microstauron fo. *biundulata* O. MÜLLER. (F. HUSTEDT, 1930, p. 320, fig. 583).
Plate C IV, fig. 4: 44×12 μ. 10 striae in 10 μ. No. 37.

Pinnularia microstauron var. *brébissonii* (KÜTZ.) HUST. fo. *diminuta* HUST. (F. HUSTEDT, 1930, p. 322, fig. 585).
Plate C IV, fig. 11: 24×5.2 μ. 11–12 striae in 10 μ. No. 11.

Pinnularia nodosa EHR. (F. HUSTEDT, 1930, p. 330, fig. 611).
Plate C IV, fig. 1: 59×10.3 μ. 9 striae in 10 μ. No. 38.
Plate C IV, fig. 2: 53×10 μ. 10 striae in 10 μ. No. 37.

Pinnularia obscura KRASSKE. (G. KRASSKE, 1932, p. 117, fig. 17).
Plate C IV, fig. 12: 23×4.5 μ. 101–1 striae in 10 μ. No. 20.

Pinnularia pulchra ØSTRUP. (F. HUSTEDT, 1942, p. 123, figs. 46–49).
Plate C IV, fig. 6: 51×7.5 μ. 8 striae in 10 μ. No. 36.

Pinnularia viridis (NITZSCH) EHR. (F. HUSTEDT, 1930, p. 334, fig. 617a).
Plate C III, fig. 1: 116×20 μ. 6 striae in 10 μ. No. 27.

Pinnularia viridis fo. *cuneata* (E. ØSTRUP, A. CLEVE) nov. comb.
Plate C III, fig. 5.
Apicibus cuneatis a typo differt.

Deviates from the type by having cuneate apices.
Plate C III, fig. 5: 88×18.5 μ. 7 striae in 10 μ. No. 23.
Plate C III, fig. 4: 81×19 μ. 6 striae in 10 μ. No. 34.
Illustration slide: Greenland No. 23/62–63/1970. FOGED Coll., Odense.
Type locality: Peat-bog, Qagssiarssuk.
Syn.: *P. cuneata* (E. ØSTRUP) A. CLEVE. (A. CLEVE 1932, p. 66. A. CLEVE-EULER 1955, IV, p. 78). *P. flexuosa* var. *cuneata* ØSTRUP, 1910.
Non: *P. cuneata* MEISTER 1932.
This form without doubt must be classed with *P. viridis*, from which it deviates by the form of the apices only. This view has been accepted by F. HUSTEDT (oral information).

Pinnularia wijkensis FOGED. (N. FOGED, 1964, p. 116, 13: 13).
Plate C IV, fig. 7: 43×6 μ. 11 striae in 10 μ. No. 37.
Plate C IV, fig. 8: 36×6 μ. 12 striae in 10 μ. No. 33.

Stauroneis javanica (GRUN.) CLEVE. (F. HUSTEDT, 1930–66, II, p. 813, fig. 1159).
Plate C I, fig. 15: 66×18 μ. 14 striae and 12–14 puncta in 10 μ. No. 30.

Stauroneis phoenicenteron EHR. (F. HUSTEDT, 1930–66, II, p. 766, fig. 1118a).
Plate C I, fig. 6: 134×27 μ. 16 striae and 15–16 puncta in 10 μ. No. 20.

Stauroneis producta GRUN. (F. HUSTEDT, 1930–66, II, p. 807, fig. 1154).
Plate C I, fig. 5: 38×10 μ. 24 striae in 10 μ. No. 21.

D. SPONGILLA SØ, SOUTH GREENLAND

A core from the lake Spongilla Sø

(59°58′N, 44°21′W)

Comments on the core, samples and tables

From the bottom of a small lake, 75×40 m, in the island Pamiagdluk in the southernmost part of Greenland a core has been taken up, from which 25 samples were selected for examination concerning content of diatoms.

The surface of the lake is now ca. 5.5 m above sea level, and the upper marine limit is ca. 30 m a.s.l. The lake came to existence during the upheavel, a bay getting debarred from the sea. The present depth in the lake is 125 cm at the coring site.

Table 8 brings information about the depth of the samples. Samples Nos. 1–5 originate from the marine facies, No. 5a from a 1.5 cm thick transition layer, while the rest of the samples (Nos 6–24) originate from the limnic facies.

Further table 8 gives the composition of the sediment besides 5 C^{14} datings.

For further details about the lake including a pollen diagram, see B. Fredskild, 1973.

In table 9 the shown polyhalobous and mesohalobous diatoms are given in alphabetical order, and the occurrence in the samples is marked by +. From this it appears that these marine and brackish water forms only occur in the lower samples of the core, in Nos 1–5 (from 241 up to 196 cm below the bottom of the lake) and in the transitional layer No. 5a. Only a single valve of the haline *Diploneis interrupta* is found in the sample just above the marine series in which only a few valves of the two freshwater forms *Eunotia pectinalis* var. *ventralis* and *Frustulia rhomboides* var. *saxonica* are found.

In the transitional layer No. 5a 9 freshwater species are found together with 6 haline species. Of the freshwater species 1 is acidophilous,

Table 8

Sample no.	cm below lake bottom	Sediment	C^{14}years B.P.
24	3– 8	0–45 cm: Rather loose, fine gyttja	
23	13– 18		
22	23– 28		
21	33– 38		33– 38 cm: 2110±100
20	43– 48	45–68 cm: Fine gyttja with mosses	
19	53– 58		
18	63– 68		
17	73– 78	68–194 cm: Fine gyttja with few mosses. In the deeper part finely laminated	73– 78 cm: 3500±100
16	83– 88		
15	93– 98		
14	103–108		
13	116–121		116–121 cm: 7670±130
12	126–131		
11	136–141		
10	146–151		146–151 cm: 8720±140
9	156–161		
8	166–171		
7	176–181		
6	186–191		
5a	195	194–195.5 cm: Greyish, clayey gyttja	191–196 cm: 9210±140
5	196–201	195.5–196 cm: Sharply delimited grey clay	
4	206–211	196–241 cm: Marine clay with gyttja	
3	216–221		
2	226–231		
1	236–241		

5 are indifferent and 3 are alkaliphilous. According to this the pH-tendency of the environment was alkaline.

Thus the borderline between the marine and the limnic sediment is astonishingly marked as no marine forms at all are found in the sample No. 6, selected only 4 cm above No. 5a, nor in the layers above.

In table 10 the freshwater forms are placed in the same way as in the previous treatises. From this it appears very clearly that the reaction of the environment during the limnic stage has been acid. Still the lower limnic samples (Nos 6–12) seem to be deposited in an environment with a somewhat less acid tendency than the upper and younger samples.

Nothing in the table indicates that sudden changes of the character of the environment at any time have taken place.

Table 9

polyhalobous + mesohalobous							
Sample no.	1	2	3	4	5	5a	6
Achnanthes brevipes AG.	+						
– *delicatula* (KÜTZ.) GRUN.	+						
– *groenlandica* (CLEVE) GRUN.	+						
– *hauckiana* GRUN.	+						
Actinoptychus undulatus (BAIL.) RALFS	+						
Amphora cruciata ÖSTRUP	+						
– *proteus* GREG.	+						
Bacillaria paradoxa GMELIN	+						
Biddulphia aurita (LYNGB.) BRÉB. & GOD.	+						
Cocconeis costata GREG.	+		+				
– *pseudomarginata* GREG.			+				
– *scutellum* EHR.	+						
Coscinodiscus curvatulus GRUN. var. *minor* (EHR.) GRUN.	+		+	+	+		
– *excentricus* EHR. var. *fasciculata* HUST.	+						
Dimerogramma minor (GREG.) RALFS	+						
Diploneis didyma EHR.	+					+	
– *interrupta* (KÜTZ.) CLEVE						+	+
– *splendida* (GREG.) CLEVE			+	+	+		
– *subcincta* (A. S.) CLEVE	+						
Grammatophora angulosa EHR.					+		
– – var. *islandica* (EHR.) GRUN.	+						
– *arcuata* EHR.	+		+				
– *hamulifera* KÜTZ.	+						
– *oceanica* (EHR.) GRUN.	+			+			
Hyalodiscus scoticus (KÜTZ.) GRUN.	+						
Licmophora oedipus (KÜTZ.) GRUN.	+						
Mastogloia elliptica (AG.) CLEVE						+	
Melosira juergensii AG.				+			
Navicula digitoradiata (GREG.) A. S.	+				+		
– – var. *minor* FOGED						+	
– *dissipata* HUST.	+						
– *lanceolata* KÜTZ. var. *cymbula* (DONK.) CLEVE	+						
Nitzschia hungarica GRUN.	+						
Rhabdonema arcuatum (LYNGB. ? AG.) KÜTZ.	+						
– *minutum* KÜTZ.	+		+				
Rhoicosphenia curvata (AG.) GRUN.	+		+				
Rhopalodia musculus (KÜTZ.) O. MÜLLER . .						+	
Trachyneis aspera EHR.	+				+		
Synedra pulchella (RALFS) KÜTZ.			+			+	
– *tabulata* (AG.) KÜTZ.	+						

Table 10

Sample no. . . .	1	2	3	4	5	5a	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1. acidobiontic																									
Anomoeoneis serians (Bréb.) Cl. . .																	+								
– – var. *brachysira* (Bréb.) Hust.											+				+	+	+	+	+	+	+	+	+	+	+
– – – fo. *thermalis* (Grun.) Hust.																+	+								
– *styriaca* (Grun.) Hust.																							+		
Eunotia rhomboidea Hust.														+				+					+		+
2. acidophilous																									
Amphicampa hemicyclus (Ehr.) Karst.														+	+	+	+	+	+	+	+	+			
Caloneis holstii Cleve.																	+	+	+				+		+
Cymbella gracilis (Rabh.) Cleve .							+		+	+						+		+	+	+	+				
– *hebridica* (Greg.) Grun.															+	+	+		+	+	+	+	+	+	+
Eunotia bidentula W. Smith																									+
– *bigibba* Kütz. var. *pumila* Grun.									+						+	+	+	+	+		+				
– *denticulata* (Bréb.) Rabh.															+										
– *diodon* Ehr.															+		+								
– *exigua* (Bréb.) Grun.							+			+							+	+		+					
– *faba* (Ehr.) Grun.															+	+	+	+	+	+	+	+	+	+	+
– *meisteri* Hust.												+					+					+			
– *monodon* Ehr.							+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+
– – var. *maior* (W. Smith) Hust.												+	+	+		+	+	+	+	+	+	+	+	+	+
– *paludosa* Grun.																	+								
– *pectinalis* (Dillw.? Kütz.) Rabh.												+				+		+		+					
– – var. *ventralis* (Ehr.) Hust. . . .			+																						
– *polyglyphis* Grun.																+	+			+			+		+
– *praerupta* Ehr.															+		+	+	+						
– – var. *bidens* Grun.														+											
– – var. *inflata* Grun.																	+								
– *robusta* Ralfs															+	+	+	+	+	+		+	+	+	+
– – var. *tetraodon* (Ehr.) Ralfs. .																									+
– *tenella* (Grun.) Hust.														+	+	+			+	+	+	+		+	+
– *triodon* Ehr.															+	+	+	+		+					
– *veneris* (Kütz.) O. Müller							+								+	+	+		+	+	+	+	+	+	+
– *testudinata* Å. Berg																	+		+	+			+	+	+
Fragilaria constricta Grun.																+	+							+	
– – fo. *stricta* A. Cleve																	+	+							+
Frustulia rhomboides (Ehr.) De Toni							+								+	+	+	+	+	+			+		+
– – var. *saxonica* (Ehr.) De Toni					+								+	+	+	+	+	+	+	+	+	+	+	+	+
Melosira distans (Ehr.) Kütz. . . .																	+	+							+
– – var. *lirata* (Ehr.) Bethge . . .															+	+	+	+	+	+	+	+	+	+	+
Navicula cocconeiformis Grun. . . .																+	+			+					+
– *subtilissima* Cleve																				+					
Neidium affine (Ehr.) Cleve																+	+			+			+		
– – var. *amphirhynchus* (Ehr.) Cl.																					+				+

(continued)

Table 10 (continued)

