

Cleve, P.T. (1873). On diatoms from the Arctic Sea. Bihang till Kongliga Svenska Vetenskaps-Akademiens Handlingar 1(13): 1-28, 4 pl.

ON DIATOMS FROM THE ARCTIC SEA

BY

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WITH 4 PLATES.

(COMMUNICATED TO THE R. SWEDISH ACAD. OF SCIENCES 12 MARS 1873).

STOCKHOLM, 1873.

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The diatoms, living in the arctic sea are relatively very little known, only one enumeration of forms observed in samples from Spetsbergen having been published by me in the Öfvers. af K. Vet. Akad. Förh. 1867 (sid. 661). This catalogue is by no means complete, as the materials for my researches were somewhat scarce and my experience in determining the species at that time not very great. Scarcely more than 40 marine species are enumerated in my paper quoted above.

Since that time I have had through the several Swedish arctic expeditions to Spetsbergen and Greenland an opportunity of examining a more complete collection of samples, partly taken on the surface of the sea between Europe and Greenland as well as from Davis Strait and collected by Mrss. TH. FRIES, P. ÖBERG and LINDAHL, and partly deposited on the bottom of the bottles, in which had been preserved smaller arctic marine animals.

The diatoms of the arctic sea form together a somewhat peculiar flora, certainly having many species in common with that of the tropical seas, but still distinguished by the frequent occurrence of several forms, not found in the southern seas, as well as by the absence of forms rarely absent in any marine mud from the middle and southern part of the Atlantic. The following species, as common on the shores of Great Britain as of Sweden, viz: *Achnanthes longipes*, *Actinoptychus undulatus*, *Surirella lata* and *fastuosa*, *Biddulphia pulchella*, *Triceratium Favus* and others are not found in any sample from the arctic sea, except some of them in only one from Spetsbergen, Kings Bay 160 fathoms deep. As I have not found the species in any other sample I regard their occurrence as doubtful and have consequently put a query before their names in the following list.

The diatoms found in the arctic samples examined by me, are the following:

1. **Hyalodiscus stelliger** BAIL. (Smiths. Contr. VII Obs. p. 10. 1855. *Coscinodiscus punctulatus* GREG. D. of Clyde. pag. 500, Pl. X, fig. 46? *Pyxidicula Adriatica?* Cl. Diat. from Spetsb. p. 662). Valve convex and covered by small and dense cellules, arranged in curved lines, crossing each other. Cellules about 30 in 0,025 m.m. The cellules are not so dense as in specimens from California, on which I have counted 38 cellules in 0,025 m.m. Specimens from Magellhaens Strait have 25 cellules in 0,025 m.m. and according to Grunow the cellules of *H. stelliger* are much more dense viz: 40—45 in 0,01".

This species is very common in the arctic sea. *Spetsbergen*: Schoal Point, Hinlopen Strait, Wijde Bay, Röde Bay, Waijgats Ids., Brandwyns Bay; depth 10—30 fathoms. *Greenland* and *Finmarken*. The *H. stelliger* is found also near Kamtchatka (Grun), California, Chile (Grun) Magellhaens Strait (Cl), Florida (Bail), Cape of Good Hope (Grun), St. Pauls Id (Grun). If *Coscin. punctulatus* GREG be the same as *H. stelliger* it occurs also on the coast of Scotland.

2. **Hyalodiscus subtilis** BAIL. (Smiths. Contrib. VII Obs. pag. 10, fig. 12, 1855. *Craspedodiscus Franklini* EHB. M. Geol. Pl. XXXV a. 23 fig. 6. *Melosira Franklini* CLEV. Öfvers. K. Vet. Akad. Förh. 1868 pag. 216).

This species is also very common in the arctic sea and has been found in numerous samples from *Spetsbergen*: Brandwyns Bay, Waijgats Ids. etc. *Greenland* very common. *Finmarken* Grötsund somewhat rare.

Hyal. subtilis is widely distributed and observed in the following localities:

Kamtchatka (Grun), California (Cl), Chile (Grun) Patagon. Guano (Janich), Australia (Cl and Hendry), Honduras (Rab. and Janich), Nova Scotia (Bail).

?3. **Hyalodiscus maculatus** (SM) CL. (*Podosira maculata* SM. Br. Diat. II pag. 54 Pl. XLIX fig. 328). This species which agrees in its sculpture very nearly with *Hyal. stelliger* and with *H. subtilis* in its central irregular spot, has been observed only in the deposit from Kings Bay in *Spetsbergen* and is for that reason doubtful as an arctic species. This diatom is also found on the coasts of Great Britain, France, Sweden and Germany. I also observed it in materials from the West-Indies and from Costa Rica.

4. *Coscinodiscus Oculus Iridis* EHB. (M. Geol. Pl. XVIII fig. 42 & XIX fig. 2). This very large and beautiful species is very common in the arctic sea and in the northern Atlantic. *Spetsbergen* e. gr. Schoal Point, Waijgats Ids. *Greenland* also common e. gr. Davis Strait. It has been found floating on the surface of the sea among other diatoms (Long. $61^{\circ} 45'$ N Lat. $53^{\circ} 43'$ W) and also in the content of the stomach of *Ctenodiscus*, dredged from the depth of 232 fathoms on the N.W. Atlantic $51^{\circ} 20'$ N $52^{\circ} 25'$ W.

On specimens from the arctic seas the cellules are mostly large in the middle and decrease in size towards the centre, where there are always some few large cellules arranged into a starlike group, and also towards the margin. The diameter of the valve between 0,22—0,31 m.m.

The median cellules were found to be 7—9 in 0,025 m.m., the cellules near the centre 8—9 and the marginal 7—10 in 0,025 m. m. The cellules on fossil specimens from the Virginia deposit were about 5 in 0,025 m.m. and on fossil specimens from Mors, Jütland, 6 in 0,025 m.m.

The *Coscinod. Oculus Iridis* occurs on the coasts of the North Sea (as near Cuxhaven), in the southern Baltic Sea (as by Kiel) and according to Grunow in Chile, Cape of Good Hope. As I have remarked in the preceeding paper I do not regard *C. Oc. Iridis* as specifically distinct from *C. radiatus*.

5. *Coscinodiscus radiatus* EHB (Sm. Syn I pag. 23 Pl. III fig. 37) *Spetsbergen*: Kings Bay (160 fathoms) Schoal Point. *Beeren Eiland* in mud dredged from the depth of 1200 fathoms. (Diam. 0,075 m.m. cellules 8 in 0,025 m.m.) *Finnmarken* Grötsund.

This form is of very wide occurrence; it is common on the coasts of Sweden, Great Britain, Germany and found also near Cape of Good Hope (Gr.), Tahiti (Gr.), Nicobaren Ids. (Gr.) Port Jackson, Australia (Cl).

6. *Coscinodiscus centralis* EHB. (M. Geol. XVIII fig. 39 *Gregory* Diat. of Clyde pag. 501 Pl. XI fig. 49) very convex, colour of the dry valve purple, cellules small, about 12—15 in 0,025 m.m. Diam. 0,26—0,31 m.m.

Spetsbergen: Waijgats Ids. (30—80 fths.). *Davis Strait* Lat. $61^{\circ} 45'$ Long. $53^{\circ} 43'$ floating on the surface among *Chaetocereæ* and other diatoms.

The same form is also found in Scotland and on the coast of Germany (Helgoland Max Schulze). *Coscinodiscus concinnus* ROPER M. J. VI pag. 20 Pl. III fig. 12 seems only to be a variety of *C. centralis*; at least I have observed on specimens from Waijgats Ids. a row of spiculæ near the margin; see also the preceding paper on diat. from the sea of Java, pag. 5.

7. *Coscinodiscus subtilis* EHB (M. Geol. Pl. XVIII fig. 36. Kg. Bac. pag. 132. T. I fig. XI c). *Finmarken*: Grötsund; very rare. *Greenland* exceedingly common in mud taken at great depths from Davis Strait and also in the contents of the stomach of *Ctenodiscus*, dredged from the depth of 232 fms. 51° 20' N 52° 25' W. (North West. Atlantic). The stomach of the *Ctenodiscus* contained an enormous number of *Cos. subtilis* and *C. Oc. Iridis*, but no other diatoms were found.

The *Cos. subtilis* occurs abundantly in the mouth of Elbe (Germany).

8. *Coscinodiscus Normannii* GREG (*Greville* M. J. VII pag. 80 Pl. VI fig. 3). *Davis Strait* in mud from great depth very rare.

9. *Coscinodiscus excentricus* EHB. (Kg. Bac. pag. 131. T. I fig. 9). *Spetsbergen*: Kingsbay (60 fthms). *Davis Strait*. *Beeren Eiland* in mud from 1200 fth dept.

Var. *lineatus* (*Cosc. lineatus* EHB. Kg. Bac. pag. 131 T. I fig 10). *Finmarken*: Grötsund. *Spetsbergen* Hackluyts. *Beeren Eiland* (1200 fths. diam. 0,048—0,06 m.m., cellules equal. 12—14 in 0,025 m.m.).

