DEPARTMENT OF TERRESTRIAL MAGNETISM
J. A. Fleming, Director

Scientific Results of Cruise VII of the CARNEGIE during 1928-1929
under Command of Captain J. P. Ault

BIOLOGY—V

The Genus Ceratium in the Pacific and North Atlantic Oceans

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CARNEGIE INSTITUTION OF WASHINGTON PUBLICATION 565
WASHINGTON, D. C.
1944

This book first issued December 30, 1944

PREFACE

Of the 110,000 nautical miles planned for the seventh cruise of the nonmagnetic ship Carnegie of the Carnegie Institution of Washington, nearly one-half had been completed on her arrival at Apia, November 28, 1929. The extensive program of observation in terrestrial magnetism, terrestrial electricity, chemical oceanography, physical oceanography, marine biology, and marine meteorology was being carried out in virtually every detail. Practical techniques and instrumental appliances for oceanographic work on a sailing vessel had been most successfully developed by Captain J. P. Ault, master and chief of the scientific personnel, and his colleagues. The high standards established under the energetic and resourceful leadership of Dr. Louis A. Bauer and his coworkers were maintained, and the achievements which had marked the previous work of the Carnegie extended.

But this cruise was tragically the last of the seven great adventures represented by the world cruises of the vessel. Early in the afternoon of November 29, 1929, while she was in the harbor at Apia completing the storage of 2000 gallons of gasoline, there was an explosion as a result of which Captain Ault and cabin boy Anthony Kolar lost their lives, five officers and seamen were injured, and the vessel with all her equipment was destroyed.

In 376 days at sea nearly 45,000 nautical miles had been covered (see map, p. iv). In addition to the extensive magnetic and atmospheric-electric observations, a great number of data and marine collections had been obtained in the field of chemistry, physics, and biology, including bottom samples and depth determinations. These observations were made at 162 stations, at an average distance apart of 300 nautical miles. The distribution of these stations is shown in the map, which delineates also the course followed by the vessel from Washington, May 1, 1928, to Apia, November 28, 1929. At each station, salinities and temperatures were obtained at depths of 0, 5, 25, 50, 75, 100, 200, 300, 400, 500, 700, 1000, 1500, etc., meters, down to the bottom or to a maximum of 6000 meters, and complete physical and chemical determinations were made. Biological samples to the number of 1014 were obtained both by net and by pump, usually at 0, 50, and 100 meters. Numerous physical and chemical data were obtained at the surface. Sonic depths were determined at 1500 points and bottom samples were obtained at 87 points. Since, in accordance with the established policy of the Department of Terrestrial Magnetism, all observational data and materials were forwarded regularly to Washington from each port of call, the records of only one observation were lost with the ship, namely, a depth determination on the short leg between Pago Pago and Apia.

The compilations of, and reports on, the scientific results obtained during this last cruise of the Carnegie are being published under the classifications Physical Oceanography, Chemical Oceanography, Meteorology, and Biology, in a series numbered, under each subject, I, II, and III, etc.

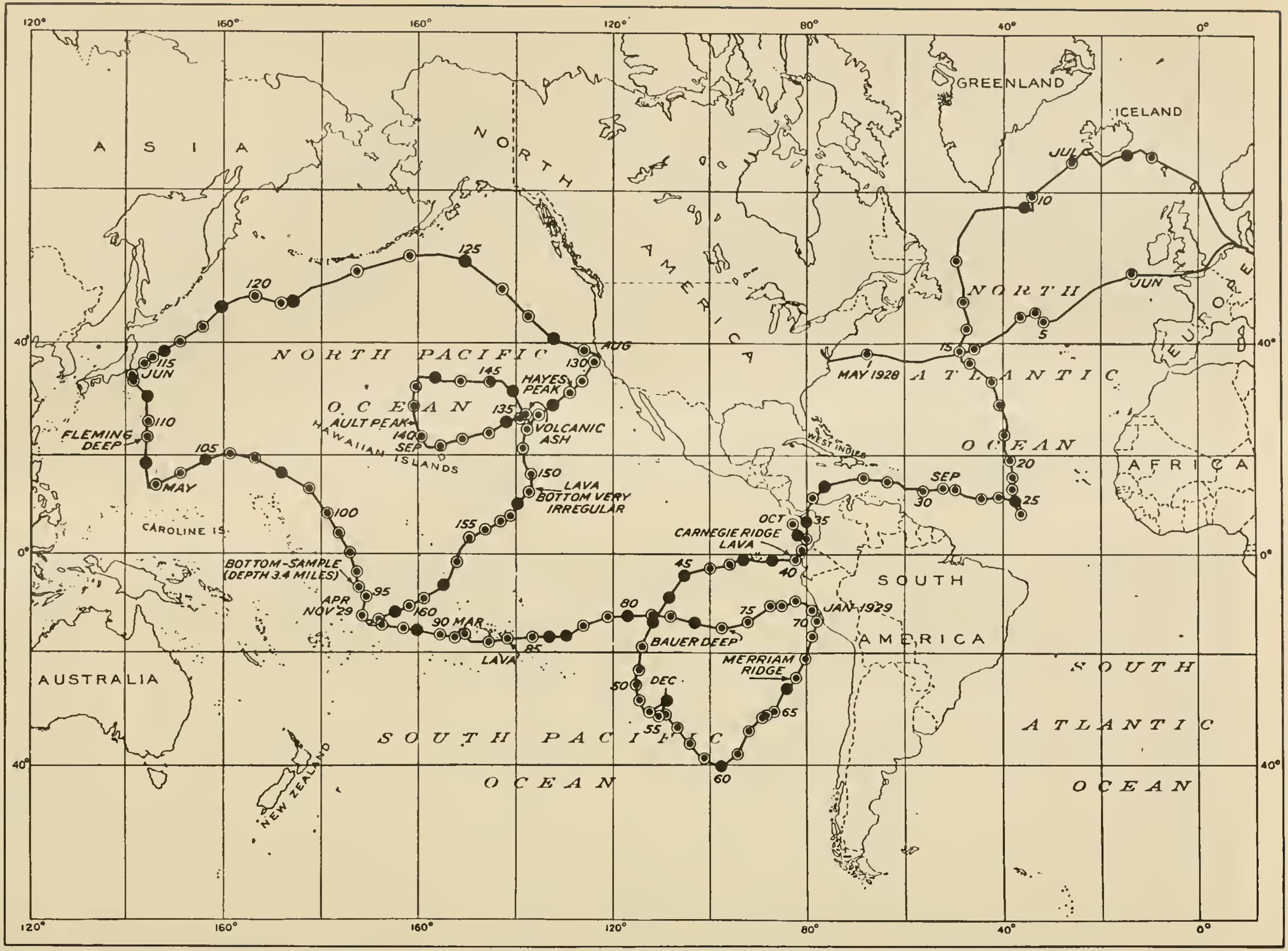
A general account of the expedition has been prepared and published by J. Harland Paul, ship's surgeon and observer, under the title The last cruise of the Carnegie, and contains a brief chapter on the previous cruises of the Carnegie, a description of the vessel and her equipment, and a full narrative of the cruise (Baltimore, Williams and Wilkins Company, 1932; xiii + 331 pages with 198 illustrations).

The preparations for, and the realization of, the program would have been impossible without the generous cooperation, expert advice, and contributions of special equipment and books received on all sides from interested organizations and investigators both in America and in Europe. Among these, the Carnegie Institution of Washington is indebted to the following: the United States Navy Department, including particularly its Hydrographic Office and Naval Research Laboratory; the Signal Corps and the Air Corps of the War Department; the National Museum, the Bureau of Fisheries, the Weather Bureau, the Coast Guard, and the Coast and Geodetic Survey; the Scripps Institution of Oceanography of the University of California; the Museum of Comparative Zoölogy of Harvard University; the School of Geography of Clark University; the American Radio Relay League; the Geophysical Institute, Bergen, Norway; the Marine Biological Association of the United Kingdom, Plymouth, England; the German Atlantic Expedition of the Meteor, Institut für Meereskunde, Berlin, Germany; the British Admiralty, London, England; the Carlsberg Laboratorium, Bureau International pour l'Exploration de la Mer, and Laboratoire Hydrographique, Copenhagen, Denmark; and many others. Dr. H. U. Sverdrup, now Director of the Scripps Institution of Oceanography of the University of California, at La Jolla, California, who was then a Research Associate of the Carnegie Institution of Washington at the Geophysical Institute at Bergen, Norway, was consulting oceanographer and physicist.

In summarizing an enterprise such as the magnetic, electric, and oceanographic surveys of the Carnegie and of her predecessor the Galilee, which covered a quarter of a century, and which required cooperative effort and unselfish interest on the part of many skilled scientists, it is impossible to allocate full and appropriate credit. Captain W. J. Peters laid the broad foundation of the work during the early cruises of both vessels, and Captain J. P. Ault, who had had the good fortune to serve under him, continued and developed that which Captain Peters had so well begun. The original plan of the work was envisioned by L. A. Bauer, the first Director of the Department of Terrestrial Magnetism, Carnegie Institution of Washington; the development of suitable methods and apparatus was the result of the painstaking efforts of his co-workers at Washington. Truly, as was stated by Captain Ault in an address during the commemorative exercises held on board the Carnegie in San Francisco, August 26, 1929, "The story of individual endeavor and enterprise, of invention and accomplishment, cannot be told."

Dr. H. W. Graham, who succeeded H. R. Seiwell as chemist and biologist, had charge of the biological work on board the Carnegie from August 1929 until the loss of the vessel at Apia, Samoa. After his return to this country, Dr. Graham was placed in charge of the biological collections, attending to their subsequent care, segregation, and distribution to various specialists for examination and report, he himself undertaking the reporting of the Peridineae (Dinoflagellata). His memoir, "Studies in the morphology, taxonomy, and ecology of the Peridiniales," is Biology-III of this series and in it Ceratium is briefly discussed. He also examined and prepared a report on the "Phytoplankton," which is the first of twelve biological reports in Biology-IV.

The present report discusses a single peridinian--



OCEANOGRAPHIC STATIONS, CRUISE VII OF THE CARNEGIE, 1928-29

(At the 35 stations marked ● true sea-water samples were also obtained for salinity calibrations) genus Ceratium of the family Ceratiaceae. Dr. Graham was assisted in the laboratory work necessary for the present volume by Mrs. Natalia Bronikovsky, who did the careful microscopic work which the dinoflagellate investigations demand.

The genus Ceratium is distributed over all the oceans of the world and is one of the most valuable genera of the peridinians for distributional studies. Not only are there cold- and warm-water species, but many species show minor phenotypic variations which are useful in tracing dynamic conditions. Fifty-eight species of this genus were found in the Carnegie material and are discussed here. Distributional and environmental data for these different species are given in the appendix tables (pp. 47-161) and charts (pp. 187-207) whenever such information is available.

The area traversed by the Carnegie was divided into five regions on the basis of Ceratium floras (chart 45). Two of these regions are in the North Atlantic and three are in the Pacific Ocean. They are also characterized by particular hydrographic conditions.

This manuscript was completed by Dr. Graham in 1938. Thus some papers printed since then are not considered.

The present volume is the eleventh in the series "Scientific results of cruise VII of the Carnegie during 1928-1929 under the command of Captain J. P. Ault." This is the fifth of the Biological Reports.

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the North Equatorial Current with a tongue of 34 per mille water reaching 140° west longitude.

In the South Pacific there is a zone of maximum salinity centered at 20° south latitude and about 125° west longitude with values over 36 per mille. Salinities decrease westward to 35 per mille at Samoa. Southeastward from the zone of maximum the surface salinities decrease to 34 per mille.

Phosphate

Since the nutrient salt content of sea water is known to be important in the total production of the phytoplankton, it is necessary to examine the variation in nutrients as a possible important factor in the distribution of individual species. Phosphorus and nitrogen are the most important plant foods in this respect. Only phosphate data are available for a discussion of the oceans as a whole but, since the variations in quantities of phosphate and nitrate run parallel, a description of phosphate distribution will suffice to give a general picture of the distribution of phytoplankton foods in the areas investigated by the Carnegie. The discussion that follows deals with values which are the means of observed values for the surface and for 50 meters, from Carnegie data.

The warm North Atlantic waters are practically devoid of phosphate to 40° north latitude. Two stations just south of this latitude (stations 1 and 2) showed values above 10 mg PO_4/m^3. North of 40° north latitude the mean values for the upper 50 meters were practically everywhere between 25 and 75 mg PO_4/m^3.

Most of the great area of the North Pacific between latitudes 10° and 38° north is practically devoid of phosphate, with values less than 10 mg. Along the subpolar convergence northeast of Japan the phosphate content rapidly increases northward to over 100 mg. In the North Pacific West Wind Drift the values are well above 100 mg to longitude 150° west where they gradually begin to drop off southward. This southward gradient is in the California Current. Close off California the values are between 25 and 75 mg. Farther out there is a rapid decrease to the very low values of the "Sargasso Sea of the Pacific." The North Equatorial Current lies in this area of extremely low phosphate content.

Nowhere to the south of this current in the Pacific is there an area devoid of phosphate. The area of lowest phosphate content in the South Pacific is in the Easter Island Eddy. At only two stations here, however, did the values fall below 10 mg. The subantarctic waters of the South Pacific West Wind Drift are rich in nutrient salts. The effects of this are shown by phosphate values above 50 mg at Carnegie stations 60 and 61 at about 40° south latitude. Values over 100 mg were found along the Peruvian coast, probably the combined effect of the Humboldt Current and local upwelling. In the general region between Peru and the Galapagos and in the Panamic region the values are above 50 mg. In the South Equatorial Current and its offshoots to the south the mean phosphate values for the upper 50 meters are mostly between 25 and 50 mg as far west as Samoa. South and west of here there is a tendency for the values to fall off.

HORIZONTAL DISTRIBUTION OF CERATIUM

Ceratium Life Zones in the Areas Traversed by the Carnegie

The area traversed by the Carnegie can be divided into five regions on the basis of the Ceratium floras (chart 54). Two of these regions are in the North Atlantic, three are in the Pacific. They are also characterized by particular hydrographic conditions.

Region 1. Cold North Atlantic (stations 3 to 13).--This region includes the loop of eleven stations lying north of 40° north and extending to Iceland. The entire area is composed of eutrophic water with surface temperatures below 16° C and the phosphate content of the upper 50 meters above 20 mg PO_4/m^3. The Ceratium flora in this region is characterized by subpolar species as well as by tolerant tropical species which probably have been carried northward by the West Wind Drift and its tributaries. It is also characterized by a paucity of species (see p. 6), although the total population is relatively high. The number of species at each station was; ten at two stations, less than this at the rest, and as low as one and two at some.[1] The total number of species found in the region was only fourteen.

The following species were found at five or more of the eleven stations in the region. They are either subpolar or cosmopolitan species.

C. arcticum
- v. arcticum at six stations
- v. longipes at seven stations
- v. ventricosum at five stations

C. furca
C. fusus
C. horridum v. horridum
C. lineatum
C. macroceros subsp. macroceros
C. tripos subsp. atlanticum

The following species were found at only one to three stations in the region. They are all tolerant tropical or cosmopolitan species.

C. arietinum subsp. bucephalum
C. azoricum
C. declinatum
C. extensum
C. hexacanthum
C. horridum var. molle
C. macroceros subsp. gallicum
C. massiliense
C. ranipes

Thus, the dominant flora of region I is subpolar in character and a subdominant element is made up of tolerant tropical species. No strictly tropical forms were found here. The least tolerant forms were C. declinatum, C. macroceros subsp. gallicum, and C. ranipes,

[1] In order to make the records comparable, only oceanographic stations are considered in the discussion of numbers of species at stations. The records of the interposed surface plankton stations have not been used.

and each of these were found at only one station in the southern limit of the region.

Region II. Warm Atlantic (stations 1 to 2, 14 to 34). --This region includes twenty-three stations, all of which lie south of 40° north latitude. The entire area is composed of water with surface temperatures above 20° C. The phosphate content is extremely low everywhere except at the three northernmost stations where the mean values for the upper 50 meters were from 14 to 52 mg PO_4/m^3. At the rest of the stations the values were 10 mg or less. Consequently, except to the north, the region supports a very small quantity of plankton and is distinctly oligotrophic. The sparse plankton, however, is composed of a large number of species. This number was between ten and twenty per station in the Caribbean Sea and western part of the North Equatorial Current, but higher at the other stations, being between twenty and thirty species per station at all stations but station 16 where there were thirty-three. The total number of species found in this region was forty-six.

The Ceratium flora in region II is distinctly tropical, with the usual number of cosmopolitan forms and a few subpolar occasionals. The following species were found at fifteen or more of the twenty-three stations. This lists represents only intolerant and slightly tolerant forms except for two very tolerant species (C. hexacanthum and C. massiliense) and two cosmopolitan species (C. macroceros and C. tripos).

C. breve
C. candelabrum
C. contortum
C. contrarium
C. euarcuatum
C. gibberum
C. gravidum
C. hexacanthum
C. macroceros
  subsp. macroceros at three stations
  subsp. gallicum at twenty-one stations
C. massiliense
C. ranipes
C. tenue
  v. inclinatum at seventeen stations
  v. tenuissimum at seven stations
C. tripos
  subsp. atlanticum at eight stations
  subsp. semipulchellum at nineteen stations
C. vultur
  v. sumatranum at fifteen stations
  v. pavillardii at eight stations
  v. japonicum at eight stations
  v. vultur at eleven stations
  v. recurvum at ten stations

The following species were found at from five to fourteen stations. They consist of tropical and cosmopolitan species as well as one subpolar.

C. arcticum
  v. arcticum at six stations
  v. longirostrum at six stations
  v. ventricossum at one station
C. arietinum
  subsp. arietinum at four stations
  subsp. gracilentum at two stations
C. carriense
C. declinatum
C. extensum
C. furca
C. fusus
C. horridum
  v. horridum at five stations
  v. molle at nine stations
  v. claviger at one station
C. limulus
C. lunula
C. paradoxides
C. pulchellum
C. reflexum
C. symmetricum
  v. symmetricum at one station
  v. coarctatum at nine stations
  v. orthoceros at four stations
C. teres
C. trichoceros

The following species were found at less than five stations in the region. This list comprises intolerant tropical species almost exclusively.

C. azoricum	C. belone
C. cephalotum	C. concilians
C. digitatum	C. falcatum
C. humile	C. incisum
C. inflatum	C. lineatum
C. longirostrum	C. longissimum
C. subrobustum	

The relative frequency of the species in this region is approximately the same as that for the collection as a whole so that no particular significance can be attached to it. The species that are rare in region II are rare throughout the world and vice versa.

The southern part of region II corresponds to the northern part of Peters' (1934) region I of the South Atlantic. The composition of dominant forms in the Carnegie material agrees with that of Peters.

The area with a low number of species per station from stations 26 to 34, including the Caribbean Sea, cannot be considered biologically different except in its greater general poverty. The temperatures are higher there, all above 27° or 28° C, and the plankton generally sparse. Although the number of species per station is generally low throughout this area, the total number for the area is not, on the basis of number of stations involved, much different from the total for region I. The species not represented are mostly the rare forms. Thus it is probably simply a case of a very poor production of all species so that the rarer forms are seldom collected.

Region III. Cold North Pacific (stations 116 to 128). --This region includes thirteen stations, all but one of which lie north of 40° north latitude. The area is composed of cold eutrophic water with surface temperatures below 17° C (as low as 7.°15 at one station), and the phosphate content of the upper 50 meters above 25 mg PO_4/m^3 at all stations but one and above 100 mg at the seven northernmost stations. Consequently this region supports a dense growth of plankton although the number of species is small. This number is below ten at all but one station.

The Ceratium flora in this region is characterized in general by a few subpolar and cosmopolitan species and at the southernmost stations there are a few records of slightly tolerant and very tolerant tropical species.

The following species were found at more than three of the stations. They are either subpolar or cosmopolitan species.

C. arcticum
  v. arcticum at two stations
  v. longipes at nine stations

C. arietinum
  subsp. arietinum at six stations
  subsp. bucephalum at two stations
C. fusus
C. pentagonum
  subsp. pacificum
C. tripos
  subsp. atlanticum at seven stations
  subsp. semipulchellum at one station

The following species were found at three or less stations in the region. This list is composed of subpolar, cosmopolitan, very tolerant, and slightly tolerant tropical species.

C. azoricum
C. carriense
C. contrarium
C. furca
C. horridum
  v. horridum
C. massiliense
C. tenue
  v. inclinatum
C. candelabrum
C. concilians
C. extensum
C. gravidum
C. lineatum
C. macroceros
  subsp. gallicum
C. petersii

Region IV. Warm Pacific (stations 45 to 47, 63 to 66, 78 to 115, and 129 to 160).--This region includes eighty-seven stations covering the tropical Pacific and extending to approximately 40° north and 35° south latitudes except in the southeast Pacific where it meets the southeast Pacific region. Region IV is characterized by warm water with surface temperatures above 20° except at the borders of the region where it is lower, particularly off California where stations with surface temperatures as low as 16°.3 have been recorded. The phosphate content of the water in this region is not the same throughout. The central part of the North Pacific is practically devoid of phosphate and mean values for the upper 50 meters is under 10 mg $PO4/m^3$. At the northern limits of the region these values increase to 25 mg. The phosphate content of the water in the southern part of region IV is mostly above 25 mg except in the Easter Island Eddy where it is between 10 and 25 mg.

Region IV is characterized by a large number of species of Ceratium per station although the total plankton population is low on the whole. The number of Ceratium species per station is everywhere between twenty and thirty except for four stations near the equator where it is over thirty and at the northern transitions where it is between ten and twenty.

The Ceratium flora of this region is distinctly tropical and includes all the strictly tropical species as well as the tolerant ones and cosmopolitan and stray subpolar forms.

The following species were found at more than sixty stations in this region. This list is composed principally of slightly tolerant and very tolerant tropical species.

C. candelabrum
C. carriense
C. contortum
C. contrarium
C. declinatum
C. euarcuatum
C. extensum
C. gibberum
C. gravidum
C. hexacanthum
C. macroceros subsp. gallicum
C. massiliense
C. tenue
  v. inclinatum at fifty-eight stations
  v. tenuissimum at twenty-one stations
C. tripos
  subsp. atlanticum at twelve stations
  subsp. semipulchellum at seventy-five stations

The following species were found at twenty-five to sixty stations in the region. This list is composed mostly of intolerant and slightly tolerant tropical species.

C. arietinum
  subsp. arietinum at sixteen stations
  subsp. bucephalum at fifteen stations
C. bigelowii
C. breve
C. cephalotum
C. concilians
C. deflexum
C. falcatum
C. furca
C. fusus
C. limulus
C. lunula
C. paradoxides
C. pentagonum
  subsp. tenerum
C. praelongum
C. platycorne
C. pulchellum
C. ranipes
C. subrobustum
C. symmetricum
C. teres
C. vultur
  v. sumatranum at thirty-four stations
  v. regulare at one station
  v. reversum at six stations
  v. pavillardii at seven stations
  v. vultur at sixteen stations
  v. japonicum at eighteen stations

The following species were found at less than twenty-five of the stations in the region. This list, also, is composed principally of intolerant and slightly tolerant species.

C. arcticum v. longipes
C. aultii
C. axiale
C. azoricum
C. belone
C. böhmii
C. carnegiei
C. digitatum
C. filicorne
C. geniculatum
C. horridum
  v. horridum at ten stations
  v. claviger at ten stations
  v. molle at seven stations
C. incisum
C. inflatum
C. kofoidii
C. longirostrum
C. petersii
C. reflexum
C. setaceum

Region V. Southeast Pacific (stations 35, 36, 38 to 44, 58 to 62, and 67 to 77).--This region includes twenty-five stations in the southeastern Pacific from Panama to 40° south latitude and from the South American coast westward. It has two tongues extending westward, one to the north, and one to the south of the Easter Island Eddy. Although the temperatures vary a great deal in this area, the water is everywhere eutrophic. The surface temperatures vary from 14.°97 C at the southernmost station to 27.°4 in the Panama region. The mean phosphate content of the upper 50 meters is everywhere above 25 mg PO_4/m^3 and is above 50 mg at all stations except those bordering the Easter Island Eddy.

The waters of this region support a large plankton population and, characteristically, few species are present. Region V has been delimited by the points at which the number of species per station rises above twenty. Not only is the number of species lower in this region than in the warmer tropical waters to the west, but the composition of the Ceratium flora is somewhat different. The following tropical species found to the west were absent from region V. They are, significantly, all intolerant tropical species.

C. axiale
C. digitatum
C. inflatum
C. reflexum
C. cephalotum
C. filicorne
C. longirostrum

The following species were found at fifteen or more stations within the region. This list is composed mostly of cosmopolitan and tolerant tropical species.

C. candelabrum
C. contortum
C. furca
C. fusus
C. horridum
  v. horridum at twelve stations
  v. molle at five stations
  v. claviger at four stations
C. lunula
C. massiliense
C. pentagonum
  subsp. tenerum
C. tripos
  subsp. atlanticum at ten stations
  subsp. semipulchellum at fifteen stations

The following species were found at five to fourteen stations in the region. They are mostly slightly tolerant tropical species.

C. arietinum
  subsp. arietinum at nine stations
  subsp. gracilentum at three stations
  subsp. bucephalum at three stations
C. azoricum
C. breve
C. carriense
C. concilians
C. declinatum
C. deflexum
C. extensum
C. gibberum
C. gravidum
C. hexacanthum
C. limulus
C. macroceros subsp. gallicum
C. ranipes
C. symmetricum
C. tenue
  v. inclinatum at four stations
  v. tenuissimum at two stations
C. teres
C. trichoceros
C. vultur
  v. vultur at two stations
  v. pavillardii at two stations
  v. reversum at seven stations
  v. regulare at one station

The following species were found at less than five stations. They are notably almost all intolerant tropical species.

C. belone
C. carnegiei
C. euarcuatum
C. incisum
C. longissimum
C. petersii
C. praelongum
C. setaceum
C. böhmii
C. compressum
C. falcatum
C. kofoidii
C. paradoxides
C. platycorne
C. pulchellum
C. subrobustum

It is evident from the above lists that the most frequent forms in region V are either cosmopolitan or tolerant tropical species. The intolerant tropical forms are rarely collected in the region so they compose the bulk of the list of rare forms.

Richness of Species in Different Areas

The well-known difference in number of species found in cold and warm areas of the oceans is well illustrated by the Carnegie Ceratium data (see chart 53). In the cold North Atlantic the number of species found at each station was everywhere less than ten. This area resembles the floristic region I, cold Atlantic.

South of this area there is a transition zone in which the number of species per station is between ten and twenty. This lies in region II, the warm Atlantic region. The rest of this region is characterized by high number of species, more than twenty, except in the western part of the North Equatorial Current, from longitude 40° west to Panama, where the values were equal to that of the transition zone, namely, between ten and twenty species per station.

In the Pacific the cold northern water is characterized by less than ten species per station. This area is almost exactly like the floristic region III, cold North Pacific. At the southern limits of this area in both the west and east there is a transition zone with values between ten and twenty species per station.

These transitions lie within region IV, warm Pacific. The rest of this region has more than twenty species per station and, at some stations, more than thirty.

In region V, southeast Pacific, the values are mostly transitional in amount, namely, between ten and twenty species per station. At one station west of the Panama area (station 37) there were more than twenty species. It is possible that this station has not been rightfully included in region V but belongs to region IV, the warm Pacific. The surface temperature at this station was higher than at any other station in region V, namely, 27.°12 C. The area at this latitude between this station and the central Pacific is unknown oceanographically and planktologically so that it is not possible to say whether station 37 lies in an eastern extension of region IV or not.

South of this station there were two stations at which the number of species per station was less than ten, stations 38 and 39. These were the only stations in latitudes lower than 40° where the number of species per station dropped below ten.

The relation between the richness of species and environmental conditions will be taken up in the following sections.

FACTORS AFFECTING THE HORIZONTAL DISTRIBUTION OF CERATIUM

Salinity

It is probable that the slight variations in salinity found in the oceanic waters have no influence on the distribution of Ceratium species. Peters (1934) could demonstrate no effect in the South Atlantic nor could Nielsen (1934) in the South Pacific. Nielsen did find that in the Panama region, where the salinity is low, the total number of species was low. Conditions were neritic there, however, so it was impossible to determine which was the influencing factor. In the Carnegie investigations no correlation could be found between salinity and the distribution of any species. In this connection it is worthy of note that the boundary between the distribution of the warm and cold water species of the North Atlantic is approximately at the 36 per mille isohaline; in the North Pacific the limits of the same species occur at 34 per mille off Japan and 33 per mille off California. Thus, apparently these species are not affected by such slight variations in the salt content as are found in the open ocean.

Nutrient Salts

Since the depletion of phosphate and nitrate is known to limit the total production of phytoplankton in some localities, it is important to examine these factors in relation to the world distribution of Ceratium species. Nitrate determinations were not made on the Carnegie but, since the fluctuations in nitrate and phosphate run in a parallel manner, it is sufficient to discuss the phosphate distribution as representative of the inorganic nutrient materials.

In general, regions of very low phosphate content are characterized by sparse populations of all species but by a larger number of species. This led Peters (1934) to suggest that nitrate and phosphate inhibited the growth of certain species. Thus in region I of the North Atlantic where the phosphate content of the upper 50 meters is above 25 mg PO_4/m^3, the number of Ceratium species is less than ten per station (see charts 52 and 53). In region II the phosphate content is under 10 mg and the number of species of Ceratium per station everywhere above ten and, usually above twenty, and at one station above thirty. Likewise in the Pacific the phosphate-rich regions are characterized by a poor Ceratium flora. Region III, where the concentrations run above 25 mg and at most stations above 100 mg, the number of species per station is less than ten. The correlation is not quite so good in region IV, the warm Pacific region. The number of species per station is between twenty and thirty throughout most of this region although the phosphate content of the northern part is under 10 mg and in the southern part it varies from 10 to 50 mg. The southeast Pacific region has many values above 50 mg, that is, higher than the warmer region to the west. Accordingly the number of species per station is less, namely, between eleven and twenty.

Thus, within any given area there seems to be a correlation between high phosphate content and small number of species. It is important to note, however, that the limit between any particular number of species does not occur at the same concentrations of phosphate. Thus, in the northern Atlantic less than ten species are found in water with 25 to 50 mg of phosphate, whereas in the South Pacific the area with more than twenty species includes water with over 25 mg PO_4/m^3. Similarly, in the North Pacific all the water containing more than 50 mg PO_4/m^3 has less than ten species per station, whereas in the southeastern Pacific there are areas where the phosphate content is above 50 and the species per station are between ten and twenty.

The same sort of correlations can be found between the Ceratium life zones and phosphate content. Each region has its characteristic phosphate content. Thus regions I, III, and V have high concentrations, whereas region II has uniformly low concentrations, and region IV is low in the north and has medium values in the south. As in the case of number of species, the correlation with floras is not exact. Thus the flora of region I has little in common with the flora of the southern part of region IV which has the same phosphate content.

These studies tend to indicate that the phosphate content of the water has no direct effect on the horizontal distribution of Ceratium species, at least not as regards absolute values. There are indications, however, that the relative values in a given region bear some relation to the Ceratium flora. Perhaps some factor associated with an increase in phosphate is significant in the distribution of Ceratium species.

Temperature

Peters (1934) came to the conclusion that water temperatures between 15° and 27.°5 C had no influence on the distribution of Ceratia in the South Atlantic. However, he was considering the yearly range of temperature at each locality. Peters was able, on the other hand, to group his species according to thermal environments. Of his fifty-five species, thirty-three were limited to warm water, twenty-one to warm and cool water, and only one was observed in the southern cold water. Nielsen (1934) was inclined to consider 15° C too low for noneffective temperatures. In the regions which he investigated in the South Pacific, however, he did not find many cases of temperature correlation. He designated only two temperate forms--C. petersii and C. tripos atlanticum. He also found that C. filicorne is restricted to high temperatures in the South Equatorial Current. Nielsen, however, did classify his species according to temperature zones with the following categories: tropical, tropical-subtropical, tropical-subtropical-temperate, and temperate.

In the Carnegie collections it is possible to study the transition from tropical to cold water regions in four different places: in the western North Atlantic, western

North Pacific, eastern North Pacific, and eastern South Pacific. A comparison of the Ceratia distributions in these regions is very interesting, and gives us a clue to the factors controlling distribution, at least in the case of some species. For these studies it is important to consider first the most common tropical species so that negative records in the transition zones can be given some weight. Ceratium contortum is a good example of a tropical distribution (chart 32). The species drops out at surface temperatures of about 20° in the North Atlantic, at above 20° off Japan, 15° off California, and 15° in the southeastern Pacific. Many other species have a similar distribution, some more closely confined to certain temperatures and some less. Ceratium massiliense (chart 38) is a common tropical form whose limits of distribution parallel rather closely the 15° C isotherms in the four transitions. Some species show a definite restriction to tropical water except for a particular displacement by a current. A good example of this is Ceratium hexacanthum which is within the 20° isotherm at the three transitions in the Pacific, but in the Atlantic it is apparently carried by the currents to Iceland where the surface temperature is less than 10°. Conversely, there are species which are restricted to warm water throughout their ranges. Examples of these are C. breve (chart 21) and C. lunula (chart 31).

A few forms are found in the cold water but not in the tropics, or only in insignificant numbers there. Ceratium arcticum (chart 47) is an example. Still a third general type of distribution is found in such forms as C. fusus (chart 17) which occur in cold water as well as in warm, and are truly cosmopolitan.

On the basis of the distributions of the Ceratium species at the Carnegie stations, a classification consisting of three main categories was devised: tropical, subpolar, and cosmopolitan. The tropical, in turn, was divided into three regions. Those species which were rather closely restricted to surface temperatures of 19° or above were grouped together as intolerant tropical species. Those which transgressed a little into the transition zones were called slightly tolerant tropical forms and, finally, those which were carried far beyond the tropical regions were designated very tolerant tropical forms. This classification has no category for temperate species such as most previous classifications had. The authors believe that there are no truly temperate oceanic species of Ceratium. The temperate latitudes are populated by tropical and cosmopolitan forms with occasional appearances of subpolar forms. Following is the geographic classification of the Carnegie Ceratia based on the above scheme.

Intolerant Tropical

C. incisum	C. longirostrum
C. inflatum	C. falcatum
C. praelongum	C. cephalotum
C. digitatum	C. belone
C. bigelowii	C. breve
C. euarcuatum	C. limulus
C. paradoxides	C. vultur
C. longissimum	C. reflexum
C. deflexum	C. lunula
C. filicorne	C. trichoceros
C. axiale	C. geniculatum
C. humile	

Slightly Tolerant Tropical

C. subrobustum	C. teres
C. kofoidii	C. gravidum
C. pulchellum	C. symmetricum
C. declinatum	C. gibberum
C. concilians	C. ranipes.
C. carriense	C. platycorne
C. tenue	C. contrarium
C. macroceros subsp. gallicum	C. pentagonum subsp. tenerum
C. candelabrum	C. contortum
C. tripos subsp. semipulchellum	C. aultii
	C. setaceum
C. carnegiei	C. böhmii

Very Tolerant Tropical

C. azoricum	C. massiliense
C. arietinum	C. extensum
C. hexacanthum	

Cosmopolitan

C. horridum	C. fusus
C. furca	C. petersii (?)
C. tripos subsp. atlanticum	

Subpolar

C. lineatum	C. macroceros subsp. macroceros
C. pentagonum subsp. pacificum	C. articum
C. compressum (?)	

Currents

Currents are certainly important in the distribution of Ceratia. They cause displacements in the normal distribution by carrying populations into regions where they have not developed, and they create displacements of the normal range of environmental conditions so that species can develop in regions which otherwise would not be favorable for them. The current factor in distribution, however, is the most difficult one to demonstrate by a gross world survey such as that of the Carnegie. The value of Ceratia as current indicators is undoubtedly much greater than the Carnegie data would indicate. The importance of such indicators is evidenced most in temporary current anomalies which can be observed satisfactorily only by a continued study of a particular area.

It should be emphasized that a current which displaces a flora from its normal distribution also displaces the environmental conditions. When the displaced water mixes with the adjacent water, it may no longer be suitable for the organisms displaced and they disappear. That the amount of mixing in such currents is great is indicated by the rather sharp delimitation of many of the Ceratium species in the Carnegie collection. This is particularly striking in the Kuroshio and Gulf Stream, two currents well known for their velocity and general influence. In these currents the tropical floras change their facies rather rapidly when the surface temperatures drop below 19° C.

Peters (1934) considered that ocean currents played a great role in the distribution of Ceratia in the South Atlantic. He was able to give comparatively few instances of displacements of species, however, in the areas he studied.

The authors tend to agree with Gran (1912) that the nature of a Ceratium flora is determined more by the chemical-physical conditions of the water than by transportation by currents. The fact that a warm current carries a tropical flora into high latitudes is not opposed to this argument, as present evidence indicates that such a current will do this principally by carrying the tropical environment with it.

In the Carnegie investigations there were four regions where current influences would be expected to be demonstrated. These concerned four great currents: the Gulf Stream, Kuroshio, California, and Humboldt currents.

In the North Atlantic West Wind Drift or "Gulf Stream" the intolerant tropical species dropped out at about 45° north. The best examples of displacement, however, were found here in the case of some of the tolerant tropical species. Thus, C. extensum was carried to the British Isles to temperatures of 12.°44 C (chart 16) and C. hexacanthum to Iceland in temperatures of 8.°92 C (chart 48). Unquestionably these are examples of current displacements as C. extensum was not found elsewhere in temperatures below 14.°97 nor C. hexacanthum below 18.°97. The occurrence of C. massiliense and C. platycorne off Ireland should probably also be considered displacements (charts 38 and 35). Other tropical species such as C. declinatum and C. ranipes were carried over into region I only as far as station 3, where the surface temperature was 15.°5 C (charts 28 and 36).

In the corresponding current of the Pacific, the Kuroshio, we find that the transition from tropical to subpolar floras is more abrupt. Most of the tropical species were not carried into water with temperatures under 20° C. Only C. gravidum, C. candelabrum, and C. tripos semipulchellum, of the tropical species, were carried into water with surface temperatures as low as 15.°93 C (charts 3, 5, and 19). No evidence of any tropical species being carried into lower temperatures than that in this region was found.

Corroboration of the lack of displacement in the Kuroshio was found in the distribution of the tropical species at similar latitudes in the western Pacific off California. If the currents were effective in displacing the distributions significantly into different environments, then the tropical species should be found in colder water off Japan than off California. The Kuroshio should sweep populations into cold water and the California Current should push the northern limit southward. This was seldom found, however. The species which disappeared at 19° C off Japan, reappeared at 19° C off California. There were many variations between species but, in the main, the tropical flora of the North Pacific had its northern limits in the western and eastern Pacific at the same isotherm, and this isotherm was at approximately the same latitude, namely 40° north.

There were two striking exceptions to this general distribution, however; the distributions of C. breve and C. lunula (charts 21 and 31). These species were found rather consistently within tropical latitudes, that is, within 20° of either side of the equator. The ranges of these species beyond these latitudes, however, does not follow that of other common tropical species which are usually found throughout the warm-water regions to about 40° north and south. In the case of C. breve the records do not extend far north or east of Hawaii, although in the western Pacific they extend to Japan. They are absent from a large part of the southeast Pacific region, although they extend to Easter Island. The distribution of C. lunula is still more uneven in the North Pacific. In the east it was found nowhere north of 20°, whereas in the west it was found continuously to northern Japan, latitude 38° north. In the South Pacific, however, it was everywhere within 20° south latitude. Is it possible that these distributions are determined by the current systems? Certainly such distributions cannot be accounted for by simple current displacements as a bodily displacement of the plankton would have displaced other species as well. Could these curious distributions be the result of a specific susceptibility to something? Is the absence of these species in the southeast Pacific owing to some deleterious effect of the outwash of subantarctic and upwelled water from the south and east, and is their absence from the region between California and Hawaii owing to the combined effects of the California Current and upwelling? The answers to these questions cannot be given until further work is done. It is remarkable that only two species show such distributions. The proof of the validity of these must await further investigations.

The equatorial currents apparently have little effect on the distribution of Ceratia. This is probably because they involve the movements of waters of very similar nature. Although the temperatures of these waters may vary from 20° to 29° C, the surface temperatures above 20° C apparently have no effect on the Ceratia. Nielsen found that C. filicorne was found only in the warmest parts of the South Equatorial Current, but this was not corroborated by Carnegie data (see p. 28). No segregation of Ceratium species within the equatorial regions could be made on the basis of temperature.

The last great current system to be considered is the Humboldt Current off South America. Unfortunately the Carnegie stations did not run near the continent except at Callao so the most highly developed part of the current system was missed. The hydrography of this region is complicated by a strong upwelling along the coast. The changes in the environmental conditions brought about by this upwelling are probably the same as those effected by the Humboldt Current, which brings water from the subantarctic. These changes consist in lowered temperatures and pH, increase in phosphate, etc., and a resultant increase in plankton production. Thus it is impossible to decide whether the biological conditions peculiar to this region should be attributed to current phenomena or to the other hydrographic feature, namely, upwelling.

Probably there is a displacement by the Humboldt Current of antarctic forms northward along the southern part of the South American coast southeast of the Carnegie track, but no evidence of this was observed at any Carnegie station. Probably the only antarctic form of Ceratium is C. pentagonum robustum (Peters, 1934). This did not occur in the Carnegie collection.

The Humboldt Current is deflected westward, and there is a more or less general movement of water away from the South American coast in the southeastern Pacific. How far westward the influences of this movement are felt is an interesting problem. In the discussion of the hydrographic conditions, it was pointed out that the influence on the chemical and physical conditions of the water are far-reaching. Associated with this we find that the biological conditions have been affected for hundreds of miles offshore. In the first place there is a high production of total plankton; secondly, there is a reduced number of species per station in the region (see chart 53); and thirdly, the development of some of the tropical species apparently has been suppressed.

Many of the tropical species common in the waters to the west were absent in at least certain parts of the southeastern Pacific. Sometimes this distributional hiatus was confined to the Peruvian coast and Galapagos area as in C. extensum (chart 16) and C. tenue (chart 45). Other species seemed to show a more or less general avoidance of the area, as for instance, C. pulchellum (chart 20), C. carriense (chart 40), C. vultur (chart 43), and C. teres (chart 11).

Here again we probably are not confronted with a problem of simple current displacement, but rather with current effects brought about through a modification of the environment. What these peculiar modifications might be, will be discussed in the next section.

Other Factors

Although the above geographic classification of the Ceratia (p. 8) has a temperature connotation, it is not intended to mean that the controlling factor in Ceratium distribution is necessarily temperature. There are still other factors which are associated with temperature which we have not yet discussed.

Nielsen (1934) is of the opinion that the concentration of plankton organic metabolic products is the most important factor in the distribution of Ceratium species in the warmer seas. Since no measurement of such substances are available, it is impossible to test this theory. Nielsen based his opinion principally on the distribution of neritic and oceanic species and on the relative number of species in these two environments. He emphasized the fact that in neritic waters only a small number of Ceratia occur. That this is not owing to higher concentrations of nutrients alone was shown by the Great Barrier Reef region where the nutrients are low as well as the Ceratium flora. Nielsen found higher concentrations of nutrients in the open ocean (eastern South Equatorial Current) and a diminution in species. He contended that the metabolic products require considerable time for decomposition, that the fertility of neritic water is replenished from shallow depths where these products have accumulated, and that in oceanic regions no such accumulation can occur. What these metabolic products are, remains to be demonstrated.

Even if the presence of such products is demonstrated and correlations found, their causative nature must be proved and this probably will have to be done experimentally.

The difficulties in establishing the important environmental conditions are accentuated by the fact that many water conditions change together. The agency which enriches the photic zone to any great degree is a movement of water from deeper levels to the surface layers. This one agency, whether near shore or in the open ocean, brings about a whole set of new environmental conditions. Not only is the phosphate and nitrate content of the water increased, but the temperature is lowered and the hydrogen-ion concentration is increased. Undoubtedly other changes are effected also. If some particular metabolic product is rather stable, as Nielsen postulated, no doubt higher concentrations of this accompany any enrichment of the photic zone. A point worth considering in this connection, however, is that Nielsen's postulated metabolic product poisoning may be purely of plant origin. In this connection Hardy's (1935) discussion of the "exclusion effect" of phytoplankton for zooplankton is interesting. Considerable evidence is being accumulated that indicates that phytoplankton exerts an exclusion effect on many animals. Is it possible that, in a similar way, it may exclude certain oceanic species of Ceratium?

The association of all these factors makes it difficult to select the particular one which might be influencing the distribution of any particular species. Thus the floristic zones outlined above are separated not only by certain temperature differences, but also by certain associated differences in phosphate, pH, plankton content, etc.

The difficulty involved in determining causative factors is well illustrated by the waters of the southeast Pacific where, obviously, some condition associated with the Humboldt Current and upwelling limits the distribution of certain Ceratium species. This condition here is probably not temperature, as many of the temperature records were over 20°. Which of the conditions associated with cold currents and upwelling is the determining one, however, cannot be pointed out at this time.

COMPARISON OF THE ATLANTIC AND PACIFIC WATERS ON THE BASIS OF THEIR CERATIUM FLORAS

There is no known difference in the environmental conditions of the waters of the Atlantic and Pacific oceans which might operate to favor or hinder certain species in one ocean and not in the other. Thus it would be expected that, given the same plankton communities, the same species would survive in each. The two oceans are completely isolated from each other, however, except in the south, where they both merge into the Antarctic Ocean, and in the far north, where they are connected by way of the Arctic Ocean and the narrow Bering Strait. Since temperature or some correlated factor is probably responsible for the distribution of Ceratium species, temperature will be discussed in connection with the comparison of the floras of the two oceans. The surface temperatures in the latitude of Cape Horn in summer are under 8° C. Whether 8° is sufficiently low to constitute a barrier to tropical Ceratium species or their spores, is unknown. The continental barrier between the Atlantic and Indian oceans certainly must be less effective since the temperatures at the Cape of Good Hope in summer may be above 20° C. There is no continental barrier between the Indian and Pacific oceans.

It would be supposed that any species originating in the Atlantic would, in time, be swept to the Indian and Pacific oceans since the currents in the far southern waters are predominantly from west to east. Whether the Pacific tropical species could find their way to the Atlantic by the southern connection is less certain.

The water connection of the two oceans to the north by way of Bering Strait and the Arctic Ocean certainly would be expected to constitute a barrier to Ceratium species, at least to the tropical forms. Bering Strait is shallow and narrow, with water temperatures around 8° C. It is not likely, however, than an organism could pass from here to the Atlantic without passing through water of 0° C or lower.

In the light of this knowledge it is interesting to compare the Ceratium floras of the Pacific and Atlantic oceans. An examination of the Carnegie lists of species for the two oceans shows that most of the species are common to both oceans. Nevertheless, there are some significant differences. Nine of the species occurred in only one ocean and this, significantly was the Pacific. One of these, C. axiale, has been found in the Atlantic by others, so it will be disregarded. The others are as follows: C. aultii, C. bigelowii, C. carnegiei, C. deflexum, C. filicorne, C. geniculatum, C. petersii, C. böhmii.

None of the Atlantic species were absent from the Pacific. In Nielsen's comparison of the two oceans, he cites two examples of Atlantic forms which are absent from the Pacific, namely, C. longinum Karsten (=C. arcuatum longinum in Peters, 1934), and C. minutum Jörgensen. These forms, however, have now been found abundantly in the Pacific in the Carnegie collections (see pp. 35 and 22). Otherwise Nielsen's comparison of the two oceans agrees well with our own, except that he lists C. humile as absent from the Atlantic. It was found in that ocean in the Carnegie collection.

It is true, of course, that the species peculiar to the Pacific are rare forms and may yet be discovered in the Atlantic. In the case of at least three of the species, (C. bigelowii, C. deflexum, and C. filicorne), however, this is not likely, as many records of their occurrence are now being accumulated. For instance, in the Carnegie collection alone there are thirty-seven sample records for C. bigelowii, one hundred five for C. deflexum, and twenty-seven for C. filicorne.

It should be noted that the eight species peculiar to the Pacific are strictly, or only slightly tolerant, tropical species, not occurring at stations where the surface temperature was less than 20° C. Thus, these species might well find it impossible to pass around Cape Horn in the cold southern water.

Therefore, it seems quite possible that the above-mentioned seven species have originated in the Pacific Ocean and must forever remain in the warm regions of that great ocean, being barred from the Atlantic by the great southern extension of South America, whereas the forms that have originated in the Atlantic have found an easy migration to the Pacific by way of the Indian Ocean.

We must also bear in mind that the other species of the two oceans may not be as similar as present workers believe. After all, the morphology of Ceratium is known only grossly; very few species have been analyzed in detail, and none of them completely. Perhaps real specific characters have been overlooked. In this connection it is important to examine some differences in the distribution of some of the species which, according to present taxonomic methods, are specifically identical in the two oceans. Five of the tropical species were decidedly more tolerant to cold water in the Atlantic than in the Pacific; namely, C. furca, C. extensum, C. horridum, C. hexacanthum, and C. tripos atlanticum, whereas one cold water species, C. arcticum was apparently more tolerant to warm water in the Atlantic than in the Pacific (see charts 6, 16, 44, 48, 18, and 47). Ceratium horridum, in addition, seemed to show a difference in its relation to oligotrophic water in the two oceans, being found practically only in eutrophic water in the Pacific but in oligotrophic as well as eutrophic water in the Atlantic. These differences in distribution in the two oceans strongly suggest that the genetic complex of the forms in the two oceans is not identical. The representatives of the two oceans may be different species or subspecies or may be "physiological subspecies." The solutions to these problems must await a more minute morphological examination of the forms in question.

About 20 per cent of the tropical species of Ceratium in the Carnegie collection show either morphological or distributional features peculiar to one ocean, indicating an isolation of the tropical waters of the Atlantic and Pacific. The evidence for the isolation of the North Pacific cold-water region, however, is even more convincing.

Although there are certain similarities between the Ceratium floras of the cold North Pacific and cold North Atlantic regions, there are, on the other hand, some very striking differences which can be accounted for only on the assumption that these two oceans are biologically isolated from each other. The similarities in the two floras are expressed by the occurrence in both regions of the two subpolar species C. lineatum and C. arcticum.

The differences in the floras of the two regions are more striking than the similarities. In contrast with the tropical floras these differences are not one-sided, that is, the "mono-oceanic" forms are not all in one ocean so that, in contrast with the southern oceans, a mutual isolation is indicated.

The significant forms in this case are not species, but subspecies. The first of these to consider is C. furca. This species, as broadly considered, is cosmopolitan. It was noticed, however, that in the Atlantic there was a hiatus between the tropical records and the cold-water records (chart 6). Although no morphological difference could be discerned between the southern and northern forms, it was suggested that they represented at least physiological subspecies (see p. 18). When we turn to the Pacific we find that the species is represented only in the warm-water regions except for one station in region III off Japan, which must be considered a displacement by the Kuroshio. The species is absent along all the rest of the cold-water area traversed by the Carnegie.

The case of another species, C. macroceros, is somewhat more convincing, inasmuch as the subspecies are morphologically easily distinguishable. Subspecies gallicum is characteristic of all warm-water regions. It is widespread over both the Atlantic and Pacific. The species is represented in the cold North Atlantic by subsp. macroceros. In the cold North Pacific, however, the species is conspicuously absent (see chart 37). An assumption of the isolation of the North Pacific based on the above two examples alone would not be very conclusive since it would be based on negative evidence in a region not well investigated, namely, the North Pacific. The following example, however, does not carry this weakness and, taken with the above two, forms a convincing proof of the isolation of that ocean.

This example concerns C. pentagonum, a widespread tropical species. Peters (1934) found a cold-water subspecies in the subantarctic waters of the South Atlantic, subsp. robustum, the most southern representative of the genus. He emphasized the remarkable absence of any representative of the species in the cold northern waters of the North Atlantic. The absence of the species in these waters is well established as the region has been thoroughly investigated. The Carnegie investigations in the North Pacific, however, revealed a very divergent subspecies, subsp. pacificum, which was found only in the cold North Pacific region (see p. 20). It attained a high degree of morphological distinctness in the coldest water, although it intergraded with var. tenerum at its southern limits. There can be no doubt that subsp. pacificum is not found in the Atlantic and, therefore, is peculiar to the cold waters of the North Pacific.

These three striking differences in the Ceratium floras of the cold regions of the two oceans indicate that a barrier to at least some of the subpolar species exists between these two water masses. The nature of this barrier, of course, is only a matter for speculation. The hydrography of Bering Strait is very poorly known. Any continuous current in either direction, however, would not permit the development of the floras now obtaining in the two oceans, providing the species could traverse the Arctic Sea. Whether they can cross this ocean is also unknown. An investigation of the phytoplankton of the Arctic should throw some light on this problem.

THE VERTICAL DISTRIBUTION OF CERATIUM

Karsten (1907) first described a special "shade flora" of the ocean. According to him this consists principally of Coscinodiscus, Planctoniella, and Gossleriella. He thought, however, that the genus Ceratium was represented at different levels by different species or varieties and designated C. gravidum Gourret; C. tripos azoricum Cl. var. breve Ostf., and C. tripos gibberum Gourret as shade species. As Nielsen (1934) states, an inspection of Karsten's lists does not corroborate this idea except in the case of C. gravidum.

Schröder (1911) listed C. inflexum f. claviceps (=C. contrarium f. claviceps), C. platycorne, and C. limulus as species which "avoid" the intense continued sunlight of the "southern waters."

Jörgensen (1920) made an intensive study of the vertical distribution of Ceratium in the Mediterranean. He found that a great number of species which occurred at the surface in the winter, inhabited the deeper levels in the summer. He concluded that the surface summer flora is more or less indigenous to the Mediterranean, whereas the winter species are dependent on a migration from the Atlantic.

Paulsen (1930) and Nielsen (1934) challenged this migration theory of Jörgensen, but Böhm (1931) accepted it. Peters (1934) could not establish any vertical distribution from the material of the "Meteor" expedition.

The Dana collected with closing nets at the following steps: 200 to 100, 100 to 50, and 50 to 0 meters. From such material it was possible to test the idea of the "layering" of the species of Ceratium. Nielsen (1934), who studied this collection, found that about one-third of the Ceratium species occurring in the southern Pacific Ocean must be designated "shade forms," whereas the rest of the species inhabit predominantly the upper layers. He found that the density of the plankton affects the vertical distribution of the shade forms. They occur in higher levels in the richer water, presumably because in such regions there is not sufficient light for growth at the lower levels.

Nielsen (1934) compared the shade forms of Ceratium with the shade plants of the tropical rain forest, all of which have their leaf surface increased in some way. The leaves are thin and there is an increase in assimilating cells. So in Ceratium the cells are thin and crowded with chromatophores. The cell body (and apical horn) may be expanded and crowded with chromatophores (chloraplasts) as in C. gravidum, or the antapicals may be expanded and rich in chloroplast as in C. platycorne, C. claviger, C. ranipes.

Long-horned forms are found among shade forms as well as among surface forms, but the shade forms always have the horns crowded with chromatophores.

Of the surface forms there is not a single example of surface expansion. Thus, the usual assumption, that surface expansion in Ceratium is a flotation adaptation, is erroneous.

Since the Carnegie plankton collection contains samples collected at 50- and 100-meter depths as well as at the surface, and, since the collection contains practically all the marine species of the genus, it was possible to test the theory of Nielsen in the case of each species. Although the Carnegie collecting nets were open nets, the duration of towing at the particular level was so much greater than the time of hauling in, that the percentage of "contaminants" would necessarily be small. These contaminants, moreover, would be upper-level forms so that they would not introduce any error into the calculations in the case of deep-water forms.

For each species reported in the Carnegie collection, the number of records for each collecting level was computed. Since there were more surface hauls than deeper hauls, these numbers needed to be weighted. Consequently they were computed as percentages of the total number of samples collected at the particular depth. Tables were compiled showing these values, as well as the actual number of records, for the three levels. Since an expression of the relative abundance of the species at each level is more significant than the mere positive record, the number of records of "rare," "occasional," etc., and their percentages were computed as well as the total number, and these were included in the tables.

Such an analysis of the Carnegie distributional records showed that twenty of the species were definitely more abundant in the deeper levels and nine were questionably so. All the twenty species showed an increase in frequency from surface to 100 meters. The agreement between these species and the species indicated as "shade species" by Nielsen is great.

There are only three cases of definite disagreement. Nielsen classified C. subrobustum and C. trichoceros as surface species, whereas the Carnegie data definitely indicate that they are shade species. On the other hand, Nielsen indicated C. hexacanthum as a shade species, whereas the Carnegie data failed to substantiate this. The agreement between the Carnegie and Dana shade species and the "winter species" of Jörgensen (1920) is also great. Only one of Jörgensen's winter species, C. kofoidii, has not been classified as a shade species by either Nielsen or the present authors. A comparison of Jörgensen's "winter species" with the shade species of Nielsen and the shade species of the Carnegie is given in table 1.

Nielsen (1934) stated that Jörgensen's (1920) observations indicated that Ceratia are phototropic; the shade species in the winter when the light intensity is low come to the surface and thus are able to maintain a position in optimal light conditions.

The authors agree that Jörgensen's observations indicated a phototropic response on the part of the "winter Ceratia," but do not believe that the vertical migration of Ceratia is a simple light reaction phenomenon. In the Carnegie collection the shade species were found most abundantly at 100 meters. Surely the light intensity at this depth even in summer could not be compared with the light intensity at the surface in winter in the Mediterranean or anywhere else in the world for that matter. It is scarcely logical to assume on the basis of the present data that the shade species of Ceratia seek a zone of a particular light intensity.

Is it not possible that we have to deal here not only with a phototropism but a trophotropism as well? In the summer time the upper levels of the sea are depleted of nutrient salts to a depth equal at least to that populated by the phytoplankton. Obviously, the species of phytoplankton which are the most tolerant of shade would have a decided advantage in the quest for nitrogen and phosphorus, which occur in the deeper levels in large quantities. Is it not possible that these forms have a positive tropic reaction to nutrient salts or some associated condition as well as a phototropic response? By such a mechanism each species would maintain a position optimal for photosynthesis.

There is another, and simpler, explanation that may account for the vertical migration of Ceratia. There may be a simple reversal of phototropic response, depending on the physiological condition of the organism; in this case on the assimilation of inorganic nutrients or some associated substance. The mechanism would be such that with the assimilation of these substances the organism is positively phototropic, thus remaining near the surface in the winter; but with the diminution of this assimilation the organism becomes negatively phototropic, and thus descends to lower levels of greater nutrient content.

It must always be borne in mind that the poverty of nitrogen and phosphorus which land plants everywhere are fighting, is accentuated to a high degree in the ocean. When a land plant dies, its nitrogen and phosphorus are soon returned to the soil to be utilized by other plants. On the other hand, when a planktonic plant dies, it sinks below the growth zone and its nutrient elements are lost, to be returned only after a long period of time except in high latitudes and in certain peculiar regions. This is particularly true of the tropics, where the thermal stratification is extreme and continuous. In these regions it is probable that the fertilization of the photic zone is accomplished alone by the nocturnal visits of a sparse zooplankton. It is in such regions as this that the shade species of Ceratium develop. Nielsen (1934) has already observed that the shade species are all warm oceanic; they do not occur in neritic conditions nor in the cold-water southeast of New Zealand. The Carnegie observations show that none of the shade species are cold water species, with the possible exceptions of C. arcticum and C. horridum. Of the twenty-nine species definitely or questionably shade species according to Carnegie data, seventeen are intolerant tropical species, eight are slightly tolerant tropical species, only two are very tolerant tropical species, one is cosmopolitan (C. horridum), and one subpolar (C. arcticum).

The data concerning the depth at which C. arcticum lives most abundantly are not conclusive, but they suggest that it is a shade species. Ceratium arcticum, a cold-water species, may be a shade species of another type entirely. Shiviroff and Federoff (1938) have found phytoplankton flourishing under the arctic ice cap. They have not yet reported the species found, but probably C. arcticum is one of them as it is characteristic of arctic currents. In the low illumination occurring under the ice it would be expected that only species with a high tolerance for shade would be found. The nutrients here are rich. These forms, when living in exposed ice-free regions, would then have the advantage of the ability to live at greater depths than the species not tolerant of shade, so they would be found at depths equal to that of the tropical shade forms.

Table 1. Shade species of Ceratium

Species	In summer, Mediterranean	Dana collection	Carnegie collection
C. praelongum	....	yes	yes
C. cephalotum	....	yes	yes
C. gravidum	yes	yes	yes
C. digitatum	yes	?	yes
C. belone	yes	no	?
C. incisum	yes	no	?
C. subrobustum	....	no	yes
C. kofoidii	yes	no	no
C. setaceum	yes	?	?
C. geniculatum	?	?	?
C. bigelowii	....	?	?
C. euarcuatum	yes	yes	yes
C. filicorne	....	yes	yes
C. symmetricum	yes	yes	yes
C. axiale	....	yes	yes
C. aultii	....	.....	?
C. azoricum	....	no	?
C. arietinum	yes	yes	yes
C. lunula	yes	yes	yes
C. carnegiei	....	.....	?
C. paradoxides	....	yes	yes
C. platycorne	yes	yes	yes
C. ranipes	yes	yes	yes
C. trichoceros	yes	no	yes
C. vultur	....[a]	yes	yes
C. horridum	....	....[b]	yes
C. tenue	yes	yes	yes
C. arcticum	....	....	?
C. longissimum	yes	yes	yes
C. hexacanthum	....	yes	no
C reflexum	....	yes	yes

? indicates either insufficient data or that the results were not conclusive. [a]Pavillardii. [b]Molle and claviger.

THE CERATIUM SPECIES OF THE CARNEGIE COLLECTION

Systematic List

I. Subgenus POROCERATIUM
1. C. praelongum (Lemmermann) Kofoid
2. C. cephalotum (Lemmermann) Jörgensen
3. C. gravidum Gourret

II. Subgenus BICERATIUM
4. C. digitatum Schütt
5. C. candelabrum (Ehrenberg) Stein
6. C. furca (Ehrenberg) Dujardin
7. C. belone Cleve
8. C. incisum (Karsten) Jörgensen
9. C. pentagonum Gourret
   subsp. tenerum Jörgensen
   subsp. pacificum n. subsp.
10. C. subrobustum (Jörgensen) Nielsen
11. C. teres Kofoid
12. C. kofoidii Jörgensen
13. C. böhmii n. sp.
14. C. lineatum (Ehrenberg) Cleve
15. C. setaceum Jörgensen

III. Subgenus AMPHICERATIUM
16. C. geniculatum (Lemmermann) Cleve
17. C. bigelowii Kofoid
18. C. inflatum (Kofoid) Jörgensen
19. C. longirostrum Gourret
20. C. falcatum (Kofoid) Jörgensen
21. C. extensum (Gourret) Cleve
22. C. fusus (Ehrenberg) Dujardin

IV. Subgenus EUCERATIUM
23. C. tripos (O. F. Müller) Nitzsch
   subsp. atlanticum Ostenfeld
   subsp. semipulchellum Jörgensen
24. C. pulchellum Schröder
25. C. humile Jörgensen
26. C. breve (Ostenfeld and Schmidt) Schröder
27. C. compressum Gran
28. C. euarcuatum Jörgensen
29. C. filicorne Nielsen
30. C symmetricum Pavillard
   var. symmetricum (Pavillard)
   var. coarctatum (Pavillard)
   var. orthoceros Jörgensen
31. C. axiale Kofoid
32. C. aultii n. sp.
33. C. azoricum Cleve
34. C. petersii Nielsen
35. C. arietinum Cleve
   subsp. arietinum (Cleve)
   subsp. bucephalum (Cleve)
   subsp. gracilentum (Jörgensen)
36. C. declinatum Karsten
37. C. gibberum Gourret
   f. subaequale Jörgensen
38. C. concilians Jörgensen
   var. subaequale n. var.
39. C. lunula Schimper
40. C. carnegiei n. sp.
41. C. contortum Cleve
42. C. limulus Gourret
43. C. paradoxides Cleve
44. C. platycorne Daday
45. C. ranipes Cleve
46. C. macroceros (Ehrenberg) Vanhöffen
   subsp. macroceros (Ehrenberg)
   subsp. gallicum (Kofoid)
47. C. massiliense (Gourret) Jörgensen
48. C. deflexum (Kofoid) Jörgensen
49. C. carriense Gourret
50. C. contrarium (Gourret) Pavillard
51. C. trichoceros (Ehrenberg) Kofoid
52. C. vultur Cleve
   var. vultur (Cleve)
   var. japonicum (Schröder)
   var. sumatranum (Karsten)
   var. pavillardii (Jörgensen)
   var. regulare n. var.
   var. reversum n. var.
   var. recurvum Jörgensen
53. C. horridum Gran
   var. horridum (Gran)
   var. molle (Kofoid)
   var. claviger (Kofoid)
54. C. tenue Ostenfeld and Schmidt
   var. inclinatum (Kofoid) Jörgensen
   var. tenuissimum (Kofoid) Jörgensen
55. C. longissimum (Schröder) Kofoid
56. C. arcticum (Ehrenberg) Cleve
   var. arcticum (Ehrenberg) Cleve
   var. longipes (Bailey) Gran
   var. ventricosum Ostenfeld
57. C. hexacanthum Gourret
58. C. reflexum Cleve

Subgenus POROCERATIUM

1. Ceratium praelongum (Lemmermann) Kofoid
Figure 1, chart 1, appendix table 1

A rare, strictly tropical species, confined to stations where the surface temperature was over 20° C. Found in the Gulf Stream to where the surface temperature dropped to 20.°5 (station 15); also sporadically in the Sargasso and Caribbean seas. Peters (1934) did not find it farther south than 25° south latitude in the South Atlantic. At Carnegie stations it was found as far north as 38.°5 north (station 15).

In the Pacific Nielsen (1934) reported it at various stations in the South Equatorial Current. Okamura (1912) found it at Japan, but it was not reported from the Pacific by Böhm (1931). In the southeastern Pacific, in the Carnegie collections, it was found at one station in the Humboldt Current (station 69), at two stations south of Easter Island, and at eight scattered stations in the South Equatorial Current. It was found continuously in the two series of stations across the equatorial currents in the central and western Pacific; at one station between Guam and Japan, at two stations off Japan, and at one station off California. It was not found farther north than latitude 35° north in the North Pacific, nor farther south than 32° south in the South Pacific. It was notably absent from the loop of stations northeast of Hawaii and in the Galapagos-Panama region.

Ceratium praelongum was never found in great numbers. In the Carnegie collection it was found only at forty stations--seven in the Atlantic and thirty-three in the Pacific. There were sixty-seven records of occurrence, fifty-one of which were rare and sixteen occasional. Forty-nine of the records were from net samples, eighteen from pump samples.

Ceratium praelongum is a shade species according to Nielsen (1934). In the Carnegie collection it was found more frequently at 50 meters than at the surface or 100 meters, and more often at 100 meters than at the surface (table 2). Thus, the Carnegie data tend to substantiate Nielsen's classification of this species as a shade form.

Table 2. Records of occurrence of C. praelongum at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	12	3.1	28	9.9	11	4.3
Occasional	5	1.3	6	2.1	5	2.0
Total	17	4.4	34	12.0	16	6.3

A=Number of records. B=Per cent of total number of samples collected at that depth.

Although C. praelongum was limited to warm water it did not show any preference for oligotrophic water. Only sixteen of the sixty-seven records were in water containing less than 10 mg PO_4/m^3. The surface temperatures at the stations where it occurred, varied from 20°.4 to 29°.4 C. The ranges of environmental conditions in situ were: temperature, 14°.2 to 29°.4 C; salinity, 33.4 to 37.1 per mille; pH, 7.87 to 8.47; phosphate, 2 to 63 mg PO_4/m^3.

Remarks.--Dissections were made of the plates of C. praelongum. The pattern is shown in ventral and left lateral views in figures 1A and B. It will be noted that in this species two apical plates touch the ventral area, whereas Jörgensen (1911) stated that in the subgenus Poroceratium only the large flat ventral apical touches the ventral area. Kofoid (1907b) devised a nomenclature for the plates of Ceratium. For Poroceratium he started numbering the apical plates with the wide ventral one, basing his system on the pattern of C. gravidum in which this plate is the only one to touch the ventral area. Thus he called this one the apical plate. Jörgensen (1911), on the other hand, called it apical four. A knowledge of the pattern of C. praelongum, a member of Poroceratium, shows that Jörgensen's system is preferable in that it indicates homologies. The suture in C. praelongum, which separates the ventral and left apical plates, is homologous with the ventral suture of C. tripos, which separates the first and fourth apicals, so that the ventral plate of Poroceratium is homologous with the fourth of C. tripos and should be designated apical 4 as in Jörgensen's system. Ceratium praelongum, in its epithecal plate pattern, is thus transitional between other members of Poroceratium and Euceratium.

Variation.--There is considerable variation in the shape of the body of C. praelongum but the variants seemed to bear no relation to geographic location or environmental conditions. The forebody may be constricted just anterior to the girdle as in figure 1A, or in the middle region (fig. 1C), or may be quite regular as in figure 1D. The last figure shows an individual with very heavy hypothecal walls and thick antapical horns. None of the variations found could be satisfactorily grouped into varieties.

2. Ceratium cephalotum (Lemmermann) Jörgensen
Figure 2, chart 2, appendix table 2

This is a rare, intolerant tropical species. Jörgensen (1911) stated that it has been reported from the North Atlantic only north of the West Indies; Peters (1934) found it only at one station in the South Atlantic. In the Carnegie collection it was found in the Atlantic at two stations between the North Atlantic Drift and the Sargasso Sea at 100 meters in both cases.

The species is never found in great numbers. In the Carnegie collection it was found at a total of thirty-two stations; two in the Atlantic, thirty in the Pacific. There were thirty-nine records of occurrence--thirty-six rare and three occasional. Thirty-six of the records were from the net samples; three from the pump samples.

Ceratium cephalotum is a shade species according to Nielsen (1934), and this classification is substantiated by the Carnegie data as shown in table 3. It was found in an increasing percentage of the samples with increase in depth. Although Nielsen found it only in the samples taken between 100 to 50 meters, in the Carnegie collection it was found almost as frequently at the surface as at 50 meters.

Table 3. Records of occurrence of C. cephalotum at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	12	3.2	9	3.2	15	5.9
Occasional	1	0.2	2	0.7	0	....
Total	13	3.4	11	3.9	15	5.9

A=Number of records. B=Per cent of total number of samples collected at that depth.

The Carnegie data suggest that this species prefers oligotrophic water. It is always found in warm water. The surface temperatures of the water at the stations where it was found varied from 23°.6 to 29°.4 C. Twenty-four of the thirty-nine records were in water containing less than 10 mg PO_4/m^3. It is particularly noteworthy in this connection that the species was found in a continuous series of stations north and east of Hawaii and all are included in the great "desert" of the North Pacific. Peters' (1934) record for the South Atlantic was also in oligotrophic water. The ranges of environmental conditions in situ were: temperature, 13°.8 to 28°.7 C; salinity, 34.1 to 36.5 per mille; pH, 8.17 to 8.47; phosphate, 4 to 36 mg PO_4/m^3.

Ceratium cephalotum is not very variable. Sometimes the overgrowth of the right side is less pronounced (fig. 2B).

3. Ceratium gravidum Gourret
Figures 3 and 4, chart 3, appendix table 3

This is a relatively rare, but widespread, slightly tolerant tropical species found at most of the Carnegie tropical stations. Peters (1934) found it only in warm oligotrophic water in the South Atlantic. In the Carnegie collection it was found at most (seventeen) of the twenty-three stations in the warm Atlantic region. It was not found at any Atlantic station where the surface temperature was less than 20° C. All the Atlantic stations were in oligotrophic water with phosphate content less than 10 mg at the surface, except at station 1 where it was thirty-two. The temperature there, however, was 24°.

In the Pacific Nielsen (1934) found C. gravidum in both eutrophic and oligotrophic water at scattered stations in the South Pacific. In the Carnegie collection it was pretty well scattered throughout the tropical waters of the Pacific, occurring at seventy-five stations and sometimes in water of somewhat lower temperature than that of the Atlantic. Off Japan it occurred to 40.°5 north, surface temperature 15.°9 C (station 117). Off California it occurred to 34° north, surface temperature 19.°1 C (station 31). In the southeastern Pacific it occurred south of Easter Island to 34° south, surface temperature 19° C (station 57). In the extreme southeastern Pacific it was not common, occurring at only four stations east of the line of stations in the longitude of Easter Island.

Although widespread, this species is never very abundant. There were 182 records of occurrence, 144 of which were rare and 38 occasional. Of these records, 164 were from the net samples and 18 from the pump samples.

Ceratium gravidum was classified as a shade species by Nielsen (1934). In oligotrophic water he found that it had its main distribution in the levels from 200 to 100 meters, although he found it in the upper levels in eutrophic water. The Carnegie data substantiate this classification of Nielsen. The total number of records (in percentage) at 50 meters is more than three times that at the surface; the number of 100-meter records shows an increase over that for 50 meters (see table 4). This distribution is shown also by the rare and occasional records separately. Thus, C. gravidum is a decided shade species.

Table 4. Records of occurrence of C. gravidum at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	27	7.7	58	20.5	59	23.0
Occasional	3	0.8	14	3.6	21	8.3
Total	30	8.5	72	24.1	80	31.3

A=Number of records. B=Per cent of total number of samples collected at that depth.

In the Carnegie collection as a whole, C. gravidum seemed to be found in both oligotrophic and eutrophic water. Sixty-one of the 182 records of occurrence were in water containing less than 10 mg PO_4/m^3. The surface temperatures at the stations where it occurred, varied from 15.°9 to 29.°5 C. The ranges of environmental conditions in situ were: temperature, 10.°6 to 29.°3 C; salinity, 33.4 to 37.0 per mille; pH, 7.76 to 8.44; phosphate, 2 to 153 mg PO_4/m^3.

Variation.--Ceratium gravidum is a variable species. Jörgensen (1911) divided it into three varieties and later (1920) described a fourth variety. These have been more or less accepted by later workers (Nielsen, 1934 and Peters, 1934), although apparently no one hitherto has had sufficient material to test the validity of these varieties. In the Carnegie studies hundreds of specimens were examined, and it was evident that no taxonomic grouping could be made of the wide variations in body form found in this species. Representative specimens are shown in figures 3 and 4. Each of these drawings is representative of a group of individuals examined and other variations between these were found. Thus, there is a complete intergradation between the wide rotund form shown in figure 3A (which is even wider than Jörgensen's var. latum) and the narrow form shown in figure 4U (which, in turn, is narrower than Jörgensen's var. angustum). The characteristics of the antapical horns such as length, thickness, curvature, and divergence (which have also been used in differentiating the varieties) also vary in such a manner that no varietal segregations are indicated. An attempt was made to correlate the variations of C. gravidum with geographic location, or with different water masses. No correlation was found; the different variations were indiscriminately scattered throughout the areas investigated. Peters (1934) found the different varieties in the same regions of the South Atlantic. Nielsen (1934) found var. latum to be restricted to the eutrophic water of the eastern part of the South Equatorial Current, whereas var. elegans and angustum were found there as well as in the oligotrophic western part and in the East Australian Current. Nielsen's results are not corroborated by the Carnegie collections. In the latter, specimens as wide or wider than var. latum were, indeed, found in the eutrophic water in the region of the Galapagos Islands, but they also occurred in the oligotrophic water of the central part of the North Equatorial Current.

Subgenus BICERATIUM

4. Ceratium digitatum Schütt

Figure 5, chart 4, appendix table 4

This is a rare intolerant tropical species, one of the most rare of the Carnegie collection. It is apparently restricted to warm water as it never approached the 20° surface isotherm except in the region of Easter Island. It is also remarkable that it was never found near large land masses, although Jörgensen (1920) found it in the Mediterranean. Peters (1934) found it at only four stations in the South Atlantic in his "main distribution region" of warm oligotrophic water. On the Carnegie cruise it was found only at two stations in the Atlantic, in the North Equatorial Current.

Nielsen (1934) is the only previous author to report C. digitatum from the Pacific. He found it at three widely separated stations in the South Equatorial Current. In the Carnegie collection it was found at twenty-three widely separated stations, from Easter Island to Guam and to a point midway between Hawaii and California. The most northern station is 33.°5 north; the most southern, 31.°5 south. On the German South Polar expedition C. digitatum was found to 31° south. This seemed extraordinary to Peters (1934) who did not find it farther south than 20° south on the Meteor expedition. He explained the fact by stating that it was probably carried south in the Agulhas Current. The Carnegie southern records in the southeastern Pacific may thus be explained by a drift from the northeast, in the large vortex characteristic of that region. The absence of this species off Japan, however, where it should be carried by the extension of the North Equatorial and Japan currents, and in the North Atlantic Drift, are noteworthy and can only be explained on the assumption that the species is so rare that its detection anywhere in the ocean must be considered fortuitous. Its limits of distribution, thus, will not be well defined until much more survey work has been done.

Ceratium digitatum is always found singly or in small numbers. In the Carnegie collection there were twenty-six records of its occurrence--all rare. Eighteen of these records were from net samples, eight from pump samples.

This species is undoubtedly a shade species, although previously insufficient data have been at hand to demonstrate this. Jörgensen (1920) found it in the Mediterranean at the deeper levels in the summer but attributed this occurrence to another cause (see p. 12). Nielsen (1934) considered it a shade species, although his few data were from above the 50-meter level. Since two of his three records for this species were from stations rich in plankton, however, the occurrence above this level does not necessarily indicate that it is not a shade species. The Carnegie records substantiate Nielsen's classification of this species as a shade species. It was found more frequently with increase in depth (table 5).

Table 5. Records of occurrence of C. digitatum at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	6	1.5	8	2.1	12	4.7
Total	6	1.5	8	2.1	12	4.7

A=Number of records. B=Per cent of total number of samples collected at that depth.

It is doubtful if C. digitatum prefers oligotrophic water. Ten of the twenty-six Carnegie records were from water containing less than 10 mg PO_4/m^3. This is not owing to the fact that most of the records are subsurface records. The phosphate content of the surface water at the stations where the species was found shows the same distribution. Ten of these are below 10 mg and the rest above, with some as high as 42. The surface temperatures at the stations where C. digitatum occurred, varied from 22.°4 to 29.°4 C. The ranges of environmental conditions in situ were as follows: temperature, 12.°5 to 28.°5 C; salinity, 34.3 to 36.5 per mille; pH, 8.16 to 8.39; phosphate, 3 to 46 mg PO_4/m^3.

Variation.--Very few variations have been reported for this species, probably owing to scanty material. Jörgensen (1920), however, described a variant, var. rotundatum, found in the Mediterranean and also in the Guinea Current. It is characterized by more rounded apex, less bent apical horn, and somewhat larger size. Peters (1934) stated that in the South Atlantic he found specimens with more rounded epitheca than Jörgensen's variety. In the Carnegie collection two specimens were found which answer well to Jörgensen's var. rotundatum. They occurred in the surface samples from stations 52 and 54, both south of Easter Island in temperatures of 22.°5 and 23.°4 C (figs. 5A and B). It is probable that this form represents a species distinct from C. digitatum as no intergrades were found between it and the typical form. The typical C. digitatum does not vary greatly, although the length of the left antapical horn varies somewhat in different specimens (figs. 4C and E).

5. Ceratium candelabrum (Ehrenberg) Stein
Figure 6, chart 5, appendix table 5

This is a common, slightly tolerant tropical species. It is not confined to warm water. At Carnegie stations the limits of distribution paralleled rather closely the surface isotherm of 15° C in all three regions where the lines of stations extended into colder regions, namely, in the southeastern Pacific, off Japan, and off the west coast of the Americas. These limits of distribution are very significant, inasmuch as within these limits there are extremely few stations without records of occurrence. At six stations off Peru it was not found, although the surface temperatures there were above 19° C. Apparently the peculiar environmental conditions in this region have an inhibitory effect on C. candelabrum. In the Atlantic the species occurred almost continuously in the warmer water, but its northern limit there coincided with the surface isotherm of 20° C rather than of 15° as in the Pacific. In respect to latitude, C. candelabrum was found approximately to 40° south and 40° north in the Pacific, and to 42° north in the Atlantic. Its southern limit in the South Atlantic is also at about 40° south (Peters, 1934). Some of the stations of the Dana expedition extend, in the southwestern Pacific, beyond 40° south. The southern records of C. candelabrum, however, end at the fortieth parallel. This rounds out a remarkable correlation between latitude and the distribution of a Ceratium. It must be mentioned, however, that in the southwestern Pacific, as well as in other parts of the Pacific, the latitudes of 40° are closely paralleled by the surface isotherms of 15° C.

This species is one of the most common of the genus. In the Carnegie collection it was found at 136 stations--26 in the Atlantic and 110 in the Pacific. There were 353 records of occurrence--206 rare, 128 occasional, and 19 common. Of these, 243 were from net samples and 110 from pump samples.

In regard to vertical distribution, Neilsen (1934) classified this species as a surface form. This classification is substantiated by the Carnegie observations. As can be seen in table 6, C. candelabrum was found most frequently at 50 meters (44.2 per cent of the 50-meter samples). It was found almost as often (36.0 per cent of the surface samples) at the surface, but only half as frequently at 100 meters (21.0 per cent). It is more significant that the records of occasional and common occurred much more frequently at the surface and 50 meters than at 100 meters.

Table 6. Records of occurrence of C. candelabrum at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	75	18.4	81	28.4	50	20.0
Occasional	57	13.4	42	14.2	29	0.8
Common	8	2.1	5	1.7	6	0.2
Total	140	33.9	128	44.3	85	21.0

A=Number of records. B=Per cent of total number of samples collected at that depth.

Ceratium candelabrum was found throughout the warm-water regions without respect to the nutrient content of the water. Thus, 117 of the 353 records of occurrence were in water containing less than 10 mg PO_4/m^3. The range of surface temperatures at the stations where it occurred was from 15.°9 to 29.°5 C. The ranges of environmental conditions in situ were: temperature, 8.°8 to 29.°5 C; salinity, 30.0 to 37.1 per mille; pH, 7.76 to 8.47; phosphate, 3 to 189 mg PO_4/m^3.

Variation.--Several varieties of C. candelabrum have been described, the most important of which are var. depressum Jörgensen (1920) and f. commune Böhm (1931). Nielsen (1934) distinguished these two variations and stated that both are found in the western part of the Pacific investigated by him but only var. depressum was found in the eastern Pacific. The writers are inclined to agree with Peters (1934) that the variations in this species are too continuous for any separation of varieties, although it must be stated that most of the Carnegie material resembled the var. depressum form. Figure 6 shows a series of specimens with variously bent horns, both apical and antapical, and with various lengths of horns.

6. Ceratium furca (Ehrenberg) Dujardin
Figure 7, chart 6, appendix table 6

Ceratium furca is an interesting cosmopolitan species probably composed of many subspecies or races. Jörgensen (1911) designated two subspecies; a northern form, subsp. α berghii and a tropical form, β eugrammum. Ceratium hircus Schröder, which Jörgensen accepted as an independent species, is probably also a variety of C. furca. In his study of Mediterranean Ceratia, Jörgensen (1920) designated many more varieties. Böhm (1931) attempted to show that in his material from the western Pacific there were two genotypes, both belonging to the tropical subspecies eugrammum. These were separated on the basis of total length; a short variety with length from 130 to 168 microns, and a large variety from 170 to 244 microns. Nielsen (1934) did not consider Böhm's evidence conclusive, and made a statistical study of length in his material from the South Pacific. In only one sample did he find a separation into two groups on this basis. In other samples long ones or short ones were represented, and often medium-sized ones. Nevertheless Nielsen considered that two races were represented.

As a result of the study of the Carnegie material the writers tend toward Jörgensen's (1920) opinion, that the species is a complex of many varieties and races, not of two. No separation could be made on the basis of size alone. No attempt was made to separate the different variants. The number is great and the intergradations common. In figure 6 several variants are shown.

The distribution of C. furca is of particular interest. Peters (1934), in his study of the Ceratia of the Meteor expedition in the South Atlantic, concluded that C. furca is a typically neritic species. It was found abundantly in the mouths of great rivers and in regions of upwelling. It seemed to avoid the middle regions of the oceans. Nielson (1934) accepted this classification of the species and stated that it is distinctly a neritic form, although also found at many oceanic stations. He found it at every station but two between Panama and Tahiti, and at various stations between that point and Australia. He stated that its occurrence at these oceanic stations can be explained by the disturbed water about the islands in the western Pacific and by the eutrophic water occurrence in the eastern part of the South Equatorial Current. Such a broad use of the term "neritic," however, leaves no room for the term oceanic so such usage cannot be accepted. Nielsen's data show, on the other hand, that C. furca is oceanic as well as neritic. In the Carnegie collection the species did show a tendency to occur more frequently and more abundantly in richer water but, nevertheless, was often found in oligotrophic water. Only 40 of the 231 records of occurrence were in water containing less than 10 mg PO_4/m^3.

In the Carnegie collection there is no indication of an avoidance of oceanic water or of the middle regions of the open oceans on the part of C. furca. Not only are there many station records for the open North Atlantic and the Pacific, but there are as many records of occasional and common for stations remote from land as for stations close to land (see chart 6).

In the Atlantic there were two distributional areas, probably representing the distributions of the two subspecies; a northern one from stations 6 to 11a (from southwest of Ireland around the North Sea and Iceland to southeast of Greenland), and a tropical region from stations 14 to 24 (straight down through the middle of the Atlantic). There was also one station in the Caribbean. In the Pacific, also, the distribution was interrupted. The species was found quite regularly in the southeastern Pacific, but was scattered irregularly over the other tropical regions of the Pacific. It was notably absent from the northern line of stations from stations 118 to 128 inclusive. No northern form was found in this ocean.

The surface temperatures in this "C. furca-free" water in the northern Pacific varied from 7.°2 to 16.°4 C. This should not have constituted a barrier to this species as it was found in the Atlantic where the surface temperatures were as low as 8.°9. The tropical subspecies was confined to warm water in the Atlantic (surface temperatures 21.°2 to 28.°0 C), but in the Pacific it extended into somewhat cooler water (surface temperatures from 15.°0 to 29.°4 C). Obviously the northern subspecies of the Atlantic was not found in the Pacific.

Ceratium furca is frequently found in quantities. Records of "abundant" were from the North Sea, southeastern Pacific, and southeast of Japan. The species was found at 91 Carnegie stations--19 in the Atlantic and 72 in the Pacific. There were 232 records of occurrence, with 140 rare, 65 occasional, 22 common, and 4 abundant.

Nielsen (1934) classified C. furca as a surface form. The Carnegie data show that it is truly not a shade form,

Table 7. Records of occurrence of C. furca at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	68	17.7	42	14.9	30	11.8
Occasional	36	9.5	14	4.9	15	5.9
Common	14	3.6	3	1.6	5	1.8
Abundant	4	1.4	0	.....	0	.....
Total	122	32.2	59	21.4	50	19.5

A=Number of records. B=Per cent of total number of samples collected at that depth.

but is found at depths below the surface in a great many cases. The table of frequencies (table 7), however, shows that it was found most frequently at the surface. This is particularly true of the records of "common" and "abundant."

The ranges of environmental conditions in situ were as follows: temperature, 6.°6 to 29.°4 C; salinity, 33.1 to 37.0 per mille; pH, 7.63 to 8.47; phosphate, 3 to 233 mg PO_4/m^3.

7. Ceratium belone Cleve
Figure 8, chart 7, appendix table 7

This is a rare, intolerant tropical species confined to water of high temperature. Peters (1934) found the species in the South Atlantic not beyond 30° south. Nielsen (1934) found it in the Pacific scattered over the entire region of the South Equatorial Current.

In the Carnegie collection C. belone was found at twenty-six stations; two in the Atlantic and twenty-four in the Pacific. The Atlantic records were in the middle North Atlantic where the surface temperatures were about 24° C (station 1b) and 27.°0 C (station 18). The most northern of these was at 38° north latitude.

In the Pacific C. belone was found at one station off Peru, at eleven stations around and north of Easter Island, at seven stations east and north of Samoa, at one station in the North Equatorial Current, and at three stations in the central North Pacific (chart 7). Its latitudinal limits were 33.°5 north and 32.°0 south, which is a rather limited distribution for a species of Ceratium. It is a curious and unexplainable fact that the species was not found west of 179° west longitude. The surface temperatures at the Pacific record stations varied from 20.°4 to 29.°4 C. It must, therefore, be considered a stenothermal species. Although it always occurred in water of high temperature, it was seldom found in water of extremely low phosphate content. Only six of the fifty-one records of occurrence were from water containing less than 10 mg PO_4/m^3.

The ranges of environmental conditions in situ were: temperature, 16.°0 to 29.°4 C; salinity, 34.1 to 37.0 per mille; pH, 8.11 to 8.47; phosphate, 5 to 48 mg PO_4/m^3.

Nielsen's (1934) classification of C. belone as a surface species is substantiated by the Carnegie data (table 8), although there were two records of "occasional" at 100 meters. The total percentages, however, show a much more frequent occurrence at the surface than at the lower levels.

The occurrence of C. belone is sporadic. Unlike some of the rarer tropical species, when it does occur, it is sometimes found in considerable numbers. Peters (1934) found this to be true in the South Atlantic. Likewise in the Carnegie collection there were several records of "occasional." The total number of records was fifty-one, of which forty-four were rare and seven were occasional.

Variation.--Ceratium belone is rather constant in shape and size, except for the divergence of the antapical horns and the length of the apical horn. There is an extreme variation in the total length of the specimens (from 335 to 910 microns), but this difference is owing entirely to the difference in the length of the apical horn. The length of the hypotheca is constant. In only one specimen (fig. 8H) was this elongate. The diameter, d, varied from 20 to 30 microns.

Table 8. Records of occurrence of C. belone Cleve at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	23	6.0	10	3.5	11	4.3
Occasional	4	1.0	1	0.4	2	0.8
Total	27	7.0	11	3.9	13	5.1

A=Number of records. B=Per cent of total number of samples collected at that depth.

8. Ceratium incisum (Karsten) Jörgensen
Figure 9, chart 8, appendix table 8

This is a rare, strictly tropical species with limited distribution. Peters (1934) found it at only four stations in the South Atlantic, and Nielsen (1934) found it at scattered stations in the South Equatorial Current of the Pacific. In the Carnegie collection it occurred at twenty-seven stations--two in the Atlantic and twenty-five in the Pacific. There were thirty records of occurrence, all rare. Twenty-two of these were from net samples and eight were from pump samples.

Of the two Atlantic stations, one was in the open Atlantic at latitude 36.°5 north, longitude 46.°5 west (station 16); the other was in the Caribbean Sea. In the Pacific the stations were scattered: one off Ecuador, six north of Easter Island at about latitude 10° south, twelve between Samoa and Guam, four in the central crossing of the equatorial regions, and two north of Hawaii. It was very restricted in its latitudinal distribution and was absent from the southeastern Pacific region except at one station off Ecuador. Its latitudinal limits in the Pacific were 29° north and 15° south. In the Atlantic it occurred to 36.°5 north.

Ceratium incisum is a stenothermal form similar to C. belone. The surface temperatures at stations at which it occurred in the Atlantic were 25.°9 and 28.°5 C. In the Pacific the range was 24.°6 to 29.°5 C. The ranges of environmental conditions in situ were: temperature, 14.°2 to 29.°3 C; salinity, 33.7 to 36.3 per mille; pH, 7.87 to 8.39; phosphate, 4 to 48 mg PO_4/m^3.

Apparently C. incisum is at home in oligotrophic water. Ten of the thirty records of occurrence were in water containing less than 10 mg PO_4/m^3. Nielsen (1934) classified this species as a surface species. In the Carnegie collection it was found about equally at the three levels (table 9).

Table 9. Records of occurrence of C. incisum at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	11	2.9	9	3.2	10	3.9
Total	11	2.9	9	3.2	10	3.9

A=Number of records. B=Per cent of total number of samples collected at that depth.

9. Ceratium pentagonum Gourret
Figures 10C, D, H-N, chart 9, appendix table 9

This is a cosmopolitan species composed of three subspecies: a widespread tropical form, subsp. tenerum (Jörgensen); a subantarctic form, subsp. robustum (Cleve); and a northern Pacific form, subsp. pacificum n. subsp. The authors agree with Nielsen (1934) that Jörgensen's var. subrobustum is specifically distinct (see below).

Subspecies tenerum is a widespread tropical form somewhat more common than C. subrobustum, but with a similar distribution except that it seems to be somewhat more tolerant of colder water. It was found at eighty-one stations--fifteen in the Atlantic and sixty-eight in the Pacific. There were 189 records of occurrence: 152 rare, 34 occasional, and 1 common. Of these records, 73 were from net samples, 114 from pump samples. Expressed in percentages these are: 13.6 per cent of net samples, and 31.8 per cent of pump samples. It is thus evident that the tropical form of C. pentagonum is too small to be properly collected in the tow nets.

The subspecies was found in the Atlantic mostly in the central line of stations; it was absent from the warmer part of the Gulf Stream and Caribbean Sea. In the Pacific its distribution is somewhat irregular, but the records are probably incomplete there, owing to the fact that the distinctness of C. subrobustum was not realized at the time of the routine census of the samples, so some of its records probably belong to C. pentagonum. Ceratium pentagonum, however, extended beyond the range of C. subrobustum in the southeastern Pacific and off California.

The surface temperatures at the stations at which subsp. tenerum occurred, varied from 15.°0 to 29.°3 C. The ranges of environmental conditions in situ were: temperature, 13.°1 to 29.°3 C; salinity, 33.4 to 37.0 per mille; pH, 7.76 to 8.47; phosphate, 3 to 233 mg PO_4/m^3.

Nielsen (1934) listed C. pentagonum as a surface species. In the Carnegie collection it was found less frequently at 100 meters than at the surface and 50-meter depths, and slightly more frequently at 50 meters than at the surface. Thus it cannot be classed as a shade species. Ceratium subrobustum, on the other hand, is definitely a shade species, with its greatest frequency at 100 meters (cf. tables 10 and 11).

Table 10. Records of occurrence of C. pentagonum subsp. tenerum at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	56	14.5	56	19.1	40	15.3
Occasional	18	4.6	11	4.0	5	1.6
Common	1	0.2	0	.....	0	.....
Total	75	19.3	67	23.1	45	16.9

A=Number of records. B=Per cent of total number of samples collected at that depth.

Ceratium pentagonum is a remarkable species, in that it has never been collected from the cold northern Atlantic although it is represented in the subantarctic by a cold-water subspecies. In the Carnegie collection the distribution of the species in the North Atlantic terminated under 45° north latitude (station 13a), which is somewhat farther north than previous authors had found it. The surface temperature there, however, was above 20° C. It apparently cannot endure transfer into temperatures much below this value.

The conspicuous absence of C. pentagonum in the northern Atlantic was particularly noted by Peters (1934) who mapped the distribution of subsp. robustum in the subantarctic waters of the South Atlantic. Peters emphasized the unequal distribution in which the species is represented in the southern cold water by the most southerly member of the genus, but is entirely absent in the cold waters of the North Atlantic. Subspecies robustum doubtless populates the entire subantarctic region as there are no barriers in this region. Thus, it probably occurs in the southern latitudes of the Pacific. Peters did not find it in the Atlantic north of about 48°, however, except where it was displaced along the South American coast by the Falkland Current to about 32° south. This subspecies was not found in the Carnegie collection probably because the stations were not far enough south. The most southern station (station 60) was at about 40° south. It is probable that the subspecies is displaced northward in the Humboldt Current to 30° or so, but in these latitudes the Carnegie stations were too far from the coast to detect it.

In view of this knowledge it was of particular interest to search for this species in the cold waters of the North Pacific. The investigations here revealed the presence of a cold-water subspecies peculiar to this region, subsp. pacificum n. subsp.

A series of forms was found south of the Aleutian Islands and they have been grouped together under this subspecies. The extreme form (fig. 10 I) is remarkably different from the other subspecies of C. pentagonum. It is large (transdiameter 78 microns), with heavy walls covered with thick ridges and lists, and the antapical horns are long (equal to the transdiameter or longer). All the forms in this cold-water region, however, do not conform to this description, and in the west grade into the southern form (see figs. 10C and J). Another variation is shown in figure 10D. These intergrades indicate that the extreme form is of subspecific rank only.

With the finding of this subspecies it was evident that in the case of C. pentagonum there is a bipolarity in the Pacific with subsp. robustum in the antarctic and subsp. pacificum in the north, whereas in the Atlantic only the southern form is represented. This distribution constitutes the most convincing evidence of the planktological isolation of the North Pacific waters (see p. 11).

Subspecies pacificum was found at seven stations and in seventeen samples (chart 9). The surface temperatures of the stations where it occurred, varied from 7.°2 to 10.°5 C. The ranges of environmental conditions in situ were: temperature, 4.°2 to 10.°5 C; salinity, 32.7 to 32.9 per mille; pH, 7.98 to 8.03; phosphate, 103 to 175 mg PO_4/m^3.

10. Ceratium subrobustum (Jörgensen) Nielsen
Figures 10A, B, E-G, chart 10, appendix table 10

This is a rare, intolerant tropical species. Peters (1934) found this form in the South Atlantic only in the Falkland Current and for that reason considered it a subspecies, raising it from the varietal rank given by Jörgensen (1920). Nielsen (1934) found it in the Pacific in the eastern part of the South Equatorial Current and at Australia, but not at the colder stations. He raised it to the rank of an independent species, and separated it from C. pentagonum on the basis of size of body and thickness of walls. He gave the transdiameter of C. subrobustum as 77 to 89 microns, and that of C. pentagonum up to 72 microns. In the Carnegie material the transdiameter of C. robustum varied from 72 to 90 microns; those of C. pentagonum (excluding subsp. pacificum n. subsp.) were from 38 to 66 microns. The transdiameter of subsp. pacificum was 55 to 78 microns.

Ceratium subrobustum is probably rarer than C. pentagonum but, nevertheless, it is much more widespread than previously was supposed. In the Carnegie collection it occurred at forty-five stations--two in the North Atlantic, where it had not been found before, and forty-three in the Pacific. There were eighty-one records of occurrence: sixty-three rare, fifteen occasional, and three common. Of these records, fifty were from net samples, and thirty-one were from pump samples. Unfortunately, when the routine examination of this species was conducted, the independence of this species was not realized, so the records of its occurrence are not complete. For this reason, the peculiar clumping of the stations in the Pacific must be considered artificial and not representing exactly the actual distribution.

It may be noted that the species is a warm-water form, however, not extending into water of low temperature. The surface temperatures at the stations where it occurred, were all above 20° C except in the southeastern Pacific, where it was found at stations with surface temperatures as low as 17° C. The ranges of environmental conditions in situ were: temperature, 14.°3 to 28.°5 C; salinity, 34.0 to 39.8 per mille; pH, 7.17 to 8.39; phosphate, 3 to 64 mg PO_4/m^3.

Nielsen (1934) stated that in the Dana collections C. subrobustum was found only in the upper 50 meters. The Carnegie data are at variance with this and strongly suggest that the species is a shade species. As can be seen from table 11, the species was found more frequently with increase in depth to 100 meters. Particularly significant are the records of "occasional," which were found in 0.3 per cent of the surface samples, 2.1 per cent of the 50-meter samples, and 3.2 per cent of the 100-meter samples. In this respect C. subrobustum differs from C. pentagonum, which was found more frequently at 50 meters.

Table 11. Records of occurrence of C. subrobustum at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	12	2.8	16	5.7	35	13.0
Occasional	1	0.3	6	2.1	8	3.2
Common	1	0.3	1	0.4	1	0.4
Total	14	3.4	23	8.2	44	16.6

A=Number of records. B=Per cent of total number of samples collected at that depth.

11. Ceratium teres Kofoid
Figures 11B-D, chart 11, appendix table 11

This is a rare, slightly tolerant tropical species, although widespread. In the Carnegie collection it occurred at sixty-two stations--twelve in the Atlantic, and fifty in the Pacific. There were 106 records of occurrence, with 85 rare and 21 occasional. The species is so small that it was collected more frequently in the pump samples. There were 30 net records and 76 pump records. Expressed in percentages these are 5.6 per cent of the net samples, 20.8 per cent of the pump samples.

In regard to geographic distribution, the species is rather too irregular to draw any conclusions. Its absence is particularly noticeable, however, in the region of Panama, Galapagos, and southward. It occurs, on the other hand, at Easter Island and south to 40° south.

Ceratium teres was mostly confined to warm water. In the Atlantic the surface temperatures at its record stations were all above 24.°8 C; in the Pacific, above 20.°6 C, except in the southeastern region where it was as low as 15.°0 C (station 60). The ranges of environmental conditions in situ were: temperature, 11.°4 to 29.°4 C; salinity, 33.9 to 37.1 per mille; pH, 7.99 to 8.39; phosphate, 3 to 123 mg PO_4/m^3.

Ceratium teres does not avoid oligotrophic water. Forty-seven of the 106 records of occurrence were in water containing less than 10 mg PO_4/m^3.

Nielsen (1934) found this species only in the samples taken from 50 to 0 meters. In the Carnegie collection it was found about as frequently in the 100-meter samples as in the samples from higher levels (table 12). The surface contamination of the deeper nets, however, must be taken into consideration here.

Table 12. Records of occurrence of C. teres at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	36	9.1	31	11.0	18	7.1
Occasional	10	2.6	3	1.1	8	3.2
Total	46	11.7	34	12.1	26	10.3

A=Number of records. B=Per cent of total number of samples collected at that depth.

12. Ceratium kofoidii Jörgensen
Figure 11H, chart 12, appendix table 12

This is a very rare, slightly tolerant tropical species, seldom collected because of its extremely small size. In the Carnegie collection it was found at eight stations in the Pacific. There were twelve records of occurrence, ten of which were rare and two occasional. It was found predominantly in the pump samples because of the smaller mesh of the pump filter net. Two of the records were from net samples and ten were from pump samples.

The record stations for C. kofoidii were widely scattered (chart 12). The surface temperatures at the stations where it occurred, varied from 16.°2 to 27.°7 C. The environmental conditions in situ were: temperature, 11.°7 to 27.°6 C; salinity, 34.4 to 35.3 per mille; pH, 8.03 to 8.34; phosphate, 5 to 58 mg PO_4/m^3.

Six of the records were from surface samples, three from 50-meter samples, and three from the 100-meter samples. Thus, it is probably a surface species. Four of the twelve records were from water containing less than 10 mg PO_4/m^3.

13. Ceratium böhmii n. sp.
Figure 12, appendix table 13

Dimensions: diameter, d, 20.5 (18-24) microns.

This species is closely related to C. kofoidii with which Böhm (1931, figs. 9C, E, and F) confused it. The dimensions are about the same. The body, however, is much more elongated and the horns, particularly the antapicals, are much longer. The length of the hypotheca from the base of the right antapical horn to the posterior edge of the girdle is more than 0.5 d, whereas in C. kofoidii this length is less than 0.5 d. The right antapical diverges laterally only slightly or not at all.

Ceratium böhmii is a tropical Pacific species, probably slightly tolerant, although this cannot be determined at present because of the paucity of records for the species. It was found at six stations widely scattered as follows: two between Ecuador and the Galapagos, two north of the Phoenix Islands, and two off Japan. There were twelve records of occurrence--eight rare and four occasional. The species was collected more frequently with the pump, probably because of its small size. There were three net records and nine pump records.

The surface temperatures at the stations where the species was found, varied from 18°.7 to 27°.9 C. The environmental conditions in situ were: temperature, 13°.9 to 27°.9 C; salinity, 33.7 to 35.3 per mille; pH, 7.85 to 8.22; phosphate, 4 to 161 mg PO_4/m^3.

Ceratium böhmii is probably a surface species, although there are not sufficient records to establish this. Five of the records were from surface samples, three were from 50-meter samples, and four from 100-meter samples.

14. Ceratium lineatum (Ehrenberg) Cleve
Figures 11E-G, chart 12, appendix table 14

Ceratium lineatum is a rare species which is difficult to classify geographically. It occurs in the cold North Atlantic region and at three stations in the warm Atlantic (chart 12). In the Pacific it occurred only off Japan (stations 115a to 117). It is possibly a subpolar species. Peters (1934) found it in the South Atlantic, mostly in the cooler waters. At Carnegie Atlantic stations the species was found mostly in colder waters with surface temperatures from 10°.9 to 15°.5 C except at stations 17 and 19. At the Pacific record stations the surface temperatures varied from 15°.9 to 16°.1 C. The environmental conditions in situ were: temperature, 6°.7 to 21°.2 C; salinity: 33.8 to 37.0 per mille; pH, 7.98 to 8.34; phosphate, 3 to 99 mg PO_4/m^3.

The total number of station records was ten, of which seven were in the Atlantic and three in the Pacific. There were twenty-six records of occurrence, ten of which were rare, fourteen occasional, and two common. The records of common were from off Japan. Twenty-one of the records were from net samples and five were from pump samples. The species was found frequently at the surface, with thirteen records for the surface, six records for 50 meters, and seven recrods for 100 meters.

The authors were unable to separate C. minutum Jörgensen from C. lineatum. Jörgensen (1920) distinguished C. minutum from C. lineatum by its smaller dimensions, less robust theca, comparatively shorter and broader body, shorter antapical horns, and relatively shorter right antapical horn. Carnegie specimens with the shape of C. minutum have relatively thick walls (fig. 11F); specimens with the typical shape of C. lineatum are in the size range of C. minutum, i.e., transdiameter 25 to 28 microns (figs. 11E, G).

15. Ceratium setaceum Jörgensen
Figure 11A, appendix table 15

This is a very rare, slightly tolerant tropical species. Nielsen (1934), who first reported it from the Pacific, found it at only two stations--one north of Samoa, and the other west of New Zealand. In the Carnegie collection it was found at only two stations also--station 70, off Peru, and station 110, between Guam and Japan. Judging from the scattered nature of these records, it is probable that C. setaceum is a widespread tropical species, but occurs in such sparse numbers that it is seldom collected. Another reason for its reported scarcity is undoubtedly its small size which enables it to pass through many nets. This is demonstrated by the fact that all the Carnegie records were from the pump samples which were collected by a much finer (no. 20) cloth than the tow nets. The records were at 0 and 50 meters at station 70, and 100 meters at station 110.

The surface temperatures at the above two stations were 21°.2 and 23°.9 C. The ranges of environmental conditions in situ were: temperature, 15°.4 to 21°.2 C; salinity, 34.7 to 35.1 per mille; pH, 7.88 to 8.14; phosphate, 11 to 178 mg PO_4/m^3.

Subgenus AMPHICERATIUM

16. Ceratium geniculatum (Lemmermann) Cleve
Figure 11J

This is a very rare tropical species. Only one specimen was found in the Carnegie collection, and this was partially broken (fig. 11J). It occurred in the 50-meter pump sample at station 45, latitude 4°.5 south, longitude 105° west. The temperature was 22°.4 C; salinity, 35.2 per mille; pH, 8.13; and phosphate, 46 mg PO_4/m^3.

17. Ceratium bigelowii Kofoid
Figures 11 I, K-M, chart 13, appendix table 16

This is a very rare intolerant tropical species, apparently confined to the Pacific and Indian oceans. It has never been reported from the Atlantic. It was reported from the Pacific by Kofoid (1907a) and Nielsen (1934), and from the Pacific and Indian oceans by Böhm (1931). Nielsen found it at four stations in the South Equatorial Current. The Carnegie records contribute considerably to our knowledge of the distribution of this species in the Pacific. They show that it is not restricted to any particular current system, but is distributed over the warm tropical waters in both hemispheres. In the Carnegie collection it was found at twenty-four stations (chart 13). These are distributed in the southeastern Pacific to latitude 34° south (station 57), in the northwestern Pacific to latitude 23°.5 north, and in the northeastern Pacific to 26° north latitude. There are forty records of occurrence--thirty-six rare and four occasional. The records of occasional were at 50 meters at stations 95, 96, and 159, and also at the surface at the last station. All three of these stations were in the region north of Samoa, and it is possible that this is a region usually rich in this species since one of these stations, station 159, was occupied seven months after the other two.

All the records of C. bigelowii are from warm water and are remote from land. The surface temperatures at the stations where it was found, varied from 20°.7 to 29°.4 C, except at station 57 south of Easter Island where the surface temperature was 19°.0. The environmental conditions in situ were: temperature, 14°.3 to 29°.3 C; salinity, 34.2 to 36.4 per mille; pH, 8.10 to 8.39; phosphate, 3 to 50 mg PO_4/m^3.

According to Nielsen's theory (1934), C. bigelowii should be a shade species since it has an expanded flattened body. Since there have been so few records of this species, however, it has not been possible to examine this feature heretofore. The Carnegie records in this connection are not conclusive. The records of rare and the total number of records for the three levels show an increase in frequency with increase in depth (table 13). The records of occasional, however, stand in opposition to this, with the greatest frequency at 50 meters. Whether C. bigelowii is a shade species cannot be decided definitely until more records of its occurrence have been accumulated.

Since it is a large species, it was collected more often in the net, with thirty-four net records, and only three pump records.

Table 13. Records of occurrence of C. bigelowii at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	9	2.1	13	3.9	14	5.5
Occasional	1	0.3	3	1.0	0	....
Total	10	2.4	16	4.9	14	5.5

A=Number of records. B=Per cent of total number of samples collected at that depth.

18. Ceratium inflatum (Kofoid) Jörgensen
Figures 11O-S, chart 14, appendix table 17

This species is very closely related to the two following. Jörgensen (1920) considered C. inflatum (Kof.) Jörgensen, C. longirostrum Gourret, C. falcatum Kofoid, and C. falcatiforme Jörgensen all separate species, whereas Peters (1934) treated them as members of a Formenkreis with subspecific rank. Nielsen (1934) considered them distinct. Whatever the taxonomic value of these groups, there is certainly an intergradation between them. In this report the first three have been kept separate, but this arrangement must be considered tentative until more statistical work is done on the group. It was found impossible, however, to separate C. falcatiforme from C. falcatum. Therefore, only the first three species are listed in this report.

One of the characters which Jörgensen (1920) used for the differentiation of the above species was length of epitheca relative to length of hypotheca--the ep/hyp ratio. For each species he gave the mean, minimum, and maximum ep/hyp ratios. It should be noted that his fractions for maxima represent the maximum length of epitheca over the maximum length of hypotheca and not the maximum ep/hyp ratios that follow them, which might be inferred from his method of presentation. The same holds true for his minima. Unfortunately, many of Jörgensen's figures for this group indicate ratios which are beyond the range that he states in the text. For instance, his figures of C. longirostrum (figs. 26 and 27) show ep/hyp ratios of 1.525 and 1.55, whereas in the description he states that the maximum ratio is 1.45. Which is correct, the figures or the description? Owing to these inaccuracies it is difficult to evaluate Jörgensen's data.

A study of the Carnegie specimens, however, resulted in measurements showing fairly close agreement with those of Jörgensen. For C. inflatum he gave an ep/hyp ratio of 1.15 (1.06 to 1.26) for an α form and 1.21 (1.18 to 1.23) for "another form." This ratio in the present material was 1.11 (0.86 to 1.25). Equally close agreement was found in the case of the other species (which see). The total length in our material is 1010 microns (640 to 1460); the diameter 40 microns (30 to 80). Incidentally, C. inflatum in our material is easily separated from C. longirostrum by its diameter alone, since the latter has a diameter of 19 microns (15 to 27).

It must also be noted that C. bigelowii is closely related to C. inflatum and should be included in the group in case it is treated as a Formenkreis. In the Carnegie material quite wide specimens of C. inflatum were found which were difficult to separate from C. bigelowii. This was particularly true where there was a lateral flattening of the body (fig. 11R).

Ceratium inflatum is a rare, intolerant tropical species confined entirely to warm water. In the Carnegie collection it occurred at twenty-four stations--five in the Atlantic and nineteen in the Pacific. There were thirty-one records of occurrence, thirty of which were rare and one occasional. Twenty-five were from net samples and six were from pump samples.

The record stations for this species were scattered over the warm-water regions. All of them were remote from land, except one near Panama. The surface temperatures at these stations were from 26°.0 to 27°.2 in the Atlantic, and from 22°.3 to 28°.0 C in the Pacific, except at one station south of Easter Island where the temperature was 19° C. The environmental conditions in situ were: temperature, 16°.6 to 28°.6 C; salinity, 34.3 to 36.8 per mille; pH, 8.00 to 8.37; phosphate, 3 to 121 mg PO_4/m^3.

Ceratium inflatum is apparently an oligotrophic species. Not only was it found principally in warm water remote from land, but it was usually found in water of low nutrient content. More than half (seventeen) of the twenty-nine records of its occurrence were in water containing less than 10 mg PO_4/m^3.

Nielsen (1934) suggested that this was a surface species although also found in the deeper samples. In the Carnegie collection it had its maximum frequency at 50 meters (see table 14). Thus, the data acquired so far indicate that the occurrence of C. inflatum is rather general in a vertical direction.

Table 14. Records of occurrence of C. inflatum at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	12	2.9	11	3.9	7	2.4
Occasional	0	....	1	0.4	0	....
Total	12	2.9	12	4.3	7	2.4

A=Number of records. B=Per cent of total number of samples collected at that depth.

19. Ceratium longirostrum Gourret
Figures 11T-V, chart 14, appendix table 18

Total length, 644 (570-730) microns; diameter, 19 (15-27) microns; ep/hyp ratio, 1.36 (1.19-1.50). Jörgensen (1920) gave the ep/hyp ratio as 1.38 (1.26-1.45). Thus, there is close agreement between the world material of the Carnegie and the Mediterranean material of Jörgensen.

Ceratium longirostrum is a rare, intolerant tropical species with a distribution similar to that of C. inflatum (see chart 14). In the Carnegie collection it was found at sixteen stations--two in the Atlantic and fourteen in the Pacific. There were twenty-six records of occurrence--twenty-one rare and five occasional. Eighteen records were from net samples and eight were from pump samples.

The surface temperatures at the stations where it occurred, varied from 22°.3 to 29°.3 C, except at one station (station 2) in the North Atlantic Drift where the temperature was 20°.5 C. The environmental conditions in situ were: temperature, 21°.6 to 28°.5 C; salinity, 34.4 to 36.6 per mille; pH, 8.14 to 8.37; phosphate, 5 to 36 mg PO_4/m^3.

Not only is C. longirostrum found in warm water remote from land, but it is often in water poor in nutrients. Fourteen of the twenty-six records of occurrence were in water containing less than 10 mg PO_4/m^3.

Nielsen (1934) listed C. longirostrum as a surface species. In the Carnegie collection there were insufficient records to draw any conclusions in this regard. It was found least often at 50 meters, but more frequently at 100 meters than at the surface (table 15).

Table 15. Records of occurrence of C. longirostrum at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	10	2.6	3	1.1	8	3.1
Occasional	2	0.5	2	0.7	1	0.4
Total	12	3.1	5	1.8	9	3.5

A=Number of records. B=Per cent of total number of samples collected at that depth.

20. Ceratium falcatum (Kofoid) Jörgensen
Figures 11W-AA, chart 15, appendix table 19

Total length, 513 (350-750) microns; diameter, 23 (15-35) microns; ep/hyp ratio, 1.38 (1.00-0.72). Jörgensen (1920) gave the ep/hyp ratios for C. falcatum as 1.56 (1.38-1.70) and for C. falcatiforme, 1.13 to 1.20. The Carnegie range thus includes both of these. It was impossible to separate in the Carnegie material a small form answering to C. falcatiforme Jörgensen. Jörgensen stated that the length of this form was about 280 microns which is smaller than any Carnegie specimen measured. Many specimens were found, however, which had the shape of the species in question, although larger than this. These intergraded into the typical C. falcatum (figs. 11W-AA). It is probable that C. falcatiforme is simply an extreme of the species C. falcatum. Nielsen (1934) considered it a well-defined species, but presented no measurements, ratios, or other evidence which might indicate that it is distinct in the Pacific. He simply stated that it is "small."

Ceratium falcatum is a rare, intolerant tropical species with a distribution similar to that of C. inflatum and C. longirostrum (see chart 15). In the Carnegie collection it was found at thirty stations--one in the Atlantic and twenty-nine in the Pacific. There were forty-seven records of occurrence--forty-six rare and one occasional. Thirty-four records were from net samples and thirteen were from pump samples.

The surface temperatures at the stations where it occurred, varied from 19°.0 to 28°.4 C. The environmental conditions in situ were: temperature, 14°.2 to 28°.5 C; salinity, 34.5 to 36.4 per mille; pH, 7.86 to 8.39; phosphate, 4 to 198 mg PO_4/m^3.

Although this species was found mostly in oligotrophic water, this was not so evident as in the case of C. inflatum and C. longirostrum. Only ten of the forty-seven records were in water containing less than 10 mg PO_4/m^3.

Nielsen (1934) listed C. falcatum and C. falcatiforme as surface species. This is borne out by the Carnegie data (see table 16).

Table 16. Records of occurrence of C. falcatum at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	26	5.7	10	2.8	10	3.9
Occasional	1	0.3	0	....	0	....
Total	27	6.0	10	2.8	10	3.9

A=Number of records. B=Per cent of total number of samples collected at that depth.

21. Ceratium extensum (Gourret) Cleve
Figures 11BB-DD, chart 16, appendix table 20

This species includes C. strictum (Okamura and Nishikawa) Kofoid, which is characterized by the presence of a well-formed right antapical horn. Since the presence of this horn is not a reliable character, and since it is the only one separating C. strictum from C. extensum, it is no longer considered a separate species (see Jörgensen, 1920; Peters, 1934; and Nielsen, 1934).

The species is a widespread very tolerant tropical form. In the Carnegie collection it occurred at 104 stations--14 in the Atlantic and 90 in the Pacific. These were distributed in the various regions as follows: 3 in the cold North Atlantic (in the North Atlantic Drift), 11 in the warm Atlantic, 1 in the cold North Pacific (off California), 79 in the warm Pacific, and 10 in the southeast Pacific. There were 234 records of occurrence--136 rare, 81 occasional, and 17 common. Of the total number, 144 were from net samples and 90 were from pump samples.

The surface temperatures at the stations where it occurred, varied from 12°.4 to 29°.4 C. In the northeastern Pacific and in the southeastern Pacific it extended into water with surface temperatures of 16°.4 and 14°.97 respectively. In the North Atlantic Drift it extended close to the British Isles to a surface temperature of 12°4 C. The environmental conditions in situ varied as follows: temperature, 10°4 to 29°4 C; salinity, 29.7 to 37.1 per mille; pH, 8.0 to 8.39; phosphate, 2 to 99 mg PO_4/m^3.

Nielsen (1934) classified C. extensum as a surface species. The Carnegie data corroborate this classification. The species was found with decreasing frequency with increase in depth (see table 17). If due correction were made for contamination of the open nets, this feature would be more pronounced.

Table 17. Records of occurrence of C. extensum at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	72	18.7	33	11.7	30	11.8
Occasional	43	11.2	28	9.9	10	3.9
Common	9	2.3	6	2.1	2	0.8
Total	124	32.2	67	23.7	42	16.5

A=Number of records. B=Per cent of total number of samples collected at that depth.

22. Ceratium fusus (Ehrenberg) Dujardin
Figures 11EE, 13A-D, chart 17, appendix table 21

Ceratium fusus is a widespread cosmopolitan species. It may be composed of subspecies but so far no morphological differences warranting a division of the species have been found. Jörgensen (1920) believed that he could distinguish a tropical subspecies (seta [Ehrenberg]) from the northern form of the species, but later workers have not been able to verify this (Peters, 1934; Nielsen, 1934). Peters found several different forms in different parts of the South Atlantic, but they intergraded so much that he was not able to separate them satisfactorily. Nielsen considered the species to represent a single genotype which is definitely modified as to size by ecological conditions. His data for the South Pacific show an increase in size under neritic conditions.

In the Carnegie collection a statistical difference was found between the forms growing in the different life zones (see table 18). It is evident from these data thatt the specimens from cold-water regions have a distinctly greater diameter than those from the warm-water regions as shown by both the means and extremes. The length, however, does not show the same correlation. The specimens from the warm Atlantic showed the greatest average length, whereas those from the warm Pacific had the smallest. It is to be hoped that a finer morphological analysis of this species will throw some light on the taxonomic-ecologic problems involved.

In the Carnegie collection C. fusus was found at ninety-four stations--twenty-five in the Atlantic, and sixty-nine in the Pacific. These stations were distributed from the warmest to the coldest regions visited (see chart 17). There are particular lines of stations, however, where C. fusus was not found. These distributional gaps cannot be explained on the basis of general rarity of the species. In the Carnegie collection there were 194 records of its occurrence.. Of these, 109 were rare, 67 occasional, 11 common, and 7 abundant. Most of the records of higher frequency, however, were from the cold Atlantic region.

Table 18. Size variation in Ceratium fusus

Region	Total length in microns	Diameter in microns
Cold Atlantic	410 (310-500)	21.6 (20-28)
Warm Atlantic	459 (345-434)	20 (16-25)
Cold North Pacific	420 (330-520)	24 (20-32)
Warm Pacific	329 (168-422)	15 (10-25)
Southeast Pacific	345 (250-405)	17 (12-22)

and it should be noted that the lines of stations where the species was not found are mostly in regions of low phosphate content. Only 23 of the 194 records of occurrence were in water containing less than 10 mg PO_4/m^3. Thus, it is possible that C. fusus does not normally develop to any great extent in oligotrophic water.

Since the species is cosmopolitan, it was found in a great range of conditions. The surface temperatures at the stations where it occurred, varied from 7°2 to 29°5 C. The environmental conditions in situ were: temperature, 2°1 to 29°5 C; salinity, 32.7 to 37.0 per mille; pH, 7.71 to 8.37; phosphate, 4 to 209 mg PO_4/m^3.

The very narrow body of C. fusus permits it to escape from the larger meshed nets. Consequently there are relatively more pump records for the species than net records. It was found in only 18 per cent of the net samples, but in 26 per cent of the pump samples.

Nielsen (1934) classified C. fusus as a surface species. This classification is probably correct. In the Carnegie collection the number of records decreased with increase in depth (see table 19). After correcting for upper-level contamination in the open nets, it is obvious that the species is much more frequent in the surface layer.

Table 19. Records of occurrence of C. fusus at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	44	10.9	34	12.0	31	12.2
Occasional	37	9.4	21	7.5	9	3.5
Common	8	2.8	1	0.4	2	0.7
Abundant	4	1.4	2	0.8	1	0.4
Total	93	24.5	58	21.7	43	16.8

A=Number of records. B=Per cent of total number of samples collected at that depth.

Subgenus EUCERATIUM

23. Ceratium tripos (O. F. Müller) Nitzsch

No species of the genus is so complex and variable as C. tripos. For a time there was a tendency to separate the components of this form into separate units with specific rank. This movement was led by Jörgensen

(1911, 1920). Later a tendency developed to lump these units into a Formenkreis or a few species. Peters (1934) included under C. tripos all the varieties of pulchellum (see Jörgensen, 1920). He divided the species into three subspecies: atlanticum, pulchellum, and semipulchellum. Nielsen (1934), on the other hand, recognized four separate species in this group as follows: C. tripodoides, C. semipulchellum, C. pulchellum, and C. tripos. He separated the first three species from each other on the basis of statistical studies of individual plankton samples. He found a grouping according to diameter and "antapical length." The last, C. tripos, which he found only in the cold water in the region of Australia and New Zealand, he considered distinct because of its shorter apical horn and stronger antapicals. These characters can hardly be sufficient for the separation of a species in this variable group. It is probable that the New Zealand-Australian form is simply a southern subspecies or race. Certainly Nielsen's drawings (figs. 32 and 33) do not show sufficient distinctness for a separation from his C. semipulchellum (fig. 30).

The present authors lean toward the view of Peters (1934) in regard to this group, with the exception that C. pulchellum (eupulchellum of Jörgensen) has been treated as a separate species. Considering the collection as a whole, there was very little intergradation between this form and semipulchellum. Between semipulchellum and tripos, on the contrary, there are many intergradations, i.e., in various characters such as size, spread of horns, and antapical curvature. It was considered advisable for the present to treat these two units as subspecies. They, in turn, are each composed of an endless number of varieties or races, which, however, are not recorded here as they are impossible to separate with our present knowledge of morphological characters in this genus.

Ceratium tripos subsp. atlanticum (Ostenfeld)
Figures 13E-K, chart 18, appendix table 22

This subspecies is more characteristic of colder waters although it is sometimes found in the tropics; The tropical forms are probably separate races; some of them vary toward the semipulchellum form.

In the Carnegie collection subsp. atlanticum was found throughout the cold Atlantic region and at ten stations in the warm Atlantic region. In the Pacific it was found in the cold North Pacific region to the west and east but not in the most northern part. In the warm Pacific region it was found at ten stations north of 27° north latitude, and at two stations in the southeastern part. In the southeast Pacific region it was found at thirteen stations. The total number of record stations for the subspecies was sixty-one--twenty-six of which were in the Atlantic and thirty-five in the Pacific.

It was not found so often as subsp. semipulchellum but a high percentage of the records were above "rare." The total number of occurrences was 163, of which 49 were rare, 61 occasional, 45 common, and 8 abundant.

Since the subspecies is cosmopolitan, the range of environmental conditions was great. It was not, however, found at the warmest stations of the Pacific. The range of surface temperatures at the record stations in the Atlantic was from 8.°9 to 28.°5 C; in the Pacific from 6.°9 to 27.°1 C. The environmental conditions in situ were: temperature, 6.°1 to 28.°2 C; salinity, 31.7 to 36.4 per mille; pH, 7.80 to 8.37; phosphate, 2 to 181 mg PO_4/m^3.

This subspecies, like the rest of the Formenkreis, is a surface species, although it is also found in considerable numbers in the deeper levels. As shown in table 20, subsp. atlanticum was found most frequently in the surface samples.

Table 20. Records of occurrence of C. tripos subsp. atlanticum at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	22	5.7	14	4.6	13	5.1
Occasional	32	8.3	13	4.6	16	6.3
Common	25	6.5	11	3.9	9	3.5
Abundant	7	1.8	1	0.4	0	....
Total	86	22.3	39	13.5	38	14.9

A=Number of records. B=Per cent of total number of samples collected at that depth.

Ceratium tripos subsp. semipulchellum (Jörgensen)
Figures 13L-N, chart 19, appendix table 23

This subspecies is a slightly tolerant tropical form which occurs almost continuously in the warm regions and the southeast Pacific region (chart 19). It is limited to the tropical waters except in the southeastern Pacific and northeast of Japan. In the Atlantic it was limited entirely to the warm Atlantic region. In the Pacific it occurred at one station northeast of Japan in the cold North Pacific region, although not in water of low temperature; the lowest surface temperature being 16.°1 C. In the southeastern Pacific region it was found at all but three stations. The surface temperatures at the record stations there were as low as 15° C. The total range of surface temperatures was from 15° to 29.°5 C. The ranges of environmental conditions in situ were: temperature, 11.°4 to 29.°4 C; salinity, 31.6 to 36.6 per mille; pH, 7.76 to 8.47; phosphate, 2 to 198 mg PO_4/m^3.

The subspecies was found at a total of 127 stations--21 in the Atlantic and 106 in the Pacific. It is one of the most common of the Ceratia. This is shown, not only by the large number of stations at which it was found, but also by the large number of single records of occurrence and relative abundance. There were 391 records of occurrence, with 161 rare, 156 occasional, 72 common, and 2 abundant. Since it is a large form, it was found more often in the net samples. There were 256 net records and 135 pump records.

The subspecies definitely does not avoid oligotrophic water, as its record stations are unbroken through regions of poor water, and 140 of the 391 records of occurrence were in water containing less than 10 mg PO_4/m^3.

In regard to depth, Nielsen (1934) states that semipulchellum is a definite surface form. The Carnegie data, on the contrary, indicate that it lives throughout the upper 100-meter layer. The greatest percentage of "rare" records was at 100 meters (see table 21); of "occasional" records at the surface; of "common" records at 50 meters; and the greatest total percentage was at 50 meters. The large number of records for the 50- and 100-meter levels cannot be explained entirely on the basis of contamination of the open nets since there were twenty-three stations scattered over the Atlantic and

Pacific where the subspecies was not recorded for the surface but was recorded for either or both the 50- and 100-meter levels.

Table 21. Records of occurrence of C. tripos subsp. semipulchellum at three levels.

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	60	15.6	46	16.0	55	21.6
Occasional	72	18.7	47	16.6	37	14.6
Common	28	7.2	31	11.0	13	5.1
Abundant	1	0.2	1	0.3	0	.....
Total	161	41.7	125	43.9	105	41.3

A=Number of records. B=Per cent of total number of samples collected at that depth.

24. Ceratium pulchellum Schröder
(=C. pulchellum f. eupulchellum Jörgensen)
Figures 14B-F, chart 20, appendix table 24

As stated above (p. 26), C. pulchellum Schröder is considered distinct from the C. tripos-C. semipulchellum complex. It is characterized by short antapical horns and small size. The diameter in our material was 46 (22-60) microns.

Ceratium pulchellum is a fairly common, slightly tolerant tropical species. In the Carnegie collection it was found at sixty-nine stations--eleven in the Atlantic and fifty-eight in the Pacific. In the Atlantic the stations were restricted to the warm Atlantic region; in the Pacific they were scattered over the warm Pacific region and the southern part of the southeast Pacific region. The total number of sample records for the species was 158, of which 97 were rare, 47 occasional, and 14 common. It is a curious fact that the relative number of pump records for the species is greater than the net samples. The species was found in 15 per cent (82) of the net samples and 21 per cent (76) of the pump samples. This probably is owing to the relatively small diameter of the species and to the short antapical horns, which permit the species to pass more readily through the coarser cloth of the tow net.

