







BOUND 1932.

SMITHSONIAN  
OCT 24 1988  
LIBRARIES





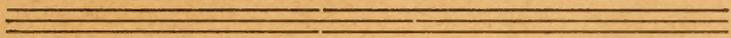
525

Section  
Marine Invertebrates  
Smithsonian Institution Library

787  
Smithsonian

42

CARDED 1923



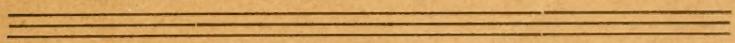
The Polychætous Annelids Dredged by the  
U.S.S. "Albatross" off the Coast of South-  
ern California in 1904. I. Syllidæ,  
Sphærodoridæ, Hesionidæ  
and Phyllodocidæ.

BY

J. PERCY MOORE.

*From the Proceedings of The Academy of Natural Sciences  
of Philadelphia, June, 1909.*

*Issued August 9, 1909.*





QL  
291  
A6 MB 1909.]  
1909  
11-1  
Inver

THE POLYCHÆTOUS ANNELIDS DREDGED BY THE U. S. S. "ALBATROSS" OFF  
THE COAST OF SOUTHERN CALIFORNIA IN 1904. / I. SYLLIDÆ,  
SPHÆRODORIDÆ, HESIONIDÆ AND PHYLLODOCIDÆ.

BY J. PERCY MOORE.

Until in 1904 the U. S. Bureau of Fisheries, the University of California, and Stanford University joined forces in initiating an investigation of the marine biology of California upon a comprehensive scale, most of the faunal work done on the invertebrates of that region had been limited to the littoral zone, and much of it had been of a local or desultory character.

Early in that year the Fisheries steamer "Albatross" was detailed to investigate the deeper waters off the coast of the southern half of the State. From March 1 to April 15 collections and physical observations were made at 139 dredging stations in the region south of Point Conception, chiefly in the vicinity of San Diego and among the Santa Catalina and Santa Barbara Islands. Between May 10 and June 15, 128 dredging stations were established in Monterey Bay, making 267 in all. The full data relating to these stations have been compiled and published as Fisheries Document No. 604, Washington, 1906.

Among the material gathered is a rich but rather indifferently preserved collection of Polychæta which was submitted to the writer for study, especially through the interest of Prof. Charles H. Gilbert, of Stanford University. Coming from the deeper waters, this collection admirably supplements the shore collections from the vicinity of San Diego and Monterey Bay contained in the Stanford University Museum and already reported upon in these PROCEEDINGS. It had been expected that the bulk of the collections would be made up of known shore forms, but the large number of undescribed species encountered in the families already studied has dispelled that anticipation. Types of new species are to be deposited in the National Museum, and sets of cotypes and duplicates, as far as possible, also in the cooperating Universities and this Academy.

SYLLIDÆ.

✓ *Syllis alternata* Moore.

This species is the most common syllid in the collection and occurs

at depths of from 33 fathoms to 1,400 fathoms and chiefly among the Santa Catalina and Santa Barbara Islands. The largest and best preserved specimens are 40–44 mm. long and have 125 to 137 segments, but some are only 12–20 mm. long. In some the eyes, and particularly the posterior pair, are enlarged until those on each side nearly meet. There are indications that this condition may be correlated with bathymetrical distribution, the approximation being most marked in the examples from the greatest depth and least in those from more shallow waters.

When contracted the notocirri exhibit a distinct thickening above the base, when extended they taper nearly uniformly from the base, but in all cases the alternation in length is obvious. Some examples have the anterior twenty or so segments each marked by a dusky band, not narrow and sharply defined as in *S. armillaris*, but broad and ill defined. The accessory tooth of the seta appendages is frequently much worn or nearly obsolete, causing the tips to appear simple. In no case do the appendages exhibit any tendency to unite with the stems, as in *Pionosyllis elongata* Johnson and other species of the *Synsyllis* group.

The chitinous lining of the pharynx terminates in a thickened, somewhat crenulated border, behind which is a circle of soft papillæ and dorsally a large, blunt, conical tooth. In the retracted state the tooth lies in somite III, the gizzard in XI–XXVII, the œsophageal loop in XVIII and the cæca in XVII and XVIII.

*S. californica* Kinberg may be this species, but no certainty can be reached from the brief diagnosis. The *Eusyllis tubifex* Gosse reported by Treadwell from near Monterey Bay is very probably this species. *S. violaceo-flava* Grube is another related species from the Philippines.

Stations 4,326, off Point La Jolla, near San Diego, March 8, 280 fathoms, green mud; 4,400, between San Diego and San Clemente Island, April 8, 500 fathoms, green mud; 4,420, off San Nicolas Island, April 12, 33 fathoms, fine gray sand; 4,427, off Santa Cruz Island, April 14, 447 fathoms, black mud and stones; 4,430, off Santa Cruz Island, April 14, 197 fathoms, black sand and pebbles; 4,574, off Cape Colnett, Lower California, October 8, 1,400 fathoms.

*Syllis* (*Ehlersia*) *heterochæta* sp. nov. Pl. XV, figs. 1–4.

Described from the type only, a small complete specimen 9 mm. long, with a width, in the region of the gizzard, of body of .4 mm. and between tips of parapodia of .7 mm. Segments 80.

Prostomium (Pl. XV, fig. 1) pentagonal, with very unequal sides, the posterior longest and nearly straight, the lateral shortest and

convex, the anterior meeting in a rounded apex; about twice as wide as long. Eyes three pairs, forming a triangular group on each side; the middle pair with distinct lenses and much the largest, but not more than one-ninth the width of the prostomium and situated about their diameter from its lateral border; the posterior also with lenses, directed dorso-caudad, about one-fourth the diameter of the middle pair and situated medio-caudad of them; the anterior<sup>1</sup> mere specks of pigment without lenses situated in line with the posterior pair and equally distant from the middle pair. Behind the posterior pair is a large black blotch on each side. Palps prominent, projecting straight forward, separate to the base, about one and one-half times as long as the prostomium, broad at the base where they equal one-half the width of the prostomium, thence diverging slightly and tapering to the rather slender, bluntly rounded tips. Median tentacle arising posterior to middle of prostomium between middle pair of eyes, lateral tentacles close to base of palps laterad of anterior eyes; both slender, little tapered, subequal, reaching about one-fifth of their length beyond palps, strongly moniliform except at base, with twenty to twenty-two joints.

Peristomium (Pl. XV, fig. 1) a short but distinct ring bearing two pairs of tentacular cirri similar to cephalic tentacles but with distinct ceratophores, similar to the cephalic tentacles; the dorsal equal to the latter and with twenty or twenty-one joints, the ventral two-thirds as long with fourteen or fifteen joints. Segments all distinct, short, uniannulate, slightly depressed, increasing in width to near the middle. Pygidium a broadly expanded, furrowed ring whose cirri have been lost.

Parapodia (Pl. XV, fig. 2) of a length generally about one-third the width of their segments. Neuropodia thick, little compressed and little tapered, divided distally into a low postsetal lip which curves over and encloses the ends of the acicula, and a slightly longer presetal lip, the supraacicular portion of which is a small, blunt, projecting lobe forming the dorso-distal angle of the neuropodium. Posteriorly this lobe is much reduced and the postsetal lip becomes longer and more pointed. Neurocirri nearly free from base of neuropodia; their cirrophores small and indistinct; styles slender, tapered, blunt, longer than neuropodium and with a swelling on the dorsal side above the base. Posteriorly they become more slender. Notocirri strongly moniliform and very distinctly jointed (though the joints become cylindrical rather than spheroidal or ellipsoidal) even to the caudal

<sup>1</sup> Omitted from the figure.

end; cirrophores short but generally distinct. Those on II and V are the longest, about one and one-half times the dorsal tentacular cirrus and exceeding the greatest width of the body; they have twenty-four to twenty-seven joints; III and IV are slightly longer than the dorsal of I and have nineteen to twenty-two segments. The remaining notocirri are more or less regularly alternately longer and shorter even to the caudal end, the longer in general equalling about three-fourths the width of their segments and the shorter about three-fifths their width. Those in the middle of the body have about sixteen or seventeen (fig. 2) and eleven to thirteen (fig. 2*a*) joints respectively.

Acicula (Pl. XV, fig. 2) of anterior parapodia in a row of six or seven, the ends of which appear in a groove at the dorso-distal angle of the neuropodia. They are pale yellow, rather stout, tapered and end in blunt points, slightly knobbed and variously slightly bent or even hooked; middle neuropodia have three or four and posterior only two.

Setæ in rough, irregular subacicular fascicles of about seven rows of three or four each. They are colorless with rather long, curved shafts slightly enlarged at the distal end (Pl. XV, fig. 3) to form simple, oblique articulations roughened by a few minute points. Appendages of all except the setæ of the dorsal row comparatively short (fig. 3), two to four times the length of the oblique end of shaft, scarcely curved and not hooked at the tip, which is a simple point below which is sometimes an obscure accessory tooth; margin strongly toothed. Setæ of dorsal series and sometimes one or two of the next row more slender (Pl. XV, fig. 4) with very long, slender, straight appendages usually about four times the longest of the lower rows, with blunt ends (fig. 4*b*) and finer marginal denticulation (fig. 4*a*). Such setæ continue to the caudal end and are similar on all segments. Many of the posterior parapodia also bear a single stout, nearly straight, spine-like simple seta, as long as the shafts of the others, in the dorsal part of the bundle; it is probably to be regarded as a prolonged aciculum.

Proboscis (Pl. XV, fig. 1) protruded about one-third of its length beyond palps, broad cylindroid, diameter exceeding prostomium, cuticle thick, smooth and entire at orifice; dorsal tooth stout and blunt, probably from wear; behind this is a circular fold bearing eight (or nine?) distant, soft, rounded papillæ. Gizzard reaches from IX to XXI and has thirty-seven rings. Colorless in alcohol.

The only specimen was taken at Station 4,423, off San Nicolas Island, April 13, 339 fathoms, gray sand, black pebbles, shells.

*Syllis (Ehlersia) anops* Ehlers, from the Straits of Magellan, is a much more elongated species with the anterior and posterior dorsal

setæ appendages differing in form. *S. singulisētis* Grube, from the Philippines, also belongs to the subgenus *Ehlersia*, but has only four eyes.

***Pionosyllis typica*** sp. nov. Pl. XV, figs. 5-7.

Form moderately slender, widest in the region of the gizzard, from which it tapers regularly to the caudal end. The well-extended and complete type has 96 segments and is 31 mm. long and 1.2 mm. in diameter at XXV.

Prostomium small, somewhat sunken into peristomium, about one and two-thirds times as wide as long, the greatest width posterior, the sides and front broadly and regularly rounded. Eyes two pairs, dark brown, small, anterior pair close to lateral border and about midway of length of prostomium; posterior pair little more than one-half diameter of anterior and slightly behind and within them. A pair of faint ridges run from the posterior eyes to the posterior border of the prostomium, nearly completing with the eyes a V-shaped figure.

Palps completely separated to base, bent somewhat ventrad, broadly triangular with rounded angles, about as long as prostomium and basal width about two-thirds length. Median tentacle arising between posterior eyes, about one and one-fourth times as long as prostomium and palps, slender and slightly tapered, divided into about twenty-four articles, distinct distally but obscure toward the base, not strongly moniliform. Lateral tentacles similar, arising from a slight depression just anterior to anterior eyes, nearly three-fourths as long as median and reaching nearly as far, divided into nineteen or twenty joints. Mouth rather large with prominent crenulated lips.

Peristomium short and partly crowded beneath prostomium, but visible for entire width of dorsum. Tentacular cirri similar to tentacles, the dorsal slightly exceeding median tentacle in length, with about twenty-six joints; the ventral somewhat shorter, with twenty joints. Body segments nearly terete, remarkably regular but separated by shallow, inconspicuous furrows; except for a few short anterior ones they are half as long as wide or more. From the maximum width at the end of the first fourth they taper regularly to the pygidium, which is a small ring and bears one of a pair of cirri as long as the last nine segments and resembling the posterior neurocirri in being scarcely articulated.

Parapodia (Pl. XV, fig. 5) situated at ventral level of body, well separated throughout, slender, rather conspicuous in ventral view but largely concealed from the dorsum. The neuropodia are slightly compressed and taper slightly to the bluntly rounded and rather abruptly contracted end, which is divided into two small lips separated by a

deep cleft, from which the setæ arise and into which the tips of the acicula enter. Neurocirri arise obliquely from basal half of neuropodium, cylindrical or slightly tapered to blunt tips reaching well beyond end of neuropodium, especially on anterior segments. Notocirri arise from rather prominent but indistinct cirrophores immediately above base of neuropodia and all at same level. Styles all approximately of one length, about two-thirds width of body, the anterior and alternate ones scarcely longer than the others, but the alternate ones carried erect. Anterior notocirri are somewhat articulated, similarly to the tentacles, but this character becomes more obscure toward the base and on more caudal cirri; most of them are rather stout, rather quickly tapered and more or less transversely wrinkled, rather than jointed. Near the caudal end they become much reduced in size.

Acicula number from five or six anteriorly to two or three posteriorly; pale yellow, tapered, the ends blunt and very slightly knobbed (Pl. XV, fig. 6).

Setæ generally about twelve or fifteen, in oblique, spreading, fan-shaped tufts; colorless, the stems long, slender, curved, the ends (Pl. XV, fig. 7) slightly enlarged, oblique, with four or five just perceptible teeth on the convexity of the front face and a slight shoulder behind. Appendages moderately long, varying from three times diameter of distal end of stem in ventral to five times its diameter in dorsal setæ, except at the posterior end, where all are shorter. They (fig. 7) are of peculiar form with very oblique base, beyond which the width remains nearly uniform; distally abruptly truncated and ending in a stout oblique spur, above which is a delicate curved tooth often nearly worn away; a very fine marginal fringe ending in a more prominent tuft of hairs.

This species stands closer to the type species than any of the three already described from the Pacific coast of North America. Johnson's species, *P. longata*, appears to be more properly referred to *Synsyllis* Verrill. Much confusion in the usage of the genus exists among authors.

Station 4,430, off Santa Cruz Island, April 14, 197 fathoms, black sand and pebbles. Two specimens.

***Pionosyllis gigantea* Moore.**

About forty anterior segments of a specimen of this large species from an unknown locality. As noted above it is doubtful if this species really belongs to *Pionosyllis*.

***Trypanosyllis intermedia* Moore.**

Owing to the deficiencies of the type the original description of this species is incomplete and may be added to here.

A complete specimen with 230 much contracted segments is 60 mm. long, with a maximum body width of 3.2 mm. at XXX. Prostomium subquadrate, slightly wider than long; with a deep postero-median dorsal incision and furrow. Palps completely separated to base, slightly longer than prostomium, somewhat divided into basal and terminal portions; the former somewhat swollen and the latter slender and abruptly bent ventrad. Median tentacle five or six times length of prostomium and composed of fifty-six very short joints; lateral tentacles about one-half as long, with thirty-five to thirty-eight joints. Eyes on each side nearly or quite coalesced. Tentacular cirri arising beneath prostomium, the dorsal nearly equal to median tentacle, with fifty joints; the ventral slightly shorter than lateral tentacle, with about thirty-five joints. Notocirrus of II the longest, about one-third more than the median tentacle, with sixty-four to seventy joints; that of III scarcely shorter and of IV two-thirds as long as II. Following this the notocirrophores of odd-numbered segments are at a slightly higher level and bear slender styles as long as the width of their segments and with as many as sixty or seventy very short joints; those of even-numbered segments have styles about two-thirds as long. Pygidium a tapered ring bearing a pair of slender cirri as long as its diameter and with twenty-five to thirty joints.

A pharynx dissected had the circle of teeth in somite VIII; there are eighteen to twenty slender compressed soft papillæ and apparently as many teeth, but the latter are so much broken that this cannot be determined with certainty. Gizzard in XVIII to XXIX with thirty-five distinct and seven or eight indistinct rings.

The anterior thirty-five or forty segments are reddish-brown above with pale intersegmental lines.

One specimen each from stations 4,417, off Santa Barbara Island, April 12, 29 fathoms, fine yellow sand, rock and coralline; and 4,420, off San Nicolas Island, April 12, 291 fathoms, gray mud and rock.

*Odontosyllis phosphorea* sp. nov. Pl. XV, figs. 8-10.

Epitokous, sexually mature examples, unfortunately much distorted and broken. The type and largest specimen lacks some of the caudal segments and measures 23 mm. long, 2.5 mm. in maximum width between tips of parapodia and 1.5 mm. in width of body only. The anterior region of twenty-three segments is 4.6 mm. long, the middle of fifty-one segments provided with swimming notopodial setæ is 17 mm., and only four segments of the posterior region remain, making seventy-eight segments in all. A smaller, more extended and

posteriorly complete cotype is 18 mm. long, the anterior region being 5 mm. and the posterior 5.5 mm. Segments  $23 + 26 + 31 = 80$ .

Form rather short and stout, widest at the middle, the ventral surface flat, the dorsal more or less arched, most so in the anterior region, which is nearly as high as wide; the middle and posterior regions depressed.

Prostomium small, short, bent downward, subprismatic with rounded angles, about two-thirds as long as wide and deeper than long, the front abruptly vertical, somewhat excavated for the tentacles. Eyes two pairs, moderately large with large lenses, brown, occupying sides of prostomium, the anterior pair directed chiefly forward, the posterior upward. Though themselves distinct they are enveloped in an irregular curved, broad band of black pigment which occupies most of the lateral and posterior dorsal part of the prostomium. The three tentacles arise close together, the median more dorsal, from a depression in the middle of the frontal face, small, slender, unjointed, subequal, somewhat exceeding length of prostomium. Palpi directed ventrad, thick, fleshy separated knobs.

Peristomium achætous, largely concealed by prostomium, only a very short dorsal ring and larger lateral prominences showing. Two pairs of tentacular cirri, unjointed but transversely wrinkled, the ventral about as long as width of prostomium, the dorsal about one and one-half times as long. The nuchal fold arises from the dorsum of II and is a prominent, semicircular, deeply pigmented, free, membranous flap, with a basal width equal to one-half the segment and covering the posterior part of the prostomium as far as the anterior eyes. Somite II and remaining setigerous segments are uniannular and well marked by irregular furrows, differing in the several regions as indicated above. Pygidium a small, low, dome-shaped ring having a pair of short, thick fusiform cirri.

Parapodia, owing partly to the contraction of the specimens, very little prominent, those of the anterior and posterior regions uniramous (Pl. XV, fig. 8), of the middle region biramous (fig. 9). Neuropodia short, stout, with blunt ends, terminating in two short, thick, rounded lips, of which the postsetal is usually slightly the longer; both terminating dorsally at the acicula, which lie slightly below the dorsal border of the neuropodia. In the middle region the neuropodia (Pl. XV, fig. 9) are somewhat longer than in the anterior region, but otherwise similar. The notopodia are low, flattened protuberances pushed out anterior to the seta tuft into a pointed, conical acicular process. In the posterior region the parapodia are neuropodial only and are gradually

reduced in size. Neurocirri arise from beneath the base and rather on the posterior face of the neuropodia, and have somewhat swollen bases and a small, slightly distinct distal piece reaching about as far as the end of the neuropodium. They are similar on all parapodia. Notocirri arising from low swellings (but not distinct cirrophores) on the dorsum well above the parapodia. Styles rather long, slender and unjointed, but more or less wrinkled. The first (on II) is longer than the others, about twice the dorsal peristomial cirrus and about one and one-third the width of the segment; that of III is less than two-fifths, of IV about three-fifths and of V about seven-eighths of that of II; remaining notocirri are alternately longer and shorter, those in the middle region being respectively about equal to three-fifths and one-third the width of their segments.

Neuropodial acicula generally two in anterior, three in middle region, moderately stout, straight, tapered, the ends slightly knobbed. Notopodial aciculum single, slender, gently tapered and curved, the distal end slightly knobbed and often bent at the end. Neuropodial setæ entirely subacicular, in dense fascicles of several ranks, rather numerous, usually ten or eleven ranks of three or four each. They are colorless, rather stout, with curved stems becoming thicker distally and ending obliquely in a blunt, slightly roughened point (Pl. XV, fig. 10). Appendages short broad blades varying in length only from once to twice the width of the distal end of the stem, the longest occurring in anterior parapodia and the ventral part of the bundles, terminating in a prominent hook, well below which is a stout spur. In the posterior region a solitary slender, curved simple seta also occurs in each fascicle, but has not been detected elsewhere.

A dissected proboscis exhibits the characteristic thick bow and fold of the chitinous rim, but the number and character of the teeth is not evident. The gizzard of the same specimen has sixty-seven annulations.

Color pale yellow with a conspicuous spot on the prostomium, the nuchal fold and narrow intersegmental transverse lines black; in the middle and posterior regions every fourth one of the latter is much wider and denser, and at these deeply pigmented furrows the frequent fractures of the body-walls always occur; appendages colorless; eyes brown.

The label reads: "Phosphorescent annelids caught at surface, Avalon Bay, Catalina Island, evening, April 11, 1904, Albatross." Professor William S. Ritter writes that a phosphorescent annelid swarms at the surface of San Diego Bay. Doubtless this is the species here described. It is a frequent characteristic of species of this genus to be luminiferous.

Syllid gen. et sp.?

A small syllid, probably a true *Syllis* or *Eusyllis*, from an unknown station, cannot be identified, and its characters are put on record for the use of a future describer.

Length 11 mm., segments 72.

Prostomium nearly twice as wide as long, rounded laterally, slightly convex anteriorly and nearly straight posteriorly. Eyes very imperfect (probably abnormal), represented by a minute speck of pigment close to the base of the palp on one side, and a larger but still very small eye with a lens on the other side. No trace of tentacles remains, but it seems very improbable that they should be normally absent in a syllid of this type. Palps projecting forward and curved downward pistally, free, broad, subelliptical, flattened, their length nearly equal to width of prostomium, and their combined width exceeding that of prostomium.

Peristomium very short above, swelling to a broad lip at the sides and below. An incomplete, strongly moniliform, dorsal tentacular cirrus with seventeen joints remaining exists on one side, but the others are lost.

Body strongly arched anteriorly, but more flattened behind. First twelve segments very short and separated by deep furrows, the others becoming longer until in the middle region they are one-fourth as long as wide. Pygidium a very short ring with a slight median lobe, bearing a pair of very long, slender, moniliform cirri as long as the last twelve segments and consisting of more than forty joints; in addition there is a very minute unjointed median cirrus.

Parapodia small, the neuropodia cylindroid, little compressed, truncate, the distal end divided into nearly equal, short, thick, rounded presetal and postsetal lips. Neurocirri rather slender, tapered, unjointed, blunt, reaching slightly beyond end of neurocirri. Notocirri arising from prominent swellings and small cirrophores well above neuropodia; very long, flexible, very strongly moniliform, alternately longer (on odd-numbered segments) and shorter (even-numbered segments). At the anterior end mostly lost; on middle segments the short ones exceed the width of their segments and have thirty-five or forty joints, the long ones are twice the width of their segments and have fifty to fifty-five joints. Even near the caudal end they are not much shorter, the longest having forty or more joints and the short ones twenty-five or thirty.

Acicula three or four in a row ending at the dorso-lateral angle, pale yellow, tapered to blunt, slightly knobbed tips. Setæ few, seldom

exceeding ten or twelve and oftener fewer, colorless, transparent, with rather stout, curved stems, terminating in enlarged, oblique ends which appear to be quite smooth. Appendages usually about twice as long as the oblique end of stem, with straight, simple points and strongly developed marginal fringe. Parapodia of the last thirty segments at least bear a single simple spine which projects prominently from the dorsal part of the bundle. It has about twice the thickness of the compound setæ, is very slightly curved and ends in a blunt point. The most posterior project very prominently to quite the length of the compound setæ; further forward they are less conspicuous, and anterior to XL none can be detected.

Proboscis retracted and on account of the opacity and pigmentation of the anterior end difficult to see. It appears, however, to have a smooth margin. Gizzard in XV to XXII, with thirty-four rings.

Color anteriorly pale brown owing to numerous granules in the integument, passing through yellow into a nearly colorless posterior end.

**Autolytus** sp.?

A single example of a stock regenerating behind and incomplete from the loss of many of the appendages. Length 16 mm., width between tips of parapodia 1.4 mm.; segments 85 with a narrow regenerating bud of 13 segments.

Prostomium broadly ellipsoid, anterior and posterior borders nearly straight, sides prominently convex; with the palps as seen from above the outline nearly circular. Eyes two pairs with lenses, the anterior nearly black, diameter about one-fifth width of prostomium, located midway of the length of prostomium at its lateral borders, looking outward and a little downward and forward; posterior brown, about one-half diameter of anterior, with which they are in contact on the dorso-postero-median side. Palps completely coalesced to tips, but having a depressed median line and barely perceptible distal emargination. Median tentacle lost, but one lateral tentacle present, arising just above base of palp nearly in line with anterior eye, coarse, little tapered, its length six or seven times prostomium and palps, but much twisted and probably incomplete.

Peristomium bearing large cirrophores, but only the ventral style of one side remaining, this being one-half the length of the lateral tentacle. Anterior segments imperfectly separated, the furrows shallow; width increasing for about twenty segments to the gizzard region and then nearly uniform to the end. A wedge-shaped median elevation with apex at the peristomium extends over the first six or

seven segments, and is bounded by the divergent epaulettes which extend caudad from the peristomium and have pigmented borders. The regenerating region is quite small, barely a mm. in length and about one-fourth that in width, and ends in an unsegmented blunt pygidium without cirri.

Parapodia, as usual in the genus, short, thick, ventral in position, lacking free neurocirri which become coalesced with the neuropodia to form opaque ventral swellings; neuropodia terminating in short, thick, presetal and postsetal lips. Notocirri with large cirrophores, often as large as the neuropodia; styles unjointed, coarse and similar to the tentacle, very easily detached and many missing. That of II very long, about twice the lateral tentacle and reaching to about XX; that of III about one-half as long; the others much shorter, the longest about one-half III or about width of body.

Acicula four (on one parapodium studied), tapered to blunt points. Setæ forming rather dense tufts, colorless, the shafts rather stout, strongly curved, distally enlarged and near the articulation denticulated on both faces. Appendages little longer than oblique end of shaft, triangular with bidentate ends, the anterior tooth larger and somewhat hooked.

No teeth visible at end of retracted proboscis, œsophagus scarcely looped; gizzard in XX-XXVIII, apparently about thirty-three rings. No color.

The single specimen comes from an unknown station.

#### SPHÆRODORIDÆ.

Although at least five generic names have been applied to the few known species of this very small family, it seems that the forms possessing compound setæ still lack proper generic designation. Indeed, if the synonymies published by European authors be correct, all of these names are based upon a single type species. As each was originally proposed for a single species, there is no difficulty about fixing the types. Three names were proposed in 1843: *Ephesia* Rathke for *E. gracilis* Rathke (n. sp.), *Sphærodonum* Oersted for *S. flavum* Oersted (n. sp.) and *Bebryce* Johnston for *P. peripatus* Johnston (n. sp.). *Ephesia* was previously used by Hübner in 1816 for a genus of Lepidoptera, and *Bebryce* is preoccupied by *Bebryce* Philippi, 1842. Nothing in the descriptions of the types serves to differentiate them; they all certainly have simple setæ and lack spherical organs other than those directly related to the parapodia. Two years later Johnston, discovering the earlier use of *Bebryce*, substituted *Pollicita*, but admits the prob-

able identity of his type species with *Sphærodorum flavum* Oersted. Perrier in 1897 proposed *Hypephesia* for species with simple setæ, naming *H. gracilis* as the type.

Levinsen employs *Ephesia* to include both typical species with simple setæ like *E. gracilis* Rathke and forms with compound setæ like *E. peripatus* Claparède (non Johnston), while *Sphærodorum* is retained for those species which bear several series of spherical appendages with granular contents and which have the setæ compound, like *S. claparedii* Greeff. St. Joseph, on the other hand, prefers to separate the genera on the basis of setæ characters, ranging under *Ephesia* species with simple setæ and under *Sphærodorum* those with the setæ compound. Finally Perrier recognizes the three generic types apparent in the family, retains Levinsen's application of *Sphærodorum* but divides his *Ephesia*, unfortunately applying that name to the *E. peripatus* group and giving a new name (*Hypephesia*) to the typical *E. gracilis* with simple setæ.

It is evident, therefore, that *Sphærodorum* is the proper name for the papillated forms with simple setæ only, and, so far as I am aware, no distinct tenable generic names are in existence for the two types with compound setæ.

The present collection includes a species of each of the three types known in the family, but all are provisionally placed in the genus *Sphærodorum*, a proceeding that may be justified because the known number of species is so small that no confusion will result from placing all in a single genus, because increased knowledge of the species of the family may make known forms possessing intermediate characters, and because the relationships of the Sphærodoridæ have been so variously conceived that it is possible that other generic names have been overlooked.

***Sphærodorum papillifer*** sp. nov. Pl. XV, figs. 11, 12.

Moderately slender, tapering both ways, the greatest width nearer the anterior end, subterete, but somewhat depressed and flattened below. Length of type 30 mm.; maximum diameter at end of anterior two-fifths 1 mm.; segments 102. Other specimens one or two millimeters shorter.

Anterior end blunt, the prostomium and peristomium retracted and difficult to distinguish, the former a very short, simple, slightly domed lobe studded with papillæ and without definite appendages, though three papillæ longer than the others may represent the tentacles and a pair of mammilliform papillæ the palps. Peristomium a simple, not clearly differentiated ring surrounding the mouth and bearing a pair

of small globoid cirri. On the dorsum is a <-shaped group of conspicuous black eye-spots which extend on to somite II. Typically there seem to be two pairs, but frequently there is an additional pair of spots or a median spot anteriorly.

Segments short and uniannular or slightly and irregularly annulated, mobile and irregularly contracted in the different regions; posteriorly becoming very small and tapering into a minute pygidium which bear a pair of spherical cirri with small apical papillæ and in addition a minute median cirrus or papilla. Surface, particularly toward the ends of the body, bearing numerous small, pointed or somewhat clavate retractile papillæ which are evidently of a sensory nature and become larger in the neighborhood of the parapodia.

Parapodia (Pl. XV, fig. 11) rather inconspicuous, lateral, probably uniramous. They consist of a slender, conical setigerous neuropodium roughened with small, conical, sensory papillæ becoming longer towards its distal end, which terminates in an especially prominent one or postsetal lobe. A much stouter process arising from the postero-ventral region of the neuropodium, having nearly the structure of the sensory papillæ, is undoubtedly the neurocirrus. Quite distinct from and well dorsad of the neuropodium is a spherical prominence (notopodium?) bearing on the middle of the distal face a small clavate cirrus. The spherical body is largest and most conspicuous on middle segments, but the distal cirrus is larger, both relatively and absolutely, at the ends. These organs are enveloped in a thick cuticle and the interior is filled with a snarl of slender, elongated bodies and opaque brownish granules, giving to the entire organ its characteristic opacity. A short distance farther dorsad is a clavate papillæ similar to that borne by the spherical body but more slender and elongated, especially on middle segments.

Neuropodial aciculum single—a rather stout, yellowish, tapered spine ending in a simple, blunt, somewhat projecting point. Setæ few, about four to six, projecting unequal distances in an irregular fascicle in each neuropodium (fig. 11). All are simple, colorless, rather stout, the shafts straight or nearly so, the ends expanded into a blade-like extremity with a knife-like edge rising into a slightly curved point and passing at the base into a slightly differentiated lateral spur. They exhibit little variety in shape or proportions (Pl. XV, fig. 12).

Proboscis unknown. Color nearly uniform pale yellow, faded, the eye-spots deep brown.

Six specimens from station 4,400, off San Diego, April 8, 500 fathoms green mud.

One is a female filled with large eggs distinctly visible to the naked eye; the others, including the type, appear to be males.

**Sphærodorum brevicapitis** sp. nov. Pl. XV, figs. 13, 14.

Although considerably larger this species closely resembles *S. papillifer* in general appearance. The type and only specimen, much contracted and distorted, is 39 mm. long, with a maximum diameter without parapodia of 1.6 mm., and has 96 segments.

Owing to the partial protrusion of the proboscis as a soft bulbous structure the prostomium is crowded dorsad. It appears as a very slight, scarcely distinguishable lobe, bearing scattered papillæ, of which five, though still small, are larger than the others; three of these are very close together near the anterior margin of the lip; the others are separated by a considerable interval on each side.

Peristomium likewise indistinct—a short achætous ring bearing a minute mammilliform papilla on each side. A pair of rather large, widely separated pigment spots, the remains of a pair of eyes, lies partly on this segment but chiefly on III. Owing to the condition of the specimen little can be determined about the normal appearance of the segments. The cutaneous papillæ, however, are less numerous and smaller than in *S. papillifer*. They are scattered fairly uniformly over the surface, becoming more numerous on the parapodia. Pygidium a minute ring bearing a pair of low, broad, mammilliform papillæ, besides at least two small, simple papillæ.

Parapodia (Pl. XV, fig. 13) in general similar to those of *S. papillifer*, but the parts more widely separated and the neuropodia more slender and cylindrical with a conical apex, rather than simply conical, and ending in a small postacicular lobe. Neurocirri small, subconical processes arising from the posterior ventral side of the neuropodia just at the base of the terminal cone. Spherical organ prominent, with a thinner cuticle than in *S. papillifer*, and the papilla borne on the ventral side of the base instead of on the outer surface. Dorsal papilla (notocirrus) well above spherical organ, small, claviform, with a widened base.

Aciculum single, rather more slender than that of *S. papillifer*, but similar in form, colorless, the blunt-pointed tip projecting freely. Setæ in irregular fascicles of usually eight or nine, rather prominent, all compound or semi-compound, becoming widened and flattened distally and then tapering into a hooked tip or appendage which is articulated to the stem by an oblique joint, the absence of which would leave these setæ very similar to those of *S. papillifer* (Pl. XV, fig. 14).

Proboscis—see above. Color slightly yellowish; opaque from presence of sperm-balls with which cœlom is packed.

. Type only, from station 4,395, off Santa Catalina Islands, March 31, 2,045 fathoms, blue-gray mud.

**Sphærodorum sphærulifer** sp. nov.

Fragment of caudal end of a species related to *S. clapedii* Greeff, but with the large spherical bodies more numerous. It is dark brown and very opaque. Each segment bears on the dorsum two or three pairs of large, and alternating with them smaller, spheroidal bodies, all partially united at their bases into a somewhat irregular transverse ridge. The smaller numbers are at the posterior end, and they increase regularly as far as the piece extends to the middle segments. Several similar but smaller bodies occur on the venter. Neuropodia generally similar to those of *S. brevicapitis*, but the very extensile neurocirri and postacicular lobes are much larger, a papilla appears to be absent from the notopodial organ and the first (a smaller one) of the transverse series of dorsal appendages may be the notocirrus of each segment. Setæ compound, similar to those of *S. brevicapitis*, but with the joint more distinct and the appendage somewhat longer.

The single specimen, included among some invertebrates presented to the Academy by Professor Harold Heath, was taken from a deep-sea fish-line in Monterey Bay on July 16, 1902.

**HESIONIDÆ.**

**Podarke pugettensis** Johnson.

About a dozen specimens with up to fifty-eight segments and except for the eyes devoid of pigment. One is regenerating the caudal end. Many have the proboscis, which has not been described, protruded. It measures about 1.5 mm. long and half as wide, the basal two-thirds swollen, bulbous and smooth, the distal portion subcylindrical or truncated conical and more or less compressed; terminal orifice a vertical slit surrounded by eight or ten faintly marked small papillæ.

The first mention of this species in literature is under the name of *Ophiodromus* by Harrington and Griffin as a parasite on *Asterias* in Puget Sound.

San Diego Bay, Beacon No. 3 Shoal, March 1, 1904.

**PHYLLODOCIDÆ.**

**Phyllodoce mucosa** Oersted.

This species, already recorded from the North Pacific, appears to be common off southern California. Most of the specimens are well

preserved and agree closely with typical examples of the species taken in the North Atlantic at Labrador and Greenland, as well as with the figures of Malmgren and other European authors. The only apparent difference is that the Pacific examples may have one or two more papillæ in some of the rows on the proboscis, most of them having 11 or 12 in the upper and lower and 13 or 14 or rarely 15 in the middle rows. None shows any trace of a median dorsal series, but the other papillæ are prominent and generally have a conspicuous brown spot on the posterior face. The form of the prostomium is very changeable and may be pyramidal, ovate or deeply cordate, but is always more or less emarginate posteriorly. The nuchal papilla is minute and inconspicuous. Several specimens are regenerating lost caudal ends and one is filled with eggs.

Seven specimens from station 4,399, off San Diego, April 7, 245 fathoms, fine gray sand and rock; and one from each of the following: 4,445, Monterey Bay, May 11, 66 fathoms, green mud; 4,476, same, May 16, 39 fathoms, soft green mud; 4,482, same, May 17, 43 fathoms, soft green mud; 4,485, same, 108 fathoms, soft green mud and sand; 4,519, same, May 26, 35 fathoms, hard gray sand; 4,548, same, June 7, 46 fathoms, coarse sand, shells and rock.

***Phyllodoce medipapillata* Moore.**

The median dorsal series of proboscoidal papillæ is always well developed and quite as conspicuous as the others. Besides this character this species is distinguished from the related *P. mucosa* by having the setæ appendages much shorter and the notocirri ovate-lanceolate instead of truncated as in that species. The large specimen is just 100 mm. long with 201 segments.

A single example was collected at each of the following stations: 4,420, off San Nicolas Island, April 12, 33 fathoms, fine gray sand; 4,460, Monterey Bay, May 12, 55 fathoms, green mud, gravel; 4,558, Monterey Bay, June 9, 40 fathoms, rock.

***Phyllodoce ferruginea* sp. nov. Pl. XV, figs. 15-18.**

Two complete specimens of nearly equal size. The type measures 46 mm. long, .7 mm. in maximum width of body and 1.2 mm. between tips of parapodia; 148 segments. Very slender, nearly linear, widest about end of anterior third, somewhat depressed.

Prostomium (Pl. XV, fig. 15) regularly elliptical, about five-sixths as wide as long, slightly depressed, slightly truncated at both ends and with a very slight posterior median emargination, strongly convex above. Eyes one pair, brown, very large with prominent lenses,

their diameter nearly one-third width of prostomium, situated just posterior to middle of length close to posterior borders of prostomium and looking dorso-laterad. Frontal tentacles arising by restricted bases, widely separated on antero-lateral borders of prostomium, long, slender and subulate, tapered regularly from above base to slender tip; the dorsal one and one-half times or more the length of prostomium, the ventral about as long as prostomium. Study of additional material may modify the last statement, as some of the tentacles of both specimens have evidently suffered injury and one (type) has two, the cotype one, in regeneration as small knob-like buds. The cells of the prostomium form a small rosette-like radiation anterior to the eyes, but there is no indication of a median tentacle.

Peristomium completely crowded beneath prostomium, projecting as lateral lobes merely, from the upper part of which arise the two pairs of tentacular cirri. No nuchal papilla. Posterior lip prominent. Somites II and III very short but distinct, except that ventrally the former coalesces with the prostomium to form the lower lip. Tentacular cirri (fig. 15) all unusually long and slender, regularly tapered, with well-developed cirrophores. The peristomial arises at about the level of the foliaceous notocirri and reaches to about XII; the dorsal of II is at a higher level and reaches XVII; ventral of II at a very low level and equals peristomial; that of III at nearly the level of succeeding notocirri and reaches XIV. Three or four small setae arise from a small tubercle between the cirri of II and a fully developed neuropodium occurs on III. Anterior segments all very short and distinctly biannulate; farther back they become nearly half as long as wide. Pygidium a rather long ring, but cirri wanting.

Parapodia (Pl. XV, fig. 16) unusually small, projecting very little from side of body, the neuropodium flattened, with postsetal lip obsolete and presetal lip large and broadly rounded distally with a very slight notch, from which the point of the aciculum projects (fig. 17). Neurocirrus very strongly foliaceous, broadly subovate, several times larger than neuropodium on all somites, completely concealing them from behind and bending dorsad until on most somites it meets the notocirrus; arrangement of veins radial. Notocirrophores prominent, somewhat flattened domes, two or three times as large at the neuropodia on middle segments. Strongly foliaceous, thin, imbricated but covering only a small part of the sides of the body, of moderate size but very large in comparison with the neuropodia, broadly cordate with apex bluntly rounded (usually broader at the end than the one figured) and base deeply excavated, with deep yellow-brown veins forming a dense bipinnate figure; rather easily detached.

Aciculum single, nearly colorless, straight, tapered to a point like a sharpened pencil which projects slightly beyond the acicular notch (fig. 17). Setæ rather numerous, in broad, fan-shaped fascicles only obscurely divided into supra- and subacicular groups; 8 + 11 on somite X, 9 + 12 on XXV and L, 7 + 9 on C of type. They are colorless with moderately long stems scarcely reaching beyond the border of the neurocirri of middle segments, slender and gently curved, rather conspicuously inflated at the ends (Pl. XV, fig. 18) to form a socket bounded by lateral ranks of slender teeth connected anteriorly by a row of much smaller teeth. Appendages rather long, equalling or generally exceeding depth of neuropodia, very delicate with striations and marginal denticulations not visible under the magnification shown.

Color generally rusty, the body pale with little color, the cephalic appendages and neurocirri deeper and the notocirri very brilliant yellowish brown which contrasts strongly with the paler body and gives the worm its conspicuous coloring. Proboscis unknown.

Station 4,550, Monterey Bay, June 7, 50 fathoms, green mud, rock.

In form of the prostomium and other features this species approaches *P. citrina* Malmgren.

**Phyllodoce (Carobia) castanea** Marenzeller.

A small example 26 mm. long with 106 segments. Like the specimen previously reported from Monterey Bay this one has notocirri somewhat more elongated than those of Marenzeller's Japanese types. The color is paler and more yellowish than in the specimen above mentioned, though, like it, this is a female with eggs. There is no trace of a nuchal papilla and the flattening of the tentacular cirri is very obvious.

*Phyllodoce polyphylla* Ehlers, from South Georgia, is probably closely related to this species, though Ehler's figure exhibits no setigerous lobe on II, which is very obvious in this specimen. The minute dorsal tentacles shown by the type of *P. polyphylla* are probably merely the result of these being in process of regeneration after having been lost, as I have seen precisely similar conditions in several species.

Station 4,496, Monterey Bay, May 19, 10 fathoms, fine gray sand and rock.

**Anaitis polynoides** sp. nov. Pl. XVI, figs. 19-21.

Owing to the closely imbricated manner in which the large notocirri overlap the slender body this species bears a superficial resemblance to an elongated *Polynoë* or even more to a *Stenelais*. The single specimen is complete, but the posterior one-fourth of the body has evidently

been recently regenerated—being abruptly unpigmented and of smaller size.

Form slender, depressed, the segments scarcely exceeding one-third of total width between margins of notocirri or tips of parapodia. From the maximum width at the end of the anterior fourth the extreme outline tapers slightly forward and regularly and continuously caudad. Length 44 mm.; maximum width of segments 1.6 mm.; total width 3.8 mm. Segments 88.

Prostomium very short, broad and depressed, decidedly bent downward. In the figure (Pl. XVI, fig. 19) the prostomium is represented as pressed upward somewhat, but in the position in which it naturally rests the anterior outline is regularly semicircular and the length (exclusive of the posterior prolongation) about one-half the width. From the slightly convex posterior margin a median prolongation fits into a deep depression in the peristomium and bears a knob-like nuchal cirrus having a diameter about equal to the eyes. Eyes one pair, conspicuous, circular, brown, about one-ninth or one-eighth the width of the prostomium and widely separated by an interval of about five times their diameter, close to the posterior margin of the prostomium. Frontal tentacles very short, subconical with small terminal appendages, very widely separated and somewhat reflexed on sides of prostomium; the dorsal about as long as one-third width of prostomium and separated by about twice their length; the ventral somewhat longer, nearer together and reflexed so that they are concealed in dorsal views.

Peristomium somewhat tumid laterally, but excavated dorso-medially for the nuchal projection and papilla, almost indistinguishably coalesced with II which is similarly tumid laterally but lacks a median depression.

Tentacular cirri four pairs, rather short, thick, blunt, and stiff. The first (or peristomial) pair scarcely longer than width of prostomium and not reaching beyond IV; dorsal of II with a much larger ceratophore and reaching VII; ventral of II equal to peristomial and that of III (notocirrus) similar to dorsal of II and reaching VIII.

Podous segments well defined, very regular, the anterior very short, but soon becoming one-third as long as wide, slightly convex above, flat below, with a shallow neural groove. Posteriorly the segments taper to a very minute pygidium bearing a pair of relatively stout, cylindroid anal cirri, the combined width of which equals that of the pygidium and the length the last five or six segments.

Parapodia (Pl. XVI, fig. 20) begin on III, strictly lateral, prominent, their length exceeding one-half width of body, toward the ends becom-

ing smaller but otherwise unmodified. Strictly uniramal, the neuropodia compressed, with obsolete postsetal lip and prominent, foliaceous presetal lip divided by an acicular notch into a larger, broadly-rounded, supra-acicular lobe and a somewhat shorter subacicular lobe obliquely tapered to a blunt point.

Notocirrophores large, those of all except most anterior segments flattened and auriculate (fig. 20), Notocirrostyles beginning with IV, thin and membranous; typically broadly lunate-reniform, the external border squarish, very regularly, closely and broadly imbricated, covering and concealing the parapodia and posteriorly the entire dorsum, but leaving the middle of the segments exposed anteriorly. Toward the anterior end the styles approach a circular form and become gradually smaller until practically the entire dorsum is left uncovered. The notocirrus of III is the last tentacular cirrus, while the neurocirrus of the same segment differs in no respect from those following. Neurocirrophores prominent swellings at base of ventral side of neuropodia. Neurostyles (fig. 20) oblong elliptical, with the broad distal end subtruncate, foliaceous, about equalling the neuropodia in size and reaching to or, on anterior parapodia, beyond their ends.

Aciculum single, stout, pale yellow, gently curved, with simple bluntly pointed tip. Setæ (Pl. XVI, fig. 21) colorless, numerous (about 30, equally divided between supra- and subacicular groups on middle segments), in a broad, fan-shaped fascicle. Shafts slender, slightly curved, slightly enlarged at the end; the very asymmetrical socket prolonged on one side into a great spine with a few small teeth on its base; the other side bearing a shoulder for articulation of the appendage which is supported by a thin, scale-like process slightly fimbriated at the end. Appendages long, about equal to the depth of the neuropodia, slender and delicate with the margin very finely but distinctly denticulated. The form of the articulation resembles the *Eteone* type.

Color generally, including prostomium and four anterior segments, under parts, parapodia, lateral parts of notocirri and posterior fourth of body, pale yellowish or yellowish ashy; exposed part of dorsum rich purplish-red with a fine blue-green iridescence. Inner thirds of notocirri rich brown, together forming a pair of broad stripes extending continuously for the anterior three-fourths and becoming darker anteriorly. Tentacular cirri except colorless tips, largely of a somewhat darker brown. Eyes dark brown.

Proboscis unknown. The type is a female containing half-grown ova which largely fill the coelom and enter the cavities of the parapodia and notocirrophores.

Station 4,548, Monterey Bay, June 7, 46 fathoms, coarse sand, shells and rock.

*Eumida tubiformis* sp. nov. Pl. XVI, figs. 22, 23.

All of the specimens are contracted and in this state are depressed and stout, with the segments much crowded, particularly at the anterior end. The type, a female with 137 segments, is 67 mm. long, with a maximum body width of 3.1 mm. and a width between tips of parapodia of 4.5 mm. A male with 104 segments is 37 mm. long, and a small portion of the anterior end of a very large example measures 7 mm. between the tips of the setæ.

Prostomium in the several specimens varying in degree of contraction and proportions, in the type and most of the others being nearly twice as wide as long, subelliptical, slightly concave posteriorly and with a tentaculiferous prominence in front, the prominent lateral ocular lobes resting upon the peristomium. One specimen has the prostomium subtriangular and only about one-fourth wider than long. In life it would probably be broadly cordate. Eyes one pair, very large, about one-fourth, or somewhat less, the width of the prostomium, with large lenses looking upward. Immediately behind and below them are the small nuchal sense organs.

Frontal tentacles arising close together on front of prostomium separated by a distance of about one-fourth width of prostomium, all subulate with basal half thickened and beyond that abruptly tapered to very slender tips, subequal or the ventral pair somewhat longer, slightly exceeding one-half width of prostomium. Median tentacle arising from a slight depression between lenses of eyes, not abruptly thickened at base, more slender and slightly longer than frontal tentacles.

Peristomium much shortened, crowded beneath prostomium, not visible as a distinct segment from above; somites II and III also much shortened and crowded. Tentacular cirri with well-developed cirrophores and large stout subulate styles shaped like the median tentacle but very much larger. Dorsal and ventral of II widely separated, the ventral being at nearly the level of the notocirri of succeeding somites. The single pairs of I and III lie opposite the interval between those of II, the peristomial being at the higher level. That of I reaches VI, ventral of II reaches VIII and dorsals of II and III reach IX.

Body of very uniform diameter, being perhaps widest at about XL, thence tapered very gradually and regularly caudad. Owing to the manner in which the notocirri are imbricated an aspect of rather strong depression results, but the body is really very little depressed. Seg-

ments arched above, flattened below with a slight neural ridge, distinctly biannulate dorsally with small intersegmental rings. Pygidium a very small, slightly thickened and rugous ring.

Normal setigerous parapodia (Pl. XVI, fig. 22) begin on III, but a small tubercle bearing a few setæ lies between the cirri of II. They arise at the ventral level of the segments and are prominent, being from more than one-third to one-half the width of their segments. Neuropodium somewhat compressed, supported by a single aciculum, the postsetal lobe nearly obsolete, presetal well developed, divided by an acicular notch into a supra- and a subacicular lobe, both rounded on anterior but bluntly pointed on posterior parapodia.

Neurocirri broadly foliaceous, ovate with bluntly pointed tip and oblique base attached to a low cirrophore, reaching to or beyond end of neuropodium which they exceed in width and overlap and conceal from behind. They are relatively much larger on anterior somites where they equal one-half the notocirri, diminishing to one-fourth the notocirri posteriorly. Notocirrophores low and broad. Notocirrostyles (Pl. XVI, fig. 22) of moderate size, broadly foliaceous and imbricated over bases of parapodia, leaving most of the dorsum of body exposed. They are broadly cordate with blunt apex and nearly symmetrical base, the anterior ones broader, often wider than long and blunter, the posterior tending to more acute, cuneate, longer, less cordate forms, with the length as much as one and one-third times the width.

Aciculum single, yellow, stout, tapered, straight or slightly curved and ending in a simple blunt point at the acicular notch. Setæ in a single vertical series spreading fanwise and only very slightly separated at the acicular notch into supra- and subacicular groups. On the type they are distributed as follows: somite X, 13 supra- and 21 subacicular; XXV, 14 and 25; L, 11 and 24; LXXV, 11 and 17; and C, 8 and 14.

They are nearly colorless, with slender slightly curved stems scarcely enlarged at the ends (Pl. XVI, fig. 23) to form an imperfect asymmetrical socket, the best developed side of which is broadly rounded and provided with a uniform series of slender teeth. Appendages of moderate length, very uniformly about one-half depth of neuropodium, rather broad at base but tapering to a slender tip with scarcely discernible marginal denticulation.

Color uniform dark brown, yellowish brown or pale yellow with a few irregularly scattered dusky or black blotches, one of which may be on the prostomium.

Proboscis of type 8.5 mm. long, 2.4 mm. in diameter at orifice; of largest specimen 16 mm. long, 3 mm. in diameter at base and 4 mm. at orifice. It is somewhat trumpet-shaped, gradually widening to the somewhat flaring distal end which is surrounded by a circle of 18 to 20 low, rounded, soft papillæ more or less incised at the base and in some cases cleft in two. When protruded the proboscis has a slight spiral twist and is marked by three narrow, raised longitudinal lines on each side, the dorsal and ventral intervals between those of the two sides being one-third more than the lateral intervals between those of the same side. The general surface is marked with fine irregular wrinkles and usually, but not always, with minute granulations which are slightly more conspicuous along the raised lines.

Stations 4,430, off Santa Cruz Island, April 14, 197 fathoms, black sand and pebbles, six specimens, two of which (including the type, a female filled with large ova) are mature; 4,423, off San Nicolas Island, April 13, 339 fathoms, gray sand, black pebbles, shells, one young specimen, in which the longest (second dorsal) tentacular cirri each bears a symmetrical swelling on its anterior face near the middle.

*Eulalia nigrimaculata* sp. nov. Pl. XVI, figs. 24-26.

Two complete specimens considerably contracted have the following measurements: Type 33 mm. long; maximum width near middle body only 1.5 mm., extreme width between tips of parapodia 3 mm.; number of segments 89; female with eggs. Cotype 36 mm. long with 90 segments.

Prostomium subglobose, slightly depressed, nearly circular in outline as seen from above; profile strongly convex, sloping downward anteriorly; sharply differentiated from peristomium. Eyes one pair, brown, with well-developed lenses, large, nearly one-fourth width of prostomium, midway of the length and close to the lateral margins of which they are situated. On the type the right eye is enormously and abnormally enlarged and occupies the most of that side, to the displacement of the dorsal right tentacle. Frontal tentacles widely separated, the dorsal just outside of line of lateral border of eyes, the ventral slightly nearer together; length of dorsal equal to prostomial width, with swollen fusiform basal half and abruptly contracted filamentous distal half; ventral similar but with much shorter terminal filament. Median tentacle (present in type only) arising between eyes, slightly longer than frontal tentacles, with less swollen base and regularly tapered.

Peristomium and II coalesced, forming a short distinct ring above, crowded forward beneath the prostomium, at the sides of which the peristomium appears. Mouth large, bounded by a nearly smooth

posterior lip. Tentacular cirri much crowded, the peristomial and that of III (notocirrus) arising almost between the dorsal and ventral cirri of II, the former at the higher level. All have short but distinct ceratophores and prominent, regularly acuminate styles with slender tips. They are slightly flattened in the type, much more strongly flattened, apparently as a result of accidental pressure, in the cotype. The longest (dorsal of II) reaches to XII, those of I and III reach to IX and the ventral of II to VI. A conspicuous tuft of neuropodial setæ occurs between the two cirri of II.

Setigerous segments sharply defined by deep furrows; very short anteriorly but increasing until in the middle region they are at least one-third as long as wide. Slightly depressed and little more convex above than below. Behind the middle they gradually diminish in size to the pygidium, which is a very short and small ring, the cirri of which have been lost.

Parapodia rather short, scarcely exceeding one-third width of their segments but with conspicuous spreading tufts of setæ which begin on II. Neuropodia (Pl. XVI, fig. 24) strongly compressed, subovate; postsetal lip rudimentary; presetal lip well developed, foliaceous, symmetrical, terminating in a blunt point but altogether lacking a notch, though there is a slight posterior groove in which the end of the aciculum rests (fig. 25). Neurocirri (fig. 24) rather thick, very large, especially anteriorly where they have an area of about four times the neuropodium, but diminishing to twice the neuropodium posteriorly. They are narrowly palette-shaped, the excavated portion attached to low cirrophores on the ventral base of the neuropodia, the broad end outward and bent dorsad behind and extending far beyond the neuropodia, which they completely conceal from behind and serve the purpose of postsetal lobes. They are crowded with deep-brown or on the margins often nearly black glands. Notocirrophores (fig. 24) large and prominent, erect, more or less dome-like with a restricted area for attachment of the styles. Styles thin and membranous, easily detached, somewhat imbricated and concealing the parapodia; anteriorly ovate with rounded ends, on middle segments broadly ovate-cuneate with pointed ends and posteriorly becoming elongated; the base oblique and asymmetrical with a shallow sinus for attachment. Internal structure finely reticular with slightly developed veins and glands.

Aciculum single, colorless, tapered, ending in a rather acute point. Setæ forming a very broad undivided, fan-shaped fascicle, very numerous for the genus (30 on X, 48 on XXV, 40 on L and 36 on LXXV),

projecting about one-fourth of their length beyond the neurocirri. Stems colorless, of moderate length, nearly straight, little enlarged at the distal end (Pl. XVI, fig. 26) where they terminate in a small shoulder and a socket bounded on each side by a fringe of long delicate teeth. Appendages very delicate, about as long as depth of neuropodium with barely discernible marginal teeth.

Proboscis (only partially protruded) cylindrical, 5.5 mm. long and .6 mm. in diameter, surface thickly covered with small, blunt, flattened, slightly retrorse papillæ, separated by considerably more than their length.

Color gray-blue or bluish-plumbeous with a metallic blue iridescence and brownish suffusions and marked with a few conspicuous gradrate black spots, especially on the ventral surface, either widely scattered singly or aggregated in groups. Notocirri uniform orange yellow. Neurocirri yellowish with dark brown or blackish margin.

Station 4,454, Monterey Bay, May 12, 71 fathoms, green mud and sand.

*Eulalia levicornuta* sp. nov. Pl. XVI, figs. 27-30.

Only one small specimen measuring 43 mm. long is complete, with 221 segments. The type is much larger, being 70 mm. long for 172 segments and lacking perhaps the caudal one-third and 100 segments; its maximum width of body at C-CXX is 1.2 mm., between tips of parapodia 1.8 mm. Another very much macerated and incomplete specimen referred here somewhat doubtfully has 240 segments and is 94 mm. long, and less than 1 mm. wide, having therefore nearly the proportions of a slender lumbriconereid.

Form very slender and elongated, nearly linear, but tapering gently both ways from about the end of the anterior third.

Prostomium (Pl. XVI, fig. 27) about as wide as long, moderately depressed, semiovate with truncate ends or subtriangular with rounded basal angles and truncated apex, usually sharply differentiated from the peristomium, but in one specimen almost continuous with it dorsally. Eyes one pair, small, about one-seventh of posterior width of prostomium, close to its postero-lateral angles, separated by three to three and one-half times their diameter, dark brown, with small lenses. Frontal tentacles situated on the sides of a distinctly separated anterior segment of the prostomium, subconical, their length about one-half prostomium. Median tentacle a minute, slender, conical papilla situated on line between anterior border of eyes and having a length of from one to one and one-half times their diameter.

Peristomium a complete ring entirely posterior to the prostomium

and usually free from it all round, scarcely wider than prostomium, dorsally elevated into a convex platform-like area which in one case overlaps the prostomium and partly covers the eyes. Mouth small with nearly smooth posterior lip. Somites II and III similarly well differentiated with similarly elevated dorsum. Tentacular cirri arising from large cirrophores, the styles rather stout, tapered and short; the peristomial pair about as long as prostomium and reaching to III; ventral of II equal to peristomial and above its base a tubercle bearing a small tuft of setæ; dorsal of II about twice as long and reaching VI or VII. Somite III bears a fully developed setigerous parapodium and its tentacular notocirrus is equal to that of II.

Anterior somites are uniannulate and very distinct, becoming less well differentiated farther back as small interpodal annuli appear. The raised dorsal field gradually merges with the general convexity of the back. The venter is flat. They very gradually increase in size to or beyond C, and taper thence caudad.

Pygidium a dome-shaped ring about twice as long as the last setigerous segment, bearing a pair of somewhat flattened, subcylindrical cirri resembling the posterior notocirri but rather larger than they, together with a minute median cirrus (described from one specimen, station 4,431).

Parapodia (Pl. XVI, figs. 28, 29) small, little prominent and scarcely exceeding one-fourth the width of their segments, but becoming relatively longer and more prominent posteriorly. Setigerous neuropodia begin on II; they are slender, only slightly compressed, and little tapered to a bluntly rounded presetal lip divided by a slight acicular notch into two equally rounded lobes, of which the subacicular is usually somewhat longer; postsetal lip scarcely developed.

Neurocirrophores broad and low, the styles (Pl. XVII, figs. 28, 29) subelliptical, little excavated for attachment, thick, more or less foliaceous, broadest and relatively largest on anterior parapodia, where they considerably exceed the neuropodia and extend somewhat beyond them. Posteriorly they are relatively smaller and narrower, but often so much longer that fully one-fourth of their length projects beyond the neuropodia, but they always tend to diverge from the latter and not to bend dorsad behind them. Notocirrophores (Pl. XVI, figs. 28, 29) of anterior somites rather small, of middle somites low but nearly as wide as the length of the neuropodia. Styles generally foliaceous but comparatively small, carried nearly erect, little imbricated and covering but a small part of the sides of the parapodia. On anterior somites (fig. 28) they are regularly ovate with broadly

rounded distal end and scarcely excavated base; on middle segments larger, more broadly ovate, with bluntly pointed tips and nearly straight symmetrical bases; while posteriorly they become again smaller and tend toward a cuneate form. They all exhibit strongly marked internal striations arranged in a partly bipinnate, partly radiate pattern. On some specimens the styles are contracted and much thicker, the anterior ones being nearly cylindrical, and all are opaque and of a more or less deep brown color. Greatly extended specimens have the notocirri all erect and widely separated.

Aciculum single, rather slender, of the form usual in the genus, with the bluntly pointed tip projecting slightly from the notch. Setæ (Pl. XVI, fig. 30) arranged in the usual fan-shaped vertical fascicles of one series, of a rather small number, as follows in the type: on X 7 supra- and 5 subacicular, on XXV 5 + 11, on L 9 + 11, on LXXV 11 + 12, on C 7 + 14 and on CLXX 14 in all. They have remarkably long, slender shafts with slightly enlarged symmetrically cleft ends forming the socket, each side of which is prolonged obliquely into a prominent elongated tooth flanked on each side by a fringe of delicate spinules. Appendages (fig. 30) rather short, usually one-third to one-half depth of neuropodium, but on one specimen (station 4,431) rather longer, broad at base and tapered and gently curved to a delicate tip, the marginal denticulations and oblique striations fine but distinct.

Proboscis of a cotype protruded 2.5 mm., .4 mm. in diameter at distal end, terete, gradually increasing in diameter distally, the entire surface covered so thickly that they touch each other with crowded, granulated, slightly flattened, rounded papillæ, at least three irregular circles of which at the distal end are of much larger size.

Color of type (female filled with eggs) faded to a uniform pale greenish drab or light olive. Another specimen is nearly uniform brown and still another pale yellow with a thin brown line of granules across each segment and the head, tentacular cirri and parapodial cirri deep brown with aggregations of similar granules.

One specimen from each of the following stations: 4,418, off Santa Barbara Island, April 12, 238 fathoms, gray sand; 4,420, off San Nicolas Island, April 12, 291 fathoms, gray mud, rocks; 4,430 (type), off Santa Cruz Island, April 14, 197 fathoms, black sand and pebbles; 4,433, off Santa Rosa Island, April 15, 265 fathoms, gray mud.

This species belongs to the *bilineata-gracilis* group and, with the exception of the Hawaiian species *E. navaica* Kinberg, appears to be the first of that group to be described from the Pacific. As is the case with *E. gracilis* Verrill, specimens in different states of contraction differ considerably in appearance.

*Eulalia (Sige) bifoliata* sp. nov. Pl. XVI, figs. 31-34.

Described from a single imperfect anterior end consisting of the head and 57 segments, having a length of 18 mm. and a maximum diameter between tips of parapodia of nearly 2 mm. Contracted and rather stout, strongly arched above, flat below and little tapered in the length of the piece.

Prostomium (Pl. XVI, fig. 31) about three-fourths as long as wide, somewhat depressed, subpyramidal with a straight, inclined profile, greatest width in posterior half, posterior border nearly straight, entire, bounded by a deep furrow separating the peristomium. No anterior furrow behind tentacles. Eyes circular with prominent lenses, brown, large, about one-fourth width of prostomium and situated at its greatest width, about one-half their diameter anterior to posterior border and close to lateral border. Frontal tentacles situated rather close together at the truncated apex of prostomium, separated by little more than one and one-half times their diameter, somewhat macerated and imperfect, but their length approximately one-half prostomium or slightly less. Median tentacle situated between anterior border of eyes at centre of prostomium, much smaller than frontal tentacle, but macerated so that the exact size is not certain. Immediately behind each eye is a faint brown spot.

Peristomium scarcely visible above, forming a swollen lower lip and small lobes beneath eyes. Remaining segments short, uniannulate. Tentacular cirri with distinct cirrophores, all styles lost except the ventral of II on one side, which is rather short and stout, conical, about one and one-half times length of prostomium and reaching to V. A small tuft of setæ on II.

Parapodia (Pl. XVI, figs. 32, 33) small and little prominent, their length about one-fourth width of somites on anterior and one-half on posterior (middle) somites, but strongly compressed and deep. Postsetal lip obsolete; presetal greatly developed and foliaceous, divided by a deep acicular notch into a much smaller subacicular lobe, rounded at the end, and a larger supra-acicular lobe prolonged into an acuminate but blunt tip frequently much longer and more slender than those figured. Neurocirrophores (figs. 32, 33) rounded swellings at base of neuropodia; styles strongly foliaceous, thin, quadrant-shaped, with the dorsal angle prolonged similarly to the supra-acicular lobe, but usually extended far beyond the latter. Though of large size they do not exceed the neuropodia of middle segments, the subsetal lobes of which they completely cover from behind, reaching slightly dorsad of the acicular notch, their nearly straight dorsal border being parallel

to the axis of the supra-acicular lobe and serving as a postsetal support to the setæ. Notocirrophores (fig. 33) low and flat, moderate in size, immediately above notopodium. Three or four only of the notostyles remain. They are strongly foliaceous but rather small, scarcely or not longer than the neurostyles and about one and one-half times as wide as they, broad ovate or suborbicular with nearly straight, truncate, scarcely excavated base, opaque brown with granules chiefly arranged in radial lines.

Aciculum single, pale yellowish, with colorless base, straight, regularly tapered to a simple point, which enters but does not project beyond the acicular notch. Setæ (Pl. XVI, fig. 34) numerous (18 supra- and 27 subacicular on XXV), forming a broad, spreading, fan-shaped fascicle, the shafts colorless, long, with about one-third of their length projecting beyond the margin of the neurocirrus, slightly curved, little enlarged at the end, where they terminate in a prominent shoulder and a pair of high, tapered processes finely denticulated at the ends which bound the socket. The only perfect appendage seen has a length of about three-fifths the depth of the neuropodium and is slender and finely denticulated.

Proboscis (dissected) tubular with smooth non-papillated lining; orifice surrounded by a circle of apparently eighteen soft papillæ.

This species has the smooth proboscis, prolonged neuropodia and neuropodial cirri and form of setæ characteristic of the subgenus *Sige*, features which appear in the descriptions of no known *Eulalia* from the North Pacific or the west coast of South America.

Type from station 4,522, Monterey Bay, May 26, 149 fathoms, gray sand and shells.

#### EXPLANATION OF PLATES XV AND XVI.

##### PLATE XV.—*Syllis heterochata*—figs. 1-4.

Fig. 1.—Anterior end,  $\times 56$ .

Fig. 2.—Parapodium XXV with one long and one short seta in place; *a*, short notocirrus from XXVI,  $\times 56$ .

Fig. 3.—End of short seta from XXV,  $\times 600$ .

Fig. 4.—Same of long seta,  $\times 250$ ; *a* and *b*, articulation and tip of appendage of same,  $\times 600$ .

##### *Pionosyllis typica*—figs. 5-7.

Fig. 5.—Parapodium with dorsalmost and ventralmost setæ represented,  $\times 24$ .

Fig. 6.—Tips of two acicula,  $\times 400$ .

Fig. 7.—End of a seta from XXV,  $\times 600$ .

##### *Odontosyllis phosphorea*—figs. 8-10.

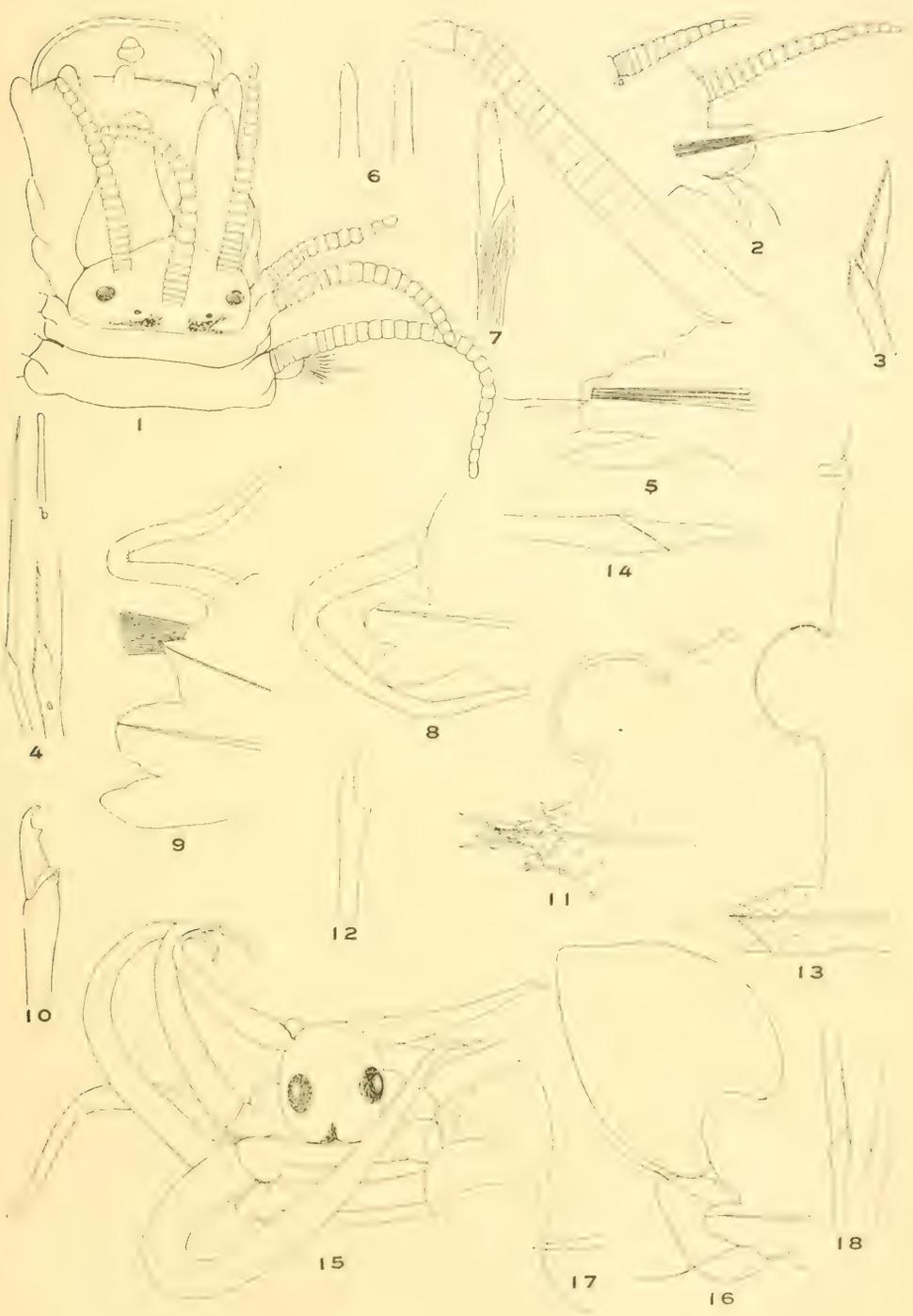
Fig. 8.—Parapodium X without setæ, 56.

Fig. 9.—Parapodium L with bases of notopodial setæ only,  $\times 56$ .

Fig. 10.—Distal end of middle seta from L,  $\times 600$ .

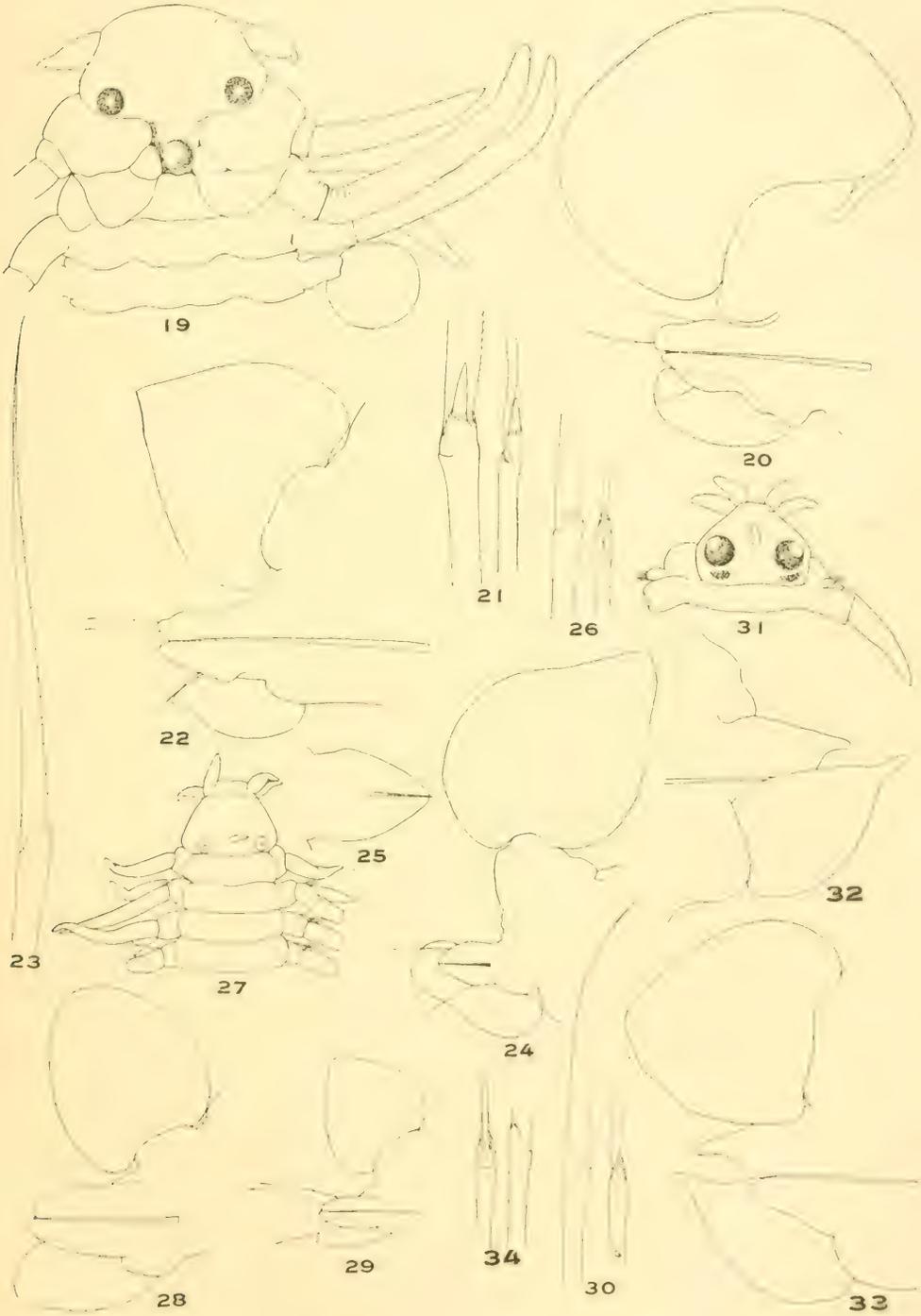
*Spharodorum papillifer*—figs. 11, 12.Fig. 11.—Parapodium X with setæ,  $\times 98$ .Fig. 12.—Seta from X,  $\times 440$ .*Spharodorum brevicapitis*—figs. 13, 14.Fig. 13.—Parapodium X (the parts may be abnormally separated owing to distention of body walls) without setæ,  $\times 56$ .Fig. 14.—Average seta from somite X,  $\times 440$ .*Phyllodoce ferruginea*—figs. 15–18.Fig. 15.—Anterior end,  $\times 56$ .Fig. 16.—Parapodium XXV with dorsalmost and ventralmost seta shown,  $\times 56$ .Fig. 17.—End of neuropodium showing tip of aciculum,  $\times 500$ .Fig. 18.—Profile and front view of region of articulation of seta from XXV,  $\times 440$ .PLATE XVI.—*Anaitis polynoides*—figs. 19–21.Fig. 19.—Anterior end, from the dorsum,  $\times 24$ .Fig. 20.—Parapodium of XXV, anterior view, dorsalmost and ventralmost setæ shown,  $\times 24$ .Fig. 21.—Profile and rear views of articular region of two setæ from somite X,  $\times 360$ .*Eumidia tubiformis*—figs. 22, 23.Fig. 22.—Anterior aspect of parapodium L, showing dorsalmost and ventralmost setæ in place,  $\times 24$ .Fig. 23.—A seta from somite XXV,  $\times 360$ .*Eulalia nigrimaculata*—figs. 24–26.Fig. 24.—Anterior aspect of parapodium L, with dorsalmost and ventralmost setæ in place,  $\times 24$ .Fig. 25.—Outline of neuropodium showing tip of aciculum,  $\times 56$ .Fig. 26.—Two views of articular region of seta from X,  $\times 440$ .*Eulalia levicornuta*—figs. 27–30.Fig. 27.—Anterior end,  $\times 24$ .Fig. 28.—Anterior aspect of parapodium XXV,  $\times 56$ .Fig. 29.—Same of parapodium LXXV, with dorsalmost and ventralmost setæ in place,  $\times 24$ .Fig. 30.—A seta from XXV; a, front view of articulation of same,  $\times 440$ .*Eulalia bifoliata*—figs. 31–34.Fig. 31.—Head from dorsum,  $\times 24$ .Fig. 32.—Posterior view of parapodium XXXIII, without notostyle or setæ,  $\times 56$ .Fig. 33.—Anterior view of parapodium XXXIX, without setæ,  $\times 56$ .Fig. 34.—Profile and rear views of articulation of seta from XXXIII,  $\times 440$ .





MOORE. POLYCHÆTOUS ANNELIDS.







The Polychætous Annelids Dredged by the  
U. S. S "Albatross" off the Coast of  
Southern California in 1904: II. Poly-  
noidæ, Aphroditidæ and Segaleonidæ.

---

BY

J. PERCY MOORE, PH.D.

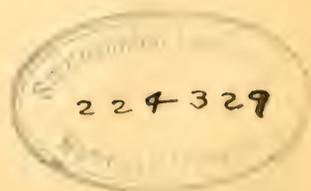
---

*From the Proceedings of The Academy of Natural Sciences  
of Philadelphia, April, 1910.*

*Issued July 21, 1910.*







THE POLYCHÆTOUS ANNELIDS DREDGED BY THE U. S. S. "ALBATROSS" OFF  
THE COAST OF SOUTHERN CALIFORNIA IN 1904: II. POLYNOIDÆ,  
APHRODITIDÆ and SEGALEONIDÆ.<sup>1</sup>

BY J. PERCY MOORE.

POLYNOIDÆ.

This family of scaled annelids is well represented in the collection by twenty-six species, about half of which belong to *Harmothoë* and related genera or, as they are here regarded because of their intergrading characters, subgenera. Twelve species are considered to have been previously undescribed; four species, previously known from Japanese waters, are recorded from the American side of the Pacific for the first time; nine are more or less well known on the shores of California or northward and one species is doubtful. It is worthy of remark that of the twelve species described as new no less than eight lack pigmented eyes, so far, at least, as can be determined without recourse to sections. These are distributed through a wide range of genera. With the exception of *Nemedia microlepidæ* they all came from considerable to great depths (500-2,000 fathoms). One species (*Polynoë renotubulata*) is further remarkable for having the nephridial papillæ prolonged into slender tubes which reach far above or beyond the parapodia.

*Halosydna pulchra* (Johnson).

*Polynoë pulchra* Johnson, Proc. Cal. Acad. Sci. (3), I (1897), p. 177.

Several specimens, the largest of which is 35 mm. long and has 60 segments, occur in the collection. Except in two cases nothing is stated on the labels regarding the commensal associations which are frequent with this species. All have the medial or the posterior half of the elytra more or less closely speckled with brown spots. Some have the dorsum of each segment conspicuously marked with two brown cross-bars. The prostomium of this species is intermediate in some respects between the form characterizing the Lepidonotinæ and the Harmothoinæ. In general it resembles the former most closely, free cephalic peaks being absent and the cephalic lobes prolonged

<sup>1</sup> Part I was published in these PROCEEDINGS for June, 1909, pp. 321-351, Pls. XV and XVI.

into the bases of the lateral tentacles, but a well-marked articulation cuts off the latter as distinct ceratophoric segments.

One example has the proboscis protruded. It is large and evidently powerful, 5 mm. long, 2.7 mm. wide, cylindroid, little depressed distally, smooth. There are nine dorsal and nine ventral prominent apertural papillæ and behind each series a small rounded median tubercle. Jaws pale brown, with large blunt fangs, the lower biting to the right; lateral cutting plates thin, low, rather extended but weak and directed chiefly laterally.

Stations 4,310, off Point Loma, vicinity of San Diego, 71-75 fathoms, green mud and fine sand; 4,414, northwest of Santa Catalina Island, 156-162 fathoms, fine gray sand and mud; 4,420, northeast of San Nicolas Island, 33 fathoms, fine gray sand; 4,453, off Point Pinos Light, Monterey Bay, 56-62 fathoms, green mud, "on *Luidia*;" 4,457, same locality, 40-46 fathoms, dark green mud, "on *Luidia*."

• *Halosydna insignis* Baird.

*Halosydna insignis* Baird, Journ. Linn. Soc. London, VIII (Zool.), 1865, p. 188.

*Polynoë brevisetosa* (Kinberg), Johnson, Proc. Cal. Acad. Sci., Ser 3., Zoology, I (1897), p. 167. Figs. 24, 31, 40 and 46.

This very remarkable species is well represented in the collection by both the commensal and the free-living phases. Were it not that Johnson's familiarity with the species in its native surroundings enabled him to demonstrate their identity workers on preserved material alone would almost certainly have separated them as distinct species, though close inspection shows that they agree in their strictly technical characters.

Though there are no accompanying notes specifying their hosts or associates it is evident that most of the examples were commensals, they having the elongated form and other characteristics of this phase. The specimens measure from 15 to 45 mm. long, the smallest, while intermediate in proportions, approximating the short stout form of the free-living rather than the slender, elongated form of the commensal phase. As is the case with the former the elytra are strongly imbricated and cover the middle of the back nearly or quite completely. Both phases exhibit color variations through various shades of gray and brown or dusky and the elytra, while usually mottled, may be quite plain and uniformly colored. The pigment may be arranged in distinct spots or assume a reticular pattern around paler areas as in *H. californica* Johnson. Most constant is a white spot over the pedicel of attachment and a black or deep brown spot mediad of or behind it. Some specimens with elytra otherwise completely pig-

mentless have the anterior ones thus marked. Rarely this assumes the character of a distinct ocellus as in *Lepidasthenia gigas* (Johnson).

The tuberculation of the elytra also varies, the larger smooth papillæ, which are scattered among the numerous small corneous prickles, being elevated and conical or low and rounded, sometimes confined to the first pair of elytra, sometimes present on all or nearly all. Marginal cilia may be confined to the anterior elytra of commensal specimens but are longer and present on all elytra of free-living individuals, which also possess a tuft of five or six long ones just behind the middle of the anterior border. The end of the notocirri may be abruptly contracted as in Johnson's figure, or taper gently into the terminal filament and this condition occurs independently of commensal or free existence. Notopodial setal tufts are usually longer than indicated in Johnson's figure and some of the dorsalmost neuropodial setæ bear an obscure accessory tooth or spur, and on commensal individuals the dorsalmost pair of neuropodials may be much enlarged.

Free-living examples of this species have much the general aspect of *Lepidonotus sublevis* Verrill and *L. clava* (Montagu), but of course are readily separated by having eighteen instead of twelve pairs of elytra and by other generic characters. Their neuropodial setæ differ from those of commensals in being more slender and less strongly hooked at the end and in having fewer (about 7) pectinated frills. Besides being larger the elytra are also tougher and more horny and the marginal cilia are longer. The distribution of the examples in this collection suggests that other conditions than commensalism may be effective in differentiating the two forms.

The proboscis appears to differ in no way in the two phases, in examples of both of which it is protruded. On a specimen 15 mm. long it has a length of 2.6 mm. and a terminal width of 1.6 mm.; one 40 mm. long has these measurements 5.5 and 3.2 mm. respectively, the base being terete, the distal end depressed, with apertural papillæ  $\frac{9}{10}$ . Jaws massive and deep brown, the fangs very stout, compressed, the ventral biting to the right; cutting plates well developed.

Ehlers,<sup>2</sup> taking a comprehensive view of this and related nominal species, unites, under the prior name of *H. patagonica* Kinberg, *H. brevisetosa* Kinberg, *Polynoë chilensis* Quatrefages, *Lepidonotus insignis* Baird, *Lepidonotus grubci* Baird and, with some doubt, *Halosydna parva* Kinberg. His conclusion is partly based upon the

---

<sup>2</sup> *Festsch. Feier d. 150-jähr. Bestehens d. Königl. Gesell. d. Wissensch. z. Göttingen*, 1901, pp. 45-47.

examination of specimens from the Californian coast sent to him by Dr. Johnson. Considered in this wide sense the species ranges along the entire Pacific coast of America from the Straits of Magellan to Stephens Passage, Alaska.

Stations 4,421, southeast of San Nicolas Island, 291-298 fathoms, gray mud and rocks (elongated form); 4,453, off Point Pinos Light, Monterey Bay, 49 fathoms, dark green mud (short form); 4,457, same locality, 40-46 fathoms, dark green mud (short form); 4,464, same locality, 36-51 fathoms, soft dark gray mud (short form); 4,496, off Santa Cruz Light, Monterey Bay, 10 fathoms, fine gray sand and rocks (20 specimens of the elongated form).

✓ *Halosydna californica* (Johnson). *Polynoe* (Darboux)

*Polynoe californica* Johnson, Proc. Bos. Soc. Nat. Hist., XXIX (1901), p. 387.

Specimens of this handsome species from 12-30 mm. long occur in the collection. The elytra present considerable color variation: Some are pale brown with the characteristic reticular pattern; others have them of a nearly uniform reddish brown, with a white spot, accentuated by a small deep brown spot, over the point of attachment; on one of the latter the first three pairs are translucent mottled grayish. Two of the smallest and the largest one have the elytra pale uniform gray with colorless lateral margins and no mottling and the white attachment spots on those of the last two pairs only. The two stations at which examples were taken yielded *H. insignis* also. No notes on commensalism are furnished but the specimens from Station 4,421 were entangled with terrebeld tentacular filaments.

Stations 4,421, southeast of San Nicolas Island, 291-298 fathoms, gray mud and rocks; 4,496, off Santa Cruz Light, Monterey Bay, 10 fathoms, fine gray sand and rocks.

✓ *Halosydna interrupta* v. Marenzeller.

*Halosydna interrupta* v. Marenzeller, Denksch. d. kais. Akad. d. Wissensch. Wien, Math.-Nat. Cl., LXXII (1902), p. 570, Taf. I, fig. 2.

