

duced; those of the seventh segment produced. The epimera almost reach the posterior angles of the segments.

Terminal segment of abdomen subtriangular or subcordate. Uropoda much shorter than the terminal abdominal segment; inner branch scarcely shorter than the outer branch. Legs long; the first six pairs gradually increasingly longer; those of the seventh pair abruptly very much longer than the others. The basis of the four posterior pairs furnished with a carina. Ungulæ long, those of the first pair manifestly shorter than the others; those of the seventh pair manifestly longer than the others.^a

OLENCIRA PRÆGUSTATOR (Latrobe).

Oniscus prægustator LATROBE, Trans. Amer. Philos. Soc., V, 1802, p. 77, pl. 1.

Cymothoa prægustator SAY, Jour. Acad. Nat. Sci. Phila., I, 1818, pp. 395-396.

Olencira lamarkii LEACH, Dict. Sci. Nat., XII, 1818, p. 351.—DESMAREST, Consid. Gen. Crust., 1825, p. 307.—MILNE EDWARDS, Hist. Nat. Crust., III, 1840, p. 264.

Olencira prægustator SCHIÆDTE and MEINERT, Naturhistorisk Tidsskrift (3), XIII, 1881-1883, pp. 152-154, pl. x, figs. 6-9.—RICHARDSON, American Naturalist, XXXIV, 1900, p. 221; Proc. U. S. Nat. Mus., XXIII, 1901, pp. 528-529.

Localities.—Potomac River; York Spit, Virginia; Dividing Cove; St. George's Island, Maryland; Fort Monroe, Head of Cockrell Creek, Hampton Creek, Lower Chesapeake Bay; Cape Charles, Virginia; off Great Wicomico; Pensacola and St. Mary's River, Florida; Mobile, Alabama; Winyah Bay, South Carolina (mouths of menhaden); Zoological Park, Washington City (on bug-fish); Crisfield, Maryland; Florida; Georgetown, District of Columbia.

Parasite of *Brevoortia patronus*; *Brevoortia tyrannus*; bug-fish.

attingentia; paris quarti, quinti, sexti angulum annuli spatium magno, subæquali, non attingentia. Pedes parium sex priorum per paria sensim longitudine paulum crescentes; paris ultimi ceteris manifesto longiores et paulo tenuiores. Ungulæ paris primi longiusculæ, crassiusculæ; paris secundi, tertii, quarti, quinti longæ vel perlongæ, crassiusculæ, longitudine subæquales; paris sexti longæ vel longiusculæ; crassiusculæ; paris septimi breviusculæ, subtenues.

Cauda ad basin obtecta, longior quam latior plus sesqui (8:5), quam truncus cum capite multo brevior (4:3). Annuli quinque priores sensim longitudine paulum crescentes. Latera annulorum quinque priorum paulum rotundate dilatata, excavata, vix marginata; annuli primi et secundi oblique truncata; annuli tertii, quarti, quinti per paria sensim profundius atque magis angulate emarginata.

Annulus analis cordatus, ad basin impressus, obscure carinatus, multo latior quam longior (6:5), ceteris annulis caudalibus conjunctis manifesto longior (10:9). Pedes anales annulo anali manifesto longiores (9:8); ramus interior quam exterior valde brevior et vix latior, pone medium angustatus, sublaminatus, apicem annuli vix superans; ramus exterior angustatus, subfalcatus.

Long. 21, 5 mm.

Color ex griseo olivaceus, annulo anali cum pedibus analibus flavicans.—SCHIÆDTE AND MEINERT, Nat. Tidsskr. (3), XIII, 1881-83, pp. 145-146.

^aSee Schiædte and Meinert for characters of genus, Nat. Tidsskr. (3), XIII, 1881-83, pp. 150-151.

Body narrow, elongate, gradually increasing in width to the seventh thoracic segment, $6\frac{1}{2}$ mm. wide, 26 mm. long.

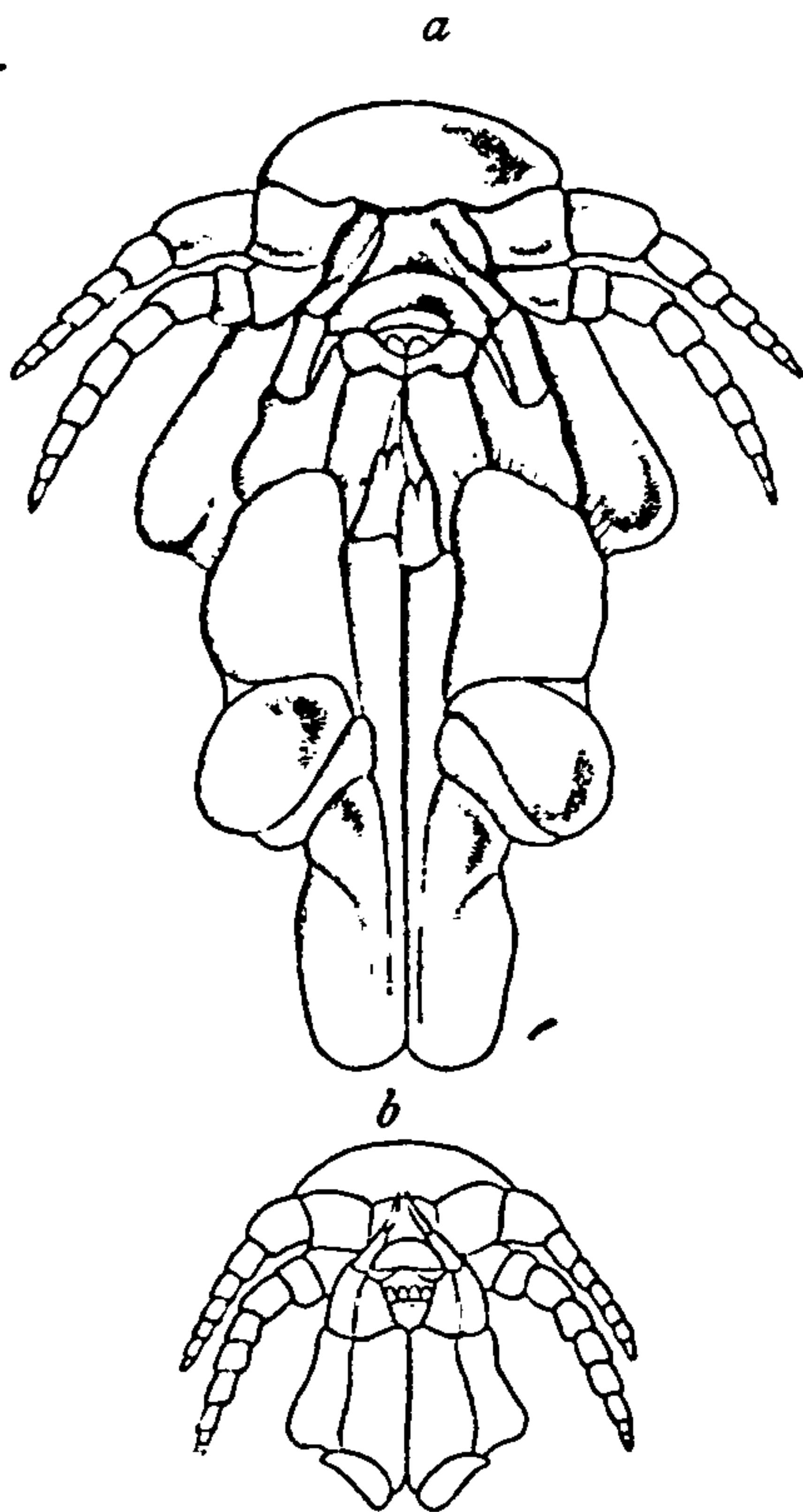


FIG. 233.—OLENCIRA PRÆGUSTATOR (AFTER SCHIEDTE AND MEINERT). *a*, HEAD OF FEMALE SHOWING ANTENNAE AND MOUTH PARTS. *b*, HEAD OF MALE SHOWING SAME. (ENLARGED.)

and third are subequal and each is 2 mm. long; the fifth and sixth are subequal and each is $1\frac{1}{2}$ mm. long; the seventh segment is the shortest and is 1 mm. in length. The epimera are distinctly separated on all the segments, with the exception of the first; they are narrow, elongate plates, which do not reach the posterior margins of the segments, except the seventh pair.

The abdomen is abruptly narrower than the thorax. The first segment is deeply set in the thorax and is covered at the sides by the seventh thoracic segment. The segments increase very little in width. The sixth or terminal segment is a little longer than wide, 5 mm.: 6 mm.; it is triangularly produced to a narrowly rounded apex.

All the legs are prehensile, with long, narrow curved dactyli. They increase slightly in length to the seventh pair, which are abruptly very

Head as wide at the base as it is long—3 mm. : 3 mm.—gradually becoming more and more narrow to the anterior extremity, which is widely rounded. The anterior extremity is half as wide as the base, being $1\frac{1}{2}$ mm. in width. The eyes are large, oblong, twice as long as wide, composite, and situated in the posterior half of the head at the post-lateral angles. The first pair of antennae are composed of eight articles, and extend to the seventh article of the second pair of antennae. The basal articles of the first antennae are not adjacent, but are separated by a distance of 1 mm. The second pair of antennae are composed of ten articles and extend to the posterior margin of the head. The maxillipeds have a palp of two articles. The palp of the mandibles is composed of three articles.

The first and fourth segments of the thorax are longest and are subequal, each being $2\frac{1}{2}$ mm. in length; the second

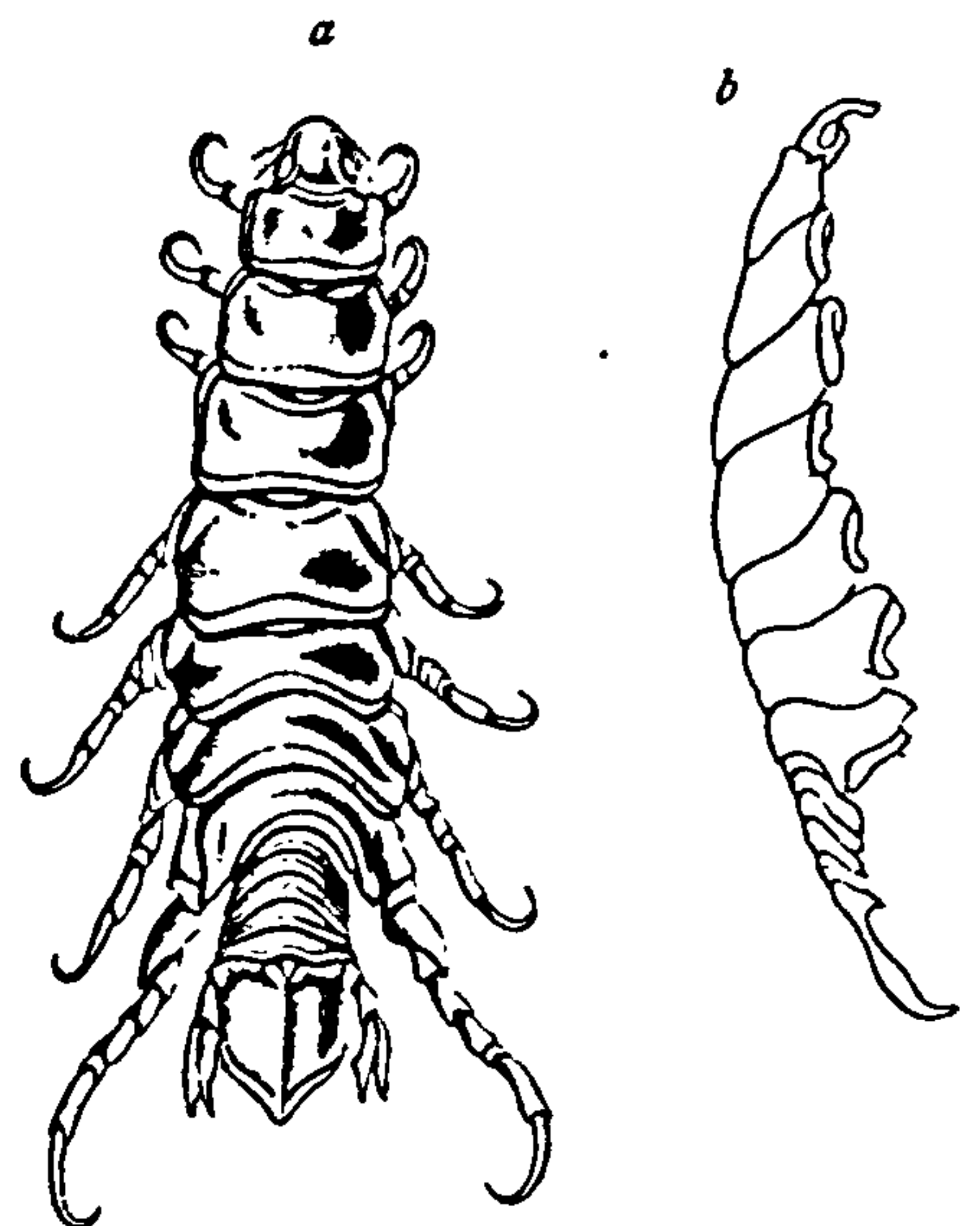


FIG. 234.—OLENCIRA PRÆGUSTATOR (AFTER SCHIEDTE AND MEINERT). *a*, ADULT FEMALE. *b*, LATERAL VIEW. (ENLARGED.)

much larger and longer than the sixth pair, being extremely long. The last three pairs have the basis furnished with a low carina.

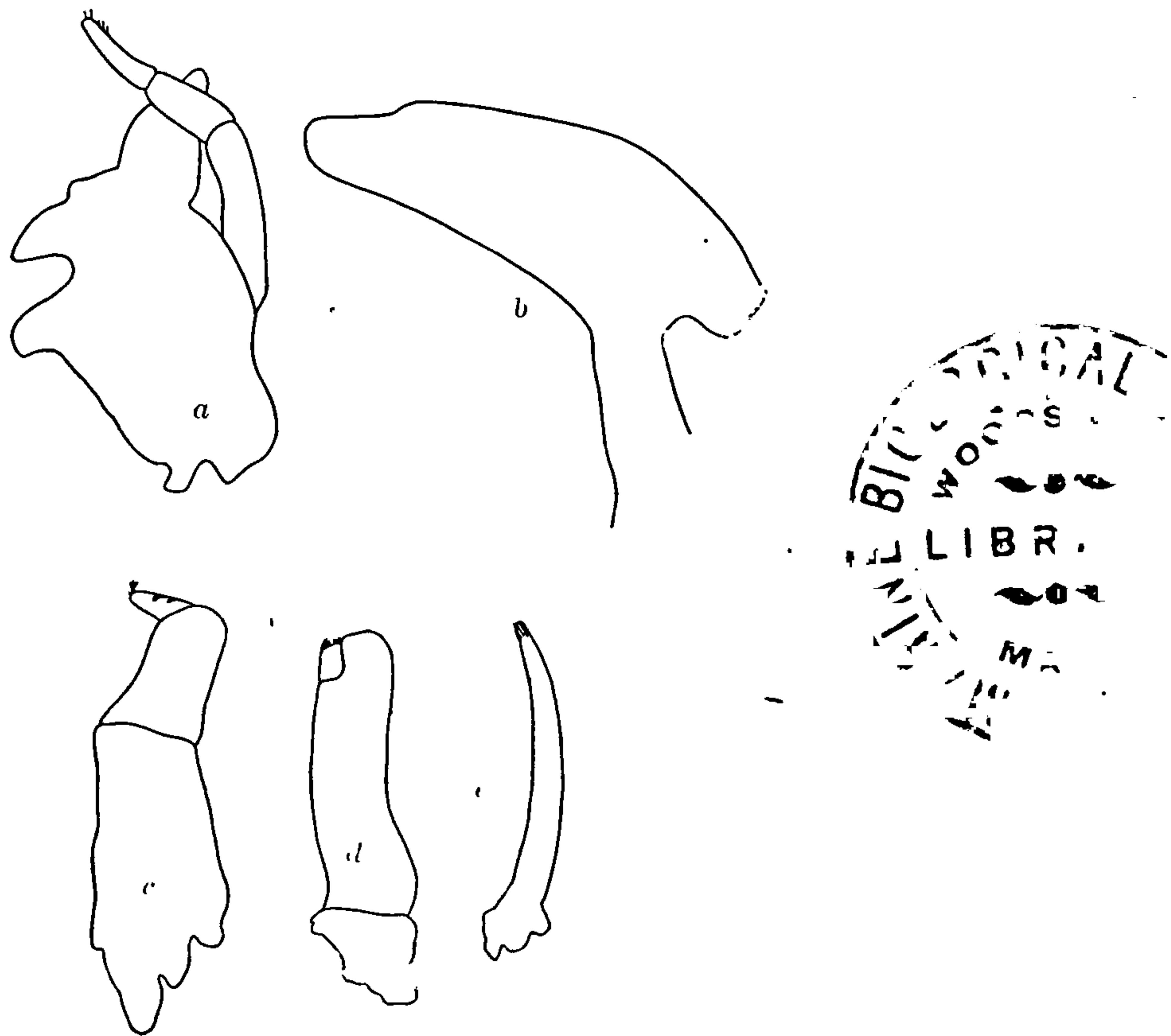


FIG. 235.—OLENCIRA PRÆGUSTATOR. *a*, MANDIBLE. $\times 27\frac{1}{2}$. *b*, MANDIBLE WITHOUT PALP. $\times 51\frac{1}{2}$. *c*, MAXILLIPED. $\times 27\frac{1}{2}$. *d*, SECOND MAXILLA. $\times 27\frac{1}{2}$. *e*, FIRST MAXILLA. $\times 27\frac{1}{2}$.

37. Genus CERATOTHOA Dana.^a

Body oblong.

Head but little immersed or set in the first thoracic segment. Eyes small. The first pair of antennæ are dilated, contiguous at the base. The second pair of antennæ are compressed.

Anterior margin of the first segment of the thorax rounded. Epimera of the first thoracic segment in the female with a carina produced in the form of a spoon or a tubercle and directed anteriorly. The anterior epimera do not reach by a great but gradually decreasing distance the posterior angle of the segment. The posterior epimera almost reach or extend a little beyond the posterior angles of the segments.

The abdomen is deeply immersed or set in the thorax. Terminal segment transverse. The legs are rather long, with the exception of the first and second pairs. The unguæ are long and strongly curved, those of the third pair in the female being the longest of all, and

^aSee Schiøedte and Meinert for characters of genus, Nat. Tidsskr. (3), XIII, 1881-83, pp. 299-300.

abruptly longer than those of the second pair. There is a high carina on the basis of the four posterior pairs of legs.

The male is smaller than the female.

CERATOTHOA IMPRESSA (Say).

Cymothoa impressa SAY, Jour. Acad. Nat. Sci. Phila., I, 1818, p. 397.

Ceratothoa linearis DANA, U. S. Expl. Exp. Crust., XIV, 1853, p. 752, pl. I, figs. 1a-1d.

Ceratothoa exocati CUNNINGHAM, Trans. Linn. Soc. London, XXVII, 1869-71, p. 499, pl. LIX, fig. 5.

Glossobius linearis SCHIÆDTE and MEINERT, Naturhistorisk Tidsskrift (3), XIII, 1881-83, pp. 301-308, pl. XII, figs. 1-2.

Ceratothoa linearis STEBBING, Hist. of Crust., 1893, p. 354.—RICHARDSON, American Naturalist, XXXIV, 1900, p. 221; Proc. U. S. Nat. Mus., XXIII, 1901, p. 529.

Localities.—From latitude 42° to 21° north; latitude 8° to 10° north, longitude 40° to 50° west; latitude 34° north, longitude 51° west; Rio de Janeiro, Brazil; in the Gulf Stream everywhere; Cape May, New Jersey (Say).

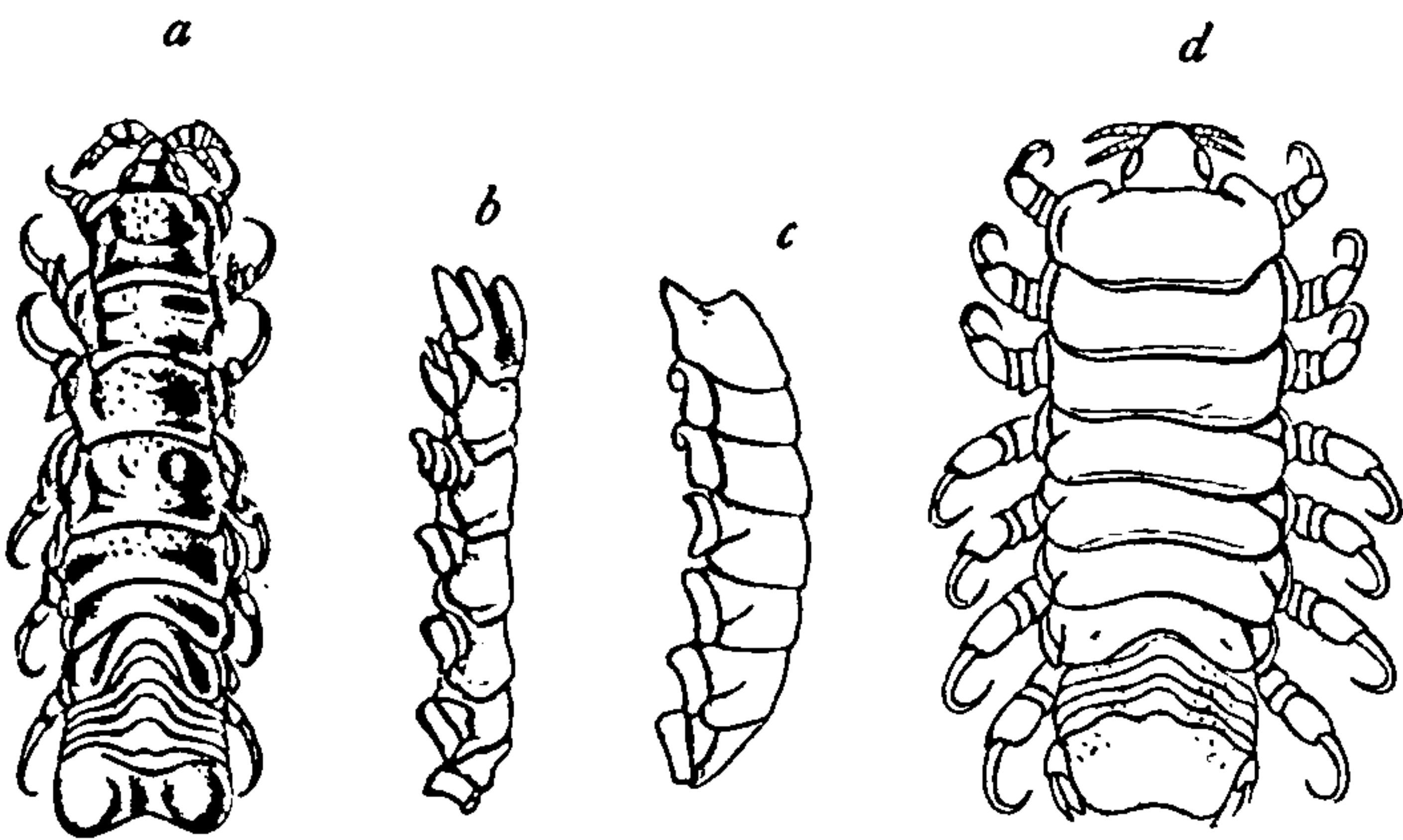


FIG. 236.—CERATOTHOA IMPRESSA (AFTER SCHIÆDTE AND MEINERT). *a*, ADULT FEMALE. *b*, LATERAL VIEW OF THORAX. *c*, LATERAL VIEW OF THORAX OF MALE. *d*, ADULT MALE. (ENLARGED.)

Having had an opportunity to examine Say's type specimen of *Cymothoa impressa*, deposited in the Philadelphia Academy of Natural Sciences, its identity with *Ceratothoa linearis* Dana is found to be unquestionable. The earlier name

will therefore have to be adopted for this species.

Parasite of flying-fish, *Exocætus* sp.; e. g., *Exocætus exiliens*, *Ex. lamelliferus*, *Ex. brachycephalus* (Schicædte and Meinert); on *Coryphæna* sp.

Body elongate, a little more than three times longer than wide, 10 mm.: 33 mm.

Head a little wider than long, 3 mm.: 4 mm., not deeply set in the thorax, with the front excavate on either side of a broad and elongate median process, 1 mm. in length and 1 mm. in width, the apex of which is obtusely pointed. The antennæ fit in these excavations. The anterolateral angles of the head are acutely pointed. The eyes are small, about twice as wide as long, and somewhat obliquely placed at the sides of the head, about halfway between the antero-lateral and post-lateral angles. The first pair of antennæ are composed of seven articles, the basal articles in each antenna being adjacent on the ventral side. The first antennæ extend just below the eyes. The second pair

of antennæ are composed of eleven articles, the last three being very minute. The articles of both pairs of antennæ are greatly dilated and flattened. The second antennæ extend to the posterior margin of the head. The maxillipeds have a palp of two articles. The palp of the

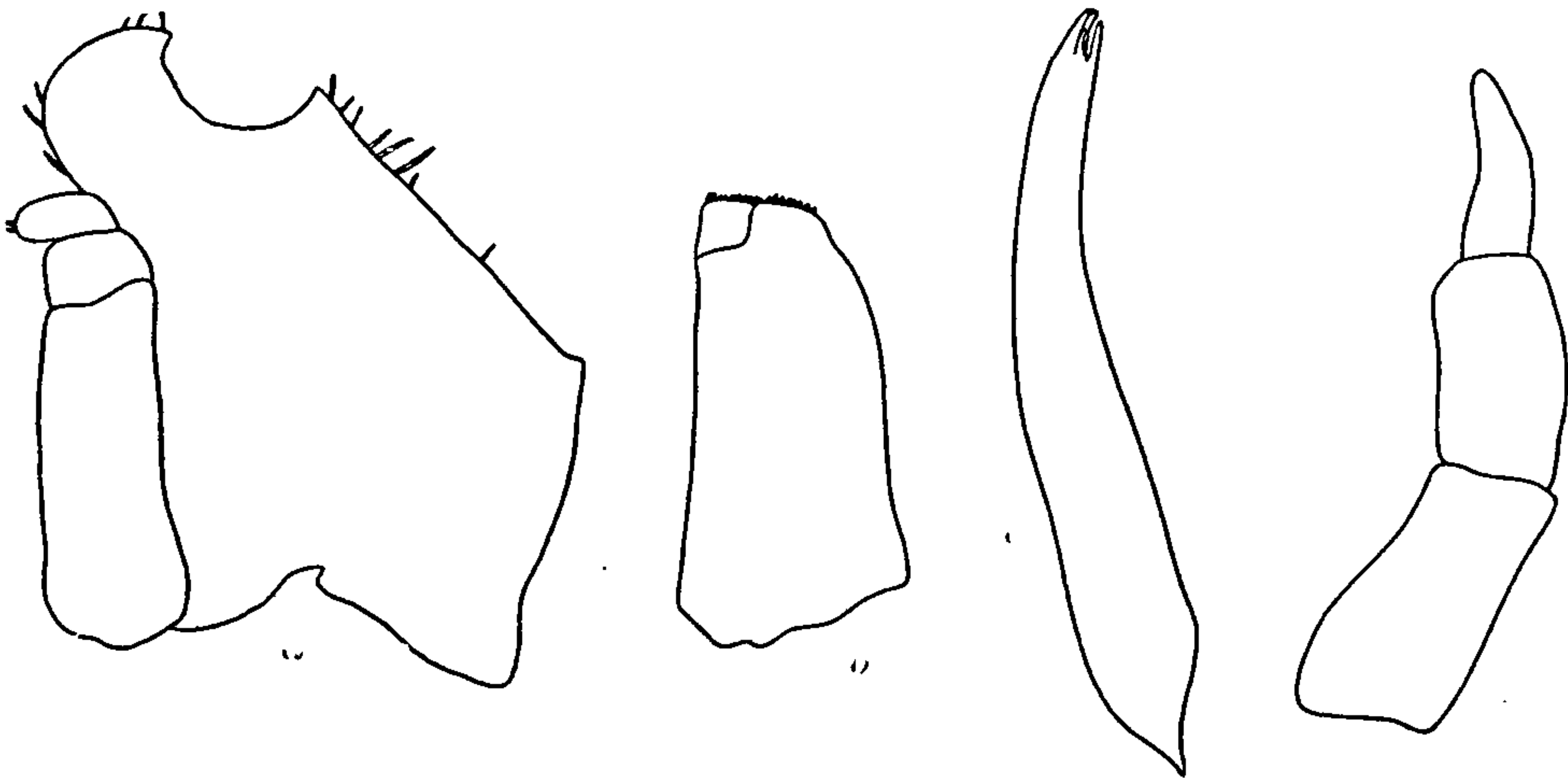


FIG. 237.—*CERATOTHOA IMPRESSA*. *a*, MAXILLIPED OF FEMALE. $\times 27\frac{1}{2}$. *b*, SECOND MAXILLA. $\times 27\frac{1}{2}$. *c*, FIRST MAXILLA. $\times 51\frac{1}{2}$. *d*, PALP OF MANDIBLE. $\times 27\frac{1}{2}$.

mandibles is very large and conspicuous and is composed of three articles. The second or posterior maxillæ are very large and conspicuous, are bilobed at the tip, both lobes being furnished with small hooks.

The first four segments of the thorax are large and about equal in length; the fifth segment is half as long as any of the four preceding segments; the sixth and seventh segments are very short in the median dorsal line and each is about one-half as long as the fifth segment. The first thoracic segment has the antero-lateral expansion

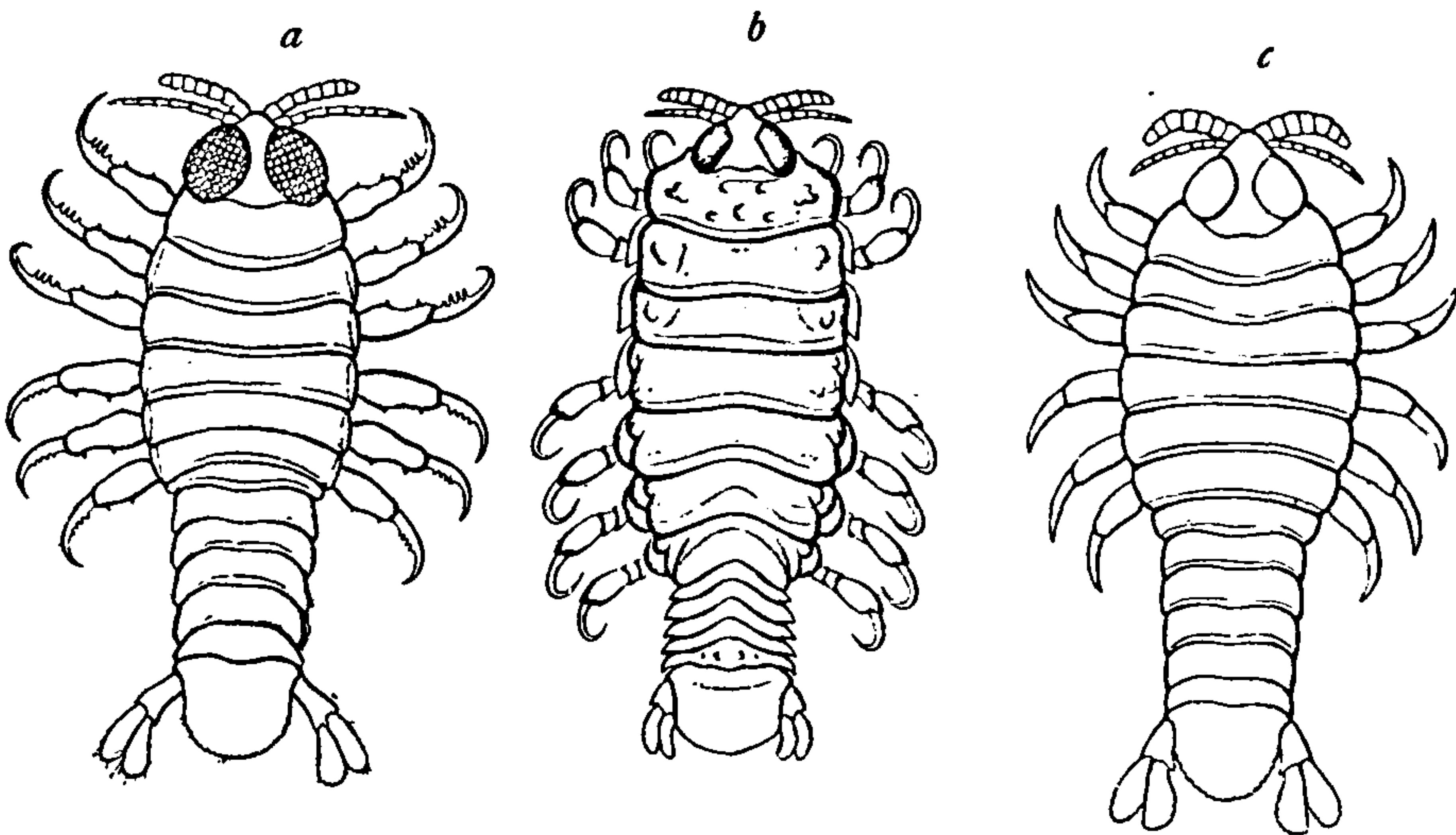


FIG. 238.—*CERATOTHOA IMPRESSA* (AFTER SCHIEDTE AND MEINERT). *a*, YOUNG OF THE SECOND STAGE. *b*, YOUNG OF THE THIRD STAGE. *c*, YOUNG OF THE FIRST STAGE. (ENLARGED.)

produced in a carinated process, produced outward and forward and terminating acutely a little anterior to the antero-lateral expansion of the segment. The epimera are distinctly separated on all the following six segments. In the second segment they are directed forward

and project in an anteriorly acute process. In the third, fourth, and fifth segments the epimera are narrow, elongated plates, occupying the anterior half of the segments. In the last two segments they are also narrow and elongate, and occupy nearly the entire length of the segment.

The abdomen is abruptly narrower than the thorax, the first segment being much narrower and deeply set in the thorax. The four



FIG. 239.—*CERATOTHOA IMPRESSA*. SEVENTH LEG. $\times 4\frac{1}{2}$.

following segments are as wide as the seventh thoracic segment, and gradually increase in width to the sixth segment, which is very wide. The terminal segment is nearly twice as wide as long; it is 10 mm. wide, 4 mm. long in the median longitudinal line, and 6 mm. long in the lateral portions. The post-lateral angles of this segment are rounded, the posterior margin being

deeply excavate. The uropoda are as long as the terminal segment, are equal in width, and are rounded at the extremities. The outer branch is very slightly shorter than the inner branch.

All the legs are prehensile, with long, narrow curved dactyli, those of the fourth pair being the longest. There is a high carina on the basis of the last four pairs of legs, the height of the carina increasing from the fourth to the seventh pair, where it is extremely high.^a

38. Genus *MEINERTIA* Stebbing.^b

Body oblong.

Head more or less deeply immersed or set in the first thoracic segment. Eyes distinct. First pair of antennæ dilated, contiguous at the base. Second pair of antennæ compressed.

First thoracic segment with the anterior margin widely sinuated or almost straight. Anterior epimera do not reach by a great but gradually decreasing distance the posterior angle of the segments. The posterior epimera almost reach or sometimes extend a little beyond the posterior angles of the segments.

Terminal segment of abdomen triangular, semicircular, often bilobed.

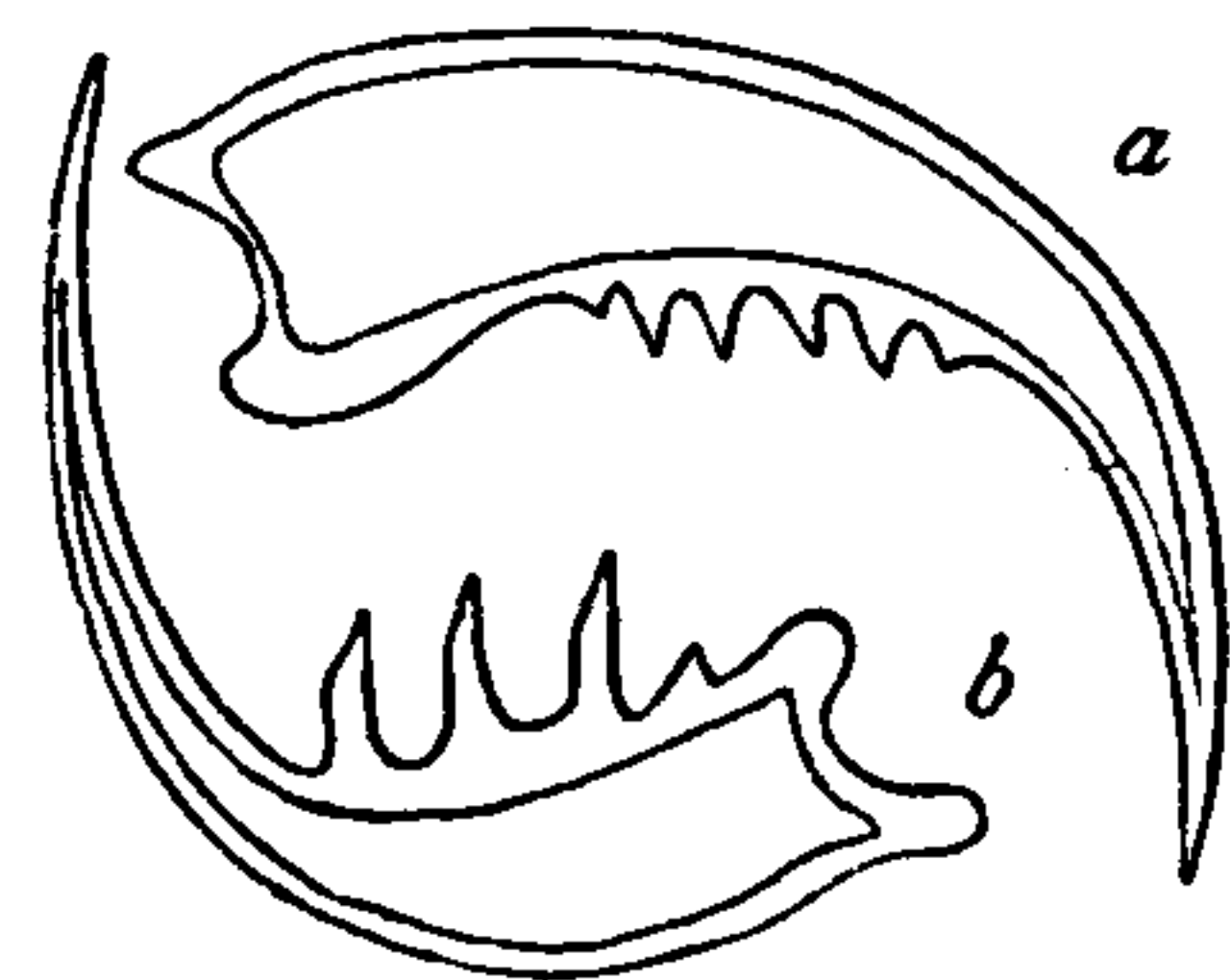


FIG. 240.—*CERATOTHOA IMPRESSA* (AFTER SCHIÖDTE AND MEINERT). *a*, UNGULA OF FIRST PAIR OF LEGS OF YOUNG OF SECOND STAGE. *b*, UNGULA OF SIXTH PAIR OF LEGS OF YOUNG OF SECOND STAGE. (ENLARGED.)

