DEPARTMENT OF TERRESTRIAL MAGNETISM
J. A. Fleming, Director

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

# BIOLOGY—IV

# BIOLOGICAL RESULTS OF THE LAST CRUISE OF THE CARNEGIE





CARNEGIE INSTITUTION OF WASHINGTON PUBLICATION 555
WASHINGTON, D. C.
1943

This book first issued July 15, 1943

# 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 co-workers 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.

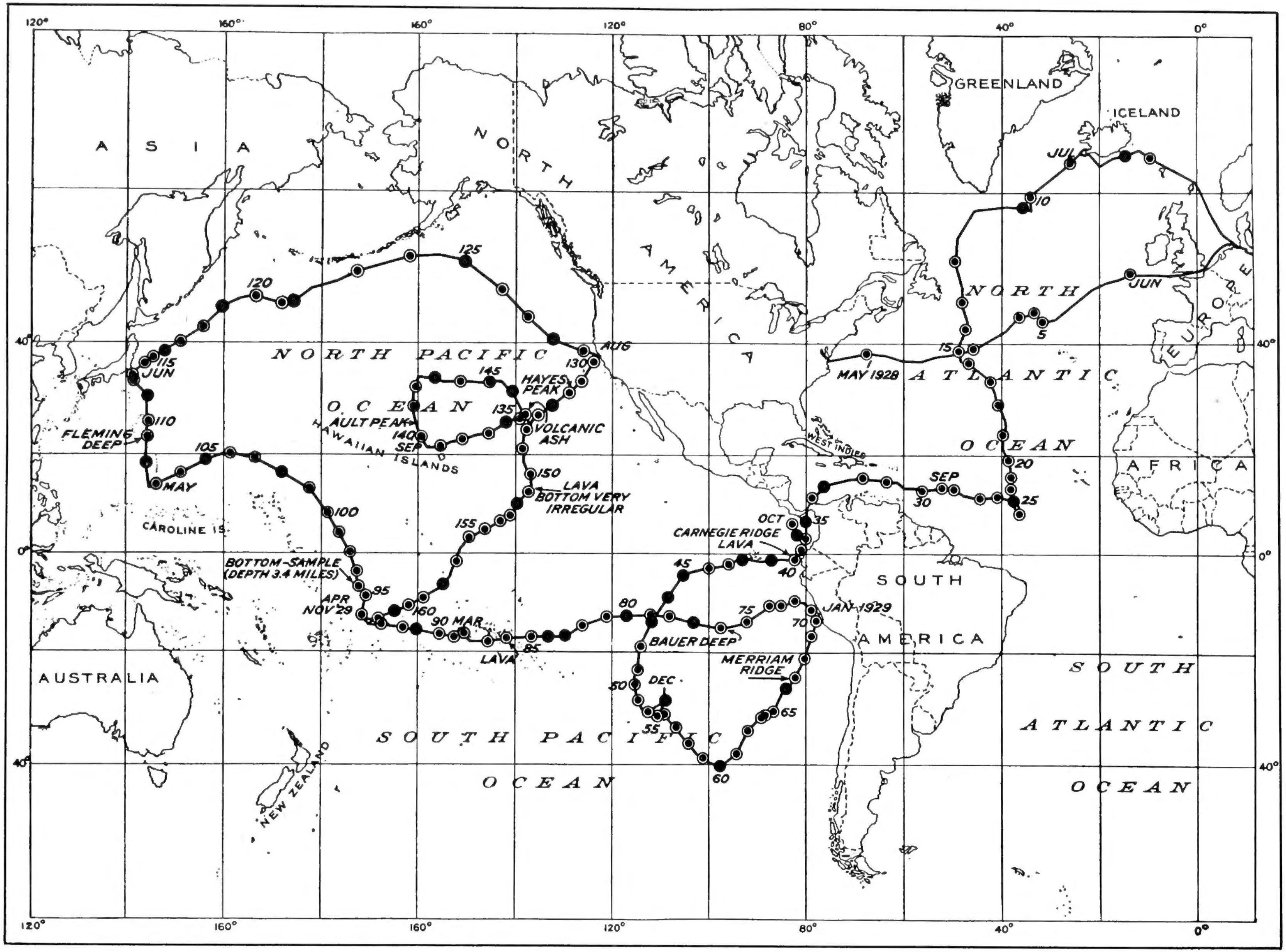
A general account of the expedition has been prepared and published by J. Harland Paul, ship's surgeon and observer, under the title The last cruise of the Carnegie, and contains a brief chapter on the previous cruises of the Carnegie, a description of the vessel and her equipment, and a full narrative 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 Zoōlogy 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 Laboratorim, 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 Peridinials. His memoir, "Studies in the morphology, taxonomy, and ecology of the Peridiniales," is Biology III of this series. He also examined and prepared a report on the "Phytoplankton" which is the first of twelve biological reports grouped in the present volume.

The macroscopic algae, gathered from the North Atlantic and South Pacific oceans, were examined by




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

(At the 35 stations marked ● true sea-water samples were also obtained for salinity calibrations)

Professor William Albert Setchell of the Department of Botany of the University of California.

A fairly large collection of polychaetous annelids was amassed, mostly from the open Pacific and Atlantic oceans. The annelid fauna of our high seas is most imperfectly known; of the twenty-eight species examined, fifteen, or more than half, are new. Professor Aaron L. Treadwell of the Department of Zoology of Vassar College made the examination of and report on these specimens.

A group of eighty-four specimens of Mysidacea were taken mainly from the open tropical Atlantic and Pacific oceans, away from land. Fifteen species, two of which are new to science, were identified and reported on by Dr. W. M. Tattersall of the Department of Zoology of the University College of South Wales.

Dr. Alexander Wetmore of the Smithsonian Institution of Washington identified the bird specimens and distributed the specimens of isopods, echinoderms, and lizard to J. O. Maloney, Austin H. Clark, and Miss Doris M. Cochran, respectively.

Fifty-seven specimens of insects and mites were sent to Harold Morrison at the United States Bureau of Entomology of the National Museum. Identifications were made by various investigators as noted under Miscellaneous Determinations. The examination of the Halobates was undertaken by Harry G. Barber of the United States Department of Agriculture.

The collection of Pyrosomidae contained but eight specimens, and these, with one exception, were too immature for identification as to species. Notes on the state of development, dimensions, etc., have been submitted by Dr. Hoyt S. Hopkins of the New York University; these will be of service to investigators interested in following up the development of the colony in Pyrosoma.

Among the collections of the Carnegie was one specimen of sponge found on the reef at Apia, Samoa, in April 1929, which has been identified as either Haliclona cinerea (Grant) new combination or Reniera cinerea (Grant) Schmidt by Dr. M. W. de Laubenfels.

The present volume is the sixth in the series "Scientific results of cruise VII of the Carnegie during 1928-1929 under command of Captain J. P. Ault." It is the fourth one devoted to Biological Reports.

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Director, Department of Terrestrial Magnetism

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BIOLOGICAL RESULTS OF LAST CRUISE OF CARNEGIE

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# THE PHYTOPLANKTON

HERBERT W. GRAHAM

below the stated level. Another uncertainty, caused by the wire angle, amounts to ± per cent. This error does not apply to the physical and chemical data.

No examination of the samples could be made on board ship because of the limited personnel and crowded program of other work. In the laboratory the samples were washed into 250-ml graduated cylinders and allowed to settle over night. Then the water was siphoned off, usually to about 20 ml, depending on the richness of the sample. This concentrate was vigorously stirred by blowing through it with a pipette after which 1 ml was taken up in the pipette. This milliliter of the sample was run into a Sedgwick-Rafter counting cell and ten random counts made of the diatom and dinoflagellate cells with the aid of a Whipple micrometer. The mean of the ten counts was taken and from this the number of cells per liter of sea water at the place of sampling was computed as described by Whipple (1927). By making duplicate samplings of the concentrated sample, the error of the method was computed to be within 10 per cent. No accuracy is claimed for values below 10 cells per liter.

The number of all diatom and dinoflagellate cells has been reported. The Coccolithophoridae escape through the net as do some of the smaller diatoms. Some of the dinoflagellates cannot be preserved. Other algal groups such as the Cyanophyceae and Chlorophyceae were extremely rare in the samples and have not been reported here. This report, therefore, is restricted to the diatoms and dinoflagellates that are to be found in net samples preserved in formaldehyde. Specific identifications have not been reported. They are of no particular significance in the present paper and complete lists of diatoms and dinoflagellates with the discussion of their distribution are reserved for other reports.

The water samples for chemical analysis and the temperatures were obtained by means of Nansen bottles, and Richter and Wiese reversing thermometers. Salinities were determined electrometrically with a Wenner salinity bridge (Wenner, Smith, and Soule, 1930). Dissolved oxygen was determined by the Winkler method (Jacobson, 1921), the percentage saturation being computed from the tables of Jacobsen (1925). Phosphates were determined by the Denigès method as described by Atkins (1925). For the estimation of silicates the method of Dienert and Wandenbulcke as modified by Atkins (1923) was employed. Standards as recommended by King and Lucas (1928) were used. Hydrogen-ion concentration was measured by means of a double-wedge comparator as described by Moberg (1926). For a more detailed description of the chemical analysis see the report of the physical and chemical results obtained on cruise VII of the **Carnegie** (in press). With a few exceptions the observations and collections were made in the morning between eight o'clock and noon ship's time.

## RESULTS

To simplify the discussion of the data the area investigated has been divided into three regions: (1) the southern region, lying south of latitude 20° south; (2) the tropical region, lying between latitudes 20° south and 20° north; (3) the northern region, lying north of latitude 20° north. Figure 1 shows the distribution of the stations in the regions and the relative abundance of diatoms and dinoflagellates at all stations.

### Southern Region

The southern region included nineteen stations (**Carnegie** stations 49 to 68 inclusive), all of which were in the southeastern Pacific between South America and longitude 120° west. The most southern station was number 60 at latitude 40° 24′ south. There were forty-eight samples collected in this region; eighteen at the surface, sixteen at 50 m, and 14 at 100 m.

This was apparently a barren region. Of the forty-eight samples eight contained no diatoms or dinoflagellates and thirty-nine had less than 50 cells. Only two samples had more than 50. One of these, the richest collected in the southern region, was taken at station 61 and contained 9 diatom and 111 dinoflagellate cells per liter.

The collections in this region were made in November and December 1928 and January 1929, the southern summer--a season during which a low plankton production would be expected.

The stations in the southern region were distributed in an area bounded by the edges of the Antarctic Drift, the Peruvian Currents, and the westward extension of the Peruvian Current. The only sample with more than 100 cells per liter occurred north of the Antarctic Drift.

### Tropical Region

The tropical region included fifty-five stations (**Carnegie** stations 35 to 48, 69 to 108, and 150 to 153) extending from Panama and Peru as far west as Guam. Fifteen stations were north of the equator and forty were in the southern hemisphere. In this region one hundred and forty-three samples were collected, including fifty-four at the surface, forty-eight at 50 m, and forty-one at 100 m.

This was another region of very scant plant life. Of the one hundred and forty-three samples collected, thirty-eight contained no diatoms or dinoflagellates and eighty-six of those containing cells had less than 50 per liter. Six samples contained between 50 and 100 cells. Only fourteen samples showed more than 100 cells per liter. Three of these were in the western part of the region, one in the north central, and the rest in the eastern part. The richest sample occurred at station 73 on the surface and contained 2065 diatom cells and 51 dinoflagellate cells per liter of water.

The collections in this region were made at widely separated dates--from Panama to station 48 during October and November 1928, from station 69 to Peru during January 1929, from Peru to Samoa during February and March 1929, from Samoa to station 108 during April and May 1929, and stations 150 to 153 during October 1929.

The stations in this region lay in the North Equatorial, South Equatorial, Counter Equatorial, and Peruvian currents, and in adjoining waters. Four of the thirty-eight samples with over 100 cells per liter were widely separated in the equatorial currents; the remainder were in the Peruvian Current and its continuation into the South Equatorial Stream.

### Northern Region

The northern region included forty stations between **Carnegie** stations 109 and 149, which were in the eastern and western Pacific and along a great circle course between Yokohama and San Francisco. The most northern station was number 124 at latitude 52° 19′ north. In this region one hundred and twelve samples were taken: thirty-nine at the surface, forty at 50 m, and thirty-three at 100 m.

This was by far the richest region visited. Only thirteen samples of the one hundred and twelve contained no diatoms or dinoflagellates, sixty had less than 50 cells, nine counts were between 50 and 100, and thirty had more than 100 cells--of the last fourteen had more than 1000. The richest sample obtained on the entire cruise was taken at 50 m at station 115. It contained 16,954 diatom cells and 26 dinoflagellate cells per liter.

All but one of these very rich samples were confined to the cruise between Yokohama and San Francisco, at stations 115 to 125. The other rich station (131) was about 300 miles southwest of San Francisco.

The dates for the collections in this region were as follows: from station 109 to Japan, May; Japan to the United States, June and July; southwest of the United States, September and October, 1929.

The stations in this region lay near the center of the North Pacific vortex and in the currents surrounding it. In general, the richer samples occurred in the regions of more rapid currents and nearer land, further removed from the center of the vortex. Samples with more than 100 cells per liter occurred in the Kuroshio or Japan Current (beginning with station 115), in its continuation--the North Pacific Drift--in the California Current, and in the water flowing westward from this current. Stations located in the central part of the North Pacific, in the northern edge of the North Equatorial Current, and south of Japan contained less than 100 cells and most of them less than 50 cells per liter.

## DISCUSSION

### Comparison of the Regions

A summary of the physical, chemical, and phytoplankton data for the three regions is presented in tables 1 and 2. The highest mean temperatures for the three levels occurred in the tropical region and the lowest in the norther region (except at the surface). The range of temperature was much greater in the northern region with some values far below any in the other regions. The tropical region had the next greatest range.

The mean salinities were highest in the tropical region and lowest in the northern region. The range was greatest in the north and would have been lowest in the tropics except for the low salinity of the surface water in the Gulf of Panama.

The hydrogen-ion concentration was greatest in the south and lowest in the north. The range was greatest in the north and least in the south.

The highest mean phosphates occurred in the north, where also the greatest range occurred. The lowest means were in the south where the range was also lowest.

Table 1. Summary of the diatom and dinoflagellate counts (in cells per liter) in the northern, tropical, and southern regions of the Pacific, showing the number of samples occurring in selected groups

| Region | Depth in meters | No. of samples containing cells | | | | No. cells in richest sample |
|---|---|---|---|---|---|---|
| | | 0 | 1-100 | 100-1000 | Over 1000 | |
| Northern | 0 | 2 | 19 | 10 | 8 | 13,800 |
| | 50 | 5 | 26 | 5 | 4 | 17,000 |
| | 100 | 6 | 24 | 1 | 2 | 1,800 |
| Tropical | 0 | 10 | 33 | 10 | 1 | 2,100 |
| | 50 | 11 | 35 | 2 | 0 | 200 |
| | 100 | 16 | 24 | 1 | 0 | 150 |
| Southern | 0 | 0 | 17 | 1 | 0 | 120 |
| | 50 | 3 | 13 | 0 | 0 | 20 |
| | 100 | 4 | 10 | 0 | 0 | 10 |

Highest mean oxygen saturations occurred in the northern region, the lowest in the tropical region. The greatest ranges occurred in the tropics and the lowest ranges in the south. The oxygen data are meager here, however.

Silicate data are available for only the tropical and northern regions. The means were lower at northern stations except at the surface. The ranges were greater in the north except at the 100-m level.

The **Carnegie** plankton series is not well distributed throughout the seasons. Since the ship's itinerary was planned to take it into the summer in each hemisphere, it usually was passing through the tropics in the spring and fall, seasons characterized in higher latitudes by diatom maxima. No collections were made outside the tropics in the spring, but samples were obtained in September 1929 in higher latitudes between San Francisco and Honolulu. Indication of an outburst of diatoms was found at station 131.

In regard to the density of population of diatoms and dinoflagellates, all three sections, on the whole, were regions of very scant plant life (see table 1). The only exception to the otherwise consistently poor areas was the region along the Kuroshio Current between stations 115 and 123, unless the area off the coast of Peru be considered also, at least as a potentially rich area (see figure 1).

In regard to the vertical distribution of the plankton there is no indication that the phytoplankton is more abundant at the 50- and 100-m levels than at the surface. Of the one hundred and fourteen stations occupied, only twenty-eight showed richer samples at a level below the surface. Half of these were in the tropics.

### Dinoflagellates

It is well known that dinoflagellates, although more diversified in form in the tropics, are more numerous in individuals in the higher latitudes. In the **Carnegie** samples the dinoflagellates never attained very large numbers. In the south only one sample contained more than 100 cells per liter. In the north only two samples showed 100 or more cells per liter, and in the tropics there were no counts of dinoflagellates as great as one hundred.

sented by only two samples (0.09 to 0.29 lower). Mean phosphates for the richer samples are higher in every case except one, which is represented by only two sam-

Table 2. Summary of the physical and chemical data and phytoplankton counts from **Carnegie** collections, 1928-1929, in the northern, tropical, and southern regions of the Pacific Ocean

| Region | Depth in meters | No. of stations | Maximum | Minimum | Mean | No. of stations | Maximum | Minimum | Mean | No. of stations | Maximum | Minimum | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Temperature, °C | | | | Hydrogen-ion, pH values | | | | Oxygen saturation, o/o | | |
| Northern | 0 | 39 | 27.40 | 2.15 | 19.17 | 38 | 8.47 | 7.96 | 8.23 | 20 | 101 | 96 | 98 |
| | 50 | 40 | 26.90 | 2.15 | 16.38 | 39 | 8.39 | 7.90 | 8.20 | 20 | 118 | 96 | 102 |
| | 100 | 33 | 25.50 | 1.60 | 14.11 | 32 | 8.39 | 7.64 | 8.14 | 16 | 112 | 51 | 96 |
| Tropical | 0 | 54 | 29.48 | 19.56 | 25.95 | 53 | 8.47 | 8.03 | 8.22 | 6 | 97 | 83 | 93 |
| | 50 | 48 | 29.30 | 14.15 | 23.92 | 47 | 8.44 | 7.80 | 8.15 | 5 | 95 | 15 | 76 |
| | 100 | 41 | 28.50 | 11.35 | 22.00 | 40 | 8.36 | 7.68 | 8.12 | 6 | 95 | 1 | 51 |
| Southern | 0 | 19 | 23.43 | 14.97 | 18.35 | 19 | 8.27 | 8.05 | 8.15 | 2 | 93 | 93 | 93 |
| | 50 | 16 | 22.55 | 13.45 | 17.45 | 16 | 8.26 | 8.05 | 8.13 | ... | ..... | ..... | ..... |
| | 100 | 14 | 21.60 | 10.60 | 15.38 | 14 | 8.25 | 8.01 | 8.11 | 1 | 98 | 98 | 98 |
| | | | Salinity, o/oo | | | | Phosphate, mg/m$^3$ | | | | Silicate, mg/m$^3$ | | |
| Northern | 0 | 39 | 35.38 | 32.63 | 34.21 | 37 | 142 | 3 | 34 | 15 | 0.89 | 0.26 | 0.53 |
| | 50 | 40 | 35.26 | 32.68 | 34.17 | 38 | 178 | 3 | 44 | 16 | 1.60 | 0.20 | 0.55 |
| | 100 | 33 | 35.17 | 32.78 | 34.21 | 31 | 228 | 3 | 60 | 12 | 1.00 | 0.26 | 0.60 |
| Tropical | 0 | 54 | 36.44 | 29.70 | 35.02 | 54 | 103 | 4 | 26 | 3 | 0.52 | 0.27 | 0.37 |
| | 50 | 48 | 36.49 | 34.42 | 35.31 | 47 | 180 | 4 | 44 | 3 | 1.50 | 0.20 | 0.77 |
| | 100 | 41 | 36.36 | 34.60 | 35.41 | 40 | 234 | 4 | 58 | 3 | 1.75 | 0.20 | 0.88 |
| Southern | 0 | 19 | 36.17 | 33.91 | 34.86 | 19 | 50 | 8 | 22 | ... | ..... | ..... | ..... |
| | 50 | 16 | 36.06 | 33.96 | 34.73 | 16 | 60 | 9 | 27 | ... | ..... | ..... | ..... |
| | 100 | 14 | 35.94 | 33.99 | 34.65 | 14 | 80 | 10 | 34 | ... | ..... | ..... | ..... |

Although they never attained the great numbers that were sometimes reached by the diatoms, the dinoflagellates in the poorer samples often outnumbered the diatoms. In the southern region twenty-nine samples out of the forty-eight (60 per cent) contained more dinoflagellates than diatoms, whereas for the northern region this applied for sixteen samples out of one hundred and twelve (14 per cent), and in the tropical region for thirty out of one hundred and forty-three (21 per cent). The dinoflagellates outnumbered the diatoms in twenty-five per cent of all the samples.

## Density of Phytoplankton and Environmental Factors

In regions which have such a wide variation in conditions, and where the plankton life is so poor generally, it would seem that no correlations could be found between the abundance of plankton and environmental conditions. If we arbitrarily separate the samples, however, into those showing less than 100 combined diatom and dinoflagellate cells per liter and those with more than that number, and compare the data accompanying them, some interesting relations stand out. Table 3 shows the mean values for certain environmental factors investigated for the waters containing over 100 cells per liter and for those containing less than 100 cells for each level in each region. It will be seen that the mean temperatures for samples with over 100 cells are lower in all cases (3.°41 to 8.°77 C lower). The mean salinities for the richer samples are consistently lower (0.03 to 0.99 o/oo lower). In the richer samples the pH values are lower except in one case where the mean is repre-

ples (17 to 103 mg $PO_4$ per cubic meter higher). As regards the percentage saturation of oxygen, in one case the oxygen means for the richer and poorer samples is the same, in three instances the mean saturation is less in the richer samples, and in one case it is greater. The meager silicate data do not suggest any correlations between number of plant cells and silicate content of the water.

To summarize we may say that in general the richer samples occurred in water of lower temperature, lower salinity, lower pH, and higher phosphate content, whereas little correlation could be found between numbers of plant cells and percentage saturation of oxygen, or between numbers of plant cells and quantity of dissolved silicate.

Before discussing these relations further, let us compare conditions in the open ocean where plankton is scarce, with conditions in a coastal region where high productivity is the usual thing. Bigelow and Leslie (1928) investigated the waters of Monterey Bay, California, in July 1928. Although their work was carried on in midsummer when phytoplankton is usually not expected to be most abundant, yet they report over one million diatom cells per liter as the average for the bay. This, therefore, represents an area with water favorable for diatom production. Table 4 shows a comparison of the Monterey Bay surface conditions with those at the **Carnegie** northern stations. The **Carnegie** stations presented here were occupied from May to October 1929. The data in this table tend further to show that relatively low temperature, low salinity, high hydrogen-ion concentration, and high phosphates are indicative of productive waters, the conclusions arrived

Table 3. Comparison of the physical and chemical data for water containing more than 100 diatom and dinoflagellate cells per liter with that found to contain less than that number from **Carnegie** collections, 1928-1929, in the northern, tropical, and southern regions of the Pacific Ocean

| Region | Depth in meters | Means for number of samples with | | | | | |
|---|---|---|---|---|---|---|---|
| | | >100 cells | <100 cells | >100 cells | <100 cells | >100 cells | <100 cells |
| | | Temperature, °C | | Hydrogen-ion, pH values | | Oxygen saturation, o/o | |
| Northern | 0 | 14.23 (17) | 23.00 (22) | 8.14 (16) | 8.30 (22) | 98 (5) | 98 (15) |
| | 50 | 11.92 (10) | 17.87 (30) | 8.11 (9) | 8.22 (30) | 99 (4) | 103 (16) |
| | 100 | 10.45 (2) | 14.34 (31) | 8.15 (2) | 8.14 (30) | 100 (1) | 96 (15) |
| Tropical | 0 | 23.24 (12) | 26.72 (42) | 8.15 (12) | 8.24 (41) | 83 (1) | 95 (5) |
| | 50 | 20.55 (2) | 24.07 (46) | 8.04 (2) | 8.16 (45) | 15 (1) | 91 (4) |
| | 100 | 13.90 (1) | 22.20 (40) | 7.84 (1) | 8.13 (39) | ........... | 51 (6) |
| Southern | 0 | 16.90 (1) | 20.31 (18) | 8.05 (1) | 8.15 (18) | ........... | 93 (2) |
| | 50 | ............ | 17.45 (16) | .......... | 8.13 (16) | ........... | ........... |
| | 100 | ............ | 15.38 (14) | .......... | 8.11 (14) | ........... | 98 (1) |
| | | Salinity, o/oo | | Phosphate, mg/m$^3$ | | Silicate, mg/m$^3$ | |
| Northern | 0 | 33.65 (17) | 34.64 (22) | 69 (15) | 11 (22) | 0.26 (2) | 0.57 (13) |
| | 50 | 33.83 (10) | 34.29 (30) | 92 (8) | 31 (30) | 0.30 (1) | 0.57 (15) |
| | 100 | 33.71 (2) | 34.24 (31) | 84 (1) | 59 (30) | ........... | 0.60 (12) |
| Tropical | 0 | 35.00 (12) | 35.03 (42) | 39 (12) | 22 (42) | ........... | 0.37 (3) |
| | 50 | 34.74 (2) | 35.33 (46) | 30 (2) | 44 (45) | 1.50 (1) | 0.40 (2) |
| | 100 | 34.99 (1) | 35.42 (40) | 159 (1) | 56 (39) | ........... | 0.88 (3) |
| Southern | 0 | 34.05 (1) | 34.91 (18) | 46 (1) | 21 (18) | ........... | ........... |
| | 50 | ............ | 34.73 (16) | .......... | 27 (16) | ........... | ........... |
| | 100 | ............ | 34.65 (14) | .......... | 34 (14) | ........... | ........... |

at from a study of the **Carnegie** data alone. They further indicate that the abundance of diatoms bears little relation to the silicate content of the water or to the percentage saturation with oxygen during the summer at least.

Conditions at La Jolla (Allen, 1928) on the coast of southern California during the second quarter of the year when diatom production is the greatest, are similar to conditions at Monterey in July, so that region will not be discussed.

Lewis (1927) in studying surface catches of phytoplankton off the coast of Oregon concludes that the colder water is more favorable for the production of diatoms. Water with temperatures below 11° C maintained a greater production than water above that temperature.

Table 4. Comparison of surface conditions at **Carnegie** northern stations with those at Monterey Bay

| Element | Carnegie stations (cells per liter) | | Means at Monterey Bay for July 1928 |
|---|---|---|---|
| | 100 | 100 | |
| Temperature, °C | 23.00 | 14.23 | 13.40 |
| Salinity, o/oo | 34.64 | 33.65 | 33.87 |
| pH | 8.30 | 8.14 | 8.14[a] |
| $PO_4$, mg/m$^3$ | 11 | 69 | 48 |
| $SiO_2$, gm/m$^3$ | 0.57 | 0.26 | 0.40 |
| $O_2$, per cent total | 98 | 98 | 99 |

[a] Since Bigelow and Leslie did not include pH determinations in their analyses, this value is the approximate mean of the second quarter of four years at La Jolla, California, taken from Moberg (14).

## VERTICAL CIRCULATION AND REPLENISHMENT OF NUTRIENTS

The data presented here show that certain conditions usually accompany a growth of phytoplankton. In any study of the relation between the abundance of phytoplankton and environmental factors, the characteristics of a phytoplankton pulse must be kept in mind. Atkins (1928) and others have found that when favorable conditions occur, such as an abundance of nutrient salts and sufficient illumination, a rapid growth of phytoplankton is initiated which continues until the nutrients are exhausted. If one were to examine the plankton and the existing conditions of the environment at different times during the progress of the pulse, different correlations would be found at different stages. Just before the rapid growth begins there is a sparse population in the presence of favorable conditions, such as high concentrations of nutrients. In other words, there is a negative relation between abundance of plankton and abundance of nutrients. After rapid growth has started there is a dense population occurring with comparatively high concentrations of nutrients, or a positive relation between abundance of phytoplankton and of nutrients. Near the close of the pulse, when the nutrients are practically depleted, there is a dense population in the presence of low concentrations of nutrients which presents a negative relation again. Still further, after the close of the pulse, the decay of the organic detritus may result in a regeneration of nutrients in the upper levels which creates another minor pulse, but before this pulse begins there occur together again high concentrations of nutrients and a sparse population of phytoplanktonic organisms, a negative relation again.

It is obvious, therefore, that any correlations between the abundance of phytoplankton and the abundance of nutrients, which are drawn from observations made at any particular instant during a phytoplankton pulse, are meaningless unless the stage in the development of the pulse is considered, for, during a single pulse, every possible combination of the two factors occurs. Such a phytoplankton pulse as described, however, can run its course only when there is a single supply of nutrients which is not augmented during the pulse. Such a situation is characteristic of cold-temperate regions. In these latitudes a supply of nutrients is brought to the upper levels during the winter when the absence of strong thermal stratification permits considerable vertical circulation. In the early spring a phytoplankton pulse probably is initiated by an increased amount of light. At the same time the temperature of the upper strata begins to rise and the body of water attains a more stable condition so that nutrients are no longer supplied in great quantities from lower depths. It must also be remembered that the abundance of plankton in high latitudes is of a higher order of magnitude than that in lower latitudes so that the phytoplankton still existing after the close of a typical northern pulse or "bloom" may be large as compared with that ordinarily found in other regions.

The vertical stability of the water probably has more to do with the abundance of plankton than any other factor. Whatever is the chemical substance limiting growth at any particular time, it probably occurs in abundance in the deep water where organic remains are decomposing and any vertical circulation of the water that brings the deep water to the photosynthetic zone will increase the fertility of that zone. Various investigators, viz., Gran (1912 and 1928), Ruud (1932), Marshall and Orr (1927), and Atkins (1928) have shown that the development of the phytoplankton is dependent on a replenishment of the supply of such nutrient salts as nitrates and phosphates in the photosynthetic zone, and that such a replenishment can usually take place only by some type of vertical circulation which carries quantities of these salts from the rich stores in the deeper water.

At Carnegie stations the richer plankton samples were obtained in regions where the surface water had characteristics of subsurface water, whereas the poorer samples were obtained mostly in regions where a strong stratification of the water caused the conditions in the surface water to be considerably different from those in the deep water. Figure 2 shows the vertical distribution of temperature, salinity, density, phosphate, and pH in the upper 1000 m at station 137 in the North Pacific where there was little circulation of any nature. Conditions here were typical of regions in which the plankton population was extremely scanty. It is evident in figure 2 that any vertical circulation which would renew the phosphate at the surface would have to extend to more than 200 m, for there was practically no phosphate in the water to that depth. It is equally evident from the temperature and density curves that there was a very pronounced thermocline and stratification of the water above 700 m so that there would be considerable resistance to any such vertical mixing.

We may now inspect conditions in two regions where the phytoplankton was relatively abundant, namely, south of the Aleutian Islands and off the coast of Peru. Conditions at the former region are represented by station 122 in figure 3 and at the latter by station 70 shown in figure 4. At station 122 there was an admixture of cold water of low salinity from the Bering Sea where vertical mixing is common. At station 70 there was an upwelling of water from a depth of about 500 to 700 m. At these two stations the difference in density between the surface water and the deep water is relatively not so great and the most rapid gradient is in the upper 100 m. Consequently, there is less resistance to vertical mixing and this fact is reflected in the higher concentrations of phosphate at the surface and in the correspondingly high concentration in the upper 500 m. At station 70, however, this is owing partly to the upwelling of subsurface water. Any vertical circulation which extended to the 100-m level at these stations would carry great quantities of phosphate to the surface layer for there were high concentrations at that depth. These observations were made in the summer when the most stable conditions occur. In the winter there would be an even greater replenishment of the nutrients in the upper levels. Although phytoplankton pulses may occur in these regions, it is probable that there is always a greater production here than in such regions as represented by station 137.