This species is widely distributed and found abundantly on the coasts of the North Sea and according to Grunnow in New Zealand, Cape of Good Hope, St. Pauls Ids., Tahiti Honduras, Chili, Nicobaren Ids.

10. *Coscinodiscus nitidus* GREG. (Diat. of Clyde pag. 499 T. X fig. 45) Some few specimens are observed in mud from great depths in Davis Strait. This species is also observed in Scotland (Greg) Auckland, Nicobaren Ids., Valparaiso (Grunnow), West Indies (Cl).

11. *Thalassiosira Nordenskiöldii* Cl. N. Sp. *Char. Gen. Thalassiosiræ*: *Sideview* circular, with a row of submarginal spines; sculpture very minutely cellular, cellules arranged in

radiating and curved lines, crossing each other. F. V. quadratic; with truncate angles connecting membrane broadly linear, without any distinct sculpture. Frustules in the living state connected by means of a central fine thread of mucus into long filaments. The form of the cells agrees with *Coscinodiscus*, but the sculpture is much more fine, than in any known species of that genus. The row of submarginal spines approximates it to *Cresswellia*, but the spines of different frustules do not touch each other. The doubtful genus *Systephania* may be the same as *Thalassiosira*.

Thalassiosira Nordenskiöldii Cl. N. Sp. Scarcely siliceous, sculpture of the fullgrown frustule minutely punctate visible only on dry specimens and by careful illumination. Colour of the dry valve pale yellowish brown.

Diam. 0,017—0,035 m.m. Height. (F.V.) 0,01—0,02 m.m.

The cellules are arranged nearly in the same manner as on *Hyalodiscus stelliger*, but they are much smaller. The frustules are connected in the same manner as those of *Triceratium undulatum* *Brightw.* In S. V. the species resembles *Systephania Anglica* *DONKIN.* (M. J. n. s. I pag. 12 Pl. I fig. 14) but I am not able to identify it with that species, which has not been completely described.

The *Thalassiosira Nordenskiöldii* occurs in enormous large masses, floating on the surface of the sea and colouring it for many miles in extent. Sometimes no other diatom is found among it. *Davis Strait* Lat. 62° 36' Long. 52° 50'; Lat. 63° 30' Long. 52° 40'; Lat. 61° 25' Long. 50° 50'. (Th. M. Fries) Pl. I fig. 1 a & b F. V. c & d S. V.

12. **Paralia sulcata** (EHB) CL (*Galionella sulcata* EHB. M. G. e. g. T. XVIII fig. 1. *Melosira sulcata* KG Bac. pag. 55 T. II fig. 7. *Orthosira marina* SM Syn. II pag. 59 Pl. LIII fig. 338. *Paralia marina* HEIB. Consp. Crit D. Dan. pag. 33). *Spetsbergen; Beeren Eiland, Finmarken Grötsund, Davis strait.*
The species occurs in all seas.

13. **Melosira nummuloides** (LYNGB) KG (var. γ Sm Syn II pag. 55). *Spetsbergen* Hackluyts. *Greenland* somewhat rare.

?14. **Actinocyclus Ehrenbergii** RALFS (in Prit. Inf. pag. 834 1861). *Spetsbergen* Kings Bay (160 fath) but observed nowhere

else in the arctic sea. This species is widely distributed in almost all seas.

15. **Actinocyclus fulvus** (SM) RALFS. (*Eupodiscus fulvus* SM Syn. I pag 24 Pl. IV fig. 40). *Spetsbergen*: Amsterdam Id., Brandwyn Bay. *Greenland* common. *Finmarken* Grötsund.

?16. **Actinoptychus undulatus** (KG) RALFS. (*Actinocyclus und.* SM Syn. I pag. 25, Pl. V fig. 43) *Spetsbergen* Kings Bay (160 fths). This species, observed only in the named sample from Kings Bay, I regard as a doubtful arctic species. It is very common in most other seas.

It abounds on the coast of the North Sea, in the equatorial seas and is also found near Cape of Good Hope (Gr.) and Magellhaens Strait (Cl).

?17. **Eupodiscus Argus** (EHB) SM. (Syn. 1 pag. 24 T. IV fig. 39) *Spetsbergen* Kings Bay (160 fathoms) some few fragments. Doubtful as an arctic species.

?18. **Triceratium Favus** EHB. (Sm Syn. I pag. 26 T. V fig. 44) *Spetsbergen* Kings Bay (160 fathoms, very rare). Doubtful as an arctic species.

19. **Trigonium arcticum** (BRIGHTW) CL. (*Triceratium arcticum* Brightw M. J. I pag. 250 Pl. IV fig. 11. *Trigonium arctic.* Cl. Öfvers. K. Vet. Akad. Förh. 1867 pag. 663) *Spetsbergen*: common ex. gr. Schoal Point. Waijgats Ids. (30—80 fathoms), Treurenberg Bay. *Greenland*. *Finmarken* Grötsund.

This arctic diatom is found also near Beechy Id. Brightw. and according to Grunow near Cape of Good Hope!!

The F. V. of *T. arcticum* is in no respects different from the F. V. of *Zygoceros Balæna* EHB., also a very common arctic species, which has exactly the same sculpture of the valve as *T. arcticum*. Among the many hundred specimens, which I have seen, I have not seen a single form intermediate between *T. arcticum* and *Z. Balæna*, but still I have some doubts if they really are specifically distinct. The genera *Triceratium* and *Biddulphia* & *Zygoceros* vary so greatly in outline that I suppose that the many forms, included in those genera may be classed among genera founded on other characters than the outline of the S. V. For instance the *Biddulphia Rhombus* Ehb and *Triceratium striatum* Ehb (= *T. Biddulphia* Heib.)

are nothing but forms of one and the same species, as I have seen in a rich collection of these two forms from Cuxhaven intermediate forms. (Pl. I fig. 2 *a—f*). They resemble each other exactly in all important characteristics, but differ only in the outline which is also sometimes quadratic. The same may be the case with *Triceratium contortum* SHADB (T. M. S. II, pag. 15. Pl. I, fig. 7) and *Biddulphia indica* ROPER (T. M. S. VII, pag. 16, Pl. II, fig. 20—22). To make distinct genera of the forms with triangular and oval outlines is tantamount to separating the two species of *Hydrosera* WALLICH into different genera and to separating *Entogonia* GREV from *Heibergia* GREV. The great difficulty in arranging the many forms of *Anguliferæ* and *Biddulphiæ* in wellfounded genera depends upon the fact, that most species are but imperfectly known and only from the S. V.

20. **Zygoceras Balæna** EHB (*Biddulphia Balæna* BRIGHTW M. J. VII, pag. 18, Pl. IX, fig. 15 *a—15 b*. *Zygoceros radiatus* BAIL Smiths. Cont. vol. VII 1853, Pl. II, fig. 29. Perhaps the same species as *Triceratium arcticum*). *Spetsbergen* common ex. gr. Waijgats Ids. (60 fath.) Schoal Point. *Greenland* very common. *Finmarken* Grötsund.

Found besides: Cornwallis Id. (Lat. N. 75° Brightw) Halifax Nov Scot. (Bail) Baltic!! (*Schumann*).

21. **Biddulphia aurita** (LYNGB) BRÉB (*Sm* Syn. II pag. 49 Pl. XLV, fig. 319). *Spetsbergen* very common *Finmark*. *Greenland* very common. *Davis Strait* floating on the surface of the sea (Lat. 32° 36' Long. 52° 50' Th. Fries). This species occurs abundantly in all seas.

In one specimen from *Greenland* I have observed a sporangial frustule (Pl. I, fig. 3 *a* och *b*). The large exterior cell measured 0,066 m.m. in height and 0,044 m.m. in breadth and the included cell was about half the size of the exterior, which it resembled in all its characters. Both figures are taken from one and the same specimen in two different positions to show that the small cell was really enclosed in the large one.

22. **Biddulphia Rhombus** EHB (*Sm* Syn. II, pag. 49, Pl. XLV, fig. 320). *Spetsbergen* only one specimen in the deposit from Kings Bay (160 fathoms) *Finmarken* Grötsund, rare.

?23. **Biddulphia turgida** (EHB) *Ralfs* (in *Prit Inf.* 1861, pag. 849. *Bidd. granulata* ROPER, T. M. S. VII pag. 13, Pl.

I, fig. 10—11 and Pl. II, fig. 12). *Spetsbergen* Kings Bay only one specimen.

?24. **Cerataulus Smithii** RALFS (*Eupodiscus radiatus* Sm. Syn. I, pag. 24, Pl. XXX, fig. 255). *Spetsbergen* Kings Bay several specimens.

Occurs besides on the coasts of the North Sea.