^a For description of the male and the female and the young of the first, second, and third stages, see Schiödte and Meinert, Nat. Tidsskr. (3), XIII, 1881-83, pp. 301-308.

^b See Schiödte and Meinert for characters of genus, Nat. Tidsskr. (3), XIII 1881-83, pp. 322-323.

The first three pairs of legs are more or less manifestly shorter than the others. Ungulæ subequal.

Male is much smaller in size than female.

ANALYTICAL KEY TO THE SPECIES OF THE GENUS MEINERTIA.

- a. First pair of antennæ short, extending to the eye or to the posterior margin of the head. Second pair of antennæ short, extending to the posterior margin of the head, and composed of only eight or nine articles. Head more or less deeply set in first thoracic segment.
- b. High carina present on the basis of the last four pairs of legs. Uropoda extend beyond the terminal abdominal segment. Eyes small. Last segment of abdomen about twice as wide as long.
- c. Body convex. Terminal abdominal segment trapezoidal and rugose dorsally.
Meinertia gaudichaudii (Milne Edwards)
- c'. Body flattened from fourth segment to end of abdomen. Terminal segment semicircular and smooth dorsally *Meinertia deplanata* (Bovallius)
- b'. No carina developed on the basis of the legs. Uropoda extend only a little beyond half the length of the abdomen. Eyes large. Last segment of abdomen nearly three times as wide as long..... *Meinertia gilberti* Richardson
- a'. First pair of antennæ long, extending to the middle of the first thoracic segment. Second pair of antennæ long, extending to the posterior margin of the first thoracic segment, and composed of fourteen articles. Head but little immersed in first thoracic segment..... *Meinertia transversa* Richardson

MEINERTIA GAUDICHAUDII (Milne Edwards).

Cymothoa gaudichaudii MILNE EDWARDS, Hist. Nat. Crust., III, 1840, p. 271

Ceratothoa rapax HELLER, Reise Novara, Crust., 1865, p. 146, fig. 17.

Ceratothoa gaudichaudii SCHIÖDTE and MEINERT, Naturhistorisk Tidsskrift (3), XIII, 1881-83, pp. 335-340, pl. XIII, figs. 11-15.

Meinertia gaudichaudii STEBBING, Hist. of Crust., 1893, p. 345.—RICHARDSON, Proc. U. S. Nat. Mus., XXI, 1899, p. 829; Ann. Mag. Nat. Hist. (7), IV, 1899, p. 171; Proc. Wash. Acad. Sci., III, 1901, p. 568.—STEBBING, Willey's Zool. Results, 1902, p. 643.

Localities.—Mazatlan; Pacific Ocean following the shores of Central America; Coquimbo; shores of Chili; Callao; Peruvian shores; Chin-chenses Islands; Black Bight, Albemarle Island, Galapagos Islands; 200 miles north of Wenman Island, Galapagos Islands; Panaieti, Louisiade Archipelago, New Guinea.

Found in the mouth of *Thunnus* sp.

Body elongate, nearly three times as long as broad; 16 mm.: 45 mm.

Head nearly twice as wide as long (4 mm.: 7 mm.) somewhat triangular in shape, with apex obtuse. The head is deeply set in the first thoracic segment, the narrow and acute antero-lateral angles of which extend half the length of the head. Eyes small, distinct, irregular in outline, but inclined to be square, and placed at the sides of the head, a little below the middle.

The first pair of antennæ are composed of seven articles, the two first ones being almost fused; they extend just below the eye. The second pair of antennæ are composed of nine articles and extend to

the posterior margin of the head. The basal articles of the first pair of antennæ are adjacent on the ventral side. The articles of both pairs of antennæ are greatly dilated and flattened. The maxillipeds have a palp of two articles. The palp of the mandibles is composed

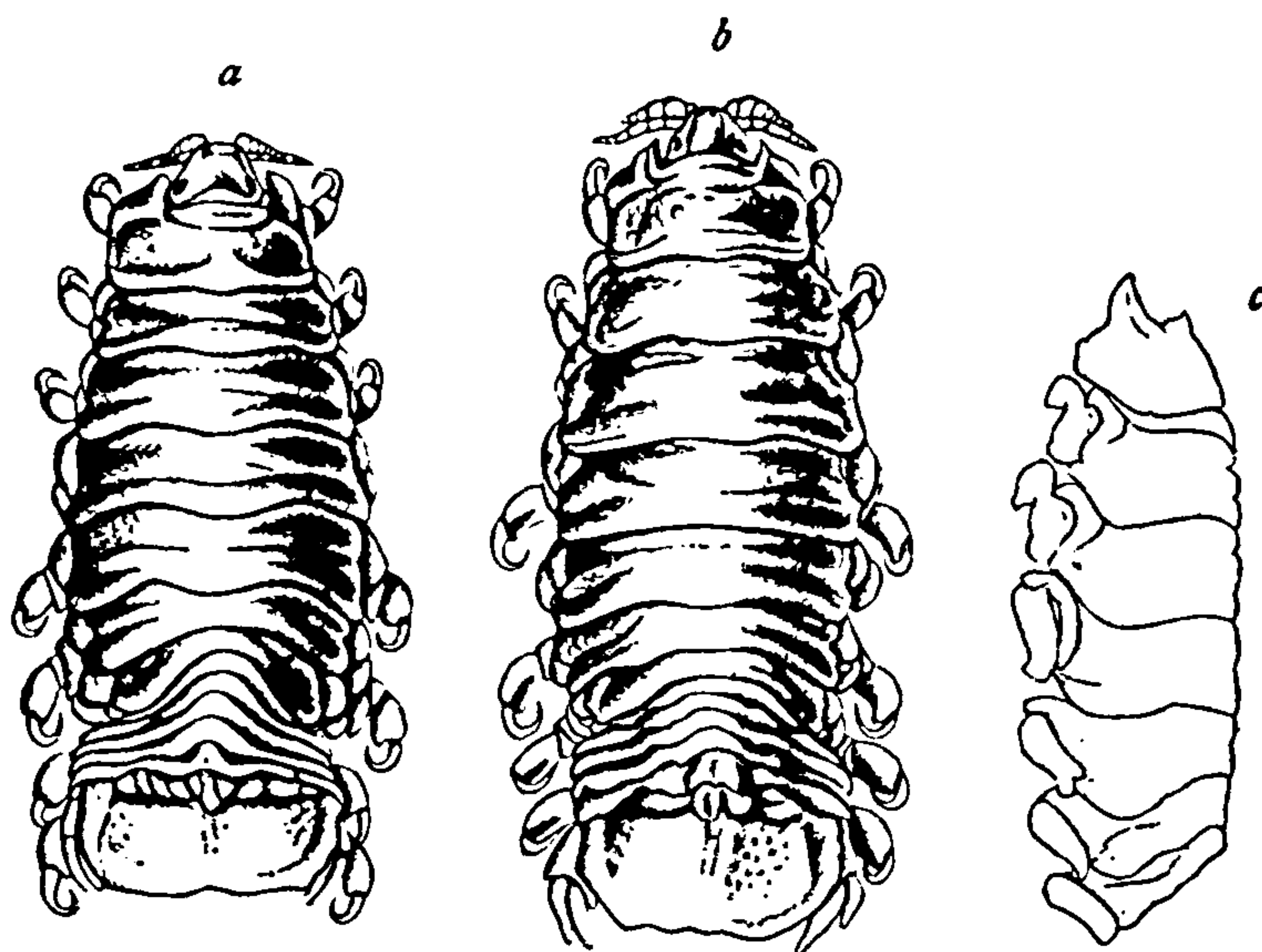


FIG. 241.—MEINERTIA GAUDICHAUDII (AFTER SCHIEDTE AND MEINERT). *a*, ADULT FEMALE. *b*, ADULT FEMALE. *c*, LATERAL VIEW OF THORAX. (ENLARGED.)

of three articles, the terminal one being very slender and minute. The second maxillæ terminate in two lobes furnished with small hooks.

The first segment of the thorax is longer than any of the others, being 6 mm. in length; the second and fifth segments are subequal, each being 4 mm. long; the third and fourth are each 5 mm. in length;

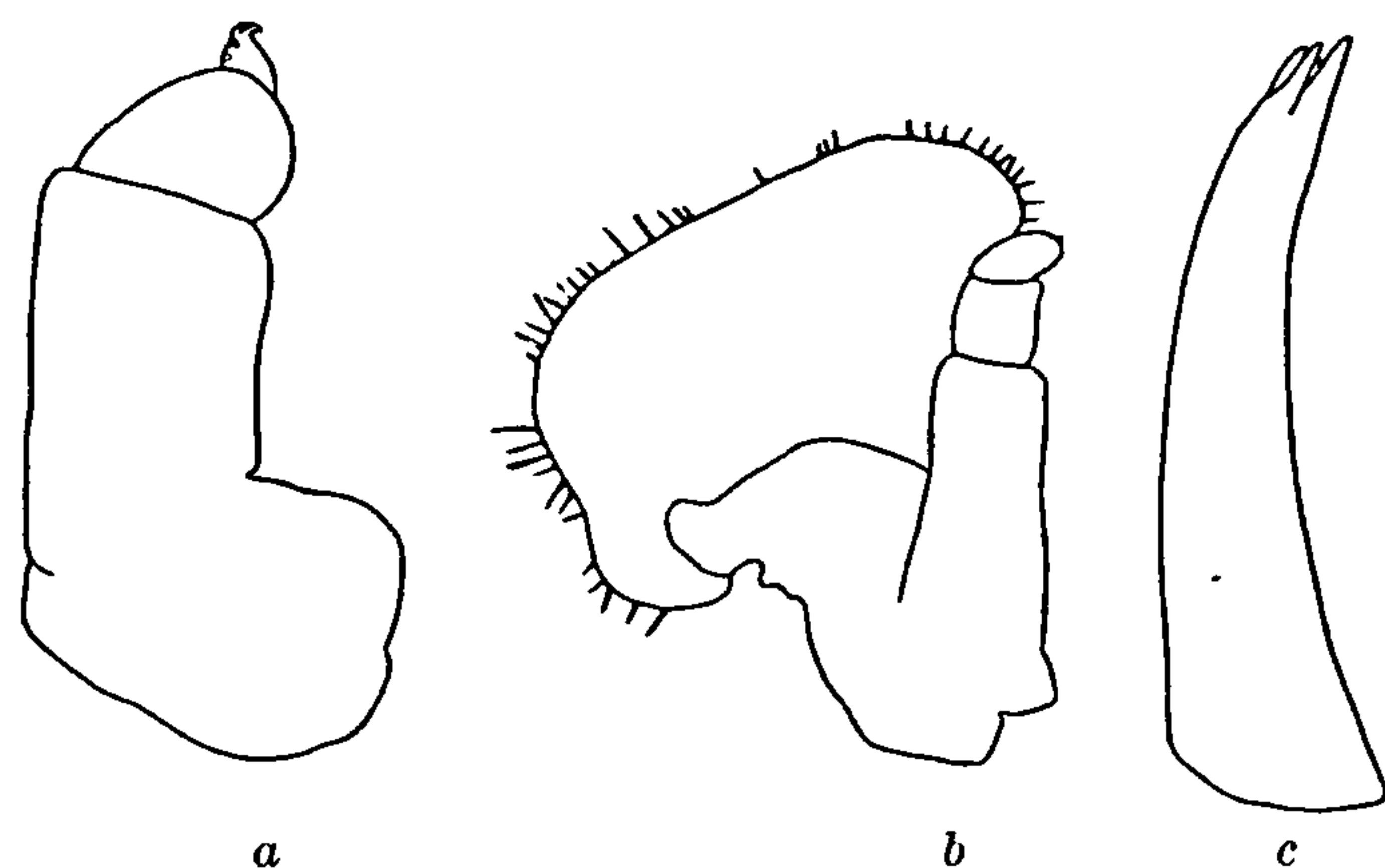


FIG. 242.—MEINERTIA GAUDICHAUDII. *a*, MAXILLIPED OF MALE. $\times 20\frac{1}{2}$. *b*, MAXILLIPED OF FEMALE. $\times 20\frac{1}{2}$. *c*, FIRST MAXILLA. $\times 39$.

the sixth segment is 3 mm. long; the seventh is 2 mm. long. The antero-lateral angles of the first segment are narrow and acute and are produced forward to about the middle of the head. The epimera are distinctly separated on all the six following segments. They are narrow, elongated plates, not extending quite to the posterior margins of the segments.

The abdomen is deeply set in the thorax. The first segment has the sides covered by the last thoracic segment. The four following

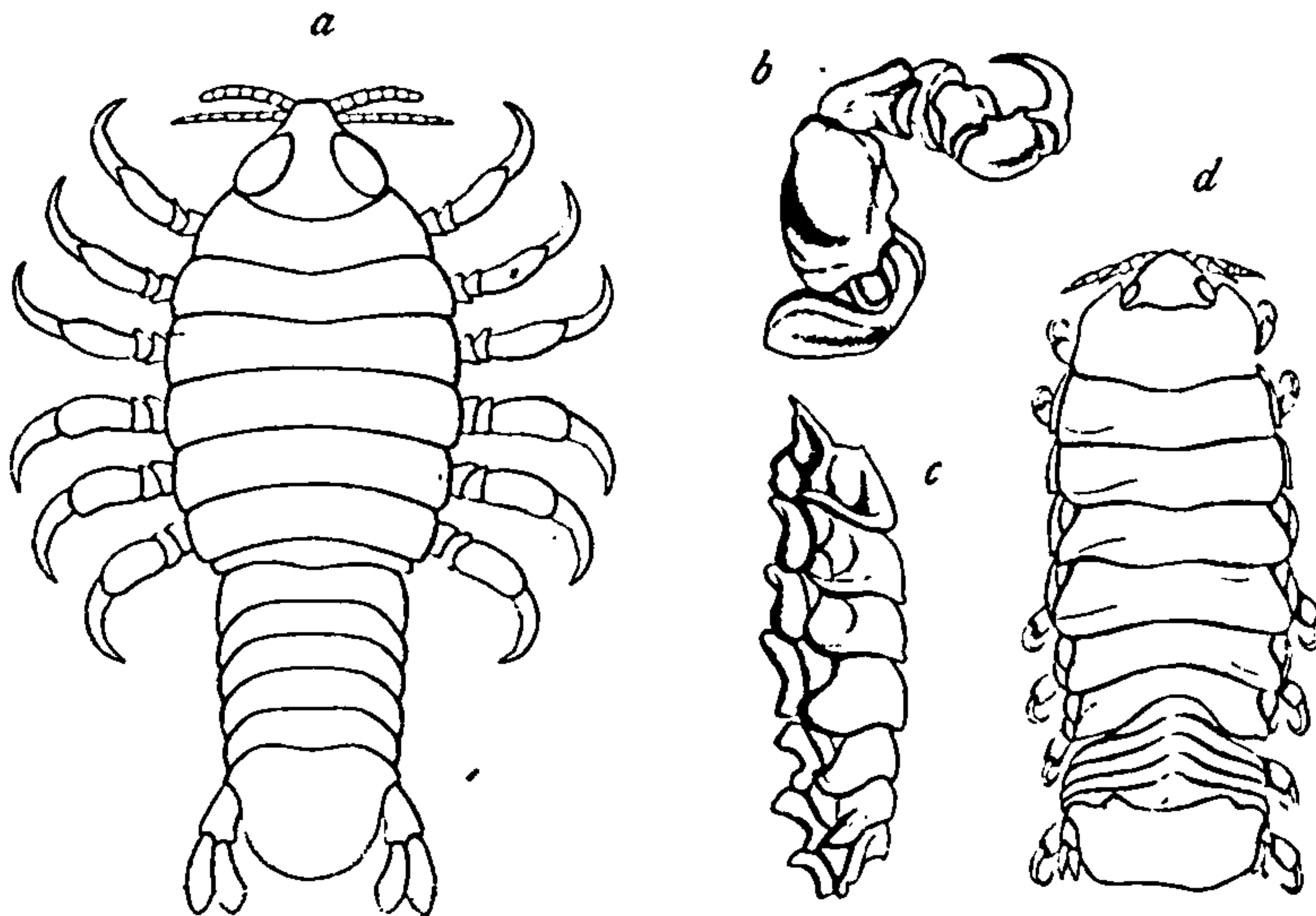


FIG. 243.—MEINERTIA GAUDICHAUDII (AFTER SCHIEDTE AND MEINERT). *a*, YOUNG OF FIRST STAGE. *b*, SECOND LEG OF ADULT MALE. *c*, LATERAL VIEW OF THORAX OF ADULT MALE. *d*, ADULT MALE. (ENLARGED.)

segments are as wide as the seventh thoracic segment or wider. The sixth or terminal segment is trapezoidal, almost twice as wide as

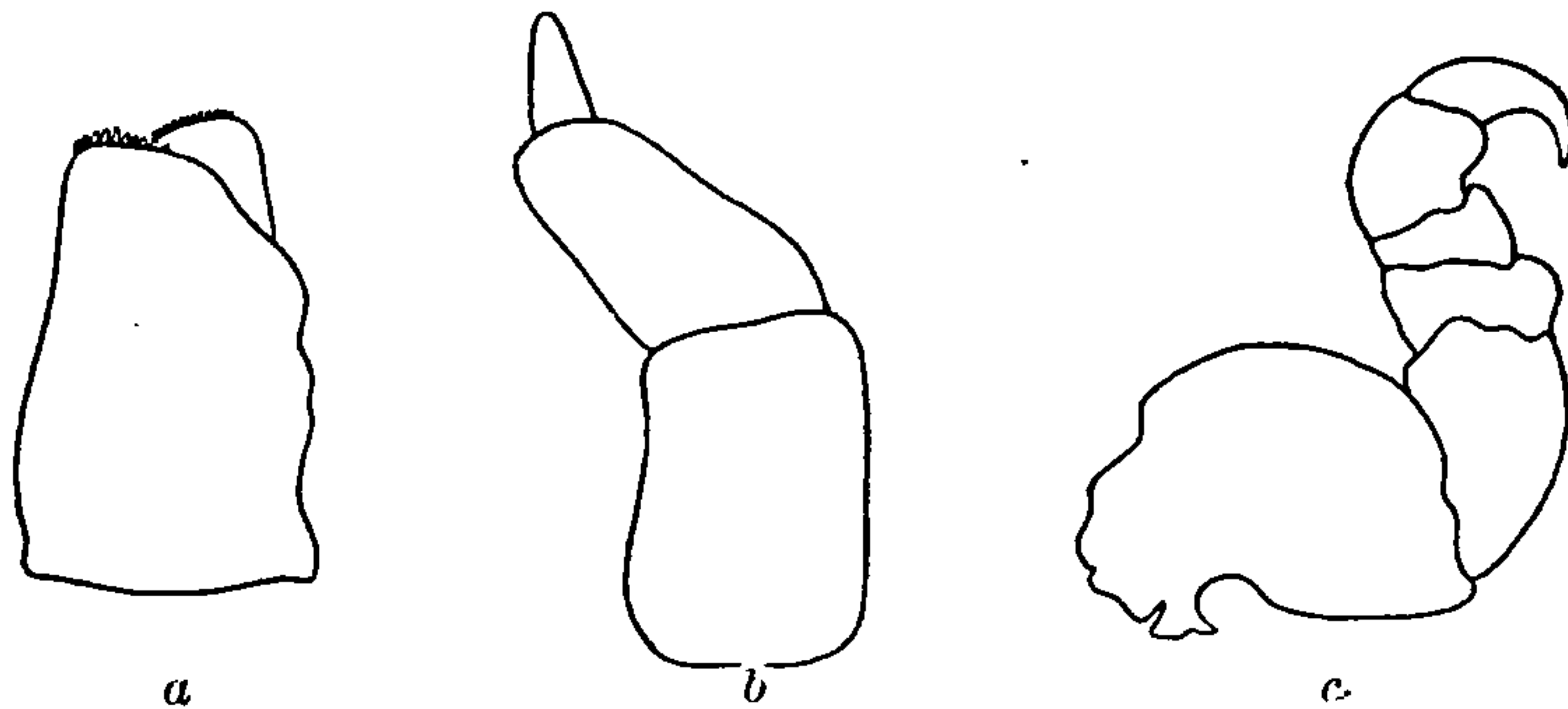


FIG. 244.—MEINERTIA GAUDICHAUDII. *a*, SECOND MAXILLA. $\times 33$. *b*, PALP OF MANDIBLE. $\times 33$. *c*, LEG OF SEVENTH PAIR. $\times 3$.

long, 7 mm : 13 mm. The post-lateral angles are rounded and the posterior margin straight. The uropoda are a little longer than the terminal abdominal segment. The inner branch is slightly longer than the outer branch. Both are narrow, elongate, and produced to acute and tapering extremities.

The legs are all prehensile, and terminate in short, stout dactyli. There is a high carina on the basis of the last four pairs of legs, the carina increasing in height from the fourth to the seventh pair, where it is extremely high.^a

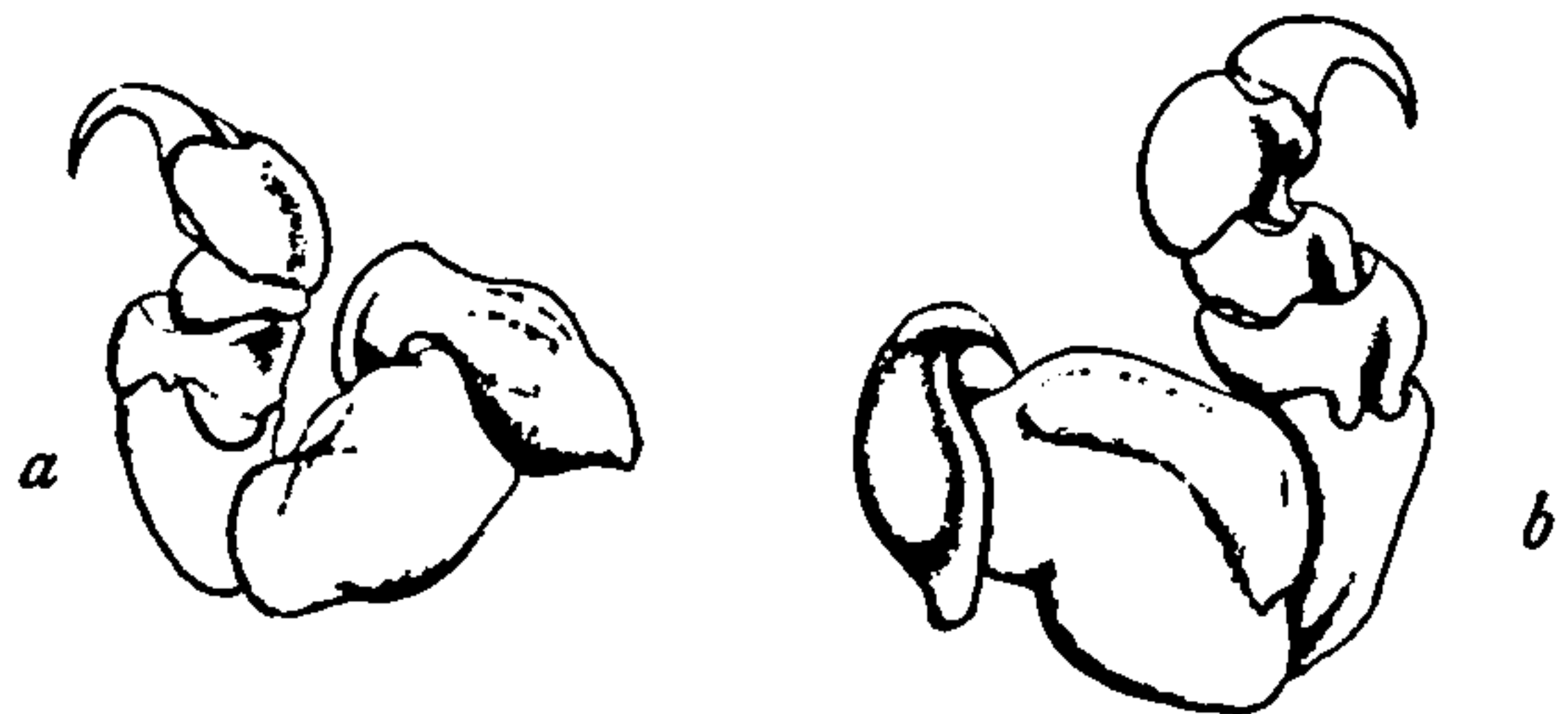


FIG. 245.—MEINERTIA GAUDICHAUDII (AFTER SCHIEDTE AND MEINERT). *a*, SECOND LEG OF ADULT FEMALE. *b*, SEVENTH LEG OF ADULT FEMALE. (ENLARGED.)

^a For description of male, female, and young of the first stage, see Schiedte and Meinert, Nat. Tidsskr., (3), XIII, 1881-1883, pp. 335-340.

MEINERTIA DEPLANATA (Bovallius).

Ceratothoa deplanata BOVALLIUS, Bihang till K. Sv. Vet.-Akad. Handl., X, No. 11, 1885, pp. 20-22.

Locality.—Coast of Haiti, West Indies.

“The form of the body is elongate, the anterior and posterior ends are only a little narrower than the middle, the anterior part is not very convex; from the fourth segment of the pereion to the end of the urus the body is quite flattened. The surface is smooth, without spots.

“The head is broad, triangular, with broadly rounded front, the sides rounded, not emarginate. The upper side is smooth, convex. The eyes are mediocre, rhomboidal, surrounded by dark diffuse spots.

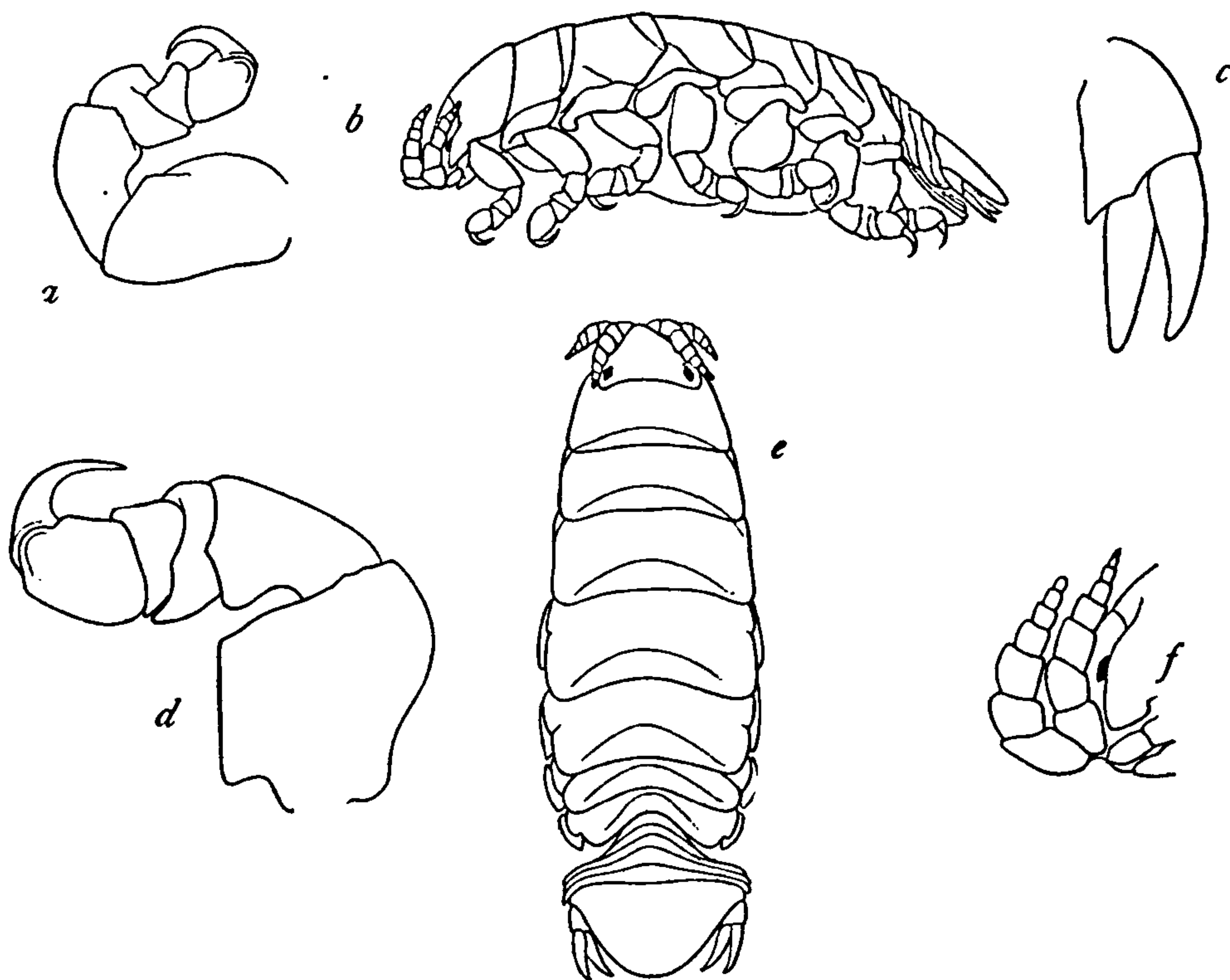


FIG. 246.—MEINERTIA DEPLANATA (AFTER BOVALLIUS). *a*, FIRST LEG. *b*, LATERAL VIEW OF FEMALE. *c*, UROPOD. *d*, SEVENTH LEG. *e*, DORSAL VIEW OF FEMALE. *f*, HEAD WITH BOTH ANTENNÆ. (ENLARGED.)

“The first pair of antennæ are nearly as long as the second, thick, not compressed, seven-jointed; they reach quite to the anterior margin of the first pereional segment. The first joint is the longest; it is as long as the two following together. The three last ones are small, tapering.

“The second pair of antennæ are but a little more slender than the first pair, eight-jointed; the first joint the longest; the four last ones small, tapering; the last very minute.

“The pereion is smooth, the sides feebly rounded. The processes of the first segment are very broad, short, bent downward; the first segment is shorter than the fifth, but as long as the second. The sixth

and seventh segments together are shorter than the second segment. The hinder corners of the two first segments are nearly rectangular; those of the third and fourth truncated; those of the last three rounded.

“The epimerals of the second and third segments are broader at the posterior end, bent downward at the anterior. That of the second segment occupies the whole side of the segment; those of the third and fourth segments scarcely more than two-thirds of it; those of the fifth and sixth segments fully three-fourths of it, and the last one the whole of the segment. The epimerals of the fourth, fifth, and sixth segments are broader at the anterior margin, narrower behind. The last one is oblong, with rounded ends.

“The first pair of pereopoda have the tibia broadly extended, the dactylus short. The two following pairs are subequal, with the femora much longer than broad. The following four pairs have much broader femora and strongly developed carinæ. In the seventh pair the femur is as broad as long, the hinder margin is straight.

“The pleon is as broad at the base as long, the first segment longer than the second, but narrower than half of the fifth (2:5). The three last pleonal segments are broader than the urus (10:9) and a little narrower than the fifth (or fourth) segment of the pereion (10:11). The whole pleon equals the fifth pereional segment in length.

“The urus is broad, nearly semicircular, not quite twice as broad as long (9:5); the upper side is perfectly plain and smooth.

“The pleon and urus together are about a third of the length of the pereion with the head (18:51).

“The uropoda reach a little beyond the posterior margin of the urus. The peduncles are long and stout, nearly as long as the inner ramus (14:17). The inner ramus reaches a little beyond the outer. It is oblong-lanceolate. The exterior one is falciform.

“Color, bright yellow.

“Length, 18 mm.”—BOVALLIUS.^a

MEINERTIA GILBERTI Richardson.

Meinertia gilberti RICHARDSON, Proc. U. S. Nat. Mus., XXVII, 1904, p. 53.

Locality.—Mazatlan.

Parasite of *Mugil hospes*.

Head set in first segment of thorax, the antero-lateral prolongations of which extend forward to about the middle of the eye. Shape of the head somewhat triangular; posterior margin straight; anterior margin produced somewhat at the middle, but quite rounded. Eyes very large, far apart, and situated at the sides of the head. First pair of antennæ consist of seven joints and extend to the middle of the eye;

^aBihang till K. Sv. Vet.-Akad. Handl., X, No. 11, 1885, pp. 21-22.

second pair consist of eight joints and reach the posterior margin of the head.

The first four segments of the thorax are about equal in length, the second being somewhat shorter. The last three segments decrease

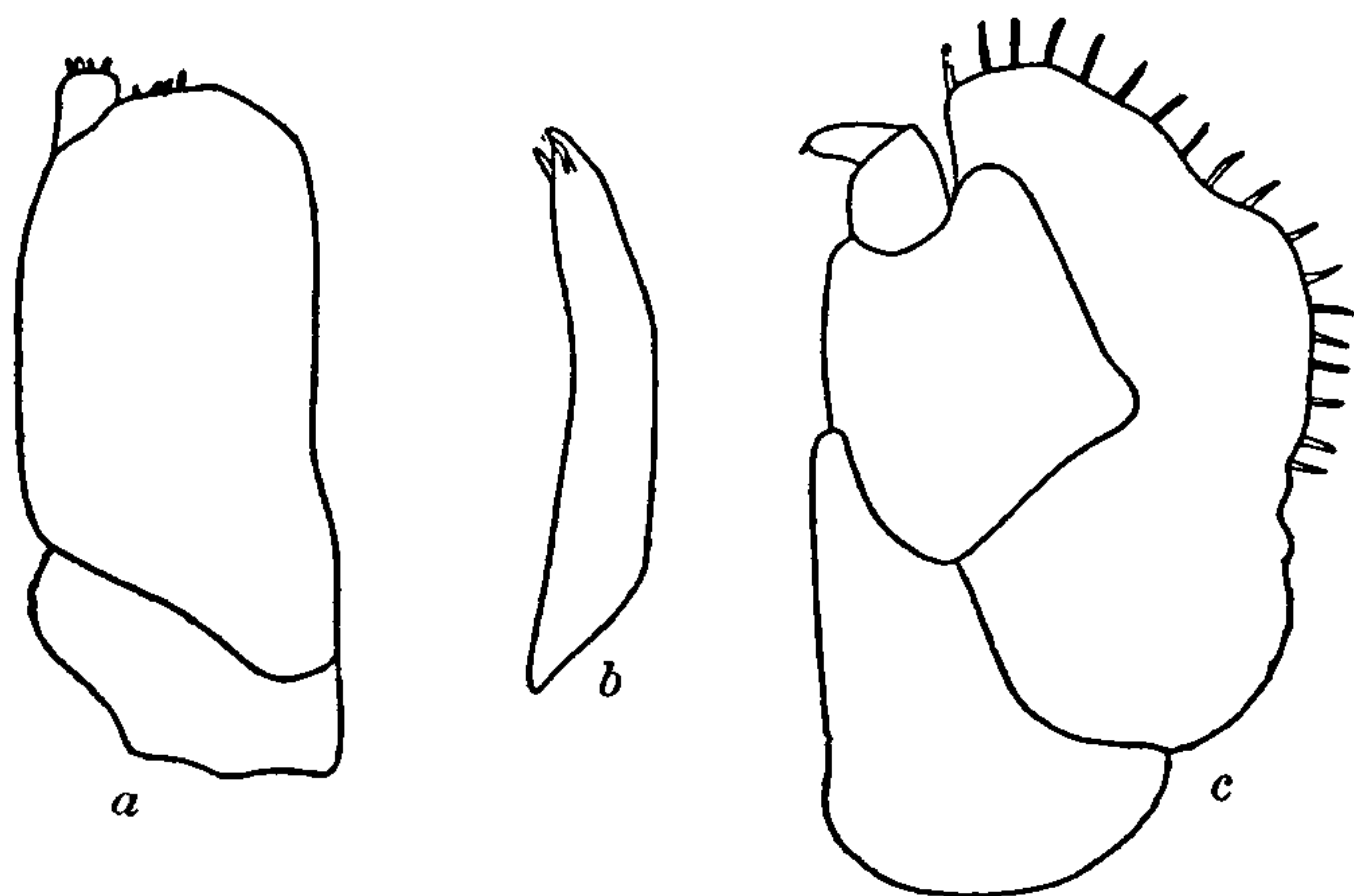


FIG. 247.—MEINERTIA GILBERTI. *a*, SECOND MAXILLA. $\times 27\frac{1}{2}$. *b*, FIRST MAXILLA. $\times 27\frac{1}{2}$. *c*, MAXILLIPED. $\times 15\frac{1}{2}$.

gradually in length. The epimera are narrow pieces at the sides of the segments; in the first five segments they do not reach the posterior margin of the segments, although the fifth pair more nearly reach the posterior margin than the others; the epimera of the last two segments reach quite to the posterior margin.

The first segment of the abdomen is as wide as the last thoracic segment. The others are wider, increasing in width gradually to the terminal segment. The last segment is about three times as broad as long, and quadrangular in shape. The uropoda are short, reaching only a little beyond half the length of the abdomen; both branches are alike and of equal length.

The legs all terminate in long recurved unguis. There is no high carina developed on the basis of any of the legs.

Color reddish brown.

Three specimens, two males and one female, were collected by Prof. C. H. Gilbert at Mazatlan. They were found in the mouth of *Mugil hospes*.

Type.—Cat. No. 29080, U.S.N.M.

This species differs chiefly from *M. gaudichaudii* (Milne Edwards)^a from near locality, in the absence of high carinae, which in *M. gaudichaudii* are strongly devel-

oped on the last four pairs of legs; in the much shorter uropoda, which in *M. gaudichaudii* extend beyond the terminal segment, both branches of which are narrowly pointed at their extremities; in the much larger eyes, and in the smaller size of the species, the adult female being only half the size of the adult female of *M. gaudichaudii*.

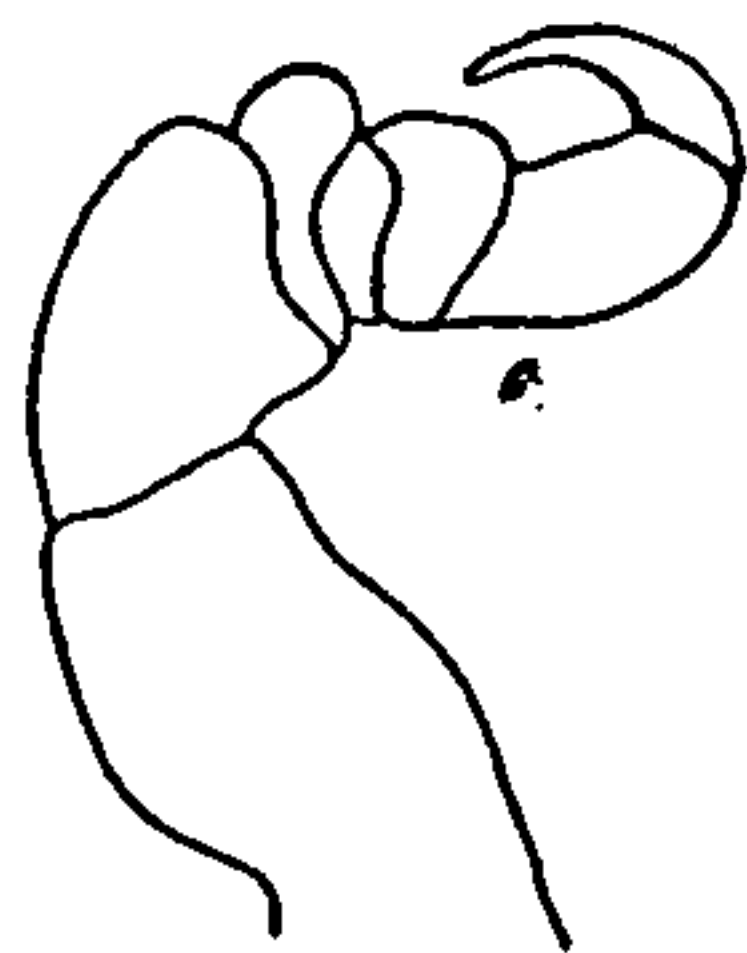


FIG. 248.—MEINERTIA GILBERTI. LEG OF SEVENTH PAIR. $\times 7$.

