

Dinoflagellates in the Australian Region

II. Recent Collections

By E. J. F. Wood

Division of Fisheries and Oceanography
Technical Paper No. 14



Commonwealth Scientific and Industrial
Research Organization, Australia
Melbourne 1963

Printed by C.S.I.R.O., Melbourne

DINOFLAGELLATES IN THE AUSTRALIAN REGION

II. RECENT COLLECTIONS

By E. J. F. WOOD*

[Manuscript received June 5, 1962]

Summary

This paper records 190 species of dinoflagellates that have been found in Australian waters since 1954, and includes Indian Ocean species collected by H.M.A.S. *Diamantina*.

Sixteen new species have been described.

The large number of species of naked flagellates recorded in this paper is ascribed to the use of volumetric samplers instead of nets and to the examination of living instead of preserved material.

I. INTRODUCTION

The first part of this monograph (Wood 1954) described dinoflagellates collected from Australian waters mainly within 100 miles of the coast. While the collection of phytoplankton was largely restricted to this area, few additional species were recorded, but since then the collecting area has been extended from about latitude 90° E. to 180° E., and it has been possible to identify some of the collected material at sea. The examination of living oceanic material has shown that much of the oceanic phytoplankton collected consists of naked flagellates belonging to the Gymnodiniaceae which were barely represented in the collections used in Part I; in fact many of these species have previously been recorded only from coastal waters. The greater extent of the area traversed has increased the possibility of collecting truly oceanic and tropical species, especially of such genera as *Histioneis*, *Parahistioneis*, *Ceratium*, *Heterodinium*, and *Oxytoxum*, and it will be seen that these genera are widely represented in the new material. The use of closing water samplers instead of nets has allowed the collection of smaller forms that frequently were missed by the net. There are far greater numbers and more representatives of the small dinoflagellates in fresh than in formalin-preserved material collected in the samples. This was checked by re-examining the preserved collections in the laboratory.

The distribution of organisms in the area studied is indicated as follows: single references (e.g. latitude or a specific point) refer to collection from one station only. "Coral Sea" or reference to a similar large area means that the organism is distributed widely but sporadically. "Common" means that the organism occurs at many stations. "Abundant" refers to the occurrence of large numbers in a given region.

II. TAXONOMY

The classification outlined in Part I of this series (Wood 1954) has been followed here. Definitions of families and genera, and keys to genera and species given in that paper have not been repeated.

* Division of Fisheries and Oceanography, C.S.I.R.O., Cronulla, N.S.W.

Order ADINIFERIDEA

Family PROROCENTRIDAE Kofoid

Genus EXUVIAELLA Cienkowski, 1881

EXUVIAELLA BALTICA Lohmann

Fig. 1

Exuviaella baltica Lohmann, 1908, p. 17, pl. 1, fig. 265. Schiller, 1933, p. 17, fig. 10a-d.

Body variable in shape, rotund to ovate, symmetrical or asymmetrical, only slightly constricted dorsoventrally: flagellar pore with a slight tooth on either side. Length 10-15 μ .

Distribution.—Neritic. North Atlantic; North Sea; Barents Sea; Adriatic Sea; Coral Sea near island chains.

Genus PROROCENTRUM Ehrenberg, 1833

There is considerable variation in the form of some species of this genus, and it is doubtful whether the numerous species described by Schiller (1933) deserve that rank. However, the species described here, and common in the Coral and Tasman Seas, do appear to be sufficiently constant in morphology to be regarded as distinct.

PROROCENTRUM ARCUATUM Issel

Fig. 2

Prorocentrum arcuatum Issel, 1928, p. 278, fig. 2.

Prorocentrum gibbosum Schiller, 1933, p. 39, fig. 42a,b.

Body in lateral view with angular dorsal margin, sharply bent near the middle, ventral margin more rounded, convex anteriorly, then somewhat concave or straight; antapex acute; spine long, fine, winged. There seems no reason to separate *P. arcuatum* from *P. gibbosum* and the name *P. arcuatum* has precedence. Length 60-70 μ .

Distribution.—Mediterranean Sea; Indian Ocean; Pacific Ocean; Coral Sea; waters off southern New Guinea.

PROROCENTRUM OBTUSIDENS Schiller

Fig. 3

Prorocentrum obtusidens Schiller, 1928, p. 57, fig. 15.

Body sub-rotund with blunt apex, sides parallel, then rounded to an acute antapex; process low, rounded. Length 50 μ .

Distribution.—Adriatic Sea; Coral Sea; off Jibbon Cape, N.S.W.

PROROCENTRUM SCHILLERI Bohm

Fig. 4

Prorocentrum schilleri Bohm in Schiller, 1933, p. 38, figs. 40a-e.

Body in lateral view with rotund anterior and tapering posterior portion; valves may be unlike, and one may have a posterior spine; anterior spine is fine, winged, and may be absent. Length 40–50 μ .

Distribution.—Adriatic Sea; Coral Sea; off the south coast of New Guinea.

PROROCENTRUM PACIFICUM, sp. nov.

Fig. 5

Body in lateral view with parallel sides, tapering to acute antapex; apex blunt with a finger-like process. This species is close to *P. obtusidens* but is narrower and the process longer and more defined. It is constant in shape.

Distribution.—Widely distributed. Coral Sea; Indian Ocean west of Fremantle; off Jibbon Cape, N.S.W.

Order DINIFERIDEA

Family DINOPHYSIDAE Kofoid & Mitchener

Genus PHALACROMA Stein, 1883

This genus is often represented in the phytoplankton of the Coral and Tasman Seas, but is rarely numerous.

PHALACROMA CIRCUMSUTUM Karsten

Fig. 6

Phalacroma circumsutum Karsten, 1907, p. 421, pl. 53, fig. 8. Kofoid and Skogsberg, 1928, p. 182, pl. 23, fig. 6.

Body in lateral view oval, widest in the middle; girdle anterior; epitheca rounded; R3 acute, ventral, supporting a sail which is connected narrowly with the left sulcal list and R2. Length 80 μ .

Distribution.—Widely distributed in tropical and warm waters; Coral Sea.

PHALACROMA CONTRACTUM Kofoid & Skogsberg

Fig. 7

Phalacroma contractum Kofoid and Skogsberg, 1928, p. 83, fig. 3.

Body subspherical with indented girdle; girdle anterior; lists narrow; sulcal list widest near girdle, rounded posteriorly. Length 30 μ .

Distribution.—Eastern tropical Pacific; Coral Sea.

PHALACROMA MUCRONATUM Kofoid & Skogsberg

Fig. 8

Phalacroma mucronatum Kofoid and Skogsberg, 1928, p. 172, pl. 22, figs. 4, 6, 8.

Body in lateral view circular; girdle anterior; epitheca low; girdle lists shallow; hypotheca rotund with an antapical spine; left sulcal list moderately wide, ending at R3. Length 40 μ .

Distribution.—Eastern tropical Pacific. Southern Coral Sea.

PHALACROMA LENTICULA Kofoid

Fig. 9

Phalacroma lenticula Kofoid, 1907, p. 194, pl. 12, fig. 69. Kofoid and Skogsberg, 1928, p. 96, figs. 3 and 7.

Body subcircular in outline, wider than long; in dorsal view lenticular; girdle submedian; girdle lists narrow; left sulcal list about half body length; body finely reticulate. Length 80 μ .

Distribution.—Eastern tropical Pacific; Coral Sea.

PHALACROMA PARVULUM (Schütt) Jörgensen

Fig. 10

Phalacroma porodictyum Stein var. *parvula* Schütt, 1895, pl. 2, fig. 13.

Phalacroma parvulum (Schütt). Jörgensen, 1923, pp. 7, 8, 9, pl. 45, fig. 4. Schiller, 1933, p. 63, fig. 57a-d.

Body small, spherical to spheroidal, widest in the middle; lists somewhat narrow, left sulcal list almost triangular, about half body length. Length 40 μ .

Distribution.—Worldwide in tropical and warm seas. Eastern Coral Sea.

PHALACROMA STRIATA Kofoid

Fig. 11

Phalacroma striata Kofoid, 1907, p. 195, pl. 12, fig. 73. Kofoid and Skogsberg, 1928, p. 131, figs. 2, 5, 8; pl. 14, fig. 3.

Body broadly cuneate; epitheca low, broadly rounded; girdle anterior; hypotheca cuneate with broadly rounded antapex; left sulcal list extends almost to antapex; ribs fine, anterior main rib may be absent. Length 100–140 μ .

Distribution.—Tropical to subtropical waters. Mediterranean Sea; Guinea current. Indian Ocean west of Australia; Eastern Pacific.

Genus DINOPHYSIS Ehrenberg, 1840

DINOPHYSIS EXIGUA Kofoid & Skogsberg

Fig. 12

Dinophysis exigua Kofoid and Skogsberg, 1928, p. 239, fig. 30.

Body in lateral view circular to subcircular; epitheca low, not above anterior girdle list, which is hyaline, and rather low; posterior list low; left sulcal list widest at R3 which is inclined posteriorly. Length 25–30 μ .

Distribution.—Eastern tropical Pacific; South Coral Sea between Cape Byron and Norfolk I.

DINOPHYSIS MICROPTERYGIA Dangeard

Fig. 13

Dinophysis micropterygia Dangeard, 1927, p. 381, fig. 433. Schiller, 1933, p. 110, fig. 101.

Body in lateral view circular to subcircular; epitheca very low; anterior girdle list low to moderate; posterior list low; left sulcal list anterior, narrow, even; R3 vestigial. Length 30–40 μ .

Distribution.—Warm water in the Atlantic Ocean; Vitiaz Strait.

DINOPHYSIS PACIFICA, sp. nov.

Fig. 14

Body almost trapezoidal with blunt apex and antapex; surface coarsely areolate; epitheca very low; anterior girdle list high, almost cylindrical; posterior list rather low; left sulcal list almost the length of hypotheca, triangular with 3 ridges posterior to fission rib. Length 60–70 μ .

Distribution.—Southern Coral Sea.

DINOPHYSIS PARVA Schiller

Fig. 15

Dinophysis parva Schiller, 1928, p. 77, fig. 39; 1933, p. 111, fig. 103.

Body regularly ovate; anterior girdle list as broad as or slightly narrower than girdle, recurved; posterior list narrow; left sulcal list about half body length. Length 20–25 μ .

Distribution.—Adriatic Sea; East Coral Sea.

DINOPHYSIS RECURVA Kofoid & Skogsberg

Fig. 16

Dinophysis recurva Kofoid and Skogsberg, 1928, p. 228. Schiller, 1933, p. 113, fig. 105a,b.

Body ovate, epitheca very small; upper girdle list about half cell diameter long; slight depression between upper and lower lists; sulcal list extending slightly more than half cell length; ribs slightly or markedly curved posteriorly; body strongly areolate. Length 40–50 μ .

Distribution.—Mediterranean, English Channel, Atlantic, Adriatic; Coral Sea.

DINOPHYSIS SCHUETTI Murray & Whitting

Fig. 17

Dinophysis schuetti Murray and Whitting, 1899, p. 331, pl. 31, fig. 10. Schiller, 1933, p. 147, fig. 140.

Body almost spherical to elliptical; epitheca very low; anterior list deep; sulcal list wide with distal dorsal rib and sail (the latter may be rudimentary). Length 40–60 μ .

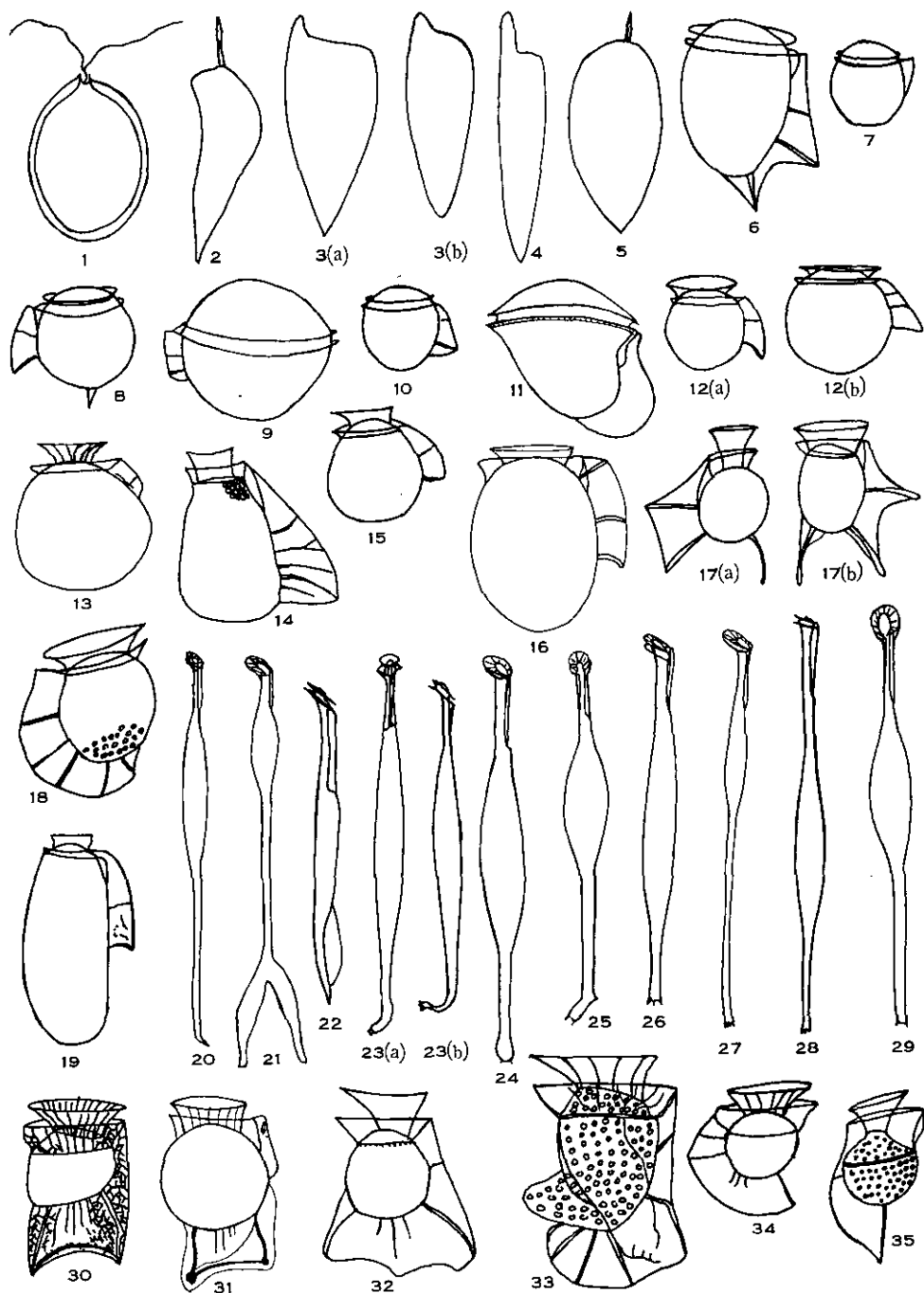
Distribution.—Eupelagic, cosmopolitan; Coral Sea and Indian Ocean.

DINOPHYSIS MORESBYENSIS, sp. nov.

Fig. 18

Body elliptic, widest in the middle; anterior girdle list wide; funnel-shaped; posterior list much narrower; left sulcal list supported by 5 ribs and ending slightly dorsally of median line, and of even width; body coarsely punctate. Length 40 μ . This species is closest to *D. jorgenseni* but the sulcal list is evenly rounded, and there is an extra rib.

Distribution.—New Guinea waters south of Port Moresby.



Figs. 1–35.—Dinoflagellates. 1, *Exuviaella baltica*. 2, *Prorocentrum arcuatum*. 3(a,b), *P. obtusidens*. 4, *P. schilleri*. 5, *P. pacificus*, sp. nov. 6, *Palacroma circumscutum*. 7, *Ph. contractum*. 8, *Ph. mucronatum*. 9, *Ph. lenticula*. 10, *Ph. parvulum*. 11, *Ph. striata*. 12(a,b), *Dinophysis exigua*. 13, *D. micropterygia*. 14, *D. pacifica*, sp. nov. 15, *D. parva*. 16, *D. recurva*. 17(a,b), *D. schuetti*. 18, *D. moresbyensis*, sp. nov. 19, *D. ventrecta*. 20, *Amphisolenia astragalus*. 21, *A. bifurcata*. 22, *A. brevicauda*. 23(a,b), *A. clavipes*. 24, *A. globifera*. 25, *A. lemmermanni*. 26, *A. palaeotheroides*. 27, *A. rectangulata*. 28, *A. schauinslandi*. 29, *A. schroederi*. 30, *Ornithocercus formosus*. 31, *O. geniculatus*. 32, *O. magnificus*, var. 33, *O. sp.* (deformation). 34, *O. australis*, sp. nov. 35, *Parahistioneis crateriformis*.

DINOPHYSIS VENTRECTA Schiller

Fig. 19

Dinophysis ventrecta Schiller, 1933, p. 133, fig. 126.

Body elongate-ovate with straight ventral and rounded dorsal margins, widest posteriorly; anterior girdle list almost cylindrical, deep; posterior list narrow; left sulcal list wide, even, reaching R3. Length 45 μ .

Distribution.—Quarnero (as *D. sacculus* by Stein); Coral Sea; Port Hacking.

Genus AMPHISOLENIA Stein, 1883

AMPHISOLENIA ASTRAGALUS Kofoid & Michener

Fig. 20

Amphisolenia astragalus Kofoid and Michener, 1911, p. 293. Kofoid and Skogsberg, 1928, p. 380, text fig. 10, Nos. 1, 6, 8, 10; pl. 49, fig. 6.

Body slightly sigmoid; antapical with slight ventral concavity; tip of antapical abruptly bent ventrally. Length 500 μ .

Distribution.—Eastern tropical Pacific; Galapagos eddy; Coral Sea.

AMPHISOLENIA BIFURCATA Murray & Whitting

Fig. 21

Amphisolenia bifurcata Murray and Whitting, 1899, p. 331, figs. 7, 8, 9; pl. 31, fig. 1a-e.

Amphisolenia thrinax Zacharias, 1906, pp. 561, 563, 564. Kofoid and Skogsberg, 1928, p. 432.

