
VIII.

LEODICIDÆ FROM FIJI AND SAMOA.

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Eight plates and 68 text-figures.

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on the opposite side of the island in the harbor of Leone. Collections were also made in the lagoon southwest of Nuuli and in the reef west of the island of Aunuu.

The specimens were narcotized in a solution of $MgSO_4$, 153 grams to the liter, killed in 10 per cent formalin, and preserved in strong alcohol.

SYSTEMATIC DESCRIPTIONS.

In an earlier paper (Treadwell, 1921a) I have discussed the anatomical features which are of most importance in the taxonomy of the Leodidæ, and later study has led to no conclusions different from those there stated, unless it is to further emphasize the importance of the jaw in classification. I found the general character of the jaw remarkably constant in any one species, especially in the form of the plates and their color. Multiplication of genera and subgenera on the part of taxonomists is a very unfortunate habit, but there would be some justification for making a subgenus of *Leodice* to include *L. siciliensis* Grube, *L. caribæa* Grube, *L. paloloides* Moore, *L. viridis* Gray, *L. viridis* var. *vernalis* Treadwell (see page 123), and *L. dubia* Woodworth, on the basis of their jaw structure. In the relatively large size of the mandible, the limited tooth development on the proximal plates, and the peculiar appearance of the distal ones, these differ from all others that I have seen.

Students of this group have not agreed on the major classification of the animals included in it. In an earlier paper (Treadwell, 1921a) I followed what seemed to be the majority opinion and classified the Leodidæ as a family, with the subfamilies Leodicinæ, Lumbrinereinæ, and Stauronereinæ. Chamberlin (1919a), in a paper which appeared after mine had gone to the editor, constructs the superfamily Leodicoidea, putting under it the families Leodidæ, Lumbrinereidæ, Onuphididæ, and Dorvilleidæ (= Stauronereidæ, see page 166). In the present paper I shall follow my original arrangement.

Family LEODICIDÆ.

Annelida varying much in size in different species, with or without prostomial tentacles, nuchal cirri, eyes, and parapodial gills. Notopodium of parapodium rudimentary or apparently absent. Jaw of maxilla and mandible, the former of two or more rows of plates, mostly toothed.

Subfamily LEODICINÆ.

With dorsal and ventral parapodial cirri, with or without nuchal cirri and parapodial gills. Prostomium with from 1 to 7 tentacles and one pair of palps more or less fused with the prostomium.

Genus LEODICE Savigny.

Savigny, J. C., *Système des Annelides* 1930, p. 13.

Prostomium 2- or 4-lobed, the lobing often obscure. With 5 tentacles and 1 pair of eyes. A pair of nuchal cirri on the second body-somite. Parapodia begin on the

third body-somite. Gills on more or fewer of the body somites. Jaw of maxilla and mandible, the former of forceps, 2 pairs of toothed plates, and 1 unpaired plate. Mandible of symmetrical halves joined anteriorly to form a cutting edge. One or two pairs of anal cirri.

Leodice viridis Gray.

Plate 1, figures 1 to 7; text-figures 1 and 2.

Palolo viridis Gray, Stair, 1847, pp. 17-18.

Palolo viridis Macdonald, 1858, pp. 237-239, pl. 41.

Lysidice palolo Quatrefages, 1865, p. 379.

Lysidice viridis Ehlers, 1864-1868, p. 367, pl. 16, figs. 17, 18.

Lysidice viridis Collin, 1897, pp. 164-174. (Reprint pp. 1-11.)

Palolowurm Friedländer, 1898, pp. 337-357.

Eunice viridis Ehlers, 1898, pp. 1-16.

Eunice viridis Woodworth, 1907, pp. 3-21, pls. 1-3.

Fully mature specimens were not found, and no measurements can be given of the completely grown individuals. One specimen measured, after preservation, 270 mm. in length and contained about 450 somites.

The prostomium (plate 1, fig. 1) is noticeably 2-lobed, and when expanded is a trifle wider than the peristomium. Dorsally it is colored a yellowish brown with many minute yellow spots, the anterior margins and the ventral surface being colorless. The tentacles are colorless, blunt-pointed, and more or less wrinkled, the median one reaching as far as the anterior border of the fifth somite, the inner paired to the middle of the third, the outer paired to the second. Ehlers (1898, p. 5) is in error in describing the tentacles and cirri as jointed. The eyes are large. The peristomium is a little longer than the prostomium; its anterior margin bends around on either side so as more or less to inclose the bases of the tentacles. It is colored much like the prostomium, the pigment extending over the lateral faces but leaving the ventral surface uncolored. The second somite is colored much like the first, but on its anterior border has an uncolored band a little wider than the bases of the nuchal cirri. The nuchal cirri are without color and extend about as far as to the anterior border of the prostomium. The color is continued as far as the region of somites 18 to 20, but the anterior colorless band in each somite becomes successively broader, so that behind the region of somite 20 the only body-color is that given to it by the contents of the intestine or, in the posterior portion, the color of the sex organs. In very young animals, where the sex products have not formed in sufficient quantities to produce a color, this posterior region is colorless. In the posterior third of the body, except for the extreme posterior end, each somite has a median ventral black spot. Woodworth (1907, plate 1) gives colored figures of the species. I was unable, owing to the time of my visit to Samoa, to collect the epitokous ends, but Woodworth's figure 3 corresponds very well with my observations.

There are two pairs of anal cirri, the ventral ones much the smaller (plate 1, fig. 2).

Throughout the median region the gills appear as single filaments larger than the dorsal cirri, to whose bases they are attached (plate 1, fig. 3), and in life are a bright red color. In a specimen 250 mm. long the gills first appeared at the region of somite 137 and continued to about 180 somites from the pygidium. The first and last of the series are the smallest and are not very prominent, but through the middle region, where the gills are largest, they are prominent because of their color.

The first parapodium has very prominent dorsal and ventral cirri and a very small setal lobe, the latter with vertical, parallel, anterior and ventral lips. Two aciculæ, one much darker than the other, extend into the setal lobe, and there is a small tuft of setæ containing both simple and compound forms. On subsequent parapodia there is a relatively great increase in size of the setal portion, and at the same time a shifting of parapodial position, so that they come to lie higher on the lateral face. The first parapodia, because of their ventral position, are partly hidden from a dorsal view

and appear to be no larger than the others. The tenth parapodium (plate 1, fig. 4) has a prominent setal lobe with its anterior lip asymmetrically bifid and with a rounded posterior lip. There is a single very large black acicula. Dorsally in the seta tuft are a few long, slender, simple setæ and ventral to these a dense tuft of compound ones with heavy basal portions and relatively short but stout terminal joints. The dorsal cirrus is very slender, the ventral one short, carried on the end of a pad-like swelling. I could find no trace of needle aciculæ.

Throughout the anterior region of the body this ventral pad-like swelling, which appears at the region of somite 10, is continued and the pads on the two sides of each somite, together with the flattened ventral surface, make up a sole-like ventral region which is in marked contrast to the rounded dorsal region. The pads disappear in the gilled somites, but the flattened ventral surface persists. A gilled parapodium (plate 1, fig. 3) has a pointed setal region with a single large acicula. The gill is attached to the base of the dorsal cirrus and when fully developed is much larger than the cirrus.

As is well known, this species develops at the approach of the breeding-season a posterior epitokous region, and consequently the form of the posterior end depends on the degree of development of the epitokous portion. The swarming occurs in October and November, and my collections were made in April, May, and June, so that the epitokous modifications had appeared only to a limited extent. According to figures given by Friedländer (1898, p. 344) and Woodworth (1907, plate 2, fig. 10), the epitokous portion is much narrower than the atokous, as if a shrinking in diameter occurs at this time. This is contrary to the conditions found in *Leodice fucata* Ehlers (the Atlantic Palolo, in which a swarming occurs), to *L. paloloides* Moore, to *L. caribæa* Grube, and to *L. viridis* var. *vernalis* (see page 133), where, when the sex products are formed, the posterior region is much broader than the anterior. Swarming has never been observed in these latter species, but (except for this question of absolute width) the structural modifications are quite as they are in the true Palolo.

I am indebted to Lieut. Commander R. C. Reed for specimens of swarming ends collected in Tutuila, Samoa, in November 1920. In these the setæ appeared to be longer than in the atokous phase, but careful measurements showed that the absolute length is the same, though because of the narrowing of the body diameter, they extend to a greater distance from the surface. A parapodium from the epitokous region is shown in plate 1, figure 5. The setal lobe is pointed and has a large conical ventral cirrus attached near the end of the lobe. The dorsal cirrus is attached much farther back from the apex, and while conical is much narrower than the ventral one.

The aciculæ are all of one kind, straight and bluntly rounded at the apex. They may be nearly colorless, as happens in the case of the smaller ones, or contain brown pigment, which may be very dense but never appears black. The setæ are of two kinds, simple and compound, and are similar in form throughout the body. The simple ones (text-fig. 2) are long and sharp-pointed, minutely denticulated along one edge. The compound ones (text-fig. 1) have relatively heavy basal joints which are denticulated at their apices, the terminal joints small, with equal-sized apical and subapical teeth covered by a hood which is minutely serrated along its border.

The maxillæ (plate 1, fig. 6) are dark, with the carrier much lighter than the remainder. The two halves of the carrier are closely united throughout most of their extent, the basal ends rounded and relatively broad. The forceps has a heavy basal portion narrowing very abruptly to form the fang at about the middle of the plate. The proximal plates are large, extending back to the carriers; the left one has 3, the right one has 2, indistinctly marked-off teeth. The forceps and proximal plates are very dark in color, with a whitish incrustation along the cutting edges. Distally are 2 plates on the right side and 3 on the left. These are very irregular in outline and their apparent form and size depends on the position from which they are viewed, more than is the case in the majority of *Leodidæ* maxillæ. Their general appearance is shown in figure 6 of plate 1. As compared with the maxilla, the mandible is very large (plate 1, fig. 7) and its lateral margins are much rolled. To the naked eye or under

very low magnification the mandible is an intense white and, as in the case of *L. caribæa* (Treadwell, 1921, p. 49), when protruded from the mouth, forms an easily recognized diagnostic character of the species. Under higher magnification the center shows dark.

Leodice viridis belongs to the group of the Leodidæ of which *L. siciliensis* is a representative species, all distinguished by the small development of the gills, the peculiar jaw apparatus and in most species by the formation of an epitokous posterior end possibly in all cases connected with a swarming. Swarming has actually been seen only in *L. viridis* and *L. dubia* (Woodworth, 1907), but it seems possible that it occurs in the other species as well. (See Treadwell, 1921, p. 47). The only other known case of swarming among the Leodidæ is that of *L. fucata*, which occurs generally in the West Indian region, where it has been reported on by Mayor (1902) and by Treadwell (1921a, p. 43-47, pl. 4, figs. 5 to 10, text-figs. 127 to 135). *L. fucata* is not, however, a member of the *siciliensis* group.

As my collecting was done some months earlier than the swarming period, I was unable to make any observations on this phenomenon and can add nothing to the literature, which is well summarized by Woodworth (1907). In collecting at the spring tides of April, May, and June successively, where low water made it possible to get near the outer edges of the reefs, I found indications of a gradual change toward the epitokous condition in the change of color due to the developing sex products, but these changes were comparatively slight. Dr. Mayor very kindly collected the species in July and reported that there was little change in color from the June condition.

My collections were all made on the reefs in and near Pago Pago Harbor in Tutuila, Samoa. The animals were to be found in rocks at all distances from the shore, but were larger and evidently more mature the farther from shore they were collected, my largest specimens being obtained at as near the edge of the reef as it was possible to go. This led to the suggestion (Treadwell, 1921, pp. 199, 200) that the rate of development may depend on the environment and that those living near shore find the conditions so unfavorable that they grow very slowly and possibly never mature. In all respects except size, these resemble those from farther out, so that there is no question as to the identity of species. I made careful studies of those localities where both the native Samoans and residents at the U. S. Naval Station told me the swarm is most numerous in October and November, but found no place where they are as abundant in the rocks as they should be to supply the enormous number of epitokous ends which appear at the swarming. It seems to me probable that the largest individuals and the greatest number of individuals are to be looked for on the edges of the reefs, where, on account of the surf, I was unable to collect.

Leodice viridis var. *vernalis*, new variety.

Plate 1, figures 8-11.

A considerable number of a small *Leodice* were collected in Suva Harbor, Fiji. Many were in the epitokous condition, with bright green eggs in the posterior part of the body. These belong to the *siciliensis* group and I at first took them for the Palolo, though puzzled by their sexual condition. As this was in April, and the first swarming would be in October, the mature condition of the eggs was hard to understand. Later the true Palolo was collected in Samoa, but it was not until a more careful examination of my collections was made after my return from the expedition that I detected the differences between the species and the variety. (In my report, (1921b, pp. 199, 200) I erroneously confused the two.) The variety does not appear in my Samoan collections, but as I was intent on collecting the largest individuals, I may have passed it over on the assumption that it was the young of the true Palolo. I do not, however, think that it occurs in Samoa, as if it had been there and as fully mature as were the Fijian forms I could hardly have failed to notice it.

The living animal has at the anterior end an intense greenish-brown color with much iridescence which is continued with a gradual diminution in intensity to the

region of somite 50. The prostomium is broader than the peristomium (plate 1, fig. 8) and decidedly 2-lobed, its dorsal surface dark in color, the anterior margin and regions lateral to the eyes being colorless. The tentacles are colorless, the median one 4 to 5 times as long as the prostomium and pointed at the apex. The tentacles are more sharply pointed and have longer cirrophores than in *L. viridis*.

Preserved material retains the coloration of the anterior end, so that for about the first 40 somites both dorsal and ventral surfaces are dark brown. The anterior somites do not have the colorless band on their anterior borders which are present in *L. viridis* (compare fig. 1 and fig. 8, plate 1). The parapodia are uncolored, as are the nuchal cirri. In the epitokous portion there is on either side of the dorsal surface in each somite a dark spot at the base of the parapodium (plate 1, fig. 11). Apparently these spots do not extend to the very posterior end, but I could not determine this with certainty in the material at my disposal. They may also be found on a few of the posterior atokous somites.

A parapodium from setigerous somite 10 is shown in plate 1, fig. 10. The prominent pad-like swelling which carries the ventral cirrus begins at about this region and extends for about the first quarter of the length of the animal. The gills have about the same arrangement that they have in *L. viridis*, but are more slender, extend into the epitokous region, and are relatively more prominent. A small *L. viridis* may be distinguished from one of the variety of the same size by the fact that the gills in *viridis* would be much smaller than in the variety.

An epitokous parapodium (plate 1, fig. 11) has a small dorsal cirrus with the long gill attached near its base. There are two pairs of anal cirri quite similar to those of *L. viridis*, the jaws, except for size, are exactly like those of the species, and the setæ and aciculæ are similar to those of the species.

The type is in the American Museum of Natural History.

Leodice aphroditois Pallas.

Plate 1, figures 12 to 17; text-figures 3 to 7.

Nereis aphroditois Pallas, 1788, p. 229, pl. 5, figs. 1-7.

Eunice aphroditois Ehlers, 1864-68, p. 306, pl. 15, figs. 23-29.

Eunice aphroditois McIntosh, 1885, p. 282, pl. 38, figs. 16, 17; pl. 20A, figs. 8-10.

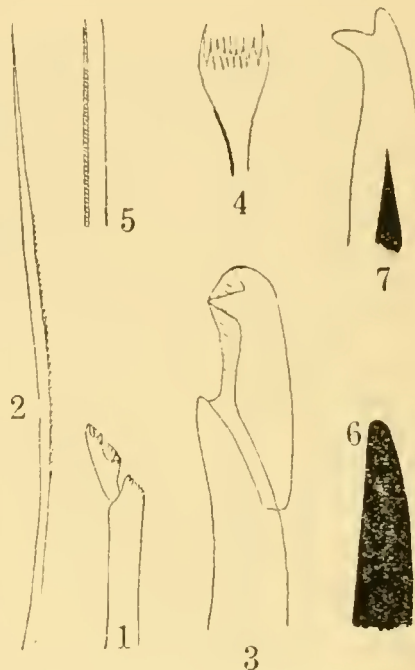
Eunice aphroditois Crossland, 1904, p. 288.

Eunice aphroditois Augener, 1913, pp. 267-270.

Eunice aphroditois Fauvel, 1917, pp. 215-220, pls. 7, 8.

References to a considerable literature concerning this species and a related or more probably identical form *L. kinbergii* will be found in the works cited above. As the material at my disposal did not enable me to attempt this question of the synonymy, it does not seem necessary to undertake any discussion of the subject.

Two specimens were collected at Pago Pago, Samoa, the smaller one 220 mm. long, with a prostomial width of 6 mm. and a larger one 450 mm. long, for the part which was preserved, a considerable portion of the posterior end having been lost. The prostomial width is 8 mm.



TEXT-FIGURES 1 TO 7.

1 and 2. *Leodice viridis*. 1, compound seta $\times 260$; 2, simple seta $\times 220$.

3 to 7. *Leodice aphroditois*. 3, compound seta $\times 220$; 4, pectinate seta $\times 220$; 5, detail of simple seta $\times 220$; 6, acicula $\times 220$; 7, ventral acicula $\times 220$.

The smaller individual in life was very dark brown, almost black. The prostomium was lighter brown in color, the peristomium greenish brown, with longitudinal black markings, and very iridescent. The tentacles were greenish brown, with white bands not regularly arranged and not uniform on the different tentacles. The remainder of the body was dark purplish-brown, becoming purple at the pygidium. There is one pair of stout purple anal cirri uncolored at their apices (plate 1, fig. 13). The larger individual was quite uniformly dark brown, with a greenish tint at the anterior end. The tentacles were faint green, with a darker tip, as were the dorsal cirri. The cirri were not banded. The fourth and fifth setigerous somites were lighter in color than the others, but did not show a distinct "collar." In alcohol, both specimens are brown, though the larger is the darker, and more color is retained in the tentacles. Both show numerous purple lines and streaks running longitudinally on the dorsal surface.

The prostomium (plate 1, fig. 12) is wider than the peristomium and very noticeably 4-lobed. The tentacles are all of about the same length, about as long as the peristomium. The latter is slightly wider anteriorly than posteriorly, with straight margins, and is as long as the following 5 somites. Somite 2 is very short and the nuchal cirri are shorter than the peristomium.

The first parapodium has the usual form, with a large dorsal and a smaller ventral cirrus, with a very small setal lobe. Two good-sized aciculæ extend into the dorsal cirrus, and there is one in the setal lobe. The tenth parapodium (plate 1, fig. 14) has a gill of 16 branches, a very heavy dorsal cirrus, which is longer than the gill, a small acicula in the dorsal cirrus, and a very large one in the setal portion. A parapodium from the posterior end of the body (plate 1, fig. 15) still shows the relatively very large dorsal cirrus and, in addition to the acicular equipment of the anterior ones, there is a ventral hooked acicula.

In the smaller specimen the gills begin on the sixth setigerous somite (the entire body having 180) and extend through about 120 somites. In the larger specimen they arise on the fifth somite on the right and sixth on the left, but as the posterior end is lost I am unable to give their extent. The basal portion of the gill is thick, giving it a heavy appearance during life, but the branches are relatively small and short.

The compound setæ (text-fig. 3) are stout with a heavy shaft and a 2-hooked terminal joint. In the anterior somites they are arranged in a formidable vertical row, but diminish in number in the posterior somites. The pectinate setæ (text-fig. 4) are small and slender, with about 10 teeth on the margin. The simple setæ are very long and slender, with a slender basal portion, widening slightly just outside the parapodial margin, and beyond this tapering gradually to an acute point. Along one edge is a marginal wing, having very fine denticulations. A detail of the shaft is shown in text-figure 5. The dorsal aciculæ are blunt-pointed (text-fig. 6), the ventral ones 2-hooked, with an uncolored apex and a very dark shaft (text-fig. 7).

The maxillæ (plate 1, fig. 16) have a short carrier, with long, slender forceps. The proximal paired plates have each 5 teeth, the right paired with 9, the left with 3, the unpaired with 6. All plates of the maxilla are very black. The shafts of the mandibles are slender, but widen decidedly toward the cutting edge, and are very black in color. The beveled portion is covered with a white incrustation (plate 1, fig. 17).

Although this species has received much attention, it seems worth while to add the above description, because, while I have no doubt as to the accuracy of the identification, the various descriptions which have been written vary so much from each other and from the specimens from Pago Pago that this must be a very variable species, and it seems desirable to record as far as possible these variations. Ehlers's figures are not very satisfactory, especially of the jaws, and the figure he gives of the simple seta shows much more of a broadening in the shaft than I have seen. He gives two figures of pectinate setæ, with 7 teeth in one and 20 in the other. He figures no ventral acicula. He states that the gills are longer than the dorsal cirrus, which is not true in

my specimens. McIntosh figures the nuchal cirri as much shorter than in Ehlers's or in mine, but his figure of the compound seta agrees with that of mine. Augener records a specimen of this species from Samoa, in the collections of the Göttingen Museum, but gives no description of it. Fauvel describes the gills as longer than the dorsal cirrus, while Crossland states that in spite of the large number of their branches, the gills really cover only a small portion of the dorsal surface. This agrees with my specimens from Pago Pago.

***Leodice antennata* Savigny.**

Eunice antennata Crossland, 1904, pp. 312-318, pl. 22, figs. 1-7, text-figs. 56-60.

Eunice antennata Augener, 1913, pp. 270-274.

Eunice antennata Fauvel, 1917, pp. 225-228, text-figs. 20a, 20b.

Eunice antennata Fauvel, 1919, p. 377.

Figures are given by Crossland, and discussions of the possible synonymy of the species will be found in the first three of the above references.

Two individuals were collected in Pago Pago Harbor, in rock near the landing in front of Cook's Hotel. In life they are brownish green in color, but rather translucent, so that the contained blood modifies the tint very decidedly. The dorsal surface of the prostomium is uncolored except for a purple band around the base of the median tentacle and a similar one around the bases of the inner paired tentacles. From each of these latter a band runs toward the median line, uniting with a broader greenish band which runs toward the anterior margin. On either side of this stripe is a colorless spot. The tentacles and all cirri are articulated, and on the tentacles and anal cirri, but not on the dorsal, are brown bands in the constrictions. From the eighth somite posteriorly a black spot is present in each somite near the dorso-lateral margin, and the smaller of the two shows traces of dorsal white spots toward its posterior end. None of the color remains in the preserved material. The animals are much more active than is usual in this genus, squirming much as does *Nereis* when captured. Crossland (pp. 313, 314) mentions the green color as an occasional variation, possibly in relation to environment, and also comments on the activity of the animals when handled.

