

ANTARCTIC PHYTOPLANKTON STUDIES.

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(Plates iii-v.)

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Synopsis.

This paper considers 126 species of diatoms which have been recorded in material collected by M.V. *Magga Dan* under charter to the Antarctic Division of the Department of External Affairs. The finding of frustules with the two valves characteristic of two genera, *Coscinodiscus* and *Asteromphalus*, is recorded.

INTRODUCTION.

The material described in this paper was collected during December, 1958, to February, 1959, from the vessels *Thala Dan* and *Magga Dan* under charter to the Antarctic Division of the Department of External Affairs, on the relief trip from Australia to the Antarctic. Grateful acknowledgement is made to the Department for allowing the collections of phytoplankton to be made. The details of the positions of stations are available in C.S.I.R.O. Aust. (1960).

The taxonomy of Antarctic diatoms is confused. The illustrations of Karsten (1905-7) are idealized rather than accurate, and later authors have tended to refer to these rather than to reproduce more accurate illustrations. Heiden and Kolbe (1928) have failed to observe the identity of certain species and have caused confusion by uniting certain other species. For example, they united *Biddulphia anthropomorpha* with *B. obtusa*, failed to unite *B. obtusa* with *B. aurita* (a more obvious relationship), and continued to distinguish *B. roperiana*, which is *B. aurita* var. *obtusa*. Because certain authors have not supplied illustrations it is difficult to tell whether much of the lumping and splitting of species is justified. In this paper a middle course has been taken, and illustrations are given of those species which have not been adequately covered in Wood (1960), Crosby and Wood (1958, 1959), and Wood, Crosby and Cassie (1959).

The finding in this collection of frustules with valves characteristic of two genera (*Coscinodiscus* and *Asteromphalus*, Pl. v, figs 67-9) makes the validity of many species doubtful; for instance, it may well be that genera such as *Schimperella* with different valves may be mutations or crosses between two genera.

DIATOMS.

Sub-Order DISCINEAE.

Family COSCINODISCACEAE.

Genus MELOSIRA Agh. 1824.

1. MELOSIRA SOL (Ehr.) Kütz. (Pl. v, fig. 62).

Kütz., 1849, 31; Hend., 1937, 234; *Gallionella sol* Ehr., 1844, 202.

Cells large, discoid, in chains; valves flat or weakly concave, with radial grooves of varying length extending from margin, central area clear; margin with a single row of pores, girdle narrow; valve mantle finely striate. Diam. 50-100 μ .

This species is extremely variable and has been described from the Antarctic and other places under a number of names. The following are probable synonyms: *M. godfroyi* Perag., 1921, 86, 5, 1; *M. hungarica* Pant. Ungarn.; *M. interjecta* Jan in vH., 1909, 33; *M. sol* ff. *typica*, *omma* (*M. omma* A.S.), *terminalis* Karst., vv. *hungarica* and *marginalis* Perag., 1921; *M. subhyalina* vH., 1909, 33, 7, 97; *M. vanheurekii* Perag., 1921,

90; *M. de wildmanni* vH., 1909, 33, 7, 98; *M. omma* Heiden and Kolbe, 1928, 467; *M. antarctica* vH., 1909, 32, 7, 93; *M. deblockii* vH., 1909, 32, 7, 93; *M. alphabetica* Mann, 1937; Mann also described variants of this species under several of the above names.

2. MELOSIRA SPHAERICA Karst. (Pl. iii, fig. 1).

Karst., 1905, 70, 1, 2; Hend., 1937, 234.

Cells in short, irregular chains; frustules weakly siliceous, without definite structure; valves rounded. Diam. 40–60 μ . *Distribution*: Magga Dan 35, 36, 37. Wilkes Land.

3. MELOSIRA POLARIS Grun. (Pl. iii, fig. 2, a-c).

Grun., 1884, 95, E33; Hend., 1937, 234.

Cells in pairs, chains or solitary; frustules doughnut-shaped in girdle view; valves depressed in centre, rounded margins, margin striate, central portion punctate. Diam. 25–35 μ . *Distribution*: Magga Dan 27, 28, 29, 30, 31, 34, 35, 37, 41, 42, 47, 51, 52, 54, 56, 58, 76.

Genus HYALODISCUS Ehr. 1845.

4. HYALODISCUS KERGUELENSIS Karst. (Pl. iii, fig. 3).

Karst, 1905, 74, 2, 6–7; Hend., 1937, 235.

Cells usually solitary or in pairs; valves deeply convex, centre with fine, somewhat indistinct granules which may be radial, outer area with radiate finely moniliform striae; marginal flange strongly striate; girdle with numerous annular segments. Diam. 100–120 μ . *Distribution*: Thala Dan 8. Magga Dan 28, 35, 41, 45, 46, 60.

Genus THALASSIOSIRA Cl. 1873.

5. THALASSIOSIRA ANTARCTICA Comber (Pl. iii, fig. 4).

Comber, 1896, 491, 11; Hend., 1937, 237.

Cells drum-shaped, in chains or mucilaginous colonies; valves circular, slightly convex, rounded margins, punctate; puncta in radiating, frequently bifurcating rows, central granules larger, margins of valves with small spinulae. Diameter of valve 20–60 μ . *Distribution*: Wilkes Land.

6. THALASSIOSIRA CONDENSATA Cl. 1900 (Pl. iii, fig. 5).

Crosby and Wood, 1958, 493, 35, 8.

Distribution: Wilkes Land.

7. THALASSIOSIRA DECIPIENS (Grun.) Jörg. 1905.

Crosby and Wood, 1958, 493, 35, 13.

Distribution: Wilkes Land.

8. THALASSIOSIRA ROTULA Meun. 1910.

Crosby and Wood, 1958, 492, 35, 6.

Distribution: Wilkes Land.

9. THALASSIOSIRA SUBTILIS (Ost.) Gran 1900.

Crosby and Wood, 1958, 493, 35, 11.

Distribution: Magga Dan 37; Wilkes Land.

Genus COSCINOSIRA Gran 1900.

Cells drum-shaped, in loose chains, cells connected by several threads, usually long; valves circular, flat, or slightly convex, areolate; marginal spinulae and spines may be present; chromatophores numerous.

10. COSCINOSIRA ANTARCTICA Mangin (Pl. iii, fig. 6).

Mangin, 1915, 55, 39.

Cells in chains connected by several threads from the inner half of valve; frustules drum-shaped, margins rounded with a series of short and long spinules. Diam. 45 μ . *Distribution*: Magga Dan 36, 73.

