MICROPLANKTON OF THE WEDDELL SEA

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Abstract. This paper deals with a study of the composition of the microplankton collected by a plankton net (mesh size 35 μ) from 11 stations in the Weddell Sea during December 1963–January 1964. The diatoms dominated the catch, followed by the dinoflagellates, the silicoflagellates, and tintinnids, in that order. Description of six new species of dinoflagellates is also given.

INTRODUCTION

In conjunction with a study of the biological productivity of the Weddell Sea (December 1963–January 1964) aboard the Argentine icebreaker *General San Martin* (see *El-Sayed and Mandelli* [1965]), phytoplankton samples were collected at several stations. These samples were intended to augment our understanding of the productivity data collected by the chlorophyll *a* and C^{14} uptake methods and to shed some light on the species of phytoplankton that contribute to this productivity. The present paper deals with a general description of the composition of microplankton collected at 11 stations in the northern, eastern, and southern Weddell Sea. The authors wish to point out the preliminary nature of this study which was primarily intended to serve as a complement to the paper of *El-Sayed and Mandelli* [1965]. Although a thorough analysis of the material at hand will require more time and effort than was allotted to the present study, it is hoped that the list of the microplankters given in the present account will fill a gap in our knowledge of the biology of one of the least-known seas in the world. Although none of the authors claims to be an authority on the taxonomy of the diatoms, we feel confident, nevertheless, that the identification has been carried out with sufficient detail.

METHODS

Vertical and horizontal hauls were made with a plankton net (mesh size 35 μ) with a mouth opening of 22 cm in diameter. The phytoplankton samples were preserved with 10% formalin and shipped to Texas A&M campus for identification and study. The relative abundance of the planktonic organisms was arrived at after a general assessment of the contribution of each species was made in several aliquots of each of the samples collected. The following abbreviations will be used to designate their relative abundance: (a) abundant, (ra) relatively abundant, (m) medium, (f) few, (r) rare, (vr) very rare, and (er) exceedingly rare. The dominant and subdominant are indicated by (d) and (sd), respectively.

RESULTS

Of the diatoms identified in the samples from the Weddell Sea, the following diatoms are the most important contributors to the standing crop: *Rhizosolenia styliformis, Rh. alata inermis, Fragilariopsis* (especially *F. sublinearis*), *Coscinodiscus* sp., *Corethron criophilum, Thalassiossira* sp., *Chaetoceros neglectum, Nitzschia closterium,* and *N. seriata.* Species of lesser importance included *Synedra reinboldi* and *Coscinodiscus bouveti.*

Next to the diatoms in abundance and importance are the dinoflagellates. In the samples examined, these are well represented by several species of the genus *Peridinium* and by *Dinophysis antarctica.* The genus *Peridinium* was found to be an important genus in the Weddell Sea material; it was especially abundant at stations 47 and 55. Although rarely reported by other

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investigators in Antarctic waters, it is possible that it could have been overlooked, owing to its small size and the fact that it is easily deformed.

It is of interest to point out that one of the authors [*Balech*, 1959] reported, for the first time, the presence of a naked dinoflagellate (*Gymnodinium*) from Antarctic waters. Examination of the samples from the Weddell Sea enabled us to add two other species to the same genus and two species to the genus *Gyrodinium*. The following genera are also reported for the first time from Antarctic waters: *Oxytoxum, Podolampas, Exuviaella,* and *Kofoidinium* among the dinoflagellates, and *Amphorellopsis* among the tintinnids.

Another interesting finding was that in the samples taken in the vertical hauls at stations 55 and 81 in the eastern Weddell Sea, the following warm-water genera were found: *Oxytoxum, Podolampas,* and *Salpingella.* In addition, *Amphorellopsis* and *Kofoidinium* (one specimen of each) were also found at station 81. All these genera were rarely encountered outside the warm-water realm. Except for *Salpingella,* none has ever been recorded in Antarctic or even sub-Antarctic waters. The species of *Salpingella* found, *S. laackmanni,* was discovered by Laackman near Wilhelm II Coast in 1909. It has never since been recorded elsewhere. The southernmost record of *Kofoidinium velleloides* is at Puerto Quequen, Argentina (latitude 39°30′S). As to *Podolampas,* it was found in the Southern Hemisphere as far south as 39°20′S in the Atlantic and 44°30′S in the Pacific. The assemblage of *Oxytoxum, Podolampas, Salpingella,* and *Amphorellopsis* gives the plankton of both stations a very peculiar character in that it resembles a relict of warm-water species which had successfully survived in cold waters. It is not easy to speculate at this stage on the significance of their occurrence only in the vertical hauls at these two eastern Weddell Sea stations. Perhaps future investigations in this region of the Weddell Sea may elucidate this interesting observation.

At stations 69, 71, and 72 we found an important colonial microalga which we could not identify. P. Bourrelly of the Musée National d'Histoire Naturelle in Paris (personal communication) believes that this alga is close to *Echinus minus* Meunier, described by *Meunier* [1910, Pl. IV, figs. 27–28] in *Le Microplankton des mers de Barents et de Kara.* The systematic position of *Echinus* is not known. Bourrelly also believes that the Antarctic organism is a *Xantophyceae* close to *Asterogloea* or even *Meringosphaera.* However, our specimens have three-valvar membrane and the *Xantophyceae* are, in general, bivalvar. It would therefore seem that the systematic position of the colonial alga from the Weddell Sea is not clear; probably it has not been described before.

In terms of relative abundance, stations 31 and 39, in northern Weddell Sea, were among the richest stations sampled. Station 26, in the vicinity of South Orkney Islands, also showed a fairly abundant concentration of phytoplankton. At station 31, *Rhizosolenia* dominated the catch, whereas at station 39 the dominant species were *Fragilariopsis* and at station 26 the main bulk of the population was formed by *Thalassiosira.* The stations located to the east and south of the Weddell Sea were comparatively poorer than the northern stations. The paucity of the population was conspicuous at the following stations: 43, 55, 72, 73, and 85. This is in good agreement with the chlorophyll *a* and C^{14} uptake presented by *El-Sayed and Mandelli* [1965] in the Weddell Sea.

1. *Plankton Composition by Stations*

Station 26. 60°46.3′S, 44°40.2′W. Date: December 16, 1963. Vertical haul, 55–0 meters. Plankton predominantly made of diatoms, moderately rich.

Dominant species: Thalassiosira antarctica; subdominant *Corethron criophilum.*

Other diatoms: Coscinodiscus stellaris, C. oculus-iridis, C. rothi stelliger (er), *Coscinodiscus* sp. (the first two are the only ones of some importance), *Thalassiosira gravida, Charcotia* sp. (vr), *Rhizosolenia alata, Rh. a. inermis* (m), *Biddulphia weissflоggi* (f). The genus *Chaetoceros* is poorly represented by some *Ch. neglectum, Ch. criophilum, Ch. atlanticum. Eucampia balaustium* (r), *Navicula* sp., *Cocconeis* sp., *Amphiprora kjellmanii,* and *Synedra reinboldi* are also represented.

Silicoflagellates: Dictyocha speculum (a).

Tintinnids: Cymatocylis convallaria (ra), *Codonellopsis frigida* (f).

Station 31. 58°52.4′S, 37°57.9′W. Date: December 18, 1963. Vertical haul, 50–0 meters. Phytoplankton rich, with the following diatoms dominating the catch: *Rhizosolenia styliformis, Chaetoceros neglectum, Cos-*

cinodiscus sp., and *Biddulphia weissflogii*. Zooplankton very poor, includes: tintinnids, *Globigerina*, small *Fritillaria* (Urochorda), and copepods.

Diatoms: *Rhizosolenia styliformis* (d), *Rh. alata inermis* (f), *Rh. hebetata* (r), *Chaetoceros chuni* (vr), *Ch. neglectum* (sd), *Ch. atlanticum* (m), *Ch. criophilum* (f), *Ch. peruvianum* (vr), *Ch. schimperianum* (vr), *Ch. bulbosum* (vr), *Thalassiosira hyalina*, *Th. antarctica*, *Charcotia* sp. (r), *Actinocyclus* sp. (*oceanicus?*), *A. oliveranus*, *Melosira sphaerica?* (er), *Asterolampra* sp., *Coscinodiscus lentiginosus*, *C. excentricus* (vr), *C. stellaris antarctica* (vr), *C. stellaris*, *C. simberskianus?*, *Asteromphalus hookeri*, *Corethron criophilum*, *Dactyliosolen antarcticus*, *Eucampia balaustium*, *Biddulphia weissflogii* (m), *Fragilariopsis sublinearis* (m), *F. rhombica* (vr), *Fragilaria oceanica* (er), *Synedra reinboldi*, *Nitzschia closterium* (ra), *N. seriata* (ra), *Thalassiothrix* sp. (er).

Silicoflagellates: *Dictyocha speculum* (ra).

Dinoflagellates: *Peridinium applanatum* (ra), *P. parvicollum* (f), *P. curtum* (r), *P.* sp. cf. *pyriforme* (r), *P. archiovatum* (vr), *P. thulesense* (er), *Phalacroma cornutum inerme* (vr).

Tintinnids: *Cymatocylis convallaria* (r), *C. affinis* (r).

Station 31. Horizontal tow. Composition of plankton is the same as in the vertical tow, but more abundant.

Station 39. 60°13′S, 27°02.5′W. Date: December 20, 1963. Vertical tow, 100–0 meters. Microplankton fairly abundant, completely dominated by diatoms. Macroplankton very poor, represented by a few copepods and nauplii, gastropods (er), the Radiolaria *Challengerion* sp. (er).

Diatoms: *Coscinodiscus lentiginosus* (sd), *C. stellaris* (vr), *C. furcatus?* (vr), *C. inflatus?* (vr), *C. rothi stelliger* (er), *Podosira hormoides?* (r), *Charcotia* sp. (f), *Asteromphalus hookeri* (r), *Thalassiosira sp.* (f), *Dactyliosolen antarcticus* (m), *Rhizosolenia alata inermis* (f), *Rh. a. gracillima* (vr), *Rh. polydactyla* (f), *Rh. styliformis* (vr), *Chaetoceros atlanticum* (ra), *Ch. criophilum* (f), *Ch. neglectum* (a), *Ch. dichaeta* (r), *Ch. peruvianum* (r), *Ch. bulbosum* (r), *Corethron criophilum*, *Eucampia balaustium* (f), *Fragilariopsis sublinearis* (d), *F. linearis* (a), *F. rhombus* (vr), *F. antarctica* (vr), *Fragilaria* sp. (vr), *Amphiprora* sp. (r), *Nitzschia closterium* (ra), *N. seriata* (ra), *Synedra reinboldi* (f).

Silicoflagellates: *Dictyocha speculum* (a).

Dinoflagellates: *Peridinium applanatum* (ra), *P. pseudoantarcticum* (f), *P. archiovatum*, *P. thulesense*, *P. obovatum*, *P. adeliense*.

Tintinnids: *Cymatocylis convallaria* (m), *Laackmanniella naviculaefera* (er), *Codonella frigida*.

This sample is dominated by the genus *Fragilariopsis* followed by *Coscinodiscus* and *Chaetoceros neglectum*. The silicoflagellate *Dictyocha speculum* is very likely more abundant than reported here since, owing to its small size, it probably escaped through the meshes of the net used.

Station 47. 62°14.4′S, 17°16′W. Date: December 22, 1963. Total amount of plankton collected is poor. Detritus content relatively high. Macroplankton fairly abundant, more nauplii present than adult copepods.