The larger of the two specimens is 65 mm. long, and has a peristomial width of 1.5 mm. The other individual is about one-third smaller. The larger one contains immature eggs, so must be adult. The first gill, of 2 branches, is on the fourth setigerous somite. The number of branches rises to 6 in the region of somites 15 to 20, through the middle of the body it drops to 2, and at the extreme posterior end of the body rises again to 4. Only the last 2 or 3 somites are free from gills. The jaws are very delicate, only their margins colored. The proximal paired plates have 6 teeth on the left and 8 on the right, the distal paired plates have 10 on the left and 8 on the right, and the unpaired has 9.

The distinguishing features of this species are the articulated tentacles and cirri, the median tentacle being long (in the larger of my two specimens it reached somite 8); the peculiar arrangement of gills whereby the number of filaments decreases throughout the middle of the body to increase again at the posterior end; and the fact that the ventral acicula has a trifid apex. Crossland's text-figure 60 (p. 317) shows this arrangement of gills, but the dorsal cirri are represented as non-articulated. As this is not in agreement with figures 1 and 7 of his plate 22, it is probably an error in the drawing. Fauvel (1919, p. 378) says that the tridentate aciculæ are rare in specimens from Madagascar, but they are mentioned as distinctive in his Australian specimens (Fauvel, 1917, p. 226, figs. 20a, 20b), and they are present in my Samoan material.

***Leodice flava-punctata*, new species.**

Plate 2, figures 1 to 7; text-figures 8 to 11.

Several specimens, none entire, were collected in Pago Pago Harbor, Samoa. The general appearance of the animals would indicate that they are immature, but the fact that several contain eggs indicates that they are adults. One individual

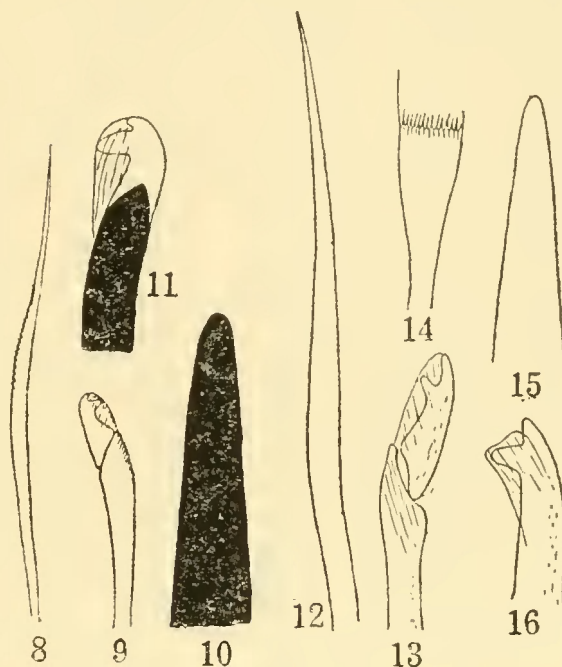
(in 3 pieces) measures altogether 50 mm. in length, has a prostomial width of 1.75 mm., and contains about 250 somites. The specific name is given because of the yellow spotting which is common in *Leodice*, but the spots are unusually prominent in this species.

The general body-color of the anterior end is dark brown, darker on the prostomium than elsewhere and gradually lightening posteriorly, the color disappearing entirely in the region of from somites 40 to 60. In the peristomium the color is continued on to the ventral surface, but in all other parts it is limited to the dorsal. Scattered over the surface of this brown are numerous yellow dots. In the type a prominent uncolored band extends along the median dorsal line of the prostomium and is continued on to somite 2 (plate 2, fig. 1). Somites 3, 4, and 5 have each a prominent uncolored spot toward the posterior dorsal border and somite 6 is uncolored. In other individuals these colorless spots are either only faintly indicated or are absent. Toward the posterior end of the body each somite is marked by a very narrow purple line across its posterior dorsal margin. One specimen was regenerating a pygidium which had one pair of short, colorless anal cirri. The tentacles are light brown except for the apices, which are uncolored, as are the nuchal and other cirri.

The prostomium (plate 2, fig. 1) is noticeably bifid, and when expanded is a little wider than the peristomium. The latter is a trifle wider than long and slightly concave along the lateral margins. Somite 2 is about one-third as long as 1 and sharply marked off from it. The tentacles are shorter than the peristomium, with inconspicuous cirrophores, and the eyes are so surrounded by pigment as to be scarcely visible. The nuchal cirri are slender and much shorter than the peristomium.

The first parapodium (plate 2, fig. 2) has a bilobed setal portion, with heavy cirri, the ventral cirrus being especially large. There is a single acicula, also needle aciculæ in the dorsal cirrus. The eleventh parapodium (plate 2, fig. 3) has a very prominent setal portion, with a dense tuft of compound setæ ventrally and a smaller tuft of simple setæ dorsally. There is a needle acicula in the dorsal cirrus. The dorsal cirrus is slender, but the ventral one is short and thick and merges gradually into the ventral pad-like swelling characteristic of the anterior parapodia in this genus, but especially prominent here. A later parapodium from behind the middle of the body (plate 2, fig. 4) has a conical setal portion with a prominent ventral swelling, carrying the short, thick ventral cirrus on its outer end. The dorsal cirrus is very slender, and the gill arises from the body-wall dorsal to its base. There is a single pointed acicula in the middle of the setal lobe, and a hooked one near its ventral surface. A few small needle aciculæ extend into the dorsal cirrus.

In a small specimen the gills arise as a single filament on the thirteenth setigerous somite and in the great majority of later somites there are two and three branches



TEXT-FIGURES 8 TO 16.

8 to 11. *Leodice flava-punctata*. 8, simple seta $\times 285$; 9, compound seta $\times 285$; 10, ventral acicula $\times 285$; 11, dorsal acicula $\times 250$.

12 to 16. *Leodice suviensis*. 12, simple seta $\times 250$; 13, compound seta $\times 250$; 14, pectinate seta $\times 250$; 15, dorsal acicula $\times 68$; 16, ventral acicula $\times 68$

(plate 2, fig. 5), with an increase posteriorly of the number of two-branched gills, but at about somite 40 the number is reduced to one. About 100 of the posterior somites of the specimen are without gills, but I have no information as to the original number of somites in the entire animal. On the right side of somite 16 the gill has 7 branches, and there are 6 on the left of somite 21. This large number of branches, limited to only a single somite, is a very unusual condition. In an individual twice the size of the one just described I could find no gill with more than 6 filaments. The filaments remain relatively large to the end of the series and the blood-vessel in each is especially prominent.

The simple setæ (text-fig. 8) are very slender, only slightly broadened toward the end and taper to acute apices with very minute denticulations along one border. The compound setæ have small terminal joints, the subapical tooth the larger, and with small denticulations along the end of the basal portion (text-fig. 9). Figure 9 is drawn from a seta from the anterior end of the body. In the posterior region the compound setæ have longer terminal joints. The pectinate setæ have about 20 slender teeth, the one at one end of the row longer than the others. The dorsal aciculæ (text-fig. 10) are bluntly rounded at the apex and dark-colored to the very tip. The ventral ones have the tip uncolored, with bluntly rounded teeth covered by a hood (text-fig. 11).

The forceps and margins of all plates of the maxilla are dark brown, while the remaining portions are much lighter. The carriers (plate 2, fig. 7) are short, the forceps long and much curved. This curvature is not adequately represented in the figure, for the forceps are drawn as pointing upward. The proximal paired plates have 5 teeth on the left and 4 on the right; the distal paired have 9 on the right and 5 on the left, 2 of these being much smaller than the others. The unpaired has 8. Beyond the paired plates are rounded pigment patches in the chitin. The mandibles (plate 2, fig. 6) are rather small and slender, the beveled portion being marked with pigment on the outer and inner margins and with concentric lines on the surface.

In structure of gill this species resembles Chamberlin's *L. lita* (1919a, pp. 240-244, pl. 54, figs. 6-10; pl. 55, figs. 1-7), but in general body-coloration, form of the peristomium, and character of jaws the two are unlike.

The type is in the American Museum of Natural History.

***Leodice suviensis*, new species.**

Plate 2, figures 8 to 13; text-figures 12 to 16.

A single specimen, collected in rock exposed at low tide on the west side of Rat Passage, in Suva Harbor, Fiji. It measures after preservation 370 mm. in length, has a prostomial width of 4 mm., and at somites 9 and 10 is 9 mm. wide.

To the naked eye the living animal appears very dark, nearly black, while under a hand lens the color is seen to be dark purple, with numerous dirty-white spots over the surface. The tentacles are dark green, uncolored at the tips. All of the cirri have uncolored tips. In preserved material the color is a dark brown, with numerous yellow spots over the surface and a considerable iridescence. The prostomium is rather small, 2-lobed, the tentacles smooth, short, and tapered gradually toward the apices. The unpaired tentacle extends as far as the anterior border of somite 3, the inner paired tentacles are about three-quarters as long as the median, the outer paired about half as long. The outer paired have their bases of attachment noticeably farther forward than the inner ones. The eyes are in the usual position (plate 2, fig. 8).

The peristomial width is to its dorso-median length about as 5 to 3, and its antero-lateral border has a prominent lip on either side. Somite 2 is about one-quarter as long as somite 1, the nuchal cirri extending to about the middle of somite 1. The ventral surface of the anterior region of the body is a little lighter in tint than the dorsal, but otherwise is colored like the dorsal. In the type the pygidium is apparently

regenerating; it has one pair of very short anal cirri colored like the anterior cirri and tentacles.

The gills arise as 2 branches on the right side and as 3 branches on the left side of somite 11 and extend throughout approximately 160 somites. The tenth parapodium has on the right side a gill with 5 filaments (plate 2, fig. 9). From setigerous somites 20 to 60 the gills are long enough to meet across the dorsal surface and may have as many as 9 filaments, but throughout the greater number of the posterior gills the number of filaments is reduced to 1.

The first parapodium has a thick dorsal cirrus, slightly smaller than the nuchal cirri, but otherwise similar to them in form. There is a very small setal lobe and a thick ventral cirrus. Parapodium 10 has a rounded postsetal lobe, the presetal with a concave margin (plate 2, fig. 9, posterior view); there are 2 very black aciculæ. The dorsal cirrus is finger-shaped, with the 5-branched gill arising at its base. The ventral cirrus is conical, on the end of a very prominent pad-like swelling. I was unable to find any needle aciculæ in the dorsal cirrus.

The fiftieth parapodium (plate 2, fig. 10) is not very different in general outline from the tenth, though the ventral cirrus is smaller. This difference is exaggerated in the drawing because the cirrus is partly under the ventral lobe and does not entirely appear. The dorsal cirrus is short and seems to arise from the base of the gill, the latter being so much greater in diameter than the cirrus. There are 2 dorsal aciculæ and 1 ventral one. The gill has 8 filaments arising from a base which is very thick at the point of attachment, but narrows toward the apex. A posterior parapodium (plate 2, fig. 11) is broadly rounded in profile, with very little distinction between anterior and posterior lips. The cirri are small. There are 2 aciculæ, 1 dorsal and 1 ventral, both very black.

In the tenth parapodium there is a tuft of simple setæ with a few pectinate, and a ventral tuft of compound ones, this latter tuft being much stouter than the other. A few of the simple setæ were bilimbate, but this did not show in all cases. In the fiftieth parapodium the pectinate setæ show an increase in number over the conditions found in the tenth, with a corresponding decrease in the number of simple ones. In posterior somites the pectinate setæ are more numerous than the simple ones and have extremely long stalks extending beyond the apex of the dorsal cirrus.

A simple seta from the tenth parapodium (text-fig. 12) is very slightly widened and curved toward the end. In the one drawn the margins are smooth, in others there is a marginal fin. The compound setæ have rather heavy stalks, the terminal joints with apical and subapical teeth covered by hoods with smooth margins (text-fig. 13). The pectinate setæ have about 16 teeth, the terminal one at one end of the row being longer than the others (text-fig. 14).

The dorsal aciculæ are bluntly rounded at the apex (text-fig. 15); the ventral ones have terminal and subterminal teeth, the latter the larger; the apices are hooded (text-fig. 16).

The maxilla (plate 2, fig. 12) is very dark, showing in the translucent portions a lighter brown. The carrier is large relative to the forceps. The proximal paired plates have 5 teeth on the right and 5 on the left, the distal paired have 8 on the right and 6 on the left; the unpaired has 7. The mandible is lighter brown in color than is the maxilla, but has longitudinal brown stripings in each of the basal halves. The beveled portion has concentric lines (plate 2, fig. 13).

The type is in the American Museum of Natural History.

***Leodice tubicola*, new species.**

Plate 3, figures 1 to 6; text-figures 17 to 23.

One entire specimen collected on rocks near Breaker Point, Pago Pago Harbor. It was in a tube which had a membranous foundation covered with débris, the tube having a general zig-zag outline with blindly ending branches. The tentacles and cirri

are long and sharp-pointed. There are no color characters to be noted. The animal is entire, is 25 mm. long, and its greatest width is 1.5 mm. There are about 110 somites.

The gills begin on setigerous somite 12 and extend to within about 10 somites of the pygidium. There is never more than one filament, which in most of the somites is quite similar in size and length to the dorsal cirrus. Toward the posterior end these filaments are shorter than the dorsal cirrus. In somite 50 (plate 3, fig. 4) the filament is also shorter than the dorsal cirrus, but a little stouter.

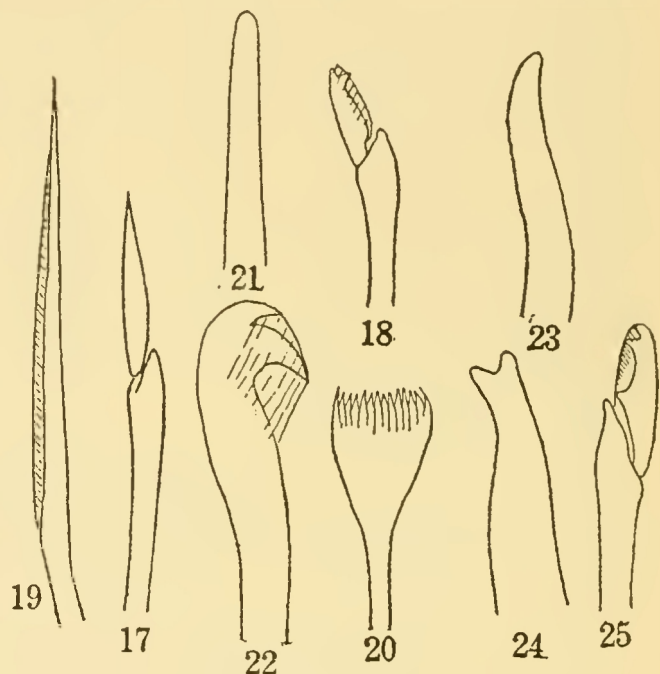
The prostomium (plate 3, fig. 1) is prominent, deeply incised, almost as long as the peristomium, but narrower. The tentacles are not quite twice as long as the prostomium, the longest barely reaching the anterior border of somite 4. The median and inner paired are almost of the same length, the outer paired are considerably shorter than these. They are all smooth and slender, with acute apices. There is a considerable distance between the bases of the median and the inner paired, so that a large part of the dorsal surface of the prostomium is uncovered. The eyes are inconspicuous.

The peristomium is on its dorso-median line about as long as the three following somites, its lateral margins very nearly straight, the small lip on either side not very prominent. Somite 2 is very short, the boundaries between it and somites 1 and 3 being very indistinct. The nuchal cirri are slender, about half as long as the first somite.

The tenth parapodium (plate 3, fig. 3) has a slender dorsal cirrus into which needle aciculæ extend, the setal lobe long, but with an unusually short dorso-ventral diameter. The anterior lip of the setal lobe is rounded; the posterior lip is a cirrus-like protrusion extending beyond the anterior. Between the two a large acicula with a bent apex

comes to the surface and extends beyond the end of the posterior lip. Dorsal to the acicula is a tuft of simple setæ, 4 in number in the parapodium drawn; ventral to it a tuft composed of two kinds of compound seta. No pectinate setæ appear in the tenth parapodium, but they are in the eleventh. I am uncertain as to their exact distribution. Where there are so few of each kind of seta in a parapodium it is not possible to be sure that non-appearance may not be due to accidental loss and exact data concerning their distribution seems impossible to procure, if indeed it is a matter of any especial importance. The ventral cirrus is short, acute on the apex, and carried on the end of a pad-like swelling.

The fiftieth parapodium (plate 3, fig. 4) has a conical setal portion, the slender dorsal cirrus arising from a common base with the gill, which is a little shorter than the cirrus but stouter. The ventral cirrus is finger-shaped. I could find no needle aciculæ in the dorsal cirrus. The most noticeable feature of this parapodium is the very large



TEXT-FIGURES 17 TO 25.

17 to 23. *Leodice tubicola*. 17, compound seta $\times 250$; 18, compound seta $\times 250$; 19, simple seta $\times 250$; 20, pectinate seta $\times 500$; 21, postero-dorsal acicula $\times 250$; 22, postero-ventral acicula $\times 250$; 23, anterior acicula $\times 250$.

24 and 25. *Leodice aciculata*. 24, ventral acicula $\times 250$; 25, compound seta $\times 250$.

ventral acicula with sharply hooked apex, which comes to the surface near the setæ tuft. The single dorsal acicula is straight and bluntly rounded at the end. Dorsally in the parapodium drawn are 3 pectinate setæ with very long shafts and a tuft of simple setæ with very much curved stalks. Ventrally is a single compound seta of the usual type. The posterior parapodia retain the long dorsal cirrus found in the anterior somites and apparently do not differ essentially from the fiftieth. As the animal was allowed to remain in its tube, the posterior end was not well preserved, and it is difficult to be certain about the details of the last parapodia.

There are two pairs of anal cirri (plate 3, fig. 2), the dorsal pair much longer than the other.

Leodice tubicola has the three kinds of setæ characteristic of this genus, but differs from the majority in that there are two kinds of compound setæ. In the anterior somites both sorts appear. One (text-fig. 17) has a terminal joint shaped like a knife-blade, with perfectly smooth edges; the other (text-fig. 18) has the bidentate terminal joint which is more characteristic of *Leodice*. As stated above, the number of these setæ is so small in any somite that accidental loss might easily remove all of any one kind, and thus the result of accident be interpreted as absence, so that I have not attempted to study their distribution or to determine how far posteriorly the first kind of compound setæ extend. They are certainly absent on the fiftieth parapodium.

The simple setæ (text-fig. 19) are long and in the posterior somites are much more curved than in the anterior, but in other respects they are similar throughout the body. Each widens toward the end and tapers to a sharp point with a wing along one margin. The pectinate (text-fig. 20) have about 12 rather prominent teeth. In posterior somites their shafts are much longer than in the anterior.

The aciculæ from anterior somites (text-fig. 23) are slightly curved at the end, bluntly rounded. In posterior somites there are two kinds of aciculæ. The dorsal ones (text-fig. 21) are straight, with rounded ends, the ventral ones much larger (text-fig. 22), their apices bidentate, the subterminal tooth in each being especially large and sharp. The apex of each of this last form is covered by a hood. The position assumed by the ventral acicula is unusual in that instead of lying at an angle with the dorsal one the two are parallel, the ventral one coming to the surface near the middle of the setal lobe (plate 3, fig. 4).

The maxilla is light brown, with apices of forceps and toothed margins of plates darker. There is a dark-brown band at the junction between the carrier and each half of the forceps; along the line of junction between the two halves of the carrier and at the base of the carrier, which is prolonged into two dark-colored tooth-like processes (plate 3, fig. 5). The proximal plate on either side has 3 teeth, the right distal paired has 8, the left distal paired has 2, the unpaired has 8. Distal to each series of paired plates is a patch of pigment and a thin plate with a recurved corner. The mandible was broken in removing and only one half is drawn. This (plate 3, fig. 6) has a small beveled surface not very sharply marked off from the shaft and carries at one side a horn-like protrusion. The shaft is noticeably marked with concentric lines.

Crossland (1904, pp. 303-310, plate 21, figs. 1 to 8, text-figs. 52-55) described *Eunice (Leodice) tubifex* from Zanzibar, which is similar to *L. tubicola* in character of tube and in the possession of two kinds of compound setæ. While Crossland does not give measurements, this species was evidently much larger than *L. tubicola* and differs from it in nearly every respect. With these larger specimens of *Eunice (Leodice) tubifex*, Crossland collected some smaller individuals which he regards as the young of the same species. These he says were about one-third the size of the full-grown ones, one of "head" and 50 somites measuring 35 mm. in length; another of "head" and 35 somites was 13 mm. long.

While these are larger than my single specimen of *L. tubicola*, they agree with it so closely in the character of jaws and setæ (the only characters Crossland gives) that I regard them as belonging to the same species, and either my *L. tubicola* is a young

Eunice (Leodice) tubifex or Crossland's small specimens are not *tubifex*, and I would adopt the latter explanation. It is evident that a comparison of Crossland's figure 7, plate 21, with his text-figure 53, showing the jaw of the small and the large individual respectively, indicates that they belong to distinct species. Figure 7 shows the proximal paired plates of the small animal. Crossland in the text gives the formula for these as 4-4, but it seems to me that the figure shows 2 teeth on the right and 3 on the left, all teeth very large, while his text-figure 53 shows these plates to have 7 on the left and 6 on the right, all teeth very small. The forms of the carriers are also quite unlike. Having made a considerable number of comparisons of the young and adult jaws in other species of *Leodice*, and having found that the general form is usually quite the same, I am very doubtful if such a jaw as is figured in figure 7 could ever become transformed into that of text-figure 53. Again, a comparison of Crossland's figures 8a to 8e, showing the setæ and aciculæ of the small, with his figures 6a to 6d, showing the same structures in the large, shows very decided differences between the two. On the other hand, the figures of the small animals referred to above agree quite closely with the figures I have given of *L. tubicola*. The most important differences are that I could not find marginal striations along the edge of the unusual form of compound setæ, that the structure of the carrier and forceps as given in his figure 7 do not agree with mine, and that his text-figure 55 shows a gill with 4 branches, while in *tubicola* I never found more than 1 filament. Points of agreement are the form of the mandible and the general arrangement of the maxilla (Crossland's figure of the distal plates is not clear, but he gives 8-8 as the formula for their teeth); the form of the setæ and of the aciculæ, especially the large hooked ventral acicula, which is exactly like that of *tubicola*. Crossland states that some of these small animals were sexually mature, which he interprets as meaning that sexual maturity appears before the animal has reached the adult structural condition. I would regard it as an adult condition, and until better evidence is presented for their distinction will include the small specimens of *tubifex* with *tubicola*.