Sample no. . . .	1	2	3	4	5	5a	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Neidium iridis (EHR.) CLEVE															+		+								
– – var. *porsildii* nov. var.																		+							
Pinnularia brevicostata CLEVE																								+	
– *hemiptera* (KÜTZ.) CLEVE var. *groenlandica*																					+				
– *lata* (BRÉB.) W. SMITH									+																
– *stomatophora* GRUN.																	+								
Stenopterobia intermedia (LEWIS) FRICKE																					+				
Tabellaria binalis (EHR.) GRUN. . .																+									
– *fenestrata* (LYNGB.) KÜTZ.					+											+	+	+	+	+		+			
– *flocculosa* (RABH.) KÜTZ.	+					+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+			
3. indifferent (circumneutral)																									
Achnanthes linearis W. SMITH							+																		
Anomoeoneis exilis (KÜTZ.) CLEVE							+	+																	
– – var. *lanceolata* A. MAYER							+	+	+								+	+	+	+	+	+	+		
Cymbella amphicephala NAEGELI .															+		+	+		+	+				
– *cesatii* (RABH.) GRUN.																+								+	
– *ventricosa* KÜTZ.							+											+							
Eunotia lunaris (EHR.) GRUN.								+																	
Fragilaria virescens RALFS						+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
– – var. *elliptica* HUST.												+	+	+	+	+									+
Navicula bacillum EHR.												+		+											
– *petersenii* HUST.														+											
– *pseudoscutiformis* HUST.	+					+	+	+	+	+															
– *pupula* KÜTZ.													+												
– *pusilla* W. SMITH							+																		
Nitzschia ignorata KRASSKE							+																		
Pinnularia gibba EHR.									+		+			+				+				+			+
– – var. *linearis* HUST.							+	+	+					+		+								+	
– *interrupta* W. SMITH							+					+			+	+	+		+	+			+	+	+
– *maior* KÜTZ.						+		+						+	+	+	+		+			+	+		+
– *mesolepta* (EHR.) SMITH																	+			+			+		
– *microstauron* (EHR.) CLEVE																				+					+
– – var. *brébissonii* (KÜTZ.) HUST.											+														
– *nodosa* EHR.							+	+																	
– *viridis* (NITZSCH) EHR.			+			+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
– *streptoraphe* CLEVE			+																						
Stauroneis anceps EHR.												+			+	+	+		+			+		+	+
– *phoenicenteron* EHR.						+								+		+	+		+						
4. alkaliphilous																									
Amphora ovalis KÜTZ. var. *libyca* (EHR.) CLEVE	+																								
Cymbella microcephala GRUN.						+																			
Diploneis ovalis (HILSE) CLEVE. . .	+																						+		

(continued)

Table 10 (continued)

Sample no.	1	2	3	4	5	5a	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Fragilaria construens (EHR.) GRUN.						+																			
– – – var. *binodis* (EHR.) GRUN.							+																		
– – var. *triundulata* REICHELT ...							+																		
– – var. *venter* (EHR.) GRUN.	+																								
Gomphonema acuminatum EHR. ..																+				+					
– *angustatum* (KÜTZ.) RABH.									+												+				
– *constrictum* EHR.																	+							+	+
– *parvulum* KÜTZ.												+				+	+	+	+		+	+		+	+
– – var. *micropus* (KÜTZ.) CLEVE.																	+			+					
Nitzschia frustulum KÜTZ.												+													
– – var. *perpusilla* (RABH.) KÜTZ.						+	+	+										+			+				
Synedra ulna (NITZSCH) EHR.															+										
5. alkalibiontic																									
Stephanodiscus astraea (EHR.) GRUN. var. *minutula* (KÜTZ.) GRUN.							+																		

Notes on Plates D I–III

Achnanthes brevipes AG. (F. HUSTEDT, 1930–66, II, p. 424, fig. 877).
Plate D II, fig. 14: 20×6 μ. 12–13 striae in 10 μ. (rapheless valve). No. 01/1971.

Achnanthes delicatula (KÜTZ.) GRUN. (F. HUSTEDT, 1930–66, II, p. 389, fig. 836).
Plate D II, fig. 18: 17×7 μ. (13)–14 striae in 10 μ. (rapheless valve). No. 01/1971.

Achnanthes groenlandica (CLEVE) GRUN. (F. HUSTEDT, 1930–66, II, p. 421, fig. 874).
Plate D I, fig. 11: 72×7 μ. 6–7 striae in 10 μ. (raphe valve).
Plate D I, fig. 12: cell 76×18 μ; in girdle view.
D I: 11 and 12 are photos from E. ØSTRUPS slide V 202, No. 2075 with the original material from Greenland.
A marine species, known from arctic seas from the Behring's Island to Spitzbergen and the Finmark. E. ØSTRUP, 1910, p. 216 gives the species from 2 localities in North-East Greenland.

Actinopthychus undulatus (BAIL.) RALFS. (F. HUSTEDT, 1930–66, I, p. 475, fig. 264).
Syn.: *A. senarius* (EHR.) EHR. (N. I. HENDEY, 1966, p. 95, 23: 1, 2).
Plate D I, fig. 2: diam.: 29 μ. No. 01/1971.

Amphicampa hemicyclus (EHR.) KARST. (F. HUSTEDT, 1930–66, II, p. 258, fig. 736).

Plate D II, fig. 6: 35×6 μ. 10 striae in 10 μ. No. 15/1971.
Previously not shown in Greenland. In the samples Nos. 13–26 it is rather frequent. In material collected in South-West Greenland in 1957 and 1970 it is found very widespread from the Ivigtut region to Kap Farvel, predominantly in oligotrophic localities.

Amphora cruciata ØSTRUP. (E. ØSTRUP, 1897, p. 325, 2: 2).
(? Syn.: *A. margaritifera* CLEVE 1895).
Plate D II, figs. 8a, b: 20×9 μ. 12–14 striae in 10 μ.
Plate D II, figs. 9a, b: 23×5 μ. 11–12 striae in 10 μ.
D II: 8a, b and 9a, b are photos from E. ØSTRUP's slide V 202, No. 2075 with the original material from Greenland.
A marine species, found by E. ØSTRUP in West Greenland (Egedesminde and Julianehåb).
Probably very widespread, but overlooked. Thus also found in my material from Mediterranean (No. 159/1962, the Volo Bay, Greece).

Amphora ovalis KÜTZ. var. *libyca* CLEVE. (F. HUSTEDT, 1930, p. 342).
Plate D III, fig. 12: cell 25×12 μ. 18 striae in 10 μ. No. 01/1971.

Anomoeoneis serians (BRÉB.) CLEVE var. *brachysira* (BRÉB.) CLEVE. (F. HUSTEDT, 1930–66, II, p. 748, figs. 1112e–h).
Plate D II, fig. 17: 20×7 μ. ca. 22 striae in 10 μ. No. 16/1971.

Anomoeoneis serians var. *brachysira* fo. *thermalis* (GRUN.) HUST. (F. HUSTEDT, 1930–66, II, p. 749, figs. 1112i–l).
Plate D II, fig. 16: 20×6 μ. ca. 22 striae in 10 μ. No. 15/1971.

Biddulphia aurita (LYNGB.) BRÉB. & GOD. (F. HUSTEDT, 1930–66, I, p. 846, fig. 501).
Plate D I, fig. 1:32×42 μ. No. 01/1971.

Caloneis holstii CLEVE. (P. T. CLEVE, 1881, p. 11, 16: 1).
Plate D III, fig. 3: 39×15.5 μ. 13 striae in 10 μ. No. 553/1957.
Plate D III, fig. 4:45×16 μ. 12 striae in 10 μ. No. 498/1957.
The species is first found by P. T. CLEVE, 1881 in material collected by Docent N. O. HOLST. As locality Kornak is given.
Since then the species does not seem to be shown in Greenland before I found it in material from the region of the fiord Sdr. Strømfjord in West Greenland (N. FOGED, 1953, p. 38; 3: 11), although I was not able to identify it as I designated it *Neidium* sp. Now it is seen that the species is common all over in South Greenland; thus I found it rather frequently in material collected in 1957 and 1970 in many localities from the Ivigtut area to Kap Farvel.
In A. SCHMIDT's Atlas 50: 48 the species—sine nome—is pictured from "Oregon, fraglich". In F. HUSTEDT, 1924, p. 554, it is given as

found in moss from an unnamed bog in the Sarek region in North Sweden.
According to E. ØSTRUP, 1913, p. 28 it is found in 2 freshwater samples in Santa Cruz, the Virgin Islands. In C. S. BOYER, 1927, p. 313, the species is stated to be marine, which is rather incomprehensible as his source is P. T. CLEVE 1894–95, I, p. 62, where it clearly is indicated to be a freshwater form.
In A. CLEVE-EULER, 1954, IV, p. 94, only the find from Sarek by HUSTEDT is given, in addition doubted by the comment: "Belege fehlen, und das Vorkommen dieser argentinischen Art in Norden bleibt zu bestätigen". (Vide References!).

Cocconeis costata GREG. (F. HUSTEDT, 1930–66, II, p. 332, fig. 785).
Plate D II, fig. 19: 12.5×8 μ. 8 striae in 10 μ. (rapheless valve).
Plate D II, fig. 20: 14×9 μ. 6 striae in 10 μ. (rapheless valve). No. 01/1971.
Plate D II, fig. 21: 23×17 μ. 6–7 striae in 10 μ. (rapheless valve). No. 01/1971.

Cocconeis pseudomarginata GREG. (F. HUSTEDT, 1930–66, II, p. 359, fig. 813).
Plate D II, fig. 22: 39×28 μ. 16 striae in 10 μ. (rapheless valve). No. 01/1971.

Cocconeis scutellum EHR. (F. HUSTEDT, 1930–66, II, p. 337, fig. 790).
Plate D II, fig. 23: 45×35 μ. 6 striae in 10 μ. (rapheless valve). No. 01/1971.

Coscinodiscus curvatulus GRUN. var. *minor* (EHR.) GRUN. (F. HUSTEDT, 1930–66, I, p. 407, fig. 217).
Plate D I, figs. 3, 4: diam.: 35 μ. No. 01/1971.
Plate D I, figs. 5, 6: diam.: 26 μ. No. 01/1971.
I feel somewhat hesitant as regards the identification of this form, the disc being more convex than usually with the species and its varieties.

Cymbella cesatii (RABH.) GRUN. (F. HUSTEDT, 1930, p. 351, fig. 638).
Plate D III, fig. 14: 37×8 μ. 16–17 striae in 10 μ. No. 15/1971.

Cymbella hebridica (GREG.) GRUN. (F. HUSTEDT, 1930, p. 359, fig. 662).
Plate D III, fig. 8: 42×12 μ. ca. 11 striae in 10 μ. No. 22/1971.
Plate D III, fig. 13: 32×9 μ. 10 striae in 10 μ. No. 15/1971.

Eunotia bigibba KÜTZ. var. *pumila* GRUN. (F. HUSTEDT, 1930–66, II, p. 282, figs. 747c–h).
Plate D II, fig. 7: 15×4.5–6 μ. 14 striae in 10 μ. No. 16/1971.

Eunotia faba (EHR.) GRUN. (F. HUSTEDT, 1930–66, II, p. 301, fig. 767).
Plate D II, fig. 4: 34×9 μ. ca. 14 striae in 10 μ. No. 22/1971.

Eunotia faba var. *rhomboidea* nov. var. Plate D II, fig. 5.
Valvis plus aut minus incocinnibus a typo differt.
Deviates from the type by the valves being more or less unsymmetrical.
Illustration slide and holotype: Greenland No. 548/1957. FOGED Coll., Odense.
Type locality: Freshwater. Pond. The island Alángorssuaq (Torssukátak), South-West Greenland.
This form was previously included under *Eunotia faba*, but as it seems to be rather constant, very widespread and extremely characteristic I think it justified to establish it as a variety of this species.
As regards the unsymmetrical valves it resembles *E. rhomboidea* HUSTEDT (1950, p. 435; 36: 34–41), but as to dimensions it greatly surpasses the latter, which may be a variety of *E. tenella*, and it does not seem to be connected with it by transitional forms. So it is established as a variety of *E. faba* to which it is closely related as regards dimensions of valves and number of striae.

Eunotia monodon EHR. (F. HUSTEDT, 1930–66, II, p. 305, figs. 772a, b).
Plate D II, fig. 1: 75×12 μ. 9–13 striae in 10 μ. No. 24/1971.

Eunotia testudinata Å. BERG. (Å. BERG, 1935, p. 425; 1: 10).
Plate D II, fig. 2: 51×18 μ. 8–9 striae in 10 μ. No. 17/Kap Farvel 1970.
Plate D II, fig. 3: 40×14.5 μ. 11 striae in 10 μ. No. 15/Kap Farvel 1970.
An *Eunotia* species characterized by having straight or faintly convex ventral margin, the pseudoraphe placed fairly far from the ventral margin and by having straight, parallel striae.
Possibly it is rather closely related to *E. monodon* var. *compacta*. Å. BERG found the species in recent material from the southern Lapland, Sweden.
The pictured specimens are from recent material from the Kap Farvel region (the samples respectively No. 17 and No. 15/1970, Kap Farvel), but the valves from the samples treated here agree with the recent ones.

Gomphonema parvulum KÜTZ. (F. HUSTEDT, 1930, p. 372, fig. 713a).
Plate D III, fig. 6: 20×5.5 μ. ca. 11 striae in 10 μ. No. 20/1971.

Grammatophora angulosa EHR. (F. HUSTEDT, 1930–66, II, p. 39, fig. 564).
Plate D I, fig. 8: 52×15 μ. 12 striae in 10 μ.

Grammatophora angulosa var. *islandica* (EHR.) GRUN. (F. HUSTEDT, 1930–66, II, p. 40, fig. 765).
Plate D I, fig. 9: 29×12 μ. (11)–12 striae in 10 μ. No. 01/1971.
Plate D II, fig. 10: 36×7 μ. 10 striae in 10 μ. No. 01/1971.