Diatoms: *Coscinodiscus* (d), *C. lentiginosus* (ra), *C. oculus-iridis* (f), *C. oculoides* (ra), *C. excentricus*, *Coscinodiscus* sp., *Actinocyclus oliveranus* (ra), *Charcotia* sp. (f), *Asteromphalus* sp. (f), *Melosira* sp. (probably *M. moniliformis*) (m), *Rhizosolenia styliformis* (f), *Rh. alata* (vr), *Rh. a. inermis* (vr), *Rh. polydactyla* (vr), *Chaetoceros criophilum* (ra), *Ch. atlanticum* (r), *Corethron criophilum* (r), *Biddulphia weissflogi* (vr), *Eucampia balaustium* (vr), *Fragilariopsis sublinearis* (m), *Synedra reinboldi* (m), *Pleurosigma directum* (vr), *Tropidoneis* sp. (er), *Nitzschia seriata* (ra), *N. closterium* (f), *Amphiprora kjellmanii* (vr).

Silicoflagellates: *Dictyocha speculum* (ra).

Dinoflagellates: *Peridinium rosaceum* (ra) *P. thulesense*, *P. applanatum*, *P. incertum*, *P. pseudoantarcticum* (r), *P. antarcticum* (vr), *P. mediocre?*, *P. turbinatum*, *P. variegatum*, *Peridinium* sp.

Tintinnids: *Laackmanniella naviculaefera* (f), *Cymatocylis convallaria* (f), *Codonellopsis gaussi* (er), *C. frigida* (er).

In this sample the relative abundance of *Peridinia* is fairly high.

Station 55. 66°55.7′S, 11°39′W. Date: December 25, 1963. Vertical tow, 100–0 meters. Plankton abundance medium to rather poor. Zooplankton relatively abundant, includes: copepods, nauplii, *Sagitta gazellae* (Chaetognatha, vr), a small medusa, *Fritillaria* sp. (*Apendicularia,* er), Polychaeta (vr), *Globigerina* (r), a few specimens of Radiolaria, including *Challengerion* and *Sticholonche zanclea.* The tintinnids are listed below.

Diatoms: Coscinodiscus (m), *C. oculus-iridis, C. oculoides, C. stellaris, C. excentricus, Charcotia* sp. (ra), *Hyalodiscus kerguelensis* (er), *Asteromphalus hookeri* (r), *Actinocyclus oliveranus* (vr), *Actinocyclus* sp. (f), *Rhizosolenia alata, Rh. a. inermis, Rh. styliformis, Rh. curvata?, Rh. hebetata* (r), *Dactyliosolen mediterraneus* (r), *Biddulphia weissflogii* (r), *Eucampia balaustium* (f), *Fragilariopsis sublinearis* (f), *F. antarctica* (vr), *F. rhombica* (er), *Fragilaria* sp. (er), *Pleurosigma* sp., *Synedra reinboldi* (r).

Silicoflagellates: Distyocha speculum (ra).

Dinoflagellates: Peridinium antarcticum, P. pseudoantarcticum, P. obovatum, P. variegatum, P. turbinatum, P. applanatum, P. thulesense, P. parvicollum, Peridinium sp. cf. *pyriforme, Dinophysis antarctica* (m), *D. tuberculata* (er), *Phalacroma cornutum inerme* (ra), *Oxytoxum criophilum* (vr), *Podolampas antarctica* (vr), *Ceratium furca* (er).

Tintinnids: Cymatocylis convallaria (r), *C. drygalski* (vr), *Codonellopsis gaussi* (vr), *Laackmanniella naviculaefera* (er), *Salpingella laackmanni* (vr).

The plankton collected in this station shows a close affinity to that of relatively warm water due to the presence of typically non-Antarctic genera such as *Oxytoxum, Podolampas, Salpingella, Ceratium,* and *Sticholonche.* The first three are represented at this station by species not yet encountered outside the Antarctic seas. *Ceratium furca* and *Sticholonche zanclea* have wide distribution in warmer seas. *Ceratium furca* could be considered as a cosmopolitan species which occurs in great abundance in cold and warm coastal areas; *Sticholonche* has always been reported from warm to rather warm waters.

Station 69. 77°34.2′S, 40°57.8′W. Date: January 5, 1964. Vertical haul, 100–0 meters. Plankton not very abundant, dominated by diatoms, a few nauplii present.

Diatoms: Melosira moniliformis? (f), *Melosira hyalina, Thalassiosira hyalina* (ra), *Podosira hormoides?* (vr), *Coscinodiscus* (rather scarce), *C. excentricus* (r), *C. stellaris* (vr), *C. simbarskianus* (vr), *Rhizosolenia alata inermis* (ra) *Chaetoceros neglectum* (vr), *C. compressum* (er), *Chaetoceros* sp., *Biddulphia weissflogii* (f), *Eucampia balaustium* (ra), *Corethron criophilum* (f), *Fragilariopsis* (d), *F. sublinearis* and *F. linearis, Synedra reinboldi* (vr), *S. tabulata* (er), *Nitzschia seriata* (m), *N. closterium* (r), *Nitzschia* sp. (vr), *N. frigida* (r), *Gyrosigma* sp. (vr), *Amphiprora kjellmanii.*

Silicoflagellates: Dictyocha speculum (m).

Dinoflagellates: Peridinium petersi, P. antarcticum, P. pseudoantarcticum, P. applanatum, P. obovatum, P. variegatum, P. archiovatum, Diplopeltopsis minor.

Tintinnids (all very scarce): *Laackmanniella naviculaefera, Cymatocylis convallaria, C. drygalski.*

Others: A colonial microalga of uncertain taxonomic position was fairly abundant at this station.

Station 71. 76°42′S, 30°00′W. Date: January 6, 1964. Vertical tow, 100–0 meters. Plankton moderately rich; a few nauplii and copepods are present.

Diatoms: Melosira moniliformis? (ra), *Coscinodiscus excentricus* (f), *C. bouveti* (ra), *C. asteromphalus* (r), *Thalassiosira* sp. (vr), *Rhizosolenia alata inermis* (r), *Chaetoceros neglectum* (r), *Ch. criophilum* (vr), *Ch. gaussi* (er), *Biddulphia weissflogii* (f), *Eucampia balaustium* (r), *Fragilariopsis sublinearis* (m), *F. linearis curta* (ra), *F. cylindrus* (f), *Nitzschia frigida* (r), *Navicula* sp. (vr), *Amphiprora kjellmanni* (vr), *Chunniella antarctica* (r), *Synedra* sp.

The most important diatoms are *Fragilariopsis, Coscinodiscus,* and *Melosira.*

Dinoflagellates: Peridinium applanatum (f), *P. petersi, P. pseudoantarcticum.*

Tintinnids: Laackmanniella naviculaefera (ra), *Cy-*

matocylis convallaria (ra), *C. drygalski* (ra), *C. vanhoeffeni* (er), *Coxliella frigida* (vr), *Salpingella laackmanni* (er).

Others: Quite a few of the same microalgal colonies found at station 69 are present in this station.

Station 72. 75°30′S, 26°36′W. Date: January 7, 1964. Surface sample, rather poor. The most important plankters are *Corethron criophilum*, *Fragilariopsis sublinearis*, and the circular diatoms; some nauplii are present.

Diatoms: *Coscinodiscus excentricus*, *C. asteromphalus* (ra), *C. oculus-iridis* (vr), *C. stellaris* (f), *C. rothi stilliger* (f), *C. belgicae oculata* (er), *C. subtilis?*, *Asteromphalus parvulus* (er), *Podosira hormoides?*, *Charcotia sp.* (f), *Thalassiosira nordenskioldi* (f), *Actinocyclus* sp. (vr), *Rhizosolenia alata inermis* (m), *Rh. hebetata semispina* (f), *Rh. truncata*, *Chaetoceros neglectum* (f), *Ch. criophilum* (vr), *Ch. bulbosum* (er), *Eucampia balaustium* (ra), *Biddulphia weissflogii* (r), *Fragilariopsis sublinearis* (m), *F. linearis* (f), *F. linearis curta* (ra), *Fragilaria* sp. (vr), *Navicula* sp. (f), *Nitzschia closterium* (r), *N. seriata* (ra), *Synedra reinboldi* (r).

Silicoflagellates: *Dictyocha speculum* (vr).

Dinoflagellates: *Peridinium petersi* (f), *P. variegatum* (vr), *P. rosaceum* (er), *Peridinium* sp. (er), *Diplopsalis granulosa* (vr), *Dinophysis antarctica* (er), *Exuviaella* sp. (vr), *Gyrodinium* sp. (er), *G. lachryma* (er).

Tintinnids: *Laackmanniella naviculaefera* (vr), *Coxliella intermedia* (er).

Others: Colonial microalgae relatively abundant.

Station 72. Vertical tow, 100–0 meters. About the same composition as the surface sample, but poorer. A few species not observed in the surface sample included the diatoms *Coscinosira antarctica* (er) and *Gyrosigma* sp., and the dinoflagellates *Peridinium applantum* (f), *P. pseudoantarcticum* (vr), and *Diplopeltopsis minor*.

Station 73. 72°02.8′S, 17°44.4′W. Date: January 8, 1964. Vertical tow, 130–0 meters. Plankton very poor. A few nauplii and copepods.

Diatoms: *Coscinodiscus oculus-iridis*, *C. stellaris*, *C. bouveti*, *C. excentricus*, *C. coronula* (er), *Podosira hormoides?* (f), *Charcotia* sp. (vr), *Thalassiosira* sp. (vr), *Chaetoceros* sp. cf. *compressus* (f), *Ch. dichaeta* (er), *Ch. schimperianus* (er), *Eucampia balaustium* (vr), *Corethron criophilum* (r), *Fragilariopsis* (d), *F. sublinearis*, *F. linearis*.

Dinoflagellates: *Peridinium archiovatum* (vr), *Peridinium* sp. (er), *Diplopeltopsis granulosa* (er), *Dinophysis antarctica* (vr), *Phalacroma cornutum inerme* (er).

Tintinnids: *Laackmanniella naviculaefera* (er).

Station 81. 64°40.2′S, 15°54.6′W. Date: January 10, 1964. Horizontal tow. Fairly rich. Among the macroplankton some copepods and nauplii are present. Dominance not well defined, shared by circular diatoms, *Fragilariopsis* and *Corethron*.

Diatoms: *Charcotia* sp., *Coscinodiscus excentricus*, *Coscinodiscus* sp. sp., *Asteromphalus hookeri* (f), *Dactyliosolen antarcticus* (r), *Rhizosolenia alata inermis* (f), *Rh. polydactyla* (er), *Chaetoceros atlanticum* (f), *Ch. dichaeta* (r), *Ch. criophilum*, *Ch. neglectum*, *Ch. bulbosum*, *Ch. schimperianum*, *Biddulphia weissflogi*, *Eucampia balaustium*, *Corethron criophilum* (a), *Fragilariopsis sublinearis* (a), *F. linearis* (ra), *Nitzschia seriata*, *N. closterium*, *Synedra reinboldi*.

Silicoflagellates: *Dictyocha speculum* (ra).

Dinoflagellates: *Peridinium defectum* (ra), *P. metananum* (ra), *P. affine* (f), *P. adeliense* (f), *P. archiovatum* (r), *P. thulesense* (er), *Dinophysis antarctica* (ra), *Phalacroma cornutum inerme* (f), *Gymnodinium frigidum* (f).

Tintinnids: *Codonellopsis gaussi* (er).

Station 81. Vertical tow, 100–0 meters. Rather poor. Zooplankton more abundant than in the surface sample; includes a few copepods, nauplii, copepod eggs, one pluteus, small *Fritillaria* (vr), *Sagitta* sp. (er), some Radiolaria, including *Sticholonche zanclea*. The tintinnids are listed below.