The type is in the American Museum of Natural History.

***Leodice coccinea* Grube.**

Eunice coccinea Grube, 1878, pp. 153-155, pl. 9, fig. 1.

Eunice coccinea Crossland, 1904, pp. 297-303, pl. 20, figs. 6 and 7, text-figs. 46 to 51.

In life the whole anterior end is dark green and very iridescent, the prostomium a little lighter green than the peristomium, the tentacles a lighter green than either. The tentacles have more or less purplish pigment around their bases and are a lighter green than the prostomium and have uncolored apices. The nuchal and dorsal cirri are colorless, except for a faint greenish band around the middle. The anterior somites are dark green, but at about the region of somite 30 the color begins to lighten and posterior to this the green is soon lost, the body-color being a light brown with numerous small yellow spots. The whole posterior region of the body is light yellowish brown, still with the yellow spots, but at the extreme posterior end a purplish tint appears which becomes most intense at the pygidium. There is one pair of anal cirri which are rather stout and colored an intense purple, but with uncolored tips.

In the preserved material the bases of the cirrophores of the tentacles and a narrow ring around the base of each tentacle are dark purple, the tentacles and anterior cirri are green with uncolored tips, while later cirri are uncolored. The third setigerous somite is much lighter in color than any of the others. The peristomium is very distinctly marked dorsally by anastomosing longitudinally arranged purplish lines, and this is continued but very faintly over the succeeding 2 or 3 somites. The quasi-articular condition of the tentacles mentioned by Grube is shown only by wrinkles.

The single specimen in my collection does not agree with Grube's figure 1, plate 9, in that it has much shorter tentacles, the prostomium is more decidedly bifid and the third setigerous somite is uncolored. Grube states, however, that an African specimen

had the whole sixth somite (fourth setigerous?) uncolored, so he evidently found some variations in this respect. Crossland's material was largely from the Maldives and evidently showed a considerable range of variability in form and color, for he identified the species as *coccinea*, although some individuals showed as great a difference from Grube's description as does my Samoan specimen. Since the Samoan material agrees with Crossland's description, I have identified it as of this species.

A single specimen was collected on Aua Reef in Pago Pago Harbor, Samoa. The body is 230 mm. long and has a peristomial width of 3 mm. The gills begin on somite 6 and extend over a distance of 40 mm. There are approximately 300 somites.

***Leodice aciculata*, new species.**

Plate 3, figures 7 to 13; text-figures 24, 25.

The general body-color is yellowish brown, somewhat lighter on the ventral surface, but otherwise with no noticeable difference in the two areas. Numerous small yellow spots are scattered over the entire dorsal surface. Toward the posterior end the general color becomes lighter, with a decided pearly luster which is more prominent on the ventral surface. A characteristic feature is an irregular banding and blotching of the tentacles and cirri with a brown pigment. On the tentacles there are several (5 or 6) of these bands which seem to extend entirely around, with many other shorter patches, which are very irregularly arranged. In alcoholic material the banding on the tentacles remains, but that on the nuchal and dorsal cirri may disappear. The pygidium and somites immediately in front of it have a decided purple color in alcohol. Irregularly distributed colorless patches occur on the dorsal surface, these patches being of various sizes. The fourth setigerous somite has a colorless dorsal band, which varies in width in different individuals. The ventral surface of the prostomium and peristomium are colorless, this appearing in a dorsal view as a whitish margin.

A specimen 190 mm. long has about 250 somites and a peristomial width of 3 mm.

The prostomium (plate 3, fig. 7) is 2-lobed, narrower than the peristomium. The tentacles are rather short and thick, the median extending as far as the second somite, the inner paired about as long as this, the outer paired shorter. The large eyes are in the usual position. As stated above, the tentacles are banded with brown, with the apices uncolored. The peristomium has straight margins, broadening at the anterior end, forming rather a prominent lip. The distinction between the first and second somites is most noticeable on the dorsal surface and is obscure elsewhere. The nuchal cirri are situated at the very anterior end of somite 2 and extend only to a little over half the length of the peristomium. They are slender and in life are banded with brown. Somite 3 is about as long as somite 2 and there is very little change in diameter until the extreme posterior end.

The apices of all parapodia are uncolored. The first has a very large dorsal cirrus, into which extend two aciculæ which are unusually large as compared with the needle-like aciculæ usually found in this position. The ventral cirrus is thick and heavy, the setal portion very small.

The tenth parapodium (plate 3, fig. 10) has a much greater dorso-ventral diameter, the dorsal cirrus smaller than in the first and provided with three aciculæ. The setal portion has a presetal and postsetal lobe, the latter the longer, and the aciculæ come to the surface between them. The ventral cirrus is also smaller than in the first parapodium, but is carried on the end of a rounded swelling, which gives it the general appearance of being larger.

A gilled parapodium (plate 3, fig. 13 of the sixtieth) shows a still greater reduction of the cirri, the setal portion remaining about as before. Two relatively large aciculæ extend into the dorsal cirrus, and two especially large ones occur in the setal portion. Toward the posterior end the parapodia (fig. 9, the twentieth from the pygidium) are more nearly conical, the distinction between the anterior and posterior setal lips is less marked, and the cirri are very small. There is one pair of stout anal cirri (plate 3,

fig. 8). The gills begin from the fourteenth to the twentieth setigerous somite. In one individual there was a 2-branched gill on the left side of the seventh and no more until the twenty-first, but this was exceptional. They arise as a single branch, but become more complicated in the immediately following somites. One individual had a 2-branched gill on setigerous somite 18, a 4-branched one on 19, and a 3-branched one on 20. Throughout the greater part of the body the gills have 5 branches, the number becoming reduced to 1 or 2 toward the posterior end, but they are relatively long. The last gill is not more than 20 somites from the pygidium. The gills (plate 3, figs. 9 and 13) arise from the base of the dorsal cirrus and are large as compared with it. The blood-vessel is also prominent.

The pectinate setæ have a very slender stalk, the apex widening to form a broad and rather flat plate, carrying about 20 teeth. Proximal to each tooth is a small, highly refractile spot. The compound setæ (text-fig. 25) have a small terminal joint, with a hood whose margin is finely denticulated, the basal joint being rather large. The terminal joint has a blunt apical and a sharp-pointed subapical tooth. The simple setæ are very long and slender, tapering gradually to a sharp point, and with a narrow wing on either side.

As stated above, the aciculæ are unusually large, especially through the median region, as is shown in plate 3, figure 13. The dorsal one of the two has a bluntly rounded apex and the ventral one is bifid (text-fig. 24). The aciculæ of the dorsal cirrus are also unusually large.

The jaw apparatus is very dark brown in color. The maxilla (plate 3, fig. 11) has a very short carrier, the forceps being long and slender and not much curved. The right proximal plate has 4, the left 3 teeth. The right paired has 5, the left has 7, the unpaired has 4. The unpaired plate is unusually small. The mandible (plate 3, fig. 12), has slender shafts widely separated, the beveled surface nearly round in outline. On the beveled surface of the mandible and on the ends of the teeth of the maxilla is a whitish incrustation.

This species was first collected in rocks outside the entrance light in Suva Harbor, Fiji. The surface of the rocks is much channeled by boring echinoids, and in the ridges left between these channels, *L. aciculata* occurs in large numbers, being the most abundant Leodid that I found in Fiji. It was later collected in Samoa, a few individuals occurring in the rocks in Pago Pago Harbor, but was more abundant in rocks from the reef at Aunuu Island. Only a very few, however, were collected in Samoa. In a collection of Hawaiian annelids sent me for identification in July 1921, by the U. S. National Museum, was a single specimen of this species labeled as collected at Waikiki Beach. It was larger than any others I had seen, measuring 350 mm. in length, but was poorly preserved, so that this is only an approximate measurement. The coloring is more intense than in those from Samoa (possibly owing to greater age) and the brown bands on the cirri persist after preservation.

The type is in the American Museum of Natural History.

Leodice armillata, new species.

Plate 3, figures 14 to 19; text-figures 26 to 29.

The living animal is reddish brown, with the second setigerous somite uncolored and a row of white dots, one to each somite in the mid-dorsal line. The prostomium is colored like the remainder of the body, but has an uncolored patch on either side of the median tentacles. The tentacles are articulated, with greenish-brown pigment in the interarticular grooves, the median tentacles reaching as far as the fifth somite. The inner paired tentacles are almost as long as the median, the outer paired are much shorter. All dorsal cirri are uncolored; the anal cirri two pairs, one very short and colorless, the other pair much longer, colored light brown, but with uncolored tips. Neither is articulated.

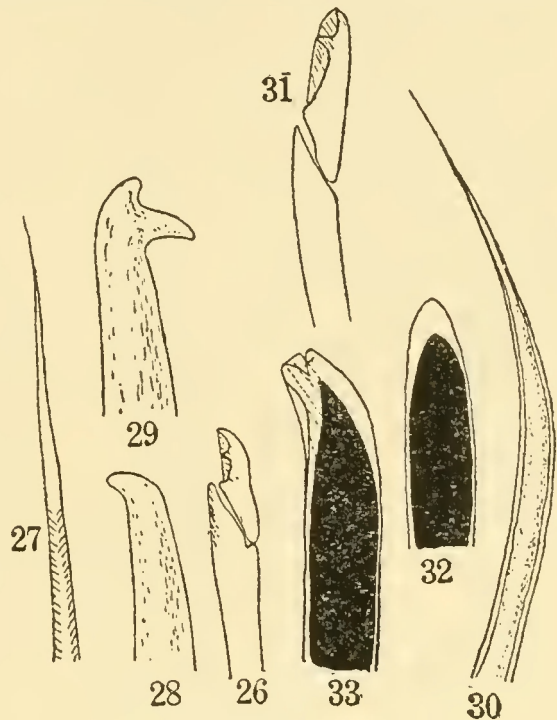
In general appearance this species is very similar to *Leodice bifirmi-cirrata*, if individuals of the same size are compared, but differ decidedly from larger individuals of the latter species. In *L. bifirmi-cirrata* the cirri and gills are large relatively to the somite; in *L. armillata* behind the middle region the somites are short, thick, and much rounded, with relatively very short parapodia. In small *L. bifirmi-cirrata* gills are absent from a considerable number of the posterior somites and there is one pair of articulated anal cirri; in *L. armillata*, even in the small individuals, the gills are continued to within 10 somites of the pygidium and there are two pairs of non-articulated anal cirri (plate 3, fig. 15).

The prostomium (plate 3, fig. 14) is bilobed, rather narrower than the peristomium. The tentacles are all moniliform without evident cirrophores, with about 25 joints in the median, 18 in the inner paired, and not more than 10 in the outer paired. The relative lengths of these tentacles in preserved material is indicated in figure 14. The eyes are prominent and lie in the usual position. The anterior border of the peristomium is produced into a narrow collar-like structure which protrudes to a short distance over the prostomium. The width of the peristomium is about twice that of its length; toward its posterior dorsal surface it has a prominent white spot, the remainder of its surface being tinted light brown. The animal figured was 2 mm. wide at the peristomium, 60 mm. long., and had 160 somites. The second somite is about one-third as long as the first, its nuchal cirri without articulations and shorter than the peristomium.

The gills begin with 1 filament on the sixth setigerous somite. On the left side of the body the eighth somite has a gill with 2 filaments, while on the right side the seventh and eighth each has 1 filament and the ninth has 3. Throughout the remainder of the anterior two-thirds of the body the number of filaments in each gill varies from 2 to 3. The number is reduced to 1 in the posterior one-third, not more than 10 of the terminal somites being without gills.

The tenth parapodium (plate 3, fig. 16) has a relatively small setal lobe with only a slight distinction between the anterior and posterior lips, while the ventral cirrus is supported on a swelling that is almost as large as the setal portion. The dorsal cirrus is long and slender, shaped much like the gill which rises at its base, the diameter of the gill being only a very little smaller than that of the cirrus. There are 2 straight aciculæ, and needle aciculæ appear in the dorsal cirrus. A posterior parapodium (plate 3, fig. 17) is small as compared with the vertical height of the somite. Each has a rounded post-setal lobe with two dorsal aciculæ and a ventral one, all nearly colorless or very faint yellowish brown. The dorsal aciculæ have curved apices, one more curved than the other (text-fig. 28), while the ventral one is bidentate (text-fig. 29).

The compound seta (text-fig. 26) has rather a stout basal shaft with a few indistinct denticulations along the longer edge. The terminal joint is small, the apex bidentate. There are only a few of these compound setæ in each somite and their basal portions



TEXT-FIGURES 26 TO 33.

26 to 29. *Leodice armillata*. 26, compound seta $\times 185$; 27, simple seta $\times 185$; 28, dorsal acicula $\times 185$; 29, ventral acicula $\times 185$.

30 to 33. *Leodice crassi-tentaculata*. 30, simple seta $\times 250$; 31, compound seta $\times 250$; 32, dorsal acicula $\times 250$; 33, ventral acicula $\times 250$.

are long, extending beyond the end of the dorsal cirrus. The simple setæ are also long, slender, and sharp-pointed, extending beyond the cirrus, with lateral striations along two sides (text-fig. 27). There were only 4 of these in the parapodium drawn. A very small tuft of pectinate setæ lie close to the base of the simple ones; they are of the usual form but very small, with about 10 teeth.

A parapodium from farther forward in the body (the thirty-fifth) differed in no essential respects from the one just described, but had a larger number of compound and fewer of the other two kinds of setæ, and no ventral acicula.

The maxilla (plate 3, fig. 18) is colored brown, darker between the halves of the carrier; the base of the forceps, and the terminal portion of each half of the forceps. The teeth are very clear-cut and prominent. The proximal paired plates have 6 teeth on the right and 5 on the left, the right distal paired has 10, the left distal paired has 8 (the plate was rolled so that I was unable to get a clear view of its margin and this number may not be quite accurate); and the unpaired has 6. The mandible (plate 3, fig. 19) is rather more delicate than the maxilla, colorless except for a pigment patch between the halves and a line on either side near the margin of the beveled portion. From these colored spots concentric lines run inward over the surface. At the outer anterior angle of each side is a horn-like cylindrical extension of the plate, which has a peculiar whitish tint, and is quite unusual for this genus.

Leodice armillata was collected on Aua and on Utile reefs in Pago Pago Harbor, Samoa.

The type is in the American Museum of Natural History.

***Leodice crassi-tentaculata*, new species.**

Plate 4, figures 1 to 5; text-figures 30 to 33.

A single specimen, collected on Utile reef in Pago Pago Harbor, in a loose coral rock lying on the sand near the shore. It has a general color-resemblance to *L. bifirmi-cirrata*, but can be distinguished from that species by the difference in the tentacles. While in *L. bifirmi-cirrata* the tentacles are articulated and not especially large, in *L. crassi-tentaculata* they are relatively enormous, being the largest as compared with the size of the entire animal that I have ever seen in this genus. The prostomial width of the specimen was 2 mm., the greatest body-width 3 mm. The specimen was in two pieces; the anterior piece 145 mm. in length with about 158 somites; the shorter piece had about 100 somites and was 60 mm. long. The extreme posterior end with pygidium was not found.

In preserved material the anterior somites are mottled dorsally with yellowish brown on pearly white; the sixth somite has more white than any other somite, and there is a brilliant iridescence. This color gradually weakens away from the anterior region, and disappears entirely behind somite 50, the remainder of the body being a dingy yellowish gray. Anteriorly the ventral surface is iridescent, but has none of the markings of the dorsal surface.

The gills first appear as a single filament on the left side of somite 34 and on the right side of somite 30. On the left side the second gill is 2-branched, while on the right it is the fifth which has the first of the 2-branched gills. This 2-branched condition is continued throughout the greater part of the specimen, but in the posterior portion of the smaller fragment there is but one branch. Gills continue to the very end of the specimen, losing, as above stated, in the posterior somites one of the gill filaments, but there is no diminution in the length of the remaining filament. The anterior gills are shorter than the dorsal cirri, but with the progressive decrease in the size of the cirri posteriorly and their own absolute increase in length, posterior ones are very much longer than the cirri.

The prostomium is deeply bilobed, each lobe subdivided incompletely into a dorso-median and a ventro-lateral portion, forming the quadripartite lobing found in many *Leodidæ*. The tentacles are very large, covering, when lying straight out in front,

the greater part of the dorsal surface of the prostomium (plate 4, fig. 1). The median tentacle is over 5 times as long as the peristomium, the inner paired more than half as long as the median, the outer paired about as long as the peristomium, all very thick and heavy. In the preserved material no tentacle shows any color. The eyes are prominent.

The lateral margins of the peristomium are nearly straight and parallel to one another, with the anterior lip on either side much in evidence. The peristomial length is about one-third less than its width and longer than the combined length of somites 2 and 3. In life the constriction between the anterior 3 somites is not very sharply defined and somite boundaries are further obscured by the dorsal mottling with pigment. The nuchal cirri are not quite as long as the peristomium.

Throughout the anterior region the dorsal cirri are especially prominent, being both long and thick. Behind the region of somite 20 they are more slender, but remain long, and in the gill region they become successively smaller beyond the region of somite 50. In the posterior portions they are shorter than the gills and are sharp-pointed.

As is common in this genus, the first parapodium has a small setal lobe with large cirri, though these latter are relatively smaller in *L. crassi-tentaculata* than in most species. The tenth parapodium (plate 4, fig. 2), has a prominent setal lobe with dense tufts of simple and compound setæ. The anterior lip is vertical, with a dorsal protrusion; the posterior lip is rounded. The apex of the setal portion has a ventro-anterior and a dorso-posterior rounded swelling. The compound setæ arise between the anterior lip and the former of these swellings, while the simple setæ arise between the latter and the posterior lip. Three heavy aciculæ reach the surface between the two swellings. The dorsal cirrus is long and symmetrically narrowed toward the apex, the ventral cirrus short and thick on a rounded swelling. A tuft of needle aciculæ extends into the base of the dorsal cirrus. The fiftieth parapodium (plate 4, fig. 3) is much smaller than the tenth, and has fewer setæ. There is one dorsal and one ventral acicula, the latter hooked at the apex. The figure shows the rounded post-setal lobe, the anterior one being vertical. The dorsal cirrus is slender and sharp-pointed, larger than the base of the gill which arises from the basal portion of the cirrus. At some distance from its point of origin the gill divides into two nearly equal branches. There is a tuft of needle aciculæ in the dorsal cirrus. The ventral cirrus is conical, on the end of a rounded swelling. Parapodia from the posterior end of the specimen in general outline and setal components are not noticeably different from the fiftieth, but the gill is 1-branched.

The simple setæ are of varying lengths, but in the tuft they are arranged so that the longest lie at the dorsal part of the tuft. Apart from length differences, they are all alike, each (text-fig. 30) curved and tapering to a sharp point at the apex with a wing along the concave and convex edges. The compound setæ (text-fig. 31) have their basal portions with no denticulations along the terminal edge, the terminal joints with terminal and subterminal teeth covered by a hood with smooth margin. The pectinate setæ are very few in number, even in the posterior somites where the number in other species frequently exceeds the number of the other kinds. Each pectinate seta is very slender and delicate, with about 20 terminal teeth, but these were very difficult to demonstrate.

The aciculæ from somite 50 are very black (except for their extreme tips), the dorsal ones with bluntly rounded tip (text-fig. 32), the ventral ones with 2 teeth, of which the ventralmost is slightly the larger (text-fig. 33).

The maxilla (plate 4, fig. 4), is dark-colored, especially at the ends of the forceps and the plates. The carrier is small, each half rounded on the margin; the forceps heavy relative to the carrier. The proximal paired plates have 4 teeth on the left and 5 on the right, the distal paired have 8 on the right and 5 on the left, the unpaired has 7. Dark pigment-patches lie just beyond the distal plates and a very thin plate with one corner bent lies on either side of them. The mandible (plate 4, fig. 5) was

broken in removing and only one half is drawn. Each half is colorless except for faint lines along the line of contact of the two, and dark lines are at the median margin and outer angle of the beveled portion. From these patches of pigment concentric lines extend over the surface.

The type is in the American Museum of Natural History.

Leodice bifirmi-cirrata, new species.

Plate 4, figures 6 to 11; text-figures 34 and 35.

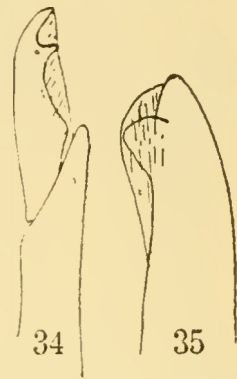
Collected both at Suva in Fiji and in Pago Pago Harbor, Samoa. A specimen from Samoa is about 95 mm. long and has a peristomial width of 2 mm. The body contains about 112 somites. The general body-color in life is an irregular splashing of white on a yellowish-brown background, the white being especially prominent on the anterior-dorsal face of the peristomium and on the fourth setigerous somite, which is entirely white, and a brownish dorso-median patch toward the posterior end. In some tentacles there is brown pigment in the constrictions between the joints. The tentacles are distinctly articulated with a small basal joint, the second joint being the longest of any, while at the apices they are moniliform. In a Suva specimen the median tentacle has 16 joints, the left inner paired one has 14, the right inner paired one has 11. It seems probable that accidental injuries are responsible for variations in this respect. The form of the peristomium and prostomium is indicated in figure 6, plate 4. The nuchal cirri are shorter than the peristomium and more or less wrinkled, but without articulations. The anal cirri are articulated (plate 6, fig. 7) and have brown pigment between the joints.

On one specimen the gills begin as a 2-branched organ on the fourth setigerous somite, become 4-branched on setigerous somite 5, 6-branched on setigerous somite 6, 7-branched on setigerous somite 8, and 6-branched on setigerous somite 12. From setigerous somites 15 to 20 the number varies between 5 and 6, but later decreases, the usual number being 3, though there are exceptionally 5. The last gill has one filament and is on the fifth parapodium in front of the pygidium.