The surface temperatures at the stations where the species was found, varied from 16°.9 (in the southeastern Pacific) to 29°.5 C (north of Samoa). The environmental conditions in situ were: temperature, 11°.4 to 29°.4 C; salinity, 34.0 to 37.1 per mille; pH, 7.76 to 8.39; phosphate, 3 to 123 mg PO_4/m^3.

Ceratium pulchellum is decidedly a surface species as can be seen from table 22.

Table 22. Records of occurrence of C. pulchellum at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	47	12.2	27	9.5	23	9.1
Occasional	32	8.3	9	3.2	6	2.4
Common	9	2.3	3	1.1	2	0.8
Total	88	22.8	39	13.8	31	12.3

A=Number of records. B=Per cent of total number of samples collected at that depth.

25. Ceratium humile Jörgensen
Figure 14A

This species was reported from Japanese waters by Jörgensen (1911), and from the Australian region by Nielsen (1934). The latter author considered it endemic in the East-Asiatic Australian region. He also considered it a purely neritic species. For this reason, the single record of this species in the Carnegie collection is remarkable. It was found in the surface sample at station 1 in the Gulf Stream. This not only extends the known distribution of the species to another ocean but indicates that, at least in the Atlantic, it is not necessarily a neritic species. The surface temperature at this station was 24°.0 C. The specimen (fig. 14A) resembles those figured by Jörgensen (1911, figs. 82 and 83) somewhat more than that figured by Nielsen (1934, fig. 34) as the right horn is more ascending.

26. Ceratium breve (Ostenfeld and Schmidt) Schröder
Figures 14G-P, chart 21, appendix table 25

This is a variable species which exhibits transitions to many other species of the genus, namely, C. schmidtii, C. tripos, and C. arcuatum. Peters (1934) has suggested that it be included in the Formenkreis C. tripos. Böhm stressed the similarity between C. breve and C. arcuatum Cleve and the present authors believe that C. schmidtii likewise is similar or identical to C. breve. A series of specimens is shown in figures 14G to P which extends from the form with short, curved antapicals as in C. schmidtii (fig. 14I) to the open parallelum type simulating C. arcuatum (fig. 14K). It is probable, as Böhm (1931) stated, that the transition to C. arcuatum is superficial rather than genetic. Whether C. schmidtii should be included in C. breve is more difficult to say. According to Jörgensen (1911) the body of C. schmidtii is concave so the antapical horns have a ventral curvature. This feature, however, is sometimes found in C. breve, so it is not possible to separate these two forms on that basis.

Ceratium breve is an intolerant tropical species. In the Carnegie collection it was found at ninety-two stations--eighteen in the Atlantic and seventy-four in the Pacific. All the Atlantic stations were in the warm Atlantic region. The Pacific stations were in the warm Pacific region or the western part of the southeast Pacific region, with the single exception of station 70 off Peru. The surface temperature there, however, was high, namely, 21°.2 C. The species was not found in most of the southeastern Pacific nor in most of the area between California and Hawaii. This distribution may represent the effects of subpolar currents (see p. 9). The complete range of surface temperatures was 18°.7 to 29°.5 C. The environmental conditions in situ were: temperature, 12°.5 to 29°.4 C; salinity, 29.7 to 36.8 per mille; pH, 7.68 to 8.47; phosphate, 2 to 189 mg PO_4/m^3.

Nielsen (1934) classified C. breve as a surface form. The Carnegie data corroborate this classification. As shown in table 23, it was found less frequently in the deeper samples. If due correction were made for the contamination of the open nets this tendency would be more pronounced.

Table 23. Records of occurrence of C. breve at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	43	10.4	37	13.9	32	12.0
Occasional	55	13.3	30	10.6	23	8.0
Common	23	6.0	10	3.5	5	2.0
Total	121	29.7	77	28.0	60	22.0

A=Number of records. B=Per cent of total number of samples collected at that depth.

The species is often found in comparatively large numbers. There were 258 records of occurrence, of which 112 were rare, 108 occasional, and 38 common. Since it is a large species, it was found more often in the net samples. There were 181 net samples and 77 pump samples. Seventy-five of the records were in water containing less than 10 mg PO_4/m^3.

27. Ceratium compressum Gran
Figure 15A

This is a very rare species previously known only from the temperate waters of the North Atlantic. In the Carnegie collection a single specimen was found. This occurred in the 100-meter net sample from station 61 in the southeastern Pacific, latitude 38°.5 south. Probably this is a bipolar species occurring in the cooler waters of both hemispheres. The surface temperature at station 61 was 16°.9 C. The environmental conditions at 100 meters were: temperature, 10°.8 C; salinity, 34.0 per mille; pH, 8.03; phosphate, 80 mg PO_4/m^3.

28. Ceratium euarcuatum Jörgensen
Figures 15N-M, chart 22, appendix table 26

This is a distinct and easily recognized species which varies comparatively little. It is an intolerant tropical species, although found almost continuously in the warm regions of the oceans (chart 22). It was found at eighty-five stations--fourteen in the Atlantic, and seventy-one in the Pacific. In the Atlantic it was confined to the warm Atlantic region and in the Pacific to the warm Pacific region except for two stations in the western part of the southeast Pacific region. The surface temperatures at the stations where it occurred in the Atlantic varied from 24°.0 to 28°.0 C and in the Pacific from 19°.0 to 29°.5 C. It was absent from the entire southeastern Pacific east of 100° west longitude except for one station west of the Galapagos Islands. Nielsen (1934), however, found a single specimen in the Panama region.

Ceratium euarcuatum probably is one of the best indicators of warm tropical water. It apparently is of no value as an indicator of intrusions of water of tropical origin, however, since it does not seem to extend beyond the tropical boundaries in such currents as the Kuroshio and Gulf Stream. Apparently it does not endure a lowering of the temperature. On the other hand, it is found within the tropics in regions where cooler water has been brought in from other regions or from vertical disturbances. Thus, it was found west of the Galapagos where the surface temperature was 19°.6 and south of Easter Island where it was 19°.0 C. Nielsen (1934) found that it was restricted to water where the surface temperatures were above 22°.5 C. During the cruise of the Dana the temperatures in the region of the Galapagos were somewhat higher than when the Carnegie visited there but the species was not found in this area by Nielsen. It is probable that this region is in the line of distributional limit for the species, that normally it does not occur southeast of there, and that its occurrence in the region of the Galapagos depends on the amount of mixing of the waters in that region and on the amount of extrusion of the water of the Humboldt Current. Peters (1934) considered C. euarcuatum an indicator of warm oligotrophic water in the South Atlantic. Nielsen (1934), on the other hand, found it in water rich in nutrients and plankton as well as in oligotrophic water.

One might conclude from the Carnegie distribution of C. euarcuatum in the Atlantic and North Pacific that the species preferred oligotrophic water because its distributional limits in these oceans parallel quite closely the line of 10 mg PO_4/m^3 (cf. charts 22 and 50). This correlation, however, does not hold in the South Pacific where the species was frequently found in water rich in nutrients. Thus, we must conclude that it is not high concentration of nutrients which is limiting the distribution of the species in the northern waters but some other factor associated with it. Only 86 of the 185 records of occurrence were in water containing less than 10 mg PO_4/m^3.

Within the tropics the species is fairly common so there were many records of occurrence, namely, 185; of which 97 were rare, 75 occasional, and 13 common. It was found more often in net samples, with 128 net records and 57 pump records.

The environmental conditions in situ were: temperature, 13°.6 to 29°.3 C; salinity, 33.9 to 37.1 per mille; pH, 7.17 to 8.47; phosphate, 3 to 123 mg PO_4/m^3.

Nielsen (1934) classified C. euarcuatum as a shade species and the Carnegie data substantiate this classification. As shown in table 24, it was found more frequently at the lower levels than at the surface.

Table 24. Records of occurrence of C. euarcuatum at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	22	5.7	49	17.4	26	12.0
Occasional	11	2.8	43	15.3	21	8.0
Common	2	0.5	5	1.7	6	2.0
Total	35	9.0	97	34.4	53	22.0

A=Number of records. B=Per cent of total number of samples collected at that depth.

29. Ceratium filicorne Nielsen
Figures 15B-C, chart 23, appendix table 27

This species was described by Nielsen from the Dana collection in the South Pacific. He stated that it is closely related to both C. euarcuatum and C. symmetricum and probably has been confused by some with the latter species, although the original figures of Pavillard (1905) and Jörgensen (1911, 1920) were not C. filicorne. In the Carnegie collection this species was identified without any difficulty, and no intergrades were found between it and either C. euarcuatum or C. symmetricum.

Ceratium filicorne has a distribution of particular interest. In the Carnegie collection it occurred only in the South Pacific. This distribution is unique for the Ceratium species. Since the only other records for the species are those of Nielsen (which are also from the South Pacific), its known distribution is limited to that region. Nielsen's records run from the Tuamotu Islands to Fiji. In the Carnegie collection there are three stations for the species between the Tuamotus and Samoa, i.e., in the same general region of those of Nielsen; the other stations, fifteen in number, are in the southeastern Pacific. These, however, are limited to the warm Pacific region, although they include all the stations (4) in the eastern extension of the region.

This is one of the most extraordinary distributions found in the genus. If it were an extremely rare species this distribution would not be remarkable as it might be explained on the basis of incomplete sampling. This probably is not the explanation in this case, however, since the species was not found in particularly small numbers within its range. Of the twenty-seven records of occurrence only six were rare, whereas fourteen were occasional, and seven were common. Fifteen of the records were from net samples and twelve were from pump samples. Why the species is not found in the equatorial regions is an enigma. Is there something peculiar to the South Pacific necessary for the development of C. filicorne?

The surface temperatures at the stations where the species occurred, varied from 19.°0 to 28.°7 C. The environmental conditions in situ were: temperature, 14.°3 to 27.°6 C; salinity, 34.4 to 36.3 per mille; pH, 7.17 to 8.27; phosphate, 8 to 32 mg PO_4/m^3.

There was only one record from water with less than 10 mg PO_4/m^3. Nielsen (1934) designated C. filicorne as a genuine shade species, and this is borne out by the Carnegie data, as can be seen in table 25. It was found predominantly in the 100-meter samples, and only a single specimen was found in the surface samples.

Table 25. Records of occurrence of C. filicorne at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	1	0.3	1	0.4	4	1.3
Occasional	0	....	3	1.1	11	4.3
Common	0	....	1	0.4	6	2.3
Total	1	0.3	5	1.9	21	7.9

A=Number of records. B=Per cent of total number of samples collected at that depth

30. Ceratium symmetricum Pavillard
Figures 15H-L, chart 24, appendix table 28

Paulsen (1931) suggested that the name C. gracile be supplanted because of the confusion of synonyms and the differences of opinion of Jörgensen (1911, 1920) and Pavillard (1923). The present authors agree that the name should be dropped, not because of the confusion of these authors' opinions, however, but because the original drawing of Gourret (1883, pl. I, fig. 1) is not identifiable.

There is a considerable difference of opinion as to what segregation of forms should be made within this group. Peters (1934) listed only two forms; C. gracile gracile and C. gracile symmetricum. He included var. orthoceros Jörgensen in his subspecies gracile. It is doubtful, however, if he found coarctatum, since his drawings do not show it. Nielsen (1934), on the basis of some statistical work on size and horn spread, decided that the various forms he found could be lumped into a single unified species. It is doubtful, however, if his measurements of horn spread properly express the difference in body shape and origins of horns--which are the distinguishing features of the segregates of this group. The present authors believe, on the basis of the study of the Carnegie material, that coarctatum and orthoceros are sufficiently distinct to justify the retention of their names and the recording of their distributions. There is sufficient intergradation between them, on the other hand, that they cannot be given more than varietal value. Variety coarctatum is characterized by long, more or less parallel, horns; var. symmetricum by widely spreading horns; var. orthoceros by short close horns, and the right antapical in particular, with an abrupt anterior turn.

The three forms of the species are not subspecies in the geographic sense; they are all found within the same regions. For this reason their records have been combined on the chart (chart 24) although the individual records are noted on the distributional list (appendix table 28).

The species as a whole is a fairly common warm-water form. In the Carnegie collection it was found at eighty-one stations--fifteen in the Atlantic and sixty-six in the Pacific. In the Atlantic these were all in the warm Atlantic region. The surface temperatures at these stations were all above 24.°0 C. In the Pacific the species occurred in the warm Pacific region and throughout the southeast Pacific region. At the northern limits of the warm Pacific region the species occurred where the surface temperatures were as low as 19.°1 C. In the southeast Pacific region it occurred at surface temperatures as low as 15.°0 C. Thus, it was classified as a slightly tolerant tropical species.

Table 26. Records of occurrence of C. symmetricum at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	10	2.6	31	11.0	45	17.7
Occasional	2	0.5	23	8.1	34	13.4
Common	0	....	3	1.6	8	3.2
Total	12	3.1	57	20.7	87	34.3

A=Number of records. B=Per cent of total number of samples collected at that depth.

Its relative abundance is also shown by the number of sample records. There were 156 records of occurrence, of which 86 were rare, 59 occasional, and 11 common. It was found more frequently in the net samples, with 100 net records and 56 pump records.

Ceratium symmetricum is a pronounced shade species. Nielsen (1934) usually found it in the samples collected below the 50-meter level except at stations rich in plankton. The Carnegie data indicate a much greater frequency in the deeper levels (see table 26). Only 12 of the 156 records, or 3.1 per cent of the surface samples, were from the surface, whereas the species was found in 34.0 per cent of the 100-meter samples.

The species is quite common in oligotrophic water. Sixty-five of the 156 records of occurrence were in water containing less than 10 mg PO_4/m^3. The environmental conditions in situ were: temperature, 12°1 to 29°3 C; salinity, 30.7 to 37.1 per mille; pH, 7.90 to 8.39; phosphate, 3 to 152 mg PO_4/m^3.

31. Ceratium axiale Kofoid
Figures 15D and E, chart 25, appendix table 29

This is a very rare intolerant tropical species. It was found only twice in the collections of the Meteor in the South Atlantic (Peters, 1934). Nielsen (1934) found it at nine stations in the Pacific in the South Equatorial and East Australian currents. The Carnegie collections extend the known range of the species both in the Northern and Southern hemispheres of the Pacific. It was not found in the Atlantic. It occurred at eleven Carnegie stations; two of these were in the southeastern Pacific, one off Japan, and the rest in the North Equatorial Current and north and east of Hawaii. It is probable that the species is more or less evenly distributed over the warm waters of the world but it is seldom collected because of its sparse numbers. In the Carnegie collection there were thirteen records of occurrence, of which eight were rare, three occasional, and two common.

The surface temperatures at the stations where it occurred, varied from 20°2 to 28°1 C. The ranges of environmental conditions in situ were: temperature, 15°6 to 27°6 C; salinity, 34.5 to 35.1 per mille; pH, 8.08 to 8.39; phosphate, 4 to 32 mg PO_4/m^3.

Five of the thirteen records were in water containing less than 10 mg PO_4/m^3.

All of Nielsen's (1934) records were from below 50-meter depths except one. The Carnegie data are in good agreement with his (see table 27). There was only one record from a surface sample and one from a 50-meter sample. The other eleven were from 100-meter samples. It is thus evident that C. axiale is unquestionably a shade species.

It is also of interest to note that eight of the records were from pump samples, whereas only five were from the net samples. Apparently the curved nature of the antapical horns permits the specimens to pass through the coarser nets.

Table 27. Records of occurrence of C. axiale at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	1	0.3	1	0.4	6	2.4
Occasional	0	....	0	....	3	1.2
Common	0	....	0	....	2	0.7
Total	1	0.3	1	0.4	11	4.3

A=Number of records. B=Per cent of total number of samples collected at that depth.

32. Ceratium aultii n. sp.
Figures 15F and G

Diameter, 55 microns; total length, 230 to 250 microns. The shape of the body is similar to those of C. symmetricum and C. axiale, except that the apical horn is displaced to the left. Curvatures of antapical horns resemble those of C. axiale except at the bases where the antapicals extend laterally from the body before they curve anteriorly.

Ceratium aultii was found at only two stations--one off Peru (station 72) and the other in the central part of the North Equatorial Current of the Pacific (station 151). It was found at 100 meters at both stations. At station 72 it was "common" in the net sample; at station 151 it was "rare" in the pump sample. The surface temperatures at the stations where it was found were 24°9 and 26°0 C. The temperatures in situ were: 14°8 at station 72, and 12°5 C at station 151.

33. Ceratium azoricum Cleve
Figures 16M-P, chart 26, appendix table 30

This species is a variable and little-known form. It is probably much more common than the number of records for it would indicate, since it is lost through the net because of its small size. It varies greatly in size (diameter from 38 to 50 microns), however, as well as in shape of body, and origin of antapical horns. The larger forms with spreading horns bear a close resemblance to C. petersii and may, in fact, be identical with this, i.e., C. petersii may represent simply one end of a line of variations of C. azoricum. At the other end of this line are the small specimens with horns close to the body. In the Carnegie collection a specimen was found which had a heavy list which joined the apical with the antapical horns (fig. 16M). This may be a new species as no definite intergrades were found between it and C. azoricum. Since only the one specimen was found, however, it was decided to postpone naming a new species until more material could be examined.

Ceratium azoricum is a very tolerant tropical species. Lebour (1925) stated that it is subtropical and is occasionally brought into the northern seas. In the Carnegie collection it was found in the region of Ireland and between Iceland and the Faeroes. In the latter region the surface temperature was 8°9 C. In the Pacific it was found at one station in the cold North Pacific region, where the surface temperature was 13°3 C. In the southeastern Pacific it was found at temperatures as low as 16°3 C. On the other hand, it occurred at temperatures as high as 29°5 C in the equatorial regions. It was found at a total of five stations in the Atlantic, only one of which was in the warm Atlantic region. In the Pacific it was found at twenty-three stations: one in the cold North Pacific region, seven in the southeast Pacific region, and fifteen in the warm Pacific region. The total number of records was sixty, of which thirty-eight were rare, twenty-one occasional, and one common. As stated above, the species is probably commoner than the reported records would indicate because it probably escapes through the nets. Nevertheless, it was found more often in the net than the pump samples. There were thirty-three records (16 per cent) for the net samples and twenty-seven records (14 per cent) for the pump samples.

Nielsen (1934) stated that C. azoricum is a typical surface species but this is not confirmed by the Carnegie data (see table 28). There are not sufficient deeper records, however, to warrant classifying C. azoricum as a typical shade species.

Table 28. Records of occurrence of C. azoricum Cleve at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	16	4.2	14	5.0	8	3.2
Occasional	6	1.6	8	2.8	7	2.8
Common	1	0.3	0	....	0	....
Total	23	6.1	22	7.8	15	6.0

A=Number of records. B=Per cent of total number of samples collected at that depth.

The ranges of environmental conditions in situ were: temperature, 8.°2 to 29.°3 C; salinity, 32.7 to 36.0 per mille; pH, 7.85 to 8.39; phosphate, 7 to 176 mg PO_4/m^3.

Only two of the sixty records of occurrence were from water containing less than 10 mg PO_4/m^3.

34. Ceratium petersii Nielsen
Figure 16L, chart 26, appendix table 31

As noted above, it is questionable whether this form should be considered separate from C. azoricum Cleve (see p. 30). For the present, however, it will be considered separately. Nielsen (1934) reported the species from southeast of New Zealand. The records of Peters (1934) for C. bucephalum in the South Atlantic were referred to C. petersii by Nielsen (1934), but the present authors cannot agree with this (see below). The Carnegie records for C. petersii were at six stations, all in the Pacific--five in the southeastern Pacific and one off the west coast of the United States. Thus it is probable that C. petersii is peculiar to the Pacific Ocean.

Geographically it has been difficult to classify C. petersii, partly because of the limited number of records and partly because of its peculiar distribution. It is either cosmopolitan or subpolar. The surface temperatures at its record stations varied from 16.°9 in the South Pacific and 16.°4 in the North Pacific to 21.°2 off Peru. It could be classified as subpolar except for its peculiar distribution in the southeastern Pacific. No other subpolar form has shown such a distribution. It is tentatively considered to be a cosmopolitan species. There is, of course, the possibility that C. petersii is a cold-water subspecies of C. azoricum but this possibility is lessened by the fact that the typical C. azoricum is also found in cold water.

The total number of sample records for C. petersii in the Carnegie collection was fifteen, of which ten were rare, four occasional, and one common. Eight of the records were from net samples and seven were from pump samples.

The ranges of environmental conditions in situ were: temperature, 10.°8 to 21.°2 C; salinity, 33.0 to 35.1 per mille; pH, 7.68 to 8.18; phosphate, 12 to 233 mg PO_4/m^3.

None of the records were in oligotrophic water.

Nielsen (1934) found the species only in the samples from 50 to 0 meters. In the Carnegie collections there were six records for the surface, six for 50 meters, and three records for 100 meters. Thus it is probably a surface species.

35. Ceratium arietinum Cleve
Figures 16A-K, chart 27, appendix table 32

This species is one of the most ill defined of the genus. It is composed of a great many variants, including C. bucephalum which is here treated as a subspecies.

Peters (1934) stated that in the Meteor material all the variation forms described by Jörgensen (1911 and 1920) were found, but two forms were more common--a small one and a large one. These intergraded but f. gracilentum was distinct.

The "large and small main form C. arietinum arietinum" was found in various regions of the South Atlantic but f. gracilentum was purely tropical, occurring between latitudes 12° north and 10° south with water temperatures over 22° C.

Nielsen (1934) stated that he found only one form in the South Pacific and that it corresponded to Jörgensen's f. detortum and f. gracilentum. Thus, apparently, Nielsen considered these two forms identical.

The Carnegie collection is particularly rich in variations of this species. Only the more important of these have been figured (figs. 16A-K).

The characteristic arietinum has the apical horn displaced to the left, whereas the right antapical horn is strongly incurved (fig. 16E). In f. gracilentum Jörgensen there is a distortion and lengthening of the apical horn, which is sharply curved proximally (fig. 16K). Jörgensen (1920) on the other hand, described a form, f. regulare, in which the apical horn is symmetrically placed. This form resembles C. bucephalum Cleve.

In the present collection the placement of the apical horn was extremely variable and showed transitions to C. bucephalum (see figs. 16A-H).

Nielsen (1934) classified Peters' (1934) southern form of C. bucephalum as a new species, C. petersii. The drawing of this species which Nielsen gives, however, is quite different from the one given by Peters. In our opinion these two forms cannot be included together. Peters' figure (plate 3, fig. 16c) is truly a form of C. bucephalum, which the authors have included as a subspecies of C. arietinum. Nielsen's figure (fig. 44), however, is probably a distinct species as he indicated. It is closely related to C. azoricum (which see).

The gracilentum form of the Pacific (fig. 16F) is different from that of the Atlantic (fig. 16K). The body is not nearly so distorted, the antapical contour is more nearly perpendicular to the axis of the apical horn, the body is relatively wide, and the apical horn is not so extended. The transitions between gracilentum and the typical arietinum, however, are continuous in both oceans.

It is very probable that several subspecies (in the geographic sense) are concerned in the present complex. Peters (1934) found f. gracilentum to be limited to the purely tropical waters between latitudes 12° north and 10° south with temperatures over 22° C. In the Carnegie collection this form was found farther north (to latitude 38.°5, station 15) but the temperatures were quite high (24.°8 C). In the Pacific this particular form does not occur. Its representative, however, (fig. 16F) is a warm-water form, although not markedly so because the form in the Pacific is not so distinct.

Bucephalum is truly of temperate- and cold-water origin. Figures 16D and E show the form from the North Pacific region, figure 16A from the Humboldt Current, and figure 16C from the southeast Pacific region. It is absent from the tropics and thus is bizonal as Peters (1934) first demonstrated.

Since bucephalum shows this geographic distribution, and since it intergrades with C. arietinum, it should be considered a subspecies of C. arietinum. Jörgensen's f. gracilentum is also a subspecies since it is limited to quite warm water. It is useless, however, to name the many variations and intergrades which occur among the subspecies as they are innumerable and apparently of no ecologic significance.

The species as a whole is a fairly common one. In the Carnegie collection it occurred at sixty-two stations --ten in the Atlantic and fifty-two in the Pacific. The total number of records was 123, of which 87 were rare, 30 occasional, 4 common, and 2 abundant. There were 67 net records and 56 pump records.

Nielsen reported C. arietinum as an outstanding deep-water species. This is substantiated by the Carnegie observations, which show the species much more frequent at the 100-meter level than at 50 meters or the surface (table 29). It was least frequent at the surface.

Table 29. Records of occurrence of C. arietinum at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	23	5.6	24	8.5	40	15.8
Occasional	6	1.6	13	4.6	11	4.3
Common	1	0.3	2	0.7	1	0.4
Abundant	1	0.3	1	0.4	0	......
Total	31	7.8	40	14.2	52	20.5

A=Number of records. B=Per cent of total number of samples collected at that depth.

As indicated by the wide range of the species, it is a rather eurythermal form. In the Atlantic it occurred at surface temperatures ranging from 11° to 27.°5 C. In the Pacific the range was greater; from 6.°9 (northeast of Japan) to 29.°5 C (in the central tropics). The total ranges of environmental conditions in situ were: temperature, 1.°6 to 29.°5 C; salinity, 32.7 to 36.5 per mille, pH, 7.85 to 8.39; phosphate, 3 to 193 mg PO_4/m^3.

The species was found more frequently in the richer waters. Only 17 of the 123 records of occurrence were from water containing less than 10 mg PO_4/m^3.

36. Ceratium declinatum Karsten
Figures 16Q-T, 17A-C, chart 28, appendix table 33

This is a very variable, slightly tolerant tropical species. Jörgensen (1911, 1920) made several varieties among the variants of the species. Peters (1934) designated three subspecies in his South Atlantic material; C. declinatum declinatum, C. declinatum angusticornum, and C. declinatum laticornum. Nielsen (1934) stated that he could not distinguish between Peters' angusticornum and laticornum, and in his South Pacific material he recognized only two "subspecies"--declinatum and angusticornum. These two forms occurred in the same regions so they are not subspecies in the sense used by Peters, who found a certain geographic segregation of the variants. When a world collection is studied, such as that of the Carnegie, it becomes evident that the species consists of a large number of intergrading units. The naming of these serves no useful purpose. They are not subspecies so far as can be determined, since they occur indiscriminately throughout the entire range of the species.

Seven of these variants are shown in figures 16Q-T and 17A-C. Some of these can be identified with named forms of other authors. Thus, figure 16S is similar to Jörgensen's var. majus; figure 16T to Peters' laticornum; figure 16Q to declinatum; figures 17A to C to angusticornum; whereas figure 16R, with outturned right antapical, has not been named.

In the Carnegie collection the species as a whole was found rather continuously throughout the warm Atlantic, warm Pacific, and southeast Pacific regions. It occurred at a total of ninety-eight stations--fourteen in the Atlantic and eighty-four in the Pacific. In the Atlantic it occurred at twelve stations in the warm Atlantic region and at one in the cold Atlantic region, where it doubtless was displaced by the Gulf Stream (station 3). In the Pacific it did not occur in the cold North Pacific region but was found off California at temperatures of 19.°1 and 16.°2 C at the northern part of the warm Pacific region. It occurred in the southern part of the southeast Pacific region at stations where the surface temperatures were as low as 16.°9 C. In the warm Pacific region it occurred where the surface temperatures were as high as 29.°5 C.

The environmental conditions in situ were as follows: temperature, 13.°6 to 29.°4 C; salinity, 31.7 to 37.1 per mille; pH, 7.17 to 8.42; phosphate, 3 to 123 mg PO_4/m^3.

The ubiquity of this species (within the tropics) is shown by the number of records, which was 204, of which 133 were rare, 67 occasional, and 4 common. Since it is a very small species, it was found more commonly in the pump samples. It occurred in 87 (16 per cent) net samples and 117 (32 per cent) pump samples.

It seemed to show no preference for oligotrophic water. Seventy-six of the 204 records of occurrence were from water containing less than 10 mg PO_4/m^3.

Nielsen (1934) stated that C. declinatum is definitely a surface form. The Carnegie records show a decrease in frequency with increase in depth (see table 30), but by no means do they indicate that the species is exclusively

Table 30. Records of occurrence of C. declinatum at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	60	15.6	36	12.7	37	14.5
Occasional	34	8.8	19	6.7	14	5.5
Common	3	0.8	0	.....	1	0.4
Total	97	25.2	55	19.4	52	20.4

A=Number of records. B=Per cent of total number of samples collected at that depth.

a surface form even when due correction is made for contamination of the deeper net hauls. For instance, it was found in 25 per cent of the surface samples, but also in 21 per cent of the 100-meter samples.

37. Ceratium gibberum Gourret
Figures 17D-G, chart 29, appendix table 34

This is a common, slightly tolerant tropical species which occurs rather uniformly throughout the warm waters of the world. Two varieties or subspecies are usually recognized. One, f. dispar Pouchet (fig. 17D), has a strongly curved right antapical horn and is common, whereas the other, f. subaequale Jörgensen (fig. 17F), has regularly curved horns and is rare. The latter was found by Peters (1934) in the South Atlantic in different regions, but it has not been reported before for the Pacific. In the Carnegie collections one specimen of this form was found (fig. 17F). This occurred off Japan at station 114; depth, 50 meters; temperature in situ, 16.°2 C.

In f. dispar there is considerable variation in the height of the epitheca, curvature of horn, and placement of apical horn, but no further segregation of the group could be made. The Pacific and Atlantic specimens appeared to be identical. A two-celled chain was found at station 48 at 100 meters (fig. 17E).

The species was found at a total of 115 stations--23 in the Atlantic and 92 in the Pacific. It was found at all but three stations in the warm Atlantic region, but not outside this region in the Atlantic (chart 29). In the Pacific it was found almost continuously at the stations in the warm Pacific region. It also occurred at ten stations in the southeast Pacific region, but was absent from the cold North Pacific region.

The total number of sample records for the species was 297, with 179 rare, 105 occasional, and 13 common. Of the total number, 221 were net records and 76 were pump records.

The environmental conditions in situ were: temperature, 14.°0 to 29.°3 C; salinity, 29.7 to 37.0 per mille; pH, 7.17 to 8.47; phosphate, 2 to 178 mg PO_4/m^3.

Nielsen (1934) found that C. gibberum had its main vertical distribution above 50 meters. The Carnegie data show that the species occurs more frequently in the upper layers, with a decrease in frequency down to 100 meters (table 31).

Table 31. Records of occurrence of C. gibberum at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	75	19.4	56	20.0	48	18.9
Occasional	58	15.0	25	8.9	22	8.7
Common	7	1.8	4	1.4	2	0.8
Total	140	36.2	85	30.3	72	28.4

A=Number of records. B=Per cent of total number of samples collected at that depth.

38. Ceratium concilians Jörgensen
Figures 17H-I, chart 30, appendix table 35

This species was formerly included in C. gibberum but was separated by Jörgensen (1920) and this separation has been accepted by later workers (Peters, 1934; Nielsen, 1934). Böhm (1931), however, figured C. gibberum under the caption of C. concilians Jörgensen.

Peters (1934) considered this species to be an indicator of warm oligotrophic water in the South Atlantic. Nielsen (1934), however, found that in the South Pacific the species is found as much in eutrophic oceanic water as in oligotrophic oceanic water. It did, however, seem to avoid neritic conditions. In the Carnegie collection in the Pacific it was found in both eutrophic and oligotrophic water. This feature could not be considered for the Atlantic as it was found at only one station there (in oligotrophic water). On the Carnegie cruise it was found in eutrophic water in the southeastern Pacific, again off Peru, and off California. On the other hand, it occurred in many waters poor in plankton and nutrients. Thus, thirty of the seventy-five records of occurrence for the species were in water containing less than 10 mg PO_4/m^3. It must be concluded that C. concilians is not limited to one type of water.

The species is not very common. In the Carnegie collection it was found at a total of forty-two stations, only one of which was in the Atlantic. The number of sample records was seventy-five, of which fifty-nine were rare, fourteen occasional, and two common. It is much less common than its close relative, C. gibberum. Since it is a fairly large form, it was found more frequently in the net samples. There were forty-seven net records and twenty-eight pump records.

The range of surface temperatures for the species is rather large for a tropical form, namely, from 16.°4 (station 128) to 29.°4 C (station 95). The ranges of environmental conditions in situ were: temperature, 12.°1 to 29.°3 C; salinity, 33.0 to 36.4 per mille; pH, 7.71 to 8.47; phosphate, 3 to 198 mg PO_4/m^3.

Nielsen (1934) designated C. concilians as a surface form. According to the Carnegie data, however, it is found about equally at the surface, 50 meters, and 100 meters (see table 32).

Table 32. Records of occurrence of C. concilians at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	24	5.3	17	6.0	18	7.1
Occasional	8	2.0	4	1.4	2	0.8
Common	2	0.5	0	....	0	....
Total	34	7.8	21	7.4	20	7.9

A=Number of records. B=Per cent of total number of samples collected at that depth.

A form was found at station 130 (fig. 17I) which has rather regular antapical horns and thus represents a variety of C. concilans corresponding to var. subaequale of C. gibberum.

39. Ceratium lunula Schimper
Figures 17J-N, chart 31, appendix table 36

Two forms of this species are commonly recognized; f. brachyceros with short apical horn and comparatively long antapicals; and f. magaceros with somewhat shorter antapicals but with long apical horn. The latter form represents the anterior cell of a chain, whereas f. brachyceros represents the remaining cells in the chain. It is inconsistent to name the two elements of a chain in this species alone as similar differences occur in the anterior and following cells of the other species as well.

In the Atlantic the species is distributed over the warm Atlantic region, extending to latitude 39° north, but it is absent from the cold North Atlantic region.

The distribution of C. lunula at Carnegie stations in the Pacific is unique among the Ceratium species (chart 31). It is similar to that of C. breve but even more restricted (see p. 27). It is definitely a tropical species and its distribution within the limits of 17° south and 20° north latitude is fairly continuous. It was not found outside these limits except in the western Pacific, where it extended in a continuous line to about 38° north off Japan (station 115). It was conspicuously absent in the loop of stations between the United States and Hawaii. It was also notably absent from all the stations in the southeastern Pacific south of 20° south. An explanation for this peculiar distribution is difficult to find. Certainly it has no relation to temperature as many of the stations where it does not occur have much higher temperatures than many of the stations where it was found. The nutrient content of the water cannot be a determining factor either. The area north and east of the Hawaiian Islands is extremely oligotrophic but so also is the region between Japan and Guam in the western Pacific, where the species was found in large numbers. Conversely, many stations in the southeast Pacific region are in eutrophic water and yet did not support this species. Is it possible that this species normally is confined within 20° of the equator in the Pacific except off Japan where it is displaced by the Kuroshio, or are the Carnegie records not representative?

Peters (1934) did not find C. lunula south of 30° south latitude in the South Atlantic. The records of the Dana (Nielsen, 1934) for the South Pacific fit in well with the distribution compiled from Carnegie data. Most of the Dana records duplicate records of the Carnegie between Panama and Samoa but its records extend somewhat west of Samoa. Nielsen, however, did not find the species south of 20° south. Thus, it is probable that the Carnegie records are representative and that the species normally is as restricted as these records indicate. Since the species is displaced northward off Japan, it is surprising that it is not also displaced southward in the region of Easter Island.

The total number of station records for the species in the Carnegie collection was sixty-eight, of which twelve were from the Atlantic and fifty-six from the Pacific. The total number of sample records was 144, of which 88 were rare, 52 occasional, and 4 common. The species was found much more frequently in the net samples, with 121 net records and only 23 pump records. Thirty of the 144 records were in water containing less than 10 mg PO_4/m^3.

Ceratium lunula was always found in water of high temperature. In the Atlantic the surface temperatures at its stations were all above 24° C, except one which was 20.°5 C. In the Pacific the surface temperatures were above 20° except at one station off Japan, where it was 19.°9 and at the Galapagos where it was 18.°7 C. The ranges of environmental conditions in situ were: temperature, 11.°4 to 29.°3 C; salinity, 29.7 to 37.0 per mille; pH, 7.71 to 8.47; phosphate 3 to 220 mg PO_4/m^3.

Ceratium lunula is probably a shade species which comes to the surface in waters rich in plankton. Nielsen (1934) found it in the deeper hauls in the stations poor in plankton. Jörgensen (1920) found it at greater depths in the Mediterranean during the summer months. The Carnegie records, not segregated according to richness of plankton, show the highest percentage of records at 50 meters and a greater percentage at 100 meters than at the surface (table 33). These records thus corroborate the classification of this species as a shade form.

Table 33. Records of occurrence of C. lunula at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	35	9.1	30	10.7	23	9.0
Occasional	15	3.9	24	8.5	13	5.2
Common	3	0.8	0	.....	1	0.4
Total	53	13.8	54	19.2	37	14.6

A=Number of records. B=Per cent of total number of samples collected at that depth.

40. Ceratium carnegiei n. sp.
Figures 18A-C

Transdiameter 92.5 (90 to 100) microns (six specimens measured). Curvature of antapical horns similar to that in C. lunula. Apical horn long and straight or slightly curved to right. Body of epitheca slightly to greatly inflated. In extreme cases the walls are parallel for about one transdiameter from the girdle, at which point they may be expanded to greater than girdle diameter. Body walls thick and covered with numerous lists as in the heavy specimens of C. lunula.

The species was found at four stations, all in the Pacific. At one of these, station 71 off Peru, the body was not much inflated. The most extreme cases were found at the warmer stations, stations 151, 152, and 158. It occurred at the surface at station 71, but at 50- and 100-meter depths at the other stations. The surface temperatures at the stations where it was found, varied from 23.°5 to 28.°2 C. The environmental conditions in situ were: temperature, 12.°5 to 27.°6 C; salinity, 35.9 to 34.0 per mille; pH, 7.87 to 8.39; phosphate, 48 to 58 mg PO_4/m^3.

41. Ceratium contortum Cleve
Figures 18D-N, chart 32, appendix table 37

There has been much confusion in the literal regarding of the taxonomy of both C. contortum Cleve and C. karstenii Pavillard (C. arcuatum Cleve). After a thorough study of the extensive material of the Carnegie collection, the writers came to the conclusion that these two species represent variants of a single species. The difficulties of previous workers probably have been owing in large part to the fact that they were attempting to differentiate between these two forms when in fact they do not exist and the separation is an artifical one.

Thus, Jörgensen (1911) in his monograph gives C. karstenii, C. longinum, and C. contortum as distinct species. Ceratium contortum is characterized by slightly distorted body and slightly inward-bent right antapical horn, except in var. saltans Schröder, which has a very decidedly distorted body and sharply bent right antapical horn. Jörgensen's figure of C. karstenii (fig. 117a), however, shows a specimen with a curled right antapical horn, which is certainly to be considered a double bending and represents a zone of instability in the same position as the bending in the horn of contortum. He represented C. longinum as more slender than C. karstenii and with longer and straight antapical horns. He also separated from C. karstenii, var. robustum, a variety which is more robust than the main species and has shorter and straight antapical horns. This form resembles C. tripos.

Later, Jörgensen (1920) found all intergrades between C. karstenii and var. robustum so he no longer considered it even a good variety.

Peters (1934) treated C. longinum as a variety of C. karstenii. He apparently considered saltans a distinct variety of C. contortum, but does not give a figure of the main species. His figures of C. karstenii and C. contortum (figs. 10e and g, plate 2) show equally distorted bodies. Nielsen (1934), in his study of the Dana South Pacific material, treated C. karstenii and C. contortum separately. He agreed with Peters (1934), however, that var. robustum cannot be separated from C. karstenii. He stated that he did not find C. longinum in his collections but his figure of C. contortum f. subcontortum (fig. 52) answers well to this form. He considered it a shade form of C. contortum.

In the Carnegie collections every possible intergrade was found between C. contortum, C. longinum, and C. karstenii, and the varieties robustum and saltans (see fig. 18). There are heavy forms and light forms; some with long horns and some with short. There are specimens with kinked horns, but not much distorted body; and, on the other hand, specimens with regular body, but bent horns. The right antapical may bend in or out, or may trail off in an attenuated manner. The extreme forms were represented by var. saltans and usually were smaller than the others and it was thought for a while that a separation of two species could be made on this basis. After measuring many specimens from all localities, however, it was found that this was impossible. There is indeed a great variation in size. The transdiameters range from 52 microns in the smaller specimens of saltans to 110 microns in the more robust specimens. There was no segregation into size groups, however; the greatest number of specimens had transdiameters ranging between 70 and 85 microns.

Ceratium contortum is a common, slightly tolerant tropical species. It was found at practically all stations in the warm Atlantic, warm Pacific, and southeast Pacific regions, but was completely absent from the cold North Atlantic and cold Pacific regions (chart 32).

Nielsen (1934) listed C. longinum Karsten as an Atlantic form absent from the Pacific. It occurred in the Carnegie collection, however, at many stations in the Pacific.

The commonness of the species is shown by the large number of sample records, namely, 461, of which 194 were rare, 178 occasional, 84 common, and 5 abundant. The net records for the species totaled 327; the pump records, 134.

The range of surface temperatures at the stations where the species occurred, varied from 16.°3 to 29.°5 C. The ranges of environmental conditions in situ were: temperature, 11.°4 to 29.°4 C; salinity, 30.0 to 37.1 per mille; pH, 7.17 to 8.47; phosphate, 2 to 138 mg PO_4/m^3.

Many of the specimens have attenuated and sometimes curved antapical horns which are extremely thin-walled. It is probable that this is an adjustment to shade conditions. Nielsen (1934) considered the subcontortum form (longinum?) a shade form of C. contortum. In the Carnegie material var. saltans showed a greater frequency at greater depths than did the more regularly-shaped forms. Although the more robust forms sometimes occurred with thin antapicals, this condition was much more common in the saltans group. In the others the larger specimens were much more predominantly surface forms. Among the specimens more than 80 microns in diameter, there were twice as many surface records as 50-meter records and very few at 100 meters. Of the specimens less than 80 microns in diameter, the number of records at the surface and 50 meters was about equal, although the number at 100 meters was almost negligible. Among saltans, too, the greatest frequency was at the surface. The percentages for the species as a whole show a predominance at the surface (see table 34).

Table 34. Records of occurrence of C. contortum at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	95	27.7	54	19.2	45	17.7
Occasional	80	20.7	53	18.7	45	17.7
Common	34	8.8	33	11.7	17	6.7
Abundant	4	0.2	0	.....	1	0.4
Total	213	57.4	140	49.6	108	42.5

A=Number of records. B=Per cent of total number of samples collected at that depth.

42. Ceratium limulus Gourret

Figure 19A, chart 33, appendix table 38

This is a rather rare intolerant tropical species which is quite characteristic and not very variable. Peters (1934) considered this species an indicator of warm oligotrophic water in the South Atlantic; but Nielsen (1934) found it in both oligotrophic and eutrophic water in the South Pacific, with its greatest abundance in eutrophic water. In the Carnegie collection it was found only in oligotrophic water in the Atlantic, but in both eutrophic and oligotrophic water in the Pacific. Is it possible that the Atlantic form is less adaptable in this regard than the Pacific form?

The species was found at fifty-five stations--nine in the Atlantic and forty-six in the Pacific. The Atlantic stations were confined to the warm Atlantic region where the surface temperatures were high (from 24.°8 to 27.°6 C) and the nutrient content of the water was low. The phosphate values for the upper 50 meters were all below 11 mg PO_4/m^3. In the Pacific the stations were confined to the warm Pacific region for the most part, although there were six stations in the southeast Pacific region. The range of conditions at the Pacific stations was much greater than those at the Atlantic stations. For instance, the surface temperatures varied from 18.°7 to 29.°3 C, and the mean phosphate value for the upper 50 meters varied from 4 to 83 mg PO_4/m^3. It should be noted, however, that all stations were remote from continents.

The ranges of environmental conditions in situ for the species at all stations were as follows: temperature, 13.°8 to 28.°2 C; salinity, 33.9 to 36 per mille; pH, 8.47 to 7.80; phosphate, 4 to 150 mg PO_4/m^3.

Thirty of the eighty-eight records were from water containing less than 10 mg PO_4/m^3.

The total number of sample records for the species was eighty-eight, of which eighty-five were rare and three occasional. There was a large proportion of pump records owing to the small size of the species (thirty-nine pump records and forty-nine net records).

Ceratium limulus apparently lives at various depths but is found somewhat more frequently in the upper levels. Bõhm (1931) found it in the Adriatic as deep as 200 meters. Nielsen (1934) found it predominantly in the 50- to 0-meter samples. In the Carnegie collection the species was found with decreasing frequency with increase in depth to 100 meters (table 35), although the frequency at 100 meters (in percentage) was more than half that at the surface.

Table 35. Records of occurrence of C. limulus at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	39	10.1	28	9.9	18	7.1
Occasional	2	0.6	1	0.4	0	....
Total	41	10.7	29	10.3	18	7.1

A=Number of records. B=Per cent of total number of samples collected at that depth.

43. Ceratium paradoxides Cleve
Figure 19B, chart 34, appendix table 39

This is a rare intolerant tropical species. Peters (1934) found it in both oligotrophic and eutrophic water in the South Atlantic. Nielsen (1934) found it scattered over the region traversed by the Dana from Panama to Australia. It is never common and its distributional records are discontinuous for this reason.

In the Carnegie collection the species was found at sixty-four stations--thirteen in the Atlantic and fifty-one in the Pacific. In the Atlantic the stations were confined to the warm Atlantic region. In the Pacific they were restricted to the warm Pacific region and the southeast Pacific region (see chart 34).

There were ninety-one records of occurrence, of which eighty were rare and eleven occasional. Sixty-six of these records were from net samples and twenty-five were from pump samples.

Nielsen (1934) stated that C. paradoxides is a shade species, and this is corroborated by the Carnegie observations. In fact, its vertical distribution is most decidedly stratified. As shown in table 36, there were only six records for the surface samples (representing only 1.6 per cent of the samples), whereas the species was found in 22.8 per cent of the 100-meter samples.

The surface temperatures at the stations where C. paradoxides occurred in the Atlantic varied from 20.°5 to 27.°6 C; in the Pacific from 19° to 29.°5 C. The environmental conditions in situ were as follows: temperature, 12.°1 to 29.°3 C; salinity, 33.4 to 37.0 per mille; pH, 7.17 to 8.39; phosphate, 4 to 123 mg PO_4/m^3. It was found in both eutrophic and oligotrophic water. Thirty-four of the ninety-one records were in water containing less than 10 mg PO_4/m^3.

Table 36. Records of occurrence of C. paradoxides at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	5	1.3	26	9.2	49	19.3
Occasional	1	0.3	1	0.4	9	3.5
Total	6	1.6	27	9.6	58	22.8

A=Number of records. B=Per cent of total number of samples collected at that depth.

44. Ceratium platycorne Daday
Figures 19C-H, chart 35, appendix table 40

This is a rare, slightly tolerant tropical species. Varieties of the species have been described, but these are of no particular importance. Variety cuneatum Jörgensen is not distinguishable from the main species. Its shorter truncated antapical horns probably are owing to autotomy or accidental breaking of the distal part of the horns. It is probable that the jagged edges of these horns never represent the original condition. Figure 19D shows a specimen with broken (truncate) right antapical which is shorter than the left. The right is normally longer than the left. Variety lamellicorne is somewhat more distinct. Nielsen (1934) found it quite distinct in the Dana collections. It is, however, simply a narrow-horned variant and intergrades are not absent (fig. 19G).

Ceratium platycorne is widespread over the tropical waters of the world and is sometimes displaced by currents. It has been found by others in the northern waters of the Atlantic (Paulsen, 1908; Lebour, 1925). In the Carnegie collection it occurred off Iceland, with a surface temperature of 12.°44 C. Otherwise, in the Atlantic it was confined to the warm Atlantic region, with surface temperatures above 20° C. In the Pacific it was limited to the warm Pacific and southeast Pacific regions, with surface temperatures ranging from 19.°27 to 28.°74 C. The ranges of environmental conditions in situ were: temperature, 12.°4 to 27.°6 C; salinity, 34.1 to 37.0 per mille; pH, 7.87 to 8.39; phosphate, 4 to 152 mg PO_4/m^3.

Peters (1934) found C. platycorne widespread in oligotrophic water in the South Atlantic, and Nielsen (1934) found it in the entire region between Panama and Australia. In the Carnegie collection it did not show any preference for one type of water. Eighteen of the fifty-three records of occurrence were from water containing less than 10 mg PO_4/m^3.

The species is not common. There were only forty-three stations at which it was found, of which fourteen were in the Atlantic and twenty-nine in the Pacific. The total number of records (fifty-three) is relatively small. Of these, forty-four were rare, eight occasional, and one common. There were thirty-eight net records, and fifteen pump records.

Ceratium platycorne is distinctly a shade species. The records indicate this even more definitely than in the case of C. paradoxides. Of the fifty-three records, only one was from the surface, whereas there were thirteen from 50 meters, and thirty-nine from 100 meters. The percentages are even more striking (table 37).

Table 37. Records of occurrence of C. platycorne at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	1	0.3	11	3.9	32	12.6
Occasional	0	....	2	0.7	6	2.4
Common	0	....	0	....	1	0.4
Total	1	0.3	13	4.6	39	15.4

A=Number of records. B=Per cent of total number of samples collected at that depth.

45. Ceratium ranipes Cleve
Figures 19I-K, 20, 21A, chart 36, appendix table 41

This is a rather common, slightly tolerant tropical species. It is variable in respect to the number of "fingers;" there may be three or four (fig. 21A) or 19 and 21 (fig. 20). The "few-fingered" forms were formerly segregated as var. ranipes of C. palmatum but, since a complete intergradation between it and the main species is commonly found, the variety recently has been disregarded (Peters, 1934; Nielsen, 1934). There is a great variation in the length of the antapical horns. The long horns usually have fewer fingers (cf. figs. 19I, 21A). A specimen was found in the Carnegie collection with an extremely large number of fingers (fig. 20). There were nineteen on the left horn and twenty-one on the right. According to the theory of shade forms (Nielsen, 1934), extreme flattening of the ends of the hind horns and their division into a number of linear branches represents an adaptation of the species to shade conditions. This is substantiated by the fact that the hind horns and fingers are densely packed with chromatophores, and is conclusively shown by the vertical distribution of species records (see below).

The horizontal distribution of C. ranipes is typical of slightly tolerant tropical species. It shows a slight tendency to drift out of the tropical regions. It was found at a total of seventy-nine Carnegie stations--twenty-one in the Atlantic and fifty-eight in the Pacific. In the Atlantic the stations were all confined to the warm Atlantic region, with the exception of one (station 3) where the species was displaced into colder water (surface temperature 15.°5 C). In the Pacific the stations were limited to the warm Pacific region and the southeast Pacific region. The range of surface temperatures at the Pacific record stations was 18.°7 to 29.°5 C.

The ranges of environmental conditions in situ for both oceans were as follows: temperature, 13.°1 to 29.°3 C; salinity, 33.7 to 36.8 per mille; pH, 8.00 to 8.47; phosphate, 2 to 99 mg PO_4/m^3.

Ceratium ranipes probably is more or less uniformly distributed in all tropical waters. Peters (1934) found a slight indication of preference for oligotrophic water in the South Atlantic, but Nielsen (1934) found the species in both eutrophic and oligotrophic water and even in neritic conditions in the South Pacific. In the Carnegie collection no preference for oligotrophic water was indicated. Forty-seven of the 147 records of occurrence were in water containing less than 10 mg PO_4/m^3.

Ceratium ranipes is a fairly common species, as indicated by Carnegie records. There was a total of 148 records of occurrence, with 116 rare and 32 occasional. Thirty-nine of these were pump records and 108 were net records.

Ceratium ranipes is definitely a shade species. Nielsen (1934) found it at deeper levels except at stations rich in plankton where it was found mostly above 50 meters. In the Carnegie collection the species was found with increasing frequency with increase in depth down to 100 meters. Expressed in percentage, the number of records at 100 meters was more than twice that at the surface (see table 38).

Table 38. Records of occurrence of C. ranipes at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	30	7.8	42	14.9	44	16.9
Occasional	8	2.1	12	4.2	12	4.7
Total	38	9.9	54	19.1	56	21.6

A=Number of records. B=Per cent of total number of samples collected at that depth.

46. Ceratium macroceros (Ehrenberg) Vanhöffen
Figures 21B-F, chart 37, appendix table 42

Ceratium macroceros is a semicosmopolitan species with a peculiar distribution. In the Atlantic there are two subspecies (Jörgensen, 1911, 1920). One, commonly called the main species, is northern and extends south to the Bay of Biscay and the northern parts of the Gulf Stream. For convenience, it is here named subsp. macroceros n. subsp. The tropical form is subsp. gallicum Kofoid. Jörgensen (1920) found only subsp. gallicum in the Mediterranean. Peters (1934) stated that in the South Atlantic subsp. gallicum predominated everywhere except in regions VI and VII (south of Africa and westward in the general latitude of 40° south), where there was a form similar to the main species of the North Atlantic. Unfortunately, he did not figure this form. It may be an antarctic subspecies indicating a bipolarity in the Atlantic. Nielsen (1934) found only subsp. gallicum in the South Pacific. In the Carnegie collections in the Atlantic the two subspecies characteristic of the North Atlantic were found. Subspecies macroceros occurred north of 40° north and at two stations south of this latitude, stations 15 and 16. Conversely, subsp. gallicum occurred principally at the tropical stations but also at one station north of 40° north, station 13. The specimens there, however, were not typical of the tropical subspecies but were in the nature of intergrades.

The northern subspecies, subsp. macroceros n. subsp., differs from subsp. gallicum in its size, shape, and curvature of antapical horns. The transdiameter of the northern form is usually from 50 to 55 microns, whereas in subsp. gallicum it is less than 50 microns. The northern form is more robust generally, and the body is somewhat longer. The antapical horns in the two forms leave the body at about the same angles but in subsp. gallicum they are much more abruptly turned anteriorly and all their horns are thinner (cf. figs. 21E and F).

The species as a whole is one of the most common of the genus. It was found at 148 stations--42 in the Atlantic and 106 in the Pacific. It was found frequently in all the samples from a station so that the total number of sample records for the species is large, namely, 482. Of these, 226 were rare, 201 occasional, 54 common, and 1 abundant. Net records predominated, of which there were 307 as compared with 175 pump records.

When dealing with a species as common as this one, a series of negative records is significant. In this connection it is interesting to turn to the distribution of the species in the North Pacific (chart 37). Subspecies gallicum was found at every station in the warm Pacific region except one off Japan, where its northern distribution in the west ended abruptly at about 38° north latitude. In the east, off California, the northern limit was equally abrupt but there it was above 40° north latitude, with one station in the cold North Pacific region. Otherwise, no representative of C. macroceros was found in the cold North Pacific region. The absence of subsp. macroceros in this area is a good indication of the planktologic isolation of the North Pacific (see p. 11).

In the South Pacific in this species we find evidence of the continuity of the colder waters of all the southern oceans. In the extreme southeastern part of the area traversed by the Carnegie the species assumed the aspect of subsp. macroceros (fig. 21C). This is possibly the southern form mentioned by Peters (1934) from the Atlantic.

Subspecies gallicum may be classified as slightly tolerant tropical. Off Japan it extended into water with surface temperature of 19.°9; off the west coast of America to temperature of 16.°4, and in the southeast Pacific to 15.°0 C. In the Atlantic subsp. gallicum occurred at surface temperatures of about 20° C, except at station 13, where the temperature was 11.°3 C.

The ranges of environmental conditions in situ were: temperature, -1.°6 to (29.°4) C; salinity, 31.7 to 37.1 per mille; pH, 7.17 to 8.47; phosphate, 2 to 123 mg PO_4/m^3.

It should be noted that the species was not found at a line of stations off Peru nor between the Galapagos Islands and Panama with the exception of two stations. The waters here, especially off Peru, are eutrophic; the phosphate content in the upper 50 meters is mostly above 50 mg PO_4/m^3. Is it possible that this accounts for the absence of C. macroceros? The temperatures at these stations were mostly above 20° C, so temperature hardly can be responsible. Possibly C. macroceros avoids high concentrations of nutrients. In this connection it should be noted that in the North Atlantic, where C. macroceros occurs at low temperatures, the phosphate content in the upper 50 meters is mostly below 50 mg, whereas in the northern North Pacific, where the species is absent, it is mostly above 100 mg. These conditions must be taken into account in any attempt to explain the distribution of this species. It was pointed out in the general discussion (p. 7), however, that it is not likely that the concentration of such plant nutrients as phosphate and nitrate found in the oceans are important in the qualitative distribution of Ceratium species.

Ceratium macroceros occurs rather uniformly down to the 100-meter depth. Nielsen (1934) found it mostly above 50 meters, but in the Carnegie collection the greatest percentage was at 50 meters, with slightly lower percentages at the surface and 100 meters (table 39).

Table 39. Records of occurrence of C. macroceros at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	94	24.1	79	28.0	54	21.2
Occasional	75	19.5	75	26.6	51	20.1
Common	25	6.5	20	7.1	9	3.5
Abundant	1	0.3	0	.....	0	.....
Total	195	50.4	174	61.7	114	44.8

A=Number of records. B=Per cent of total number of samples collected at that depth.

47. Ceratium massiliense (Gourret) Jörgensen
Figures 22E-L, chart 38, appendix table 43

Ceratium massiliense is one of the most variable and difficult species of the genus. The typical form is shown in figure 22F (which, incidently, is a two-celled chain). It has the most common form of body, although the horns frequently are much shorter. Variety armatum (Karsten) Jörgensen is shown in figure 22L. This was rare in the Carnegie collection. Peters (1934) considered it to be a cold-water subspecies in the South Atlantic, but in our collection no correlation with lower temperature was evident. Variety protuberans (Karsten) Jörgensen is another variation of the species which has been recorded in the literature. It has a somewhat elongated body and thin antapical horns, which are somewhat more widely spread than in the typical form (fig. 22I). There is a form in the Atlantic which simulates somewhat C. deflexum (fig. 22H). This probably accounts for Peters' (1934) including C. deflexum in the species C. massiliense (see next species below). It will be noted that in this variety of C. massiliense the left antapical horn, where it leaves the body, is directed slightly antapically so the posterior curvature of the horn and the posterior edge of the body are not in the same line. The right antapical is directed somewhat more posteriorly than in the main form of the species. This type of divergence, as regards antapical horns, may be accentuated even more, so that the specimens resemble, to a degree, C. macroceros (fig. 22G). In this case the curvatures of the antapical horns extend to a distance about 0.5 transdiameter beyond the body. A variation of this is shown in figure 22J in which the right horn does not extend far posteriorly but laterally. Still another variation was found in which the origins of the antapicals are more lateral than in the main species, and the horns themselves are much more widespread (fig. 22K).

Most of the Carnegie material of this species could be placed in one of the above nine varieties. Intergrades were fairly common, however, so the complex as a whole represents a single variable species. The varieties showed no correlation with geographic position or hydrographic conditions, except that the deflexum type was confined to the Atlantic.

There is also a form which tends toward the body shape of C. contrarium (fig. 22E). The left antapical leaves the body in line with the posterior edge of the body; the right extends somewhat posteriorly. The horns are slender. A four-celled chain was found in this form.

The species, as a whole, is one of the most common of the genus. It is a very tolerant tropical species which may be displaced by currents. It was found at a total of 152 stations--28 in the Atlantic and 124 in the Pacific. In the Atlantic it was found at practically every station in the warm Atlantic region and at three stations in the cold Atlantic region, the most northern of these being station 6c off Ireland where the surface temperature was 12.°4 C. In the Pacific it occurred almost continuously throughout the warm Pacific and southeast Pacific regions. It extended northward at either side of the Pacific, somewhat beyond the limits of this region: off Japan to station 116 where the surface temperature was 16.°1 C; and off the United States to station 128, surface temperature 16.°4 C. In the southeastern Pacific it occurred at the southernmost station, station 60, where the surface temperature was 15.°0 C.

The environmental conditions in situ were: temperature, 10.°6 to 29.°5 C; salinity, 29.7 to 37.0 per mille; pH, 7.17 to 8.47; phosphate, 2 to 233 mg PO_4/m^3.

Of the 476 records, 194 were from water containing less than 10 mg PO_4/m^3.

The species is quite common, as shown by the number of sample records which totaled 479. Of these, 159 were rare, 210 occasional, 102 common, and 8 abundant. Net samples predominated, with 348 records as against 131 pump records. The large number of net records doubtless was owing to the large spread of the horns which made the capture of this species efficient in the coarser cloth of the tow net.

Nielsen (1934) classified C. massiliense as a surface species. The Carnegie data corroborate this (table 40). The species was found with decreasing frequency with increase in depth although the decrease was not great.

Table 40. Records of occurrence of C. massiliense at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	65	16.9	45	15.6	49	18.9
Occasional	96	24.9	65	22.3	49	19.3
Common	55	14.3	31	11.0	16	6.3
Abundant	5	1.3	2	0.7	1	0.4
Total	221	57.4	143	49.6	115	44.9

A=Number of records. B=Per cent of total number of samples collected at that depth.

48. Ceratium deflexum (Kofoid) Jörgensen
Figures 22C-D, chart 39, appendix table 44

Ceratium deflexum is an intolerant tropical species, probably restricted to the Pacific and Indian oceans. Peters (1934), in his study of the material of the Meteor from the South Atlantic, included C. deflexum as a variation of C. massiliense. Unfortunately, he did not give a figure of it. Undoubtedly it was the variety mentioned above (p. 38, fig. 22H), which is a variant of C. massiliense but is not to be identified with C. deflexum. Ceratium deflexum is characterized by a ventral curvature of the antapical horns (fig. 22D) which is not found in any of the variants of C. massiliense. In addition to this, the posterior extension of the horns is much greater than in C. massiliense. Ceratium deflexum is a distinctive species and is easily recognized after it has been observed once.

In the Carnegie collection it was found at fifty-three stations--all in the Pacific. There were 105 records of occurrence, of which 58 were rare, 34 occasional, and 13 common. Eighty-four were from net records and 21 were from pump records.

Most of the stations were concentrated in the eastern and central Pacific between latitudes 20° north and 20° south, except for one station at Japan and two stations in the southern part of the southeast Pacific region. The species probably is not as limited in its distribution as the Carnegie data indicate, since it was found off San Diego, California by Kofoid (1907a), in the China Sea south of 20° north latitude by Böhm (1931), and in the Indian Ocean by Jörgensen (1911).

The species was found only at stations with high temperatures, except at the two stations to the southeast. The surface temperatures at the main group of stations ranged from 18.°7 to 29.°3 C; at the two stations in the southeast, 16.°9 and 19.°2 C. The ranges of environmental conditions in situ were: temperature, 10.°8 to 29.°3 C; salinity, 29.7 to 36.5 per mille; pH, 7.82 to 8.47; phosphate, 4 to 166 mg PO_4/m^3.

The curious distribution of this species may be owing to a preference for eutrophic water. In the large oligotrophic area of the North Pacific, where the average phosphate content of the upper 50 meters was less than 10 mg PO_4/m^3, there were only nine stations. Its absence off Peru might be attributed, then, to lower temperatures, and its absence in the Easter Island region to oligotrophic conditions. The greatest number of stations were in the regions where the average phosphate content was above 25 mg and the greatest populations were found at stations where the phosphate content was above 25 or 50 mg PO_4/m^3. In this connection it is to be noted that of the 107 sample records for the species, only 11 were in water containing less than 10 mg PO_4/m^3.

The species is a surface form. In the Carnegie collection it was found with decreasing frequency with increase in depth (see table 41). Thus, it was found in 15.5 per cent of the surface samples and only 6.7 per cent of the 100-meter samples. Because of contamination of the deeper hauls, the real distribution is probably even more definitely a surface one than the present data indicate.

Table 41. Records of occurrence of C. deflexum at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	32	8.0	16	5.7	11	4.3
Occasional	19	4.7	11	3.9	5	1.9
Common	11	2.8	1	0.3	1	0.4
Total	62	15.5	28	9.9	17	6.6

A=Number of records. B=Per cent of total number of samples collected at that depth.

49. Ceratium carriense Gourret
Figure 22A, chart 40, appendix table 45

This is a rather variable species of uncertain taxonomic position. Certain varieties have been named which show characteristic spread of horns (for instance, var. volans Cleve and f. ceylonicum Schröder), but in the

Carnegie collection many intergradations were found between these and still other variants so they have not been recorded. Some of the variants are similar to modifications of C. massiliense. Indeed, these two species may be identical. They have been kept separate in this report on the basis of the origin of the left antapical horn which in C. carriense starts in a posterior direction before curving laterally, so at its proximal end it does not form a straight line with the posterior edge of the body. The demarcation was indefinite, however, with numerous intergrades.

The distribution of the species as considered here is similar to that of C. massiliense, except that it does not extend as far outside the tropical regions. In the Carnegie collection in the Atlantic there is only one station outside the warm Atlantic region, station 13a. In the Pacific it has about the same distribution as C. massiliense in the north, but was not well represented in the southeastern part of the Pacific (chart 40). Nielsen (1934) found it in the Pacific from Panama to Australia, and Peters (1934) found it widely distributed in the warm water of the South Atlantic.

The total number of Carnegie stations at which it was found, was 111, 12 of which were in the Atlantic and 99 in the Pacific. The total number of sample records for the species was 281, with 138 rare, 124 occasional, and 19 common. The net records numbered 219; the pump records, 62.

The range of environmental conditions in which the species was found was similar to that of C. massiliense, though somewhat more restricted. The surface temperatures at its record stations in the Atlantic ranged from 21°.2 to 28°.5 C and in the Pacific from 16°.3 to 29°.5 C. Of the 281 records, 98 were from water containing less than 10 mg PO_4/m^3. The complete ranges of environmental conditions in situ were: temperature, 12°.5 to 29°.4 C; salinity, 29.7 to 35.9 per mille; pH, 7.82 to 8.47; phosphate, 3 to 153 mg PO_4/m^3.

Ceratium carriense is a surface species (Nielsen, 1934). In the Carnegie collection it was found with decreasing frequency with increase in depth (table 42).

Table 42. Records of occurrence of C. carriense at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	58	13.5	47	14.4	33	12.0
Occasional	51	13.0	43	14.2	30	11.9
Common	13	3.4	6	2.2	0	.....
Total	122	29.9	96	30.8	63	23.9

A=Number of records. B=Per cent of total number of samples collected at that depth.

50. Ceratium contrarium (Gourret) Pavillard
Figures 22E, 24A-B, chart 41, appendix table 46

This species is rather distinctive, and fairly constant in its body shape and origin of horns. There is one variation of the species, however, which has club-shaped ends on the antapical horns, var. claviceps Schröder (fig. 24B). In this variant the apical horn also may be expanded, but only gradually toward the tip. It was found rather frequently in both the Atlantic and Pacific. It apparently does not represent a response to shade conditions, as it was found frequently at the surface.

The species as a whole is one of the most common of the genus. Peters (1934) found it commonly in the South Atlantic to about 33° south latitude generally and to almost 40° south, south of the Cape of Good Hope. Nielsen found it at all oceanic stations in the South Pacific with surface temperatures over 19° C. In the Carnegie collection it occurred at almost all the stations in the warm Atlantic region, warm Pacific, and southeast Pacific region as well as at one station in the cold North Pacific region (chart 41). The total number of station records was 138, of which 20 were in the Atlantic and 118 in the Pacific. The total number of sample records was 467, of which 167 were rare, 172 occasional, and 128 common. The net records numbered 298; the pump records, 169.

The distribution of the species at Carnegie stations indicated a greater tolerance for lower temperatures in the Pacific than in the Atlantic. In the Atlantic it did not occur in the North Atlantic Drift but stopped abruptly at the 20° isotherm. In the Pacific, on the other hand, it occurred to surface temperatures of 16°.4 off the United States, and 15° C at 40° south in the southeastern Pacific. It showed no regard for the nutrient content of the water, being found as much in oligotrophic as eutrophic water. Of the 467 records of occurrence, 154 were in water containing less than 10 mg PO_4/m^3. The environmental conditions in situ were as follows: temperature, 10°.2 to 29°.5 C; salinity, 30.7 to 37.1 per mille; pH, 7.76 to 8.47; phosphate, 2 to 178 mg PO_4/m^3.

Ceratium contrarium is a surface species. Nielsen (1934) always found it more common in the 50- to 0-meter samples than in the deeper samples. In the Carnegie collection it was found with decreasing frequency with increase in depth (table 43). For example, it was found in 57.2 per cent of the surface samples, but only 37.4 per cent of the 100-meter samples.

Table 43. Records of occurrence of C. contrarium at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	80	20.8	50	17.4	37	14.6
Occasional	83	21.5	60	21.3	29	11.4
Common	58	15.1	41	14.5	29	11.4
Total	221	57.4	151	53.2	95	37.4

A=Number of records. B=Per cent of total number of samples collected at that depth.

51. Ceratium trichoceros (Ehrenberg) Kofoid
Figure 22B, chart 42, appendix table 47

This is a widespread intolerant tropical species characterized by widespread horns which lie parallel in their distal parts. It is fairly constant in its shape, although Nielsen (1934) has noted a tendency for an increase in diameter in colder or neritic waters.

In the Carnegie collection the species was found widely distributed in the warm regions, although not so commonly as such species as C. massiliense. Ceratium trichoceros occurred at eighty-six stations--fourteen in the Atlantic and seventy-two in the Pacific. The total number of sample records for the species was only 181, of which 89 were rare, 67 occasional, 24 common, and 1 abundant. The net records numbered 118; the pump records, 63. Peters (1934) found it widespread in the warm South Atlantic but principally in his region I and along the west coast of Africa. Nielsen (1934) found it throughout the region from Panama to Australia.

According to the Carnegie distribution this is a rather strictly tropical species. In the Atlantic it was confined to the warm Atlantic region, with surface temperatures from 21°.2 to 28°.5 C. In the Pacific it was confined to the warm Pacific region and the southeast Pacific region. The total range of surface temperatures in the Pacific was from 19°.0 to 29°.5 C. The total ranges of environmental conditions in situ were: temperature, 14°.0 to 29°.4 C; salinity, 31.7 to 37.1 per mille; pH, 7.82 to 8.47; phosphate, 2 to 159 mg PO_4/m^3.

The Carnegie data do not show any preference on the part of this species for any particular type of water within the warm-water regions. It does not shun oligotrophic water. Of the 181 records of occurrence, 63 were from water containing less than 10 mg PO_4/m^3.

It is uncertain at what depth this species normally lives most abundantly. Nielsen (1934) stated that it was always more abundant in his 50- to 0-meter samples. In the Carnegie collection, however, there were more records for 100 meters than for the upper levels, with the fewest records for the surface (see table 44).

Table 44. Records of occurrence of C. trichoceros at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	28	7.3	23	8.1	38	15.0
Occasional	20	5.2	23	8.1	24	9.5
Common	8	2.1	10	3.6	6	2.4
Abundant	1	0.3	0	....	0	.....
Total	57	14.9	56	19.8	68	26.9

A=Number of records. B=Per cent of total number of samples collected at that depth.

52. Ceratium vultur Cleve
Figures 23A-H, chart 43, appendix table 48

The species as here considered includes C. sumatranum (Karsten) Jörgensen and C. pavillardii Jörgensen. Ceratium vultur is a variable species with many variable characters giving rise to what seem, at times, separate species. The study of the extensive material of the Carnegie collections, however, convinced the authors that these are variants of a single large species. The intergrades between them are numerous. Peters (1934) and Nielsen (1934) have already considered C. vultur and C. sumatranum as a single species, with sumatranum a variety of the former. In our material it was possible to distinguish seven different varieties as follows.

Variety vultur (Cleve) is stout and long-horned (fig. 23H). The right antapical ascends moderately; the left antapical extends posteriorly less than 0.5 girdle width before turning anteriorly.

Variety japonicum (Schröder) is as above, except that the left antapical extends posteriorly more than 0.5 girdle width before turning anteriorly (figs. 23E-F).

Variety sumatranum (Karsten). The right antapical extends more or less laterally. The left antapical extends posteriorly a varying distance before turning anteriorly (fig. 23D).

Variety pavillardii (Jörgensen). The right antapical is as in var. sumatranum. The left antapical is kinked at the origin, and turns abruptly to the anterior (fig. 23C).

Variety regulare n. var. The right antapical extends laterally at the base but turns anteriorly. The left antapical does not extend posteriorly, but laterally, before turning anteriorly. In this respect it resembles C. massiliense (fig. 23G).

Variety reversum n. var. The right antapical is kinked at the origin and turns abruptly to the anterior. The left antapical extends somewhat posteriorly before turning anteriorly. The curvature of the antapical horns, then, is the reverse of that in var. pavillardii (fig. 23B).

Variety recurvum Jörgensen. The right antapical begins laterally, then at about half its length turns posteriorly. The left antapical begins posteriorly, turns laterally, and then posteriorly (fig. 23A).

Most of these varieties had the same distribution in both the tropical Atlantic and Pacific oceans. Varieties regulare and reversum, however, were confined to the Pacific, whereas var. recurvum was common in the North Equatorial Current of the Atlantic but occurred at only two stations in the entire Pacific, stations 98 and 149.

The species as a whole is intolerant tropical and confined to regions of warm water. Peters (1934) found C. vultur to be confined to warm, definitely oligotrophic water. Nielsen (1934) found it in the Panama region and the South Equatorial Current. In the Carnegie collection in the Atlantic it was confined to the warm Atlantic region, with surface temperatures ranging from 20°.5 to 28°.5 C. It was found at all stations in this region except one (chart 43). In the Pacific it was confined to the warm Pacific and southeast Pacific regions. The surface temperatures at the Pacific stations varied from 19°.4 (station 66 in the southeast Pacific) to 29°.4 C. The ranges of environmental conditions in situ were: temperature, 19°.8 to 29°.3 C; salinity, 29.7 to 37.1 per mille; pH, 7.76 to 8.42; phosphate, 2 to 189 mg PO_4/m^3.

It occurred at ninety-nine stations--twenty-four in the Atlantic and seventy-five in the Pacific. There were 251 records of occurrence, with 168 rare, 71 occasional, and 12 common. Of these, 203 were net records and 48 were pump records.

Nielsen (1934) found both the main species and var. sumatranum to be shade species. The Carnegie data substantiate these findings in that they show an increasing frequency with increase in depth (table 45).

Table 45 Records of occurrence of C. vultur at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	58	15.1	59	20.1	51	20.1
Occasional	27	7.1	21	7.5	23	9.1
Common	8	2.1	1	0.4	3	1.2
Total	93	24.3	81	28.0	77	30.4

A=Number of records. B=Per cent of total number of samples collected at that depth.

53. Ceratium horridum Gran
Figures 23I-L, 24C-I, 25A-G,
chart 44, appendix table 49

This species comprises a variable and uncertain group of the genus. The authors cannot agree with Jörgensen (1920), however, who combines this group with C. tenue. Peters (1934) followed Jörgensen's classification but did not name or figure any of the forms of the inclusive species. Paulsen (1930) and Nielsen (1934), on the other hand, separated C. horridum from C. tenue, as the authors have done in the present report. The two species can be separated on the basis of body shape and curvature of horns and also, in part, on the basis of size. The different shapes can be seen by reference to figures 23 to 26. Ceratium horridum is larger than C. tenue, having an average diameter of 44 microns as compared with 37 microns for C. tenue. The extremes, however, overlap, with a minimum of 30 microns for C. horridum and a maximum of 45 microns for C. tenue.

Ceratium horridum is made up of a number of variable units; formerly separated as C. horridum (C. intermedium), C. molle, and C. claviger. Nielsen (1934) still considered C. claviger a species distinct from C. molle, but in the Carnegie collection no evidence for this separation was found. It seems best, therefore, to treat these forms as varieties.

Variety molle and var. claviger are tropical forms, whereas var. horridum is more or less cosmopolitan. It is probable that there are northern and tropical forms of var. horridum which overlap in such a way that they are not distinguishable. In any event, a certain difference can be discerned between the cold- and warm-water forms. In figures 24D and G are two specimens representative of the cold-water form of the North Atlantic; figure 24H shows a specimen from the warm Gulf Stream or North Atlantic West Wind Drift. Peters (1934) found the inclusive species widespread over the South Atlantic, as did Nielsen (1934) in the South Pacific.

The Pacific material is similar to that of the Atlantic, at least in part. The variety in the Panama region, for instance, (fig. 24E) is similar to the Gulf Stream form. The Galapagos form (fig. 25B), on the other hand, rather closely resembles the cold-water form of the North Atlantic. In the cool water of the southeast Pacific the variety was more robust and long-horned (fig. 25E). In the Humboldt Current the variety was even more robust and the horns were more extended (fig. 25F). In the warm equatorial waters it was slender and long-horned (fig. 24C). In the cold waters of the cold North Pacific region it was found only at three stations off the west coast of North America, stations 126 to 128, and at one station off Japan, station 114 (figs. 24I, 25A). At these stations the variety did not resemble the cold-water form of the North Atlantic. It was slender and long-horned, resembling much more the equatorial form of the Pacific (figs. 24C, 25G). It was, however, much more spiny. The surface temperatures at the eastern stations varied from 11°.2 to 16°.4 C and at the station off Japan it was 19°.9 C. The differences between the forms of var. horridum in the northern Atlantic and northern Pacific is another indication of the isolation of the northern Pacific waters. Its absence in the most northern (coldest) stations in this region, however, may be owing to the temperatures, which were mostly less than 10° C. This was lower than the temperatures of the northern Atlantic where the variety occurred.

Variety molle is similar to var. horridum but is confined to the warm regions. Its occurrence in the Carnegie collection was sporadic. Its most northern position in the Atlantic was at station 3 (see fig. 25D). Here it was rather robust but had the typical long horns. In the warmer stations it was more slender and delicate (see fig. 23I). The Pacific form of var. molle was quite similar to that of the Atlantic (see fig. 23K).

Frequently varieties were found which were difficult for the authors to assign to either molle or horridum. Figures 25C and G show two such. In a sense these are intergrades between the two varieties, but figure 25G shows a specimen with extremely long and attenutated antapical horns. Specimens such as this have been partly responsible, perhaps, for the opinion that C. horridum and C. tenue are part of the same species complex. It is not likely, however, that this represents an intergrade, as the origin of the horns and proximal curvatures are different from those of C. tenue (cf. figs. 26C-D).

Among recent workers, Nielsen (1934) is the only one who considered C. claviger Kofoid a separate species. This opinion probably is owing to a lack of sufficient material, as it is plain from the Carnegie material that this form is characterized only by the swollen ends of the antapical horns. The body shape and origins of horns may be that of var. horridum or var. molle (see figs. 23J, L).

The species as a whole is not very common. It was found at a total of eighty Carnegie stations--twenty-eight in the Atlantic and fifty-two in the Pacific. Since there are apparently cold- and warm-water varieties of the species, the ranges of temperatures for these stations are not very significant. In the Atlantic the surface temperatures at the record stations varied from 8°.9 to 28°.5 C and in the Pacific from 11°.2 to 29°.4 C. The environmental conditions in situ were as follows: temperature, 6°.3 to 29°.3 C; salinity, 31.7 to 36.8 per mille; pH, 7.68 to 8.39; phosphate, 4 to 233 mg PO_4/m^3.

The total number of sample records for the species was only 149, of which 96 were rare, 38 occasional, 11 common, and 4 abundant. The net records numbered 96; the pump records, 53.

Ceratium horridum is not a species of oligotrophic water. Although it was found in some "barren" regions, it occurred predominantly in richer waters. Only 16 of the 149 records were in water containing less than 10 mg PO_4/m^3.

The species is a decided shade form. In the cold-water region of the North Atlantic it was found about equally at the three levels, but elsewhere it was found much more frequently at greater depths, particularly at 100 meters. The depth records for the species throughout

Table 46. Records of occurrence of C. horridum at three levels

Occurrence	Depth in meters 0 A	0 B	50 A	50 B	100 A	100 B
Rare	31	8.1	32	11.4	33	13.0
Occasional	12	3.1	14	4.9	12	4.7
Common	1	0.3	3	1.1	7	2.8
Abundant	3	0.8	1	0.3	0	......
Total	47	12.3	50	17.7	52	20.5

A=Number of records. B=Per cent of total number of samples collected at that depth.

its entire range show an increase in frequency with an increase in depth (table 46).

54. Ceratium tenue Ostenfeld and Schmidt
Figures 26C-D, chart 45, appendix table 50

Two varieties of this species can be recognized: var. inclinatum, in which the antapical horns are directed more or less apically (fig. 26C); and var. tenuissimum, in which the antapical horns are directed laterally (fig. 26D). It is important to note that the origin and proximal curvatures of the antapicals in these varieties are the same, the differences being due to curvatures more than one-half girdle diameter from the body.

The two varieties do not have separate ranges of distribution but are found together in the warm regions of the world. The species as a whole is more common than C. horridum, but does not have any cold-water representative.

Peters (1934) apparently included this form in C. horridum, following Jörgensen (1920), but he gave no figures. Nielsen (1934), who separated it from C. horridum, stated that it had a distribution in the South Pacific similar to that species.

The total number of station records for the species in the Carnegie collection was 100--19 of these were in the Atlantic and 81 were in the Pacific. The Atlantic records were all restricted to the warm Atlantic region, with surface temperatures from 21.°2 to 28.°5 C. The Pacific stations were in the warm Pacific region and the southeast Pacific region, except for one station off California which extended into the cold Pacific region (station 128, surface temperature 16.°4 C). Throughout its range the species was found fairly uniformly except off Peru and the Panama and Galapagos areas, where it seldom occurred.

The total number of sample records for the species was 236, of which 129 were rare, 99 occasional, and 8 common. The net records numbered 115; the pump records, 121. The environmental conditions in situ were as follows: temperature, 8.°8 to (29.°4) C; salinity, 33.2 to 37.1 per mille; pH, 7.93 to 8.39; phosphate, 2 to 176 mg PO_4/m^3.

Ceratium tenue is definitely a shade species. In the Carnegie collection it was found with increasing frequency with increase in depth. There were almost four times as many records for 100 meters as for the surface (table 47). Nielsen (1934) also found the species to be a shade form in the Pacific.

Table 47. Records of occurrence of C. tenue at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	29	7.3	43	14.2	57	20.9
Occasional	14	3.6	35	12.1	50	18.9
Common	1	0.3	1	0.4	6	2.4
Total	44	11.2	79	26.7	113	42.2

A=Number of records. B=Per cent of total number of samples collected at that depth.

55. Ceratium longissimum (Schröder) Kofoid
Figures 26A-B, chart 46, appendix table 51

This is a rare intolerant tropical species. It is not variable in form and for this reason it is interesting to note a constant difference in the spread of the horns between the Atlantic and Pacific specimens. In the Atlantic form (fig. 26A) the three horns are practically parallel, whereas in the Pacific form (fig. 26B) the antapicals, although proximally almost parallel in position, soon diverge considerably from the apical horn. Also, the horns in the Pacific form are much more slender.

The species was found at twenty-eight stations--five in the Atlantic and twenty-three in the Pacific. The Atlantic stations were all in the warm Atlantic region, with surface temperatures above 20° C. The Pacific stations were in the warm Pacific and southeast Pacific regions with surface temperatures above 21° C. There was a particular concentration of stations in the general area between Hawaii and North America. The distribution as a whole was closely restricted as to latitude, lying between latitudes 14° south and 34° north. Nielsen's (1934) records, which were the first for the Pacific, lie within these limits except for one station in Australian waters at latitude 32° south. The temperature there, however, was above 20° C. In the Atlantic the northern limit was somewhat farther north than in the Pacific, namely, 38.°5 north.

The rarity of the species is further shown by the number of sample records, which was thirty-two. Of these, twenty-five were rare and seven occasional. Only six were pump records; twenty-six were net records. The species may prefer oligotrophic water as it was seldom found in regions rich in plankton and fifteen of the thirty-two records of occurrence were in water containing less than 10 mg PO_4/m^3. The ranges of environmental conditions in situ were: temperature, 12.°3 to 28.°0 C; salinity, 34.3 to 36.4 per mille; pH, 7.92 to 8.39; phosphate, 3 to 138 mg PO_4/m^3.

Ceratium longissimum is one of the most pronounced shade species encountered. Of the thirty-two records of occurrence, none were for the surface, only five for 50 meters, and twenty-seven for 100 meters (see table 48). Nielsen (1934) found it only in the samples taken from 200 to 100 meters and 100 to 50 meters.

Table 48. Records of occurrence of C. longissimum at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	0	....	5	1.8	20	7.8
Occasional	0	....	0	....	7	2.8
Total	0	....	5	1.8	27	10.6

A=Number of records. B=Per cent of total number of samples collected at that depth.

56. Ceratium arcticum (Ehrenberg) Cleve
Figures 26E-H, 27A-E, chart 47, appendix table 52

Ceratium longipes (Bailey) Gran and C. arcticum (Ehr.) Cleve intergrade in such a way that the authors are forced to include them under a single species. According to the international rules of botanical nomenclature the name for this inclusive species must be C. arcticum, as it was used as a specific name earlier than C. longipes (see Jörgensen, 1911, pp. 84-85). The longipes form, however, is sufficiently distinct to be separated as a variety. Variety ventricosum Ostenfeld is a robust, heavily armored form, with swollen body (fig. 26E). It is apparently limited to the northern Atlantic waters. In the Carnegie collection it occurred only in the cold Atlantic region, with the single exception of station 14, where the surface temperature was 21°.2. At the other record stations the temperatures were under 11° C.

Variety arcticum probably is more characteristic of colder water than is longipes, although not so much so as the name would indicate. Variety longipes is found more frequently over a wider range than var. arcticum, but the latter strays far from its northern home. Cleve (1900) found it as far south as the Azores and the Straits of Gibralter. In the Carnegie collection it was found as far south as 20° north in the central Atlantic (station 20) and at one station in the Caribbean (station 33). It was never found at the surface in these warm regions, however, although the temperatures in situ were quite high; namely, 25°.8 C at station 20 and 28°.2 C at station 33. This is a curious distribution for a species of Ceratium. Its center of abundance unquestionably is in the cold waters where the temperatures are less than 10° C at the surface in the summer; yet isolated specimens find their way into the heart of the tropics.

Apparently a similar situation exists in the North Pacific. The main distribution of arcticum is to the north in cold water (Carnegie stations 120 to 121, surface temperatures less than 8° C), yet a specimen was found at station 146 between Hawaii and the United States, where the surface temperature was 22°.4 C. To be sure, the record was for the 100-meter sample, but even here the temperature was 19°.7 C.

Variety longipes, on the other hand, although it occurs abundantly over a wider range than var. arcticum, is not found so far from its centers of abundance as var. arcticum.

The inclusive species was found at a total of thirty-one stations, of which twenty-one were in the Atlantic and ten in the Pacific. The total number of sample records was eighty-four, with thirty-seven rare, twenty-seven occasional, eleven common, and nine abundant. Net samples predominated with fifty-nine records, as compared with twenty-five pump sample records.

The total ranges of environmental conditions in situ were: temperature, -1°.2 to 28°.2 C; salinity, 32.7 to 37.1 per mille; pH, 7.64 to 8.29; phosphate, 3 to 228 mg PO_4/m^3.

No one has reported anything regarding the depth at which the species normally lives since Nielsen (1934) did not find the species. The Carnegie records (table 49) show an increase in frequency with increase in depth to 100 meters. The increase is not great, however, with the species occurring in 8.1 per cent of the surface samples and 10.6 per cent of the 100-meter samples. Is it possible that C. arcticum, which is characteristic of arctic waters, is a shade species adapted for life under the polar ice cap where the intensity of illumination cannot be great? The Carnegie data alone cannot be conclusive regarding the vertical distribution of this species. Many of the station records are from cold northern waters where the plankton in the upper layers is comparatively dense so there is much greater chance of contamination of the open nets during hauling in. On the other hand, it should be noted that the records for the species in the warm oligotrophic water of the Atlantic are predominantly subsurface records. This occurrence may be owing to the lower temperatures obtaining there rather than to the preference for, or superior survival in, levels of weak illumination so the species may not be a shade species in the true sense of the term.

Table 49. Records of occurrence of C. arcticum at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	7	1.8	14	5.0	16	6.3
Occasional	12	3.2	7	2.5	8	3.2
Common	6	1.6	4	1.4	1	0.4
Abundant	6	1.6	1	0.4	2	0.8
Total	31	8.2	26	9.3	27	10.7

A=Number of records. B=Per cent of total number of samples collected at that depth.

57. Ceratium hexacanthum Gourret
Figures 27F-G, chart 48, appendix table 53

This is a common, very tolerant tropical species. The antapical horns tend to be extremely thin and attenuated, and to curl so that various modifications of these horns occur. There seems to be no justification for creating varieties such as var. spiralis Kofoid, on the basis of such characters as the curl of the horns.

In the Pacific the species was confined to the warm tropical waters. The surface temperatures at the Pacific record stations were all above 20° except at two stations in the southeastern Pacific (stations 57 and 62), where the surface temperatures were 19°.0 and 19°.2 C. In the Atlantic, on the other hand, the species is apparently carried by the North Atlantic Drift to the British Isles and as far as Iceland (see chart 48) into water with surface temperatures as low as 8°.9 C. Morpholgically no separation could be made between the Atlantic and Pacific forms. The form carried into the cold waters of the North Atlantic, however, probably is a particular subspecies, at present indistinguishable from the tropical form because the tropical form does not invade cold water elsewhere. Peters (1934) stated that it was noticeably absent from the South Atlantic south of about 33° south. It dropped out at about this latitude at the Carnegie stations in the southeastern Pacific, and at the Dana stations in the southeastern Pacific (Nielsen, 1934). Thus, it kept within the 20° isotherm in the North Pacific, which indicates that the race of the Pacific is at least physiologically different from that in the North Atlantic.

The ranges of environmental conditions in situ for the species as a whole were: temperature, 8°.2 to 29°.3 C; salinity, 30.7 to 37.1 per mille; pH, 7.17 to 8.47; phosphate, 2 to 198 mg PO_4/m^3.

The total number of station records was 124--28 in the Atlantic and 96 in the Pacific. There were 327 records of occurrence, of which 169 were rare, 129 occasional, and 29 common. The net records numbered 267; the pump records, 60.

Nielsen (1934) classified C. hexacanthum as a shade species. He found that in the eastern part of the South Pacific, where there were stations rich in plankton, the species had its main distribution above 50 meters; at the western stations, where the plankton population was less dense, the species had its main distribution below 50 meters. The Carnegie data do not, however, substantiate these results. The number of records in the Carnegie collection decreased with increase in depth. Perhaps, if a classification of the Carnegie tropical stations as to plankton content could be made, some correlation with plankton density could be discovered. The authors can conclude that C. hexacanthum, however, is not a typical shade species as many other species in the Carnegie collection showed a decided increase in frequency of occurrence with increase in depth, considering the collection as a whole.

Table 50. Records of occurrence of C. hexacanthum at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	72	18.2	53	17.9	44	17.3
Occasional	63	16.3	43	15.2	23	9.1
Common	13	3.4	9	3.2	7	2.7
Total	148	37.9	105	36.3	74	29.1

A=Number of records. B=Per cent of total number of samples collected at that depth.

58. Ceratium reflexum Cleve
Figure 27, chart 49, appendix table 54

This is a very rare, intolerant tropical species. It was not reported from the South Atlantic by Peters (1934) although it had been reported from as far south as 19°.5 south latitude in the Atlantic by Cleve (1900). Nielsen (1934) found it at only four stations in the South Pacific.

In the Carnegie collection it occurred at twenty-one stations--six in the Atlantic and fifteen in the Pacific. The Atlantic stations were between 11° and 24° north latitude. The Pacific stations were much scattered (see chart 49). The range of surface temperatures at the record stations for the species was from 23°.4 to 29°.4 C. The ranges of environmental conditions in situ were: temperature, 17°.5 to 28°.6 C; salinity, 34.4 to 37.1 per mille; pH, 7.99 to 8.39; phosphate, 3 to 123 mg PO_4/m^3.

The total number of sample records was thirty-nine, of which thirty-three were rare, five occasional, and one common. The record of common was at station 105 near Guam; the occasional records were from station 20 (tropical Atlantic), station 97 (near the Phoenix Islands), and station 107 (near Guam). The species perhaps prefers oligotrophic water since twenty-three of the thirty-nine records were in water containing less than 10 mg PO_4/m^3.

It is probably a shade species. Practically all Nielson's (1934) records were from the deeper layers. The Carnegie data show an increase in frequency with increase in depth (table 51).

Table 51. Records of occurrence of C. reflexum at three levels

Occurrence	Depth in meters					
	0		50		100	
	A	B	A	B	A	B
Rare	8	2.1	13	4.6	12	4.7
Occasional	2	0.6	0	....	3	1.2
Common	0	....	1	0.4	0	....
Total	10	2.7	14	5.0	15	5.9

A=Number of records. B=Per cent of total number of samples collected at that depth.

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APPENDIX TABLES 1 - 54

TABLES OF DISTRIBUTIONAL AND ENVIRONMENTAL RECORDS

Abbreviations and Numerical Equivalents Used in Tables

For Relative Abundance

a (abundant) indicates over 50 individuals

c (common) from 25 to 50 individuals

oc (occasional) from 11 to 25 individuals

r (rare) from 6 to 10 individuals

For Apparatus

n = sample taken by net

p = sample taken by pump

Values enclosed in parentheses are interpolated

Table 1. Distributional and environmental records for Ceratium praelongum

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m^3
1	1	0	r	n	5/12/28	24.0	36.2	8.16	34
1b	7	50	r	n	5/16/28	(22.2	36.3	8.21	38)
15	101	50	r	n	8/11/28	19.8	36.5	8.21	8
15	102	100	r	n	8/11/28	18.4	36.4	8.20	19
16	104	50	r	p	8/13/28	24.4	36.4	8.23	8
16	108	100	r	n	8/13/28	19.9	36.5	8.17	13
19	121	50	r	p	8/20/28	25.2	37.1	8.27	5
31	191	0	r	n	10/ 3/28	28.5	34.4	8.27	2
33	198A	50	r	p	10/ 8/28	28.2	36.2	8.24	4
47	267	50	r	n	11/23/28	23.8	36.0	8.23	20
47	268	100	r	n	11/23/28	22.7	36.2	8.23	20
47	269	0	r	p	11/23/28	23.9	36.0	8.23	17
48	273	100	r	n	11/25/28	22.7	36.3	8.26	16
49	278	50	r	n	11/27/28	22.6	36.1	8.26	13
55	327	50	r	p	12/16/28	18.7	35.0	8.18	12
56	329	50	r	n	12/18/28	18.5	35.1	8.14	9
56	330	100	r	n	12/18/28	16.6	34.8	8.11	12
69	424	0	r	n	1/12/29	21.1	35.2	8.12	62
76	471	50	r	p	2/16/29	22.1	35.9	8.14	42
77	472	50	oc	p	2/18/29	23.5	36.0	8.19	16
81	491	0	r	n	2/26/29	26.5	35.8	8.19	38
81	492	50	r	n	2/26/29	26.4	35.9	8.19	38
81	493	0	r	p	2/26/29	26.5	35.8	8.19	38
85	511	50	r	n	3/ 6/29	27.8	36.2	8.22	40
87	522	50	r	n	3/11/29	26.5	36.1	8.26	20
95	568A	0	r	n	4/25/29	(29.4	34.7	8.26	14)
96	569	50	r	n	4/26/29	29.2	35.3	8.23	12
96	572	50	r	p	4/26/29	29.2	35.3	8.23	12
97	575	50	r	n	4/28/29	28.0	35.4	8.16	21
98	581	0	r	n	4/30/29	27.0	35.3	8.16	24
98	583	100	r	n	4/30/29	26.7	35.4	8.14	32
98	584	0	r	p	4/30/29	27.0	35.3	8.16	24
98	588	0-100	oc	p	4/30/29	26.7	35.4	8.14	32
99	590	50	oc	n	5/ 2/29	27.8	34.9	8.22	12
99	591	100	oc	n	5/ 2/29	27.8	35.0	8.22	17
100	596	50	oc	n	5/ 4/29	27.6	34.7	8.21	10
100	597	100	oc	n	5/ 4/29	27.6	34.7	8.22	12
100	599	50	r	p	5/ 4/29	27.6	34.7	8.21	10
100	602	100	r	p	5/ 4/29	27.6	34.7	8.22	12
101	604	50	r	n	5/ 7/29	26.2	34.7	8.24	8
102	610	50	r	n	5/ 9/29	25.8	35.0	8.24	8
102	611	100	r	n	5/ 9/29	25.6	35.0	8.23	8
109	656	100	r	n	5/29/29	19.4	34.8	8.18	5
112	675	50	oc	n	6/ 5/29	21.7	34.6	8.23	7
113	681	50	r	n	6/25/29	23.8	34.6	8.25	5
113	684	50	r	p	6/25/29	23.8	34.6	8.25	5
114	687	50	r	n	6/27/29	16.2	34.6	8.04	63
132	803	100	r	p	9/ 8/29	14.3	33.4	8.30	16
152	945	50	r	n	10/27/29	14.2	34.5	7.87	53
152	949	50	r	p	10/27/29	14.2	34.5	7.87	53
153	955	0	r	p	10/29/29	28.1	34.2	8.47	7
153	956	50	r	p	10/29/29	28.1	34.4	8.39	7
154	958	0	r	n	10/31/29	28.3	34.2	8.39	7
155	965	0	oc	n	11/ 2/29	27.8	34.9	8.29	29
155	966	50	r	n	11/ 2/29	27.7	34.9	8.30	30
155	967	100	oc	n	11/ 2/29	27.2	35.0	8.30	35
156	972	0	oc	n	11/ 4/29	27.6	35.0	8.34	28
156	973	50	r	n	11/ 4/29	27.0	35.1	8.37	46
157	978	0	oc	n	11/ 6/29	27.1	35.3	8.27	47
157	979	50	oc	n	11/ 6/29	27.1	35.2	8.32	60
157	980	100	oc	n	11/ 6/29	26.8	35.5	8.30	64
158	983	0	oc	n	11/ 8/29	28.2	35.6	8.34	36
158	984	50	oc	n	11/ 8/29	28.2	35.6	8.39	50
158	985	100	oc	n	11/ 8/29	27.6	35.9	8.39	48
159	990	0	r	n	11/11/29	28.6	35.7	8.37	15
159	991	50	r	n	11/11/29	28.5	35.7	8.39	15
160	1003	100	r	n	11/13/29	28.5	35.7	8.44	16

Table 2. Distributional and environmental records for Ceratium cephalotum

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
1b	8	100	r	n	5/16/28	(20.3	36.5	8.18	36)
16	108	100	r	n	8/13/28	19.9	36.5	8.17	13
48	273	100	r	n	11/25/28	22.7	36.3	8.26	16
83	501	0	r	n	3/ 2/29	27.5	36.3	8.24	29
89	529	50	r	n	3/23/29	28.6	35.8	8.27	12
90	533	0	r	n	3/25/29	28.5	35.5	8.27	21
90	534	50	oc	n	3/25/29	28.6	35.6	8.26	21
91	540	0	oc	n	3/27/29	28.7	35.1	8.30	21
91	541	50	oc	n	3/27/29	28.5	35.2	8.30	24
92	545	0	r	n	3/29/29	28.5	35.3	8.29	28
93	551	50	r	n	3/31/29	28.5	34.8	8.30	28
95	563	50	r	n	4/24/29	29.3	34.9	8.24	16
96	569	50	r	n	4/26/29	29.2	35.3	8.23	12
101	605	100	r	n	5/ 7/29	25.2	35.1	8.23	8
103	615	0	r	n	5/11/29	26.0	35.0	8.25	5
103	616	50	r	n	5/11/29	25.8	35.2	8.25	5
103	617	100	r	n	5/11/29	24.8	35.2	8.25	5
104	623	100	r	n	5/13/29	25.3	35.3	8.21	7
105	628	50	r	n	5/15/29	26.8	34.9	8.23	5
108	648	100	r	n	5/27/29	25.2	35.0	8.23	4
109	656	100	r	n	5/29/29	19.4	34.8	8.18	5
113	681	50	r	n	6/25/29	23.8	34.6	8.25	5
132	797	0	r	n	9/ 8/29	21.0	33.9	8.34	15
133	804	0	r	n	9/10/29	22.7	34.7	8.47	7
134	808	0	r	n	9/12/29	22.9	34.7	8.34	6
135	826	100	r	p	9/14/29	18.7	34.8	8.34	5
136	827	0	r	n	9/16/29	24.6	35.4	8.37	3
136	828	50	r	n	9/16/29	21.4	35.1	8.39	3
140	860	0	r	p	10/ 3/29	26.9	35.0	8.42	7
141	864	0	r	n	10/ 5/29	25.9	35.2	8.34	5
141	865	50	r	n	10/ 5/29	24.8	35.3	8.34	5
142	874	100	r	n	10/ 7/29	16.6	34.4	8.27	7
142	876	0	r	p	10/ 7/29	24.1	34.8	8.33	5
143	883	100	r	n	10/ 9/29	13.8	34.1	8.30	10
144	886	0	r	n	10/11/29	23.3	35.0	8.37	6
145	892	100	r	n	10/13/29	16.0	34.1	8.31	6
146	898	100	r	n	10/15/29	19.7	34.3	8.26	7
147	905	100	r	n	10/17/29	19.2	35.0	8.29	5
150	931	100	r	n	10/23/29	19.6	34.6	8.32	11

Table 3. Distributional and environmental records for Ceratium gravidum

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
1	1	0	r	n	5/12/28	24.0	36.2	8.16	34
1b	6	0	r	n	5/16/28	(22.3	36.3	8.20	46)
1b	7	50	oc	n	5/16/28	(22.2	36.4	8.21	39)
1b	8	100	oc	n	5/16/28	(20.3	35.5	8.18	36)
15	98	50	r	p	8/11/28	19.8	36.5	8.21	8
15	99	100	r	p	8/11/28	18.4	36.4	8.20	19
15	101	50	oc	n	8/11/28	19.8	36.5	8.21	8
15	102	100	r	n	8/11/28	18.4	36.4	8.20	19
16	107	50	r	n	8/13/28	24.4	36.4	8.23	8
16	108	100	r	n	8/13/28	19.9	36.5	8.17	13
18	116	100	r	p	8/17/28	20.4	36.8	8.21	5
18	119	100	oc	n	8/17/28	20.4	36.8	8.21	5
19	124	100	oc	n	8/20/28	22.4	37.0	8.25	5
20	129	50	r	n	8/22/28	25.8	36.6	8.26	3
20	130	100	oc	n	8/22/28	22.6	36.7	8.19	5
22	143	50	r	n	8/27/28	24.5	36.2	8.21	9
23	149	50	r	n	8/29/28	20.9	36.0	8.14	13
24	155	50	oc	n	8/31/28	23.1	36.0	8.14	8
25	158	50	r	p	9/ 3/28	21.5	36.0	8.22	12
25	161	50	oc	n	9/ 3/28	21.5	36.0	8.22	12
25	161	50	r	n	9/ 3/28	21.5	36.0	8.22	12
25	162	100	r	n	9/ 3/28	14.6	35.7	7.93	121
26	164	50	r	p	9/ 5/28	24.1	36.1	8.21	5
27	168	50	r	p	9/ 7/28	26.0	36.2	8.30	4
27	171	50	oc	n	9/ 7/28	26.0	36.2	8.30	4
27	171	50	oc	n	9/ 7/28	26.0	36.2	8.30	4
28	177	50	r	n	9/11/28	26.7	36.3	8.26	4
30	189	50	r	n	9/15/28	27.8	36.1	8.29	3
31	192	50	r	n	10/ 3/28	28.2	35.4	8.23	2

Table 4. Distributional and environmental records for Ceratium digitatum

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
25	158	50	r	p	9/ 3/28	21.5	36.0	8.22	12
26	164	50	r	p	9/ 5/28	24.1	36.1	8.21	5
45	257	50	r	n	11/19/28	22.4	35.2	8.13	46
46	265	50	r	p	11/21/28	23.2	35.3	8.16	40
49	279	100	r	n	11/27/28	21.6	35.9	8.26	13
49a	283	0	r	n	11/28/28	(23.2	36.0	8.23	13)
50	287	0	r	p	11/29/28	23.2	36.0	8.23	13
52	302	0	r	p	12/ 3/28	22.5	35.4	8.21	8
53	305	100	r	n	12/ 5/28	19.9	35.6	8.19	13
54	322	0	r	p	12/14/28	23.4	35.5	8.22	9
78	478	0	r	p	2/20/29	24.6	36.0	8.17	32
83	502	50	r	n	3/ 2/29	27.4	36.5	8.24	25
92	546	50	r	n	3/29/29	28.4	35.4	8.29	28
95	564	100	r	n	4/24/29	28.5	35.4	8.22	21
99	591	100	r	n	5/ 2/29	27.8	35.0	8.22	17
100	596	50	r	n	5/ 4/29	27.6	34.7	8.21	10
102	611	100	r	n	5/ 9/29	25.6	35.0	8.23	8
102	612	0	r	p	5/ 9/29	25.8	35.0	8.24	8
105	629	100	r	n	5/15/29	25.2	35.1	8.23	5
107	641	100	r	n	5/19/29	26.8	34.9	8.23	11
136	829	100	r	n	9/16/29	18.6	35.0	8.39	3
140	858	100	r	n	10/ 3/29	25.5	35.0	8.34	7
145	891	50	r	n	10/13/29	18.7	34.3	8.34	6
147	905	100	r	n	10/17/29	19.2	35.0	8.29	5
151	939	100	r	n	10/26/29	12.5	34.6	.....	...
155	967	100	r	n	11/ 2/29	27.2	35.0	8.30	35

Table 5. Distributional and environmental records for Ceratium candelabrum

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
1	1	0	oc	n	5/12/28	24.0	36.2	8.16	34
1a	4	0	r	n	5/14/28	(22.3	36.3	8.20	46)
1a	5	0	r	n	5/14/28	(22.3	36.3	8.20	46)
1b	6	0	oc	n	5/16/28	(22.3	36.3	8.20	46)
1b	7	50	oc	n	5/16/28	(22.2	36.3	8.20	39)
2	14	0	r	n	5/18/28	20.5	36.4	8.23	58
13a	89	0	r	n	8/ 8/28	(16.3	34.0	8.14	15)
14	92	50	r	p	8/ 9/28	15.0	35.1	8.18	16
14	93	0	r	p	8/ 9/28	21.2	35.2	8.18	11
14	95	50	r	n	8/ 9/28	15.0	35.1	8.18	16
15	99	100	r	p	8/11/28	18.4	36.4	8.20	19
15	102	100	oc	n	8/11/28	18.4	36.4	8.20	19
16	103	0	r	p	8/13/28	25.9	36.2	8.24	8
16	104	50	r	p	8/13/28	24.4	36.4	8.23	8
16	106	0	r	n	8/13/28	25.9	36.2	8.24	8
16	107	50	r	n	8/13/28	24.4	36.4	8.23	8
16	108	100	r	n	8/13/28	19.9	36.5	8.17	13
17	109	0	oc	p	8/15/28	26.2	36.6	8.29	9
17	111	0	r	n	8/15/28	26.2	36.6	8.29	9
17	112	50	r	n	8/15/28	21.9	36.6	8.28	12
18	114	0	r	p	8/17/28	27.0	37.0	8.23	5
18	115	50	oc	p	8/17/28	22.4	36.8	8.24	5
18	116	100	r	p	8/17/28	20.4	36.8	8.21	5
18	117	0	oc	n	8/17/28	27.0	37.0	8.23	5
18	118	50	r	n	8/17/28	22.4	36.8	8.24	5
19	123	50	r	n	8/20/28	25.2	37.1	8.27	5
19	124	100	r	n	8/20/28	22.4	37.0	8.25	5
20	126	50	r	p	8/22/28	25.8	36.6	8.26	3
20	128	0	r	n	8/22/28	26.0	36.6	8.37	5
20	129	50	oc	n	8/22/28	25.8	36.6	8.26	3
20	130	100	oc	n	8/22/28	22.6	36.7	8.19	5
20-21	131	0	c	n	8/23/28	(26.6	36.3	8.32	4)
21	134	100	c	p	8/24/28	21.0	36.8	8.20	7
21	135	0	oc	n	8/24/28	26.6	36.3	8.32	4
21	137	100	r	n	8/24/28	21.0	36.8	8.20	7
22	139	0	oc	p	8/27/28	28.7	36.0	8.26	8
22	143	50	r	n	8/27/28	24.5	36.2	8.21	9
23	145	0	oc	p	8/27/28	26.7	36.0	8.26	8
23	149	50	oc	n	8/27/28	24.5	36.2	8.21	9
23	150	100	r	n	8/29/28	16.6	36.0	8.18	75
24	152	50	r	p	8/31/28	23.1	36.0	8.14	8
25	157	0	oc	p	9/ 3/28	27.5	35.6	8.31	5

Table 5. Distributional and environmental records for Ceratium candelabrum--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
25	158	50	oc	p	9/ 3/28	21.5	36.0	8.22	12
25	160	0	r	n	9/ 3/28	27.5	35.6	8.31	5
25	161	50	oc	n	9/ 3/28	21.5	36.0	8.22	12
26	164	50	r	p	9/ 5/28	24.1	36.1	8.21	5
26	165	100	r	p	9/ 5/28	14.9	35.6	8.11	40
27	171	50	r	n	9/ 7/28	26.0	36.2	8.30	4
28	177	50	r	n	9/11/28	26.7	36.3	8.26	4
30	189	50	r	n	9/15/28	27.8	36.1	8.29	3
31	193	100	r	n	10/ 3/28	23.4	36.5	8.19	28
32	194A	0	r	p	10/ 5/28	28.0	36.0	8.23	2
32	195	50	r	n	10/ 5/28	27.2	36.0	8.24	2
32	196	100	r	n	10/ 5/28	22.2	36.4	8.10	30
33	197A	0	r	p	10/ 8/28	28.5	35.6	8.23	4
34	200	0	oc	n	10/ 9/28	28.5	35.9	8.28	2
34	200A	0	r	p	10/ 9/28	28.5	35.9	8.28	2
34	201	100	oc	n	10/ 9/28	20.5	36.6	8.16	16
35	205	100	r	n	10/26/28	14.4	34.9	7.88	189
35	206	0	r	p	10/26/28	27.4	29.7	8.31	15
35-36	209	0	r	n	10/27/28	(27.0	30.0	8.27	16)
35-36	211	0	r	n	10/27/28	(27.0	30.0	8.27	16)
36	213	0	r	n	10/30/28	26.5	31.5	8.23	16
36	215	100	r	n	10/30/28	14.4	34.9	7.85	149
36	216	0	r	p	10/30/28	26.5	31.5	8.23	16
37	218	50	r	n	11/ 1/28	18.8	34.5	8.00	121
37	219	100	r	n	11/ 1/28	15.1	34.9	7.82	153
40	232	0	r	p	11/ 8/28	22.2	33.7	8.21	24
41	238	0	r	p	11/10/28	20.4	34.2	8.11	32
41a	240	0	r	n	11/12/28	(19.6	34.5	8.09	39)
43	244	0	r	n	11/15/28	19.6	34.8	8.09	52
44	250	0	oc	n	11/17/28	20.7	34.9	8.03	38
44	251	50	oc	n	11/17/28	20.4	34.9	8.04	34
44	253	0	oc	p	11/17/28	20.7	34.9	8.03	38
45	256	0	oc	n	11/19/28	22.4	35.3	8.12	38
45	257	50	oc	n	11/19/28	22.4	35.2	8.13	46
45	258	100	r	n	11/19/28	18.6	35.1	8.00	50
45	259	0	r	p	11/19/28	22.4	35.3	8.12	38
45	260	50	r	p	11/19/28	22.4	35.2	8.13	46
46	261	0	r	n	11/21/28	23.3	35.3	8.16	36
46	262	50	r	n	11/21/28	23.2	35.3	8.16	40
46	263	100	oc	n	11/21/28	22.5	35.4	8.17	40
46	264	0	oc	p	11/21/28	23.3	35.3	8.16	36
47	266	0	r	n	11/23/28	23.9	36.0	8.23	17
47	267	50	oc	n	11/23/28	23.8	36.0	8.23	20
47	268	100	oc	n	11/23/28	22.7	36.2	8.23	20
47	269	0	oc	p	11/23/28	23.9	36.0	8.23	17
48	273	100	oc	n	11/25/28	22.7	36.3	8.26	16
48	274	0	r	p	11/25/28	23.6	36.4	8.23	13
49	278	50	r	n	11/27/28	22.6	36.1	8.26	13
49	279	100	r	n	11/27/28	21.6	35.9	8.26	13
50	285	50	r	n	11/29/28	22.0	35.9	8.23	13
50	288	50	oc	p	11/29/28	22.0	35.9	8.23	13
51	294	50	r	n	12/ 1/28	20.5	35.6	8.22	17
51	295	100	r	n	12/ 1/28	20.0	35.6	8.22	17
52	300	50	oc	n	12/ 3/28	20.2	35.6	8.20	8
52	301	100	oc	n	12/ 3/28	18.2	35.2	8.17	8
53	305	100	r	n	12/ 5/28	19.9	35.6	8.19	13
54	320	50	oc	n	12/14/28	19.8	35.4	8.18	17
54	321	100	oc	n	12/14/28	18.7	35.4	8.16	20
55	324	50	oc	n	12/16/28	18.7	35.0	8.18	12
55	325	100	oc	n	12/16/28	16.7	34.9	7.17	12
56	328	0	oc	n	12/18/28	20.8	34.9	8.13	9
56	329	50	oc	n	12/18/28	18.5	35.1	8.14	9
56	330	100	oc	n	12/18/28	16.6	34.8	8.11	12
56	332	50	r	p	12/18/28	18.5	35.1	8.14	9
56	333	100	r	p	12/18/28	16.6	34.8	8.11	12
56-57	334	0	oc	n	12/19/28	(19.0	34.5	8.14	20)
57	335	0	r	n	12/20/28	19.0	34.5	8.14	20
57	336	50	oc	n	12/20/28	15.6	34.3	8.14	21
57	337	100	r	n	12/20/28	14.3	34.4	8.10	40
57	338	0	r	p	12/20/28	19.0	34.5	8.14	20
57	340	100	r	p	12/20/28	14.3	34.4	8.10	40
58	341	0	r	n	12/22/28	17.0	34.0	8.12	20
58	342	50	r	n	12/22/28	14.8	34.0	8.12	25
59	351	0	r	p	12/24/28	16.3	34.0	8.10	38
61	363	0	oc	n	12/28/28	16.9	34.0	8.05	46
61	364	50	r	n	12/28/28	14.0	34.0	8.05	60

Table 5. Distributional and environmental records for Ceratium candelabrum--Continued

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
61	365	100	r	n	12/28/28	10.8	34.0	8.03	80
61	366	0	r	p	12/28/28	16.9	34.0	8.05	46
61-62	369	0	oc	n	12/29/28	(16.9	34.0	8.05	46)
61-62	370	0	c	n	12/29/28	(16.9	34.0	8.05	46)
62	371	0	c	n	12/30/28	19.2	34.2	8.12	32
62	372	50	c	n	12/30/28	16.2	34.3	8.10	28
62	373	100	c	n	12/30/28	13.1	34.2	8.06	48
62	374	0	oc	p	12/30/28	19.2	34.2	8.12	32
62	375	50	r	p	12/30/28	16.2	34.3	8.10	28
63	379	0	r	n	1/ 1/29	20.5	34.6	8.07	21
63	381	100	r	n	1/ 1/29	15.6	34.6	8.08	24
63	384	100	r	p	1/ 1/29	15.6	34.6	8.08	24
63-64	387	0	r	n	1/ 2/29	(20.5	34.6	8.07	21)
63-64	390	0	r	n	1/ 2/29	(20.5	34.6	8.07	21)
64	395	50	r	n	1/ 3/29	17.2	34.6	8.12	29
64	396	100	r	n	1/ 3/29	15.8	34.5	8.10	32
64-65	401	0	oc	n	1/ 3/29	(20.6	34.6	8.12	21)
64-65	402	0	oc	n	1/ 4/29	(20.6	34.6	8.12	21)
64-65	403	0	r	n	1/ 4/29	(20.6	34.6	8.12	21)
64-65	404	0	r	n	1/ 4/29	(20.6	34.6	8.12	21)
65	408	0	r	p	1/ 5/29	20.2	34.5	8.10	24
65	409	50	r	p	1/ 5/29	16.5	34.5	8.10	25
66	415	100	r	p	1/ 7/29	17.8	34.9	8.12	21
67	416	0	r	n	1/ 8/29	19.3	34.9	8.11	21
67	418	100	oc	n	1/ 8/29	16.2	34.6	8.05	40
73	452	100	r	n	2/10/29	14.7	35.0	7.80	178
75	462	0	oc	n	2/14/29	22.8	35.8	8.18	44
76	467	0	oc	n	2/16/29	23.4	35.9	8.15	50
76	468	50	r	n	2/16/29	22.1	35.9	8.14	42
76	469	100	r	n	2/16/29	21.2	35.8	8.12	45
76	471	50	r	p	2/16/29	22.1	35.9	8.14	42
77	474	50	oc	p	2/18/29	23.5	36.0	8.19	16
78	475	0	oc	n	2/20/29	24.6	36.0	8.17	32
78	476	50	oc	n	2/20/29	23.8	36.1	8.14	32
78	477	100	oc	n	2/20/29	21.9	36.2	8.14	34
78	478	0	oc	p	2/20/29	24.6	36.0	8.17	32
78	479	50	oc	p	2/20/29	23.8	36.1	8.14	32
79	481	0	oc	n	2/22/29	25.2	36.0	8.17	34
79	482	50	oc	n	2/22/29	24.5	36.1	8.17	34
79	483	100	oc	n	2/22/29	21.8	36.2	8.13	45
79	484	0	oc	p	2/22/29	25.2	36.0	8.17	34
79	485	50	oc	p	2/22/29	24.5	36.1	8.17	34
80	486	0	oc	n	2/24/29	26.0	35.9	8.20	36
80	487	50	r	n	2/24/29	25.9	36.0	8.19	29
80	488	0	oc	p	2/24/29	26.0	35.9	8.20	36
80	489	50	oc	p	2/24/29	25.9	36.0	8.19	29
80	490	100	r	p	2/24/29	23.4	36.2	8.16	32
81	491	0	c	n	2/26/29	26.5	35.8	8.19	38
81	492	50	oc	n	2/26/29	26.4	35.9	8.19	38
81	493	0	r	p	2/26/29	26.5	35.8	8.19	38
81	494	50	r	p	2/26/29	26.4	35.9	8.19	38
81	495	100	r	p	2/26/29	23.6	36.2	8.18	36
82	496	0	oc	n	2/28/29	27.2	36.3	8.21	34
82	497	50	r	n	2/28/29	27.2	36.3	8.21	34
83	502	50	r	n	3/ 2/29	27.4	36.5	8.24	25
84	506	50	oc	n	3/ 4/29	27.5	36.4	8.21	24
85	510	0	oc	n	3/ 6/29	27.9	36.2	8.22	40
85	511	50	r	n	3/ 6/29	27.8	36.2	8.22	40
85	513	50	r	p	3/ 6/29	27.8	36.2	8.22	40
86	517	50	r	n	3/ 9/29	27.4	36.2	8.29	17
86	519	50	r	p	3/ 9/29	27.4	36.2	8.29	17
87	522	50	oc	n	3/11/29	26.5	36.1	8.28	20
87	524	50	r	p	3/11/29	26.5	36.1	8.28	20
88	526	0	oc	n	3/21/29	28.5	35.9	8.23	16
88	527	50	oc	n	3/21/29	28.4	35.9	8.25	13
89	528	0	oc	n	3/23/29	28.4	35.6	8.25	21
89	529	50	oc	n	3/23/29	28.6	35.8	8.27	12
90	533	0	c	n	3/25/29	28.5	35.5	8.27	21
90	534	50	oc	n	3/25/29	28.6	35.6	8.26	21
90	535	0	r	p	3/25/29	28.5	35.5	8.27	21
90	536	50	r	p	3/25/29	28.6	35.6	8.26	21
90	537	100	r	p	3/25/29	26.3	35.8	8.24	21
91	540	0	r	n	3/27/29	28.7	35.1	8.30	21
91	541	50	c	n	3/27/29	28.5	35.2	8.30	24
91	542	0	r	p	3/27/29	28.7	35.1	8.30	21
91	543	50	r	p	3/27/29	28.5	35.2	8.30	24

Table 5. Distributional and environmental records for Ceratium candelabrum--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
91	544	100	oc	p	3/27/29	25.8	36.0	8.25	30
92	546	50	c	n	3/29/29	28.4	35.4	8.29	28
92	548	50	r	p	3/29/29	28.4	35.4	8.29	28
93	551	50	r	n	3/31/29	28.5	34.8	8.30	28
93	552	0	r	p	3/31/29	28.7	34.7	8.30	28
Samoa	555	0	r	n	....	.....	.....	.....	...
94	558	50	r	n	4/22/29	29.3	34.7	8.25	14
94	560	0	r	p	4/22/29	29.5	34.7	8.25	14
95	563	50	oc	n	4/24/29	29.3	34.9	8.24	16
95	564	100	r	n	4/24/29	28.5	35.4	8.22	21
95	565	0	r	p	4/24/29	29.4	34.7	8.26	14
96	568	0	oc	n	4/26/29	29.3	35.3	8.23	12
95	568A	0	r	n	4/25/29	(29.4	34.7	8.26	14)
96	569	50	r	n	4/26/29	29.2	35.3	8.23	12
96	572	50	r	p	4/26/29	29.2	35.3	8.23	12
96	573	100	r	p	4/26/29	28.2	35.7	8.19	25
97	574	0	oc	n	4/28/29	28.3	35.2	8.16	24
97	575	50	oc	n	4/28/29	28.0	35.4	8.16	21
97	576	100	oc	n	4/28/29	27.6	35.6	8.15	25
97	579	100	r	p	4/28/29	27.6	35.6	8.15	25
98	581	0	oc	n	4/30/29	27.0	35.3	8.16	24
98	588	100	r	p	4/30/29	26.7	35.4	8.14	32
99	590	50	c	n	5/ 2/29	27.8	34.9	8.22	12
99	591	100	c	n	5/ 2/29	27.8	35.0	8.22	17
99	592	0	oc	p	5/ 2/29	27.9	34.9	8.21	12
99	593	50	r	p	5/ 2/29	27.8	34.9	8.22	12
99	594	100	oc	p	5/ 2/29	27.8	35.0	8.22	17
99	595	0	oc	n	5/ 2/29	27.9	34.9	8.21	12
100	596	50	c	n	5/ 4/29	27.6	34.7	8.21	10
100	597	100	c	n	5/ 4/29	27.6	34.7	8.22	12
100	598	0	oc	p	5/ 4/29	27.7	34.7	8.21	10
100	599	50	oc	p	5/ 4/29	27.6	34.7	8.21	10
100	602	100	oc	p	5/ 4/29	27.6	34.7	8.22	12
101	604	50	oc	n	5/ 7/29	26.2	34.7	8.24	8
101	605	100	oc	n	5/ 7/29	25.2	35.1	8.23	8
101	606	0	r	p	5/ 7/29	26.3	34.7	8.24	8
102	609	0	oc	n	5/ 9/29	25.8	35.0	8.24	8
102	612	0	r	p	5/ 9/29	25.8	35.0	8.24	8
102	613	50	r	p	5/ 9/29	25.8	35.0	8.24	8
103	615	0	r	n	5/11/29	26.0	35.0	8.25	5
103	616	50	r	n	5/11/29	25.8	35.2	8.25	5
103	617	100	oc	n	5/11/29	24.8	35.2	8.25	5
103	618	0	r	p	5/11/29	26.0	35.0	8.25	5
104	621	0	r	n	5/13/29	26.1	35.2	8.24	7
104	622	50	r	n	5/13/29	25.8	35.2	8.24	7
104	625	50	r	p	5/13/29	25.8	35.2	8.24	7
105	628	50	r	n	5/15/29	26.8	34.9	8.23	5
105	630	0	r	p	5/15/29	26.9	34.9	8.23	5
106	633	0	r	n	5/17/29	27.2	35.0	8.23	5
106	634	50	r	n	5/17/29	27.0	35.0	8.23	5
106	635	100	r	n	5/17/29	25.8	35.1	8.23	5
107	639	0	r	n	5/19/29	28.0	34.4	8.23	5
107	640	50	oc	n	5/19/29	27.9	34.4	8.23	4
107	641	100	r	n	5/19/29	26.8	34.9	8.23	11
107	642	0	r	p	5/19/29	28.0	34.4	8.23	5
107	645	50	r	p	5/19/29	27.9	34.4	8.23	4
108	646	0	r	n	5/27/29	28.4	35.0	8.25	4
108	647	50	r	n	5/27/29	26.8	35.0	8.24	4
108	648	100	r	n	5/27/29	25.2	35.0	8.23	4
109	655	50	oc	n	5/29/29	23.1	35.0	8.22	3
109	656	100	c	n	5/29/29	19.4	34.8	8.18	5
109	658	50	r	p	5/29/29	23.1	35.0	8.22	3
110	661	0	c	n	5/31/29	23.9	34.7	8.18	5
110	663	100	oc	n	5/31/29	17.9	34.7	8.14	11
110	664	0	oc	p	5/31/29	23.9	34.7	8.18	5
110	665	50	oc	p	5/31/29	18.4	34.8	8.16	7
111	668	0	oc	n	6/ 3/29	20.1	34.5	8.18	5
111	671	0	oc	p	6/ 3/29	20.1	34.5	8.18	5
112	675	50	r	n	6/ 5/29	21.7	34.6	8.23	7
112	676	100	r	n	6/ 5/29	19.8	34.7	8.20	8
112	677	0	r	p	6/ 5/29	23.2	34.6	8.22	7
113	680	0	oc	n	6/25/29	24.2	34.5	8.25	5
113	681	50	oc	n	6/25/29	23.8	34.6	8.25	5
113	682	100	r	n	6/25/29	21.5	34.7	8.23	8
113	684	50	r	p	6/25/29	23.8	34.6	8.25	5
114	686	0	oc	n	6/27/29	19.9	34.3	8.15	7

Table 5. Distributional and environmental records for Ceratium candelabrum--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
114	687	50	oc	n	6/27/29	16.2	34.6	8.04	63
114	688	100	oc	n	6/27/29	13.0	34.5	8.00	91
114	689	0	oc	p	6/27/29	19.9	34.3	8.15	7
115	692	0	r	n	6/29/29	20.6	34.6	8.19	4
115	693	50	r	n	6/29/29	17.5	34.6	8.12	17
117	709	50	r	n	7/ 3/29	12.5	34.2	8.06	51
128	779	0	oc	n	7/25/29	16.4	33.0	8.12	29
129	780	0	r	n	7/27/29	16.3	33.1	8.13	25
130	781	0	oc	n	9/ 4/29	16.2	33.4	8.34	36
130	784	0	oc	p	9/ 4/29	16.2	33.4	8.34	36
130	785	50	r	p	9/ 4/29	11.7	33.4	8.26	83
130	786	100	r	p	9/ 4/29	8.8	33.7	8.06	176
130	787	0	c	n	9/ 4/29	16.2	33.4	8.34	38
131	789	100	oc	n	9/ 6/29	12.1	33.4	8.32	...
131	792	0	oc	p	9/ 4/29	16.2	33.4	8.34	36
131	793	0	r	p	9/ 6/29	19.3	33.4	8.34	...
132	797	0	oc	n	9/ 8/29	21.0	33.9	8.34	15
132	798	50	r	n	9/ 8/29	17.6	33.9	8.33	19
132	799	100	oc	n	9/ 8/29	14.3	33.4	8.30	16
132	801	0	r	p	9/ 8/29	21.0	33.9	8.34	15
132	802	50	r	p	9/ 8/29	17.6	33.9	8.33	19
132	803	100	r	p	9/ 8/29	14.3	33.4	8.30	16
133	805	50	r	n	9/10/29	20.8	34.7	8.37	7
134	808	0	oc	n	9/12/29	22.9	34.7	8.34	6
134	809	50	r	n	9/12/29	19.8	34.6	8.34	6
134	810	100	r	n	9/12/29	18.1	34.6	8.34	6
134	815	0	r	p	9/12/29	22.9	34.7	8.34	6
135	821	50	r	n	9/14/29	21.5	35.0	8.37	5
135	822	100	r	n	9/14/29	18.7	34.8	8.34	5
135	825	50	r	p	9/14/29	21.5	35.0	8.37	5
136	828	50	r	n	9/16/29	21.4	35.1	8.39	3
136	832	0	r	p	9/16/29	24.6	35.4	8.37	3
137	836	0	r	n	9/18/29	25.5	35.0	8.39	4
139	850	50	r	n	9/22/29	25.8	34.9	8.31	6
139	851	100	r	n	9/22/29	22.4	35.2	8.28	6
140	858	100	r	n	10/ 3/29	25.5	35.0	8.34	7
141	865	50	r	n	10/ 5/29	24.8	35.3	8.34	5
142	873	50	oc	n	10/ 7/29	21.8	34.8	8.30	5
142	874	100	oc	n	10/ 7/29	16.6	34.4	8.27	7
142	877	50	r	p	10/ 7/29	21.8	34.8	8.30	5
143	881	0	r	n	10/ 9/29	22.4	34.4	8.30	6
143	883	100	r	n	10/ 9/29	13.8	34.1	8.30	10
143	885	50	r	p	10/ 9/29	19.0	34.2	8.34	6
145	891	50	r	n	10/13/29	18.7	34.3	8.34	6
146	896	0	r	n	10/15/29	22.4	34.9	8.37	6
146	897	50	r	n	10/15/29	22.4	34.9	8.30	6
146	898	100	oc	n	10/15/29	19.7	34.3	8.26	7
147	904	50	r	n	10/17/29	23.1	35.3	8.29	5
149	921	50	r	n	10/21/29	23.3	35.0	8.37	6
149	927	0	r	p	10/21/29	23.5	35.0	8.34	6
150	929	0	r	n	10/23/29	25.6	34.7	8.39	7
150	930	50	oc	n	10/23/29	22.8	34.8	8.35	10
150	931	100	oc	n	10/23/29	19.6	34.6	8.32	11
151	937	0	oc	n	10/26/29	26.0	34.0	.....	...
151	938	50	oc	n	10/26/29	18.3	34.4	.....	...
151	939	100	r	n	10/26/29	12.5	34.6	.....	...
151	941	0	r	p	10/26/29	26.0	34.0	.....	...
152	944	0	oc	n	10/27/29	27.4	33.7	8.35	20
152	945	50	oc	n	10/27/29	14.2	34.5	7.87	53
152	946	100	r	n	10/27/29	11.4	34.7	7.76	75
152	948	0	r	p	10/27/29	27.4	33.7	8.35	20
153	951	0	oc	n	10/29/29	28.1	34.2	8.47	7
153	952	50	r	n	10/29/29	28.1	34.4	8.39	7
153	953	100	oc	n	10/29/29	20.5	34.7	8.28	31
154	959	50	r	n	10/31/29	28.2	34.2	8.40	7
155	965	0	r	n	11/ 2/29	27.8	34.9	8.29	29
155	966	50	r	n	11/ 2/29	27.7	34.9	8.30	30
155	967	100	oc	n	11/ 2/29	27.2	35.0	8.30	35
156	972	0	r	n	11/ 4/29	27.6	35.0	8.34	28
156	973	50	r	n	11/ 4/29	27.0	35.1	8.37	46
156	974	100	oc	n	11/ 4/29	26.4	35.1	8.30	48
157	978	0	oc	n	11/ 6/29	27.1	35.3	8.27	47
157	979	50	r	n	11/ 6/29	27.1	35.2	8.32	60
157	980	100	r	n	11/ 6/29	26.8	35.5	8.30	64
158	983	0	c	n	11/ 8/29	28.2	35.6	8.34	36
158	984	50	oc	n	11/ 8/29	28.2	35.6	8.39	50