Grammatophora arcuata EHR. (F. HUSTEDT, 1930–66, II, p. 42, fig. 567).
Plate D II, fig. 11: 28×7 μ. No. 01/1971.

Grammatophora hamulifera KÜTZ. (F. HUSTEDT, 1930–66, II, p. 40, fig. 566).
Plate D I, fig. 10: 22×14 μ. 12–13 striae in 10 μ. No. 01/1971.

Navicula digitoradiata (GREG.) A. SCHMIDT. (F. HUSTEDT, 1930, p. 501, fig. 518).
Plate D III, fig. 7: 54×12 μ. 10 striae in 10 μ. No. 01/1971.

Navicula dissipata HUST. (F. HUSTEDT, 1930–66, III, p. 549, fig. 1587).
Syn.: *N. auriculata* HUSTEDT 1944.
Plate D III, fig. 5: 12×5 μ. ca. 20 striae in 10 μ. No. 01/1971.
A small euryhaline marine species, not rare at the European coasts. Seems to be very widespread, as I found it in Ghana (N. FOGED, 1966, p. 82), Queensland (Australia No. 254/1966), and in other places.

Neidium iridis (EHR.) CLEVE var. *porsildii* nov. var. Plate III, fig. 1.
Parte valvae versus marginem non striata, sed intervallis punctorum irregularibus a typo differt.
Deviates from the species by having irregular distances between the puncta in a part of the valve near the margin so that no striation comes into existence there.
Plate D III, fig. 1: 74×17 μ. 16–17 striae in 10 μ.
Illustration slide and holotype: Greenland No. 498/1957. FOGED Coll., Odense.
Type locality: Freshwater. Pond. The island Isa, South-West Greenland.
Plate D III, fig. 2: 60×20 μ. 18–19 striae in 10 μ.
The pictured specimens are from recent material from South-West Greenland (respectively Greenland No. 498/1957 and No. 396/1957). This variety, occurring rather widespread, but sparsely in South-West Greenland, is in this material only found in sample No. 17. It is a variety closely related to the species, but the peculiar punctation of striae is so diverging and so characteristic that I find it justified to regard it as a separate variety of the species. Typical specimens of *N. iridis* are found in the samples Nos. 14 and 16, but not in No. 17.
Dedicated to the late botanist MORTEN P. PORSILD, the founder of the Arctic Station, Godhavn, Greenland.

Nitzschia plana SM. var. *fennica* HUST. fo. *ornata* KOLBE. (R. W. KOLBE, 1948, p. 460, figs. 4, 5).

Plate D III, fig. 11: width: 12 μ. 7–8 keel puncta and 16–17 striae in 10 μ. No. 15/1971.

This form occurs in freshwater whereas *N. plana* as well as var. *fennica* are found in brackish and salt water. R. W. KOLBE, 1948 described it the first time from Sweden. Still it seems to be fairly widespread, but as a rule it only occurs sparsely. So far I have found it in several localities in Sweden and Eire and in a few in Norway and Denmark. The form seems to be rather eurytope, still it is most often found in more or less acid oligoptrophic localities.

Pinnularia maior (KÜTZ.) CLEVE. (F. HUSTEDT, 1930, p. 331, fig. 614).

Plate D III, fig. 9: 114×18 μ. ca. 11 striae in 10 μ. No. 16/1971.

Pinnularia streptoraphe CLEVE. (F. HUSTEDT, 1930, p. 337, fig. 628).

Plate D III, fig. 10: 250×42 μ. 4–5 striae in 10 μ. No. 03/1971.

Rhabdonema minutum KÜTZ. (F. HUSTEDT, 1930–66, II, p. 18, figs. 548a–d).

Plate D I, fig. 7: 42×30 μ. No. 01/1971.

Plate D II, fig. 15: 20×11 μ. 8 striae in 10 μ. No. 01/1971.

Surirella amphioxys W. SMITH. (F. HUSTEDT, 1930, p. 435, fig. 842).

Syn.: *S. moelleriana* GRUN.

Plate D III, fig. 15: 32×16 μ. No. 23/1971.

Tabellaria binalis (EHR.) GRUN. (F. HUSTEDT, 1930–66, II, p. 30, fig. 559).

Plate D II, fig. 12: 15×10 μ. No. 15/1971.

Plate D II, fig. 13: 20×2.5 μ. 14 striae in 10 μ. No. 538/1957.

This species is only found in sample No. 15, where it occurs rather frequently.

It is not previously stated from Greenland, but as several other peculiar species it proves to be fairly widespread and common in South-West Greenland.

By B. J. CHOLNOKY, 1968, p. 338 it is stated to have its pH-optimum at 5.0 and "Die Art erträgt keine pH-Schwankungen". So it perhaps ought to be characterized as acidobiontic and juxtaposed with the three above mentioned acidobiontic forms of *Anomoeoneis* the occurrence of which has its maximum in the core in samples Nos. 15 and 16. This should point to the conclusion that during the sedimentation of these samples a maximum of acidity has come into existence in the locality.

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Færdig fra trykkeriet den 24. august 1972.

PLATES

Plate A I

1. *Stephanodiscus niagarae* EHR.
2. *Cyclotella antiqua* W. SMITH
3. *Coscinodiscus lacustris* GRUN. var. *septentrionalis* GRUN.
4. *Cyclotella antiqua* W. SMITH
5. *Cyclotella antiqua* W. SMITH
6. *Fragilaria pinnata* EHR.
7. *Fragilaria pinnata* EHR.
8. *Caloneis schumanniana* (GRUN.) CLEVE
9. *Caloneis schumanniana* (GRUN.) CLEVE
10. *Stauroneis anceps* EHR.
11. *Cocconeis placentula* EHR.
12. *Cocconeis placentula* EHR.
13. *Cocconeis placentula* var. *klinoraphis* GEITLER
14. *Eunotia arcus* EHR.
15. *Eunotia praerupta* EHR.

Scales 10 μ

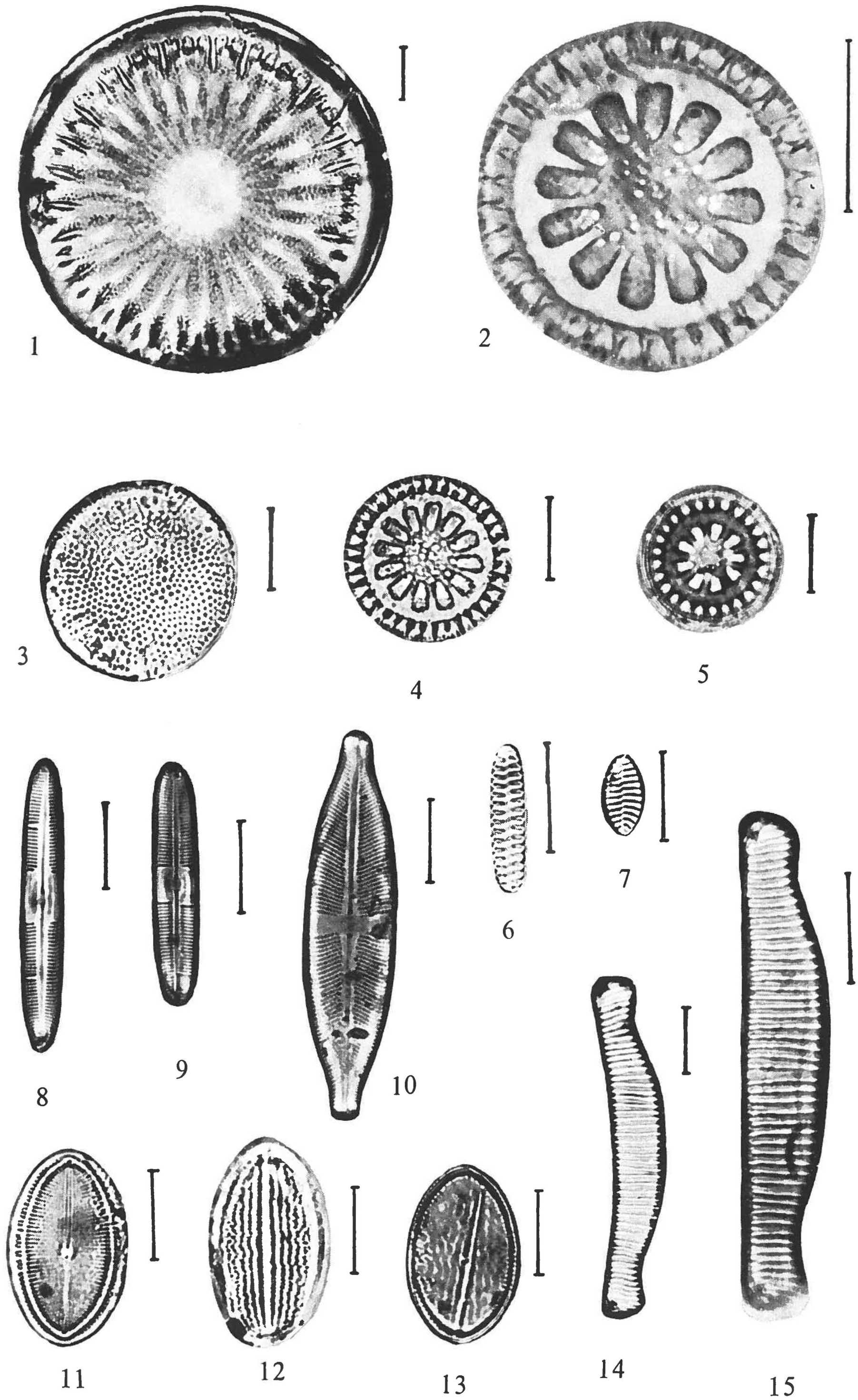
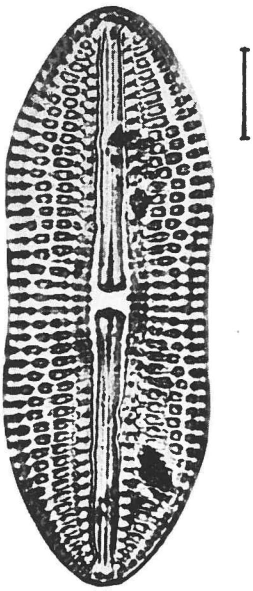


Plate A II

1. *Diploneis bomboides* (A. S.) CLEVE var. *media* GRUN.
2. *Diploneis crabro* EHR.
3. *Diploneis crabro* EHR.
4. *Diploneis smithii* (BRÉB.) CLEVE
5. *Diploneis smithii* (BRÉB.) CLEVE
6. *Trachyneis aspera* (EHR.) CLEVE

Scales 10 μ



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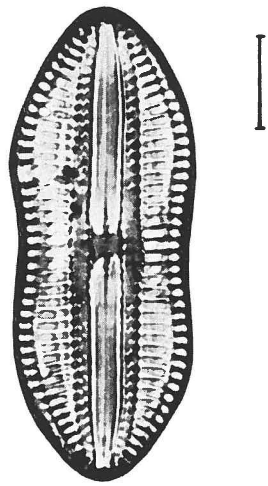

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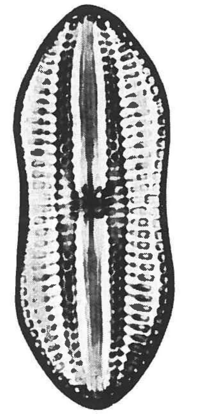

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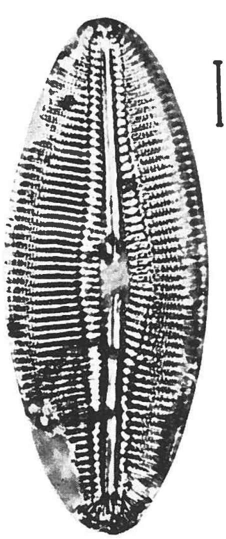

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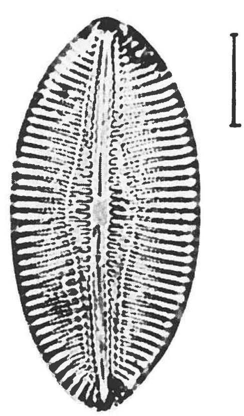

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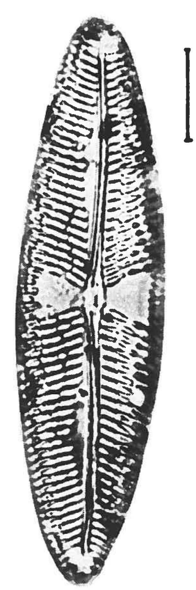

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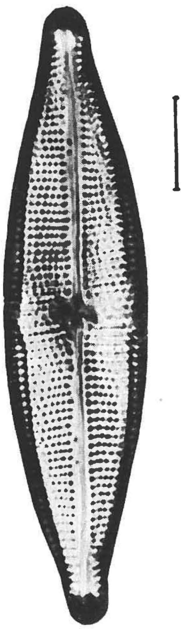
Plate A III

1. *Neidium distincte-punctatum* HUST.
2. *Neidium distincte-punctatum* HUST.
3. *Neidium iridis* (EHR.) CLEVE
4. *Scoliopleura tumida* (BRÉB.) RABH.
5. *Navicula digitoradiata* (GREG.) A. SCHMIDT
6. *Navicula digitoradiata* (GREG.) A. SCHMIDT
7. *Navicula radiosa* KÜTZ.
8. *Navicula vulpina* KÜTZ.

