Studies on Australian and New Zealand Diatoms

III.—Descriptions of Further Discoid Species

By E. J. Ferguson Wood, L. H. Crosby, and Vivienne Cassie*

[*Received by the Editor, February 2, 1959.*]

Abstract

Thirty-seven species of discoid diatoms are described and illustrated, including four new species and two which are probably unnamed.

The new species are *Stephanopyxis orbicularis* sp. nov., which is common in New Zealand estuaries and in Cook Strait, *Planktoniella florea* sp. nov., which occurs in the Port Hacking region, *Biddulphia cylindrata* sp. nov., which occurs in the Arafura and Timor Seas, and an apparently new *Gossleriella* (*G. punctata* sp. nov.) which also occurs in New Zealand waters and off Jervis Bay.

Since the publication of Parts I and II of this series (Crosby and Wood, 1958, 1959), a large number of additional species has been recorded from Australia and New Zealand. In this paper the species belonging to the Coscinodiscaceae, Actinodiscaceae, Auliscaceae, Biddulphiaceae, Chaetoceraceae, and Rhizosoleniaceae are described and illustrated.

Family COSCINODISCACEAE

Genus Melosira Agh.

1. **Melosira undulata** (Ehr.) Kütz. (Plate 15, Fig. 1)

Kütz., 1844, 54.
A. S., 1892, 176, 4–6.
Boyer, 1927, 28.
A. S., 1893, 180, 1–7, 14, 16, 17, 21.
Ehr., 1840, 17.

Frustules usually solitary, in pairs, or short chains, with valves of opposite frustules united; usually broader than long, constricted near margin; valves with 6 to 12 internal projections, forming with the outline of the constriction a polygonal figure with the circumference; valve surface with radiating lines of puncta, replaced near centre by numerous coarse granules. Dia. 20μ.

Distribution. Fresh water; New Zealand: Wellington.

2. **Melosira granulata** (Ehr.) Ralfs. (Plate 15, Fig. 2)

Ralfs in Pritch., 1861, 820.
Gallionella granulata Ehr., 1838, 170.

Frustules cylindrical, of variable length; may be slender, elongate or broad and short, with wide apertures; in girdle view with large puncta arranged spirally or longitudinally, with also a more or less transverse arrangement in valve view and denticulate margin and a row of puncta, centre hyaline or with scattered puncta. Dia. 10–20μ.

Distribution. Has apparently a wide salt temperature range. Weber Deep (7,400 m, ex Galathea). Australia: Darwin, north Australian phytoplankton (Arafura Sea), Heron I. (coral reef), Nepean R. New Zealand: Wellington, L. Ellesmere.

3. **Melosira distans** ? (Ehr.) Kütz. (Plate 15, Fig. 3)

Kütz., 1844, 54.
Gallionella distans Ehr., 1838, 170.
A. S., 184, 4–5.

Frustules slender, with furrow on each side of suture forming a hyaline band; puncta in longitudinal rows. Dia. 10μ.

---

* New Zealand Oceanographic Institute Contribution No. 67.

DISTRIBUTION. Fresh water. Australia: Nepean R. Recorded from Australasia by Ehrenberg, 1869, and Boyer, 1927.

Genus CYCLOTELLA (Kütz.) Grun.

4. **Cyclotella stelligera** Cl. & Grun. (Plate 15, Fig. 4)

Cl. & Grun., ex Hust., 1942.
A. S., 1900, 222, 48, 49.
Hust. in Huber-Pest., 397, 484.

Cell almost discoid but raised in centre on one valve, the other correspondingly depressed; marginal zone about ¼ radius with strong, radial costae; central area with radial costae forming a star, usually a single punctum in centre; area between star and marginal zone with radial or irregular puncta. Dia. 5–25μ.

DISTRIBUTION. Australia: Heron I. in coral sand. New Zealand: L. Ellesmere, Rotorua (Cleve, 1881).

Genus HYALODISCUS Ehr.

5. **Hyalodiscus pustulatus** A.S. (Plate 15, Fig. 5)

A. S., 1891, 140, 15.

Frustule elliptical in girdle view; valves almost hemispherical; surface finely but somewhat irregularly punctate, giving an impression of areolae; small spinulae present in outer portion of valve; central area hyaline small; margin radially striate. Dia. 40–90μ.

DISTRIBUTION. New Zealand: L. Ellesmere, Canterbury.

TYPE LOCALITY. Gulf of Carpentaria, A. S., 1891.

6. **Hyalodiscus subtilis** Bail. (Plate 15, Fig. 6)

Bail., 1854, 10, 1.12.
A. S., 1888, 139, 15 (unidentified).

Valves circular, central area about ½ valve diameter, and with fine, irregularly radial puncta and an irregular margin; rest of valve with no visible ornamentation or extremely fine radial puncta; margin clear. Dia. 80μ.

DISTRIBUTION. Australia: Gippsland Lakes. Samoa (A. S.). New Zealand: Dunedin area (Rawson coll.), Oamaru (Gr. and St., 1887), Campbell I. (Petit, 1877).

Genus STEPHANOPYXIS Ehr.

7. **Stephanopyxis orbicularis** sp. nov. (Plate 15, Figs. 7a and 7b)

Cellae corpore paene orbiculari, paucis filis, 4–9, coniunctae inter cellas vertebratis, dimidio inter centrum valvae et marginem ortis. Superficies valvae tenuiter et aequaliter areolata; cinctus delicatus; sculptura omnino obscuranta. Dia. 25–30μ.