Table 5. Distributional and environmental records for Ceratium candelabrum--Concluded

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
158	985	100	c	n	11/ 8/29	27.6	35.9	8.39	48
159	990	0	oc	n	11/11/29	28.6	35.7	8.37	15
159	991	50	r	n	11/11/29	28.5	35.7	8.39	15
159	992	100	r	n	11/11/29	28.0	35.7	8.37	23
160	1000	0	r	n	11/13/29	28.6	35.6	8.37	12
160	1002	50	oc	n	11/13/29	28.6	35.6	8.39	15
160	1003	100	r	n	11/13/29	28.5	35.7	8.44	16

Table 6. Distributional and environmental records for Ceratium furca Ehrenbergi

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
5a	33	0	c	n	5/30/28	(12.4	35.6	8.15	21)
5a	34	0	r	n	5/30/28	(12.4	35.6	8.15	21)
6	35	0	c	n	5/31/28	12.4	35.6	8.15	21
6	36	50	c	n	5/31/28	11.6	35.6	8.12	32
6	37	100	c	n	5/31/28	11.3	35.6	8.08	41
6a	42	0	c	n	5/31/28	(12.4	35.6	8.15	21)
6b	43	0	c	n	6/ 2/28	(12.4	35.6	8.15	21)
6b	44	0	oc	n	6/ 2/28	(12.4	35.6	8.15	21)
6b	45	0	oc	n	6/ 2/28	(12.4	35.6	8.15	21)
6b	46	0	c	n	6/ 2/28	(12.4	35.6	8.15	21)
6c	47	100	c	n	6/ 2/28	(11.3	35.6	8.08	41)
6c	48	0	oc	n	6/ 3/28	(12.4	35.6	8.15	21)
6c	49	0	c	n	6/ 4/28	(12.4	35.6	8.15	21)
6c	52	0	r	n	7/ 8/28	(10.6	35.4	8.12	27)
6g	54	0	c	n	7/10/28	(10.6	35.4	8.12	27)
6h	55	0	a	n	7/11/28	(10.6	35.4	8.12	27)
7	57	50	oc	n	7/13/28	8.2	35.2	8.03	47
7	58	100	r	n	7/13/28	8.1	35.2	8.04	57
8	59	0	r	n	7/15/28	10.3	35.2	7.93	13
8	60	50	r	n	7/15/28	9.1	35.2	7.95	27
9	64	0	r	n	7/28/28	11.2	35.1	8.08	20
9	65	50	oc	n	7/28/28	8.4	35.1	7.96	55
9	66	100	oc	n	7/28/28	7.6	35.1	7.98	56
10	68	0	oc	n	7/30/28	10.9	34.9	8.08	28
10	69	50	r	n	7/30/28	10.0	34.9	8.04	34
10	70	100	oc	n	7/30/28	6.6	35.0	7.95	52
11a	78	0	oc	n	8/ 2/28	(10.7	34.9	8.06	27)
13a	89	0	r	n	8/ 2/28	(21.2	35.2	8.18	11)
14	93	0	r	p	8/ 9/28	21.2	35.2	8.18	11
15	97	0	r	p	8/11/28	24.8	36.4	8.21	11
16	105	100	r	p	8/13/28	19.9	36.3	8.17	13
16	108	100	r	n	8/13/28	19.9	36.3	8.17	13
17	111	0	r	n	8/15/28	28.2	36.6	8.29	9
19	122	0	r	n	8/20/28	26.6	37.0	8.34	5
20-21	131	0	r	n	8/23/28	(26.6	36.3	8.32	4)
21	134	100	r	p	8/24/28	21.0	36.8	8.20	7
23	145	0	oc	p	8/29/28	27.2	35.9	8.25	4
24	151	0	r	p	8/31/28	27.2	35.2	8.32	4
24	156	100	r	n	8/31/28	15.6	35.6	7.96	99
32	194A	0	r	p	10/ 5/28	28.0	36.0	8.23	2
40	232	0	r	p	11/ 8/28	22.2	33.7	8.21	24
40	233	50	r	p	11/ 8/28	15.3	34.9	7.87	161
41a	240	0	r	n	11/12/28	(18.7	34.7	8.06	45)
42	241	0	r	n	11/13/28	18.7	34.7	8.06	45
42	242	50	r	n	11/13/28	17.2	34.9	7.99	68
42	243	100	r	n	11/13/28	13.8	35.0	7.91	150
43	245	50	oc	n	11/15/28	17.0	34.9	7.93	80
43	246	100	oc	n	11/15/28	13.6	35.0	7.90	92
43	247	0	r	p	11/15/28	19.6	34.8	8.09	52
43	249	100	r	p	11/15/28	13.6	35.0	7.90	92
44	250	0	r	n	11/17/28	20.7	34.9	8.03	38
44	251	50	r	n	11/17/28	20.4	34.9	8.04	34
44	252	100	r	n	11/17/28	13.8	35.0	7.85	70
44	253	0	oc	p	11/17/28	20.7	34.9	8.03	38
44	254	50	r	p	11/17/28	20.4	34.9	8.04	34
45	257	50	r	n	11/19/28	22.4	35.2	8.13	46
45	258	100	r	n	11/19/28	18.6	35.1	8.00	50
45	259	0	r	p	11/19/28	22.4	35.3	8.12	38
45	260	50-0	r	p	11/19/28	22.4	35.2	8.13	46
46	263	100	oc	n	11/21/28	22.5	35.4	8.17	40

Table 6. Distributional and environmental records for Ceratium furca Ehrenbergi--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
46	264	0	oc	p	11/21/28	23.3	35.3	8.16	36
47	266	0	r	n	11/23/28	23.9	36.0	8.23	17
47	267	50	r	n	11/23/28	23.8	36.0	8.23	20
47	268	100	oc	n	11/23/28	22.7	36.2	8.23	20
47	269	0	r	p	11/23/28	23.9	36.0	8.23	17
47	270	50	r	p	11/23/28	23.8	36.0	8.23	20
50	289	100	r	p	11/29/28	20.5	35.7	8.22	13
56-57	334	0	r	n	12/19/28	(19.0	34.5	8.14	20)
57	336	50	r	n	12/20/28	15.6	34.3	8.14	21
58	341	0	oc	n	12/22/28	17.0	34.0	8.12	20
58	342	50	c	n	12/22/28	14.8	34.0	8.12	25
58	344	0	oc	p	12/22/28	17.0	34.0	8.12	20
58	345	50	oc	p	12/22/28	14.8	34.0	8.12	25
58	346	100	oc	p	12/22/28	12.3	34.1	8.05	40
59	347	0	oc	n	12/24/28	16.3	34.0	8.10	38
59	348	0	oc	n	12/24/28	16.3	34.0	8.10	38
59	349	50	r	n	12/24/28	14.0	34.0	8.08	38
59	350	100	c	n	12/24/28	11.4	34.1	8.03	72
59	351	0	c	p	12/24/28	16.3	34.0	8.10	38
59	352	50	r	p	12/24/28	14.0	34.0	8.08	38
59	353	100	r	p	12/24/28	11.4	34.1	8.03	72
60	354	0	oc	n	12/26/28	15.0	34.0	8.07	50
60	355	50	oc	n	12/26/28	13.4	34.0	8.06	54
60	356	100	oc	n	12/26/28	10.6	34.0	8.03	62
60	357	0	oc	p	12/26/28	15.0	34.0	8.07	50
60	358	50	r	p	12/26/28	13.4	34.0	8.06	54
60	359	0	r	p	12/26/28	15.0	34.0	8.07	50
60-61	360	0	c	n	12/26/28	(15.0	34.0	8.07	50)
60-61	361	0	oc	n	12/26/28	(15.0	34.0	8.07	50)
60-61	362	0	r	n	12/26/28	(15.0	34.0	8.07	50)
61	363	0	r	n	12/28/28	16.9	34.0	8.05	46
61	364	50	r	n	12/28/28	14.0	34.0	8.05	60
61	365	100	r	n	12/28/28	10.8	34.0	8.03	80
61	366	0	a	p	12/28/28	16.9	34.0	8.05	46
61	367	50	oc	p	12/28/28	14.0	34.0	8.05	60
61	368	100	oc	p	12/28/28	10.8	34.0	8.03	80
61-62	369	0	c	n	12/29/28	(16.9	34.0	8.05	46)
61-62	370	0	a	n	12/29/28	(16.9	34.0	8.05	46)
62	372	50	oc	n	12/30/28	16.2	34.3	8.10	28
62	373	100	c	n	12/30/28	13.1	34.2	8.06	48
62	374	0	oc	p	12/30/28	19.2	34.2	8.12	32
62	375	50	r	p	12/30/28	16.2	34.3	8.10	28
62	376	100	r	p	12/30/28	13.1	34.2	8.06	48
62-63	377	0	r	n	12/31/28	(20.5	34.6	8.07	21)
63	382	0	r	p	1/ 1/29	20.5	34.6	8.07	21
63	384	100	r	p	1/ 1/29	15.6	34.6	8.08	24
63-64	386	0	oc	n	1/ 1/29	(20.5	34.6	8.07	21)
63-64	387	0	r	n	1/ 2/29	(20.5	34.6	8.07	21)
63-64	388	0	r	n	1/ 2/29	(20.5	34.6	8.07	21)
63-64	389	0	oc	n	1/ 2/29	(20.5	34.6	8.07	21)
63-64	390	0	r	n	1/ 2/29	(20.5	34.6	8.07	21)
63-64	391	0	oc	n	1/ 3/29	(20.5	34.6	8.07	21)
63-64	392	0	r	n	1/ 3/29	(20.5	34.6	8.07	21)
63-64	393	0	r	n	1/ 3/29	(20.5	34.6	8.07	21)
64	394	0	r	n	1/ 3/29	(20.5	34.6	8.07	21)
64	395	50	r	n	1/ 3/29	17.2	34.6	8.12	29
64	397	100	r	n	1/ 3/29	15.8	34.5	8.10	32
64	398	0	oc	p	1/ 3/29	20.6	34.6	8.12	21
64	399	50	r	p	1/ 3/29	17.2	34.6	8.12	29
64	400	100	r	p	1/ 3/29	15.8	34.5	8.10	32
64-65	401	0	oc	n	1/ 3/29	(20.6	34.6	8.12	21)
64-65	402	0	oc	n	1/ 4/29	(20.6	34.6	8.12	21)
64-65	403	0	oc	n	1/ 4/29	(20.6	34.6	8.12	21)
64-65	404	0	r	n	1/ 4/29	(20.6	34.6	8.12	21)
65	405	0	r	n	1/ 5/29	20.2	34.5	8.10	24
65	406	50	r	n	1/ 5/29	16.5	34.5	8.10	25
65	408	0	oc	p	1/ 5/29	20.2	34.5	8.10	24
65	409	50	oc	p	1/ 5/29	16.5	34.5	8.10	25
68	422	0	r	p	1/10/29	19.2	35.1	8.14	29
68	423	50	r	p	1/10/29	18.2	35.0	8.14	29
69	425	50	r	n	1/12/29	17.4	35.1	7.99	151
69	426	100	r	n	1/12/29	14.6	34.8	7.86	198
69	427	0	oc	p	1/12/29	21.1	35.2	8.12	62
70	432	50	r	n	1/13/29	15.4	35.0	7.88	178
70	433	100	r	n	1/13/29	12.6	34.8	7.68	233
70	434	0	r	p	1/13/29	21.2	35.1	8.05	103

Table 6. Distributional and environmental records for Ceratium furca Ehrenbergi--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
71	439	50	r	n	2/ 6/29	16.7	35.1	7.90	150
71	441	0	oc	p	2/ 6/29	23.5	35.2	8.13	58
72	444	50	oc	n	2/ 8/29	18.7	35.4	8.12	60
72	445	100	r	n	2/ 8/29	14.8	35.0	7.94	154
72	446	0	r	p	2/ 8/29	24.9	35.3	8.16	50
72	447	50	r	p	2/ 8/29	18.7	35.4	8.12	60
72-73	449	0	oc	n	2/ 9/29	(25.3	35.4	8.21	44)
73	450	0	oc	n	2/10/29	25.3	35.4	8.21	44
73	451	50	oc	n	2/10/29	18.7	35.4	8.05	122
73	452	100	oc	n	2/10/29	14.7	35.0	7.80	178
73	453	0	c	p	2/10/29	25.3	35.4	8.21	44
73	454	50	r	p	2/10/29	18.7	35.4	8.05	122
73	455	100	r	p	2/10/29	14.7	35.0	7.80	178
74	456	0	r	n	2/12/29	24.2	35.6	8.17	68
74	457	50	r	n	2/12/29	19.2	35.4	8.06	80
74	459	0	r	p	2/12/29	24.2	35.6	8.17	68
74	460	50	r	p	2/12/29	19.2	35.4	8.06	80
75	464	100	oc	n	2/14/29	17.8	35.4	8.00	75
75	465	0	r	p	2/14/29	22.8	35.8	8.18	44
77	473	0	r	p	2/18/29	23.7	36.0	8.19	16
78	476	50	r	n	2/20/29	23.8	36.1	8.14	32
78	477	100	oc	n	2/20/29	21.9	36.2	8.14	34
78	478	0	r	p	2/20/29	24.6	36.0	8.17	32
78	479	50	r	p	2/20/29	23.8	36.1	8.14	32
79	483	100	r	n	2/22/29	21.8	36.2	8.13	45
80	488	0	r	p	2/24/29	26.0	35.9	8.20	36
80	490	100	r	p	2/24/29	23.4	36.2	8.16	32
81	493	0	r	p	2/26/29	26.5	35.8	8.19	38
82	498	0	r	p	2/28/29	27.2	36.3	8.21	34
83	504	50	r	p	3/ 2/29	27.4	36.5	8.24	25
89	530	0	r	p	3/23/29	28.4	35.6	8.25	21
89	532	0	r	n	3/23/29	(28.4	35.6	8.25	21)
Samoa	555	0	oc	n	4/ 2/29	.....	.....	.....	...
96	568	0	r	n	4/26/29	29.3	35.3	8.23	12
95	568A	0	r	n	4/25/29	(29.4	34.7	8.26	14)
96	571	0	oc	p	4/26/29	29.3	35.3	8.23	12
96	573	100	oc	p	4/26/29	28.2	35.7	8.19	25
97	577	0	oc	p	4/28/29	28.3	35.2	8.16	24
97	578	50	r	p	4/28/29	28.0	35.4	8.16	21
97	579	100	oc	p	4/28/29	27.6	35.6	8.15	25
98	584	0	r	p	4/30/29	27.0	35.3	8.16	24
99	593	50	r	p	5/ 2/29	27.8	34.9	8.22	12
100	596	50	r	n	5/ 4/29	27.6	34.7	8.21	10
104	624	0	r	p	5/13/29	26.1	35.2	8.24	7
105	630	0	r	p	5/15/29	26.9	34.9	8.23	5
108	649	0	r	p	5/27/29	28.4	35.0	8.25	4
110	661	0	c	n	5/31/29	23.9	34.7	8.18	5
110	662	50	c	n	5/31/29	18.4	34.8	8.16	7
110	663	100	c	n	5/31/29	17.9	34.7	8.14	11
110	664	0	a	p	5/31/29	23.9	34.7	8.18	5
110	665	50	oc	p	5/31/29	18.4	34.8	8.16	7
110	666	100	oc	p	5/31/29	17.9	34.7	8.14	11
111	668	0	c	n	6/ 3/29	20.1	34.5	8.18	5
111	669	50	oc	n	6/ 3/29	19.4	34.6	8.17	5
111	671	0	oc	p	6/ 3/29	20.1	34.5	8.18	5
111	672	50	r	p	6/ 3/29	19.4	34.6	8.17	5
112	675	50	oc	n	6/ 5/29	21.7	34.6	8.23	7
112	676	100	oc	n	6/ 5/29	19.8	34.7	8.20	8
112	677	0	r	p	6/ 5/29	23.2	34.6	8.22	7
112	678	50	r	p	6/ 5/29	21.7	34.6	8.23	7
113	680	0	r	n	6/25/29	24.2	34.5	8.25	5
113	683	0	r	p	6/25/29	24.2	34.5	8.25	5
114	688	100	r	p	6/27/29	13.0	34.5	8.00	91
114	689	0	c	p	6/27/29	19.9	34.3	8.15	7
114	690	50	oc	p	6/27/29	16.2	34.6	8.04	63
115	693	50	r	n	6/29/29	17.5	34.6	8.12	17
115	694	100	r	n	6/29/29	15.6	34.6	8.08	27
115	695	0	oc	p	6/29/29	20.6	34.6	8.19	4
115	696	0	oc	p	6/29/29	20.6	34.6	8.19	4
115	697	50	r	p	6/29/29	17.5	34.6	8.12	17
117	709	50	r	n	7/ 3/29	12.5	34.2	8.06	51
117	710	100	r	n	7/ 3/29	8.8	34.1	7.98	84
117	711	0	r	p	7/ 3/29	15.9	34.3	8.17	3
129	780	0	r	n	7/27/29	16.3	33.1	8.13	25
130	784	0	r	p	9/ 4/29	16.2	33.4	8.34	36
131	792	0	r	p	9/ 4/29	16.2	33.4	8.34	36

Table 6. Distributional and environmental records for Ceratium furca Ehrenbergi--Concluded

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
131	793	0	r	p	9/ 6/29	19.3	33.4	8.34	...
131	794	0	r	p	9/ 6/29	19.3	33.4	8.34	...
131	795	0	r	p	9/ 6/29	19.3	33.4	8.34	...
132	797	0	r	n	9/ 8/29	21.0	33.9	8.34	15
132	801	0	oc	p	9/ 8/29	21.0	33.9	8.34	15
132	803	100	r	p	9/ 8/29	14.3	33.4	8.30	16
136	832	0	r	p	9/16/29	24.6	35.4	8.37	3
136	833	50	r	p	9/16/29	21.4	35.1	8.39	3
140	858	100	r	n	10/ 3/29	25.5	35.0	8.34	7
141	869	50	r	p	10/ 5/29	24.8	35.3	8.34	5
142	872	0	r	n	10/ 7/29	24.1	34.8	8.33	5
142	877	50	r	p	10/ 7/29	21.8	34.8	8.30	5
142	879	100	r	p	10/ 7/29	16.6	34.4	8.27	7
144	889	100	r	p	10/11/29	16.6	34.5	8.37	6
146	897	50	r	n	10/15/29	22.4	34.9	8.30	6
146	900	0	r	p	10/15/29	22.4	34.9	8.37	6
147	907	0	r	p	10/17/29	23.3	35.3	8.26	8
153	955	0	oc	p	10/29/29	28.1	34.2	8.47	7
158	983	0	r	n	11/ 8/29	28.2	35.6	8.34	36
158	985	100	r	n	11/ 8/29	27.6	35.9	8.39	48

Table 7. Distributional and environmental records for Ceratium belone

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
1b	8	100	r	n	5/16/28	20.3	36.5	8.18	36
18	114	0	r	p	8/17/28	27.0	37.0	8.23	5
47	267	50	r	n	11/23/28	23.8	36.0	8.23	20
47	268	100	r	n	11/23/28	22.7	36.2	8.23	20
49	277	0	oc	n	11/27/28	23.4	36.2	8.27	13
49	278	50	r	n	11/27/28	22.6	36.1	8.26	13
49	279	100	oc	n	11/27/28	21.6	35.9	8.26	13
49	280	0	r	p	11/27/28	23.4	36.2	8.27	13
49a	283	0	oc	n	11/28/28	(23.2	36.0	8.23	13)
50-51	290	0	r	n	11/30/28	(22.8	35.6	8.22	16)
50-51	291	0	oc	n	11/30/28	(22.8	35.6	8.22	16)
50-51	292	0	r	n	11/30/28	(22.8	35.6	8.22	16)
51	293	0	r	n	12/ 1/28	22.8	35.6	8.22	16
51	294	50	oc	n	12/ 1/28	20.5	35.6	8.22	17
51	295	100	oc	n	12/ 1/28	20.0	35.6	8.22	17
53-54	310	0	r	n	12/10/28	(23.0	35.6	8.22	11)
53-54	311	0	r	n	12/10/28	(23.0	35.6	8.22	11)
53-54	313	0	r	n	12/10/28	(23.0	35.6	8.22	11)
54	320	50	r	n	12/14/28	19.8	35.4	8.18	17
54	321	100	r	n	12/14/28	18.7	35.4	8.16	20
55	323	0	r	n	12/16/28	20.4	34.9	8.19	12
55	324	50	r	n	12/16/28	18.7	35.0	8.18	12
56	330	100	r	n	12/18/28	16.6	34.8	8 11	12
74	456	0	r	n	2/12/29	24.2	35.6	8.17	68
79	481	0	r	n	2/22/29	25.2	36.0	8.17	34
79	482	50	r	n	2/22/29	24.5	36.1	8.17	34
79	483	100	r	n	2/22/29	21.8	36.2	8.13	45
80	488	0	oc	p	2/24/29	26.0	35.9	8.20	36
81	493	0	r	p	2/26/29	26.5	35.8	8.19	38
82	496	0	r	n	2/28/29	27.2	36.3	8.21	34
91	540	0	r	n	3/27/29	28.7	35.1	8.30	21
91	541	50	r	n	3/27/29	28.5	35.2	8.30	24
94	558	50	r	n	4/22/29	29.3	34.7	8.25	14
95	563	50	r	n	4/24/29	29.3	34.9	8.24	16
96	569	50	r	n	4/26/29	29.2	35.3	8.23	25
96	570	100	r	n	4/26/29	28.2	35.7	8.19	25
96	571	0	r	p	4/26/29	29.3	35.3	8.23	12
97	574	0	r	n	4/28/29	28.3	35.2	8.16	24
97	576	100	r	n	4/28/29	27.6	35.6	8.15	25
97	577	0	r	p	4/28/29	28.3	35.2	8.16	24
97	579	100	r	p	4/28/29	27.6	35.6	8.15	25
100	598	0	r	p	5/ 4/29	27.7	34.7	8.21	10
133	804	0	r	n	9/10/29	22.7	34.7	8.47	7
142	874	100	r	n	10/ 7/29	16.6	34.4	8.27	7
145	890	0	r	n	10/13/29	22.3	34.6	8.29	6
145	893	0	r	p	10/13/29	22.3	34.6	8.29	6
145	895	100	r	p	10/13/29	16.0	34.1	3.31	6

Table 7. Distributional and environmental records for Ceratium belone--Concluded

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
158	983	0	r	n	11/ 8/29	28.2	35.6	8.34	36
158	985	100	r	n	11/ 8/29	27.6	35.9	8.39	48
159	990	0	r	n	11/11/29	28.8	35.7	8.37	15
159	991	50	r	n	11/11/29	28.5	35.7	8.39	15

Table 8. Distributional and environmental records for Ceratium incisum

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
16	103	0	r	p	8/13/28	25.9	36.2	8.24	8
33	198	50	r	n	10/ 8/28	28.2	36.2	8.24	4
33	198A	50	r	p	10/ 8/28	28.2	36.2	8.24	4
40	232	0	r	p	11/ 8/28	22.2	33.7	8.21	24
46	261	0	r	n	11/21/28	23.3	35.3	8.16	36
46	261	0	r	p	11/21/28	23.3	35.3	8.16	36
78	477	100	r	n	2/20/29	21.9	36.2	8.14	34
79	483	100	r	n	2/22/29	21.8	36.2	8.13	45
80	488	0	r	p	2/24/29	26.0	35.9	8.20	36
81	493	0	r	p	2/26/29	26.5	35.8	8.19	38
82	497	50	r	n	2/28/29	27.2	36.3	8.21	34
94	559	100	r	n	4/22/29	28.5	35.6	8.21	25
95	563	50	r	n	4/24/29	29.3	34.9	8.24	16
96	570	100	r	n	4/26/29	28.2	35.7	8.19	25
97	574	0	r	n	4/28/29	28.3	35.2	8.16	24
98	588	0-100	r	p	4/30/29	26.7	35.4	8.14	32
99	591	100	r	n	5/ 2/29	27.8	35.0	8.22	17
100	597	100	r	n	5/ 4/29	27.6	34.7	8.22	12
100	602	100	r	p	5/ 4/29	27.6	34.7	8.22	12
101	605	100	r	n	5/ 7/29	25.2	35.1	8.23	8
103	615	0	r	n	5/11/29	26.0	35.0	8.25	5
105	628	50	r	n	5/15/29	26.8	34.9	8.23	5
106	634	50	r	n	5/17/29	27.0	35.0	8.23	5
108	648	100	r	n	5/27/29	25.2	35.0	8.23	4
139	850	50	r	n	9/22/29	25.8	34.9	8.31	6
141	864	0	r	n	10/ 5/29	25.9	35.2	8.34	5
152	945	50	r	n	10/27/29	14.2	34.5	7.87	53
155	965	0	r	n	11/ 2/29	27.8	34.9	8.29	29
156	973	50	r	n	11/ 4/29	27.0	35.1	8.37	46
158	985	100	r	n	11/ 8/29	27.6	35.9	8.39	48

Table 9. Distributional and environmental records for Ceratium pentagonum

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
				Subspecies tenerum					
13a	88	0	c	n	8/ 8/28	21.2	35.2	8.18	11
13a	89	0	r	n	8/ 8/28	21.2	35.2	8.18	11
14	90	0	r	n	8/ 9/28	21.2	35.2	8.18	11
14	92	50	r	p	8/ 9/28	15.0	35.1	8.18	16
14	93	0	oc	p	8/ 9/28	21.2	35.2	8.18	11
15	97	0	r	p	8/11/28	24.8	36.4	8.21	11
15	98	50	r	p	8/11/28	19.8	36.5	8.21	8
15	99	100	r	p	8/11/28	18.9	36.4	8.20	19
16	103	0	r	p	8/13/28	25.9	36.2	8.24	8
16	108	100	r	n	8/13/28	19.9	36.5	8.17	13
17	109	50	oc	p	8/15/28	21.9	36.6	8.28	12
17	110	50	oc	p	8/15/28	21.9	36.6	8.28	12
17	111	0	oc	n	8/15/28	26.2	36.6	8.29	9
18	114	0	r	p	8/17/28	27.0	37.0	8.23	5
18	115	50	oc	p	8/17/28	22.4	36.8	8.24	5
18	118	50	r	n	8/17/28	22.4	36.8	8.24	5
19	121	50	r	p	8/20/28	25.2	37.1	8.27	5
20	125	0	r	p	8/22/28	26.0	36.6	8.37	5
20	126	50	r	p	8/22/28	25.8	36.6	8.26	3
20	127	100	r	p	8/22/28	22.6	38.7	8.19	5
20	128	0	r	n	8/22/28	26.0	38.6	8.37	5

Table 9. Distributional and environmental records for Ceratium pentagonum--Continued

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
			Subspecies tenerum--Continued						
20	130	100	oc	n	8/22/28	22.6	36.7	8.19	5
21	134	100	r	p	8/24/28	21.0	36.8	8.20	7
21	136	50	r	n	8/24/28	24.4	36.2	8.26	4
22	141	100	r	p	8/27/28	17.5	36.1	7.99	123
23	145	0	r	p	8/29/28	27.2	35.9	8.25	4
24	155	50	r	n	8/31/28	23.1	36.0	8.14	8
25	157	0	r	p	9/ 3/28	27.5	35.6	8.31	5
26	164	50	r	p	9/ 5/28	24.1	36.1	8.21	5
30	189	50	r	n	9/15/28	27.8	36.1	8.29	5
30	190	100	r	n	9/15/28	24.1	36.4	8.10	20
37	221	50	r	p	11/ 1/28	18.8	34.5	8.00	121
40	231	100	r	n	11/ 8/28	13.9	35.0	7.85	159
40	232	0	oc	p	11/ 8/28	22.2	33.7	8.21	24
40	234	100	r	p	11/ 8/28	13.9	35.0	7.85	159
41	235	0	r	n	11/10/28	20.4	34.2	8.11	32
41	236	50	oc	n	11/10/28	14.6	35.0	7.94	58
41	238	0	r	p	11/10/28	20.4	34.2	8.11	32
41	239	100	r	p	11/10/28	14.5	35.0	7.91	152
42	241	0	r	n	11/13/28	18.7	34.7	8.06	45
42	242	50	r	n	11/13/28	17.2	34.9	7.99	68
43	245	50	r	n	11/15/28	17.0	34.9	7.93	80
43	246	100	r	n	11/15/28	13.6	35.0	7.90	92
43	247	0	r	p	11/15/28	19.6	34.8	8.09	52
43	248	50	r	p	11/15/28	17.0	34.9	7.93	80
43	249	100	r	p	11/15/28	13.6	35.0	7.90	92
44	252	100	r	n	11/17/28	13.8	35.0	7.85	70
44	253	0	oc	p	11/17/28	20.7	34.9	8.03	38
44	254	50	oc	p	11/17/28	20.4	34.9	8.04	34
44	255	100	r	p	11/17/28	13.8	35.0	7.85	70
45	256	0	r	n	11/19/28	22.4	35.3	8.12	38
45	257	50	oc	n	11/19/28	22.4	35.2	8.13	46
45	258	100	r	n	11/19/28	18.6	35.1	8.00	50
45	259	0	oc	p	11/19/28	22.4	35.3	8.12	38
45	260	50	r	p	11/19/28	22.4	35.2	8.13	46
46	264	0	oc	p	11/21/28	23.3	35.3	8.16	36
46	265	50	r	p	11/21/28	23.2	35.3	8.16	40
47	269	0	r	p	11/23/28	23.9	36.0	8.16	17
47	270	50	r	p	11/23/28	23.8	36.0	8.16	20
48	274	0	r	p	11/23/28	23.6	36.4	8.23	13
49	280	0	r	p	11/27/28	23.4	36.2	8.27	13
49	281	50	r	p	11/27/28	22.6	36.1	8.26	13
50	286	100	r	n	11/29/28	20.5	35.7	8.22	13
50	287	0	r	p	11/29/28	23.2	36.0	8.23	13
50	288	50	r	p	11/29/28	22.0	35.9	8.23	13
50	289	100	r	p	11/29/28	20.5	35.7	8.22	13
54	322	0	r	p	11/29/28	23.4	35.5	8.22	9
59	348	0	r	n	12/24/28	16.3	34.0	8.10	38
60	359	0	r	p	12/26/28	15.0	34.0	8.07	50
62	371	0	r	n	12/30/28	19.2	34.2	8.12	32
62	372	50	r	n	12/30/28	16.2	34.3	8.10	28
62	373	100	oc	n	12/30/28	13.1	34.2	8.06	48
62	376	100	r	p	12/30/28	13.1	34.2	8.06	48
63	377	0	r	n	12/31/28	(20.5	34.6	8.07	21)
63	380	50	r	n	1/ 1/29	17.0	34.6	8.08	25
63	381	100	r	n	1/ 1/29	15.6	34.6	8.08	24
63	383	50	r	p	1/ 1/29	11.0	34.6	8.08	25
63-64	385	0	r	n	1/ 1/29	(20.5	34.6	8.07	21)
63-64	386	0	oc	n	1/ 1/29	(20.5	34.6	8.07	21)
63-64	387	0	r	n	1/ 2/29	(20.5	34.6	8.07	21)
63-64	389	0	r	n	1/ 2/29	(20.5	34.6	8.07	21)
63-64	390	0	r	n	1/ 2/29	(20.5	34.6	8.07	21)
63-64	391	0	oc	n	1/ 3/29	(20.5	34.6	8.07	21)
63-64	392	0	oc	n	1/ 3/29	(20.5	34.6	8.07	21)
64	397	100	r	n	1/ 3/29	15.8	34.5	8.10	32
64	398	0	r	p	1/ 3/29	20.6	34.6	8.12	21
64	400	100	r	p	1/ 3/29	15.8	34.5	8.10	32
64-65	401	0	r	n	1/ 3/29	(20.6	34.6	8.12	21)
64-65	402	0	r	n	1/ 4/29	(20.6	34.6	8.12	21)
65	409	50	r	p	1/ 5/29	16.5	34.5	8.10	25
66	411	0	r	n	1/ 7/29	19.4	34.7	8.10	29
66	412	100	r	n	1/ 7/29	17.8	34.9	8.12	21
66	413	0	oc	p	1/ 7/29	19.4	34.7	8.10	29
66	414	50	r	p	1/ 7/29	17.8	34.8	8.10	29
67	416	0	r	n	1/ 8/29	19.3	34.9	8.11	21

Table 9. Distributional and environmental records for Ceratium pentagonum--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
			Subspecies tenerum--Continued						
67	418	100	r	n	1/ 8/29	16.2	34.6	8.05	40
68	422	0	r	p	1/10/29	19.2	35.1	8.14	29
68	423	50	r	p	1/10/29	18.2	35.0	8.14	29
69	425	50	r	n	1/12/29	17.4	35.1	7.99	151
69	426	100	r	n	1/12/29	14.6	34.8	7.86	198
69	427	0	oc	p	1/12/29	21.1	35.2	8.12	62
69	428	50	r	p	1/12/29	17.4	35.1	7.99	151
70	432	50	r	n	1/13/29	15.4	35.0	7.88	178
70	434	0	r	p	1/13/29	21.2	35.1	8.05	103
70	436	100	r	p	1/13/29	12.6	34.8	7.68	233
71	441	0	oc	p	2/ 6/29	23.5	35.2	8.13	58
72	444	50	r	n	2/ 8/29	18.7	35.4	8.12	60
72	446	0	r	p	2/ 8/29	24.9	35.3	8.16	50
72	447	50	oc	p	2/ 8/29	18.7	35.4	8.12	60
72	448	100	r	p	2/ 8/29	14.8	35.0	7.94	154
73	450	0	r	n	2/10/29	25.3	35.4	8.21	44
73	451	50	oc	n	2/10/29	18.7	35.4	8.05	122
73	452	100	oc	n	2/10/29	14.7	35.0	7.80	178
73	453	0	oc	p	2/10/29	25.3	35.4	8.21	44
73	454	50	r	p	2/10/29	18.7	35.4	8.05	122
74	459	0	r	p	2/12/29	24.2	35.6	8.17	68
79	481	0	r	n	2/22/29	25.2	36.0	8.17	68
79	482	50	r	n	2/22/29	24.5	36.1	8.17	68
79	485	50	oc	p	2/22/29	24.5	36.1	8.17	68
87	522	50	r	n	3/11/29	26.5	36.1	8.26	20
87	523	0	r	p	3/11/29	27.8	36.1	8.28	17
87	524	50	r	p	3/11/29	26.5	36.1	8.26	20
87	525	100	r	p	3/11/29	23.9	36.0	8.23	20
89	531	100	r	p	3/23/29	26.4	36.0	8.24	12
90	533	0	r	n	3/25/29	28.5	35.5	8.27	21
90	535	0	r	p	3/25/29	28.5	35.5	8.27	21
90	536	50	r	p	3/25/29	28.6	35.6	8.26	21
91	541	50	r	n	3/27/29	28.5	35.2	8.30	24
91	542	0	r	p	3/27/29	28.7	35.1	8.30	21
91	543	50	r	p	3/27/29	28.5	35.2	8.30	24
92	548	50	r	p	3/29/29	28.4	35.4	8.29	28
93	553	100	r	p	3/31/29	27.6	35.8	8.27	29
96	572	50	r	p	4/26/29	29.2	35.3	8.23	12
101	606	0	r	p	5/ 7/29	26.3	35.3	8.24	8
102	612	0	r	p	5/ 9/29	25.8	35.0	8.24	8
102	613	50	r	p	5/ 9/29	25.8	35.0	8.24	8
104	624	0	oc	p	5/13/29	26.1	35.2	8.24	7
104	626	100	oc	p	5/13/29	25.3	35.3	8.21	7
105	630	0	oc	p	5/19/29	26.9	34.9	8.23	5
105	631	50	r	p	5/19/29	26.8	34.9	8.23	5
106	635	100	r	n	5/17/29	25.6	35.1	8.23	5
106	636	0	r	p	5/17/29	27.2	35.0	8.23	5
106	637	50	r	p	5/17/29	27.0	35.0	8.23	5
107	642	0	r	p	5/19/29	28.0	34.4	8.23	5
107	645	50	oc	p	5/19/29	27.9	34.4	8.23	4
108	647	50	r	n	5/27/29	26.8	35.0	8.24	4
108	648	100	r	n	5/27/29	25.2	35.0	8.23	4
110	665	50	oc	p	5/31/29	18.4	35.0	8.16	7
110	666	100	oc	p	5/31/29	17.9	34.7	8.14	11
111	671	0	oc	p	5/31/29	17.9	34.7	8.14	11
111	672	50	r	p	5/31/29	19.4	34.6	8.17	11
112	675	50	r	n	6/ 5/29	21.7	34.6	8.23	7
112	677	0	r	p	6/ 5/29	23.2	34.6	8.22	7
112	678	50	r	p	6/ 5/29	21.7	34.6	8.23	7
			Subspecies pacificum						
118	719	....	r	..	7/ 5/29	.....	.....	.....	...
120	729	0	r	p	7/ 9/29	7.2	33.0	7.98	137
120	730	50	r	p	7/ 9/29	2.2	33.1	7.90	177
121	732	0	r	n	7/11/29	7.5	32.9	7.98	141
121	735	0	oc	p	7/11/29	7.5	32.9	7.98	141
122	738	0	r	p	7/13/29	8.2	32.8	7.98	130
122	741	0	r	n	7/13/29	8.2	32.8	7.98	130
123	745	50	oc	p	7/15/29	4.4	32.9	7.94	150
123	747	0	r	n	7/15/29	8.1	32.8	8.03	113
124	749	0	oc	n	7/17/29	9.3	32.7	8.04	113
124	752	0	r	p	7/17/29	9.3	32.7	8.04	103
124	750	50	r	n	7/17/29	5.4	32.7	8.02	110
125	755	0	c	n	7/19/29	10.5	32.8	8.03	125

Table 9. Distributional and environmental records for Ceratium pentagonum--Concluded

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
				Subspecies pacificum--Concluded					
125	756	50	oc	n	7/19/29	5.5	32.8	7.98	138
125	757	100	oc	n	7/19/29	4.2	32.9	7.90	175
125	758	0	c	p	7/19/29	10.5	32.8	8.03	125
125	759	50	oc	p	7/19/29	5.5	32.8	7.98	138
				Subspecies tenerum--Concluded					
132	803	100	r	p	9/ 8/29	14.3	33.4	8.30	16
133	804	0	r	n	9/10/29	22.7	34.7	8.47	7
134	815	0	r	p	9/12/29	22.9	34.7	8.34	6
135	821	50	r	n	9/14/29	21.5	35.0	8.37	5
135	825	50	r	p	9/14/29	21.5	35.0	8.37	5
135	826	100	r	p	9/14/29	18.7	34.8	8.34	5
136	829	100	r	n	9/16/29	18.6	35.0	8.39	3
136	833	50	r	p	9/16/29	21.4	35.1	8.39	3
138	847	0	r	p	9/20/29	26.1	34.8	8.35	3
138	848	50	r	p	9/20/29	25.6	34.7	8.30	3
139	850	50	r	n	9/22/29	25.8	34.9	8.31	6
139	851	100	r	n	9/22/29	22.4	35.2	8.28	6
139	854	50	r	p	9/22/29	25.8	34.9	8.31	6
139	855	100	r	p	9/22/29	22.4	35.2	8.28	6
141	864	0	r	n	10/ 5/29	25.9	35.2	8.28	5
141	865	50	r	n	10/ 5/29	24.8	35.3	8.28	5
141	871	100	r	p	10/ 5/29	20.0	35.0	8.33	5
143	884	0	r	p	10/ 9/29	22.4	34.4	8.30	6
143	885	50	r	p	10/ 9/29	19.0	34.2	8.34	6
146	900	0	r	p	10/15/29	22.4	34.9	8.37	6
146	902	100	r	p	10/15/29	19.7	34.3	8.26	7
147	904	50	r	n	10/17/29	23.1	35.3	8.29	5
147	907	0	r	p	10/17/29	23.3	35.3	8.26	8
147	908	50	r	p	10/17/29	19.2	35.0	8.29	5
148	911	50	r	n	10/19/29	23.0	35.1	.....	...
148	917	0	oc	p	10/19/29	23.4	35.2	.....	...
149	921	50	r	n	10/21/29	23.3	35.0	8.37	6
149	927	0	oc	p	10/21/29	23.5	35.0	8.34	6
150	931	100	r	n	10/23/29	19.6	34.6	8.32	6
150	936	100	r	p	10/23/29	19.6	34.6	8.32	6
151	941	0	r	p	10/26/29	26.0	34.0	.....	...
152	946	100	r	n	10/27/29	11.4	34.7	7.76	75
152	948	0	r	p	10/27/29	27.4	33.7	8.35	20

Table 10. Distributional and environmental records for Ceratium subrobustum

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
15	102	100	r	n	8/11/28	18.4	36.4	8.20	19
19	123	50	oc	n	8/20/28	25.2	27.1	8.27	5
47	268	100	r	n	11/23/28	22.7	36.2	8.23	20
48	273	100	oc	n	11/25/28	22.7	36.3	8.26	16
48	276	100	r	p	11/25/28	22.7	36.3	8.26	16
49	279	100	oc	n	11/27/28	21.6	35.9	8.26	13
49	282	100	r	p	11/27/28	21.6	35.9	8.26	13
50	286	100	r	n	11/29/28	20.5	35.7	8.22	13
51	298	100	r	p	12/ 1/28	20.0	35.6	8.22	17
53	305	100	r	n	12/ 5/28	19.9	35.6	8.19	13
54	321	100	r	n	12/14/28	18.7	35.4	8.16	20
55	324	50	oc	n	12/16/28	18.7	35.0	8.18	12
55	325	100	r	n	12/16/28	16.7	34.9	7.17	12
56	330	100	oc	n	12/18/28	16,6	34.8	8.11	12
57	337	100	oc	n	12/20/28	14.3	34.4	8.10	40
57	340	100	r	p	12/20/28	14.3	34.4	8.10	40
58	342	50	r	n	12/22/28	14.8	34.0	8.12	25
58	345	50	r	p	12/22/28	14.8	34.0	8.12	25
75	462	0	r	n	2/14/29	22.8	35.8	8.18	44
76	468	50	r	n	2/16/29	22.1	35.9	8.14	42
76	469	100	r	n	2/16/29	21.2	35.8	8.12	45
77	472	0	r	n	2/18/29	23.7	36.0	8.19	16
77	473	0	r	p	2/18/29	23.7	36.0	8.19	16
77	474	50	r	p	2/18/29	23.5	36.0	8.19	16
78	477	100	r	n	2/20/29	24.6	36.0	8.17	32
94	559	100	r	n	4/22/29	28.5	35.6	8.21	25

Table 10. Distributional and environmental records for Ceratium subrobustum--Concluded

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
97	575	50	r	n	4/28/29	28.0	35.4	8.16	21
97	576	100	r	n	4/28/29	27.6	35.6	8.15	25
97	577	0	r	p	4/28/29	28.3	35.2	8.16	24
97	579	100	r	p	4/28/29	27.6	35.6	8.15	25
98	584	0	r	p	4/30/29	27.0	35.3	8.16	24
98	585	50	r	p	4/30/29	26.9	35.3	8.16	28
99	589	0	r	n	5/ 2/29	27.9	34.9	8.21	12
99	590	50	r	n	5/ 2/29	27.8	34.9	8.22	12
99	591	100	r	n	5/ 2/29	27.8	35.0	8.22	17
99	592	0	oc	p	5/ 2/29	27.9	34.9	8.21	12
99	595	0	r	n	5/ 2/29	27.9	34.9	8.21	12
100	596	50	r	n	5/ 4/29	27.6	34.7	8.21	10
100	597	100	oc	n	5/ 4/29	27.6	34.7	8.22	12
100	599	50	r	p	5/ 4/29	27.6	34.7	8.21	10
100	602	100	r	p	5/ 4/29	27.6	34.7	8.22	12
109	656	100	r	n	5/29/29	19.4	34.8	8.18	5
109	658	50	r	p	5/29/29	23.1	35.0	8.22	3
109	659	100	r	p	5/29/29	19.4	34.8	8.18	5
111	668	0	r	n	6/ 3/29	20.1	34.5	8.18	5
113	684	50	r	p	6/25/29	23.8	34.6	8.25	5
114	689	0	r	p	6/27/29	19.9	34.3	8.15	7
115	695	0	r	p	6/29/29	20.6	34.6	8.19	4
133	805	50	r	n	9/10/29	20.8	34.7	8.37	7
134	817	100	r	p	9/12/29	18.1	34.6	8.34	6
136	829	100	r	n	9/16/29	18.6	35.0	8.39	3
137	841	50	r	p	9/18/29	29.4	35.1	8.34	4
139	851	100	r	n	9/22/29	22.4	35.2	8.28	6
139	855	100	r	p	9/22/29	22.4	35.2	8.28	6
140	858	100	r	n	10/ 3/29	25.5	35.0	8.34	7
140	862	100	r	p	10/ 3/29	25.5	35.0	8.34	7
142	873	50	r	n	10/ 7/29	21.8	34.8	8.30	5
142	874	100	c	n	10/ 7/29	16.6	34.4	8.27	7
142	878	100	r	p	10/ 7/29	16.6	34.4	8.27	7
142	879	100	r	p	10/ 7/29	16.6	34.4	8.27	7
144	888	50	oc	p	10/11/29	21.1	34.7	8.33	6
144	889	100	oc	p	10/11/29	16.6	34.5	8.37	6
145	891	50	c	n	10/13/29	18.7	34.3	8.34	6
145	892	100	oc	n	10/13/29	16.0	34.1	8.31	6
145	894	50	r	p	10/13/29	18.7	34.3	8.34	6
145	895	100	r	p	10/13/29	16.0	34.1	8.31	6
146	897	50	oc	n	10/15/29	22.4	34.9	8.30	6
147	905	100	r	n	10/15/29	19.7	34.3	8.26	7
149	922	100	r	n	10/15/29	19.7	34.3	8.26	7
151	939	100	r	n	10/26/29	12.5	34.6	.....	...
153	957	100	r	p	10/29/29	20.5	34.7	8.28	31
155	965	0	r	n	11/ 2/29	27.8	34.9	8.29	29
155	966	50	r	n	11/ 2/29	27.7	34.9	8.30	30
155	967	100	oc	n	11/ 2/29	27.2	35.0	8.30	35
155	973	50	oc	p	11/ 2/29	27.7	34.9	8.30	30
156	972	0	r	n	11/ 4/29	27.6	35.0	8.34	28
156	974	100	r	n	11/ 4/29	26.4	35.1	8.30	48
157	978	0	c	n	11/ 6/29	27.1	35.3	8.27	47
157	979	50	oc	n	11/ 6/29	27.1	35.2	8.32	60
157	980	100	r	n	11/ 6/29	26.8	35.5	8.30	64
158	985	100	r	n	11/ 8/29	27.6	35.9	8.39	48

Table 11. Distributional and environmental records for Ceratium teres

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
15	102	100	r	n	8/11/28	18.4	36.4	8.20	19
17	109	0	r	p	8/15/28	26.2	36.6	8.29	9
18	114	0	oc	p	8/17/28	27.0	37.0	8.23	5
18	115	50	r	p	8/17/28	22.4	36.8	8.24	5
18	118	50	r	n	8/17/28	22.4	36.8	8.24	5
19	121	50	r	p	8/20/28	25.2	37.1	8.27	5
19	123	50	r	n	8/20/28	25.2	37.1	8.27	5
20	127	100	r	p	8/22/28	22.6	36.7	8.19	5
20	130	100	r	n	8/22/28	22.6	36.7	8.19	5
20-21	131	0	r	n	8/23/28	(26.6	36.3	8.32	4)
21	134	100	r	p	8/24/28	21.0	36.8	8.20	7

Table 11. Distributional and environmental records for Ceratium teres--Continued

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
21	137	100	r	n	8/24/28	21.0	36.8	8.20	7
22	140	50	r	p	8/27/28	24.5	36.2	8.21	9
22	143	50	r	n	8/27/28	24.5	36.2	8.21	9
22	144	100	r	n	8/27/28	17.5	36.1	7.99	123
23	145	0	oc	p	8/29/28	27.2	35.9	8.25	4
23	149	50	r	n	8/29/28	20.9	36.0	8.14	13
24	151	0	r	p	8/31/28	27.2	35.2	8.32	4
24	152	50	r	p	8/31/28	23.1	36.0	8.14	8
30	189	50	r	n	9/15/28	27.8	36.1	8.29	3
32	194A	0	r	p	10/ 5/28	28.0	36.0	8.23	2
46	262	50	r	n	11/21/28	23.2	35.3	8.16	40
46	263	100	oc	n	11/21/28	22.5	35.4	8.17	40
46	264	0	r	p	11/21/28	23.3	35.3	8.16	36
47	270	50	r	p	11/23/28	23.8	36.0	8.23	20
48	276	100	r	p	11/25/28	22.7	36.3	8.26	16
49	279	100	r	n	11/27/28	21.6	35.9	8.26	13
49	281	50	r	p	11/27/28	22.6	36.1	8.26	13
50	289	100	oc	p	11/29/28	20.5	35.7	8.22	13
50-51	290	0	r	n	11/30/28	(22.8	35.6	8.22	16)
50-51	291	0	r	n	11/30/28	(22.8	35.6	8.22	16)
50-51	292	0	r	n	11/30/28	(22.8	35.6	8.22	16)
51	294	50	r	n	12/ 1/28	20.5	35.6	8.22	17
51	297	50	r	p	12/ 1/28	20.5	35.6	8.22	17
54	322	0	r	p	12/14/28	23.4	35.5	8.22	9
57	338	0	r	p	12/20/28	19.0	34.5	8.14	20
58	342	50	r	n	12/22/28	14.8	34.0	8.12	25
58	344	0	r	p	12/22/28	17.0	34.0	8.12	20
58	345	50	oc	p	12/22/28	14.8	34.0	8.12	25
59	348	0	r	n	12/24/28	16.3	34.0	8.10	38
59	350	100	oc	n	12/24/28	11.4	34.1	8.03	72
59	351	0	oc	p	12/24/28	16.3	34.0	8.10	38
59	352	50	r	p	12/24/28	14.0	34.0	8.08	38
60	357	0	r	p	12/26/28	15.0	34.0	8.07	50
60-61	360	0	r	n	12/26/28	(15.0	34.0	8.07	50)
60-61	361	0	r	n	12/26/28	(15.0	34.0	8.07	50)
67	416	0	r	n	1/ 8/29	19.3	34.9	8.11	21
68	422	0	r	p	1/10/29	19.2	35.1	8.14	29
80	489	50	r	p	2/24/29	25.9	36.0	8.19	29
80	490	100	r	p	2/24/29	23.4	36.2	8.16	32
81	493	0	r	p	2/26/29	26.5	35.8	8.19	38
81	495	100	r	p	2/26/29	23.6	36.2	8.18	36
85	512	0	r	p	3/ 6/29	27.9	36.2	8.22	40
87	523	0	r	p	3/11/29	27.8	36.1	8.28	17
87	524	50	r	p	3/11/29	26.5	36.1	8.26	20
89	530	0	r	p	3/23/29	28.4	35.6	8.25	21
90	536	50	r	p	3/25/29	28.6	35.6	8.26	21
90	537	100	r	p	3/25/29	26.3	35.8	8.24	21
91	542	0	oc	p	3/27/29	28.7	35.1	8.30	21
91	544	100	r	p	3/27/29	25.8	36.0	8.25	30
92	547	0	r	p	3/29/29	28.5	35.3	8.29	28
92	549	100	oc	p	3/29/29	26.2	36.0	8.28	28
93	552	0	oc	p	3/31/29	28.7	34.7	8.30	28
93	553	100	oc	p	3/31/29	27.6	35.8	8.27	29
94	562	100	r	p	4/22/29	28.5	35.6	8.21	25
95	565	0	r	p	4/24/29	29.4	34.7	8.26	14
95	566	50	r	p	4/24/29	29.3	34.9	8.24	16
95	567	100	r	p	4/24/29	28.5	35.4	8.22	21
96	573	100	r	p	4/26/29	28.2	35.7	8.19	25
97	577	0	oc	p	4/28/29	28.3	35.2	8.16	24
97	578	50	oc	p	4/28/29	28.0	35.4	8.16	21
99	593	50	r	p	5/ 2/29	27.8	34.9	8.22	12
100	598	0	r	p	5/ 4/29	27.7	34.7	8.21	10
100	602	100	oc	p	5/ 4/29	27.6	34.7	8.22	12
101	606	0	r	p	5/ 7/29	26.3	34.7	8.24	8
102	610	50	r	n	5/ 9/29	25.8	35.0	8.24	8
102	612	0	r	p	5/ 9/29	25.8	35.0	8.24	8
102	614	100	oc	p	5/ 9/29	25.6	35.0	8.23	8
103	616	50	r	n	5/11/29	25.8	35.2	8.25	5
103	618	0	oc	p	5/11/29	26.0	35.0	8.25	5
103	620	100	r	p	5/11/29	24.8	35.2	8.25	5
104	626	100	oc	p	5/13/29	25.3	35.3	8.21	7
105	630	0	oc	p	5/15/29	26.9	34.9	8.23	5
105	631	50	oc	p	5/15/29	26.8	34.9	8.23	5
107	640	50	r	n	5/19/29	27.9	34.4	8.23	4
107	642	0	oc	p	5/19/29	28.0	34.4	8.23	5

Table 11. Distributional and environmental records for Ceratium teres--Concluded

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
109	660	0	r	p	5/29/29	27.4	35.0	8.23	3
112	675	50	r	n	6/ 5/29	21.7	34.6	8.23	7
112	678	100	r	n	6/ 5/29	19.8	34.7	8.20	8
112	677	0	r	p	6/ 5/29	23.2	34.6	8.22	7
115	692	0	r	n	6/29/29	20.6	34.6	8.19	4
132	801	0	r	p	9/ 8/29	21.0	33.9	8.34	15
134	815	0	r	p	9/12/29	22.9	34.7	8.34	6
136	828	50	r	p	9/16/29	21.4	35.1	8.39	3
136	832	0	r	p	9/16/29	24.6	35.4	8.37	3
136	833	50	r	n	9/16/29	21.4	35.1	8.39	3
141	869	50	r	p	10/ 5/29	24.8	35.3	8.34	5
142	876	0	r	p	10/ 7/29	24.1	34.8	8.33	5
144	887	0	oc	p	10/11/29	23.3	35.0	8.37	6
145	893	0	r	p	10/13/29	22.3	34.6	8.29	6
146	901	50	r	p	10/15/29	22.4	34.9	8.30	6
146	902	100	r	p	10/15/29	19.7	34.3	8.26	7
147	907	0	r	p	10/17/29	23.3	35.3	8.26	8
148	918	50	r	p	10/19/29	23.0	35.1	.....	...
151	941	0	r	p	10/26/29	26.0	34.0	.....	...
153	956	50	r	p	10/29/29	28.1	34.4	8.39	7

Table 12. Distributional and environmental records for Ceratium kofoidii

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
44	253	0	r	p	11/17/28	20.7	34.9	8.03	38
45	256	0	r	n	11/19/28	22.4	35.3	8.12	38
45	257	50	r	n	11/19/28	22.4	35.2	8.13	46
45	259	0	oc	p	11/19/28	22.4	35.3	8.12	38
71	441	0	r	p	2/ 6/29	23.5	35.2	8.13	58
100	600	100	r	p	5/ 4/29	27.6	34.7	8.22	12
111	671	0	oc	p	6/ 3/29	20.1	34.5	8.18	5
111	672	50	r	p	6/ 3/29	19.4	34.6	8.17	5
112	679	100	r	p	6/ 5/29	19.8	34.7	8.20	8
130	784	0	r	p	9/ 4/29	16.2	33.4	8.34	36
130	785	50	r	p	9/ 4/29	11.7	33.4	8.26	83
142	879	100	r	p	10/ 7/29	16.6	34.4	8.27	7

Table 13. Distributional and environmental records for Ceratium bőhmii

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
40	230	50	r	n	11/ 8/28	15.3	34.9	7.87	161
40	232	0	r	p	11/ 8/28	22.2	33.7	8.21	24
40	234	100	r	p	11/ 8/28	13.9	35.0	7.85	159
42	243	100	r	n	11/13/28	13.8	35.0	7.91	150
98	585	50	r	p	4/30/29	26.9	35.3	8.16	28
99	589	0	r	n	5/ 2/29	27.9	34.9	8.21	12
99	594	100	r	p	5/ 2/29	27.8	35.0	8.22	17
114	689	0	oc	p	6/27/29	19.9	34.3	8.15	7
114	690	50	r	p	6/27/29	16.2	34.6	8.04	63
115	695	0	oc	p	6/29/29	20.6	34.6	8.19	4
115	696	0	oc	p	6/29/29	20.6	34.6	8.19	4
115	698	100	oc	p	6/29/29	15.6	34.6	8.08	27

Table 14. Distributional and environmental records for Ceratium lineatum

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
3	20	0	r	n	5/21/28	15.5	36.1	8.15	99
4	23	100	r	n	5/23/28	13.4	35.9	8.12	50
6	37	100	r	n	5/31/28	11.3	35.6	8.08	41
6b	46	0	r	n	5/31/28	(12.4	35.6	8.15	21)
9	64	0	r	n	7/28/28	11.2	35.1	8.08	20
9	65	50	oc	n	7/28/28	8.4	35.1	7.96	55
9	66	100	r	n	7/28/28	7.6	35.1	7.98	56
10	68	0	oc	n	7/30/28	10.9	34.9	8.08	28
10	69	50	oc	n	7/30/28	10.0	34.9	8.04	34
10	70	100	oc	n	7/30/28	6.6	35.0	7.95	52
11a	78	0	oc	n	8/ 1/28	(10.7	34.9	8.06	27)
13a	88	0	r	n	8/ 9/28	(21.2	35.2	8.18	11)
17	111	0	oc	n	8/16/28	26.2	36.6	8.29	9
19	122	0	r	n	8/20/28	26.6	37.0	8.34	5
115a	700	0	c	n	7/ 1/29	(18.4	34.3	8.18	4)
115a	702	0	oc	n	7/ 1/29	16.1	34.0	8.17	4
115a	705	0	oc	p	7/ 1/29	16.1	34.0	8.17	4
116	703	50	oc	n	7/ 1/29	10.6	33.8	8.11	23
116	704	100	oc	n	7/ 1/29	6.7	33.8	.....	...
116	706	50	oc	p	7/ 1/29	10.6	33.8	8.11	23
116	707	100	r	p	7/ 1/29	6.7	33.8	.....	...
117	708	0	r	n	7/ 3/29	15.9	34.3	8.17	3
117	709	50	oc	n	7/ 3/29	12.5	34.2	8.06	51
117	710	100	oc	n	7/ 3/29	8.8	34.1	7.98	84
117	711	0	c	p	7/ 3/29	15.9	34.3	8.17	3
117	712	50	oc	p	7/ 3/29	12.5	34.2	8.06	51

Table 15. Distributional and environmental records for Ceratium setaceum

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
70	434	0	r	p	1/13/29	21.2	35.1	8.05	103
70	435	50	r	p	1/13/29	15.4	35.0	7.88	178
110	666	100	oc	p	5/31/29	17.9	34.7	8.14	11

Table 16. Distributional and environmental records for Ceratium bigelowii

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
45	257	50	r	n	11/19/28	22.4	35.2	8.13	46
47	267	50	r	n	11/23/28	23.8	36.0	8.23	20
47	268	100	r	n	11/23/28	22.7	36.2	8.23	20
48	272	50	r	n	11/25/28	23.6	36.4	8.24	16
49	278	50	r	n	11/27/28	22.6	36.1	8.26	13
54	321	100	r	n	12/14/28	18.7	35.4	8.16	20
56	330	100	r	n	12/18/28	16.6	34.8	8.11	12
57	337	100	r	n	12/20/28	14.3	34.4	8.10	40
78	477	100	r	n	2/20/29	21.9	36.2	8.14	34
78	478	0	r	p	2/20/29	24.8	36.0	8.17	32
81	492	50	r	n	2/26/29	26.4	35.9	8.19	38
89	529	50	r	n	3/23/29	28.6	35.8	8.27	12
89	530	0	r	p	3/23/29	28.4	35.6	8.25	21
89	532	0	r	n	3/23/29	(28.4	35.6	8.25	21)
95	563	50	oc	n	4/24/29	29.3	34.9	8.24	16
95	564	100	r	n	4/24/29	28.5	35.4	8.22	21
95	567	100	r	p	4/24/29	28.5	35.4	8.22	21
96	568	0	r	n	4/26/29	29.3	35.3	8.23	12
96	569	50	oc	n	4/26/29	29.2	35.3	8.23	12
96	570	100	r	n	4/26/29	28.2	35.7	8.19	25
100	596	50	r	n	5/ 4/29	27.6	34.7	8.21	10
100	597	100	r	n	5/ 4/29	27.6	34.7	8.22	12
103	615	0	r	n	5/11/29	26.0	35.0	8.25	5
105	627	50	r	n	5/15/29	26.8	34.9	8.23	5
106	634	50	r	n	5/17/29	27.0	35.0	8.23	5
107	639	0	r	n	5/19/29	28.0	34.4	8.23	5
107	641	100	r	n	5/19/29	28.8	34.9	8.23	11
108	648	100	r	n	5/27/29	25.2	35.0	8.23	4
109	655	50	r	n	5/29/29	23.1	35.0	8.22	3
136	829	100	r	n	9/16/29	18.6	35.0	8.39	3

Table 16. Distributional and environmental records for Ceratium bigelowii--Concluded

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
154	958	0	r	n	10/31/29	28.3	34.2	8.39	7
154	959	50	r	n	10/31/29	28.2	34.2	8.40	7
155	965	0	r	n	11/ 2/29	27.8	34.9	8.29	29
155	966	50	r	n	11/ 2/29	27.7	34.9	8.30	30
155	967	100	r	n	11/ 2/29	27.2	35.0	8.30	35
158	983	0	r	n	11/ 8/29	28.2	35.6	8.34	36
158	984	50	r	n	11/ 8/29	28.2	35.6	8.39	50
159	990	0	oc	n	11/11/29	28.6	35.7	8.37	15
159	991	50	oc	n	11/11/29	28.5	35.7	8.39	15
159	992	100	r	n	11/11/29	28.0	35.7	8.37	23

Table 17. Distributional and environmental records for Ceratium inflatum

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
17	112	50	r	n	8/15/28	21.9	36.6	8.28	12
18	118	50	r	n	8/17/28	22.4	36.8	8.24	5
20-21	131	0	r	n	8/24/28	(26.6	36.3	8.32	4)
24	151	0	r	p	8/31/28	27.2	35.2	8.32	4
37	218	50	r	n	11/ 1/28	18.8	34.5	8.00	121
53	304	50	r	n	12/15/28	21.2	35.8	8.20	13
54	320	50	r	n	12/14/28	19.8	35.4	8.18	17
56	330	100	r	n	12/18/28	16.6	34.8	8.11	12
90	533	0	r	n	3/25/29	28.5	35.5	8.27	21
99	589	0	r	n	5/ 2/29	27.9	34.9	8.21	12
99	590	50	oc	n	5/ 2/29	27.8	34.9	8.22	12
99	595	0	r	n	5/ 2/29	27.9	34.9	8.21	12
100	597	100	r	n	5/ 4/29	27.6	34.7	8.22	12
101	603	0	r	n	5/ 7/29	26.3	34.7	8.24	8
101	605	100	r	n	5/ 7/29	25.2	35.1	8.23	8
104	621	0	r	n	5/13/29	25.8	35.2	8.24	7
104	625	50	r	p	5/13/29	25.8	35.2	8.24	7
105	627	50	r	n	5/15/29	26.8	34.9	8.23	5
105	629	100	r	n	5/15/29	25.2	35.1	8.23	5
106	633	0	r	n	5/17/29	27.2	35.0	8.23	5
106	634	50	r	n	5/17/29	27.0	35.0	8.23	5
106	635	100	r	n	5/17/29	25.6	35.1	8.23	5
107	642	0	r	p	5/19/29	28.0	34.4	8.23	5
111	672	50	r	p	6/ 3/29	19.4	34.6	8.17	5
138	845	100	r	n	9/20/29	22.2	34.8	8.31	3
142	874	100	r	n	10/ 8/29	16.8	34.4	8.27	7
145	890	0	r	n	10/13/29	22.3	34.6	8.29	6
145	894	50	r	p	10/13/29	18.7	34.3	8.34	6
151	942	50	r	p	10/26/29	18.3	34.4	.....	...
158	983	0	r	n	11/ 8/29	28.2	35.6	8.34	36
159	990	0	r	n	11/11/29	28.6	35.7	8.37	15

Table 18. Distributional and environmental records for Ceratium longirostrum

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
1b	8	100	r	n	5/18/28	(20.3	36.5	8.18	36)
20	128	0	r	n	8/22/28	26.0	36.6	8.37	5
49	277	0	r	n	11/27/28	23.4	36.2	8.27	13
49	279	100	r	n	11/27/28	21.6	35.9	8.26	13
49	282	100	r	p	11/27/28	21.6	35.9	8.26	13
49a	283	0	r	n	11/29/28	(23.2	36.0	8.23	13)
78	479	50	r	p	2/20/29	23.8	36.1	8.14	32
84	505	0	r	n	3/ 4/29	27.8	36.2	8.23	24
93	551	50	oc	n	3/31/29	28.5	34.8	8.30	28
93	553	100	r	p	3/31/29	27.6	35.8	8.27	29
96	570	100	r	n	4/26/29	28.2	35.7	8.19	25
96	573	100	r	p	4/26/29	28.2	35.7	8.19	25
98	585	50	r	p	4/30/29	26.9	35.3	8.16	28
101	605	100	oc	n	5/ 7/29	25.2	35.1	8.23	8
102	609	0	oc	n	5/ 9/29	25.8	35.0	8.24	8
102	610	50	oc	n	5/ 9/29	25.8	35.0	8.24	8
103	615	0	oc	n	5/11/29	26.0	35.0	8.25	5

Table 18. Distributional and environmental records for Ceratium longirostrum--Concluded

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
103	616	50	r	n	5/11/29	25.8	35.2	8.25	5
103	617	100	r	n	5/11/29	24.8	35.2	8.25	5
103	618	0	r	p	5/11/29	26.0	35.0	8.25	5
104	621	0	r	n	5/13/29	26.1	35.2	8.24	7
106	635	100	r	n	5/17/29	25.6	35.1	8.23	5
107	639	0	r	n	5/19/29	28.0	34.4	8.23	5
107	642	0	r	p	5/19/29	28.0	34.4	8.23	5
145	890	0	r	n	10/13/29	22.3	34.6	8.29	6
145	893	0	r	p	10/13/29	22.3	34.6	8.29	6

Table 19. Distributional and environmental records for Ceratium falcatum

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
15	102	100	r	n	8/11/28	18.4	36.4	8.20	19
50	286	100	r	n	11/29/28	20.5	35.7	8.22	13
50a	291	0	r	n	12/ 1/28	22.8	35.6	8.22	16
51	293	0	r	n	12/ 1/28	22.8	35.6	8.22	16
51	294	50	r	n	12/ 1/28	20.5	35.6	8.22	17
51	295	100	r	n	12/ 1/28	20.0	35.6	8.22	17
51	296	0	r	p	12/ 1/28	22.8	35.6	8.22	16
52	299	0	r	n	12/ 3/28	22.8	35.6	8.22	16
52	301	100	r	n	12/ 3/28	18.2	35.2	8.17	8
53	304	50	r	n	12/ 5/28	21.2	35.8	8.20	13
53-54	310	0	r	n	12/14/28	(23.0	35.6	8.22	11)
55	323	0	r	n	12/16/28	20.4	34.9	8.19	12
55	324	50	r	n	12/16/28	18.7	35.0	8.18	12
56	330	100	r	n	12/18/28	16.6	34.8	8.11	12
56	331	0	r	p	12/18/28	20.8	34.9	8.13	9
56-57	334	0	r	n	12/20/28	(19.0	34.5	8.14	20)
69	425	50	r	n	1/12/29	17.4	35.1	7.99	151
69	426	100	r	n	1/12/29	14.6	34.8	7.86	198
71	441	0	r	p	2/ 6/29	23.5	35.2	8.13	58
74	459	0	r	p	2/12/29	24.2	35.6	8.17	68
76	467	0	r	n	2/16/29	23.4	35.9	8.15	50
80	488	0	r	p	2/24/29	26.0	35.9	8.20	36
81	493	0	r	p	2/26/29	26.5	35.8	8.19	38
82	498	0	r	p	2/28/29	27.2	36.3	8.21	34
86	516	0	r	n	3/ 9/29	28.3	36.2	8.29	20
86	518	0	r	p	3/ 9/29	28.3	36.2	8.29	20
87	521	0	r	n	3/11/29	27.8	36.1	8.28	17
87	522	50	r	n	3/11/29	26.5	36.1	8.26	20
87	523	0	r	p	3/11/29	27.8	36.1	8.28	17
88	526	0	r	n	3/21/29	28.5	35.9	8.23	16
89	532	0	r	n	3/23/29	(28.4	35.6	8.25	21)
90	533	0	r	n	3/25/29	28.5	35.5	8.27	21
90	535	0	r	p	3/25/29	28.5	35.5	8.27	21
102	609	0	oc	n	5/ 9/29	25.8	35.0	8.24	8
108	697	50	r	n	5/27/29	26.8	35.0	8.24	4
109	656	100	r	n	5/29/29	19.4	34.8	8.18	5
110	664	0	r	p	5/31/29	23.9	34.7	8.18	5
138	843	0	r	n	9/20/29	26.1	34.8	8.35	5
138	844	50	r	p	9/20/29	25.6	34.7	8.30	3
139	850	50	r	n	9/22/29	25.8	34.9	8.31	6
140	858	100	r	n	10/ 3/29	25.5	35.0	8.34	7
149	920	0	r	n	10/21/29	23.5	35.0	8.34	6
149	927	0	r	p	10/21/29	23.5	35.0	8.34	6
150	930	50	r	n	10/23/29	22.8	34.8	8.35	10
150	931	100	r	n	10/23/29	19.6	34.6	8.32	11
152	945	50	r	n	10/27/29	14.2	34.5	7.87	53
158	985	100	r	n	10/27/29	27.6	35.9	8.39	48

Table 20. Distributional and environmental records for Ceratium extensum

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
1	1	0	r	n	5/12/28	24.0	36.2	8.16	34
1a	5	0	r	n	5/18/28	(22.3	36.3	8.20	46)
1b	6	0	oc	n	5/18/28	(22.3	36.3	8.20	46)
1b	7	50	oc	n	5/18/28	(22.3	36.3	8.20	46)
2	13	100	oc	n	5/18/28	19.8	36.4	8.21	33
2	14	0	r	n	5/18/28	20.5	36.4	8.23	58
3	17	0	c	n	5/21/28	15.5	36.1	8.15	99
3	18	50	oc	n	5/21/28	15.0	36.0	8.19	30
6b	44	0	c	n	5/31/28	(12.4	35.6	8.15	21)
6b	45	0	oc	n	5/31/28	(12.4	35.6	8.15	21)
6b	46	0	oc	n	5/31/28	(12.4	35.6	8.15	21)
6c	48	0	oc	n	5/31/28	(12.4	35.6	8.15	21)
6c	49	0	c	n	5/31/28	(12.4	35.6	8.15	21)
16	103	0	r	p	8/13/28	25.9	36.2	8.24	8
16	105	100	r	p	8/13/28	19.9	36.5	8.17	13
16	106	0	r	n	8/13/28	25.9	36.2	8.24	8
16	107	50	r	n	8/13/28	24.4	36.4	8.23	8
17	109	0	r	p	8/15/28	26.2	36.6	8.29	9
18	114	0	r	p	8/17/28	27.0	37.0	8.23	5
19	123	50	r	n	8/20/28	25.2	37.1	8.27	5
31	193	100	r	n	10/ 3/28	23.4	36.5	8.19	28
33	197A	0	r	p	10/ 8/28	28.5	35.6	8.23	4
34	200A	0	oc	p	10/ 9/28	28.5	35.9	8.28	2
35-36	209	0	oc	n	10/26/28	(27.4	29.7	8.31	15)
45	256	0	r	n	11/19/28	22.4	35.3	8.12	38
45	257	50	r	n	11/19/28	22.4	35.2	8.13	46
45	258	100	r	n	11/19/28	18.6	35.1	8.00	50
45	259	0	r	p	11/19/28	22.4	35.3	8.12	38
46	261	0	oc	n	11/21/28	23.3	35.3	8.16	36
46	262	50	r	n	11/21/28	23.2	35.3	8.16	40
46	263	100	r	n	11/21/28	22.5	35.4	8.17	40
46	264	0	r	p	11/21/28	23.3	35.3	8.16	36
46	265	50	oc	p	11/21/28	23.2	35.3	8.16	40
47	266	0	r	n	11/23/28	23.9	36.0	8.23	17
47	267	50	oc	n	11/23/28	23.8	36.0	8.23	20
47	268	100	oc	n	11/23/28	22.7	36.2	8.23	20
47	269	0	oc	p	11/23/28	23.9	36.0	8.23	17
47	270	50	r	p	11/23/28	23.8	36.0	8.23	20
48	272	50	r	n	11/25/28	23.6	36.4	8.24	16
48	273	100	oc	n	11/25/28	22.7	36.3	8.26	16
48	274	0	r	p	11/25/28	23.6	36.4	8.23	13
49	277	0	oc	n	11/27/28	23.4	36.2	8.27	13
49	279	100	oc	n	11/27/28	21.6	35.9	8.26	13
49	280	0	r	p	11/27/28	23.4	36.2	8.27	13
49	281	50	r	p	11/27/28	22.6	36.1	8.26	13
49a	283	0	oc	n	11/28/28	(23.2	36.0	8.23	13)
50	284	0	oc	n	11/29/28	23.2	36.0	8.23	13
50	286	100	oc	n	11/29/28	20.5	35.7	8.22	13
50-51	290	0	r	n	11/30/28	(22.8	35.6	8.22	16)
50-51	291	0	oc	n	11/30/28	(22.8	35.6	8.22	16)
50-51	292	0	oc	n	11/30/28	(22.8	35.6	8.22	16)
51	293	0	oc	n	12/ 1/28	(22.8	35.6	8.22	16)
51	294	50	r	n	12/ 1/28	20.5	35.6	8.22	17
51	295	100	r	n	12/ 1/28	20.0	35.6	8.22	17
51	296	0	oc	p	12/ 1/28	22.8	35.6	8.22	16
52	299	0	r	n	12/ 3/28	22.5	35.4	8.21	8
53-54	310	0	r	n	12/10/28	(23.0	35.6	8.22	11)
53-54	311	0	r	n	12/10/28	(23.0	35.6	8.22	11)
53-54	312	0	oc	n	12/10/28	(23.0	35.6	8.22	11)
54	319	0	r	n	12/14/28	23.4	35.5	8.22	9
54	320	50	oc	n	12/14/28	19.8	35.4	8.18	17
54	322	0	r	p	12/14/28	23.4	35.5	8.22	9
55	323	0	r	n	12/16/28	20.4	34.9	8.19	12
56	330	100	r	n	12/18/28	16.6	34.8	8.11	12
56	333	100	r	p	12/18/28	16.6	34.8	8.11	12
57	335	0	oc	n	12/20/28	19.0	34.5	8.14	20
59	351	0	r	p	12/24/28	16.3	34.0	8.10	38
60	355	50	r	n	12/26/28	13.4	34.0	8.06	54
60	356	100	r	n	12/26/28	10.6	34.0	8.03	62
61	368	100	r	p	12/28/28	10.8	34.0	8.03	80
61-62	369	0	r	n	12/28/28	(16.9	34.0	8.05	46)
61-62	370	0	r	n	12/28/28	(16.9	34.0	8.05	46)
63	381	100	r	n	1/ 1/29	15.6	34.6	8.08	24
63-64	386	0	r	n	1/ 1/29	(20.5	34.6	8.07	21)
63-64	387	0	r	n	1/ 2/29	(20.5	34.6	8.07	21)
63-64	388	0	r	n	1/ 2/29	(20.5	34.6	8.07	21)

Table 20. Distributional and environmental records for Ceratium extensum--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
63-64	389	0	r	n	1/ 2/29	(20.5	34.6	8.07	21)
63-64	390	0	r	n	1/ 2/29	(20.5	34.6	8.07	21)
63-64	391	0	r	n	1/ 3/29	(20.5	34.6	8.07	21)
63-64	392	0	r	n	1/ 3/29	(20.5	34.6	8.07	21)
63-64	393	0	r	n	1/ 3/29	(20.5	34.6	8.07	21)
64	394	0	r	n	1/ 3/29	20.6	34.6	8.12	21
64	398	0	r	p	1/ 3/29	20.6	34.6	8.12	21
64-65	402	0	r	n	1/ 4/29	(20.6	34.6	8.12	21)
65	408	0	r	p	1/ 5/29	20.2	34.5	8.10	24
67	416	0	oc	n	1/ 8/29	19.3	34.9	8.11	21
68	422	0	r	p	1/10/29	19.2	35.1	8.14	29
76	468	50	r	n	2/16/29	22.1	35.9	8.14	42
76	469	100	r	n	2/16/29	21.2	35.8	8.12	45
77	472	0	r	n	2/18/29	23.7	36.0	8.19	16
78	476	50	r	n	2/20/29	23.8	36.1	8.14	32
78	477	100	oc	n	2/20/29	21.9	36.2	8.14	34
78	478	0	r	p	2/20/29	24.6	36.0	8.17	32
78	479	50	r	p	2/20/29	23.8	36.1	8.14	32
78	480	100	r	p	2/20/29	21.9	36.2	8.14	34
79	481	0	oc	n	2/22/29	25.2	36.0	8.17	34
79	482	50	oc	n	2/22/29	24.5	36.1	8.17	34
79	483	100	r	n	2/22/29	21.8	36.2	8.13	45
79	484	0	r	p	2/22/29	25.2	36.0	8.17	34
80	486	0	r	n	2/24/29	26.0	35.9	8.20	36
80	488	0	r	p	2/24/29	26.0	35.9	8.20	36
80	489	50	oc	p	2/24/29	25.9	36.0	8.19	29
80	490	100	r	p	2/24/29	23.4	36.2	8.16	32
81	491	0	r	n	2/26/29	26.5	35.8	8.19	38
81	492	50	c	n	2/26/29	26.4	35.9	8.19	38
81	493	0	oc	p	2/26/29	26.5	35.8	8.19	38
81	494	50	oc	p	2/26/29	26.4	35.9	8.19	38
81	495	100	r	p	2/26/29	23.6	36.2	8.18	36
82	496	0	oc	n	2/28/29	27.2	36.3	8.21	34
82	497	50	oc	n	2/28/29	27.2	36.3	8.21	34
82	498	0	oc	p	2/28/29	27.2	36.3	8.21	34
83	501	0	c	n	3/ 2/29	27.5	36.3	8.24	29
83	502	50	r	n	3/ 2/29	27.4	36.5	8.24	25
83	504	50	r	p	3/ 2/29	27.4	36.5	8.24	25
84	505	0	oc	n	3/ 4/29	27.8	36.2	8.23	24
84	506	50	oc	n	3/ 4/29	27.5	36.4	8.21	24
85	510	0	oc	n	3/ 6/29	27.9	36.2	8.22	40
85	511	50	r	n	3/ 6/29	27.8	36.2	8.22	40
85	512	0	r	p	3/ 6/29	27.9	36.2	8.22	40
86	516	0	oc	n	3/ 9/29	28.3	36.2	8.29	20
86	517	50	oc	n	3/ 9/29	27.4	36.2	8.29	17
86	518	0	r	p	3/ 9/29	28.3	36.2	8.29	20
87	521	0	oc	n	3/11/29	27.8	36.1	8.28	17
87	523	0	r	p	3/11/29	27.8	36.1	8.28	17
87	525	100	r	p	3/11/29	23.9	36.0	8.23	20
88	526	0	oc	n	3/21/29	28.5	35.9	8.23	16
89	528	0	oc	n	3/23/29	28.4	35.6	8.25	21
89	529	50	oc	n	3/23/29	28.6	35.8	8.27	12
89	530	0	r	p	3/23/29	28.4	35.6	8.25	21
89	532	0	r	n	3/23/29	(28.4	35.6	8.25	21)
90	533	0	c	n	3/25/29	28.5	35.5	8.27	21
90	535	0	oc	p	3/25/29	28.5	35.5	8.27	21
90	536	50	oc	p	3/25/29	28.6	35.6	8.26	21
91	540	0	c	n	3/27/29	28.7	35.1	8.30	21
91	541	50	c	n	3/27/29	28.5	35.2	8.30	24
91	542	0	oc	p	3/27/29	28.7	35.1	8.30	21
91	543	50	r	p	3/27/29	28.5	35.2	8.30	24
91	544	100	r	p	3/27/29	25.8	36.0	8.25	30
92	545	0	oc	n	3/29/29	28.5	35.3	8.29	28
92	546	50	c	n	3/29/29	28.4	35.4	8.29	28
92	548	50	r	p	3/29/29	28.4	35.4	8.29	28
93	551	50	c	n	3/31/29	28.5	34.8	8.30	28
93	552	0	r	p	3/31/29	28.7	34.7	8.30	28
93	553	100	r	p	3/31/29	27.6	35.8	8.27	29
94	558	50	r	n	4/22/29	29.3	34.7	8.25	14
94	559	100	r	n	4/22/29	28.5	35.6	8.21	25
94	561	50	r	p	4/22/29	29.3	34.7	8.25	14
95	565	0	r	p	4/24/29	29.4	34.7	8.26	14
95	568A	0	oc	n	4/25/29	(29.4	34.7	8.26	14)
96	569	50	oc	n	4/26/29	29.2	35.3	8.23	12
96	572	50	r	p	4/26/29	29.2	35.3	8.23	12
97	577	0	r	p	4/28/29	28.3	35.2	8.16	24

Table 20. Distributional and environmental records for Ceratium extensum--Continued

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
97	578	50	r	p	4/28/29	28.0	35.4	8.16	21
98	584	0	r	p	4/30/29	27.0	35.3	8.16	24
98	585	50	r	p	4/30/29	26.9	35.3	8.16	28
99	594	100	r	p	5/ 2/29	27.8	35.0	8.22	17
99	595	0	r	n	5/ 2/29	27.9	34.9	8.21	12
100	596	50	r	n	5/ 4/29	27.6	34.7	8.21	10
100	597	100	r	n	5/ 4/29	27.6	34.7	8.22	12
100	598	0	r	p	5/ 4/29	27.7	34.7	8.21	10
102	609	0	c	n	5/ 9/29	25.8	35.0	8.24	8
102	610	50	oc	n	5/ 9/29	25.8	35.0	8.24	8
102	611	100	oc	n	5/ 9/29	25.6	35.0	8.23	8
102	612	0	r	p	5/ 9/29	25.8	35.0	8.24	8
102	613	50	r	p	5/ 9/29	25.8	35.0	8.24	8
103	615	0	oc	n	5/11/29	26.0	35.0	8.25	5
103	616	50	r	n	5/11/29	25.8	35.2	8.25	5
103	617	100	oc	n	5/11/29	24.8	35.2	8.25	5
103	618	0	r	p	5/11/29	26.0	35.0	8.25	5
104	622	50	oc	n	5/13/29	25.8	35.2	8.24	7
104	626	100	r	p	5/13/29	25.3	35.3	8.21	7
105	627	50	c	n	5/15/29	26.8	34.9	8.23	5
105	628	50	c	n	5/15/29	26.8	34.9	8.23	5
105	630	0	oc	p	5/15/29	26.9	34.9	8.23	5
105	631	50	oc	p	5/15/29	26.8	34.9	8.23	5
106	633	0	c	n	5/17/29	27.2	35.0	8.23	5
106	634	50	oc	n	5/17/29	27.0	35.0	8.23	5
106	635	100	c	n	5/17/29	25.6	35.1	8.23	5
106	636	0	r	p	5/17/29	27.2	35.0	8.23	5
106	637	50	r	p	5/17/29	27.0	35.0	8.23	5
107	639	0	c	n	5/19/29	28.0	34.4	8.23	5
107	640	50	oc	n	5/19/29	27.9	34.4	8.23	4
107	641	100	oc	n	5/19/29	26.8	34.9	8.23	11
107	642	0	r	p	5/19/29	28.0	34.4	8.23	5
107	643	50	r	p	5/19/29	27.9	34.4	8.23	4
107	645	50	oc	p	5/19/29	27.9	34.4	8.23	4
108	649	0	r	p	5/27/29	28.4	35.0	8.25	4
Guam	652	0	oc	n	5/ /29	.....	.....	.....	...
109	654	0	oc	n	5/29/29	27.4	35.0	8.23	4
109	655	50	r	n	5/29/29	23.1	35.0	8.22	3
109	658	50	oc	p	5/29/29	23.1	35.0	8.22	3
110	664	0	oc	p	5/31/29	23.9	34.7	8.18	5
112	675	50	r	n	6/ 5/29	21.7	34.6	8.23	7
112	677	0	r	p	6/ 5/29	23.2	34.6	8.22	7
128	779	0	r	n	7/25/29	16.4	33.0	8.12	29
129	780	0	r	n	7/27/29	16.3	33.1	8.13	25
130	787	0	oc	n	9/ 4/29	16.2	33.4	8.34	36
131	793	0	r	p	9/ 6/29	19.3	33.4	8.34	....
132	801	0	r	p	9/ 8/29	21.0	33.9	8.34	15
133	814	100	r	p	9/10/29	18.4	34.8	8.31	7
134	808	0	r	n	9/12/29	22.9	34.7	8.34	6
134	809	50	r	n	9/12/29	19.8	34.6	8.34	6
137	840	0	r	p	9/18/29	25.5	35.0	8.39	4
140	862	100	r	p	10/ 3/29	25.5	35.0	8.34	7
141	864	0	r	n	10/ 5/29	25.9	35.2	8.34	5
141	868	0	r	p	10/ 5/29	25.9	35.2	8.34	5
142	872	0	r	n	10/ 7/29	24.1	34.8	8.33	5
142	873	50	oc	n	10/ 7/29	21.8	34.8	8.30	5
142	876	0	r	p	10/ 7/29	24.1	34.8	8.33	5
142	877	50	r	p	10/ 7/29	21.8	34.8	8.30	5
142	879	100	r	p	10/ 7/29	16.6	34.4	8.27	7
143	881	0	oc	n	10/ 9/29	22.4	34.4	8.30	6
143	882	50	oc	n	10/ 9/29	19.0	34.2	8.34	6
143	883	100	oc	n	10/ 9/29	13.8	34.1	8.30	10
143	884	0	r	p	10/ 9/29	19.0	34.2	8.34	6
143	885	50	oc	n	10/ 9/29	19.0	34.2	8.34	6
144	886	0	r	n	10/11/29	23.3	35.0	8.37	6
144	887	0	oc	p	10/11/29	23.3	35.0	8.37	6
144	888	50	r	p	10/11/29	21.1	34.7	8.33	6
144	889	100	r	p	10/11/29	16.6	34.5	8.37	6
145	890	0	oc	n	10/13/29	22.3	34.6	8.29	6
145	891	50	oc	n	10/13/29	18.7	34.3	8.34	6
145	893	0	oc	p	10/13/29	22.3	34.6	8.29	6
145	894	50	oc	p	10/13/29	18.7	34.3	8.34	6
146	898	100	r	n	10/15/29	19.7	34.3	8.26	7
146	900	0	r	p	10/15/29	22.4	34.9	8.37	6
146	902	100	r	p	10/15/29	19.7	34.3	8.26	7

Table 20. Distributional and environmental records for Ceratium extensum--Concluded

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
152	946	100	r	n	10/27/29	11.4	34.7	7.76	75
152	949	50	r	p	10/27/29	14.2	34.5	7.87	53
158	983	0	oc	n	11/ 8/29	28.2	35.6	8.34	36
158	984	50	oc	n	11/ 8/29	28.2	35.6	8.39	50
158	985	100	c	n	11/ 8/29	27.6	35.9	8.39	48
159	991	50	oc	n	11/11/29	28.5	35.7	8.39	15
159	992	100	r	n	11/11/29	28.0	35.7	8.37	23

Table 21. Distributional and environmental records for Ceratium fusus

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
3	19	100	r	n	5/21/28	13.6	35.9	8.10	48
3	20	0	c	n	5/21/28	15.5	36.1	8.15	99
3-4	21	0	r	n	5/23/28	(15.1	36.0	8.15	96)
4	24	50	r	n	5/23/28	14.4	36.0	8.15	21
4	25	0	r	n	5/23/28	14.6	35.9	8.16	92
5	28	50	oc	n	5/25/28	14.6	36.0	8.21	36
5	29	0	oc	n	5/25/28	15.0	35.9	8.19	16
5a	33	0	c	n	5/31/28	(12.4	35.6	8.15	21)
5a	34	0	r	n	5/31/28	(12.4	35.6	8.15	21)
6	35	0	c	n	5/31/28	12.4	35.6	8.15	21
6	36	50	c	n	5/31/28	11.6	35.6	8.12	32
6	37	100	c	n	5/31/28	11.3	35.6	8.08	41
6	42	0	c	n	5/31/28	(12.4	35.6	8.15	21)
6b	43	0	oc	n	5/31/28	(12.4	35.6	8.15	21)
6b	44	0	c	n	5/31/28	(12.4	35.6	8.15	21)
6b	45	0	oc	n	5/31/28	(12.4	35.6	8.15	21)
6b	46	0	oc	n	5/31/28	(12.4	35.6	8.15	21)
6c	48	0	oc	n	5/31/28	(12.4	35.6	8.15	21)
6c	49	0	c	n	5/31/28	(12.4	35.6	8.15	21)
7	56	0	oc	n	7/13/28	8.9	35.2	8.08	34
8	59	0	oc	n	7/15/28	10.3	35.2	7.93	13
8	60	50	r	n	7/15/28	9.1	35.2	7.95	27
8	61	100	oc	n	7/15/28	8.4	35.3	7.95	54
9	64	0	a	n	7/28/28	11.2	35.1	8.08	20
9	65	50	a	n	7/28/28	8.4	35.1	7.96	55
9	66	100	a	n	7/28/28	7.6	35.1	7.98	56
10	68	0	a	n	7/30/28	10.9	34.9	8.08	28
10	69	50	a	n	7/30/28	10.0	34.9	8.04	34
11	73	0	oc	n	8/ 1/28	10.7	34.9	8.06	27
11	74	50	oc	n	8/ 1/28	7.3	34.9	7.92	63
11	75	0	r	p	8/ 1/28	10.7	34.9	8.06	27
11	76	50	r	p	8/ 1/28	7.3	34.9	7.92	63
11	77	100	r	p	8/ 1/28	6.3	35.1	7.90	66
11a	78	0	a	n	8/ 1/28	(10.7	34.9	8.06	27)
13	83	0	r	n	8/ 7/28	11.3	32.7	8.09	19
13a	89	0	r	n	8/ 9/28	(21.2	35.2	8.18	11)
14	93	0	c	p	8/ 9/28	21.2	35.2	8.18	11
14	95	50	r	n	8/ 9/28	15.0	35.1	8.18	16
15	97	0	oc	p	8/11/28	34.8	36.4	8.21	11
15	98	50	oc	p	8/11/28	19.8	36.5	8.21	8
15	99	100	oc	p	8/11/28	18.4	36.4	8.20	19
15	100	0	oc	n	8/11/28	24.8	36.4	8.21	11
15	102	100	r	n	8/11/28	18.4	36.4	8.20	19
16	103	0	r	p	8/13/28	25.9	36.2	8.24	8
16	104	50	r	p	8/13/28	24.4	36.4	8.23	8
16	105	100	r	p	8/13/28	19.9	36.5	8.17	13
16	106	0	r	n	8/13/28	25.9	36.2	8.24	8
16	107	50	r	n	8/13/28	24.4	36.4	8.23	8
16	108	100	oc	n	8/13/28	19.9	36.5	8.17	13
17	109	0	r	p	8/15/28	26.2	36.6	8.29	9
17	110	50	oc	p	8/15/28	21.9	36.6	8.28	12
17	111	0	a	n	8/15/28	26.2	36.6	8.29	9
18	114	0	oc	p	8/17/28	27.0	37.0	8.23	5
18	117	0	r	n	8/17/28	27.0	37.0	8.23	5
22	139	0	r	p	8/27/28	26.7	36.0	8.26	8
23	145	0	r	p	8/29/28	27.2	35.9	8.25	4
25	158	50	r	p	9/ 3/28	21.5	36.0	8.22	12
33	197A	0	r	p	10/ 8/28	28.5	35.6	8.23	4
35	207	50	r	p	10/26/28	16.8	34.7	7.92	138
37	219	100	r	n	11/ 1/28	15.1	34.9	7.82	153

Table 21. Distributional and environmental records for Ceratium fusus--Continued

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
40	232	0	r	p	11/ 8/28	22.2	33.7	8.21	24
41	236	50	r	n	11/10/28	14.6	35.0	7.94	58
41a	240	0	r	n	11/13/28	(18.7	34.7	8.06	45)
45	256	0	r	n	11/19/28	22.4	35.3	8.12	38
45	258	100	r	n	11/19/28	18.6	35.1	8.00	50
45	259	0	oc	p	11/19/28	22.4	35.3	8.12	38
45	260	50-0	oc	p	11/19/28	22.4	35.2	8.13	46
47	267	50	r	n	11/23/28	23.8	36.0	8.23	20
50	285	50	r	n	11/29/28	22.0	35.9	8.23	13
50	286	100	r	n	11/29/28	20.5	35.7	8.22	13
50	289	100	r	p	11/29/28	20.5	35.7	8.22	13
50-51	292	0	r	n	12/ 1/28	(22.8	35.6	8.22	16)
51	293	0	r	n	12/ 1/28	22.8	35.6	8.22	16
51	295	100	r	n	12/ 1/28	20.0	35.6	8.22	17
58	341	0	oc	n	12/22/28	17.0	34.0	8.12	20
58	342	50	oc	n	12/22/28	14.8	34.0	8.12	25
58	344	0	r	p	12/22/28	17.0	34.0	8.12	20
58	345	50	oc	p	12/22/28	14.8	34.0	8.12	25
59	348	0	r	n	12/24/28	16.3	34.0	8.10	38
59	350	100	oc	n	12/24/28	11.4	34.1	8.03	72
59	351	0	oc	p	12/24/28	16.3	34.0	8.10	38
59	352	50	r	p	12/24/28	14.0	34.0	8.08	38
60	355	50	oc	n	12/26/28	13.4	34.0	8.06	54
60	356	100	oc	n	12/26/28	10.6	34.0	8.03	62
60	358	50	r	p	12/26/28	13.4	34.0	8.06	54
60	359	0	r	p	12/26/28	15.0	34.0	8.07	50
60-61	362	0	r	n	12/26/28	(15.0	34.0	8.07	50)
61	368	100	r	p	12/28/28	10.8	34.0	8.03	80
61-62	370	0	r	n	12/28/28	(16.9	34.0	8.05	46)
62	373	100	r	n	12/30/28	13.1	34.2	8.06	48
63-64	392	0	r	n	1/ 1/29	(20.5	34.6	8.07	21)
64	395	50	r	n	1/ 3/29	17.2	34.6	8.12	29
64-65	401	0	r	n	1/ 3/29	(20.6	34.6	8.12	21)
64-65	402	0	oc	n	1/ 3/29	(20.6	34.6	8.12	21)
64-65	403	0	r	n	1/ 3/29	(20.6	34.6	8.12	21)
65	408	0	r	p	1/ 5/29	20.2	34.5	8.10	24
65	409	50	r	p	1/ 5/29	16.5	34.5	8.10	25
67	416	0	oc	n	1/ 8/29	19.3	34.9	8.11	21
68	422	0	r	p	1/10/29	19.2	35.1	8.14	29
68	423	50	r	p	1/10/29	18.2	35.0	8.14	29
69	427	0	r	p	1/12/29	21.1	35.2	8.12	62
70	434	0	r	p	1/13/29	21.2	35.1	8.05	103
71	439	50	r	n	2/ 6/29	16.7	35.1	7.90	150
71	440	100	r	n	2/ 6/29	13.9	35.0	7.71	220
71	441	0	oc	p	2/ 6/29	23.5	35.2	8.13	58
71	442	50	r	p	2/ 6/29	16.7	35.1	7.90	150
72	444	50	r	n	2/ 8/29	18.7	35.4	8.12	60
72	446	0	r	p	2/ 8/29	24.9	35.3	8.16	50
72	448	100	r	p	2/ 8/29	14.8	35.0	7.94	154
74	459	0	oc	p	2/12/29	24.2	35.6	8.17	68
75	466	50	r	p	2/14/29	20.0	35.5	8.14	46
76	467	0	r	n	2/16/29	23.4	35.9	8.15	50
76	471	50	r	p	2/16/29	22.1	35.9	8.14	42
78	476	50	r	n	2/20/29	23.8	36.1	8.14	32
78	477	100	r	n	2/20/29	21.9	36.2	8.14	34
78	478	0	r	p	2/20/29	24.6	36.0	8.17	32
78	479	50	oc	p	2/20/29	23.8	36.1	8.14	32
78	480	100	r	p	2/20/29	21.9	36.2	8.14	34
79	483	100	r	n	2/22/29	21.8	36.2	8.13	45
80	488	0	oc	p	2/24/29	26.0	35.9	8.30	36
80	489	50	oc	p	2/24/29	25.9	36.0	8.19	29
80	490	100	oc	p	2/24/29	23.4	36.2	8.16	32
81	493	0	oc	p	2/26/29	26.5	35.8	8.19	38
81	494	50	r	p	2/26/29	26.4	35.9	8.19	38
81	495	100	r	p	2/26/29	23.6	36.2	8.18	36
82	498	0	oc	p	2/28/29	27.2	36.3	8.21	34
82	500	100	r	p	2/28/29	24.4	36.5	8.19	34
85	513	50	oc	p	3/ 6/29	(27.8	36.2	8.22	40
85	514	100	r	p	3/ 6/29	25.2	36.3	8.23	42
86	519	50	r	p	3/ 9/29	27.4	35.2	8.29	17
89	530	0	r	p	3/23/29	28.4	35.6	8.25	21
90	536	50	r	p	3/25/29	28.6	35.6	8.26	21
92	549	100	r	p	3/29/29	26.2	36.0	8.28	28
93	551	50	oc	n	3/31/29	28.5	34.8	8.30	28
93	552	0	r	p	3/31/29	28.7	34.7	8.30	28
93	553	100	oc	p	3/31/29	27.6	35.8	8.27	29

Table 21. Distributional and environmental records for Ceratium fusus--Concluded

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
Samoa	555	0	r	n	4/ /29	.....	.....	.....	...
94	561	50	r	p	4/22/29	29.3	34.7	8.25	14
95	566	50	r	p	4/24/29	29.3	34.9	8.24	16
95	566	50	oc	p	4/24/29	29.3	34.9	8.24	16
95	568A	0	oc	n	4/24/29	(29.4	34.7	8.26	14)
96	572	50	oc	p	4/26/29	29.2	35.3	8.23	12
98	584	0	oc	p	4/30/29	27.0	35.3	8.16	24
100	602	100	r	p	5/ 4/29	27.6	34.7	8.22	12
110	666	100	r	p	5/31/29	17.9	34.7	8.14	11
111	668	0	r	n	6/ 3/29	20.1	34.5	8.18	5
111	669	50	oc	n	6/ 3/29	19.4	34.6	8.17	5
111	671	0	oc	p	6/ 3/29	20.1	34.5	8.18	5
111	672	50	oc	p	6/ 3/29	19.4	34.6	8.17	5
112	677	0	r	p	6/ 5/29	23.2	34.6	8.22	7
114	688	100	r	p	6/27/29	13.0	34.5	8.00	91
114	689	0	oc	p	6/27/29	19.9	34.3	8.15	7
115	692	0	oc	p	6/29/29	20.6	34.6	8.19	4
115	693	50	r	n	6/29/29	17.5	34.6	8.12	17
115	698	100	r	p	6/29/29	15.6	34.6	8.08	27
115a	700	0	r	n	7/ 1/29	(18.3	34.3	8.18	4)
116	706	50	r	p	7/ 1/29	10.6	33.8	8.11	23
120	726	0	oc	p	7/ 9/29	7.2	33.0	7.98	137
120	727	50	r	n	7/ 9/29	2.2	33.1	7.90	177
120	729	0	r	p	7/ 9/29	7.2	33.0	7.98	137
120	730	50	oc	p	7/ 9/29	2.2	33.1	7.90	177
121	732	0	c	n	7/11/29	7.5	32.9	7.98	141
121	733	50	r	n	7/11/29	3.6	33.1	7.92	159
121	735	0	oc	p	7/11/29	7.5	32.9	7.98	141
121	734	100	r	n	7/11/29	2.1	33.2	7.86	184
121	736	50	r	p	7/11/29	3.6	33.1	7.92	159
121	737	100	r	p	7/11/29	2.1	33.2	7.86	184
122	738	0	c	n	7/13/29	8.2	32.8	7.98	130
122	740	100	r	n	7/13/29	2.4	33.1	7.90	161
122	741	0	oc	p	7/13/29	8.2	32.8	7.98	130
123	744	0	oc	n	7/15/29	8.1	32.8	8.03	113
123	745	50	oc	n	7/15/29	4.4	32.9	7.94	150
123	746	100	oc	n	7/15/29	3.0	33.4	7.79	209
123	747	0	oc	p	7/15/29	8.1	32.8	8.03	113
124	749	0	oc	n	7/17/29	9.3	32.7	8.04	103
124	752	0	r	p	7/17/29	9.3	32.7	8.04	103
125	755	0	oc	n	7/19/29	10.5	32.8	8.03	125
125	756	50	oc	n	7/19/29	5.5	32.8	7.98	138
125	757	100	c	n	7/19/29	4.2	32.9	7.90	175
125	758	0	oc	p	7/19/29	10.5	32.8	8.03	125
125	759	50	oc	p	7/19/29	5.5	32.8	7.98	138
127	772	100	r	p	7/23/29	8.2	32.8	8.00	72
128	774	50	oc	p	7/25/29	11.8	33.1	8.11	29
128	775	100	r	p	7/25/29	10.2	33.2	8.06	46
128	777	50	oc	p	7/25/29	11.8	33.1	8.11	29
130	787	0	oc	n	9/ 4/29	16.2	33.4	8.34	36
131	795	0	r	p	9/ 6/29	19.3	33.4	8.34	...
141	869	50	r	p	10/ 5/29	24.8	35.3	8.34	5
141	870	50	r	p	10/ 5/29	24.8	35.3	8.34	5
142	874	100	r	n	10/ 7/29	16.6	34.4	8.27	7
143	883	100	oc	n	10/ 9/29	13.8	34.1	8.30	10
144	887	0	r	p	10/11/29	23.3	35.0	8.37	6
144	889	100	r	p	10/11/29	16.6	34.5	8.37	6
151	941	0	r	p	10/26/29	26.0	34.0	.....	...

Table 22. Distributional and environmental records for Ceratium tripos subsp. atlanticum

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
1	1	0	oc	n	5/12/28	24.0	36.2	8.16	34
1	2	70	r	n	5/12/28	(22.4	36.4	8.15	36)
1a	3	0	oc	n	5/18/28	(22.3	36.3	8.20	46)
1b	7	50	c	n	5/18/28	(21.7	36.3	8.20	38)
2	12	50	oc	n	5/18/28	20.5	36.4	8.21	46
2	13	100	c	n	5/18/28	19.8	36.4	8.21	46
2	14	0	c	n	5/18/28	20.5	36.4	8.23	58
2	15	0	r	n	5/18/28	20.5	36.4	8.23	58
3	17	0	oc	n	5/21/28	15.5	36.1	8.15	99

Table 22. Distributional and environmental records for Ceratium tripos subsp. atlanticum--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
3	19	100	r	n	5/21/28	13.6	35.9	8.10	48
4	23	100	r	n	5/23/28	13.4	35.9	8.12	50
4	24	50	r	n	5/23/28	14.4	36.0	8.15	21
5a	33	0	c	n	5/31/28	(12.4	35.6	8.15	21)
5a	34	0	r	n	5/31/28	12.4	35.6	8.15	21
6	35	0	c	n	5/31/28	12.4	35.6	8.15	21
6	36	50	c	n	5/31/28	11.6	35.6	8.12	32
6	37	100	c	n	5/31/28	11.3	35.6	8.08	41
6a	40	0	r	n	5/31/28	(12.4	35.6	8.15	21)
6a	42	0	c	n	6/ 2/28	(12.4	35.6	8.15	21)
6b	43	0	c	n	6/ 2/28	(12.4	35.6	8.15	21)
6b	44	0	c	n	6/ 2/28	(12.4	35.6	8.15	21)
6b	45	0	c	n	6/ 2/28	(12.4	35.6	8.15	21)
6b	46	0	c	n	6/ 2/28	(12.4	35.6	8.15	21)
6c	47	100	c	n	6/ 2/28	(11.3	35.6	8.08	41)
6c	48	0	c	n	6/ 2/28	(12.4	35.6	8.15	21)
6c	49	0	c	n	6/ 4/28	(12.4	35.6	8.15	21)
6e	52	0	r	n	7/ 8/28	(10.6	35.4	8.11	28)
6f	53	0	c	n	7/ 9/28	(10.6	35.4	8.11	28)
6g	54	0	c	n	7/10/28	(10.6	35.4	8.11	28)
6h	55	0	oc	n	7/11/28	(10.6	35.4	8.11	28)
7	56	0	oc	n	7/11/28	8.9	35.2	8.08	34
7	57	50	oc	n	7/11/28	8.2	35.2	8.03	47
7	58	100	oc	n	7/11/28	8.1	35.2	8.04	57
8	59	0	c	n	7/15/28	10.3	35.2	7.93	13
8	60	50	c	n	7/15/28	9.1	35.2	7.95	27
8	61	100	oc	n	7/15/28	8.4	35.3	7.95	54
9	64	0	a	n	7/28/28	11.2	35.1	8.08	20
9	65	50	a	n	7/28/28	8.4	35.1	7.96	55
9	66	100	c	n	7/28/28	7.6	35.1	7.98	56
9	67	0	r	n	7/28/28	11.2	35.1	8.08	20
10	68	0	a	n	7/30/28	10.9	34.9	8.08	28
10	69	50	c	n	7/30/28	10.0	34.9	8.04	34
10	70	100	oc	n	7/30/28	6.6	35.0	7.95	52
11	73	0	oc	n	8/ 1/28	10.7	34.9	8.06	27
11	74	50	r	n	8/ 1/28	7.3	34.9	7.92	63
11	75	0	oc	p	8/ 1/28	10.7	34.9	8.06	27
11	77	100	r	p	8/ 1/28	6.3	35.1	7.90	66
11a	78	0	oc	n	8/ 1/28	(10.7	34.9	8.06	27)
14	90	0	oc	n	8/ 9/28	21.2	35.2	8.18	27
14	91	100	oc	p	8/ 9/28	14.0	35.6	8.06	34
14	93	0	c	p	8/ 9/28	21.2	35.2	8.18	34
16	106	0	oc	n	8/13/28	25.9	36.2	8.24	8
16	107	50	c	n	8/13/28	24.4	36.4	8.23	8
25	157	0	r	p	9/ 3/28	27.5	35.6	8.31	5
30	186	50	r	p	9/15/28	27.8	36.1	8.29	3
30	189	50	r	n	9/15/28	27.8	36.1	8.29	3
32	194	0	oc	n	10/ 5/28	28.0	36.0	8.23	2
32	196A	100	r	p	10/ 5/28	22.2	36.4	8.10	30
33	198A	50	oc	p	10/ 8/28	28.2	36.2	8.24	4
37	217	0	oc	n	11/ 1/28	27.1	31.7	8.28	15
37	218	50	oc	n	11/ 1/28	18.8	34.5	8.00	121
37	220	0	oc	p	11/ 1/28	27.1	31.7	8.28	15
39	225	0	r	n	11/ 1/28	24.8	33.0	8.24	16
39	226	50	r	n	11/ 6/28	16.3	34.6	7.92	48
39	227	100	r	n	11/ 6/28	14.0	35.0	7.88	181
41	235	0	r	n	11/10/28	20.4	34.2	8.11	32
42	241	0	r	n	11/13/28	18.7	34.7	8.06	45
42	242	50	r	n	11/13/28	17.2	34.9	7.99	68
43	246	100	r	n	11/15/28	13.6	35.0	7.90	92
43	247	0	r	p	11/15/28	19.6	34.8	8.09	52
44	253	0	r	p	11/17/28	20.7	34.9	8.03	38
45	256	0	oc	n	11/19/28	22.4	35.3	8.12	38
45	258	100	oc	n	11/19/28	18.6	35.1	8.00	50
60	354	0	c	n	12/26/28	15.0	34.0	8.07	50
60	355	50	oc	n	12/26/28	13.4	34.0	8.06	34
60	356	100	oc	n	12/26/28	10.6	34.0	8.03	62
60	357	0	oc	p	12/26/28	15.0	34.0	8.07	50
60-61	360	0	c	n	12/26/28	(15.0	34.0	8.07	50)
60-61	361	0	oc	n	12/26/28	(15.0	34.0	8.07	50)
60-61	362	0	c	n	12/26/28	(15.0	34.0	8.07	50)
61	363	0	a	n	12/28/28	16.9	34.0	8.05	46
61	364	50	c	n	12/28/28	14.0	34.0	8.05	60
61	365	100	oc	n	12/28/28	10.8	34.0	8.03	80
61	366	0	a	p	12/28/28	16.9	34.0	8.05	46
61	367	50	c	p	12/28/28	14.0	34.0	8.05	60
61	368	100	c	p	12/28/28	10.8	34.0	8.03	80

Table 22. Distributional and environmental records for Ceratium tripos subsp. atlanticum--Concluded

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
61-62	369	0	c	n	12/28/28	(16.9	34.0	8.05	46)
62	371	0	c	n	12/30/28	19.2	34.2	8.12	32
62	372	50	c	n	12/30/28	16.2	34.3	8.10	28
62	373	100	c	n	12/30/28	13.1	34.2	8.06	48
62	375	50	oc	p	12/30/28	16.2	34.3	8.10	28
62-63	378	0	r	n	1/ 1/29	(16.2	34.3	8.10	28)
63-64	391	0	r	n	1/ 1/29	(20.5	34.6	8.07	21)
73	450	0	c	n	2/10/29	25.3	35.4	8.21	44
73	451	50	oc	n	2/10/29	18.7	35.4	8.05	122
73	452	100	oc	n	2/10/29	14.7	35.0	7.80	178
73	453	0	oc	p	2/10/29	25.3	35.4	8.21	44
74	457	50	r	n	2/12/29	19.2	35.4	8.06	80
79	481	0	r	n	2/22/29	25.2	36.0	8.17	34
79	482	50	oc	n	2/22/29	24.5	36.1	8.17	34
114	688	100	r	p	6/27/29	13.0	34.5	8.00	91
114	690	50	oc	p	6/27/29	16.2	34.6	8.04	63
114	691	100	r	n	6/27/29	13.0	34.5	8.00	91
115	692	0	oc	n	6/29/29	20.6	34.6	8.19	4
115	695-6	0	oc	p	6/29/29	20.6	34.6	8.19	4
115a	699	0	a	n	7/ 1/29	(18.3	34.3	8.18	4)
115a	700	0	a	n	7/ 1/29	(18.3	34.3	8.18	4)
115a	702	0	oc	n	7/ 1/29	18.3	34.3	8.18	4
115a	705	0	oc	p	7/ 1/29	18.3	34.3	8.18	4
116	703	50	c	n	7/ 1/29	10.6	33.8	8.11	23
116	704	100	c	n	7/ 1/29	6.7	33.8	.....	...
116	706	100	c	n	7/ 1/29	10.6	33.8	8.11	23
116	707	100	r	p	7/ 1/29	6.7	33.8	.....	....
117	708	0	oc	n	7/ 3/29	15.9	34.3	8.17	3
117	710	100	oc	n	7/ 3/29	8.8	34.1	7.98	84
117	711	0	oc	p	7/ 3/29	15.9	34.3	8.17	3
117	712	50	r	p	7/ 3/29	12.5	34.2	8.06	51
118	716	100	r	n	7/ 5/29	6.1	33.8	7.94	114
118	717	0	r	p	7/ 5/29	10.2	33.6	8.21	90
119	720	0	r	p	7/ 7/29	6.9	33.0	7.96	142
126	761	0	oc	n	7/21/29	11.2	32.6	8.09	76
127	767	0	oc	n	7/23/29	13.4	32.7	8.12	43
127	768	50	r	n	7/23/29	10.5	32.8	8.09	56
128	773	0	c	n	7/25/29	16.4	33.0	8.12	29
128	774	50	r	n	7/25/29	11.8	33.1	8.11	29
128	776	0	c	p	7/25/29	16.4	33.0	8.12	29
128	775	100	oc	n	7/25/29	10.2	33.2	8.06	46
128	777	50	r	p	7/25/29	11.8	33.1	8.11	29
128	778	100	r	p	7/25/29	10.2	33.2	8.06	46
128	779	0	oc	n	7/25/29	16.4	33.0	8.12	29
129	780	0	oc	n	7/27/29	16.3	33.1	8.13	25
130	781	0	a	n	9/ 4/29	16.2	33.4	8.34	26
130	782	50	c	n	9/ 4/29	11.7	33.4	8.26	83
130	783	100	c	n	9/ 4/29	8.8	33.7	8.06	176
130	784	0	c	p	9/ 4/29	16.2	33.4	8.34	26
130	785	50	c	p	9/ 4/29	11.7	33.4	8.26	83
130	786	100	r	p	9/ 4/29	8.8	33.7	8.06	176
130	787	0	c	n	9/ 4/29	16.2	33.4	8.34	36
131	788	0	r	n	9/ 6/29	19.3	33.4	8.34	...
131	789	100	oc	n	9/ 6/29	12.1	33.4	8.32	...
131	792	0	oc	p	9/ 6/29	19.3	33.4	8.34	...
131	793	0	r	p	9/ 6/29	19.3	33.4	8.34	...
131	794	0	r	p	9/ 6/29	19.3	33.4	8.34	...
131	795	0	r	p	9/ 6/29	19.3	33.4	8.34	...
132	797	0	oc	n	9/ 8/29	21.0	33.9	8.34	15
132	798	50	oc	n	9/ 8/29	17.6	33.9	8.33	19
132	799	100	oc	n	9/ 8/29	14.3	33.4	8.30	16
132	801	0	r	p	9/ 8/29	21.0	33.9	8.34	15
132	802	50	r	p	9/ 8/29	17.6	33.9	8.33	19
132	803	100	oc	p	9/ 8/29	14.3	33.4	8.30	16
143	881	0	oc	n	10/ 9/29	22.4	34.4	8.30	6
143	882	50	oc	n	10/ 9/29	19.0	34.2	8.34	6
143	883	100	oc	n	10/ 9/29	19.0	34.2	8.34	6
143	884	0	r	p	10/ 9/29	22.4	34.4	8.30	6
145	890	0	c	n	10/ 9/29	19.0	34.2	8.34	6
145	892	100	oc	n	10/ 9/29	16.0	34.1	8.31	6
145	893	0	oc	p	10/ 9/29	19.0	34.2	8.34	6
145	895	100	c	p	10/ 9/29	16.0	34.1	8.31	6
146	896	0	oc	n	10/15/29	22.4	34.9	8.37	6
146	897	50	oc	n	10/15/29	22.4	34.9	8.30	6
146	898	100	oc	n	10/15/29	19.7	34.3	8.26	7
146	901	50	r	p	10/15/29	22.4	34.9	8.30	6
147	905	100	r	n	10/15/29	19.2	35.0	8.29	5

Table 23. Distributional and environmental records for Ceratium tripos subsp. semipulchelium

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
1	1	0	oc	n	5/12/28	24.0	36.2	8.16	34
1	2	70	r	n	5/12/28	(22.4	36.4	8.15	36
1a	4	0	c	n	5/18/28	(22.3	36.3	8.20	46)
1a	5	0	c	n	5/18/28	(22.3	36.3	8.20	46)
1b	6	0	c	n	5/18/28	(22.3	36.3	8.20	46)
1b	7	50	c	n	5/18/28	(21.7	36.3	8.20	38)
1b	8	100	oc	n	5/18/28	(20.0	36.5	8.18	36)
2	12	50	oc	n	5/18/28	20.5	36.4	8.21	46
14	101	50	r	n	8/ 9/28	15.0	35.1	8.18	16
15	102	100	r	n	8/11/28	18.4	36.4	8.20	19
16	104	50	r	p	8/13/28	24.4	36.4	8.23	8
16	107	50	r	n	8/13/28	24.4	36.4	8.23	8
16	108	100	r	n	8/13/28	19.9	36.5	8.17	13
17	111	0	r	n	8/15/28	26.2	36.6	8.29	9
17	112	50	r	n	8/15/28	21.9	36.6	8.28	12
17	113	100	r	n	8/15/28	19.3	36.5	8.23	9
20	125	0	r	p	8/22/28	26.0	36.6	8.37	5
20	128	0	oc	n	8/22/28	26.0	36.6	8.37	5
23	145	0	oc	p	8/29/28	27.2	35.9	8.25	4
23	148	0	oc	n	8/29/28	27.2	35.9	8.25	4
23	149	50	oc	n	8/29/28	20.9	36.0	8.14	13
23	150	100	r	n	9/29/28	16.6	36.0	8.18	75
24	151	0	oc	p	8/31/28	27.2	35.2	8.32	4
24	153	100	r	p	8/31/28	15.6	35.6	7.96	99
24	154	0	oc	n	8/31/28	27.2	35.2	8.32	4
24	156	100	r	n	8/31/28	15.6	35.6	7.96	99
25	161	50	oc	n	9/ 3/28	21.5	36.0	8.22	12
26	165	100	r	p	9/ 5/28	14.9	35.6	8.11	40
27	169	100	r	p	9/ 7/28	17.7	36.0	8.09	46
27	172	100	oc	n	9/ 7/28	17.7	36.0	8.09	46
28	174	50	r	p	9/11/28	26.7	36.3	8.26	4
28	177	50	r	n	9/11/28	26.7	36.3	8.26	4
29	180	50	r	p	9/13/28	27.2	36.2	8.29	3
29	182	0	r	n	9/13/28	27.6	36.2	8.31	3
30	186	50	oc	p	9/15/28	27.8	36.1	8.29	3
30	189	50	c	n	9/15/28	27.8	36.1	8.29	3
30	190	100	oc	n	9/15/28	24.1	36.4	8.10	20
31	191	0	oc	n	10/ 3/28	28.5	34.4	8.27	2
31	192	50	oc	n	10/ 3/28	28.2	35.4	8.23	2
32	195	50	r	n	10/ 5/28	27.2	36.0	8.24	2
33	198	50	r	n	10/ 8/28	28.2	36.2	8.24	4
33	199A	100	r	p	10/ 8/28	22.3	36.5	8.18	23
34	201	100	oc	n	10/ 9/28	20.5	36.6	8.16	16
34	202	50	oc	n	10/ 9/28	25.0	36.5	8.21	3
35	207	50	r	p	10/26/28	16.8	34.7	7.92	138
35a	208	0	oc	n	10/30/28	(26.5	31.6	8.23	16)
35-36	209	0	oc	n	10/26/28	(27.4	29.7	8.31	15)
35-36	212	0	oc	n	10/30/28	(26.9	35.6	8.27	15)
36	213	0	r	n	10/30/28	26.5	31.6	8.23	16
36	215	100	r	n	10/30/28	14.4	34.9	7.85	149
38	216	0	oc	p	10/30/28	26.5	31.6	8.23	16
37	219	100	oc	n	11/ 1/28	15.1	34.9	7.82	153
40	229	0	r	n	11/ 8/28	22.2	33.7	8.21	24
40	231	100	r	n	11/ 8/28	13.9	35.0	7.85	159
40	232	0	r	p	11/ 8/28	22.2	33.7	8.21	24
40	233	50	r	p	11/ 8/28	15.3	34.9	7.87	161
40	234	100	r	p	11/ 8/28	13.9	35.0	7.85	159
41	235	0	r	n	11/10/28	20.4	34.2	8.11	32
41	237	100	r	n	11/10/28	14.5	35.0	7.91	152
41	238	0	r	p	11/10/28	20.4	34.2	8.11	32
41	239	100	r	p	11/10/28	14.5	35.0	7.91	152
41a	240	0	r	n	11/10/28	(20.4	34.2	8.11	32)
42	241	0	r	n	11/13/28	18.7	34.7	8.06	45
43	247	0	r	p	11/15/28	19.6	34.8	8.09	52
44	250	0	r	n	11/17/28	20.7	34.9	8.03	38
45	257	50	r	n	11/19/28	22.4	35.2	8.13	46
45	259	0	oc	p	11/19/28	22.4	35.3	8.12	38
46	261	0	oc	n	11/21/28	23.3	35.3	8.16	36
46	262	50	r	n	11/21/28	23.2	35.3	8.16	40
46	263	100	r	n	11/21/28	22.5	35.4	8.17	40
46	264	0	r	p	11/21/28	23.3	35.3	8.16	36
46	265	50	r	p	11/21/28	23.2	35.3	8.16	40
47	266	0	r	n	11/23/28	23.9	36.0	8.23	17
47	267	50	c	n	11/23/28	23.8	36.0	8.23	20
47	268	100	oc	n	11/23/28	22.7	36.2	8.23	20
47	269	0	oc	p	11/23/28	23.9	36.0	8.23	17

Table 23. Distributional and environmental records for Ceratium tripos subsp. semipulchellum--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
47	269	0	r	p	11/23/28	23.9	36.0	8.23	17
47	270	50	r	p	11/23/28	23.9	36.0	8.23	17
48	271	0	oc	n	11/25/28	23.6	36.4	8.23	13
48	272	50	oc	n	11/25/28	23.6	36.4	8.24	16
48	273	100	r	n	11/25/28	22.7	36.3	8.26	16
48	274	0	r	p	11/25/28	23.6	36.4	8.23	13
49	277	0	r	n	11/27/28	23.4	36.2	8.27	13
49	281	50	r	p	11/27/28	22.6	36.1	8.26	13
56	330	100	oc	n	12/18/28	16.6	34.8	8.11	12
56	333	100	r	p	12/18/28	16.6	34.8	8.11	12
56-57	334	0	oc	n	12/20/28	(19.0	34.5	8.14	20)
57	335	0	oc	n	12/20/28	19.0	34.5	8.14	20
57	336	50	r	n	12/20/28	15.6	34.3	8.14	21
57	337	100	oc	n	12/20/28	14.3	34.4	8.10	40
57	338	0	r	p	12/20/28	19.0	34.5	8.14	20
57	340	100	r	p	12/20/28	14.3	34.4	8.10	40
58	344	0	r	p	12/22/28	17.0	34.0	8.12	20
59	348	0	r	n	12/24/28	16.3	34.0	8.10	38
59	350	100	r	n	12/24/28	11.4	34.1	8.03	72
59	351	0	r	p	12/24/28	16.3	34.0	8.10	38
60-61	361	0	r	n	12/24/28	(16.3	34.0	8.10	38)
61	364	50	a	n	12/28/28	14.0	34.0	8.10	60
61-62	369	0	oc	n	12/28/28	(16.9	34.0	8.05	46)
61-62	370	0	r	n	12/28/28	(16.9	34.0	8.05	46)
62	372	50	c	n	12/30/28	16.2	34.3	8.10	28
62	373	100	oc	n	12/30/28	13.1	34.2	8.06	48
62	374	0	oc	p	12/30/28	19.2	34.2	8.12	32
62	376	100	r	p	12/30/28	13.1	34.2	8.06	48
62-63	378	0	r	n	1/ 1/29	(20.5	34.6	8.07	21)
63	379	0	oc	n	1/ 1/29	20.5	34.6	8.07	21
63	380	50	oc	n	1/ 1/29	17.0	34.6	8.08	25
63	382	0	r	p	1/ 1/29	20.5	34.6	8.07	21
63	383	50	oc	p	1/ 1/29	17.0	34.6	8.08	25
63-64	385	0	r	p	1/ 1/29	(20.5	34.6	8.07	21)
63-64	387	0	r	n	1/ 1/29	(20.5	34.6	8.07	21)
63-64	388	0	oc	n	1/ 1/29	(20.5	34.6	8.07	21)
63-64	389	0	r	n	1/ 1/29	(20.5	34.6	8.07	21)
63-64	390	0	r	n	1/ 1/29	(20.5	34.6	8.07	21)
63-64	391	0	r	n	1/ 1/29	(20.5	34.6	8.07	21)
63-64	391	0	oc	n	1/ 1/29	(20.5	34.6	8.07	21)
64	394	0	r	n	1/ 3/29	20.6	34.6	8.12	21
64	395	50	r	n	1/ 3/29	17.2	34.6	8.12	29
64	399	50	r	p	1/ 3/29	17.2	34.6	8.12	29
64-65	401	0	c	n	1/ 3/29	(20.6	34.6	8.12	21)
64-65	401	0	r	n	1/ 3/29	(20.6	34.6	8.12	21)
64-65	401	0	oc	n	1/ 3/29	(20.6	34.6	8.12	21)
64-65	402	0	oc	n	1/ 3/29	(20.6	34.6	8.12	21)
64-65	403	0	oc	n	1/ 3/29	(20.6	34.6	8.12	21)
64-65	403	0	r	n	1/ 3/29	(20.6	34.6	8.12	21)
64-65	404	0	r	n	1/ 3/29	(20.6	34.6	8.12	21)
65	405	0	r	n	1/ 5/29	20.2	34.5	8.10	24
65	406	50	r	n	1/ 5/29	16.5	34.5	8.10	25
65	407	100	r	n	1/ 5/29	14.8	34.3	8.10	34
65	408	0	r	p	1/ 5/29	20.2	34.5	8.10	24
65	409	50	oc	p	1/ 5/29	16.5	34.5	8.10	25
65	410	100	r	p	1/ 5/29	14.8	34.3	8.10	34
66	411	0	r	n	1/ 7/29	19.4	34.7	8.10	29
66	412	100	r	n	1/ 7/29	17.8	34.9	8.12	21
66	413	0	r	p	1/ 7/29	19.4	34.7	8.10	29
66	414	50	r	p	1/ 7/29	17.8	34.8	8.10	29
66	415	100	r	p	1/ 7/29	17.8	34.9	8.12	21
67	416	0	c	n	1/ 8/29	19.3	34.9	8.11	21
67	418	100	oc	n	1/ 8/29	16.2	34.6	8.05	40
69	424	0	oc	n	1/12/29	21.1	35.2	8.12	62
69	'25	50	oc	n	1/12/29	17.4	35.1	7.99	151
69	426	100	r	n	1/12/29	14.6	34.8	7.86	198
70	431	0	r	n	1/13/29	21.2	35.1	8.05	103
70	432	50	r	n	1/13/29	15.4	35.0	7.88	178
70	434	0	r	p	1/13/29	21.2	35.1	8.05	103
71	438	0	oc	n	2/ 6/29	23.5	35.2	8.13	58
71	439	0	r	n	2/ 6/29	23.5	35.2	8.13	58
72	444	50	r	n	2/ 8/29	18.7	35.4	8.12	60
72-73	449	0	r	n	2/10/29	(25.3	35.4	8.21	44)
73	451	50	oc	n	2/10/29	18.7	35.4	8.05	122
73	452	100	oc	n	2/10/29	14.7	35.0	7.80	178