Scales 10 μ

PLATE A III



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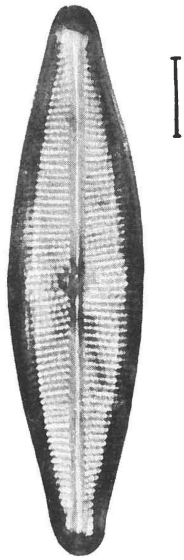

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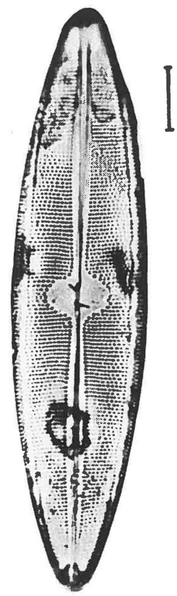

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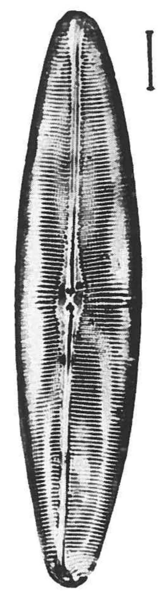

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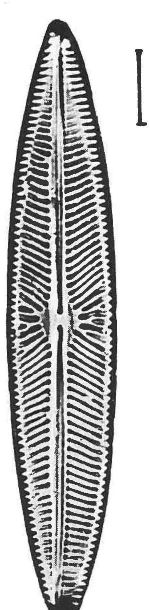

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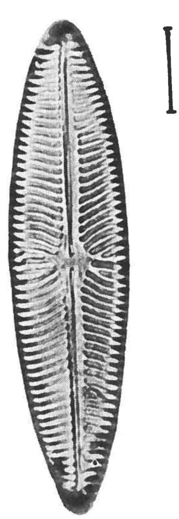

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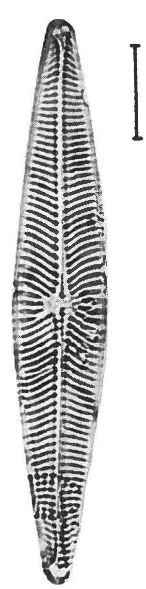

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Plate A IV

1. *Navicula cuspidata* KÜTZ. var. *ambigua* (EHR.) CLEVE
2. *Navicula simplex* KRASSKE
3. *Navicula simplex* KRASSKE
4. *Navicula tuscula* (EHR.) GRUN.
5. *Navicula tuscula* (EHR.) GRUN.
6. *Navicula tuscula* (EHR.) GRUN.
7. *Navicula tuscula* (EHR.) GRUN.
8. *Navicula tuscula* (EHR.) GRUN.
9. *Navicula vulpina* KÜTZ.

Scales 10 μ

Plate A IV

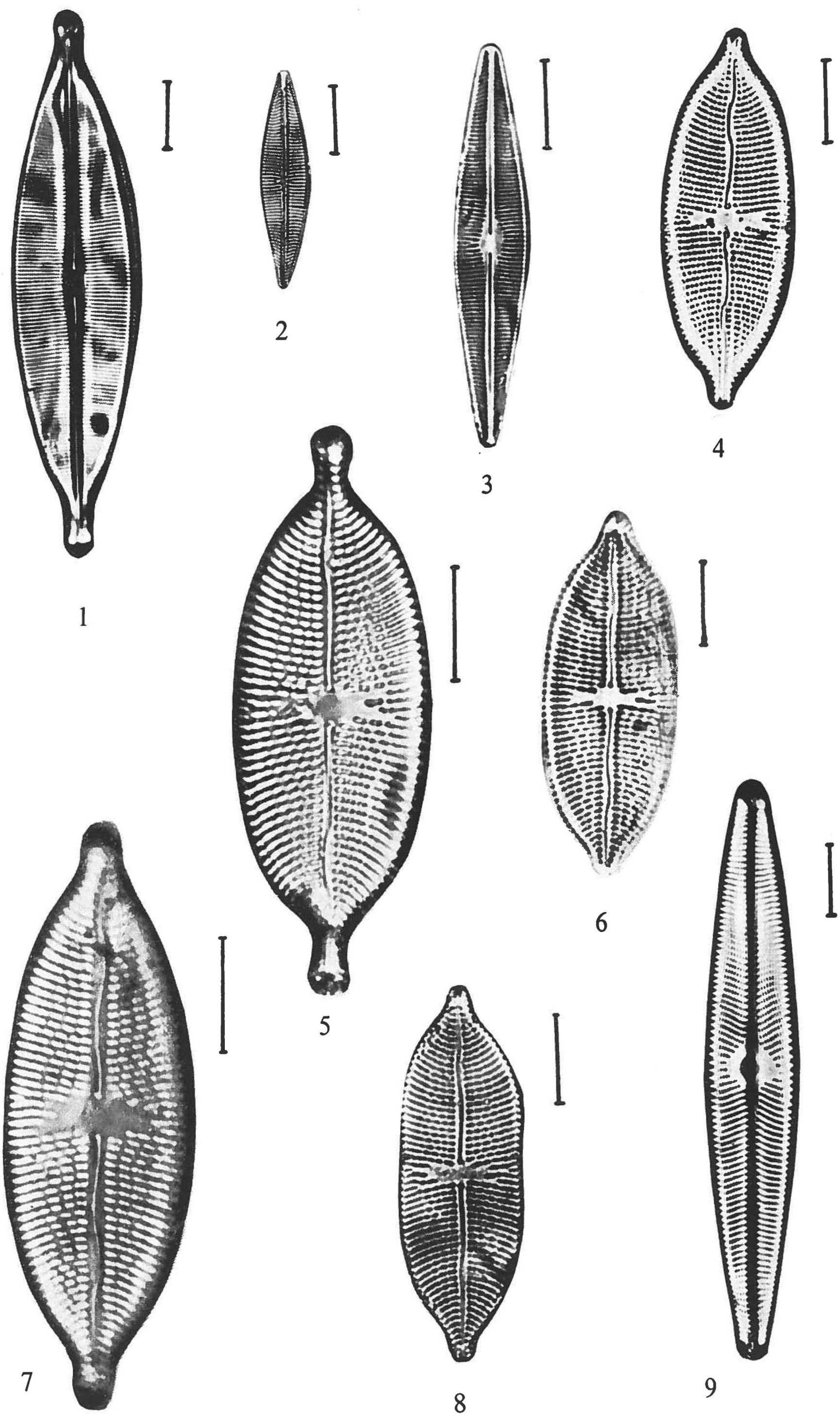

Plate A V

1. *Amphora ovalis* Kütz. var. *libyca* (Ehr.) Cleve
2. *Amphora proteus* Greg.
3. *Amphora proteus* Greg.
4. *Amphora proteus* Greg.
5. *Cymbella leptoceros* (Ehr.?) Grun.
6. *Cymbella leptoceros* (Ehr.?) Grun.
7. *Cymbella leptoceros* (Ehr.?) Grun.
8. *Cymbella cymbiformis* (Ag.? Kütz.) Van Heurck
9. *Cymbella norvegica* Grun.
10. *Pinnularia quadratarea* A. Schmidt
11. *Nitzschia denticula* Grun.
12. *Nitzschia apiculata* (Greg.) Grun.
13. *Amphora angusta* (Greg.) Cleve
14. *Cymbella cistula* (Hempr.) Grun.

Scales 10 μ

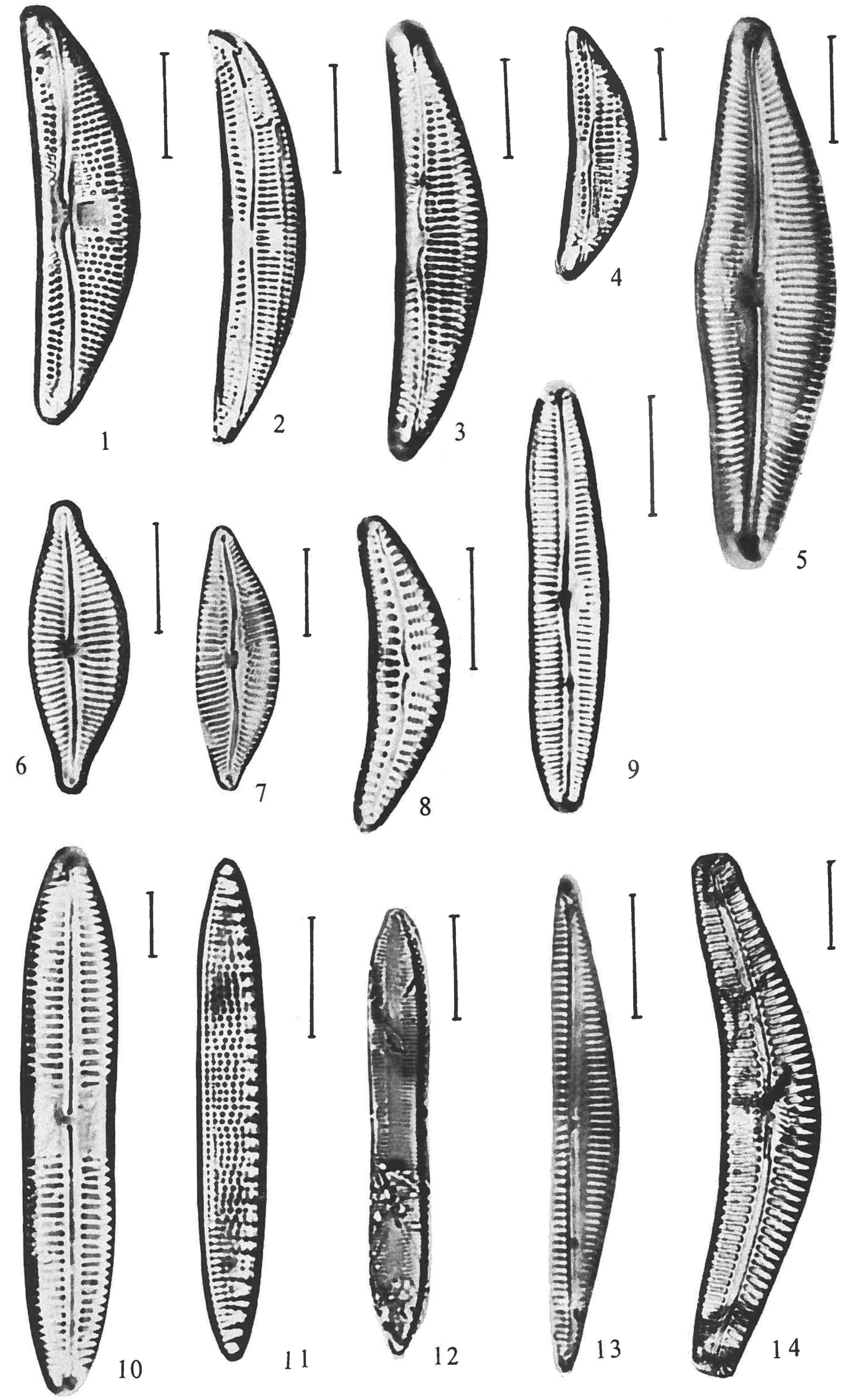
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Plate B I

1. *Cyclotella kützingiana* THWAITES
2. *Cyclotella ocellata* PANT.
3. *Cyclotella antiqua* W. SMITH
4. *Melosira islandica* O. MÜLLER
5. *Melosira roeseana* RABH.
6. *Stephanodiscus astraea* (EHR.) GRUN.
7. *Melosira granulata* (EHR.) RABH.
8. *Melosira granulata* (EHR.) RABH.
9. *Pinnularia gracillima* GREG.
10. *Eunotia praerupta* EHR.
11. *Neidium iridis* (EHR.) CLEVE
12. *Stauroneis dilatata* EHR.
13. *Stauroneis javanica* (GRUN.) CLEVE
14. *Stauroneis javanica* (GRUN.) CLEVE
15. *Eunotia monodon* EHR.

