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ON SOME NEW SPECIES OF APHRODITIDAE FROM THE COAST OF CALIFORNIA

BY

CHRISTINE ESSENBERG

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A. INTRODUCTION

While examining the abundant material in the Zoological Museum at the University of California, my attention was first drawn to the Aphroditidae. This family having received little attention, some species were found which evidently were new, and it is the aim of the present paper to describe them.

B. ACKNOWLEDGMENTS

I gladly avail myself of this opportunity to express my sincerest thanks to Professor Charles A. Kofoid for his encouragement, his valuable suggestions, and his criticism in this work. I further wish to extend hearty thanks to Dr. Olive Swezy for her kind criticism and her interest in the work.

C. GENERAL DESCRIPTION OF THE APHRODITIDAE

The Aphroditidae are exclusively deep-water annelids, although occasionally, after severe storms, specimens are found on the shores, where they have been driven by the waves. The distribution of the Aphroditidae is known over the various parts of the Atlantic, Pacific, and Indian oceans. They occur in all zones from the boreal to the subtropic regions.

Some Aphroditidae are noted for their beautiful, iridescent fibers. Especially *Aphrodita aculeata*, the well-known seamouse, has been the object of the great admiration of many observers. Cuvier (1834) says of *Aphrodita aculeata:* "From its sides spring bundles of flexible bristles, shining brilliantly with all the splendor of gold, and changing into all the hues of the rainbow. They do not yield in beauty either to the plumage of the hummingbird or to the most brilliant of the precious stones." Linnaeus compares its vivid colors with those of the peacock. On the Pacific Coast *Aphrodita refulgida*, with its brilliant iridescent lateral fibers, takes the place of the *Aphrodita aculeata* of the Atlantic Coast.

The species of *Aphrodita* are less numerous than are those of the nearest related families. Dr. J. P. Moore, who has done the most work on the Pacific Coast annelids, reports six species of *Aphrodita* from this coast: *Aphrodita castanea, A. refulgida, A. negligens, A. parva, A. armifera,* and *A. japonica.* Treadwell (1914, p. 177) in his report on the polychaetous annelids from the collections of the University of California, enumerates four species of that genus: *Aphrodita castanea, A. refulgida, A. parva,* and *A. negligens.* The first two species are in abundance in the collection. However, I failed to find any representatives of *Aphrodita negligens,* although some specimens were labeled as *Aphrodita negligens* which belonged to other species. The same may be said in regard to *Aphrodita parva.* I have not found any specimens that agree with Dr. Moore's *Aphrodita parva.*

The Aphroditidae may be characterized as follows: They are ovate or oblong in shape, convex dorsally, with a distinct, lobed head or prostomium on the anterior end of which are a pair of ocular hemispheres, each usually bearing a pair of eye-spots. From the center of the anterior margin of the prostomium springs a median tentacle. Ventrad to this is a papillose facial tubercle. Two palpi arise from the base of the prostomium. The mouth is ventral, bordered by a

broad lip. There are usually fifteen pairs of elytra, occurring on segments 2, 4, 5, 7, and on all alternate segments to 25; then on segments 28 and 32. Beginning with the sixth segment are the fimbriated organs occurring on all cirriferous segments. Over the elytra is a thick coat of a felty layer, formed by the tufts of dorsal fibers arising from the notopodia. The parapodia are biramous, each ramus being supported by a strong bristle or aciculum. The neuropodium terminates in a peculiar, three-step-like fashion. There are no lateral prostomial tentacles. The notocirri are long and occur on all alternate segments; the neurocirri are short, occurring on all segments.

The presence of the lateral and of the felt fibers, of ocular hemispheres, of the facial tubercle, of the fimbriated organs, and neuropodia terminating in the three-step-like fashion, and the absence of the lateral prostomial tentacles distinguish the Aphroditidae from the Polynoidae and from any other family of annelids. The genus *Aphrodita* differs from the genus *Laetmatonice* in the sessile eyes, in the simple ventral setae, and in a thicker dorsal felt. In *Laetmatonice* the eyes are pedunculate, the dorsum is covered with thin felt, or the latter may be absent from the dorsum, and the ventral bristles are semipinnate.

The differentiation of the species is based partly on the size and the shape of the body. Further characteristics concerned in diagnosis are: the relative length of the neuropodia; the shape of the prostomium; the shape and the size of the ocular peduncles, and the size of the eyes; the length of the median tentacle; the relative length of the palpi; the arrangement of the notosetae; the form and the structure of the setae; the shape of the fimbriated organs and of the elytra; and, to some extent, the shape and the size of the papillae.

1. **Aphrodita longipalpa**, sp. nov.

Pl. 31, figs. 1–14; pl. 37, figs. 77–78

Comparison.—The description of this species is based on two specimens which are in the collection of the University of California. They have a slight resemblance to *Aphrodita castanea* (Moore, 1910). The chief resemblance lies in the arrangement of the dorsal setae, which are recumbent, pointing posteriorly, and covering the dorsolateral surface of the worm, as in *Aphrodita castanea.* Probably the latter characteristic led Treadwell to the conclusion that the speci-

mens belonged to the species *castanea,* as he so classified these specimens (1914). Closer observation and comparison of the specimens with *Aphrodita castanea,* which Dr. Moore had kindly sent to us, as also with the numerous examples of *A. castanea* in the collections of the University, showed some essential characteristics distinguishing these specimens from *Aphrodita castanea.* We have therefore assigned them to a new species, *A. longipalpa,* distinguished from *A. castanea* as follows: (1) the shape of the body of *Aphrodita longipalpa* is narrower than that of *A. castanea;* (2) the dorsum is more convex; (3) the notosetae, although arranged in the same manner as those of *A. castanea,* lack the golden-brown, lustrous appearance of the latter, and are rather dull and inconspicuous; (4) the parapodia are relatively longer than in *A. castanea;* (5) the neurosetae are very long, of a dark-brown, almost black, color; (6) the palpi are the longest known in any species of the genus; (7) the shape of the prostomium differs also from that of *A. castanea;* (8) the ocular hemispheres are less prominent, without any trace of pigmented eye-spots, while in *A. castanea* the two pairs of eye-spots show very distinctly; and (9) the fimbriated organs in *A. longipalpa* are less deeply lobed, and the lobes are less numerous, than they are in *castanea,* being obtusely rounded instead of long, narrow, and pointed.

Description.—The body (pl. 37, figs. 77, 78) is narrow and the dorsum is convex. The length of body in the two specimens is 26 and 34 mm. respectively, and the greatest width is 19 and 22 mm. respectively, measured from tip to tip of the setae. The width of body between the parapodia is 6 and 8 mm. respectively. The number of segments is 33.

The width of the prostomium (pl. 31, fig. 1) is slightly greater than its length. The two ocular prominences are hemispherical, slightly depressed from above. No eye-spots are visible on either of the specimens. The palpi are 11.5 times the length of the prostomium, having a definite short basal part. They are stout at the base, tapering very gradually toward the distal end, covered with very fine sensory papillae, which are visible only under high magnification. The median tentacle consists of a short cirratophore and a style of equal length. It is so far ventrad that it is invisible when viewed from the dorsal surface. The facial tubercle is large, compressed between the palpi. It ends in a long, finger-like projection extending ventrally over the mouth, and is covered with prominent papillae. The mouth is ventral. The ventral lip is definitely marked off by

deep furrows on each side and extends to the third segment. The dorsum is covered with a thick, felty layer; beneath this are fifteen pairs of tough, widely overlapping elytra (pl. 31, fig. 10) covering the entire dorsum. They are arranged in the usual order characteristic of the genus and are partly covered with brown pigment. The fimbriated organs (pl. 31, fig. 12) are hatchet-shaped, consisting of three or more lobes, each lobe having two or three short projections.

The ventral and dorsal surfaces are studded with papillae. The latter are simple, without the caps (pl. 31, figs. 13, 14). The parapodia are biramous (pl. 31, fig. 11). The notopodium is a mere protuberance. The neuropodium is very long and slender. The neurosetae, which are arranged in the usual three series, are very dark brown, almost black, and are very long. The dorsal row consists of two stout setae, the ends of which are tapered, slightly curved, and pillose (pl. 31, figs. 2, 2′). The median row has four setae, equal in structure to the former, but smaller in diameter (pl. 31, fig. 4). The six setae from the ventral series are lighter brown in color, smaller in diameter, with a subterminal enlargement ending in an attenuated, curved, and richly pillose extremity (pl. 31, fig. 3). The neurosetae of the second parapodium are specially modified with long, dentate projections (pl. 31, fig. 6). The caudal neurosetae are long, ending bluntly, with the distal portion covered with conspicuous protuberances (pl. 31, figs. 5, 5′, 5″). The notosetae are in two rows, the lateral ones forming a fan-like arrangement pointing dorsally. The dorsalmost are very long, with colorless, slightly hooked tips (pl. 31, fig. 9), meeting in the dorsum or overlapping. The notosetae are covered with asperities, which are visible only under higher magnification (pl. 31, fig. 7). Some of the dorsal setae near the posterior extremity end more bluntly and are surrounded by a gelatinous envelope (pl. 31, fig. 8).

The lateral fibers are short, coarse, and colorless. They are sparse and do not conceal the neuropodia. The long fibers form a heavy, felt layer over the dorsum.

The neurocirrus arises from the parapodium at a point about two-thirds of its length from the body; it is only about one-fourth of the length of the notocirrus (pl. 31, fig. 11).

Occurrence.—The two specimens, type and cotype, were found at Station 1124 at 32° 55′.1 N, 117° 18′.5 W, off La Jolla, California, at a depth of 292 metres, on green mud bottom, June 25, 1906.

2. **Aphrodita californica,** sp. nov.

Pl. 32, figs. 15–26; pl. 37, figs. 79–80

Comparisons.—Only one specimen of this interesting species is in the collection. It had been included with those annelids identified by Treadwell (1914) as *Aphrodita castanea.* However, it differs from the latter in the following characteristics: the shape of the body is shorter and broader than that of *A. castanea;* the golden-brown dorsal setae, which are conspicuous in *A. castanea,* are covered by the colorless lateral fibers and are of a dull, pale color; the shape of the prostomium is somewhat squarish; the eyes are very large; the median tentacle is unusually long in *A. californica,* while in *A. castanea* it is very short; the fimbriated organs have short projections ending bluntly; the neurosetae in *A. californica* are perfectly smooth, without any trace of hairiness, while those of *A. castanea* have pillose tips.

Description.—The body (pl. 37, figs. 79, 80) is oval, broadly rounded anteriorly, tapering abruptly posteriorly to a narrow caudal region. It is dark gray in color. The dorsal surface is covered with a heavy felty covering and with debris, so that the animal at first sight looks more like a piece of inorganic matter than like an annelid. The length of the body is 18 mm.; the width, 8 mm., from tip to tip of setae; distance between the parapodia, 4 mm. There are thirty-three segments, very definitely marked off. The parapodia are marked off from the main body by a deep groove on each side of the ventral surface. The ventral surface is thickly covered with large papillae (pl. 32, fig. 22) which have capped tips.

The prostomium (pl. 32, fig. 15) is somewhat squarish in shape, subglobular, the width slightly exceeding the length. The narrow isthmus by which it is attached to the peristomium is about one-third of the width of the prostomium. The ocular prominences are large, each bearing a pair of comparatively large eyes of which only one is visible from the dorsal surface, while the other is located at the extreme anterior end of the ocular hemisphere. The palpi arise from short basal portions. They are stout, somewhat uniform in diameter except the distal ends, which slope gradually to attenuated tips. The length of the palpi is four times that of the prostomium, and their surface is covered with fine sensory papillae. The median tentacle arises from a prominent cirrophore, which is one-fifth of the style and is covered with papillae. A few papillae are also scattered on

the dorsal surface of the anterior portion of the prostomium. The median tentacle is unusually long in this species. In this respect it resembles Kinberg's (1855) *Aphrodita longicornis*, but differs from it in the absence of the iridescent lateral fibers and in the shape and the size of the body.

The ventral lip extends to the third segment and is well marked off laterally by deep grooves on each side. The facial tubercle reaches ventrally to the mouth.

There are fifteen pairs of elytra, arranged in the usual order characteristic of the genus. The elytra (pl. 32, fig. 18) are large, thin, and transparent, covering the entire dorsum. The branchiae (pl. 32, fig. 23) are hatchet-shaped, having three or four main lobes, which are more or less deeply indented.

The parapodia (pl. 32, fig. 24) are biramous, supported by two long, dark-brown aciculi, piercing the tips of parapodia. The neuropodium is of median length, bearing the three rows of setae. The dorsal series consists of two very stout, bluish-brown setae (pl. 32, fig. 16), arising one on each side of the aciculum. They are perfectly smooth, with slightly curved and attenuating, bluntly ending tips. The second row is made up of three or more setae (pl. 32, fig. 20), similar to the former, but differing from them in the smaller size and the straighter, more bluntly-ending tips. The ventral series consists of five or six setae (pl. 32, fig. 17) similar to the others in shape, but smaller. The neurosetae of the second parapodium (pl. 32, fig. 19) are specially modified, bearing spinous projections with the distal ends spirally twisted. The posterior or caudal neurosetae (pl. 32, fig. 26) are similar to the neurosetae of the second parapodium except that they end more bluntly and that the large protuberances are distributed more evenly on the entire surface of the distal portion.

The notopodium is a broad, low protuberance. It bears two rows of setae. Each row is made up of ten or eleven pale-brown setae, which are completely covered by debris. The tips of the notosetae are almost colorless, very fragile, fine, ending in an abrupt curve or hook (pl. 32, fig. 25). The fibers of the ventral tuft are very coarse. They are abundant, partly concealing the neuropodia, and are white or colorless. Those of the dorsal tufts are long and form a very thick, felty covering over the dorsum.

The neurocirrus is about one-fifth of the length of the notocirrus (pl. 32, figs. 21, 24). The notocirrus arises from a prominent cirratophore and extends posteriorly and laterally, lying on the surface of

the felty layer. It has a subterminal enlargement and ends in a blunt tip.

Occurrence.—The only specimen, the type, was taken at Station LXV, 32° 42′.7 N, 117° 13′.4 W, off Coronado, California, from sandy bottom at a depth of 6–5 metres, on July 20, 1901.

3. **Aphrodita solitaria,** sp. nov.