Cells almost orbicular, connected by a few (4–9) straight threads obviously joined between cells and arising about half way from centre of valve to margin; valve surfaces very finely and evenly punctate, girdle delicate without visible sculpture. Dia. 25–30μ.

DISTRIBUTION. Planktonic in New Zealand coastal waters.

Genus COSCINODISCUS Ehr.

8. **Coscinodiscus gazellae** Jan. ex Grun. (Plate 15, Fig. 8)

Grun., 1879, 688.
Ethmodiscus gazellae Hendey, 1937.

Cells very large, cylindrical, circular in valve view, sub-rectangular in girdle view; valves convex, central area flat to depressed; surface with very fine puncta in radial lines; central area small; girdle deep, simple; weakly siliceous and may be confused with *C. rex*, but does not have small protuberances. Dia. 700–1,000μ.

DISTRIBUTION. Australia: Arafura Sea, Queensland coast.

9. **Coscinodiscus lacustris** Grun. (Plate 15, Fig. 9)

Grun., in Cl. & Grun., 1880, 114.
A. S., 1901, 225; 16.
Boyer, 1927, 59.
Cyclotella punctata W. Sm., 1856.
Stephanodiscus punctatus Grun., 1878.

Frustule in girdle view undulate, in valve view circular, but slightly irregular in diameter; valves punctate, puncta radiate, but interrupted by two depressed areas, one on either side of

centre. Dia. 40μ.

DISTRIBUTION. Australia: Gippsland Lakes.

10. **Coscinodiscus lineatus** Ehr., 1838 (Plate 15, Fig. 10 a, b)

Ehr., 1840. (v. also Part I).

The figure quoted above shows two valves of one frustule, one with the characteristics of *C. lineatus* and one with those of *C. radiatus*; this suggests a close connection between the two species, if indeed they are not identical.

DISTRIBUTION. New Zealand: L. Ellesmere.

11. **Coscinodiscus nitidus** Greg. (Plate 15, Fig. 11)

Greg., 1857, 449, 10, 45.
C. nitidus A. S., 1876, 58, 20, 21.
Boyer, 1916, 21, 2, 19.

Valves circular, irregular or subtriangular; surface flat, without central space; puncta radiating, larger, and scattered in centre. Dia. 25μ.

DISTRIBUTION. Australia: Heron I.

12. **Coscinodiscus oculus iridis** Ehr. (Plate 15, Fig. 12)

Ehr., 1841, 147.
Cupp, 1943, 62, 26, 3, 2.

Cells discoid; valve slightly concave; hyaline area may be present, rosette usually large, areolae large, somewhat radial and in two curved excentric, intersecting rows; margins small. Dia. 100–300μ.

DISTRIBUTION. Australia: Northern Coral Sea, Torres Strait, Arafura Sea, Cairns. New Zealand: Hauraki Gulf.

13. **Coscinodiscus rex** Wallich (Plate 15, Fig. 13)

Wall., 1879, 688.
Ratt., 1890, 568, 120.
A. S., 114, 7.
Ethmodiscus rex Wiseman and Hendey, 1953, 48.

Valves circular; surface flat to slightly convex; margin flat, mantle sudden, deep; narrow hyaline band or valve margin; surface with straight radiating lines of puncta, slightly closer near margin, with irregular hyaline areas nearer centre where puncta are arranged round small processes 10μ long; girdle deep, imbricate. Dia. 1–1.5 mm.

DISTRIBUTION. Rare in vicinity of slope current off eastern Australia.

14. **Coscinodiscus asteromphalus** Ehr. (Plate 15, Fig. 14)

Ehr., 1844, 77.
A. S., 63, 5.
Boyer, 1916, 23, 2, 16.

Valves convex, with a small central space surrounded by a rosette of large polygonal cells from which radiate hexagonal areolae increasing to about half way to margin, then decreasing; valve punctate. Dia. 100–120μ.

DISTRIBUTION. New Zealand: Otago Peninsula.

15. **Coscinodiscus rothii** (Ehr.) Grun. (Plate 15, Fig. 15)

Grun., 1878, 125.
Boyer, 1927, 51.
Heterostephania rothii Ehr., 1854, 35, 13, 4, 5.
C. symmetricus A. S., 57, 25–27.

Valve convex, central space absent; surface areolate, areolae hexagonal, even, in fasciculate rows; short apiculi at the middle of the outer margin of each fascicle. Dia. 80μ.

DISTRIBUTION. Australia: Heron I.

16. **Coscinodiscus janischii** A.S. (Plate 15, Figs. 16 a, b, c.)

A. S., 1878, 64, 34.
Boyer, 1927, 56.
Karsten, 1907, 155, 25, 9.
C. wailesii Gran and Angst, 1931, 448, 26a-c.

Cells drum-shaped in girdle view with deep girdle and valve mantle; girdle without visible sculpture, mantle areolate; valve concave, slightly undulate, surface areolate with hyaline central area. Gran and Angst depict a central portion very like that of *C. gigas*, but with the areoles in less regular radial lines; in our samples, the girdle view is that of

C. wailesii as described by Gran and Angst, but in valve view the sculpture resembles that of *C. janischii* A. S., which Boyer (1927) regards as close to *C. gigas*. The valve view of *C. wailesii* is very similar to that of *C. diorama* A. S., a synonym of *C. gigas*, but we have no record of the girdle view of this fossil form. A few of our specimens did show a valve sculpture similar to that of *C. gigas*, which is often somewhat concave in valve surface, but discoid rather than drum-shaped.