?25. **Amphitetras antediluviana** EHB (Sm. Syn. II, pag. 47, Pl. XLIV, fig. 318). *Spetsbergen*: Kings Bay, only one specimen. This species occurs besides in most seas.

26. **Plagiogramma Staurophorum** (GREV) HEIBERG (*Denticula stauroph.* GREG Diat. of Clyde, pag. 496, Pl. X, fig. 37). *Spetsbergen*: Brandwyns Bay. *Greenland* not very rare. *Finmarken*: Grötsund rare.

This species occurs besides on the coast of Sweden, Denmark and Great Britain.

27. **Asteromphalus Brookei** BAIL (*Pritch* Inf. pag. 837, Pl. V, fig. 79). *Greenland*: Davis Strait in mud from great depths. Small forms; Diam. 0,05 m.m., rays 6—8 Pl. IV fig. 19.

Found before near Kamtchatka and in the Atlantic.

28. **Isthmia nervosa** KG (Sm Syn. II, pag. 53, Pl. XLVII). Very rare. *Spetsbergen*: Waijgats Ids. (60 fths). *Beeren Eiland* one valve found in the bottom-clay from the depth of 1200 fathoms. *Iceland* (according to Lyngbye).

29. **Isthmiella enervis** (EHB) CL (*Isthmia enervis* Sm Syn II, pag. 52, Pl. XLVIII). *Spetsbergen*: Kings Bay (160 fths) *Finmarken* Grötsund.

I have separated the new genus *Isthmiella* from *Isthmia* on account of the absence of costæ.

30. **Rhizosolenia styliiformis** BRIGHTW. (M. I. VI, pag. 9, Pl. V, fig. 5) *Northern Atlantic* floating in large masses on the surface Lat. 60° 25' Long. 19° 50' (Th. Fries). *Davis Strait* Lat. 61° 45' Long. 53° 43'. This Oceanic species is widely distributed as in North Sea (Helgoland, *Max Schulze* and on the coasts of Great Britain) Sea of Java (Cl) Nicobaren Ids. (Grun).

31. **Rhizosolenia alata** BRIGHTW (M. I. VI, pag. 95, Pl. V, fig. 8). *Northern Atlantic* (Lat. 61° 25' Long. 19° 50' Th. Fries) sparingly on the surface of the sea.

Observed also on the sea of Java (Cl) and near Nicobaren Ids. (Grun).

32. **Chætoceros decipiens** Cl. N. Sp. Frustules compressed, connected into a flat band with oval, not very large foramina. Awns long, all directed in the same plane, not spinous, but densely striated, striae 20—25 in 0,025 m.m. S.V. narrow linear with rounded apices terminating in long straight awns. Length of the frustule 0,027—0,034 m.m. height (f. v.) 0,018—0,025.

Very common and occurring in large masses floating on the surface of the sea; *Northern Atlantic* Lat. 60° 25' Long. 19° 50' (Th. Fries) *Davis Strait* in many places (Lat. 61° 25'—63° 30' Long 50° 50'—53° 43').

This species resembles greatly *Ch. Lorenzianum* GRUN. but is distinguished by the very delicate striation of the awns, which are in *Ch. Lorenzianum* coarsely punctated. *Chat. Barillaria* Btw (M. J. IV, T. VII, fig. 1—2) differs by its striated membrane.

Pl. I, fig. 5 *a* & *b*.

33. **Chætoceros Atlanticum** Cl N. Sp. Frustules compressed, valve in F V deeply concave and ending in long, slightly curved awns, which are densely transversely striated (striae about 50 in 0,025 m.m.) and also have four rows of larger spines (about 6 in 0,025 m.m.). The centre of the valve has often a small spine.

Length of the frustule 0,034 m.m. Br. (FV) 0,017 m.m. awns measure often more than 0,22 m.m. in length and are more conspicuously spinose towards the ends.

Found floating on the surface of the sea: *Northern Atlantic* (Lat. 60° 25' Long. 19° 50' Th. Fries) *Davis Strait* Lat. 62° 36' Long. 52° 50'. Pl. II, fig. 8 *a* & *b*.

34. **Chatoceros pelagicum** Cl. N. Sp. Small, scarcely siliceous, awns very thin and slender, not spinous. Valves deeply concave, in F. V. connected into chains, having large foramina between the frustules. Length 0,01 m.m. Breadth (F.V.) 0,008 m.m.

Northern Atlantic (Lat. 60° 25' Long. 19° 50' Th. Fries). Pl. I, fig. 4.

35. **Chætoceros Wighami** BRIGHTW (M. J. IV, pag. 108, T. VII, fig. 19—36). Frustules quadrate, connected into chains which have very narrow foramina.

Northern Atlantic (Lat. $60^{\circ} 25'$ Long. $19^{\circ} 50'$ Th. Fries). Davis Strait Lat. $62^{\circ} 36'$ Long. $52^{\circ} 50'$. (Th. Fries).

36. **Chætoceros boreale** Bayl. (New Sp. of Diat. Smithson. Contr. vol. VII, pag. 8, fig. 22, 23). Northern Atlantic Lat. $58^{\circ} N$. Long. $32^{\circ} V$. (P. Öberg).

Var. *Brightwellii* n. var. CL. Awns with smaller spines; frustules densely concatenated. Height of the frustule 0,022 m.m. breadth 0,027 m.m. Northern Atlantic Lat. $60^{\circ} 25'$ Long. $19^{\circ} 50'$. (Th. Fries). Davis Strait Long. $61^{\circ} 45'$ Lat. $53^{\circ} 43'$.

Nearly related to *Ch. boreale* BAIL, but has smaller spines on the awns. Pl. II, fig. 7 a—e.

37. **Chætoceros Peruvianum** BRIGHTW. (M. J. IV, pag. 107, Pl. VII, fig. 16—18). Northern Atlantic Lat. $60^{\circ} 25'$, Long. $19^{\circ} 50'$. Davis Strait Long. $61^{\circ} 45'$ Lat. $53^{\circ} 43'$.

Somewhat rare. — Found also in guano from Callao and on the sea of Java.

38. **Syndendrium Diadema** EHB (M. Geol. Pl. XXXV A. 18, fig. 13, BTW. M. J. IV, Pl. VII, fig. 49—52). Northern Atlantic Lat. $60^{\circ} 25'$ Long. $19^{\circ} 50'$ rare. Found before on the coast of Great Britain, in Peruvian guano and in the sea of Kamtschatka. *Syndendrium diadema* is certainly nothing but a sporangial form of some species of *Chætoceros*.

39. **Di cladia Groenlandica** CL. N. Sp. Conical with bifid top, having at its ends simple or branched spines. Breadth 0,036 m.m.

Davis Strait great depth, somewhat rare.

This form seems to be the same as *Periptera* Bail Sm. Contr. II, 1851. Microsc. exam. of soundings, fig. 53.

? 40. **Novilla fastuosa** (SM) CL very rare, found only in the sample from Kings Bay. In most seas it is one of the most common diatoms.

? 41. **Surirella lata** SM (Syn I, pag. 31, T. IX, fig. 61) found together with *S. fastuosa* in the mud from Kings Bay.

42. **Surirella Gemma** EHB (*Sm* Syn. I, pag. 32, T. IX, fig. 65). *Spetsbergen*: Hackluyts, Kings Bay (160 fathoms).

43. **Surirella ovata** KG (*Sm* Syn. I, pag. 33, T. IX, fig. 70). *Spetsbergen*: Hackluyts.

44. **Campylodiscus angularis** GREG (Diat. of Clyde, pag. 502, Pl. XI, fig. 53). This fine species is tolerably common throughout the whole arctic sea. *Spetsbergen*: Amsterdam Id., Brandwyns Bay, Schoal Point, Treurenberg Bay. *Greenland*. *Finnmarken*: Grötsund.

C. angularis has been found before only in Scotland. Scotch specimens have according to Gregory 160—180 costæ, but on specimens from Spetsbergen I counted only 80.

Campylodiscus angularis Rab & Jan. (Hond. Diat. pag. 6, Pl. I, fig. 10) from Honduras is certainly another species probably *C. crebrecostratus* Greville.

45. **Campylodiscus Groenlandicus** CL. N. Sp. Orbicular, central space smooth, no median line; costæ about 32—34 distant, delicate, radiate, scarcely reaching over half of the area of the disc. Margin of the disc faintly striated. Diam. 0,096; costæ about 3 in 0,025 m.m. Very rare, only two specimens being observed in mud from *Greenland*. Nearly related to *C. costatus* γ *Hibernicus* Grun. but distinguished from this freshwater species by its perfectly smooth disc, its more distant and delicate costæ. Pl. II, fig. 9.

46. **Campylodiscus Ralfsii** SM (Syn. I, pag. 30, Pl. XXX, fig. 257). Very rare, found only in mud from *Davis Strait*, dredged from great depths, and in the deposit from Kings Bay, *Spetsbergen*. This generally rare species is found in most other seas.