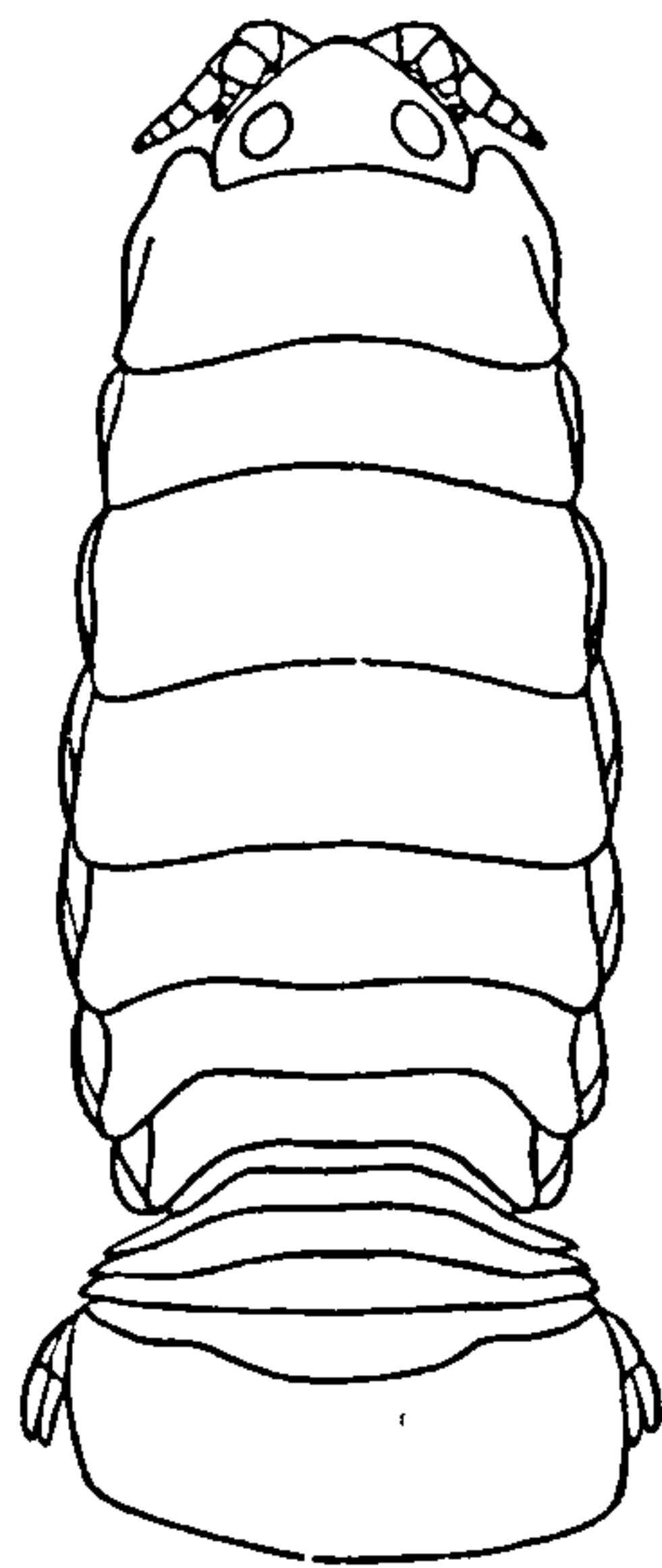


FIG. 249.—MEINERTIA GILBERTI, $\times 2\frac{1}{2}$.

^a Naturhistorisk Tidsskrift, XIV, 1883-84, pp. 335-340, pl. XIII, figs. 11-15.

MEINERTIA TRANSVERSA Richardson.

Meinertia transversa RICHARDSON, American Naturalist, XXXIV, 1900, p. 221; Proc. U. S. Nat. Mus., XXIII, 1901, pp. 529-530.

Locality.—Between the delta of the Mississippi and Cedar Keys, Florida.

Head very little immersed in first thoracic segment, large, subtriangular, anterior margin pointed with sides slightly sinuate. Eyes situated at extreme post-lateral margins, almost obscure. First pair of antennæ, with joints dilated, issuing close together, eight articulate. Second pair of antennæ slender, extending a little beyond posterior margin of first thoracic segment; fourteen jointed.

Thoracic segments subequal in length.

Abdomen not at all immersed. All the segments visible and equal in width and length. Terminal segment sub-

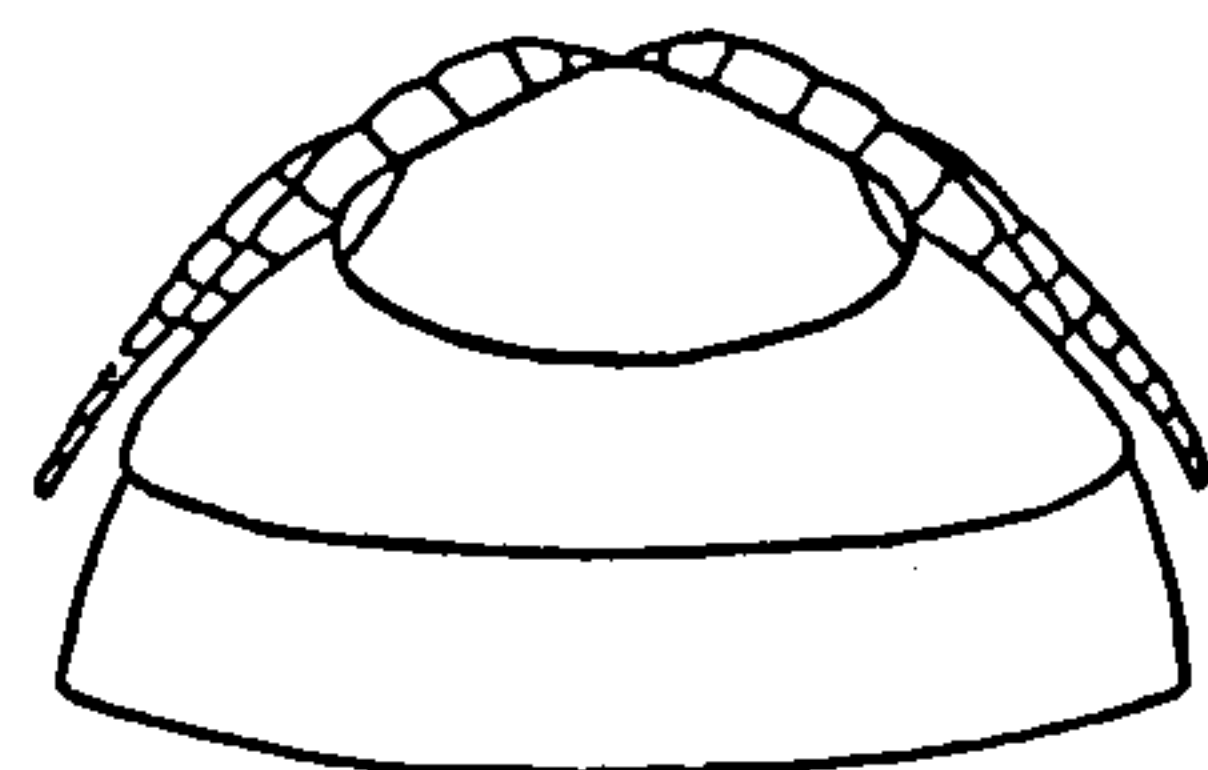


FIG. 250.—MEINERTIA TRANSVERSA. HEAD.

triangular with apex round, impressed at the base, equal in length to the first five segments taken together. Uropoda a little longer than apex of terminal segment, branches similar in shape, oar-like, and of equal length.

Legs increasing in length from first to seventh pair.

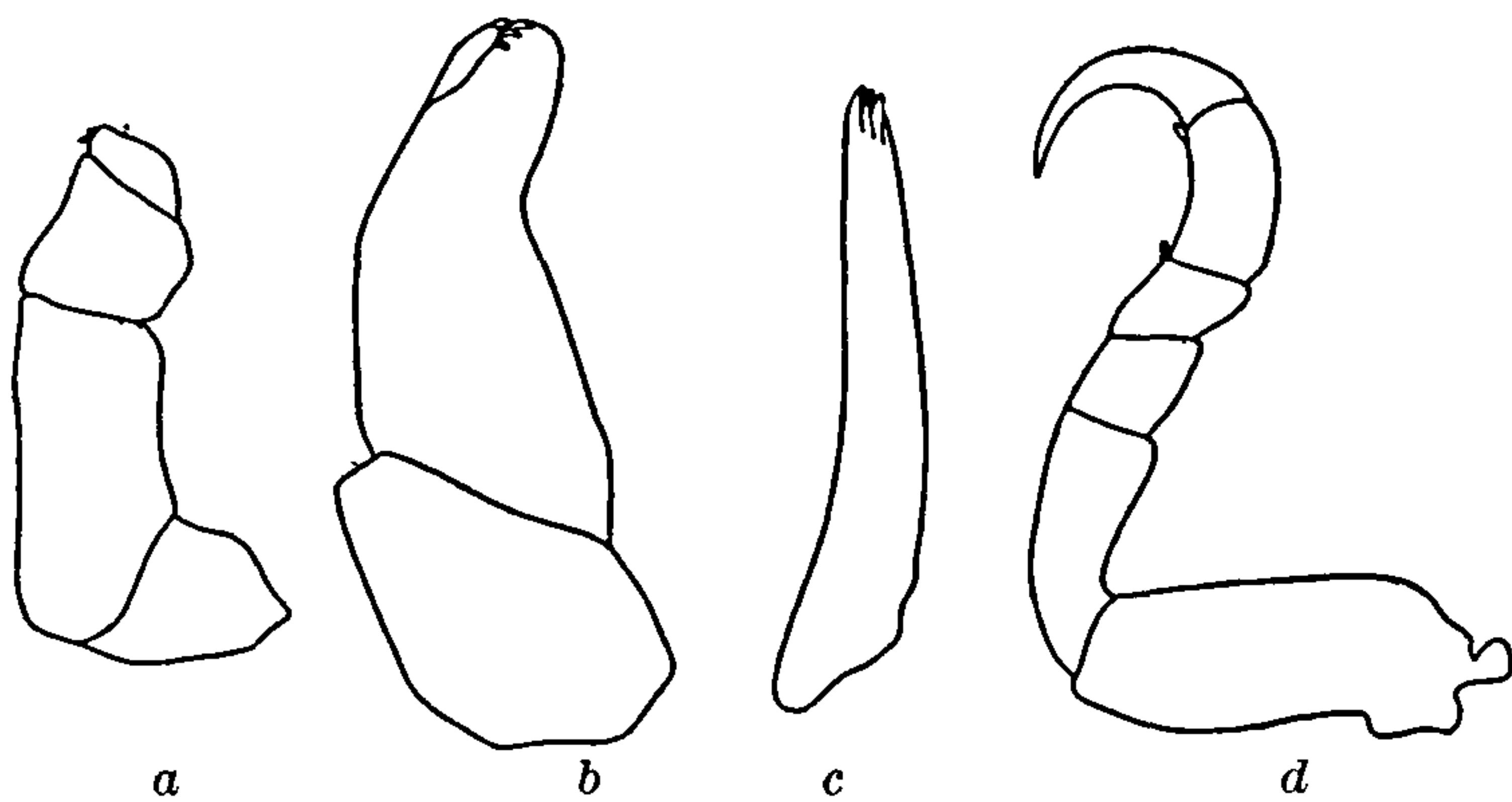


FIG. 251.—MEINERTIA TRANSVERSA. a, MAXILLIPED. $\times 20\frac{1}{2}$. b, SECOND MAXILLA. $\times 39$. c, FIRST MAXILLA. $\times 39$. d, SEVENTH LEG. $\times 11\frac{1}{2}$.

Color yellowish brown.

One specimen from between the delta of the Mississippi and Cedar Keys, Florida, collected by the U. S. Bureau of Fisheries' steamer *Albatross*.

Type.—Cat. No. 9728, U.S.N.M.

39. Genus AGARNA Schiøedte and Meinert.

Body compressed from side to side and hunched, very asymmetrical. One side of the posterior segments of the thorax flattened and dilated.

Head deeply immersed. First pair of antennæ separated but little at the base, almost contiguous, rather compressed.

Anterior margin of the first thoracic segment very deeply sinuated; antero-lateral angles scarcely produced, rounded. Epimera present

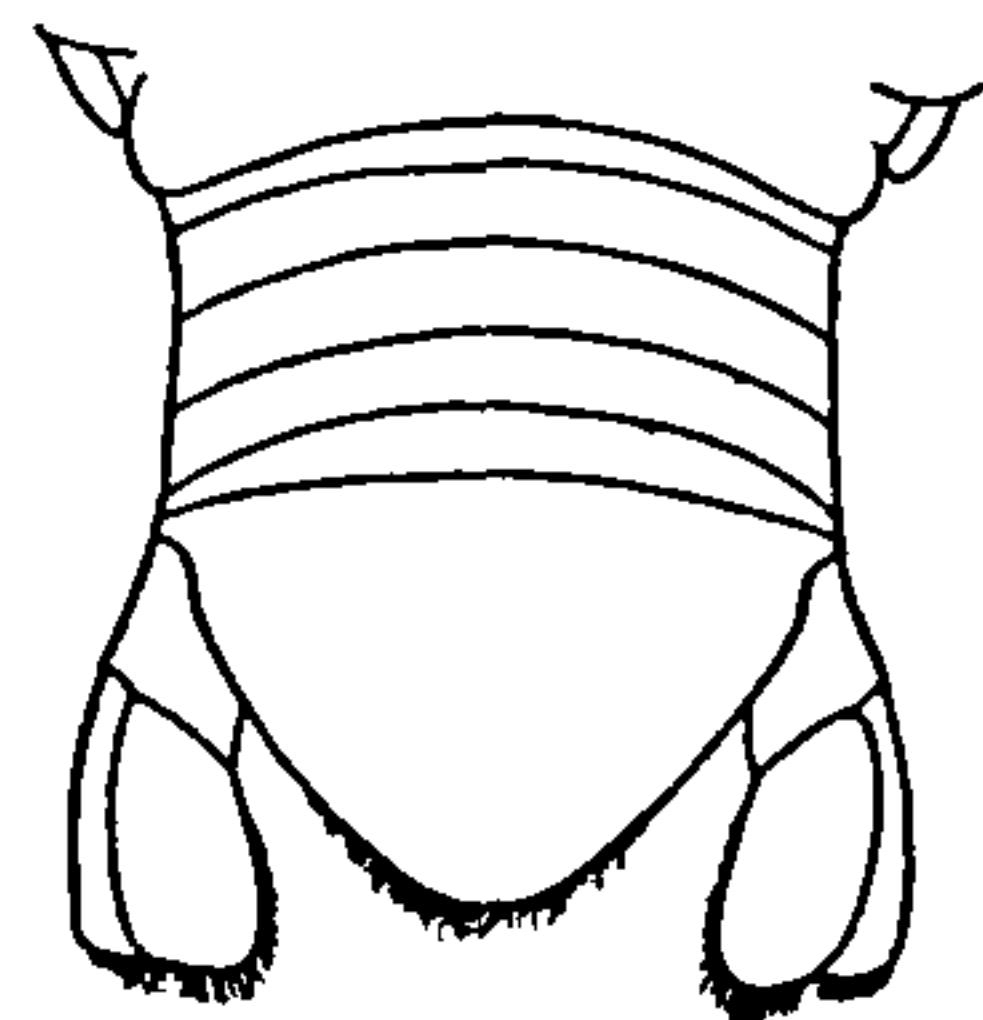


FIG. 252.—MEINERTIA TRANSVERSA. ABDOMEN.

on all the segments of the thorax with the exception of the first and the seventh. There are two pairs of epimera on the fourth thoracic segment and two pairs of legs are attached to this segment. The seventh segment has no appendages.

Abdomen continuous with thorax, not narrower than thorax; deeply immersed. Carina on the four posterior pairs of legs moderately high.

AGARNA CARINATA Schiøedte and Meinert.

Agarna carinata SCHIØEDTE and MEINERT, Naturhistorisk Tidsskrift (3), XIV, 1883-84, pp. 329-334, pl. XIII, figs. 1-3.—RICHARDSON, Proc. U. S. Nat. Mus., XXIII, 1901, p. 531.

Localities.—St. Croix Island, West Indies; Key West, Florida.
Found on *Teuthis chirurgus*.

Body very asymmetrical, with the last four thoracic segments on

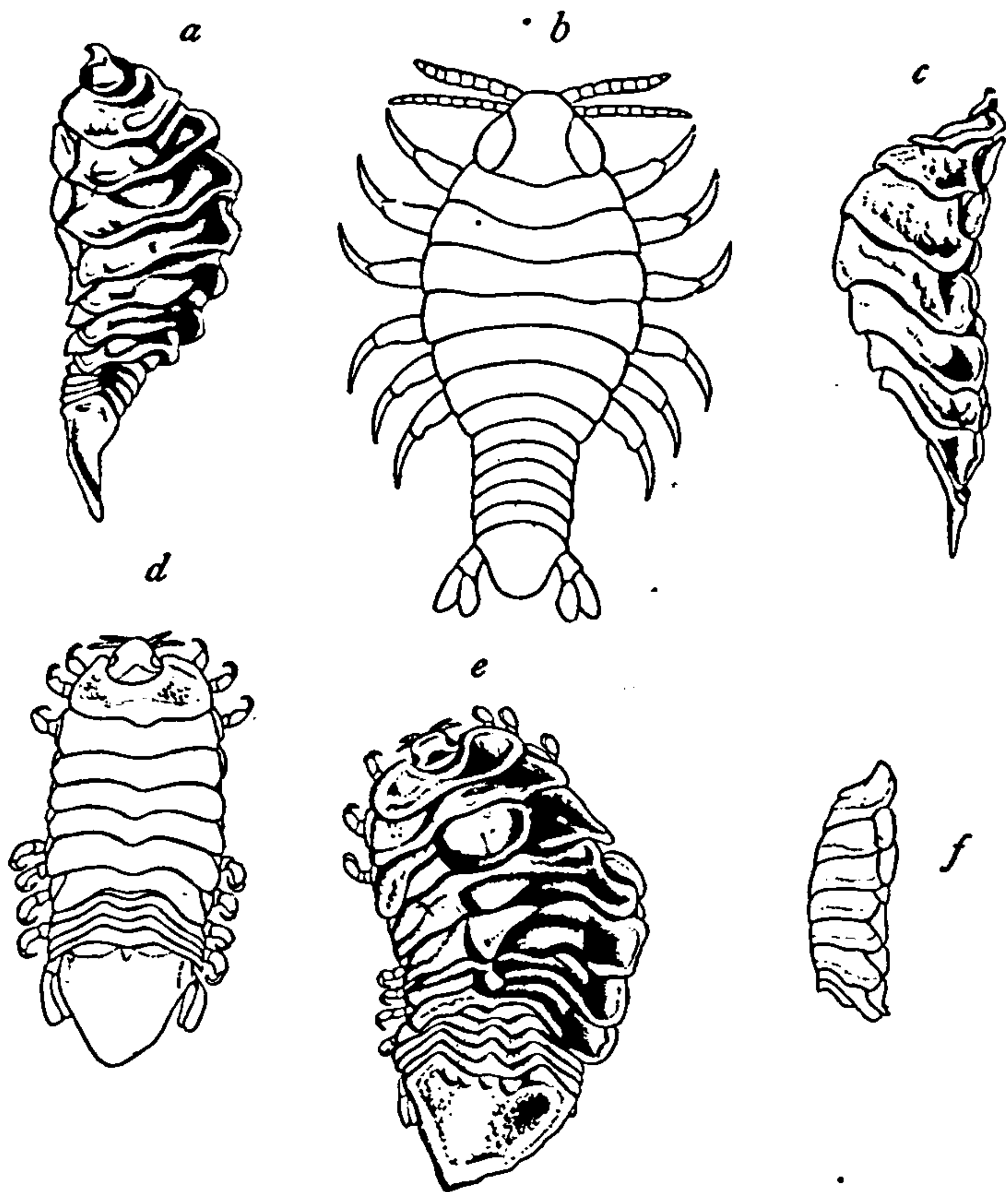


FIG. 253.—AGARNA CARINATA (AFTER SCHIØEDTE AND MEINERT). *a*, LATERAL VIEW OF ADULT FEMALE (LEFT SIDE). *b*, YOUNG OF THE FIRST STAGE. *c*, LATERAL VIEW OF ADULT FEMALE (RIGHT SIDE). *d*, ADULT MALE. *e*, ADULT FEMALE. *f*, LATERAL VIEW OF THORAX OF ADULT MALE. (ALL ENLARGED.)

one side abruptly very much wider than the first three. Body twisted to one side, which is shorter than the other side, twice as long as its width above the fourth thoracic segment, 9 mm.:18 mm. At the fourth and fifth thoracic segments it is 11 mm. wide. The body is also very much hunched, rising very high, until at the third and fourth segment it is 7 mm. high.

The head is wider than long, 2 mm.:3 mm., somewhat rectangular, with the anterior margin widely rounded. The eyes are small, round, composite and situated in the post-lateral angles of the head. The first

pair of antennæ are composed of seven articles. The basal articles are almost contiguous. The second pair of antennæ are composed of "ten" articles. The head is deeply set in the first thoracic segment, the antero-lateral angles of which extend to the anterior margin of the head. The maxilliped has a palp of two articles. The palp of the mandibles is composed of three articles.

The first, second, and third thoracic segments are equal in length,

each being 2 mm. long. The fourth and fifth are subequal, each being 1 mm. in length. The sixth and seventh are each only $\frac{1}{2}$ mm. long. The epimera are not distinctly separated on the first segment. The following five segments have distinct epimera. There are none on the seventh segment, and there are no appendages to this segment. There are two pairs of legs attached to the fourth segment, two legs on either side, and two pairs of epimera. The epimera of the second and third segments are narrow plates, extending the full length of the lateral margin on the shortened side of the body, the epimera of the third segment on the longer side not extending quite to the post-lateral angle. The fourth segment has two pairs of epimera, an anterior and a posterior pair; the two are equal in size on the short side, the anterior one on the long side of the body being small, the posterior one being transversely elongated, not laterally placed, but extending along the posterior margin of the lateral expansion of the segment. The epimera of the fifth and sixth segments, on the short side of the body, occupy the post-lateral angles; those of the long side are transversely

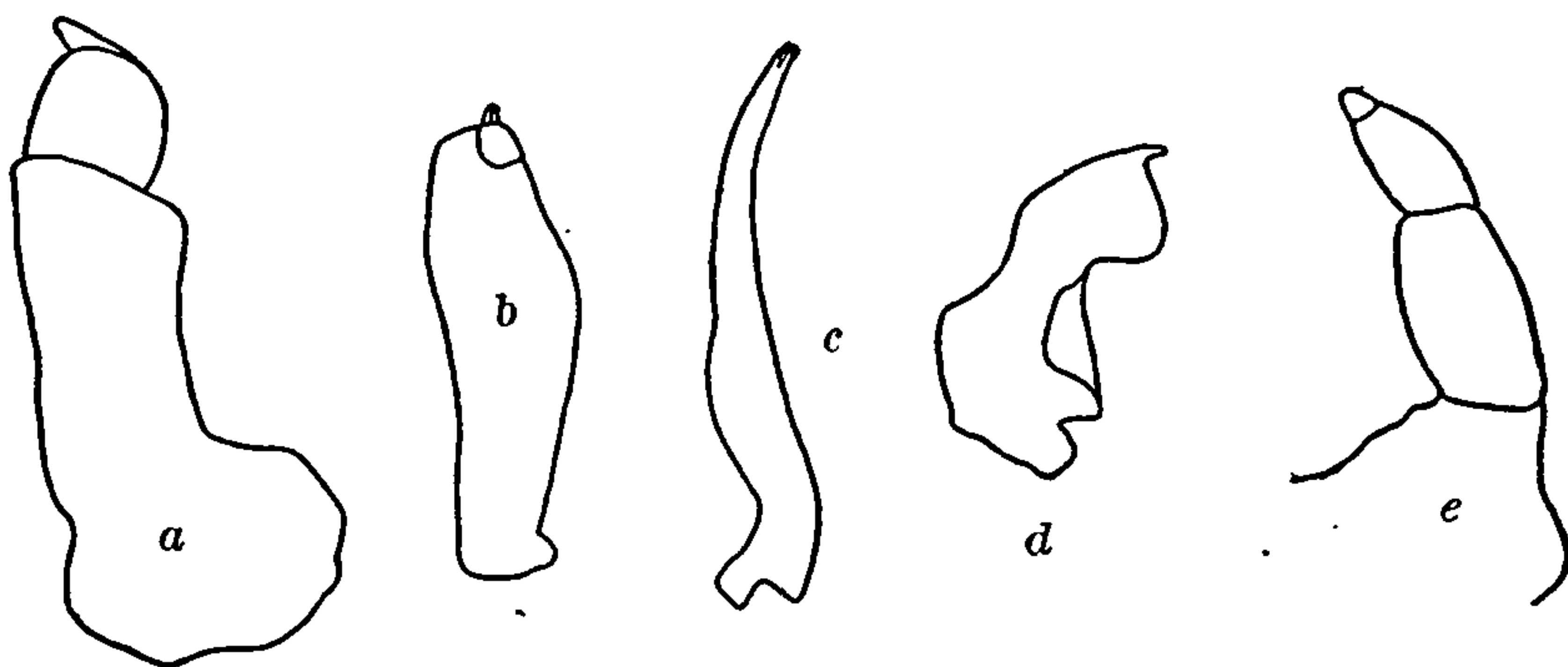


FIG. 254.—*AGARNA CARINATA*. *a*, MAXILLIPED. $\times 29$. *b*, SECOND MAXILLA. $\times 29$. *c*, FIRST MAXILLA. $\times 29$. *d*, MANDIBLE. $\times 29$. *e*, PALP OF MANDIBLE. $\times 29$.

elongated, not laterally, but posteriorly placed on the lateral expansions of the segments. There are no epimera on the seventh segment.

The abdomen is deeply set in the thorax, the seventh thoracic segment covering the lateral parts of the first two or three segments. The first segment of the abdomen is as wide as the last thoracic segment; the following segments gradually increase in width, especially on the shorter side of the body, so that the abdomen here becomes wider than the thorax. The terminal segment is large, triangular in shape, with apex rounded; it is 6 mm. long and 8 mm. wide at the base. The uropoda are very short, extending less than one-third the length of the abdomen. The outer branch is a little longer and wider than the inner branch.

The legs are all prehensile, with short, stout, curved dactyli. The ischium of the last four pairs is flattened and very much longer than in the first three pairs. There is also a moderately high carina on the basis of the last four pairs of legs.^a

^aFor complete description of this form, the male and female and the young of the first stage, see Schiøedte and Meinert, Nat. Tidsskr., (3) XIV, 1883-84, pp. 329-334.

40. Genus *INDUSA*^a Schiøedte and Meinert.

Body convex, anteriorly narrowed, or compressed from side to side. Head but little immersed. First pair of antennæ almost contiguous at the base, slender, not dilated.

Anterior margin of the first thoracic segment widely sinuated, the antero-lateral angles but little produced, rounded.

Abdomen but little immersed.

INDUSA CARINATA^b Richardson.

Indusa carinata RICHARDSON, Proc. U. S. Nat. Mus., XXVII, 1904, p. 52.

Locality.—West coast of Panama.

Parasite of *Mugil hospes*.

Body very convex, being highly and roundly elevated. Thorax large, rounded, almost as wide as long, the last two segments rapidly

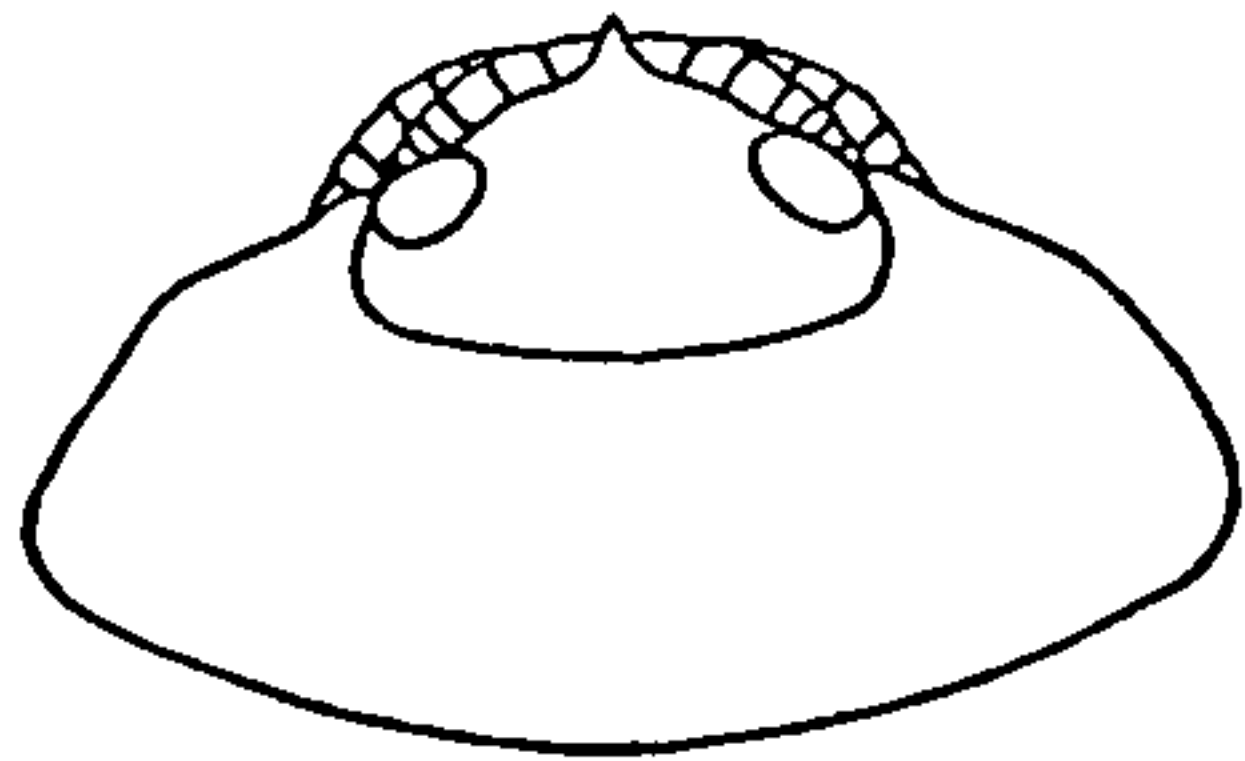


FIG. 255.—*INDUSA CARINATA*.
HEAD AND FIRST THORAC-
IC SEGMENT. $\times 5$.

converging to the narrow abdomen. Abdomen nearly three times narrower than greatest width of thorax, with all the segments of equal width.

Head about two and a half times narrower than first thoracic segment and four times narrower than fourth segment; front triangular in shape and produced into an acute point projecting between the basal joints of the antennæ. Eyes distinct and situated at the sides and about the middle of the head. First pair of antennæ, which are almost contiguous, being separated only by the very acute median point, reach to the eyes; flagellum seven jointed. Second pair of antennæ extend to the posterior margin of the head; flagellum nine jointed.

First thoracic segment rounded anteriorly and posteriorly, the sides of the segment surrounding the head, the lateral angles extending to the eyes. The first four segments gradually increase in width. The fourth and fifth are about equally wide. The sixth and seventh rapidly decrease in width, converging to the narrow abdomen. The epimera are well developed on all the segments with the exception of the first; they are narrow and elongate, rounded posteriorly and not reaching the posterior margin of their respective segments.

The abdomen is likewise very convex and is nearly three times narrower than the thorax at its greatest width. The segments are of

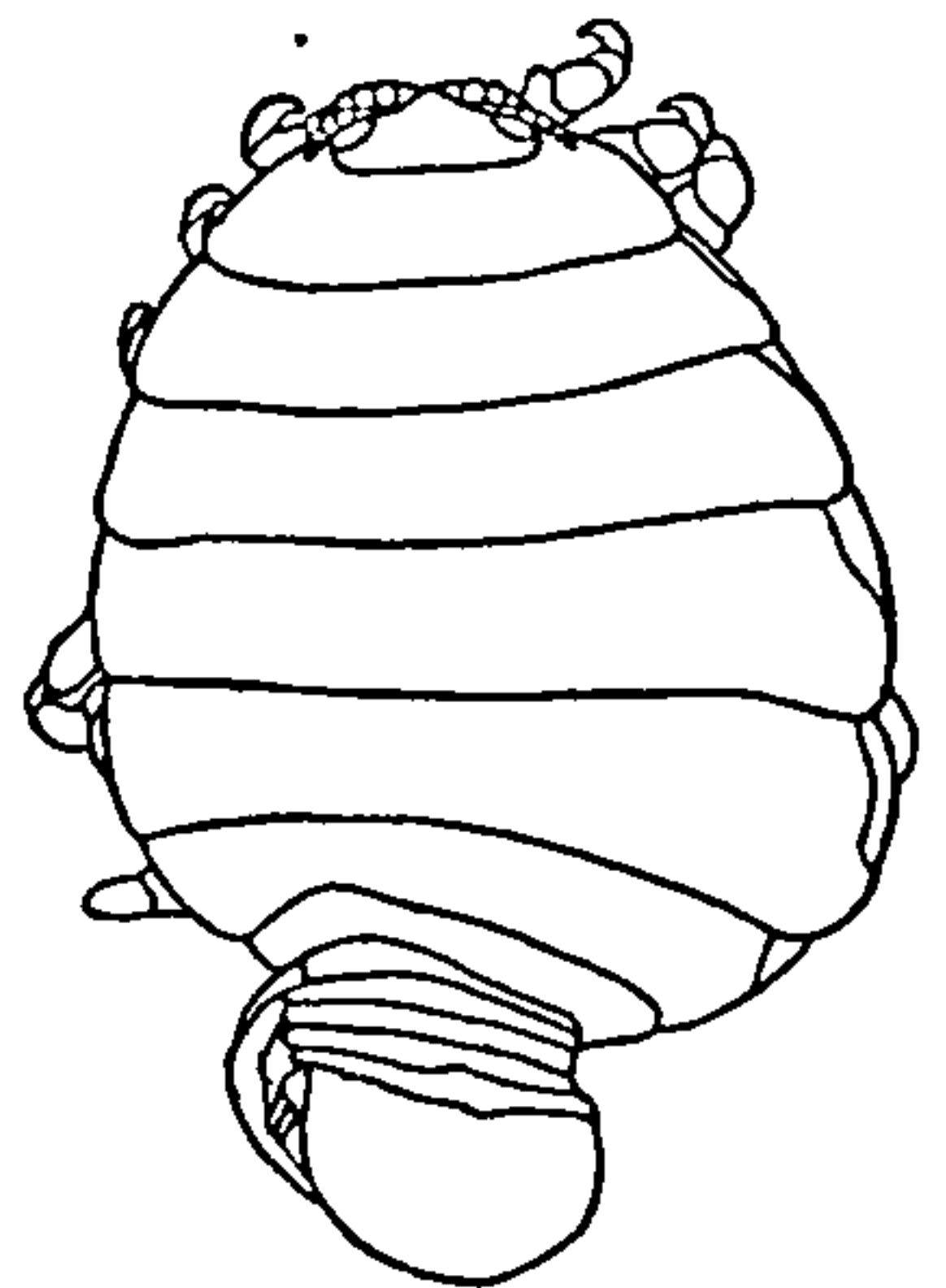


FIG. 256.—*INDUSA CARINATA*. $\times 24$.

^aSchiøedte and Meinert, Naturhistorisk Tidsskrift (3), XIV, pp. 334-335.

^bThis species is included because the fish on which it is parasitic is found on the coast of Mexico.

equal width. The terminal segment is rounded posteriorly or slightly triangular. The uropoda are very short, less than half the length of the terminal segment; the branches are equal in length.

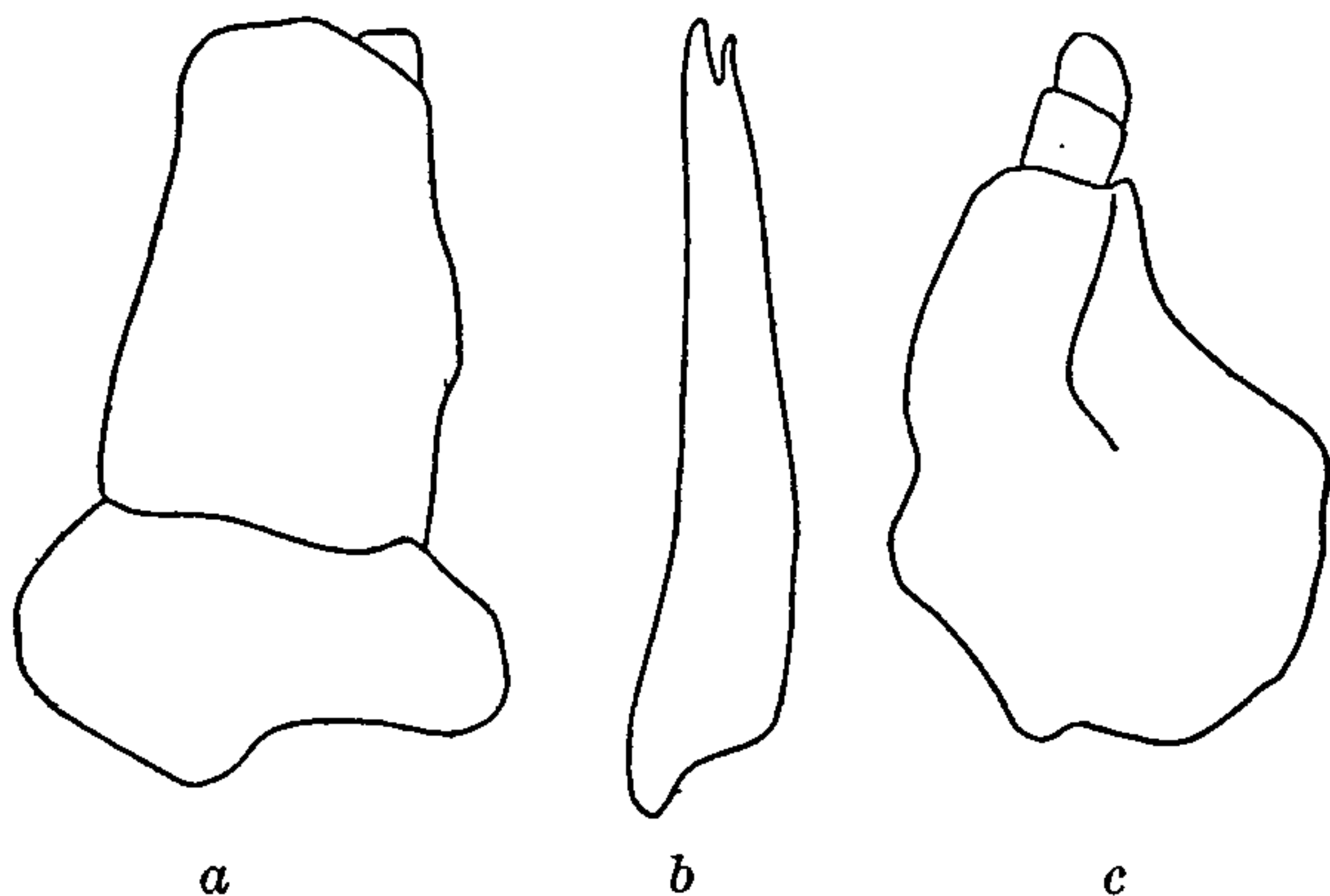


FIG. 257.—INDUSA CARINATA. *a*, SECOND MAXILLA. $\times 39$. *b*, FIRST MAXILLA. $\times 39$. *c*, MAXILLIPED. $\times 20\frac{1}{2}$.