DISTRIBUTION. New Zealand: Wellington Harbour as dominant.

17. **Coscinodiscuis strigillatus** Witt (Plate 15, Fig. 17)

Witt, 1877.
A. S., 1890, 138, 20.
Haynaldiella antiqua Pant., 1892.
C. antiquus Karst. 1928, 213.

Cells discoid; valves domed, areolate, with an irregularly patterned surface, appearing hirsute under low-power magnification. Dia. 30–60μ.

DISTRIBUTION. New Zealand: Wellington Harb. Antarctic.

Genus GOSSLERIELLA Schutt

18. **Gossleriella punctata** sp. nov. (Plate 16, Fig. 18)

Cellae circulares; valvae cum area centrale, punctisque radialibus; spinis et longis fortibus et brevis tenuibus e margino extendentibus.

Frustules discoid; valve with central area and large radial puncta; marginal spines of 2 orders, one stout and about half length of cell radius, the other lying between the larger spines, much finer and shorter. Dia. 80μ.

DISTRIBUTION. Australia: East of Jervis Bay. New Zealand: Cook Strait, Port Chalmers.

Genus PLANKTONIELLA (Wallich) Schütt

19. **Planktoniella florea** sp. nov. (Plate 16, Fig. 19)

Cella corpore circulare crasse areolato, alaque pellucida circumstante; a circiter septem radiis sustinente.

Cell discoid, valve convex, coarsely areolate, surrounded by a translucent wing which is supported by 7 rays, and slightly undulate between rays.

DISTRIBUTION. Australia: Planktonic, off Port Hacking.

Family ACTINODISCACEAE

Genus ACTINOCYCLUS Ehr., 1837, em. Ratt., 1890

Valves circular to elliptical; surface convex, flat near centre, occasionally undulating; central space more or less evident, circular or irregular usually with scattered granules; markings areolate or granular, round or punctate in radial, interrupted or fasciculate rows which are slightly curved parallel to the central or to a marginal row; marginal portion with decussating lines; hyaline interspaces may be prominent at border; apiculi often present; pseudonodule usually present.

20. **Actinocyclus octonarius** Ehr. (Plate 16, Fig. 20)

Ehr. 1838, 172, 21, 7.
Ralfs in Pritch., 1861.
Eupodiscus ralfsii W. Sm. 1856.2.86.
Actinoptychus interpunctatus Brightw., 1860.
A. ehrenbergii Ralfs. 1861.
A. barklyi (Coates). Boyer, 1927.

Cells solitary, discoid; central space round or irregular with scattered granules; surface flat for about half diameter, then rounded, divided into wedges by hyaline interspaces, frequently granular; puncta roughly concentric, and radial; circular pseudonodule near margin; size and colour very variable.

DISTRIBUTION. Australia: Heron I. Yarra (as *A. barklyi*; (Coates) by Boyer, 1927). New Zealand: (Brightw., 1860) Foveaux Str., Lyall B. (Petit, 1877.39). Ostenfeld (1915) remarks and we concur that *A. ralfsii* and *A. ehrenbergii* (= *A. octonarius*) cannot be maintained as separate species. *A. moniliformis* Ralfs probably belongs to this rather variable species (v. Boyer, 1927, 85) and has been found on Heron I.