Genus COSCINODISCUS Ehr. 1838.

11. COSCINODISCUS CENTRALIS Ehr. 1839.

Crosby and Wood, 1958, 495, 31, 7.

Distribution: Magga Dan 23, 24, 36, 37, 77; Wilkes Land.

12. COSCINODISCUS COMPTUS Castr. (Pl. iii, fig. 7).

Castr., 1886, 157, 13, 9.

Cells discoid, solitary, valves with a central hyaline area from which radial rows of puncta extend to the margin; between these rows are shorter rows of puncta extending a short distance in from the margin. *Distribution*: Magga Dan 27, 28, 37.

13. COSCINODISCUS CURVATULUS Grun. 1876.

Crosby and Wood, 1958, 496, 31, 14.

Distribution: Magga Dan 15, 17, 20, 23, 26, 35, 74, 87, 88.

14. COSCINODISCUS EXCENTRICUS Ehr. 1840.

Crosby and Wood, 1958, 496, 31, 10.

Distribution: Magga Dan 21, 22, 23, 26, 27, 28, 29, 30, 31, 33, 35, 37, 48, 54, 86.

15. COSCINODISCUS GEMMATULUS Castr. (Pl. iii, fig. 8).

Castr., 1886, 161, 17, 9.

Cells small, discoid, solitary; valves with striate, and punctate margin, large radially disposed puncta and a hyaline central area. *Distribution*: Magga Dan 27.

16. COSCINODISCUS GRANULOSUS Grun. 1880.

Crosby and Wood, 1958, 496, 31, 13.

Distribution: Magga Dan 21, 23, 29, 30, 41, 51, 60, 74.

17. COSCINODISCUS GRISEUS Grev. (Pl. iii, fig. 9).

Grev., 1863, 230, 9, 7; A.S.A., 1885, 58, 13, 14.

Cells small, discoid, solitary; valves flat, with punctate margin and large radiating rows of granules; central area hyaline with scattered granules. *Distribution*: Magga Dan.

18. COSCINODISCUS INCURVUS Karst. (Pl. iii, fig. 10).

Karst., 1905, 85, 7, 8; Hend., 1937, 252.

Cells discoid, solitary; valves flat, with hyaline central area and puncta uniform in size, fasciculate. Diam. 80 μ . *Distribution*: Magga Dan.

19. COSCINODISCUS INTERMITTENS Karst. (Pl. iii, fig. 11).

Karst., 1906, 156, 26, 14; Hend., 1937, 247.

Cells solitary, discoid; valves slightly convex, punctate, puncta coarse with a few in a cluster at centre, rest radiating, some rows reaching centre, others not, margin with small puncta and small spinulae. Diam. 90 μ . *Distribution*: Magga Dan 73.

20. COSCINODISCUS JANISCHII A.S. 1878.

Wood, Crosby and Cassie, 1959, 16, 1, 16.

Distribution: Magga Dan 32.

21. COSCINODISCUS KRYOPHILUS Grun. (Pl. iii, fig. 12).

Grun., 1884, 81, 3, 21; Karst., 1905, 85, 7, 4; Hend., 1937, 253.

Frustules discoid, solitary; valves covered with fine puncta in fasciculate rows and secondary oblique rows within each fascicule, no central hyaline area, puncta uniform; spinulae at margin. Diam. 40–60 μ . *Distribution*: Magga Dan 27, 56.

22. COSCINODISCUS LENTIGINOSUS Jan. in A.S. (Pl. iii, fig. 3).

Jan. in A.S. Atl., 1878, 58, 11; Karst., 1906, 155, 26, 11; Hend., 1937, 248.

Cells discoid, small, solitary; valves flat, surface with granules, irregular in centre

but radial, and becoming closely packed towards valve margin; narrow hyaline space just inside valve margin which is strong, narrow and radially striate. Diam. 40–100 μ .
Distribution: Magga Dan 27.

23. *COSCINODISCUS LINEATUS* Ehr. 1838.

Crosby and Wood, 1958, 497, 31, 15.

Distribution: Magga Dan 9, 20, 27, 28, 29, 30, 33, 75, 88.

24. *COSCINODISCUS MARGINATUS* Ehr. 1841.

Crosby and Wood, 1958, 495, 31, 9.

Distribution: Wilkes Land.

25. *COSCINODISCUS NITIDUS* Greg. 1857.

Wood, Crosby and Cassie, 1959, 5, 1, 11.

Distribution: Magga Dan 16, 26, 27, 29, 31, 33, 52, 53, 54, 56, 57, 74, 78, 88.

26. *COSCINODISCUS RADIATUS* Ehr. 1840.

Crosby and Wood, 1958, 496, 31, 12.

Distribution: Magga Dan 21, 29, 31, 35, 48, 74.

27. *COSCINODISCUS ROTHII* (Ehr.) Grun. 1878.

Wood, Crosby and Cassie, 1959, 6, 1, 15.

Distribution: Magga Dan 31.

28. *COSCINODISCUS STELLARIS* Roper (Pl. iii, fig. 14).

Roper, 1858, 6, 21, 3, 31; A.S., 1892, 164, 4; Hend., 1937, 242. *Coscinosira stellaris* Heiden and Kolbe, 1928, 469.

Cells solitary discoid; valves flat with fine hexagonal areolation; areolae uniform except near margin where they decrease; three to six thickened protuberances or ridges near centre forming a stellate pattern. Diam. 80–95 μ . *Distribution*: Magga Dan 62; Wilkes Land.

29. *COSCINODISCUS SUBTILIS* Ehr. (Pl. iii, fig. 15).

Ehr., 1841, 412, 3, 18; A.S., 1885, 57, 11, 13; Karst., 1905, 86, 7, 11, 11a,

Cells discoid, solitary; valves flat or convex with fine hexagonal areolae in fasciculae; margin with numerous spinulae. *Distribution*: Magga Dan.

Genus *ETHMODISCUS* Castr. 1886.

30. *ETHMODISCUS SUBTILIS* Karst. (Plate iii, fig. 16).

Karst., 1905, 87, 8, 3; Hend., 1937, 255.

Cells drum-shaped; valves weakly convex, sometimes centrally concave; finely punctate, puncta radial, slightly curved towards margin; no central area or rosette. Diam. 45 μ . *Distribution*: Magga Dan.

Genus *SCHIMPERIELLA* Karst. 1905.