To return to the correlations discussed above, the richer phytoplankton samples were found in water of lower temperature, salinity, and pH, and of higher phosphate content. A glance at figures 2, 3, and 4 will show that any vertical circulation that carries phosphate-rich water to the surface and thus increases the fertility of the surface water will also lower the temperature and pH of that water. Under such conditions the salinity of the surface water may be increased or decreased. For example, in figures 2 and 3 there is an increase in salinity with depth, but in figure 4 there is a decrease. It is also evident in figure 2 that a transport of water from lower levels should increase the silicate content of the surface water, and it is probable that a correlation between silicate content and abundance of phytoplankton similar to that between phosphate content and abundance of phytoplankton would be found if the silicate data were as extensive as those for phosphate.

It is well known that the cold waters of high latitudes support the greatest production of plankton. It is probable that low temperature, per se, is not particularly favorable for plankton growth except as it affects the particular species which are now adapted to low temperatures. The more abundant life of the colder seas is probably only indirectly related to low temperatures. Lower surface temperatures cause less stable conditions and thus permit a more rapid renewal of the fertility of the photosynthetic zone.

## DISSOLVED OXYGEN IN THE PHYTOSYNTHETIC ZONE

A study of the dissolved oxygen in the photosynthetic zone reveals an interesting situation. Of the twenty stations (stations 130 to 149) in the northern region at which oxygen determinations were made, all but two showed supersaturation in the upper 100 m. Figure 5 shows the vertical distribution curve of percentage saturation of oxygen at station 145 which is characteristic of the region. Supersaturation occurred here between

20 and 80 m. Now the question arises as to the source of this oxygen. It cannot have been brought up from lower levels because the adjoining water was deficient in oxygen. It is very unlikely that a thin horizontal layer could move in from some region rich in oxygen along this high level where vertical mixing so often occurs. Furthermore, the temperature and salinity data do not permit such a conclusion. The only other possible source of oxygen is the photosynthetic organisms inhabiting the upper strata of water. Of the twenty oxygen stations, only six produced samples with more than 100 diatom and dinoflagellate cells per liter, and at only one of these were samples collected giving over 1000 cells per liter. Zero counts were obtained at a subsurface level at four of these stations. It does not seem possible that such a low population of diatoms and dinoflagellates could produce such an excess of oxygen. There are two possible explanations for this condition. Either there is present in the upper 100 m a large population of photosynthetic organisms which pass through the ordinary filter net, or else it is possible for a layer of water to exist in the ocean at this level and maintain its supersaturation with respect to oxygen after the phytoplankton, which has produced the oxygen, has disappeared. The latter explanation is hardly tenable except for regions where the water strata are in a very stable condition.

Gran (1912) found in the Atlantic that the Coccolithophoridae, which readily passed through the finest net, far outnumbered the diatoms and dinoflagellates which were retained in the net. It was doubted, however, if the photosynthetic activity of such small organisms, even in such large numbers, could surpass that of the larger forms occurring in smaller numbers. The **Carnegie** data lead one to suspect very strongly that in some instances the photosynthetic activity in the sea is confined principally to such minute organisms. Much more work must be done in the Pacific before such problems as this can be satisfactorily solved.

At the fifteen oxygen stations in the tropical region only one observation showed complete saturation. This is in strong contrast with the northern group of stations among which were only two that did not show saturation at some level. Moberg and Graham (1930) have pointed out that this "can be accounted for only by assuming that at these stations at least part of the water had recently come from depths at which oxygen content is normally low." Unfortunately the quantitative plankton samples for most of these stations were lost, but the samples from six of them and from other tropical stations indicate that the plankton flora in this region is much scantier than in the north, which condition also contributes to the low oxygen content of the upper strata.

## SUMMARY


1. There was a very sparse population of diatoms and dinoflagellates in the open waters of the Pacific in 1928 and 1929 at 0-, 50-, and 100-m levels.

2. Although dinoflagellates never reached the large numbers attained by the diatoms at some stations, they outnumbered the diatoms in 25 per cent of the samples.

3. When a rich sample is defined as one with more than 100 combined diatom and dinoflagellate cells per liter, the richer samples occurred in waters of lower temperature, lower salinity, higher phosphates, and higher hydrogen-ion concentration. No definite correlations were found between either dissolved oxygen or silicate and number of plant cells. The richer areas occurred in regions where subsurface water is brought to the surface by vertical circulation.

4. A comparison of the **Carnegie** data with results obtained by Bigelow and Leslie in Monterey Bay shows the same correlation between the above factors and quantity of phytoplankton.

5. Supersaturation of oxygen in the upper 100 m in regions where the diatom and dinoflagellate populations were very low suggested the presence of photosynthetic organisms not captured in the ordinary filter net.

6. The **Carnegie** investigations have shown the necessity of making quantitative studies of the phytoplankton that pass through the ordinary filter net and of securing more complete vertical series over the whole ocean.

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FIGURES 1 - 5

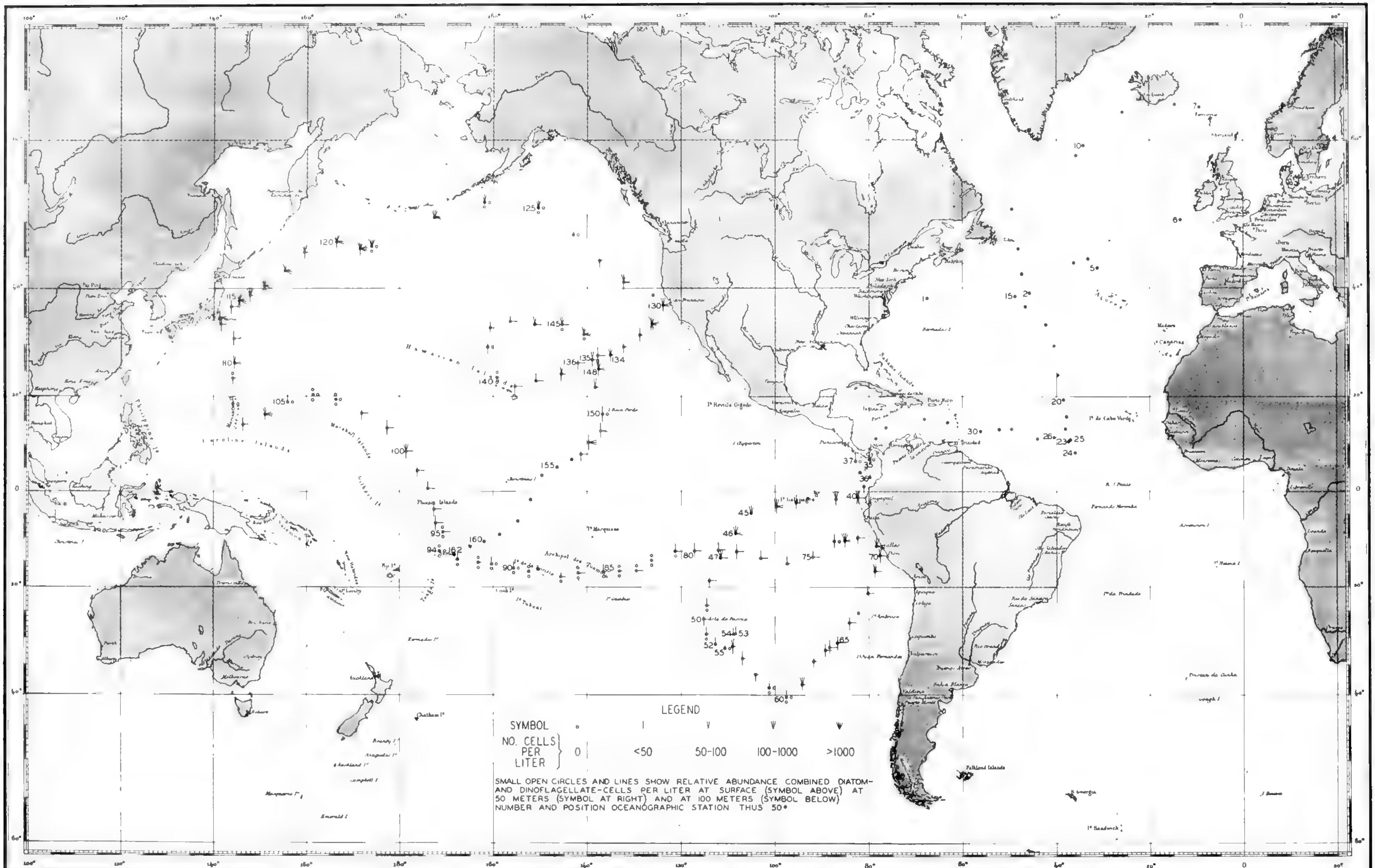
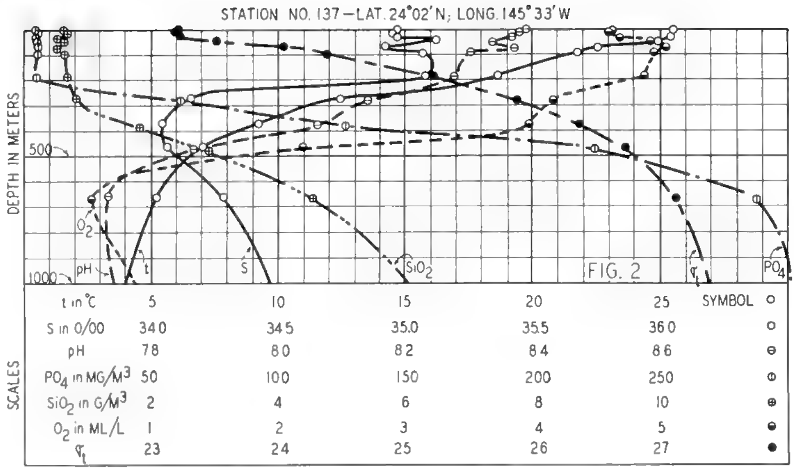
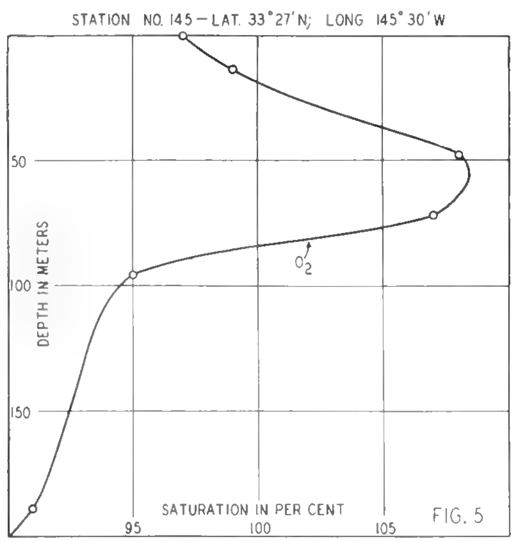



FIG. 1—DISTRIBUTION CARNEGIE QUANTITATIVE PLANKTON-STATIONS, PACIFIC OCEAN, 1928-1929, SHOWING ABUNDANCE PLANT-CELLS FOR EACH SAMPLE



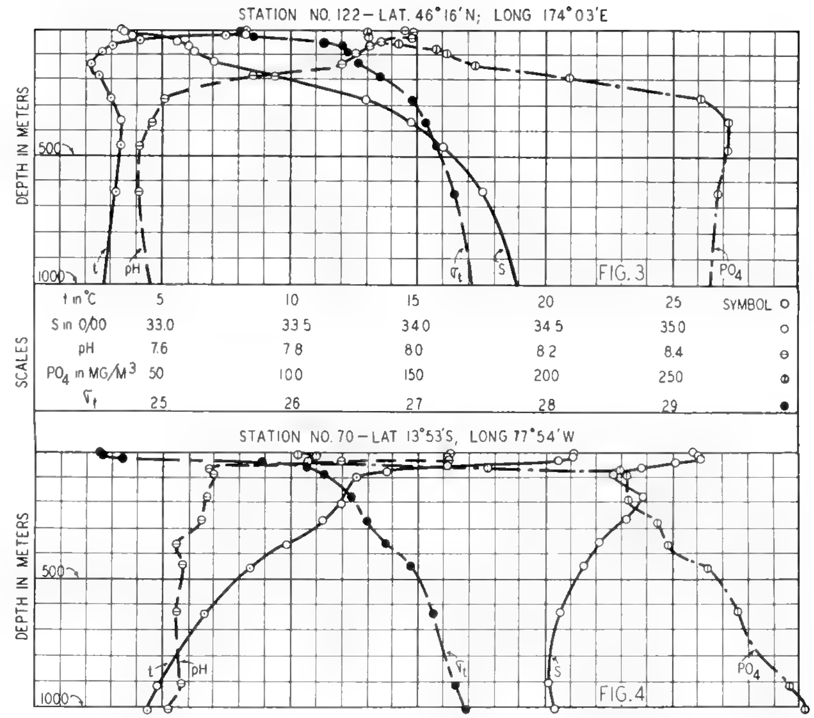




FIG. 2—VERTICAL DISTRIBUTION SOME ENVIRONMENTAL FACTORS, UPPER 1000 METERS, CARNEGIE STATION NO. 137, CONDITIONS TYPICAL SCARCITY PHYTOPLANKTON

FIGS. 3 AND 4—VERTICAL DISTRIBUTION SOME ENVIRONMENTAL FACTORS, UPPER 1000 METERS, CARNEGIE STATIONS NOS. 122 AND 70, CONDITIONS TYPICAL ABUNDANCE PHYTOPLANKTON

FIG. 5—VERTICAL DISTRIBUTION DISSOLVED OXYGEN, PER CENT SATURATION, UPPER 200 METERS, CARNEGIE STATION NO. 145

# BIOLOGICAL RESULTS OF LAST CRUISE OF CARNEGIE

II

# MARINE ALGAE

WILLIAM ALBERT SETCHELL

# CONTENTS

# MARINE ALGAE

## INTRODUCTION

Among the numerous plankton collections made by the **Carnegie**, a few contained algae of large size, making up the macroscopic, floating population, some species of which, particularly **Sargassum natans** (L.) Meyen (better known as **Sargassum bacciferum** [Turn.] C. Ag.) and S. **fluitans** Boerg. seem to become members of true self-perpetuating pleuston formations. Of such collections, some twenty-six bottles of various sizes were placed in the hands of the author for examination and report, all of which except one (bottle 1798) contained at least some minute fragment of the larger marine algae. The collections were gathered from the North Atlantic and the South Pacific oceans. The three samples (nos. 309, 317, and 318) from the neighborhood of Easter Island in the Pacific Ocean and bottle 8169, from Apia, Samoa represent localities south of the equator.

Sargassum fluitans Boerg.

| Station | Latitude | Longitude | Sample | Bottle | Depth | Date | Quantity |
|---|---|---|---|---|---|---|---|
| | ° ′ | ° ′ | | | | 1928 | |
| 1 | 38 14 N | 67 34 W | 2 | 1976 | 70 m | May 12 | 1 scrap |
| 1- 2 | 37 45 N | 53 26 W | 6 | 3020 | Surface | May 16 | 1 vesicle |
| 1- 2 | 37 53 N | 52 46 W | 9 | 3009 | Surface | May 16 | 1 scrap |
| 1- 2 | 37 53 N | 52 46 W | 11 | 3868 | Surface | May 16 | 2 or 3 vesicles |
| 34 | 11 18 N | 78 34 W | 200 | 4745 | Surface | Oct. 9 | Abundant |
| 34 | 11 18 N | 78 34 W | 202 | 4773 | 50 m | Oct. 9 | 1 scrap |

Sargassum natans (L.) Meyen

| Station | Latitude | Longitude | Sample | Bottle | Depth | Date | Quantity |
|---|---|---|---|---|---|---|---|
| | ° ′ | ° ′ | | | | 1928 | |
| 1 | 38 14 N | 67 34 W | 1 | 3805 | Surface | May 12 | 2 vesicles |
| 1- 2 | 37 53 N | 52 46 W | 9 | 3009 | Surface | May 16 | Abundant |
| 2 | 39 06 N | 45 41 W | 15 | 3900 | Surface | May 18 | 1 vesicle |
| 2- 3 | 40 00 N* | 44 00 W* | 16 | 3023 | Surface | May 18 | Scraps |
| 13-14 | 42 10 N | 47 19 W | 90 | 4232 | Surface | Aug. 9 | Abundant |
| 14 | 42 10 N | 47 19 W | 96 | 4257 | Surface | Aug. 9 | Scraps |
| 15 | 38 48 N | 48 48 W | 100 | 4258 | Surface | Aug. 11 | 1 scrap |
| 16 | 36 47 N | 46 31 W | 106 | 4298 | Surface | Aug. 13 | Abundant |
| 16 | 36 47 N | 46 31 W | 107 | 4300 | 50 m | Aug. 13 | 1 scrap |
| 17 | 33 42 N | 42 41 W | 112 | 4338 | 50 m | Aug. 15 | 1 vesicle |
| 18 | 29 47 N | 40 36 W | 117 | 3724 | Surface | Aug. 17 | 1 scrap |
| 19 | 24 00 N | 39 36 W | 122 | 4383 | Surface | Aug. 20 | 1 scrap |

* Approximately

## ATLANTIC COLLECTIONS

The majority of the samples show, as might be expected, fragments of the two most common Sargasso weeds of the floating types, **Sargassum natans** (L.) Meyen and **S. fluitans** Boerg., both of which are usually designated as **Sargassum bacciferum** (Turn.) C. Ag. Although scraps (at times a single vesicle) are not always certainly to be identified as to the one or the other species, most of these samples seem fairly clear as to distinction.

In the neighborhood of station 6, latitude 50° 22′ north and longitude 13° 31′ west, off the coast of Ireland, the dip net (sample 38, bottle 4011) brought up floating **Ascophyllum nodosum** (L.) Le Jolis, or "bottle wrack." North from this, on the way to station 7, off the Faroes, the 1/2 meter net caught more of this species (sample 51, bottle 3040, June 6, 1928) on which there was abundant epiphytic **Scytosiphon lomentarius** (Lyng.) J. Ag. There were also 2 or 3 large fragments of **Fucus vesiculosus** L. and on this was considerable epiphytic **Pylaiella litoralis** (L.) Kjellm. Sample 51 also showed as epiphytes, excellently developed specimens of **Enteromorpha crinita** (Roth) J. Ag., a widely spread species closely related to, if not identical with, **E. plumosa** Kuetz. On June 4 (sample 49, bottle 4074) the 1/2 meter net caught from the surface a single bladder of **Ascophyllum**.

The Atlantic collections present nothing except what was to be expected. The data are given for reference as to floating conditions and possible depth relations.

## PACIFIC COLLECTIONS

A collection was made in April 1929 on the reef at Apia, on Upolu of the Samoan group (bottle 8169). Several entire specimens of the bright green pom pom-like **Chlorodesmis comosa** Harv. et Bail. were found in the bottle: two fairly large specimens of the light green, areolate **Dictyosphaeria australis** Setchell; and two specimens of a light red, flat, and laciniately much branched alga with the surfaces covered with low, blunt papillae, which seems to be referable to **Meristotheca papulosa** (Mont.) J. Ag., but with more the habit of **Halymenia ceylonica** Harv. Unfortunately it is sterile.

Between stations 115 and 116, latitude 38° 06′ north and longitude 146° 53′ east (sample 699), the 1/2 meter net caught a couple of small fragments of what seems to be the Japanese brown alga, **Cystophyllum hakodatense** Yendo, a very probable find.

Around Easter Island, south of the equator, three samples containing **Sargassum** prove to be the most interesting and novel catches of the whole plankton collections, so far as the macroscopic marine algae are concerned. The samples (309, 317, and 318) represent different phases of attached and floating forms, and seem also to have a definite bearing on the "Sargasso Sea" type of situation in the Indo-Pacific Ocean area. The specimens, which are excellent as such material goes, are closely related to a species group to which may be referred **Sargassum stenophyllum** J. Ag. (non Martius), **S. lanceolatum** J. Ag. (non Greville), and **S. Skottsbergii** Sjöstedt.

Sample 309 of the **Carnegie** collections was brought up from a depth of 15.4 fathoms by the snapper. It shows several plants. Two of these are species of **Zonaria**, probably to be referred to Z. **variegata** (Lam'x) Mert. and to Z. **crenata** J. Ag.; the former a prostrate specimen, the latter represented by two upright specimens. Unfortunately, all the **Zonaria** plants are both young and sterile. There are, in addition, several specimens of **Sargassum**, two of which lack only the very holdfasts themselves of being complete. They show short (1 to 2 cm in these specimens), relatively stout, cylindrical, erect primary axes with sparse lateral tubercles, and with the primary branches grouped about the apex. The primary branches are compressed (even to flat below), and the leaves and secondary branches are arranged distichously. All branches show marginal cryptostomata. The leaves are linear-lanceolate, sharply cuneate at the base, and attenuate above to a sharper or a somewhat obtuse apex. The margins are all sharply and rather coarsely dentate, with teeth one- to two-fifths the diameter of the leaf, projecting outward and sharply forward, and broadly or narrowly triangular in outline. The costa is stout and conspicuous below, broadening toward the upper part to the point of vanishing somewhat below the apex. The cryptostomata are smaller, less prominent, and scattered, in the lower leaves, becoming larger and more conspicuous above, arranged uniseriately on each side of the costa, frequently in pairs along it. The leaves are shortly petiolate. The secondary branches are frequent (at intervals of approximately 1 cm) and short (2 to 4 cm long) as compared with the primary branch (up to 30 cm long), whence they arise. Only one of the plants shows receptacles. These are cymosely branched, about 1 cm in height. The individual branchlets are arranged dichotomously below, but subdichotomously, almost racemosely, above, are compressed cylindrical, tapering above, and alternately torulose as the individual conceptacles mature and become protuberant. All the conceptacles show antheridia only, thus suggesting a dioecious species.

Sample 317 is made up of about sixteen fragments, evidently of the same species as those of sample 309. It was collected about two miles northeast of Easter Island, in latitude 27° 25′ south and longitude 109° 25′ west, from the surface. Axes and leaves of these tips of plants agree with those of sample 309. Evidently they had not been long detached, since in color, consistency, etc., they seem not at all modified. The receptacles, however, are varied. Both antheridial and oōgonial receptacles are present, but on different fragments, the majority being antheridial. The antheridial receptacles of these plants are similar in shape and branching to those of sample 309, except that some of them are more elongated (up to 1.5 and 1.75 cm) and very slender. The oōgonial receptacles, though still of the Malacocarpic, or unarmed (i.e. without teeth or spines) type, are very different from the long linear antheridial type. They are shorter (about 5 mm high) and less divided (only once or twice dichotomously cleft or lobed), the divisions being narrowly ellipsoidal fusiform, with the conceptacular openings broader and more gaping. In the **Carnegie** specimens, only the apical conceptacles of each receptacle show oōgonia, but the lower conceptacles show swollen structures such as are found in antheridial conceptacles.

Sample 318 was taken from floating masses (surface) about 8.5 miles southeast of Easter Island. The masses show the peculiar yellow of the **Sargassa** of the Sargasso Sea and might readily be taken for similar masses of **Sargassum natans** (L.) Meyen. The short individual fragments (up to 10 cm long) seem likely to have arisen in the floating state. The stems, leaves, bladders, and receptacles, however, are practically identical in the principal details of their structure with those of samples 309 and 317. The costae (or midribs) of the leaves, however, seem stouter, the cryptostomata fewer and less conspicuous (at least in some of the fragments) and there are encrusting bryozoans, etc., on them similar to those occurring on the floating fragments of S. **natans** in the Sargasso Sea of the Atlantic Ocean.

There does not seem to exist for the Pacific or Indian oceans any real approximation to the Sargasso Sea of the North Atlantic. In the extreme south Pacific a pleuston, often very conspicuous and of large masses, is frequently met with, especially in the vicinity of Cape Horn and the west Patagonian coast. This has for its chief constituent, plants of **Macrocystis.** In the extreme northern Pacific Ocean, vast floating masses of **Nereocystis** or of **Alaria fistulosa** may be seen, particularly near Unimak Pass, in the Aleutian Islands. These masses, often of several acres in extent, are made up of stems and the huge terminal bladders of the **Nereocystis** or of the long leaves of the **Alaria** with their interruptedly swollen and inflated midribs. Both the **Macrocystis** formations (which may be true pleuston) and the floating masses of **Nereocystis** or of **Alaria** (not true pleustons) are characteristic of cold waters, but waifs from them seemingly stray into the edges of tropical waters. This is indicated by the attribution of **Macrocystis** and **Lessonia**, and even of **Durvillaea**, species of the west South American coasts to such tropical localities as the coasts of Tahiti.

Nevertheless, patches of floating seaweeds may be seen at times near the various islands or archipelagoes within the tropics (or warmer waters) and forms approaching very closely to S. **natans** (L.) Meyen (S. **bacciferum** [Turn.] C. Ag.) are to be found in herbaria, designated as from Indo-Pacific areas. The exact localities are not always certain, but it may be presumed that at times the Atlantic species may pass around the Cape of Good Hope. Indigenous Indo-Pacific species of **Sargassum** may be suspected as possible of adopting, as well as adapting themselves to, a pleuston (or continued floating and self-propagating existence), but there is little certainty in this direction. Sample 318, taken in connection with samples 309 and 317, is a plausible suggestion along this line and may have a bearing on the question as to a limited type of Sargasso Sea in the southeastern tropical Pacific.

The **Sargassum** of samples 309, 317, and 318 raise morphological, taxonomic, and distributional questions. Sample 309 is composed of attached specimens, living at a depth of 15.4 fathoms. As already stated, this species agrees most nearly with the description of **Sargassum lanceolatum** J. Ag. J. G. Agardh, however, does not indicate of what sex (or sexes?) his type specimens were, but Grunow states that the receptacles in this species (as he understands it) are androgynous. It seems that some dioecious species may have androgynous states (or possibly seasonal conditions). It has not been possible to examine the type plants (from the west coast of Australia, preserved in Herb. Mus. Paris), so the determination as to S. **lanceolatum** is not fully substantiated.

The only species hitherto known with certainty from Easter Island is **Sargassum Skottsbergii** Sjöstedt (<u>in</u> Skottsberg, The Natural History of Juan Fernandez and Easter Island, vol. II, part III, p. 311, 1924). The plants of this species are very close to those of sample 309, except that the leaves of the antheridial plant are entire or only sparingly and minutely denticulate, with few (at times no) and inconspicuous cryptostomata, whereas those of the oōgonial plant are more conspicuously and acutely denticulate, with the cryptostomata more numerous and conspicuous. The receptacles vary somewhat in both Sjōstedt's plants, and the **Carnegie** samples 317 and 318 are fully as much swollen as those figured by Sjōstedt (loc. cit., fig. 3), and thoroughly merit his description of "breviora, latiora, conica." Plants appearing to be identical with those of S. **Skottsbergii** occur commonly on the shores of Tongatabu in the Tonga Archipelago. Both, however, seem to correspond in detail to the description of S. **stenophyllum** J. Ag., from the western shores of Australia (type specimen in Herb. Mus. Paris, not seen). Grunow says that the receptacles of the type specimen of S. **stenophyllum** are androgynous, whereas all the Tongatabu and Easter Island specimens examined seem varyingly androgynous or polygamous (i.e. receptacles with exclusively male and female conceptacles, receptacles with largely male or female conceptacles, and finally receptacles with conceptacles in which male and female are mixed). Therefore the three species represented by the binomials S. **stenophyllum** J. Ag., S. **lanceolatum** J. Ag., and S. Skottsbergii Sjost., seem very near to one another, sufficiently so to form a narrow species group, or even possibly a species cycle. Assuming that S. **stenophyllum** J. Ag. (1848) may be the same as S. **Skottsbergii** Sjöstedt, the latter name has the preference since S. **stenophyllum** Martius (now S. **cymosum** C. Ag.) dates from much earlier (at least as early as 1827) than S. **stenophyllum** J. Ag. (1848). If all are considered to be only members of one form cycle about S. **lanceolatum** J. Ag. (1848), this name will apply, the S. **lanceolatum** Greville (1849) being different (now S. **coriifolium** J. Ag.) from S. **lanceolatum** J. Ag. (1848), and of sufficiently probable later date of publication as to be rejected (not being an earlier homonym).

A number of photographs are reproduced in connection with the collection of samples 309, 317, and 318, in order to make more clear and more certain than may be accomplished by words, the variation of the receptacles in size, shape, and the coordination with sex segregation.

Figure 1 shows two plants of diverse age and development of sample 309, from fourteen fathoms depth off Easter Island. The younger plant (above) shows the short main axis (characteristic of this species group) giving off several lateral axes. The older plant is only the upper part of a lateral axis, with branches, leaves, and well-developed receptacles which are antheridial. Figure 2 shows the receptacular branchlet enlarged 6 diameters. The coarse, compact, cymose receptacle is somewhat flattened and sufficiently condensed to be dentate on the margins (because of suppressed branchlets). Because of this, the Agardhian arrangement would remove this plant far from those of the other numbers (into the "Series" **Acanthicarpicae**, "Tribe" **Biserrulae** of J. G. Agardh). This seems unsuitable from other resemblances of habit and structure between this and the other numbers of the **Carnegie** collections and also from plants collected in the Tonga Islands.

Figure 3 shows a sheet of fragments of collection sample 317, collected floating about two miles northeast of Easter Island, but it seemed to be fairly recently torn away. The two lower fragments have elongated, slender antheridial receptacles (see figure 4,♂), whereas those of the upper row have shorter, more robust receptacles (see figure 4,♀), antheridial below, oōgonial toward the apex. Figure 5 shows receptacles from the fragments shown 6 diameters. The details of the long, slender antheridial receptacles and the short, robust receptacles with antheridial conceptacles below and oōgonial receptacles above are shown. The receptacles of sample 317 are from fragments, are neither definitely flattened nor toothed, and consequently are not ancipate. They differ in these respects from those of sample 309. Sample 309 would be placed under "Series" **Malacocarpicae**, "Tribe" **Cymosae** of J. G. Agardh.

Figure 6 shows receptacular branchlets from two fragments of still other plants of sample 317, both oōgonial toward the apex, but antheridial below. The disproportion between the length-breadth indices of the two sets of receptacles is marked.

Figure 7 shows four samples from the mass of floating fragments of the light yellowish color characteristic of the floating fragments from the Atlantic Sargasso Sea, under sample 318. The mass of sample 318 was floating about eight miles southeast of Easter Island.

Figure 8 shows characteristic sterile fragments from this collection, whereas figures 9 and 10, enlarged 2 diameters, show characteristic fruiting fragments, both with androgynous receptacles. In figure 9 these are shorter and more robust (as seen enlarged 6 diameters in figure 11). In figure 10 they are longer and more slender than some (enlarged 6 diameters in figure 12). The dark oōgonia may readily be seen in the upper parts, and even fairly evenly distributed in the receptacles, of figure 11, whereas none are seen in figure 12. There is, however, one oōgonium in an antheridial conceptacle of the receptacles represented on figure 12. In the type collection of **Sargassum Skottsbergii** Sjōst. from Easter Island, described as dioecious, the author has seen an occasional oōgonium in an antheridial receptacle and an occasional antheridial conceptacle in receptacles otherwise exclusively oōgonial.

It seems, therefore, that in this naturally smaller assemblage of species passing under the names of S. **stenophyllum** J. Ag., S. **lanceolatum** J. Ag., and S. **Skottsbergii** Sjōst., the sexes may vary from partially even to completely segregated, but the receptacles are more properly polygamous, some plants having receptacles exclusively (or almost exclusively) of one sex or the other whereas other plants may have the sexes in separate conceptacles but both kinds of conceptacles in the same receptacle. According to the type of dominance the receptacles vary, elongated and slender for receptacles purely (or approximately pure) antheridial but shorter and more robust according to the admixture of, or purity of, oōgonial conceptacles. In plants of this group from the Tonga Islands, seemingly otherwise of the same species cycle, there has been seen, chiefly, specimens in which oōgonia and antheridia are found in the same receptacle, at least in the middle parts of the moderately long and moderately robust receptacles.

To the same smaller group as the one being discussed belongs also another cycle of species, viz., S. **Grevillei** J. Ag., S. **oligocystum** Mont., and S. **oligocystoides** Grun. These species have broader leaves than those of the Easter Island group. Their receptacles are polygamous as are those of the Easter Island group, and with similar variation in length-breadth index, compression, and absence or presence of denticulate or spinose margins. Material of these species was found in some collections made by the personnel of Charles Templeton Crocker's Yacht Zaca, in southeastern Melanesia, during June and July 1933. They are being reported on elsewhere and tend to round out the general situation found in the species of Easter and Tonga islands.