Scales 10 μ

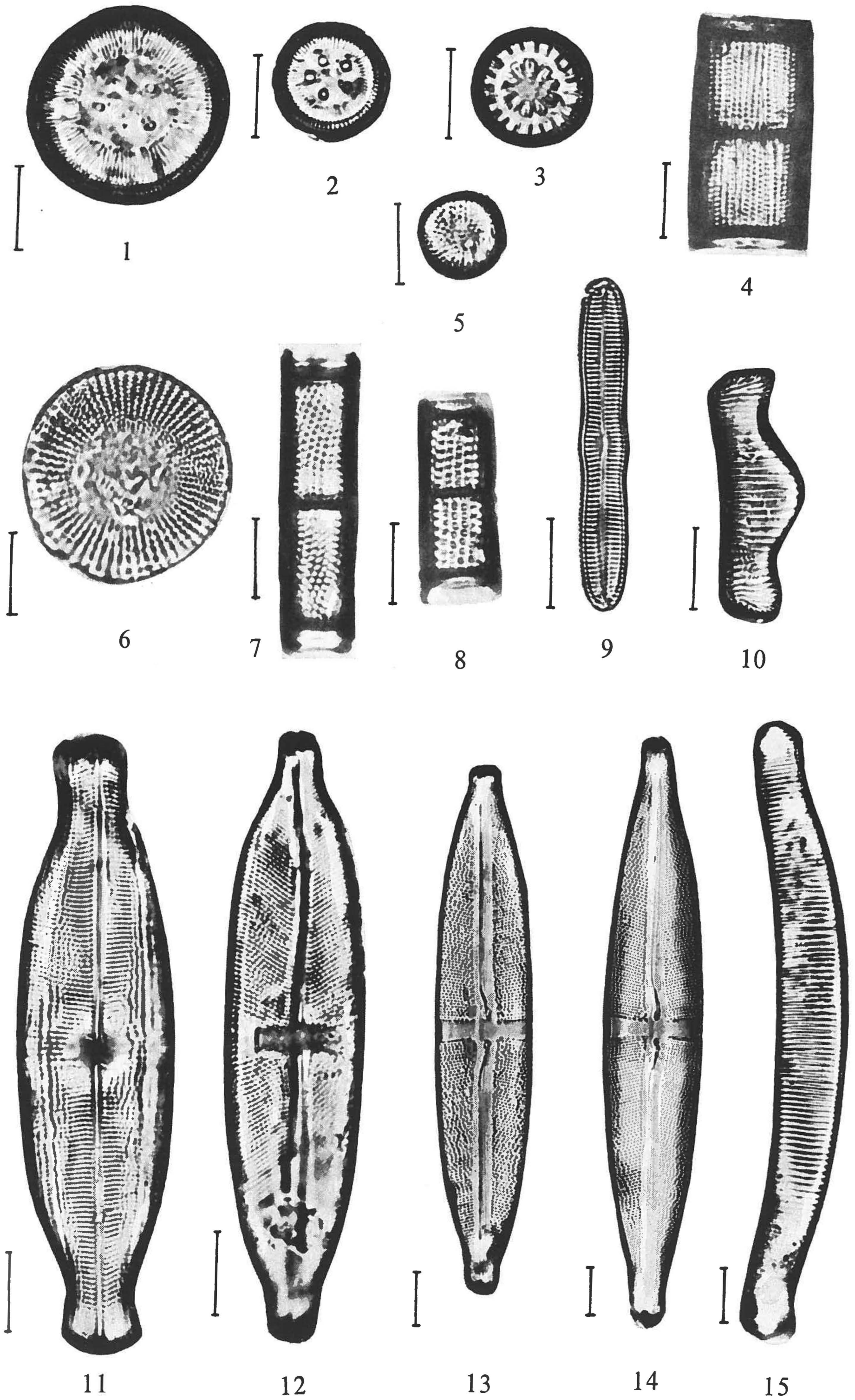
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Plate B II

1. *Stauroneis phoenicenteron* (Nitzsch) Ehr. var. *brunii* (Per. & Hérib.) M. Voigt
2. *Neidium iridis* (Ehr.) Cleve
3. *Navicula amphibola* Cleve
4. *Navicula lundströmii* Cleve
5. *Navicula paludosa* Hust.
6. *Pinnularia gracillima* Gregory
7. *Pinnularia gracillima* Gregory
8. *Pinnularia microstauron* (Ehr.) Cleve
9. *Pinnularia divergens* W. Smith
10. *Pinnularia divergens* W. Smith
11. *Pinnularia divergens* W. Smith
12. *Pinnularia divergens* W. Smith
13. *Pinnularia lata* (Bréb.) Smith

Scales 10 μ

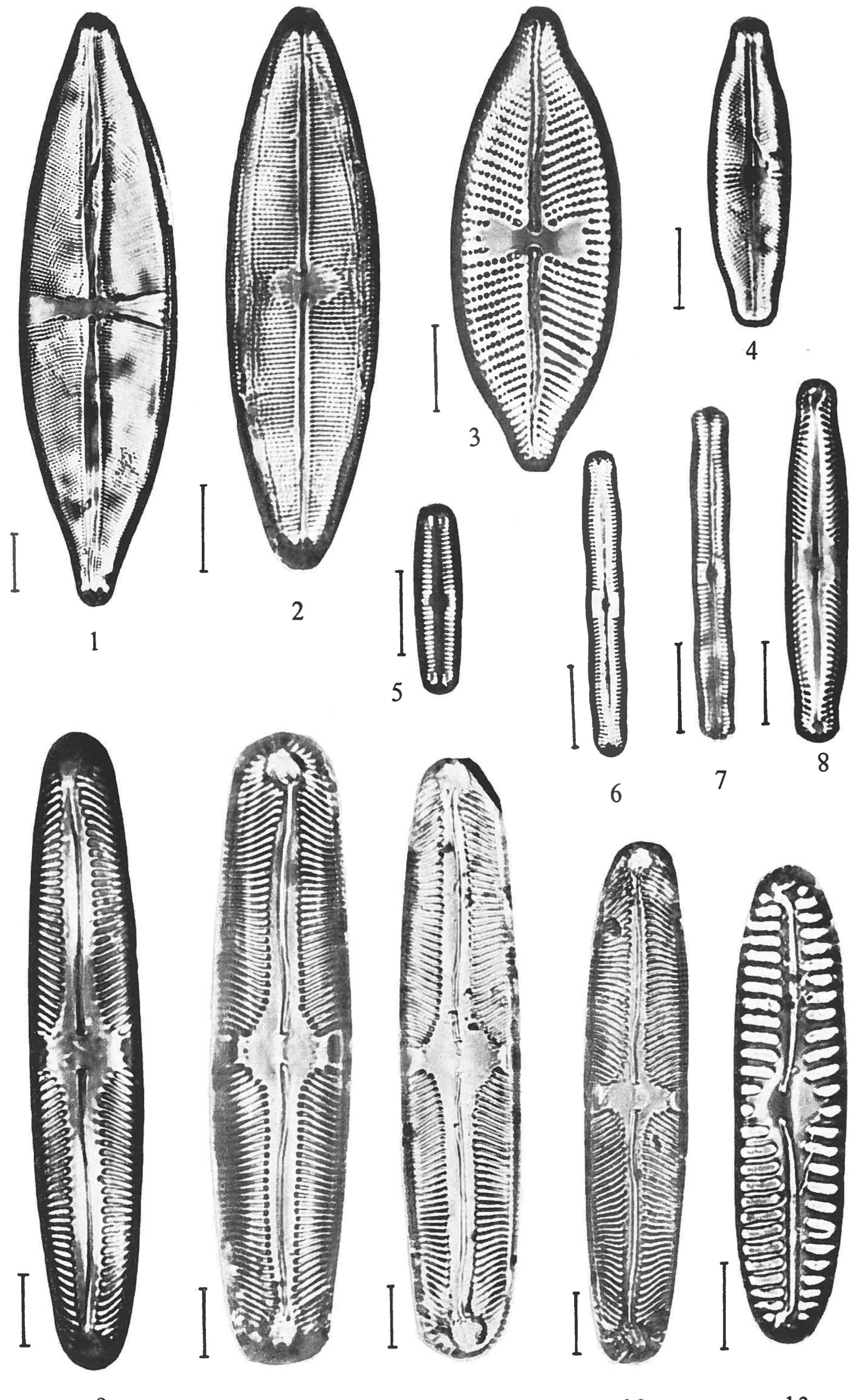
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Plate B III

1. *Cymbella similis* KRASSKE
2. *Cymbella norvegica* GRUN.
3. *Cymbella lata* GRUN.
4. *Cymbella heteropleura* EHR. fo. *minor* CLEVE
5. *Rhopalodia gibba* (EHR.) O. MÜLLER
6. *Epithemia zebra* (EHR.) KÜTZ. var. *saxonica* (KÜTZ.) GRUN.
7. *Cymbella obtusa* GREG.
8. *Cymbella ventricosa* KÜTZ.
9. *Hantzschia amphioxys* (EHR.) GRUN.
10. *Hantzschia amphioxys* (EHR.) GRUN.
11. *Hantzschia amphioxys* (EHR.) GRUN.
12. *Hantzschia amphioxys* (EHR.) GRUN.
13. *Hantzschia amphioxys* (EHR.) GRUN.
14. *Hantzschia amphioxys* var. *vivax* (HANTZSCH) GRUN.

Scales 10 μ

Plate B III

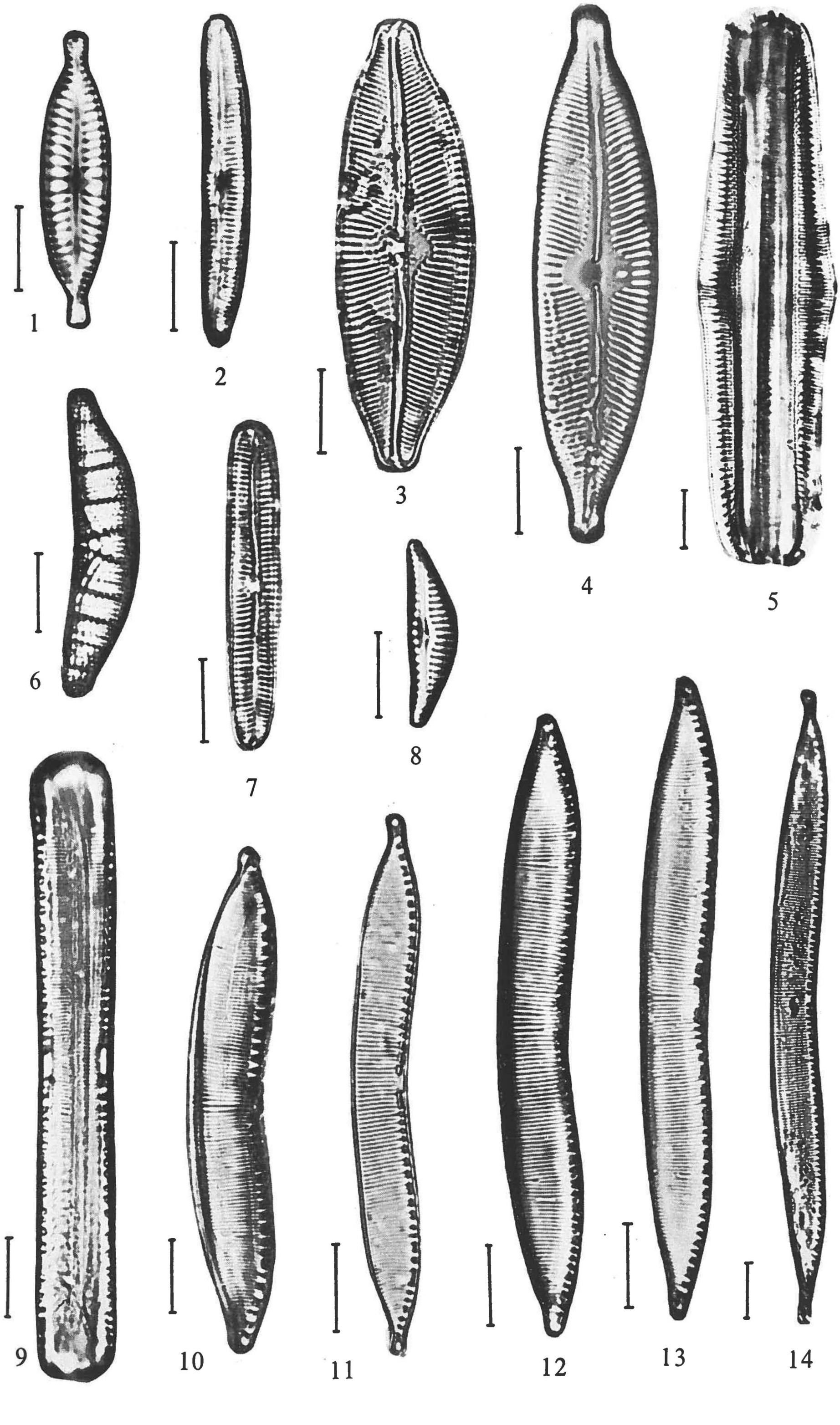

Plate CI

1. *Eunotia monodon* Ehr.
2. *Eunotia praerupta* Ehr.
3. *Eunotia diodon* Ehr.
4. *Eunotia pectinalis* (Kütz.) Rabh. var. *minor* (Kütz.) Rabh.
5. *Stauroneis producta* Grun.
6. *Stauroneis phoenicenteron* Ehr.
7. *Caloneis silicula* (Ehr.) Cleve
8. *Caloneis silicula* (Ehr.) Cleve
9. *Caloneis silicula* (Ehr.) Cleve
10. *Caloneis silicula* var. *truncatula* Grun.
11. *Caloneis schumanniana* (Grun.) Cleve var. *linearis* Hust.
12. *Navicula amphibola* Cleve
13. *Diploneis ovalis* (Hilse) Cleve
14. *Diploneis ovalis* (Hilse) Cleve
15. *Stauroneis javanica* (Grun.) Cleve