47. **Campylodiscus echineis** EHB (*C. Argus* Bail, *C. cribrus* Sm). Very rare, only one fragment being found by Danes Id. *Spetsbergen*.

This species is widely distributed. North America from New Haven to New Orleans (Bail), California, Australia and also in the Baltic.

48. **Campylodiscus Thuretii** BAIL (*C. simulans* Greg. *C. fastuosus* Grun. *C. parvulus* Sm. *C. bicruciatu*s Greg). Very

common in the Arctic sea. *Spetsbergen*: ex. gr. Kings Bay, Treurenberg Bay. *Greenland*. *Finmarken* Grötsund.

C. Thuretii is found to be tolerably common on the coasts of the North Sea and according to Grunow it occurs sparingly in the mediterranean sea and near Honduras. Among all the numerous samples from various tropical seas, examined by me, I nowhere met with *C. Thuretii*, but in mud from Magellhaens Strait I found it very common.

49. ***Cocconeis decipiens*** CL N. Sp. Broadly oval, median line elegantly sigmoid, nodule transversely elongated. Striæ faint, but distinctly granular 24 in 0,025 m.m. Length 0,0476—0,0595 m.m. Breadth 0,034—0,042 m.m. *Greenland* very rare.

Similar to *C. heteroidea* Hantzsch but the striæ are much more distant and composed of distinct granules. Pl. I, fig. 6.

50. ***Cocconeis arctica*** CL. N. Sp. Broadly oval with rounded apices; median line sigmoid; central nodule obsolete, surrounded by a large blank space. Striæ distinct, and radiate, composed of somewhat elongated puncta, so arranged that they form irregular, wavy longitudinal lines.

Length 0,041 m.m. Breadth 0,0425 m.m. Striæ 33—34 in 0,025 m.m. *Greenland*. *Finmarken* Grötsund. P. II, fig. 11 *a* & *b*.

51. ***Cocconeis pellucida*** GRUN (Novara. p. 12 Hantzsch in Rab. Beitr. pag. 21, fig. 11). Very common. *Finmarken*. *Greenland*. *Spetsbergen*: Amsterdam Id., Brandwyns Bay.

52. ***Cocconeis Scutellum*** EHB. *Spetsbergen*: Amsterdam Id., Kings Bay. *Greenland*. *Var. distans* (GREG) GRUN (Novara pag. 12) *Greenland*.

Coc. *Scutellum* occurs abundantly in most seas, also in the Baltic.

53. ***Cocconeis glacialis*** CL N. Sp. Oval with broadly rounded extremities; median line straight. Central nodule surrounded by a large blank space. Striæ radiate, very distinct, composed of sperate and somewhat elongated puncta, more numerous near the margin. The puncta are disposed in longitudinal, wavy and irregular lines; some of them, being larger than others, give the valve in a certain focus the appearance of being covered with scattered puncta (almost

as on *Navicula prætecta*). Length 0,076—0,11 m.m. Breadth 0,051—0,066 m.m. Striæ 23—27 in 0,025 m.m.

Spetsbergen Brandwyns Bay. *Greenland*. Pl. III, fig. 12.

54. **Cocconeis costata** GREG (T. M. S. V, pag. 68, Pl. I, fig. 7. *Sarirella quarnerensis* GRUN Verh. 1862, pag. 456, T. IX, fig. 10?). Tolerably common *Spetsbergen*, *Greenland*, *Davis Strait*, *Finmarken*.

55. **Navicula Smithii** BRÉB (*N. elliptica* Sm. Syn. I, pag. 48, Pl. XVII, fig. 152. *Nav. didyma* Sm. l. c., fig. 154 a). Very common. *Spetsbergen*: ex. gr. Amsterdam Id. 20 fath. Brandwyns Bay 10—15 fath., Kings Bay 150 fath. *Finmarken* Grötsund. *Greenland*. Common in all seas.

56. **Navicula fusca** GREG (*N. Smithii* var. *fusca* Greg Diat. of Clyde pag. 486, Pl. IX, fig. 15. *N. hyperborea* GRUN. Verh. 1862, pag. 531, Pl. I, fig. 16). *Finmarken*. Somewhat rare. Found before in Scotland and on the coasts of Sweden.

57. **Navicula suborbicularis** GREG (Diat. of Clyde pag. 541, Pl. IX, fig. 17). *Davis Strait* in mud from great depths. This species is also widely distributed in almost all seas.

58. **Navicula æstiva** DONK. (T. M. S. N. S. VI, pag. 32, Pl. III, fig. 18. *Donk. Br. Diat.* pag. 6, Pl. I, fig. 3). *Finmarken* Grötsund somewhat rare. Length 0,12 m.m. Breadth 0,065 m.m. Striæ 15—16 in 0,025 m.m.

59. **Navicula didyma** (EHB) *Donk. Br. Diat.* Pl. VII, fig. 8 a. b). *Spetsbergen* ex. gr. Hackluyts, Schoal Point, Hinlopen Strait. Kings Bay (160 fths) *Finmarken*. *Davis Strait*. Common in all seas.

60. **Navicula splendida** GREG (T. M. S. IV, pag. 44, fig. 14. *Nav. Bombus* Cl. p. p. Öfvers. K. Vet. Akad. Förh. 1867, pag. 665. *Nav. Entomon* DONK Br. Diat. Pl. VII, fig. 5?). This form, closely related to *N. didyma*, if not its variety, occurs very commonly in the arctic sea. *Spetsbergen*: Amsterdam Id. (20 fths), Brandwyns Bay (10—15 fths), Schoal Point. *Beeren Eiland*, *Finmarken*, *Greenland*.

61. **Navicula Bombus** EHB (GREG Diat. of Clyde pag. 484, Pl. IX, fig. 12. *Donk. Br. D. Pl. VII*, fig. 7 a). *Finmarken* Grötsund somewhat rare.

62. *Navicula pygmæa* KG (Sp Alg pag. 77. *Navicula minutula* Sm. Syn II, pag. 91. Syn I, pag. 48, Pl. XXXI, fig. 274. *Donk. Br. D.* pag. 10, Pl. I, fig. 10). *Finmarken* Grötsund.

63. *Navicula Lyra* EHB (GREG. Diat. of Clyde pag. 485, Pl. IX, fig. 13 b. *Donk. Br. D.* pag. 14, Pl. II, fig. 7). *Finmarken* Grötsund. *Spetsbergen* Schoal Point. *Greenland* somewhat rare. This very variable species occurs abundantly in most seas.

64. *Navicula (Amphiprora?) arctica* CL N. Sp. S. V. elliptical lanceolate, gradually attenuated from the middle to the somewhat obtuse apices. Striæ fine, about 34 in 0,025, almost parallel, interrupted by a line, passing in the middle of each of the halves of the valve. Central nodule transversely dilated as in a *Stauroneis* and the ends of the stauros joined to the two lines.

Length 0,119 m.m. Breadth 0,034 m.m.

Finmarken Grötsund very rare, only one specimen being observed.

This navicula or stauroneis resembles somewhat the doubtful »*Amphora Stauroptera*» Bail Sm. Contr. vol. VII, 1855, notes on new Sp. pag. 8, fig. 14 & 15.

Pl. III, fig. 13.

?65. *Navicula abrupta* GREG. (Diat. of Clyde pag. 14, Pl. I, fig. 14. *Donk. Br. D.* pag. 13, Pl. II, fig. 6). *Spetsbergen* Kings Bay.

66. *Navicula Hennedyi* SM. (Syn. II, pag. 93. *Donk. Br. D.* pag. 11, Pl. II, fig. 3). *Finmarken. Spetsbergen: Hackluyts, Schoal Point, Hinlopen Strait, Kings Bay.*

N. Hennedyi is one of the most common diatoms and occurs in almost all seas.

67. *Navicula Pinnularia* CL. (Öfvers. af K. Vet. Akad. Förh. 1868, pag. 224, Pl. IV, fig. 122). *Finmarken* Grötsund. *Spetsbergen* Hackluyts. *Greenland.* Found before on the western coast of Sweden.

68. *Navicula directa* (SM) (*Pinnularia directa* Sm. Syn. I, pag. 56, Pl. XVIII, fig. 172) very common. *Finmarken. Spets-*

bergen in many localities. *Greenland*. *Navic. directa* occurs in almost all seas (ex. gr. Magellhaens Strait, West Indies, Honolulu etc.).

69. *Navicula distans* (SM) (*Pinnularia distans* Sm. Syn. I, pag. 56, Pl. XVIII, fig. 169). *Finmarken* Grötsund. *Spetsbergen* Kings Bay. *Greenland* in mud from great depths in Davis Strait.

N. distans lives on the Swedish and British coasts and, according to Grunow, also in the Adriatic and Mediterranean seas as well as near New Zealand.