Pl. 37, figs. 81, 82; pl. 33, figs. 27–38

Comparisons.—The description of *Aphrodita solitaria* is based on a single specimen that had been previously identified by Treadwell (1914) as *Aphrodita refulgida.* It differs from the latter in some essential characteristics. The shape of the body is narrower and more attenuated at the anterior and the posterior extremities. The brilliant, iridescent lateral fibers, which are conspicuous in *A. refulgida,* are absent in this species, and their place is taken by short, colorless fibers. The neurosetae of *A. solitaria* have strongly pillose tips, while those of *A. refulgida* are perfectly smooth. Furthermore, the shape of the prostomium and of the fimbriated organs differs from that in *A. refulgida.*

Description.—The shape of the body is narrowly ovate. The length of the body is 34 mm. The greatest width of the body, between segments 13 and 15, is 23 mm. from tip to tip of the setae, and 10 mm. between parapodia. The body tapers very gradually towards both ends. The posterior segments decrease abruptly in width, and the last 12–13 caudal segments form a narrow portion about 0.5 mm. in width. The specimen has forty segments, which are well marked ventrally. The ventral surface is gray (in alcohol), densely studded with papillae. The latter are prominent, with capped tips (pl. 33, fig. 22). The dorsum is arched. The dorsal setae are partly concealed by the felty layer and by the adherent debris.

The prostomium (pl. 33, fig. 27) is slightly wider than long, and is attached to the peristomium by the narrow isthmus, which is about one-sixth of the width of the prostomium. The ocular hemispheres are inconspicuous, each having a pair of minute eye-spots. The median tentacle consists of a prominent cirrophore and a style three times the former. The length of the palpi is five times that of the prostomium. The palpi are comparatively stout, gradually decreasing in diameter towards their distal ends, grooved longitudinally, and are covered with fine sensory cilia, visible only under high magnification.

The ventral lip extends to the third segment. The facial tubercle is prominent, covered with papillae, and ends in a finger-like projection hanging over the mouth ventrally.

The fifteen pairs of elytra (pl. 33, fig. 35) are thin, tough, and transparent, and are attached to the notopodia by strong elytrophores. Slight venations radiate from the place of attachment in all directions.

The branchiae begin on the sixth segment, occurring thence posteriorly on all cirriferous segments except the last few caudal ones. They are hatchet-shaped (pl. 33, fig. 36), with from seven to nine irregular, prominent projections.

The parapodia are biramous (pl. 33, fig. 28). The neuropodia are subtruncate, ending in the usual three-step-like fashion. The tips of all the neurosetae are strongly pillose. Their color is dark brown, with a bluish reflection in light. The neurosetae from the dorsal series are the largest (pl. 33, figs. 29, 30). The four setae of the second row are finer (pl. 33, fig. 33). The six setae from the ventral series are the finest and have a subterminal enlargement (pl. 33, fig. 31). The neurosetae from the second parapodium (pl. 33, fig. 34) are specially modified, ending in a fine point, and are covered with prominent spines. The caudal setae have the same shape as the setae of other parapodia except that their ends are perfectly smooth. The dorsal setae are arranged in two rows. The dorsal row consists of four setae and the ventral of from eight to ten. The notosetae are long and brown, with pale, colorless ends terminating in a fine, strongly curved hook (pl. 33, fig. 32).

The dorsal cirrus is long, smooth, tapering gradually towards the distal end, and terminating in a bulbous tip. Its length is about eight times that of the neurocirrus (pl. 33, fig. 28).

Occurrence.—No data as to its habitat are available, but it is probable that the specimen came from collections made off the coast of southern California in 1901–1904.

4. **Aphrodita cryptommata**, sp. nov.

Pl. 34, figs. 39–50; pl. 37, fig. 83

Comparisons.—This species was labeled as *Aphrodita parva* and was evidently identified as such by Treadwell (1914). Comparing the specimen here described with the one sent to us by Dr. P. J. Moore, some essential differences were discovered.

The shape of the body in *Aphrodita cryptommata* is more slender, ending in a narrow caudal region; in *A. parva* the body ends posteriorly more obtusely. The neuropodia are more slender in *A. parva.* The shape of the prostomium is also different in the two species. The median tentacle is very short in *A. cryptommata;* it is very long in *A. parva.* The neurosetae of *A. cryptommata* are perfectly smooth, without any hairiness; they are pillose with a prominent spur in *A. parva.* The fimbriated organs in *A. cryptommata* differ from those of *A. parva* and from any other known species by having four to five conspicuously long, finger-like lobes. The elytra are somewhat squarish in *A. cryptommata;* they are more rounded in *A. parva.*

Description.—The body is ovately elongated, tapering towards both extremities, more toward the posterior end (pl. 37, fig. 83). The dorsum is arched, and the segmentation is well marked on the ventral surface. The two specimens in the collection of the University of California are 28 and 29 mm. long respectively. The width of the body is 16 mm. from tip to tip of the setae, and 10 mm. between parapodia. The greatest width of the body is between segments 10 and 11. The width decreases thence towards both ends. The ventral surface is thickly covered with prominent, capped papillae. There are thirty-eight segments.

The prostomium (pl. 34, fig. 39) is semiglobular, having the width equal to the length. The ocular protuberances are prominent, each bearing a pair of minute eyes, of which the dorsal pair only is visible from the dorsal surface. The median tentacle is very short, consisting of a short cirrophore and a short style. The palpi are white, stout, slightly grooved longitudinally, tapering gradually toward the distal end, and are covered with fine cilia. Their length is about five and one-half times the length of the prostomium. The fifteen pairs of elytra are thin, squarish in shape (pl. 34, fig. 40), strongly overlapping, and completely covering the dorsum. They are sparsely covered with papillae and fine venations radiating from the point of attachment in all directions.

The fimbriated organs have from four to six long, smooth, finger-like projections (pl. 34, fig. 47).

The parapodia are of the usual shape characteristic of the genus (pl. 34, fig. 49). The neurosetae are smooth, with abruptly narrowing ends terminating bluntly. There are two dark-brown, stout neurosetae in the dorsal series (pl. 34, fig. 43); five finer setae from the middle series (pl. 34, fig. 42) equal in structure to the former; eight

setae from the ventral series (pl. 34, fig. 41) lighter in color and finer than either of the former, with a slight subterminal enlargement. The notosetae pierce the felty covering. They are long and fine, and are arranged in two rows. The tips are strongly hooked, forming almost a ring (pl. 34, fig. 44). The lateral and the dorsal fibers also have hooked tips. The neurosetae of the second parapodium (pl. 34, figs., 45 and 46) have spinous protuberances and end in a fine point. The caudal neurosetae (pl. 34, fig. 50) are long, ending bluntly. They are covered with spiny hooks.

The notocirri occur on all non-elytroferous segments. They are four times the length of the neurocirri, terminating bluntly.

Occurrence.—One of the specimens, the type, was taken on June 14, 1901, at Station XIX, Haul 1, at 33° 34′.6 N, 117° 55′.6 W, off Newport, California, in a haul of the trawl at a depth of from 185 to 55 metres, on a bottom of soft mud, sand, and pebbles. The other one, the paratype, has no data.

5. **Aphrodita brevitentaculata**

Pl. 35, figs. 51–63; pl. 37, fig. 84

Comparisons.—A single specimen, the type, is in the collection of the Zoological Museum of the University of California. It was previously identified by Treadwell (1914) as *Aphrodita negligens.* Comparing the specimen with a cotype of *A. negligens* which Dr. J. P. Moore kindly sent to us, some essential differences were discovered.

The size of the body differs considerably. Of the two specimens from Dr. Moore, one, the type, is 40 mm. long and 17 mm. wide, excluding the setae; the other one is 60 mm. long and 40 mm. wide. *Aphrodita brevitentaculata* is only about one-third of that size, its length being 23 mm. and its width 9 mm. Further differences are found in the shape of the body, which is more obtusely rounded anteriorly in *A. brevitentaculata,* with the dorsum less arched. The prostomium differs in shape in the two species. The eyes are very small in *A. negligens,* but are unusually large in *A. brevitentaculata.* The palpi are relatively shorter in *A. brevitentaculata,* being two and a half times the length of the prostomium, while those of *A. negligens* are four and a half times the length of the prostomium. The lateral and the felt fibers of *A. negligens* are iridescent, of a dull green or bluish color; those of *A. brevitentaculata* are colorless. In *A. negligens*

the neurosetae are curved, with the tips slightly covered with hairs; in *A. brevitentaculata* the neurosetae are smooth, with the tips less curved—almost straight. The elytra are granular in *A. brevitentaculata;* they are thin and smooth in *A. negligens.*

Description.—The body (pl. 37, fig. 84) is ovate, slightly arched on the dorsum and slightly convex ventrally, i.e., the rest of the body from the base of the parapodia is slightly elevated. The length of the body is 23 mm. The width at the widest part of the body, between segments 9 and 17, is 14 mm. from tip to tip of setae, 9 mm. between parapodia. The anterior end of the body is broadly rounded. Towards the posterior portion the body width decreases very gradually, then attenuates abruptly before the last seven or eight segments in a narrow caudal portion about 0.5 mm. in width. There are thirty-five well-defined segments. The ventral surface is gray, thickly covered with fine papillae varying in size. The dorsal papillae (pl. 35, fig. 58) are still smaller than the ventral, with capped tips.

The prostomium (pl. 35, fig. 51) is slightly broader than it is long and is attached to the peristomium by a long, narrow isthmus about one-fourth of the width of the prostomium. The median tentacle is short, bends upwards and ends in a bulbous tip. Each ocular prominence bears a pair of large eyes which are slightly fused. The palpi are stout, decreasing in diameter very gradually towards the distal ends. They have a short basal portion, and are two and a half times the length of the prostomium. They are smooth without any grooves and are sparsely covered with minute sensory cilia, visible only under high magnification. The facial caruncle is compressed between the palpi, ending in a long finger-like projection that hangs over the mouth ventrally. The mouth is situated ventrally, bounded by the third segment, and the broad ventral lip is well marked off from the rest of the body by deep grooves on each side of it.

There are fifteen pairs of elytra (pl. 35, fig. 55) arranged in the usual order. They are attached to the body by long elytrophores, and are covered with fine papillae and brown incrustations.

The branchiae (pl. 35, fig. 59) begin at the sixth segment, occurring thence on all cirriferous segments to the thirtieth. As usual, the anterior and posterior ones are smaller and less developed, those toward the center of the body are broad, each having 8 to 11 simple, finger-like projections.

The parapodia (pl. 35, fig. 61) are comparatively short, biramous, and supported by two aciculi. The neuropodium is of the usual shape

characteristic to the genus. The three series of neurosetae consist of two setae in the dorsal series, three in the middle series, and five in the ventral series. They are similar in shape and structure, except for the difference in size (pl. 35, fig. 57, 60, 63). The neurosetae of the second parapodium (pl. 35, figs. 52, 53) are decorated with spinous projections ending bluntly or in a spiral twist. The neurosetae of the caudal parapodia (pl. 35, fig. 54) are covered with spiny hooks.

The dorsal setae are arranged in two rows inserted at different angles. Each row consists of ten or eleven setae, which pierce the layer of felt fibres, extending dorsad. The tips of the notosetae are fine and brittle, ending in an abruptly bent hook (pl. 35, fig. 56). The fibers arise as usual in three tufts, the dorsal, intermediate, and ventral. The felt fibers arise in tufts immediately above the dorsal notopodial setae on elytroferous segments only. A smaller tuft arises between the two facicles of setae on all segments. The lateral tufts of fibres arise below the notopodial setae. On the elytroferous segments the dorsal bundle of fibers, which furnishes the greater part of the dorsal felt, is lacking. The lateral fibers are covered with fine hairs and terminate in a hook (pl. 35, fig. 62).

The notocirri are about four times the length of the neurocirri. The latter are fusiform and reach to the base of the second row of the neuropodial setae.

Occurrence.—There is only one specimen, the type. It was taken off San Diego, in September, 1898, by Professor S. J. Holmes, from the holdfasts of kelp.

6. **Aphrodita raripillata,** sp. nov.

Pl. 36, figs. 64–76; pl. 37, figs. 85–86

Comparisons.—The description of this species is based on three examples which are in the Zoological Museum of the University of California. Two of these were labeled, probably by Treadwell (1914), *Aphrodita parva,* while the third specimen was labeled *Aphrodita negligens.* The characteristics of the latter species have been previously discussed in this paper in comparison with other species. It is unnecessary, therefore, to repeat the description here. It may be said, however, that observation shows at once that the specimens here described are neither *A. parva* nor *A. negligens,* as they differ from both in the shape of the body, which is more slender, with the dorsum

apparently more arched. This appearance, however, is due to the prominent dorsal setae, which stand out arching over the dorsum, thus making the animal appear deeper dorso-ventrally. A further distinguishing characteristic is the very thin, clear, felty covering over the dorsum. The dorsal setae are very stout dark brown, covered with asperities, and ending more bluntly than they do in any other species of *Aphrodita* except *A. armifera*.

Aphrodita raripillata has a great resemblance to *Aphrodita armifera* (Moore, 1910), and is undoubtedly closely related to it. The chief difference is in the structure of the neurosetae. In *Aphrodita armifera* the neurosetae of the ventral series are covered with asperities and have a subterminal spur, while in *A. raripillata* no spur or asperities are seen even under the highest magnification. Moreover, Dr. Moore (1910) in his description of *A. armifera* states that the lateral and the felt fibers of this species are almost colorless, while in *A. raripillata* they are colorless.

In a specimen of *A. armifera* in the collections of the Marine Biological Laboratory of the Scripps Institution at La Jolla, the neurosetae are covered with the asperities and possess a subterminal spur. The lateral and the dorsal fibers, although not conspicuously colored, show a slight tinge of dull green color.

I feel justified in separating this species on the difference in the setae, since Dr. Moore (1910), in a similar case, based the distinction of *Aphrodita parva* from *A. intermedia* McIntosh on the structure of the setae, the only difference between them. Bourne (1883), in his discussion of variable and constant characters in the Polynoidae, states that the characteristics of the setae of corresponding segments are constant. Comparing a large number of *A. refulgida* and *A. castanea*, I have found that the structure of the setae is a reliable distinguishing characteristic in these species of *Aphrodita*.

Description.—The shape of the body is ovate (pl. 37, figs. 85, 86), obtusely rounded at the anterior end, reaching its maximum width about the tenth segment, decreasing thence towards the posterior end until the last five or six segments form a very narrow caudal end (pl. 37, fig. 85). The dorsum is arched and is covered with a very thin, felty layer over which the golden brown setae arch with their ends nearly meeting over the dorsum near the anterior end. At the posterior end of the body the ends of the notosetae meet or overlap. On the ventral surface (pl. 37, fig. 86) the segmentation is well indicated by transverse ridges. There are thirty-three segments. The

respective length of the three specimens at hand is 12, 15, and 28 mm. The respective width, from tip to tip of the setae, is 8, 12 and 15 mm.; between the parapodia, 5, 8, and 9 mm. respectively.

The prostomium (pl. 36, fig. 64) is subglobate, slightly wider than long. The ocular hemispheres are prominent, each bearing a pair of median-sized eyespots located on the dorsal and the antero-ventral surface of the hemispheres. The median tentacle consists of a short cirrophore, bearing a style almost equal in length to the cirriphore, ending in a bulbous tip. The white, stout palpi are almost uniform in width, tapering very slightly towards the distal ends, and are covered with sensory cilia. Their length is four times that of the prostomium.