Cells solitary, discoid; but two valves different, one with a striate margin; pseudonodule absent.

31. *SCHIMPERIELLA ANTARCTICA* Karst. (Pl. iii, fig. 17).

Karst., 1905, 88, 8, 6; Hend., 1937, 256.

Cells discoid, solitary; valves dissimilar, upper with wide flat radially striate margin, interior with puncta in straight or curved irregular striae; lower valve without striate margin and with radial puncta. Diam. 35–50 μ . *Distribution*: Magga Dan 24, 27, 28, 30, 31, 33, 43, 45, 48, 51, 52, 53, 54, 56, 68, 71, 72, 74, 75, 76, 78.

32. *SCHIMPERIELLA VALDIVIAE* Karst. (Pl. iii, fig. 18, a, b).

Karst., 1905, 88, 8, 7; Hend., 1937, 256.

Cells discoid, solitary; valves dissimilar, upper convex with wide, flat radially striate margin and convex middle with radial striae and small central hyaline area,

puncta increasing in size and denser as they approach margin; lower valve with striate margin, fine areolation and no hyaline central area. Diam. 30–50 μ . *Distribution*: Magga Dan 15, 23, 27, 28, 30, 31, 33, 41, 46, 52, 70, 78.

Genus CHARCOTIA M. Perag. 1921.

33. CHARCOTIA BIFRONS (Castr.) Perag. M. 1921.

Crosby and Wood, 1958, 498, 32, 17.

Distribution: Magga Dan 27, 29, 37.

Family ACTINODISCACEAE.

Genus ACTINOCYCLUS Ehr. 1837 em. Ratt. 1890.

34. ACTINOCYCLUS BIFRONS Karst. (Pl. iii, fig. 19, *a*, *b*).

Karst., 1905, 92, 9, 8; Hend., 1937, 260.

Cells solitary, discoid; valves dissimilar, upper slightly convex with narrow radially striate margin; puncta irregular in centre, fasciculate, radiate towards margin; pseudocellus marginal; lower valve more convex with broad striate margin and inner part with moniliform striae, fasciculate in outer, irregular in central part. Diam. 70–80 μ . *Distribution*: Magga Dan 35, 36, 37, 40, 42.

35. ACTINOCYCLUS INTERMITTENS Karst. (Pl. iii, fig. 20).

Karst., 1905, 92, 9, 5; Hend., 1937, 261.

Cells discoid, solitary; valves convex with slightly flat centre; puncta irregular in centre, radial towards margin which is narrow, hyaline with small pseudocellus. *Distribution*: Magga Dan 27, 37.

36. ACTINOCYCLUS JANUS Karst. (Pl. iii, fig. 21).

Karst., 1905, 92, 9, 7; Hend., 1937, 262.

Cells solitary, discoid; valves dissimilar, upper convex with flat centre, surface punctate, puncta in irregularly concentric and radial lines, sparser near centre; hyaline area may be present; pseudocellus small; lower valve convex with depressed centre, broad striate margin and punctate inner portion, irregular, sparser in centre. Diam. 60 μ . *Distribution*: Magga Dan 27.

37. ACTINOCYCLUS UMBONATUS Castr. (Pl. iii, fig. 22, *a*, *b*).

Castr., 1886, 145, 4, 4; Karst., 1905, 91, 9, 1.

Cells solitary, discoid; valves convex with broad flat margin which is radially striate and may have hyaline rim; inner part of valve with moniliform striae in radiate or tangential rows; puncta uniform in size, hyaline central area may be present. Diam. 60–100 μ . *Distribution*: Magga Dan 42.

38. ACTINOCYCLUS sp. a. (Pl. v, fig. 65).

Cells solitary, discoid; valves convex, flattened near centre; puncta radial-fasciculate with stellate, hyaline central area which may contain a few puncta; marginal pseudonodule present. Diam. 50–60 μ . *Distribution*: Magga Dan; Antarctic water.

39. ACTINOCYCLUS sp. b. (Pl. v, fig. 66).

Cells small, solitary; valves slightly convex; surface covered with small, uniform areolae, arranged radially and secondarily in excentric circles; dotted irregularly over the valve surface are small thickenings which obscure the areolae; pseudonodule marginal. Diam. 40–50 μ . *Distribution*: Magga Dan; Antarctic water.

Genus ASTEROMPHALUS Ehr. 1844.

40. ASTEROMPHALUS BEAUMONTII Ehr. (Pl. iii, fig. 23).

Ehr., 1844, 200, 5; *A. ralfsianus* A.S.A., 1875, 38, 6, 7.

Cells small, discoid, to slightly oval solitary; valves circular, with large hyaline central area and broad rays separating cuneate sectors with very large puncta and

joined to centre by undulate lines; this species differs from *A. parvulus* and *A. hookeri* by the cuneate sectors and the very large puncta. Diam. 45μ . *Distribution*: Magga Dan 11.

41. *ASTEROMPHALUS FLABELLATUS* (Breb.) Grev. 1859.

Wood, Crosby and Cassie, 1959, 24, 2, 24.

Distribution: Magga Dan 45.

42. *ASTEROMPHALUS HOOKERI* Ehr. 1844 (Pl. iii, fig. 24).

Crosby and Wood, 1958, 502, 32, 27.

Distribution: Magga Dan 9, 11, 16, 20, 21, 23, 26, 27, 28, 29, 30, 33, 35, 39, 41, 42, 43, 45, 46, 48, 51, 52, 53, 56, 57, 63, 64, 66, 70, 71, 72, 73, 74, 75, 76, 80, 86.

43. *ASTEROMPHALUS ANTARCTICUS* Castr. (Pl. iii, fig. 25, a, b).

Castr., 1886, 136, 16, 11; Karst., 1905, 90, 8, 14; Hend., 1937, 270.

Cells discoid in valve view, octagonal in girdle view, solitary; valves with large central hyaline area, and 4 to 6 hyaline rays, one much narrower than the others; peripheral sectors with large puncta; branched or zigzag lines radiating from centre to peripheral sectors, meeting these sectors on their indented inner margin. Diam. $30-40\mu$. *Distribution*: Magga Dan 27, 31, 42, 43, 46, 47, 52, 53, 54, 56, 57, 60, 72, 74, 88.

44. *ASTEROMPHALUS ROPERIANUS* Ralfs (Pl. iv, fig. 26).

Ralfs in Pritch., 1861; Karst., 1905, 90, 8, 8a.