The first parapodium has large cirri, but shows no especial characteristics. The tenth parapodium (plate 4, fig. 8) has a stout setal lobe with rounded posterior lip, 2 very heavy dark aciculæ which extend beyond the end of the posterior lip, and needle aciculæ in the dorsal cirrus. The dorsal cirrus is large and more or less wrinkled, but is not at all articulated, and a 4-branched gill arises near its base. Just inside the body-wall on the dorsal surface of the parapodium is a black pigment spot and there is a smaller brown one near the ventral surface. The dorsal spots can be seen in a surface view of the entire animal. The ventral cirrus is ovate on the end of a pad-like swelling. The thirty-fifth parapodium is very similar to the tenth in general appearance, but the ventral pad has disappeared and the ventral cirrus is much larger, extending to a considerable distance beyond the setal lobe. The dorsal cirri and gills are as in the tenth, but a ventral hooked acicula has made its appearance. In posterior somites the parapodia change very little in their general character, but the ventral pigment spot disappears and there is a gradual decrease in the number of gill branches.

The compound seta (text-fig. 34) has a heavy basal portion and a relatively small terminal joint, the latter with two large teeth. The simple setæ vary in length but all have clearly seen denticulations along one edge. Some are nearly straight, others are much longer and curved. The pectinate setæ are delicate with about 20 terminal teeth, the terminal one at one end being the longest.

The maxillæ are extremely delicate and were very easily broken, so that I was not able to get an entire one mounted for study. Figure 9 of plate 4 shows the right forceps



TEXT-FIGURES 34
AND 35.

Leodice bifirmi-cirrata.
34, compound seta
× 185; 35, acicula
× 185.

with the right proximal and distal paired plates, the former with 5, the latter with 8 teeth; figure 10 shows the left half of the forceps, the left proximal paired, and the unpaired plates. The proximal has 5 large teeth. The unpaired plate has 6 teeth. The forceps are slender and have very small carriers. It is not easy to understand how such delicate jaws as these could function in chewing and they may have been abnormal, though they are alike in all of the specimens I have. The mandibles have slender shafts which are darker and evidently much harder than the maxillary plates. They are dark brown, with the outer portion of the shaft next to the beveled portion lighter in tint. The beveled portion is covered by a whitish incrustation (plate 4, fig. 11).

The hooked acicula is heavy, with an especially large subterminal tooth (text-fig. 35).

This species shows some points of resemblance to *Leodice (Eunice) tentaculata* Quatrefages as described by Fauvel (1917, pp. 209-215, text-fig. 17), but differs in that the dorsal and nuchal cirri are not articulated, the number of filaments is much less, and the jaws have not the same structure.

The type is in the American Museum of Natural History.

Leodice gracili-cirrata, new species.

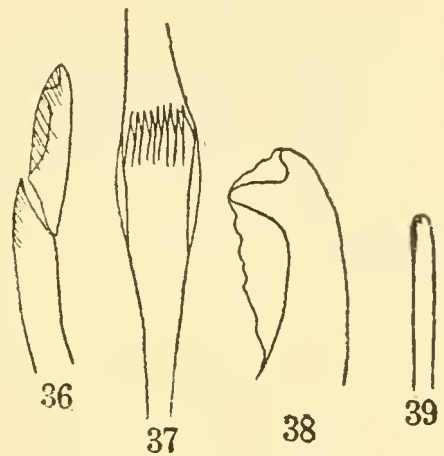
Plate 5, figures 1 to 8; text-figures 36 to 38.

A slender, easily broken form, first found in loosely constructed tubes made of stones and shells and fastened to the under side of rocks in Suva Harbor, Fiji. Later they were found in cavities in the dead stag-horn coral, and in this latter locality were without definite tubes. The body of the living animal has a pearly luster with a good deal of iridescence, a pink tint anteriorly because of the blood, and the middle region decidedly purple. Toward the posterior end there is a large dark pigment spot on either side in each somite. The pygidium has pigment spots. The whole posterior portion may be colorless (except for the dark spots), in which case the pygidium is pink.

A specimen of average size measured after preservation 220 mm. in length, with a peristomial width of 2 mm., and this general width was maintained for the greater part of the body, but it tapered toward the pygidium.

The prostomium (plate 5, fig. 1) is rather short and obscurely 4-lobed. The median tentacle extends to the posterior border of the fifth somite, the inner paired to the anterior border of somite 3, and the outer paired are a trifle shorter than the inner. In preserved material the median tentacle shows a slight trace of articulations, the inner paired are jointed for their terminal half, the outer paired for about the terminal third. The peristomium is as long as the three following somites, is noticeably narrowest along its anterior margin, its lateral margin decidedly rounded. Somite 2 is about one-third as long as somite 1, the nuchal cirri are long and slender, extending fully to half the length of the outer paired tentacles. The pygidium (plate 5, fig. 2) carries two pairs of anal cirri, the larger dorsal ones being stout at the base, but narrow rapidly and are very long; the ventral ones are very small and slender.

The tenth parapodium (plate 5, fig. 3) has a long dorsal cirrus which frequently has an appearance of jointing due to superficial wrinkling, and a broadly lanceolate ventral cirrus. Two aciculæ are in the setal lobe and there is a tuft of needle aciculæ in the dorsal cirrus. The fiftieth parapodium (plate 5, fig. 4) has a rounded post-setal lobe



TEXT-FIGURES 36 TO 39.

36 to 38. *Leodice gracili-cirrata*. 36, compound seta $\times 250$; 37, pectinate seta $\times 250$; 38, acicula $\times 250$. 39, ventral acicula of *Marphysa simplex* $\times 250$.

with smooth aciculæ in the setal portion and needle aciculæ as before. The dorsal cirrus is long and slender, longer than the gills. The ventral cirrus is rather long, finger-shaped. A posterior parapodium (plate 5, fig. 5) has a setal lobe with a rounded outline and no elongated postsetal portion. The dorsal cirrus is very long and slender, the ventral one sharply pointed. There are 2 straight dorsal aciculæ and 2 ventral hooked ones. I could find no needle aciculæ. Inside the body-wall is a large black pigment spot just dorsal to the bases of the aciculæ.

The gills in one specimen begin as a single very long and slender filament on the third setigerous somite and the number of filaments increased to 2 on the fifth. Gills extend to about the region of the one-hundred and twenty-fifth from the pygidium. The largest number of filaments I could find in this specimen was 7. The dorsal cirrus has much the appearance of a gill filament, but is a little longer than any of the latter. The posterior gills are of but a single filament and very small.

The compound setæ (text-fig. 36) are similar throughout the body; the basal portions have narrow shafts much broadened at the apices, the terminal margins minutely serrated. The terminal joints have apical and subapical teeth, and a hood with minute marginal denticulations. The simple seta is long and slender, with a very slight increase in width toward the end and tapers gradually from this wider portion to the extremely acute tip. The pectinate seta (text-fig. 37) has the usual form with the terminal teeth the largest and about 9 other teeth along the edge.

The acicula (text-fig. 38) is heavy, with a large subapical and a smaller apical tooth, both covered by a hood.

The jaw apparatus varies in color with the size of the individual, being much darker in the larger and presumably older specimens. In the one figured (plate 5, fig. 6) the maxilla was light brown, with darker transverse bands on the base of the forceps. In a larger specimen the whole maxilla was one-third larger than the one figured and very much darker, the terminal two-thirds of the forceps being nearly black, and there was much dark pigment on the plates. In even the smallest specimens the shafts of the mandible are black (plate 5, fig. 7). The carrier of the maxilla is small, the terminal portions much curved. The right proximal paired plate has 7 teeth, the left one has 6, the right distal paired plate has 9, the left has 5, and the unpaired has 7. There is on either side a small rectangular plate lateral to the distal paired. The mandible has black shafts and a beveled portion which is not very sharply marked-off from the shaft. On either side is a thin chitinous plate with an irregular margin.

The type is in the American Museum of Natural History.

Genus **MARPHYSA** Savigny.

J. C. Savigny, 1820, *Système des Annélides*, p. 13.

Similar to *Leodice* in most characters, but without nuchal cirri.

Marphysa can always be distinguished from *Leodice* by the lack of nuchal cirri. Other characteristics, which are usually but not always present, are the relatively small size of the carriers of the maxilla, the presence of compound setæ with long terminal joints, at most only finely denticulated along one edge, instead of the toothed distal joint covered by a hood, which is found in *Leodice*. A frequent feature of *Marphysa* is also the pectinate setæ of the posterior end, which, instead of the fine teeth of those farther forward, have only a few very heavy ones.

Marphysa californica Moore.

Plate 4, figures 12 to 14; plate 6, figure 1.

Marphysa californica Moore, 1909, pp. 251 to 253, pl. 7, figs. 13 to 18; pl. 8, figs. 19, 20.

Collected in sandy mud outside of mangroves in a lagoon a short distance southwest of Nuuli. In life the prostomium is a little wider than the peristomium, and its dorsal surface is greenish in color, the margins uncolored. The peristomium and the first few somites are dark green, the peristomium dotted with minute white specks, but

posterior to the sixth to eighth somite the green color disappears and the whole body has a flesh-color due to the blood in the body-walls. The gills are bright red and are prominent in the living animal. In the preserved material all color is lost, and the whole body has a milk-white appearance, with much iridescence at the anterior end. The anterior end of the body is rounded in cross-section, posteriorly it becomes very flat, as is common in this genus.

An entire specimen after preservation is 160 mm. long, 1.5 mm. wide at the prostomium, and 3 mm. wide in the widest part. This is considerably smaller than Moore's type, but about the size of his cotype, assuming that his "3 mm." refers to the body-width.

The prostomium (plate 6, fig. 1) is laterally rounded and deeply bilobed, so that if the median constriction were deepened each half would form nearly a circle. The tentacles are slender, the unpaired the longest, the others successively shorter, but all at least twice the length of the prostomium. The eyes are very small, situated between the bases of the inner and outer paired tentacles. Moore's specimens lacked the posterior end. The pygidium of the Samoan specimen has 2 pairs of anal cirri, one pair much larger than the other, both situated ventral to the large oval anus (plate 4, fig. 12, ventral view).

The parapodia are as described by Moore. The setal lobe becomes more and more pointed toward the posterior somites and the ventral cirrus is very large and thick, fused to the setal lobe for the greater part of the length of the latter (plate 4, fig. 13). I found 4 aciculæ in anterior somites, 3 in the forty-fifth (plate 4, fig. 14), and 2 in the one-hundredth parapodium, which is essentially in agreement with Moore's description. The only lack of agreement is in the character of the ventral acicula, which comes to the surface just dorsal to the ventral cirrus. Moore did not find this in his type and in the cotype it is bifid and hooded. I find it present in all except the anterior parapodia, but its form is very unusual in that it is not bifid and hooded, but has a straight end, bluntly rounded at the apex, quite similar to the other aciculæ.

The gills in one specimen begin as 1 short filament on the twenty-fifth parapodium, on the twenty-sixth there are 3 very short filaments, and from here the number increases gradually to a maximum of 6. The filaments are slender and arise from a base which is very thick at the point of attachment and gradually narrows with the formation of each successive filament. The last gill has only one filament and is on the twentieth somite from the pygidium. The number of somites is approximately 300, so that gills extend over about 250 somites.

I can add nothing to the description Moore gave of the setæ or jaws except to make a slight change in nomenclature of the maxillary plates. Moore's figure 19, plate 8, is the left half of the maxilla (erroneously referred to in the text as the right). His III is the unpaired plate and his IV the left paired according to the nomenclature I am employing in this paper.

***Marphysa macintoshi* Crossland.**

Marphysa macintoshi Crossland, 1903, pp. 137-138, pl. xiv, figs. 3 to 6; text-fig. 12.

A number of specimens collected in Suva Harbor, Fiji, which I have identified as belonging to this species because of the peculiar form of the undivided prostomium, the character of the jaw apparatus, and the general form of the parapodia. In the Fijian specimens the gills had fewer branches and the dorsal cirri were longer than indicated in Crossland's figure 6.

***Marphysa simplex*, new species.**

Plate 5, figures 8 to 12; text-figure 39.

One specimen collected in Suva Harbor, in association with *M. macintoshi*, and much like it in general appearance, but differing decidedly in the form of the prostomium and tentacles. While in *macintoshi* the prostomium is shaped like a broad hoof of a horse, with no trace of a median indentation, in *M. simplex* (plate 5, fig. 8) it is

decidedly bifid. The tentacles of *simplex* are twice as long as the prostomium, while in *macintoshi* they hardly reach its anterior border.

The prostomium (plate 5, fig. 8) is about half as long as the peristomium and decidedly bifid, with a definite angle at the anterior and the outer posterior portion of each half. The tentacles are rather stout, smooth, tapering at the ends, the unpaired and inner paired ones nearly equal in length, the outer paired ones much shorter. In the preserved material their bases are colored much like the prostomium, but at the ends they are very dark brown, nearly black in color. No eyes are visible in the preserved material. The prostomium is about twice as long as the second somite; the two somites together are about as long as they are wide. There is no color in the anterior region, but the surface is very iridescent. This shades into a dirty gray posteriorly and toward the posterior end there is a faint trace of purple, due apparently to the tint of the intestine. Anteriorly the body is rounded, posteriorly it is much flattened.

The animal is 100 mm. long, with a peristomial width of 2 mm., a greatest body-width counting parapodia of 4 mm., and contains about 200 somites. It seems to be entire, but lacks anal cirri.

The gills begin as a single short filament on somite 242, the number increases to 2 on about somite 30 (plate 5, fig. 10) there is later an increase to 3, and throughout the greater portion of the gill region the number is 4 (plate 5, fig. 11). The last gill is on about the twentieth somite from the posterior end, the decrease in number of filaments being very abrupt at the end.

The parapodia are unusually uniform in size throughout the body. The tenth (plate 5, fig. 9) has a short anterior and a rounded posterior lip, with aciculæ protruding from between the lips. The ventral cirrus is rounded, the dorsal cirrus pointed at the apex. The forty-fifth parapodium does not show the distinction between anterior and posterior setal lips shown by the tenth, and the dorsal cirrus is narrower (plate 5, fig. 10). A bifid gill arises from the dorsal surface and there are 2 dorsal and 2 ventral aciculæ. A tuft of needle aciculæ extends into the dorsal cirrus. A posterior parapodium (plate 5, fig. 11) differs from the forty-fifth, mainly in the greater gill development. It has one dorsal and one ventral acicula and needle aciculæ in the dorsal cirrus. I could not find any of these needle aciculæ in the dorsal cirrus of the tenth parapodium.

The dorsal aciculæ are straight with rounded ends, while the ventral ones have the usual form, with a terminal and a subterminal tooth and a hood (text-fig. 39).

No compound setæ were to be found. The simple setæ are very long and slender, showing nowhere any indication of a broadening from the average width of the stalk, but tapering apically to a very slender point, the whole setæ thrown into several curves. Along one margin there may be a series of very small denticulations. The simple setæ are quite similar in form throughout the body, varying only in the number of curves, in length, and in the sharpness of the marginal denticulation.

Pectinate setæ occur sparingly in anterior somites, a parapodium from the region of somite 45 showing two, but I could find none in the parapodium drawn in figure 9. At the extreme posterior end they are more prominent. They are all of one kind, with a broad unsymmetrical end and about 25 very slender teeth.

The maxilla is dark brown in color. The whole jaw apparatus was broken in removing it from the body, and I am unable to give all of the details of its structure. The carriers are broken (plate 5, fig. 12). The forceps are long and not much curved, the left proximal plate has 5 teeth, and apparently the right one has 5 or 6. The right distal paired plate has 8 teeth, the left paired has 2, the unpaired has 9. The forceps are dark brown, the other plates much lighter in tint, but colored dark brown along the edge where the teeth are. The mandible was too badly broken to describe, so that aside from the statement that along the cutting edge and on the shaft there is much dark pigment I am unable to make any statements concerning it.

The type is in the American Museum of Natural History.

Genus PARAMARPHYSA Ehlers.

Ernst Ehlers, Florida Anneliden, p. 99.

Similar to *Marphysa* in every respect except that it lacks gills. The individuals are usually small as compared with *Marphysa* and have delicate and comparatively soft jaw-apparatus.

Paramarphysa teres, new species.

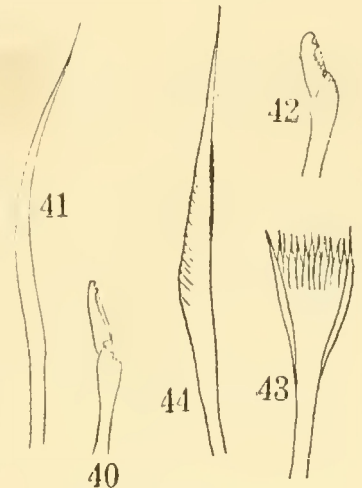
Plate 6, figures 2 to 6; text-figures 40, 41.

Two incomplete specimens were collected in Pago Pago Harbor. One specimen, incomplete posteriorly, is 75 mm. long, 0.75 mm. in diameter at its widest part, and contains over 200 somites.

The prostomium (plate 6, fig. 2) is deeply bilobed, hardly wider than the peristomium. The median tentacle is about twice as long as the prostomium, the inner paired about half as long as the unpaired, the outer paired rather more than half as long as the inner paired. On either side there is a prominent eye situated just outside the base of the inner paired tentacle. No pigmentation is present in any portion of the body. In the preserved material the anterior ventral surface is much flattened, the parapodia prominent, and the dorsal cirri are relatively large. Behind about the region of somite 50 there is a change in the form of the body, in that the cross-section is nearly round and the dorsal cirrus becomes very small.

One of the two specimens was badly distorted as a result of drying and the prostomium of the other had been injured, so that neither was entirely normal, but neither showed any distinction between the first two somites, which together are longer than the prostomium. At the anterior border the prostomium has a median indentation, and its anterior diameter is a trifle wider than its posterior.

Anterior parapodia (a drawing of the thirteenth is shown in figure 3, plate 6) have relatively rather prominent dorsal cirri, with a vertical anterior and a rounded posterior lip, and a dense tuft of setæ arising between the two. There is a single acicula situated near the dorsal surface of the parapodium. The acicula has a very dark base, but is much lighter in color near the apex. Both simple and compound setæ were present in the parapodium drawn. A number were broken, but apparently the arrangement is that there is an anterior vertical row of compound setæ extending to the dorsal surface of the parapodium. Posterior to the dorsal end of this row is a smaller tuft of simple setæ. A posterior parapodium (plate, 6, fig. 4, from the region of the two-hundredth somite) is conical, with no evident distinction between anterior and posterior lips, and with quite similar dorsal and ventral cirri. The ventral cirrus is located a little nearer the apex of the parapodium than is the dorsal, but otherwise they are very similar. In the one drawn there were 2 simple and 2 compound setæ, the simple lying ventral to the compound. Simple setæ from the region of the two-hundredth parapodium are very slender, of uniform width to about one-third of their length outside the body-wall; at this point they bend at an angle of about 45° and taper to a very fine point. The compound setæ are very small and slender, the terminal portion having an apical and a subapical tooth and a hood (text-fig. 40). In the thirteenth parapodium the compound setæ are similar to those in later somites, while the simple ones widen slightly, bend toward the apex, becoming very narrow and curved beyond the bend (text-fig. 41).



TEXT-FIGURES 40 TO 44.

40 and 41. *Paramarphysa teres*. 40, compound seta $\times 250$; 41, simple seta $\times 250$.

42 to 44. *Lysidice fusca*. 42, compound seta $\times 250$; 43, pectinate seta $\times 500$; 44, simple seta $\times 250$.

In both of the specimens at my disposal the jaw apparatus was incomplete, apparently due to injury. The carrier is large, the forceps have heavy bases and slender apices, and the proximal paired plates each has 3 teeth. I could find no other plates (plate 6, fig. 5). The mandible is composed of slender halves rather widely separated (plate 6, fig. 6).

The type is in the American Museum of Natural History.

Genus ONUPHIS Audouin et Milne Edwards.

Audouin et Milne Edwards, 1834, p. 151, pl. 3A, figs. 1 to 5.

Prostomium with 7 appendages arranged in 3 rows, the anterior row of two "frontal tentacles" or "frontal palps," short and rounded at the ends. Other appendages on ringed cirrophores. Anterior parapodia produced so as to extend in front of the prostomium. The gills are pectinate or simple. With one pair of nuchal cirri.

Onuphis may be distinguished from *Diopatra* by the gills, which in the latter genus are spirally coiled, and from *Hyalinæcia* by the possession of nuchal cirri lacking in *Hyalinæcia*.

***Onuphis holobranchiata* v. Marenzeller.**

Onuphis holobranchiata v. Marenzeller, 1879, p. 24-26, pl. 4, fig. 1.

Onuphis holobranchiata Crossland, 1903, p. 135, pl. 14, fig. 2.

Onuphis holobranchiata Augener, 1913, p. 283-284.

A single incomplete specimen lacking the posterior end was collected in Suva Harbor, Fiji. What remains of the body is 30 mm. long, 2 mm. in greatest width, and contains 69 somites. The color is a uniform dark brown, with brilliant iridescence on the dorsal anterior surface. In all details of surface structure this agrees closely with v. Marenzeller's description and figures. In the jaws there are only slight discrepancies, the carriers having more globular outlines than v. Marenzeller described.

Augener suggests that this species may be identical with Johnson's *Onuphis* (*Northia*) *elegans* and *iridescens* (1901, pp. 406 to 408, plates 8, 9, figs. 77 to 92). In gill structure *O. holobranchiata* agrees more closely with Johnson's species *elegans* than with *iridescens*. I have compared the Suva specimen with one of *O. elegans* which I collected at Friday Harbor, Washington. Neither has the 3-jointed inner paired tentacles figured by Johnson, but my Friday Harbor specimen agreed in other details, especially as to the jaws, with Johnson's description, and differed in jaw structure from the Suva specimen. I think they are distinct species, though closely related.

v. Marenzeller's specimens came from the east coast of Enosima Island, and Augener's from Sharks Bay, Freycinet, estuary between Baba Head and Cararong "Halb-Inseln," in 7 to 11 meters.

Genus LYSIDICE Savigny.

J. C. Savigny, *Système des Annélides*, 1820, p. 13.

With a jaw apparatus like that of *Leodice*, but with only 3 tentacles and no nuchal cirri. The mandible is usually very large as compared with the maxilla. Generally rather small in size.

***Lysidice fusca*, new species.**

Plate 6, figures 7 to 13; text-figures 42 to 44.