*Polynoe semierma* Moore, Proc. Acad. Nat. Sci. Phila. (1903), pp. 402, 403, Pl. XXIII, figs. 2 and 3.

The occurrence of a well-preserved and apparently complete example (though in three pieces) of this species in the collection permits of the determination of the above synonymy and the correction of both original descriptions, which were based upon incomplete and poorly preserved specimens. The prostomium of the type of *P. semierma* is badly macerated and the description based upon it quite incorrect and misleading. The following description of the present example is therefore supplied.

Prostomium small, nearly as long as broad, depressed, with a median dorsal furrow dividing it for the entire length into two smooth, convex lobes that taper at the anterior end gently into the bases of the slender tentacular ceratophores. No peaks and no prominent ocular lobes. Eyes two pairs, very small; the posterior strictly dorsal near caudal border; the anterior lateral on widest convexity of prostomium. Median ceratophore arising from cephalic sinus, slender, about one-half of its length extending beyond lateral ceratophore. Median tentacular style about five and one-half times length of prostomium, slender, tapered, smooth, with a moderate subterminal enlargement and a very delicate terminal filament about as long as the prostomium. Lateral tentacles arising from the frontal prolongation or ceratophores; styles slightly more than one-half as long as the median style, very slender, without evident subterminal enlargements and the terminal filaments relatively longer than those of the median tentacle. The single palp remaining is moderately stout at the base, about five times as long as the prostomium, strongly annulated and tapered to a very short terminal filament.

Peristomial parapodia apparently quite achæitous. Tentacular cirri like median tentacle and about three-fourths as long, the ventral slightly shorter. Notocirri alternately longer and shorter; the longer styles frequently having a line of fracture or articulation near the middle which gives the appearance of a greatly elongated cirrophore. Posteriorly the longer cirri follow immediately the elytra and are succeeded by shorter ones. The neurocirrus of somite III of one side is duplicated.

The specimen is 55 mm. long and has 107 segments. The elytra are small, leaving the entire middle of the back uncovered, and there are thirty-six pairs the first fifteen arranged as in *Harmothoë* to somite XXXII, the sixteenth on XXXIV and the remaining ones on every third following segment. Von Marenzeller's specimen, which was dredged at a depth of 480 m. off Eno-sima, Japan, consisted of two pieces. The anterior of nineteen segments bore ten pairs of elytra arranged like their homologues in *Harmothoë*, etc. The posterior piece consisted of twenty-seven segments terminated by a pygidium and bearing seven pairs of elytra on the third, sixth, eighth and every third segment following. Marenzeller considers that somites XX to XXIII along with two pairs of elytra on XXI and XXIII have been lost and that the first three pairs of elytra on the posterior piece are borne, therefore, on XXVI, XXIX and XXXI. This placing of the elytra is the only discrepancy existing between his description and

the present specimen, which agrees fully in this respect with the type of *P. semierma*. If v. Marenzeller's example, however, lacks the seven segments (XX-XXVI) and the three pairs of elytra borne on XXI, XXIII and XXVI the elytra on the posterior piece would fall on somites XXIX, XXXII, XXXIV, XXXVII, etc. and the agreement would be complete.

This specimen is well colored, each segment being marked on the dorsum with a rather bold, transverse dull purplish-brown bar and the elytra are slightly mottled with brown.

Station 4,339, off Point Loma Light, vicinity of San Diego, 241-369 fathoms, green mud.

***Lepidonotus caloris* Moore.**

*Lepidonotus caloris* Moore, Proc. Acad. Nat. Sci. Phila., 1903, pp. 412-414, Pl. XXIII, fig. 12.

This species, originally discovered off Japan and later found to be widely and plentifully distributed from Vancouver to the Kadiak Islands, is now determined to be equally common in the region covered by these explorations, from which it was previously known through a single small example dredged at Monterey Bay. The bathymetrical range shown by these explorations is from 26 to 1,400 fathoms.

These specimens range in size from 8 to 35 mm. and present all of the color varieties of yellow, orange, reddish, olive brown, dark brown, dusky and nearly black, the brighter colors being sometimes confined to the papillæ, sometimes overspreading the entire elytra. The elytral tubercles show a distinct tendency to become larger than on northern examples and at the same time lower, flatter and smoother, especially on middle scales. At the ends of the body they are frequently conical.

Several specimens have the proboscis extended. On one 25 mm. long it is 5.3 mm. long and 3 mm. wide, cylindroid, somewhat depressed at distal end and bearing the usual nine dorsal and nine ventral blunt papillæ. Jaws deep brown; the fangs rather stout and blunt, cutting edge rather long, knife-like.

Stations 4,310, Point Loma Light, San Diego, 71-75 fathoms, green mud and sand; 4,326, off Point La Jolla, vicinity of San Diego, 243-280 fathoms, soft green mud; 4,411, off Long Point, Santa Catalina Island, 143-245 fathoms, gray sand and shells; 4,417, off Santa Barbara Island, 29 fathoms, fine yellow sand and coralline rock; 4,420, off San Nicolas Island 32-33 fathoms, fine gray sand; 4,421, same locality, 229-291 fathoms, gray mud and rocks; 4,423, same locality, 216-339 fathoms, gray sand, black pebbles and shells; 4,427, off Santa Cruz

Island, 447-510 fathoms, black mud and rocks; 4,430, off Gull Island, Santa Cruz Island, 197-281 fathoms, black sand, pebbles and rocks; 4,431, off Santa Rosa Island, 38-40 fathoms, mud, sand and rock; 4,461, Monterey Bay, off Point Pinos Light, 285-357 fathoms, green mud; 4,515, same, 368-495 fathoms, green mud, sand and shells; 4,531, same, 26-28 fathoms, fine gray sand, pebbles and rock; 4,550, same, 50-57 fathoms, green mud and rock; 4,574, off Cape Colnett, Lower California, 1,400 fathoms. Especially plentiful at stations 4,420, 4,421, 4,430, 4,431 and 4,461, most of the other stations yielding only one or two specimens.

\* *Lepidonotus* sp. ?

A nearly perfect *Lepidonotus* 12 mm. long was at first referred to *L. carinulatus* Grube, a species that has been recorded from the Red Sea and the Philippine Islands by Grube, from Japan by v. Marenzeller and more recently from Ceylon by Willey. There exists a close resemblance, especially in the character of the elytra between this specimen and Grube's description but serious discrepancies arise with Marenzeller's and even more with Willey's descriptions. The neuropodial setæ are of the typical *Lepidonotus* type with no trace of a true subapical spur, but the last pair of toothed plates is greatly developed and superficially somewhat resembles a spur, the remaining ones being reduced in number and much reduced in size or even obsolete. On the whole they resemble the corresponding setæ of *L. caloris* but are more slender.

On most of the elytra the horny bosses take the form of subcircular bases rising into more or less compressed keels, many of which are more or less irregular and spinous but which as a rule are smooth and lack the sculpturing so evident on typical *L. caloris*. Anterior elytra, however, show traces of this sculpturing on the more conical papillæ. The marginal fringe is very long and extensive. The prostomium has the typical *Lepidonotus* form quite unlike Willey's figure of *L. carinulatus*. Their color is pale brown with a light spot over the point of attachment.

On the whole it seems best to consider this specimen provisionally as a variation of *L. caloris*.

Station 4,496, off Santa Cruz Light, Monterey Bay, 10 fathoms, fine gray sand and rocks.

\* *Eunoë barbata* sp. nov. Pl. XXVIII, figs. 1-6.

Form moderately robust, dorso-ventral depth nearly equal to width of body in anterior half but the posterior tapering region much more

depressed. Segments 39. Type 29 mm. long; maximum width at XII: body alone, 4.5 mm.; between tips of parapodia, 8 mm.; between tips of setæ, 10 mm.

Prostomium very small, its width less than one-fifth width of body, broader than long; dorsal furrow shallow and short, the cephalic lobes not well differentiated from each other or from the median ceratophore. Peaks very short and blunt, inconspicuous, but diverging from the median tentacle, well above and largely free from the lateral tentacles. Eyes two pairs, black, conspicuous, the diameter of each about one-eighth width of prostomium; the posterior pair dorsal and near the postero-lateral border; the anterior pair ventro-lateral, anterior to middle of prostomium. Median tentacle with short, stout ceratophore half as thick and one-third as long as prostomial width; styles lost from both type and cotype. Lateral tentacles with ceratophores one-half length and one-fourth diameter of median; styles nearly twice length of prostomium, the basal half nearly uniform in diameter, followed by a slight enlargement bearing the abruptly filamentous terminal third, sensory cilia few and scattered, short, with slightly bulbous tips. Palps slender, terete or slightly five-angled with prominent longitudinal lines of densely placed cylindrical cilia, regularly tapered, about five to five and one-half times as long as the prostomium. Facial ridge low but, owing to its dark brown color on a white background, very conspicuous.

Peristomium represented dorsally by a small nuchal fold, ventrally produced forward and united with prostomium. Its parapodia bear from one to three small curved setæ. Cirrophores of tentacular cirri prominent, reaching beyond anterior border of prostomium; styles rather stout, subequal, the dorsal reaching to end of third quarter of palps, the ventral slightly shorter, gently tapered to a fusiform sub-terminal enlargement which passes abruptly into a terminal filament less than one-fifth the total length; sensory cilia scattered, short with thickened ends. Mouth with the usual swollen, rugose lips, the lateral pair embracing the facial ridge anteriorly. Metastomial segments strongly arched anteriorly, posteriorly depressed and tapering to the minute pygidium which (on the type) bears a single cirrus resembling the tentacular cirri but little more than half as long and entirely pale. Neural groove broad and well defined. Nephridial papillæ begin on VI at postero-lateral border of segments, short and directed slightly upward into the furrows.

Typical parapodia rather short, less than one-half width of segments, stout, little compressed, interramal cleft little developed, the notopod-

dium overlapping neuropodium from behind. Notopodium much smaller than neuropodium but reaching nearly as far distad, ovate, compressed, oblique, divided by the setigerous cleft and bearing near the ventral border a prominent, conical acicular tubercle. Neuro-podium compressed, the base somewhat narrowed and distal part expanded and tapering to a right-angular apex near the dorsal border, from which the tapered truncate acicular process projects and bears on the dorsal side of its distal end a blunt, finger-like cirrus equal to its own length. On posterior segments the two rami become more nearly equal, the notopodium more slender and projecting and the interramal sinus wider.

Notocirrophores prominent, cylindroid with tumid base, suberect and curved, arising postero-dorsad to notopodia; styles similar to tentacular cirri, mostly curved postero-medially over dorsum, on middle segments reaching the length of their terminal filaments beyond median line and nearly unchanged in length posteriorly. On all parts except the terminal filament they bear numerous cilia of varied lengths, many of those on the basal half having a length of twice the diameter of the style. Neurocirri arise much proximad of the middle of ventral face of neuropodium, are smooth, subulate, slender and reach nearly to the base of the acicular process of neuropodium. Neurocirrus of II about two and one-half times length of others and terminated abruptly in a filament.

Aciculum single in each ramus, stout, tapered, yellow, the blunt end projecting for a considerable distance beyond the acicular process. Setæ all pale yellow. Notopodials arranged in a short compact tuft projecting much dorsad but spreading only slightly. They (Pl. XXVIII, figs. 2 and 3) are about as stout as the neuropodials, the distal half bearing numerous, rather distinct and extensive combs; their ends blunt and free of the transverse pectinated processes for only a short distance, some nearly or quite smooth but many bearing a greater or less number (figs. 2 and 3) of appressed scale-like teeth and a few with brush-like ends like those of *E. truncata*. The few peristomial setæ are like the shorter, curved notopodials. Neuropodial setæ (fig. 1) in about three supra-acicular and six subacicular series, gently curved, with enlarged ends bearing from eleven, on the short setæ of the ventral row, to twenty, on those of the dorsal row, transverse pectinæ on each side which become conspicuous in size and distinctly alternate in position only toward the distal end; smooth tips long, two to three times greatest diameter of the setæ, stout, strongly hooked and without trace of an accessory process. Caudally the setæ become much more slender but are otherwise unmodified.

Elytraphores 15 pairs, on II, IV, V, VII, to XXIII, XXVI, XXIX, XXXII. They are rather small and only moderately prominent with oval or slightly auricular scars from which the elytra are very easily detached. Alternating with them but more mesad in position are small and simple rounded dorsal tubercles. Elytra (Pl. XXVIII, fig. 4) of moderate size and rather thick, soft, texture. Except for a few posterior segments they nearly or quite cover the dorsum. Those of the first pair are small and irregularly circular, the second and third pairs narrow and strongly reniform or bean-shaped; remaining ones so far as known rather broadly ovate-elliptical with the broader end lateral and the anterior border slightly concave or nearly straight. The small scar lies well anterior and slightly lateral to the middle. Except for a small translucent portion of the antero-medial border the surface is thickly covered with hard tubercles, very small and numerous at the antero-medial margin (figs. 4 and 5) but becoming larger and fewer toward the postero-lateral margin (figs. 4 and 6). With the exception of the very smallest these tubercles are knoblike and bear on the summit two, three or more stout, sharp points; some of them are very thickly studded with spines which vary in length on different elytra. A variable number of tubercles near the posterior border and in the neighborhood of the scar are much more massive than the others; these likewise are studded with spines, long or short according to the habit of the particular elytron; many of them are surrounded by a raised ring. Marginal fringe extensive, passing round nearly the entire exposed margin, the cilia slightly knobbed distally and varying much in length, those on the posterior border short and inconspicuous, those of the lateral border exceeding the length of the largest papillæ. Scattered over the exposed surface among the spines are numerous short cilia and slightly behind the middle of the posterior border is a loose irregular tuft of cilia, some of which are even longer than the longest lateral cilia. On the first pair large rough tubercles are scattered round the entire margin and the cilia have an even more extensive distribution but are much shorter.

Color of middle portion of dorsum brown or olive; parapodia and under parts chiefly colorless. Prostomium purple; eyes black; tentacular elytraphores brown, the lateral very dark; styles of cephalic tentacles, tentacular cirri and notocirri of setigerous segments beautifully mottled brown and white with the white tip preceded by a brown and this again by a white annulus at the beginning of the subterminal enlargement. Facial ridge brown, palps and notocirri colorless. Elytra, except for the translucent colorless portion, beautifully mottled with brown, gray and white, the papillæ brown or yellow.

A single specimen of this species (cotype) occurs in the collection from Station 4,496.

The type is No. 2,028 of the collection of this Academy and is referred to on p. 335 of the PROCEEDINGS for 1908 under the name of *Harmothoë hirsuta* Johnson as coming from Station 4,205 in Puget Sound. My belief at that time was that *H. hirsuta* lost the areolation of the elytra and the accessory tooth of the tips of the neuropodial setæ with age but additional material has convinced me that this is not the case. This species, though related to *H. hirsuta*, differs in the form of both notopodial and neuropodial setæ and in the absence of elytral areas.

Station 4,496, Monterey Bay, off Santa Cruz Light, 10 fathoms, fine gray mud and sand.

*Ennoë caeca* sp. nov. Pl. XXVIII, figs. 7-12.

A species having the general aspect of *Polynoë pulchra* Johnson, of similar commensalistic habits, but somewhat stouter. The body is rather thick dorso-ventrally and the parapodia slope upward, forming a shallow, open trough above, a peculiarity that at once distinguishes this species from the last. The type is 40 mm. long, the maximum width at about X being, body—6 mm., between tips of parapodia—11 mm., between tips of setæ—14 mm. Number of segments 43. Two of the cotypes are of equal size, the third about one-fourth smaller.

Prostomium (Pl. XXVIII, fig. 7) squarish, the posterior border alone strongly rounded, slightly wider than long, posterior half of lateral border somewhat bulging and convex, sides anterior to this gently convergent to the prominent antero-lateral angles or peaks; anterior borders nearly straight with a very shallow median emargination; no dorsal furrow and no eyes. Ceratophore of median tentacle at level of dorsal surface of prostomium and separated from it by a very slight transverse groove, barrel-shaped, about one-half length of prostomium and, owing to slight development of anterior fissure, standing freely and prominently forward. Style (fig. 7) about three and one-half times length of prostomium, slender, regularly tapered, with filamentous tip and no subterminal enlargement; sensory papillæ almost entirely wanting, only a very few small ones being present. Lateral tentacles arising at a low level on antero-ventral face of prostomium from cylindrical ceratophores which are nearly as long as, but much more slender than, the median ceratophore and which lie well mediad of the cephalic peaks; styles about one and one-third to one and one-half times length of prostomium, very slender, subulate, with long filamentous tips. Palpi also very long, slender and

perfectly smooth, four to four and one-half times length of prostomium; sensory papillæ not obvious. Facial tubercle unusually large, elevated on facial ridge.

Mouth large with prominent, pouting, trifid, furrowed lips, the facial ridge passing between the anterior pair. Peristomium obvious only through its parapodia which project well forward beyond the cephalic peaks and bear on the medial side a prominent tubercle from which projects the end of a stout brown aciculum and below this a pair of stout notopodial setæ; beyond this the cirrophores separate. Styles of tentacular cirri similar to median tentacle which the dorsal slightly exceeds, the ventral slightly shorter.

Metastomial segments indistinctly separated by faint furrows, the whole ventral surface forming a somewhat prominent sole-like structure, with the neural furrow and lateral ridges only moderately well-marked. Nephridial papillæ begin of VI; small, flattened, inconspicuous and projecting upward between the bases of the parapodia. Owing to the peculiar elevation of the parapodia the dorsum of the body appears to be depressed and gives the effect of a furrow. Elytrophores occur on II, IV, V, VII, IX, XI, XIII, XV, XVII, XIX, XXI, XXIII, XXVI, XXIX and XXXII = 15 pairs; they lie well out on the bases of the parapodia, are low and wide and often constricted below the nearly circular free surface. Dorsal tubercles are subconical prominences occurring at the same level as the elytrophores but projecting beyond them slightly lateral. The greatest width is at about somite X, anterior to which the sides curve broadly into the oral region and behind which they taper regularly to the pygidium, which is a minute, short, tubular segment with dorsal anus, below which is a common cirrophore bearing the two very slender anal cirri exceeding in length the greatest width of the body without parapodia.

Parapodia rather short, on anterior and middle segments scarcely more than one-half width of segments bearing them. As indicated above they slope dorsad from the ventral surface rather strongly. They are compressed and at the base rather deep, the rami only slightly separated (Pl. XXVIII, fig. 8). Notopodium very short and thick, the moderately elongated, conical acicular process obliquely truncated at the end, projecting from its ventral margin and reaching to or slightly beyond the end of the neuropodial acicular process. Neuro-podium compressed, tapered to a blunt point and extended beyond the notopodium by a foliaceous margin or presetal lobe including in its dorsal part the rather obscure acicular process, which is broad and flat, nearly as long as the notopodial acicular process and bears at its

end a short, blunt flat cirrus. Parapodium II scarcely differs from the others.

Notocirrophores arising almost directly behind notopodia, prominent, suberect, reaching level of neuropodial acicular process, cylindroid with somewhat tumid base. Styles (fig. 8) long and slender, reaching to middle of dorsum and far beyond setæ tips, like medium tentacle in all respects. Those at the caudal end much elongated and slender.

Acicula single, deep brown, very stout, tapered to acute, pale tips which project slightly beyond the acicular processes in both rami. Neuropodial setæ (Pl. XXVIII, figs. 9 and 10) reduced in number, usually two supra-acicular and six subacicular series of two to four each on middle segments. All stout, deep yellow, prominent, with the thickened terminal portion strong and long (generally about two-fifths of exposed length); transverse pectinations numerous and close but exceedingly fine and on many setæ quite obsolete, apparently as the result of wear; smooth tip rather long (2-3 times diameter of seta) stout, curved and lacking an accessory tooth (fig. 10). Notopodial setæ also comparatively few, forming an irregular loose bundle, deep yellow, about as stout as the neuropodials but much shorter, nearly straight, tapered to blunt, smooth tips and with the transverse rows of spines nearly or quite obsolete (figs. 11 and 12). Both kinds of setæ resemble those figured by McIntosh for *Polynoë enplectella* but are stouter.

Elytra attached with moderate firmness, of delicate gelatinoid consistency and in their evidently much contracted state shrunken away from the middle line and having a deep central depression and more or less folded and frilled raised margins. Probably they are in life flat and overlap widely. So far as can be determined the first is circular, the others more or less broadly reniform. They are colorless, translucent and totally without marginal cilia or obvious tubercles on the smooth dorsal surface. Under the microscope an area of rather closely placed minute horny tubercles appears behind the hilum and similar tubercles are scattered widely over the entire surface.

Except for a slight purplish brown color of the head the entire worm is colorless.

Station 4,537, Monterey Bay, off Point Pinos Light, 861-1,062 fathoms, hard sand and mud. Commensal on *Holothuria* sp. (four specimens).

**Harmothoë (Lagisca) multisetosa Moore.**

*Lagisca multisetosa* Moore, Proc. Acad. Nat. Sci. Phila., 1902; pp. 267-269, Pl. XIV, figs. 29-36.

The specimens in the collection referred to under this and the

following two names form a puzzling group the status of which was decided upon only after much hesitation. This arose chiefly from the imperfect preservation of the specimens and the absence of attached elytra, but also because of the similarity and variability of the species. All three species have the caudal end of the body slender and tapered and prolonged considerably beyond the last elytra.

The cephalic peaks vary greatly, being sometimes much more prominent and acute than is usual in the genus, sometimes short and round, but it is probable that these variations arose as the result of conditions of preservation. No attached elytra were found but two or three loose ones differ from those typical of this species in no way except in the slight development of soft papillæ. A bottle from station 4,405 containing some examples of this and the next species yielded three kinds of loose elytra: those typical of the two species and another form lacking large soft papillæ and covered thickly with long slender acute spines, resembling very closely, therefore, the elytra of *Lagisca crosetensis* McIntosh. A study of all the material at my disposal brings to light an unbroken series between this form and those with large soft papillæ and small spines. The setæ figured by McIntosh differ considerably from those of *L. multisetosa* which have the pectinated plates of the neuropodials continued almost to the tip. It seems not improbable, however, that a fuller knowledge of the *Lagiscæ* of the Pacific will demonstrate a multiplicity of variable and intergrading forms.

Stations 4,405, off San Clemente Island, 654-704 fathoms, green mud; 4,427, off Santa Cruz Island, 447-510 fathoms, black mud and rocks; 4,453, Monterey Bay, off Point Pinos Light, 49-51 fathoms, green mud; 4,517, same, 750-766 fathoms, green mud and sand; 4,574, off Cape Colnett, Lower California, 1,400 fathoms.

*Lagisca*  
**Harmothoë (*Lagisca*) lamellifera** v. Marenzeller.

*Polynoë (Lævillia) lamellifera* v. Marenzeller, Denkschr. königl. Akad. Wiss. Wien, XLI, Math.-Nat. Cl., 2d. Abth. (1879), pp. 115-117, Taf. I, fig. 5.

*Lagisca multisetosa papillata* Moore, Proc. Acad. Nat. Sci. Phila., 1908 p. 335.

Most of the specimens here referred to this species agree closely with v. Marenzeller's description and figures but others have setæ and elytra that vary somewhat in the direction of both the preceding and following species, from typical examples of both of which these are distinguished by the much reduced cephalic peaks, the sparseness of the marginal fringe of cilia on the elytra, the very short blunt tips of the notopodial setæ and the very slender and elongated neuropodial

setæ with their remarkably rich pectination consisting of forty or more pairs of combs reaching nearly to the tip.

Marenzeller's figure of the prostomium is undoubtedly drawn from a specimen in which the peaks were retracted and bent dorsad so that they fail to be represented in the figure. All of my specimens possess minute but quite evident peaks. If my interpretation be correct the ventral lamella referred to by v. Marenzeller is an integumental fold close to the nephridial papillæ and under certain conditions of preservation appears in many species. It is therefore not diagnostic and occurs in some of these specimens and is absent from others.

Typical elytra quite like v. Marenzeller's figure were found in bottles containing specimens of this species from stations 4,339, 4,405, 4,425 and 4,428. The margin bears but a few short cilia and the outer surface is thickly studded with small, truncate horny spines among which are scattered, posterior to the attachment and more or less arranged in oblique rows, the larger soft papillæ. These are generally brown in color and of low, rounded, somewhat recumbent form and appear to be hollow. Usually they are small and quite numerous. Others have the papillæ near the posterior border much more enlarged and several from stations 4,339 and 4,405 have few small soft papillæ but much larger mammilliform or sugar-loaf-shaped submarginal papillæ exactly like those of the types of *L. multisetosa papillata*. In one case these papillæ number only four or five, clavate and connate with the surface of the scale except at the tips, and in the case of two elytra from station 4,405, which appear to be the first pair, the papillæ are large, decumbent cones.

The setæ agree closely with v. Marenzeller's figures but the accessory tooth of the tip of the neuropodials is present more commonly than he indicates and the pectinated plates reach nearer to the tip. The rows of spines of the notopodials always reach nearly to the blunt tip which is frequently roughened but the extent of the tip thus exposed varies somewhat.

While most of the specimens are small and much broken some of those from station 4,405, although completely denuded of appendages, have all segments present. One of the largest of these has forty-three segments, the fifteenth pair of elytophores occurring on XXXII, and measures 55 mm. by 15 mm. between setæ tips. Marenzeller gives only thirty-six segments.

The color above is a pale or medium brown with two narrow, white lines across each segment, the venter gray; elytra more or less suffused with brown on the medial half. Several of the specimens are filled with eggs.

Stations 4,305, off Point Loma Light, near San Diego, 67-116 fathoms, gray sand and shells; 4,310, same, 71-75 fathoms, green mud and fine sand; 4,339, same, 241-369 fathoms, green mud; 4,389, off Point Loma Lighthouse, 639-671 fathoms, green mud, gray sand; 4,405, off San Clemente Island, 654-704 fathoms, green mud; 4,425, off San Nicolas Island, 1,100 fathoms, green *Globergerina* mud and fine sand; 4,428, off Santa Cruz Island, 764-891 fathoms, green mud.

**Harmothoë (*Lagisca*) *yokohamiensis* McIntosh.**

*Lagisca yokohamiensis* McIntosh, Challenger Reports, Zoology, Vol. XII, pp. 89, 90, Pl. XIA, figs. 12 and 13.

This species lacks the large soft papillæ that adorn the elytra of the two preceding. The horny papillæ are small, conical or truncate and are uniformly distributed over the entire exposed portion of the elytra. Marginal cilia are moderately long and have slightly bulbous tips and a few longer cilia are borne on the surface near the posterior margin.

Notopodial setæ are rather stout, the largest about three times the diameter of the neuropodials and their smooth tips (Pl. XXXI, fig. B) are much longer than in the preceding species, the rows of spines very numerous and the longest nearly encircling the seta. The extent to which they bend over the dorsum and protect the elytra is noteworthy and calls to mind the condition in *Gattyana*. Neuropodials (Pl. XXXI, fig. A) also have much longer tips and only twenty to thirty pairs of pectinated plates and the rather prominent accessory tooth is present on all but the ventralmost rows. Notocirri are long and very slender with the subterminal enlargement scarcely visible and the terminal filament unusually long and bear a moderate number of clavate cilia much longer than those on the tentacles.

Several have the proboscis protruded. In one 28 mm. long it is 4.6 mm. long and 2.5 mm. at the orifice. It is clavate, the distal end nearly circular, the mouth rather small and lozenge-shaped; orificial papillæ nine above and nine below. Jaws pale brown, the fangs compressed, prominently outstanding like a parrot's beak and the knife-like cutting plates directed more antero-posteriorly than transversely. Complete examples have from forty-four to forty-six segments.

Color above dark or usually pale brown with or without narrow transverse white lines, below nearly colorless. Elytra colorless or the posterior part marked with brown usually in three large blotches. Ova occur in only one specimen from an unknown station.

This may be the Hawaiian species referred to *H. haliacta* McIntosh by Treadwell. These specimens agree very closely with McIntosh's

description and figures. The marginal cilia of the elytra might be more correctly described, however, as moderate in size and number rather than long and numerous. McIntosh pointed out that his species is closely related to *Polynoë* (*Laenilla*) *lamellifera* Marenzeller, the only conspicuous difference being the absence of soft elytral papillæ. *Polynoë subfumida* Grube is another allied species.

Stations 4,414, off Santa Catalina Island, 152-162 fathoms, fine gray sand and mud; 4,427, off Santa Cruz Island, 447-510 fathoms, black mud, rocks; 4,430, off south coast of Santa Cruz Island, 197-281 fathoms, black sand, pebbles, rocks; 4,515, Monterey Bay, Point Pinos Light, 368-495 fathoms, green mud, sand, shells; 4,537, same, 1,041-1,062 fathoms, hard sand and mud.

*Harmothoë scriptoria* sp. nov. Pl. XXVIII, figs. 13-17.

A pretty, dainty species with delicate, easily detached scales. Moderately slender, slightly depressed, little tapered toward the two ends which are nearly equally rounded. Measurements of type: length 15 mm., width at X, body, 1.6 mm., between tips of parapodia 4 mm., between tips of setæ 5.5 mm. Number of segments 39. Type ♀ filled with ova.

Prostomium (Pl. XXVIII, fig. 13) slightly longer than wide with a distinct longitudinal dorsal median furrow for its entire length, slightly and regularly convex laterally, broadly rounded or subtruncate anteriorly, without distinct peaks and little or not at all overhanging the bases of the lateral tentacles. Eyes, two pairs, black, small; the posterior not more than one-fourteenth width of prostomium, dorso-lateral, separated by two or three times its diameter from posterior border of prostomium; the anterior slightly larger, lateral and slightly ventral, about one-third of length of prostomium from its anterior end. Median ceratophore short and thick, projecting but little from the cephalic sinus; style of median tentacle unknown but its character may be judged by the tentacular cirri. Lateral tentacles small, total length less than prostomium, arising from anterior face of prostomium slightly below median ceratophore, their ceratophores very short; styles regularly subulate. Palps two and one-half or three times as long as prostomium, rather stout and projecting laterally beyond prostomium at base, tapering gradually to near tip and then rapidly to a sharp point; no distinct raised lines or ridges. Facial ridge large, broad and rounded.

Peristomial parapodia large and projecting well-forward beyond prostomium; achaetous, the tentacular cirrophores well separated; style: moderately slender, regularly tapered, without subterminal

enlargement, terminal filament short or indistinct; the dorsal about four-fifths, the ventral three-fourths length of palpi. Mouth surrounded by a furrowed trilobate lip. Remaining segments well marked. Greatest width near anterior end (VII or VIII), thence body regularly but very gently tapered caudad. Neural furrow distinct and deep. Nephridial papillæ not clearly seen, evidently very small. Dorsum with intersegmental furrows well developed except in pharyngeal region. Dorsal tubercles small and inconspicuous. Pygidium larger than usual in the family; anus dorsal. Anal cirri lost but a pair of small cirri, evidently the last notopodials, at sides of anus.

Parapodia (fig. 14) rather prominent, nearly equalling width of body on middle segments. In the type the base somewhat swollen with eggs, thence tapered distad to the pointed apex. Neuropodium large, compressed, tapered to a prominent, acutely triangular, flattened, acicular lobe, beyond which the aciculum appears not to project (fig. 14<sup>a</sup>). Notopodium of typical parapodia reduced to a small antero-dorsal setigerous lobe with a finger-shaped acicular process at its ventral border from the end of which the tip of the small aciculum projects.

Notocirrophores small, but rather elevated, situated a little dorsad and caudad of notopodia; styles short, reaching tips of neuropodial setæ only, subulate with thickened base tapered to slender, acute point, bearing a very few minute clavate sensory cilia or none. Neurocirri arising far out beyond middle of ventral face of parapodia, not reaching end of neuropodia, slender, regularly subulate, acute. Neurocirrus of II about twice as long as its parapodium, nearly equal to ventral tentacular cirrus.

Elytra 15 pairs, having the customary arrangement, small, and little elevated. Elytra (Pl. XXVIII, fig. 15) easily detached, only slightly imbricated and barely covering dorsum. First pair subcircular and completely hiding prostomium, its small scar slightly caudad of middle; the next two strongly reniform with a deep hilum close to which is the scar of attachment; succeeding ones larger, broader and less deeply emarginate, with the scar slightly antero-lateral of the center; the last pair, finally, subquadrate-elliptical with the attachment anterior to the center. All are thin, delicate and membranous, perfectly smooth, and entirely lack cilia and tubercles, except for a small area of minute, rounded corneous granules just behind the hilum. They are pale and daintily colored, with a bluish-gray ground and white subcentral spot, a pale brown postero-medial submarginal crescent and a small more deeply colored pigment spot over the point of attach-

ment. The first has a complete circle of brown round a white center. Under the microscope the surface shows close and curious fine pencil-like white markings (fig. 15<sup>a</sup>) usually wavy or crenulated and often bent or branched, having somewhat the appearance of written characters. The branching of the nerves from the scar is also very obvious.

Acicular single in each ramus, the notopodial very small and its acute tip projecting freely from the end of the acicular process; neuropodial very much stouter, its tip just appearing at the surface ventrad and proximad to the tip of the acicular process.

Notopodial setæ (Pl. XXVIII, fig. 17) forming a whorl, few, short, not reaching to level of tip of neuropodium, about as stout as neuropodials, colorless or pale yellow, scarcely curved, tapered, blunt-pointed, the distal half marked with numerous, fine, close combs, which become longer distally and reach nearly to the tip. As usual the dorsalmost are stouter, shorter and more curved. Neuropodial setæ (Pl. XXVIII, fig. 16) in three supra- and eight subacicular series, colorless, slender and rather long, with the distal enlargement short and strong except on the ventral rows; marked with twelve (dorsalmost) to twenty-two (ventralmost) pairs of pectinated plates which are closely appressed, the longer proximal ones being finely divided, the distal becoming shorter and nearly entire, the last very close to the accessory tooth; smooth tip very short, ending in a short, strongly hooked, claw-like tooth and an almost equally prominent and strong accessory tooth. On II the neuropodials are much smaller and more slender and nearly like the notopodials.

Dorsum olive green, venter gray; prostomium purplish, a dorso-lateral area overlooking the anterior eyes pale; tentacular ceratophores brown, the base of the lateral styles also brown; palps and tentacular cirri unpigmented; lips and facial ridge slightly brown or colorless; parapodia uncolored; notocirrostyles with basal half brown, sometimes marked by a white ring, and distal half also white; neurocirrostyles brown with white tip and often a white ring or spot above base.

Stations 4,452 (type), Monterey Bay, Point Pinos Light, 49-50 fathoms, green mud and fine sand; 4,460, same, 55-167 fathoms, green mud, gravel.

*Harmothoe triannulata* sp. nov. Pl. XXIX, figs. 18-22.

A species of neat and trim appearance, more slender than *H. imbricata*, about as depressed as that species and on the whole resembling it. The four known specimens are all small, the largest being 17 mm. long; the type is 12 mm. long; maximum width of body 1.4 mm.;

between tips of parapodia 3 mm. and between tips of setæ 4.8 mm. Number of segments 39.

Prostomium (Pl. XXIX, fig. 18) small, depressed, the frontal slope slight and nearly plain, divided for nearly the entire length by a median dorsal furrow; width slightly exceeding length, greatest in posterior half, anterior to that contracted and narrowed into cephalic peaks, which are prominent, acute and widely divergent and well separated from the median ceratophore; anterior sinus broad and moderately deep (about one-third prostomial length), continued by dorsal furrow nearly to caudal border. Eyes black, conspicuous but not large; the posterior dorsal and touching or nearly touching posterior border of prostomium, their diameter one-eighth or one-ninth of prostomial width; anterior pair on sides of prostomium behind middle, little visible from above, looking laterad and slightly forward, in type but little larger than posterior eyes but on other specimens one-fourth or more larger in diameter.

Median ceratophore (Pl. XXIX, fig. 18) arising in frontal sinus, short and stout, its length not exceeding one-third prostomium and width nearly equal, cask-shaped, scarcely reaching beyond peaks. Style rather stout, not more than twice length of prostomium, basal two-thirds subcylindrical with a very slight subterminal enlargement, nearly the distal third coarsely filamentous; sensory cilia numerous, nearly as long as diameter of style, with slightly bulbous tips. Ceratophores of lateral tentacles short and thick, situated far back so that they are invisible from above, nearly meeting below median tentacle; styles (fig. 18) less than one-half length of median style, subulate, the base somewhat thickened but the distal half very slender and delicate; sensory cilia scattered, much shorter than on median tentacle. Palps (fig. 18) also arising far back, about three to three and one-half times length of prostomium, rather slender, the base less than one-half width of prostomium, gently tapered to near end, then abruptly contracted into a short terminal filament, thickly covered with minute globoid sensory cilia giving to it a brownish coloration. Facial ridge short and narrow.

Peristomial parapodia (Pl. XXIX, fig. 18) achæitous, the tentacular cirrophores not quite reaching level of cephalic peaks; styles exactly like that of median tentacle except that they are slightly more slender; the dorsal equal to median tentacle, the ventral slightly shorter but with the filament relatively longer. Mouth with the usual full, pouting lips.

Body rather deep, the segments well differentiated and of remark-

ably uniform width to near the caudal end where they taper rapidly into the minute pygidium. Neural furrow and lateral ridges little marked but the ventral field as a whole prominent and very smooth; the dorsal surface very little cross-furrowed. Nephridial papillæ begin at VI but are very minute and inconspicuous throughout, often pigmented. Anal cirri similar to notocirri but longer, equal to greatest width of body and parapodia without setæ. Elytrophores small and prominently elevated, with constricted pedicle and circular bearing surface; because of their whiteness in a brown background they are very conspicuous; fifteen pairs with the usual arrangement.

Parapodia (Pl. XXIX, fig. 19) rather short and small, little compressed, their basal depth much less than the depth of the body and their length nowhere exceeding by more than a trifle one-half the width of the segments; posterior parapodia not relatively longer than others. Notopodia little prominent, flattened lobes prolonged into a short, blunt, postsetal, acicular process. Neuropodium much larger but short and abruptly truncated, the nearly square or very broadly rounded postsetal lip merging with the presetal lip at the dorsal margin; the presetal lip prolonged from the dorsal margin into the short, broad, blunt acicular lobe, which bears a minute finger-like cirrus above the projecting end of the aciculum.

Notocirrophore (Pl. XXIX, fig. 19) slightly dorso-caudad of notopodium, short, reaching not quite to base of notopodial acicular process; base swollen, the rest cylindrical and rather strongly curved. Style exactly like median tentacle, scarcely reaching tips of longest setæ and but little beyond median line, longer near caudal end, rather richly provided with sensory cilia with bulbous ends and nearly as long as diameter of style. Neurocirri (fig. 19) with small cirrophore posterior to ventral border proximad of middle of neuropodium; style very regularly subulate, slender, short, not reaching end of postsetal lip at level of aciculum; no sensory cilia. Neurocirrus of II two-thirds as long as ventral tentacular cirrus.

Acicula as usual single, straight, tapering, yellow styles, both projecting freely from the ends of their respective acicular processes. Neuropodial setæ in four supra-acicular and seven or eight subacicular series, nearly colorless, rather stout, nearly equaling notopodials in this respect; the shafts straight and distal enlargements (Pl. XXIX, fig. 21) of moderate length, gently curved and tapered, with from sixteen (ventral) to twenty-two (dorsal) pectinated plates on each side which are deeply and finely divided, becoming prominent and somewhat imbricated toward the distal end, which is smooth for a

distance of about one and one-half to twice the diameter of the seta and terminates in a slightly curved point and slender appressed accessory process, which is absent from the ventral row or two. Notopodial setæ moderate in number, short, forming an inconspicuous depressed whorl, short, very pale yellow, little stouter than neuropodials, gently curved, with numerous, and close ( $3\frac{1}{4}$  to  $3\frac{1}{2}$  in space of diameter of seta), rather conspicuous (especially on dorsal setæ) transverse pectinæ leaving a rather long, blunt, smooth tip not less than the diameter of the seta (Pl. XXIX, fig. 22). Setæ not elongated caudally.

Elytra (Pl. XXIX, fig. 20) completely covering dorsum of all but five or six posterior segments, the first nearly circular, the others broadly elliptical with a slight antero-marginal concavity. Scar antero-lateral of center. Except for a very small naked area at the antero-medial margin the entire surface is studded with small horny cones or blunt, rough tubercles which become somewhat larger latero-caudad where the margin bears a sparse fringe of rather short cilia with slightly bulbous ends, a few short ones of the same kind being scattered over the surface back of the border. Along the margin there is also usually one or a few small soft papillæ like those of *H. imbricata* but usually ovate (though in one specimen they are rod-shaped) and scattered over the entire surface posterior to the scar.

Colors pale and delicate on these specimens, the dorsum generally colorless or white, the median field quite unspotted anteriorly in the proboscoidal region but generally with a more or less evident transversely elongated brown spot near the posterior margin of middle and posterior segments. On each side of each segment is a somewhat V-shaped brown spot, the apex of which covers the dorsal tubercles and the anterior face of the elytophores. On the most pigmented segments two small brown spots may occur at the base of, but not on, the cirrophores. On the exposed caudal segments these several spots tend to merge. Parapodia, elytophores, notocirrophores, neurocirri, anal cirri and venter uncolored. Prostomium slightly purplish or pink, probably brightly colored in life but not pigmented; eyes black. Styles of median tentacle, tentacular cirri and notocirri white with three pale brown but obvious bands at the base, the proximal and the distal ends of the subterminal enlargement. Lateral tentacles, facial ridge, nephridial papillæ and lips pale brown; palps uncolored or dusky. Elytra delicately blotched with somewhat irregular, confluent pale brown spots on a colorless ground, the median and covered portions and lateral border being free from pigment and the deepest coloration occurring over the point of attachment behind which is a

conspicuous small white spot from which the markings somewhat radiate.

Proboscis of one specimen (cotype) protruded nearly 3 mm., width 1.7 mm., cylindroid, depressed slightly; orifice with nine dorsal and nine ventral prominent papillæ. Jaws pale brown, the fangs large and prominent, the ventral biting to right; cutting plates low and curved caudo-laterad.

There are four specimens, two from each station and three of them are filled with nearly mature ova and sperm.

This species is closely related to *H. imbricata* but differs obviously in the much more posterior position of the anterior eyes, which are placed more nearly as in *H. crassicirrata*.

Stations 4,420 (cotype), off San Nicolas Island, 238 fathoms, hard black mud; 4,431 (type and cotype), off Santa Rosa Island, 38-41 fathoms, green mud, coarse sand and rocks.

**Harmothoë sp. ?**

A small specimen denuded of all cephalic appendages, cirri and elytra. The setæ rather closely resemble those of *Lagisca elizabethi* as figured by McIntosh. It is possible that this may be the species recorded by Treadwell in his paper on Polychæta of Hawaiian waters under the name of *Harmothoë halvita*. According to Treadwell's account his specimens differ considerably from McIntosh's description.

Station 4,463, Monterey Bay, off Point Pinos Light, 48-111 fathoms, rocky.

**Harmothoë hirsuta Johnson.**

*Harmothoë hirsuta* Johnson, Proc. Cal. Acad. Sci., 3d Series, Zoology, Vol. I, pp. 182, 183, figs. 27-29, 38 and 53.

This species, originally described by Johnson from San Pedro, has since been recorded by Ehlers from the coast of Chile, by Treadwell from the vicinity of San Diego and by the writer from Alaska and Puget Sound. Unfortunately the latter record is partly erroneous owing to an apparently mistaken belief that marked changes take place in the character of the scales and setæ during growth. This error is corrected under the heading of *Eunoë barbata* of which species one of the Puget Sound specimens referred to in 1908 under the name of *H. hirsuta* is the type.

The elytra and setæ are quite characteristic and agree closely with Johnson's figures. Some of the marginal polygonal areas bearing the large papillæ may be ill-defined, the spines are often rough, bifid or trifid and the cilia on the posterior are as long as those on the lateral

margin. Frequently the smooth tips of both notopodial and neuropodial setæ are even longer than indicated by Johnson's figures. The accessory tooth of the latter is best developed on the dorsal rows and frequently absent on the ventralmost two rows. The palpi are slightly angulated by six raised longitudinal lines bearing cilia. One of the most striking superficial characters of this species is the prominence of the notopodial setæ.

Stations 4,420, off San Nicolas Island, 32-33 fathoms, fine gray sand; 4,496, Monterey Bay, off Santa Cruz Light, 10 fathoms, fine gray sand, rocks.

*Harmothoe tenebricosa* sp. nov. Pl. XXIX, figs. 23-28.

A rather broad and strongly depressed species with long, laterally directed parapodia. The type, like one of the two largest specimens, has 41 segments, is 35 mm. long and at somite X has a width of body of 4 mm., between tips of parapodia of 9.5 mm. and between tips of setæ of 14 mm.

Prostomium (Pl. XXIX, fig. 23) about one-fifth wider than long, strongly arched above, sloping forward from the prominent posterior region; greatest width near posterior end, the sides strongly convex; anterior border depressed in middle, with a wide fissure from which a furrow extends for a short distance caudad; at a distance from the fissure equal to its width the blunt peaks rise rather abruptly and project prominently forward freely above the bases of the palps and lateral tentacles. (One specimen has the peaks retracted and little prominent and another (sta. 4,528) has the prostomium less contracted anteriorly and more quadrate in form.) Eyes totally wanting. Frontal ridge and tubercle very conspicuous, mouth trilobate, surrounded by very prominent protuberant furrowed lips.

Ceratophore of median tentacle (fig. 23) arising from frontal fissure, cylindroid, short, projecting only a little way beyond the peaks; style less than three times length of prostomium, moderately slender with a faintly indicated subterminal enlargement and a rather long, slender subterminal filament. Ceratophores of lateral tentacles at level of palps and partly covered by median tentacle, reaching nearly to end of median ceratophore; styles scarcely longer than prostomium the basal half or more tapered, the rest filamentous. Sensory papillæ absent or nearly so from all cephalic appendages. Palps slender, regularly tapered, from three to five times length of prostomium according to state of contraction or extension in different specimens; filamentous tip very short, no longitudinal ridges or lines of sensory cilia.

Peristomium not distinct, its parapodia (Pl. XXIX, fig. 23) elongated and reaching beyond cephalic peaks, bearing on its medial face two small setæ beyond which the cirrophores diverge slightly; styles of tentacular cirri similar to median tentacle, the dorsal about as long as the latter, the ventral slightly shorter. Metastomial segments depressed, with strongly marked neural furrow and muscular ridges below; segments anterior to XX of nearly uniform width, posterior to that tapering regularly to pygidium which has the usual form but has lost its cirri. Nephridial papillæ begin on VI, when fully developed prominent, subconical, with enlarged base and tubular end directed dorsad between bases of the feet.

Parapodia (Pl. XXIX, fig. 24) very prominent, fully as long as width of segments bearing them on middle of body and exceeding this caudally, in basal part dorsal and ventral borders nearly parallel; rami well differentiated. Neuropodium compressed and expanded into a large, obliquely-ovate, foliaceous, presetal lobe prolonged slightly into a tongue-shaped process and including in its dorsal border the acicular process and aciculum. Notopodium rather prominent, with a constricted base and compressed free setigerous lobe, its ventral part prolonged into a very long, slender, tapered, blunt-ended acicular process which reaches nearly as far as the neuropodial acicular process and bears no terminal cirrus. The foliaceous lobes are largely developed on middle somites but are reduced toward the ends of the body. Posterior parapodia become more slender and elongated.

Notocirrophores (Pl. XXIX, fig. 24) arise almost in contact with the notopodia but slightly caudad and dorsad of them; they are cylindroid with enlarged bases and reach far beyond the notopodial setigerous lobe. Styles slender, elongated, reaching far beyond tips of setæ or well beyond dorsal median line, tapered nearly regularly, with very slight subterminal enlargement, to a long filamentous tip; a very few small clavate sensory cilia scattered throughout their length. Neurocirri with short, well-differentiated cirrophores and rather long, regularly tapered styles reaching to the middle of the foliaceous presetal lobes.

Acicula single in each ramus, stout and brown at base, tapering to slender, colorless tips which project freely, the notopodial from the end of the acicular process, the neuropodial from behind the tip of the presetal lobe. Notopodial setæ (Pl. XXIX, figs. 27, 28) in an irregular, slightly spreading tuft, moderately numerous, pale yellow, rather stout, straight or slightly curved, tapered to blunt points and practically smooth, the pectinations being nearly obsolete. Two

setæ of this kind occur on the peristomial parapodium; and on posterior parapodia the number is much reduced. Neuropodial setæ longer and more slender than in *H. caeca* and pale yellow or straw-color instead of deep yellow. They are few in number, only from one to three in each series and on middle somites usually only one or two supra-acicular and six (or five) subacicular setæ or series of two or three setæ. The shafts are nearly or quite as stout as the notopodial setæ and the long distal enlargements (fig. 25) arise gradually and are never strongly developed but are longer than in *E. caeca*. They are only slightly curved and taper gently to rather strongly hooked, acute tips (fig. 26) provided with a prominent, slender and acute accessory tooth which becomes progressively smaller on setæ of the more ventral rows and is often absent on the ventralmost. Transverse pectinations are equally close and numerous and only slightly more marked than in *E. caeca*.

Elytrophores have the same arrangement as in *E. caeca* but are rather smaller and more elevated. They are situated far out on the parapodia. The dorsal tubercles (fig. 24) which alternate with the elytrophores project very prominently and their free ends come nearly into contact with the notocirrhores. Elytra have small areas of attachment and are readily displaced, nearly all of them being loose in the known specimens. They are nearly indistinguishable from those of *E. caeca* but are somewhat more membraneous and delicate. They lack marginal cilia and surface tubercles except for a single triangular area of crowded small ones with its base at the hilum and apex at the scar. The branching nerves radiating excentrically from the scar of attachment are particularly large.

Entire body pale yellow entirely lacking pigment; all cephalic appendages, cirri and elytra quite colorless.

Stations 4,400, north of San Diego, lat. 32°, 50' N., 118°, 03' W., 500–507 fathoms, green mud (type and cotype); 4,528, Monterey Bay, Point Pinos Light, 545–800 fathoms, soft gray mud (cotype).

This species resembles *E. caeca* in general appearance but differs in many respects and especially in the longer and more slender neuropodial setæ with accessory subterminal tooth. It departs in many ways from the more typical species of *Harmothoë*, especially in the structure of the parapodium.

*Harmothoë (Evarne) fragilis* sp. nov. Pl. XXIX, figs. 29, 30; XXX, figs. 31–33.

In general resembling *Evarne impar* Malmgren, moderately depressed, greatest width far forward tapering regularly but only slightly caudad. Length of type 19 mm.; maximum width (VII or VIII), 3 mm.;

between tips of parapodia about 5 mm., and between tips of setæ, 7.2 mm. Number of segments 37.

Prostomium (Pl. XXIX, fig. 29) as wide or slightly wider than long, depressed, frontal slope moderate, divided by a median dorsal furrow for most of length, the halves smoothly rounded; postocular region somewhat contracted but concealed by a membranous nuchal fold; greatest width slightly anterior to middle and occupied by prominent ocular swellings anterior to which is a rather abrupt constriction sloping immediately into the peaks. Cephalic peaks usually rather large and prominent, with steep medial slopes and blunt apices separated from the median ceratophore by an interval not exceeding three-fifths diameter of median sinus which reaches nearly to the center of the prostomium and is continued into the dorsal furrow. Eyes two pairs, both large and prominent, black; the posterior one-sixth to one-eighth width of prostomium, facing nearly dorsad at posterior lateral angle, separated from concealed caudal border of prostomium by nearly their diameter and from each other by three to five times their diameter; anterior eyes one-fourth to one-sixth width of prostomium, on sides of ocular swellings anterior to middle and seen from above only through the tissues of the head, separated from posterior eyes by one to one and one-quarter times the diameter of the latter. Some specimens have the eyes even larger and they are always conspicuous although the anterior are little visible from above.

Median ceratophore (Pl. XXIX, fig. 29) about one-half length of prostomium but deeply inserted into sinus and scarcely reaching beyond peaks; style unknown, missing from all specimens. Ceratophores of lateral tentacles cylindroid, fully half as long as median ceratophore but owing to position well back on ventral face of prostomium they are usually completely concealed in dorsal view by the cephalic peaks; styles nearly three-fourths length of prostomium, subulate, the distal one-third slender; sensory cilia elongated and enlarged. Palps about three to three and one-half times prostomial length, rather stout at base, where their diameter nearly equals one-half width of prostomium, smooth or often annulated, tapered to a short terminal filament and bearing a few lines of very small globoid sensory cilia. Facial ridge moderately prominent, reaching into mouth, which is surrounded by the usual prominent trifold lips.

Peristomium obsolete above, its rather small parapodia bearing a small tuft of notopodial setæ and its cirrophores not quite reaching level of prostomial peaks, largely concealed by notopodial setæ of II which spread over them; styles (Pl. XXIX, fig. 29) unusually slender,

elongated subulate with filamentous ends, without subterminal enlargement and bearing filamentous sensory cilia with rounded ends and as long as one-half diameter of style; the dorsal twice, the ventral one and three-fifth times length of prostomium. Metastomial segments separated by only obscure furrows; the dorsum little convex and with scarcely noticeable transverse ridges; elytophores and dorsal tubercles both low and inconspicuous. Venter very smooth; neural furrow and lateral muscular ridges little developed except toward caudal end. Nephridial papillæ begin at VI, arising from well-marked, rounded swellings at posterior base of parapodia, all small and directed dorsad into interpodal clefts. Pygidium minute with dorsal anus directed dorso-caudad and surrounded by a finely crenulated border. Anal cirri missing from all specimens but judging from the size of their scars of large size.

Parapodia (Pl. XXX, fig. 31) short, less than one-half width of segments at anterior end and middle of type, longer toward caudal end and throughout the length of some specimens but never prominent, compressed, fully as deep as long, dorsal slope very steep, rami well differentiated, not greatly unequal in size. Neuropodium rather slender, divided distally into a short, broad, truncate postsetal lobe and a much longer, slender, compressed presetal lobe tapering to a blunt end and including the acicular process which terminates in a slender cirrus about two-thirds as long as the process. Notopodium relatively large, nearly as broad as setigerous portion of neuropodium which it overlaps broadly from behind, bearing a long, slender, tapered blunt, acicular process lacking a cirrus and reaching nearly to the end of the neuropodial acicular process without its cirrus. Some specimens have the parapodia studded with small spherical bodies filled with a mass resembling spores which project from the surface and which are probably parasitic in nature.

Notocirrophores (Pl. XXX, fig. 31) situated close to the notopodia and partly concealed behind their setæ, subconical with swollen base reaching tip of notopodial acicular process; styles long and slender like tentacular cirri, regularly tapered without subterminal enlargement, bearing sparsely distributed slender cilia with globoid ends, many of them as long as diameter of style, reaching about two-fifths of length beyond tips of longest neuropodial setæ and to elytophores of opposite side. Neurocirri (fig. 31) arising behind middle of ventral face of parapodia by a small cirrophore; styles subulate, slender, reaching to base of acicular process or beyond, entirely lacking sensory cilia or with a very few minute ovate ones. Neurocirrus of II more than twice length of others.

Acicula of the usual form, pale yellow, the acute ends projecting freely. All setæ pale yellow, all rather short and little spreading, becoming very little longer caudad. Notosetæ in a single ranked whorl, this arrangement obscured by their being depressed. The shortest and most curved are antero-medial and they increase in size and become straighter laterad, caudad, mediad and back nearly to starting point. They are much stouter than the neurosetæ, many being two and one-half to three times the diameter of the latter, more or less curved and tapering to blunt tips (Pl. XXX, fig. 33); pectinations extending over more than one-half of exposed portion, rather prominent, very regular, two to two and one-half rows in distance of greatest diameter, continuing nearly to tip leaving only a very short and blunt point which is smooth or more or less sculptured or even tufted. Neurosetæ in vertical fan-shaped tufts directed nearly laterad. They are numerous and crowded and appear to be in four or five supra-acicular and eight or nine subacicular series. Nearly colorless with long, slender, very slightly curved shafts; the distal enlargements (Pl. XXIX, fig. 30) rather prominent and long, gracefully curved and tapered; the pectinated appendages rather long and in face-views conspicuous, finely and deeply divided, rather widely spaced, and not numerous, from sixteen in ventral to twenty-three in dorsal series, the proximal ones small; smooth ends long, often three to four times diameter of seta, with rather strongly hooked tips below which on all except the ventralmost is a very slender, acute accessory process reaching nearly to the main tooth.

Elytra fifteen pairs having the usual arrangement. Very little is known of them, few remaining with the specimens. So far as known they are rather small and probably leave a portion of the dorsum uncovered. The first is circular, the next two very deeply reniform or broadly lunate (Pl. XXX, fig. 32), the others ovate reniform with a small and very excentric area of attachment. All known are soft and semi-gelatinous or gelatino-membraneous in texture and the dorsal surface is thickly studded with small conical or truncate roughened spines or horny tubercles among which a few longer cilia are scattered. Rather long cilia form a somewhat dense fringe along the lateral margin. In addition each elytron bears along the posterior margin, beyond which they project freely, several (4-7) large, recumbent, inflated, ovate, deep brown, soft papillæ which are usually very conspicuous and give to the elytron a very irregular outline.

Entire middle field of dorsum between elytophores deep chocolate brown, rarely paler brown, each segment marked by two delicate

transverse white lines which converge and meet on each side at the dorsal tubercle or elytophore. Parapodia, elytophores, notocirri, neurocirri, prostomium, palps, tentacular cirri, median ceratophore and under parts unpigmented or (as preserved) white. Facial ridge, paired lips and lateral ceratophores pale brown. Elytra translucent, pale brown, the large papillæ chocolate. The deep solid pigmentation of the dorsum is very characteristic of this species among California Polynoidæ and very few examples fail to exhibit it.

One small example has the proboscis protruded, 2.8 mm. long, about 1 mm. in diameter, subcylindrical, depressed at the orifice which is surrounded by nine dorsal and nine ventral papillæ. Jaws deep brown, of the usual form, the fangs small, the cutting plates broad and directed laterad.

This species differs from *Evarne sexdentata* Marenzeller especially in the character of the elytral papillation, the horny papillæ in the latter being pointed and often bifid, the soft papillæ much smaller. The setæ differ but slightly.

Although represented in the collection by a considerable number of specimens this species is so fragile that not a single perfect example is known. The type is one of two that have all segments and both of these lack elytra and most of the cirri, etc. Not a single one possesses the median tentacle or anal cirri and only eight elytra in all are known. Most of the specimens are anterior ends of fifteen to twenty segments without elytra or cirriform appendages. Another source of imperfection is the frequency with which the parapodia are cast off, some specimens being completely denuded for a considerable distance. There is some variation in the length and sculpturing of the tips of the notopodial setæ and in the length of the cephalic peaks due to varying states of contraction. The only specimen containing nearly mature ova was taken at station 4,418. Two specimens were taken at stations 4,413 and 4,423; only one at each of the others.

Stations 4,351, Point Loma Light, vicinity of San Diego, 423-488, soft green mud; 4,400, lat. 32° 50' N., long. 118° 03' W., 500-507 fathoms, green mud; 4,402, off San Clemente Island, 542-599 fathoms, green mud (cotype); 4,407, off Santa Catalina Island, 334-600 fathoms, gray sand and rocks; 4,413, off Santa Catalina Island, 152-162 fathoms, fine sand (type and cotype); 4,418, off Santa Barbara Island, 238-310 fathoms, dark mud and sand (cotype); 4,421, off San Nicolas Island, 291-298 fathoms, gray mud and rock; 4,423, same, 216-339 fathoms, gray sand, black pebbles and shells; 4,430, off Santa Barbara Island, 197-281 fathoms, black sand, pebbles and rocks; 4,436, off San Miguel Island, 264-271 fathoms, green mud.

\* **Harmothoë (Evarne) forcipata** v. Marenzeller.

*Evarne forcipata*, v. Marenzeller, Denksch. kaiserl. Akad. Wiss. Wien, Math.-Nat. Cl., Bd. LXXII, p. 573, Taf. II, fig. 7.

The type of this species, taken off Eno-sima, Japan, at a depth of 200-480 meters, is only 12 mm. long. A similar specimen taken by the Albatross at station 3,707 in Suruga Bay, Japan, in 1900 is in the collection of this Academy.

Much larger specimens, three 15 mm. long, one 27 mm. long and one 36 mm. long, occur in the present collection. The neuropodial setæ are of very characteristic form and agree exactly with v. Marenzeller's figures; those of the ventralmost series, however, are much smaller, very delicate, smooth and have simple acute tips. There are two or three rather large setæ on the peristomial parapodia. The cephalic peaks are very prominent and the anterior eyes nearly twice as large as the posterior. On the first pair of scales the entire surface is thickly studded with small conical points, on the others they are confined to a broad curved marginal band projecting beyond the center of the scale. Notocirri have rather fewer cilia than figured by Marenzeller. Nephridial papillæ begin on VI and are directed upward between the parapodia.

Stations 4,401, south of San Clemente Island, lat. 32° 52' N., long. 118° 13' W., 448-468 fathoms, green mud, sand and rocks; 4,427, off Santa Cruz Island, 447-510 fathoms, black mud, rocks; 4,429, same, 506-580 fathoms, green mud.

**Antinoë macrolepida** Moore.

*Antinoë macrolepida* Moore, Proc. Acad. Nat. Sci. Phila., 1905, pp. 538-541, Pl. XXV, figs. 21-23.

The anterior end of a single specimen with the pectination of the notopodial setæ even finer than usual but quite typical in every other respect. When intact in the parapodia the distal halves of the neuropodial fascicles of setæ have a distinct orange color.

Station 4,523, Monterey Bay, Point Pinos Light, 75-108 fathoms, soft/dark mud.

\* **Antinoë anoculata** sp. nov. Pl. XXX, figs. 34-40.

A fragile species which reaches a larger size than the average in this family. All of the three specimens lack the caudal end, the type being most complete. Form much depressed, with long parapodia and the body strongly tapered from near the cephalic end. The type measures 36 mm. long; width at X, of body only 4 mm., between tips of parapodia 11 mm., between tips of setæ 14.3 mm.

Prostomium (Pl. XXX, fig. 34) slightly longer than wide, the widest

region little more than one-third from the posterior end where the sides swell out abruptly and prominently; from this point the sides are nearly straight and converge rapidly to the anterior lobes which are small and separated by a wide fissure occupied by the base of the median tentacular ceratophore; cephalic peaks minute, well separated from the median ceratophore and well above and free from the lateral tentacles. Dorsum of prostomium very smooth, prominently elevated posteriorly and sloping regularly to the peaks; median furrow very slightly developed and no trace whatever of pigmented eyes.

Median tentacle (Pl. XXX, fig. 34) with large ceratophore nearly or quite one-half the length of the prostomium and rapidly tapered from the broad base which is inserted for only a short distance into the prostomium and united to its anterior lobes. Style slender, delicate, flagelliform and regularly tapered to the end; scarcely twice length of prostomium. Lateral tentacles arising from small, slightly tumid ceratophores beneath peaks and at a level lower than the median ceratophore; the styles small, about as long as median ceratophore, subulate, tapering to slender tips. Palps slender and elongated, nearly twice median tentacle, regularly tapered, smooth, terete, longitudinally striated and terminated by a minute filament. Facial ridge prominent, reaching to trifid mouth which is bounded by rugous lips. All cephalic appendages thickly clothed with minute sensory cilia which on the palpi are scarcely elevated above the surface.

Peristomium obsolete except laterally where it is crowded far forward in the form of parapodia bearing the tentacular cirrophores, which reach the level of the prostomial peaks, and a small achæitous acicular lobe. Styles of tentacular cirri resembling median tentacle, smooth, slender, tapered, and lacking subterminal enlargements, the dorsal about equalling, the ventral three-fourths as long as the median tentacle. Body rather narrow and depressed, regularly tapered from near the anterior end; below with prominent lateral muscular ridges bounding a furrow in which is a prominent neural ridge. On the dorsum each segment is marked with deep transverse depressions. Nephridial papillæ begin on VI, arising from the sides of small elevations in the usual position; they soon become long tubes curved upward and backward into the interpodal furrows. Pygidium unknown.

Parapodia (Pl. XXX, fig. 35) very prominent, on anterior segments quite equal to width of body, posteriorly still longer, projecting strictly laterad, the base broad and compressed, the rami well-differentiated. Notopodia rather prominent projections from the strongly

sloping face of the parapodia, convex dorsally, its ventral border prolonged into a slender, tapered, acicular process from the extreme end of which the tip of the single stout aciculum projects. Neuropodia very large, sloping from both dorsal and ventral borders to a blunt tip from which projects a blunt, stout acicular process bearing a finger-like terminal cirrus beneath which the tip of the aciculum appears.

Notocirrophores arise immediately above and behind notopodia; they are unusually long and slender and nearly equal the length of the notopodium with its acicular process (fig. 35); styles also long and slender, reaching beyond mid-dorsal line and fully one-third of their length beyond tips of longest neuropodial setæ, regularly tapered to slender tips without subterminal enlargements and bearing a few very short clavate sensory papillæ. Neurocirri very small, arising near middle of ventral face of parapodium and scarcely reaching to ventralmost row of neuropodial setæ, slender, tapered, subulate and quite smooth. On somite II the rami are nearly equal and the neurocirrus reaches nearly to the setæ tips.

Elytrophores low and inconspicuous, borne on somites II, IV, V, VII and alternate segments to XXIII, XXVI, XXIX=14, a fifteenth on XXXII being probably normal. Dorsal tubercles, which alternate with elytrophores, small but rising prominently above the level of the dorsum, especially on anterior segments. Elytra very readily detached, large and completely covering dorsum, except the first, which is circular with central attachment, the others broadly ovate-reniform with oval scar antero-mediad of center (Pl. XXX, fig. 36). Texture soft and membranous; to the naked eye surface appears smooth and lacking cilia; under the microscope they exhibit an area of minute tubercles between the scar and the anterior border, a slightly granular surface elsewhere and a few minute cilia along the margin. The nerves, branching and radiating from the scar, are conspicuous through the translucent tissues. Many of the elytra are covered with a greenish-yellow incrustation with oblique parallel streaking.

Acicula single, deep yellow, of the usual stout, tapered form with simple tips. Setæ all pale straw-colored, long, forming prominent tufts. Notopodials much stouter than neuropodials, the fascicles forming whorled tufts directed more laterad than dorsad; the setæ (Pl. XXX, figs. 39, 40) very slightly curved, tapered to blunt-pointed, smooth tips below which are very numerous close rows of teeth so fine that they can be differentiated only under high magnification. Somite I (peristomium) possesses two short setæ of this type pro-

jecting from below the tip of the aciculum. Neuropodial setæ (P. XXX, figs. 37 and 38) more numerous, arranged in three supra-acicular and six or seven subacicular series. All much longer than the notopodials but averaging only about one-third their diameter; the shafts long and distal enlargements inconspicuous, slightly curved and tapered to long, prominent but not especially slender smooth tips, below which are narrow pectinations which become longer and more prominent distad. Setæ of the two dorsal rows (fig. 37<sup>a</sup>) are especially slender, with the little enlarged pectinated regions taking up about half of the exposed portion and bearing thirty-five or more pairs of pectinæ. Those of middle rows (fig. 37<sup>b</sup>) are stouter and bear about thirty pairs of pectinæ of which the basal ones are mere striations, the smooth tips being especially elongated. Setæ of the ventralmost row (fig. 37<sup>c</sup>) have much shorter distal regions with fewer pectinæ and very acute tips. Posteriorly all setæ become longer and more slender.

Except for a slight duskiness in places pigment appears to be wanting but the cuticle exhibits a purplish iridescence.

In the character of its setæ this species departs somewhat from the typical condition and approaches *Eunoë*.

Stations 4,381, off North Coronado Island, vicinity of San Diego, 618-667 fathoms, green mud; 4,517, Monterey Bay, off Point Pinos Light, 750-766 fathoms, green mud and sand (type and cotype).

• *Gattyana senta* Moore.

*Gattyana senta* Moore, Proc. Acad. Nat. Sci. Phila., 1902, pp. 259-263 Pl. XIII, figs. 1-13.

One specimen occurs in the collection from each of four stations and two from a fifth. Most of the very characteristic and remarkably protected elytra are in place; often they are blotched with brown; the marginal spines of posterior elytra have extremely long acute prongs. As Treadwell states the nephridial papillæ begin on VI but the anterior ones are very small.

A medium-sized example has the proboscis protruded. It measures 4.5 mm. long, 3.6 mm. deep at the middle and 2.4 mm. wide at the end, being truncate subfusiform in shape, compressed at the base, depressed at the aperture; Apertural papillæ nine above and nine below, rather long, blunt at the end. Jaws pale brown, of the usual form, with fang and cutting plate, the ventral somewhat larger and biting to right of upper.

Stations 4,361, Point Loma Light, vicinity of San Diego, 91-97 fathoms, gray sand, mud and rock; 4,377, same, 127-299 fathoms, green mud and sand; 4,420, off San Nicolas Island, 32-33 fathoms,

fine gray sand; 4,463, Monterey Bay, off Point Pinos Light, 48-111 fathoms, rocky; 4,532, same, 30 fathoms, gray sand and rocks.

*Nemidia microlepidia* sp. nov. Pl. XXX, figs. 42-44; Pl. XXXI, figs. 45, 46.

The single specimen known fortunately retains the full number of segments and is a long, slender, depressed worm of very even width. Number of segments 85; length 58 mm.; width at X, body only 2.5 mm., spread of parapodia 7.2 mm.; at L, body 2 mm., spread of parapodia 6.8 mm.; greatest depth about 2 mm.

Prostomium (Pl. XXX, fig. 42) small, slightly wider than long, greatest width a little behind the middle where the sides project prominently; anterior to this point the sides are straight and converge strongly to the minute peaks which lie very close to but free from the median ceratophore; anterior fissure rather deep but completely filled by the median ceratophore which is soldered to the prostomial lobes, not more than its distal third being free. Eyes wanting. Median tentacle stout and swollen in the middle, completely filling cephalic sinus and coalesced with the prostomium, on the dorsum of which it rises as a ridge, the distal third free. Style short, about one and one-third times length of prostomium, rather slender, the distal one-third tapering to a short filament. Lateral tentacles (fig. 42) arising from short, thick ceratophores which are united in the median line below the median ceratophore, at the sides of which they are largely exposed; styles short, rather stout and subulate, tapering to very short terminal filaments, their length one-half or less of median style. Palps (fig. 42) imperfect from sloughing of their ends, rather short, little exceeding twice head, thick, little tapered till near end, terete and perfectly smooth, without sensory cilia.

Peristomial parapodia (Pl. XXX, fig. 42) short and thick, diverging above base of palps, supported by a single stout aciculum, the tip of which appears in a dorso-median position; apparently achætous; cirrophores united nearly to their ends; styles like median tentacle and the dorsal of equal length, the ventral slightly shorter, both rather stout, tapered to a short terminal filament and lacking sensory cilia.

Body narrow, at widest part only one-third of width between ends of parapodia and posteriorly, where the parapodia are longer, much less than that; tapering very gently and regularly caudad. Segments well defined, each bearing on the dorsum two prominent, blunt, median papillæ in tandem, all together forming a series which becomes higher and more crowded posteriorly, finally constituting an almost continuous serrated crest. On the ventral side the usual

neural furrow is bounded by low, smooth, lateral muscular ridges. Nephridial papillæ begin on VI in the usual position and soon become prominent, strongly clavate, appendages having a length about one-half the diameter of the foot and projecting freely ventro-latero-caudad. Pygidium a short tube bearing a pair of cirri about as long as the median tentacle but much more slender.

Parapodia (Pl. XXX, fig. 43) long, directed strictly laterad and enhancing the appearance of depression; posteriorly they are relatively long so that the extreme width remains nearly uniform. Typical parapodia are scarcely compressed, subconical in form, with the end obliquely truncate. Rami very unequal, the notopodium a scarcely differentiated process about halfway between the notocirrus and tip of the neuropodium consisting chiefly of a rather short subconical acicular process. Neuropodium large, little tapered, its obliquely beveled end slightly compressed and divided into a low presetal lip, slightly prolonged into a short acicular process surmounted by a short, somewhat flattened supra-acicular cirrus, and an equally low postsetal lip. On the first two parapodia the neuropodium is shorter and the notopodium larger; at the caudal end this condition is reversed, the neuropodium becoming very long and slender.

Notocirrus (Pl. XXX, fig. 43) arising from behind base of parapodium far mediad of notopodium, its cirrophore short and stout, directed nearly laterad, style moderately slender with the distal half tapering to a terminal filament which reaches barely beyond the end of the neuropodium and not nearly to the middle line; it bears a few scattered, short, clavate sensory cilia. Neurocirrus arising from a very low cirrophore on ventral side of foot halfway between nephridial papilla and ventral border of neuropodial setæ bundle but is so short that its tip fails to reach either; basal half thickened, tapered to a filamentous distal third, bearing a few cilia like those on the notocirrus.

Acicula of the usual character, the neuropodial especially stout and the blunt tips of both projecting slightly. Setæ very imperfectly known, all except those on a few segments at the ends of the body being broken off flush with the surface. Most of those remaining, like the exposed tips of the acicula are encrusted with a reddish deposit. The description necessarily refers to setæ at the ends of the body, those of the middle segments being probably shorter and stouter. Notopodials a small tuft, colorless, very slender and capillary with close fine serrations for nearly entire length. Neuropodials (Pl. XXXI, figs. 45 and 46) in moderate number, forming an obliquely vertical fascicle not arranged in the usual horizontal series, colorless, all deli-

cate; when complete the distal thickening tapers into a long tenuous tip armed with conspicuous pectinations. Very few setæ possess this tip, being broken off just beyond the thickening as shown in figure 46 but it is probable that the filament is normally present in all.

Elytrophores on II, IV, V, VII, IX, XI, XIII, XV, XVII, XIX, XXI, XXIII, XXVI, XXIX and XXXII = 15. All other metastomial somites bear notocirri and dorsal tubercles. Elytrophores are situated close to the posterior border of the base of the parapodia and slightly mediad of the alternating notocirrophores. They are very small and little elevated with depressed circular centers. Dorsal tubercles are scarcely noticeable on anterior segments but rather better developed behind the elytrophores region.

Elytra (Pl. XXX, fig. 44) rather firmly attached but so small that they were at first overlooked altogether. They about equal the antero-posterior diameter of the parapodia and because of their posterior position slightly overlap the following foot and leave the anterior portion of the one to which they are attached uncovered. The lateral border reaches the lateral side of the notocirrus and the mediad border falls far short of the base of the parapodium, the body being of course, entirely uncovered. They are not in the slightest degree imbricated but are separated by a space equal to at least one-half their own diameter. All are rather thick, firm and leathery, circular or nearly so with the circular or elliptical scar close to the anterior border; the cuticle thick and smooth, without trace of surface or marginal cilia or papillæ; the interior finely granular and opaque.

Extended proboscis 4.5 mm. long, 3.5 mm. wide at end; stout, terete at base, somewhat depressed at end; seven blunt bifid papillæ above and seven below, the lateral pairs of most polynoids wanting. Jaws rather thin, the median sutures obliterated, forming above and below an entire transverse plate of a gray color thickened near middle line by a pair of brown ridges that rise into very small points corresponding to the fangs of other polynoids.

No color or pigmentation.

Station 4,522, Monterey Bay, off Point Pinos Light, 149-130 fathoms, gray sand and shells (type only).

Next follow the descriptions of four very imperfectly known blind species described from very imperfect material. They are not very closely related but owing to my doubts regarding their generic designation and my hesitation to establish any new genera that more complete knowledge may show to be superfluous all are here provisionally placed in the genus *Polynoë*.

• *Polynoë(?) remigata* sp. nov. Pl. XXXI, figs. 47-51.

Described from a single incomplete and mutilated specimen having 18 setigerous segments and measuring 17 mm. long, with a maximum body width of about 3 mm. and a width between setæ tips of about 10 mm.

Prostomium (Pl. XXXI, fig. 47) about one-third wider than long, consisting of two broadly pyriform smooth lobes with broad spheroidal ends caudad, the anterior ends narrower but rounded, without distinct peaks. Anterior fissure deep, reaching to middle of prostomium and continued to its posterior border by a narrow furrow. Pigmented eyes totally absent. Median ceratophore arises near middle of head and occupies anterior fissure, moderately stout and cylindroid; style missing. A pair of small swellings below the anterior ends of the cephalic lobes probably represent the bases of the lateral tentacles, the rest of which is missing. Palps both present but the left only perfect, rather small, their basal diameter not exceeding one-third of the width and their length two and one-half times the length of the prostomium, smooth, tapered, with no sensory cilia and no distinct terminal filament.

Peristomium a short but quite distinct ring united to the median furrow of the prostomium by a slight median fold. Its parapodia (Pl. XXXI, fig. 47) fail to reach anterior border of the prostomium, its ceratophores distinct distally. All styles except the left peristomial notocirrus, which has grown fast to the base of the palpus, lost. It (fig. 47) is slightly longer than the palpus, has a slight subterminal enlargement and a short but pronounced terminal filament and lacks sensory cilia.

Few parapodia are perfect. In the middle region (Pl. XXXI, fig. 48) they are little longer than the width of their segments, compressed at the base, the rami well differentiated. Neuropodium elongated, with nearly parallel borders terminated by a short, slightly convex postsetal lip and a pointed presetal lip which is prolonged into a slender, spine-like acicular process nearly the length of the free neuropodium and bearing a short terminal cirrus. Notopodium rather large, more than half as long and half as deep as the neuropodium, truncated conical; the ventral border prolonged into a straight, stiff, slender, blunt-ended acicular process more than one-half the length of that of the neuropodium. All notocirri and neurocirri lost; notocirrophores (fig. 48) very large (probably swollen in preservation), well separated from notopodium. All elytra missing; elytraphores borne on base of feet of somites II, IV, V, VII, IX, XI, XIII, XV and

XVII, high and prominent. Dorsal tubercles rather long and slender. Nephridial papillæ thick and very short.

Acicula rather slender, of usual form. Notopodial setæ very few, usually three to six very closely appressed to acicular process, pale yellow, slightly stouter than neuropodials, straight, blunt and with the transverse lines of teeth extremely close, fine and numerous, appearing under 500 diameters as scarcely discernible transverse lines (Pl. XXXI, fig. 49). Neuropodials (figs. 50 and 51) numerous, forming dense rather long brushes, colorless and delicate, the ends flattened but not much expanded, the marginal serrations very fine and the point rather acute. Colorless.

Station 4,407, off Santa Catalina Island, 334-600 fathoms, gray sand and rocks (type only).

• *Polynoë*(?) *flamentosa* sp. nov. Pl. XXXI, figs. 52-56.

Known from a single imperfect and incomplete specimen consisting of 24 setigerous segments, 17 mm. long, the body 2.5 mm. wide and the width between seta tips 8.5 mm. Found with *P. remigata* and somewhat resembling that species but with the body more slender and the setæ quite different.

Prostomium unknown, being much macerated and torn and all cephalic appendages lost. No elytra are in place; elytophores rather small and elevated, farther out on parapodia than on *P. remigata*; borne on the usual somites on the anterior region of the body. Dorsal tubercles very long and slender, especially on posterior segments on which they reach nearly to the ends of the notocirrophores. Nephridial tubercles very short and rather thick and truncated.

Parapodia (Pl. XXXI, fig. 52) closely similar to those of *P. remigata*, the notopodium not so well separated, more conical and tapered and the acicular process stouter at the base and also more tapered. Notocirrophores arise above base of notopodium and are much smaller than in *P. remigata*. A single style remaining on somite XVIII is remarkable for its great length and tenuity, which may be enhanced by abnormal stretching. It is more than one-half the entire length of the worm or twice the total width of body and parapodia, flagelliform without subterminal enlargement or sensory cilia. Neurocirri (fig. 52) arise halfway between nephridial papillæ and end of ventral border of neuropodium to which they reach; they are slender and uniformly tapered.

Notopodial setæ moderately numerous, forming somewhat prominent radiating bundles. They are colorless, rather coarse (Pl. XXXI, fig. 54) nearly straight, tapering to acute points (fig. 53) and bear

rather conspicuous half-round ensheathing plates with entire or nearly entire margins along one side. Neuropodial setæ (fig. 55) are very numerous and form dense brush-like bundles as in *P. remigata* but the setæ are considerably stouter than the notopodials, with broad, paddle-like distal expansions (fig. 56) having simple marginal serrations which become rather coarse toward the subacute tip.

The only pigment is a little of reddish brown color on the elytophores. Station 4,407, off Santa Catalina Island, 334-600 fathoms, gray sand and rocks (type only).

*Polynoë(?) aciculata* sp. nov. Pl. XXXI, figs. 57 and 58.

A single very imperfect specimen, with 18 setigerous segments and measuring 9 mm. long and 7 mm. between the setæ tips, represents this species.

Prostomium distorted, much contracted and bent dorsad by the protruded proboscis. It is about twice as wide as long and deeply divided by a median fissure into a pair of anteriorly divergent, rounded lobes from between which a small cylindrical median ceratophore, from which the style has been lost, arises. The lateral tentacles and palps also are missing and there is no trace of pigmented eyes. A single ventral tentacular cirrus remains and is a slender, tapered style without subterminal thickening and about twice as long as the width of the prostomium.

The body is slightly depressed and somewhat fusiform, the segments well defined and rather longer than usual, most of them being nearly half as long as wide. Elytophores on II, IV, V, and alternate segments to XVII, small, low, at base of parapodia and widely separated from notopodial ramus. Dorsal tubercles very small slightly hooked laterally, situated in line with elytophores. Nephridial papillæ not obvious.

Parapodia largely lost or injured and those remaining evidently considerably retracted (Pl. XXXI, fig. 57). Their length does not exceed the width of the segments and they are strongly compressed and about as deep as long, the rami very unequal. Neuropodium with steep dorsal border and truncate end, the presetal lip of which is produced into a long, stiff, acute, spine-like acicular process which appears to lack a terminal cirrus. Notopodium a contracted achætout subconical tubercle prolonged into an acicular process similar to that on the neuropodium and nearly as long, usually slightly curved.

Notocirrophores (fig. 57) arising in contact with the notopodial tubercle far out on parapodium, prominent and rather long; noto-

cirrostyles flagelliform, smooth, reaching beyond the tips of the longest setæ, only a few in place. No neurocirri remaining.

Both acicula are rather stout, the distal ends being less attenuated than usual and apparently not perforating the integument of their processes; they are longitudinally striated throughout. No trace of notopodial setæ can be detected. Neuropodial setæ are numerous and form a dense silvery white, flat brush not divided into horizontal series and nearly twice as long as the foot. They are straight, delicate and colorless with slender shafts and thin expanded distal ends tapered to blunt points. The margins are serrated with short, appressed teeth which are rather coarse on dorsal setæ (Pl. XXXI, fig. 58), very fine on those in the ventral part of the bundle.

Proboscis clavate, strongly depressed distally, 4 mm. long, 2.2 mm. broad and 1.3 mm. deep at distal end. Orifical papillæ rather small, nine above and nine below in close series. Jaws deep brown, hard; the fangs prominent; the cutting plates rather small and directed transversely, the ventral biting inside dorsal.

The specimen is of a nearly uniform pea-green color quite probably the result of staining.

Station 4,352, off Point Loma Light, vicinity of San Diego, 549-585 fathoms, green mud (type only).

**Polynoë(?) renotubulata** sp. nov. Pl. XXXI, figs. 59-64.

Known from the type only—a much mutilated specimen consisting of 35 somites which measure 26 mm. long, with a width of body just behind middle of piece of 3.6 mm., between ends of parapodia of 13 mm. and between tips of setæ of 22 mm.

Prostomium (Pl. XXXI, fig. 59) shaped much like that of *Polynoë longipedata* McIntosh but shorter, the length being about two-thirds width, without the lateral ceratophores subrectangular; posterior region constricted to form a sort of pedicle, anterior to which the prostomium abruptly expands into a pair of opaque hemispherical prominences forming its widest part and corresponding to the ocular lobes, within which the opaque white bodies are probably modified eyes lacking every trace of pigment. Anterior to these lobes the prostomium is more translucent and tapers slightly into the lateral ceratophores and anterior margin. There is no anterior sinus, dorsal furrow or cephalic peaks. Median ceratophore arising on dorsal surface posterior to middle, short, thick, its diameter more than one-third width of prostomium; its free ends with a deep rim deficient anteriorly and projecting at the sides as rounded lobes possibly corresponding to the tentacular scales referred to by McIntosh in his

description of *P. longipedata*. Ceratophores of lateral tentacles cylindrical, continuous with the sides of the cephalic face of the prostomium and separated by about their own diameter or more, their length about one-fourth of prostomium, projecting straight forward; style, three times length of prostomium without ceratophores. Palps very large, stout at base where they very nearly equal width of prostomium, length about six times prostomium, tapered to rather blunt tips lacking a terminal filament; surface smooth and without raised lines or sensory cilia.

Peristomium little developed, concealed largely by prostomium, its parapodia with large ceratophores and apparently achæatous. Styles of tentacular cirri long, slender, and regularly tapered, the dorsal as long as the palps, the ventral slightly shorter (Pl. XXXI, fig. 59). Body generally subfusiform. Anterior segments narrow, those following widening to middle of piece and decidedly depressed (partly the result of injury), then tapering again to caudal end which terminates in a small pygidium with dorsal anus from which the cirri have been lost. Segments fairly well differentiated, smooth dorsally, the venter with neural furrow and prominent neural ridge. Nephridial papillæ (Pl. XXXI, fig. 60) very remarkable. They begin on VI, arising in the usual position at the posterior base of the foot and directed dorsad into the interpodal cleft. At first they are delicate and not longer than the diameter of the foot but they rapidly increase in length until at XIV they reach the end of the neuropodium and on following segments extend considerably beyond it as far as the tip of its long acicular process. They are very slender, tapering at the base and filiform for most of their length. Posteriorly they become again shorter. Just how these long papillæ are disposed in the living worm is uncertain but several occupy the position shown by the dotted lines in the figure, passing between the parapodia and in a groove along the posterior face of the one to which they belong to end at the base of the fascicle of neuropodial setæ. Probably this is the normal position but a larger number and especially some longer than the one figured rise, as shown by the solid lines, like dorsal cirri above the parapodia and back. Elytrophores and dorsal tubercles of moderate size but most of them abnormally inflated, precluding an accurate description; the former situated on II, IV, V and alternate segments to XXIII, then on XXVI and XXVIII = 14. Owing to the mutilation of the specimen this distribution cannot be affirmed with entire certainty and it is probable that a fifteenth pair of small ones may exist on the reduced segments at the caudal end.