The fifteen pairs of round, transparent elytra (pl. 36, fig. 66) are arranged in the usual order. The fimbriated organs (pl. 36, fig. 67) begin at the sixth segment, occurring thence on all cirriferous segments. They consist of six to eight prominent lobes. Each is subdivided into two or more smaller lobes, although undivided lobes occur.

The parapodia (pl. 36, fig. 73) are of median size, biramous, and are supported by two strong, dark-brown aciculi. The neuropodial setae from the three series (pl. 36, figs. 74, 75, and 76) are very much alike except for the difference in size. They are smooth, with slightly bent tips ending bluntly. The tips of the setae of the middle series are less curved than those of the other two series. The neurosetae of the second parapodium (pl. 36, fig. 71) are covered with prominent spines, except the extreme distal tip, which is smooth, and terminates in a pointed end. The caudal neurosetae (pl. 36, fig. 65) bear prominent spinous projections which are evenly distributed on the distal portion of the setae, except on the extreme distal end, which is smooth.

The notopodium is an inconspicuous tuberosity bearing two rows of dark brown setae and the lateral and the dorsal fibers. The dorsal setae (pl. 36, fig. 72) are almost straight, ending bluntly, and are covered with asperities. The latter are less conspicuous near the distal end, increasing in size toward the proximal end.

The neurocirrus arises from a strong cirrophore and is about one-sixth of the length of the notocirrus.

The body of the worm is covered with papillae, of which the dorsal papillae are less prominent, and with papillae of the simple type without the caps (pl. 36, figs. 68, 69, 70).

Occurrences.—The three specimens of *Aphrodita raripillata* in the collection of the University of California are of different sizes. One of them has the egg-sacs attached to the ventral surface. Another specimen, judging by the size, is young. These three specimens, the type and two paratypes, were taken off Southern California at different depths, from 27 to 55 metres. The type is from Station LV, Haul 2, at 32° 32′ N, 117° 14′ W, off San Diego, where it was taken July 18, 1901, at a depth of 46 to 41 metres, on bottom of soft mud, sand, and rocks. One of the paratypes is from Station LVIII, at 32° 26′ N, 117° 15′.2 W, off San Diego, at a depth of 33–27 metres on a bottom of sand and broken shells, taken July 19, 1901. The other paratype was taken at Station XXIII, Haul 2, at 33° 19′.3 N, 118° 18′.2 W, off Avalon, Catalina Island, at a depth of 55–42 metres, on a bottom of fine gray sand and broken shells, on June 22, 1901.

Transmitted November 3, 1916.

Zoological Laboratory,
University of California.

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F. EXPLANATION OF PLATES

All figures drawn with camera lucida

PLATE 31

All figures of *Aphrodita longipalpa*, sp. nov.

Fig. 1. Prostomium, × 10.
Figs. 2 and 2′. Tips of neurosetae from dorsal series. × 75.
Fig. 3. Tips of neuroseta from ventral series. × 75.
Fig. 4. Tip of median neuroseta. × 75.
Figs. 5, 5′, 5″. Tips of caudal setae. × 75.
Fig. 6. Tip of neuroseta from the second parapodium. × 75.
Fig. 7. Tip of dorsal seta. × 320.
Fig. 8. Tip of dorsal seta, showing the gelatinous envelope. × 75.
Fig. 9. Tip of dorsal seta. × 160.
Fig. 10. Fourth elytron. × 10.
Fig. 11. Twelfth parapodium. × 10.
Fig. 12. Fimbriated organ. × 75.
Fig. 13. Dorsal papillae. × 320.

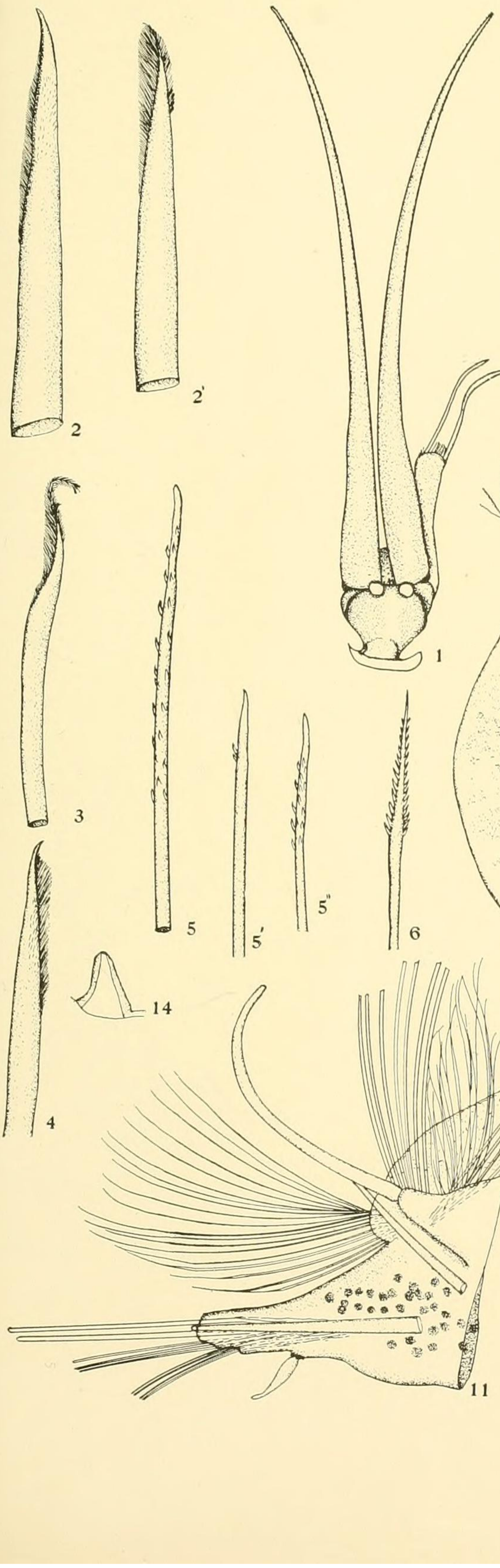
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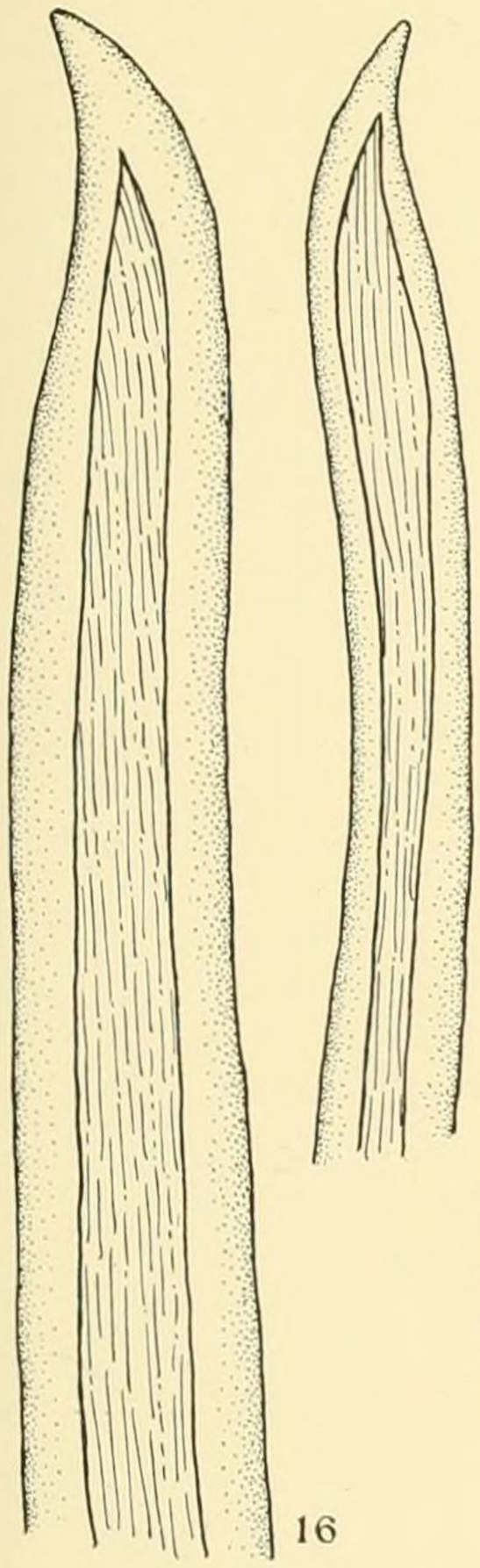
PLATE 32

All figures of *Aphrodita californica,* sp. nov.

Fig. 15. Prostomium. × 20.
Figs. 16, 17, 20. Tips of neurosetae. × 320.
Fig. 18. Fifth elytron. × 20.
Fig. 19. Tip of neuroseta of second parapodium. × 320.
Fig. 21. Dorsal cirrus. × 20.
Fig. 22. Dorsal papillae. × 20.
Fig. 23. Branchiae. × 75.
Fig. 24. Tenth parapodium. × 10.
Fig. 25. Tip of dorsal seta. × 320.
Fig. 26. Tip of caudal neuroseta. × 320.



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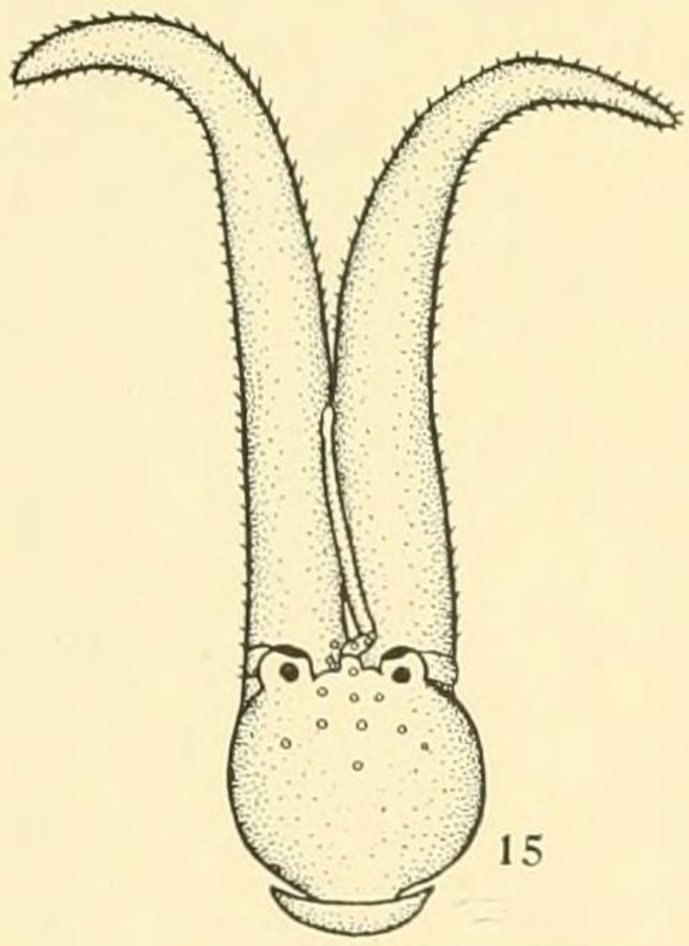

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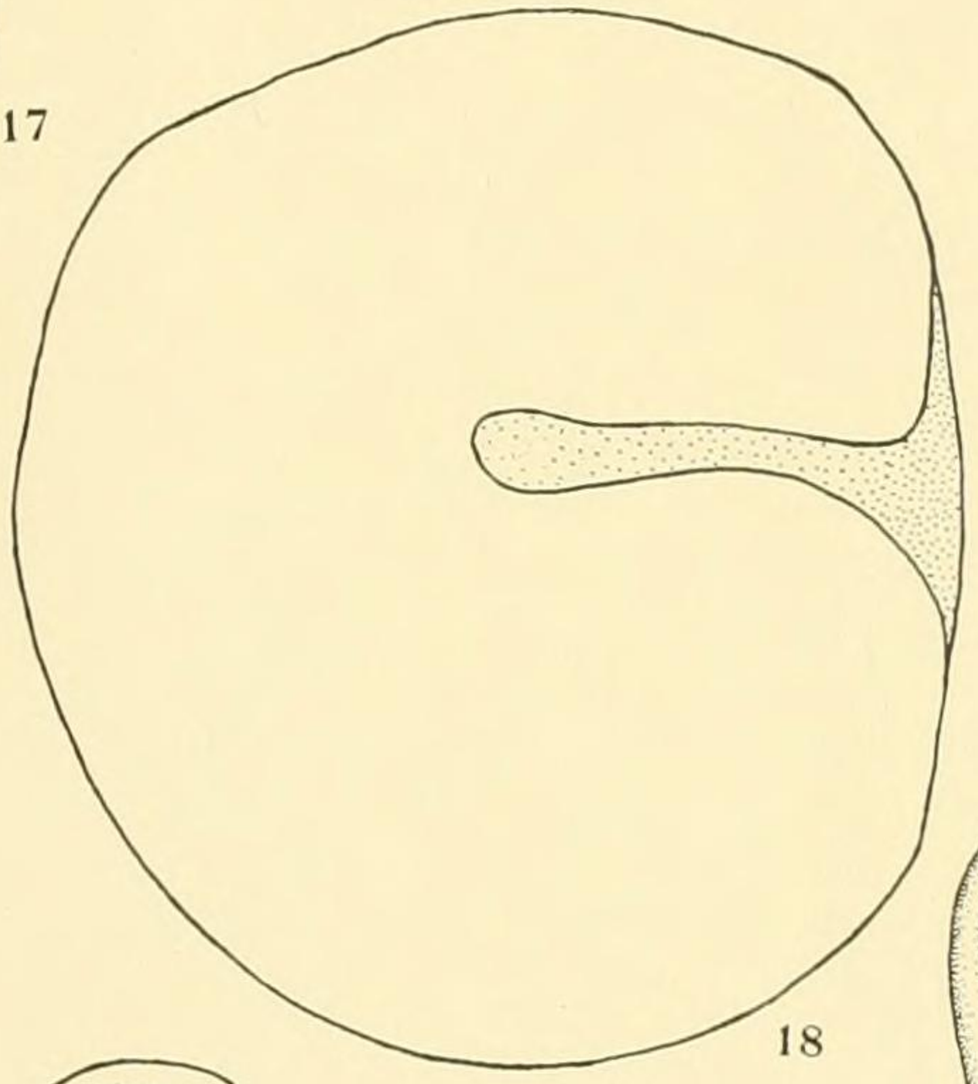