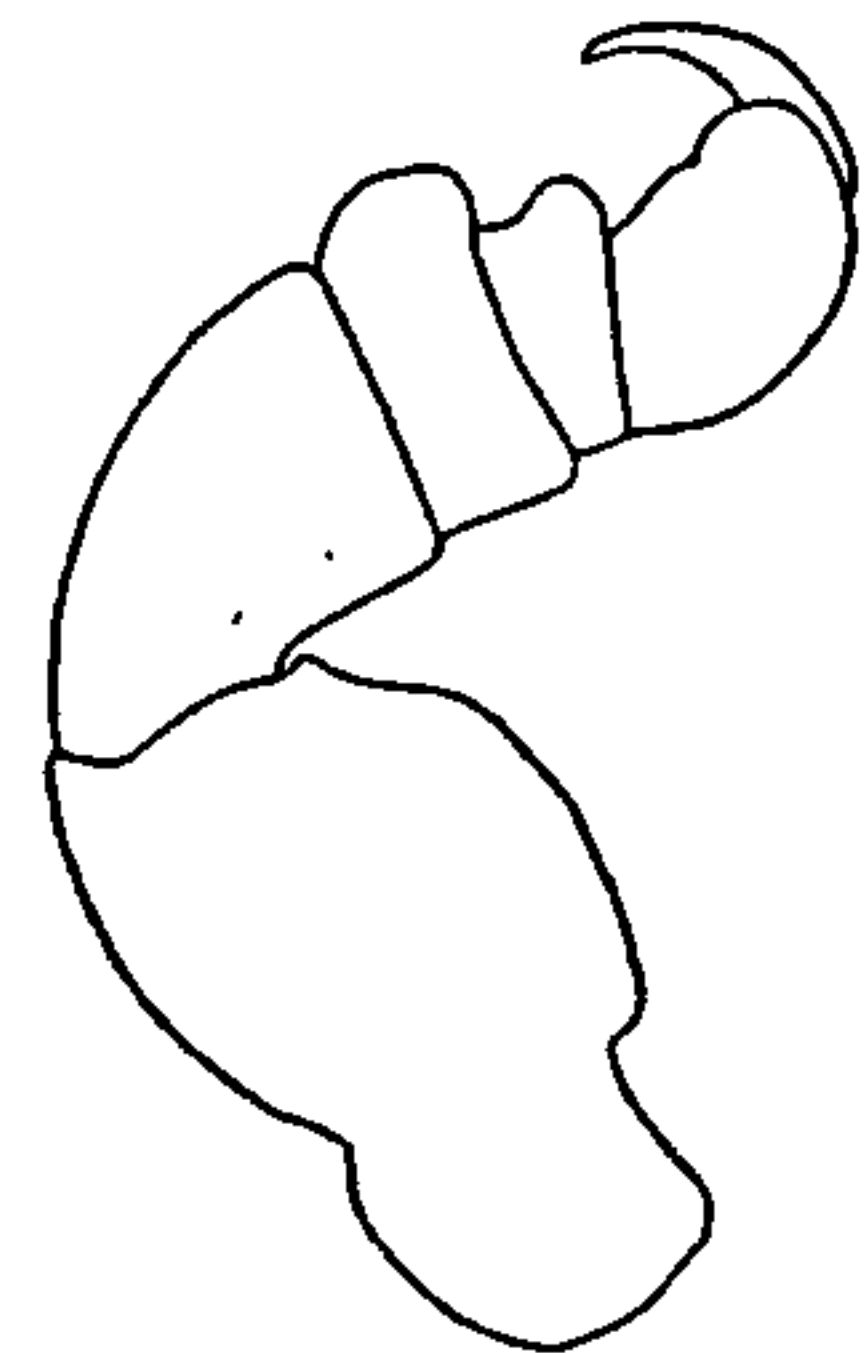


FIG. 258.—INDUSA CARINATA. LEG OF SEVENTH PAIR. $\times 7$.

There is a high carina on the four posterior pairs of legs, and a small one on the three anterior pairs. Color reddish brown.

Two specimens, a male and a female, were collected by Prof. C. H. Gilbert from the west coast of Panama. They were found in the mouth of *Mugil hospes*.

Type.—Cat. No. 28961, U.S.N.M.

41. Genus CYMOTHOA Fabricius.

Body ovate. Head more or less deeply immersed.

First pair of antennæ widely separated at the base, rather compressed. First thoracic segment manifestly longer than the second; its anterior margin more or less sinuated, with the anterior angles short or produced. Epimera distinct on all the segments with the exception of the first; those of the first five pairs do not reach by a greater or less distance the posterior angle of the segment; the posterior ones reach the posterior angles of the segment or extend beyond by a small distance.

The abdomen is deeply immersed, manifestly separated from the thorax, and abruptly narrower than the thorax. The legs are rather short, those of the first three pairs being a little shorter than the others. Carina of the four posterior pairs of legs high.

ANALYTICAL KEY TO THE SPECIES OF THE GENUS CYMOTHOA.

- a*. Antero-lateral angles of the first thoracic segment extend half the length of the head or less. Eyes distinct or only traces of eyes apparent. First segment of thorax one and a half times longer than second segment. Uropoda short, shorter than the terminal abdominal segment.
- b*. Antero-lateral angles of the first thoracic segment narrow.
- c*. Antero-lateral angles of the first thoracic segment acutely produced and reaching the middle of head..... *Cymothoa excisa* Perty

c'. Antero-lateral angles of the first thoracic segment obtusely rounded, not reaching the middle of the head.....*Cymothoa exigua* Schiøedte and Meinert

b'. Antero-lateral angles of the first thoracic segment wide.

Cymothoa caraibica Bovallius

a'. Antero-lateral angles of the first thoracic segment very large and wide, half as wide as the head, rounded and extending to the anterior margin of the head. No traces of eyes present. First thoracic segment twice as long as second segment. Uropoda as long as the terminal abdominal segment. Outer branch slightly shorter than inner branch.....*Cymothoa æstrum* (Linnæus)

CYMOTHOA EXCISA Perty.

Cymothoa excisa PERTY, Del. Amin., 1830-34, p. 211.

Cymothoa parasita SAUSSURE, Revue Mag. Zool. (2), IX, 1857, p. 306; Mém. Soc. Phys. Genève, XIV, Pt. 2, 1858, p. 485, pl. v, fig. 44.

Cymothoa excisa SCHIØEDTE and MEINERT, Naturhistorisk Tidsskrift (3), XIV, 1883-84, pp. 238-244, pl. vi, figs. 11-16. (See Schiøedte and Meinert for above synonymy.)—RICHARDSON, American Naturalist, XXXIV, 1900, p. 221; Proc. U. S. Nat. Mus., XXIII, 1901, p. 530.

Localities.—Massachusetts; Florida Reefs; Charleston Harbor, South Carolina; Bahamas; Biloxi, Mississippi; Cuba; Maranhao; Rio

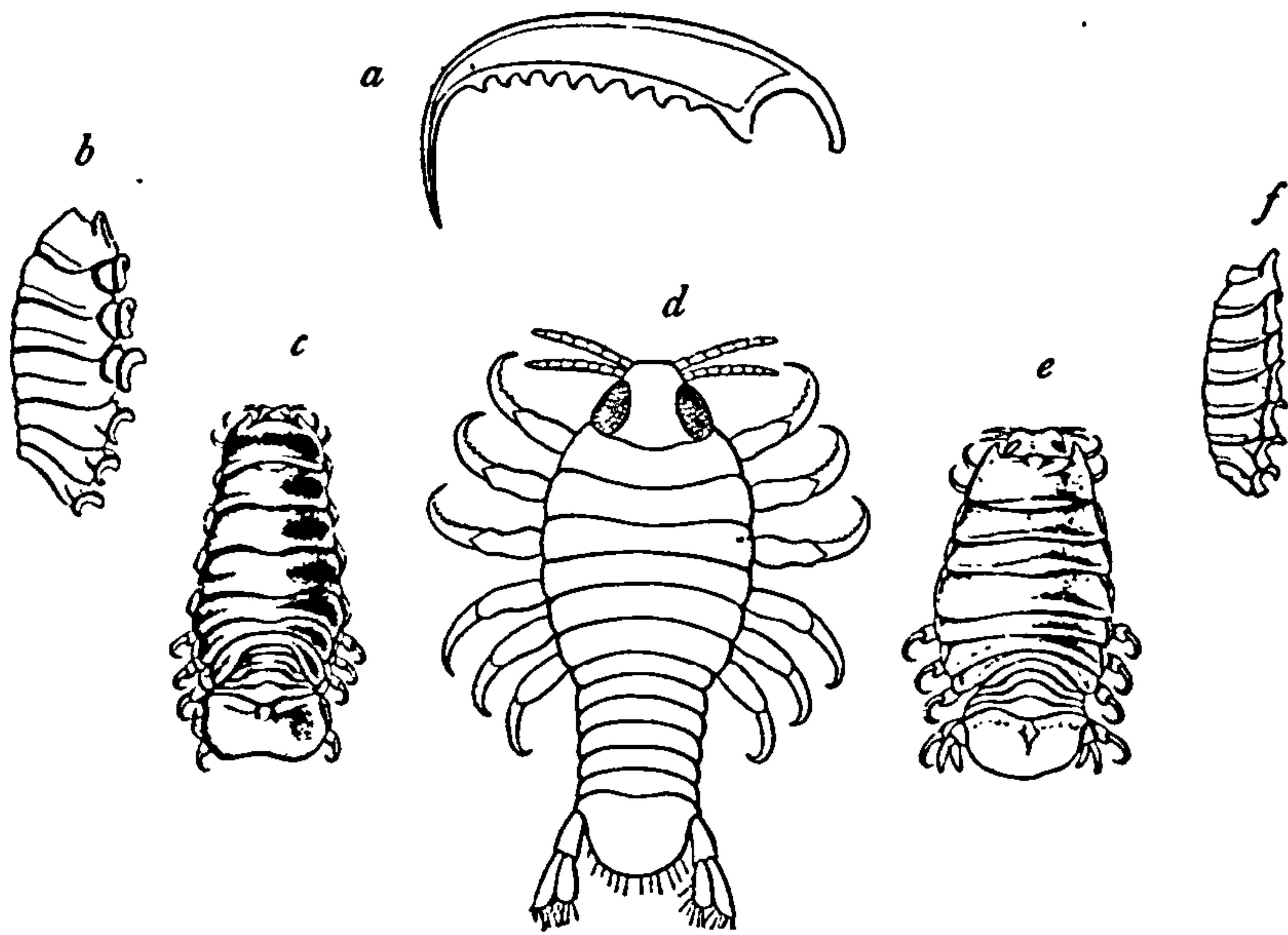


FIG. 259.—CYMOTHOA EXCISA (AFTER SCHIØEDTE and MEINERT). a, UNGULA OF THE LEG OF THIRD PAIR OF YOUNG OF SECOND STAGE (ENGARGED). b, LATERAL VIEW OF THORAX OF ADULT FEMALE (REDUCED). c, ADULT FEMALE (REDUCED). d, YOUNG OF SECOND STAGE (ENLARGED). e, ADULT MALE (ENLARGED). f, LATERAL VIEW OF THORAX OF ADULT MALE (ENLARGED).

Janeiro; South Florida; Key West, Florida; Porlamar, Margarita Island, Venezuela.

Parasite of chub (from lip); in the gills of a sparid ("*Sparus*" sp. Schiøedte and Meinert).

Body oblong-ovate, nearly twice as long as wide, 12 mm.: 23 mm.

Head a little wider than long, 3 mm.: 4 mm., and deeply set in the first thoracic segment, the narrow, acute antero-lateral angles of which extend half the length of the head. The antero-lateral angles of the head are rounded and curve slightly upward, the anterior portion of

the head between them and a little anterior to them curving downward, so that in a dorsal view the anterior margin seems slightly excavate. The eyes are very indistinct, and have almost disappeared; traces of them are seen on the lateral margins, halfway between the anterior and the posterior margins. The first pair of antennæ are composed of eight articles and extend almost to the posterior margin of the head. The basal articles of the first pair of antennæ are widely separated by a distance equal to 2 mm. The second antennæ are composed of nine articles, and extend three articles beyond the first pair of antennæ. The maxillipeds have a palp of two articles. The palp of the mandibles is composed of three articles.

The first segment of the thorax is about one and a half times longer than any of the three following segments, which are subequal. The fifth and sixth segments are each about half as long as any of the three preceding segments in the median dorsal line. The seventh segment is about half as long as the sixth. The epimera are distinctly separated on all the segments with the exception of the first; they are narrow, elongate plates, which in the second, third, and fourth segments extend a little more than two-thirds the length of the segment, in the fifth extend almost to the post-lateral angles of the segment, and in the last two extend quite to the extremity of the post-lateral angles.

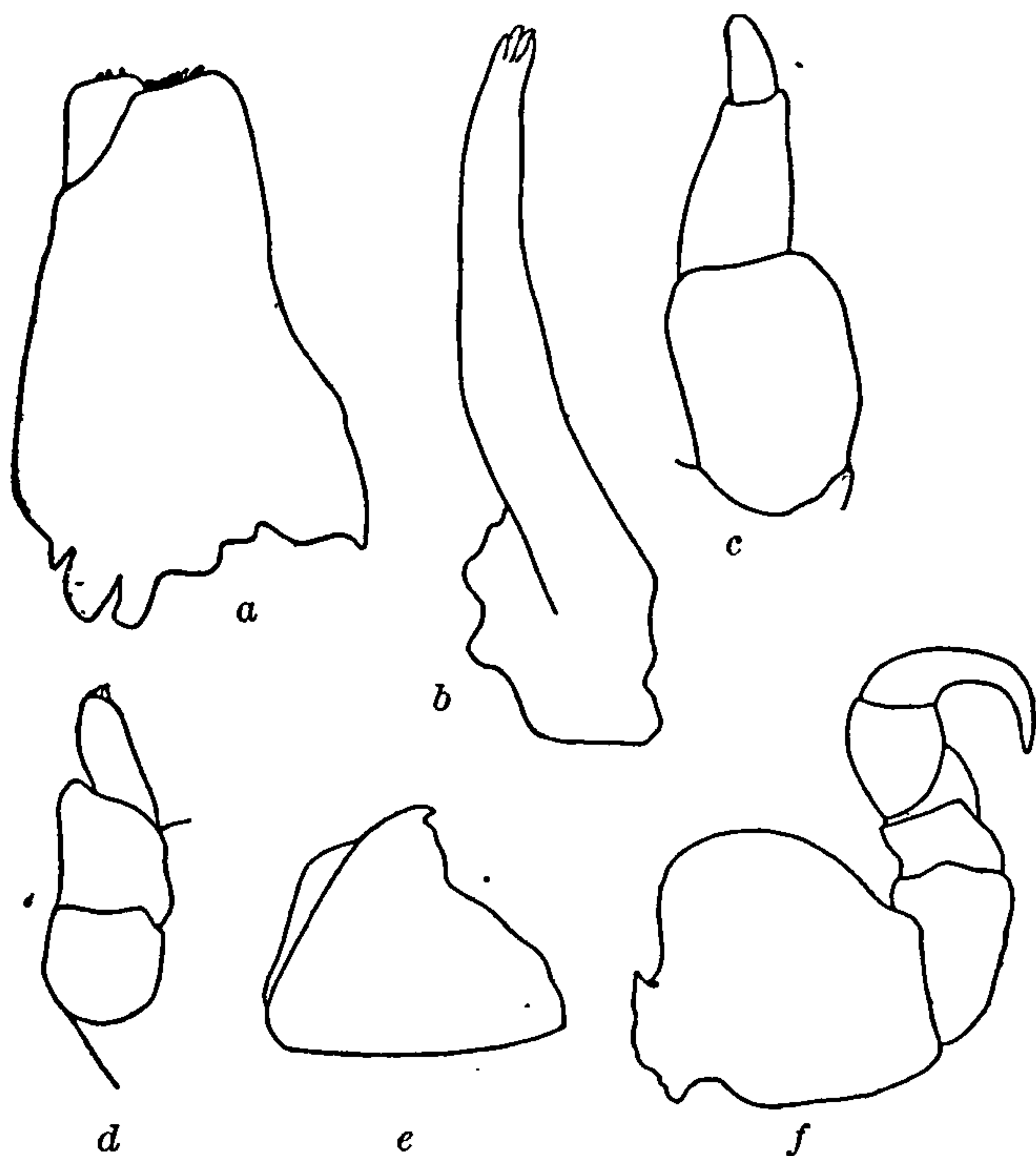


FIG. 260.—CYMOTHOA EXCISA. a, SECOND MAXILLA. $\times 39$. b, FIRST MAXILLA. $\times 39$. c, PALP OF MANDIBLE. $\times 39$. d, MAXILLIPED. $\times 39$. e, MANDIBLE. $\times 39$. f, SEVENTH LEG. $\times 7$.

The abdomen is deeply set in the thorax, the post-lateral angles of the seventh thoracic segment reaching to the anterior portion of the sixth abdominal segment. All the segments of the abdomen are distinct. The first is abruptly very narrow; the others gradually increase in width to the last. The terminal segment is twice as wide as long, $4\frac{1}{2}$ mm. : 9 mm. The post-lateral angles are widely rounded and the posterior margin slightly excavate in the middle. The uropoda are short, extending a little beyond the median transverse line of the terminal abdominal segment. The outer branch is a little longer than the inner branch. Both are similar in shape, and terminate in narrow, rounded extremities.

All the legs are prehensile, terminating in long, narrow curved dactyli. There is a high carina on the exterior margin of the basis of the last four pairs of legs; the height of the carina increases from the fourth to the seventh, where it is extremely high.^a

CYMOTHOA EXIGUA^b Schiøedte and Meinert.

Cymothoa exigua SCHIØEDTE and MEINERT, Naturh. Tidsskrift (3), XIV, 1883-84, pp. 232-234, pl. VI, figs. 7-8.

Localities.—Panama; also Charles Island, between the Galapagos Islands.

Found in the mouth of *Citharichthys sordida*.

Body ovate, rather compressed, more than twice as long as wide (9:4).

Head moderately large, subtriangular, widely rounded in front, two or three times narrower than the fourth thoracic segment (almost 2:5), manifestly wider than long (almost 7:6), a little immersed, frontal margin incurved, widely rounded.

Eyes distinct, moderately large, subtriangular or subrectangular. First pair of antennæ smooth, rather stout, extending with the last article to the anterior angle of the first segment of the thorax, or to the eighth article of the second pair of antennæ; they are composed of eight articles.

The second pair of antennæ are smooth, or rather compressed, much more slender than the first pair of antennæ, and extend with the two last articles to the anterior angle of the first thoracic segment; they are composed of nine articles.

The anterior margin of the first thoracic segment is straight, with the anterior angles short and obtusely rounded; the sides of the segment are straight.

The posterior angles of the anterior thoracic segments are rounded, those of the posterior ones truncately rounded.

The epimera are incurved and rather long; those of the first and second pairs are rather narrow, posteriorly a little dilated, obliquely and rounded truncate; those of the third and fourth segments are rather narrow, posteriorly a little narrower, obliquely and widely rounded; those of the fifth and sixth pairs are rather wider, posteriorly very much narrower (but little narrower in the young female), and obliquely and widely rounded. The epimera of the first, second, and third pairs do not reach by a great and gradually increasing distance the posterior angle of the segment; those of the fourth pair do not reach by a small

^aFor the description of the male, female, and the young of the first and second stages, see Schiøedte and Meinert, Nat. Tidsskr. (3), XIV, 1883-84, pp. 238-244.

^bThis species is included because the fish on which it is parasitic is found as far north as the coast of California.

distance the posterior angle of the segment; those of the fifth pair almost reach the posterior angle of the segment; those of the sixth pair extend a small distance beyond the posterior angle of the segment.

The legs of the first three pairs are shorter than the others; those of the last four pairs gradually but slightly increase in length. The ungulae are long, rather stout, less curved and subequal in length. The carina of the four posterior pairs is high, gradually and greatly increasing in height, the exterior angle being rounded, the posterior margin more or less widely rounded.

The abdomen is deeply immersed (less deeply immersed in the young female), the inferior angles of the first segment being covered, the sides of the second, third, fourth, and fifth segments together being a little sinuated, manifestly divergent; the abdomen is obscurely bisulcate, much wider than long (almost 5:4), two or three times shorter than the thorax with the head (almost 2:5). The first segment is covered for the greatest part; the second, third, and fourth segments are subequal in length or gradually increasing a little, manifestly shorter than the fifth segment. The posterior margin of the first five segments is widely sinuated, and produced at the sides in an obtuse lobe. The superior angles of the second, third, fourth, and fifth segments are almost vanishing. The inferior angles of the second, third, and fourth segments are produced, rather acute, and decrease gradually in length; those of the fifth segment are produced and obtusely rounded.

The terminal segment is transverse, with the sides rounded, the posterior margin widely sinuated, depressed at the base in the middle, obscurely pitted, much wider than the fifth abdominal segment, more than twice as wide as long (7:3), and a little longer than the other abdominal segments together. The uropoda are equal in length to the terminal segment of the abdomen; the inner branch is much shorter and a little narrower than the outer branch, becoming a little narrower and narrowly rounded; the outer branch is sickle shaped and posteriorly narrowly rounded.

Length of adult female 20 mm.

Length of young female 15.5 mm. Color yellow, sprinkled with minute obscure spots, the spots on the head confluent in a transverse row, those of the thorax confluent in a median area, with oblong waxen spots remaining.^a

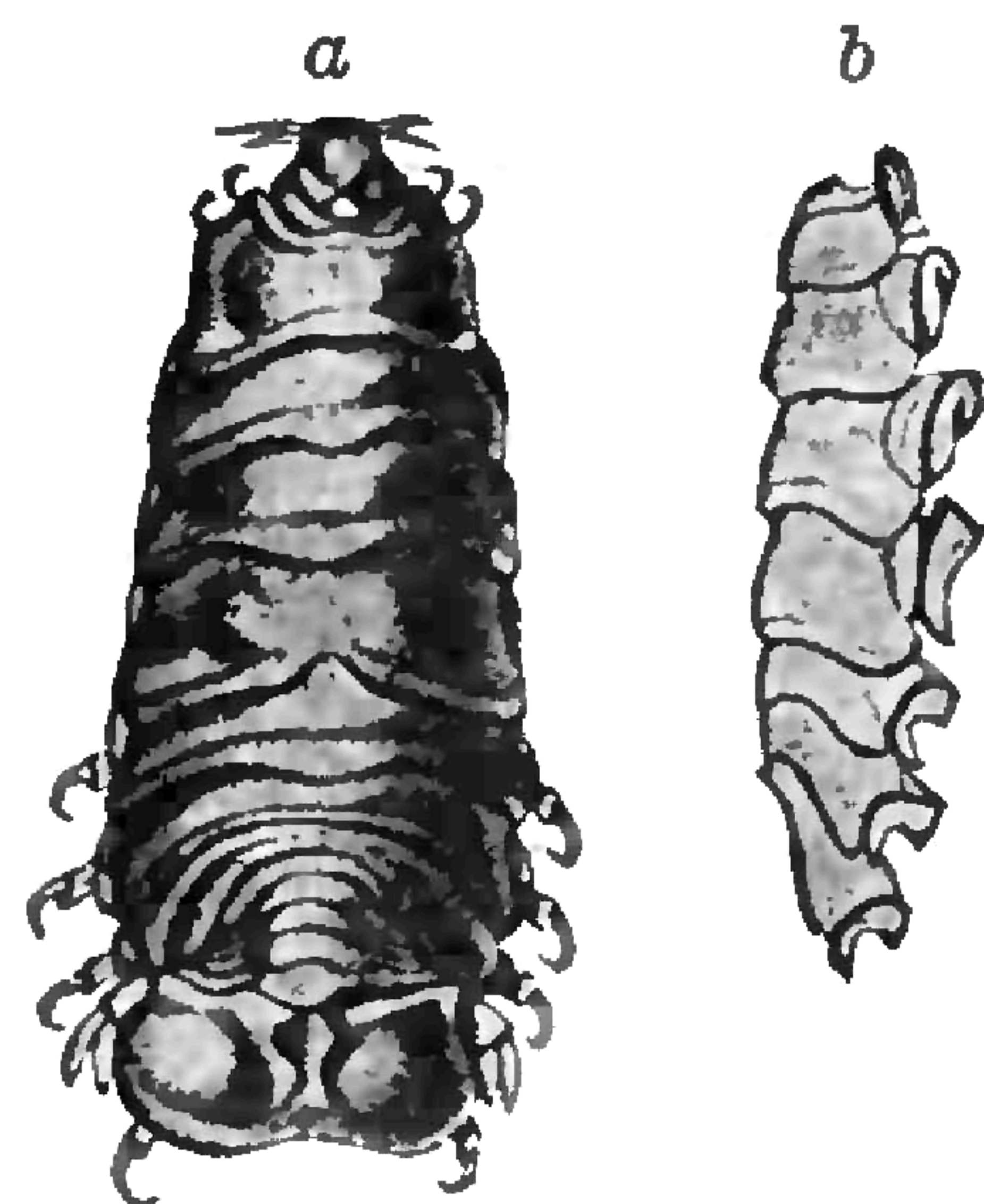


FIG. 261.—CYMOTHOA EXIGUA (AFTER SCHIEDTE AND MEINERT). *a*, ADULT FEMALE. *b*, LATERAL VIEW OF THORAX. (BOTH ENLARGED.)

^aThe above description is adapted from the following one of Schiedte and Meinert's:

Producte obovata, compressiuscula, plus duplo longior quam latior (9:4). Caput mediocre, subtrigonum, ante late rotundatum, quam annulus quartus trunci bis vel

CYMOTHOA CARAIBICA Bovallius.

Cymothoa caraibica BOVALLIUS, Bihang till k. Sv. Vet.-Akad. Handl., X, No. 11, 1885, pp. 27-29, pl. v, figs. 58-61.

Locality.—South coast of Hayti, West Indies.

“The head is large and long, only a little shorter than broad, the front margin forms no border on the under-side, but is only bent

ter angustius (fere 2:5), manifesto latius quam longius (fere 7:6), paulum immersum, fronte ante incurva, late rotundata.

Oculi manifesti, mediocres, subtrigoni, vel subrectanguli.

Antennæ primi paris subteretes, crassiusculæ, angulum priorem annuli primi trunci articulo ultimo superantes, articulum octavum antennarum secundi paris explentes; 8-articulatæ.

Antennæ secundi paris subteretes vel compressiusculæ, quam antennæ primi paris multo tenuiores, angulum priorem annuli primi trunci articulis binis ultimis superantes; 9-articulatæ.

Margo anticus annuli primi trunci subrectus, angulis prioribus brevibus, rotundate obtusis; latera annuli subrecta.

Anguli postici annulorum priorum trunci rotundati, posteriorum rotundate truncati.

Epimera incurva vel subincurva, longiuscula; paris primi et secundi angustiuscula, post paulum dilatata, in obliquum rotundate truncata; paris tertii et quarti angustiuscula, post paulum angustata, in obliquum late rotundata; paris quinti et sexti latiuscula, post valde vel vix (virgini) angustata, in obliquum late rotundata. Epimera paris primi, secundi, tertii angulum annuli spatio magno, per paria sensim crescente, non attingentia; paris quarti angulum annuli spatio parvo non attingentia; paris quinti angulum annuli fere explentia; paris sexti angulum annuli spatio parvo superantia.

Pedes parium trium priorum ceteris breviores; parium quattuor posteriorum per paria sensim longitudine vix crescentes. Ungulæ longæ, crassiusculæ, minus curvatæ, longitudine subæquales. Carina pedum parium quattuor posteriorum alta, per paria sensim valde crescens, angulo exteriori rotundato, margine postico plus vel minus late rotundato. Cauda profunde vel minus profunde (virgini) immersa, angulis inferioribus annuli primi obtectis, lateribus annuli secundi, tertii, quarti, quinti, conjunctim paulum sinuatis, manifesto divergentibus: obscure bisulcata, multo latior quam longior (fere 5:4), quam truncus cum capite bis vel ter brevior (fere 2:5). Annulus primus maximam partem obtectus; annulus secundus, tertius, quartus longitudine subæquales vel sensim paulum crescentes, quam annulus quintus manifesto breviores.

Margo posticus annulorum quinque priorum late sinuatus, ad latera in lobum obtusum productus. Anguli superiores annuli secundi, tertii, quarti, quinque fere evanidi. Anguli inferiores annuli secundi, tertii, quarti producti, acutiusculi, per paria sensim longitudine decrescentes; annuli quinti prominuli, rotundate obtusi.

Annulus analis transversus, lateribus rotundatis, margine postico late sinuato, ad basin in medio impressus, obscure foveolatus, quam annulus quintus caudalis multo latior, plus duplo latior quam longior (7:3), annulis ceteris caudalibus conjunctis paulo longior. Pedes anales annulum analem longitudine subæquantes; ramus interior quam exterior multo brevior et paulo angustior, paulum angustatus, breviter rotundatus; ramus exterior subfalcatus, post breviter rotundatus.

Long. feminae ovigeræ 20 mm. Long. virginis 15.5 mm. Color cereus, maculis minutis, obscuris sparsus, maculis in strigam transversam capitis et in plagam mediam, maculis oblongis cereis relictis, trunci confluentibus.—Schiedte and Meinert, Nat. Tidsskr. (3), XIV, 1883-84, pp. 232-233.

downward in the middle; the anterior margin is rounded, the upper side slightly convex.

“The eyes are of median size, placed a little behind the middle of the head near the lateral margins.

“The first pair of antennæ are thick and robust, eight-jointed, without distinction between the peduncle and the flagellum, the last joints without hairs or spines. The second pair of antennæ are considerably more slender, a little shorter, eight-jointed. The processes of the first segment of the pereion are shorter and narrower than in *Cymothoa elegans*, rounded at the ends. The anterior margin of the first segment is slightly emarginate; it is longer than the fourth segment (5:4), and only a little narrower than the fifth (5:6). From the fifth to the seventh, the segments decrease in length, but scarcely in breadth. The seventh segment is longer than half the sixth. The three first segments together are as long as the four last ones together.

“The epimerals of the second and third segments are fixed along the whole length of the segments, the following ones only along half or two-thirds of the length of the corresponding segments; all the epimerals are equal in length to their corresponding segments.

“The first three pairs of pereopoda have long, strong dactyli, as long as the dactyli of the following pairs. The last four pairs have strongly developed carinæ on the femora. The femur of the seventh pair is longer than broad (24:17).

“The pleon is broad, much broader at the base than long (5:3). The first segment is almost totally hidden, the pleon being a little more immersed than in *Cymothoa elegans*. The last is broadest and longest, the three preceding being equal in length. The second pair of pleopoda carry very long styliform processes.

“The urus is as long as the pleon, and only a little broader than the last pleonal segment (12:11); it is smooth on its upper side, broadly rounded at its lateral and hinder margins, exactly twice as broad as

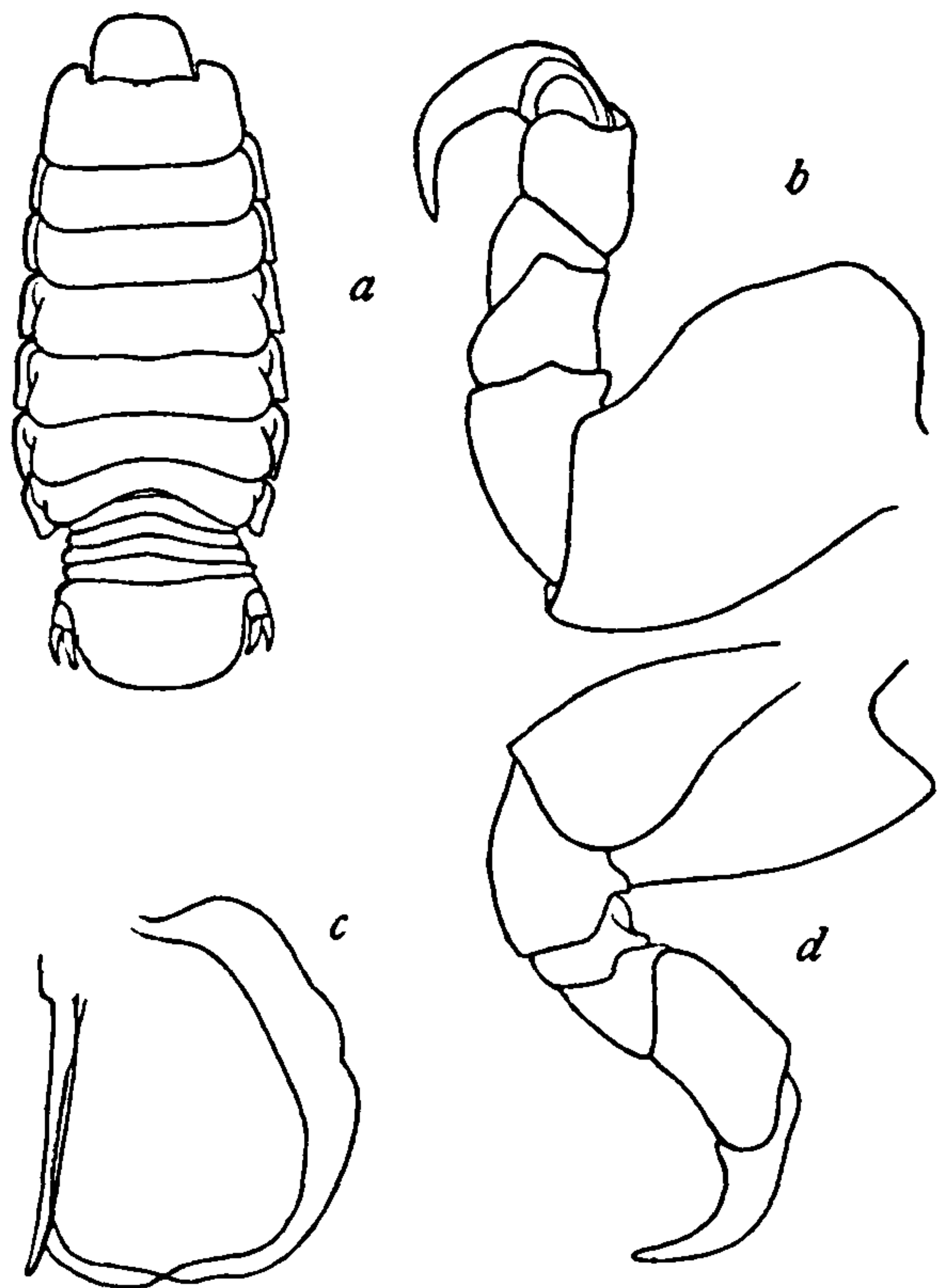


FIG. 262.—CYMOTHOA CARAIBICA (AFTER BOVALLIUS).
 a, DORSAL VIEW OF MALE. $\times \frac{5}{2}$. b, SEVENTH LEG OF
 RIGHT SIDE. $\times 12$. c, FOURTH LEG OF RIGHT SIDE.
 $\times 12$. d, SECOND PLEOPOD. $\times 12$.

long. The pleon and urus together are equal in length to half of the pereion without the head.

“The uropoda do not reach to the hinder margin of the urus. The peduncle is shorter than the inner ramus. The inner ramus is longer than the outer.

“Color. Yellowish-white, with smaller and larger brown-red spots on the anterior part of each segment; the posterior part is almost white.

“Length. The female virgo, 17 mm.

“The males, 12, 15, 16 mm.”—BOVALLIUS.^a

CYMOTHOA ÆSTRUM (Linnæus).

Oniscus æstrum LINNÆUS, Syst. Nat., 10th ed., I, 1758, p. 636, No. 2; Fauna suecica., 2d ed., 1761, p. 499, No. 2053; Syst. Nat., 12th ed., I, 1767, Pt. 2, p. 1059, No. 2.

Asellus æstrum OLIVIER, Encycl. Méthod., IV, 1789, p. 253.

Cymothoa æstrum FABRICIUS, Entom. Syst., II, 1798, p. 505, No. 6.—LEACH, Trans. Linn. Soc. London, XI, 1815, p. 372; Dict. Sci. Nat., XII, 1818, p. 352.

Cymothoa dufresnei LEACH, Dict. Sci. Nat., XII, 1818, p. 352.

Cymothoa immersa SAY, Jour. Acad. Nat. Sci. Phila., I, 1818, pp. 399–400.

Cymothoa æstrum DESMAREST, Consid. Gén. Crust., 1825, p. 309, pl. XLVII, figs. 6–7.—MIERS, Proc. Zool. Soc., 1877, pp. 671–672.—SCHIÆDTE and MEINERT, Naturh. Tidsskr. (3), XIV, 1883–84, pp. 271–279, pl. VIII, figs. 5–13.—RICHARDSON, American Naturalist, XXXIV, 1900, p. 221; Proc. U. S. Nat. Mus., XXIII, 1901, p. 530.

Localities.—Caribbean Sea and Gulf of Mexico to shores of Virginia; Swan Island; St. Bartholomew; St. Christopher; Jamaica; Guadeloupe; St. Georges, Bermudas; St. Anna, Mexico; Key West, Florida; Curaçao, Venezuela; Peru; Barbados (from stomach of a “redfish”).

Parasite of *Caranx latus*, “jackfish” (from branchial cavity); redfish (stomach); in the tongue of Scombroid fishes; from the mouth of *Priacanthus arenatus* and *Trachurops crumenophthalmus*; on *Strombus giganteus*.

Body oblong-ovate, twice as long as wide, 15 mm. : 30 mm.

Head, wider than long, 4 mm. : 6 mm., with the antero-lateral angles rounded and the anterior margin appearing straight from a dorsal view, but actually being somewhat triangularly produced and bent downward over the antennæ. The head is deeply set in the first thoracic segment, the broad and widely rounded antero-lateral angles of which extend to the anterior margin of the head. The eyes are absent, and no traces of them are seen. The first pair of antennæ are composed of eight articles and extend a little beyond the middle of the head. The second pair of antennæ are composed of nine articles and extend two articles beyond the first pair of antennæ. The basal arti-

^a Bihang till K. Sv. Vet.-Akad. Handl., X, No. 11, 1885, pp. 28–29.

cles of the first pair of antennæ are widely separated, being nearly 2 mm. apart. The maxillipeds have a palp of two articles. The palp of the mandibles is composed of three articles.