Parapodia (Pl. XXXI, fig. 60) remarkably elongated; many have been torn away or injured but a sufficient number remains to make evident their noteworthy features. They are much longer than the width of the segments to which they are attached, are compressed at the base and tapered into the neuropodium which is slender with nearly parallel dorsal and ventral borders, slightly compressed and subtruncate distally, the presetal lip longer and somewhat pointed and prolonged into a delicate, acicular process fully half as long as the ventral border of the parapodium and tipped with a short, blunt cirrus overhanging the projecting point of the aciculum. Notopodium scarcely separated from neuropodium, its basal part a small, slightly inflated cone bearing a small tuft of delicate capillary setæ and prolonged into a delicate, slightly curved, almost fiber-like acicular process as long as that of the neuropodium. Above and proximad of the neuropodium is a small notocirrophore and slightly further proximad the slightly developed connate dorsal tubercle alternating with the larger elytrorphores.

All notocirrostyles are lost but the appearance of the cirrophores indicates that they are quite small and perhaps rudimentary and it may be that the nephridial papillæ assume some of their functions. Neurocirri (Pl. XXXI, fig. 60) arise from slight cirrophores proximad of the middle of ventral border of parapodia, somewhat inflated (perhaps abnormally) at the base and tapered to delicate tips which reach the base of the nephridial papilla but fall considerably short of the ends of the neuropodia. Anteriorly they are relatively larger and the large cirrophore of II indicates that the lost style is of large size.

Acicula single in each ramus, yellow tinted, much prolonged into delicate, fragile ends which reach to the ends of the acicular processes enveloped in a thin integument beyond which the tip of the neuropodial alone projects. Notopodial setæ a small tuft of very delicate, smooth and long fibers. Neuropodials (Pl. XXXI, figs. 62-64) form a long and dense, flattened, brush-like fascicle projecting conspicuously laterad and slightly dorsad. They are nearly colorless, vitreous and have a fine satiny luster. The shafts are long and delicate, the distal expansions relatively short but very broad and oar-like, gradually widening to near the end and then rather abruptly tapered to a bifid tip (fig. 63); marginal serrations are slightly developed along the convex border, longest at the point of greatest width and becoming obsolete toward the tip.

A single elytron (Pl. XXXI, fig. 61) only—the first one of the left side

—is known. It is attached to II and covers most of the prostomium and immediately adjacent region. It is irregularly orbicular with a very small subcircular scar of attachment, remarkably thick, soft and of cushiony texture, the outer surface and borders everywhere thickly covered with peculiar large, soft hemispherical or dome-shaped soft papillæ, each bearing at its summit a single coarse filament or cilium. Postero-laterally these become larger and frequently confluent in twos and threes to form bilobed or trilobed papillæ.

The specimen is entirely unpigmented; the cuticle is thin and the tissues delicate and translucent with large nerves visible through it. In many places the tissues are more or less inflated. These appearances call to mind the conditions of the similarly abyssal *Laetmonice*.

This species is closely related to the imperfectly known *Polynoë* (*Adametella*) *longipedata* McIntosh from the North Atlantic, but the latter has stout notopodial setæ peculiarly bifid at the tips.

Station 4,397, off Santa Catalina Islands, lat. 33° 43' N., long. 117° 42' W., 2,196–2,228 fathoms, gray mud (type only).

#### APHRODITIDÆ.

The type genus abounds in this region, being represented in the collection by five species, two of which are evidently abundant. They vary in size from the little aberrant *A. parva*, sometimes less than ten millimeters in length to huge bulky specimens of *A. japonica* seven inches in length and nearly three inches wide. Three of the species have not been described previously. Less common is *Laetmonice*, represented by two species, one of which (*L. producta wyvillei*) occurs at the greatest depth (2,228 fathoms) at which Polychæta were taken by this expedition.

- ***Aphrodita armifera*** sp. nov. Pl. XXXI, figs. 65, 66; Pl. XXXII, figs. 67–75.

This very noteworthy species is represented by a single specimen. From broad ovate, the anterior end broadly rounded, the greatest width at XV, which is the middle of the length, the width rapidly reduced after XXI, and segments after XXVII forming a slender attenuated caudal region. Moderately depressed, the dorsum less arched than in many species and covered with a thin, clean layer of felt fibers at the sides of which the great lustrous brown spines are quite uncovered and rise over the back much as in a *Hermione*, the largest ones meeting or nearly meeting in the middle line.

Prostomium (Pl. XXXII, fig. 67) deep sunken between the parapodia of I and II and completely concealed by the elytra and felt, regularly ellipsoidal, the width about one and one-third times the length;

posterior margin subtruncate and united to the peristomium by a median nuchal fold, which is about one-fourth as wide as the prostomium and slightly arched. Ocular peduncles small, hemispherical, close together on anterior margin, the right bearing two small black eye-specks, the left lacking them. Tentacle arising from frontal face immediately below ocular prominences, bent downward, very short, not more than one-fourth length of prostomium, consisting of a very short ceratophore and a scarcely longer obpyriform style. Palpi moderately long and slender, about six times length of prostomium with a scarcely distinguishable basal segment, the cuticle smooth and polished to the naked eye but bearing numerous very fine sensory cilia just visible under a magnification of fifty diameters. Facial caruncle a thin compressed plate with somewhat serrated free border, covered with small round papillæ, the ventral process very short.

Peristomium represented dorsally by a short transverse fold, ventrally by small anterior lips; its parapodia (fig. 67) reaching about half their length in front of the prostomium. Tentacular cirri with well-separated stout cirrophores, the styles long and slender, with distinctly bulbous tips preceded by a constriction and slight subterminal enlargement; the dorsal about one-half length of palps and directed upward, the ventral slightly shorter than dorsal and directed downward. Mouth bounded by the peristomium, somite II and posteriorly by a broad, nearly smooth lip which divides III into a pair of lateral swellings and reaches to IV.

Metastomial segments indicated on the venter by transverse integumental ridges on a nearly flat surface bounded laterally by a shallow trench along the bases of the parapodia and divided into a median translucent neural third and lateral muscular thirds; cuticle thickly studded with small globular papillæ. Dorsally the segments are ill-defined, without distinct bounding furrows and with thin integuments and powerful lateral muscle ridges; cuticle thin and thickly studded] with minute papillæ (Pl. XXXI, fig. 66). Pygidium slightly cleft for the terminal anus which does not cut through several segments.

Elytra fifteen pairs on II, IV, V and every alternate segment to XXIII, then apparently on XXV, XXVIII and XXXI though the last three are somewhat doubtful. They are of large size and are broadly imbricated, completely covering the dorsum beneath the felt, colorless, translucent without markings or incrustations of any kind, soft and thin but tough and leathery. First three pairs elliptical with major axis transverse; several following nearly circular with attachment anterior to center; proceeding caudally they become

successively longer and the line of attachment, which extends from the middle to the lateral margin, shifts to a more posterior position. Those of the last pair are nearly three times as long as wide, tapered posteriorly and are attached about one-fifth of their length from the anterior end. They fold round the slender caudal region and reach beyond the anus, the edges meeting to form a nearly complete tube.

Owing to the rigidity of the dorsal spines and my desire to injure them as little as possible the dorsal fimbriated organs were incompletely studied. Apparently they begin on VI and occupy all cirriferous somites as far as XXVIII, occurring in the usual position near the posterior border of the segments at the level of the lateral border of the elytophore. They are small and thin, compressed and deeply fimbriated, the middle ones bearing seven to nine rather long, simple or bifid cirriform papillæ (Pl. XXXI, fig. 65).

Parapodia of the usual form, biramous. Neuropodium stout, supported by a single very stout aciculum, truncate, rough and at the end stepped for the three series of setæ, the surface, except dorsally densely covered with spherical papillæ of various sizes but averaging larger than those on the ventral surface of the segments. Notopodium a low, thick ridge prolonged to the dorsum. Neurocirrus arising from a low cirrophore located somewhat distad of the middle of the neuropodium and covered with crowded spherical papillæ of the largest size; style smooth, rather slender, tapered to a slightly bulbous tip which reaches to about base of middle series of setæ. Notocirrus with large cylindrical cirrophore arising just behind the ventral fascicle of notopodial setæ; style reaching to about tip of second largest spine of this group, slender, smooth, tapered to a distinct subterminal enlargement beyond which is a constriction and terminal ball. Peristomial parapodia (Pl. XXXII, fig. 67) small, slender and directed forward, supported by a single aciculum which terminates in the somewhat enlarged end bearing three dense tufts of fine capillary setæ. At the caudal end both rami become free and prolonged laterally and the notopodium lamelliform with a prominent acicular process, while the notocirri are relatively longer with very conspicuous terminal bulbs.

Neuropodial setæ in the usual three horizontal series. On middle segments the ventral series consists of five or six equal, brownish yellow, rather slender and slightly curved setæ, the end (Pl. XXXII, figs. 72 and 73) enlarged, tapered to a slightly hooked, acute tip and usually bearing a pair of small spurs and a few scattered tubercles. Middle series of three, brown, becoming stouter caudad, all smooth, gently curved, tapered without evident enlargement (fig. 71). Dorsal

series usually of two stouter, deep glistening brown, nearly straight spines (fig. 70). All middle neuropodial setæ are quite free from hairs and nearly or quite smooth. Toward the caudal end they become gradually elongated with increasing asperities and finally pale-yellow subcapillary setæ roughened with numerous short spines more or less regularly alternating on the two sides (fig. 75). The usual dense fascicle of pinnate setæ replaces the ventral neuropodials on II. In this species, so far as can be determined from a single specimen the spiral pennon is less developed than on the other species (fig. 74).

Notopodial setæ consist of stout, fragile spines and flexible fibers. The former (Pl. XXXII, fig. 68) are deep lustrous brown and form a conspicuous bristling armature penetrating the felt at the sides and protecting the sides and dorsum of the body for its entire length. They are more or less flattened, slightly curved near the base, then straight, very rigid and tapered to subacute points. The core is striated longitudinally and here and there fractured transversely and the hard outer shell is roughened by numerous small tubercles which increase in size toward the distal end until they are just visible under a magnification of four or five diameters (fig. 67). These spines are arranged in a dorsal and a ventral group on each segment. Ventral on middle segments of nine to eleven arranged in a vertical series and rapidly increasing in size from below dorsad, the most dorsal many times larger than the most ventral and more recumbent on the felt. Posteriorly they become longer and more recumbent and anteriorly shorter and more erect. Dorsal fascicles usually consist of two small oblique rows of five or six but on elytriphorous segments may be limited to a single somewhat longer row. These increase in size postero-caudad, the last of each series being much flattened and very long so that they cross those of the opposite side in an abattis-like arrangement. Anteriorly they are short, more erect and do not cross. At the extreme caudal end they become quite slender.

Fibers arise as usual in three tufts, the dorsal felt being formed by the intermediate tufts on all parapodia and by the larger dorsal tufts on elytriphorous segments only. They are exceedingly long and fine with peculiarly hooked tips and interlace to form the even but rather thin layer of felt which in this specimen is free from silt. The ventral or lateral tuft consists of much shorter, coarser, roughened fibers with straight fine points which do not felt but hang in loose fringes behind the parapodia. They correspond to the iridescent fibers of other species but nearly lack this quality and are dull gray and more or less covered with silt.

No color. Much affected with attached parasites which are often arranged with remarkable symmetry on the dorsal side.

Station 4,557, Monterey Bay, off Point Pinos Light-house, 28-40 fathoms, rocky.

In general appearance this species resembles *Aphrodita (Lætmonice) aphroditoides* (McIntosh) but the setæ differ and the palpi are much stouter. The most striking characteristics are the formidable rows of long, stout, lustrous, brown spines which posteriorly meet over the back, and the entire absence of brilliantly iridescent lateral fringes.

*Aphrodita japonica* v. Marenzeller.

*Aphrodita japonica* v. Marenzeller, Denks. K. Akad. Wissensch., Wien, XLI (1879), pp. 111 and 112.

This species has been reported already<sup>3</sup> from the dredgings of the "Albatross" as occurring on our coasts from the Gulf of Georgia to Alaska. The Academy of Natural Sciences possesses two very large and bulky specimens nearly seven inches long collected by Professor Harold Heath in 12 fathoms at Pacific Grove, Monterey Bay, in 1897. Professor Treadwell's remarks on the notopodial setæ render it probable that the species reported from Hawaiian waters<sup>4</sup> as *A. echidna* is really this species.

*Aphrodita japonica* occurs plentifully at numerous stations scattered over the whole range of these investigations, the largest number (twelve) being taken at station 4,436. The specimens vary from 28 mm. (sta. 4,322) to 155 mm. long and 70 mm. in extreme width between tips of neuropodial spines (sta. 4,457). The setæ and other characters agree exactly with the northern examples. The neuropodials increase in number with age and the densely hairy tips of the young become worn quite smooth on old specimens. A characteristic of the species—distinguishing it from related species with elongated hooked notopodial setæ—is the slender, rather long, tapered median tentacular style. This character, however, must be used with caution as the style is sometimes lost or broken and in this condition may resemble the short, clavate tentacles of other species. Marenzeller gives a good figure. The lateral fringes are dull reddish but detached tufts of the dorsal felt often exhibit a dull green color.

Stations 4,322, off Point La Jolla, vicinity of San Diego, 110-199 fathoms, green mud and shells; 4,325, same locality, 191-292 fathoms, green mud and fine sand; 4,334, off Point Loma Light, vicinity of

<sup>3</sup> *Proc. Acad. Nat. Sci.*, 1908, p. 338.

<sup>4</sup> *Bull. U. S. Bureau of Fisheries*, 1903, p. 1,157.

San Diego, 525-541 fathoms, green mud and fine sand; 4,335, same locality and bottom, 500-530 fathoms; 4,353, same region, 628-640 fathoms, green mud; 4,354, same locality and bottom, 646-650 fathoms; 4,358, same region, 167-191 fathoms, green mud; 4,432 and 4,433, off Santa Rosa Island, 243-272 fathoms, green mud; 4,435 and 4,436, off San Minguel Island, 264-287 fathoms, green mud; 4,452, off Point Pinos Light, Monterey Bay, 49-50 fathoms, green mud and fine sand; 4,457, same locality, 40-46 fathoms, dark green mud; 4,464, same region, 51-36 fathoms, soft, dark gray mud; 4,482, off Santa Cruz Light, Monterey Bay, 43-44 fathoms, soft green mud; 4,522, off Point Pinos Light, Monterey Bay, 130-149 fathoms, gray sand and shells.

With the exception of the last, at which a single specimen was taken, the bottom at all of these stations was muddy. Most of the specimens are thickly covered with foreign matter and stained deep brown or black.

**Aphrodita refulgida** sp. nov. Pl. XXXII, figs. 76-84.

A species of the *japonica-hamata* group, so far as known of moderate size and of smooth, neat appearance. Easily distinguished from *A. castanea* by the brilliant green lateral fibers, the attenuated ends of the neurosetæ and the much less conspicuous notosetæ. Form more broadly ovate than *A. castanea*, only moderately depressed and with regularly arched dorsum, caudal end attenuate. Length of type 36 mm.; maximum width (XV) of body 10.5 mm., between tips of parapodia 18 mm., between tips of neuropodial setæ 24 mm.; total width including lateral fibers when floating in water 29 mm.; maximum depth 11.5 mm. Number of segments 42, the last twelve very small and forming a narrow caudal region concealed by the setæ. Cotypes 23 and 35 mm. long with 40 and 43 segments respectively.

Prostomium (Pl. XXXII, fig. 78) subelliptical, nearly twice as wide as long, smooth and strongly convex dorsally, the sides and front regularly rounded, the posterior border truncate and nearly straight and united to the short peristomium by a broad, convex median nuchal isthmus about one-fourth the width of the prostomium, on each side of which is a deep transverse furrow. Ocular peduncles hemispherical prominences nearly in contact and projecting over the anterior face, each bears two minute black eyes, one dorsal and one ventral. Median tentacle arises from anterior face beneath ocular peduncles, about as long as prostomium, consisting of a short cylindrical ceratophore and a slender tapered style about three times as long as the ceratophore, its distal half colored yellow and terminal bulb minute. Palpi white,

the very short basal segment more than one-half the width of prostomium, the rest regularly tapered, only moderately slender, about seven times as long as the prostomium, with slender pointed tips and bearing minute sensory cilia. Facial caruncle a rather prominent, nearly smooth plate, very thin and strongly compressed between the bases of the palpi but somewhat swollen above, terminating above mouth in a short blunt papilla. In all the specimens this papilla is much shorter than on most species.

Peristomium a short transverse dorsal fold united to the prostomium by the nuchal isthmus and forming the anterior lips ventrally. Peristomial parapodia (Pl. XXXII, fig. 78) much prolonged forward, reaching beyond the prostomium fully twice its length, much compressed to near the end which is expanded but not divided into rami; distal end receiving a dorsal aciculum only and bearing three dense flat tufts of capillary setæ, one above the notocirrus, one above and distal to the neurocirrus and the third ventral and much more proximal. Tentacular cirri borne on distal end of medial face of peristomial parapodia. Both consist of short ceratophores and slender tapered styles about one-fifth as long as the palps and with scarcely developed terminal bulb. Mouth bounded by peristomium and posteriorly by a long quadrate lip that occupies the entire middle region of somites II and III and cuts into IV. Anus a small dorsal slit with furrowed rim cutting through the last 4 segments.

Metastomial segments flat below, the boundary between segments and parapodia clearly defined by a deep continuous trench. Segments indicated by thick and deep transverse integumental folds; neural area not sharply differentiated from muscular area. Cuticle thick and opaque on the venter, studded with spherical papillæ, much smaller and less crowded than on *A. castanea*, dorsally thinner and on the body smooth with few and scattered minute conical, capped papillæ (Pl. XXXII, fig. 76) which become much more numerous on the bases of the parapodia.

Elytra fifteen pairs, borne on II, IV, V and alternate segments to XXIII and then somewhat doubtfully on XXV, XXVIII and XXXI, following which are eleven small segments tapering to the minute pygidium. Elytra all large, widely imbricated and completely covering dorsum of body and head; they are thin, flexible and tough, having the same form and mode of attachment as in *A. castanea*. The last pair folded into a tube enclosing the caudal segments. Dorsal fimbriated organs begin on VI and alternate with the elytra to XXX, the last two pairs being rudimentary. The others are erect, compressed

and hatchet-shaped with the crest-like border divided into six to eight short, blunt processes sometimes flattened or even bifid (Pl. XXXII, fig. 77).

Parapodia prominent, the neuropodia of typical segments about one-third width of segments, pointing straight laterad, stout, conical, little tapered, truncate distally and stepped for the usual three series of setæ. Integument much wrinkled and studded on the sides and venter with spherical papillæ much more widely separated than those of *A. castanea* and smaller than those of *A. armifera*, but larger and more crowded at the bases of the setæ. The aciculum projects slightly from the dorsal step of the foot. Notopodium a low nub extended to the dorsal surface. Neurocirrus arises postero-ventrally from a low fold or ridge in place of a distinct ceratophore near middle of neuropodium; style acuminate, rather stout in basal half, slender and tapered distally and terminated by a scarcely evident knob, smooth, not quite reaching base of middle series of setæ. Notocirri spring from stout cirrophores behind the lateral tuft of notopodial spines; styles slender throughout and little tapered, a slight subterminal and a scarcely evident terminal enlargement. They perforate the felt and rise above it along with the lateral tufts of notopodial spines. Anteriorly the parapodia are gradually reduced in size and directed more and more forward, the first or peristomial being alluded to above. Neurocirrus of II somewhat longer than the others and arising nearer to the base of the foot which approximates the form of the first. Posteriorly the parapodia become very small but slender and elongated with the notopodium as well as the neuropodium projecting freely. They bend ventrad and toward the middle, converting the venter of this region into a groove closed posteriorly. The neurocirri become relatively longer and the subterminal and terminal enlargements are exaggerated.

Dorsal felt an even, regular and near smooth investiture covered with a coating of mucous, silt and foreign particles of various kinds. It is unusually thick and composed of very fine fibers arranged in two layers, the inner thin, membrane-like and clean, the outer much thicker and carrying much foreign matter. Penetrating its lateral parts along the sides of the worm are the stout, brown, notopodial setæ in two series and below these the beautiful flowing plumes—unusually long and abundant—of iridescent setæ which glow with a fine golden-green or in some lights, a blue-green metallic luster. Many of these fibers curve upwards onto the felt, the fibers of which also are slightly iridescent when clean.

Neuropodial setæ mostly concealed above by the felt, arranged in the usual three series, the dorsal being stout and deep brown and two or sometimes three in number, the middle paler, about half as thick and four or five, the ventral yellowish brown and much more slender and more numerous, ten being almost invariably present on middle segments. As compared with most similar species setæ of all three series are long and slender and shaped more nearly like those of *A. hamata* than any other species. All are nearly straight—those of the ventral series (Pl. XXXII, fig. 81c) most curved—perfectly smooth with no trace of hairyness or tuberculation and with a slight subterminal enlargement tapering to a slender acuminate tip, the last two characters also much more accentuated on the ventral setæ (figs. 81a-c).

Notopodium bearing two series of large setæ (Pl. XXXII, figs. 79 and 80) the ventralmost or lateral arranged in a nearly vertical series of six to eight which pass through the felt and then bend sharply dorsad with their slender ends resting upon it. The dorsalmost group is irregular and usually consists of six to eight setæ more or less distinctly in two short rows which penetrate the felt obliquely and rest upon it more or less concealed in the covering silt. All of these setæ are dull brown, soft of texture, longitudinally striated, quite without surface asperities, stout and flat at the base and tapered to slender ends with hooked tips. The apical sheaths sometimes present are unusually long and are free of hairyness (fig. 80). Seta of the ventral series are shorter and more abruptly tapered, the dorsal more gently tapered and reaching beyond the middle of the body, increasing in length from before backward. The capillary fibers have the usual arrangement into dorsal, intermediate and ventral tufts. The former are confined to elyptrophorous segments and are very abundant, forming, with the intermediate tuft, the dorsal felt, the individual fibers being very long and slender with hooked tips. The ventral tuft forms the iridescent plumes and the fibers are short, coarser, somewhat rigid, tapered to very fine straight points and are very smooth so that no foreign matter adheres to them.

Toward the head the arrangement of the notopodial setæ becomes simplified by the merging of the two groups of notopodial setæ and two groups of fibers. Neuropodial setæ become longer and more slender and on III and II, the ventral series is replaced by a dense patch of delicate bipinnate setæ (Pl. XXXII, fig. 82). In this group the dorsalmost setæ are longest and coarsest and bear a short pennant-like tip. Passing toward the ventral side this tip increases in size at the expense of the remainder of the setæ and becomes spirally turned until on the

smaller ventral setæ nearly the entire toothed portion consists of a spiral of four to five and one-half turns. On I all setæ are smooth fiber-like capillaries. Toward the caudal end, the neuropodial spines become more and more slender and acquire rather conspicuous spur-like teeth, at first few and irregularly arranged and finally in two regular series, extending for a long distance on the very slender and much elongated setæ (figs. 83 and 84). Notopodial spines become more slender and lateral fibers coarser and in brush-like tufts.

No natural color exists on the body but some parts are stained with a yellowish incrustation. Numerous external parasites are attached to the integuments of both dorsal and ventral surfaces.

Stations 4,457, Monterey Bay, off Point Pinos Light, 40-46 fathoms, dark green mud (2 cotypes); 4,464, same region, 36-51 fathoms, soft gray mud (type).

• *Aphrodita castanea* sp. nov. Pl. XXXII, figs. 85-97; Pl. XXXIII, fig. 98.

A species of the *A. japonica* group; narrowly ovate, tapered toward both ends but the posterior much more slender and attenuated, strongly depressed with a nearly flat dorsum and flat, sole-like venter; especially remarkable for the serried rows of numerous rich chestnut-colored notopodial setæ which cover the sides nearly completely. The type is 48 mm. long; maximum width of body (at XIV) 14.5 mm., between ends of parapodia 22 mm., between tips of setæ 31.5 mm.; depth 10.5 mm. number of segments 43.

Prostomium (Pl. XXXII, fig. 85) subglobose, nearly circular in outline or slightly wider than long, slightly depressed, strongly convex above, the ocular elevations prominent and hemispherical, in the position of the prostomium of most of these specimens very little projecting beyond the anterior margin, or even entirely dorsal so that both pairs of eyes are visible from above. Eyes two pairs, minute, black, one above or behind the other according to the degree of elevation of the prostomium. Nuchal fold a sharply defined isthmus about one-fourth as wide as the prostomium and sloping downward to the transverse peristomial fold. Median tentacle arising from the frontal face below the ocular peduncles, its ceratophore short, obconical and about one-fourth to one-fifth the prostomial length, the style (about 15 examined) scarcely longer than ceratophore, strongly clavate, bent into a V-shaped hook. Palpi with rather swollen bases, somewhat obscurely separated as ceratophores; styles four to six and one-half times the length of the prostomium, moderately slender, regularly tapered to acute tips, the cuticle smooth and polished, bearing numerous delicate pointed cilia. Facial ridge very prominent, nearly as long as

the prostomium, the dorsal border somewhat inflated above the palpi, the remainder compressed and terminating in front of mouth in a slender, pendant, finger-like process studded with numerous pediculate globular papillæ.

Peristomium forming a narrow transverse fold above connected with the nuchal fold, below a rugous lip. Its parapodia (Pl. XXXII, fig. 85) strongly compressed and prolonged straight forward, more than half its length beyond the prostomium, the distal end slightly expanded and bearing three rather small tufts of capillary setæ. Tentacular cirri with short, rather stout cirriphores arising from the dorsum and venter of the expanded distal end, the dorsal directed somewhat upward, the ventral chiefly outward; styles moderately slender, tapered, without distinct subterminal or terminal bulbs and without cilia. Mouth a small opening bounded by furrowed lips, the posterior lip a broad plate occupying the entire ventral area of II and III and cutting somewhat into IV.

Metastomial segments forming a flat ventral surface fairly well separated from the parapodia by a lateral furrow and differentiated by shallow transverse furrows. To the twenty-ninth the body is nearly equally curved and tapered anteriorly and posteriorly; posterior to this the caudal region is slender and attenuated. Ventral integument thick and opaque, so that the neural area, though constituting about two-fifths of the width, is not clearly defined from the muscular as in some species. Venter so thickly studded with spherical tubercles that in many places they touch over large areas, especially on the parapodia. On the dorsum the integument is thinner and translucent and is rather sparsely studded with small bluntly-conical papillæ (Pl. XXXII, fig. 87). Anus a short dorsal slit extending through the last four segments.

Elytra fifteen pairs, on II, IV, V, VII and alternate segments to XXIII, XXVI, XXIX and XXXII, strongly imbricated, in general nearly circular with a slight lateral notch from which the broad linear attachment extends to the center. Posterior ones elongated with anterior attachment, the last about twice as long as wide and folded with its fellow into a tube reaching somewhat beyond the pygidium. In texture they are somewhat firmer and thicker than on the other species here noticed.

Dorsal fimbriated organs begin on VI and occur on all cirriferous somites to and including XXXI. The first is small and the last two rudimentary. On middle segments they are unusually large. They are of lappet-like form, produced freely on the medial side. Free

border bearing six or seven lobes most of which are again divided into two or three finger-like papillæ each with a terminal sense organ (Pl. XXXII, fig. 86).

Parapodia of the usual form, the neuropodia shorter and stouter than in *A. refulgida*, terminating in the usual three step-like folds, and on the ventral face thickly crowded with short pediceled globular papillæ, the largest of which occur at the bases of the setæ. Neurocirri arise at about middle of ventral face of neuropodia and reach bases of middle series of setæ. They are slender, especially in the distal half, and end in slightly bulbous tips. No sensory cilia on style but a close cluster of somewhat enlarged spherical papillæ round the base. Notocirri project through the felt at the ventral border of each lateral tuft of notopodial setæ and curve freely dorsad and caudad to a point about opposite the middle of the next succeeding homologous tuft. They arise from large ceratophores and the styles are slender with scarcely obvious subterminal enlargement or terminal bulb and no sensory cilia. Notopodium a scarcely elevated tuberosity receiving the end of a stout aciculum. Toward the ends both rami become more prolonged, the neuropodium slender and the notopodium compressed and somewhat spade-shaped. Peristomial parapodium much prolonged forward and the rami united to the end, the notopodium only retaining an aciculum and the setæ though differentiated into fascicles being all of one kind. Neurocirrus of II about twice as long as the others. Cirri of the much crowded caudal parapodia, which approach each other ventrad, have exaggerated subterminal and terminal thickenings and the notocirri are relatively longer, neurocirri shorter than on middle segments.

Dorsal felt covering somewhat thinner than on *A. refulgida* and not distinctly differentiated into two layers, but continuous and of uniform thickness; formed of a close web of fine dull gray fibers and coated externally with silt. As noted above the notopodial setæ are very conspicuous and the neuropodial spines are freely exposed and project prominently at the sides. Neuropodial setæ in the usual three series, medium sized specimens like the type having commonly two in the dorsal, three or four in the middle and six to eight in the ventral series. All are dark brown, the dorsal ones being especially deep and exhibiting the most splendid bronzy reflections. Dorsal setæ (Pl. XXXII, fig. 92*a*) are nearly straight and retain but little hairiness. Ventral ones (Pl. XXXII, fig. 92*c*, and Pl. XXXIII, fig. 98) are about one-fourth diameter of the dorsal, more curved, with distinctly enlarged and densely pilose ends on which the hairs form a dense cushiony

brush often agglutinated into a kind of spur, in addition to which a hirsute sheath may be present. Setæ of the middle series (fig. 92*b*) are intermediate in character. Anteriorly on II and III the ventral series is replaced by a dense tuft of several rows of small pinnate setæ (Pl. XXXII, fig. 93) the longer dorsalmost of which have the tips simply prolonged while on the ventral ones they become spirally twisted, and increase in length at the expense of the strictly pinnate region until the most ventral consist chiefly of a spiral of two to two and one-half turns. Posteriorly all neuropodial setæ become slender, elongated and more or less spinous, the spines appearing at first irregularly and in a restricted region and becoming more regularly biserial and more widely distributed as the setæ become longer and more slender (figs. 94 and 95).

Notopodial setæ in the usual two fascicles; the ventral a vertical series of fourteen to eighteen, visible above the felt on the medium-sized type and cotypes (37–48 mm. long); dorsal fascicle arising in two short parallel oblique series of six to eight each, or on elytriphorous segments sometimes in one series of about fifteen. In each group they increase in size from below dorsally and one or two minute ones may be concealed beneath the felt. Those of the ventral series are bent rather abruptly caudad on to the felt and give an aspect of a series of waves. At the base they are flattened and very stout and taper rather rapidly into the slender ends. Otherwise they are like those of the dorsal fascicle. Setæ of the dorsal fascicle penetrate the felt more obliquely, those on elytriphorous segments at a more dorsal level than the others, and are consequently more recumbent on the felt. They curve rather gently dorsad and at the same time taper very gradually into the long slender ends which cross those of the opposite side and on posterior segments often reach the opposite side of the body. All of those setæ have a chestnut or pale brown color, are soft, flexible and friable, stout and compressed at the base and taper more or less gently to the tip which is rather abruptly contracted into a hard, pointed, strongly bent hook (Pl. XXXII, fig. 88). They are finely striated longitudinally and the surface of the convex side bears numerous small hard asperities (fig. 89). Posteriorly they become more slender and anteriorly much shorter, the former finally terminating in a more open hook and like the lateral felt fibers becoming covered with sticky hairs (Pl. XXXII, fig. 96). Felt fibers arise in dense tufts immediately above the dorsal notopodial setæ on scale-bearing segments only and spread horizontally in a tangled layer. A smaller tuft arises between

the two fascicles of setæ on all segments. The fibers are nearly or quite colorless, smooth, very fine, long and of nearly uniform diameter but taper to abruptly hooked tips (fig. 90). Lateral tufts of fibers arising below the notopodial setæ are rather sparse, not much longer than the neuropodial setæ and hang down between the parapodia. They are much coarser than the felt fibers, especially at the base from which they taper to fine straight tips (fig. 91). They are arranged in regular rows like the large setæ. Usually they are very heavily coated with silt but when this is cleaned off they exhibit none of the brilliance of color of many species and scarcely a trace of iridescence. The somewhat roughened surface is covered with a fine hairiness which may result from a mucous coat or the separation of the more superficial constituent fibers (fig. 97). In any case this feature seems to insure the adhesion of silt.

No color other than the extraneous ferruginous incrustation. One specimen dissected contained strings of large ova. None has the proboscis protruded.

Stations in Monterey Bay, 4,446, off Point Pinos Light-house, 52-59 fathoms, green mud; 4,457, same locality, 40-46 fathoms, dark green mud; 4,464, same locality, 36-51 fathoms, soft dark gray mud; 4,467, off Santa Cruz Light-house, 51-54 fathoms, soft dark green mud (cotypes); 4,468, same locality, 51-309 fathoms, fine sand (cotypes); 4,481, same locality, 45-50 fathoms, hard sand; 4,482, same locality, 43-44 fathoms, soft green mud (type and cotypes); 4,485, same locality, 39-108 fathoms, soft green mud and sand; 4,550, off Point Pinos Light-house, 50-57 fathoms, green mud and rocks.

This plainly colored but handsome and very interesting species is confined, so far as known, to the waters of Monterey Bay where it appears to be quite plentiful, the collection yielding twenty-six specimens. With the exception of one doubtful record of depth (51-309 fathoms at station 4,467) it was taken practically exclusively at depths varying little from fifty fathoms and chiefly on muddy bottoms, though a few occurred on sand.

Though resembling *A. japonica*, *A. negligens* and *A. refulgida* in many respects and especially in the long, soft, hooked notopodial setæ, this species is easily distinguished from all of them by the large number and rich chestnut color of these setæ, and in addition from *A. japonica* by having a short and clavate, tentacular style instead of an elongated tapered one, and from *A. refulgida* by having densely hairy instead of smooth neuropodial setæ and instead of brilliant

lateral fringes only tufts of short brownish hair. *A. negligens*<sup>5</sup> is undoubtedly its nearest ally in the Pacific and the resemblance is especially pronounced in young specimens of *A. castanea* in which the lateral fascicles of notopodial setæ tend to be erected, producing the disordered effect that is so characteristic of the known examples of *A. negligens*, but even specimens 19 mm. long have a greater number of setæ than full-grown ones (40–60 mm. long) of *A. negligens*.

The examples in this collection vary from 16–74 mm. long and all exhibit the characteristic flatness of the body, the color and prominence of the notopodial setæ. Both neuropodial and notopodial setæ increase in number with size of the animal. Specimens 16 mm. long have six or seven ventral neuropodials, five to seven visible above the felt besides smaller ones in ventral notopodial fascicles, and nine to eleven in dorsal fascicles. In the ventral notopodial fascicles, in which the increase is most noteworthy, specimens 19 mm. long have nine to ten visible, 24 mm. long about eleven, 30 mm. long twelve or thirteen, 37 mm. long thirteen or fourteen, 47–50 mm. long fifteen to eighteen and 74 mm. long twenty on middle somites; the largest specimen has nine or ten ventral neuropodials. There is also a marked change in the character of the neuropodial setæ, those of the youngest and smallest specimens being always much more densely hairy as well as smaller. The dorsal neuropodial setæ of specimens 16–19 mm. long resemble those of the ventral series of medium-sized specimens while the largest example not only has the setæ of the dorsal series exceedingly stout and blunt, but those of the ventral series of middle segments have through wear lost the apical brush of hairs and the slight terminal curvature and consequently resemble the dorsal setæ of medium-sized specimens. There is no doubt that these changes progress with advancing age.

As is usually true of *Aphrodite* numerous parasites are adherent to the cuticle, especially of the larger specimens.

\* *Aphrodita parva* Moore.

*Aphrodita parva* Moore, Proc. Acad. Nat. Sci. Phila., 1905, pp. 529–532, Pl. XXXIV, figs. 3–7.

In the original account of this species, in comparing it with the closely related *A. intermedia* McIntosh it is stated that the latter is 15 mm. long. This should have been 5 mm., making the type of that species smaller than the known specimens of *A. parva*. Until now the latter is known only from the two types taken in the Gulf of Georgia.

<sup>5</sup> Re-examination of the notopodial setæ of *A. negligens* shows that they are often roughened precisely as are those of *A. castanea*.

Four specimens occur in the present collections and have extreme lengths of 9–17 mm. They agree fully with the types.

Stations 4,381 and 4,382, off south point of North Coronado Island, vicinity of San Diego, 642–667 fathoms, green mud.

• *Lætmonice producta wyvillei* McIntosh.

*L. producta wyvillei* McIntosh, Challenger Reports, Zool., Vol. XII, pp. 44, 45, Pl. VII, fig. 3, IV A, figs. 9–11.

This species is also recorded from Hawaiian waters by Treadwell. McIntosh's specimens had eighteen pairs of elytra. The two in this collection have only fifteen and sixteen pairs respectively with thirty-nine setigerous segments. One of them is evidently regenerating posteriorly. One specimen is much coated with silt. Villiform papillæ are chiefly limited to the oral region.

The protruded proboscis of the larger example is 9 mm. long and 3 mm. in diameter, cylindroid. At the end, surrounding the orifice, is a dense brush of fine papillæ above and below, separated laterally by a small rounded eminence with a small papillæ below and one above the lateral line. The fine papillæ are really the fimbriated borders of closely packed lamellæ. No jaws.

Station 4,397, off Santa Catalina Islands, Lat. 33° 10' 15" N., Long. 121° 42' 15" W., 2,196–2,228 fathoms, gray mud.

• *Lætmonice pellucida* Moore.

*Lætmonice pellucida* Moore, Proc. Acad. Nat. Sci., 1903, pp. 420–422, Pl. XXIII, figs. 19 and 20.

These specimens agree fully with the types taken in Bering Sea. They all have fifteen pairs of elytra which nearly or just meet medially without overlapping. The ventral villiform papillæ are confined to the posterior lip. The specimens vary in length from 20 to 34 mm. and several contain egg strings. Compared with *L. producta wyvillei* the tubercles of the notopodial spines are much larger and the portion of the neuropodial setæ beyond the spur is shorter while the hairs are nearly twice as long as in that species.

Stations 4,353, 4,354, off Point Loma Light-house, vicinity of San Diego, 628–650 fathoms, green mud; 4,382, south of North Coronado Island, 642–666 fathoms, green mud; 4,389, off Point Loma, 639–671 fathoms, green mud and gray sand.

#### SIGALEONIDÆ.

Of the five species representing this family four are new to the region and three have not been previously described.

• *Peisidice aspera* Johnson.

*Peisidice aspera* Johnson, Proc. Cal. Acad. Sci., 3d Series, Zoology, Vol. I, pp. 184, 185, figs. 56-59, 63.

One specimen has as many as twenty pairs of elytra. The setæ of the first setigerous parapodium (II) have very much longer appendages than the others.

Johnson's specimens were taken in Monterey Bay and the writer has recorded the species from Alaska. Now reported only from,—

Station 4,460, off Point Pinos Light, 55-167 fathoms, green mud and gravel.

• *Leanira alba* sp. nov. Pl. XXXIII, figs. 99-104.

The type and only known specimen is an excellently preserved anterior end of 52 fully-developed segments and a caudal regeneration cone of 5 + segments. Length 58 mm.; greatest width (at XXX), of body 3 mm., between tips of parapodia 6 mm., between tips of setæ 7.5 mm.; depth at XXX 3.5 mm.

Prostomium (Pl. XXXIII, fig. 99) about three-fourths as long as wide, foreshortened pentagonal in shape, the posterior or basal side slightly concave, postero-lateral pair of sides nearly straight, antero-lateral slightly convex, meeting in a blunt, notched apex. No distinct eyes but an obscure deep-seated pigment spot on each side of base of median ceratophore. Median tentacle arising in a shallow depression on dorsum immediately behind anterior border; ceratophore short but distinct with trace of aliform lamellæ; style short, thick and stiff, its length about equal to width of prostomium, stout fusiform at base, tapering to a short thick filament like the handle of an Indian club. Lateral tentacles coalesced at the base with the dorso-medial face of the peristomial parapodia but more largely free than in *Stenelais tertiaglabra*, similar to median tentacular style and reaching beyond its end, basal two-thirds fusiform, distal third a thick filament, scarcely covered by buccal or peristomial lamellæ. Palpi flagelliform, excessively slender and elongated, about thirteen or fourteen times as long as the prostomium, very regularly tapered to subacute tips and very smooth. The palpi are crowded away from the <sup>perist.</sup>prostomium by the inserted peristomial parapodia, with the ventral side of the base of which they are united for a short distance. At the base they pass through a loose sleeve formed by the partial union of two foliaceous curved lamellæ (fig. 99) which are united with the ventral face of the parapodium and end in free truncate lobes bending round the palpus, one on its medial ventral side being twice as long as the parapodium, the other on the lateral side reaching scarcely beyond its end. A low smooth facial ridge runs from the prostomium to the mouth.

Prostomium not obvious from above, forming a pair of prominent lateral lips below; parapodia produced straight forward (fig. 99), coalesced with the lateral tentacles above and the palpi below, stout and not much elongated, projecting little more than one-third of their length beyond the prostomium and not at all beyond the parapodia of II, supported by a single (notopodial) aciculum and bearing a small tuft of long, very slender, finely hispid capillary setæ. Tentacular cirri nearly in contact at their bases, separated by the small tuft of setæ only; the dorsal arising by a rather prominent cirrophore, the style also rather stout, tapered, about two and one-half times as long as the prostomium and obscurely moniliform or articulated distally; ventral immediately beneath dorsal, apparently lacking a distinct cirrophore, and the style only about one-third as long as the dorsal but nearly as stout at the base.

The general aspect of the body is remarkably like a *Nephtys*, being somewhat quadrate or prismatic with the dorsum slightly arched and anteriorly finely cross-wrinkled, the ventral muscles forming a somewhat sole-like tract, the intersegmental furrows nearly obsolete, the diameter nearly uniform but gently tapering caudad and the cuticle very smooth with a delicate pearly luster. Only a small regenerating pygidium is present and bears no cirri.

Parapodia arise at a level slightly above the ventral sole and with the exception of several at the cephalic end project directly laterad. They are somewhat compressed and oblong, truncate distally where alone the rami are differentiated. Taking XXV (Pl. XXXIII, fig. 100*b*) as typical the rami are of equal length or the notopodium slightly longer and each supported by a single stout aciculum. The neuropodium is about twice as deep as the notopodium, broad and nearly truncate at the end but sloping gently and symmetrically dorsally and ventrally from a slight elevation and shallow notch which receives the tip of the straight aciculum. On the distal end are two tufts of finger-shaped or fusiform stylodes, a supra-acicular of nine or ten arranged in two rows, of which the posterior are nearly twice as long as the anterior and nearly equal to the setæ and a subacicular of four or five of various lengths; a low entire presetal membrane passes vertically down the anterior face. The setæ are arranged in three curved series, a dorsal anterior curving from the dorsum down the anterior face and slightly caudad above the aciculum, partly enclosing the dorsal group of stylodes, an antero-ventral beginning below and anterior to the aciculum and curving round the ventral side of the ventral group of stylodes, and a postero-intermediate which forms a postero-ventral

quadrant round the aciculum as a center. Frequently a fourth short series is detached from the dorsal end of the antero-ventral series and passes obliquely in part between the latter and the postero-intermediate series. Notopodium about half as deep as the neuropodium and partly overlapping it behind, slightly compressed and with gently curved outlines, the distal end divided into two short blunt lobes, the ventralmost of which receives the tip of the curved aciculum while from the furrow between arises the long rank of setæ along a curved, sickle-shaped line with stout anterior and much longer posterior limb passing down the posterior face of the notopodium. Round the outer face of the setæ is a series of seven or eight stylodes more slender than those on the neuropodium, in addition to two or three more dorsal detached ones and a very much larger one with constricted base and widened middle attached immediately above the tip of the aciculum. Dorsal to the parapodium is a deep and wide bay bounded dorsally by the elevated and projecting elyrophore, from the overhanging tip of which projects a minute blunt notocirrus (branchia). On this and more anterior segments ctenidia are absent and the epidermis of the supraparapodial bay is quite smooth. Neurocirrus arising from a low cirrophore near base of neuropodium; style reaching nearly to base of ventralmost setæ, rather stout at base, tapered regularly to an obscurely articulated end bearing a small rounded tubercle on the dorsal side of the base. Other parapodia in the region differ somewhat in the number and form of the stylodes which appear to be somewhat caducous and contractile.

Toward the cephalic end the entire foot becomes shorter, the notocirrus disappears, the neurocirrus becomes short and stout and the end of the notopodium turns round the tip of its aciculum and faces dorsad, presenting a very characteristic rosette of stylodes from the center of which springs a small whorl of capillary setæ. Beginning at IV the parapodia bend successively more forward, that of II pressing the peristomial parapodia closely and reaching to its end (Pl. XXXIII, fig. 100*a*). Caudally of XXV the parapodia soon become relatively longer and their stylodes more slender or extended; near the end of the piece the neurocirri are again shorter but continue slender. At about XXX (XXIX in this specimen) slender stylodes appear in front of the antero-dorsal setæ of the neuropodium and three or four continue to be present in this position to the end of the piece. At XXVII well-developed ciliated pads or ctenidia appear in the dorsal bay and the notocirri (branchiæ) begin to become much larger, swollen, and ciliated. When fully developed as on somite L (fig. 100*c*) they are very stout and hang

downward to nearly or quite touch the notopodium. Ctenidia (fig. 100c) form three long nearly continuous ciliated cushions, the ventral occupying about the proximal two-thirds of the dorsum of the foot, the intermediate nearly as long a space at the bottom of the bay, and the dorsal a slightly shorter distance reaching nearly to the base of the branchia.

Elytrophores occur on II, IV, V and alternate somites to XXVII and then on every somite. The first three are small, low and cylindrical and situated on the base of the parapodia; following ones soon become more elevated, separated from the parapodia and provided with ovoid scars and protruding lateral ends. At XXVII and beyond they become still more prominent and tumid. Branchiæ (notocirri) occur on elytriferous segments only and first appear as a minute non-ciliated process on the overhanging end of the elytrifer at XIII. They undergo little change to XXVII where they rather abruptly become larger and ciliated and continue to increase in size as above indicated.

Elytra are easily detached and most of them lie loose in the bottle. The first two are small and nearly circular with central attachment. Those following (probably as far as XXV) are more or less rhomboid or trapezoid (Pl. XXXIII, fig. 101a) with rounded corners and slightly concave or indented sides and the scar somewhat laterad of the center; the others are irregularly narrowly ovate with the broad end laterad and scar nearly central, a well-marked umbilicus and deep lateral emargination, resulting in a somewhat trilobate outline (fig. 101b). Apparently the dorsum is incompletely covered in the anterior region but completely covered after XXVII, though the elytra cannot overlap much medially. All elytra are soft, flexible, perfectly colorless, smooth and free from cilia or definite papillæ. Some of them (fig. 101b) exhibit one to three large, bleb-like elevations along the lateral margins which may be, however, pathological. Internally they are composed of a mass of vertical fibers among which the nerve fibers and nerve cells and slender end organs may be seen.

Acicula yellow; setæ all colorless. Notopodial setæ in a spreading whorl arising along a long curved line which becomes more restricted to the dorsum anteriorly. All are slender and capillary, some quite smooth, others hispid with small stiff hairs arranged in oblique rings or part rings toward the base of the setæ (Pl. XXXIII, fig. 104a) this arrangement being gradually replaced in the middle region by one of larger nearly opposite paired spines (fig. 104b) which gradually become reduced and disappear, leaving a long and very delicate smooth tip. Such

setæ are found in the dorsal part of the bundle, being most numerous and widely distributed posteriorly and fewer and more restricted anteriorly where the first four or five parapodia appear to bear only smooth notopodial setæ in the small fascicles. Neuropodial setæ are mostly semicomound with an imperfect articulation differentiating the peculiarly canaliculated or camerated appendage which tapers to a delicate attenuated tip (fig. 102). All three groups are made up of similar setæ except that those of the posterior series are smaller, and on anterior segments the joint becomes obsolete on antero-dorsal setæ. On XXV and following parapodia one or two delicate setæ with alternating ensheathing plates and delicate very acute tips (fig. 103) occur in the extreme posterior dorsal part of the anterior dorsal series.

Station 4,354, off Point Loma, vicinity of San Diego, 646-650 fathoms, green mud.

This is the first true *Leanira* that has been reported from the North Pacific. McIntosh described several species under this generic designation but as has been several times pointed out these were incorrectly assigned and Willey has recently proposed the genus *Sthenolepis* for them and related species.

***Sthenolepis areolata*** (McIntosh) Willey.

*Leanira areolata* McIntosh, Challenger Reports, Zoology, Vol. XII, pp. 151-153, Pl. XXI, fig. 3.

This species has been reported hitherto only from the Western Pacific, having been described from Japanese waters by McIntosh and the writer. It was taken south of Yedo in 345 fathoms and in Sagami Bay in 153-749 fathoms.

Several examples in this collection agree perfectly with McIntosh's description and with the Japanese specimens examined by me. The elytra exhibit a slight tendency toward a trilobate form and have a few small blunt horny papillæ not mentioned by McIntosh scattered over the surface. At about XXX the marginal fringe and lateral areolation of the elytra become well marked. The peculiar elongated notocirrus of III is well exhibited in these specimens and is a noteworthy character of the genus. All of the specimens are broken and incomplete, the longest having a length of 130 mm. and 112 segments.

Stations 4,382, south of North Coronado Island, vicinity of San Diego, 642-666 fathoms, green mud; 4,398, Lat. 32° 43' 20" N., Long. 117° 42' 10" W., 620 fathoms, green mud, rock; 4,518, off Point Pinos Light-house, 66-140 fathoms, hard sand; 4,538, same region, 795-871 fathoms, hard gray sand.

***Sthenelanelia uniformis*** gen. et. sp. nov. Pl. XXXIII, figs. 105-112.

A slender; little depressed species very gently tapered from somite

X. The only known specimen is a male filled with sperm represented by the anterior 36 segments and measuring 11 mm. long and 2 mm. in total width.

Prostomium (Pl. XXXIII, fig. 105) partly sunken into peristomium, its profile nearly straight to ocular region where it bends downward rather abruptly into the vertical anterior face; outline nearly circular, truncate behind and slightly wider than long. Eyes black, two pairs, situated close to median ceratophore, both visible from above, those of each side nearly in contact and of the two sides separated by nearly two-thirds of the prostomial width; the anterior pair at about the level of the tentacular axis and twice the diameter of the posterior pair which are dorsal. Median tentacle arising from a short ceratophore not more than one-third of the length of the prostomium and dorso-anterior in position; style about one and one-half times length of prostomium, the basal two-thirds rather stout, the remainder rather abruptly contracted into a filament with a slightly knobbed tip. Tentacular lamellæ thin, aliform, bilobed by a lateral notch, not longer than ceratophore to which the medial border is broadly united. Lateral tentacles united with dorso-medial aspect of peristomial parapodia, only their filamentous tips free, the rest concealed by the buccal lamellæ, to the lateral face of which they are united. Palpi arising from distinct ceratophores appearing external to the peristomial parapodia, the styles nearly flagelliform, slender and regularly tapered to delicate tips, more than three times as long as the median tentacle. All cephalic appendages lack cilia but are provided with a few regularly arranged sensillæ bearing minute sensory hairs projecting through cuticular pores.

Peristomium and its parapodia largely coalesced with venter of prostomium, beyond which the latter project for half their length (Pl. XXXIII, fig. 105), bearing at the distal end a dorsal and a ventral tuft of capillary setæ which spread anteriorly and cross in front of the prostomium. Tentacular cirri with very short indistinct cirrophores, the styles similar in form to the median tentacle, the dorsal nearly equal to the latter, the ventral about two-thirds as long. Buccal or peristomial lamella a thin curved plate attached to the medial side of the peristomium and reaching slightly beyond its end.

Metastomial segments rather well marked, except dorsally in the pharyngeal region which is very smooth, about four or five times as wide as long with well-marked ventral muscular ridges and between them a neural groove.

Parapodia strictly lateral, arising near ventral level, rather stout

and more strongly compressed than usual in the family. For the most part they project strictly laterad and their length is two-fifths to two-thirds the width of the somites. Though conspicuously biramous the rami are closely united and the interramal cleft is little developed. Neuropodium (Pl. XXXIII, figs. 106 and 107) deep and compressed, scarcely tapered, ending in a thick, obliquely truncate, notched acicular process, surrounded above, behind and below by a perisetal fold, the posterior part of which is well developed as a broad, deep, oblique membrane with the margins entire, the dorsal and ventral portions being less developed, discontinuous and bearing small marginal sensory papillæ. Notopodium (figs. 106 and 107) very much smaller than neuropodium and slightly overlapping its posterior face, subconical or prolonged mammilliform, receiving the tip of the aciculum in the apex and bearing a spreading fascicle of setæ. On the dorsal side of its base is a large opaque hemispherical swelling which bears the ventral etenidium except on anterior parapodia.

Notocirrus rudimentary throughout length of piece—a minute papilla (Pl. XXXIII fig. 107) on the ventro-lateral part of a rather prominent opaque swelling representing the dorsal tubercle, ceratophore and elytophore combined, on the ventral side of the projecting end of which is a peculiar scale-like ensheathing lamina bearing a ciliated area probably representing the dorsal etenidium. Between the dorsal process and the parapodium is the usual deep bay. Ctenidia are slightly developed and obvious on only certain parapodia. The dorsal and ventral have already been mentioned; the intermediate one (fig. 107)—no better developed—occurs about midway between the others. Neurocirri arise from near base of parapodium from a small cirrophore and reach base of ventralmost setæ; basal half of style enlarged and with a dorsal concavity, distal half slender and divided into three incompletely differentiated subequal segments. First four parapodia directed progressively more forward. On II and III the neurocirri are longer, that of II reaching slightly beyond the end of its parapodia.

Elytra borne on II, IV, V and alternate segments to at least XXI, beyond which I am unable to distinguish which segments have borne elytra. Only the first four pairs and the eleventh elytra are attached, beside which there are a number of loose elytra in the bottle. Those in place fail to meet medially, leaving a large part of the dorsum uncovered and the eleventh pair is especially small, but all curve down the sides quite to the parapodia. First pair circular, the next few oblong with the medial end boldly rounded and the anterior border slightly concave (Pl. XXXIII, fig. 108), the posterior ones nearly equal-sided

rhomboids with rounded corners. In all cases the scar of attachment is slightly laterad of the center, and the lateral margin is peculiarly thickened and upturned. The lateral margin of the first bears a close fringe of short, thick, crowded papillæ arranged in two or three rows; succeeding ones bear no papillæ or only a few near the antero-lateral angle, while those still farther back have an increased number partly of cylindroid, partly of clavate papillæ each with an apical sense organ (fig. 109). All elytra are of soft and delicate texture, especially the more posterior which are colorless or exhibit faint traces of pigment. The first four at least are rather heavily pigmented with a mosaic of polygonal chromatophores of slaty fuscous and orange brown forming a blotched reticular pattern enclosing colorless areas, the brown abounding on the periphery, the fuscous toward the center. On the first pair nearly the entire surface is blotched, on the others only a broad oblique band covering the postero-medial exposed parts, the lateral and covered portions being quite colorless (fig. 108).

Acicula, which occur singly in each ramus, are stout, tapered, straight and yellow. Setæ colorless and translucent. Notopodials—loose tufts curving dorsad—of long, very slender, soft, flexible capillaries, plumose with fine hairs alternating on the two sides and, toward the base, where they become long and conspicuous, possibly arranged spirally; they diminish in size and finally become obsolete distally, leaving a long smooth fiber-like tip (Pl. XXXIII, fig. 112). Neuropodial setæ arranged in a modification of the horse-shoe-shaped fascicle of *Sthenelais tertiglabra*, the anterior gap becoming very large, the whole fascicle much flattened antero-posteriorly and the ventral supplementary series crowded against its ventral face; the result is practically a single vertical rank of setæ with slight dorsal and ventral spurs. These setæ differ greatly from those typical of *Sthenelais*, all of the appendages being short, simple-pointed and non-articulate. The two or three in the dorsal spur have the slightly enlarged end of the shaft roughened by two or three rows of small stiff hairs on each side (a character that becomes less evident and probably disappears posteriorly), and the appendages two or three times as long as the diameter of the shaft, cigar-shaped with blunt tips and more pointed bases (fig. 110). The remainder of the setæ of the main series are stouter, have the ends of the shafts quite smooth, the appendages pointed, straight and conical and from one and one-half to twice the diameter of the shafts (fig. 111a). Setæ of the ventral spur again more slender with short somewhat claw-like appendages and smooth shafts (fig. 111b). There is a general tendency for the appendages

to become longer and more curved anteriorly, while posteriorly many of those in the middle part of the main series become imperfectly coalesced with the shafts to form simple setæ. Peristomial setæ are all of the notopodial-capillary type but the hairs are reduced to the finest denticulations.

Station unknown. Labeled "with yellow *Doris*" probably indicating a commensal habit.

In general aspect this species somewhat resembles *Sthenelais fusca* Johnson but differs greatly in the character of the setæ. Indeed, the character of the setæ is so unique that I feel compelled to separate this species from typical *Sthenelais*, having a complex group of neuropodial setæ most of which have distinct articulated appendages, as the type of a distinct genus or subgenus *Sthenelanella*.

*Sthenelais tertiaglabra* sp. nov. Pl. XXXIII, figs. 113-120.

Based on two short anterior ends: a cotype consisting of 36 segments from a slightly larger specimen and the type of 45 segments, measuring 22 mm. long, with a maximum body width of 1.3 mm., 2.5 mm. between tips of parapodia and 3.1 mm. between tips of setæ; depth about 1 mm.

Prostomium (Pl. XXXIII, fig. 113) subcircular, somewhat wider than long, with the sides bulging slightly toward the anterior end, slightly narrowed behind and bearing a low protruberance on each side. Eyes two pairs, black; the dorsal larger, situated behind base of middle tentacle, separated by one-fourth or more width of prostomium; ventral pair on frontal face immediately beneath tentacular lamellæ, smaller and somewhat closer together than dorsal pair. Median tentacle arising between the four eyes by a stout ceratophore about three-fourths as long as prostomium; style moderately slender, regularly tapered to a short faintly articulated filament terminating in a minute knob, the cuticle unequally thickened and peculiarly crenulated or crinkled but lacking sensory cilia. Antennal lamellæ spoon-shaped, ovate, diverging wing-like from each side of base of ceratophore and nearly as long. Lateral tentacles coalesced with dorso-medial face of peristomial parapodia, the short free tip projecting beyond the end of the parapodium to a distance of about one-half the length of the latter with the end knobbed and slightly articulated. Like the median tentacles these lack large sensory cilia but are provided with minute tactile organs visible under high magnification. Palpi slender and delicate, about five and one-half times length of prostomium, regularly tapered and smooth. A very slight facial ridge runs to the mouth.

<sup>(Fig. 113) - dorsal view</sup>  
Prostomium completely concealed beneath parapodia, its parapodia produced straight forward at sides of prostomium and reaching about

its length anterior to it (Pl. XXXIII, fig. 113). It is supported by a notopodial aciculum, dorsal and ventral to which on the medial side arise the two tufts of capillary setæ. Parapodial lamella a thin, narrow elongated curved plate embracing the medial face of the parapodium like a scale nearly to its end and covering most of the lateral tentacle. Tentacular cirri arising close together on lateral side of distal end of parapodium; dorsal with a short cirrophore and style resembling the median tentacle but much more slender and only about two-thirds as long; ventral without distinct cirrophore and style only about two-fifths as long as dorsal.

Mouth bounded by a pair of lateral lips formed by II and a broad, furrowed, posterior lip extending through III and IV. Body slender and nearly linear, the dorsum more convex than the muscular venter, transverse diameter little greater than vertical, sides nearly vertical but owing to greater width at dorsum slightly overhanging. Segments scarcely defined, the furrows being obsolete and the cuticle very smooth.

Parapodia (with the exception of the first four pairs) projecting directly laterad from near the ventral level, generally little longer than one-half width of segments, somewhat compressed, dorsal and ventral borders nearly parallel, the rami of equal length and separated by a narrow cleft. Notopodium about one-half diameter of neuropodium, broadly rounded and nearly truncate at the end, which bears a low papilla in which the aciculum ends. Ventral to the acicular papilla is a row of four or five short, finger-shaped processes or stylodes increasing in length from behind forward and forming the chord of a high-arched series of setæ surrounding the aciculum and backed by a low crenulated integumental fold. Neuropodium much deeper and more compressed distally where it terminates in a low triangle, the blunt apex of which lies nearer the dorsal than the ventral side and which receives the tip of the aciculum. Surrounding this acicular prominence is a flattened, incomplete ring or horse-shoe of setæ open anteriorly and backed by a low membrane bearing a regular series of stylodes most of which are very short, but increase in length both dorsally and ventrally where from four to six become prominent. A single much longer stylode is appended to the tip of the acicular papilla but is frequently wanting and is probably caducous. Notocirrus separated from the parapodium by a rounded bay equalling the latter in width, pendant from a prominent swollen cirrophore or elyrophore and usually curved inward, short and thick, reaching scarcely more than half way to the neuropodium and very densely

ciliated on one (normally inner) face. Ciliated pads or etenidia three, two occupying the notopodial bay, the ventral one on the dorsum of the notopodium; middle one nearly twice the length of the dorsal which exceeds the ventral. Neurocirrus arises by a short cirrophore near base of neuropodium; style rather slender, tapered and reaching beyond base of ventralmost setæ; dorsal side curiously irregular, at the base a short, blunt, spur-like process followed by a shallow depression and just proximad of the middle by a low swelling beyond which the dorsal side exhibits a crenulated outline gradually deepening toward the tip which is composed of two or three moniliform articulations.

Caudally the parapodia become relatively longer and anteriorly the first four or five are directed more and more forward and become longer, the first two pointing directly forward. Neurocirrus of II about twice as long as the others.

Acicula single in each ramus, stout, tapered, slightly curved, the tip projecting a little. Notopodial setæ in a dense oblique row, becoming much longer toward the dorsal and posterior end from which they rise in a long falcate pencil over the outer margin of the elytra. All simple, capillary, very slender, and very finely setose with minute, mostly opposite hairs. Neuropodials in a flattened horse-shoe-shaped series open anteriorly, besides which there is an outer ventral curved series reaching farther dorsad in front and a small, detached dorsal tuft. The latter consists of three to five delicate, acutely pointed, simple setæ with tapering shaft and spirally wound fringe of twelve to fifteen conspicuous turns, diminishing and becoming obsolete distally (Pl. XXXIII, fig. 120). Associated with these there is often present on anterior parapodia one or rarely two compound setæ with the distal end of the shaft provided with a spiral fringe of several turns and the very long, slender, articulated appendage ending in a simple delicate point (fig. 117). Most remaining neuropodial setæ are compound and on anterior segments have slender, tapering, articulated appendages terminating in bifid tips which, however, may be so weak and obscure on some of the more slender ones that this character may appear doubtful. The largest and stoutest setæ are in the posterior side of the principal series and have short, few-jointed appendages and obscurely bifid tips (fig. 116). The dorsal arc is formed of setæ of moderate thickness with the end of the shaft often ornamented with several antrorse pectinæ or spinulose rows and the elongated and slender appendages with ten to fifteen articulations and distinctly bifid tips. Those of the main ventral arc have quite smooth shafts

and appendages of intermediate length. Setæ composing the outer ventral arc are very slender with smooth (or anteriorly slightly spinulose), rather strongly curved shafts and appendages with the number of joints increasing from one on ventral to seven or eight on the most dorsal and anterior setæ and varying correspondingly in length. These have the tips conspicuously hooked and bifid (fig. 118). Two stout dark-colored setæ with short unjointed strongly hooked and bifid appendages (fig. 119) occur about the middle of the posterior row regularly on parapodia behind XXX. On the cotype one of these was found on V but none could be detected on other anterior parapodia. Proceeding caudally all articulated setæ tend to have fewer joints.

Elytra occur on II, IV, V and alternate segments to XXVII and after that on every consecutive segment to the end of the piece. They are thin, only moderately arched and in the type devoid of pigment, though anterior ones of the cotype are each marked with a short curved dusky bar near the median border; posteriorly most of them are covered with a light ferruginous deposit. They are of the usual broadly lunate form (Pl. XXXIII, fig. 114), becoming narrower behind XXVII, truncate laterally where they are fimbriated with rather sparse but moderately long processes, often arranged in small groups with minute papillæ between (fig. 115*b*). The elliptical scar lies laterad of the middle, the third of the elytron external to its outer edge being noteworthy for its rich supply of branching nerves and the absence of surface nodules except for a narrow area adjacent to the umbilicus. The remainder of the surface is thickly studded with small hard trihedral nodules or spines, becoming slightly larger toward the posterior border (fig. 115*a*).

Stations 4,343, south of South Coronada Island, vicinity of San Diego, 55-155 fathoms, fine gray sand (type); 4,552, off Point Pinos Light-house, Monterey Bay, 66-73 fathoms, green mud and rocks (two cotypes).

This species resembles *Sthenelais blanchardi* Kinberg, of the coast of Chile, in having all of the compound neuropodial setæ bifid at the tips, but differs in having those of the ventral group much less slender and with fewer articulations than figured by Kinberg, the median tentacle relatively longer and the smooth lateral area of the elytra decidedly broader.

#### EXPLANATION OF PLATES XXVIII-XXXIII.

Unless stated otherwise, all figures are drawn, with aid of the camera lucida, from the types.

PLATE XXVIII—*Eunoë barbata*—Figs. 1-6.

- Fig. 1—Neuropodial seta from middle of somite X,  $\times 250$ .  
 Fig. 2—End of a middle notopodial seta from X,  $\times 250$ .  
 Fig. 3—Nearly smooth tip of a ventral notopodial seta from X,  $\times 250$ .  
 Fig. 4—Third elytron of right side,  $\times 9$ .  
 Figs. 5 and 6—Portions of the same elytron at points respectively indicated by A and B,  $\times 56$ .

*Eunoë caeca*—figs. 7-12.

- Fig. 7—Head region from above, the prostomium slightly tipped up in front, tentacular cirri shown on left side only,  $\times 9$ .  
 Fig. 8—Posterior view of parapodium X without setæ,  $\times 17$ .  
 Fig. 9—Neuropodial seta from middle of fascicle of somite X,  $\times 56$ .  
 Fig. 10—Tip of the same,  $\times 250$ .  
 Fig. 11—End of middle notopodial of X,  $\times 56$ .  
 Fig. 12—Tip of the same,  $\times 250$ .

*Harmothoë scriptoria*—figs. 13-17.

- Fig. 13—Head region from above, median tentacular style missing and tentacular cirri shown on left side only,  $\times 24$ .  
 Fig. 14—Anterior aspect of parapodium XX without setæ,  $\times 33$ ; 14a, tip of acicular process of neuropodium of the same viewed from behind, more highly magnified.  
 Fig. 15—Elytron from somite XI,  $\times 9$ ; 15a, a small portion of the surface at A,  $\times 56$ .  
 Fig. 16—End of a neuropodial from middle of fascicle of X,  $\times 440$ .  
 Fig. 17—Tip of middle notopodial of X,  $\times 250$ .

PLATE XXIX—*Harmothoë triannulata*—figs. 18-22.

- Fig. 18—Prostomium and peristomium with appendages, from above,  $\times 24$ .  
 Fig. 19—Parapodium X without setæ or notocirrus, caudal aspect,  $\times 33$ .  
 Fig. 20—An anterior elytron,  $\times 33$ .  
 Fig. 21—Neuropodial seta from middle of fascicle of X,  $\times 250$ .  
 Fig. 22—End of an average notopodial seta from X,  $\times 440$ .

*Harmothoë tenebricosa*—figs. 23-28.

- Fig. 23—Dorsal aspect of head region, tentacular cirri and palpus shown on left side only,  $\times 9$ .  
 Fig. 24—Anterior aspect of parapodium X without setæ and notocirrus,  $\times 24$ .  
 Fig. 25—Neuropodial seta from middle of fascicle of X,  $\times 56$ .  
 Fig. 26—Tip of the same,  $\times 250$ .  
 Fig. 27—Middle notopodial from X,  $\times 56$ .  
 Fig. 28—Tip of the same,  $\times 250$ .  
 Figs. 25-28—drawn from cotype.

*Harmothoë (Evarne) fragilis*—figs. 29-30.

- Fig. 29—Dorsal aspect of prostomium and peristomial parapodia, lacking median tentacular style and right tentacular cirri,  $\times 24$ . Left tentacular cirri from a cotype.  
 Fig. 30—Neuropodial seta from middle of fascicle of X,  $\times 250$ .

PLATE XXX—*Harmothoë fragilis*—figs. 31-33.

- Fig. 31—Anterior aspect of parapodium X of a cotype (Sta. 4,418),  $\times 33$ .  
 Fig. 32—Third elytron of the same cotype,  $\times 24$ .  
 Fig. 33—Tip of average notopodial of X,  $\times 250$ .

*Antinoë anoculata*—figs. 34-40.

- Fig. 34—Cephalic region from the dorsum,  $\times 9$ .  
 Fig. 35—Posterior aspect of parapodium X without setæ,  $\times 9$ .  
 Fig. 36—Fourth right elytron (VII),  $\times 9$ .  
 Fig. 37—Neuropodial setæ from X; a, dorsal, b, middle, and c, ventral,  $\times 56$ .

Fig. 38—Tips of three of the same more highly magnified; *b* and *c*, middle and ventral setæ respectively,  $\times 250$ ; *d*, a ventral seta with peculiarly bifid tip,  $\times 440$ .

Fig. 39—Distal portion of an average notopodial from X,  $\times 56$ .

Fig. 40—Tip of the same,  $\times 250$ .

*Nemidia microlepidia*—figs. 42–44.

Fig. 42—Dorsal aspect of cephalic region with base of protruded proboscis; left ventral tentacular cirrus only represented,  $\times 17$ .

Fig. 43—Anterior aspect of parapodium X,  $\times 24$ ; *a*, posterior aspect of tip of the neuropodium,  $\times 33$ .

Fig. 44—Elytron from somite XVII,  $\times 24$ .

PLATE XXXI—*Nemidia microlepidia*—figs. 45, 46.

Fig. 45—Complete neuropodial seta from LXXX,  $\times 250$ .

Fig. 46—Worn neuropodial seta as usually found, from a posterior segment,  $\times 250$ .

*Polynoë(?) remigata*—figs. 47–51.

Fig. 47—Incomplete and distorted head region,  $\times 17$ .

Fig. 48—Anterior aspect of a middle parapodium without setæ or cirri,  $\times 24$ .

Fig. 49—End of a notopodial from middle region,  $\times 250$ .

Fig. 50—Neuropodial from middle segment,  $\times 33$ .

Fig. 51—Tip of a neuropodial,  $\times 250$ .

*Polynoë(?) filamentosa*—figs. 52–56.

Fig. 52—Anterior aspect of parapodium XXIII, without setæ or notocirrus,  $\times 24$ .

Fig. 53—Tip of a long notopodial seta from XVIII,  $\times 250$ .

Fig. 54—A short notopodial from XVIII,  $\times 33$ .

Fig. 55—An average neuropodial seta from XVIII,  $\times 33$ .

Fig. 56—Tip of the same,  $\times 250$ .

*Polynoë(?) aciculata*—figs. 57, 58.

Fig. 57—A much retracted parapodium without setæ or neurocirrus but with notocirrus, anterior view,  $\times 24$ .

Fig. 58—End of a dorsal neuropodial seta,  $\times 250$ .

*Polynoë(?) renotubulata*—figs. 59–64.

Fig. 59—Head lacking some of the appendages,  $\times 9$ .

Fig. 60—Posterior aspect of parapodium from behind middle of body, without setæ, and showing the greatly elongated nephridial papilla (*n*),  $\times 9$ .

Fig. 61—First elytron,  $\times 9$ .

Fig. 62—Average neuropodial seta from XXIII,  $\times 33$ .

Fig. 63—End of the same,  $\times 250$ .

Figs. 64*a* and 64*b*—Side and face views respectively of end of a ventral neuropodial from XXIII,  $\times 250$ .

*Aphrodita armifera*—figs. 65, 66.

Fig. 65—Dorsal finbriated organ from XII,  $\times 56$ .

Fig. 66—Two dorsal papillæ,  $\times 250$ .

Figs. A and B—Free-hand sketches of tips of average neuropodial and notopodial setæ from somite X of *Harmothoë yokohamiensis*.

PLATE XXXII—*Aphrodita armifera*—figs. 67–75.

Fig. 67—Head from above,  $\times 9$ .

Fig. 68—Medium sized notopodial seta from ventral fascicles of X,  $\times 24$ .

Fig. 69—Tip of the same showing the asperities which are largest near the end,  $\times 56$ .

Fig. 70—Two neuropodial setæ of the dorsal row of X, one in profile and another in face view,  $\times 56$ .

Fig. 71—Neuropodial seta of middle row of X,  $\times 56$ .

- Fig. 72—Two setæ of ventral neuropodial row of X,  $\times 56$ .  
 Fig. 73—Tip of the smaller seta shown in fig. 72, slightly turned to show flattened concave surface,  $\times 250$ .  
 Fig. 74—End of one of the more dorsal pinnate setæ from the ventral neuropodial fascicle of II,  $\times 250$ .  
 Fig. 75—Portion of a slender spinous neuropodial seta from a caudal parapodium,  $\times 360$ .

*Aphrodita refulgida*—figs. 76–84.

- Fig. 76—Dorsal papillæ,  $\times 56$ .  
 Fig. 77—Dorsal fimbriated organ from XV,  $\times 56$ .  
 Fig. 78—Head (peristomial parapodia of right side omitted; dorsal tentacular cirrus, added from cotype),  $\times 9$ .  
 Fig. 79—notopodial seta (in two pieces) from dorsal fascicle of X,  $\times 24$ .  
 Fig. 80—Tip of another of the same, showing the sheath sometimes present,  $\times 250$ .  
 Fig. 81—*a*, *b* and *c*, outlines of ends of dorsal, middle and ventral neuropodial setæ respectively, from X,  $\times 56$ .  
 Fig. 82—End of a seta from near dorsal part of ventral neuropodial fascicle of II,  $\times 250$ .  
 Fig. 83—End of one of the shorter, slender spinous neuropodials from caudal parapodia,  $\times 250$ .  
 Fig. 84—Portion of end of elongated neuropodial from caudal region,  $\times 250$ .

*Aphrodita castanea*—figs. 85–97.

- Fig. 85—Head of cotype (Sta. 4,468). The right peristomial foot exhibits an abnormal condition in the presence of two dorsal tentacular cirri,  $\times 9$ .  
 Fig. 86—Fimbriated organ from XII,  $\times 24$ .  
 Fig. 87—Two dorsal papillæ,  $\times 250$ .  
 Fig. 88—Hooked tips of two notopodial setæ from dorsal fascicle of X (cotype sta. 4,482),  $\times 250$ .  
 Fig. 89—Superficial roughening of small portion from middle of a dorsal notopodial of X (cotype),  $\times 250$ .  
 Fig. 90—Tip and small portion of dorsal felt fiber of middle segment,  $\times 600$ .  
 Fig. 91—Same of lateral fiber,  $\times 600$ .  
 Fig. 92—*a*, *b* and *c*, dorsal, middle and ventral neuropodial setæ respectively (cotype sta. 4,482) of X,  $\times 56$ .  
 Fig. 93—Pinnate seta from middle of ventral neuropodial fascicle of II,  $\times 250$ .  
 Fig. 94—Short spinous ventral neuropodial of caudal region,  $\times 250$ .  
 Fig. 95—Long same,  $\times 250$ .  
 Fig. 96—Tip of notopodial from caudal region showing the sticky hairy surface,  $\times 600$ .  
 Fig. 97—Portion of middle of lateral fiber from caudal region showing same condition,  $\times 600$ .  
 Figs. 85, 88, 89, 92, 93, 94, 95, and 98 were drawn from a cotype (sta. 4,482).

PLATE—XXXIII.

- Fig. 98—Ventral neuropodial seta from somite X of *A. castanea*,  $\times 250$ .

*Leanira alba*—figs. 99–104.

- Fig. 99—Dorsal view of anterior end, with second right and third left elytra in place, right side not completed,  $\times 9$ .  
 Fig. 100—*a*, *b* and *c*, parapodia II, XXV and I, respectively, anterior views without seta,  $\times 17$ .  
 Fig. 101—*a* and *b*, outlines of elytra IX and XXXIX, respectively,  $\times 9$ .  
 Fig. 102—Profile view of an average, anterior, subacicular neuropodial seta of XXV,  $\times 250$ .  
 Fig. 103—An extreme dorsal neuropodial seta from XXV,  $\times 250$ .  
 Fig. 104—*a* and *b*, basal and middle portions of a notopodial seta from XXV,  $\times 440$ .

*Sthenelanellella uniformis*—figs. 105–112.

Fig. 105—Head from above,  $\times 24$ .

Fig. 106—Anterior view of parapodium X,  $\times 56$ .

Fig. 107—Posterior view of parapodium XX,  $\times 56$ .

Fig. 108—Elytron V,  $\times 24$ . The light and dark stippling represent somewhat crudely the distribution of brown and fuscous pigment.

Fig. 109—Small portion of lateral border of elytron II,  $\times 250$ .

Fig. 110—Ends of dorsal neuropodial setæ, *a*, profile view of one from XX, *b*, posterior view of one from V,  $\times 440$ .

Fig. 111—Neuropodial setæ from XX; *a*, middle one with imperfect articulation, *b*, a fully compound ventral one,  $\times 440$ .

Fig. 112—Small portion of plumose notopodial seta from XX,  $\times 440$ .

*Sthenelais tertiaglabra*—figs. 113–120.

Fig. 113—Head from dorsum,  $\times 24$ .

Fig. 114—Elytron XXV,  $\times 17$ .

Fig. 115—*a*, four trihedral horny papillæ from near posterior border of elytron; *b*, portion of lateral margin with cirriform and minute ovate papillæ,  $\times 250$ .

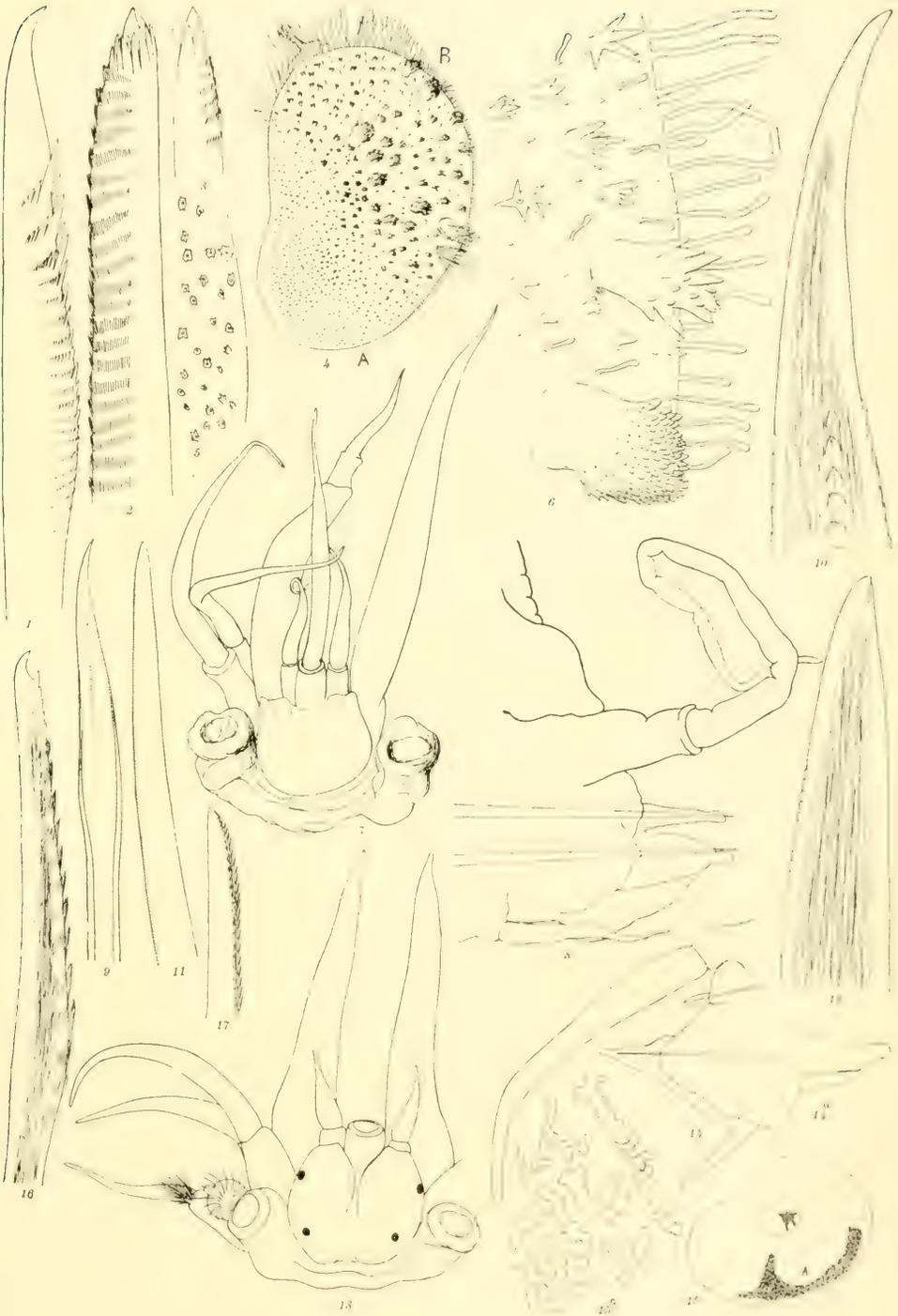
Fig. 116—Stout posterior neuropodial seta of usual type, from XX,  $\times 360$ .

Fig. 117—Slender dorsal neuropodial of XX,  $\times 360$ .

Fig. 118—Neuropodial seta of outer ventral arc, from X; *a*, tip of another,  $\times 360$ .

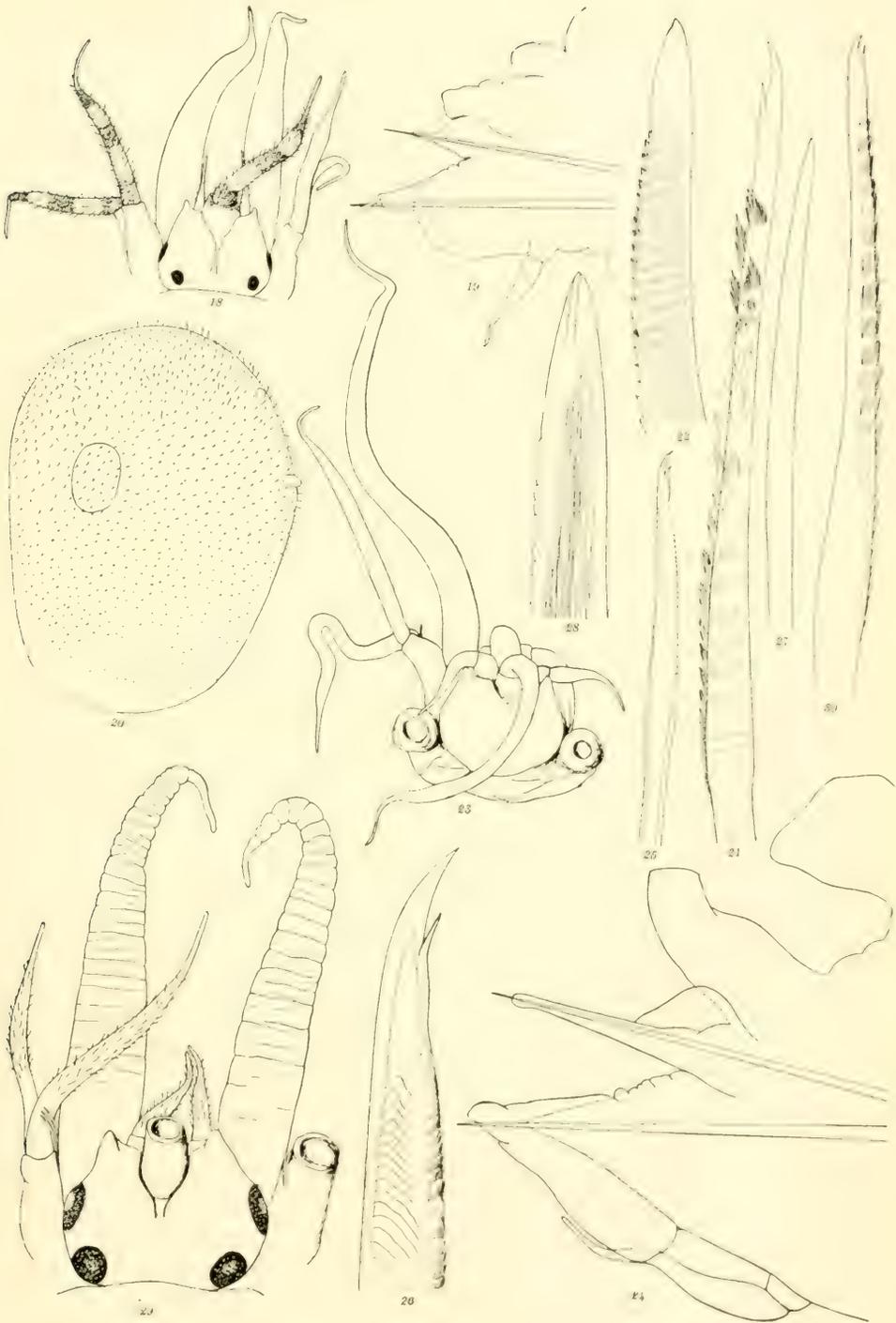
Fig. 119—Stout neuropodial with unjointed appendage from posterior series of XXXV of cotype,  $\times 250$ .

Fig. 120—Simple dorsal neuropodial seta from XX,  $\times 360$ .