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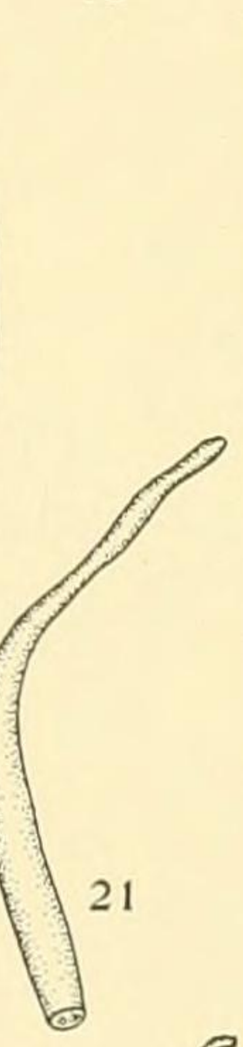

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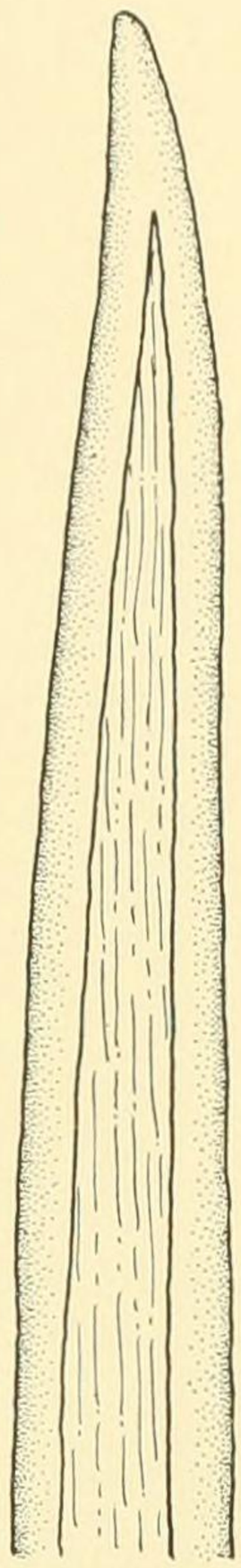

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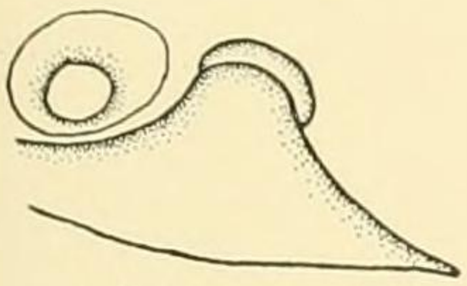

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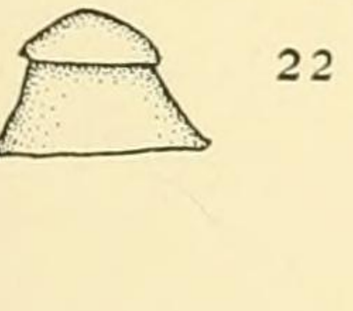

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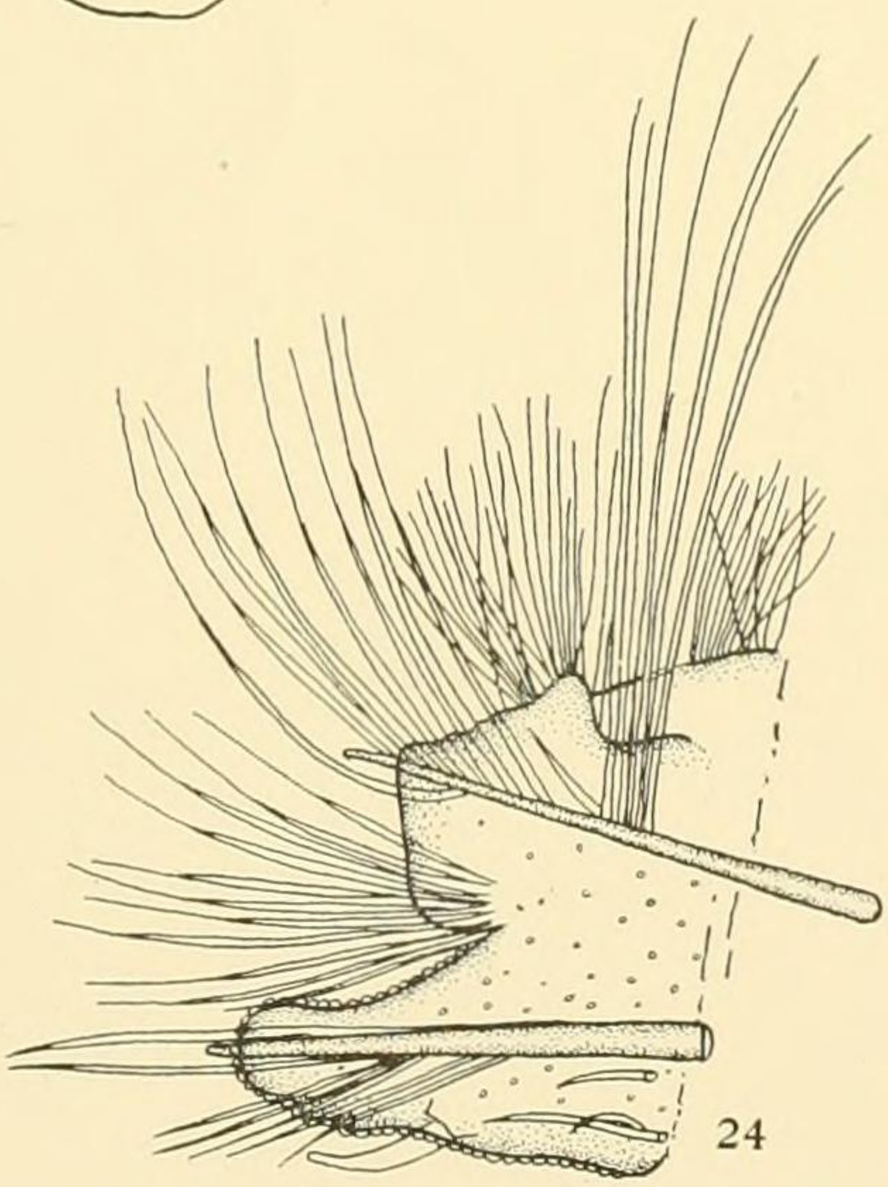

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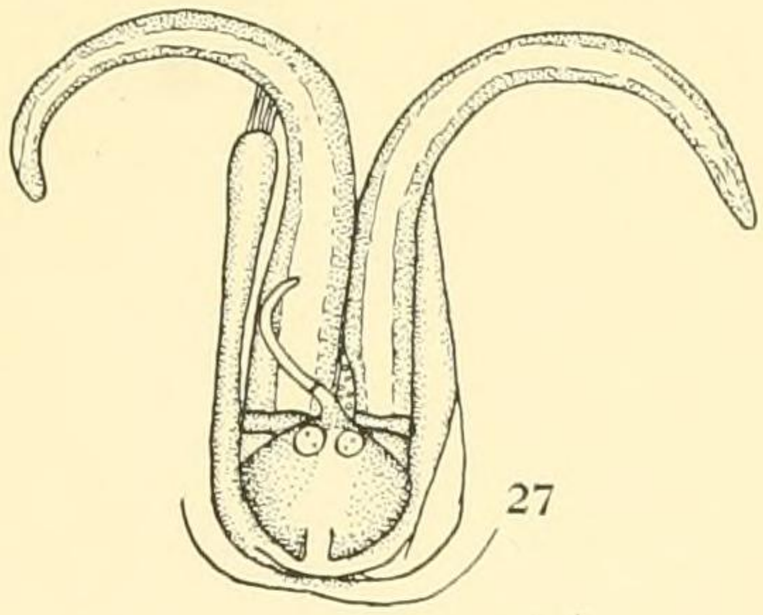
PLATE 33

All figures of *Aphrodita solitaria,* sp. nov.

Fig. 27. Prostomium. × 10.
Fig. 28. Twelfth parapodium. × 10.
Fig. 29. Tip of dorsal neuroseta. × 160.
Fig. 30. Dorsal papillae. × 160.
Fig. 31. Tip of ventral neuroseta. × 160.
Fig. 32. Tip of dorsal seta. × 75.
Fig. 33. Tip of median neuroseta. × 160.
Fig. 34. Tip of neurosetae from second parapodium. × 320.
Fig. 35. Fifth elytron. × 10.
Fig. 36. Branchiae. × 45.
Fig. 37, 38. Tips of median neurosetae. × 160.



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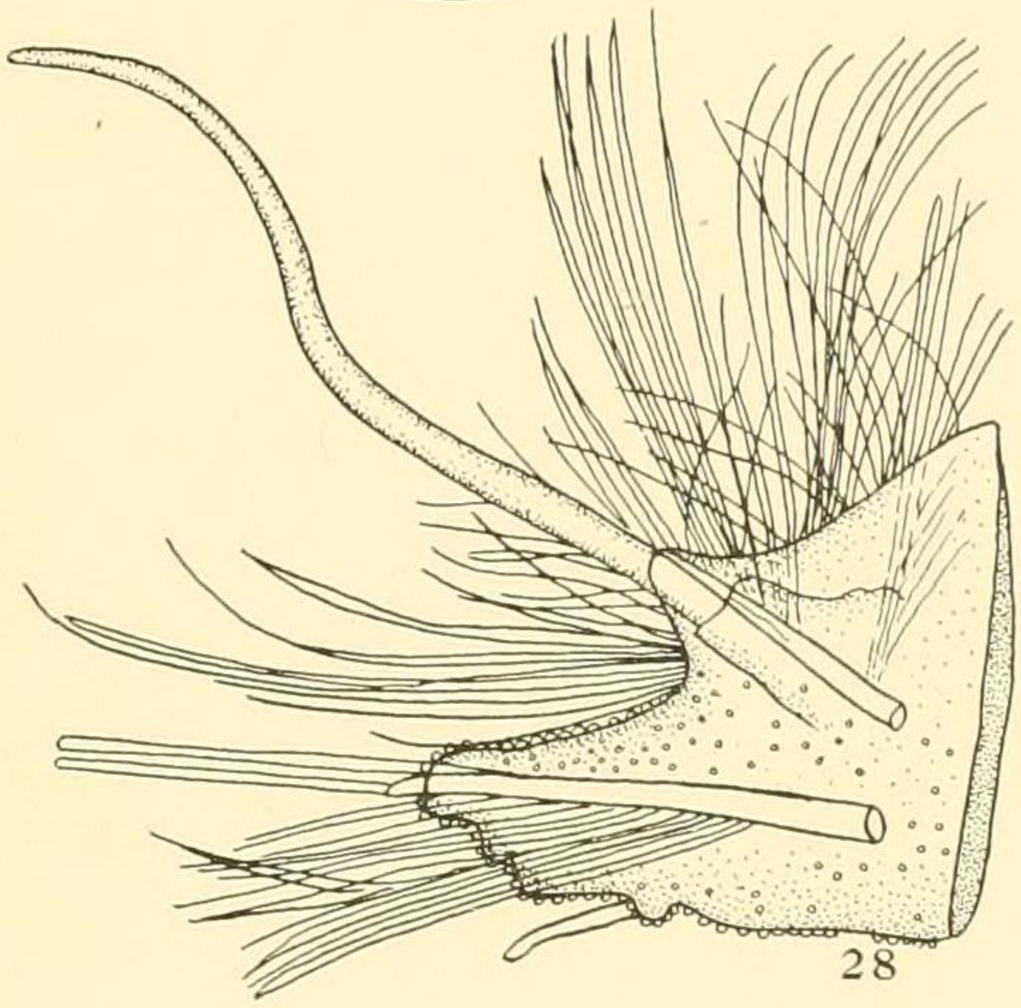

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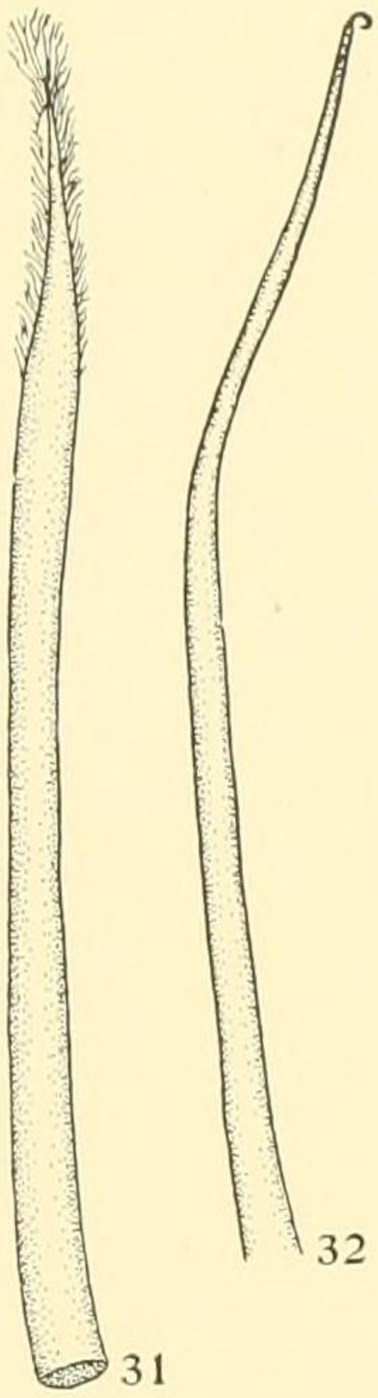

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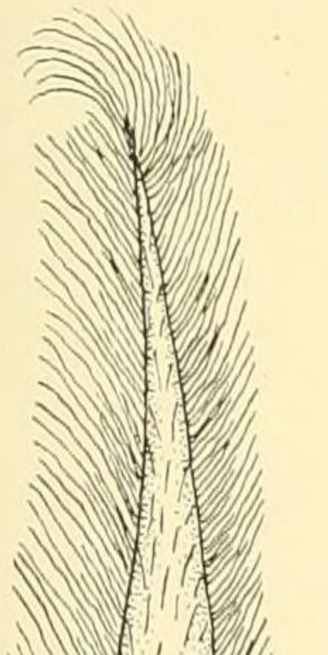