Collected both at Suva in Fiji and at Pago Pago Harbor in Samoa. The animal lives in the porous rocks in association with *Nicidion*, and in Samoa is as abundant in the porous surface of the dead rock as is *Nicidion* in the West Indies. Because of the way it twists its body into the intricate cavities of the rock, unbroken specimens are difficult to secure.

There is considerable variability in both size and color. The specimen whose maxilla is drawn in figure 12 was 2 mm. in body diameter, and this would be about the maximum size. The most characteristic coloration is that figured (plate 6, fig. 7),

in which there is a sharply defined dark patch on the dorsal surface of the prostomium and the first 3 somites are dark brown with numerous white spots. Somites 4 and 5 are uncolored and the remainder of the body is like the anterior region, except that the colors are lighter. In most of the body each somite has a narrow darker band across its anterior margin. The pygidium (plate 6, fig. 8) is darker than is most of the body, with a narrow very dark band across the posterior margin of each somite. The third body somite may show less pigment than the first and second and there may be a little pigment on the fourth and fifth. Preserved material shows at best only a trace of this coloration and it may be entirely lost.

The prostomium (plate 6, fig. 7) is deeply bilobed and is wider than the peristomium. The tentacles are uncolored, the median one a little longer than the prostomium, the two lateral ones extend just beyond its anterior margin. The kidney-shaped eyes are very dark and prominent.

The first parapodium (plate 6, fig. 9) has a heavy ventral and a more slender dorsal cirrus; the tenth (plate 6, fig. 10) has a very large setal lobe and the ventral cirrus is on the end of a heavy pad-like structure; in posterior parapodia (plate 6, fig. 11) the setal lobe is conical and the ventral cirrus very small. In all parapodia the dorsal cirrus is slender. The anterior parapodia have each one large acicula, to which a ventral hooked acicula is added in later somites. There are no needle aciculæ in the dorsal cirri. There is one pair of stout anal cirri (plate 6, fig. 8).

The setæ are all very small. The tenth parapodium has a dense tuft of compound setæ, each with a shaft serrated at the apex; the terminal portion has a terminal and a subterminal tooth covered by a hood with serrated margin (text-fig. 42). The pectinate setæ are small, each with about 12 teeth (text-fig. 43). The simple setæ (text-fig. 44) are short, curved toward the ends, and with serrated convex margins. In the posterior parapodia the pectinate setæ are much larger than anteriorly and form a prominent dorsal tuft on the setal lobe, while the other setæ remain as in anterior somites.

The maxilla (plate 6, fig. 12) is dark brown in color, the color deepening toward the inner margins, though in the forceps the extreme margin is colorless. The carriers are conical, almost as long as the forceps. The basal portion of the forceps is about as long as the free fang. The right proximal paired plate has 3 teeth, the left has 4. The right distal paired has 5 teeth, the left has 2. The unpaired plate has 3 teeth. On either side is a small accessory plate. The mandible (plate 6, fig. 13) is relatively rather large, each half with a decidedly rolled edge which is darker than the remainder. (Note that it is drawn under about half the magnification of the maxilla.) Most of the mandible is light in color, but there are numerous dark bands (plate 6, fig. 13).

The type is in the American Museum of Natural History.

***Lysidice parva*, new species.**

Plate 6, figures 14 to 17; text-figures 45, 46.

So far as my material goes, the animals of this species are of small size, the type, which was the only complete individual in my collection, being 70 mm. long and at no place more than 0.5 mm. in width. Other individuals were larger, but none more than 1 mm. in body-width. The anterior region of the living animal is colorless, except for faint indications of brownish spots on the parapodia on either side. Behind the colorless anterior region is one where there is a prominent dark spot on the dorsal surface of each parapodium. Farther back the body-color is lemon-yellow, due apparently to the intestine seen through the colorless body-wall. In preserved material the color is a uniform brown.

The prostomium (plate 6, fig. 14) is about as long as the peristomium and is bilobed, this lobing being more noticeable in some individuals than in others. The median tentacle is twice as long as the prostomium; the lateral ones extend for about one-third of their length beyond the prostomial border. The eyes are not very large, but are very distinct, dark brown in color. The peristomium is nearly twice as long as somite

2, the line of separation between the two being very indistinct. Later somites continue in general the diameter of the first two, with a narrowing and a flattening toward the posterior end, which carries one pair of rather heavy anal cirri.

Each anterior parapodium (plate 6, fig. 15) has a single acicula which is very dark brown in color except for the very apex, contained in a rounded setal lobe. The dorsal cirrus is long and slender, the ventral one much shorter. Posteriorly the only change in the parapodium is that the setal lobe becomes more pointed. The setæ are very small (note the scale of text-fig. 45); the simple ones broaden near the end and narrow to a very fine point (text-fig. 46); the compound ones have inconspicuous teeth on their hooded terminal joints (text-fig. 45).

The jaws are extremely small and very easily broken. The carrier (plate 6, fig. 16) is larger than the forceps, being broader and about of the same length. The forceps has slender fangs. Each proximal paired plate has lobings, hardly to be called teeth. I was unable to get satisfactory preparations of the distal plates, and beyond the statement that there are two on one side and one on the other I can say nothing of their structure. The whole maxilla is pale yellow in transmitted light, with a dark transverse band at the junction between carrier and forceps. The mandible is larger than the maxilla (note the difference in the scale of magnification in the drawings), and is very thin and delicate (plate 6, fig. 17).

In general form and in the structure of jaw and setæ this species is closely related to *Lysidice tortugæ* of the Gulf of Mexico (Treadwell, 1921a, p. 85, figs. 298 to 304).

The type is in the American Museum of Natural History.

Genus NICIDION Kinberg.

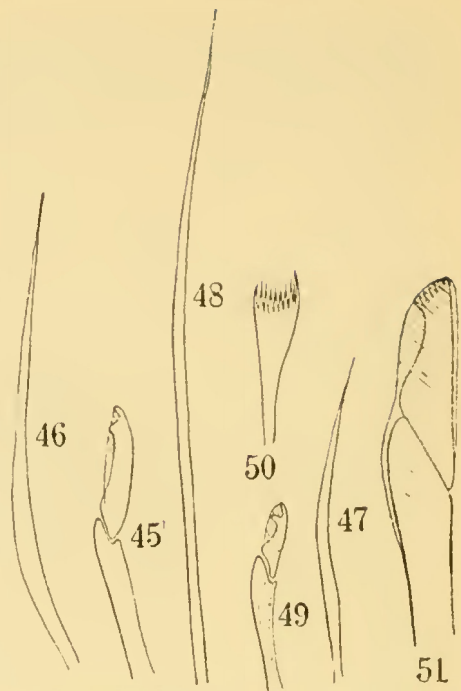
J. G. Kinberg, *Annulata Nova*, 1864, p. 564.

Similar to *Leodice* in having 5 tentacles and a pair of nuchal cirri, but without gills. The parapodial development, especially in the median and posterior regions, is very slight. They might be mistaken for young *Leodice* in which the gills have not appeared, but can be distinguished from these by the feeble parapodial structure.

Nicidion fusca-fasciata, new species.

Plate 7, figure 5; text-figures 47 to 50.

Collected near the Governor's wharf and on Aua Reef in Pago Pago Harbor, Samoa. The prostomium is entirely colorless, a little wider than the peristomium, and has a very shallow anterior median notch. The unpaired and the inner paired tentacles are yellowish brown in color, except for the extreme tips, which are without color. The outer paired are entirely colorless. The median tentacle is as long as the first 3 somites, the others from the inner to the outer become progressively shorter. The eyes are prominent. The peristomium is colorless and is longer than the two following somites. Somites 2 and 3 are entirely colored, except for a small white patch on either side of the mid-dorsal line on the anterior margin of each somite, and in somite



TEXT-FIGURES 45 TO 51.

45 and 46. *Lysidice parva*. 45, compound seta $\times 560$; 46, simple seta $\times 250$.

47 to 50. *Nicidion fusca-fasciata*. 47, simple seta $\times 250$; 48, simple seta $\times 250$; 49, compound seta $\times 250$; 50, pectinate seta $\times 250$.

51. Compound seta of *Lumbrineris sphærocephala* $\times 250$.

2 the small nuchal cirri, which are entirely colorless and very small, so that they look like two small white patches, one on either side of the somite. A very narrow band of the posterior margin of somite 3 is colorless. Somite 4 has on either side on the dorsal surface a triangular pigment patch with the apex pointed dorsally; somite 5 has a similar but larger patch and on somite 6 and 7 these patches from opposite sides have united in the mid-dorsal line. These are yellowish brown like those on somites 2 and 3, but are lighter in tint than on those somites. Behind somite 7 the pigment patch begins in front of the parapodium, bends around it so as to lie dorsal to it, and then extends dorsally to meet its fellow, leaving the posterior half of the dorsal surface of the somite uncolored. On either side is a colorless patch similar to those on somites 2 and 3. Behind the region of somite 20 these patches disappear and the band of pigment becomes entire, bifurcating at its ends so as to go on either side of the parapodium. The pigment disappears behind the region of somite 50, the posterior end being, so far as I can tell, without color.

The first parapodium has relatively very large dorsal and ventral cirri and a large acicula (plate 7, fig. 6). There is an antero-ventral and a postero-ventral setal lobe. The tenth parapodium (plate 7, fig. 7) has a slender dorsal and heavy ventral cirrus, 2 postsetal and one presetal lobes, and a single large acicula which is colorless at the base and end but dark in the middle region. A posterior parapodium (plate 7, fig. 8) consists mainly of a rounded setal lobe with very small dorsal and ventral cirri and 2 black aciculæ, the ventral one hooked at the end.

The simple setæ of the first parapodium are not very long, are very slightly widened toward the end, and very sharp (text-fig. 47). In later somites these setæ are much longer and not at all widened (text-fig. 48). The compound setæ are very small, with a minute terminal joint carrying a pointed terminal and a rounded subterminal tooth, the two covered by a hood (text-fig. 49). Anteriorly the pectinate setæ (text-fig. 50) are small, with about 12 teeth. Posteriorly they are larger and with more numerous teeth.

The pygidium was not present in any of my specimens.

The mandible (plate 7, fig. 9) is thin and only very faintly colored, except for dark bands at the base of the forceps and between the forceps and carrier. The carrier is small, the forceps long and not much curved; the right proximal plate has 6 teeth, the left has 5; the right distal paired plate has 9 teeth, the left has 4; the unpaired has 6. The mandibles (plate 7, fig. 10) are long and slender, the halves only slightly united, and have practically no pigment.

The type is in the American Museum of Natural History.

Subfamily LUMBRINEREINÆ.

Ventral cirrus absent, dorsal cirrus rudimentary or foliaceous. No appendages or evident gills, but with anal cirri. The maxillary plates are all paired, but the two of the same pair may or may not be symmetrical.

Dorsal lobes, probably functioning as gills, have been described in *Lumbrinereis branchiata* (Treadwell, 1921a, pp. 94, 95, plate 8, figs. 5, 6; text-figs. 333-343), but it is doubtful whether these could be regarded as homologous with the gills of the other Leodidicæ.

Genus LUMBRINEREIS de Blainville.

H. M. de Blainville, Dictionnaire des Sciences Naturelles, 1828, p. 46.

Body elongated, without prostomial appendages or parapodial cirri. The first somite interrupted ventrally by a forward extension of somite 2 to form the posterior border of the mouth. Maxilla of short carriers, forceps, and 3 pairs of toothed plates. Mandible about as long as maxilla, the two halves more or less fused. Setæ compound, simple, and hooked.

***Lumbrinereis sphærocephala* Schmarda.**

Text-figure 51.

Notocirrus sphærocephala Schmarda, 1861, p. 116.*Lumbriconereis sphærocephala* Ehlers, 1904, pp. 33-34, pl. v, figs. 3 to 11.*Lumbriconereis sphærocephala* Augener, 1913, p. 288.

A single specimen was collected at low tide in Suva Harbor, Fiji. The living animal is more like *Oenone* than *Lumbrinereis* in its general appearance, for it has a soft body which secretes much mucus and it moves much more slowly than is usual in *Lumbrinereis*. In life the prostomium varies in form according to the degree of contraction, but is always nearly hemispherical. The greater part of the dorsal surface of the prostomium is colored dark greenish-brown, leaving only the margin uncolored. On the dorsal surface of the peristomium are two pigmented bands with sharply defined pigment rows lying in the broader one. Similar cross-bands appear in following somites, but gradually decrease in size posteriorly, so that behind the one-hundredth somite the dorsal surface of each somite is marked only by many minute spots of a golden color. The ventral surface has a yellowish tint, but no pigment. Intersegmental constrictions are uncolored. Preserved material as far back as somite 30 is reddish brown with darker bands in the middle of each somite, while behind this the whole animal has a decidedly greenish tint.

In the structure of the head region, the parapodia, and the jaws my specimen agrees with Ehlers's description, except that the prostomium is more rounded than is shown in Ehlers's figures 3 and 4. The teeth in the setæ are more sharply defined than Ehlers represents them (text-fig. 51), but this may have been merely an error made by his artist.

Ehlers's material was collected at Pitt's Island and Chatham Island; Schmarda's at Auckland, New Zealand; Augener's at Station 1, Sharks Bay, northwest of Middle Bluff, in 7 to 8 metres; Station 26, Sharks Bay, Sunday Island, 5.5 meters; Station 56, Koombaua Bay, 6 to 7 English miles southwest of Bunbury, 14.5 to 18 meters.

Benham (1915, p. 227) records a single specimen identified as of this species from east of Babel Island, Bass Strait.

Lumbriconereis brevicirra* Schmarda.Lumbriconereis brevicirra* Schmarda, 1861, p. 117.*Lumbriconereis brevicirra* Ehlers, 1904, pp. 35-36, pl. iv, figs. 13 to 20; pl. v, figs. 1 and 2.*Lumbriconereis brevicirra* Augener, 1913, p. 288.

Two specimens were collected at Rat Passage, in Suva Harbor, Fiji, in sand at the bottom of a shallow pool on the surface of the reef at low tide. Later some were collected in mud near the Carnegie Library at Suva. In the preserved material the two from Rat Passage are uniformly dark gray in color, with only very faint pigment bands in some of the posterior somites. In life each had a median and two lateral pigment patches on both the dorsal and ventral prostomial surfaces. The median patches are circular in outline, the lateral ones are nearly linear. In the specimens from the mud the whole body-color is much lighter and the prostomial pigment patches are very prominent. In these latter specimens each somite throughout the body has a transverse reddish-orange pigment band, covering more than half of the dorsal and ventral surfaces. There are two pairs of anal cirri, one of which, in one specimen, was bifid.

The Fijian specimens agree with Ehlers's figures and description in the form of the prostomium and in the nearly complete fusion of somites 1 and 2. They all show more of the longitudinal plications on the ventral surface of somite 2 where it extends forward to form the boundary of the mouth than Ehlers shows in his figure 13, and I saw no trace of the everted nuchal organs Ehlers shows in his figure 14. The parapodia have longer posterior cirri than Ehlers describes, but the structure of setæ and aciculæ correspond with his description. In the jaw apparatus the maxilla is as Ehlers

describes it, but the mandible is quite different. Ehlers shows the mandible as constricted near the middle of the shaft, which widens at either end. My specimens have a mandible much more like that of *L. sphærocephala* as given in Ehlers's plate v, figure 11. This mandible which Ehlers figures is very different from anything which has been described for this genus, and it seems to me legitimate to question whether it was a normal specimen.

Schnarda recorded the species from Port Jackson; Ehlers from Chatham, Waitangi; Augener from Sharks Bay, 2 to 4.5 meters, Cockburn Sound, Port Royal, 14.5 to 18 meters, Albany, Princess Royal Harbor and Oyster Harbor.

***Lumbrinereis japonica* v. Marenzeller.**

Plate 7, figures 1 to 4.

Lumbrinereis japonica v. Marenzeller, 1879, pp. 29-30, pl. v, figs. 3 to 3d.

Two specimens were collected in Pago Pago Harbor, on the under surface of loose coral rock at Utile reef. This is an unusual position for this genus, which is essentially mud-dwelling. The larger individual is 250 mm. long and composed of about 300 somites. The pygidial region is regenerating and contains about 15 very short and narrow somites. There are two pairs of short, stout, unequal anal cirri. v. Marenzeller's specimen lacked the posterior end. The second of my specimens is only about two-thirds as large as the other one, and only the anterior half is retained.

The prostomium (plate 7, fig. 1) is about as wide as it is long, with a blunt-pointed apex. The peristomium is a little wider than the prostomium, and is about twice as long as somite 2, from which it is separated by a poorly defined constriction. Ventrally, as is characteristic of this genus, somite 2 extends forward through an interruption in somite 1 to form the posterior border of the mouth. This ventral prolongation is longitudinally plicated.

The parapodia have prominent posterior lobes and, as stated by v. Marenzeller, each parapodium has a rudimentary dorsal cirrus into which a tuft of seta extends (plate 7, fig. 2, taken from somite 100). Posteriorly there is an increase in the length of the posterior parapodial lobes, but aside from this the parapodia are of the same form throughout.

The maxilla (plate 7, fig. 3) is dark brown, almost black, but with occasional lighter brown areas, especially along the margins of the carriers. The carrier is rather long and the margins have a frayed appearance. The forceps is slender. The left proximal plate has 4 teeth, the right proximal has 5. Apparently the 2 terminal teeth of the right plate are more or less broken. The second and third pairs of plates have respectively 2 teeth and 1 tooth on a side. In the figure these are shown as inverted, a position assumed during dissection. The teeth should lie on the inner side of each plate. The mandible (plate 7, fig. 4) is narrow at the base, but broadens at the anterior end. It is marked by concentric lines both in the shaft and in the beveled portion, the latter with very darkly pigmented ends.

v. Marenzeller gives no drawing of the prostomium, but his figures of parapodia and jaw agree so well with those of the Samoan specimens that I have no hesitation in assigning them to this species. v. Marenzeller figures three forms of setæ, simple winged, simple hooded, and compound hooded, the last two agreeing in form of apex and hood. In the smaller of my two specimens I find the form and distribution of setæ exactly as v. Marenzeller described them, but the larger specimen lacks the compound ones. It would be desirable to examine a series of varying sizes to determine if these setæ are lost with increasing age or size, but the material now in hand is not sufficient for this purpose.

Moore (1903, p. 454) records this species from Sagami and Suruga Bays, Japan. v. Marenzeller's was from the east coast of Eno-Sima Island.

Genus *ARABELLA* Grube.

A. E. Grube, Die Familien der Anneliden, etc., 1851, p. 45.

Body elongated, slender, without prostomial appendages or gills, with rudimentary dorsal and anal cirri. No compound, pectinate, or hooked setæ. Eyes often present on the prostomium. Maxilla with long slender carriers, forceps, and 4 or 5 pairs of toothed plates which may or may not be symmetrically arranged on the two sides. Mandible well developed, the shafts pointed and well separated. All jaw apparatus very dark in color.

Arabella may easily be distinguished from *Lumbrinereis*, which it resembles very closely in general appearance, by the fact that the first somite forms the posterior border of the mouth, instead of the second, as in *Lumbrinereis*. In structure of the jaw *Arabella* resembles *Drilonereis*, but the maxillary plates are larger and may be more numerous, and the mandible is always more developed than in that genus.

Arabella dubia, new species.

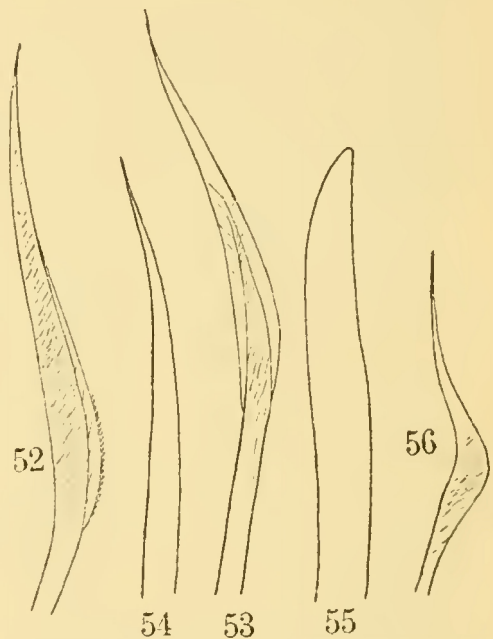
Plate 7, figures 11, 12; plate 8, figures 8, 9; text-figure 52.

The type is from Pago Pago Harbor, Samoa, and is about 70 mm. long, with a prostomial width of less than 0.5 mm. An incomplete specimen found in mud in Suva Harbor, Fiji, is much larger but is badly preserved, so that measurements are of little value. It is possible that the type may be immature. The body is very iridescent. One preserved specimen from Pago Pago shows transverse brown bands on the somites, while the other is colorless.

The prostomium (plate 7, fig. 11) is elongated sugar-loaf in form, its length about one-third greater than its width. There are two pairs of eyes, the inner pair lying close together near the posterior border of the prostomium, and easily seen; the second pair are much less easily seen and lie one on either side, at a little more than half the distance from the corresponding inner eye to the prostomial border. The first somite is a little wider than the prostomium, but about two-thirds as long. Its anterior margin is noticeably recurved.

The parapodia are well developed from the beginning. They have the form usual in this genus, with a rounded setal lobe and a finger-shaped posterior one. There is a single, rather prominent, yellow-colored acicula, rounded at the apex. The setæ (text-fig. 52) are broadened and bent toward the apex, this bent region striated. Along the convex margin is a narrow wing. A denticulation along the margin of the wing is very marked in some and barely discernible in others. The number of setæ in each somite is very small.

There are two pairs of stout anal cirri (plate 7, fig. 12). The maxilla is jet-black with long carriers, not all of which are shown in the figure (plate 8, fig. 8). On the basal portion of the right forceps are 7 prominent teeth, with smaller denticulations at the base. In the forceps figured, the right half has a bifid apex which apparently is not present in the other specimen at my disposal and is probably an individual



TEXT-FIGURES 52 TO 56.