Hypotheca almost straight but fusiform to bifurcate antapical region, two legs being subequal or of slightly different lengths, somewhat swollen anteriorly, distal parts spinulate. Length 850 μ .

Distribution.—Atlantic and Caribbean, California, Easter I., South Equatorial drift; Indian Ocean west of Australia; Coral Sea.

AMPHISOLENIA BREVICAUDA Kofoid

Fig. 22

Amphisolenia brevicauda Kofoid, 1907, p. 197, pl. 13, fig. 79. Kofoid and Skogsberg, 1928, p. 372, text fig. 49, no. 3; text fig. 50, no. 6; pl. 6, figs. 1-4.

Body slightly sigmoid; midbody elongate; antapical sharply differentiated from midbody on ventral side, even on dorsal; dorsal margin sigmoid; antapical acute. Length 150 μ .

Distribution.—Eastern tropical Pacific; Vitiaz Strait.

AMPHISOLENIA CLAVIPES Kofoid

Fig. 23

Amphisolenia clavipes Kofoid, 1907, p. 14, fig. 90. Kofoid and Skogsberg, 1928, p. 402, pl. 11, figs. 8-11.

Body curved near antapex; epitheca convex; hypotheca fusiform, more or less sharply bent near antapex, widened at end, with 2 spinules. Length 250 μ .

Distribution.—Eastern tropical Pacific: off Fiji and south of New Caledonia.

AMPHISOLENIA GLOBIFERA Stein

Fig. 24

Amphisolenia globifera Stein, 1883, p. 24, pl. 21, figs. 9, 10. Kofoed and Skogsberg, 1928, p. 388, text figs. 1, 2, 4, 8; pl. 49, fig. 9; pl. 50, figs. 1–5.

Body straight or slightly sigmoid; hypotheca swollen anteriorly; antapex characteristically globose, bidentate. Length 150–250 μ .

Distribution.—Atlantic, Indian Ocean off Australia; Eastern Pacific: Coral Sea.

AMPHISOLENIA LEMMERMANNI Kofoed

Fig. 25

Amphisolenia lemmermanni Kofoed, 1907, p. 199, pl. 14, figs. 88, 89. Kofoed and Skogsberg, 1928, p. 419, text fig. 9, nos. 1, 12; pl. 50, fig. 8; pl. 56, fig. 2.

Body straight; hypotheca markedly swollen anteriorly, then straight, tubular, with slightly splayed antapex; bidentate, spurred. Length 500 μ .

Distribution.—Indian Ocean west of Australia. Eastern tropical Pacific; Mexican current; Panama, Peruvian current; Easter I., south equatorial drift; Coral Sea.

AMPHISOLENIA PALAEOTHEROIDES Kofoed

Fig. 26

Amphisolenia palaeotheroides Kofoed, 1907, p. 199, pl. 14, fig. 84. Kofoed and Skogsberg, 1928, p. 427, text fig. 11, nos. 2, 3, 4; pl. 56, fig. 4.

Body almost straight; hypotheca fusiform, tapering gently from swollen middle in both directions; antapical portion slightly broadened, tridentate. Length 500 μ .

Distribution.—Peruvian current; Easter I., south equatorial drift; Coral Sea.

AMPHISOLENIA RECTANGULATA Kofoed

Fig. 27

Amphisolenia rectangulata Kofoed, 1907, p. 200, pl. 14, fig. 83. Kofoed and Skogsberg, 1928, p. 378, text fig. 8, nos. 3, 5, 6, 7, 9; pl. 49, fig. 5.

Body almost straight; hypotheca slightly swollen anteriorly, posterior portion cylindrical, slightly curved towards antapex which is slightly swollen and bidentate. Length 600–700 μ .

Distribution.—Indian Ocean off Australia. Eastern Pacific.

AMPHISOLENIA SCHAUINSLANDI Lemmermann

Fig. 28

Amphisolenia schauinslandi Lemmermann, 1899, pp. 317, 350, 373, fig. 19. Kofoed and Skogsberg, 1928, p. 374, text fig. 7, nos. 1–8; pl. 49, no. 4, pl. 51.

Body straight, head capitate; epitheca flattened; hypotheca fusiform, posterior part short, straight; antapex with 4 spinulae. Length 200–300 μ .

Distribution.—Tropical and subtropical Indian Ocean: Gulf of Aden; Tropical Pacific Ocean: Coral Sea.

AMPHISOLENIA SCHROEDERI Kofoid

Fig. 29

Amphisolenia schroederi Kofoid, 1907, p. 201, pl. 13, fig. 81. Kofoid and Skogsberg, 1928, p. 400, text fig. 10, nos. 2–4; pl. 49, fig. 15.

Body straight, hypotheca swollen anteriorly, tapering rather more quickly anteriorly than posteriorly; antapex almost straight, not swollen, bidentate. Length 500 μ .

Distribution.—Pacific Ocean: Mexican and Peruvian currents, south equatorial drift; Coral Sea; Indian Ocean west of Australia.

Genus ORNITHOCERCUS Stein

ORNITHOCERCUS FORMOSUS Kofoid & Michener

Fig. 30

Ornithocercus formosus Kofoid and Michener, 1911, p. 300, fig. 197a–d. Schiller, 1933, p. 207, fig. 197a–d.

Body subcircular; anterior girdle list funnel-shaped with radial ribs; posterior girdle list ribbed and reticulate; left sulcal list ends dorsally, almost linear with body, more or less quadrate, supported by strong, posteriorly-directed, dorsally attached rib and a weaker rib in the ventral portion; list reticulate. Length 45 μ .

Distribution.—Eastern tropical Pacific: Coral Sea.

ORNITHOCERCUS GENICULATUS Dangeard

Fig. 31

Ornithocercus geniculatus Dangeard, 1927, p. 383, fig. 45b. Schiller, 1933, p. 196, fig. 188.

Body almost spherical, slightly thicker than high; upper girdle list with about 8 ribs, smaller than lower which has 12–14; left sulcal list without lower rib and distinct from sail, which is ventral and supported by two strong, clavate ribs directed posteriorly and joined near margin, with supplementary veins; ventral margin of sail convex, dorsal sigmoid, posterior concave. Length 40 μ .

Distribution.—Atlantic Ocean; Coral Sea, Jervis Bay.

ORNITHOCERCUS MAGNIFICUS Stein, var.

Fig. 32

(See Wood 1954.) This is a form with a weakly ribbed left sulcal list and sail.

The species is variable, but there are two usual forms, one with a round body, and very poorly developed left sulcal list, the other with a subovate body and a wider

sulcal list. The latter was much more common than the former in the Coral Sea in summer of 1960, but there is no evidence for creating another species at this stage.

Distribution.—Off Fiji.

ORNITHOCERCUS sp.

Fig. 33

This is obviously a deformation; the cell was entire. The epitheca was low, anterior list deep and funnel-shaped; girdle zone wide; hypotheca subconical; left sulcal list narrow to R2 then wider, with rounded margin ending dorsally and supported by 4 ribs.

Distribution.—Off Fiji.

ORNITHOCERCUS AUSTRALIS, sp. nov.

Fig. 34

Body circular, girdle wide; anterior girdle list funnel-shaped, striate; posterior list of equal height; left sulcal list semicircular, extending slightly ventrally, hyaline except for 3 striae. Length 45 μ . This species is closest to *O. orbiculatus* Kofoid but the posterior girdle list and the left sulcal list are much more hyaline and the intermediate ribs are rudimentary.

Distribution.—The Slot, Solomon Is.

Genus PARAHISTIONEIS Kofoid & Skogsberg

PARAHISTIONEIS CRATERIFORMIS (Stein) Kofoid & Skogsberg

Fig. 35

Histioneis crateriformis Stein, 1883, p. 22, figs. 5 and 6.

Parahistioneis crateriformis (Stein). Kofoid and Skogsberg, 1928, p. 590.

Hypotheca in side view semicircular; epitheca conical with concave sides; girdle broad; anterior girdle list flared, posterior list of even width, cylindrical; left sulcal list with sigmoid margin ending ventrally of median line. Length 90 μ .

Distribution.—Atlantic Ocean; Coral Sea and Solomon Is., Slot.

PARAHISTIONEIS GARRETTI (Kofoid) Kofoid & Skogsberg

Fig. 36

Histioneis garretti Kofoid, 1907, p. 203, pl. 16, fig. 97.

Parahistioneis garretti (Kofoid). Kofoid and Skogsberg, 1928, p. 596, text fig. 19, no. 1; pl. 93, fig. 5.

Body broadly subovate; anterior girdle list flared; epitheca low; girdle wider dorsally; posterior girdle list rather low, hyaline; left sulcal list narrow to R2 which is directed posteroventrally, reticulate, wider between R2 and R3, margin in this specimen notched; list hyaline from R3 to somewhat ventral junction with hypotheca. Length 40 μ .

Distribution.—Eastern tropical Pacific: south Coral Sea.

PARAHISTIONEIS GASCOYNENSIS, sp. nov.

Fig. 37

Body rotund; epitheca low, higher dorsally than ventrally; anterior girdle list broadly flaring, strongly ribbed; posterior list rather low hyaline; left sulcal list narrow to R2 which is deflected posteriorly, wider and rounded to R3 which is posteroventral, strong and much thickened at end. In this specimen, the list from R2 to R3 is radially ribbed, thus distinguishing it from *P. paraformis*. The species is close to *P. reticulata*, but the body is more rotund and R3 stronger. Length 45 μ .

Distribution.—Coral Sea.

PARAHISTIONEIS PARAFORMIS Kofoid & Skogsberg

Fig. 38

Parahistioneis paraformis Kofoid and Skogsberg, 1928, p. 598, text fig. 19, nos. 3–6; pl. 93, fig. 4.

Body rotund; girdle wide; anterior girdle list funnel-shaped, ribbed; posterior list with few ribs; left sulcal list with rounded margin, ending at R3 which is slightly ventral; list granular in antapical portion. Length 40 μ .

Distribution.—Tropical and subtropical Pacific: Coral Sea.

PARAHISTIONEIS ROTUNDATA (Kofoid & Michener) Kofoid & Skogsberg

Fig. 39

(See Wood 1954.) A variant of the species.

Genus HISTIONEIS Stein, 1883

HISTIONEIS AEQUATORIALIS, sp. nov.

Fig. 40

Body boat-shaped; epitheca conical; anterior girdle list tubular, flaring symmetrically at end; posterior list tubular, slightly constricted in the middle, striate at end; sulcal list extending right round body as a sail, margin on ventral side sigmoid, R2 directed posteriorly, R3 branched; supplementary ribs present. The shape of the body resembles that of *H. longicollis* but the sail is far more developed, especially on the dorsal side. Length 150 μ .

Distribution.—Coral Sea.

HISTIONEIS AUSTRALIAE, sp. nov.

Fig. 41

Body boat-shaped, anterior girdle list moderate, flared, striate; posterior list nearly as high, gibbous; left sulcal list rounded ventrally, extending to ventral portion of base of body; a thickening extends from R2 to R3. The body and girdle lists of this species resemble those of *H. pacifica* but the sail and ribs are quite unlike that species. Length 70 μ .

Distribution.—Coral Sea.

HISTIONEIS BOUGAINVILLEAE, sp. nov.

Fig. 42

Body saccate; collar high; anterior girdle list long and tubular, striate; posterior list with striate margin, reticulate upper portion and hyaline lower part; left sulcal list narrow ventrally, extending posteriorly, supported by a U-shaped rib deriving from a rectangular window and extending ventrally. This species is close to *H. depressa* but the sail is very different, and the collar higher and more ribbed. Length 80 μ .

Distribution.—West of Bougainville I.

HISTIONEIS CERASUS Bohm

Fig. 43

Histioneis cerasus Bohm in Schiller, 1933, p. 229, fig. 221.

Body in lateral view cherry-shaped, in ventral view elliptical; epitheca very low; anterior girdle list with moderate tube, widely flaring; posterior list lower dorsally with ribbed margin; pouches wide, supported by horizontal ribs; left sulcal list wide, ventral; R2 directed ventrally and branched, R3 also branched. Length 40–60 μ .

Distribution.—Indian Ocean: South Queensland off Surfer's Paradise.

HISTIONEIS COSTATA Kofoid & Michener

Fig. 44

Histioneis costata Kofoid and Michener, 1911, p. 295. Kofoid and Skogsberg, 1928, p. 647, text fig. 20, nos. 3, 10; pl. 95, fig. 4.

Body rounded, hypotheca semicircular in side view; anterior girdle list funnel-shaped, tube short; list anteriorly striate; posterior list wider and lower, sub-cylindrical; left sulcal list reticulate in front of R2, and narrow; R3 submarginal, posterior, margin strikingly angular between R2 and R3. Length 70 μ . R3 is proportionally much longer than in Kofoid's and Skogsberg's illustrations.

Distribution.—Eastern tropical Pacific: west of Fiji.

HISTIONEIS DEPRESSA Schiller, vars.

Fig. 45

Histioneis depressa Schiller. Wood, 1954, p. 213.

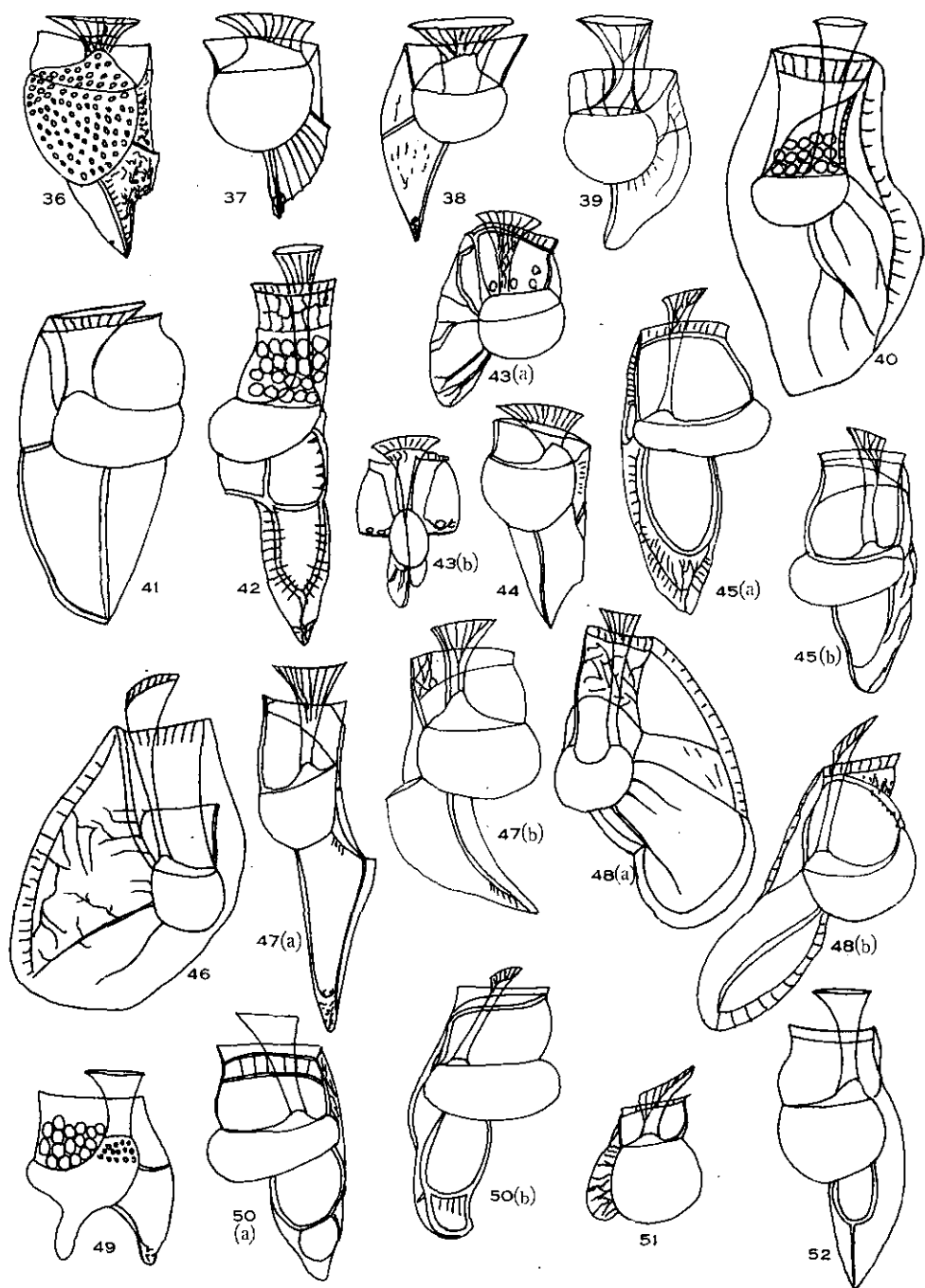
The forms illustrated here are closer to the type than that given in Wood (1954).

Distribution.—Coral Sea between Samurai and Bougainville I. Previously recorded from Trial Bay, N.S.W.

HISTIONEIS DOLON Murray & Whitting, var.

Fig. 46

This illustration of a form with a much simpler sail than that shown in Wood (1954, p. 215, fig. 72) is included to show the variation that can be expected in this



Figs. 36-52.—Dinoflagellates. 36, *Parahistioneis garretti*. 37, *P. gascoynensis*, sp. nov. 38, *P. paraformis*. 39, *P. rotundata*. 40, *Histioneis aequatorialis*, sp. nov. 41, *H. australiae*, sp. nov. 42, *H. bougainvilleae*, sp. nov. 43(a,b), *H. cerasus*. 44, *H. costata*. 45(a,b), *H. depressa*, formae. 46, *H. dolon*, var. 47(a), *H. elongata*; 47(b), *H. elongata* var. *curvata*, var. nov. 48(a,b), *H. helenae*. 49, *H. highleyi*. 50(a,b), *H. hyalina*. 51, *H. inclinata*. 52, *H. jorgenseni*.

and other species, some of which could probably be united if the degree of variation of each species were known.

Distribution.—Coral Sea.

HISTIONEIS ELONGATA Kofoid & Michener

Fig. 47(a)

Histioneis elongata Kofoid and Michener, 1911, p. 295. Kofoid and Skogsberg, 1928, p. 661, fig. 96, no. 3.