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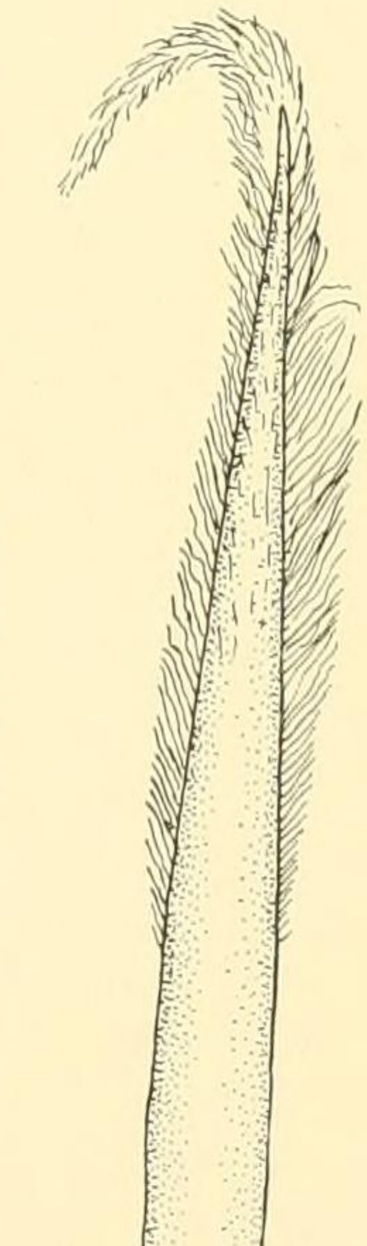

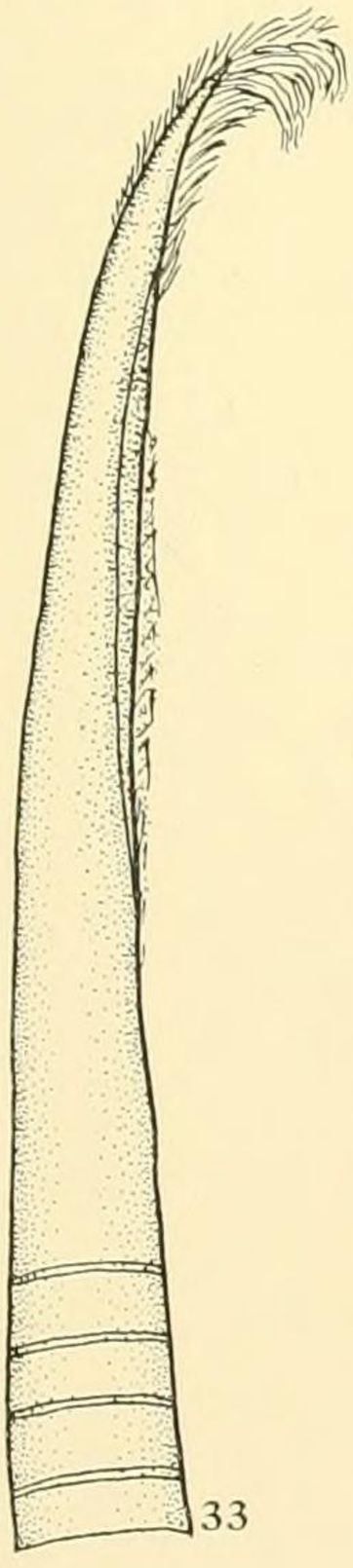

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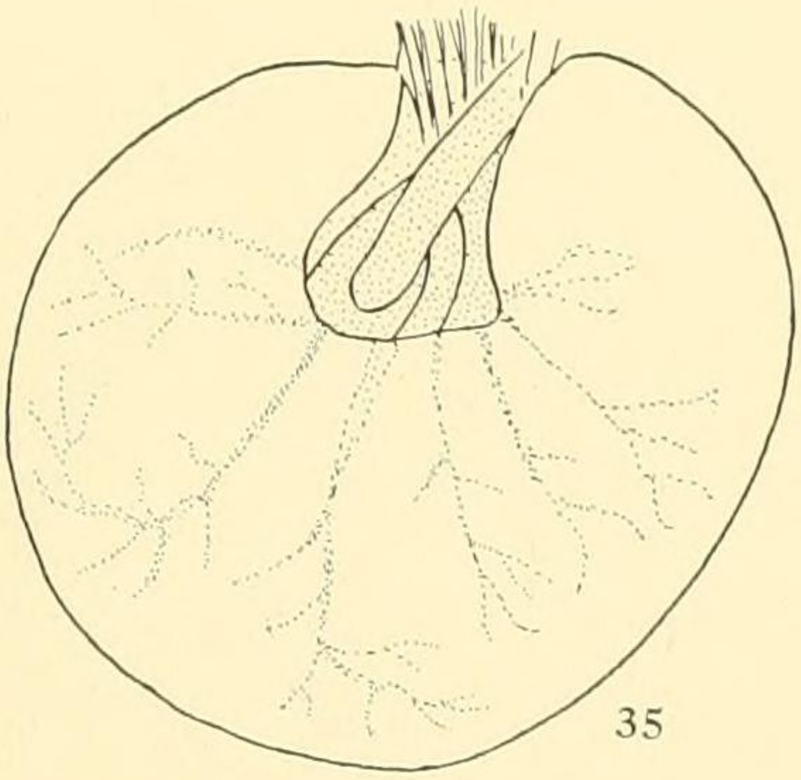

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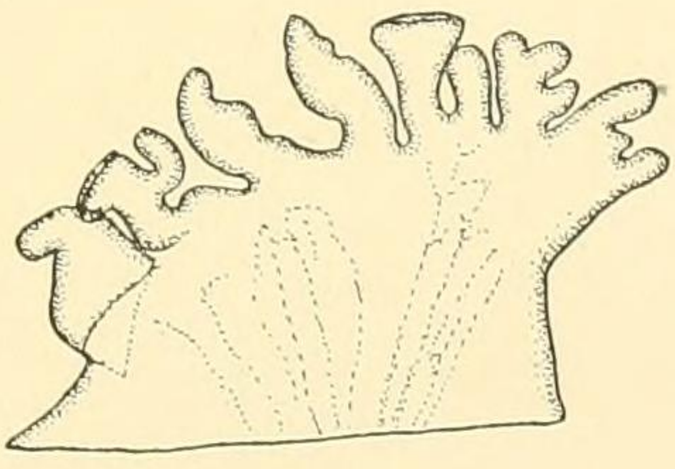

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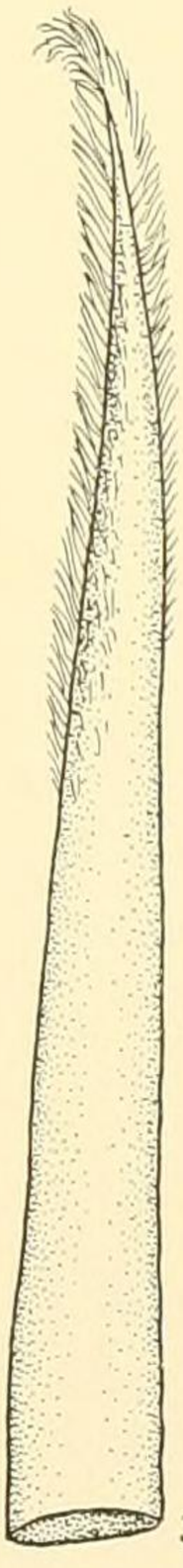

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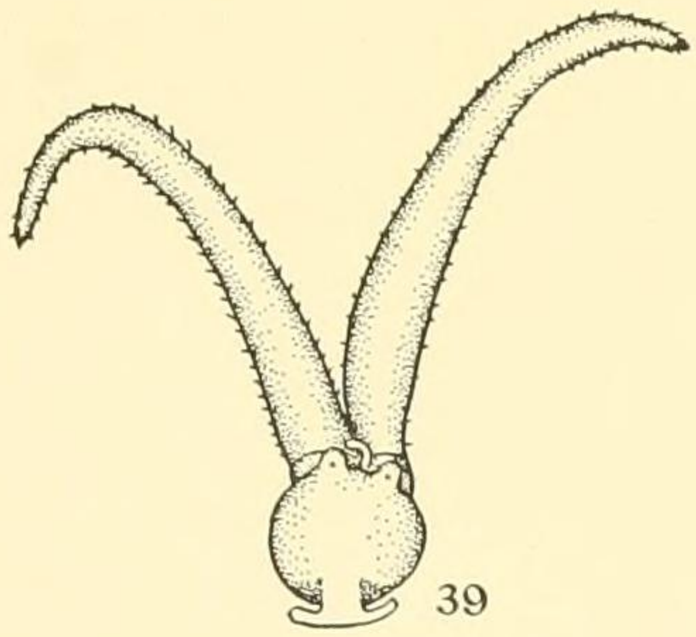
PLATE 34

All figures of *Aphrodita cryptommata*, sp. nov.

Fig. 39. Prostomium. × 10.
Fig. 40. Fifth elytron. × 10.
Figs. 41, 42, 43. Tips of neurosetae. × 160.
Fig. 44. Tip of notoseta. × 320.
Fig. 45. Tip of neuroseta from second parapodium. × 360.
Fig. 46. Neuroseta from second parapodium. × 160.
Fig. 47. Branchiae. × 45.
Fig. 48. Dorsal papillae. × 160.
Fig. 49. Twelfth parapodium. × 10.
Fig. 50. Portion of caudal seta. × 320.



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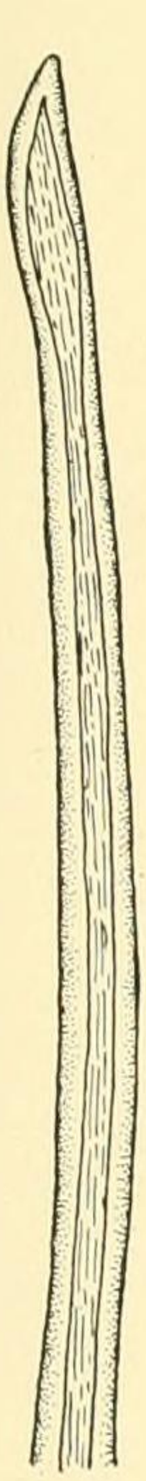

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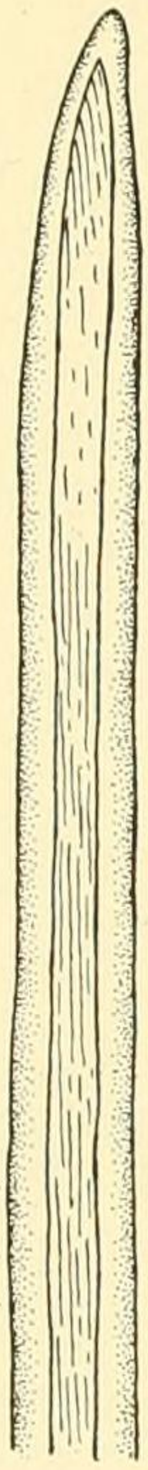

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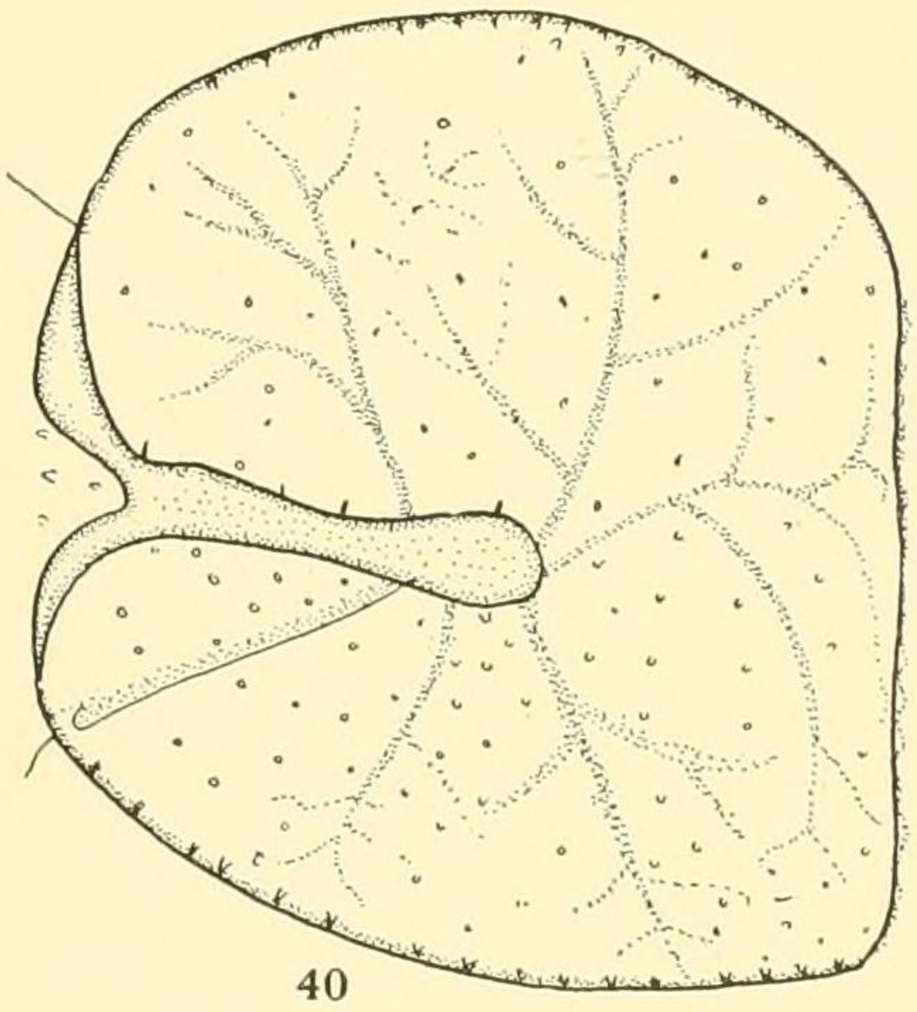

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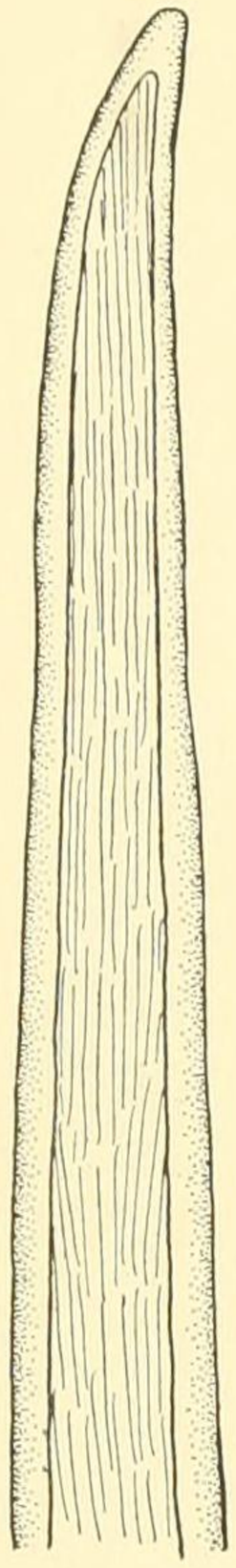