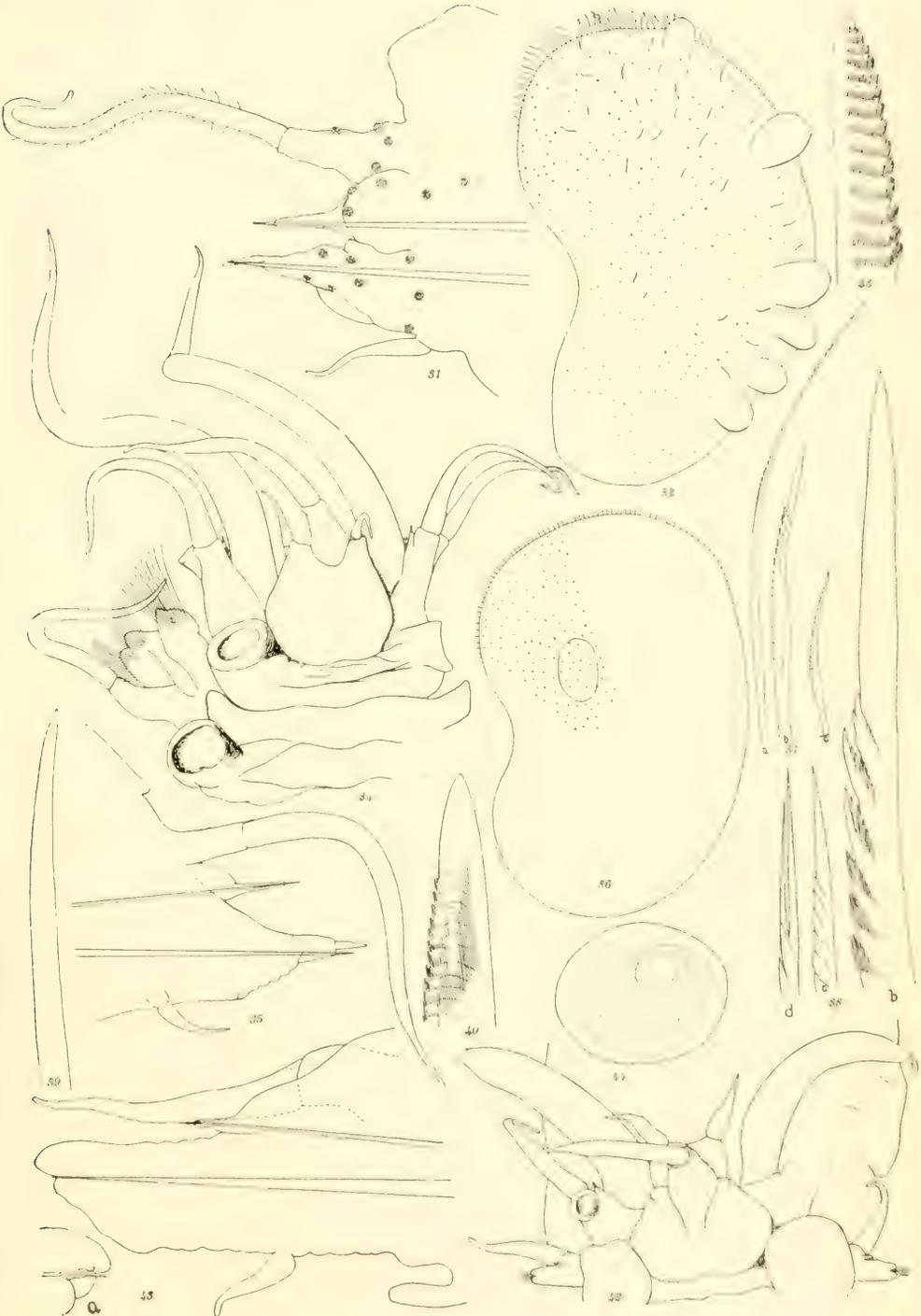
MOORE: POLYCHÆTOUS ANNELIDS.





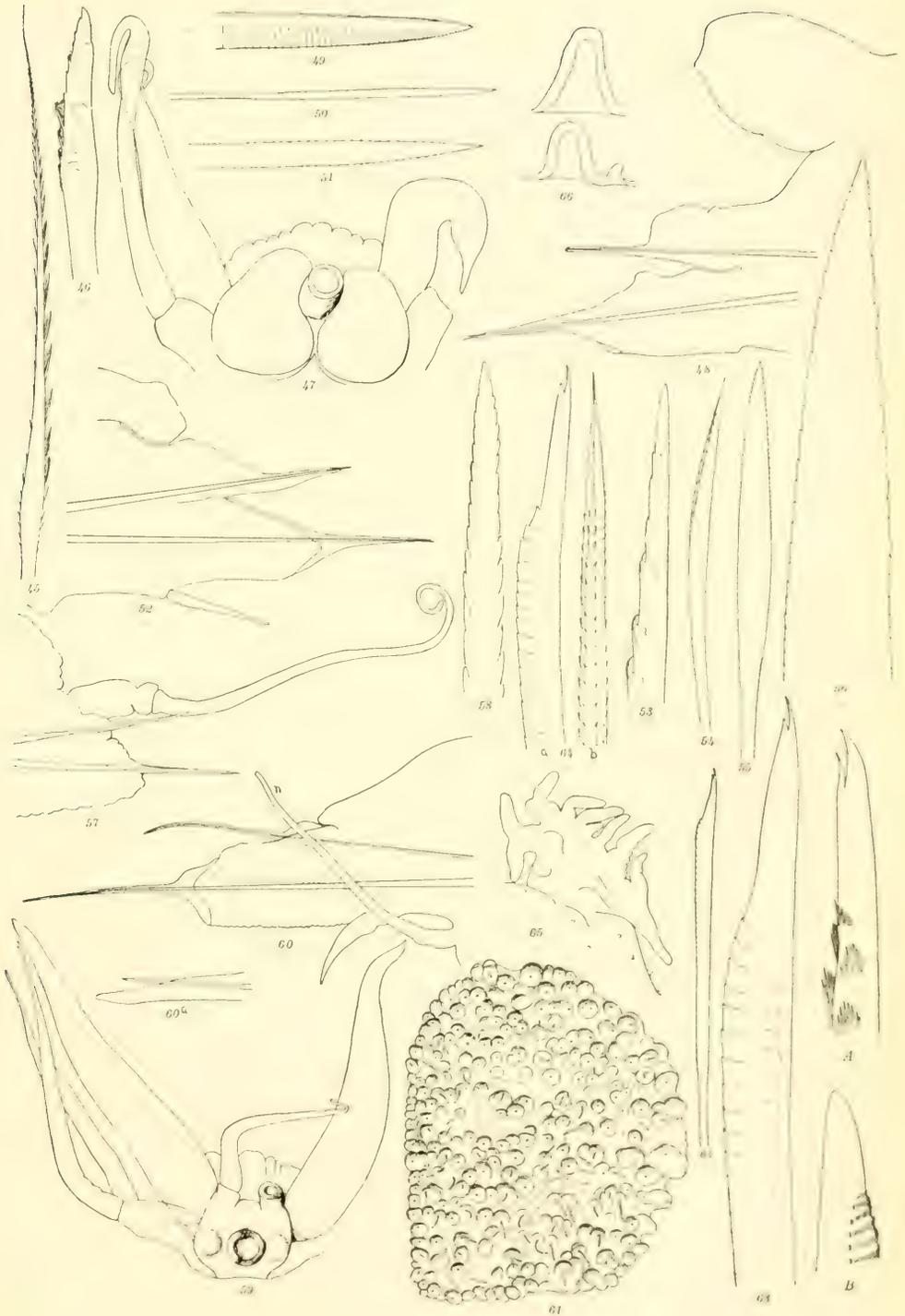
MOORE: POLYCHÆTOUS ANNELIDS.





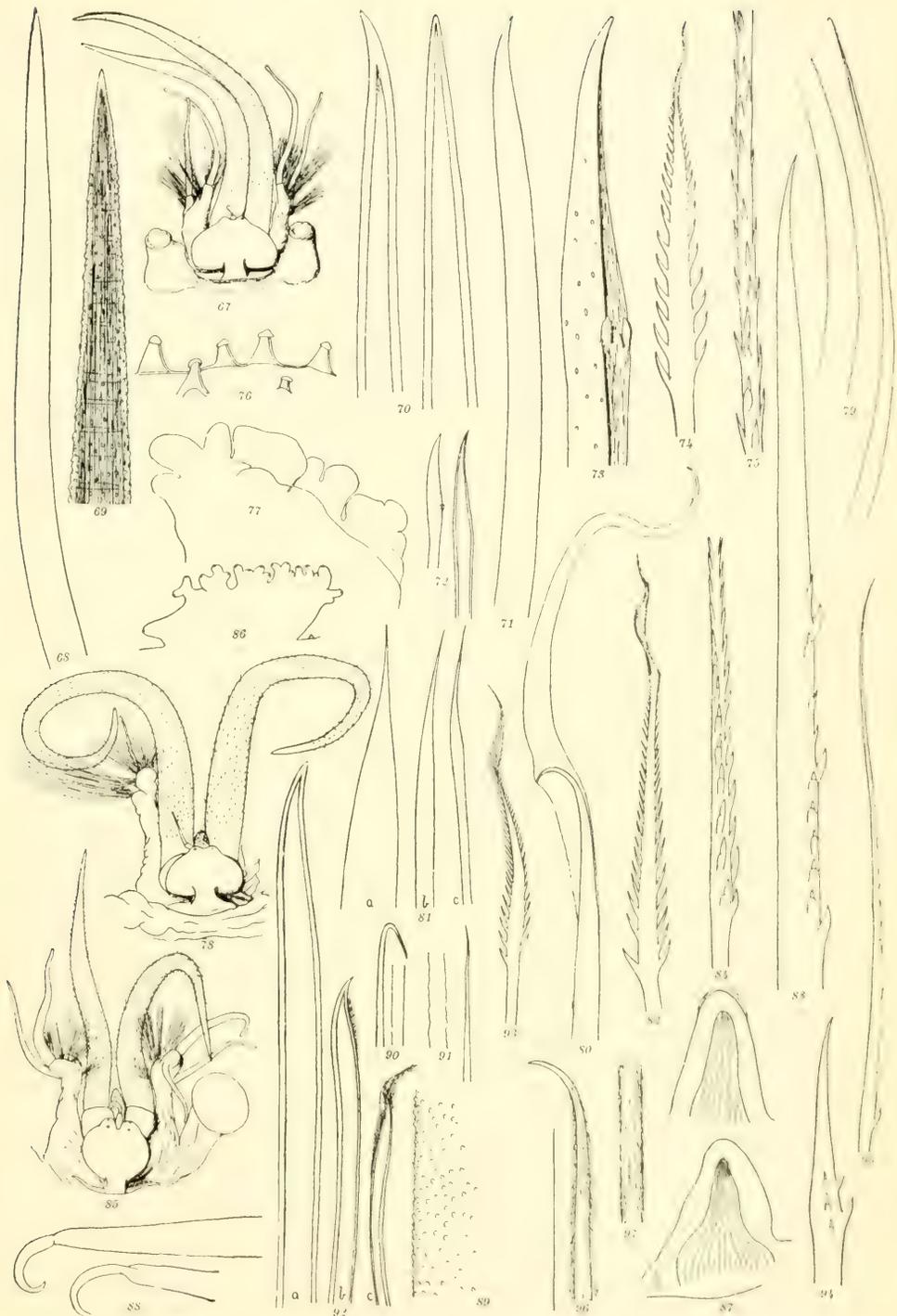
MOORE: POLYCHÆTOUS ANNELIDS.





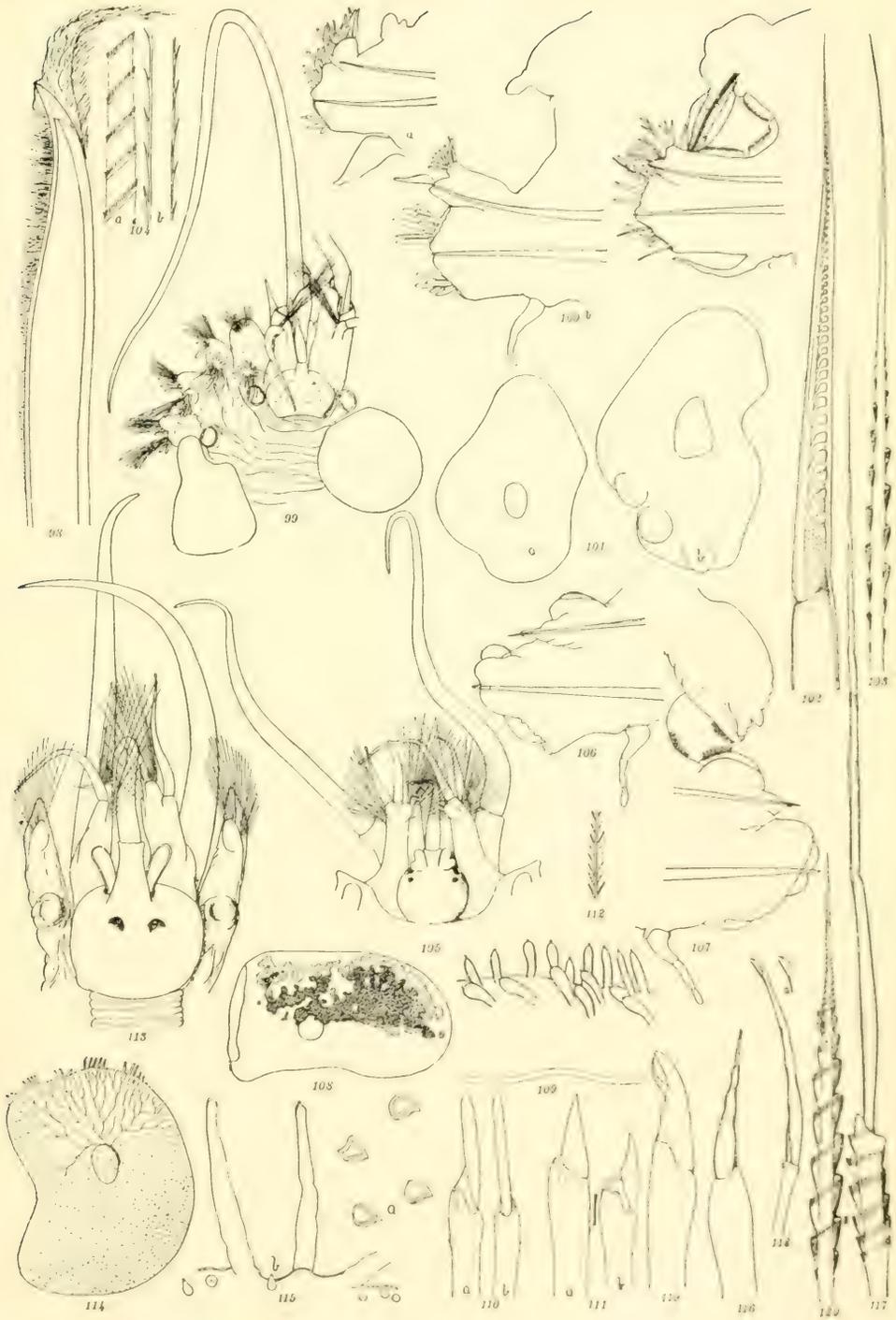
MOORE: POLYCHÆTOUS ANNELIDS





MOORE: POLYCHÆTOUS ANNELIDS.





MOORE: POLYCHAETOUS ANNELIDS.



The Polychætus Annelids Dredged by  
the U. S. S. "Albatross" off  
the Coast of Southern  
California in 1904:  
III. Euphrosynidæ to Goniadidæ.

BY

J. PERCY MOORE, PH.D.

---

*From the Proceedings of The Academy of Natural Sciences  
of Philadelphia, April, 1911.*

Issued June 22, 1911.







THE POLYCHÆTOUS ANNELIDS DREDGED BY THE U. S. S. "ALBATROSS"  
OFF THE COAST OF SOUTHERN CALIFORNIA IN 1904:  
III. EUPHROSYNIDÆ TO GONIADIDÆ.

BY J. PERCY MOORE.

The present paper is in continuation of two parts already published under the same title and completes the Nereidiformia. Parts I and II were published in these PROCEEDINGS for June, 1909, and April, 1910, respectively. A fourth part dealing with the remaining Polychæta and completing the report is nearly ready for publication. The large number of species that it has been necessary to name and describe in this paper further illustrates the richness of the Polychæte fauna of California and particularly of Monterey Bay and emphasizes the incompleteness of our knowledge of the subject.

EUPHROSYNIDÆ.

Four species of *Euphrosyne*, two of which are previously undescribed, represent this family.

*Euphrosyne bicirrata* Moore.

*Euphrosyne bicirrata* Moore. Proc. Acad. Nat. Sci. Phila., 1905, pp. 532-534, Pl. XXXIV, figs. 8-12.

Two specimens of 7.5 and 15 mm. long, each having 26 segments. The setæ are remarkably long, the notopodials often exceeding the width of the body, and agree in character and distribution with the type. There are six or seven pairs of gills on each somite, each consisting of two filaments which are subequal on the larger specimen and mostly distinctly unequal on the other; rarely one or two smaller gills are added. The caruncle of the smaller specimen reaches to the anterior border of V. Median tentacle exceeds two-thirds the caruncle, the distal half being filamentous. Middle cirrus between second and third gills from dorsum.

Stations 4,339, off Point Loma Lighthouse, vicinity of San Diego, 241-369 fathoms, green mud; 4,549, Monterey Bay, off Point Pinos Lighthouse, 56-57 fathoms, coarse sand, shells and rock.

*Euphrosyne hortensis* Moore.

*Euphrosyne hortensis* Moore. Proc. Acad. Nat. Sci. Phila., 1905, pp. 534-536, Pl. XXXIV, figs. 13-16.

Two specimens of nine and ten millimeters long have 29 and 31 segments, respectively. The caruncle reaches the middle of VI. The

branched and tufted gills form continuous rows of coarse filaments behind the palisades of setæ and occur in seven or eight pairs, of which the lowermost, occupying the interramal space, and the uppermost tend to split up. The middle cirrus is either opposite to the fourth or fifth gill or opposite the interval between them.

The setæ are somewhat more slender than on the original specimens, but agree with them in other respects. The dorsal ones project conspicuously above the gills and more or less cover the median dorsal area.

This species has much in common with *E. heterobranchia* Johnson, but lacks the smooth, cleft notopodial setæ of that species.

Stations 4,463, Monterey Bay, Point Pinos Lighthouse, 48-111 fathoms, rocky; 4,552, same locality, 66-73 fathoms, green mud and rocks.

*Euphrosyne dumosa* sp. nov. Pl. XV, figs. 12-17.

A stout but little depressed species with conspicuous gills and much of the aspect of an Arctian caterpillar. The type, having 34 segments, is 16 mm. long, with a maximum width, exclusive of the setæ, of 8 mm. and a maximum depth of about 4.8 mm., exclusive of the gills and setæ, and of 6 mm. including them. The cotype is 10 mm. long and 4 mm. wide with 32 segments.

Prostomial caruncle long and narrow, the tip of the crest reaching to or slightly beyond the furrow VI/VII, the base to the middle of VI only; base and crest well-differentiated and separated by deep longitudinal furrows; the crest smooth, not marked by distinct longitudinal grooves, continued forward by a low ridge to the furrow separating the palps. Eyes, two pairs; the dorsal immediately at the anterior end of the caruncle on each side of the median tentacle, conspicuous, black, round or slightly elongated; the ventral about one-half as large, very close together between bases of peristomial parapodia. Median tentacle situated at anterior end of caruncle, between dorsal eyes and composed of a short cylindrical ceratophore about as long as the basal width of the caruncle and a short style which is incomplete in both specimens. Paired tentacles minute papillæ immediately ventral to ventral eyes. Palps smooth, flattened, ovate pads, separated by a median fissure and continuous by their contracted anterior ends with the peristomial parapodia. A low facial ridge runs forward and downward to the fissure between the palpi. Mouth bounded by palps in front, somite IV at the sides and the furrowed lip of V behind.

Peristomium coalesced with prostomium and the anterior part of the latter largely concealed between its forwardly directed para-

podia. Segments 32 to 34, strongly differentiated ventrally by deep furrows which are well-marked dorsally also, except in the median area where they become obsolete in a series of biconvex intersegmental areas. Median naked field about one-fifth total width of dorsum, the parapodial areas densely covered with rows of branchiæ and setæ and occupying the rest of the dorsum. Ventrally a slight neural groove runs from the posterior lip to the pygidium. Pygidium minute, situated between the last pair of posteriorly directed parapodia and bearing a pair of appressed vertical lamellar anal cirri with thickened borders.

Parapodia of the usual form, the notopodia sessile and dorsal; neuropodia lateral, slightly projecting, low lamellæ, overlapping the ventral end of the notopodia from behind. Cirri usually about equal to gills in length, but sometimes slightly longer or shorter, rather stout, gently tapered. Notocirrus usually the shortest of the three, reaching only slightly beyond the middle line and situated slightly mediad of the setæ palisade and a little anterior to the branchiæ. Middle cirrus in line with notocirrus and opposite interval between third and fourth or fourth and fifth gills from the dorsum. Neurocirrus similar, situated just within the postero-ventral margin of the neuropodial fascicle of setæ.

Branchiæ borne on all setigerous segments, usually ten (but sometimes nine or eleven) pairs on middle segments, the three ventralmost in the interrampal area much crowded and often in actual contact or even with their stems partially coalesced. Each gill (Pl. XV, fig. 12) consists of a well-defined, stout stem bifurcated into a pair of nearly symmetrical trunks which divide dichotomously three or four times and end in rather slender, cylindroid, pointed filaments often half the total height of the gill. The angles of bifurcation are wide and the branching spreading in a plane so that the twigs of neighboring gills intercross. In the oral region the number of gills is somewhat reduced, and on somite I there are only six pairs with more or less coalesced bases and rather short filaments often thickened in the middle. The latter condition sometimes appears on other gills, but usually the filaments are extended and of regular diameter.

Notopodial setæ (Pl. XV, figs. 13-15) arranged in a long palisade of three rows running the entire length of the gill series. All are hollow, brittle, calcareous, translucent and white, or the granular contents of some of the larger ones slightly yellowish. All are relatively short and few project beyond the ends of the gills. Serrate bifid setæ are unusually numerous and appear not only to make up the anterior

series completely, but to enter largely into the formation of the other rows, especially at the dorsal end. Their ends have the form shown in figures 15, 15*a*, both forks being gently curved, tapered and strongly serrated along the inner borders, the longer being about twice as long as the shorter and without a widened region. Such setæ appear to be absent from I, but are alike on other segments and are usually distinctly shorter than the gills. They seldom show any trace of internal annulation or cameration. Most of the setæ of the second and third rows are of the simple spurred form (Pl. XV, figs. 13, 14) with nearly straight, smooth tips, those of the second row being longer and stouter, many of them reaching beyond the gills, those of the third row shorter than the serrate setæ. At the extreme ventral end of the palisade is a small compact tuft of much shorter setæ with very short tips.

Neuropodial setæ (Pl. XV, figs. 16 and 17) arise in several rows from an elliptical area. Those in the dorsal part of the bundle are nearly twice as long as the neurocirrus, but ventrally they become shorter until the most ventral are scarcely one-third as long as the cirrus. They have the general form of the smooth notopodial cirri, but are rather more slender and have longer, more curved ends and longer spurs.

Except for a pair of dusky spots on each segment of the median dorsal field and some dusky suffusions elsewhere, both specimens are colorless.

Stations 4,410, off Santa Catalina Island, 178-195 fathoms, gray sand, gravel and rocks (type); 4,470, off Point Pinos Lighthouse, Monterey Bay, 61-69 fathoms, hard gray sand.

• *Euphrosyne limbata* sp. nov. Pl. XV, figs. 7-11.

The single strongly curved specimen has a length of 17 mm., a maximum width of 7 mm., and a depth of 3 mm.; segments 36.

Prostomial caruncle short, beginning at posterior border of II and reaching barely beyond caudal border of IV; low, depressed rather than compressed, the base narrow and overlapped laterally by the spreading crest which reaches slightly beyond the base posteriorly also. Eyes two pairs, the dorsal black, somewhat elongated, slightly larger than the ventral, situated close together at the sides of the anterior end of the caruncle; ventral eyes smaller, nearly touching at median line, situated at ventral end of a low ridge which continues the caruncle forward and ventrad. Median tentacle situated as usual at anterior end of caruncle between dorsal eyes, consisting of a stout cylindrical ceratophore about one-third length of caruncle and a

minute conical style about one-half as long as the ceratophore. Paired tentacles minute papillæ immediately ventro-lateral of the ventral eyes. Palps smaller than usual, irregularly ovate with narrower prolongations not continuous with the peristomial parapodia, but entering the cleft between them. Mouth bounded by rugous lips formed laterally by III and IV and posteriorly by IV and V.

Segments 36, all well defined, especially ventrally where they are superficially wrinkled. Neural furrow slight, median dorsal naked field slightly exceeding one-fifth of total width, the triangular inter-segmental areas rather obscure. Caudal cirri short and thick, each folded longitudinally on itself so that the lamellar form is obscured.

Parapodia as in *E. dumosa*. Notocirrus arising just dorsad (mediad) and slightly caudad of the notopodial setæ, rather short, simple, tapered and reaching slightly beyond the middle line. Neurocirrus similar, arising just within ventro-posterior portion of setæ fascicle. Intermediate cirrus situated about three-fifths length of setæ palisade from its dorsal end or at least ventral to its middle, opposite interval between sixth and seventh or fifth and sixth gills from the dorsum and between the setæ palisade and series of gills.

Branchiæ (Pl. XV, figs. 7, 8), usually twelve pairs on each side of middle segments, but somewhat fewer toward the ends of the body. The nine dorsalmost form a straight row well behind the setæ and cirri, the three lowermost occupying the interramal space and usually separated from the others by a short interval. Each gill has a very short trunk soon divided into two, each of which is again divided dichotomously about four or five times to form thirty or more long terminal filaments. All parts of the gill are slender and the terminal twigs so numerous and long that they form a dense interlacing mass between the rows of setæ, the longest of which, however, rise well above and shelter them.

Setæ all colorless and transparent and of one type, none being serrate or strictly bifid. Notopodials (Pl. XV, fig. 9) erect in a narrow palisade of three irregular rows, those of anterior and posterior rows small and less than the gills in length; those of the middle row are fully twice as long and thick and rise conspicuously above the gills. All are alike hollow, calcareous and brittle, with rather long, slightly curved, smooth tips strongly annulated or camerated within and bearing a prominent, subterminal, divergent spur. Neuropodial setæ are of the same type and those in the ventral part of the bundle (Pl. XV, fig. 10) differ little except in length from the longer notopodial setæ. Dorsal neuropodials (Pl. XV, fig. 11), however, are much

longer and more slender, with very acute, straight tips and, as stated above, project laterally as very prominent fringes.

No color remains.

The only specimen comes from station 4,420, off San Nicholas Island, 32-33 fathoms, fine gray sand.

This species is evidently closely related to *E. maculata* Horst from Timor, but lacks serrated, ringent dorsal setæ. Compared with *E. dumosa*, it appears remarkably broad and depressed, besides differing in many technical characters.

#### AMPHINOMIDÆ.

• *Chloëia pinnata* sp. nov. Pl. XV, figs. 1-6.

A very pretty, small and slender species of a slightly depressed, fusiform shape, tapering most toward the caudal end. The type is 26 mm. long, 6.5 mm. wide at XI, where it is 5.5 mm. deep, and has a spread of setæ of 12 mm.; segments 26. Other specimens vary in length from 7 to 30 mm. and have from 17 to 28 segments.

Prostomium coalesced with peristomium, its broadly truncate anterior border produced laterally round the peristomial parapodia; ventrally it appears as a tumid elliptical pad divided by a median longitudinal cleft and reaching the mouth; dorsally somewhat T-shaped, the broad anterior end extending laterally, while posteriorly it is contracted between the parapodia of somites I and II. Caruncle arises from the prostomium and reaches to the anterior or occasionally to the posterior border of IV, but is entirely free from these segments, over which it passes like a flowing plume. Two longitudinal furrows divide it into a compressed crest with accordion-plaited sides and smaller basal ridge also divided by transverse furrows into twelve or thirteen deep crenulations, each marked, like the crest folds, with a small brown spot. Eyes two pairs, black, equally conspicuous, but the anterior slightly the larger, situated at sides of anterior end of caruncle, the anterior slightly in advance, the posterior slightly behind the anterior border. Median tentacle arising from a low, smooth elevation coalesced with anterior end of caruncle, the style moderately slender, tapered, smooth, suberect, about one-fourth longer than the caruncle, but fragile and seldom complete. Paired tentacles sessile, in contact between anterior eyes, similar in form to median tentacle and about one-half as long.

Peristomium and its parapodia completely coalesced with prostomium, not appearing as a distinct segment. Somite II well-differentiated, divided ventrally by the mouth and forming the rugous lateral

lips. Mouth bounded behind by III which is united with IV to form the rugous posterior lip. Remaining segments few, large, distinct, strongly differentiated by deep furrows below and more shallow ones above; lateral borders deeply and coarsely serrated; entire ventral surface and median dorsal (interbranchial) field quite smooth. Segments increase in size to XI, then gradually decrease to the small bilobed pygidium which bears a pair of thick, truncate, cylindrical, appressed cirri about as long as the lateral tentacles.

Parapodia simple but rather prominent, lateral swellings producing the coarse lateral serrations, biramous, the notopodial and neuropodial tubercles widely separated and each bearing a large setigerous sac with elliptical orifice and an eversible rim, the notopodial orifice facing laterad and slightly dorsad and caudad, the neuropodial laterad and caudad. Toward the ends the parapodia become smaller and the setæ tufts gradually reduced; the anterior ones shift toward the dorsum, the first or peristomial foot being strictly dorsal; approaching the caudal end the setæ fascicles are directed more and more caudad.

Notocirri arise at the caudo-dorsal border of the notopodial tuft of setæ and reach to the base of the corresponding cirrus of the opposite side or on posterior segments beyond it. Cirrophores long, slender, terete, nearly as long as the segments to which they belong; styles flagelliform, three to three and one-half times as long as the cirrophores. Neurocirri arise within the lips of the setæ sacs on the ventral side of the neuropodial fascicle; they consist of short and obscure cirrophores and long, slender, fragile, flagelliform styles equalling the notocirri on middle segments, but diminishing in size posteriorly and also anterior to V. The first three parapodia have the cirri relatively short and stout, the notocirrus considerably shorter than the neurocirrus. They also possess a third much smaller cirrus situated immediately dorsal to the notocirrus and probably representing the gills; they are similar to the notocirri and that on the peristomium is longest.

Branchiæ begin on somite IV and continue, gradually diminishing in size, to the caudal end. They arise on the posterior border of the dorsum of their segments, separated by about one-third of the total width, and lie nearly flat on the dorsum, reaching caudad over the succeeding segment so that they are slightly imbricated. Form broadly suboval, lamellar, bipinnatifid; composed on middle segments of a tapered and somewhat sinuous axis bearing alternately on each side about eight simply pinnate branches diminishing in size and complexity distally, where the series is completed by two or three simple pinnæ. Toward the ends of the body they become smaller, with a diminished number of pinnæ.

Proboscis protruded on many specimens to varying degrees and presenting very different aspects. On the type it is a short truncate cylinder 3.5 mm. in diameter and equally long, divided by three furrows into as many zones: first, a soft, somewhat inflated basal zone which, because of the incompleteness of the furrows in a narrow medial dorsal region, here encroaches on the other rings to the end of the proboscis; second, a narrower, firm and muscular middle ring and, third, a still shorter terminal muscular disk of a deep brown color with a central rugous area and a slight vertical furrow dividing it to the margins. On other specimens the basal annulus is much larger and more inflated, the terminal disk is sometimes folded together along the vertical furrow in partial retraction, and sometimes in complete extension has the rugous area protruded as a prominent rounded mass turned toward the dorsum to conceal the mouth from below and marked by a slight median furrow and numerous, slightly sinuous, transverse raised lines. Still other specimens have this distal region much more extended to a length exceeding all the rest of the proboscis, and bearing the large orifice at the end of the flat, smooth and soft dorsal part, the deep spoon-shaped or ventricose sides and venter being completely formed by the rugous area.

Setæ all nearly or quite colorless, tubular, with soft, granular contents, very brittle. When massed the setæ are sometimes distinctly yellow and those of some of the younger specimens exhibit a beautiful satiny luster. Notopodials in somewhat whorled, suberect tufts, becoming longer and more recumbent toward the caudal end. They are rather stout, slightly curved and tapered to rather blunt points, below which, at a varying distance, is a spur, conspicuous on the more ventral setæ (Pl. XV, fig. 1) which are truly bifid, nearly obsolete on dorsal setæ (Pl. XV, fig. 3). Most notosetæ of middle segments are smooth or nearly so, but some (fig. 2) exhibit slight serrations, and this may be the normal state of unworn setæ. Posteriorly the setæ become longer and usually lack the spur; anteriorly contrary changes occur. Neuropodial setæ much more numerous, slender and elongated, forming very dense tufts which spread laterad, but posteriorly more caudad. Posterior setæ are more elongated and truly capillary, but on some examples they exceed the body width, even on the middle parapodia. They are of the same type as the notopodials, but the spur is close to the tip and small or obsolete (Pl. XV, figs. 4, 5). Toward the ends of the body modifications similar to those affecting the notosetæ occur (Pl. XV, fig. 6).

Color. Probably richly colored in life, but most of the preserved

specimens are faded and colorless except for a wedge-shaped brown or purple spot in front of the lateral tentacles, a rich madder purple coloration of the notocirri and a brown spot at the end of each anal cirrus; others show traces of a more extensive purple coloration, especially on posterior segments. The under parts, including the neurocirri, are always colorless, as are the tentacles and one to three or four pairs of the anterior notocirri. Not infrequently also, the color is lost more or less completely from the styles of IV, V and VI, but the cirrophores always retain the deep purple color. A specimen from station 4,416 is of a fine rosy color above with a median series of white oval spots. Several specimens from station 4,454 have the notocirri brown and the ventral surface, proboscis and rarely portions of the dorsal surface spotted with sharply defined, quadrate, brown spots. Sometimes only three or four occur on the entire ventral surface, in which case some are likely to occur on the dorsum; sometimes they are much more numerous and in places crowded or even coalesced and rarely the spots are X-shaped.

*Chloeia pinnata* is one of the most abundantly represented and generally distributed species included in this collection. There are in all nearly three hundred specimens, about half of which came from stations 4,460, 4,475 and 4,552 and about twenty each from stations 4,349, 4,480 and 4,485, all of these being muddy bottoms. No less than ninety-seven were taken at station 4,475, from among which the type was selected.

The full list is as follows: Stations 4,309, Point Loma Lighthouse, vicinity of San Diego, 67-78 fathoms, fine sand, shells and rock; 4,310, same locality, 71-75 fathoms, fine sand and green mud; 4,322, off Point La Jolla, vicinity of San Diego, 110-199 fathoms, green mud and shells; 4,332, off Point Loma Lighthouse, 62-183 fathoms, gray and black sand with rocks; 4,339, same locality, 168-254 fathoms, green mud, fine sand and rock; 4,349, same locality, 75-134 fathoms, green mud and fine sand; 4,364, same locality, 101-129 fathoms, gray sand, mud and rock; 4,365, same locality, 130-158 fathoms, green mud; 4,366, same locality and bottom, 176-181 fathoms; 4,416, off Santa Barbara Island, 323-448 fathoms, dark green mud and rock; 4,418, same locality, 238-310 fathoms, dark mud, sand and rock; 4,420, off San Nicolas Island, 32-33 fathoms, fine gray sand; 4,423, same locality, 216-339 fathoms, gray sand with black pebbles and shells; 4,454, Monterey Bay, Point Pinos Lighthouse, 65-71 fathoms, green mud, sand and gravel; 4,460, same locality, 55-167 fathoms, green mud and gravel; 4,464, same locality, 36-51 fathoms, soft dark

gray mud; 4,475, same locality, 85-142 fathoms, soft green mud; 4,480, Monterey Bay, off Santa Cruz Lighthouse, 53-76 fathoms, dark green mud and sand; 4,485, same locality, 39-108 fathoms, soft green mud and sand; 4,510, Monterey Bay, off Point Pinos Lighthouse, 91-184 fathoms, gray mud; 4,522, same locality, 130-149 fathoms, gray sand and shells; 4,523, same locality, 75-108 fathoms, soft dark mud; 4,552, same locality, 66-73 fathoms, green mud and rocks; 4,553, same locality, 65-74 fathoms, rock.

#### NEPHTHYDIDÆ.

##### \* *Nephtys cæca* (Fabricius) Oersted.

*Nephtys cæca*, Ehlers, Die Borstenwürmer, 1869, pp. 588-617, Taf. XXIII, figs. 10-34; Wiren, Vega Expeditionens, II, pp. 392-397, Taf. 30 and 31.

After puzzling a long time over the many specimens of *Nephtys* in this collection, I have been unable to come to any satisfactory conclusion regarding the number of species actually represented, and have, therefore, tentatively begged the question and followed Wiren in listing all of the forms represented under the above name. As a matter of fact, scarcely a single specimen can be confidently said to be typical *N. cæca*, though a number differ from it only intangibly. Most of them, in having the neuropodial postsetal lip much larger than the corresponding part of the notopodium, resemble *N. hombergi* Aud. and M. E. (= *N. assimilis* Oersted, Malmgren). Here belong especially those from stations 4,443, 4,462, 4,482, 4,485, 4,510, 4,523 and 4,548, all in Monterey Bay. One lot (station 4,436), in the almost total absence of parapodial lamellæ, approaches very closely *N. ciliata* (Müller) Rathke and has the rami widely separated as in *N. incisa* Malmgren but all of them have more segments than the latter. Specimens from stations 4,306 and 4,549 also approach this type, but the lamellæ are better developed. Two small specimens (station 4,482) have the long setæ and long involute gills of *N. malmgreni* Theel (= *N. longisetosa* Malmgren non Oersted). Examples from many of the other stations present intermediate characters, and it is for this reason that I do not here separate the forms as I have done previously, though I am by no means convinced that more than one species may not be represented.

The specimens vary in size from little more than 1 mm. wide to 8 and 9 mm. wide, the largest invariably incomplete. Many of the smaller ones show a conspicuous color pattern in the form of an irregular brown or dusky spot on the prostomium and bars of the same color across many of the anterior segments.

Stations 4,306, off Point Loma Lighthouse, vicinity of San Diego, 207-497 fathoms, green mud, fine sand and gravel; 4,310, same locality, 71-75 fathoms, green mud and fine sand; 4,349, same locality, 81-134 fathoms, green mud and fine sand; 4,364, same locality, 101-129 fathoms, gray sand, mud and rock; 4,431, off Santa Rosa Island, 38-45 fathoms, varied bottom; 4,436 off San Miguel Island, 264-271 fathoms, green mud; 4,443, off Point Pinos Lighthouse, Monterey Bay, 32-37 fathoms, fine gray sand; 4,462, same locality, 161-265 fathoms, green mud; 4,464, same locality, 36-51 fathoms, soft dark gray mud; 4,475, same locality, 58-85 fathoms, soft green mud; 4,480, off Santa Cruz Lighthouse, 53-76 fathoms, dark green mud, sand; 4,482, same locality, 43-44 fathoms, soft green mud; 4,485, same locality, 39-108 fathoms, soft green mud, sand; 4,510, off Point Pinos Lighthouse, 91-156 fathoms, gray mud; 4,522, same locality, 130-149 fathoms, gray sand and shells; 4,523, same locality, 75-108 fathoms, soft dark mud; 4,526, same locality, 204-239 fathoms, soft gray mud; 4,538, same locality, 795-871 fathoms, hard gray sand; 4,548, same locality, 46-54 fathoms, coarse sand, shells and rock; 4,549, same locality and bottom, 56-57 fathoms.

#### NEREIDÆ.

The Nereidæ are represented less richly than in similar collections along the more northern shores of the Pacific side of North America. The absence of any of the large species of *Alitta* is especially noteworthy.

• *Nereis procera* Ehlers. Pl. XV, fig. 18.

*Nereis procera* Ehlers, Die Borstenwürmer, 1868, pp. 557-559; Taf. XXIII, fig. 2.

Represented by a number of small specimens, 21 to 45 mm. long, in the atokous phase and all sexually immature, which agree closely with Ehlers' description and also with larger mature examples already reported in these PROCEEDINGS for 1909 from the littoral zone at San Diego and Monterey Bay. The jaws and paragnaths conform generally to Ehlers' description, but group V may be absent or represented by either one or two paragnaths and the band VII-VIII varies much in width. The number of segments varies from 60 to 75.

The setæ, studied on one specimen, are disposed as follows: On anterior parapodia the notopodium bears six or eight homogomphs with slender "fish-bone" appendages, the neuropodial supra-acicular fascicle contains four or five similar homogomphs and usually two stout heterogomphs with short, scarcely falcate appendages, and the

neuropodial subacicular fascicle two or three homogomphs and five or six heterogomphs like the above, together with a few heterogomphs with longer appendages. On middle segments the number of homogomphs increases, but the heterogomphs become stouter and fewer. By about XXXIX the slender notopodials are replaced by two stout homogomphs with short, stout, fusiform, nearly buried appendages. A specimen from station 4,425 has the parapodia longer with more pointed lingulae than usual and the characteristic notopodial setae apparently wanting, but in all other respects, including the paragnaths, is typical.

Several from station 4,496 have the color pattern well-preserved. The anterior end is ashy, marked with brown spots and streaks gradually fading out and disappearing at about XVIII, beyond which the cuticle exhibits a conspicuous iridescence on a pigmentless integument. A large triangular spot (formed of a central and two lateral lines) occupies nearly the entire dorsum of the prostomium with its base resting on the eyes. The segments are marked by a central transverse dash, a pair of paramedian dashes near the anterior end, a similar pair near the posterior end, and a pair of lateral spots. On the first few segments the anterior and posterior pairs of spots tend to unite into two lines.

Of greater interest are five male specimens in the epitokous phase, hitherto unknown, taken at station 4,355. All are small, varying from 17 mm. and 54 segments to 28 mm. and 67 segments. In the latter the anterior region is 10.6 mm. long. In all cases the anterior region has 14 setigerous segments besides the apodous peristomium.

Prostomium of the general form seen in the atokous phase, but rather shorter and more broadly rounded anteriorly and strongly bent ventrad so that the anterior eyes lie rather more than half beneath the posterior. Eyes of each side coalesce, but not especially enlarged, each being little more than one-fourth the prostomial width. Both have large lenses, the ventral looking ventrad and laterad, the dorsal dorsad and laterad. Tentacles about three-fourths as long as prostomium, but ventrad and regularly tapered. Palps directed ventrad, short, scarcely more than one-half length of prostomium, basal segment stout, distal minute.

Peristomium obscurely biannulate with a narrow, feebly separated anterior ring. Tentacular cirri all short, rather distinctly but irregularly articulated; posterior dorsal reaches to V, anterior dorsal to beyond middle of III, and the two very short ventral cirri scarcely beyond the anterior border of II. On the largest specimen, which has the anterior segments more extended, the cirri are relatively shorter.

Pygidium minute, top-shaped, bearing a pair of rudimentary parapodia, two pairs of short ventral subanal cirri and a whorl of slender papillæ.

Parapodia of anterior region similar in general characters and setæ to atokous type of corresponding segments. Notopodia of first seven with basal half much enlarged, the distal portion remaining filiform, but not strongly bent. Neurocirri of first five setigerous segments also thickened at the base. All remaining parapodia are modified to the natatorial type, there being no caudal region, but the serrated notocirri continue to about XLV only, behind which they are smooth. The form of the complex lamellæ and lingulæ is best understood by reference to figure 18 (Pl. XV). All setæ are of the usual natatorial type and none of the peculiar setæ so characteristic of the middle notopodia of atokous individuals are present.

One specimen has the proboscis protruded and exhibits the paragnaths and jaws in characteristic arrangement.

Stations 4,355, San Diego Harbor, surface; 4,405, off San Clemente Island, 654-704 fathoms, green mud; 4,415, off Santa Barbara Island, 302-638 fathoms, green mud; 4,417, off Santa Barbara Island, 29 fathoms, fine yellow sand and rock; 4,420, off San Nicolas Island, 32-33 fathoms, fine gray sand; 4,421, same locality, 229-298 fathoms, gray mud and rock; 4,425, same locality, 1,100-1,084 fathoms, green mud, fine sand and *Globigerina*; 4,427, off Santa Cruz Island, 447-510 fathoms, black mud and rock; 4,431, off Santa Rosa Island, 38-41 fathoms, varied bottom; 4,496, off Santa Cruz Lighthouse, Monterey Bay, 10 fathoms, fine gray sand and rock; 4,531, off Point Pinos Lighthouse, 26-28 fathoms, fine gray sand, rock.

\* *Nereis paucidentata* Moore.

*Nereis paucidentata* Moore. Proc. Acad. Nat. Sci. Phila., 1903, pp. 430, 431, Pl. XXIV, figs. 28-30.

A single small imperfect specimen from station 4,397, Lat. 33° 10' 15" N. Long. 121° 42' 15" W., 2,196 fathoms, gray mud. This is the first record of this species south of the Gulf of Georgia and the bathymetrical range is even more extended from 270 fathoms. The species is not uncommon in Alaskan waters.

\* *Nereis cyclurus* Harrington.

*Nereis cyclurus* Harrington, Trans. N. Y. Acad. Sci., XVI, 1897, p. 214.

Two fine specimens showing faintly the annular bands of color. "Commensal in *Natica* shell with hermit crab."

Station 4,560, off Santa Cruz Lighthouse, Monterey Bay, 10-12 fathoms, fine gray sand and rock.

*Platynereis agassizi* (Ehlers). Pl. XV, fig. 19.

*Nereis agassizi* Ehlers, Die Borstenwürmer, 1868, pp. 542-546, Taf. XXIII, fig. 1.

Besides several atokous individuals, two of which (station 4,559) contain eggs, a large number of sexually mature epitokous examples were taken at station 4,355 by means of a surface electric light and dip-nets. Of the latter 83 were males and only 5 females. As the latter have never been described, a brief description is here added.

In general appearance they agree closely with the males, but average somewhat larger, from 21 to 33 mm. long. The two regions of the body of the two extremes measure, respectively, 5 and 16 mm. and 11 and 22 mm. long, and the segments number from 93 (28 + 65) to 131 (28 + 103), the anterior region of the female comprising, therefore, seven more segments than that of the male, which has 21. One female has only 27.

The color is generally pale and faded, but shows indications of transverse brown lines and posteriorly more distinct transverse rows of spots. Some of the specimens exhibit the same yellow color anteriorly as shown by the males, but usually much paler.

Prostomium almost exactly as in the males, the eyes, coalesced on each side, scarcely perceptibly smaller, the palps and tentacles turned almost as markedly ventrad. Peristomial cirri, so far as preserved, have the same proportions as in the males and, also, as in the males, are easily detached, so that many of them are wanting. One specimen, however, in which all are present, has two dorsal cirri nearly equal, both reaching XV, and the anterior ventral reaching to VI. There is a very short caudal region of ten or twelve segments with few or no swimming setæ and a short, tapering, tubular pygidium often constricted into two rings, quite different from that of the male in that it bears four cirriform papillæ in place of the whorl existing in the latter.

The first five (on the smallest specimen four) notocirri only are thickened and the slender distal end much less abruptly hooked than on the males. First four neuropodia similar to those of the males. Parapodia and setæ of anterior region also as in the males. Posterior parapodia differ from those of the males chiefly in the total absence from both notocirri and neurocirri of the sense organs which cause them to appear serrated, the cirri in the females being therefore quite smooth, simple and tapered.

Most of the specimens have shed the greater part of their eggs, but one remains filled with them as far forward as the tenth setigerous somite, inclusive, and a few have escaped into more anterior somites.

They crowd the basal part of the parapodia as well as the coelom. The character of the mature eggs is shown in figure 19, Pl. XV.

Stations 4,346, off Point Loma Lighthouse, 46-50 fathoms, dark green mud and fine sand; 4,347, same locality, 55-58 fathoms, fine gray sand (both epitoke and atoke); 4,355, San Diego Harbor, surface (many epitokes); 4,420, off San Nicolas Island, 32-33 fathoms, fine gray sand; 4,422, same locality, 31-32 fathoms, gray sand and shells; 4,559, off Point Pinos Lighthouse, Monterey Bay, 8-22 fathoms, fine gray sand.

#### EUNICIDÆ.

• **Eunice (Eriphyle) paloloides** Moore.

*Eunice (Eriphyle) paloloides* Moore, Proc. Acad. Nat. Sci. Phila., 1909, pp 246-249, Pl. VII, figs. 5-7.

A much broken and macerated female specimen containing a few eggs in the posterior region. The sexual region begins at about segment CLXXXV. The tentacles and branchiæ are somewhat shorter than those of the type, but this probably results from the macerated condition of the specimen. In all other features studied it agrees with the type.

Station 4,420, off San Nicolas Island, 32-33 fathoms, fine gray sand.

• **Eunice multipectinata** sp. nov. Pl. XV, figs. 20-23.

A fine, robust species which reaches a considerable size. The type is 205 mm. long with a maximum width of body of 7.5 mm. and between the setæ tips of 13 mm. Number of segments 181. Other complete specimens vary from 47 mm. long, 2 mm. wide, with 87 segments to 203 mm. long and 9 mm. wide. One 195 mm. long and 7 mm. wide has 177 segments. Incomplete specimens range all the way from 1 mm. to 11 mm. in width.

Prostomium in all except the smallest specimens retracted and deeply sunken into the peristomial collar to the tentacles; deeply incised and bilobed anteriorly to form the somewhat divergent, short, thick, bluntly rounded palps, slightly divided by a shallow transverse groove into a larger ventral and a smaller dorsal segment. Tentacles in a crowded transverse row, each with a small indistinct ceratophore; the styles more or less strongly and irregularly annulated or distinctly articulated; on the smaller specimens the median has about seven articulations and reaches to VII, the inner paired have but five articulations and reach to IV or V and the outer paired four articulations and reach III. Large specimens have shorter tentacles which have evidently worn away at the tips. Eyes always large and conspicuous, situated immediately behind the outer paired tentacles

Peristomium very large, fully as long as the three succeeding segments and forming a prominent collar, into which the prostomium is retracted, most deeply in the larger specimens; on each side a shallow notch, below which it is produced forward more prominently to form a slightly crenulated lower lip with concave border. Somite II also apodous, not exceeding one-third length of peristomium with which it is coalesced at the sides. Nuchal cirri similar to cephalic tentacles but more slender, reaching to or nearly to the cephalic border of the prostomium. Metastomial podous segments well-defined, very regular, simple, 10-14 times as wide as long anteriorly, not over 8 times as wide as long posteriorly, strongly arched above, flattened, with neural furrow below. They increase in width gradually to about XL, then taper gently caudad.

Pygidium a short ring with a slight marginal thickening and bearing a pair of slender, little-tapered, stiff and smooth cirri as long as the last six segments and arising close together below the large anus. Immediately below and concealed by these is a second pair of minute and inconspicuous cirri.

Parapodia (Pl. XV, fig. 20) of simple form and exhibiting the changes in position and proportions usual in the genus. Notocirri four or five, or posteriorly (where the parapodia become shortened) even more, times as long as the neuropodia, slightly tapered and smooth or very slightly wrinkled, becoming much more slender posteriorly. Neurocirri prominent anteriorly, with thick, swollen, ovate bases and short, thick, cylindroid styles. Farther back the basal part is gradually reduced and finally becomes minute and the style becomes first short and conical and then slender and tapered, but always considerably exceeds the neuropodium in length.

Acicula all very dark brown and opaque except that the tips are often pale; the neuropodial three or anteriorly sometimes two, projecting from the acicular tubercle at the dorsal level of the fascicle of simple setæ. They are simple, tapering rods with rather acute points on anterior parapodia and blunt, often bent or somewhat knobbed ends on posterior parapodia where they become very stout. Notopodial acicula a fascicle of slender brown fibers passing into the base of the notocirrus in connection with a heavy mass of brown pigment.

With the exception of the stout crochets which are brown, the setæ are colorless or pale yellow. Three kinds occur on all segments. Simple, slender, wingless capillary setæ form a small dorsal tuft in connection with the acicula. Among the bases of the capillary setæ are delicate pectinate setæ with slightly curved ends provided with a few indistinct

teeth and a marginal mucron (Pl. XV, fig. 22). Most numerous are the compound setæ (fig. 21) which are arranged in about six rows, are pale yellow, with curved and distally thickened shafts and short, strongly hooked, and bidentate appendages with a delicate guard finely denticulated on the margin. The last become larger caudad. Beginning at about XXVII two (sometimes one) stout crochets appear projecting prominently obliquely from the neuropodium ventral to the compound setæ; they are slightly curved, with stout principal tooth and smaller more distal accessory tooth and provided with a split guard (fig. 23).

Branchiæ strictly unilateral pectinate throughout (Pl. XV, fig. 20), consisting of a tapered main stem arising from the base of the neurocirrus on its dorsal side and curving gently up the sides of the body, but remaining erect, leaving the dorsum uncovered; filaments arising nearly at right angles to the stem in a close rank and lying nearly parallel, slender, the longest not exceeding two-thirds the length of the notocirrus and the main trunk, exclusive of the terminal filament into which it is prolonged, not much greater. On the type the gills begin on somite IX with seven filaments, attain the maximum of twelve filaments and retain this number, with occasionally one or two more for a great many segments, then undergo gradual reduction posteriorly, the gill on the fourth preanal segment still being trifold.

With few exceptions the gills of all specimens begin on IX, the only departures being three specimens, on two of which the first on one side occurs on VIII and on another on X. The number of filaments varies greatly, increasing with the size of the specimen. The smallest example (1 mm. wide) has the first gill simple and most of the others bifid. A complete specimen, 47 mm. long and 2 mm. wide with 87 segments, bears gills on all podous segments beginning with IX, the first and the last two consisting of a single filament each and the maximum number of filaments being three. One 140 mm. long and 4 mm. wide lacks gills on the last four segments, the maximum number of filaments is seven and most of the gills caudad of the middle of the body are trifold. Another, 195 mm. long and 7 mm. wide, with 177 segments, has trifold gills on IX of one side, X of the other and attains a maximum of twelve or thirteen filaments, with the last three segments abbranchiate. The largest complete specimen is 203 mm. long and 9 mm. wide and bears a small gill of two filaments on one side of VIII, the maximum number of filaments being fourteen and the last gill on the fourth preanal segment. Bifid filaments occur frequently.

Jaws (described from a cotype, station 4,431) hard and firm. Mandibles with stout, divergent, nearly black stems joined only slightly by an anterior isthmus; masticatory plates hard, white, oval, with smooth, entire anterior border. Maxillæ black or nearly so. Carriers of forceps-jaws nearly as wide as long, broadly rounded behind; the forceps of the usual falcate form; II very large and stout with five large teeth and one small one on each side; III on the right side is a long narrow piece with eleven teeth diminishing in size from before backward and is paired with two pieces on the left side with four and eight teeth, respectively; IV bears a single prominent tooth on each side; V is a small toothless plate. Two other specimens dissected agree in all essentials, the teeth being generally tipped with white and the border of the mandible in one case tridentate.

Color of the full-grown specimens pearl or gray with a beautiful and delicate iridescence. Two of the larger specimens have the dorsum finely mottled with brown. The smallest examples are more distinctively colored: one is pale brown above with an obscure white zone on IV and V; another (the smallest) has the first three segments almost solidly orange-brown, IV and V pure opalescent white and several succeeding segments annulated with brown and white.

Stations 4,312, off Point Loma Lighthouse, vicinity of San Diego, 95-135 fathoms, fine gray sand and rock; 4,373, same locality, 95-225 fathoms, green mud, sand and rock; 4,377 (Type), same locality, 127-299 fathoms, green mud and sand; 4,420, off San Nicolas Island, 32-33 fathoms, fine gray sand; 4,431, off Santa Rosa Island, 38-41 fathoms, varied bottom; 4,463, off Point Pinos Lighthouse, 285-357 fathoms, green mud; 4,532, same locality, 30 fathoms, gray sand and rock.

This species is related to *E. bilobata* Treadwell, but is readily distinguished by several characters, especially by the notably smaller number of gill filaments. The type of *E. bilobata* is 5.5 mm. wide and the first gill (on IX) has nine filaments, the maximum reaching eighteen. A specimen of *E. multipectinata* of the same size has only two filaments on the first gill and a maximum of seven filaments.

Other species having pectinate gills for the entire length which have been reported from the Pacific Ocean are *E. antennata* Savigny, *E. microprion* v. Marenzeller and *E. flavo-fasciata* Grube. All of these have the gills beginning farther forward and differ in other respects also.

***Eunice hawaiiensis* Treadwell?**

*Eunice hawaiiensis* Treadwell, Bull. U. S. Fish Comm., XXIII (1906), Pl. III, pp. 1166, 1167, figs. 42-44.

The solitary incomplete example referred to here, while differing considerably from Treadwell's description, is certainly very closely related to, if not identical with, *E. hawaiiensis*. It consists of 122 anterior segments having a length of 76 mm. and a width without parapodia of 5.5 mm. and with them, but excluding setæ, of 8.5 mm.

The prostomium with its tentacles, the parapodia, setæ (of which, however, Treadwell's figure does not show a full profile view), and maxillæ are practically identical with those of *E. hawaiiensis*. The branchiæ, however, are fewer and much less complex than those of the type. They have the following distribution and number of filaments on the right side, the left being almost identical: 1 filament somite V, 2 filaments somite VIII, 5 on IX, 9 on X, 13 on XII, 15 on XV, 19 on XX, 15 on XXVI, 16 on XXXV, 8 on XL, 5 on XLII, 2 on XLIII and 1 on XLIV. Where best developed, from XV to XXX, the gills are very large with numerous long, parallel filaments equalling about one-third the body width. Although closely resembling the gills of *E. hawaiiensis*, the stems are always gently curved, never abruptly bent. The first three consist of the main trunks only. The type of *E. hawaiiensis* is larger, measuring 7 mm. in body width and has the gills beginning on IV with three filaments and continuing to beyond L, and when best developed possessing as many as thirty filaments. This is a greater difference than one would expect in two individuals of the same species differing no more in size than do these.

The hard, white masticatory plates of the mandibles, in addition to the large lateral tooth, bear three small teeth near the median line.

*Eunice congesta* v. Marenzeller may be mentioned as another closely related Pacific species.

Station 4,537, off Point Pinos Lighthouse, Monterey Bay, 1,062 fathoms, hard sand and mud.

***Morphysa conferta* sp. nov. Pl. XVI, figs. 29-34.**

Known from a single specimen 24 mm. long and 1.9 mm. wide between tips of parapodia with 57 segments and a regeneration cone of about a dozen indistinct segments.

Prostomium (Pl. XVI, fig. 29) large, nearly as wide as the peristomium, suborbicular but bent downward so that in dorsal view it is foreshortened and appears much wider than long, depressed, with an anterior notch that is the termination of a ventral groove that slightly divides it into somewhat swollen rounded halves. Eyes one pair,

large, conspicuous, brown, situated close to the posterior border immediately behind the lateral tentacles. Tentacles five, arising along a slightly curved transverse line near the posterior end of the prostomium, but passing in front of the eyes laterally. All slightly fusiform, tapered to distal end and transversely wrinkled or subarticulated, the median about one and one-third times the length of the prostomium, the others successively somewhat shorter.

Peristomium a simple, regularly cylindrical, smooth, apodous ring with a slight median ventral notch on the lip and no trace of nuchal cirri. Somite II scarcely more than one-half as long as I, but otherwise similar. The remainder of the body is terete, of nearly uniform diameter except that the posterior portion is somewhat enlarged and distended with ova. The segments become shorter to the branchial region, where they are about four and one-half times as wide as long; posterior to this the length again increases until at the posterior end they are only twice as wide as long. With the fourth (Pl. XVI, fig. 29) a small ring separates at the anterior end of each segment and increases until in the post-branchial region it forms a regular propodal annulus. Pygidium at the end of the regeneration cone a short tube bearing one cirrus about equal to one-fourth the body width and another half as long as the first.

Parapodia (Pl. XVI, figs. 30, 31) strictly lateral and in the probranchial and branchial regions prominent and outstanding, becoming smaller in the postbranchial region, strictly uniramous, there being no trace of a notopodium. Anterior parapodia consist of a low, rounded, slightly compressed setigerous tubercle, behind which is a compressed postsetal lip at the base as deep as the setigerous lobe, while its bluntly ending dorsal part is prolonged to about twice the length of the base. The notocirrus arises just above the foot and is about twice its length, somewhat enlarged at the base, slender and tapering distally and marked with obscure annular furrows. The neurocirrus has a thick, swollen base broadly attached to the ventral face of the neuropodium and bearing a small papilliform distal piece which is bent more or less ventrad. Posterior to the branchial region the parapodia and all of their parts become gradually smaller. The neuropodia become low, compressed cones (fig. 31), the apex of which is formed by the acicular process, while the postsetal lip becomes low and inconspicuous. The basal part of the neurocirri is much reduced, leaving only the short, bluntly rounded cirrus which reaches to the end of the acicular process. The notocirrus while undergoing reduction in size retains its characteristic form and proportions, having a

basal enlargement and a slender style about three times as long as the foot.

Neuropodial acicula two or three simple, straight, tapered rods with the ends pale and the middle brown or black. Posteriorly there is only one of these, the distal end of which projects freely. No notopodial acicula.

Branchiæ (Pl. XVI, fig. 30) remarkable for their large size and restriction to nine segments (X–XVIII inclusive). The first on X has five fully developed filaments and the number on the others varies from five to seven. Each consists of a short, stout, tapered trunk arising from the dorsal side of the base of the notocirrus and curving dorsad over the back, its distal end abruptly bent to form the last filament, parallel and nearly equal to the others, which are slender and tapered and nearly equal in length to the notocirrus with which the ventralmost is coalesced at the base. The largest meet across the dorsum.

Setæ of four kinds, all but the crochets colorless. Compound setæ (fig. 32) form a dense subacicular fascicle of several rows, very numerous anteriorly, fewer behind. The shafts are slender, curved, with the ends enlarged, oblique and bearing a deep cleft or socket with finely serrated borders. Appendages loosely attached, tapered from the basal enlargement to the bidentate tip, remarkable for the length and wide separation of the teeth; detached front border finely denticulated or striated and continued into the delicate hood. Supra-acicular fascicle composed of a tuft of delicate simple capillary setæ, some of which are prolonged as far as the end of the notocirrus and associated with these on postbranchial parapodia a few very delicate pectinate setæ with 16 or 18 short mucronate teeth and one margin bearing a slender filament (fig. 33). Posterior parapodia bear a single ventral crochet of a yellow color and having the end bidentate and hooded (fig. 34).

Practically colorless and lacking notable iridescence, only a slight greenish shimmer anteriorly. Jaws not dissected.

The type, a female filled with ova, comes from station 4,431, off Brockway Point, Santa Rosa Island, 38–40 fathoms, coarse gray sand, yellow mud and rocks.

#### ONUPHIDÆ.

The large number of species representing this family is noteworthy, there being in the collection five species of *Nothria*, three of *Onuphis*, one of *Diopatra* and two of *Hyalinæcia*—no less than eleven in all.

Within areas of similar size and under similar conditions of collecting one usually finds not over four or five species. Three species were found each at station 4,387, in deep water off the Gulf of Santa Catalina, and 4,510, in Monterey Bay. With few exceptions, they occurred on muddy bottoms.

*Nothria iridescens* Johnson.

*Nothria iridescens* Johnson, Proc. Soc. Nat. Hist., XXIX, p. 408, Pl. 8, figs. 86, 87; Pl. 9, figs. 88-92.

The gills of this species begin on the first parapodium. Two points in Johnson's description require modification after a study of the large number of specimens in this collection. The biarticulate style of the posterior paired tentacles is accidental and inconstant. Similar breaks may occur on any of the styles; there may be several on one style or be asymmetrical on the two styles of a pair or, as is most usual, altogether absent. Neurocirri do not disappear on V, but remain quite prominent, though short and thick, to VII, and their thickened bases continue as glandular swellings to the middle of the body as in many other species of the genus. The posterior paired tentacles, although quite variable in length, seem always to exceed the median tentacle. The color is quite variable, but usually more or less blotched with deep purple and brightly iridescent anteriorly.

A tube of average size is 190 mm. long and 5.5 mm. in diameter, the outer end being slightly larger than the inner. The larger end is composed almost entirely of a very fragile wall of fine silt nearly 2 mm. thick and lacks the tough membranous lining that extends through the remainder of the tube.

This species occurs generally throughout the region covered by this report and was taken in abundance at stations 4,462, 4,485, 4,508, 4,510, 4,523, 4,525 and 4,526.

Stations 4,322, Soledad Hill, Point La Jolla, vicinity of San Diego, 110-199 fathoms, soft green mud; 4,339, off Point Loma Lighthouse, vicinity of San Diego, 289-369 fathoms, green mud; 4,433, off Santa Rosa Island, 243-265 fathoms, green mud; 4,436, off San Miguel Island, 264-271 fathoms, green mud; and the following stations in Monterey Bay: 4,446, 4,457, 4,461, 4,462, 4,463, 4,464, 4,475, 4,482, 4,485, 4,508, 4,510, 4,522, 4,523, 4,524, 4,525, 4,526, 5,428 at depths varying from 36 to 357 fathoms, except in the case of the last station where the depth is recorded as 766-800 fathoms. The bottoms were muddy, usually "soft green mud," except at station 4,463, which was rocky and yielded a single specimen, and at station 4,522, which yielded ten specimens and is recorded as of gray sand and shells, though evidently adjoining a bed of green mud (station 4,523, etc.).

• **Nothria geophiliformis** Moore.

*Nothria geophiliformis* Moore, Proc. Acad. Nat. Sci. Phila., 1903, pp. 445-448, Pl. XXV, figs. 57-59.

Gills may begin on either V or VI, usually the latter. A young specimen has a pair of minute eye specks. The small size of this species has probably caused it to be overlooked at some stations. The anterior articulated crochets differ strikingly from those of *N. pallida*.

Stations 4,445, off Point Pinos Lighthouse, Monterey Bay, 60-66 fathoms, green mud; 4,480, off Santa Cruz Lighthouse, Monterey Bay, 53-76 fathoms, dark green mud and sand; 4,510, off Point Pinos Lighthouse, 91-156, gray mud.

• **Nothria pallida** sp. nov. Pl. XV, figs. 24-28; pl. XVI, 35-37.

A moderately elongated species, terete anteriorly, depressed for most of the length. The type—an incomplete specimen with the caudal end regenerating—consists of 166 segments and is 82 mm. long with a maximum body width of 4 mm. and a depth of 2.7 mm. at the end of the anterior third. A complete specimen 62 mm. long and 2.8 mm. wide has 266 segments. Another broken specimen has an aggregate length of 124 mm. and 290 segments.

Prostomium relatively larger than in *N. geophiliformis*, quadrate orbicular in outline, slightly wider than long, with the greatest width at the level of the posterior paired tentacles. No distinct eyes, though several obscure dusky spots appear on the prostomium. Frontal tentacles nearly in contact at the base, arising on extreme anterior border of prostomium, divergent, cylindroid with a lateral emargination about which they are bent into a bean-like shape; about twice as long as thick and one-half as long as the prostomium. Anterior or outer paired tentacles barely reaching to III, the annulated ceratophore of thirteen rings and a short, non-annulated end, about one and one-fourth times as long as the short, smooth conical style. Posterior lateral tentacles reaching XVI or XVII, the ceratophores nearly as long as the entire anterior tentacles and composed of seventeen rings and a smooth end-piece; styles flagelliform, much more slender than ceratophores and three and one-half times as long. Median tentacle reaching to IX, similar to posterior paired tentacles, but ceratophores only half as long with nine or ten annuli. A small specimen has the styles of the anterior paired tentacles nearly equal to the ceratophores and the median and posterior paired tentacles shorter than on the type, the latter reaching to XII only. Palps situated immediately in front of mouth, separated by a narrow cleft only, thick, quadrate, and divergent, about twice the size of the frontal tentacles.

Peristomium not longer than prostomium, continuing its regular outline and widening posteriorly; deeply cleft below for mouth and bearing the wide, bilobed, hammer-shaped, posterior lip. Nuchal tentacles arising from its extreme anterior border, separated by slightly more than their length and reaching extreme anterior endoprostomium. Anterior region of body slender and terete, the segments about as long as wide and not much wider anteriorly than posteriorly. Beyond V the segments become gradually shorter, wider and more depressed until in the middle region they are very regularly about eight times as wide as long. Farther back they become gradually narrower and less depressed without change in length till near the pygidium. Pygidium short, cylindroid, abruptly truncated, bearing two pairs of slender divergent cirri, of which the dorsal is twice the length of the ventral and one-half the body width.

Parapodia (Pl. XV, figs. 24, 25, and Pl. XVI, fig. 35) exhibit the usual characteristics of the genus. The first five are widely separated and modified, but gradually become less so from before backward. The three cirriform processes (figs. 24 and 25) are present and moderately slender and elongated, the notocirrus the longest of the three and reaching the middle of the preceding foot in each case, the neurocirrus and the middle cirrus or postsetal lobe each from one-half to two-thirds as long on the different parapodia, the latter the stouter and flattened at the base. Just before and after the gills appear, the notocirrus exhibits a conspicuous constriction and distortion near the base. After the fifth parapodium the neurocirrus becomes rapidly reduced to an opaque glandular ridge below the base of the parapodium which for a few segments bears at its lateral end a short blunt papilla which recedes into the ridge in the course of three or four segments. The postsetal lobe becomes reduced rapidly and completely; beginning with the sixth foot, it becomes shorter and blunt and continues to be changed until at the eleventh it becomes a small, blunt, rounded papilla lying ventral to the setæ and almost replacing the here obsolete neurocirrus, but postacicular instead of preacicular. Farther back (fig. 35) it totally disappears. The notocirrus remains well-developed for the entire length, but undergoes gradual reduction in size after the appearance of the branchiæ, appearing upon the largest of these as a much smaller lateral process. The neuropodium becomes rapidly shorter and simplified as in other species.

Branchiæ (Pl. XVI, fig. 35) simple throughout, the first appearing in connection with the fourth foot (V) or more rarely with the third on IV, in the latter case being usually quite small. They appear as

the direct continuation of the base of the notocirrus, which they displace ventrally or toward the neuropodium. The first is always much more slender than the notocirrus, but nearly as long. By somite X the gill is three times as long as the notocirrus, and when, on middle segments, its maximum size is reached is fully four times as long and reaches well beyond the mid-dorsal line except on one specimen, on which they are strongly contracted. All of the gills, which continue nearly to the caudal end, are coarse round filaments apparently not at all ligulate and contain two large longitudinal blood-vessels connected by a large number of semiannular transverse vessels.

Neuropodial acicular three or four stout, tapered rods with mucronate tips projecting freely beyond the surface antero-ventral to the curved series of capillary setæ from which they are not sharply distinguished. Notopodial acicula a fascicle of a few very slender and delicate fibers passing through the notopodial base and far into the notocirrus.

Setæ are of five forms, all but the yellow posterior crochets being colorless. The first five neuropodia bear a nearly complete circle enclosing the acicula, of semi-articulated, tridentate, guarded crochets (Pl. XV, fig. 26) and simple capillary setæ differing little from the acicula save only in their longer projecting points. The latter increase in number and in size and in parapodia immediately following the fifth (VI) replace the crochets. In the course of ten or twelve segments they gradually disappear. All parapodia, beginning with the sixth, bear a curved fascicle dorsal to the postacicular lobe of delicate, nearly straight, capillary setæ which, on anterior segments, are provided with a narrow limbus not discernible posteriorly. Among the bases of these are very delicate setæ ending in gouge-shaped expansions bearing eighteen or twenty regular mucronate teeth (fig. 27). Beginning at about XVII two large and stout crochets appear antero-ventral to the acicular papilla; their shafts are slightly curved and distally thickened and the little projecting ends bidentate and enclosed between a pair of guards (fig. 28).

Jaws described from a single dissection of a cotype (station 4,401). Mandibles (Pl. XVI, fig. 36) pale brown with pure white masticatory plates, soft, the two halves only very slightly joined by the bases of the masticatory plates, the long slender stems or carriers widely separated and of nearly equal width throughout. Masticatory plates white with a black trifid spot near the base of each, narrowly ovate quadrilateral with obscurely bidentate end. Maxillæ (fig. 37) rather soft, pale brown with certain very dark lines and thickenings as shown

in the figure. Carriers of forceps jaws (I) only slightly united, widest at the middle, their posterior ends separated and pointed; forceps stout at base, the ends acute and strongly hooked. Large dental plates (II) stout and broad, the right with nine nearly equal stout teeth, the left with six teeth, of which the first is enlarged and separated from the others by a considerable gap. Left unpaired plate (IIa) with seven or eight teeth. Anterior pieces (III) with a narrow, curved, toothed ridge and a large flaring basal plate or wing, the left six- or seven-toothed, the right larger, with eight teeth. Small accessory jaws (IV) triangular, each bearing a single tooth.

Except for a small brown spot at the base of each notocirrus and smaller ones on the bases of the tentacles, the specimens are colorless.

The anterior ten or twelve segments of every specimen are strongly bent upwards so that the head is usually quite reversed.

Stations 4,352 (Type), off Point Loma Lighthouse, vicinity of San Diego Bay, 549-585 fathoms, green mud; 4,400, Lat.  $32^{\circ} 50' 20''$  N., Long.  $118^{\circ} 03' 30''$  W., 500-507 fathoms, green mud; 4,401, Lat.  $32^{\circ} 52' 40''$  N.,  $118^{\circ} 13' 40''$  W., 448-468 fathoms, green mud, black sand; 4,415, off Santa Barbara Island, 302-638 fathoms, green mud.

\* *Nothria* sp.? Pl. XVI, figs. 38-40.

The anterior end of a rather small *Nothria* 1.6 mm. wide, probably representing another undescribed species. It has much of the aspect of *N. geophiliformis* and the setæ resemble those of that species, from all typical examples of which it differs, however, in the first appearance of the gills on VII. The cephalic tentacles are peculiar and may be abnormal. The median just equals the anterior or outer paired and its style is about two-fifths that of the posterior paired. The frontal tentacles are shorter than their diameter. All cephalic ceratophores are short and 5- or 6-annulate. No eyes. Nuchal cirri very short, only one-third or one-fourth of the distance separating them. Gills begin abruptly on VII, resemble those of *N. holobranchia* and in their full development reach to the opposite side. Jaws not dissected.

Taken from a simple mud tube from station 4,387, Lat.  $32^{\circ} 32' 40''$  N., Long.  $118^{\circ} 04' 20''$  W., 1,059 fathoms, green mud.

\* *Nothria hiatidentata* sp. nov. Pls. XVI, XVII, figs. 41-50.

A very interesting species based on two specimens found in a jar of *Hyalinacia tubicola*, to which species this bears a remarkably close superficial resemblance. Indeed, in most characters except the presence of nuchal cirri this species resembles *Hyalinacia* more closely than ordinary *Nothria*. It is a noteworthy case of associative resemblance.

The type is a complete example of 94 segments, 112 mm. long, with a maximum body width at XXV of 4.8 mm. and a depth of 4 mm.

Prostomium (Pl. XVI, fig. 41) in the strongly up-bent position in which it occurs in both specimens nearly circular, the seven tentacles radiating very regularly about its margin and as usual increasing in length from before caudad. Frontal tentacles in contact medially on the extreme anterior border of the prostomium from which they are scarcely delimited, little divergent, nearly two-thirds as long as the prostomium, short ellipsoidal and slightly bilobate from a shallow lateral furrow. Probably the styles of none of the dorsal tentacles are quite complete, the ends of all being more or less worn and ragged. The ceratophores of all are short, scarcely longer than thick and divided into three or four annuli. The styles increase in both length and diameter from before backward, the anterior paired reaching to II, the posterior paired to XII or XIII and the median to XV. Palpi large, subgloboid, slightly bilobed processes bounding the mouth in front, in contact medially and projecting ventrad and laterally beyond the sides of the prostomium.

Peristomium reduced, scarcely half as long as the prostomium and not much wider. Nuchal cirri (fig. 41) arising slightly behind anterior border of peristomium in line with lateral border of base of posterior lateral tentacles, slender, tapered, not quite reaching base of one of opposite side. Posterior lip somewhat bilobed, furrowed, its antero-lateral margins continuous with mandibular cushions and not projecting freely as in many species. Somite II much enlarged, more than twice as long as I and nearly twice as wide, strongly convex and rising beyond I on all sides and embracing it completely laterally. Anterior region of body stout, not slender as in many species; III and IV rapidly reduced in length, V about normal; its width about six times length. These proportions are maintained throughout the middle region, but the width gradually decreases posteriorly until it becomes only three times the length. Dorsum very strongly arched, venter flat with neural groove. Body walls firm and muscular anteriorly, softer with translucent walls posteriorly. Caudal end tapered rather rapidly to a short tubular pygidium with expanded rim bearing a pair of very slender subanal cirri as long as the last eleven segments and one and one-third times the greatest body width.

Parapodia of anterior end much like those of *Hyalinæcia* (Pl. XVI, figs. 42, 43). The first (fig. 41) much enlarged, most modified and strongly bent forward at sides of prostomium to the level of its anterior border, cylindroid or subconical and truncate, much and deeply fur-

rowed, terminating in a low, rounded acicular process and two broad, flat lips, the post-acicular one being much the longer and truncate distally. The short, simple notocirrus arises about the middle of its dorsal face and barely reaches the distal end of the neuropodium. Neurocirrus arises on ventral side close to mouth and fails to reach the bases of the setæ. Second parapodium (III) (fig. 42) is similar but much smaller and both the post-acicular process (middle cirrus) and notocirrus are much more slender and elongated, while the neurocirrus is enlarged and bluntly conical. The third foot is of more normal size and position and the notocirrus is still longer, reaching beyond the postacicular lobe. But the chief change affects the neurocirrus, which is no longer truly cirriform, but merely a small, rounded, cylindrical papillæ. The fourth parapodium (fig. 43) differs only in the complete suppression of the neurocirrus. After the fourth (somite V) the neuropodia are gradually reduced in size until they become low, compressed cones (fig. 44). The maximum size of the post-acicular lobe is attained at about VII or VIII, after which it undergoes gradual reduction, being still distinct at XV but obsolete at XXX. The notocirrus retains its length longer, at its maximum reaching about half-way to the middle line and exhibiting but little change until after the appearance of the gills, when it becomes rapidly reduced to a slender filament about one-third as long as the gill (fig. 44). Behind IV the neurocirri become small, rounded glandular elevations which gradually become smaller and finally disappear.

Gills begin on XIV, though a small prophetic papillæ occurs on one side of XIII of one specimen. They arise at a brown vascular knot on the dorsal side of the base of the notopodium, which, however, is not so abruptly displaced ventrad as in *Nothria pallida*, though, when the cirrus reaches its greatest reduction, it appears as little more than a lateral process of the gill (fig. 44). From the first they equal the notocirrus in length and seldom reach more than half-way to the middle line. They have the usual form and structure but, unlike those of *N. iridescens* and other species, become little flattened posteriorly.

Neuropodial acicula four or five, stout, slightly curved and tapered, the simply pointed tip apparently not reaching beyond the surface on anterior parapodia. Farther back there are three with abruptly tapered, acute, curved and often bent tips exposed for a short distance. There are no evident notopodial acicula.

Setæ are of four kinds. Large setæ on the anterior modified segments mostly broken, but several that are intact (Pl. XVI, fig. 45) are simple spines with the ends worn smooth as in *Hyalinæcia*. A

single newly erupted smaller one on III (fig. 46) shows that they are bidentate and guarded at the tip, but apparently not articulated. Limbate setæ and pectinate setæ (fig. 47) begin on the second foot, on which the type specimen bears in a dorsal fascicle several of the former and one of the latter. Beginning with the fourth foot and continuing to the caudal end there are both dorsal and ventral small fascicles of limbate setæ. They have rather long stems and gently sigmoid, tapered and very acute ends bearing lanceolate, bilimbate blades. They become longer posteriorly. Delicate colorless pectinate setæ (Pl. XVI, fig. 47) occur among the bases of the dorsal limbate setæ from III to the caudal end and, except on the first two or three parapodia, form a dense cluster. The ends appear to be funnel-form with about one-third of the circle cut out and the border striated and finely denticulated. Ventral crochets begin on V, at first single and slender, but after about XV there are two or three. Two very stout yellow ones (fig. 48) are characteristic of the middle region. These have fibrous cores and slightly curved shafts, swelling distally, then rather abruptly contracted to the small head which is terminated by two rather long processes placed at nearly a right angle to the shaft and enclosed in a pair of narrow, subtriangular guards. The terminal teeth become shorter on anterior segments.

Jaws described from the cotype. Mandibles chiefly dark brown except the masticatory plates which are white with two or three very dark brown lines across the basal part (Pl. XVII, fig. 49). The two halves are very lightly united; the stems of nearly uniform width, with slightly expanded distal ends grooved to bear the masticatory plates which are elliptical with irregularly crenulated free margins. Maxillæ (fig. 50) massive, dark brown, hard. Carriers of forceps jaws very broad in posterior half, about one and one-fourth times length, the posterior border broadly rounded. Forceps rather long and slender, strongly hooked with acute tips. Maxilla II, left outer plate with nine teeth, of which the first is very large and widely separated from the second very small tooth by a wide bay fitting the anterior end of the left inner plate, which bears nine regular stout teeth; right plate very large with ten large, somewhat hooked teeth. Maxillæ III, narrow curved pieces, the left bearing ten, the right thirteen teeth. Maxillæ IV, small plates bearing a single tooth on each side.

Color all faded out with the exception of small brown spots at the base of the gills.

Described from two specimens (of which the cotype is filled with sperm balls) both from station 4,387, off San Diego, Lat.  $32^{\circ} 32' 40''$  N., Long.  $118^{\circ} 04' 20''$  W., 1,059 fathoms, green mud.

*Onuphis parva* sp. nov. Pl. XVII, figs. 51-57, and Pl. XVIII, figs. 98, 99.

A small, slender species of linear form, the type measuring 36 mm. long and, exclusive of the parapodia, about .6 mm. wide, with 104 segments. A large number of specimens are of similar size and only a very few larger, the maximum being about 45 mm. long and .9 mm. wide. Sexual maturity is attained at a length of 30 mm.

Prostomium longer than usual, about one and one-quarter times as long as wide, elliptical in outline. Frontal tentacles on ventro-anterior border, nearly their length apart, divergent, ovate in outline with a constricted pedicle, their length about two-fifths prostomium. Anterior paired tentacles on antero-lateral border, barely reaching IV; ceratophore about one-third style, 4-annulate. Posterior paired tentacles on dorsal face close to lateral margins and slightly in advance of middle, reaching IX or X; ceratophore slightly longer than those of anterior pair, its basal half of three distinct rings, the distal half not distinctly annulated. Median tentacle arising at almost exact center of prostomium, constantly slightly shorter than posterior paired tentacles, reaching only to VIII or middle of VII, its ceratophore similar to that of posterior pair. Eyes situated immediately caudad of base of posterior paired tentacles, usually two minute black specks (sometimes coalesced into one) on each side. Palps rather prominent, ovate lobes on ventral face of prostomium, projecting slightly beyond its margins.

Peristomium similar in size and proportions to immediately following segments, shortest above, where it is about one-half prostomium, the latter being much more extensively exposed than in most species. Nuchal cirri widely separated on extreme anterior border of peristomium, short conical, barely reaching to middle line or posterior border of peristomium. Somite II neither wider nor longer than succeeding segments, not embracing peristomium and its parapodia, not obviously enlarged nor strongly bent forward. The first three or four podous segments differ from the others only in having the walls somewhat firmer, the integuments more pigmented, in being more terete and in having the parapodia more ventral in position. Middle and posterior segments strongly depressed, with the parapodia and especially the gills carried high, the parapodial area thick and glandular and the dorsal and ventral field flat and translucent. They are remarkably uniform in size, but taper gradually in the posterior half.

Pygidium tubular with an obliquely truncate end having a thickened border and at the produced ventral margin a cluster of two pairs of very slender and delicate anal cirri, the dorsal about four times as long as the ventral and equal to the last seven segments.

Parapodia all small and little prominent, even the first, although slightly enlarged and somewhat modified as in other species, presenting none of the extreme modifications so often exhibited. The first has a low presetal and a much enlarged postsetal lip, the latter being broad and flat at the base. Both cirri arise far out and the notocirrus is tapered and reaches much beyond the end of the postsetal lobe; neurocirrus bluntly truncated and falls short of the tip of the latter. The second (Pl. XVII, fig. 51) and third differ chiefly in the shorter base, shorter and broader postsetal lobe, shorter neurocirrus and successively more dorsal position. With the fourth (fig. 52) the parapodia have about reached the dorsal position characteristic of this species and the neurocirrus has been lost in a low rounded infrapodal glandular swelling. The postsetal lobe continues to shrink, and by XV is quite inconspicuous and little longer than the presetal lip; the neuropodium becomes a broad, low, conical eminence (fig. 53) and the notocirrus, although gradually reduced in size, remains well-developed to the caudal end.

Branchiæ begin on the fourth foot (somite V) of the type, but although this is the most frequent beginning small simple ones may be detected on IV or even III of some specimens; more rarely the first occurs on VI. The first gill is simple or bifilar, the former being especially the case when they have the more anterior origin. The single filament (Pl. XVII, fig. 52) is erect and forms the main trunk of the gill, along the lateral side of which the secondary filaments arise on more posterior gills. The first few gills are no longer than the notocirri, but they increase as the latter diminish in size, the main stems often reaching to or beyond the dorsimeson. Characteristically, they are erect or semi-erect and pectinate (fig. 53) with a maximum of about seven filaments, though the number varies from five to nine according to the size of the specimen. On the type the last gill occurs on XXXVII. A cotype, on which the gills are more fully extended, has the gills arranged as follows: 3 filaments on VIII, 4 on XII, 5 on XIV, 6 on XV, 7 on XX-XXVII, 6 on XXVIII and XXIX, 5 on XXX, 4 on XXXI and XXXII, 3 on XXXIII, 2 on XXXIV, and one on XXXVI. This is about the usual distribution.

Neuropodial acicula usually four, little tapered until near the end where they taper abruptly to a slender exposed mucron, the longer of which project nearly to the border of the postsetal lobe. Farther back they become fewer. Notopodial acicula delicate fibers passing far into the notocirri.

Setæ all colorless. Setæ of first parapodium (Pl. XVII, fig. 54)

exclusively (except perhaps the dorsalmost) semicompound, bidentate and guarded crochets with the articulation very imperfect and the guards much prolonged and very acute. None of these setæ is much enlarged and the dorsalmost is very slender and acute and may lack the hooked and bifid tip. The second and third parapodia have a few similar setæ in the anterior part of the fascicles, together with a few simple acute setæ in the dorsal part. On the fourth foot all setæ are of the latter type. Toward the distal end they become somewhat enlarged and minutely pilose, but not truly limbate and then taper to an acute tip. On the fourth parapodium there are only seven of these setæ, four being anterior and three dorsal, the latter more slender. Simple setæ of this type appear on all subsequent parapodia, but after a few segments are limited to a small dorsal fascicle of two to four and gradually become more slender and elongated toward the caudal end. Pectinate setæ (fig. 55) first detected on IX and present on all following segments as a small dorsal tuft of three to six. They are extremely delicate and have slightly curved asymmetrically expanded ends with the margin distinctly denticulated. Two large ventral crochets (fig. 56) appear on X, but become larger and more exposed farther back. They are peculiar in the length of the beak and small size of the accessory tooth and the somewhat unusual width of the guards. Toward the caudal end they become much smaller and one has the teeth reduced and the other more or less straightened out and the guards are frequently absent (fig. 57).