70. *Navicula fortis* (GREG) *Grün* (*Pinnul. fortis* Greg. T. M. S. IV, pag. 47, Pl. V, fig. 19. *Nov. fortis* Donk. Br. D. Pl. VIII, fig. 8. *Pinnularia constricta* O'MEARA? M. J. N. S. VII, pag. 117. T. V, fig. 8). *Spetsbergen* Brandwyns Bay. *Greenland*. Seems to be a very widely distributed, but somewhat rare species.

71. *Navicula flantica* GRUN (Verh. 1860, pag. 527, Pl. I, fig. 9). *Finmarken* Grötsund very rare. Grunow discovered this species in the Adriatic sea.

72. *Navicula lacustris* GRUN (Verh. 1860, pag. 534, Pl. I, fig. 37). *Spetsbergen* Kings Bay (160 fths). *Greenland*.

This form, which evidently is nearly related to *Nav. permagna* (Bail) Ralfs., has been found by Grunow in Neuziedler Sea.

Obs. The name *N. lacustris* was given by Gregory to another species (M. J. IV pag. 6, Pl. I, fig. 23) and Mr. O'Meara has proposed to name our species *N. Grunowii* (O'Meara in litt.).

73. *Navicula liber* SM. (Syn. I, pag. 48, Pl. XVI, fig. 133). *Finmarken* Grötsund. *Spetsbergen* Hackluyts. *Greenland*.

Var. bicuneata GRUN (*Nav.?* *bicuneata* Cl. Öfvers. af K Vet. Akad. Förh. 1868, pag. 227, Pl. IV, fig. 3 & 4). *Spetsbergen* Kings Bay (160 faths).

Var. maxima GRUN (*Navicula maxima* GREG). *Spetsbergen* Kings Bay (160 fths).

Nav. liber is a very common diatom in all seas.

74. *Navicula latissima* GREG (*Donk.* Br. D. pag. 17, Pl. III, fig. 2. *Nav. granulata* CL. Öfvers. af K. Vet. Akad.

Förh. 1868, pag. 226). *Finmarken* Grötsund very rare. Striæ coarse 17—18 in 0,025 m.m. Length 0,07, Breadth 0,03.

75. *Navicula marina* RALFS (in Pritch. Inf. pag. 90; *Donk. Br. D.* pag. 19, Pl. III, fig. 5. *Nav. punctulata* S. Syn. I, pag. 52, pl. XVI, fig. 151). *Davis Strait* in mud from deep water, only one specimen observed; Striæ 23 in 0,025 m.m. Length 0,0544, Breadth 0,031 m.m.

76. *Navicula subsalina* DONK. (*Br. Diat.* pag. 24, Pl. IV fig. 2). *Spetsbergen* Hackluyts.

77. *Libellus Grevillei* (AG) CL (*Schizonema Grevillei* S. Syn. II, pag. 77, Pl. LVIII, fig. 364. *Navicula Libellus* Grev. *Diat. of Clyde* pag. 528, Pl. XIV, fig. 101. *Navicula Grevillei* CL. Öfvers. af K. Vet. Akad. Förh. 1868, pag. 665). *Finmarken* Grötsund. *Spetsbergen* Schoal Point, Amsterdam I (20 fths). *Danes Id.* (6 fths) *Kings Bay* (160 fths).

I have separated the new genus *Libellus* on account of the structure of the connecting membrane, which has several longitudinal ribs or «plicæ» (probably rudiments of diaphragm). I am not able to find any important difference between *Schizonema Grevillei* and *Navicula Libellus*, for which reason I have placed them in one species.

Navicula Grevillei DONK. 1871 (*Brit. Diat.* pag. 47) is quite another species nearly related to *N. crabro*.

78. *Stauroneis aspera* EHB (*St. pulchella* SM Syn I, pag. 61, Pl. XIX, fig. 194). Certainly the most common of all diatoms in the arctic sea and scarcely absent from any sample of mud. *Finmarken. Greenland. Spetsbergen.* Abundant in all seas.

? 79. *Scoliopleura convexa* (SM) GRUN. *S. convexa* SM Syn. I, pag. 49, Pl. XVI, fig. 136). *Spetsbergen. Kings Bay* rare. Striæ unusually coarse 15 in 0,025. (According to Smith 21 in 0,01").

80. *Rhoicosigma arcticum* CL. N. Sp. S. V. elongate, sigmoid, acuminate; nodule central; med. line irregularly bent; striæ delicate, transverse, about 37—44 in 0,025 m.m. but still visible in balsam. F. V. linear, bent, narrow.

Length 0,070—0,204 m.m. Breadth and thickness 0,0204 m.m. *Spetsbergen* Hackluyts. Brandwyns Bay (10—15 fths), Kings Bay (160 fths), *Greenland*, rare.

Pl. III, fig. 16 a SV. b FV.

? 81. *Pleurosigma decorum* SM (Syn. I, pag. 63, Pl. XXI, fig. 196). *Spetsbergen* Kings Bay (160 fths).

Very widely distributed ex. gr. on the coasts of the North Sea, Mediterranean Sea (Gr.), Honduras (Gr.) Tahiti (Gr.), Cape of Good Hope (Gr). Vest Indies (CI).

82. *Pleurosigma formosum* SM (Syn. I, pag. 63, Pl. XX, fig. 195). *Spetsbergen* Kings Bay (160 fthms). *Greenland* common in most seas.

83. *Pleurosigma delicatulum* SM (Syn. I, pag. 64, Pl. XXI, fig. 202 & *Pl. elongatum* Sm l. c. Pl. XX, fig. 199) *Spetsbergen* Schoal Point, Brandwyns Bay, Hackluyts, Amsterdam *Finmarken* Grötsund.

84. *Pleurosigma intermedium* SM (Syn. I, pag. 64, Pl. XXI, fig. 200). *Spetsbergen* Schoal Point.

85. *Pleurosigma longum* CLIN. Sp. Very long and narrow, about 40 times longer than broad, slightly sigmoid, ends somewhat obtuse; median line very slightly sigmoid. Striæ coarse, oblique, about 30 in 0,025 m.m. Colour of the dry valve chestnut-brown. Length 0,98 m.m. Br. 0,024 m.m. *Spetsbergen* Hackluyts. *Greenland*.

Pl. III, fig. 14.

86. *Pleurosigma naviculaceum* BRÉB (*Pl. transversale* SM. Syn. II, pag. 96). *Greenland*. Davis Strait in mud from great depths.

87. *Pleurosigma angulatum* SM (Syn. I, pag. 65, Pl. XXI, fig. 205). *Spetsbergen* Hackluyts, Kings Bay. *Finmarken*. *Greenland*.

88. *Pleurosigma obscurum* SM. (Syn. I, pag. 65, Pl. XX, fig. 206). *Spetsbergen* Hackluyts.

89. *Pleurosigma rigidum* SM (Syn. I, pag. 64, Pl. XX, fig. 198). *Spetsbergen* Hackluyts, tolerably rare. *Greenland* rare.

The striæ are transverse and at the same time oblique. *Pl. validum* Shadb. seems to be synonymous with *Pl. rigidum*.

90. **Pleurosigma Balticum** SM (Syn. I, pag. 66, Pl. XXII, fig. 207). *Spetsbergen* Hackluyts, Kings Bay.

Widely distributed, I have found it in samples from Honolulu, Magellhaens Strait, Manilla (Philipp.).

91. **Pleurosigma fasciola** (KG) SM (Syn. I, fig. 67, Pl. XXI, 211). *Spetsbergen* Amsterdam Id., Hackluyts. *Greenland*.

Pl. fasciola is found on the coasts of the North Sea as well as in the Mediterranean Sea (Gr.).

92. **Amphiprora longa** CL. N. Sp. F. V. linear with almost parallel sides and rounded ends S. V. lanceolate with acute apices; median line straight; striæ parallel transverse, very distinct, about 27 in 0,025 m.m. Dry valve not coloured.

Length 0,22—0,3 m.m.

Spetsbergen Hackluyts. *Greenland*. *Finmarken*.

Very like *A. lepidoptera* Greg, but this species has, when dry, a brown colour and striæ twice as dense.

Pl. III, fig. 15 *a* S.V. *b* F.V.

93. **Amphiprora (?) Nitzschioides** CL N. Sp. F. V. panduriform elongated, having on the margins a row of distinct and large puncta. Connecting membrane with several longitudinal lines, valves finely striate; striæ parallel, visible only by careful illumination and with high power. S.V. unknown. Length 0,144 m.m. Breadth (greatest) 0,036. Puncta 12 in 0,025 m.m.

Spetsbergen Brandwyns Bay (rare).

Pl. 4, fig. 18.

94. **Amphicampa duplex** (DONK) RAB (*Amphiprora duplex* DONK. T. M. S. VI, pag. 28, Pl. III, fig. 13). *Spetsbergen*, Hackluyts, Kings Bay. *Greenland*.

95. **Amphora Proteus** GREG (Diat. of Clyde pag. 518, Pl. XIII, fig. 81). *A. affinis* (KG) SM Syn. I, pag. 19, Pl. II, fig. 27). Very common in the arctic sea. *Spetsbergen* ex. gr. Hackluyts, Brandwyns Bay. *Greenland*.