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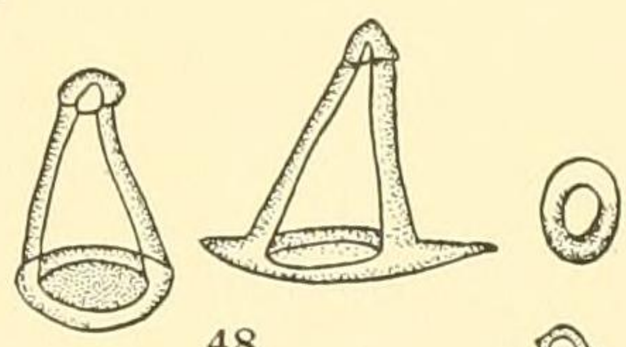

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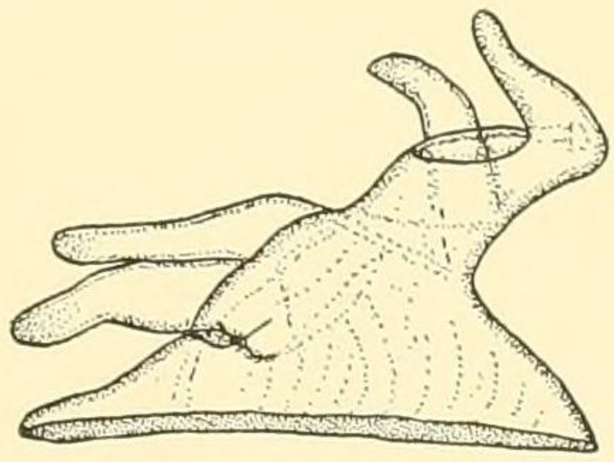

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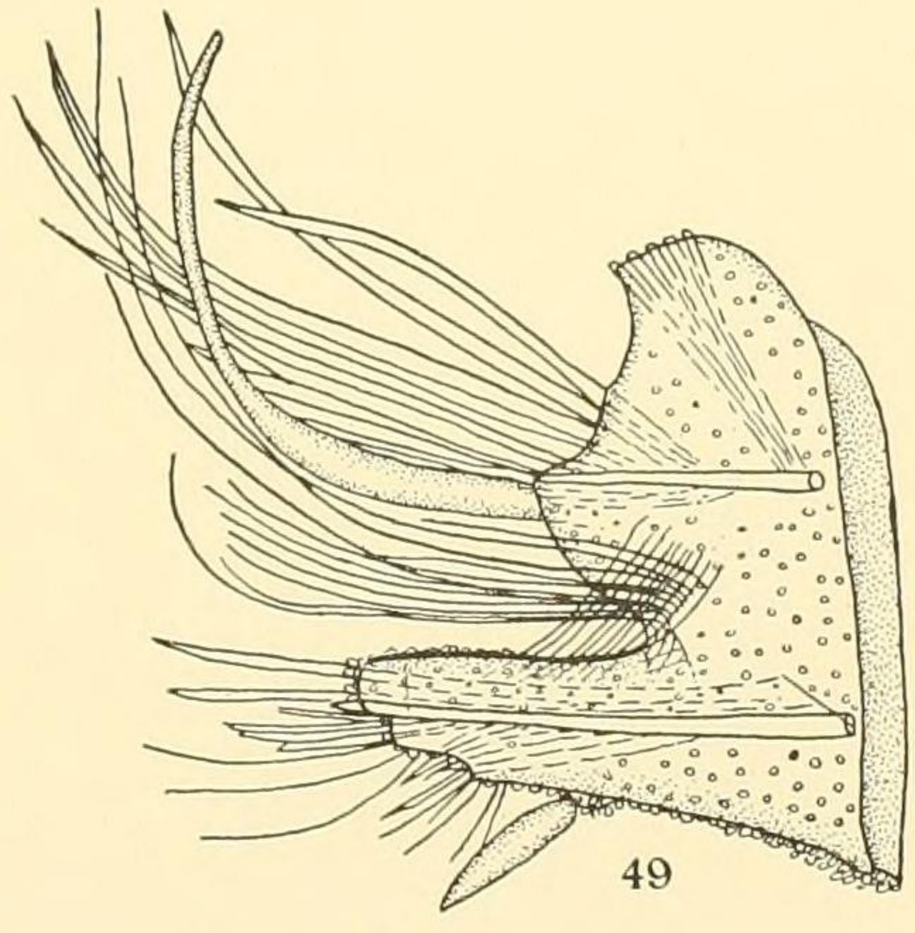

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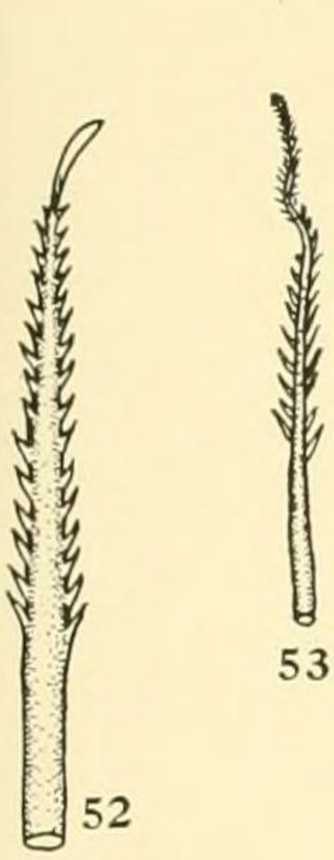
PLATE 35

All figures of *Aphrodita brevitentaculata*, sp. nov.

Fig. 51. Prostomium. × 20.
Figs. 52, 53. Neurosetae from second parapodium. × 160.
Fig. 54. Caudal neuroseta. × 75.
Fig. 55. Third elytron. × 10.
Fig. 56. Tip of notoseta. × 160.
Fig. 57. Tip of median neuroseta. × 160.
Fig. 58. Dorsal papillae. × 160.
Fig. 59. Branchiae. × 45.
Fig. 60. Tip of neuroseta from dorsal series. × 160.
Fig. 61. Twelfth parapodium. × 10.
Fig. 62. Tip of felt fiber. × 320.
Fig. 63. Tip of neuroseta from the ventral series. × 160.



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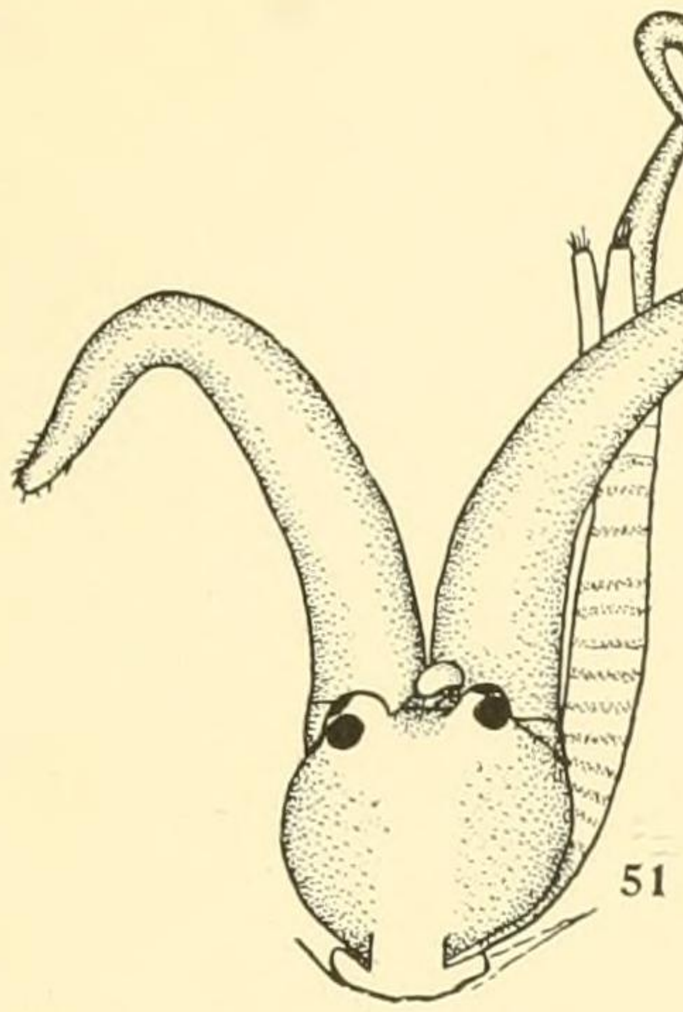

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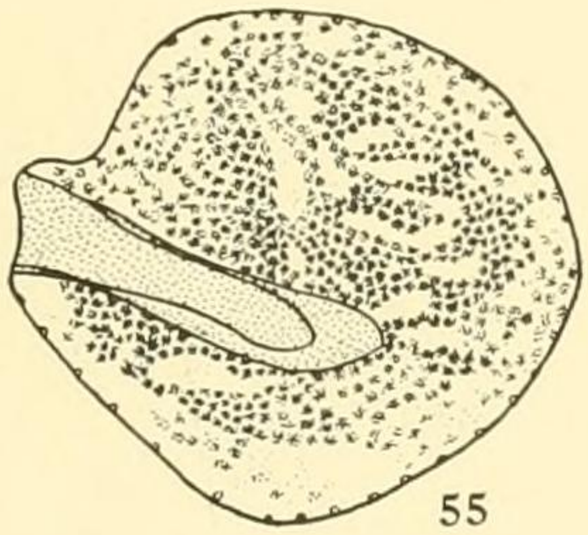

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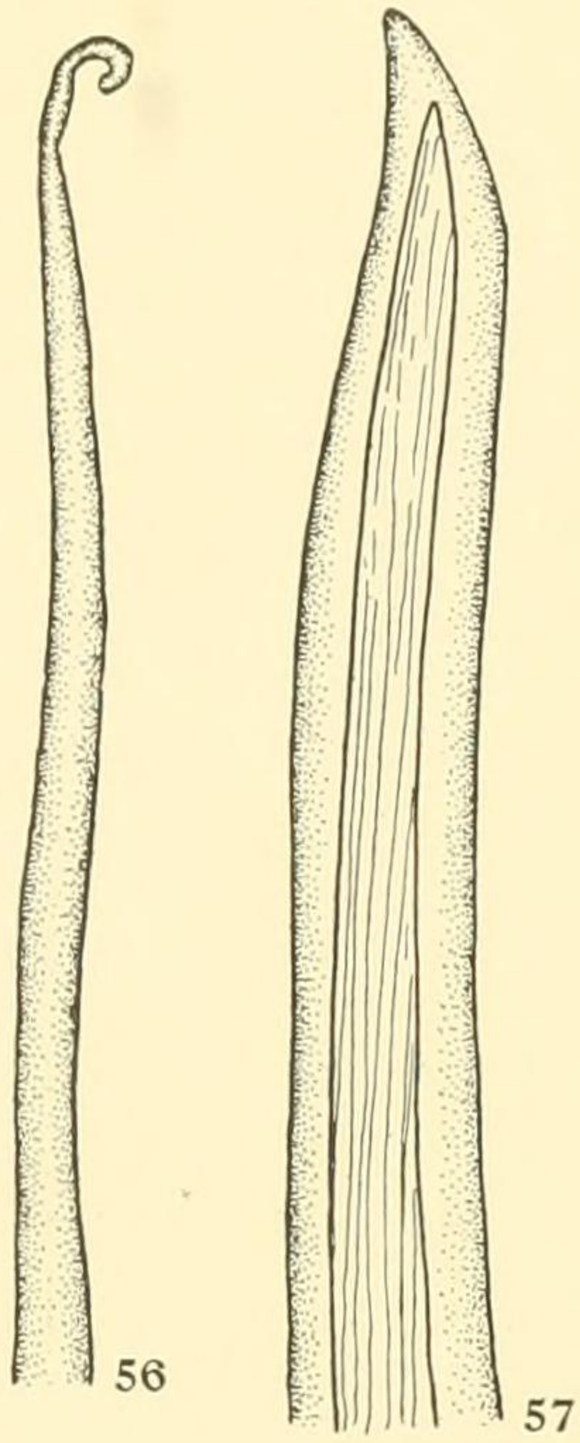

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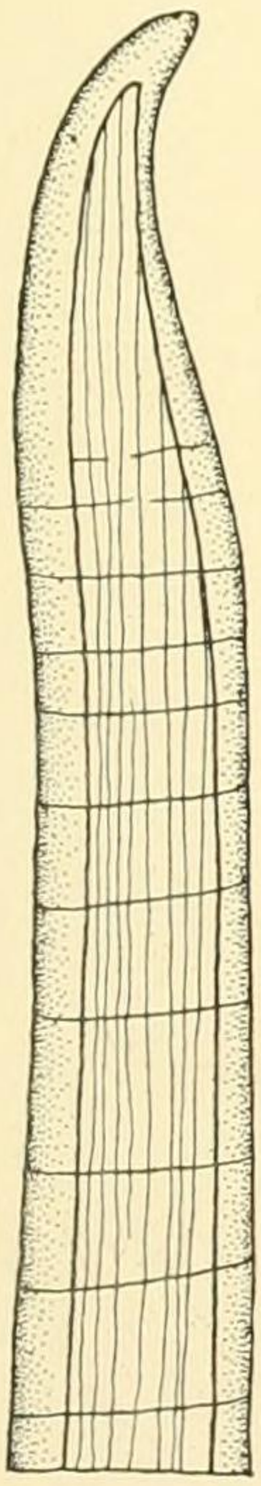

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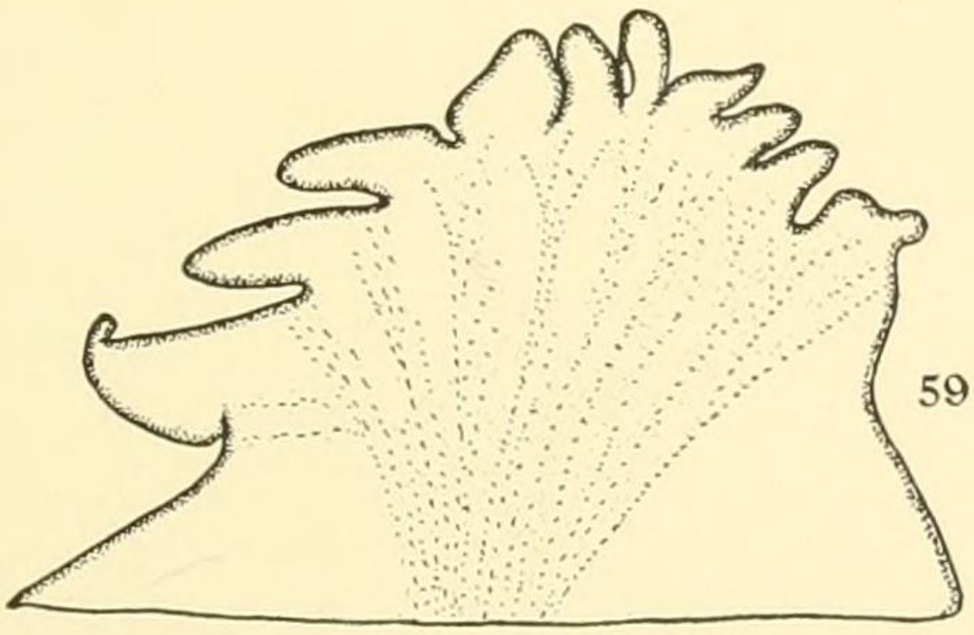