The first segment of the thorax is about twice as long as any of the three following segments, which are subequal. The antero-lateral expansions of the first segment are half as wide as the head, 3 mm. in width, and they are widely rounded at the anterior extremity. The fifth and sixth segments are half as wide in the median longitudinal line as any of the three preceding segments. The seventh segment is a little shorter than the sixth. The epimera are distinctly separated

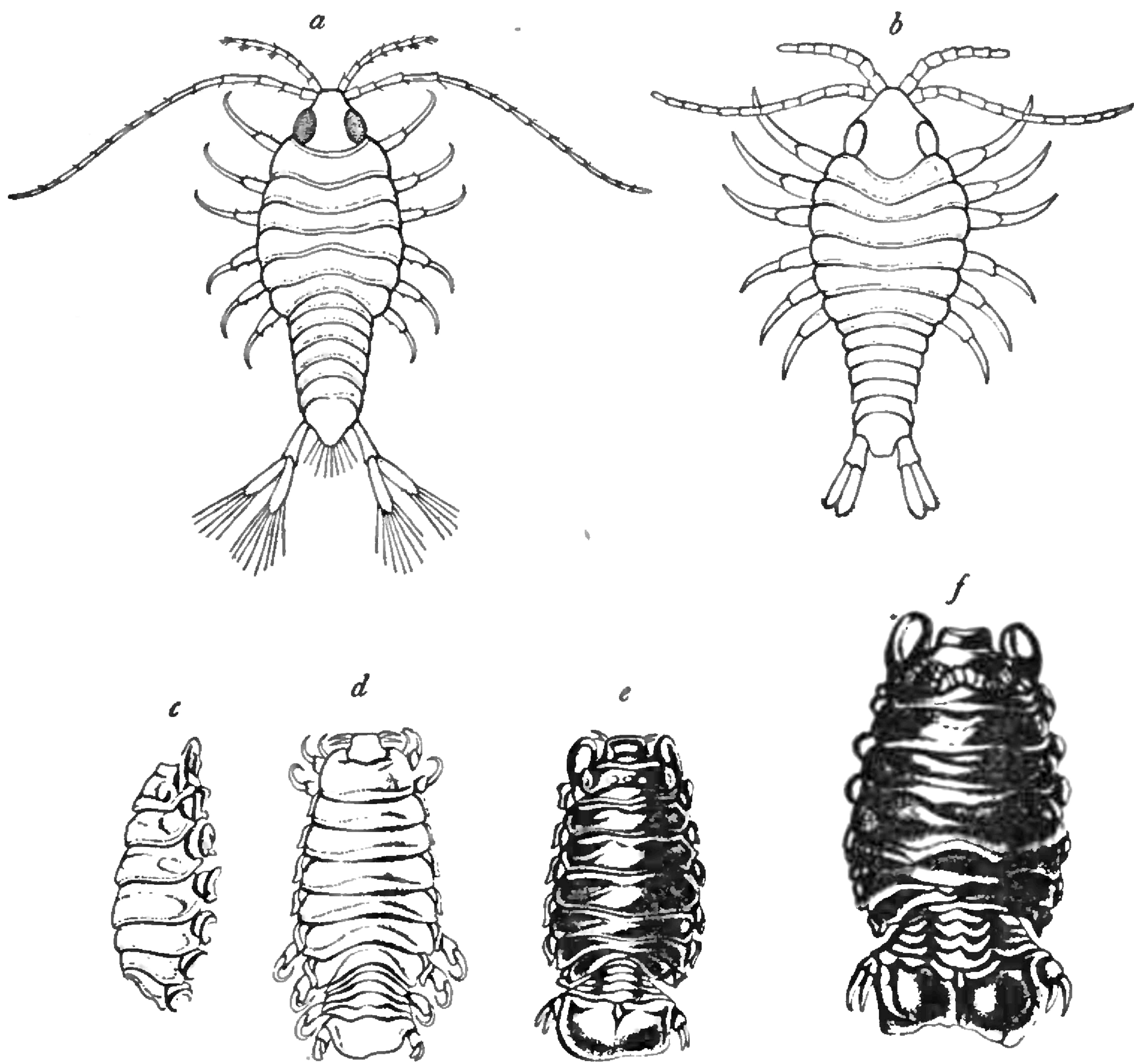


FIG. 263.—CYMOTHOA OESTRUM (AFTER SCHIÖDTE AND MEINERT). *a*, YOUNG OF THE SECOND STAGE (ENLARGED). *b*, YOUNG OF THE FIRST STAGE (ENLARGED). *c*, LATERAL VIEW OF THORAX OF ADULT FEMALE (REDUCED). *d*, ADULT MALE (ENLARGED). *e*, ADULT FEMALE (REDUCED). *f*, ADULT FEMALE (REDUCED).

on all the segments with the exception of the first. They are narrow plates, extending or nearly extending the full length of the segments. Those of the second segment are a little broader anteriorly than are the others.

The abdomen is deeply set in the thorax. All the segments are distinct, the lateral parts of the first two being covered by the seventh thoracic segment, so that these segments appear abruptly narrower than the thorax. The following segments gradually increase in width. The sixth or terminal segment is twice as broad as long, 6 mm.: 12

mm. The post-lateral angles are rounded, and the posterior margin is slightly excavate in the middle. The uropoda are as long as the

terminal abdominal segment. The outer branch is slightly shorter than the inner branch. Both are equal in width, and narrow, with extremities rounded.

The legs are all prehensile, with short, stout, curved dactyli. There is a high carina on the basis of the last four pairs, the carina increasing gradually from the fourth to the seventh pair, where it is extremely high.^a

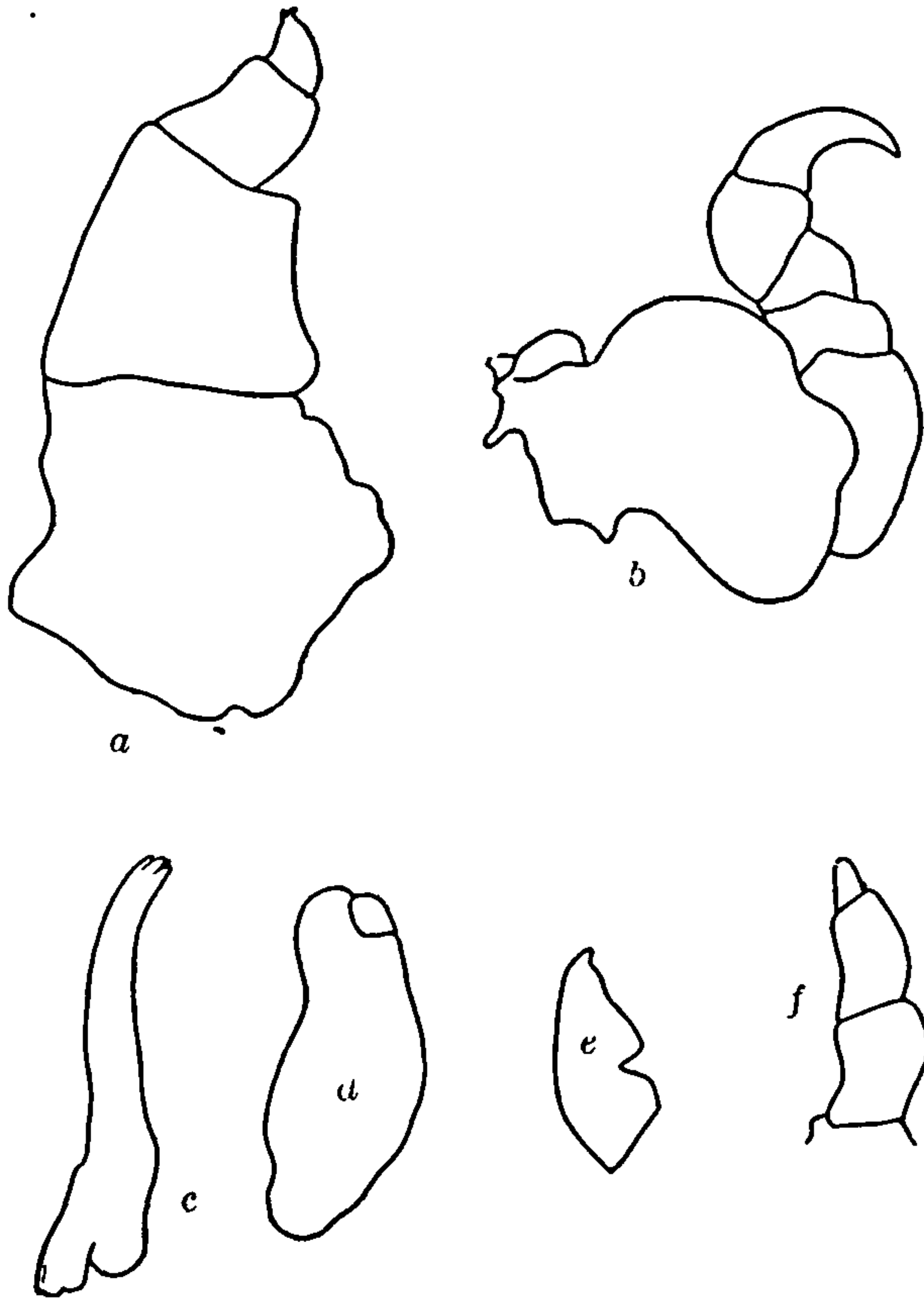


FIG. 264.—CYMOTHOA OESTRUM. a, MAXILLIPED. $\times 15\frac{1}{2}$. b, SEVENTH LEG. $\times 4\frac{1}{2}$. c, FIRST MAXILLA. $\times 15\frac{1}{2}$. d, SECOND MAXILLA. $\times 15\frac{1}{2}$. e, MANDIBLE. $\times 15\frac{1}{2}$. f, PALP OF MANDIBLE. $\times 15\frac{1}{2}$.

42. Genus LIVONECA
Leach.

Body suboval, more or less twisted.

Head most always deeply immersed. First pair of antennæ widely separated at the base, rather compressed.

Anterior margin of the first thoracic segment widely sin-

uated in the middle, more or less sinuated or incised at the anterolateral angles.

Abdomen very little immersed, continuous with thorax, not narrower than thorax.

ANALYTICAL KEY TO THE SPECIES OF THE GENUS LIVONECA.

- a. Abdomen somewhat immersed in thorax, the sides of the first segment being almost entirely covered by the seventh thoracic segment.
- b. Head quadrate, but little broader at the base than at the anterior end.
 - Livoneca panamensis* Schiødte and Meinert
- b'. Head triangular, nearly twice as broad at the base as at the anterior extremity.
- c. Head roundly truncate in form. Terminal segment of abdomen nearly twice as broad as long.....*Livoneca vulgaris* Stimpson
- c'. Head narrowly rounded in front. Terminal segment of abdomen about as long as broad.....*Livoneca californica* Schiødte and Meinert
- a'. Abdomen not immersed in thorax, the sides of the first segment free.

^aFor complete description of this form, the male and female and the young of the first and second stages, see Schiødte and Meinert, Nat. Tidsskr. (3), XIV, 1883-84, pp. 271-278

- b.* Uropoda much longer than caudal segment; inner branch narrow, obtuse, much shorter than outer branch. Epimera of last two thoracic segments not longer than segments.....*Livoneca redmanni* Leach
- b'.* Uropoda hardly surpassing the caudal segment; both branches equal in length. Epimera of last two segments of thorax surpassing the segments.
Livoneca ovalis (Say)

LIVONECA PANAMENSIS Schiødte and Meinert.

Livoneca panamensis SCHIØDTE and MEINERT, Naturhistorisk Tidsskrift (3), XIV, 1883-84, pp. 349-353, p. XIII, figs. 11-12.—RICHARDSON, Proc. U. S. Nat. Mus., XXI, 1899, p. 830; Ann. Mag. Nat. Hist. (7), IV, 1899, p. 172.

Localities.—Mazatlan; west shores of Central America; Panama.

Body ovate, less than twice as long as wide, 16 mm.: 27 mm.

Head quadrangular, wider than long, 3 mm.: 4 mm., with the anterior margin truncate and about 2 mm. wide. The eyes are small and distinct and situated at the sides of the head near the posterior margin. The first pair of antennæ are separated in front by a distance of 1 mm. They are composed of eight articles, and extend to the posterior margin of the head. The second pair of antennæ are composed of ten articles and extend to the middle of the first thoracic segment.

The first segment of the thorax has the anterolateral angles produced to surround the head, where they extend to the middle of the lateral margin. The first segment is 4 mm. in length. The second and third are subequal and each is 3 mm. long. The fourth and fifth are subequal and each is 2½ mm. in length. The sixth is 2 mm. long. The seventh is 1½ mm. The epimera of all the segments, with the exception of the first, are distinctly separated from the segments. The epimera extend the full length of the lateral margins, with the exception of those of the fifth and sixth segments, which do not quite reach the posterior margins of the segments.

The abdomen is slightly immersed or set in the thorax. The first segment is entirely covered by the seventh thoracic segment except in the dorsal portion. All the segments are distinct. The sixth or terminal segment is large, nearly twice as wide as long, 6 mm.: 10 mm., and has the posterior margin irregularly rounded. The uropoda have both branches similar in shape and size and of equal length. They are long and narrow with posterior

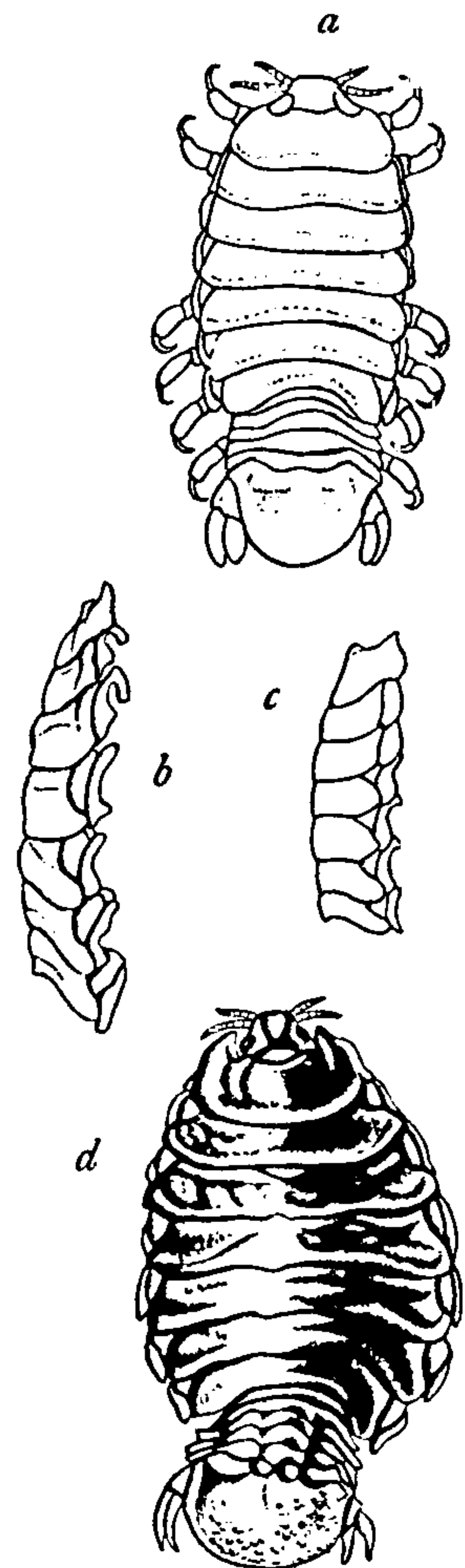


FIG. 265.—LIVONECA PANAMENSIS (AFTER SCHIØDTE AND MEINERT). *a*, ADULT MALE. *b*, LATERAL VIEW OF THORAX OF ADULT FEMALE. *c*, LATERAL VIEW OF THORAX OF ADULT MALE. *d*, ADULT FEMALE. (ALL ENLARGED.)

margins rounded and do not extend quite to the extremity of the terminal abdominal segment.

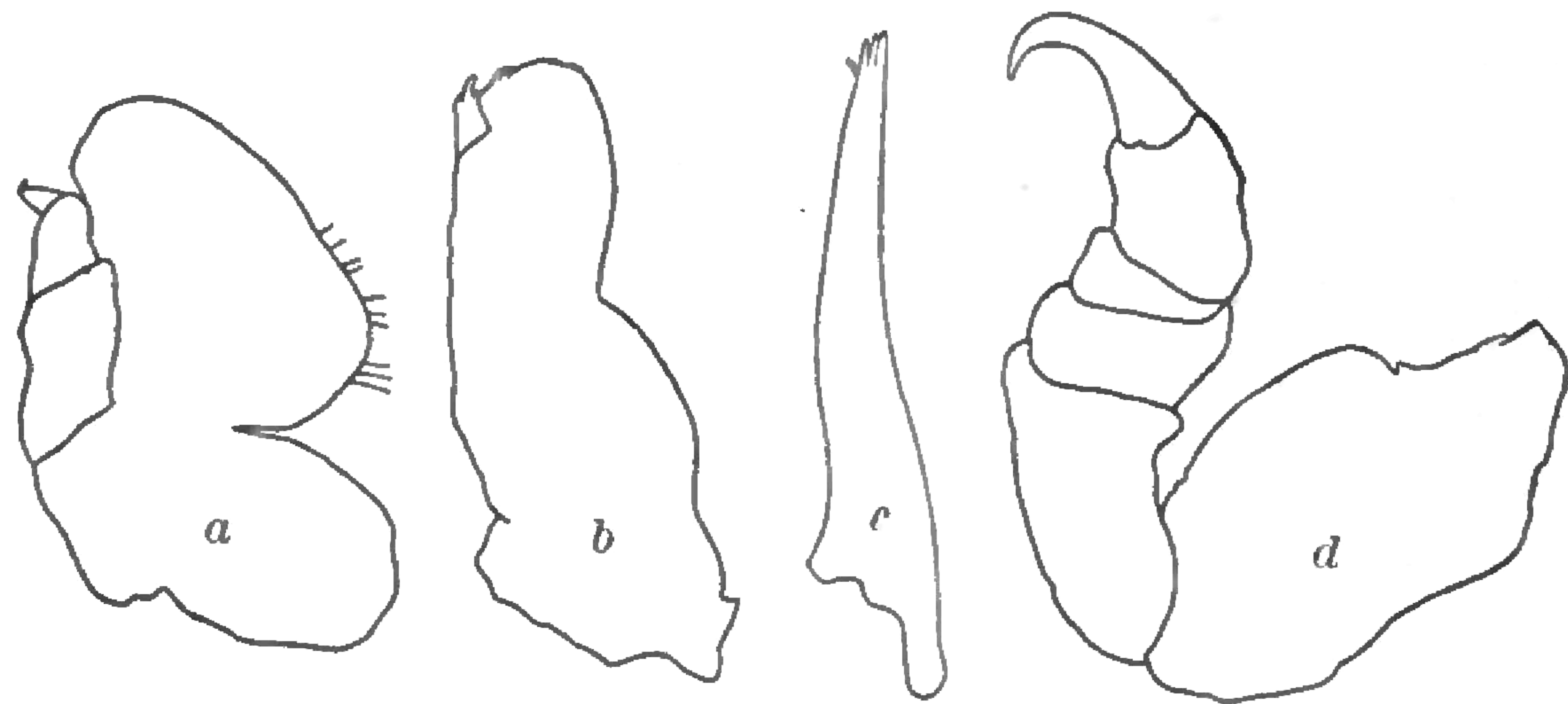


FIG. 266.—LIVONECA PANAMENSIS. *a*, MAXILLIPED OF FEMALE. $\times 11\frac{1}{2}$. *b*, SECOND MAXILLA. $\times 20\frac{1}{2}$. *c*, FIRST MAXILLA. $\times 20\frac{1}{2}$. *d*, SEVENTH LEG. $\times 7$.

The legs are all prehensile. Those of the last four pairs have a high carina on the basis, the carina increasing gradually in height from the fourth to the seventh pair.

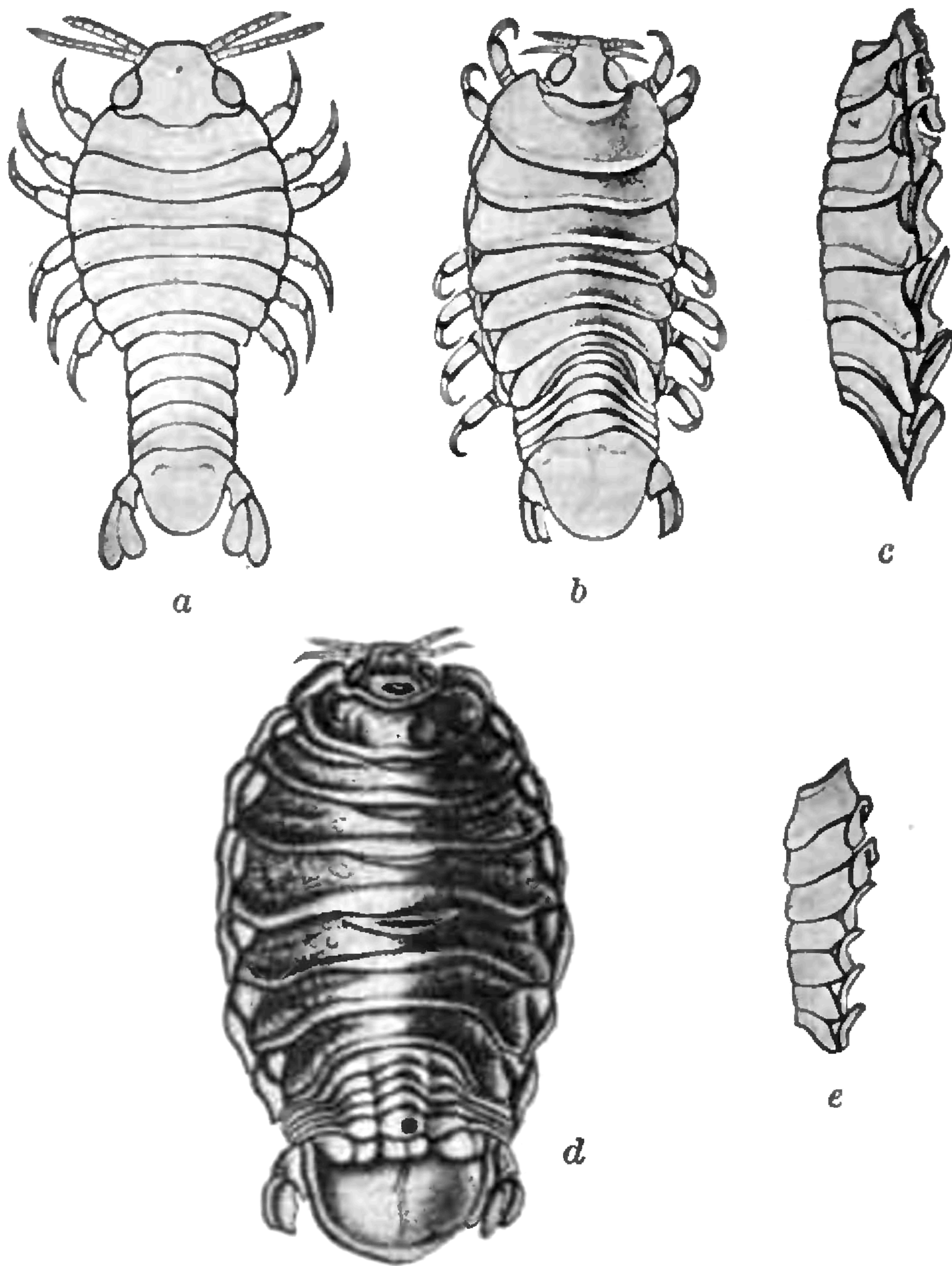


FIG. 267.—LIVONECA VULGARIS (AFTER SCHIÆDTE AND MEINERT). *a*, YOUNG OF THE FIRST STAGE. *b*, ADULT MALE. *c*, LATERAL VIEW OF THORAX OF ADULT FEMALE. *d*, ADULT FEMALE. *e*, LATERAL VIEW OF THORAX OF ADULT MALE. (ALL ENLARGED.)

LIVONECA VULGARIS Stimpson.

Livoneca vulgaris STIMPSON, Bost. Jour. Nat. Hist., VI, 1857, p. 508, pl. XXII, fig. 9.—SCHIÆDTE and MEINERT, Naturhistorisk Tidskrift (3), XIV, 1883-84, pp. 344-349, pl. XIV, figs. 1-2.—RICHARDSON, Proc. U. S. Nat. Mus., XXI, 1899, p. 830; Ann. Mag. Nat. Hist. (7), IV, 1899, p. 172.

Anilocra occidentalis^a RICHARDSON, Proc. U. S. Nat. Mus., XXI, 1899, pp. 830-831; Ann. Mag. Nat. Hist. (7), IV, 1899, pp. 172-174; Amer. Nat., XXXIV, 1900, p. 220.

Livoneca vulgaris RICHARDSON, American Naturalist, XXXIV, 1900, p. 221; Harriman Alaska Expedition, Crust., X, 1904, p. 214; Proc. U. S. Nat. Museum, XXVII, 1904, p. 659.

Localities.—Shores of California, near San Francisco, to Santa Margarita Island, Lower California; San Francisco Bay.

Parasites of the rock cod; of flounder; from Chinese shrimp nets; on *Hyperprosopon argenteus*; in gills of *Steindachneria*, *Ophiodon elongatus*.

^aThis form is probably the young male of *Livoneca vulgaris*.

Body ovate, not twice as wide as long, 17 mm. : 28 mm., widest at the fourth thoracic segment.

The head is triangular, and at the base is wider than long, 3 mm. : 5 mm.; it is partly set in the first thoracic segment, the antero-lateral angles of which extend to about the middle of the head. The eyes are small, oval, composite, situated in the post-lateral angles of the head, and separated anteriorly by a distance nearly equal to the length of one eye. The posterior margin of the head is rounded; the anterior margin is widely rounded. The anterior end is 2 mm. wide. The first pair of antennæ are composed of eight articles and extend to the end of the sixth article of the second pair of antennæ. The basal articles are not adjacent, being separated by a distance equal to 1 mm. The second pair of antennæ are composed of ten articles, and extend to the middle of the first thoracic segment. The maxillipeds have a

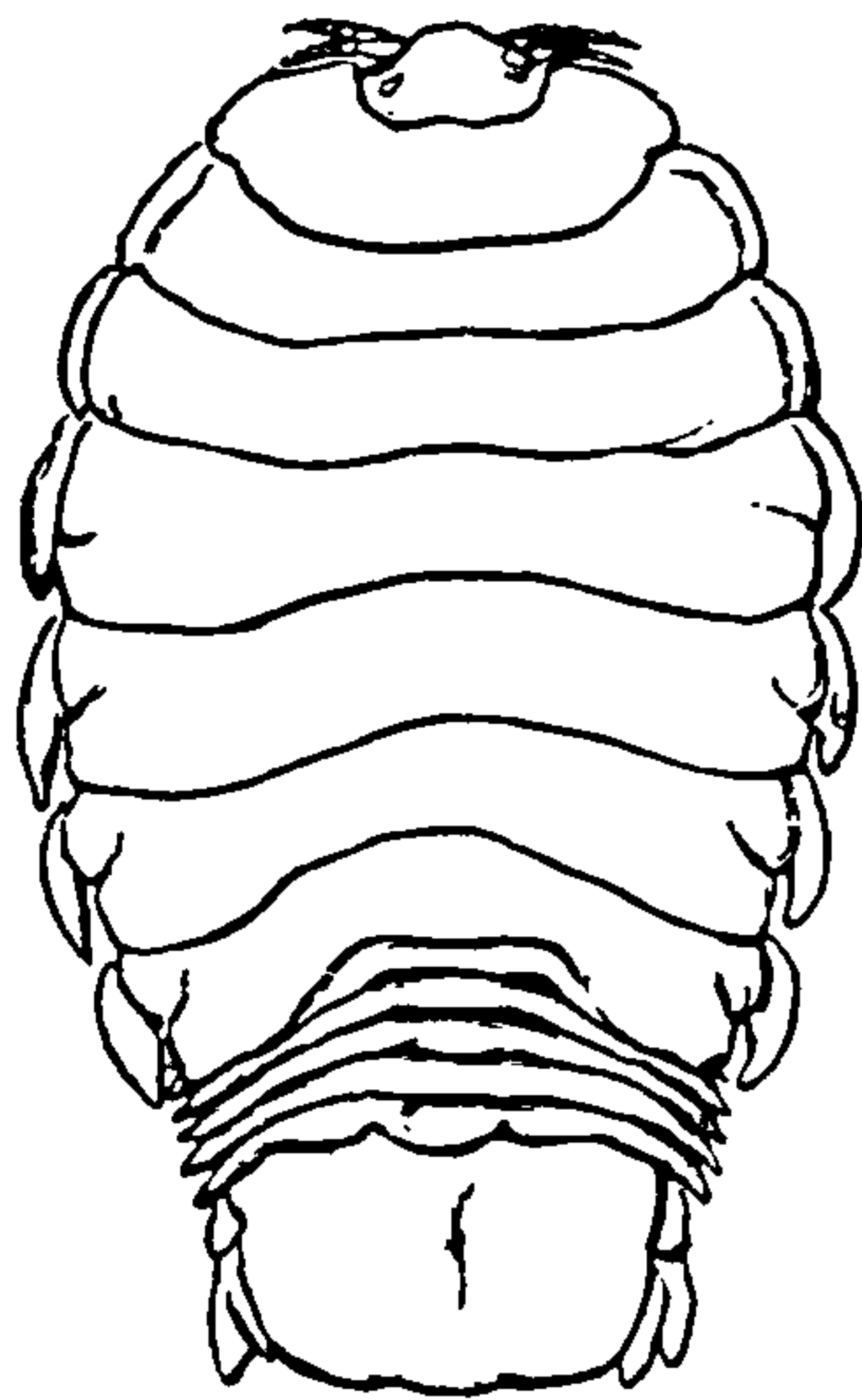


FIG. 268.—LIVONECA VULGARIS (AFTER STIMPSON).

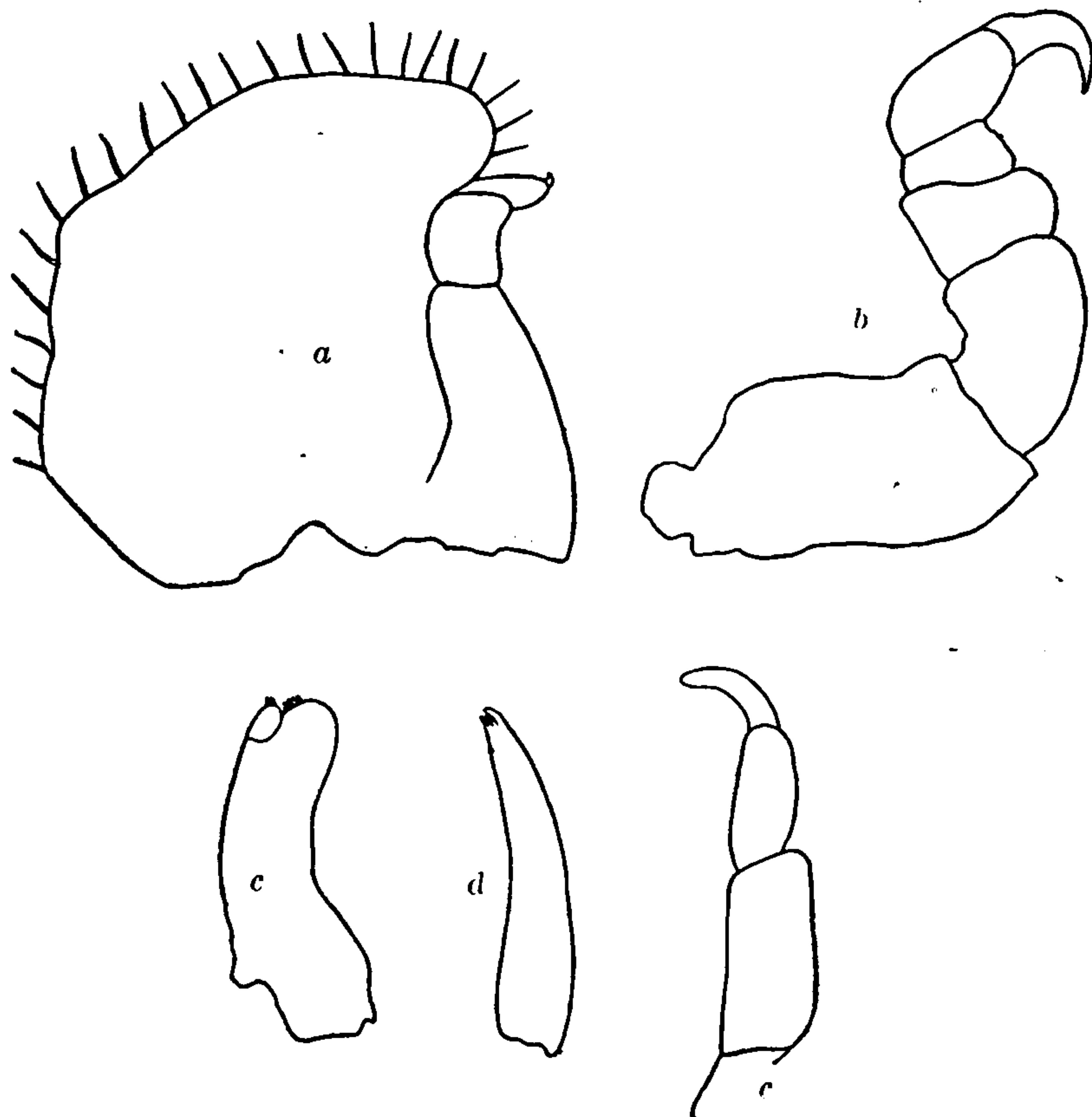


FIG. 269.—LIVONECA VULGARIS. *a*, MAXILLIPED OF FEMALE. $\times 27\frac{1}{2}$. *b*, SEVENTH LEG. $\times 9\frac{3}{4}$. *c*, SECOND MAXILLA. $\times 27\frac{1}{2}$. *d*, FIRST MAXILLA. $\times 27\frac{1}{2}$. *e*, PALP OF MANDIBLE. $\times 27\frac{1}{2}$.

palp of two articles. The palp of the mandibles is composed of three articles.

The first and fourth segments of the thorax are the longest, each being 3 mm. in length. The second and sixth are each 2 mm. long.

The third and fifth are subequal, each being $2\frac{1}{2}$ mm. in length. The seventh is the shortest, being $1\frac{1}{2}$ mm. long. The epimera are distinctly separated on the last six segments. They are narrow plates, extending the full length of the lateral margins of the segments.

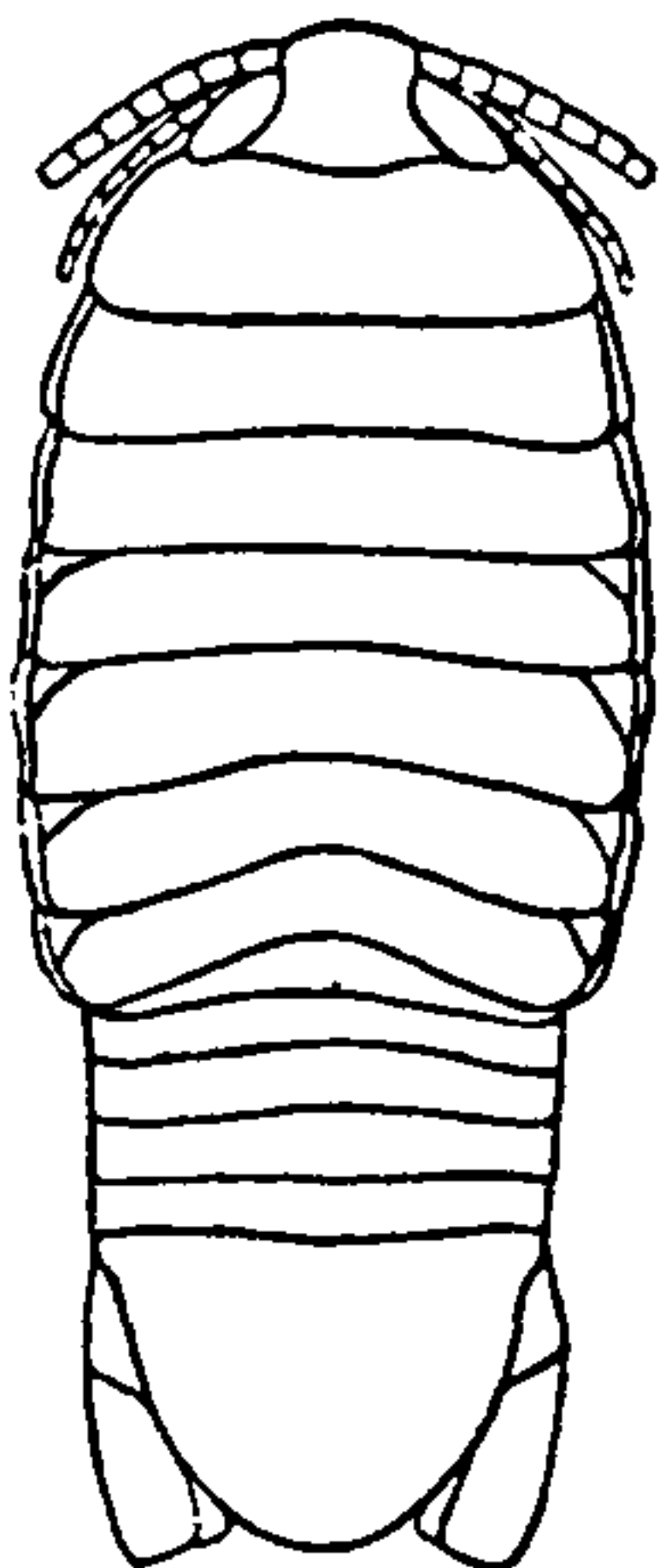


FIG. 270. —LIVONECA VULGARIS. YOUNG MALE.

The abdomen is not narrower than the last thoracic segment. The first segment is covered at the sides by the seventh thoracic segment. The terminal segment is nearly twice as wide as long, 5 mm. : 9 mm. and is widely rounded posteriorly. The uropoda are as long as the terminal segment. Both branches are of equal width and length, and are alike in shape, terminating in rounded extremities.

The legs are all prehensile, and are furnished with long, narrow dactyli. The basis of the last four pairs is produced in a not very high carina.^a

LIVONECA CALIFORNICA Schiøedte and Meinert.

Livoneca californica SCHIØEDTE and MEINERT, Naturhistorisk Tidsskrift (3), XIV, 1883-84, pp. 372-374, pl. xvi, figs. 1-2.—RICHARDSON, Proc. U. S. Nat. Mus., XXI, 1899, p. 829; Ann. Mag. Nat. Hist. (7), IV, 1899, p. 172; Amer. Nat., XXXIV, 1900, p. 221.

Localities.—Shores of California, near San Francisco; Fort Point, San Francisco, California; off Point Nuevo, California; San Pedro, California; South Belmont Oyster Beds, San Francisco Bay, California; Santa Cruz, California.

Parasite of "shiner."

Body oblong-ovate, a little more than twice as long as wide, 7 mm. : 16 mm., and twisted somewhat to one side, the right side being shortened.

The head is as wide at the base as it is long, 2 mm. : 2 mm., and is somewhat triangular, becoming gradually more narrow to an apex which is $\frac{1}{2}$ mm. wide and narrowly rounded. The eyes are large, oval, composite, and situated in the post-lateral angles of the head; they are separated anteriorly by a distance equal to the length of one eye. The posterior margin of the head is rounded. The first pair of antennæ are composed of eight articles. The basal articles are not contiguous, but the distance between them is very small, owing to the narrowness of the anterior part of the head. The second pair of antennæ are composed of eight articles. They extend to the end of the seventh article of the first pair of antennæ and are very slender and feeble. The maxillipeds have a palp of two articles. The palp of the mandibles is composed of three articles.