Scales 10 μ

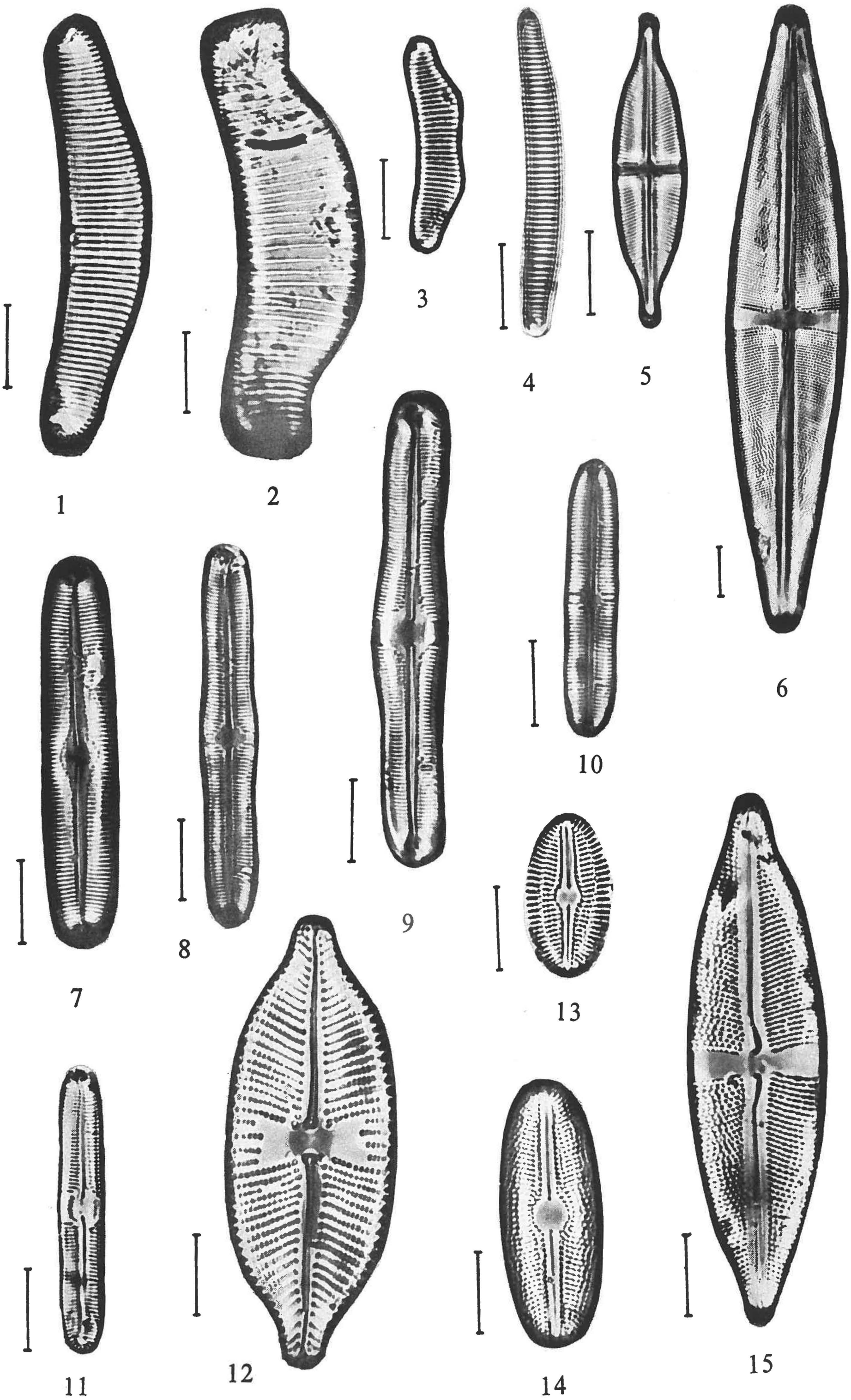
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Plate C II

1. *Neidium iridis* (EHR.) CLEVE
2. *Neidium iridis* (EHR.) CLEVE
3. *Neidium iridis* (EHR.) CLEVE fo. *elliptica* nov. fo.
4. *Neidium affine* (EHR.) CLEVE
5. *Neidium bisulcatum* (LAGERST.) CLEVE
6. *Navicula cuspidata* KÜTZ.
7. *Neidium affine* (EHR.) CLEVE
8. *Neidium affine* (EHR.) CLEVE
9. *Neidium affine* var. *longiceps* (GREG.) CLEVE
10. *Navicula wittrockii* (LAGERST.) A. CLEVE-EULER
11. *Navicula wittrockii* (LAGERST.) A. CLEVE-EULER
12. *Navicula cincta* (EHR.) KÜTZ. var. *heufleri* GRUN.
13. *Navicula similis* KRASSKE
14. *Navicula clementis* (GREG.) A. SCHMIDT
15. *Navicula clementioides* HUST.
16. *Navicula mutica* KÜTZ. fo. *cohnii* (HILSE) GRUN.
17. *Navicula mutica* KÜTZ. fo. *cohnii* (HILSE) GRUN.

Scales 10 μ

PLATE CII

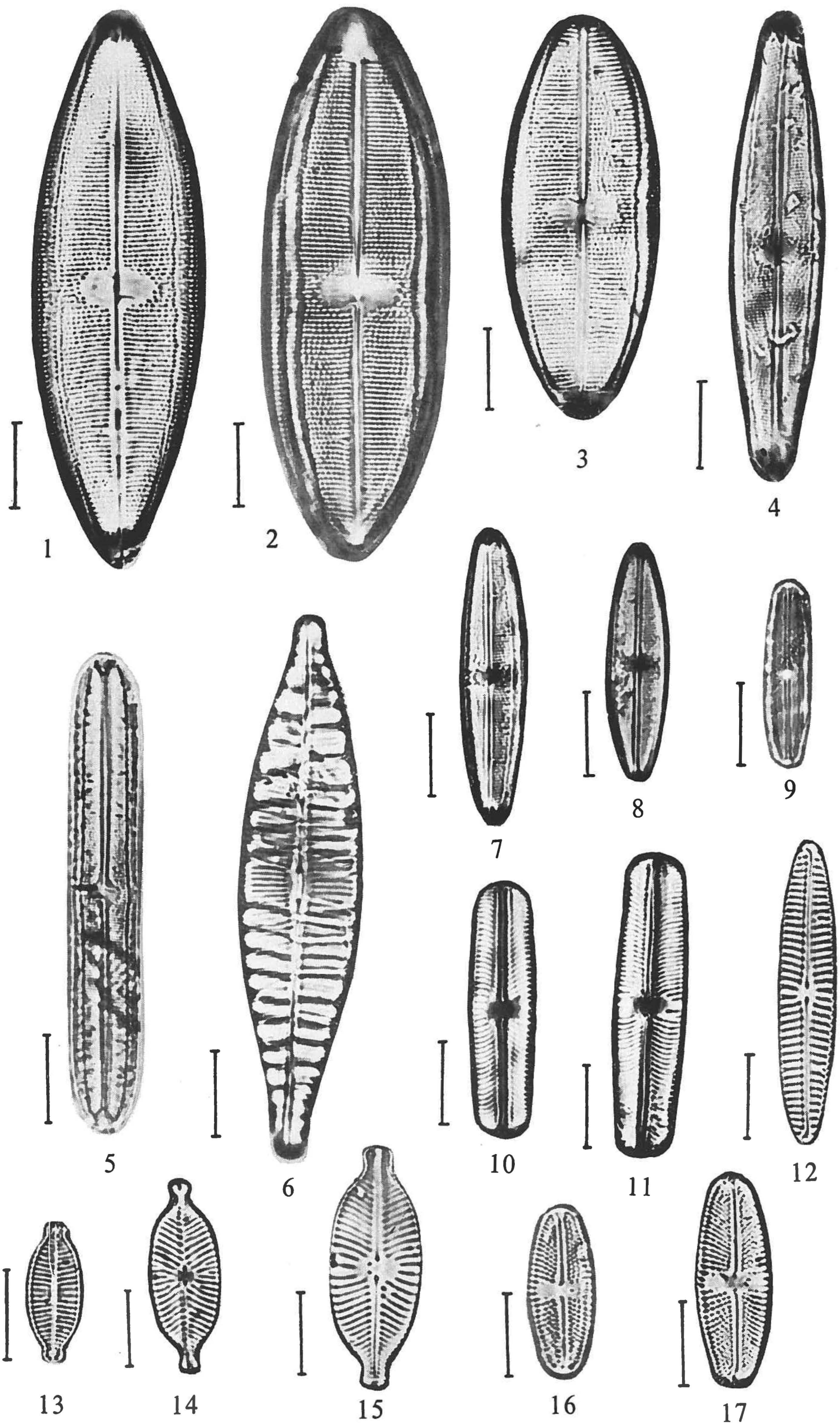

Plate C III

1. *Pinnularia viridis* (Nitzsch) Ehr.
2. *Pinnularia gentilis* (Donk.) Cleve
3. *Pinnularia gentilis* (Donk.) Cleve
4. *Pinnularia viridis* fo. *cuneata* (Østrup-A. Cleve) nov. comb.
5. *Pinnularia viridis* fo. *cuneata* (Østrup-A. Cleve) nov. comb.
6. *Pinnularia lata* (Bréb.) Smith
7. *Pinnularia borealis* Ehr.
8. *Pinnularia borealis* Ehr.
9. *Pinnularia borealis* Ehr.
10. *Pinnularia gibba* Ehr.
11. *Pinnularia lagerstedtii* (Cleve) Hust.
12. *Pinnularia lagerstedtii* (Cleve) Hust.
13. *Pinnularia intermedia* Lagerst.
14. *Pinnularia intermedia* Lagerst.

Scales 10 μ

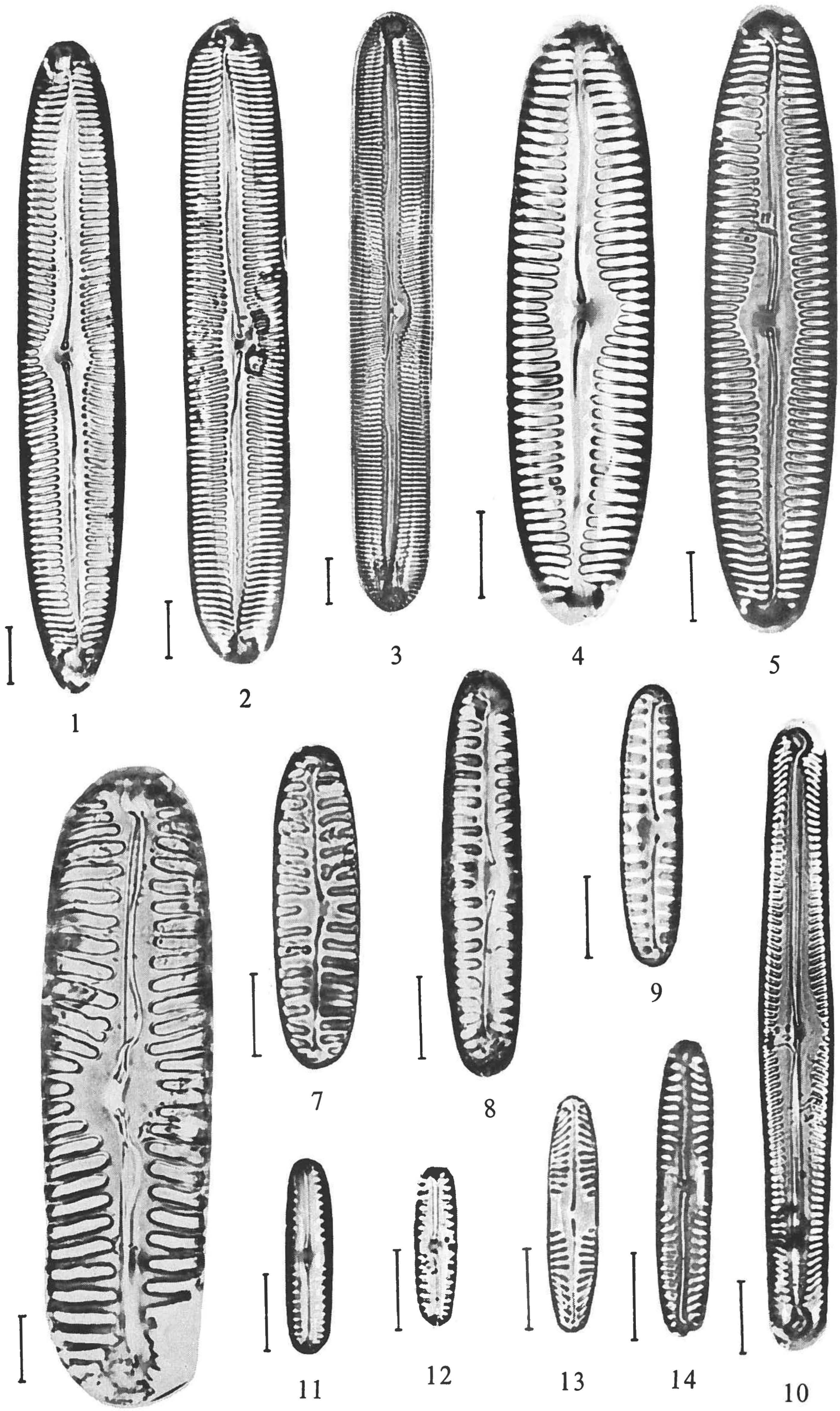
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Plate C IV