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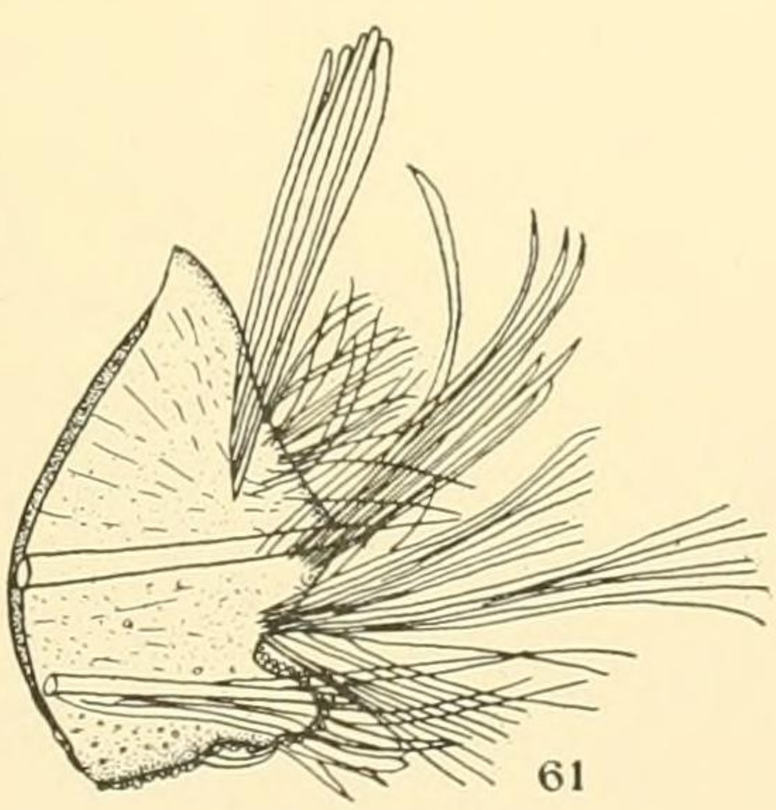

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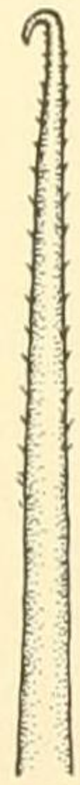

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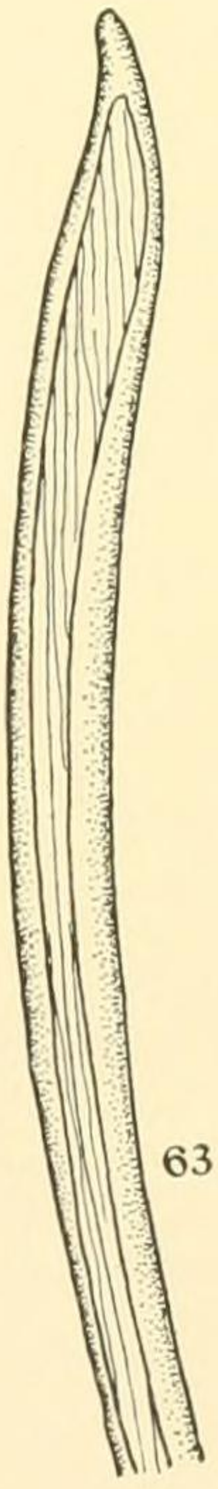

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PLATE 36

All figures of *Aphrodita raripillata*

Fig. 64. Prostomium. × 20.
Fig. 65. Caudal neuroseta. × 75.
Fig. 66. Fourth elytron. × 10.
Fig. 67. Branchiae. × 75.
Figs. 68, 69, 70. Dorsal papillae. × 160.
Fig. 71. Neuroseta from second parapodium. × 310.
Fig. 72. Tip of dorsal seta. × 160.
Fig. 73. Thirteenth parapodium. × 10.
Figs. 74, 75, 76. Neurosetae. × 160.

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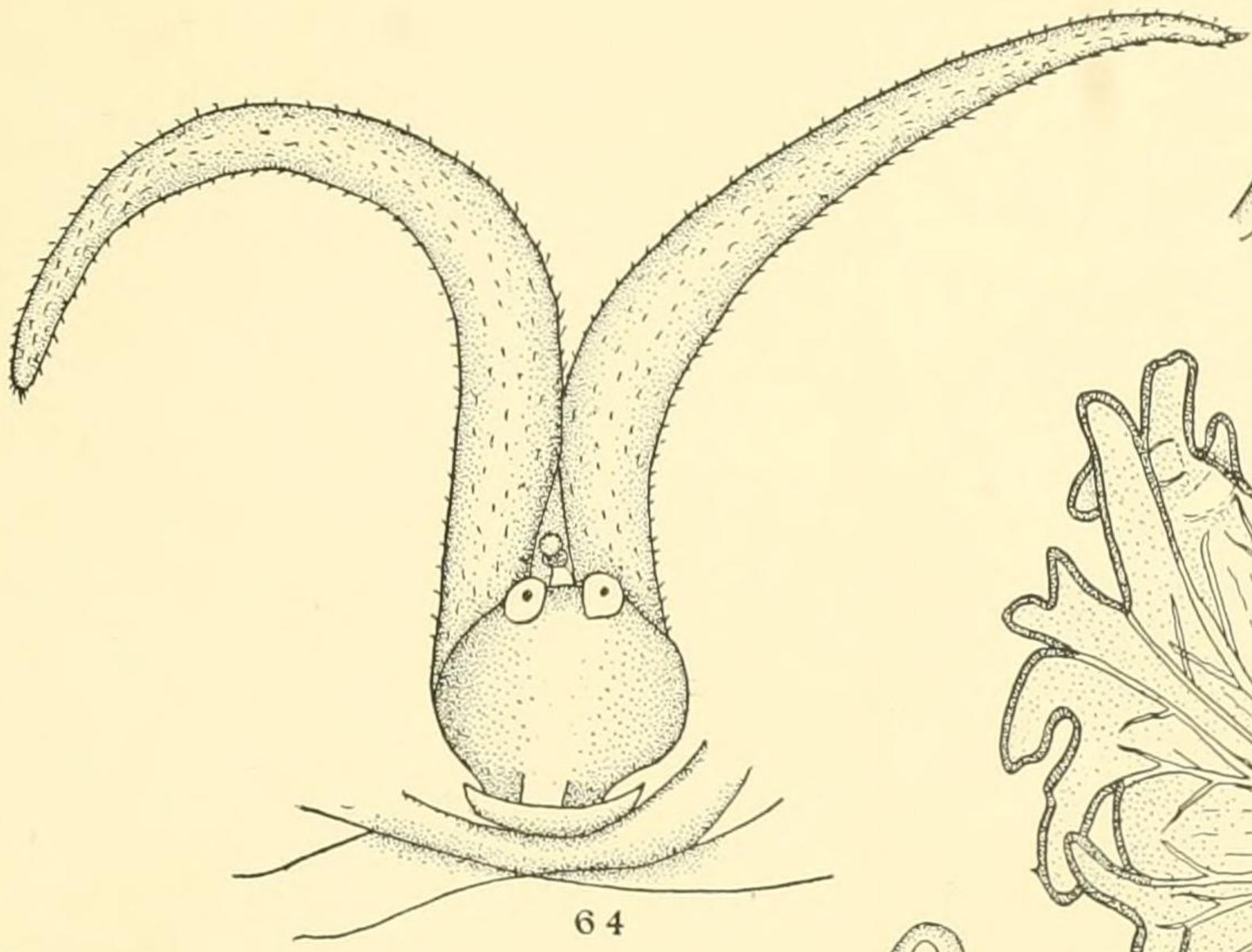

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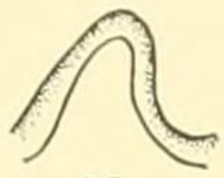

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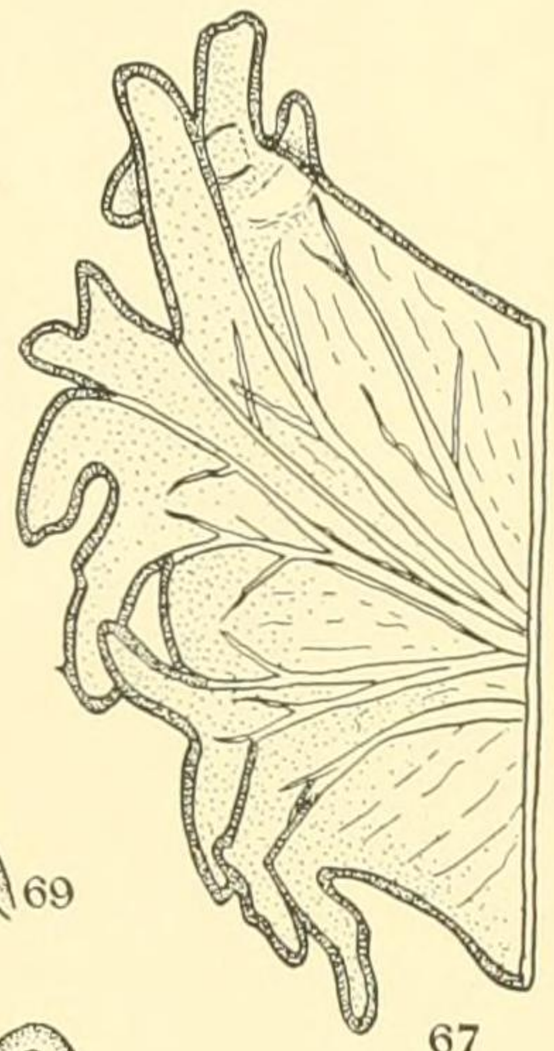

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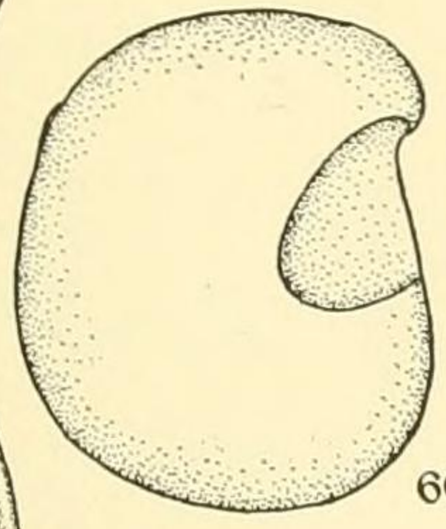

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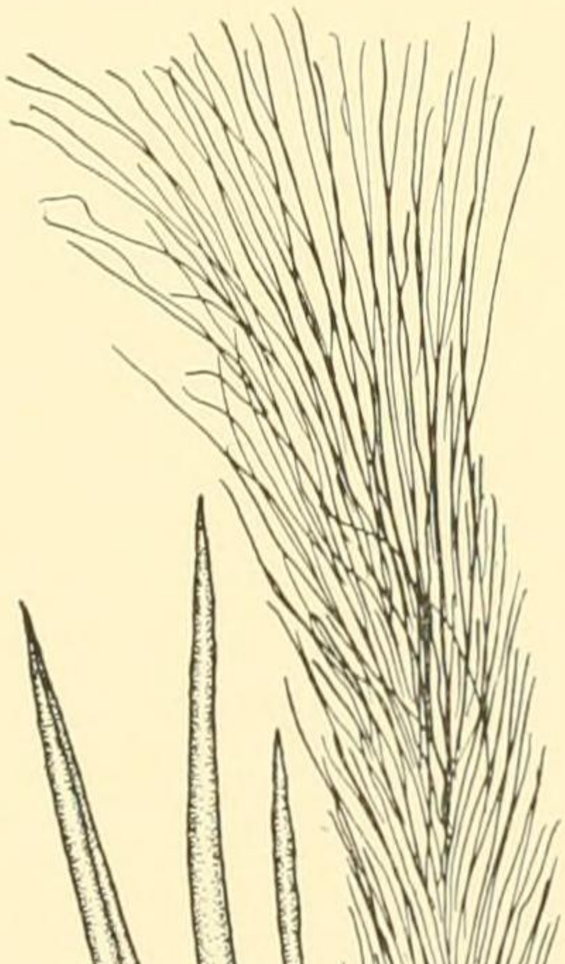

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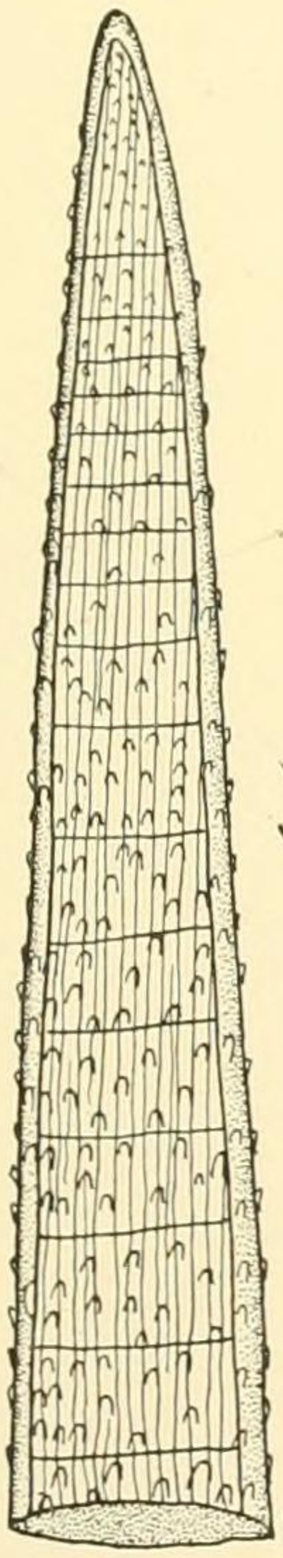

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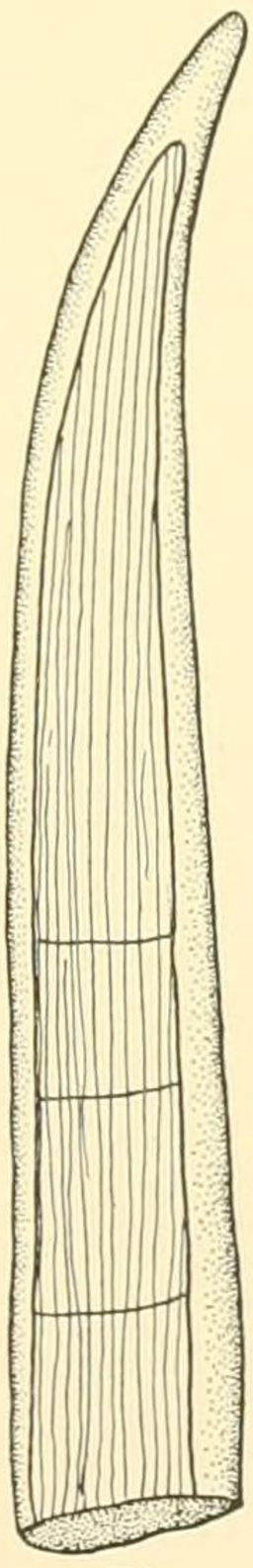

