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

BY J. PERCY MOORE.

POLYNOIDÆ.

This family of sealed 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 *Lepidonotinae* and the *Harmothoinae*. In general it resembles the former most closely, free cephalic peaks being absent and the cephalic lobes prolonged

¹Part 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 subleris* 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 $\frac{2}{3}$. Jaws massive and deep brown, the fangs very stout, compressed, the ventral biting to the right; cutting plates well developed.

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

² *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).

Polynoë 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 terrebelid 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.

Polynoë 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 cirro-phore. 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 cæloris* Moore.**

Lepidonotus cæloris 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 notopo-

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.

Eunoë cæca 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. Neuropodium 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 *Polymoë 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 *Lagisca* 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.

Harmothoë (*Lagisca*) lamellifera v. Marenzeller.

Polyinoë (Lænilla) 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 Globigerina mud and fine sand; 4,428, off Santa Cruz Island, 764-891 fathoms, green mud.

Harmothoe (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 (Lanilla) 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.

Harmothoe 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; styles 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^a). 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^a) 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.

Harmothoë 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) achætous, 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 halavita*. 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 neuro-podial 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.

Harmothoë 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, cylindrical, 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 notocirrophores. 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 membranous 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 elyptrophores 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) foroipata v. Marenzeller.

Evarne jociyata, 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^a) 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^b) 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^c) 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 achæitous; 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 post-setal 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 papilla 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(?) filamentosa 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 achæitous 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; styles 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 achæitous. 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 cylindroid 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 ramî 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 already³ 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 waters⁴ 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

³ *Proc. Acad. Nat. Sci.*, 1908, p. 338.

⁴ *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 Miguel 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. castanca* by the brilliant green lateral fibers, the attenuated ends of the neurosetæ and the much less conspicuous notosetæ. Form more broadly ovate than *A. castanca*, 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 investature 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 elytriphorous 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 hairyness. 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*⁵ 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 *Aphrodita* 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.

⁵ 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 peristomium 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 elytrophorous segments only and first appear as a minute non-ciliated process on the overhanging end of the elytrophore 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.

Aricula 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.

Sthenelabella 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 interamal 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 ctenidium 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 ctenidium. 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 tertiaglabra*, 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. 111*a*). Setæ of the ventral spur again more slender with short somewhat claw-like appendages and smooth shafts (fig. 111*b*). 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 tertagliabra 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 protuberance 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.

Prostomium completely concealed beneath prostomium, 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 elytophore 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 ctenidia 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 *Harmothoe 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 L, 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, $\times 250$.

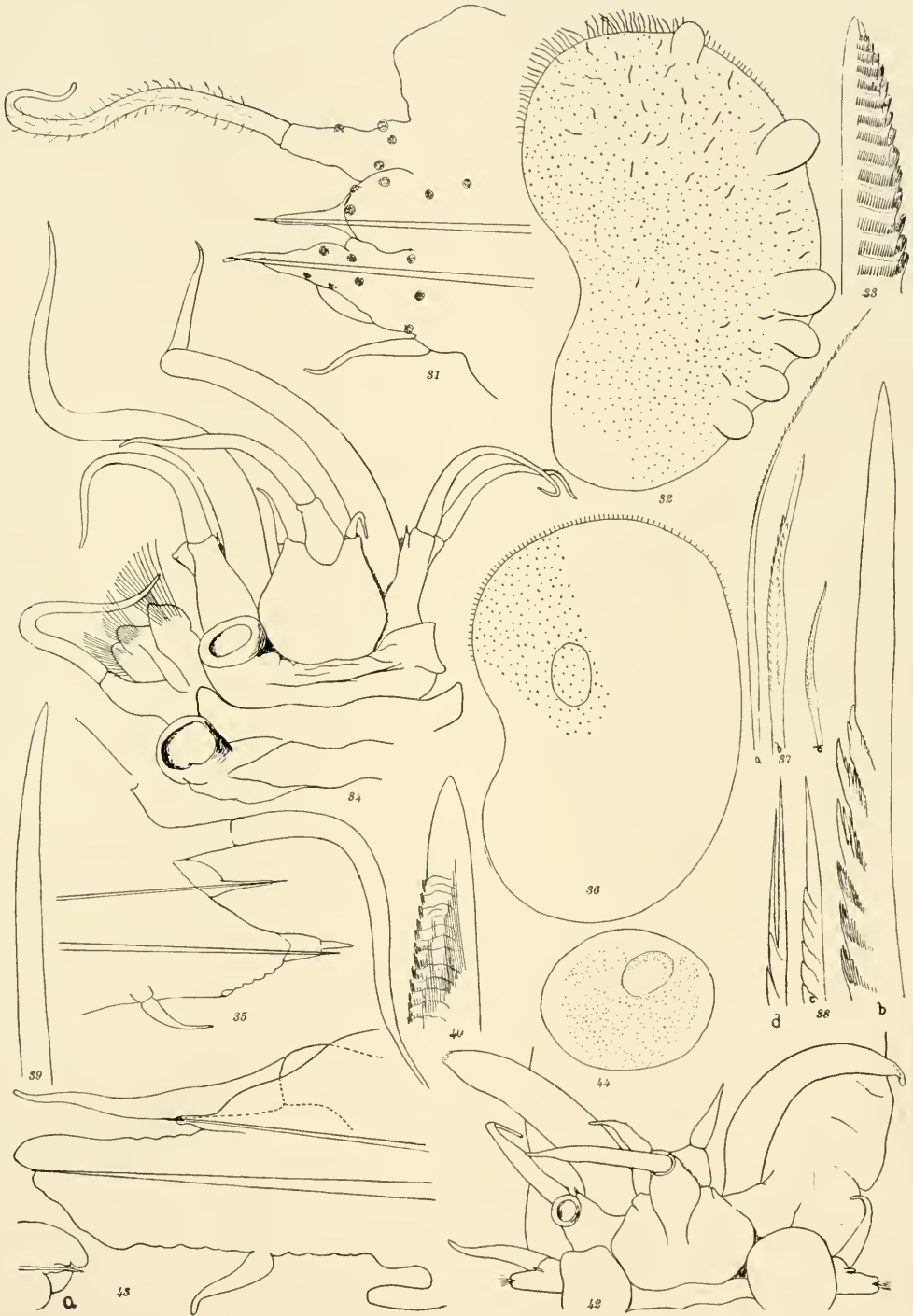
Fig. 120—Simple dorsal neuropodial seta from XX, $\times 360$.