Body ovate; anterior girdle list of moderate height, striate; posterior list moderate, hyaline; left sulcal list cuneate, R3 long with cross rib extending ventrally; sail triangular, extended posteriorly from R2 to R3. Length 120 μ .

Distribution.—Coral Sea.

HISTIONEIS ELONGATA var. CURVATA, var. nov.

Fig. 47(b)

This variety differs from the type species in having the sail strongly curved dorsally, together with the marginal R3.

Distribution.—Coral Sea.

HISTIONEIS HELENÆ Murray & Whitting

Fig. 48

Histioneis helenæ Murray and Whitting, 1899, p. 333, pl. 33, fig. 2. Kofoid and Skogsberg, 1928, p. 696.

Body in side view reniform; anterior girdle list long, tubular and curved, with striate, funnel-shaped opening; posterior list long, cylindrical, reticulate; epitheca saddle-shaped; two hyaline lobes on either side of posterior list; left sulcal list extending into sail from R2 and undulate; R3 submarginal; sail with submarginal thickening. Length 150 μ .

Distribution.—Atlantic Ocean; Pacific Ocean: South Coral Sea.

HISTIONEIS HIGHLEYI Murray & Whitting

Fig. 49

Histioneis highleyi Murray and Whitting, 1899, p. 334, pl. 32, fig. 5. Kofoid and Skogsberg, 1928, p. 673, pl. 98, 95, fig. 14.

Body asymmetrically Y-shaped, with posterior protuberance; girdle sigmoid; anterior girdle list arising from small, conical epitheca, funnel-shaped, ribbed; posterior list more or less cylindrical; left sulcal list extending to R3 which is strong and curved, more or less as long as process; surface of theca coarsely punctate. Length 65 μ .

Distribution.—Widely distributed in warm seas; Coral Sea.

HISTIONEIS HYALINA Kofoid & Michener

Fig. 50

Histioneis hyalina Kofoid and Michener, 1911, p. 296. Kofoid and Skogsberg, 1928, p. 679, text fig. 20, no. 4; fig. 95, no. 5.

Body boat-shaped in lateral outline, slightly higher dorsally; anterior girdle list with long narrow tube and slight funnel; posterior girdle list slightly gibbous dorsally, hyaline; left sulcal list narrow, R2 directed posteriorly, joined to R3 near middle; R3 slightly ventral, posterior. Length 60 μ .

Distribution.—Tropical Indian Ocean; tropical Pacific Ocean: north of New Zealand.

HISTIONEIS INCLINATA Kofoid & Skogsberg

Fig. 51

Histioneis inclinata Kofoid and Skogsberg, 1928, p. 652, text fig. 22, no. 5; pl. 95, fig. 13.

Body subrotund in lateral outline; epitheca low; anterior girdle list flared, longer dorsally than ventrally; posterior list slightly gibbous and flared at the end; left sulcal list short, ending on ventral surface, margin rounded, surface reticulate; R3 absent. Length 35 μ .

Distribution.—Eastern tropical Pacific: south of New Britain in Coral Sea.

HISTIONEIS JORGENSENI Schiller

Fig. 52

Histioneis jorgenseni Schiller, 1928, p. 83, fig. 42; 1933, p. 226, fig. 217.

Body rotund, kidney-shaped; epitheca low, flat, apex slightly domed; anterior girdle list with long tube, and flared end; posterior list cylindrical, slightly gibbous; left sulcal list with sigmoid margin, R2 directed posteriorly, joining R3 about half way along; R3 marginal or submarginal. Length 80 μ .

Distribution.—Adriatic Sea; Solomon Is.

HISTIONEIS LANCEOLATA, sp. nov.

Fig. 53

Body obovate; epitheca low; anterior girdle list funnel-shaped with moderate tube and striate margin; posterior list deep, cylindrical, not reinforced; hypotheca obovate; left sulcal list narrow to R2 then abruptly widened between R2 and R3 and much thickened and ridged; R3 as long as cell, posterior and submarginal, sail ending slightly dorsally. Length 300 μ . This species differs from *H. elongata* in R3 not being marginal or submarginal and in having a supplementary rib branching from R3 ventrally.

Distribution.—Eastern Coral Sea:

HISTIONEIS LONGICOLLIS Kofoid

Fig. 54

Histioneis longicollis Kofoid, 1907, p. 204, pl. 16, fig. 100. Kofoid and Skogsberg, 1928, p. 677, text fig. 20, no. 5, text fig. 21, no. 5; pl. 95, fig. 7.

Body in lateral view obliquely rotund; anterior girdle lists with long tube and striate funnel; girdle moderately raised; posterior list cylindrical, reticulate; left sulcal list narrow, margin gently sigmoid; R2 directed posteriorly to unite or nearly unite with R3 which is ventral, posterior, and distally branched. Length 80 μ .

Distribution.—Eastern tropical Pacific: Coral Sea.

HISTIONEIS MITCHELLANA Murray & Whitting

Fig. 55

Histioneis mitchellana Murray and Whitting, 1899, p. 333, pl. 33, fig. 3. Schiller, 1933, p. 245, figs. 239a,b.

Body boat-shaped, higher dorsally; anterior girdle list narrow, funnel-shaped, posterior list deep, with or without reticulate markings; left sulcal list evenly rounded in margin, fenestrate. Length 120 μ .

Distribution.—Widely distributed in tropical and subtropical waters. Coral Sea.

HISTIONEIS MORESBYENSIS, sp. nov.

Fig. 56

Body rotund; anterior girdle list moderate, hyaline with ribbed funnel; left sulcal list with reticulate sculpture to R2 which is bent sharply backwards to form margin of sail almost parallel to sigmoid R3, hyaline from R2 to R3. Length 50 μ . Closest to *H. costata* but differs in the marginal extension of R2 and the strength of R3.

Distribution.—Off Port Moresby.

HISTIONEIS OXYPTERIS Schiller

Fig. 57

Histioneis oxypteris Schiller, 1928, p. 84, pl. 3, fig. 6.

Body deep-reniform to subspherical; anterior girdle list with short tube, flared; posterior list hyaline; left sulcal list sigmoid, with thickenings; R2 ventral; R3 ventral, directed posteriorly, marginal to submarginal. Length 45 μ .

Distribution.—Adriatic Sea, Mediterranean Sea; south Coral Sea.

HISTIONEIS PAULSENI Kofoid

Fig. 58

Histioneis paulseni Kofoid, 1907, p. 204, pl. 15, fig. 94. Kofoid and Skogsberg, 1928, p. 650, text fig. 20, nos. 1, 2; pl. 95, fig. 8.

Body subrotund; hypotheca somewhat reniform; anterior girdle list flared; posterior list cylindrical; left sulcal list with sigmoid margin ending at R3; R2 and R3 directed posteroventrally; striae between R2 and R3. Length 60 μ .

Distribution.—Tropical Pacific: north of New Zealand.

HISTIONEIS PIETSMANNI Bohm

Fig. 59

Histioneis pietsmanni Bohm in Schiller, 1933, p. 247, fig. 241.

Body reniform, higher dorsally; anterior girdle list with long tube and reticulate funnel; posterior list gibbous, margins reticulate; left sulcal list with irregular margin, reticulate; R2 branched, posterior part joining short R3 to form a semicircle. Length 100 μ .

Distribution.—Indian Ocean; Coral Sea.

HISTIONEIS PLANETA, sp. nov.

Fig. 60

Body subrotund, coarsely and evenly porulate; anterior girdle list with long tube and flared end, margin striate; posterior list strongly reticulate; left sulcal list with sigmoid margin R2 directed posteriorly joining R3 but with a branch close to R3 reaching margin of list; R3 posteroventral, dilated at end. Length 80 μ . Close to *H. longicollis*, but collar is shorter and ribs of sulcal list are more developed.

Distribution.—Coral Sea near Planet trench.

HISTIONEIS PULCHRA Kofoid

Fig. 61

Histioneis pulchra Kofoid, 1907, p. 205, pl. 16, fig. 99. Kofoid and Skogsberg, 1928, p. 686, text fig. 96, pl. 21, fig. 4, 7; pl. 23, fig. 2.

Body saddle-shaped, higher dorsally: epitheca low; anterior girdle list forming a rather long tube, flaring symmetrically; striate in upper portion; posterior list cylindrical, nearly as wide as body, lobed, with irregular interlocking thickenings; left sulcal list triangular, extending about a body length below antapex; R2 directed posteriorly and united with R3, list with irregularly anastomosing thickenings. Length 150 μ .

Distribution.—Eastern tropical and subtropical Pacific. Coral Sea.

HISTIONEIS SCHILLERI Bohm

Fig. 62

Histioneis schilleri Bohm in Schiller, 1933, p. 244, fig. 238a,b.

Body boat-shaped, higher dorsally; collar long; anterior girdle list funnel-shaped, striate; posterior list nearly body width, long, reticulate on upper portion;

left sulcal list with triangular extension ventrally, a circular to rectangular window and tapering posteriorly; sculpture reticulate. Length 100 μ .

Distribution.—Indian Ocean; Solomon Is. Slot.

HISTIONEIS SIMPLEX, sp. nov.

Fig. 63

Body stirrup-shaped; anterior girdle list low, flared; posterior list low, slightly gibbous, hyaline; left sulcal list hyaline, ventral, rounded, R3 absent. Length 40 μ . Close to *H. inclinata* but the left sulcal list is devoid of structure and the body is of different shape.

Distribution.—East Coral Sea.

HISTIONEIS TUBIFERA Bohm

Fig. 64

Histioneis tubifera Bohm in Schiller, 1933, p. 224, fig. 214.

Body irregularly oval; anterior girdle list funnel-shaped; epitheca dome-shaped; girdle high; posterior list slightly gibbous; left sulcal list with R2 short, ventral; R3 directed posteriorly and marginal, almost in vertical axis of cell, margin gently rounded. Length 25–30 μ .

Distribution.—Indian Ocean; North Tasman and Coral Seas.

HISTIONEIS VARIABILIS Schiller

Fig. 65

Histioneis variabilis Schiller, 1933, p. 231, fig. 223a–d.

Body cherry-shaped, variable; anterior girdle list with long tube and striate funnel; girdle slightly concave; posterior list somewhat gibbous, variable; R2 and R3 both ventral, forming one or two loops; left sulcal list reinforced in various patterns. Length 60 μ .

Distribution.—Adriatic Sea; Atlantic; North Tasman Sea north of New Zealand; Coral Sea.

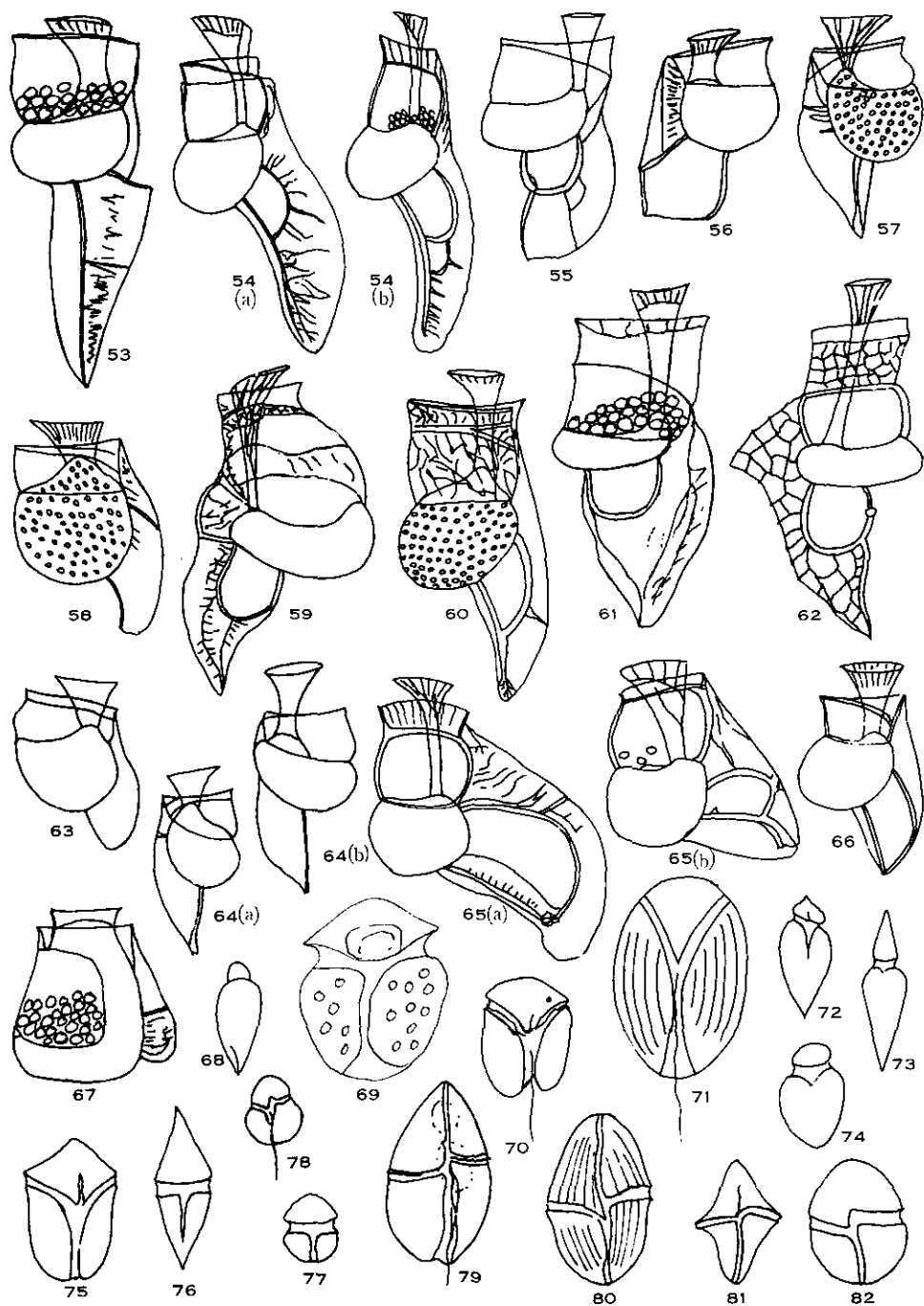
HISTIONEIS VOUCKI Schiller

Fig. 66

Histioneis voucki Schiller, 1928, p. 82, fig. 41; 1933, p. 225, fig. 216.

Body rotund, kidney-shaped; anterior girdle list with short tube about equal to funnel, which is striate; girdle low; posterior list slightly concave and funnelled, hyaline; left sulcal list hyaline, margin sigmoid; R2 posterior joined to end of R3 which is marginal to submarginal. Length 40 μ .

Distribution.—Adriatic Sea; north Tasman and south Coral Seas.



Figs. 53-82.—Dinoflagellates. 53, *Histioneis lanceolata*, sp. nov. 54(a,b), *H. longicollis*. 55, *H. mitchellana*. 56, *H. moresbyensis*, sp. nov. 57, *H. oxypterus*. 58, *H. paulseni*. 59, *H. pietschmanni*. 60, *H. planeta*, sp. nov. 61, *H. pulchra*. 62, *H. schilleri*. 63, *H. simplex*, sp. nov. 64(a,b), *H. tubifera*. 65(a,b), *H. variabilis*. 66, *H. voucki*. 67, *Citharistes apsteini*. 68, *Amphidinium acutissimum*. 69, *A. amphidinoides*. 70, *A. bipes*. 71, *A. cucurbita*. 72, *A. flagellans*. 73, *A. sphenoides*. 74, *A. turbo*. 75, *A. vasculum*. 76, *Gymnodinium biconicum*. 77, *G. bogoriense*. 78, *G. cinctum*. 79, *G. coerulatum*. 80, *G. costatum*. 81, *G. diploconus*. 82, *G. flavum*.

Genus CITHARISTES Stein, 1883

Body C-shaped; epitheca low, within flared anterior girdle list; girdle narrow, even; posterior girdle list low; phaeosome chamber hyaline, dorsal; left sulcal list ventral, not extending beyond antapex of cell which is flat or rounded, list reinforced by parallel veins.

CITHARISTES APSTEINI Schütt

Fig. 67

Citharistes apsteini Schütt, 1895, p. 5, fig. 14. Kofoed and Skogsberg, 1928, p. 712, text fig. 102, nos. 1-5; text fig. 103.

Body C-shaped in lateral view, deepest near posterior end, width nearly uniform; girdle moderate; anterior girdle list of moderate width, posterior list narrower; phaeosome chamber with dorsal rib slightly sigmoid; left sulcal list approximately the length of body, thickened posteriorly. Length 62 μ .

Distribution.—In tropical and subtropical seas. Atlantic Ocean. Coral Sea: Solomon Is. region.

Family GYMNODINIIDAE Kofoed

Genus AMPHIDINIUM Claparède & Lachmann, 1858

AMPHIDINIUM ACUTISSIMUM Schiller

Fig. 68

Amphidinium acutissimum Schiller, 1933, p. 277, fig. 263.

Epicone small, dome-shaped; hypocone with convex margins, tapering to a sharp point; girdle flat, upper margin ill-defined. Length 20 μ .

Distribution.—Adriatic Sea; Coral Sea; North Tasman Sea; off Jibbon Cape.

AMPHIDINIUM AMPHIDINIOIDES (Geitler) Schiller

Fig. 69

Gymnodinium amphidinoides Geitler, 1924, fig. 110a-f.

Amphidinium amphidinoides (Geitler). Schiller, 1933, p. 278, fig. 265a-d.

Body elongate-elliptic; epicone bluntly conical, symmetrical; hypocone rounded with almost parallel sides; girdle slightly offset; sulcus not reaching antapex. Length 25 μ .

Distribution.—Freshwater near Linz and Vienna, Austria; Swan River, West Australia.

AMPHIDINIUM BIPES Herdman

Fig. 70

Amphidinium bipes Herdman, C. E., 1924, p. 78, fig. 19. Schiller, 1933, p. 280, fig. 267.

Epicone triangular, apex slightly concave; girdle deep, angled; sulcus broad, reaching antapex; hypocone with rotund sides and deep antapical hollow. Length 28 μ .