1. *Pinnularia nodosa* EHR.
2. *Pinnularia nodosa* EHR.
3. *Pinnularia interrupta* W. SMITH
4. *Pinnularia microstauron* (EHR.) CLEVE fo. *biundulata* O. MÜLLER
5. *Pinnularia microstauron* (EHR.) CLEVE
6. *Pinnularia pulchra* ØSTRUP
7. *Pinnularia wijkensis* FOGED
8. *Pinnularia wijkensis* FOGED
9. *Pinnularia microstauron* (EHR.) CLEVE
10. *Pinnularia microstauron* (EHR.) CLEVE
11. *Pinnularia microstauron* var. *brébissonii* (KÜTZ.) HUST. fo. *diminuta* HUST.
12. *Pinnularia obscura* KRASSKE
13. *Pinnularia krookei* GRUN.
14. *Cymbella naviculiformis* AUERSWALD
15. *Cymbella ehrenbergii* KÜTZ.
16. *Cymbella ehrenbergii* KÜTZ.
17. *Cymbella cuspidata* KÜTZ.

Scales 10 *u*

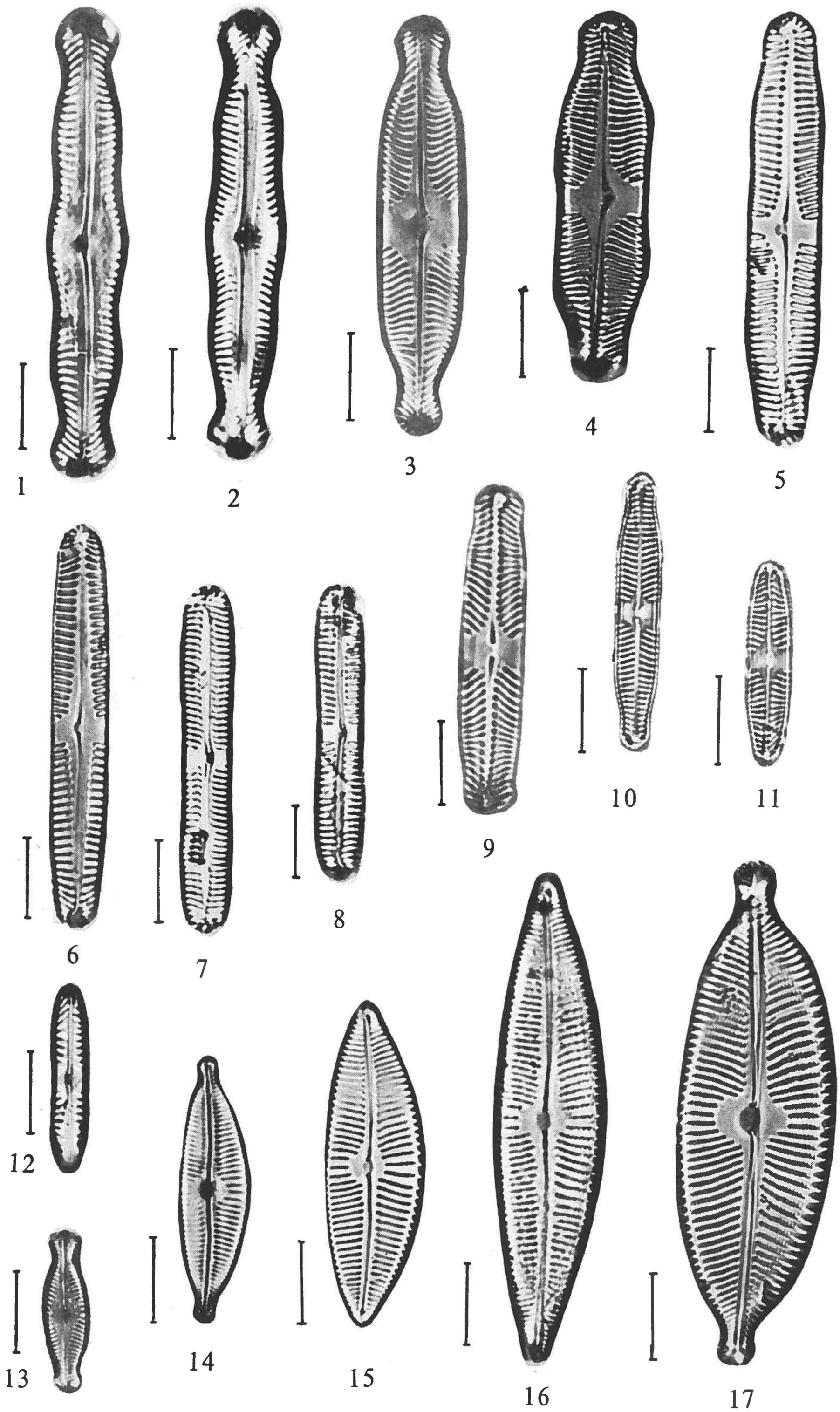
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Plate C V

1. *Amphora ovalis* Kütz. var. *libyca* (Ehr.) Cleve
2. *Cymbella hybrida* Grun.
3. *Cymbella hybrida* Grun.
4. *Cymbella obtusa* Greg.
5. *Cymbella incerta* Grun.
6. *Cymbella gracilis* (Rabh.) Cleve
7. *Cymbella ventricosa* Kütz. var. *groenlandica* Foged
8. *Cymbella naviculiformis* Auerswald
9. *Gomphonema angustata* (Kütz.) Rabh. var. *producta* Grun.
10. *Gomphonema acuminatum* Ehr. var. *brébissonii* (Kütz.) Cleve
11. *Gomphonema acuminatum* Ehr. var. *coronata* (Ehr.) W. Smith
12. *Gomphonema acuminatum* Ehr. var. *coronata* (Ehr.) W. Smith
13. *Gomphonema constrictum* Ehr. var. *capitata* (Ehr.) Cleve
14. *Gomphonema constrictum* Ehr. var. *capitata* (Ehr.) Cleve
15. *Gomphonema constrictum* Ehr. var. *capitata* (Ehr.) Cleve
16. *Epithemia zebra* (Ehr.) Kütz. var. *saxonica* (Kütz.) Grun.
17. *Epithemia turgida* (Ehr.) Kütz. var. *granulata* (Ehr.) Grun.
18. *Hantzschia amphioxys* (Ehr) Grun.
19. *Hantzschia amphioxys* (Ehr.) Grun.
20. *Hantzschia amphioxys* (Ehr.) Grun.

Scales 10 μ

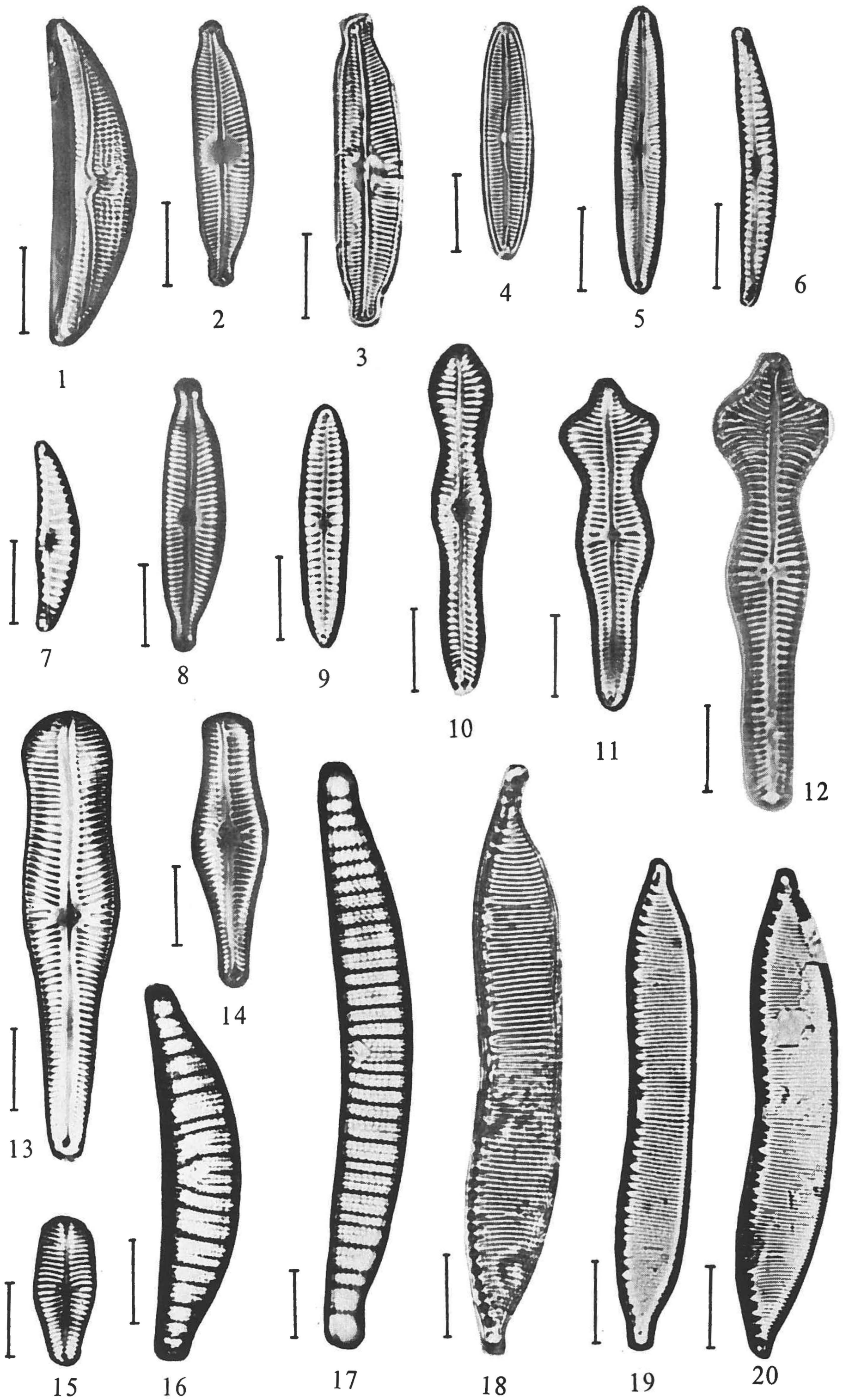
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Plate D I

1. *Biddulphia aurita* (LYNGB.) BRÉB. & GOD.
2. *Actinoptychus undulatus* (BAIL.) RALFS
3. *Coscinodiscus curvatulus* GRUN. var. *minor* (EHR.) GRUN.
4. *Coscinodiscus curvatulus* var. *minor* (EHR.) GRUN.
5. *Coscinodiscus curvatulus* var. *minor* (EHR.) GRUN.
6. *Coscinodiscus curvatulus* var. *minor* (EHR.) GRUN.
7. *Rhabdonema minutum* KÜTZ.
8. *Grammatophora angulosa* EHR.
9. *Grammatophora angulosa* var. *islandica* (EHR.) GRUN.
10. *Grammatophora hamulifera* KÜTZ.
11. *Achnanthes groenlandica* (CLEVE) GRUN.
12. *Achnanthes groenlandica* (CLEVE) GRUN.