Jaws (Pl. XVIII, figs. 98-99) pale brown or yellow, translucent, soft, and flexible. Mandibles very delicate, the carriers slender, widening very little distally, feebly united, the masticatory plate narrowly elliptical, prolonged forward, a small tooth on the medial side. Maxillæ (fig. 99) with acute, strongly hooked forceps jaws, the carriers about two-thirds as wide as long, each half prolonged into a slender posterior process. Maxillæ II broad plates, the left outer with eight or nine teeth, the inner with seven or eight, the right with nine or ten larger teeth; III, left five or six teeth, right seven or eight teeth; IV rudimentary, edentulous.

Nearly all of those examined are practically colorless, the anterior end more opaque and iridescent. Some examples from station 4,454 have the cephalic appendages dark or black and conspicuous quadrate blotches of black scattered over all parts of the body both dorsally and ventrally and on parts enclosed by the tubes as well as parts exposed.

Tubes generally about 45 mm. long and 2 mm. to 2.3 mm. in diameter, tapering off at one end to a thin membranous portion. The thicker

portions are composed mainly of fine silt, but sometimes with a few sand grains or minute pebbles.

This appears to be an abundant species, and were it not for its small size would doubtless have been collected at many more stations. It was especially abundant at stations 4,467 and 4,468, where several hundred tubes were taken, and at 4,475, where about fifty were obtained.

Stations 4,445, off Point Pinos Lighthouse, Monterey Bay, 60–66 fathoms, green mud; 4,446, same locality, 52–59 fathoms, green mud (type); 4,452, 4,453, 4,454, same locality, 49–71 fathoms, green mud and sand; 4,457, same locality, 40–46 fathoms, dark green mud; 4,464, same locality, 36–51 fathoms, soft dark gray mud; 4,467, off Santa Cruz Lighthouse, Monterey Bay, 51–54 fathoms, soft dark green mud; 4,468, same locality, fine sand; 4,475, off Point Pinos Lighthouse, 58–142 fathoms, soft green mud; 4,480, off Santa Cruz Lighthouse, 53–76 fathoms, dark green mud and sand; 4,485, same locality, 89–108 fathoms, soft green mud and sand; 4,510, off Point Pinos Lighthouse, 91–184 fathoms, gray mud; 4,522, same locality, 130–149 fathoms, gray sand and shells; 4,523, same locality, 75–108 fathoms, soft dark mud.

***Onuphis vexillaria*** sp. nov. Pl. XVII, figs. 69–76.

A slender, elongated and very distinct species described from a single anterior end and four other pieces which are believed to form a single specimen, complete except for the caudal end. The aggregate length is 159 mm., the width without parapodia 3 mm. and including them 4.2 mm. in the middle region; and the total number of segments 242.

Prostomium small, nearly circular, with a slight posterior emargination, convex, its surface largely occupied by the bases of the tentacles, which are arranged in the form of an ellipse. Frontal tentacles short, thick and ovate, about one-half length of prostomium, short pedunculate, divergent and separated by a space exceeding their diameter. A pair of minute eye-spots at the medial side of their bases. Dorsal tentacles all with annulated ceratophores and slender smooth styles. Anterior pair reach to middle of III, the style three times the length of the ceratophore which has seven articulations. Posterior pair reaching X, the ceratophore as long as the anterior but with a smooth distal part in addition to seven articulations. Median reaching VIII with much shorter ceratophore of six annuli. Palps immediately anterior to mouth, strongly divergent, stouter and somewhat longer than frontal tentacles and divided by a shallow cross-furrow.

Peristomium narrow, continuing outline of prostomium in a regular dome-like curve, but separated by a well-defined dorsal furrow. It is produced somewhat forward to embrace the prostomium at the sides and dorsally slightly overlaps it as a low, somewhat convex nuchal collar. Ventrally it is cut almost to the posterior furrow by the large mouth, which is partly covered by a broad lip with laterally produced angles. Nuchal cirri slender, tapered, simple, rising high up at the level of the inner lateral tentacles from the extreme anterior margin of the prostomium and separated by one-half their length. They reach to the caudal border of II or well beyond the anterior border of the prostomium.

Anterior metastomial region slender and nearly terete, the first five podous segments of nearly equal length and width, the ratio being about as two to two and one-half, the greatest width being at the anterior end where the parapodia arise. After VII the segments become gradually wider and rather abruptly shorter until by XX they are about five times as wide as long and distinctly depressed with the dorsum flattened. This depressed form continues throughout the middle and posterior region. Furrows generally rather weakly developed except between the parapodia. Integuments rather soft, semitranslucent and grayish except in the subparapodial region, where there are thick, opaque, whitish glandular areas; surface very smooth with highly iridescent cuticle. Pygidium unknown.

Parapodia of anterior end prominent, beginning on II near the ventral level and gradually shifting dorsad until by XV they have attained nearly the dorsal level. Anterior parapodia (Pl. XVII, figs. 69 and 70) are remarkable for the great length of their parts. The first is situated at the extreme anterior end of somite II and is directed only slightly forward. Succeeding ones shift to a more caudal position and lose the forward slope until the sixth is on the middle of its segment and the third is directed straight laterad. They have a rather long pedicle bearing a notocirrus, neurocirrus and slender neuropodial setigerous lobe divided at the distal end into a scarcely perceptible presetal lip and a remarkably prolonged, attenuate cirri-form postsetal lip. Neurocirrus arises near the base of the ventral surface and is of similar form and nearly equal length to the postsetal cirrus. Notocirrus arises dorsally nearly opposite to the neurocirrus from a thickened notopodial pedicle, into which the acicula enter, followed by a constriction and again by a swelling tapering into a long slender style one and one-half to twice the length of the neurocirrus, and the longest exceeding the diameter of the anterior segments

(figs. 69 and 70). Little change takes place in the first five parapodia, but with the sixth the whole parapodium begins to diminish in size, the neurocirrus especially dwindling until by the ninth the entire style has disappeared and the base is represented only by the usual opaque, somewhat swollen, whitish area ventral to the base of the foot, which becomes smaller but continues to the caudal end. The postsetal lip becomes smaller very gradually, but remains to the middle segments as a small conical process. Except that it becomes more slender and assumes the proportions of a gill filament, the notocirrus undergoes little change (fig. 71).

Branchiæ appear on both sides of somite V (fig. 70) as a single filament as long, but much more slender than the postsetal cirrus, arising from the notopodial base in common with and on the dorsal side of the notocirrus. On succeeding segments the filament becomes long and on IX a second appears; additional ones then appearing (symmetrically except as mentioned) up to the number of nine, as follows: three on XIII (XIV on right), four on XVI, five on XIX, six on XX, seven on XXI, eight on XXVII and nine at about XXXV. The last number (fig. 71) continues to at least L. The largest gills on pieces from the middle of the body, the segment numbers being undetermined, bear as many as twelve filaments and the most caudal segments represented bear unifilar gills. Until they possess upward of four filaments, the gills scarcely exhibit a main stem or pinniform structure which is always obvious on the more complex gills. The main stem curves rather sharply dorsad, tapering, and bearing along its lateral side the filaments, which diminish in size to the last. On anterior segments the filaments are shorter than the notocirrus, but farther back they are longer. New ones appear to be added from the growing point at the tip of the stem. Branch blood-vessels from the main trunk enter all of the filaments.

Neuropodial acicula, which on anterior parapodia are not very clearly distinguished from the setæ, are from three to five in a row, rather stout, tapered gently to near the end and then abruptly into slender, very acute projecting tips, appearing at the bases of the dorsal setæ. Notopodial acicula are very long and slender fibers which enter the base of the notopodium and continue far into the cirrus (fig. 71). Perhaps they would be more correctly described as buried setæ.

Except the large ventral crochets, all setæ are colorless or nearly so. All segments bear a small tuft of slender, acute, capillary setæ dorsal to the acicula, among the bases of which are a very few much more

delicate and inconspicuous asymmetrical pectinate setæ with one margin prolonged (fig. 73). The first five parapodia bear in the anterior and ventral part of the fascicle a few larger setæ or hooded crochets (fig. 72) with two accessory teeth below the principal hook and the guards but little prolonged. Some of the larger ones show traces of an articulation near the end. Parapodia succeeding these have the crochets replaced by short setæ with mucronate tips and narrow limbæ. These gradually disappear and no trace of them remains at XXV. Somewhere between this point and somite I, the exact segment undetermined, appear two stout yellow bidentate guarded crochets (fig. 74) projecting slightly and obliquely from below the acicula.

The jaws are imperfectly chitinized, being soft and delicate and except at a few thickened points, pale brown. Mandibles probably abnormal, very small, the form of one half being shown in two pieces in (Pl. XVII, fig. 75). Maxillæ (fig. 76) have long, acute, strongly curved forceps jaws with nearly circular carriers. The two plates of II on the left side have, respectively, six and seven teeth, on the right side eight or nine teeth. Plate III of each side bears an unusually large basal wing and six small teeth; IV is small and bears a single tooth.

No color remains. This species is known only from the type and a small portion of the middle region of another specimen from station 4,401.

Stations 4,326, Soledad Hill, Point La Jolla, vicinity San Diego; 243-280 fathoms, soft green mud; 4,401, Lat. 32° 52' 40" N., Long. 118° 13' 40" W., 448-468 fathoms, green mud and black sand.

• *Onuphis nebulosa* sp. nov. Pl. XVII, figs. 58-68.

This species has the anterior end slender with prominently outstanding parapodia, the remainder of the body, so far as known, depressed and of very uniform width and the small gills beginning on VIII or IX. The type, consisting of the prostomium and 83 anterior segments, is 25 mm. long and has a maximum width, exclusive of the parapodia, of 1.3 mm.

Prostomium about four-fifths as long as wide, elliptical with an anterior median emargination, strongly convex above. No eyes detected. Frontal tentacles ovate, about one-third longer than wide and about half as long as the prostomium, arising on the frontal border of prostomium separated by a space of one-half their diameter and bent strongly downward. Anterior paired tentacles arise from antero-lateral border immediately behind frontal tentacles; their ceratophores

about equal to frontal tentacles, quadri-annulate; styles two and one-half times as long as ceratophores and reaching to middle of II. Posterior paired tentacles arise on the dorsal surface opposite the middle of the prostomium and just within its lateral borders; ceratophores similar to those of the anterior pair; styles reach somite VII or VIII. Median tentacle behind center of prostomium, similar to posterior paired tentacles, but somewhat shorter, reaching only to VI or VII. Palps cushion-like, arising from posterior ventral surface close to mouth, diverging from median line, the broadly rounded ends projecting beyond the sides of the prostomium.

Peristomium very short above, in the median line only about one-half as long as the prostomium, nearly twice as long at the sides and carried forward to embrace the prostomium, the cephalic margin as a consequence being deeply concave. Ventrally it forms the usual bilobed lip, which is quite distinct from II. Nuchal cirri arise from extreme anterior border of peristomium in line with the posterior paired tentacles and separated by a distance of twice their length, very slender and tapered. Somites II and III equal and elongated, each as long as prostomium and peristomium combined, but no wider than the latter. Both are simple segments, widest anteriorly. Behind III the segments gradually increase in width and decrease in length to X, from which they remain nearly uniform for the length of the piece, being quite simple and about five times as wide as long; dorsally they are flat, ventrally strongly convex, the parapodia arising high up. Furrows well-marked and clean-cut and the cuticle very smooth and highly iridescent.

Anterior parapodia (Pl. XVII, figs. 58 and 59) elongated and rather slender, prominently outstanding and fully equalling the width of their somites, from the anterior ends of which they arise. The first two are directed somewhat forward, but little more than those of *O. vexillaria*. From the ventral level of the first they gradually rise until the dorsal level is attained by the eighth. No important difference is noticeable among the first seven or eight. All have the somewhat prolonged, slightly flattened, neuropodial body terminated by a short and broadly rounded presetal lip and a moderately prolonged postsetal lip decidedly flattened at the base. Notocirri and neurocirri clavate, with thickened bases and more slender distal parts ending bluntly; the former are longer than the postsetal lips and more slender, and below their thickened bases, borne on a slightly constricted notopodial base; the neurocirri more proximal in origin and equal to or shorter than the postsetal lip. At the eighth foot the

neurocirrus begins to undergo rapid reduction, and by the eleventh its conical form and cirrus character are lost and it has assumed the form of a low, smooth, rounded, opaque and whitish swelling, which increases in size to about XXV and then diminishes gradually, though it remains as a small whitish spot even at the end of the piece. The postsetal lobe retains its character longer, undergoing very gradual reduction after X and shifting more ventrad. Even at XX it is quite as long as the body of the parapodium and of a short conical or subtriangular form. At L (fig. 60) it is a minute blunt papilla, ventrocaudad of the seta tuft, and farther back disappears altogether. Notocirri become more slender, but retain their length, continuing to reach the middle line as far back at least as the eighty-ninth segment. In the middle region the bodies of the parapodia are reduced and somewhat compressed and bluntly rounded, and are situated near the level of the dorsum.

On the three specimens known the gills begin as single filaments on somites VIII or IX and never possess more than four filaments, and that number only rarely. Two filaments appear at from XXII to XXVI, three at from XXXIII to XL and continue to LVI or LXIX where the number is reduced to two again and so continues to the end of the several pieces. Not infrequently a segment fails to develop a gill on one or both sides and frequently the number of filaments is below the normal of the region. The gills, though of few filaments, are typically pinnate (fig. 60) and the filaments rather thick and short, the longest very constantly reaching just to the median line. They arise on the dorsal side of the notocirri on a common notopodial base.

Acicula of anterior neuropodia usually three, yellow, stout, tapered, gently curved and terminated by long freely projecting mucronate tips. On posterior neuropodia there are often only two acicula which are like the anterior ones except that they are rather abruptly bent near the distal end. Notopodial acicula are three or four delicate fibers which enter the base of the notocirrus.

Setæ are of vitreous structure and all more or less yellow, the more slender ones being very pale, the stouter ones deeper. The usual four kinds occur, but they present greater variation and more transition forms than usual. Articulated crochets (Pl. XVII, figs. 61, 62) are confined to the first eight parapodia. On the first three they occur in an irregular, open, vertical, preacicular series of three or four, one or two on the acicular tubercle beneath the aciculum and one post-acicular—about six or seven in all. On the fourth foot (V) those in the dorsalmost part of the fascicle are replaced by simple acute setæ, but

at least one compound crochet persists to the eighth foot and three to the seventh. They are rather slender, with well-developed articulation and distal pieces that vary much in length (figs. 61 and 62) the longest being dorsal, the shortest ventral. They end in a slender, acute, strongly hooked tip, beneath which are two prominent and acute spurs, the whole enclosed in a split guard closely fitting the terminal hook and scarcely prolonged beyond it. Simple, acute setæ are represented by one or two small ones on the first and second parapodia, but are not clearly distinguished from the acicula, above and behind which they lie. Farther back they become more numerous, longer, much more slender, and finally even the very narrow limb that they present anteriorly disappears. On posterior parapodia the fascicle is composed exclusively of six or eight setæ of this type. In the subacicular region the articulated crochets are replaced by short, rather broad, acute setæ, more or less distinctly articulated (fig. 63). Such setæ continue to between somites XV and XX. The larger articulated crochet which appears in the acicular process of anterior parapodia seems to persist, become stouter, lose its articulation and gradually its terminal hook (fig. 65), thus becoming converted into a simple bidentate hooded crochet similar to those occurring on posterior segments. This transition is well shown up to somite XV of the mounted cotype. Apparently, however, there is a gap between the last of these and the first of the posterior simple crochets, two of which appear together ventral to the acicula at about somite XX of these specimens. Unlike the anterior crochets, they project only slightly. They are deep yellow, stout, bifid, with the main tooth below and have the end enclosed in the usual cleft hood (fig. 66). Pectinate setæ (fig. 64) occur in the dorsal fascicle of most segments, but their exact distribution was not determined. They are very delicate, with the widened end very little curved and bearing only a small number of rather long processes.

Jaws described from a single dissection. Mandibles (fig. 67) soft and thin, the carriers nearly colorless with a black streak distally, narrow, of nearly uniform diameter, lightly united at the distal end; masticatory plates white, irregularly trapezoidal, each divided by a deep anterior notch into two large teeth, each of which is again notched. Maxillæ (fig. 68) thin, very pale brown with narrow deep brown marginal lines and thickenings; carriers of forceps-jaws as wide as long, shield-shaped, with straight transverse hinge line; basal half of forceps thickened, distal slender, regularly tapered, moderately curved and acute. Maxillæ II large, subtriangular plates, each of the three bearing

ten (or the outer left, nine) small, regular close teeth. Maxillæ III curved, ridge-like pieces, the left with six, the right with eight small teeth. Maxillæ IV very small, edentulous.

Color generally dull olive-gray, becoming purplish and more iridescent anteriorly, except on the parapodia and cephalic appendages. Dorsum and to a less extent the sides obscurely clouded, or on one specimen distinctly mottled with dusky. Except on the first ten or twelve segments, there is a more or less distinct double dorsal median dark brown line showing a tendency to break into metameric spots. A series of dorso-lateral spots above the parapodia. Like so many of the species taken at the same station, the surface is marked with strictly quadrate spots scattered over the head and its appendages, parapodia and body segments.

A complete tube is 152 mm. long and has an external diameter of 2.5 to 3 mm. Its foundation is a rather tough membranous lining intermediate in character to that of ordinary *Nothria* and *Hyalinæcia* tubes and having a diameter of 1.4 mm. The tubes are very fragile and covered externally with a thick but irregular layer of sand grains and small pebbles. Many of them bear a few rather large pebbles, especially near the lower end, where they probably serve as anchors. One is peculiar in the development at one end of an expanded disk, from the margins of which radiate irregularly a number of hollow fibers or minute tubes probably the work of another than the rightful occupant.

Thirty tubes and three worms were taken at the only station, 4,454, off Point Pinos Lighthouse, Monterey Bay, 65-71 fathoms, green mud, sand and gravel.

***Diopatra ornata*** sp. nov. Pl. XVIII, figs. 77-85.

So far as known, this species is below the size usual in the genus, but all of the four specimens are incomplete. The type and most complete one is in three pieces, having an aggregate length of 84 mm. and 121 segments. Maximum width (at XX) of body only 3 mm., between tips of parapodia 4 mm.; depth 1.8 mm.

As viewed antero-dorsally, the prostomium is nearly circular, being bent downward with a nearly vertical flattened frontal face, the seven tentacles almost in contact at their bases, radiating regularly from a point anterior to the center of the prostomium, the flattened circle enclosed by their bases scarcely exceeding the sectional area of any one of the tentacles, while the region posterior to the tentacles is strongly convex. Frontal tentacles almost in contact on anterior margin, about as long as prostomium, conical, obscurely annulated. Anterior paired

tentacles situated slightly dorsal to margin, immediately behind and almost in contact with frontal tentacles, reaching to VII or VIII; the ceratophores slightly longer than frontal tentacles, divided to the end into eight or ten annuli; the styles smooth and slender. Posterior paired tentacles on dorsum well back from margin and immediately above and behind anterior paired, reaching to XV or XVI; ceratophores shorter and stouter than anterior paired, nine- to eleven-annulate. Median tentacle posterior to middle of prostomium, reaching XIV, with a shorter ceratophore having nine annuli. Apparently all of the tentacles have lost a short portion of the tip and each one is marked by a more or less distinct broad purple zone. Palps prominent, divergent and directed ventrad, bilobed by a shallow transverse furrow. No eyes detected and *pigmented* eyes certainly absent.

Peristomium nearly as long as prostomium, its anterior end scarcely wider, little concave and its sides continuous with prostomium, its dorsum strongly convex. Nuchal cirri on anterior margin of peristomium, slightly longer than prostomium and reaching two-thirds or three-fourths to base of opposite cirrus, regularly tapered from base to tip, often with a purple spot. Ventrally the peristomium forms a pair of thick folds behind the palps and a bilobed hinder lip. The next two segments, each about as long as peristomium, slightly carried forward at sides to bear parapodia and embrace the preceding segment, but not conspicuously enlarged. Succeeding segments become slightly wider to about XV, after which they remain practically unchanged. Those of middle region about four times as wide as long, smooth, simple, rather strongly depressed. Pygidium unknown.

Parapodia of the prebranchial region (Pl. XVIII, fig. 77) large and prominent, the undivided body alone of the first three exceeding one-half the width of their segments, projecting somewhat forward from the anterior ventro-lateral region of their segments. They have stout, slightly compressed, subtruncate, cross-furrowed, chiefly neuropodial bodies and the usual notocirrus, neurocirrus and postsetal lobe or middle cirrus, all of which are rather stout and subconical, the postsetal lobe being somewhat flattened and the notocirrus about one and one-half times as long as the others, with a basal constriction. The fourth foot (on somite V) is similar to the three preceding ones, but decidedly smaller. With the fifth a considerable reduction in size takes place and the parapodia have approached the dorsum, at which level all succeeding ones remain, the body becoming at the same time much reduced, short, truncate, subconical and directed somewhat dorsad. At the fifth parapodium the neurocirrus becomes much

shorter and bluntly rounded at the apex; at the sixth it is replaced by an oval glandular swelling, which increases in area but becomes less elevated for six or seven segments and then undergoes gradual reduction in the post-branchial region. After the appearance of the gills on VI the notocirrus also undergoes reduction, but so gradually that a small cirrus is still present on the one hundred and twenty-first segment. The postsetal lobe becomes smaller simultaneously with the notocirrus, but much more rapidly, soon becoming minute and shifting to a post-setal position and practically disappearing by the end of the branchial region.

Gills begin on somite VI and continue to XLIX to LII on the several specimens. They arise on the dorsal side of the base of the parapodia by a stout base, on the ventral or lateral side of which the neurocirrus is borne (Pl. XVIII, fig. 78). Several anterior pairs are very large, the second in all cases exceeding all of the others and reaching quite to the tip of the notocirrus of the opposite side, the first being about seven-eighths and the third about three-fourths or more as long as the second. Succeeding ones diminish in length, at first rapidly, then slowly, the eighth equalling the body width, the twenty-first reaching the middle line, the forty-first being only as long as the notocirrus. Anterior gills are tall and slender when fully extended, being shaped much like Lombardy poplar trees. The trunks have stout, feebly annulated bases above which they taper and are spirally twisted, bearing numerous, rather short spirally arranged filaments which become smaller distally. This spiral arrangement of the gills persists to at least XXXV, the number of turns varying with the length of the gill, the second and longest having twelve. Beyond somite XXXV, the trunks have become so short and the filaments so crowded that the appearance is brush-like. At XL there are only three short filaments, and the last seven gills consist of a single filament, each of which gradually diminishes in length.

Neuropodial acicula three or four, tapered, curved, terminating in acute tips projecting beyond the end of the acicular process. Notopodials one or two delicate rods or a bundle of fibers.

Setæ of the first four parapodia (II-V) chiefly compound crochets (Pl. XVIII, 79 and 80) arranged in a loose vertical preacicular series of about six or eight, of which one, much stouter than the others, is subacicular and one more slender postacicular. The latter (fig. 80) has the appendage considerably longer than the rest. All have the articulation well-developed, the end very strongly hooked and provided with a prominent accessory spur and well-developed guard, the end of

which is somewhat obliquely prolonged. On at least the first branchiate parapodium a few semicompound, sometimes acute (fig. 81), sometimes obscurely hooked setæ persist, but give place to true acute simple setæ on subsequent segments. A few short, simple setæ occur in the dorsal part of the supra-acicular region of the first foot, and they soon form a well-marked, curved, horizontal series dorsal to the acicular process. These setæ are slender with a very narrow limbus. On anterior branchiate parapodia, beginning with VI and continuing to about XXX is a vertical row of five or six short, stouter, thickened, but alimbate setæ forming a vertical preacicular fascicle. These disappear as the gills become short and the stout ventral crochets appear, leaving only the dorsal group of acute setæ, which become longer. Beginning somewhere between VI and X, and at first few in number, but increasing to a compact tuft clustered among the dorsal acute setæ and persisting with them to the end of the worm, are delicate gouge-shaped setæ with finely pectinate border (fig. 82). A stout yellow crochet (fig. 83) appears below the acicula at about XXX and a few segments behind is joined by a second; they have a strong beak, short, thick accessory tooth and a pair of small guards.

Mandibles dark brown with pale masticatory plates. Stems rather broad, of nearly uniform width, the distal end scarcely widened, the two sides very slightly united by a slender and short isthmus. Masticatory plates small, transversely elliptical, scarcely toothed (fig. 84). Maxillæ (fig. 85) dark brown, massive, opaque. Forceps jaws (I) massive, the carriers broad, together nearly orbicular with a flexible median joint and a posterior median notch; hinge line short; forceps with basal half thick, tapered to the incurved subacute ends. Maxillæ II broad, triangular, the cotype figured with the inner left plate absent, the remaining pair nearly symmetrical, the left with seven, the right with eight teeth, the most anterior in each case being larger than the others. The type has the normal arrangement of two pieces on the left side and one on the right, each bearing seven teeth like those figured. Maxilla III large curved plates usually with eight unequal teeth on each side. Maxilla IV small plates bearing a single small tooth.

Color generally faded to a dull gray, the anterior end slightly purplish and purple zones on the cephalic tentacles and spots at the base of the nuchal cirri. Cuticle slightly iridescent.

Some fragments of the exposed ends of tubes have the usual structure, with a tough, parchment-like basis thickly covered with pebbles, bits of shells, coral and other hard bodies mostly arranged transversely.

They closely resemble the tubes of *Diopatra cuprea*, but are scarcely more than one-half their diameter.

Stations 4,457 (tubes only), off Point Pinos Lighthouse, Monterey Bay, 40-46 fathoms, dark green mud; 4,467, off Santa Cruz Lighthouse, 51-54 fathoms, soft dark green mud; 4,519, off Point Pinos Lighthouse, 27-35 fathoms, hard gray sand (type).

***Hyalinœcia juvenalis*** sp. nov. Pl. XVIII, figs. 86-95.

A small species represented by the anterior ends of two individuals, which, though mature, retain certain characters of setæ, etc., which are found in quite young examples only of *H. tubicola*. The cotype, comprising the head and 35 segments, is 19 mm. long and 1.9 mm. in maximum width. The type, of the same size, has 32 segments and a posterior regenerating cone.

Prostomium trapezoidal, the greatest width posterior and about one-third more than the length, the anterior and posterior sides convex, the converging lateral sides nearly straight. Frontal tentacles small, less than one-third length of prostomium, situated at antero-lateral angles, directed somewhat ventrad, but little divergent, subfusiform, about twice as long as thick, the pedicles much constricted. Median and posterior lateral tentacles situated well within posterior half of prostomium close together on dorsal face; anterior lateral tentacles farther forward on lateral margin. Ceratophores of anterior paired tentacles about as long as thick and 4-annulate, styles thickish and stout, barely reaching III. Ceratophores of median and posterior paired tentacles very short, obscurely divided into three annuli, the styles smooth, moderately slender, about one-half the diameter of the anterior pair, tapered, the median reaching to IX, the longest lateral to XI. Eyes black, very conspicuous, immediately behind the anterior and below the posterior paired tentacles. The type has but one pair about one-half the diameter of the base of the anterior tentacles; the cotype bears a second pair, almost as conspicuous and immediately dorsal to the first pair. Palps rather small, about one-third width of prostomium, globoid, directed ventrad immediately in front of mouth and only slightly in contact medially.

Peristomium small, scarcely wider than prostomium and less than one-half as long, bearing the bilobed posterior lip. Somite II very much larger, nearly twice as wide and three times as long as the peristomium, extending forward and embracing the sides of the latter. The next few segments diminish in length rapidly until the normal length to width ratio of one to four or five is reached at somite VI. Beyond this point the segments continue to increase in size and the

maximum diameter is probably not quite attained in these pieces. The first few segments are firm-walled and bounded by deep furrows, but farther back they become softer and the furrows shallower. All are nearly terete, but slightly flattened and grooved ventrally. Pygidium a very small, short, truncate cone bearing a pair of very slender tapering cirri about one and one-fourth times the greatest diameter of the body.

Parapodia generally similar to those of larger species, but relatively less enlarged and prominent. First pair (on II) largest, projecting forward and slightly ventrad, but barely reaching level of anterior border of palps, truncate, conical, transversely furrowed and terminated by a broad, flat, prominent, preacicular lip and a slender but about equally long, more cirriform postacicular lip. Both notocirri and neurocirri are simple, conical styles without differentiated cirrophore and of similar form and size, not quite reaching the end of the terminal lips, the neurocirrus arising on the antero-ventral part of the base of the neuropodium close to the side of the mouth, the notocirrus nearly half-way out on the postero-dorsal aspect of the foot. The second foot (Pl. XVIII, fig. 86) is similar, but decidedly smaller and projects very little forward and ventrad. The third is modified still farther in these respects, and the fourth (fig. 87) has attained the typical position and nearly typical proportions and differs particularly from preceding parapodia in its much shorter, blunt neurocirrus. The one figured (fig. 87) has the postsetal lip abnormally bifid. On the first parapodium the postsetal lip is shorter than the presetal, but on the second this relation is reversed and the latter disparity becomes more pronounced on succeeding parapodia until at somite X the postsetal lip becomes again reduced to the length of the presetal lip and assumes the form of a small cylindroid papilla. This continues to diminish, shifts to a more ventral position and finally disappears, leaving only the short, broadly rounded presetal lip of the low, flat parapodia of middle segments (fig. 88). Notocirri undergo very regular and gradual diminution in size and with the appearance of the gills (about XX) have become quite minute and little longer than the presetal lip, appearing as small processes from the outer side of the base of the gills. Neurocirri remain the same for the first three parapodia and then very abruptly become altered to a small, thick papilla which in the course of one or two more segments becomes absorbed into a low swelling and extensive glandular region ventral to the parapodium.

On the cotype gills begin symmetrically on XIX; on the type there is a small one on one side of XVIII, fully developed ones on both sides

of XIX, none on XX and then from both sides of XXI caudad. On both specimens they continue to increase in length gradually and probably reach their maximum size at XXIII where they about reach the dorsimeson and are five to six times the length of the dorsal cirrus, the length of which, indeed, scarcely exceeds their diameter (fig. 88). They have the usual structure, being coarse filaments containing a large axial blood-vessel, and within the limits of the piece exhibit no indication of becoming flattened.

Neuropodial acicula pale yellow, generally three, but posteriorly only two, stout, tapered, slightly curved, the pointed apices projecting only slightly beyond the integument. Notopodial acicula a small fascicle of fibers.

Setæ of four kinds. The first three parapodia bear a few stout, compound crochets in a vertical series. They are especially large on the first and project freely forward. On the second and third parapodia (fig. 89) they become smaller and paler in color. None seem to be truly compound, but the oblique joint is imperfect and near the end. The shaft or portion of the setæ proximad of this interruption is slightly thickened in its distal portion and minutely roughened, partly with minute imbricated, antrorse scales and partly with minute hairs. The distal piece or appendage is somewhat recurved, tapered to the peculiarly formed bidentate tip, which is enclosed in a pair of broad obliquely truncate guards. It is possible that larger specimens (should such occur) would lose some of these characters through wear. Beginning on the fourth foot (V), the compound crochets (one or two of which may remain, though there are none on these specimens) are replaced by simple setæ which are characterized by a finely roughened enlargement beyond which they taper to an acute curved tip. Farther back these setæ are partly reduced in size, but chiefly transformed into small supra-acicular and subacicular fascicles of simple setæ with broadly bilimbate, lanceolate blades (fig. 91). Associated with these setæ in the dorsal fascicle, beginning on the second foot is a dense tuft of very delicate pectinate setæ, the abruptly widened end of which (fig. 92) is bent into semicircular form and bears about thirty regular and equal teeth and mucrons. On posterior segments they become much wider and flatter. Beginning at about somite XX, two stout, yellow, slightly clavate, bluntly rounded bidentate and guarded crochets appear in the subacicular fascicle of each crochet (fig. 90).

Jaws thin and fragile, but hard and well-chitinized. Mandibles (figs. 93 and 94) pale brown, with some dark streaks, the stems regularly tapered, slightly enlarged at the distal end where the two are feebly

united. Masticatory plates white and hard, slender, ovate, with smooth or slightly wavy margins, borne in a distal depression of the stem which projects beyond the masticatory plate on the lateral side as a blunt tooth. The mandibles of the type are much larger than those of the cotype, though the two worms differ but little in size. Maxillæ (fig. 95) pale brown, the teeth and other thickened parts darker. Carriers of forceps-jaws (I) broad, together about four-fifths length, subquadrate, with a short, blunt projection at the posterolateral angle; the forceps with basal half broad and nearly straight, the distal half slender, tapered and not very strongly hooked. Maxillæ II, outer left plate with thirteen large and one or more very small posterior teeth, inner left with twelve teeth, right plate with fourteen or sixteen or even more teeth. Maxillæ III, left with seven to nine small teeth, right with about ten teeth. Maxilla IV, delicate, with one small tooth or none.

Generally pale or colorless, a small, indefinite, median dorsal, purple spot on anterior dorsal part of prostomium, a pair of small ventral spots below outer lateral tentacles, small brown spots at base of notocirri and a few dark speckles on anterior segments. Cuticle only slightly iridescent.

A probably incomplete tube is 65 mm. long, slightly curved and tapered, the large end being 2.5 mm., the smaller 2.2 mm. The surface is rougher than that of small tubes of *H. tubicola* and the annulations are 2 mm. apart and obscure. Although translucent and nearly free of incrustations, it is not possible to determine the character of the valves.

An empty tube has living within it a small polynoid, not yet removed for examination, and, completely closing the larger orifice so that the annelid could not leave, is a small hermit crab (*Eupagurus* or *Parapagurus*) with very unequal chela, the right being much the larger and forming a symmetrical plug beautifully adapted to the form and size of the tube.

Type and only station 4,431, off Santa Rosa Island, 38-45 fathoms, varied bottom.

\* *Hyalinœcia tubicola* (Müller) Malmgren, *stricta* subsp. nov. Pl. XVIII, figs. 96, 97.

*Hyalinœcia tubicola* Malmgren, Öfversigt Kongl. Vetens-Akad. Förh., XXIV (1867), 181, 2, Taf. IX, fig. 49.

This is a form of large size, as indicated by the measurements of the tubes given below, somewhat exceeding *H. artifex* Verrill. In many respects it resembles *H. t. longibranchiata* McIntosh, from the vicinity of New Zealand, but has no eyes.

Ceratophores of cêphalic tentacles, either not annulated or obscurely 3- or 4-annulate. Anterior paired tentacle reaches IV or V, posterior paired XIII to XVII on different specimens, and median tentacle usually to XX. Somite II is much enlarged, being fully double the length of the peristomium, and its very large stout parapodia bear three or four stout spines which reach quite to the anterior level of the prostomium. Neurocirri of the first parapodium lie close to the sides of the mouth; they diminish in size after the third foot (IV) and become obsolete after VII. On different specimens the gills begin on from XXVI to XXX and at their maximum development reach about three-fourths of the width of the dorsum. They continue to the twelfth segment preceding the pygidium, becoming rapidly reduced in size toward the caudal end. Pygidium ending in a furrowed circumanal ring directed dorsad and bearing a pair of subanal cirri arising in contact, flagelliform, very slender and as long as the last eleven segments or twice diameter of body.

The distinctive features of the subspecies are found mainly in the large posterior crochets and the jaws. The former (Pl. XVIII, fig. 97) have the terminal teeth continued nearly in the direction of the shaft and not placed at a considerable angle with it as in most forms. Pectinate setæ have the plates bent into two-thirds of a circle with very numerous denticulations. A young specimen (about 2 mm. in diameter) still retains on the large spines of anterior parapodia traces of terminal teeth and guards (fig. 96).

The maxillæ are long, with numerous teeth: II left side outer plate 18 teeth, inner plate 15 teeth, right side 17 teeth; III, left 9 teeth, right 10 teeth; IV rudimentary with one tooth on each side. Mandibles have the two sides entirely distinct.

The anterior end of the body and the head are minutely speckled with pigment.

A typical example of the more than thirty tubes in the collection is 198 mm. long, 4.5 mm. in diameter at the small and 6 mm. at the large end. Others vary from 72 mm. long and 3 mm. in diameter to 236 mm. long and 7 mm. in diameter, the great majority being about 200 mm. long. They are gently curved and tapered and toward the larger end elliptical, not circular, in section, the diameter in the plane of curvature being slightly less, indicating a dorso-ventral depression. The tubes have a quill-like texture, but are harder and more rigid than any quill of similar size and can be cut with a knife only with difficulty. The maximum thickness of more than  $\frac{1}{2}$  mm. is at the middle, where the number of layers is greatest and diminishes most toward the large end

where the last inch or so is rather soft and semicollapsible. For the entire length the tube is marked with annular lines which, on a tube 198 mm. long, are 6.5 mm. apart at the small end and 5 mm. apart at the large end. These annulations are formed by the exposed edges of the successive layers of material, which are laid down on the inside and project beyond the orifice to a distance equal to that between two rings. Thus a tube showing thirty-five rings has probably been constructed of as many successive layers of material.

Both orifices are guarded against intrusion by several sets of soft membranous valves, usually three or four at the large end and probably as many at the small end. These are placed in pairs consisting of a wide dorsal and a ventral flap or pocket attached obliquely to the inside of the tube in such manner that the free borders directed toward the orifice meet in the middle and thus effectually bar against entrance, while yielding readily to pressure from within. Presumably, should a worm leave its tube it would itself be debarred from re-entering. One small tube (110 mm.) has the orifice ornamented with a few foraminifera shells, sea-urchin spines and small pebbles.

Evidently the tubes wear away at the small end, the worm occupying the newer parts and building extensions at the large end and at the same time removing old valves and replacing them by new pairs. It is evident also that the length of additions decreases as the tubes become larger and that there is much individual variation in this respect.

Old tubes are always covered with a friable black incrustation, except on the newer parts at the large end, and especially adherent at the rings. Some of them also bear growths of hydroids and an occasional barnacle (*Scalpellum proximum* Pilsbry) small tunicate (*Styela*) or small actinian (*Sagartia* sp.)

Found at only one station, but there in abundance: 4,387, vicinity of San Diego, Lat. 32° 32' 40" N., Long. 118° 04' 20" W., 1,059 fathoms, green mud.

#### LUMBRINERIDÆ.

This is another fairly well-represented family and from the point of view of geographical distribution is interesting because, more than any other family, it resembles the fauna of the southern Pacific coast of South America. This resemblance is seen not alone in the fact that the two regions possess two species in common, but also in the resemblance of other species which are distinct.

•/ *Ninoe gemmea* sp. nov. Pl. XIX, figs. 101-109.

Form moderately elongated, slender and terete, the anterior branchiate region wider and depressed. A complete example (type) is 104 mm. long with a maximum width, exclusive of parapodia, of 2.4 mm. at XXX. Segments 146.

Prostomium small, slightly longer than wide, distinctly depressed, subovate, continuing the outline of the anterior end of the body forward to a subacute apex, very smooth and differentiated only indistinctly from the peristomium at the sides. The mid-dorsal portion of the pro-peristomial furrow forms a broad but shallow, semicircular or crescentic furrow, the horns of which end at a pair of small translucent spots marking the tips of the forward lateral projections of the peristomium. It is uncertain whether or not a minute obscure papilla exists at the bottom of this nuchal furrow. On the ventral surface is a pair of slight submarginal longitudinal grooves which meet the lateral furrows bounding the prominent quadrant-shaped palps which are separated by a deep medial furrow. No eyes.

The outline passing from the prostomium into the peristomium and body is very regular and unbroken. Peristomium and somite II apodous, together equalling the prostomium in length; the peristomium longer at the sides, but dorsally cut into by a deep re-entering bay, reducing it to the length of II. Ventrally they coalesce to form a deeply furrowed lip. Segments simple, very smooth and regular, and separated by deep, even furrows, the length to width ratio varying from one to four or five at the anterior end to one to two at the posterior end, toward which their length increases both relatively and actually. From the point of greatest diameter at about XXX, the body tapers very regularly and gently to the caudal end, being for most of the length strictly terete. Cuticle highly polished, with a pearly iridescence.

Pygidium a small, obliquely flaring ring, bearing at the sides of a small ventral platform a pair of conical cirri about as long as the diameter of the pygidium.

Parapodia strictly lateral, uniramous, with quite rudimentary notopodium. The first few are very small, slightly compressed tubercles with obsolete presetal lip and subfoliaceous, cuneate-ovate postsetal lip as long as the body of the foot (Pl. XIX, fig. 101). Farther back, in the branchial region, the presetal lobe becomes a hemispherical swelling, which is again lost posteriorly. At VI, or in one case, V, the postsetal lip bifurcates, the ventral lobe remaining as before, the dorsal being cirriform and slightly longer. On succeeding segments the

latter becomes more distinct and larger than the other branchial filaments and curves somewhat dorsad into a suberect position (fig. 102). The remainder of the postsetal lip then divides into the filaments of the digitate gill, the ventralmost filament of which retains a trace of the foliaceous condition in a small basal wing. Otherwise the branchial filaments resemble the dorsalmost filament or cirrus, and where best developed only equal the foot in length and spread in a palmate fashion (fig. 103). On the type there are two filaments at X, three at XIII, continuing with three or occasionally four to XLIX. The filaments increase in length to about XL and then rapidly diminish without change in number to XLIX, at which segment the dorsal one alone remains. It bears a small basal wing and remains quite prominent for many segments and finally after reduction to a small postsetal papilla continues to the end. A slightly larger cotype has two branchial filaments at VIII, three at XVI, four or rarely five between XX and XLII and three from XLII to LII. In the postbranchial region the parapodia (fig. 104) are more slender and relatively more prominent, cylindroid with the end slightly cleft into pre-setal and postsetal lips, the latter a subconical papilla. A minute notopodial papilla at the dorsal base of the neuropodium of all segments.

Neuropodial acicula black with pale bases, usually four, slightly tapered to blunt tips which reach, but ordinarily do not project beyond, the surface. Notopodial acicular fine fibers which pass from the segments above the parapodia strongly ventrad, curving into the notopodial tubercle.

All setæ have black or dark brown stems and pale ends, which on the limbate setæ includes the entire blade. All setæ are simple, and limbate setæ and crochets occur together on all parapodia, the former being more numerous on anterior, the latter on posterior parapodia. All are very brittle and, owing to the frequency with which they are broken, the exact arrangement was not determined. At least one crochet occurs in the subacicular fascicle of III along with three or four limbate setæ, of which an equal number exist in the supra-acicular fascicle. At X there are four supra-acicular acute limbate setæ, six subacicular limbate crochets and below these two more acute setæ. At XXV the numbers are respectively seven, five and one. On posterior parapodia the usual arrangement is one acute seta and one crochet in the supra-acicular fascicle and four crochets in the subacicular fascicle.

The pointed setæ (Pl. XIX, fig. 105) are of the usual bilimbate type and either simply or sigmoidly curved. Some of those in the dorsal

fascicle of anterior segments have the wings abruptly terminated and the shaft continued as a very long acute mucron. They differ considerably in length and proportions in the same bundle and posteriorly all become much elongated and slender. Anterior crochets (figs. 106, 106*a*) are transitional to the acute limbate setæ, having long, slender limbate ends passing into delicate rounded hoods which enclose the small, indistinctly toothed heads. Though gradually diminishing in length, they undergo no conspicuous change through the branchial region, but posteriorly become converted into true crochets (fig. 107) which are alimbate, somewhat stouter and have shorter, thicker ends and more inflated hoods enclosing a well-developed beaked and crested head.

Mandibles (Pl. XIX, fig. 108) delicate, flexible and nearly white, except that the tips of the masticatory plates and a pair of submedian lines are black. Carriers or stems long and slender, separated for about the posterior two-thirds of their length, firmly united anteriorly and widened into a broad plate bearing the narrow, strongly curved continuous masticatory plate which terminates in a strongly but irregularly toothed apex. Maxillæ (Pl. XIX, fig. 109) deep brown, opaque, the forceps jaws with long bases or carriers nearly equal to the jaws in length, together having the outline of an urn, but not united medially; hinges well-developed and the jaws very strongly and regularly curved. The large dental plates (II) are massive, symmetrical and each provided with a series of eight regular stout teeth on the inner margin. Maxillæ III small, narrowly ovate with one large hooked tooth succeeded by a slightly curved, serrate margin. Anterior maxillæ (IV) large, with similarly serrate, medial margin, but the large tooth less well-developed. A pair of long, narrow, brown, chitinized bands lie at the sides of the large dental plates.

Integuments unpigmented, but cuticle with a beautiful pearly luster.

Known from three specimens, one each from stations 4,450 (type), off Point Pinos Lighthouse, Monterey Bay, 55-60 fathoms, dark green mud; 4,485, off Santa Cruz Lighthouse, Monterey Bay, 39-108 fathoms, soft green mud and sand; 4,523, off Point Pinos Lighthouse, 75-108 fathoms, soft dark mud.

*Ninoë fusca* sp. nov. Pl. XIX, figs. 110-118.

This species, described from a single incomplete specimen, has the general *Lumbrineris* build, but is stouter and more depressed than most species of the genus. The type, consisting of two pieces together

comprising 120 anterior segments, is 48 mm. long and has a maximum width of 3.5 mm. at somite XXV.

Prostomium (Pl. XIX, fig. 110) nearly an equilateral triangle with bluntly rounded apex. A slightly elevated median dorsal field is bounded by a pair of shallow grooves which extend from near the apex to the nuchal fold where they include nearly one-half of the prostomial width between them. At these points the prostomium is attached to the peristomium by a pair of folds having almost the form of ball-and-socket joints, separated medially by a deep nuchal pit much wider than long and covered by a nuchal fold of the peristomium. No eyes. Ventral surface smooth with a deep transverse fissure just anterior to the palps. Palps subquadrate cushions separated by a median furrow, their lateral ends trilobate and partially united with the peristomial lip behind. Immediately behind them and anterior to the lip is a small fold guarding the end of the mandible.

Peristomium and II achætous, together not as long as the prostomium, but much wider; I slightly longer and wider than II and thickened below to form the lateral lobes of the lip. The anterior median region of the peristomium forms a nuchal fold which roofs the nuchal pit between it and the prostomium. When this is drawn back as in fig. 110, the posterior or peristomial face of the pit is seen to bear a vertical groove lodging a small and apparently retractile cirrus or papilla, the merest tip only of which is visible when the fold is in place. Anterior somites in general have the dorsum strongly arched and the venter flattened.

Except for the minute, scarcely noticeable notopodial tubercles, the parapodia are uniramous. Anteriorly they are very small and so near to the venter that they are scarcely visible from above. After about XV they are larger and lateral, but remain nearer to the dorsal than the ventral surface. They are short, thick, subcylindrical, somewhat thickened at the distal end, the presetal portion of which forms a hemispherical thickening. The postsetal lip is produced dorso-distally into a small, erect finger-like cirrus or gill containing a large vascular loop. This is fully developed on the first parapodium (III) and undergoes no marked change in the first forty segments (figs. 111, 112), after which it gradually diminishes in size, the thickened distal end of the foot undergoing simultaneous reduction. Toward the end of the piece the parapodia (fig. 113) are more slender and taper to simple blunt points.

Neuropodial acicula are three or four, stout, slightly tapered black rods with colorless bases, the tips bluntly pointed and either not

projecting or projecting only slightly beyond the surface. Notopodial acicula obsolete, corresponding to the extreme reduction of the notopodia.

Setæ moderate in number, disposed in a supra-acicular and a sub-acicular fascicle, the former nearly horizontal, the latter vertical in arrangement. At somite XV there are eight in the former, fifteen in the latter, a number which is reduced posteriorly to three in each group, of which the subacicular are crochets. All are dark brown at the base, pale or colorless distally. Anteriorly acute setæ (Pl. XIX, fig. 114) alone occur. They are long, slender, narrowly bilimbate and slightly sigmoid with prolonged capillary tips. Those in the supra-acicular fascicle longer than the subacicular, but otherwise similar. On posterior parapodia they become shorter (fig. 115). It is impossible to ascertain from the type alone at just what segment crochets appear, but certainly none are present before somite L, and about LXX would appear to mark the point of their appearance. They are slightly stouter than the limbate setæ, with slightly curved, not thickened stems, ending in an imperfect small head enclosed in a delicate hood (Pl. XIX, fig. 116).

Mandibles (Pl. XIX, fig. 117) rather delicate, flexible, soft, white with black or dark brown apices and parallel dark brown lines on the masticatory plates and more delicate brown lines and a heavy median dark band on the carriers. The anterior half of the carriers is a broad solid piece, the posterior half a pair of slender slightly divergent stems. Masticatory plate a continuous, narrow, hard, curved band bordering the free end of the carrier and obscurely toothed at the apex. Maxillæ (Pl. XIX, fig. 118) dark brown or black, opaque. Forceps jaws with base plate or carrier about two-thirds as long as jaws, ovate with a constricted anterior end and straight hinge; the jaws with stout bases and strongly curved ends. First dental plates (II) irregular and each with only two large teeth on medial border. They are possibly abnormal or much worn. The next plate (III) is small and narrow with one large apical tooth, and the anterior plate (IV) is remarkably large, triangular with a single stout tooth.

Color uniform brown.

This species is imperfectly known through a single specimen taken at station 4,397, off Santa Catalina Islands, 33° 10' 15" N., 121° 42' 15" W., 2,196 to 2,228 fathoms, gray mud.

*Ninoë fusca* is closely related to *Ninoë simpla* Moore previously described from Alaskan waters. Both have the nuchal papilla and simple unifilar gills and their setæ are closely similar, but they differ

much in the form of the postsetal lip of the parapodia and of the maxillæ. These two species taken in conjunction with such species of *Lumbrineris* as *erecta* and *tetraura* largely break down the distinction based on the presence or absence of branchiæ that is usually made between the two genera. On the other hand, their possession of the nuchal papilla segregates them from the majority of species of both genera.

The species of *Lumbrineris* and related genera of this region are noteworthy because of their tendency to develop prolonged branchial processes of the parapodia. This tendency seems to be most marked in the fauna of the deeper waters of Monterey Bay and reaches its maximum in *L. bifilaris*.

***Lumbrineris japonica*** v. Marenzeller, **index** subsp. nov. Pl. XIX, figs. 119-127.

*Lumbriconereis japonica* v. Marenzeller, Denkschr. K. Akad. Wissensch. (1879), XLI, pp. 137, 138, Taf. V, fig. 3.

This well-marked form presents a superficial resemblance to *L. erecta* of the littoral zone of the coast of California, but its technical characters so closely ally it with *L. japonica* that it is regarded as belonging to that species. The chief peculiarity is found in the noteworthy elongation of the postsetal lip of middle and posterior parapodia which is quite as pronounced as in *L. erecta*. The erectness and rigidity characteristic of these processes in the latter species is here absent; they are evidently more flexible and mobile and usually directed laterad in many cases (fig. 120), reminding one of a pointing finger. This feature does not appear on anterior parapodia, on which the postsetal lips are foliaceous, the digitiform or cirriform character usually becoming pronounced by about somite XXXV.

Articulated crochets occur as far forward as III on the type and persist to XXV; on other specimens they were not detected anterior to III, V or VIII, but continued as far as XXX, after which point simple crochets only occur. Limbate setæ may cease at LVI, as on the type, or continue to LXXV. The form of these crochets differs somewhat from those of Japanese examples of the species. (See Pl. XIX, figs. 124, 125.) There is a single chitinized area on each side in connection with the maxillæ, instead of two as in *L. bifilaris*.

The jaws (Pl. XIX, figs. 126, 127) agree very closely with v. Marenzeller's figures. The maxillæ are opaque and very dark brown or nearly black, the mandibles pale brown marked with darker brown lines and the whitish masticatory plates tipped with a black edging.

The type (station 4,464) is 109 mm. long with a maximum width at XII of 2.8 mm. and between setæ tips of 5.7 mm. Segments 201.

Other specimens are slightly larger. Several specimens are marked with coarse pigment spots arranged in transverse bands.

Stations 4,325, off Point La Jolla, vicinity of San Diego, 191-292 fathoms, green mud and fine sand; 4,405, off San Clemente Island, 654-704 fathoms, green mud; 4,406, off Santa Catalina Island, 650 fathoms, green mud; 4,452, Monterey Bay, off Point Pinos Lighthouse, 49-50 fathoms, green mud and fine sand; 4,457, same locality, 40-46 fathoms, dark green mud; 4,464, same locality, 36-51 fathoms, soft dark green mud; 4,467, Monterey Bay, off Santa Cruz Lighthouse, 51-54 fathoms, soft dark green mud.

• *Lumbrineris inflata* sp. nov. Pls. XIX, XX, figs. 128-134.

A small and apparently an immature form. At least none of the specimens contains genital products. It presents, however, so many peculiar features that it is probably not the young of any species already described from the Pacific. The type is 68 mm. long, with a maximum width in the proboscis region of about 1 mm. Segments 134. The largest specimen is an anterior end 1.5 mm. in diameter. Form linear, tapering gently to the caudal end, terete.

Prostomium thick and scarcely depressed, length equal to or slightly exceeding width, subgloboid or short ellipsoid, sides and front equally rounded, dorsum strongly convex, venter with a broad, shallow, median groove. Eyes totally wanting. Nuchal isthmus and pit narrow, the peristomium scarcely emarginated. Palps simple cushions, wider than long.

Peristomium distinctly longer than II, which is also apodous, the two together equalling or slightly exceeding the prostomium in length. Dorsally they are sharply differentiated by a distinct furrow and the peristomium is slightly emarginated at the nuchal pit; ventrally they are united to form the furrowed lip, II being produced forward and cutting into I. Succeeding metastomial segments remarkably well-differentiated by deep furrows and more or less biannulate or marked with a narrow, raised, whitish line; anterior segments about three times as wide as long, posterior nearly as long as wide. Pygidium a minute, slightly widened ring bearing four short, equal, symmetrical, conical cirri.

Parapodia (Pl. XIX, figs. 128, 129) arise nearer the ventral than the dorsal surface, especially toward the ends of the body, and are of simple, uniform structure throughout. Neuropodia slightly thickened distally, divided at the end into a very short presetal lobe and a longer, stiffly outstanding postsetal lobe about equalling the body of the

neuropodium in length. Instead of increasing in length and becoming cirriform and highly vascular caudally, as is the case with most species of *Lumbrineris* inhabiting this region, the postsetal lobe, if changed at all, becomes somewhat smaller posteriorly and never shows any indication of becoming erect. A minute papilla at the dorsal side of the base of the neuropodium represents the notopodium.

Neuropodial acicula two or three, pale brown, of the usual tapering form, the tips not appearing beyond the surface. Notopodial acicula very delicate, their ends imbedded in a spherical opaque mass.

Setæ all colorless, of the usual simple limbate and hooded crochet types, the former on the first thirty to forty segments only, the latter on all segments. The number of setæ is moderate, their distribution on the type being as follows: the first foot (III) has seven limbate setæ and two articulated crochets; X has five limbate setæ in the supra-acicular fascicle and four articulated crochets and one limbate seta in the subacicular fascicle; XXV has three supra-acicular limbate setæ and two subacicular crochets, of which the ventralmost is simple; middle parapodia have three or four simple crochets, with which a limbate seta may be associated as far as XL. Other examples have a practically similar distribution, but the last compound crochet may occur at XVIII and the first simple one at XVII. The limbate setæ (Pl. XIX, fig. 130) are in no way characteristic; they are rather sharply bent, very acute and the blades narrowly lanceolate. Crochets of anterior parapodia (Pl. XIX, fig. 131) are imperfectly compound, with an oblique articulation that divides the stem but not the hood, which is, however, adherent to the stem in such a manner as to produce a rather pronounced double inflation; the stem terminates in a high, finely divided crest. Simple crochets (fig. 132) have a short, strongly inflated hood and a long-beaked head surmounted by a crest of fine teeth.

Jaws much like those of *L. hebes* Verrill. Mandibles in one specimen rudimentary, in another (Pl. XX, fig. 133) colorless and delicate, stems long and slender, united by their anterior halves; masticatory plates very oblique, separated by a deep anterior cleft, each when intact with a large apical and a somewhat smaller internal tooth. Maxillæ (fig. 134) dark brown, carriers of forceps jaws (I) with halves very imperfectly united, slender, a deep incision on each side in anterior third, the part posterior to which is more than twice as long as wide and acutely pointed behind; hinge well-developed; the forceps moderately stout in basal third, strongly hooked distally. Large tooth plates (II), with stout body and large outstanding quadrate

lateral wing and four or five stout teeth. The next anterior plate (III) has an oblong, lateral supporting plate and a curved dentigerous margin, bearing three or, in one case, four teeth. Anterior plate (IV) slightly larger than III, with ovate-quadrate supporting plate and a thick medial border bearing two stout triangular teeth.

All of the specimens are pigmentless with a delicate pale blue cuticular luster.

Stations 4,454, Monterey Bay, off Point Pinos Lighthouse, 65-71 fathoms, green mud, shells and gravel; 4,463, same locality, 36-51 fathoms, soft dark gray mud; 4,496 (type), Monterey Bay, off Santa Cruz Lighthouse, 10 fathoms, fine gray sand and rock.

**Lumbrineris tetraura** (Schmarda) Ehlers.

*Lumbriconereis tetraura* Ehlers, Festschr. K. Gesellsch. Wissensch. Göttingen, 1901, pp. 137-139, Taf. XVII, figs. 1-10.

A fine example of what is undoubtedly this far southern species was found among some *Aracoda semimaculata*. It is 114 mm. long and 1.6 mm. wide at XII, the spread between the tips of the parapodia at the same place being 3 mm. Segments 121. Compared with Ehler's figures, the prostomium is somewhat shorter and much more broadly rounded and the postsetal lobes somewhat longer and more erect.

The segments often exhibit a faint biannulation. Posteriorly they are somewhat depressed and the appearance of depression is considerably enhanced by the prominent outstanding parapodia which equal the width of the segments. Pygidium a short ring bearing two pairs of cirri, of which the dorsal is somewhat shorter and thicker, the ventral slightly divergent, longer and more slender. Crochets occur on all segments, the anterior being long and limbate with small heads, but they gradually assume the typical form which is attained by about XXXV. A single acute seta continues to at least C. Both setæ and jaws agree closely with Ehler's description, the three pairs of maxillæ having one, two and four teeth, respectively, and the mandible a very characteristic form. It is to be noted, however, that Ehler states that limbate setæ extend to about somite XXI only and that articulated crochets occur in the anterior seventeen segments of young worms.

Station 4,496, off Santa Cruz Lighthouse, Monterey Bay, 9-11 fathoms, hard sand.

**Lumbrineris biflaris** Ehlers. Pl. XX, figs. 135-142.

*Lumbriconereis biflaris* Ehlers, Festsch. K. Gesellsch. Wissensch. Göttingen, 1901, Math.-Phys. Kl., pp. 139-141, Taf. XVIII, figs. 1-10.

This interesting and abundant species resembles Ehler's south Chilean species very closely in every respect except the structure of

the jaws. Ehler's figure of the latter differs in certain respects so greatly from the form usual in the genus that I have assumed that the single specimen available to him was abnormal or imperfect in these respects. Otherwise these specimens could scarcely be regarded as conspecific with his, notwithstanding their close external similarity. Even on this assumption there is by no means complete identity, and further study of Chilean material may necessitate subspecific or even wider separation.

A set of well-preserved jaws is represented in figures 141, 142, and several others which were dissected agree closely, the principal differences being in the occasional presence of a third large tooth in place of the first small tooth on one of the large-toothed maxillæ (II) and in the variable length of the stems of the mandibles.

The peristomium of Ehler's type is decidedly more elongated than that of the Californian examples, in which the basal width equals the length.

Parapodia of the anterior, middle and posterior regions are illustrated in figures 135-137. Those of the latter region with their two cirriform processes are very characteristic and bear a very close resemblance to Ehler's figure, which, however, is inverted. The ventral outstanding filamentous process is postsetal and the dorsal erect one, which contains a conspicuous vascular loop, is presetal in origin. The notopodial tubercle or rudimentary cirrus is quite distinct from the latter, but becomes obsolete on posterior segments. Parapodia exhibiting this extreme development of the lobes are confined to the posterior third or two-fifths of the body, those in the middle region having them digitiform and only about as long as the body of the foot (fig. 136) and in this respect these specimens differ somewhat from Ehler's, in which the filiform character becomes established farther forward. This difference, though somewhat indefinite, is quite striking and is equally true of large and small specimens alike. The resemblance of the bidigitate parapodia of the middle region to those of *L. bifurcata* McIntosh is striking and, indeed, the two species have much in common, but they diverge in the character of the posterior parapodia (fig. 137).

Although the setæ (Pl. XX, figs. 138-140) in general resemble those of the type in form and distribution, in respect to the latter there are some noteworthy variations and differences. Anterior parapodia bear both limbate setæ and crochets, the latter being themselves limbate, slender and with small imperfect heads; posteriorly only true hooded crochets with short bodies and strongly hooked heads

occur. Ehlers states that crochets occur on all podous segments, the anterior being limbate and that acute limbate setæ cease at LV. On my material crochets may begin on the first foot (III), which is usual, or they may be absent for from four to twelve anterior parapodia. This is notably the case in three specimens from station 4,523, in which the first occurs in X, XII and XIV, respectively, the first two specimens being about 5 mm., the last 3 mm. in diameter. On two still larger specimens 5 mm. and 7 mm. in diameter, from stations 4,406 and 4,402, no crochets were detected anterior to XIX and XXI, respectively. The passage from limbate to true crochets is a gradual one, but typical crochets may usually be recognized at about the fortieth parapodium. The last limbate seta may occur anywhere from segment XLII to segment LXXXIX, the average of fourteen specimens on which this was determined accurately being LXIV. There is no relation between size and the position of the last acute seta, as there is in the case of the first crochet. The variation, however, is less than would appear, for in cases where a large number of parapodia contain acute, limbate setæ, the last twenty or thirty bear but one.

Few of the specimens are obviously pigmented. Most are of a dull gray or yellowish-brown color, one having a russet ground color is marked with narrow dark brown annulations, and one lot from station 4,454, like other species from the same station, is marked with quadrate black spots. The ground is pale slate color with cuticular iridescence. The spots are sharply defined, always confined to one segment, though those of adjacent segments may coalesce. They occur on both dorsal and ventral surfaces, somewhat more plentifully on the former, and apparently increase toward the middle region, leaving the ends of the body less maculated. Individuals differ greatly in the richness of the spotting, some having very few and widely scattered spots, while on others they are numerous and often confluent; some have the prostomium unspotted, while on others it bears from one to three spots.

In all seventy-seven specimens, ranging in diameter from .8 mm. to 7 mm., were examined, and although only a very few were complete all exhibited the characteristic alteration in the form of the parapodia from before caudad and the characteristic arrangement of the setæ. A complete specimen 155 mm. long has 312 segments, and at the point of maximum diameter (XVII) the width is 3 mm. (exclusive of the parapodia) and the depth 2.4 mm. A medium-sized specimen from station 4,574 is packed with eggs.

Although taken at many stations throughout the whole range of

the cruise, only a single one occurs at more than half of them and more than five specimens at 4,454, 4,548 (where thirteen occur) and 4,574 only. The bathymetrical range is great, being from 36 to 2,182 fathoms.

Stations 4,306, off Point Loma Lighthouse, vicinity of San Diego, 207-497 fathoms, green mud, sand and gravel; 4,322, off Point La Jolla, 110-199 fathoms, green mud and shells; 4,364, off Point Loma, 101-129 fathoms, green mud, sand and rock; 4,366, off Point Loma Lighthouse, 176-181 fathoms, green mud; 4,382, off North Coronado Island, vicinity of San Diego, 642-666 fathoms, green mud; 4,390, off Santa Catalina Islands, Lat. 33° 02' 15" N., 120° 42' W., 1,350-2,182 fathoms, gray mud and fine sand; 4,402, off San Clemente Island, 542-599 fathoms, green mud; 4,406, off Santa Catalina Island, 650 fathoms, green mud; 4,416, off Santa Barbara Island, 323-448 fathoms, dark green mud and rocks; 4,431, off Santa Rosa Island, 38-45 fathoms, varied bottom; the following in Monterey Bay, 4,445, off Point Pinos Lighthouse, 60-66 fathoms, green mud; 4,450, same, 55-60 fathoms; 4,452, same, 49-50 fathoms, green mud and fine sand; 4,453, same, 49-51 fathoms, dark green mud; 4,454, same, 65-71 fathoms, green mud, sand and gravel; 4,457, same, 40-46 fathoms, dark green mud; 4,464, same, 36-51 fathoms, soft dark gray mud; 4,467, off Santa Cruz Lighthouse, 51-54 fathoms, soft dark green mud; 4,475, off Point Pinos Lighthouse, 58-142 fathoms, soft green mud; 4,482, off Santa Cruz Lighthouse, 43-44 fathoms, soft green mud; 4,485, same, 39-108 fathoms, soft green mud and sand; 4,507, off Point Pinos Lighthouse, 308-383 fathoms, green mud; 4,523, same, 75-108 fathoms, soft dark mud; 4,541, same, 381-633 fathoms, green mud and sand; 4,548, same, 46-54 fathoms, coarse sand, shells and rock; 4,549, same, 56-57 fathoms, same bottom; 4,550, same, 50-57 fathoms, green mud and rocks; 4,556, same, 56-59 fathoms, rocks; 4,557, same, 53-54 fathoms, rocks; 4,574, off Cape Colnett, Lower California, 1,400 fathoms, bottom ?.

\* **Lumbrineris minuscula** nom. nov.

*Lumbriconereis minuta* Treadwell, Bull. U. S. Fish Comm., 1906, p. 1171, figs. 57, 58 (nom. preoc. *L. minuta* Theel, 1879).

Three very poorly preserved anterior ends of a species that is much like Treadwell's *L. minuta*, but differ in several respects and especially in the great prolongation of the limbate setæ, which, coupled with the fact that the specimens, and especially one male, are filled with genital products, leads to the suspicion that they are an epitokous phase of that species.

All three examples have a diameter of about 1 mm. Prostomium relatively smaller and more slender than usual in the genus. Eyes apparently wanting, but a small median brown spot on the dorsum of the prostomium immediately beneath the border of the nuchal fold. Parapodia poorly preserved, but evidently small and inconspicuous, and evidently with the lips little produced, though the postsetal is somewhat the longer. Most interesting are the setæ. From somite III to XXV all setæ are of the capillary bilimbate type. A few segments beyond XXV crochets appear and continue to the end of the pieces or beyond C. On anterior segments the limbate setæ agree with Treadwell's description, being long and slender, bilimbate and bent. They number ten or twelve and the ventral four or five are longer than the others. Farther caudad, after the crochets appear, the number of limbate setæ is reduced to a single short one dorsal to the crochets and five to six ventral to them in subacicular bundle. It is the latter that become so greatly elongated, projecting far beyond the ends of the parapodia and in one specimen equalling the diameter of the body. They are nearly straight with greatly restricted limbæ and the shaft continued into an excessively tenuous end. Anteriorly the crochets are restricted to two in the supra-acicular fascicle, but farther back two more are added in the subacicular fascicle. They are little, if any, stouter than the setæ, anteriorly margined for a short distance below the small head. Within a few segments, however, they lose the margin and assume the form figured by Treadwell.

While the jaws in general resemble Treadwell's figure, there are some differences which it seems probable result from imperfections in Treadwell's specimen. The maxillæ are remarkably massive for so small a species. Forceps jaws characterized by the very small base; maxillæ II with five teeth on the right and four on the left side, the first tooth on each side being very large and well-separated from the others by a wide interval. The anterior pairs of plates (III) are both very large, triangular and bear a single apical tooth. Mandibles pale with dark tips and differing little in form from those of *L. bifilaris*.

Station 4,390, off Santa Catalina Islands, 33° 02' 15" N., 120° 42' W., 1,350-2,182 fathoms, gray mud and fine sand.

*Aracoda semimaculata* sp. nov. Pl. XX, figs. 143-149.

Form slender, subterete, but owing to the prominence of the parapodia appearing widened and depressed in the middle and posterior regions. The type, in which the caudal end terminates in a small cone of regeneration, is 165 mm. long and 2.8 mm. wide, exclusive of the parapodia. Segments 278. Four other examples accompany the

type. Three small complete ones are from 52–93 mm. long and have from 135 to 209 segments, and a larger one, lacking the caudal end, is 155 mm. long, 2 mm. wide and has 235 segments.

Prostomium as long or slightly longer than wide, subovate, slightly depressed, the ventral face with a slightly impressed median area bounded by a pair of parallel furrows which pass into the mouth. Eyes four in a transverse row near the posterior border. In the two larger specimens the eyes are obscure, especially the outer larger pair; on the smaller ones they are much more distinct and the middle always decidedly smaller. Peristomium and succeeding achæitous segment together about as long as the prostomium, the former slightly the longer; lip but little furrowed and palpal pads at base of prostomium scarcely evident.

Segments all simple and sharply defined, varying from four to six times as wide as long, nearly terete, but the venter slightly flattened. Lateral or parapodial furrow slightly developed. Pygidium a minute cylinder bearing two or four very small padlike cirri.

Parapodia (Pl. XX, figs. 143–145) begin on III. The anterior are very small and inconspicuous, but they increase in size and become prominent farther back. The body is slightly flattened, cylindroid, constricted at the base and divided at the distal end by a vertical setigerous cleft into presetal and postsetal lips. The former is short and broadly rounded on all parapodia, the latter undergoes conspicuous change. On anterior parapodia (fig. 143) it is nearly as long as the body of the foot, moderately flattened and subtriangular, with the blunt apex directed upward and outward. It rapidly becomes longer, thicker and cylindroid and bends dorsad (fig. 144). Throughout the middle region it presents the appearance of a short finger crooked upward. Still farther back, continuing to increase in length and arising more from the ventral aspect of the foot, it takes a slightly spiral turn and a suberect posture and retains this character to the caudal end (fig. 145). On all parapodia the notopodium appears as a rather prominent but small angulated tubercle on the base of the dorsal face of the neuropodium.

Neuropodial acicula usually two or three, straight, tapered, pale, with the dark, bluntly pointed tips protruding a short distance beyond the surface. Notopodial acicula two or three slender fibers entering the notopodial tubercle.

Setæ few, from six to eight on anterior, diminishing to usually four on posterior parapodia. All are pale yellow, acute, bilimbate, more or less sigmoidly curved and geniculate at the first bend. The genic-

ulum is directed dorsad and is most strongly developed on the dorsal-most setæ which are also the longest. On anterior parapodia the margins of the setæ are smooth or nearly so (fig. 146); farther back the serrations become more prominent, especially on dorsal setæ, which also have a few transverse pectinæ at the base of the geniculum (fig. 147).

Jaws of two specimens dissected. Mandibles (Pl. XX, fig. 148) dense opaque black, the posterior half or two-fifths narrow and somewhat tapered, separated on the two sides by a wide median space, the anterior portion abruptly twice as wide, the two halves united by an extensive suture, the exposed tips slightly divergent with finely denticulated free margins. Maxillæ (Plate XX, fig. 149) also dense opaque black, the forceps jaws supported by a pair of small triangular carriers prolonged into tapered filaments about one and one-third times as long as the series of jaws, the forceps with massive bases and short, strongly hooked ends, the left bearing on its medial margin eight or nine stout teeth of diminishing size, the right about seven smaller teeth. Maxillæ II asymmetrical, the left short and stout with eight teeth, the right long and narrow with about thirteen teeth diminishing in size from before backward. III<sup>1</sup> is a curved piece bearing two teeth on each side; IV is irregular with five or six unequal teeth; V is also irregular with four or five slender teeth and the most anterior (VI) is a small piece with one slender tooth and a bifid base. A long ribbon-like band of chitin exceeding the forceps filaments in length extends caudad from the posterior maxillæ ventral to the forceps carriers.

In color some are pale gray and unspotted, but three of the specimens are blotched with three dorsal series of dusky bluish spots and the peristomium is deeply pigmented above. The cuticle is more or less iridescent.

Known only from station 4,496, Monterey Bay, off Santa Cruz Lighthouse, 10 fathoms, fine gray sand and rocks.

From *Aracoda cerulea* Schmarda, as redescribed by Ehlers, this species is abundantly separated, particularly through the characters of the jaws, which in fact depart materially from the form typical of the genus.

***Arabella attenuata* Treadwell?**

*Arabella attenuata* Treadwell, Bull. U. S. Fish Comm., XXIII, part III (1906), p. 1172, fig. 62.

A small portion of the middle of a large specimen about 3 mm. in

---

<sup>1</sup>Through an oversight maxilla III was overlooked in labeling fig. 149.

diameter which may belong to this species. The parapodia bear large, semierect respiratory postsetal lobes as in *A. spinijera* Moore and also possess the conspicuously protruding spine and the winged and toothed setae of that species, though the latter are less distinctly geniculate.

Station 4,351, off Point Loma Lighthouse, Monterey Bay, 423-488 fathoms, soft green mud.

***Drilonereis falcata*** sp. nov. Pl. XX, figs. 150-154.

A typical member of the genus known from incomplete worms only. The type consists of an anterior piece of 188 segments, and a posterior of 41 segments, possibly belonging to the same individual, the middle region of which is wanting. Together the pieces measure 121 mm. long and have a maximum width of 1.2 mm. and a depth practically the same. Form linear, terete.

Prostomium elongated, ovate-elliptical, one and one-half or more times as long as wide, strongly depressed, the depth about two-fifths width, the greatest width being at the posterior end where the prostomium is mortised into the peristomium. No distinct nuchal organs or longitudinal grooves and no eyes above; a shallow median longitudinal groove below.

Peristomium and II achætous, about equal above and together about two-thirds as long as prostomium. Peristomium broadly excavated for half its length above for the insertion of the prostomium, produced forward below to form a prominent but simple bilobed lip, not sharply differentiated from the small palps.

Body segments of nearly uniform diameter, subterete or slightly depressed, the venter very slightly flattened, very firm and wiry anteriorly, softer behind. Segments sharply defined and very regular, simple anteriorly, biannulate behind, generally about one-half as long as wide, but exceeding this in middle region. Close to the caudal end the segments are abruptly contracted and depressed. Pygidium a minute ring, bearing four short, conical, equally divergent cirri. Cuticle very smooth, polished, iridescent. Color nearly uniform purplish-brown.

Parapodia (Pl. XX, figs. 150, 151) are set into slight lateral depressions and project straight out. Anteriorly (fig. 150) they are nearly as long as the segments, but gradually become smaller simultaneously with the elongation of the segments until they are only one-third as long, though near the caudal end they are again relatively longer. All are simple, short, truncated, cylindroid, setigerous tubercles with a small dorsal steplike tubercle representing the notopodium and a somewhat ventral, papilliform postsetal lobe which

is as long as the setigerous tubercle and projects straight out beyond it. No noteworthy changes in form of the parapodia occur throughout its entire length.

True setæ are all of one form (Pl. XX, figs. 151, 152), simple, bilimbate, sigmoid, tapered to an acute point and with a finely serrate margin and distinctly striated stem. Those in the dorsal part of the fascicle are usually longer. Beginning at XIII, IX or X in the several specimens, they are accompanied by a single yellow, stout, blunt, rodlike aciculum (fig. 151) which projects obliquely far beyond the surface from the ventral border of the setæ bundle. Farther back it becomes even stouter and reaches nearly or quite to the tip of the postsetal lobe.

The most distinctive characters of the species are found in the jaws (Pl. XX, figs. 153, 154). Mandibles rather large for the genus, black, shaped like a pair of broad snow-shoes with the tapering heels behind and united anterior to the middle by a broad chitinous band (fig. 153). Maxillæ black; forceps jaws (I) very strongly falcate and hamate with acute tips, stout at the base with massive, quadrate masticatory plates, the inner margin of which bears only three or four distinct small teeth and some obscure crenulations. Hinge-pieces of carriers (fig. 154) very small and strongly divergent from an irregular horizontal plate with attached fringed chitinous tendons at the united anterior ends of the long, slender, attenuated filaments, which barely exceed twice the length of the series of jaws. Large tooth plates, narrow and nearly straight or oblong, with a supporting flange or plate running nearly their entire length and meeting at nearly a right angle in a ridge bearing a series of six or seven teeth, the first of which is enlarged and talonlike, the remainder equal, regular, acute and recurved. Anterior to this plate on each side is a group of three small crowded tooth plates, each bearing a single, long, slender, strongly curved and very acute tooth on a V-shaped base. These represent III, IV and V (fig. 154).

Stations 4,451, Monterey Bay, off Point Pinos Lighthouse, 47-51 fathoms, green mud and sand; 4,460 (type station) same locality, 55-167 fathoms, green mud and gravel.

#### GLYCERIDÆ.

##### *Glycera capitata* Oersted.

*Glycera capitata* Oersted, Grönl. Ann. Dorsibr., 1843, p. 44, Tab. VII.

What is undoubtedly a variety of this species, differing in only a slight and variable degree from typical examples from the Atlantic Ocean, is not uncommon throughout this region. The principal

differences exhibited by these specimens is that the parapodia are longer with the postsetal lobes and neurocirrus much more elongated, slender and acute, and the appendages of the compound setæ longer and more slender. In all important respects, prostomium, parapodia, proboscis papillæ and jaws, the resemblance is very close.

All specimens are small, the largest varying from 40 to 46 mm. long with 98 to 109 segments and most being much smaller. All are largest in the proboscis region and tapered to a slender posterior region. Prostomium with eight rings beyond the enlarged base, the three terminal ones being very small. Body segments always distinctly triannulate.

The jaws are typical and the clavate proboscis thickly covered with slender conical papillæ and either eighteen or twenty longitudinal rows of larger ovate papillæ, both of which are exactly like those of Atlantic specimens.

*Glycera nana* Johnson is very closely related to *G. capitata*, the principal differences being that the segments of the former are only biannulate and that the lobes of the parapodia have slightly different forms. In this connection it should be noted that at least some of the specimens reported by me from San Diego under the name of *G. nana* (Proc. A. N. S., 1909, p. 259) are really small examples of other species. One of these is a young *G. robusta* Ehlers and the other a *G. rugosa* Johnson with completely retracted gills.

Specimens of *G. capitata* occur from the following stations: 4,343 off South Coronado Island, vicinity of San Diego, 60-155 fathoms, fine gray sand; 4,452, off Point Pinos Lighthouse, Monterey Bay, 49-50 fathoms, green mud and fine sand; 4,457, same locality, 40-46 fathoms, dark green mud; 4,464, same locality, 36-51 fathoms, soft dark gray mud; 4,485, off Santa Cruz Lighthouse, Monterey Bay, 39-108 fathoms, soft green mud and sand; 4,548, 4,549, 4,550 and 4,551, all off Point Pinos Lighthouse, Monterey Bay, 46-57 fathoms, coarse sand, shells and rock, except 4,550, where green mud and rock; 4,557, off Point Pinos Lighthouse, 53-54 fathoms, rock.

***Glycera tessellata* Grube.**

*Glycera tessellata* Grube, Arch. Naturgesch., XXIX, I, p. 41, Taf. IV, fig. 4.

This second European species as nearly as frequent and, at southern stations, as generally distributed in the region as *G. capitata*. The only obvious respect in which these examples appear to differ from European ones is in the possession of a smaller number of prostomial rings, for, whereas Ehlers attributes thirteen and McIntosh seventeen rings to this region, these have only eleven or twelve nearly equal rings above the enlarged base.

All of the specimens are stout and more or less inflated anteriorly in the proboscoidal region and taper rather abruptly into the slender and attenuated posterior half. All segments are biannulate. Several have the proboscis fully protruded, showing the very dense covering of very high slender papillæ, among which are a few somewhat stouter but otherwise similar papillæ. The jaw appendages differ from those of *G. nana* in having a much narrower basal wing.

The color is generally a rich orange-brown, most pronounced anteriorly, and only lacking on the smallest specimens, which are clear yellow.

This species has already been recorded from the North Pacific in the Gulf of Georgia and off Japan.

Stations 4,326, off Soledad Hill, Point La Jolla, vicinity of San Diego, 243-264 fathoms, soft green mud; 4,399, Lat. 32° 44' 50" N., Long. 117° 48' 45" W., 264-285 fathoms; fine gray sand and rock; 4,410, off Santa Catalina Island, 143-245 fathoms, gray sand, shells, gravel and rocks; 4,415, off Santa Barbara Island, 302-638 fathoms, green mud; 4,418, same locality, 238-310 fathoms, dark green mud, sand and rock; 4,430, off Santa Cruz Island, 197-281 fathoms, black sand, pebbles and rock; 4,431, off Santa Rosa Island, 38-45 fathoms, varied bottom; 4,463, off Point Pinos Lighthouse, Monterey Bay, 48-111 fathoms, rocky.

• *Glycera alba* Rathke *macrobranchia* subsp. nov.

*Glycera alba* Rathke, Nov. Act. Acad. Nat. Cur., XX, p. 173, Tab. IX, fig. 9.

Represented by a single long, slender, nearly complete specimen. Length 99 mm., width 2.7 mm. Number of segments 129, probably 25 or 30 at the caudal end missing.

The segments are all strongly biannulate, with the middle or foot-bearing annulus somewhat larger. Parapodia small, in middle region about one-third as long as the body width. The dorsal gills begin at XXII and reach a very large size before L, remaining nearly unaltered to the end of the piece. Compared with European and Japanese examples of the species, the gills of this specimen are much larger and the postsetal lobe smaller.

The jaws are unknown, but the half-protruded proboscis was studied. Its surface is very finely granular from the presence of very numerous small, pediculated, oval papillæ, bearing inclined, winged, cuticular terminal plates, among which are scattered some much smaller subconical papillæ. Compared with typical examples of the species, these papillæ are distinctly larger, with relatively shorter stalks and less pronounced wings on the end plates.

The single specimen is labelled Beaver Shoal, San Diego Bay, mud, 7/19/05.

*Glycera branchiopoda* sp. nov. Pls. XX, XXI, figs. 155-159.

A small, rather slender species, characterized by the well-developed ligulate dorsal and ventral gills. The type is 90 mm. long without proboscis; the maximum width, exclusive of parapodia, 2.8 mm., with parapodia 3.5 mm. Proboscis, not fully extended, 22 mm. long, 2 mm. in diameter at base and 3.5 mm. at the distal end.

Prostomium of the usual form, consisting of a broad, rugous, basal region constituting about two-fifths of its length and a slender, somewhat depressed conical portion divided into seven annuli decreasing in size regularly from base to apex, the basal three aggregating considerably more than one-half of its length. Terminal segment very small, dome-shaped, bearing the four minute apical tentacles which are divergent and all directed somewhat ventrad, the dorsal slightly longer than the ventral. There is a median dorsal and a median ventral groove, the latter being the better developed.

Peristomium closely united with prostomium, divided below by the large mouth. Metastomial region increases in diameter to about XL, from which the body tapers to the caudal end. Anterior segments very short and crowded, the first with modified parapodia closely crowded against the head. Remainder of the body nearly terete, the segments strongly arched above and slightly flattened below. Anteriorly they are at least eight times as wide as long, but increase gradually in length while decreasing in width until the ratio is two to one. All segments are strongly and completely triannulate and the annuli are of nearly equal width, only the third or postpodal being slightly larger than the others, especially posteriorly where they are marked above by a straight cross-furrow. On the short and crowded anterior segments the prepodal annulus is frequently united with the middle annulus laterally and partly bears the parapodia. Middle annulus, though never enlarged, is frequently conspicuous by reason of its paler color. Pygidium unknown.

Parapodia characteristic, the anterior short and deep, the posterior longer and more cylindrical. First two situated high by the sides of the mouth with the notopodium much reduced and notocirrus totally lacking, consequently consisting of a neuropodium bearing a short, rounded postsetal lip and a longer acute asymmetrical presetal lip. Remaining parapodia (Pl. XXI, figs. 158, 159) all biramous, the postsetal lip short, broad, and undivided, broadly rounded, often slightly emarginated on middle segments. Presetal lip deeply cleft

into a dorsal and a ventral lobe. On anterior segments (fig. 157) these present no striking peculiarities; both are foliaceous at the base where the ventral lobe is much the larger, while the distal portion, which is separated by a slight constriction, is longer and acute in the dorsal lobe and usually obtuse in the ventral lobe. Neurocirrus prominent, attached to middle of ventral face of neuropodium, somewhat grooved and embracing the neuropodium at the base and tapered to an acute tip which usually diverges more or less from the foot. Notocirrus a small globose or subcylindrical papilla situated on the side of the body well above the parapodium. Passing caudad, the foliaceous base of the dorsal presetal lobe is gradually reduced and the distal part enlarged to form a gill which becomes fully established at about XXXV (fig. 158). Throughout the middle region and nearly if not quite to the caudal end this lobe forms a prominent, subligulate, erect gill rising from the dorsum of the end of the foot and fully equaling or exceeding the latter in length (fig. 159). The ventral presetal lobe does not become branchiform, but elongates and finally takes a slender finger-like form (fig. 159). Simultaneously with the development of the dorsal gill a ventral gill develops from the modification of the neurocirrus. This is similar in form to the dorsal gill, but when fully developed (figs. 158, 159) becomes even larger, reaching beyond the end of the postsetal lip. Near the caudal end it undergoes considerable reduction in size. Both dorsal and ventral gills are thin-walled and sacular with large cavities communicating with the cœlom and a layer of longitudinal and slightly oblique muscle fibers by which they may be retracted.

Acicula two, corresponding to the two principal fascicles of setæ, both simple, nearly straight, tapered, pale rods, the ventral much the stouter. Setæ colorless, in three fascicles, a dorsal oblique row of very slender simple setæ, a middle horizontal and a ventral vertical series of compound setæ. The latter have slender shafts terminating in deep asymmetrical sockets and slender, tapered, finely punctated blades, with minute marginal denticulations. On the first two parapodia simple setæ are absent, but the dorsalmost compound setæ have very long slender blades. In general the blades of the compound setæ decrease in length from the dorsalmost ventrad and from the anterior end caudad.

Proboscis described from a cotype (station 4,517), this being the only one in which it is everted to the jaw pads. The nearly complete worm is 35 mm. long, the proboscis 12 mm. long, 1.5 mm. in diameter at the base and 3.2 mm. at the distal end. Clavate, the distal end

domed and terminated by sixteen large, soft papillæ flattened against one another in a circle at the base of the still retracted jaws. Surface proximad of these papillæ thickly covered with small cutaneous papillæ of three forms and sizes. The most numerous are tall, slender cones (Pl. XX, fig. 155*a*), the second are larger, low, truncate cones (fig. 155*b*) arranged in eighteen or twenty longitudinal rows along the muscle bands; the third are a few scattered and smaller papillæ (fig. 155*c*). All three kinds have a similar structure, with an apical pore at which a pair of refringent fibers end, and containing a few large sensory cells and a supporting framework. Jaws of the usual falcate form, strong, black, clawlike with expanded, hollow bases and an appendage consisting of a rod and a large thin, triangular, basal wing supported by a thickened marginal rib (fig. 156).

Color as preserved pale yellow.

Stations 4,517, off Point Pinos Lighthouse, Monterey Bay, 750–766 fathoms, green mud and sand; 4,525, same locality, 222 fathoms, soft gray mud; 4,527, same locality, 183–337 fathoms, hard sand; 4,528, same locality, 766–800 fathoms, soft gray mud; 4,574 (type), off Cape Colnett, Lower California, Lat. 30° 35' N., Long. 117° 23' W., 1,400 fathoms.