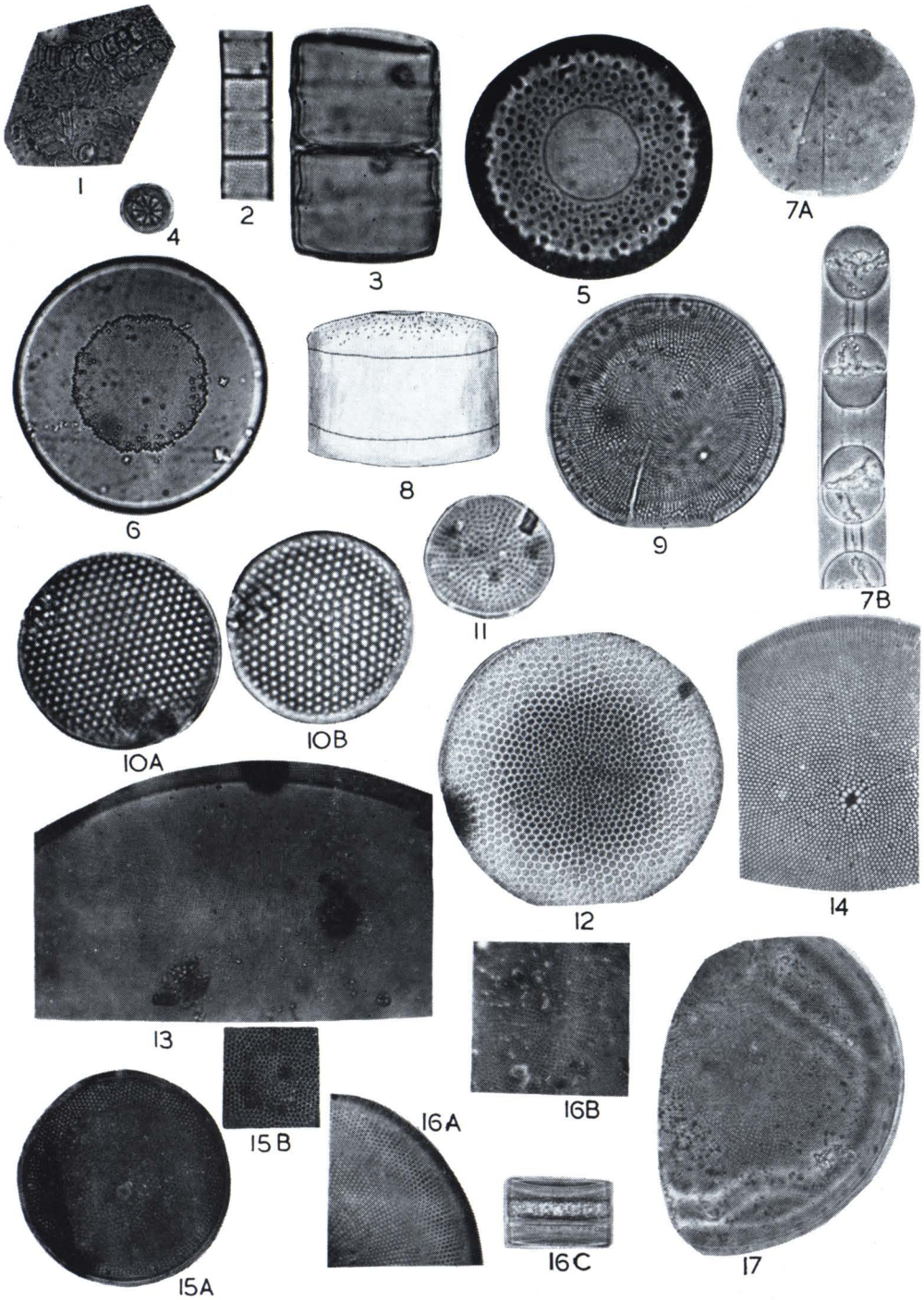

Fig. 1.—*Melosira undulata* (Ehr.) Kütz. Fig. 2.—*M. granulata* (Ehr.) Ralfs. Fig. 3.—*M. distans* ? (Ehr.) Kütz. Fig. 4.—*Cyclotella stelligera* Cl. & Grun. Fig. 5.—*Hyalodiscus pustulatus* A.S. Fig. 6.—*H. subtilis* Bail. Fig. 7.—*A. B. Stephanopyxis orbicularis* sp. nov. Fig. 8.—*Coscinodiscus gazellae* Jan. ex Grun. Fig. 9.—*C. lacustris* Grun. *Fig.* 10.—A.B. *C. lineatus* Ehr. Fig. 11.—*C. nitidus* Greg. Fig. 12.—*C. oculus iridis* Ehr. Fig. 13.—*C. rex* Wallich. Fig. 14.—*C. asteromphalus* Ehr. *Fig.* 15.—*C. rothii* (Ehr.) Grun. Fig. 16.—A.B.C. *C. janischii* A.S. Fig. 17.— *C. strigillatus* Witt.