Diatoms: *Melosira* sp. (ra), *Charcotia* sp. (f), *Coscinodiscus* sp. sp., *Dactyliosolen antarcticus*, *D. mediterraneus* (vr), *Rhizosolenia alata inermis*, *Rh. hebetata semispina* (r), *Rh. polymorpha* (vr),

Chaetoceros neglectum (vr), *Ch. criophilum* (r), *Amphiprora kjellmanni* (r), *Pleurosigma* sp. (vr), *Nitzschia seriata.*

Silicoflagellates: *Dictyocha speculum* (ra).

Dinoflagellates: *Peridinium affine* (ra), *P. adeliense* (ra), *P. pseudoantarcticum, P. metananum* (r), *P. turbinatum* (er), *P. defectum* (vr), *P. petersi* (vr), *P. rosaceum* (vr), *Peridinium* sp. cf. *pyriforme, Phalacroma cornutum inerme* (vr), *Phalacroma* sp. (er), *Dinophysis antarctica* (r), *Oxytoxum criophilum* (r), *Gonyaulax* sp. (vr), *Diplopeltopsis minor* (vr), *Kofoidinium velleloides* (er), *Gymnodinium frigidum* (f), *G. baccatum* (f), *Exuviaella* sp. (vr).

Tintinnids: *Cymatocylis affinis* (er), *C. convallaria* (vr), *Salpingella laackmanni* (r), *Coxliella minor* (er), *Codonellopsis gaussi* (er), *Laackmanniella naviculaefera* (er), *Amphorellopsis* sp. (er).

Station 85. 62°23.8′S, 21°49′W. Date: January 11, 1964. Vertical tow, 100–0 meters. Plankton poor. A few copepods. Polychaeta (vr). Phytoplankton dominated by circular diatoms; *Fragilariopsis.* The third main constituent is the dinoflagellates, especially *Dinophysis antarctica.*

Diatoms: *Coscinodiscus belgicae?* (vr), *C. stellaris* (f), *C. oculus-iridis* (vr), *Coscinodiscus* sp. sp. (m), *Charcotia* sp. (f), *Melosira* sp., *Asteromphalus hookeri, Rhizosolenia alata inermis* (er), *Eucampia balaustium* (vr), *Fragilariopsis* (ra), *F. sublinearis, R. linearis, Nitzschia closterium.*

Silicoflagellates: *Dictyocha speculum* (f).

Dinoflagellates: *Dinophysis antarctica* (ra), *Phalacroma cornutum inerme* (vr), *Peridinium pseudoantarcticum* (vr), *P. metananum* (f), *P. obovatum, P. turbinatum, P. petersi, P.* sp. cf. *pyriforme, Peridinium* sp.

Tintinnids: *Laackmanniella naviculaefera* (f), *Cymatocylis convallaria* (er), *Codonellopsis gaussi* (er).

2. *On Some New or Interesting Species of Dinoflagellates and Tintinnids*

In the description of the Peridiniales the plate nomenclature used by Kofoid will be adopted. The following abbreviations are used in describing the sulcal plates: S.a. (anterior sulcal); S.l. (left sulcal); S.r. (right sulcal); S.p. (posterior sulcal); S.p.a. (accessory posterior sulcal); S.m. (medium sulcal); and t (transitional).

For the Dinophysiales the general nomenclature given by *Tai and Skogsberg* [1934] will be followed, with some modification. The cingular plates are designated by the letter *C* followed by a number indicating order of arrangement beginning with the left ventral plate and counted counterclockwise. All measurements are given in microns (μ).

Dinoflagellates

Exuviaella sp.

Plate III, fig. 55

A small species, laterally compressed. In lateral view, shape varies from large oval to almost pentagonal; thin-walled with pores of very irregular distribution, more abundant near the edges.

Dimensions: length 20–23; maximum width 17, 5–19, 5.

Probably a new species; a few specimens were collected at stations 72 and 81.

Gymnodinium frigidum Balech, new species

Plate I, figs. 6–7

A medium-sized species of irregular pentagonal shape, low and broad, with a strong membrane. Cin-

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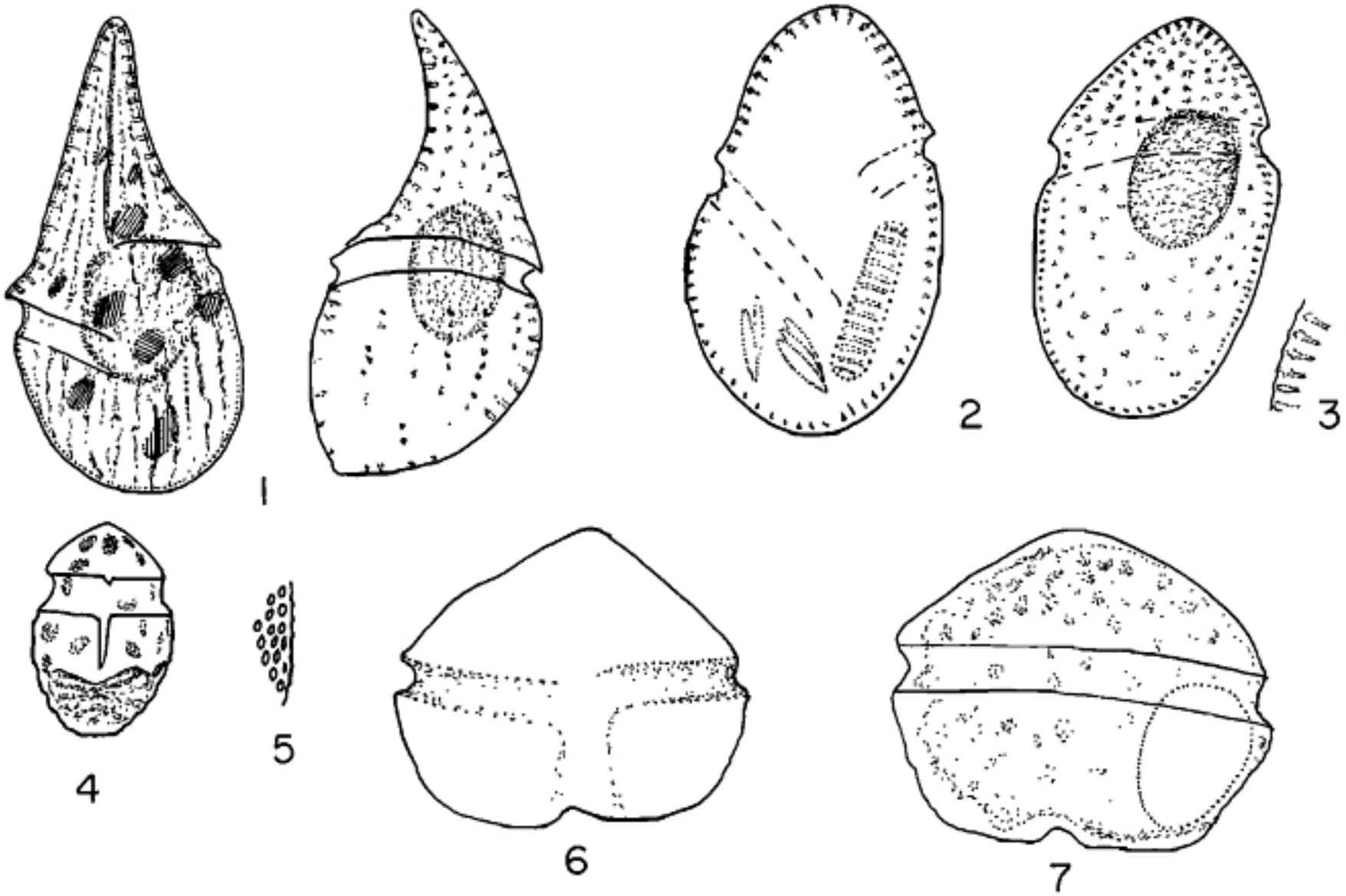
Plate I. Fig. 1, *Gyrodinium lachryma,* ventral and lateral view. Figs. 2–3, *Gyrodinium* sp.; 2, ventral and lateral view; 3, trichocysts. Figs. 4–5, *Gymnodinium baccatum;* 4, ventral view; 5, detail of the membrane. Figs. 6–7, *G. frigidum,* ventral and dorsal view. Figs. 8–11, *Phalacroma* sp.; 8, right lateral view; 9, dorsal view; 10, s_2 in lateral and frontal view; 11, H_2. Figs. 12–18, *Phalacroma cornutum inerme;* 12, (*above*) ventral extremity of the dorsal or main right epithecal, C_4, and the right ventral epithecal, (*below*) left moieties and the pore plate; 13, pore plate; 14, ventral epithecal plates; 15–16, right lateral view of the specimens; 17, s_1; 18, s_2. Figs. 1, 2, 4, 6–9, 15, and 16 magnifications between 500 and 550; the others at convenient magnifications not calculated.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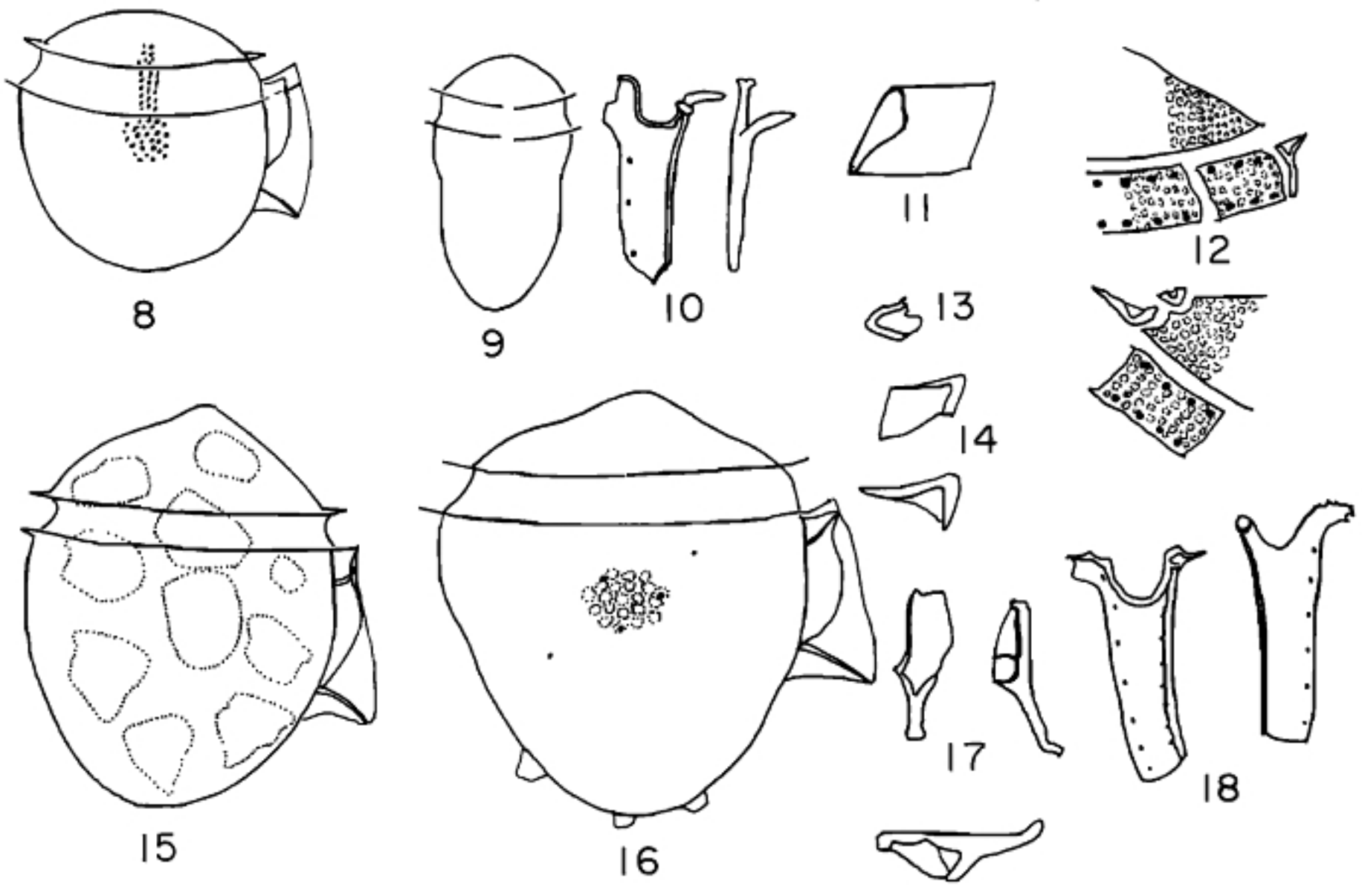
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gulum somewhat fading out at both ends, descending about ½ to 1 girdle-width. Sulcus shallow, faintly defined, generally little indenting the antapex; the remaining antapical border irregularly flattened. Protoplasm rather granular, in general somewhat contracted and more or less separated from the membrane. Nucleus located to the right of the hypocone.