Distribution.—Beach sand on Isle of Man; Coral Sea.

AMPHIDINIUM CUCURBITA Kofoid & Swezy

Fig. 71

Amphidinium cucurbita Kofoid and Swezy, 1921, p. 136, pl. 1, fig. 9; text figs. U12, W3.

Body large, broadly elliptic; girdle far anterior, not displaced, narrow; sulcus extending to and widening towards antapex; surface with longitudinal striae and furrows. Length 100–120 μ .

Distribution.—North Pacific; Coral Sea off New Hebrides.

AMPHIDINIUM FLAGELLANS Schiller

Fig. 72

Amphidinium flagellans Schiller, 1928, p. 136, fig. 13a,b; 1933, p. 291, fig. 283a,b.

Body bluntly fusiform, not flattened dorsoventrally; epicone subconical, pointed; hypocone rounded and tapering to antapex; girdle deep and broad; sulcus narrow and epicone, wide and tapering on hypocone, left margin slightly higher. Length 20–25 μ .

Distribution.—Adriatic Sea; Coral Sea.

AMPHIDINIUM SPHENOIDES Wulff

Fig. 73

Amphidinium sphenoides Wulff, 1916, p. 105, pl. 1, fig. 9a,b. Schiller, 1933, p. 315, fig. 318a,b.

Body spindle-shaped; epicone triangular, smaller than triangular hypocone, apex and antapex acute; girdle deep and narrow; sulcus small. Length 40 μ .

Distribution.—Barents Sea; off Solomon Is.

AMPHIDINIUM TURBO Kofoid & Swezy

Fig. 74

Amphidinium turbo Kofoid and Swezy, 1921, p. 155, pl. 9, fig. 98.

Epicone small, elliptical; hypocone cordate; girdle anterior, not displaced, broad. Length 20–30 μ .

Distribution.—Californian coast; Coral Sea (common).

AMPHIDINIUM VASCULUM Kofoid & Swezy

Fig. 75

Amphidinium vasculum Kofoid and Swezy, 1921, p. 156, text fig. U27.

Body large, subcuneiform; apex acute, epicone short; hypocone with parallel sides and rounded antapex; girdle narrow, not displaced; sulcus reaching antapex. Length 100 μ .

Distribution.—Californian coast; Coral Sea.

Genus GYMNO DINIUM Stein, 1883

Body not twisted; girdle circular or forming a slightly offset left spiral; sulcus may reach from apex to antapex or may be small to rudimentary.

In the present studies it has been found that *Gymnodinium* species are usually present in phytoplankton catches made in the open sea, and are frequently numerous, occasionally dominant. They can, however, only be adequately recognized by examining fresh material at sea, and collections must be made in bottle-type collectors and not in nets, because most of them escape the latter.

GYMNO DINIUM BICONICUM Schiller

Fig. 76

Gymnodinium biconicum Schiller, 1928, p. 143, fig. 19; 1933, p. 337, fig. 342.

Body spindle-shaped, slightly narrowed dorsoventrally; epicone and hypocone subequal, tapering from girdle to apices; girdle wide, not displaced; sulcus narrow. Length 25 μ .

Distribution.—Adriatic Sea; Coral Sea.

GYMNO DINIUM BOGORIENSE Klebs

Fig. 77

Gymnodinium bogoriense Klebs, 1912, pp. 419, 439, fig. 7c,d. Kofoid and Swezy, 1921, p. 193, text fig. X10.

Body small, ovoid, dorsoventrally flattened; epicone and hypocone hemispherical; girdle deep and wide; not displaced; sulcus from girdle to antapex. Length 20 μ .

Distribution.—Freshwater in Java; oceanic in Coral Sea.

GYMNO DINIUM CINCTUM Kofoid & Swezy

Fig. 78

Gymnodinium cinctum Kofoid and Swezy, 1921, p. 196, pl. 7, fig. 75, text fig. X28.

Body roughly ovate; epicone subconical; hypocone rotund, larger than epicone; girdle anterior, displaced one width; sulcus rudimentary. Length 25 μ .

Distribution.—Californian coast; Coral Sea, oceanic.

GYMNO DINIUM COERULATUM Dogiel

Fig. 79

Gymnodinium coerulatum Dogiel, 1906, pp. 35, 36, 40, fig. 2; pp. 46, 47. Kofoid and Swezy, 1921, p. 197, text fig. Z4.

Body elongate, biconical to 8-shaped, about twice as long as wide, flattened ventrally; girdle submedian, constricted, displaced about 2 widths; sulcus from apex to antapex, narrow at apex, wider from girdle to antapex; base indented. Length 125 μ .

Distribution.—Coral Sea.

GYMNODINIUM COSTATUM Kofoid & Swezy

Fig. 80

Gymnodinium costatum Kofoid and Swezy, 1921, p. 200, pl. 3, fig. 33, text fig. Z10.

Body subovoid, large; girdle submedian, displaced; sulcus extends from apex to antapex; surface ridged. Length 120 μ .

Distribution.—Californian coast; Coral Sea.

GYMNODINIUM DIPLOCONUS Schütt

Fig. 81

Gymnodinium diploconus Schütt, 1895, p. 24, fig. 78. Kofoid and Swezy, 1921, p. 203, text fig. Y6.

Body roughly diamond-shaped with concave sides, biconical with rounded apices and flared girdle; sulcus from girdle to antapex, somewhat sinuous. Length 60–80 μ .

Distribution.—Mediterranean Sea; Atlantic; Pacific: Coral Sea.

GYMNODINIUM FLAVUM Kofoid & Swezy

Fig. 82

Gymnodinium flavum Kofoid and Swezy, 1921, p. 208, pl. 9, fig. 100, text fig. X7.

Body minute, broadly elliptic, slightly compressed dorsoventrally, girdle submedian, displaced about twice its width; sulcus from girdle to antapex. Length 20–30 μ .

Distribution.—Californian coast; Coral Sea, numerous and frequent.

GYMNODINIUM FUSUS Schütt

Fig. 83

Gymnodinium fusus Schütt, 1895, p. 24, figs. 79, 81. Karsten, 1907, p. 340. Kofoid and Swezy, 1921, p. 212, text fig. X5.

Body roughly diamond-shaped; epicone and hypocone rather roughly tapering to a slightly produced apex and antapex; girdle median; sulcus from below apex to antapex. Length 60 μ .

Distribution.—Neritic and oceanic. Mediterranean, Adriatic; Atlantic; Pacific; Indian Ocean; Jibbon Station, N.S.W.

GYMNODINIUM GALEAEFORME Matzenauer

Fig. 84

Gymnodinium galeaeforme Matzenauer, 1933, p. 595.

Epicone helmet-shaped; sides slightly concave; girdle slightly displaced; hypocone with concave sides and concave antapex; sulcus reaching antapex. Length 60 μ .

Distribution.—Indian Ocean; Jibbon Station.

GYMNODINIUM GELBUM Kofoid

Fig. 85

Gymnodinium gelbum Kofoid, 1931, p. 13, pl. 1, fig. 1. Schiller, 1933, p. 363, fig. 368.

Body rotund; epicone hemispherical; hypocone slightly depressed antapically; girdle median, displaced about 1 width; sulcus from girdle to antapex; chromatophores large, lanceolate. Length 30 μ .

Distribution.—Matsu-wan; Solomon Is. region.

GYMNODINIUM GRAMMATICUM (Pouchet) Kofoid & Swezy

Fig. 86

Gymnodinium punctatum var. *grammaticum* Pouchet, 1877, p. 107, pl. 10, figs. 8, 9.

Gymnodinium grammaticum Kofoid and Swezy, 1921, p. 217, text fig. X22.

Small rotund body; girdle median narrow; hypocone with posterior furrow; sulcus on hypocone only. Length 25 μ .

Distribution.—French coast; Mediterranean and Adriatic Seas; Eastern Coral Sea.

GYMNODINIUM HETEROSTRIATUM Kofoid & Swezy

Fig. 87

Gymnodinium heterostriatum Kofoid and Swezy, 1921, p. 221, text fig. Y7, pl. 2, fig. 24; pl. 5, fig. 56.

Body ovate; apex rounded, antapex obtusely rounded; girdle narrow, displaced one width; sulcus narrow, almost linear, from apex to antapex. Length 60–70 μ .

Distribution.—Mediterranean Sea; coast of Britain; California; Japan; Solomons region.

GYMNODINIUM MARINUM Saville Kent

Fig. 88

Gymnodinium marinum Saville Kent, 1880–82, p. 444, pl. 25, figs. 60, 61. Schiller, 1933, p. 382, fig. 391.

Body roughly ovate; epicone almost elliptical, narrower than hypocone which is also rotund and deeply divided by the narrow sulcus; girdle very narrow, constricting body. Length 20–30 μ .

Distribution.—English Channel; Coral Sea (very common).

GYMNODINIUM MINOR Lebour

Fig. 89

Gymnodinium minor Lebour, 1917, p. 192, fig. 8. Kofoid and Swezy, 1921, p. 233, text fig. X12.

Body small, ovoid; girdle constricted near sulcus on right, sulcus from girdle to antapex, somewhat indented. Length 25 μ .

Distribution.—Near Plymouth; Coral Sea; Vitiaz Strait, New Britain, Solomon I.

GYMNODINIUM MULTISTRIATUM Kofoid & Swezy

Fig. 90

Gymnodinium multistriatum Kofoid and Swezy, 1921, p. 236, text fig. Y1, pl. 4, fig. 37.

Body biconical to ovate; epicone slightly greater than hypocone; girdle approximately median, displaced at least 1 width; sulcus straight from apex to antapex, narrower than girdle. Length 100 μ .

Distribution.—Californian coast; Coral Sea.

GYMNODINIUM NANUM Schiller

Fig. 91

Gymnodinium nanum Schiller, 1928, p. 142, pl. 5, fig. 17; 1933, p. 389, fig. 401.

Body small; epicone hemispherical; hypocone ovate; girdle wide displaced; sulcus short. Length 5 μ .

Distribution.—Adriatic Sea; Coral Sea.

GYMNODINIUM OBESUM Schiller

Fig. 92

Gymnodinium obesum Schiller, 1933, p. 391, figs. 4–5a–g.

Body broadly oval, slightly constricted in the middle; epicone and hypocone similar, rotund; girdle median; ends slightly offset; sulcus extending about two-thirds length of both epi- and hypocone. Length 25–30 μ .

Distribution.—Freshwater in Europe; Indian Ocean off Fremantle.

GYMNODINIUM OCHRACEUM Kofoid

Fig. 93

Gymnodinium ochraceum Kofoid, 1931, p. 17, pl. 1, fig. 6.

Body broadly ovate; epicone with rounded apex and straight or slightly convex sides; hypocone rounded; girdle median, offset nearly one width. Length 55 μ .

Distribution.—Mutsu-wan; Coral Sea.

GYMNODINIUM PUNCTATUM Pouchet

Fig. 94

Gymnodinium punctatum Pouchet, 1887, p. 105, pl. 10, fig. 7. Kofoid and Swezy, 1921, p. 244, text fig. BB18.

Body small, rotund; epicone hemispherical; hypocone deeply indented at antapex; girdle median; sulcus from girdle to antapex. Length 10 μ .

Distribution.—Off French coast; Coral Sea (abundant).

GYMNODINIUM PYGMAEUM Lebour

Fig. 95

Gymnodinium pygmaeum Lebour, 1925, p. 38, pl. 4, fig. 4.

Body rotund; epicone with apex slightly depressed, and sulcus running from this depression to antapex, widening posteriorly; hypocone rounded; girdle submedian. Length 15–20 μ .

Distribution.—English Channel; Coral Sea.

GYMNODINIUM ROTUNDATUM Klebs

Fig. 96

Gymnodinium rotundatum Klebs, 1912, pp. 392, 403, 439, fig. 5. Kofoid and Swezy, 1921, p. 251, text fig. X8.

Body small, round, subspherical; girdle not displaced; sulcus from apex to antapex, narrow on epicone. Length 30 μ .

Distribution.—Europe (freshwater); Coral Sea, abundant.

GYMNODINIUM RUBRUM Kofoid & Swezy

Fig. 97

Gymnodinium rubrum Kofoid and Swezy, 1921, p. 253, pl. 8, fig. 86, text figs. A, Y4.

Body large, ovoid but labile in shape; girdle slightly posterior, wide, impressed, displaced; hypocone more asymmetrical than epicone and more irregular in outline; sulcus sinuous from apex to base, widening towards antapex; surface longitudinally striate. Length 100 μ .

Distribution.—Californian coast. Coral Sea.

GYMNODINIUM SCOPULOSUM Kofoid & Swezy

Fig. 98

Gymnodinium scopulosum Kofoid and Swezy, 1921, p. 255, pl. 1, fig. 7, text fig. X6.

Body ovate, tending to fusiform; girdle submedian, displaced about one-third width; sulcus from near apex to antapex. Length 45 μ .

Distribution.—Californian coast; Coral Sea.

GYMNODINIUM SIMPLEX (Lohmann) Kofoid & Swezy

Fig. 99

Protodinium simplex Lohmann, 1908, pp. 264–5, pl. 17, fig. 17.

Gymnodinium simplex (Lohmann). Kofoid and Swezy, 1921, p. 256, text fig. BB8.

Form minute, ellipsoidal with wide girdle in the middle; sulcus absent? (K & S), present in species as seen, narrow in epicone (cf. Schiller 1933, p. 413). Length 2–20 μ .

Distribution.—Neritic. European waters; Coral Sea: Vitiaz Strait, New Britain, New Ireland (common and abundant).

GYMNODINIUM SITULA Kofoid & Swezy

Fig. 100

Gymnodinium situla Kofoid and Swezy, 1921, p. 257, pl. 1, fig. 12, text fig. Z6.

Body of medium size, rotund; epicone bluntly conical; girdle slightly anterior, slightly displaced; sulcus from apex to antapex, narrow anteriorly. Length 60 μ .

Distribution.—Californian coast; Coral Sea.

GYMNODINIUM SPHAERICUM Calkins

Fig. 101

Gymnodinium sphaericum Calkins, 1902, p. 429, fig. 20. Kofoid and Swezy, 1921, pl. 4, fig. 42, text fig. AA9.

Medium-sized spherical body, slightly flattened dorsoventrally; girdle anterior, offset 1 width; sulcus short on epicone, extending to antapex. Length 60 μ .

Distribution.—Atlantic; Pacific; Coral Sea: Vitiaz Strait, New Britain, common.

GYMNODINIUM SPLENDENS Lebour

Fig. 102

Gymnodinium splendens Lebour, 1925, p. 43, pl. 5, fig. 1.

Body ovate, flattened dorsoventrally; epicone and hypocone subequal; epicone subhemispherical, hypocone constricted at antapex; girdle offset about 1 width; sulcus from girdle to antapex, wider posteriorly. Length 50 μ .

Distribution.—English Channel; Coral Sea.

GYMNODINIUM sp.

Fig. 103

Epicone conical with slightly indentate apex; girdle anterior deflected about twice girdle width; sulcus reaching base of hypocone which is about twice height of epicone, with tapering sides and rounded, cleft base. Length 50 μ .

Distribution.—Port Hacking, N.S.W.

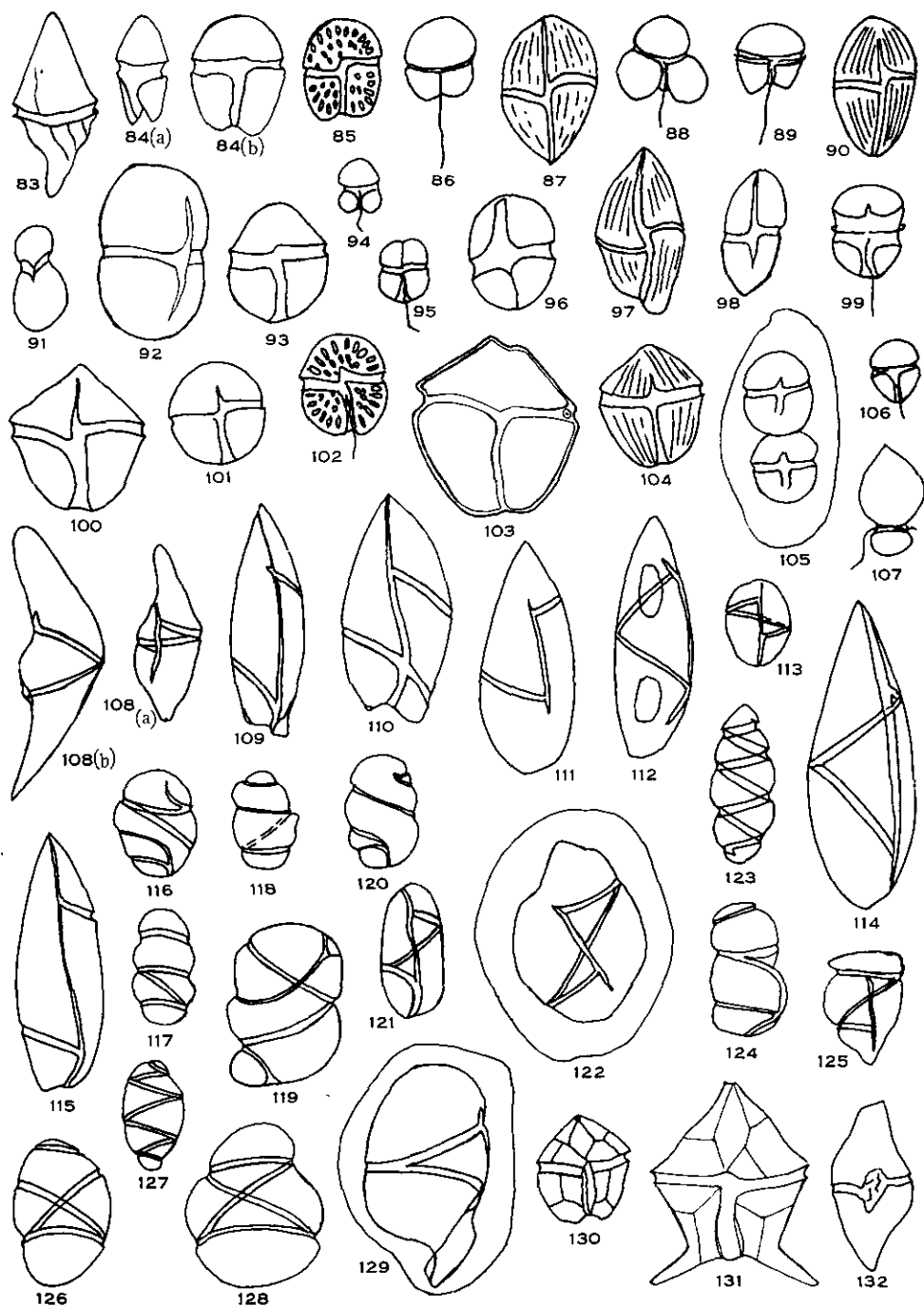
GYMNODINIUM SULCATUM Kofoid & Swezy

Fig. 104

Gymnodinium sulcatum Kofoid and Swezy, 1921, p. 259, text fig. XI.