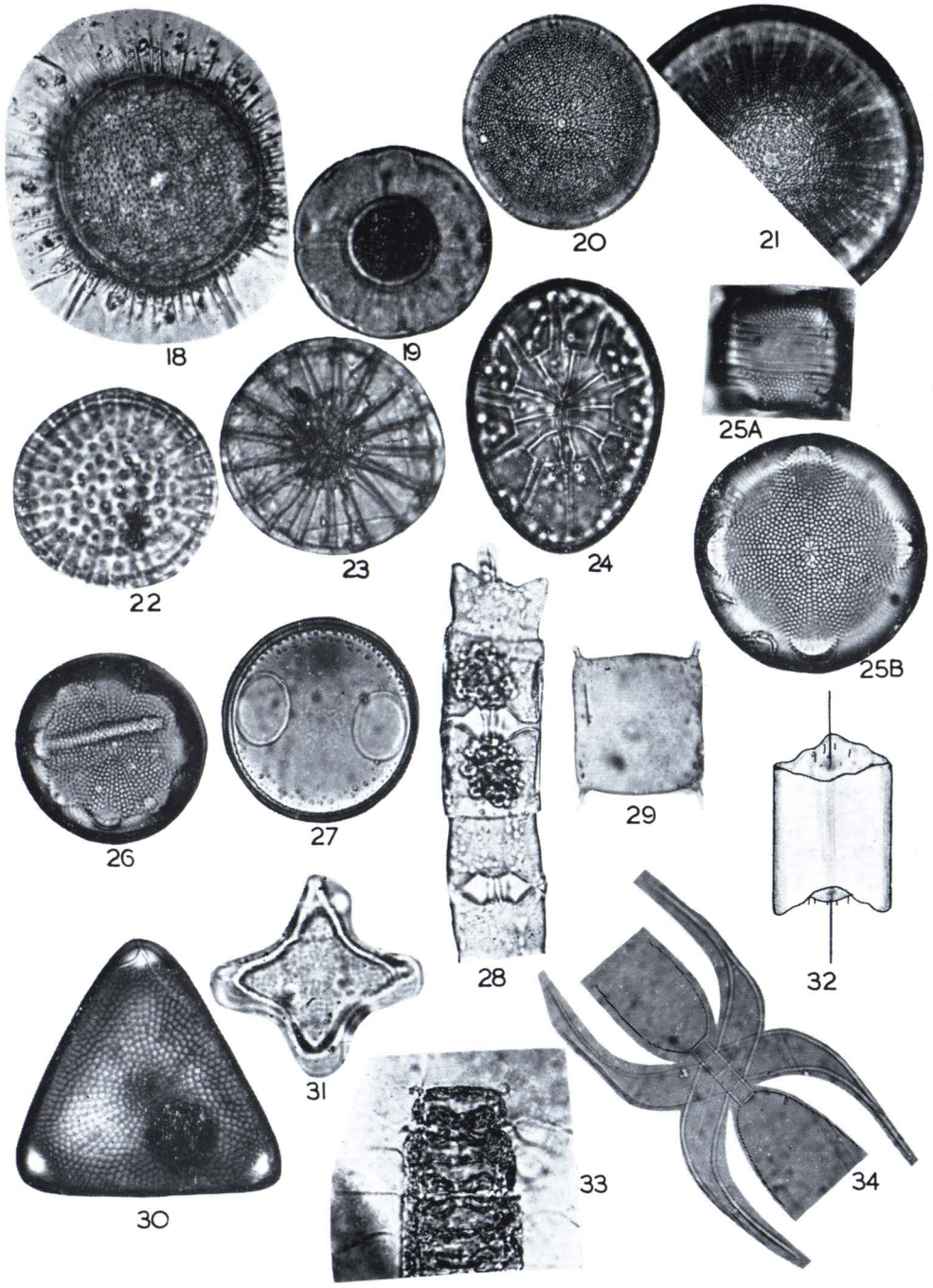

Fig. 18.—*Gossleriella punctata* sp. nov. Fig. 19.—*Planktoniella florea* sp. nov. Fig. 20.—*Actinocyclus octonarius* Ehr. Fig. 21.—*Cosmiodiscus elegans* Grev. Fig. 22.—*Stictodiscus argus* A.S. Fig. 23.—*Asteromphalus elegans* Grev. Fig. 24.—*A. flabellatus* (Breb.) Grev. Fig. 25.—A.B. *Aulacodiscus kittonii* (Arn.) Ralfs. Fig. 26.—*Aulacodiscus angulatus* Grev. Fig. 27.—*Auliscus punctatus* Bail. Fig. 28.—*Biddulphia aurita* var. *obtusa* (Kütz.) Hust. Fig. 29.—*B. cylindrata* sp. nov. Fig. 30.—*Triceratium arcticum* Brightw. Fig. 31.—*T. biquadratum* Jan. Fig. 32.—*Ditylum sol* (Grun.) de Toni. Fig. 33.—*Chaetoceros armatum* Tuffen West. Fig. 34.—*C. diversum* Cl.

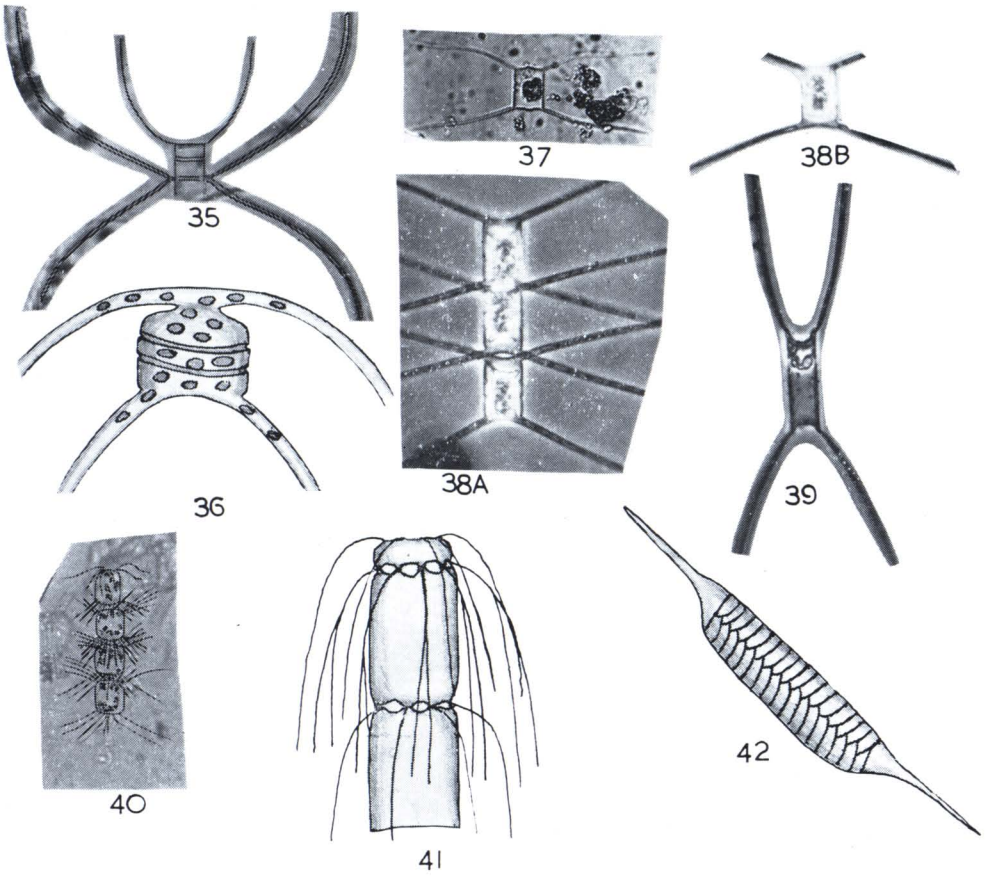

FIG. 35.—*Chaetoceros laeve* Leud. Fort. Fig. 36.—*C. pendulum* Karst. *Fig.* 37.—*C. simplex* Ost. Fig. 38, a, 2.—*Chaetoceros* sp. Fig. 39.—*C. vistulae* Apstein. Fig. 40.—*Bacteriastrum Hyalinum* Lauder. Fig. 41.—*B. comosum* Pav. Fig 42.— *Rhizosolenia eriensis* H. L. Sm.