Dimensions: Length 45–50; transdiameter 50–55; depth about 28.

This species is not uncommon at station 81. At first glance it could be mistaken for a *Peridinium* after shedding its theca. However, due to the relative abundance of this species and the fact that *Peridinium petersi* is the only *Peridinium* whose protoplasm is somewhat similar (although it differs in general shape, membrane, optical characteristics, and nucleus from the one described here), one has to accept this species as a *Gymnodinium*. Some individuals were seen united in couples (possibly after some divisional stages).

G. frigidum seems to be a distinct species. The only species similar to it is *G. uberrimum* (Allman) Kofoid and Swezy with which it is related on account of the general body shape and size. However, Allman's species, besides being a fresh-water species, is comparatively narrower, has yellow or brown chromoplasts, a red stigma, and a wide and quite impressed sulcus.

The specific name (from Latin *frigere* = to be cold) refers to its habitat.

Gymnodinium baccatum Balech, new species

Plate I, figs. 4 and 5

A small species, outline elliptical in ventral view, conspicuously flattened dorsoventrally. Girdle wide, deeply impressed, circular, with the posterior margin wider than the anterior, remarkably displaced anteriorly, located near the union of the anterior third with the posterior two-thirds of the body. Sulcus narrow and short, difficult to see, not extending to the epicone. Epicone dome-shaped, regular; hypocone hemielliptical. Membrane very strong, smooth on the epicone, strikingly granular on the hypocone. Nucleus located posteriorly, more or less triangular, and with exceedingly coarse chromatin. Chloroplasts numerous, small, somewhat irregular, and elongated.

Dimensions: Length 28–39; transdiameter 14–25.

Relatively abundant at station 81. The specific name of the new species is derived from Latin *baccatum* = set with pearls.

This species could be included in the genus *Amphidinium* on account of the anterior displacement of its cingulum; the distinction between both genera, however, is sometimes difficult.

Among the genus *Gymnodinium*, only *G. sphaericum* and *G. herbaceum* are closely related. *G. sphaericum* is relatively much wider, has a somewhat descendent cingulum, protoplasm clear and transparent, nucleus anteriorly located, membrane with undulation but without rotund formations. *G. herbaceum* is, on the other hand, circular (not flattened) in cross section; has less displacement of the cingulum, which in this species is narrow, nucleus small and spherical, membrane thin and striated.

All the typical *Amphidinium* have greater displacement of the girdle. The only one with a similar displacement is the little-known *A. globosum* Schröder whose allocation in the genus *Amphidinium* is dubious according to Kofoid and Swezy. It has a different shape and size, seemingly without round spots.

A. crassum Lohmann, according to *Hulburt* [1957], has the same general shape and size (though a little smaller) but its nucleus is spherical, the sulcus indents deeply the epicone which is smaller (typical of true *Amphidinium*); it is a holozoic species that lacks chromatophores and has a smooth membrane. Lohmann's original drawing is somewhat different from that given by Hulburt and shows a conical, pointed epicone and a more rounded hypocone.

Gyrodinium sp.

Plate I, figs. 2 and 3

In ventral view the body is ovoid with somewhat pointed apex, antapex rounded. The anterior margin of the girdle is more noticeable than the posterior one, especially at the dorsal and right sides; its right extremity is strongly and almost sharply displaced posteriorly, about 4–5 times its own width. Sulcus indistinct. Protoplasm granular, without chromatophores; very strong and closely packed trichocysts, especially abundant and somewhat stronger in the epicone. Nucleus elliptical located near the middle of the cell or somewhat anteriorly.

Dimensions: Length 59; transdiameter 33.5; maximum width 39.5.

Only one specimen which seems characteristic enough to justify a new species. The closest known species is *G. flavescens* Kofoid and Swezy (length 50), whose elongated nucleus could be an indication of a predivisional stage. It has a well-defined sulcus and lacks the very strong and characteristic trichocysts.

Our specimen, taken from the surface sample at station 72, had swallowed two relatively large *Fragilariopsis* and four unidentified small diatoms, besides a protoplasmatic mass (possibly a small dinoflagellate).

Gyrodinium lachryma (Meunier) Kofoid and Swezy

Plate I, fig. 1

Spirodinium lachryma Meunier, 1910, p. 63, pl. 14 (21–22).

Gyrodinium lachryma (Meunier) Kofoid and Swezy, 1921, p. 314, text fig. EE, 6.

Long pear-shaped (or tear-shaped as indicated by its name), asymmetrical. Hypocone subhemispherical in frontal view, somewhat pointed in lateral view. Epicone conical and pointed; upper part deflected to the left and ventrally.

Membrane thick, furrowed, with longitudinal irregular 'plicae' which make it difficult to distinguish the extension of the sulcus; the sulcus seems to extend to the apex or close to it; in the hypocone the sulcus is very shallow and fades out posteriorly without actually reaching the antapex. Cingulum with projecting anterior edge; posterior edge somewhat indistinct; cingulum descending, its right end being displaced posteriorly about 4 times its own width. Very strong trichocysts especially noted in the epicone; in the hypocone they seem to be irregularly packed along the plicae. Protoplasm light, somewhat granular, with some small irregular chloroplasts which are more abundant around the nucleus. Nucleus big, ovoid, located near the middle of the cell.

Dimensions: Length 72; transdiameter 31; maximum width 33.5.

One individual collected at station 72. Despite its small and pale chloroplasts the organism is a predator since it contained a small diatom in the hypocone.

G. lachryma, an arctic species, was found by Meunier in the Kara Sea. Although it shows great resemblance to the specimen described above from the Weddell Sea, it should be pointed out that Meunier's species is much bigger, the distal or right end of its cingulum being more displaced and ending at 0.9 the total length (a little less than 0.8 in our specimen). Further, Meunier's species is devoid of the strong ridges and trichocysts that are present in the Weddell Sea species. Therefore, the specific assignment of the Weddell Sea specimen to Meunier's species should be regarded as a tentative one.

Phalacroma cornutum Peters subspecies *inerme* Balech, new subspecies

Plate I, figs. 12–18

A medium-sized species, with highly irregular conical epitheca and an almost triangular hypotheca about twice as long as the epitheca, very irregular. In lateral view the epitheca has somewhat wavy sides; slightly convex at the base, and slightly concave at the upper half ending in a more or less pointed, sometimes a little flattened, apex. Cingulum more concave in the dorsal than in the ventral side. Body in ventral view laterally very compressed except in the megacytic individuals; in the same view hypothecal sides almost straight in most of their extension. Theca, including the cingulum, covered by small, irregular, and densely packed poroids, some of them perforated by a pore. Cingular lists of medium size, horizontal, hyaline, without ribs. Left sulcal list very variable, generally wider at the posterior end (as much as two times wider than the anterior one). R_1 and R_2 very close to each other: R_2 has a somewhat raised distal end approaching R_1. R_3 obliquely directed posteroventrally. Right sulcal list rather long, ending at the level of R_3; free edge S-shaped. Plate C_1 somewhat wider than C_4; both bear 3–4 pores along each main edge; poroids in longitudinal rows, each is composed of 4–5 poroids. The sulcal plates are shown in figs. 17 and 18.

Dimensions: Length in general 57–60; epithecal length around 12–14; epithecal depth 31; hypothecal depth 45–50; maximum width of the left list 8–11; R_1–R_2 3–5; R_2–R_3 11–14.5 (7–20).

The protoplasm very often filled with big, highly refringent bodies. Sometimes the epitheca, the hypotheca, or both bear some tenuous, short, almost rectangular excrescences or crests, but they are always much smaller in size than in the typical *P. cornutum*. The left sulcal list is also conspicuously narrower. Most of the specimens are completely devoid of crests. The differences seem to be important enough to war-

rant their consideration as different taxonomic entities. However, since the general shape, size, sculpture, and plates are about the same in the two forms (the sulcal principal plate, s_2, is but slightly different; the new subspecies seems to have a better developed left apophysis), it would seem that there is no justification in creating a new species. This is especially true if one considers the wide range of variation in the posterior width of the left sulcal list and the excrescences or 'tubercules' of another Antarctic species, *Dinophysis tuberculata*. Nevertheless, since we did not find among the many specimens studied any true intermediate form there is ample ground for identifying it as a subspecies.

Phalacroma sp.

Plate I, figs. 8–11

Short and rotund body, epitheca rather low, evenly convex. Hypotheca regularly rounded in lateral outline; in ventral view, hypotheca is swollen in the upper half and almost triangular, with gently curved sides posteriorly tapering to a subacute antapex. Longitudinal axis about perpendicular to girdle.

Cingulum wide and concave, with well-developed, structureless membranes.

Left sulcal list has almost the same width throughout; R_2 close and parallel to R_1. Right list of medium length, subtriangular tapering posteriorly; its free edge is gently and evenly convex except for a small upper concavity. General sculpture made up of regular, small, closely-set areolae. Plate s_2 with high right and left apophysis; the left one has a single subsquare tooth (in some views it is possible to detect some very minute denticulation); posterior end triangular; three pores along the left margin.

Dimensions: Length 42; epithecal length 9; depth of the epitheca 29; depth of the hypotheca 36.5; maximum width of the left sulcal list 6; R_1–R_2, 3; R_2–R_3, 10 (17).

In ventral view this species is fairly similar to *P. expulsum*, but the lateral outline is quite different. Although probably a new species, we feel that since only one specimen was taken at station 55, this does not provide sufficient material to warrant a description of a *bona fide* species.

Peridinium archiovatum Balech

Plate II, figs. 19–24

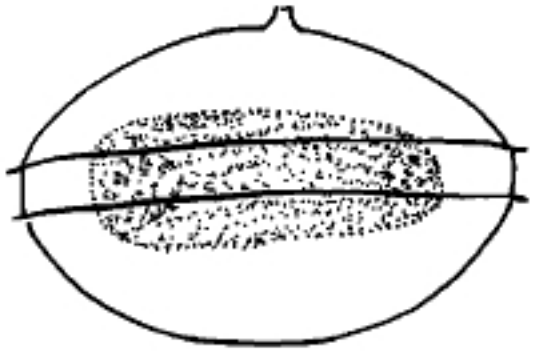
Peridinium archiovatum Balech, 1958*a*, p. 84, Lam. III (45–48); Balech, 1958*b*, p. 385, Pl. I (23–26).