Body rotund, of medium size, ovoid; girdle slightly anterior, not offset; sulcus narrow, extending from apex to antapex; hypocone sparsely ribbed, epicone ribbed. Length 50–60 μ .

Distribution.—Californian coast; Coral Sea.



Figs. 83–132.—Dinoflagellates. 83, *Gymnodinium fusus*. 84(a,b), *G. galeaeforme*. 85, *G. gelbum*. 86, *G. grammaticum*. 87, *G. heterostriatum*. 88, *G. marinum*. 89, *G. minor*. 90, *G. multistriatum*. 91, *G. nanum*. 92, *G. obesum*. 93, *G. ochraceum*. 94, *G. punctatum*. 95, *G. pygmaeum*. 96, *G.*

[For continuation see opposite page.]

GYMNODINIUM UBERRIMUM (Allman) Kofoid & Swezy

Fig. 105

Peridinium uberrima Allman, 1854, pp. 118, 120.*Gymnodinium uberrimum* (Allman). Kofoid and Swezy, 1921, p. 264, text fig. X9.

Body small, rotund; epicone and hypocone subequal; girdle slightly displaced; sulcus slight on epicone, and on hypocone; tendency to form chains. Length 40 μ .

Distribution.—Europe (freshwater); Coral Sea.

GYMNODINIUM VARIANS Maskell

Fig. 106

Gymnodinium varians Maskell, 1877, p. 7, pl. 1, fig. 9a,b. Schiller, 1933, p. 425, fig. 447.

Body ovate, greatest diameter anterior to middle; girdle median; hypocone somewhat narrower than epicone with rounded, subconical apex; sulcus from girdle to antapex, straight. Length 8–15 μ .

Distribution.—New Zealand, Java (freshwater); Coral Sea (common in west): Vitiaz Strait, Solomon I.

Genus MASSARTIA Conrad, 1926

Resembles an inverted *Amphidinium*; hypocone much smaller than epicone; sulcus poorly developed.

MASSARTIA ROTUNDATA (Lohmann) Schiller

Fig. 107

Amphidinium rotundatum Lohmann, 1908, p. 147 *et seq.**Massartia rotundata* (Lohmann). Schiller, 1933, p. 438, fig. 464a–e.

Body top-shaped; epicone conical, nearly twice as long as hypocone, the latter hemispherical; girdle deep; sulcus little developed. Length 12–15 μ .

Distribution.—Adriatic Sea; North Sea; English Channel; Coral Sea: Vitiaz Strait.

Genus GYRODINIUM Kofoid & Swezy, 1921

Girdle forming a left spiral, the ends offset more than one-fifth of the length of the organism; sulcus from apex to antapex, straight or slightly curved.

Figs. 83–132 (Continued)

rotundatum. 97, *G. rubrum*. 98, *G. scopulosum*. 99, *G. simplex*. 100, *G. situla*. 101, *G. sphaericum*. 102, *G. splendens*. 103, *G. sp.* 104, *G. sulcatum*. 105, *G. uberrimum*. 106, *G. varians*. 107, *Massartia rotundata*. 108(a,b), *Gyrodinium caudatum*. 109, *Gyr. cornutum*. 110, *Gyr. nasutum*. 111, *Gyr. ochraceum*. 112, *Gyr. pingue*. 113, *Gyr. prunus*. 114, *Gyr. spirale*. 115, *Gyr. submarinum*. 116, *Cochlodinium faurei*. 117, *C. flavum*. 118, *C. pupa*. 119, *C. rosaceum*. 120, *C. virescens*. 121, *Protopsis elongata*. 122, *Pr. simplex*. 123, *Nematodinium torpedo*. 124, *Warnowia atra*. 125, *W. rosea*. 126, *W. subnigra*. 127, *W. virescens*. 128, *W. voracis*. 129, *Protoerythropsis crassicauda*. 130, *Peridinium avellana*. 131, *P. fatulipes*. 132, *Goniaulax birostris*.

GYRODINIUM CAUDATUM Kofoid & Swezy

Fig. 108

Gyrodinium caudatum Kofoid and Swezy, 1921, p. 289, text fig. CC1; pl. 9, fig. 102.

Body broadly fusiform; anterior and inferior processes present; blunt, deflected; girdle displaced about 4 widths; sulcus narrow, flexuous. Length 70–80 μ .

Distribution.—Californian coast; east part of Coral Sea.

GYRODINIUM CORNUTUM (Pouchet) Kofoid & Swezy

Fig. 109

Gymnodinium spirale var. *cornuta* Pouchet, 1885, pl. 4, fig. 31.*Gymnodinium cornutum* (Pouchet). Kofoid and Swezy, 1921, p. 293, text fig. EE9.

Body fusiform; girdle a descending left spiral displaced about 1.25 trans-diameters; sulcus from apex to antapex; antapex of hypocone with 2 protuberances. Length 100 μ .

Distribution.—French coast; Coral Sea and Vitiaz Strait.

GYRODINIUM NASUTUM (Wulff) Schiller

Fig. 110

Spirodinium nasutum Wulff, 1916, p. 108, pl. 1, fig. 6a–c.*Gyrodinium nasutum* (Wulff). Schiller, 1933, p. 481, fig. 512.

Body variable in shape, rather elongate; at the base is a small, blunt process; girdle a spiral of 1 turn; sulcus narrow, from apex to base. Length 100 μ .

Distribution.—Barents Sea; Coral Sea.

GYRODINIUM OCHRACEUM Kofoid & Swezy

Fig. 111

Gyrodinium ochraceum Kofoid and Swezy, 1921, p. 321, pl. 7, figs. 76, 82, text fig. DD17.

Body bullet-shaped, acute at apex, rounded at antapex; girdle strongly displaced; sulcus slightly spiral. Length 110 μ .

Distribution.—Californian coast; Adriatic; Coral Sea; Vitiaz Strait.

GYRODINIUM PINGUE (Schütt) Kofoid & Swezy

Fig. 112

Gymnodinium spiralis var. *pingue* Schütt, 1895, p. 21, fig. 65.*Gyrodinium pingue* (Schütt). Kofoid and Swezy, 1921, p. 327, pl. 4, fig. 38, text fig. DD15.

Body fusiform, broadly rounded posteriorly, narrowly so anteriorly; girdle a descending left spiral displaced about one trans-diameter; sulcus from near apex to near antapex, slightly sinuous. Length 55 μ .

Distribution.—Atlantic; Mediterranean; Adriatic; Californian coast; Barents Sea; Coral Sea.

GYRODINIUM PRUNUS (Wulff) Lebour

Fig. 113

Spirodinium prunus Wulff, 1920, p. 107, fig. 3.*Gyrodinium prunus* (Wulff). Lebour, 1925, p. 52, fig. 14a.

Body plum-shaped; girdle narrow forming 1 turn; sulcus slightly curved. Length 40–45 μ .

Distribution.—Barents Sea; Coral Sea.

GYRODINIUM SPIRALE (Bergh) Kofoid & Swezy

Fig. 114

Gymnodinium spirale Bergh, 1881, p. 66.*Gyrodinium spirale* (Bergh). Kofoid and Swezy, 1921, p. 332, pl. 4, fig. 43, text fig. DD14.

Body fusiform, blunter at apex; girdle steeply inclined spiral; sulcus from apex to antapex; surface striate. Length 50 μ .

Distribution.—Cosmopolitan; Coral Sea.

GYRODINIUM SUBMARINUM Kofoid & Swezy

Fig. 115

Gyrodinium submarinum Kofoid and Swezy, 1921, p. 335, pl. 10, fig. 110, text fig. DD1.

Body slender, fusiform; girdle displaced 1.75 trans-diameters; sulcus from apex to antapex; surface striate. Length 125 μ .

Distribution.—Californian coast; Coral Sea.

Genus COCHLODINIUM Schütt, 1896

COCHLODINIUM FAUREI Kofoid & Swezy

Fig. 116

Cochlodinium faurei Kofoid and Swezy, 1921, p. 366, pl. 2, fig. 25, text fig. GG4.

Body subovate to ellipsoidal; girdle a left spiral of 2 turns, much displaced; sulcus a spiral of about 1.2 turns with apical and antapical loops. Length 60 μ .

Distribution.—Californian coast; Coral Sea; Vitiaz Strait, off Manus I.

COCHLODINIUM FLAVUM Kofoid

Fig. 117

Cochlodinium flavum Kofoid, 1931, p. 26, pl. 2, fig. 13.

A small species with any asymmetrically elliptic body, deeply indented, with helical girdle and low epicone. Length 40 μ .

Distribution.—Mutsu-wan; southern Coral Sea.

COCHLODINIUM PUPA Lebour

Fig. 118

Cochlodinium pupa Lebour, 1925, p. 63, pl. 9, fig. 4a-c.

Body barrel-shaped; epicone and hypocone low; girdle deep, making about 2 turns; sulcus making a contrary spiral and reaching antapex. Length 40 μ .

Distribution.—English Channel; south-east Coral Sea.

COCHLODINIUM ROSACEUM Kofoed & Swezy

Fig. 119

Cochlodinium rosaceum Kofoed and Swezy, 1921, p. 379, pl. 8, fig. 85, text fig. HH4.

Body rotund with broad apices; epicone larger than hypocone; latter rounded with flat antapex; girdle a left spiral, transverse at distal end; sulcus begins near apex. Length 75 μ .

Distribution.—Californian coast; Coral Sea.

COCHLODINIUM VIRESCENS Kofoed & Swezy

Fig. 120

Cochlodinium virescens Kofoed and Swezy, 1921, p. 386, pl. 9, fig. 104, text fig. HH11.

Body ellipsoid, nearly symmetrical, deeply constricted; girdle a left spiral; sulcus twisted nearly 1 turn. Length 45 μ .

Distribution.—Californian coast; Coral Sea.

Genus PROTOPSIS Kofoed & Swezy, 1921

Possesses ocellus, a girdle and sulcus of the *Gymnodinium* or *Gyrodinium* type, no tentacle, no apical sulcal loop, and no twisting of the body; girdle does not make more than 1 turn round body.

PROTOPSIS ELONGATA Schiller

Fig. 121

Protopsis elongata Schiller, 1928, p. 160, fig. 36a-c; 1933, p. 555, fig. 583a-c.

Body elongate-elliptic; sides straight or convex; girdle beginning near apex forming a left spiral; sulcus from apex to base, slightly bent, widest between girdle ends. Length 70 μ .

Distribution.—Adriatic; Coral Sea.

PROTOPSIS SIMPLEX Lebour

Fig. 122

Protopsis simplex Lebour, 1925, p. 70, pl. 10, fig. 4.

Body ovate, irregular; girdle widely displaced; sulcus slightly curved, extending well beyond girdle, but not reaching apex or antapex; cell encysted. Length 80 μ .

Distribution.—Plymouth; Coral Sea.

Genus NEMATODINIUM Kofoid & Swezy, 1921

Nematocysts present; girdle with more than 1 turn, displaced more than 1.5 trans-diameter; sulcus twisted 0.75 or more turns with a posterior turn on dorsal side of antapex; ocellus distributed or concentrated, posterior.

NEMATODINIUM TORPEDO Kofoid & Swezy

Fig. 123

Nematodinium torpedo Kofoid and Swezy, 1921, p. 426, pl. 11, fig. 124, text fig. NN3.

Body fusiform, long; girdle a left-hand spiral of over 2 turns; sulcus spiral. Length 80–100 μ .

Distribution.—Californian coast; Coral Sea, common.

Genus WARNOWIA Lindemann, 1928

Pouchetia Schütt, 1895 (in part). (*Pouchetia* is a valid genus of Rubiaceae Richard, 1830.)

Ocellus is located at left of sulcus; no posterior prod; girdle a left spiral of 1.15–2 turns; sulcus 0.25–1.75 turns with apical and antapical loops.

WARNOWIA ATRA (Kofoid & Swezy) Schiller

Fig. 124

Pouchetia atra Kofoid and Swezy, 1921, p. 439, pl. 11, fig. 126, text fig. PP5.

Warnowia atra (Kofoid and Swezy). Schiller, 1933, p. 565, fig. 595.

Body ovoid; girdle a descending spiral of 2.6 turns; sulcus with 2 turns. Length 60 μ .

Distribution.—Californian coast; Coral Sea.

WARNOWIA ROSEA (Pouchet) Schiller

Fig. 125

Gymnodinium polyphemus var. *roseum* Pouchet, 1879, pp. 93, 96, 97, 112, pl. 10, fig. 1.

Pouchetia rosea Kofoid and Swezy, 1921, p. 460, text fig. OO4. Non Schütt, 1895, p. 94, pl. 26, fig. 92.

Warnowia rosea (Pouchet). Schiller, 1933, p. 583, fig. 612a,b.

Body irregularly eplipsoid, variable; girdle a spiral of at least 1.25 turns; sulcus with less than 0.5 turns. Length 50 μ .

Distribution.—Atlantic; Mediterranean; Mutsu-wan; Coral Sea.

WARNOWIA SUBNIGRA (Kofoid & Swezy) Schiller

Fig. 126

Pouchetia subnigra Kofoid and Swezy, 1921, p. 468, pl. 6, fig. 66, text fig. OO6.

Warnowia subnigra (Kofoid and Swezy). Schiller, 1933, p. 588.

Body ovoidal; girdle a spiral of 1.3 turns; sulcus with anterior and posterior loops, twisted 1 turn; hypocone narrower and subconical. Length 100 μ .

Distribution.—Californian coast; Coral Sea and Solomon I.

WARNOWIA VIOLESCENS (Kofoid & Swezy) Lindemann

Fig. 127

Pouchetia violescens Kofoid and Swezy, 1921, p. 469, pl. 11, figs. 118, 120, text fig. OO1.

Warnowia violescens (Kofoid and Swezy). Lindemann, 1928, p. 52.

Body ovoid; girdle a spiral of 1·8 turns; sulcus with 3 turns and apical and antapical loops. Length 100–120 μ .

Distribution.—Californian coast; Coral Sea; Vitiaz Strait, Manus I., New Ireland.

WARNOWIA VORACIS (Kofoid & Swezy) Schiller

Fig. 128

Pouchetia voracis Kofoid and Swezy, 1921, p. 471, pl. 8, fig. 89, text fig. PP2.

Warnowia voracis (Kofoid and Swezy). Schiller, 1933, p. 590.

Body rotund; girdle a spiral of 1·25 turns; sulcus with 0·5 turn. Length 75 μ .

Distribution.—Californian coast; Coral Sea.

Genus PROTOERYTHROPSIS Kofoid & Swezy, 1921

Girdle median, ocellus posterior, and stout rudimentary prod or tentacle.

PROTOERYTHROPSIS CRASSICAUDA Kofoid & Swezy

Fig. 129

Protoerythropsis crassicauda Kofoid and Swezy, 1921, p. 11, fig. 123, text fig. PP9.

Body ellipsoid; girdle a spiral of 1·2 turns; sulcus of about 0·6 turns; stout ventro-posterior process. Length 72 μ .

Distribution.—Californian coast; eastern Coral Sea.

Family PERIDINIIDAE Kofoid

Genus PERIDINIUM Ehrenberg, 1832

PERIDINIUM AVELLANA (Meunier) Lebour

Fig. 130

Properidinium avellana Meunier, 1919, p. 56, pl. 18, figs. 37–41.

Peridinium avellana (Meunier). Lebour, 1925, p. 108, pl. 17, fig. 1.

Body suborbicular, epitheca and hypotheca equal; sides straight or slightly concave, ends rounded; girdle depressed; base slightly indentate. Length 35 μ .

Distribution.—English Channel; east Coral Sea.

PERIDINIUM FATULIPES Kofoid

Fig. 131

Peridinium fatulipes Kofoid, 1907, p. 174, pl. 5, fig. 30.

Body large, much widened at girdle; epitheca conical, sides concave, tapering into a rather long apical horn; hypotheca trapezoidal with antapical horns strongly

diverging, about equal in length to apical, and may be spinulate; meta, quadra. Length 150–200 μ .

Distribution.—Tropical seas. Indian Ocean.

Genus GONIAULAX Diesing, 1866

GONIAULAX BIROSTRIS Stein

Fig. 132

(See Wood 1954.) Figure 132 illustrates a spore newly emerged from the theca.

GONIAULAX MILNERI (Murray & Whitting) Kofoed

Fig. 133

Goniodoma milneri Murray and Whitting, 1899, p. 325, fig. 2a–d.

Goniaulax milneri (Murray and Whitting). Kofoed, 1911, p. 203.

Epitheca dome-shaped with blunt apex; sutures strongly raised forming spines at junction of girdle and sulcus; girdle displaced 1 width; hypotheca rectangular to trapezoidal; sutures extended posteriorly into short spines. Length 30 μ .

Distribution.—Atlantic; Indian Ocean; Coral Sea.

GONIAULAX TAMARENSIS Lebour

Fig. 134

Goniaulax tamarensis Lebour, 1925, p. 95, pl. 14, fig. 1a–d.

Body rotund, slightly ovate; apex acute, no apical horn; antapical with 2 tiny horns; girdle median deep, lists thick, displaced about one-half width; sulcus widening posteriorly, reaching antapex. Length 40 μ .

Distribution.—Plymouth; Coral Sea.