Cells solitary, discoid, valves with central area less than half diameter and seven hyaline rays reaching margin, one much narrower than the others; sectors punctate with a row of much larger puncta adjacent to hyaline portions, joined to centre of valve by irregular lines. Diam. 70μ . *Distribution*: Magga Dan 43, 78.

Family BIDDULPHIACEAE.

Genus *CERATAULINA* Perag. 1892.

45. *CERATAULINA PELAGICA* (Cl.) Hend. 1937.

Crosby and Wood, 1958, 502, 36, 18.

Distribution: Magga Dan 26, 37; Lewis I.

Genus *BIDDULPHIA* Gray 1821.

46. *BIDDULPHIA ANTHROPOMORPHA* van Heurck (Pl. iv, fig. 27).

van H., 1909, 39, 10, 136-7; Hend., 1937, 277, 13, 5; *B. polymorpha* Mangin, 1915.

Cells in chains with processes often longer than cell, but variable in same chain; valves oval to elliptic-lanceolate, punctate, and with a variable number of spines of varying length, two much stouter than the rest; in girdle view frustule has a narrow to wide simple girdle, centre of valve is domed, and two long somewhat sinuate processes with clavate ends arise on each side of central portion. Length $80-120\mu$. *Distribution*: Wilkes Land.

47. *BIDDULPHIA AURITA* (Lyngb.) Breb. 1838.

Crosby and Wood, 1958, 504, 33, 33.

Distribution: Wilkes Land.

48. *BIDDULPHIA WEISSFLOGII* Jan. in van H. (Pl. iv, fig. 28).

van H., 1880, 85, 100, 1, 2; *B. stricta*, Karst., 1905, 122, 71, 2, 3; Mangin, 1915, 22, 1; Hend., 1937, 278, 10, 4, 5.

Cells in short chains or solitary, almost rectangular in girdle view, elliptical in valve view; valves with very short, rounded processes at margins, and four slightly curved spines near slightly convex or flat central area; girdle may be slightly inflated; surface of cell finely punctate. Length $100-120\mu$. *Distribution*: Magga Dan 28. Also recorded from Eden, N.S.W., in June, 1959. The latter record is interesting since Hendey (1937) considers that *B. striata* is unlikely to cross the Antarctic convergence.

GENUS TRICERATIUM Ehr. 1839.

49. TRICERATIUM ARCTICUM Brightw. 1853 (Pl. v, fig. 57).

Wood, Crosby, and Cassie, 1959, 12, 2, 30.

Distribution: Wilkes Land.

50. TRICERATIUM FAVUS Ehr. 1839.

Crosby and Wood, 1958, 505, 33, 35.

Distribution: Wilkes Land.

Genus EUCAMPIA Ehr. 1839.

51. EUCAMPIA BALAUSTIUM Castr. 1886 (Pl. v, fig. 58).

Eucampia antarctica Mangin, 1910; *Hemiaulus ambiguous* Jan. Heiden and Kolbe, 1928, 545.

Distribution: Magga Dan 27, 29, 35, 41, 48, 62, 74; Wilkes Land.

52. EUCAMPIA ZODIACUS Ehr. 1839.

Crosby and Wood, 1958, 511, 36, 28.

Distribution: Magga Dan 36, 37.

Family CHAETOCERACEAE.

Genus CHAETOCEROS Ehr. 1844.

53. CHAETOCEROS AFFINE Lauder 1864.

Crosby and Wood, 1958, 513, 36, 54.

Distribution: Magga Dan 71.

54. CHAETOCEROS ATLANTICUM Cl. 1873.

Crosby and Wood, 1958, 513, 36, 35, *a-c*.

Distribution: Magga Dan 23, 26, 28, 42.

f. AUDAX Gran 1904.

Distribution: Magga Dan 21, 39, 41, 45, 54, 71, 73.

var. NEAPOLITANA (Schr.) Hust. 1930.

Distribution: Magga Dan 37.

55. CHAETOCEROS BOREALE Bail. 1855 (Pl. iv, fig. 29).

Crosby and Wood, 1958, 514.

Distribution: Magga Dan 20, 23, 24, 27, 28, 29, 30, 33, 51, 74.

56. CHAETOCEROS BULBOSUM (Ehr.) Heiden and Kolbe (Pl. iv, fig. 33).

Heiden and Kolbe, 1928, 526, 9, 171; *C. radiculum*, Castr., 1886, 79. Karst., 1905, 117, 15, 3; *Di cladia bulbosa* Ehr., 1844, 35A, 21, 10.

Cells solitary or in pairs; frustules somewhat octagonal; centre of valve slightly raised; setae bulbous at base, tapering sharply and often striate, striae originating in frustule itself; in the chains, the global setae are terminal. Diam. 40–50 μ . *Distribution*: Magga Dan 27, 29, 35; Wilkes Land.

57. CHAETOCEROS CASTRACANEI Karst. 1905 (Pl. iv, fig. 30).

Crosby and Wood, 1958, 514, 37, 38.

Distribution: Magga Dan 73.

58. CHAETOCEROS CONCAVICORNE Mangin 1917.

Crosby and Wood, 1958, 514, 37, 40.

Distribution: Magga Dan 23, 24, 42, 43, 45, 48, 54, 60, 74, 84, 88, 91, 92.

59. CHAETOCEROS CONVOLUTUM Castr. 1886.

Crosby and Wood, 1958, 515, 34, 47.

Distribution: Magga Dan 32, 36.

60. *CHAETOCEROS CRIOPHILUM* Castr. 1886.

Crosby and Wood, 1958, 515, 34, 48.

Distribution: Thala Dan 8; Magga Dan 21, 23, 26, 27, 28, 30, 34, 35, 36, 37, 40, 44, 45, 47, 48, 49, 50, 52, 53, 54, 56, 57, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 74, 86, 91, 92.

61. *CHAETOCEROS DEBILE* Cl. 1894.

Crosby and Wood, 1958, 515, 37, 43.

Distribution: Magga Dan 21, 35, 92; Wilkes Land.

62. *CHAETOCEROS DENTICULATUM* Lauder 1864.

Crosby and Wood, 1958, 516, 37, 45.

Distribution: Magga Dan 23, 29.

63. *CHAETOCEROS DIADEMA* (Ehr.) Gran 1897.

Crosby and Wood, 1958, 516, 37, 46.

Distribution: Magga Dan 23, 26, 27, 29, 34, 35, 42, 51, 56, 74, 84.