FIGURES 1 - 12

FIG. 1

FIG. 2

FIG. 1—SARGASSUM LANCEOLATUM J. AG. PLANTS OF DIVERSE AGE AND DEVELOPMENT FROM DEPTH 15.4 FATHOMS; HONGA ROA, EASTER ISLAND, SAMPLE 309

FIG. 2—SARGASSUM LANCEOLATUM J. AG. RECEPTACULAR BRANCHLET; MAGNIFICATION: X 6, SAMPLE 309

FIG. 3

FIG. 4

FIG. 3—SARGASSUM LANCEOLATUM J. AG. FRAGMENTS FROM SURFACE 2 MILES NORTHEAST OF EASTER ISLAND, SAMPLE 317

FIG. 4—SARGASSUM LANCEOLATUM J. AG. ELONGATED, SLENDER ANTHERIDIAL RECEPTACLES, ♂; SHORT, ROBUST RECEPTACLES, ANTHERIDIAL BELOW AND OÖGONIAL TOWARD APEX, ♀; MAGNIFICATION: X 2, SAMPLE 317

FIG 5

FIG. 6

FIG. 5—<u>SARGASSUM</u> <u>LANCEOLATUM</u> J. AG. FRAGMENTS OF ♂ AND ♀ RECEPTACLES; MAGNIFICATION: X 6, SAMPLE 317

FIG. 6—<u>SARGASSUM</u> <u>LANCEOLATUM</u> J. AG. RECEPTACULAR BRANCHLETS, ♂ AND ♀, OF SAMPLE 317

FIG 7—SARGASSUM LANCEOLATUM J. AG. FLOATING CONDITION (SIMILAR TO THAT OF S. NATANS IN ATLANTIC OCEAN); FROM SURFACE ABOUT 8 MILES SOUTHEAST OF EASTER ISLAND, SAMPLE 318

FIG. 8—SARGASSUM LANCEOLATUM J. AG. STERILE FRAGMENTS FROM FLOATING MASS; MAGNIFICATION: X 2, SAMPLE 318


FIG. 9

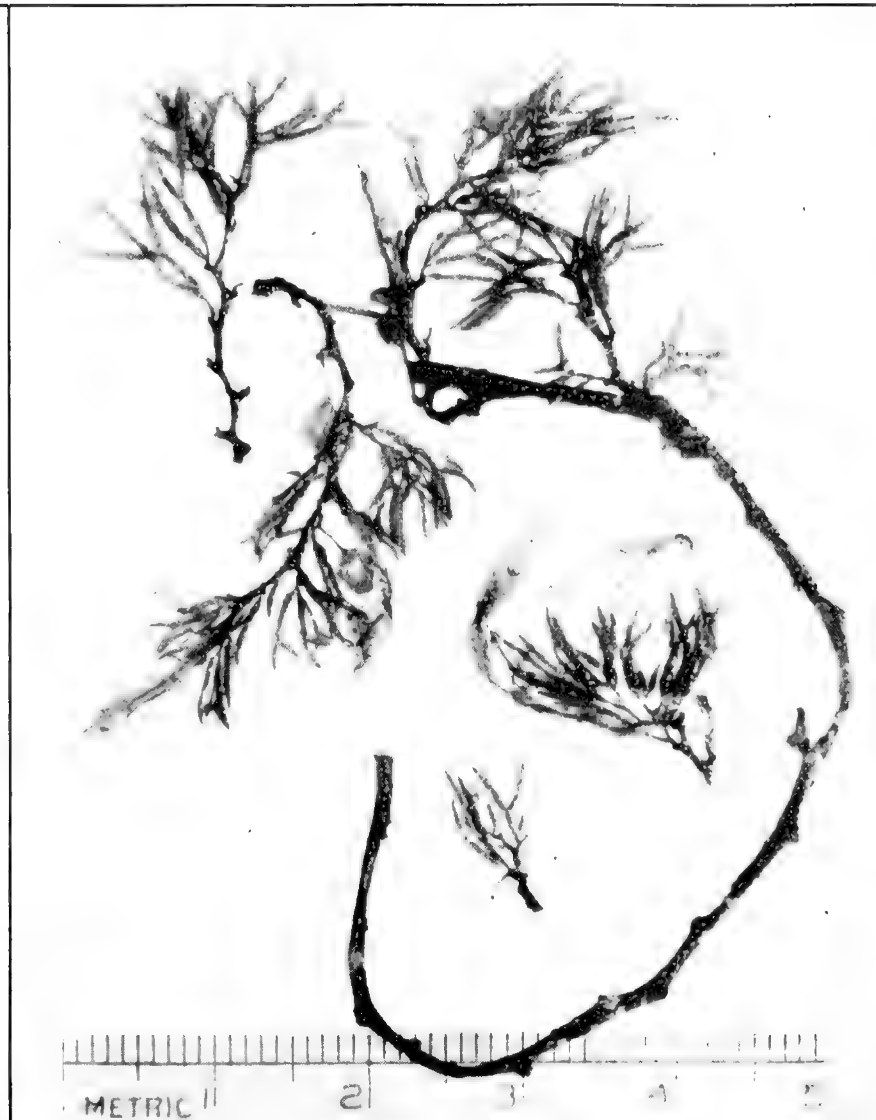
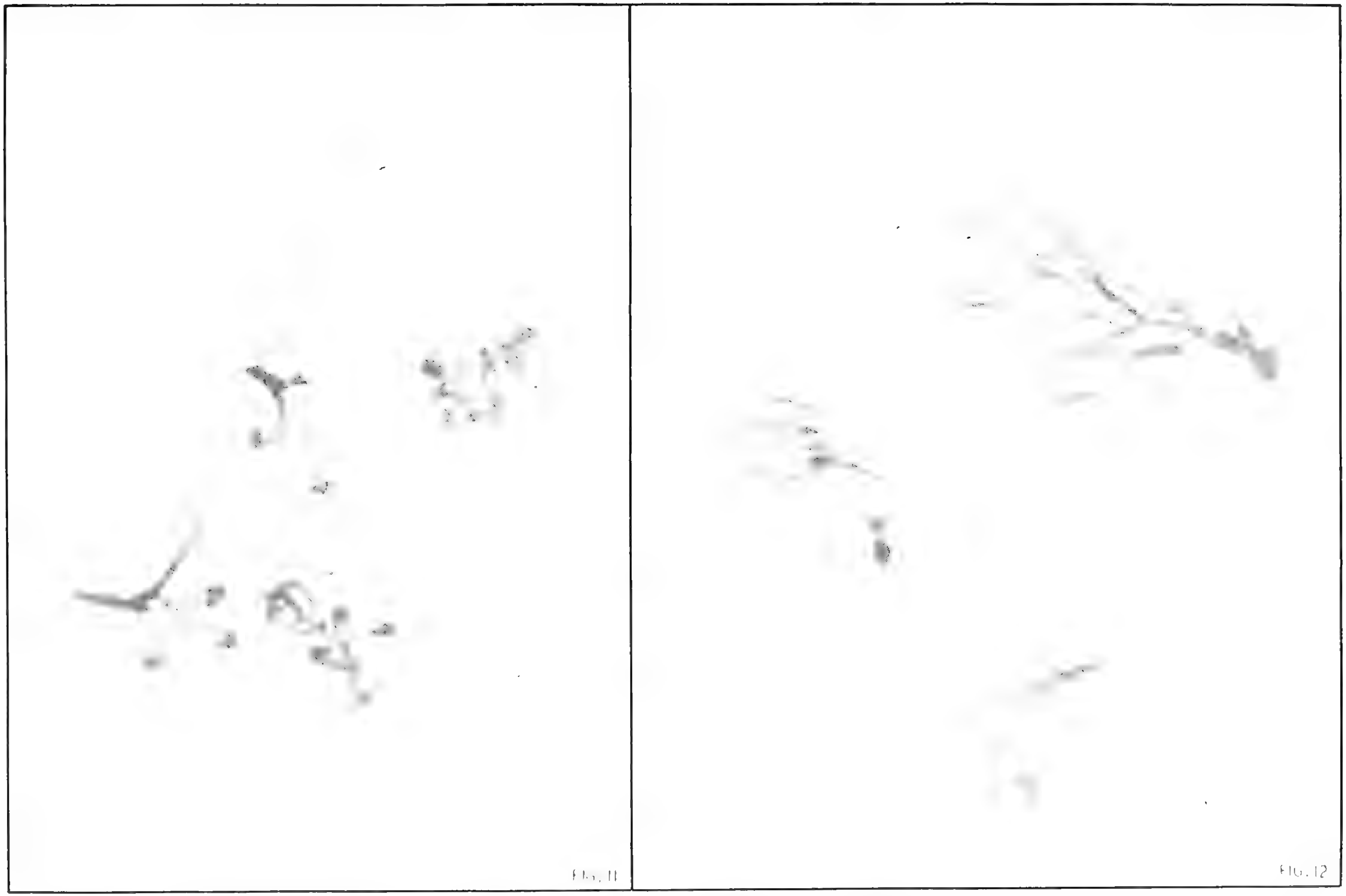



FIG. 10

FIGS. 9 AND 10 — SARGASSUM LANCEOLATUM J. AG. CHARACTERISTIC FRUITING FRAGMENTS, ♂ AND ♀, WITH ANDROGYNOUS RECEPTACLES; MAGNIFICATION: X 2, SAMPLE 318




FIGS. 11 AND 12—SARGASSUM LANCEOLATUM J. AG. CHARACTERISTIC FRUITING FRAGMENTS WITH ANDROGYNOUS RECEPTACLES (OF VARYING PROPORTION OF INTERSEXES); MAGNIFICATION: X 6, SAMPLE 318

# BIOLOGICAL RESULTS OF LAST CRUISE OF CARNEGIE

III

## POLYCHAETOUS ANNELIDS

AARON L. TREADWELL

CONTENTS

# POLYCHAETOUS ANNELIDS

## INTRODUCTION

The following is a report on the polychaetous annelids collected by the **Carnegie** on cruise VII in 1928-1929, and submitted to the writer for study through the courtesy of Dr. J. A. Fleming, Director of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington. As indicated on the accompanying map (p. iv) and on the list giving the geographical positions of the collecting stations (pp. 44-51), the cruise covered extensive areas in the North Atlantic and Pacific oceans. With only a few exceptions three hauls were made at each station at depths of 0 (surface), 50 m, and 100 m. With the description of each species the author has given the depth or depths at which it was collected, arranging these data in tabular form for convenience of reference in the case of the more abundant species. The location of each station is designated on maps 1 to 4 (pp. 56-59) by black circles. The station numbers are indicated by vertical figures for every fifth station in multiples of five, except where clarity requires numbering at more frequent intervals. The slant figures designate the species according to the legends on the maps.

In view of the imperfect knowledge of the annelid fauna of the oceans, it is to be specially noted that of the twenty-eight species (not larvae or fragments) dealt with or collected, fifteen are new, and two of the remaining thirteen are not forms of the open ocean, as in the case of **Eurythoe complanata** Pallas collected on Luminao Reef, Guam, Mariana Islands.

These fifteen new species belonging to seven families are shown in table 1.

Table 1. Fifteen new species of polychaetous annelids collected by the **Carnegie** 1928-1929

| Family | Species |
|---|---|
| Polynoidae | Polynoella brunnea |
| Phyllodocidae | Haliplanella pacifica<br>Lopadorhynchus varius |
| Iospilidae | Phalacrophorus niger<br>Phalacrophorus maculatus<br>Phalacrophorus attenuatus |
| Alciopidae | Alciopa distorta<br>Torea fasciata<br>Vanadis uncinata<br>Corynocephalus magnachaetus<br>Callizonella pigmenta |
| Typhloscolecidae | Plotobia paucichaeta |
| Syllidae | Autolytus pacificus<br>Epitoka pelagica |
| Nereidae | Nereis singularis |

The types and a representative set of specimens have been deposited in the United States National Museum.

## SYSTEMATIC DISCUSSION

### FAMILY AMPHINOMIDAE

Genus **EURYTHOE** Kinberg

**Eurythoe complanata** Pallas

**Aphrodita complanata** Pallas, 1776, p. 109, pl. 8, fig. 1926.
**Eurythoe pacifica** Kinberg, 1857, p. 14.

A single specimen recorded as collected on Luminao Reef, Guam.

Two bottles contained immature amphinomids, both having been collected on the surface at station 40. In one bottle was a single specimen having a rounded prostomium and two eyes with no trace of tentacle or caruncle. The dorsal setae are heavy and serrate; the ventral ones slender and smooth. The gills are pinnate.

The other bottle contained several specimens, each having rounded prostomium and a caruncle in the form of a triangle, the base of the triangle being anterior. There are four eyes. It seems probable that these are **Eurythoe,** although instead of the heavy teeth figured (e.g.) by McIntosh for **Eurythoe** (1885, pl. 3A, fig. 7) they have toothed setae carrying two rows of heavy spikes.

### FAMILY POLYNOIDAE

Fragments of a specimen, evidently a species of **Halosydna,** were taken on a reef in Apia, Samoa, and another in 100 m at station 40. The latter are translucent-white and have very long tentacles and dorsal cirri. The only elytra present are those of the first pair which cover the head. Other larval polynoids were recorded from Easter Island.

Genus **POLYNOELLA** McIntosh

(Plate I, figures 1-3)

**Polynoella brunnea** n. sp.

The body is 10 mm long and, for the first five somites, 2 mm wide. Behind somite 5 the body tapers to a narrow pygidium. The prostomium (pl. I, fig. 1) is composed of two oval lobes placed at such an angle with one another that their anterior ends are farther apart than their posterior ends, and they are separated by a deep constriction. The median cirrophore fits into the anterior angle between the prostomial lobes, its posterior end being quite narrow. From here it widens to about one-third its length from the anterior end, and then narrows again. Its style is very long and tapers gradually to a sharp point. The cirrophores of the lateral tentacles are more nearly uniform in diameter but are narrower than the median. Their styles are similar in form to the median but are smaller. The tentacular cirri are similar in form to the lateral styles as are the palps, though much larger.

There are ten pairs of elytrophores but unless a transparent, much wrinkled bit of tissue attached to the head is the first elytron, none of these are present. The anterior eyes are somewhat larger than the posterior and placed farther apart. All eyes are brown in color.

A parapodium from the middle of the body (pl. I, fig. 2) is long and slender and has two nearly equal lobes at the apex, the setae protruding to the surface from between the lobes. There is one very stout acicula which does not quite reach the surface. The dorsal cirrus is long, extending beyond the apex of the parapodium. The ventral one is much smaller. Just ventral to the dorsal cirrophore is a very small lobe representing the notopodium, which contains one small acicula but no setae. The notopodial setae are of two kinds. Those of the dorsal part of the tuft are long, slender, and numerous in the bundle; the ventrally placed ones are much heavier and less numerous. The latter have straight shafts which expand near the ends and then narrow abruptly (pl. I, fig. 3). There is a heavy terminal and a smaller subterminal tooth. On one side, near the expanded part, is a row of very small teeth.

One specimen has a protruded pharynx which carries nine marginal lobes on each of the dorsal and ventral lips, and paired teeth on the ventral lip.

The type is no. 20078 in the United States National Museum, and was collected in 50 m at station 41. Others were taken in 50 m at station 39 and in 100 m at station 94. See map 1 (p. 56).

## FAMILY PHYLLODOCIDAE

### Genus HALIPLANELLA Reibisch

Reibisch states that the chief difference between **Haliplanella** and **Haliplanes** (1895, pp. 24-25), is that in the latter there are four tentacles, whereas in the former there are two, and thinks that because the second pair is sometimes pressed against the lower surface of the prostomium and hence not easily seen, there may have been confusion of these genera in the literature. In the specimens in the **Carnegie** collection there certainly are no second tentacles and the author has assigned them to **Haliplanella**. This has one pair of tentacles and no eyes on the prostomium. On the first somite are dorsal and ventral cirri and a tuft of stout, simple setae. The second somite carries on either side a single long tentacular cirrus.

#### Haliplanella pacifica n. sp.

(Plate I, figures 4-6)

The type is 1.4 mm long and 1.1 mm wide, with a prostomial width of 0.4 mm. The general form of the prostomium is that of a rounded sugar loaf divided into anterior and posterior parts by lateral indentations on the sides just anterior to the point of insertion of the tentacles (pl. I, fig. 4). The anterior of these divisions is nearly twice as wide as long, and its anterior margin shows a faint division into three lobes. The tentacles are longer than the width of the anterior part of the prostomium and are attached on its ventral surface. Near this point of attachment the prostomium abruptly widens. The first somite is short with slender dorsal and ventral cirri, the latter reaching to the fourth somite. The second is nearly twice as long as the first and carries very long dorsal cirri. The ventral cirri of this somite consist of a short conical style carried on a relatively prominent cirrophore. In the type the following twelve somites have heavy dorsal cirri bluntly rounded at the ends but the last four pairs of these are not quite as heavy as the others. The ventral cirri of these somites are similar in outline to the dorsal but very much smaller. On either side of the anal somite is a bluntly rounded lobe.

The setae of the first somite make up a small bundle of only four or five. Some of these taper smoothly to an acutely curved point, others have a constriction near the end which is more noticeable in some than in others (pl. I, fig. 5). In all later somites the setae are compound and built on the plan of the one shown in plate I, figure 6. The basal joint is long and slightly curved, expands a little at the end and on one side of this expansion carries a small spine. There are two terminal joints, one rather short and stout inserted next to the spine, and the other much longer and more slender. In somites 2, 3, and 4 these setae are few in number and are all rather stout though one is heavier than the others. Beginning with somite 5 the setal arrangement is such that there is a tuft of long slender compound setae having the structure described, and one of the same structure but much heavier. This increase in the size of the large setae is more noticeable in posterior somites. The setal lobe of the parapodium is sharp-pointed and shorter than either dorsal or ventral cirri. A single acicula comes to the surface at its apex.

The type is no. 20079 in the United States National Museum and was collected in 100 m at station 23. Others were taken in 50 m at stations 24, 46, and 99. See map 1 (p. 56).

### Genus LOPADORHYNCHUS Grube

#### Lopadorhynchus varius n. sp.

(Plate I, figures 7-10)

The type is 3 mm long and 1 mm wide, counting the parapodial length. The prostomium (pl. I, fig. 7) is bluntly rounded along its anterior margin, which is continued laterally into the dorsal tentacles. The ventral tentacles are attached ventrally to, and are much smaller than the dorsal. There are no eyes. Two pairs of large tentacular cirri are attached to the proper somites, and are long enough to extend beyond the first parapodium. The author was unable to find any trace of ventral cirri corresponding to these. There is a rounded lobe looking like a cirrophore which may represent these cirri, but no trace of styles.

There are sixteen parapodia, of which the first two are shorter and stouter than the succeeding ones and protrude nearly at right angles from the body; later ones become more and more folded against the sides of the body. The first two parapodia carry the heavy hooks, sharp-pointed setae, whose curved shafts occupy a considerable part of the parapodium and whose apices extend beyond its margin (pl. I, fig. 8). In the specimen figured there were six of these. There is a short, ovate dorsal cirrus. Later parapodia are similar to these in general outlines but are more slender. The outer posterior surface is flattened, and forms a broad, slightly curved plate from which arises a tuft of twenty-five to thirty natatory setae. In some of the more anterior parapodia there are a few simple setae but they do not appear in posterior ones. In general these resemble those of the first two parapodia but are broader and protrude farther from the surface. The natatory setae look much like those of some compound setae of the nereids (pl. I, fig. 9). The terminal joint is flattened and sharp-pointed, and carries on one margin a row of sharp teeth set well apart.

The pygidium (pl. I, fig. 10) is bluntly rounded and carries two pairs of blunt cirri.

The type is no. 20080 in the United States National Museum and was collected in 100 m at station 149. Others were taken as indicated below.

| Station | 50 m | 100 m | 1000 m | Station | 50 m | 100 m | 1000 m |
|---|---|---|---|---|---|---|---|
| 22 | x | .. | .. | 99 | x | .. | .. |
| 52 | .. | x | .. | 100 | x | .. | .. |
| 56 | .. | x | .. | 136 | .. | x | .. |
| 64 | .. | .. | x | 137 | .. | x | .. |
| 96 | .. | x | .. | 149 | .. | x | .. |

(See map 1, p. 56)

### Lopadorhynchus nans Chamberlin

**Lopadorhynchus nans** Chamberlin, 1919, pp. 116-119, pl. 17, figs. 1-5.

| Station | Surface | 50 m | 100 m | Station | Surface | 50 m | 100 m |
|---|---|---|---|---|---|---|---|
| 20 | .. | x | .. | 98 | .. | x | .. |
| 28 | .. | x | .. | 99 | .. | .. | x |
| 29 | .. | .. | x | 101 | .. | .. | x |
| 35 | .. | .. | x | 108 | .. | x | .. |
| 39 | .. | .. | x | 112 | .. | x | .. |
| 45 | .. | .. | x | 146 | .. | .. | x |
| 47 | .. | .. | x | 149 | .. | x | .. |
| 50 | .. | .. | x | 150 | .. | x | .. |
| 63-64 | x | .. | .. | 151 | .. | x | .. |
| 82 | .. | x | .. | 153 | .. | .. | x |
| 90 | .. | x | .. | | | | |

(See map 1, p. 56)

### Genus PELAGOBIA Greef

### Pelagobia viguieri Gravier

**Pelagobia viguieri** Gravier, 1911, p. 62.
**Pelagobia viguieri** Chamberlin, 1919, pp. 122-125.

These the author has identified from Chamberlin's description. As indicated in the following list of stations, the species is widely distributed in both the Atlantic and Pacific areas.

| Station | Surface | 50 m | 100 m | Station | Surface | 50 m | 100 m |
|---|---|---|---|---|---|---|---|
| 14 | .. | .. | x | 80 | x | .. | .. |
| 19 | x | .. | .. | 82 | .. | x | .. |
| 20 | .. | .. | x | 86 | .. | x | .. |
| 21 | .. | x | .. | 87 | x | .. | .. |
| 23 | .. | .. | x | 88 | .. | x | .. |
| 24 | .. | .. | x | 89 | .. | x | .. |
| 25 | .. | x | x | 89-90 | x | .. | .. |
| 28 | .. | x | .. | 90 | .. | x | .. |
| 32 | .. | .. | x | 92 | .. | x | .. |
| 35 | .. | x | x | Samoa | x | .. | .. |
| 35-36 | x | .. | .. | 94 | .. | x | x |
| 36 | .. | .. | x | 96 | x | x | x |
| 37 | .. | x | .. | 97 | .. | .. | x |
| 39 | .. | .. | x | 98 | .. | .. | x |
| 40 | .. | x | x | 99 | .. | x | x |
| 41 | .. | x | x | 100 | .. | x | x |
| 42 | x | x | x | 103 | .. | .. | x |
| 43 | .. | x | x | 104 | .. | x | x |
| 44 | .. | .. | x | 105 | .. | x | x |
| 45 | .. | .. | x | 106 | x | x | x |
| 47 | .. | x | .. | 107 | .. | x | .. |
| 49 | .. | .. | x | 108 | .. | .. | x |
| 52 | .. | .. | x | 109 | .. | x | x |
| 55 | .. | x | x | 110 | .. | x | .. |
| 56 | .. | .. | x | 111 | .. | x | x |
| 58 | .. | .. | x | 112 | .. | x | x |
| 61-62 | x | .. | .. | 113 | .. | x | x |
| 64-65 | x | .. | .. | 114 | x | x | x |
| 64 | .. | .. | x | 115 | .. | x | .. |
| 65 | .. | x | x | 117 | .. | x | x |
| 66 | .. | x | x | 120 | .. | .. | x |
| 67 | .. | .. | x | 128 | .. | .. | x |
| 68 | .. | .. | x | 137 | .. | .. | x |
| 69 | x | x | x | 139 | x | x | .. |
| 70 | .. | x | .. | 147 | .. | x | .. |
| 71 | .. | x | x | 149 | .. | .. | x |
| 72 | .. | x | x | 151 | .. | .. | x |
| 73 | x | .. | x | 152 | .. | x | x |
| 74 | .. | .. | x | 153 | .. | x | .. |
| 75 | .. | x | x | 154 | .. | x | .. |
| 76 | .. | .. | x | 156 | .. | x | .. |
| 77 | x | .. | .. | 157 | .. | x | .. |

(See map 1, p. 56)

## FAMILY IOSPILIDAE

### Genus PHALACROPHORUS Greef

### Phalacrophorus niger n. sp.

(Plate I, figure 15)

In the type the body length is 4 mm and there are twenty-five somites but it is not probable that the body is entire, some of the posterior region having been lost. The most noticeable feature is the surface pigmentation, which, over the first two somites and prostomium, is in irregular blotches but in later somites appears as large, many-branched chromatophores (plate I, fig. 15). In one specimen, in the anterior somites, there is one large chromatophore on either side, dorsal to the parapodial base, with irregular pigment patches on the dorsal surface between them; in the sixth and seventh somites there are two large patches on either side; in the eighth there is a median one near the anterior somite border; and in the ninth there are two of this latter type of patches. In later somites there is a restriction of the large chromatophores to one on either side, with a number of smaller ones scattered between them on the dorsal surface. Throughout the greater part of the body there is a single chromatophore on the anterior face of each parapodium and typically there is a transverse row of three on the ventral face of each somite.

The prostomium (pl. I, fig. 15) is rounded and carries two lateral outgrowths which are probably to be regarded as palps. There are two round, brown eyes set well apart on the prostomial surface. In the specimen figured they are sunk under the surface and are somewhat obscured by surface pigment. Between, and a little in front of them is a pigment spot which has a superficial resemblance to an eye. On either side somites 1 and 2 carry a single tentacular cirrus. These are much larger than the corresponding cirri in **P. maculatus** (see below) and the second is much larger than the first, being fully as long, though not so thick, as the parapodium of the fifth somite. They are located much nearer the ventral body surface than are the first. Setae appear in the second somite but not in the first. The parapodia of somites 3 and 4 consist each of a dorsal and a ventral rounded lobe which are scarcely longer than thick, the dorsal one being located a little posterior to the ventral. A tuft of long slender setae lies in the setal part. The parapodium of somite 5 has a dorsal lobe which is shaped like that of somite 4 but is larger, whereas the ventral cirrus in form is much like that shown in plate I, figure 12 of **P. maculatus.** The dorsal cirrus is heavier and more bluntly rounded than in **P. maculatus.** Later parapodia differ from this mainly in the greater size and larger number of setae which spread out fan wise. The setae are slender and compound, essentially similar to those of **P. maculatus** (pl. I, fig. 13).

The type is no. 20081 in the United States National Museum and was collected at station 5 in 50 m. Others were taken at stations 3 and 57 in 50 m, at station 59 in 100 m, and at the surface at stations 60, 61, 72, 73, and 97. See map 2 (p. 57).

### **Phalacrophorus maculatus** n. sp.

(Plate I, figures 11-13)

The type specimen has about thirty somites, the precise number being in doubt because of the crowded condition of the extreme posterior end. The length is 3.5 mm. The prostomium (pl. I, fig. 11) is rounded on its anterior margin, its width being a trifle more than its length. In common with the somites immediately following, it has numerous small pigment spots on the dorsal surface and a row of larger spots along the anterior margin. There are two eyes set well toward the margin. Somites 1 and 2 have each a pair of tentacular cirri that are considerably larger on 2. A few slender compound setae arise near the base of the second tentacular cirrus, but none are on the first. Somites 3 and 4 carry setae tufts which arise practically from the somite surface, the parapodial elevation being very small. There is a short ventral cirrus. Beginning with somite 5 the parapodia become prominent and later ones increase in size toward the middle of the body. The parapodia are all thick in proportion to their length, and there is little decrease in size posteriorly. The chief difference between the two regions is that whereas anterior parapodia project at right angles to the surface, posterior ones are pressed against it. The setal lobes are conical in outline (pl. I, fig. 12) and carry a slender, colorless, sharp acicula which protrudes from the apex. The dorsal cirrus is rounded and much shorter than the setal part.

The setae are all very long, slender, and compound (pl. I, fig. 13).

Dorsally the body carries many small dark brown pigment spots which, except for the anterior somites, have a tendency to lie along the margins, and on the parapodial surface leave the median region clear. Ventrally these are more uniformly distributed and in addition there are larger brown spots lying one at the base of each parapodium. In some the parapodial region is very dark-colored, whereas the remainder of the body is much lighter.

The type is no. 20082 in the United States National Museum and was taken on the surface at station 39. Others were collected as indicated below.

| Station | Surface | 50 m | 100 m | Station | Surface | 50 m | 100 m |
|---|---|---|---|---|---|---|---|
| 24 | .. | .. | x | Samoa | x | .. | .. |
| 32 | .. | .. | x | 90 | .. | x | .. |
| 36 | x | .. | .. | 92 | .. | x | .. |
| 39 | x | .. | .. | 96 | .. | x | .. |
| 50 | .. | .. | x | 97 | x | x | x |
| 55 | .. | .. | x | 99 | .. | x | .. |
| 56 | .. | .. | x | 100 | .. | x | x |
| 58 | .. | x | .. | 103 | .. | x | .. |
| 60 | .. | .. | x | 104 | .. | .. | x |
| 61-62 | x | .. | .. | 107 | .. | x | .. |
| 62 | .. | .. | x | 109 | .. | .. | x |
| 63 | .. | x | .. | 110 | .. | x | x |
| 66 | .. | .. | x | 111 | .. | x | .. |
| 68 | x | .. | x | 112 | .. | x | .. |
| 70 | x | .. | .. | 113 | x | .. | .. |
| 73 | .. | x | x | 114 | .. | x | .. |
| 74 | x | x | x | 115 | .. | x | .. |
| 75 | .. | x | x | 116 | .. | x | .. |
| 76 | x | .. | .. | 128 | .. | x | .. |
| 80 | x | .. | .. | 129 | x* | .. | .. |
| 85-86 | x | .. | .. | 131-132 | x | .. | .. |
| 88 | .. | x | .. | 143 | .. | x | .. |
| 89 | .. | x | .. | 156 | .. | .. | x |
| 89-90 | x | .. | .. | | | | |

*This sample was taken at 10 m. (See map 2, p. 57).

### **Phalacrophorus attenuatus** n. sp.

(Plate I, figure 14)

This species is represented in the collection by a number of specimens, none of which is entire or well preserved. The largest piece is 15 mm long and contains forty somites. The greatest width is about 0.25 mm. The prostomium (pl. I, fig. 14) is rounded on its anterior margin much as is **P. maculatus**; there are two brown eyes and brown spots along the anterior margin. The tentacular cirri on somites 1 and 2 resemble those of **P. maculatus**, the second one being the larger. There is a setal lobe on the second somite. The third, fourth, and fifth parapodia are about equal in length to the setal part of the second. On the sixth there is the beginning of a dorsal cirrus, and behind this there is an increase in parapodial size so that by the fifteenth they are about equal in length to the body diameter. The setae are similar to those of **P. maculatus.** A pair of heavy jaws is visible through the body wall (pl. I, fig. 14).

The type is no. 20083 in the United States National Museum and was collected in 50 m at station 100. Others were taken on the surface at stations 76 and 112 in 50 m, and at station 75 in 100 m. See map 2 (p. 57).

A fragment of **Phalacrophorus** of indeterminable species was collected at stations 95 and 96.

## FAMILY ALCIOPIDAE

Members of this family are very abundant in the collections but, unfortunately, very few specimens are entire so that identification has necessarily depended largely on the character of the anterior ends. In the key as given by Chamberlin (1919, p. 130) the presence or absence of a terminal cirriform appendage on the end of the parapodium is taken as an important diagnostic character. In the **Carnegie** material it was not easy to determine in all cases whether this cirrus (or these cirri, for in some genera there are two) is present and some errors in identification may have arisen. The author has separated **Corynocephalus** from **Rhynchonerella** mainly on the character of the setae, the head being often too distorted for any accurate description. **Corynocephalus** has a large percentage of spikes in the anterior parapodia, whereas **Rhynchonerella** has very few. **Corynocephalus** has only simple setae, whereas **Rhynchonerella** has compound. In these latter the terminal joint is very small and in slender setae it often looks as if it were merely a bent terminal part.