Table 23. Distributional and environmental records for Ceratium tripos subsp. semipulchellum--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
75	464	100	r	n	2/14/29	17.8	35.4	8.00	75
75	466	50	r	p	2/14/29	20.0	35.5	8.14	46
77	472	0	c	n	2/18/29	23.7	36.0	8.19	16
77	473	0	oc	p	2/18/29	23.7	36.0	8.19	16
77	474	50	oc	p	2/18/29	23.5	36.0	8.19	16
78	475	0	oc	n	2/20/29	24.6	36.0	8.17	32
78	476	50	r	n	2/20/29	23.8	36.1	8.14	32
78	477	100	oc	n	2/20/29	21.9	36.2	8.14	34
78	478	0	oc	p	2/20/29	24.6	36.0	8.17	32
78	479	50	r	p	2/20/29	23.8	36.1	8.14	32
78	480	100	r	p	2/20/29	21.9	36.2	8.14	34
79	481	0	oc	n	2/22/29	25.2	36.0	8.17	34
79	482	50	oc	n	2/22/29	24.5	36.1	8.17	34
79	483	100	oc	n	2/22/29	21.8	36.2	8.13	45
79	484	0	oc	p	2/22/29	25.2	36.0	8.17	34
79	485	50	oc	p	2/22/29	24.5	36.1	8.17	34
80	486	0	oc	n	2/24/29	26.0	35.9	8.20	36
80	487	50	oc	n	2/24/29	25.9	36.0	8.19	29
80	488	0	oc	p	2/24/29	26.0	25.9	8.20	36
80	489	50	oc	p	2/24/29	25.9	36.0	8.19	29
80	490	100	oc	p	2/24/29	23.4	36.2	8.16	32
81	491	0	c	n	2/26/29	26.5	35.8	8.19	38
81	492	50	oc	n	2/26/29	26.4	35.9	8.19	38
81	493	0	oc	p	2/26/29	26.5	35.8	8.19	38
81	494	50	oc	p	2/26/29	26.4	35.9	8.19	38
81	495	100	r	p	2/26/29	23.6	36.2	8.18	36
82	497	50	oc	n	2/28/29	27.2	36.3	8.21	34
82	500	100	r	p	2/28/29	24.4	36.5	8.19	34
83	501	0	oc	n	3/ 2/29	27.5	36.3	8.24	29
83	502	50	c	n	3/ 2/29	27.4	36.5	8.24	25
83	503	0	r	p	3/ 2/29	27.5	36.3	8.24	29
84	505	0	r	n	3/ 4/29	27.8	36.2	8.23	24
84	506	50	oc	n	3/ 4/29	27.5	36.4	8.21	24
85	510	0	oc	n	3/ 6/29	27.9	36.2	8.22	40
85	511	50	oc	n	3/ 6/29	27.8	36.2	8.22	40
86	517	50	oc	n	3/ 9/29	27.4	36.2	8.22	17
88	526	0	oc	n	3/21/29	28.5	35.9	8.23	16
88	527	50	oc	n	3/21/29	28.4	35.9	8.25	13
89	528	0	oc	n	3/23/29	28.4	35.6	8.25	21
89	529	50	c	n	3/23/29	28.6	35.8	8.27	12
89	531	100	r	p	3/23/29	26.4	36.0	8.24	12
90	533	0	r	n	3/25/29	28.5	35.5	8.27	21
90	535	0	oc	p	3/25/29	28.5	35.5	8.27	21
91	540	0	r	n	3/27/29	28.7	35.1	8.30	21
91	541	50	c	n	3/27/29	28.5	35.2	8.30	24
92	546	50	c	n	3/29/29	28.4	35.4	8.29	28
92	548	50	r	p	3/29/29	28.4	35.4	8.29	28
93	550	0	c	n	3/31/29	28.7	34.7	8.30	28
93	551	50	c	n	3/31/29	28.5	34.8	8.30	28
93	552	0	oc	p	3/31/29	28.7	34.7	8.30	28
93	553	100	r	p	3/31/29	27.6	35.8	8.27	29
94	558	50	oc	n	4/22/29	29.3	34.7	8.25	14
94	559	100	oc	n	4/22/29	28.5	35.6	8.21	25
95	563	50	c	n	4/24/29	29.3	34.9	8.24	16
95	564	100	c	n	4/24/29	28.5	35.4	8.22	21
95	566	50	r	p	4/24/29	29.3	34.9	8.24	16
95	567	100	r	p	4/24/29	28.5	35.4	8.22	21
96	568	0	c	n	4/26/29	29.3	35.3	8.23	12
95	568A	0	oc	n	4/24/29	(29.4	34.7	8.26	14)
96	569	50	oc	n	4/26/29	29.2	35.3	8.23	12
96	570	100	oc	n	4/26/29	28.2	35.7	8.19	25
96	571	0	r	p	4/26/29	29.3	35.3	8.23	12
96	573	100	r	p	4/26/29	28.2	35.7	8.19	25
97	575	50	c	n	4/28/29	28.0	35.4	8.16	21
97	576	100	oc	n	4/28/29	27.6	35.6	8.15	25
97	578	50	r	p	4/28/29	28.0	35.4	8.16	21
97	579	100	r	p	4/28/29	27.6	35.6	8.15	25
98	581	0	oc	n	4/30/29	27.0	35.3	8.16	24
98	582	50	oc	n	4/30/29	26.9	35.3	8.16	28
98	584	0	oc	p	4/30/29	27.0	35.3	8.16	24
98	585	50	r	p	4/30/29	26.9	35.3	8.16	28
98	588	100	r	p	4/30/29	26.7	35.4	8.14	32
99	589	0	c	n	5/ 2/29	27.9	34.9	8.21	12
99	590	50	c	n	5/ 2/29	27.8	34.9	8.22	12
99	591	100	c	n	5/ 2/29	27.8	35.0	8.22	17

Table 23. Distributional and environmental records for Ceratium tripos subsp. semipulchellum--Continued

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
99	592	0	oc	p	5/ 2/29	27.9	34.9	8.21	12
99	592	0	r	p	5/ 2/29	27.9	34.9	8.21	12
99	593	50	r	p	5/ 2/29	27.8	34.9	8.22	12
99	594	100	r	p	5/ 2/29	27.8	35.0	8.22	17
99	595	0	c	n	5/ 2/29	27.9	34.9	8.21	12
100	596	50	c	n	5/ 4/29	27.6	34.7	8.21	10
100	597	100	c	n	5/ 4/29	27.6	34.7	8.22	12
100	598	0	oc	p	5/ 4/29	27.7	34.7	8.21	10
100	599	50	oc	p	5/ 4/29	27.6	34.7	8.21	10
100	602	100	oc	p	5/ 4/29	27.6	34.7	8.22	12
101	603	0	c	n	5/ 7/29	26.3	34.7	8.24	8
101	606	0	r	p	5/ 7/29	26.3	34.7	8.24	8
101	607	50	r	p	5/ 7/29	26.2	34.7	8.24	8
102	609	0	c	n	5/ 9/29	25.8	36.0	8.24	8
102	610	50	c	n	5/ 9/29	25.8	35.0	8.24	8
102	611	100	c	n	5/ 9/29	25.6	35.0	8.23	8
102	612	0	r	p	5/ 9/29	25.8	35.0	8.24	8
102	613	50	oc	p	5/ 9/29	25.8	35.0	8.24	8
103	615	0	c	n	5/11/29	26.0	36.0	8.25	5
103	616	50	c	n	5/11/29	25.8	35.2	8.25	5
103	617	100	c	n	5/11/29	24.8	35.2	8.25	5
103	618	0	r	p	5/11/29	26.0	35.0	8.25	5
103	620	100	r	p	5/11/29	24.8	35.2	8.25	5
104	621	0	c	n	5/13/29	26.1	35.2	8.24	7
104	622	50	c	n	5/13/29	25.8	35.2	8.24	7
104	623	100	c	n	5/13/29	25.3	35.3	8.21	7
104	625	50	r	p	5/13/29	25.8	35.2	8.24	7
104	626	100	r	p	5/13/29	25.3	35.3	8.21	7
105	628	50	c	n	5/15/29	26.8	34.9	8.23	5
105	629	100	oc	n	5/15/29	25.2	35.1	8.23	5
105	630	0	r	p	5/15/29	26.9	34.9	8.23	5
106	633	0	oc	n	5/17/29	27.2	35.0	8.23	5
106	634	50	c	n	5/17/29	27.0	35.0	8.23	5
106	635	100	c	n	5/17/29	25.6	35.1	8.23	5
107	639	0	c	n	5/19/29	28.0	34.4	8.23	5
107	640	50	c	n	5/19/29	27.9	34.4	8.23	4
107	641	100	c	n	5/19/29	26.8	34.9	8.23	4
108	646	0	oc	n	5/27/29	28.4	35.0	8.25	4
108	647	50	c	n	5/27/29	26.8	35.0	8.24	4
108	648	100	c	n	5/27/29	25.2	35.0	8.23	4
109	656	100	oc	n	5/29/29	19.4	34.8	8.18	5
109	658	50	r	p	5/29/29	23.1	35.0	8.22	3
109	659	100	r	p	5/29/29	19.4	34.8	8.18	5
110	661	0	r	n	5/31/29	23.9	34.7	8.18	5
110	661	0	oc	p	5/31/29	23.9	34.7	8.18	5
111	664	0	a	n	6/ 3/29	20.1	34.5	8.18	5
111	669	50	oc	n	6/ 3/29	19.4	34.6	8.17	5
111	670	100	r	n	6/ 3/29	18.2	34.7	8.13	13
111	671	0	oc	p	6/ 3/29	20.1	34.5	8.18	5
111	672	50	oc	p	6/ 3/29	19.4	34.6	8.17	5
111	674	0	c	n	6/ 3/29	20.1	34.5	8.18	5
112	675	50	c	n	6/ 5/29	21.7	34.6	8.23	7
112	676	100	oc	n	6/ 5/29	19.8	34.7	8.20	8
112	677	0	oc	p	6/ 5/29	23.2	34.6	8.22	7
113	680	0	c	n	6/25/29	24.2	34.5	8.25	5
113	681	50	c	n	6/25/29	23.8	34.6	8.25	5
113	682	100	c	n	6/25/29	21.5	34.7	8.23	8
113	683	0	oc	p	6/25/29	24.2	34.5	8.25	5
114	690	50	oc	p	6/27/29	16.2	34.6	8.04	63
115	692	0	oc	n	6/29/29	20.6	34.6	8.19	4
115	693	50	r	n	6/29/29	17.5	34.6	8.12	17
115	694	100	r	n	6/29/29	15.6	34.6	8.08	27
115	695-6	0	oc	p	6/29/29	20.6	34.6	8.19	4
117	709	50	oc	n	7/ 3/29	12.5	34.2	8.06	51
133	804	0	oc	n	9/10/29	22.7	34.7	8.47	7
133	805	50	oc	n	9/10/29	20.8	34.7	8.37	7
133	806	100	r	n	9/10/29	18.4	34.8	8.31	7
134	808	0	c	n	9/12/29	22.9	34.7	8.34	6
134	809	50	oc	n	9/12/29	19.8	34.6	8.34	6
134	810	100	oc	n	9/12/29	18.1	34.6	8.34	6
133	812	0	oc	p	9/10/29	22.7	34.7	8.47	7
133	814	100	oc	p	9/10/29	18.4	34.8	8.31	7
134	815	0	oc	p	9/12/29	22.9	34.7	8.34	6
134	817	100	oc	p	9/12/29	18.1	34.6	8.34	6
135	822	100	oc	n	9/14/29	18.7	34.8	8.34	5

Table 23. Distributional and environmental records for Ceratium tripos subsp. semipulchellum--Continued

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m^3
135	824	0	r	p	9/14/29	23.8	35.1	8.37	7
135	826	100	r	p	9/14/29	18.7	34.8	8.34	5
136	827	0	oc	n	9/16/29	24.6	35.4	8.37	3
136	828	50	oc	n	9/16/29	21.4	35.1	8.39	3
136	832	0	r	p	9/16/29	24.6	35.4	8.37	3
136	829	100	oc	n	9/16/29	18.6	35.0	8.39	3
136	833	50	r	p	9/16/29	21.4	35.1	8.39	3
136	834	100	r	p	9/16/29	18.6	35.0	8.39	3
137	836	0	c	n	9/18/29	25.5	35.0	8.39	4
137	837	0	c	n	9/18/29	25.5	35.0	8.39	4
137	840	0	r	p	9/18/29	25.5	35.0	8.39	4
137	841	0	oc	p	9/18/29	25.5	35.0	8.39	4
138	843	0	oc	n	9/20/29	26.1	34.8	8.35	5
138	845	100	c	n	9/20/29	22.2	34.8	8.31	3
138	848	50	r	p	9/20/29	26.1	34.8	8.35	5
139	849	0	r	n	9/22/29	26.7	34.8	8.34	6
139	850	50	c	n	9/22/29	25.8	34.9	8.31	6
139	851	100	oc	n	9/22/29	22.4	35.2	8.28	6
139	854	50	r	p	9/22/29	25.8	34.9	8.31	6
139	855	100	r	p	9/22/29	22.4	35.2	8.28	6
140	856	0	c	n	10/ 3/29	26.9	35.0	8.42	7
140	857	50	oc	n	10/ 3/29	26.9	35.0	8.39	7
140	858	100	oc	n	10/ 3/29	25.5	35.0	8.34	7
140	860	0	r	p	10/ 3/29	26.9	35.0	8.42	7
140	861	50	r	p	10/ 3/29	26.9	35.0	8.39	7
140	863	100	r	p	10/ 3/29	25.5	35.0	8.34	7
141	864	0	c	n	10/ 5/29	25.9	35.2	8.34	5
141	865	50	c	n	10/ 5/29	24.8	35.3	8.34	5
141	871	100	r	p	10/ 5/29	20.0	35.0	8.33	5
142	873	50	oc	n	10/ 5/29	20.0	35.0	8.33	5
142	874	100	c	n	10/ 5/29	16.6	34.4	8.27	7
142	876	0	oc	p	10/ 5/29	24.1	34.8	8.33	5
142	878	100	r	p	10/ 5/29	16.6	34.4	8.27	7
142	879	100	r	p	10/ 5/29	16.6	34.4	8.27	7
143	881	0	c	n	10/ 9/29	22.4	34.4	8.30	6
143	882	50	oc	n	10/ 9/29	19.0	34.2	8.34	6
143	883	100	oc	n	10/ 9/29	13.8	34.1	8.30	10
143	884	0	oc	p	10/ 9/29	22.4	34.4	8.30	6
144	886	0	c	n	10/11/29	23.3	35.0	8.37	6
144	887	0	oc	p	10/11/29	23.3	35.0	8.37	6
144	889	100	r	p	10/11/29	16.6	34.5	8.37	6
145	891	50	c	n	10/11/29	18.7	34.3	8.34	6
145	894	50	r	p	10/11/29	18.7	34.3	8.34	6
146	896	0	oc	n	10/15/29	22.4	34.9	8.37	6
146	897	50	oc	n	10/15/29	22.4	34.9	8.30	6
146	898	100	oc	n	10/15/29	19.7	34.3	8.26	7
146	901	50	r	p	10/15/29	22.4	34.9	8.30	6
147	903	0	oc	n	10/17/29	23.3	35.3	8.26	8
147	904	50	r	n	10/17/29	23.1	35.3	8.29	5
147	907	0	oc	p	10/17/29	23.3	35.3	8.26	8
149	920	0	oc	n	10/21/29	23.5	35.0	8.34	6
149	921	50	oc	n	10/21/29	23.3	35.0	8.37	6
149	922	100	oc	n	10/21/29	20.3	34.9	8.38	6
149	928	50	r	p	10/21/29	23.3	35.0	8.37	6
150	929	0	oc	n	10/23/29	25.6	34.7	8.39	7
150	930	50	r	n	10/23/29	27.8	34.8	8.35	10
150	931	100	r	n	10/23/29	19.8	34.6	8.32	11
151	938	50	c	n	10/26/29	18.3	34.4	.....	...
151	939	100	oc	n	10/26/29	12.5	34.6	.....	...
151	942	50	oc	p	10/26/29	18.3	34.4	.....	...
152	945	50	oc	n	10/27/29	14.2	34.5	7.87	53
152	949	50	r	p	10/27/29	14.2	34.5	7.87	53
152	950	100	r	p	10/27/29	11.4	34.7	7.76	75
153	951	0	oc	n	10/27/29	28.1	34.2	8.47	7
153	952	50	c	n	10/29/29	28.1	34.4	8.39	7
153	953	100	oc	n	10/29/29	20.5	34.7	8.28	31
153	955	0	r	p	10/29/29	28.1	34.2	8.47	7
153	956	50	oc	p	10/29/29	28.1	34.4	8.39	7
153	957	100	oc	p	10/29/29	20.5	34.7	8.28	31
154	958	0	oc	n	10/31/29	28.3	34.2	8.39	7
154	959	50	oc	n	10/31/29	28.2	34.2	8.40	7
154	960	100	oc	n	10/31/29	25.3	34.8	7.93	21
155	965	0	c	n	11/ 2/29	27.8	34.9	8.29	29
155	966	50	c	n	11/ 2/29	27.7	34.9	8.30	30
155	967	100	oc	n	11/ 2/29	27.2	35.0	8.30	35

Table 23. Distributional and environmental records for Ceratium tripos subsp. semipulchellum--Concluded

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
155	973	50	r	p	11/ 2/29	27.7	34.9	8.30	30
156	972	0	oc	n	11/ 4/29	27.6	35.0	8.34	28
156	972	0	r	n	11/ 4/29	27.6	35.0	8.34	28
156	974	100	oc	n	11/ 4/29	26.4	35.1	8.30	48
157	978	0	oc	n	11/ 6/29	27.1	35.3	8.27	47
157	979	50	c	n	11/ 6/29	27.1	35.2	8.32	60
157	980	100	r	n	11/ 6/29	26.8	35.5	8.30	64
158	983	0	c	n	11/ 8/29	28.2	35.6	8.34	36
158	984	50	c	n	11/ 8/29	28.2	35.6	8.39	50
158	985	100	c	n	11/ 8/29	27.6	35.9	8.39	48
159	990	0	c	n	11/11/29	28.6	35.7	8.37	15
159	991	50	c	n	11/11/29	28.5	35.7	8.39	15
159	992	100	r	n	11/11/29	28.0	35.7	8.37	23
160	1000	0	r	n	11/13/29	28.6	35.6	8.37	12
160	1002	50	oc	n	11/13/29	28.6	35.8	8.39	15
160	1003	100	r	n	11/13/29	28.5	35.7	8.44	16

Table 24. Distributional and environmental records for Ceratium pulchellum

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
14	93	0	oc	p	8/ 9/28	21.2	35.2	8.18	11
15	101	50	r	n	8/11/28	19.8	36.5	8.21	8
15	102	100	r	n	8/11/28	18.4	36.4	8.20	19
16	103	0	r	p	8/13/28	25.9	36.2	8.24	8
17	109	0	r	p	8/15/28	26.2	36.6	8.29	9
18	114	0	oc	p	8/17/28	27.0	37.0	8.23	5
19	123	50	r	n	8/20/28	25.2	37.1	8.27	5
20	125	0	r	p	8/22/28	26.0	36.6	8.37	5
20	126	50	r	p	8/22/28	25.8	36.6	8.26	3
20	127	100	r	p	8/22/28	22.6	36.7	8.19	5
20-21	131	0	r	n	8/24/28	(26.6	36.3	8.32	4)
21	134	100	r	p	8/24/28	21.0	36.8	8.20	7
21	136	50	r	n	8/24/28	24.4	36.2	8.26	4
21	137	100	r	n	8/24/28	21.0	36.8	8.20	7
22	144	100	r	n	8/27/28	17.5	36.1	7.99	123
23	145	0	r	p	8/29/28	27.2	35.9	8.25	4
48	272	50	r	n	11/25/28	23.6	36.4	8.24	16
48	274	0	oc	p	11/25/28	23.6	36.4	8.24	16
48	275	50	oc	p	11/25/28	23.6	36.4	8.24	16
49	280	0	r	p	11/27/28	23.4	36.2	8.27	13
49a	283	0	r	n	11/29/28	(23.2	36.0	8.23	13)
50	285	50	r	n	11/29/28	22.0	35.9	8.23	13
50	287	0	oc	p	11/29/28	23.2	36.0	8.23	13
50-51	290	0	oc	n	12/ 1/28	(22.8	35.6	8.22	16)
50-51	291	0	oc	n	12/ 1/28	(22.8	35.6	8.22	16)
50-51	292	0	oc	n	12/ 1/28	(22.8	35.6	8.22	16)
51	294	50	oc	n	12/ 1/28	20.5	35.6	8.22	17
51	296	0	r	p	12/ 1/28	22.8	35.6	8.22	16
51	297	50	r	p	12/ 1/28	20.5	35.6	8.22	17
52	300	50	r	n	12/ 3/28	20.2	35.6	8.20	8
52	301	100	r	n	12/ 3/28	18.2	35.2	8.17	8
52	302	0	oc	p	12/ 3/28	22.5	35.4	8.21	8
53	304	50	r	n	12/ 5/28	21.2	35.8	8.20	13
53	305	100	r	n	12/ 5/28	19.9	35.6	8.19	13
53	306	0	r	p	12/ 5/28	22.6	35.7	8.22	13
53-54	310	0	r	n	12/14/28	(23.0	35.6	8.22	11)
53-54	311	0	r	n	12/14/28	(23.0	35.6	8.22	11)
53-54	313	0	r	n	12/14/28	(23.0	35.6	8.22	11)
54	320	50	r	n	12/14/28	19.8	35.4	8.18	17
54	321	100	r	n	12/14/28	18.7	35.4	8.16	20
54	322	0	oc	p	12/14/28	23.2	35.5	8.22	9
55	323	0	r	n	12/16/28	20.4	34.9	8.19	12
55	324	50	r	n	12/16/28	18.7	35.0	8.18	12
55	325	100	r	n	12/16/28	16.7	34.9	7.17	12
56	328	0	oc	n	12/18/28	20.8	34.9	8.13	9
56	330	100	oc	n	12/18/28	16.8	34.8	8.11	12
56	331	0	r	p	12/18/28	20.8	34.9	8.13	9
56-57	334	0	c	n	12/20/28	(19.0	34.5	8.14	20)
61-62	369	0	c	n	12/28/28	(16.9	34.0	8.05	46)
61-62	370	0	oc	n	12/28/28	(16.9	34.0	8.05	46)

Table 24. Distributional and environmental records for Ceratium pulchellum--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO mg/m^3
62	372	50	oc	n	12/30/28	16.2	34.3	8.10	28
62	373	100	oc	n	12/30/28	13.1	34.2	8.06	48
62	374	0	oc	p	12/30/28	19.2	34.2	8.12	32
62	375	50	oc	p	12/30/28	16.2	34.3	8.10	28
62-63	377	0	oc	n	1/ 1/29	(20.5	34.6	8.07	21)
62-63	378	0	r	n	1/ 1/29	(20.5	34.6	8.07	21)
63	379	0	oc	n	1/ 1/29	20.5	34.6	8.07	21
63	381	100	r	n	1/ 1/29	15.6	34.6	8.08	24
63	382	0	oc	p	1/ 1/29	20.5	34.6	8.07	21
63	384	100	r	p	1/ 1/29	15.6	34.6	8.08	24
63-64	385	0	r	p	1/ 1/29	(20.5	34.6	8.07	21)
63-64	386	0	c	n	1/ 1/29	(20.5	34.6	8.07	21)
63-64	387	0	c	n	1/ 1/29	(20.5	34.6	8.07	21)
63-64	388	0	oc	n	1/ 1/29	(20.5	34.6	8.07	21)
63	389	0	oc	n	1/ 1/29	(20.5	34.6	8.07	21)
63-64	390	0	oc	n	1/ 1/29	(20.5	34.6	8.07	21)
63-64	391	0	c	n	1/ 1/29	(20.5	34.6	8.07	21)
63-64	392	0	oc	n	1/ 1/29	(20.5	34.6	8.07	21)
63-64	393	0	oc	n	1/ 1/29	(20.5	34.6	8.07	21)
64	394	0	oc	n	1/ 3/29	20.6	34.6	8.12	21
64	395	50	r	n	1/ 3/29	17.2	34.6	8.12	29
64	396	100	oc	n	1/ 3/29	15.8	34.5	8.10	32
64	397	100	r	n	1/ 3/29	15.8	34.5	8.10	32
64	398	0	c	p	1/ 3/29	20.6	34.6	8.12	21
64	399	50	oc	p	1/ 3/29	17.2	34.6	8.12	29
64	400	100	r	p	1/ 3/29	15.8	34.5	8.10	32
64-65	401	0	oc	n	1/ 3/29	(15.8	34.5	8.10	32)
64-65	402	0	oc	n	1/ 3/29	(15.8	34.5	8.10	32)
64-65	403	0	oc	n	1/ 3/29	(15.8	34.5	8.10	32)
68	422	0	r	p	1/10/29	19.2	35.1	8.14	29
84	506	50	oc	n	3/ 4/29	27.5	36.4	8.21	24
84	507	0	r	p	3/ 4/29	27.8	36.2	8.23	24
86	516	0	r	n	3/ 9/29	28.3	36.2	8.29	20
86	518	0	oc	p	3/ 9/29	28.3	36.2	8.29	20
86	519	50	r	p	3/ 9/29	27.4	36.2	8.29	17
87	523	0	oc	p	3/ 9/29	28.3	36.2	8.29	20
87	525	100	r	p	3/11/29	23.9	36.0	8.23	20
89	528	0	r	n	3/23/29	28.4	35.6	8.25	21
89	529	50	oc	n	3/23/29	28.6	35.8	8.27	12
89	530	0	r	p	3/23/29	28.4	35.6	8.25	21
90	535	0	r	p	3/23/29	28.5	35.5	8.27	21
90	536	50	r	p	3/23/29	28.6	35.6	8.28	21
91	542	0	r	p	3/23/29	28.7	35.1	8.30	21
91	543	50	r	p	3/27/29	28.5	35.2	8.30	24
91	544	100	r	p	3/27/29	25.8	36.0	8.25	30
92	545	00	r	n	3/29/29	28.5	35.3	8.29	28
93	552	0	oc	p	3/29/29	28.7	34.7	8.29	28
94	558	50	oc	n	4/22/29	29.3	34.7	8.25	14
95	565	0	r	p	4/22/29	29.4	34.7	8.26	14
95	568A	0	r	n	4/24/29	(29.4	34.7	8.26	14)
96	571	0	r	p	4/26/29	29.3	35.3	8.23	12
101	605	100	r	n	5/ 7/29	25.2	35.1	8.23	8
101	606	0	r	p	5/ 7/29	26.3	34.7	8.24	8
102	610	50	c	n	5/ 2/29	25.8	35.0	8.24	8
102	612	0	r	p	5/ 9/29	25.8	35.0	8.24	8
102	614	100	r	p	5/ 9/29	25.6	35.0	8.23	8
104	624	0	r	p	5/13/29	26.1	35.2	8.24	7
105	627	50	c	n	5/15/29	26.8	34.9	8.23	5
106	635	100	c	n	5/17/29	25.6	35.1	8.23	5
106	636	0	r	p	5/17/29	27.2	35.0	8.23	5
107	642	0	oc	p	5/17/29	28.0	34.4	8.23	5
107	643	50	r	p	5/17/29	27.9	34.4	8.23	4
107	645	50	r	p	5/17/29	27.9	34.4	8.23	4
108	649	0	r	p	5/17/29	28.4	35.0	8.25	4
108	651	100	r	p	5/17/29	25.2	35.0	8.23	4
112	677	0	oc	p	5/17/29	23.2	34.6	8.22	7
135	820	0	r	n	9/14/29	23.8	35.1	8.37	7
135	822	100	oc	n	9/14/29	18.7	34.8	8.34	5
135	824	0	r	p	9/14/29	23.8	35.1	8.37	7
135	825	50	r	p	9/14/29	21.5	35.0	8.37	5
135	826	100	r	p	9/14/29	18.7	34.8	8.34	5
136	827	0	oc	n	9/16/29	24.6	35.4	8.37	3
136	832	0	r	p	9/16/29	24.6	35.4	8.37	3
136	833	50	r	p	9/16/29	21.4	35.1	8.39	3
136	835	100	r	p	9/16/29	21.4	35.1	8.39	3
137	838	100	r	n	9/16/29	21.5	35.1	8.30	5

Table 24. Distributional and environmental records for Ceratium pulchellum--Concluded

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
138	843	0	r	n	9/20/29	26.1	34.8	8.35	5
138	844	50	r	p	9/20/20	26.1	34.8	8.35	5
138	847	0	r	p	9/20/29	26.1	34.8	8.35	5
141	868	0	r	p	9/20/29	26.1	34.8	8.35	5
141	870	50	r	p	9/20/29	26.1	34.8	8.35	5
142	872	0	r	n	10/ 7/29	24.1	34.8	8.33	5
142	873	50	r	n	10/ 7/29	21.8	34.8	8.30	5
142	876	0	r	p	10/ 7/29	24.1	34.8	8.33	5
142	878	100	r	p	10/ 7/29	16.6	34.4	8.27	7
143	881	0	c	n	10/ 9/29	22.4	34.4	8.30	6
143	883	100	r	n	10/ 9/29	13.8	34.1	8.30	10
144	886	0	r	n	10/11/29	23.3	35.0	8.37	6
144	887	0	oc	p	10/11/29	23.3	35.0	8.37	6
144	888	50	r	p	10/11/29	21.1	34.7	8.33	6
145	890	0	c	n	10/13/29	22.3	34.6	8.29	6
145	891	50	c	n	10/13/29	18.7	34.3	8.34	6
145	892	100	oc	n	10/13/29	16.0	34.1	8.31	6
145	893	0	oc	p	10/13/29	22.3	34.6	8.29	6
145	894	50	r	p	10/13/29	18.7	34.3	8.34	6
145	895	100	c	p	10/13/29	16.0	34.1	8.31	6
146	897	50	oc	n	10/15/29	22.4	34.9	8.37	6
146	900	0	r	p	10/15/29	22.4	34.9	8.37	6
146	901	50	r	p	10/15/29	22.4	34.9	8.30	6
148	910	0	oc	n	10/19/29	23.4	35.2	.....	...
148	911	50	r	n	10/19/29	23.0	35.1	.....	...
148	917	0	r	p	10/19/29	23.4	35.2	.....	...
149	920	0	r	n	10/21/29	23.5	35.0	8.34	6
149	927	0	r	p	10/21/29	23.5	35.0	8.34	6
149	928	50	r	p	10/21/29	23.5	35.0	8.34	6
151	937	0	r	n	10/26/29	26.0	34.0	.....	...
151	941	0	r	p	10/26/29	26.0	34.0	.....	...
152	946	100	oc	n	10/26/29	11.4	34.7	7.76	75
159	991	50	r	n	10/26/29	11.4	34.7	7.76	75

Table 25. Distributional and environmental records for Ceratium breve

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
1	1	0	r	n	5/12/28	24.0	36.2	8.16	34
2	12	50	r	n	5/18/28	20.5	36.4	8.21	46
16	103	0	r	p	8/13/28	25.9	36.2	8.24	8
16	106	0	oc	n	8/13/28	25.9	36.2	8.24	8
16	108	100	r	n	8/13/28	19.9	36.5	8.17	13
20-21	131	0	c	n	8/23/28	(26.6	36.3	8.32	4)
21	132	0	c	p	8/24/28	26.6	36.3	8.32	4
21	134	100	c	p	8/24/28	21.0	36.8	8.20	7
21	135	0	oc	n	8/24/28	26.6	36.3	8.32	4
21	137	100	oc	n	8/24/28	21.0	36.8	8.20	7
22	139	0	oc	p	8/27/28	26.7	36.0	8.26	8
22	144	100	r	n	8/27/28	17.5	36.1	7.99	123
23	145	0	c	p	8/29/28	27.2	35.9	8.25	4
23	149	50	r	n	8/29/28	20.9	36.0	8.14	13
23	150	100	r	n	8/29/28	16.6	36.0	8.18	75
24	151	0	c	p	8/31/28	27.2	35.2	8.32	4
24	152	50	r	p	8/31/28	23.1	36.0	8.14	8
24	153	100	r	p	8/31/28	15.6	35.6	7.96	99
24	154	0	r	n	8/31/28	27.2	35.2	8.32	4
24	155	50	r	n	8/31/28	23.1	36.0	8.14	8
24	156	100	r	n	8/31/28	15.6	35.6	7.96	99
25	157	0	c	p	9/ 3/28	27.5	35.6	8.31	5
25	160	0	r	n	9/ 3/28	27.5	35.6	8.31	5
25	161	50	r	n	9/ 3/28	21.5	36.0	8.22	12
25	162	100	r	n	9/ 3/28	14.6	35.7	7.93	121
26	163	0	oc	p	9/ 5/28	27.6	36.0	8.30	5
26	164	50	r	p	9/ 5/28	24.1	36.1	8.21	5
27	167	0	r	p	9/ 7/28	27.5	36.3	8.31	4
27	172	100	r	n	9/ 7/28	17.7	36.0	8.09	46
28	175	100	r	p	9/11/28	22.8	36.6	8.22	7
28	177	50	r	n	9/11/28	26.7	36.3	8.26	4
29	179	0	oc	p	9/13/28	27.6	36.2	8.31	3
29	182	0	oc	n	9/13/28	27.6	36.2	8.31	3
29	183	50	r	n	9/13/28	27.2	36.2	8.29	3

Table 25. Distributional and environmental records for Ceratium breve--Continued

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
30	188	0	r	n	9/15/28	28.0	36.1	8.30	2
30	189	50	c	n	9/15/28	27.8	36.1	8.29	3
30	190	100	oc	n	9/15/28	24.1	36.4	8.10	20
31	191	0	r	n	10/ 3/28	28.5	34.4	8.27	2
31	193	100	r	n	10/ 3/28	23.4	36.5	8.19	28
32	194	0	oc	n	10/ 5/28	28.0	36.0	8.23	2
32	194A	0	r	p	10/ 5/28	28.0	36.0	8.23	2
32	195	50	r	n	10/ 5/28	27.2	36.0	8.24	2
33	197A	0	r	p	10/ 8/28	28.5	35.6	8.23	4
34	200	0	r	n	10/ 9/28	28.5	35.9	8.28	2
35	205	100	r	n	10/26/28	14.4	34.9	7.88	189
35	206	0	c	p	10/26/28	27.4	29.7	8.31	15
35	207	50	r	p	10/26/28	16.8	34.7	7.92	138
35a	208	0	c	n	10/26/28	(27.4	29.7	8.31	15)
35-36	209	0	c	n	10/27/28	(27.4	29.7	8.31	15)
35-36	211	0	oc	n	10/28/28	(27.0	30.7	8.27	16)
35-36	212	0	c	n	10/28/28	(27.0	30.7	8.27	16)
36	213	0	oc	n	10/30/28	26.5	31.6	8.23	16
36	216	0	oc	p	10/30/28	26.5	31.6	8.23	16
37	217	0	oc	n	11/ 1/28	27.1	31.7	8.28	15
37	218	50	oc	n	11/ 1/28	18.8	34.5	8.00	121
37	219	100	oc	n	11/ 1/28	15.1	34.9	7.82	153
37	220	0	oc	p	11/ 1/28	27.1	31.7	8.28	15
39	226	50	r	n	11/ 6/28	16.3	34.6	7.92	48
41	235	0	r	n	11/10/28	20.4	34.2	8.11	32
41a	240	0	oc	n	11/12/28	(18.7	34.7	8.06	45)
42	241	0	r	n	11/13/28	18.7	34.7	8.06	45
42	242	50	r	n	11/13/28	17.2	34.9	7.99	68
42	243	100	r	n	11/13/28	13.8	35.0	7.91	150
43	245	50	r	n	11/15/28	17.0	34.9	7.93	80
43	247	0	r	p	11/15/28	19.6	34.8	8.09	52
44	250	0	c	n	11/17/28	20.7	34.9	8.03	38
44	251	50	oc	n	11/17/28	20.4	34.9	8.04	34
44	252	100	oc	n	11/17/28	13.8	35.0	7.85	70
44	253	0	c	p	11/17/28	20.7	34.9	8.03	38
44	254	50	r	p	11/17/28	20.4	34.9	8.04	34
44	255	100	r	p	11/17/28	13.8	35.0	7.85	70
45	256	0	oc	n	11/19/28	22.4	35.3	8.12	38
45	257	50	oc	n	11/19/28	22.4	35.2	8.13	46
45	258	100	oc	n	11/19/28	18.6	35.1	8.00	50
45	259	0	oc	p	11/19/28	22.4	35.3	8.12	38
45	260	50	r	p	11/19/28	22.4	35.2	8.13	46
46	261	0	oc	n	11/21/28	23.3	35.3	8.16	36
46	262	50	oc	n	11/21/28	23.2	35.3	8.16	40
46	263	100	r	n	11/21/28	22.5	35.4	8.17	40
46	264	0	r	p	11/21/28	23.3	35.3	8.16	36
47	266	0	oc	n	11/23/28	23.9	36.0	8.23	17
47	267	50	oc	n	11/23/28	23.8	36.0	8.23	20
47	268	100	oc	n	11/23/28	22.7	36.2	8.23	20
47	269	0	oc	p	11/23/28	23.9	36.0	8.23	17
47	270	50	r	p	11/23/28	23.8	36.0	8.23	20
48	271	0	oc	n	11/25/28	23.6	36.4	8.23	13
48	272	50	oc	n	11/25/28	23.6	36.4	8.24	16
48	273	100	r	n	11/25/28	22.7	36.3	8.26	16
49	277	0	r	n	11/27/28	23.4	36.2	8.27	13
49	279	100	r	n	11/27/28	21.6	35.9	8.26	13
49	280	0	r	p	11/27/28	23.4	36.2	8.27	13
50	284	0	r	n	11/29/28	23.2	36.0	8.23	13
50	288	50	r	p	11/29/28	22.0	35.9	8.23	13
70	433	100	r	n	1/13/29	12.6	34.8	7.68	233
70	434	0	r	p	1/13/29	21.2	35.1	8.05	103
77	473	0	r	p	2/18/29	23.7	36.0	8.19	16
77	474	50	oc	p	2/18/29	23.5	36.0	8.19	16
78	475	0	oc	n	2/20/29	24.8	36.0	8.17	32
78	476	50	r	n	2/20/29	23.8	36.1	8.14	32
78	477	100	oc	n	2/20/29	21.9	36.2	8.14	34
78	478	0	oc	p	2/20/29	24.6	36.0	8.17	32
78	479	50	r	p	2/20/29	23.8	36.1	8.14	32
78	480	100	r	p	2/20/29	21.9	36.2	8.14	34
79	481	0	oc	n	2/22/29	25.2	36.0	8.17	34
79	482	50	oc	n	2/22/29	24.5	36.1	8.17	34
79	483	100	oc	n	2/22/29	21.8	36.2	8.13	45
79	484	0	oc	p	2/22/29	25.2	36.0	8.17	34
80	486	0	oc	n	2/24/29	28.0	35.9	8.20	36
80	488	0	oc	p	2/24/29	26.0	35.9	8.20	38
80	489	50	oc	p	2/24/29	25.9	36.0	8.19	29

Table 25. Distributional and environmental records for Ceratium breve--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
80	490	100	oc	p	2/24/29	23.4	36.2	8.16	32
81	491	0	oc	n	2/26/29	26.5	35.8	8.19	38
81	492	50	oc	n	2/26/29	26.4	35.9	8.19	38
81	493	0	r	p	2/26/29	26.5	35.8	8.19	38
81	494	50	r	p	2/26/29	26.4	35.9	8.19	38
82	496	0	oc	n	2/28/29	27.2	36.3	8.21	34
82	497	50	oc	n	2/28/29	27.2	36.3	8.21	34
82	498	0	r	p	2/28/29	27.2	36.3	8.21	34
83	501	0	c	n	3/ 2/29	27.5	36.3	8.24	29
83	502	50	oc	n	3/ 2/29	27.4	36.5	8.24	25
83	503	0	r	p	3/ 2/29	27.5	36.3	8.24	29
84	505	0	oc	n	3/ 4/29	27.8	36.2	8.23	24
84	506	50	oc	n	3/ 4/29	27.5	36.4	8.21	24
85	510	0	oc	n	3/ 6/29	27.9	36.2	8.22	40
85	511	50	r	n	3/ 6/29	27.8	36.2	8.22	40
86	515	0	.oc	n	3/ 8/29	(28.3	36.2	8.29	20)
86	516	0	oc	n	3/ 9/29	28.3	36.2	8.29	20
87	521	0	r	n	3/11/29	27.8	36.1	8.28	17
88	526	0	oc	n	3/21/29	28.5	35.9	8.23	16
88	527	50	r	n	3/21/29	28.4	35.9	8.25	13
89	528	0	oc	n	3/23/29	28.4	35.6	8.25	21
89	529	50	r	n	3/23/29	28.6	35.8	8.27	12
89	530	0	r	p	3/23/29	28.4	35.6	8.25	21
89	532	0	r	n	3/23/29	(28.4	35.6	8.25	21)
90	533	0	c	n	3/25/29	28.5	35.5	8.27	21
90	534	50	oc	n	3/25/29	28.6	35.6	8.26	21
90	535	0	oc	p	3/25/29	28.5	35.5	8.27	21
91	540	0	c	n	3/27/29	28.7	35.1	8.30	21
91	541	50	c	n	3/27/29	28.5	35.2	8.30	24
91	542	0	r	p	3/27/29	28.7	35.1	8.30	21
92	545	0	oc	n	3/29/29	28.5	35.3	8.29	28
92	546	50	c	n	3/29/29	28.4	35.4	8.29	28
92	548	50	r	p	3/29/29	28.4	35.4	8.29	28
93	550	0	oc	n	3/31/29	28.7	34.7	8.30	28
93	551	50	c	n	3/31/29	28.5	34.8	8.30	28
93	552	0	r	p	3/31/29	28.7	34.7	8.30	28
94	558	50	r	n	4/22/29	29.3	34.7	8.25	14
94	559	100	r	n	4/22/29	28.5	35.6	8.21	25
95	563	50	c	n	4/24/29	29.3	34.9	8.24	16
95	564	100	oc	n	4/24/29	28.5	35.4	8.22	21
95	566	50	r	p	4/24/29	29.3	34.9	8.24	16
95	568A	0	oc	n	4/25/29	(29.4	34.7	8.24	14)
96	568	0	c	n	4/26/29	29.3	35.3	8.26	12
96	569	50	oc	n	4/26/29	29.2	35.3	8.23	12
96	570	100	oc	n	4/26/29	28.2	35.7	8.19	25
96	571	0	oc	p	4/26/29	29.3	35.3	8.23	12
96	572	50	r	p	4/26/29	29.2	35.3	8.23	12
96	573	100	oc	p	4/26/29	28.2	35.7	8.19	25
97	574	0	c	n	4/28/29	28.3	35.2	8.16	24
97	575	50	c	n	4/28/29	28.0	35.4	8.16	21
97	576	100	c	n	4/28/29	27.6	35.6	8.15	25
97	578	50	oc	p	4/28/29	28.0	35.4	8.16	21
97	579	100	r	p	4/28/29	27.6	35.6	8.15	25
98	581	0	oc	n	4/30/29	27.0	35.3	8.16	24
98	582	50	oc	n	4/30/29	26.9	35.3	8.16	28
98	583	100	oc	n	4/30/29	26.7	35.4	8.14	32
98	585	50	r	p	4/30/29	26.9	35.3	8.16	28
98	588	100	r	p	4/30/29	26.7	35.4	8.14	32
99	589	0	c	n	5/ 2/29	27.9	34.9	8.21	12
99	590	50	c	n	5/ 2/29	27.8	34.9	8.22	12
99	591	100	c	n	5/ 2/29	27.8	35.0	8.22	17
99	592	0	oc	p	5/ 2/29	27.9	34.9	8.21	12
99	593	50	oc	p	5/ 2/29	27.8	34.9	8.22	12
99	595	0	c	n	5/ 2/29	27.9	34.9	8.21	12
100	596	50	c	n	5/ 4/29	27.6	34.7	8.21	10
100	597	100	c	n	5/ 4/29	27.6	34.7	8.22	12
100	598	0	oc	p	5/ 4/29	27.7	34.7	8.21	10
100	599	50	oc	p	5/ 4/29	27.6	34.7	8.21	10
100	600	100	r	p	5/ 4/29	27.6	34.7	8.22	12
100	602	100	r	p	5/ 4/29	27.6	34.7	8.22	12
101	604	50	oc	n	5/ 7/29	26.2	34.7	8.24	8
101	605	100	r	n	5/ 7/29	25.2	35.1	8.23	8
102	609	0	oc	n	5/ 9/29	25.8	35.0	8.24	8
102	610	50	oc	n	5/ 9/29	25.8	35.0	8.24	8
102	611	100	oc	n	5/ 9/29	25.6	35.0	8.23	8
103	615	0	oc	n	5/11/29	26.0	35.0	8.25	5

Table 25. Distributional and environmental records for Ceratium breve--Concluded

Station	Sample	Depth (m)	Relative abundance	Appa- ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
103	617	100	r	n	5/11/29	24.8	35.2	8.25	5
104	621	0	r	n	5/13/29	26.1	35.2	8.24	7
105	627	50	c	n	5/15/29	26.8	34.9	8.23	5
105	628	50	oc	n	5/15/29	26.8	34.9	8.23	5
105	629	100	oc	n	5/15/29	25.2	35.1	8.23	5
105	630	0	r	p	5/15/29	26.9	34.9	8.23	5
106	633	0	oc	n	5/17/29	27.2	35.0	8.23	5
106	635	100	c	n	5/17/29	25.6	35.1	8.23	5
106	636	0	r	p	5/17/29	27.2	35.0	8.23	5
107	639	0	oc	n	5/19/29	28.0	34.4	8.23	5
107	640	50	oc	n	5/19/29	27.9	34.4	8.23	4
107	641	100	oc	n	5/19/29	26.8	34.9	8.23	11
107	642	0	r	p	5/19/29	28.0	34.4	8.23	5
108	646	0	oc	n	5/27/29	28.4	35.0	8.25	4
108	648	100	r	n	5/27/29	25.2	35.0	8.23	4
Guam	652	0	oc	n	5/ /29	.....	.....	.....	...
109	654	0	oc	n	5/29/29	27.4	35.0	8.23	3
109	655	50	oc	n	5/29/29	23.1	35.0	8.22	3
111	668	0	r	n	6/ 3/29	20.1	34.5	8.18	5
112	674	0	c	n	6/ 5/29	23.2	34.6	8.22	7
112	676	100	r	n	6/ 5/29	19.8	34.7	8.20	8
113	680	0	oc	n	6/25/29	24.2	34.5	8.25	5
113	681	50	oc	n	6/25/29	23.8	34.6	8.25	5
113	682	100	oc	n	6/25/29	21.5	34.7	8.23	8
113	683	0	oc	p	6/25/29	24.2	34.5	8.25	5
137	836	0	r	n	9/18/29	25.5	35.0	8.39	4
139	849	0	r	n	9/22/29	26.7	34.8	8.34	6
139	851	100	r	n	9/22/29	22.4	35.2	8.28	6
140	857	50	r	n	10/ 3/29	26.9	35.0	8.39	7
140	858	100	oc	n	10/ 3/29	25.5	35.0	8.34	7
140	860	0	r	p	10/ 3/29	26.9	35.0	8.42	7
140	861	100	r	p	10/ 3/29	25.5	35.0	8.34	7
141	864	0	r	n	10/ 5/29	25.9	35.2	8.34	5
141	865	50	r	n	10/ 5/29	25.9	35.2	8.34	5
141	868	0	r	p	10/ 5/29	25.9	35.2	8.34	5
141	869	50	r	p	10/ 5/29	24.8	35.3	8.34	5
149	920	0	r	n	10/21/29	23.5	35.0	8.34	6
149	921	50	r	n	10/21/29	23.3	35.0	8.37	6
150	929	0	c	n	10/23/29	25.6	34.7	8.39	7
150	930	50	oc	n	10/23/29	22.8	34.8	8.35	10
150	931	100	r	n	10/23/29	19.6	34.6	8.32	11
151	937	0	r	n	10/26/29	26.0	34.0	.....	...
151	939	100	r	n	10/26/29	12.5	34.6	.....	...
151	941	0	r	p	10/26/29	26.0	34.0	.....	...
151	942	50	r	p	10/26/29	18.3	34.4	.....	...
152	944	0	oc	n	10/28/29	12.5	34.6	.....	...
152	945	50	oc	n	10/27/29	14.2	34.5	7.87	53
152	948	0	r	p	10/27/29	27.4	33.7	8.35	20
153	951	0	oc	n	10/29/29	28.1	34.2	8.47	7
153	952	50	c	n	10/29/29	28.1	34.4	8.39	7
153	953	100	oc	n	10/29/29	20.5	34.7	8.28	31
153	955	0	r	p	10/29/29	28.1	34.2	8.47	7
153	956	50	r	p	10/29/29	28.1	34.4	8.39	7
154	958	0	c	n	10/31/29	28.3	34.2	8.39	7
154	959	50	oc	n	10/31/29	28.2	34.2	8.40	7
154	960	100	oc	n	10/31/29	25.3	34.8	7.93	21
155	965	0	oc	n	11/ 2/29	27.8	34.9	8.29	29
155	966	50	r	n	11/ 2/29	27.7	34.9	8.30	30
155	967	100	oc	n	11/ 2/29	27.2	35.0	8.30	35
156	972	0	oc	n	11/ 4/29	27.6	35.0	8.34	28
156	974	100	oc	n	11/ 4/29	26.4	35.1	8.30	48
157	978	0	c	n	11/ 6/29	27.1	35.3	8.27	47
157	979	50	oc	n	11/ 6/29	27.1	35.2	8.32	60
157	980	100	r	n	11/ 6/29	26.8	35.5	8.30	64
158	983	0	c	n	11/ 8/29	28.2	35.6	8.34	36
158	984	50	oc	n	11/ 8/29	28.2	35.6	8.39	50
158	985	100	oc	n	11/ 8/29	27.6	35.9	8.39	48
159	990	0	oc	n	11/11/29	28.6	35.7	8.37	15
159	991	50	r	n	11/11/29	28.5	35.7	8.39	15
159	992	100	r	n	11/11/29	28.0	35.7	8.37	23
160	1000	0	r	n	11/13/29	28.6	35.6	8.37	12
160	1002	50	r	n	11/13/29	28.6	35.6	8.39	15

Table 26. Distributional and environmental records for Ceratium euarcuatum

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
1	1	0	r	n	5/12/28	24.0	36.2	8.16	34
1b	7	50	r	n	5/16/28	22.2	36.4	8.21	39
15	102	100	r	n	8/11/28	18.4	36.4	8.20	19
16	103	0	r	p	8/13/28	25.9	36.2	8.24	8
16	104	50	r	p	8/13/28	24.4	36.4	8.23	8
16	107	50	r	n	8/13/28	24.4	36.4	8.23	8
18	118	50	oc	n	8/17/28	22.4	36.8	8.24	5
19	121	50	oc	p	8/20/28	25.2	37.1	8.27	5
19	123	50	oc	n	8/20/28	25.2	37.1	8.27	5
19	124	100	r	n	8/20/28	22.4	37.0	8.25	5
20	125	0	r	p	8/22/28	26.0	36.6	8.37	5
20	126	50	c	p	8/22/28	25.8	36.6	8.26	3
20	128	0	r	n	8/22/28	26.0	36.6	8.37	5
20	129	50	oc	n	8/22/28	25.8	36.6	8.26	3
20	130	100	oc	n	8/22/28	22.6	36.7	8.19	5
21	136	50	r	n	8/24/28	24.4	36.2	8.26	4
21	137	100	r	n	8/24/28	21.0	36.8	8.20	7
22	143	50	r	n	8/27/28	24.5	36.2	8.21	9
22	144	100	r	n	8/27/28	17.5	36.1	7.99	123
25	161	50	r	n	9/ 3/28	21.5	36.0	8.22	12
25	162	100	r	n	9/ 3/28	14.6	35.7	7.93	121
26	163	0	r	p	9/ 5/28	27.6	36.0	8.30	5
27	168	50	oc	p	9/ 7/28	26.0	36.2	8.30	4
27	171	50	r	n	9/ 7/28	26.0	36.2	8.30	4
27	172	100	r	n	9/ 7/28	17.7	36.0	8.09	46
28	174	50	r	p	9/11/28	26.7	36.3	8.26	4
28	183	50	oc	n	9/11/28	26.7	36.3	8.26	4
29	184	100	r	n	9/13/28	23.1	36.6	8.21	8
30	186	50	oc	p	9/15/28	27.8	36.1	8.29	3
30	189	50	oc	n	9/15/28	27.8	36.1	8.29	3
30	190	100	oc	n	9/15/28	24.1	36.4	8.10	20
43	246	100	r	n	11/15/28	13.6	35.0	7.90	92
45	256	0	oc	n	11/19/28	22.4	35.3	8.12	38
46	264	0	r	p	11/21/28	23.3	35.3	8.16	36
46	265	50	oc	p	11/21/28	23.2	35.3	8.16	40
48	276	100	r	p	11/25/28	22.7	36.3	8.26	16
49	278	50	r	n	11/27/28	22.6	36.1	8.26	13
49	281	50	r	p	11/27/28	22.6	36.1	8.26	13
50	285	50	r	n	11/29/28	22.0	35.9	8.23	13
50	286	100	oc	n	11/29/28	20.5	35.7	8.22	13
50	288	50	oc	p	11/29/28	22.0	35.9	8.23	13
51	295	100	oc	n	12/ 1/28	20.0	35.6	8.22	17
51	297	50	r	p	12/ 1/28	20.5	35.6	8.22	17
54	320	50	oc	n	12/14/28	19.8	35.4	8.18	17
54	321	100	oc	n	12/14/28	18.7	35.4	8.16	20
55	323	0	r	n	12/16/28	20.4	34.9	8.19	12
55	325	100	oc	n	12/16/28	16.7	34.9	7.17	12
56	329	50	oc	n	12/18/28	18.5	35.1	8.14	9
56	330	100	c	n	12/18/28	16.6	34.8	8.11	12
56	332	50	oc	p	12/18/28	18.5	35.1	8.14	9
56	333	100	r	p	12/18/28	16.6	34.8	8.11	12
56-57	334	0	oc	n	12/19/28	19.0	34.5	8.14	20
57	336	50	oc	n	12/20/28	15.6	34.3	8.14	21
57	337	100	oc	n	12/20/28	14.3	34.4	8.10	40
57	338	0	r	p	12/20/28	19.0	34.5	8.14	20
57	339	50	r	p	12/20/28	15.6	34.3	8.14	21
77	472	0	r	n	2/18/29	23.7	36.0	8.19	16
77	473	0	r	p	2/18/29	23.7	36.0	8.19	16
77	474	50	c	p	2/18/29	23.5	36.0	8.19	16
78	476	50	r	n	2/20/29	23.8	36.1	8.14	32
78	477	100	oc	n	2/20/29	21.9	36.2	8.14	34
78	479	50	r	p	2/20/29	23.8	36.1	8.14	34
81	492	50	oc	n	2/26/29	26.4	35.9	8.19	38
81	494	50	r	p	2/26/29	26.4	35.9	8.19	38
81	495	100	r	p	2/26/29	23.6	36.2	8.18	36
82	497	50	oc	n	2/28/29	27.2	36.3	8.21	34
82	500	100	r	p	2/28/29	24.4	36.3	8.19	34
83	502	50	oc	n	3/ 2/29	27.4	36.5	8.24	25
83	504	50	r	p	3/ 2/29	27.4	36.5	8.24	25
84	506	50	oc	n	3/ 4/29	27.5	36.4	8.21	24
84	508	50	r	p	3/ 4/29	27.5	36.4	8.21	24
85	511	50	r	n	3/ 6/29	27.8	36.2	8.22	40
85	513	50	r	p	3/ 6/29	27.8	36.2	8.22	40
86	517	50	r	n	3/ 9/29	27.4	36.2	8.29	17
86	519	50	r	p	3/ 9/29	27.4	36.2	8.29	17
87	525	100	r	p	3/11/29	23.9	36.0	8.23	20

Table 26. Distributional and environmental records for Ceratium euarcuatum--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
88	527	50	r	n	3/21/29	28.4	35.9	8.25	13
89	529	50	oc	n	3/23/29	28.6	35.8	8.27	12
89	531	100	r	p	3/23/29	26.4	36.0	8.24	12
91	541	50	oc	n	3/27/29	28.5	35.2	8.30	24
92	546	50	oc	n	3/29/29	28.4	35.4	8.29	28
92	548	50	r	p	3/29/29	28.4	35.4	8.29	28
93	551	50	oc	n	3/31/29	28.5	34.8	8.30	28
93	553	100	r	p	3/31/29	27.6	35.8	8.27	29
95	563	50	oc	n	4/24/29	29.3	34.9	8.24	16
95	564	100	oc	n	4/24/29	28.5	35.4	8.22	21
95	566	50	r	p	4/24/29	29.3	34.9	8.24	16
95	567	100	r	p	4/24/29	28.5	35.4	8.22	21
96	569	50	oc	n	4/26/29	29.2	35.3	8.23	12
98	583	100	oc	n	4/30/29	26.7	35.4	8.14	32
98	588	0-100	oc	p	4/30/29	26.7	35.4	8.14	32
99	589	0	oc	n	5/ 2/29	27.9	34.9	8.21	12
99	592	0	r	p	5/ 2/29	27.9	34.9	8.21	12
99	595	0	r	n	5/ 2/29	27.9	34.9	8.21	12
100	596	50	oc	n	5/ 4/29	27.6	34.7	8.21	10
100	597	100	oc	n	5/ 4/29	27.6	34.7	8.22	12
101	604	50	r	n	5/ 7/29	26.2	34.7	8.24	8
102	609	0	oc	n	5/ 9/29	25.8	35.0	8.24	8
102	610	50	oc	n	5/ 9/29	25.8	35.0	8.24	8
103	615	0	r	n	5/11/29	28.0	35.0	8.25	5
103	616	50	r	n	5/11/29	25.8	35.2	8.25	5
103	617	100	oc	n	5/11/29	24.8	35.2	8.25	5
104	622	50	oc	n	5/13/29	25.8	35.2	8.24	7
104	623	100	oc	n	5/13/29	25.3	35.3	8.21	7
104	626	100	r	p	5/13/29	25.3	35.3	8.21	7
105	628	50	r	n	5/15/29	26.8	34.9	8.23	5
105	629	100	oc	n	5/15/29	25.2	35.1	8.23	5
106	633	0	r	n	5/17/29	27.2	35.0	8.23	5
106	634	50	oc	n	5/17/29	27.0	35.0	8.23	5
106	635	100	c	n	5/17/29	25.6	35.1	8.23	5
106	637	50	r	p	5/17/29	27.0	35.0	8.23	5
106	638	100	r	p	5/17/29	25.6	35.1	8.23	5
107	641	100	oc	n	5/19/29	26.8	34.9	8.23	11
108	647	50	oc	n	5/27/29	26.8	35.0	8.24	4
108	648	100	c	n	5/27/29	25.2	35.0	8.23	4
108	650	50	r	p	5/27/29	26.8	35.0	8.24	4
109	656	100	r	n	5/29/29	19.4	34.8	8.18	5
109	658	50	oc	p	5/29/29	23.1	35.0	8.22	3
110	662	50	r	n	5/31/29	18.4	34.8	8.16	7
112	675	50	r	n	6/ 5/29	21.7	34.6	8.23	7
113	680	0	oc	n	6/25/29	24.2	34.5	8.25	5
132	798	50	oc	n	9/ 8/29	17.6	33.9	8.33	19
132	799	100	r	n	9/ 8/29	14.3	33.4	8.30	18
133	804	0	oc	n	9/10/29	22.7	34.7	8.47	7
133	805	50	oc	n	9/10/29	20.8	34.7	8.37	7
133	806	100	oc	n	9/10/29	18.4	34.8	8.31	7
133	813	50	r	p	9/10/29	20.8	34.7	8.37	7
133	814	100	r	p	9/10/29	18.4	34.8	8.31	7
133	812	0	r	p	9/10/29	22.7	34.7	8.47	7
134	808	0	oc	n	9/12/29	22.9	34.7	8.34	6
134	809	50	oc	n	9/12/29	19.8	34.6	8.34	6
135	821	50	oc	n	9/14/29	21.5	35.0	8.37	5
135	822	100	r	n	9/14/29	18.7	34.8	8.34	5
135	824	0	r	p	9/14/29	23.8	35.1	8.37	7
135	825	50	r	p	9/14/29	21.5	35.0	8.37	5
136	828	50	c	n	9/16/29	21.4	35.1	8.39	3
136	829	100	c	n	9/16/29	18.6	35.0	8.39	3
136	833	50	r	p	9/16/29	21.4	35.1	8.39	3
137	836	0	oc	n	9/18/29	25.5	35.0	8.39	4
137	837	50	oc	n	9/18/29	24.4	35.1	8.34	4
138	844	50	r	n	9/18/29	25.6	34.7	8.30	3
138	848	50	oc	p	9/20/29	25.6	34.7	8.30	3
139	850	50	r	n	9/22/29	25.8	34.9	8.31	6
140	857	50	r	n	10/ 3/29	26.9	35.0	8.39	7
141	864	0	r	n	10/ 5/29	25.9	35.2	8.34	5
141	865	50	oc	n	10/ 5/29	24.8	35.3	8.34	5
141	869	50	r	p	10/ 5/29	24.8	35.3	8.34	5
142	873	50	c	n	10/ 7/29	21.8	34.8	8.30	5
142	874	100	c	n	10/ 7/29	16.8	34.4	8.27	7
142	877	50	r	p	10/ 7/29	21.8	34.8	8.30	5
143	881	0	r	n	10/ 9/29	22.4	34.4	8.30	6
143	882	50	oc	n	10/ 9/29	22.4	34.4	8.30	6

Table 26. Distributional and environmental records for Ceratium euarcuatum--Concluded

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
143	883	100	c	n	10/ 9/29	13.8	34.1	8.30	10
143	855	50	r	p	10/ 9/29	19.0	34.2	8.34	6
144	886	0	c	n	10/ 9/29	23.3	35.0	8.37	6
144	887	0	oc	p	10/11/29	23.3	35.0	8.37	6
144	888	50	r	p	10/11/29	21.1	34.7	8.33	6
145	891	50	c	n	10/13/29	18.7	34.3	8.34	6
145	894	50	oc	p	10/13/29	18.7	34.3	8.34	6
145	895	100	r	p	10/13/29	16.0	34.1	8.31	6
146	897	50	oc	n	10/15/29	22.4	34.9	8.30	6
147	903	0	r	n	10/17/29	23.3	35.3	8.26	8
147	904	50	oc	n	10/17/29	23.1	35.3	8.29	5
148	912	100	oc	n	10/19/29	20.0	35.0	.....	...
149	921	50	oc	n	10/21/29	23.3	35.0	8.37	6
150	929	0	r	n	10/23/29	25.6	34.7	8.39	7
150	930	50	r	n	10/23/29	22.8	34.8	8.35	10
150	931	100	oc	r	10/23/29	19.6	34.6	8.32	11
153	952	50	r	n	10/29/29	28.1	34.4	8.39	7
153	956	50	r	p	10/29/29	28.1	34.4	8.39	7
154	958	0	r	n	10/31/29	28.3	34.2	8.39	7
154	959	50	r	n	10/31/29	28.2	34.2	8.40	7
155	965	0	oc	n	11/ 2/29	27.8	34.9	8.29	29
156	972	0	r	n	11/ 4/29	27.6	35.0	8.34	28
156	967	100	oc	n	11/ 4/29	26.4	35.1	8.30	48
156	973	50	r	n	11/ 4/29	27.0	35.1	8.37	46
156	974	100	r	n	11/ 4/29	26.4	35.1	8.30	48
157	978	0	oc	n	11/ 6/29	27.1	35.3	8.27	47
157	979	50	oc	n	11/ 6/29	27.1	35.2	8.32	60
157	980	100	oc	n	11/ 6/29	26.8	35.3	8.30	64
158	983	0	c	n	11/ 8/29	28.2	35.6	8.34	36
158	985	100	r	n	11/ 8/29	27.6	35.9	8.39	48
159	991	50	r	n	11/11/29	28.5	35.7	8.39	15
159	992	100	r	n	11/11/29	28.0	35.7	8.37	23
160	1002	50	r	n	11/13/29	28.6	35.6	8.39	15

Table 27. Distributional and environmental records for Ceratium filicorne

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
48	276	100	oc	p	11/25/28	22.7	36.3	8.26	16
49	278	50	oc	n	11/27/28	22.6	36.1	8.26	13
50	286	100	c	n	11/29/28	20.5	35.7	8.22	13
50	289	100	oc	p	11/29/28	20.5	35.7	8.22	13
50-51	290	0	r	n	11/30/28	(22.8	35.6	8.22	16)
51	295	100	c	n	12/ 1/28	20.0	35.6	8.22	16
51	298	100	oc	p	12/ 1/28	20.0	35.6	8.22	16
52	301	100	c	n	12/ 3/28	18.2	35.2	8.17	8
53	305	100	c	n	12/ 5/28	19.9	35.6	8.19	13
54	321	100	oc	n	12/14/28	18.7	35.4	8.16	20
55	325	100	oc	n	12/16/28	16.7	34.9	7.17	12
56	330	100	c	n	12/18/28	16.6	34.8	8.11	12
56	333	100	oc	p	12/18/28	16.6	34.8	8.11	12
57	337	100	c	n	12/20/28	14.3	34.4	8.10	40
57	340	100	oc	p	12/20/28	14.3	34.4	8.10	40
63	380	50	c	n	1/ 1/29	17.0	34.6	8.08	25
63	381	100	r	n	1/ 1/29	15.6	34.6	8.08	25
63	383	50	oc	p	1/ 1/29	17.0	34.6	8.08	25
63	384	100	r	p	1/ 1/29	15.6	34.6	8.08	24
64	396	100	oc	n	1/ 3/29	15.8	34.5	8.10	32
64	399	50	r	p	1/ 3/29	17.2	34.6	8.12	29
64	400	100	oc	p	1/ 3/29	15.8	34.5	8.10	32
65	406	50	oc	n	1/ 5/29	16.5	34.5	8.10	25
66	412	100	oc	n	1/ 7/29	17.8	34.9	8.12	21
87	525	100	r	p	3/11/29	23.9	36.0	8.23	20
91	544	100	oc	p	3/27/29	25.8	36.0	8.25	30
93	553	100	r	p	3/31/29	27.6	35.8	8.27	29

Table 26. Distributional and environmental records for Ceratium symmetricum

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3	Variety
1a	4	0	r	n	5/14/28	(22.3	36.3	8.20	46)	or
1a	5	0	r	n	5/14/28	(22.3	36.3	8.20	46)	or
1b	7	50	oc	n	5/16/28	(22.2	36.4	8.21	39)	or
1b	8	100	r	n	5/16/28	(20.3	35.5	8.18	36)	sy
15	99	100	r	p	8/11/28	18.4	36.4	8.20	19	or
15	102	100	r	n	8/11/28	18.4	36.4	8.20	19	or
16	104	50	r	p	8/13/28	24.4	36.4	8.23	8	co
16	107	50	r	n	8/13/28	24.4	36.4	8.23	8	co
16	108	100	r	n	8/13/28	19.9	36.5	8.17	13	co
17	112	50	r	n	8/15/28	21.9	36.6	8.28	12	or
17	113	100	oc	n	8/15/28	19.3	36.5	8.23	9	or
18	116	100	r	p	8/17/28	20.4	36.8	8.21	5	co
18	118	50	r	n	8/17/28	22.4	36.8	8.24	5	co
18	119	100	c	n	8/17/28	20.4	36.8	8.21	5	co
19	123	50	oc	n	8/20/28	25.2	37.1	8.27	5	co
19	124	100	oc	n	8/20/28	22.4	37.0	8.25	5	co
20	130	100	r	n	8/22/28	22.6	36.7	8.19	5	sy
23	146	50	r	p	8/29/28	20.9	36.0	8.14	13	co
23	149	50	r	n	8/29/28	20.9	36.0	8.14	13	co
24	152	50	r	p	8/31/28	23.1	36.0	8.14	6	co
25	161	50	r	n	9/ 3/28	21.5	36.0	8.22	12	co, sy
26	165	100	r	p	9/ 5/28	14.9	35.6	8.11	40	co
27	172	100	r	n	9/ 7/28	17.7	36.0	8.09	46	co
29	179	0	r	p	9/13/28	27.6	36.2	8.31	8	or
29	180	50	oc	p	9/13/28	27.2	36.2	8.29	3	or
29	183	50	oc	n	9/13/28	27.2	36.2	8.29	3	or
32	196	100	r	n	10/ 5/28	22.2	36.4	8.10	30	co
35-36	211	0	r	n	10/28/28	(27.0	30.7	8.27	16)	sy
36	214	50	r	n	10/30/28	18.5	34.5	8.03	122	sy
37	218	50	r	n	11/ 1/28	18.8	34.5	8.00	121	co
41	239	100	r	p	11/10/28	14.5	35.0	7.91	152	co
42	243	100	r	n	11/13/28	13.8	35.0	7.91	150	co
45	257	50	c	n	11/13/28	17.2	34.9	7.99	68	or
45	258	100	oc	n	11/19/28	18.6	35.1	8.00	50	or
45	259	0	oc	p	11/19/28	22.4	35.3	8.12	38	or
45	260	50	r	p	11/19/28	22.4	35.2	8.13	46	or
46	261	0	oc	n	11/21/28	23.3	35.3	8.16	36	or
46	262	50	r	n	11/21/28	23.2	35.3	8.16	40	or
46	263	100	r	n	11/21/28	22.5	35.4	8.17	40	co
46	265	50	oc	p	11/21/28	23.2	35.3	8.16	40	or
47	266	0	r	n	11/23/28	23.9	36.0	8.23	17	or
47	267	50	oc	n	11/23/28	23.8	36.0	8.23	20	co, or
47	268	100	oc	n	11/23/28	22.7	36.2	8.23	20	co, or
47	270	50	r	p	11/23/28	23.8	36.0	8.23	20	or
48	274	0	r	p	11/25/28	23.6	36.4	8.23	13	or
48	275	50	r	p	11/25/28	23.6	36.4	8.24	16	or
48	277	0	r	n	11/25/28	23.6	36.4	8.23	13	or
49	278	50	r	n	11/27/28	22.6	36.1	8.26	13	or
51	294	50	oc	n	12/ 1/28	20.5	35.6	8.22	17	or
51	295	100	oc	n	12/ 1/28	20.0	35.6	8.22	17	or
56	330	100	c	n	12/20/28	16.6	34.8	8.11	12	co
57	337	100	oc	n	12/20/28	14.3	34.4	8.10	40	or
57	340	100	r	p	12/20/28	14.3	34.4	8.10	40	sy
58	346	100	r	p	12/22/28	12.3	34.1	8.05	40	sy
59	352	50	r	p	12/24/28	14.0	34.0	8.08	36	sy
60	354	0	r	n	12/26/28	15.0	34.0	8.07	50	sy
62	373	100	r	n	12/30/28	13.1	34.2	8.06	48	sy
62	376	100	r	p	12/30/28	13.1	34.2	8.06	48	sy
63	380	50	c	n	1/ 1/29	17.0	34.6	8.08	25	sy
63	382	0	oc	p	1/ 1/29	20.5	34.6	8.07	21	co
63	383	50	oc	p	1/ 1/29	17.0	34.6	8.08	25	sy
63	384	100	r	p	1/ 1/29	15.6	34.6	8.08	24	co
63-64	387	0	oc	n	1/ 1/29	(23.2	36.0	8.23	13)	sy
63-64	388	0	r	n	1/ 1/29	(23.2	36.0	8.23	13)	sy
63-64	389	0	r	n	1/ 1/29	(23.2	36.0	8.23	13)	sy
63-64	390	0	r	n	1/ 1/29	(20.5	34.6	8.07	21)	sy
63-64	392	0	oc	n	1/ 1/29	(20.5	34.6	8.07	21)	sy
64	395	50	r	n	1/ 3/29	17.2	34.6	8.12	29	co
64	398	0	r	p	1/ 3/29	20.6	34.6	8.12	21	sy
64	399	50	r	p	1/ 3/29	17.2	34.6	8.12	29	co
64	400	100	oc	p	1/ 3/29	15.8	34.5	8.10	32	co
64-65	401	0	r	n	1/ 3/29	(20.2	34.5	8.10	24)	sy
65	406	50	oc	n	1/ 5/29	16.5	34.5	8.10	25	or
65	407	100	r	n	1/ 5/29	14.8	34.3	8.10	34	co
66	412	100	oc	n	1/ 7/29	17.8	34.9	8.12	21	co
66	415	100	r	p	1/ 7/29	17.8	34.9	8.12	21	co

Table 28. Distributional and environmental records for Ceratium symmetricum--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3	Variety
68	421	100	r	n	1/10/29	16.5	34.8	8.13	34	or
68	423	50	r	p	1/10/29	18.2	35.0	8.14	29	or
69	427	0	r	p	1/12/29	21.1	35.2	8.12	62	or
71	439	50	r	n	2/ 6/29	16.7	35.1	7.90	150	or
76	469	100	r	n	2/16/29	21.2	35.8	8.12	45	or
76	471	50	r	p	2/16/29	22.1	35.9	8.14	42	or
78	477	100	r	n	2/20/29	21.9	36.2	8.14	34	co
79	482	50	oc	n	2/22/29	24.5	36.1	8.17	34	or
79	483	100	oc	n	2/22/29	21.8	36.2	8.13	45	or
79	485	50	oc	p	2/22/29	24.5	36.1	8.17	34	or
80	487	50	r	n	2/24/29	25.9	36.0	8.19	29	or
80	489	50	oc	p	2/24/29	25.9	36.0	8.19	29	or
80	490	100	r	p	2/24/29	23.4	36.2	8.16	32	or
91	541	50	oc	n	3/27/29	28.5	35.2	8.30	24	or
91	544	100	oc	p	3/27/29	25.8	36.0	8.25	30	or
94	559	100	r	n	4/22/29	28.5	35.6	8.21	25	sy
95	564	100	oc	n	4/24/29	28.5	35.4	8.22	21	sy
95	566	50	r	p	4/24/29	29.3	34.9	8.24	16	sy
99	590	50	c	n	5/ 2/29	27.8	34.9	8.22	12	sy
100	597	100	oc	n	5/ 4/29	27.6	34.7	8.22	12	sy
100	600	100	r	p	5/ 4/29	27.6	34.7	8.22	12	co
101	605	100	oc	n	5/ 7/29	25.2	35.1	8.23	8	sy
102	611	100	r	n	5/ 9/29	25.6	35.0	8.23	8	or
102	614	100	r	p	5/ 9/29	25.6	35.0	8.23	8	or
103	617	100	r	n	5/11/29	24.8	35.2	8.25	5	or
103	620	100	oc	p	5/11/29	24.8	35.2	8.25	5	or
104	623	100	r	n	5/13/29	25.3	35.3	8.21	7	or
106	635	100	c	n	5/17/29	25.6	35.1	8.23	5	sy
106	638	100	r	p	5/17/29	25.6	35.1	8.23	5	sy
108	648	100	oc	n	5/27/29	25.2	35.0	8.23	4	or
109	655	50	oc	n	5/29/29	23.1	35.0	8.22	3	or
109	656	100	oc	n	5/29/29	19.4	34.8	8.18	5	or
109	658	50	oc	p	5/29/29	23.1	35.0	8.22	3	or
109	659	100	r	p	5/29/29	19.4	34.8	8.18	5	or
110	663	100	oc	n	5/31/29	17.9	34.7	8.14	11	or
110	665	50	oc	p	5/31/29	18.4	34.8	8.16	7	or
111	670	100	r	n	6/ 3/29	18.2	34.7	8.13	13	or
112	675	50	r	n	6/ 5/29	21.7	34.6	8.23	7	or
112	676	100	oc	n	6/ 5/29	19.8	34.7	8.20	8	or
113	681	50	oc	n	6/25/29	23.8	34.6	8.25	5	or
113	682	100	oc	n	6/25/29	21.5	34.7	8.23	8	or
113	683	0	r	p	6/25/29	29.2	34.5	8.25	5	or, co
113	684	50	r	p	6/25/29	23.8	34.6	8.25	5	co
113	685	100	oc	p	6/25/29	21.5	34.7	8.23	8	co
114	687	50	oc	n	6/27/29	16.2	34.6	8.04	63	sy
114	688	100	r	n	6/27/29	13.0	34.5	8.00	91	co
114	690	50	oc	p	6/27/29	16.2	34.6	8.04	63	sy
115	693	50	r	n	6/29/29	17.5	34.6	8.12	17	co
131	788	0	r	n	9/ 6/29	19.3	33.4	8.34	...	co
131	789	100	r	n	9/ 6/29	12.1	33.4	8.32	...	co
132	798	50	oc	n	9/ 8/29	17.6	33.9	8.33	19	co
132	799	100	c	n	9/ 8/29	14.3	33.4	8.30	16	sy
132	802	50	r	p	9/ 8/29	17.6	33.9	8.33	19	co
132	803	100	oc	p	9/ 8/29	14.3	33.4	8.30	16	sy
133	806	100	oc	n	9/10/29	18.4	34.8	8.31	7	sy, co
133	814	100	r	p	9/10/29	18.4	34.8	8.31	7	sy
134	808	0	r	n	9/12/29	22.9	34.7	8.34	6	sy
134	809	50	r	n	9/12/29	19.8	34.6	8.34	6	sy
134	810	50	r	n	9/12/29	19.8	34.6	8.34	6	sy
134	811	100	oc	n	9/12/29	18.1	34.6	8.34	6	co
134	817	100	r	p	9/12/29	18.1	34.6	8.34	6	sy
135	822	100	oc	n	9/14/29	18.7	34.8	8.34	5	sy
135	826	100	r	p	9/14/29	18.7	34.8	8.34	5	sy
136	829	100	c	n	9/16/29	18.6	35.0	8.39	3	sy
136	834	100	oc	p	9/16/29	18.6	35.0	8.39	3	sy
137	838	100	oc	n	9/18/29	21.5	35.1	8.30	5	sy
137	841	50	r	p	9/18/29	24.4	35.1	8.34	4	sy
138	845	100	oc	n	9/20/29	22.2	34.8	8.31	3	sy
139	850	50	r	n	9/22/29	25.8	34.9	8.31	6	sy
139	851	100	oc	n	9/22/29	22.4	35.2	8.28	6	sy
139	855	100	r	p	9/22/29	22.4	35.2	8.28	6	sy
140	858	100	oc	n	10/ 3/29	25.5	35.0	8.34	7	sy
141	871	100	r	p	10/ 5/29	20.0	35.0	8.33	5	sy
142	874	100	oc	n	10/ 7/29	16.6	34.4	8.27	7	sy
143	883	100	oc	n	10/ 9/29	13.8	34.1	8.30	10	co, sy
144	889	100	r	p	10/11/29	16.6	34.5	8.37	6	co

Table 28. Distributional and environmental records for Ceratium symmetricum--Concluded

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3	Variety
145	891	50	oc	n	10/13/29	18.7	34.3	8.34	6	or
145	892	100	oc	n	10/13/29	16.0	34.1	8.31	6	co
145	894	50	oc	p	10/13/29	18.7	34.3	8.34	6	or
145	895	100	r	p	10/13/29	16.0	34.1	8.31	6	co, or
146	897	50	r	n	10/15/29	22.4	34.9	8.30	6	or, sy
146	898	100	c	n	10/15/29	19.7	34.3	8.26	7	co, or
146	901	50	r	p	10/15/29	22.4	34.9	8.30	6	or
147	905	100	oc	n	10/17/29	19.2	35.0	8.29	5	co, sy
148	912	100	c	n	10/19/29	20.0	35.0	.....	...	or, co
148	919	100	r	p	10/19/29	20.0	35.0	.....	...	or
149	922	100	c	n	10/21/29	20.3	34.9	8.38	6	co, or
150	931	100	r	n	10/23/29	19.6	34.6	8.32	11	co, or
151	938	50	oc	n	10/26/29	18.3	34.4	.....	...	or
151	939	100	r	n	10/26/29	12.5	34.6	.....	...	or
153	953	100	oc	n	10/29/29	20.5	34.7	8.28	31	or, co
153	957	100	r	p	10/29/29	20.5	34.7	8.28	31	or

Abbreviations: or=var. orthoceros; sy=var. symmetricum; co=var. coarctatum

Table 29. Distributional and environmental records for Ceratium axiale

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
63	384	100	r	p	1/ 1/29	15.6	34.6	8.08	24
64	400	100	oc	p	1/ 3/29	15.8	34.5	8.10	32
100	600	100	r	p	5/ 4/29	27.6	34.7	8.22	12
115	694	100	r	n	6/29/29	15.6	34.6	8.08	27
134	810	100	oc	n	9/12/29	18.1	34.6	8.34	6
136	829	100	c	n	9/16/29	18.6	35.0	8.39	3
136	834	100	oc	p	9/16/29	18.6	35.0	8.39	3
137	841	50	r	p	9/18/29	24.4	35.1	8.34	4
140	863	100	r	p	10/ 3/29	25.5	35.0	8.34	7
148	912	100	c	n	10/19/29	20.0	35.0	.....	...
148	917	0	r	p	10/19/29	23.4	35.2	.....	...
150	931	100	r	n	10/23/29	19.6	34.6	8.32	11
153	957	100	r	p	10/29/29	20.5	34.7	8.28	31

Table 30. Distributional and environmental records for Ceratium azoricum

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
5a	33	0	r	n	5/30/28	(13.7	35.8	8.17	19)
5a	34	0	r	n	5/30/28	(13.7	35.8	8.17	19)
6	36	50	oc	n	5/31/28	11.6	35.6	8.12	32
6	37	100	oc	n	5/31/28	11.3	35.6	8.08	41
6b	45	0	oc	n	6/ 2/28	(12.4	35.6	8.15	21)
6b	46	0	oc	n	6/ 2/28	(12.4	35.6	8.15	21)
7	57	50	r	n	7/13/28	8.2	35.2	8.03	47
22	143	50	r	n	8/27/28	24.5	36.2	8.21	9
37	220	0	r	p	11/ 3/28	26.5	32.9	8.33	20
40	232	0	r	p	11/ 8/28	22.2	33.7	8.21	24
41	236	50	r	n	11/10/28	14.6	35.0	7.94	58
41	238	0	r	p	11/10/28	20.4	34.2	8.11	32
41a	240	0	r	n	11/12/28	(19.6	34.5	8.09	39)
42	241	0	r	n	11/13/28	18.7	34.7	8.06	45
42	242	50	r	n	11/13/28	17.2	34.9	7.99	68
42	243	100	oc	n	11/13/28	13.8	35.0	7.91	150
43	244	0	oc	n	11/15/28	19.6	34.8	8.09	52
43	245	50	oc	n	11/15/28	17.0	34.9	7.93	80
43	246	100	oc	n	11/15/28	13.6	35.0	7.90	92
43	247	0	r	p	11/15/28	19.6	34.8	8.09	52
43	248	50	oc	p	11/15/28	17.0	34.9	7.93	80
43	249	100	r	p	11/15/28	13.6	35.0	7.90	92
44	250	0	r	n	11/17/28	20.7	34.9	8.03	38
44	251	50	r	n	11/17/28	20.4	34.9	8.04	34
44	252	100	r	n	11/17/28	13.8	35.0	7.85	70
44	253	0	oc	p	11/17/28	20.7	34.9	8.03	38
44	254	50	oc	p	11/17/28	20.4	34.9	8.04	34
44	255	100	r	p	11/17/28	13.8	35.0	7.85	70

Table 30. Distributional and environmental records for Ceratium azoricum--Concluded

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
45	259	0	r	p	11/19/28	22.4	35.3	8.12	38
47	269	0	r	p	11/23/28	23.9	36.0	8.23	17
47	270	50	r	p	11/23/28	23.8	36.0	8.23	20
53-54	313	0	r	n	12/10/28	(23.0	35.8	8.22	11)
65	406	50	r	n	1/ 5/29	16.5	34.5	8.10	25
65	409	50	r	p	1/ 5/29	16.5	34.5	8.10	25
65	410	100	r	p	1/ 5/29	14.8	34.3	8.10	34
94	561	50	r	p	4/22/29	29.3	34.7	8.25	14
96	569	50	r	n	4/26/29	29.2	35.3	8.23	12
96	571	0	r	p	4/26/29	29.3	35.3	8.23	12
100	597	100	r	n	5/ 4/29	27.6	34.7	8.22	12
100	598	0	oc	p	5/ 4/29	27.7	34.7	8.21	10
100	599	50	oc	p	5/ 4/29	27.6	34.7	8.21	10
100	600	100	oc	p	5/ 4/29	27.6	34.7	8.22	12
100	602	100	oc	p	5/ 4/29	27.6	34.7	8.22	12
110	665	50	r	p	5/31/29	18.4	34.8	8.16	7
127	767	0	c	n	7/23/29	13.4	32.7	8.12	43
127	768	50	oc	n	7/23/29	10.5	32.8	8.09	56
127	769	100	oc	n	7/23/29	8.2	32.8	8.00	72
127	771	50	oc	p	7/23/29	10.5	32.8	8.09	56
127	772	100	r	p	7/23/29	8.2	32.8	8.00	72
129	780	0	r	n	7/27/29	16.3	33.1	8.13	25
130	781	0	r	n	9/ 4/29	16.2	33.4	8.34	36
130	783	100	oc	n	9/ 4/29	8.8	33.7	8.06	176
130	784	0	oc	p	9/ 4/29	16.2	33.4	8.34	36
130	785	50	oc	p	9/ 4/29	11.7	33.4	8.26	83
131	789	100	r	n	9/ 6/29	12.1	33.4	8.32	...
131	793	0	r	p	9/ 6/29	19.3	33.4	8.34	...
132	799	100	r	n	9/ 8/29	14.3	33.4	8.30	16
151	942	50	r	p	10/26/29	18.3	34.4	.....	...
152	945	50	r	n	10/27/29	14.2	34.5	7.87	53
159	991	50	r	n	11/11/29	28.5	35.7	8.39	15

Table 31. Distributional and environmental records for Ceratium petersii

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
55	324	50	r	n	12/16/28	18.7	35.0	8.18	12
58	342	50	oc	n	12/22/28	14.8	34.0	8.12	25
58	344	0	r	p	12/22/28	17.0	34.0	8.12	20
58	345	50	r	p	12/22/28	14.8	34.0	8.12	25
58	346	100	r	p	12/22/28	12.3	34.1	8.05	40
61	364	50	c	n	12/28/28	14.0	34.0	8.05	60
61	365	100	oc	n	12/28/28	10.8	34.0	8.03	80
61	366	0	r	p	12/28/28	16.9	34.0	8.05	46
61	367	50	r	p	12/28/28	14.6	34.0	8.05	60
61-62	369	0	oc	n	12/20/28	(18.1	34.1	8.09	39)
70	431	0	r	n	1/13/29	21.2	35.1	8.05	103
70	433	100	r	n	1/13/29	12.6	34.8	7.68	233
70	434	0	r	p	1/13/29	21.2	35.1	8.05	103
128	773	0	oc	n	7/25/29	16.4	33.0	8.12	29
128	777	50	r	p	7/25/29	11.8	33.1	8.11	29

Table 32. Distributional and environmental records for Ceratium arietinum

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3	Sub-species
1	1	0	r	n	5/12/28	24.0	36.2	8.16	34	ar
1b	6	0	r	n	5/16/28	(22.3	36.3	8.20	46)	ar
1b	7	50	r	n	5/16/28	22.2	36.4	8.21	39	ar
1b	8	100	oc	n	5/16/28	20.3	35.5	8.18	36	ar
3	17	0	c	n	5/16/28	20.3	35.5	8.18	36	bu
3	19	100	r	n	5/21/28	13.6	35.9	8.10	48	bu
3	20	0	r	n	5/21/28	15.5	36.1	8.15	99	bu
6h	55	0	oc	n	7/11/28	(10.6	35.4	8.18	28)	bu
14	92	50	r	p	8/ 9/28	15.0	35.1	8.18	16	ar
14	95	50	r	n	8/ 9/28	15.0	35.1	8.18	16	ar

Table 32. Distributional and environmental records for Ceratium arietinum--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3	Subspecies
15	98	50	oc	p	8/11/28	19.8	36.5	8.21	8	ar
15	99	100	r	p	8/11/28	18.4	36.4	8.20	19	ar
15	101	50	r	n	8/11/28	19.8	36.5	8.21	8	ar
15	102	100	oc	n	8/11/28	18.4	36.4	8.20	19	ar
16	108	100	r	n	8/13/28	19.9	36.5	8.17	13	ar
18	116	100	r	p	8/17/28	20.4	36.8	8.21	5	ar
22	141	100	r	p	8/27/28	17.5	36.1	7.99	123	gr
22	144	100	r	n	8/27/28	17.5	36.1	7.99	123	gr
23	146	50	r	p	8/29/28	20.9	36.0	8.14	13	gr
36	215	100	r	n	10/30/28	14.4	34.9	7.85	149	gr
40	230	50	r	n	11/ 8/28	15.3	34.9	7.87	161	ar
40	233	50	r	p	11/ 8/28	15.3	34.9	7.87	161	ar
41	239	100	r	p	11/10/28	14.5	35.0	7.91	152	ar
44	254	50	r	p	11/17/28	20.4	34.9	8.04	34	gr
44	255	100	r	p	11/17/28	13.8	35.0	7.85	70	gr
45	256	0	r	n	11/19/28	22.4	35.3	8.12	38	ar
45	257	50	oc	n	11/19/28	22.4	35.2	8.13	46	ar
45	258	100	oc	n	11/19/28	18.6	35.1	8.00	50	ar
45	259	0	oc	p	11/19/28	22.4	35.3	8.12	38	ar
45	260	50	r	p	11/19/28	22.4	35.2	8.13	46	ar
46	263	100	r	n	11/21/28	22.5	35.4	8.17	40	ar
46	265	50	r	p	11/21/28	23.2	35.3	8.16	40	ar
47	268	100	r	n	11/23/28	22.7	36.2	8.23	20	ar
47	269	0	r	p	11/23/28	23.9	36.0	8.23	17	ar
47	270	50	oc	p	11/23/28	23.8	36.0	8.23	20	ar
48	273	100	oc	n	11/25/28	22.7	36.3	8.26	16	ar
48	274	0	r	p	11/25/28	23.6	36.4	8.23	13	ar
48	276	100	r	p	11/25/28	22.7	36.3	8.26	16	ar
49	280	0	r	p	11/27/28	23.4	36.2	8.27	13	ar
57	340	100	r	p	12/20/28	14.3	34.4	8.10	40	ar
58	345	50	r	p	12/22/28	14.8	34.0	8.12	25	ar
58	346	100	r	p	12/22/28	12.3	34.1	8.05	40	ar
59	350	100	r	n	12/24/28	11.4	34.1	8.03	72	ar
59	352	50	r	p	12/24/28	14.0	34.0	8.08	38	ar
59	353	100	r	p	12/24/28	11.4	34.1	8.03	72	ar
60	359	0	r	p	12/26/28	(15.0	34.0	8.07	50	ar
61	365	100	a	n	12/28/28	10.8	34.0	8.03	80	ar, bu
61	367	50	oc	p	12/28/28	14.0	34.0	8.05	60	ar
61	368	100	r	p	12/28/28	10.8	34.0	8.03	80	bu
61-62	369	0	r	n	12/29/28	(16.9	34.0	8.05	46)	ar
61-62	370	0	r	n	12/29/28	(16.9	34.0	8.05	46)	ar
62	372	50	oc	n	12/30/28	16.2	34.3	8.10	28	bu
62	373	100	r	n	12/30/28	13.1	34.2	8.06	48	ar
62	376	100	r	p	12/30/28	13.1	34.2	8.06	48	ar
63	381	100	r	n	1/ 1/29	15.6	34.6	8.08	24	ar
63-64	392	0	r	n	1/ 3/29	20.5	34.6	8.07	21	ar
64-65	402	0	r	n	1/ 4/29	(20.6	34.6	8.12	21)	bu
65	407	100	r	n	1/ 5/29	14.8	34.3	8.10	34	bu
65	409	50	r	p	1/ 5/29	16.5	34.5	8.10	25	bu
65	410	100	r	p	1/ 5/29	14.8	34.3	8.10	34	bu
66	412	100	r	n	1/ 7/29	17.8	34.9	8.12	21	bu
66	413	0	r	p	1/ 7/29	19.4	34.7	8.10	29	bu
66	414	50	r	p	1/ 7/29	17.8	34.8	8.10	29	bu
66	415	100	r	p	1/ 7/29	17.8	34.9	8.12	21	bu
69	427	0	r	p	1/12/29	21.1	35.2	8.12	62	ar
70	432	50	r	n	1/13/29	15.4	35.0	7.88	178	ar
73	452	100	r	n	2/20/29	14.7	35.0	7.80	178	bu
78	477	100	r	n	2/20/29	21.9	36.2	8.14	34	ar
94	559	100	r	n	4/22/29	28.5	35.6	8.21	25	ar
94	560	0	r	p	4/22/29	29.5	34.7	8.25	14	ar
98	581	0	oc	n	4/30/29	27.0	35.3	8.16	24	ar
98	582	50	oc	n	4/30/29	26.9	35.3	8.16	28	ar
98	584	0	r	p	4/30/29	27.0	35.3	8.16	24	ar
98	585	50	oc	p	4/30/29	26.9	35.3	8.16	28	ar
101	605	100	r	n	5/ 7/29	25.2	35.1	8.23	8	ar
101	606	0	r	p	5/ 7/29	26.3	34.7	8.24	8	ar
101	607	50	oc	p	5/ 7/29	26.2	34.7	8.24	8	ar
102	612	0	r	p	5/ 9/29	25.8	35.0	8.24	8	ar
102	613	50	oc	p	5/ 9/29	25.8	35.0	8.24	8	ar
104	626	100	oc	p	5/13/29	25.3	35.3	8.21	7	ar
110	663	100	r	n	5/31/29	17.9	34.7	8.14	11	ar
111	668	0	r	n	6/ 3/29	20.1	34.5	8.18	5	ar
111	669	50	r	n	6/ 3/29	19.4	34.6	8.17	5	ar
113	680	0	r	n	6/25/29	24.2	34.5	8.25	5	ar
114	688	100	oc	n	6/27/29	13.0	34.5	8.00	91	ar
114	690	50	oc	p	6/27/29	16.2	34.6	8.04	63	ar

Table 32. Distributional and environmental records for Ceratium arietinum--Concluded

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3	Sub-species
115	693	50	r	n	6/29/29	17.5	34.6	8.12	17	ar
115a	700	0	r	n	6/30/29	(18.4	34.3	8.18	4)	ar
116	703	50	c	n	7/ 1/29	10.6	33.8	8.11	23	ar
116	704	100	oc	n	7/ 1/29	6.7	33.8	.....	...	ar
116	706	50	c	p	7/ 1/29	10.6	33.8	8.11	23	ar
116	707	100	r	p	7/ 1/29	6.7	33.8	8.11	23	ar
117	709	50	oc	n	7/ 3/29	12.5	34.2	8.06	51	ar
117	710	100	oc	n	7/ 3/29	8.8	34.1	7.98	84	ar
116	716	100	r	n	7/ 5/29	6.1	33.8	7.94	114	bu
118	718	50	r	p	7/ 5/29	8.2	33.7	8.21	92	bu
119	722	100	r	n	7/ 7/29	1.6	33.2	7.85	193	bu
127	767	0	oc	n	7/23/29	13.4	32.7	8.12	43	bu
127	768	50	oc	n	7/23/29	10.5	32.8	8.09	56	bu
127	769	100	r	n	7/23/29	8.2	32.8	8.00	72	bu
127	770	0	r	p	7/23/29	13.4	32.7	8.12	43	bu
127	772	100	r	p	7/23/29	13.4	32.7	8.12	43	bu
127	773	0	oc	n	7/23/29	13.4	32.7	8.12	43	bu
128	774	50	r	n	7/25/29	11.8	33.1	8.11	29	bu
128	775	100	c	n	7/25/29	10.2	33.2	8.06	46	ar
128	777	50	r	p	7/25/29	11.8	33.1	8.11	29	bu
128	778	100	oc	p	7/25/29	10.2	33.2	8.06	46	bu
130	782	50	r	n	9/ 4/29	11.7	33.4	8.26	83	bu
130	783	100	oc	n	9/ 4/29	8.8	33.7	8.06	176	bu
131	786	0	oc	n	9/ 6/29	19.3	33.4	8.34	...	ar
131	789	100	r	n	9/ 6/29	12.1	33.4	8.32	...	ar
132	799	100	r	n	9/ 8/29	14.3	33.4	8.30	16	ar
132	803	100	r	p	9/ 8/29	14.3	33.4	8.30	16	ar
134	815	0	r	p	9/12/29	22.9	34.7	8.34	6	ar
135	825	50	r	p	9/14/29	21.5	35.0	8.37	5	ar
136	828	50	r	n	9/16/29	21.4	35.1	8.39	3	ar
136	834	100	r	p	9/16/29	18.6	35.0	8.39	3	ar
148	919	100	oc	p	10/19/29	20.0	35.0	.....	...	ar
150	935	100	r	p	10/23/29	19.6	34.6	8.32	11	ar
151	939	100	r	n	10/26/29	12.5	34.6	.....	...	ar
152	945	50	oc	n	10/27/29	14.2	34.5	7.87	53	ar
152	949	50	r	p	10/27/29	14.2	34.5	7.87	53	ar

Abbreviations: ar=subsp. arietinum; bu=subsp. bucephalum; gr=subsp. gracilentum.

Table 33. Distributional and environmental records for Ceratium declinatum

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
3	20	0	oc	n	5/21/28	15.5	36.1	8.15	99
13a	88	0	r	n	8/ 8/28	(21.2	35.2	8.18	11)
13a	89	0	r	n	8/ 8/28	(21.2	35.2	8.18	11)
15	97	0	c	p	8/11/28	24.8	36.4	8.21	11
15	98	50	r	p	8/11/28	19.8	36.5	8.21	8
15	99	100	oc	p	8/11/28	18.4	36.4	8.20	19
15	101	50	oc	n	8/11/28	19.8	36.5	8.21	8
15	102	100	r	n	8/11/28	18.4	36.4	8.20	19
17	109	0	oc	p	8/15/28	26.2	36.6	8.29	9
17	110	50	r	p	8/15/28	21.9	36.6	8.28	12
17	111	0	oc	n	8/15/28	26.2	36.6	8.29	9
17	112	50	r	n	8/15/28	21.9	36.6	8.28	12
18	114	0	c	p	8/17/28	27.0	37.0	8.23	5
18	115	50	oc	p	8/17/28	22.4	36.8	8.24	5
18	116	100	oc	p	8/17/28	20.4	36.8	8.21	5
18	117	0	r	n	8/17/28	27.0	37.0	8.23	5
18	118	50	oc	n	8/17/28	22.4	36.8	8.24	5
19	121	50	r	p	8/20/28	25.2	37.1	8.27	5
20	125	0	r	p	8/22/28	26.0	36.6	8.37	5
20	126	50	r	p	8/22/28	25.6	36.6	8.26	3
20	127	100	oc	p	8/22/28	22.6	36.7	8.19	5
20	130	100	r	n	8/22/28	22.6	36.7	8.19	5
20-21	131	0	oc	n	8/23/28	(26.6	36.3	8.32	4)
21	134	100	c	p	8/24/28	21.0	36.8	8.20	7
21	136	50	r	n	8/24/28	24.4	36.2	8.28	4
21	137	100	oc	n	8/24/28	21.0	36.8	8.20	7
22	139	0	oc	p	8/27/28	26.7	36.0	8.26	8
22	141	100	r	p	8/27/28	17.5	36.1	7.99	123
22	143	50	oc	n	8/27/28	24.5	36.2	8.21	9
22	144	100	oc	n	8/27/28	17.5	36.1	7.99	123
23	145	0	oc	p	8/29/28	27.2	35.9	8.25	4

Table 33. Distributional and environmental records for Ceratium declinatum--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
23	149	50	oc	n	8/29/28	20.9	36.0	8.14	13
24	151	0	r	p	8/31/28	27.2	35.2	8.32	4
24	152	50	r	p	8/31/28	23.1	36.0	8.14	8
29	183	50	r	n	9/13/28	27.2	36.2	8.29	3
33	197A	0	oc	p	10/ 8/28	28.5	35.6	8.23	4
36	216	0	r	p	10/30/28	26.5	31.6	8.23	16
37	218	50	r	n	11/ 1/28	18.8	34.5	8.00	121
37	220	0	r	p	11/ 1/28	27.1	31.7	8.28	15
37	221	50	oc	p	11/ 1/28	18.8	34.5	8.00	121
42	241	0	r	n	11/13/28	18.7	34.7	8.06	45
43	246	100	r	n	11/15/28	13.6	35.0	7.90	92
46	263	100	r	n	11/21/28	22.5	35.4	8.17	40
47	267	50	r	n	11/23/28	23.8	36.0	8.23	20
47	268	100	r	n	11/23/28	22.7	36.2	8.23	20
47	269	0	r	p	11/23/28	23.9	36.0	8.23	17
48	271	0	r	n	11/25/28	23.6	36.4	8.23	13
48	274	0	oc	p	11/25/28	23.6	36.4	8.23	13
49	280	0	r	p	11/27/28	23.4	36.2	8.27	13
50	287	0	r	p	11/29/28	23.2	36.0	8.23	13
50	288	50	oc	p	11/29/28	22.0	35.9	8.23	13
50-51	291	0	r	n	11/30/28	(22.8	35.6	8.22	16)
50-51	292	0	r	n	11/30/28	(22.8	35.6	8.22	16)
51	296	0	r	p	12/ 1/28	22.8	35.6	8.22	16
51	298	100	r	p	12/ 1/28	20.0	35.6	8.22	17
52	302	0	r	p	12/ 3/28	22.5	35.4	8.21	8
53	304	50	oc	n	12/ 5/28	21.2	35.8	8.20	13
53	306	0	r	p	12/ 5/28	22.6	35.7	8.22	13
54	322	0	r	p	12/14/28	23.4	35.7	8.22	9
55	325	100	r	n	12/16/28	16.7	34.9	7.17	12
56-57	334	0	oc	n	12/19/28	(19.0	34.5	8.14	20)
57	335	0	r	n	12/20/28	19.0	34.5	8.14	20
57	337	100	r	n	12/20/28	14.3	34.4	8.10	40
57	338	0	r	p	12/20/28	19.0	34.5	8.14	20
61-62	370	0	r	n	12/28/28	(16.9	34.0	8.05	46)
62-63	377	0	oc	n	12/31/28	(20.5	34.6	8.07	21)
62-63	378	0	oc	n	12/31/28	(20.5	34.6	8.07	21)
63	379	0	oc	n	1/ 1/29	20.5	34.6	8.07	21
63	381	100	r	n	1/ 1/29	15.6	34.6	8.08	24
63	383	50	r	p	1/ 1/29	17.0	34.6	8.08	25
63	384	100	r	p	1/ 1/29	15.6	34.6	8.08	24
64	400	100	r	p	1/ 3/29	15.8	34.5	8.10	32
65	408	0	r	p	1/ 5/29	20.2	34.5	8.10	24
65	409	50	r	p	1/ 5/29	16.5	34.5	8.10	25
65	410	100	r	p	1/ 5/29	14.8	34.3	8.10	34
66	414	50	r	p	1/ 7/29	17.8	34.8	8.10	29
67	416	0	oc	n	1/ 8/29	19.3	34.9	8.11	21
67	418	100	oc	n	1/ 8/29	16.2	34.6	8.05	40
68	422	0	r	p	1/10/29	19.2	35.1	8.14	29
68	423	50	r	p	1/10/29	18.2	35.0	8.14	29
73	450	0	r	n	2/10/29	25.3	35.4	8.21	44
73	452	100	oc	n	2/10/29	14.7	35.0	7.80	178
74	458	100	r	n	2/12/29	15.4	35.1	7:80	175
79	484	0	r	p	2/22/29	25.2	36.0	8.17	34
80	490	100	r	p	2/24/29	23.4	36.2	8.16	32
81	493	0	r	p	2/26/29	26.5	35.8	8.19	38
81	494	50	r	p	2/26/29	26.4	35.9	8.19	38
82	498	0	r	p	2/28/29	27.2	36.3	8.21	34
83	501	0	r	n	3/ 2/29	27.5	36.3	8.24	29
84	507	0	r	p	3/ 4/29	27.8	36.2	8.23	24
85	510	0	r	n	3/ 6/29	27.9	36.2	8.22	40
85	511	50	r	n	3/ 6/29	27.8	36.2	8.22	40
85	512	0	r	p	3/ 6/29	27.9	36.2	8.22	40
86	516	0	r	n	3/ 9/29	28.3	36.2	8.29	20
86	518	0	oc	p	3/ 9/29	28.3	36.2	8.29	20
86	519	50	r	p	3/ 9/29	27.4	36.2	8.29	17
87	521	0	r	n	3/11/29	27.8	36.1	8.28	17
87	523	0	oc	p	3/11/29	27.8	36.1	8.28	17
87	524	50	oc	p	3/11/29	26.5	36.1	8.26	20
87	525	100	r	p	3/11/29	23.9	36.0	8.23	20
89	528	0	r	n	3/23/29	28.4	35.8	8.25	21
89	530	0	oc	p	3/23/29	28.4	35.8	8.25	21
90	534	50	r	n	3/25/29	28.6	35.8	8.26	21
90	535	0	oc	p	3/25/29	28.5	35.5	8.27	21
90	536	50	oc	p	3/25/29	28.6	35.8	8.26	21
91	542	0	r	p	3/27/29	28.7	35.1	8.30	21
91	544	100	oc	p	3/27/29	25.8	36.0	8.25	30

Table 33. Distributional and environmental records for Ceratium declinatum--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
92	548	50	r	p	3/29/29	28.4	35.4	8.29	28
93	550	0	r	n	3/31/29	28.7	34.7	8.30	28
93	551	50	oc	n	3/31/29	28.5	34.8	8.30	28
93	552	0	oc	p	3/31/29	28.7	34.7	8.30	28
95	564	100	r	n	4/24/29	28.5	35.4	8.22	21
95	565	0	r	p	4/24/29	29.4	34.7	8.26	14
95	568A	0	r	n	4/25/29	29.4	34.7	8.26	14
96	571	0	oc	p	4/26/29	29.3	35.3	8.23	12
96	572	50	oc	p	4/26/29	29.2	35.3	8.23	12
96	573	100	oc	p	4/26/29	28.2	35.7	8.19	25
97	576	100	oc	n	4/28/29	27.6	35.6	8.15	25
97	577	0	oc	p	4/28/29	28.3	35.2	8.16	24
97	578	50	oc	p	4/28/29	28.0	35.4	8.16	21
97	579	100	r	p	4/28/29	27.6	35.6	8.15	25
99	589	0	r	n	5/ 2/29	27.9	34.9	8.21	12
99	591	100	r	n	5/ 2/29	27.8	35.0	8.22	17
99	592	0	oc	p	5/ 2/29	27.9	34.9	8.21	12
99	593	50	r	p	5/ 2/29	27.8	34.9	8.22	12
99	594	100	r	p	5/ 2/29	27.8	35.0	8.22	17
99	595	0	r	n	5/ 2/29	27.9	34.9	8.21	12
100	596	50	oc	n	5/ 4/29	27.6	34.7	8.21	10
100	597	100	oc	n	5/ 4/29	27.6	34.7	8.22	12
100	598	0	c	p	5/ 4/29	27.7	34.7	8.21	10
100	599	50	oc	p	5/ 4/29	27.6	34.7	8.21	10
100	602	100	oc	p	5/ 4/29	27.6	34.7	8.22	12
101	603	0	oc	n	5/ 7/29	26.3	34.7	8.24	8
101	606	0	r	p	5/ 7/29	26.3	34.7	8.24	8
102	611	100	r	n	5/ 9/29	25.6	35.0	8.23	8
102	613	50	r	p	5/ 9/29	25.8	35.0	8.24	8
103	616	50	r	n	5/11/29	25.8	35.2	8.25	5
103	618	0	oc	p	5/11/29	26.0	35.0	8.25	5
105	630	0	oc	p	5/15/29	26.9	34.9	8.23	5
105	631	50	oc	p	5/15/29	26.8	34.9	8.23	5
106	635	100	r	n	5/17/29	25.8	35.1	8.23	5
106	636	0	r	p	5/17/29	27.2	35.0	8.23	5
107	639	0	r	n	5/19/29	28.0	34.4	8.23	5
107	640	50	oc	n	5/19/29	27.9	34.4	8.23	4
107	641	100	r	n	5/19/29	26.8	34.9	8.23	11
107	642	0	oc	p	5/19/29	28.0	34.4	8.23	5
107	643	50	r	p	5/19/29	27.9	34.4	8.23	4
107	644	100	oc	p	5/19/29	26.8	34.9	8.23	11
107	645	50	oc	p	5/19/29	27.9	34.4	8.23	4
108	649	0	oc	p	5/27/29	28.4	35.0	8.25	4
109	658	50	r	p	5/29/29	23.1	35.0	8.22	3
110	661	0	r	n	5/31/29	23.9	34.7	8.18	5
110	663	100	r	n	5/31/29	17.9	34.7	8.14	11
110	664	0	oc	p	5/31/29	23.9	34.7	8.18	5
111	668	0	oc	n	6/ 3/29	20.1	34.5	8.18	5
112	677	0	oc	p	6/ 5/29	23.2	34.8	8.22	7
130	787	0	r	n	9/ 4/29	16.2	33.4	8.34	36
131	792	0	r	p	9/ 6/29	19.3	33.4	8.34	...
131	793	0	r	p	9/ 6/29	19.3	33.4	8.34	...
132	797	0	r	n	9/ 8/29	21.0	33.9	8.34	15
132	801	0	oc	p	9/ 8/29	21.0	33.9	8.34	15
134	808	0	oc	n	9/12/29	22.9	34.7	8.34	6
134	815	0	oc	p	9/12/29	22.9	34.7	8.34	6
134	817	100	r	p	9/12/29	18.1	34.8	8.34	6
136	829	100	r	n	9/16/29	18.6	35.0	8.39	3
136	832	0	r	p	9/16/29	24.8	35.4	8.37	3
137	840	0	r	p	9/18/29	25.5	35.0	8.39	4
139	854	50	r	p	9/22/29	25.8	34.9	8.31	6
139	855	100	r	p	9/22/29	22.4	35.2	8.28	8
140	858	100	r	n	10/ 3/29	25.5	35.0	8.34	7
140	860	0	r	p	10/ 3/29	26.9	35.0	8.42	7
140	861	50	r	p	10/ 3/29	26.9	35.0	8.39	7
140	863	100	r	p	10/ 3/29	25.5	35.0	8.34	7
141	868	0	r	p	10/ 5/29	25.9	35.2	8.34	5
141	870	50	r	p	10/ 5/29	24.8	35.3	8.34	5
142	873	50	r	n	10/ 7/29	21.8	34.8	8.30	5
142	874	100	r	n	10/ 7/29	16.6	34.4	8.27	7
142	876	0	oc	p	10/ 7/29	24.1	34.8	8.33	5
142	877	50	r	p	10/ 7/29	21.8	34.8	8.30	5
143	881	0	r	n	10/ 9/29	22.4	34.4	8.30	6
144	889	100	r	p	10/11/29	16.6	34.5	8.37	6
146	897	50	r	n	10/15/29	22.4	34.9	8.30	6
147	903	0	r	p	10/17/29	23.3	35.3	8.26	8

Table 33. Distributional and environmental records for Ceratium declinatum--Concluded

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
147	908	50	r	p	10/17/29	23.1	35.3	8.29	5
148	917	0	r	p	10/19/29	23.4	35.2	.....	...
149	920	0	r	n	10/21/29	23.5	35.0	8.34	6
149	927	0	r	p	10/21/29	23.5	35.0	8.34	6
149	928	50	r	p	10/21/29	23.3	35.0	8.37	6
150	930	50	oc	n	10/23/29	22.8	34.8	8.35	10
150	931	100	r	n	10/23/29	19.6	34.6	8.32	11
150	933	0	oc	p	10/23/29	25.6	34.7	8.39	7
150	936	100	r	p	10/23/29	19.6	34.6	8.32	11
151	941	0	r	p	10/26/29	26.0	34.0	.....	...
152	948	0	r	p	10/27/29	27.4	33.7	8.35	20
153	952	50	r	n	10/29/29	28.1	34.4	8.39	7
153	956	50	r	p	10/29/29	28.1	34.4	8.39	7
153	957	100	r	p	10/29/29	20.5	34.7	8.28	31
155	967	100	r	n	11/ 2/29	27.2	35.0	8.30	35
156	973	50	r	p	11/ 4/29	27.0	35.1	8.37	46
156	974	100	oc	n	11/ 4/29	26.4	35.1	8.30	48
157	980	100	r	n	11/ 6/29	26.8	35.5	8.30	64
159	992	100	r	n	11/11/29	28.0	35.7	8.37	23
160	1000	0	r	n	11/13/29	28.6	35.6	8.37	12
160	1002	50	r	n	11/13/29	28.6	35.6	8.39	15

Table 34. Distributional and environmental records for Ceratium gibberum

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
1	1	0	oc	n	5/12/28	24.0	36.2	8.16	34
1a	4	0	oc	n	5/14/28	(22.3	36.3	8.20	46)
1a	5	0	oc	n	5/14/28	(22.3	36.3	8.20	46)
1b	6	0	c	n	5/16/28	(22.3	36.3	8.20	46)
1b	7	50	r	n	5/16/28	(22.2	36.4	8.21	39)
1b	8	100	oc	n	5/16/28	(20.3	35.5	8.18	36)
2	12	50	oc	n	5/18/28	20.5	36.4	8.21	46
2	14	0	r	n	5/18/28	20.5	36.4	8.23	58
13a	89	0	r	n	8/ 8/28	(21.2	35.2	8.18	11)
14	90	0	r	n	8/ 9/28	21.2	35.2	8.18	11
14	94	100	r	n	8/ 9/28	14.0	35.6	8.06	34
15	97	0	oc	p	8/ 9/28	24.8	36.4	8.21	11
15	98	50	r	p	8/ 9/28	19.8	36.5	8.21	8
15	101	50	oc	n	8/ 9/28	19.8	36.5	8.21	8
15	102	100	oc	n	8/ 9/28	18.4	36.4	8.20	19
16	106	0	r	n	8/13/28	25.9	36.2	8.24	8
16	108	100	oc	n	8/13/28	19.9	36.5	8.17	13
17	109	0	r	p	8/15/28	26.2	36.6	8.29	9
17	110	50	r	p	8/15/28	21.9	36.6	8.28	12
17	111	0	r	n	8/15/28	26.2	36.6	8.29	9
17	112	50	r	n	8/15/28	21.9	36.6	8.28	12
18	114	0	r	p	8/17/28	27.0	37.0	8.23	5
18	115	50	r	p	8/17/28	22.4	36.8	8.24	5
18	116	100	r	p	8/17/28	20.4	36.8	8.21	5
18	117	0	r	n	8/17/28	27.0	37.0	8.23	5
20	126	50	r	p	8/22/28	25.8	36.6	8.26	3
20	130	100	r	n	8/22/28	22.6	36.7	8.19	5
20-21	131	0	r	n	8/23/28	(26.6	36.3	8.32	4)
21	134	100	r	p	8/24/28	21.0	36.8	8.20	7
21	135	0	oc	n	8/24/28	26.6	36.3	8.32	4
21	137	100	r	n	8/24/28	21.0	36.8	8.20	7
23	145	0	r	p	8/29/28	27.2	35.9	8.25	4
23	149	50	r	n	8/29/28	20.9	36.0	8.14	13
23	150	100	r	n	8/29/28	16.6	36.0	8.18	75
24	151	0	r	p	8/31/28	27.2	35.2	8.32	4
24	155	50	r	n	8/31/28	23.1	36.0	8.14	8
24	156	100	r	n	8/31/28	15.6	35.6	7.96	99
25	157	0	oc	n	9/ 3/28	27.5	35.6	8.31	5
25	160	0	r	n	9/ 3/28	27.5	35.6	8.31	5
25	161	50	r	n	9/ 3/28	21.5	36.0	8.22	12
26	164	50	r	p	9/ 5/28	24.1	36.1	8.21	5
27	171	50	r	n	9/ 7/28	26.0	36.2	8.30	4
30	188	0	r	n	9/15/28	28.0	36.1	8.30	2
30	189	50	r	n	9/15/28	27.8	36.1	8.29	3
30	190	100	r	n	9/15/28	24.1	36.4	8.10	20
31	191	0	r	n	10/ 3/28	28.5	34.4	8.27	2
31	193	100	r	n	10/ 3/28	23.4	36.5	8.19	28

Table 34. Distributional and environmental records for Ceratium gibberum--Continued

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m^3
32	194	0	oc	n	10/ 5/28	28.0	36.0	8.23	2
32	195	50	r	n	10/ 5/28	27.2	36.0	8.24	2
32	196	100	r	n	10/ 5/28	22.2	36.4	8.10	30
33	197A	0	oc	p	10/ 8/28	28.5	35.6	8.23	4
34	200	0	r	n	10/ 9/28	28.5	35.9	8.28	2
34	200A	0	oc	p	10/ 9/28	28.5	35.9	8.28	2
34	202	50	r	n	10/ 9/28	25.0	36.5	8.21	3
35-36	209	0	oc	n	10/27/28	(27.4	29.7	8.31	15)
35-36	212	0	oc	n	10/28/28	(27.0	30.7	8.27	16)
37	217	0	r	n	11/ 1/28	27.1	31.7	8.28	15
37	218	50	r	n	11/ 1/28	18.8	34.5	8.00	121
37	219	100	oc	n	11/ 1/28	15.1	34.9	7.82	153
37	221	50	r	p	11/ 1/28	18.8	34.5	8.00	121
42	242	50	r	n	11/13/28	17.2	34.9	7.99	68
45	256	0	r	n	11/19/28	22.4	35.3	8.12	38
45	258	100	r	n	11/19/28	18.6	35.1	8.00	50
45	259	0	oc	p	11/19/28	22.4	35.3	8.12	38
45	260	50	r	p	11/19/28	22.4	35.2	8.13	46
46	261	0	r	n	11/21/28	23.3	35.3	8.16	36
46	262	50	oc	n	11/21/28	23.2	35.3	8.16	40
46	263	100	r	n	11/21/28	22.5	35.4	8.17	40
46	264	0	r	p	11/21/28	23.3	35.3	8.16	36
46	265	50	r	p	11/21/28	23.2	35.3	8.16	40
47	266	0	oc	n	11/23/28	23.9	36.0	8.23	17
47	267	50	oc	n	11/23/28	23.8	36.0	8.23	20
47	268	100	r	n	11/23/28	22.7	36.2	8.23	20
47	269	0	r	p	11/23/28	23.9	36.0	8.23	17
47	270	50	r	p	11/23/28	23.8	36.0	8.23	20
48	273	100	r	n	11/25/28	22.7	36.3	8.26	16
48	274	0	r	p	11/25/28	23.6	36.4	8.23	13
48	276	100	r	p	11/25/28	22.7	36.3	8.26	16
49	277	0	r	n	11/27/28	23.4	36.2	8.27	13
49	279	100	oc	n	11/27/28	21.6	35.9	8.26	13
49	282	100	r	p	11/27/28	21.6	35.9	8.26	13
50	284	0	oc	n	11/29/28	23.2	36.0	8.23	13
50	285	50	oc	n	11/29/28	22.0	35.9	8.23	13
50	286	100	oc	n	11/29/28	20.5	35.7	8.22	13
50	287	0	oc	p	11/29/28	23.2	36.0	8.23	13
50	289	100	r	p	11/29/28	20.5	35.7	8.22	13
51	295	100	r	n	12/ 1/28	20.0	35.6	8.22	17
51	298	100	r	p	12/ 1/28	20.0	35.6	8.22	17
52	300	50	r	n	12/ 3/28	20.2	35.6	8.20	8
52	301	100	r	n	12/ 3/28	18.2	35.2	8.17	8
53	305	100	r	n	12/ 5/28	19.9	35.6	8.19	13
53-54	307	0	r	n	12/ 5/28	(23.0	35.6	8.22	11)
53-54	308	0	r	n	12/ 5/28	(23.0	35.6	8.22	11)
53-54	312	0	r	n	12/10/28	(23.0	35.6	8.22	11)
53-54	316	0	r	n	12/12/28	(23.0	35.6	8.22	11)
54	320	50	oc	n	12/14/28	19.8	35.4	8.18	17
54	321	100	oc	n	12/14/28	18.7	35.4	8.16	20
54	322	0	r	p	12/14/28	23.4	35.5	8.22	9
55	324	50	oc	n	12/16/28	18.7	35.0	8.18	12
55	325	100	r	n	12/16/28	16.7	34.9	7.17	12
56	328	0	oc	n	12/18/28	20.8	34.9	8.13	9
56	329	50	r	n	12/18/28	18.5	35.1	8.14	9
56	330	100	oc	n	12/18/28	16.6	34.8	8.11	12
56	331	0	oc	p	12/18/28	20.8	34.9	8.13	9
56-57	334	0	oc	n	12/19/28	(19.0	34.5	8.14	20)
57	335	0	oc	n	12/20/28	19.0	34.5	8.14	20
57	336	50	r	n	12/20/28	15.6	34.3	8.14	21
57	337	100	oc	n	12/20/28	14.3	34.4	8.10	40
57	338	0	r	p	12/20/28	19.0	34.5	8.14	20
57	340	100	oc	p	12/20/28	14.3	34.4	8.10	40
58	344	0	r	p	12/22/28	17.0	34.0	8.12	20
63	379	0	r	n	1/ 1/29	20.5	34.6	8.07	21
63	381	100	r	n	1/ 1/29	15.6	34.6	8.08	24
63-64	386	0	r	n	1/ 1/29	(20.5	34.6	8.07	21)
63-64	387	0	oc	n	1/ 2/29	(20.5	34.6	8.07	21)
63-64	388	0	r	n	1/ 2/29	(20.5	34.6	8.07	21)
63-64	390	0	r	n	1/ 2/29	(20.5	34.6	8.07	21)
63-64	391	0	r	n	1/ 3/29	(20.5	34.6	8.07	21)
63-64	392	0	r	n	1/ 3/29	(20.5	34.6	8.07	21)
63-64	393	0	r	n	1/ 3/29	(20.5	34.6	8.07	21)
64	394	0	oc	n	1/ 3/29	20.6	34.6	8.12	21
64	398	0	r	p	1/ 3/29	20.6	34.6	8.12	21
64-65	401	0	oc	n	1/ 3/29	(20.6	34.6	8.12	21)

Table 34. Distributional and environmental records for Ceratium gibberum--Continued

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
64-65	402	0	oc	n	1/ 4/29	(20.6	34.6	8.12	21)
64-65	403	0	oc	n	1/ 4/29	(20.6	34.6	8.12	21)
64-65	404	0	oc	n	1/ 4/29	(20.6	34.6	8.12	21)
65	405	0	oc	n	1/ 5/29	20.2	34.5	8.10	24
65	406	50	r	n	1/ 5/29	16.5	34.5	8.10	25
65	407	100	r	n	1/ 5/29	14.8	34.3	8.10	34
65	408	0	oc	p	1/ 5/29	20.2	34.5	8.10	24
65	409	50	r	p	1/ 5/29	16.5	34.5	8.10	25
66	413	0	r	p	1/ 7/29	19.4	34.7	8.10	29
67	416	0	oc	n	1/ 8/29	19.3	34.9	8.11	21
67	418	100	oc	n	1/ 8/29	16.2	34.6	8.05	40
73	450	0	c	n	2/10/29	25.3	35.4	8.21	44
73	451	50	oc	n	2/10/29	18.7	35.4	8.05	122
73	452	100	oc	n	2/10/29	14.7	35.0	7.80	178
73	453	0	oc	p	2/10/29	25.3	35.4	8.21	44
73	454	50	r	p	2/10/29	18.7	35.4	8.05	122
73	455	100	r	p	2/10/29	14.7	35.0	7.80	178
74	456	0	oc	n	2/12/29	24.2	35.6	8.17	68
74	457	50	r	n	2/12/29	19.2	35.4	8.06	80
74	458	100	r	n	2/12/29	15.4	35.1	7.80	175
74	459	0	r	p	2/12/29	24.2	35.6	8.17	68
74	461	100	r	p	2/12/29	15.4	35.1	7.80	175
75	462	0	oc	n	2/14/29	22.8	35.8	8.18	44
75	463	50	r	n	2/14/29	20.0	35.5	8.14	46
75	464	100	r	n	2/14/29	17.8	35.4	8.00	75
75	465	0	r	p	2/14/29	22.8	35.8	8.18	44
76	467	0	oc	n	2/16/29	23.4	35.9	8.15	50
76	468	50	r	n	2/16/29	22.1	35.9	8.14	42
77	472	0	oc	n	2/18/29	23.7	36.0	8.19	16
77	473	0	r	p	2/18/29	23.7	36.0	8.19	16
77	474	50	oc	p	2/18/29	23.5	36.0	8.19	16
78	475	0	oc	n	2/20/29	24.6	36.0	8.17	32
78	476	50	oc	n	2/20/29	23.8	36.1	8.14	32
78	477	100	oc	n	2/20/29	21.9	36.2	8.14	34
78	478	0	oc	p	2/20/29	24.6	36.0	8.17	32
78	479	50	oc	p	2/20/29	23.8	36.1	8.14	32
79	481	0	oc	n	2/22/29	25.2	36.0	8.17	34
79	482	50	oc	n	2/22/29	24.5	36.1	8.17	34
79	483	100	oc	n	2/22/29	21.8	36.2	8.13	45
79	484	0	oc	p	2/22/29	25.2	36.0	8.17	34
79	485	50	oc	p	2/22/29	24.5	36.1	8.17	34
80	486	0	oc	n	2/24/29	26.0	35.9	8.20	36
80	487	50	r	n	2/24/29	25.9	36.0	8.19	29
80	488	0	oc	p	2/24/29	26.0	35.9	8.20	36
80	489	50	r	p	2/24/29	25.9	36.0	8.19	29
80	490	100	r	p	2/24/29	23.4	36.2	8.16	32
81	491	0	c	n	2/26/29	26.5	35.8	8.19	38
81	492	50	r	n	2/26/29	26.4	35.9	8.19	38
81	493	0	r	p	2/26/29	26.5	35.8	8.19	38
82	497	50	r	n	2/28/29	27.2	36.3	8.21	34
83	501	0	r	n	3/ 2/29	27.5	36.3	8.24	29
83	502	50	oc	n	3/ 2/29	27.4	36.5	8.24	25
85	510	0	oc	n	3/ 6/29	27.9	36.2	8.22	40
85	511	50	r	n	3/ 6/29	27.8	36.2	8.22	40
86	516	0	oc	n	3/ 9/29	28.3	36.2	8.29	20
87	521	0	r	n	3/11/29	27.8	36.1	8.28	17
88	527	50	oc	n	3/21/29	28.4	35.9	8.25	13
89	528	0	oc	n	3/23/29	28.4	35.6	8.25	21
89	529	50	oc	n	3/23/29	28.6	35.8	8.27	12
90	533	0	c	n	3/25/29	28.5	35.5	8.27	21
90	534	50	oc	n	3/25/29	28.6	35.6	8.26	21
90	535	0	oc	p	3/25/29	28.5	35.5	8.27	21
90	536	50	r	p	3/25/29	28.6	35.6	8.26	21
91	540	0	oc	n	3/27/29	28.7	35.1	8.30	21
91	541	50	c	n	3/27/29	28.5	35.2	8.30	24
91	542	0	r	p	3/27/29	28.7	35.1	8.30	21
91	543	50	r	p	3/27/29	28.5	35.2	8.30	24
91	544	100	r	p	3/27/29	25.8	36.0	8.25	30
92	546	50	oc	n	3/29/29	28.4	35.4	8.29	28
93	550	0	oc	n	3/31/29	28.7	34.7	8.30	28
93	551	50	oc	n	3/31/29	28.5	34.8	8.30	28
95	567	100	r	p	4/24/29	28.5	35.6	8.21	25
96	568	0	oc	n	4/26/29	29.3	35.3	8.23	12
96	569	50	oc	n	4/26/29	29.2	35.3	8,23	12
96	570	100	oc	n	5/26/29	28.2	35.7	8.19	25
9[illegible]	581	0	r	n	4/30/29	27.0	35.3	8.16	24

Table 34. Distributional and environmental records for Ceratium gibberum--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
99	589	0	c	n	5/ 2/29	27.9	34.9	8.21	12
99	591	100	c	n	5/ 2/29	27.8	35.0	8.22	17
99	592	0	oc	p	5/ 2/29	27.9	34.9	8.21	12
99	594	100	oc	p	5/ 2/29	27.8	35.0	8.22	10
99	595	0	c	n	5/ 2/29	27.9	34.9	8.21	12
100	596	50	c	n	5/ 4/29	27.6	34.7	8.21	10
100	597	100	oc	n	5/ 4/29	27.6	34.7	8.22	12
100	598	0	oc	p	5/ 4/29	27.7	34.7	8.21	10
100	602	100	r	p	5/ 4/29	27.6	34.7	8.22	12
101	603	0	oc	n	5/ 7/29	26.3	34.7	8.24	8
101	604	50	c	n	5/ 7/29	26.2	34.7	8.24	8
101	605	100	r	n	5/ 7/29	25.2	35.1	8.23	8
101	606	0	r	p	5/ 7/29	26.3	34.7	8.24	8
102	609	0	oc	n	5/ 9/29	25.8	35.0	8.24	8
102	611	100	r	n	5/ 9/29	25.6	35.0	8.23	8
103	617	100	r	n	5/11/29	24.8	35.2	8.25	5
104	621	0	r	n	5/13/29	26.1	35.2	8.24	7
105	627	50	r	n	5/15/29	26.8	34.9	8.23	5
105	628	50	r	n	5/15/29	26.8	34.9	8.23	5
106	635	100	r	n	5/17/29	25.6	35.1	8.23	5
107	639	0	oc	n	5/19/29	28.0	34.4	8.23	5
107	640	50	r	n	5/19/29	27.9	34.4	8.23	4
107	645	50	r	p	5/19/29	27.9	34.4	8.23	4
108	646	0	r	n	5/27/29	28.4	35.0	8.25	4
108	648	100	oc	n	5/27/29	25.2	35.0	8.23	4
109	655	50	r	n	5/29/29	23.1	35.0	8.22	3
109	656	100	r	n	5/29/29	19.4	34.8	8.18	5
110	661	0	r	n	5/31/29	23.9	34.7	8.18	5
111	668	0	r	n	6/ 3/29	20.1	34.5	8.18	5
111	671	0	r	p	6/ 3/29	20.1	34.5	8.18	5
112	674	0	oc	n	6/ 5/29	23.2	34.6	8.22	7
112	675	50	oc	n	6/ 5/29	21.7	34.6	8.23	7
112	676	100	r	n	6/ 5/29	19.8	34.7	8.20	8
113	680	0	oc	n	6/25/29	24.2	34.5	8.25	5
113	681	50	oc	n	6/25/29	23.8	34.6	8.25	5
113	682	100	oc	n	6/25/29	21.5	34.7	8.23	8
113	684	50	oc	p	6/25/29	23.8	34.6	8.25	5
114	687	50	oc	n	6/27/29	16.2	34.6	8.04	63
114	687	50	r	n	6/27/29	16.2	34.6	8.04	63
130	784	0	r	p	9/ 4/29	16.2	33.4	8.34	36
133	805	50	r	n	9/10/29	20.8	34.7	8.37	7
133	806	100	r	n	9/10/29	18.4	34.8	8.31	7
133	812	0	r	n	9/10/29	22.7	34.7	8.47	7
134	808	0	r	n	9/12/29	22.9	34.7	8.34	6
134	810	100	r	n	9/12/29	18.1	34.6	8.34	6
134	815	0	r	p	9/12/29	22.9	34.7	8.34	6
134	817	100	r	p	9/12/29	18.1	34.6	8.34	6
135	821	50	r	n	9/14/29	21.5	35.0	8.37	5
136	827	0	r	n	9/16/29	24.6	35.4	8.37	3
136	832	0	r	p	9/16/29	24.6	35.4	8.37	3
136	833	50	r	p	9/16/29	21.4	35.1	8.39	3
137	836	0	r	n	9/18/29	25.5	35.0	8.39	4
138	844	50	r	n	9/20/29	25.6	34.7	8.30	3
139	849	0	r	n	9/22/29	26.7	34.8	8.34	6
140	856	0	r	n	10/ 3/29	26.9	35.0	8.42	7
141	864	0	r	n	10/ 5/29	25.9	35.2	8.34	5
141	865	50	r	n	10/ 5/29	24.8	35.3	8.34	5
141	868	0	r	p	10/ 5/29	25.9	35.2	8.34	5
141	869	50	r	p	10/ 5/29	24.8	35.3	8.34	5
142	872	0	r	n	10/ 7/29	24.1	34.8	8.33	5
144	886	0	r	n	10/11/29	23.3	35.0	8.37	6
145	890	0	r	n	10/13/29	22.3	34.6	8.29	6
145	891	50	r	n	10/13/29	18.7	34.3	8.34	6
145	892	100	r	n	10/13/29	16.0	34.1	8.31	6
146	896	0	r	n	10/15/29	22.4	34.9	8.37	6
146	898	100	oc	n	10/15/29	19.7	34.3	8.26	7
147	905	100	r	n	10/17/29	19.2	35.0	8.29	5
148	910	0	r	n	10/19/29	23.4	35.2	......	...
149	920	0	r	n	10/21/29	23.5	35.0	8.34	6
150	929	0	r	n	10/23/29	25.6	34.7	8.39	7
150	930	50	r	n	10/23/29	22.8	34.8	8.35	10
150	931	100	oc	n	10/23/29	19.6	34.6	8.32	11
151	937	0	oc	n	10/26/29	26.0	34.0	.....	...
151	938	50	oc	n	10/26/29	18.3	34.4	.....	...
151	939	100	r	n	10/26/29	12.5	34.6	.....	...
151	941	0	r	p	10/26/29	26.0	34.0	.....	...