Genus COSMIODISCUS Grev. 1866

Cell in girdle view undulate, in valve view circular, with a number (up to 25) of rays ending in small tubercles; surface and rays punctate, puncta in definite fasciculate radial rows, varying in number of rows between rays; central area clear.

21. **Cosmiodiscus elegans** Grev. (Plate 16, Fig. 21)

Grev., 1866, 79, 13.
Actinocyclus elegans Kars., 1905, 93, 9, 9.
Coscinodiscus perikompsos Ratt., 1890, 576.
A. S., 1892, 229, 2.

Description as for genus. Dia. 30–80μ.

The genus *Cosmiodiscus*, established by Greville, was abandoned by Rattray, and the species, with the exception of *C. imperfectus*, transferred to the genus *Coscinodiscus*. We believe that *Cosmiodiscus elegans* Greville has a great deal more in common with the genus *Actinocyclus* than with *Coscinodiscus*—e.g., the fasciculate arrangement and the form of the puncta. Our specimen did not have a pseudonodule, but this is not always present in *Actinocyclus*. It seems best, therefore, to retain the genus *Cosmiodiscus*, which contains one species, *C. elegans*.

DISTRIBUTION. Australia: Gippsland Lakes; a form previously recorded from Torres Strait (A. S., 1902, 229, 1).

Genus STICTODISCUS Grev., 1861

Frustules solitary, discoid or prismatic; valves circular or angular with coarse granules separated by radiating lines more evident near margin where they may appear costate; no central space.

22. **Stictodiscus argus** A.S. (Plate 16, Fig. 22)

A. S., 1875, 74, 12.

Valves circular, slightly domed, with radial costae extending about ⅓ radius from margin, and large, almost quadrate puncta radially arranged, almost as wide as intercostal space at margin, somewhat smaller and rounder towards centre. Dia. 30–40μ.

DISTRIBUTION. Sahul Bank (Timor Sea).

Genus ASTEROMPHALUS Ehr.

23. **Asteromphalus elegans** Grev. (Plate 16, Fig. 23)

Grev., 1859, 161, 7, 6.
Hendey, 1937, 269.
A. S., 1876, 38, 1, 2.
A. wyvillii Castr. 1886, 134, 5, 6.

Cells discoid, flat; valves circular in outline, surface divided into 12–26 sectors by narrow, regular rays; central area large, hyaline, nucleal line looped, system of lines running therefrom to rays which are regular and even; sectors finely punctate. Dia. 100–150μ.

DISTRIBUTION. Australia: Princess Charlotte B.

24. **Asteromphalus flabellatus** (Bréb.) Grev. (Plate 16, Fig. 24)

Grev., 1859, 160.
Boyer, 1927, 74.
Spatangidium flabellatus Bréb., 1857, 297.

Valves oval; hyaline area about half diameter; rays from approximate segments nearly parallel, connected by single rays to lateral segments which are usually from 6 to 9; interspaces rather narrow, not expanded, slightly attenuated near border; markings punctate, small. Length, 40–60μ.

DISTRIBUTION. Australia: L. Macquarie, Heron I. New Zealand: Hauraki G., Lyall B. (Petit, 1877).

Genus AULACODISCUS Ehr.

25. **Aulacodiscus kittonii** (Arn.) Ralfs (Plate 16, Fig. 25, a and b)

Arnott MS.
Ralfs in Pritch., 1861, 844.
Boyer, 1927, 79.

Valves circular, surface slightly domed to ⅓ dia., then depressed with four slightly raised processes which are rounded, and may be within or slightly projecting beyond margin; central

rosette of angular areolae present; hexagonal areolae on valve, in two rows on processes radiating from central area. Dia. 150–200μ.

DISTRIBUTION. Australia: Paynesville, Heron I. New Zealand: Manukau Harb., Muriwai, Waiterere, Type loc. Bay of Islands.

26. **Aulacodiscus angulatus** Grev., 1863. (Plate 16, Fig. 26)

Grev., 1863, 71, 5, 15.

Valve convex, margin circular, central zone round to angular, strongly raised, sloping towards processes; surface areolate, areolae delicate; primary rays hyaline, narrow. Dia. 60–70μ.

DISTRIBUTION. Australia: Heron I.

Family AULISCACEAE

Genus AULISCUS Ehr.

27. **Auliscus punctatus** Bail. (Plate 16, Fig. 27)

Bail, 1853, 5.

Boyer, 1927, 91.

A. S., 31, 8, 9; 61, 7, 8; 89, 14–17.

Valves elliptical; surface punctate, puncta connected by delicate lines radiating from a round central space, more evident on transverse area and less evident near processes; processes 2, large. Variations occur in which puncta are more evenly distributed, and transverse area less evident. Dia. 120μ.

DISTRIBUTION. Australia: L. Macquarie, Gulf of Carpentaria (A. S., 1875, 31); New Zealand: Oamaru (Gr. & St., 1887, 77).