In the references cited above, Balech described this *Peridinium* and its general plate pattern. He also stated that *Peridinium* is generally much more scarce than *Diplopletopsis minor*, another lenticular dinoflagellate found in Antarctic waters. In the present material from the Weddell Sea, *P. archiovatum* was found to be relatively abundant which enabled a detailed study of its sulcal plates.

The anterior sulcal (S.a.) has a long and narrow anterior part or neck, and a relatively wide body with well-marked angles; posterior apophyses small. Left plate (S.l.) J-shaped, wider posteriorly; posterior branch little differentiated; internal margin with a narrow and smooth reinforcement which projects as a small posterior spine. Right plate (S.r.) of a very peculiar form, crescent-shaped, somewhat irregular, without a neck, list almost elliptical. Posterior plate (S.p.) short, flattened, and irregularly broad, J-shaped with concave, reinforced margin. In antapical view the sulcus is crescent-shaped with a strong concavity to the right and is remarkably asymmetrical in position, being noticeably displaced to the left. The general plates have rounded and relatively big poroids and small dots among them.

The protoplasm is always clear and shows like threads of granular material radiating from near the center; this can be helpful in distinguishing *Peridinium archiovatum* from *Diplopeltopsis minor*.

Plate II. Figs. 19–24, *Peridinium archiovatum;* 19, dorsal view; 20, hypothecal view; 21, 5‴ and 1‴; 22, S.a.; 23, S.r., S.m., and S.l.; 24, S.p. Figs 25–26, *P. obovatum;* 25, ventral view; 26, sulcal plates. Figs. 27–33, *P. metananum;* 27, ventral and dorsal views; 28, 4″ and 2_a; 29, 1′; 30, S.a. and t.; 31, two aspects of S.r.; 32, S.l.; 33, S.p. Figs. 34–41, *P. adeliense;* 34, ventral view; 35, dorsal epithecal plates; 36, 2⁗ and 1⁗; 37, sulcal plates, t, and 1‴; 38, S.a.; 39, S.r.; 40, S.l.; 41, different aspects of S.p. Figs. 19, 20, 25, 27, 34–37, × 500 approximately; the others at magnifications not calculated.



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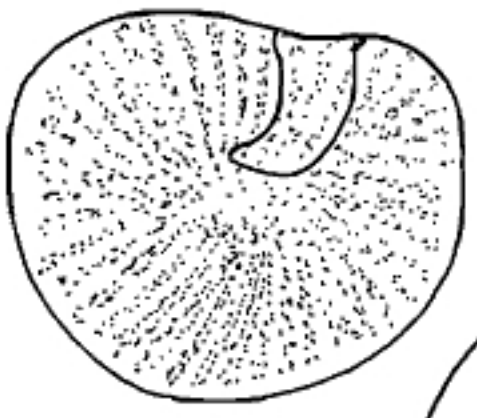

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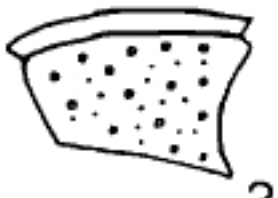

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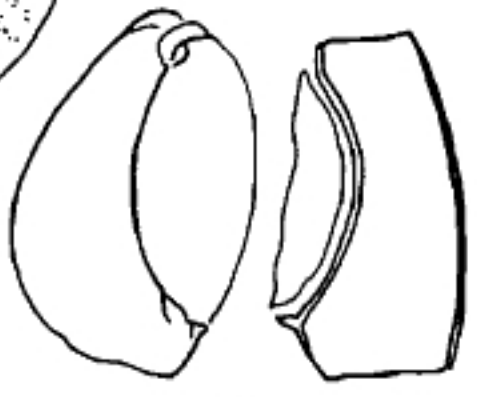

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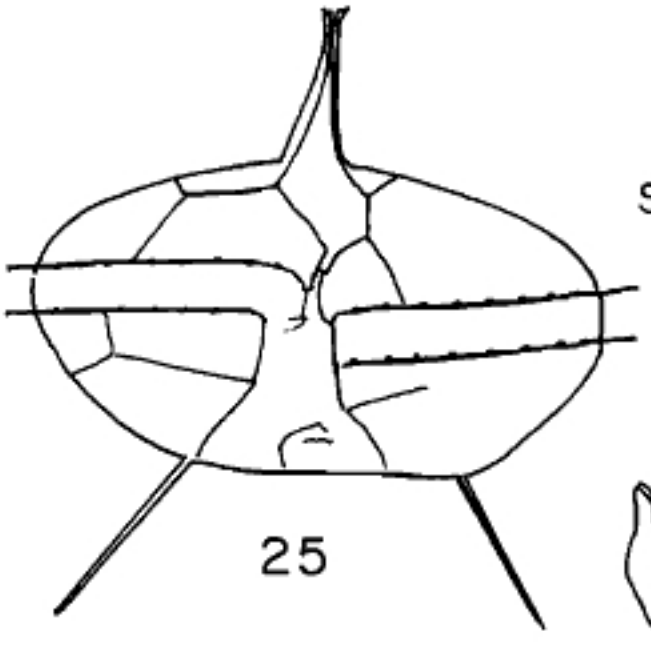

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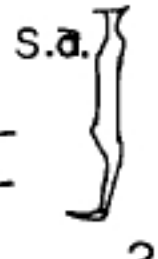

S.a.

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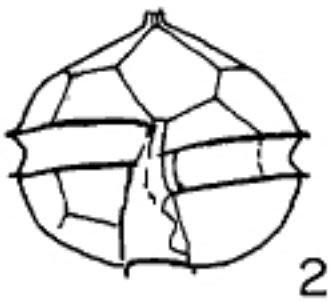
S.d.

S.p.



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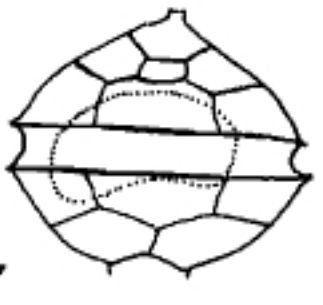

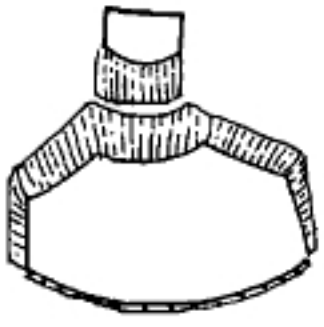

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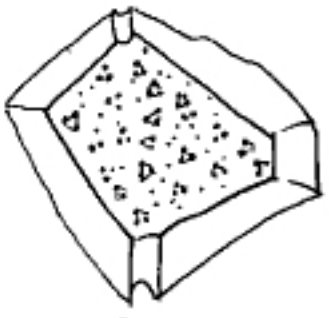

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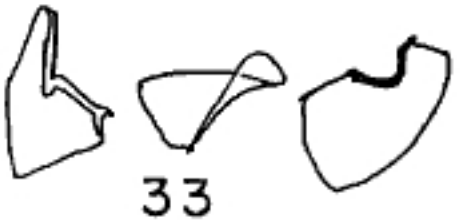

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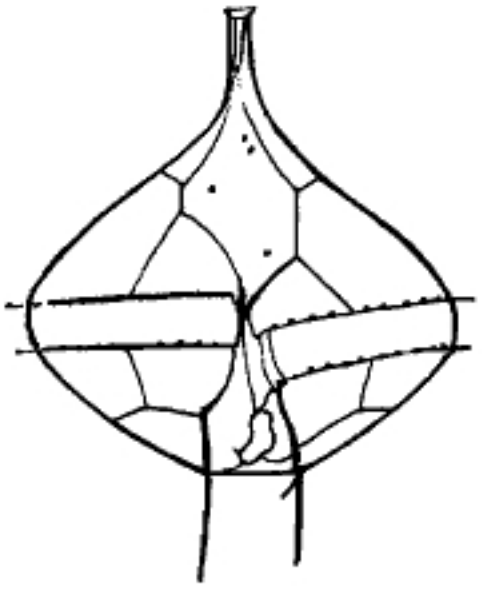

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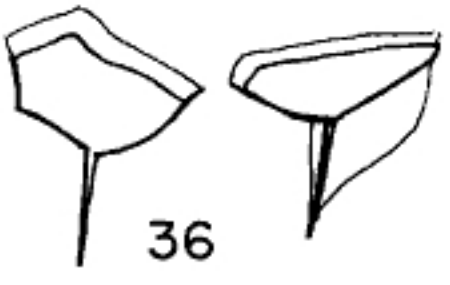

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Peridinium defectum Balech, new species

Plate III, figs. 42–50

A small species, irregularly pentagonal in shape, with a long apical horn and two long and dissimilar antapical spines. In ventral view, sides somewhat convex, sometimes slightly undulated. Apical horn narrowly conical, a little deflected to the right; this deflection is enhanced by the posteromargin of the body which is also oblique anteriorly and to the right. Two antapical wingless spines, strong and sharp, the right one is about 4/7 to 3/5 the length of the left; the left spine arises from a short conical projection. Cingulum wide, slightly ascendent, sometimes almost circular, excavated (species *cavozone*), wider posteriorly and furnished with a well-developed list with radial ribs.

Archaeperidinium (two intercalaries), meta, apparently with only six precingular. Most of the epitheca is formed by the last precingular which dorsally loses contact with the cingulum. The two true dorsal precingulars are 4″ which has a relatively high left part and a much wider and very low right part; 5″ low, like a narrow irregular ribbon. 1″ low, irregular trapezoidal in shape; 2″ more or less pentagonal and somewhat higher; 3″ wider than both. At least the three first precingulars bear some more or less rounded, relatively large but faint pores.

Four apical plates plus one 'plate of the apical groove.' Plate 1′ long, narrow, irregularly S-shaped; its narrow concave upper edge touches the plate of the apical groove; to the right it is connected with 4″ and 6″; its posterior right angle, truncated, receives the end of the anterior sulcal plate; on the posterior and left sides it contacts 1″, 2″, 2′, and also the first intercalary. Plate 2′ bears three pores in a longitudinal row. Plate 3′ is narrowly triangular and truncate, apparently lacking pores. Plate 4′, narrow at its upper part, has an expanded base ordinarily with 2–3 pores arranged in an oblique line. Both intercalaries elongated anteroposteriorly, 2_a longer and narrower than 1_a. The latter bears, in general, 3 pores in a longitudinal row.

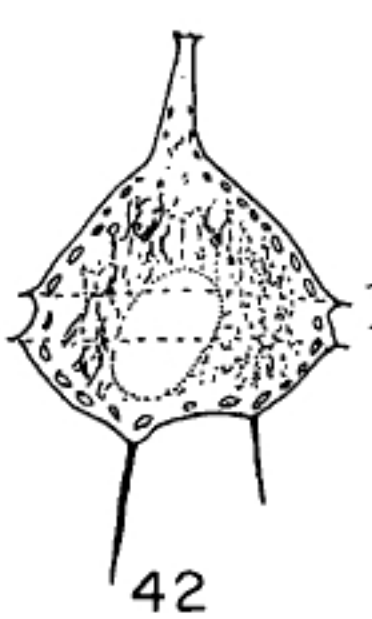
The hypotheca has a normal plate pattern as regards the number: five postcingulars and two antapicals. Like the epitheca, the hypotheca has one plate (2‴) which forms most of its body. 2‴, after a relatively short left part furnished with cingular membrane, is separated from the cingular edge by the very low and wide 2‴ and a long, left apophysis of 4‴. Last postcingular, 5‴ is much wider than 1‴. The antapical ″″ is prolonged to the right into a narrow and rather long apophysis. The two terminal cingular plates C_1 and C_3 are very narrow, united to the C_2 by wide, striated sutural bands. Transitional plate more or less similar to C_1. S.a. very long, with S-shaped body most of which indents the epitheca to the left and extends over 1″. Left sulcal shaped like a broad J, without pores, reinforcements, or spines. Right sulcal with a broad body supporting to the left a short and rather narrow membrane. S.p. crescent-shaped, somewhat wider at the left end with an indentation at the right end.