96. **Amphora granulata** GREG (Diat. of Clyde pag. 525, Pl. XIV, fig. 96). *Spetsbergen* Hinlopen Strait. *Finmarken* Grötsund.

97. **Amphora cymbifera** GREG (Diat. of Clyde pag. 526, T. XIV, fig. 97. *A. costata* SM I, pag. 20, T. XXX, fig. 253?) Very common. *Spetsbergen, Greenland, Finnmarken.*

98. **Amphora Arcus** GREG. (T. M. S. V., pag. 75, Pl. I, fig. 37. Diat. of Clyde pag. 522, Pl. XIII, fig. 88). *Spetsbergen* Hinlopen Strait, Kings Bay.

99. **Amphora fasciata** GREG (Diat. of Clyde, pag. 523, Pl. XIII, fig. 90, T. M. S. V. pag. 73, Pl. I, fig. 36 sub. nom. *Am. Grevilleana*). *Spetsbergen* Brandwyns Bay.

100. **Amphora complexa** GREG. (Diat. of Clyde pag. 523, Pl. XIII, fig. 91). *Finnmarken* Grötsund.

101. **Amphora plicata** GREG (T. M. S. V. pag. 70, Pl. I, fig. 31). *Spetsbergen* Hackluyts.

102. **Amphora lanceolata** CL. (Öfvers. K. Vet. Ak. Förh. 1868, pag. 667, Pl. XXIII, fig. 2 a b). Very common. *Spetsbergen, Finnmarken, Greenland.*

103. **Amphora Eunotia** CL. N. Sp. Complex, oval, broadly truncated. Median line straight, forming together with the apices a square space. Valves coarsely striate, striæ moniliform, about 14—15 in 0,025 m.m. fasciæ densely punctated, puncta about 22 in 0,025 m.m. Noduli rounded, distinct. S. V. with regularly curved dorsum and almost straight ventral line, apices somewhat produced.

Length 0,08, Breadth 0,05 m.m.

Pl. III, fig. 17.

Spetsbergen Brandwyns Bay. *Greenland.*

104. **Amphora crassa** GREG (Tr. M. S. V. pag. 72, Pl. I, fig. 35. Diat. of Clyde pag. 524, Pl. XIV, fig. 94. *A. sulcata* Roper T. M. S. VI, Pl. III, fig. 7?). Very common *Spetsbergen* ex. gr. Brandwyns Bay, Treurenberg Bay, Schoal Point, *Greenland*, Davis Strait. *Finnmarken.*

Am. crassa occurs on the coasts of Sweden and Great Britain and has also been observed in mud from Magellhaens Strait.

105. **Amphora vitrea** CL. (Öfvers. K. Vet. Akad. Förh. 1868, pag. 237, Pl. IV, fig. 5—6. *A. Kamorthensis* GRUN?

Novara. pag. 99, Pl. I A, fig. 12). *Spetsbergen* Brandwyns Bay, rare.

106. **Amphora acuta** GREG. (Diat. of Clyde pag. 524, Pl. XIV, fig. 93—39 b). *Spetsbergen* Amsterdam Id. *Greenland*, Davis Strait. *Finmarken*.

107. **Synedra tabulata** (KG?) SM (Syn. I, pag. 72, Pl. XII, fig. 96). *Spetsbergen*. *Greenland*.

108. **Synedra Kantschatica** GRUN (Verh. 1862, pag. 404, Pl. VIII, fig. 6). *Spetsbergen* Waijgats Ids. (30—80 fths).
The striæ are about 36 in 0,025 m.m.

109. **Synedra Thalassotrix** CL. N. Sp. extremely long, 90—100 times longer than broad, linear. Ends (S.V.) somewhat rounded; striæ faint about 25 in 0,025 m.m. Length 3—4 m.m. Breadth 0,042 m.m.

This species occurs floating on the surface of the sea in large masses.

Northern Atlantic Lat. 60° 25' Long. 19° 50' (Th. Fries)
Davis Strait Lat. 61° 45' Long. 53° 43'.

Pl. IV, fig. 24 a, b, c.

? 110. **Synedra undulata** (BAIL) GREG (Diat. of Clyde pag. 531, Pl. XIV, pag. 107). *Spetsbergen* Kings Bay (160 faths) rare. Not found in any other sample from the arctic sea.

? 111. **Synedra fulgens** (GREV) SM (Syn. I, pag. 74, Pl. XII, fig. 103) *Spetsbergen* Kings Bay.

? 112. **Synedra chrystallina** (AG) SM (Syn. I, pag. 74, Pl. XII, fig. 101) *Spetsbergen* Kings Bay.

? 113. **Synedra superba** (KG) SM (Syn. I, pag. 74, Pl. XII, fig. 102) *Spetsbergen* Kings Bay.

? 114. **Dimerogramma minus** (GREG) GRUN (*Denticula minor* Greg. Diat. of Clyde pag. 495, Pl. X, fig. 35) *Spetsbergen* Kings Bay (160 fathoms) rare.

115. **Fragilaria oceanica** Cl. N. Sp. Elliptic-linear with distinct marginal striæ (about 28 in 0,025 m.m.) ends rounded. F. V. narrow-linear.

Length of the frustule (= breadth of the filament) 0,024 m.m., breadth 0,0048 m.m.

The cells occur united into long filaments, which are found floating on the surface of the sea together with *Thalassosira*, *Chatocerae*, *Rhizosolenia* etc. In the cells there seems to occur the same reproduction of interior cells as is known to be the case with *Himanthidium Soleirolii*.

Pl. 4, fig. 25 a F. V. b S. V.

116. **Raphoneis (Dimerogramma) Quarnerensis** GRUN (Verh. 1862, pag. 381, Pl. VII, fig. 24) *var. major* n. var. *Costae* 16 in 0,025 m.m. Length 0,05 m.m. *Spetsbergen* Brandwyns Bay. *Greenland*. *Finmarken*. The *costae* are more distant than on specimens from the Adriatic Sea (20—24 in 0,01" according to Grunow).

Pl. IV, fig. 26.

117. **Grammonema striatula** (LYNGB.) AG (*Fragilaria striatula* SM Syn. II, pag. 23, Pl. XXXV, fig. 298). *Spetsbergen*. *Greenland*.

118. **Striatella unipunctata** (LYNGB) SM (Syn. II, pag. 37, Pl. XXXIX, fig. 307). *Spetsbergen* Kings Bay. *Finmarken* Grötsund.

119. **Striatella Chilensis** GRUN (Novara pag. 96, Pl. I A, fig. 1 a, b, c). *Greenland* very rare.

120. **Grammatophora Oceanica** EHB. GRUNOW (*Gr. macilenta* Sm. Syn. II, pag. 43, Pl. LXI, fig. 382). *Spetsbergen* Kings Bay (160 faths). *Finmarken* Grötsund. This species, which in most seas is one of the most common, is rare in the arctic sea and has not been observed from *Greenland*.

121. **Grammatophora arctica** CL (Öfvers. K. Vet. Akad. Förh. 1867, pag. 664, Pl. XXIII, fig. 1) *Spetsbergen* common. *Greenland* common. *Finmarken* rare.

122. **Grammatophora arcuata** EHB. (*Grun.* Verh. 1862 pag. 420, Pl. XI, fig. 7). *Spetsbergen* Schoal Point, Treurenberg Bay, Hinlopen Strait. *Greenland*.

123. *Grammatophora Islandica* EHB (Grun. Verh. 1862 pag. 418 var. γ and δ) *Spetsbergen* Kings Bay (160 faths) Amsterdam Id., Danes Id. *Finmarken* Grötsund. *Greenland* Davis Strait.

124. *Rhabdonema Torelli* CL N. Sp. S. V. lanceolate, gibbous in the middle, covered by strong costæ united in the middle of the valve, thus forming two series of large, more or less irregular cellules. F. V. quadrate, with numerous transverse costæ (margins of the diaphragms). The entire surface finely striate; striæ composed of small granules. Diaphragms 10 — more with only one large opening in the middle.

Length and thickness of the frustule 0,096—0,140 m.m. Striæ 20—24 in 0,025 m.m. Cellulæ 6—8 in 0,025 m.m. Diaphragms 3 in 0,025 m.m.

Greenland. Spetsbergen Waijgats Ids. rare.

This very large and beautiful species has some resemblance with the *R. robustum* GRUN (Verh. 1862, pag. 422, Pl. VIII, fig. 1 a, b, c) but is distinguished by its fine and regular striæ, composed of small granules.

Pl. IV, fig. 20 a F.V. b S.V. c »annulus».

125. *Rhabdonema arcuatum* (LYNGB) SM (Syn. II, pag. 34, Pl. XXXVIII, fig. 305). Exceedingly common in the arctic sea. *Spetsbergen, Finmarken, Greenland.*

Striatella Crozierii Ehb. (M. G. Pl. XXXV A XXIII, fig. 14, 16) is in no respects distinct from *R. arcuatum*, but *Rh. Crozierii* Pritch. is quite another species.