### Genus ALCIOPA Audouin et Milne-Edwards

#### **Alciopa distorta** n. sp.

(Plate I, figures 16, 17; plate II, figure 18)

The body is 38 mm long and 3 mm wide at the widest part, tapering from there to a width of less than 1 mm at the anterior end and to a much less width at the pygidium. The anterior body region as far back as the fifth somite is rather rigid, apparently owing to the heavy pharynx, but behind this point it is much distended and thin walled. Although the body wall is translucent, no internal organs can be seen through it, and its whole appearance is that of an empty shell.

The eyes are large and their lenses are directed downward. Between them on the dorsal surface is a wide and rather deep depression in which lies the short stumpy median tentacle, attached at about the level of the mid-diameter of the eyes. The anterior prostomial margin is rounded but has a median notch. In front of this lie the frontal tentacles, which are ovate in outline and larger than the median. The base of the first tentacular cirrus forms a sort of cup which partly encloses the eye, its terminal part extending to the outer eye margin (pl. I, fig. 16). The second somite has on either side a pair of very small cirri, which, owing to distortion of the specimen, show only on one side in the figure. The third somite has a large, ovoid ventral cirrus and a more slender dorsal one; the fourth has cirri similar to these but much heavier; on the fifth the ventral cirrus is small and the dorsal one very large; the sixth has more of the form of those in succeeding somites and is the first one which has setae. Beginning with the seventh, each somite has a very prominent dark-brown pigment spot on the dorsal surface near the parapodial base.

As noted above, the pharynx, when retracted, gives the anterior region of the body a rigid appearance and it is wider here than elsewhere. The appearance of the protruded pharynx is shown in plate I, figure 17. Its margin is recurved, which may possibly indicate merely an incomplete protrusion and the lateral lobes are short and conical. The parapodia (pl. II, fig. 18) are relatively small, their vertical diameters being much less than that of the body, and the cirri are also small. The dorsal cirrus is attached to the parapodial margin for its entire length but the ventral one is free except for its point of attachment.

The type is no. 20084 in the United States National Museum and was collected at station 137 in 50 m. Others were collected between stations 1 and 2 in 100 m and at station 84 in 50 m. See map 2 (p. 57).

### Genus **TOREA** Quatrefages

#### **Torea pelagica** Chamberlin

**Torea pelagica** Chamberlin, 1919, pp. 131-133, pl. 24, figs. 4-9.

Collected in 50 m at station 88 and in 100 m at station 102. See map 2 (p. 57).

#### **Torea fasciata** n. sp.

(Plate II, figures 19, 20)

A slender species marked by prominent dark-brown bands throughout the entire body length, the ground color of the body being light yellowish-brown. The bands vary in size, sometimes involving only one somite and in other cases covering as many as three. They may be separated by as few as three or as many as eight somites, and they generally extend entirely around the body. The dark-brown segmental glands found in many genera of this family did not appear in either of the two specimens at the author's disposal.

Neither of the two individuals is entire and both are badly macerated about the anterior body region. The type retains 110 of the anterior somites and is 42 mm long. The width at the eyes is 2 mm, which is nearly twice that of the first somites. In the type there is a gradual narrowing of the body to the region of the tenth somite and behind this an increase to the fifteenth, where it is about 1.5 mm wide. This width is retained to the end of the fragment.

Because of imperfect preservation, a complete description of the prostomial appendages and first pairs of parapodia is impossible. On the dorsal surface no tentacle is visible. Ventrally (pl. II, fig. 19), one anterior tentacle remains. The eyes are very large, are nearly in contact on the ventral surface, and their lenses point ventrolaterally. There are three pairs of tentacular cirri, those of the first somite are the largest and extend to the outer border of the eye. The second pair is smaller and about equal in size to the third. In the specimen figured the first was broken on the right side (left in figure), and the ventral one of the second pair on the left was also injured. The first three parapodia are very short and have no setae; the fourth is longer and has a single seta; the fifth is still longer and has more setae. Throughout the greater part of the body the parapodia are longer than the body diameter. Each has a setal part which is conical in outline and carries a single large acicula (pl. II, fig. 20) and a tuft of very slender, long, compound setae. The dorsal and ventral cirri are flattened, the former a trifle more separated from the setal part than is the latter but both are small in comparison with the setal lobe. Setae are very slender and long, and only in a few cases were the terminal joints retained. This joint is small as compared with the basal one.

The type is no. 20085 in the United States National Museum and was collected in 50 m at station 133. Others were collected at stations 79 and 132 in 50 m and at station 23 in 100 m. See map 2 (p. 57).

### Genus **VANADIS** Claperède

#### **Vanadis formosa** Claperède

**Vanadis formosa** Claperède, 1869, pp. 480-482, pl. 10, fig. 3.
**Vanadis formosa** Chamberlin, 1919, pp. 134-135.

Chamberlin gives a long list of localities from which this species was taken on the expeditions of the **Albatross**, and concludes that it is identical with **V. fusca punctata** Treadwell (see below). The two species are quite unlike, however, **V. formosa** being much larger and stouter in every way. In **V. formosa** the body has a very thin wall whereas in **V. fusca punctata** this is relatively heavy.

Stations and depths of collection are as follows:

| Station | Surface | 50 m | 100 m | Station | Surface | 50 m | 100 m |
|---|---|---|---|---|---|---|---|
| 17 | .. | x | .. | 105 | .. | x | .. |
| 18 | .. | x | .. | 134 | .. | x | .. |
| 30 | .. | .. | x | 137 | .. | x | .. |
| 54 | .. | .. | x | 143 | .. | x | .. |
| 87 | .. | x | .. | 157 | .. | x | .. |
| 88 | .. | x | .. | 158 | .. | x | .. |
| 89 | .. | x | .. | 160 | .. | .. | x |

(See map 3, p. 58).

#### **Vanadis fusca punctata** Treadwell

**Vanadis fusca punctata** Treadwell, 1906, pp. 1159-1160, figs. 29-31.
**Vanadis minuta** Treadwell, 1906, pp. 1158-1159, figs. 25-28.

In the above mentioned paper the author has listed these as distinct species. Having had access in the **Carnegie** material to a much larger number of individuals, he has discovered that they really are the same species.

Stations and depth of collections were as follows:

| Station | Surface | 50 m | 100 m | Station | Surface | 50 m | 100 m |
|---|---|---|---|---|---|---|---|
| 16 | .. | x | x | 90 | .. | x | .. |
| 17 | .. | x | .. | 91 | .. | x | .. |
| 18 | .. | .. | x | 92 | .. | x | .. |
| 19 | .. | .. | x | 94 | .. | x | .. |
| 20 | .. | x | x | 95 | .. | x | x |
| 23 | .. | .. | x | 96 | .. | .. | x |
| 32 | .. | .. | x | 97 | .. | .. | x |
| 34 | .. | x | .. | 98 | .. | .. | x |
| 35-36 | x | .. | .. | 99 | .. | x | .. |
| 37 | x | .. | .. | 101 | .. | x | .. |
| 44 | .. | x | .. | 102 | .. | x | .. |
| 47 | .. | .. | x | 104 | .. | .. | x |
| 48 | .. | .. | x | 105 | .. | x | x |
| 49 | .. | x | x | 106 | .. | .. | x |
| 50 | .. | x | x | 109 | .. | x | x |
| 50-51 | x | .. | .. | 112 | .. | x | .. |
| 51 | .. | .. | x | 131-132 | x | .. | .. |
| 52 | .. | x | x | 132 | .. | x | x |
| 53 | .. | x | x | 133 | .. | .. | x |
| 54 | .. | x | x | 134 | .. | .. | x |
| 55 | .. | x | x | 135 | .. | .. | x |
| 56 | x | .. | x | 137 | .. | .. | x |
| 57 | .. | x | .. | 138 | .. | x | .. |
| 63 | .. | x | .. | 139 | .. | x | .. |
| 63-64 | x | .. | .. | 142 | .. | x | .. |
| 64 | .. | .. | x | 143 | .. | x | x |
| 64-65 | x | .. | .. | 145 | .. | .. | x |
| 82 | .. | x | .. | 147 | .. | .. | x |
| 83 | .. | x | .. | 149 | .. | .. | x |
| 84 | .. | x | .. | 150 | .. | x | x |
| 85 | .. | x | .. | 151 | .. | x | .. |

#### **Vanadis uncinata** n. sp.

(Plate II, figures 23, 24)

Three pieces apparently together compose an entire individual. The anterior fragment contains about forty-five somites and is 20 mm long, the second has twenty-three somites and is 15 mm long, whereas the third, which is 12 mm long, has about twenty somites and a narrow terminal part. Apstein (1900, p. 10, pl. 1, fig. 1) describes and figures a similar, much more slender prolongation on **V. formosa**, which he says does not always appear. In **V. uncinata** this shows faint traces of metamerism and the anal opening is at its posterior end. It is evidently a regenerating pygidium.

The eyes (pl. II, fig. 23) are not particularly prominent, the total width across the two being 1.5 mm. In this specimen, in which the proboscis is protruded, and hence it is possible that there has been more or less distortion, the eyes are widely separated and the prostomial surface between them depressed. The tentacles are conical in form, the median one situated at about the level of the middle of the eye. The proboscis is relatively short and stout, its two terminal branches ending in sharply recurved pointed hooks. Dorsally, the membrane uniting the bases of these hooks carries about nine marginal lobes, the ventral one never having more than five.

There are three pairs of tentacular cirri of which the first is the largest. The peristomial width is about equal to the distance between the eyes and the following somites, as far as the seventh, are successively narrower. This width increases in later somites until by the fifteenth the diameter is twice that of the seventh. The anterior parapodia are hardly as long as the first tentacular cirrus and their cirri are small. Beginning in the region of the eighth to the tenth they increase in size as the body widens, but never become large as compared with the body width. In a fully developed parapodium (pl. II, fig. 24) the setal lobe is sharp-pointed and has a single acicula whose tip projects beyond the apex of the setal lobe. A slender cirrus, characteristic of the genus, is attached to the end of the setal lobe posterior to the acicula tip. In each parapodium there is a bunch of very long and slender compound setae. A rounded, brown-colored setal gland lies on the dorsal surface just posterior to the parapodium. The appearance of this varies in different individuals.

The type is no. 20086 in the United States National Museum and was collected in 50 m at station 47. See map 3 (p. 58).

### Genus **MAUITA** Chamberlin

A fragment of a species belonging to this genus was taken in 50 m at station 47.

### Genus **RHYNCHONERELLA** A. Costa

#### **Rhynchonerella pycnocera** Chamberlin

**Rhynchonerella pycnocera** Chamberlin, 1919, pp. 147-150, pl. 25, figs. 7, 8; pl. 29, figs. 1-6.

Collected at stations and depths as follows:

| Station | 50 m | 100 m | Station | 50 m | 100 m |
|---|---|---|---|---|---|
| 16 | x | x | 69 | x | .. |
| 28 | x | x | 88 | x | .. |
| 29 | .. | x | 96 | .. | x |
| 32 | .. | x | 97 | .. | x |
| 39 | .. | x | 98 | .. | x |
| 40 | .. | x | 99 | x | .. |
| 41 | x | x | 108 | .. | x |
| 42 | .. | x | 109 | .. | x |
| 43 | .. | x | 112 | x | x |
| 45 | .. | x | 113 | .. | x |
| 52 | .. | x | 131 | .. | x |
| 55 | .. | x | 137 | .. | x |
| 57 | .. | x | 143 | x | .. |
| 60 | .. | x | 149 | x | .. |
| 66 | .. | x | | | |

(See map 3, p. 58).

Genus **CORYNOCEPHALUS** Levinsen

**Corynocephalus paumotanus** Chamberlin

**Corynocephalus paumotanus** Chamberlin, 1919, pp. 141-143, pl. 23, figs. 1-3

Collected as indicated below.

| Station | Surface | 50 m | 100 m | Station | Surface | 50 m | 100 m |
|---|---|---|---|---|---|---|---|
| 1 | x | .. | .. | 97 | .. | x | .. |
| 1- 2 | .. | .. | x | 99 | .. | x | x |
| 4 | .. | .. | x | 100 | .. | .. | x |
| 15 | .. | x | x | 104 | .. | x | x |
| 18 | .. | .. | x | 105 | .. | .. | x |
| 27 | .. | .. | x | 106 | .. | x | x |
| 31 | .. | .. | x | 107 | .. | x | .. |
| 36 | x | .. | .. | 109 | .. | x | x |
| 37 | .. | .. | x | 113 | .. | x | .. |
| 41 | .. | .. | x | 115 | .. | x | .. |
| 47 | .. | .. | x | 121 | .. | x | .. |
| 50-51 | x | .. | .. | 131 | .. | x | .. |
| 51 | .. | .. | x | 132 | .. | x | .. |
| 52 | .. | .. | x | 135 | .. | .. | x |
| 53 | .. | x | .. | 136 | .. | x | x |
| 55 | .. | x | .. | 137 | .. | .. | x |
| 56 | .. | x | x | 138 | .. | .. | x |
| 63-64 | x | .. | .. | 143 | .. | x | .. |
| 71 | .. | x | .. | 146 | .. | .. | x |
| 74 | .. | .. | x | 148 | .. | .. | x |
| 75 | .. | .. | x | 149 | x | x | .. |
| 82 | .. | x | .. | 151 | .. | x | .. |
| 84 | .. | x | .. | 152 | .. | x | x |
| 85 | .. | x | .. | 153 | .. | x | .. |
| 87 | .. | x | .. | 156 | .. | .. | x |
| 89 | .. | x | .. | 157 | .. | .. | x |
| 91 | .. | x | .. | 159 | .. | x | .. |
| 94 | .. | x | x | 160 | .. | .. | x |
| 95 | .. | x | .. | | | | |

(See map 3, p. 58).

**Corynocephalus magnachaetus** n. sp.

(Plate II, figures 21, 22)

A slender, elongated species about 20 mm in length and containing about 90 somites. The body is not more than 0.5 mm in diameter and the prostomium 0.75 mm. The body width is fairly uniform until near the posterior end where there is a narrowing; the pygidium width being not more than one-fourth that of the widest part of the body. These measurements were made on the type specimen which may not have been fully grown but others agreed fairly well with this. The body is much more slender and there is less overlapping of somites than is the case in **C. paumotanus** of Chamberlin.

The prostomium is depressed between the eyes and has a very short median tentacle near its anterior border (pl II, fig. 21). In most individuals, including the type, the prostomium was bent so that no good view of it could be obtained. In the one drawn the left anterior tentacle remains, the right one having been lost. The anterior tentacles are essentially similar in form and size to the posterior and are bent back under the prostomium. There are five pairs of tentacular cirri, one on the first somite and two on each of the following. The first are small and ventrally placed, each about equal to tentacle in size. The second and third ventral cirri are successively smaller than the first. The dorsal cirrus of the second somite is considerably larger than the ventral a and the third is still larger. In the one drawn, the head region had been bent so that on the left side the large tentacular cirrus appears to be in contact with the prostomium. In his key to the described species of **Corynocephalus**, Chamberlin (1919, p. 141) uses the axes of the eyes in their relation to one another as important features of the diagnosis. Owing to distortion during preservation, or for other reasons, none of the **Carnegie** material was sufficiently uniform in this respect to be of value in species determination.

The parapodia carry broad dorsal and ventral cirri, the dorsal being the larger, and anterior ones are smaller than those from near the middle of the body. The setae are characteristic in that as far back as somites 14 or 15 each parapodium has a bundle of four or five very long heavy ones, radiating fan like from the parapodial surface, there being only a few slender ones. Behind the region of somite 15 the parapodia are larger and carry tufts of long, slender, simple setae; the stout setae as a rule disappear completely. In some specimens the only pigmentation is a small spot on either side at the base of the parapodium, but what seems to be a more typical condition is shown in plate II, figure 22. On the dorsal surface of the otherwise colorless somite fine brown lines outline a trapezoid, the anterior one of these lines being the shorter. Toward their middle these lines show a tendency to break up and be connected by a network of finer lines. From each basal angle of the trapezoid a line extends to the pigment spot on the parapodial surface and a much finer one extends in a loop forward from the anterior angles.

The type was collected at station 97 in 50 m and is no. 20087 in the United States National Museum. Others were taken in 50 m at stations 2, 44, and 71; and in 100 m at stations 74 and 99. See map 3 (p. 58).

Genus **PLOTOHELMIS** Chamberlin

**Plotohelmis alata** Chamberlin

**Plotohelmis alata** Chamberlin, 1919, pp. 144-146, pl. 23, figs. 4-10, pl. 24, figs. 1-3.

Collected at stations 97 in 50 m and 132 in 100 m. See map 3 (p. 58).

### Genus **CALLIZONELLA** Apstein

#### **Callizonella pigmenta** n. sp.

(Plate II, figure 25)

The following description is tentatively offered for a new species of this genus, of which a very few appeared in the collections. The body is about 5 mm long and not over 0.5 mm wide in the widest part, which is about the middle region. From here there is a very decided tapering to the pygidium. The most noticeable feature is a deposit of black pigment on the dorsal face of the first five somites, a color character easily visible to the naked eye. The eyes (pl. II, fig. 25) are very large and separated from one another by a narrow but relatively deep depression. Apparently the lenses normally are pointed ventrally but distortions are so easy in the case of the eyes that the author is not certain this is the case, or whether the condition is a result of preservation and mounting. He could find no median tentacle.

On either side of the first somite is a ventral tentacular cirrus which is covered over by the very large pigmented cirrophore of the dorsal tentacular cirrus of the second somite. Of the tentacular cirri of the second pair, the ventral one is similar in size and form to that of the first. Because of distortion and poor preservation it is impossible to be certain, but apparently the third pair of tentacular cirri is a small dorsal and much larger ventral one, the bases of the latter nearly meeting on the ventral surface. In the following somites the ventral cirri are similar to the smaller ones of the ventral tentacular cirri.

The pigment above mentioned ceases abruptly on the posterior border of the fifth setigerous somite. The parapodia are acutely conical at the apices and each has the terminal cirrus characteristic of the genus. As the body narrows posteriorly, the parapodia retain their length and at the same time become more slender so that they are very prominent. No cirri were to be found. The setae are of two kinds, capillary and crochets. They are both very long, especially those in posterior somites where they are longer than the body diameter. In these posterior somites the crochets are more numerous with reference to the capillary than is the case farther forward.

The type is no. 20088 in the United States National Museum and was collected at station 151 in 50 m. See map 3 (p. 58).

A fragment of a specimen of this genus was taken in 50 m at station 23.

## FAMILY TYPHLOSCOLECIDAE

### Genus **TYPHLOSCOLEX** Busch

#### **Typhloscolex mulleri** Busch

(Plate II, figure 27)

**Typhloscolex mulleri**, Busch, 1851.
**Typhloscolex mulleri**, Reibisch, 1895, pp. 52-53; pl. 5, figs. 1-5.

The identification was by means of the descriptions given by Reibisch.

Stations and depths of collections were as follows:

| Station | Surface | 50 m | 100 m | Station | Surface | 50 m | 100 m |
|---|---|---|---|---|---|---|---|
| 27 | .. | .. | x | 82 | x | x | .. |
| 30 | .. | x | .. | 88 | .. | x | .. |
| 39 | x | .. | .. | 89 | .. | x | .. |
| 41 | .. | x | x | 89-90 | x | .. | .. |
| 53 | .. | .. | x | 90 | .. | x | .. |
| 60-61 | x | .. | .. | 94 | .. | x | x |
| 61-62 | x | .. | .. | 95 | .. | .. | x |
| 62-63 | x | .. | .. | 96 | .. | .. | x |
| 63-64 | x | .. | .. | 97 | .. | .. | x |
| 66 | .. | .. | x | 98 | .. | x | x |
| 68 | .. | .. | x | 105 | .. | .. | x |
| 69 | .. | x | x | 109 | .. | .. | x |
| 71 | .. | x | .. | 112 | x | .. | .. |
| 72 | .. | x | .. | 113 | .. | x | .. |
| 72-73 | x | .. | .. | 117 | .. | .. | x |
| 73 | .. | x | .. | 120 | .. | x | .. |
| 74 | .. | x | .. | 123 | .. | .. | x |
| 75 | .. | x | x | 125 | .. | .. | x |
| 76 | x | .. | .. | 128 | .. | .. | x |
| 79 | .. | .. | x | 129 | x | .. | .. |

See map 4, p. 59. Indeterminable species of this genus were taken at the surface at stations 31 and 36, and in 100 m at 22 and 71.

### Genus **PLOTOBIA** Chamberlin

#### **Plotobia simplex** Chamberlin

**Plotobia simplex** Chamberlin, 1919, pp. 155-156, pl. 65, figs. 6-11; pl. 66, fig. 1.

Collected in 50 m at station 122 and in 100 m at stations 120 and 123. The record shows that one was taken at station 64 in 1000 m. This probably should read 100 m.

#### **Plotobia paucichaeta** n. sp.

(Plate II, figure 26)

As defined by Chamberlin (1919, p. 152) this genus is characterized by the possession of a dorsal pair of nuchal organs, which in one of his two species is branched and in the other cirriform. The cirrus-like structures on the dorsal prostomial surface of these specimens seem to be homologous with Chamberlin's nuchal organs and the author has accordingly placed them in the genus **Plotobia**.

The type is 3.5 mm long and the prostomium is bluntly rounded but in others it carries the characteristic pointed tentacle (plate II, fig. 26). Dorsally the prostomium is elevated and on either side is a broad cirrus. The rounded nuchal organs lie on the dorsal surface and there are no eyes.

Along the side of the body are twenty pairs of platelike cirri which are broadly lanceolate in outline and are largest near the middle of the body except that the anal pair are very large and broad. The posterior somites are short and in consequence the posterior cirri are much crowded together. The only setae in the body are on the last three somites, immediately in front of the pygidium. The author was unable to find any setae at all in the type, but they occur in other specimens. In each seta tuft are two stout, colorless, and slightly bent setae.

The type is no. 20090 in the United States National Museum and was collected at the surface at station 82. Others were taken as indicated below.

| Station | Surface | 50 m | 100 m | Station | Surface | 50 m | 100 m |
|---|---|---|---|---|---|---|---|
| 16 | .. | x | .. | 64-65 | x | .. | .. |
| 17 | .. | .. | x | 68 | x | .. | x |
| 19 | .. | .. | x | 69 | .. | x | .. |
| 20-21 | x | .. | .. | 71 | .. | x | .. |
| 23 | .. | .. | x | 74 | .. | .. | x |
| 24 | .. | x | x | 80 | x | .. | .. |
| 27 | .. | .. | x | 81 | x | .. | .. |
| 29 | .. | x | .. | 82 | .. | x | .. |
| 32 | .. | .. | x | 89 | .. | x | .. |
| 35 | .. | .. | x | 90 | .. | x | .. |
| 41 | .. | x | .. | 93 | x | .. | .. |
| 42 | .. | x | .. | 95 | .. | .. | x |
| 45 | .. | .. | x | 97 | .. | x | x |
| 50 | .. | .. | x | 98 | .. | .. | x |
| 53 | .. | .. | x | 99 | .. | x | .. |
| 55 | .. | x | x | 102 | .. | x | x |
| 56 | .. | x | .. | 104 | .. | .. | x |
| 57 | .. | x | x | 119 | .. | x | x |
| 61-62 | x | .. | .. | 128 | .. | .. | x |
| 62-63 | x | .. | .. | 129* | x** | .. | .. |
| 63-64 | x | .. | .. | 141 | .. | x | .. |
| 64 | .. | .. | x* | | | | |

See map 4, p. 59. *This sample was taken at 1000 m. **This sample was taken at 10 m.

### Genus TRAVISOPSIS Levinsen

Specimens recognizable as this genus, but not well enough preserved for species diagnosis, were taken at stations 25 and 27 in 50 m and on the surface at station 29.

## FAMILY TOMOPTERIDAE

### Genus TOMOPTERIS Escholtz

### Tomopteris eura Chamberlin

**Tomopteris eura** Chamberlin, 1919, pp. 160-161, pl. 27, figs. 1, 2.

Characterized by the presence of a first cirrus and a long tail devoid of parapodia. The author has listed a few small ones in which the tail does not appear as of this species, since it seems probable that this condition is owing to imperfect preservation.

Collected as recorded below.

| Station | Surface | 50 m | 100 m | Station | Surface | 50 m | 100 m |
|---|---|---|---|---|---|---|---|
| 18 | .. | .. | x | 74 | .. | .. | x |
| 52 | .. | .. | x | 104 | x | .. | .. |
| 54 | .. | .. | x | 112 | x | .. | .. |
| 56 | .. | .. | x | 113 | x | .. | .. |
| 65 | x | .. | .. | 120 | .. | .. | x |

What are probably the young of this species were collected in 50 m at station 132, and in 100 m at stations 18 and 54. See map 4 (p. 59).

### Tomopteris septentrionalis Quatrefages

**Tomopteris septentrionalis** Quatrefages, 1865, p. 220.

The author has identified these from the diagnosis given by Rosa (1908, pp. 297-301, pl. 12, fig. 17). Rosa figures only a parapodium, and the **Carnegie** specimens agree with his diagnosis in all respects except that the hyaline glands are not always visible. In most parapodia they appear as rusty-red spots lying near the chromophile glands. There are no rosettes.

This species has been recorded from the South Pacific region by Benham (1921, p. 64; 1929, pp. 195-196) and by Munro (1930, pp. 86-87). Most of these were collected nearer the Antarctic region than were any of the **Carnegie** specimens, though Munro has one record from 23° south latitude.

Collected as indicated below.

| Station | Surface | 50 m | 100 m | Station | Surface | 50 m | 100 m |
|---|---|---|---|---|---|---|---|
| 6 | .. | x | x | 113 | x | .. | .. |
| 6-7 | x | .. | x | 117 | .. | .. | x |
| 12 | .. | .. | x | 119 | .. | x | x |
| 28 | .. | .. | x | 120 | .. | x | x |
| 37 | .. | x | .. | 121 | .. | x | x |
| 41 | .. | .. | x | 122 | .. | x | x |
| 42 | .. | .. | x | 123 | .. | .. | x |
| 61 | .. | x | .. | 124 | .. | .. | x |
| 65 | x | .. | .. | 125 | .. | x | x |
| 68 | .. | .. | x | 128 | .. | x | .. |
| 96 | .. | .. | x | 130 | .. | .. | x |
| Samoa | x | .. | .. | 131 | .. | .. | x |

(See map 4, p. 59).

Very small specimens, agreeing with these in the form of the prostomium and tentacles and undoubtedly the young of this species, were taken as indicated below.

| Station | Surface | 50 m | 100 m | Station | Surface | 50 m | 100 m |
|---|---|---|---|---|---|---|---|
| 5-6 | x | .. | .. | 55 | .. | .. | x |
| 6-7 | x | .. | .. | 56 | .. | x | .. |
| 8 | .. | x | .. | 57 | .. | .. | x |
| 10 | .. | .. | x | 63 | .. | x | .. |
| 20 | .. | .. | x | 127 | .. | .. | x |
| 37 | .. | x | .. | 137 | .. | .. | x |
| 41 | .. | x | .. | 149 | .. | .. | x |
| 42 | .. | x | .. | 151 | .. | .. | x |
| 45 | .. | .. | x | 152 | .. | .. | x |
| 51 | .. | .. | x | 153 | .. | x | .. |
| 53 | .. | .. | x | | | | |

(See map 4, p. 59).

### Tomopteris sp.

Under this head the author has listed a considerable number of specimens which are either too young or too badly mutilated for accurate identification. It seems probable that most of them are **T. septentrionalis**. Collected as indicated below.

| Station | Surface | 50 m | 100 m | Station | Surface | 50 m | 100 m |
|---|---|---|---|---|---|---|---|
| 6- 7 | x | .. | .. | 69 | .. | x | x |
| 9 | .. | x | x | 72 | .. | x | .. |
| 10 | .. | x | .. | 73 | .. | .. | x |
| 19 | .. | .. | x | 76 | .. | .. | x |
| 20 | .. | x | .. | 82 | .. | x | .. |
| 21 | .. | x | .. | 95-96 | x | .. | .. |
| 22 | .. | .. | x | 98 | .. | .. | x |
| 25 | .. | .. | x | 99 | .. | .. | x |
| 28 | .. | x | .. | 109 | .. | .. | x |
| 35 | .. | .. | x | 111 | .. | .. | x |
| 38 | .. | .. | x | 112 | .. | .. | x |
| 39 | x | .. | .. | 115 | .. | .. | x |
| 40 | .. | .. | x | 128 | .. | .. | x |
| 49 | .. | .. | x | 130 | .. | x | .. |
| 50-51 | x | .. | .. | 131 | .. | .. | x |
| 56 | x | .. | .. | 132 | .. | .. | x |
| 59 | .. | x | .. | 136 | .. | .. | x |
| 60-61 | x | .. | .. | 137 | .. | x | .. |
| 63-64 | x | .. | .. | 147 | .. | .. | x |
| 66 | .. | x | .. | 149 | .. | x | .. |
| 67 | .. | x | .. | 153 | .. | x | .. |

## FAMILY SYLLIDAE

### Genus **AUTOLYTUS** Grube

### **Autolytus pacificus** n. sp.

(Plate II, figures 28-30)

Only female individuals were present and of these one was carrying a prominent bunch of eggs attached to the ventral surface, as is common in this genus. The body of the type is about 3 mm long and somewhat less than 0.4 mm wide. It is divided into three regions: the anterior, the median, and the terminal region. The most anterior region is composed of a head and five setigerous somites in which there are no evident parapodia, the setae arising directly from the body wall. The median region is composed of twelve somites which carry prominent parapodia. The terminal region is shorter than the anterior one, and it is not possible, owing to the conditions of the material, to determine the precise somite number. There seems to be about eight (pl. II, fig. 28).

Seen from the dorsal surface the prostomium (pl. II, fig. 29) shows a median and two lateral rounded lobes, and two pairs of eyes of which the ventral ones are much the larger. These sometimes lie in such a position that the smaller one is seen on top the larger (fig. 29). There are no tentacles unless small rounded lobes ventral to the eye may represent these organs.

In the anterior region four or five setae arise directly from the body wall on either side of each somite. These (pl. II, fig. 30) are slender and short, and are bifurcated at their ends. In none of these somites is there any trace of compound setae. In the median region each parapodium carries a tuft of setae similar to these but having longer stalks and in addition some very long, slender, sharp-pointed ones.

The type is no. 20089 in the United States National Museum and was collected at Samoa on the surface.

The author admits that he is entirely uncertain of the systematic position of the annelids now to be described and has given them new generic and specific names. If they really belong in some well-known genus, that fact will doubtless appear later. Tentatively they are grouped with the Syllidae.

### **EPITOKA** n. genus

Palps completely fused, forming a prostomial margin ventral to the bases of the dorsal tentacles. There are two pairs of tentacles, two eyes, and one pair of tentacular cirri. The apices of all parapodia are drawn out into slender processes much longer than the body width. Setae begin on the second somite, and are long, slender, and compound. Dorsal and ventral cirri are short and ovate with acute apices.

### **Epitoka pelagica** n. sp.

(Plate II, figure 31)

The body is very slender and transparent, not more than 3 mm long, prostomial width 0.17 mm. The prostomial breadth is about twice its length, and it is moderately incised on the anterior margin, each side being prolonged into an anterior tentacle. Ventrally a rounded lobe (fused palps?) extends in front of the prostomium. The ventral tentacles are somewhat heavier than the dorsal ones (pl. II, fig. 31). On the prostomium are two large eyes with their lenses directed outward. The first somite is short and definitely marked off from the prostomium. It carries a pair of tentacular cirri which much resemble the tentacles in appearance. On the second somite are parapodia, which, at a distance from the body about equal to the diameter of the latter, decidedly narrow and are carried beyond this point to a distance of five or six times the body diameter. The type was somewhat macerated so the exact outline of this parapodial prolongation was difficult to determine, but apparently it widens toward the outer end, thus being club-shaped. A small and inconspicuous dorsal cirrus lies near the parapodial base. The ventral cirrus, similarly located, is somewhat larger than the dorsal. The parapodial prolongation of the second setigerous somite is hardly more than one half as long as that of the first, and the whole parapodium is smaller than the first. In all, there are sixteen somites and this parapodial arrangement holds throughout, there being only a very slight narrowing toward the posterior end. There is one pair of long anal cirri, similar in form to the parapodial prolongations. A muscular pharynx lies wholly in somite 3 (second setigerous). Scattered through the coelom and in the parapodial cavities of the type were numerous eggs in cleavage stages.