***Glycera rugosa* Johnson.**

*Glycera rugosa* Johnson, Proc. Bos. Sci. Nat. Hist., XXIX, pp. 409–411, Pl. 10, figs. 101, 102.

Owing to the complete retractibility of the branched gills of this species, their presence is easily overlooked as was done on a former occasion in hastily determining such a specimen from San Diego as *G. nana*. Careful examination in direct sunlight always renders visible the orifices through which the gills have been withdrawn. Those from station 4,454 are marked with quadrate black spots.

Stations 4,431, off Santa Rosa Island, 38–45 fathoms, varied bottom; 4,454, off Point Pinos Lighthouse, 65–71 fathoms, green mud, sand and gravel; 4,548, same locality, 46–54 fathoms, coarse sand, shells and rock.

***Glycera longissima* Arwidsson.**

*Glycera longissima* Arwidsson, Bergens Museums Aabog for 1898 (1899), pp. 23, 24, Pl. I, figs. 15, 19; *G. chilensis* Arwidsson, *ibid.*, pp. 24, 25, Pl. I, figs. 20, 21.

Arwidsson's two species are probably identical, as Ehlers has already indicated. This species is represented by a very large, practically complete example 305 mm. long and 8 mm. wide exclusive of the parapodia. Segments 230, a few of the most caudal and the pygidium missing.

Prostomium 12-annulate, the four apical tentacles minute. Segments strongly biannulate. Gills begin at XIV in the same position as in *G. rugosa*, but are much more complex than in that species. All are branched, but the most anterior and posterior have only two or three slender divisions. The most are very large and complex, reaching from their place of origin at the posterior dorsal part of the foot over most of its posterior face. The largest divide immediately at the base into three or four large branches, each of which spreads vertically into a flat plane divided irregularly several times into slender filaments. Most of the larger gills consist of thirty or forty filaments. Proboscis 53 mm. long and 7 mm. in diameter, but jaws not exposed, thickly covered with papillæ of the same form as those of *G. rugosa*. This specimen agrees rather better with the description of *G. chilensis*, especially in the form of the jaw appendage and the mode of branching of the gills.

Station 4,322, off San Nicolas Island, 31-32 fathoms, gray sand and shells.

#### GONIADIDÆ.

##### *Goniada annulata* Moore.

*Goniada annulata* Moore, Proc. Acad. Nat. Sci. Phila., 1905, pp. 549-553, Pl. XXXVI, figs. 45-48.

A considerable representation of this species, usually only one example from each station, shows a wide range of color variation from yellow through light brown, gray and dark brown to purple, usually more or less distinctly annulated, but some of the most deeply pigmented ones nearly uniform. Some of them are sexually mature. Notopodial setæ begin on XXXIII or XXXIV, in the latter case the preceding parapodium being usually provided with a small achaetous notopodium. The sexual region, characterized by long swimming setæ and neural eye-spots, begins on different specimens at LIV, LV or LVI. The proboscis and its jaws and papillæ agree very closely with the types.

Stations 4,307, off Point Loma Lighthouse, 490-496 fathoms, green mud and fine sand; 4,326, off Point La Jolla, vicinity of San Diego, 243-264 fathoms, soft green mud; 4,325, same locality, 275-292 fathoms, green mud and fine sand; 4,352, off Point Loma Lighthouse, vicinity of San Diego, 549-585 fathoms, green mud; 4,353, same locality, 628-640 fathoms, green mud; 4,366, same locality, 176-181 fathoms, green mud; 4,369, same locality, 260-284 fathoms, green mud, sand and rock; 4,462, off Point Pinos Lighthouse, Monterey Bay, 161-265 fathoms, green mud; 4,508, same locality, 292-303

fathoms, soft green mud; 4,524, 4,525, 4,526, same locality, 204-239 fathoms, soft gray mud; 4,574, off Cape Colnett, 30° 35' N., 117° 23' W., 1,400 fathoms.

***Goniada brunnea* Treadwell.**

*Goniada brunnea* Treadwell, Bull. U. S. Fish Comm., 1906, p. 1174, figs. 67-69.

Several excellently preserved specimens of this species occur in the collection and permit some minor additions to Treadwell's description. The largest individual is 111 mm. long with a maximum width of body in the anterior region of 1.8 mm. and between the tips of the parapodia of about 3 mm., the corresponding measurements of the posterior region being 2.6 and 4.2 mm.

Prostomium shaped as in Treadwell's figure, composed of from seven to nine equal rings above the base, the higher numbers in small specimens. As Treadwell supposed from the appearance of his, in this respect imperfectly preserved, specimen, the apical tentacles are biarticulate, the larger basal joint clavate and the minute terminal piece retractile. Parapodia are as figured by Treadwell, but his figure 68 is inverted. Notopodia with setæ appear abruptly at XLIV or XLV. Treadwell says at L. The distinction between the two regions of the body is never sharply indicated. Usually the anterior region is of a paler color and neural eye-spots, having the form of short dashes, and swimming setæ begin at about LVI. Pygidium a minute obliquely truncate cylinder with a somewhat thickened marginal welt and no cirri in place. The color is pale brown or yellowish-brown, either with paler annulations at the furrows or dusky markings, paling to clear yellow posteriorly.

No specimen has more than a small portion of the proboscis protruded and the jaws were seen by dissection. The large jaws are black, with four large, stout, clawlike teeth and apparently no small teeth. Dorsal arc of small jaws absent. Ventral arc of nine small black jaws apparently all bidentate with bilobed bases. Chevron jaws on the largest specimen eighteen, on a very small one nine on one side ten on the other and on other specimens fourteen or fifteen. Soft papillæ in a circle of eighteen. The surface of the proboscis appears smooth under a pocket lens, but when more highly magnified is seen to be thickly covered with minute hemispherical papillæ with an asymmetrical basal pore.

Stations 4,366, off Point Loma Lighthouse, vicinity of San Diego, 176-181 fathoms, green mud; 4,381, off South Coronado Island, 618-654 fathoms, green mud; 4,457, off Point Pinos Lighthouse,

Monterey Bay, 40-46 fathoms, dark green mud; 4,464, same locality, 36-51 fathoms, soft dark gray mud; 4,480, off Santa Cruz Lighthouse, 53-76 fathoms, dark green mud and sand.

*Glycinde armigera* sp. nov. Pl. XXI, figs. 160-171.

A slender species with the two regions not sharply differentiated. Length of type 81 mm., maximum width near middle, body only 1.8 mm., between tips of parapodia 3.1 mm. Number of segments 178. The largest example is 118 mm. long and has 191 segments.

Prostomium (Pl. XXI, fig. 160) much elongated, equal to the first seven segments, very slender and acutely conical, depressed. Base or oral region coalesced with peristomium, forming a somewhat swollen region wider than second setigerous segment and divided by an indistinct cross-furrow. Attenuated distal part divided very regularly into sometimes eight, sometimes nine, equal wings, the apical one bearing four small tentacles with clavate basal joints and minute cylindrical retractile distal joints. Median dorsal and ventral fields broad, smooth and continuous for entire length with the cross-furrows shallow, the lateral fields bounded by deep dorsal and ventral grooves and much more deeply cut by the interannular furrows. Mouth a small crescentic slit within the enlarged basal region and bounded laterally by the small palps. Eyes one pair, minute, black, widely separated on basal region, frequently indiscernible on larger specimens; no apical eyes.

Peristomium united with base of prostomium, forming the simple posterior lip and bearing a pair of small parapodia. Anterior end of body very slender, at first narrower than the oral region of head, terete; the segments well-defined, simple, slightly flattened below and in the parapodial field, strongly arched above with a narrow, somewhat softened dorsal field. The segments very gradually increase in both diameter and length to the point of greatest width (about LX), where they are about three times as wide as long. The two regions are less sharply differentiated than in many species, but a few segments behind the point of greatest width of the anterior region a slight constriction occurs, followed at somite LXX to LXXVI on different specimens by a more or less obvious increase in size of the parapodia accompanied by the presence, in mature examples, of genital products in the coelom. The neural eye-spots, which take the form of short brown —s crossing the intersegmental furrows in the neural line, become conspicuous at the same place, but may be traced much farther forward, often to about L, gradually becoming fainter. Segments of

posterior region somewhat depressed, relatively shorter and more crowded than anteriorly and gradually tapered to the caudal end.

Pygidium a minute wing bearing a pair of long, very slender, flagelliform subanal cirri at least equal to the greatest width of the body, including the parapodia, and often one-third longer.

Parapodia situated near the ventral level anteriorly, extending their entire depth on most of the posterior region, all long and slender, those at the anterior end of the anterior region and throughout the posterior region equalling the width of the segments or, near the caudal end, exceeding them. As far as somite XXIX they are uniramous. The first foot (fig. 160) is small, with a minute setigerous tubercle nearly concealed between the much longer dorsal and ventral cirri. Succeeding ones gradually enlarge and the next few have the neuropodium divided into presetal and postsetal lobes of nearly equal length, the former broad and with an axial prolongation, the latter narrow and tapered (fig. 160). Dorsal and ventral cirri are about one-fourth longer than the neuropodium, moderately slender and tapered to blunt points, the former with a pitlike depression and glandular swelling near the base, beyond which it is bent somewhat abruptly dorsad, the latter nearly straight. On still succeeding somites all parts of the parapodium become increasingly compressed and foliaceous and the neuropodium longer than or at least equal to the cirri. On typical parapodia of this region (Pl. XXI, fig. 162) the broadly ovate postsetal lip is longer than the presetal lip, which is broadly obcordate petalliform with a tongue-shaped prolongation arising from the sinus. Neurocirrus about as long as neuropodium, compressed, of nearly uniform width to near the bluntly triangular tip. Notocirrus always irregular and somewhat distorted in outline, the base somewhat contracted, the distal part subovate, somewhat foliaceous and more or less abruptly bent dorsad.

At somite XXX a small notopodium appears abruptly anterior to the base of the notocirrus and immediately consists of a small setigerous tubercle, a short presetal lip and a longer postsetal lip. Through the remainder of the anterior region the biramous parapodia undergo no marked change, but with the beginning of the posterior sexual region (about somite LXX to LXXVI) they become distinctly larger and the rami better differentiated. Typical parapodia of this region (fig. 163) are large and deep with the neuropodium much exceeding the notopodium, compressed, somewhat widened distally into a broadly rounded acicular tubercle enclosed between broadly foliaceous, more or less irregularly ovate, presetal and postsetal lips, of which the

latter is somewhat the longer and the former marked by a slight constriction separating a distal portion corresponding to a much broadened lingulate process of anterior parapodia. Neurocirrus much shorter than neuropodium and divergent from it. The notopodium consists of a deep postsetal lip broadly attached to the notocirrus above with a slight emargination at the tip of the aciculum, and a small subovate presetal lip or process just ventral to the end of the aciculum. Notocirrus shaped much like neurocirrus, but shorter and lacking the basal depression and bending which characterizes anterior notocirri. Toward the caudal end the rami are relatively longer and more divergent.

Acicula in each ramus single, rather stout, straight, tapering rods ending in blunt points ending flush with the surface, the neuropodial being sometimes slightly bent at the tip. Neuropodial setæ in a broad spreading fan-shaped fascicle of one series, divided into nearly equal dorsal and ventral groups by a considerable interval at the aciculum into which the tonguelike prolongation of the presetal lip enters. On the type they are distributed as follows: somite X 16 supra-acicular and 14 subacicular, XXV 21 and 22, L 23 and 22, C 28 and 24. They are all of one kind, compound, capillary, slender and colorless, the gently curved shafts slightly enlarged at the distal end (fig. 164) to form a bifurcate socket with unequal limbs, the longer of which is faintly toothed. Appendages very delicate, slender, tapered, more or less curved, very finely punctate and along the edge finely fringed. They are shortest at the dorsal and ventral borders of the fascicles and gradually increase in length to acicular borders. Except that they are very long and slender on the middle segments, there is no obvious distinction between these setæ on the two regions of the body. Notopodial setæ (fig. 165) are few, three supra-acicular on XXX, three supra-acicular and two subacicular on L and four and three, respectively, on C. They are simple, colorless, delicate and very small, with a peculiar knoblike prominence on one side, beyond which they are prolonged into a very slender, acute tip. On more anterior parapodia these tips are exposed, but farther back they are shorter and concealed between the notopodial lips.

Proboscis, when fully retracted, reaches to somite XLIX, where the jaws lie. None of the specimens has it fully everted. It is most fully so on a cotype (station 4,480) on which it is 8 mm. long and 2 mm. in diameter, cylindroid, of uniform diameter, with four broad longitudinal ridges (one dorsal and one ventral pair) bearing four bands of horny papillæ or paragnaths. These bands extend for nearly the entire length of the eversible proboscis from the jaws nearly to

the base, where they dwindle away. When the proboscis is everted the paragnaths become more or less erect and form a formidable and bristling armature. The ventral bands are borne on a pair of rather sharp ridges and each consists of two series of horny papillæ, those of the more medial series (Pl. XXI, fig. 167) being larger with broad crescentic, flat bases and somewhat bent, acute, conical tops. Those of the more lateral series are more complex (fig. 168), about one-third to one-half as high as the inner papillæ, truncate and bent and bearing on the convex side a thick, horny scale or plate with three short spines at its lower border. Both kinds have a subapical pore and both become smaller toward the jaws, to which the bands nearly reach. Papillæ of the dorsal bands are larger and stouter, especially those of the inner or more medial series, which are clawlike, directed toward the middle line, with a broad base and subapical pore (fig. 169). Supporting these, between and behind them, are three irregular rows of somewhat smaller papillæ similar to the principal ones, except that they are more or less bifid at the apex, a feature which is very obvious on the tall papillæ at the middle of the series (fig. 170). All of these papillæ are very hard and horny and continue to the jaws without material decrease in size, but in the opposite direction, toward the base of the proboscis, gradually become reduced. Between the four armed bands are a few minute spheroid papillæ with roughened summits (fig. 171).

The circle of soft jaw papillæ appears to comprise twenty. Jaws black, the principal pair (fig. 166*a*) ventral, the width of four or five soft papillæ apart, with three (sometimes four) large, clawlike teeth and on the medial side an additional very small tooth or none. No ventral arc of small jaws. Dorsal arch of about thirty small, double, quadridentate jaws consisting of a larger anterior and a smaller posterior pair mostly like *b* (fig. 166), but a few like *c*.

Color variable, pale yellow, light brown, often with bluish reflections, drab, etc., more or less mottled with dusky, and those from station 3,454 exhibiting a few quadrate black spots. The general color of the type is a clear amber-brown with the furrows and median dorsal field bluish-gray and the prostomium pale gray. In the posterior region the color is almost entirely blue-gray, except on the parapodia which retain the brown. Neural eye-spots dark brown, very conspicuous in the posterior region.

Represented usually by single specimens from the following stations: 4,309, 4,310, off Point Loma Lighthouse, near San Diego, 67-78 fathoms, fine sand, green mud and rocks; 4,332, same locality, 62-183

fathoms, gray sand and rock; 4,334, same locality, 514-541 fathoms, green mud and fine sand; 4,436, off San Miguel Island, 264-271 fathoms, green mud; 4,452, 4,453, 4,454, off Point Pinos Lighthouse, Monterey Bay, 49-71 fathoms, green mud, sand and gravel; 4,457, same locality, 40-46 fathoms, dark green mud; 4,464, 4,467, same locality, 36-54 fathoms, soft dark mud; 4,480, off Santa Cruz Lighthouse, 53-76 fathoms, dark green mud and sand; 4,548, off Point Pinos Lighthouse, 46-54 fathoms, coarse sand, shells and rocks; 4,550, same locality, 50-57 fathoms, green mud and rocks.

• *Aricia nuda* sp. nov. Pl. XXI, figs. 172-176.

As usual in the genus, this is a very fragile worm, and no complete examples are known, but only four short anterior ends and a fragment from near the caudal end. The type comprises two pieces not certainly belonging to the same individual: an anterior piece of 41 segments, 31 mm. long, 5 mm. wide and 3.2 mm. deep at somite VIII, and a much more slender and gently tapered piece of 72 segments and evidently from near the caudal end.

Prostomium mammilliform or flattened dome-shaped, bearing a blunt, nipple-like apical palpode about one-half as long as the prostomium, the combined length of both being about equal to the basal width of the prostomium. An obscure, rather large pigment spot or eye at each side close to the base of the palpode. On the ventral side a pair of parallel longitudinal grooves include between them a slightly depressed area ending at the quadrate mouth which is bounded on the sides by the peristomium and behind by a lip derived chiefly from somite II.

Anterior end of body for the first fifteen segments depressed, distinctly wider than deep, both dorsal and ventral surfaces moderately convex. Segments increase rather rapidly in width to VIII or IX, then become more gradually narrower. They are generally from four to six times as wide as long. At XVI, coincident with the shifting of the parapodia dorsad, the segments become much shorter, deeper, much more strongly convex below and flatter above. These conditions are maintained in the slender posterior region. There is no trace of the pectinated ventral fold or ventral rows of papillæ characterizing the more typical species of the genus. Walls of anterior part of body firm, of posterior region rather soft and translucent. Pygidium unknown.

Parapodia begin on I and are biramous throughout, the first fifteen differing from the others in the lateral position and large size of the neuropodium and the fimbriated or pectinated postsetal membrane.

The first two or three are smaller and of simpler structure than the others, consisting of small contiguous notopodial and neuropodial setigerous areas and behind each a postsetal lobe of which the notopodial is narrow, erect and pointed triangular, the neuropodial a low, broad, feebly pectinated fold, corresponding to the larger size of the latter. The neuropodium increases in size rapidly and soon becomes a low platform rising toward the caudal margin and bearing the setæ in a close phalanx of several, gradually rising tiers. They attain the maximum size at IX to XIII on which the setæ palisade is about four times as deep as long, and the now conspicuous postsetal fold bears twelve to fourteen or fifteen marginal processes (Pl. XXI, fig. 172), of which the dorsal is frequently somewhat larger than the others and occupies a more detached position above the setæ. On somites XII to XV, inclusive, the ordinary palisade setæ are much reduced and in part replaced in the dorsal portion of the posterior row by a few stout spines, the dorsalmost of which is very large and provided with a special cirrus, at the base of which opens a large pyriform gland, sometimes visible to the naked eye as a whitish swelling on the surface of the postsetal fold (Pl. XXI, fig. 174). At the same time the entire neuropodium undergoes reduction from the ventral side and the postsetal fold becomes smaller with few marginal processes. Except that it gradually shifts dorsad and becomes larger, with a conspicuous asymmetrical wing on the ventral side of the base, the notopodial postsetal lobe undergoes no change in the anterior region. At somite XVI the neuropodium becomes abruptly reduced in size, turned dorsad as a narrow erect process, which may bear one of two small papillæ on its lateral margin but often lacks them, and is elevated upon a winglike compressed base which unites it to and also bears the notopodium. Just above its base the neuropodium is constricted, and distally is divided into a short, truncate, postsetal lip and a longer postsetal and ventral acute conical lip (Pl. XXI, fig. 173) between which the acicula end and the small tuft of setæ arises. The notopodium of XVI consists of a setigerous tubercle bearing a large spreading fascicle of setæ and provided with an erect, broad, lamellar, asymmetrical ovate, postsetal lip which is abruptly constricted at the end to a slender attenuated tip reaching nearly to the tips of the setæ. On succeeding segments parapodia (Pl. XXI, fig. 173) continue to change in the direction initiated on XVI, the thin basal plate rising higher and the notopodia and neuropodia becoming more slender and erect until they become strictly dorsal, with the two small erect rami elevated on a lamelliform pedicle. The lips of the neuropodium

remain much as described, the presetal short and truncate, the postsetal longer and acute. The notopodial presetal lip is obsolete and the postsetal lip becomes much elongated, narrow and acute, with strongly constricted base. The postsetal lobes of both rami contain numerous irregular long, longitudinal vascular loops quite different in arrangement from those in the gills. Neurocirrus (fig. 173) a slender, pointed process rising a short distance ventral to the neuropodium, obsolete in the anterior region and becoming very small toward the caudal end. Notocirrus wanting unless represented by the gills.

Acicula of anterior parapodia apparently a large number of simple tapering rods not easily distinguished from setæ. On posterior segments there are two or three notopodial and usually one neuropodial acicula, both very slender and tapered. On segments XIII to XV, inclusive, appears a series of five to seven stout, brown spines in a vertical row at the cephalic margin of the much reduced palisade of setæ and which are probably to be considered as modified acicula. The dorsalmost (Pl. XXI, fig. 174) is much larger than the others and projects very prominently and obliquely upward across the interramal space. At its base, as noted above, is a cirrus and large pear-shaped gland. Like the largest of the others, only the tips of which are exposed, the dorsalmost spine ends in a thickened, spearlike, acute point. Among the large spines are some smaller ones with attenuate tips.

Setæ are all simple and of one type in both rami, though differing considerably in proportions and structural details. Omitting the above-described spines, all are more or less acute, tapered and flexible. Notopodial setæ are generally longer and more slender and arranged in dense fan-shaped fascicles on anterior somites and in delicate tufts of a few setæ on posterior somites. Neuropodials of the anterior region form dense phalanges of four to six ranks in which the setæ increase in length and change somewhat in structure from before backward. On the posterior region they form erect tufts of very few setæ similar in every respect to the notopodials. On the first few parapodia notopodial and neuropodial setæ differ only in length. Both are colorless and slender. The basal portion of the exposed part contains a conspicuous spiral canal (Pl. XXI, fig. 175) wound round a central fibrous axis and more capacious on one side than on the other, so that the axis is somewhat eccentric. Farther out the canal becomes reduced and then obsolete on the side upon which it was least developed, thus leaving an asymmetrical camerated structure, often accompanied by a very minute serrulation which gradually disappears,

leaving nearly smooth, solid capillary tips. On the posterior region the more slender and elongated setæ have the structure of the more delicate parts of the anterior setæ, the basal region with its canal being absent and the shaft provided with minute appressed teeth. No bifurcate setæ, such as are present in *A. johnsoni*, can be detected in this species. In the neuropodium it is evident after a few somites that the shorter setæ of the first rank or two have become dark-colored and have lost both the external serrulation and internal cavity. These changes become emphasized for several segments. Setæ of the posterior rows are of the same type as the notopodial setæ, but have the basal canalization and cameration more evident and the slender solid tips less prolonged. At the ventral end of the fascicle is a small, somewhat isolated tuft of shorter setæ, some of which are simple spines finely serrulated along one margin and a few short blunt spines with the ends enclosed in a mucronate hood. All of these differentiations become more pronounced to somite XI, after which the stout acicular spines appear in association with a conspicuous reduction in the number and size of the other setæ, particularly those of the anterior rows. In this region the small ventral tuft is composed entirely of a few small hooded spines (fig. 176), below which is a second tuft of the largest canaliculated setæ remaining on the neuropodium. In the posterior region the neuropodial setæ have exactly the structure of the notopodial, but are fewer in number.

Branchiæ begin on somite V of all specimens, rising from the dorsal area as a pair of foliaceous, rather broadly lanceolate processes barely reaching to the notopodia and separated by a distance greater than their length. Proceeding caudad, they regularly increase in length and size (Pl. XXI, fig. 172) until by somite XL their length is about three-fifths the width of the body, their form foliaceous lanceolate and posture erect. On the posterior piece they have become fully one-and-one-half times the body width and taper to filamentous tips, being therefore much elongated and very conspicuous (Pl. XXI, fig. 173). They show no special areas of strong ciliation, but are very richly vascular, having a large axial vessel with a spacious bulbous expansion at the base and a complex bipinniform system of very numerous lateral branches extending to the margins. Anteriorly the gills are quite free from each other and from the notopodia, but as the parapodia assume the dorsal position they become united by a transverse membraneous fold that crosses the whole width of the dorsum.

Proboscis very imperfectly known, only the ends of a few of the lacinated divisions being exposed on any of the specimens.

Color at anterior end pale yellow, fading out and leaving the posterior end nearly colorless and much more translucent. A rather conspicuous series of median dorsal brown spots begins on VII and continues to the caudal end. On some of the specimens the anterior spots are double. The only other color is a slight anterior cuticular iridescence, the obscure eye-spot (?) on each side of the prostomium and a duskiness of certain of the palisades of setæ.

Most of the examples are sexually mature, both males and females occurring, the type being of the latter sex. A specimen from station 4,306 is noteworthy because of the occurrence of abnormalities, the gills of many of the anterior segments being bifid and the postsetal lobes more or less divided into slender often lacinated processes.

Stations 4,306, off Point Loma Lighthouse, vicinity of San Diego, 207-497 fathoms, green mud, fine sand and gravel; 4,327, off Soledad Hill, Point La Jolla, vicinity of San Diego, 263-330 fathoms, soft green mud; 4,339 (type), off Point Loma Lighthouse, 241-369 fathoms, green mud.

#### EXPLANATION OF PLATES XV-XXI.

Unless stated otherwise, all drawings are made from the types.

PLATE XV.—*Chloëia pinnata*, figs. 1-6 (from cotype, station 4,475).

Fig. 1.—Posterior ventral bifid notopodial seta from X,  $\times 98$ .

Fig. 2.—Tip of serrated notoseta from X,  $\times 250$ .

Fig. 3.—Tip of spurred anterior notoseta from near notocirrus of X,  $\times 98$ .

Fig. 4.—*a* and *b*, respectively, tips of stout and slender neurosetæ from X,  $\times 250$ .

Fig. 5.—Tip of anterior neuroseta from X,  $\times 98$ .

Fig. 6.—Same of somite I,  $\times 250$ .

*Euphrosyne limbata*, figs. 7-11.

Fig. 7.—Fifth gill from somite X, incomplete,  $\times 40$ .

Fig. 8.—Main division of 3d gill from X,  $\times 56$ .

Fig. 9.—Large notoseta of X,  $\times 98$ .

Fig. 10.—Ventral neuropodial of X,  $\times 98$ .

Fig. 11.—Dorsal neuropodial of X; *a*, end of another with wider angle of divergence of the spur,  $\times 98$ .

*Euphrosyne dumosa*, figs. 12-17.

Fig. 12.—Gill from somite XV of cotype (station 4,470),  $\times 56$ .

Fig. 13.—Large smooth notopodial seta from 2d row of X,  $\times 98$ .

Fig. 14.—Small same from 3d row,  $\times 98$ .

Fig. 15.—Bifid serrate notoseta from X,  $\times 98$ ; *a*, tip of same,  $\times 250$ .

Fig. 16.—Ventral neuroseta from XV,  $\times 98$ .

Fig. 17.—Dorsal same,  $\times 98$ .

Fig. 18.—*Nereis procera*, parapodium L of male epitoke from station 4,355,  $\times 40$ .

Fig. 19.—*Platynereis agassizi*, two mature eggs from cœlom of epitoke from station 4,355,  $\times 56$ .

*Eunice multipectinata*, figs. 20-23.

Fig. 20.—Parapodium and gill from somite XXV,  $\times 17$ .

Fig. 21.—Compound seta from XV,  $\times 250$ .

Fig. 22.—Pectinate seta from L,  $\times 440$ .

Fig. 23.—A rather slender ventral crochet from CL,  $\times 250$ .

*Nothria pallida*, figs. 24-28.

- Fig. 24.—Anterior view of 2d parapodium,  $\times 24$ .  
 Fig. 25.—Posterior view of 4th parapodium,  $\times 24$ .  
 Fig. 26.—Hooded crochet from IV,  $\times 360$ .  
 Fig. 27.—Pectinate seta from LXXV,  $\times 440$ .  
 Fig. 28.—End of crochet from XXV,  $\times 250$ .

PLATE XVI.—*Marphysa conferta*, figs. 29-34.

- Fig. 29.—Head and first four segments.  
 Fig. 30.—Parapodium X with gill,  $\times 56$ .  
 Fig. 31.—Parapodium L,  $\times 56$ .  
 Fig. 32.—Compound seta from X,  $\times 440$ .  
 Fig. 33.—Pectinate seta from L,  $\times 440$ .  
 Fig. 34.—Crochet from L,  $\times 360$ .

*Nothria pallida*, figs. 35-37.

- Fig. 35.—Parapodium L,  $\times 24$ .  
 Fig. 36.—Mandibles of cotype (station 4,401) from the venter,  $\times 33$ .  
 Fig. 37.—Maxillæ of same from the dorsum,  $\times 33$ .

*Nothria species?*, figs. 38-40.

- Fig. 38.—Parapodium XXV,  $\times 24$ .  
 Fig. 39.—Compound crochet from III,  $\times 440$ .  
 Fig. 40.—End of simple-crochet from XXV,  $\times 250$ .

*Nothria hiatidentata*, figs. 41-50.

- Fig. 41.—Anterior end from the dorsum,  $\times 5$ .  
 Fig. 42.—Anterior aspect of 2d parapodium,  $\times 24$ .  
 Fig. 43.—Same of 4th parapodium,  $\times 24$ .  
 Fig. 44.—Parapodium L,  $\times 17$ .  
 Fig. 45.—Tip of a much worn large spine from III,  $\times 250$ .  
 Fig. 46.—End of slightly worn crochet from IV seen in  $\frac{1}{4}$  face,  $\times 250$ .  
 Fig. 47.—End of a pectinate seta from IV,  $\times 440$ .  
 Fig. 48.—End of a large hooded crochet from L,  $\times 250$ .  
 Figs. 41-48 are all drawn from a cotype (station 4,387).

## PLATE XVII.—

- Fig. 49.—Ventral view of mandibles of cotype,  $\times 24$ .  
 Fig. 50.—Dorsal view of maxillæ of same,  $\times 24$ .

*Onuphis parva*, figs. 51-57, all from cotype (station 4,446).

- Fig. 51.—Posterior aspect of parapodium III,  $\times 56$ .  
 Fig. 52.—Anterior aspect of parapodium V,  $\times 56$ .  
 Fig. 53.—Same of parapodium XXV,  $\times 56$ .  
 Fig. 54.—End of compound crochet of IV,  $\times 600$ .  
 Fig. 55.—Pectinate seta from XXV,  $\times 600$ .  
 Fig. 56.—End of hooded crochet from XXV,  $\times 600$ .  
 Fig. 57.—Slender crochet without guard from L,  $\times 600$ .

*Onuphis nebulosa*, figs. 58-68, all from cotype (station 4,454).

- Fig. 58.—Anterior aspect of parapodium III,  $\times 33$ .  
 Fig. 59.—Same of V,  $\times 33$ .  
 Fig. 60.—Same of L, with gill,  $\times 33$ .  
 Fig. 61.—End of a compound crochet from II,  $\times 360$ .  
 Fig. 62.—End of a compound crochet from VI,  $\times 360$ .  
 Fig. 63.—End of a transition compound seta from X,  $\times 440$ .  
 Fig. 64.—Pectinate seta from X,  $\times 440$ .  
 Fig. 65.—Transition hooded crochet from XV,  $\times 440$ .  
 Fig. 66.—Hooded crochet from LXXV,  $\times 440$ .  
 Fig. 67.—Ventral view of mandibles,  $\times 33$ .  
 Fig. 68.—Dorsal view of maxillæ,  $\times 33$ .

*Onuphis vexillaria*, figs. 69-76.

- Fig. 69.—Anterior aspect of parapodium III,  $\times 24$ .  
 Fig. 70.—Same of V,  $\times 24$ .  
 Fig. 71.—Same of L with gill,  $\times 24$ .  
 Fig. 72.—End of compound crochet from IV,  $\times 440$ .  
 Fig. 73.—Pectinate seta from a posterior segment,  $\times 440$ .  
 Fig. 74.—Tip of a crochet from L,  $\times 360$ .

Fig. 75.—Ventral aspect of one-half of a probably abnormal mandible, represented cut in two,  $\times 24$ .

Fig. 76.—Dorsal aspect of maxillæ,  $\times 24$ .

PLATE XVIII.—*Diopatra ornata*, figs. 77–85.

Fig. 77.—Anterior aspect of parapodium III,  $\times 24$ .

Fig. 78.—Anterior aspect of parapodium XV, with gill,  $\times 24$ .

Fig. 79.—Large compound crochet from 1st foot,  $\times 360$ .

Fig. 80.—A slender compound crochet from 3d foot,  $\times 360$ .

Fig. 81.—A semi-articulated subacicular seta from somite VI,  $\times 360$ .

Fig. 82.—A pectinate seta from C,  $\times 360$ .

Fig. 83.—End of a large simple guarded crochet from C,  $\times 360$ .

Fig. 84.—Ventral aspect of left half of mandible,  $\times 24$ .

Fig. 85.—Dorsal view of maxillæ of cotype (station 4,519),  $\times 17$ .

*Hyalinacia juvenalis*, figs. 86–95.

Fig. 86.—Anterior aspect of parapodium of III,  $\times 33$ .

Fig. 87.—Posterior aspect of parapodium of V,  $\times 33$ .

Fig. 88.—Anterior aspect of parapodium XXV, with gill,  $\times 33$ .

Fig. 89.—Crochet from III,  $\times 360$ .

Fig. 90.—Crochet from XXV,  $\times 250$ .

Fig. 91.—Limbate seta from ventral fascicle of XXV,  $\times 360$ .

Fig. 92.—Pectinate seta from L,  $\times 360$ .

Fig. 93.—Left mandible of cotype from venter,  $\times 33$ .

Fig. 94.—Same of type,  $\times 33$ .

Fig. 95.—Maxillæ of type from the dorsum, somewhat crushed,  $\times 33$ .

Figs. 86, 87, 88 and 93 are from a cotype (station 4,431).

Fig. 96.—Unworn tip of a hooded crochet of a young specimen of *Hyalinacia tubicola stricta*, seen in  $\frac{1}{4}$  face,  $\times 600$ .

Fig. 97.—Same from L of a full-grown specimen,  $\times 250$ .

*Onuphis parva*, figs. 98, 99.

Fig. 98.—Cephalic end of mandible of a cotype (station 4,475), ventral aspect,  $\times 56$ .

Fig. 99.—Dorsal aspect of the maxillæ of the same,  $\times 56$ .

Fig. 100.—Dorsal view of anterior end of *Onuphis nebulosa*,  $\times 9$ .

PLATE XIX.—*Ninoë gemmea*, figs. 101–109.

Figs. 101–104.—Parapodia of V, XV, XXV and CXXV, respectively, profile outlines as seen from in front,  $\times 33$ .

Fig. 105.—Limbate seta from XXV, *a* and *b*, respectively, profile and  $\frac{3}{4}$ -face views,  $\times 98$ .

Fig. 106.—Crochet from XXV,  $\times 98$ ; *a*, tip of another,  $\times 250$ .

Fig. 107.—End of crochet from C,  $\times 440$ .

Figs. 108, 109.—Ventral view of mandibles and dorsal view of maxillæ, respectively, of cotype (station 4,523),  $\times 24$ .

*Ninoë fusca*, figs. 110–118.

Fig. 110.—Prostomium and peristomium from above,  $\times 9$ .

Figs. 111–113.—Parapodia X, XXV and C, the first as seen from behind, the others from in front,  $\times 82$ .

Fig. 114.—Supra-acicular limbate seta from X,  $\times 250$ .

Fig. 115.—Same from C,  $\times 250$ .

Fig. 116.—Crochet from C,  $\times 250$ .

Fig. 117.—Dorsal view of mandibles,  $\times 17$ .

Fig. 118.—Ventral view of maxillæ,  $\times 17$ .

*Lumbrineris japonica index*, figs. 119–127.

Figs. 119–121.—Parapodia X, C and CXVII, outlines as seen from in front, from cotype (station 4,406),  $\times 33$ .

Fig. 122.—Dorsal limbate seta from X,  $\times 98$ .

Fig. 123.—Very slender dorsal seta from L of specimen from station 4,405,  $\times 98$ .

Fig. 124.—Compound crochet from XX,  $\times 250$ ; *a*, head of same,  $\times 440$ .

Fig. 125.—Crochet of somite XLVI,  $\times 250$ .

Fig. 126.—Mandibles from dorsum,  $\times 9$ .

Fig. 127.—Maxillæ from venter,  $\times 9$ . All figures except 123 from cotype (station 4,406).

*Lumbrineris inflata*, figs. 128-132.

Figs. 128-129.—Outlines of parapodia X and C, as seen from in front,  $\times 56$ .

Fig. 130.—Two limbate setae from X in profile and face views,  $\times 250$ .

Fig. 131.—Compound crochet from X,  $\times 440$ .

Fig. 132.—Simple crochet from C,  $\times 440$ .

PLATE XX.—*Lumbrineris inflata*, figs. 133 and 134 (cotype, station 4,496).

Fig. 133.—Ventral view of mandibles,  $\times 83$ .

Fig. 134.—Dorsal view of maxillae,  $\times 83$ .

*Lumbrineris bifilaris*, figs. 135-142.

Figs. 135-137.—Outlines of anterior aspects of parapodia X, C and CCL,  $\times 33$ .

Fig. 138.—Profile of ventral and face view of dorsal limbate seta from somite X,  $\times 98$ .

Fig. 139.—Limbate crochet from somite V,  $\frac{3}{4}$ -face view,  $\times 250$ ; *a*, profile view of tip of another,  $\times 440$ .

Fig. 140.—End of simple hooded crochet from C,  $\times 250$ .

Fig. 141.—Ventral view of mandibles of cotype (station 4,485),  $\times 9$ .

Fig. 142.—Maxillae of same, forceps jaws dorsal, other pieces ventral,  $\times 9$ .

*Aracoda semimaculata*, figs. 143-149.

Figs. 143-145.—Parapodia X, C and CCL, from in front,  $\times 33$ .

Fig. 146.—Dorsal seta from X,  $\times 250$ .

Fig. 147.—Middle seta from LXXV,  $\times 250$ .

Fig. 148.—Outline of mandibles of cotype (station 4,496), — 17.

Fig. 149.—Maxillae of the same from the dorsal aspect,  $\times 17$ . III, IV and V indicate maxillae IV, V, and VI respectively, maxilla III being unlabeled.

*Drilonereis falcata*, figs. 150-154.

Fig. 150.—Anterior aspect of parapodium X of cotype,  $\times 56$ .

Fig. 151.—Anterior aspect of parapodium C,  $\times 83$ .

Fig. 152.—Seta from XXV,  $\times 440$ .

Fig. 153.—Mandibles of cotype (station 4,460) from the dorsum,  $\times 33$ .

Fig. 154.—Maxillae of same from venter,  $\times 33$ .

*Glycera branchiopoda*, figs. 155 and 156.

Fig. 155.—The three forms of proboscis papillae from a cotype (station 4,517), *a*, *c* and *c*, respectively,  $\times 250$ .

Fig. 156.—Jaw appendage of the same,  $\times 56$ .

PLATE XXI.—*Glycera branchiopoda*, figs. 157-159.

Figs. 157-159.—Parapodia X, L and C, respectively, the first and last in caudal aspect,  $\times 40$ , L in cephalic aspect,  $\times 24$ .

*Glycinde armigera*, figs. 160-171.

Fig. 160.—Dorsal view of prostomium of cotype (station 4,310),  $\times 56$ .

Figs. 161-163.—Anterior aspects of parapodia V, XXV and C (concealed outlines dotted),  $\times 56$ .

Fig. 164.—Part of a shorter ventral neuropodial seta from XXX,  $\times 400$ .

Fig. 165.—Exposed portion of a notopodial seta from XXX,  $\times 400$ .

Fig. 166.—Elements of the circle of jaws; *a*, large ventral jaw,  $\times 125$ ;

*b*, one from the dorsal arch,  $\times 250$ ; *c*, *c*, two forms of smaller size from the dorsal arch,  $\times 250$ .

Fig. 167.—Large paragnaths from the ventral bands, in profile and top view,  $\times 250$ .

Fig. 168.—Profile and top views of small papillae (paragnaths) from ventral bands,  $\times 250$ .

Fig. 169.—Two papillae (paragnaths) from dorsal bands near jaws,  $\times 98$ .

Fig. 170.—Large bifid paragnath from dorsal bands,  $\times 250$ .

Fig. 171.—Two of the small scattered papillae,  $\times 250$ .

Figs. 166-171 are drawn from a cotype (station 4,548).

*Aricia nuda*, figs. 172-176.

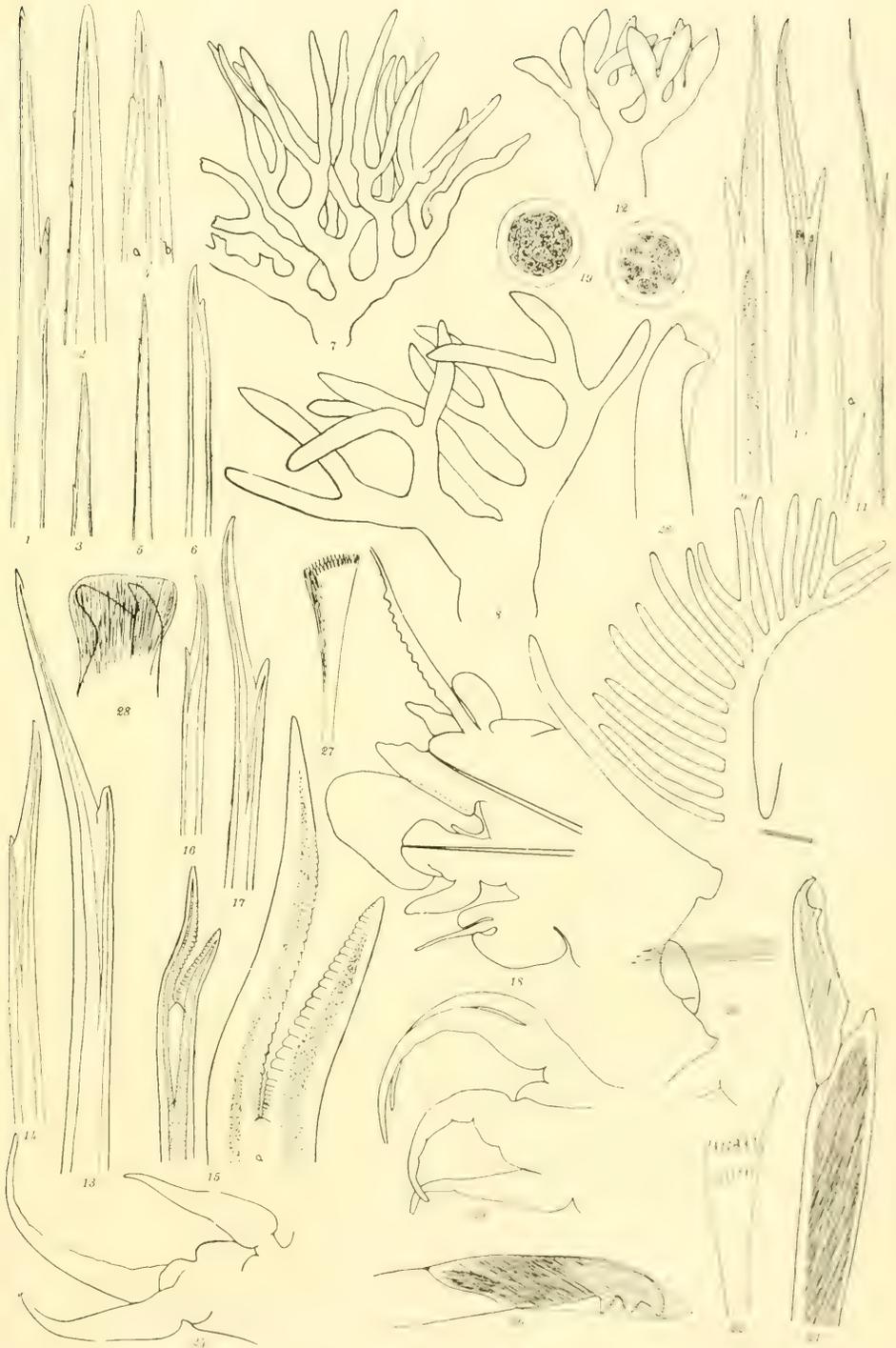
Fig. 172.—Outline of parapodium and gill of X from behind,  $\times 17$ .

Fig. 173.—Same of L from in front,  $\times 24$ .

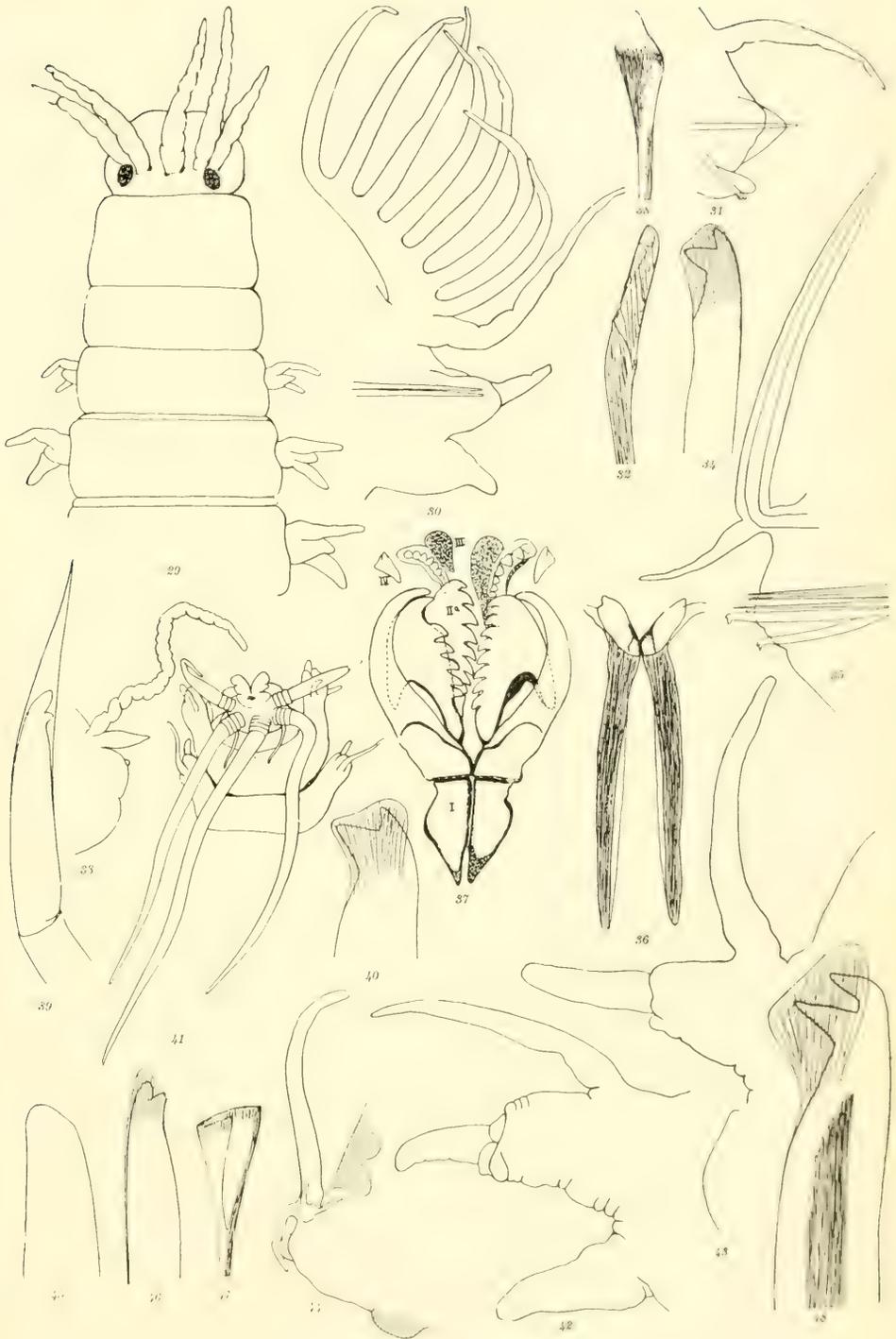
Fig. 174.—Large dorsal neuropodial spine with gland and cirrus from XV,  $\times 56$ .

Fig. 175.—Small portion of base of neuropodial of X; *a*, from the side; *b*, from front,  $\times 600$ .

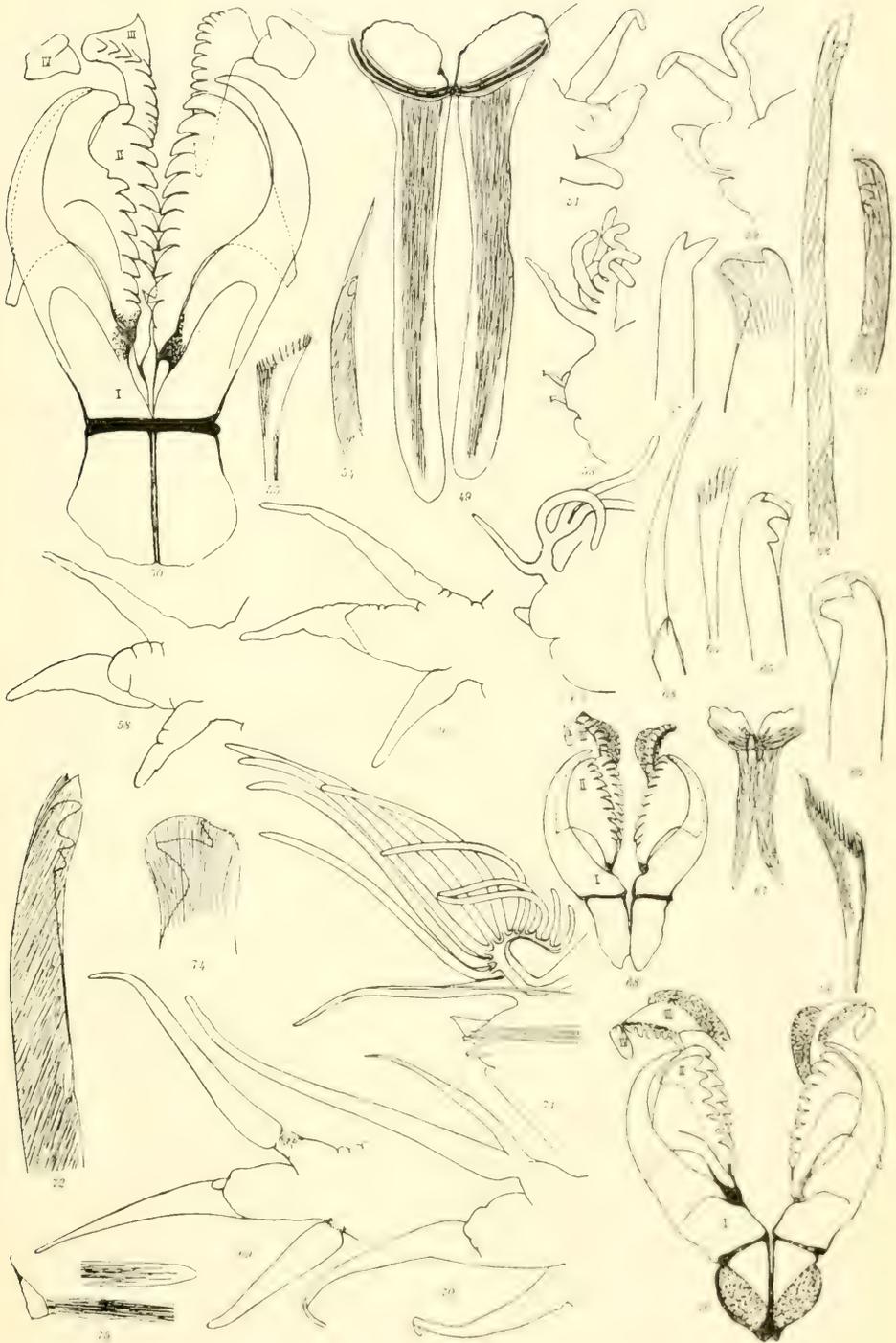
Fig. 176.—Hooded spine from ventral part of neuropodium of XV,  $\times 250$ .





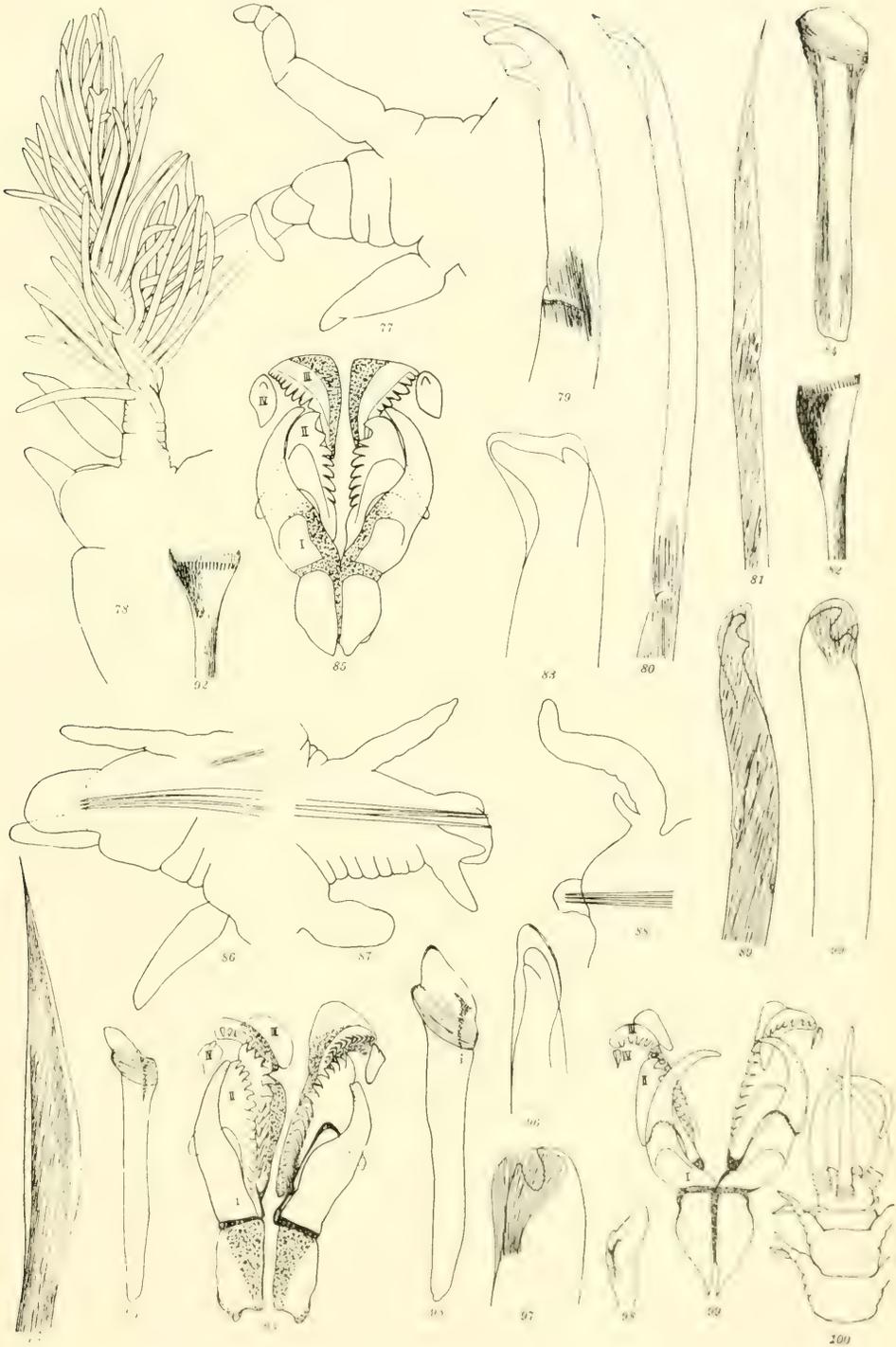




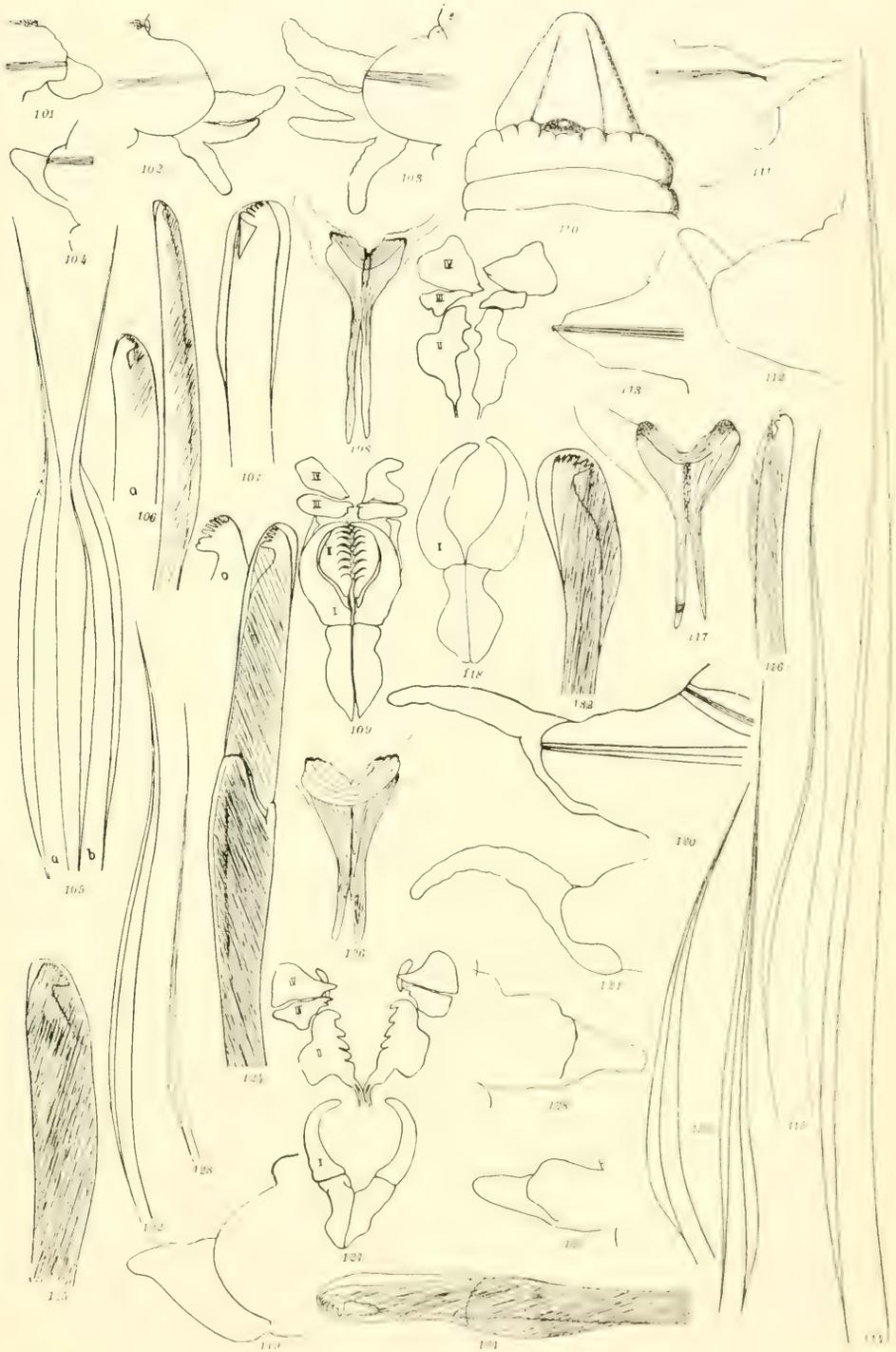


J. P. MOORE: POLYCHAETOUS ANNELIDS.

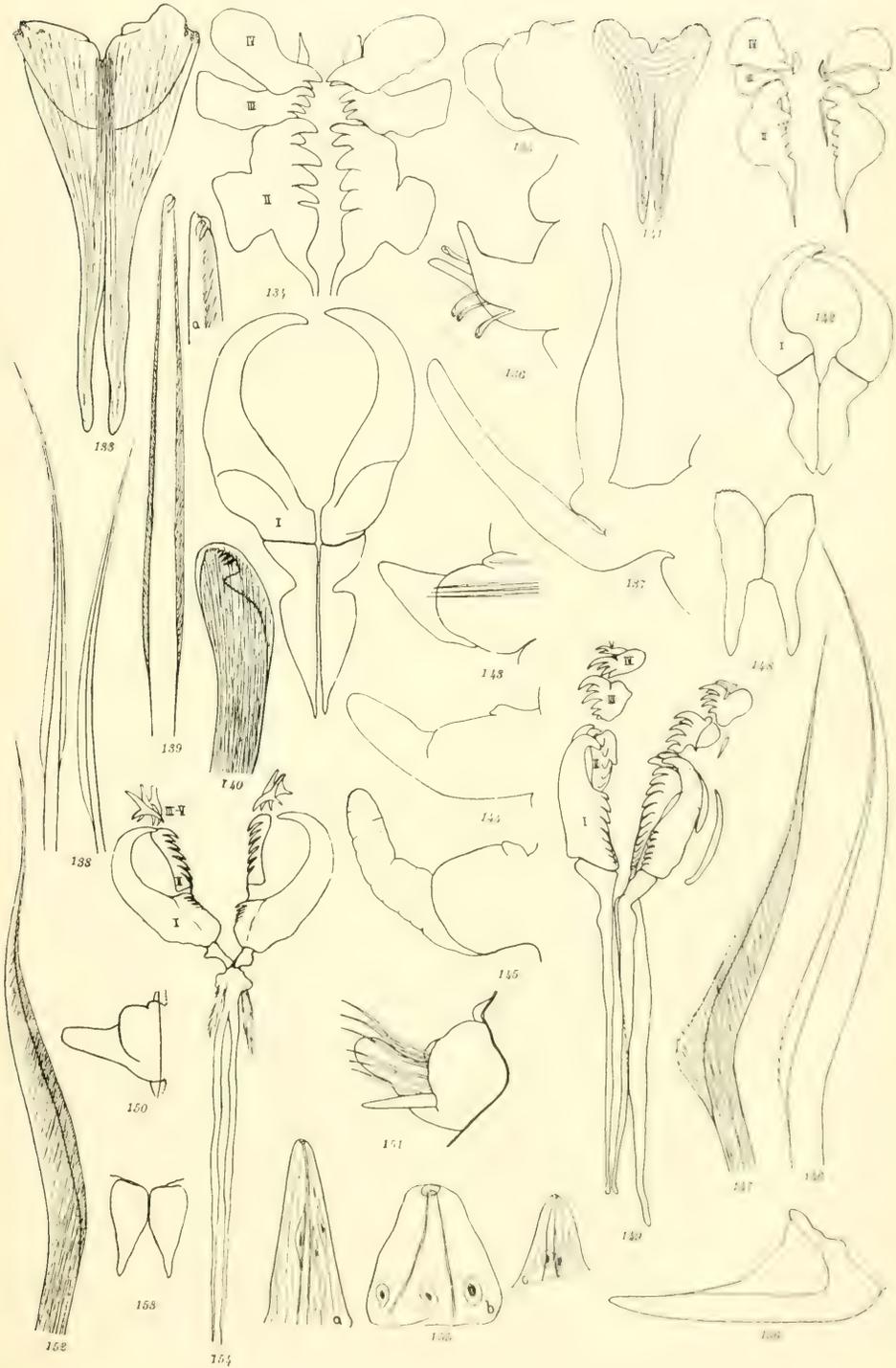




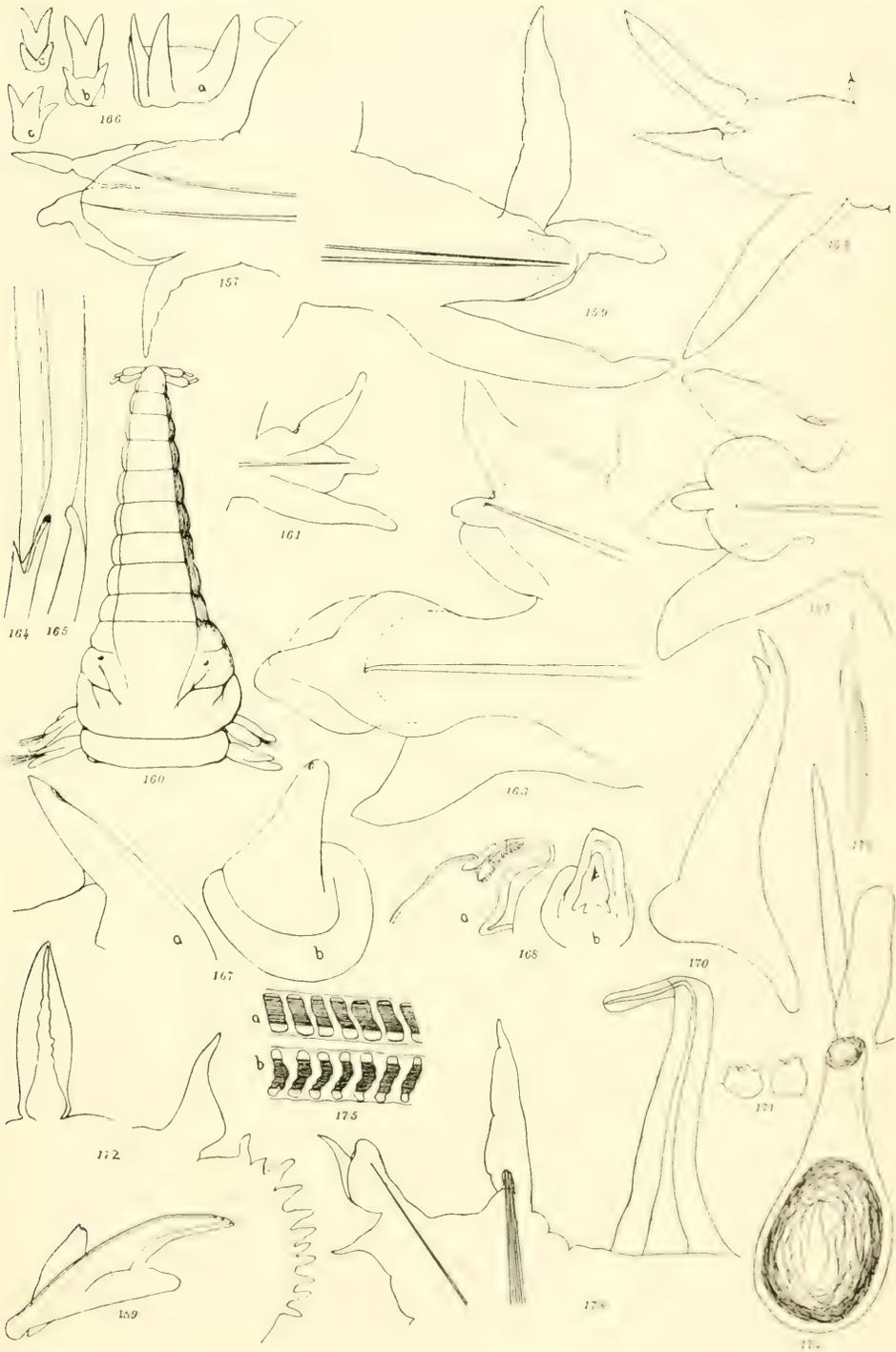












J. P. MOORE: POLYCHAETOUS ANNELIDS.



THE POLYCHÆTOUS ANNELIDS  
DREDGED BY THE U. S. S. "ALBATROSS"  
OFF THE COAST OF SOUTHERN CALIFORNIA  
IN 1904

IV. SPIONIDAE TO SABELLARIIDAE

BY  
J. PERCY MOORE

*Proceedings*  
of  
*The Academy of Natural Sciences of Philadelphia*  
Vol. LXXV, 1923, pages 179-259

NOV 20 1923

262721



THE POLYCHÆTOUS ANNELIDS DREDGED BY THE U. S. S. "ALBATROSS"  
OFF THE COAST OF SOUTHERN CALIFORNIA IN 1904.

IV. SPIONIDAE TO SABELLARIIDAE.

BY J. PERCY MOORE

Three parts of this paper dealing with the Nereidiformia of the "Albatross" collections have been published in these PROCEEDINGS as follows: I, 1909, pp. 321-351, Plates XV and XVI; II, 1910, pp. 328-402, Plates XXVIII-XXXIII; III, 1911, pp. 234-318, Plates XV-XVI. The long delay in the appearance of this fourth and concluding part is due to several unavoidable circumstances. The paper was practically completed in 1911, but before submission for publication the entire manuscript including the figures was unaccountably lost. For a long time, the author was reluctant to believe that it would not be recovered, and took no steps to replace it. Later, he became completely occupied with other work, and only recently has found time to rewrite it.

The text has now been prepared chiefly from the original notes, but supplemented by some additional studies. Some of the drawings have been replaced, and appear on the plates, but unfortunately it has been impossible to redraw all of the figures and as a result this part is less fully illustrated than the others.

In the meantime, several of the species named as new in the original MS. have been described by others, as referred to in the text. The types of all new species are in the collection of the U. S. National Museum, and a set of cotypes and duplicates is deposited at this Academy.

SPIONIDAE

*Spiophanes fimbriata* sp. nov.

The type and most complete example consists of the prostomium and forty setigerous segments, having a length of 22 mm. and a maximum width, including parapodia, at the fifth setigerous somite, of 2.8 mm.

Prostomium subtriangular with the somewhat truncated apex posterior and the base anterior and slightly concave, the angles rounded, and the sides concave anteriorly, slightly convex posteriorly toward the apex. Rim all around a slightly raised welt,

leaving the dorsal surface a little sunken. One specimen exhibits a narrow brown line, probably a row of ocelli, near the anterior border; this is absent or faded in the type. Arising from the truncated apex is a slender, erect tentacle, about as long as the basal width of the prostomium. On the ventral face of the prostomium, is a small median tubercle which fits into a corresponding groove in the peristomium.

Peristomium a small, somewhat horseshoe-shaped ring beneath the prostomium and surrounding the mouth ventrally and laterally. Ventrally it is coalesced with II to form a slightly inflated lower lip. Laterally it is free from II, and bears a pair of rounded bean-shaped parapodial wings or lamellæ, arising at the sides of the prostomium, the two sides curving in front of these into the mouth as a pair of conjoined hooks at the extreme end of each of which is a minute globular appendage. Peristomial cirri (tentacles) are lost.

Anterior setigerous segments slightly depressed, generally about two and one-half times as wide as long ventrally, but much narrower dorsally. With the parapodia, the effect is of a marked ventral convexity and dorsal concavity, though the segments themselves are convex on both surfaces. Greatest width, both with and without parapodia, at the fifth to seventh setigerous somites, behind which the body tapers to about the fourteenth setigerous somite and then remains approximately constant to the end of the piece. Somite III bears on the ventral surface a pair of small approximated papillæ in contact with the caudal border of the lower lip. Succeeding somites each bear a broad glandular ventral plate divided by a transverse furrow into two nearly equal parts; beginning with XVI these are gradually reduced and by XIX have disappeared, after which the somites become smooth as on the dorsum.

At from XVII to XIX the transverse dorsal membrane appears as a low indistinct fold uniting the paired notopodia. This rapidly becomes higher and involves the entire notopodium until by XXIV it is three-fourths as high as the depth of the segment and forms a prominent fold with a frilled, thickened, and apparently glandular margin, and so remains to somite XL at least, the segments of this region having the aspect of a lot of thin, ruffled disks, strung together.

Anterior parapodia are large, their length fully equaling the width of their somites and, being turned dorsad, they impart to the body the broad, depressed, concave aspect of this region. All are biramous and of the same type, but differ in relative proportions of parts. The first four have the two rami separated, the notopodium well dorsad, with a rather prominent anteroposteriorly flattened setigerous tubercle bearing a fan-shaped seta fascicle, and a flattened, slender, lanceolate post-setal lamella. Neuropodia generally similar, but the setigerous tubercle is larger and more

compressed, the seta fascicle larger, but less spreading, and the post-setal lamella more foliaceous, broader, stouter, triangular, and curved dorsad to a semi-erect position that diminishes caudad.

On the fifth and succeeding somites, the two rami are much more closely united, the notopodium directed laterad instead of dorsad, the notopodial setigerous tubercle laterad, and the post-setal lamella small and broadly triangular. The reduction in width of the body from this point caudad is due chiefly to the diminution in size of the parapodial bases, the notopodia at the same time again assuming gradually a more dorsal and erect position, and developing a filamentous tip to the post-setal lamella. This condition reaches its maximum at XVII with the appearance of the dorsal transverse fold, in which the notopodium becomes completely involved a few segments further caudad; it then assumes a more lateral position with the post-setal lobe diminishing in size to a delicate filament which appears like an appendage to the transverse membrane and so continues to the end of the piece (somite XL).

At VI, the neuropodium is thickened and the post-setal lobe is short, thick, blunt, and fleshy, ending in a small round projection bearing several small marginal nodules, probably sense organs. The fleshy thickening quickly becomes reduced and at IX is practically gone. At the same segment, the fascicle of capillary setæ becomes smaller and dorsal, and posterior to it appears a conspicuous black spot which increases in size for five segments and then abruptly disappears. At this point (XV) the neuropodial setæ have become reduced to a minute fascicle in a strictly ventral position and a delicate interpodal membrane appears, uniting successive parapodia at the level of the dorsal border of the neuropodia. This soon becomes a continuous fold forming a series of lateral pockets between the successive transverse folds. There is no trace of branchial or ventral cirri on any segments.

Setæ all simple, faintly colored, but the thicker parts dull and opaque from internal granules. Anterior notopodials form large, spreading, fan-shaped fascicles of numerous slender capillary setæ which curve high over the back. Dorsalmost much the longer, becoming progressively shorter ventrad. Passing caudad, they become fewer, straighter, and somewhat shorter.

Anterior neuropodials (beginning on III and reaching to IX or X) form dense fascicles of very numerous setæ similar to the notopodials but shorter and more strongly curved. They quickly become shortened, forming a dense palisade of very short abruptly tapered setæ. This palisade is then gradually reduced from the dorsum, and the ends of the setæ become even more abruptly tapered and provided with a short filamentous tip. All through this region one or two larger and stouter setæ stand abruptly out as a distinct fascicle from the ventral end of the neuropodium. Appar-

ently at XIX crochets appear, forming a small, almost concealed group below the glandular neuropodial thickening.

Known only from three anterior ends, one each from Stations 4431, off Santa Rosa Island, 38-45 fathoms, green mud, coarse gray sand; 4461, off Point Pinos Lighthouse, 285-357 fathoms, green mud; 4541, same locality, 381-633 fathoms, green mud, sand, (type).

***Spionides foliata* sp. nov.**

Prostomium T-shaped, with a nearly vertical profile, consisting of a broad, sub-crescentic, anterior limb, from the middle of which the gradually narrowing ridge-like longitudinal limb reaches to the second setigerous somite. At the first setigerous somite it bears a small conical tentacle and immediately anterior to this a pair of conspicuous eyes. Peristomium small and completely united with prostomium, forming a pair of lateral wings uniting behind with the parapodia of II and bounding the cirriphoral scars laterally. No peristomial cirri are in place, but several detached ones which fit the scars measure in their contracted state 8 mm. long and 1 mm. in diameter just beyond the contracted base; they taper to a bent end and one margin is strongly frilled.

Body of nearly uniform width, increasing slightly from the head for several segments and then remaining nearly uniform for upwards of one hundred segments, beyond which it tapers very gradually. Segments are all very short, well marked by distinct but shallow furrows, more or less biannulate and with dorsal and ventral surfaces both slightly convex. Caudal end slender, ending in a slightly enlarged sucker-like pygidium bearing twelve small marginal cirri.

Parapodia begin on II and are strictly lateral, not encroaching upon the dorsum anteriorly. First 3 or 4 smaller but after attaining full size at about the fifth they remain practically unchanged in size to the end of the branchial region. Both rami sessile on body wall, less crowded together than those of *S. sacculata*, but just appreciably in contact except on the first six or eight which are separated by a distinct interval. Rami similar, each consisting of broad flat tubercles with small presetal and large foliaceous post-setal lamellæ, between which the spreading fan-shaped setæ fascicles are borne. Anterior neuropodial post-setal lobes are simple ear-shaped lamellæ, strongly convex on the lateral margin and tapering to the sides of the body below. Notopodial post-setal lobes are much larger and rise above the dorsum as erect triangular lamellæ which in some of the larger specimens arch across the back and nearly meet. Except that they increase in size to a maximum, the parapodia undergo no change to about XI, beyond which they begin to decrease in size coincidentally with the appearance of the interpodal membrane and pockets at from XXIX to XXXVII.

As these become large both rami are reduced. Following the disappearance of the gills at XLIII to XLIX the neuropodia are reduced to small setigerous tubercles with only a thin inconspicuous post-setal lobe, being dwarfed by the large interpodal pockets. Notopodia are similar in form but larger and are united with the body above by thin transverse folds and to the neuropodia by similar folds.

Gills begin on III and continue on different specimens to from XLIII to LI, occupying the same position as in *Scolecopsis*. At first very small, by XV they are fully developed and as long as one-half the body width, semi-erect, slender, tapered, lanceolate and marked on the caudal face with numerous plications corresponding to the arrangement of the blood vessels. At about XXXV, they begin to diminish in size, the last few usually being mere tubercles, and disappear at from XLIII to LI according to the size of the specimen.

Both rami of anterior somites bear dense fan-shaped fascicles of internally granular, yellowish, strongly curved setæ in two series, the only difference being that the notopodials are somewhat longer. Passing caudad they gradually become less curved and reduced in size and number, finally forming small fan-shaped fascicles of straight setæ in two ranks, those of one being much more delicate than those of the other. A few small hooded crochets appear in the middle of the neuropodial fascicles immediately succeeding the branchial region, but they replace the setæ much more gradually than in *S. sacculata* and are always fewer, much smaller and much more inconspicuous. For example, at LX, there are 22 neuropodial setæ and two crochets; at LXXX, 12 setæ and 10 crochets.

No specimen is complete and a region of uncertain length between the middle and the caudal segments is unknown. The most complete specimen, designated as the type, consists of the head and 111 setigerous segments. This is 62 mm. long, with a maximum breadth of 4.2 mm. Other specimens vary from 1.5 to 5.2 mm. in width.

Stations 4343, off S. Coronado Island, 55-155 fathoms, fine gray sand; 4428, off Santa Cruz Island, 764-891 fathoms, green mud; 4430, off Santa Cruz Island, 197-281 fathoms, black sand and pebbles; 4457, off Point Pinos Lighthouse, 40-46 fathoms, dark green mud; 4464, same locality, 36-51 fathoms, soft, dark gray mud, (12 specimens); 4524, same locality, 213-228 fathoms, soft gray mud; 4549, same locality, 56-57 fathoms, coarse sand, (type and 2 others); 4550, same locality, 50-57 fathoms, green mud; 4552, same locality, 66-73 fathoms, green mud; 4557, same locality, 53-54 fathoms, rocks.

*Spionides sacculata* sp. nov.

Prostomium somewhat T-shaped, without distinct carina; transverse limb nearly as long as longitudinal, slightly recurved at lateral ends; longitudinal limb thickened in front where the profile is steep, rising to a compressed narrow ridge in the middle and terminating in a narrow, tapering posterior portion, that fades out on the dorsum of somite III. Over the peristomial region a small, erect, conical tentacle arises from this ridge and just anterior to this is one pair of small eyes, one on each side of the ridge. On the ventral side the prostomium is closely united with the peristomium which here forms a prominent swollen lip dorsal to which the conspicuous lateral wings project, unite with the parapodia of II behind and, together with the prostomium, enclose the scars of the detached peristomial cirri.

Setigerous somites short, generally one-fourth or less of width, convex dorsally, venter with a deep neural groove, biannulate, most conspicuously so on the venter, the posterior ring slightly larger and bearing the parapodia. Caudal end and pygidium unknown.

Parapodia difficult to study on account of crowding and fragility. All are biramous, the two rami crowded closely together and sessile. On anterior segments they occupy the full depth of the lateral face of the segments and extend on to the dorsum across which the postsetal lobes of the notopodia of the first 5 or 6 meet. Neuro-podia more uniform, consisting of a broad ear-like postsetal lamella anterior to which the broad fan-shaped fascicles of capillary setæ spread dorsad, laterad and curve caudad, being borne on a broad tubercle lacking a distinct presetal lobe.

At about XXX (XXIX-XXXII), the interpodal membrane connecting the dorsal borders of successive neuropodia appears and forms a series of conspicuous pockets widely open above and with their bottoms at the level of the ventral surface. After these reach their full development in the middle region the neuropodia gradually decrease in size but undergo no change in form. Neuro-podia of this region also become smaller and restricted to the sides of the segments but as far as known (to LXXXV) remain larger than the neuropodia and free from the interpodal membrane.

Dorsal transverse membrane much less conspicuous than in *S. foliata* and many other species, reaching from the dorsal border of the notopodium only about half-way to the middle of the dorsum where they fade out.

Branchiæ begin on III, arising from the caudal face of the dorsal border of the notopodia at the root of the post-setal lobe. At first very small, they rapidly increase in size and by XXV, are erect or semi-erect, tapering filaments as long as the dorsal interspace between the parapodia and arising almost independently of the latter. At about LV, they begin to diminish in size rapidly and within ten segments more, have disappeared.

Both rami bear dense, vertical, spreading fan-shaped fascicles of long curved capillary setæ, the notopodial fascicles being larger and the setæ longer. As the rami become smaller, the fascicles are correspondingly reduced, but the notopodial setæ undergo little reduction in length though becoming straighter and more slender. Hooded crochets appear in the ventral part of the neuropodium at about LV and increase in number as the gills cease and throughout the post-branchial region and soon replace all but a few very small setæ of which some remain in the ventral part of the bundle to the end of the piece. The crochets are stouter than the setæ and darker colored.

There is a broad, nearly black longitudinal neural stripe on both specimens.

Stations 4429, off Santa Cruz Island, 506-580 fathoms, green mud; 4452, off Point Pinos Lighthouse, 49-50 fathoms, green mud; 4525, same locality, 222 fathoms, soft, gray mud, (type).

***Prionospio alata* sp. nov.**

✓Type only known, an example consisting of the head and 52 anterior segments and measuring 29 mm. long and 1.6 mm. wide. Form slender and linear, very slightly depressed and widened in front.

Prostomium a truncated ridge about five times as long as wide; anterior end blunt, slightly rounded and without lateral projections; caudal end more compressed and terminating in a point but apparently lacking a tentacle.

Peristomium biannulate, prolonged forward nearly to the tip of the prostomium, united laterally with II and elevated as a pair of conspicuous, thin, translucent wings with rounded margins which conceal the greater part of the head, including the scars of attachment of the detached peristomial cirri.

Segments well defined by deep furrows which become shallower toward caudal end, the anterior ones very short, but gradually increasing in length until about two-thirds width, the region from X to XX slightly swollen. Anterior segments are faintly biannular with large podal and very short interpodal rings, but the furrow soon disappears.

First parapodium on II, rudimentary and bearing very few setæ. Next four conspicuous and placed at a high level, biramous, the two rami closely united, with small presetal and large foliaceous postsetal lobes, that of the neuropodium sub-triangular with the point directed caudad, the notopodial about twice as large, palatte-shaped, with the broad free ends covering the back. Beginning with VII the parapodia shift more ventrad and the foliaceous post-setal lobes becomes smaller, the dorsal extension of the notopodial and the point of the neuropodial gradually disappearing. By XXV both are much reduced, the neuropodium being a mere

setigerous tubercle bearing a few long capillary setae and the notopodium retaining a small flattened postsetal lobe.

Branchiæ occur on somites III, IV and V, but on the left side only of the latter. Whether they have been lost from other segments is uncertain. They all arise immediately above and very slightly in front of the neuropodium to which they belong and when fully developed are from 2 to  $2\frac{1}{2}$  times the width of the body and stand more or less erect. They consist of tapering, slightly articulated stems, each bearing a double row of about forty flattened pinnæ on the caudal face. The pinnæ begin slightly above the base and increase in size distally. The first and second gills on the right side are evidently in process of regeneration and consist of a delicate filament with rudimentary pinnæ. Apparently all are alike when fully developed.

Setæ bundles form broad dense fan-shaped fascicles, the notopodial being much larger, of long capillaries curving strongly backward. Further caudad, as the parapodia become smaller, the fascicles become more diffuse, the setæ straight and their number reduced. Anterior notopodial setæ moderately stout, strongly curved, tapered to acute tips, nearly colorless, formed of an outer, hard, longitudinally striated shell and an inner more opaque, finely granular core. On the branchial segments, they are longer and curved dorsad, on post-branchial segments shorter and curved rather strongly caudad. At about XIV, they become straighter and more delicate and reduced in number, and continue to be reduced until by L they become very inconspicuous.

Neuropodials are similar to notopodials but shorter and become reduced more quickly. At about XX, crochets appear and by XXV have replaced one-half of the setæ, there being 13-15 small hooded crochets and an equal number of delicate colorless setæ, a condition which continues to LII at least.

Station 4549, off Point Pinos Lighthouse, 56-57 fathoms, coarse sand, shells and rock.

#### CHÆTOPTERIDAE

##### *Spiochætopterus* sp.?

Tubes of two species having exactly the form and structure of those of *Spiochætopterus*, but entirely lacking remains of their fabricators were taken at a few stations.

One is a large form measuring 4-6 mm. in diameter and collected at Stations 4410, off Santa Catalina Island, 178-195 fathoms, gray sand; 4418, off Santa Barbara Island, 238-310 fathoms, black mud and gray sand.

The other form of tube is only 1-1.5 mm. in diameter, long and slender. Stations 4431, off Santa Rosa Island, 38-45 fathoms,

green mud and coarse gray sand; 4461, Point Pinos Lighthouse, 285-357 fathoms, green mud, 4508, same locality, 292-356 fathoms, soft green mud; 4517, same locality, 750-766 fathoms, green mud and sand.

#### CIRRATULIDAE

##### *Audouinia luxuriosus* (Moore)

Setæ and cirri begin on IV. The dorsal gills on VII, VIII and IX appear to be rather more numerous than on the type but are so crowded and tangled that the number cannot be exactly determined. Neuropodial capillary setæ are replaced at LXV by three black spines, transition spines appearing on several preceding segments. Throughout the middle and posterior region, there is a single (rarely 2) very stout black spine. Spines more highly developed than in the type, appearing farther forward and on caudal segments unaccompanied by capillary setæ. In the notopodia the change to spines is much less abrupt and complete. They remain smaller, paler, rarely reduced to a single one (usually two or three) and are usually accompanied by one or more capillary setæ.

A single large specimen from station 4496, off Santa Cruz Lighthouse, 10 fathoms, fine gray sand and rocks.

##### *Tharyx multifilis* Moore.

One poorly-preserved regenerating example 30 mm. long bursting with eggs. Segments 88.

Peristomium triannulate, achætous. Prehensile grooved tentacles arise dorso-laterally from the furrow between the peristomium and first setigerous somite. Remaining somites all setigerous. Branchial filaments all detached, but the scars present on a great many segments immediately in contact with the notopodia.

Station 4461, off Point Pinos Lighthouse, 285-323 fathoms, green mud.