Dimensions: Length, without spines, 30–42. Total length 44–56. Length of the apical horn 11–12; length of the left spine 9–15, right 6–8.5. Separation of the bases of spines in general 11–12; transdiameter 19.5–31; depth (measured in a few specimens) 15.5–17.

The nucleus is located posteriorly and in most of the individuals is somewhat elongated and inclined from the anterior part to the left posterior; sometimes spheroidal. The chloroplasts were not clearly discernible; usually there seems to be only one chloroplast, very lobulated and somewhat vacuolized; in other individuals it appears fragmented into elliptical bodies. The protoplasm shows peculiar longitudinal and more or less moniliform threads.

The plate pattern is exceedingly difficult to establish. The plates are very thin; their limits very faint, hard to distinguish even after the treatment with hypochlorite and under oil immersion and phase contrast. The

Plate III. Figs. 42–50, *Peridinium defectum*; 42, dorsal view; 43, right lateral view; 44, ventral view; 45, 6″; 46, apical and intercalaries plates; 47, antapicals; 48, precingulars; 49, S.a., S.r., S.l., and S.p.; 50, dorsal epithecal plates. Figs. 51–54, *Oxytoxum criophilum*; 51, ventral and left ventral views; 52, sulcal area; 53, antapical plate; 54, 1‴ and 5‴. Fig. 55, *Exuviaella* sp. Figs. 42–43, 50–52, and 55, × 500 approximately; the others at magnifications not calculated.



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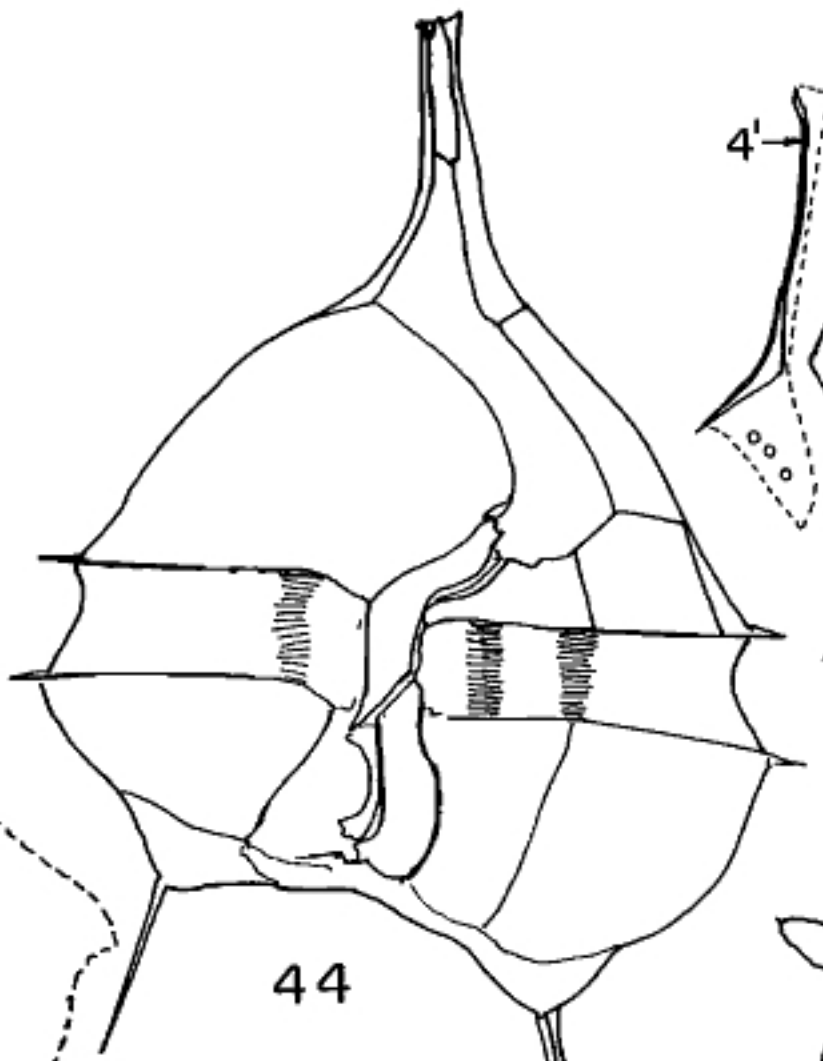

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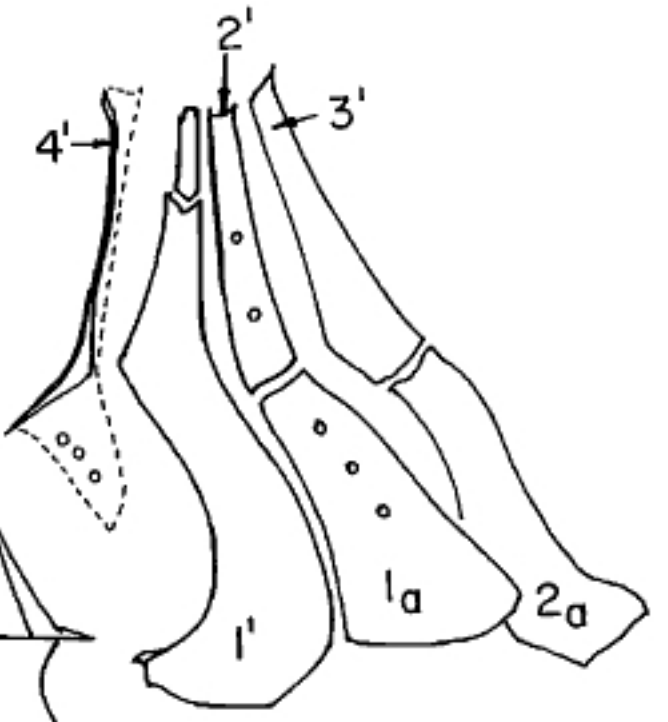

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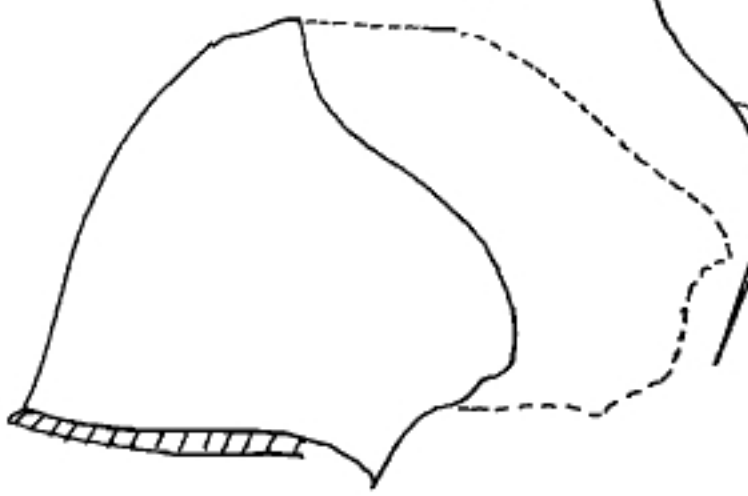

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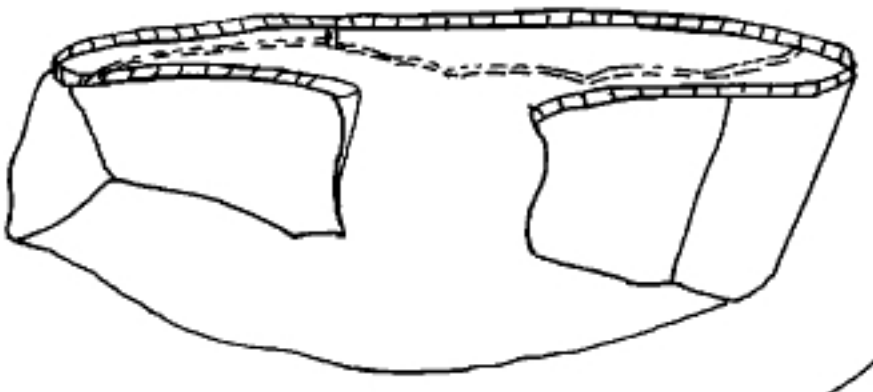

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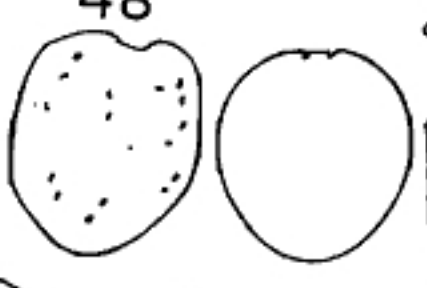

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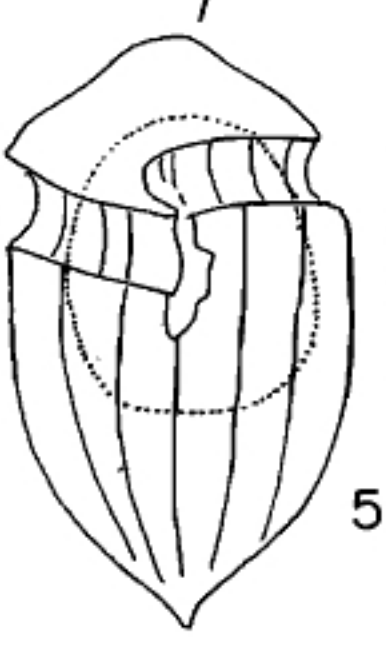

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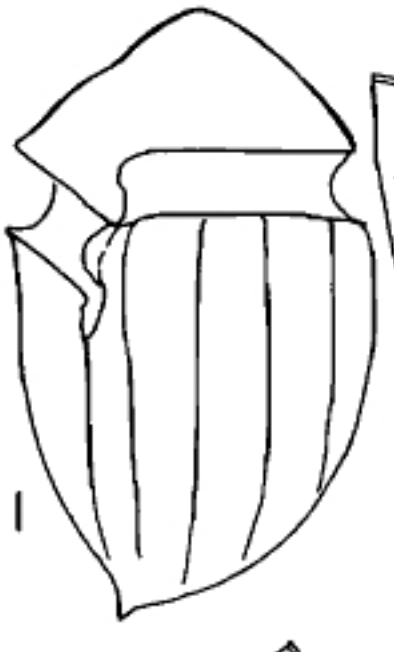

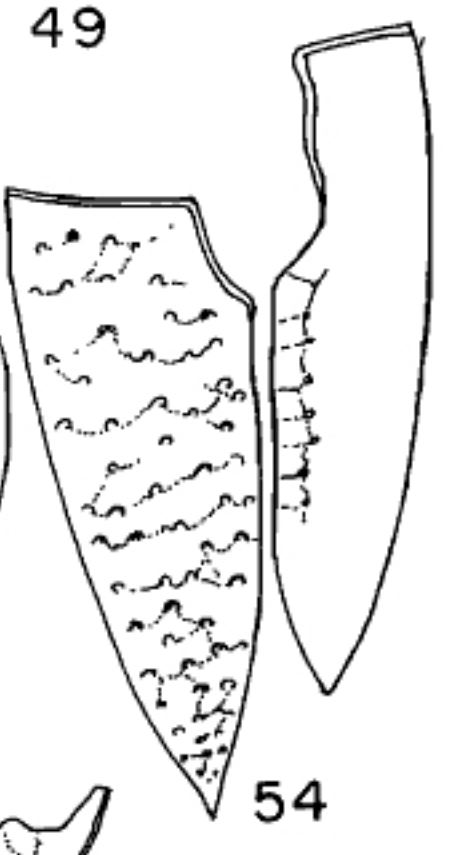

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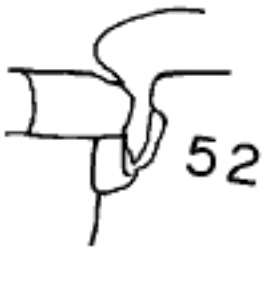

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cell membrane is exceptionally resistant, which adds to the difficulties of studying the plate pattern. Although we are confident in the soundness of the pattern established above, some doubt arises when considering the precingular plates which could be 7 in number, although 6 were repeatedly found. If it is 6, then the only known species with a similarly reduced number of precingular and an abnormal growth of the sixth is *P. anomaloplaxum* Balech, found in plankton samples taken along the Argentine coast [*Balech*, 1964]. However, the other distinguishing features are quite different. The shape of *P. defectum* is very characteristic, and the abnormal development of the second postcingular is unique in that genus. Further, and very typically, the first intercalary touches 1′.