In each setigerous somite there are very long setae, which, in some cases, extend beyond the ends of the parapodial prolongations. They are all compound (pl. II, fig. 32); the basal joint broad and flattened, the terminal joint slender and needle-like.

Because of poor preservation it is probable that the drawing (fig. 31) is incorrect in some details, such as the relative diameters in different parts of the parapodial expansions, etc., but the proportions are as accurate as they could be made with the material at the author's disposal.

The type is no. 20091 in the United States National Museum and was collected at station 62 in 50 m. Others were collected at stations 60, 74, and 96 in 50 m, and at station 73 in 100 m.

## FAMILY NEREIDAE

### Genus **NEREIS** Linnaeus

### **Nereis singularis** n. sp.

(Plate III, figures 33-37)

The type is 8 mm long and 0.5 mm wide at the prostomium, tapering toward the posterior end. The prostomial length is about equal to its width, its greatest diameter being just in front of the anterior eyes (pl. III, fig. 33). The tentacles are separate to their bases, rather stout, and nearly as long as the prostomium. The palps have globular basal joints and narrower terminal ones which are more or less distorted in the specimen from which the drawing was made. The eyes are represented by two irregularly shaped masses of brownish pigment spots in which no indication of the usual separation into two pairs of eyes can be seen. The first somite extends rather far forward by the sides of the prostomium. The longest tentacular cirrus is the dorsal one of the second pair which extends to somite 9.

In the parapodium the dorsoventral diameter is somewhat less than that of the somite, its setal lobes being about equal in length. The dorsal cirrus is very long (pl. III, fig. 34), and the lobe which carries it is longer than the others. The ventral cirrus is very short. There are three kinds of setae. The most ventral ones are compound and have short terminal joints (pl. III, fig. 35) which are bent at the ends. Dorsal to these, and making up most of the dorsal bundle, are other compound setae whose terminal joints are long and slender, and toothed along one margin (pl. III, fig. 36). In the dorsal bundle is a single much larger compound seta having the form shown in figure 37.

The type is no. 20092 in the United States National Museum and was collected at stations 13 and 14 at the surface. See map 4 (p. 59).

## LARVAE AND GENERICALLY INDETERMINABLE MATERIAL

### HETERONEREIDS

Heteronereids were numerous in a sample taken at Easter Island and another at Guam, but no attempt was made at identification.

### SPIONIDS

The collections also contain pelagic larvae of uncertain relationships which show certain resemblances to larvae described by Hãcker (1898). Hãcker identified some larvae as spionids, and though none bore any very close resemblance to those of the **Carnegie** collection, it is quite possible that some of the latter belong in this family. Hãcker gave the type name "Rostraria" to larvae characterized by a peculiarly shaped prostomium bearing large eyes, posterolateral prolongations, and a pair of very heavy tentacles which may be longer than the entire body. On either side of the first somite is a tuft of long setae. Hãcker described four groups of these larvae so definitely distinct from one another that he gave them specific names. One specimen of the **Carnegie** collection is very close to Hãcker's **R. galatea** (1898, pl. IV, fig. 33) but is not sufficiently well preserved for the author to attempt a species diagnosis. Hãcker thought that his larvae probably belonged in the family Disomidae.

### LARVA A

The body is 5 mm long and 0.5 mm wide in the widest part. The prostomium (pl. III, fig. 38) has a width nearly twice its length, and on its dorsal surface are two pairs of eyes of which the larger are nearer the lateral margin. The peristomium is nearly four times as wide as the prostomium and three times as long. On either side it carries a cirrus and a tuft of about ten very heavy setae which carry numerous spines on their surfaces (pl. III, fig. 39). The next somite is much shorter than the first and has on either side a small ovoid dorsal, and much larger ventral cirrus. Between the two is a small tuft of slender curved setae. In the next somite the dorsal cirrus is essentially the same as before except that it is larger and the setae ventral to this dorsal cirrus are larger. In this somite two setae appear ventral to the larger (ventral) cirrus, one being slender, the other much larger and spiked along the margin. In later somites the arrangement is that two large spiked setae lie just ventral to the elongated oval dorsal cirrus, between it and the ventral cirrus. Ventral to the ventral cirrus is a seta tuft containing only two setae; one very slender, the other spiked. The latter are much smaller than those in the dorsal bundle. Posteriorly the somites become much shorter and narrower; the long dorsal cirrus and heavy setae disappear. The pygidium (pl. III, fig. 40) is broad and carries a large tuft of cilia on either side. In the specimen figured the twenty-second, twenty-third, and twenty-fourth somites were ciliated dorsal to the parapodium. The author could not determine if this extended across the dorsum.

Collected at stations 39 and 40 in 50 m. See map 4 (p. 59).

### LARVA B

Possibly a later stage of A, though it may belong to a different species. The pygidium is not ciliated but approaches the definite form of a spionid. The prostomium (pl. III, fig. 41) is broadly rounded and carries two pairs of eyes of which the lateral are nearer the ventral surface than are the median, and in the mounted material they show only faintly through the overlying tissue. There is a short anterior median tentacle and a heavy tentacle on either side. The peristomium is similar to that of larva A, with its cirri and tuft of heavy spiked setae (not shown in fig. 41).

The specimens were poorly preserved but so far as the author could tell, the arrangement of cirri and setae in the anterior body region is exactly as described for larva A. Posterior to the region of somite 20 the body form changes as in larva A, but gills are beginning to appear on the dorsal surface of each somite in these posterior somites. Two somites composing the pygidium have no parapodia or setae but are much flattened and their margins are covered with pigment spots.

Collected at stations 53 and 54 on the surface. See map 4 (p. 59).

## SPIONID LARVA

It seems probable that larvae A and B are spionids and quite certain that the next one to be described belongs in that family. The single specimen is 10 mm long and about 0.5 mm wide. The prostomium (pl. III, fig. 42) is definitely spionid in form. It is rounded on the anterior margin and its greatest diameter is just behind the anterior eyes. From here it narrows rather rapidly and terminates in a tongue-like part which extends backward over the first somite. A second pair of very inconspicuous eyes lies near the posterior prostomial margin. The author is uncertain as to whether the part immediately behind the prostomium is composed of two somites or is a biannulate somite. The somite following it (second or third?) has a small dorsal, and slightly larger ventral cirrus in each parapodium, which also carries a tuft of slender setae, longer than the body diameter. The second setigerous somite has larger dorsal and ventral cirri than has the first and setae similar to the first but much shorter. In addition, each neuropodium has a single stout spine (pl. III, fig. 43). In later somites all the heavy setae are straight, sharp-pointed, and much heavier than anteriorly. The simple setae in these posterior somites are few in number and sometimes have a jointed appearance. This probably is owing to accidental breaks and not to true jointing.

Collected at station 89 in 50 m. See map 4 (p. 59).

## LARVA C

The body is 3 to 4 mm long and about 3 mm wide. The prostomium (pl. III, fig. 44) is rounded anteriorly with a median marginal indentation. The anterior prostomial margin is carried ventrally to form a broad upper lip. On either side is a massive tentacle, and dorsally a pair of inconspicuous eyes. Just posterior to the eye on either side is a curved (nuchal?) organ. Between the tentacle and the upper lip, on either side, is a bunch of long cilia (not shown in the figure). The first somite has on either side a ventral tuft of short, sharp, curved setae and a dorsal bundle of much longer ones exactly similar to those in later somites. Under low power these appear smooth, but a higher magnification brings out fine spines scattered over the surface. On the first parapodium there is a lobe between the two seta tufts. In anterior somites the setal arrangement is similar to that of the first, except that there are a few short setae similar to the ventral ones of the first parapodium, lying at the bases of the long setae. Some long setae appear in the ventral tuft more posteriorly. The setae are several times as long as the body diameter and in the preserved material are very much tangled. There is a decrease in body diameter toward the posterior end, and a complete ring of cilia on the pygidium. The only parapodial cirri the author could find are the ones lying between the setae tufts.

This is possibly a spionid but the author is very uncertain of even this identification.

Collected at stations 41 in 50 m, and 114 and 115 in 100 m. See map 4 (p. 59).

## LARVA D

A single small specimen not quite 3 mm long. The prostomium in outline is a very blunt cone (pl. III, fig. 45), its lateral margins being much obscured by large bundles of cilia. On each side of the dorsal prostomial surface are six groups of pigment spots, of which the median pair are much more clearly defined than is either lateral group. There is a single pair of large tentacles, one of which was broken off in mounting the specimen. There is a bundle of long, straight, colorless setae on either side of the prostomium, each seta having minute spines scattered over its surface. Similar but slightly smaller setae occur on following somites, and toward the pygidium, where the body is narrower, they become very small. On the ventral side of each parapodium is a tuft of shorter curved setae, and there is a cirrus between the two seta tufts. On each parapodium, just posterior to the dorsal seta tuft, is a rather prominent oval gill. Beginning on somite 9 long, slender, hooded crochets appear and continue in later somites, being especially prominent toward the posterior end of the body. The pygidium is ciliated.

These possibly are spionids.

Collected at station 112 in 50 m. See map 4 (p. 59). What is possibly an earlier stage of this species was taken at station 96 in 100 m.

## TEREBELLIDS

Larval terebellids of indeterminable genera and species were collected at the surface at stations 2, 31, and 36; in 50 m at station 118; and in 100 m at stations 2, 66, and 111.

## "CHAETOSPHAERA"

Larvae corresponding in appearance to what Häcker (1898, pp. 19-20) named **Chaetosphaera**. The body is very much rolled ventrally so that prostomium and pygidium are almost touching, and its most evident characteristic is the arrangement of the very large setae. These are nearly as long as the transverse diameter of the body, and spread in such a fashion as to completely cover the dorsal surface and extend anteriorly and posteriorly as well as laterally to considerable distances from the body margins. Each seta is curved, its apex entire, and has a row of sharp teeth along its convex margin. The setae are rich chestnut in color and, being so numerous, they give this tint to the entire animal. The prostomium (pl. III, fig. 46) is distinctly bilobed, each lobe being rounded on the anterior margin, and there are two prominent eyes. On either side is a heavy tentacle. The specimen was coiled so that only about eight somites were visible from the dorsal view, and details of pygidial structure were difficult to get. So far as could be determined the pygidium is rounded.

Collected at stations 89 and 90 at the surface, and 110 in 50 m. See map 4 (p. 59).

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Table 2. Distribution of polychaetous annelids

Letters in table designate depth at which sample was taken: a = surface,

| Station | Latitude | Longitude | Map 1 | | | | | Map 2 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Species | | | | | Species | | | | | | | |
| | | | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 |
| | ° ′ | ° ′ | | | | | | | | | | | | | |
| 1[A] | 38 14 N | 67 34 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | .... |
| Between 1- 2 | 37 45 N | 53 26 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | .... |
| 2 | 39 06 N | 45 41 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | .... |
| 3 | 44 00 N | 36 10 W | .. | .. | .. | .. | ...... | b | ...... | .. | .. | .. | .. | .. | .... |
| 4 | 44 39 N | 33 06 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | .... |
| 5 | 43 15 N | 31 32 W | .. | .. | .. | .. | ...... | b | ...... | .. | .. | .. | .. | .. | .... |
| Between 5- 6 | 50 00 N | 14 27 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | .... |
| 6 | 50 22 N | 13 31 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | .... |
| Between 6- 7 | 56 00 N | 4 00 E | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | .... |
| Between 6- 7[B] | 58 50 N | 1 48 E | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | .... |
| 8 | 63 30 N | 14 41 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | .... |
| 9[C] | 62 45 N | 25 52 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | .... |
| 10 | 59 19 N | 34 15 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | .... |
| 12 | 51 40 N | 49 32 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | .... |
| Between 13- 14 | 42 18 N | 47 11 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | .... |
| 14 | 42 10 N | 47 19 W | .. | .. | .. | .. | c | .. | ...... | .. | .. | .. | .. | .. | .... |
| 15 | 38 39 N | 48 48 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | .... |
| 16 | 36 47 N | 46 31 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | b,c |
| 17 | 33 42 N | 42 21 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | b | b |
| 18 | 29 47 N | 40 36 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | b | c |
| 19 | 24 00 N | 39 36 W | .. | .. | .. | .. | a | .. | ...... | .. | .. | .. | .. | .. | c |
| 20 | 19 13 N | 38 28 W | .. | .. | .. | b | c | .. | ...... | .. | .. | .. | .. | .. | b,c |
| Between 20- 21 | 16 01 N | 37 52 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | .... |
| 21 | 15 50 N | 37 56 W | .. | .. | .. | .. | b | .. | ...... | .. | .. | .. | .. | .. | .... |
| 22 | 13 25 N | 38 00 W | .. | .. | b | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | .... |
| 23 | 10 50 N | 37 24 W | .. | c | .. | .. | c | .. | ...... | .. | .. | .. | c | .. | c |
| 24 | 8 15 N | 36 10 W | .. | b | .. | .. | c | .. | c | .. | .. | .. | .. | .. | .... |
| 25 | 11 02 N | 37 06 W | .. | .. | .. | .. | b | .. | ...... | .. | .. | .. | .. | .. | .... |
| 27 | 11 20 N | 44 12 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | .... |
| 28 | 13 10 N | 49 36 W | .. | .. | .. | b | b | .. | ...... | .. | .. | .. | .. | .. | .... |
| 29 | 13 16 N | 52 13 W | .. | .. | .. | c | ...... | .. | ...... | .. | .. | .. | .. | .. | .... |
| 30 | 12 54 N | 56 15 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | c | .... |
| 31 | 14 46 N | 63 26 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | .... |
| 32 | 15 18 N | 68 11 W | .. | .. | .. | .. | c | .. | c | .. | .. | .. | .. | .. | c |
| 33[A] | 13 37 N | 76 22 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | .... |
| 34 | 11 18 N | 78 34 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | b |
| 35 | 6 32 N | 80 04 W | .. | .. | .. | c | b,c | .. | ...... | .. | .. | .. | .. | .. | .... |
| Between 35- 36 | 6 16 N | 80 17 W | .. | .. | .. | .. | a | .. | ...... | .. | .. | .. | .. | .. | .... |
| Between 35- 36 | 4 16 N | 79 39 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | a |
| 36 | 2 54 N | 80 02 W | .. | .. | .. | .. | c | .. | a | .. | .. | .. | .. | .. | .... |
| 37 | 5 59 N | 82 56 W | .. | .. | .. | .. | b | .. | ...... | .. | .. | .. | .. | .. | a |
| 38[D] | 3 46 N | 81 37 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | .... |
| 39 | 0 52 N | 81 14 W | b | .. | .. | c | c | .. | ...... | .. | .. | .. | .. | .. | .... |
| 40 | 1 32 S | 82 16 W | .. | .. | .. | .. | c | .. | ...... | .. | .. | .. | .. | .. | .... |
| 41 | 1 37 S | 86 58 W | b | .. | .. | .. | b,c | .. | ...... | .. | .. | .. | .. | .. | .... |
| 42 | 1 32 S | 93 10 W | .. | .. | .. | .. | b,c | .. | ...... | .. | .. | .. | .. | .. | .... |
| 43 | 2 30 S | 95 43 W | .. | .. | .. | .. | b,c | .. | ...... | .. | .. | .. | .. | .. | .... |
| 44 | 3 15 S | 99 48 W | .. | .. | .. | .. | c | .. | ...... | .. | .. | .. | .. | .. | b |
| 45 | 4 35 S | 105 03 W | .. | .. | .. | c | c | .. | ...... | .. | .. | .. | .. | .. | .... |
| 46 | 9 06 S | 108 20 W | .. | b | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | .... |
| 47 | 14 07 S | 111 50 W | .. | .. | .. | c | b | .. | ...... | .. | .. | .. | .. | .. | c |
| 48 | 19 06 S | 114 07 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | c |
| 49 | 23 16 S | 114 45 W | .. | .. | .. | .. | c | .. | ...... | .. | .. | .. | .. | .. | b |
| 50 | 26 27 S | 115 21 W | .. | .. | .. | c | ...... | .. | c | .. | .. | .. | .. | .. | b,c |
| Between 50- 51 | 28 38 S | 114 59 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | a |
| Between 50- 51 | 28 45 S | 114 55 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | a |
| 51 | 29 06 S | 114 48 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | c |
| 52 | 31 28 S | 112 51 W | .. | .. | c | .. | c | .. | ...... | .. | .. | .. | .. | .. | b,c |
| 53 | 29 06 S | 108 44 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | b,c |
| Between 53- 54 | 27 25 S | 109 25 W | .. | .. | .. | .. | ...... | .. | ...... | .. | .. | .. | .. | .. | .... |

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b = 50 meters, c = 100 meters, d = 10 meters, e = 1000 meters

| Map 3 | | | | | | Map 4 | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Species | | | | | | Species | | | | | | | | | | | | | |
| 3 | 4 | 5 | 6 | 7 | 8 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| .. | a | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | c | .. | .. | .. | .... | .... | .. | .... | c | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | b | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | c | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | a | .. | .... | .. | .. | .. | . | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | b,c | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | c | a | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | b | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | ... | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | c | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | c | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | d | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | b,c | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | b,c | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | c | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | c | .. | .. | .. | .... | .... | .. | .... | .... | .. | c | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | c | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | c | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | a | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | c | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | b,c | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | c | .. | .. | .. | .... | c | .. | c | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | c | .... | .. | .... | c | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | c | .... | .. | c | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | c | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | c | .... | .. | c | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | c | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | c | .. | .. | .. | .... | .... | .. | .... | .... | b | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | c | a | .. | .... | .... | .. | .. | .... | .. | b | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | c | .... | .. | .... | .... | .. | .. | .... | .. | c | .. | .. | .. | .. | .. |
| .. | c | .. | .. | .. | b,c | b,c | .. | b | c | b | .. | .... | .. | .. | .. | .. | b | .. | .. |
| .. | .... | .. | .. | .. | c | .... | .. | b | c | b | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | c | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | b | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | ..... | .. | .. | .. | c | .... | .. | c | .... | c | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| b | c | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | c | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | a | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | c | .. | .. | .. | .... | .... | .. | .... | .... | c | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | c | .. | .. | .. | c | .... | .. | .... | .... | .. | c | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | b | .. | .. | .. | .... | c | .. | c | .... | c | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | a | .. | .. | .. | .. |

Table 2. Distribution of polychaetous annelids

| Station | Latitude | Longitude | Map 1 | | | | | Map 2 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Species | | | | | Species | | | | | | | |
| | | | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 |
| | ° ′ | ° ′ | | | | | | | | | | | | | |
| 54 | 29 17 S | 108 54 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | c | b |
| 55 | 32 03 S | 110 55 W | .. | .. | .. | .. | b,c | .. | c | .. | .. | .. | .. | .. | b,c |
| 56 | 31 49 S | 109 04 W | .. | .. | c | .. | c | .. | c | .. | .. | .. | .. | .. | a,c |
| 57 | 33 59 S | 106 43 W | .. | .. | .. | .. | ....... | b | ....... | .. | .. | .. | .. | .. | b |
| 58 | 36 51 S | 104 55 W | .. | .. | .. | .. | c | .. | b | .. | .. | .. | .. | .. | .... |
| 59 | 39 51 S | 101 04 W | .. | .. | .. | .. | ....... | c | ....... | .. | .. | .. | .. | .. | .... |
| 60 | 40 24 S | 97 33 W | .. | .. | .. | .. | ....... | .. | c | .. | .. | .. | .. | .. | .... |
| Between 60- 61 | 40 26 S | 97 12 W | .. | .. | .. | .. | ....... | a | ....... | .. | .. | .. | .. | .. | .... |
| Between 60- 61 | 40 22 S | 96 59 W | .. | .. | .. | .. | ....... | a | ....... | .. | .. | .. | .. | .. | .... |
| 61 | 38 29 S | 94 14 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | .... |
| Between 61- 62 | 37 35 S | 93 35 W | .. | .. | .. | .. | a | .. | ....... | .. | .. | .. | .. | .. | .... |
| Between 61- 62 | 37 34 S | 93 35 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | .... |
| 62 | 34 35 S | 91 52 W | .. | .. | .. | .. | ....... | .. | c | .. | .. | .. | .. | .. | .... |
| Between 62- 63 | 32 25 S | 89 49 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | .... |
| Between 62- 63 | 32 23 S | 89 42 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | .... |
| 63 | 32 10 S | 89 04 W | .. | .. | .. | .. | ....... | .. | b | .. | .. | .. | .. | .. | b |
| Between 63- 64 | 32 05 S | 88 58 W | .. | .. | .. | a | ....... | .. | ....... | .. | .. | .. | .. | .. | a |
| Between 63- 64 | 32 03 S | 88 55 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | .... |
| Between 63- 64 | 32 01 S | 88 54 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | a |
| Between 63- 64[B] | 31 58 S | 88 18 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | .... |
| Between 63- 64[B] | 31 51 S | 88 21 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | .... |
| Between 63- 64 | 31 50 S | 88 22 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | .... |
| 64 | 31 54 S | 88 17 W | .. | .. | e | .. | c | .. | ....... | .. | .. | .. | .. | .. | c |
| Between 64- 65 | 31 52 S | 87 51 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | .... |
| Between 64- 65 | 31 52 S | 87 46 W | .. | .. | .. | .. | a | .. | ....... | .. | .. | .. | .. | .. | a |
| Between 64- 65 | 31 31 S | 86 57 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | .... |
| 65 | 31 07 S | 86 39 W | .. | .. | .. | .. | b,c | .. | ....... | .. | .. | .. | .. | .. | .... |
| 66 | 27 04 S | 84 01 W | .. | .. | .. | .. | a,c | .. | c | .. | .. | .. | .. | .. | .... |
| 67 | 24 57 S | 82 15 W | .. | .. | .. | .. | c | .. | ....... | .. | .. | .. | .. | .. | .... |
| 68 | 21 28 S | 80 26 W | .. | .. | .. | .. | c | .. | a,c | .. | .. | .. | .. | .. | .... |
| 69 | 16 49 S | 78 39 W | .. | .. | .. | .. | a,b,c | .. | ....... | .. | .. | .. | .. | .. | .... |
| 70 | 13 53 S | 77 54 W | .. | .. | .. | .. | b | .. | a | .. | .. | .. | .. | .. | .... |
| 71 | 11 57 S | 78 37 W | .. | .. | .. | .. | b,c | .. | ....... | .. | .. | .. | .. | .. | .... |
| 72 | 9 58 S | 82 10 W | .. | .. | .. | .. | b,c | .. | ....... | .. | .. | .. | .. | .. | .... |
| Between 72- 73 | 10 30 S | 84 20 W | .. | .. | .. | .. | ....... | a | ....... | .. | .. | .. | .. | .. | .... |
| 73 | 10 45 S | 84 57 W | .. | .. | .. | .. | a,b,c | .. | b,c | .. | .. | .. | .. | .. | .... |
| 74 | 11 00 S | 87 24 W | .. | .. | .. | .. | c | .. | a,b,c | .. | .. | .. | .. | .. | .... |
| 75 | 14 15 S | 92 05 W | .. | .. | .. | .. | b,c | .. | b,c | c | .. | .. | .. | .. | .... |
| 76 | 15 18 S | 97 28 W | .. | .. | .. | .. | c | .. | a | a | .. | .. | .. | .. | .... |
| 77 | 14 20 S | 103 12 W | .. | .. | .. | .. | a | .. | ....... | .. | .. | .. | .. | .. | .... |
| 78[B] | 13 02 S | 108 03 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | .... |
| 79 | 12 36 S | 112 14 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | b | .. | .... |
| 80 | 12 39 S | 117 22 W | .. | .. | .. | .. | a | .. | a | .. | .. | .. | .. | .. | .... |
| 81 | 13 03 S | 121 12 W | .. | .. | .. | .. | ....... | .. | ....... | ... | .. | .. | .. | .. | .... |
| 82 | 14 52 S | 126 07 W | .. | .. | .. | b | b | .. | ....... | .. | .. | .. | .. | .. | b |
| 83 | 17 00 S | 129 45 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | b |
| 84 | 17 11 S | 133 18 W | .. | .. | .. | .. | ....... | .. | ....... | .. | b | .. | .. | .. | b |
| 85 | 17 12 S | 136 37 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | b |
| Between 85- 86 | 17 48 S | 140 49 W | .. | .. | .. | .. | ....... | .. | a | .. | .. | .. | .. | .. | .... |
| 86 | 17 36 S | 141 55 W | .. | .. | .. | .. | b | .. | ....... | .. | .. | .. | .. | .. | .... |
| 87 | 18 05 S | 145 33 W | .. | .. | .. | .. | a | .. | ....... | .. | .. | .. | .. | .. | .... |
| 88 | 16 42 S | 150 41 W | .. | .. | .. | .. | b | .. | b | .. | .. | b | .. | .. | b |
| 89 | 17 09 S | 152 41 W | .. | .. | .. | .. | b | .. | b | .. | .. | .. | .. | .. | b |
| Between 89- 90 | 17 04 S | 152 58 W | .. | .. | .. | .. | a | .. | a | .. | .. | .. | .. | .. | .... |
| 90 | 16 35 S | 155 45 W | .. | .. | .. | b | b | .. | b | .. | .. | .. | .. | .. | b |

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| Map 3 | | | | | | Map 4 | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Species | | | | | | Species | | | | | | | | | | | | | |
| 3 | 4 | 5 | 6 | 7 | 8 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | c | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | b | .. | .. | .. | c | .... | .. | b,c | .... | c | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | a,c | .. | .. | .. | .... | .... | .. | b,c | .... | b | c | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | c | .... | .. | b | .... | c | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | c | .... | .. | .... | .... | .. | .. | b | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | a | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | b | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | a | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | a | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | b | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | a | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | a | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | b | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | a | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | a | .. | .. | .. | .... | .... | .. | a | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | a | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | a | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | e | c | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | a | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | a | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | a | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | a | .. | a | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | c | c | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | c | .. | a,c | c | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | b | b,c | .. | b | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | b | b | .. | .. | .... | b | .. | b | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | b | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | a | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | b | .. | .... | .... | .. | .. | c | .. | .. | .. | .. | .. | .. | .. |
| .. | c | c | .. | .. | .... | c | .. | c | .... | .. | c | b | .. | .. | .. | .. | .. | .. | .. |
| .. | b | .. | .. | .. | .... | b,c | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | c | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | a | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | a | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | b | .. | .. | .. | .... | a,b | .. | a,b | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | b | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | b | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | . | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | b | b | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | b | .. | .. | .. | .... | b | .. | b | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | a | .. | .... | .... | .. | .. | .... | .. | .. | .. | a | .. | .. | a |
| .. | .... | .. | .. | .. | .... | b | .. | b | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |

Table 2. Distirbution of polychaetous annelids

| Station | Latitude | Longitude | Map 1 | | | | | Map 2 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Species | | | | | Species | | | | | | | |
| | | | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 |
| | ° ′ | ° ′ | | | | | | | | | | | | | |
| 91 | 15 44 S | 160 25 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | b |
| 92 | 15 18 S | 163 14 W | .. | .. | .. | .. | b | .. | b | .. | .. | .. | .. | .. | b |
| 93 | 14 41 S | 167 41 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | .... |
| Between 93- 94 E | (14 18 S) | (170 42 W) | .. | .. | .. | .. | a | .. | a | .. | .. | .. | .. | .. | .... |
| 94 | 12 47 S | 171 35 W | c | .. | .. | .. | b,c | .. | ....... | .. | .. | .. | .. | .. | b,c |
| 95 | 8 43 S | 170 56 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | b,c |
| 96 | 6 47 S | 172 23 W | .. | .. | c | .. | a,b,c | .. | b | .. | .. | .. | .. | .. | c |
| 97 | 3 47 S | 172 39 W | .. | .. | .. | .. | c | a | a,b,c | .. | .. | .. | .. | .. | c |
| 98 | 0 18 N | 173 59 W | .. | .. | .. | b | c | .. | ....... | .. | .. | .. | .. | .. | c |
| 99 | 4 22 N | 176 23 W | .. | b | b | c | b,c | .. | a,b | .. | .. | .. | .. | .. | b |
| 100 | 8 05 N | 178 48 W | .. | .. | b | .. | b,c | .. | b,c | b | .. | .. | .. | .. | .... |
| 101 | 13 23 N | 177 27 E | .. | .. | .. | c | ....... | .. | ....... | .. | .. | .. | .. | .. | b |
| 102 | 16 25 N | 171 59 E | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | c | .. | .. | b |
| 103 | 19 19 N | 166 23 E | .. | .. | .. | .. | c | .. | b | .. | .. | .. | .. | .. | .... |
| 104 | 20 12 N | 161 19 E | .. | .. | .. | .. | b,c | .. | c | .. | .. | .. | .. | .. | c |
| 105 | 18 43 N | 156 16 E | .. | .. | .. | .. | b,c | .. | ....... | .. | .. | .. | .. | b | b,c |
| 106 | 16 14 N | 151 04 E | .. | .. | .. | .. | a,b,c | .. | ....... | .. | .. | .. | .. | .. | c |
| 107 | 14 05 N | 146 06 E | .. | .. | .. | .. | b | .. | b | .. | .. | .. | .. | .. | .... |
| 108 | 18 26 N | 144 01 E | .. | .. | .. | b | b,c | .. | ....... | .. | .. | .. | .. | .. | .... |
| 109 | 23 22 N | 144 08 E | .. | .. | .. | .. | b,c | .. | c | .. | .. | .. | .. | .. | b,c |
| 110 | 26 20 N | 144 24 E | .. | .. | .. | .. | b | .. | b,c | .. | .. | .. | .. | .. | .... |
| 111 | 31 00 N | 144 16 E | .. | .. | .. | .. | b,c | .. | b | .. | .. | .. | .. | .. | .... |
| 112 | 33 51 N | 141 15 E | .. | .. | .. | b | b,c | .. | b | b | .. | .. | .. | .. | b |
| 113 | 34 44 N | 141 04 E | .. | .. | .. | .. | b,c | .. | a | .. | .. | .. | .. | .. | .... |
| 114 | 36 38 N | 143 34 E | .. | .. | .. | .. | a,b,c | .. | b | .. | .. | .. | .. | .. | .... |
| 115 | 37 40 N | 145 26 E | .. | .. | .. | .. | b,c | .. | b | .. | .. | .. | .. | .. | .... |
| 116 | 38 41 N | 147 41 E | .. | .. | .. | .. | ....... | .. | b | .. | .. | .. | .. | .. | .... |
| 117 | 40 20 N | 150 58 E | .. | .. | .. | .. | b,c | .. | ....... | .. | .. | .. | .. | .. | .... |
| 118F | 42 29 N | 155 24 E | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | ... | .... |
| 119 | 45 24 N | 159 36 E | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | .... |
| 120 | 47 02 N | 166 20 E | .. | .. | .. | .. | c | .. | ....... | .. | .. | .. | .. | .. | .... |
| 121 | 46 05 N | 171 32 E | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | .... |
| 122 | 46 16 N | 174 03 E | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | .... |
| 123 | 50 27 N | 172 51 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | .... |
| 124 | 52 19 N | 162 02 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | .... |
| 125 | 51 58 N | 150 39 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | .... |
| 127 | 44 16 N | 137 37 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | .... |
| 128 | 40 37 N | 132 23 W | .. | .. | .. | .. | c | .. | c | .. | .. | .. | .. | .. | .... |
| 129 | 38 50 N | 126 02 W | .. | .. | .. | .. | ....... | .. | d | .. | .. | .. | .. | .. | .... |
| 130 | 37 05 N | 123 43 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | .... |
| 131 | 33 49 N | 126 20 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | .... |
| Between 131-132 | 32 32 N | 127 45 W | .. | .. | .. | .. | ....... | .. | a | .. | .. | .. | .. | .. | a |
| 132 | 31 38 N | 128 48 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | b | .. | b,c |
| 133 | 29 21 N | 132 30 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | b | .. | c |
| 134 | 27 45 N | 135 22 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | b | c |
| 135 | 26 39 N | 139 07 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | c |
| 136 | 26 13 N | 142 02 W | .. | .. | c | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | .... |
| 137 | 24 02 N | 145 33 W | .. | .. | c | .. | c | .. | ....... | .. | b | .. | .. | b | b |
| 138 | 22 53 N | 151 15 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | b |
| 139 | 21 47 N | 155 31 W | .. | .. | .. | .. | a,b | .. | ....... | .. | .. | .. | .. | .. | b |
| 140B | 23 26 N | 159 27 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | .... |
| 141 | 29 02 N | 161 11 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | .... |
| 142 | 32 42 N | 160 44 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | b |
| 143 | 34 06 N | 157 09 W | .. | .. | .. | .. | ....... | .. | b | .. | .. | .. | .. | b | b,c |
| 145 | 33 27 N | 145 30 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | c |
| 146 | 31 51 N | 140 50 W | .. | .. | .. | c | ....... | .. | ....... | .. | .. | .. | .. | .. | .... |
| 147 | 27 27 N | 138 14 W | .. | .. | .. | .. | b | .. | ....... | .. | .. | .. | .. | .. | c |
| 148 | 24 57 N | 137 44 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | .... |
| 149 | 21 18 N | 138 36 W | .. | .. | c | b | c | .. | ....... | .. | .. | .. | .. | .. | c |
| 150 | 16 15 N | 137 06 W | .. | .. | .. | c | ....... | .. | ....... | .. | .. | .. | .. | .. | c |
| 151 | 12 40 N | 137 32 W | .. | .. | .. | b | c | .. | ....... | .. | .. | .. | .. | .. | b |
| 152 | 10 05 N | 139 44 W | .. | .. | .. | .. | b,c | .. | ....... | .. | .. | .. | .. | .. | .... |
| 153 | 7 45 N | 141 24 W | .. | .. | .. | c | b | .. | ....... | .. | .. | .. | .. | .. | .... |
| 154 | 6 42 N | 143 22 W | .. | .. | .. | .. | b | .. | ....... | .. | .. | .. | .. | .. | .... |
| 156 | 3 01 N | 149 46 W | .. | .. | .. | .. | b | .. | c | .. | .. | .. | .. | .. | .... |
| 157 | 1 48 S | 152 22 W | .. | .. | .. | .. | b,c | .. | ....... | .. | .. | .. | .. | .. | b |
| 158 | 6 33 S | 154 58 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | b |
| 159 | 9 24 S | 159 01 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | .... |
| 160 | 10 54 S | 161 53 W | .. | .. | .. | .. | ....... | .. | ....... | .. | .. | .. | .. | .. | c |