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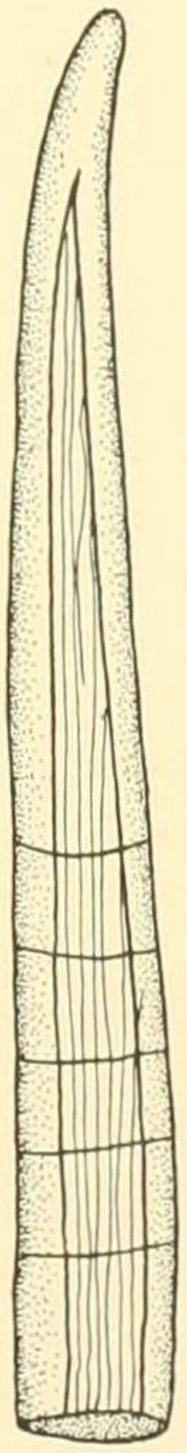

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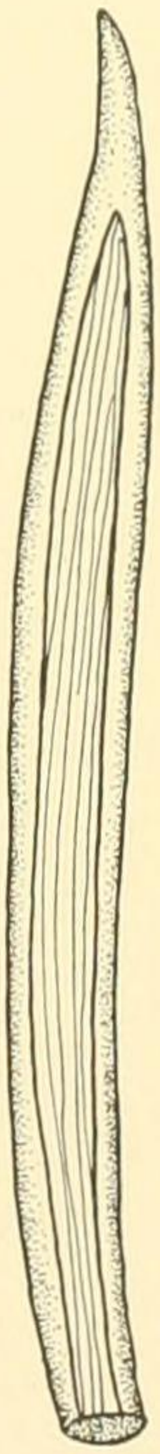

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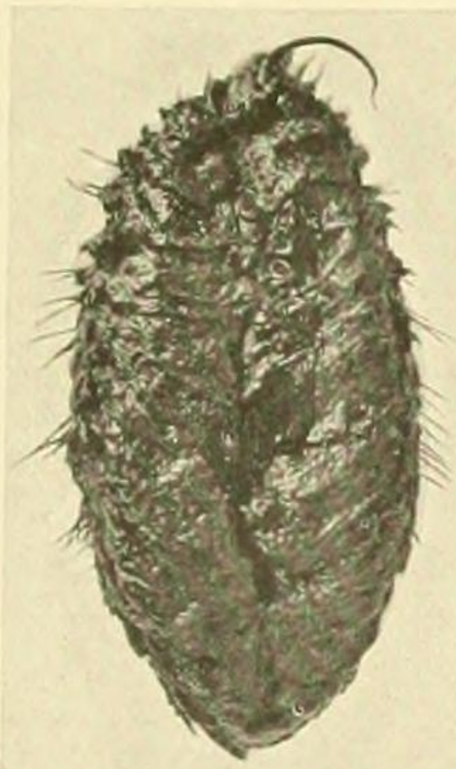
PLATE 37

Fig. 77. *Aphrodita longipalpa,* dorsal surface. × 2.
Fig. 78. The same, ventral view. × 2.
Fig. 79. *Aphrodita californica,* dorsal surface. × 2.
Fig. 80. Ventral view of the same. × 2.
Fig. 81. *Aphrodita solitaria,* dorsal view. × 2.
Fig. 82. The same, ventral view. × 2.
Fig. 83. Ventral view of *Aphrodita cryptommata.* × 2.
Fig. 84. Ventral view of *Aphrodita brevitentaculata.* × 2.
Fig. 85. Dorsal view of *Aphrodita raripillata.* × 2.
Fig. 86. Ventral view of the same. × 2.



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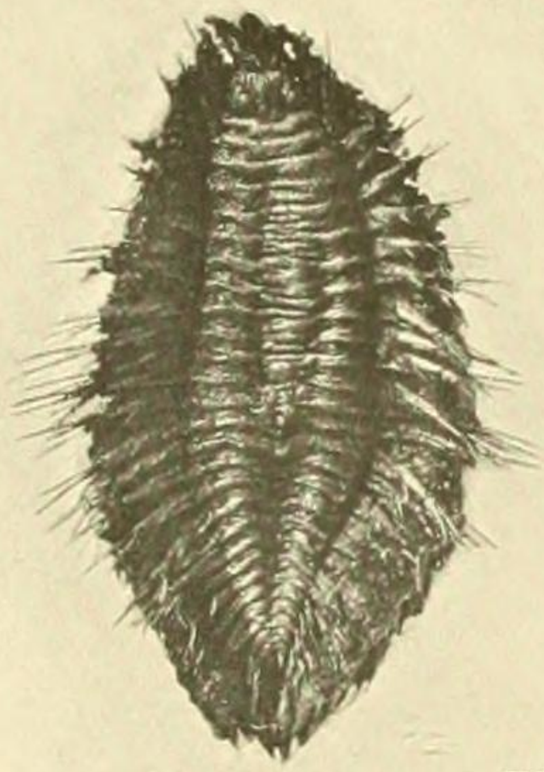

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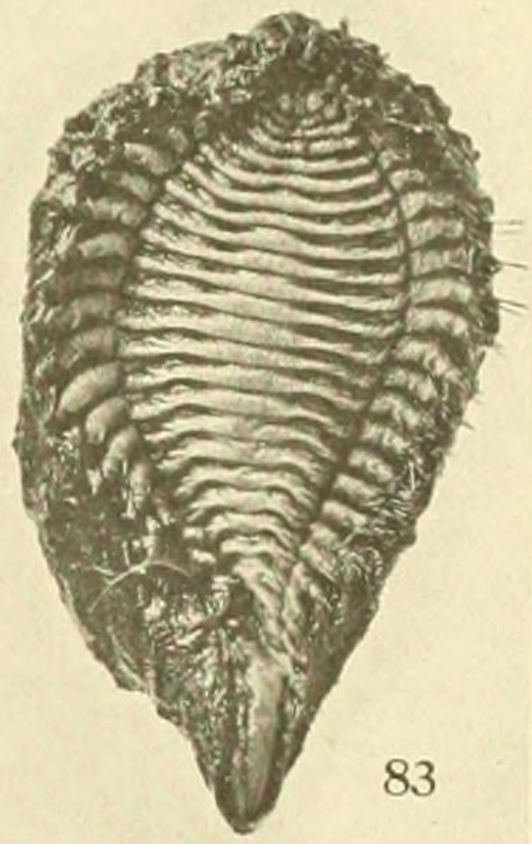

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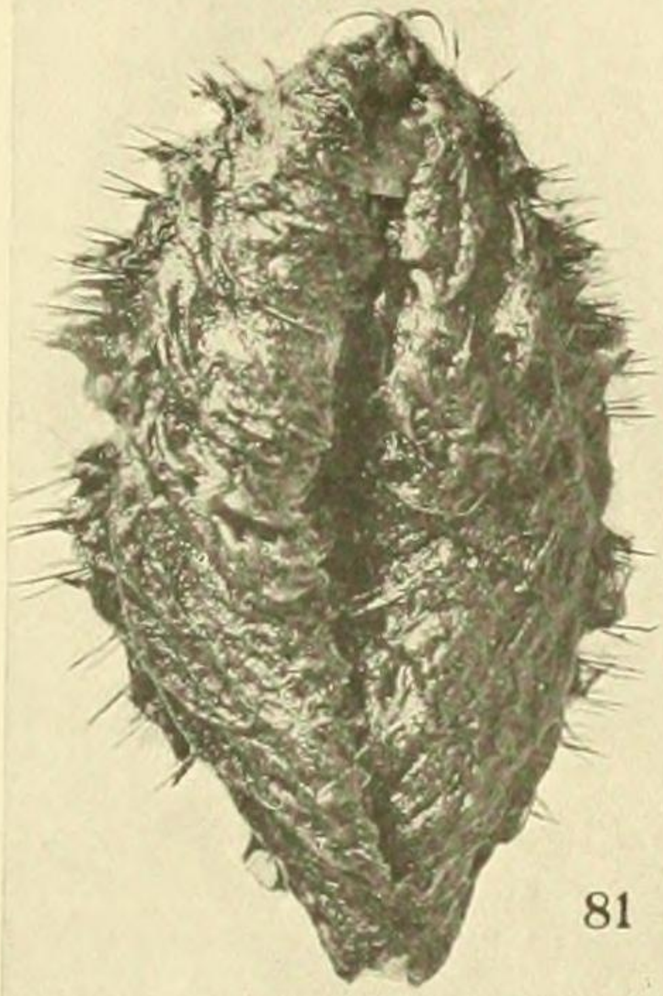

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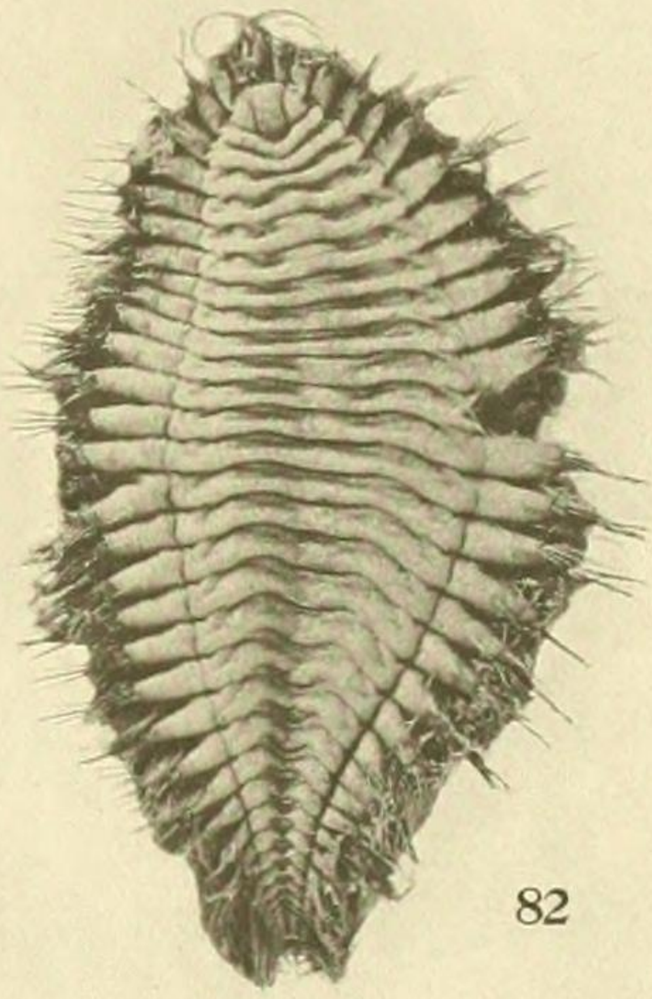

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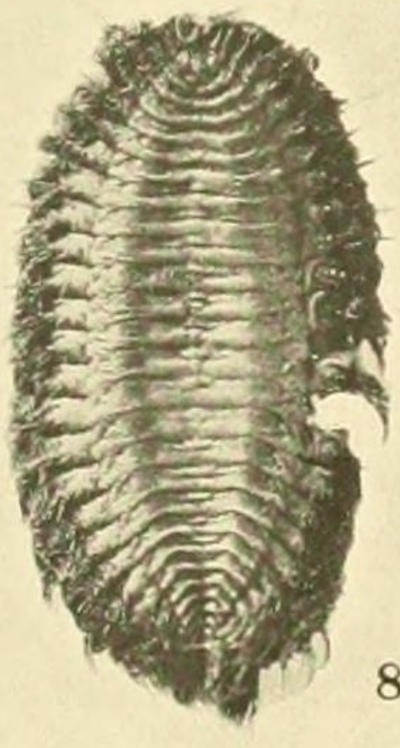

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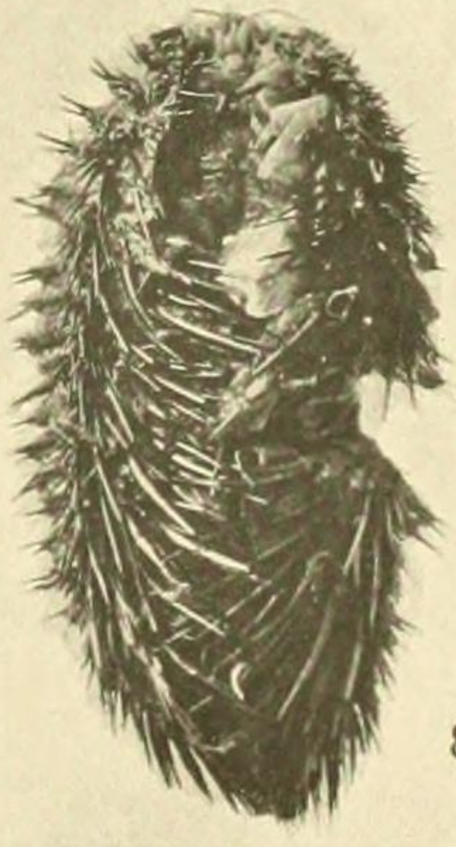

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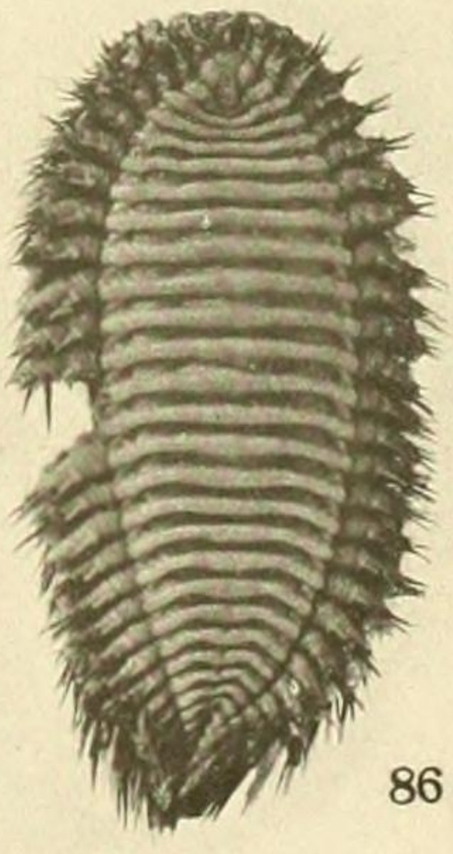

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