Scales 10 μ

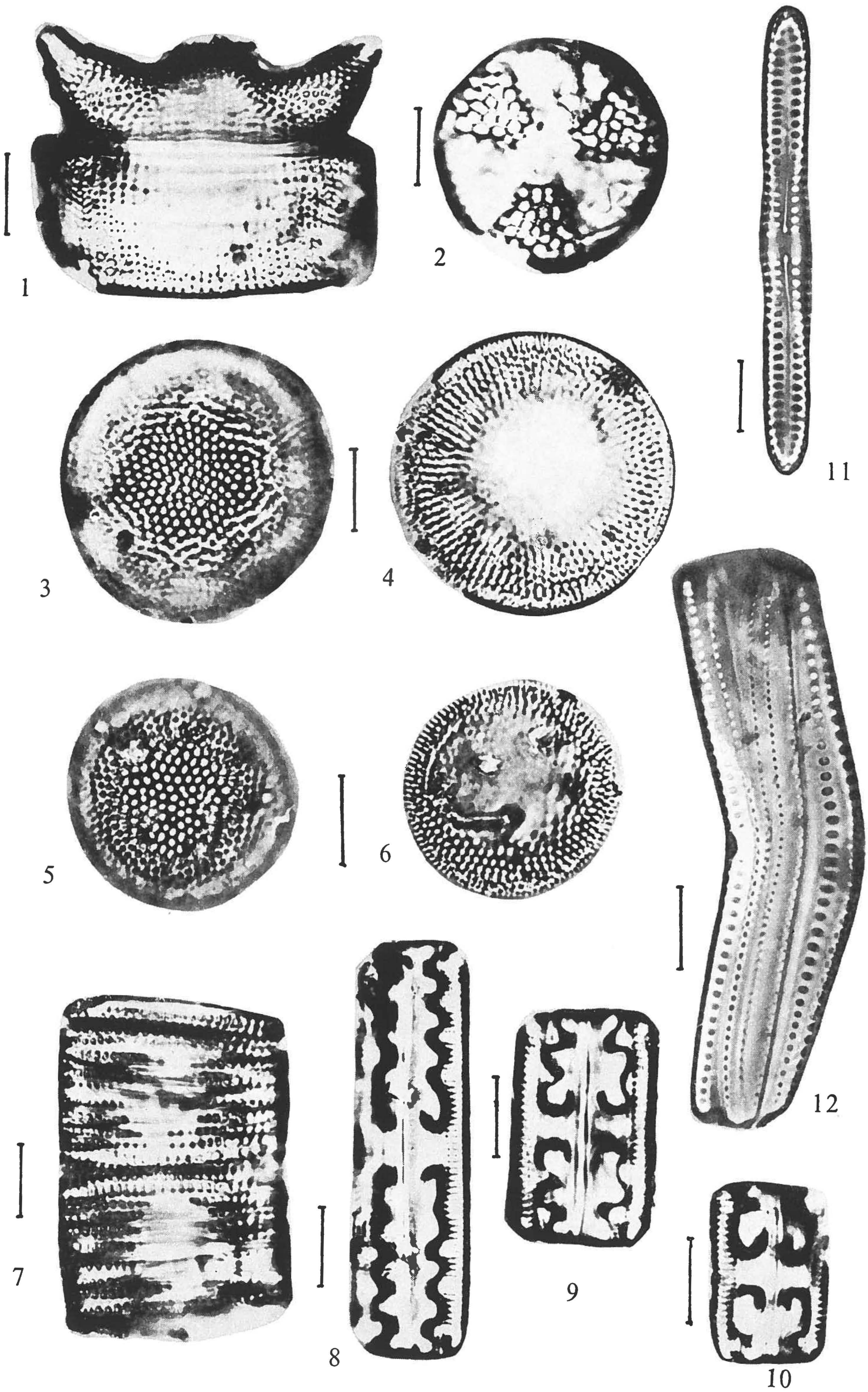
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Plate D II

1. *Eunotia monodon* EHR.
2. *Eunotia testudinata* Å. BERG.
3. *Eunotia testudinata* Å. BERG.
4. *Eunotia faba* (EHR.) GRUN.
5. *Eunotia faba* var. *rhomboidea* nov. var.
6. *Amphicampa hemicyclus* (EHR.) KARST.
7. *Eunotia bigibba* KÜTZ. var. *pumila* GRUN.

8a, b. *Amphora cruciata* ØSTRUP

9a, b. *Amphora cruciata* ØSTRUP

10. *Grammatophora angulosa* EHR. var. *islandica* (EHR.) GRUN.
11. *Grammatophora arcuata* EHR.
12. *Tabellaria binalis* (EHR.) GRUN.
13. *Tabellaria binalis* (EHR.) GRUN.
14. *Achnanthes brevipes* AG.
15. *Rhabdonema minutum* KÜTZ.
16. *Anomoeoneis serians* (BRÉB.) CLEVE var. *brachysira* fo. *thermalis* (GRUN.) HUST.
17. *Anomoeoneis serians* var. *brachysira* (BRÉB.) CLEVE
18. *Achnanthes delicatula* (KÜTZ.) GRUN.
19. *Cocconeis costata* GREG.
20. *Cocconeis costata* GREG.
21. *Cocconeis costata* GREG.
22. *Cocconeis pseudomarginata* GREG.
23. *Cocconeis scutellum* EHR.

Scales 10 μ

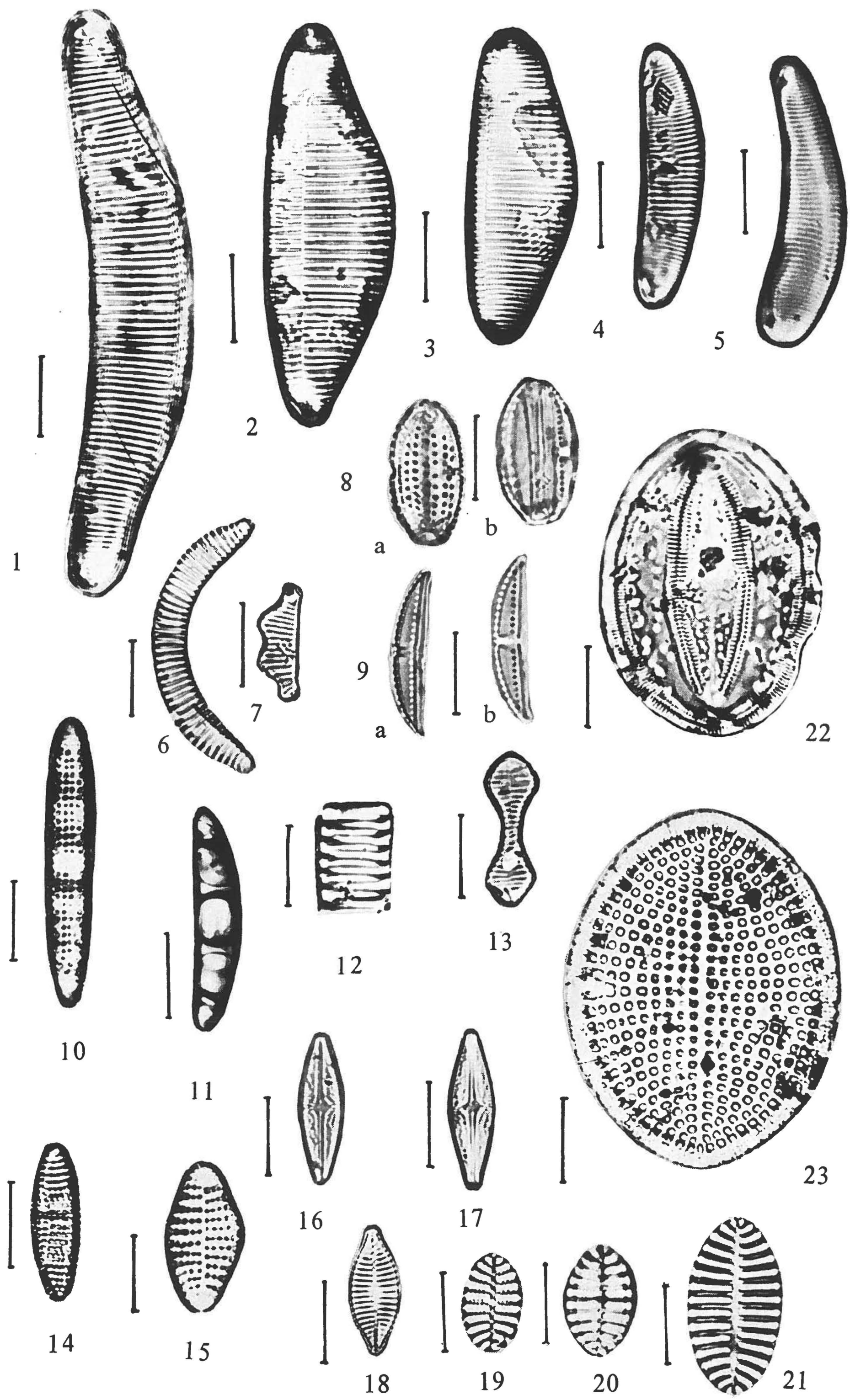
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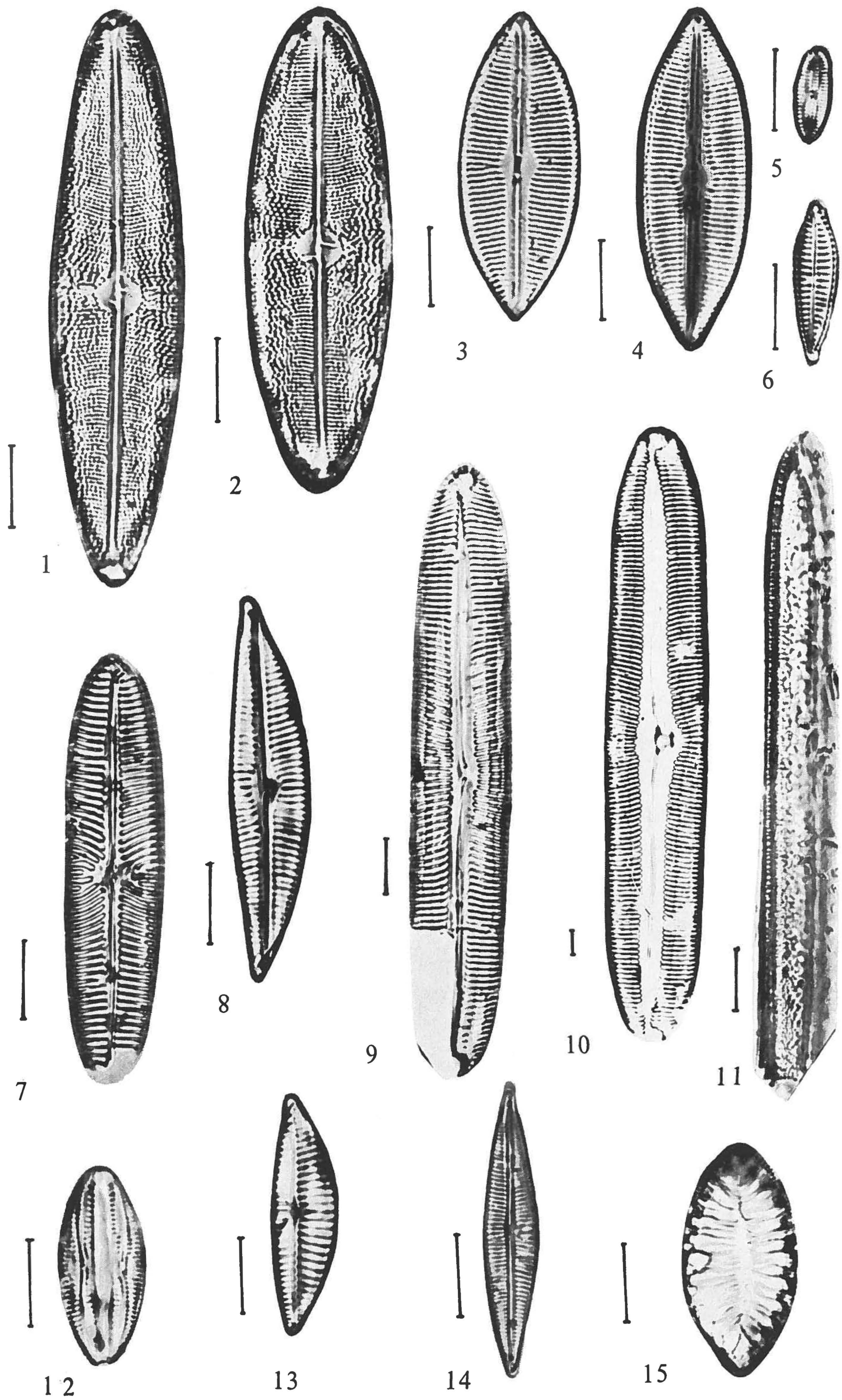
Plate D III

1. *Neidium iridis* (EHR.) CLEVE var. *porsildii* nov. var.
2. *Neidium iridis* var. *porsildii* nov. var.
3. *Caloneis holstii* CLEVE
4. *Caloneis holstii* CLEVE
5. *Navicula dissipata* HUST.
6. *Gomphonema parvulum* KÜTZ.
7. *Navicula digitoradiata* (GREG.) A. SCHMIDT
8. *Cymbella hebridica* (GREG.) GRUN.
9. *Pinnularia maior* (KÜTZ.) CLEVE
10. *Pinnularia streptoraphe* CLEVE
11. *Nitzschia plana* SM. var. *fennica* HUST. fo. *ornata* KOLBE
12. *Amphora ovalis* KÜTZ. var. *libyca* (EHR.) CLEVE
13. *Cymbella hebridica* (GREG.) GRUN.
14. *Cymbella cesatii* (RABH.) GRUN.
15. *Surirella amphioxys* W. SMITH

Scales 10 μ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