52. Simple seta of *Arabella dubia* \times 250.53 to 55. *Drilonereis lumbricus*. 53, simple seta \times 185; 54, acicula \times 185; 55, acicula \times 185.56. Simple seta of *Drilonereis paucidentata* \times 500.

abnormality. The left half of the forceps has a shorter base and longer fang than the right; the base has 4 well-marked teeth. The first pair of plates are asymmetrical, the right one much shorter than the left, and its margin has 7 rounded teeth, while the left one is longer than the forceps, with at least 10 large, sharp teeth. The second, third, and fourth pairs of plates are symmetrical, the second and third each has 4 and 3 teeth respectively, while each one of the fourth pair has one tooth. The mandible (plate 8, fig. 9) is large as compared with the maxilla, its halves fused for more than half their length.

In character of prostomium, parapodia, and setæ this species is closely allied to *A. attenuata* Treadwell (1906, p. 1172, fig. 62), but differs in the character of the jaw. In the structure of the jaw it approaches more closely to *A. munda* Chamberlin (1919b, pp. 258-259), but differs in the number of teeth on the maxillary plates.

The type is in the American Museum of Natural History.

Genus DRILONERIES Clapérède.

E. Clapérède, Les Annelides Chætopodes, etc., 1870, p. 399.

Body elongated, slender, without prostomial appendages. Parapodia with rudimentary dorsal cirri, but frequently in anterior somites the parapodium reduced or practically absent. No compound or hooked setæ. Prostomium always very much flattened dorsoventrally, so that vertical diameter at the base is little greater than at apex. Maxilla with long, slender carriers, forceps, and three or four pairs of plates, the latter feebly developed as compared with *Arabella*. Mandible absent or rudimentary.

Drilonereis can usually be distinguished from *Arabella*, to which it bears a very close resemblance, by the peculiar flattened prostomium (see plate 7, fig. 14).

Drilonereis lumbricus, new species.

Plate 7, figures 13 to 15; plate 8, figure 10; text-figures 53 to 55.

Individuals of this species are large for the genus *Drilonereis*, measuring 150 mm. in length, with a prostomial width of 1 mm. and a body diameter of 2 mm. in the widest part. Apparently the diameter becomes smaller toward the posterior end, but the single specimen at my disposal was too badly preserved posteriorly to be certain on this point.

The prostomium (plate 7, fig. 13) has an oval outline as seen from above and is narrower at the posterior end, where it fits into the anterior margin of the peristomium. In preserved material the prostomium is bent ventrally so as to make an angle with the main axis of the body. On its median dorsal line is a relatively deep depression extending nearly the whole length of the prostomium. The peristomium is short on the dorsal surface, but extends forward on either side, so that the lateral length is more than double that of the dorsal. Ventrally it is thrown into a number of folds (plate 7, fig. 14). Near the posterior margin on the dorsal surface is a depression, the nuchal organ.

The anterior somites for about one-quarter of the whole body are smooth, highly iridescent, and greatly resemble an earthworm in general appearance. Behind this region the body-color is a dirty brown, but this may have been in part due to imperfect preservation. Apparently the pygidium is very narrow. The first setæ arise in a tuft on the side of somite 3, but the first appearance of anything that could be called a parapodium is on somite 30. Behind this region parapodia are clearly to be seen, but are never very prominent. Anteriorly each (plate 7, fig. 15) has a posterior lobe, a single stout acicula, and a tuft of simple bilimbate setæ curved at the end. Owing to poor preservation no satisfactory preparation of the parapodia could be obtained, and the figure from the forty-fifth somite is the best I could get. Farther posteriorly the acicula becomes relatively smaller, the shafts of the setæ elongate, the bilimbate

setæ become more numerous, and a second, smaller form of seta appears. In a posterior parapodia there are 6 of each form of seta. The bilimbate setæ (text-fig. 53) have long shafts, are noticeably curved toward the apices, with a striated wing which is wider on the convex side of the curve. It was not always possible to see this bilimbate structure, but this may have been due to the position the seta assumed in the preparation. The second form of seta (text-fig. 54) may have a base nearly or quite as broad as the bilimbate, but they narrow rapidly and terminate in a very slender sharp apex which barely protrudes from the surface of the setal lobe. The acicula is very large (plate 7, fig. 15, and text-fig. 55).

The jaw (plate 8, fig. 10) is jet-black. The carriers are long and slender, the forceps has a heavy basal portion with teeth on the inner margin of each half, the terminal portion strongly hooked. The proximal paired plates, each with four teeth, lie inside the curves of the forceps. There are two pairs of distal plates, each with one tooth. The mandible is represented by a pair of black plates lying in the wall of the pharynx considerably in front of the maxilla. There is a small plate attached to the ventral surface of the maxilla. This is really darker in color than is indicated in the figure, where it is shaded lightly so as to be more readily seen.

One specimen collected in Suva Harbor, Fiji.

The type is in the American Museum of Natural History.

***Drilonereis paucidentata*, new species.**

Plate 7, figures 16, 17; plate 8, figure 11; text-figure 56.

Two individuals were collected, both very slender and very much elongated. One was found in Suva Harbor, Fiji, and one in Pago Pago Harbor, Samoa. The following description and figures are taken from the Samoan individual, which is incomplete but has about 450 somites. Its prostomial width is not over 0.25 mm. and the average somite length is 0.3 mm. I have designated as the type the specimen from Suva, which is nearly twice the size of this but also lacks the posterior end.

The prostomium (plate 7, fig. 16) is relatively rather large and is bluntly rounded. It is only a little narrower than the average body somite and is about as long as somite 1. As is characteristic of this genus, the prostomium does not, as in *Lumbrinereis*, thicken from the apex toward the base, but is of nearly uniform thickness throughout, the vertical diameter being about half that of the first somite (compare fig. 14 of *D. lumbricus*). In life the body has a yellowish tint which is most noticeable toward the anterior region, while posteriorly the intestinal contents give the body a gray tint. Preserved material shows a transverse brown band in the middle of each somite, but this is apparently due to coagulated blood and appears in so many of the *Lumbrinereis* as to have little diagnostic value.

The parapodia begin on somite 3 and are at first very small. They increase in size posteriorly but never become very prominent. Each has when fully developed a rounded setal lobe and a finger-shaped posterior lobe. Between the two on the ventral surface a heavy acicula protrudes to a considerable distance beyond the surface of the parapodium (plate 7, fig. 17). The setæ are all of the same kind, differing only in the length of the shafts. Toward the end each seta broadens and bends and narrows rapidly to an acute tip. There is little distinction to be made between a central shaft and a wing (text-fig. 56).

The jaws (plate 8, fig. 11) are jet-black. The maxilla has 2 long, slender carriers; the basal portion of the forceps is short and without teeth on the inner margins; the terminal portion is relatively large. Each proximal paired plate has 5 teeth, each of the second pair has 1 long and 2 short teeth, while each of the third pair has 1. A dark triangular plate is attached to the ventral face of the carrier, but I saw no mandible.

The type is in the American Museum of Natural History.

Genus OENONE Savigny.

J. C. Savigny, *Système des Annélides*, etc., 1820.

Prostomium with 3 short tentacles which may be covered by the anterior border of the peristomium. Two lobes of the dorsal surface of the peristomium may be protruded so as to cover the prostomium or be retracted into pits. Two pairs of prostomial eyes. The dorsal cirri are flattened plates. Maxilla with long, slender carriers and 2 series of toothed plates which may or may not be symmetrical on the two sides. Mandible short and broad. Setæ all simple, in a vertical row between the two lobes of the parapodium.

Oenone fulgida Savigny.

Text-figures 57 to 64.

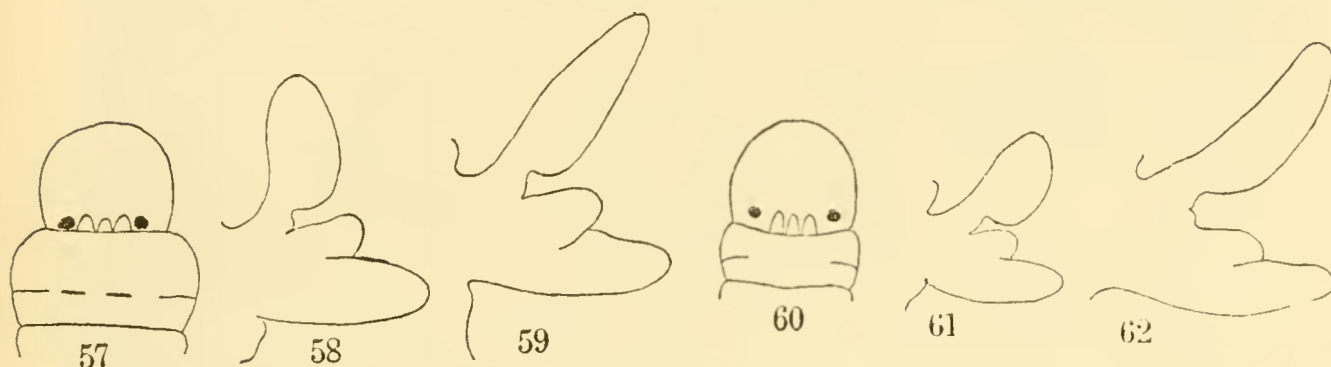
Aglaura fulgida Savigny, 1820, p. 55, pl. 5, fig. 2.

Oenone lucida Savigny, 1820, p. 56, pl. 5, fig. 3.

Aglaurides fulgida Fauvel, 1917, p. 240-254, pl. 6, figs. 52 to 55.

For a diagnosis of the species and a full literature list see the paper by Fauvel.

Collected at Aua Reef and near the governor's wharf at Pago Pago Harbor, Samoa. The living animals are yellowish brown in color and very iridescent, but have no



TEXT-FIGURES 57 TO 62.

57 to 59. *Oenone fulgida* from Samoa. 57, anterior end $\times 5$; 58, tenth parapodium $\times 5$; 59, one-hundredth parapodium $\times 5$.

60 to 62. *Oenone diphyllidia* from Tobago. 60, anterior end $\times 5$; 61 tenth parapodium $\times 5$; 62, one-hundredth parapodium $\times 5$.

special pigment markings. They are very active in confinement and will crawl out of uncovered dishes. The prostomium is broadly rounded, with 3 tentacles and evertible nuchal organs which appear when the animal is moving. There are two pairs of eyes, the outer ones larger than the inner. After preservation the body-pigment turns to a brownish purple which is darker in some individuals than in others and in all cases is of a lighter tint ventrally than dorsally. In some cases in the preserved material this pigment completely obscures the eyes, while in others the smaller pair only are invisible. It seems probable that this condition is responsible for confusion in the classification of this and related species, some of which have been described as having only one pair or no eyes.

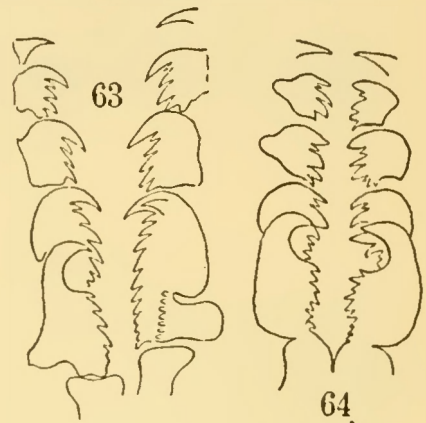
The peristomium is wider than the prostomium and usually is a little wider than the first setigerous somite. In some individuals there is a faint constriction, especially noticeable on the lateral and ventral areas, which obviously marks the boundary between the first and second somites. By a number of writers the possession of one or two apodous somites has been regarded as of importance in the separation of genera. If this distinction really occurs it would be important as indicating that the second apodous somite of one genus is homologous with the first setigerous of another. In my study of the Leodidæ I have found so much variability between closely allied

species of the same genus in the degree of distinctness of the first two somites that I very much doubt whether there is anywhere a Leodicid with only one apodous somite. While this assertion is perhaps going beyond the evidence in such a genus as *Onuphis*, it seems to me obvious that these lateral and ventral markings in *Oenone* indicate clearly a fusion of somites and that a classification which separates this genus from others because of the (apparently) single apodous condition is erroneous.

The appearance of the ventral prostomial surface varies with the amount of protrusion of the palpal lobes, but it usually shows some longitudinal wrinklings. In other respects there is nothing to be added to the descriptions already given by Fauvel and others.

The genera of the Lumbrinereinæ with foliaceous dorsal cirri are somewhat confused. The first genera and species were described by Savigny (1820, pp. 55, 56, plate 5, figs. 2 and 3) as *Aglaura fulgida* and *Oenone lucida*. The type of the latter species and genus was afterward found to be an immature individual belonging to *Aglaura fulgida*, so that the latter was regarded as the valid genus and species. Ehlers (1864-1868, pp. 407, 408) showed that the name *Aglaura* was preoccupied and proposed instead the generic name *Aglaurides*. Savigny's original description of *Oenone* might be interpreted to read that the lack of tentacles was characteristic of the genus, and Ehlers redefined *Oenone* as having no tentacles and 1 apodous somite, while *Aglaurides* has 3 tentacles and 2 apodous somites. In other respects the two genera are alike. Fauvel (1917, pp. 240 to 257) accepts *Aglaurides* as the valid name, arguing that since *Oenone* was founded on an evident error it should disappear from the literature, and I followed this procedure in a paper on the West Indian Leodicidæ (Treadwell, 1921a, p. 116). In a personal letter Dr. Chamberlin pointed out that this procedure is contrary to the rules of nomenclature in that when *Aglaura* was discovered to have been preoccupied, *Oenone*, the oldest recorded synonym, should take its place. The criticism is valid and I have used *Oenone* accordingly.

Gravier (1900, p. 222) accepts *Aglaurides* as defined by Ehlers and retains *Oenone* to include species without antennæ or nuchal organs. Augener (1913, pp. 290, 291) and Chamberlin (1919a, p. 326) use *Oenone* as the only valid genus for this group, but neither writer seems to attach much importance to the tentacles and apparently they confuse the tentacles with the nuchal organs. Chamberlin (1919a, p. 337) speaks of "obscure antennal nodules—apparently subject to retraction like true antennal organs," and Augener (p. 290), in speaking of the "so genannten 3 Fuhler," says "Diese Fuhler sind ohne zweifel keine fuhlerartigen Anhänge des Kopfes in gewöhnlichen Sinne sondern als Nackenorgane aufzufassen." Chamberlin (1919a, p. 335, plate 62, figs. 2 to 5) describes as *Oenone telura* a species without tentacles, with peculiarly shaped somites around the mouth, and with a maxillary apparatus quite unlike any thus far figured in other species. Chamberlin states that the specimen had apparently been dried, which would lead to a distortion of the soft parts, and its resemblance in some details to *Oenone fulgida* would lead to a suspicion that the drying had been responsible for the apparent lack of tentacles. Dr. Chamberlin kindly offered to reexamine the specimen to be certain on this point, but it proved to be inaccessible and so the matter can not be determined. So far as I know, this is the only recorded case of an "*Oenone*" without tentacles, and since the presence or absence of tentacles



TEXT-FIGURES 63 AND 64.

Jaws of *Oenone*. 63, jaw of *Oenone fulgida* from Samoa \times 40; 64, jaw of *Oenone diphyllidia* from Tobago \times 40.

is obviously of generic importance, a new genus should be created for the reception of this species *telura*.

I have collected *Oenone* in Bermuda, Tobago, and the Dry Tortugas in the Atlantic and in Samoa in the Pacific. In a description of the West Indian species I suggested (Treadwell, 1921*a*, pp. 118, 119), that the species described by Ehlers (1887, pp. 109–111, plate 34, figs. 1–7) as *Oenone diphyllidia* of Schmarda (1861, p. 120, plate 32, fig. 256) was really *Oenone fulgida* Savigny, and that those of my own collections were *Aglaurides* (*Oenone*) *diphyllidia* Schmarda, which might be identical with *Aglaurides* (*Oenone*) *symmetrica* of Fauvel (Fauvel, 1917, p. 252). Augener (1913, p. 290), who apparently had access to Ehlers's collections, reported that he had identified as *Oenone fulgida* specimens from south Australia, and that a comparison of these with Ehlers's West Indian specimens showed that the two are identical. As will be noted immediately, the jaw structure is important in this connection, and it is perfectly possible that Augener did not examine this organ, but made his comparisons entirely from surface features.

I have made a careful comparison of my West Indian with my Samoan specimens and find that they agree in every respect except the form of the jaws. Text-figures 57, 58, and 59 are outline drawings of the anterior end, the tenth and the one-hundredth parapodium of the Samoan *Oenone*, while text-figures 60, 61, and 62 are corresponding drawings of specimens from Tobago in the West Indies. In other details, such as size, coloration, and habits, they are alike. It seems obvious that, *so far as these structures are concerned*, there are no differences of specific value between the animals from the two localities. Reexamination of my Bermuda material shows that the acicula I figured (Treadwell, 1921*a*, text-fig. 452) was not typical and that the aciculæ agree with those drawn in Fauvel's figure 52.

On the other hand, there are decided differences in the form of the jaw, as shown in text-figures 63 and 64. The jaw shown in text-figure 63 agrees in all essentials with Fauvel's description if due allowance is made for a slight difference in the position of the plates. In profile the teeth look large and sharp, but when rolled so as to be seen in full face they have the appearance shown by Fauvel, and in one specimen the second and third plates of the right-hand series had more teeth than here represented. The small plate adjoining the right-hand end of the carrier seems to me to be attached to the larger one and its teeth are to be seen only in strong reflected light, appearing then as bright spots.

My Samoan specimens are evidently *Oenone fulgida* Savigny, which is synonymous with *Oenone diphyllidia* Ehlers, while the ones I have seen from the West Indies are *O. diphyllidia* Schmarda. It seems probable that this latter species is synonymous with *O. symmetrica* Fauvel.

If my suggestion that all of the Leodicidæ have two apodous somites is correct, and if it be remembered that in *Oenone* either one or both pairs of eyes are not to be seen in preserved material, the distinction usually made between *Halla* and *Oenone* (see Gravier, 1900, p. 322, and Chamberlin, 1919*a*, p. 326) would appear of doubtful accuracy. I have examined a specimen bought of the Naples Zoological Station as *Halla parthenopeia* and two specimens identical with this belonging to the American Museum of Natural History but without data, and find that they are certainly the species described by Ehlers (1864–1868, p. 408, plate 17, figs. 25–34) as *Cirrobranchia parthenopeia*. A second pair of eyes apparently escaped Ehlers's attention and he does not mention the protrusible lobes which distinguish his genus *Aglaurides* from *Cirrobranchia*. Dissection of these specimens, however, shows the lobes lying under the peristomial border exactly as in *Oenone*. It seems probable that Ehlers really had a species of *Oenone* and probable that *Halla* was originally described from a member of this genus. The matter could, I suppose, be settled only by reference to the original type specimen, but I am skeptical as to the validity of *Halla*. *Cirrobranchia*, as Cham-

berlin and others have noted, is synonymous with *Halla*, which has precedence, if *Halla* is a valid genus.

Subfamily DORVILLEINÆ.

The characteristic genus of this family was named *Staurocephalus* by Grube (1855, p. 97), but Verrill (1900, pp. 647, 648) showed that the name was preoccupied and renamed it *Stauronereis*, making the subfamily Stauronereinæ. Chamberlin (1919a, pp. 338, 339) showed that *Stauronereis* was preoccupied by *Dorvillea*, given by Parfitt (1866, pp. 113, 114, with 5 figures) to a new genus *Dorvillea*. The name of the principal genus should then be *Dorvillea* and the subfamily renamed accordingly.

Chamberlin is in error in referring to a swarming like that of Palolo in *Dorvillea*. Mayer (1902) corrected an error in an earlier paper and pointed out that this swarming species is *Leodice fucata* Ehlers.

Genus DORVILLEA Parfitt.

Parfitt, E, 1866, Zoologist, 2d series, pp. 113, 114.

Prostomium rounded, pentagonal or quadrangular, with two more or less articulated tentacles and elongated palps which may be spirally contorted. Body with relatively few somites, parapodia with dorsal and ventral cirri but without gills. Four anal cirri. Maxilla of 2 or more rows of toothed plates on either side, the rows all united at the base but diverging in a V-shape. Mandible bifurcated, with slender shafts, the margin often prolonged laterally into rows of plates.

Dorvillea australiensis McIntosh.

Plate 8, figures 1 to 7; text-figures 65 to 68.

Staurocephalus australiensis McIntosh, 1885, pp. 232, 233, pl. 36, fig. 6; pl. 17A, figs. 9 and 10.

Staurocephalus australiensis Treadwell, 1906, p. 1173, figs. 63 to 66.

Dorvillea (Staurocephalus) australiensis was described by McIntosh from a posterior fragment of a single individual. Treadwell identified with this a species from Hawaii and figured the prostomium with appendages in which the tentacles are shown as unsegmented. Augener (1913, pp. 293–296) and Benham (1915, pp. 209–212, plates 41, figs. 58 to 66) described specimens of this genus from the Australian region as *S. australiensis*, though all of the tentacles in their specimens had strongly articulated tentacles. I have reexamined the Hawaiian specimen (now No. 5463 in the U. S. National Museum) and find that the tentacles certainly are not strongly articulated, though they show a jointing toward the end.

The only structures in which direct comparison is possible between McIntosh's and Benham's specimens are in the parapodia and setæ. The difference between the two figures of the parapodia (Benham, plate 41, fig. 62, and McIntosh, plate 36, fig. 6) might be due to imperfect preservation of the material or to the fact that they represent parapodia from different regions of the body, but this explanation does not hold for the setæ. Benham figures the terminal joints of the compound setæ as each having a stout subapical tooth and a denticulated margin to the hood, and he describes the simple setæ as "long, curved, capilliform" with fine serrations along the upper convex margin, while in McIntosh's figures (plate 17A, figs. 9, 10) the terminal joint of the compound seta has a small subapical tooth and no serration along the margin of the hood. The simple seta has a serrated edge and terminates in a bifid extremity.

In the form of the setal lobes and setæ Benham's specimens differ from the Hawaiian and the Samoan species. He states that the mandibles are without denticulations, while in the Samoan specimens they are denticulated (plate 8, fig. 7). The form of the paragnaths is quite unlike in the two cases. Augener's specimens from Australia had on the parapodia "am Ende 3 blatt-formige Lippen-eine vordere obere und eine

hindere mediane," while McIntosh's description of the type is that "superiorly the free edge of the foot presents two prominent mammillæ, between which the bristles of the region emerge." This is not in entire agreement with his figure, but is quite in accord with the conditions found in the Samoan and Hawaiian specimens and quite unlike those described by Augener. Augener followed Benham in his identification of his specimens with those of McIntosh and Treadwell, explaining the differences as due to poor preservation. It seems to me evident that the species described by Benham and Augener are not the same as the ones I have seen from Hawaii and Samoa, which I regard as belonging to McIntosh's species.