^a For description of this form, the male, female, and the young of the first stage, see Schiøedte and Meinert, Nat. Tidsskr. (3), XIV, 1883-84, pp. 344-349.

The first segment of the thorax is longest, being 2 mm. in length. The second and third are subequal, each being $1\frac{1}{2}$ mm. long. The fourth, fifth, and sixth are subequal, each being 1 mm. long. The seventh is shortest, being only $\frac{1}{2}$ mm. in length. The head is partly immersed or set in the first thoracic segment, the antero-lateral angles of which extend to about the middle of the head. The epimera are distinctly separated on the last six segments. They are narrow plates, which in the sec-

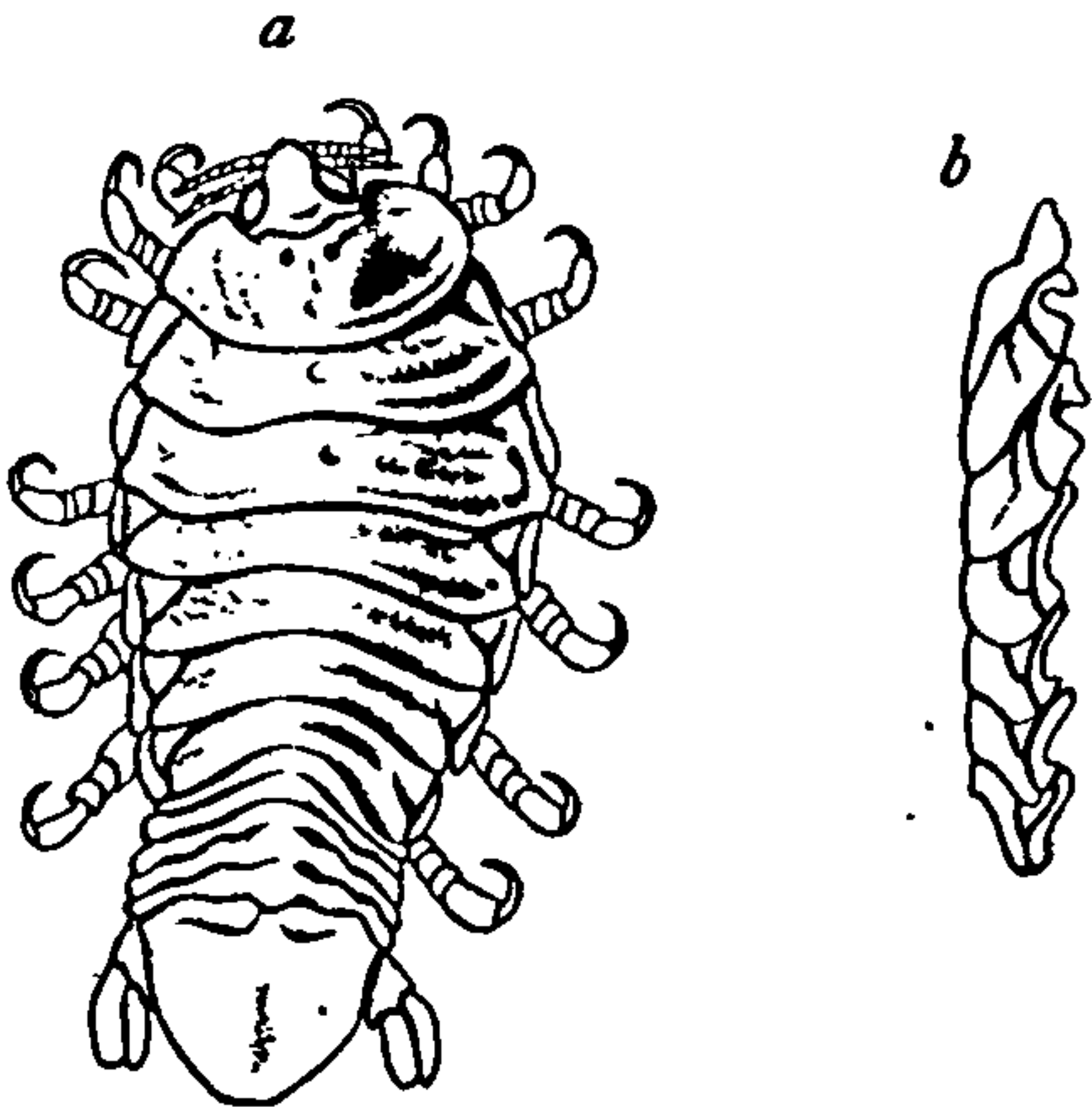


FIG. 271.—LIVONECA CALIFORNICA (AFTER SCHIEDTE AND MEINERT). *a*, ADULT FEMALE. *b*, LATERAL VIEW OF THORAX. (BOTH ENLARGED.)

ond and third segments do not quite reach the post-lateral angles of the segments. In the last four the epimera extend the full

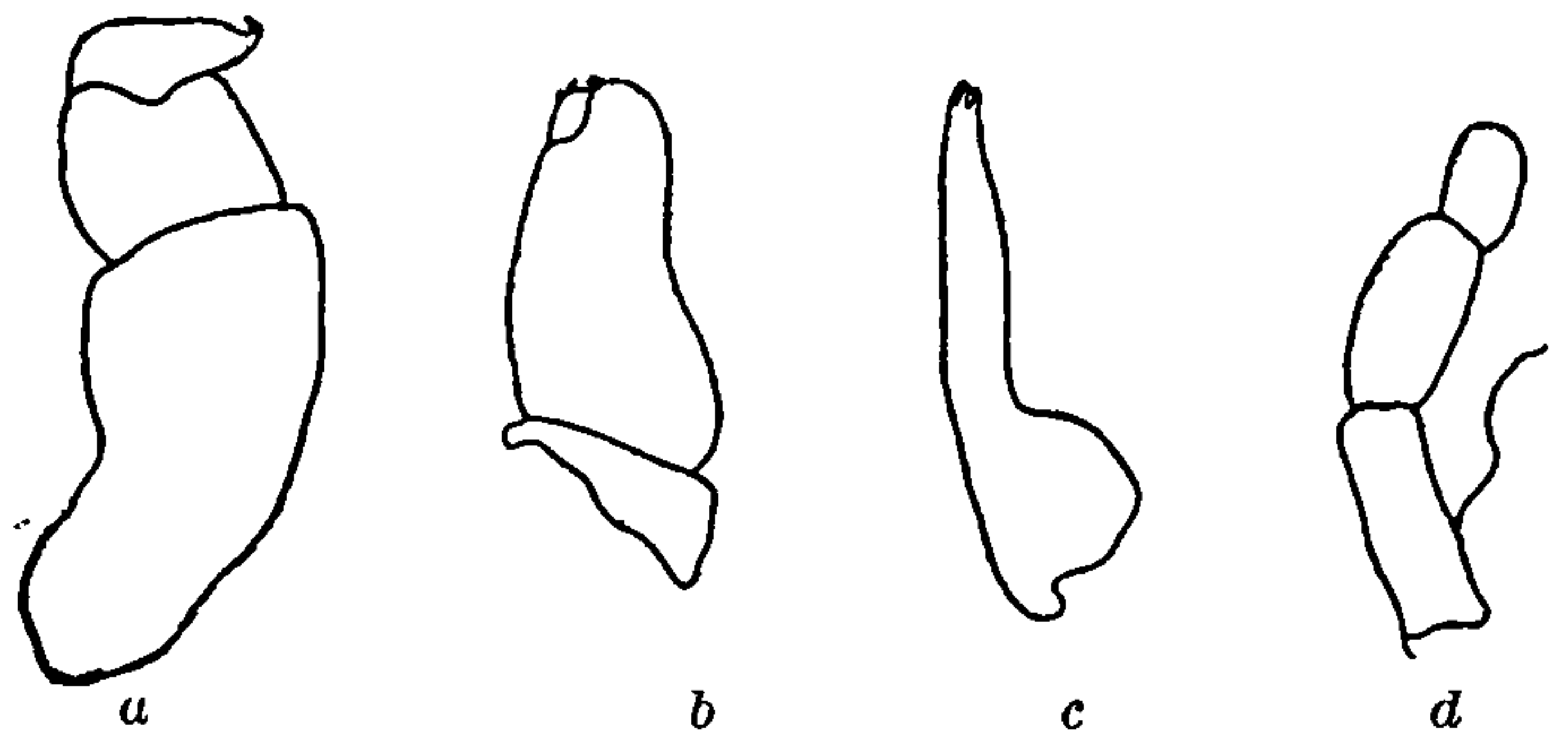


FIG. 272.—LIVONECA CALIFORNICA. *a*, MAXILLIPED. $\times 33$. *b*, SECOND MAXILLA. $\times 33$. *c*, FIRST MAXILLA. $\times 33$. *d*, PALP OF MANDIBLE. $\times 33$.

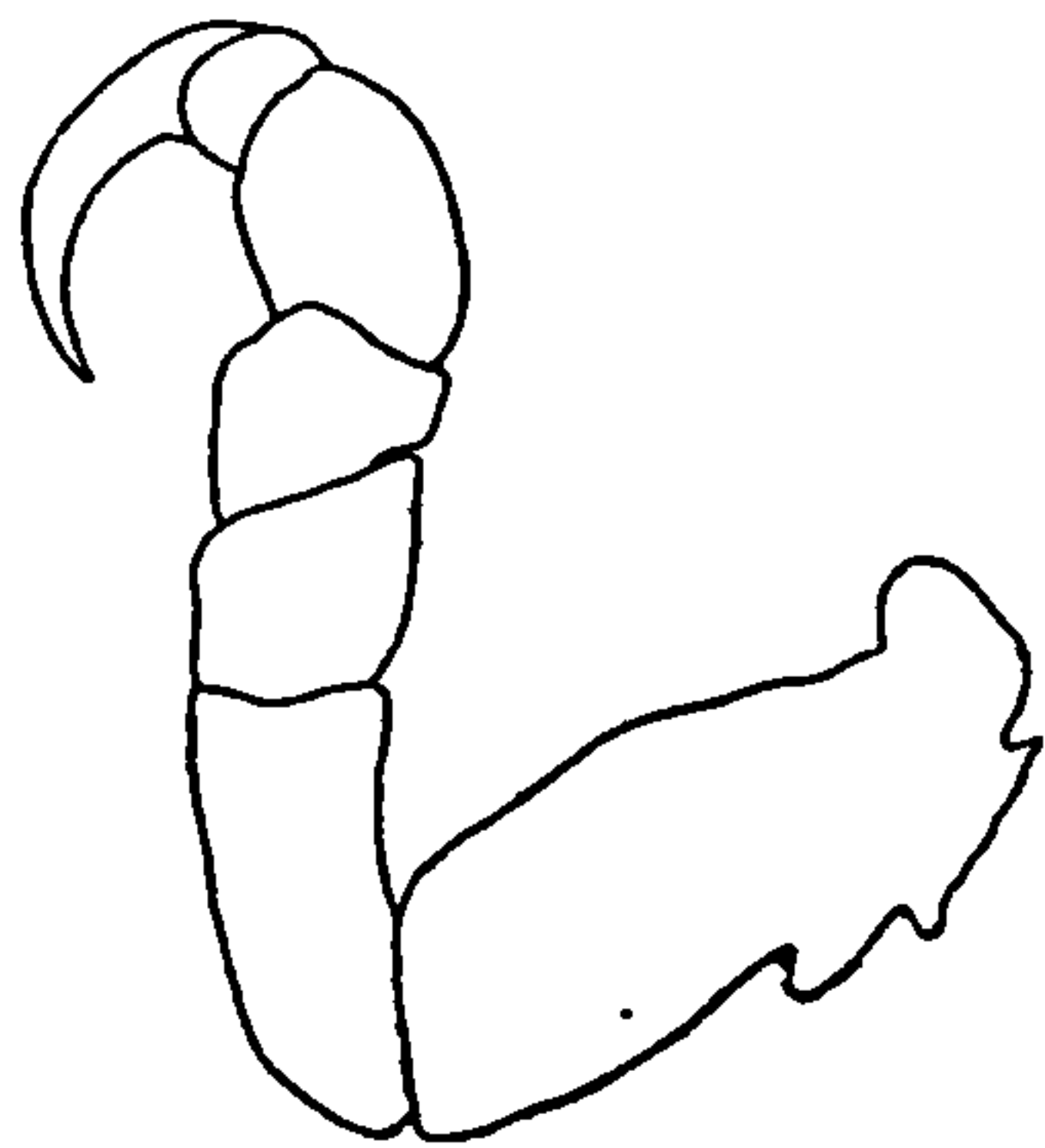


FIG. 273.—LIVONECA CALIFORNICA. SEVENTH LEG. $\times 11\frac{1}{2}$.

length of the lateral margins of the segments.

The abdomen is not narrower than the last thoracic segment. The first segment is partly covered at the sides by the seventh thoracic segment. The terminal segment is rounded posteriorly; it is 4 mm. wide and $3\frac{1}{2}$ mm. long. The uropoda are not longer, but as long as the terminal abdominal segment. The branches are equal in length and width, are alike in shape, terminating in rounded extremities.

All the legs are prehensile, being furnished with long, narrow, curved dactyli. There is no carina on the basis of any of the legs.

LIVONECA REDMANNI. Leach.

Livoneca redmanni LEACH, Dict. Sci. Nat., XII, 1818, p. 352.

Livoneca desmarestii LEACH, Dict. Sci. Nat., XII, 1818, p. 352.

Livoneca redmanni DESMAREST, Consid. Gén. Crust., 1825, p. 308.

Livoneca desmarestii DESMAREST, Consid. Gén. Crust., 1825, p. 308.

Livoneca redmanni MILNE EDWARDS, Hist. Nat. Crust., III, 1840, p. 261.

Livoneca desmarestii MILNE EDWARDS, Hist. Nat. Crust., III, 1840, p. 261.

Livoneca redmanni MILNE EDWARDS, Cuvier's Règne Anim., pl. LXVI, figs. 4-4a.

Livoneca desmarestii MILNE EDWARDS, Cuvier's Règne Anim., pl. LXVI, figs. 3-3a.

Livoneca redmanni SCHIEDTE and MEINERT, Naturh. Tidsskr. (3), XIV, 1883-84, pp. 353-358, pl. XIV, figs. 6-12.—RICHARDSON, American Naturalist, XXXIV, 1900, p. 221; Proc. U. S. Nat. Mus., XXIII, 1901, p. 531.

Localities.—Cuba; St. Christopher; Jamaica; Bahia and Rio de Janeiro, Brazil.

Parasite of kingfish (on gills).

Body ovate, nearly twice as long as wide, 13 mm.: 25 mm.

Head a little wider than long, 3 mm.: 4 mm.; twice as wide at the posterior end as at the anterior end, with the posterior margin widely rounded, the anterior margin somewhat rounded and deflected downward over the antennæ. The eyes are indistinct and perhaps functionless; they are situated in the post-lateral lobes of the head. The first pair of antennæ are composed of eight articles. The basal articles of each antenna are not adjacent, but are separated by a distance

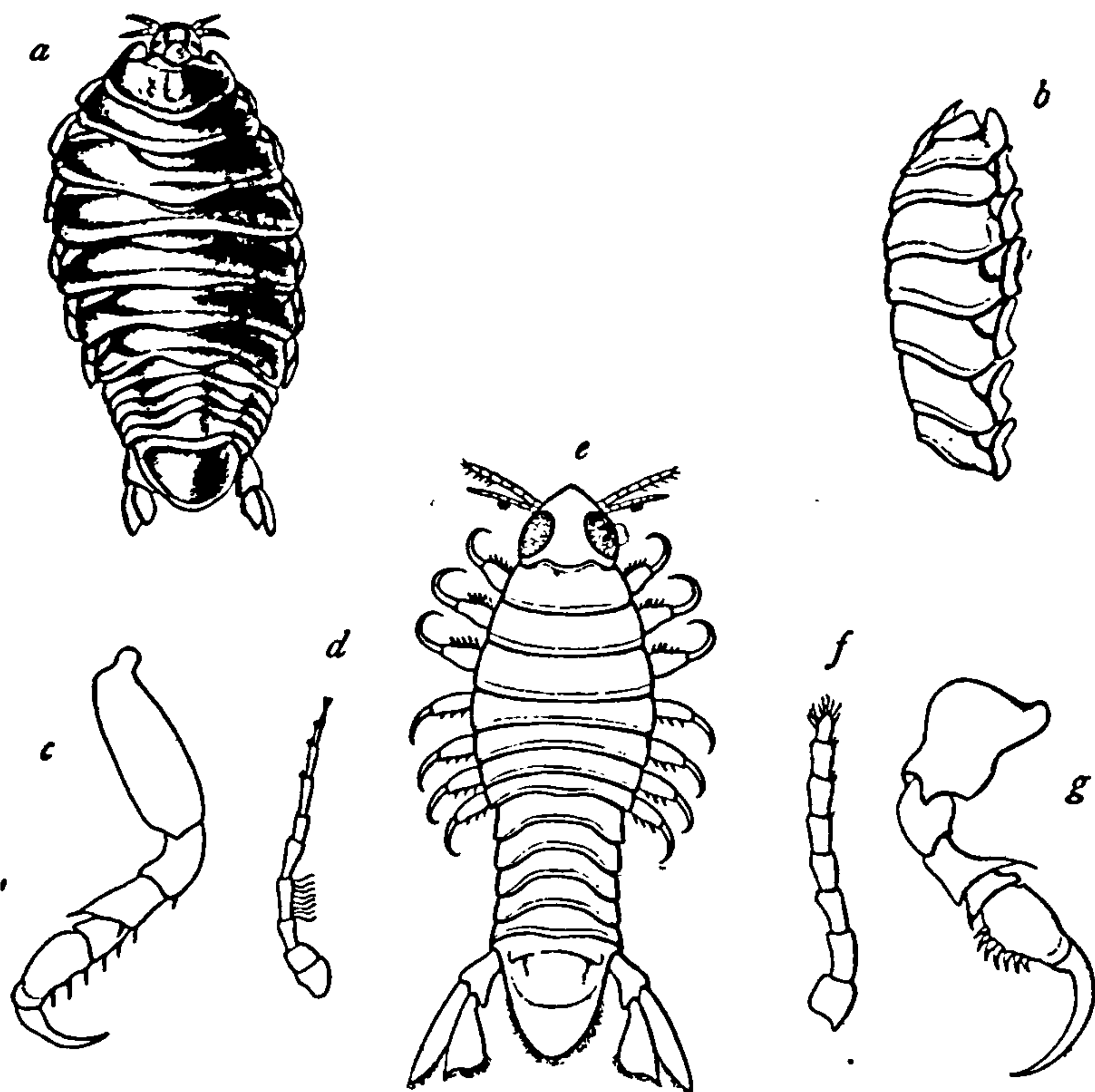


FIG. 274.—LIVONECA REDMANNI (AFTER SCHIEDTE AND MEINERT). *a*, ADULT FEMALE. *b*, LATERAL VIEW OF THORAX OF SAME. *c*, LEG OF SEVENTH PAIR OF YOUNG FEMALE. *d*, ANTENNA OF SECOND PAIR OF SAME. *e*, YOUNG FEMALE. *f*, ANTENNA OF FIRST PAIR OF SAME. *g*, THIRD LEG OF SAME. (ALL ENLARGED.)

of 1 mm. The second antennæ are composed of ten articles and extend almost to the middle of the first thoracic segment. The maxillipeds have a palp of two articles. The palp of the mandibles is composed of three articles.

The head is but little immersed or set in the first thoracic segment. The antero-lateral angles of the first segment extend one-third the length of the head. The first and fifth segments are a little longer than any of the others, each being $2\frac{1}{2}$ mm. long. The second, third, fourth, and sixth segments are subequal, and each is 2 mm. in length. The seventh segment is shortest, being only $1\frac{1}{2}$ mm. long. The epimera are narrow plates, distinctly separated on the last six segments and extending the full length of the segment.

The abdomen at its base is not abruptly narrower than the thorax. It tapers to a narrower extremity. The first segment is as wide as the seventh thoracic segment and is partly covered by it. The sixth or terminal segment is rounded posteriorly; it is 6 mm. long and 8 mm. wide at the base. The uropoda are much longer than the terminal abdominal segment and extend some distance (2 mm.) beyond its extremity. The outer branch is longer and narrower than the inner branch and has the posterior extremity rounded. The inner branch is broad at its posterior end, which is obliquely truncate, with the outer post-lateral angle produced in a rounded lobe, the inner angle being obtuse.

The legs are all prehensile, with long, curved dactyli. The basis of the last four pairs is produced in a low carina.

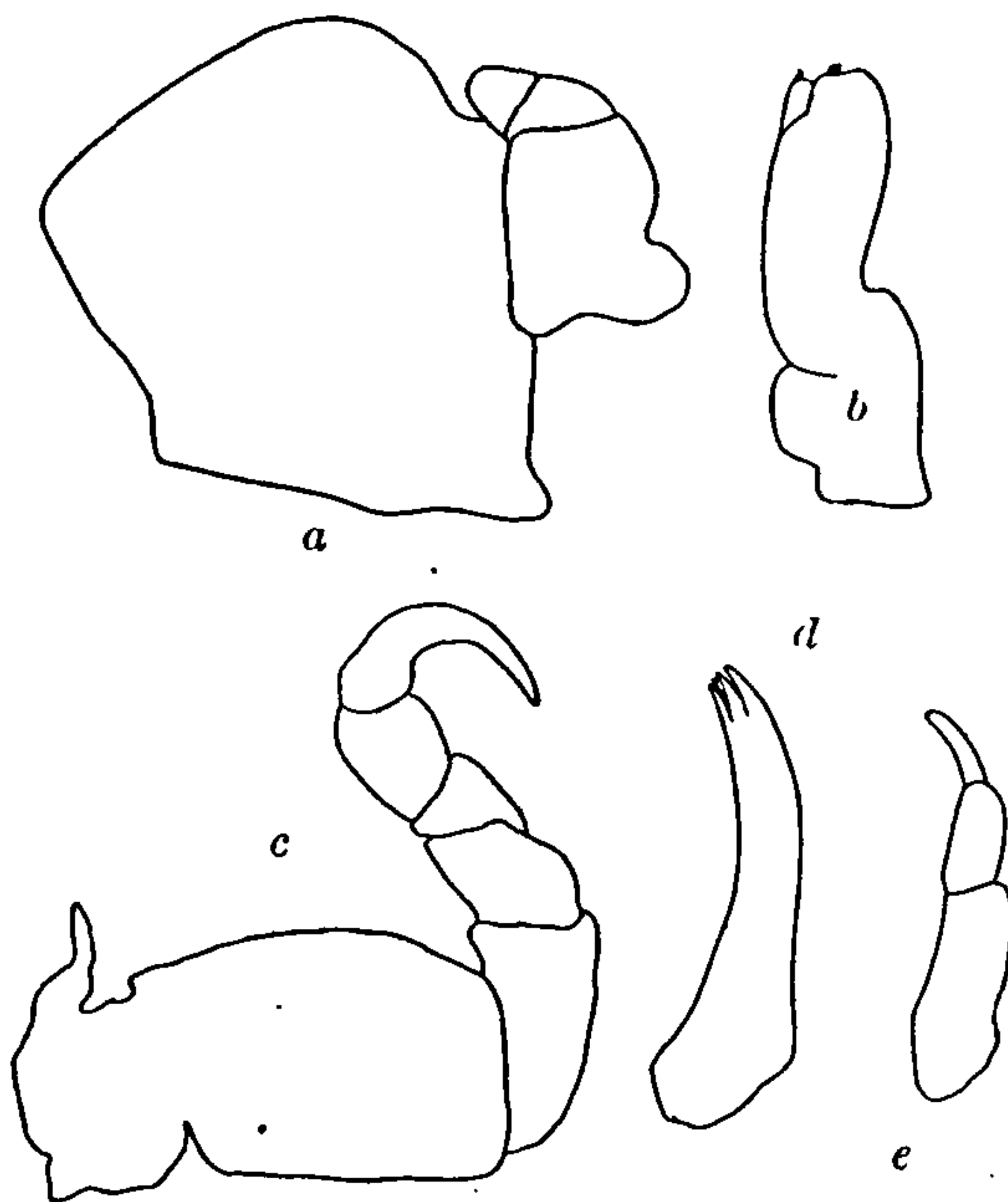


FIG. 275.—LIVONECA REDMANNI. a, MAXIL-
LIPED OF FEMALE. $\times 39$. b, SECOND MAXILLA.
 $\times 20\frac{1}{2}$. c, SEVENTH LEG. $\times 7$. d, FIRST MAX-
ILLA. $\times 39$. e, PALP OF MANDIBLE. $\times 20\frac{1}{2}$.

LIVONECA OVALIS (Say).

Cymothoa ovalis SAY, Jour. Acad. Nat. Sci. Phila., I, 1818, p. 394.

Cymothoa triloba DE KAY, Nat. Hist. New York, Pt. 1, 1843, p. 46, pl. x, fig. 40.

(?) *Cymothoa olivacea* DE KAY, Nat. Hist. New York, Pt. 1, 1843, p. 47, pl. x, figs. 41-41a.

Livoneca ovalis WHITE, Cat. Crust. Brit. Mus., 1847, p. 109.—HARGER, with VERRILL, Report U. S. Commissioner of Fish and Fisheries, Pt. 1, 1873, p. 572 (278), pl. VI, fig. 29.—HARGER, Proc. U. S. Nat. Mus., II, 1879, p. 162; Report U. S. Commissioner of Fish and Fisheries, Pt. 6, 1880, pp. 395-396, pl. XI, fig. 67.—RICHARDSON, American Naturalist, XXXIV, 1900, p. 222; Proc. U. S. Nat. Mus., XXIII, 1901, p. 531.

Localities.—New Haven, Connecticut; Thimble Islands; Long Island Sound; Woods Hole, Massachusetts; Vineyard Sound; New York; Patapsco River; Bonday's Wharf, Patapsco, Baltimore City, Maryland; Charleston, South Carolina; Pensacola, Florida; St. Marys River, Florida; Mobile, Alabama; Biloxi, Mississippi; Sandy Hook Bay, New Jersey; Hunger's wharf, Virginia; Chesapeake Bay; South Florida; Long Island; Great South Bay, Long Island; Tolchester, Maryland.

Parasite of the blue-fish *Pomatomus saltatrix* (from gills); *Lagodon rhomboides* (under gill cover); saw-fish *Pristis semisagittatus*; scup *Stenotomus chrysops* (on gills); *Trachurops crumenophthalmus* (from gill); trout *Cynoscion regalis?* (on gills); sun fish (on gills); *Micropogon undulatus*.

Body ovate, about one and two-thirds times longer than wide, 13 mm.: 21 mm.

Head as wide as long, 3 mm.: 3 mm., narrower anteriorly than posteriorly with the frontal margin widely rounded. Eyes small, indistinct and situated in the post-lateral angles of the head. Posterior margin of head rounded. The first pair of antennæ are composed of six to seven articles, and extend to the antero-lateral angles of the first thoracic segment, but not to the posterior margin of the head; they are separated in front by a distance equal to 1 mm. The second pair of antennæ are composed of eight to nine articles and extend to the posterior margin of the head. The maxillipeds have a palp of two articles.

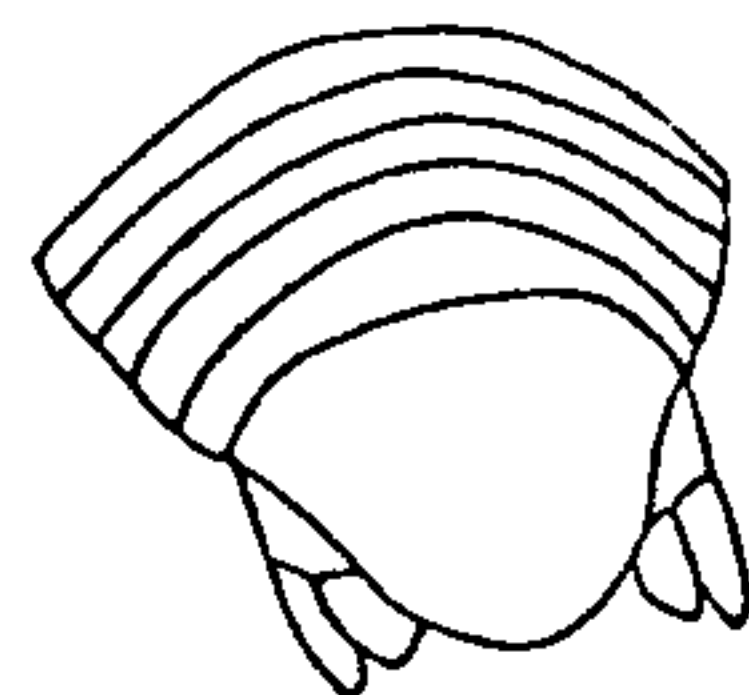


FIG. 276.—LIVONECA OVALIS. ABDOMEN.

The first five segments of the thorax are subequal, each being about 2 mm. in length. The sixth and seventh are subequal, each being a

little shorter than any of the preceding segments, and each about $1\frac{1}{2}$ mm. long. The epimera are distinctly separated on all the segments with the exception of the first; they occupy the entire lateral margin in the second, third, fourth, and fifth segments. In the sixth and seventh segments the posterior extremities are produced beyond the posterior margins of the segments, a distance of 1 mm. in the seventh segment.

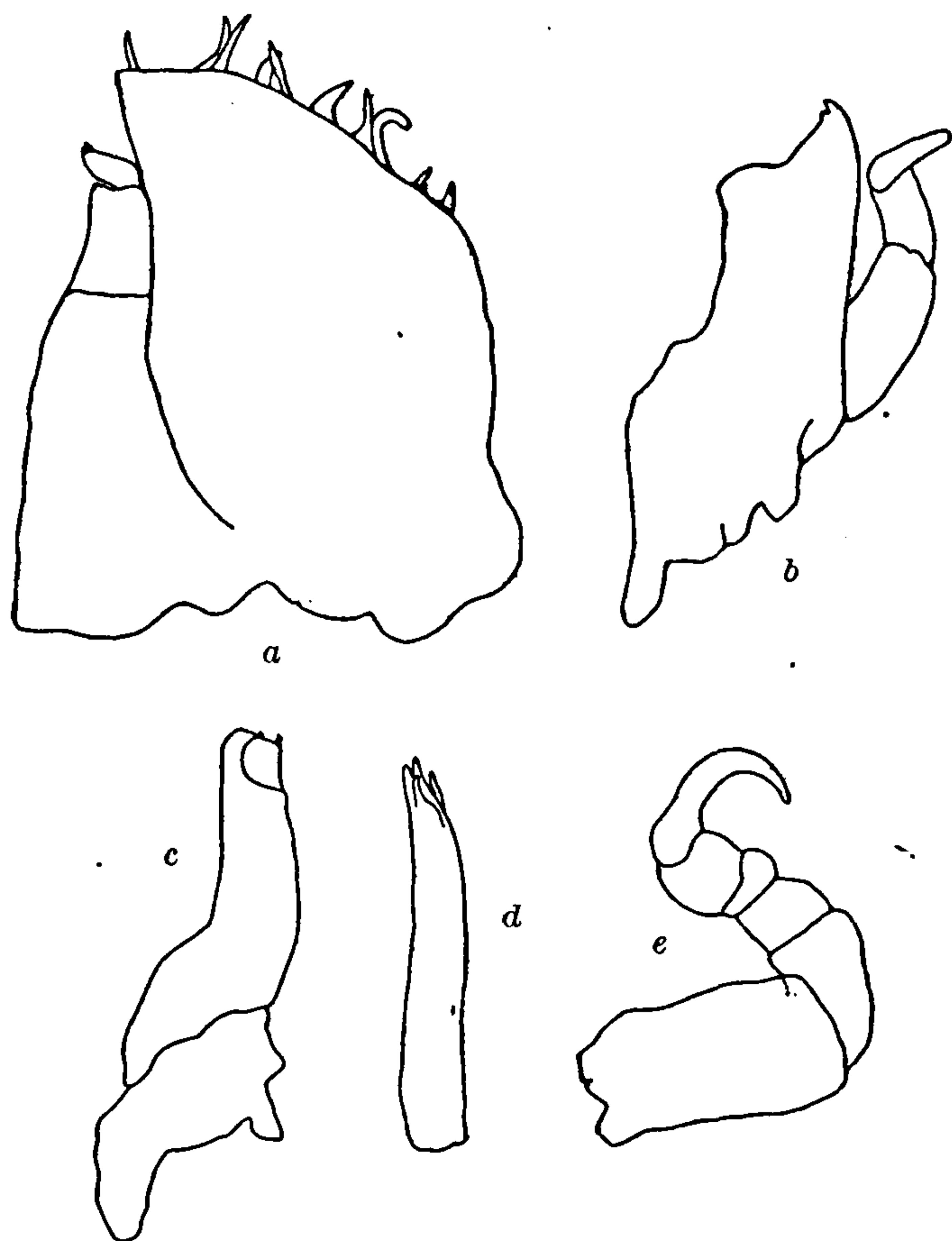


FIG. 277.—LIVONECA OVALIS. *a*, MAXILLIPED. $\times 27\frac{1}{2}$. *b*, MANDIBLE. $\times 27\frac{1}{2}$. *c*, SECOND MAXILLA. $\times 51\frac{1}{2}$. *d*, FIRST MAXILLA. $\times 27\frac{1}{2}$. *e*, SEVENTH LEG.

abdomen being as wide as the seventh thoracic segment. The segments gradually decrease in width. The sixth or terminal segment is rounded posteriorly. It is $4\frac{1}{2}$ mm. long and 5 mm. wide at the base. The uropoda do not reach the extremity of the terminal abdominal

All six segments of the abdomen are distinct. The abdomen is not immersed or set in the thorax, and is not abruptly narrower than the thorax, the first segment of the

segment. Both branches are equal in length and similar in shape. The outer branch is about half as wide as the inner branch. The branches are of equal width throughout their length; the outer branch is rounded posteriorly; the inner branch is obliquely truncate, with post-lateral angles rounded.

The legs are all prehensile with long curved dactyli. There is no carina on the basis of any of the legs.

The color is brown, with a transverse band of yellow along the posterior margins of all the segments. The epimera are also yellow.

43. Genus IRONA Schiøedte and Meinert.^a

Body oval. Head deeply immersed.

First pair of antennæ widely separated at the base, rather compressed.

The anterior margin of the first thoracic segment widely sinuated, the antero-lateral angles short. First thoracic segment manifestly longer than the second. Anterior epimera rather long and narrow, gradually increasing in width; the posterior ones rather short and rather wide.

Body of female asymmetrical; that of male more symmetrical.

Abdomen continuous with thorax, not narrower than thorax; deeply immersed. Carina on the four posterior pairs of legs almost absent.

IRONA NANA Schiøedte and Meinert.

Irona nana SCHIØEDTE and MEINERT (3), XIV, 1883-84, pp. 390-395, pl. xvii, figs. 6-11.—RICHARDSON, Proc. U. S. Nat. Mus., XXIII, 1901, p. 531.

Localities.—Caribbean Sea and Atlantic Ocean; St. John; St. Bartholomew; Rio Janeiro; Harrington Sound, Bermudas (collected by Doctor Linton).

Found parasitic in gills of *Hemirhamphus* sp.; on *Atherina* sp.; on *Atherina harringtonensis*. Doctor Linton says the attachment is voluntary, the parasite frequently leaving the host when disturbed.

Body subovate or ovately produced, very much twisted, rather convex, more than one and a half times or twice as long as wide (5:3 or 2:1).

The head is small, subtriangular or subconical, one-third or one-fourth as wide as the fourth segment of the thorax (3:1 or 4:1), much wider than long (5:4), deeply immersed, with the front bent downward and narrowly rounded. The eyes are large and subpentagonal.

The first pair of antennæ are rather compressed, rather stout, widely separated, reaching with the fifth article the anterior angle of the first

^aSee Schiøedte and Meinert for characters of genus, Nat. Tidsskr. (3), XIV, 1883-84, pp. 381-383.

thoracic segment, scarcely as long as the second pair of antennæ; they are composed of eight articles. The second pair of antennæ are sub-filiform, one-half as wide as the first pair of antennæ, almost reaching with the sixth article the anterior angle of the first thoracic segment; they are composed of nine articles.

The anterior margin of the first thoracic segment is very widely sinuated, the angles being produced and narrowly rounded and rather obtuse; the sides of the segment are not constricted, but are widely rounded.

The posterior angles of the anterior segments of the thorax are very widely rounded, those of the posterior segments are subrotund.

The epimera are usually unequally produced; the first three are rather long, rather narrow, and posteriorly narrowly rounded; the three posterior ones are rather short or short, rather wide or wide, gradually increasing in width, posteriorly truncate or truncate rounded. The three anterior epimera do not reach by a greater or less distance the posterior angle of the segment, and gradually decrease in length; the three posterior epimera almost reach the posterior angle of the segment.

The legs are rather short, gradually increasing in length; the first three pairs together are very divergent; the four posterior pairs are scarcely convergent, incurved on one side. The ungulæ are rather long or long, rather stout or stout, those of the first five pairs gradually increasing in length and strength; those of the sixth and seventh pairs are a little shorter and more slender than the preceding ones and are less curved. The carina of the four posterior pairs of legs is vanishing.

The abdomen is deeply immersed, the sides of the first three segments, at least on one side, being covered; the sides of the second, third, fourth, and fifth segments together are slightly curved, scarcely converging; the abdomen is rather convex, a little or scarcely wider than long, less than half as long as the thorax with the head. A large part or the greater part of the first segment is covered; the second, third, and fourth segments are subequal in length, almost one and a half times shorter than the fifth segment. The posterior margin of the first four segments are very widely sinuated; that of the fifth segment is straight, obscurely flexuous. The posterior angles of the second, third, fourth, and fifth segments are produced, entire, and narrowly rounded.

The terminal segment is narrowly subtriangular, a little narrower than the fifth segment, almost one and a half times wider than long (almost 5:7), one and a half times longer than the other segments of the abdomen together. The uropoda are a little longer than the terminal segment of the abdomen; the inner branch is almost one and a half

times shorter and a little narrower than the outer branch, and is laminar in shape; the outer branch is sickle-shaped, rather acute, and lightly flexuous.