Var. *ventricosum* CL. N. Sp. S. V. gibbous in the middle; striæ fine about 25 in 0,025 m.m.

Length 0,05 m.m. Breadth 0,03 m.m. (S.V.).

Greenland Davis Strait.

Pl. IV, fig. 21.

Rhabdonema arcuatum occurs most abundantly in the northern Atlantic. According to Grunow it has been found also in the Mediterranean sea, but I have never seen any specimen from the tropical or southern seas. The *Rhabd. arcuatum* Rab & Jan from Honduras (Beitr. pag. 12, Pl. III, fig. 19) is certainly, if the figure be correct, another species probably *Rh. Crozierii* Ralfs. in Pritch Inf. pag. 805, Pl. IV, fig. 43.

126. **Rhabdonema minutum** (KG) SM (Syn. II, pag. 35, Pl. XXXVIII, fig. 306). Tolerably common in the arctic sea *Spetsbergen* many localities. *Greenland. Finmarken.*

This species occurs on the coasts of Sweden and Great Britain, has been found also at great depths in the Baltic sea, but has not been observed either in the Mediterranean or in the tropical seas. It has been found by Mr. Grunow in samples from the *Cape of Good Hope.*

127. **Rhabdonema Adriaticum** (KG) SM (Syn. II, pag. 35, Pl. XXXVIII, fig. 305 *a'* & *b'*) very rare. *Spetsbergen* Kings Bay (160 faths). *Finmarken* Grötsund. Only some very few frustules of this, otherwise very common species, have been found in the arctic sea. *Rh. Adriaticum* occurs on the coasts of Sweden and Great Britain, in the Mediteranean and Red seas, on the eastern coasts of North America, in West Indies, Brasil (Grun) Cape of Good Hope (Grun). St. Pauls Id. and Mauritius (Grun) Honolulu (Cl).

? 128. **Achnanthidium brevipes** (AG) HEIB (*Achnantes brevipes* SM Syn. II, pag. 27, Pl. XXXVII, fig. 301 and 301 β). *Spetsbergen* Schoal Point. A somewhat doubtful arctic species, as it has not been found in any sample examined by me after the year 1867.

129. **Achnanthidium arcticum** CL N. Sp. S.V. linear oblong, apices rounded, somewhat constricted in the middle. The convex valve with coarse striæ, composed of large and distinct puncta (striæ about 13 in 0,025 m.m.). Concave valve with more numerous striæ (about 17 in 0,025 m.m.), composed of more numerous puncta in the middle with a distinct raphe and with a broad stauros. Connecting membrane with several rows of fine puncta.

Length 0,048 m.m. Height 0,024 m.m. Breadth 0,017 m.m.
Spetsbergen, Greenland, Finmarken.

Pl. IV, fig. 22 *a* F. V. *b* S. V.

130. **Achnanthidium Groenlandicum** CL. N. Sp. S. V. linear, Convex valve without any distinct median line and central nodule; striæ coarse, composed of some few, distinct, large puncta. Concave valve with distinct median line and with a

large nodule in the middle. Striæ coarse, composed of 2—3 puncta. F. V. linear, narrow, angularly bent; connecting membrane with several rows of finer puncta.

Length 0,06 m.m. Breadth 0,007. Height 0,013.

Striæ on the convex valve 11 in 0,025 m.m. on the concave valve 14 in 0,025 m.m.; puncta on the connecting membrane 17 in 0,025 m.m.

Spetsbergen Brandwyns Bay, *Greenland*, *Finmarken*.

Pl. IV, fig. 23 a F. v. b & c S. v.

131. **Rhoiconeis Bolleana** GRUN (Verh. 1863, pag. 147, Pl. XIII, fig. 11 a and b) common in the arctic seas *Spetsbergen* Brandwyns Bay, Danes Id., Amsterdam Id. *Greenland* very common.

Striæ on the convex valve 18 in 0,025 m.m. on the concave valve 22 in 0,025. Length 0,025—0,11. Height 0,024—0,022 m.m.

Grunow discovered this species on algæ from the northern Pacific ocean.

132. **Rhoicosphenia curvata** (KG) HEIBERG (*Gomphon. curvata* & *marina* SM Syn. I, Pl. XXIX, fig. 245—246). *Spetsbergen*, *Greenland*, *Finmarken*.

133. **Amphipleura rigida** KG (*A. sigmoidea* SM. Syn. I, pag. 45, Pl. XV, fig. 128). *Spetsbergen* Kings Bay (160 faths) *Greenland*.

134. **Tryblionella marginata** SM (Syn. I, pag. 35, Pl. X, fig. 76 a & 76 b). *Spetsbergen* Hackluyts.

? 135. **Tryblionella punctata** SM (Syn. I, pag. 63, Pl. X, fig. 76 a' & Pl. XXX, fig. 261) *Spetsbergen* Kings Bay.

136. **Nitzschia sigma** KG (Syn. I, pag. 39, Pl. XIII, fig. 108) *Greenland*. *Spetsbergen* Kings Bay (160 faths). *Finmarken*. This species occurs in the Atlantic and according to Grunow, in the Mediterranean sea, Red sea, Cape of Good Hope, Tahiti, Honduras and Nicobaren Ids.

? 137. **Nitzschia distans** GREGORY (Diat. of Clyde, pag. 530, Pl. XIV, fig. 103) *Spetsbergen* Kings Bay (160 faths).

138. *Nitzschia socialis* GREG. (T. M. Soc. V, pag. 80, Pl. I, fig. 45) *Greenland*.

139. *Nitzschia angularis* SM. (Syn. I, pag. 40, Pl. XIII, fig. 117) *Greenland*. Found before on the coasts of Gr. Britain and according to Grunow in the Adriatic sea.

140. *Nitzschia insignis* GREG (T. M. S. V. pag. 80, Pl. I, fig. 46) *Spetsbergen* Brandwyns Bay, Hinlopen Strait, Schoal Point, Kings Bay. *Greenland. Finmarken*. Found before in Glenshira sand (fossil) Scotland, Gregory, and according to Grunow in the Adriatic sea.

141. *Nitzschia Closterium* (EHB) SM (Syn. I, pag. 42, Pl. XV, fig. 120) *Spetsbergen*.

142. *Nitzschia constricta* KG (Sm Syn. I, pag. 41, Pl. XIII, fig. 112) *Spetsbergen* Hackluyts, Wijde Bay. Found also in the Atlantic, and according to Grunow in the Mediterranean and Red seas, Cape of Good Hope. West Indies (*Cl*).

143. *Nitzschia vitrea* NORMAN (T. M. S. N. S. I, pag. 7, Pl. II, fig. 4) *Spetsbergen* Hackluyts. Found near Hull.

144. *Nitzschia macilenta* GREG. (Greville in M. I. VII, pag. 83, Pl. VI, fig. 8—9) *Spetsbergen* Hackluyts. Found before in Scotland (Gregory) and in the Adriatic sea (Grunow).

During the two last Swedish expeditions to Greenland several samples of diatoms were collected on the surface of the sea between Europe and Greenland as well as in Davis Strait. The variety of forms was not very great in these samples, most of them, collected in the month of June, contained: *Thassosira Nordenskiöldii*, *Chaetoceros decipiens*. Besides were found in samples from the Atlantic *Rhizosolenia styliformis*. Samples, collected in the month of August in Davis Strait, contained principally *Synedra Thalassotrix*.

The Rev. E. O'Meara of Dublin has published in the Journal of the Roy. Dubl. Soc. July 1860 a list of diatoms, found in gatherings made by Sir Leopold M'Clintock. The list, of which I was not cognizant before this paper was written, contains 85, species, of which I have not noticed the following in the samples from the arctic sea, examined by me.

Achnanthes longipes.	Navicula inconspicua.
Amphiprora alata.	» clutensis.
» constricta.	» minor.
Amphora hyalina.	» interrupta.
» robusta.	» cyprina.
» proboscidea.	» latestriata.
» tenera.	» Johnsohii.
Bacillaria paradoxa.	Nitzschia hyalina.
Cocconeis splendida.	» lanceolata.
» nitida.	» parvula.
» ornata.	Pleurosigma lanceolatum.
» ovalis.	» prolongatum.
» pseudomarginata.	» strigosum.
Coscinodiscus punctulatus.	Podosira hormoides.
» minor.	Rhizosolenia Calcar avis.
Doryophora Boeckii.	Schizonema cruciger.
Eupodiscus crassus.	Stauroneis crucicula.
Grammatophora marina.	Synedra gracilis.
» serpentina.	

Including those 37 species the whole number found in the arctic sea is 181, among which are 17 in my enumeration, which I do not regard as of certain occurrence in that region.

Description of plates I—IV

Pl. I.

Fig.