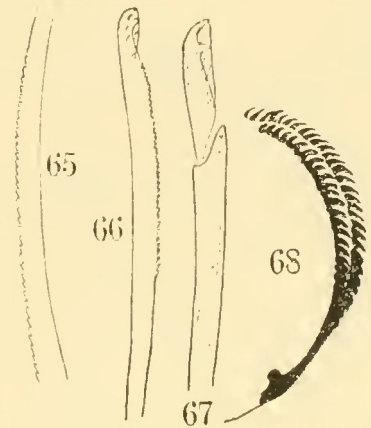
Several specimens were collected on Aua reef in Pago Pago Harbor in rocks near the upper end of the harbor and one on the reef at Aunuu. They are very sensitive to changes in the water and most of them died before they could be got to the laboratory. In the living animal the prostomium has a faint pink color on the anterior margin, but this fades out on the dorsal surface. The palps are colorless or only faintly tinted with pink. The peristomium is pink, this color being most intense along the posterior edges of the antero-lateral depressions and on the "caruncle." The first 6 somites show a pink color which is most intense along the anterior margins, but behind the region of somite 6 the pink color disappears and is replaced by a decided yellow. No color persists in the preserved material.

The prostomium is rounded (plate 8, fig. 1), not more than one-third the diameter of the peristomium. The palps are large, thick at the base, unjointed, and with rather blunt tips. The tentacles are less than half the diameter of the palps at the base and not more than three-quarters as long as they, and are jointed only toward the apices. There are two pairs of eyes—the dorsal ones the smaller, the larger ventral ones visible from the dorsal surface only through the translucent bases of the tentacles. Both pairs of eyes are very black. The peristomium is rectangular in outline, but with a deep depression on either side on the dorsal surface. The median ridge between these two depressions is continued forward to join with a knob which belongs to the prostomium, the whole forming a sort of caruncle.

The first parapodium (plate 8, fig. 2) has a rounded setal lobe, with lips equal in length. The dorsal cirrus is 2-jointed, the basal joint much the longer. The ventral cirrus is rather large, joined for about half its length to the setal lobe. There is a heavy acicula in the setal lobe and a tuft of needle setæ in the dorsal cirrus. There are two tufts of setæ, the dorsal ones simple and the ventral ones compound. In the tenth parapodium (plate 8, fig. 3) the parts are all larger, but the relative forms are about as before, except for an increase in the vertical diameter of the setal lobe. There are a dorsal and a ventral tuft of setæ with aciculæ as in the first parapodium. The pygidium is rounded, with one pair of long anal cirri (plate 8, fig. 4).

The dorsal setæ are long and curved, with minute denticulations along the convex margin and very small terminal teeth at the end (text-fig. 65). Ventral to these is a row of stouter setæ with serrated convex margin and apical and subapical teeth covered by a hood (text-fig. 66). Ventral to these are compound setæ having smooth basal joints; the terminal joints have each a large apical and a smaller subapical tooth, the whole covered by a hood (text-fig. 67).

The maxilla has the form characteristic of this genus, composed of two rows of plates on either side, with from 35 to 40 plates in each row, the rows from opposite



TEXT-FIGURES 65 TO 68.

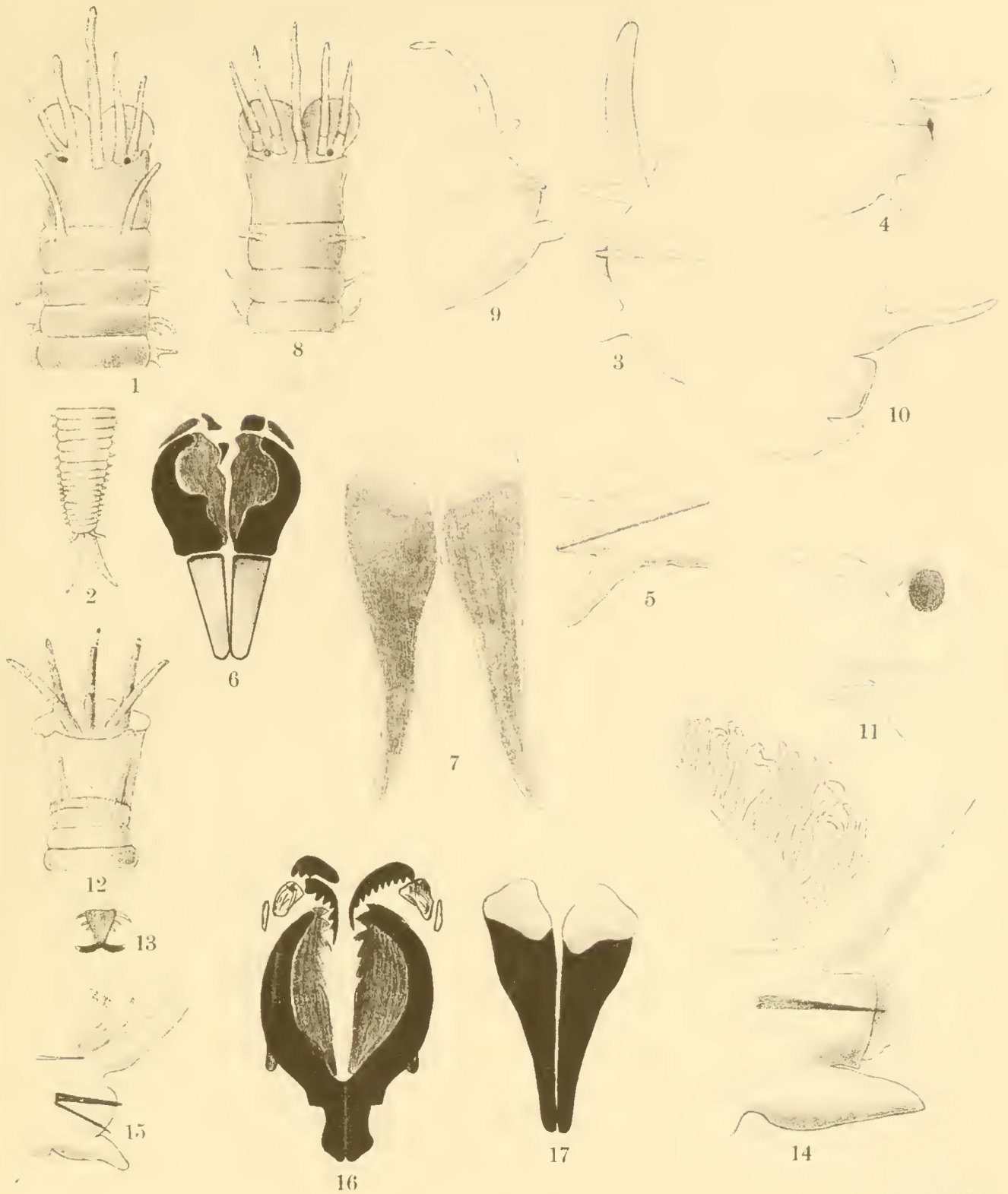
Dorvillea australiensis. 65, dorsal simple seta $\times 250$; 66, ventral hooded seta $\times 250$; 67, compound seta $\times 250$; 68, one half of maxilla $\times 12.5$.

sides united in pairs by a V-shaped connection (text-fig. 68 shows one-half of the jaw). In the basal portion of each row the plates are closely united, looking like a series of vertebræ. At about the middle of the series (plate 8, fig. 6) the plates reach their greatest development. Each has a bifurcated base and a rather heavy fang. Along one edge of the fang is a plate-like protrusion with a row of teeth along its margin. In the view drawn the teeth appear as if on the margin of the fang, but in reality they are on a plate set at an angle to the fang and pointed away from the observer. At the apex of the row the plates become smaller and the teeth disappear (plate 8, fig. 5). The inner row is a little shorter than the outer. The mandible (plate 8, fig. 7) is black, each half with teeth along the anterior margin and small plates lateral to the apex. Apparently the number of these plates is not constant.

BIBLIOGRAPHY.

- AUDOUIN, J. V., et A. MILNE-EDWARDS. 1834. Recherches pour servir à l'histoire du littoral de la France. *Annélides*. v. 2, pp. 1-290, pls. 1-8.
- AUGENER, H. 1813. Die Fauna Südwest Australiens. Ergebnisse der Hamburger südwestaustralischen Forschungsreise 1905. *Polychæta* 1. Errantia, pp. 65-304, pls. 2, 3, 42 text-figs.
- BENHAM, W. B. 1915. Report on the Polychæta obtained by the F. I. S. *Endeavor* on the coast of New South Wales, Victoria, Tasmania, and South Australia. Zoölogical results of fishing experiments carried on by the F. I. S. *Endeavor* 1900-1904. Pt. 1, pp. 173-237, pls. 38-45.
- BLAINVILLE, H. M. de. 1828. Dictionnaire des Sciences Naturelles. T. 67, Articles Néréides et Vers.
- CHAMBERLIN, R. V. 1919a. The Annelida Polychæta, pp. 1-514, plates 1-80.
- Reports on an exploration off the west coast of Mexico, Central and South America, and off the Galapagos Islands, in charge of Alexander Agassiz, by the U. S. Fish Commission steamer "*Albatross*" during 1891, Lieut.-Commander Z. I. Tanner, U. S. N., commanding. xxxviii.
- Reports on the scientific results of the expedition to the tropical Pacific, in charge of Alexander Agassiz, by the U. S. Fish Commission steamer "*Albatross*," from August 1899 to March 1900, Commander Jefferson F. Moser, U. S. N., commanding. xx.
- Reports on the scientific results of the expedition to the eastern tropical Pacific in charge of Alexander Agassiz, by the U. S. Fish Commission steamer "*Albatross*" from October 1904 to March 1905, Lieut-Commander L. M. Garrett, U. S. N., commanding. xxxi.
- 1919b. Pacific Coast Polychæta collected by Alexander Agassiz. *Bull. Museum of Comparative Zoology of Harvard College*, vol. 65, No. 6, pp. 251-270, pls. 1-5.
- CLAPÉRÈDE, E. 1870. Les Annélides chétopodes du golfe de Naples. *Mem. Soc. Phys. et Hist. Nat. de Genève*, vol. 20, pp. 305-542, pls. 1-8.
- COLLIN, ANT. 1897. Bemerkungen über den essbaren Palolowurm, *Lysidice viridis* (Gray). Anhang zu Kramer; Ueber den Bau der Korallenriffe und die Planktonvertheilung an den Samoanischen Küsten.
- CROSSLAND, CYRIL. 1903. On the marine fauna of Zanzibar and British East Africa, from collections made by Cyril Crossland in the years 1901 and 1902. The Polychæta; Part II, pp. 129-144, pls. 14 and 15, text-figs. 12-15; *Proc. Zool. Soc. London*, 1903, vol. 2.
- 1904. On the marine fauna of Zanzibar and British East Africa, from collections made by Cyril Crossland in the years 1901 and 1902. The Polychæta; Part III; with which is incorporated the account of Stanley Gardiner's collection made in the Maldivé Archipelago in the year 1889, pp. 287-330, plates 20-22, text-figs. 43-46. *Proc. Zool. Soc. of London*, 1904, vol. 1.
- EHLERS, ERNST. 1864-68. Die Borstenwürmer (*Annelida chatopoda*) nach systematischen und anatomischen untersuchungen. pp. 1-748, pls. 1-24.
- 1887. Florida Anneliden. Reports on the results of dredging under the direction of L. F. Pourtales during the years 1868-70, and in the Caribbean Sea (1878-79) in the U. S. Coast Survey Steamer "*Blake*." *Memoirs Museum of Comparative Zoölogy at Harvard College*, 15; pp. vi+1-328, pls. 1-60.
- 1898. Ueber Palolo *Eunice viridis* (Gray). *Nachrichten der K. Gesellschaft der Wissenschaft zu Göttingen, Math-phys. Klasse*, Hft. 4, pp. 1-16.
- 1904. Neusseländische Anneliden. *Abhandlungen der K. Gesellschaft der Wissenschaften zu Göttingen, Math-phys. Klasse, Neue Folge*, Bd. 3, No. 1, pp. 1-79, pls. 1-9.
- FAUVEL, PIERRE. 1914. Annélides polychaètes de San Thomé (Golfe de Guinée) recueillies par M. Chas. Gravier. *Archiv. de Zoologie Expérimentale et Générale*, T. 54, fasc. 5, pp. 105-155, pls. 7, 8.
- 1917. Annélides polychètes de l'Australie méridionale. *Archiv. de Zoologie Expérimentale et Générale*, T. 56, fasc. 3, pp. 159-277, pls. 4-8, text-figs. 1-29.
- 1919. Annélides Polychètes de Madagascar, de Dibouti et du Golfe Persique. *Archiv. de Zoologie Expérimentale et Générale*, T. 58, pp. 315-473, pls. 15-17, text-figs. 1-11.
- FRIEDLAENDER, BENEDICT. 1898. Ueber die so-genannten Palolowurm. *Biologisches Centralblatt*, Bd. 18, pp. 337-357.

- GRAVIER, CH. 1900. Contribution à l'étude des Annélides Polychètes de la Mer Rouge. *Nouvelles Archives du Museum de Hist. Nat.* 4 Série, vol. 2, fasc. 11, pp. 137-282, pls. 9-11.
- GRUBE, ADOLPH-EDUARD. 1851. Die Familien der Anneliden, mit Angabe ihrer Gattungen und Arten. pp. 1-164.
- 1855. Beschreibung neuer oder wenig bekannter Anneliden. *Archiv. f. Naturgesch.* 21, p. 97.
- 1878. *Annulata Semperiana*. Beiträge zur Kenntniss der Annelidenfauna der Philippinen. *Mémoires de l'académie impériale des sciences de St. Pétersbourg*, 7th series, vol. 25, pp. 1-300, pls. 1-15.
- JOHNSON, H. P. 1901. The Polychæta of the Puget Sound region. *Proceedings of Boston Society of Natural History*, 29, pp. 381-437, pls. 1-19.
- KINBERG, J. G. H. 1864. *Annulata nova* (Eunicea). *Öfvers af K. Vetensk. Akad. Förhandling*, vol. 21, pp. 559-574.
- MACDONALD, J. D. 1858. On the External anatomy and Natural history of the genus of annelids named Palolo by the Samoans and Tonguese, and Mbalolo by the Fijians. *Trans. Linnean Society of London*, 22, pt. 3, No. 16, pp. 237-239, pl. 41.
- McINTOSH, W. C. 1885. Report on the Annelida Polychæta collected by H. M. S. *Challenger* during the years 1873-1876. Report on the Scientific Results of the Voyage of H. M. S. *Challenger*, vol. 12, pp. i-xxvi + 1-554, pls. 1-55, 1A-39A.
- V. MARENZELLER, EMIL. 1879. Südjapanische Anneliden. *Denkschriften der Mathematisch-Naturwissenschaftlichen Classe der Kaiserlichen Akademie der Wissenschaften*. Vienna, Bd. 41. pp. 1-45 (of separate), pls. 1-6.
- MAYER, A. G. 1902. The Atlantic Palolo. *Science Bull., Museum Brooklyn Inst. Arts and Sciences*, vol. 1, No. 3, pp. 93-103, 1 pl.
- MOORE, J. PERCY. 1903. Polychæta from the coastal slope of Japan and from Kamchatka. *Proceedings of the Academy of Natural Sciences of Philadelphia* 55, pp. 401-490, pls. 23-27.
- 1904. New Polychæta from California. *Proceedings of the Academy of Natural Sciences of Philadelphia* 56, pp. 484-503, pls. 37, 38.
- 1909. Polychætous Annelids from Monterey Bay and San Diego, California. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 61, pp. 235-295, pls. 7-9.
- 1911. The Polychætous Annelids Dredged by the U. S. S. *Albatross* off the Coast of Southern California in 1904. III. Euphrosynidæ to Goniadidæ. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 63, pp. 234-318, pls. 15-21.
- PALLAS, P. 1788. *Marina varia nova et rariora*. *Nova Acta Acad. Scientiar. Imper. Petropolitanae*, Tom. 2, p. 229, pl. 5, figs. 1-7.
- PARFITT, EDWARD. 1866. Description of a *Nereis* new to science. *Zoologist*, series 2, vol. 1, pp. 113-114, 5 text-figs.
- QUATREFAGES, M. A. DE. 1865. *Histoire naturelle des Annelés marins et d'eau douce*, T. 2, pp. 1-794, pls. 1-20.
- SAVIGNY, J. C. 1820. *Système des Annélides principalement de celles des côtes de l'Egypte et de la Syrie*.
- SCHMARDA, LUDWIG K. 1861. *Neue wirbellose Thiere beobachtet und gesammelt auf einer reise um der Erde 1853 bis 1857*. Band 1, Hft. 2, pp. 1-164, pls. 16-37.
- STAIR, J. B. 1847. An account of Palolo, a sea-worm eaten in the Navigator Islands; with a description by J. E. Gray. *Proceedings of the Zoological Society of London*, part 15, pp. 17, 18.
- TREADWELL, A. L. 1906. Polychætous Annelids of the Hawaiian Islands collected by the steamer *Albatross* in 1902. *Bulletin U. S. Fish Commission for 1903*, pt. III, pp. 1145 to 1181.
- 1921a. *Leodiciidæ of the West Indian Region*. *Carnegie Inst. Wash. Pub. No.* 293, pp. 1-129, pls. 1-9, text-figs. 1-467.
- 1921b. Report on the annelids of Puget Sound, Fiji, and Samoa. *Carnegie Institution of Washington, Year Book No.* 19, pp. 199-200.
- VERRILL, A. E. 1900. Additions to the Turbellaria, Nemertinea, and Annelida of the Bermudas. *Trans. Connecticut Academy of Sciences*, vol. 10, part 2. pp. 595-670; pl. lxx.
- WOODWORTH, W. McM. 1907. The Palolo worm, *Eunice viridis* Gray. *Bull. Museum Comparative Zoology at Harvard College*, vol. 51, No. 1, pp. 3-21, pls. 1-3.

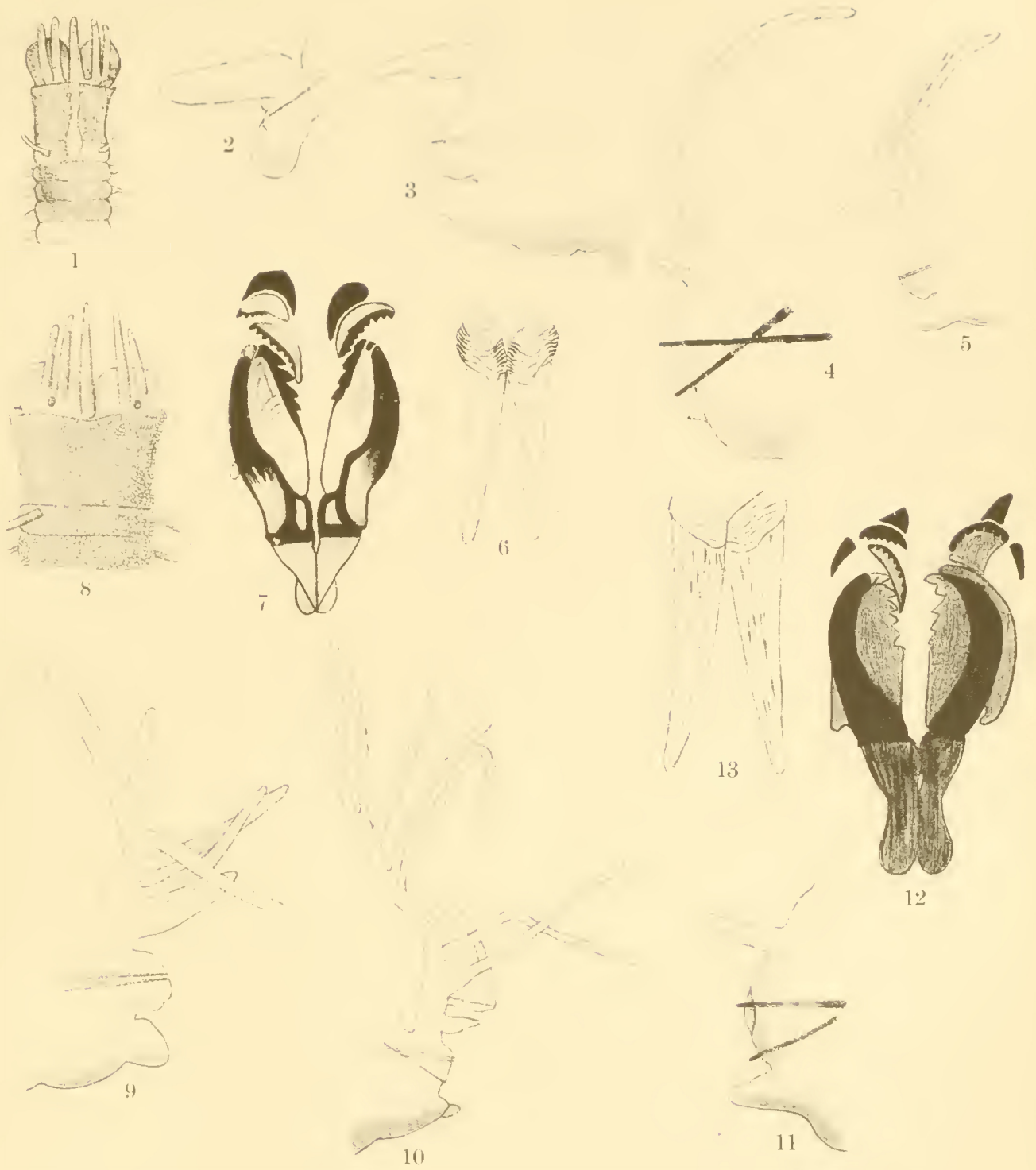


A. Haenel & Co. Berlin

FIGURES 1 to 7, *Leodice viridis* Gray. Fig. 1, anterior end $\times 7.5$. Fig. 2, pygidium $\times 7.5$. Fig. 3, gilled parapodium $\times 22$. Fig. 4, tenth parapodium $\times 27$. Fig. 5, epitokous parapodium $\times 68$. Fig. 6, maxilla $\times 15$. Fig. 7, mandible $\times 15$.