64. *CHAETOCEROS DICHAETA* Ehr. 1844 (Pl. v, fig. 59).

Crosby and Wood, 1958, 516, 37, 47.

Distribution: Magga Dan 20, 21, 23, 24, 26, 27, 28, 29, 30, 34, 35, 36, 37, 39, 41, 42, 43, 44, 45, 48, 49, 51, 52, 54, 56, 70, 71, 74.

65. *CHAETOCEROS DIFFICILE* Cl. 1900.

Crosby and Wood, 1958, 516, 37, 48.

Distribution: Magga Dan 36, 49, 56, 74; Wilkes Land.

66. *CHAETOCEROS FILIFERUM* Karst. (Pl. iv, fig. 31).

Karst., 1907, 392, 44, 15.

Cells in short chains, 4-12 in a chain, rectangular in girdle view, with rounded corners; valves almost circular, surface flat or slightly convex; setae arising from corners of cells, and crossing those of neighbouring cell at some distance from margin, short; aperture long and narrow, lanceolate. Diam. 20μ . *Distribution*: Magga Dan.

67. *CHAETOCEROS GAUSSII* Heiden and Kolbe (Pl. iv, fig. 43).

Heiden and Kolbe, 1928, 534, 12, 181.

Cells solitary, cylindrical; valves shallow, concave, with two long marginal hollow processes; girdle with scale-like plates. Length $100-120\mu$. *Distribution*: Magga Dan 28, 32.

68. *CHAETOCEROS LACINIOSUM* Schütt 1895.

Crosby and Wood, 1958, 517, 37, 50.

Distribution: Magga Dan 32, 56.

69. *CHAETOCEROS LORENZIANUM* Grun. 1863.

Crosby and Wood, 1958, 517, 38, 52.

Distribution: Wilkes Land.

70. *CHAETOCEROS PERUVIANUM* Brightw. 1856 (Pl. iv, fig. 32).

Crosby and Wood, 1958, 518.

Distribution: Magga Dan 23, 52, 56, 91.

71. *CHAETOCEROS SCHIMPERIANUM* Karst. 1905.

Crosby and Wood, 1958, 518, 34, 50.

Distribution: Magga Dan 21, 23, 29, 31, 34, 56, 74, 78.

72. *CHAETOCEROS SOCIALE* Lauder, 1864.

Crosby and Wood, 1958, 518, 38, 57.

Distribution: Magga Dan 36; Wilkes Land.

73. *CHAETOCEROS VANHEURCKII* Gran 1897.

Crosby and Wood, 1958, 519, 38, 59.

74. *CHAETOCEROS VISTULAE* Apstein 1909.

Wood, Crosby and Cassie, 1959, 39, 3, 39.

Distribution: Magga Dan 32, 88.

75. *CHAETOCEROS SEYCHELLARUM* Karst. (Pl. iv, fig. 34).

Karst., 1907, 387, 43, 4.

Cells in chains, drum-shaped; valve surface domed with a characteristic rectangular depression in the centre occupying about one-third valve surface; setae emerging within valve margin, and extending at right angles to chain axis; apertures narrow, with central rectangular portion due to depressions in opposing valves; chromatophores numerous, extending into setae. Diam. 30μ . *Distribution*: Magga Dan.

Sub-Order SOLENIINEAE.

Family RHIZOLENIACEAE.

Genus *RHIZOLENIA* (Ehr.) em. Brightw. 1858.

76. *RHIZOLENIA ALATA* Brightw. 1858.

Crosby and Wood, 1958, 520, 38, 62.

This species appears in various forms including the type form, and formae *indica* and *inermis*. The last does not appear north of the sub-Antarctic convergence, and its distribution will be considered separately.

f. TYPICA.

Distribution: Thala Dan 8, 9, 10; Magga Dan 2, 4, 5, 10, 11, 14, 16, 18, 20, 23, 24, 27, 28, 29, 31, 33, 36, 37, 41, 44, 45, 47, 48, 54, 57, 60, 62, 64, 69, 71, 72, 73, 76, 77, 80, 81, 82, 83, 84, 85, 86, 87, 88, 90, 91.

f. INERMIS.

Distribution: Magga Dan 21, 23, 26, 28, 30, 33, 34, 35, 36, 37, 39, 41, 42, 43, 44, 47, 48, 49, 50, 51, 52, 53, 54, 56, 57, 58, 60, 62, 63, 65, 66, 67, 68, 69, 71, 72, 74, 75, 85, 87, 92.

77. *RHIZOLENIA ANTARCTICA* Karst. (Pl. iv, fig. 35, a, b).

Karst., 1905, 95, 11, 1.

Cells cylindrical in straight chains or solitary; valves domed, low, with slightly excentric spine, emerging almost parallel to transverse axis, bent towards apical axis; intercalary bands annular. Length $60-110\mu$. *Distribution*: Magga Dan 23, 28.

78. *RHIZOLENIA BIDENS* Karst. (Pl. iv, fig. 36).

Karst., 1905, 98, 9, 13; Hend., 1937, 312.

Cells cylindrical, solitary; valves conical with large bifurcated spine, points diverging; intercalary bands scale-like, resembling those of *R. styliiformis*. Length $50-85\mu$. *Distribution*: Magga Dan 30, 36, 45, 75, 76.

79. *RHIZOLENIA CHUNII* Karst. 1905 (Pl. iv, fig. 37).

Crosby and Wood, 1958, 521, 38, 67.

Distribution: Magga Dan 20, 21, 22, 23, 24, 29, 33, 37, 45, 54, 76, 78; Lewis I.; also recorded from Eden, N.S.W., in 1959.

80. *RHIZOLENIA CRASSA* Schimper ex Karst. (Pl. iv, fig. 38).

Karst., 1905, 99, 11, 6; Hend., 1937, 314.

Cells large, usually in chains, cylindrical but may be laterally flattened; valves oblique, abruptly conical, with a long excentric spine which is swollen and hollow at base, tapering to a fine point; girdle with scale-like intercalary bands. Length $300-400\mu$. *Distribution*: Magga Dan 31, 48; Wilkes Land.

81. *RHIZOLENIA CURVATA* Zach. 1905.

Crosby and Wood, 1958, 521, 38, 69.

Distribution: Magga Dan 16, 21, 80, 85, 86, 88; Lewis I.

82. RHIZOSOLENIA CYLINDRUS Cl. 1897.

Crosby and Wood, 1958, 522, 38, 70.

Distribution: Magga Dan 21, 28.