Genus AMPHIDOMA Stein, 1883

Body more or less biconical, girdle circular, slightly displaced; central or somewhat posterior; apical horn and antapical spine may be present; plate formula 6', 0a, 6'', 6, 6'', 1p, 1''''.

AMPHIDOMA sp.

Fig. 135

A small biconical form with rounded apex and antapex; sulcus was not seen, so further identification was not possible.

Distribution.—Inshore waters, Port Moresby.

Genus MELANODINIUM Schiller, 1937

Body ovate to subspherical; girdle median slightly offset; sulcus extending from apex to antapex in a deep furrow; surface with three- to four-sided areoles with triangular hyaline platelets arising from the sides.

MELANODINIUM NIGRICANS Schiller

Fig. 136

Melanodinium nigricans Schiller, 1937, p. 320, fig. 336a-d.

Body ovate, almost circular in outline; epitheca and hypotheca roughly hemispherical with a deep groove from apex to antapex containing the sulcus; plates not obvious, masked by dense three- or four-sided areoles with a central pore and three-sided platelets protruding from the sides of the areoles. Diameter 40 μ .

Distribution.—Red Sea; Solomon Is.

Family HETERODINIIDAE Lindemann

Genus HETERODINIUM Kofoid, 1906

HETERODINIUM AUSTRALIAE, sp. nov.

Fig. 137

Body subrotund; epitheca slightly lower than hypotheca, sides strongly convex, tapering to apical pore and protruding at girdle; hypotheca depressed antapically with two small, even spines; sulcus somewhat sinuous; surface of body reticulate, coarse. Distinguishing features are the equal antapical spines, the subrotund shape and the overlapping girdle. Length 60 μ .

Distribution.—Indian Ocean 100 miles south of Albany; northern Coral Sea.

HETERODINIUM CRASSIPES Schiller

Fig. 138

Heterodinium crassipes Schiller, 1916, p. 210, fig. 1; 1937, p. 338, fig. 361.

Epitheca conical with somewhat swollen margins; hypotheca smaller with two pointed horns separated by a winged membrane. Length 100 μ .

Distribution.—Adriatic; Coral Sea off Norfolk I.

HETERODINIUM FENESTRATUM Kofoid

Fig. 139

Heterodinium fenestratum Kofoid, 1907, p. 179, pl. 8, fig. 47. Kofoid and Adamson, 1933, p. 54, pl. 7, figs. 1, 4-6, pl. 15, fig. 14.

Body pentagonal, epitheca triangular, slightly larger than hypotheca; hypotheca trapezoidal; girdle overhanging; surface coarsely reticulate; antapicals stout, subconical; post margin with ribbed list; girdle displaced, overlapping. Length 95 μ .

Distribution.—Tropical Pacific: Coral Sea.

HETERODINIUM HINDMARCHI (Murray & Whitting) Kofoid

Fig. 140

Peridinium hindmarchi Murray and Whitting, 1899, p. 326, fig. 29-1a,b.*Heterodinium hindmarchi* (Murray and Whitting). Kofoid, 1906, p. 359. Kofoid and Adamson, 1933, p. 66, pl. 8, figs. 5, 7, pl. 15, fig. 23.

Body elongate, pentagonal, with high epitheca tapering from girdle to apical horn; hypotheca shallower, with two stout horns slightly recurved; surface polygonally reticulate; girdle displaced without overlap; sulcus short. Length 120 μ .

Distribution.—Tropical Pacific; Coral Sea.

HETERODINIUM MEDITERRANEUM Pavillard

Fig. 141

Heterodinium mediterraneum Pavillard, 1932, p. 3, fig. 3.

Body rotund with conical epitheca and apical horn; hypotheca suborbicular, with one small and one large, rugose antapical spine; girdle displaced about 2 widths. Length 60 μ .

Distribution.—Mediterranean; Pacific: Solomons Slot, Planet Trench.

HETERODINIUM MILNERI (Murray & Whitting) Kofoid

Fig. 142

Peridinium milneri Murray and Whitting, 1899, p. 327, fig. 29-3a,b.

Heterodinium milneri (Murray and Whitting). Kofoid, 1906, p. 353.

Body subspheroidal with conical epitheca and a short apical horn; hypotheca rotund with 4 finned antapical spines; girdle displaced. Length 60 μ .

Distribution.—Tropical Atlantic; Coral Sea.

Family CERATIIDAE

Genus CERATIUM Schrank, 1795

CERATIUM BIGELOWI Kofoid

Fig. 143

Ceratium bigelowi Kofoid, 1907, p. 170, pl. 3, fig. 22.

Epitheca globose, much larger than hypotheca, tapering into a long, slightly bent apical horn; hypotheca small, with one antapical very short, the other very long, bent towards end. Length 1000 μ .

Distribution.—Tropical Indian Ocean west of Australia; Pacific Ocean.

CERATIUM DIGITATUM Schütt

Fig. 144

Ceratium digitatum Schütt, 1895, p. 12, fig. 42. Steemann Nielsen, 1934, p. 8, fig. 5.

Epitheca swollen, strongly bent dorsally, in ventral view somewhat flat, sharply bent, tapering obtusely to a blunt point; antapical horns very unlike, the left strongly sigmoid bending forward and then turned backwards, right much shorter, straight, tapering to a sharp point. Length 100 μ .

Distribution.—Rare in warm waters; Coral Sea; Lord Howe Island.

CERATIUM GENICULATUM (Lemmermann) Cleve, var.

Fig. 145

Ceratium geniculatum (Lemmermann) Cleve. Wood, 1954, p. 279, fig. 197.

This species shows considerable variation. Two views of a Coral Sea variant are shown in Figure 145.

Distribution.—Rare but widely distributed in tropical seas. Indian Ocean; Coral Sea and west Pacific.

CERATIUM GRAVIDUM Gourret var. ELONGATA, var. nov.

Fig. 146

Differs from type in that the epitheca is elongate with parallel sides and rounded apex.

Distribution.—Off Jibbon Cape and at several stations in the Coral Sea.

CERATIUM PARADOXIDES Cleve

Fig. 147

Ceratium paradoxides Cleve, 1900, p. 15, pl. 7, fig. 14. Wood, 1954, p. 296 (not illustrated).

This species was recorded between Sydney and Moreton Bay by Steemann Nielsen (1934) but not observed by Wood. It has since been found in the Coral Sea and tropical Indian Ocean; this species intergrades with *C. limulus* of which it is probably a subspecies.

CERATIUM PRAELONGUM (Lemmermann) Kofoed

Fig. 148

Ceratium gravidum var. *praelongum* Lemmermann, 1900, p. 349, pl. 1, fig. 16.*Ceratium praelongum* (Lemmermann). Kofoed, 1907, p. 182. Steemann Nielsen, 1934, p. 7, fig. 1.

Epitheca about twice length of hypotheca; margins in ventral view almost straight for about two-thirds length, then evenly rounded with a central pore but no apical horn; hypotheca slightly tapering with 2 straight, pointed antapical horns. Length 200–250 μ .

Distribution.—Tropical oceans and seas: eastern Indian Ocean; Coral Sea.

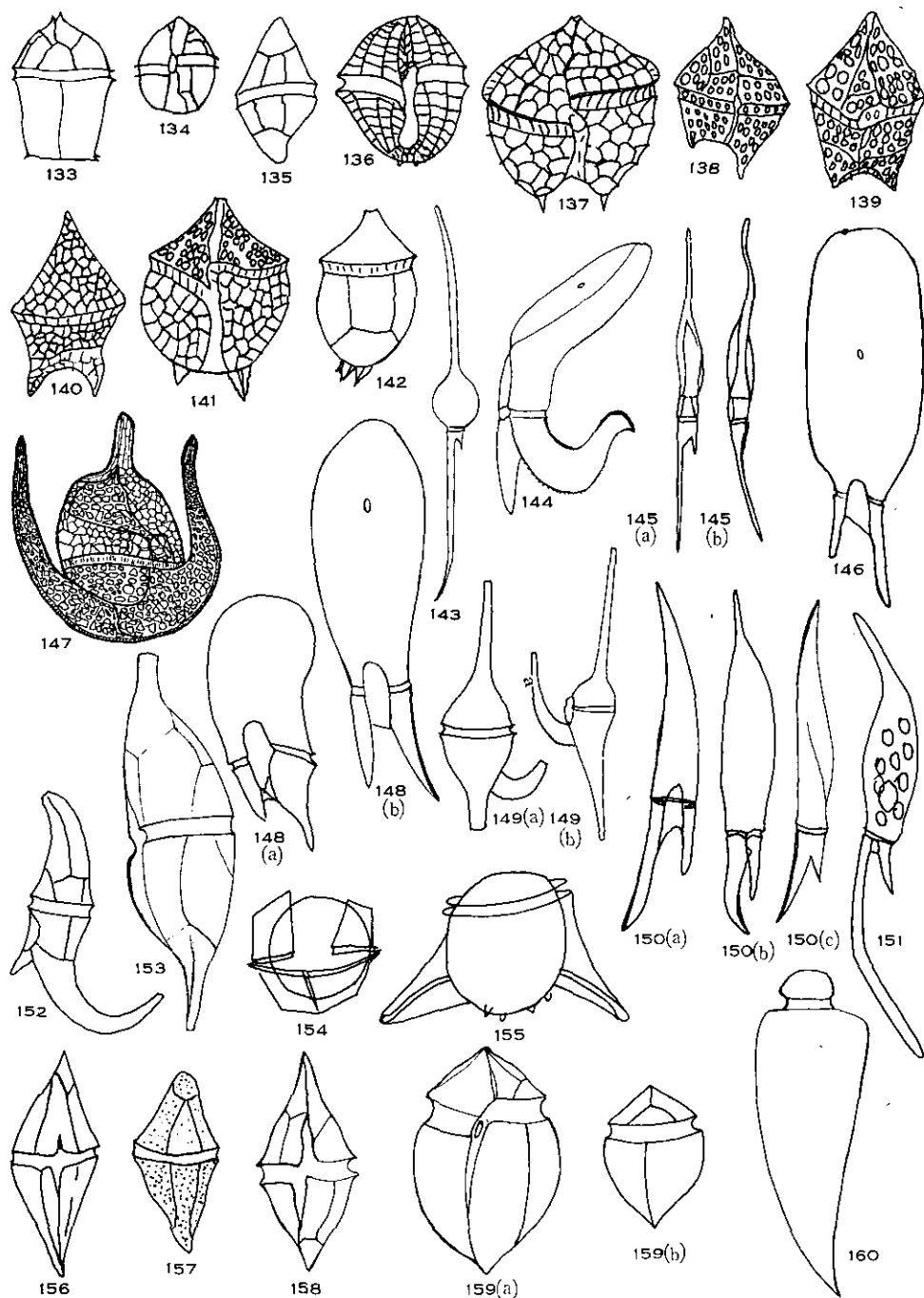
CERATIUM REFLEXUM Cleve

Fig. 149

Ceratium reflexum Cleve, 1900, p. 15, figs. 7, 8, 9. Wood, 1954, p. 305 (not illustrated).

Length 150–200 μ . Recorded by Steemann Nielsen (1934) but not by Wood from the Australian region.

Distribution.—Rare tropical species. Indian Ocean; Coral Sea.



Figs. 133–160.—Dinoflagellates. 133, *Goniaulax milneri*. 134, *G. tamarensis*. 135, *Amphidoma* sp. 136, *Melanodinium nigricans*. 137, *Heterodinium australiae*, sp. nov. 138, *H. crassipes*. 139, *H. fenestratum*. 140, *H. hindmarchi*. 141, *H. mediterraneum*. 142, *H. milneri*. 143, *Ceratium bigelowi*. 144, *C. digitatum*. 145(a,b), *C. geniculatum*. 146, *C. gravidum* var. *elongatum*, var. nov. 147, *C. paradoxides*. 148(a,b,c), *C. praelongum*. 149(a,b), *C. reflexum*. 150(a,b,c), *C. schroeteri*. 151, *C. pacificum*, sp. nov. 152, *C. tasmaniae*, sp. nov. 153, *Centrodinium complanatum*. 154, *Goniodoma polyedricum*. 155, *Ceratocorys* sp. 156, *Murrayella biconica*. 157, *M. intermedia*. 158, *M. spinosa*. 159(a,b), *Oxytoxum belgicae*. 160, *O. caudatum*.

CERATIUM SCHROETERI B. Schröder

Fig. 150

Ceratium schroeteri Schröder, B., 1906, p. 368, fig. 43.

Epitheca elongate, slightly twisted, ventral margin sigmoid, dorsal straight to slightly sigmoid, tapering to a fine point; hypotheca short, smaller antapical evenly tapering to a point, larger stronger and curved outwards and posteriorly.

Distribution.—Rare warm water species: Coral Sea; North Tasman; Eden, N.S.W.

CERATIUM PACIFICUM, sp. nov.

Fig. 151

Epitheca large, somewhat swollen and produced into a bent apical horn; girdle narrow, depressed; hypotheca small, one antapical horn slightly curved and spur-like, the other long, straight for about half length then curved at an angle of 30–45°. Length 300 μ . Is distinct but probably closest to *C. schroeteri*. The long antapical horns and clearly differentiated apical horn are unique.

Distribution.—Off Bougainville I. in the Solomon Slot.

CERATIUM TASMANIAE, sp. nov.

Fig. 152

Epitheca and hypotheca of equal width; apical horn strong, short, bent ventrally; antapicals unequal, one short, slightly curved ventrally, the other strong and recurved, ending anteriorly. Length 200 μ . This species seems to belong to the *Digitata* section.

Distribution.—Latitude 30° S., off Norfolk I.

Genus CENTRODINIUM Kofoid, 1907

CENTRODINIUM COMPLANATUM (Cleve) Kofoid

Fig. 153

Steiniella complanata Cleve, 1903, p. 37.*Centrodinium complanatum* (Cleve). Kofoid, 1907, p. 186.

Epitheca more convex dorsally than ventrally with short, open apical horn; hypotheca tapering with twisted, open antapical with 3 antapical teeth. Length 80–100 μ .

Distribution.—Rare warm water form. Indian Ocean.

Genus GONIODOMA Stein, 1883

GONIODOMA POLYEDRICUM (Pouchet) Jorgensen

Fig. 154

(See Wood 1954.) Spore bursting from theca.

Distribution.—Coral Sea.

Genus CERATOCORYS Stein, 1883

CERATOCORYS sp.

Fig. 155

This specimen had the form of *C. gourreti*, but with the 4 antapical processes reduced to stubs resembling the stubs of *C. armata*. As only one example was seen and there seems to be a great variability in the processes of this genus, the present form has not been given a specific name.

Distribution.—Indian Ocean.

Genus MURRAYELLA Kofoid, 1907

Body spherical or fusiform; no apical pore; girdle median, may or may not overlap.

MURRAYELLA BICONICA (Murray & Whitting) Pavillard

Fig. 156

Ceratium biconicum Murray and Whitting, 1899, p. 27, fig. 4a-c.

Murrayella biconica (Murray and Whitting). Pavillard, 1931, p. 98, pl. 3, fig. 15. Schiller, 1937, p. 450, fig. 496a-c.

Body biconical, ends acute; epitheca and hypotheca subequal; girdle submedian; slightly displaced; sulcus narrow in intact cell; surface porulate. Length 80 μ .

Distribution.—Warm Atlantic waters; south-eastern Coral Sea.

MURRAYELLA INTERMEDIA Pavillard

Fig. 157

Murrayella intermedia Pavillard, 1916, p. 44, pl. 2, fig. 5.

Body biconical with blunt apex and spined, deflected antapex; girdle deep; surface porulate. Length 50 μ .

Distribution.—Warm Atlantic waters; east Coral Sea.

MURRAYELLA SPINOSA Kofoid

Fig. 158

Murrayella spinosa Kofoid, 1907, p. 192, pl. 9, fig. 57. Schiller, 1933, p. 449, fig. 493.

Body biconical, girdle median, epitheca and hypotheca about equal in length, conical with apex and antapex acute; girdle offset about one-half girdle width; sulcus about two-thirds length of epi- and hypotheca; plates 2', 1a, 6'', 5'', 1'''. Length 40 μ .

Distribution.—Eastern tropical Pacific Ocean; Indian Ocean.

Genus OXYTOXUM Stein, 1883

OXYTOXUM BELGICAE Meunier

Fig. 159

Oxytoxum belgicae Meunier, 1910, p. 55, pl. 16, figs. 38–41.

Body suborbicular with obtusely angled apex and subacute antapex which is slightly spined; epitheca low conical, girdle displaced 1 width, deep; hypotheca slightly swollen below girdle, equal in diameter to epitheca; plate sutures well marked; plates finely punctate. Length 50–60 μ .

Distribution.—Kara Sea; Coral Sea west of New Hebrides.

OXYTOXUM CAUDATUM Schiller

Fig. 160

Oxytoxum caudatum Schiller, 1937, p. 454, fig. 504.

Epitheca domed, small, with small apical spinule; girdle wide, deep; hypotheca wider than epitheca, tapering to acute antapex. Length 90 μ .

Distribution.—Adriatic; Indian Ocean.

OXYTOXUM CHALLENGEROIDES Kofoed

Fig. 161

Oxytoxum challengeroides Kofoed, 1907, p. 187, pl. 10, fig. 65.

Epitheca conical with concave margins tapering into a central horn; girdle wide and deep; hypotheca top-shaped with convex margins and antapical spine; sulcus about one-third length of hypotheca. Length 80–100 μ .

Distribution.—Eastern tropical Pacific: Coral Sea, North Tasman Sea.

OXYTOXUM COMPRESSUM Kofoed

Fig. 162

Oxytoxum compressum Kofoed, 1907, p. 188, pl. 10, fig. 63. Schiller, 1937, p. 461, fig. 522.

Body top-shaped; epitheca obtusely conical; hypotheca top-shaped with ventrally curved spine at antapex; girdle wide, displaced about one-half width. Length 65–110 μ .

Distribution.—East tropical Pacific: off New Britain, south Coral Sea.

OXYTOXUM CONSTRICTUM (Stein) Bütschli

Fig. 163

Pyrgidium constrictum Stein, 1883, p. 5, figs. 15–18.

Oxytoxum constrictum (Stein). Bütschli, 1885, p. 1006, pl. 53, fig. 5. Schiller, 1937, p. 460, fig. 521a–c.