Family BIDDULPHIACEAE

Genus BIDDULPHIA Gray, 1821.

28. **Biddulphia aurita** var. **obtusa** (Kütz.) Hust. (Plate 16, Fig. 28)

Hust., 1930, 1, 484, 502.

Odontella obtusa Kütz., 1844, 137, 18, 8, 1–3, 6–8.

Differs from type in shortness of processes and absence of central spines.

DISTRIBUTION. New Zealand: Wellington Harbour.

29. **Biddulphia cylindrata** sp. nov. (Plate 16, Fig. 29)

Cellae corpore cylindrato, amplo; quadratae aspectu a latere, a valvis rotundatae, marginibus teretibus, et prope ad margines duobus tuberculis minutis duabusque spinis; areolae obscurantissimae; chloroplastae parvae, permultae; primo aspectu Coscinodisco concinno similis videtur. Dia. 100–200μ.

Cells large, rotund, square to rectangular in girdle view, circular in valve view, with rounded margins and two small, capitate processes and two small spines close to margins; areolations very faint; chloroplasts small, numerous; appears at first sight like *Coscinodiscus concinnus*. Dia. 100–200μ.

DISTRIBUTION. Australia: Arafura Sea.

Genus TRICERATIUM Ehr.

30. **Triceratium arcticum** Brightw. (Plate 16, Fig. 30)

Brightw., 1853, 250.

A. S., 1885, 79, 12–13.

Cells rectangular in girdle view; valves triangular, sides straight or slightly curved; valve surface slightly convex, processes extremely blunt, not projecting above valve nor constricted on valve mantle. Dia. 200μ.

DISTRIBUTION. South of New Zealand (H.M.N.Z.S. Pukaki), Oamaru (Gr. & St., 1886, 326).

31. **Triceratium biquadratum** Jan. (Plate 16, Fig. 31)

Jan. in A. S., 1886, 98, 4–6.

Cells solitary; valves quadrangular with slightly or deeply concave sides and rounded angles; processes large, very short, truncate, frequently unequal; surface with coarse, rounded or hexagonal reticulations, smaller at centre, from which they radiate forming concentric circles with thickened walls; secondary layer punctate; ends of processes minutely punctate. Dia. 60–100μ.

Mills (1933) regards *T. biquadratum* Jan. as a synonym of *T. biharense* Part. 1892. If we are consistent in regarding Schmidt's illustrations as adequate authorship (and this is frequently done for other species) his name must stand, in which case *T. biharense* would be a synonym of *T. biquadratum*.

DISTRIBUTION. Australia: Heron I., Booby I.

Genus DITYLUM Bail.

32. **Ditylum sol** (Grun.) de Toni (Plate 16, Fig. 32)

de Toni, 1894, 1018.
Hendey, 1937, 285, 12, 4.
Triceratium sol Grun. in vH, 1881, 115.

Cells solitary triangular in valve view, rectangular in girdle view; surface of valve undulate, central area with fine puncta in curved, radiating lines, but hyaline in centre; single central spine and several smaller spines arising from edge of hyaline area; marginal area with fine puncta in more or less parallel lines; margin crenulate; girdle simple, punctate; chromatophores numerous. Length on pervalvar axis 40–80μ.

DISTRIBUTION. Australia: Arafura Sea, Torres Str., Princess Charlotte B., Cairns; tropical, rare off northern New South Wales coast.

Family CHAETOCERACEAE

Genus CHAETOCEROS Ehr.

33. **Chaetoceros armatum** Tuffen West (Plate 16, Fig. 33)

West, T., 1860, 151, 7–12.

Cells in chains, compressed; frustules quadrangular in girdle view, angles excavated, oval in valve view imperfectly siliceous with mucous investment; from each valve arise setae sharply angled near base and with acute hairs at base: valve elliptical. 40–70μ x 20μ.

DISTRIBUTION. Occurs in vast quantities on many New Zealand beaches where it forms the chief food of the Toheroa. Previously recorded on few occasions only from beaches in the North Atlantic.

34. **Chaetoceros diversum** Cl. (Plate 16, Fig. 34)

Cl., 1873, 11, 9, 2, 12.
Cupp, 1943, 132, 87.

Cells in long chains, cylindrical in girdle, elliptical in valve view; valves slightly raised in centre, apertures narrow, setae of two orders, terminal thin, at right angles to chain axis, then turning smoothly until parallel to axis; some median setae similar to terminal setae, others much thicker, anastomosed at base, then oblique, each pair becoming opposite, parallel to chain axis; ends clavate. One chromatophore. Dia. 10–12μ.

DISTRIBUTION. Arafura Sea, Torres Str., Fiji, New Guinea (A. S., 1921, 338, 4), Java Sea (Cl. 1873, 9. type locality).

35. **Chaetoceros laeve** Leud. Fort. (Plate 17, Fig. 35)

Leud. Fort., 1892, 11, 38, 6, 2.
Cupp, 1943, 133, 68.

Cells in short, straight chains, rectangular in girdle view, oval in valve view; valves almost flat, apertures very narrow, setae of two orders, terminal setae thin, for half their length perpendicular to, then parallel with, chain axis, thinner setae anastomosing, oblique; thick setae anastomosing near cell, perpendicular to chain axis, then one of each pair turning at right angles in opposite directions; one chromatophore. Dia. 12μ.

This species is very similar to *Ch. diversum*, and has much the same habitat; the chains are much shorter, and there is a difference in the curvature of the setae, but *Ch. laeve* may well be a variety of *Ch. diversum*.