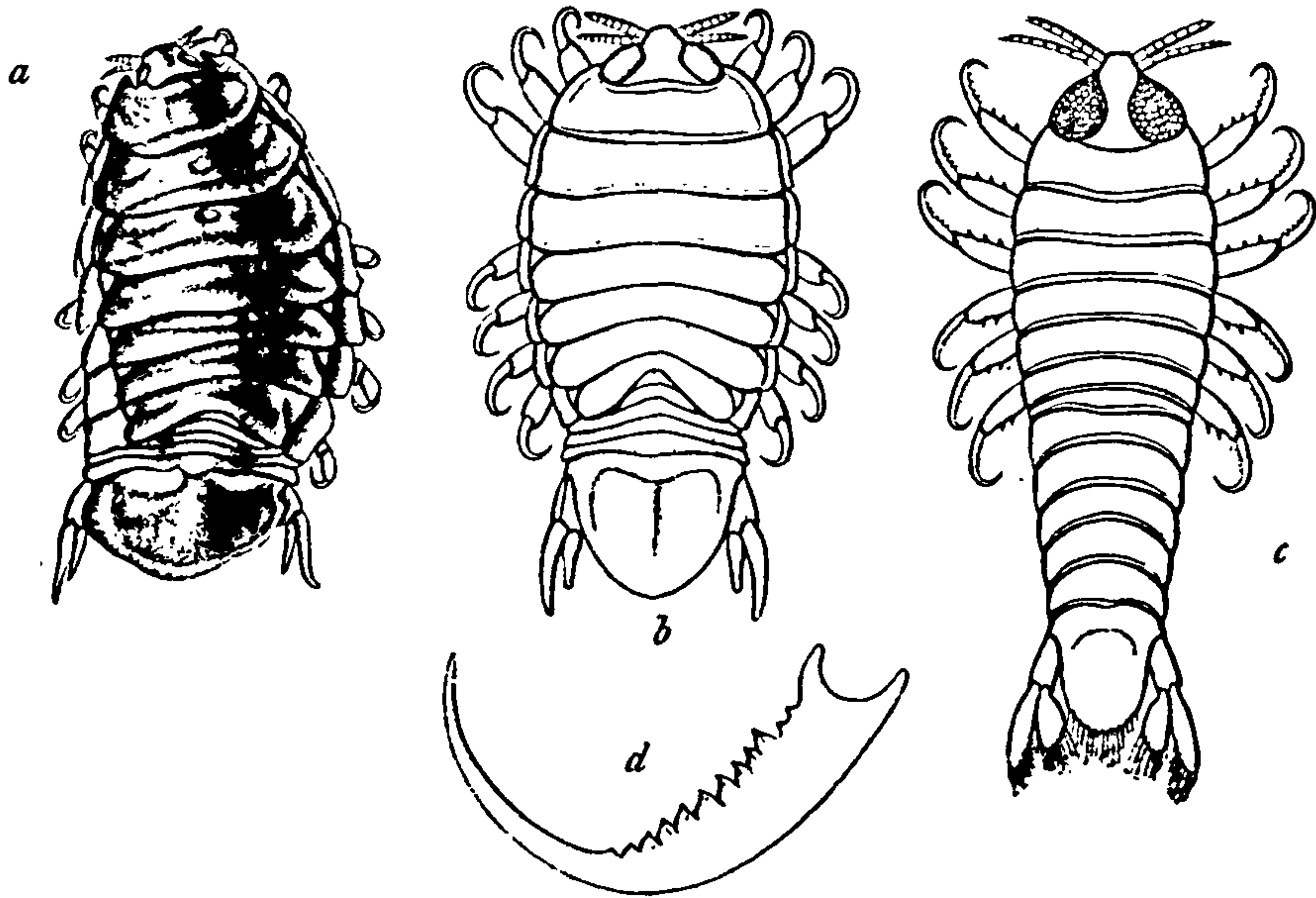


FIG. 278.—*IRONA NANA* (AFTER SCHICEDTE AND MEINERT). *a*, ADULT FEMALE. *b*, YOUNG MALE. *c*, YOUNG OF THE SECOND STAGE. *d*, UNGULA OF THE LEG OF THE THIRD PAIR OF SAME. (ALL ENLARGED.)

Length, 8–18 mm.

Color yellow, with large or small dark, branching spots, arranged in transverse series, scattered over the middle of the body; the eyes are black.^a

^aThe above description is adapted from the following one of Schicædte and Meinert's: Subovata vel producte obovata, valde contorta, convexiuscula, plus sesqui vel duplo longior quam latior (5 : 3 vel 2 : 1).

Caput parvum, subtrigonum vel subconicum, quam annulus quartus trunci ter vel quarter angustius (3 : 1 vel 4 : 1), multo latius quam longius (5 : 4), profunde immersum, fronte declivi, breviter rotundata. Oculi magni, subpentagoni. Antennæ primi paris compressiusculæ, crassiusculæ, late distantes, angulum priorem annuli primi trunci articulo quinto attingentes, antennas secundi paris vix complentes; 8-articulatæ.

Antennæ secundi paris subfiliformes, quam antennæ primi paris duplo tenuiores angulum priorem annuli primi trunci articulo sexto fere attingentes; 9-articulatæ. Margo anticus annuli primi trunci latissime sinuatus, angulis prominulis, rotundate angustatis, obtusiusculis; latera annuli non constricta, late rotundata.

Anguli postici annulorum priorum trunci latissime rotundati, posteriorum subrotundati.

Epimera in æquum fere porrecta; terna priora longiuscula, angustiuscula, post breviter rotundata; terna posteriora breviuscula vel brevia, latiuscula vel lata, per paria sensim latitudine crescentia, post truncata vel rotundate truncata. Epimera terna priora angulum annuli spatio majore vel minore, per paria sensim longitudine decrescente, non attingentia; terna posteriora angulum annuli fere explentia. Pedes breviusculi, per paria sensim longitudine crescentes; parium trium priorum conjunctim valde divergentes; parium quattuor posteriorum conjunctim vix convergentes, in latere altero incurvi. Ungulæ longiusculæ vel longæ, crassiusculæ vel crassæ,

Family X. LIMNORIIDÆ.^a

Body oblong, subdepressed, contractile into a ball. Head short and blunt in front. Both pairs of antennæ small, subequal; flagella short. Mouth parts normal. Mandibles without molar expansion; with a small, three-jointed palp. Palp of maxillipeds composed of five articles. Eyes lateral.

Segments of thorax distinct; first segment longer than second. Epimera well defined on all the segments of the thorax with the exception of the first.

Abdomen composed of six distinct segments; terminal segment large, broad, flattened above.

Legs all ambulatory.

Pleopods uniform in structure, both natatory and branchial; inner plate of second pair in male with a stylet.

Uropoda small, lateral; outer branch short, unguiform, almost obsolete; inner branch linear.

44. Genus LIMNORIA Leach.

Only genus. With characters of family.

parium quinque priorum per paria sensim longitudine et robore crescentes, paris sexti et septimi præcedentibus paulo breviores atque tenuiores, minus curvatæ. Carina pedum parium quattuor posteriorum evanida.

Cauda profunde immersa, lateribus annulorum trium priorum, saltem alterius lateris, obtectis, annuli secundi, tertii, quarti, quinti conjunctim leviter curvatis, vix convergentibus: convexiuscula, paulo vel vix latior quam longior, quam truncus cum capite plus duplo brevior. Annulus primus magnam vel maximam partem obtectus; annulus secundus, tertius, quartus longitudine subæquales, quam annulus quintus fere sesqui breviores. Margo posticus annulorum quattuor priorum latissime sinuatus; annuli quinti subrectus, obscure flexuosus. Anguli postici annuli secundi, tertii, quarti, quinti prominuli, integri, breviter rotundati. Annulus analis breviter subtriangulus, quam annulus quintus caudalis paulo angustior, sesqui ferme latior quam longior (fere 5:7), annulis ceteris caudalibus conjunctis sesqui longior. Pedes anales quam annulus analis paulo longiores; ramus interior quam exterior fere sesqui brevior et paulo angustior, producte laminatus; ramus exterior subfalcatus, acutiusculus, leviter flexuosus. Long. 8-18 mm.

Color cereus, maculis majoribus vel minoribus, fuscis, racemosis, in series transversas digestis, in medio corpore sparsus; oculi nigri.—SCHIÆDTE and MEINERT, Nat. Tidsskr. (3), XIV, 1883-84, pp. 390-395.

For description of the male and the young of the second stage, see same reference, pp. 392-395.

^a See Sars for characters of family, Crust. of Norway, II, 1899, pp. 74-75.

LIMNORIA LIGNORUM (Rathke).

Cymothoa lignorum RATHKE, Skrivt. af Natur. Selsk., V, 1799, p. 101, pl. III, fig. 14.

Limnoria tenebrans LEACH, Edinb. Encycl., VII, 1813, p. 433 (Am. ed., p. 273); Trans. Linn. Soc. London, XI, 1815, p. 37; Dict. Sci. Nat., XII, 1818, p. 353.—DESMAREST, Consid. Gén. Crust., 1825, p. 312.—LATREILLE, Règne Anim., IV, 1829, p. 135.—EDWARDS, Annot. de Lamarck, V, 1838, p. 276; Hist. Nat. Crust., III, 1840, p. 145.—GOULD, Invert. Mass., 1841, pp. 338, 354.—EDWARDS, Règne Anim. Crust., 1849, p. 197, pl. LXVII, fig. 5.

Limnoria lignorum WHITE, Pop. Hist. Brit. Crust., 1857, p. 227, pl. XII, fig. 5.—BATE, Report Brit. Assoc., 1861, p. 225.

Limnoria uncinata HELLER, Verh. k. k. Zool. Bot. Ges. Wien, XVI, 1866, p. 734.

Limnoria lignorum BATE and WESTWOOD, British Sessile-eyed Crust., II, 1868, p. 351.—NORMAN, Report British Assoc., 1869, p. 288.

Limnoria tenebrans VERRILL, Proc. Am. Assoc. Adv. Sci., 1874, p. 367.

Limnoria californica HEWSTON, Proc. Cal. Acad. Sci., V, 1874, p. 24 (nomen nudum).

Limnoria lignorum VERRILL, Am. Jour. Sci., VII, 1874, pp. 133–135; Proc. Am. Assoc., 1874, p. 371.—HARGER with VERRILL, Report U. S. Commissioner of Fish and Fisheries, Pt. 1, 1873, p. 379 (85), p. 571 (277), pl. VI, fig. 25.—STEBBING, Trans. Devon. Assoc., 1874, p. 8; Ann. Mag. Nat. Hist. (4), XVII, 1876, p. 79.—HARGER, Proc. U. S. Nat. Mus., II, 1879, p. 161.—SMITH, Proc. U. S. Nat. Mus., II, 1879, p. 232, fig. 2.—HARGER, Report U. S. Commissioner of Fish and Fisheries, Pt. 6, 1880, pp. 373–376 (See Harger for synonymy).—RICHARDSON, Proc. U. S. Nat. Mus., XXI, 1899, pp. 821–822; Ann. Mag. Nat. Hist. (7), IV, 1899, pp. 161–162.—SARS, Crust. of Norway, II, 1899, pp. 76–77, pl. XXXI.—RICHARDSON, American Naturalist, XXXIV, 1900, p. 222; Proc. U. S. Nat. Mus., XXIII, 1901, p. 532.

Localities.—From Florida to Halifax and Gulf of St. Lawrence; Pacific Ocean; San Diego, California; also coast of Great Britain; Kielerbucht, Germany; North Sea; Adriatic Sea; coast of Norway; Bering Island; Woods Hole, Massachusetts.

This species is destructive to wood and submerged timber, boring holes which causes its decay.

Body oblong-ovate, twice as long as wide, $1\frac{1}{2}$ mm.: 3 mm.

Head wider than long, about twice as wide, with the anterior margin slightly excavate. Eyes small, distinct, and situated at the sides of the head. The first pair of antennæ have the first two articles subequal; the third is a little longer than the second; the fourth or first flagellar article is half as long as the third; the fifth or second flagellar article is minute. The first antennæ extend to the end of the fourth article of the second pair of antennæ. The second pair of antennæ have the first article large; the second is not as long as the first; the third and fourth are subequal and each is about as long as the

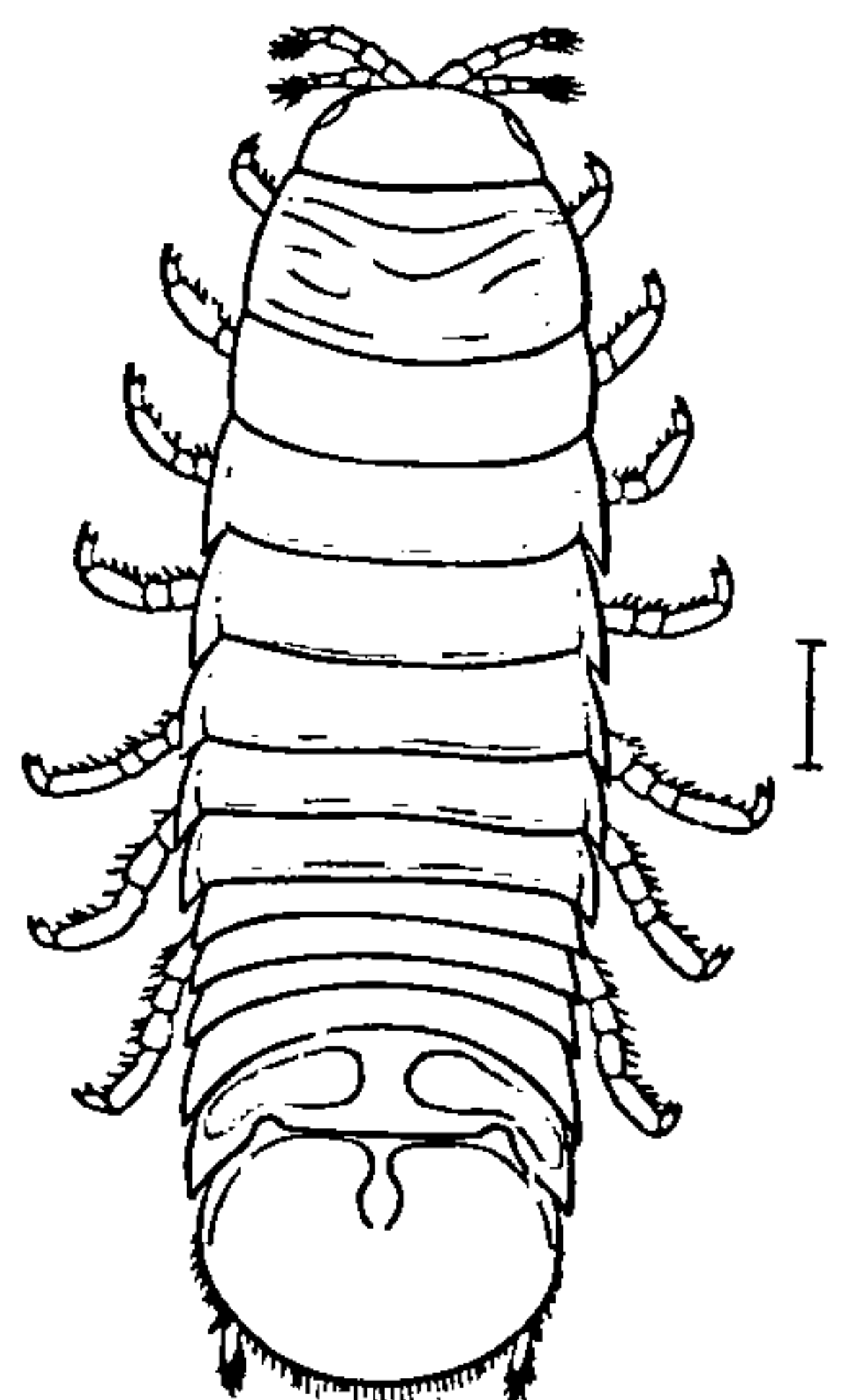


FIG. 279.—LIMNORIA LIGNORUM (AFTER HARGER).

first; the fifth article is about as long as the fourth. The flagellum is composed of two or three indistinctly defined articles. The maxillipeds have a palp of five articles. The palp of the mandibles is composed of three articles.

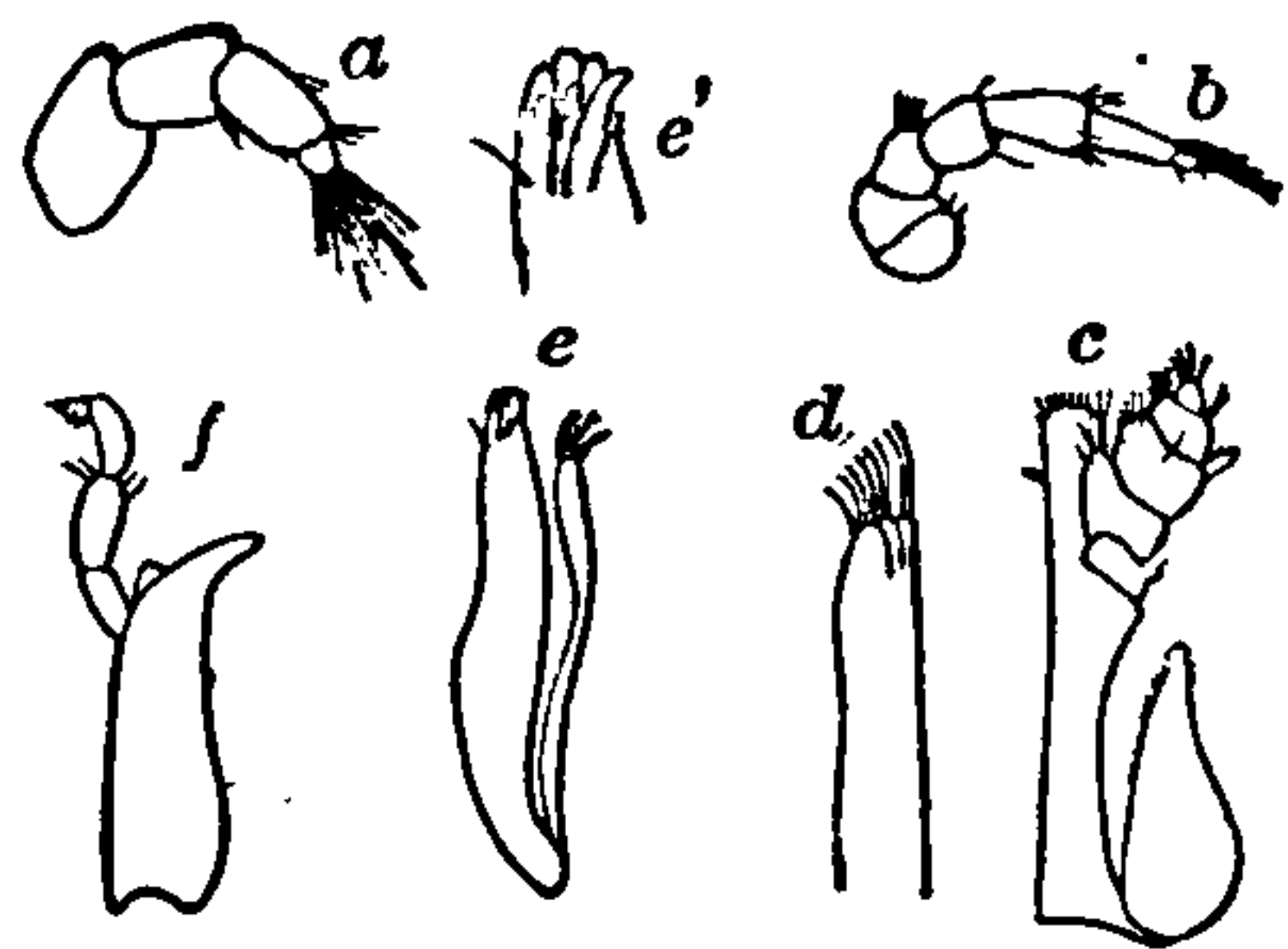


FIG. 280.—*LIMNORIA LIGNORUM* (AFTER HARGER). *a*, FIRST ANTENNA. $\times 25$. *b*, SECOND ANTENNA. $\times 25$. *c*, MAXILLIPED. $\times 25$. *d*, SECOND MAXILLA. $\times 25$. *e*, FIRST MAXILLA. $\times 25$. *e'*, DISTAL END OF FIRST MAXILLA. $\times 66$. *f*, MANDIBLE. $\times 25$.

The first segment of the thorax is longer than any of those following, which are subequal; it is almost twice as long. Epimera are distinctly separated on all the segments with the exception of the first.

The abdomen is composed of six distinct segments. The first five are short and subequal. The sixth or terminal segment has the posterior margin widely rounded. The uropoda are laterally placed. The outer branch is small and rudimentary. The inner branch reaches the extremity of the abdomen.

All the legs are ambulatory.

Family XI. SPHÆROMIDÆ.

Body short, oval, convex. Head transverse.

First and second pairs of antennæ multiarticulate with evident distinction into peduncle and flagellum. Mandibles with palps. Anterior segments of abdomen united into a single segment, which, with the large terminal segment, forms a biarticulate abdomen.

Uropoda lateral, forming, with the terminal abdominal segment, a caudal fan. Outer branch of uropoda, when present, movable. Inner branch fixed, immovable.

Epimera united with the thoracic segments.

ANALYTICAL KEY TO THE GENERA OF THE FAMILY SPHÆROMIDÆ.

- a*. Outer branch of the uropoda entirely wanting.....Genus *Ancinus* Milne Edwards
- a'*. Both branches of the uropoda present.
 - b*. Outer branch of the uropoda small, rudimentary.....Genus *Cassidisca*, new genus
 - b'*. Outer branch of the uropoda not rudimentary.
 - c*. First and second pairs of legs subchelate in male; only first pair subchelate in female.....Genus *Tecticeps* Richardson
 - c'*. Legs all ambulatory.
 - d*. Outer branch of uropoda capable of folding under inner branch; both branches similar in shape and salient.

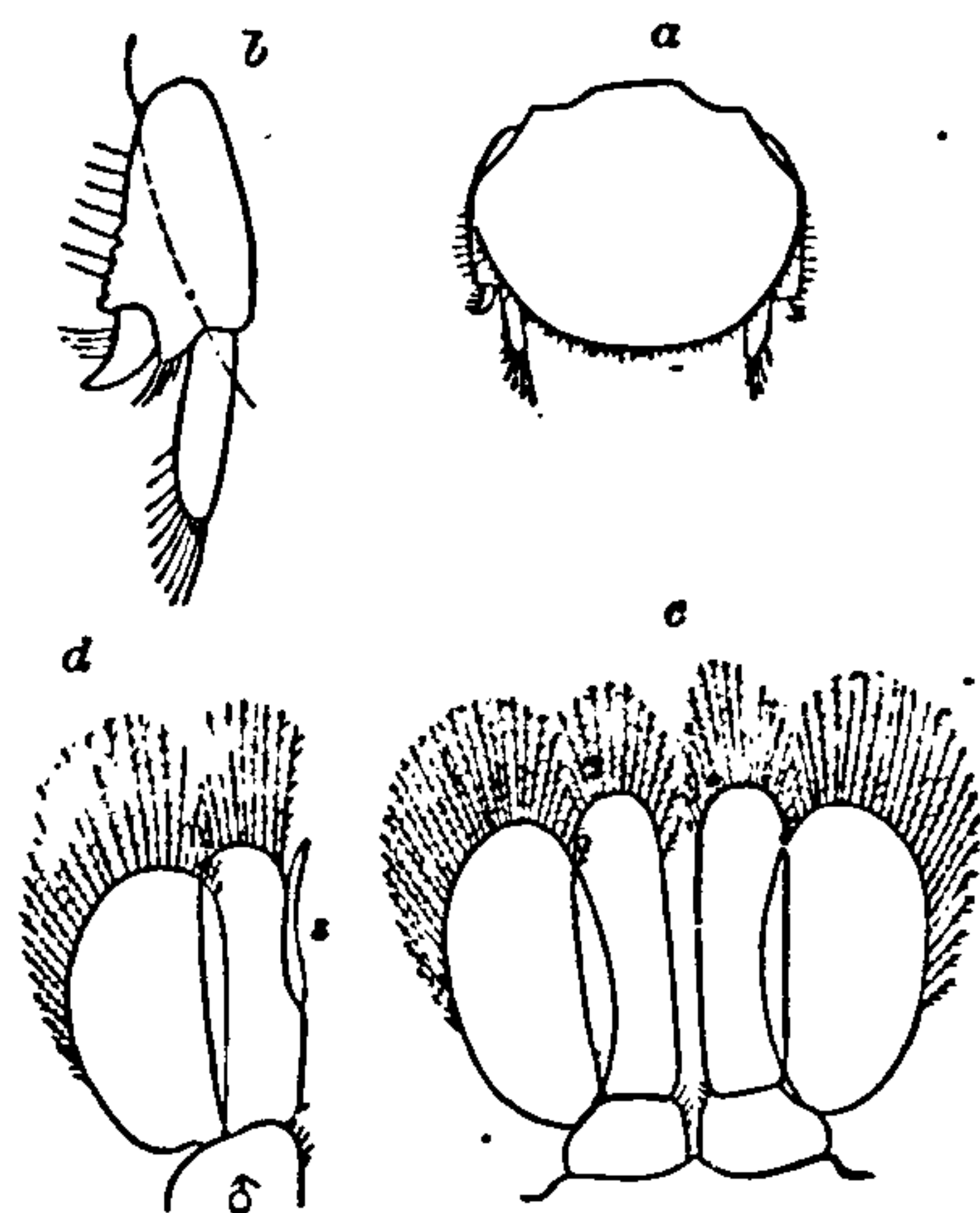


FIG. 281.—*LIMNORIA LIGNORUM* (AFTER HARGER). *a*, LAST SEGMENT OF ABDOMEN WITH UROPODA. $\times 10$. *b*, UROPOD. $\times 30$. *c*, FIRST PAIR OF PLEOPODA. $\times 20$. *d*, SECOND PLEOPOD OF MALE. $\times 20$.

- e. Terminal segment of abdomen entire.
 f. Maxillipeds with second, third, and fourth articles of the palp not produced into lobes.....Genus *Sphæroma* Latreille
 f'. Maxillipeds with second, third, and fourth articles of the palp produced into lobesGenus *Exosphæroma* Stebbing
 e'. Terminal segment of abdomen with a median emargination.
 f. Second, third, and fourth articles of palp of maxillipeds produced into lobesGenus *Dynamene* Leach
 f'. Second, third, and fourth articles of palp of maxillipeds not produced into lobes.....Genus *Paradynamene*, new genus
 d'. Outer branch of uropoda not capable of folding under inner branch; branches unlike, only outer one salient.....Genus *Cilicæa* Leach

45. Genus ANCINUS Milne Edwards.

Abdomen composed of two segments, the first segment formed by the fusion of several segments.

Outer branch of the uropoda entirely wanting.

First and second pairs of legs subchelate; remaining pairs ambulatory.

ANCINUS DEPRESSUS (Say).

Næsa depressa SAY, Jour. Acad. Nat. Sci. Phila., I, 1818, pp. 483-484.—RICHARDSON, American Naturalist, XXXIV, 1900, p. 224; Proc. U. S. Nat. Mus., XXIII, 1901, p. 537.

Locality.—Egg Harbor, New Jersey.

Depth.—Found on surface.

“Body broad, depressed, linear; first caudal segment concealed, second attenuated; anterior feet monodactyle.

“Inhabits Egg Harbor.

“Cabinet of the Academy.

“Body broad, depressed, punctured, sides parallel; segments subequal, anterior ones rather shorter; first segment of the tail not visible, second equal, as long as the three preceding visible ones, attenuated to an obtuse point, which is carinated above and attained by the lateral, spiniform, acute processes; beneath concave, effuse at tip; eyes apparently lunated, but really rounded; with distant granules, and touching the anterior segment of the body; hands of the anterior feet dilated, ovate, thumb as long as the palm, nearly attaining the carpus, tip closing within a prominent spinose tooth on the base of the palm; hands of the second pair cylindric, incurved, with a process dentate at tip and placed at the inner base, armed with an equal incurved thumb not closing on the hand, obtuse, and furnished with a seta at tip; remaining feet ciliated.

“Length half an inch, breadth rather more than one-fifth of an inch.

“Found with the preceding species, common.”—SAY.^a

^aJourn. Acad. Nat. Sci. Phila., I, 1818, pp. 483-484.

A single dried specimen of this species, the type, is in the Philadelphia Academy of Natural Sciences.

The body is ovate, about twice as wide as long, 6 mm.: 12 mm.

The head is short and wide, being 1 mm.: 4 mm., with lateral margins and lateral angles rounded. The anterior margin is produced in a linguiform median process extending forward over the basal articles of the first antennæ.

The segments of the thorax are subequal.

The first segment of the abdomen is almost entirely concealed. The second or terminal segment is 4 mm. long and 5 mm. wide at the base. It is triangular in shape, with apex funnel-shaped, the sides being turned downward and inward. The uropoda are single-branched, and are in the form of a long, narrow, tapering branch, posteriorly acute, and extending to the tip of the terminal abdominal segment. This branch seems fixed to the sides of the abdomen, and immovable. There is no trace or indication of an outer branch.

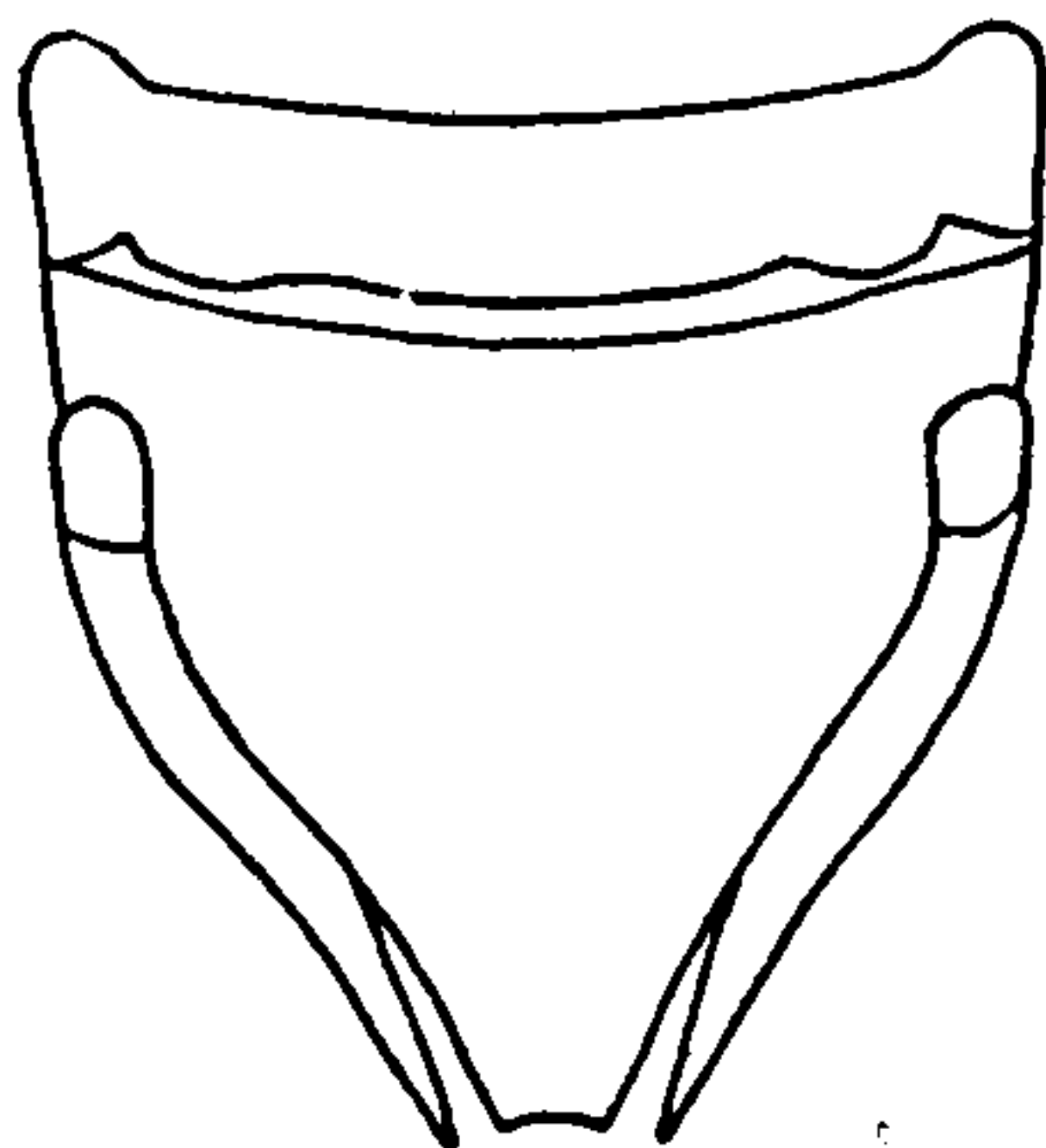


FIG. 282.—*ANCINUS DEPRESSUS*. ABDOMEN WITH UROPODA. $\times 6\frac{1}{2}$.

The first pair of antennæ have the first three peduncular articles dilated, and of nearly equal length.

As the dried specimen is glued to a piece of paper, nothing can be ascertained of the structure of the legs.^a

The specimen was evidently formerly mounted on a pin, as there is a hole in the paper and through the body of the specimen, breaking it at about the middle.

46. Genus *CASSIDISCA*, new genus.

Body oval, depressed.

Maxillipeds with second, third, and fourth articles of palp not produced into lobes.

Abdomen composed of two segments, the first segment formed by the fusion of several segments.

The inner branch of the uropoda is large and well-developed, and is immovable and firmly fixed to the side of the abdomen. The outer branch is rudimentary and very short, and not entirely separated from the inner branch, sometimes being represented by a small incision in the exterior margin of the inner branch.

Legs all ambulatory.

^aThis genus is quite similar to *Scuteloidea* Chilton, but differs, according to Say, in having the first two pairs of legs subchelate, while in *Scuteloidea* the legs are all ambulatory.

This genus differs from *Cassidina*^a Milne Edwards and *Cassidinella* Whitelegge,^b in not having the palp of the maxillipeds with the second, third, and fourth articles produced into lobes.

ANALYTICAL KEY TO THE SPECIES OF THE GENUS CASSIDISCA.

- a.* Terminal segment of abdomen smooth. Outer branch of uropoda about one-fourth as long as inner branch. Apex of abdomen truncate. *Cassidisca lunifrons* (Richardson)
- a'.* Terminal segment of abdomen with three low transverse elevations as the base. Outer branch of uropoda more than one-third but not quite one-half as long as the inner branch. Apex of abdomen triangulate.... *Cassidisca ovalis* (Say)

CASSIDISCA LUNIFRONS (Richardson).

Cassidina lunifrons RICHARDSON, American Naturalist, XXXIV, 1900, p. 222; Proc. U. S. Nat. Mus., XXIII, 1901, p. 533.

Locality.—Great Egg Harbor, New Jersey.

Body oval, surface smooth.

Head broader anteriorly than posteriorly, the antero-lateral angles being produced in a lateral direction and forming very acute angles. The eyes are situated at the post-lateral corners of the head. The first pair of antennæ reach two or three joints beyond the antero-lateral angle of the head; flagellum six-jointed. The second pair almost reach the posterior margin of the first thoracic segment; flagellum consists of about eight joints, the first four being large, the last four small and setose.

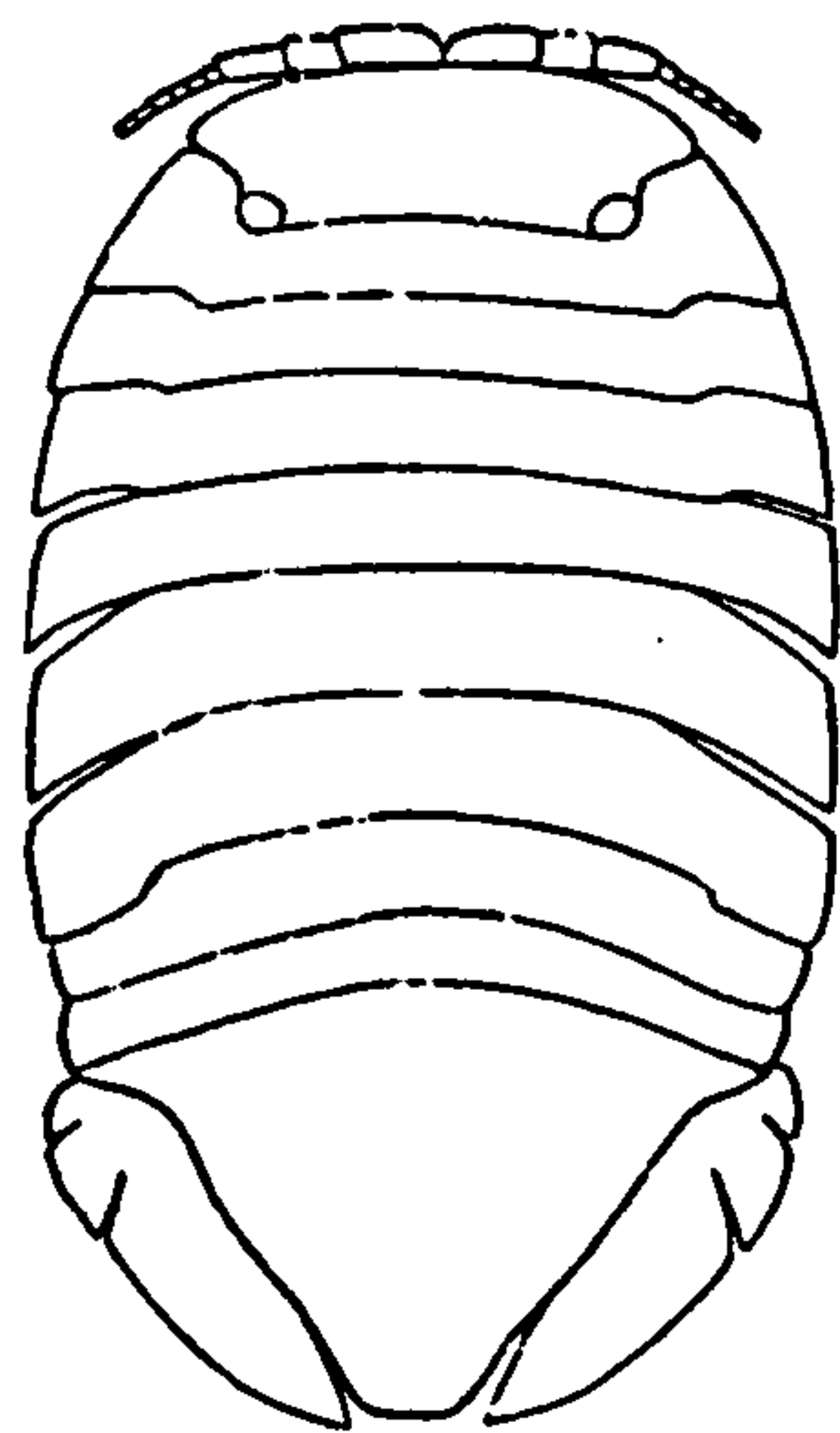


FIG. 283.—CASSIDISCA LUNIFRONS.

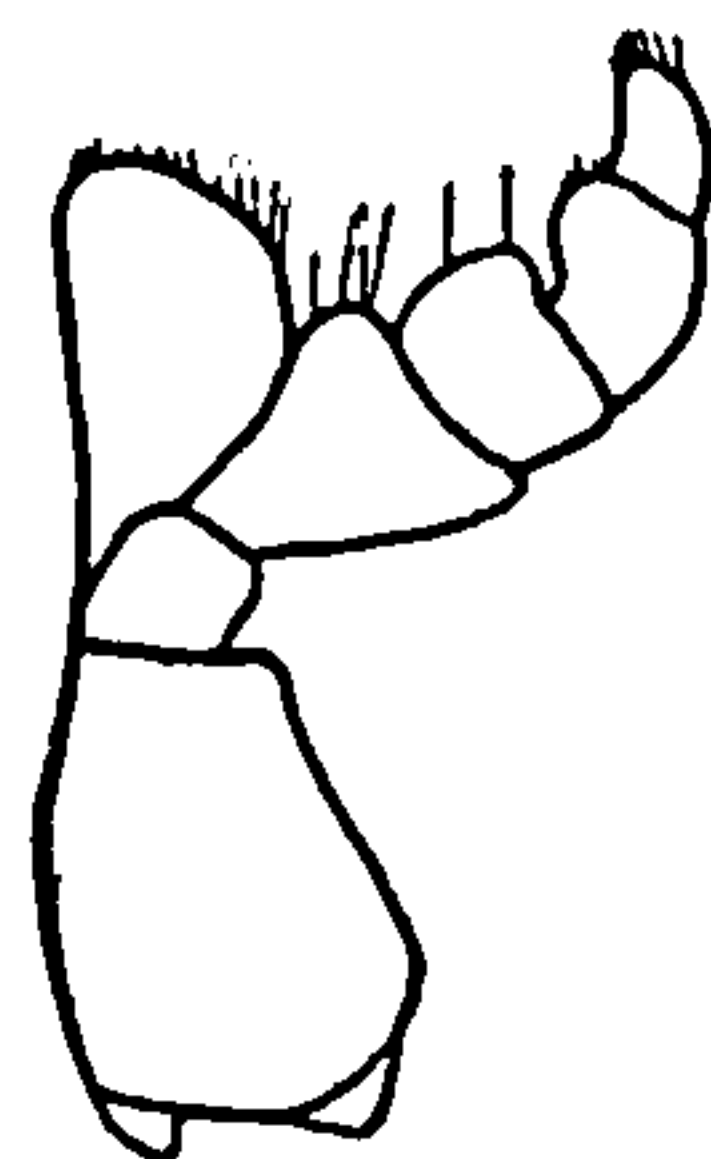


FIG. 284.—CASSIDISCA LUNIFRONS. MAXILLIPED. $\times 77\frac{1}{2}$.