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| Map 3 | | | | | | Map 4 | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Species | | | | | | Species | | | | | | | | | | | | | |
| 3 | 4 | 5 | 6 | 7 | 8 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| .. | b | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | a | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | a | .. | .. |
| .. | b,c | .. | .. | .. | .... | b,c | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | b | .. | .. | .. | .... | c | .. | c | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | c | c | .. | .... | c | .. | .. | b,c | .. | .. | .. | .. | .. | .. | .. |
| .. | b | b | b | .. | c | c | .. | b,c | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | c | b,c | .. | c | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | b | c | .. | .. | b | .... | .. | b | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | c | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | b,c | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | b,c | .. | .. | .. | .... | .... | .. | c | .... | .. | a | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | c | .. | .. | .. | .... | c | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | b,c | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | b | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | c | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | c | .. | .. | .. | c | c | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | b |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | b | a | .. | .... | .... | .. | a | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | b | .. | .. | .. | c | b | .. | .... | a | .. | a | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | c | .. | .. |
| .. | b | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | c | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | c | .. | .... | c | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | b,c | b,c | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | b | c | .... | b,c | .. | c | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | b | .. | .. | .. | .... | .... | .. | .... | b,c | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | b | .... | b,c | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | c | c | .... | c | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | c | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | c | .. | .... | b,c | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | c | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | c | .. | c | b | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | a | .. | d | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | c | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | c | .. | .. | .. | c | .... | .. | .... | .... | c | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | b | .. | c | .. | .... | .... | .. | .... | .... | .. | b | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | c | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | b,c | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | b,c | .. | .. | .. | c | .... | .. | .... | ..... | c | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | c | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | b | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | b | .. | .. | .. | b | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | c | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | c | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | a,b | .. | .. | .. | b | .... | .. | .... | .... | c | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | ... | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | b | .. | .. | b | .... | .... | .. | .... | .... | c | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | b,c | .. | .. | .. | .... | .... | .. | .... | .... | b | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | b | .. | .. | .. | .... | .... | .. | .... | .... | b | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | c | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | c | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | .... | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | b | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |
| .. | c | .. | .. | .. | .... | .... | .. | .... | .... | .. | .. | .... | .. | .. | .. | .. | .. | .. | .. |

Table 2. Distribution of polychaetous annelids

Summary showing

| Region | Stations | Map 1 | | | | | Map 2 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Species | | | | | Species | | | | | | | | |
| | | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| | | Number of stations at | | | | | | | | | | | | | |
| North Atlantic | 1- 34 | 0 | 2 | 1 | 3 | 9 | 2 | 2 | 0 | 0 | 0 | 1 | 3 | 8 | 0 |
| Northeast Pacific | 123-149 | 0 | 0 | 3 | 2 | 5 | 0 | 4 | 0 | 1 | 0 | 2 | 3 | 13 | 0 |
| Southeast Pacific | 35- 80 | 2 | 1 | 3 | 6 | 35 | 5 | 17 | 2 | 0 | 0 | 1 | 1 | 22 | 1 |
| Northwest Pacific | 101-122 | 0 | 0 | 0 | 3 | 15 | 0 | 11 | 1 | 0 | 1 | 0 | 1 | 7 | 0 |
| Central Pacific | 81-100<br>150-160 | 1 | 1 | 3 | 7 | 21 | 1 | 12 | 1 | 1 | 1 | 0 | 0 | 20 | 0 |
| Total | | 3 | 4 | 10 | 21 | 85 | 8 | 46 | 4 | 2 | 2 | 4 | 8 | 70 | 1 |

[A]Unidentifiable fragments. [B]No annelids in bottle. [C]Tomopteris fragments. [D]Fragments--

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regional distribution

| Map 3 | | | | | Map 4 | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Species | | | | | Species | | | | | | | | | | | | | | |
| 4 | 5 | 6 | 7 | 8 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | |
| which annelids were taken | | | | | | | | | | | | | | | | | | | |
| 7 | 1 | 0 | 0 | 4 | 1 | 1 | 7 | 5 | 5 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 36 |
| 10 | 0 | 1 | 0 | 4 | 4 | 1 | 2 | 6 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 26 |
| 13 | 3 | 0 | 0 | 12 | 18 | 1 | 22 | 5 | 10 | 5 | 4 | 0 | 2 | 1 | 0 | 1 | 0 | 0 | 67 |
| 8 | 0 | 0 | 0 | 4 | 6 | 2 | 3 | 6 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 22 |
| 17 | 2 | 1 | 1 | 5 | 10 | 0 | 9 | 1 | 3 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 33 |
| 55 | 6 | 2 | 1 | 29 | 39 | 5 | 43 | 23 | 22 | 11 | 5 | 1 | 2 | 1 | 1 | 4 | 0 | 2 | 184 |

Tomopteris and unidentifiable. [E]Pago Pago Harbor, Samoan Islands. [F]Fragments of young Terebellids.

PLATE I - III

MAPS 1 - 4

## FIGURES 1 - 46

### PLATE I

Fig. 1. Polynoella brunnea. Head region; magnification: × 27.5

Fig. 2. Polynoella brunnea. Parapodium; magnification: × 27.5

Fig. 3. Polynoella brunnea. Notopodial seta; magnification: × 500

Fig. 4. Haliplanella pacifica. Anterior end; magnification: × 27.5

Fig. 5. Haliplanella pacifica. Simple seta; magnification: × 500

Fig. 6. Haliplanella pacifica. Compound seta; magnification: × 500

Fig. 7. Lopadorhynchus varius. Anterior end; magnification: × 27.5

Fig. 8. Lopadorhynchus varius. Parapodium showing hooks; magnification: × 45

Fig. 9. Lopadorhynchus varius. Natatory seta; magnification: × 250

Fig. 10. Lopadorhynchus varius. Pygidium; magnification: × 68

Fig. 11. Phalacrophorus maculatus. Anterior end; magnification: × 68

Fig. 12. Phalacrophorus maculatus. Parapodium; magnification: × 47.5

Fig. 13. Phalacrophorus maculatus. Compound seta; magnification: × 250

Fig. 14. Phalacrophorus attenuatus. Anterior end; magnification: × 68

Fig. 15. Phalacrophorus niger. Anterior end; magnification: × 27.5

Fig. 16. Alciopa distorta. Anterior end; magnification: × 27.5

Fig. 17. Alciopa distorta. Protruded pharynx; magnification: × 6

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Fig. 18. Alciopa distorta. Parapodium; magnification: × 47.5

Fig. 19. Torea fasciata. Ventral view of anterior end; magnification: × 27.5

Fig. 20. Torea fasciata. Parapodium; magnification: × 27.5

Fig. 21. Corynocephalus magnachaetus. Head; magnification: × 27.5

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Fig. 26. Plotobia paucichaeta. Anterior end; magnification: × 45

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Fig. 28. Autolytus pacificus. Entire animal; magnification: × 45

Fig. 29. Autolytus pacificus. Prostomium; magnification: × 136

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Fig. 31. Epitoka pelagica. Anterior end; magnification: × 59

Fig. 32. Epitoka pelagica. Seta; magnification: × 250

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Fig. 34. Nereis singularis. Parapodium; magnification: × 27.5

Fig. 35. Nereis singularis. Seta; magnification: × 500

Fig. 36. Nereis singularis. Seta; magnification: × 500

Fig. 37. Nereis singularis. Seta; magnification: × 500

Fig. 38. Larva A. Anterior end; magnification: X 57

Fig. 39. Larva A. Seta; magnification: × 85

Fig. 40. Larva A. Pygidium; magnification: × 57

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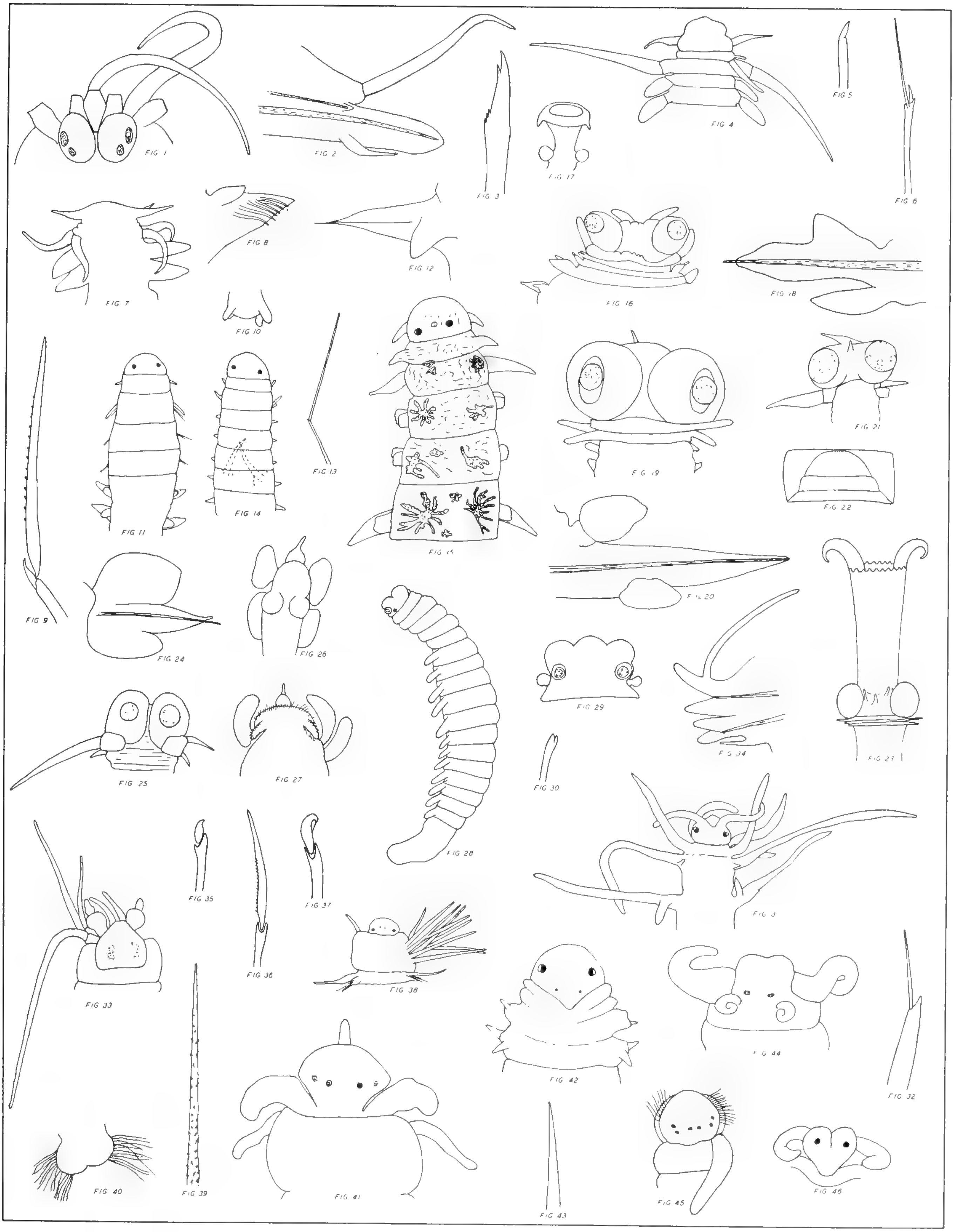
Fig. 42. Spionid larva. Anterior end; magnification: × 45

Fig. 43. Spionid larva. Seta; magnification: × 68

Fig. 44. Larva C. Anterior end; magnification: × 57

Fig. 45. Larva D. Anterior end; magnification: × 45

Fig. 46. "Chaetosphaera." Anterior end; magnification: × 185



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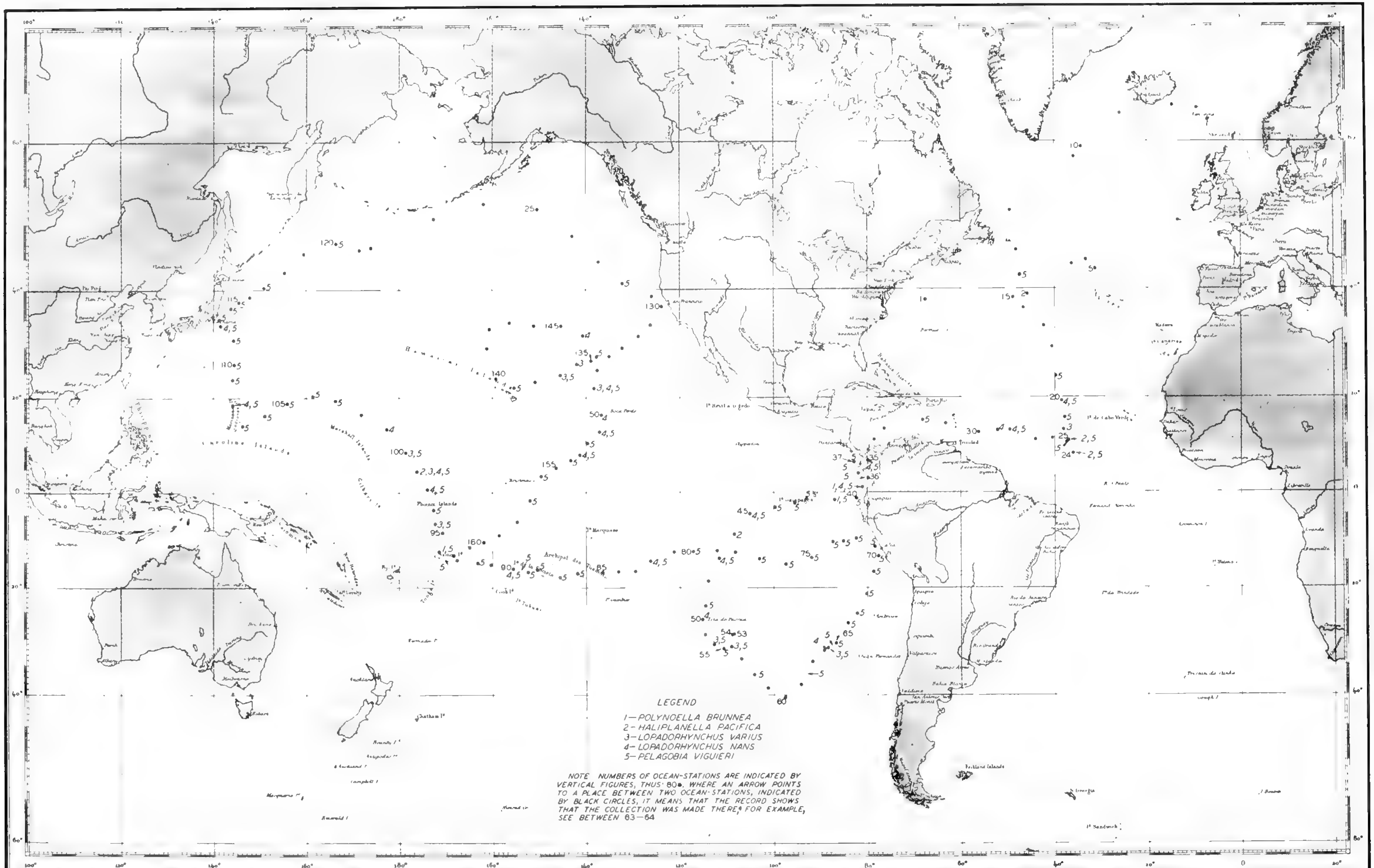
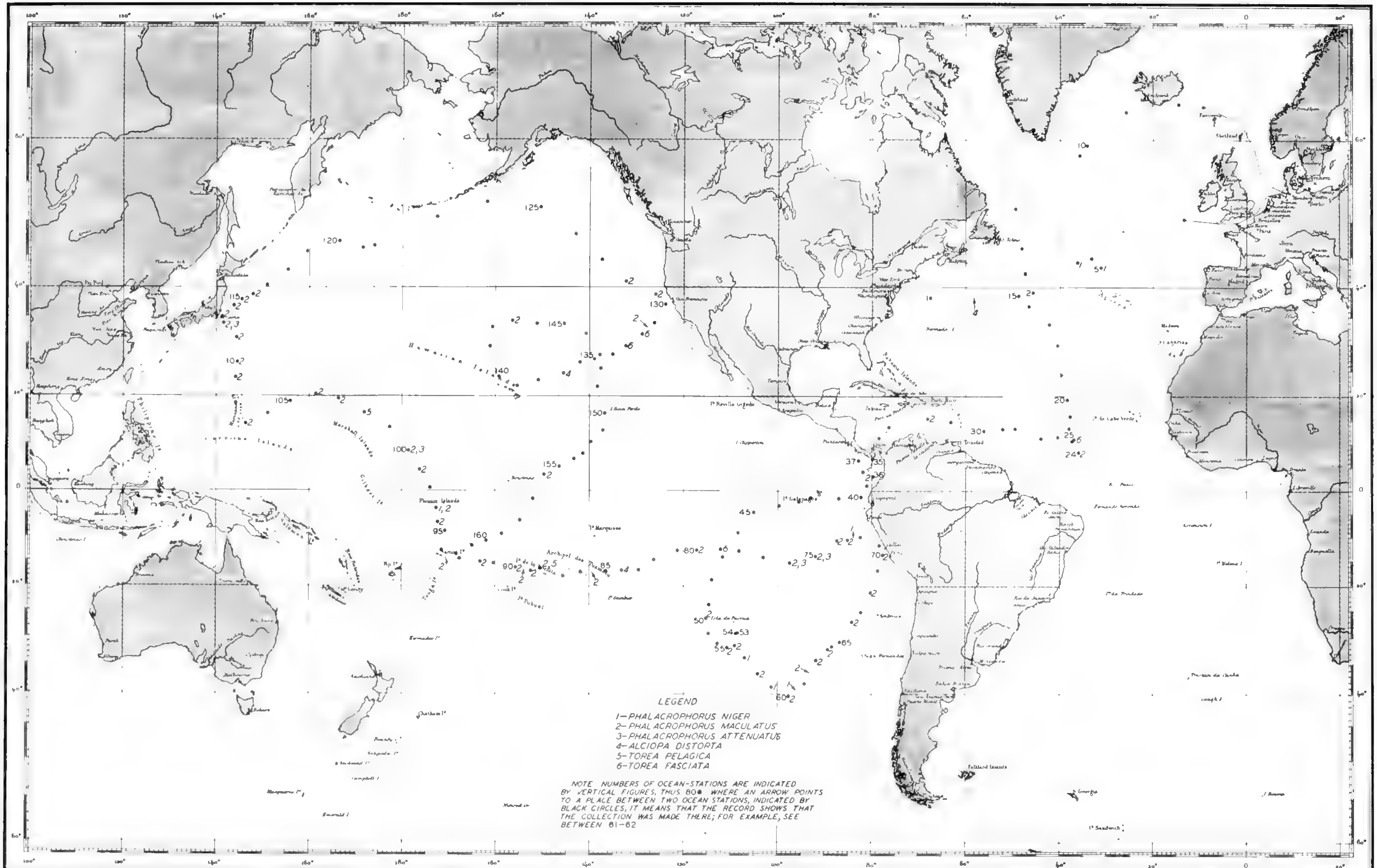
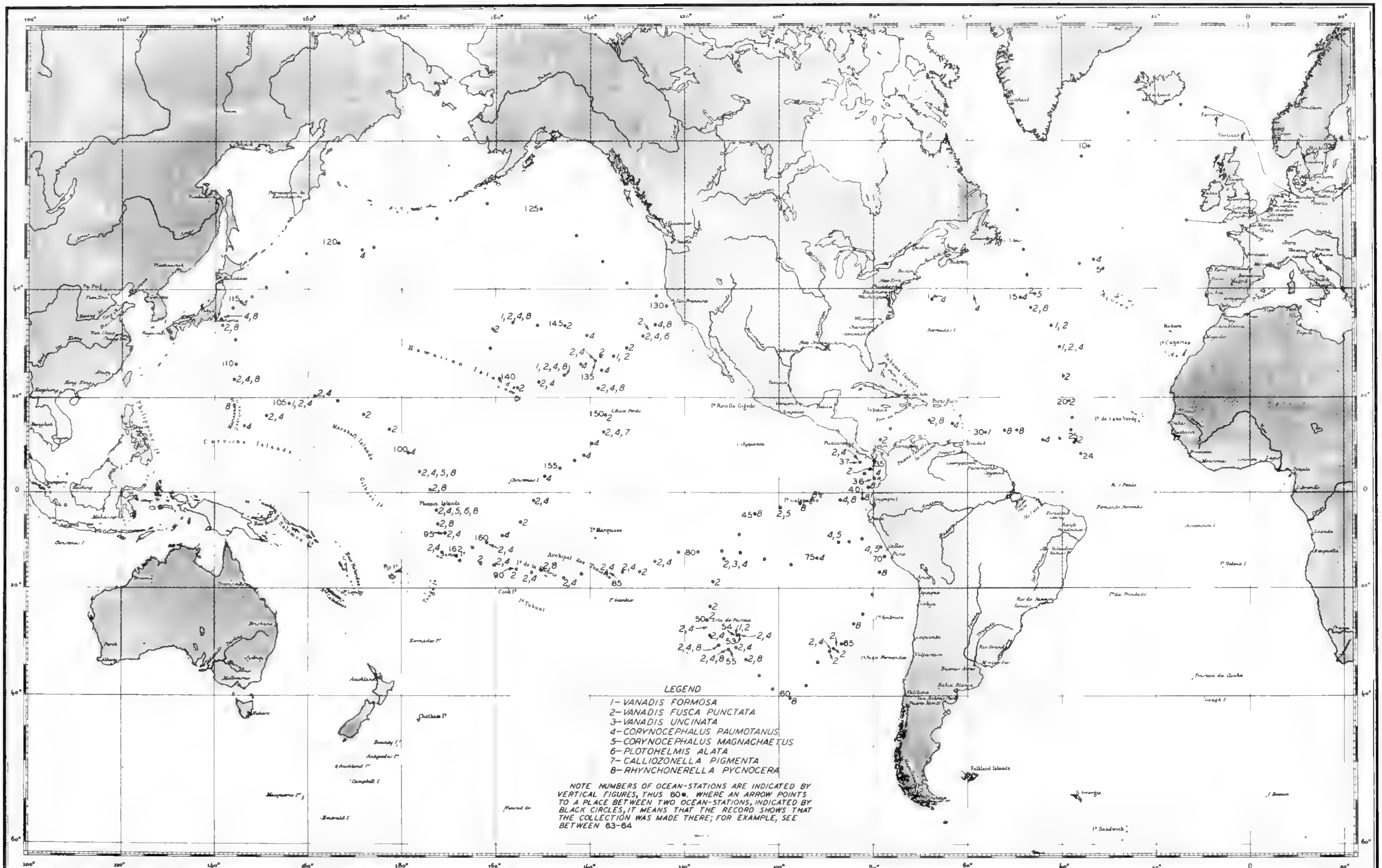


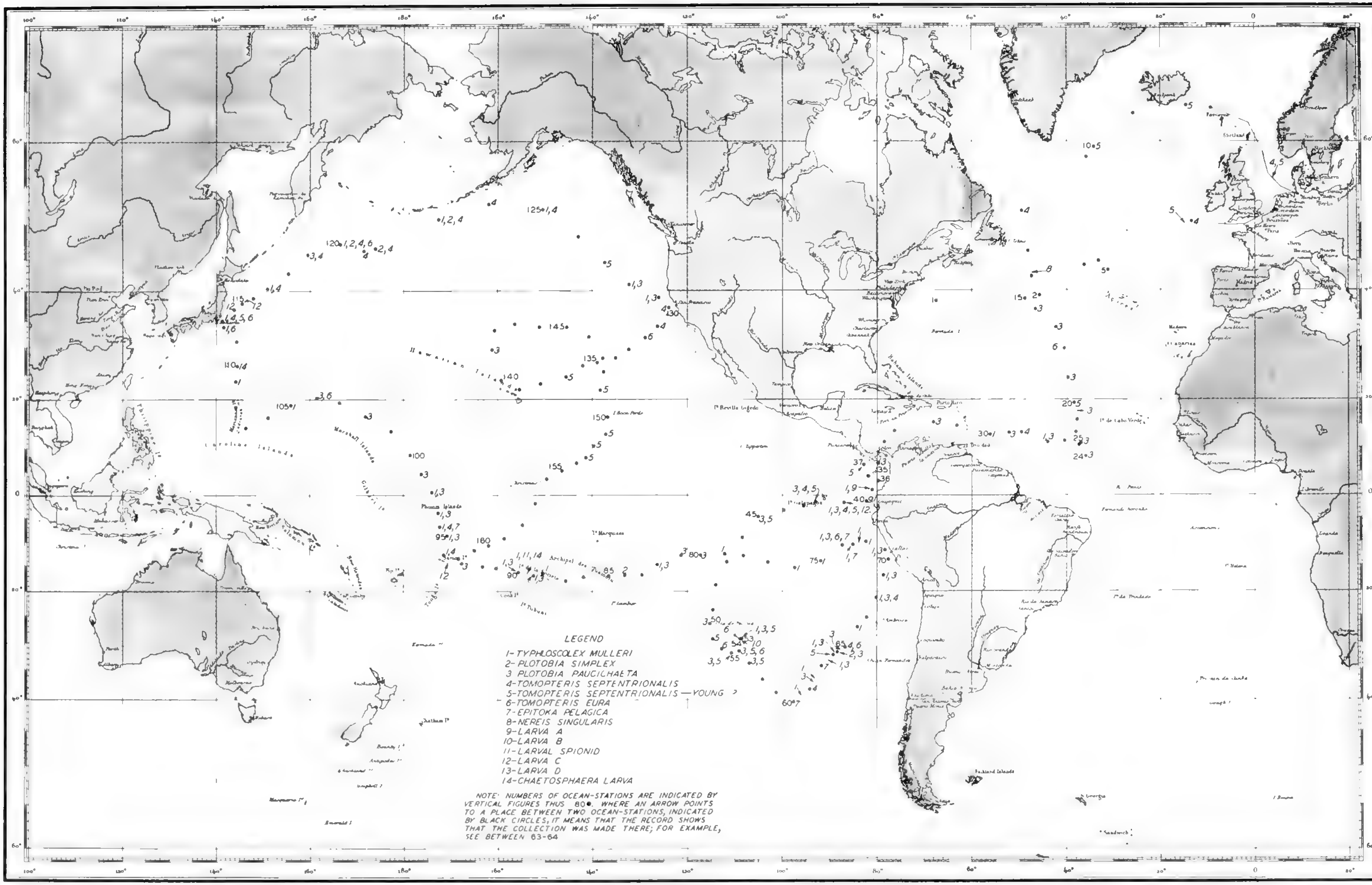

MAP NO 1—DISTRIBUTION OF POLYCHAETOUS ANNELIDS COLLECTED BY THE CARNEGIE, 1928–1929




MAP NO 2—DISTRIBUTION OF POLYCHAETOUS ANNELIDS COLLECTED BY THE CARNEGIE, 1928–1929




MAP NO. 3—DISTRIBUTION OF POLYCHAETOUS ANNELIDS COLLECTED BY THE CARNEGIE, 1928–1929




MAP NO. 4—DISTRIBUTION OF POLYCHAETOUS ANNELIDS COLLECTED BY THE CARNEGIE, 1928–1929

# BIOLOGICAL RESULTS OF LAST CRUISE OF CARNEGIE

IV

# THE MYSIDS

W. M. TATTERSALL

CONTENTS

# THE MYSIDS

## INTRODUCTION

The Mysidacea from the plankton hauls made by the **Carnegie** during the world cruise which, unfortunately, had such a tragic termination in the harbor of Apia, Western Samoa, in November 1929, were kindly submitted to me for examination. The author is greatly indebted to Dr. J. A. Fleming, Director of the Department of Terrestrial Magnetism, for the privilege of reporting on this collection. It was not rich in species, nor in individuals, with the exception of **Siriella thompsonii**, but contained examples of interesting and rare species. Fifteen species are represented altogether, two of which are new to science. One of these is a new species of the genus **Anchialina**, and the other a single specimen of a very curious and anomalous form, whose affinities are for the moment obscure in the absence of male specimens. The author has associated it with the ill-fated vessel to which we owe its capture, in a new genus, **Carnegieomysis**.

The geographical range of most of the species has been extended by the work of the **Carnegie**. The author has indicated under each species the known geographical range, and the additions made to it by the present records.