Table 34. Distributional and environmental records for Ceratium gibberum--Concluded

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
151	942	50	r	p	10/26/29	18.3	34.4	.....	...
153	952	50	r	n	10/29/29	28.1	34.4	8.39	7
153	953	100	r	n	10/29/29	20.5	34.7	8.28	31
153	956	50	r	p	10/29/29	28.1	34.4	8.39	7
154	958	0	r	n	10/31/29	28.3	34.2	8.39	7
154	959	50	r	n	10/31/29	28.2	34.2	8.40	7
154	960	100	r	n	10/31/29	25.3	34.8	7.95	21
155	961	0	r	n	11/ 2/29	27.8	34.9	8.29	29
155	965	0	r	n	11/ 2/29	27.8	34.9	8.29	29
155	967	100	oc	n	11/ 2/29	27.2	35.0	8.30	35
156	972	0	oc	n	11/ 4/29	27.6	35.0	8.34	28
157	978	0	oc	n	11/ 6/29	27.1	35.3	8.27	47
157	979	50	r	n	11/ 6/29	27.1	35.2	8.32	60
157	980	100	oc	n	11/ 6/29	26.8	35.3	8.30	64
158	983	0	c	n	11/ 8/29	28.2	35.6	8.34	36
158	984	50	c	n	11/ 8/29	28.2	35.6	8.39	50
158	985	100	c	n	11/ 8/29	27.6	35.9	8.39	48
159	990	0	oc	n	11/11/29	28.6	35.7	8.37	15
159	991	50	r	n	11/11/29	28.5	35.7	8.39	15
159	992	100	r	n	11/11/29	28.0	35.7	8.37	23
160	1000	0	r	n	11/13/29	28.6	35.6	8.37	12
160	1003	100	r	n	11/13/29	28.5	35.7	8.44	16

Table 35. Distributional and environmental records for Ceratium concilians

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
16	103	0	r	p	8/13/28	25.9	36.2	8.24	8
16	104	50	r	p	8/13/28	24.4	36.4	8.23	8
16	107	50	r	n	8/13/28	24.4	36.4	8.23	8
44	251	50	r	n	11/17/28	20.4	34.9	8.04	34
44	253	0	r	p	11/17/28	20.7	34.9	8.03	38
45	257	50	oc	n	11/19/28	22.4	35.2	8.13	46
61	366	0	r	p	12/28/28	16.9	34.0	8.05	46
61-62	369	0	oc	n	12/28/28	(16.9	34.0	8.05	46)
61-62	370	0	c	n	12/29/28	(16.9	34.0	8.05	46)
62	371	0	c	n	12/30/28	19.2	34.2	8.12	32
62	372	50	r	n	12/30/28	16.2	34.3	8.10	28
62	373	100	r	n	12/30/28	13.1	34.2	8.06	48
62	374	0	oc	p	12/30/28	19.2	34.2	8.12	32
62	375	50	r	p	12/30/28	16.2	34.3	8.10	28
62-63	377	0	oc	n	12/31/28	(20.5	34.6	8.07	21)
62-63	378	0	r	n	12/31/28	(20.5	34.6	8.07	21)
69	425	50	r	n	1/12/29	17.4	35.1	7.99	151
69	426	100	r	n	1/12/29	14.6	34.8	7.86	198
69	427	0	oc	p	1/12/29	21.1	35.2	8.12	62
70	435	50	r	p	1/13/29	15.4	35.0	7.88	178
71	438	0	r	n	2/ 6/29	23.5	35.2	8.13	58
71	440	100	r	n	2/ 6/29	13.9	35.0	7.71	220
71	441	0	r	p	2/ 6/29	23.5	35.2	8.13	58
72	444	50	oc	n	2/ 8/29	18.7	35.4	8.12	60
72	445	100	r	n	2/ 8/29	14.8	35.0	7.94	154
72	446	0	r	p	2/ 8/29	24.9	35.3	8.16	50
72	447	50	r	p	2/ 8/29	18.7	35.4	8.12	60
87	524	50	r	p	3/11/29	26.5	36.1	8.26	20
88	526	0	oc	n	3/21/29	28.5	35.9	8.23	16
93	552	0	r	p	3/31/29	28.7	34.7	8.30	28
95	563	50	r	n	4/24/29	29.3	34.9	8.24	16
95	566	50	r	p	4/24/29	29.3	34.9	8.24	16
96	569	50	oc	n	4/26/29	29.2	35.3	8.23	12
96	571	0	r	p	4/26/29	29.3	35.3	8.23	12
96	572	50	oc	p	4/26/29	29.2	35.3	8.23	12
102	609	0	oc	n	5/ 9/29	25.8	35.0	8.24	8
102	612	0	r	p	5/ 9/29	25.8	35.0	8.24	8
103	615	0	r	n	5/11/29	26.0	35.0	8.25	5
103	618	0	r	p	5/11/29	26.0	35.0	8.25	5
104	626	100	r	p	5/13/29	25.3	35.3	8.21	7
105	630	0	r	p	5/15/29	26.9	34.9	8.23	5
108	647	50	r	n	5/27/29	26.8	35.0	8.24	4
108	648	100	oc	n	5/27/29	25.2	35.0	8.23	4
109	656	100	r	n	5/29/29	19.4	34.8	8.18	5
109	659	100	r	p	5/29/29	19.4	34.8	8.18	5

Table 35. Distributional and environmental records for Ceratium concilians--Concluded

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
110	661	0	r	n	5/31/29	23.9	34.7	8.18	5
110	663	100	r	n	5/31/29	17.9	34.7	8.14	11
110	664	0	oc	p	5/31/29	23.9	34.7	8.18	5
110	665	50	r	p	5/31/29	18.4	34.8	8.16	7
112	674	0	r	n	6/ 5/29	23.2	34.6	8.22	7
112	676	100	r	n	6/ 5/29	19.8	34.7	8.20	8
128	779	0	r	n	7/25/29	16.4	33.0	8.12	29
129	780	0	r	n	9/27/29	16.3	33.1	8.13	25
130	781	0	r	n	9/ 4/29	16.2	33.4	8.34	36
130	782	50	r	n	9/ 4/29	11.7	33.4	8.26	83
130	784	0	r	p	9/ 4/29	16.2	33.4	8.34	36
131	789	100	oc	n	9/ 6/29	12.1	33.4	8.32	...
136	834	100	r	p	9/16/29	18.6	35.0	8.39	3
138	845	100	r	n	9/20/29	22.2	34.8	8.31	3
140	858	100	r	n	10/ 3/29	25.5	35.0	8.34	7
140	862	100	r	p	10/ 3/29	25.5	35.0	8.34	7
141	868	0	r	p	10/ 5/29	25.9	35.2	8.34	5
142	874	100	r	n	10/ 7/29	16.6	34.4	8.27	7
142	879	100	r	p	10/ 7/29	16.6	34.4	8.27	7
146	897	50	r	n	10/15/29	22.4	34.9	8.30	6
150	930	50	r	n	10/23/29	22.8	34.8	8.35	10
150	931	100	r	n	10/23/29	19.6	34.6	8.32	11
151	941	0	r	p	10/26/29	26.0	34.0	.....	...
153	951	0	r	n	10/29/29	28.1	34.2	8.47	7
154	958	0	r	n	10/31/29	28.3	34.2	8.39	7
154	959	50	r	n	10/31/29	28.2	34.2	8.40	7
155	965	0	r	n	11/ 2/29	27.8	34.9	8.29	29
156	974	100	r	n	11/ 4/29	26.4	35.1	8.30	48
157	978	0	r	n	11/ 6/29	27.1	35.3	8.27	47
158	983	0	oc	n	11/ 8/29	28.2	35.6	8.34	36
158	985	100	r	n	11/ 8/29	27.6	35.9	8.39	48

Table 36. Distributional and environmental records for Ceratium lunula

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
1	1	0	oc	n	5/12/28	24.0	36.2	8.16	34
1	2	70	r	n	5/12/28	(22.4	36.4	8.17	35)
1a	5	0	r	n	5/14/29	(22.3	36.3	8.20	46)
1b	6	0	c	n	5/16/28	(22.3	36.3	8.20	46)
1b	7	50	oc	n	5/16/28	(22.2	36.4	8.21	39)
1b	8	100	oc	n	5/16/28	(20.3	35.5	8.18	36)
2	14	0	r	n	5/18/28	20.5	36.4	8.23	58
15	98	50	r	p	8/11/28	19.8	36.5	8.21	8
15	100	0	r	n	8/11/28	24.8	36.4	8.21	11
15	101	50	r	n	8/11/28	19.8	36.5	8.21	8
16	107	50	r	n	8/13/28	24.4	36.4	8.23	8
18	118	50	r	n	8/17/28	22.4	36.8	8.24	5
19	124	100	r	n	8/20/28	22.4	37.0	8.25	5
20	129	50	r	n	8/22/28	25.8	36.6	8.26	3
25	161	50	r	n	9/ 3/28	21.5	36.0	8.22	12
31	193	100	r	n	10/ 3/28	23.4	36.5	8.19	28
34	201	100	r	n	10/ 9/28	20.5	36.6	8.16	16
34	202	50	r	n	10/ 9/28	25.0	36.5	8.21	3
35	203	0	r	n	10/26/28	27.4	29.7	8.31	15
35a	208	0	oc	n	10/26/28	(27.4	29.7	8.31	15)
35-36	209	0	r	n	10/27/28	(27.4	29.7	8.31	15)
39	226	50	oc	n	11/ 6/28	16.3	34.6	7.92	48
40	231	100	r	n	11/ 8/28	13.9	35.0	7.85	159
41	235	0	r	n	11/10/28	20.4	34.2	8.11	32
41	236	50	r	n	11/10/28	14.6	35.0	7.94	58
42	241	0	r	n	11/13/28	18.7	34.7	8.06	45
46	263	100	r	n	11/21/28	22.5	35.4	8.17	40
46	264	0	r	p	11/21/28	23.3	35.3	8.16	36
47	266	0	r	n	11/23/28	23.9	36.0	8.23	17
47	267	50	r	n	11/23/28	23.8	36.0	8.23	20
47	268	100	r	n	11/23/28	22.7	36.2	8.23	20
69	424	0	oc	n	1/12/29	21.1	35.2	8.12	62
69	425	50	oc	n	1/12/29	17.4	35.1	7.99	151
69	426	100	oc	n	1/12/29	14.6	34.8	7.86	198
69	427	0	oc	p	1/12/29	21.1	35.2	8.12	62
69	428	50	oc	p	1/12/29	17.4	35.1	7.99	151

Table 36. Distributional and environmental records for Ceratium lunula--Continued

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
69	429	100	r	p	1/12/29	14.6	34.8	7.86	198
70	431	0	r	n	1/13/29	21.2	35.1	8.05	103
70	432	50	oc	n	1/13/29	15.4	35.0	7.88	178
70	435	50	oc	p	1/13/29	15.4	35.0	7.88	178
71	440	100	r	n	2/ 6/29	13.9	35.0	7.71	220
71	441	0	oc	p	2/ 6/29	23.5	35.2	8.13	58
72	443	0	r	n	2/ 8/29	24.9	35.3	8.16	50
72	444	50	r	n	2/ 8/29	18.7	35.4	8.12	60
72-73	449	0	r	n	2/ 9/29	(25.3	35.4	8.21	44)
73	451	50	r	n	2/10/29	18.7	35.4	8.05	122
73	452	100	r	n	2/10/29	14.7	35.0	7.80	178
74	456	0	r	n	2/12/29	24.2	35.6	8.17	68
75	462	0	oc	n	2/14/29	22.8	35.8	8.18	44
75	463	50	oc	n	2/14/29	20.0	35.5	8.14	46
75	464	100	oc	n	2/14/29	17.8	35.4	8.00	75
75	465	0	r	p	2/14/29	22.8	35.8	8.18	44
75	466	50	r	p	2/14/29	20.0	35.5	8.14	46
76	467	0	c	n	2/16/29	23.4	35.9	8.15	50
76	469	100	r	n	2/16/29	21.2	35.8	8.12	45
76	470	0	r	p	2/16/29	23.4	35.9	8.15	50
77	472	0	r	n	2/18/29	23.7	36.0	8.19	16
77	472	0	r	p	2/18/29	23.7	36.0	8.19	16
79	483	100	r	n	2/22/29	21.8	36.2	8.13	45
80	486	0	r	n	2/24/29	26.0	35.9	8.20	36
80	487	50	r	n	2/24/29	25.9	36.0	8.19	29
81	491	0	r	n	2/26/29	26.5	35.8	8.19	38
81	492	50	r	n	2/26/29	26.4	35.9	8.19	38
81	493	0	r	p	2/26/29	26.5	35.8	8.19	38
82	496	0	oc	n	2/28/29	27.2	36.3	8.21	34
82	497	50	oc	n	2/28/29	27.2	36.3	8.21	34
82	498	0	r	p	2/28/29	27.2	36.3	8.21	34
82	500	100	r	p	2/28/29	27.4	36.5	8.19	34
83	501	0	r	n	3/ 2/29	27.5	36.3	8.24	29
85	510	0	r	n	3/ 6/29	27.9	36.2	8.22	40
91	540	0	r	n	3/27/29	28.7	35.1	8.30	21
91	541	50	r	n	3/27/29	28.5	35.2	8.30	24
93	551	50	oc	n	3/31/29	28.5	34.8	8.30	28
94	558	50	oc	n	4/22/29	29.3	34.7	8.25	14
94	559	100	r	n	4/22/29	28.5	35.6	8.21	25
95	563	50	r	n	4/24/29	29.3	34.9	8.24	16
96	569	50	r	n	4/26/29	29.2	35.3	8.23	12
96	570	100	oc	n	4/26/29	28.2	35.7	8.19	25
96	572	50	r	p	4/26/29	29.2	35.3	8.23	12
97	574	0	oc	n	4/28/29	28.3	35.2	8.16	24
97	575	50	oc	n	4/28/29	28.0	35.4	8.16	21
97	576	100	oc	n	4/28/29	27.6	35.6	8.15	25
97	578	50	r	p	4/28/29	28.0	35.4	8.16	21
98	581	0	r	n	4/30/29	27.0	35.3	8.16	24
98	582	50	r	n	4/30/29	26.9	35.3	8.16	28
99	589	0	oc	n	5/ 2/29	27.9	34.9	8.21	12
99	590	50	r	n	5/ 2/29	27.8	34.9	8.22	12
99	591	100	r	n	5/ 2/29	27.8	35.0	8.22	17
99	595	0	oc	n	5/ 2/29	27.9	34.9	8.21	12
100	596	50	oc	n	5/ 4/29	27.6	34.7	8.21	10
100	597	100	r	n	5/ 4/29	27.6	34.7	8.22	12
100	602	100	r	p	5/ 4/29	27.6	34.7	8.22	12
102	610	50	r	n	5/ 9/29	25.8	35.0	8.24	8
104	623	100	oc	n	5/13/29	25.3	35.3	8.21	7
105	627	50	oc	n	5/15/29	26.8	34.9	8.23	5
105	628	50	oc	n	5/15/29	26.8	34.9	8.23	5
105	629	100	r	n	5/15/29	25.2	35.1	8.23	5
106	634	50	r	n	5/17/29	27.0	35.0	8.23	5
106	635	100	r	n	5/17/29	25.6	35.1	8.23	5
108	647	50	oc	n	5/27/29	26.8	35.0	8.24	4
108	648	100	oc	n	5/27/29	25.2	35.0	8.23	4
109	655	50	oc	n	5/29/29	23.1	35.0	8.22	3
109	656	100	oc	n	5/29/29	19.4	34.8	8.18	5
110	662	50	r	n	5/31/29	18.4	34.8	8.16	7
111	668	0	r	n	6/ 3/29	20.1	34.5	8.18	5
111	670	100	oc	n	6/ 3/29	18.2	34.7	8.13	13
112	674	0	oc	n	6/ 5/29	23.2	34.6	8.22	7
112	675	50	oc	n	6/ 5/29	21.7	34.6	8.23	7
112	676	100	oc	n	6/ 5/29	19.8	34.7	8.20	8
112	677	0	r	p	6/ 5/29	23.2	34.6	8.22	7
113	680	0	oc	n	6/25/29	24.2	34.5	8.25	5
113	681	50	r	n	6/25/29	23.8	34.6	8.25	5

Table 36. Distributional and environmental records for Ceratium lunula--Concluded

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m^3
113	682	100	r	n	6/25/29	21.5	34.7	8.23	8
114	687	50	oc	n	6/27/29	16.2	34.6	8.04	63
114	688	100	oc	n	6/27/29	13.0	34.5	8.00	91
114	690	50	oc	p	6/27/29	16.2	34.6	8.04	63
115	692	0	r	n	6/29/29	20.6	34.6	8.19	4
115	694	100	r	n	6/29/29	15.6	34.6	8.08	27
150	930	50	r	n	10/23/29	22.8	34.8	8.35	10
150	931	100	r	n	10/23/29	19.6	34.6	8.32	11
151	937	0	r	n	10/26/29	26.0	34.0	.....	...
152	946	100	c	n	10/27/29	11.4	34.7	7.76	75
153	951	0	oc	n	10/29/29	28.1	34.2	8.47	7
153	955	0	r	p	10/29/29	28.1	34.2	8.47	7
153	952	50	oc	n	10/29/29	28.1	34.4	8.39	7
153	953	100	r	n	10/29/29	20.5	34.7	8.28	31
153	956	50	r	p	10/29/29	28.1	34.4	8.39	7
154	959	50	r	n	10/31/29	28.2	34.2	8.40	7
155	965	0	r	n	11/ 2/29	27.8	34.9	8.29	29
155	966	0	r	n	11/ 2/29	27.8	34.9	8.29	29
155	967	100	oc	n	11/ 2/29	27.2	35.0	8.30	35
156	972	0	r	n	11/ 4/29	27.6	35.0	8.34	28
156	973	0	r	p	11/ 4/29	27.6	35.0	8.34	28
156	974	100	oc	n	11/ 4/29	26.4	35.1	8.30	48
157	978	0	c	n	11/ 6/29	27.1	35.3	8.27	47
157	979	50	oc	n	11/ 6/29	27.1	35.2	8.23	60
157	980	100	r	n	11/ 6/29	26.8	35.5	8.30	64
158	983	0	oc	n	11/ 8/29	28.2	35.6	8.34	36
158	984	50	oc	n	11/ 8/29	28.2	35.6	8.39	50
159	990	0	oc	n	11/11/29	28.6	35.7	8.37	15
159	991	50	oc	n	11/11/29	28.5	35.7	8.39	15
159	992	100	r	n	11/11/29	28.0	35.7	8.37	23
160	1002	50	r	n	11/13/29	28.6	35.6	8.39	15

Table 37. Distributional and environmental records for Ceratium contortum

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m^3
1	1	0	c	n	5/12/28	24.0	36.2	8.16	34
1	2	70	oc	n	5/12/28	(23.9	36.3	8.20	31)
1a	3	0	r	n	5/14/28	(22.3	36.3	8.20	46)
1a	4	0	oc	n	5/14/28	(22.3	36.3	8.20	46)
1a	5	0	oc	n	5/14/28	(22.3	36.3	8.20	46)
1b	6	0	oc	n	5/16/28	(22.3	36.3	8.20	46)
1b	7	50	c	n	5/16/28	(22.2	36.4	8.21	39)
1b	8	100	c	n	5/16/28	(20.3	35.5	8.18	36)
2	12	50	c	n	5/18/28	20.5	36.4	8.21	46
2	13	100	oc	n	5/18/28	19.8	36.4	8.21	33
2	14	0	c	n	5/18/28	20.5	36.4	8.21	46
13a	89	0	r	n	8/ 8/28	(21.2	35.2	8.18	11)
14	90	0	oc	n	8/ 8/28	21.2	35.2	8.18	11
14	91	100	oc	p	8/ 9/28	14.0	35.6	8.06	34
14	93	0	r	p	8/ 9/28	21.2	35.2	8.18	11
14	95	50	r	n	8/ 9/28	15.0	35.1	8.18	16
15	97	0	r	p	8/11/28	24.8	36.4	8.21	11
15	101	50	r	n	8/11/28	19.8	36.5	8.21	8
15	102	100	oc	n	8/11/28	18.4	36.4	8.20	19
16	103	0	r	p	8/13/28	25.9	36.2	8.24	8
16	106	0	r	n	8/13/28	25.9	36.2	8.24	8
16	108	100	r	n	8/13/28	19.9	36.5	8.17	13
17	109	0	r	p	8/15/28	26.2	36.6	8.29	9
17	110	50	r	p	8/15/28	21.9	36.6	8.28	12
17	111	0	r	n	8/15/28	26.2	36.6	8.29	9
17	112	50	r	n	8/15/28	21.9	36.6	8.28	12
17	113	100	r	n	8/15/28	19.3	36.5	8.23	9
18	115	50	r	p	8/17/28	22.4	36.8	8.24	5
18	117	0	oc	n	8/17/28	27.0	37.0	8.23	5
18	118	50	c	n	8/17/28	22.4	36.8	8.24	5
18	119	100	oc	n	8/17/28	20.4	36.8	8.21	5
19	120	0	r	p	8/20/28	36.6	37.0	8.34	5
19	121	50	r	p	8/20/28	25.2	37.1	8.27	5
19	122	0	oc	n	8/20/28	26.6	37.0	8.34	5
19	123	50	r	n	8/20/28	25.2	37.1	8.27	5
19	124	100	r	n	8/20/28	22.4	37.0	8.25	5

Table 37. Distributional and environmental records for Ceratium contortum--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
20	125	0	r	p	8/22/28	26.0	36.6	8.37	5
20	126	50	oc	p	8/22/28	25.8	36.6	8.26	3
20	127	100	r	p	8/22/28	22.6	36.7	8.19	5
20	128	0	c	n	8/22/28	26.0	36.6	8.37	5
20	129	50	c	n	8/22/28	25.8	36.6	8.26	3
20	130	100	r	n	8/22/28	22.6	36.7	8.19	5
20-21	131	0	oc	n	8/23/28	(26.6	36.3	8.32	4)
21	132	0	r	p	8/24/28	26.6	36.3	8.32	4
21	134	100	a	p	8/24/28	21.0	36.8	8.20	7
21	135	0	c	n	8/24/28	26.6	36.3	8.32	4
21	136	50	r	n	8/24/28	24.4	36.2	8.26	4
21	137	100	oc	n	8/24/28	21.0	36.8	8.20	7
22	139	0	c	p	8/27/28	26.7	36.0	8.26	8
22	142	0	r	n	8/27/28	26.7	36.0	8.26	8
22	143	50	r	n	8/27/28	24.5	36.2	8.21	9
22	144	100	r	n	8/27/28	17.5	36.1	7.99	123
23	145	0	oc	p	8/29/28	27.2	35.9	8.25	4
23	148	0	r	n	8/29/28	27.2	35.9	8.25	4
23	149	50	r	n	8/29/28	20.9	36.0	8.14	13
23	150	100	r	n	8/29/28	16.6	36.0	8.18	75
24	151	0	oc	n	8/31/28	27.2	35.2	8.32	4
24	154	0	oc	n	8/31/28	27.2	35.2	8.32	4
24	155	50	oc	n	8/31/28	23.1	36.0	8.14	8
24	156	100	r	n	8/31/28	15.6	35.6	7.96	99
25	157	0	c	p	9/ 3/28	27.5	35.6	8.31	5
25	160	0	oc	n	9/ 3/28	27.5	35.6	8.31	5
25	161	50	r	n	9/ 3/28	21.5	36.0	8.22	12
25	162	100	r	n	9/ 3/28	14.6	35.7	7.93	121
26	163	0	oc	p	9/ 5/28	27.6	36.0	8.30	5
26	166	0	oc	n	9/ 5/28	27.6	36.0	8.30	5
27	167	0	r	p	9/ 7/28	27.5	36.3	8.31	4
27	171	50	r	n	9/ 7/28	26.0	36.2	8.30	4
27	172	100	r	n	9/ 7/28	17.7	36.0	8.09	46
28	176	0	oc	n	9/11/28	27.6	36.3	8.29	4
28	177	50	oc	n	9/11/28	26.7	36.3	8.26	4
28	178	100	r	n	9/11/28	22.8	36.6	8.22	7
29	179	0	c	p	9/13/28	27.6	36.2	8.31	3
29	182	0	oc	n	9/13/28	27.6	36.2	8.31	3
29	183	50	r	n	9/13/28	27.2	36.2	8.29	3
29	184	100	oc	n	9/13/28	23.1	36.6	8.21	8
30	186	50	r	p	9/15/28	27.8	36.1	8.29	3
30	188	0	oc	n	9/15/28	28.0	36.1	8.30	2
30	189	50	c	n	9/15/28	27.8	36.1	8.29	3
30	190	100	r	n	9/15/28	24.1	36.4	8.10	20
31	191	0	oc	n	10/ 3/28	28.5	34.4	8.27	2
31	192	50	r	n	10/ 3/28	28.2	35.4	8.23	2
31	193	100	c	n	10/ 3/28	23.4	36.5	8.19	28
32	194	0	c	n	10/ 5/28	28.0	36.0	8.23	2
32	194A	0	oc	p	10/ 5/28	28.0	36.0	8.23	2
32	195	50	oc	n	10/ 5/28	27.2	36.0	8.24	2
32	196	100	oc	n	10/ 5/28	22.2	36.4	8.10	30
32	196A	100	r	p	10/ 5/28	22.2	36.4	8.10	30
33	197A	0	oc	p	10/ 8/28	28.5	35.6	8.23	4
33	198	50	oc	n	10/ 8/28	28.2	36.2	8.24	4
34	200	0	c	n	10/ 9/28	28.5	35.9	8.28	2
34	200A	0	oc	p	10/ 9/28	28.5	35.9	8.28	2
34	201	100	r	n	10/ 9/28	20.5	36.6	8.16	16
34	202	50	oc	n	10/ 9/28	25.0	36.5	8.21	3
35	204	50	r	n	10/26/28	16.8	34.7	7.92	138
35	206	0	oc	p	10/26/28	27.4	29.7	8.31	15
35a	208	0	r	n	10/26/28	(27.0	30.7	8.27	16)
35-36	209	0	oc	n	10/26/28	(27.0	30.7	8.27	16)
35-36	212	0	oc	n	10/26/28	(27.0	30.7	8.27	16)
36	213	0	r	n	10/30/28	26.5	31.6	8.23	16
36	214	50	r	n	10/30/28	18.5	34.5	8.03	122
37	218	50	r	n	11/ 1/28	18.8	34.5	8.00	121
39	225	0	r	n	11/ 6/28	24.8	33.0	8.24	16
40	232	0	r	p	11/ 8/28	22.2	33.7	8.21	24
41	235	0	r	n	11/10/28	20.4	34.2	8.11	32
41a	240	0	r	n	11/19/28	(22.4	35.3	8.12	38)
45	256	0	c	n	11/19/28	22.4	35.3	8.12	38
45	257	50	oc	n	11/19/28	22.4	35.2	8.13	46
45	258	100	r	n	11/19/28	18.6	35.1	8.00	50
46	261	0	oc	n	11/21/28	23.3	35.3	8.16	38
46	262	50	oc	n	11/21/28	23.2	35.3	8.16	40
46	263	100	oc	n	11/21/28	22.5	35.4	8.17	40

Table 37. Distributional and environmental records for Ceratium contortum--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
47	266	0	r	n	11/23/28	23.9	36.0	8.23	17
47	267	50	r	n	11/23/28	23.8	36.0	8.23	20
47	268	100	r	n	11/23/28	22.7	36.2	8.23	20
47	269	0	r	p	11/23/28	23.9	36.0	8.23	17
48	271	0	r	n	11/25/28	23.6	36.4	8.23	13
48	272	50	r	n	11/25/28	23.6	36.4	8.24	16
48	273	100	oc	n	11/25/28	22.7	36.3	8.26	16
48	274	0	oc	p	11/25/28	23.6	36.4	8.23	13
48	275	50	r	p	11/25/28	23.6	36.4	8.24	16
48	276	100	r	p	11/25/28	22.7	36.3	8.26	16
49	277	0	oc	n	11/27/28	23.4	36.2	8.27	13
49	278	50	oc	n	11/27/28	22.6	36.1	8.26	13
49	279	100	oc	n	11/27/28	21.6	35.9	8.26	13
49	281	50	r	p	11/27/28	22.6	36.1	8.26	13
49	282	100	r	p	11/27/28	21.6	35.9	8.26	13
49a	283	0	oc	n	11/28/28	(23.2	36.0	8.23	13)
50	284	0	oc	n	11/29/28	23.2	36.0	8.23	13
50	285	50	oc	n	11/29/28	22.0	35.9	8.23	13
50	286	100	oc	n	11/29/28	20.5	35.7	8.22	13
50	287	0	oc	p	11/29/28	23.2	36.0	8.23	13
50	288	50	oc	p	11/29/28	22.0	35.9	8.23	13
50	289	100	r	p	11/29/28	20.5	35.7	8.22	13
50-51	290	0	oc	n	11/30/28	(22.8	35.6	8.22	16)
50-51	291	0	oc	n	11/30/28	(22.8	35.6	8.22	16)
50-51	292	0	oc	n	11/30/28	(22.8	35.6	8.22	16)
51	293	0	oc	n	11/30/28	22.8	35.6	8.22	16
51	294	50	oc	n	12/ 1/28	20.5	35.6	8.22	17
51	295	100	oc	n	12/ 1/28	20.0	35.6	8.22	17
51	296	0	r	p	12/ 1/28	22.8	35.6	8.22	16
51	297	50	r	p	12/ 1/28	20.5	35.6	8.22	17
52	299	0	oc	n	12/ 3/28	22.5	35.4	8.21	8
52	300	50	c	n	12/ 3/28	20.2	35.6	8.20	8
52	301	100	oc	n	12/ 3/28	18.2	35.2	8.17	8
52	302	0	r	p	12/ 3/28	22.5	35.4	8.21	8
53	304	50	oc	n	12/ 5/28	21.2	35.8	8.20	13
53	305	100	c	n	12/ 5/28	19.9	35.6	8.19	13
53	306	0	r	p	12/ 5/28	22.6	35.7	8.22	13
53-54	307	0	r	n	12/ 6/28	(23.0	35.6	8.22	11)
54	308	0	r	n	12/ 6/28	(23.0	35.6	8.22	11)
53-54	310	0	a	n	12/10/28	(23.0	35.6	8.22	11)
53-54	311	0	o	n	12/10/28	(23.0	35.6	8.22	11)
53-54	312	0	o	n	12/10/28	(23.0	35.6	8.22	11)
53-54	313	0	o	n	12/10/28	(23.0	35.6	8.22	11)
54	316	0	r	n	12/12/28	(23.0	35.6	8.22	11)
53-54	317	0	c	n	12/12/28	(23.0	35.6	8.22	11)
54	320	50	oc	n	12/14/28	19.8	35.4	8.18	17
54	321	100	oc	n	12/14/28	18.7	35.4	8.16	20
54	322	0	oc	p	12/14/28	23.4	35.5	8.22	9
55	323	0	oc	n	12/16/28	20.4	34.9	8.19	12
55	324	50	oc	n	12/16/28	18.7	35.0	8.18	12
55	325	100	c	n	12/16/28	16.7	34.9	7.17	12
55	326	0	r	p	12/16/28	20.4	34.9	8.19	12
56	328	0	c	n	12/18/28	20.8	34.9	8.13	9
56	329	50	oc	n	12/18/28	18.5	35.1	8.14	9
56	330	100	oc	n	12/18/28	16.6	34.8	8.11	12
56	331	0	oc	p	12/18/28	20.8	34.9	8.13	9
56	332	50	oc	p	12/18/28	18.5	35.1	8.14	9
56	333	100	r	p	12/18/28	16.6	34.8	8.11	12
56-57	334	0	a	n	12/19/28	(19.0	34.5	8.14	20)
57	335	0	a	n	12/20/28	19.0	34.5	8.14	20
57	336	50	oc	n	12/20/28	15.6	34.3	8.14	21
57	337	100	oc	n	12/20/28	14.3	34.4	8.10	40
57	338	0	oc	p	12/20/28	19.0	34.5	8.14	20
57	339	50	r	p	12/20/28	15.6	34.3	8.14	21
57	340	100	r	p	12/20/28	14.3	34.4	8.10	40
58	346	100	r	p	12/22/28	12.3	34.1	8.05	40
59	347	0	r	n	12/24/28	16.3	34.0	8.10	38
61-62	370	0	r	n	12/28/28	(16.9	34.0	8.05	46)
63	379	0	r	n	1/ 1/29	20.5	34.6	8.07	21
63	380	50	r	n	1/ 1/29	17.0	34.6	8.08	25
63	381	100	r	n	1/ 1/29	15.6	34.6	8.08	24
63	382	0	r	p	1/ 1/29	20.5	34.6	8.07	21
63	384	100	r	p	1/ 1/29	15.6	34.6	8.08	24
63-64	385	0	r	n	1/ 1/29	(20.5	34.6	8.07	21)
63-64	386	0	r	n	1/ 1/29	(20.5	34.6	8.07	21)
63-64	387	0	r	n	1/ 1/29	(20.5	34.6	8.07	21)

Table 37. Distributional and environmental records for Ceratium contortum--Continued

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
63-64	388	0	r	n	1/ 1/29	(20.5	34.6	8.07	21)
63-64	390	0	r	n	1/ 1/29	(20.5	34.6	8.07	21)
63-64	391	0	r	n	1/ 1/29	(20.5	34.6	8.07	21)
63-64	392	0	r	n	1/ 1/29	(20.5	34.6	8.07	21)
63-64	393	0	r	n	1/ 1/29	(20.5	34.6	8.07	21)
64	394	0	r	n	1/ 3/29	20.6	34.6	8.12	21
64	398	0	r	p	1/ 3/29	20.6	34.6	8.12	21
64-65	401	0	r	n	1/ 3/29	(20.6	34.6	8.12	21)
64-65	402	0	r	n	1/ 3/29	(20.6	34.6	8.12	21)
65	405	0	oc	n	1/ 5/29	20.2	34.5	8.10	24
65	408	0	r	p	1/ 5/29	20.2	34.5	8.10	24
66	411	0	r	n	1/ 7/29	19.4	34.7	8.10	29
66	412	100	r	n	1/ 7/29	17.8	34.9	8.12	21
66	414	50	r	p	1/ 7/29	17.8	34.8	8.10	29
67	416	0	oc	n	1/ 8/29	19.3	34.9	8.11	21
67	417	50	r	n	1/ 8/29	17.4	34.7	8.11	20
67	418	100	oc	n	1/ 8/29	16.2	34.6	8.05	40
68	419	0	r	n	1/10/29	19.2	35.1	8.14	29
68	420	50	r	n	1/10/29	18.2	35.0	8.14	29
68	422	0	r	p	1/10/29	19.2	35.1	8.14	29
69	424	0	oc	n	1/12/29	21.1	35.2	8.12	62
69	426	100	r	n	1/12/29	14.6	34.8	7.86	198
69	427	0	r	p	1/12/29	21.1	35.2	8.12	62
75	462	0	r	n	2/14/29	22.8	35.8	8.18	44
75	463	50	r	n	2/14/29	20.0	35.5	8.14	46
75	464	100	oc	n	2/14/29	17.8	35.4	8.00	75
75	466	50	r	p	2/14/29	20.0	35.5	8.14	46
76	467	0	c	n	2/16/29	23.4	35.9	8.15	50
76	469	100	r	n	2/16/29	21.2	35.8	8.12	45
77	472	0	oc	n	2/18/29	23.7	36.0	8.19	16
77	473	0	r	p	2/18/29	23.7	36.0	8.19	16
78	475	0	oc	n	2/20/29	24.6	36.0	8.17	32
78	477	100	oc	n	2/20/29	21.9	36.2	8.14	34
79	482	50	oc	n	2/22/29	24.5	36.1	8.17	34
79	483	100	c	n	2/22/29	21.8	36.2	8.13	45
79	484	0	r	p	2/23/29	25.2	36.0	8.17	34
80	486	0	r	n	2/24/29	26.0	35.9	8.20	36
80	488	0	r	p	2/24/29	26.0	35.9	8.20	36
80	489	50	oc	p	2/24/29	25.9	36.0	8.19	29
81	491	0	oc	n	2/26/29	26.5	35.8	8.19	38
81	492	50	oc	n	2/26/29	26.4	35.9	8.19	38
82	496	0	oc	n	2/28/29	27.2	36.3	8.21	34
82	497	50	oc	n	2/28/29	27.2	36.3	8.21	34
82	498	0	oc	p	2/28/29	27.2	36.3	8.21	34
83	501	0	oc	n	3/ 2/29	27.5	36.3	8.24	29
83	502	50	c	n	3/ 2/29	27.4	36.5	8.24	25
83	503	0	r	p	3/ 2/29	27.5	36.3	8.24	29
83	504	50	r	p	3/ 2/29	27.4	36.5	8.24	25
84	505	0	r	n	3/ 4/29	27.8	36.2	8.23	24
84	506	50	oc	n	3/ 4/29	27.5	36.4	8.21	24
84	508	50	r	p	3/ 4/29	27.5	36.4	8.21	24
85	510	0	oc	n	3/ 6/29	27.9	36.2	8.22	40
85	511	50	oc	n	3/ 6/29	27.8	36.2	8.22	40
85	512	0	r	p	3/ 6/29	27.9	36.2	8.22	40
85	513	50	oc	p	3/ 6/29	27.8	36.2	8.22	40
86	515	0	oc	n	3/ 9/29	(28.3	36.2	8.29	20)
86	516	0	oc	n	3/ 9/29	28.3	36.2	8.29	20
86	517	50	oc	n	3/ 9/29	27.4	36.2	8.29	17
86	518	0	r	p	3/ 9/29	28.3	36.2	8.29	20
87	521	0	oc	n	3/11/29	27.8	36.1	8.28	17
87	522	50	oc	n	3/11/29	26.5	36.1	8.26	20
87	523	0	r	p	3/11/29	27.8	36.1	8.28	17
87	524	50	r	p	3/11/29	26.5	36.1	8.26	20
87	525	100	r	p	3/11/29	23.9	36.0	8.23	20
88	526	0	oc	n	3/21/29	28.5	35.9	8.23	16
88	527	50	oc	n	3/21/29	28.4	35.9	8.25	13
89	528	0	oc	n	3/23/29	28.4	35.6	8.25	21
89	529	50	r	n	3/23/29	28.6	35.8	8.27	12
89	530	0	r	p	3/23/29	28.4	35.6	8.25	21
90	533	0	c	n	3/25/29	28.5	35.5	8.27	21
90	534	50	c	n	3/25/29	28.6	35.6	8.26	21
90	535	0	oc	p	3/25/29	28.5	35.5	8.27	21
90	536	50	oc	p	3/25/29	28.6	35.6	8.26	21
91	540	0	oc	n	3/27/29	28.7	35.1	8.30	21
91	541	50	c	n	3/27/29	28.5	35.2	8.30	24
91	542	0	r	p	3/27/29	28.7	35.1	8.30	21

Table 37. Distributional and environmental records for Ceratium contortum--Continued

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
91	543	50	r	p	3/27/29	28.5	35.2	8.30	21
91	544	100	r	p	3/27/29	25.8	36.0	8.25	30
92	545	0	oc	n	3/29/29	28.5	35.3	8.29	28
92	546	50	c	n	3/29/29	28.4	35.4	8.29	28
92	548	50	r	p	3/29/29	28.4	35.4	8.29	28
93	551	50	c	n	3/31/29	28.5	34.8	8.30	28
94	558	50	oc	n	4/22/29	29.3	34.7	8.25	14
94	559	100	oc	n	4/22/29	28.5	35.6	8.21	25
95	563	50	c	n	4/24/29	29.3	34.9	8.24	16
95	564	100	oc	n	4/24/29	28.5	35.4	8.22	21
95	566	50	r	p	4/24/29	29.3	34.9	8.24	16
96	568	0	oc	n	4/26/29	29.3	35.3	8.23	12
95	568A	0	oc	n	4/26/29	(29.4	34.7	8.26	14)
96	569	50	r	n	4/26/29	29.2	35.3	8.23	12
96	571	0	r	p	4/26/29	29.3	35.3	8.23	12
97	574	0	c	n	4/28/29	28.3	35.2	8.16	24
97	575	50	c	n	4/28/29	28.0	35.4	8.16	21
97	576	100	oc	n	4/28/29	27.6	35.6	8.15	25
97	577	0	r	p	4/28/29	28.3	35.2	8.16	24
97	578	50	r	p	4/28/29	28.0	35.4	8.16	21
98	581	0	r	n	4/30/29	27.0	35.3	8.16	24
99	589	0	c	n	5/ 2/29	27.9	34.9	8.21	12
99	590	50	c	n	5/ 2/29	27.8	34.9	8.22	12
99	591	100	c	n	5/ 2/29	27.8	35.0	8.22	17
99	592	0	r	p	5/ 2/29	27.9	34.9	8.21	12
99	595	0	r	n	5/ 2/29	27.9	34.9	8.21	12
100	596	50	c	n	5/ 4/29	27.6	34.7	8.21	10
100	597	100	c	n	5/ 4/29	27.6	34.7	8.22	12
100	598	0	r	p	5/ 4/29	27.7	34.7	8.21	10
100	602	100	r	p	5/ 4/29	27.6	34.7	8.22	12
101	603	0	oc	n	5/ 7/29	26.3	34.7	8.24	8
101	604	50	oc	n	5/ 7/29	26.2	34.7	8.24	8
101	605	100	oc	n	5/ 7/29	25.2	35.1	8.23	8
101	607	50	r	p	5/ 7/29	26.2	34.7	8.24	8
102	609	0	c	n	5/ 9/29	25.8	35.0	8.24	8
102	610	50	c	n	5/ 9/29	25.8	35.0	8.24	8
102	611	100	oc	n	5/ 9/29	25.6	35.0	8.23	8
102	612	0	r	p	5/ 9/29	25.8	35.0	8.24	8
102	613	50	r	p	5/ 9/29	25.8	35.0	8.24	8
102	614	100	r	p	5/ 9/29	25.6	35.0	8.23	8
103	615	0	c	n	5/11/29	26.0	35.0	8.25	5
103	616	50	c	n	5/11/29	25.8	35.2	8.25	5
103	617	100	c	n	5/11/29	24.8	35.2	8.25	5
104	621	0	oc	n	5/13/29	26.1	35.2	8.24	7
104	622	50	c	n	5/13/29	25.8	35.2	8.24	7
104	623	100	c	n	5/13/29	25.3	35.3	8.21	7
104	626	100	r	p	5/13/29	25.3	35.3	8.21	7
105	627	50	c	n	5/15/29	26.8	34.9	8.23	5
105	628	50	oc	n	5/15/29	26.8	34.9	8.23	5
106	633	0	oc	n	5/17/29	27.2	35.0	8.23	5
106	634	50	c	n	5/17/29	27.0	35.0	8.23	5
106	635	100	oc	n	5/17/29	25.8	35.1	8.23	5
106	636	0	r	p	5/17/29	27.2	35.0	8.23	5
107	639	0	c	n	5/19/29	28.0	34.4	8.23	5
107	640	50	c	n	5/19/29	27.9	34.4	8.23	4
107	641	100	c	n	5/19/29	26.8	34.9	8.23	11
107	642	0	r	p	5/19/29	28.0	34.4	8.23	5
107	644	100	r	p	5/19/29	26.8	34.9	8.23	11
108	646	0	c	n	5/27/29	28.4	35.0	8.25	4
108	648	100	oc	n	5/27/29	25.2	35.0	8.23	4
109	654	0	r	n	5/29/29	27.4	35.0	8.23	3
109	655	50	oc	n	5/29/29	23.1	35.0	8.22	3
109	656	100	oc	n	5/29/29	19.4	34.8	8.18	5
109	658	50	oc	p	5/29/29	23.1	35.0	8.22	3
110	661	0	a	n	5/31/29	23.9	34.7	8.18	5
110	662	50	oc	n	5/31/29	18.4	34.8	8.16	7
110	663	100	c	n	5/31/29	17.9	34.7	8.14	11
110	664	0	c	p	5/31/29	23.9	34.7	8.18	5
110	665	50	oc	p	5/31/29	18.4	34.8	8.16	7
110	666	100	r	p	5/31/29	17.9	34.7	8.14	11
111	668	0	oc	n	6/ 3/29	20.1	34.5	8.18	5
111	670	100	oc	n	6/ 3/29	18.2	34.7	8.13	13
111	671	0	r	p	6/ 3/29	20.1	34.5	8.18	5
111	672	50	r	p	6/ 3/29	19.4	34.6	8.17	5
112	674	0	oc	n	6/ 5/29	23.2	34.6	8.22	7
112	675	50	oc	n	6/ 5/29	21.7	34.6	8.23	7

Table 37. Distributional and environmental records for Ceratium contortum--Continued

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
112	676	100	r	n	6/ 5/29	19.8	34.7	8.20	8
112	677	0	r	p	6/ 5/29	23.2	34.6	8.22	7
113	680	0	oc	n	6/25/29	24.2	34.5	8.25	5
113	681	50	c	n	6/25/29	23.8	34.6	8.25	5
113	682	100	c	n	6/25/29	21.5	34.7	8.23	8
113	683	0	oc	p	6/25/29	24.2	34.5	8.25	5
113	684	50	r	p	6/25/29	23.8	34.6	8.25	5
113	685	100	r	p	6/25/29	21.5	34.7	8.23	8
130	787	0	c	n	9/ 4/29	16.2	33.4	8.34	36
131	789	100	r	n	9/ 6/29	12.1	33.4	8.32	...
131	792	0	oc	p	9/ 6/29	19.3	33.4	8.34	...
132	797	0	oc	n	9/ 8/29	21.0	33.9	8.34	15
132	798	50	oc	n	9/ 8/29	17.6	33.9	8.33	19
132	799	100	oc	n	9/ 8/29	14.3	33.4	8.30	16
132	801	0	r	p	9/ 8/29	21.0	33.9	8.34	15
132	802	50	r	p	9/ 8/29	17.6	33.9	8.33	19
133	804	0	r	n	9/10/29	22.7	34.7	8.47	7
133	805	50	oc	n	9/10/29	20.8	34.7	8.37	7
133	806	100	oc	n	9/10/29	18.4	34.8	8.31	7
133	808	0	oc	n	9/10/29	22.7	34.7	8.47	7
133	809	50	oc	n	9/10/29	20.8	34.7	8.37	7
134	810	100	oc	n	9/10/29	18.4	34.8	8.31	7
134	813	50	r	p	9/12/29	19.8	34.6	8.34	6
134	815	0	r	p	9/12/29	22.9	34.7	8.34	6
134	817	100	r	p	9/12/29	18.1	34.6	8.34	6
135	821	50	c	n	9/14/29	21.5	35.0	8.37	5
135	822	100	oc	n	9/14/29	18.7	34.8	8.34	5
135	824	0	r	p	9/14/29	23.8	35.1	8.37	7
135	825	50	r	p	9/14/29	21.5	35.0	8.37	5
136	827	0	r	n	9/16/29	24.6	35.4	8.37	3
136	828	50	c	n	9/16/29	21.4	35.1	8.39	3
136	829	100	c	n	9/16/29	18.6	35.0	8.39	3
136	833	50	r	p	9/16/29	21.4	35.1	8.39	3
136	834	100	r	p	9/16/29	18.6	35.0	8.39	3
137	836	0	c	n	9/18/29	25.5	35.0	8.39	4
137	838	100	c	n	9/18/29	21.5	35.1	8.30	5
137	840	0	r	p	9/18/29	25.5	35.0	8.39	4
137	841	50	r	p	9/18/29	24.4	35.1	8.34	4
138	843	0	oc	n	9/20/29	26.1	34.8	8.35	5
138	844	50	r	n	9/20/29	25.6	34.7	8.30	3
138	847	0	r	p	9/20/29	26.1	34.8	8.35	5
139	849	0	r	n	9/22/29	26.7	34.8	8.34	6
139	850	50	c	n	9/22/29	25.8	34.9	8.31	6
139	851	100	oc	n	9/22/29	22.4	35.2	8.28	6
139	853	0	r	p	9/22/29	26.7	34.8	8.34	6
140	856	0	c	n	10/ 3/29	26.9	35.0	8.42	7
140	857	50	oc	n	10/ 3/29	26.9	35.0	8.39	7
140	858	100	c	n	10/ 3/29	25.5	35.0	8.34	7
141	864	0	c	n	10/ 5/29	25.9	35.2	8.34	5
141	865	50	c	n	10/ 5/29	24.8	35.3	8.34	5
141	868	0	r	p	10/ 5/29	25.9	35.2	8.34	5
142	872	0	oc	n	10/ 7/29	24.1	34.8	8.33	5
142	873	50	c	n	10/ 7/29	21.8	34.8	8.30	5
142	874	100	c	n	10/ 7/29	16.6	34.4	8.27	7
142	876	0	r	p	10/ 7/29	24.1	34.8	8.33	5
142	878	100	r	p	10/ 7/29	16.6	34.4	8.27	7
142	881	0	c	n	10/ 7/29	24.1	34.8	8.33	5
143	882	50	c	n	10/ 9/29	19.0	34.2	8.34	6
143	884	0	oc	p	10/ 9/29	22.4	34.4	8.30	6
143	885	50	r	p	10/ 9/29	19.0	34.2	8.34	6
144	886	0	r	n	10/11/29	23.3	35.0	8.37	6
144	887	0	r	p	10/11/29	23.3	35.0	8.37	6
144	888	50	r	n	10/11/29	21.1	34.7	8.33	6
144	889	100	r	p	10/11/29	16.6	34.5	8.37	6
145	890	0	c	n	10/13/29	22.3	34.6	8.29	6
145	891	50	c	n	10/13/29	18.7	34.3	8.34	6
145	892	100	oc	n	10/13/29	16.0	34.1	8.31	6
145	893	0	oc	p	10/13/29	22.3	34.6	8.29	6
145	894	50	r	p	10/13/29	18.7	34.3	8.34	6
146	896	0	oc	n	10/15/29	22.4	34.9	8.37	6
146	897	50	oc	n	10/15/29	22.4	34.9	8.30	6
146	898	100	oc	n	10/15/29	19.7	34.3	8.26	7
147	903	0	oc	n	10/17/29	23.3	35.3	8.26	8
147	904	50	oc	n	10/17/29	23.1	35.3	8.29	5
147	905	100	oc	n	10/17/29	19.2	35.0	8.29	5
147	907	0	r	p	10/17/29	23.3	35.3	8.28	8

Table 37. Distributional and environmental records for Ceratium contortum--Concluded

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
148	910	0	oc	n	10/19/29	23.4	35.2	.....	...
148	912	100	r	n	10/19/29	20.0	35.0	.....	...
149	920	0	r	n	10/19/29	23.5	35.0	8.34	6
149	921	50	oc	n	10/21/29	23.3	35.0	8.37	6
149	922	100	oc	n	10/21/29	20.3	34.9	8.38	6
149	927	0	r	p	10/21/29	23.5	35.0	8.34	6
150	929	0	c	n	10/23/29	25.6	34.7	8.39	7
150	930	50	oc	n	10/23/29	22.8	34.8	8.35	10
150	931	100	oc	n	10/23/29	19.6	34.6	8.32	11
150	933	0	r	p	10/23/29	25.6	34.7	8.39	7
151	937	0	c	n	10/26/29	26.0	34.0	.....	...
151	939	100	oc	n	10/26/29	12.5	34.6	.....	...
151	941	0	r	p	10/26/29	26.0	34.0	.....	...
151	942	50	r	p	10/26/29	18.3	34.4	.....	...
151	943	100	oc	n	10/26/29	12.5	34.6	.....	...
152	944	0	oc	n	10/27/29	27.4	33.7	8.35	20
152	945	50	oc	n	10/27/29	14.2	34.5	7.87	53
152	946	100	oc	n	10/27/29	11.4	34.7	7.76	75
152	948	50	oc	n	10/27/29	14.2	34.5	7.87	53
152	949	50	oc	p	10/27/29	14.2	34.5	7.87	53
153	951	0	oc	n	10/29/29	28.1	34.2	8.47	7
153	952	50	c	n	10/29/29	28.1	34.4	8.39	7
153	953	100	oc	n	10/29/29	20.5	34.7	8.28	31
153	955	0	r	p	10/29/29	28.1	34.2	8.47	7
153	956	50	r	p	10/29/29	28.1	34.4	8.39	7
154	958	0	c	n	10/31/29	28.3	34.2	8.39	7
154	959	50	oc	n	10/31/29	28.2	34.2	8.40	7
154	960	100	r	n	10/31/29	25.3	34.8	7.93	21
155	965	0	c	n	11/ 2/29	27.8	34.9	8.29	29
155	966	50	c	n	11/ 2/29	27.7	34.9	8.30	30
155	967	100	oc	n	11/ 2/29	27.2	35.0	8.30	35
156	972	0	oc	n	11/ 4/29	27.6	35.0	8.34	28
156	974	100	oc	n	11/ 4/29	26.4	35.1	8.30	48
157	978	0	c	n	11/ 6/29	27.1	35.3	8.27	47
157	979	50	c	n	11/ 6/29	27.1	35.2	8.32	60
157	980	100	oc	n	11/ 6/29	26.8	35.5	8.30	64
158	983	0	c	n	11/ 8/29	28.2	35.6	8.34	36
158	984	50	c	n	11/ 8/29	28.2	35.6	8.39	50
158	985	100	c	n	11/ 8/29	27.6	35.9	8.39	48
159	990	0	c	n	11/11/29	28.6	35.7	8.37	15
159	991	50	oc	n	11/11/29	28.5	35.7	8.39	15
159	992	100	r	n	11/11/29	28.0	35.7	8.37	23
160	1000	0	r	n	11/13/29	28.6	35.6	8.37	12
160	1002	50	oc	n	11/13/29	28.6	35.6	8.39	15
160	1003	100	r	n	11/13/29	28.5	35.7	8.44	16

Table 38. Distributional and environmental records for Ceratium limulus Gourret

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
15	98	50	r	p	8/11/28	19.8	36.5	8.21	8
16	103	0	r	p	8/13/28	25.9	36.2	8.24	8
17	109	0	r	p	8/15/28	26.2	36.6	8.29	9
17	112	50	r	n	8/15/28	21.9	36.6	8.28	12
17	113	100	r	n	8/15/28	19.3	36.5	8.23	9
18	115	50	r	p	8/17/28	22.4	36.8	8.24	5
18	118	50	r	n	8/17/28	22.4	36.8	8.24	5
25	161	50	r	n	9/ 3/28	21.5	36.0	8.22	12
26	165	100	r	p	9/ 5/28	14.9	36.6	8.11	40
27	171	50	r	n	9/ 7/28	26.0	36.2	8.30	4
29	179	0	r	p	9/13/28	27.6	36.2	8.31	3
29	181	100	r	p	9/13/28	23.1	36.6	8.21	8
30	186	50	r	p	9/15/28	27.8	36.1	8.29	3
41a	240	0	r	n	11/12/28	(18.7	34.7	8.06	45)
42	241	0	r	n	11/13/28	18.7	34.7	8.06	45
42	243	100	r	n	11/13/28	13.8	35.0	7.91	150
43	247	0	r	p	11/15/28	19.6	34.8	8.09	52
44	253	0	r	p	11/17/28	20.7	34.9	8.03	38
45	258	100	r	n	11/29/28	18.6	35.1	8.00	50
45	259	0	r	p	11/19/28	22.4	35.3	8.12	38
45	260	50	r	p	11/19/28	22.4	35.2	8.13	46
46	265	50	r	p	11/21/28	23.2	35.3	8.16	40

Table 38. Distributional and environmental records for Ceratium limulus Gourret--Concluded

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
47	269	0	r	p	11/23/28	23.9	36.0	8.23	17
50	287	0	r	p	11/29/28	23.2	36.0	8.23	13
50	288	50	oc	p	11/29/28	22.0	35.9	8.23	13
50	289	100	r	p	11/29/28	20.5	35.7	8.22	13
50-51	290	0	r	n	11/30/28	(22.8	35.6	8.22	16)
50-51	291	0	r	n	11/30/28	(22.8	35.6	8.22	16)
50-51	292	0	r	n	11/30/28	(22.8	35.6	8.22	16)
51	294	50	r	n	12/ 1/28	20.5	35.6	8.22	17
51	296	0	r	p	12/ 1/28	22.8	35.6	8.22	16
51	298	100	r	p	12/ 1/28	20.0	35.6	8.22	17
52	300	50	r	n	12/ 3/28	20.2	35.6	8.20	8
52	302	0	oc	p	12/ 3/28	22.5	35.4	8.21	8
53	306	0	oc	p	12/ 5/28	22.6	35.7	8.22	13
53-54	310	0	r	n	12/10/28	(23.0	35.6	8.22	11)
53-54	311	0	r	n	12/10/28	(23.0	35.6	8.22	11)
54	322	0	r	p	12/14/28	23.4	35.5	8.22	9
55	324	50	r	n	12/16/28	18.7	35.0	8.18	12
56	330	100	r	n	12/18/28	16.6	34.3	8.11	12
57	336	50	r	n	12/20/28	15.6	34.3	8.14	21
58	342	50	r	n	12/22/28	14.8	34.0	8.12	25
62-63	377	0	r	n	12/31/28	(20.5	34.6	8.07	21)
62-63	378	0	r	n	12/31/28	(20.5	34.6	8.07	21)
63-64	385	0	r	n	1/ 1/29	(20.5	34.6	8.07	21)
63-64	387	0	r	n	1/ 2/29	(20.5	34.6	8.07	21)
63-64	388	0	r	n	1/ 2/29	(20.5	34.6	8.07	21)
63-64	391	0	r	n	1/ 2/29	(20.5	34.6	8.07	21)
63-64	393	0	r	n	1/ 1/29	(20.5	34.6	8.07	21)
64-65	402	0	r	n	1/ 4/29	(20.6	34.6	8.12	21)
64-65	403	0	r	n	1/ 4/29	(20.6	34.6	8.12	21)
65	209	50	r	p	1/ 5/29	16.5	34.5	8.10	25
65	410	100	r	p	1/ 5/29	14.8	34.3	8.10	34
66	415	100	r	p	1/ 7/29	17.8	34.9	8.12	21
73	452	100	r	n	2/10/29	14.7	35.0	7.80	178
77	474	50	r	p	2/18/29	23.5	36.0	8.19	16
96	573	100	r	p	4/26/29	28.2	35.7	8.19	25
97	575	50	r	n	4/28/29	28.0	35.4	8.16	21
97	578	50	r	p	4/28/29	28.0	35.4	8.16	21
98	585	50	r	p	4/30/29	26.9	35.3	8.16	28
100	596	50	r	n	5/ 4/29	27.6	34.7	8.21	10
100	597	100	r	n	5/ 4/29	27.6	34.7	8.22	12
101	604	50	r	n	5/ 7/29	26.2	34.7	8.24	8
101	605	100	r	n	5/ 7/29	25.2	35.1	8.23	8
102	610	50	r	n	5/ 9/29	25.8	35.0	8.24	8
102	611	100	r	n	5/ 9/29	25.6	35.0	8.23	8
102	612	0	r	p	5/ 9/29	25.8	35.0	8.24	8
103	616	50	r	n	5/11/29	25.8	35.2	8.25	5
106	634	50	r	n	5/17/29	27.0	35.0	8.23	5
107	639	0	r	n	5/19/29	28.0	34.4	8.23	5
107	640	50	r	n	5/19/29	27.9	34.4	8.23	4
107	642	0	r	p	5/19/29	28.0	34.4	8.23	5
107	645	50	r	p	5/19/29	27.9	34.4	8.23	4
132	797	0	r	n	9/ 8/29	21.0	33.9	8.34	15
132	801	0	r	p	9/ 8/29	21.0	33.9	8.34	15
133	812	0	r	p	9/10/29	22.7	34.7	8.47	7
138	847	0	r	p	9/20/29	26.1	34.8	8.35	5
140	858	100	r	n	10/ 3/29	25.5	35.0	8.34	7
141	868	0	r	p	10/ 5/29	25.9	35.2	8.34	5
144	886	0	r	n	10/11/29	23.3	35.0	8.37	6
147	907	0	r	p	10/17/29	23.3	35.3	8.26	8
148	917	0	r	p	10/19/29	23.4	35.2	.....	...
149	928	50	r	p	10/21/29	23.3	35.0	8.37	6
157	978	0	r	n	11/ 6/29	27.1	35.3	8.27	47
158	983	0	r	n	11/ 8/29	28.2	35.6	8.34	36
158	984	50	r	n	11/ 8/29	28.2	35.6	8.39	50
158	985	100	r	n	11/ 8/29	27.6	35.9	8.39	48
159	992	100	r	n	11/11/29	28.0	35.7	8.37	23

Table 39. Distributional and environmental records for Ceratium paradoxides Cleve

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m^3
1b	7	50	r	n	5/16/28	(22.2	36.4	8.21	39)
2	14	0	r	n	5/18/28	20.5	36.4	8.23	58
15	98	50	r	p	8/11/28	19.8	36.5	8.21	8
15	101	50	r	n	8/11/28	19.8	36.5	8.21	8
15	102	100	r	n	8/11/28	18.4	36.4	8.20	19
18	115	50	r	p	8/17/28	22.4	36.8	8.24	5
18	116	100	oc	p	8/17/28	20.4	36.8	8.21	5
18	119	100	r	n	8/17/28	20.4	36.8	8.21	5
19	124	100	r	n	8/20/28	22.4	37.0	8.25	5
20	127	100	r	p	8/22/28	22.6	36.7	8.19	5
20	130	100	r	n	8/22/28	22.6	36.7	8.19	5
20-21	131	0	r	n	8/23/28	(26.6	36.3	8.32	4)
21	137	100	r	n	8/24/28	21.0	36.8	8.20	7
22	140	50	r	p	8/27/28	24.5	36.2	8.21	9
22	143	50	r	n	8/27/28	24.5	36.2	8.21	9
22	144	100	r	n	8/27/28	17.5	36.1	7.99	123
23	149	50	r	n	8/29/28	20.9	36.0	8.14	13
25	158	50	r	p	9/ 3/28	21.5	36.0	8.22	12
25	161	50	r	n	9/ 3/28	21.5	36.0	8.22	12
25	162	100	r	n	9/ 3/28	14.6	35.7	7.93	121
26	164	50	r	p	9/ 5/29	24.1	36.1	8.21	5
28	177	50	r	n	9/11/28	26.7	36.3	8.26	4
35	204	50	r	n	10/26/28	16.8	34.7	7.92	138
42	242	50	r	n	11/13/28	17.2	34.9	7.99	68
43	245	50	r	n	11/15/28	17.0	34.9	7.93	80
43	249	100	r	p	11/15/28	13.6	35.0	7.90	92
44	251	50	r	n	11/17/28	20.4	34.9	8.04	34
44	255	100	r	p	11/17/28	13.8	35.0	7.85	70
45	257	50	r	n	11/19/28	22.4	35.2	8.13	46
45	258	100	oc	n	11/19/28	18.6	35.1	8.00	50
46	263	100	r	n	11/21/28	22.5	35.4	8.17	40
47	268	100	r	n	11/23/28	22.7	36.2	8.23	20
50	286	100	r	n	11/29/28	20.5	35.7	8.22	13
50	287	0	r	p	11/29/28	23.2	36.0	8.23	13
52	301	100	r	n	12/ 3/28	18.2	35.2	8.17	8
53	305	100	r	n	12/ 5/28	19.9	35.6	8.19	13
54	321	100	r	n	12/14/28	18.7	35.4	8.16	20
55	324	50	r	n	12/16/28	18.7	35.0	8.18	12
55	325	100	r	n	12/16/28	16.7	34.9	7.17	12
56	330	100	oc	n	12/18/28	16.6	34.8	8.11	12
56	333	100	r	p	12/18/28	16.6	34.8	8.11	12
56-57	334	0	oc	n	12/19/28	(19.0	34.5	8.14	20)
57	337	100	r	n	12/20/28	14.3	34.4	8.10	40
57	338	0	r	p	12/20/28	19.0	34.5	8.14	20
57	340	100	r	p	12/20/28	14.3	34.4	8.10	40
62	372	50	r	n	12/30/28	16.2	34.3	8.10	28
66	412	100	oc	n	1/ 7/29	17.8	34.9	8.12	21
66	415	100	r	p	1/ 7/29	17.8	34.9	8.12	21
67	416	0	r	n	1/ 8/29	19.3	34.9	8.11	21
67	418	100	oc	n	1/ 8/29	16.2	34.6	8.05	40
80	490	100	r	p	2/24/29	23.4	36.2	8.16	32
82	500	100	r	p	2/28/29	24.4	36.5	8.19	34
85	514	100	r	p	3/ 6/29	25.2	36.3	8.23	42
91	544	100	r	p	3/27/29	25.8	36.0	8.25	30
94	559	100	r	n	4/22/29	28.5	35.6	8.21	25
95	563	50	r	n	4/24/29	29.3	34.9	8.24	16
95	564	100	r	n	4/24/29	28.5	35.4	8.22	21
96	570	100	oc	n	4/26/29	28.2	35.7	8.19	25
96	573	100	oc	p	4/26/29	28.2	35.7	8.19	25
97	576	100	r	n	4/28/29	27.6	35.6	8.15	25
100	597	100	r	n	5/ 4/29	27.6	34.7	8.22	12
101	605	100	r	n	5/ 7/29	25.2	35.1	8.23	8
102	611	100	r	n	5/ 9/29	25.6	35.0	8.23	8
103	617	100	r	n	5/11/29	24.8	35.2	8.25	5
105	629	100	r	n	5/15/29	25.2	35.1	8.23	5
106	635	100	r	n	5/17/29	25.6	35.1	8.23	5
107	641	100	r	n	5/19/29	26.8	34.9	8.23	11
109	656	100	oc	n	5/29/29	19.4	34.8	8.18	5
109	659	100	r	p	5/29/29	19.4	34.8	8.18	5
110	663	100	r	n	5/31/29	17.9	34.7	8.14	11
112	675	50	oc	n	6/ 5/29	21.7	34.6	8.23	7
113	681	50	r	n	6/25/29	23.8	34.6	8.25	5
113	684	50	r	p	6/25/29	23.8	34.6	8.25	5
113	684	100	r	p	6/25/29	21.5	34.7	8.23	8
131	789	100	r	n	9/ 6/29	12.1	33.4	8.32	...
132	798	50	r	n	9/ 8/29	17.6	33.9	8.33	19

Table 39. Distributional and environmental records for Ceratium paradoxides Cleve--Concluded

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
132	799	100	r	n	9/ 8/29	14.3	33.4	8.30	16
135	822	100	r	n	9/14/29	18.7	34.8	8.34	5
136	834	100	r	p	9/16/29	18.6	35.0	8.39	3
137	838	100	r	n	9/18/29	21.5	35.1	8.30	5
137	841	50	r	p	9/18/29	24.4	35.1	8.34	4
145	891	50	r	n	10/13/29	18.7	34.3	8.34	6
146	898	100	r	n	10/15/29	19.7	34.3	8.26	7
147	905	100	r	n	10/17/29	19.2	35.0	8.29	5
149	922	100	r	n	10/21/29	20.3	34.9	8.38	6
151	939	100	r	n	10/26/29	12.5	34.6	.....	...
152	945	50	r	n	10/27/29	14.2	34.5	7.87	53
152	949	50	r	p	10/27/29	14.2	34.5	7.87	53
154	960	100	r	n	10/31/29	25.3	34.8	7.93	21
157	980	100	r	n	11/ 6/29	26.8	35.5	8.30	64
158	985	100	oc	n	11/ 8/29	27.6	35.9	8.39	48

Table 40. Distributional and environmental records for Ceratium platycorne

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
1b	7	50	r	n	5/16/28	(22.2	36.4	8.21	39)
6b	46	0	r	n	6/ 2/28	(12.4	35.6	8.15	21)
14	91	100	r	n	8/ 9/28	14.0	35.6	8.06	34
14	92	50	r	p	8/ 9/28	15.0	35.1	8.18	16
14	95	50	oc	n	8/ 9/28	15.0	35.1	8.18	16
15	102	100	r	n	8/11/28	18.4	36.4	8.20	19
16	105	100	r	p	8/13/28	19.9	36.5	8.17	13
16	108	100	oc	n	8/13/28	19.9	36.5	8.17	13
17	113	100	r	n	8/15/28	19.3	36.5	8.23	9
18	118	50	r	n	8/17/28	22.4	36.8	8.24	5
19	124	100	r	n	8/20/28	22.4	37.0	8.25	5
20	130	100	r	n	8/22/28	22.6	36.7	8.19	5
22	144	100	oc	n	8/27/28	17.5	36.1	7.99	123
23	150	100	r	n	8/29/28	16.6	36.0	8.18	75
24	156	100	r	n	8/31/28	15.6	35.6	7.96	99
25	158	50	r	p	9/ 3/28	21.5	36.0	8.22	12
25	161	50	r	n	9/ 3/28	21.5	36.0	8.22	12
27	171	50	r	n	9/ 7/28	26.0	36.2	8.30	4
28	177	50	oc	n	9/11/28	26.7	36.3	8.26	4
37	221	50	r	p	11/ 1/28	18.8	34.5	8.00	121
41	239	100	r	p	11/10/28	14.5	35.0	7.91	152
45	258	100	r	n	11/19/28	18.6	35.1	8.00	50
46	263	100	r	n	11/21/28	22.5	35.4	8.17	40
47	268	100	r	n	11/23/28	22.7	36.2	8.23	20
65	407	100	oc	n	1/ 5/29	14.8	34.3	8.10	34
65	410	100	oc	p	1/ 5/29	14.8	34.3	8.10	34
67	418	100	r	n	1/ 8/29	16.2	34.6	8.05	40
68	421	100	r	n	1/10/29	16.5	34.8	8.13	34
93	553	100	r	p	3/31/29	27.6	35.8	8.27	29
101	605	100	r	n	5/ 7/29	25.2	35.1	8.23	8
102	611	100	r	n	5/ 9/29	25.6	35.0	8.23	8
103	620	100	r	p	5/11/29	24.8	35.2	8.25	5
104	626	100	r	p	5/13/29	25.3	35.3	8.21	7
106	635	100	r	n	5/17/29	25.6	35.1	8.23	5
107	641	100	r	n	5/19/29	26.8	34.9	8.23	11
107	644	100	r	p	5/19/29	26.8	34.9	8.23	11
108	648	100	oc	n	5/27/29	25.2	35.0	8.23	4
110	663	100	r	n	5/31/29	17.9	34.7	8.14	11
110	666	100	r	p	5/31/29	17.9	34.7	8.14	11
111	670	100	r	n	6/ 3/29	18.2	34.7	8.13	13
113	681	50	r	n	6/25/29	23.8	34.6	8.25	5
115	694	100	r	n	6/29/29	15.6	34.6	8.08	27
115	698	100	r	p	6/29/29	15.6	34.6	8.08	27
134	817	100	r	p	9/12/29	18.1	34.6	8.34	6
135	826	100	r	p	9/14/29	18.7	34.8	8.34	5
141	865	50	r	n	10/ 5/29	24.8	35.3	8.34	5
142	874	100	r	n	10/ 8/29	16.6	34.4	8.27	7
143	883	100	c	n	10/ 9/29	13.8	34.1	8.30	10
145	892	100	r	n	10/13/29	16.0	34.1	8.31	6
152	945	50	r	n	10/27/29	14.2	34.5	7.87	53
152	949	50	r	p	10/27/29	14.2	34.5	7.87	53
153	953	100	oc	n	10/29/29	20.5	34.7	8.28	31
158	985	100	r	n	11/ 8/29	27.6	35.9	8.39	48

Table 41. Distributional and environmental records for Ceratium ranipes Cleve

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
1	1	0	r	n	5/12/28	24.0	36.2	8.16	34
1b	7	50	oc	n	5/16/28	(22.2	36.4	8.21	39)
1b	8	100	oc	n	5/16/28	(20.3	35.5	8.18	36)
3	20	0	r	n	5/21/28	15.5	36.1	8.15	99
15	98	50	r	p	8/11/28	19.8	36.5	8.21	8
15	101	50	r	n	8/11/28	19.8	36.5	8.21	8
15	102	100	r	n	8/11/28	18.4	36.4	8.20	19
16*	104	50	r	p	8/13/28	24.4	36.4	8.23	8
16	107	50	r	n	8/13/28	24.4	36.4	8.23	8
16*	108	100	r	n	8/13/28	19.9	36.5	8.17	13
18	119	100	r	n	8/17/28	20.4	36.8	8.21	5
19	123	50	r	n	8/20/28	25.2	37.1	8.27	5
20	127	100	r	p	8/22/28	22.6	36.7	8.19	5
20	130	100	oc	n	8/22/28	22.6	36.7	8.19	5
21	137	100	r	n	8/24/28	21.0	36.8	8.20	7
22	144	100	r	n	8/27/28	17.5	36.1	7.99	123
23	145	0	r	p	8/29/28	27.2	35.9	8.25	4
23	148	0	r	n	8/29/28	27.2	35.9	8.25	4
23	149	50	oc	n	8/29/28	20.9	36.0	8.14	13
24	152	50	r	p	8/31/28	23.1	36.0	8.14	8
24	155	50	r	n	8/31/28	23.1	36.0	8.14	8
25	157	0	r	p	9/ 3/28	27.5	35.6	8.31	5
25	161	50	r	n	9/ 3/28	21.5	36.0	8.22	12
27	172	100	oc	n	9/ 7/28	17.7	36.0	8.09	46
28	174	50	r	p	9/11/28	26.7	36.3	8.26	4
29	179	0	r	p	9/13/28	27.6	36.2	8.31	3
30	186	50	r	p	9/15/28	27.8	36.1	8.29	3
30	189	50	r	n	9/15/28	27.8	36.1	8.29	3
31	191	0	oc	n	10/ 3/28	28.5	34.4	8.27	2
32	194	0	r	n	10/ 5/28	28.0	36.0	8.23	2
32	195	50	r	n	10/ 5/28	27.2	36.0	8.24	2
32	196	100	oc	n	10/ 5/28	22.2	36.4	8.10	30
33	198A	50	r	p	10/ 8/28	28.2	36.2	8.24	4
40	232	0	r	p	11/ 8/28	22.2	33.7	8.21	24
41a	240	0	r	n	11/12/28	(18.7	34.7	8.06	45)
44	254	50	r	p	11/17/28	20.4	34.9	8.04	34
45	256	0	r	n	11/19/28	22.4	35.3	8.12	38
45	258	100	r	n	11/19/28	18.6	35.1	8.00	50
46	261	0	r	n	11/21/28	23.3	35.3	8.16	36
46	262	50	r	n	11/21/28	23.2	35.3	8.16	40
46	263	100	r	n	11/21/28	22.5	35.4	8.17	40
46	264	0	r	p	11/21/28	23.3	35.3	8.16	36
46	265	50	r	p	11/21/28	23.2	35.3	8.16	40
47	267	50	r	n	11/23/28	23.8	36.0	8.23	20
47	268	100	r	n	11/23/28	22.7	36.2	8.23	20
48	273	100	n	r	11/25/28	22.7	36.3	8.26	16
49	279	100	r	n	11/27/28	21.6	35.9	8.26	13
49	282	100	r	p	11/27/28	21.6	35.9	8.26	13
50	286	100	r	n	11/29/28	20.5	35.7	8.22	13
50	289	100	r	p	11/29/28	20.5	35.7	8.22	13
52	301	100	r	n	12/ 3/28	18.2	35.2	8.17	8
54	321	100	r	n	12/14/28	18.7	35.4	8.16	20
55	324	50	r	n	12/16/28	18.7	35.0	8.18	12
56	330	100	r	n	12/18/28	16.6	34.8	8.11	12
57	337	100	oc	n	12/20/28	14.3	34.4	8.10	40
57	340	100	r	p	12/20/28	14.3	34.4	8.10	40
62	372	50	r	n	12/30/28	16.2	34.3	8.10	28
62	373	100	r	n	12/30/28	13.1	34.2	8.06	48
62	375	50	r	p	12/30/28	16.2	34.3	8.10	28
63	384	100	r	p	1/ 1/29	15.8	34.6	8.08	24
64	396	100	r	n	1/ 3/29	15.8	34.5	8.10	32
66	415	100	r	p	1/ 7/29	17.8	34.9	8.12	21
74	459	0	r	p	2/12/29	24.2	35.6	8.17	68
77	472	0	r	n	2/18/29	23.7	36.0	8.19	16
77	473	0	r	p	2/18/29	23.7	36.0	8.19	16
77	474	50	oc	p	2/18/29	23.5	36.0	8.19	16
78	476	50	r	n	2/20/29	23.8	36.1	8.14	32
81	491	0	r	n	2/26/29	26.5	35.8	8.19	38
81	492	50	r	n	2/26/29	26.4	35.9	8.19	38
82	497	50	r	n	2/28/29	27.2	36.3	8.21	34
87	522	50	r	n	3/11/29	26.5	36.1	8.26	20
93	551	50	r	n	3/31/29	28.5	34.8	8.30	28
93	553	100	r	p	3/31/29	27.6	35.8	8.27	29
94	558	50	r	n	4/22/29	29.3	34.7	8.25	14
94	559	100	r	n	4/22/29	28.5	35.6	8.21	25
95	563	50	oc	n	4/24/29	29.3	34.9	8.24	16

Table 41. Distributional and environmental records for Ceratium ranipes Cleve--Concluded

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m^3
95	564	100	oc	n	4/24/29	28.5	35.4	8.22	21
95	566	50	r	p	4/24/29	29.3	34.9	8.24	16
96	568	0	oc	n	4/26/29	29.3	35.3	8.23	12
96	569	50	oc	n	4/26/29	29.2	35.3	8.23	12
96	570	100	oc	n	4/26/29	28.2	35.7	8.19	25
96	571	0	r	p	4/26/29	29.3	35.3	8.23	12
96	572	50	r	p	4/26/29	29.2	35.3	8.23	12
97	574	0	r	n	4/28/29	28.3	35.2	8.16	24
97	575	50	oc	n	4/28/29	28.0	35.4	8.16	21
97	576	100	r	n	4/28/29	27.6	35.6	8.15	25
98	581	0	oc	n	4/30/29	27.0	35.3	8.16	24
98	582	50	r	n	4/30/29	26.9	35.3	8.16	28
98	583	100	oc	n	4/30/29	26.7	35.4	8.14	32
98	585	50	r	p	4/30/29	26.9	35.3	8.16	28
98	588	0-100	r	p	4/30/29	26.7	35.4	8.14	32
99	589	0	oc	n	5/ 2/29	27.9	34.9	8.21	12
99	591	100	oc	n	5/ 2/29	27.8	35.0	8.22	17
99	592	0	r	p	5/ 2/29	27.9	34.9	8.21	12
99	593	50	r	p	5/ 2/29	27.8	34.9	8.22	12
99	595	0	oc	n	5/ 2/29	27.9	34.9	8.21	12
100	596	50	oc	n	5/ 4/29	27.6	34.7	8.21	10
100	597	100	oc	n	5/ 4/29	27.6	34.7	8.22	12
100	598	0	r	p	5/ 4/29	27.7	34.7	8.21	10
100	599	50	r	p	5/ 4/29	27.6	34.7	8.21	10
101	603	0	r	n	5/ 7/29	26.3	34.7	8.24	8
101	605	100	r	n	5/ 7/29	25.2	35.1	8.23	8
103	616	50	r	n	5/11/29	25.8	35.2	8.25	5
107	641	100	r	n	5/19/29	26.8	34.9	8.23	11
108	647	50	r	n	5/27/29	26.8	35.0	8.24	4
108	648	100	r	n	5/27/29	25.2	35.0	8.23	4
109	656	100	oc	n	5/29/29	19.4	34.8	8.18	5
109	659	100	r	p	5/29/29	19.4	34.8	8.18	5
112	675	50	oc	n	6/ 5/29	21.7	34.6	8.23	7
112	676	100	r	n	6/ 5/29	19.8	34.7	8.20	8
113	681	50	r	n	6/25/29	23.8	34.6	8.25	5
113	685	100	r	p	6/25/29	21.5	34.7	8.23	8
132	798	50	r	n	9/ 8/29	17.6	33.9	8.33	19
133	806	100	r	n	9/10/29	18.4	34.8	8.31	7
134	810	100	r	n	9/12/29	18.1	34.6	8.34	6
135	822	100	r	n	9/14/29	18.7	34.8	8.34	5
137	838	100	r	n	9/18/29	21.5	35.1	8.30	5
138	845	100	r	n	9/20/29	22.2	34.8	8.31	3
145	891	50	r	n	10/13/29	18.7	34.3	8.34	6
145	892	100	r	n	10/13/29	16.0	34.1	8.31	6
149	922	100	r	n	10/21/29	20.3	34.9	8.38	6
150	931	100	r	n	10/23/29	19.6	34.6	8.32	11
150	936	100	r	p	10/23/29	19.6	34.6	8.32	11
151	937	0	r	n	10/26/29	26.0	34.0	.....	...
151	938	50	oc	n	10/26/29	18.3	34.4	.....	...
152	948	0	r	p	10/27/29	27.4	33.7	8.35	20
153	952	50	oc	n	10/29/29	28.1	34.4	8.39	7
153	953	100	r	n	10/29/29	20.5	34.7	8.28	31
153	955	0	r	p	10/29/29	28.1	34.2	8.47	7
153	956	50	r	p	10/29/29	28.1	34.4	8.39	7
154	958	0	r	n	10/31/29	28.3	34.2	8.39	7
154	959	50	oc	n	10/31/29	28.2	34.2	8.40	7
155	965	0	r	n	11/ 2/29	27.8	34.9	8.29	29
155	966	50	oc	n	11/ 2/29	27.7	34.9	8.30	30
155	967	100	r	n	11/ 2/29	27.2	35.0	8.30	35
156	972	0	r	n	11/ 4/29	27.6	35.0	8.34	28
156	973	50	r	n	11/ 4/29	27.0	35.1	8.37	46
157	978	0	oc	n	11/ 6/29	27.1	35.3	8.27	47
157	979	50	r	n	11/ 6/29	27.1	35.2	8.32	60
157	980	100	r	n	11/ 6/29	26.8	35.3	8.30	64
158	983	0	oc	n	11/ 8/29	28.2	35.6	8.34	36
158	984	50	oc	n	11/ 8/29	28.2	35.6	8.39	50
158	985	100	oc	n	11/ 8/29	27.6	35.9	8.39	48
159	990	0	r	n	11/11/29	28.6	35.7	8.37	15
159	991	50	r	n	11/11/29	28.5	35.7	8.39	15
160	1000	0	r	n	11/13/29	28.6	35.6	8.37	12
160	1002	50	r	n	11/13/29	28.6	35.6	8.39	15

*Only four fingers.

Table 42. Distributional and environmental records for Ceratium macroceros

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3	Subspecies
1	1	0	oc	n	5/12/28	24.0	36.2	8.16	34	gal
1a	4	0	r	n	5/14/28	(22.3	36.3	8.20	46)	gal
1a	5	0	oc	n	5/14/28	(22.3	36.3	8.20	46)	gal
1b	6	0	oc	n	5/16/28	(22.3	36.3	8.20	46)	gal
1b	7	50	oc	n	5/16/28	(22.2	36.4	8.21	39)	gal
2	12	50	oc	n	5/18/28	20.5	36.4	8.21	46	gal
2	13	100	oc	n	5/18/28	19.8	36.4	8.21	33	gal
2	14	0	c	n	5/18/28	20.5	36.4	8.23	58	gal
2	15	0	r	n	5/18/28	20.5	36.4	8.23	58	gal
3	17	0	c	n	5/21/28	15.5	36.1	8.15	99	mac
3	18	50	oc	n	5/21/28	15.0	36.0	8.19	30	mac
3	20	0	oc	n	5/21/28	15.5	36.1	8.15	99	mac
5a	33	0	r	n	5/30/28	(12.4	35.6	8.15	21)	mac
6	36	50	r	n	5/31/28	11.6	35.6	8.12	32	mac
6	37	100	r	n	5/31/28	11.3	35.6	8.08	41	mac
6b	43	0	r	n	6/ 2/28	(12.4	35.6	8.15	21)	mac
6b	44	0	r	n	6/ 2/28	(12.4	35.6	8.15	21)	mac
6b	45	0	oc	n	6/ 2/28	(12.4	35.6	8.15	21)	mac
6b	46	0	oc	n	6/ 2/28	(12.4	35.6	8.15	21)	mac
6c	47	100	r	n	6/ 2/28	(11.3	35.6	8.08	41)	mac
6f	53	0	oc	n	7/ 9/28	(10.6	35.4	8.11	28)	mac
6g	54	0	oc	n	7/10/28	(10.6	35.4	8.11	28)	mac
6h	55	0	a	n	7/11/28	(10.6	35.4	8.11	28)	mac
7	56	0	r	n	7/13/28	8.9	35.2	8.08	34	mac
7	57	50	oc	n	7/13/28	8.2	35.2	8.03	47	mac
7	58	100	r	n	7/13/28	8.1	35.2	8.04	57	mac
8	59	0	oc	n	7/15/28	10.3	35.2	7.93	13	mac
8	61	100	r	n	7/15/28	8.4	35.3	7.95	54	mac
9	64	0	c	n	7/28/28	11.2	35.1	8.08	20	mac
9	65	50	oc	n	7/28/28	8.4	35.1	7.96	55	mac
9	66	100	r	n	7/28/28	7.6	35.1	7.98	56	mac
10	68	0	oc	n	7/30/28	10.9	34.9	8.08	28	mac
11	74	50	oc	n	8/ 1/28	7.3	34.9	7.92	63	mac
11	75	0	oc	p	8/ 1/28	10.7	34.9	8.06	27	mac
11a	78	0	oc	n	8/ 2/28	(10.7	34.9	8.06	27)	mac
12	80	50	r	p	8/ 5/28	3.9	34.7	7.91	95	mac
12	82	0	r	p	8/ 5/28	8.4	33.6	8.10	27	mac
13	85	50	r	n	8/ 7/28	-1.6	33.4	7.87	59	gal
13a	88	0	r	n	8/ 8/28	(21.2	35.2	8.18	11)	mac
13a	89	0	r	n	8/ 8/28	(11.3	32.7	8.09	19)	gal
14	91	100	r	p	8/ 9/28	14.0	35.6	8.06	34	mac
14	93	0	oc	p	8/ 9/28	21.2	35.2	8.18	11	mac
14	94	100	oc	n	8/ 9/28	14.0	35.6	8.06	34	mac
15	97	0	r	p	8/11/28	24.8	36.4	8.21	11	mac
15	98	50	r	p	8/11/28	19.8	36.5	8.21	8	mac
15	99	100	oc	p	8/11/28	18.4	36.4	8.20	19	mac
15	100	0	r	n	8/11/28	24.8	36.4	8.21	11	mac
15	101	50	oc	n	8/11/28	19.8	36.5	8.21	8	mac
15	102	100	r	n	8/11/28	18.4	36.4	8.20	19	mac
16	103	0	r	p	8/13/28	25.9	36.2	8.24	8	gal
16	104	50	r	p	8/13/28	24.4	36.4	8.23	8	gal
16	106	0	r	n	8/13/28	25.9	36.2	8.24	8	mac
16	107	50	r	n	8/13/28	24.4	36.4	8.23	8	mac
17	109	0	oc	p	8/15/28	26.2	36.6	8.29	9	gal
17	110	50	r	p	8/15/28	21.9	36.6	8.28	12	gal
17	111	0	r	n	8/15/28	26.2	36.6	8.29	9	gal
17	112	50	oc	n	8/15/28	21.9	36.6	8.28	12	gal
17	113	100	oc	n	8/15/28	19.3	36.5	8.23	9	gal
18	114	0	oc	p	8/17/28	27.0	37.0	8.23	5	gal
18	115	50	c	p	8/17/28	22.4	36.8	8.24	5	gal
18	116	100	r	p	8/17/28	20.4	36.8	8.21	5	gal
18	117	0	r	n	8/17/28	27.0	37.0	8.23	5	gal
18	118	50	c	n	8/17/28	22.4	36.8	8.24	5	gal
18	119	100	oc	n	8/17/28	20.4	36.8	8.21	5	gal
19	120	0	oc	p	8/20/28	26.6	37.0	8.34	5	gal
19	121	50	oc	p	8/20/28	25.2	37.1	8.27	5	gal
19	123	50	oc	n	8/20/28	25.2	37.1	8.27	5	gal
19	124	100	oc	n	8/20/28	22.4	37.0	8.25	5	gal
20	127	100	r	p	8/22/28	22.6	36.7	8.19	5	gal
20	128	0	oc	n	8/22/28	26.0	36.6	8.37	5	gal
20	130	100	oc	n	8/22/28	22.6	36.7	8.19	5	gal
20-21	131	0	r	n	8/23/28	(26.6	36.3	8.32	4)	gal
22	139	0	r	p	8/27/28	26.7	36.0	8.26	8	gal
22	143	50	r	n	8/27/28	24.5	36.2	8.21	9	gal
22	144	100	r	n	8/27/28	17.5	36.1	7.99	123	gal
23	145	0	r	p	8/29/28	27.2	35.9	8.25	4	gal

Table 42. Distributional and environmental records for Ceratium macroceros--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3	Subspecies
23	149	50	r	n	8/29/28	20.9	36.0	8.14	13	gal
23	150	100	r	n	8/29/28	16.6	36.0	8.18	75	gal
24	155	50	r	n	8/31/28	23.1	36.0	8.14	8	gal
25	161	50	r	n	9/ 3/28	21.5	36.0	8.22	12	gal
25	162	100	r	n	9/ 3/28	14.6	35.7	7.93	121	gal
26	163	0	r	p	9/ 5/28	27.6	36.0	8.30	5	gal
26	166	0	r	n	9/ 5/28	27.6	36.0	8.30	5	gal
27	170	0	r	n	9/ 7/28	27.5	36.3	8.31	4	gal
28	178	100	r	n	9/11/28	22.8	36.6	8.22	7	gal
28	182	0	r	n	9/13/28	27.6	36.2	8.31	3	gal
29	183	50	r	n	9/13/28	27.2	36.2	8.31	3	gal
30	188	0	r	n	9/15/28	28.0	36.1	8.30	2	gal
30	189	50	r	n	9/15/28	27.8	36.1	8.29	3	gal
30	190	100	r	n	9/15/28	24.1	36.4	8.10	20	gal
31	192	50	r	n	10/ 3/28	28.2	35.4	8.23	2	gal
32	194	0	oc	n	10/ 5/28	28.0	36.0	8.23	2	gal
33	197A	0	r	p	10/ 8/28	28.5	35.6	8.23	4	gal
33	198	50	oc	n	10/ 8/28	28.2	36.2	8.24	4	gal
33	198A	50	r	p	10/ 8/28	28.2	36.2	8.24	4	gal
34	200A	0	r	p	10/ 9/28	28.5	35.9	8.28	2	gal
34	201	100	oc	n	10/ 9/28	20.5	36.6	8.16	16	gal
34	202	50	oc	n	10/ 9/28	25.0	36.5	8.21	3	gal
37	218	50	r	n	11/ 1/28	18.8	34.5	8.00	121	gal
37	220	0	r	p	11/ 1/28	27.1	31.7	8.28	15	gal
40	232	0	r	p	11/ 8/28	22.2	33.7	8.21	24	gal
42	241	0	r	n	11/13/28	18.7	34.7	8.06	45	gal
43	246	100	r	n	11/15/28	13.6	35.0	7.90	92	gal
44	250	0	r	n	11/17/28	20.7	34.9	8.03	38	gal
45	257	50	oc	n	11/19/28	22.4	35.2	8.13	46	gal
45	258	100	r	n	11/19/28	18.6	35.1	8.00	50	gal
45	260	50-0	r	p	11/19/28	22.4	35.2	8.13	46	gal
46	262	50	oc	n	11/21/28	23.2	35.3	8.16	40	gal
46	263	100	oc	n	11/21/28	22.5	35.4	8.17	40	gal
46	264	0	oc	p	11/21/28	23.3	35.3	8.16	36	gal
46	265	50	r	p	11/21/28	23.2	35.3	8.16	40	gal
47	266	0	r	n	11/23/28	23.9	36.0	8.23	17	gal
47	267	50	oc	n	11/23/28	23.8	36.0	8.23	20	gal
47	268	100	oc	n	11/23/28	22.7	36.2	8.23	20	gal
47	269	0	oc	p	11/23/28	23.9	36.0	8.23	17	gal
47	270	50	r	p	11/23/28	23.8	36.0	8.23	20	gal
48	271	0	oc	n	11/25/28	23.6	36.4	8.23	13	gal
48	272	50	r	n	11/25/28	23.6	36.4	8.24	16	gal
48	273	100	oc	n	11/25/28	22.7	36.3	8.26	16	gal
48	274	0	oc	p	11/25/28	23.6	36.4	8.23	13	gal
48	275	50	r	p	11/25/28	23.6	36.4	8.24	16	gal
48	276	100	oc	p	11/25/28	22.7	36.3	8.26	16	gal
49	278	50	r	n	11/27/28	22.6	36.1	8.26	13	gal
49	279	100	r	n	11/27/28	21.6	35.9	8.26	13	gal
49	281	50	oc	p	11/27/28	22.6	36.1	8.26	13	gal
49	282	100	r	p	11/27/28	21.6	35.9	8.26	13	gal
49a	283	0	oc	n	11/28/28	(23.2	36.0	8.23	13)	gal
50	285	50	oc	n	11/29/28	22.0	35.9	8.23	13	gal
50	286	100	oc	n	11/29/28	20.5	35.7	8.22	13	gal
50	288	50	oc	p	11/29/28	22.0	35.9	8.23	13	gal
51	294	50	oc	n	12/ 1/28	20.5	35.6	8.22	17	gal
51	295	100	oc	n	12/ 1/28	20.0	35.6	8.22	17	gal
51	297	50	r	p	12/ 1/28	20.5	35.6	8.22	17	gal
51	298	100	oc	p	12/ 1/28	20.0	35.6	8.22	17	gal
52	300	50	oc	n	12/ 3/28	20.2	35.6	8.20	8	gal
52	301	100	oc	n	12/ 3/28	18.2	35.2	8.17	8	gal
53	304	50	oc	n	12/ 5/28	21.2	35.8	8.20	13	gal
53	305	100	oc	n	12/ 5/28	19.9	35.6	8.19	13	gal
53	306	0	r	p	12/ 5/28	22.6	35.7	8.22	13	gal
53-54	308	0	oc	n	12/ 6/28	(23.0	35.6	8.22	11)	gal
53-54	311	0	r	n	12/10/28	(23.0	35.6	8.22	11)	gal
53-54	316	0	r	n	12/12/28	(23.0	35.6	8.22	11)	gal
54	320	50	oc	n	12/14/28	19.8	35.4	8.18	17	gal
54	321	100	oc	n	12/14/28	18.7	35.4	8.16	20	gal
55	324	50	oc	n	12/16/28	18.7	35.0	8.18	12	gal
55	325	100	oc	n	12/16/28	16.7	34.9	7.17	12	gal
55	327	50	r	p	12/16/28	18.7	35.0	8.18	12	gal
56	328	0	c	n	12/18/28	20.8	34.9	8.13	9	gal
56	329	50	oc	n	12/18/28	18.5	35.1	8.14	9	gal
56	330	100	c	n	12/18/28	16.6	34.8	8.11	12	gal
56	332	50	oc	p	12/18/28	18.5	35.1	8.14	9	gal
56	333	100	r	p	12/18/28	16.6	34.8	8.11	12	gal

Table 42. Distributional and environmental records for Ceratium macroceros--Continued

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3	Sub-species
56-57	334	0	oc	n	12/19/28	(19.0	34.5	8.14	20)	gal
57	335	0	oc	n	12/20/28	19.0	34.5	8.14	20	gal
57	336	50	oc	n	12/20/28	15.6	34.3	8.14	21	gal
57	337	100	oc	n	12/20/28	14.3	34.4	8.10	40	gal
57	338	0	r	p	12/20/28	19.0	34.5	8.14	20	gal
57	339	50	oc	p	12/20/28	15.6	34.3	8.14	21	gal
57	340	100	r	p	12/20/28	14.3	34.4	8.10	40	gal
58	341	0	r	n	12/22/28	17.0	34.0	8.12	20	gal
60	355	50	oc	n	12/26/28	13.4	34.0	8.06	54	gal
60	356	100	oc	n	12/26/28	10.6	34.0	8.03	62	gal
60	358	50	r	p	12/26/28	13.4	34.0	8.06	54	gal
60	359	0	r	p	12/26/28	15.0	34.0	8.07	50	gal
60-61	360	0	oc	n	12/26/28	(15.0	34.0	8.07	50)	gal
61	363	0	c	n	12/28/28	16.9	34.0	8.05	46	gal
61	364	50	c	n	12/28/28	14.0	34.0	8.05	60	gal
61	365	100	oc	n	12/28/28	10.8	34.0	8.03	80	gal
61	366	0	c	p	12/28/28	16.9	34.0	8.05	46	gal
61	367	50	oc	p	12/28/28	14.0	34.0	8.05	60	gal
61-62	369	0	oc	n	12/28/28	(16.9	34.0	8.05	46)	gal
61-62	370	0	oc	n	12/29/28	(16.9	34.0	8.05	46)	gal
62	371	0	oc	n	12/30/28	19.2	34.2	8.12	32	gal
62	372	50	oc	n	12/30/28	16.2	34.3	8.10	28	gal
62	373	100	oc	n	12/30/28	13.1	34.2	8.06	48	gal
62	374	0	oc	p	12/30/28	19.2	34.2	8.12	32	gal
62	375	50	r	p	12/30/28	16.2	34.3	8.10	28	gal
62	376	100	r	p	12/30/28	13.1	34.2	8.06	48	gal
62-63	377	0	r	n	12/31/28	(20.5	34.6	8.07	21)	gal
63	379	0	oc	n	1/ 1/29	20.5	34.6	8.07	21	gal
63	380	50	oc	n	1/ 1/29	17.0	34.6	8.08	25	gal
63	383	50	r	p	1/ 1/29	17.0	34.6	8.08	25	gal
63-64	385	0	r	n	1/ 1/29	(20.5	34.6	8.07	21)	gal
63-64	387	0	r	n	1/ 2/29	(20.5	34.6	8.07	21)	gal
64	395	50	r	n	1/ 3/29	17.2	34.6	8.12	29	gal
64	396	100	r	n	1/ 3/29	15.8	34.5	8.10	32	gal
64	398	0	r	p	1/ 3/29	20.6	34.6	8.12	21	gal
64-65	402	0	r	n	1/ 4/29	(20.6	34.6	8.12	21)	gal
64-65	404	0	r	n	1/ 4/29	(20.6	34.6	8.12	21)	gal
65	405	0	r	n	1/ 5/29	20.2	34.5	8.10	24	gal
65	406	50	r	n	1/ 5/29	16.5	34.5	8.10	25	gal
65	408	0	r	p	1/ 5/29	20.2	34.5	8.10	24	gal
65	409	50	r	p	1/ 5/29	16.5	34.5	8.10	25	gal
66	411	0	r	n	1/ 7/29	19.4	34.7	8.10	29	gal
66	413	0	r	p	1/ 7/29	19.4	34.7	8.10	29	gal
66	414	50	r	p	1/ 7/29	17.8	34.8	8.10	29	gal
66	415	100	r	p	1/ 7/29	17.8	34.9	8.12	21	gal
67	416	0	c	n	1/ 8/29	19.3	34.9	8.11	21	gal
76	471	50	r	p	2/16/29	22.1	35.9	8.14	42	gal
77	474	50	r	p	2/18/29	23.5	36.0	8.19	16	gal
78	475	0	oc	n	2/20/29	24.6	36.0	8.17	32	gal
78	476	50	oc	n	2/20/28	23.8	36.1	8.14	32	gal
78	477	100	oc	n	2/20/28	21.9	36.2	8.14	34	gal
78	478	0	r	p	2/20/28	24.6	36.0	8.17	32	gal
78	479	50	oc	p	2/20/29	23.8	36.1	8.14	32	gal
78	480	100	r	p	2/20/29	21.9	36.2	8.14	34	gal
79	481	0	oc	n	2/22/29	25.2	36.0	8.17	34	gal
79	482	50	r	n	2/22/29	24.5	36.1	8.17	34	gal
79	483	100	oc	n	2/22/29	21.8	36.2	8.13	45	gal
79	484	0	r	p	2/22/29	25.2	36.0	8.17	34	gal
80	486	0	oc	n	2/24/29	26.0	35.9	8.20	36	gal
80	487	50	r	n	2/24/29	25.9	36.0	8.19	29	gal
80	488	0	oc	p	2/24/29	26.0	35.9	8.20	36	gal
80	489	50	r	p	2/24/29	25.9	36.0	8.19	29	gal
80	490	100	r	p	2/24/29	23.4	36.2	8.16	32	gal
81	491	0	c	n	2/26/29	26.5	35.8	8.19	38	gal
81	492	50	oc	n	2/26/29	26.4	35.9	8.19	38	gal
81	493	0	oc	p	2/26/29	26.5	35.8	8.19	38	gal
81	494	50	oc	p	2/26/29	26.4	35.9	8.19	38	gal
81	495	100	r	p	2/26/29	23.6	36.2	8.18	36	gal
82	496	0	oc	n	2/28/29	27.2	36.3	8.21	34	gal
82	497	50	r	n	2/28/29	27.2	36.3	8.21	34	aal
82	498	0	oc	p	2/28/29	27.2	36.3	8.21	34	gal
82	500	100	r	p	2/28/29	24.4	36.5	8.19	34	gal
83	501	0	c	n	3/ 2/29	27.5	36.3	8.24	29	gal
83	502	50	c	n	3/ 2/29	27.4	36.3	8.24	25	gal
83	503	0	r	p	8/ 2/29	27.5	36.3	8.24	29	gal
83	504	50	oc	p	3/ 2/29	27.4	36.5	8.24	25	gal

Table 42. Distributional and environmental records for Ceratium macroceros--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3	Subspecies
84	505	0	c	n	3/ 4/29	27.8	36.2	8.23	24	gal
84	506	50	oc	n	3/ 4/29	27.5	36.4	8.21	24	gal
84	507	0	r	p	3/ 4/29	27.8	36.2	8.23	24	gal
84	508	50	oc	p	3/ 4/29	27.5	36.4	8.21	24	gal
85	510	0	oc	n	3/ 6/29	27.9	36.2	8.22	40	gal
85	511	50	oc	n	3/ 6/29	27.8	36.2	8.22	40	gal
85	512	0	r	p	3/ 6/29	27.9	36.2	8.22	40	gal
85	513	50	oc	p	3/ 6/29	27.8	36.2	8.22	40	gal
86	516	0	oc	n	3/ 9/29	28.3	36.2	8.29	20	gal
86	519	50	r	p	3/ 9/29	27.4	36.2	8.29	17	gal
87	521	0	r	n	3/11/29	27.8	36.1	8.28	17	gal
87	522	50	oc	n	3/11/29	26.5	36.1	8.26	20	gal
87	524	50	r	p	3/11/29	26.5	36.1	8.26	20	gal
87	525	100	r	p	3/11/29	23.9	36.0	8.23	20	gal
88	526	0	oc	n	3/21/29	28.5	35.9	8.23	16	gal
88	527	50	oc	n	3/21/29	28.4	35.9	8.25	13	gal
89	528	0	oc	n	3/23/29	28.4	35.6	8.25	21	gal
89	529	50	c	n	3/23/29	28.6	35.8	8.27	12	gal
89	530	0	oc	p	3/23/29	28.4	35.6	8.25	21	gal
90	533	0	oc	n	3/25/29	28.5	35.5	8.27	21	gal
90	534	50	oc	n	3/25/29	28.6	35.6	8.26	21	gal
90	535	0	r	p	3/25/29	28.5	35.5	8.27	21	gal
90	536	50	r	p	3/25/29	28.6	35.6	8.26	21	gal
91	540	0	r	n	3/27/29	28.7	35.1	8.30	21	gal
91	541	50	c	n	3/27/29	28.5	35.2	8.30	24	gal
91	543	50	r	p	3/27/29	28.5	35.2	8.30	24	gal
91	544	100	oc	p	3/27/29	25.8	36.0	8.25	30	gal
92	545	0	oc	n	3/29/29	28.5	35.3	8.29	28	gal
92	546	50	c	n	3/29/29	28.4	35.4	8.29	28	gal
92	547	0	r	p	3/29/29	28.5	35.3	8.29	28	gal
92	549	100	r	p	3/29/29	26.2	36.0	8.28	28	gal
93	551	50	oc	n	3/31/29	28.5	34.8	8.30	28	gal
93	552	0	r	p	3/31/29	28.7	34.7	8.30	28	gal
93	553	100	r	p	3/31/29	27.6	35.8	8.27	29	gal
94	558	50	r	n	4/22/29	29.3	34.7	8.25	14	gal
94	559	100	oc	n	4/22/29	28.5	35.6	8.21	25	gal
94	561	50	r	p	4/22/29	29.3	34.7	8.25	14	gal
95	563	50	oc	n	4/24/29	29.3	34.9	8.24	16	gal
95	564	100	oc	n	4/24/29	28.5	35.4	8.22	21	gal
95	566	50	r	p	4/24/29	29.3	34.9	8.24	16	gal
96	568	0	r	n	4/26/29	29.3	35.3	8.23	12	gal
95	568A	0	r	n	4/25/29	(29.4	34.7	8.26	14)	gal
96	569	50	r	n	4/26/29	29.2	35.3	8.23	12	gal
96	570	100	oc	n	4/26/29	28.2	35.7	8.19	25	gal
96	572	50	r	p	4/26/29	29.2	35.3	8.23	12	gal
97	575	50	oc	n	4/28/29	28.0	35.4	8.16	21	gal
97	576	100	r	n	4/28/29	27.6	35.6	8.15	25	gal
97	578	50	r	p	4/28/29	28.0	35.4	8.16	21	gal
98	582	50	oc	n	4/30/29	26.9	35.3	8.16	28	gal
98	583	100	r	n	4/30/29	26.7	35.4	8.14	32	gal
98	585	50	r	p	4/30/29	26.9	35.3	8.16	28	gal
99	589	0	r	n	5/ 2/29	27.9	34.9	8.21	12	gal
99	590	50	c	n	5/ 2/29	27.8	34.9	8.22	12	gal
99	591	100	c	n	5/ 2/29	27.8	35.0	8.22	17	gal
99	592	0	r	p	5/ 2/29	27.9	34.9	8.21	12	gal
99	595	0	oc	n	5/ 2/29	27.9	34.9	8.21	12	gal
100	596	50	oc	n	5/ 4/29	27.6	34.7	8.21	10	gal
100	597	100	r	n	5/ 4/29	27.6	34.7	8.22	12	gal
100	598	0	oc	p	5/ 4/29	27.7	34.7	8.21	10	gal
100	599	50	r	p	5/ 4/29	27.6	34.7	8.21	10	gal
100	602	100	r	p	5/ 4/29	27.6	34.7	8.22	12	gal
101	603	0	c	n	5/ 7/29	26.3	34.7	8.24	8	gal
101	604	50	c	n	5/ 7/29	26.2	34.7	8.24	8	gal
101	605	100	oc	n	5/ 7/29	25.2	35.1	8.23	8	gal
101	606	0	r	p	5/ 7/29	26.3	34.7	8.24	8	gal
101	607	50	oc	p	5/ 7/29	26.2	34.7	8.24	8	gal
101	608	100	r	p	5/ 7/29	25.2	35.1	8.23	8	gal
102	609	0	c	n	5/ 9/29	25.8	35.0	8.24	8	gal
102	610	50	oc	n	5/ 9/29	25.8	35.0	8.24	8	gal
102	611	100	oc	n	5/ 9/29	25.6	35.0	8.23	8	gal
102	612	0	oc	p	5/ 9/29	25.8	35.0	8.24	8	gal
102	613	50	oc	p	5/ 9/29	25.8	35.0	8.24	8	gal
102	614	100	oc	p	5/ 9/29	25.6	35.0	8.23	8	gal
103	615	0	oc	n	5/11/29	26.0	35.0	8.25	5	gal
103	616	50	c	n	5/11/29	25.8	35.2	8.25	5	gal
103	617	100	c	n	5/11/29	24.8	35.2	8.25	5	gal

Table 42. Distributional and environmental records for Ceratium macroceros--Continued

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3	Sub-species
103	618	0	oc	p	5/11/29	26.0	35.0	8.25	5	gal
103	619	50	r	p	5/11/29	25.8	35.2	8.25	5	gal
104	621	0	oc	n	5/13/29	26.1	35.2	8.24	7	gal
104	622	50	c	n	5/13/29	25.8	35.2	8.24	7	gal
104	623	100	c	n	5/13/29	25.3	35.3	8.21	7	gal
104	624	0	r	p	5/13/29	26.1	35.2	8.24	7	gal
104	625	50	oc	p	5/13/29	25.8	35.2	8.24	7	gal
104	626	100	r	p	5/13/29	25.3	35.3	8.21	7	gal
105	627	50	oc	n	5/15/29	26.8	34.9	8.23	5	gal
105	628	50	c	n	5/15/29	26.8	34.9	8.23	5	gal
105	629	100	oc	n	5/15/29	25.2	35.1	8.23	5	gal
105	630	0	r	p	5/15/29	26.9	34.9	8.23	5	gal
105	631	50	r	p	5/15/29	26.8	34.9	8.23	5	gal
106	633	0	c	n	5/17/29	27.2	35.0	8.23	5	gal
106	634	50	c	n	5/17/29	27.0	35.0	8.23	5	gal
106	635	100	c	n	5/17/29	25.6	35.1	8.23	5	gal
106	636	0	r	p	5/17/29	27.2	35.0	8.23	5	gal
106	637	50	r	p	5/17/29	27.0	35.0	8.23	5	gal
106	638	100	r	p	5/17/29	25.6	35.1	8.23	5	gal
107	639	0	c	n	5/19/29	28.0	34.4	8.23	5	gal
107	640	50	c	n	5/19/29	27.9	34.4	8.23	4	gal
107	641	100	oc	n	5/19/29	26.8	34.9	8.23	11	gal
107	642	0	oc	p	5/19/29	28.0	34.4	8.23	5	gal
107	643	50	r	p	5/19/29	27.9	34.4	8.23	4	gal
107	644	100	r	p	5/19/29	26.8	34.9	8.23	11	gal
108	647	50	c	n	5/27/29	26.8	35.0	8.24	4	gal
108	648	100	c	n	5/27/29	25.2	35.0	8.23	4	gal
108	649	0	r	p	5/27/29	28.4	35.0	8.25	4	gal
108	650	50	r	p	5/27/29	26.8	35.0	8.24	4	gal
109	655	50	r	n	5/29/29	23.1	35.0	8.22	3	gal
109	656	100	oc	n	5/29/29	19.4	34.8	8.18	5	gal
109	658	50	r	p	5/29/29	23.1	35.0	8.22	3	gal
109	659	100	r	p	5/29/29	19.4	34.8	8.18	5	gal
110	662	50	r	n	5/31/29	18.4	34.8	8.16	7	gal
111	668	0	oc	n	6/ 3/29	20.1	34.5	8.18	5	gal
111	670	100	oc	n	6/ 3/29	18.2	34.7	8.13	13	gal
111	671	0	r	p	6/ 3/29	20.1	34.5	8.18	5	gal
112	674	0	oc	n	6/ 5/29	23.2	34.6	8.22	7	gal
112	675	50	oc	n	6/ 5/29	21.7	34.6	8.23	7	gal
112	676	100	r	n	6/ 5/29	19.8	34.7	8.20	8	gal
112	677	0	r	p	6/ 5/29	23.2	34.6	8.22	7	gal
112	678	50	r	p	6/ 5/29	21.7	34.6	8.23	7	gal
113	680	0	oc	n	6/25/29	24.2	34.5	8.25	5	gal
113	681	50	oc	n	6/25/29	23.8	34.6	8.25	5	gal
113	682	100	r	n	6/25/29	21.5	34.7	8.23	8	gal
113	683	0	oc	p	6/25/29	24.2	34.5	8.25	5	gal
113	684	50	oc	p	6/25/29	23.8	34.6	8.25	5	gal
114	687	50	r	n	6/27/29	16.2	34.6	8.04	63	gal
128	773	0	r	n	7/25/29	16.4	33.0	8.12	29	gal
128	774	50	r	n	7/25/29	11.8	33.1	8.11	29	gal
128	776	0	r	p	7/25/29	16.4	33.0	8.12	29	gal
128	779	0	c	n	7/25/29	16.4	33.0	8.12	29	gal
129	780	0	c	n	7/27/29	16.3	33.1	8.13	25	gal
130	781	0	oc	n	9/ 4/29	16.2	33.4	8.34	36	gal
130	784	0	oc	p	9/ 4/29	16.2	33.4	8.34	36	gal
130	785	50	r	p	9/ 4/29	11.7	33.4	8.26	83	gal
130	787	0	c	n	9/ 4/29	16.2	33.4	8.34	36	gal
131	788	0	oc	n	9/ 6/29	19.3	33.4	8.34	...	gal
131	789	100	oc	n	9/ 6/29	12.1	33.4	8.32	...	gal
131	792	0	oc	p	9/ 6/29	19.3	33.4	8.34	...	gal
131	793	0	r	p	9/ 6/29	19.3	33.4	8.34	36	gal
131	795	0	r	p	9/ 6/29	19.3	33.4	8.34	36	gal
132	797	0	c	n	9/ 8/29	21.0	33.9	8.34	15	gal
132	798	50	r	n	9/ 8/29	17.6	33.9	8.33	19	gal
132	799	100	oc	n	9/ 8/29	14.3	33.4	8.30	16	gal
132	801	0	r	p	9/ 8/29	21.0	33.9	8.34	15	gal
132	802	50	r	p	9/ 8/29	17.6	33.9	8.33	19	gal
132	803	100	oc	p	9/ 8/29	14.3	33.4	8.30	16	gal
133	804	0	r	n	9/10/29	22.7	34.7	8.47	7	gal
133	805	50	r	n	9/10/29	20.8	34.7	8.37	7	gal
133	806	100	r	n	9/10/29	18.4	34.8	8.31	7	gal
133	813	50	r	p	9/10/29	20.8	34.7	8.37	7	gal
134	808	0	oc	n	9/12/29	22.9	34.7	8.34	6	gal
134	809	50	oc	n	9/12/29	19.8	34.6	8.34	6	gal
134	810	100	oc	n	9/12/29	18.1	34.6	8.34	6	gal
134	815	0	r	p	9/12/29	22.9	34.7	8.34	6	gal

Table 42. Distributional and environmental records for Ceratium macroceros--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3	Subspecies
134	817	100	r	p	9/12/29	18.1	34.6	8.34	6	gal
135	820	0	r	n	9/14/29	23.8	35.1	8.37	7	gal
135	821	50	oc	n	9/14/29	21.5	35.0	8.37	5	gal
135	822	100	oc	n	9/14/29	18.7	34.8	8.34	5	gal
135	824	0	r	p	9/14/29	23.8	35.1	8.37	7	gal
135	825	50	oc	p	9/14/29	21.5	35.0	8.37	5	gal
135	826	100	r	p	9/14/29	18.7	34.8	8.34	5	gal
136	827	0	oc	n	9/16/29	24.6	35.4	8.37	3	gal
136	828	50	oc	n	9/16/29	21.4	35.1	8.39	3	gal
136	829	100	oc	n	9/16/29	18.6	35.0	8.39	3	gal
136	832	0	r	p	9/16/29	24.6	35.4	8.37	3	gal
136	833	50	r	p	9/16/29	21.4	35.1	8.39	3	gal
137	836	0	oc	n	9/18/29	25.5	35.0	8.39	4	gal
137	837	50	oc	n	9/18/29	24.4	35.1	8.34	4	gal
137	838	100	c	n	9/18/29	21.5	35.1	8.30	5	gal
137	840	0	r	p	9/18/29	25.5	35.0	8.39	4	gal
138	843	0	c	n	9/20/29	26.1	34.8	8.35	5	gal
138	844	50	c	n	9/20/29	25.6	34.7	8.30	3	gal
138	845	100	oc	n	9/20/29	22.2	34.8	8.31	3	gal
138	847	0	r	p	9/20/29	26.1	34.8	8.35	5	gal
138	848	50	r	p	9/20/29	25.6	34.7	8.30	3	gal
139	849	0	oc	n	9/22/29	26.7	34.8	8.34	6	gal
139	850	50	c	n	9/22/29	25.8	34.9	8.31	6	gal
139	851	100	oc	n	9/22/29	22.4	35.2	8.28	6	gal
139	854	50	r	p	9/22/29	25.8	34.9	8.31	6	gal
140	856	0	r	n	10/ 3/29	26.9	35.0	8.42	7	gal
140	858	100	oc	n	10/ 3/29	25.5	35.0	8.34	7	gal
140	860	0	r	p	10/ 3/29	26.9	35.0	8.42	7	gal
140	861	50	r	p	10/ 3/29	26.9	35.0	8.39	7	gal
141	864	0	r	n	10/ 5/29	25.9	35.2	8.34	5	gal
141	865	50	c	n	10/ 5/29	24.8	35.3	8.34	5	gal
141	868	0	r	p	10/ 5/29	25.9	35.2	8.34	5	gal
141	869	50	r	p	10/ 5/29	24.8	35.3	8.34	5	gal
141	870	50	oc	p	10/ 5/29	24.8	35.3	8.34	5	gal
142	872	0	c	n	10/ 7/29	24.1	34.8	8.33	5	gal
142	873	50	c	n	10/ 7/29	21.8	34.8	8.30	5	gal
142	874	100	c	n	10/ 7/29	16.6	34.4	8.27	7	gal
142	876	0	oc	p	10/ 7/29	24.1	34.8	8.33	5	gal
142	878	100	r	p	10/ 7/29	16.6	34.4	8.27	7	gal
143	881	0	c	n	10/ 9/29	22.4	34.4	8.30	6	gal
143	882	50	oc	n	10/ 9/29	19.0	34.2	8.34	6	gal
143	883	100	oc	n	10/ 9/29	13.8	34.1	8.30	10	gal
144	886	0	c	n	10/11/29	23.3	35.0	8.37	6	gal
144	887	0	oc	p	10/11/29	23.3	35.0	8.37	6	gal
144	888	50	oc	p	10/11/29	21.1	34.7	8.33	6	gal
144	889	100	oc	p	10/11/29	16.6	34.5	8.37	6	gal
145	890	0	c	n	10/13/29	22.3	34.6	8.29	6	gal
145	891	50	oc	n	10/13/29	18.7	34.3	8.34	6	gal
145	892	100	oc	n	10/13/29	16.0	34.1	8.31	6	gal
145	893	0	r	p	10/13/29	22.3	34.6	8.29	6	gal
145	894	50	r	p	10/13/29	18.7	34.3	8.34	6	gal
146	896	0	oc	n	10/15/29	22.4	34.9	8.37	6	gal
146	897	50	oc	n	10/15/29	22.4	34.9	8.30	6	gal
146	901	50	r	p	10/15/29	22.4	34.9	8.30	6	gal
146	902	100	r	p	10/15/29	19.7	34.3	8.26	7	gal
147	903	0	r	n	10/17/29	23.3	35.3	8.26	8	gal
147	904	50	oc	n	10/17/29	23.1	35.3	8.29	5	gal
147	907	0	r	p	10/17/29	23.3	35.3	8.26	8	gal
147	908	50	oc	p	10/17/29	23.1	35.3	8.29	5	gal
147	905	100	r	n	10/17/29	19.2	35.0	8.29	5	gal
148	910	0	oc	n	10/17/29	23.4	35.2	.....	...	gal
148	911	50	oc	n	10/19/29	23.0	35.1	.....	...	gal
148	912	100	oc	n	10/19/29	20.0	35.0	.....	...	gal
148	917	0	r	p	10/19/29	23.4	35.2	.....	...	gal
149	920	0	c	n	10/19/29	23.5	35.0	8.34	6	gal
149	921	50	c	n	10/21/29	23.3	35.0	8.37	6	gal
149	922	100	c	n	10/21/29	20.3	34.9	8.38	8	gal
149	927	0	r	p	10/21/29	23.5	35.0	8.34	6	gal
150	929	0	oc	n	10/23/29	25.6	34.7	8.39	7	gal
150	930	50	oc	n	10/23/29	22.8	34.8	8.35	10	gal
150	933	0	r	p	10/23/29	25.6	34.7	8.39	7	gal
151	937	0	oc	n	10/23/29	26.0	34.0	.....	...	gal
151	938	50	oc	n	10/26/29	18.3	34.4	.....	...	gal
151	941	0	r	p	10/26/29	26.0	34.0	.....	...	gal
151	942	50	r	p	10/26/29	18.3	34.4	.....	...	gal
152	945	50	oc	n	10/27/29	14.2	34.5	7.87	53	gal

Table 42. Distributional and environmental records for Ceratium macroceros--Concluded

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3	Subspecies
152	946	100	oc	n	10/27/29	11.4	34.7	7.76	75	gal
152	949	50	oc	p	10/27/29	14.2	34.5	7.87	53	gal
153	951	0	r	n	10/29/29	28.1	34.2	8.47	7	gal
153	952	50	r	n	10/29/29	28.1	34.4	8.39	7	gal
153	953	100	r	p	10/29/29	20.5	34.7	8.28	31	gal
153	956	50	oc	p	10/29/29	28.1	34.4	8.39	7	gal
154	957	0	oc	p	10/29/29	28.3	34.2	8.39	7	gal
154	958	0	oc	n	10/31/29	28.3	34.2	8.39	7	gal
154	960	100	r	n	10/31/29	25.3	34.8	7.93	21	gal
155	965	0	oc	n	11/ 2/29	27.8	34.9	8.29	29	gal
155	966	50	r	n	11/ 2/29	27.7	34.9	8.30	30	gal
155	967	100	r	n	11/ 2/29	27.2	35.0	8.30	35	gal
156	972	0	r	n	11/ 4/29	27.6	35.0	8.34	28	gal
156	973	50	r	n	11/ 4/29	27.0	35.1	8.37	46	gal
156	974	100	r	n	11/ 4/29	26.4	35.1	8.30	48	gal
157	978	0	oc	n	11/ 6/29	27.1	35.3	8.27	47	gal
157	979	50	oc	n	11/ 6/29	27.1	35.2	8.32	60	gal
157	980	100	r	n	11/ 6/29	20.8	35.5	8.30	64	gal
158	983	0	c	n	11/ 8/29	28.2	35.6	8.34	36	gal
158	984	50	r	n	11/ 8/29	28.2	35.6	8.39	50	gal
158	985	100	oc	n	11/ 8/29	27.6	35.9	8.39	48	gal
159	990	0	r	n	11/11/29	28.6	35.7	8.37	15	gal
159	991	50	r	n	11/11/29	28.5	35.7	8.39	15	gal
159	992	100	r	n	11/11/29	28.0	35.7	8.37	23	gal
160	1002	50	r	n	11/13/29	28.6	35.6	8.39	15	gal
160	1003	100	r	n	11/13/29	28.5	35.7	8.44	16	gal

Abbreviations: mac=subsp. macroceros; gal=subsp. gallicum.