Although this species was rather abundant in the surface haul taken at station 81, it was rare in the vertical haul.

The name (from Latin *defectus* = lack, disappearance) refers to the low number of plates.

Peridinium obovatum Wood

Plate II, figs. 25–26

Peridinium obovatum Wood, 1954, p. 242, fig. 159.

Balech [1962] gave a description of this species, which was inadequately described by its discoverer, and stated the close similarity between this species and *P. applanatum Mangin*. In the Weddell Sea samples taken on this cruise, *P. obovatum* was one of the most abundant species. Time did not allow a thorough study of its variation; however, the sulcal plates were studied and are shown in Figure 26. Their similarities to those of *P. applanatum* are striking, although the general body form is different. The variations in shapes and sizes are still under study. In the Weddell Sea samples the typical *P. obovatum* is always bigger than the typical *P. applanatum*.

Peridinium metananum Balech, new species

Plate II, figs. 27–33

A very small, broad, pentagonal species, almost cake-shaped, meta, quadra, without antapical horns. Epitheca very widely conical with convex sides, it tapers abruptly to a small apical horn. Cingulum excavated, ascendent, displaced almost a girdle-width and limited by very narrow lists with radial ribs. Hypotheca of convex sides truncated aborally with indentation at sulcus. Two very small antapical spines at both sides of the sulcus. Plate 1′ is very asymmetrical, expanded to the left. Intercalary 2_a quadrangular and very small; 1_a and 3_a much bigger and elongated transversally. In the hypotheca 3‴ more or less symmetrical. The cingulum is characterized by the highly developed ventral plates, especially C_3, which made C_2 relatively very short, accounting for no more than ½ of the total cingular length. Transitional very narrow.

In the sulcus, S.a. is long but also fairly wide, very pointed posteriorly. S.l. short, wide, with concavity short and shallow and very poorly differentiated, reinforced, posterior branch. S.r. broadly trapezoidal; narrow neck; posterior half of the internal edge somewhat thickened but without a true list and a projected posterior corner, spine-shaped, small. S.p. irregularly triangular, short, with a conspicuous dorsal angle and reinforced indented ventral margin.

The sculpture of the general plates is very peculiar: with dry objectives it appears to be formed by more or less irregular dots; under oil immersion these dots resolve into groups of three, sometimes two, pores united by very faint lines; scattered among these more or less triangular groups of pores there are some other very small pores.

Protoplasm clear. Nucleus sausage-shaped.

Dimensions: Length 23–34; transdiameter 25.5–36.5; depth 4–6 microns less than transdiameter. Length of the horn and spines 1.5. Separation between spines 7.5–11. Cingular membranes 1.5 wide.

The closest species is also an Antarctic one, *P. nanum* Balech, which is para instead of meta (1962).

Peridinium adeliense Balech

Plate II, figs. 34–41

Peridinium adeliense Balech, 1958*b*, p. 396, Pl. IV (101–112).

In some samples, especially at station 81, several individuals were found that look somewhat different from those previously described from the Adélie coast. Their forms are even more elegant and the hypotheca shorter, very regularly rounded; sometimes its sides are almost straight. Dorsal epithecal plate relatively narrow. Plate 4″ not so high as in the typical speci-

mens; 3″ and 5″ touch 2_a by a very short border. In most of the specimens studied, the sutures are broad and striated. Sculpture of the plates formed by faint and small reticulation and some very irregularly scattered dots. Despite some differences in general shape and in the details of the plates, it does not seem to be a different species.

Dimensions: Length 42–53, total length 53–61.5; length of the apical horn around 9–10; transdiameter 36–45. Separation of the antapical spines at their bases 7–8.5; at their ends 10–11.5.

Oxytoxum criophilum Balech, new species

Plate III, figs. 51–54

Epitheca low, triangular, with somewhat convex or wavy sides. Hypotheca, in frontal view, with sides almost straight and parallel in the anterior half, rounded conical in the posterior one, abruptly tapering to a short medium spine. Cingulum deeply depressed, descendent, displaced its own width, slightly overhanging. Sulcus very short. The sculpture of the epitheca is very irregular, reticulate, with some nodules at the knots of the meshes. The hypothecal plates are furnished with longitudinal ribs and also with a seemingly irregular reticulum with stronger transversal lines. Under oil immersion the reticulum appears to be formed by very short, blunt spines united by fine irregular lines, most of them almost transversal. Protoplasm dark, brown, with some clusters of rodlike bodies (rhabdites) and ingested particles, especially parts of diatoms. Evidently this species is predatory, and the rhabdites may be some form of nematocysts. Nucleus very big, somewhat displaced anteriorly.

Dimensions: Length 56–61 (epitheca 11.5–14) transdiameter 25–26; maximum width 33–36.

Found in vertical tows at stations 55 and 81. The nearest species is *O. elegans* Pavillard, one of the very rare species with some overhanging. However, the epitheca and the sculpture are very different in both. (See *Schiller* [1933–1937], p. 464.)

Podolampas antarctica Balech, new species

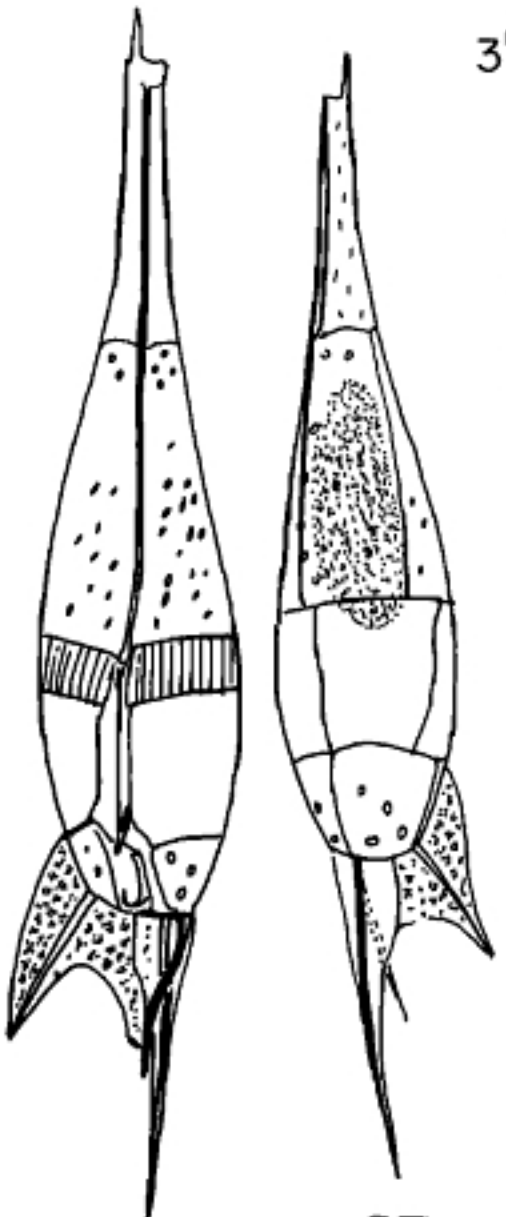
Plate IV, figs. 56–64

Body club-shaped, relatively narrow; apical horn terminated by a spine; aboral end rounded, furnished with three well-developed spines, especially the one borne by 2‴′. The first apical (1′) is very narrow, threadlike, without medium bulge; the widest of this series is 3′ which bears the spine; 2′ and 3′ are perforated by strong oblique pores. The intercalary, very long and narrow, almost reaches the apex; smooth in contrast with the apical. Five precingular; the fifth has a posterior internal projection; all of them with irregular and elongated pores and a small cluster of 3–5 smaller, rounded pores located near the plate apex and separated from the other by an hyaline area. In the cingular series, C_1 is relatively very wide. The three cingular are devoid of pores. Of the three postcingular the first, almost triangular in shape, is the smallest; all three have elliptical large but faint pores.

The three antapical bear spines; 1‴″ has the longest body, narrow and irregularly quadrangular in its posterior 2/3, rhombic and protruded anteriorly into a spiniform neck; body with a few scattered pores; the posterior end bears a spine devoid of membranes; both body and spine are directed inward thus forming between the two an angle open to the right of about 120°–140°. In ventral view the spine is almost superimposed on the main spine which is supported by 2‴″. The latter has a strong, very long spine, almost 1/2 body length, parallel to the main axis; it is bordered at both sides by membranes of which the internal has an expanded base. Plate 3‴″ has an angular body in ventral view with longer right side; spine shorter than that of 2‴″ (approximately 1/2 to 3/5) furnished with a very well-developed membrane, especially at left; this membrane is covered with a rather small but heavy and irregular areolation. The sulcal plates are very close to those of *P. spinifer*.

Dimensions: Length (body and apical spine) 88–90; total length 120.5–123. Longer antapical spine 30–33.5; right antapical spine 14–19; transdiameter 16.5–17.