Epitheca bluntly conical, apex rounded, sides concave; hypotheca conical with convex margins, constricted near the upper third and with a short, sharp spine. Length 70–85 μ .

Distribution.—Mediterranean Sea; Coral Sea: Solomons Slot.

OXYTOXUM CORONATUM Schiller

Fig. 164

Oxytoxum coronatum Schiller, 1937, p. 454, fig. 503.

Epitheca small, cap-shaped with a short conical spinule; girdle broad and deep, forming a wing on the upper side suggesting a crown; hypotheca tapering to acute antapex with longitudinal stripes. Length 40–45 μ .

Distribution.—Adriatic; Indian Ocean.

OXYTOXUM CRIBROSUM Stein

Fig. 165

Oxytoxum cribrosum Stein, 1883, p. 5, fig. 4. Schiller, 1937, p. 460, fig. 520.

Epitheca dome-shaped with a tapering apical spine; girdle moderately wide, deep; hypotheca narrowly top-shaped with convex sides and a thin antapical spine. Length 80 μ .

Distribution.—Atlantic Ocean; North Tasman Sea.

OXYTOXUM CURVATUM (Kofoid) Kofoid

Fig. 166

Prorocentrum curvatum Kofoid, 1907, p. 166, pl. 1, figs. 1, 2.*Oxytoxum curvatum* (Kofoid). Kofoid, 1911, p. 287.

Epitheca shortly cylindrical; hypotheca with blunt apical region and curved, tapering antapex. Length 50–60 μ .

Distribution.—Atlantic Ocean; Indian Ocean; eastern tropical Pacific: Coral Sea (abundant), Tasman Sea.

OXYTOXUM ELEGANS Pavillard

Fig. 167

Oxytoxum elegans Pavillard, 1916, p. 43, pl. 2, fig. 4.

Epitheca shallow-conical with short, acute pointed spine; girdle displaced 1 width; hypotheca deep, rounded with a short abrupt pointed spine; striate at right angles to plate margins. Length 35–45 μ .

Distribution.—Gulf of Lyons; Indian Ocean west of Australia; Coral Sea, Tasman Sea.

OXYTOXUM ELONGATUM, sp. nov.

Fig. 168

Body very elongate; epitheca rounded with longish spine, but much smaller than hypotheca; hypotheca elongate, tapering, with angular shoulders at girdle and a posterior spine. Rather like a much elongated *O. scolopax* but without the globular distal portion. Length 150–200 μ .

Distribution.—Common in eastern Coral Sea, Vitiaz Strait, and off New Ireland.

OXYTOXUM GRACILE Schiller

Fig. 169

Oxytoxum gracile Schiller, 1937, p. 455, fig. 506.

Epitheca conical pointed with concave margins; girdle narrow, varying in depth; hypotheca with wide shoulders, tapering to antapical spine; sulcus short. Length 20–35 μ .

Distribution.—Adriatic Sea; Tasman and South Coral Seas.

OXYTOXUM LATICEPS Schiller

Fig. 170

Oxytoxum laticeps Schiller, 1937, p. 461, fig. 523.

Body small, top-shaped; epitheca hemispherical; girdle deep, even; hypotheca truncate-ovate with antapical spine. Length 25 μ .

Distribution.—Adriatic Sea; Coral Sea; Solomons Slot; Indian Ocean.

OXYTOXUM LONGICEPS Schiller

Fig. 171

Oxytoxum longiceps Schiller, 1937, p. 464, fig. 532.

Epitheca conical, tapering into a long acute spine; girdle deep and very wide; sulcus extending about girdle width on both epi- and hypotheca; hypotheca tapering, curved; striae longitudinal on epi- and hypotheca, and girdle. Length 70 μ .

Distribution.—Adriatic Sea; Indian Ocean.

OXYTOXUM LONGUM Schiller

Fig. 172

Oxytoxum longum Schiller, 1937, p. 457, fig. 511.

Epitheca hemispherical with a small excentric apical process; girdle wide, shallow; hypotheca almost cylindrical with acute antapex and fine antapical spine. Length 50–60 μ .

Distribution.—Adriatic Sea; Coral Sea.

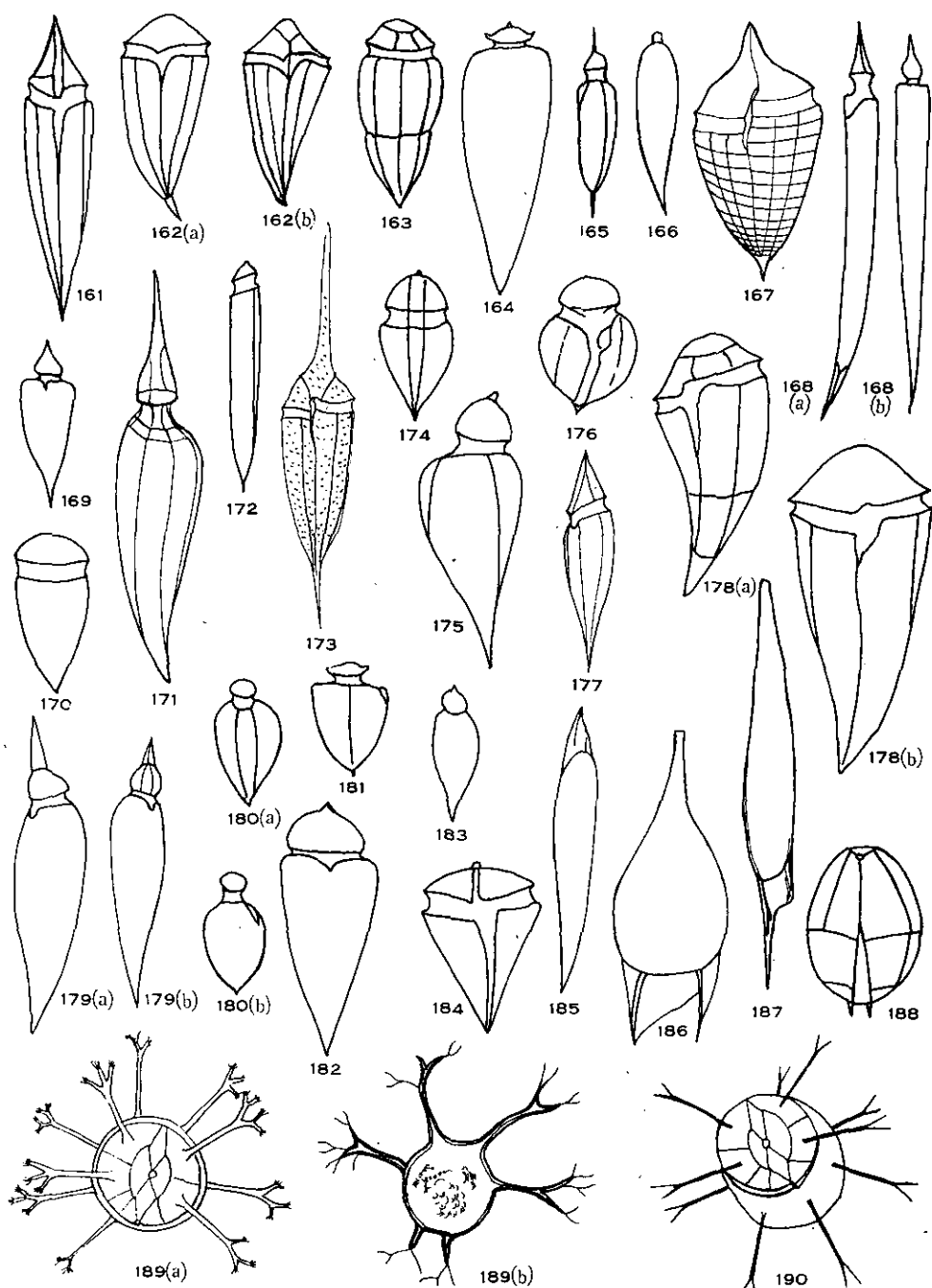
OXYTOXUM MILNERI Murray & Whitting

Fig. 173

Oxytoxum milneri Murray and Whitting, 1899, p. 328, pl. 27, fig. 6. Schiller, 1937, p. 465, fig. 533.

Epitheca low, broadly conical, then tapering into a long, asymmetrical point; hypotheca deep, conical with convex margins, then forming an acute point; plate margins ridged, plates areolate. Length 130 μ .

Distribution.—Warm water species in Atlantic and Mediterranean; Indian Ocean west of Australia, Tasman Sea.



Figs. 161-190.—Dinoflagellates. 161, *Oxytoxum challengeroides*. 162(a,b), *O. compressum*. 163, *O. constrictum*. 164, *O. coronatum*. 165, *O. cribratum*. 166, *O. curvatum*. 167, *O. elegans*. 168, *O. elongatum*, sp. nov. 169, *O. gracile*. 170, *O. laticeps*. 171, *O. longiceps*. 172, *O. longum*. 173, *O. milneri*. 174, *O. mitra*. 175, *O. obliquum*. 176, *O. pachyderme*. 177, *O. parvum*. 178(a,b), *O. robustum*. 179(a,b), *O. sceptrum*. 180(a,b), *O. sphaeroides*. 181, *O. sphaeroides* var. *steini*. 182, *O. turbo*, var. 183, *O. variabile*. 184, *O. sp.* 185, *Podolampas curvatus*. 186, *Pod. elegans*. 187, *Pod. spinifer*. 188, *Blepharocysta splendormaris*. 189(a,b), *Cladopyxis brachiolata*. 190, *C. caryophyllum*.

OXYTOXUM MITRA Stein

Fig. 174

Oxytoxum mitra Stein, 1883, pl. 5, fig. 22, pl. 6, fig. 1. Schiller, 1937, p. 459, fig. 517.

Epitheca hemispherical with a small, blunt process; girdle moderate; hypotheca top-shaped with a small antapical process. Length 70 μ .

Distribution.—Mediterranean Sea; Coral Sea.

OXYTOXUM OBLIQUUM Schiller

Fig. 175

Oxytoxum obliquum Schiller, 1937, p. 457, fig. 513.

Epitheca with rounded margin and blunt process slightly offset from longitudinal axis of cell; girdle of varying width; hypotheca subconical with rounded anterior margin and acute posterior ending in a small spine. Length 50–60 μ .

Distribution.—Southern Adriatic; north Coral Sea.

OXYTOXUM PACHYDERME Schiller

Fig. 176

Oxytoxum pachyderme Schiller, 1937, p. 460, fig. 519.

Body rotund, epitheca low rounded with slight spine; hypotheca much larger, almost spherical; girdle wide, anterior; sulcus about half body length. Length 30 μ .

Distribution.—Adriatic; Coral Sea.

OXYTOXUM PARVUM Schiller

Fig. 177

Oxytoxum parvum Schiller, 1937, p. 464, fig. 531.

Body biconical; epitheca much smaller than hypotheca, pointed, sides concave; girdle wide and deep, angled; hypotheca with margins convex below girdle, then tapering to a spine. Length 30–45 μ .

Distribution.—Adriatic Sea; Indian Ocean; common in Coral Sea and adjacent waters. Tasman Sea.

OXYTOXUM ROBUSTUM Kofoed

Fig. 178

Oxytoxum robustum Kofoed, 1911, p. 288.

Epitheca dome-shaped, apex rounded; girdle moderate; hypotheca horn-shaped, bent at antapex with antapical spine.

Distribution.—Californian coast; Coral Sea and north Tasman Sea.

OXYTOXUM SCEPTRUM (Stein) B. Schröder

Fig. 179

Pyrgidium sceptrum Stein, 1883, p. 5, figs. 19–21.*Oxytoxum sceptrum* (Stein). Schröder, B., 1906, p. 327.

Epitheca more or less globiform with a conspicuous acute spine; girdle deep, of varying width; hypotheca wider than epitheca, sides convex, tapering to antapical spine. Length 75–90 μ .

Distribution.—Indian Ocean.

OXYTOXUM SPHAEROIDES Stein

Fig. 180

Oxytoxum sphaeroides Stein, 1883, pl. 5, fig. 9. Schiller, 1937, p. 452, figs. 498–500.

Epitheca rotund; hypotheca ovate, antapex acute to rounded; girdle wide and deep; sulcus short. Length 25–45 μ .

Distribution.—A warm water species; widely distributed in Coral and North Tasman Seas.

var. STEINI Ostenfeld & Paulsen

Fig. 181

Oxytoxum sphaeroides var. *steini* Ostenfeld and Paulsen, 1904, p. 165. Schiller, 1937, p. 453, fig. 500.

Epitheca conical with a raised margin.

Distribution.—Noumea–Fiji region.

OXYTOXUM TURBO Kofoid, var.

Fig. 182

(See Wood 1954.) Girdle narrower than type; shoulders of hypotheca less rounded. *O. turbo* is a very variable species.

Distribution.—Northern Coral Sea, Tasman Sea.

OXYTOXUM VARIABLE Schiller

Fig. 183

Oxytoxum variable Schiller, 1937, p. 455, fig. 505.

Epitheca hemispherical to broadly conical with a short fine spinule; hypotheca more or less cordate or top-shaped, ending in a fine spinule; girdle narrow; sulcus long, only on hypotheca. Length 25–30 μ .

Distribution.—Adriatic Sea; Solomons Slot; Tasman Sea.

OXYTOXUM sp.

Fig. 184

Epithea shallow, rounded with a short blunt apical process; girdle wide, shallow; hypotheca conical, tapering to a point; sulcus from apex to antapex, wider on hypotheca but tapering to antapex. Length 45 μ .

Distribution.—West of Solomon I.

Family **PODOLAMPIIDAE** LindemannGenus **PODOLAMPAS** Stein, 1883**PODOLAMPAS CURVATUS** Schiller

Fig. 185

Podolampas curvatus Schiller, 1937, p. 476, fig. 549.

Body cigar-shaped, curved to the right apex which is sharply pointed; right antapical spine fine and short; left long, with a wide wing. Length 45 μ .

Distribution.—Adriatic Sea; north Tasman off New Zealand.

PODOLAMPAS ELEGANS Schütt

Fig. 186

Podolampas elegans Schütt, 1895, p. 18, fig. 57.

Body pear-shaped, tapering into a tube-like apical horn and with two subequal antapical spines joined by a wing which also extends on outer sides of spines. Length 20–50 μ .

Distribution.—Atlantic Ocean; Mediterranean Sea; Indian Ocean; Coral Sea.

PODOLAMPAS SPINIFER Okamura

Fig. 187

Podolampas spinifer Okamura, 1912, p. 17, pl. 2, figs. 35, 36. Schiller, 1937, p. 476, fig. 458.

Body elongate-pyriform, apex truncate with a short spine; antapical spine single, winged. Length 35–70 μ .

This species is probably a variant of *P. palmipes* as intergrades are frequent.

Distribution.—Western Mediterranean; Japan Sea; Indian Ocean; Coral Sea (abundant).

Genus **BLEPHAROCYSTA** Ehrenberg, 1873

Cells spherical to ovate; typical girdle and sulcus absent, their positions marked by plate margins and wings.

BLEPHAROCYSTA SPLENDORMARIS (Ehrenberg) Ehrenberg, nom. emend.

Fig. 188

Peridinium splendor maris Ehrenberg, 1859, p. 791.*Blepharocysta splendor maris* Ehrenberg, 1873.

Body ovate with apical pore, marked plate margins, two posterior wings extending from girdle region. Length $50\ \mu$.

Distribution.—North Sea; Mediterranean; Coral Sea; off C. D'Entrecasteaux.

Family CLADOPYXIIDAE**Genus CLADOPYXIS Stein, 1883***Cladopyxis* Stein, 1883.*Acanthodinium* Kofoid, 1907, p. 193.

Body ovate-spherical, epitheca smaller than hypotheca and with apical pore; girdle anterior; from the middle of the 4 epithecal and 6 hypothecal plates arise spines or processes which may be straight or branched. Plate formula $48, 0a, 8'', 6'', 2''$.

CLADOPYXIS BRACHIOLATA Stein

Fig. 189

Cladopyxis brachiolata Stein, 1883, p. 2, figs. 7, 8. Schiller, 1937, p. 471, fig. 541a,b.

Body oval; girdle premedian, narrow, circular, offset; sulcus small, elliptical; epitheca low, rounded, with 4 thick, repeatedly branched processes, each with an axial fibre; hypotheca rounded, with 6 similar processes. Length $50\ \mu$.

Distribution.—Tropical Atlantic; Mediterranean; Indian Ocean; east Pacific: Coral Sea.

CLADOPYXIS CARYOPHYLLUM (Kofoid) Pavillard

Fig. 190

Acanthodinium caryophyllum Kofoid, 1907, p. 193, pl. 11, fig. 67.*Cladopyxis caryophyllum* (Kofoid). Pavillard, 1931, p. 102.

Body subglobose; epitheca with 4 once-branched arms, hypotheca with 6; girdle anterior. Diameter $40\text{--}50\ \mu$.

Distribution.—Indian Ocean; eastern tropical Pacific.

III. REFERENCES

- BERG, R. S. (1881).—Bidrag til cilioflagellaternes naturhistorie. *Nat. Vidensk. Medd., Copenhagen* **1881**: 60–76.
- BÜTSCHLI, O. (1885).—Dinoflagellata. In Bronn's "Klassen und Ordnungen des Tierreichs". Abt. Protozoa (1880–1889). Vol. 1, pp. 906–1029. (Leipzig and Heidelberg.)
- CALKINS, G. (1902).—Marine protozoa from Woods Hole. *Bull. Fish. U.S.* **21**: 413.
- CLEVE, P. T. (1900).—Notes on some Atlantic plankton organisms. *K. Svenska Vetensk. Akad. Handl.* **34**(1): 1–22.
- 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.