DISTRIBUTION. Torres Str., Arafura Sea, Fiji.

36. **Chaetoceros pendulum** Karst. (Plate 17, Fig. 36)

Karst., 1905, 2, 2a, 118, 15, 7, 7a.
Cupp, 1943, 114, 69.

Cells solitary; valves unlike, upper with smooth, gently recurved setae almost continuous across top of valve, lower with more sharply curved setae commencing within cell margin; mantle deep, notched at junction with girdle; no deep notch between setae of upper valve as in *C. peruvianum;* chromatophores numerous, extending into setae. Dia. of cell 10–20μ.

DISTRIBUTION. Australia: East of Coff's Harb., August.

37. **Chaetoceros simplex** Ost. (Plate 17, Fig. 37)

Ost., 1901, 137, 8.
Paulsen, 1905, 6, 8.
A. S., 1924, 342, 7–8.

Cells solitary or in pairs, rectangular in girdle view; valves concave with slight protuberance in middle; setae delicate, long, arising at corners almost parallel with transverse axis of cell. The forms seem to resemble those of Paulsen, but the setae were generally, but not universally, curved somewhat in the manner of *Ch. schimperianum* but without the basal swelling; chromatophores 2. Dia. 15μ.

DISTRIBUTION. Australia: East of Sydney. New Zealand: Wellington Harb.

38. **Chaetoceros** sp. (Plate 17, Fig. 38, a, b)

Cells solitary or in short chains; cylindrical terminal cells not differentiated; valves almost circular, slightly concave; setae long, emerging inside margin, straight, oblique, smooth; mantle and girdle deep, apertures narrow, lanceolate; chromatophores numerous, extending into setae. Dia. 30–40μ.

DISTRIBUTION. Australia: East coast. New Zealand: Lyttelton Harbour.

39. **Chaetoceros vistulae** Apstein (Plate 17, Fig. 39)

Apstein, 1909, 11, 136, 2.
Cupp, 1943, 144, 102.

Cells solitary or in pairs, valves elliptical in valve view, in girdle view, strongly concave, corners extending into setae, which are curved slightly oblique to, then approximately parallel with, apical axis; one chromatophore. Length, 10μ.

DISTRIBUTION. New Zealand: North-west of New Plymouth.

Family BACTERIACEAE

Genus BACTERIASTRUM Shadb.

40. **Bacteriastrum hyalinum** Lauder, 1864. (Plate 17, Fig. 40)

Lauder, 1864, 12, 6, 3, 7.
Cupp, 1943, 96, 56a.

Cells cylindrical; pervalvar axis often shorter than diameter; chains long, straight or curved; apertures narrow, distinct; setae 12 to 25 with short base, then branched at intervals, giving a hairy appearance, terminal setae like those of *B. varians.*

DISTRIBUTION. Australia: North from Darwin east into the Coral Sea. New Zealand: North-west of New Plymouth.

41. **Bacteriastrum comosum** Pav. (Plate 17, Fig. 41)

Pav., 1916, 29, 1, 3.
Cupp, 1943, 99, 58.

Cells in short, straight chains, longer than broad; apertures somewhat wide; inner setae with short base, pairs united for about $\frac{1}{2}$ dia. of cell, then transversely bifurcate, curving posteriorly parallel to chain axis; anterior cell with setae bent posteriorly, posterior cell with slightly thicker, twisted setae.

DISTRIBUTION. Australia: Cairns to Thursday I., Port Stephens, Montague I.

Family RHIZOSOLENIACEAE

Genus RHIZOSOLENIA Ehr. em Brightw. (Plate 17, Fig. 42)

42. **Rhizosolenia eriensis** H. L. Sm.

Sm., H. L., 1872, 44.
Boyer, 1927, 96.
A. S., 1914, 314, 24–26.

Frustules flattened, 6–12 times as long as broad, solitary; valves oblique, with a thick, slightly bent, tapering process, intercalary bands obvious, annular, meeting to form a zig-zag pattern. Length, 50–80μ.

DISTRIBUTION. Fresh water. Australia: Hawkesbury River reservoir. New Zealand: Wainui-o-mata (Wellington).

REFERENCES

APSTEIN, C., 1909. *Chaetoceros gracile* Schmidt und *Chaetoceros vistulae* n.sp. *Ber. Wiss. Untersuch. dtsch. Meere. Kiel* N.F. 11: 133–7.

CROSBY, L. H., and WOOD, E. J. F., 1958. Studies on Australian and New Zealand diatoms. I. Planktonic and allied species. *Trans. Roy. Soc. N.Z.* 85: 483–536.

——— 1959. Studies on Australian and New Zealand diatoms. II. Normally epontic and benthic genera. *Trans. Roy. Soc. N.Z.* 86: 1–58.

HUBER-PESTALOZZI, G., 1938. Das Phytoplankton des Süsswasser in Die Binnengewässer 16, 2. 2.

KARSTEN, G., 1928. Abt. Bacillariophyta (Diatomeae) in Engler u. Prantl, Die Natürlichen Pflanzenfamilien 2 (2): 105-303.

E. J. FERGUSON WOOD,
L. H. CROSBY,
C.S.I.R.O. Division of Fisheries and Oceanography,
Cronulla, N.S.W.,
Australia.

MRS. VIVIENNE CASSIE,
D.S.I.R. Oceanographic Institute,
Wellington, N.Z.