Table 43. Distributional and environmental records for Ceratium massiliense

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
1	1	0	c	n	5/12/28	24.0	36.2	8.16	34
1	2	70	r	n	5/12/28	(23.9	36.3	8.20	31)
1a	3	0	c	n	5/14/28	(22.0	36.3	8.20	46)
1a	4	0	oc	n	5/14/28	(22.0	36.3	8.20	46)
1a	5	0	c	n	5/14/28	(22.0	36.3	8.20	46)
1a	6	0	c	n	5/16/28	(22.0	36.3	8.20	46)
1b	7	50	oc	n	5/16/28	(22.0	36.3	8.20	46)
1b	8	100	c	n	5/16/28	(22.0	36.3	8.20	46)
2	13	100	oc	n	5/18/28	19.8	36.4	8.21	33
2	14	0	c	n	5/18/28	20.5	36.4	8.23	58
2	15	0	r	n	5/18/28	20.5	36.4	8.23	58
3	18	50	oc	n	5/21/28	20.5	36.4	8.21	46
3	19	100	oc	n	5/21/28	13.6	35.9	8.10	48
3	20	0	r	n	5/21/28	15.5	36.1	8.15	99
4	23	100	r	n	5/23/28	13.4	35.9	8.12	50
6c	47	100	r	n	6/ 3/28	(11.3	35.6	8.08	41)
14	91	100	r	p	8/ 9/28	14.0	35.6	8.06	34
15	97	0	oc	p	8/11/28	24.8	36.4	8.21	11
15	98	50	r	p	8/11/28	19.8	36.4	8.21	8
15	99	100	r	p	8/11/28	18.4	36.5	8.20	19
15	100	0	oc	n	8/11/28	24.8	36.4	8.21	11
15	101	50	oc	n	8/11/28	19.8	36.5	8.21	8
15	102	100	oc	n	8/11/28	18.4	36.4	8.20	19
16	103	0	r	p	8/13/28	25.9	36.2	8.24	8
16	104	50	oc	p	8/13/28	24.4	36.4	8.23	8
16	106	0	c	n	8/13/28	25.9	36.2	8.24	8
16	107	50	oc	n	8/13/28	24.4	36.4	8.23	8
17	111	0	r	n	8/15/28	26.2	36.6	8.29	9
17	112	50	r	n	8/15/28	21.9	36.6	8.28	12
17	113	100	r	n	8/15/28	19.3	36.5	8.23	9
18	114	0	oc	p	8/17/28	27.0	37.0	8.23	5
18	116	100	oc	p	8/17/28	20.4	36.8	8.21	5
18	117	0	c	n	8/17/28	27.0	37.0	8.23	5
18	118	50	c	n	8/17/28	22.4	36.8	8.24	5
18	119	100	oc	n	8/17/28	20.4	36.8	8.21	5
20	125	0	r	p	8/22/28	26.0	36.6	8.37	5
20	126	50	r	p	8/22/28	25.8	36.6	8.26	3
20	128	0	oc	n	8/22/28	26.0	36.6	8.37	5
20	129	50	oc	n	8/22/28	25.8	36.6	8.26	3
20	130	100	r	n	8/22/28	22.6	36.7	8.19	5

Table 43. Distributional and environmental records for Ceratium massiliense--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
20-21	131	0	c	n	8/23/28	(26.3	36.4	8.35	45)
21	132	0	r	p	8/24/28	26.6	36.3	8.32	4
21	134	100	oc	p	8/24/28	21.0	36.8	8.20	7
21	135	0	oc	n	8/24/28	26.6	36.3	8.32	4
21	136	50	r	n	8/24/28	24.4	36.2	8.26	4
21	137	100	c	n	8/24/28	21.0	36.8	8.20	7
22	139	0	c	p	8/27/28	26.7	36.0	8.26	8
22	140	50	r	p	8/27/28	24.5	36.2	8.21	9
22	142	0	oc	n	8/27/28	26.7	36.0	8.26	8
22	143	50	oc	n	8/27/28	24.5	36.2	8.21	9
22	144	100	r	n	8/27/28	17.5	36.1	7.99	123
23	145	0	oc	p	8/29/28	27.2	35.9	8.25	4
23	148	0	oc	n	8/29/28	27.2	35.9	8.25	4
23	149	50	oc	n	8/29/28	20.9	36.0	8.14	13
24	151	0	oc	p	8/31/28	27.2	35.2	8.32	4
24	152	50	r	p	8/31/28	23.1	36.0	8.14	8
24	153	100	r	p	8/31/28	15.6	35.6	7.96	99
24	154	0	c	n	8/31/28	27.2	35.2	8.32	4
24	155	50	oc	n	8/31/28	23.1	36.0	8.14	8
24	156	100	r	n	8/31/28	15.6	35.6	7.96	99
25	157	0	c	p	9/ 3/28	27.5	35.6	8.31	5
25	160	0	c	n	9/ 3/28	27.5	35.6	8.31	5
25	161	50	oc	n	9/ 3/28	21.5	36.0	8.22	12
25	162	100	r	n	9/ 3/28	14.6	35.7	7.93	121
26	163	0	r	p	9/ 5/28	27.6	36.0	8.30	5
26	166	0	r	n	9/ 5/28	27.6	36.0	8.30	5
27	170	0	r	n	9/ 7/28	27.5	36.3	8.31	4
27	171	50	oc	n	9/ 7/28	26.0	36.2	8.30	4
28	174	50	r	p	9/11/28	26.7	36.3	8.26	4
28	176	0	oc	n	9/11/28	27.6	36.3	8.29	4
28	178	100	r	n	9/11/28	22.8	36.6	8.22	7
29	179	0	r	p	9/13/28	27.6	36.2	8.31	3
29	182	0	r	n	9/13/28	27.6	36.2	8.31	3
29	183	50	r	n	9/13/28	27.2	36.2	8.29	3
29	184	100	r	n	9/13/28	23.1	36.6	8.21	8
30	186	50	r	p	9/15/28	27.8	36.1	8.29	3
30	188	0	oc	n	9/15/28	28.0	36.1	8.30	2
30	189	50	c	n	9/15/28	27.8	36.1	8.29	3
30	190	100	oc	n	9/15/28	24.1	36.4	8.10	20
31	191	0	c	n	10/ 3/28	28.5	34.4	8.27	2
31	192	50	oc	n	10/ 3/28	28.2	35.4	8.23	2
31	193	100	c	n	10/ 3/28	23.4	36.5	8.19	28
32	194	0	c	n	10/ 5/28	28.0	36.0	8.23	2
32	194A	0	oc	p	10/ 5/28	28.0	36.0	8.23	2
32	195	50	oc	n	10/ 5/28	27.2	36.0	8.24	2
32	196	100	oc	n	10/ 5/28	22.2	36.4	8.10	30
33	198	50	oc	n	10/ 8/28	28.2	36.2	8.24	4
34	200	0	oc	n	10/ 9/28	28.5	35.9	8.28	2
34	200A	0	r	p	10/ 9/28	28.5	35.9	8.28	2
34	201	100	oc	n	10/ 9/28	20.5	36.6	8.16	16
34	202	50	r	n	10/ 9/28	25.0	36.5	8.21	3
35	203	0	r	n	10/26/28	27.4	29.7	8.31	15
35	204	50	oc	n	10/26/28	16.8	34.7	7.92	138
35a	208	0	r	n	10/26/28	(27.4	29.7	8.31	15)
35-36	209	0	oc	n	10/26/28	(27.4	29.7	8.31	15)
35-36	212	0	c	n	10/28/28	(27.0	30.0	8.27	15)
36	213	0	oc	n	10/30/28	26.5	31.6	8.23	16
36	215	100	r	n	10/30/28	14.4	34.9	7.85	149
36	216	0	oc	p	10/30/28	26.5	31.6	8.23	16
37	218	50	oc	n	11/ 1/28	18.8	34.5	8.00	121
38	222	0	r	n	11/ 3/28	26.5	32.9	8.33	20
39	225	0	r	n	11/ 6/28	24.8	33.0	8.24	16
39	226	50	c	n	11/ 6/28	16.3	34.6	7.92	48
39	227	100	r	n	11/ 6/28	14.0	35.0	7.88	181
41a	240	0	r	n	11/13/28	(18.7	34.7	8.06	45)
44	250	0	r	n	11/17/28	20.7	34.9	8.03	38
44	251	50	r	n	11/17/28	20.4	34.9	8.04	34
45	256	0	c	n	11/19/28	22.4	35.3	8.12	38
45	257	50	c	n	11/19/28	22.4	35.2	8.13	46
45	258	100	c	n	11/19/28	18.6	35.1	8.00	50
45	259	0	oc	p	11/19/28	22.4	35.3	8.12	38
46	261	0	oc	n	11/21/28	23.3	35.3	8.16	36
46	262	50	c	n	11/21/28	23.2	35.3	8.16	40
46	263	100	r	n	11/21/28	22.5	35.4	8.17	40
46	264	0	oc	p	11/21/28	23.3	35.3	8.16	36
47	266	0	r	n	11/23/28	23.9	36.0	8.23	17

Table 43. Distributional and environmental records for Ceratium massiliense--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
47	267	50	r	n	11/23/28	23.8	36.0	8.23	20
47	268	100	r	n	11/23/28	22.7	36.2	8.23	20
48	271	0	oc	n	11/25/28	23.6	36.4	8.23	13
48	272	50	c	n	11/25/28	23.6	36.4	8.24	16
48	273	100	c	n	11/25/28	22.7	36.3	8.26	16
48	274	0	oc	p	11/25/28	23.6	36.4	8.23	13
48	275	50	oc	p	11/25/28	23.6	36.4	8.24	16
49	277	0	oc	n	11/27/28	23.4	36.2	8.27	13
49	278	50	r	n	11/27/28	22.6	36.1	8.26	13
49	279	100	r	n	11/27/28	21.6	35.9	8.26	13
49	280	0	r	p	11/27/28	23.4	36.2	8.27	13
49	282	100	r	p	11/27/28	21.6	35.9	8.26	13
49a	283	0	c	n	11/29/28	(23.2	36.0	8.23	13)
50	284	0	oc	n	11/29/28	23.2	36.0	8.23	13
50	285	50	r	n	11/29/28	22.0	35.9	8.23	13
50	286	100	c	n	11/29/28	20.5	35.7	8.22	13
50	287	0	oc	p	12/ 1/28	22.8	35.6	8.22	16
50-51	290	0	c	n	12/ 1/28	(22.8	35.6	8.22	16)
50-51	291	0	oc	n	12/ 1/28	(22.8	35.6	8.22	16)
50-51	292	0	oc	n	12/ 1/28	(22.8	35.6	8.22	16)
51	293	0	oc	n	12/ 1/28	22.8	35.6	8.22	16
51	294	50	oc	n	12/ 1/28	20.5	35.6	8.22	17
51	295	100	oc	n	12/ 1/28	20.0	35.6	8.22	17
52	299	0	c	n	12/ 3/28	22.5	35.4	8.21	8
52	300	50	oc	n	12/ 3/28	20.2	35.6	8.20	8
52	301	100	c	n	12/ 3/28	18.2	35.2	8.17	8
52	302	0	r	p	12/ 3/28	22.5	35.4	8.21	8
53	303	0	oc	n	12/ 5/28	22.6	35.7	8.22	13
53	304	50	oc	n	12/ 5/28	21.2	35.8	8.20	13
53	305	100	oc	n	12/ 5/28	19.9	35.6	8.19	13
53	306	0	r	p	12/ 5/28	22.6	35.7	8.22	13
53-54	307	0	r	n	12/ 6/28	(23.0	35.6	8.22	11)
53-54	310	0	a	n	12/10/28	(23.0	35.6	8.22	11)
53-54	311	0	oc	n	12/10/28	(23.0	35.6	8.22	11)
53-54	312	0	c	n	12/10/28	(23.0	35.6	8.22	11)
53-54	313	0	oc	n	12/10/28	(23.0	35.6	8.22	11)
53-54	316	0	r	n	12/10/28	(23.0	35.6	8.22	11)
53-54	317	0	oc	n	12/12/28	(23.0	35.6	8.22	11)
54	319	0	c	n	12/14/28	23.4	35.5	8.22	9
54	320	50	oc	n	12/14/28	19.8	35.4	8.18	17
54	321	100	oc	n	12/14/28	18.7	35.4	8.16	20
54	322	0	oc	p	12/14/28	23.4	35.5	8.22	9
55	323	0	oc	n	12/16/28	20.4	34.9	8.19	12
55	324	50	oc	n	12/16/28	18.7	35.0	8.18	12
55	325	100	oc	n	12/16/28	16.7	34.9	7.17	12
55	326	0	r	p	12/16/28	20.4	34.9	8.19	12
56	328	0	c	n	12/18/28	20.8	34.9	8.13	9
56	329	50	oc	n	12/18/28	18.5	35.1	8.14	9
56	330	100	oc	n	12/18/28	16.6	34.8	8.11	12
56	331	0	oc	p	12/18/28	20.8	34.9	8.13	9
56	332	50	r	p	12/18/28	18.5	35.1	8.14	9
56	333	100	r	p	12/18/28	16.6	34.8	8.11	12
56-57	334	0	c	n	12/19/28	(19.0	34.5	8.14	20)
57	335	0	a	n	12/20/28	19.0	34.5	8.14	20
57	336	50	oc	n	12/20/28	15.6	34.3	8.14	21
57	337	100	oc	n	12/20/28	14.3	34.4	8.10	40
57	338	0	oc	p	12/20/28	19.0	34.5	8.14	20
57	340	100	r	p	12/20/28	14.3	34.4	8.10	40
58	341	0	oc	n	12/22/28	17.0	34.0	8.12	20
58	344	0	r	p	12/22/28	17.0	34.0	8.12	20
58	346	100	r	p	12/22/28	12.3	34.1	8.05	40
59	347	0	r	n	12/24/28	16.3	34.0	8.10	38
59	350	100	r	n	12/24/28	11.4	34.1	8.03	72
60	355	50	oc	n	12/26/28	13.4	34.0	8.06	54
60	356	100	oc	n	12/26/28	10.6	34.0	8.03	62
60	357	0	r	p	12/26/28	15.0	34.0	8.07	50
60	359	0	r	p	12/26/28	15.0	34.0	8.07	50
60-61	360	0	oc	n	12/26/28	(15.0	34.0	8.07	50)
60-61	362	0	oc	n	12/26/28	(15.0	34.0	8.07	50)
61	363	0	oc	n	12/28/28	16.9	34.0	8.05	46
61-62	369	0	r	n	12/28/28	(16.9	34.0	8.05	46)
61-62	370	0	oc	n	12/28/28	(16.9	34.0	8.05	48)
62	373	100	oc	n	12/30/28	13.1	34.2	8.06	48)
62-63	378	0	r	n	12/31/28	(20.5	34.6	8.07	21)
63	379	0	oc	n	1/ 1/29	20.5	34.6	8.07	21
63	380	50	r	n	1/ 1/29	17.0	34.6	8.08	25

Table 43. Distributional and environmental records for Ceratium massiliense--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
63	381	100	r	n	1/ 1/29	15.6	34.6	8.08	24
63	384	100	r	p	1/ 1/29	15.6	34.6	8.08	24
63-64	385	0	r	n	1/ 1/29	(20.5	34.6	8.07	21)
63-64	386	0	oc	n	1/ 1/29	(20.5	34.6	8.07	21)
63-64	387	0	oc	n	1/ 2/29	(20.5	34.6	8.07	21)
63-64	388	0	oc	n	1/ 2/29	(20.5	34.6	8.07	21)
63-64	389	0	r	n	1/ 2/29	(20.5	34.6	8.07	21)
63-64	390	0	r	n	1/ 2/29	(20.5	34.6	8.07	21)
63-64	393	0	r	n	1/ 3/29	(20.5	34.6	8.07	21)
63-64	394	0	r	n	1/ 3/29	(20.5	34.6	8.07	21)
64	395	50	r	n	1/ 3/29	17.2	34.6	8.12	29
64	396	100	r	n	1/ 3/29	15.8	34.5	8.10	32
64	399	50	r	p	1/ 3/29	17.2	34.6	8.12	29
64-65	402	0	r	n	1/ 4/29	(20.6	34.6	8.12	21)
67	416	0	c	n	1/ 8/29	19.3	34.9	8.11	21
67	417	50	r	n	1/ 8/29	17.4	34.7	8.11	20
67	418	100	oc	n	1/ 8/29	16.2	34.6	8.05	40
68	419	0	oc	n	1/10/29	19.2	35.1	8.14	29
68	420	50	r	n	1/10/29	18.2	35.0	8.14	29
68	421	100	r	n	1/10/29	16.5	34.8	8.13	34
68	422	0	oc	p	1/10/29	19.2	35.1	8.14	29
69	424	0	oc	n	1/12/29	21.1	35.2	8.12	62
69	425	50	oc	n	1/12/29	17.4	35.1	7.99	151
70	436	100	r	p	1/13/29	12.6	34.8	7.68	233
71	441	0	r	p	2/ 6/29	23.5	35.2	8.13	58
74	456	0	c	n	2/12/29	24.2	35.6	8.17	68
75	462	0	oc	n	2/14/29	22.8	35.8	8.18	44
75	463	50	oc	n	2/14/29	20.0	35.5	8.14	46
75	465	0	r	p	2/14/29	22.8	35.8	8.18	44
76	467	0	r	n	2/16/29	23.4	35.9	8.15	50
77	472	0	r	n	2/18/29	23.7	36.0	8.19	16
77	473	0	oc	p	2/18/29	23.7	36.0	8.19	16
78	475	0	r	n	2/20/29	24.6	36.0	8.17	32
78	477	100	oc	n	2/20/29	21.9	36.2	8.14	34
79	481	0	oc	n	2/22/29	25.2	36.0	8.17	34
79	483	100	oc	n	2/22/29	21.8	36.2	8.13	45
79	484	0	r	p	2/22/29	25.2	36.0	8.17	34
80	486	0	oc	n	2/24/29	26.0	35.9	8.20	36
80	487	50	r	n	2/24/29	25.9	36.0	8.19	29
80	488	0	oc	p	2/24/29	26.0	35.9	8.20	36
81	491	0	oc	n	2/26/29	26.5	35.8	8.19	38
81	492	50	oc	n	2/26/29	26.4	35.9	8.19	38
81	494	50	r	p	2/26/29	26.4	35.9	8.19	38
82	496	0	c	n	2/28/29	27.2	36.3	8.21	34
82	497	50	oc	n	2/28/29	27.2	36.3	8.21	34
82	498	0	oc	p	2/28/29	27.2	36.3	8.21	34
83	501	0	c	n	3/ 2/29	27.2	36.3	8.24	29
83	502	50	oc	n	3/ 2/29	27.4	36.5	8.24	25
83	503	0	r	p	3/ 2/29	27.5	36.3	8.24	29
83	504	50	r	p	3/ 2/29	27.4	36.5	8.24	25
84	505	0	c	n	3/ 4/29	27.8	36.2	8.23	24
84	506	50	oc	n	3/ 4/29	27.5	36.4	8.21	24
85	510	0	oc	n	3/ 6/29	27.9	36.2	8.22	40
85	511	50	oc	n	3/ 6/29	27.8	36.2	8.22	40
85	512	0	r	p	3/ 6/29	27.9	36.2	8.22	40
86	515	0	c	n	3/ 9/29	(28.3	36.2	8.29	20)
86	516	0	a	n	3/ 9/29	28.3	36.2	8.29	20
86	517	50	c	n	3/ 9/29	27.4	36.2	8.29	17
86	518	0	oc	p	3/ 9/29	28.3	36.2	8.29	20
87	521	0	c	n	3/11/29	27.8	38.1	8.28	17
87	522	50	oc	n	3/11/29	26.5	36.1	8.25	20
87	524	50	r	p	3/11/29	26.5	36.1	8.25	20
87	526	0	oc	n	3/11/29	27.8	36.1	8.28	17
88	527	50	oc	n	3/21/29	28.4	35.9	8.25	13
89	528	0	oc	n	3/23/29	28.4	35.6	8.25	21
89	529	50	a	n	3/23/29	28.6	35.8	8.27	12
89	530	0	r	p	3/23/29	28.4	35.6	8.25	21
89	532	0	oc	n	3/23/29	(28.4	35.6	8.25	21)
90	533	0	a	n	3/25/29	28.5	35.5	8.27	21
90	534	50	c	n	3/25/29	28.6	35.8	8.26	21
90	535	0	oc	p	3/25/29	28.5	35.5	8.27	21
90	536	50	oc	p	3/25/29	28.6	35.8	8.26	21
91	540	0	c	n	3/27/29	28.7	35.1	8.30	21
91	541	50	a	n	3/27/29	28.5	35.2	8.30	24
91	542	0	r	p	3/27/29	28.7	35.1	8.30	21
91	543	50	oc	p	3/27/29	28.5	35.2	8.30	24

Table 43. Distributional and environmental records for Ceratium massiliense--Continued

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
91	544	100	oc	p	3/27/29	25.8	36.0	8.25	30
92	545	0	c	n	3/29/29	28.5	35.3	8.29	28
92	546	50	c	n	3/29/29	28.4	35.4	8.29	28
92	548	50	r	p	3/29/29	28.4	35.4	8.29	28
92	549	100	r	p	3/29/29	26.2	36.0	8.28	28
93	550	0	c	n	3/31/29	28.7	34.7	8.30	28
93	551	50	c	n	3/31/29	28.5	34.8	8.30	28
95	563	50	c	n	4/24/29	29.5	34.9	8.24	16
95	566	50	r	p	4/24/29	29.3	34.9	8.24	16
96	568	0	c	n	4/26/29	29.3	35.3	8.23	12
95	568A	0	r	n	4/25/29	(29.4	34.7	8.26	14)
96	569	50	c	n	4/26/29	29.2	35.3	8.23	12
96	570	100	oc	n	4/26/29	28.2	35.7	8.19	25
96	571	0	oc	p	4/26/29	29.3	35.3	8.23	12
96	573	100	r	p	4/26/29	28.2	35.7	8.19	25
97	574	0	c	n	4/28/29	28.3	35.2	8.16	24
97	575	50	c	n	4/28/29	28.0	35.4	8.16	21
97	576	100	c	n	4/28/29	27.0	35.6	8.15	25
97	577	0	r	p	4/28/29	28.3	35.2	8.16	24
97	578	50	oc	p	4/28/29	28.0	35.4	8.16	21
97	579	100	r	p	4/28/29	27.6	35.6	8.15	25
98	581	0	oc	n	4/30/29	27.0	35.3	8.16	24
98	583	100	oc	n	4/30/29	26.7	35.4	8.14	32
99	589	0	oc	n	5/ 2/29	27.9	34.9	8.21	12
99	590	50	r	n	5/ 2/29	27.8	34.9	8.22	12
99	595	0	oc	n	5/ 2/29	27.9	34.9	8.21	12
100	596	50	c	n	5/ 4/29	27.6	34.7	8.21	10
100	597	100	a	n	5/ 4/29	27.6	34.7	8.22	12
100	598	0	oc	p	5/ 4/29	27.7	34.7	8.21	10
100	599	50	oc	p	5/ 4/29	27.6	34.7	8.21	10
101	603	0	c	n	5/ 7/29	26.3	34.7	8.24	8
101	604	50	c	n	5/ 7/29	26.2	34.7	8.24	8
101	605	100	c	n	5/ 7/29	25.2	35.1	8.23	8
101	606	0	r	p	5/ 7/29	26.3	34.7	8.24	8
102	609	0	c	n	5/ 9/29	25.8	35.0	8.24	8
102	610	50	c	n	5/ 9/29	25.8	35.0	8.24	8
102	611	100	oc	n	5/ 9/29	25.6	35.0	8.23	8
103	615	0	c	n	5/11/29	26.0	35.0	8.25	5
103	616	50	oc	n	5/11/29	25.8	35.2	8.25	5
103	617	100	r	n	5/11/29	24.8	35.2	8.25	5
104	621	0	c	n	5/13/29	26.1	35.2	8.24	7
104	622	50	c	n	5/13/29	25.8	35.2	8.24	7
104	623	100	c	n	5/13/29	25.3	35.3	8.21	7
104	624	0	r	p	5/13/29	26.1	35.2	8.24	7
104	625	50	r	p	5/13/29	25.8	35.2	8.24	7
105	627	50	c	n	5/15/29	26.8	34.9	8.23	5
105	628	50	c	n	5/15/29	26.8	34.9	8.23	5
105	630	0	oc	p	5/15/29	26.9	34.9	8.23	5
105	631	50	r	p	5/15/29	26.8	34.9	8.23	5
106	633	0	c	n	5/17/29	27.2	35.0	8.23	5
106	634	50	c	n	5/17/29	27.0	35.0	8.23	5
106	635	100	oc	n	5/17/29	25.6	35.1	8.23	5
106	636	0	r	p	5/17/29	27.2	35.0	8.23	5
106	638	100	r	p	5/17/29	25.6	35.1	8.23	5
107	639	0	c	n	5/19/29	28.0	34.4	8.23	5
107	640	50	c	n	5/19/29	27.9	34.4	8.23	4
107	641	100	oc	n	5/19/29	26.8	34.9	8.23	11
107	642	0	oc	p	5/19/29	28.0	34.4	8.23	5
107	643	50	r	p	5/19/29	27.9	34.4	8.23	4
107	644	100	r	p	5/19/29	26.8	34.9	8.23	11
108	646	0	oc	n	5/27/29	28.4	35.0	8.25	4
108	647	50	oc	n	5/27/29	26.8	35.0	8.24	4
108	548	100	c	n	5/27/29	25.2	35.0	8.23	4
109	654	0	oc	n	5/29/29	27.4	35.0	8.23	3
109	655	50	oc	n	5/29/29	23.1	35.0	8.22	3
109	656	100	c	n	5/29/29	19.4	34.8	8.18	5
109	658	50	r	p	5/29/29	23.1	35.0	8.22	3
110	661	0	a	n	5/31/29	23.9	34.7	8.18	5
110	662	50	oc	n	5/31/29	18.4	34.8	8.16	7
110	663	100	c	n	5/31/29	17.9	34.7	8.14	11
110	664	0	c	p	5/31/29	23.9	34.7	8.18	5
110	666	100	r	p	5/31/29	17.9	34.7	8.14	11
111	668	0	c	n	6/ 3/29	20.1	34.5	8.18	5
111	669	50	oc	n	6/ 3/29	19.4	34.6	8.17	5
111	671	0	oc	p	6/ 3/29	20.1	34.5	8.18	5
111	672	50	oc	p	6/ 3/29	19.4	34.6	8.17	5

Table 43. Distributional and environmental records for Ceratium massiliense--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
112	675	50	c	n	6/ 5/29	21.7	34.6	8.23	7
112	676	100	oc	n	6/ 5/29	19.8	34.7	8.20	8
112	679	100	r	p	6/ 5/29	19.8	34.7	8.20	8
113	680	0	c	n	6/25/29	24.2	34.5	8.25	5
113	681	50	oc	n	6/25/29	23.8	34.6	8.25	5
113	682	100	oc	n	6/25/29	21.5	34.7	8.23	8
113	683	0	r	p	6/25/29	24.2	34.5	8.25	5
113	684	50	oc	p	6/25/29	23.8	34.6	8.25	5
113	685	100	r	p	6/25/29	21.5	34.7	8.23	8
114	686	0	oc	n	6/27/29	19.9	34.3	8.15	7
114	687	50	oc	n	6/27/29	16.2	34.6	8.04	63
114	689	0	oc	p	6/27/29	19.9	34.3	8.15	7
114	690	50	oc	p	6/27/29	16.2	34.6	8.04	63
115	693	50	r	n	6/29/29	17.5	34.6	8.12	17
115	695	0	r	p	6/29/29	20.6	34.6	8.19	4
116	703	50	r	n	7/ 1/29	10.6	33.8	8.11	23
128	779	0	c	n	7/25/29	16.4	33.0	8.12	29
129	780	0	c	n	7/27/29	16.3	33.1	8.13	25
130	781	0	oc	n	9/ 4/29	16.2	33.4	8.34	36
130	782	50	r	n	9/ 4/29	11.7	33.4	8.26	83
130	784	0	oc	p	9/ 4/29	16.2	33.4	8.34	36
130	787	0	c	n	9/ 4/29	16.2	33.4	8.34	36
131	788	0	oc	n	9/ 6/29	19.3	33.4	8.34	36
131	789	100	c	n	9/ 6/29	12.1	33.4	8.32	36
131	792	0	oc	p	9/ 6/29	19.3	33.4	8.34	...
131	793	0	r	p	9/ 6/29	19.3	33.4	8.34	36
132	797	0	c	n	9/ 8/29	21.0	33.9	8.34	15
132	798	50	oc	n	9/ 8/29	17.6	33.9	8.32	19
132	801	0	oc	p	9/ 8/29	21.0	33.9	8.34	15
132	802	50	r	p	9/ 8/29	17.6	33.9	8.33	19
132	799	100	r	n	9/ 8/29	14.3	33.4	8.30	16
132	803	100	r	p	9/ 8/29	14.3	33.4	8.30	16
133	804	0	oc	n	9/10/29	22.7	34.7	8.47	7
133	805	50	oc	n	9/10/29	20.8	34.7	8.37	7
134	808	0	oc	n	9/12/29	22.9	34.7	8.34	6
134	809	50	r	n	9/12/29	19.8	34.6	8.34	6
134	810	100	oc	n	9/12/29	18.1	34.6	8.34	6
134	817	100	r	p	9/12/29	18.1	34.6	8.34	6
135	821	50	oc	n	9/14/29	21.5	35.0	8.37	5
135	822	100	oc	n	9/14/29	18.7	34.8	8.34	5
135	825	50	r	p	9/14/29	21.5	35.0	8.37	5
135	826	100	r	p	9/14/29	18.7	34.8	8.34	5
136	827	0	oc	n	9/16/29	24.6	35.4	8.37	3
136	828	50	c	n	9/16/29	21.4	35.1	8.39	3
136	829	100	oc	n	9/16/29	18.6	35.0	8.39	3
136	833	50	r	p	9/16/29	21.4	35.1	8.39	3
136	834	100	r	p	9/16/29	18.6	35.0	8.39	3
137	836	0	c	n	9/18/29	25.5	35.0	8.39	4
137	837	50	oc	n	9/18/29	24.4	35.1	8.34	4
137	838	100	c	n	9/18/29	21.5	35.1	8.30	5
137	838	100	r	p	9/18/29	21.5	35.1	8.30	5
137	840	0	r	p	9/18/29	25.5	35.0	8.39	4
137	842	100	r	p	9/18/29	21.5	35.1	8.30	5
138	843	0	oc	n	9/20/29	26.1	34.8	8.35	5
138	844	50	c	n	9/20/29	25.6	34.7	8.30	3
138	845	100	oc	n	9/20/29	22.2	34.8	8.31	3
139	849	0	oc	n	9/22/29	26.7	34.8	8.34	6
139	850	50	c	n	9/22/29	25.8	34.9	8.31	6
139	851	100	oc	n	9/22/29	22.4	35.2	8.28	6
139	854	50	r	p	9/22/29	25.8	34.9	8.31	6
140	856	0	c	n	10/ 3/29	26.9	35.0	8.42	7
140	857	50	oc	n	10/ 3/29	26.9	35.0	8.39	7
140	858	100	oc	n	10/ 3/29	25.5	35.0	8.34	7
140	860	0	c	p	10/ 3/29	26.9	35.0	8.42	7
140	861	50	r	p	10/ 3/29	26.9	35.0	8.39	7
140	862	100	r	p	10/ 3/29	25.5	35.0	8.34	7
140	863	100	r	p	10/ 3/29	25.5	35.0	8.34	7
141	864	0	r	n	10/ 5/29	25.9	35.2	8.34	5
141	865	50	oc	n	10/ 5/29	24.8	35.3	8.34	5
142	872	0	oc	n	10/ 7/29	24.1	34.8	8.33	5
142	873	0	oc	n	10/ 7/29	24.1	34.8	8.33	5
142	874	100	oc	n	10/ 7/29	16.6	34.4	8.27	7
142	878	100	r	p	10/ 7/29	16.6	34.4	8.27	5
143	881	0	c	n	10/ 9/29	22.4	34.4	8.30	6
143	882	50	c	n	10/ 9/29	19.0	34.2	8.34	6
143	883	100	c	n	10/ 9/29	13.8	34.1	8.30	10
144	884	0	r	p	10/ 9/29	22.4	34.4	8.30	6

Table 43. Distributional and environmental records for Ceratium massiliense--Concluded

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m^3
143	885	50	r	p	10/ 9/29	19.0	34.2	8.34	6
144	886	0	oc	n	10/11/29	23.3	35.0	8.37	6
144	887	0	oc	p	10/11/29	23.3	35.0	8.37	6
144	889	100	r	p	10/11/29	16.6	34.5	8.37	6
145	890	0	r	n	10/13/29	22.3	34.6	8.29	6
145	891	50	oc	n	10/13/29	18.7	34.3	8.34	6
145	892	100	oc	n	10/13/29	16.0	34.1	8.31	6
145	893	0	r	p	10/13/29	22.3	34.6	8.29	6
146	897	50	oc	n	10/15/29	22.4	34.9	8.30	6
146	898	100	oc	n	10/15/29	19.7	34.3	8.26	7
146	900	0	r	n	10/15/29	22.4	34.9	8.37	6
146	902	100	r	p	10/15/29	19.7	34.3	8.26	7
147	903	0	oc	n	10/17/29	23.3	35.3	8.26	8
147	904	50	c	n	10/17/29	23.1	35.3	8.29	5
147	905	100	oc	n	10/17/29	19.2	35.0	8.29	5
147	908	50	r	p	10/17/29	23.1	35.3	8.29	5
148	910	0	oc	n	10/19/29	23.4	35.2	.....	...
148	911	50	r	n	10/19/29	23.0	35.1	.....	...
148	912	100	oc	n	10/19/29	20.0	35.0	.....	...
148	917	0	r	p	10/19/29	23.4	35.2	8.29	5
148	918	50	r	p	10/19/29	23.0	35.1	8.29	5
149	920	0	oc	n	10/21/29	23.5	35.0	8.34	6
149	921	50	oc	n	10/21/29	23.3	35.0	8.37	6
149	922	100	oc	n	10/21/29	20.3	34.9	8.38	6
150	929	0	oc	n	10/23/29	25.6	34.7	8.39	7
150	930	50	oc	n	10/23/29	22.8	34.8	8.35	10
150	931	100	oc	n	10/23/29	19.6	34.6	8.32	11
151	937	0	r	n	10/26/29	26.0	34.0	.....	...
151	938	50	oc	n	10/26/29	18.3	34.4	.....	...
152	944	0	r	n	10/27/29	27.4	33.7	8.35	20
152	945	50	oc	n	10/27/29	14.2	34.5	7.87	53
152	946	100	oc	n	10/27/29	11.4	34.7	7.76	75
153	951	0	oc	n	10/29/29	28.1	34.2	8.47	7
153	952	50	c	n	10/29/29	28.1	34.4	8.39	7
153	953	100	oc	n	10/29/29	20.5	34.7	8.28	31
153	955	0	r	p	10/29/29	28.1	34.2	8.47	7
153	956	50	oc	p	10/29/29	28.1	34.4	8.39	7
154	958	0	c	n	10/31/29	28.3	34.2	8.39	7
154	959	50	oc	n	10/31/29	28.2	34.2	8.40	7
154	960	100	r	n	10/31/29	25.3	34.8	7.93	21
155	966	50	c	n	11/ 2/29	27.7	34.9	8.30	30
155	967	100	oc	n	11/ 2/29	27.2	35.0	8.30	35
156	972	0	oc	n	11/ 4/29	27.6	35.0	8.34	28
156	973	50	oc	n	11/ 4/29	27.0	35.1	8.37	46
156	974	100	oc	n	11/ 4/29	26.4	35.1	8.30	48
157	978	0	c	n	11/ 6/29	27.1	35.3	8.27	47
157	979	50	c	n	11/ 6/29	27.1	35.2	8.32	60
157	980	100	oc	n	11/ 6/29	26.8	35.5	8.30	64
158	983	0	c	n	11/ 8/29	28.2	35.6	8.34	36
158	984	50	c	n	11/ 8/29	28.2	35.6	8.39	50
158	985	100	oc	n	11/ 8/29	27.6	35.9	8.39	48
159	990	0	oc	n	11/11/29	28.6	35.7	8.37	15
159	991	50	oc	n	11/11/29	28.5	35.7	8.39	15
159	992	100	oc	n	11/11/29	28.0	35.7	8.37	23
Penryhn Island	997	0	oc	n	....	.....	.....	.....	...
160	1000	0	oc	n	11/13/29	28.6	35.6	8.37	12
160	1002	50	oc	n	11/13/29	28.6	35.6	8.39	15
160	1003	100	oc	n	11/15/29	26.0	36.0	8.33	23

Table 44. Distributional and environmental records for Ceratium deflexum

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m^3
35	203	0	c	n	10/26/28	27.4	29.7	8.31	115
35	204	50	r	n	10/26/28	16.8	34.7	7.92	138
35	206	0	c	p	10/26/28	27.4	29.7	8.31	15
35a	208	0	c	n	10/26/28	(27.4	29.7	8.31	15)
35a	209	0	c	n	10/27/28	(27.4	29.7	8.31	15)
35-36	212	0	c	n	10/28/28	(27.0	30.7	8.27	16)
36	213	0	oc	n	10/30/28	26.5	31.6	8.23	16
36	216	0	r	p	10/30/28	26.5	31.6	8.23	16

Table 44. Distributional and environmental records for Ceratium deflexum--Continued

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
37	217	0	oc	n	11/ 1/28	27.1	31.7	8.28	15
37	218	50	r	n	11/ 1/28	18.8	34.5	8.00	121
37	219	100	oc	n	11/ 1/28	15.1	34.9	7.82	153
37	220	0	r	p	11/ 1/28	27.1	31.7	8.28	15
38	224	100	r	n	11/ 3/28	15.6	34.9	7.91	166
40	229	0	r	n	11/ 8/28	22.2	33.7	8.21	24
41	235	0	r	n	11/10/28	20.4	34.2	8.11	32
41a	240	0	c	n	11/12/28	(18.7	34.7	8.06	45)
42	241	0	r	n	11/13/28	(18.7	34.7	8.06	45)
42	242	50	r	n	11/13/28	17.2	34.9	7.99	68
42	243	100	r	n	11/13/28	13.8	35.0	7.91	150
43	246	100	r	n	11/15/28	13.6	35.0	7.90	92
43	247	0	r	p	11/15/28	19.6	34.8	8.09	52
44	250	0	r	n	11/17/28	20.7	34.9	8.03	38
44	251	50	oc	n	11/17/28	20.4	34.9	8.04	34
44	253	0	oc	p	11/17/28	20.7	34.9	8.03	38
45	256	0	r	n	11/19/28	22.4	35.3	8.12	38
45	257	50	r	n	11/19/28	22.4	35.2	8.13	46
45	259	0	r	p	11/19/28	22.4	35.3	8.12	38
46	261	0	oc	n	11/21/28	23.3	35.3	8.16	36
46	262	50	oc	n	11/21/28	23.2	35.3	8.16	40
46	263	100	r	n	11/21/28	22.5	35.4	8.17	40
46	264	0	r	p	11/21/28	23.3	35.3	8.16	36
46	265	50	r	p	11/21/28	23.2	35.3	8.16	40
47	266	0	r	n	11/23/28	23.9	36.0	8.23	17
47	267	50	oc	n	11/23/28	23.8	36.0	8.23	20
47	268	100	oc	n	11/23/28	22.7	36.2	8.23	20
48	272	50	r	n	11/25/28	23.6	36.4	8.24	16
61	364	50	oc	n	12/28/28	14.0	34.0	8.05	60
61	365	100	c	n	12/28/28	10.8	34.0	8.03	80
61	368	100	r	p	12/28/28	10.8	34.0	8.03	80
62	372	50	r	n	12/30/28	16.2	34.3	8.10	28
74	456	0	r	n	2/12/29	24.2	35.6	8.17	68
78	475	0	oc	n	2/20/29	24.6	36.0	8.17	32
78	477	100	oc	n	2/20/29	21.9	36.2	8.14	34
78	478	0	oc	p	2/20/29	24.6	36.0	8.17	32
79	482	50	r	n	2/22/29	24.5	36.1	8.17	34
79	484	0	r	p	2/22/29	25.2	36.0	8.17	34
80	486	0	oc	n	2/24/29	26.0	35.9	8.20	36
80	487	50	r	n	2/24/29	25.9	36.0	8.19	29
80	488	0	r	p	2/24/29	26.0	35.9	8.20	36
81	491	0	oc	n	2/26/29	26.5	35.8	8.19	38
81	492	50	oc	n	2/26/29	26.4	35.9	8.19	38
82	496	0	c	n	2/28/29	27.2	36.3	8.21	34
82	497	50	oc	n	2/28/29	27.2	36.3	8.21	34
82	498	0	r	p	2/28/29	27.2	36.3	8.21	34
83	501	0	c	n	3/ 2/29	27.5	36.3	8.24	29
83	502	50	oc	n	3/ 2/29	27.4	36.5	8.24	25
84	505	0	oc	n	3/ 4/29	27.8	36.2	8.23	24
84	506	50	oc	n	3/ 4/29	27.5	36.4	8.21	24
84	507	0	r	p	3/ 4/29	27.8	36.2	8.23	24
85	510	0	oc	n	3/ 6/29	27.9	36.2	8.22	40
85	511	50	r	n	3/ 6/29	27.8	36.2	8.22	40
85	512	0	r	p	3/ 6/29	27.9	36.2	8.22	40
86	515	0	oc	n	3/ 8/29	(28.3	36.2	8.29	20)
86	516	0	oc	n	3/ 9/29	(28.3	36.2	8.29	20)
87	521	0	r	n	3/11/29	27.8	36.1	8.28	17
88	526	0	r	n	3/21/29	28.5	35.9	8.23	16
89	528	0	r	n	3/23/29	28.4	35.6	8.25	21
89	532	0	r	n	3/23/29	(28.4	35.6	8.25	21)
91	540	0	oc	n	3/27/29	28.7	35.1	8.30	21
91	541	50	r	n	3/27/29	28.5	35.2	8.30	24
92	545	0	r	n	3/29/29	28.5	35.3	8.29	28
92	549	100	r	p	3/29/29	26.2	36.0	8.28	28
93	550	0	c	n	3/31/29	28.7	34.7	8.30	28
93	551	50	oc	n	3/31/29	28.5	34.8	8.30	28
93	552	0	oc	p	3/31/29	28.7	34.7	8.26	14
96	568	0	r	n	4/26/29	29.3	35.3	8.23	12
97	574	0	oc	n	4/28/29	28.3	35.2	8.16	24
97	576	100	r	n	4/28/29	27.6	35.6	8.15	25
101	604	50	r	n	5/ 7/29	26.2	34.7	8.24	8
105	627	50	c	n	5/15/29	26.8	34.9	8.23	5
105	628	50	r	n	5/15/29	26.8	34.9	8.23	5
106	633	0	r	n	5/17/29	27.2	35.0	8.23	5
107	640	50	r	n	5/19/29	27.9	34.4	8.23	4
113	680	0	oc	n	6/25/29	24.2	34.5	8.25	5

Table 44. Distributional and environmental records for Ceratium deflexum--Concluded

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
113	682	100	r	n	6/25/29	21.5	34.7	8.23	8
150	929	0	c	n	10/23/29	25.6	34.7	8.39	7
150	930	50	oc	n	10/23/29	22.8	34.8	8.35	10
150	933	0	oc	p	10/23/29	25.6	34.7	8.39	7
150	934	50	r	p	10/23/29	22.8	34.8	8.35	10
150	935	100	r	p	10/23/29	19.6	34.6	8.32	11
150	931	100	oc	n	10/23/29	19.6	34.6	8.32	11
151	937	0	c	n	10/26/29	26.0	34.0	.....	...
151	941	0	r	p	10/26/29	26.0	34.0	.....	...
152	944	00	oc	n	10/27/29	27.4	33.7	8.35	20
152	948	0	r	p	10/27/29	27.4	33.7	8.35	20
153	951	0	r	n	10/29/29	28.1	34.2	8.47	7
153	953	100	r	n	10/29/29	20.5	34.7	8.28	31
153	955	0	r	p	10/29/29	28.1	34.2	8.47	7
155	965	0	r	n	11/ 2/29	27.8	34.9	8.29	29
156	972	0	r	n	11/ 4/29	27.6	35.0	8.34	28
156	974	100	r	n	11/ 4/29	26.4	35.1	8.30	48
157	978	0	r	n	11/ 6/29	27.1	35.3	8.27	47
158	983	0	oc	n	11/ 8/29	28.2	35.6	8.34	36
158	984	50	oc	n	11/ 8/29	28.2	35.6	8.39	50
158	985	100	oc	n	11/ 8/29	27.6	35.9	8.39	48
159	991	50	r	n	11/11/29	28.5	35.7	8.39	15
160	1000	0	r	n	11/13/29	28.6	35.6	8.37	12

Table 45. Distributional and environmental records for Ceratium carriense

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
1	1	0	r	n	5/12/28	24.0	36.2	8.16	34
1	2	70	r	n	5/12/28	(22.4	36.4	8.17	35)
1b	6	0	c	n	5/16/28	(22.3	36.3	8.20	46)
13a	89	0	r	n	8/ 8/28	(21.2	35.2	8.18	11)
16	103	0	r	p	8/13/28	25.9	36.2	8.24	8
16	104	50	r	p	8/13/28	24.4	36.4	8.23	8
16	106	0	r	n	8/13/28	25.9	36.2	8.24	8
16	107	50	r	n	8/13/28	24.4	36.4	8.23	8
17	112	50	r	n	8/15/28	21.9	36.6	8.28	12
19	121	50	r	p	8/20/28	25.2	37.1	8.27	5
19	122	0	c	n	8/20/28	26.6	37.0	8.34	5
19	123	50	oc	n	8/20/28	25.2	37.1	8.27	5
19	124	100	oc	n	8/20/28	22.4	37.0	8.25	5
23	145	0	r	p	8/29/28	27.2	35.9	8.25	4
23	146	50	r	p	8/29/28	20.9	36.0	8.14	13
23	149	50	oc	n	8/29/28	20.9	36.0	8.14	13
23	150	100	r	n	8/29/28	16.6	36.0	8.18	75
25	160	0	r	n	9/ 3/28	27.5	35.6	8.31	5
25	161	50	r	n	9/ 3/28	21.5	36.0	8.22	12
28	174	50	r	p	9/11/28	26.7	36.3	8.26	4
28	176	0	r	n	9/11/28	27.6	36.3	8.29	4
28	178	100	r	n	9/11/28	22.8	36.6	8.22	7
31	191	0	r	n	10/ 3/28	28.5	34.4	8.27	2
31	192	50	r	n	10/ 3/28	28.2	35.4	8.23	2
32	194	0	r	n	10/ 5/28	28.0	36.0	8.23	2
34	202	50	oc	n	10/ 9/28	25.0	36.5	8.21	3
35	203	0	r	n	10/26/28	27.4	29.7	8.31	15
35	204	50	r	n	10/26/28	16.8	34.7	7.92	138
37	217	0	r	n	11/ 1/28	27.1	31.7	8.28	15
37	219	100	r	n	11/ 1/28	15.1	34.9	7.82	153
37	220	0	oc	p	11/ 1/28	27.1	31.7	8.28	15
40	232	0	r	p	11/ 8/28	22.2	33.7	8.21	24
41	235	0	r	n	11/10/28	20.4	34.2	8.11	32
41	238	0	r	p	11/10/28	20.4	34.2	8.11	32
44	255	100	r	p	11/17/28	13.8	35.0	7.85	70
45	256	0	r	n	11/19/28	22.4	35.3	8.12	38
46	261	0	oc	n	11/21/28	23.3	35.3	8.16	36
46	262	50	oc	n	11/21/28	23.2	35.3	8.16	40
46	263	100	r	n	11/21/28	22.5	35.4	8.17	40
46	264	0	r	p	11/21/28	23.3	35.3	8.16	36
47	266	0	r	n	11/23/28	23.9	36.0	8.23	17
47	267	50	oc	n	11/23/28	23.8	36.0	8.23	20
47	268	100	oc	n	11/23/28	22.7	36.2	8.23	20
47	269	0	r	p	11/23/28	23.9	36.0	8.23	27

Table 45. Distributional and environmental records for Ceratium carriense--Continued

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
48	271	0	oc	n	11/25/28	23.6	36.4	8.23	13
48	272	50	oc	n	11/25/28	23.6	36.4	8.24	16
48	273	100	oc	n	11/25/28	22.7	36.3	8.26	16
48	274	0	r	p	11/25/28	23.6	36.4	8.23	13
48	276	100	r	p	11/25/28	22.7	36.3	8.26	16
49	277	0	oc	n	11/27/28	23.4	36.2	8.27	13
49	278	50	oc	n	11/27/29	22.6	36.1	8.26	13
49	279	100	oc	n	11/27/28	21.8	35.9	8.26	13
49a	283	0	oc	n	11/28/28	(23.2	36.0	8.23	13)
50	284	0	oc	n	11/29/28	23.2	36.0	8.23	13
50	285	50	oc	n	11/29/28	22.0	35.9	8.23	13
50	286	100	oc	n	11/29/28	20.5	35.7	8.22	13
50	288	50	oc	p	11/29/28	22.0	35.9	8.23	13
50	289	100	r	p	11/29/28	20.5	35.7	8.22	13
50-51	291	0	oc	n	11/30/28	(22.8	35.6	8.22	16)
50-51	292	0	oc	n	11/30/28	(22.8	35.6	8.22	16)
51	293	0	oc	n	12/ 1/28	22.8	35.6	8.22	16
51	294	50	oc	n	12/ 1/28	20.5	35.6	8.22	17
51	295	100	oc	n	12/ 1/28	20.0	35.6	8.22	17
51	296	0	r	p	12/ 1/28	22.8	35.6	8.22	16
52	299	0	r	n	12/ 3/28	22.5	35.4	8.21	8
52	300	50	oc	n	12/ 3/28	20.2	35.6	8.20	8
52	302	0	r	p	12/ 3/28	22.5	35.4	8.21	8
53	304	50	oc	n	12/ 5/28	21.2	35.8	8.20	13
53	305	100	oc	n	12/ 5/28	19.9	35.6	8.19	13
53-54	308	0	oc	n	12/ 6/28	(23.0	35.6	8.22	11)
53-54	310	0	oc	n	12/10/28	(23.0	35.6	8.22	11)
54	320	50	oc	n	12/14/28	19.8	35.4	8.18	17
54	321	100	oc	n	12/14/28	18.7	35.4	8.16	20
55	323	0	r	n	12/16/28	20.4	34.9	8.19	12
55	324	50	oc	n	12/16/28	18.7	35.0	8.18	12
55	327	50	r	p	12/16/28	18.7	35.0	8.18	12
56	328	0	c	n	12/18/28	20.8	34.9	8.13	9
56	330	100	oc	n	12/18/28	16.6	34.8	8.11	12
56	332	50	r	p	12/18/28	18.5	35.1	8.14	9
56-57	334	0	oc	n	12/19/28	(19.0	34.5	8.14	20)
57	335	0	oc	n	12/20/28	19.0	34.5	8.14	20
57	338	0	oc	p	12/20/28	19.0	34.5	8.14	20
59	352	50	r	p	12/24/28	14.0	34.0	8.08	38
67	416	0	r	n	1/ 8/29	19.3	34.9	8.11	21
69	424	0	oc	n	1/12/29	21.1	35.2	8.12	62
69	425	50	r	n	1/12/29	17.4	35.1	7.99	151
69	427	0	r	p	1/12/29	21.1	35.2	8.12	62
71	438	0	r	n	2/ 6/29	23.5	35.2	8.13	58
75	462	0	oc	n	2/14/29	22.8	35.8	8.18	44
75	463	50	r	n	2/14/29	20.0	35.5	8.14	46
75	464	100	r	n	2/14/29	17.8	35.4	8.00	75
75	466	50	r	p	2/14/29	20.0	35.5	8.14	46
76	467	0	oc	n	2/16/29	23.4	35.9	8.15	50
76	471	50	r	p	2/16/29	22.1	35.9	8.14	42
77	472	0	oc	n	2/18/29	23.7	36.0	8.19	16
77	473	0	r	p	2/18/29	23.7	36.0	8.19	16
78	475	0	r	n	2/20/29	24.6	36.0	8.17	32
78	477	100	oc	n	2/20/29	21.9	36.2	8.14	34
78	478	0	r	p	2/20/29	24.6	36.0	8.17	32
79	482	50	r	n	2/22/29	24.5	36.1	8.17	34
79	483	100	oc	n	2/22/29	21.8	36.2	8.13	45
80	486	0	oc	n	2/24/29	26.0	35.9	8.20	36
80	487	50	r	n	2/24/29	25.9	36.0	8.19	29
80	488	0	oc	p	2/24/29	26.0	35.9	8.20	36
80	489	50	r	p	2/24/29	25.9	36.0	8.19	29
81	491	0	oc	n	2/26/29	26.5	35.8	8.19	38
81	492	50	oc	n	2/26/29	26.4	35.9	8.19	38
81	493	0	r	p	2/26/29	26.5	35.8	8.19	38
81	494	50	r	p	2/26/29	26.4	35.9	8.19	38
81	495	100	r	p	2/26/29	23.6	36.2	8.18	36
82	496	0	oc	n	2/28/29	27.2	36.3	8.21	34
82	497	50	oc	n	2/28/29	27.2	36.3	8.21	34
82	498	0	r	p	2/28/29	27.2	36.3	8.21	34
83	501	0	c	n	3/ 2/29	27.5	36.3	8.24	29
83	502	50	oc	n	3/ 2/29	27.4	36.5	8.24	25
83	503	0	r	p	3/ 2/29	27.5	36.3	8.24	29
84	505	0	oc	n	3/ 4/29	27.8	36.2	8.23	24
84	506	50	oc	n	3/ 4/29	27.5	36.4	8.21	24
85	510	0	oc	n	3/ 6/29	27.9	36.2	8.22	40
85	511	50	oc	n	3/ 6/29	27.8	36.2	8.22	40

Table 45. Distributional and environmental records for Ceratium carriense--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
86	515	0	r	n	3/ 8/29	(28.3	36.2	8.29	20)
86	516	0	oc	n	3/ 9/29	28.3	36.2	8.29	20
86	519	50	r	p	3/ 9/29	27.4	36.2	8.29	17
87	522	50	oc	n	3/11/29	26.5	36.1	8.26	20
88	526	0	oc	n	3/21/29	28.5	35.9	8.23	16
88	527	50	r	n	3/21/29	28.4	35.9	8.25	13
89	529	50	oc	n	3/23/29	28.6	35.8	8.27	12
90	533	0	r	n	3/25/29	28.5	35.5	8.27	21
90	534	50	r	n	3/25/29	28.6	35.6	8.26	21
90	535	0	r	p	3/25/29	28.5	35.5	8.27	21
91	540	0	oc	n	3/27/29	28.7	35.1	8.30	21
91	541	50	oc	n	3/27/29	28.5	35.2	8.30	24
91	544	100	r	p	3/27/29	25.8	36.0	8.25	30
92	546	50	r	n	3/29/29	28.4	35.4	8.29	28
93	550	0	c	n	3/31/29	28.7	34.7	8.30	28
93	551	50	c	n	3/31/29	28.5	34.8	8.30	28
93	553	100	r	p	3/31/29	27.6	35.8	8.27	29
Samoa	555	0	r	n	4/ 2/29	.....	.....	.....	...
94	558	50	r	n	4/22/29	29.3	34.7	8.25	14
95	563	50	c	n	4/24/29	29.3	34.9	8.24	16
95	564	100	oc	n	4/24/29	28.5	35.4	8.22	21
95	566	50	r	p	4/24/29	29.3	34.9	8.24	16
96	568A	0	oc	n	4/25/29	(29.4	34.7	8.26	14)
96	568	0	oc	n	4/26/29	29.3	35.3	8.23	12
96	569	50	oc	n	4/26/29	29.2	35.3	8.23	12
96	570	100	r	n	4/26/29	28.2	35.7	8.19	25
96	571	0	r	p	4/26/29	29.3	35.3	8.23	12
96	572	50	r	p	4/26/29	29.2	35.3	8.23	12
97	574	0	oc	n	4/28/29	28.3	35.2	8.16	24
97	575	50	c	n	4/28/29	28.0	35.4	8.16	21
97	576	100	oc	n	4/28/29	27.6	35.6	8.15	25
98	581	0	oc	n	4/30/29	27.0	35.3	8.16	24
98	582	50	r	n	4/30/29	26.9	35.3	8.16	28
98	583	100	oc	n	4/30/29	26.7	35.4	8.14	32
99	589	0	oc	n	5/ 2/29	27.9	34.9	8.21	12
99	590	50	c	n	5/ 2/29	27.8	34.9	8.22	12
99	591	100	r	n	5/ 2/29	27.8	35.0	8.22	17
99	592	0	r	p	5/ 2/29	27.9	34.9	8.21	12
99	595	0	oc	n	5/ 2/29	27.9	34.9	8.21	12
100	596	50	oc	n	5/ 4/29	27.6	34.7	8.21	10
100	597	100	oc	n	5/ 4/29	27.6	34.7	8.22	12
101	603	0	oc	n	5/ 7/29	26.3	34.7	8.24	8
101	604	50	oc	n	5/ 7/29	26.2	34.7	8.24	8
101	605	100	r	n	5/ 7/29	25.2	35.1	8.23	8
101	608	100	r	p	5/ 7/29	25.2	35.1	8.23	8
102	609	0	r	n	5/ 9/29	25.8	35.0	8.24	8
102	610	50	r	n	5/ 9/29	25.8	35.0	8.24	8
102	611	100	r	n	5/ 9/29	25.6	35.0	8.23	8
103	615	0	oc	n	5/11/29	26.0	35.0	8.25	5
103	617	100	oc	n	5/11/29	24.8	35.2	8.25	5
104	621	0	r	n	5/13/29	26.1	35.2	8.24	7
104	623	100	oc	n	5/13/29	25.3	35.3	8.21	7
105	627	50	oc	n	5/15/29	26.8	34.9	8.23	5
105	628	50	r	n	5/15/29	26.8	34.9	8.23	5
106	633	0	r	n	5/17/29	27.2	35.0	8.23	5
106	634	50	r	n	5/17/29	27.0	35.0	8.23	5
106	635	100	r	n	5/17/29	25.6	35.1	8.23	5
107	639	0	c	n	5/19/29	28.0	34.4	8.23	5
107	640	50	c	n	5/19/29	27.9	34.4	8.23	4
107	641	100	r	n	5/19/29	26.8	34.9	8.23	11
107	642	0	r	p	5/19/29	28.0	34.4	8.23	5
108	648	100	oc	n	5/27/29	25.2	35.0	8.23	4
109	655	50	r	n	5/29/29	23.1	35.0	8.22	3
109	656	100	oc	n	5/29/29	19.4	34.8	8.18	5
112	674	0	oc	n	6/ 5/29	23.2	34.6	8.22	7
112	675	50	oc	n	6/ 5/29	21.7	34.6	8.23	7
112	676	100	r	n	6/ 5/29	19.8	34.7	8.20	8
113	680	0	oc	n	6/25/29	24.2	34.5	8.25	5
113	681	50	oc	n	6/25/29	23.8	34.6	8.25	5
113	682	100	oc	n	6/25/29	21.5	34.7	8.23	8
128	779	0	oc	n	7/25/29	16.4	33.0	8.12	29
129	780	0	c	n	7/27/29	16.3	33.1	8.13	25
130	787	0	oc	n	9/ 4/29	16.2	33.4	8.34	36
131	789	100	oc	n	9/ 6/29	12.1	33.4	8.32	...
131	792	0	r	p	9/ 6/29	19.3	33.4	8.34	...
131	793	0	r	p	9/ 6/29	19.3	33.4	8.34	36
132	797	0	oc	n	9/ 8/29	21.0	33.9	8.34	15

Table 45. Distributional and environmental records for Ceratium carriense--Continued

Station	Sample	Depth (m)	Relative abundance	Appa- ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
132	798	50	oc	n	9/ 8/29	17.6	33.9	8.33	19
132	799	100	r	n	9/ 8/29	14.3	33.4	8.30	16
132	801	0	r	p	9/ 8/29	21.0	33.9	8.34	15
132	802	50	r	p	9/ 8/29	17.6	33.9	8.33	19
132	803	100	r	p	9/ 8/29	14.3	33.4	8.30	16
133	804	0	oc	n	9/10/29	22.7	34.7	8.47	7
133	805	50	r	n	9/10/29	20.8	34.7	8.37	7
133	806	100	r	n	9/10/29	18.4	34.8	8.31	7
134	808	0	r	n	9/12/29	22.9	34.7	8.34	6
134	809	50	r	n	9/12/29	19.8	34.6	8.34	6
134	810	100	oc	n	9/12/29	18.1	34.6	8.34	6
135	820	0	r	n	9/14/29	23.8	35.1	8.37	7
135	821	50	oc	n	9/14/29	21.5	35.0	8.37	5
135	822	100	r	n	9/14/29	18.7	34.8	8.34	5
135	824	0	r	p	9/14/29	23.8	35.1	8.37	7
136	827	0	oc	n	9/16/29	24.6	35.4	8.37	3
136	828	50	oc	n	9/16/29	21.4	35.1	8.39	3
137	836	0	c	n	9/18/29	25.5	35.0	8.39	4
137	837	50	c	n	9/18/29	24.4	35.1	8.34	4
137	838	100	r	n	9/18/29	21.5	35.1	8.30	5
137	840	0	r	p	9/18/29	25.5	35.0	8.39	4
138	843	0	oc	n	9/20/29	26.1	34.8	8.35	5
138	844	50	oc	n	9/20/29	25.6	34.7	8.30	3
138	845	100	oc	n	9/20/29	22.2	34.8	8.31	3
138	847	0	r	p	9/20/29	26.1	34.8	8.35	5
139	849	0	oc	n	9/22/29	26.7	34.8	8.34	6
139	850	50	oc	n	9/22/29	25.8	34.9	8.31	6
140	856	0	c	n	10/ 3/29	26.9	35.0	8.42	7
140	857	50	oc	n	10/ 3/29	26.9	35.0	8.39	7
140	858	100	r	n	10/ 3/29	25.5	35.0	8.34	7
140	861	50	r	p	10/ 3/29	26.9	35.0	8.39	7
141	864	0	r	n	10/ 5/29	25.9	35.2	8.34	5
141	865	50	r	n	10/ 5/29	24.8	35.3	8.34	5
141	870	50	r	p	10/ 5/29	24.8	35.3	8.34	5
142	873	50	r	n	10/ 7/29	21.8	34.8	8.30	5
142	874	100	r	n	10/ 7/29	16.6	34.4	8.27	7
142	877	50	r	p	10/ 7/29	21.8	34.8	8.30	5
143	881	0	c	n	10/ 9/29	22.4	34.4	8.30	6
143	882	50	oc	n	10/ 9/29	19.0	34.2	8.34	6
143	883	100	oc	n	10/ 9/29	13.8	34.1	8.30	10
143	884	0	r	p	10/ 9/29	22.4	34.4	8.30	6
145	890	0	r	n	10/13/29	22.3	34.6	8.29	6
145	891	50	r	n	10/13/29	18.7	34.3	8.34	6
145	892	100	r	n	10/13/29	16.0	34.1	8.31	6
147	904	50	r	n	10/17/29	23.1	35.3	8.29	5
148	910	0	oc	n	10/19/29	23.4	35.2	.....	...
148	911	50	oc	n	10/19/29	23.0	35.1	.....	...
148	912	100	oc	n	10/19/29	20.0	35.0	.....	...
148	917	0	r	p	10/19/29	23.4	35.2	.....	...
149	920	0	c	n	10/21/29	23.5	35.0	8.34	6
149	921	50	oc	n	10/21/29	23.3	35.0	8.37	6
150	929	0	r	n	10/23/29	25.6	34.7	8.39	7
150	931	100	r	n	10/23/29	19.6	34.6	8.32	11
151	938	50	oc	n	10/26/29	18.3	34.4	.....	...
151	939	100	oc	n	10/26/29	12.5	34.6	.....	...
151	942	50	r	p	10/26/29	18.3	34.4	.....	...
152	945	50	oc	n	10/27/29	14.2	34.5	7.87	53
153	951	0	oc	n	10/29/29	28.1	34.2	8.47	7
153	952	50	oc	n	10/29/29	28.1	34.4	8.39	7
153	953	100	r	n	10/29/29	20.5	34.7	8.28	31
153	955	0	r	p	10/29/29	28.1	34.2	8.47	7
153	956	50	r	p	10/29/29	28.1	34.4	8.39	7
153	957	100	r	p	10/29/29	20.5	34.7	8.28	31
154	958	0	r	n	10/31/29	28.3	34.2	8.39	7
154	959	50	r	n	10/31/29	28.2	34.2	8.40	7
154	960	100	r	n	10/31/29	25.3	34.8	7.93	21
155	965	0	c	n	11/ 2/29	27.8	34.9	8.29	29
155	966	0	oc	n	11/ 2/29	27.8	34.9	8.29	29
155	967	100	r	n	11/ 2/29	27.2	35.0	8.30	35
156	972	0	oc	n	11/ 4/29	27.6	35.0	8.34	28
156	973	0	r	p	11/ 4/29	27.6	35.0	8.34	28
156	974	100	oc	n	11/ 4/29	26.4	35.1	8.30	48
157	978	0	oc	n	11/ 6/29	27.1	35.3	8.27	47
157	979	50	r	n	11/ 6/29	27.1	35.2	8.32	60
157	980	100	oc	n	11/ 6/29	26.8	35.5	8.30	64
158	983	0	c	n	11/ 8/29	28.2	35.6	8.34	36

Table 45. Distributional and environmental records for Ceratium carriense--Concluded

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
158	984	50	oc	n	11/ 8/29	28.2	35.6	8.39	50
158	985	100	oc	n	11/ 8/29	27.6	35.9	8.39	48
159	990	0	oc	n	11/11/29	28.6	35.7	8.37	15
159	991	50	oc	n	11/11/29	28.5	35.7	8.39	15
159	992	100	r	n	11/11/29	28.0	35.7	8.37	23
160	1000	0	oc	n	11/13/29	28.6	35.6	8.37	12
160	1002	50	oc	n	11/13/29	28.6	35.6	8.39	15
160	1003	100	oc	n	11/13/29	28.5	35.7	8.44	16

Table 46. Distributional and environmental records for Ceratium contrarium

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
1	1	0	oc	n	5/12/28	24.0	36.2	8.16	34
1	2	70	r	n	5/12/28	(22.4	36.4	8.17	35)
1a	3	0	oc	n	5/14/28	(22.3	36.3	8.20	46)
1a	4	0	c	n	5/14/28	(22.3	36.3	8.20	46)
1a	5	0	c	n	5/14/28	(22.3	36.3	8.20	46)
1b	6	0	oc	n	5/16/28	(22.3	36.3	8.20	46)
1b	7	50	r	n	5/16/28	(22.2	36.4	8.21	39)
2	14	0	c	n	5/18/28	20.5	36.4	8.23	58
15	97	0	c	p	8/11/28	24.8	36.4	8.21	11
15	98	50	r	p	8/11/28	19.8	36.5	8.21	8
15	99	100	c	p	8/11/28	18.4	36.4	8.20	19
15	100	0	oc	n	8/11/28	24.8	36.4	8.21	11
15	101	50	oc	n	8/11/28	19.8	36.5	8.21	8
15	102	100	r	n	8/11/28	18.4	36.4	8.20	19
16	103	0	r	p	8/13/28	25.9	36.2	8.24	8
16	106	0	r	n	8/13/28	25.9	36.2	8.24	8
16	108	100	oc	n	8/13/28	19.9	36.5	8.17	13
17	109	0	r	p	8/15/28	26.2	36.6	8.29	9
17	110	50	oc	p	8/15/28	21.9	36.6	8.28	12
17	111	0	r	n	8/15/28	26.2	36.6	8.29	9
17	112	50	oc	n	8/15/28	21.9	36.6	8.28	12
17	113	100	r	n	8/15/28	19.3	36.5	8.23	9
18	114	0	oc	p	8/17/28	27.0	37.0	8.23	5
18	115	50	oc	p	8/17/28	22.4	36.8	8.24	5
18	117	0	c	n	8/17/28	27.0	37.0	8.23	5
18	118	50	c	n	8/17/28	22.4	36.8	8.24	5
19	120	0	oc	p	8/20/28	26.6	37.0	8.34	5
19	121	50	r	p	8/20/28	25.2	37.1	8.27	5
19	122	0	c	n	8/20/28	26.6	37.0	8.34	5
19	123	50	c	n	8/20/28	25.2	37.1	8.27	5
19	124	100	oc	n	8/20/28	22.4	37.0	8.25	5
20	125	0	r	p	8/22/28	26.0	36.6	8.37	5
20	126	50	oc	p	8/22/28	25.8	36.6	8.26	3
20	127	100	r	p	8/22/28	22.6	36.7	8.19	5
20	128	0	c	n	8/22/28	26.0	36.6	8.37	5
20	129	50	c	n	8/22/28	25.8	36.6	8.26	3
20	130	100	c	n	8/22/28	22.6	36.7	8.19	5
20-21	131	0	oc	n	8/23/28	(26.6	36.3	8.32	4)
21	135	0	c	n	8/24/28	26.6	36.3	8.32	4
21	136	50	oc	n	8/24/28	24.4	36.2	8.26	4
21	137	100	oc	n	8/24/28	21.0	36.8	8.20	7
22	139	0	oc	p	8/27/28	26.7	36.0	8.26	8
22	142	0	oc	n	8/27/28	26.7	36.0	8.26	8
22	143	50	oc	n	8/27/28	24.5	36.2	8.21	9
23	148	0	r	n	8/29/28	27.2	35.9	8.25	4
23	149	50	r	n	8/29/28	20.9	36.0	8.14	13
25	161	50	r	n	9/ 3/28	21.5	36.0	8.22	12
27	168	50	r	p	9/ 7/28	26.0	36.2	8.30	4
28	174	50	oc	p	9/11/28	26.7	36.3	8.26	4
28	176	0	oc	n	9/11/28	27.6	36.3	8.29	4
28	177	50	r	n	9/11/28	26.7	36.3	8.26	4
28	178	100	r	n	9/11/28	22.8	36.3	8.22	7
29	183	50	r	n	9/13/28	27.2	36.2	8.29	3
30	188	0	r	n	9/15/28	28.0	36.1	8.30	2
30	189	50	oc	n	9/15/28	27.8	36.1	8.29	3
31	192	50	oc	n	10/ 3/28	28.2	35.4	8.23	2
35	203	0	c	n	10/26/28	27.4	29.7	8.31	15
35	206	0	c	p	10/26/28	27.4	29.7	8.31	15
35a	208	0	oc	n	10/26/28	(27.4	29.7	8.31	15)

Table 46. Distributional and environmental records for Ceratium contrarium--Continued

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
35-36	212	0	r	n	10/28/28	(27.0	30.7	8.27	16)
36	213	0	oc	n	10/30/28	26.5	31.6	8.23	16
36	216	0	oc	p	10/30/28	26.5	31.6	8.23	16
37	219	100	r	n	11/ 1/28	15.1	34.9	7.82	153
37	220	0	r	p	11/ 1/28	27.1	31.7	8.28	15
37	221	50	oc	p	11/ 1/28	18.8	34.5	8.00	121
41	235	0	r	n	11/10/28	20.4	34.2	8.11	32
41a	240	0	r	n	11/12/28	(18.7	34.7	8.06	45)
42	241	0	r	n	11/13/28	18.7	34.7	8.06	45
43	246	100	r	n	11/15/28	13.6	35.0	7.90	92
44	250	0	r	n	11/17/28	20.7	34.9	8.03	38
45	256	0	c	n	11/19/28	22.4	35.3	8.12	38
45	257	50	oc	n	11/19/28	22.4	35.2	8.13	46
45	258	100	oc	n	11/19/28	18.6	35.1	8.00	50
45	259	0	r	p	11/19/28	22.4	35.3	8.12	38
45	260	50	r	p	11/19/28	22.4	35.2	8.13	46
46	261	0	oc	n	11/21/28	23.3	35.3	8.16	36
46	262	50	oc	n	11/21/28	23.2	35.3	8.16	40
46	263	100	r	n	11/21/28	22.5	35.4	8.17	40
46	264	0	r	p	11/21/28	23.3	35.3	8.16	36
46	264	0	oc	p	11/21/28	23.3	35.3	8.16	36
46	265	50	r	p	11/21/28	23.2	35.3	8.16	40
47	266	0	r	n	11/23/28	23.9	36.0	8.23	17
47	267	50	oc	n	11/23/28	23.8	36.0	8.23	20
47	268	100	oc	n	11/23/28	22.7	36.2	8.23	20
47	269	0	oc	p	11/23/28	23.9	36.0	8.23	17
47	270	50	r	p	11/23/28	23.8	36.0	8.23	20
48	271	0	c	n	11/25/28	23.6	36.4	8.23	13
48	272	50	oc	n	11/25/28	23.6	36.4	8.24	16
48	273	100	c	n	11/25/28	22.7	36.3	8.26	16
48	274	0	oc	p	11/25/28	23.6	36.4	8.23	13
48	275	50	oc	p	11/25/28	23.6	36.4	8.24	16
48	276	100	r	p	11/25/28	22.7	36.3	8.26	16
49	277	0	oc	n	11/27/28	23.4	36.2	8.27	13
49	278	50	c	n	11/27/28	22.6	36.1	8.26	13
49	279	100	c	n	11/27/28	21.6	35.9	8.26	13
49	280	0	r	p	11/27/28	23.4	36.2	8.27	13
49	281	50	oc	p	11/27/28	22.6	36.1	8.26	13
49	282	100	r	p	11/27/28	21.6	35.9	8.26	13
49a	283	0	oc	n	11/28/28	(23.2	36.0	8.23	13)
50	284	0	c	n	11/29/28	23.2	36.0	8.23	13
50	285	50	oc	n	11/29/28	22.0	35.9	8.23	13
50	286	100	c	n	11/29/28	20.5	35.7	8.22	13
50	289	100	oc	p	11/29/28	20.5	35.7	8.22	13
50-51	290	0	oc	n	11/30/28	(22.8	35.6	8.22	16)
50-51	291	0	oc	n	11/30/28	(22.8	35.6	8.22	16)
50-51	292	0	oc	n	11/30/28	(22.8	35.6	8.22	16)
51	293	0	oc	n	12/ 1/28	22.8	35.6	8.22	16
51	294	50	oc	n	12/ 1/28	20.5	35.6	8.22	17
51	297	50	r	p	12/ 1/28	20.5	35.6	8.22	17
51	298	100	r	p	12/ 1/28	20.0	35.6	8.22	17
54	320	50	oc	n	12/14/28	19.8	35.4	8.18	17
54	321	100	oc	n	12/14/28	18.7	35.4	8.16	20
55	323	0	oc	n	12/16/28	20.4	34.9	8.19	12
55	325	100	oc	n	12/16/28	16.7	34.9	7.17	12
55	326	0	r	p	12/16/28	20.4	34.9	8.19	12
55	327	50	r	p	12/16/28	18.7	35.0	8.18	12
56	328	0	c	n	12/18/28	20.8	34.9	8.13	9
56	330	100	oc	n	12/18/28	16.6	34.8	8.11	12
56	331	0	oc	p	12/18/28	20.8	34.9	8.13	9
56	332	50	oc	p	12/18/28	18.5	35.1	8.14	9
56	333	100	r	p	12/18/28	16.6	34.8	8.11	12
56-57	334	0	c	n	12/19/28	(19.0	34.5	8.14	20)
57	335	0	c	n	12/20/28	19.0	34.5	8.14	20
57	336	50	oc	n	12/20/28	15.6	34.3	8.14	21
57	338	0	oc	p	12/20/28	19.0	34.5	8.14	20
57	339	50	r	p	12/20/28	15.6	34.3	8.14	21
57	340	100	r	p	12/20/28	14.3	34.4	8.10	40
58	346	100	r	p	12/22/28	12.3	34.1	8.05	40
59	349	50	r	n	12/24/28	14.0	34.0	8.08	38
59	351	0	r	p	12/24/28	16.3	34.0	8.10	38
60	355	50	r	n	12/26/28	13.4	34.0	8.06	54
60-61	360	0	r	n	12/26/28	(15.0	34.0	8.07	50)
61	363	0	oc	n	12/28/28	16.9	34.0	8.05	46
61	366	0	r	p	12/28/28	16.9	34.0	8.05	46
61-62	369	0	r	n	12/28/28	(16.9	34.0	8.05	46)

Table 46. Distributional and environmental records for Ceratium contrarium--Continued

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
61-62	370	0	oc	n	12/28/28	(16.9	34.0	8.05	46)
62	371	0	oc	n	12/30/28	19.2	34.2	8.12	32
62	372	50	r	n	12/30/28	16.2	34.3	8.10	28
62	373	100	r	n	12/30/28	13.1	34.2	8.06	48
62	376	100	r	p	12/30/28	13.1	34.2	8.06	48
62-63	378	0	r	n	12/31/28	(20.5	34.6	8.07	21)
63	379	0	oc	n	1/ 1/29	20.5	34.6	8.07	21
63	380	50	oc	n	1/ 1/29	17.0	34.6	8.08	25
63	381	100	r	n	1/ 1/29	15.6	34.6	8.08	24
63	382	0	r	p	1/ 1/29	20.5	34.6	8.07	21
63	383	50	r	p	1/ 1/29	17.0	34.6	8.08	25
63-64	385	0	r	n	1/ 1/29	(20.5	34.6	8.07	21)
63-64	386	0	oc	n	1/ 1/29	(20.5	34.6	8.07	21)
63-64	387	0	oc	n	1/ 2/29	(20.5	34.6	8.07	21)
63-64	388	0	oc	n	1/ 2/29	(20.5	34.6	8.07	21)
63-64	390	0	oc	n	1/ 2/29	(20.5	34.6	8.07	21)
63-64	391	0	oc	n	1/ 3/29	(20.5	34.6	8.07	21)
63-64	392	0	oc	n	1/ 3/29	(20.5	34.6	8.07	21)
63-64	393	0	r	n	1/ 3/29	(20.5	34.6	8.07	21)
64	394	0	r	n	1/ 3/29	20.6	34.6	8.12	21
64	395	50	r	n	1/ 3/29	17.2	34.6	8.12	29
64	396	100	r	n	1/ 3/29	15.8	34.5	8.10	32
64	398	0	r	p	1/ 3/29	20.6	34.6	8.12	21
64-65	401	0	oc	n	1/ 3/29	(20.6	34.6	8.12	21)
64-65	402	0	r	n	1/ 4/29	(20.6	34.6	8.12	21)
64-65	403	0	oc	n	1/ 4/29	(20.6	34.6	8.12	21)
64-65	404	0	r	n	1/ 4/29	(20.6	34.6	8.12	21)
65	405	0	r	n	1/ 5/29	20.2	34.5	8.10	24
65	406	50	r	n	1/ 5/29	16.5	34.5	8.10	25
65	408	0	r	p	1/ 5/29	20.2	34.5	8.10	24
65	409	50	r	p	1/ 5/29	16.5	34.5	8.10	25
66	411	0	r	n	1/ 7/29	19.4	34.7	8.10	29
66	413	0	r	p	1/ 7/29	19.4	34.7	8.10	29
66	414	50	r	p	1/ 7/29	17.8	34.8	8.10	29
67	416	0	oc	n	1/ 8/29	19.3	34.9	8.11	21
68	419	0	r	n	1/10/29	19.2	35.1	8.14	29
71	441	0	r	p	2/ 6/29	23.5	35.2	8.13	58
73	452	100	oc	n	2/10/29	14.7	35.0	7.80	178
74	456	0	oc	n	2/12/29	24.2	35.6	8.17	68
74	459	0	r	p	2/12/29	24.2	35.6	8.17	68
75	462	0	r	n	2/14/29	22.8	35.8	8.18	44
76	467	0	oc	n	2/16/29	23.4	35.9	8.15	50
76	468	50	r	n	2/16/29	22.1	35.9	8.14	42
76	469	100	r	n	2/16/29	21.2	35.8	8.12	45
77	472	0	oc	n	2/18/29	23.7	36.0	8.19	16
77	473	0	oc	p	2/18/29	23.7	36.0	8.19	16
77	474	50	oc	p	2/18/29	23.5	36.0	8.19	16
78	475	0	oc	n	2/20/29	24.6	36.0	8.17	32
78	476	50	oc	n	2/20/29	23.8	36.1	8.14	32
78	477	100	oc	n	2/20/29	21.9	36.2	8.14	34
78	478	0	oc	p	2/20/29	24.6	36.0	8.17	32
78	479	50	oc	p	2/20/29	23.8	36.1	8.14	32
79	482	50	oc	n	2/22/29	24.5	36.1	8.17	34
79	483	100	oc	n	2/22/29	21.8	36.2	8.13	45
80	486	0	oc	n	2/24/29	26.0	35.9	8.20	36
80	488	0	oc	p	2/24/29	26.0	35.9	8.20	36
80	489	50	oc	p	2/24/29	25.9	36.0	8.19	29
80	490	100	r	p	2/24/29	23.4	36.2	8.16	32
81	491	0	c	n	2/26/29	26.5	35.8	8.19	38
81	492	50	oc	n	2/26/29	26.4	35.9	8.19	38
81	493	0	r	p	2/26/29	26.5	35.8	8.19	38
81	494	50	oc	p	2/26/29	26.4	35.9	8.19	38
81	495	100	r	p	2/26/29	23.6	36.2	8.18	36
82	496	0	c	n	2/28/29	27.2	36.3	8.21	34
82	497	50	oc	n	2/28/29	27.2	36.3	8.21	34
82	498	0	oc	p	2/28/29	27.2	36.3	8.21	34
83	501	0	c	n	3/ 2/29	27.5	36.3	8.24	29
83	502	50	c	n	3/ 2/29	27.4	36.5	8.24	25
83	503	0	r	p	3/ 2/29	27.5	36.3	8.24	29
83	504	50	r	p	3/ 2/29	27.4	36.5	8.24	25
84	505	0	c	n	3/ 4/29	27.8	36.2	8.23	24
84	506	50	c	n	3/ 4/29	27.5	36.4	8.21	24
84	507	0	oc	p	3/ 4/29	27.8	36.2	8.23	24
84	508	50	oc	p	3/ 4/29	27.5	36.4	8.21	24
85	510	0	c	n	3/ 6/29	27.9	36.2	8.22	40
85	511	50	oc	n	3/ 6/29	27.8	36.2	8.22	40

Table 46. Distributional and environmental records for Ceratium contrarium--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
85	512	0	r	p	3/ 6/29	27.9	36.2	8.22	40
85	513	50	oc	p	3/ 6/29	27.8	36.2	8.22	40
86	515	0	c	n	3/ 8/29	(28.3	36.2	8.29	20)
86	516	0	c	n	3/ 9/29	28.3	36.2	8.29	20
86	517	50	c	n	3/ 9/29	27.4	36.2	8.29	17
86	519	50	r	p	3/ 9/29	27.4	36.2	8.29	17
87	521	0	oc	n	3/11/29	27.8	36.1	8.28	17
87	522	50	c	n	3/11/29	26.5	36.1	8.26	20
87	523	0	oc	p	3/11/29	27.8	36.1	8.28	17
87	524	50	oc	p	3/11/29	26.5	36.1	8.26	20
87	525	100	r	p	3/11/29	23.9	36.0	8.23	20
88	526	0	oc	n	3/21/29	28.5	35.9	8.23	16
89	528	0	oc	n	3/23/29	28.4	35.6	8.25	21
89	529	50	c	n	3/23/29	28.6	35.8	8.27	12
89	530	0	r	p	3/23/29	28.4	35.6	8.25	21
89	532	0	oc	n	3/23/29	(28.4	35.6	8.25	21)
90	533	0	c	n	3/25/29	28.5	35.5	8.27	21
90	534	50	c	n	3/25/29	28.6	35.6	8.26	21
90	535	0	oc	p	3/25/29	28.5	35.5	8.27	21
90	536	50	oc	p	3/25/29	28.6	35.6	8.26	21
91	540	0	c	n	3/27/29	28.7	35.1	8.30	21
91	541	50	c	n	3/27/29	28.5	35.2	8.30	24
91	542	0	r	p	3/27/29	28.7	35.1	8.30	21
91	543	50	r	p	3/27/29	28.5	35.2	8.30	24
92	545	0	c	n	3/29/29	28.5	35.3	8.29	28
92	546	50	c	n	3/29/29	28.4	35.4	8.29	28
92	548	50	r	p	3/29/29	28.4	35.4	8.29	28
92	549	100	r	p	3/29/29	26.2	36.0	8.28	28
93	550	0	c	n	3/31/29	28.7	34.7	8.30	28
93	551	50	c	n	3/31/29	28.5	34.8	8.30	28
93	552	0	r	p	3/31/29	28.7	34.7	8.30	28
93	553	100	oc	p	3/31/29	27.6	35.8	8.27	29
94	557	0	r	n	4/22/29	29.5	34.7	8.25	14
94	558	50	oc	n	4/22/29	29.3	34.7	8.25	14
94	559	100	c	n	4/22/29	28.5	35.6	8.21	25
94	561	50	r	p	4/22/29	29.3	34.7	8.25	14
95	563	50	c	n	4/24/29	29.3	34.9	8.24	16
95	564	100	c	n	4/24/29	28.5	35.4	8.22	21
95	565	0	r	p	4/24/29	29.4	34.7	8.26	14
95	566	50	r	p	4/24/29	29.3	34.9	8.24	16
95	568A	0	r	n	4/25/29	(29.4	34.7	8.26	14)
96	568	0	c	n	4/26/29	29.3	35.3	8.23	12
96	569	50	c	n	4/26/29	29.2	35.3	8.23	12
96	570	100	oc	n	4/26/29	28.2	35.7	8.19	25
96	571	0	oc	p	4/26/29	29.3	35.3	8.23	12
96	572	50	oc	p	4/26/29	29.2	35.3	8.23	12
97	574	0	oc	n	4/28/29	28.3	35.2	8.16	24
97	575	50	c	n	4/28/29	28.0	35.4	8.16	21
97	576	100	c	n	4/28/29	27.6	35.6	8.15	25
97	577	0	oc	p	4/28/29	28.3	35.2	8.16	24
97	578	50	oc	p	4/28/29	28.0	35.4	8.16	21
98	581	0	c	n	4/30/29	27.0	35.3	8.16	24
98	582	50	oc	n	4/30/29	26.9	35.3	8.16	28
98	584	0	r	p	4/30/29	27.0	35.3	8.16	24
98	588	0-100	r	p	4/30/29	26.7	35.4	8.14	32
99	589	0	oc	n	5/ 2/29	27.9	34.9	8.21	12
99	591	100	c	n	5/ 2/29	27.8	35.0	8.22	17
99	593	50	r	p	5/ 2/29	27.8	34.9	8.22	12
99	595	0	c	n	5/ 2/29	27.9	34.9	8.21	12
100	596	50	c	n	5/ 4/29	27.6	34.7	8.21	10
100	597	100	c	n	5/ 4/29	27.6	34.7	8.22	12
100	598	0	oc	p	5/ 4/29	27.7	34.7	8.21	10
101	603	0	c	n	5/ 7/29	26.3	34.7	8.24	8
101	604	50	c	n	5/ 7/29	26.2	34.7	8.24	8
101	605	100	c	n	5/ 7/29	25.2	35.1	8.23	8
101	606	0	r	p	5/ 7/29	26.3	34.7	8.24	8
101	607	50	r	p	5/ 7/29	26.2	34.7	8.24	8
102	609	0	c	n	5/ 9/29	25.8	35.0	8.24	8
102	610	50	c	n	5/ 9/29	25.8	35.0	8.24	8
102	611	100	oc	n	5/ 9/29	25.6	35.0	8.23	8
102	612	0	oc	p	5/ 9/29	25.8	35.0	8.24	8
102	613	50	oc	p	5/ 9/29	25.8	35.0	8.24	8
103	615	0	c	n	5/11/29	26.0	35.0	8.25	5
103	616	50	c	n	5/11/29	25.8	35.2	8.25	5
103	617	100	c	n	5/11/29	24.8	35.2	8.25	5
103	818	0	r	p	5/11/29	26.0	35.0	8.25	5

Table 46. Distributional and environmental records for Ceratium contrarium--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
103	619	50	r	p	5/11/29	25.8	35.2	8.25	5
104	621	0	c	n	5/13/29	26.1	35.2	8.24	7
104	622	50	c	n	5/13/29	25.8	35.2	8.24	7
104	623	100	c	n	5/13/29	25.3	35.3	8.21	7
104	624	0	r	p	5/13/29	26.1	35.2	8.24	7
104	625	50	oc	p	5/13/29	25.8	35.2	8.24	7
105	627	50	c	n	5/15/29	26.8	34.9	8.23	5
105	630	0	r	p	5/15/29	26.9	34.9	8.23	5
105	631	50	oc	p	5/15/29	26.8	34.9	8.23	5
106	633	0	c	n	5/17/29	27.2	35.0	8.23	5
106	634	50	c	n	5/17/29	27.0	35.0	8.23	5
106	635	100	c	n	5/17/29	25.6	35.1	8.23	5
106	637	50	r	p	5/17/29	27.0	35.0	8.23	5
106	638	100	r	p	5/17/29	25.6	35.1	8.23	5
107	639	0	c	n	5/19/29	28.0	34.4	8.23	5
107	640	50	c	n	5/19/29	27.9	34.4	8.23	4
107	641	100	c	n	5/19/29	26.8	34.9	8.23	11
107	642	0	oc	p	5/19/29	28.0	34.4	8.23	5
107	643	50	oc	p	5/19/29	27.9	34.4	8.23	4
107	644	100	oc	p	5/19/29	26.8	34.9	8.23	11
107	645	50	oc	p	5/19/29	27.9	34.4	8.23	4
108	646	0	c	n	5/27/29	28.4	35.0	8.25	4
108	647	50	c	n	5/27/29	26.8	35.0	8.24	4
108	648	100	c	n	5/27/29	25.2	35.0	8.23	4
108	649	0	r	p	5/27/29	28.4	35.0	8.25	4
108	651	100	r	p	5/27/29	25.2	35.0	8.23	4
Guam	652	0	oc	n	5/ /29	.....	.....	.....	...
109	654	0	oc	n	5/29/29	27.4	35.0	8.23	3
109	655	50	c	n	5/29/29	23.1	35.0	8.22	3
109	656	100	c	n	5/29/29	19.4	34.8	8.18	5
109	658	50	oc	p	5/29/29	23.1	35.0	8.22	3
110	662	50	oc	n	5/31/29	18.4	34.8	8.16	7
111	668	0	oc	n	6/ 3/29	20.1	34.5	8.18	5
112	674	0	c	n	6/ 5/29	23.2	34.6	8.22	7
112	675	50	c	n	6/ 5/29	21.7	34.6	8.23	7
112	676	100	oc	n	6/ 5/29	19.8	34.7	8.20	8
112	677	0	r	p	6/ 5/29	23.2	34.6	8.22	7
112	678	50	r	p	6/ 5/29	21.7	34.6	8.23	7
113	680	0	r	n	6/25/29	24.2	34.5	8.25	5
113	681	50	c	n	6/25/29	23.8	34.6	8.25	5
113	682	100	oc	n	6/25/29	21.5	34.7	8.23	8
113	684	50	oc	p	6/25/29	23.8	34.6	8.25	5
113	685	100	oc	p	6/25/29	21.5	34.7	8.23	8
114	687	50	r	n	6/27/29	16.2	34.6	8.04	63
128	773	0	r	n	7/25/29	16.4	33.0	8.12	29
128	774	50	r	n	7/25/29	11.8	33.1	8.11	29
128	775	100	r	n	7/25/29	10.2	33.2	8.06	46
128	776	0	r	p	7/25/29	16.4	33.0	8.12	29
128	779	0	c	n	7/25/29	16.4	33.0	8.12	29
129	780	0	c	n	7/27/29	16.3	33.1	8.13	25
130	781	0	oc	n	9/ 4/29	16.2	33.4	8.34	36
130	787	0	c	n	9/ 4/29	16.2	33.4	8.34	36
131	788	0	oc	n	9/ 6/29	19.3	33.4	8.34	...
131	789	100	oc	n	9/ 6/29	12.1	33.4	8.32	...
131	792	0	oc	p	9/ 6/29	19.3	33.4	8.34	...
131	793	0	r	p	9/ 6/29	19.3	33.4	8.34	...
131	794	0	r	p	9/ 6/29	19.3	33.4	8.34	...
132	797	0	c	n	9/ 8/29	21.0	33.9	8.34	15
132	798	50	oc	n	9/ 8/29	17.6	33.9	8.33	19
132	799	100	oc	n	9/ 8/29	14.3	33.4	8.30	16
132	801	0	oc	p	9/ 8/29	21.0	33.9	8.34	15
132	802	50	r	p	9/ 8/29	17.6	33.9	8.33	19
133	804	0	oc	n	9/10/29	22.7	34.7	8.47	7
133	805	50	oc	n	9/10/29	20.8	34.7	8.37	7
133	806	100	r	n	9/10/29	18.4	34.8	8.31	7
133	812	0	r	p	9/10/29	22.7	34.7	8.47	7
133	814	100	oc	n	9/10/29	18.4	34.8	8.31	7
134	808	0	oc	n	9/12/29	22.9	34.7	8.34	6
134	809	50	oc	n	9/12/29	19.8	34.6	8.34	6
134	810	100	oc	n	9/12/29	18.1	34.6	8.34	6
134	815	0	r	p	9/12/29	22.9	34.7	8.34	6
134	817	100	r	p	9/12/29	18.1	34.6	8.34	6
135	820	0	c	n	9/14/29	23.8	35.1	8.37	7
135	821	50	oc	n	9/14/29	21.5	35.0	8.37	5
135	822	100	c	n	9/14/29	18.7	34.8	8.34	5
135	824	0	oc	p	9/14/29	23.8	35.1	8.37	7

Table 46. Distributional and environmental records for Ceratium contrarium--Continued

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
135	825	150	r	n	9/14/29	21.5	35.0	8.37	5
136	827	0	oc	n	9/16/29	24.6	35.4	8.37	3
136	828	50	c	n	9/16/29	21.4	35.1	8.39	3
136	829	100	c	n	9/16/29	18.6	35.0	8.39	3
136	832	0	r	p	9/16/29	24.6	35.4	8.37	3
136	833	50	r	p	9/16/29	18.6	35.0	8.39	3
137	836	0	c	n	9/18/29	25.5	35.0	8.39	4
137	837	50	c	n	9/18/29	24.4	35.1	8.34	4
137	838	100	c	n	9/18/29	21.5	35.1	8.30	5
137	840	50	r	p	9/18/29	24.4	35.1	8.34	4
137	841	50	r	p	9/18/29	24.4	35.1	8.34	4
137	842	100	r	p	9/18/29	21.5	35.1	8.30	5
138	843	0	c	n	9/20/29	26.1	34.8	8.35	5
138	844	50	c	n	9/20/29	25.6	34.7	8.30	3
138	845	100	c	n	9/20/29	22.2	34.8	8.31	3
138	847	0	r	p	9/20/29	25.6	34.7	8.30	3
138	848	50	r	p	9/20/29	25.6	34.7	8.30	3
139	849	0	oc	n	9/22/29	26.7	34.8	8.34	6
139	850	50	c	n	9/22/29	25.8	34.9	8.31	6
139	854	50	r	p	9/22/29	25.8	34.9	8.31	6
140	856	0	c	n	10/ 3/29	26.9	35.0	8.42	7
140	857	50	c	n	10/ 3/29	26.9	35.0	8.39	7
140	858	100	c	n	10/ 3/29	25.5	35.0	8.34	7
140	860	0	r	p	10/ 3/29	26.9	35.0	8.42	7
140	862	100	r	p	10/ 3/29	25.5	35.0	8.34	7
140	863	100	r	p	10/ 3/29	25.5	35.0	8.34	7
141	864	0	c	n	10/ 5/29	25.9	35.2	8.34	5
141	865	50	c	n	10/ 5/29	24.8	35.3	8.34	5
141	869	50	r	p	10/ 5/29	24.8	35.3	8.34	5
141	870	50	oc	p	10/ 5/29	24.8	35.3	8.34	5
141	871	100	r	p	10/ 5/29	20.0	35.0	8.33	5
143	872	0	c	n	10/ 7/29	24.1	34.8	8.33	5
142	873	50	c	n	10/ 7/29	21.8	34.8	8.30	5
142	874	100	c	n	10/ 7/29	16.6	34.4	8.27	7
142	876	0	oc	p	10/ 7/29	24.1	34.8	8.33	5
143	881	0	c	n	10/ 9/29	22.4	34.4	8.30	6
143	882	50	oc	n	10/ 9/29	19.0	34.2	8.34	6
143	883	100	c	n	10/ 9/29	22.4	34.4	8.30	6
143	884	0	r	p	10/ 9/29	22.4	34.4	8.30	6
143	885	50	r	p	10/ 9/29	19.0	34.2	8.34	6
144	886	0	c	n	10/11/29	23.3	35.0	8.37	6
144	887	0	r	p	10/11/29	23.3	35.0	8.37	6
144	888	50	r	p	10/11/29	21.1	34.7	8.33	6
145	890	0	c	n	10/13/29	22.3	34.6	8.29	6
145	891	50	c	n	10/13/29	18.7	34.3	8.34	6
145	892	100	c	n	10/13/29	16.0	34.1	8.31	6
145	893	0	oc	p	10/13/29	22.3	34.6	8.29	6
145	894	50	oc	p	10/13/29	18.7	34.3	8.34	6
145	895	100	r	p	10/13/29	16.0	34.1	8.31	6
146	896	0	c	n	10/15/29	22.4	34.9	8.37	6
146	897	50	oc	n	10/15/29	22.4	34.9	8.30	6
146	898	100	c	n	10/15/29	19.7	34.3	8.26	7
146	900	0	r	p	10/15/29	22.4	34.9	8.37	6
146	901	50	r	p	10/15/29	22.4	34.9	8.30	6
146	902	100	r	p	10/15/29	19.7	34.3	8.26	7
147	903	0	oc	n	10/15/29	23.3	35.3	8.26	8
147	904	50	oc	n	10/17/29	23.1	35.3	8.29	5
147	905	100	oc	n	10/17/29	19.2	35.0	8.29	5
147	907	0	oc	p	10/17/29	23.3	35.3	8.26	8
147	908	50	oc	p	10/17/29	23.1	35.3	8.29	5
147	909	100	r	p	10/17/29	19.2	35.0	8.29	5
148	910	0	oc	n	10/19/29	23.4	35.2	.....	...
148	911	50	oc	n	10/19/29	23.0	35.1	.....	...
148	912	100	oc	n	10/19/29	20.0	35.0	.....	...
149	920	0	c	n	10/19/29	20.0	35.0	.....	...
149	921	50	c	n	10/21/29	23.3	35.0	8.37	6
149	922	100	c	n	10/21/29	20.3	34.9	8.38	6
149	927	0	r	p	10/21/29	23.5	35.0	8.34	6
150	929	0	c	n	10/23/29	25.6	34.7	8.39	7
150	930	50	r	p	10/23/29	22.8	34.8	8.35	10
150	931	100	oc	n	10/23/29	19.6	34.6	8.32	11
150	933	0	r	p	10/23/29	25.6	34.7	8.39	7
150	934	50	r	p	10/23/29	22.8	34.8	8.35	10
150	935	100	r	p	10/23/29	19.6	34.6	8.32	11
151	937	0	oc	n	10/26/29	26.0	34.0	.....	...
151	938	50	oc	n	10/26/29	18.3	34.4	.....	...

Table 46. Distributional and environmental records for Ceratium contrarium--Concluded

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m^3
151	939	100	c	n	10/26/29	12.5	34.6	.....	...
151	941	0	r	p	10/26/29	26.0	34.0	.....	...
151	942	50	r	p	10/26/29	18.3	34.4	.....	...
152	944	0	r	n	10/27/29	27.4	33.7	8.35	20
152	946	100	r	n	10/27/29	11.4	34.7	7.76	75
152	948	0	r	p	10/27/29	27.4	33.7	8.35	20
153	951	0	r	n	10/29/29	28.1	34.2	8.47	7
153	952	50	oc	n	10/29/29	28.1	34.4	8.39	7
153	953	100	r	n	10/29/29	20.5	34.7	8.28	31
153	956	50	r	p	10/29/29	28.1	34.4	8.39	7
155	965	0	r	n	11/ 2/29	27.8	34.9	8.29	29
157	978	0	oc	n	11/ 6/29	27.1	35.3	8.27	47
158	983	0	c	n	11/ 8/29	28.2	35.6	8.34	36
158	984	50	c	n	11/ 8/29	28.2	35.6	8.39	50
158	985	100	c	n	11/ 8/29	27.6	35.9	8.39	48
159	990	0	c	n	11/11/29	28.6	35.7	8.37	15
159	991	50	c	n	11/11/29	28.5	35.7	8.39	15
159	992	100	oc	n	11/11/29	28.0	35.7	8.37	23
160	1000	0	oc	n	11/13/29	28.6	35.6	8.37	12
160	1002	50	c	n	11/13/29	28.6	35.6	8.39	15
160	1003	100	oc	n	11/13/29	28.5	35.7	8.44	16

Table 47. Distributional and environmental records for Ceratium trichoceros

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m^3
1	1	0	c	n	5/12/28	24.0	36.2	8.16	34
1b	6	0	c	n	5/16/28	(22.3	36.3	8.20	46)
1b	7	50	oc	n	5/16/28	(22.2	36.4	8.21	39)
1b	8	100	c	n	5/16/28	(20.3	35.5	8.18	36)
2	13	100	oc	n	5/18/28	19.8	36.4	8.21	33
2	14	0	oc	n	5/18/28	20.5	36.4	8.23	58
13a	88	0	r	n	8/ 8/28	(21.2	35.2	8.18	11)
13a	89	0	r	n	8/ 8/28	(21.2	35.2	8.18	11)
14	90	0	r	n	8/ 9/28	21.2	35.2	8.18	11
14	93	0	oc	p	8/ 9/28	21.2	35.2	8.18	11
14	94	100	r	n	8/ 9/28	14.0	35.6	8.06	34
16	103	0	r	p	8/13/28	25.9	36.2	8.24	8
16	104	50	oc	p	8/13/28	24.4	36.4	8.23	8
16	106	0	r	n	8/13/28	25.9	36.2	8.24	8
16	107	50	oc	n	8/13/28	24.4	36.4	8.23	8
17	112	50	oc	n	8/15/28	21.9	36.6	8.28	12
18	115	50	r	p	8/17/28	22.4	36.8	8.24	5
18	116	100	oc	p	8/17/28	20.4	36.8	8.21	5
18	119	100	r	n	8/17/28	20.4	36.8	8.21	5
19	123	50	oc	n	8/20/28	25.2	37.1	8.27	5
19	124	100	c	n	8/20/28	22.4	37.0	8.25	5
20	126	50	r	p	8/22/28	25.8	36.6	8.26	3
20	129	50	r	n	8/22/28	25.8	36.6	8.26	3
22	139	0	r	p	8/27/28	26.7	36.0	8.26	8
32	194	0	r	n	10/ 5/28	28.0	36.0	8.23	2
32	194A	0	r	p	10/ 5/28	28.0	36.0	8.23	2
32	195	50	oc	n	10/ 5/28	27.2	36.0	8.24	2
32	196	100	oc	n	10/ 5/28	22.2	36.4	8.10	30
33	197A	0	r	p	10/ 8/28	28.5	35.6	8.23	4
33	198	50	oc	n	10/ 8/28	28.2	36.2	8.24	4
33	198A	50	r	p	10/ 8/28	28.2	36.2	8.24	4
33	199A	100	r	p	10/ 8/28	22.3	36.5	8.18	23
34	200A	0	oc	p	10/ 9/28	28.5	35.9	8.28	2
34	202	50	oc	n	10/ 9/28	25.0	36.5	8.21	3
37	218	50	oc	n	11/ 1/28	18.8	34.5	8.00	121
37	219	100	r	n	11/ 1/28	15.1	34.9	7.82	153
37	220	0	oc	p	11/ 1/28	27.1	31.7	8.28	15
37	221	50	oc	p	11/ 1/28	18.8	34.5	8.00	121
38	222	0	r	n	11/ 3/28	26.5	32.9	8.33	20
39	226	50	r	n	11/ 6/28	16.3	34.6	7.92	48
40	232	0	r	p	11/ 8/28	22.2	33.7	8.21	24
40	234	100	r	p	11/ 8/28	13.9	35.0	7.85	159
41	236	50	r	n	11/10/28	14.6	35.0	7.94	58
41	237	100	r	n	11/10/28	14.5	35.0	7.91	152
41	238	0	r	p	11/10/28	20.4	34.2	8.11	32
49	282	100	r	p	11/27/28	21.6	35.9	8.26	13

Table 47. Distributional and environmental records for Ceratium trichoceros--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
50	286	100	oc	n	11/29/28	20.5	35.7	8.22	13
50	288	50	oc	p	11/29/28	22.0	35.9	8.23	13
52	300	50	oc	n	12/ 3/28	20.2	35.6	8.20	8
52	301	100	oc	n	12/ 3/28	18.2	35.2	8.17	8
53	303	0	r	n	12/ 5/28	22.6	35.7	8.22	13
53	304	50	oc	n	12/ 5/28	21.2	35.8	8.20	13
53	305	100	oc	n	12/ 5/28	19.9	35.6	8.19	13
53	306	0	r	p	12/ 5/28	22.6	35.7	8.22	13
53-54	307	0	r	n	12/ 6/28	(23.0	35.6	8.22	11)
53-54	308	0	oc	n	12/ 6/28	(23.0	35.6	8.22	11)
53-54	310	0	oc	n	12/10/28	(23.0	35.6	8.22	11)
53-54	311	0	oc	n	12/10/28	(23.0	35.6	8.22	11)
53-54	313	0	r	n	12/10/28	(23.0	35.6	8.22	11)
53-54	317	0	r	n	12/12/28	(23.0	35.6	8.22	11)
56	330	100	oc	n	12/18/28	16.6	34.8	8.11	12
57	340	100	r	p	12/20/28	14.3	34.4	8.10	40
64	396	100	oc	n	1/ 3/29	15.8	34.5	8.10	32
66	414	50	oc	p	1/ 7/29	17.8	34.8	8.10	29
66	415	100	r	p	1/ 7/29	17.8	34.9	8.12	21
67	416	0	oc	n	1/ 8/29	19.3	34.9	8.11	21
67	418	100	r	n	1/ 8/29	16.2	34.6	8.05	40
69	425	50	r	n	1/12/29	17.4	35.1	7.99	151
75	466	50	r	p	2/14/29	20.0	35.5	8.14	46
76	471	50	r	p	2/16/29	22.1	35.9	8.14	42
78	476	50	r	n	2/20/29	23.8	36.1	8.14	32
78	477	100	r	n	2/20/29	21.9	36.2	8.14	34
78	479	50	r	p	2/20/29	23.8	36.1	8.14	32
81	491	0	oc	n	2/26/29	26.5	35.8	8.19	38
81	492	50	oc	n	2/26/29	26.4	35.9	8.19	38
81	493	0	r	p	2/26/29	26.5	35.8	8.19	38
81	494	50	r	p	2/26/29	26.4	35.9	8.19	38
82	497	50	r	n	2/28/29	27.2	36.3	8.21	34
82	500	100	oc	p	2/28/29	24.4	36.5	8.19	34
89	531	100	r	p	3/23/29	26.4	36.0	8.24	12
91	544	100	r	p	3/21/29	25.8	36.0	8.25	30
92	549	100	r	p	3/29/29	26.2	36.0	8.28	28
93	551	50	oc	n	3/31/29	28.5	34.8	8.30	28
93	552	0	r	p	3/31/29	28.7	34.7	8.30	28
Samoa	555	0	r	n	4/ 2/29	.....	.....	.....	...
94	558	50	r	n	4/22/29	29.3	34.7	8.25	14
95	559	100	r	n	4/22/29	28.5	35.6	8.21	25
94	561	50	r	p	4/22/29	29.3	34.7	8.25	14
95	563	50	oc	n	4/24/29	29.3	34.9	8.24	16
95	566	50	r	p	4/24/29	29.3	34.9	8.24	16
95	567	100	r	p	4/24/29	28.5	35.4	8.22	21
95	568A	0	r	n	4/25/29	(29.4	34.7	8.26	14)
96	568	0	c	n	4/26/29	29.3	35.3	8.23	12
96	569	50	c	n	4/26/29	29.2	35.3	8.23	12
96	570	100	oc	n	4/26/29	28.2	35.7	8.19	25
96	571	0	r	p	4/26/29	29.3	35.3	8.23	12
96	572	50	r	p	4/26/29	29.2	35.3	8.23	12
96	573	100	r	p	4/26/29	28.2	35.7	8.19	25
97	575	50	c	n	4/28/29	28.0	35.4	8.16	21
97	577	0	r	p	4/28/29	28.3	35.2	8.16	24
97	578	50	oc	p	4/28/29	28.0	35.4	8.16	21
98	581	0	oc	n	4/30/29	27.0	35.3	8.16	24
98	584	0	oc	p	4/30/29	27.0	35.3	8.16	24
99	589	0	oc	n	5/ 2/29	27.9	34.9	8.21	12
99	590	50	c	n	5/ 2/29	27.8	34.9	8.22	12
99	591	100	c	n	5/ 2/29	27.8	35.0	8.22	17
99	592	0	oc	p	5/ 2/29	27.9	34.9	8.21	12
99	594	100	r	p	5/ 2/29	27.8	35.0	8.22	17
99	595	0	c	n	5/ 2/29	27.9	34.9	8.21	12
100	596	50	c	n	5/ 4/29	27.6	34.7	8.21	10
100	597	100	oc	n	5/ 4/29	27.6	34.7	8.22	12
100	598	0	oc	p	5/ 4/29	27.7	34.7	8.21	10
100	599	50	oc	p	5/ 4/29	27.6	34.7	8.21	10
100	602	100	oc	p	5/ 4/29	27.6	34.7	8.22	12
101	605	100	r	n	5/ 7/29	25.2	35.1	8.23	8
103	617	100	r	n	5/11/29	24.8	35.2	8.25	5
104	623	100	r	n	5/13/29	25.3	35.3	8.21	7
105	629	100	oc	n	5/15/29	25.2	35.1	8.23	5
106	635	100	oc	n	5/17/29	25.6	35.1	8.23	5
107	642	0	r	p	5/19/29	28.0	34.4	8.23	5
109	656	100	oc	n	5/29/29	19.4	34.8	8.18	5
110	665	50	r	p	5/31/29	18.4	34.8	8.16	7

Table 47. Distributional and environmental records for Ceratium trichoceros--Concluded

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
111	668	0	oc	n	6/ 3/29	20.1	34.5	8.18	5
111	670	100	r	n	6/ 3/29	18.2	34.7	8.13	13
112	674	0	oc	n	6/ 5/29	23.2	34.6	8.22	7
112	675	50	oc	n	6/ 5/29	21.7	34.6	8.23	7
112	676	100	oc	n	6/ 5/29	19.8	34.7	8.20	8
113	680	0	c	n	6/25/29	24.2	34.5	8.25	5
113	682	100	oc	n	6/25/29	21.5	34.7	8.23	8
113	683	0	oc	p	6/25/29	24.2	34.5	8.25	5
113	684	50	r	p	6/25/29	23.8	34.6	8.25	5
113	685	100	r	p	6/25/29	21.5	34.7	8.23	8
131	793	0	r	p	9/ 6/29	19.3	33.4	8.34	...
132	799	100	r	n	9/ 8/29	14.3	33.4	8.30	16
133	806	100	r	n	9/10/29	18.4	34.8	8.31	7
133	314	100	r	p	9/10/29	18.4	34.8	8.31	7
134	810	100	r	n	9/12/29	18.1	34.6	8.34	6
134	817	100	r	p	9/12/29	18.1	34.6	8.34	6
135	822	100	oc	n	9/14/29	18.7	34.8	8.34	5
136	829	100	r	n	9/16/29	18.6	35.0	8.39	3
137	837	50	r	p	9/18/29	24.4	35.1	8.34	4
138	845	100	r	n	9/20/29	22.2	34.8	8.31	3
139	850	50	r	n	2/22/29	25.8	34.9	8.31	6
139	851	100	r	n	2/22/29	22.4	35.2	8.28	6
140	858	100	r	n	10/ 3/29	25.5	35.0	8.34	7
140	862	100	r	p	10/ 3/29	25.5	35.0	8.34	7
141	871	100	r	p	10/ 5/29	20.0	35.0	8.33	5
142	874	100	c	n	10/ 7/29	16.6	34.4	8.27	7
142	878	100	r	p	10/ 7/29	16.6	34.4	8.27	7
142	879	100	r	p	10/ 7/29	16.6	34.4	8.27	7
144	888	50	oc	p	10/11/29	21.1	34.7	8.33	6
145	891	50	r	n	10/13/29	18.7	34.3	8.34	6
146	898	100	r	n	10/15/29	19.7	34.3	8.26	7
147	905	100	oc	n	10/17/29	19.2	35.0	8.29	5
150	930	50	oc	n	10/23/29	22.8	34.8	8.35	10
150	931	100	r	n	10/23/29	19.6	34.6	8.32	11
151	937	0	r	n	10/26/29	26.0	34.0	.....	...
151	938	50	r	p	10/26/29	18.3	34.4	.....	...
153	951	0	oc	n	10/29/29	28.1	34.2	8.47	7
153	952	50	c	n	10/29/29	28.1	34.4	8.39	7
153	953	100	oc	n	10/29/29	20.5	34.7	8.28	31
153	955	0	r	p	10/29/29	28.1	34.4	8.39	7
154	958	0	c	n	10/31/29	28.3	34.2	8.39	7
154	959	50	c	n	10/31/29	28.2	34.2	8.40	7
155	965	0	r	n	11/ 2/29	27.8	34.9	8.29	29
155	966	50	c	n	11/ 2/29	27.7	34.9	8.30	30
155	967	100	oc	n	11/ 2/29	27.2	35.0	8.30	35
156	972	0	oc	n	11/ 4/29	27.6	35.0	8.34	28
156	973	50	oc	n	11/ 4/29	27.0	35.1	8.37	46
156	974	100	oc	n	11/ 4/29	26.4	35.1	8.30	48
157	978	0	c	n	11/ 6/29	27.1	35.3	8.27	47
157	980	100	c	n	11/ 6/29	26.8	35.3	8.30	64
158	983	0	a	n	11/ 8/29	28.2	35.6	8.34	36
158	984	50	c	n	11/ 8/29	28.2	35.6	8.39	50
158	985	100	c	n	11/ 8/29	27.6	35.9	8.39	48
159	990	0	c	n	11/11/29	28.6	35.7	8.37	15
159	991	50	c	n	11/11/29	28.5	35.7	8.39	15
159	992	100	oc	n	11/11/29	28.0	35.7	8.37	23
160	1000	0	oc	n	11/13/29	28.6	35.6	8.37	12
160	1002	50	c	n	11/13/29	28.6	35.6	8.39	15
160	1003	100	oc	n	11/13/29	28.5	35.7	8.44	16

Table 48. Distributional and environmental records for Ceratium vultur

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3	Variety
1	1	0	oc	n	5/12/28	24.0	36.2	8.16	34	v, t, p
1b	6	0	c	n	5/18/28	(22.2	36.3	8.20	47)	j, p
2	13	100	r	n	5/18/28	19.8	36.4	8.21	33	j, p
2	15	0	r	n	5/18/28	20.5	36.4	8.23	58	p
13a	89	0	r	n	8/ 9/28	(21.2	35.2	8.18	11)	v
15	98	50	r	p	8/11/28	19.8	36.5	8.21	8	p
15	99	100	r	p	8/11/28	18.4	36.4	8.20	19	p
15	100	0	r	n	8/11/28	24.8	36.4	8.21	11	v
15	101	50	r	n	8/11/28	19.8	36.5	8.21	8	p
15	102	100	oc	n	8/11/28	18.4	36.4	8.20	19	p, v
16	104	50	r	p	8/13/28	24.4	36.4	8.23	8	t
16	106	0	r	n	8/13/28	25.9	36.2	8.24	8	v
16	107	50	oc	n	8/13/28	25.9	36.2	8.24	8	p, v
16	108	100	r	n	8/13/28	19.9	36.5	8.17	13	p
17	111	0	r	n	8/15/28	26.2	36.6	8.29	9	v
17	112	50	r	n	8/15/28	21.9	36.6	8.28	12	p
17	113	100	r	n	8/15/28	19.3	36.5	8.23	9	p
18	116	100	r	p	8/17/28	20.4	36.8	8.21	5	p
18	117	0	oc	n	8/17/28	27.0	37.0	8.23	5	v
18	118	50	oc	n	8/17/28	22.4	36.8	8.24	5	p, v
18	119	100	r	n	8/17/28	20.4	36.8	8.21	5	v
19	120	0	r	p	8/20/28	26.6	37.0	8.34	5	v
19	121	50	r	p	8/20/28	25.2	37.1	8.27	5	j
19	122	0	oc	n	8/20/28	26.6	37.0	8.34	5	j
19	123	50	r	n	8/20/28	25.2	37.1	8.27	5	p, j
19	124	100	oc	n	8/20/28	22.4	37.0	8.25	5	p, j
20	125	0	r	p	8/22/28	26.0	36.6	8.37	5	v,
20	126	50	r	p	8/22/28	25.8	36.6	8.26	3	t, v
20	128	0	oc	n	8/22/28	26.0	36.6	8.37	5	v
20	129	50	r	n	8/22/28	25.8	36.6	8.26	3	p, v
20	130	100	oc	n	8/22/28	22.6	36.7	8.19	5	p, r
20-21	131	0	r	n	8/24/28	(26.6	36.3	8.32	4)	r, v
21	132	0	r	p	8/24/28	26.6	36.3	8.32	4	v
21	134	100	r	p	8/24/28	25.2	37.1	8.27	5	j
21	135	0	c	n	8/24/28	26.6	36.3	8.32	4	v
21	136	50	r	n	8/24/28	24.4	36.2	8.26	4	v
21	137	100	r	n	8/27/28	21.0	36.8	8.20	7	v
22	139	0	oc	p	8/27/28	26.7	36.0	8.26	8	t
22	141	100	r	p	8/27/28	17.5	36.1	7.99	123	v
22	142	0	c	n	8/27/28	26.7	36.0	8.26	8	v
22	143	50	r	n	8/29/28	24.5	36.2	8.21	9	r, v
22	144	100	r	n	8/29/28	17.5	36.1	7.99	123	t, v
23	145	0	r	p	8/29/28	27.2	35.9	8.25	4	t
23	148	0	oc	n	8/29/28	27.2	35.9	8.25	4	t
23	149	50	r	n	8/29/28	20.9	36.0	8.14	13	t
23	150	100	r	n	8/29/28	16.6	36.0	8.18	75	r, j
24	155	50	r	n	8/31/28	23.1	36.0	8.14	8	r
24	156	100	r	n	8/31/28	15.6	35.6	7.96	99	v
25	157	0	r	p	9/ 3/28	27.5	35.6	8.31	5	t
25	180	0	oc	n	9/ 3/28	27.5	35.6	8.31	5	t
25	161	50	r	n	8/24/28	21.5	36.0	8.22	12	t, r
25	162	100	r	n	8/24/28	14.6	35.7	7.93	121	t
26	163	0	r	p	9/ 5/28	27.6	36.0	8.30	5	t
26	164	50	r	p	9/ 5/28	24.1	36.1	8.21	5	t
26	165	100	r	p	9/ 5/28	14.9	35.6	8.11	40	t
26	166	0	r	n	9/ 5/28	27.6	36.0	8.30	5	t
27	171	50	r	n	9/ 7/28	26.0	36.2	8.30	4	t
27	172	100	oc	n	9/ 7/28	17.7	36.0	8.09	46	t, j
28	174	50	r	p	9/11/28	26.7	36.3	8.26	4	t
28	176	0	oc	n	9/11/28	27.6	36.3	8.29	4	t
28	177	50	oc	n	9/11/28	26.7	36.3	8.26	4	r, v, j
28	178	100	oc	n	9/11/28	22.8	36.6	8.22	7	t, v, r
29	179	0	r	p	9/13/28	27.6	36.2	8.31	3	t
29	181	100	r	p	9/13/28	23.1	36.6	8.21	8	r
29	182	0	r	n	9/13/28	27.6	36.2	8.31	3	t, j
29	183	50	r	n	9/13/28	27.2	36.2	8.29	8	j
29	184	100	r	n	9/13/28	23.1	36.6	8.21	8	t, r
30	188	0	c	n	9/15/28	28.0	36.1	8.30	2	t, j
30	189	50	r	n	9/15/28	27.8	36.1	8.29	3	t, j
30	190	100	r	n	9/15/28	24.1	36.4	8.10	20	r, v, j
31	191	0	oc	n	10/ 3/28	28.5	34.4	8.27	2	t, r
32	194	0	r	n	10/ 5/28	28.0	36.0	8.23	2	v
32	195	50	r	n	10/ 5/28	27.2	36.0	8.24	2	t
32	196	100	oc	n	10/ 5/28	22.2	36.4	8.10	30	t
33	197A	0	r	p	10/ 8/28	28.5	35.6	8.23	4	t
33	198	50	r	n	10/ 8/28	28.2	36.2	8.24	4	t

Table 48. Distributional and environmental records for Ceratium vultur--Continued

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3	Variety
34	200	0	r	n	10/ 9/28	28.5	35.9	8.28	2	t
34	201	100	oc	n	10/ 9/28	20.5	36.6	8.16	16	r
34	202	50	r	n	10/ 9/28	25.0	36.5	8.21	3	r, t
35	203	0	oc	n	10/26/28	27.4	29.7	8.31	15	nt
35	204	50	r	n	10/26/28	16.8	34.7	7.92	138	nt, p
35	205	100	r	n	10/26/28	14.4	34.9	7.88	189	nt, v
35	206	0	oc	p	10/26/28	27.4	29.7	8.31	15	nt
35a	208	0	oc	n	10/26/28	(27.4	29.7	8.31	15)	nt
35-36	209	0	oc	n	10/26/28	(28.0	32.2	8.29	85)	nt
35-36	212	0	oc	n	10/26/28	(28.0	32.2	8.29	85)	nt
36	214	50	r	n	10/30/28	18.5	34.5	8.03	122	m
37	217	0	r	n	11/ 1/28	27.1	31.7	8.28	15	nt
37	218	50	oc	n	11/ 1/28	18.8	34.5	8.00	121	nt
37	219	100	r	n	11/ 1/28	15.1	34.9	7.82	153	nt
37	221	50	r	p	11/ 1/28	18.8	34.5	8.00	121	p, v
38	223	50	r	n	11/ 3/28	21.3	34.4	8.14	35	nt
39	226	50	r	n	11/ 6/28	16.3	34.6	7.92	48	nt
39	227	100	r	n	11/ 6/28	14.0	35.0	7.88	181	nt
40	230	50	r	n	11/ 8/28	15.3	34.9	7.87	161	nt, ?
40	232	0	r	p	11/ 8/28	22.2	33.7	8.21	24	nt
40	233	50	r	p	11/ 8/28	15.3	34.9	7.87	161	nt
41	237	100	r	n	11/10/28	14.5	35.0	7.91	152	nt
41	239	100	r	p	11/10/28	14.5	35.0	7.91	152	nt
44	250	0	r	n	11/17/28	20.7	34.9	8.03	38	v
44	252	100	r	n	11/17/28	13.8	35.0	7.85	70	v
45	256	0	r	n	11/19/28	22.4	35.3	8.12	38	nt
45	257	50	r	n	11/19/28	22.4	35.2	8.13	46	nt
45	258	100	r	n	11/19/28	18.6	35.1	8.00	50	nt
45	259	0	r	p	11/19/28	22.4	35.2	8.13	46	v
47	266	0	r	n	11/23/28	23.9	36.0	8.23	17	m
47	267	50	r	n	11/23/28	23.8	36.0	8.23	20	m
47	268	100	oc	n	11/23/28	22.7	36.2	8.23	20	m
47	269	0	r	p	11/23/28	23.9	36.0	8.23	17	m
48	274	0	r	p	11/25/28	23.6	36.4	8.23	13	v
50	284	0	r	n	11/29/28	23.2	36.0	8.23	13	v
51	295	100	r	n	12/ 1/28	20.0	35.6	8.22	17	nt, p
52	300	50	r	n	12/ 3/28	20.2	35.6	8.20	8	p
52	301	100	r	n	12/ 3/28	18.2	35.2	8.17	8	p
53	304	50	r	n	12/ 5/28	21.2	35.8	8.20	13	p, j
53	305	100	r	n	12/ 5/28	19.9	35.6	8.19	13	p, j
53-54	307	0	r	n	12/ 6/28	(23.0	35.6	8.22	11)	j
53-54	308	0	r	n	12/ 6/28	(23.0	35.0	8.22	11)	j
53-54	317	0	r	n	12/12/28	(23.0	35.0	8.22	11)	j
54	321	100	r	n	12/14/28	18.7	35.4	8.16	20	j
55	324	50	r	n	12/16/28	18.7	35.0	8.18	12	p
56	330	100	r	n	12/18/28	16.6	34.8	8.11	12	p, nt
56-57	334	0	r	n	12/18/28	(20.0	34.6	8.13	145)	nt
57	337	100	r	n	12/20/28	14.3	34.4	8.10	40	p
66	415	100	r	p	1/ 7/29	17.8	34.9	8.12	21	p
85	510	0	r	n	3/ 6/29	27.9	36.2	8.22	40	t
86	517	50	r	n	3/ 9/29	27.4	36.2	8.29	17	t
87	521	0	oc	n	3/11/29	27.8	36.1	8.28	17	t
87	522	50	r	n	3/11/29	26.5	36.1	8.26	20	t
88	526	0	oc	n	3/21/29	28.5	35.9	8.23	16	t
88	527	50	oc	n	3/21/29	28.4	35.9	8.25	13	t
89	528	0	r	n	3/23/29	28.4	35.6	8.25	21	t
89	529	50	r	n	3/23/29	28.6	35.8	8.27	12	t, v
89	530	0	r	p	3/23/29	28.4	35.6	8.25	21	t
89	532	0	r	n	3/25/29	(28.4	35.5	8.26	21)	t
90	533	0	oc	n	3/25/29	28.5	35.5	8.27	21	t, v
90	534	50	r	n	3/25/29	28.6	35.6	8.26	21	t
90	535	0	r	p	3/25/29	28.5	35.5	8.27	21	t, j
91	540	0	r	n	3/27/29	28.7	35.1	8.30	21	j
91	541	50	oc	n	3/27/29	28.5	35.2	8.30	24	t
91	542	0	r	p	3/27/29	28.7	35.1	8.30	21	t
91	543	50	r	p	3/27/29	28.5	35.2	8.30	24	t
92	545	0	oc	n	3/29/29	28.5	35.3	8.29	28	t
92	546	50	oc	n	3/29/29	28.4	35.4	8.29	28	t
93	550	0	r	n	3/31/29	28.7	34.7	8.30	28	t
93	551	50	r	n	3/31/29	28.5	34.8	8.30	28	t
95	563	50	r	n	4/24/29	29.3	34.9	8.24	16	v
95	564	100	r	n	4/24/29	29.6	35.8	8.27	29	v
98	581	0	r	n	4/30/29	27.0	35.3	8.16	24	r
98	582	50	r	n	4/30/29	26.9	35.3	8.16	28	r
99	591	100	r	n	5/ 2/29	27.8	35.0	8.22	17	t
99	595	0	r	n	5/ 2/29	27.9	34.9	8.21	12	v

Table 48. Distributional and environmental records for Ceratium vultur--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3	Variety
100	596	100	r	n	5/ 4/29	27.6	34.7	8.22	12	j
100	597	100	r	n	5/ 4/29	27.6	34.7	8.22	8	j
101	603	0	r	n	5/ 7/29	26.3	34.7	8.24	8	t
101	604	50	oc	n	5/ 7/29	26.2	34.7	8.24	8	t
101	605	100	oc	n	5/ 7/29	25.2	35.1	8.23	8	t, v
102	609	0	oc	n	5/ 9/29	25.8	35.0	8.24	8	t, v
102	610	50	oc	n	5/ 9/29	25.8	35.0	8.24	8	t
102	611	100	r	n	5/ 9/29	25.6	35.0	8.23	8	t, v
102	613	50	r	p	5/ 9/29	25.8	35.0	8.24	8	v
102	614	100	r	p	5/ 9/29	25.6	35.0	8.23	8	p
103	615	0	r	n	5/11/29	26.0	35.0	8.25	5	t
103	616	50	oc	n	5/11/29	35.8	35.2	8.25	5	t
103	617	100	r	n	5/11/29	24.8	35.2	8.25	5	t
103	620	100	r	p	5/11/29	24.8	35.2	8.25	5	t
104	621	0	r	n	5/11/29	26.1	35.2	8.24	7	j
104	622	50	r	n	5/13/29	25.8	35.2	8.24	7	t
104	623	100	r	n	5/13/29	35.3	35.3	8.21	7	t, j
105	627	50	oc	n	5/15/29	26.8	34.9	8.23	5	t
105	628	50	oc	n	5/15/29	26.8	34.9	8.23	5	t
105	629	100	oc	n	5/15/29	25.2	35.1	8.23	5	t
106	633	0	r	n	5/17/29	27.2	35.0	8.23	5	t
106	634	50	r	n	5/17/29	27.0	35.0	8.23	5	t, j
106	635	100	oc	n	5/17/29	25.6	35.1	8.23	5	t
106	636	0	r	p	5/17/29	27.2	35.0	8.23	5	t
107	639	0	c	n	5/19/29	28.0	34.4	8.23	5	t, v
107	640	50	oc	n	5/19/29	27.9	34.4	8.23	4	t
107	641	100	oc	n	5/19/29	26.8	34.9	8.23	4	t
107	642	0	r	p	5/19/29	28.0	34.4	8.23	5	j
108	646	0	oc	n	5/27/29	28.4	35.0	8.25	4	t, j
108	647	50	r	n	5/27/29	26.8	35.0	8.24	4	t, j
108	648	100	oc	n	5/27/29	25.2	35.0	8.23	4	t
109	654	0	r	n	5/29/29	27.4	35.0	8.23	3	j
109	655	50	r	n	5/29/29	23.1	35.0	8.22	3	t
109	656	100	oc	n	5/29/29	19.4	35.0	8.18	5	t
110	666	100	r	n	5/31/29	17.9	34.8	8.14	5	t
111	668	0	r	p	6/ 3/29	20.1	34.7	8.18	5	t
112	674	0	r	n	6/ 5/29	23.2	34.5	8.22	7	t
112	675	50	r	n	6/ 5/29	21.7	34.6	8.23	7	t
112	676	100	r	n	6/ 5/29	19.8	34.7	8.20	8	t, j
113	680	0	oc	n	6/25/29	24.2	34.5	8.25	5	t
113	681	50	oc	n	6/25/29	23.8	34.6	8.25	5	t
132	799	100	r	n	9/ 8/29	14.3	33.4	8.30	16	p
133	804	0	oc	n	9/10/29	22.7	34.7	8.47	7	v
133	805	50	r	n	9/10/29	20.8	34.7	8.23	7	v
134	808	0	oc	n	9/12/29	22.9	34.7	8.34	6	v, j
134	809	50	r	n	9/12/29	19.8	34.6	8.34	6	v
134	810	100	oc	n	9/12/29	18.1	34.6	8.34	6	v
135	820	0	r	p	9/14/29	23.8	35.1	8.37	7	v
135	821	50	r	n	9/14/29	21.5	35.0	8.37	5	v
135	822	100	oc	n	9/14/29	18.7	34.8	8.34	5	v
135	825	50	r	p	9/14/29	21.5	35.0	8.37	5	v
136	827	0	r	n	9/16/29	24.6	35.4	8.37	3	v
136	828	50	r	n	9/16/29	21.4	35.1	8.39	3	v
136	829	100	c	n	9/16/29	18.6	35.0	8.39	3	j
137	836	0	c	n	9/18/29	25.5	35.0	8.39	4	t
137	837	50	oc	n	9/18/29	24.4	35.1	8.34	4	t, v, j
137	838	100	c	n	9/18/29	21.5	35.1	8.30	5	t, j
137	842	100	r	p	9/18/29	21.5	35.1	8.30	5	t
138	843	0	oc	n	9/20/29	26.1	34.8	8.35	5	t
138	844	50	oc	n	9/20/29	25.6	34.7	8.30	3	t
139	849	0	oc	n	9/22/29	26.7	34.8	8.34	6	t
139	850	50	oc	n	9/22/29	25.8	34.9	8.31	6	t
139	851	100	oc	n	9/22/29	22.4	35.2	8.28	6	t
139	855	100	r	p	9/22/29	22.4	35.2	8.28	6	t
140	856	0	oc	n	10/ 3/29	26.9	35.0	8.42	7	t, j
140	857	50	oc	n	10/ 3/29	26.9	35.0	8.39	7	t
140	858	100	oc	n	10/ 3/29	25.5	35.0	8.34	7	t
140	862	100	r	p	10/ 3/29	25.5	35.0	8.34	7	t
141	864	0	c	n	10/ 5/29	25.9	35.2	8.34	5	t
141	865	50	oc	n	10/ 5/29	25.9	35.2	8.34	5	t, j
141	868	0	r	p	10/ 5/29	25.9	35.2	8.34	5	t
141	870	50	r	p	10/ 5/29	24.8	35.3	8.34	5	t
142	873	50	r	n	10/ 7/29	21.8	34.8	8.30	5	p
142	874	100	oc	n	10/ 7/29	16.6	34.4	8.27	7	p, j
143	883	100	oc	n	10/ 9/29	13.8	34.1	8.30	10	p
146	898	100	oc	n	10/15/29	19.7	34.3	8.26	7	p

Table 48. Distributional and environmental records for Ceratium vultur--Concluded

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3	Variety
147	903	0	r	n	10/17/29	23.3	35.3	8.26	8	t
147	904	50	r	n	10/17/29	23.1	35.3	8.29	5	p
147	905	100	r	n	10/17/29	19.2	35.0	8.29	5	p
148	911	50	r	n	10/19/29	23.0	35.1	.....	...	p
148	912	100	r	n	10/19/29	20.0	35.0	.....	...	p, nt
149	920	0	oc	n	10/21/29	23.5	35.0	8.34	6	r
149	921	50	oc	n	10/21/29	23.3	35.0	8.37	6	r
149	922	100	oc	n	10/21/29	20.3	34.9	8.38	6	r
150	929	0	r	n	10/23/29	25.6	34.7	8.39	7	nt
150	930	50	r	n	10/23/29	22.8	34.8	8.35	10	p
150	931	100	r	n	10/23/29	19.6	34.6	8.32	10	p, nt
151	938	50	r	n	10/26/29	18.3	34.4	.....	...	p
152	945	50	c	n	10/27/29	14.2	34.5	7.87	53	t
152	946	100	c	n	10/27/29	11.4	34.7	7.76	75	t
153	952	50	oc	n	10/29/29	28.1	34.4	8.39	7	t, j
155	965	0	r	n	10/29/29	28.1	34.4	8.39	7	t
155	966	50	r	p	11/ 2/29	27.7	34.9	8.30	30	v
155	967	100	r	n	11/ 2/29	27.2	35.0	8.30	35	v
156	974	100	r	n	11/ 4/29	26.4	35.1	8.30	48	v
160	1000	0	r	n	11/13/29	28.6	35.6	8.37	12	t

Abbreviations: v=var. vultur; j=var. japonicum; p=var. pavillardii; r=var. recurvum; t=var. sumatranum; m=var. regulare; nt=var. reversum.