83. RHIZOSOLENIA HEBETATA (Bail.) em. Gran 1904.

f. SEMISPINA (Hensen) Gran 1904.

Distribution: Magga Dan 3, 6, 10, 14, 18, 21, 27, 30, 33, 35, 37, 40, 42, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 56, 60, 62, 63, 64, 65, 66, 67, 69, 70, 71, 74, 82.

f. HIEMALIS Gran 1904.

Distribution: Thala Dan 9; Magga Dan 5, 9, 12, 14, 18, 21, 27, 29, 35, 41, 47, 48, 52, 56, 57, 64, 75, 85, 88, 90.

84. RHIZOSOLENIA IMBRICATA Brightw. 1858.

Crosby and Wood, 1958, 522, 39, 74.

Distribution: Magga Dan 28, 48, 80, 82, 84, 85, 88.

85. RHIZOSOLENIA RHOMBUS Karst. (Pl. iv, fig. 39).

Karst., 1905, 97, 10, 6, a-c; Hend., 1937, 317.

Frustules large, usually solitary; valves bluntly conical, oblique, with short, stout, winged spine; impression of opposing spine strongly indented into valve; girdle with scale-like intercalary markings, finely punctate. Length 400–500 μ . *Distribution*: Magga Dan 84, 85.

86. RHIZOSOLENIA ROSTRATA (Heiden and Kolbe) (Pl. iv, fig. 41).

R. alata v. *inermis* f. *rostrata* Heiden and Kolbe, 1928, 522, 9, 167.

Frustules solitary; valves tapering; spine hollow, spatulate with rounded end; intercalary bands scale-like. Length 150–250 μ . *Distribution*: Magga Dan 9, 15, 16, 17, 27, 28, 30, 31, 54, 57, 70, 86, 88.

87. RHIZOSOLENIA SIMPLEX Karst. (Pl. iv, fig. 40).

Karst., 1905, 95, 10, 1.

Cells small, cylindrical, usually solitary; frustules straight; valves acutely conical with slender tapering spine; girdle zone with very lightly outlined scale-like intercalary bands. Length 200–300 μ . *Distribution*: Magga Dan 43, 51, 91.

88. RHIZOSOLENIA STYLIFORMIS Brightw. 1858.

Crosby and Wood, 1958, 523, 34, 2.

Distribution: Thala Dan 15, 17; Magga Dan 2, 3, 10, 16, 17, 21, 28, 22, 36, 41, 44, 45, 47, 48, 54, 56, 58, 60, 64, 69, 76, 80, 81, 82, 84, 85, 86, 88, 92.

89. RHIZOSOLENIA TRUNCATA Karst. (Pl. iv, fig. 42).

Karst., 1905, 97, 10, 3a; Hend., 1937, 320.

Frustules small, cylindrical, solitary or in short chains; valves rounded, with oblique process and a projection into which opposing process fits; terminal cell of chain has straight process; intercalary markings faint. Length 100–140 μ . *Distribution*: Magga Dan 37.

Family LEPTOCYLINDRACEAE.

Genus LEPTOCYLINDRUS Cl. 1889.

90. LEPTOCYLINDRUS DANICUS Cl. 1889.

Crosby and Wood, 1958, 524, 39, 80.

Distribution: Magga Dan 9.

Genus DACTYLIOSOLEN Castr. 1886.

91. DACTYLIOSOLEN ANTARCTICUS Castr. 1886.

Crosby and Wood, 1958, 524, 39, 82.

Distribution: Magga Dan 20, 21, 22, 23, 26, 27, 28, 29, 33, 41, 42, 51, 52, 54, 74, 75, 77, 78, 84, 88, 90.

92. DACTYLIOSOLEN MEDITERRANEUS Perag. 1892.

Crosby and Wood, 1958, 524, 39, 81.

Distribution: Magga Dan 9, 16, 17, 23, 74, 75, 76, 78, 80, 81, 82, 88, 91, 92.

Family CORETHRONACEAE.

Genus CORETHRON Castr. 1886.

93. CORETHRON CRIOPHILUM Castr. 1886.

Crosby and Wood, 1958, 525, 39, 83.

The great variation in this species and the intergrades between forms described by Hendey (1937) were encountered in the Magga Dan material. This differs from the tropical strain which is uniform in appearance, but apparently identical with some of the Antarctic forms. *Distribution*: Thala Dan 8, 9, 10, 15, 16; Magga Dan 4, 6, 8, 13, 16, 21, 22, 23, 24, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 56, 57, 58, 60, 61, 62, 63, 64, 65, 66, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 80, 81, 86, 87, 88, 90, 91.

Sub-Order ARAPHIDINEAE.

Family FRAGILARIACEAE.

Genus FRAGILARIA Lyngb. 1819.

94. FRAGILARIA GRANULATA Karst. (Pl. iv, fig. 44).

Karst., 1905, 396, 45, 8; Hend., 1937, 230.

Cells in curved chains, often forming horse-shoe; valves linear-lanceolate, slightly inflated, transversely striate; valves slightly rounded in girdle view. Length 40–50 μ . *Distribution*: Wilkes Land.

95. FRAGILARIA LINEARIS Castr. (Pl. iv, fig. 45).

Castr., 1886, 56, 19, 9; Heiden and Kolbe, 1928, 550, 6, 128. *Fragilaria curta* van H., 1909, 24, 3, 37.

Cells in flat ribbon-like chains; frustules linear; valves flat, apices rounded, lateral margins straight; surface finely transversely striate; girdle simple. Length 30–50 μ . *Distribution*: Magga Dan 9, 30, 35, 36, 39, 49, 51, 52, 53, 54, 56, 58, 60, 62, 68, 69, 66, 72, 75, 86, 26, 41, 43, 48.

96. FRAGILARIA OCEANICA Cl. 1873 (Pl. iv, fig. 46).

Crosby and Wood, 1959, 2, 2, 1.

Distribution: Thala Dan 9; Magga Dan 9, 27, 28, 35, 39, 48, 58, 61, 62, 65, 68, 71, 74, 88.

97. FRAGILARIA STRIATULA Lyngb. 1819 (Pl. iv, fig. 47).

Crosby and Wood, 1959, 2, 1, 1.

Distribution: Magga Dan 8, 17, 21, 23, 24, 26, 30, 33, 35, 37, 74, 75, 76, 78, 80, 81, 82, 88, 91, 92.