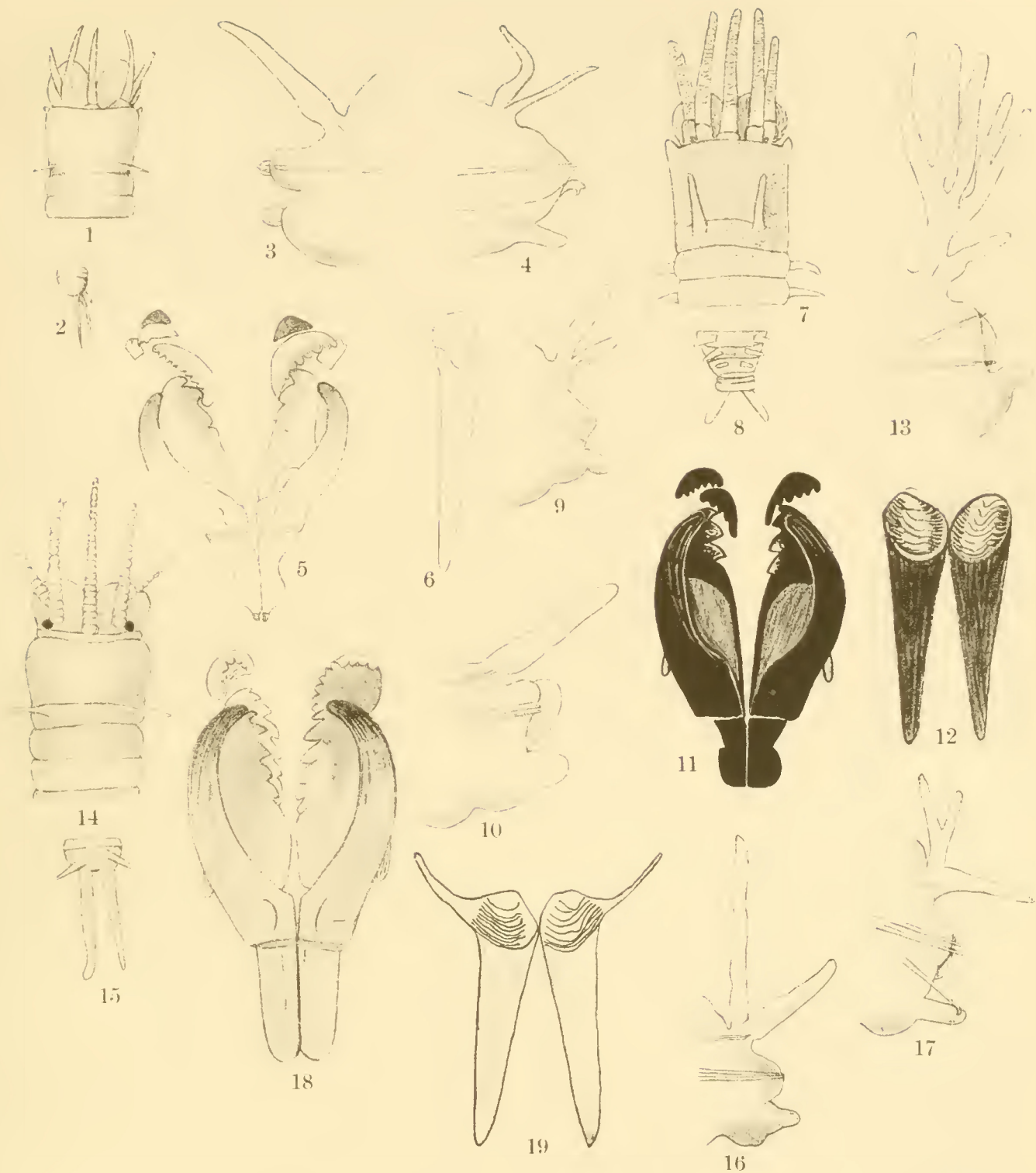
FIGURES 8 to 11, *Leodice viridis* Gray, variety *vernalis* Treadwell. Fig. 8, anterior end $\times 10$. Fig. 9, gilled parapodium $\times 20$. Fig. 10, ninth parapodium $\times 68$. Fig. 11, posterior parapodium $\times 55$.

FIGURES 12 to 17, *Leodice aphroditois* Pallas. Fig. 12, anterior end $\times 2.5$. Fig. 13, pygidium $\times 2.5$. Fig. 14, tenth parapodium $\times 15$. Fig. 15, posterior parapodium $\times 15$. Fig. 16, maxilla $\times 6.5$. Fig. 17, mandible $\times 6.5$.



FIGURES 1 to 7, *Leodice flava-punctata* Treadwell. Fig. 1, anterior end $\times 6$. Fig. 2, first parapodium $\times 48$. Fig. 3, eleventh parapodium $\times 48$. Fig. 4, posterior parapodium $\times 48$. Fig. 5, twenty-sixth parapodium $\times 23$. Fig. 6, mandible $\times 20$. Fig. 7, maxilla $\times 20$.

FIGURES 8 to 13, *Leodice suviensis* Treadwell. Fig. 8, anterior end $\times 6$. Fig. 9, gilled parapodium $\times 11$. Fig. 10, fiftieth parapodium $\times 8.5$. Fig. 11, posterior parapodium $\times 23$. Fig. 12, maxilla $\times 8$. Fig. 13, mandible $\times 8$.

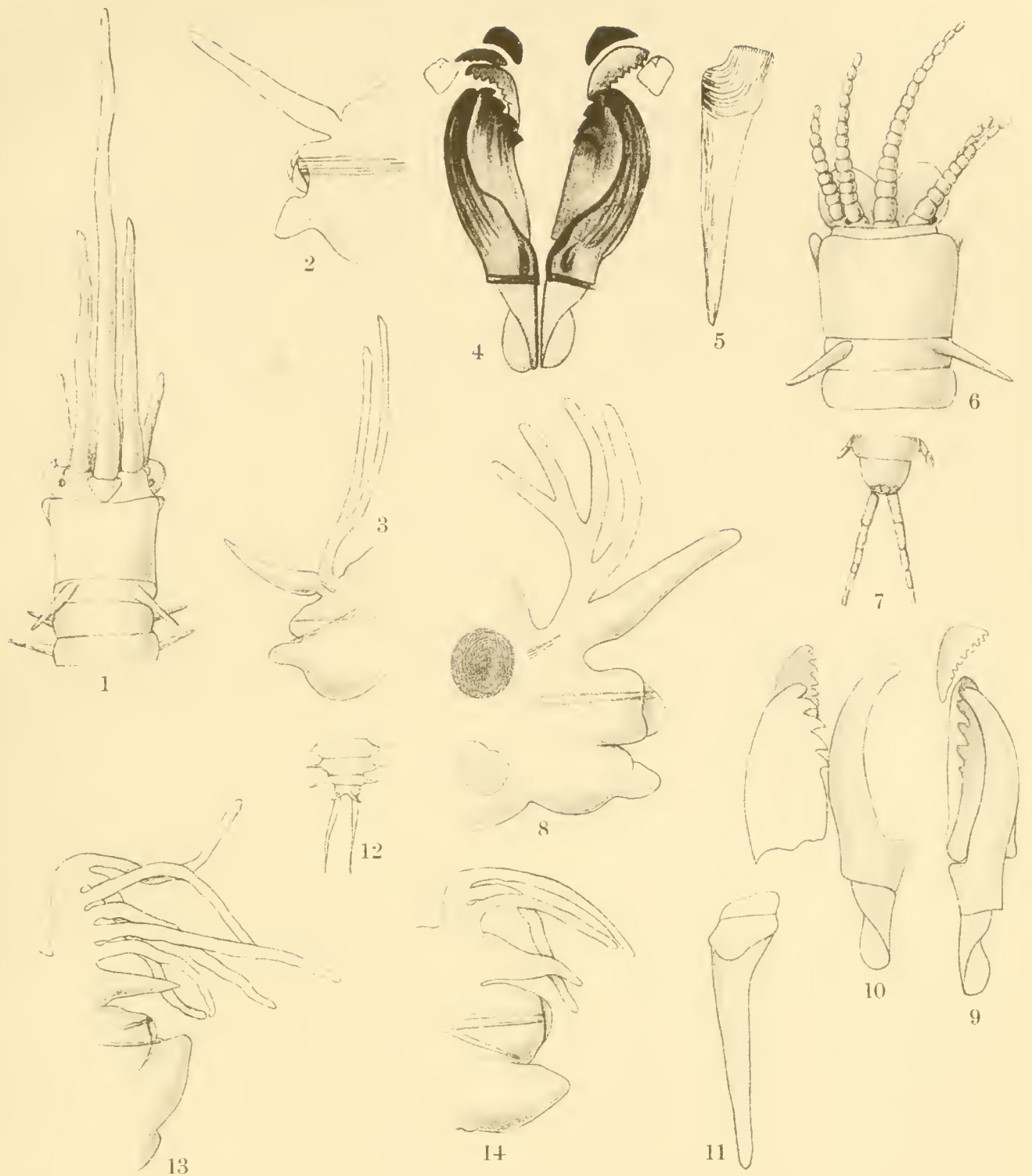


A. J. R. 15. La Balmaine

FIGURES 1 to 6, *Leodice tubicola* Treadwell. Fig. 1, anterior end $\times 7.5$. Fig. 2, pygidium $\times 7.5$.
 Fig. 3, tenth parapodium $\times 35$. Fig. 4, fiftieth parapodium $\times 35$. Fig. 5, maxilla $\times 23$.
 Fig. 6, mandible $\times 23$.

FIGURES 7 to 13, *Leodice aciculata* Treadwell. Fig. 7, anterior end $\times 4$. Fig. 8, pygidium $\times 4$.
 Fig. 9, posterior parapodium $\times 23$. Fig. 10, tenth parapodium $\times 23$. Fig. 11, maxilla $\times 8$.
 Fig. 12, mandible $\times 8$. Fig. 13, sixtieth parapodium $\times 23$.

FIGURES 14 to 19, *Leodice armillata* Treadwell. Fig. 14, anterior end $\times 13$. Fig. 15, pygidium $\times 14$.
 Fig. 16, tenth parapodium $\times 23$. Fig. 17, posterior parapodium $\times 32$. Fig. 18, maxilla $\times 23$.
 Fig. 19, mandible $\times 23$.



Astoria & LaBelle

FIGURES 1 to 5, *Leodice crassi-tentaculata* Treadwell. Fig. 1, anterior end $\times 7.5$. Fig. 2, tenth parapodium $\times 23$. Fig. 3, fiftieth parapodium $\times 17$. Fig. 4, maxilla $\times 15$. Fig. 5, mandible $\times 15$.

FIGURES 6 to 11, *Leodice bifirmi-cirrata* Treadwell. Fig. 6, anterior end $\times 4$. Fig. 7, pygidium $\times 4$. Fig. 8, tenth parapodium $\times 13$. Fig. 9, right half of maxilla $\times 9$. Fig. 10, left half of maxilla $\times 9$. Fig. 11, half of mandible $\times 9$.

FIGURES 12 to 14, *Marphysa californica* Moore. Fig. 12, pygidium $\times 7.5$. Fig. 13, one-hundredth parapodium $\times 40$. Fig. 14, forty-fifth parapodium $\times 40$.



A. H. J. & Co. Baltimore

FIGURES 1 to 7, *Leodice gracilicirrata* Treadwell. Fig. 1, anterior end $\times 7.5$. Fig. 2, pygidium $\times 7.5$. Fig. 3, tenth parapodium $\times 20$. Fig. 4, fiftieth parapodium $\times 13$. Fig. 5, posterior parapodium $\times 20$. Fig. 6, maxilla $\times 22$. Fig. 7, mandible $\times 22$.

FIGURES 8 to 12, *Marphysa simplex* Treadwell. Fig. 8, anterior end $\times 7$. Fig. 9, tenth parapodium $\times 23$. Fig. 10, forty-fifth parapodium $\times 23$. Fig. 11, posterior parapodium $\times 23$. Fig. 12, maxilla $\times 23$.

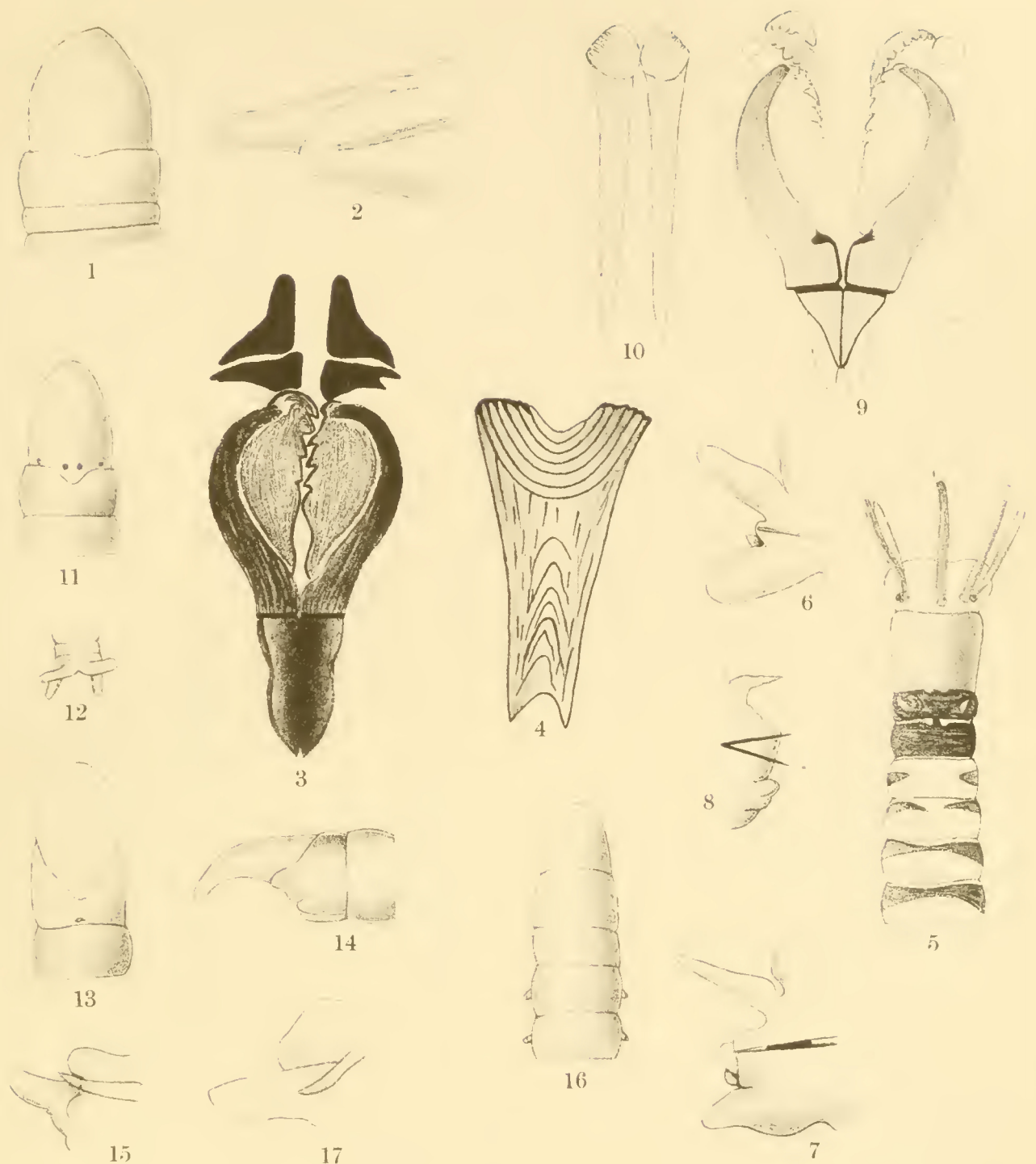


FIGURE 1, *Marphysa californica* Moore, anterior end $\times 7.5$.

FIGURES 2 to 6, *Paramarphysa teres*, Treadwell. Fig. 2, anterior end $\times 15$. Fig. 3, thirteenth parapodium $\times 185$. Fig. 4, posterior parapodium $\times 185$. Fig. 5, maxilla $\times 45$. Fig. 6, mandible $\times 45$.

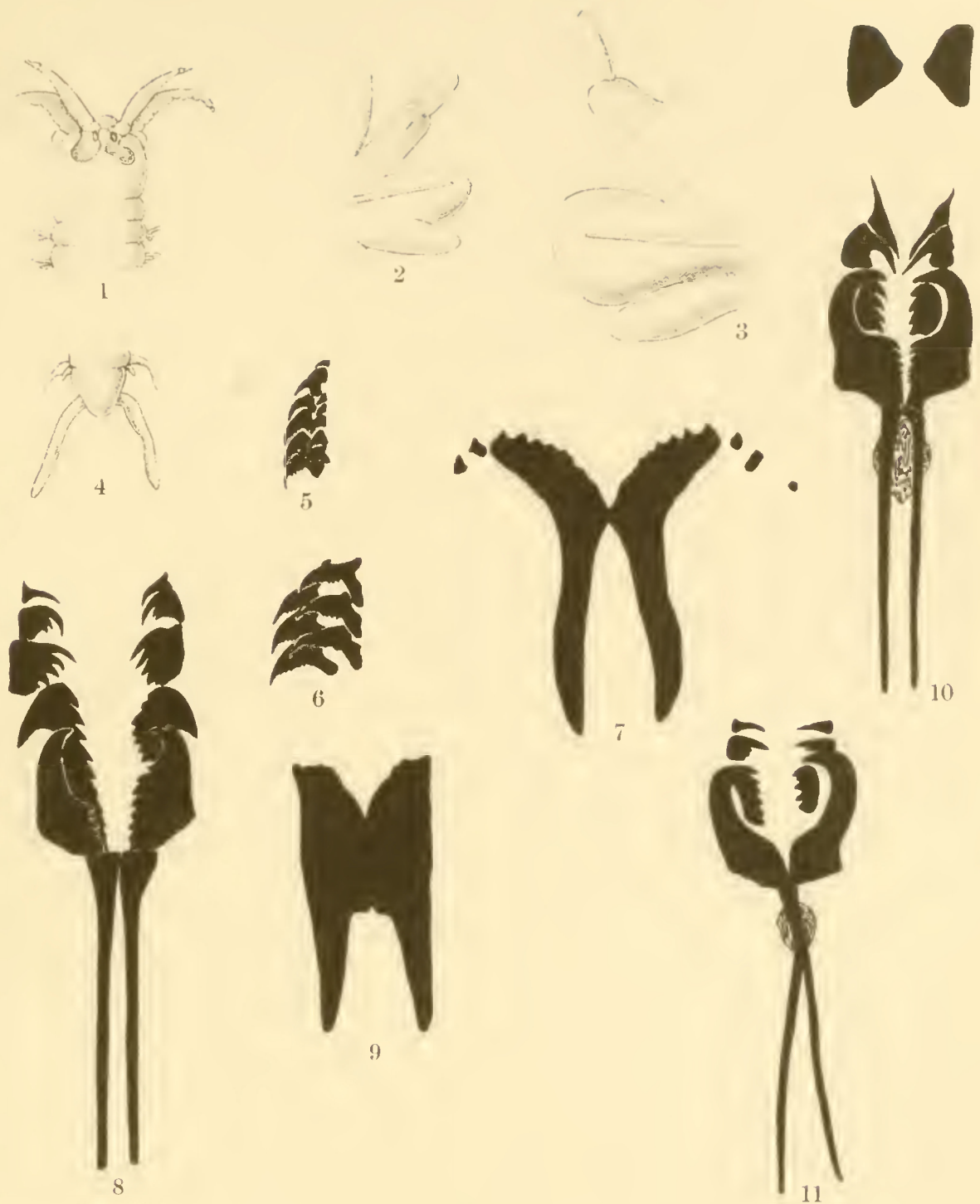
FIGURES 7 to 13, *Lysidice fusca* Treadwell. Fig. 7, anterior end $\times 13$. Fig. 8, pygidium $\times 13$. Fig. 9, first parapodium $\times 48$. Fig. 10, tenth parapodium $\times 48$. Fig. 11, posterior parapodium $\times 48$. Fig. 12, maxilla $\times 41$. Fig. 13, mandible $\times 20$.

FIGURES 14 to 17, *Lysidice parva* Treadwell. Fig. 14, anterior end $\times 23$. Fig. 15, parapodium $\times 100$. Fig. 16, maxilla $\times 68$. Fig. 17, mandible $\times 41$.



A. Hoehn & Er. Bahr, sculp.

- FIGURES 1 to 4. *Lumbrinereis japonica* v. Marenzeller. Fig. 1, anterior end $\times 10$. Fig. 2, ninety-eighth parapodium $\times 28$. Fig. 3, maxilla $\times 23$. Fig. 4, mandible $\times 35$.
- FIGURES 5 to 10, *Nicidion fusca-fasciata* Treadwell. Fig. 5, anterior end $\times 10$. Fig. 6, first parapodium $\times 62$. Fig. 7, tenth parapodium $\times 48$. Fig. 8, posterior parapodium $\times 48$. Fig. 9, maxilla $\times 48$. Fig. 10, mandible $\times 48$.
- FIGURES 11 and 12, *Arabella dubia* Treadwell. Fig. 11, anterior end $\times 20$. Fig. 12, pygidium $\times 23$.
- FIGURES 13 to 15, *Drilonereis lumbricus* Treadwell. Fig. 13, dorsal view of anterior end $\times 10$. Fig. 14, lateral view of anterior end $\times 10$. Fig. 15, parapodium $\times 22.5$.
- FIGURES 16 and 17, *Drilonereis paucidentata* Treadwell. Fig. 16, anterior end $\times 20.5$. Fig. 17, parapodium $\times 220$.



A. H. H. & L. B. B. B.

FIGURES 1 to 7, *Dorvillea australiensis* McIntosh. Fig. 1, anterior end $\times 6$. Fig. 2, first parapodium $\times 41$. Fig. 3, tenth parapodium $\times 41$. Fig. 4, pygidium $\times 20$. Fig. 5, anterior plates of the maxillary series $\times 41$. Fig. 6, median plates of the maxillary series $\times 41$. Fig. 7, mandible $\times 41$.

FIGURES 8 and 9, *Arabella dubia* Treadwell. Fig. 8, maxilla $\times 68$. Fig. 9, mandible $\times 68$.

FIGURE 10, maxilla of *Drilonercis lumbricus* Treadwell $\times 20$.

FIGURE 11, maxilla of *Drilonercis pancidentata*, Treadwell $\times 55$.