Table 49. Distributional and environmental records for Ceratium horridum

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3	Variety
1	1	0	r	n	5/12/28	24.0	36.2	8.16	34	mh
1	4	0	r	n	5/12/28	(24.0	36.2	8.16	34)	c
1a	5	0	r	n	5/12/28	(22.2	36.3	8.20	46)	c
1b	6	0	oc	n	5/12/28	(22.2	36.3	8.20	46)	h
1b	7	50	oc	n	5/12/28	(22.0	36.4	8.21	38)	c, m
1b	8	100	r	n	5/12/28	(20.0	36.5	8.18	36)	c
3	19	100	r	n	5/21/28	13.6	35.9	8.10	48	h, m
3	20	0	r	n	5/21/28	15.5	36.1	8.15	99	c, m
5a	33	0	oc	n	5/31/28	(12.4	35.6	8.15	21)	h
8	36	50	r	n	5/31/28	11.6	35.6	8.12	32	h
6	37	100	oc	n	5/31/28	11.3	35.6	8.08	41	h
6b	44	0	r	n	6/ 2/28	(12.4	35.6	8.15	21)	h
6b	46	0	oc	n	6/ 2/28	(12.4	35.6	8.15	21)	h
6c	47	100	r	n	6/ 2/28	(11.3	35.6	8.08	41)	h
6f	53	0	oc	n	7/ 9/28	(10.6	35.4	8.11	28)	h
6g	54	0	oc	n	7/10/28	(10.6	35.4	8.11	28)	h
6h	55	0	a	n	7/11/28	(10.6	35.4	8.11	28)	h
7	56	0	oc	n	7/11/28	10.6	35.4	8.11	28	h
7	57	50	oc	n	7/11/28	8.2	35.2	8.03	47	m
7	58	100	c	n	7/11/28	8.1	35.2	8.04	57	h
8	59	0	a	n	7/15/28	10.3	35.2	7.93	13	h
8	60	50	a	n	7/15/28	9.1	35.2	7.95	27	h
8	61	100	c	n	7/15/28	8.4	35.3	7.95	54	h
9	64	0	c	n	7/28/28	11.2	35.1	8.08	20	h
9	65	50	c	n	7/28/28	8.4	35.1	7.96	55	h
9	66	100	oc	n	7/28/28	7.6	35.1	7.98	56	h
9	67	0	r	n	7/28/28	11.2	35.1	8.08	20	h
10	68	0	a	n	7/30/28	10.9	34.9	8.08	28	m
10	70	100	c	n	7/30/28	6.6	35.0	7.95	52	h
11	73	0	oc	n	8/ 1/28	10.7	34.9	8.06	27	h
11	74	50	oc	n	8/ 1/28	7.3	34.9	7.92	63	h
11	75	0	r	p	8/ 1/28	10.7	34.9	8.06	27	h
11	76	50	oc	p	8/ 1/28	7.3	34.9	7.92	63	h
11	77	100	r	p	8/ 1/28	6.3	35.1	7.90	66	h
11a	78	0	oc	n	8/ 5/28	(8.4	33.6	8.10	27)	h
14	91	100	r	p	5/ 9/28	14.0	35.6	8.06	34	mh
14	92	50	oc	p	5/ 9/28	15.0	35.1	8.18	16	m
14	93	0	r	p	5/ 9/28	21.2	35.2	8.18	11	m
14	94	100	r	n	5/ 9/28	14.0	35.6	8.06	34	m
14	95	50	oc	n	5/ 9/28	15.0	35.1	8.18	16	c
16	104	50	r	p	8/13/28	24.4	36.4	8.23	8	mh
16	108	100	oc	n	8/13/28	19.9	36.5	8.17	13	mh
18	116	100	r	p	8/17/28	20.4	36.8	8.21	5	mh
18	119	100	r	n	8/17/28	20.4	36.8	8.21	5	mh
21	134	100	r	p	8/24/28	21.0	36.8	8.20	7	h

Table 49. Distributional and environmental records for Ceratium horridum--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3	Variety
24	152	50	r	p	8/31/28	23.1	36.0	8.14	8	m
24	155	50	r	n	8/31/28	23.1	36.0	8.14	8	m
25	161	50	oc	n	8/31/28	21.5	36.0	8.22	12	m, mh, h
25	162	100	oc	n	8/31/28	14.6	35.7	7.93	121	h
26	163	0	r	p	9/ 5/28	27.6	36.0	8.30	5	h
26	164	50	r	p	9/ 5/28	24.1	36.1	8.21	5	m
27	172	100	r	n	9/ 7/28	17.7	36.0	8.09	46	h
28	178	50	r	p	9/11/28	26.7	36.3	8.26	4	h, mh
31	193	100	r	n	10/ 3/28	23.4	36.5	8.19	28	mh
32	196	100	r	n	10/ 5/28	22.2	36.4	8.10	30	mh
35	204	50	r	n	10/26/28	16.8	34.7	7.92	138	mh
35	205	100	r	n	10/26/28	14.4	34.9	7.88	189	h
36	214	50	r	n	10/30/28	18.5	34.5	8.03	122	c
36	215	100	r	n	10/30/28	14.4	34.9	7.85	149	c
37	219	100	r	n	11/ 1/28	15.1	34.9	7.82	153	m
37	220	0	r	p	11/ 1/28	27.1	31.7	8.28	15	m
38	222	0	r	n	11/ 3/28	26.5	32.9	8.33	20	mh
40	229	0	r	n	11/ 8/28	22.2	33.7	8.21	24	m
40	231	100	r	n	11/ 8/28	13.9	35.0	7.85	159	m
40	232	0	r	p	11/ 8/28	22.2	33.7	8.21	24	m
40	233	50	r	p	11/ 8/28	15.3	34.9	7.87	161	m
41	235	0	r	n	11/10/28	20.4	34.2	8.11	32	m
41a	240	0	oc	n	11/13/28	(19.5	34.4	8.09	38)	h, m
42	241	0	r	n	11/13/28	18.7	34.7	8.06	45	h
42	243	100	r	n	11/13/28	13.8	35.0	7.91	150	mh, h
43	245	50	r	n	11/15/28	17.0	34.9	7.93	80	h
43	246	100	r	n	11/15/28	13.6	35.0	7.90	92	h
43	247	0	r	p	11/15/28	19.6	34.8	8.09	52	mh
44	250	0	r	n	11/17/28	20.7	34.9	8.03	38	h
44	251	50	r	n	11/17/28	20.4	34.9	8.04	34	h
44	253	0	r	p	11/17/28	20.7	34.9	8.03	38	h
44	254	50	r	p	11/17/28	20.4	34.9	8.04	34	m, h
45	256	0	oc	n	11/19/28	22.4	35.3	8.12	38	h
45	257	50	oc	n	11/19/28	22.4	35.2	8.13	46	c, h
45	258	100	oc	n	11/19/28	18.6	35.1	8.00	50	mh,* h
45	260	50	r	p	11/19/28	22.4	35.2	8.13	46	c
46	264	0	r	p	11/21/28	23.3	35.3	8.16	36	h
46	265	50	r	p	11/21/28	23.2	35.3	8.16	40	h
47	266	0	r	n	11/23/28	23.9	36.0	8.23	17	h
47	267	50	r	n	11/23/28	23.8	36.0	8.23	20	h
47	268	100	r	n	11/23/28	22.7	36.2	8.23	20	h
47	269	0	r	p	11/23/28	23.9	36.0	8.23	17	h
47	270	50	r	p	11/23/28	23.8	36.0	8.23	20	c
61	364	50	c	n	12/28/28	14.0	34.0	8.05	60	h
61	365	100	c	n	12/28/28	10.8	34.0	8.03	80	h
61	366	0	oc	p	12/28/28	16.9	34.0	8.05	46	h
61	367	50	r	p	12/28/28	14.0	34.0	8.05	60	h
62	372	50	r	n	12/30/28	16.2	34.3	8.10	28	h
62	376	100	r	p	12/30/28	13.1	34.2	8.06	48	h
66	413	0	r	p	1/ 7/29	19.4	34.7	8.10	29	h
66	414	50	r	p	1/ 7/29	17.8	34.8	8.10	29	h
69	426	100	r	n	1/12/29	14.6	34.8	7.86	198	h
69	429	100	r	p	1/12/29	14.6	34.8	7.86	198	h
70	432	50	r	n	1/13/29	15.4	35.0	7.88	178	h
70	433	100	oc	n	1/13/29	12.6	34.8	7.68	233	h
70	435	50	r	p	1/13/29	15.4	35.0	7.88	178	h
71	440	100	oc	n	2/ 6/29	13.9	35.0	7.71	220	h
72	444	50	r	n	2/ 8/29	18.7	35.4	8.12	60	h
72	445	100	oc	n	2/ 8/29	14.8	35.0	7.94	154	h
72	447	50	r	p	2/ 8/29	18.7	35.4	8.12	60	h
72	448	100	r	p	2/ 8/29	14.8	35.0	7.94	154	h
73	454	50	r	p	2/10/29	18.7	35.4	8.05	122	h
77	473	0	r	p	2/18/29	23.7	36.0	8.19	16	h
77	474	50	r	p	2/18/29	23.5	36.0	8.19	16	c, h
78	479	50	r	p	2/20/29	23.8	36.1	8.14	32	c
81	491	0	r	n	2/26/29	26.5	35.8	8.19	38	h
81	492	50	r	n	2/26/29	26.4	35.9	8.19	38	h
81	493	0	r	p	2/26/29	26.5	35.8	8.19	38	h
81	494	50	oc	p	2/26/29	26.4	35.9	8.19	38	h
81	495	100	r	p	2/26/29	23.6	36.2	8.18	36	h
93	553	100	r	p	3/ 3/29	27.6	35.8	8.27	29	c
95	583	50	r	n	4/24/29	29.3	34.9	8.24	16	h
96	568	0	r	n	4/25/29	29.3	35.3	8.23	12	h
96	569	50	oc	n	4/26/29	29.2	35.3	8.23	12	h
96	570	100	r	n	4/26/29	28.2	35.7	8.19	25	c, h
97	578	50	r	p	4/28/29	28.0	35.4	8.16	21	h

Table 49. Distributional and environmental records for Ceratium horridum--Concluded

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3	Variety
97	579	100	r	p	4/28/29	27.6	35.6	8.15	25	h
98	581	0	oc	n	4/30/29	27.0	35.3	8.16	24	h
98	584	0	r	p	4/30/29	27.0	35.3	8.16	24	h
98	585	50	oc	p	4/30/29	26.9	35.3	8.16	28	h
99	592	0	r	p	5/ 2/29	27.8	35.0	8.22	17	mh
100	597	100	r	n	5/ 4/29	27.6	34.7	8.22	12	mh
111	668	0	r	n	6/ 3/29	20.1	34.5	8.18	5	mh
113	684	50	r	p	6/25/29	23.8	34.6	8.25	5	c
113	685	100	r	p	6/25/29	21.5	34.7	8.23	8	c
114	686	0	r	n	6/27/29	19.9	34.3	8.15	7	m
114	690	50	oc	p	6/27/29	16.2	34.6	8.04	63	m
126	766	100	r	p	7/21/29	6.4	32.7	8.01	100	h
127	769	100	oc	n	7/23/29	8.2	32.8	8.00	72	h, mh
127	772	100	oc	p	7/23/29	8.2	32.8	8.00	72	mh
130	783	100	c	n	9/ 4/29	8.8	33.7	8.06	176	mh
130	784	100	oc	p	9/ 4/29	8.8	33.7	8.06	176	m
135	822	100	r	n	9/14/29	18.7	34.8	8.34	5	c
149	922	100	oc	n	10/21/29	20.3	34.9	8.38	6	c
151	937	0	r	n	10/26/29	26.0	34.0	.....	...	c
151	938	50	r	n	10/26/29	18.3	34.4	.....	...	c
151	939	100	c	n	10/26/29	12.5	34.6	.....	...	c
152	945	50	c	n	10/27/29	14.2	34.5	7.87	53	h, c
152	946	100	c	n	10/27/29	11.4	34.7	7.76	75	h
152	947	100	r	p	10/27/29	11.4	34.7	7.76	75	h
153	952	50	oc	n	10/29/29	28.1	34.4	8.39	7	mh
153	953	100	r	n	10/29/29	20.5	34.7	8.28	31	mh
157	978	0	r	n	11/ 6/29	27.8	35.3	8.27	47	mh
157	979	50	oc	n	11/ 6/29	27.1	35.2	8.32	60	mh

* Or c. Abbreviations: c=var. claviger; m=var. molle; h=var. horridum
mh=intergrade between molle and horridum.

Table 50. Distributional and environmental records for Ceratium tenue

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3	Variety
14	95	50	r	n	8/ 9/28	15.0	35.1	8.18	16	t, i
15	97	50	r	p	8/11/28	19.8	36.5	8.21	8	i
15	98	50	r	p	8/11/28	19.8	36.5	8.21	8	t
15	99	100	r	p	8/11/28	18.4	36.4	8.20	19	t
16	103	0	r	p	8/13/28	25.9	36.2	8.24	8	i
17	110	50	oc	p	8/15/28	21.9	36.6	8.24	12	i
18	114	0	oc	p	8/17/28	27.0	37.0	8.23	5	i
18	116	100	oc	p	8/17/28	20.4	36.8	8.21	5	i
18	118	50	oc	n	8/17/28	22.4	36.8	8.24	5	i
18	119	100	oc	n	8/17/28	20.4	36.8	8.21	5	i
19	120	0	oc	p	8/20/28	26.6	37.0	8.34	5	i
19	121	50	oc	p	8/20/28	25.2	37.1	8.27	5	i
19	123	50	oc	n	8/20/28	25.2	37.1	8.27	5	i
19	124	100	c	n	8/20/28	22.4	37.0	8.25	5	i
20	127	100	r	p	8/22/28	22.6	36.7	8.19	5	i
20	129	50	oc	n	8/22/28	25.8	36.6	8.26	3	i
20	130	100	c	n	8/22/28	22.6	36.7	8.19	5	i
20-21	131	0	r	n	8/24/28	(26.6	36.3	8.32	4)	i
21	132	0	r	p	8/24/28	26.6	36.3	8.32	4	t
21	136	50	r	n	8/24/28	24.4	36.2	8.26	4	i
21	137	100	oc	n	8/24/28	21.0	36.8	8.20	7	t
22	140	50	r	p	8/27/28	24.5	36.2	8.21	9	t
23	146	50	oc	p	8/29/28	20.9	36.0	8.14	13	i
24	152	50	r	p	8/31/28	23.1	36.0	8.14	8	i
25	161	50	r	n	9/ 3/28	21.5	36.0	8.22	12	i
26	164	50	oc	p	9/ 5/28	24.1	36.1	8.21	5	i
26	165	100	oc	p	9/ 5/28	14.9	35.8	8.11	40	i
27	168	50	oc	p	9/ 7/28	26.0	36.2	8.30	4	i
27	171	50	r	n	9/ 7/28	26.0	36.2	8.30	4	t
30	186	50	oc	p	9/15/28	27.8	36.1	8.29	3	i
30	190	100	r	n	9/15/28	24.1	36.4	8.10	20	t
31	191	0	r	n	10/ 3/28	28.5	34.4	8.27	2	i
31	192	50	r	n	10/ 3/28	28.2	35.4	8.23	2	i
32	195	50	r	n	10/ 5/28	27.2	36.0	8.24	2	i
32	198	100	oc	n	10/ 5/28	22.2	36.4	8.10	30	i
34	201	100	oc	n	10/ 9/28	20.5	36.6	8.16	16	t
34	202	50	oc	n	10/ 9/28	25.0	36.5	8.21	3	i

Table 50. Distributional and environmental records for Ceratium tenue--Continued

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m^3	Variety
37	221	50	r	p	11/ 1/28	18.8	34.5	8.00	121	t, i
41a	240	0	oc	n	11/13/28	(19.5	34.4	8.08	38)	t
47	268	100	r	n	11/23/28	22.7	36.2	8.23	20	i
48	275	50	r	p	11/25/28	23.6	36.4	8.24	16	i
48	276	100	oc	p	11/25/28	22.7	36.3	8.26	16	i
49	277	0	r	n	11/27/28	23.4	36.2	8.27	13	i
49	278	50	r	n	11/27/28	22.6	36.1	8.26	13	i
49	279	100	r	n	11/27/28	21.6	35.9	8.26	13	i
49	281	50	oc	p	11/27/28	22.6	36.1	8.26	13	i
49	282	100	oc	p	11/27/28	21.6	35.9	8.26	13	i
50	286	100	r	n	11/29/28	20.5	35.7	8.22	13	t
50	288	50	oc	p	11/29/28	22.0	35.9	8.23	13	i
50	289	100	oc	p	11/29/28	20.5	35.7	8.22	13	i
51	294	50	oc	n	12/ 1/28	20.5	35.6	8.22	17	i
51	297	50	oc	p	12/ 1/28	20.5	35.6	8.22	17	i
51	298	100	oc	p	12/ 1/28	20.0	35.6	8.22	17	i
53	304	50	oc	n	12/ 5/28	21.2	35.8	8.20	13	i
53	305	100	oc	n	12/ 5/28	19.9	35.6	8.19	13	i
53	306	0	r	p	12/ 5/28	22.6	35.7	8.22	13	i
53-54	308	0	r	n	12/ 6/28	(23.0	35.6	8.22	11)	i
55	324	50	oc	n	12/16/28	18.7	35.0	8.18	12	i
55	325	100	r	n	12/16/28	18.7	35.0	8.18	12	i
55	327	50	r	p	12/16/28	18.7	35.0	8.18	12	i
56	329	50	r	n	12/18/28	18.5	35.1	8.14	9	i
56	330	100	oc	n	12/18/28	16.6	34.8	8.11	12	i
56	331	0	r	p	12/18/28	20.8	34.9	8.13	9	i
56	332	50	oc	p	12/18/28	18.5	35.1	8.14	9	i
56	333	100	r	p	12/18/28	16.6	34.8	8.11	12	i
57	339	50	oc	p	12/20/28	15.6	34.3	8.14	21	i
57	340	100	r	p	12/20/28	14.3	34.4	8.10	40	i
60	359	0	r	p	12/26/28	15.0	34.0	8.07	50	t
61	368	100	r	p	12/28/28	10.8	34.0	8.03	80	t
61-62	369	0	r	n	12/28/28	(16.9	34.0	8.05	46)	t
63	380	50	r	n	1/ 1/29	17.0	34.6	8.08	25	i
63	381	100	r	n	1/11/29	15.6	34.6	8.08	24	i
63	383	50	oc	p	1/ 1/29	17.0	34.6	8.08	25	i
63	384	100	r	p	1/ 1/29	15.6	34.6	8.08	24	i
64	395	50	r	n	1/ 3/29	17.2	34.6	8.12	29	i
64	396	100	r	n	1/ 3/29	15.8	34.5	8.10	32	i
64	399	50	oc	p	1/ 3/29	17.2	34.6	8.12	29	i
64	400	100	r	p	1/ 3/29	15.8	34.5	8.10	32	i
65	406	50	oc	n	1/ 5/29	16.5	34.5	8.10	25	i
65	407	100	r	n	1/ 5/29	14.8	34.3	8.10	34	i
65	408	0	r	p	1/ 5/29	20.2	34.5	8.10	24	i
65	409	50	r	p	1/ 5/29	16.5	34.5	8.10	25	i
65	410	100	r	p	1/ 5/29	14.8	34.3	8.10	34	i
66	412	100	r	n	1/ 7/29	17.8	34.9	8.12	21	i
67	416	0	oc	n	1/ 8/29	19.3	34.9	8.11	21	i
67	418	100	r	n	1/ 8/29	16.2	34.6	8.05	40	i
68	419	0	r	n	1/10/29	19.2	35.1	8.14	29	i
68	421	100	r	n	1/10/29	16.5	34.8	8.13	34	i
68	422	0	r	p	1/10/29	19.2	35.1	8.14	29	i
75	464	100	oc	n	2/14/29	17.8	35.4	8.00	75	i
76	469	100	r	n	2/16/29	21.2	35.8	8.12	45	i
78	475	0	r	n	2/20/29	24.6	36.0	8.17	32	i
78	476	50	r	n	2/20/29	23.8	38.1	8.14	32	i
78	477	100	oc	n	2/20/29	21.9	36.2	8.14	34	i
78	478	0	oc	p	2/20/29	24.6	36.0	8.17	32	i
78	479	50	oc	p	2/20/29	23.8	36.1	8.14	32	i
78	480	100	oc	p	2/20/29	21.9	36.2	8.14	34	i
79	482	50	oc	n	2/22/29	24.5	36.1	8.17	34	i
79	483	100	r	n	2/22/29	21.8	36.2	8.13	45	i
79	484	0	r	p	2/22/29	25.2	36.0	8.17	34	i
80	486	0	r	n	2/24/29	26.0	35.9	8.20	36	i
80	488	0	oc	p	2/24/29	26.0	35.9	8.20	36	i
80	490	100	oc	p	2/24/29	23.4	36.2	8.16	32	i
81	492	50	r	n	2/26/29	26.4	35.9	8.19	38	i
81	493	0	oc	p	2/26/29	26.5	35.8	8.19	38	i
81	495	100	r	p	2/26/29	23.6	36.2	8.18	36	i
82	496	0	r	n	2/28/29	27.2	36.3	8.21	34	i
82	498	0	oc	p	2/28/29	27.2	36.3	8.21	34	i
82	500	100	oc	p	2/28/29	24.4	36.5	8.19	34	i
83	504	50	oc	p	3/ 2/29	27.4	36.2	8.24	25	i
84	505	0	oc	n	3/ 4/29	27.8	36.2	8.23	24	i
84	507	0	oc	p	3/ 4/29	27.8	36.2	8.23	24	i
84	508	50	r	p	3/ 4/29	27.5	36.4	8.21	24	i

Table 50. Distributional and environmental records for Ceratium tenue--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3	Variety
85	513	50	oc	p	3/ 6/29	27.8	36.2	8.22	40	i
85	514	100	r	p	3/ 6/29	25.2	36.3	8.23	42	i
86	515	0	r	n	3/ 9/29	(28.3	36.2	8.29	20)	i
86	518	0	r	p	3/ 9/29	28.3	36.2	8.29	20	i
87	524	50	r	p	3/11/29	26.5	36.1	8.26	20	i
87	525	100	r	p	3/11/29	23.9	36.0	8.23	20	i
89	531	100	r	p	3/23/29	26.4	36.0	8.24	12	i
91	544	100	oc	p	3/27/29	25.8	36.0	8.25	30	i
92	546	50	r	n	3/29/29	28.4	35.4	8.29	28	i
92	547	0	r	p	3/29/29	28.5	35.3	8.29	28	i
92	549	100	oc	p	3/29/29	26.2	36.0	8.28	28	i
93	552	0	r	p	3/31/29	28.7	34.7	8.30	28	i
93	553	100	oc	p	3/31/29	27.6	35.8	8.27	29	i
94	559	100	r	n	4/22/29	28.5	35.6	8.21	25	i
95	568A	0	oc	n	4/25/29	(29.4	34.7	8.26	14)	t
96	570	100	c	n	4/26/29	28.2	35.7	8.19	25	t
96	573	100	oc	p	4/26/29	28.2	35.7	8.19	25	t
97	576	100	oc	n	4/28/29	27.6	35.6	8.15	25	t
97	579	100	r	p	4/28/29	27.6	35.6	8.15	25	t
98	581	0	r	n	4/30/29	27.0	35.3	8.16	24	t
98	583	100	r	n	4/30/29	26.7	35.4	8.14	32	t
98	584	0	oc	p	4/30/29	27.0	35.3	8.16	24	t
98	585	50	r	p	4/30/29	26.9	35.3	8.16	28	t
98	588	100	r	p	4/30/29	26.9	35.3	8.16	28	t
98	586	50	oc	n	5/ 2/29	27.8	34.9	8.22	12	t
99	590	50	oc	n	5/ 2/29	27.8	34.9	8.22	12	t
99	592	0	r	p	5/ 2/29	27.9	34.9	8.21	12	i
99	594	100	oc	p	5/ 2/29	27.8	35.0	8.22	17	t
100	597	100	r	n	5/ 4/29	27.6	34.7	8.22	12	t
101	605	100	oc	n	5/ 4/29	27.6	34.7	8.22	12	t
101	607	50	oc	p	5/ 7/29	26.2	34.7	8.24	8	t
101	608	100	oc	p	5/ 7/29	25.2	35.1	8.23	8	t
102	612	0	r	p	5/ 9/29	25.8	35.0	8.24	8	t
102	613	50	oc	p	5/ 9/29	25.8	35.0	8.24	8	t
102	614	100	r	p	5/ 9/29	25.6	35.0	8.23	8	t
104	626	100	oc	p	5/13/29	25.3	35.3	8.21	7	i
106	635	100	oc	n	5/17/29	25.6	35.1	8.23	5	i
106	636	0	oc	p	5/17/29	27.2	35.0	8.23	5	i
106	638	100	r	p	5/17/29	25.6	35.1	8.23	5	i
107	641	100	r	n	5/19/29	26.8	34.9	8.23	11	i
107	643	50	r	p	5/19/29	27.9	34.4	8.23	4	i
107	644	100	oc	p	5/19/29	26.8	34.9	8.23	4	i
108	647	50	r	n	5/27/29	26.8	35.0	8.24	4	i
109	656	100	oc	n	5/29/29	19.4	34.8	8.18	5	..
109	658	50	r	p	5/29/29	23.1	35.0	8.22	3	..
109	659	100	r	p	5/29/29	19.4	34.8	8.18	5	i
110	663	100	r	n	5/31/29	17.9	34.7	8.14	11	i
110	665	50	r	p	5/31/29	18.4	34.8	8.16	7	i
110	666	100	oc	p	5/31/29	17.9	34.7	8.14	11	i
112	676	100	r	n	6/ 5/29	19.8	34.7	8.20	8	i
112	678	50	r	p	6/ 5/29	21.7	34.6	8.23	7	..
113	680	0	r	n	6/25/29	24.2	34.5	8.25	5	i
113	681	50	oc	n	6/25/29	23.8	34.6	8.25	5	i
113	682	100	oc	n	6/25/29	21.5	34.7	8.23	8	i
113	683	0	r	p	6/25/29	24.2	34.5	8.25	5	i
113	684	50	r	p	6/25/29	23.8	34.6	8.25	5	i
113	685	100	oc	p	6/25/29	21.5	34.7	8.23	8	i
128	778	100	r	p	7/25/29	10.2	33.2	8.06	46	i
130	783	100	c	n	9/ 4/29	8.8	33.7	8.06	176	i
131	789	100	oc	n	9/ 6/29	12.1	33.4	8.32	...	i
132	799	100	r	n	9/ 8/29	14.3	33.4	8.30	16	i
134	810	100	oc	n	9/12/29	18.1	34.6	8.34	6	i
134	817	100	oc	p	9/12/29	18.1	34.6	8.34	6	i
135	821	50	r	n	9/14/29	21.5	35.0	8.37	5	i
135	822	100	r	n	9/14/29	18.7	34.8	8.34	5	i
135	825	50	r	p	9/14/29	21.5	35.0	8.37	5	i
135	826	100	r	p	9/14/29	18.7	34.8	8.34	5	i
136	829	100	oc	n	9/16/29	18.6	35.0	8.39	3	i
136	834	100	oc	p	9/16/29	18.6	35.0	8.39	3	i
137	838	100	oc	n	9/18/29	21.5	35.1	8.30	5	i
138	845	100	r	n	9/20/29	22.2	34.8	8.31	3	i
138	848	50	r	p	9/20/29	25.6	34.7	8.30	3	i
139	851	100	oc	n	9/22/29	22.4	35.2	8.28	6	i
139	855	100	oc	p	9/22/29	22.4	35.2	8.28	6	i
140	858	100	r	n	10/ 3/29	25.5	35.0	8.34	7	t
140	863	100	r	p	10/ 3/29	25.5	35.0	8.34	7	i

Table 50. Distributional and environmental records for Ceratium tenue--Concluded

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3	Variety
141	869	50	r	p	10/ 5/29	24.8	35.3	8.34	5	i
141	870	50	oc	p	10/ 5/29	24.8	35.3	8.34	5	i
141	871	100	r	p	10/ 5/29	20.0	35.0	8.33	5	i
142	873	50	r	n	10/ 7/29	21.8	34.8	8.30	5	i
142	874	100	c	n	10/ 7/29	16.6	34.4	8.27	7	i
142	877	50	r	p	10/ 7/29	21.8	34.8	8.30	5	i
142	878	100	r	p	10/ 7/29	16.6	34.4	8.27	7	i
144	888	50	oc	p	10/11/29	21.1	34.7	8.33	6	i
144	889	100	oc	p	10/11/29	16.6	34.5	8.37	6	t
145	892	100	r	n	10/13/29	18.0	34.1	8.31	6	t
146	896	0	r	p	10/15/29	22.4	34.9	8.37	6	t
146	898	100	oc	n	10/15/29	19.7	34.3	8.26	7	t
146	901	50	r	p	10/15/29	22.4	34.9	8.30	6	t
146	902	100	oc	p	10/15/29	19.7	34.3	8.26	7	t
147	904	50	r	n	10/17/29	23.1	35.3	8.29	5	t
147	905	100	r	n	10/17/29	19.2	35.0	8.29	5	t
147	908	50	r	p	10/17/29	23.1	35.3	8.29	5	t
147	909	100	oc	p	10/17/29	19.2	35.0	8.29	5	t
148	912	100	r	n	10/19/29	20.0	35.0	.....	...	t
148	919	100	r	p	10/19/29	20.0	35.0	.....	...	t
149	921	50	oc	n	10/21/29	23.3	35.0	8.37	6	l
149	922	100	r	n	10/21/29	20.3	34.9	8.38	6	l
149	927	0	r	p	10/21/29	23.5	35.0	8.34	6	i
150	929	0	r	n	10/23/29	25.8	34.7	8.39	7	i
150	930	50	r	n	10/23/29	22.8	34.8	8.35	10	l
150	931	100	r	n	10/23/29	19.6	34.6	8.32	11	t
151	938	50	oc	n	10/26/29	18.3	34.4	.....	...	t
151	939	100	r	n	10/26/29	12.5	34.6	.....	...	l
151	941	0	r	p	10/26/29	26.0	34.0	.....	...	i
152	946	100	oc	n	10/27/29	11.4	34.7	7.76	75	i
152	950	100	r	p	10/27/29	11.4	34.7	7.76	75	i
153	953	100	oc	n	10/29/29	20.5	34.7	8.28	31	i
153	956	50	r	p	10/29/29	28.1	34.4	8.39	7	i
153	957	100	r	p	10/29/29	20.5	34.7	8.28	31	i
154	960	100	oc	p	10/31/29	25.3	34.8	7.93	21	l
158	983	0	c	n	11/ 8/29	28.2	35.6	8.34	36	i
158	985	100	c	n	11/ 8/29	27.6	35.9	8.39	48	l
159	990	0	oc	n	11/11/29	28.6	35.7	8.37	15	l
159	991	50	r	n	11/11/29	28.5	35.7	8.39	15	t
159	992	100	oc	n	11/11/29	28.0	35.7	8.37	23	t
160	1002	50	oc	n	11/13/29	28.6	35.6	8.39	15	i
160	1003	100	r	n	11/13/29	28.5	35.7	8.44	16	t

Abbreviations: l=var. inclinatum; t=var. tenuissimum.

Table 51. Distributional and environmental records for Ceratium longissimum

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
1b	8	100	r	n	5/16/28	(20.3	35.5	8.18	36)
15	99	100	r	p	8/11/28	18.4	36.4	8.20	19
16	107	50	r	n	8/13/28	24.4	36.4	8.23	8
23	150	100	r	n	8/29/28	16.6	36.0	8.18	75
25	161	50	r	n	9/ 3/28	21.5	38.0	8.22	12
35	204	50	r	n	10/26/28	16.8	34.7	7.92	138
37	221	50	r	p	11/ 1/28	18.8	34.5	8.00	121
45	258	100	r	n	11/19/28	18.6	35.1	8.00	50
47	268	100	r	n	11/23/28	22.7	36.2	8.23	20
75	464	100	r	n	2/14/29	17.8	35.4	8.00	75
78	477	100	r	n	2/20/29	21.9	36.2	8.14	34
80	490	100	r	p	2/24/29	23.4	36.2	8.16	32
109	656	100	r	n	5/29/29	19.4	34.8	8.18	5
112	676	100	r	n	6/ 5/29	19.8	34.7	8.20	8
132	799	100	r	n	9/ 8/29	14.3	33.4	8.30	16
133	806	100	oc	n	9/10/29	18.4	34.8	8.31	7
134	810	100	oc	n	9/12/29	18.1	34.6	8.34	6
134	817	100	r	p	9/12/29	18.1	34.6	8.34	6
135	822	100	r	n	9/14/29	18.7	34.8	8.34	5
136	829	100	oc	n	9/16/29	18.6	35.0	8.39	3
137	838	100	r	n	9/18/29	21.5	35.1	8.30	5
142	874	100	r	n	10/ 7/29	16.6	34.4	8.27	7
142	878	100	r	p	10/ 7/29	16.6	34.4	8.27	7
142	879	100	r	p	10/ 7/29	16.6	34.4	8.27	7

Table 51. Distributional and environmental records for Ceratium longissimum--Concluded

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
146	898	100	oc	n	10/15/29	19.7	34.3	8.26	7
147	905	100	oc	n	10/17/29	19.2	35.0	8.29	5
148	912	100	oc	n	10/19/29	20.0	35.0	.....	...
149	922	100	oc	n	10/21/29	20.3	34.9	8.38	6
150	931	100	r	n	10/23/29	19.6	34.6	8.32	11
151	938	50	r	n	10/26/29	18.3	34.4	.....	...
151	939	100	r	n	10/26/29	12.5	34.6	.....	...
159	992	100	r	n	11/11/29	28.0	35.7	8.37	23

Table 52. Distributional and environmental records for Ceratium arcticum

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3	Variety
6f	53	0	a	n	7/ 9/28	(10.6	35.4	8.11	28)	l
6g	54	0	a	n	7/10/28	(10.6	35.4	8.11	28)	l
6h	55	0	a	n	7/11/28	(10.6	35.4	8.11	28)	l, v
7	56	0	oc	n	7/13/28	8.9	35.2	8.08	34	l, v
7	57	50	c	n	7/13/28	8.2	35.2	8.03	47	l, a
7	58	100	c	n	7/13/28	8.1	35.2	8.04	57	l
8	59	0	c	n	7/15/28	10.3	35.2	7.93	13	l, v, a
8	60	50	c	n	7/15/28	9.1	35.2	7.95	27	l, a
8	61	100	oc	n	7/15/28	8.4	35.3	7.95	54	l
9	64	0	oc	n	7/28/28	11.2	35.1	8.08	20	l
9	65	50	r	n	7/28/28	8.4	35.1	7.96	55	a, l
10	68	0	a	n	7/30/28	10.9	34.9	8.08	28	a, l
10	69	50	c	n	7/30/28	10.0	34.9	8.04	34	l
10	70	100	r	n	7/30/28	6.6	35.0	7.95	52	l
11	73	0	oc	n	8/ 1/28	10.7	34.9	8.06	27	l, a
11	74	50	oc	n	8/ 1/28	7.3	34.9	7.92	63	l, a
11	76	50	r	p	8/ 1/28	7.3	34.9	7.92	63	a
11a	78	0	oc	n	8/ 1/28	(10.7	34.9	8.06	27)	l, v
12	79	0	a	n	8/ 5/28	8.4	33.6	8.10	27	l, a
12	80	50	a	n	8/ 5/28	3.9	34.7	7.91	95	l, v, a
12	81	100	a	n	8/ 5/28	3.4	34.9	7.89	82	v, a
12	82	0	a	p	8/ 5/28	8.4	33.6	8.10	27	l, a
13	83	0	c	n	8/ 7/28	11.3	32.7	8.09	19	a, l
13	85	50	r	n	8/ 7/28	-1.6	33.4	7.87	59	l
13	86	100	a	n	8/ 7/28	-1.2	33.6	7.87	60	l, a
13	87	0	c	p	8/ 7/28	11.3	32.7	8.09	19	l, a
14	91	100	oc	p	8/ 9/28	14.0	35.6	8.06	34	v, l, a
14	92	50	oc	p	8/ 9/28	15.0	35.1	8.18	16	l
14	93	0	oc	p	8/ 9/28	21.2	35.2	8.18	11	l
14	94	100	oc	n	8/ 9/28	14.0	35.6	8.06	34	l
14	95	50	c	n	8/ 9/28	15.0	35.1	8.18	16	l
15	97	0	r	p	8/11/28	24.8	36.4	8.21	11	a
15	98	50	oc	p	8/11/28	19.8	36.5	8.21	8	a
15	99	100	oc	p	8/11/28	18.4	36.4	8.20	19	a
15	101	50	r	n	8/11/28	19.8	36.5	8.21	8	a
15	102	100	r	n	8/11/28	18.4	36.4	8.20	19	a
16	104	50	r	p	8/13/28	24.4	36.4	8.23	8	a
16	105	100	r	p	8/13/28	19.9	36.5	8.17	13	l
16	108	100	r	n	8/13/28	19.9	36.5	8.17	13	a
17	111	0	r	n	8/15/28	26.2	36.6	8.29	9	l
17	112	50	oc	n	8/15/28	21.9	36.6	8.28	12	l
17	113	100	r	n	8/15/28	19.3	36.5	8.23	9	l
18	116	100	r	p	8/17/28	20.4	36.8	8.21	5	l
18	118	50	r	n	8/17/28	22.4	36.8	8.24	5	l
19	123	50	oc	n	8/20/28	25.2	37.1	8.27	5	a
19	124	100	r	n	8/20/28	22.4	37.0	8.25	5	a
20	127	100	r	p	8/22/28	22.6	36.7	8.19	5	a
20	129	50	r	n	8/22/28	25.8	36.6	8.26	3	a
20	130	100	r	n	8/22/28	22.6	36.7	8.19	5	a
21	134	100	oc	p	8/24/28	21.0	36.8	8.20	7	l
22	139	0	oc	p	8/27/28	26.7	36.0	8.26	8	l
22	140	50	r	p	8/27/28	24.5	36.2	8.21	9	l
22	143	50	r	n	8/27/28	24.5	36.2	8.21	9	l
33	198a	50	r	p	10/ 8/28	28.2	36.2	8.24	4	a
116	704	100	oc	n	7/11/29	6.7	33.8	.....	...	l
116	707	100	r	p	7/ 1/29	6.7	33.8	8.24	4	l
117	713	100	oc	p	7/ 3/29	8.8	34.1	7.98	84	l
118	714	0	oc	n	7/ 5/29	10.2	33.6	8.21	90	l
118	715	0	r	n	7/ 5/29	10.2	33.6	8.21	90	l

Table 52. Distributional and environmental records for Ceratium arcticum--Concluded

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3	Variety
118	716	100	r	n	7/ 5/29	6.1	33.8	7.94	114	l
118	719	....	r	..	7/ 5/29	.....	.....	.....	.....	l
120	726	0	oc	n	7/ 9/29	7.2	33.0	7.98	137	a, l
120	727	50	oc	n	7/ 9/29	2.2	33.1	7.90	177	a
120	728	100	r	n	7/ 9/29	2.0	33.2	7.84	197	a
120	729	0	r	p	7/ 9/29	7.2	33.0	7.98	137	a, l
121	732	0	oc	n	7/11/29	7.5	32.9	7.98	141	a
121	733	50	r	n	7/11/29	3.6	33.1	7.92	159	a
121	734	100	r	n	7/11/29	2.1	33.2	7.86	184	l
121	735	0	oc	p	7/11/29	7.5	32.9	7.98	141	a
122	738	0	c	n	7/13/29	8.2	32.8	7.98	130	l
122	739	50	r	n	7/13/29	3.6	33.1	7.94	142	l
122	740	100	r	n	7/13/29	2.4	33.1	7.90	161	l
122	741	0	c	p	7/13/29	8.2	32.8	7.98	130	l
123	744	0	oc	n	7/15/29	8.1	32.8	8.03	113	l
123	745	50	oc	n	7/15/29	4.4	32.9	7.94	150	l
123	746	100	oc	n	7/15/29	3.0	33.4	7.79	209	l
123	747	0	oc	p	7/15/29	8.1	32.8	8.03	113	l
123	748	50	r	p	7/15/29	4.4	32.9	7.94	150	l
124	749	0	c	n	7/17/29	9.3	32.7	8.04	103	l
124	750	50	r	n	7/17/29	5.4	32.7	8.02	110	l
124	751	100	r	n	7/17/29	4.0	33.6	7.64	228	l
124	752	0	r	p	7/17/29	9.3	32.7	8.04	103	l
125	755	0	r	n	7/19/29	10.5	32.8	8.03	125	l
125	757	100	r	n	7/19/29	4.2	32.9	7.90	175	l
146	898	100	r	n	7/19/29	4.2	32.9	7.90	175	l

Abbreviations: a=var. arcticum; l=var. longipes; v=var. ventricosum.

Table 53. Distributional and environmental records for Ceratium hexacanthum

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
1	1	0	oc	n	5/12/28	24.0	36.2	8.16	34
1	2	70	r	n	5/12/28	(22.4	36.4	8.17	35)
1a	5	0	oc	n	5/14/28	(22.3	36.3	8.20	46)
1b	6	0	c	n	5/16/28	(22.3	36.3	8.20	46)
1b	7	50	c	n	5/16/28	(22.2	36.4	8.21	39)
1b	8	100	c	n	5/16/28	(20.3	35.5	8.18	36)
2	12	50	oc	n	5/18/28	20.5	36.4	8.21	46
2	13	100	oc	n	5/18/28	19.8	36.4	8.21	33
2	14	0	c	n	5/18/28	20.5	36.4	8.23	58
4	24	50	r	n	5/23/28	14.4	36.0	8.15	21
5a	33	0	oc	n	5/30/28	(12.4	35.6	8.15	21)
5a	34	0	r	n	5/30/28	(12.4	35.6	8.15	21)
6	35	0	r	n	5/31/28	12.4	35.6	8.15	21
6	36	50	r	n	5/31/28	11.6	35.6	8.12	32
6	37	100	oc	n	5/31/28	11.3	35.6	8.08	41
6a	42	0	oc	n	5/31/28	(12.4	35.6	8.15	21)
6b	43	0	r	n	6/ 2/28	(12.4	35.6	8.15	21)
6b	44	0	oc	n	6/ 2/28	(12.4	35.6	8.15	21)
6b	45	0	c	n	6/ 2/28	(12.4	35.6	8.15	21)
6b	46	0	oc	n	6/ 2/28	(12.4	35.6	8.15	21)
6c	47	100	r	n	6/ 3/28	(11.3	35.6	8.08	41)
6c	48	0	r	n	6/ 3/28	(12.4	35.6	8.15	21)
6c	49	0	c	n	6/ 4/28	(12.4	35.6	8.15	21)
7	57	50	r	n	7/13/28	8.2	35.2	8.03	47
15	98	50	r	p	8/11/28	19.8	36.5	8.21	8
15	99	100	oc	p	8/11/28	18.4	36.4	8.20	19
15	101	50	r	n	8/11/28	19.8	36.5	8.21	8
15	102	100	r	n	8/11/28	18.4	36.4	8.20	19
16	104	50	r	p	8/13/28	24.4	36.4	8.23	8
16	106	0	r	n	8/13/28	25.9	36.2	8.24	8
16	107	50	r	n	8/13/28	24.4	36.4	8.23	8
16	108	100	r	n	8/13/28	19.9	36.5	8.17	13
17	110	50	r	p	8/15/28	21.9	36.6	8.28	12
17	112	50	oc	n	8/15/28	21.9	36.6	8.28	12
18	114	0	r	p	8/17/28	27.0	37.0	8.23	5
18	115	50	r	p	8/17/28	22.4	36.8	8.24	5
18	116	100	r	p	8/17/28	20.4	36.8	8.21	5
18	117	0	c	n	8/17/28	27.0	37.0	8.23	5
18	118	50	c	n	8/17/28	22.4	36.8	8.24	5
19	122	0	oc	n	8/20/28	26.6	37.0	8.34	5

Table 53. Distributional and environmental records for Ceratium hexacanthum--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
19	123	50	oc	n	8/20/28	25.2	37.1	8.27	5
19	124	100	oc	n	8/20/28	22.4	37.0	8.25	5
20	128	0	r	n	8/22/28	26.0	36.6	8.37	5
20	129	50	r	n	8/22/28	25.8	36.6	8.26	3
21	135	0	r	n	8/29/28	26.6	36.3	8.32	4
21	136	50	r	n	8/29/28	24.4	36.2	8.26	4
23	148	0	r	n	8/29/28	27.2	35.9	8.25	4
24	154	0	r	n	8/31/28	27.2	35.2	8.32	4
24	156	100	r	n	8/31/28	15.6	35.6	7.96	99
25	161	50	r	n	9/ 3/28	21.5	36.0	8.22	12
28	176	0	r	n	9/11/28	27.6	36.3	8.29	4
30	188	0	r	n	9/15/28	28.0	36.1	8.30	2
31	191	0	r	n	10/ 3/28	28.5	34.4	8.27	2
31	192	50	r	n	10/ 3/28	28.2	35.4	8.23	2
31	193	100	c	n	10/ 3/28	23.4	36.5	8.19	28
32	194	0	c	n	10/ 5/28	28.0	36.0	8.23	2
32	194A	0	oc	p	10/ 5/28	28.0	36.0	8.23	2
32	196	100	r	n	10/ 5/28	22.2	36.4	8.10	30
32	196A	100	r	p	10/ 5/28	22.2	36.4	8.10	30
33	197A	0	r	p	10/ 8/28	28.5	35.6	8.23	4
34	200	0	oc	n	10/ 9/28	28.5	35.9	8.28	2
34	201	100	r	n	10/ 9/28	20.5	36.6	8.16	16
35	205	100	r	n	10/26/28	14.4	34.9	7.88	189
35-36	209	0	r	n	10/27/28	(27.4	29.7	8.31	15)
35-36	212	0	r	n	10/28/28	(27.0	30.7	8.27	16)
36	216	0	r	p	10/30/28	26.5	31.6	8.23	16
38	222	0	r	n	11/ 3/28	26.5	32.9	8.33	20
40	232	0	r	p	11/ 8/28	22.2	33.7	8.21	24
45	257	50	r	n	11/19/28	22.4	35.2	8.13	46
45	258	100	oc	n	11/19/28	18.6	35.1	8.00	50
47	266	0	r	n	11/19/28	23.9	36.0	8.23	17
47	267	50	r	n	11/23/28	23.8	36.0	8.23	20
47	268	100	oc	n	11/23/28	22.7	36.2	8.23	20
48	271	0	oc	n	11/25/28	23.6	36.4	8.23	13
48	272	50	r	n	11/25/28	23.6	36.4	8.24	16
48	273	100	oc	n	11/25/28	22.7	36.3	8.26	16
48	274	0	r	p	11/25/28	23.6	36.4	8.23	13
49	277	0	r	n	11/27/28	23.4	36.2	8.27	13
49	278	50	r	n	11/27/28	22.6	36.1	8.26	13
49	279	100	r	n	11/27/28	21.6	35.9	8.26	13
49a	283	0	oc	n	11/28/28	(23.2	36.0	8.23	13)
50	284	0	oc	n	11/29/28	23.2	36.0	8.23	13
50	286	100	r	n	11/29/28	20.5	35.7	8.22	13
50	287	0	r	p	11/29/28	23.2	36.0	8.23	13
50-51	290	0	oc	n	11/30/28	(22.8	35.6	8.22	16)
50-51	291	0	oc	n	11/30/28	(22.8	35.6	8.22	16)
50-51	292	0	oc	n	11/30/28	(22.8	35.6	8.22	16)
51	293	0	oc	n	12/ 1/28	22.8	35.6	8.22	16
51	294	50	oc	n	12/ 1/28	20.5	35.6	8.22	17
51	295	100	oc	n	12/ 1/28	20.0	35.6	8.22	17
51	296	0	r	p	12/ 1/28	22.8	35.6	8.22	16
52	299	0	oc	n	12/ 3/28	22.5	35.4	8.21	8
52	300	50	oc	n	12/ 3/28	20.2	35.6	8.20	8
52	301	100	oc	n	12/ 3/28	18.2	35.2	8.17	8
53	303	0	oc	n	12/ 5/28	22.6	35.7	8.22	13
53	304	50	oc	n	12/ 5/28	21.2	35.8	8.20	13
53	305	100	oc	n	12/ 5/28	19.9	35.6	8.19	13
53	306	0	r	p	12/ 5/28	22.6	35.7	8.22	13
53-54	307	0	oc	n	12/ 6/28	(23.0	35.6	8.22	11)
53-54	308	0	oc	n	12/ 6/28	(23.0	35.6	8.22	11)
53-54	310	0	oc	n	12/10/28	(23.0	35.6	8.22	11)
53-54	311	0	oc	n	12/10/28	(23.0	35.6	8.22	11)
53-54	312	0	r	n	12/10/28	(23.0	35.6	8.22	11)
53-54	313	0	r	n	12/10/28	(23.0	35.6	8.22	11)
53-54	316	0	r	n	12/12/28	(23.0	35.6	8.22	11)
53-54	317	0	oc	n	12/12/28	(23.0	35.6	8.22	11)
54	319	0	r	n	12/14/28	23.4	35.5	8.22	9
54	320	50	oc	n	12/14/28	19.8	35.4	8.18	17
55	324	50	oc	n	12/16/28	18.7	35.0	8.18	12
55	325	100	oc	n	12/16/28	16.7	34.9	7.17	12
56	328	0	oc	n	12/18/88	20.8	34.9	8.13	9
56	329	50	oc	n	12/18/28	18.5	35.1	8.14	9
56	330	100	oc	n	12/18/28	16.6	34.8	8.11	12
56	331	0	oc	p	12/18/28	20.8	34.9	8.13	9
56-57	334	0	oc	n	12/19/28	(19.0	34.5	8.14	20)
57	335	0	oc	n	12/20/28	19.0	34.5	8.14	20

Table 53. Distributional and environmental records for Ceratium hexacanthum--Continued

Station	Sample	Depth (m)	Relative abundance	Appa-ratus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
57	336	50	oc	n	12/20/28	15.6	34.3	8.14	21
57	337	100	r	n	12/20/28	14.3	34.4	8.10	40
57	338	0	oc	p	12/20/28	19.0	34.5	8.14	20
62	372	50	oc	n	12/30/28	16.2	34.3	8.10	28
62	373	100	r	n	12/30/28	13.1	34.2	8.06	48
62	375	50	r	p	12/30/28	16.2	34.3	8.10	28
63	379	0	r	n	1/ 1/29	20.5	34.6	8.07	21
63	380	50	oc	n	1/ 1/29	17.0	34.6	8.08	25
64	396	100	r	n	1/ 3/29	15.8	34.5	8.10	32
65	409	50	r	p	1/ 5/29	16.5	34.5	8.10	25
66	412	100	r	n	1/ 7/29	17.8	34.9	8.12	21
66	414	50	r	p	1/ 7/29	17.8	34.8	8.10	29
66	415	100	r	p	1/ 7/29	17.8	34.9	8.12	21
67	416	0	oc	n	1/ 8/29	19.3	34.9	8.11	21
67	418	100	r	n	1/ 8/29	16.2	34.6	8.05	40
69	424	0	oc	n	1/12/29	21.1	35.2	8.12	62
69	426	100	r	n	1/12/29	14.6	34.8	7.86	198
71	439	50	r	n	2/ 6/29	16.7	35.1	7.90	150
73	452	100	r	n	2/10/29	14.7	35.0	7.80	178
75	462	0	r	n	2/14/29	22.8	35.8	8.18	44
76	467	0	oc	n	2/16/29	23.4	35.9	8.15	50
77	472	0	oc	n	2/18/29	23.7	36.0	8.19	16
78	475	0	r	n	2/20/29	24.6	36.0	8.17	32
78	476	50	r	n	2/20/29	23.8	36.1	8.14	32
78	477	100	r	n	2/20/29	21.9	36.2	8.14	34
78	478	0	r	p	2/20/29	24.6	36.0	8.17	32
79	482	50	r	n	2/22/29	24.5	36.1	8.17	34
79	483	100	r	n	2/22/29	21.8	36.2	8.13	45
80	486	0	oc	n	2/24/29	26.0	35.9	8.20	36
80	488	0	r	p	2/24/29	26.0	35.9	8.20	36
81	491	0	oc	n	2/26/29	26.5	35.8	8.19	38
81	492	50	oc	n	2/26/29	26.4	35.9	8.19	38
82	496	0	oc	n	2/28/29	27.2	36.3	8.21	34
82	497	50	oc	n	2/28/29	27.2	36.3	8.21	34
82	498	0	r	p	2/28/29	27.2	36.3	8.21	34
83	501	0	oc	n	3/ 2/29	27.5	36.3	8.24	29
83	502	50	oc	n	3/ 2/29	27.4	36.3	8.24	25
83	503	0	r	p	3/ 2/29	27.5	36.3	8.24	29
84	505	0	oc	n	3/ 4/29	27.8	36.2	8.23	24
84	507	0	r	p	3/ 4/29	27.8	36.2	8.23	24
85	510	0	oc	n	3/ 6/29	27.9	36.2	8.22	40
86	516	0	r	n	3/ 9/29	28.3	36.2	8.29	20
86	517	50	oc	n	3/ 9/29	27.4	36.2	8.29	17
87	521	0	r	n	3/11/29	27.8	36.1	8.28	17
87	522	50	r	n	3/11/29	26.5	36.1	8.26	20
88	526	0	oc	n	3/21/29	28.5	35.9	8.23	16
88	527	50	r	n	3/21/29	28.4	35.9	8.25	13
89	528	0	oc	n	3/23/29	28.4	35.6	8.25	21
89	529	50	oc	n	3/23/29	28.6	35.8	8.27	12
89	532	0	r	n	3/23/29	(28.4	35.8	8.25	21)
90	533	0	oc	n	3/25/29	28.5	35.5	8.27	21
90	534	50	oc	n	3/25/29	28.6	35.6	8.26	21
90	535	0	r	p	3/25/29	28.5	35.5	8.27	21
90	536	50	r	p	3/25/29	28.6	35.6	8.26	21
91	540	0	oc	n	3/27/29	28.7	35.1	8.30	21
91	541	50	oc	n	3/27/29	28.5	35.2	8.30	24
92	545	0	r	n	3/29/29	28.5	35.3	8.29	28
92	546	50	oc	n	3/29/29	28.4	35.4	8.29	28
93	551	50	oc	n	3/31/29	28.5	34.8	8.30	28
94	558	50	r	n	4/22/29	29.3	34.7	8.25	14
94	559	100	r	n	4/22/29	28.5	35.6	8.21	25
96	568	0	r	n	4/26/29	29.3	35.3	8.23	12
96	569	50	r	n	4/26/29	29.2	35.3	8.23	12
96	570	100	oc	n	4/26/29	28.2	35.7	8.19	25
97	574	0	oc	n	4/28/29	28.3	35.2	8.16	24
97	575	50	oc	n	4/28/29	28.0	35.4	8.16	21
97	576	100	r	n	4/28/29	27.6	35.6	8.15	25
98	581	0	oc	n	4/30/29	27.0	35.3	8.16	24
98	584	0	r	p	4/30/29	27.0	35.3	8.16	24
98	585	50	r	p	4/30/29	26.9	35.3	8.16	28
99	589	0	oc	n	5/ 2/29	27.9	34.9	8.21	12
99	590	50	c	n	5/ 2/29	27.8	34.9	8.22	12
99	591	100	c	n	5/ 2/29	27.8	35.0	8.22	17
99	595	0	c	n	5/ 2/29	27.9	34.9	8.21	12
100	596	50	c	n	5/ 4/29	27.6	34.7	8.21	10
100	597	100	c	n	5/ 4/29	27.6	34.7	8.22	12

Table 53. Distributional and environmental records for Ceratium hexacanthum--Continued

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
100	598	0	r	p	5/ 4/29	27.7	34.7	8.21	10
100	599	50	r	p	5/ 4/29	27.6	34.7	8.21	10
101	603	0	c	n	5/ 7/29	26.3	34.7	8.24	8
101	604	50	c	n	5/ 7/29	26.2	34.7	8.24	8
101	605	100	r	n	5/ 7/29	25.2	35.1	8.23	8
101	606	0	r	p	5/ 7/29	26.3	34.7	8.24	8
101	607	50	r	p	5/ 7/29	26.2	34.7	8.24	8
102	609	0	c	n	5/ 9/29	25.8	35.0	8.24	8
102	610	50	oc	n	5/ 9/29	25.8	35.0	8.24	8
102	611	100	r	n	9/ 9/29	25.6	35.0	8.23	8
102	612	0	r	p	5/ 9/29	25.8	35.0	8.24	8
102	613	50	r	p	5/ 9/29	25.8	35.0	8.24	8
102	614	100	r	p	5/ 9/29	25.6	35.0	8.23	8
103	615	0	c	n	5/11/29	26.0	35.0	8.25	5
103	616	50	oc	n	5/11/29	25.8	35.2	8.25	5
103	617	100	oc	n	5/11/29	24.8	35.2	8.25	5
103	618	0	r	p	5/11/29	26.0	35.0	8.25	5
103	619	50	r	p	5/11/29	25.8	35.2	8.25	5
104	621	0	c	n	5/13/29	26.1	35.2	8.24	7
104	622	50	c	n	5/13/29	25.8	35.2	8.24	7
104	623	100	r	n	5/13/29	25.3	35.3	8.21	7
105	627	50	c	n	5/15/29	26.8	34.9	8.23	5
105	628	50	oc	n	5/15/29	26.8	34.9	8.23	5
105	629	100	oc	n	5/15/29	25.2	35.1	8.23	5
105	630	0	r	p	5/15/29	26.9	34.9	8.23	5
106	633	0	c	n	5/17/29	27.2	35.0	8.23	5
106	634	50	c	n	5/17/29	27.0	35.0	8.23	5
106	635	100	c	n	5/17/29	25.6	35.1	8.23	5
106	636	0	r	p	5/17/29	27.2	35.0	8.23	5
106	637	50	r	p	5/17/29	27.0	35.0	8.23	5
107	639	0	oc	n	5/19/29	28.0	34.4	8.23	5
107	640	50	c	n	5/19/29	27.9	34.4	8.23	4
107	641	100	c	n	5/19/29	26.8	34.9	8.23	11
108	646	0	oc	n	5/27/29	28.4	35.0	8.25	4
108	647	50	oc	n	5/27/29	26.8	35.0	8.24	4
108	648	100	c	n	5/27/29	25.2	35.0	8.23	4
Guam	652	0	r	n	5/ /29	.....	.....	.....	...
109	654	0	r	n	5/29/29	27.4	35.0	8.23	3
109	655	50	r	n	5/29/29	23.1	35.0	8.22	3
112	674	0	r	n	6/ 5/29	23.2	34.6	8.22	7
112	675	50	oc	n	6/ 5/29	21.7	34.6	8.23	7
112	676	100	r	n	6/ 5/29	19.8	34.7	8.20	8
113	680	0	r	n	6/25/29	24.2	34.5	8.25	5
113	681	50	oc	n	6/25/29	23.8	34.6	8.25	5
113	682	100	r	n	6/25/29	21.5	34.7	8.23	8
113	684	50	r	p	8/25/29	23.8	34.6	8.25	5
132	797	0	r	n	9/ 8/29	21.0	33.9	8.34	15
132	798	50	oc	n	9/ 8/29	17.6	33.9	8.33	19
132	799	100	oc	n	9/ 8/29	14.3	33.4	8.30	16
133	804	0	r	n	9/10/29	22.7	34.7	8.47	7
133	805	50	r	n	9/10/29	20.8	34.7	8.37	7
133	813	50	r	p	9/10/29	20.8	34.7	8.37	7
133	814	100	r	p	9/10/29	18.4	34.8	8.31	7
135	820	0	r	n	9/14/29	23.8	35.1	8.37	7
135	822	100	r	n	9/14/29	18.7	34.8	8.34	5
135	824	0	r	p	9/14/29	23.8	35.1	8.37	7
135	825	50	r	p	9/14/29	21.5	35.0	8.37	5
136	827	0	oc	n	9/16/29	24.6	35.4	8.37	3
136	828	50	oc	n	9/16/29	21.4	35.1	8.39	3
136	829	100	r	n	9/16/29	18.6	35.0	8.39	3
136	832	0	oc	p	9/16/29	24.6	35.4	8.37	3
137	836	0	oc	n	9/18/29	25.5	35.0	8.39	4
137	837	50	oc	n	9/18/29	24.4	35.1	8.34	4
137	838	100	r	n	9/18/29	21.5	35.1	8.30	5
138	843	0	oc	n	9/20/29	26.1	34.8	8.35	5
138	844	50	oc	n	9/20/29	25.6	34.7	8.30	3
138	845	100	oc	n	9/20/29	22.2	34.8	8.31	3
138	847	0	r	p	9/20/29	26.1	34.8	8.35	5
139	849	0	oc	n	9/22/29	26.7	34.8	8.34	6
130	850	50	oc	n	9/22/29	25.8	34.9	8.31	6
139	851	100	oc	n	9/22/29	22.4	35.2	8.28	6
140	856	0	r	n	10/ 3/29	26.9	35.0	8.42	7
140	857	50	oc	n	10/ 3/29	26.9	35.0	8.39	7
140	858	100	r	n	10/ 3/29	25.5	35.0	8.34	7
140	860	0	r	p	10/ 3/29	26.9	35.0	8.42	7
141	864	0	oc	n	10/ 5/29	25.9	35.2	8.34	5

Table 53. Distributional and environmental records for Ceratium hexacanthum--Concluded

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO_4 mg/m^3
141	865	50	oc	n	10/ 5/29	24.8	35.3	8.34	5
142	872	0	r	n	10/ 7/29	24.1	34.8	8.33	5
142	873	50	r	n	10/ 7/29	21.8	34.8	8.30	5
142	874	100	r	n	10/ 7/29	16.6	34.4	8.27	7
142	876	0	r	p	10/ 7/29	24.1	34.8	8.33	5
142	879	100	r	p	10/ 7/29	16.6	34.4	8.27	7
143	881	0	r	n	10/ 9/29	22.4	34.4	8.30	6
144	886	0	oc	n	10/11/29	23.3	35.0	8.37	6
145	890	0	c	n	10/13/29	22.3	34.6	8.29	6
145	891	50	oc	n	10/13/29	18.7	34.3	8.34	6
145	892	100	r	n	10/13/29	16.0	34.1	8.31	6
145	893	0	r	p	10/13/29	22.3	34.6	8.29	6
146	896	0	r	n	10/15/29	22.4	34.9	8.37	6
146	897	50	oc	n	10/15/29	22.4	34.9	8.30	6
146	898	100	oc	n	10/15/29	19.7	34.3	8.26	7
146	901	50	r	p	10/15/29	22.4	34.9	8.30	6
147	904	50	r	n	10/15/29	23.1	35.3	8.29	5
147	905	100	oc	n	10/17/29	19.2	35.0	8.29	5
147	908	50	r	p	10/17/29	23.1	35.3	8.29	5
148	910	0	oc	n	10/19/29	23.4	35.2	.....	...
148	911	50	r	n	10/19/29	23.0	35.1	.....	...
148	912	100	r	n	10/19/29	20.0	35.0	.....	...
149	920	0	oc	n	10/21/29	23.5	35.0	8.34	6
149	921	50	oc	n	10/21/29	23.3	35.0	8.37	6
149	922	100	oc	n	10/21/29	20.3	34.9	8.38	6
150	929	0	oc	n	10/23/29	25.6	34.7	8.39	7
150	930	50	r	n	10/23/29	22.8	34.8	8.35	10
150	931	100	r	n	10/23/29	19.6	34.6	8.32	11
151	937	0	r	n	10/26/29	26.0	34.0	.....	...
151	938	50	oc	n	10/26/29	18.3	34.4	.....	...
151	939	100	r	n	10/26/29	12.5	34.6	.....	...
151	941	0	r	p	10/26/29	26.0	34.0	.....	...
151	942	50	r	p	10/26/29	18.3	34.4	.....	...
152	944	0	oc	n	10/27/29	27.4	33.7	8.35	20
152	945	50	oc	n	10/27/29	14.2	34.5	7.87	53
152	946	100	oc	n	10/27/29	11.4	34.7	7.76	75
152	948	0	r	p	10/27/29	27.4	33.7	8.35	20
152	949	50	oc	p	10/27/29	14.2	34.5	7.87	53
153	951	0	oc	n	10/29/29	28.1	34.2	8.47	7
153	952	50	r	n	10/29/29	28.1	34.4	8.39	7
154	958	0	r	n	10/31/29	28.3	34.2	8.39	7
154	959	50	r	n	10/31/29	28.2	34.2	8.40	7
155	965	0	oc	n	11/ 2/29	27.8	34.9	8.29	29
155	966	50	oc	n	11/ 2/29	27.7	34.9	8.30	30
155	967	100	oc	n	11/ 2/29	27.2	35.0	8.30	35
156	972	0	oc	n	11/ 4/29	27.6	35.0	8.34	28
156	973	50	r	n	11/ 4/29	27.0	35.1	8.37	46
156	974	100	r	n	11/ 4/29	26.4	35.1	8.30	48
157	978	0	oc	n	11/ 6/29	27.1	35.3	8.27	47
157	979	50	oc	n	11/ 6/29	27.1	35.2	8.32	60
157	980	100	r	n	11/ 6/29	26.8	35.5	8.30	64
158	983	0	oc	n	11/ 8/29	28.2	35.6	8.34	36
158	984	50	r	n	11/ 8/29	28.2	35.6	8.39	50
158	985	100	r	n	11/ 8/29	27.6	35.9	8.39	48
159	990	0	r	n	11/11/29	28.6	35.7	8.37	15
159	991	50	r	n	11/11/29	28.5	35.7	8.39	15
159	992	100	r	n	11/11/29	28.0	35.7	8.37	23
160	1000	0	r	n	11/13/29	28.6	35.6	8.37	12
160	1002	50	r	n	11/13/29	28.6	35.6	8.39	15

Table 54. Distributional and environmental records for Ceratium reflexum

Station	Sample	Depth (m)	Relative abundance	Apparatus	Date	Temperature (°C)	Salinity (o/oo)	pH	PO4 mg/m3
19	121	50	r	p	8/20/28	25.2	37.1	8.27	5
19	123	50	r	n	8/20/28	25.2	37.1	8.27	5
19	124	100	r	n	8/20/28	22.4	37.0	8.25	5
20	126	50	r	p	8/22/28	25.8	36.6	8.26	3
20	127	100	r	p	8/22/28	22.6	36.7	8.19	5
20	128	0	r	n	8/22/28	26.0	36.6	8.37	5
20	130	100	oc	n	8/22/28	22.6	36.7	8.19	5
20-21	131	0	r	n	8/23/28	(26.6	36.3	8.32	4)
21	132	0	r	p	8/24/28	26.6	36.3	8.32	4
21	137	100	r	n	8/24/28	21.0	36.8	8.20	7
22	139	0	r	p	8/27/28	26.7	36.0	8.26	8
22	143	50	r	n	8/27/28	24.5	36.2	8.21	9
22	144	100	r	n	8/27/28	17.5	36.1	7.99	123
23	149	50	r	n	8/29/28	20.9	36.0	8.14	13
48	271	0	r	n	11/25/28	23.6	36.4	8.23	13
48	273	100	r	n	11/25/28	22.7	36.3	8.26	16
53	305	100	r	n	12/ 5/28	19.9	35.6	8.19	13
87	522	50	r	n	3/11/29	26.5	36.1	8.26	20
95	564	100	r	n	4/24/29	28.5	35.4	8.22	21
95	567	100	r	p	4/24/29	28.5	35.4	8.22	21
97	575	50	r	n	4/28/29	28.0	35.4	8.16	21
97	576	100	oc	n	4/28/29	27.6	35.6	8.15	25
97	578	50	r	p	4/28/29	28.0	35.4	8.16	21
99	591	100	r	n	5/ 2/29	27.8	35.0	8.22	17
105	628	50	c	n	5/15/29	26.8	34.9	8.23	5
106	633	0	r	n	5/17/29	27.2	35.0	8.23	5
106	634	50	r	n	5/17/29	27.0	35.0	8.23	5
106	635	100	r	n	5/17/29	25.6	35.1	8.23	5
107	639	0	oc	n	5/19/29	28.0	34.4	8.23	5
107	640	50	r	n	5/19/29	27.7	34.4	8.23	4
107	641	100	oc	n	5/19/29	26.8	34.9	8.23	11
107	642	0	oc	p	5/19/29	28.0	34.4	8.23	5
108	648	100	r	n	5/27/29	25.2	35.0	8.23	4
Guam	652	0	r	n	5/ /29	.....	.....	.....	...
113	681	50	r	n	6/25/29	23.8	34.6	8.25	5
140	856	0	r	n	10/ 3/29	26.9	35.0	8.42	7
140	858	100	r	n	10/ 3/29	25.5	35.0	8.34	7
150	930	50	r	n	10/23/29	22.8	34.8	8.35	10
160	1002	50	r	n	11/13/29	28.6	35.6	8.39	15

FIGURES 1 - 27

CHARTS 1 - 54

FIGURES 1 - 5

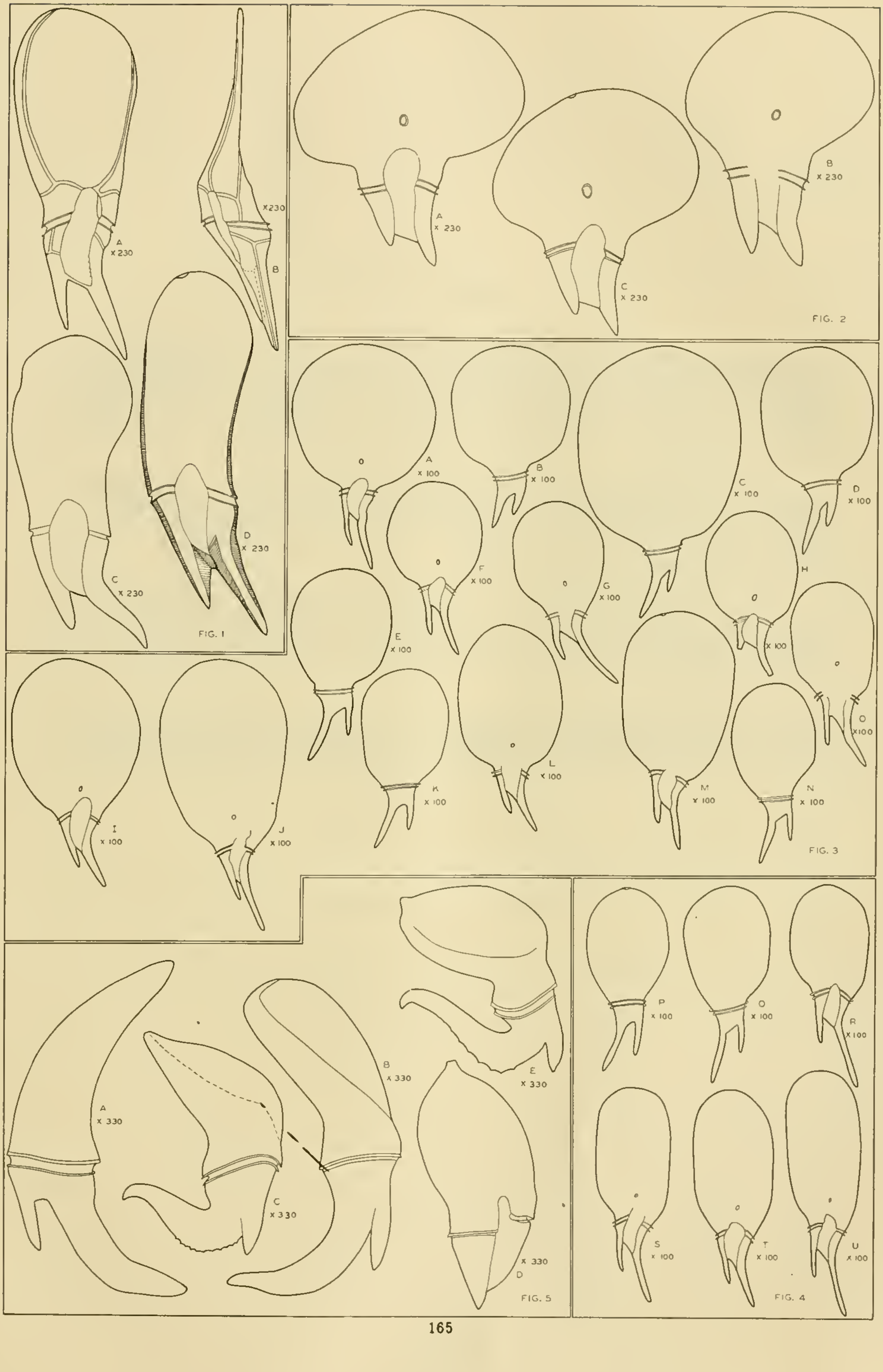
Fig. 1. Ceratium praelongum (Lem.) Kof. A, ventral view of specimen from station 31, Caribbean Sea; B, left lateral view of same; C, specimen from station 16, Sargasso Sea; D, heavy-walled individual from station 33, Caribbean Sea.

Fig. 2. Ceratium cephalotum (Lemm.) Jörg. A, specimen from station 91, near Samoa; B, from station 132, off California; C, from station 1b, warm North Atlantic.

Fig. 3. Variation in C. gravidum Gourret. A, from station 151, equatorial Pacific; B, from station 131, off California; C, from station 75, southeast Pacific; D, from station 149, east of Hawaii; E, from station 48, north of Easter Island; F, from station 107, near Guam; G, from station 91, near Samoa; H, from station 32, Caribbean Sea, showing autotomy of antapical horns; I, from station 81, east of Tuamotu Islands; J, from station 140, Hawaii; K, from station 19, Sargasso Sea; L, from station 97, near Phoenix Islands; M, from station 15, warm Atlantic; N, from station 26, Atlantic North Equatorial Current; O, from station 108, near Guam.

Fig. 4. Variation in C. gravidum Gourret. P, from station 22, Atlantic North Equatorial Current; Q, from station 18, Sargasso Sea; R, from station 55, south of Easter Island; S, from station 99, north of Phoenix Islands; T, from station 37, Pacific Panama area; U, from station 81, east of Tuamotu Islands.

Fig. 5. Ceratium digitatum Schütt. A, variety rotundatum Jörgensen from station 52, south of Easter Island; B, same from station 54, south of Easter Island; C, right lateral view of typical C. digitatum Schütt from station 25, Atlantic North Equatorial Current; D, ventral view of same specimen; E, specimen with unusually long left antapical horn from station 105, northeast of Guam.


A
x 230
x230
B
C
x 230
D
x 230
FIG. 1
A
x 230
C
x 230
B
x 230
FIG. 2
A
x 100
B
x 100
C
x 100
D
x 100
E
x 100
F
x 100
G
x 100
H
x 100
I
x 100
J
x 100
K
x 100
L
x 100
M
x 100
N
x 100
O
x 100
FIG. 3
P
x 100
Q
x 100
R
x 100
S
x 100
T
x 100
U
x 100
FIG. 4
A
x 330
B
x 330
C
x 330
D
x 330
E
x 330
FIG. 5

FIGURES 6 - 9

Fig. 6. Variation in C. candelabrum (Ehr.) Stein. A, specimen from station 87, near Tuamotu Islands; B, from station 83, near Tuamotu Islands; C, from station 91, near Samoa; D, from station 48, north of Easter Island; E, from station 97, near Phoenix Islands; F, from station 85, near Tuamotu Islands; G, from station 46, warm southeast Pacific; H, from station 1, Gulf Stream; I, from station 31, Caribbean Sea; J, from station 50, near Easter Island; K, from station 52, near Easter Island.

Fig. 7. Ceratium furca (Ehr.) Dujardin. A, specimen from southeastern Pacific, station 79; B, from southeastern Pacific, station 50; C, from off Peru, station 71; D, from north of Hawaii, station 140; E, from southeastern Pacific, station 77; F, from southeast of Greenland, station 10; G, from southwest of Ireland, station 6; H, two-celled chain from station 73, southeastern Pacific.

Fig. 8. Ceratium belone Cleve. A, specimen from station 49, north of Easter Island; B and C, specimen from station 100, east of Marshall Islands; D, station 53a, Easter Island; E, from station 81, east of Tuamotu Islands; F, from station 18, Sargasso Sea; G, from station 158, northeast of Samoa; H, from station 47, southeastern Pacific; I, from station 94, near Samoa.

Fig. 9. Ceratium incisum (Karsten) Jörgensen. A, from station 99, north of Phoenix Islands; B, from station 95, north of Samoa; C, from station 158, northeast of Samoa; D, from station 103, north of Marshall Islands; E, from station 98, north of Phoenix Islands.

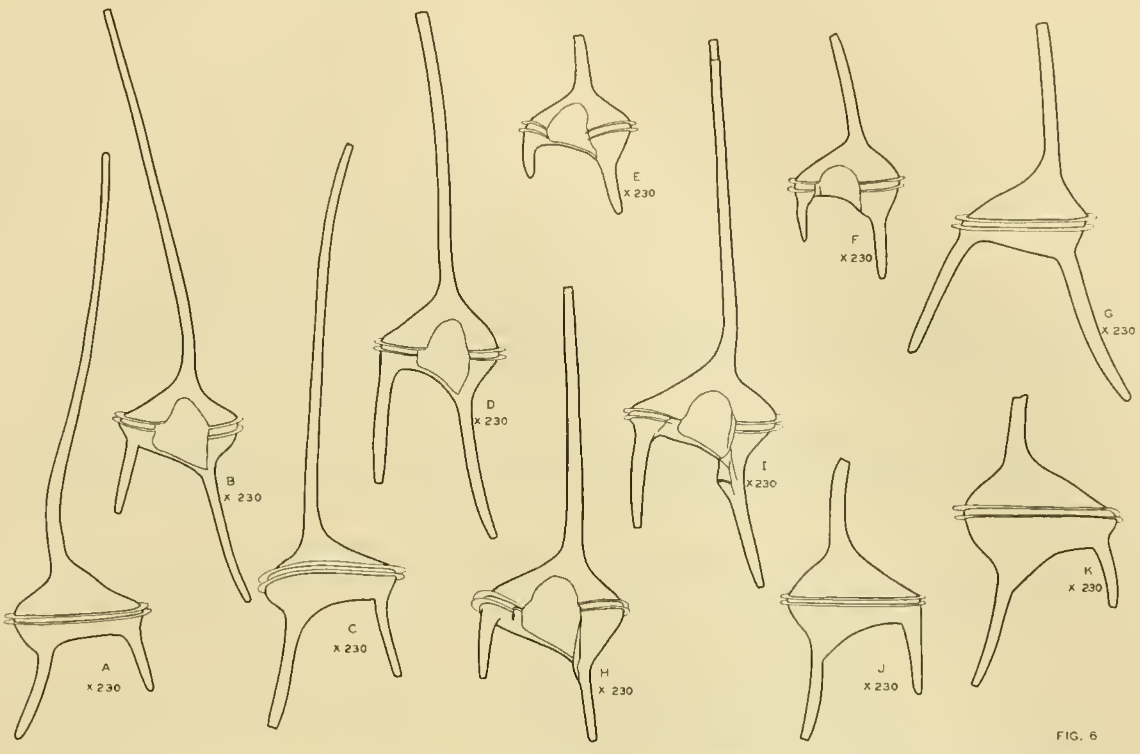


FIG. 6

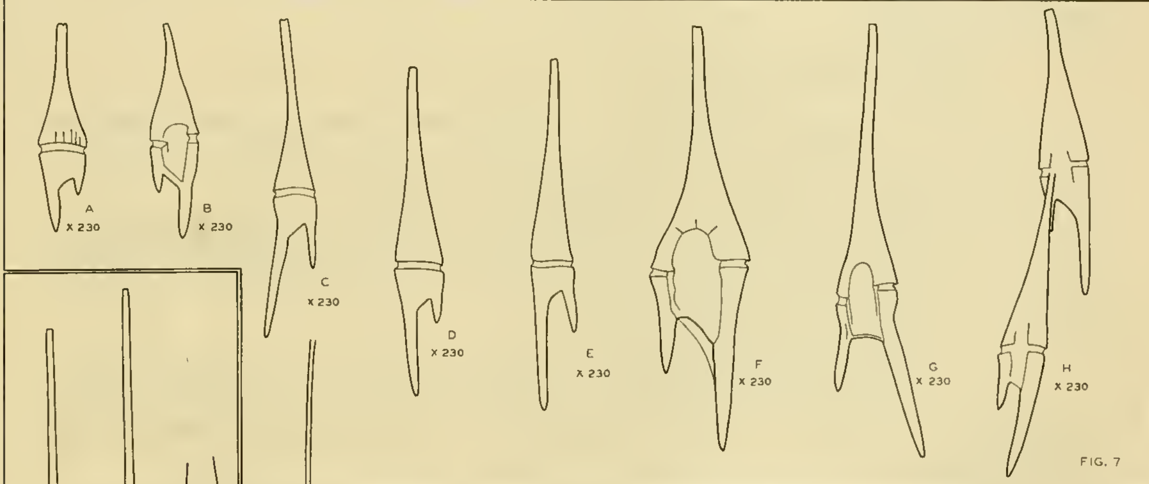


FIG. 7

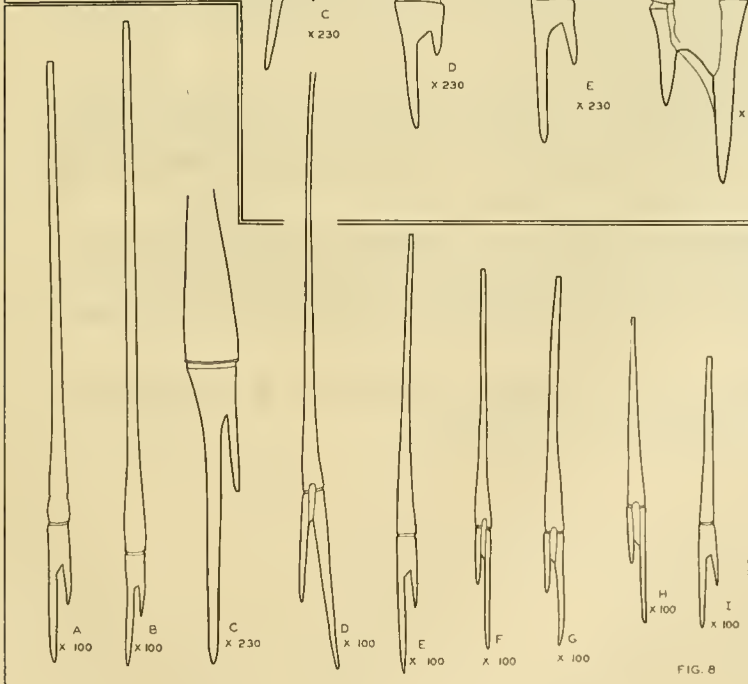


FIG. 8

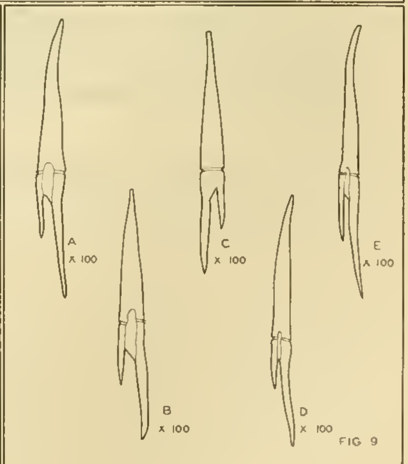


FIG 9

FIGURES 10 - 12

Fig. 10. A, B, E-G. Ceratium subrobustum (Jörg.) Nielsen. A, long-horned form with curved apical horn, from south of Easter Island, station 53; B, long-horned form from central Pacific, station 99; E, short-horned form from central North Atlantic, station 19; F, short-horned form from central Pacific, station 158; G, chain from central Pacific, station 97.

H, K-N. Ceratium pentagonum subsp. tenerum (Jörg.). H, short-horned form from the tropical Atlantic, station 24; K, long-horned form from the tropical North Atlantic, station 19; L, small form from southeastern Pacific, station 79; M, chain from Humboldt Current, station 73; N, long-horned form with curved antapical horns from off California, station 133.

C, D, I, J. Ceratium pentagonum subsp. pacificum n. subsp. C, comparatively thin-walled individual from station 118; D, heavy-walled, short-horned form from station 123; I, large, long-horned form from station 122; J, thin-walled form from same sample as C.

Fig. 11. A, Ceratium setaceum Jörgensen, from station 110, north of Guam.

B-D. Ceratium teres Kofoid. B, from station 101, northeast of Marshall Islands; C, from station 141, north of Hawaii; D, two-celled chain from station 85, Tuamotu Islands.

E-G. Ceratium lineatum (Ehr.) Cleve. E, from station 6, off Ireland; F, specimen similar to C. minutum from station 10, southeast of Greenland; G, from station 11a southeast of Greenland.

H, Ceratium kofoidii Jörgensen from station 111, southeast of Japan.

J, Ceratium geniculatum (Lemm.) Cleve. Partly separated. Specimen from station 45, southeast Pacific.

I, K-N. Ceratium bigelowii Kofoid. I, enlarged ventral view of specimen shown in M, from station 47, southeast Pacific; K, specimen with little expanded body from station 154, central Pacific; L, latero-ventral view of specimen from station 158, central Pacific; M, dorsal view of specimen shown in I; N, right lateral view of same.

O-S. Ceratium inflatum (Kofoid) Jörgensen. O, dorsal view of specimen from station 101, northeast of Marshall Islands; P, ventral view of specimen from station 20a, tropical Atlantic; Q, dorsal view of specimen from station 99, north of Phoenix Islands; R, right lateral view of specimen from station 101, northeast of Marshall Islands; S, ventral view of specimen from station 54, near Easter Island.

T-V. Ceratium longirostrum Gourret. T, from station 145, central North Pacific; U, from station 98, north of Phoenix Islands; V, from station 103, north of Marshall Islands.

W-AA. Ceratium falcatum (Kofoid) Jörgensen showing variation in size and curvature. W, from station 52, south of Easter Island; X, from station 158, northeast of Samoa; Y, from station 108, north of Guam; Z, from station 50, west of Easter Island; AA, from station 76, southeast Pacific.

BB-DD. Ceratium extensum (Gourret) Cleve. BB, specimen with well-developed right antapical horn, (C. strictum) from station 81, tropical Pacific; CC, typical specimen without right antapical horn, from station 158, tropical Pacific; DD, enlargement of same specimen; EE, Ceratium fusus (Ehr.) Duj. Wide form from cold North Pacific region, station 123.

Fig. 12. Ceratium böhmii n. sp. A, from station 114, off Japan; B, from station 98, north of Phoenix Islands; C, from station 40, off Ecuador.

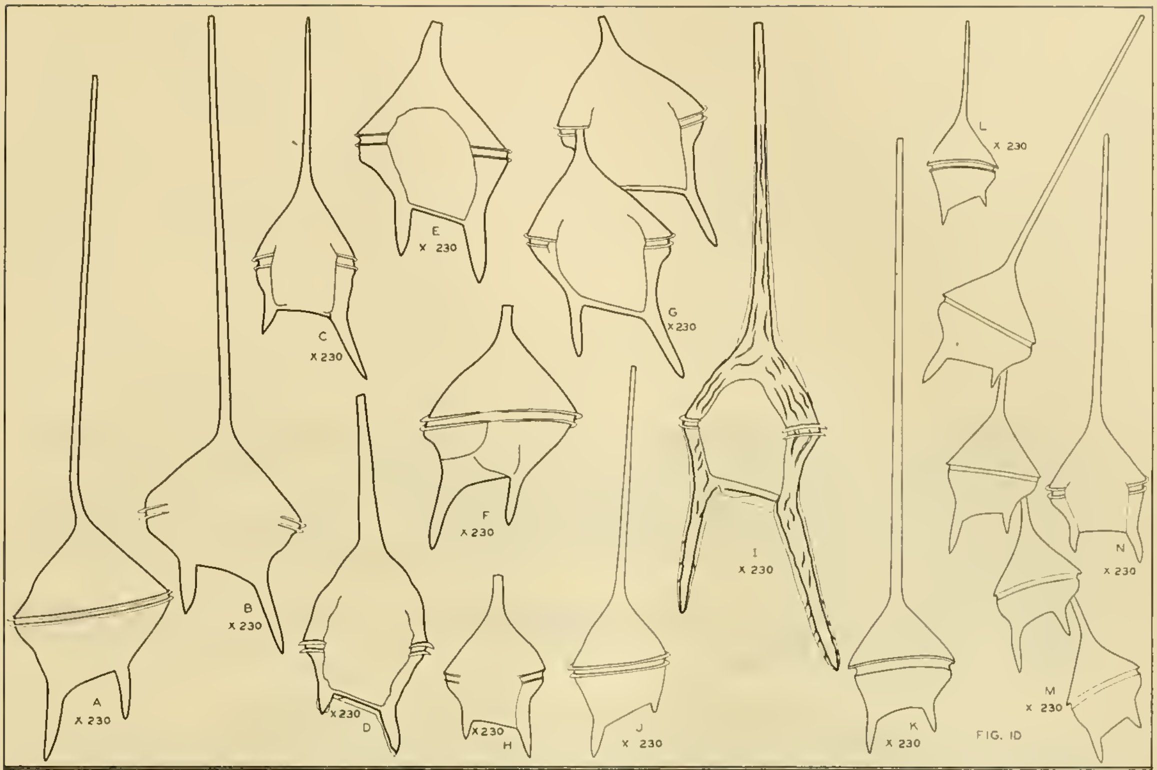


FIG. 10

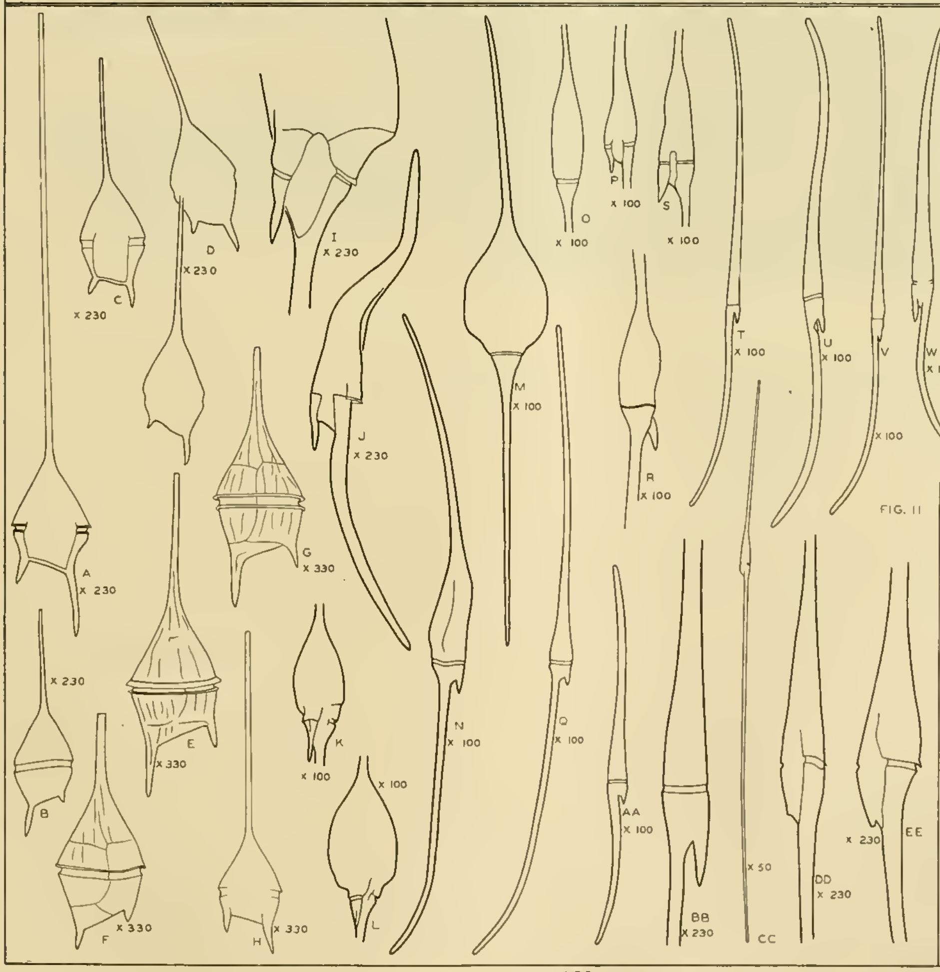


FIG. 11

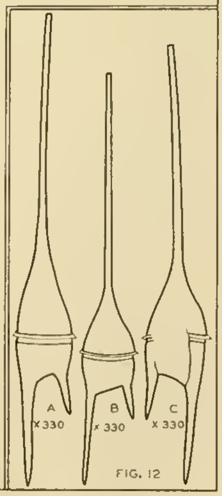


FIG. 12

FIGURES 13 and 14

Fig. 13. A-D. Ceratium fusus (Ehr.) Duj. A, enlarged dorsal view of specimen shown in D; B, specimen from warm Pacific, station 35; C, specimen from cold North Pacific region, station 123; D, specimen from cold Atlantic, station 11a.

E-K. Ceratium tripos subsp. atlanticum (Ostenfeld). E, from station 39, off Ecuador; F, from station 61, southern part of southeast Pacific region; G, from station 118, northeast of Japan in cold North Pacific region; H, from station 43, region of Galapagos Islands; I, from station 6h, North Sea.

L-N. Ceratium tripos subsp. semipulchellum (Jörgensen). L, from station 68, southeast Pacific region; M, from station 46, southeastern part of warm Pacific region; N, from station 1, Gulf Stream of Atlantic.

Fig. 14. A, Ceratium humile Jörgensen, from station 1, Gulf Stream.

B-F. Ceratium pulchellum Schröder. B, long-horned form resembling semipulchellum, from station 15, warm Atlantic; C, wide form from station 63, southeast Pacific; D, typical form from station 138 northeast of Hawaii, warm Pacific; E, from station 19, warm Atlantic; F, from station 87, near Tuamotu Islands, warm Pacific.

G-P. Ceratium breve (Ostenfeld and Schmidt) Schröder. G, from station 41a, near Galapagos Islands; H, two-celled chain from station 35a, Panama region (shows a transition between the curvulum and parallelum types); I, form similar to C. schmidtii Jörgensen, from station 150, warm Pacific; J, specimen from station 91, intermediate between the schmidtii form and the typical breve; K, open form resembling C. arcuatum, from station 16, warm Atlantic; L, from station 105, western warm Pacific; M, from station 30, warm Atlantic; N, from station 24, warm Atlantic; O, from station 16, warm Atlantic; P, another specimen resembling C. schmidtii, from station 35, Panama region.


A
x 100
B
x 100
C
x 100
D
x 100
E
x 170
F
x 170
G
x 170
H
x 170
I
x 170
J
x 170
K
x 170
L
x 170
M
x 170
N
x 170
FIG. 13


A
x 170
B
x 170
C
x 170
D
x 170
E
x 170
F
x 170
G
x 170
H
x 170
I
x 170
J
x 170
K
x 170
L
x 170
M
x 170
N
x 170
O
x 170
P
x 170
FIG. 14

FIGURES 15 and 16

Fig. 15. A, Ceratium compressum Gran from station 61, southeast Pacific.

B-C. Ceratium filicorne Nielsen. B, from south of Easter Island, station 57; C, from near Samoa, station 93.

D-E. Ceratium axiale Kofoid. D, from off Japan, station 112; E, from station 63, southeast Pacific region.

F-G. Ceratium aultii n. sp. F, from station 72, off Peru; G, from station 151, eastern warm Pacific region.

H-I. Ceratium symmetricum Pavillard. H, variety orthoceros Jörgensen, from station 43, north of Easter Island; I, variety symmetricum Pavillard, from station 153, eastern warm Pacific region.

J-L. Variety coarctatum Pavillard. J, from station 67, southeast Pacific region; K, from station 153; L, from station 57, south of Easter Island.

M-N. Ceratium euarcuatum Jörgensen. M, from station 16, warm Atlantic; N, from station 1b, warm Atlantic.

Fig. 16. A-K. Ceratium arietinum Cleve. From station 130, off California. B, from station 73, off Peru (answers to southern form of bucephalum of Peters); C, from station 61, southern end of southeast Pacific region (also corresponds to southern form of bucephalum); D, from station 127, cold North Pacific (corresponds to Pacific northern form of bucephalum); E, specimen from same sample showing the more typical arietinum form; F, from station 46, eastern tropical Pacific (corresponds to subsp. gracilentum of the Atlantic); G, from station 148, between United States and Hawaii (small arietinum type); H, from station 6h, North Sea (corresponds to C. bucephalum of the North Atlantic); I, from station 130, off California; J, from station 110, between Japan and Guam; K, subspecies gracilentum of Atlantic, from station 22, North Equatorial Current.

L, Ceratium petersii Nielsen. From station 61, southern end of southeast Pacific region.

M-P. Ceratium azoricum Cleve. M, from station 44, west of Galapagos; N, from station 110, between Japan and Guam; O, from station 127, cold North Pacific; P, from station 6, off Ireland.

Q-T. Ceratium declinatum Karsten. Q, variety declinatum from station 15, North Atlantic West Wind Drift; R, from station 67, southeast Pacific region (characteristic of southeast Pacific but found in other regions as well); S, variety majus from station 3, cold North Atlantic; T, variety laticornum from station 13a, cold Atlantic region.


A
x 230
B
x 170
C
x 170
D
x 170
E
x 170
F
x 170
G
x 170
H
x 170
I
x 170
J
x 170
K
x 170
L
x 170
M
x 170
N
x 170

FIG. 15


A
x 170
B
x 170
C
x 170
D
x 170
E
x 170
F
x 170
G
x 170
H
x 170
I
x 170
J
x 170
K
x 170
L
x 170
M
x 230
N
x 230
P
x 230
Q
x 170
Q
x 230
R
x 170
S
x 170
T
x 170

FIG 16

FIGURES 17 and 18

Fig. 17. A-C. Ceratium declinatum Karsten. A, short-horned form of variety angusticornum, from station 37, Panama region of Pacific; B, long-horned form of var. angusticornum from the Pacific, station 54; C, similar form from the Atlantic, station 18.

D-G. Ceratium gibberum Gourret. D, typical form of the species, from station 95, region of Samoa; E, chain of two cells, from station 48 north of Easter Island; F, form subaequale Jörgensen, from station 114, off Japan; G, variant of main species with elongated and nongibbous body, from off west coast of Panama, station 37.

H-I. Ceratium concilians Jörgensen. H, typical form from station 118, northeast of Japan; I, form with more regular horns corresponding to f. subaequale of C. gibberum, from station 130, off California.

J-N. Ceratium lunula Schimper. J, brachyceros form from Atlantic, station 1b; K, chain of two cells showing regeneration of antapical horns, from station 1b; L, magaceros form with widely spreading horns, from station 158, central tropical Pacific; M, magaceros form with extremely long antapical horns, from station 40, off Ecuador; N, heavy-walled magaceros form from Atlantic, station 2.

Fig. 18. A-C. Ceratium carnegiei n. sp. A, from station 158, northeast of Samoa. B and C, from station 151, southeast of Hawaii.

D-N. Ceratium contortum Cleve. D, from station 148, between Hawaii and the United States; E, from station 88, near Tahiti; F, from station 1, Gulf Stream; G, from station 107, near Guam; H, from station 158, northeast of Samoa; I, from station 148, between Hawaii and the United States; J, from station 138, near Hawaii; K, from station 131, off California; L, from station 26, Atlantic North Equatorial Current; M, from station 103, north of the Marshall Islands; N, from station 52, southeast of Easter Island.


A x 170
B x 170
C x 170
D x 170
E x 170
F x 170
G x 170
H x 170
I x 170
J x 100
K x 100
L x 100
M x 100
N x 100

FIG. 17


A x 100
B x 100
C x 100
D x 100
E x 100
F x 100
G x 100
H x 100
I x 100
J x 100
K x 100
L x 100
M x 100
N x100

FIG. 18

FIGURES 19 and 21

Fig. 19. A, Ceratium limulus Gourret from station 17, central North Atlantic; B, Ceratium paradoxides Cleve from station 25, Atlantic North Equatorial Current.

C-H. Ceratium platycorne Daday. C, from station 93, near Samoa; D and E, from station 25, North Equatorial Current, Atlantic; F, from station 41, between Galapagos Islands and Ecuador; G, from station 15, North Atlantic West Wind Drift; H, from station 1 off east coast of United States.

I-K. Ceratium ranipes Cleve. I, from station 47, north of Easter Island; J, from station 48, north of Easter Island (same specimen as in fig. 20); K, from station 30, east of the Caribbean Sea.

Fig. 21. A, Ceratium ranipes Cleve. From station 16, North Atlantic West Wind Drift.

B-F. Ceratium macroceros Cleve. B, subspecies gallicum, from station 139, near Hawaii; C, from station 61, southeastern Pacific, possibly the subantarctic subspecies; D, subspecies gallicum from station 128, off west coast of United States; E, same specimen as in D, lower magnification; F, subspecies macroceros from station 10, southeast of Greenland.


A x 170
B x 170
C x 170
D x 170
E x 170
F x 170
G x 170
H x 170
I x 230
J x 230
K x 230
FIG. 19


A x 170
B x 170
C x 170
D x 230
E x 170
F x 170
FIG. 21

FIGURES 20 and 22

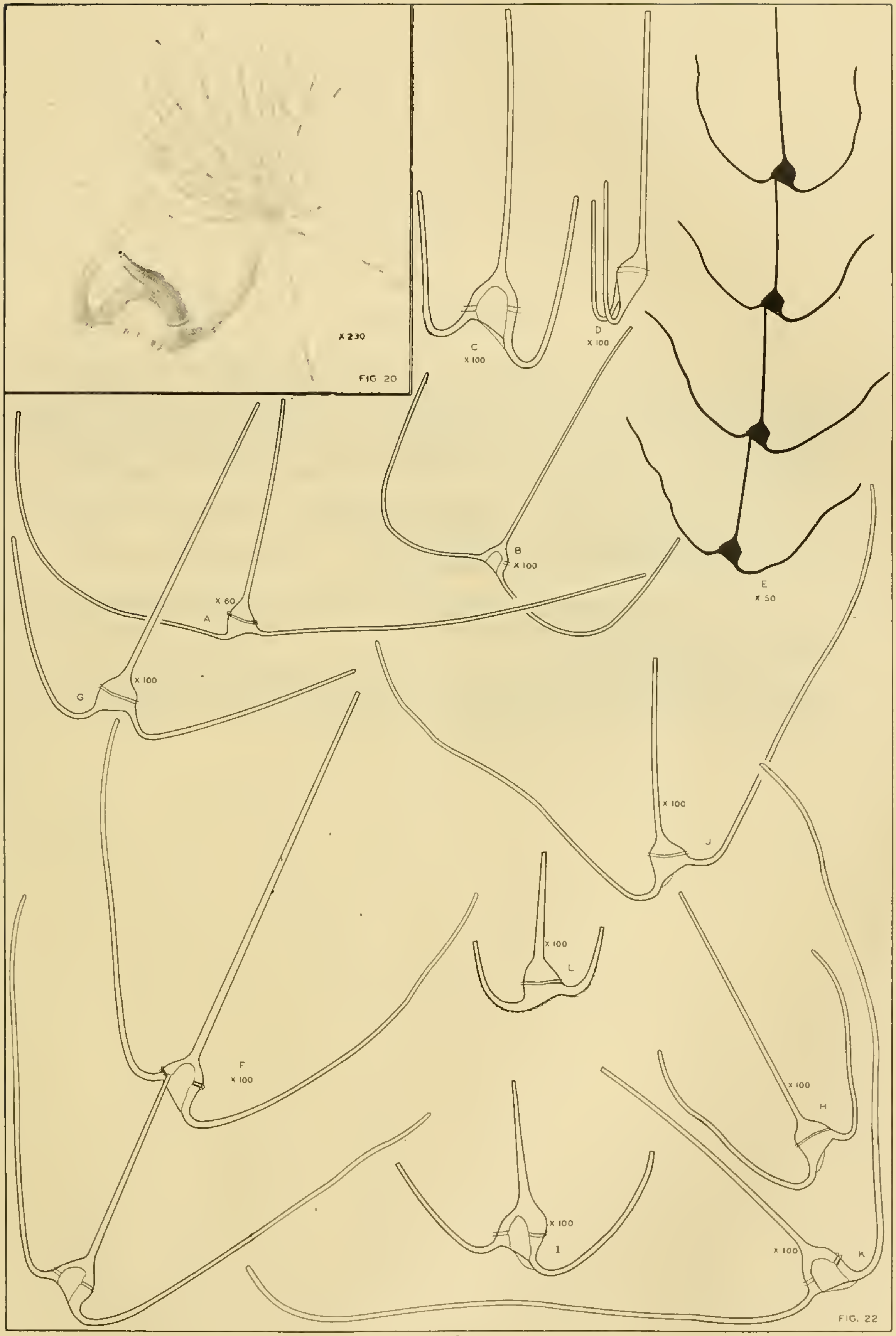
Fig. 20. Ceratium ranipes Cleve with extreme number of "fingers" on antapical horns. From station 48, northof Easter Island. Full ventral view of this specimen is shown in fig. 19J.

Fig. 22. A, Ceratium carriense Gourret, from station 1, Gulf Stream; B, Ceratium trichoceros (Ehr.) Kofoid, from station 50, near Easter Island.

C-D. Ceratium deflexum Kofoid. C, ventral view of specimen from station 152, Pacific North Equatorial Current; D, right lateral view of same showing ventral curvature of antapical horns.

E. Ceratium contrarium (Gourret) Pavillard. Four-celled chain from station 52, near Easter Island.

F-L. Ceratium massiliense (Gourret) Jõrgensen. E, four-celled chain of form diverging toward C. contrarium, from station 52, south of Easter Island; F, two-celled chain from station 152, Pacific North Equatorial Current; G, form with posteriorly extended posterior horns, from station 143, central North Pacific; H, form simulating C. deflexum, from station 18, Sargasso Sea; I, variety protuberans (Karsten) Jõrgensen, from station 80, eastern tropical Pacific; J, variant from station 37, Pacific Panama region; K, variant from station 85, near Tuamotu Islands; L, variety armatum (Karsten) Jõrgensen, from station 25, Atlantic North Equatorial Current.



X 230
FIG 20
C
x 100
D
x 100
E
x 50
B
x 100
x 60
A
x 100
G
x 100
J
x 100
L
F
x 100
x 100
H
x 100
I
x 100
K
FIG. 22

FIGURES 23 and 24

Fig. 23. A-H. Ceratium vultur Cleve. A, variety recurvum Jörgensen from station 29, east of the Caribbean Sea; B, variety reversum n. var. from station 40, off Ecuador; C, variety pavillardii (Jörgensen) from station 132, between California and Hawaii; D, variety sumatranum (Karsten) from station 138, near Hawaii; E, variety japonicum (Schröder) from station 104, northeast of Guam; F, variety japonicum from station 153, central Pacific; G, variety regulare n. var. from station 47, north of Easter Island; H, variety vultur (Cleve) from station 156, central Pacific.

I, K. Ceratium horridum var. molle (Kofoid) Jörgensen. I, from station 26, Atlantic North Equatorial Current; K, from station 130, off California.

J, L. Ceratium horridum var. claviger (Kofoid). C, from station 1b, Gulf Stream; D, from station 96, between Samoa and Phoenix islands.

Fig. 24. A-B. Ceratium contrarium (Gourret) Pavillard. A, from station 19, Sargasso Sea; B, Ceratium contrarium var. claviceps Schröder, from station 152, North Equatorial Current of Pacific.

C-I. Ceratium horridum Gran. C, from station 151, Pacific North Equatorial Current; D, from station 8, cold North Atlantic; E, from station 35, Pacific Panama region; F, from station 126, south of Gulf of Alaska; G, from station 6f, cold North Atlantic; H, from station 1b, Gulf Stream; I, from station 114, off Japan.

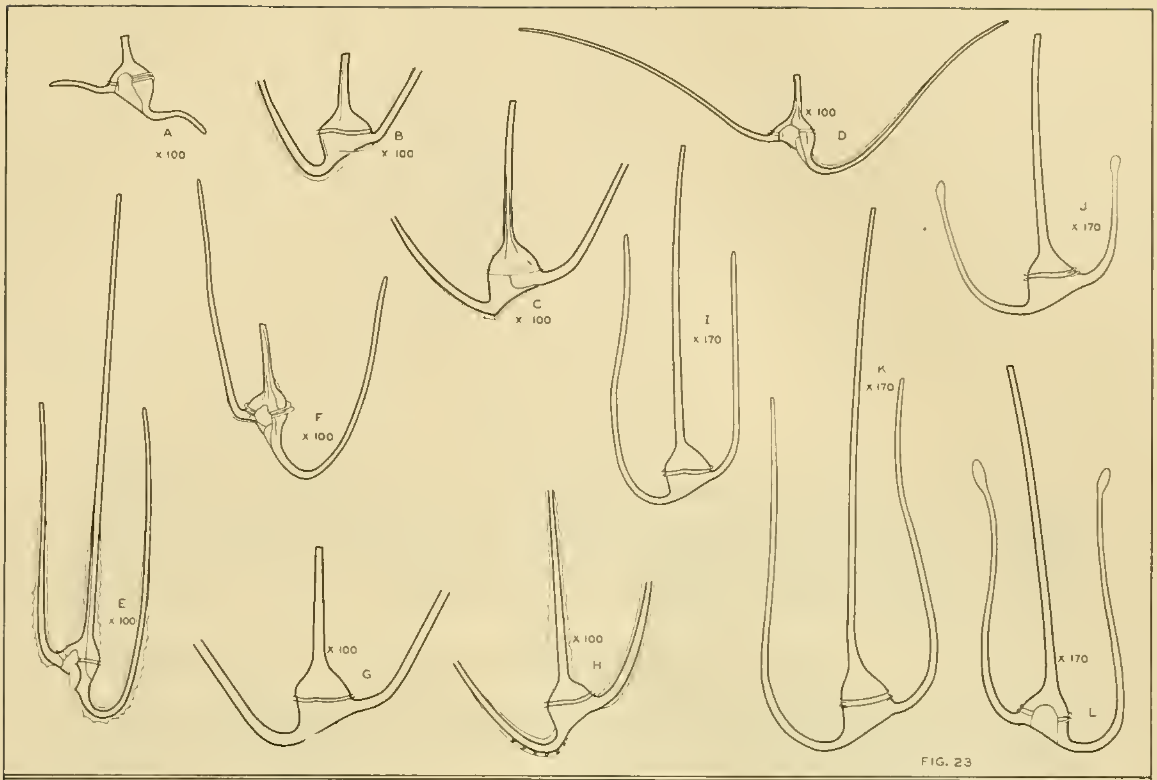

A
x 100
B
x 100
C
x 100
D
x 100
E
x 100
F
x 100
G
x 100
H
x 100
I
x 170
J
x 170
K
x 170
L
x 170

FIG. 23


A
x 100
B
x 100
C
x 170
D
x 170
E
x 170
F
x 170
G
x 170
H
x 170
I
x 170

FIG. 24

FIGURES 25 and 26

Fig. 25. A-C, E-G. Ceratium horridum Gran. A, from station 128, off west coast of United States; B, from station 41a, near Galapagos; C, from station 111, southeast of Japan; E, from station 61, cool southeast Pacific; F, from station 72, off Peru; G, from station 151, Pacific North Equatorial Current.

D, Ceratium horridum var. molle (Kofoid) Jörgensen, from station 3, North Atlantic West Wind Drift.

Fig. 26. A-B. Ceratium longissimum (Schröder) Kofoid. A, from the Atlantic, station 25; B, from the Pacific, station 80.

C-D. Ceratium tenue Ostenfeld and Schmidt. C, variety inclinatum (Kofoid) Jörgensen from station 30, east of Caribbean Sea; D, variety tenuissimum (Kofoid) Jörgensen from station 15, North Atlantic Drift.

E-H. Ceratium arcticum (Ehrenberg) Cleve. E, variety ventricosum Ostenfeld from station 11a, off Greenland; F, variety arcticum (Ehrenberg) Cleve from station 19, Sargasso Sea; G, same from station 146, between California and Hawaii; H, same from station 13, off Newfoundland.

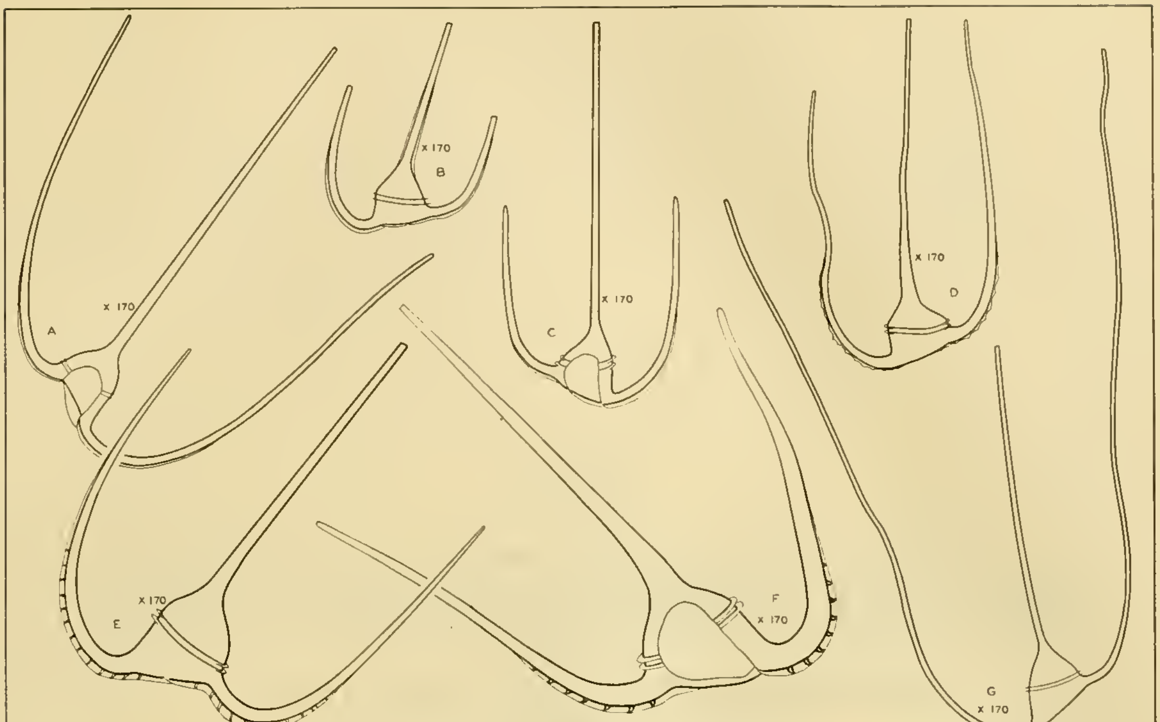

x 170
A
x 170
B
x 170
C
x 170
D
x 170
E
F
x 170
G
x 170

FIG. 25


x 170
A
x 170
B
x 170
C
x 170
D
x 170
E
x 170
F
x 170
G
x 170
H

FIG. 26

FIGURE 27

Fig. 27. A-E. Ceratium arcticum (Ehrenberg) Cleve. A, variety arcticum from station 13, off Newfoundland (enlarged ventral view of body showing sutures); B, same specimen, dorsal view; C, variety longipes (Bailey) Gran from station 8, off Iceland; D, same from station 123, off Aleutian Islands; E, same from station 117, northeast of Japan.

F-G. Ceratium hexacanthum Gourret. F, from station 50, near Easter Island; G, chain of four cells from station 103, north of Marshall Islands.

H, Ceratium reflexum Cleve, from station 108, north of Guam.

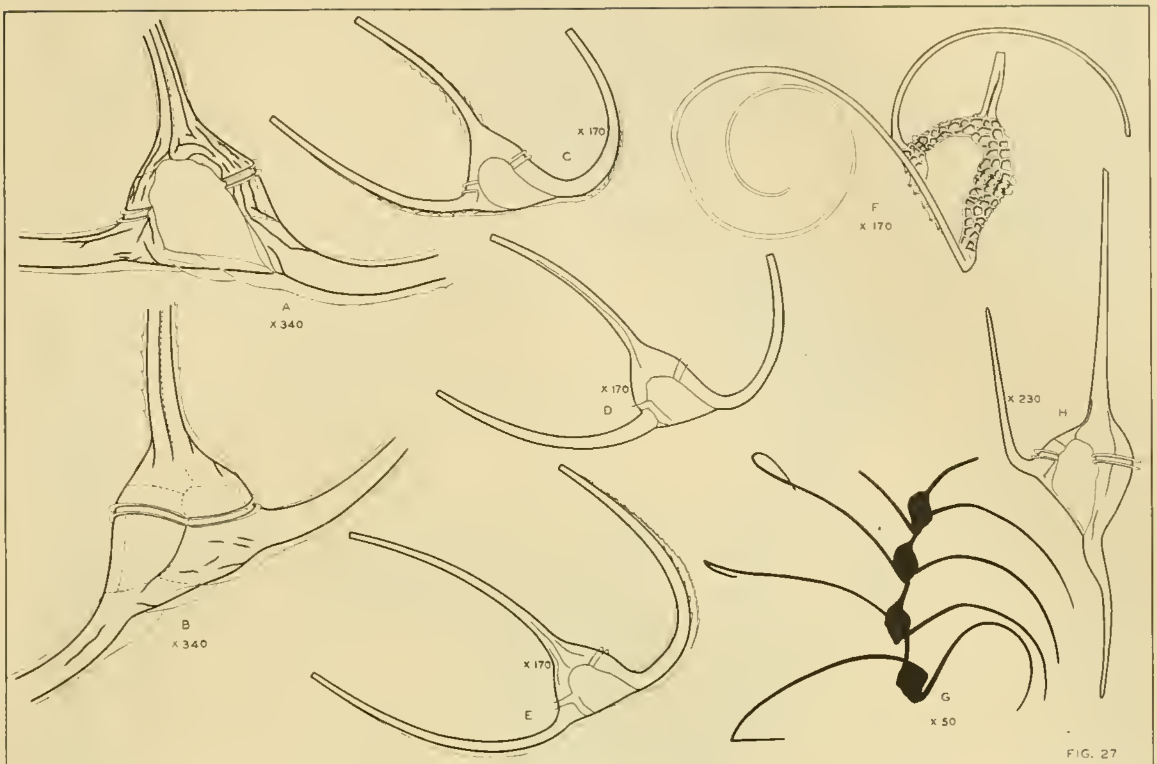


FIG. 27

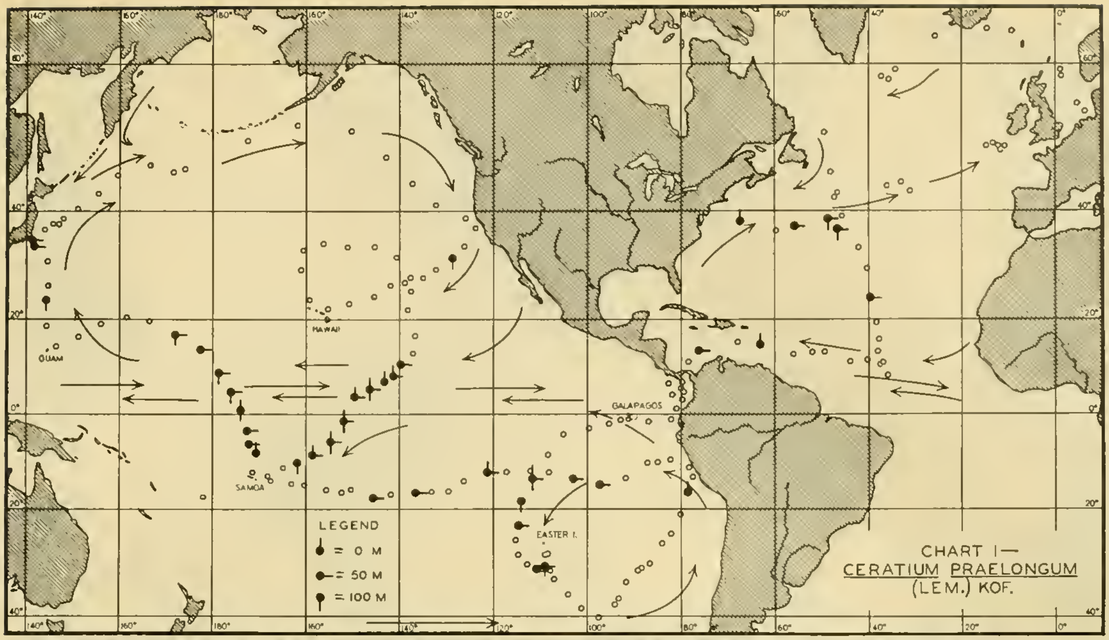


CHART 1—
CERATIUM PRAELONGUM
(LEM.) KOF.

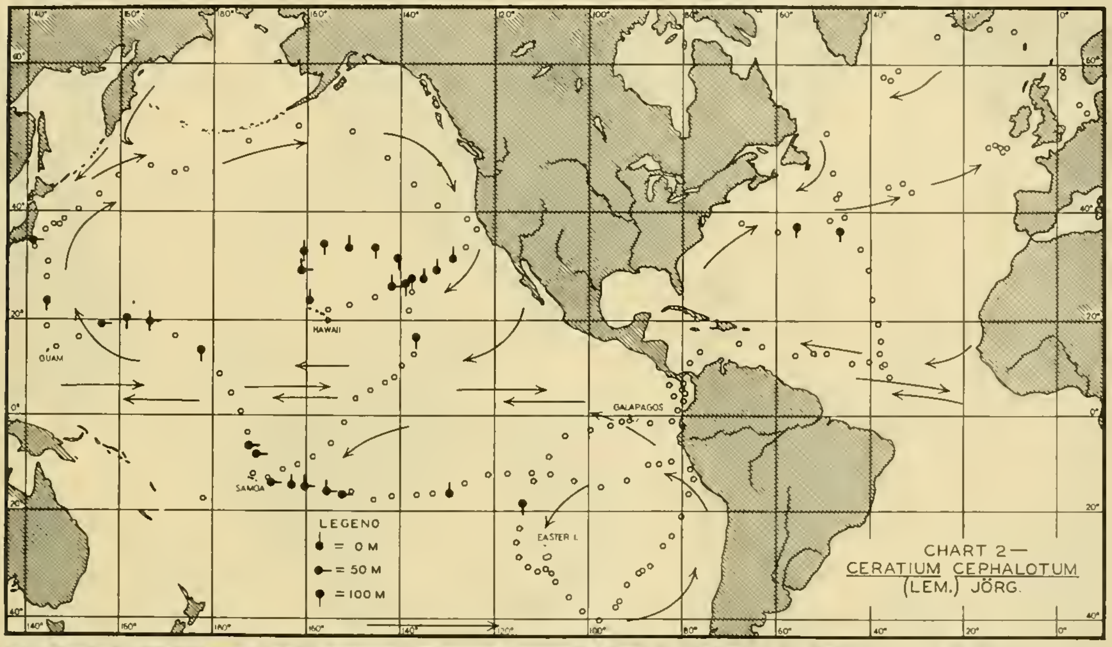


CHART 2—
CERATIUM CEPHALOTUM
(LEM.) JÖRG.