98. FRAGILARIA sp. (Pl. iv, fig. 60).

Cells in chains; valves ellipsoid with acute ends, pseudoraphe evident; valves with striae transverse, those towards centre of valve interrupted. Length 40 μ . *Distribution*: Wilkes Land.

Genus FRAGILARIOPSIS. Hust. 1913.

99. FRAGILARIOPSIS ANTARCTICA (Castr.) Hust. 1913.

Crosby and Wood, 1959, 3, 2, 3a, b.

Distribution: Thala Dan 8; Magga Dan 15, 16, 20, 21, 22, 23, 24, 26, 27, 28, 29, 31, 33, 34, 39, 41, 42, 43, 45, 48, 51, 52, 53, 54, 56, 57, 62, 63, 73, 74, 76, 78, 82, 87.

Genus THALASSIOTHRIX Cl. and Grun. 1880.

100. THALASSIOTHRIX ANTARCTICA Karst. 1906.

Crosby and Wood, 1959, 4, 1, 5.

Distribution: Thala Dan 7, 8, 9, 10, 15, 16; Magga Dan 4, 6, 8, 10, 11, 16, 17, 18, 20, 21, 22, 23, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 42, 44, 45, 51, 52, 54, 56, 57, 58, 68, 69, 70, 72, 73, 76, 77, 78, 80, 82, 84, 86, 87, 88, 91.

101. THALASSIOTHRIX LONGISSIMA Cl. and Grun. 1880.

Crosby and Wood, 1959, 3, 1, 4.

Distribution: Thala Dan 4, 8, 9, 10, 15, 17; Magga Dan 1, 2, 3, 4, 5, 6, 10, 12, 14, 16, 18, 21, 27, 31, 33, 34, 35, 36, 41, 45, 46, 48, 49, 54, 56, 61, 62, 63, 64, 66, 68, 69, 71, 76, 80, 87, 88, 90, 91.

Genus LICMOPHORA Agh. 1827.

102. LICMOPHORA FLABELLATA (Carm.) Agh. 1830.

Crosby and Wood, 1959, 9, 2, 24.

Distribution: Wilkes Land.

Genus SYNEDRA Ehr. 1830.

103. SYNEDRA GAILLONII (Bory) Ehr. 1838.

Crosby and Wood, 1959, 6, 2, 14.

Distribution: Magga Dan 15.

104. SYNEDRA REINBOLDII v H. 1909.

S. spathulata Sch. in Karsten, 1905, 124, 17, 11; *S. pelagica* Hend., 1937, 335; Crosby and Wood, 1959, 5, 2, 7.

Distribution: Thala Dan 8, 11, 13, 15, 17; Magga Dan 2, 17, 18, 20, 23, 24, 36, 37, 40, 42, 45, 47, 52, 54, 56, 78.

105. SYNEDRA ULNA (Nitzsch) Ehr.

Crosby and Wood, 1959, 3.

var. AMPHIRHYNCHUS (Ehr.) Grun. (Pl. v, fig. 63).

Grun., 1862, 397; *Synedra amphirhynchus* Ehr., 1841, 3, 1, 25.

Sub-Order MONORAPHIDINEAE.

Family ACHNANTHACEAE.

Genus ACHNANTHES Bory 1822.

106. ACHNANTHES BREVIPES Agh. 1824.

Crosby and Wood, 1959, 13, 3, 37.

Distribution: Wilkes Land.

107. ACHNANTHES TAENIATA Grun. in Cl. and Grun. 1880.

Wood, 1960, 2, 48.

Distribution: Wilkes Land.

Genus COCCONEIS Ehr. 1838, em. Grun. 1868.

108. COCCONEIS IMPERATRIX A.S. (Pl. iv, fig. 48, a, b).

A.S., 1894, 189, 11-15; Hend., 1937, 342, 10, 8-9.

Cells elliptical, large; valves dissimilar; upper very ornate; raphe fine; hyaline area narrow, central area broad, dilated reaching margin; surface furrowed, furrows with two rows of puncta which also occur in the marginal loculi; lower valve with fusiform pseudoraphe, furrows with double row of puncta but no submarginal hyaline ridge. Length 80-120 μ . *Distribution*: Wilkes Land.

Sub-Order BIRAPHIDINEAE.

Family NAVICULACEAE.

Genus NAVICULA Bory 1794.

109. NAVICULA MEMBRANACEA Cl. (Pl. iv, fig. 49).

Cl., 1897, 24, 2, 25-28; Hend., 1937, 345, 11, 4.

Cells in straight chains; frustules in valve view linear with slight median inflation and pointed apices; in valve view rectangular with wide girdle; chromatophores two undulating ribbons. Length 60-70 μ . *Distribution*: Magga Dan 30, 56, 60, 71.

Genus TRACHYNEIS Cl. 1894.

110. TRACHYNEIS ASPERA (Ehr.) Cl. 1894.

Crosby and Wood, 1959, 22, 5, 63.

Distribution: Magga Dan 21, 42; Wilkes Land.

Genus PLEUROSIGMA W. Sm. 1853.

111. PLEUROSIGMA DECORUM W. Sm. (Pl. v, fig. 52).

W. Sm., 1853, 63, 21, 196.

Valves lanceolate, sigmoid, apices acute, one margin slightly angled opposite central nodule; raphe very sigmoid, close to margin from half-way between central nodule and apices; striae fine. Length 80μ . *Distribution*: Magga Dan 28; Wilkes Land.

112. PLEUROSIGMA DIRECTUM Grun. 1880 (Pl. iv, fig. 51).

Wood, 1960, 4, 100.

Distribution: Thala Dan 9; Magga Dan 9, 21, 24, 27, 30, 33, 34, 56, 69.

Genus AMPHIPRORA Ehr. 1843.

113. AMPHIPRORA ALATA (Ehr.) Kütz. 1844.

Crosby and Wood, 1959, 31, 7, 91.

Distribution: Wilkes Land.

114. AMPHIPRORA KJELLMANII Cl. (Pl. v, figs 53-64).

Cl. and Grun., 1880, 15, 4, 83; Hend., 1937, 349.

Cells large, solitary, twisted about valve axis; valves elliptic-lanceolate, apices rounded, keel prominent, winged; alae sigmoid, striate, striae medium; girdle zone complex, plicate. Length 125μ . *Distribution*: Wilkes Land.

Genus TROPIDONEIS Cl. 1891.

115. TROPIDONEIS ANTARCTICA (Grun.) Cl. (Pl. iv, fig. 50).

Cl., 1894, 24; Karst., 1905, 128, 18, 7; Hend., 1937, 350.