## ORDER MYSIDACEA

### Suborder MYSIDA

### FAMILY MYSIDAE DANA

### Subfamily SIRIELLINAE, Norman

### Genus SIRIELLA, Dana

**Siriella thompsonii** (Milne-Edwards)

OCCURRENCE

| Station | Latitude | Longitude | Depth | Date | Sample |
|---|---|---|---|---|---|
| | | | Atlantic Ocean | | |
| | ° ′ | ° ′ | | 1928 | |
| 1- 2 | 37 00 N | 60 00 W | Surface | May 14 | One male and one female |
| 2 | 37 45 N | 53 26 W | Surface | May 16 | One female |
| 18 | 29 47 N | 40 36 W | Surface | Aug.17 | Ten juvenile |
| 20-21 | 16 01 N | 37 52 W | Surface | Aug.23 | One juvenile |
| 22 | 13 25 N | 38 00 W | 100 m | Aug.27 | One juvenile |
| 24 | 08 15 N | 36 10 W | Surface | Aug.31 | One juvenile |
| 24 | 08 15 N | 36 10 W | 100 m | Aug.31 | One female, with eggs in the brood pouch |
| 29 | 13 16 N | 52 13 W | 50 m | Sep. 13 | One female, with eggs in the brood pouch |
| 30 | 12 54 N | 56 15 W | Surface | Sep. 15 | One juvenile |
| | | | Pacific Ocean | | |
| 35-36 | 05 22 N | 79 59 W | Surface | Oct. 27 | One adult male, two immature |
| 44 | 03 15 S | 99 48 W | Surface | Nov.17 | One female with young in the brood pouch |
| 49-50 | 26 27 S | 115 21 W | Surface | Nov.28 | Four adult males, three adult females with young in the brood pouch, and four immature |
| 50-51 | 28 38 S | 114 59 W | Surface | Nov.30 | One adult female with young in the brood pouch, three immature females, four immature females, and thirteen juveniles |
| 50-51 | 28 38 S | 114 59 W | Surface | Nov.30 | Three immature females, two immature males and two juvenile |
| 50-51 | 28 45 S | 114 55 W | Surface | Nov.30 | One adult female with young in the brood pouch, two immature females, one immature male, and six juvenile |
| 56 | 31 49 S | 109 04 W | Surface | Dec.18 | One juvenile |
| 61-62 | 37 34 S | 93 35 W | Surface | Dec.28 | One adult and one immature male, one immature female |
| 62-63 | 32 25 S | 89 49 W | Surface | Dec.31 | One juvenile |
| 62-63 | 32 23 S | 89 42 W | Surface | Dec.31 | Three adult and three immature males, five adult and two immature females, five juvenile |

Siriella thompsonii (Milne-Edwards)--Concluded

| Station | Latitude | Longitude | Depth | Date | Sample |
|---|---|---|---|---|---|
| | | | Pacific Ocean--Concluded | | |
| | ° ′ | ° ′ | | 1929 | |
| 63- 64 | 32 05 S | 88 58 W | Surface | Jan. 1 | One immature female and two juvenile |
| 63- 64 | 32 03 S | 88 55 W | Surface | Jan. 1 | One adult male and eleven juvenile |
| 63- 64 | 32 01 S | 88 54 W | Surface | Jan. 2 | One adult female and three juvenile |
| 63- 64 | 32 00 S | 88 52 W | Surface | Jan. 2 | One adult and one immature males, two adult females, and one juvenile |
| 63- 64 | 31 58 S | 88 50 W | Surface | Jan. 2 | One adult female and one juvenile |
| 63- 64 | 31 50 S | 88 22 W | Surface | Jan. 2 | One adult and two immature males, four adult and two immature females, and twenty-nine juvenile |
| 63- 64 | 31 51 S | 88 21 W | Surface | Jan. 3 | One adult female and seven juvenile |
| 63- 64 | 31 52 S | 88 20 W | Surface | Jan. 3 | One adult male and twelve juvenile |
| 63- 64 | 31 54 S | 88 18 W | Surface | Jan. 3 | One adult female |
| 64 | 31 54 S | 88 17 W | Surface | Jan. 3 | Six juvenile |
| 64 | 31 54 S | 88 17 W | 1000 m | Jan. 3 | One juvenile |
| 64- 65 | 31 52 S | 87 51 W | Surface | Jan. 3 | About two hundred and fifty specimens, including adults, and immature and juvenile specimens of both sexes |
| 64- 65 | 31 52 S | 87 46 W | Surface | Jan. 4 | Five adult males, five adult females, and thirty-one juvenile |
| 64- 65 | 31 52 S | 87 42 W | Surface | Jan. 4 | Four adult males, four adult females, and forty-three juvenile |
| 64- 65 | 31 31 S | 86 57 W | Surface | Jan. 4 | About fifty specimens including adults and juveniles of both sexes |
| 68 | 21 28 S | 80 26 W | Surface | Jan. 10 | One adult female |
| 77 | 14 20 S | 103 12 W | Surface | Feb.18 | One immature female |
| 80 | 12 39 S | 117 22 W | Surface | Feb.24 | Seven juvenile |
| 84 | 17 11 S | 133 18 W | 50 m | Mar. 4 | One juvenile |
| 89- 90 | 17 04 S | 152 58 W | Surface | Mar 23 | Nine juvenile |
| 96 | 06 47 S | 172 23 W | Surface | Apr.26 | One juvenile |
| 101 | 13 23 N | 177 27 E | 100 m | May 7 | One adult and one immature male |
| 106 | 16 14 N | 151 04 E | 50 m | May 17 | One adult male |
| 108 | 18 26 N | 144 01 E | Surface | May 27 | One juvenile |
| 131 | 33 49 N | 126 20 W | Surface | Sep. 6 | One juvenile |
| 132 | 31 38 N | 128 48 W | 100 m | Sep. 8 | One immature female |
| 133 | 29 21 N | 132 30 W | Surface | Sep. 10 | Three juvenile |
| 134 | 27 45 N | 135 22 W | Surface | Sep. 12 | Three juvenile |
| 134-135 | 26 44 N | 138 27 W | Surface | Sep. 13 | One adult female |
| 134-135 | 26 44 N | 138 27 W | Surface | Sep. 13 | One adult female |
| 136 | 26 13 N | 142 02 W | Surface | Sep. 16 | One juvenile |
| 138 | 22 53 N | 151 15 W | 50 m | Sep. 20 | One immature male |
| 140 | 23 26 N | 159 27 W | 50 m | Oct. 3 | One juvenile |
| 141 | 29 02 N | 161 11 W | 50 m | Oct. 5 | One adult male and one adult female |
| 142 | 32 42 N | 160 44 W | Surface | Oct. 7 | Two juvenile |
| 142 | 32 42 N | 160 44 W | 100 m | Oct. 7 | One adult and one immature males, one adult and one immature females |
| 144 | 33 38 N | 151 47 W | Surface | Oct. 11 | One adult female and one immature male |
| 145 | 33 27 N | 145 30 W | Surface | Oct. 13 | One immature male |
| 146 | 31 51 N | 140 50 W | Surface | Oct. 15 | One adult female |
| 147 | 27 27 N | 138 14 W | Surface | Oct. 17 | One juvenile |
| 147 | 27 27 N | 138 14 W | Surface | Oct. 17 | One juvenile |

## RESULTS

These records definitely establish the fact that this species is a pelagic, surface, oceanic, and mainly tropical form. In both the Atlantic and Pacific oceans it was not captured at any station north of latitude 40° north. There were no stations south of latitude 40° south in either ocean. It was particularly abundant between latitudes 20° to 40° south and longitudes 80° to 100° west. It was never taken in any of the townet hauls made in any of the harbors and anchorages in the islands of the Pacific, but always in the open sea away from land. Of the above records, forty-eight (or eighty per cent) were from surface hauls, six from 50 m, five from 100 m, and one only from 1000 m (the specimen, a very young one, in all probability caught as the net was hauled to the surface). These facts clearly show that **S. thompsonii** frequents the upper 100 m of water and is mainly a surface form.

Siriella gracilis, Dana

OCCURRENCE

| Station | Latitude | Longitude | Depth | Date | Sample |
|---|---|---|---|---|---|
| | ° ′ | ° ′ | | 1928 | |
| 35- 36 | 05 22 N | 79 59 W | Surface | Oct. 27 | One adult male and nine juvenile |
| 35- 36 | 04 16 N | 79 47 W | Surface | Oct. 28 | One adult male and seven juvenile |
| 37 | 05 59 N | 82 56 W | 50 m | Nov. 1 | One juvenile |
| | | | | 1929 | |
| 141 | 29 02 N | 161 11 W | 50 m | Oct. 5 | One juvenile |
| 156 | 03 01 N | 149 48 W | 50 m | Nov. 4 | One juvenile |

REMARKS

It is interesting to note that no specimens of this species occurred in the townet hauls made in the Atlantic Ocean. This is in accordance with previous records of its distribution.

### Siriella **nodosa**, H. J. Hansen

S. **nodosa**, Hansen, 1910
S. **nodosa**, Colosi, 1918
S. **nodosa**, Colosi, 1920

OCCURRENCE

Moored in Guam Harbor, May 1929, surface townet, 8.10 to 9.50 p.m., light in net mouth, one female.

DISTRIBUTION

Hansen records this species from the Karkaralong group of islands in the East Indian Archipelago, and Colosi from the Torres Straits. The present station is 20° east of the Philippines.

### Siriella **vulgaris**, H. J. Hansen

S. **vulgaris**, Hansen, 1910
S. **vulgaris**, Tattersall, 1922
S. **vulgaris**, Colosi, 1924
S. **vulgaris**, Tattersall, 1928

OCCURRENCE

Region of Samoa, April 1929, surface, two males and two females. Moored in Guam Harbor, May 1929, surface townet, 8.10 to 9.50 p.m., light in net mouth, four males and one female.

DISTRIBUTION

The records of Hansen and Tattersall show that this species is an inshore shallow-water form, found only in the neighborhood of land. It has been recorded from numerous stations in the East Indian Archipelago, Port Blair in the Andaman Islands, and Flinders Island, North Queensland. Colosi (1924) records the species from the Arabian Sea without more precise definition of the locality. The species is obviously widely distributed in the tropical parts of the Indian and Pacific oceans, in suitable shallow-water localities.

### Siriella **media**, H. J. Hansen

S. **media**, Hansen, 1910
S. **media**, Hansen, 1912

OCCURRENCE

Moored in Guam Harbor, May 1929, surface townet, 8.10 to 9.50 p.m., light in net mouth, four males and two females.

DISTRIBUTION

Hitherto known only from the East Indian Archipelago and the Gilbert Islands. The present record, therefore, represents a considerable easterly and northerly extension of its known range.

### Siriella **aequiremis**, H. J. Hansen

S. **aequiremis**, Hansen, 1910
S. **aequiremis**, Tattersall, 1911
S. **aequiremis**, Hansen, 1912
S. **aequiremis**, Colosi, 1918
S. **aequiremis**, Colosi, 1920

OCCURRENCE

Between stations 35 and 36, latitude 05° 22′ north, longitude 79° 59′ west, surface, October 27, 1928, one immature male. Moored in Guam Harbor, May 1929, surface townet, 8.10 to 9.50 p.m., light in net mouth, six immature females.

REMARKS

No adult males are present in the collection. The immature male from the first station noted above shows the characteristic coloration of the species mentioned by Hansen (1910), "abdomen with black lateral spots."

DISTRIBUTION

The records of Hansen, Tattersall, and Colosi show this species to be widely distributed throughout the whole of the tropical parts of the Indian and Pacific oceans, from the neighborhood of the Amirante Islands in the western part of the Indian Ocean to stations off the coast of Mexico and the Panama Isthmus. Like S. **thompsonii** and S. **gracilis**, it is often an oceanic form, but is also found nearer to land and even in the harbors of the Pacific Islands.

**Siriella distinguenda**, H. J. Hansen

**S. distinguenda**, Hansen, 1910

OCCURRENCE

Region of Samoa, April 1929, surface, thirty adults of both sexes.

DISTRIBUTION

This species has only been recorded once previously, by Hansen, from three stations in the East Indian Archipelago. The present record, therefore, indicates a considerable extension eastward of its known distribution. It would appear to be a shallow-water and harbor species.

Genus **HEMISIRIELLA**, Hansen, 1910

**Hemisiriella pulchra**, H. J. Hansen

**H. pulchra**, Hansen, 1910

OCCURRENCE

Region of Samoa, April 1929, surface, one male and fourteen females.

Moored in Guam Harbor, May 1929, surface townet, 8.10 to 9.50 p.m., light in net mouth, one female.

DISTRIBUTION

This species has only been recorded once before, namely by Hansen from six stations in the East Indian Archipelago.

**Hemisiriella parva**, H. J. Hansen

**H. parva**, Hansen, 1910
**H. parva**, Colosi, 1918 and 1920
**H. parva**, Zimmer, 1918
**H. parva**, Tattersall, 1922

OCCURRENCE

Station 95, latitude 08° 43′ south, longitude 170° 56′ west, 100 m, April 24, 1929, one immature male.

Station 100, latitude 08° 05′ north, longitude 178° 48′ west, 50m, May 4, 1929, one immature male.

DISTRIBUTION

This species has been recorded from four stations in the East Indian Archipelago (Hansen, 1910), Bay of Bengal (Hansen, 1910), Java (Zimmer, 1918), Indian Ocean (Colosi, 1918 and 1920) and the Andaman Islands (Tattersall, 1922). The present records, therefore, extend its known range considerably eastward.

Subfamily GASTROSACCINAE, Norman

Genus **ANCHIALINA**, Norman and Scott

**Anchialina flemingi**, n. sp.

OCCURRENCE

Between stations 89 and 90, latitude 17° 04′ south, longitude 152° 58′ west, surface, March 23, 1929, one adult male.

Region of Samoa, April 1929, surface, two immature specimens.

DESCRIPTION

Carapace, in the male, produced into a long triangular, acutely pointed rostral plate extending forward as far as the distal margin of the first joint of the antennular peduncle (fig. 1a, p. 72).

Eyes small, about as broad as the antennular peduncle, pigment light brown.

Antennular peduncle stout, third joint longer than the second.

Antennal scale (fig. 2a, p. 72) small, not extending very much beyond the distal end of the first joint of the antennular peduncle and shorter than the second joint of the antennal peduncle; twice as long as broad; outer margin entire, terminating in a short spine beyond which the setose part of the scale is prolonged for about one quarter of its length; terminal joint distinctly articulated; antennal peduncle with the second joint large and stout, longer than the antennal scale, and about twice as long as broad.

First thoracic limbs (fig. 3a, p. 72) with the endopod very stout, nail very long and stout, longer than the sixth joint.

Second thoracic limbs (fig. 3b, p. 72) with the second joint of the endopod massive, fifth joint expanded on its inner margin to form almost a right-angled projection, the margin between the projection and the sixth joint with six or seven minute teeth; sixth joint not expanded; nail long.

Pseudobranchial lamellae of the male pleopods not bilobed, more or less triangular in shape with the inner angle broadly rounded, outer angle more narrowly rounded and armed with a single seta.

Exopod of the third pair of pleopods of the male (fig. 3c, p. 72) at least one and a half times as long as the endopod, nine-jointed, each joint with a seta on both the inner and outer corner; last four setae on the outer margin and the last three on the inner margin modified, much shorter and stouter than the other setae, with minutely hooked tips.

Sixth segment of the abdomen one and a half times as long as the fifth.

Telson (fig. 1b, p. 72) longer than the sixth segment of the abdomen, three times as long as broad at the base; cleft one sixth of the length of the telson in depth, and armed on both margins with a closely set row of saw-like teeth; lateral margins armed throughout their length with about thirty-three spines arranged in groups of twos and threes, particularly toward the distal end; terminal lobes of the telson armed with a single spine, longer and stouter than any of the spines on the lateral margins.

Endopod of the uropods (fig. 2b, p. 72) longer than the telson; inner margin armed for at least four-fifths of its length with a closely set row of spines, arranged in groups of three or four smaller spines between much larger spines; there are about seventeen of the larger spines, the distal two of which are much longer and stouter than the others and have no smaller spines between them.

Exopod of the uropods (fig. 2b, p. 72) a little shorter and broader than the endopod, outer margin armed with about twenty-three spines, gradually increasing in size toward the distal end of the margin and not arranged in groups.

Length of an adult male, 6 mm.

REMARKS

This species is distinguished from **A. typica**, Kr,, and **A. truncata**, Sars, by the produced and pointed rostral plate. It differs, also, from **A. obtusifrons**, Hansen, in having the rostral plate acutely pointed and not obtusely rounded. In the character of the rostral plate, it agrees with **A. agilis**, Sars. **A, grossa**, Hansen, and **A. penicillata**, Zimmer. From the last two species it is distinguished by the form of the second thoracic limb of the male, which is without the blunt process on the inner margin of the fifth joint characteristic of **A. grossa** and **A. penicillata**. It also differs from these two species in the much simpler and more normal exopod of the third pleopod of the male. It is most closely allied to **A. agilis**, Sars, and differs from it in the slightly different form of the endopod of the second thoracic limb of the male and in the details of the exopod of the third male pleopod. No females occurred in the collection and the male type lacked all the endopods of the third to the eighth thoracic limbs.

The author takes pleasure in associating this species with the name of the Director of the Department of Terrestrial Magnetism, Carnegie Institution of Washington, under whose auspices the **Carnegie** set out on her last voyage of exploratory work.

## Subfamily MYSINAE

### Tribe ERYTHROPINI

### Genus **EUCHAETOMERA**, G. O. Sars

**Euchaetomera glyphidophthalmica**, Illig. ?

**E. glyphidophthalmica**, Illig, 1906
**E. glyphidophthalmica**, Zimmer, 1914 and 1915
**E. glyphidophthalmica**, Colosi, 1929
**E. glyphidophthalmica**, Illig, 1930

OCCURRENCE

Station 28, latitude 13° 10′ north, longitude 49° 36′ west, 50 m, September 11, 1928, one immature male.

DISTRIBUTION

This species is known principally by the records of Zimmer (1914) and Illig (1930) from the tropical parts of the Atlantic Ocean. It has been recorded doubtfully from the Mediterranean by Zimmer (1915) and Colosi (1929). The present record does not extend its known geographical range appreciably.

**Euchaetomera plebeja**, H. J. Hansen

**E. plebeja**, Hansen, 1912

OCCURRENCE

Station 36, latitude 02° 54′ north, longitude 80° 02′ west, 100 m, October 30, 1928, one adult male.

Station 66, latitude 27° 04′ south, longitude 84° 01′ west, 100 m, January 7, 1929, one immature male.

DISTRIBUTION

This species has only been recorded once previously, by Hansen (1912) from two stations in the Eastern Pacific. The present records are also from the Eastern Pacific and extend the southern range of the species somewhat, but not beyond the purely tropical regions of these waters.

### Genus **EUCHAETOMEROPSIS**, Tattersall

**Euchaetomeropsis merolepis** (Illig)

**Euchaetomera merolepis**, Illig, 1908
**Euchaetomeropsis merolepis**, Tattersall, 1909
**Euchaetomeropsis merolepis**, Zimmer, 1914
**Euchaetomeropsis merolepis**, Colosi, 1929
**Euchaetomeropsis merolepis**, Illig, 1930

OCCURRENCE

Station 128, latitude 40° 37′ north, longitude 132° 23′ west, 100 m, July 25, 1929, one immature male.

DISTRIBUTION

This species has been previously recorded from the Gulf of Guinea and four stations in the Indian Ocean (Illig, 1908 and 1930), the Mediterranean (Tattersall, 1909 and Colosi, 1929), and the South Atlantic (Zimmer, 1914). The present record is the first one from the Pacific Ocean and extends the known geographical range of the species by the full extent of that ocean.

### Tribe LEPTOMYSINI

### Genus **DOXOMYSIS**, Hansen, 1912

**Doxomysis quadrispinosa** (Illig)

**Mysis quadrispinosa**, Illig, 1906
**Mysis quadrispinosa**, Tattersall, 1911
**Doxomysis pelagica**, Hansen, 1912
**Doxomysis tattersalli**, Colosi, 1920
**Doxomysis quadrispinosa**, Illig, 1930

OCCURRENCE

Station 38, latitude 03° 46′ north, longitude 81° 37′ west, 50 m, November 3, 1928, one adult male.

### DISTRIBUTION

This species is known from the tropical part of the Indian Ocean (Illig and Tattersall) and from the Eastern Pacific (Hansen and Colosi). The present specimens are from the same waters as the latter records.

## **Doxomysis** sp. ?

### OCCURRENCE

Station 99, latitude 04° 22′ north, longitude 176° 23′ west, 50 m, May 2, 1929, one damaged specimen.

### REMARKS

This specimen is too damaged to identify with certainty. Like **D. quadrispinosa** it has the abdomen spinulose and it may be a mutilated example of this species.

## INCERTAE CEDIS

## Genus **CARNEGIEOMYSIS**, nov.

### DEFINITION

General form robust and gibbous, abdomen flexed. Carapace large, covering the whole of the thorax in dorsal view, produced laterally and posteriorly to cover the whole of the first and half of the second abdominal somites, produced anteriorly into a large triangular rostral plate with a blunt apex, which partially covers the eyes. Eyes very large, pyriform in shape in lateral view, the cornea divided by a distinct groove into a larger ventral part with smaller facets and a smaller dorsal part with larger facets. Antennal scale rather short and narrow, setose all round, with a distal part marked off by a distinct suture. Thoracic limbs with the endopods rather slender, that of the first thoracic limbs with a feeble masticatory lobe on the second joint only, those of the third to the eighth thoracic limbs with the sixth joint undivided. Telson short, entire, spatulate in shape, apex armed with a few short stout spines, lateral margins with a few spines distally.

Type-**Carnegieomysis xenops**, n. sp.

### REMARKS

The systematic position of this genus must remain uncertain until male specimens are available for examination. The author anticipates that it will prove to belong to the Tribe Mysini, near to such genera as **Anisomysis**, **Idiomysis**, and **Lycomysis**. It is a curious and anomalous genus, recalling **Idiomysis** in its gibbous form and abdominal flexure, but sharply distinguished from all mysids known to the author by the large pyriform eyes divided into dorsal and ventral parts by a groove. The eyes resemble, in a general way, the eyes of some of the Euphausiacea, such as **Thysanoëssa** and **Nematoscelis**. For the rest, the rather feeble and slender endopods of the thoracic limbs, the undivided sixth joint of the endopods of the third to the eighth thoracic limbs, and the entire telson, together provide additional distinguishing features by which the genus may be recognized. The author is glad to associate this distinct form with the name of the vessel to whose researches its capture is due.

## **Carnegieomysis xenops**, gen. and n. sp.

### OCCURRENCE

Station 148, latitude 24° 57′ north, longitude 137° 44′ west, 100 m, October 19, 1929, one adult female.

### DESCRIPTION

General form (fig. 4, p. 72) gibbous with the abdomen flexed ventrally; lateral parts of the abdominal somites covered with very small spinules; similar spinules scattered over other parts of the body, particularly on the anterior end of the carapace.

Carapace relatively large, covering all the somites of the thorax dorsally and produced laterally into a well-marked wing partially covering the anterior abdominal somites laterally; produced anteriorly into a broad bluntly pointed rostral plate forming a hood partially covering the large eyes dorsally and extending forward to the level of the front of the eyes.

Eyes (fig. 4, p. 72) very large, brown in color, pyriform in shape viewed laterally, divided into a small dorsal part with larger corneal facets and a large ventral part with smaller facets, the two parts separated by a groove broader posteriorly than anteriorly, and devoid of facets and therefore of pigment. The cornea appears to be pushed in as a more or less circular depression in the region of the groove, the depression affecting the lower part of the dorsal section and the upper part of the ventral section of the eye.

Antennular peduncle with the second joint having a well-developed, recurved finger-like process dorsally, the process with two or three small setae at the apex.

Antennal scale (fig. 5a, p. 72) small and narrow, barely extending beyond the antennular peduncle, eight times as long as broad, a small distal segment marked off by a distinct suture, setose all round.

Thoracic limbs. The general form and structure of these limbs can best be seen from the figures (figs. 5b-c, p. 72). The first thoracic limb (fig. 5b, p. 72) has a small masticatory lobe on the second joint of the endopod but none on the other joints. In the third to the eighth pairs the sixth joint of the endopod is undivided and armed with rather long plumose setae on the inner margin. The nail is well developed in all the endopods of the thoracic limbs. The basal joint of the exopod is moderately expanded and has the outer distal corner rounded, without a spine.

Abdominal somites. The sixth abdominal somite is more than twice as long as the fifth.

Telson (fig. 5f, p. 72) a little shorter than the sixth abdominal somite and narrower than this somite at the base; about twice as long as broad at its base; lateral margins rather abruptly narrowing for more than half the length of the telson and then diverging slightly to form a spatulate distal part of the telson, ending in a broadly rounded entire apex; the apex armed with five quite short, rather stout spines more or less equidistantly placed; lateral margins armed with three short spines about the center of the margin just anterior to the narrowest part of the telson.

Uropods about twice as long as the telson; inner and outer uropods equal in length; inner uropod without any outer uropods equal in length; inner uropod without any spines on the lower and inner margins.

Length of the type and only specimen, a female, 3 mm.

### REMARKS

The exact systematic position of this species must remain uncertain until male specimens are available for examination as to the form of the pleopods. The author thinks, from a comparison with known forms, that the species will eventually find a place in the Tribe Mysini, near to such pelagic genera as **Anisomysis**, **Cryptomysis**, and **Idiomysis**. The most striking feature of the species is the quite peculiar and unique character of the eyes. The latter resemble, in a superficial manner at any rate, the eyes of some of the Euphausians, such as **Nematoscelis**, **Thysanoëssa**, or **Stylocheiron**, in having the cornea divided into distinct dorsal and ventral parts. In **Carnegieomysis**, however, the two parts are separated by a groove in which corneal elements are absent. It is a type of eye which is developed in response to a pelagic habit of life and is probably closely similar in general structure, though even more developed than, the eye of **Euchaetomera** and allied genera. There is no other mysid with which it can be confused in the character of the eyes. Apart from the eyes, the most outstanding characters are the form and size of the antennal scale, and the shape and armature of the telson.

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FIGURES 1 - 5

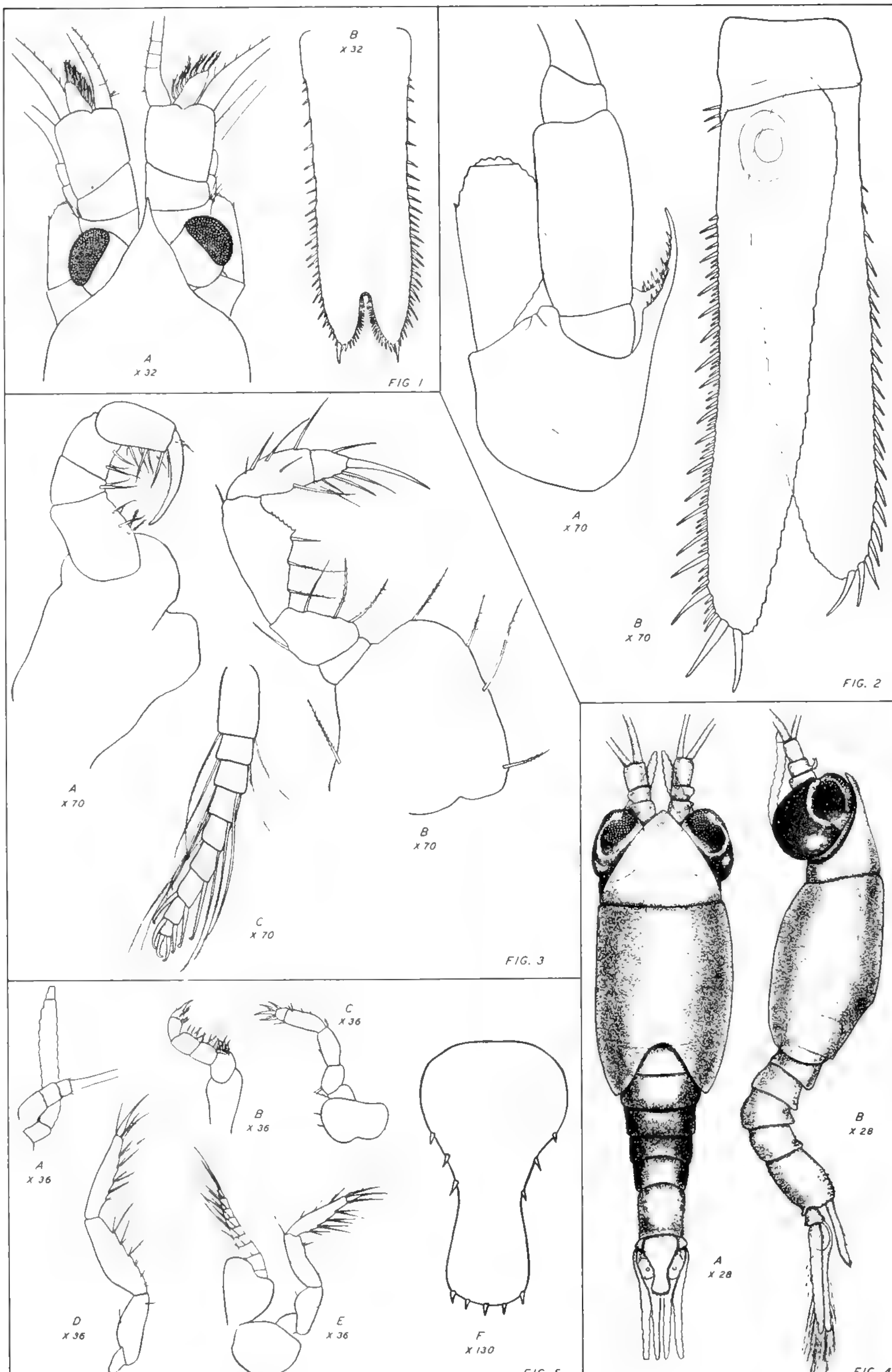


FIG. 1—ANCHIALINA FLEMINGI, N. SP. A, ANTERIOR END OF A MALE; B, TELSON. MAGNIFICATION: X 32

FIG. 2—ANCHIALINA FLEMINGI, N. SP. A, ANTENNAL SCALE AND PEDUNCLE; B, UROPODS. MAGNIFICATION: X 70

FIG. 3—ANCHIALINA FLEMINGI, N. SP. A, ENDOPOD OF FIRST THORACIC LIMB; B, ENDOPOD OF SECOND THORACIC LIMB OF MALE; C, EXOPOD OF THIRD PLEOPOD OF MALE. MAGNIFICATION: X 70

FIG. 4—CARNEGIEOMYSIS XENOPS, N. GEN. AND N. SP. A, FEMALE DORSAL VIEW; B, FEMALE LATERAL VIEW. MAGNIFICATION: X 28

FIG. 5—CARNEGIEOMYSIS XENOPS, N. GEN. AND N. SP. A, ANTENNAL SCALE; B, ENDOPOD OF FIRST THORACIC LIMB; C, ENDOPOD OF SECOND THORACIC LIMB; D, ENDOPOD OF THIRD THORACIC LIMB; E, LAST THORACIC LIMB; F, TELSON. MAGNIFICATION: A-E, X 36; F, X 130

# BIOLOGICAL RESULTS OF LAST CRUISE OF CARNEGIE

## V

## THE ISOPODS

JAMES O. MALONEY

## CONTENTS

# THE ISOPODS

## INTRODUCTION

The isopods taken during the last cruise of the **Carnegie**, 1928-1929, are a well-known and widely distributed species, five in number, representing three families and three genera. In these are included specimens of **Idothea metallica** Bosc. It is interesting to note that the only previous Pacific record for this species was based on specimens from Japan; new records established by the **Carnegie** are off Easter Island (station 53) and off Chile (station 59). As a matter of convenience, reference has been made to the original descriptions and to a paper in which each of the several species is adequately figured.

The author wishes to thank the Carnegie Institution of Washington for the privilege of examining this collection.

## SYSTEMATIC DISCUSSION

### FAMILY CIROLANIDAE

Genus **EURYDICE** Leach

**Eurydice truncata** Norman

**Eurydice truncata** Norman, Ann. Mag. Nat. Hist., ser. 4, vol. 2, 1868, p. 421, pl. 23, figs. 12-15. Tattersall, Isop.; Nord. Plankton, vol. 6 (Lief. 14), 1911, p. 214, figs. 72-79.

#### OCCURRENCE

Off Ireland, between stations 6 and 7, 50° 00′ north, 12° 00′ west, three specimens. Off Ireland, between stations 6 and 7, 50° 00′ north, 11° 00′ west, eight specimens.

#### DISTRIBUTION

West coast of Europe and the Mediterranean.

### FAMILY IDOTHEIDAE

Genus **IDOTHEA** Fabricius

**Idothea baltica** (Pallas)

**Idothea baltica** Pallas, Spic. Zool. (9), 1772, pp. 67-78, pl. IV, fig. 6. Richardson, Bull. 59, U. S. Nat. Mus., 1905, pp. 364-365, 3 figs.

#### OCCURRENCE

Off Ireland, between stations 6 and 7, 50° 00′ north, 10° 00′ west, forty specimens.

#### DISTRIBUTION

Widely distributed in Atlantic and adjacent waters.

**Idothea emarginata** (Fabricius)

**Idothea emarginata** Fabricius, Ent. Syst. ii, 1793, p. 508. Sars, Crust. Norway, vol. II, 1899, pp. 81-82, pl. 33.

#### OCCURRENCE

Off Ireland, between stations 6 and 7, 50° 00′ north, 10° 00′ west, ten specimens.