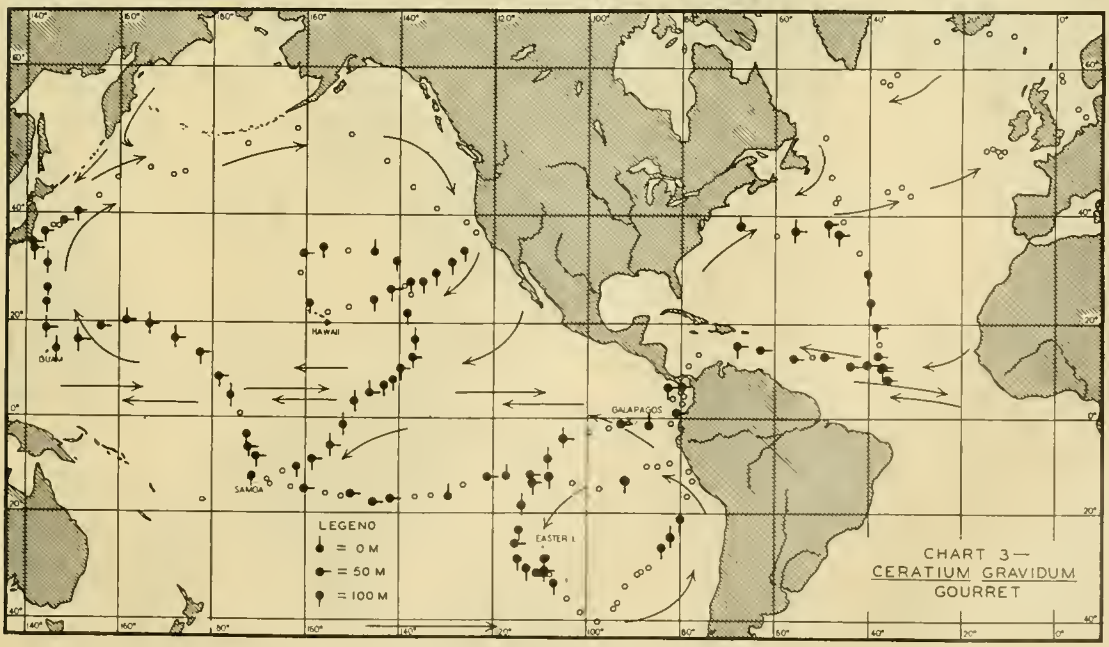
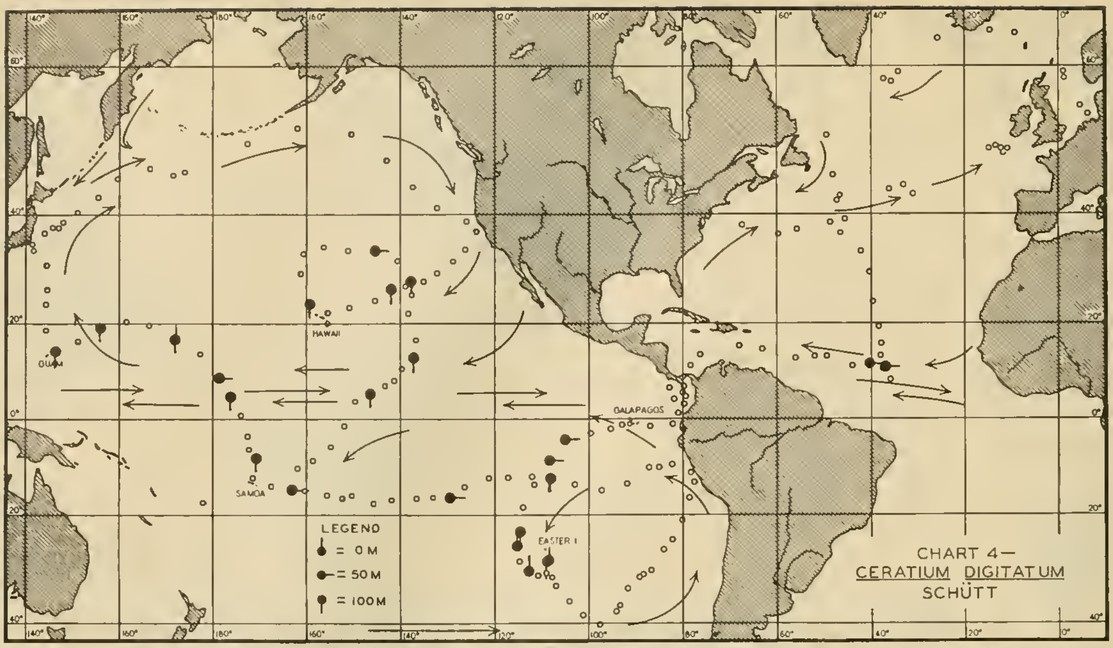
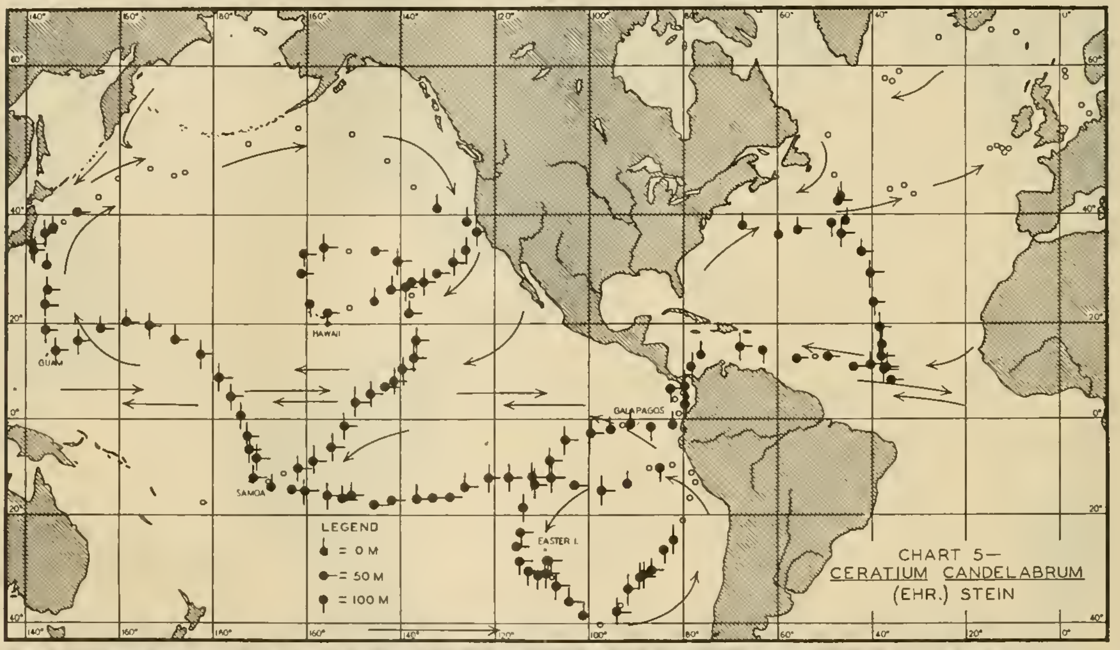
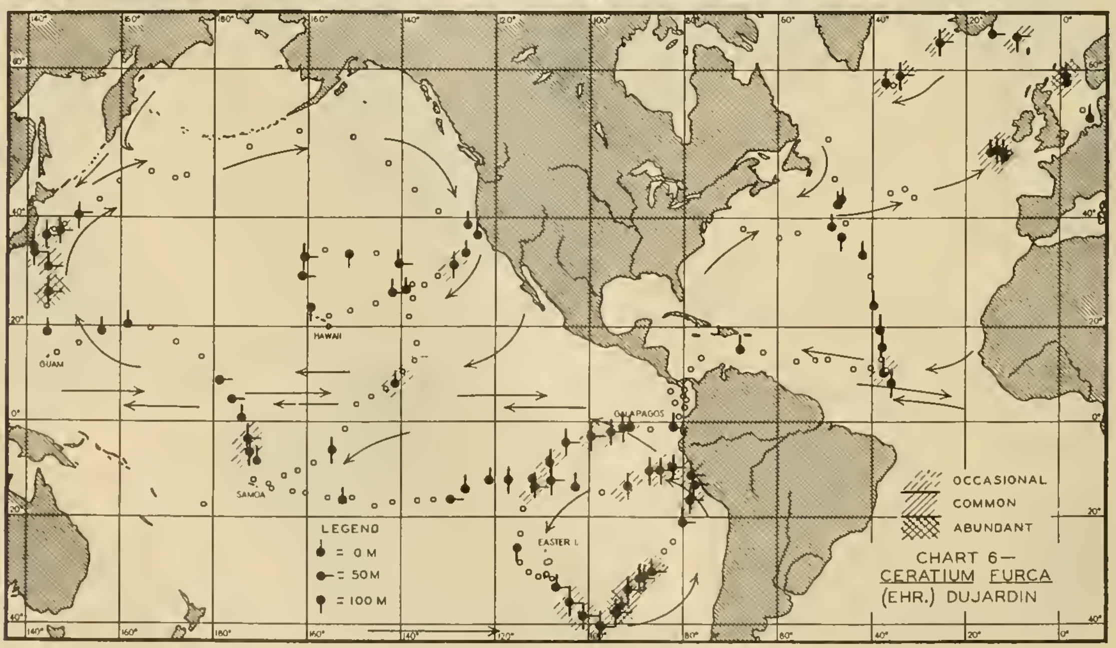
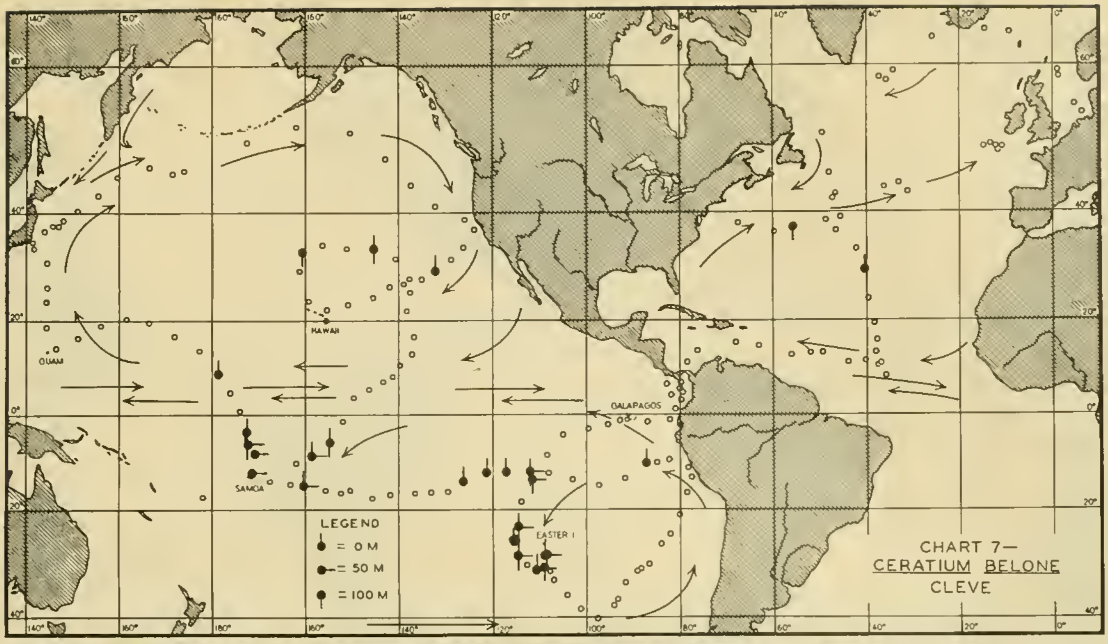


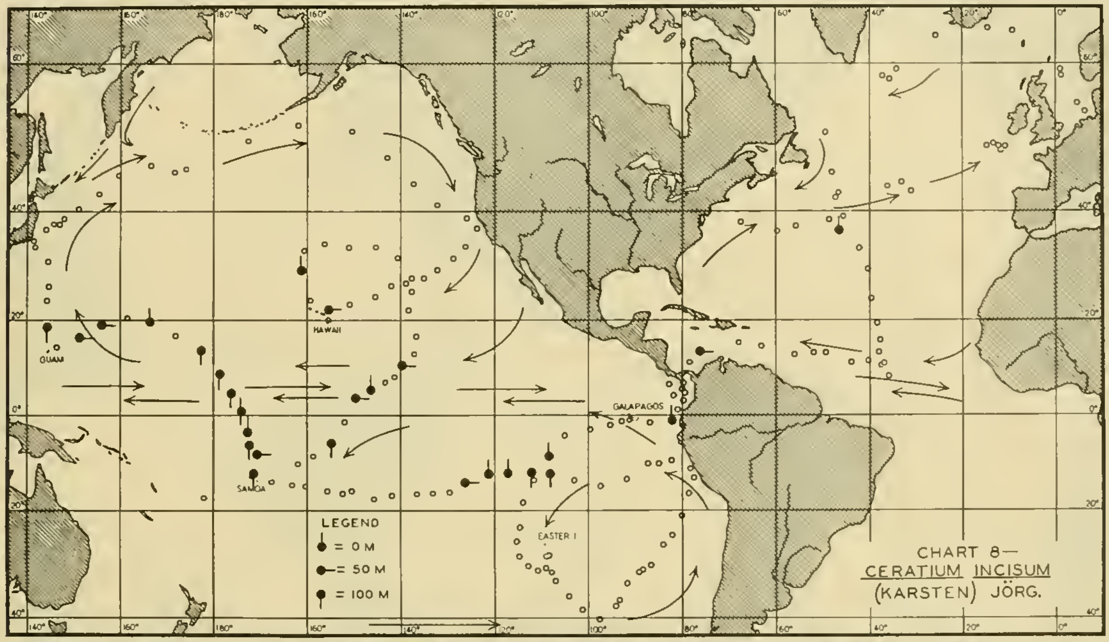
CHART 3—
CERATIUM GRAVIDUM
GOURRET

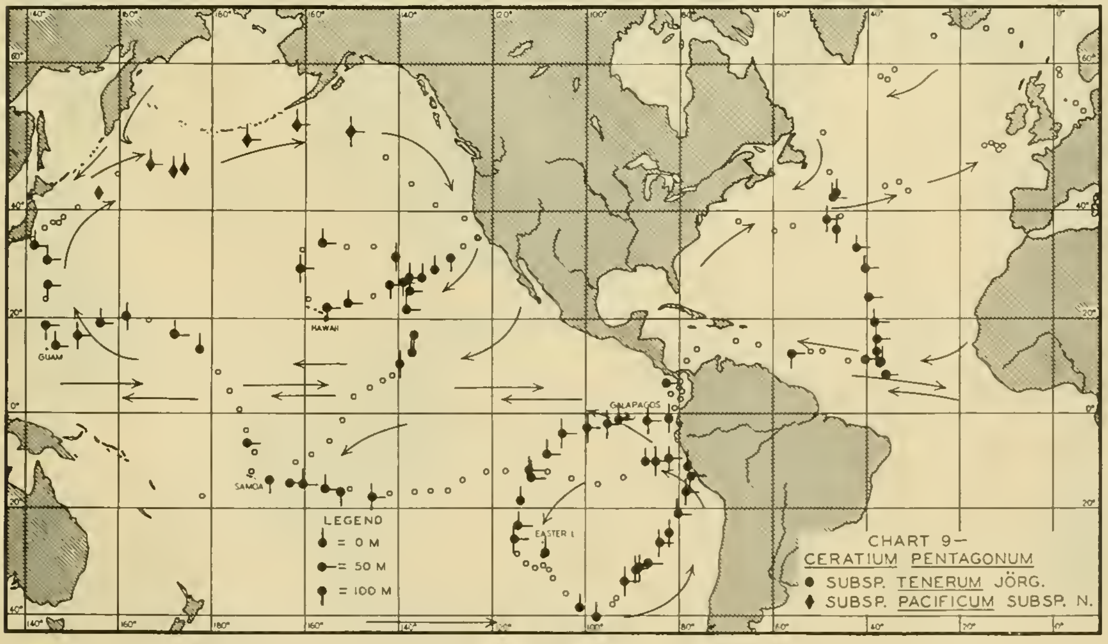

HAWAII
GUAM
SAMOA
GALAPAGOS
EASTER I.
LEGEND
= 0 M
= 50 M
= 100 M
CHART 4—
CERATIUM DIGITATUM
SCHÜTT


HAWAII
GUAM
SAMOA
GALAPAGOS
EASTER I.
LEGEND
= 0 M
= 50 M
= 100 M
CHART 5—
CERATIUM CANDELABRUM
(EHR.) STEIN


HAWAII
GUAM
SAMOA
GALAPAGOS
EASTER I.
OCCASIONAL
COMMON
ABUNDANT
LEGEND
= 0 M
= 50 M
= 100 M
CHART 6—
CERATIUM FURCA
(EHR.) DUJARDIN


HAWAII
GUAM
GALAPAGOS
SAMOA
EASTER I
LEGEND
= 0 M
= 50 M
= 100 M
CHART 7—
CERATIUM BELONE
CLEVE


HAWAII
GUAM
GALAPAGOS
SAMOA
EASTER I
LEGEND
= 0 M
= 50 M
= 100 M
CHART 8—
CERATIUM INCISUM
(KARSTEN) JÖRG.


HAWAII
GUAM
GALAPAGOS
SAMOA
EASTER I
LEGEND
= 0 M
= 50 M
= 100 M
CHART 9—
CERATIUM PENTAGONUM
● SUBSP. TENERUM JÖRG.
♦ SUBSP. PACIFICUM SUBSP. N.

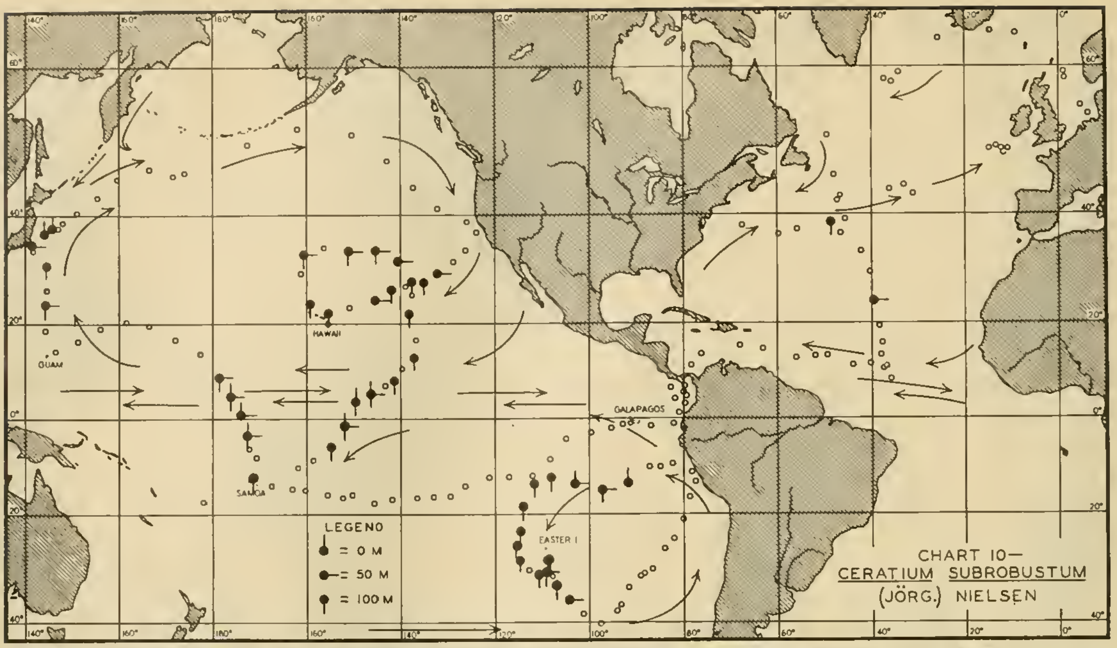


CHART 10—
CERATIUM SUBROBUSTUM
(JÖRG.) NIELSEN
LEGEND
= 0 M
= 50 M
= 100 M
HAWAII
GUAM
SAMOA
GALAPAGOS
EASTER I

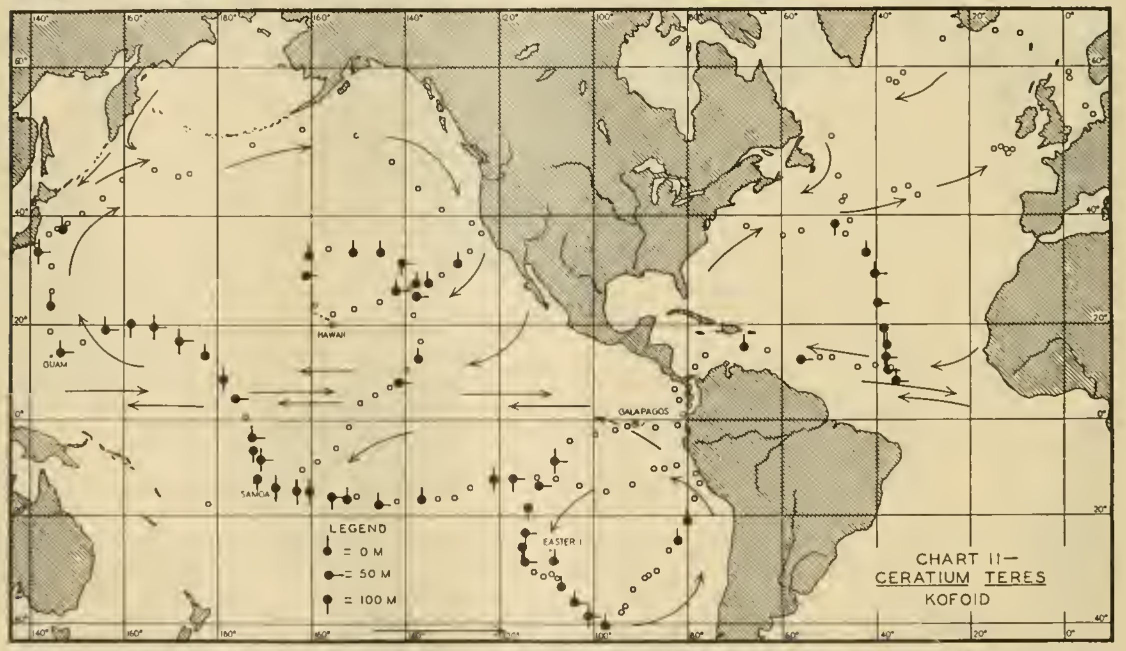


CHART 11—
CERATIUM TERES
KOFOID
LEGEND
= 0 M
= 50 M
= 100 M
HAWAII
GUAM
SAMOA
GALAPAGOS
EASTER I

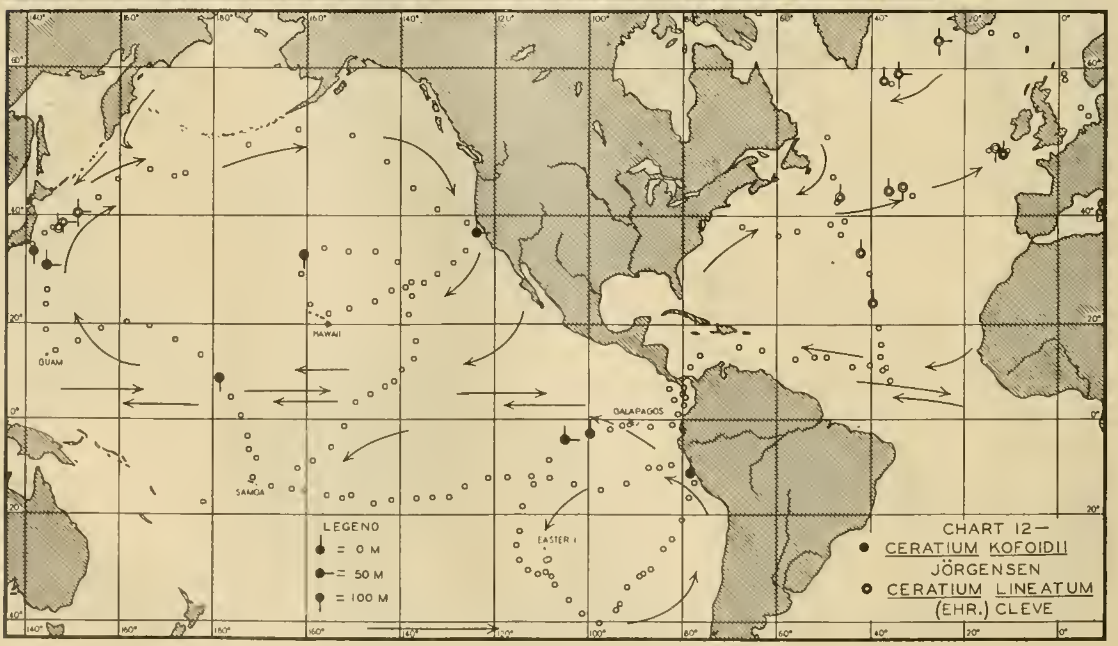
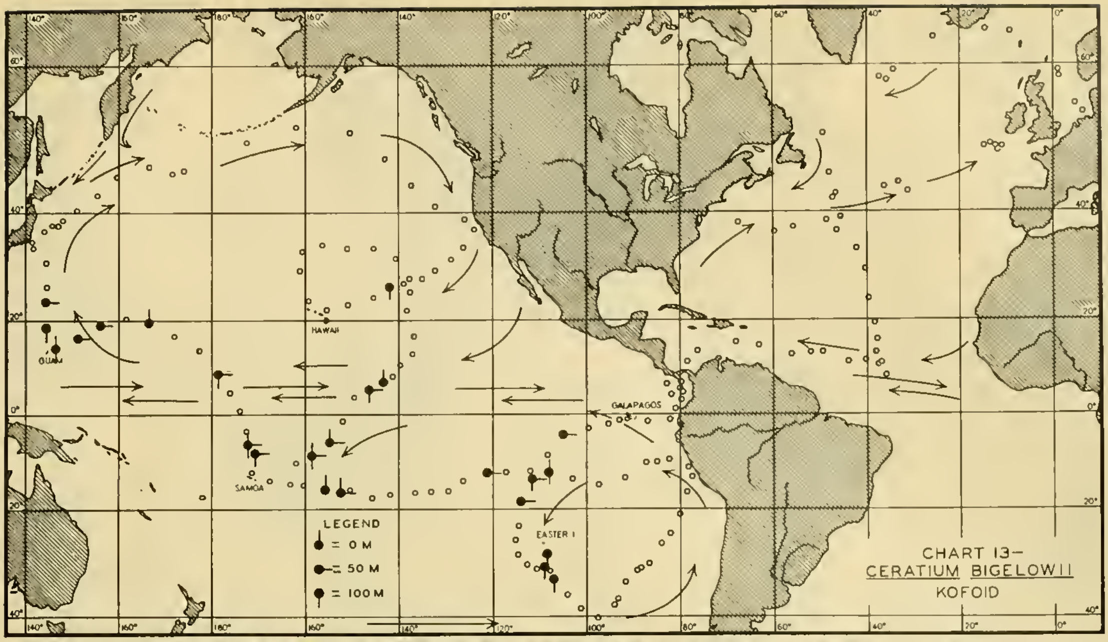
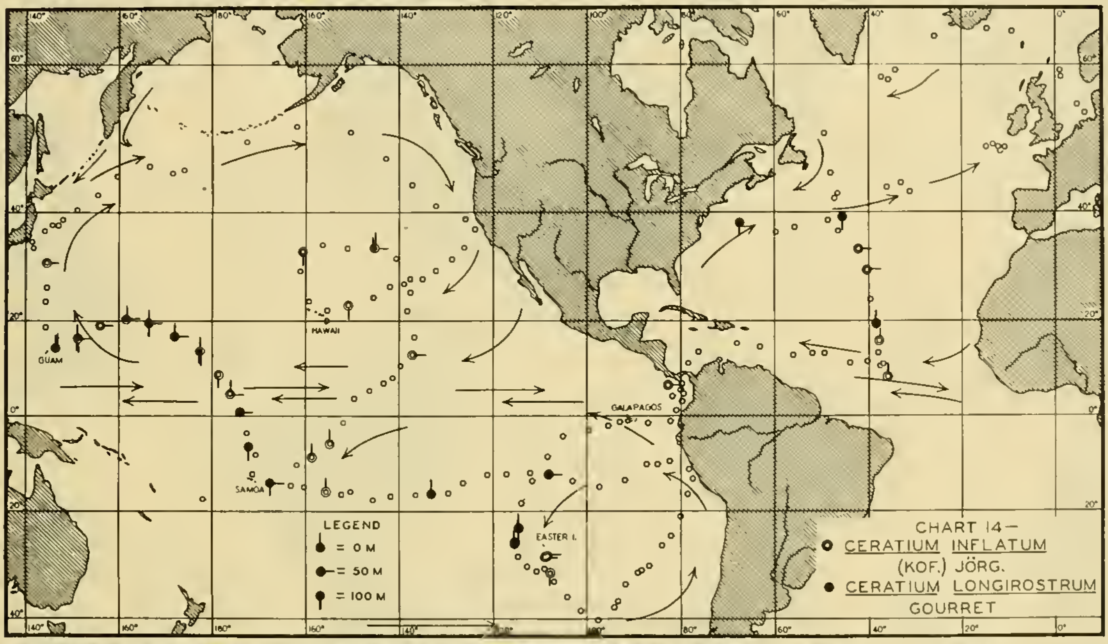
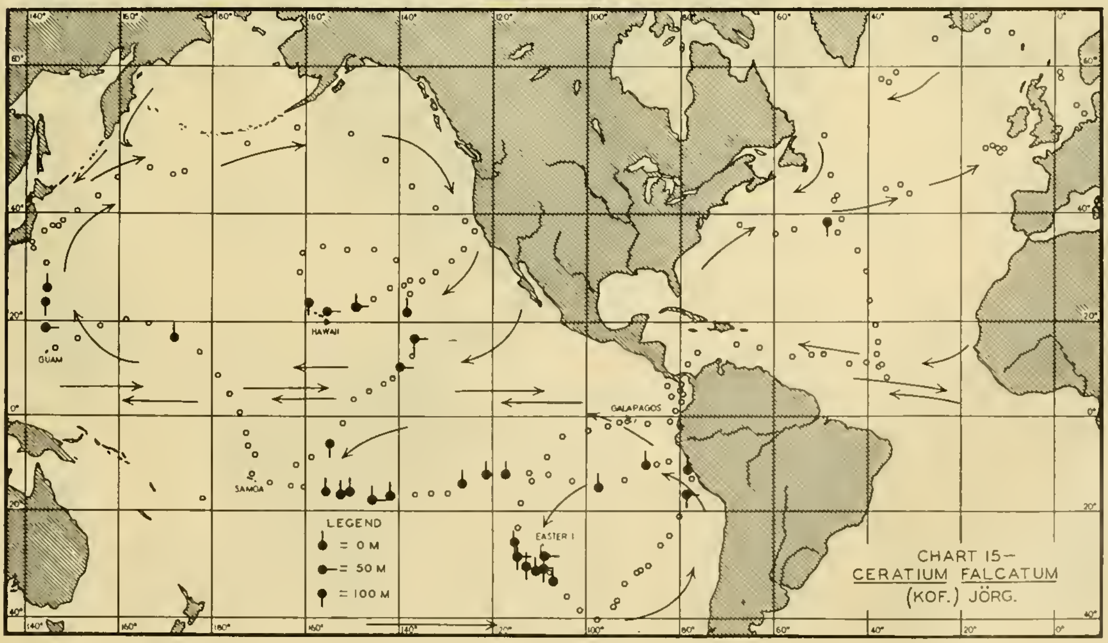


CHART 12—
CERATIUM KOFOIDII
JÖRGENSEN
CERATIUM LINEATUM
(EHR.) CLEVE
LEGEND
= 0 M
= 50 M
= 100 M
HAWAII
GUAM
SAMOA
GALAPAGOS
EASTER I


HAWAII
GUAM
SAMOA
GALAPAGOS
EASTER I.
LEGEND
= 0 M
= 50 M
= 100 M
CHART 13—
CERATIUM BIGELOWII
KOFOID


HAWAII
GUAM
SAMOA
GALAPAGOS
EASTER I.
LEGEND
= 0 M
= 50 M
= 100 M
CHART 14—
CERATIUM INFLATUM
(KOF.) JÖRG.
CERATIUM LONGIROSTRUM
GOURRET


HAWAII
GUAM
SAMOA
GALAPAGOS
EASTER I.
LEGEND
= 0 M
= 50 M
= 100 M
CHART 15—
CERATIUM FALCATUM
(KOF.) JÖRG.

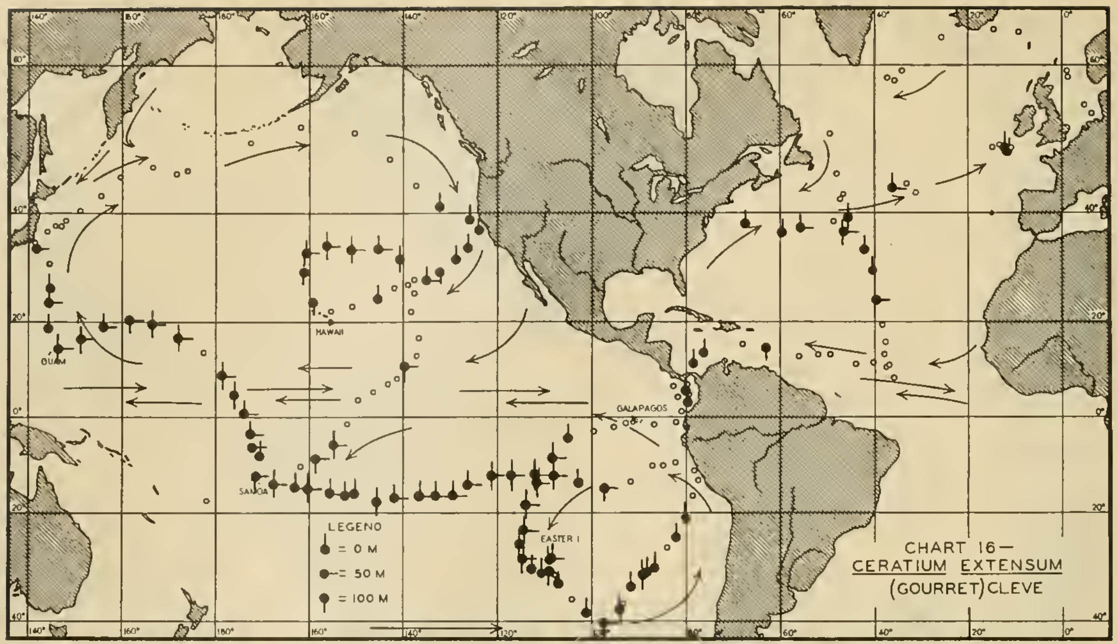


CHART 16—
CERATIUM EXTENSUM
(GOURRET) CLEVE

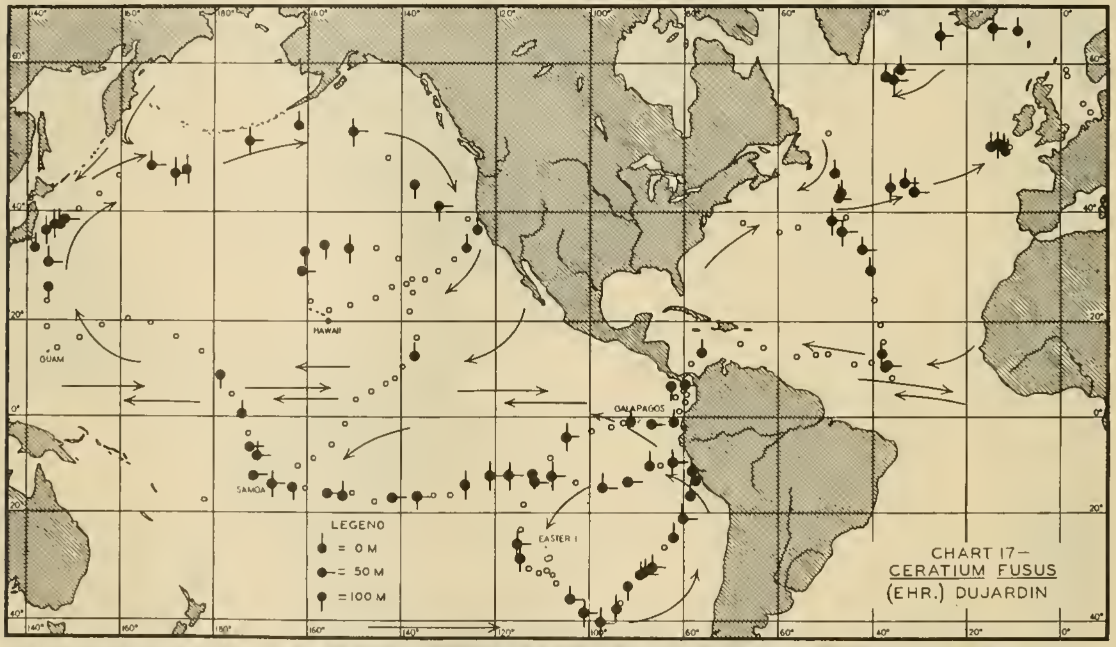


CHART 17—
CERATIUM FUSUS
(EHR.) DUJARDIN

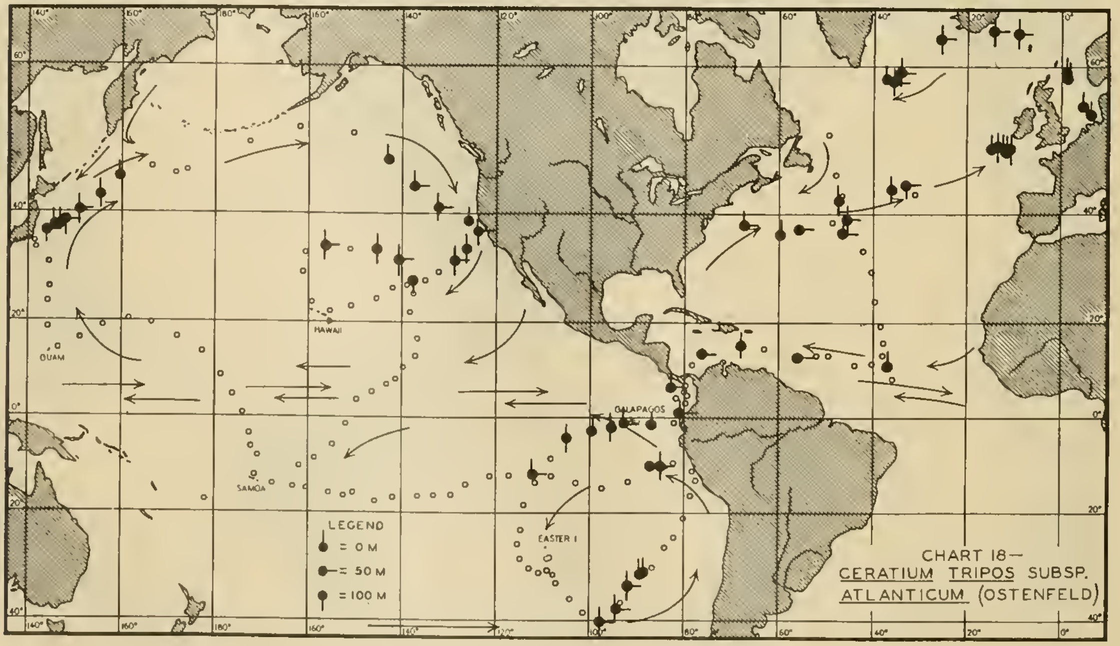


CHART 18—
CERATIUM TRIPOS SUBSP.
ATLANTICUM (OSTENFELD)

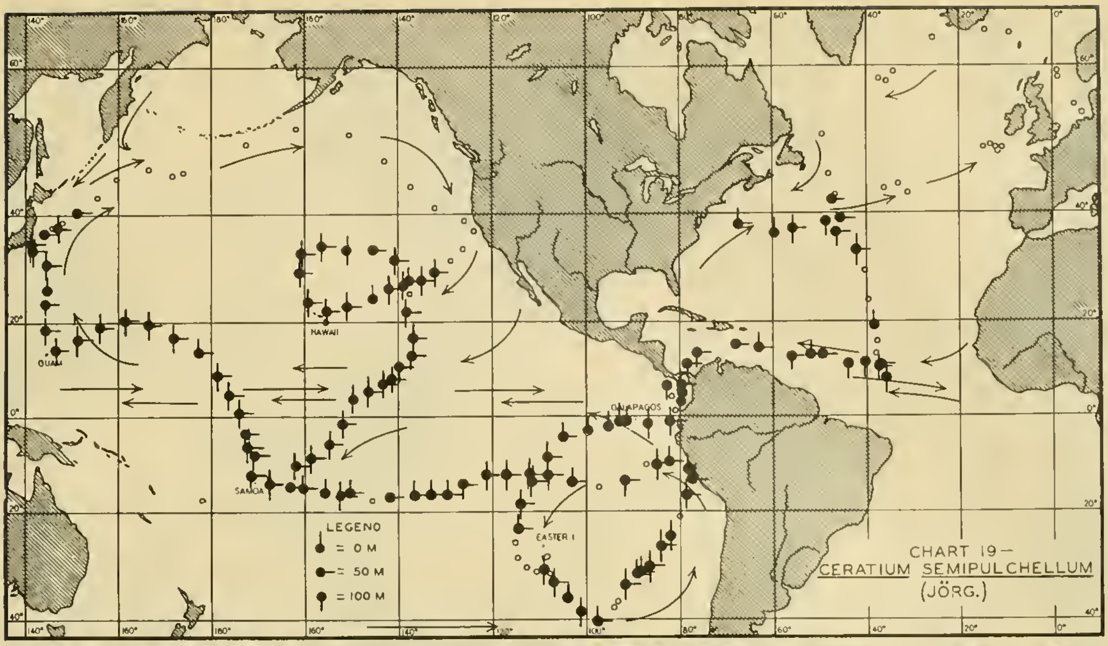


CHART 19—
CERATIUM SEMIPULCHELLUM
(JÖRG.)

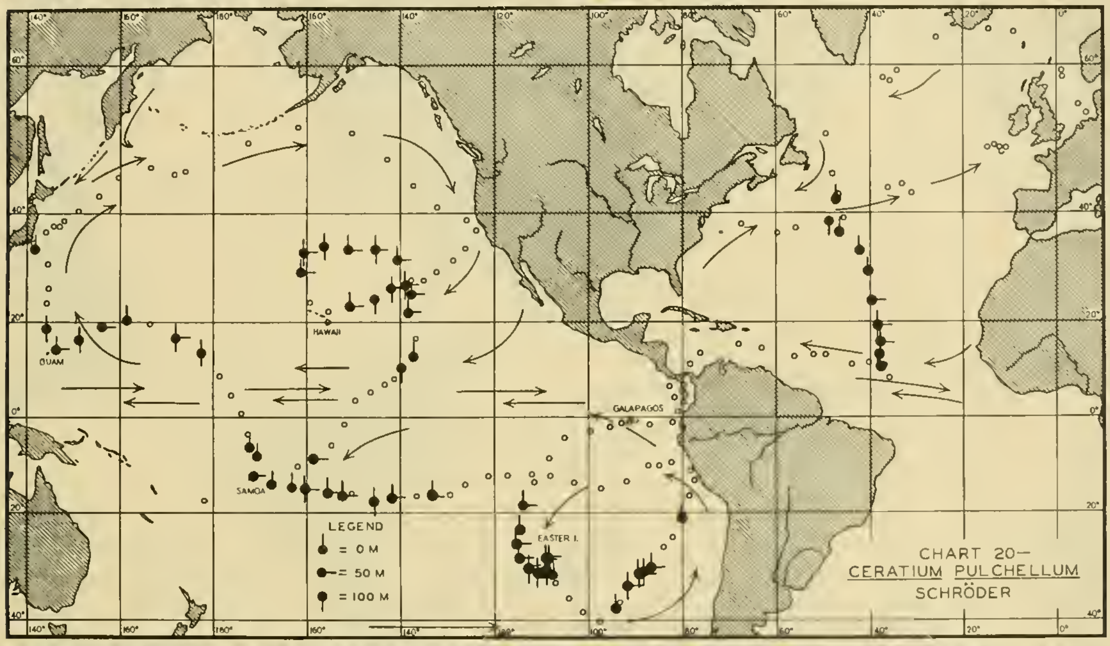


CHART 20—
CERATIUM PULCHELLUM
SCHRÖDER

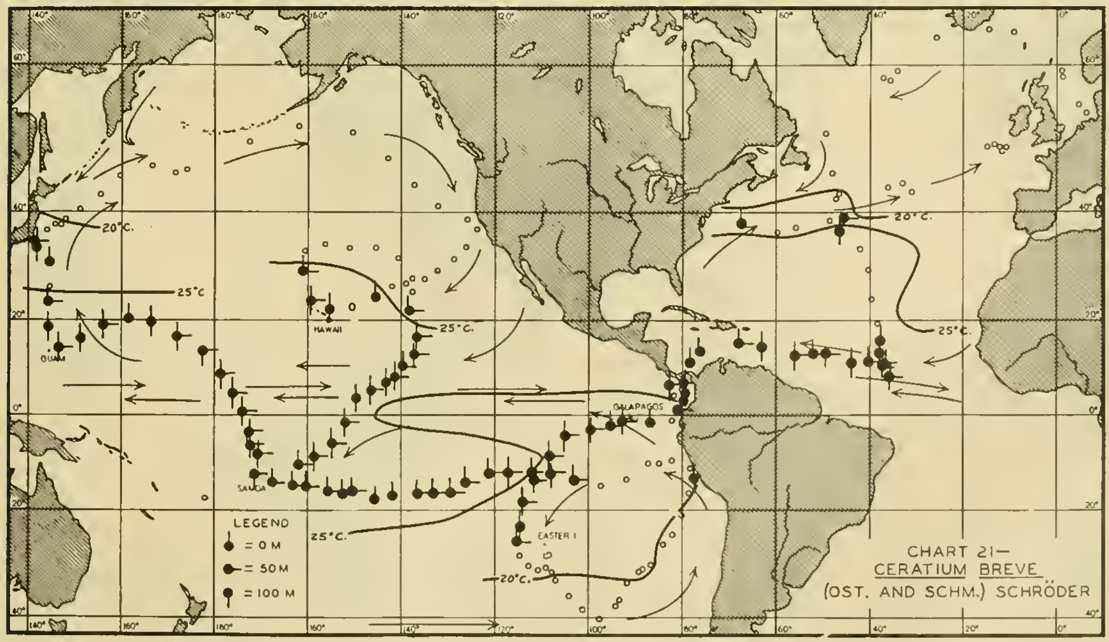
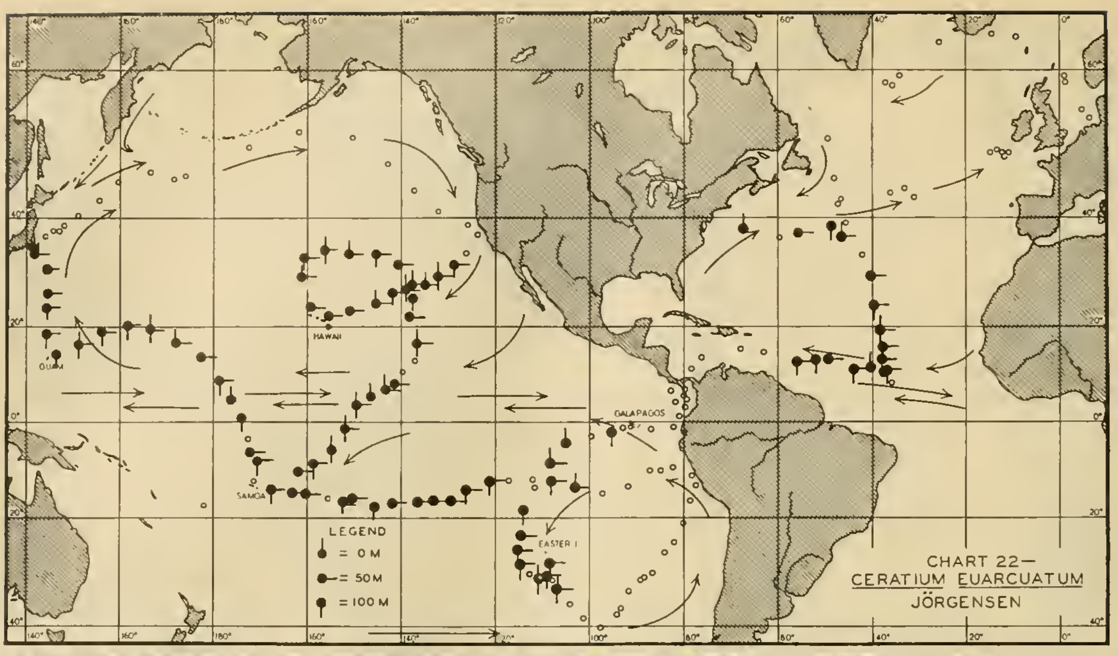
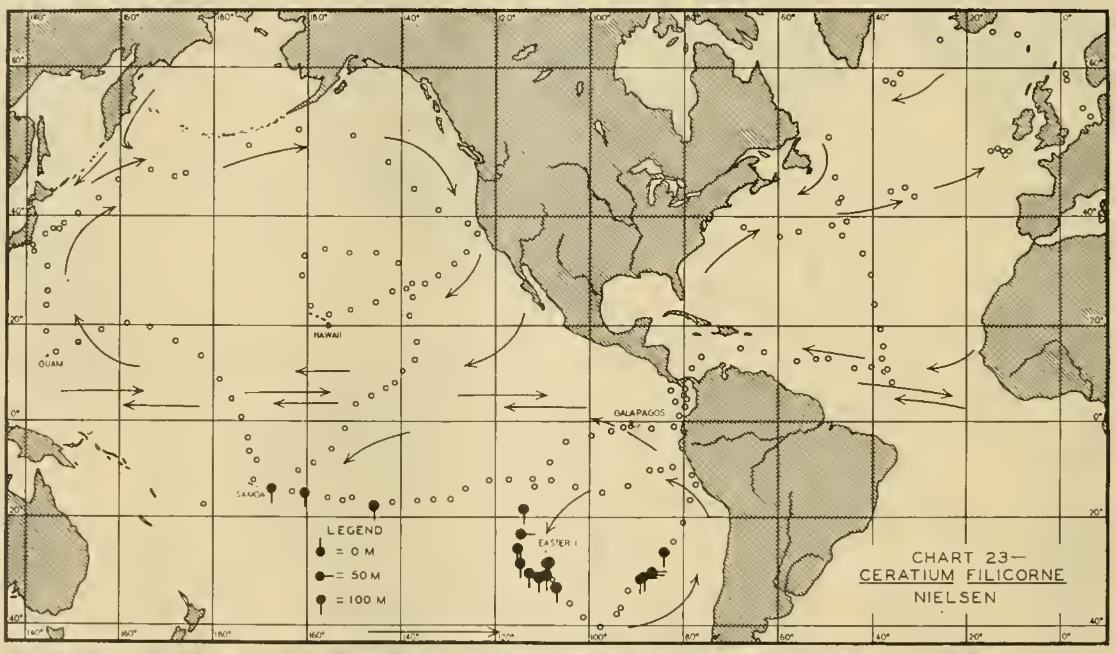
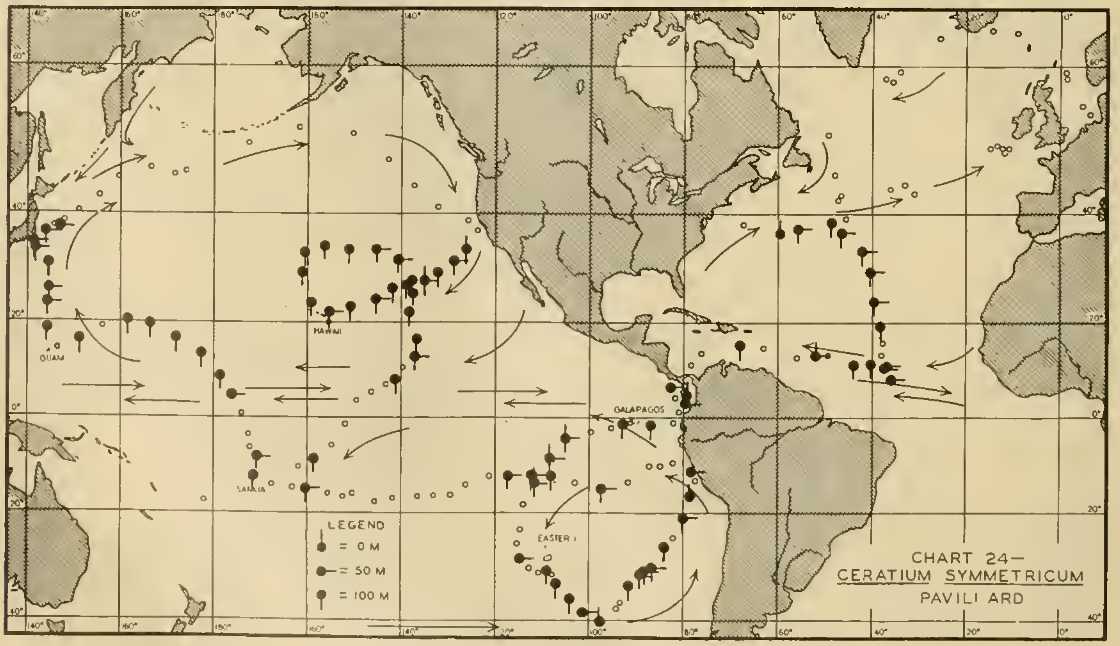
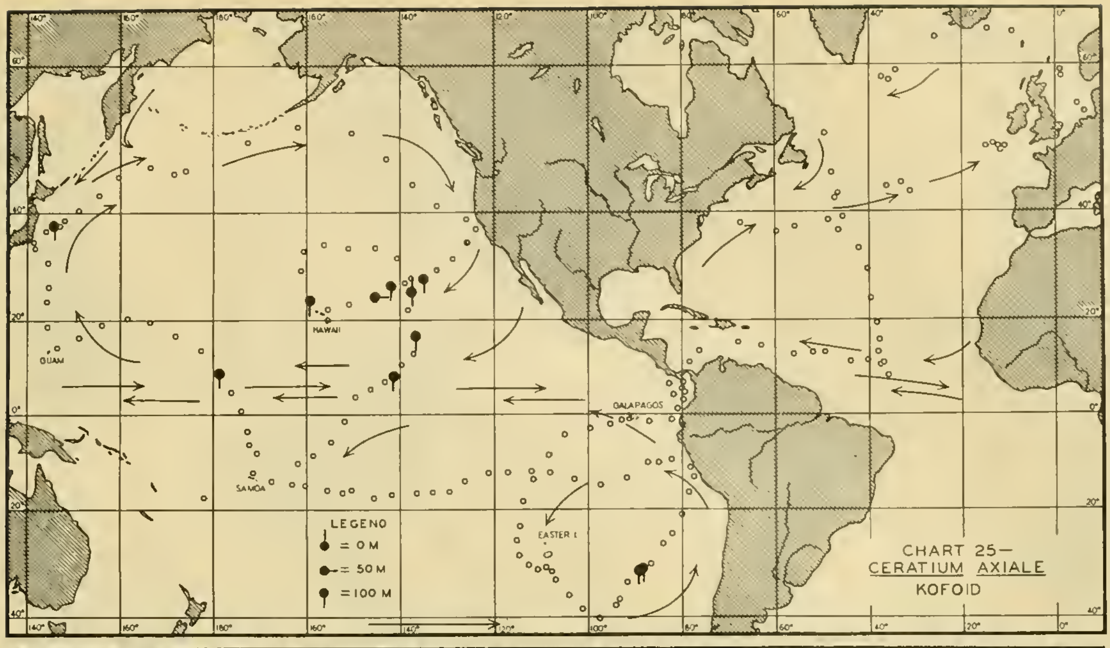


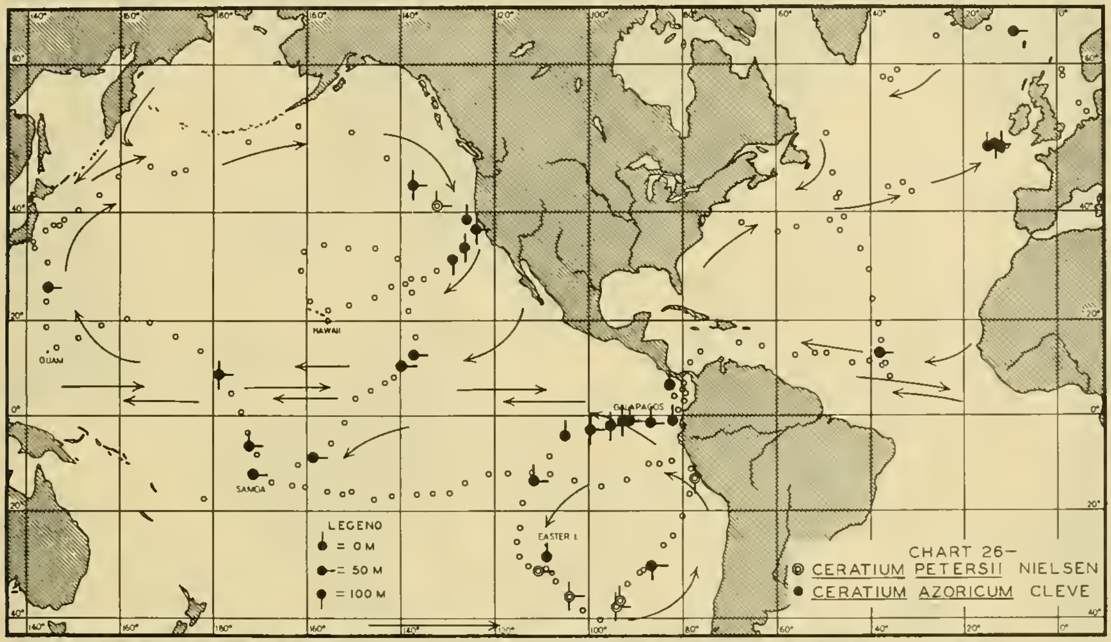
CHART 21—
CERATIUM BREVE
(OST. AND SCHM.) SCHRÖDER

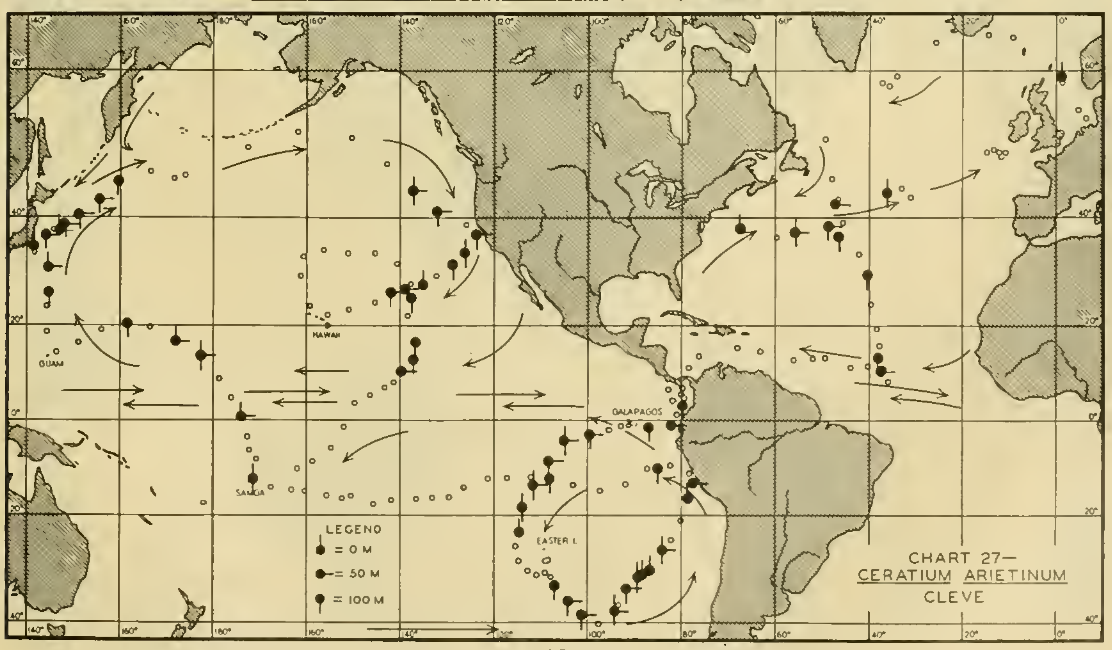

GUAM
HAWAII
SAMOA
GALAPAGOS
EASTER I
LEGEND
= 0 M
= 50 M
= 100 M
CHART 22—
CERATIUM EUARCUATUM
JÖRGENSEN

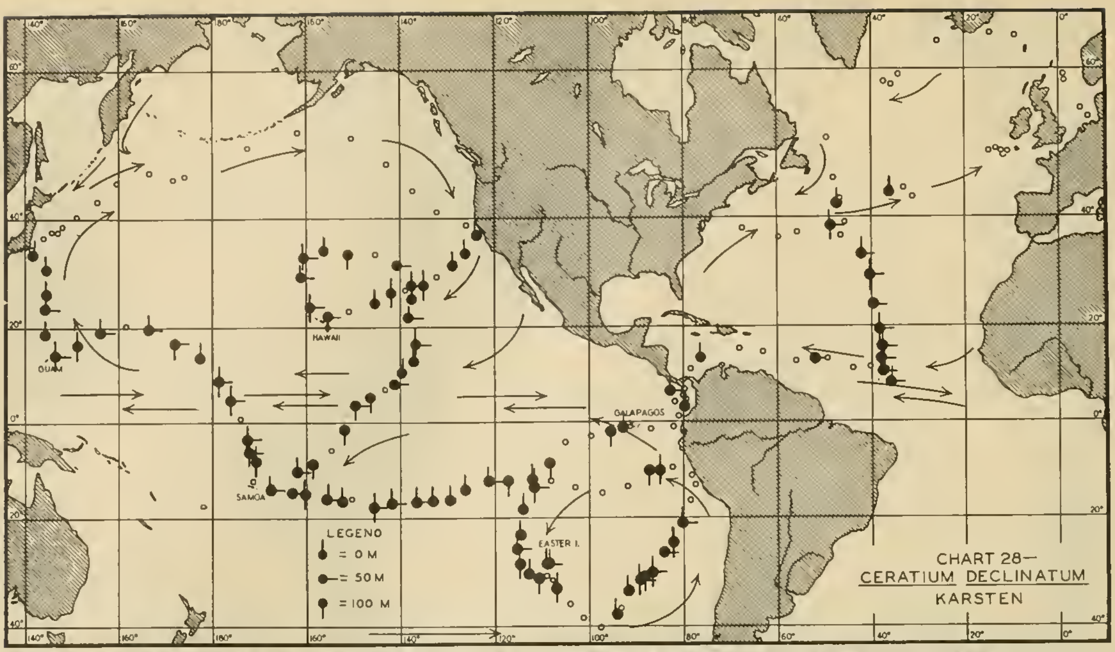

GUAM
HAWAII
SAMOA
GALAPAGOS
EASTER I
LEGEND
= 0 M
= 50 M
= 100 M
CHART 23—
CERATIUM FILICORNE
NIELSEN

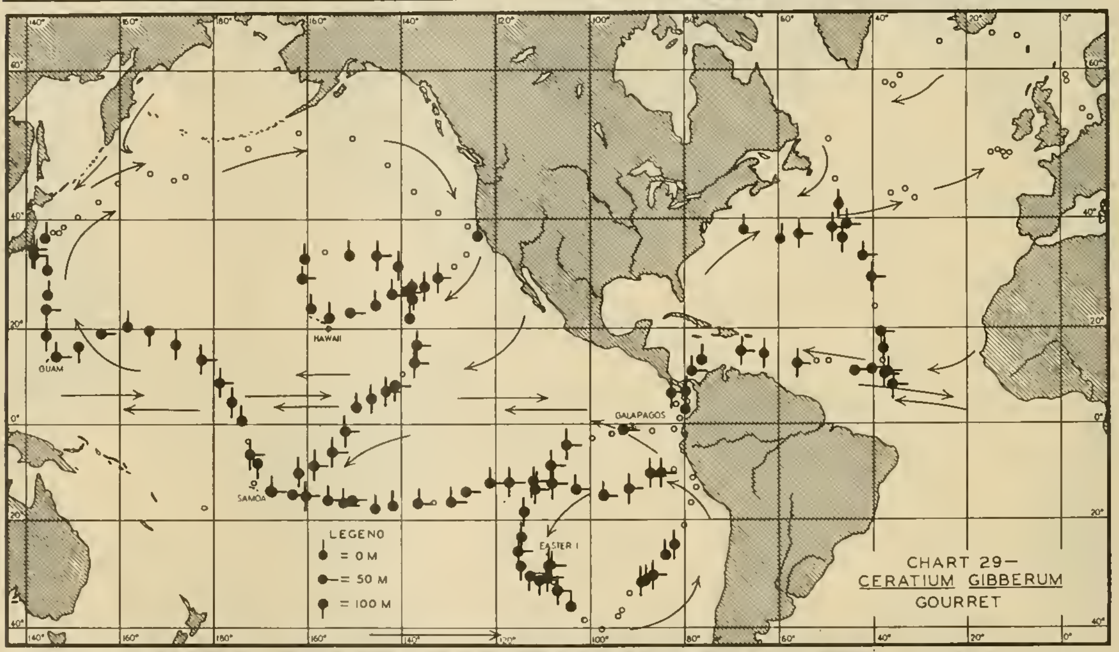

GUAM
HAWAII
SAMOA
GALAPAGOS
EASTER I
LEGEND
= 0 M
= 50 M
= 100 M
CHART 24—
CERATIUM SYMMETRICUM
PAVILLARD

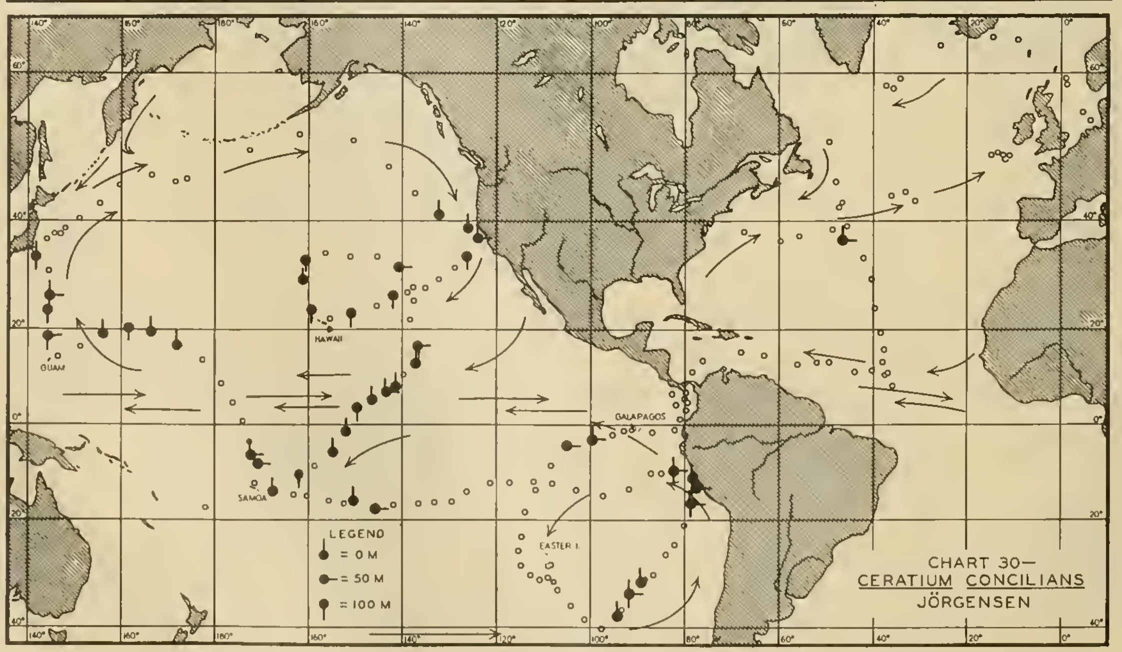

GUAM
HAWAII
GALAPAGOS
SAMOA
EASTER I.
LEGEND
= 0 M
= 50 M
= 100 M
CHART 25—
CERATIUM AXIALE
KOFOID


GUAM
HAWAII
GALAPAGOS
SAMOA
EASTER I.
LEGEND
= 0 M
= 50 M
= 100 M
CHART 26—
CERATIUM PETERSII NIELSEN
CERATIUM AZORICUM CLEVE


GUAM
HAWAII
GALAPAGOS
SAMOA
EASTER I.
LEGEND
= 0 M
= 50 M
= 100 M
CHART 27—
CERATIUM ARIETINUM
CLEVE


GUAM
HAWAII
SAMOA
GALAPAGOS
EASTER I.
LEGEND
= 0 M
= 50 M
= 100 M
CHART 28—
CERATIUM DECLINATUM
KARSTEN


GUAM
HAWAII
SAMOA
GALAPAGOS
EASTER I.
LEGEND
= 0 M
= 50 M
= 100 M
CHART 29—
CERATIUM GIBBERUM
GOURRET


GUAM
HAWAII
SAMOA
GALAPAGOS
EASTER I.
LEGEND
= 0 M
= 50 M
= 100 M
CHART 30—
CERATIUM CONCILIANS
JÖRGENSEN

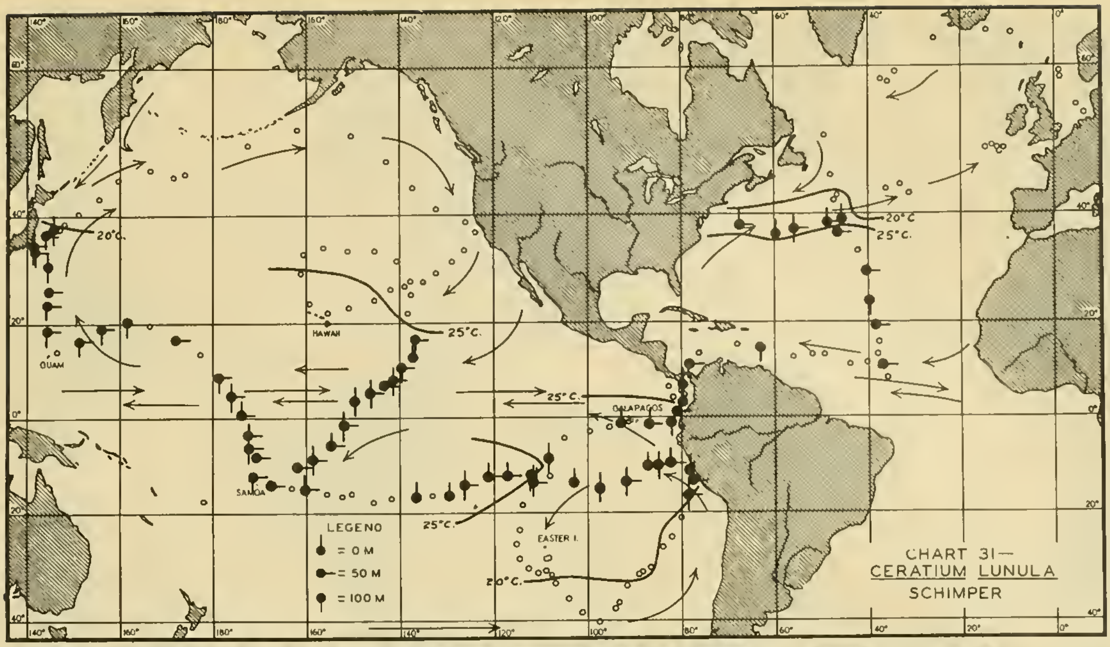


CHART 31—
CERATIUM LUNULA
SCHIMPER

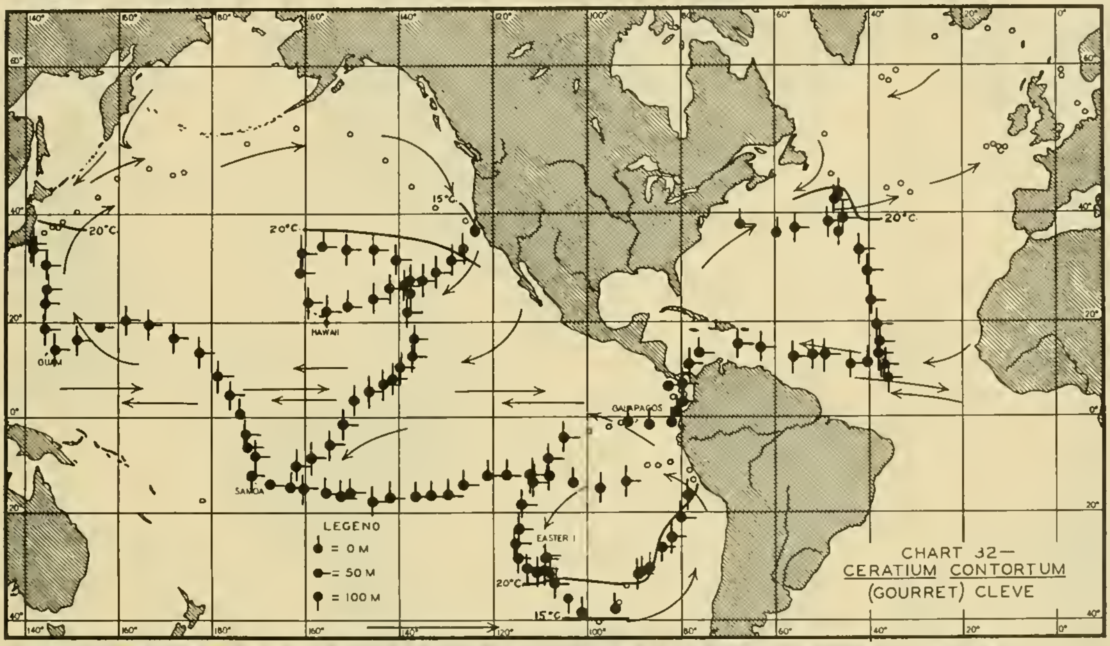


CHART 32—
CERATIUM CONTORTUM
(GOURRET) CLEVE

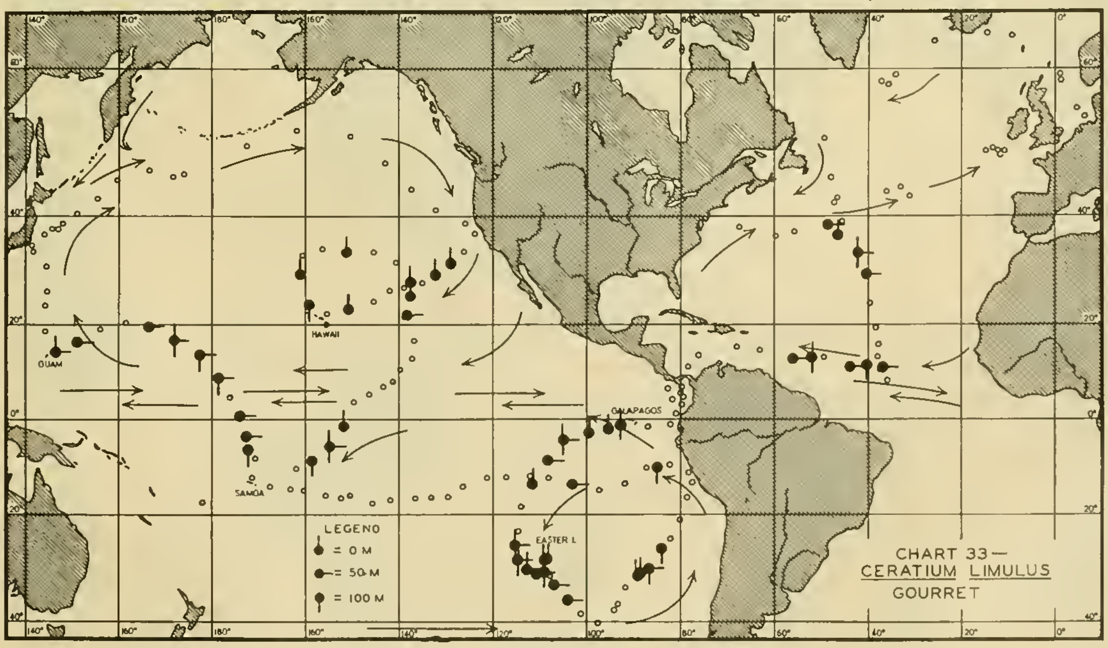


CHART 33—
CERATIUM LIMULUS
GOURRET

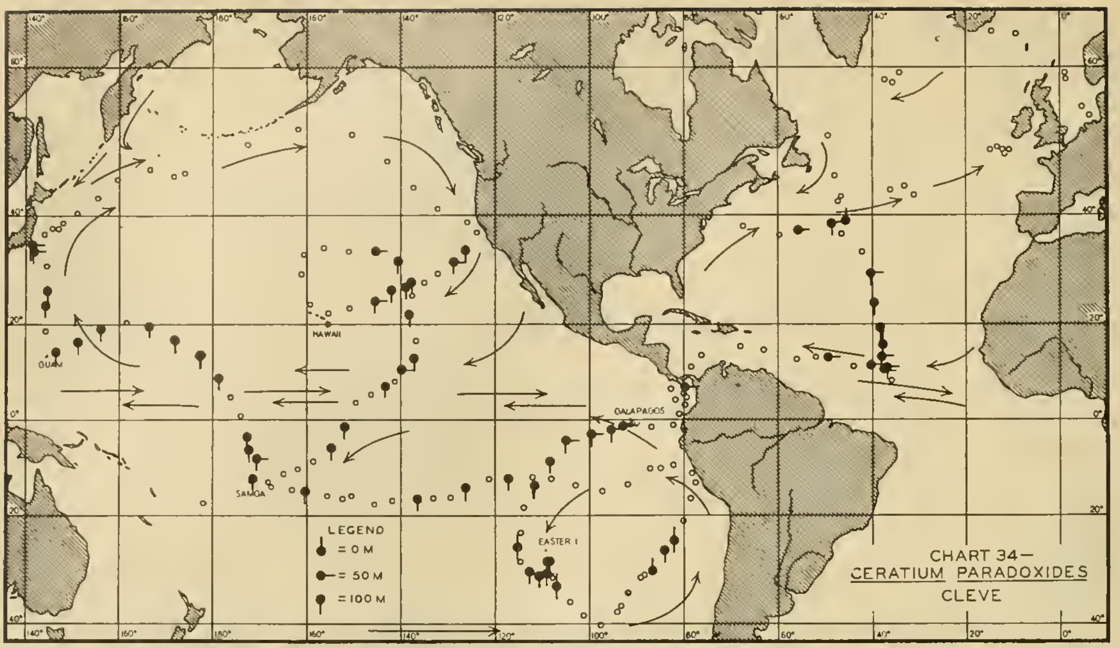


CHART 34— CERATIUM PARADOXIDES CLEVE

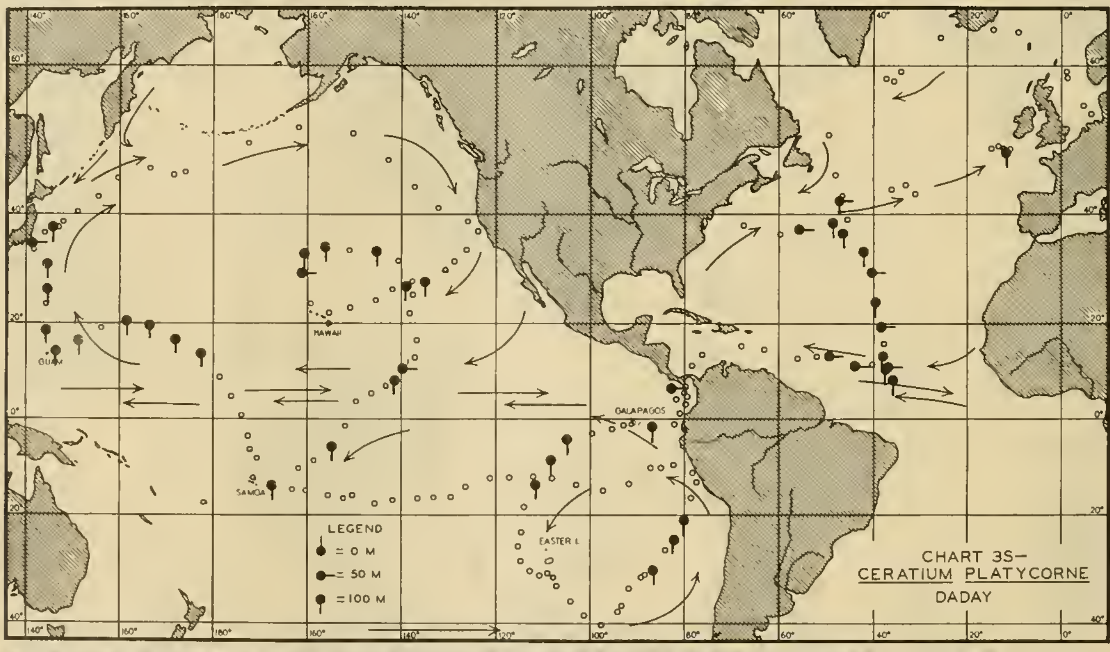


CHART 35— CERATIUM PLATYCORNE DADAY

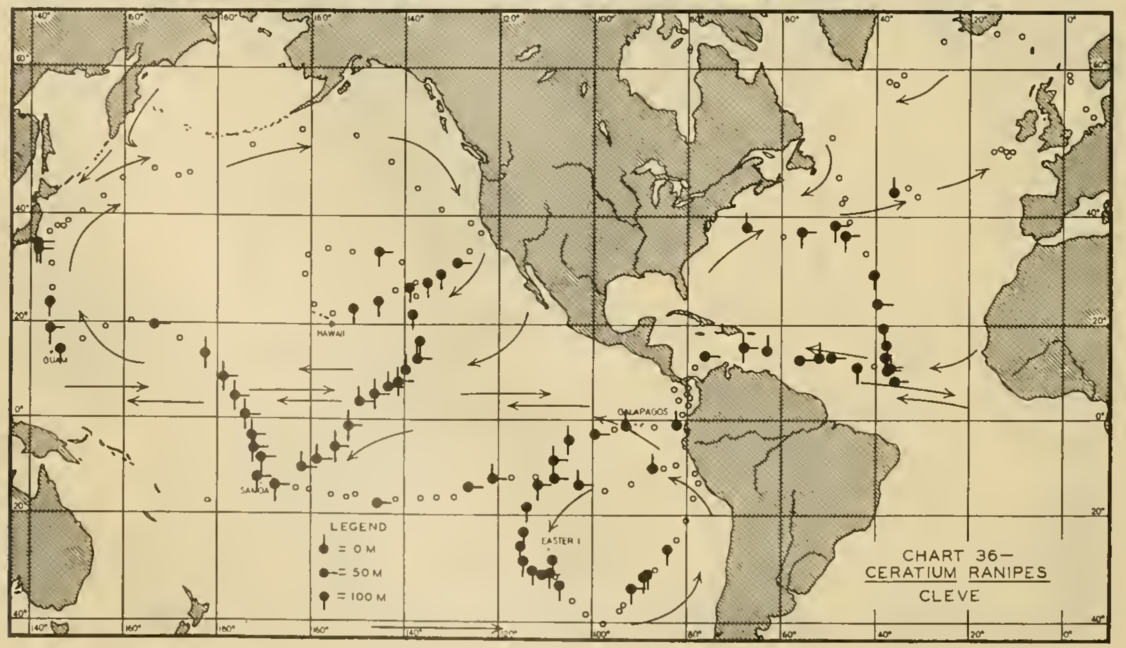
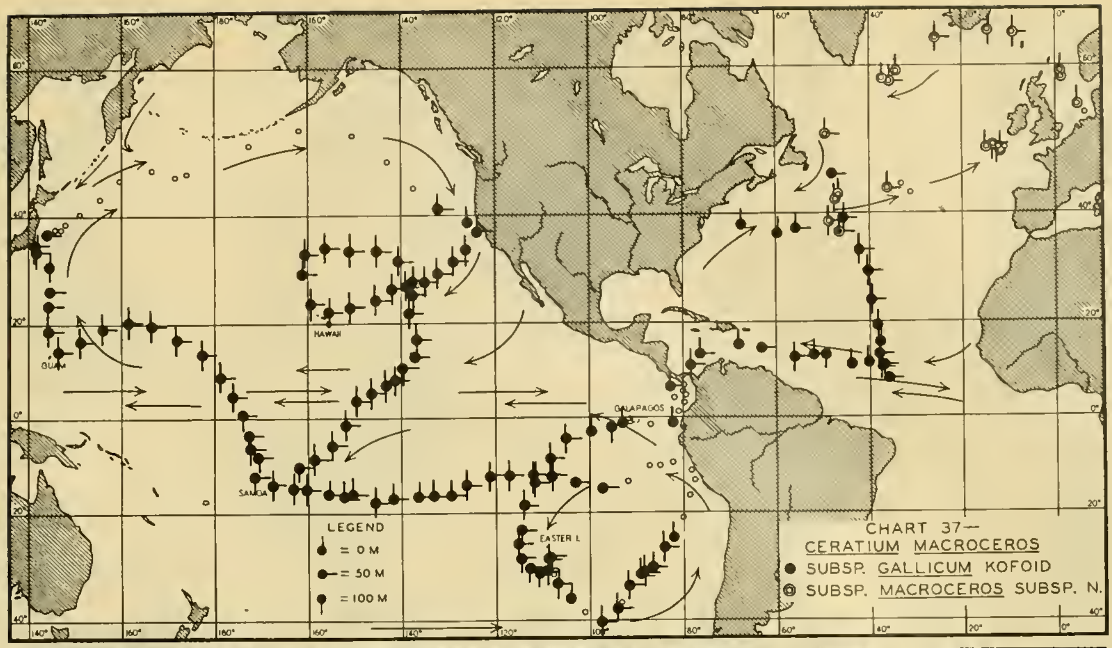
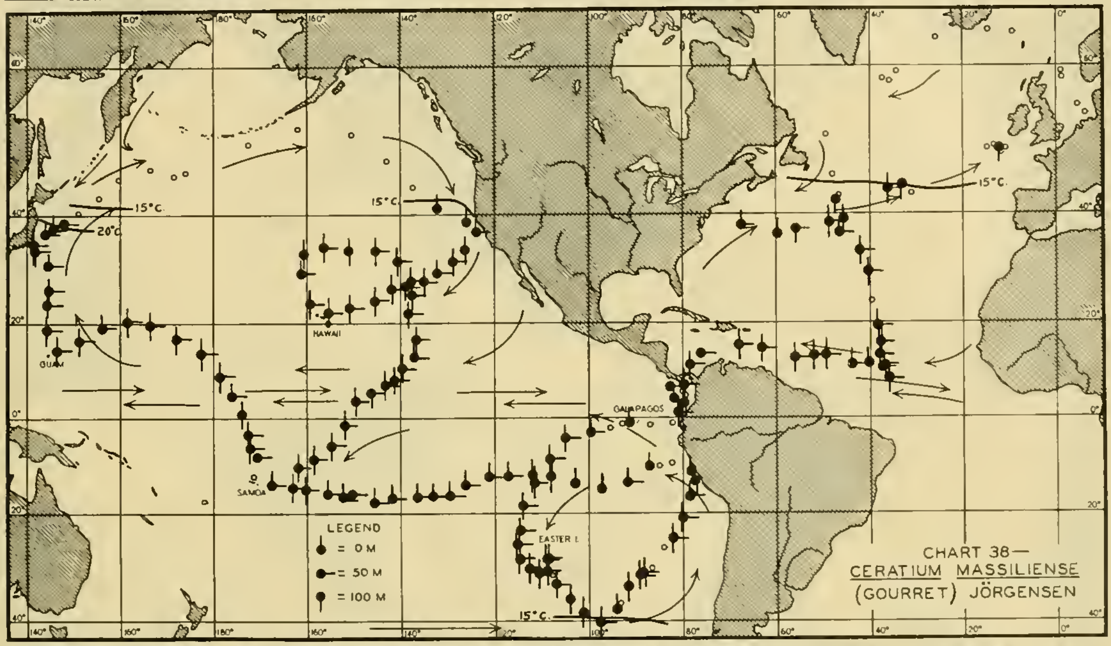
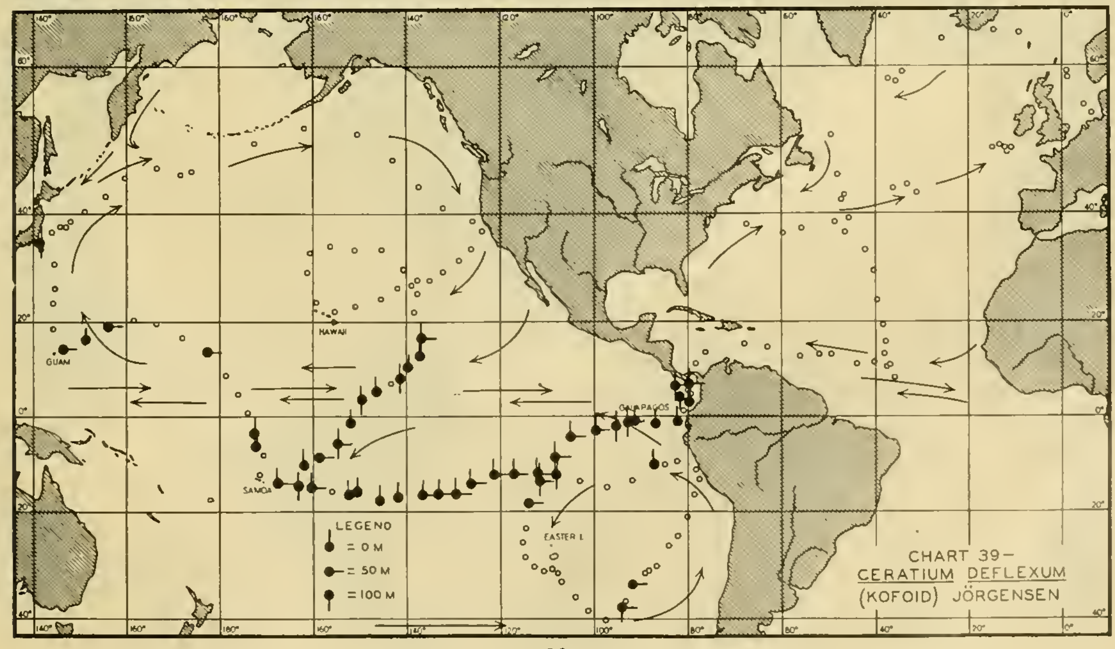
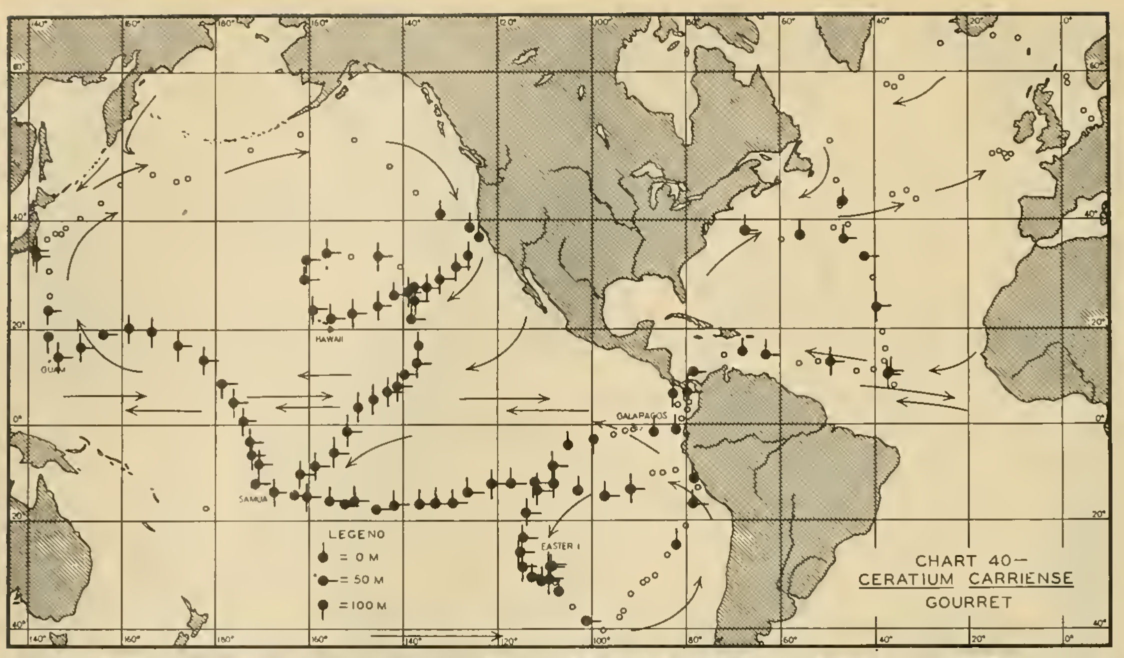


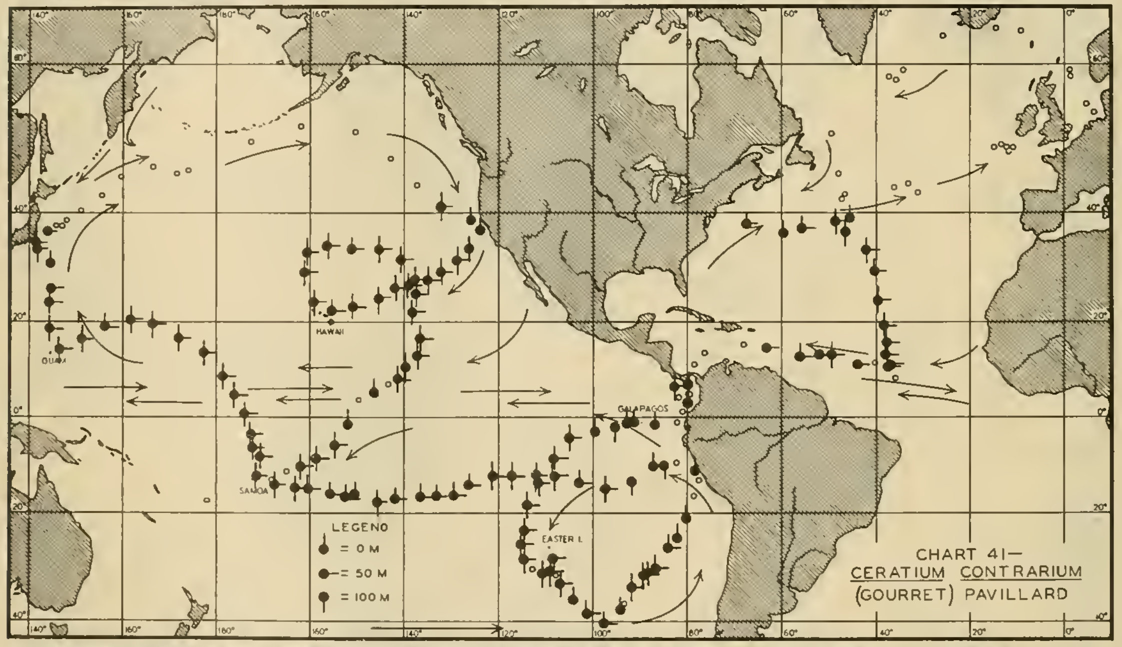
CHART 36— CERATIUM RANIPES CLEVE

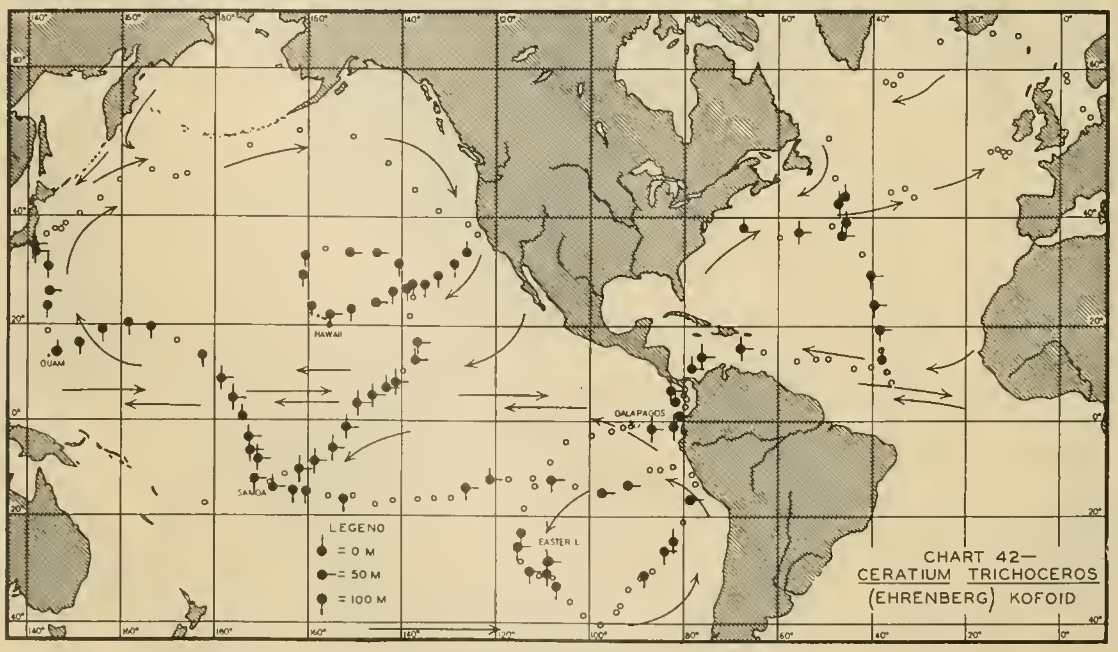

GUAM
HAWAII
SAMOA
GALAPAGOS
EASTER I.
LEGEND
= 0 M
= 50 M
= 100 M
CHART 37—
CERATIUM MACROCEROS
SUBSP. GALLICUM KOFOID
SUBSP. MACROCEROS SUBSP. N.


15°C.
20°C.
GUAM
HAWAII
SAMOA
GALAPAGOS
EASTER I.
LEGEND
= 0 M
= 50 M
= 100 M
CHART 38—
CERATIUM MASSILIENSE
(GOURRET) JÖRGENSEN


GUAM
HAWAII
SAMOA
GALAPAGOS
EASTER I.
LEGEND
= 0 M
= 50 M
= 100 M
CHART 39—
CERATIUM DEFLEXUM
(KOFOID) JÖRGENSEN


HAWAII
GUAM
GALAPAGOS
SAMOA
EASTER I.
LEGEND
= 0 M
= 50 M
= 100 M
CHART 40—
CERATIUM CARRIENSE
GOURRET


HAWAII
GUAM
GALAPAGOS
SAMOA
EASTER I.
LEGEND
= 0 M
= 50 M
= 100 M
CHART 41—
CERATIUM CONTRARIUM
(GOURRET) PAVILLARD


HAWAII
GUAM
GALAPAGOS
SAMOA
EASTER I.
LEGEND
= 0 M
= 50 M
= 100 M
CHART 42—
CERATIUM TRICHOCEROS
(EHRENBERG) KOFOID

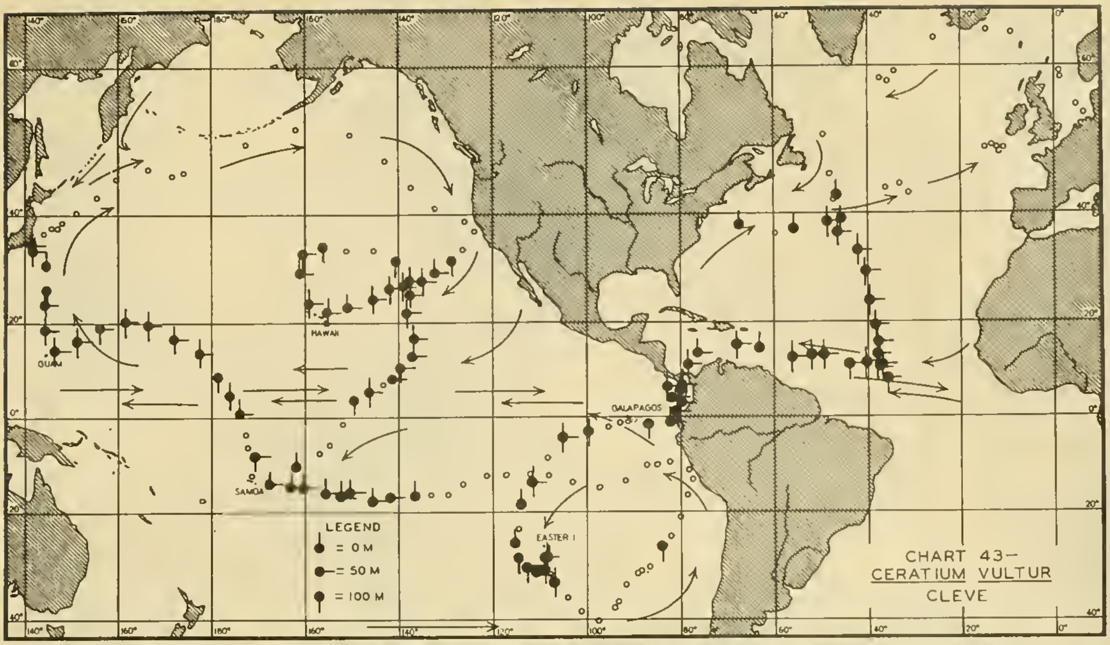


CHART 43—
CERATIUM VULTUR
CLEVE

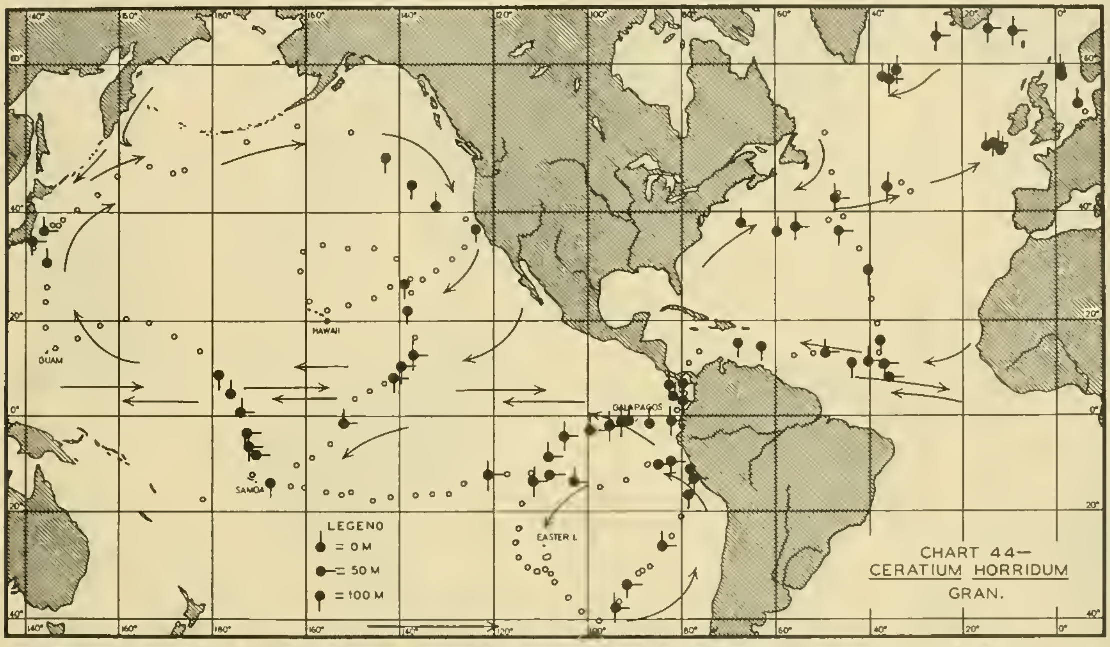


CHART 44—
CERATIUM HORRIDUM
GRAN.

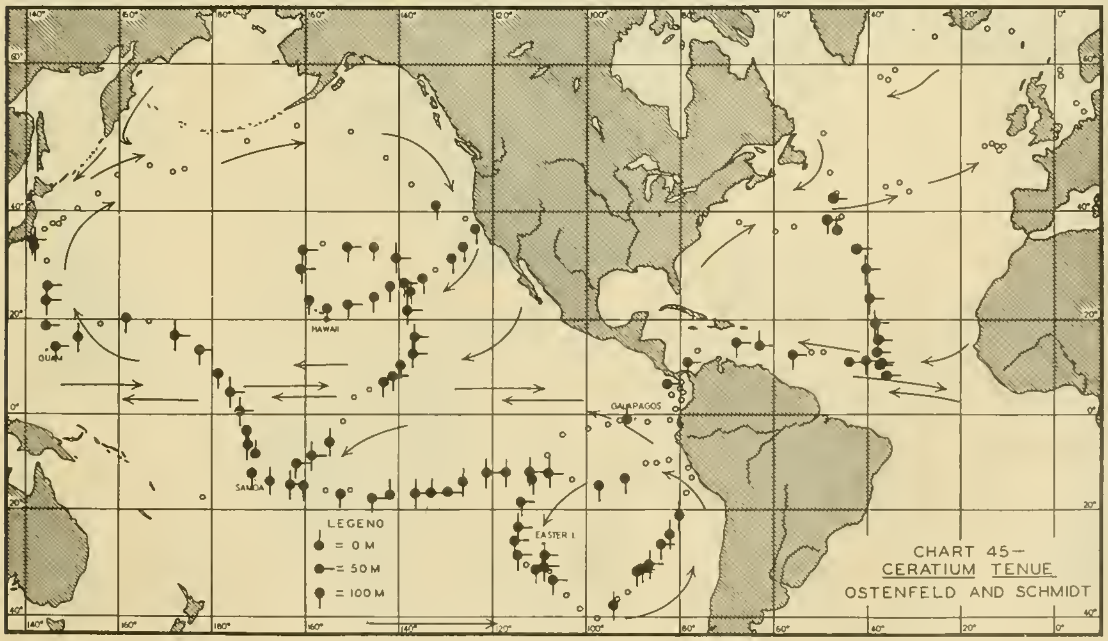
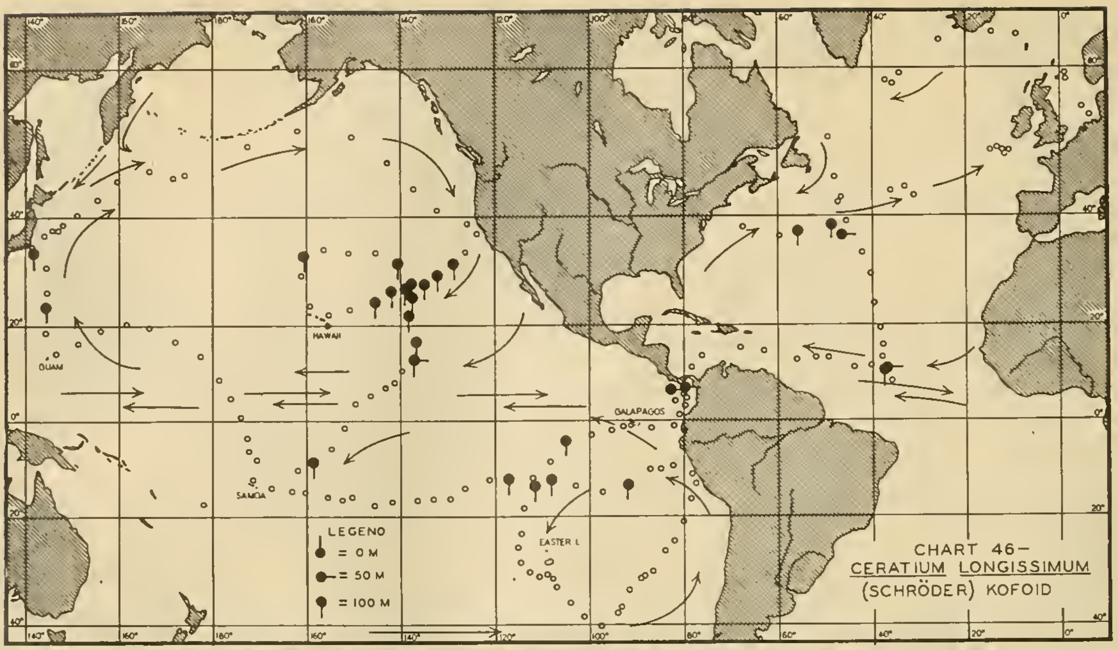
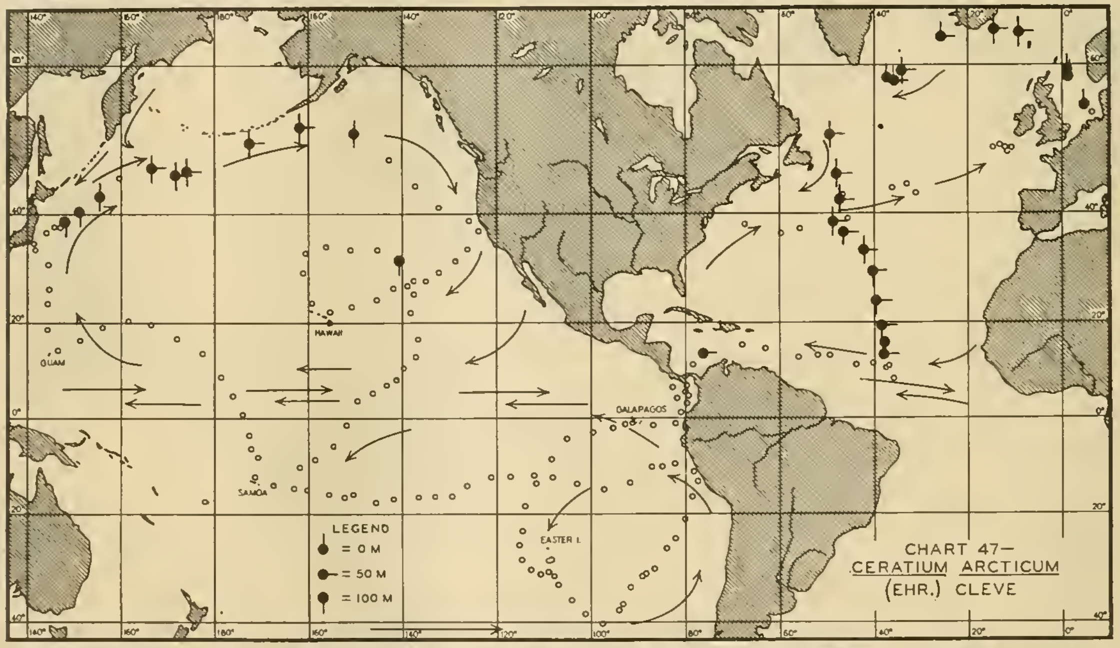
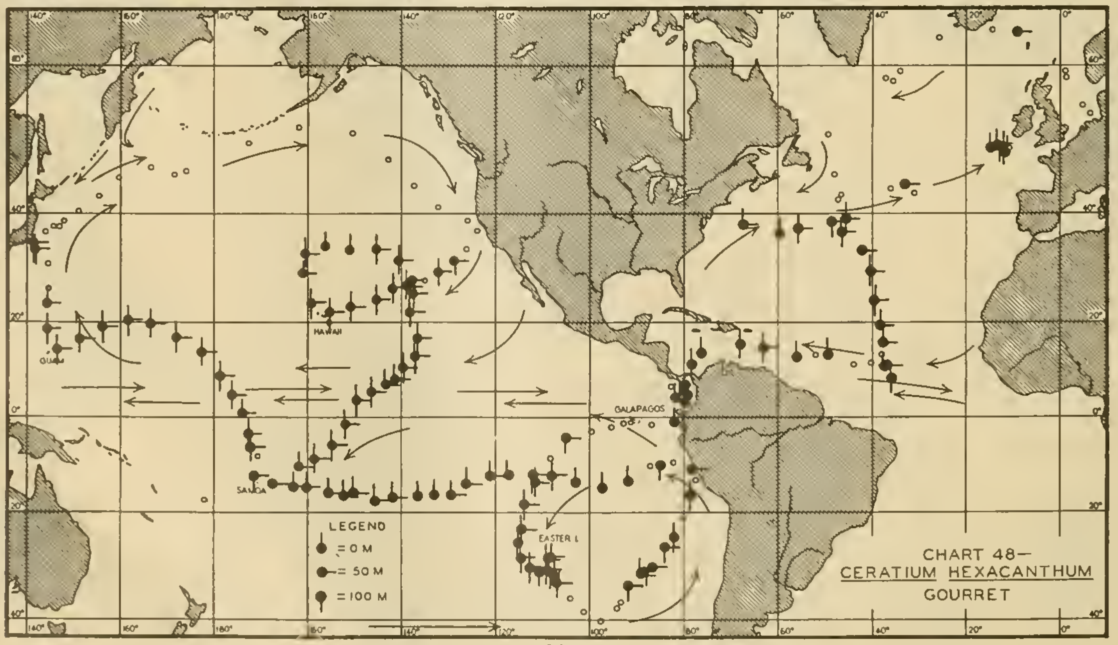
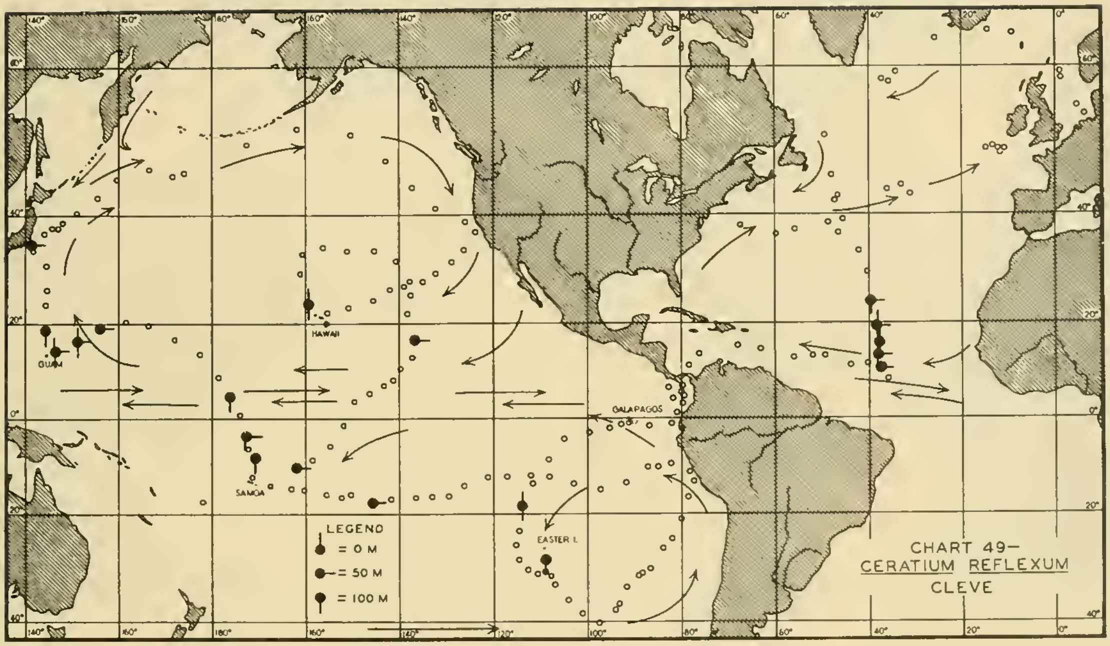


CHART 45—
CERATIUM TENUE
OSTENFELD AND SCHMIDT


HAWAII
GUAM
GALAPAGOS
SAMOA
EASTER I.
LEGEND
= 0 M
= 50 M
= 100 M
CHART 46—
CERATIUM LONGISSIMUM
(SCHRÖDER) KOFOID


HAWAII
GUAM
GALAPAGOS
SAMOA
EASTER I.
LEGEND
= 0 M
= 50 M
= 100 M
CHART 47—
CERATIUM ARCTICUM
(EHR.) CLEVE


HAWAII
GUAM
GALAPAGOS
SAMOA
EASTER I.
LEGEND
= 0 M
= 50 M
= 100 M
CHART 48—
CERATIUM HEXACANTHUM
GOURRET



GUAM
HAWAII
SAMOA
GALAPAGOS
EASTER I.
LEGEND
= 0 M
= 50 M
= 100 M
CHART 49—
CERATIUM REFLEXUM
CLEVE

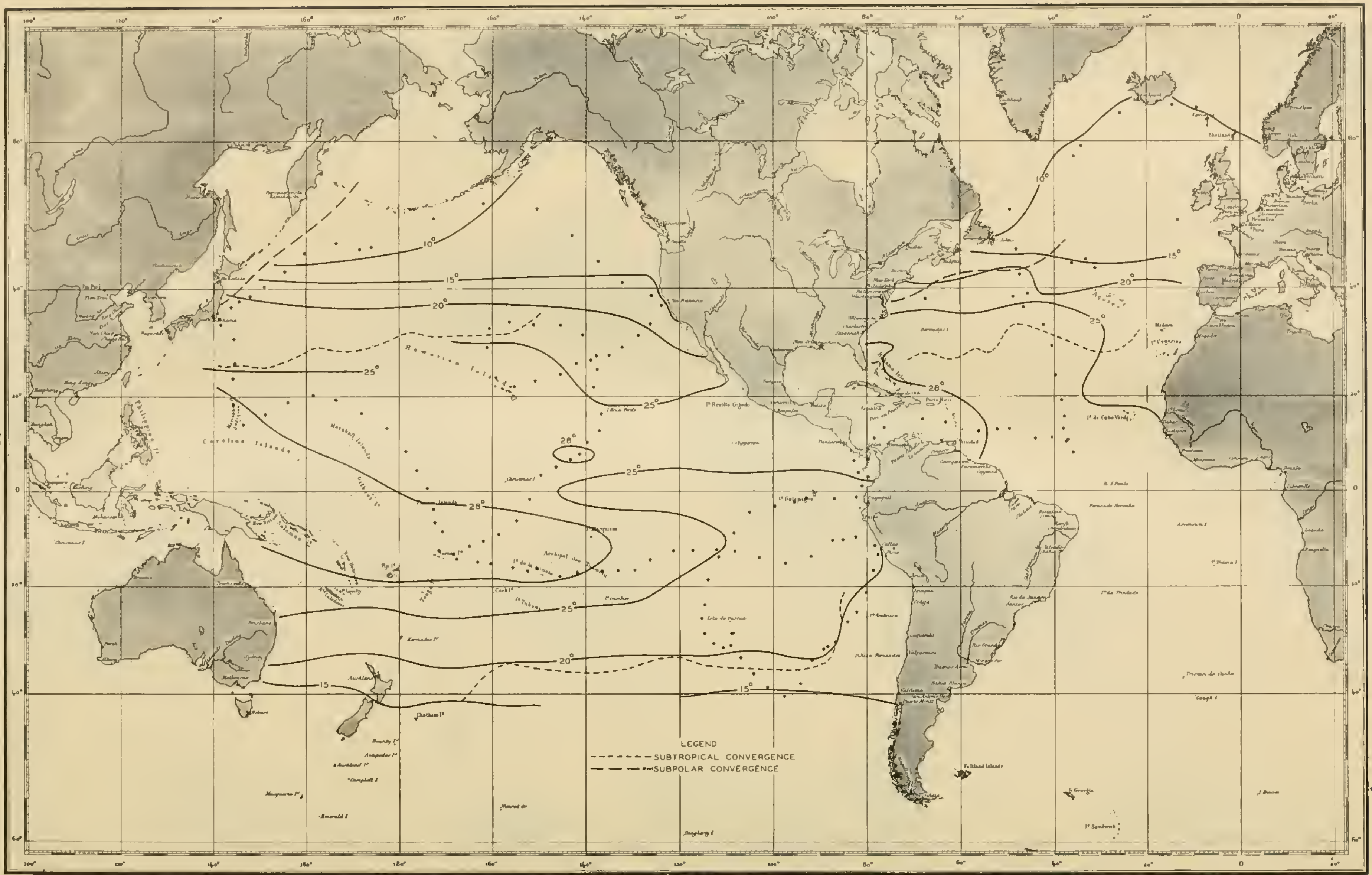


CHART 50—SURFACE TEMPERATURES, °C

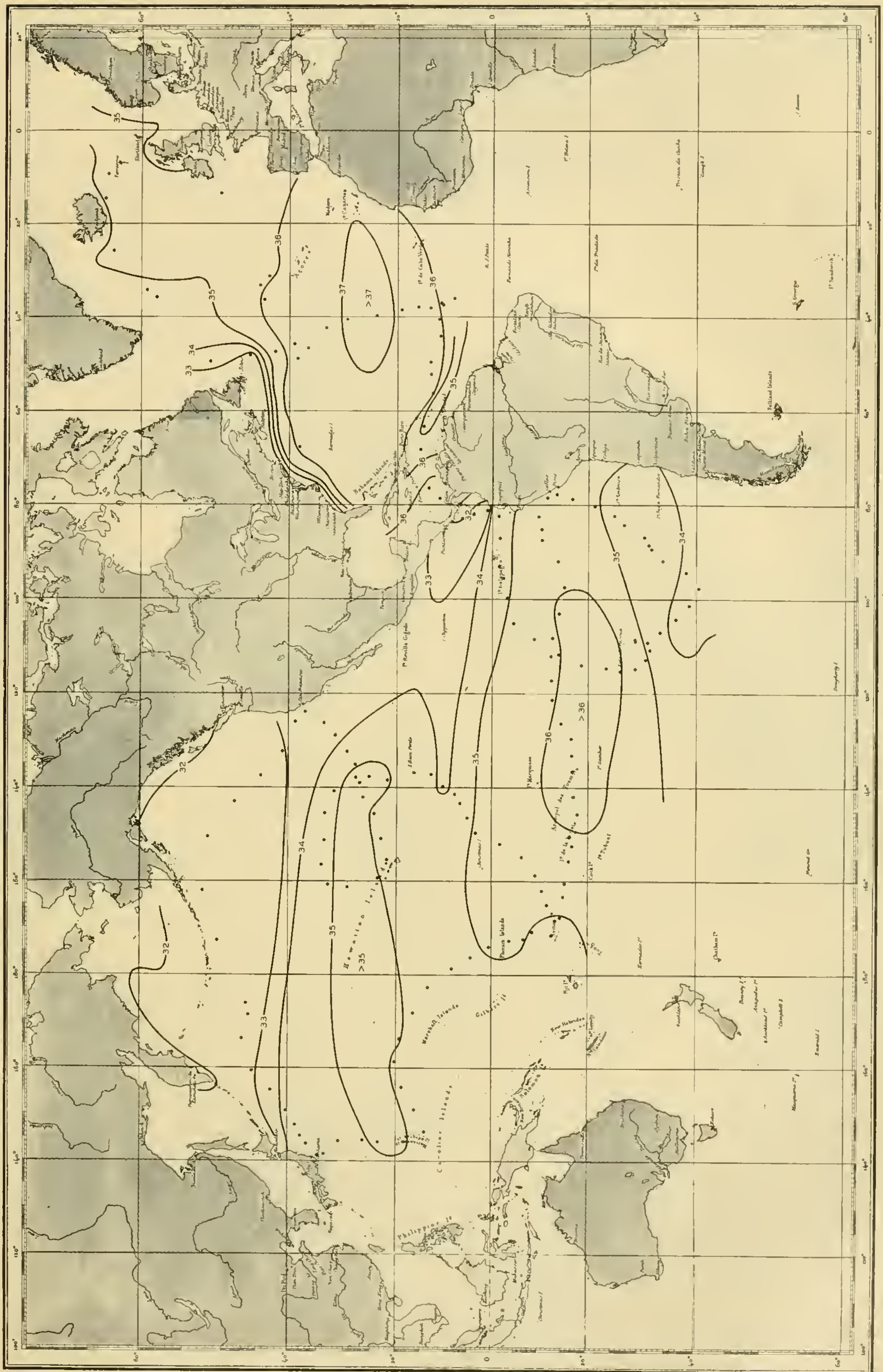


CHART 51—SURFACE SALINITIES IN 0/00

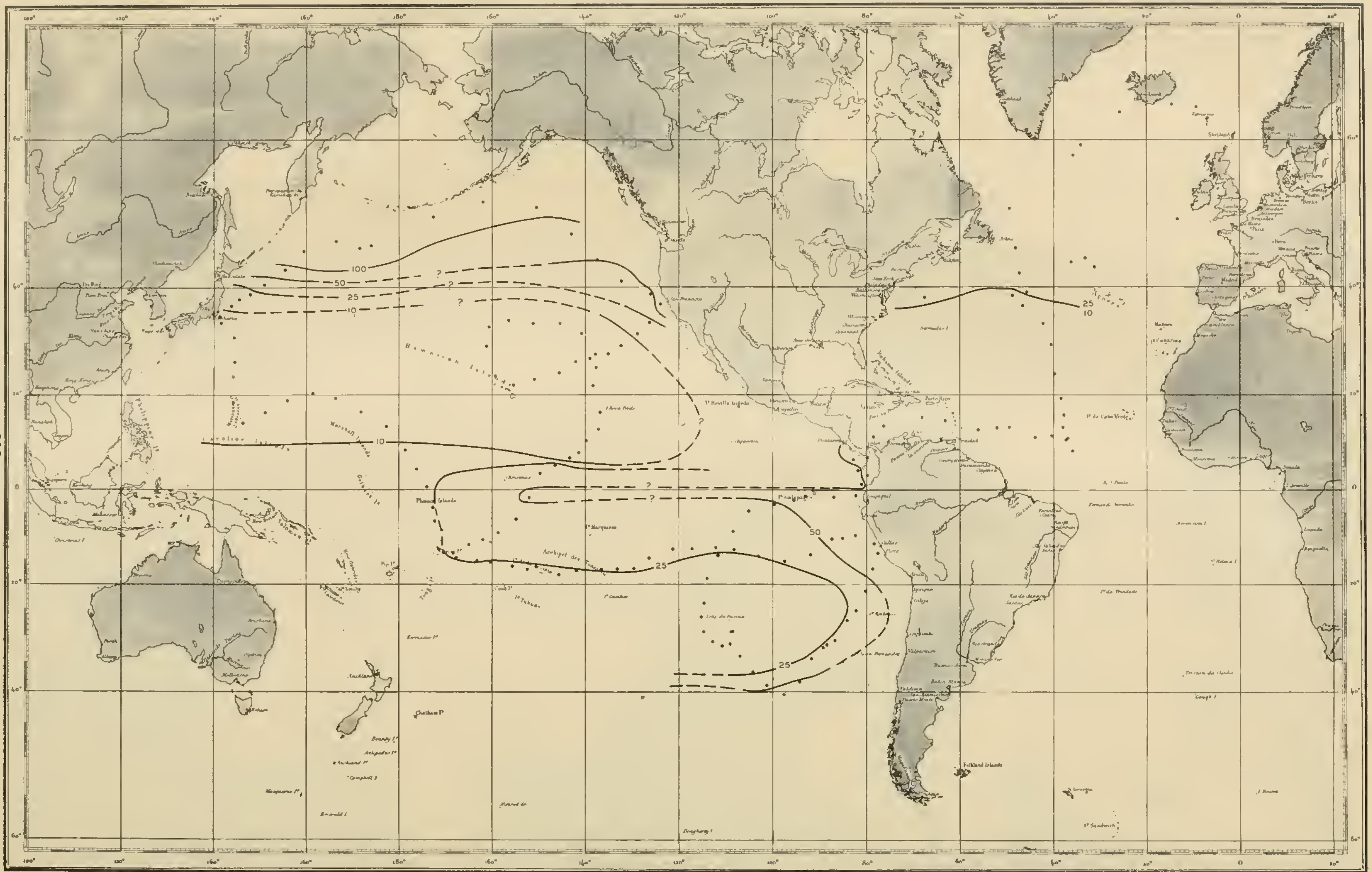


CHART 52—MEAN PHOSPHATE CONTENT OF UPPER 50 METERS, mg PO_4/m^3

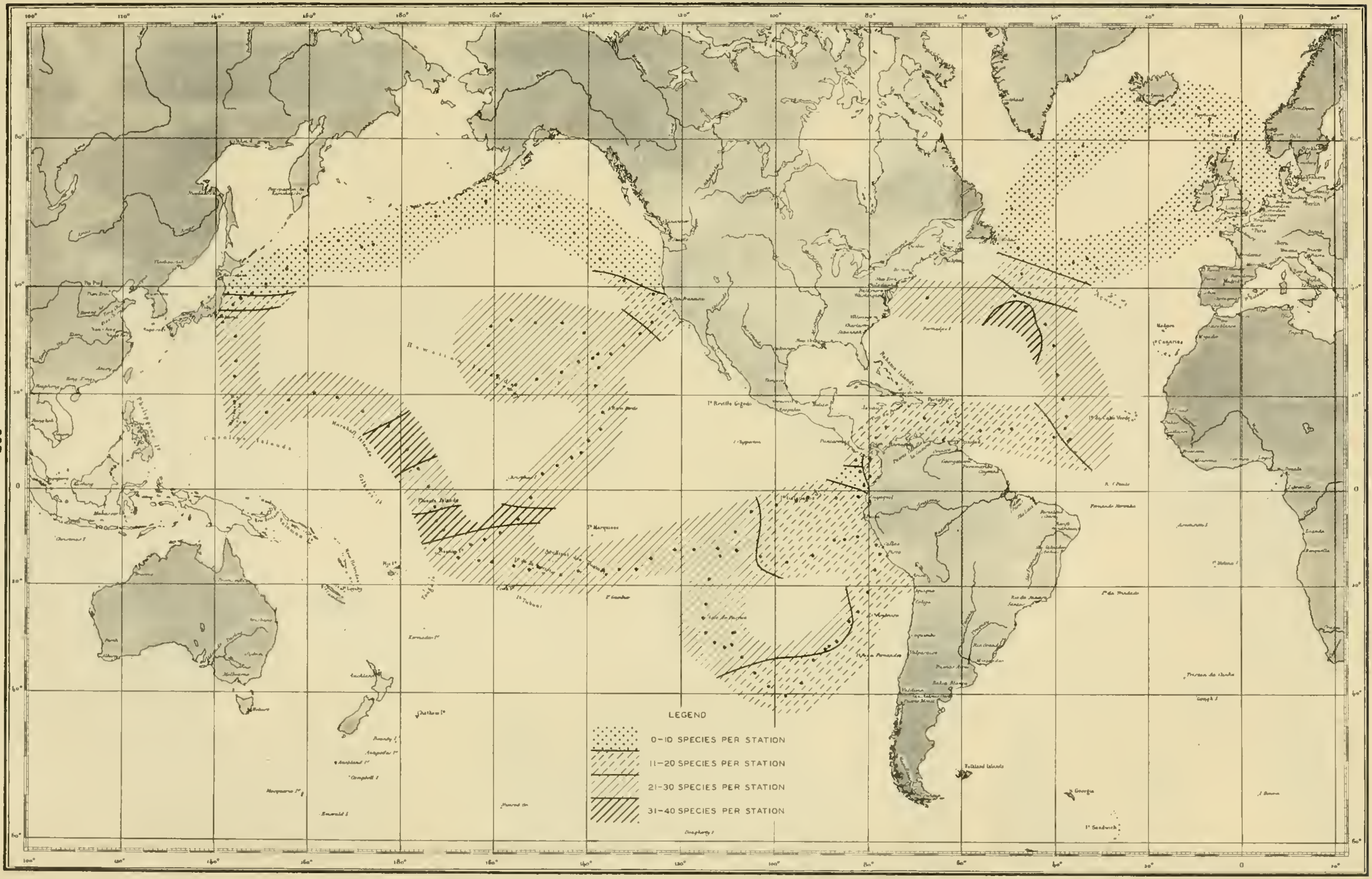


CHART 53—ZONES OF SPECIES-ABUNDANCE IN THE WATERS TRAVERSED BY THE CARNEGIE

CHART 54—CERATIUM LIFE ZONES IN THE WATERS TRAVERSED BY THE CARNEGIE

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