Cells large, weakly siliceous; valves linear-elliptic; not winged; lateral area narrow, dilated at middle into a narrow stauros; surface finely striate; striae transverse, divergent near apices; girdle view slightly constricted at central nodule, girdle zone simple. Length $100-160\mu$. *Distribution*: Magga Dan 41, 42, 51, 27, 37, 46, 52, 54, 56, 60, 70, 77.

Family BACILLARIACEAE.

Genus NITZSCHIA Hassall, 1845, em. Grun. 1880.

116. NITZSCHIA CLOSTERIUM (Ehr.) W. Sm. 1853.

Crosby and Wood, 1959, 33, 1, 17.

Distribution: Magga Dan 40.

117. NITZSCHIA COMPRESSA (Bail.) Boyer 1926 (Pl. v, fig. 61).

Wood, 1960, 6, 174.

Distribution: Magga Dan.

118. NITZSCHIA GRANULATA Grun. 1880.

Wood, 1960, 6, 178.

Distribution: Magga Dan.

119. NITZSCHIA LONGISSIMA (Breb.) Ralfs 1861.

Crosby and Wood, 1959, 38, 1, 16.

Distribution: Magga Dan 2, 14, 30, 34, 35, 37, 45, 56, 60, 73, 86, 88.

120. NITZSCHIA MARTIANA (Ag.) Schütt 1896.

Crosby and Wood, 1959, 39, 1, 24.

Distribution: Wilkes Land.

121. NITZSCHIA PACIFICA Gupp 1843.

Crosby and Wood, 1959, 39, 1, 23.

Distribution: Magga Dan 9, 15, 21, 23, 26, 27, 28, 29, 30, 31, 33, 35, 36, 37, 42, 41, 46, 47, 45, 62, 74, 84.

122. *NITZSCHIA PELAGICA* Karst. (Pl. v, fig. 54).

Karst., 1905, 129, 18, 10; Hend., 1937, 352.

Cells large, elliptic-lanceolate, apices acute; raphe central, distinct; girdle zone deep. simple. Length 250 μ . *Distribution*: Magga Dan.

123. *NITZSCHIA SERIATA* Cl. 1883.

Crosby and Wood, 1959, 38, 1, 18.

Distribution: Magga Dan 16, 21, 22, 23, 24, 27, 31, 34, 41, 61, 64, 73, 74, 76, 77, 80, 83, 86, 88.

124. *NITZSCHIA TRYBLIONELLA* Hantzsch 1859.

Wood, 1960, 6, 185.

Distribution: Magga Dan 27, 34, 42, 43, 45, 48, 51, 56, 60, 62.

Genus *CHUNIELLA* Karst. 1905.

Frustules with a more or less excentric keel and raphe; keel puncta may be present.

125. *CHUNIELLA ANTARCTICA* Karst. (Pl. v, fig. 55).

Karst., 1905, 130, 18, 14.

Cells solitary or in pairs, in girdle view lanceolate with blunt ends and a slight median constriction, in valve view lanceolate evenly tapering to pointed ends, raphe strongly excentric, borne on keel; chromatophores small, spherical. Length 180 μ . *Distribution*: Magga Dan 23, 24, 27, 28.

126. *CHUNIELLA OCEANICA* (Karst.) Hend. (Pl. v, fig. 56, a, b).

Hend., 1937, 353; *Navicula oceanica* Karst., 1905, 126, 18, 4.

Frustules large, usually solitary; valves broadly lanceolate, apices acute; surface apparently hyaline; raphe excentric, slightly depressed in the middle; girdle view truncate-elliptic, ends rounded, girdle simple. Length 200 μ . *Distribution*: Magga Dan 16, 20, 21, 23, 24, 27, 28, 29, 31, 33, 41, 42, 51, 52, 56, 61, 68, 75.

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EXPLANATION OF PLATES III-V.

Plate iii

1, *Melosira sphaerica*; 2, *M. polaris*; 3, *Hyalodiscus kerguelensis*; 4, *Thalassiosira antarctica*; 5, *T. condensata*; 6, *Coscinosira antarctica*; 7, *Coscinodiscus comptus*; 8, *C. gemmatulus*; 9, *C. griseus*; 10, *C. incurvus*; 11, *C. intermittens*; 12, *C. kryophilus*; 13, *C. lentiginosus*; 14, *C. stellaris*; 15, *C. subtilis*; 16, *Ethmodiscus subtilis*; 17, *Schimperella antarctica*; 18, a, b, *S. valdiviae*; 19, a, b, *Actinocyclus bifrons*; 20, *A. intermittens*; 21, *A. janus*; 22, a, b, *A. umbonatus*; 23, *Asteromphalus beaumontii*; 24, *A. hookeri*; 25, a, b, *A. antarcticus*.

Plate iv.

26, *Asteromphalus roperianus*; 27, *Biddulphia anthropomorpha*; 28, *B. weissflogii*; 29, *Chaetoceros borealis*; 30, *C. castracanei*; 31, *C. filiferum*; 32, *C. peruvianum*; 33, *C. bulbosum*; 34, *C. seychellarum*; 35, a, b, *Rhizosolenia antarctica*; 36, *R. bidens*; 37, *R. chunii*; 38, *R. crassa*; 39, *R. rhombus*; 40, *R. simplex*; 41, *R. rostrata*; 42, *R. truncata*; 43, *Chaetoceros gaussii*; 44, *Fragilaria granulata*; 45, *F. linearis*; 46, *F. oceanica*; 47, *F. striatula*; 48, a, b, *Cocconeis imperatrix*; 49, *Navicula membranacea*; 50, *Tropidoneis antarctica*; 51, *Pleurosigma directum*.

Plate v.

52, *Pleurosigma decorum*; 53, *Amphiprora kjellmanii*; 54, a, b, *Nitzschia pelagica*; 55, *Chuniella antarctica*; 56, a, b, *Ch. oceanica*; 57, *Triceratium antarcticum*; 58, *Eucampia balaustium*; 59, *Chaetoceros dichæta*; 60, *Fragilaria* sp.; 61, *Nitzschia compressa*; 62, *Melosira sol*; 63, *Synedra ulna* v. *amphirhynchus*; 64, *Amphiprora kjellmanii*; 65, *Actinocyclus* sp. a; 66, *Actinocyclus* sp. b; 67-9, *Coscinodiscus asteromphalus*.



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