##### *Tharyx gracilis* sp. nov. Plate XVII, figs. 1, 2.

Head region (Plate XVII, fig. 1) generally similar to that of *T. multifilis*, but much more elongated and slender and the dorsal surface of the peristomium thickened and slightly raised above the general surface, appearing as a sort of nuchal cope reaching to the prehensile tentacles. A quadrate ventral area, defined anteriorly by a transverse groove on the prostomium, bounds the mouth in front, while behind and laterally the peristomium forms its boundary.

Metastomium approximately terete with a faint neural groove, tapering regularly and nearly equally both ways from the middle region; the ventral surface smooth. Segments quite simple, very

regular, defined by clear-cut furrows and increasing somewhat in relative length to the middle, where they are three to three and one-half times as wide as long.

Pygidium a minute, slightly compressed, simple ring with the ventral border somewhat produced and the anus a vertical slit.

Prehensile tentacles borne on dorso-lateral region of first setigerous somite immediately above and anterior to the notopodia and beneath the border of the nuchal cope. They are grooved for the entire length, smooth, slender and filamentous and in length probably equal one-half the length of the worm, though owing to their much coiled condition, exact measurements cannot be made.

Branchial filaments nearly as long as the tentacles but much more delicate, arising immediately at the dorsal margin and slightly behind the notopodia. They apparently occur on every setigerous somite except the first and about the last twenty.

Parapodia consist of minute, scarcely elevated notopodia and neuropodia separated by a slight interval. Notopodia bear a small tuft of very delicate colorless capillary setæ, those on the middle segments being nearly as long as the diameter of the worm. Neuropodial setæ (Plate XVII, fig. 2) in a transverse series of seven to twelve, dark colored and except at the anterior end much stouter and not more than  $\frac{1}{4}$  or  $\frac{1}{5}$  as long as the notopodial setæ. Alternating with the acute setæ are short blunt ones.

Color pale buff with a faint pearly iridescence anteriorly.

Type complete, 110 segments, 29 mm. long, 1 mm. diam., ♀ filled with opaque eggs.

Station 4397, off Santa Catalina Islands, 2196 fathoms, gray mud, (type); 4430, off Santa Cruz Island, 197-281 fathoms, black sand, (cotype).

*Acrocirrus crassifilis* sp. nov. Plate XVII, figs. 3-7.

Prostomium and peristomium (Plate XVII, figs. 3, 4) completely coalesced to form an obliquely annular head, opening by a large mouth directed ventrad and forming a convex dome-like over-arching lip above, which, however, projects little beyond the mouth. Prostomium a convex rhomboid area, the anterior angle of which ends in a narrow, strongly compressed vertical ridge lying between the bases of the cephalic tentacles and reaching ventrally to the anterior margin of the mouth. At its dorsal end, the ridge bifurcates into a pair of raised lines which skirt the anterior borders of the prostomium to its lateral angles. These angles are completely occupied by a pair of remarkably large eyes having a diameter of fully one-fourth the width of the prostomium. These eyes are directed forward and immediately behind them and in line with their medial borders, so close indeed as to be in contact with the large eyes and distinguished from them with difficulty, is a pair of minute eyes directed caudad. A faint white line passes trans-

versely across the prostomium in front of the eyes and two similar lines parallel and very close together behind the eyes, along what is apparently the pro-peristomial boundary.

Representing the peristomium is an annulus, narrow dorsally and expanded ventrally to reach forward nearly as far as the anterior end of the prostomium. It forms prominent, much furrowed, pouting lips, surrounding the large antero-posteriorly elongated mouth, in front of which is a pair of transverse, compressed cushion-like elevations probably representing the palps. Immediately dorsal to these, below the eyes and separated from each other by the anterior frontal ridge only, are the large, prehensile tentacles, which are thick and transversely grooved at the base and in the contracted state, in which they exist in this specimen, reach to somite XXV. These tentacles are similar to those of the *Spionidae* and apparently belong to the peristomium, though v. Marenzeller and some others consider them to be prostomial.

The metastomial region is somewhat depressed, with the venter flattened and the dorsum regularly arched, but posteriorly it becomes nearly terete. It increases in width to about XXX and then gently narrows to the caudal end which is terminated by a short dome-shaped pygidium with a vertical slit-like anus. Except for the first two, which are coalesced ventrally, the somites are well defined by sharp furrows. The first is very short, the second, equally short ventrally, but much longer dorsally. Succeeding ones become gradually longer until by XXXV, they are about one-half as long as wide, which is about the proportion maintained for the rest of the length. The anterior twenty are somewhat contracted and marked by cross-furrows which divide them more or less irregularly into three or four secondary annuli. In the middle and posterior region these furrows disappear and the surface becomes smooth.

Beginning at the furrow II/III and continuing to XXIII/XXIV, are very obvious, though small, intersegmental pores in the median dorsal line. Caudal of that point they can no longer be detected.

Four pairs of stout, round, smooth, slightly tapered notocirri or gills are borne on the first four metastomial segments (II-V). At the base they are about as thick as the cephalic tentacles and equal in length the anterior 18 to 22 segments. All arise near the dorsalmost level of their segments, but the first and last are most ventral, the second slightly higher and the third still higher. Below the second is a small achætous tubercle not present in relation with any of the others.

Somites I to IV are achætous (Plate XVII, figs. 3, 4), V bears a setigerous neuropodial tubercle and all of the others both neuropodia and notopodia bearing setæ. All parapodia are simple ventrolateral elevations, each divided by a slight depression into a small neuropodial and notopodial papilla of which the former is most

prominent. Ventral to the neuropodium are three or four small detached papillæ in a transverse row; and other still smaller papillæ continue the series behind and above the neuropodium. On more caudal segments these papillæ become greatly reduced.

Neuropodial setæ fascicles consist of three or four rather large compound crochets (Plate XVII, figs. 5, 6) alternating with as many much smaller straight or slightly curved simple pointed spines (Plate XVII, fig. 7). Compound setæ are nearly colorless, flattened and very finely striated; stem curved chiefly at the point of emergence, beyond which it becomes widened to an unequally bifurcate end connected with the appendage by a thin, flexible membrane; appendage tapered to a strongly hooked pointed tip, beneath which is a peculiar thin, transparent, scale-like guard which projects slightly beyond the main point, the whole having the bird's-beak aspect of the setæ of many Sigaleonidæ. On anterior parapodia the appendages are much longer and become gradually reduced caudad, but throughout the body they are always longer proportionally to the width than the one figured by v. Marenzeller for *A. validus*.

Notosetæ are simple, very slender, straight and apparently normally smooth capillaries, on most segments having a length nearly equaling the diameter of the body. On a few of the anterior segments only one or two occur in a fascicle but usually there are 4-6.

Type only known, 104 segments, length 77 mm., maximum diam. (XXX), 3 mm.

Station 4430, off Santa Cruz Island, 197-281 fathoms, black sand.

**Dodecacaria pacifica** Fewkes.

Besides several pieces of rock, bearing populous colonies of tubes, there are twenty-five extracted and well-preserved worms which agree with specimens described from Monterey Bay. Some are deep black throughout, others dark brown, either throughout, or with the caudal end black. Usually the first five notocirral gills are equally enlarged, the fifth sometimes somewhat smaller and followed by from two to five (usually four) much shorter filaments. One example is peculiar in that the first three pairs of gills are enlarged, the fourth very small and the fifth and sixth again enlarged.

Although the rock to which they are attached is an impure fossiliferous limestone easily and almost completely soluble in HCL, the worms have actually excavated its surface very little. They cover it to a depth of two or three inches with a solid mass of intricately interlacing tubes, cemented together firmly and forming rounded nodules, to the surface of which the tubes of other annelids and various other sedentary animals are attached. When the mass is broken it is found to consist exclusively of tubes

and channels containing hundreds of the more or less mutilated worms.

Station 4496, off Santa Cruz Island, 10 fathoms, fine gray sand and rocks; 4502, same locality, 9-11 fathoms, hard sand.

#### TEREBELLIDAE

##### *Artacama conifera* Moore.

Of sixteen examples of this species only one (Sta. 4522) is complete with twenty thoracic and sixty-three abdominal segments and measures sixty-eight mm. in length. The pygidium is a rugous ring equal in diameter to those which precede it and bearing a few small papillæ but no cirri. Several have the proboscis exerted. It consists of a rugous basal ring and a slender cone thickly studded with small papillæ.

Station 4485, off Santa Cruz Island, 39-108 fathoms, soft green mud; 4510, off Point Pinos Lighthouse, 91-184 fathoms, gray mud; 4522, same locality, 130-149 fathoms, gray sand and shells; 4523, same locality, 75-108 fathoms, soft, dark mud.

##### *Leæna gracilis* sp. nov. Plate XVII, fig. 8.

The type and only known specimen is a well-preserved, slender and nearly complete worm measuring 38 mm. long by 1.2 mm. in diameter and consisting of 44 segments, 18 of which are thoracic. Setae begin in IV, uncini on V.

Prostomium a thick, prominent, arched bilobed plate bearing about a dozen tentacles, the longest about twice the maximum diameter of the body; others have become detached. Mouth small, largely overarched by the prostomium and bounded ventrally by the peristomium.

Peristomium nearly twice as long dorsally as ventrally, forming above a low fold projecting over prostomium, and below a smooth lip divided into two rings by a transverse furrow. Somite II is less than one-half and III less than two-thirds the dorsal length of I, both with thick lateral prostomial projections, otherwise quite smooth and simple. IV is precisely similar except that the dorsal-most and most prominent part of the parapodial projection bears a small tuft of setae. A very minute tubercle or vestigial cirrus occurs on III above the level of the parapodium. There is no trace whatever of gills.

Remainder of body of nearly uniform diameter, tapering very gently. Thoracic segments not indicated by furrows but only by the parapodia and ventral plates; they increase in length very slowly to XI and behind that more rapidly, the posterior thoracic and anterior abdominal being each about two-thirds as wide as long. With the exception of the first two or three, abdominal

segments are about as long as wide and separated by clearly defined furrows. The dorsal two-thirds of the thoracic segments takes the form of a perfectly smooth continuous arch, the ventral one-third of a pair of broad, prominent, muscular, parapodial ridges which are separated by the ventral plates anteriorly and by the neural groove posteriorly, the latter continuing on to the abdomen. The last abdominal segment is similar to the others and may not be the true pygidium but a regenerated ring.

Anterior ventral plates are thick, ill-defined, glandular areas filling the entire space between the parapodia. They begin to be differentiated at VII, and those on VIII to XI are distinct, broadly elliptical areas, the last (on XII) being very small and divided into halves by a median groove.

Parapodia begin as prominences on the side of II and for several segments form a continuous ridge not clearly defined from the ventral plates. With the differentiation of the ventral plates, the parapodia also become distinct and form short, thick, prominent tori in the thoracic region never exceeding a length of  $\frac{1}{4}$  or  $\frac{1}{5}$  the circumference of the body. On III, there is a minute cirrus just above each parapodium; none is evident on other segments. Abdominal parapodia are small, prominent, backward projections from the caudo-ventral-lateral region of the somites. The first two segments (XIX and XX), which lack setæ, have tori of a transitional type and may be expected to bear setæ in some specimens.

Small compact setæ tufts arise from the dorsal ends of the parapodia on fifteen segments (IV to XVIII) and curve strongly dorsad. The setæ are rather long, slender, strongly curved and have a narrow wing and very delicate flattened tips. Uncini (Plate XVII, fig. 8) begin on V and form single series to X, double series for the remainder of the thorax. Number of uncini always small, 46 on VII, about 36 on each row of X, about 40 on each row of XVIII. They have a small body with narrower base than those of *L. nuda*; large head with strongly hooked beak and large, high crest, consisting of about six rows of from six to ten spines and very obscure guard. Abdominal uncini are in a single series (32 on XXV) and are similar to the thoracic but smaller and more delicate.

A small portion of tube is formed of fine mud and is very fragile.

Type only known. Station 4526, off Point Pinos Lighthouse, 204-239 fathoms, soft gray mud.

*Polymnia nesidensis* v. Marenzeller subsp. *japonica* Moore.

A single example appears to be of this form, hitherto known only from Japanese waters. It differs from the European *P. congruens* v. Marenzeller, in the strictly dichotomous branching of the gills. Gills three pairs, differing much in size; those of the first pair largest, with tall erect stems branched dichotomously eight or nine

times to the short terminal twigs. Third pair very small. Eyespots brown, very numerous, in a crowded transverse band with a short median interruption. Small lateral wings or flanges on II and III, the former about twice the size of the latter and more ventral in position. Ventral gland plates rather ill-defined, fifteen or sixteen in number and occupying the entire space between the ventral ends of the tori. Anterior ones are rugous with longitudinal furrows, and the last one is very indistinct.

Station 4399, lat.  $32^{\circ} 44' 50''$  N., long.  $117^{\circ} 48' 45''$  W., 245-285 fathoms, fine gray sand, rocks.

**Amphitrite robusta** Johnson.

Numerous specimens agree perfectly with Johnson's description and with examples from Alaska but some of the larger ones from Stations 4415 and 4427 have the gills much more richly branched with more numerous terminal filaments.

Stations 4310, off Point Loma Lighthouse, 71 fathoms, fine sand and shells; 4405, off San Clemente Island, 654-704 fathoms, green mud; 4415, off Santa Barbara Island, 302-638 fathoms, green mud; 4421, off San Nicolas Island, 238 fathoms, fine gray sand and rocks; 4425, same locality, 1084-1100 fathoms, green mud, fine sand, *Globigerina*; 4427, off Santa Cruz Island, 447-510 fathoms, black mud and rocks; 4430, same locality, 197-281 fathoms, black sand and pebbles; 4460, off Point Pinos Lighthouse, 55-67 fathoms, green mud, *Globigerina*; 4461, same locality, 285-357 fathoms, green mud; 4496, same locality, 10 fathoms; fine gray sand and rocks; 4517, same locality, 750-766, green mud and sand. Most plentiful at 4427.

**Amphitrite radiata** Moore.

A complete example is 37 mm. long exclusive of the tentacles and 3 mm. in diameter. Segments 64, IV-XX setigerous. Gills—three pairs on II, III and IV, having 16, 14 and 11 filaments respectively. Slight wings on the same segments and cirri on VI, VII and VIII.

Station 4421, 447-510 fathoms, black mud and rocks.

**Pista cristata** Müller.

In all sixteen specimens, some of which are excellently preserved, of this European species were studied. Most of them are 80-90 mm. long and 3-3.5 mm. in diameter, with three plume-like gills of the usual form and of very unequal size, but one has all four

gills developed, the anterior right one being by far the largest. Except for the more delicate stem, the uncini agree perfectly with the North Pacific specimens previously described.

Stations 4322, off Point La Jolla, 110 fathoms, green mud and shells; 4461, off Point Pinos Lighthouse, 285-357 fathoms, green mud; 4464, same locality, 36-51 fathoms, soft dark gray mud; 4475, same locality, 58-85 fathoms, soft green mud; 4485, off Santa Cruz Lighthouse, 39-108 fathoms, soft green mud and sand; 4510, off Point Pinos Lighthouse, 91-184 fathoms, green mud; 4522, same locality, 130-149 fathoms, gray sand and shells; 4523, same locality, 75-108 fathoms, gray sand and shells; 4523, same locality 75-108 fathoms, soft dark mud.

***Pista disjuncta*** sp. nov. Plate XVII, fig. 9.

The distinctive characteristics of this species are the large size of the gills and especially the great distance separating those of the two sides, and the reduced size of the second pair of cirri.

Prostomium scarcely arched, being a nearly straight transverse fold strongly reflexed ventrad at the sides to form conspicuous lateral lobes, its free margin upturned as a somewhat frilled membrane covering the bases of the tentacles which spring from a thick fold. Tentacles mostly detached, but evidently more numerous than in *P. brevibranchiata* (= *fimbriata*.)

Peristomium a tumid lip ventrally, divided dorsally by a transverse furrow into two rings; wings scarcely developed, the sides being somewhat thickened, and connected with the lateral lobes of the prostomium.

Somite II is distinct all round, nowhere with glandular thickenings but somewhat tumid below, and bears a pair of small wings at the neuropodial level. On each side, separated from each other by a wide interval equal to about half the width of the segment is a slight forward projection bearing the first gill. Both transversely and longitudinally, III is a considerably larger segment, resembling II ventrally, but with the narrow distally rounded lateral wings, which project stiffly outward and upward at a higher level and larger than those on II, but decidedly smaller than the corresponding part of *P. brevibranchiata* and other species. Immediately dorsad of each wing is a groove and above this a glandular thickening continuing forward into the projection bearing the gills which lie caudo-laterad of those on II. On the dorsum is a large smooth interbranchial area as long as I and II combined. This branchial and prebranchial region of the worm is distinctly flattened, but beginning with IV the form is terete or nearly so. Otherwise IV is similar to III, but the lateral wings are replaced by narrow frills which closely resemble typical tori and bear setæ

tufts but no gills. Remaining thoracic segments are very similar, well differentiated by distinct furrows. Dorsally they are smooth and arched, all, except the most anterior, with a transverse furrow separating a shorter posterior, from a longer anterior annulus. Ventrally slightly flattened, with rather conspicuous ventral plates which become more prominent to XIX where they abruptly cease, there being none on the last thoracic segment.

Parapodia well developed, with prominent setigerous tubercles from IV to XX, bearing flat tufts of setæ. Uncinigerous tori begin on V. The second is the longest, equaling about  $\frac{1}{7}$  of the circumference of its segment. Succeeding segments decrease regularly in length to the last which is slightly more than  $\frac{1}{2}$  as long as the second; first about equals the eighth or ninth. Small cirri, retractile into pits, occur just above and behind the setæ tufts of VI and VII, but are much smaller than those of *P. brevibranchiata*.

Gills two pairs, arising from tubercles on the extreme dorso-lateral region of II and III, easily detached and regenerated and consequently always of unequal size, the left anterior being largest on the type and one other, the right anterior on others and the left posterior on still another; several have all gills missing. When fully developed they are very large and bushy, and conceal the anterior end of the body. Stalk short, thick and flattened, divided abruptly into several (about 5) large branches, which immediately subdivide repeatedly six or seven times to the terminal filaments. The branches are long, low, spreading, and densely crowded, probably giving in life an aspect very different from the smaller and more erect gills of *P. brevibranchiata*. The smallest and presumably youngest gills are simpler, with the main branches only developed, others appearing with increase in size.

Colorless in preservation except the dorsum of the first five segments which are deep brown and very highly vascular.

Setæ form conspicuous tufts and except that they are stouter and have less prolonged tips are similar in form and arrangement to those of *P. brevibranchiata*. Uncini (Plate XVII, fig. 9) of thoracic segments with prominent stout beak and high full crown, composed of about six transverse series of numerous crowded teeth. Guard well developed and breast full and prominent. On anterior somites they have the prolonged stem-like bases characteristic of the genus, but behind X, where the setæ are arranged alternately in two rows facing each other, they are more slender, with fewer teeth in the crown, more delicate guards and the stout stem replaced by a delicate ligament. Abdominal uncini are much like the posterior thoracic, but more delicate and possess long filamentous ligaments.

Several are enclosed in fragments of thick-walled tubes of fine mud.

Stations 4307, off Point Loma, 169-490 fathoms, green mud and fine sand; 4331, same locality, 57-58 fathoms, green sand and rocks;

4339, same locality, 241–369 fathoms, green mud, (type); 4402, off San Clemente Island, 542–599 fathoms, green mud; 4406, off Santa Catalina Island, 650 fathoms, green mud; 4436, off San Miguel Island, 264–271 fathoms, green mud, 2 specimens; 4487, off Santa Cruz Lighthouse, 18–19 fathoms, hard gray sand.

**Pista brevibranchiata** Chamberlin.

A species well represented by upwards of forty specimens and which was described in the original manuscript under the name of *P. fimbriata* appears to be this species. It belongs to the *Scionopsis* group, having aborescent instead of bottle-brush-like gills.

If this identification is correct, Chamberlin's single example is not in all respects typical.

Characteristics of the species are the wings and frills which adorn somites I to VII and the form and close approximation of the gills. Typically there are two pairs of gills, but they are always asymmetrical and seldom more than two are well developed. Any one, two, or even three, may be wanting but usually three gills are present, in which case the two best developed are usually placed diagonally and the third is much smaller, very simply branched, or even cirriform. When fully developed, the gills consist of a thick, columnar stem bearing at the top from three to five branches arising at the same level and spreading horizontally. Between these there may be a few small secondary branches. The large branches dichotomize unequally three or four or even six times to form the delicate terminal filaments. In a few cases one or two smaller branches arise from the main stem at a slightly lower level than the main branches as though secondary divisions of these had become independent.

Pairs of small papilliform cirri occur on the dorsum of V, VI, and VII. Those on III lie close to the furrow III/IV and are non-retractile; those on VI and VII lie above and behind the corresponding setæ tufts and arise out of small pits into which they appear to be retractile.

The uncini resemble Chamberlin's figure except that the sinus between the beak and the neck is broader and the guard, instead of being incomplete, is very long and reaches to the apex of the beak but is very delicate. They form a single series from V to X inclusive and on abdominal tori and double interlocking series on XI to XX inclusive. They are large and with well-developed manubrium to X, behind which they become gradually reduced in size and the handle more slender and weaker until it disappears.

Stations 4339, off Point Loma Lighthouse, 241–369 fathoms, green mud; 4364, same locality, 101–129 fathoms, green mud; 4430, off Santa Cruz Island, 197–281 fathoms, black sand and pebbles;

4464, off Point Pinos Lighthouse, 36-51 fathoms, soft dark gray mud; 4467, off Santa Cruz Lighthouse, 51-54 fathoms, soft dark gray mud; 4475, off Point Pinos Lighthouse, 58-142 fathoms, soft green mud; 4485, off Santa Cruz Lighthouse, 39-108 fathoms, soft green mud and sand; 4492, same locality, 26-27 fathoms, soft green mud; 4522, off Point Pinos Lighthouse, 130-149 fathoms, gray sand and shells; 4523, same locality, 75-108 fathoms, soft dark mud; 4552, off Point Pinos Lighthouse, 66-73 fathoms, green mud. Twenty-two at station 4485, 1 to 3 at the others.

**Pista** sp.?

Three specimens of another *Pista*, which may be new, are left unnamed because their very poor state of preservation prevents a satisfactory description. All three are incomplete and the largest measures 5.2 mm. in maximum width.

Gills three pairs, on II, III, and IV, with slender, spirally twisted, erect, tapered stalks, which may be traced to the apex. Branches eight to thirteen, arranged in a spiral, open below but crowded and diminishing in size toward the apex. Each branch consists of a closely crowded tuft of short filaments. As usual in this genus the gills are asymmetrical and differ greatly in size.

The wings, which are developed on somites I-IV, exhibit some striking peculiarities. On I, they are very large, rounded, ventrolateral and bent forward at the sides. II bears an anterior ventral fold only. From a similar but deeper and longer fold on III, there rises just below the level of the gills, a long, prominent, tongue-like extension with a slight spiral twist which reaches forward to a point slightly in advance of the prostomium. The wings on IV are small, subtriangular and project forward at the same level as the free ends of the fold on II.

Parapodia, setæ and uncini have the distribution and form typical of *Pista*.

Stations 4430, off Santa Cruz Island, 197-281 fathoms, black sand, pebbles and rocks, 1 specimen; 4523, off Point Pinos Lighthouse, 75-108 fathoms, soft dark mud, 2 specimens.

**Thelepus branchialis** Treadwell.

In each of the gills the filaments are arranged in two transverse rows. The number of filaments varies greatly, increasing with the size of the specimen, those of the first pair having from 6 to 22, the second, 4-16 and the third, 1-12. Setæ begin on III and continue for from 31 to 41 segments. Uncini may have either two or three apical teeth above the fang.

A few fragments of tubes have the usual form and texture with shells of Foraminifera, minute molluscan shells and fragments of larger ones, sponge spicules, etc., attached to the surface.

Stations 4310, off Point Loma Lighthouse, 71-75 fathoms, green mud and fine gray sand; 4312, same locality, 95-135 fathoms, fine gray sand and rocks; 4359, same locality, 98-220 fathoms, green mud; 4420, off San Nicolas Island, 32-33 fathoms, fine gray sand (8 specimens); 4421, same locality, 229-298 fathoms, gray mud and rocks (2 specimens); 4431, off Santa Rosa Island, 38-41 fathoms, coarse gray sand, some mud, (3 specimens). Only one specimen except as indicated.

***Polycirrus perplexus* sp. nov.**

Prostomium a large flat or usually folded ovoid plate equaling the first nine segments and half as wide as long, usually completely concealed beneath the confused mass of tentacles. Tentacles so numerous and tangled that beyond the fact that they are attached to the dorsum of the prostomium in several rows neither their number nor arrangement can be made out. They are of various lengths and degrees of contraction, some very slender, filiform and terete, others short, broad and flat and more or less folded or grooved.

Peristomium a short ring bounding the mouth, with a short rugous and tumid glandular lower lip or first ventral plate, and expanded above into a triangular area bounded on the two sides and anterior apex by the broad welt-like rim of the enveloping prostomium.

Somite II very short above where it is crowded between I and III. Ventrally it is larger and bears the large ventral plate which is divided into a quadrate anterior portion nearly continuous with the first and a broad transversely elliptical posterior portion, both of which are deeply furrowed longitudinally. Remaining anterior thoracic segments about  $\frac{1}{6}$  as long as wide and more or less distinctly triannulate above and all setigerous. III bears a very short, slightly developed ventral plate divided into a median and paired lateral portions. Besides the three already mentioned, there are nine pairs of large ventral plates and three or four pairs of small ones of diminishing size, all divided by a deep narrow median groove. When best developed the plates are nearly quadrate, about twice as wide as long, thick, swollen and longitudinally furrowed, so deeply on the largest specimens that they have the aspect of being laminated. Posterior setigerous somites taper and grade into the abdominal region. Here the body, exclusive of the parapodia, is nearly terete. The segments are clearly defined, somewhat rugous and terminate in a small conical pygidium.

Anterior parapodia prominent, laterally compressed, truncate cones, the first smaller than the others, projecting dorso-laterad from a level nearer to the venter than the dorsum. The first seven (II-VIII) bear minute rounded tubercle-like tori, lacking uncini, on the ventral face close to the base. Beginning with the eighth (IX) the setigerous tubercles become relatively smaller and the tori much larger and flattened with ear-shaped ends. Farther back toward the end of the setigerous series the parapodia become more ventral in position, smaller and the setigerous tubercle a mere projection from the dorso-lateral angle of the flattened torus. In the abdominal region following the disappearance of the setigerous tubercles the parapodia have much the form of the prolegs of a sphingid caterpillar. The number both of setigerous and of uncinigerous segments is variable, the former running from 26 to 40, beginning always on II and the latter beginning on IX on three specimens and continuing to the caudal end. On a large specimen no uncini can be detected on the first eleven setigerous segments and on another of average size, on the first nine.

Setæ form prominent flattened crescentic tufts and are colorless, capillary and alimbate. Uncini form curved series along the free border of the tori, apparently always arranged in a single series. They are small, colorless and moderately numerous, exceeding 100 on the middle setigerous segments, and are distinguished from those of most species of the genus by the relative prominence of the beak; posterior ligament process also prominent and the ligament long and slender.

The type is 56 mm. long exclusive of the tentacles and 2.7 mm. in maximum diameter. Segments 74, of which 40 are setigerous, beginning with II; uncini begin on IX.

Stations 4430, off Santa Cruz Island, 197-281 fathoms, black sand, pebbles and rocks; 4463, off Point Pinos Lighthouse, 48-111 fathoms, rocky, (type); 4476, same locality, 25-39 fathoms, soft green mud (cotypes); 4496, off Santa Cruz Lighthouse, 10 fathoms, fine gray sand and rocks (fragment of a large specimen, 3.2 in. in diameter).

***Terebellides stroemi* Sars.**

This species is widely distributed on muddy bottoms and was found especially abundant at Stations 4452, 4457, 4485, 4517 and 4522. The species is extremely variable and almost every colony exhibits some slight though definite peculiarities. They may aptly be compared to de Vries' elementary species among plants. These differences find expression chiefly in the form of the crochets and the structure and proportions of the gills.

Stations 4427, off Santa Cruz Island, 447-510 fathoms, black mud and rocks; 4433, off Santa Rosa Island, 243-265 fathoms, green mud; 4436, off San Miguel Island, 264-271 fathoms, green mud; 4452, off Point Pinos Lighthouse, 49-50 fathoms, green mud and fine sand; 4457, same locality, 40-46 fathoms, dark green mud; 4467, off Santa Cruz Lighthouse, 51-54 fathoms, soft dark green mud; 4485, off Santa Cruz Lighthouse, 108 fathoms, soft green mud and sand; 4510, 91-156 fathoms, gray mud; 4513, 389-413 fathoms, green mud; 4517, 750-766 fathoms, green mud and sand; 4522, 130-149 fathoms, gray sand and shells; 4523, 75-108 fathoms, soft dark mud; 4538, 795-871 fathoms, hard gray sand; 4541, 381-633 fathoms, green mud and sand; 4549, 56-57 fathoms, coarse sand, shells and rock; 4550, 50-57 fathoms, green mud and rocks; 4552, 66-73 fathoms, green mud and rocks; 4557, 53-54 fathoms, rocky; all off Point Pinos Lighthouse, Monterey Bay.

***Terebellides stroemi* Sars subsp. *japonica* Moore.**

Four specimens agree exactly with the types in all respects except that the long thoracic crochets have longer beaks.

Stations 4421, off San Nicolas Island, 229-299 fathoms, gray mud and rocks; 4454, off Point Pinos Lighthouse, 65-71 fathoms, green mud and shells; 4482, off Santa Cruz Lighthouse, 43-44 fathoms, soft green mud.

***Terebellides ehlersii* McIntosh. Plate XVII, fig. 10.**

Six specimens agree fully with the description of McIntosh's species taken by the "Challenger" south of the Fiji Islands in 210 fathoms. The long crochets of VIII, (Plate XVII fig. 10), which McIntosh does not mention, are very strongly hooked and quite different from those of *T. stroemi*.

Stations 4382, off N. Coronado Island, 642-666 fathoms, green mud; 4467, off Santa Cruz Lighthouse, 51-54 fathoms, soft dark green mud.

AMPHARETIDAE

***Ampharete arctica* Malmgren.**

A large number of specimens of various sizes agree perfectly with examples of this species reported by me from Alaska. From the typical species as described by Malmgren from Spitzbergen, they differ only in the longer paleoli, with longer, more attenuated mucrons. The paleoli in each fascicle vary from fifteen to twenty-

one according to size of the worm, and the number of setigerous abdominal segments is either thirteen or fourteen. Many contain nearly mature ova or sperm.

Stations all in the vicinity of Point Pinos, Monterey Bay, 4461, 285-357, green mud; 4517, 750-766 fathoms, green mud and sand; 4528, 766-800 fathoms; 4536, 1006-1041 fathoms, hard sand and mud; 4537, 861-1062 fathoms, hard sand and mud (18 specimens); 4538, 795-861 fathoms, hard gray sand and mud (80 specimens); 4546, 849 fathoms, fine black sand.

***Ampharete gracilis*** Malmgren.

Several mud tubes contain fairly well preserved specimens of a small slender species conforming closely with Malmgren's description and figures. The paleoli are twelve to fourteen, colorless, very slender and regularly tapered, forming small inconspicuous fans scarcely reaching the end of the prostomium and not meeting medially.

Stations 4433, off Santa Rosa Island, 243-265 fathoms, green mud; 4468, off Santa Cruz Lighthouse, 32-309 fathoms, fine sand; 4513, off Point Pinos Lighthouse, 389-456 fathoms, green mud.

***Ampharete grubei*** Malmgren.

The three specimens agree in having the prostomium trilobate anteriorly and the paleoli fifteen or sixteen, forming rather compact fans, regularly tapered to attenuate tips but much less slender than those of *A. gracilis*. Pygidium a short ring bearing a circle of eighteen short, slender cirri about as long as one-half the diameter of the pygidium, except that two lateral pairs are twice that length.

Station 4517, 750-766 fathoms, green mud and sand.

***Lysippe annectens*** sp. nov. Plate XVII, figs. 11-13.

Cephalic end and particularly the broad fimbriated lip with much of the aspect of a *Samytha*. Prostomial shield shorter and broader than usual in that genus, nearly quadrate, the apex not bifurcated and less prominent than in *S. sexcirrata* and without upturned border. A pair of short prominent transverse series of small eye-spots near the posterior border of cephalic shield. Lateral lobes very small. Margin of lower lip fimbriate, crenulate and furrowed. Tips only of numerous very short smooth tentacles exposed.

Branchial fold high and prominent, transverse, on IV and V, bearing four pairs of distinct scars in the usual pattern, the two inner posterior nearly in contact, the outer posterior connected

by a narrow ridge with the setigerous tubercle of VI. One specimen (the type) has three gills in place, each having a length of three times the width of the thorax and in form inflected, rather thick and tapering to acute tips.

Thorax of twenty segments, of which III bears paleoli and the following seventeen true setæ fascicles. Up to X, the segments are short and crowded and bear distinct gland plates. Behind X, they become elongated and the gland plates undergo reduction in size and become scarcely discernible.

Abdominal segments ten, tapering, the dorsal cirri nearly obsolete. Pygidium slightly quadrilobate, the ventral pair of lobes bearing short stiff cirri at their dorsal margins.

The paleoli on III form an inconspicuous tuft of nine or ten very small flattened spines no larger than the true setæ on IV. They project forward and are very acute, alimbate, and longitudinally striated. True setæ tufts, except the first three, are rather prominent, the tubercles borne on a pronounced lateral longitudinal ridge. Each tuft consists of ten or twelve pairs of larger and smaller tapering narrowly limbate setæ. Counting 3 prebranchial segments, the tori begin on VII, the anterior being largest, but all remarkably small, as in *Samytha*, their width not exceeding  $\frac{1}{8}$  or even  $\frac{1}{10}$  of the segment. X bears about 60 to 70 small uncini (Plate XVII, figs. 11, 12) having one large hooked tooth below and three or four irregular rows of three to five smaller teeth above, with a marginal arch of still smaller teeth. In fig. 11, the lowermost tooth is worn down. Abdominal tori also small narrow lappets rounded at the border and with a simple slightly developed dorsal cirrus separated from the torus by the width of the lateral ridge only. Abdominal uncini (fig. 13) similar to thoracic but smaller, with the crest teeth in a crowded tuft of three rows of three or four each.

All three specimens are too soft to permit of a complete description. The only complete one is 27 mm. long, about 2 mm. in maximum diameter, elongated fusiform and consists of thirty segments. All three contain eggs.

Stations 4387, lat. 32° 32' 40'' N., long 118° 04' 20'' W., 1059 fathoms, green mud; 4431, off Santa Rosa Island, 38-45 fathoms, green and yellow mud, etc. (type); 4436, off San Miguel Island, 264-271 fathoms, green mud. If these soundings are correctly recorded this species has the rather remarkable bathymetric range of more than 1000 fathoms.

***Amplicteis scaphobranchiata* Moore.**

Several well-preserved specimens agree fully with the types of this very distinct species. Full grown and mature individuals, some of which contain eggs or sperm, measure 33-54 mm. and have

from fourteen to seventeen paleoli in each fascicle. The anterior median gill is always scaphiform with a slender distal appendage which is sharply hooked at the end, except in a single case in which it is straight. The larger specimens have the marginal lobation of this gill more pronounced and the tip more prolonged than the types. The original description fails to mention the membranous wing borne on the distal end of the setigerous tubercles ventral to the setæ tufts. The uncini have six teeth with occasionally a small, inferior seventh.

Stations 4322, off Point La Jolla, 193-227 fathoms, soft green mud; 4325, same locality, 191-292 fathoms, green mud and fine sand; 4358, off Point Loma Lighthouse, 167-191 fathoms, green mud; 4364, same locality, 101-129 fathoms, green mud; 4400, lat.  $32^{\circ} 50' 20''$  N. long.  $118^{\circ} 03' 30''$  W., 500-507 fathoms, green mud; 4425, off San Nicolas Island, 1084-1100 fathoms, green mud and fine sand; 4433, off Santa Rosa Island, 243-265 fathoms, green mud; 4461, off Point Pinos Lighthouse, 285-357 fathoms, green mud; 4462, same locality, 161-265 fathoms, green mud; 4464, same locality, 36-51 fathoms, soft dark gray mud; 4467, off Santa Cruz Lighthouse, 51-54 fathoms, soft dark-green mud; 4482, same locality, 43-44 fathoms, soft green mud.

***Amphicteis mucronata* sp. nov.**

This species is characterized especially by the prolonged terminal mucrons of the paleoli and the large size of the branchiæ.

Form moderately slender for the genus, regularly tapered caudad, subterete, the ventral parts forming a broader, flattened, sole-like expansion upon which the smooth, domed, dorsal part rests. Segments, counting the paleolar as III, thoracic 20 (17 setigerous), abdominal 15 uncinigerous.

Cephalic region broadly truncate, sub-conical, somewhat depressed and slightly longer than width at the posterior border which exceeds that of the anterior. Prostomium not clearly distinguished from peristomium, its anterior part depressed, consisting of an oblong median cephalic plate  $1\frac{1}{2}$ -2 times as long as broad, divided by a median longitudinal furrow into a pair of low, rounded ridges, each ending anteriorly in a slightly free, projecting, rounded lobe (palps?) and which are sometimes more prominent and unite ventrally into a wedge-shaped thickening (palpode) extending to the mouth. Lateral lobes about equal in size and similar to median plate but quite simple and plain in structure, with anterior and lateral borders free. Ocular ridges usually high and prominent (but sometimes low) rounded, transverse,

curved, the two together bracket-shaped, nearly meeting at a wide angle medially, the lateral ends bent or hooked anteriorly to embrace the pad-like nuchal organs just mediad of which they bear short series or groups of small eye-spots. When the ocular folds are pigmented, as they often are, the eyes are obscure but when they are unpigmented 8-10 of these eyes stand out conspicuously on each ridge. Nuchal organs small, low, rounded, pad-like elevations arising from a slight depression between the ocular ridges and the ridges of the median plate. Tentacular lobe a thick, crescentic or horse-shoe shaped, somewhat trilobate fold, with its lateral ends tucked into the mouth. Tentacles about 40, arranged in a narrow, crowded, transverse band or single irregular series, varying in length, the longest equaling the prebranchial region, slender, terete, slightly clavate toward tips. Mouth large, with a thick internal lower lip inside the margin of the peristomium.

Counting the region anterior to the paleoli as I and II (Fauvel), these two segments are obviously divided by a very shallow annular furrow into two rings of equal size dorsally, of which the first or peristomium is about twice as long as II ventrally and projects forward as a prominent, slightly crenulate, flattened lower lip. Ventrally each of these segments is crossed by a narrow, raised, transverse line, both somewhat glandular.

The setigerous thoracic region (IV-XX) constitutes about  $\frac{3}{5}$  of entire length, consisting of a broad, flat, ventral sole with prominent lateral parapodial ridges which are somewhat rugous and project beyond the sides of the very smooth arched dorsal region. Somite III is enlarged, about one-half as long as I and II ventrally, bearing dorsally prominent paleolar tubercles which extend forward and somewhat embrace II. Somites IV and V together about equal III. The remaining thoracic segments gradually increase in length and diminish in width until the last is about three-fifths as long as wide. Ventrally the segments bear ventral glandular plates, each marked by a slight transverse ridge, especially prominent on III. On the pre-uncinial segments these ventral plates reach high up to the setigerous tubercles and cover the entire length of the segment, but from VII caudad they are confined between the tori and gradually become shorter, until in the posterior thoracic region (beginning with XIII) they form only narrow transverse bands across the anterior region of the segments. Ventrally the segments are well defined by the ventral plates and dorsally by shallow but distinct furrows which often disappear posteriorly. Posterior thoracic segments pass gradually into the abdominal, the last two often lacking all trace of ventral plates and distinguishable from abdominal segments by the possession of setæ only.

Abdomen regularly tapering caudad, the segments becoming shorter as well as narrower, generally similar to thoracic segments,

but owing to the form of the parapodia more or less strongly quadrate in section, especially toward the caudal end. Pygidium a short, simple ring with large anus and a pair of slender, tapered, ventro-lateral cirri which vary in length from  $1\frac{1}{2}$  to 3 times the diameter of the pygidium, according to the state of extension.

Branchial fold low but broad, connected at the sides anteriorly with the paleolar tubercles, anterior margin deeply concave, arching over III and roofing a recess. Interbranchial area keystone-shaped with an anterior median notch, very little longer than wide, less than the branchial fold and not reaching to posterior border of V. The lateral border of this region is marked by a deep groove which passes between the paleolar tubercle and the setigerous tubercle of IV, being, therefore, the boundary between these two somites. It is unequally conspicuous in different specimens. Branchial scars large, slightly elevated on branchiophores, arranged in a crowded lozenge-shaped figure, the two anterior pairs on IV and united by a fold of integument with the paleolar tubercle, the two posterior on V, but the more laterad connected with VI also.

Gills easily detached, large, nearly half length of thorax, stout at base, regularly tapered to acute tips, terete or nearly so, sometime more or less coiled, marked with fine transverse furrows which become more conspicuous in contraction.

Parapodium III bears paleolar tubercles only; IV, V, and VI setigerous tubercles only, the remaining thoracic somites both tubercles and uncinigerous tori. Setigerous tubercles are prominent, slightly compressed, cylindroid, rising obliquely from the parapodial flange or ridge; distally divided into two low lips between which the setae arise in a slightly curved rank, at the ventral margin of which is the short clavate cirrus. The tubercles on IV and V are much smaller than the others and bear larger, much more thickened cirri, that on IV crowded beneath the one on V. Uncinigerous tori begin on VII ventral to the parapodial ridge as auricular lappets with contracted base and long free margin just behind which the long rank of uncini is borne; dorsal and ventral angles, especially the latter, produced. Anteriorly the uncinigerous margin is about as long as the segment but posteriorly gradually becomes shorter and the tori more elevated and with less contracted base. On abdominal segments the tori are narrower and longer with shorter uncinial line. These characters become more pronounced posteriorly until the last torus is almost stalk-like and projects beyond the anus along with the caudal cirri. All of the posterior tori bear a minute cirriform process at the dorsal end of the line of uncini. True dorsal cirri are large, flat, bent processes shaped like the paddles of swimming crabs and well separated from the uncinigerous tori with which they are connected by thickenings resembling the broken parapodial ridge. Posteriorly the gap widens until it equals the depth of the segment, the torus being at the

ventro-lateral and the cirrus at the dorso-lateral angle, resulting in the quadrate section of this region already referred to

Paleoli form compact palmæ which may reach not quite to the end of the prostomium or as much as one-fifth of their length beyond it as they are retracted or projected. They vary in number from 11 to 15, in part correlated with the size of the worm. They are of a rich yellow or brownish-yellow color, striated and burnished, somewhat flattened, gently tapered, slightly curved at the ends and when perfect rather abruptly contracted into a very slender and elongated mucron having a length of 2-3 times the maximum diameter of the paleolus. Setæ fascicles generally prominent, suberect, arising in a gentle arc, arranged in from 10-14 pairs, each composed of a large and a smaller more slender seta both tapering and very acute, with a narrow limbus especially narrow on the smaller one. On the first two fascicles they are fewer and much smaller. Uncini in long lines just behind the free border of the tori, very numerous (190 on X), fewer on abdominal segments and decreasing in number caudad. Thoracic uncini nearly colorless, usually with six (sometimes five) major teeth above the small inferior one; lower angle produced forward rather prominently like a chin. Abdominal uncini not appreciably different.

The type is 48 mm. long, of which the thorax is 28.5 mm., maximum width at anterior end 4.5, width at anterior end of abdomen 3.5 mm. Other specimens vary from 19 to 50 mm. long, most of them being 35-40 mm.

Fragments of tubes show that they are composed at one end of thick mud walls 7 mm. in diameter, and at the other are soft and mucoid.

Stations 4322 (type and cotypes), off Point La Jolla, 110-199 fathoms, green mud and shells; 4343, off South Coronado Island, 55-155 fathoms, fine gray sand; 4366, off Point Loma Lighthouse, 176-181 fathoms, green mud; 4381, off N. Coronado Island, 618-654 fathoms, green mud; 4452, off Point Pinos Lighthouse, 49-50 fathoms, green mud, fine sand; 4457 (cotypes), same locality, 40-46 fathoms, dark green mud; 4467, off Santa Cruz Lighthouse, 51-54 fathoms, soft dark green mud; 4482, off Santa Cruz Lighthouse, 43-44 fathoms, soft green mud; 4513, off Point Pinos Lighthouse, 389-456 fathoms, green mud; 4533 (cotype), same locality, 144-293 fathoms, green mud and sand.

The greatest number of specimens (16) were taken at Stations 4452, 4457 and 4467 in the vicinity of Point Pinos, Monterey Bay, in 40-54 fathoms.

**Amphicteis glabra** Moore.

Five specimens of this species. One large example has seventeen or eighteen paleoli; the others are normal in this and generally in other respects. Except on one in which they are often six-toothed, the uncini are always five-toothed. The anal cirri are long as in *A. mucronata*.

Stations 4452, off Point Pinos Lighthouse, 49–50 fathoms, green mud, fine sand; 4526, same locality, 204–239 fathoms, soft gray mud.

**Amphicteis** sp.?

Two small, poorly-preserved specimens, lacking all gills, resemble *A. scaphobranchiata* in the number and form of the paleoli and the number of uncinial teeth. The thoracic uncini, however, are much less produced above and the prostomium is truncate and entire and not produced and tri-lobed. In both of these respects it approaches *Ampharete* and differs from typical *Amphicteis*.

Stations 4453, off Point Pinos Lighthouse, 49–51 fathoms, dark green mud; 4508, same locality, 292–356 fathoms, soft green mud.

**Amage arieticornuta** sp. nov. Plate XVII, figs. 14–18.

Prostomium coalesced with peristomium, firm and rigid, trilobate, consisting of a quadrate, petalliform median plate and a pair of flaring lateral lobes; median plate broader than long, widest at anterior border, saddle-shaped, being strongly concave antero-posteriorly and convex transversely, anterior border strongly flaring dorsad, with a truncate anterior face; lateral lobes strongly marked, with convex borders, somewhat tumid, rigid. On each side a shallow furrow runs caudad from the incision between the median and lateral lobes. Extending transversely across the median plate and uniting with the lateral lobes at the sides is a broad annulus, the free anterior border of which forms a low transversely concave nuchal fold, the lateral portions of which conceal the nuchal sensory slits and almost conceal the low pads anterior to them. A soft median papilla is visible in some specimens above the mouth and nearly concealed by the base of the prostomial plate. No eyes. Tentacular membrane concealed. Tentacles moderately numerous, very short, smooth, scarcely visible beneath the prostomium.

Peristomium contracted dorsally but ventrally forming a broad thick, stiff, much furrowed, projecting lower lip, produced laterally into a pair of auriculate wings.

Somite II a well-developed simple ring dorsally, a short, rounded glandular ridge ventrally. III is a much larger segment with a thick glandular plate below, prominently projecting lateral masses

bearing tubercles but without paleoli at the sides and forming a thickened and somewhat elevated, but little free, prebranchial fold above, the middle part of which is continued caudad over segments IV and V.

The next three segments are podous and branchiferous. Dorsally they are annulated and each bears a prominent transverse glandular ridge covering most of its surface. The branchial scars are borne on the medial ends of tumid areas so arranged that they converge in a pair of slightly oblique lines, the posterior and most approximate ends being separated by about one-third of the body width. The first two pairs of scars are on IV, the third and fourth pairs on V, though the last is connected with and really belongs to VI. Remaining thoracic somites are larger, the maximum ratio of length to width being about 1.2. Dorsally they are strongly arched, smooth and rather soft, divided into three or six rings. Ventrally the parapodial annulus is largely occupied by a glandular plate which rises to a prominent ridge on the first two or three uncinigerous segments and then becomes gradually flatter. On the last few thoracic segments the glandular plate is much reduced.

Branchiæ very easily detached from the small scars and on these specimens seldom found in place. They differ much in size in the several specimens and it is evident that normally they are frequently lost and regenerated. The type bears three partly grown ones in place. When full grown the gills are large, thick, tumid at the base, and taper gradually to slender tips; length about twice the maximum diameter of the worm or two-fifths the length of the thorax. For most of their length they are ridged longitudinally and marked with cross furrows, which together with the fact that they are twisted into a spiral, gives them a striking resemblance to the figure of a ram's horn.

The thorax passes regularly into the abdomen, the segments differing only in the character of the parapodia and the absence of ventral glandular plates on the abdomen. Abdomen short, one-half or less the length of the thorax and consisting of eleven segments, the anterior six of which taper rapidly to a groove behind which the remaining five are of nearly uniform width but progressively more depressed. The last two or three are short and much crowded.

Pygidium a very short ring with large open anus bounded by a ventro-lateral pair of short, stiff, thick styles above which are four or five small papillæ or crenulations on each side.

Parapodia begin on IV, I to III being entirely apodous. On somites IV-VI (Plate XVII, figs. 14, 15) they are small tubercles with enlarged and somewhat flattened ends and vestigial setæ which on the first two apparently quite fail to reach the surface and on the third barely project. Remaining thoracic segments (VII-XVIII) bear both setigerous tubercles and uncinigerous tori.

The former are cylindroid with a small dorso-terminal presetal process and project prominently dorso-laterad from a somewhat rugous lateral area. They become longer posteriorly. A small papilla is borne on the middle of the ventral face of the last three and also on VII and VIII, being exceedingly small on the latter. Uncinigerous tori, beginning on VII, increase in size, the last thoracic being fully 50% larger than the first and its margin equal to at least one-third the body width. All are auriculate, with constricted bases and the ventral angle produced, especially on the more caudal parapodia, into a short cirriform process.

Abdominal parapodia (Plate XVII, fig. 16) consist of shorter and thicker, more fleshy tori, with more elevated bases and shorter uncinial lines and become reduced in size and more crowded posteriorly. A rugous, somewhat tumid area connects the tori to the short hamate, and clavate dorsal cirri, which represent the reduced bases of the setigerous tubercles.

From VII to XVII, the setæ fascicles are prominent, becoming increasingly so caudad. They arise in half circles open forward and consist of 12-20 pairs of a large and a very small, deep yellow, delicate, tapering and acute, narrowly limbate setæ, the dorsal-most of which are longest and gently curved dorsad, giving to the fascicles a graceful shape. The minute tuft of very small setæ on VI projects from the anterior face and barely reaches to the end of the tubercles.

Uncini are arranged in a single rank on the anterior face of the distal margins of the tori, the number varying proportionately to the length of the margin from about 190 on X to 110 on XVIII, etc. Thoracic uncini (Plate XVIII, fig. 17) are pale yellowish, broadly triangular with prominently projecting inferior angle, a small ligament process and five large teeth with sometimes an incipient sixth superior one. Abdominal uncini are somewhat smaller with ventral margin more convex but otherwise similar to the thoracic. Teeth on all uncini strictly uniserial.

Color pale gray, no pigment, the glandular plates more or less yellowish.

The numerous specimens are remarkably uniform in size, varying in length from 35 to 45 mm. and in maximum width (exclusive of parapodia) at IX from 4 to 5.5 mm. Thoracic segments 17 (14 setigerous), abdominal 12.

A few fragments of mud tubes are 8-9 mm. in diameter with thin very fragile walls of fine silt.

A large species allied to *Grubianella* McIntosh, but peculiar in the reduction of the preuncinial setæ tufts.

"Albatross" station 4382, off North Coronado Island, 618-657 fathoms, green mud; 4433, off Santa Rosa Island, 243-265 fathoms,

green mud; 4436, off San Miguel Island, 264–271 fathoms, green mud (type and 71 others); 4547, off Point Pinos Lighthouse, 1083 fathoms, soft gray mud.

**Amage anops** (Johnson)

This species, at first thought to be distinct under the name *A. perfecta*, is now regarded as identical with Johnson's species or at most as only a subspecies. The specimens all have twelve instead of fourteen or fifteen abdominal segments and most of the thoracic uncini have five teeth, though some are provided with an additional small upper sixth tooth as in Johnson's figure.

Stations 4322, off Point LaJolla, 110–199 fathoms, soft green mud; 4454, same locality, 65–71 fathoms, green mud and shells; 4525, same locality 222 fathoms, soft gray mud.

**Amage scutata** sp. nov. Plate XVII, figs. 19–24.

Form elongated fusiform or subcylindroid, with tapered abdomen. Nearly terete, much more slender than *A. anops*. Type (with eggs) 25 mm. long, maximum width 4 mm., length of abdomen 7.3 mm. Thoracic segments 17, abdominal 10.

Anterior border of prostomium a thin, erect, entire, vertical and transverse, semicircular plate from the middle of the anterior border of which projects a small papilla or palpode from which a low ridge runs to the dorsal border of the mouth. At the root of its posterior face is a transverse thickening and behind this the pair of nearly united transverse nuchal slits, themselves bounded by a broad transverse annulus, the lateral ends of which are cut off by a pair of shallow furrows and probably represent the lateral prostomial lobes, which, however, are excluded from the anterior border of the prostomium. Tentacular membrane short, not projecting beyond border of prostomium, horseshoe-shaped, with one deep median plication. Tentacles grouped in a pair of small lateral tufts of about twelve each of very short ones and a pair of more medial and dorsal tufts of about four each of longer ones about one-half width of body. All are smooth and clavate. No eyes.

Peristomium reduced and obscure dorsally, produced forward ventrally into a stiff glandular lip having a much furrowed and crenulated margin and small but somewhat prominent inturred lateral lobes. Somite III, along with the two succeeding somites is abruptly enlarged and tumid above to form the branchial pedistal. Its ventral plate is produced into a pair of small lateral lobes or wings resembling those of the lower lip. Somites IV and V are short and crowded; VI is somewhat longer. These three bear parapodial tubercles and gills and prominent ridge-like ventral gland-plates.

Remaining thoracic segments obscurely defined, very smooth above, very obscurely annulated ventrally, with rather poorly developed glandular transverse bands or ridges. A small specimen which is strongly contracted has the segments better defined. Abdominal segments similar but separated by more distinct furrows, tapered and decreasing in length caudally.

Gills arranged much as in other species, in converging oblique lines, but the first pair crowded somewhat outside of the second pair on the dorsum of VI, and those of the last pair very nearly in contact on the dorsum of V, but as usual connected with the parapodial region of VI by a ridge. Interbranchial field broad but short, being confined to III and IV. There is no free interbranchial fold, this region being connate with III to form the tumid region referred to above. Gills delicate, long and slender, tapered, with sub-filamentous ends, subequal, generally about two and one-half times width of body, the last reaching to XII on the type and to XVI on a smaller specimen.

Pygidium a very short ring with large subpentagonal anus and one pair of short, thick conical, papilliform cirri.

The first parapodium on IV (Plate XVII, fig. 19) has a discoid flattened end supported on a slender foot and lies at a more ventral level than usual in the genus. The parapodium on V (Plate XVII, fig. 20) is larger, slightly dorsal to the succeeding ones, flattened and of an almost sigmoid form owing to the addition to its enlarged, ventrally hooked end of a small wing on the ventral aspect of the base. Parapodium VI (Plate XVII, fig. 21) is somewhat flattened and bears a slight ventral wing, but no enlarged hooked end and is consequently nearly normal in form. Remaining thoracic parapodia are biramal and except for the relatively smaller size of both the setigerous tubercles and the uncinigerous tori are quite similar to those of *A. anops*. Posterior tubercles bear no ventral papillæ. Largest tori on middle thoracic segments are from  $\frac{1}{3}$  to  $\frac{1}{6}$ , the body width on different specimens.

Abdominal parapodia (Plate XVII, fig. 22) consist of small thick tori situated at the extreme ventral level of the body, bearing small papilliform cirri at the dorsal end of the uncinal series and, widely separated from these near the dorsal level, the dorsal cirri with flattened ovoid ends hooked ventrally and supported on short, slender bases.

Setæ begin on IV; the fascicles on IV and V much reduced, only the extreme tips of the fibroid setæ appearing from a minute pore on the anterior face of the parapodium far proximad of the end of the tubercle. On VI, the fascicle is larger and more normal, the setæ appearing between the short terminal lips of the tubercle. Other thoracic fascicles conspicuous, folded into a trough-like form and composed in the usual manner of 12-15 pairs of large and small acute limbate setæ.

Uncini in single series, about 65 on X, 45 on XXII. Thoracic uncini (Plate XVII, fig. 23) broadly triangular, with five or four superior teeth. Abdominal (Plate XVII, fig. 24) much smaller and differently shaped, with usually four teeth. All of these uncini on both thoracic and abdominal tori have the teeth uniserial, except the lowermost pair of acute ones and the uppermost small one which are sometimes subdivided into pairs.

Stations 4415, off Santa Barbara Island, 302-638 fathoms, green mud; 4457, off Point Pinos Lighthouse, 40-46 fathoms, dark green mud (type).

**Melinna cristata** (Sars) subspecies **heterodonta** nov. Plate XVII, fig. 25.

A complete specimen measures 80 mm. long and 3.5 mm. wide at the anterior end and has 73 segments, 19 of which are thoracic.

Prostomium nearly twice as wide as long, with a convex, slightly crenulated anterior margin, a transverse sensory ridge, and pair of small lateral pads near its posterior end; middle field slightly elevated for entire length. Tentacles 14 in type, the middle ones stouter. Lips well developed, the upper much plicated, lower flat, smooth and thick.

Peristomium united to II, which bears ventrally a deep, free fold into which the prostomium may be retracted. The sides of this collar fold rise into wings which continue on to III and IV, sloping obliquely dorsad and on IV forming a somewhat distinct rounded lobe rising freely above the rest of the wing or flange. Just ventrad to the margin of this are borne the three slender linear tufts of setæ belonging to somites II, III and IV. Somite V bears a small torus and a dorsal tuft of setæ like those on following segments but smaller. Post-branchial denticulated fold rises from posterior region of V and reaches to anterior part of IV, extending across the entire width of the thorax between the setigerous flanges; margin coarsely denticulated with 14, 15 or 16 unequal triangular teeth, the middle ones larger. One small specimen has only 12.

Gills in general similar to those of *M. cristata* and *M. denticulata* but arising from a thick transverse fold on the dorsum of II and III which is limited caudally by the nuchal hooks. The four pairs are arranged in a trapezoidal figure on each side in such a way that the two more anterior pairs are the more widely separated and alternate with the posterior pairs and the two more medial pairs are slightly caudad of the two outer pairs. The anterior innermost pair are strongly united by a transverse fold and the unions of the others, though confined to their bases, are firm and permanent. The gills thus resemble those of *M. cristata* rather than *M. denticulata*. They differ considerably in degree of extension, varying in length from much less than three times to more than five times the width of the thorax, and also vary in the length of their basal union.

The setæ, uncini (Plate XVII, fig. 25) and other characters agree with *M. cristata*.

Length of available specimens 23 to 90 mm.

A number of tubes measure 130 mm. long and 3 mm. in diameter and have the typical form and structure.

The differences between this form and typical *M. cristata* are constant but so slight that it is designated as a subspecies. While generally a deep water form it has a remarkable bathymetric range of over 2000 fathoms.

Stations 4322, off Point LaJolla, 110-199 fathoms, soft green mud; 4325, 191-292 fathoms, green mud and fine sand; 4396, lat.  $33^{\circ} 01' 35''$  N. long.  $121^{\circ} 28' 30''$  W, 2228 fathoms, red mud; 4415, off Santa Barbara Island, 302-638 fathoms, green mud; 4433, off Santa Rosa Island, 243-265 fathoms, green mud; 4517, off Point Pinos Lighthouse, 750-766 fathoms, green mud and sand; 4537; same locality 1006-1041 fathoms, hard sand and mud; 4541, same locality, 381-633 fathoms, green mud and sand; 4546, same locality, 849 fathoms, fine black sand (27 specimens, including type and cotypes); 4574, lat.  $30^{\circ} 35'$  N., long.  $117^{\circ} 24'$  W., 1400 fathoms.

**Melinna denticulata** Moore.

The original description is in error in describing as the lower lip the inferior flange or collar of somite II into which the prostomium and ventral portion of the peristomium are retractile. The post-branchial membrane of each of the three specimens bears seven or eight minute teeth. An even more obvious distinction between this species and *M. cristata* is that the former has seventeen, the latter eighteen thoracic setigerous somites. The branchiæ also differ and the thoracic uncini of *M. denticulata* have the superior teeth more robust and the inferior teeth longer. The nuchal hooks are straighter and more tapering than in most species.

An incomplete tube is 2.5-3.5 mm. in diameter, with a thin membranous lining and a thick, very fragile covering of fine silt containing numerous small scales of mica placed transversely to the axis of the tube.

Stations 4351, off Point Loma Lighthouse, 423-488 fathoms, soft green mud; 4352, same locality, 549-585 fathoms, green mud; 4365, same locality 130-158 fathoms, green mud.

**Melinna pacifica** McIntosh.

The collection includes more than forty specimens and a number of tubes from Station 4436, and three from Station 4390. Un-

fortunately all are badly macerated. Most of them have the posterior abdominal region strongly coiled. A straight one (not one of the largest) is 96 mm. long and exactly 5 mm. in greatest width. Segments 61, 17 thoracic setigerous. Except that McIntosh's figure shows a considerable interval between the two antero-medial ones the gills agree fully with his description. The post-branchial or nuchal fold is relatively less extensive and usually has seventeen (sometimes only fifteen or sixteen) teeth, instead of eighteen as figured by McIntosh. The lateral wings on segments II, III and IV are thick and prominent with the anterior borders nearly vertical and the dorsal margins abutting on the gills. Uncini have exactly the form figured by McIntosh. A careful search failed to discover any nuchal spines. Many contain ova or sperm.

Tubes are very large, 7-8 mm. in diameter and 400 mm. in length and constructed of heavy mud walls.

Stations 4390, off Santa Catalina Islands, 33° 02' 15'' N., 120° 42' W., 1350-2182 fathoms, gray mud and fine sand; 4436, off San Miguel Island, 264-271 fathoms, green mud.

***Samytha sexcirrata* Sars.?**

A single specimen is referred somewhat doubtfully to Sars' species. It agrees closely with an example from Labrador and differs distinctly from *S. bioculata*.

Length 19 mm. of which the abdomen is 6.5 mm. Greatest width at XI about 3.5 mm. Form generally clavate, slightly depressed, moderately stout. Thoracic somites twenty, of which seventeen are setigerous, abdominal fifteen. The gills have been lost but the three pairs of flattened scars are very distinct; the anterior lateral and the middle pairs being borne on IV, the posterior medial on V, the missing pair of those present in *Amage*, etc., apparently being the most posterior on VI.

Thoracic uncini bear five large teeth in one series and alternating with these smaller teeth in a second imperfect series. The Labrador specimen has the second series of teeth usually complete. Abdominal uncini are smaller than the thoracic with the teeth in two complete series of five and four or four and four placed alternately. *S. bioculata* has a single series of usually four teeth on both thoracic and abdominal uncini.

Station 4464, off Point Pinos Lighthouse, 52-59 fathoms, green mud.

*Sosanopsis armipotens* sp. nov. Plate XVIII, figs. 26-29.

A single incomplete specimen of a slender and terete male worm filled with sperm, resembling *Melinna*, but lacking the post-branchial membrane.

Length 31 mm. of which the thorax is 11 mm.; maximum width 1.3 mm. The thorax consists of nineteen segments with setae beginning on IV and continuing to XIX. About twenty abdominal segments remain.

As in *Melinna* the prostomium (Plate XVIII, figs. 26, 27) is simple and truncate without any clearly defined characters and is coalesced with the peristomium. No visible eyes. Below is a simple, horse-shoe-shaped tentacular lobe bearing on each side a few small terete tentacles about as long as the prebranchial region and on each side near the middle line a single enormous flattened tentacle folded on itself longitudinally and dorsally, the dorso-lateral margins of the groove marked with numerous fine transverse ridges. When straightened and flattened these tentacles measure 12 mm. long and about 8 mm. wide, while the longest of the small tentacles does not exceed 1 mm.

Peristomium and II united (Plate XVIII, figs. 26, 27), together forming a broad, simple truncate lower lip with a conspicuous oblong yellow glandular area at its base. Somite III bears below a stiff glandular collar into which the head region may be retracted; laterally it is continuous with the stiff lateral glandular walls bounding the branchial area, but lacks distinct wings. Somites IV and V, forming the branchial region, are below and at the sides stiffened by a thick layer of pale yellow glands. Ventral plates only two, one on III, and one on IV and V united. At the sides the glandular areas of these three segments coalesce and rise to the dorsal level as a low ridge but not as a prominent wall as in many species of *Melinna*. This ridge, which bounds the branchial area laterally slopes dorsally to VI and just below its edge bears the three short vertical series of setae representing the parapodia of segments IV-VI. No nuchal spines can be detected.

The branchial area (Plate XVIII, fig. 26) occupying the dorsum of segments IV to VI is narrow and bounded caudally by a narrow glandular band across the dorsum of VII, which undoubtedly represents the obsolete post-branchial fold. Four pairs of branchiae are borne far forward on IV and are arranged as in *Melinna*, three behind and one forward, all with their bases coalesced, the two outer posterior most completely united and continued caudally by a narrow ridge. All firmly attached, slender and almost filiform, the posterior subequal and the anterior more than one-third longer or nearly three times the width of the branchial region and reaching to about segment XIV or XV.

Remaining thoracic somites gradually increase in length, with little change in diameter. They are smooth and quite undefined above and indicated below chiefly by glandular plates which become successively smaller and thinner until on the last two or three they have almost disappeared. About twenty much softened abdominal segments remain. They are fairly well indicated by furrows and the anterior are longer than wide but the proportions gradually alter until the posterior are twice as wide as long.

Definite parapodia begin on VII; dorsal setæ fascicles and tubercles small (especially the first) but increase in size for several segments, flattened and directed obliquely dorsad. Tori very small, flattened processes immediately beneath the setæ tufts, diminishing in size posteriorly where they are scarcely visible on many segments. Abdominal tori are even smaller and the dorsal cirri appear to be totally lacking.

Nuchal spines absent. Setæ of fascicles IV-VI in short, vertical, slightly curved lines of thirty to forty each, the stems deeply buried, the blades very short, delicate, tapered to acute points and the dorsalmost just visible above the dorsal level of the segments. Fascicles of succeeding segments flattened and consisting of pairs of large and small, normally bilimbate acute setæ, there being only six pairs on VII and these much larger than the setæ on IV-VI but smaller than those on succeeding somites, which usually bear eight or nine pairs.

Uncini small and of moderate number, about fifty on X, falling to eighteen on XXV. Thoracic uncini (Plate XVIII, fig. 28) are like those of *Melinna* in outline and bear two series of closely appressed teeth of three and four or four and four each. Abdominal uncini (fig. 29) resemble those of *Terebellides*, have broad crowns with teeth arranged in four rows of 1, 4, 6 or 7 and 10-12 respectively, the size of the teeth decreasing as their number increases.

Station 4396, off Santa Catalina Islands, lat. 33° 01' 35" N., long. 121° 32' W., 2228 fathoms, red mud. Type only.

#### AMPHICTENIDAE

##### *Pectinaria brevicoma* Johnson.

A large number of specimens agree with Johnson's description. The smaller scapha spines are, however, somewhat more strongly hooked, and Johnson's figures of the uncini do not show the enlarged base or manubrium. Paleoli vary in number with the size of the worm from eleven to fourteen pairs and on full-grown specimens the paleolar membrane bears about thirty-two marginal cirri.

Numerous tubes are formed of sand grains, sometimes fine, sometimes coarse and of various colors, but occasionally in part

or whole of broken sponge spicules which are placed transversely to the axis of the tube.

This species unites *Pectinaria* and *Cistenides*.

Stations 4307, off Point Loma Lighthouse, 169–490 fathoms, fine sand and green mud; 4322, off Point La Jolla, 110–199 fathoms, soft green mud; 4326, same locality, 243–280 fathoms, soft green mud; 4452, off Point Pinos Lighthouse 49–50 fathoms, green mud, fine sand; 4453, same locality, 49–51 fathoms, dark green mud; 4457, same locality, 40–46 fathoms, dark green mud; 4464, same locality, 36–51 fathoms, soft dark gray mud; 4467, off Santa Cruz Lighthouse, 51–54 fathoms, soft dark-green mud; 4475, off Point Pinos Lighthouse, 58–142 fathoms, soft green mud; 4485, off Santa Cruz Lighthouse, 39–108 fathoms, soft green mud and sand; 4522, off Point Pinos Lighthouse, 130–149 fathoms, gray sand and shells; 4523; same locality, 75–108 fathoms, soft dark mud; 4525, same locality, 222 fathoms, soft gray mud; 4526, same locality, 204–239 fathoms, soft gray mud; 4549, same locality, 56–57 fathoms, coarse sand and shells; 4550, same locality, 50–77 fathoms, green mud and rocks, 4552, same locality, 66–73 fathoms green mud and rocks; 4553, same locality, 65–74 fathoms, rocks; 4557, same locality, 53–54 fathoms, rocks.

#### CAPITELLIDAE

##### *Notomastus* sp.?

Four fragments each consisting of twelve thoracic and from two to eleven abdominal segments and measuring in diameter from 1.5 to 3.5 mm.

Stations 4382, off S. Coronado Island, 642–666 fathoms, green mud; 4415, off Santa Barbara Island, 302–638 fathoms, green mud; 4454, off Point Pinos Lighthouse, 65–71 fathoms, green mud; 4549; off Point Pinos Lighthouse, 56–57 fathoms, coarse sand and shells.

#### SCALIBREGMIDAE

##### *Scalibregma inflatum* Rathke.

A single specimen lacking the caudal end and exceeding 3 mm. in diameter appears to be quite typical in all respects. Parapodial cirri are rather shorter than usual, both cephalic and caudal parapodia have dark pigment spots and the furcate setae are very short.

Station 4548, off Point Pinos Lighthouse, 46–54 fathoms, coarse sand and shells.

## STERNASPIDAE

**Sternaspis scutata** (Ranzani) Otto.

Two specimens agree fully with North Pacific examples of the species. They measure 31 mm. long and 14 mm. in diameter and bear six pairs of anterior and ten pairs of lateral scutal setæ bundles.

Station 4339, off Point Loma Lighthouse, 241–269 fathoms, green mud.

**Sternaspis fossor** Stimpson.

Unlike the last this species is widely and abundantly represented. As in specimens previously reported from the North Pacific there is one less pair of anterior scutal costæ and setæ bundles than in *S. scutata*. They range from 8 to 15 mm. in diameter. Very abundant at stations 4457, 4464 and 4475.

Stations 4309, off Point Loma Lighthouse, 67–73 fathoms, fine sand; 4322, off Point La Jolla, 110–199 fathoms, soft green mud; 4332, off Point Loma Lighthouse, 62–183 fathoms, gray sand; 4343, off South Coronado Island, 55–155 fathoms, fine gray sand; 4349, off Point Loma, 75–134 fathoms, green mud and fine sand; 4351, off Point Loma Lighthouse, 433–488 fathoms, soft green mud; 4354, same locality, 646–650 fathoms, green mud; 4364, same locality, 101–129 fathoms, green mud, gray sand; 4381, off North Coronado Island, 618–667 fathoms, green mud; 4453, off Point Pinos Lighthouse, 49–51 fathoms, dark-green mud; 4457, same locality, 40–46 fathoms, dark-green mud; 4464, same locality, 36–51 fathoms, soft dark-gray mud; 4475, same locality, 58–142 fathoms, soft green mud; 4480, off Santa Cruz Lighthouse, 53–76 fathoms, dark-green mud and sand; 4485, same locality, 39–108 fathoms, soft green mud and sand; 4510, off Point Pinos Lighthouse, 91–156 fathoms, gray mud; 4522, same locality, 130–149 fathoms, gray sand and shells; 4523, same locality, 75–108 fathoms, soft dark mud; 4550, same locality, 50–57 fathoms, green mud.

## OPHELIIDAE

**Ophelia** sp.?

One much damaged specimen.

Station 4549, off Point Pinos Lighthouse, 56–57 fathoms, coarse sand.

***Ammotrypane aulogaster*** Rathke.

Several specimens measuring from 25 to 44 mm. long with forty-eight to fifty-two segments agreeing in all respects with *A. aulogaster* of European waters. Most of them have the ventral caudal cirri shorter than usually figured; on one they are three-fourths the length of the spoon-shaped appendage.

Stations 4306, off Point Loma Lighthouse, 207-497 fathoms, green mud and fine sand; 4307, same locality, 169-496 fathoms, gray mud and fine sand; 4364, same locality, 101-129 fathoms, green mud and gray sand; 4367, same locality, 201-215 fathoms, green mud; 4382, off N. Coronado Island, 642-666 fathoms, green mud; 4387, same locality, 85 fathoms, gray sand; 4453, off Point Pinos Lighthouse, 49-51 fathoms, dark-green mud; 4475, same locality, 85-142 fathoms, soft green mud; 4524, same locality, 213-228 fathoms, soft gray mud.

***Travisia granulata*** sp. nov.

Five specimens vary in length from 30-52 mm. and in diameter from 3 to 7 mm. Diameter very uniform throughout most of length, tapering at ends only. Segments 32 to nearly 50.

Prostomium and rather prominent blunt cone clearly distinguished from the uniannular peristomium which is marked by a deep groove at the parapodial level on each side, ventral to which it is continued as a narrow, grooved, median area, which cuts through somite II to the mouth. Somite II is setigerous and conspicuously divided into two rings and by several longitudinal grooves into smaller areas especially conspicuous at the sides. Somites III to XX are triannulate, the middle or setigerous annulus being distinctly larger than the 1st and 3rd. The more anterior segments are divided into areas by several longitudinal furrows. At XXI, the first ring disappears and the anterior is three or four times as long as the posterior. Caudally, these biannulate somites gradually change to the simple uniannulate somites, the number of which varies in different specimens and which gradually diminish in size to the pygidium.

Pygidium a small cylindrical ring, divided into thirteen rather irregular, marginal papillæ, usually alternately larger and smaller.

A conspicuous characteristic of this species is the large size and abundance of the surface pustules which are so crowded over most parts of the body as to give an aspect of close granulation. They are largest on the anterior segments and elsewhere in the neighborhood of the parapodia and along the caudal border of each annulus which forms a faintly lobulated fold embracing the succeeding ring. The lateral sense organs, which are so conspicuous

in *T. pupa* and *T. forbesii* and other species, are so covered by these structures that they are hidden.

Parapodia and setæ present no distinctive features. No setæ were detected on the last five segments. Notopodial cirri (branchiæ) begin on III and are present on all but about the last six somites and on most segments have a length of nearly or quite one-fourth of the body diameter at that point, but become reduced before disappearing at the caudal end.

This species belongs to *Dindymeme* Kinberg (*Dindymenides* Chamberlin) if that genus be recognized.

Stations 4304, off Point Loma Lighthouse, 25 fathoms, coarse yellow sand; 4479, off Santa Cruz Lighthouse, 33-45 fathoms, hard sand, (type); 4549, off Point Pinos Lighthouse, 56-57 fathoms, coarse sand, shells and rock.

**Travisia brevis** sp. nov.

The five known specimens of this species are all small, measuring from 11 to 21 mm. long and 3.5 to 4 mm. in diameter, and all have 29 segments.

Prostomium and peristomium together form a bell-shaped head, of which the former represents the handle, being a short blunt cone, thickly covered, like the rest of the body, with pustules. Peristomium uniannulate and in the neural field produced caudad and cutting II to the mouth. Somite II slightly longer than I and obscurely divided into two rings, of which the caudal bears the setæ and between them a sensory pit. Mouth a small opening surrounded by radiating furrows between II and III.

Somite III obscurely triannular above, the posterior annulus being well differentiated but the furrow between the first and second very shallow. Somites IV to XVI or XVII are triannulate, the equal rings being very distinct dorsally and ventrally but indistinguishable laterally in the parapodial areas. At about XIII these parapodial areas begin to increase and encroach upon the interannular furrows which become correspondingly reduced both above and below and finally restricted to the dorsal and ventral fields, the segments also becoming correspondingly smaller. By XX the segments have become practically uniannular, the third ring being suppressed and the first reduced to short crescentic dorsal and ventral inserts. In this region the parapodia have shifted to the ventral surface which consequently appears angulated. At XXVI the diameter is abruptly reduced, the remaining four somites forming a tube which terminates in the slightly enlarged rosette-like pygidium marked by twelve radial furrows into ridges ending in as many short perianal papillæ.

Parapodia from III to XXVI inclusive, biramous. On anterior segments they are very short and being retractile into pits, the

small notopodial and neuropodial setæ tufts often appear to be sessile, with a minute dorsal notopodial and a ventral neuropodial tubercle, while between the rami is a sensory pit. Caudad of the middle of the body, as the setæ become smaller, these tubercles increase in length and by XVII they are quite prominent and become increasingly so for several segments but are again smaller on XXIV to XXVI where they cease.

The intra-podal sensory pore may be traced from II to XXVI inclusive. At VIII<sup>1</sup> a larger pore appears just ventral and anterior of the neuropodium and may be traced to XV.

Notopodial cirri or branchiæ begin on III and continue to XXIV, arising in contact with the ventrocaudal faces of the notopodial tubercles. They are slightly flattened, conical, tapering, and slightly shorter than the segments to which they belong, becoming much reduced caudally.

Stations 4322, off Point La Jolla, 110 fathoms, green mud and shells; 4332, off Point Loma Lighthouse, 62-183 fathoms, gray sand, (type); 4550, off Point Pinos Lighthouse, 50-57 fathoms, green mud.

**Travisia pupa** Moore.

Eleven specimens in all measuring up to 85 × 18 mm. agreeing in having thirty-one or thirty-two segments, cirri on III to XXVI inclusive and hispid setæ, from the following stations: 4325, off Point La Jolla, 191-292 fathoms, green mud and fine sand; 4358, off Point Loma Lighthouse, 167-191 fathoms, green mud; 4365, 6 and 7, same locality, 130-215 fathoms, green mud.

CHLORHÆMIDAE

**Stylaroides collarifer** Ehlers.?

A single specimen of a species identical with or very close to *S. collarifer*. There are thirty-four segments and the body is much swollen in the middle part, contracted toward the ends and with the cephalic region flattened. An adherent layer of sand forms a hard crust especially at the anterior end and roughens the surface throughout.

Station 4351, off Point Loma Lighthouse, 423-488 fathoms, soft green mud.

**Stylaroides papillata** Johnson.

Two specimens of 18 mm. and 31 mm., both exclusive of the cephalic setæ, have forty-five and sixty-seven segments respectively.

<sup>1</sup>Very minute ventral sensory pores may be detected in some specimens on segments anterior to VIII.

The setæ of the first setigerous segment are about four times the body diameter, those of the second two-thirds and of the third one-half as long. Ventral setæ much shorter.

Stations 4431, off Santa Rosa Island, 38-45 fathoms, mud and coarse gray sand; 4574, off Cape Colnett, lat. 30° 35' N., long. 117° 23' W., 1400 fathoms.

*Stylaroides pluribranchiata* sp. nov.<sup>2</sup>

The type is 30 mm. long with a maximum diameter including the parapodia near the cephalic end of 2.8 mm. and has 40 setigerous segments. First twelve segments uniform in diameter, very slightly depressed, the others terete, tapering very gradually to the caudal three or four segments which taper rapidly to the small pygidium.

Prostomium retracted into the short, collar-like first setigerous segment, only the tentacles (branchiæ) and palpi showing. Tentacles in a crowded mass filling the opening of the cephalic collar, divided into a pair of groups of sixty or seventy each. All are slender, smooth, finger-like and about double the length of the first segment. Palpi project from ventral part of the mass of tentacles, fitting a recess formed by the narrowed ventral margin of the first setigerous somite. They are about twice as long as the ventral tentacles, thick, stout, blunt, deeply grooved and smooth, except for a cross-furrow here and there.

Segments well marked throughout, only slightly less so anteriorly than posteriorly. First setigerous segment fully as wide as those following, forming a collar-like ring, prolonged and projecting at the sides opposite to the parapodia, contracted ventrally to about half this length and forming a sinus to accommodate the palpi. Succeeding segments slightly shorter than the first and simple rings separated by distinct but shallow furrows. After about XII, they become gradually reduced in diameter but undergo little change in length to about the caudal fourth. In this region, while the furrows are no deeper, the segments appear more distinct owing to the greater prominence of the parapodia.

Pygidium a minute ring, slightly oblique dorsad, with a whorl of minute papillæ surrounding the widely open anus.

Integument rather thickly and uniformly studded throughout with relatively coarse, rough papillæ, arranged more or less regularly in four transverse rows on each segment. They are of fairly uniform size throughout and each consists of a conical base and filamentous tip. Considerable fine sand adheres to the surface between the papillæ but is displaced rather easily.

Parapodia consist of small flat notopodial and neuropodial papillæ, the former about three times the diameter and height of

---

<sup>2</sup>This may belong to *Saphobranchia* which it resembles in the character of the setæ.

the latter, placed close together on the sides of the segments. Posteriorly, while not becoming distinctly longer, but owing to the decreased diameter of the segments, the neuropodia stand out more prominently and the notopodia arise from their bases. Each ramus bears an especially long filamentous papilla behind the fascicle of setæ, which may represent the cirrus, and several similar but smaller papillæ clustered about the ramus.

Setæ of both rami of the first pair of parapodia project directly forward as flat fascicles of eight to ten each enclosing the head laterally. These setæ, alike on the two rami, are as long as twice the body diameter, slender, tapering, articulated, the basal articulations being only as long as the diameter but increasing toward the tip to about four times as much. On II the setæ of the notopodium are about one-half as long as on I, similar in form and project less sharply forward. Those of the neuropodium are stouter and shorter. On all remaining somites the notopodial setæ project laterad, are about half the diameter of the body, slender capillary, regularly tapered, jointed and colorless. Neuropodial setæ are stouter (about three times diameter of notopodials), tapering near the end rather abruptly to a filamentous tip, pale brown, with articulations shorter and more numerous than the notopodials.

Other specimens have a length up to 40 mm. and differ somewhat in the degree to which the body is distended, some being stouter, others more slender. In the first case the papillæ are more widely separated, in the second more crowded than in the type.

Stations 4307, off Point Loma Lighthouse, 169–490 fathoms, green mud and fine sand; 4326, off Point La Jolla, 243–280 fathoms, soft green mud; 4369, off Point Loma Lighthouse, 260–284 fathoms, green mud and gray sand; 4412, off Santa Catalina Island, 265–274 fathoms, green mud and gravel (cotype); 4430, off Santa Cruz Island, 197–281 fathoms, black sand (type); 4517, off Point Pinos Lighthouse, 750–766 fathoms, green mud and sand.

***Flabelligera infundibularis* Johnson.**

A single fragmentary specimen probably of this species taken at Station 4412, off Santa Catalina Island, 265–274 fathoms, green mud.

MALDANIDAE

***Rhodine bitorquata* sp. nov. Plate XVIII, fig. 30.**

This well-characterized species is known from fragments of anterior ends only. The type, consisting of the head and seven setigerous somites, is the best preserved and principally served for the description. The piece is 3.8 mm. long with a maximum

diameter of 1.6 mm. which is very slightly exceeded by one other specimen.

Head an irregular knob-like enlargement forming an angle with the body axis of about  $45^\circ$ ; slightly compressed in caudal half but somewhat depressed forward where it tapers to the rounded palpode; length about twice greatest width and one and one-third greatest depth, both at caudal end. Limbus obsolete except for a slight transverse fold that remains of the posterior portion and extends across the dorsum at the boundary between the peristomium and somite II and a short flange at each side of the broad, flat, semicircular palpode. Keel high, narrow, prominent, uniform, reaching from palpode to end of middle-third of head, where a faint furrow encircles the latter. Nuchal organs deeply incised, narrowly >-shaped, the medial limb close to and parallel with the keel, the lateral limb about  $\frac{2}{3}$  as long and nearly parallel with the margin of the head. Mouth large for a maldanid, crescent-shaped, with a cushion-like upper lip occupying an elliptical depression.

Other specimens have the head somewhat more contracted and forming an angle with the body slightly greater or less than the type, and nuchal organs forming a somewhat wider >.

Somite II separated from the head by a faint furrow only, elongated and slender, length four to four and one-half times and diameter two-thirds head, strictly cylindrical, not distinctly divided into two annuli but marked by numerous faint encircling lines, setæ fascicles close to anterior end. Somite III is of slightly greater diameter than II and one-half (in some of the cotypes) to three-quarters (in the type) the length of II. One-fifth of this length is of the collar which is slightly oblique, with the dorsal margin less produced and somewhat emarginate. Otherwise its margin is perfectly entire and smooth and it closely embraces the slightly contracted caudal end of II. IV is similar to III which it slightly exceeds in diameter, but is somewhat shorter. It bears a similar but slightly lower collar and differs from III in the thick glandular zone that covers its cephalic two-thirds. Both III and IV, but especially the former, are very readily detached.

The remaining four segments of the type lack collars, but the slightly projecting anterior glandular margins somewhat embrace the preceding segment laterally. V is the shortest, being about three-fourths as long as IV, while VI, VII and VIII each nearly equals III. All of these have the anterior end to and including the tori thickly glandular, except in the dorsi-meson, and the slight lateral lips embracing the preceding segment.

On the first two stigerous segments the fascicles lie close to the anterior end; on the others somewhat cephalad of the middle. The first four (II-V incl.) bear setæ only, the others both setæ and uncini, the setæ fascicles on the latter being larger and the tori low and narrow.

The setæ are numerous and arranged in two rows in the large fascicles. All are of one type, colorless, with bilimbate ends much like those of *Notoprotus* but more slender and elongated.

The uncini (Plate XVIII, fig. 30) are small and numerous, upwards of 100 on a detached segment of unknown number. They are arranged in two facing and interlocking series and resemble those of certain terebellids (*Pista*).

A few segments of tube (the largest 70 mm long) have a diameter of 2.3 mm. and are of a deep-brown color, horny, laminated and friable. One tube is thinner and orange-colored.

All specimens come from the vicinity of Cape Pinos, Monterey Bay, on bottoms mostly of gray but occasionally of green mud and at depths varying from 75 fathoms (station 4523) to 766 fathoms (station 4517).

Stations 4508, 4510, 4517, 4523, 4524, 4526, the last yielding the type and two cotypes.

***Praxillura maculata*** sp. nov. Plate XVIII, figs. 31, 32.

Head, including the small posterior peristomial annulus, one and two-thirds times as long as deep. Profile gibbous, continuing direction of anterior segments for caudal three-fourths of dorsum, then dropping at right angles for slightly more than one-half depth of head and then again bending sharply forward as a broad projecting lip. There is no trace of a cephalic limb and the region of the disk is much reduced, consisting of a depressed area on the steep frons bounded by the lip below, slight, cheek-like swellings laterally and a slight frontal prominence above. Within this area, occupying the steep portion of the profile, is the very short low median carina, scarcely longer than broad, separated by faint transverse grooves from the lip below and the frontal prominence above and bounded laterally by the longitudinal limbs of the nuchal organs. Nuchal organs rather distinct, each consisting of two limbs of approximately equal length, one longitudinal, straight, and bounding the carina, the other diverging laterad and cephalad at an angle of about  $110^\circ$  and slightly curved. On the caudal part of the head a small annulus is rather distinctly cut off and there are a number of irregular transverse furrows. Mouth very large, occupying most of the ventral surface of the head and bounded by loose wrinkled lips. No eye-spots can be detected.