Idothea **metallica** Bosc

**Idothea metallica** Bosc, Hist. Nat. Crust., II, 1802, p. 179, pl. XV, fig. 6. Richardson, Bull. 54, U. S. Nat. Mus., 1905, pp. 362-363, 3 figs.

#### OCCURRENCE

Off Ireland, between stations 6 and 7, 50° 00′ north, 10° 00′ west, four specimens. Off Ireland, station 6, 50° 22′ north, 13° 31′ west, seven specimens. Off Easter Island, station 53, 29° 06′ south, 108° 44′ west, one specimen. Mid-North Atlantic, station 2, 39° 06′ north, 45° 41′ west, one specimen. Off Chile, station 59, 39° 51′ south, 101° 04′ west, one specimen. Off Japan, between stations 115 and 116, 38° 22′ north, 147° 20′ east, three specimens.

#### DISTRIBUTION

Cosmopolitan.

### FAMILY JANIRIDAE

Genus **JANIRA** Leach

**Janira minuta** Richardson

**Janira minuta** Richardson, Trans. Conn. Acad. Sci., vol. XI, 1902, p. 297, pl. XXXIX, figs. 50-52. Bull. 54, U. S. Nat. Mus., 1905, pp. 471-472, 3 figs.

#### OCCURRENCE

Mid-North Atlantic, between stations 1 and 2, 37° 53′ north, 52° 46′ west, one specimen. Mid-North Atlantic, between stations 13 and 14, 42° 10′ north, 47° 19′ west, four specimens. Caribbean Sea, station 34, 11° 18′ north, 78° 34′ west, one specimen.

#### DISTRIBUTION

New England coast and Bermudas.

#### REMARKS

Two specimens, the one from station 34 and the other from between stations 1 and 2, are identified with this species with some hesitation because of their very small size and the fact that many of the appendages are missing.

BIOLOGICAL RESULTS OF LAST CRUISE OF CARNEGIE

VI

# THE HALOBATES

HARRY G. BARBER

CONTENTS

# THE HALOBATES

## INTRODUCTION

The only truly pelagic insects known belong to the genus **Halobates** placed in the family Gerridae, subfamily Halobatinae. Like all their congenors they are gregarious, adapted to skim very rapidly over the surface of the water, and are carnivorous, feeding on both living and dead animals.

Over twenty species of the genus have been described. Some of them, such as **H. micans** Esch. and **H. sericeus** Esch., are widely spread oceanic forms where as most of the others, according to the records, occur not far from land areas or are restricted to definite seas or oceanic coastal regions or small bodies and streams of salt water. Apparently they are rarely or never found in fresh water. The best single account of this group is that of F. Buchanan White in "The report on the pelagic Hemiptera procured during the voyage of H.M.S. **Challenger** in the years 1873-1876," published in 1883. Besides a detailed description with figures of the ten known species, considerable space is devoted to a general consideration of their structure with a few observations on their habits and geographical distribution. Since the publication of this report, the number of species has been more than doubled and considerable added to our knowledge of their habits and life history by various scientists, notably William Lundbeck (1914), H. C. Delsman (1926), Fred C. Hadden (1931), and G. M. Henry (1932).

The genus **Halobates** was established in 1822 by J. Friederich Eschscholtz in Entomographien I, p. 106. A rather free translation of the salient factors of his characterization is as follows: The head is broad. Eyes large. Ocelli missing. Rostrum three-jointed. The four-jointed antennae attached before the eyes; first joint the longest. Pronotum very short, ring-formed. Apterous. Abdomen very short. Fore legs very short, with thickened femora; the tibiae cylindrical and equal to the femora in length, provided inwardly with a projecting hook-like process; the tarsi composed of two rather long, thick joints; the second joint provided with two curved hooks. Middle legs two or three times as long as the body; femora very long, cylindrical; tibiae thinner and about one-half the length of femora; tarsi two-jointed, the first segment a little shorter than tibiae and usually bent, the apical joint short, fine, and provided with several long hairs. Hind legs joined to the body above the middle legs, about one-third shorter than the latter, with longer coxal joints; finer tibiae and tarsi; the second joint of the latter is acutely pointed and long haired. The body is covered with very fine silver-colored scales. The legs are usually black. These animals leap over the surface of the ocean and live only in or near the tropics.

For distinguishing the various species the chief characters in use are the size of the anterior femora, the relative lengths of the segments of the antennae, of the legs, and particularly of the tarsal segments, as well as the character of the male genital segment. In several species the shape of the body, as well as the color, is quite characteristic.

One hundred and thirty-six specimens of **Halobates** were collected on the voyage of the **Carnegie**. Of these, seventy-six were adults and sixty were nymphs or nymphal skins. Only three species are represented: **H. micans** Esch. (=wüllerstorffi Frauen.), **H. sericeus** Esch., and **H. splendens** Witl. The first two of these are the most common and widely distributed pelagic species of the genus.

### KEY TO THE THREE SPECIES OF HALOBATES

1. Fore femora and antennae black, never steel blue. Second and third segments of antennae together subequal to fourth, third segment but little if any longer than second. Anterior tarsus with the terminal segment about twice as long as basal; tarsus of intermediate legs with the basal segment about seven times as long as terminal; tarsus of hind legs with terminal segment one-third as long as basal . . . . . . . . . . . . . . . . . . . . . **sericeus** Esch.
   Fore femora, antennae in part, and often the other legs steel blue. Terminal segment of fore tarsus not twice as long as basal . . . . . . . . . . . . . . . . . 2
2. Anterior tarsus with the terminal segment one-fourth to one-fifth longer than basal. Tarsus of intermediate legs with the basal segment 4 to 5 times as long as the terminal one; posterior femur one-third to one-fourth longer than tibia . . . . . . . **micans** Esch.
   Anterior tarsus with the two segments subequal. Tarsus of intermediate legs with the basal segment 6 to 7 times as long as the terminal one; posterior femur one-eighth longer than tibia . . . . . . **splendens** Witl.

## DISCUSSION

### **Halobates sericeus** Eschscholtz

Figure 1 (A)

Body not at all parallel sided; ovate, widest across the middle of the mesonotum. Color ash-gray or pruinose above and below, with anterior ventral segments often embrowned; legs and antennae black, never steel blue. Antennae two-fifths shorter than body; first segment not nearly twice as long as second but plainly longer than second and third united; third segment nearly equal to second and much shorter than fourth. Anterior femur about one-sixth longer than tibia and the latter two-fifths longer than tarsus. Anterior femur, seen from the side, at the widest point, about one-fourth as wide as long; the basal segment of the anterior tarsus one-half the length of the terminal one. Intermediate legs with the femur twice as long as the tibia, and the latter subequal to the tarsus in length; basal segment of the tarsus 6 to 7 times as long as the terminal. Posterior legs with femur over one-third longer than tibia, the latter just over three times as long as tarsus. Length 3 mm, diameter 1.75 to 2 mm.

Most of the specimens taken in the Pacific Ocean belong to this widely spread species. The numerous stations at which this species was taken show an extreme range from latitudes 34° 06′ north to 31° 28′ south. A copy of the record of its capture is as follows:

| Latitude | Longitude | Latitude | Longitude |
|---|---|---|---|
| ° ′ | ° ′ | ° ′ | ° ′ |
| 09 06 S | 108 20 W | 19 06 S | 114 07 W |
| 23 16 S | 114 45 W | 26 27 S | 115 21 W |
| 29 06 S | 114 48 W | 31 28 S | 112 51 W |
| 15 18 S | 97 28 W | 14 52 S | 126 07 W |
| 17 04 S | 129 45 W | 17 00 S | 129 45 W |
| 17 11 S | 133 18 W | 16 25 N | 171 59 E |
| 19 19 N | 166 23 E | 20 12 N | 161 19 E |
| 16 14 N | 151 04 E | 29 21 N | 132 30 W |
| 26 44 N | 138 27 W | 26 39 N | 139 07 W |
| 26 13 N | 142 02 W | 24 02 N | 145 33 W |
| 22 53 N | 151 15 W | 23 26 N | 159 27 W |
| 29 02 N | 161 11 W | 29 02 N | 161 11 W |
| 34 06 N | 157 09 W | 33 38 N | 151 47 W |
| 21 18 N | 138 36 W | 21 18 N | 138 36 W |
| 16 15 N | 137 06 W | 12 40 N | 137 32 W |

### **Halobates micans** Eschscholtz

Figure 1 (B)

=H. wüllerstorffi Frauenfeld 1867

Body not parallel sided, widest just behind the middle of the mesonotum. Color grayish-blue with metallic reflection above, ash-gray below; at least the basal segment of the antennae, the anterior femora and often the femora of other legs, and the genital segment of the male, steel blue. Antennae just over one-half as long as the body; first segment over twice as long as second and plainly longer than second and third united; third segment but slightly shorter than second and much shorter than fourth. Anterior femora about one-seventh longer than tibia, the latter a little longer than tarsus; basal segment of tarsus about one-fourth to one-fifth shorter than terminal one; anterior femur, seen from the side, about one-fourth to one-fifth as wide as long. Intermediate legs with the femur not twice as long as tibia, the latter subequal to length of tarsus; basal segment of the tarsus about three and a half to four times as long as terminal one. Posterior legs with the femur about one-third longer than tibia; the latter three to four times as long as the tarsus. Length 3.5 to 4.5 mm, diameter 2.3 to 2.5 mm.

This widely distributed species occurs in the warmer parts of both the Atlantic and Pacific oceans. A cast skin was obtained in the Caribbean Sea at latitude 15° 18′ north, longitude 68° 11′ west; a nymph was taken near the Galapagos Islands at latitude 03° 15′ south, longitude 99° 48′ west; another adult just a little north of the Fiji Islands at latitude 14° 41′ south, longitude 167° 41′ west. A little north of the Sicily Islands three nymphs were taken which apparently belong to this species--two at latitude 01° 48′ south, longitude 152° 22′ west, and one at latitude 04° 51′ north, longitude 146° 46′ west.

### **Halobates splendens** Witlaczil

Figure 1 (C)

Body not parallel sided, widest across middle of the mesonotum. Color above blackish-blue, beneath ash-gray; antennae, legs, and terminal male genital segment steel blue. First segment of antennae nearly as long as the other three segments united and at least three times as long as second segment; third segment slightly shorter than second and nearly one-half as long as the fourth. Anterior femora scarcely longer than the tibia, the latter about one-fourth longer than tarsus; basal segment of tarsus subequal to terminal one or a little shorter; anterior femur, seen from the side, one-fourth as wide as long. Intermediate legs with the femur not twice as long as tibia (13:7.5); the latter subequal to length of tarsus; basal segment of the tarsus about five and one-half to six times the length of the terminal one. Posterior legs with the femur only one-eighth longer than the tibia; the latter almost three times as long as tarsus. Length 4.66 to 5.33 mm, diameter 2.5 mm.

This species is closely related to **micans** Esch. with the same steel-blue appendages but the different relative lengths of the tarsal segments will differentiate it. Witlaczil described this from the west coast of America between the equator and the Tropic of Capricorn. The **Carnegie** plankton collection contains an adult and ten nymphs collected in the same region--latitude 09° 58′ south and longitude 82° 10′ west.

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### Halobates splendens Witlaczil

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FIGURES 1(A), 1(B), AND 1(C)

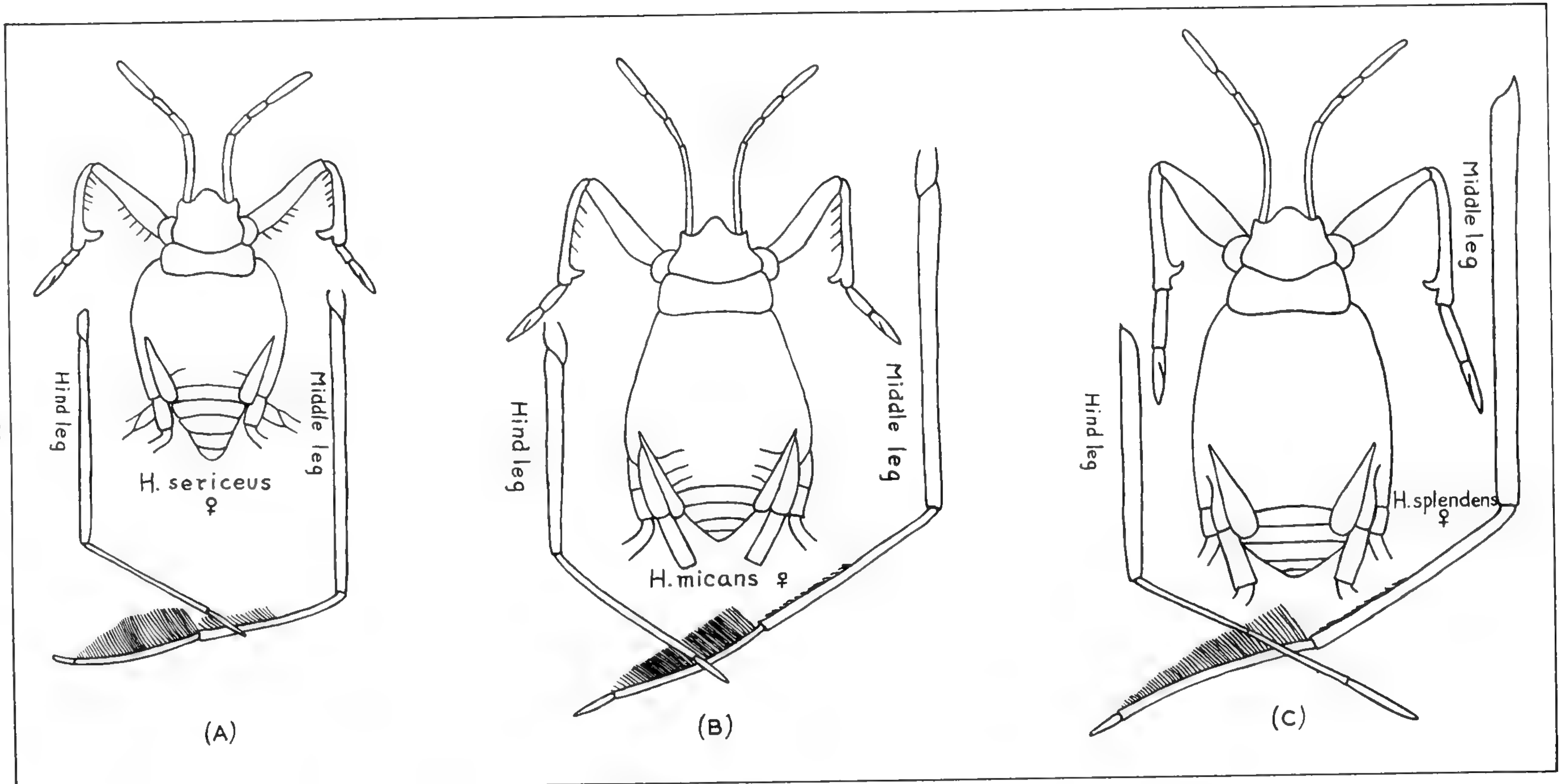


FIG. 1—THREE SPECIES OF HALOBATES: (A) HALOBATES SERICEUS ESCHSCHOLTZ; (B) HALOBATES MICANS ESCHSCHOLTZ; (C) HALOBATES SPLENDENS WITLACZIL

# BIOLOGICAL RESULTS OF LAST CRUISE OF CARNEGIE

## VII

## LIST OF BIRDS

ALEXANDER WETMORE

CONTENTS

## LIST OF BIRDS

In making plans for this cruise Captain J. P. Ault, because of his interest in various fields of science, offered to collect birds for the United States National Museum on those rare occasions when a day ashore in a suitable place might afford opportunity. Two small lots of specimens have come from this work; one from Reykjavik, Iceland, obtained on July 24, 1928, and another from the Island of Guam, in the Marianas Islands, secured May 22, 1929. With the latter there is included one noddy tern obtained at sea, west of the New Hebrides, March 29, 1929. These specimens, preserved in alcohol, are a valuable and useful addition to the National collections.

To complete the record they are listed here, divided under the two main regions from which they were obtained.

### SPECIMENS FROM REYKJAVIK, ICELAND

(Taken July 24, 1928)

#### FAMILY PHALACROCORACIDAE

**Phalacrocorax carbo carbo,** (Linnaeus): Cormorant

One, U. S. N. M. no. 292,350 (collector's no. 12).

#### FAMILY HAEMATOPODIDAE

**Haematopus ostralegus** Linnaeus: Oyster-catcher

Two, U. S. N. M. nos. 292,354 and 292, 355 (collector's nos. 2 and 3). The form of Iceland is supposed to be intermediate in characters between the typical race **ostralegus** and **H. o. occidentalis** of the British Isles.

#### FAMILY CHARADRIIDAE

**Pluvialis apricaria altifrons** Brehm:
Northern Golden Plover

One, U. S. N. M. no. 292,353 (collector's no. 10).

#### FAMILY SCOLOPACIDAE

**Arquatella maritima maritima** (Brünnich):
Purple Sandpiper

Two, U. S. N. M. nos. 292,351 and 292,352 (collector's nos. 6 and 7).

#### FAMILY LARIDAE

**Sterna macrura** Naumann: Arctic Tern

Two adults, U. S. N. M. nos. 292,356 and 292,357 (collector's nos. 4 and 5); one juvenile, U. S. N. M. no. 292,358, without collector's number. The proper scientific name for the arctic tern is as given above, since the current **Sterna paradisaea** of Brünnich (1764) is preoccupied by **Sterna paradisaea** Pontoppidan (1763) which cannot be identified from the description.

#### FAMILY ALCIDAE

**Cepphus grylle grylle** (Linnaeus):
Black Guillemot

One, U. S. N. M. no. 292, 349 (collector's no. 11).

**Fratercula arctica arctica** (Linnaeus):
Northern Puffin

Five specimens were collected, U. S. N. M. nos. 292,344 and 292,348 (collector's nos. 1, 13-16).

#### FAMILY TURDIDAE

**Oenanthe oenanthe leucorhoa** (Gmelin):
Greenland Wheatear

Two, U. S. N. M. nos. 292,359 and 292,360 (collector's nos. 8 and 9.

### SPECIMENS FROM GUAM

(Taken May 22, 1929)

With the exception of the fairy tern, and the noddy tern secured west of the New Hebrides, these are resident forms that are not known certainly outside of the Mariana Islands, and in some cases are restricted to Guam alone.

#### FAMILY ARDEIDAE

**Ixobrychus sinensis bryani** (Seale):
Marianne Bittern. "Kákkak"

One specimen, U. S. N. M. no. 318,050 (collector's no. 30). Whether the form of the Pelew Islands is the same as that of Guam is not certainly known.

#### FAMILY LARIDAE

**Anoüs stolidus pileatus** (Scopoli): Pacific Noddy

One specimen collected at latitude 15° 06′ south, longitude 163° 59′ west, March 29, 1929, by Captain J. P. Ault; U. S. N. M. no. 318,048 (collector's no. 18).

**Gygis alba candida** (Gmelin):
White Tern, Fairy Tern. "Chúngi"

One specimen, U. S. N. M. no. 318,049 (collector's no. 26).

#### FAMILY COLUMBIDAE

**Gallicolumba xanthonura** (Temminck):
White-headed Pigeon. "Apáka"

One specimen, U. S. N. M. no. 318,047 (collector's no. 25).

## FAMILY ALCEDINIDAE

**Halcyon cinnamomina cinnamomina** Swainson:
Guam Kingfisher. "Síhig" or "Carpintero"

Two specimens, U. S. N. M. nos. 318,051 and 318,052 (collector's nos. 23 and 24).

## FAMILY CORVIDAE

**Corvus kubaryi** Reichenow. Kubary's Crow:
"Ága" or "Cuervo"

One specimen, U. S. N. M. no. 318,061 (collector's no. 19). Recorded questionably from the Pelew Islands also.

## FAMILY MUSCICAPIDAE

**Rhipidura rufifrons uraniae** Oustalet:
Guam Fan-tailed Fly-catcher. "Chichiríka"

Two specimens, U. S. N. M. nos. 318,055 and 318,056 (collector's nos. 21 and 22).

## FAMILY STURNIDAE

**Aplonis opaca guami** Momiyama:
Guam Glossy Starling. "Sáli" or "Tordo"

Four specimens, U. S. N. M. nos. 318,057-318,060 (collector's nos. 27, 29, 31, and 37).

## FAMILY ZOSTEROPIDAE

**Zosterops conspicillata conspicillata** (Kittlitz):
Guam White-fronted Silver-eye. "Nóssak"

Two specimens, U. S. N. M. nos. 318,053 and 318,054 (collector's nos. 20 and 28).

BIOLOGICAL RESULTS OF LAST CRUISE OF CARNEGIE

# VIII

# MISCELLANEOUS DETERMINATIONS

CONTENTS

## THE SPONGE

The sponge specimen (contained in bottle 8165) which was collected in April 1929 on the reef at Apia, Samoa by the **Carnegie** party belongs to a very common genus, usually called **Reniera** or **Chalina**. Both names were given in 1862, the former by O. Schmidt and the latter by Bowerbank. A previous name is Haliclona Grant 1841, but no one has used this name since, so far as the author knows, unless very recently. The species is very close to the cosmopolitan **cinerea** Grant 1827, and may be so identified. It is, then, either **Haliclona cinerea** (Grant) new combination or **Reniera cinerea** (Grant) Schmidt. The decorous procedure would seem to be to use the latter name.

## THE ECHINODERMS

The Curator of Echinoderms of the Smithsonian Institution (Austin H. Clark) identified the echinoderms collected as follows:

### ASTEROIDEA

**Oreaster**, sp. Reef, Apia, Samoa, April 1929, one very young specimen.

**Linckia multifora** (Lamarck). Reef, Apia, Samoa, April 1929, one specimen.

**Linckia multifora** (Lamarck) Luminao Reef, Guam, May 1929, sample 563, one specimen.

### OPHIUROIDEA

**Ophiacantha bidentata** (Retzius). August 2, 1928, latitude 46° 06′ north, longitude 48° 01′ west, station 13, one specimen.

**Ophiopholis aculeata** (L.). August 2, 1928, latitude 46° 06′ north, longitude 48° 01′ west, station 13, one specimen.

**Ophiocoma erinaceus** Muller and Troschel. Reef, Apia, Samoa, April 1929, two specimens.

**Ophiarthrum elegans** Peters. Reef, Apia, Samoa, April 1929, one specimen.

**Ophiothrix propinqua** Lyman. Reef, Apia, Samoa, April 1929, one specimen.

### ECHINOIDEA

**Echinometra mathaei** (de Blainville). Luminao Reef, Guam, May 1929, one specimen.

**Echinometra mathaei** (de Blainville). Reef, Apia, Samoa, April 1929, four specimens.

**Echinarachnius parma** (Lamarck). August 2, 1928, latitude 46° 06′ north, longitude 48° 01′ west, station 13, one specimen.

## THE INSECTS AND MITES

The following is a list of identifications giving the names for the various insects and mites so far as they have been recognized.

Staphylinidae - Aleocharinae? January 3, 1929, latitude 31° 54′ south, longitude 88° 17′ west, station 64. Determined by E. A. Chapin.

One broken and mouldy specimen of a minute Carabid, apparently **Tachys** sp. February 26, 1929, latitude 13° 03′ south, longitude 121° 12′ west, station 81. Determined by L. L. Buchanan.

**Coninomus constrictus** Gyll. (Family Lathridiidae) Coleoptera. July 13, 1928, latitude 63° 21′ north, longitude 09° 25′ west, station 7. Determined by W. S. Fisher.

Hydroporinae. December 7, 1928, Katiki Volcano Crater Lake, Easter Island, between stations 53 and 54. Determined by A. G. Boving.

**Cynthia (=Vanessa) cardui** L. May 31, 1928, latitude 50° 22′ north, longitude 13° 31′ west, station 6. Determined by F. H. Benjamin.

**Plusia gamma** L. June 3, 1928, latitude 50° 02′ north, longitude 12° 05′ west, between stations 6 and 7. Determined by F. H. Benjamin.

**Plutella Maculipennis** Curtis. May 31, 1928, latitude 50° 22′ north, longitude 13° 31′ west, station 6. Determined by August Busck.

**Hydrellia griseola** Fall. One specimen. Common in Europe and North America. June 3, 1928, latitude 50° 02′ north, longitude 12° 05′ west, between stations 6 and 7. Determined by J. M. Aldrich.

**Napomyza nigriceps** Vdw. One specimen. European. June 3, 1928, latitude 50° 02′ north, longitude 12° 05′ west, between stations 6 and 7. Determined by J. M. Aldrich.

**Drosophila** sp. Too poor condition to ascertain the species. One specimen. October 26, 1928, latitude 06° 33′ north, longitude 80° 04′ west, station 35. Determined by J. M. Aldrich.

Unrecognizable fragment of fly. One specimen. May 31, 1928, latitude 50° 00′ north, longitude 13° 02′ west, between stations 6 and 7. Determined by J. M. Aldrich.

**Culex**. Twelve specimens. December 7, 1928, Easter Island between stations 35 and 36. Determined by Alan Stone.

**Culex quinquefasciatus** Say. Larvae. Eighteen specimens. December 7, 1928, Easter Island between stations 35 and 36. Determined by Alan Stone.

A predaceous mite of family Parasitidae. April 22, 1929, latitude 12° 47′ south, longitude 171° 35′ west, station 94. Determined by H. E. Ewing.

**Anisolabis annulipes** Lucas. ♀ January 7, 1929, latitude 27° 04′ south, longitude 84° 01′ west, station 66. Determined by A. N. Caudell.

**Blattella germanica** Linn. A minute nymph. November 8, 1929, latitude 06° 33′ south, longitude 154° 58′ west, station 158. Determined by A. N. Caudell.

European Chrysopidae. May 31, 1928, latitude 50° 22′ north, longitude 13° 31′ west, station 6. Determined by A. N. Caudell.

**Cryptotermes** sp. One dealated adult. February 6, 1929, latitude 11° 57′ south, longitude 78° 37′ west, station 71. Determined by T. E. Snyder.

Collembolan. **Entomobrya** sp. November 13, 1929, latitude 10° 54′ south, longitude 161° 53′ west, station 160. Determined by J. W. Folsom.

**Halobates micans** Esch. November 17, 1928, latitude 03° 15′ south, longitude 99° 48′ west, station 44. March 31, 1929, latitude 14° 41′ south, longitude 167° 41′ west, station 93. November 6, 1929, latitude 01° 48′ south, longitude 152° 22′ west, station 157. October 5, 1928, latitude 15° 18′ north, longitude 68° 11′ west, station 32. November 2, 1929, latitude 04° 51′ north, longitude 146° 46′ west, station 155. Determined by H. G. Barber.

**Halobates splendens** Witl. February 8, 1929, latitude 09° 58′ south, longitude 82° 10′ west, station 72. Determined by H. G. Barber.

**Xyleborus** sp. January 5, 1929, latitude 31° 07′ south, longitude 86° 39′ west, station 65. Determined by M. W. Blackman.

**Neoxyloctonus** sp. April 2, 1929, latitude 12° 47′ south, longitude 171° 35′ west, Samoa. Determined by M. W. Blackman.

**Halobates sericeus** Eschscholtz

| Date | Latitude | Longitude | Station |
|---|---|---|---|
| | ° ′ | ° ′ | |
| Nov. 25, 1928 | 19 07 S | 114 07 W | 48 |
| 27, 1928 | 23 16 S | 114 45 W | 49 |
| Feb. 28, 1929 | 14 52 S | 126 07 W | 82 |
| Mar. 2, 1929 | 17 00 S | 129 45 W | 83 |
| 4, 1929 | 17 11 S | 133 18 W | 84 |
| May 9, 1929 | 16 25 N | 171 59 E | 102 |
| 11, 1929 | 19 19 N | 166 23 E | 103 |
| 13, 1929 | 20 12 N | 161 19 E | 104 |
| 17, 1929 | 16 14 N | 151 04 E | 106 |
| Sep. 10, 1929 | 29 21 N | 132 30 W | 133 |
| 14, 1929 | 26 39 N | 139 07 W | 135 |
| 16, 1929 | 26 13 N | 142 02 W | 136 |
| 18, 1929 | 24 02 N | 145 33 W | 137 |
| 20, 1929 | 22 53 N | 151 15 W | 138 |
| Oct. 3, 1929 | 23 27 N | 159 27 W | 140 |
| 5, 1929 | 29 02 N | 161 11 W | 141 |
| 9, 1929 | 34 06 N | 157 09 W | 143 |
| 11, 1929 | 33 38 N | 151 47 W | 144 |
| 21, 1929 | 21 18 N | 138 36 W | 149 |
| Sep. 13, 1929 | 26 44 N | 138 27 W | 134-135 |
| Nov. 21, 1928 | 09 06 S | 108 20 W | 46 |
| Dec. 3, 1928 | 31 28 S | 112 51 W | 52 |
| Oct. 21, 1929 | 21 18 N | 138 36 W | 149 |
| Sep. 20, 1929 | 22 53 N | 151 15 W | 138 |
| Oct. 5, 1929 | 29 02 N | 161 11 W | 141 |
| 23, 1929 | 16 15 N | 137 06 W | 150 |
| 25, 1929 | 12 40 N | 137 32 W | 151 |
| Feb. 16, 1929 | 15 18 S | 97 28 W | 76 |
| Mar. 2, 1929 | 17 00 S | 129 45 W | 83 |
| 4, 1929 | 17 11 S | 133 18 W | 84 |
| Nov. 29, 1928 | 26 27 S | 115 21 W | 50 |
| Dec. 1, 1928 | 29 06 S | 114 48 W | 51 |

Determined by H. G. Barber.

## THE PYROSOMIDS

Dr. Hoyt S. Hopkins, of New York University, kindly determined the Pyrosomids collected.

January 3, 1929, latitude 31° 54′ south, longitude 88° 17′ west, station 64, sample 397. **Pyrosoma spinosum** Herdman. Two, or more (?) incomplete colonies. Represented by one tubular part of a colony, broken at each end; length 50 cm; diameter of tube (flattened), 6 cm at wider end, 5 cm at narrower end, tapering uniformly. Also, another fragment, not tubular but torn open, of about 60 cm length; and two short tubular parts, apparently belonging to this same colony, having a diameter of about 11 cm. The largest ascidiozooids are 7 mm long, and have 20 to 25 branchial crossbars; testes immature; ovaries not seen, probably not developed.

June 29, 1929, latitude 37° 40′ north, longitude 145° 26′ east, station 115, sample 694. **Pyrosoma** sp. An immature colony, of 12 ascidiozooids; belonging to the subgenus **Pyrosomata ambulata**, but too young to be identified as to species. Length of colony 3 to 4 mm, diameter 2 to 3 mm.

April 24, 1929, latitude 08° 43′ south, longitude 170° 56′ west, station 95, sample 564. **Pyrosoma** sp. A primary zooid colony of two primary ascidiozooids, the two other primary zooids (of the "tetrazooid colony") having degenerated, as shown by the persistence of two extra pairs of test vessels near the colony opening. Colony nearly spherical, about 2 mm in diameter. Belongs to the subgenus **Pyrosomata ambulata**, but is not identifiable as to species.

October 3, 1929, latitude 23° 27′ north, longitude 159° 27′ west, station 140, sample 858. **Pyrosoma** sp. An immature colony, of 12 ascidiozooids, and four buds forming on primary ascidiozooids. Colony nearly spherical, 3 to 4 mm in diameter. Belongs to the subgenus **Pyrosomata ambulata**, but is too young to be identified as to species.

September 15, 1928, latitude 12° 54′ north, longitude 56° 15′ west, station 30, sample 190. **Pyrosoma** sp. A primary zooid colony of three primary ascidiozooids. Colony nearly spherical, about 2 mm in diameter. Belongs to subgenus **Pyrosomata ambulata**, but is not identifiable as to species.

## THE LIZARD

A specimen of lizard which was included in the material has been identified by the Assistant Curator of Reptiles and Batrachians of the Smithsonian Institution (Miss Doris M. Cochran) as **Cryptoblepharus poecilopleurus**, which belongs to a group which is distributed widely over the tropical regions of both hemispheres. It was taken under a stone on land at Easter Island December 9, 1928, between stations 53 and 54.