MOORE: POLYCHÆTOUS ANNELIDS.



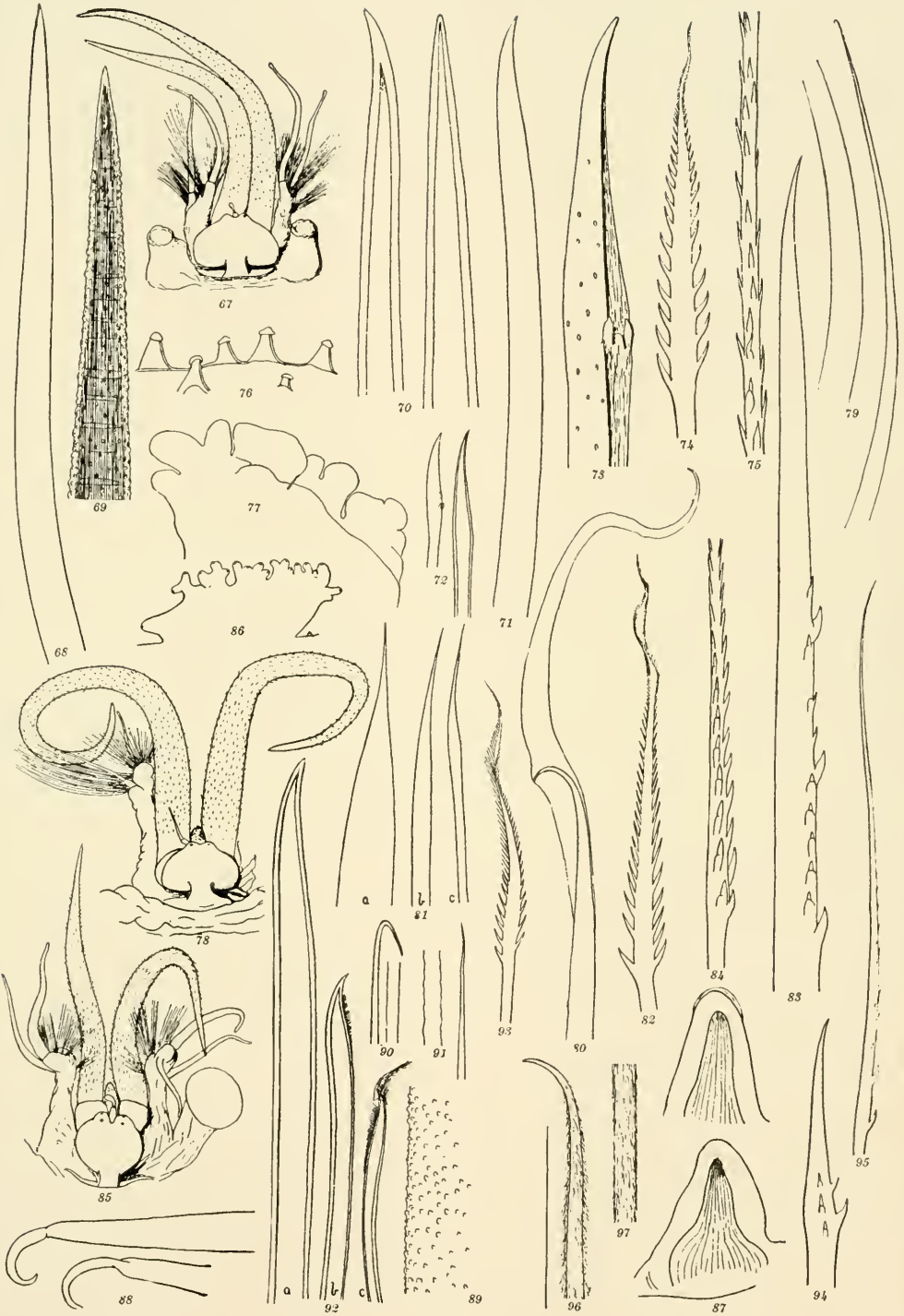
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