Anterior setigerous segments very short, the first two together about equal to the total length of the head. They increase gradually and by VIII or IX the length equals the diameter. These segments are separated by deep furrows and are strongly biannulate, the anterior setigerous ring being three times the length of the posterior. The first four or five are rather strongly gibbous at the sides ventral to the setæ but this condition soon disappears. At XIII

the annuli become relatively longer and from this point to XX the segments are slightly longer than wide; beyond XX to the end of the piece (XXVII) they are more slender and about 50% longer than wide, but this region is somewhat distorted. Intersegmental furrows also disappear at XX and the tori shift to the caudal region on XXI. Pygidium unknown.

The first seven setigerous somites bear stout spines, the others crochets in tori, though the first four pairs of tori (IX to XII incl.) are indistinct as are also the glandular areas. On XIII both are well developed and on XIV prominent, the tori forming conspicuous ventro-lateral swellings and the glands complete whitish zones, which ventrally and laterally cover all of the somite anterior to and including the parapodia and dorsally are reduced to a narrow band. After XX the glandular zones become narrower and shift with the tori caudad.

Somites II to VIII bear small lateral tufts of setæ and immediately ventral to them one or two stout spines. At XIII definite tori with crochets begin, while IX to XII are intermediate, bearing two to five transitional, nearly sessile crochets. The number of crochets is always small, being on middle segments 9 to 11, arranged in a single row.

Setæ of anterior bundles are of two forms, most of them small, narrowly bilimbate and very slender lanceolate, the others longer and lacking margins altogether. Further back they all tend toward the latter type, the limbate setæ being reduced both in number and distinctiveness. At the caudal end, while the number of setæ is not increased, the length of individual setæ is about doubled, resulting in much greater prominence of the fascicles. These posterior setæ are very slender, straight and smooth, except at the tip where fine asperities cause them to become coated with foreign matter. All notopodial setæ are colorless and exhibit only the very faintest internal striations.

Anterior spines (Plate XVIII, fig. 31) are of a deep brownish-yellow color, strongly striated internally and all more or less stout, tapering towards the ends and slightly curved. Most of them have weak claw-like tips but some are nearly straight and simply taper to blunt points. From XIII at least crochets are all of one kind; stem and shoulder cannot be well made out in the preparation but the exposed part as shown in figure 32 bears a stout beak and a crest of four main teeth with the usual lateral brush and a broad guard divided in halves, each ending in a frayed filament.

The cephalic end, including the head and segments to XIII, bears a conspicuously maculated pattern of small rounded or somewhat irregular brown spots most numerous dorsally and anteriorly and gradually fading away ventrally and caudally. They present no definite pattern but it is noticeable that the largest spots are frequently arranged symmetrically on the dorsum

of the setigerous zone of the small annulus and in corresponding positions on the head, indicating that an annular or metameric pattern may prevail in life.

Tube unknown.

Type only. Station 4427, off Santa Cruz Island, 447-510 fathoms, black mud, rocks.

✓ **Nicomache carinata** Moore.

Fifteen specimens of various sizes agree fully with the types in form, setae and color, the only differences being in such proportions of segments etc. as would result from different degrees of contraction. The number of short subequal cirri on the pygidial funnel varies from fourteen to twenty-one, eighteen being the most frequent number. Some specimens are filled with eggs or sperm. Several tubes attached in a mass to a stone are almost horny with a covering of sand.

Stations 4325, off Point La Jolla, 243-280 fathoms, soft green mud; 4411, off Santa Catalina Island, 143-245, fine gray sand and shells; 4415, off Santa Barbara Island, 302-638 fathoms, green mud; 4421, off San Nicolas Island, 229-298 fathoms, gray mud; 4423, same locality, 216-339 fathoms, gray sand and shells; 4430, off Santa Cruz Island, 197-281 fathoms, black sand, pebbles and rock; 4574, off Cape Colnett, Lower California, 1400 fathoms.

**Leichone borealis** Arwardson.

Two fragments measuring 1.7 mm. and 2.5 mm. in diameter consist of the head and 8 and 9 segments respectively. As far as represented they are indistinguishable from *L. borealis*.

Station 4352 only, off Point Loma Lighthouse, 549-585 fathoms, green mud.

**Pseudoclymene longiceps** sp. nov. Plate XVIII, figs. 33, 34.

The type consists of head and twelve setigerous segments.

Prostomium and peristomium completely united, their boundaries indicated by a faint ventral half-furrow, the dorsal end of which is joined by a scarcely better defined longitudinal furrow reaching to postcephalic furrow I/II. Anterior cephalic angle about 50° (45° in a cotype). Cephalic plate elongated, oval, one and three-fourths as long as broad, the greatest width being at the end of the first third, tapering to a narrow caudal end which reaches almost to the furrow I/II and is marked by five transverse furrows. Limbus low but firm, of uniform height and with smooth entire margin; the posterior half erect, the anterior flaring; no

definite lateral incisions, the only interruptions being the anterior median opening through which the small, tongue-like palpode projects and the faint irregular notches, or in one specimen crenulations, which correspond with the cross-furrows on the disk. No true median carina, the well defined area of one-fifth of the width of the disk between the nuchal organs being not at all elevated. Nuchal organs well defined, one-fourth length of cephalic plate, with exception of a slight curvature at anterior end almost perfectly straight. Mouth a relatively small slightly crescentic slit, far forward near end of head, with raised slightly rugous lips.

Somite II cylindrical, about one-fourth longer than head, diameter one-half length, smooth, undivided into annuli and lacking conspicuous glandular areas. The next three segments are evidently contracted and distinctly shorter than II; VI is longer than V and VII still longer, equalling II; VIII equals the head and II combined; IX and X are united, without dividing furrow; XI is slender and much elongated, approaching the combined length of IX and X. Two other specimens agree with the type in these proportions; a fourth has the posterior somites more elongated and the furrows obsolete after VIII/IX. All segments are uniannular. From III to IX, they have proparapodial glandular zones, those on VII and VIII being best developed. Somite V bears a high membranous collar which closely embraces IV and except for slight emarginations (which in one specimen become distinct notches) at the level of the seta fascicles are quite entire and of even height. On another specimen faint lateral and ventral impressions give the collar a slightly trilobate character, the dorsal lobe being a little the longest. Somites III, IV, VII, VIII and to a slight degree IX, exhibit false collars due to the retraction within their anterior ends of the preceding segments. These folds are thicker and evidently double reduplicatures of the skin instead of true collars.

Although more or less indicated on all anterior segments, proparapodial glandular zones are conspicuously developed on VII, VIII and IX only; on these they are complete and occupy the entire region cephalad of the setæ.

Definite parapodia are lacking on II, III and IV, which bear a dorsal tuft of sessile setæ and a single stout ventral spine each. Remaining somites bear tori, which from V to IX inclusive, are anterior and on succeeding somites posterior in position. Each bears a long row of crochets occupying as much as one-fifth or even one-fourth of the circumference and dorsal to it a flattened lappet with a prominent tuft of setæ. The number of crochets varies from 9 to 14 on V, is about 30 on VIII to X, and 40 or more on XII.

On II to IV, the setæ are arranged in a vertical line of two ranks, one of small and one of longer slender, capillary, narrowly bilim-

bate and smooth setæ and ventral to them a single, stout, yellow, blunt and internally fibrous spine (Plate XVIII, fig. 33). Beginning with V, the setæ remain as before but the spine is replaced by a single series of slightly curved, pale-colored crochets (Plate XVIII, fig. 34), with a rather weak curved beak, a low crown of three or four principal teeth and a secondary flanking series of fine ones on each side; guard of three or only two filaments on each half. They gradually change in form as they increase in number and by VIII are strongly curved, with a stout and nearly straight beak, a high crest of six or seven teeth of diminishing size and the secondary teeth nearly obsolete. As posterior segments are lacking and most of the setæ of anterior segments are broken, it is impossible to determine if any serrate or spiral setæ exist.

The natural colors have faded, but the head and first three segments are ashy, the rest light or dark brown and the glandular zones whitish. One specimen has the anterior segments marked with quadrate black spots.

Portions of tubes are thick and firm, composed mostly of large sand-grains of various colors, closely and securely fitted together with little hard cement.

Stations 4427, off Santa Cruz Island, 447-510 fathoms, black mud; 4464, off Santa Cruz Lighthouse, 9-10 fathoms, rocky; 4556, off Point Pinos Lighthouse, 56-59 fathoms, rocks (type).

*Heteroclymene glabra* sp. nov. Plate XVIII, figs. 35, 36.

A species very imperfectly known through a single anterior end consisting of the head and eight setigerous segments; measuring 22 mm. long and 1.2 mm. in diameter.

Owing to the faintness of the furrow I/II the head and first setigerous segment have a continuous tapering outline, of which somite II contributes about four-sevenths of the length. Cephalic plate inclined at an angle of less than  $45^\circ$ , the center deeply depressed below the limbus which exhibits a sigmoid profile and nearly circular outline. Limbus with high, prominent, lateral lobes, slightly auriculate anteriorly, the posterior lobe lower and stiffer, with a deep median notch and slightly crenulated margin. Carina low, flat, straight, about three-fourths length of cephalic plate, contracted in the middle and slightly widened at both ends, the anterior terminated by a small blunt-pointed palpode set in a notch between the lateral lobes. Nuchal organs very narrow slits almost as long as the carina and nearly straight with a very slight lyriform curvature. Mouth prominent, crescentic, with large furrowed lip. Prostomium with no marked characters.

Somite II about one-third longer than head, tapered to contracted caudal end, smooth, with a faint anterior glandular zone and neural groove; III is similar as is IV also, except that it is only as

long as the head. Parapodial areas on all three are anterior and consist of a dorsal line of setæ and a single ventral spine, both sessile. Somite V is as long as IV, cylindrical, much darker in color than the preceding segments; VI, VII and VIII are similar, except that the latter passes into IX without any furrow. Beginning with V, there is a short dorsal line or tuft of setæ and a ventral transverse series of crochets. On V to VIII the setæ are at the middle, on IX near the caudal end, though owing to mutilation it is impossible to determine the exact length of the latter. None of these segments exhibits clearly marked glandular areas.

Notopodial setæ form dense flat fascicles of moderate size and appear to be alike on all segments, though most of them are broken. They are simple, colorless, alimbate, very slender, capillary, tapering and smooth. Spines (Plate XVIII, fig. 35) on anterior segments (II to IV), much smaller than in related species. They are relatively slender, nearly straight, except near the end where there is a slight bend below the blunt point, pale yellow and faintly striated. Crochets (Plate XVIII, fig. 36) about fifteen or twenty in each series, small and slender, with curved, tapering stem, shoulder and neck only slightly marked and head but little bent back, with acute beak at right angle to shaft and depressed crest of four rather acute teeth of diminishing size and a lateral brush; guard weak, of about eight slender, short filaments.

Station 4326, off Point La Jolla, 243-280 fathoms, soft green mud (type only).

*Euclymene reticulata* sp. nov. Plate XVIII, figs. 37, 38.

Described from the type only, a large example consisting of the head and nine setigerous segments, measuring 52 mm. long and 4.5 mm. in diameter.

The head and first setigerous segment are completely united into a single piece twice as long as III, somewhat depressed, distinctly widened in the middle and contracted slightly, both immediately behind the cephalic plate and at the furrow II/III. Cephalic plate forming with the body axis a dorsal angle of about 45°, with semi-erect limbate margins, which, with the depressed center, give a general saucer-like effect. The margin of the limbus is smooth and entire, except for an anterior interruption from which the palpode protrudes, a posterior median notch and a pair of larger lateral notches about one-third of the length from the caudal end; the limbus anterior to these being wider and more flaring, posterior stiffer and more erect. Central disk oval, widest at the lateral notches, one and one-third times as long as wide, and marked by a few wrinkles. Carina low and rounded but well marked, long and straight, of nearly uniform width and about three-fourths length of central disk or two-thirds length of entire cephalic plate.

Nuchal organs perfectly straight deep slits bounding carina for entire length and ending anteriorly at each side of the small rounded palpode. Mouth small, far forward, bounded by a slightly wrinkled anterior lip continuous with the ventral side of the palpode and a crescentic hind lip.

Peristomium in no way separated from the prostomium and from II only by a slight constriction anterior to its setæ and preceded by an enlargement. What is considered to represent II is a simple segment widest anteriorly and tapering slightly caudad and as long as prostomium and peristomium combined; III is similar, but slightly shorter. Somites IV to IX inclusive are strongly contracted short cylinders, separated by well-defined furrows and lacking glandular zones or other conspicuous features; X is again longer, equalling VIII and IX combined.

The head and somite II, except at the extreme caudal end, are ornamented by a conspicuous finely reticulated pattern of raised lines and depressed areas like chased work on metals. This is somewhat faintly indicated on succeeding segments, but on these annular lines predominate. From VI to IX, the segments are quite smooth; X is marked with transverse wrinkles and the surface is softer.

Setigerous tubercles are situated toward the anterior ends of the segments from II to VIII inclusive, at the middle on IX and posteriorly on X. Except on II the tubercles are remarkably elongated and conspicuous. II, III, and IV each bear a single large ventral spine. The tori on following segments are all small and inconspicuous and bear few crochets; 6 on V, 8 on VI, 18 on VIII, and 26 to 35 on X.

Capillary setæ have the usual arrangement but are uncommonly numerous. Unfortunately all bundles are broken and no intact setæ could be found. Neuropodials on II, III and IV consist of one or rarely two stout, deep-yellow fibrous spines, crooked at the tip and with slight indications of teeth when unworn. (Plate XVIII, fig. 37.) Few crochets are intact. The stems are long, slender and strongly curved, the shoulder slight, neck rather strongly marked but swelling rapidly into the broad thick head, with thick, ample crest of five transverse rows of teeth; beak rather short and stout; guard moderately developed, of seven slender filaments on the only one intact (Plate XVIII, fig. 38).

Caudal end and tube unknown.

Stations 4337, off Point Loma Lighthouse, 617-680 fathoms, green mud (fragment consisting of a few segments only); 4482, off Santa Cruz Lighthouse, 43-44 fathoms, hard green mud (type).

***Euclymene delineata*** sp. nov. Plate XVIII, figs. 39, 40.

The type consists of a head and ten setigerous segments measuring 29 mm. long and 1.6 mm. in diameter. A cotype from the same

station consists of a pygidium, three non-setigerous and two setigerous segments and is more slender and attenuated.

Head as a whole much contracted, about as long as deep, the cephalic plate inclined at nearly a right angle with the body axis. Cephalic disk one-third longer than wide, oval. Limbus well developed, with a pair of small but distinct postero-lateral notches, anterior to which the lateral lobes are well developed, widely flaring and with smooth entire margins, the posterior lobe abruptly lower, stiff, erect and with the margin faintly crenulated or obscurely toothed and a distinct median notch. Palpode small, thick, bluntly rounded and continuous behind with the narrow, prominent median carina which reaches caudally to the level of the postero-lateral notches. Nuchal organs deep, narrow, perfectly straight slits bounding carina for entire length. Laterad of each is a slightly elevated line and crossing the cephalic disk caudad of the carina are two small concentric ridges. Integument of entire post-oral portion of peristomium deeply and closely reticulated.

First three setigerous segments (II-VI) each about one-fifth longer than the head, cylindrical, the first slightly larger anteriorly. Each bears a presetal anterior one-fourth smooth glandular zone, the remainder being reticulated like the peristomium but with the furrows predominantly transverse. The next three segments are similar in form and size but the glandular zones occupy the anterior two-fifths and the postsetal reticulations are much reduced. These six somites are remarkably uniform in size, VIII is more slender and elongated, IX and X are coalesced and together about one-half longer than VII. None of these segments bear collars or present other noteworthy characters.

Somites II, III and IV bear small linear tufts of setæ and ventrally one or two spines situated one-fourth of the length from the cephalic border; VI, VII and VIII have the spines replaced by from twelve to twenty crochets in a sessile vertical row in a slightly more caudal position; VIII, IX and X bear raised biscuit-shaped tori with a larger number (about 30 on X) of crochets.

At the caudal end, the fifth and fourth propygidial segments are each seven or eight times as long as thick; the next succeeding non-setigerous segment is about half as long, enlarged caudally to a clavate form; the next again is further reduced in length about one-half and bears a slight annular thickening at the caudal end. The last is very much shorter and consists principally of a prominent raised ring out of which the caudal funnel arises. This bears no setæ and no definite parapodia; the two preceding segments, though achætous, bear prominent lappet-like parapodia, while the two setigerous segments have typical parapodia with small erect tufts of dorsal setæ and small tori with crochets.

The pygidium consists of a well-defined funnel with flaring borders spreading to the width of the preceding segment and bearing

eighteen slender filaments of various lengths. The longest are about one-third of the diameter of the funnel, but much shorter ones alternate with them, especially on the dorsal side and one such occupies the median ventral line in continuation of the neural ridge.

Anterior notopodial setæ bundles are rather large, double-ranked, of numerous slender, simple, capillary, bilimbate setæ of two sizes. Further back all are broken but are apparently of the same form. At the caudal end the fascicles are smaller. Neuropodials on II, III and IV are single (rarely 2), simple spines slightly curved or hooked at the tip (Plate XVIII, fig. 39). On all succeeding setigerous somites they are true crochets. On V, they number at least twelve in a single series (Plate XVIII, fig. 40). They are small, dark colored and closely striated. The shoulder is a marked but gradual swelling. The head is small and expands rather abruptly; the crest full, low and rounded, of four to six median teeth of diminishing size, flanked by a few smaller ones; the beak rather small and strongly hooked and the delicate guard of peculiar form in that the filaments arise in a pinnate instead of the usual palmate figure. On X and the last two caudal setigerous segments the crochets are more numerous and are somewhat larger with the crest much higher and composed of seven or more median and several lateral teeth, the beak more strongly hooked and the filaments of the guard longer and less obviously pinnate.

Other anterior fragments agree with the type but only the one caudal end is known.

Fragments of associated tubes are  $1\frac{1}{2}$  to 2 mm. in diameter, very thin and fragile and formed of silt containing many foraminifer shells.

Known from Station 4433, off Santa Rosa Island, 243-265 fathoms, green mud.

***Maldane carinata* sp. nov.**

Type a complete specimen of twenty-one somites, prostomium and pygidium, measuring 79 mm. long and 2.3 mm. in diameter, which is very uniform throughout the length.

Cephalic disk broadly elliptical in outline, the width about two-thirds the length. Limbate margin divided by a pair of deep smooth incisions into a pair of lateral flaring lobes or wings and a posterior appressed lobe or collar. The former forms about three-fourths of the length and has a perfectly entire margin which is slightly auriculate at the caudal end. The collar lobe is high, stiff and erect, its margin smooth with a very wide, shallow, median emargination. It arises from the posterior border of the peristomium and is closely appressed to the head, forming a deep narrow pit. Palpode

broadly rounded, the width one-third and the length about one-fifth of width of disk (on another specimen it is somewhat narrower). Carina forming a prominent, arched profile; anteriorly, beginning at the palpode, it is nearly vertical and at right angles to the body axis, but bends caudally in a broad curve until it becomes parallel with the body axis and then continues as a perfectly straight ridge, higher than wide, and disappears in the pit beneath the collar lobe. Mouth prominent, trifold, consisting of a transverse crescentic slit from which a longitudinal groove of equal length runs forward. Peristomium completely merged in head, slightly biannulate ventrally, the more cephalic annulus smaller.

Somites II to IV strongly biannulate, the anterior rings being in each case completely glandular and about one-half as long as the posterior setigerous ring; III and IV are each about as long as the head, II being somewhat shorter; V and VI are longer, VI being nearly twice as long as II; both are biannulate but the furrows are obscure and the gland cells have completely disappeared from the dorsum but remain well developed ventrally and laterally.

Remaining somites obscurely differentiated, the furrows having disappeared. Measured by the distances between the tori, they increase in length rapidly to XI which is eleven times the length of II, the difference being due perhaps in part to the fact that the middle region of the body was encased in a tube and thereby protected from the contracting action of the preserving fluid. After XI, the segments gradually decrease in length to XX which is slightly longer than II. VII retains a small ventral crescent of gland cells representing the anterior annulus and a rather broad ventral band connecting the tori. On VIII the latter band only, much reduced in width, remains. Other middle segments lack glands altogether, except for a few small areas about the tori; caudal segments bear only slight traces of glands. There are no true collars on any of the anterior segments, but VII bears an anterior dorsal flange that slightly overlaps VI. Probably there are two short, achæitous, preanal segments, but they are indistinctly developed, the first in contraction forming a slight transverse dorsal fold or low collar. The rectum is prolapsed as a finely rugous tube about 2 mm. long.

Except for the palpode, nuchal organs and carina (and there is even a faint imitation of the latter), the pygidium is a nearly perfect duplicate in funnel and platform of the cephalic plate, but of course reversed in dorso-ventral aspect. The setigerous tubercles and tori have quite the usual size and arrangement and present no noteworthy features.

On II, III and IV, there are rather numerous setæ in prominent fascicles. They are colorless and slender, with the limbus confined to the basal part below the very long, slender, smooth capillary end. Posteriorly the fascicles become smaller and the anterior

type of setæ is replaced by even more slender setæ without trace of limbi and bearing series of broad ensheathing awns or scales which become smaller and disappear at the tip.

Crochets are small and numerous (upwards of forty in the middle region). The stems are extremely long and slender, tapered to the surface of the body, strongly curved, the shoulder prominent and abrupt, neck rather short and stout, head small, broad, nearly spherical, with a rather long, slender, flattened beak and a broad low crest of three transverse rows of numerous teeth. The guard consists of about ten filaments and spreads before and above beak.

This species is known only from the type, Station 4405, off San Clemente Island, 654-704 fathoms, green mud; a fragment of a small specimen of doubtful determination from Station 4431, off Santa Rosa Island, 31-45 fathoms, green and yellow mud, and coarse gray sand; and an anterior end from Station 4547, off Point Pinos Lighthouse, 1073 fathoms, soft gray mud.

**Maldane lacera** sp. nov.

The type and only specimen is complete and measures 55 mm. long and very uniformly 2.3 mm. in diameter.

Outline of cephalic plate broadly elliptical, width nearly four-fifths length. Limbus divided into a pair of lateral and a posterior lobe by a pair of deep clefts which continue on to the peristomium; the lateral lobes small with contracted base and expanded margin irregularly divided into sharp triangular teeth of variable size; posterior lobe prominent and constituting about one-half of margin, its border divided into twelve teeth, sharply triangular and similar to those of lateral lobes, but of nearly regular size. Median carina low, broad and rounded, about one-fourth as wide as cephalic plate, slightly longer than lateral lobes at the anterior margin of which it abruptly expands into the broad, short rounded palpode which has a width of about one-half the cephalic plate and exceeds the lateral lobes in size. Mouth a conspicuous opening bounded by the biannulate peristomium which projects from the enveloping collar borne by somite II.

Following the head are nineteen setigerous somites and apparently but one, or possibly two, very short and crowded achæteous preanal segments. None of these segments more than slightly exceeds in length its diameter and most are less than this.

Somite II is about two-thirds as long as wide and divided by a deep furrow into an anterior setigerous and collared ring and a posterior ring about two-thirds as long. The presetal collar is prominent and embraces closely the peristomium, its height being about one-third of the length of the segment and its margin thin and smooth and entire except for a notch at the level of the setæ bundles, ventral to which the rounded border flares strongly.

The next four segments (III to VI) are similarly biannulate, cylindrical, of about equal length, the posterior rings being about two-fifths and the anterior three-fifths of the total length. VII is a still shorter segment consisting of a setigerous ring only. The following segments are reversed, the setæ fascicles and tori lying nearer to the caudal end; annular furrows are absent and the form regularly cylindrical and about one-third longer than wide to XVIII; this and the two succeeding segments being about two-thirds as long as wide, uniannulate and bearing very large swollen tori. The last preanal segment is still shorter, achætous, and bears a thickened region corresponding to the tori on the ventral side where they merge with the base of the caudal funnel.

The anus is located on a prominent papilla dorsal to the base of the anal funnel, which is of an interesting and characteristic form corresponding to the cephalic plate, but slightly more oblique than the latter, the dorsal border being the more produced. A pair of deep, rounded notches, contracted at the rim, divides the limb into a dorsal and a ventral lobe, the latter being again divided into four prominent teeth or sublobes, two on each side, the median pair triangular and pointed, the lateral somewhat curved dorsad and blunt. The dorsal lobe is divided into six somewhat less regular and smaller teeth, usually separated by rather shallow intervals, the ventral pair broad and square with angles slightly produced, the other two pair small and acute; on the medial side of each of the dorsalmost is a smaller additional tooth making eight in all.

Tori and setigerous tubercles have the arrangement usual in the genus and the former become relatively longer in the posterior region. Somite II bears small tufts of capillary setæ only. They are all broken so that their characteristics are undetermined. Remaining somites bear both setæ and uncini.

Many setæ are broken but the following seems to be their distribution and characteristics. On anterior somites they are arranged in from five to nine pairs of one large and one small in a short vertical line. On III and IV all appear to be of one form, simple, acute, smooth, slightly bent and narrowly limbate. Beginning with V, the large limbate setæ are replaced by more elongated and slender capillary setæ, which may have a length of one-third the body diameter, especially on more posterior somites, but in all cases some of the smaller limbate setæ remain. Most of the free portion of these setæ, except the extreme tip, is ornamented with numerous whorls of divergent hairs or awns, always arranged transversely and never spirally. So far as could be determined no other kinds of setæ are present.

Uncini occur on all segments from III to XX arranged in a single vertical series varying in number from 10 on III, to 28 on X, 25 on XV, and 19 on XX. When characteristically developed, as they

are on all except the first two or three segments, they are crochets with rather strongly curved stem, prominent shoulder, constricted neck, full head and crest, stout tapering beak and fully-formed arched guard. On the first torus they have less expanded head and crest, straighter and less tapered beak and weaker guard, which arises close beneath the beak. They are also paler in color.

A portion of tube is of fine silt and very fragile.

Type specimen only, Station 4352, off Point Loma Lighthouse, 549-585 fathoms, green mud.

***Maldane sarsi*** Malmgren var.

Numerous specimens of a small *Maldane* close to *M. sarsi* are indistinguishable structurally from examples from Europe, Labrador, Alaska and Japan but are constantly characterized by the entire absence of dark-brown pigment specks which are usually found on the anterior region of the typical form. This form is abundant and widely distributed in the southern Californian region on muddy bottoms and lives in thick walled mud tubes.

Stations 4307, off Point Loma Lighthouse, 169-490 fathoms, green mud and fine sand; 4322, off Point La Jolla, 110-199 fathoms, soft green mud; 4339, off Point Loma Lighthouse, 241-369 fathoms, green mud; 4351, same locality, 423-488 fathoms, soft green mud; 4431, off Santa Rosa Island, 38-45 fathoms, green mud and coarse gray sand; 4433, same locality, 243-265 fathoms, green mud (upwards of 170); 4436, off San Miguel Island, 274-287 fathoms, green mud; 4452, off Point Pinos Lighthouse, 49-50 fathoms, green mud, fine sand; 4457, same locality, 40-46 fathoms, dark-green mud; 4464, same locality, 36-51 fathoms, soft dark gray mud; 4468, off Santa Cruz Lighthouse, 32-309 fathoms, fine sand; 4482, same locality, 43-44 fathoms, soft green mud; 4485, same locality, 39-108 fathoms, soft green mud; 4510, off Point Pinos Lighthouse, 91-156 fathoms, gray mud; 4513, same locality, 389-456 fathoms, green mud; 4523, same locality, 75-108 fathoms, soft dark mud; 4526, same locality, 204-239 fathoms, soft gray mud; 4528, same locality, 766-800 fathoms, soft gray mud. Besides 4433, this annelid is plentiful in the collections from stations 4431, 4452, 4457, 4464, 4485, 4510 and 4526.

***Maldane (Asychis) disparidentata*** Moore.

A complete specimen is 178 mm. long and 7 mm. in diameter, of twenty one segments (nineteen of which are setigerous and eighteen uncinigerous) and no propygidial non-setigerous segment. While

some specimens have the teeth on the cephalic limbus prominent and acute, others have them much more obscure and in one case the limbus is scarcely more than crenulated. A specimen 165 mm., long taken on Beaver Shoal in San Diego Bay, is filled with large ova.

Stations 4510, off Point Pinos Lighthouse, 91-184 fathoms, gray mud; 4548, same locality, 46-54 fathoms, coarse sand and shells; Beaver Shoal, San Diego Bay, mud.

**Praxillella gracilis** (Sars).

Six specimens represent this species. A complete one is 145 mm. long, 3.6 mm. in diameter at VIII. There are twenty-one segments, the last four being achætous. Somites II, III and IV bear setæ and one to three ventral spines; V to XVIII bear setæ and crochets. The head bears a slender, cirriform palpode. Two anal funnels bear twenty-one and twenty-three slender, equal cirri and another much stouter mid-ventral cirrus. Some fragments of tubes are soft and fragile and covered with a thin coating of fine sand.

Stations 4452, off Point Pinos Lighthouse, 49-51 fathoms, green mud and sand; 4463, same locality, 48-111 fathoms, rocky; 4517, same locality, 750-766 fathoms, green mud, sand.

**Praxillella?** sp.?

A pygidium and four achætous segments of a large specimen about 5 mm. in diameter. The margin of the anal funnel bears forty-nine teeth or cirri, the median ventral being double, but not larger than the others. In all other respects this species resembles the preceding one.

**Notoproctus pacificus** Moore.

This species, which was described in the original ms. as new under the name of *N. lineatus*, is now considered to be *N. pacificus*, though it may eventually prove to be distinct when a larger number of examples of both forms is available for comparison.

The features in which this differs from the type of *N. pacificus* are the smaller number (about six instead of twelve) of filaments in the crochet guards, the greater number of uncini in each series, the total absence of pigment and difference in the number of propygidal achætous segments, one of these specimens having one, the other three, while the type of *N. pacificus* has two. As the last

feature is variable in *N. oculatus* it is probably variable in this species also. The bathymetrical range is noteworthy.

Stations 4397, off Santa Catalina Islands, lat.  $33^{\circ} 10' 15''$  N., long.  $121^{\circ} 42' 32''$  W., 2196–2228 fathoms, gray mud; 4454, off Point Pinos Lighthouse, 65–71 fathoms, green mud and sand.

#### AMMOCHARIDAE

##### *Ammocharis occidentalis* Johnson?

This determination is based upon probability only, as owing to the toughness of the tubes and the closeness of their contact with the worms, the latter are in a poor state of preservation and cannot be extracted. The uncini are bifid as in Johnson's species but are colorless. Capillary setæ are fringed at the tips only.

A tube is 90 mm. long and 2.5 mm. in diameter and covered with small fragments of shells arranged in the usual imbricated manner.

Station 4496, off Santa Cruz Lighthouse, 10 fathoms, fine gray sand and rocks.

#### SABELLIDAE

##### *Branchiomma circumspectum* sp. nov. Plate XVIII, figs. 41, 42

Known and described from the type only,—a well-preserved specimen 31 mm. long, of which the gills are 6 mm. and the thorax 5.5 mm., the maximum width of the thorax being 1.8 mm. Segments, thoracic 9 (8 setigerous), abdominal 59.

Branchial bases simple, low, of even height, slightly prolonged ventrally but not coiled, well separated dorsally. Radioles fourteen pairs, the ventral pair rudimentary, cleft and separated nearly to the base, no interbranchial membrane, rounded on external face and totally destitute of marginal expansions, rather thick and gently tapered, the dorsal pair being somewhat thicker and of almost uniform diameter. Barbs also rather short, thick and stiff, the longest about one-third width of thorax, a short distal portion of the radioles free from them. At this point where the barbs cease are situated the compound eyes, a single one on each radiole facing toward the center of the circle formed by the gills. Eyes subspherical, enclosing the radiole internally, laterally and except for a narrow cleft, externally, swelling prominently internally. They are deep brown and very conspicuous but vary in size. Generally they are about equal to the greatest diameter of the radiole bearing them and about twice the diameter of the end of the filament but they decrease in size ventrally, the ventralmost on the immature radioles being scarcely visible. The dorsalmost

pair on the other hand are enlarged, being fully four times the diameter of the next largest. The separate facets can be detected easily under a magnification of four or five diameters.

Collar well preserved, prominent and flaring. Starting as a broad fold at the second fascicle of setæ its margin runs straight forward, enclosing the collar fascicle, anterior to which it bends ventrad at a rounded right angle and then continues of even height to a level ventrad of the thoracic tori where it is produced into a pair of triangular lobes as long as the first two somites and projecting forward in mutual contact. On each side of a median dorsal cleft is a broadly-rounded dorsal lobe, united with the body of the collar by a thin membrane dorsal to the collar setæ, with which it forms a pocket.

Oral membranes foliaceous, reflexed onto the branchial base. Tentacles a pair of foliaceous, vertical folds, slightly exceeding the oral membranes in length and bearing a terminal filament nearly as long as the broad basal portion.

Thorax distinctly depressed, about two-thirds as deep as wide, becoming narrower caudad. Segments well marked, the ratio of length to width varying from 1:3 anteriorly to 1.2 posteriorly. Thoracic portion of fecal groove nearly obsolete. Ventral plates 8, well developed, separated from the parapodia laterally by a continuous groove, all nearly square except the last which has the right posterior corner cut off. Parapodia well marked, formed of prominent dorsal setigerous papillæ and immediately ventral to these transverse tori nearly uniformly one-eighth the circumference of the segment.

Abdomen subterete, of nearly uniform diameter almost to the tapered caudal end. Anterior segments similar to posterior thoracic segments, becoming regularly shorter until they are four or five times as wide as long. Ventral plates thick and well marked, divided into equal halves by a deep fecal groove. They remain of uniform width and consequently the anterior ones are nearly square and the posterior about four times as wide as long.

Ground color of body pale, the dorsum of the abdomen much tinged with brown and a pair of conspicuous brown spots occupying the third, fourth and fifth segments dorsal to the setæ. Lighter brown spots occur between the parapodia also and other parts of the body are tinged with brown. The gills are pale, marked with five zones of deep brown usually equal in width to the intervals separating them, the first close to the base, the last about its own width from the tip. Different gills vary greatly, some being almost colorless, others with deep pigmentation covering solidly sections of the radiole and entire barbs arising at that point. Narrow dashes of pigment also mark the intervals between the barbs on the base.

Setæ all colorless or nearly so. Thoracic tufts rather prominent but too much broken on this specimen for full description. Those

of the ventral ranks of III to IX expanded distally into a narrowly elliptical plate tipped by a prominent mucron (Plate XVIII, fig. 41). Thoracic tori bear a posterior series of avicular uncini and an anterior series of pick-shaped setæ, 15-20 in each series. The former (fig. 42) have small body, prominent breast, high, erect neck and small head with reduced crest and straight, strongly decurved beak. Pick-shaped setæ are nearly as stout as the setæ of the dorsal fascicles with slightly curved stems, widened and truncated obliquely at the end which is striated and bears a small mucron in front. The end is enclosed in a flattened hood produced in front into a straight acute process. Abdominal setæ form small tufts of ten to twelve and are similar to the dorsal thoracic setæ; broadly bilimbate but produced into long tapered acute points from which the limbi are gradually lost. The uncini are generally about 15 and except that the beak is slightly smaller do not differ perceptibly from those of thoracic segments.

Station 4431, off Santa Rosa Island, 38-45 fathoms, green mud, coarse gray sand.

**Sabella elegans** Bush.

Two anterior ends represent this species. Each gill consists of twenty to twenty-one fully developed radioles in addition to three or four rudimentary ones. They are whitish at the base and distal end and are marked with five zones of reddish brown alternating with white. From five to seven pairs of eyes are borne on each of the ventral and three, one or none on the extreme dorsal filaments all at the end of the most distal brown patch.

A tube is 140 mm. long and slightly under 5 mm. in diameter, mucocartilagenoid in consistency and very fragile, pale brown, translucent and slightly encrusted with fine sand grains, etc.

Station 4312, off Point Loma Lighthouse, 95-135 fathoms, fine gray sand and rock.

**Parasabella pallida** sp. nov.

Branchiæ with low branchiophores slightly prolonged ventrally but not spirally coiled. Radioles twelve on one, thirteen on the other side, the most ventral about one-half as long as dorsalmost, entirely free with no connecting basal membrane whatever, slightly flattened but not definitely squared on the outer face, rather thick and coarse, slightly tapered, about one-fifth of the tip free from barbs. Barbs relatively few, more widely separated than usual. No eyes; no color whatever.

Collar prominent, of two conspicuous halves, widely separated dorsally and prolonged ventrally as a pair of narrow pointed lobes which are in contact along their contiguous borders.

Body short and stout, little tapered to near the caudal end. Fecal groove indistinct on thorax but well developed on venter of abdomen. Ventral plates well developed throughout, generally about four times as wide as long except on extreme caudal segments; those on abdomen divided in halves by fecal groove. Pygidium a small simple ring with large anus looking caudo-ventrad.

Ventral setæ on thorax wider than those figured for *P. media* and more like those figured for *P. maculata* by Miss Bush. The beaked setæ on the other hand more closely resemble those of the former although the cleft at the base of the mucron is less marked.

This is very probably the "small colorless species" recorded by Miss Bush from Pacific Grove.

Type only, a small somewhat contracted specimen 15 mm. long and 1.5 mm. diameter. Thoracic segments 9 (8 setigerous), abdominal segments 50.

Station 4496, off Santa Cruz Lighthouse, 10 fathoms, fine gray sand and rock.

***Pseudopotamilla splendida* Moore.**

Two typical specimens from station 4341, off South Coronado Island, 188-323 fathoms, gray sand, and one each from stations 4420, off San Nicholas Island 32-33 fathoms, fine gray sand, and 4546, off Point Pinos Lighthouse, 849 fathoms, black sand.

***Pseudopotamilla brevibranchiata* Moore.**

Two fine specimens represent this species. The cephalic eyes are conspicuous, very deep red spots confined to the more dorsal radioles and distributed within a zone occupying the second fifth of their length. The exact distribution on one specimen is as follows, the radioles being numbered from the dorsalmost: Left side, 1st—0, 2nd—3, 3rd—3, 4th—2, 5th—2, 6th to 8th—1 each; right side, 1st—0, 2nd—3, 3rd—3, 4th—2, 5th—3, 6th and 7th—each 2, 8th and 9th—each 1.

Stations 4421, off San Nicolas Island, 229-298 fathoms, gray mud; 4496, off Santa Cruz Lighthouse, 10 fathoms, fine gray sand.

Tubes of *Pseudopotamilla* were found at stations 4433 and 4519 also.

***Potamilla neglecta* (Sars) Malmgren.**

This circumboreal species is represented by four worms and a large number of tubes. No eyes or other pigmentation occur on any of the gills. The ventral collar lobes which are much elongated

and pointed in European examples of the species are even more so in this.

Stations 4433, off Santa Rosa Island, 243-265 fathoms, green mud; 4435, off San Miguel Island, 274-287 fathoms, green mud.

Another small specimen taken from a tube attached to a colony of *Pseudopotamilla splendida* may be an aberrant example of this species. It has only seven setigerous thoracic segments.

Station 4341, off South Coronado Island, 266-323 fathoms, gray sand.

**Potamilla californica** Treadwell.

A large specimen was so difficult to remove from a tightly coiled tube that complete study was impossible but it conforms to the incomplete description of this species.

Length about 100 mm., of which the thorax comprises 12 mm., and the gills 16 mm., diameter 4.5 mm. Branchiophores simple, low, not produced ventrally or obviously involuted. Radioles twenty-six pairs, free, rather stout, broadly winged on median dorsal margins, the barbs short, very numerous and crowded, leaving a distal broad naked tip which on the dorsal radioles has a length equaling one-half the width of the thorax. They bear no definite eyes but numerous minute specks of brown pigment. Nine or ten zones of small brown pigment spots are confined chiefly to the bases of the barbs.

Station 4496, off Santa Cruz Lighthouse, 10 fathoms, fine gray sand.

**Potamilla** sp.

Other empty tubes of a *Potamilla* were taken at stations 4463 and 4496.

**Notaulax mucronata** sp. nov. Plate XVIII, figs. 43, 44.

Gills 15 pairs including three or four central ones which are somewhat inturned. Branchiophores or bases very small, weakly attached, somewhat prolonged ventrally but not spirally coiled. Radioles differ greatly in length in different specimens (from  $\frac{1}{3}$  to nearly  $\frac{1}{2}$  total length) chiefly due to their easy loss and regeneration. They are completely free to the bases, there being no trace of an interconnecting membrane, thick, rounded and entirely without appendages, wings or margins. Barbs very delicate, elongated and widely separated, becoming shorter distally, where a considerable tip of the radiole is left naked.

Collar probably somewhat abnormally retracted, closely appressed to branchial bases and with flaring margins divided by

dorsal and ventral fissures into two lobes, the margins of which meet across the fissures both dorsally and ventrally, at the former reflexed into and continuous with the margins of the fecal grooves. Except ventrally, where it is produced into a pair of rather prominent rounded lobes, it remains of even height, low and inconspicuous.

Oral membranes partially folded, with a thickened lateral lobe. Tentacles with a broad leaf-like base as long as wide and a somewhat longer terminal filament.

Peristomium more elongated than usual and more exposed owing to retraction of the collar.

Thorax of nine segments, eight of which are setigerous, somewhat depressed, especially anteriorly where the width is fully one-third more than the depth. Segments well marked by deep furrows. Dorsum flat, with prominent median fecal groove ending in a deep anterior cleft; venter strongly convex. Ventral gland plates not well marked but occupying the entire width of the venter, the last one reduced to half the length of the segment.

Abdomen of 49 and 57 segments in two specimens counted, slender and terete, except posteriorly where it is slightly depressed and the segments very short, finally tapering to the minute pygidium which bears a short, rounded cirrus on each side. There are no abdominal ventral plates and the fecal groove is scarcely noticeable in this region of the type, but both are better developed though inconspicuous on the smaller cotype.

Thoracic setæ form very conspicuous glistening pale-yellow fascicles placed at an unusually high dorsal level. Collar fascicles placed even higher, and in form longer and narrower. The individually nearly colorless setæ are of two kinds except on the collar, those of the dorsalmost series longer, lanceolate with narrow wings and acute tips; the remainder a ventral phalanx of five or six rows of broadly ovate or nearly orbicular paddle-shaped setæ bearing a long, strong, terminal mucron. (Plate XVIII, fig. 43). Abdominal setæ tufts small and strictly lateral, the setæ nearly or quite alimbate, becoming very long and slender caudally.

Thoracic tori short linear, transverse, a little ventrad of the setæ tufts. They bear slender crochets only. These have long, slender, curved stems of less diameter than the setæ, slender necks, strong curved beaks and a long and broad but low crest of many rows of teeth. (Plate XVIII, fig. 44). Abdominal uncini intermediate between the crochet and avicular type, very delicate, with the base fading away into the muscles.

Tubes soft and flexible, covered with fine mud except at the base, where the worm is usually found, which is transparent. They form clusters of several (about 20) attached by their basal ends.

The type measures 57 mm. long of which the gills are 26 mm. and the thorax 5.5 mm. long by 2 mm. wide, and has 66 segments

in all. Another specimen (cotype) from the same cluster is 22 mm. long with the gills only 7 mm. and 58 segments. This is a female filled with nearly mature ova. Most of the specimens, being contained within the tubes, were somewhat softened and otherwise not in good condition for description.

From the type of *Notaulax* this species differs in having collar setæ fascicles of the ordinary form and the spatulate thoracic setæ mucronate.

Stations 4394, off Santa Catalina Islands, lat.  $32^{\circ} 54' 20''$  N., long.  $121^{\circ} 15'$  W., 2259 fathoms, soft gray mud; 4397, lat.  $33^{\circ} 10' 15''$  N., long.  $121^{\circ} 41' 15''$  W., 2196 fathoms, gray mud (type and cotype); 4427, off Santa Cruz Island, 447–510 fathoms, black mud.

***Myxicola pacifica* Johnson.**

Two fine specimens of 67 and 37 mm. respectively agree well with the description of both this and *M. affinis* Bush which appears to me to be the same species. In the designation of thoracic segments, Miss Bush does not enumerate the achæitous peristomium as a distinct segment. The lateral eye-spots of the larger specimen are orange, of the smaller black.

Stations 4430, off Santa Cruz Island, 197–281 fathoms, black sand; 4464, off Point Loma Lighthouse, 36–51 fathoms, soft dark gray mud.

***Euchone magna* sp. nov.** Plate XVIII, figs. 45, 46.

Branchiæ unknown, missing from both specimens.

Collar typical, very high and prominent, especially ventrally where it equals the combined length of the first two segments. Margin full, entire, uninterrupted except at the dorsal cleft, where the ends come into contact in a broad sweep and join at their bases the pair of folds bounding the end of the fecal groove. Prostomium a small recurved tubercle above the mouth. Both tentacles and palps lost.

Thoracic segments nine (8 setigerous), abdominal 76. Form terete, of nearly uniform diameter to near caudal end where the body is tapered and slightly flattened, without caudal membrane and terminates in a minute trilobed pygidium. Peristomium a simple ring hidden in the collar. Segments very regularly and sharply defined, the last seven of the thorax and the abdominal to about L equally and strongly biannulate. Fecal groove deep and well defined throughout. Beginning at the caudal end it passes along the middle of the venter to X, around the right side of which and of IX it passes obliquely to the dorsum and continues

along the median line, always sharply defined, to disappear into a deep slit between the two dorsal collar lobes

Collar setæ tufts very small, arising along a short, nearly horizontal line. Remaining thoracic tufts also small but arising from vertical lines, somewhat nearer the dorsal than the ventral midline. Thoracic tori scarcely elevated, their length not exceeding one-eighth of circumference, the dorsal ends slightly overlapping setæ tufts. Abdominal parapodia are still smaller, the setæ tufts midway between dorsum and venter and the tori, which lie immediately dorsad of them about one-third as long as the thoracic tori. All parapodia are situated at the interannular grooves.

Collar setæ are all broken but appear to be of the dorsal type found on remaining thoracic segments. These consist of a large dorsal group of long, very slender capillary setæ and a ventral group of spatulate setæ, the former usually with a slight sigmoid curvature and unequally narrowly bilimbate, the wider limb, which nowhere exceeds the diameter of the stem, striated, the end alimbate for a considerable distance. The latter (Plate XVIII fig. 45) are stouter, broadly paddle-shaped and without trace of a mucron, though the stems extend to the ends of the strongly striated blades. In lacking any mucron they resemble the spatulate setæ of *Metachone mollis* but most of them are much broader than figured by Miss Bush and more nearly of the proportions of typical *Chone*. Abdominal setæ form very small fascicles of minute setæ, in general resembling the dorsal thoracic except toward the caudal end where they become much elongated and of the strictly capillary type. Thoracic crochets (Plate XVIII, fig. 46) are arranged in a crowded, irregular, rank or partially in two ranks. They have long, slender, slightly curved shaft, head bent at nearly right angles to the shaft, with rather slender unstriated beak and small, low crest of numerous slender striated teeth. Abdominal uncini of the Terebellid form, with quadrate bases not prolonged backward, a deep notch and long slender beak with a few teeth in the very small crest.

Except that the gills are lacking both specimens are well preserved. The type is 83 mm. long and 3.5 mm. in diameter, the cotype measures 47 and 2 mm.

Stations 4436, off San Miguel Island, 264-271 fathoms, green mud (type); 4523, off Point Pinos Lighthouse, 75-108 fathoms, soft dark mud.

***Jasminiera ecaudata* sp. nov.**

Branchiæ arising in seven to nine dainty pairs from low, simple branchiophores which do not appear beyond the collar. Radioles free, without interbranchial membrane but provided on each side with a narrow, free margin of increasing width and passing into the distal barbless tip which is flattened and coiled like a

watch spring. Barbs very long, slender and delicate, most of them of a length equalling or exceeding the body width, increasing in length distally. Oral membranes and tentacles not clearly seen.

Collar high and ample, reaching somewhat beyond the branchiophores to the bases of the radioles, which it loosely envelops; its margin regular, entire, smooth, of even height, the dorsal angles rounded and the dorsal borders reflexed to the peristomium and bounding the fecal groove as a pair of thin parallel folds separated from the collar proper by deep incisions.

Thoracic segments nine (8 setigerous), short, about one-fourth as long as wide, simple, uniannulate and separated by distinct furrows. Fecal groove very obscure except in the collar region. No distinct ventral plates. Abdominal segments 17 or 18, strongly marked by deep furrows, uniannulate; as the body tapers becoming relatively longer toward the caudal end which is rather acutely pointed. Fecal groove well developed throughout the abdominal region, but there appear to be no true glandular ventral plates. Pygidium small, pointed, with no caudal style but only a small dorsal tubercle above the slit-like anus which is directed obliquely caudo-ventrad.

Collar setæ in rather prominent linear fascicles; remaining thoracic fascicles more compact. Thoracic tori narrow, transverse ridges below and slightly behind the setæ tufts, the largest not exceeding one-twelfth the circumference of the segment, and bearing a short series of only about fifteen crochets. Abdominal setæ tufts ventral and very small, the dorsal tori shorter and less elevated than the thoracic, with the number of uncini varying from about a dozen anteriorly to three or four at the caudal end.

All setæ and uncini colorless. Collar setæ and dorsal setæ on remaining thoracic segments very narrowly lanceolate, evenly bilimbate, with the borders strongly striated. Ventral thoracic setæ with broadly obovate expanded ends having strongly striated borders and a stout mucron. Abdominal setæ very few in each fascicle, like the dorsalmost thoracic setæ but more slender and becoming gradually more elongated until at the caudal end they are practically strictly smooth capillaries without limbi. Thoracic uncini of crochet form with slender, curved, striated stem about the diameter of dorsal setae and with small beaked head with finely striated crest toothed on the vertex only. Abdominal uncini of the terebellid type with short quadrate base, deep sinus and long, slender beak surmounted by a small crest.

Tubes delicate, closely fitting the worms and so far as preserved not exceeding them in length, soft and membranous, the basal half without covering, thin and transparent, the distal half increasingly coated with a soft, gray, flocculent silt in which are scattered minute fragments of shell, etc.

Four excellently preserved examples with expanded gills in tubes and measuring (type) 10 mm. long, of which the gills are 3.2 mm. to 14 mm. long, gills 4.5 mm.

Station 4431 only, off Santa Cruz Island, 38-45 fathoms, mud and coarse gray sand.

#### SERPULIDAE

##### *Protula atypha* Bush.

Two specimens having fifty-two pairs of branchial radioles. A tube is 70 mm. long, 5 mm. in external diameter at the large and 3 mm. at the small end, regularly tapered, terete throughout and somewhat roughened externally by irregular transverse growth lines, polished internally, slightly tortuous, erect, unattached, Station 4431, as above. Small portions of *Protula* tubes, possibly of this species, taken at stations 4420 and 4421 also.

##### *Apomatus geniculata* Moore.

Three examples were taken at as many stations. One of these has the operculum as on the type. Another has no fully-developed operculum, the larger one on the right side about twice diameter of its radiole, which is about three-fifths as long as the longest radiole and bears barbs as far as the short constriction preceding the operculum. That on the left side is minute and borne on the end of a radiole that is but one-fourth the length of the next one and appears to have been broken and regenerated. Tubes are from 55 to 100 mm. long with an orifical diameter of about 5 mm., generally terete, but attached to stones by a flattened side, the basal part more or less coiled and sometimes coherent, the terminal part erect, thickwalled, stony, white, marked by fine transverse line.

Stations 4410, off Santa Catalina Island, 178-195 mm., gray sand; 4431, off Santa Rosa Island, 38-45 fathoms, mud and sand; 4463, off Point Pinos Lighthouse, 48-111 fathoms, rocky.

##### *Spirabranchnus spinosus* sp. nov. Plate XVIII, fig. 47.

Gills arise in a spiral coil of about three turns, about forty-five pairs, very much crowded and packed together, making a detailed description impossible, the short radioles strongly compressed, with a slender free tip, the basal two-fifths connected by a membrane and bearing numerous short delicate crowded barbs.

Operculum (left side) large and conspicuous, lying entirely distad of the gills; the stalk slightly depressed, gradually widening to

the opercular disk, with a pair of broad, thin wings, occupying the distal three-fifths and ending in a pair of free lobes at the operculum. The opercular disk is attached to the stalk eccentrically and reaches ventrad over the ends of the gills. The disk itself is nearly circular, hard and calcareous, slightly pink in color, with a rough, irregular outer surface bearing three irregularly branched slightly flexible spines, a fourth having probably been lost, and closely resembles that of *Pomatoceras quadricornis* Grube from the Philippine Islands.

The oral membranes cannot be seen. Setigerous somites: thoracic, 7; abdominal (incomplete), 86. Peristomium and first setigerous somite elongated, the region of the thorax anterior to the first torus comprising one-third of its total length. There are no distinct ventral plates but merely a triangular glandular interpodal area with the caudally directed apex prolonged into a linear area between the last three or four pairs of tori. Abdominal segments very short and crowded with soft, smooth, dorsal and ventral areas and obscure lateral tori, ventrad to which are minute inconspicuous tufts of setæ.

Collar closely appressed to the branchial bases, thrown into deep folds and produced into dorsal and ventral lobes. The margin is irregular and bears small processes and lobes but no deep fissures. The ample mantle is also closely wrapped round the thorax and much plicated; anterior border produced on each side into a narrow lobe that reaches beyond the base of the opercular wing; its dorsal border rises well above the setæ and meets its fellow medially as far back as the fourth pair of setæ tufts; ventral transverse fold also wide and overlaps the first abdominal segment.

The small tufts of collar setæ widely separated from those of both the same and the opposite side on the dorsum. Remaining six thoracic tufts large and fan-like, lateral, but becoming successively more ventral. Tori begin immediately ventral to the setæ and are very long, the last three pairs practically meeting ventrally. They form thin flat folds projecting freely caudad and overlapping the bases of the setæ tufts dorsally and the venter of the segments ventrally and bear the very numerous uncini on their free margins.

Collar setæ tufts very small, containing only 8 or 10 very small, simple tapering setae. Other thoracic fascicles are large and conspicuous, of much larger, simple, tapered, curved, limbate and acute setæ. Abdominal setæ very few and very delicate, with obliquely expanded finely toothed and pennoned ends. Thoracic uncini (Plate XVIII, fig. 47) very numerous, with eleven acute appressed teeth and one lower blunt and flattened tooth. Abdominal uncini similar but smaller with seven acute and one blunt tooth.

Tube known from a few fragments attached to the worm, white, very hard and stony, lumen circular, 2.5 mm. in diameter, the surface more or less pitted and produced into small irregular wings

and flanges arranged as a comparatively simple fold on one side and two much more complex, often hollow folds on the opposite side.

Known from the type only, an incomplete specimen 23 mm. long, (gills 6.2 mm. thorax 4 mm.), diameter of thorax 2 mm.

Station 4417, off Santa Barbara Island, 29 fathoms, fine yellow sand and coralline rock.

**Spirorbis rugatus** Bush.

Several tubes attached to the tubes of large serpulids and *Spiochaetopterus* along with a few tubes of *Hyalopomotopsis* and bryozoans, and to hydroid stocks with barnacles. Most of the tubes are coiled flat but some of those associated with bryozoans are elevated. The operculum agrees with Miss Bush's figure but the collar setæ are toothed rather than scalloped.

Stations 4454, off Point Pinos Lighthouse, 65-71 fathoms, green mud, gravel and sand; 4555, same locality, 66-69 fathoms, green mud and rocks.

**Filograna tribranchiata** sp. nov.

The largest specimens, including the type, measure nearly 5 mm. in length, of which the branchiæ are 1.3 mm., thorax 1.2 mm., and abdomen (including the unsegmented region) 2.4 mm. Setigerous thoracic segments 8, abdominal 24 to 26.

Gills three pairs, poorly preserved, but apparently only one, the right dorsal, usually bearing a spoon-shaped operculum at the end of the radiole. Barbs few, short and macerated. Collar and mantle appear to be typical though, probably as a result of maceration, no lateral notches can be detected.

First setigerous somite much longer than the other thoracic somites which are about one-half as long as wide. Following the thorax is a region of about one-half of its length in which no segments or setæ can be distinguished and then the segmented abdomen, in which the segments become rapidly short and crowded, terminating in a short bifid pygidium.

Collar setæ are in two series of five or six each. The dorsalmost are simple, tapered and delicate, the ventral much larger, with a prominent, coarsely toothed basal fin separated by a wide notch from a tapering finely toothed distal limb. Those of remaining thoracic segments are also in two series of about four each, those of one series like the dorsal collar setæ, those of the other similar in form but larger. The anterior third of the abdomen bears no setæ, the segmented portion at first single setæ, then tufts of two and finally at the caudal end of three. Abdominal setæ are all of one kind, perfectly simple, slender, curved, capillary, finally be-

coming so long as to almost equal the width of the body. Uncini are almost sessile, the tori being scarcely elevated. On the thorax these are 20-25 and on the abdomen about half as many in each series. As usual in the genus they are small, triangular plates with numerous fine marginal teeth arranged in three or four rows of about eight or nine teeth each.

Tubes white, delicate, calcareous, not more than .4 mm. in diameter, slightly roughened by growth lines but otherwise of simple structure. They form coherent groups side by side and taking slightly tortuous courses in which particular tubes will attach to and separate from small clusters, the result being the formation of an irregularly reticulated mass.

Worms for description were extracted from the tubes by solution in acid and consequently was so indifferently preserved that a full account is impossible.

Known from one small mass of tubes only from Station 4431 off Santa Rosa Island, 38-45 fathoms, mud, sand and rocks.

*Metavermilia multiannulata* sp. nov. Plate XVIII, fig. 48

Described from the type, which is a complete specimen filled with small ova removed from a portion of tube. Length 24 mm., (gills 4.5 mm., thorax 3.2) maximum width 1 mm. Segments about 72, thorax seven setigerous, six uncinigerous, abdomen about 64, the last few indistinct.

Operculum 3 mm. long, 1.3 mm. in diameter, projecting 4.2 mm. beyond end of gills; base egg-shaped, white and soft, prolonged distally into a slender, brown conical tip (shaped like a fool's cap) about three times as long as the white base and marked by fourteen slightly raised annular lines spaced nearly regularly, the last at the slightly truncate tip. A faint annular furrow marks the junction of base and cap. The operculum is not quite radially symmetrical, being more convex and swollen ventrad and slightly flattened dorsad. Opercular stalk, which is the left dorsalmost branchial radiole, slightly depressed, enlarged at both ends, the narrow part in the middle region of a diameter about twice the other radioles. It has a peculiarly twisted appearance, being marked by raised strands separated by furrows, nearly transverse at the base but spiral elsewhere, much like a piece of rope. At the point of attachment of the operculum to the stalk is a slight furrow.

Gills 14 pairs, closely wrapped round the opercular stalk or radiole and fitted to the base of the operculum, together forming a cylindrical plug equal in diameter to the operculum and with it closely filling the mouth of the tube. Bases or branchiophores simple, not produced ventrally. Radioles thick, coarse, and brittle, appearing as though swollen, slightly inrolled on the dorsal, not the ventral, side and each ending in a naked, flattened tip having

a length of about 3-4 times the diameter. Barbs numerous, short and crowded, the longest toward the distal end about equalling the naked tip.

Thoracic region broad and depressed, with segments of the usual form. Mantle ample and prominent with a regular margin, the ventral lobe, which is reflexed and reaches to IV, separated completely from the lateral lobes by incisions which cut to the base. Lateral lobes especially high at the antero-dorsal angles and gradually diminishing caudad, including the first four setæ fascicles and ending behind the fourth. Abdomen slender and elongated, slightly depressed, anterior segments about as long as wide and indistinct, becoming more depressed and crowded and at the same time more distinct posteriorly and ending in a minute pygidium.

Thoracic parapodia consist of flattened dorsal setigerous tubercles and ventral lappet-like tori. Collar fascicle small and directed somewhat forward. Remaining fascicles much larger, more spreading and directed chiefly dorsad and laterad, the first four included in the mantle at the level of the collar setæ, the last (on VI) free, more widely separated and more ventral. The tori are free lappets overlapping caudad; the first (on II) quite small, the others becoming successively larger, more imbricated and more ventral in position until the last becomes a broad plate with rounded free margin equal to the depth of the body, overlapping the setigerous tubercle above and in contact with its fellow below. Abdominal parapodia are very small and indistinct, both setigerous tubercles and tori being obscure at the caudal end where, without being larger, they stand out more distinctly.

Small distinct glandular ventral plates occur on somites V-VIII, the last being concealed by the tori of the same segment.

The small compact collar fascicle is composed of colorless setæ in two rows. Those of one row are shorter, straight and strictly capillary; of the other longer, curved and slightly winged. Remaining thoracic fascicles larger, more spreading, of three rows, one of small, strictly capillary, the other two of narrowly limbate setæ, one row of the latter being like the limbate collar setæ and of the other shorter and slightly sigmoid. Abdominal fascicles reduced to 2-4 very delicate pennoned setæ. Thoracic uncini colorless, numerous, 122 on V. They have the form shown in figure 48 but with usually only 12 or 13 teeth. Abdominal tori bear fewer uncini (60 on XXXV) which are smaller (fig. 48), with 13-15 teeth but otherwise quite like the thoracic. Setæ at the caudal end are broken so that it is uncertain if some are capillary.

Except for the brown opercular cap and a dorsal area of reddish-brown at the caudal end all parts of the preserved worm are colorless.

A small fragment of tube taken off of this specimen is whitish with very irregular rough surface but no distinctive markings. A piece of tube from another much smaller specimen having only

eight opercular annulations is thick and stony, very rough with overlapping plates that rise to a median ridge.

Stations 4550, off Point Pinos Lighthouse, 50-57 fathoms, green mud and rocks (type); 4420, off San Nicolas Island, 32-33 fathoms, fine gray sand.

***Protis pacifica* sp. nov.**

Branchiæ as packed closely in tube form a terete mass in which the individual gills are straight except for a slight spiral twist and distal inflection. Branchiophores small, low and of nearly even height, not prolonged ventrally or spirally coiled as in *Protula*. Radioles 18 pairs, their outer faces swollen and turgid but neither angulated nor margined, coherent but not united by an interbranchial membrane. Barbs numerous, very small, strongly ciliated and continued practically to the extreme end of the radioles.

Oral membranes not discernible. Collar and mantle wide and prominent but much broken so that specific characters cannot be determined. Thorax and abdomen terete, the latter becoming somewhat depressed at the caudal end. Thoracic somites 8 (7 setigerous), abdominal 64, or possibly more, as several may have been missed in the mutilated middle region. First three or four abdominal segments elongated, the remaining ones very short, the last few abruptly tapered to a small simple pygidium.

Thoracic setæ all yellow, in prominent fascicles, the collar fascicle at a higher level and directed considerably forward, the other six erect and well separated. Abdominal fascicles very small, erect, inconspicuous on anterior segments because of the shortness of the setæ but becoming elongated and much more conspicuous at the caudal end. Six pairs of thoracic tori delicate, slightly curved lines immediately behind and below the setæ tufts which they somewhat overlap. Abdominal tori shorter but more elevated than the thoracic and glandularly thickened.

Collar setæ in two series of about twelve each, those of one longer and stouter with a prominent basal fin bearing five or six coarse teeth in a rounded crest, distad to which, following a broad notch, is a narrow, finely denticulated blade, which gradually tapers into a delicate, flexible, smooth capillary tip. The smaller setæ of the other series lack both basal fin and capillary tip but are longer, with very narrow blade. Remaining thoracic tufts are of three series of six or seven each all of the form of the smaller collar setæ except that the tips are less prolonged. Thoracic uncini very numerous and closely crowded in a series diminishing in size ventrad and with the teeth directed cephalad. They have the body restricted and a longer border bearing six or seven prominent, acute curved teeth diminishing in size from below. Abdominal setæ usually but one, sometimes two, in a fascicle, similar to the shorter thoracic setæ, with a slight limbus or fin and a slender

tip. Posteriorly they become erect and much longer, some of them equalling the diameter of the body. Abdominal uncini about twenty in each torus. Smaller than thoracic uncini, with one large stout tooth below and above it usually four vertical rows of eight or nine very small closely crowded teeth.

The specimens removed from tubes were macerated and very fragile, rendering complete description impossible. The type (in four pieces) is about 41 mm. long of which the gills are 7 mm. and thoracic diameter 3.3 mm. A cotype is 17.5 mm., gills 6 mm., thorax about 3 mm., diameter 1 mm., thoracic segments 8, abdominal over 50.

Tubes attached singly to tubes of *Pseudopotamilla*; terete, except for the attached side which is flattened or concave, conforming to the sabellid tube. Length of one 49 mm., diameter at mouth 4.2 mm., tapering regularly to less than .5 mm. at basal end. Tube slightly tortuous, stony, surface marked with circular growth lines, sometimes conspicuous, white stained with yellow. Another tube measures 65 mm. long and only 3.6 diam. at the mouth, the distal half being nearly uniform. Some are nearly straight others more tortuous or even bent back sharply on themselves.

Station 4433, off Santa Rosa Island, 243-265 fathoms, green mud.

***Hyalopomatopsis occidentalis* Bush.**

A number of tubes and included worms are undoubtedly of this species which the form of the collar setæ would seem to place rather in the genus *Zopyrus*. The soft ovate operculum has an orange or brown colored internal vesicle, a thin opaque and possibly calcified terminal disk, and in one case two small simple spines which may be the result of injury.

The tubes are attached for nearly the entire length to the tubes of larger annelids and calcareous bryozoans. They are 20-30 mm. long and measure at the aperture .8 mm. in transverse and 1.2 mm. vertical diameter, the difference being due to a prominent flange which runs along the outer face for its entire length, here and there, rising into irregular projections. The attached face is flattened and often spreading. Surface wrinkled with irregularly transverse growth lines of varied prominence, with deepened valleys at fairly regular intervals, giving a narrowly fenestrated appearance. At the mouth some tubes bear three projecting spines. White, stony, opaque, but some of the smaller tubes translucent.

Station 4431, off Santa Rosa Island, 38-45 fathoms, mud and coarse sand.

**Eupomatus gracilis** Bush.

The funtional operculum on the left side is funnellform marked with thirty-four ribs each terminating in a small free marginal tooth. From the interior of the funnel rises a brown, horny, inverted cone, bearing at the upper margin a circle of ten stout tapering spines abruptly bent at the ends at right angles inwards into as many sharp claws which meet at a center. This and other characters agree with Miss Bush's description but the terminal hooks on the opercular spines are not mentioned, though she states that the spines resemble those of *E. uncinatus* which are hooked. On the right side is a rudimentary bulbous operculum.

Station 4496, off Santa Cruz Lighthouse, 10 fathoms, fine gray sand and rocks.

**Serpula columbiana** Johnson.

This species is well represented by tubes and worms. Usually the funtional operculum is the left, with a rudimentary one on the right side, but one specimen has this arrangement reversed and another has two equally developed opercula. The number of opercular ribs and teeth varies from 112 on a specimen 47 mm. long to 158 on one 67 mm. long. Setigerous thoracic segments are constantly seven and abdominal segments vary from 180 to 262. Pairs of branchial radioles are 28 to 52. Tubes are single or more often in clusters, more or less tortuously encrusting stones, from which the ends rise erect and free. This erect portion is terete, white, stony, and either opake or porcellaneous; the attached basal part is somewhat depressed with an internal longitudinal flange.

Stations 4417, off Santa Barbara Island, 29 fathoms, fine yellow sand and coralline rock; 4431, off Santa Rosa Island, 38-45 fathoms, mud and coarse gray sand; 4496, off Santa Cruz Lighthouse, 10 fathoms, fine gray sand and rocks.

## SABELLARIIDAE

**Sabellaria cementarium** Moore.

Stations 4531, off Point Pinos Lighthouse, 26-28 fathoms, fine gray sand; 4558, same locality, 28-40 fathoms, rocks.

## APPENDIX

In the bottles containing the specimens described above were found a number of examples of species listed in the earlier parts of this paper. Those coming from stations not previously reported are listed here.

**Syllis alternata** Moore.

One from among serpulid tubes. Station 4417.

**Syllis heterochaeta** Moore.

A second complete specimen agreeing fully with the type, from Station 4460, off Point Pinos Lighthouse, 55-167 fathoms, green mud and gravel.

**Pionosyllis gigantea** Moore.

One doubtfully referred example, a female filled with eggs, from Station 4373.

**Autolytus** sp.

A small "heterosyllis" male 5.5 mm. long with three anterior setigerous segments, fifteen swimming segments, and eight or ten caudal segments. Station 4355, San Diego Harbor, electric light.

**Sphaerodorum papillifer** Moore.

One from Station 4421, off San Nicolas Island, 229-298 fathoms gray mud and rock.

**Eulalia levicornuta** Moore.

Stations 4460, off Point Pinos Lighthouse, 55-167 fathoms, green mud and gravel; 4496, off Santa Cruz Lighthouse, 10 fathoms, fine gray sand.

**Eunoë caeca** Moore.

A complete specimen of this blind species agreeing fully with the type. Station 4351, off Point Loma Lighthouse, 423-488 fathoms, soft green mud.

**Harmothoe (Lagisca) lamellifera** (v. Marenzeller)

Station 4373.

**Harmothoe (Evarne) fragilis** Moore.

Station 4373.

**Nemidia microlepada** Moore.

A caudal end agreeing with the type from Station 4485, off Santa Cruz Lighthouse, 39-108 fathoms, soft green mud and sand.

**Aphrodita castanea** Moore.

Station 4475.

**Euphrosyne hortensis** Moore.

Another young specimen from Station 4463 with the setæ so protuded that they project far above the branchiæ which they completely conceal.

**Nephtys cæca** (Fabricius)

Stations 4366, 4452, 4457 and 4508.

**Nereis paucidentata** Moore.

One example from Station 4546, off Point Pinos Lighthouse, 849 fathoms, fine black sand.

**Nereis procera** Ehlers.

The anterior end of an epitokous female filled with eggs from Station 4428 and a very slender example about an inch long from Station 4463. The latter retains one ordinary "fish-bone" seta in addition to the characteristic homogomphs throughout the notopodia of the middle region.

**Lumbrineris bifilaris** Ehlers.

Station 4381.

**Lumbrineris inflata** Moore.

Station 4431, off Santa Rosa Island, 38-45 fathoms, green and yellow mud, coarse gray sand and rocks; 4445.

## EXPLANATION OF PLATES XVII, XVIII.

Unless otherwise stated all figures are drawn from the types.

## PLATE XVII.

Figs. 1, 2.—*Tharyx gracilis*.

Fig. 1.—Lateral view of head region. ( $\times 24$ )

Fig. 2.—Two neuropodial setæ in situ, somite L. ( $\times 250$ )

Figs. 3-7.—*Acrocirrus crassifilis*.

Fig. 3.—Dorsal view of head region. ( $\times 3.5$ )

Fig. 4.—Lateral view of same. ( $\times 3.5$ )

Figs. 5, 6.—Compound setæ from X and L respectively. ( $\times 250$ )

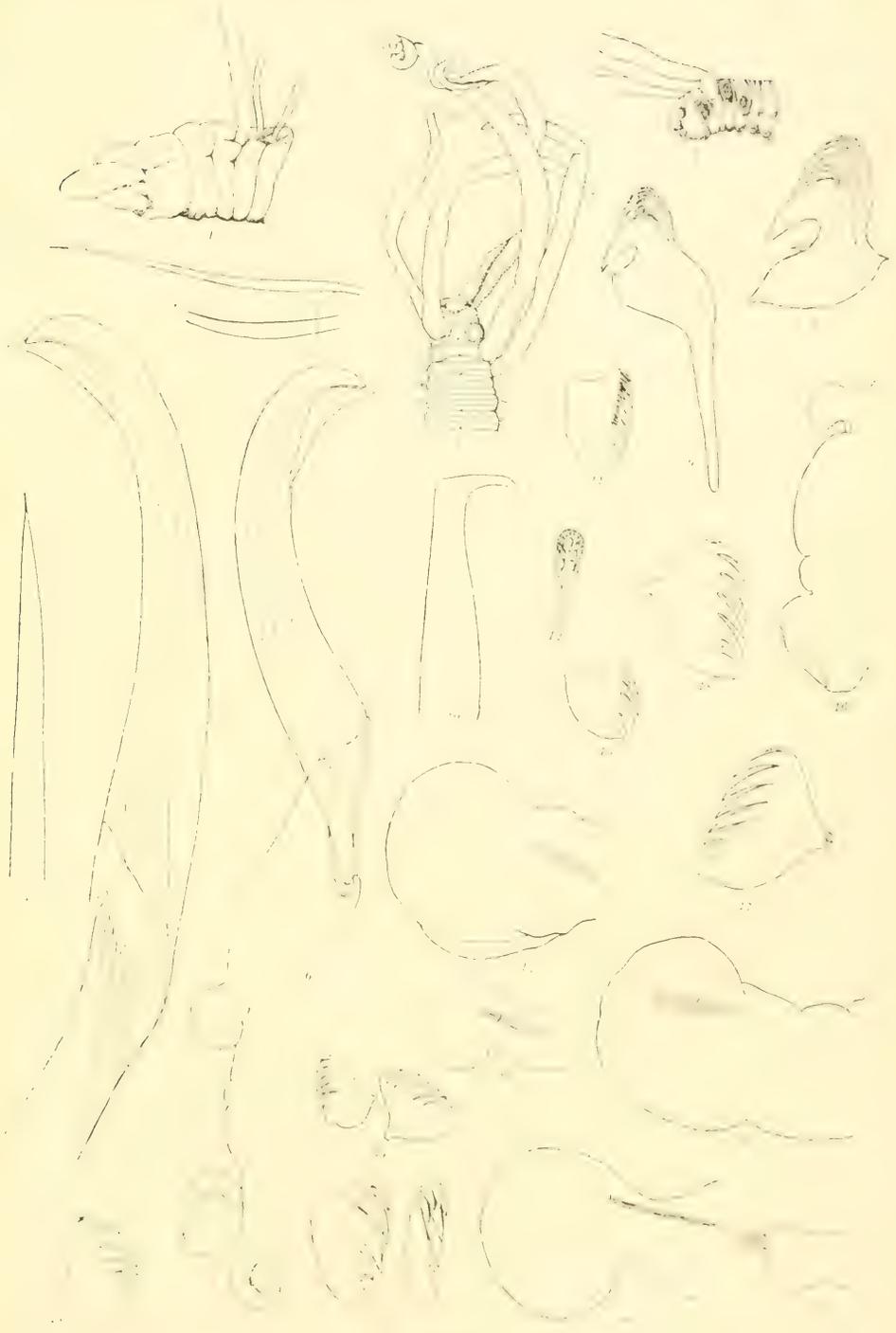
- Fig. 7.—Simple seta from L. ( $\times 250$ )  
 Fig. 8.—*Leæna gracilis*—Uncinus from X. ( $\times 600$ )  
 Fig. 9.—*Pista disjuncta*—Uncinus from V. ( $\times 440$ )  
 Fig. 10.—*Terebellides ehlersi* McIntosh—Outline of spine on VIII of specimen from station 4382. magnified  
 Figs. 11–13.—*Lysippe annectens*.  
 Figs. 11, 12.—Lateral and face views of uncinus from X of cotype (sta. 4436). ( $\times 600$ )  
 Fig. 13.—Uncinus from XXV, somewhat crushed. ( $\times 600$ )  
 Figs. 14–18.—*Amage arieticornuta*, cotype (sta. 4436).  
 Fig. 14.—Outline of parapodium IV. ( $\times 56$ )  
 Fig. 15.—Same of VI. ( $\times 40$ )  
 Fig. 16.—Same of XXV. ( $\times 12$ )  
 Figs. 17, 18.—Uncini from X and XXV. ( $\times 400$ )  
 Figs. 19–24.—*Amage scutata*.  
 Fig. 19.—Outline of parapodium IV. ( $\times 56$ )  
 Figs. 20, 21.—Same of V and VI respectively. ( $\times 24$ )  
 Fig. 22.—Same of XXV, ( $\times 12$ ); a caudal face of notocirrus. ( $\times 12$ )  
 Fig. 23.—Uncinus of X. ( $\times 400$ )  
 Fig. 24.—Two (one partly turned) uncini of XXV. ( $\times 400$ )  
 Fig. 25.—*Melinna cristata heterodonta* cotype (sta. 4546)—Two abdominal uncini, one nearly face. ( $\times 400$ )

## PLATE XVIII.

- Figs. 26–29.—*Sosanopsis armipotens*.  
 Figs. 26, 27.—Dorsal and lateral aspects of head end of type. ( $\times 8$ )  
 Fig. 28.—Face and lateral views of uncinus from X. ( $\times 400$ )  
 Fig. 29.—Lateral and face views of abdominal uncinus. ( $\times 400$ )  
 Fig. 30.—*Rhodine bitorquata* (sta. 4524)—uncinus of double series. ( $\times 440$ )  
 Figs. 31, 32.—*Praxillura maculata*.  
 Fig. 31.—Tip of spine from II. ( $\times 83$ )  
 Fig. 32.—Crochet from X. ( $\times 360$ )  
 Figs. 33, 34.—*Pseudoclymene longiceps*.  
 Fig. 33.—Tip of spine from III. ( $\times 83$ )  
 Fig. 34.—Crochet from V. ( $\times 360$ )  
 Figs. 35, 36.—*Heteroclymene glabra*.  
 Fig. 35.—Spine from II. ( $\times 250$ )  
 Fig. 36.—Crochet from V. ( $\times 360$ )  
 Figs. 37, 38.—*Euclymene reticulata* (sta. 4337).  
 Fig. 37.—Tip of spine from II. ( $\times 126$ )  
 Fig. 38.—Crochet from X. ( $\times 360$ )  
 Figs. 39, 40.—*Euclymene delineata* (sta. 4433).  
 Fig. 39.—Spine from II. ( $\times 126$ )  
 Fig. 40.—Crochet from V. ( $\times 440$ )  
 Figs. 41, 42.—*Branchiomma circumspectum* (sta. 4431).  
 Fig. 41.—Spatulate seta from III. ( $\times 360$ )  
 Fig. 42.—Uncinus from V. ( $\times 360$ )  
 Figs. 43, 44.—*Notaulex mucronata* (sta. 4397).

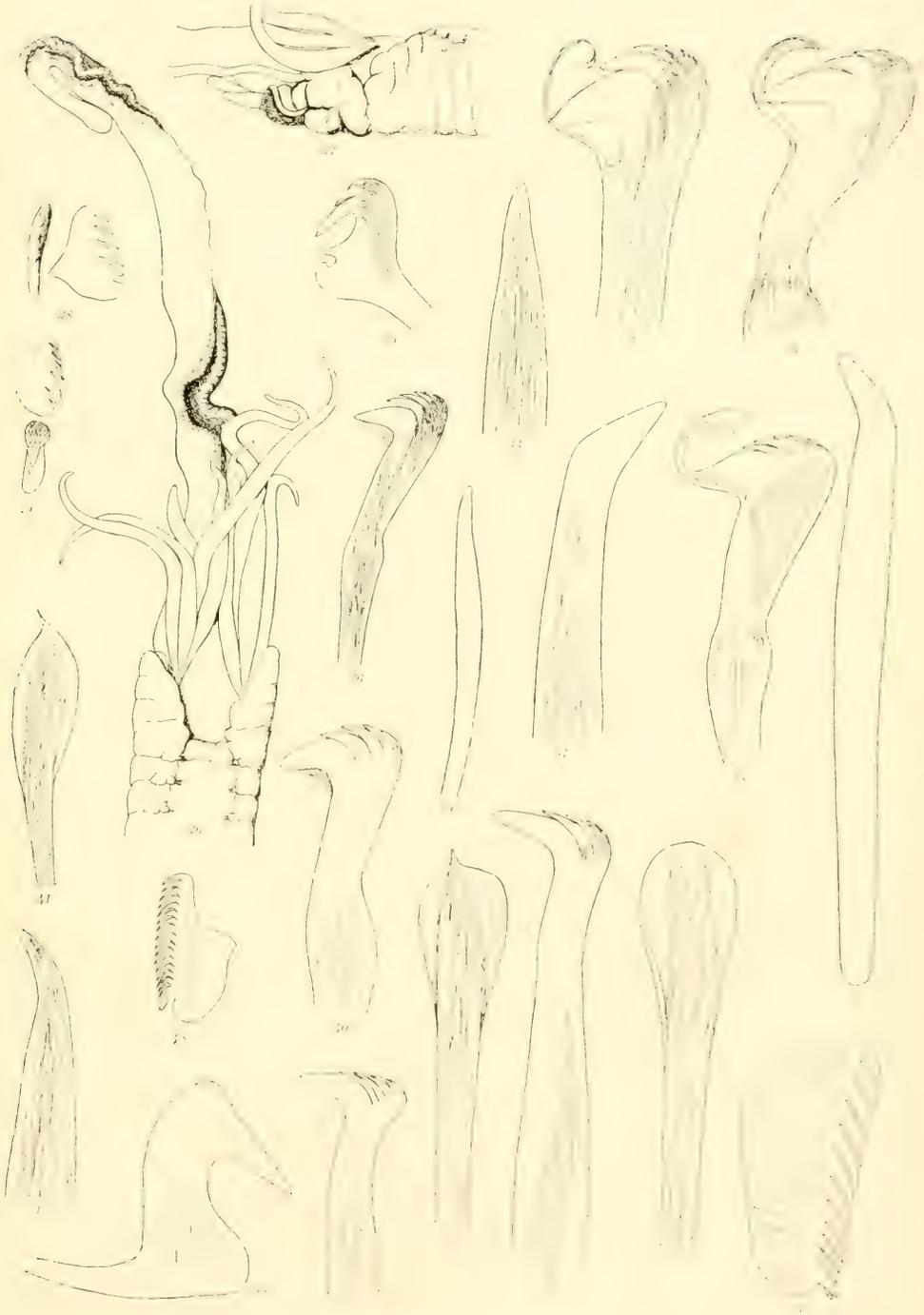
- Fig. 43.—Dorsal spatulate seta from V. ( $\times 360$ )  
Fig. 44.—Uncinus from V. ( $\times 600$ )  
Figs. 45, 46.—*Euchone magna*.  
Fig. 45.—Spatulate seta from V. ( $\times 360$ )  
Fig. 46.—Crochet from same. ( $\times 360$ )  
Fig. 47.—*Spirabranchus spinosus*—Uncinus from XV. ( $\times 440$ )  
Fig. 48.—*Metavermilia multiannulata*—Uncinus from XXV. ( $\times 440$ )





MOORE: POLYCHETOUS ANNELIDS,—IV.





MOORE: POLYCHETOUS ANNELIDS,—IV.









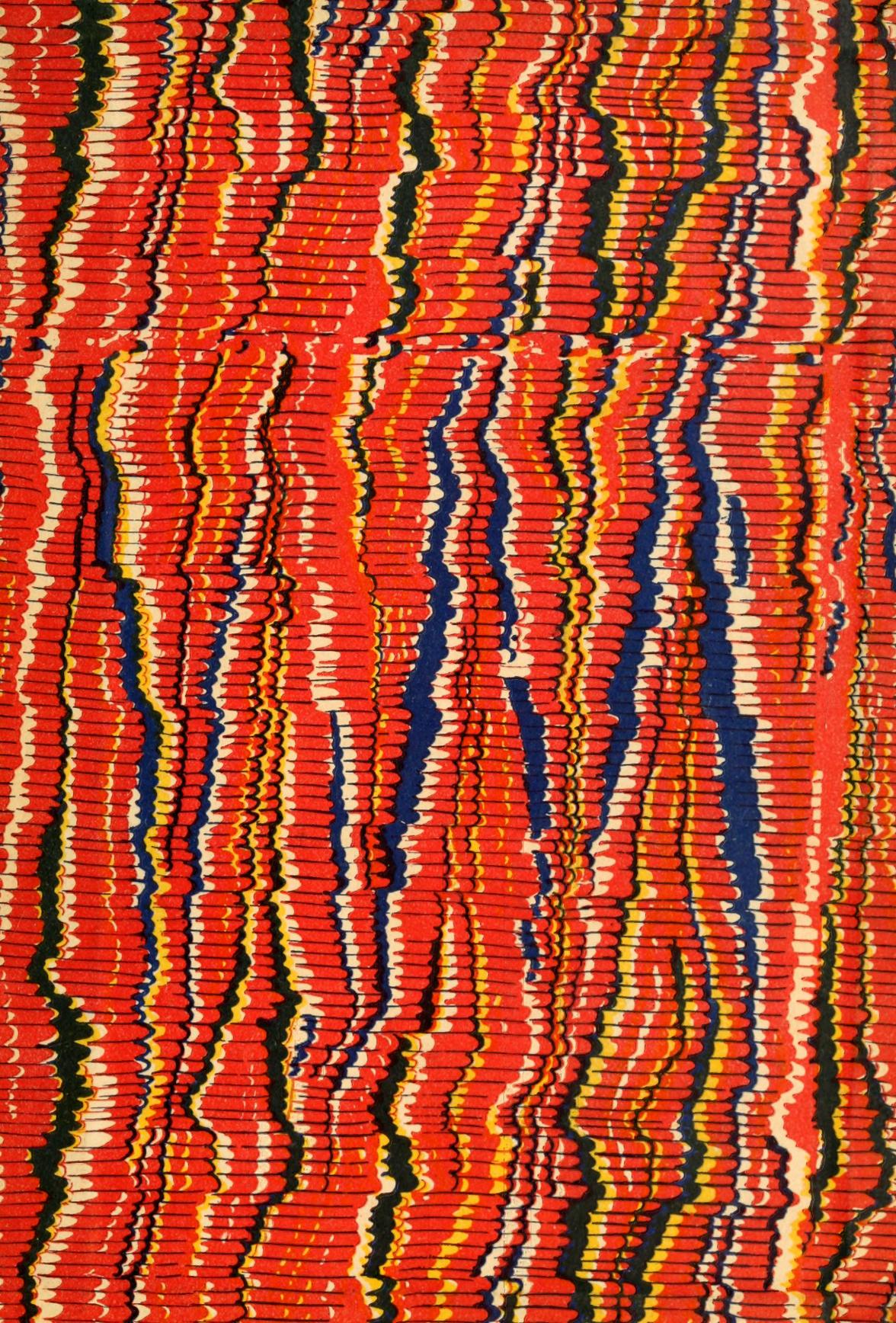












SMITHSONIAN INSTITUTION LIBRARIES



3 9088 00574 3620