The genus *Podolampas* being generally distributed in warm waters, its discovery in the Weddell Sea was wholly unexpected. We found two individuals at station 55, and six in the vertical haul at station 81. At first it was mistaken for *P. spinifer*, to which it shows a striking resemblance in general form, apical spine, and dimensions; however, it was easily distinguished from it on account of the three well-developed spines and the wide antapical membrane, covered by a coarse areolation. Close examination of this species revealed additional differences (for *P.*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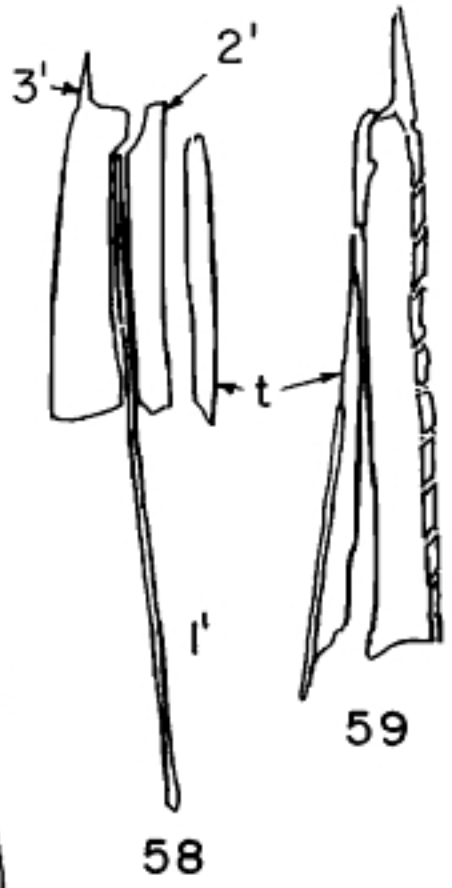
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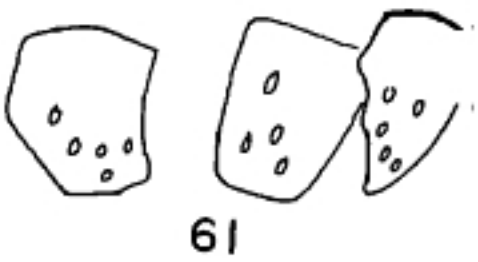
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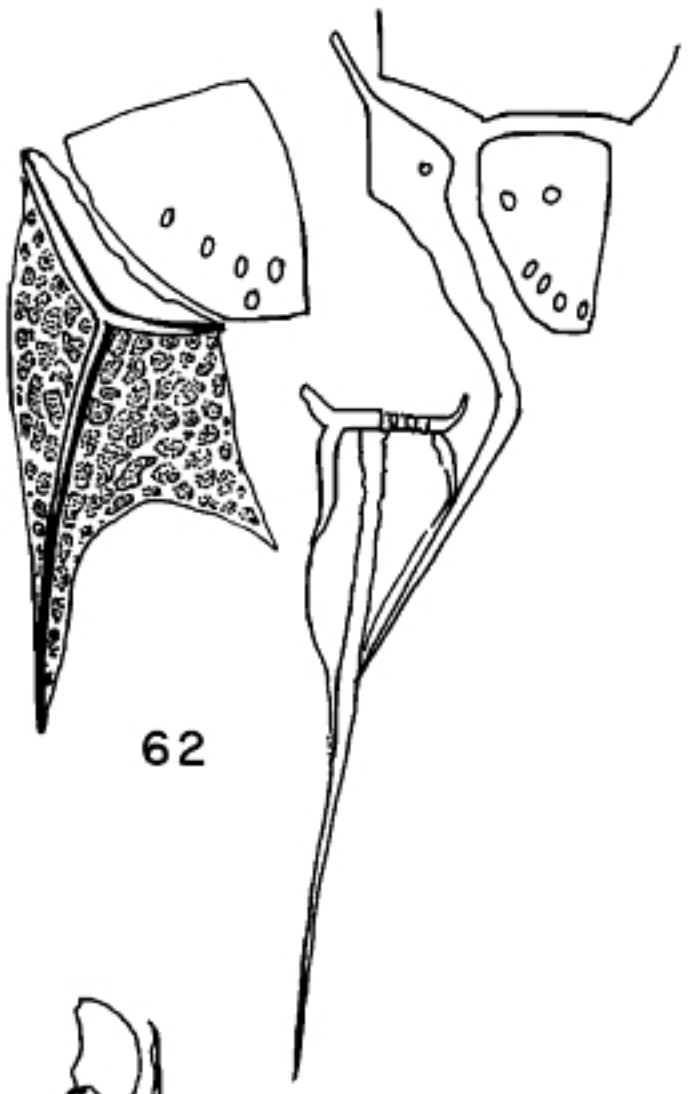
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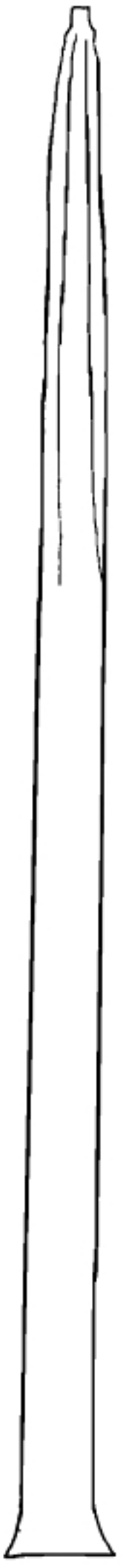
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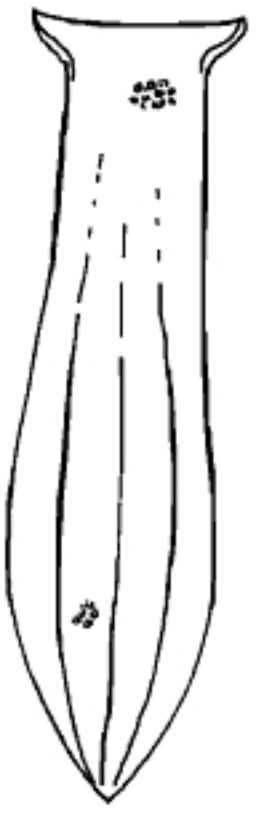
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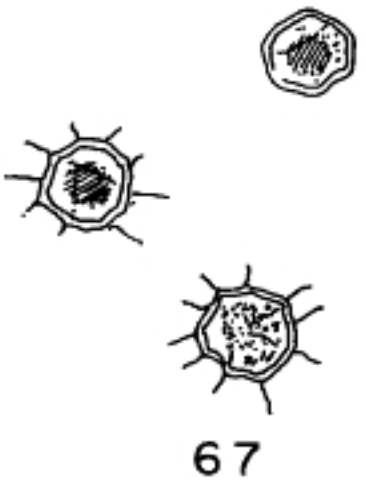
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spinifer see *Balech* [1963]). For instance, plate 2‴ is much higher, C_1 bigger than C_2; body of 3⁗ of a quite different form, intercalary completely different.

Tintinnids

Salpingella laackmanni Kofoid and Campbell

Plate IV, fig. 65

Tintinnus acuminatoides var *seccata* Laackmann, 1909, p. 409, pl. 50 (7–8).

Salpingella laackmanni Kofoid and Campbell, 1929, p. 353, fig. 670.

Long and narrow tubular lorica expanded at the oral end to form a collar (angle 60°–70°). Oral rim sharp, neither reinforced nor everted. Posterior third of the lorica subconical, sometimes with sides slightly convex and always bearing 5–6 longitudinal crests. Very short aboral tube of almost square contour, separated from the posterior cone by a low annular expansion.

Dimensions: Length 224–241; length of crests 67–76; length of the collar approximately 8–9; length of the aboral cylinder 2–3; oral diameter 16.5–18; diameter of the middle body 10–11; aboral opening 2–2.5.

Seven loricae obtained in vertical tows at stations 55 and 81 were studied.

This species is very closely related to *S. acuminata* and *S. gloeckontegori;* in general it has a more regular form, but it differs from them in the form of the collar which is less expanded, not everted, and its oral diameter is much smaller.

Amphorellopsis sp.

Plate IV, fig. 66

Lorica elongated, gradually expanded from the base of the collar to the posterior 2/5; from there it is contracted into an ogival, pointed aboral part. Collar low, wide, with somewhat concave external contour, with a very short oral convexity where the sides become parallel; oral margin very thin. Five strong crests depart from the aboral tip and clearly overpass the middle; from that point they become very faint, simple lines hardly traced to near the base of the collar. The whole lorica has a clear alveolar structure made up of regular alveoli of about 1 μ in diameter, somewhat attenuate in the collar.

Dimensions: Total length 84; length of the collar 5.5–6; length of the raised part of the crests around 64; oral diameter 20.5; suboral diameter 15.5; maximum diameter of the bowl 23.

Only one specimen was collected at station 81 in the vertical tow; its peculiar characteristics seem to justify a new species, which we do not want to create on only one individual.

The closest species are *A. acuta* and *A. laevis.* Our specimen is much smaller than *A. acuta,* with bowl relatively more expanded, and has five crests instead of three. It differs from the 5-crested *A. laevis* in that its maximum bowl expansion, besides being more abrupt, is situated posterior to the middle; the collar is also more abruptly expanded (suboral diameter much larger in *A. laevis*), and of a very different form. The Antarctic *Amphorellopsis* differs from all known species in having a clearly alveolated wall structure.

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REFERENCES

Balech, E., Plancton de la Campaña Antárctica Argentina, 1954–1955, *Physis, 21*(60), 75–108, 1958*a*.

Balech, E., Dinoflagellés et Tintinnides de la Terre Adélie (Secteur français antarctique), *Vie et Milieu, 8*(4), 382–408, 1958*b*.

Balech, E., Operación Oceanográfica Merluza, V Crucero, Plancton, *Servicio de Hidrografia Naval, 618,* 1–43, 1959.

Balech, E., Plancton de las campañas oceanográficas Drake I y II, *Servicio de Hidrografia Naval, 627,* 1–57, 1962.

Plate IV. Figs. 56–64, *Podolampas antarctica;* 56, ventral view; 57, dorsal view; 58, apical plates and intercalary; 59, 1_a and 3′; 60, cingulars; 61, postcingulars; 62, 1‴, 3‴, and the three antapical plates; 63, S.a. and S.r.; 64, S.l. and S.p. Fig. 65, *Salpingella laackmanni.* Fig. 66, *Amphorellopsis* sp. Fig. 67, colonial microalgae. Figs. 56–58, × 550; Figs. 65 and 66, × 500; the others at magnifications not calculated.

Balech, E., La familia Podolampacea (Dinoflagellata), *Bol. Inst. Biol. Marina, 2,* 1–33, 1963.

Balech, E., El plancton de Mar del Plata durante el periodo 1961–1962, *Bol. Inst. Biol. Marina, 4,* 1–49 (5 pls.), 1964.

El-Sayed, S. Z., and E. Mandelli, Primary production and standing crop of phytoplankton in the Weddell Sea and Drake Passage, *this volume,* 1965.

Frenguelli, J., and H. A. Orlando, Spermatogonia antiqua Leud. Fortm., *Notas del Museo de la Plata, Zool., 18*(161), 169–174 (2 pls.), 1955.

Frenguelli, J., and H. A. Orlando, Diatoméas y Silicoflagelados del Sector Antártico Sudamericano, *Instituto Antartico Argentino,* Publ. *5,* 1–191, 1958.

Hulburt, E. M., The taxonomy of unarmored Dinophyceae of shallow embayments on Cape Cod, Mass., *Biol. Bull., 112*(2), 196–219, 1957.

Karsten, G., Das Phytoplankton des Antarktischen Meeres nach dem Material der deutschen Tiefsee-Expedition 1898–1899, *Wiss. Ergebn. Deutsch. Tiefsee-Exped. Dampf. "Valdivia," 2*(2), 1907.

Kofoid, C. A., and A. S. Campbell, A conspectus of the marine and fresh-water ciliata belonging to the Suborder Tintinnoinea, *Univ. Calif. Publ. Zool., 34,* 1–403, 1929.

Kofoid, C. A., and T. Skogbserg, The Dinoflagellata; The Dinophysoideae, *Mem. Mus. Comp. Zool. Harvard Univ., 51,* 1928. 1928.

Kofoid, C. A., and O. Swezy, The free living unarmored Dinoflagellata, *Mem. Univ. California, 5,* 1921.

Laackmann, H., Antarktische Tintinnen, *Zool. Anz., 31,* 235–239, 1907.

Laackmann, H., Die Tintinnodeen der deutschen Südpolar Expedition 1901–1903, *Deutsche Südpolar Exp., 11,* 340–496, 1909.

Meunier, A., Microplancton des Mers de Barents et de Kara, *Duc D'Orléans Campagne Arctique, 1907,* 355 pp., 37 pls., 1910.

Peters, N., Die Peridineenvevolkerung der Weddellsee mit besonderer Berucksichtigung der Wachstums-und-Variationsformen, *Intern. Rev. Ges. Hydrobiol. Hydrogr., 21,* 18–146, 1928.

Schiller, J., Dinoflagellatae, in *Rabenhorst's Kryptogamenflora,* Vols. 1–2, 1933–1937.

Tai, L. S., and T. Skogsberg, Studies on the Dinophysoidae, marine armored Dinoflagellates of Monterey, California, *Arch. Prot., 82,* 380–482, 1934.

Wood, E. J. F., Dinoflagellates in the Australian region, *Australian J. Marine Freshwater Res., 5*(2), 171–351, 1954.

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