- CROSBY, L. H., and WOOD, E. J. F. (1959).—Studies on Australian and New Zealand diatoms. II. Normal epontic and benthic genera. *Trans. Roy. Soc. N.Z.* **86**: 1–58.
- DANGEARD, P. (1927).—Phytoplankton de la croisière du *Sylvana*. *Ann. Inst. Oceanogr.* **4**(8): 289.
- DOGEIL, V. (1906).—Beiträge zur Kenntnis der Peridineen. *Mitt. Zool. Sta. Neapel* **18**: 1–45.
- EHRENBERG, C. G. (1859).—Über das Leuchten und über neue mikroskopische Leuchttiere des Mittelmeeres. *Mber. Berl. Akad. Wiss.* **1859**.
- EHRENBERG, C. G. (1873).—Mikrogeologische Studien über das kleinste Leben des Meerestiefgrundes aller Zonen und dessen geologischen Einfluss. *Abh. Akad. Wiss., Berl.* **1873**.
- GEITLER, L. (1924).—*Gymnodinium amphidinioides*, eine neue blaugrüne Peridinee. *Bot. Arch.* **110**.
- JÖRGENSEN, E. (1923).—Mediterranean Dinophysiaceae. *Rep. Danish Oceanogr. Exped. Medit.* **23**(2).
- KARSTEN, G. (1907).—Das indische Phytoplankton. *Wiss. Ergebn. 'Valdivia'* **2**: 221–348.
- KLEBS, G. (1912).—Über Flagellaten und algenähnliche Peridineen. *Verh. naturh.-med. Ver. Heidelb. (N.S.)* **11**: 367–451.
- KOFOID, C. A. (1907).—New species of Dinoflagellates. *Bull. Mus. Comp. Zool. Harv.* **50**: 161–208.
- KOFOID, C. A. (1911).—Dinoflagellata of the San Diego Region. IV. *Univ. Calif. Publ. Zool.* **8**: 187–300.
- KOFOID, C. A. (1931).—Report of the biological survey of Mutsu Bay. 18. Protozoan fauna. *Sci. Rep. Tohoku Imp. Univ.* (4) **6**(1): 1–34.
- KOFOID, C. A., and MICHENER, E. (1911).—Reports on the scientific results of the expedition to the eastern tropical Pacific in charge of Alexander Agassiz. 22. New genera and species of dinoflagellates. *Bull. Mus. Comp. Zool. Harv.* **54**: 265.
- KOFOID, C. A., and SKOGSBERG, T. (1928).—Dinoflagellata; the Dinophysiidae. *Mem. Mus. Comp. Zool. Harv.* No. 51.
- KOFOID, C. A., and SWEZY, O. (1921).—The free-living unarmored Dinoflagellates. *Mem. Univ. Calif.* No. 5.
- LEBOUR, M. V. (1917).—The peridiniales of Plymouth Sound from the region beyond the break-water. *J. Mar. Biol. Ass. U.K.* **11**: 183–200.
- LEBOUR, M. V. (1925).—“The Dinoflagellates of Northern Seas.” (Mar. Biol. Ass: Plymouth.)
- LEMMERMANN, E. (1899).—Planktonalgen; Ergebnisse einer Reise nach dem Pazifik. *Abh. naturw. Ver. Bremen* **16**: 313–98.
- LINDEMANN, E. (1928).—Experimentelle Studien über die Fortpflanzungserscheinungen der Süßwasserperidinen auf Grund von Reinkulturen. *Arch. Protistenk.* **68**: 1.
- LOHMANN, H. (1908).—Untersuchungen zur Feststellung des vollständigen Gehaltes des Meeres an Plankton. *Wiss. Meeresuntersuch.* **10**: 129–370.
- MASKELL, W. M. (1887).—On the fresh water Infusoria of the Wellington district. *Trans. Proc. N.Z. Inst.* **20**: 3–19.
- MATZENAUER, L. (1933).—Die Dinoflagellaten des Indischen Ozeans. *Bot. Arch.* **35**: 437–510.
- MEUNIER, A. (1910).—Microplankton des Mers de Barents et de Kara. Duc d'Orléans Campagne Arctique de 1907. (Bulens: Brussels.)
- MURRAY, G., and WHITTING, F. (1899).—New Peridineaceae from the Atlantic. *Trans. Linn. Soc. Lond. (Bot.)* **5**: 321.
- OKAMURA, K. (1912).—Plankton organisms from Bonito fishing grounds. *Rep. Imp. Bur. Fish. Jap.* No. 1.
- PAVILLARD, J. (1916).—Recherches sur les Péridiniens du Golfe de Lyon. *Trav. Inst. Bot. Univ. Montpellier* **4**: 9–70.
- PAVILLARD, J. (1931).—Phytoplankton (Diatomées, Péridiniens) provenant des campagnes scientifiques du Prince Albert I de Monaco. *Résult. Camp. Sci. Monaco* **82**: 1–200.
- POUCHET, G. (1887).—Quatrième contribution à l'histoire des Péridiniens. *J. Anat. Physiol.* **23**: 87.
- SAVILLE KENT, W. (1880–1882).—“A Manual of the Infusoria.” (Bogue: London.)
- SCHILLER, J. (1916).—Die neue Gattung *Heterodinium* in der Adria. *Arch. Protistenk.* **36**: 209.
- SCHILLER, J. (1928).—Die planktischen Vegetationen des adriatischen Meeres. *Cat. Dinoflagellatae* No. 61, p. 45.
- SCHILLER, J. (1933–1937).—Dinoflagellatae. In “Rabenhorsts Kryptogamenflora von Deutschland, Österreich und der Schweiz”. Vol. 10(3)(1), pp. 1–617.
- SCHRÖDER, B. (1906).—Beiträge zur Kenntnis des Phytoplanktons warmer Meere. *Vjschr. naturf. Ges. Zürich* **51**: 319–77.

- SCHÜTT, F. (1895).—Die Peridineen der Plankton Expedition. *Ergeb. Plankton Expedition der Humboldt-Stiftung*. Vol. 4A, pp. 1–170.
- STEEMANN NIELSEN, E. (1934).—Untersuchungen über die Verbreitung, Biologie und Variation der Ceratien im südlichen Stillen Ozean. *'Dana' Exp.* 1(4): 1–67.
- STEIN, F. (1878, 1883).—"Der Organismus der Flagellaten nach eigenen Forschungen in systematischer Reihenfolge bearbeitet." Vol. III, pt. 1, pp. 1–154, pt. 2, pp. 1–30.
- WOOD, E. J. F. (1954).—Dinoflagellates in the Australian region. *Aust. J. Mar. Freshw. Res.* 5: 171–351.
- WOOD, E. J. F., CROSBY, L. H., and CASSIE, V. (1959).—Studies on Australian and New Zealand Diatoms. III. Descriptions of further discoid species. *Trans. Roy. Soc. N.Z.* 87: 211–9.
- WULFF, A. (1916).—Über das Kleinplankton der Barentsee. *Wiss. Meeresuntersuch.* (N.S.) 13: 1.
- ZACHARIAS, O. (1906).—Das Plankton als Gegenstand eines zeitgemässen biologischen Schulunterrichts. *Arch. Hydrobiol. (Plankt.)* 1: 245.

LIST OF SPECIES

Genus <i>Amphidinium</i>		Genus <i>Ceratocorys</i> Stein	43
Claparède & Lachmann	22	sp.	43
<i>acutissimum</i> Schiller	22	Genus <i>Citharistes</i> Stein	22
<i>amphidinoides</i> (Geitler) Schiller	22	<i>apsteini</i> Schütt	22
<i>bipes</i> Herdman	22	Genus <i>Cladopyxis</i> Stein	51
<i>cucurbita</i> Kofoid & Swezy	23	<i>brachiolata</i> Stein	51
<i>flagellans</i> Schiller	23	<i>caryophyllum</i> (Kofoid) Pavillard	51
<i>sphenoides</i> Wulff	23	Genus <i>Cochlodinium</i> Schütt	33
<i>turbo</i> Kofoid & Swezy	23	<i>faurei</i> Kofoid & Swezy	33
<i>vasculum</i> Kofoid & Swezy	23	<i>flavum</i> Kofoid	33
Genus <i>Amphidoma</i> Stein	37	<i>pupa</i> Lebour	34
sp.	37	<i>rosaceum</i> Kofoid & Swezy	34
Genus <i>Amphisolenia</i> Stein	9	<i>virescens</i> Kofoid & Swezy	34
<i>astragalus</i> Kofoid & Michener	9	Genus <i>Dinophysis</i> Ehrenberg	6
<i>bifurcata</i> Murray & Whitting	9	<i>exigua</i> Kofoid & Skogsberg	6
<i>brevicauda</i> Kofoid	9	<i>micropterygia</i> Dangeard	6
<i>clavipes</i> Kofoid	9	<i>moresbyensis</i> , sp. nov.	7
<i>globifera</i> Stein	10	<i>pacifica</i> , sp. nov.	7
<i>lemmermanni</i> Kofoid	10	<i>parva</i> Schiller	7
<i>palaeotheroides</i> Kofoid	10	<i>recurva</i> Kofoid & Skogsberg	7
<i>rectangulata</i> Kofoid	10	<i>schuetti</i> Murray & Whitting	7
<i>schauinslandi</i> Lemmermann	10	<i>ventrecta</i> Schiller	8
<i>schoederi</i> Kofoid	10	Genus <i>Exuviaella</i> Cienkowski	4
Genus <i>Blepharocysta</i> Ehrenberg	50	<i>baltica</i> Lohmann	4
<i>splendormaris</i> (Ehrenberg) Ehrenberg,		Genus <i>Goniaulax</i> Diesing	37
nom. emend.	51	<i>birostris</i> Stein	37
Genus <i>Centrodinium</i> Kofoid	42	<i>milneri</i> (Murray & Whitting) Kofoid	37
<i>complanatum</i> (Cleve) Kofoid	42	<i>tamarensis</i> Lebour	37
Genus <i>Ceratium</i> Schrank	39	Genus <i>Goniodoma</i> Stein	42
<i>bigelowi</i> Kofoid	39	<i>polydricum</i> (Pouchet) Jorgensen	42
<i>digitatum</i> Schütt	39	Genus <i>Gymnodinium</i> Stein	24
<i>geniculatum</i> (Lemmermann) Cleve	40	<i>biconicum</i> Schiller	24
<i>gravidum</i> Gourret var. <i>elongata</i> , var.		<i>bogoriense</i> Klebs	24
nov.	40	<i>cinctum</i> Kofoid & Swezy	24
<i>pacificum</i> , sp. nov.	42	<i>coerulatum</i> Dogiel	24
<i>paradoxides</i> Cleve	40	<i>costatum</i> Kofoid & Swezy	25
<i>praelongum</i> (Lemmermann) Kofoid	40	<i>diploconus</i> Schütt	25
<i>reflexum</i> Cleve	40	<i>flavum</i> Kofoid & Swezy	25
<i>schoeteri</i> B. Schröder	42	<i>fusus</i> Schütt	25
<i>tasmaniae</i> , sp. nov.	42	<i>galeaeforme</i> Matzenauer	25

Genus <i>Gymnodinium</i> (continued)			
<i>gelbum</i> Kofoed	26	<i>jorgenseni</i> Schiller	17
<i>grammaticum</i> (Pouchet) Kofoed & Swezy	26	<i>lanceolata</i> , sp. nov.	17
<i>heterostriatum</i> Kofoed & Swezy	26	<i>longicollis</i> Kofoed	18
<i>marinum</i> Saville Kent	26	<i>mitschellana</i> Murray & Whitting	18
<i>minor</i> Lebour	26	<i>moresbyensis</i> , sp. nov.	18
<i>multistriatum</i> Kofoed & Swezy	27	<i>oxypteris</i> Schiller	18
<i>nanum</i> Schiller	27	<i>paulseni</i> Kofoed	18
<i>obesum</i> Schiller	27	<i>pietschmanni</i> Bohm	19
<i>ochraceum</i> Kofoed	27	<i>planeta</i> , sp. nov.	19
<i>punctatum</i> Pouchet	27	<i>pulchra</i> Kofoed	19
<i>pygmaeum</i> Lebour	28	<i>schilleri</i> Bohm	19
<i>rotundatum</i> Klebs	28	<i>simplex</i> , sp. nov.	20
<i>rubrum</i> Kofoed & Swezy	28	<i>tubifera</i> Bohm	20
<i>scopulosum</i> Kofoed & Swezy	28	<i>variabilis</i> Schiller	20
<i>simplex</i> (Lohmann) Kofoed & Swezy	28	<i>voucki</i> Schiller	20
<i>situla</i> Kofoed & Swezy	29	Genus <i>Massartia</i> Conrad	31
sp.	29	<i>rotundata</i> (Lohmann) Schiller	31
<i>sphaericum</i> Calkins	29	Genus <i>Melanodinium</i> Schiller	37
<i>splendens</i> Lebour	29	<i>nigricans</i> Schiller	38
<i>sulcatum</i> Kofoed & Swezy	29	Genus <i>Murrayella</i> Kofoed	43
<i>uberrimum</i> (Allman) Kofoed & Swezy	31	<i>biconica</i> (Murray & Whitting) Pavillard	43
<i>varians</i> Maskell	31	<i>intermedia</i> Pavillard	43
Genus <i>Gyrodinium</i> Kofoed & Swezy	31	<i>spinosa</i> Kofoed	43
<i>caudatum</i> Kofoed & Swezy	32	Genus <i>Nematodinium</i> Kofoed & Swezy	35
<i>cornutum</i> (Pouchet) Kofoed & Swezy	32	<i>torpedo</i> Kofoed & Swezy	35
<i>nasutum</i> (Wulff) Schiller	32	Genus <i>Ornithocercus</i> Stein	11
<i>ochraceum</i> Kofoed & Swezy	32	<i>australis</i> , sp. nov.	12
<i>pingue</i> (Schütt) Kofoed & Swezy	32	<i>formosus</i> Kofoed & Michener	11
<i>prunus</i> (Wulff) Lebour	33	<i>geniculatus</i> Dangeard	11
<i>spirale</i> (Bergh) Kofoed & Swezy	33	<i>magnificus</i> Stein	11
<i>submarinum</i> Kofoed & Swezy	33	sp.	12
Genus <i>Heterodinium</i> Kofoed	38	Genus <i>Oxytoxum</i> Stein	44
<i>australiae</i> , sp. nov.	38	<i>belgicae</i> Meunier	44
<i>crassipes</i> Schiller	38	<i>caudatum</i> Schiller	44
<i>fenestratum</i> Kofoed	38	<i>challengeroides</i> Kofoed	44
<i>hindmarchi</i> (Murray & Whitting) Kofoed	38	<i>compressum</i> Kofoed	44
<i>mediterraneum</i> Pavillard	39	<i>constrictum</i> (Stein) Bütschli	44
<i>milneri</i> (Murray & Whitting) Kofoed	39	<i>coronatum</i> Schiller	45
Genus <i>Histioneis</i> Stein	13	<i>cribrosum</i> Stein	45
<i>aequatorialis</i> , sp. nov.	13	<i>curvatum</i> (Kofoed) Kofoed	45
<i>australiae</i> , sp. nov.	13	<i>elegans</i> Pavillard	45
<i>bougainvilleae</i> , sp. nov.	14	<i>elongatum</i> , sp. nov.	45
<i>cerasus</i> Bohm	14	<i>gracile</i> Schiller	46
<i>costata</i> Kofoed & Michener	14	<i>laticeps</i> Schiller	46
<i>depressa</i> Schiller	14	<i>longiceps</i> Schiller	46
<i>dolon</i> Murray & Whitting	14	<i>longum</i> Schiller	46
<i>elongata</i> Kofoed & Michener	16	<i>milneri</i> Murray & Whitting	46
var. <i>curvata</i> , var. nov.	16	<i>mitra</i> Stein	48
<i>helenae</i> Murray & Whitting	16	<i>obliquum</i> Schiller	48
<i>highleyi</i> Murray & Whitting	16	<i>pachyderme</i> Schiller	48
<i>hyalina</i> Kofoed & Michener	17	<i>parvum</i> Schiller	48
<i>inclinata</i> Kofoed & Skogsberg	17	<i>robustum</i> Kofoed	48
		<i>sceptrum</i> (Stein) B. Schröder	49
		sp.	50

<i>sphaeroides</i> Stein	49	Genus <i>Podolampas</i> Stein	50
<i>var. steini</i> Ostenfeld & Paulsen ..	49	<i>curvatus</i> Schiller	50
<i>turbo</i> Kofoid, <i>var.</i>	49	<i>elegans</i> Schütt	50
<i>variabile</i> Schiller	49	<i>spinifer</i> Okamura	50
Genus <i>Parahistioneis</i> Kofoid & Skogsberg	12	Genus <i>Prorocentrum</i> Ehrenberg	4
<i>crateriformis</i> (Stein) Kofoid &		<i>arcuatum</i> Issel	4
Skogsberg	12	<i>obtusidens</i> Schiller	4
<i>garretti</i> (Kofoid) Kofoid & Skogsberg	12	<i>pacificum</i> , <i>sp. nov.</i>	5
<i>gascoynensis</i> , <i>sp. nov.</i>	13	<i>schilleri</i> Bohm	4
<i>paraformis</i> Kofoid & Skogsberg ..	13	Genus <i>Protoerythroopsis</i> Kofoid & Swezy	36
<i>rotundata</i> (Kofoid & Michener)		<i>crassicauda</i> Kofoid & Swezy	36
Kofoid & Skogsberg	13	Genus <i>Protopsis</i> Kofoid & Swezy ..	34
Genus <i>Peridinium</i> Ehrenberg	36	<i>elongata</i> Schiller	34
<i>avellana</i> (Meunier) Lebour	36	<i>simplex</i> Lebour	34
<i>fatulipes</i> Kofoid	36	Genus <i>Warnowia</i> Lindemann	35
Genus <i>Phalacroma</i> Stein	5	<i>atra</i> (Kofoid & Swezy) Schiller ..	35
<i>circumsutum</i> Karsten	5	<i>rosea</i> (Pouchet) Schiller	35
<i>contractum</i> Kofoid & Skogsberg ..	5	<i>subnigra</i> (Kofoid & Swezy) Schiller ..	35
<i>lenticula</i> Kofoid	6	<i>violescens</i> (Kofoid & Swezy)	
<i>mucronatum</i> Kofoid & Skogsberg ..	5	Lindemann	36
<i>parvulum</i> (Schütt) Jörgensen	6	<i>voracis</i> (Kofoid & Swezy) Schiller ..	36
<i>striata</i> Kofoid	6		