1. *Thalassosira Nordenskiöldii* *Cl* × 500.
2. *Triceratium striolatum* & *Biddulphia rhombus* × 200.
3. Sporangial frustule of *Biddulphia aurita* × 700.
4. *Chaetoceros pelagicum* *Cl* × 500.
5. *Ch. decipiens* *Cl a* × 200 *b* × 500.
6. *Cocconeis decipiens* *Cl.* × 500.

Pl. II.

7. *Chaetoceros boreale* var. *Brightwelli* *Cl. a b & d* × 500, *c* × 200, *e* × 700.
8. *Ch. Atlanticum* *Cl a* × 200 *b* × 500.
9. *Campylodiscus Groenlandicus* *Cl* × 500.
10. *Dicladia Groenlandica* *Cl* × 500.
11. *Cocconeis arctica* *Cl.* × 500.

Pl. III.

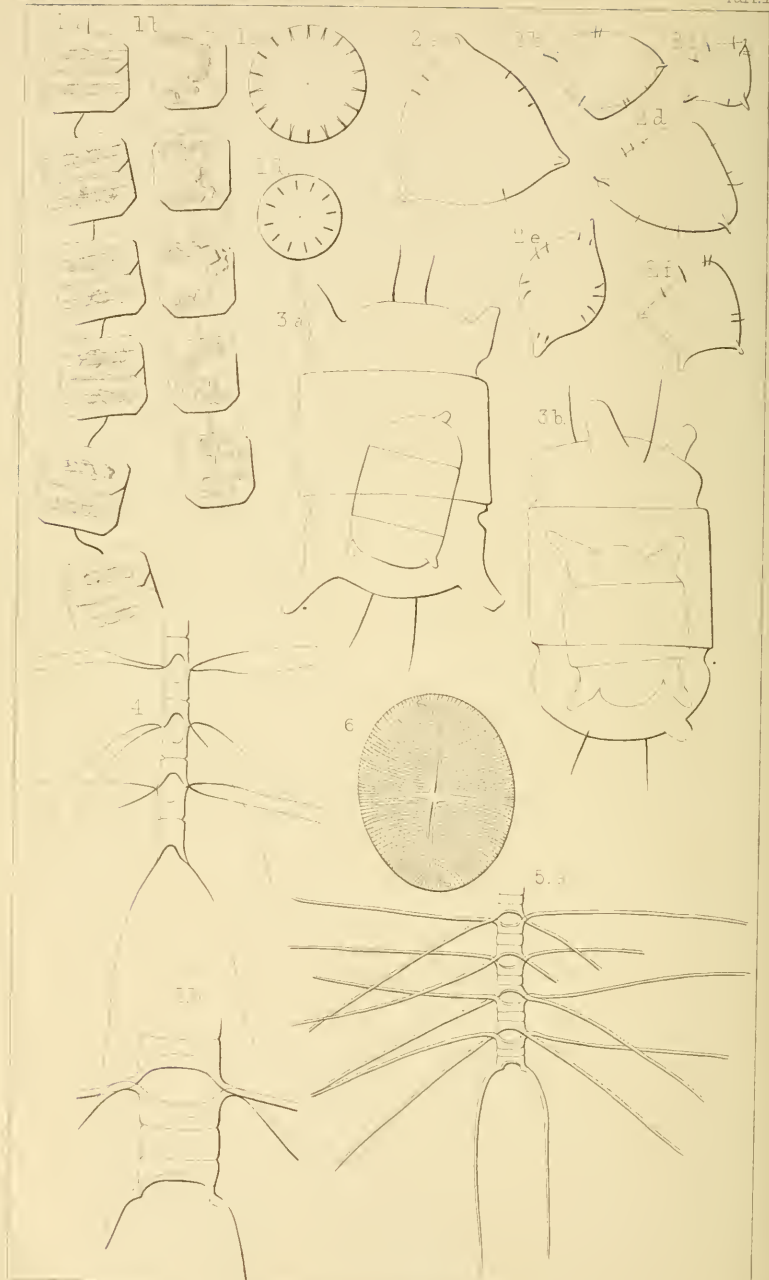
× 500.

12. *Cocconeis glacialis* *Cl.*
13. *Navicula(?) arctica* *Cl.*
14. *Pleurosigma longum* *Cl.*
15. *Amphiprora longa* *Cl.*
16. *Rhoicosigma arcticum* *Cl.*
17. *Amphora Eunotia* *Cl.*

Pl. IV.

× 500.

18. *Amphiprora Nitzschioides* *Cl.*
 19. *Asteromphalus Brookei* *Bail.*
 20. *Rhabdonema Torelli* *Cl*
 21. *R. arcuatum* v. *ventricosum* *Cl.*
 22. *Achnanthidium arcticum* *Cl.*
 23. *A. Groenlandicum* *Cl.*
 24. *Synedra Thalassotrix* *Cl.*
 25. *Fragilaria oceanica* *Cl.*
 26. *Raphoneis Quarnerensis* *Gr.* var. *major* *Cl.*
-



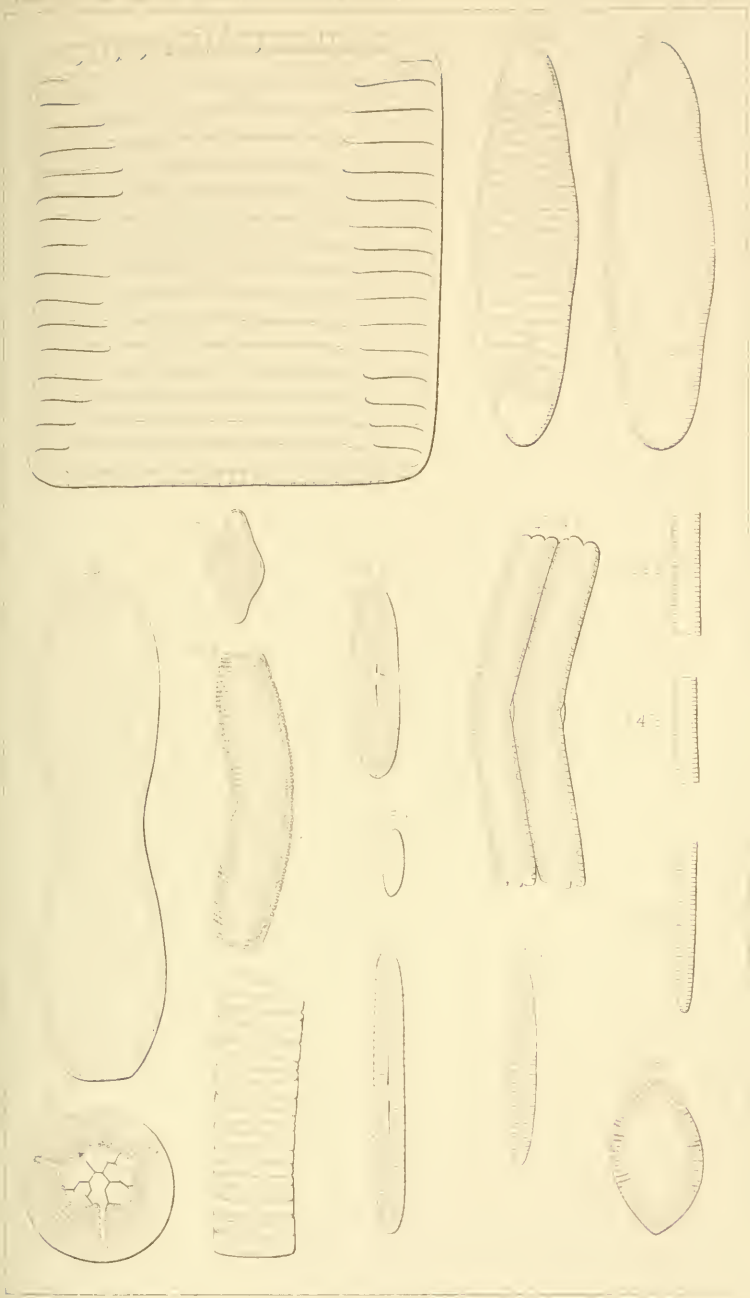
1. *Chalcid* sp. 2. *Chalcid* sp. 3. *Chalcid* sp. 4. *Chalcid* sp. 5. *Chalcid* sp. 6. *Chalcid* sp.



Figures 1-15

Figures 16-18

1. *Cl.* of *...* 2. *Cl.* of *...* 3. *Cl.* of *...* 4. *Cl.* of *...* 5. *Cl.* of *...* 6. *Cl.* of *...*
 7. *Cl.* of *...* 8. *Cl.* of *...* 9. *Cl.* of *...* 10. *Cl.* of *...* 11. *Cl.* of *...* 12. *Cl.* of *...* 13. *Cl.* of *...* 14. *Cl.* of *...* 15. *Cl.* of *...*



Cl. ... Bail
Cl. ... Cl.
Cl. ... Cl.
Cl. ... Cl.