The first thoracic segment is well fitted to the head, so that the elliptical outline of the body is preserved. The segments are subequal, with straight lateral margins. The epimera are not distinct from the segments.

The first segment of the abdomen is short. The terminal segment is subtriangular, with apex truncate. The inner branch of the uropoda is pointed at its extremity, and reaches the tip of the abdomen. The outer branch is rudimentary, about one-fourth as long as the inner branch.

^a Gerstaecker (Bronn's Klassen und Ordnungen des Thier-Reichs, V, Pt. 2, Pts. 1, 2, 3, 1881, pl. vi, fig. 12a) figures the maxilliped of *Cassidina typa* Milne Edwards, and shows the second, third, and fourth articles of the palp produced into lobes. Specimens of *Cassidina emarginata* in the collection of the U. S. National Museum have the maxillipeds with the second, third, and fourth articles of the palp also produced into lobes.

^b Austral. Mus. Mem., IV, 1901, pp. 201-246.

Color, brown.

Specimens were found at Great Egg Harbor, New Jersey, by Dr. William Stimpson.

Type.—Cat. No. 4402, U.S.N.M.

This species is very similar to the following one, and may prove to be the same. As the type and only specimen of Say's species is in such a bad state of preservation, I am unwilling as yet to identify this species with it.

CASSIDISCA OVALIS (Say).

Nassa ovalis SAY, Jour. Acad. Nat. Sci. Phila., I, 1818, pp. 484–485.—RICHARDSON, American Naturalist, XXXIV, 1900, p. 224; Proc. U. S. Nat. Mus., XXIII, 1901, p. 537.

Locality.—South Carolina.

Depth.—Found on surface.

“Body oval, depressed; ultimate segment of the tail obtuse, with three hardly raised, very obtuse lines at base; lateral appendices dilated, three caudal segments.

“Inhabits bays and inlets of the United States; common. Cabinet of the Academy.

“Body perfectly oval, segments subequal, fourth, fifth, and sixth largest, first segment of the tail equal to the preceding one, simple; terminal segment triangular, obtusely rounded at tip, rectilinear each side, half as long as the body, with three longitudinal, abbreviated, raised, very obtuse lines at base, of which the middle one is most conspicuous; lateral processes dilated, depressed, rectilinear within and rounded on the external margin, so as to form with the

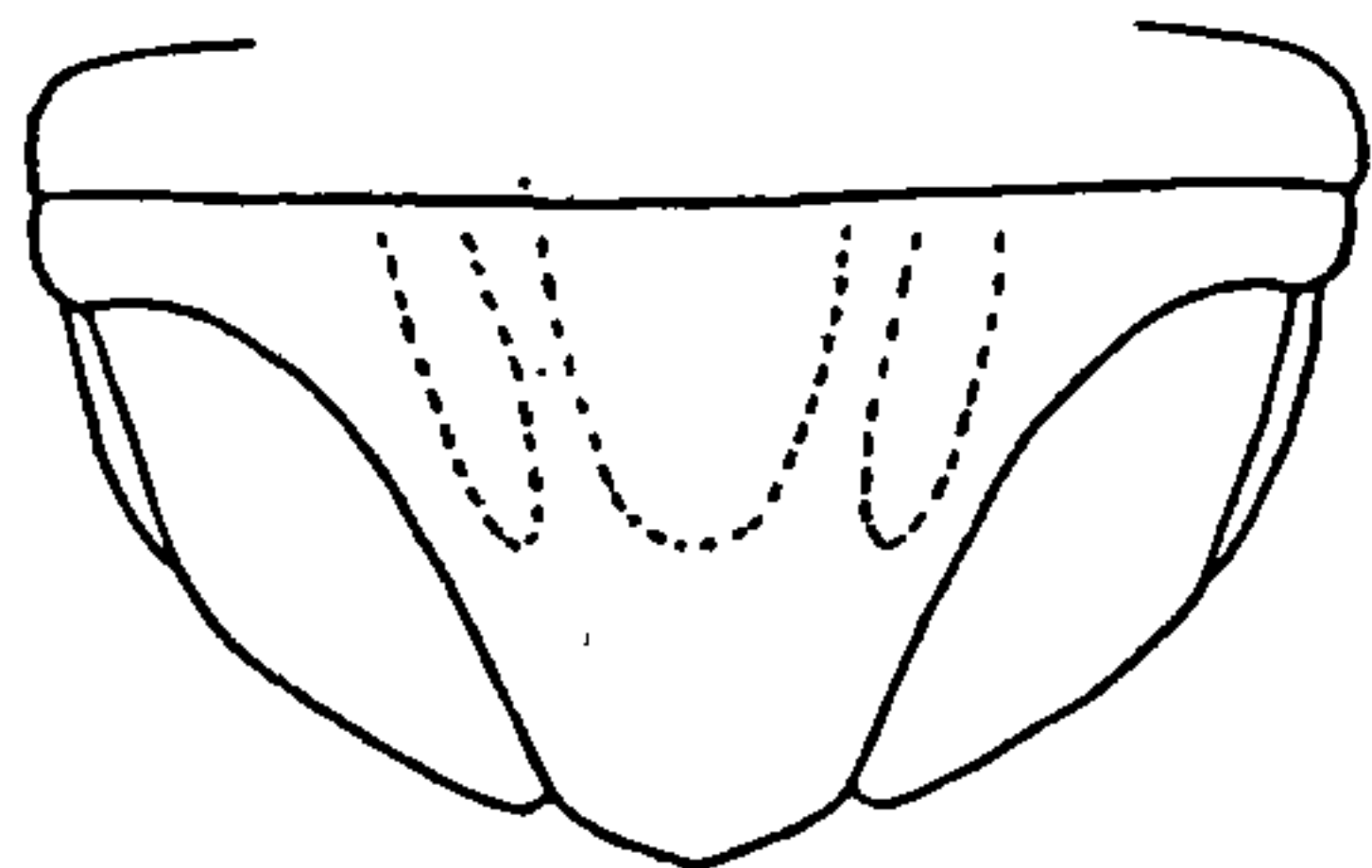


FIG. 285. — CASSIDISCA OVALIS.
ABDOMEN WITH UROPODA.
× 9½.

terminal segment a perfectly semiorbicular termination of the body, without interval; head somewhat unequal; eyes conspicuous, hemispherical; antennæ equal; labrum triangular, advanced, very conspicuous, terminating the head before and forming, with the base of the superior antennæ behind it, a rounded termination without interval, completing the oval form of the body; feet all armed with bifid nails, none of which close on the preceding joint.

“Length less than three-twentieths of an inch.

“This little animal is extremely common in sea water, usually creeping on fuci and other marine plants; we found it as far south as St. Johns River in Florida.” SAY.^a

A dried specimen, mounted on a pin, the type and only specimen of this species is in the Philadelphia Academy of Natural Sciences. The specimen was loaned me for examination.

^a Journ. Acad. Nat. Sci. Phila., I, 1818, pp. 484–485.

I have been able to ascertain that the species should be referred to the genus *Cassidisca*. The outer branch of the uropoda is more than one-third as long as the inner branch, and in the dried specimen was rather difficult to find. By carefully scraping off some of the incrusting substance the form of the uropoda was disclosed.

The body is oval, depressed, about 5 mm. in length.

The seven segments of the thorax are distinct; the first three are subequal in length; the three following segments are subequal, and are longer than the three preceding segments; the seventh segment is a little shorter than the sixth segment.

The first segment of the abdomen is short, about as long or perhaps a little shorter than the seventh thoracic segment. The terminal segment is triangular with apex obtusely triangulate. The base of the segment appears to have a large median longitudinal elevation or boss, and a smaller one on either side.

The inner branch of the urópoda is as long as the terminal segment; the inner margin is straight; the outer margin is curved. The outer branch is a little more than one-third the length of the inner branch, and is marked off only by a small incision in the exterior margin of the inner branch. It is separated on the inner margin from the inner branch only by a depressed line. In a fresh specimen the separation might be more complete.

Nothing can be ascertained of the antennæ.

47. Genus TECTICEPS Richardson.

Body oval and somewhat flattened.

Head subquadrangular, broader anteriorly than posteriorly, with its anterior and lateral margins produced, concealing the antennæ. The antennæ, which are entirely hidden, extend backward and lie under the epimeral plates at the sides of the thorax.

The first and second pairs of legs are subchelate in the male; only the first pair are subchelate in the female; the first pair terminate in a large oval hand and finger, bearing a small hook; the second pair in the male terminate in a more irregularly shaped hand. All the other legs are simple in structure.

The terminal segment of the abdomen is triangular and entire, and is pointed at the extremity. The uropoda are double branched and lateral, and resemble closely those of the genus *Sphæroma*.

The second, third, and fourth articles of the palp of the maxillipeds are produced in lobes as in the genus *Exosphæroma*.

ANALYTICAL KEY TO THE SPECIES OF THE GENUS TECTICEPS.

- a. First pair of antennæ, with a flagellum of ten articles, extend to the posterior angle of the first thoracic segment. Second pair of antennæ, with a flagellum of

twelve articles, extend to the middle of the second thoracic segment. Terminal segment of abdomen acutely pointed. Outer branch of uropoda much longer than inner branch. Eyes placed on the posterior half of the head. Sixth and seventh pairs of legs have the propodus and dactylus very much more elongated than in preceding pairs of legs. . . . *Tecticeps alascensis* Richardson

b. First pair of antennæ, with a flagellum of sixteen articles, extend to the posterior angle of the third thoracic segment. Second pair of antennæ, with a flagellum of thirteen articles, extend to the middle of the fourth thoracic segment. Terminal segment of abdomen posteriorly rounded. Outer branch of uropods equal in length to inner branch. Eyes placed in the middle transverse line of the head. Sixth and seventh pairs of legs with propodus and dactylus only gradually a little longer than those of preceding pairs of legs.

Tecticeps convexus Richardson

TECTICEPS ALASCENSIS Richardson.

Tecticeps alascensis RICHARDSON, Proc. Biol. Soc. Washington, XI, 1897, pp. 181-183; Proc. U. S. Nat. Mus., XXI, 1899, p. 837; Ann. Mag. Nat. Hist. (7), IV, 1899, p. 181; American Naturalist, XXXIV, 1900, p. 223.

Localities.—Alaska; Kamchatka; Off Iturup Island, Kurile Islands, Okhotsk Sea; latitude $60^{\circ} 16'$ north, longitude $167^{\circ} 41'$ west; Bering Sea, west of Pribilof Islands (106 fathoms); between Pinnacle and Ulakhla, Unalaska; Bering Sea, off Nunivak Island.

Depth.—9-106 fathoms.

Found in fine gray sand, pebbles, gravel, shells, black and red sand, green mud, and fine dark volcanic sand.

Outline of body oval. Surface quite smooth, but covered with little points of depression.

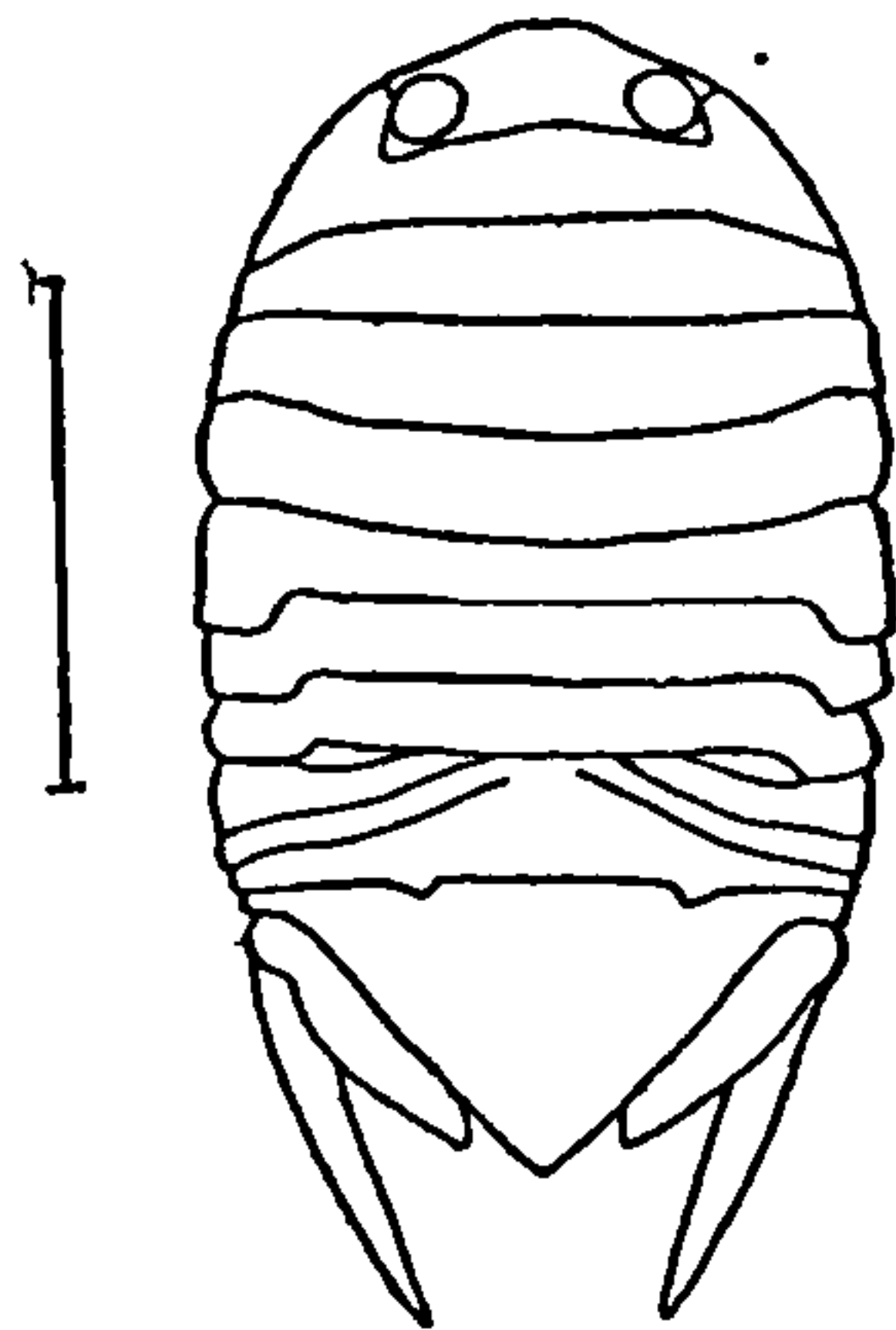


FIG. 286.—TECTICEPS ALASCENSIS. $\times 2\frac{1}{2}$.

Head large; twice as long as any one of the thoracic segments. The anterior margin is produced in a way to conceal the antennæ, as are also the antero-lateral margins, making the anterior portion of the head in front of the eyes much broader than the posterior portion, and forming very acute antero-lateral angles. This frontal margin forms a very broad obtuse angle with its apex in the median line. On either side of this apex to the antero-

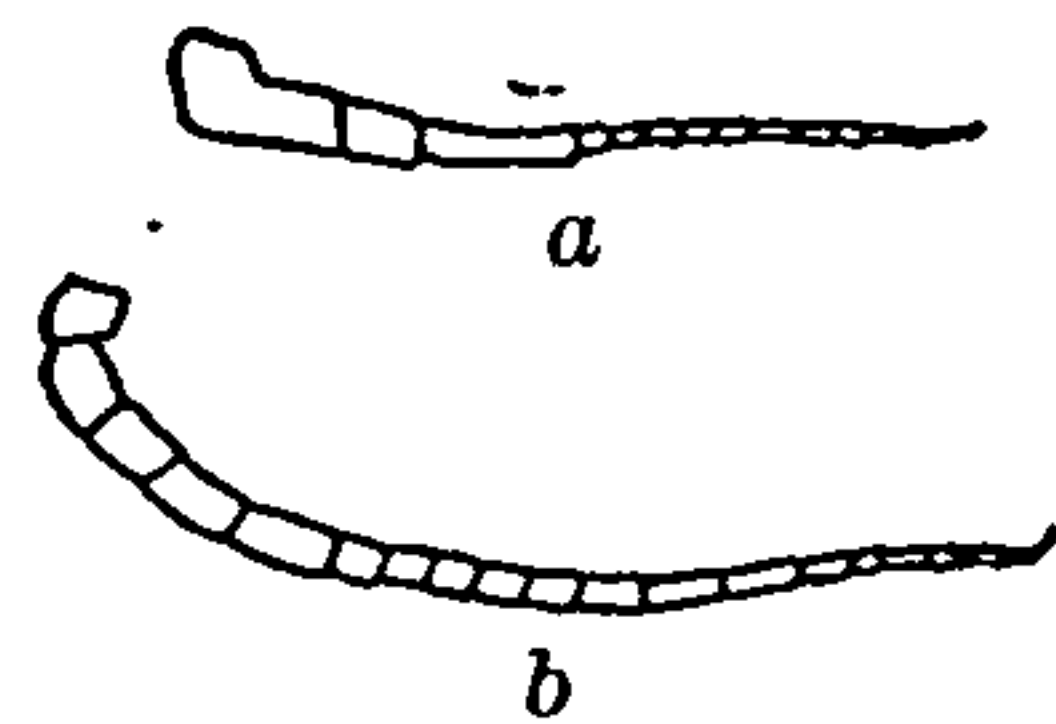


FIG. 287.—TECTICEPS ALASCENSIS. a, ANTENNA OF FIRST PAIR. b, ANTENNA OF SECOND PAIR. $\times 5\frac{1}{2}$.

lateral angle this portion of the head is somewhat depressed. The antennæ are not conspicuous, lying concealed beneath the frontal margin of the head. The first pair extend to the posterior angle of the first thoracic segment; the flagellum consists of ten articles. The second pair reach the middle of the second segment; the flagellum is twelve-jointed. The eyes are dorsally situated on the posterior half of the head.

The thoracic segments are about equal in length. The first one extends laterally around the posterior portion of the head, forming a

broad plate at the side of the segment. The epimera of all the segments are about twice as broad as long, with the exception of those of the fifth segment, which are nearly square and very conspicuous.

The first segment of the abdomen has three suture lines, and its posterior margin projects down in two small triangular processes, one on either side, over the terminal segment. The terminal segment is triangular, and has a very pointed extremity. The branches of the uropods differ considerably. The inner one is broad and tapering, and does not reach the tip of the abdomen. The outer one is slender and sharply pointed, and extends beyond the abdomen.



FIG. 288.—TECTICEPS ALASCENSIS. *a*, MANDIBLE. *b*, MANDIBULAR APPENDAGE. $\times 5\frac{3}{4}$. *c*, MAXILLIPED. $\times 20\frac{1}{2}$.

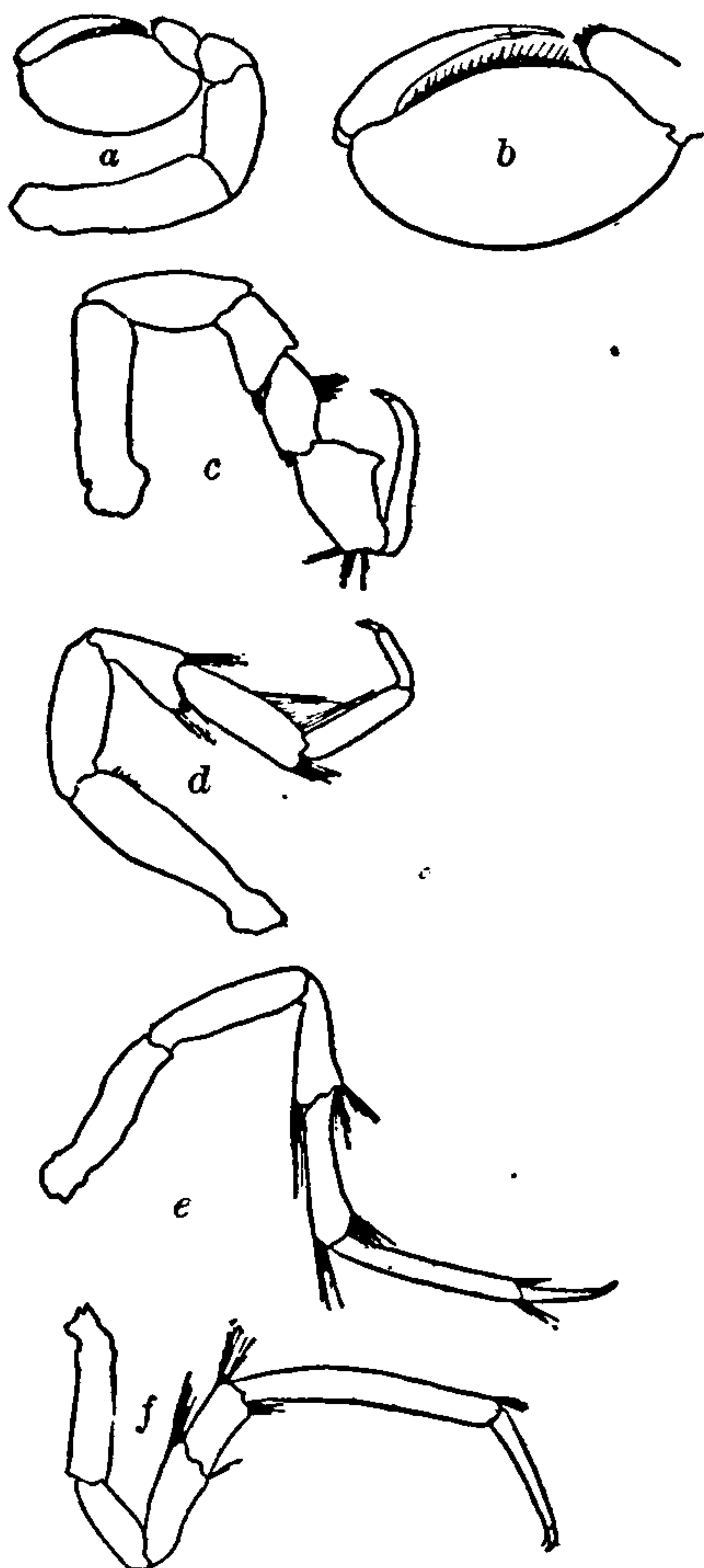


FIG. 289.—TECTICEPS ALASCENSIS. *a*, LEG OF FIRST PAIR. $\times 5\frac{3}{4}$. *b*, LAST TWO JOINTS OF SAME. $\times 10\frac{3}{4}$. *c*, LEG OF SECOND PAIR OF MALE. $\times 5\frac{3}{4}$. *d*, LEG OF THIRD PAIR. $\times 5\frac{3}{4}$. *e*, LEG OF SIXTH PAIR. $\times 5\frac{3}{4}$. *f*, LEG OF SEVENTH PAIR. $\times 5\frac{3}{4}$.

The first pair of legs are subchelate, as are also the second pair in the male. In the first pair the propodus is large and oval in shape, and bears in the palma a row of stiff bristles at regular intervals and pointing obliquely in the same direction, while a thick row of fine cilia, pointing obliquely in the opposite direction, crosses these almost at right angles. The dactylus terminates in a single hook, at the base of which two smaller hooks are situated. In the legs of the second pair the propodus is irregular in shape with an indication of a rudimentary pollex. There are no hairs or bristles in the palma. The legs of the third, fourth, and fifth pairs present nothing unusual in structure, but resemble the ambulatory legs common to this family. In the sixth and seventh pairs the structure is the same as that of the preceding legs of the third, fourth, and fifth pairs, but with an increasing disproportion in the length of the propodus and dactylus. In the seventh pair of legs these joints, but more especially the propodus, attain a size most conspicuous for their length. The propodus becomes over $3\frac{1}{2}$ times longer than the carpus which immediately precedes it.

Color.—The color varies from dark brown to yellow, more or less

dotted with black. In the darker specimens the epimera and the uropods are almost white, with scattered spots of black. Other specimens are brown with markings of red, and some are bluish-gray in color tinged with brown or orange.

Type.—The type specimen was found at station 3515, latitude $59^{\circ} 59'$ north, longitude $167^{\circ} 53'$ west, at a depth of 13 fathoms. Catalogue No. 20031, U.S.N.M.

Distribution.—This species extends all along the coast of Alaska, having been found at the following stations: Station 3272, north of Amak Island (31 fathoms); station 3297, off Cape Menchikoff (26 fathoms); station 3246, south of Hagemeister Island ($17\frac{1}{2}$ fathoms); station 2841, North Head, Akutan Island (56 fathoms); station 3248, off Bristol Bay (21 fathoms); station 3600, Aleutian Islands, off Unimak Island (9 fathoms).

TECTICEPS CONVEXUS Richardson.

Tecticeps convexus RICHARDSON, Proc. U. S. Nat. Mus., XXI, 1899, pp. 837-838; Ann. Mag. Nat. Hist. (7), IV, 1899, pp. 181-183; American Naturalist, XXXIV, 1900, p. 223.

Locality.—Monterey Bay, California.

Depth.—30 feet, sandy bottom.

Body oval, somewhat flattened. Surface smooth; color light yellow with markings of brown.

Head with the anterior margin much broader than the posterior margin, produced in front but not wholly concealing the basal joints of the first pair of antennæ, and somewhat raised, forming two small convex elevations. The antero-lateral margin is likewise produced, forming an acute angular projection, which extends in a lateral direction beyond the post-lateral margin of the head. The eyes are dorsally situated in a median transverse line. The first pair of antennæ, with a flagellum of sixteen articles, extend to the posterior angle of the third thoracic segment. The second pair of antennæ, with a flagellum of thirteen articles, extend to the middle of the fourth thoracic segment, and exceed by one joint the length of the first pair of antennæ. Both pairs of antennæ are disposed to lie concealed under the broad epimeral plates of the thoracic segments.

The thoracic segments are subequal in length. The first segment has its antero-lateral angles produced around the anterior portion of the head, forming a broad plate at the side of the segment. The epimera are almost twice as broad as long; those of the fifth segment extend downward, with the anterior margin straight, making the length and breadth about equal, and forming almost square epimera; in the epimera of the sixth and seventh segments the anterior margins are in the same direction as the posterior margins, which extend downward.

The first segment of the abdomen has three suture lines, and its posterior margin is produced in two small points, one on each side of the median line, about equidistant from it and the lateral margin of the segment. The terminal segment is widely rounded posteriorly. The inner branch of the uropoda is of nearly equal width throughout its length and is rounded at its extremity; the outer branch is slender and sharply pointed. Both branches are of nearly equal length and neither extends beyond the tip of the abdomen.

The first pair of legs have the propodus dilated and the dactylus reflexible. The propodus is large and oval in shape. In the legs of the second pair the propodus is irregular in shape, dilated with reflexible dactylus in the male, and simple in the female. The legs of the other five pairs are similar in structure, ambulatory, and show a gradual increase in length.

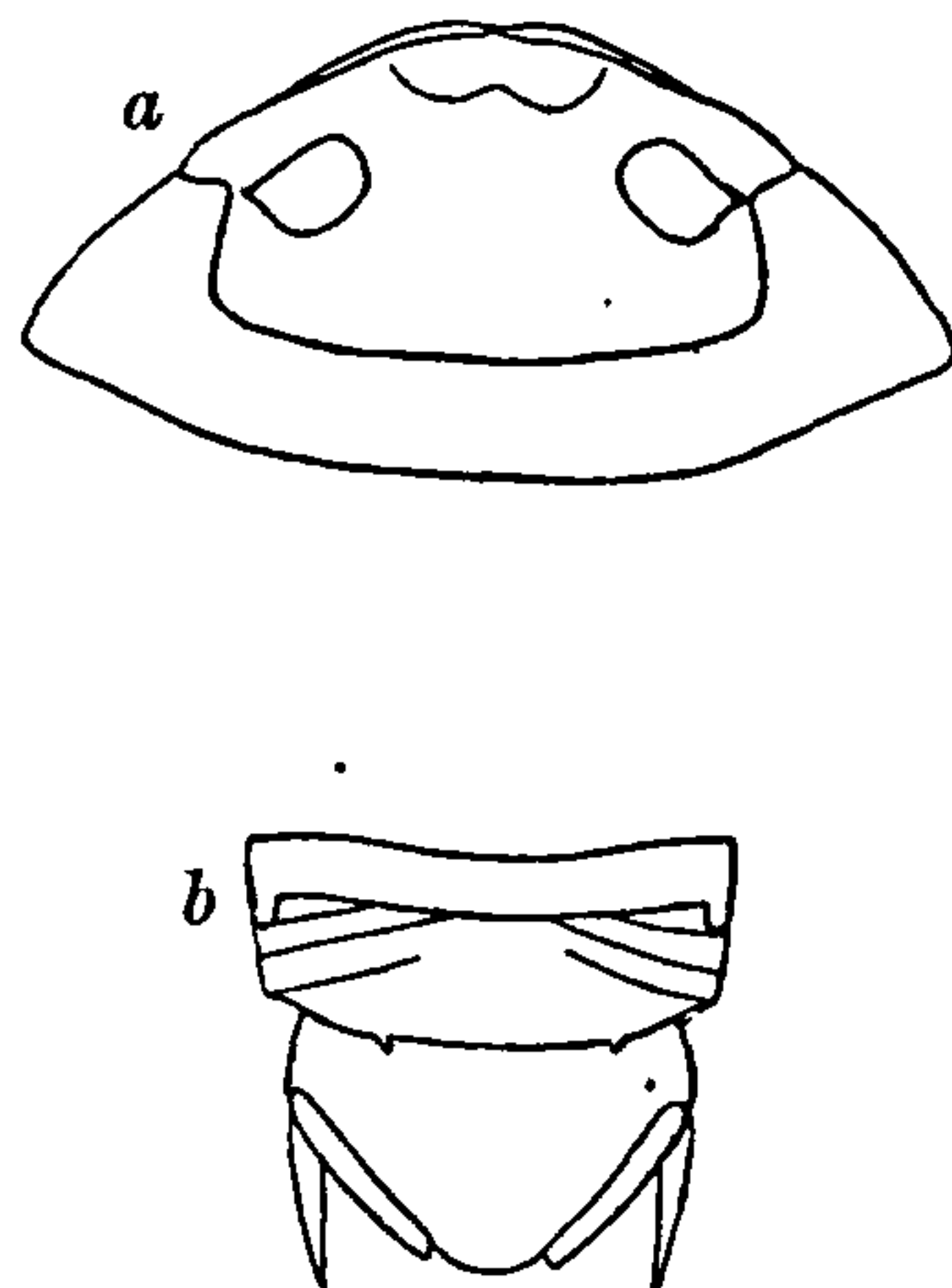


FIG. 290.—TECTICEPS CONVEXUS. *a*, HEAD. $\times 5\frac{1}{2}$. *b*, ABDOMEN AND LAST THORACIC SEGMENT. $\times 2\frac{3}{4}$.

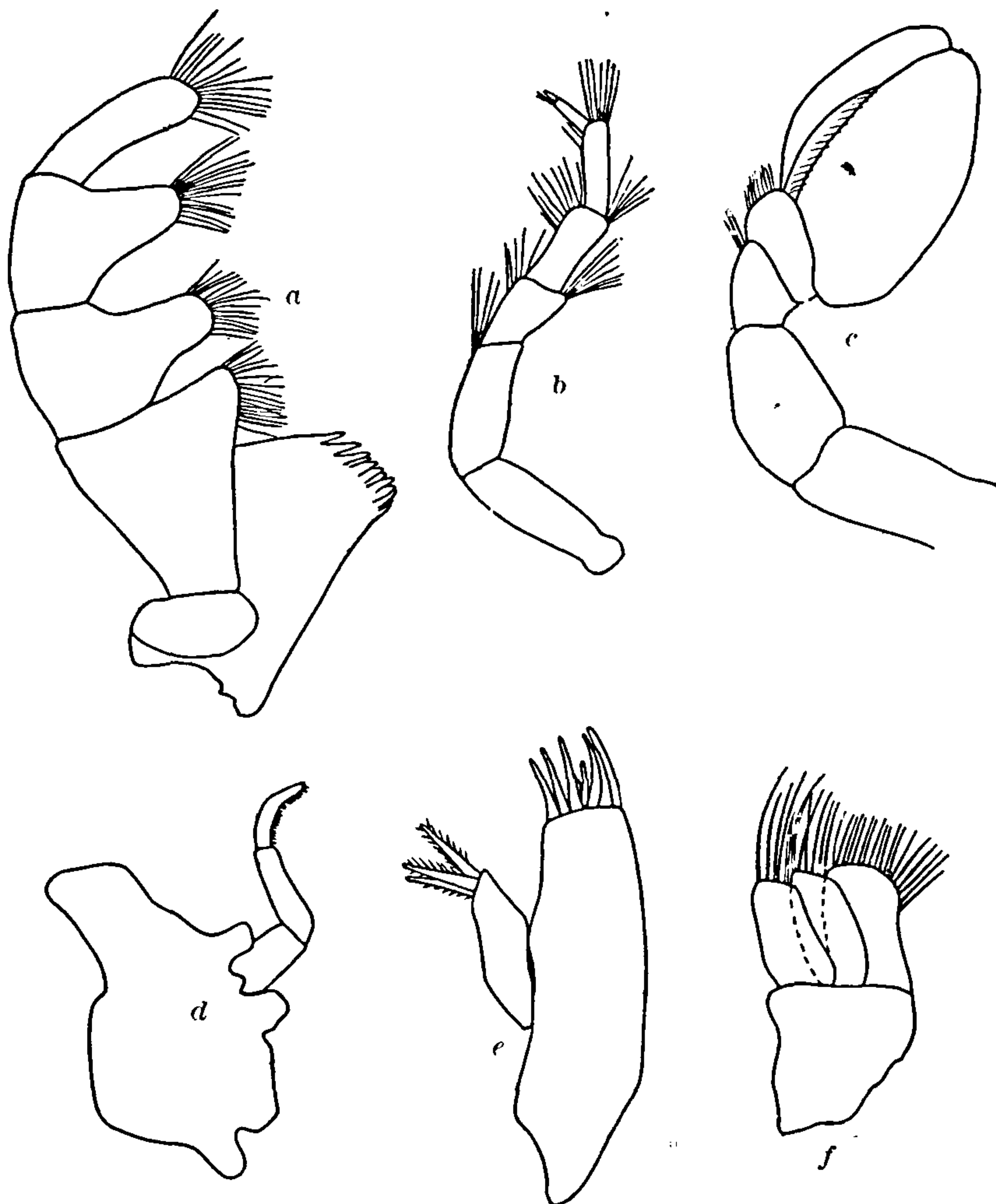


FIG. 291.—TECTICEPS CONVEXUS. *a*, MAXILLIPED. $\times 27\frac{1}{2}$. *b*, SECOND LEG OF FEMALE. $\times 27\frac{1}{2}$. *c*, FIRST LEG. $\times 15\frac{1}{2}$. *d*, MANDIBLE. $\times 15\frac{1}{2}$. *e*, SECOND MAXILLA. $\times 27\frac{1}{2}$. *f*, FIRST MAXILLA. $\times 27\frac{1}{2}$.

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A number of individuals were found at Monterey Bay, California, and sent to the U. S. National Museum by Mr. Heath, who gives the following note of their habits:

They were taken by the Chinese fishermen from a sandy sea bottom about 30 feet below the surface (according to the Chinese statement). These are rapid swimmers, and the moment they are disturbed they roll into a ball and project the exopodite of the last free segment. This is undoubtedly for protection. I have not had time to accurately examine the position nor character of this appendage, but its sharp, swordlike nature is readily recognized.

Type.—Cat. No. 22572, U.S.N.M.

This species differs from *T. alascensis* in having longer antennæ and antennulæ; in having the terminal segment rounded, which in that species is very pointed; in having the outer branch of the uropods as short as the inner, which in that species is much longer; in having only a gradual increase in the length of the legs, which in that species show such marked disproportions in the propodus of the sixth and seventh pairs, and in the position of the eyes, which in this species are situated in the median transverse line of the head, while in *T. alascensis* they are placed in the posterior half of the head.

48. Genus SPHÆROMA Latreille.

Body contractile, able to roll into a complete ball. Abdomen composed of two segments, the first of which is formed by the fusion of several coalesced segments. The terminal segment is rounded, entire.

The branches of the uropoda are similar, both being salient. The outer branch of the uropoda is denticulate along the exterior margin; the inner branch is immovable and fixed to the side of the abdomen; the outer branch is movable, and capable of folding under the inner branch.

The second, third, and fourth articles of the palp of the maxillipeds not produced into lobes, but furnished with exceedingly long hairs.

Legs all ambulatory in structure.

ANALYTICAL KEY TO THE SPECIES OF THE GENUS SPHÆROMA.

a. Abdomen without tubercles *Sphæroma quadridentatum* Say

a'. Abdomen with tubercles.

b. Tubercles on terminal segment of abdomen arranged in a transverse row of four on anterior portion. Two tubercles on first abdominal segment, one on either side of the median line. A transverse row of four tubercles, two on either side of the median line on the seventh thoracic segment. Posterior extremity of terminal segment of abdomen without prominent transverse elevation.

Sphæroma destructor Richardson

b'. Tubercles on terminal segment of abdomen arranged in two longitudinal series of four, a series on either side of the median line. No tubercles on first segment of abdomen or on seventh thoracic segment. Posterior extremity of terminal segment of abdomen with prominent transverse elevation.

Sphæroma pentodon Richardson

SPHÆROMA QUADRIDENTATUM Say.

Sphæroma quadridentatum SAY, Jour. Acad. Nat. Sci. Phila., I, 1818, p. 400.—HARGER, Am. Jour. Sci. (3), V, 1873, p. 314.—HARGER with VERRILL, Report U. S. Commissioner of Fish and Fisheries, 1873, Pt. 1, p. 315 (21); p. 569 (275), pl. v, fig. 21.—HARGER, Proc. U. S. Nat. Mus., II, 1879, p. 161; Report U. S. Commissioner of Fish and Fisheries, Pt. 6, 1880, pp. 368-370, pl. IX, fig. 53.—RICHARDSON, American Naturalist, XXXIV, 1900, p. 223; Proc. U. S. Nat. Mus., XXIII, 1901, p. 533.

Localities.—New England; Vineyard Sound; Provincetown, Massachusetts; Savin Rock, New Haven; Cape Charles City, Virginia; St. Catherine Island, Georgia; Beaufort, North Carolina; east Florida; Key West, Florida; south Florida.

Depth.—Surface to one-half fathom.

The type locality is St. Catherine Island, Georgia.

Body ovate, nearly twice as long as wide, 5 mm. : 10 mm.

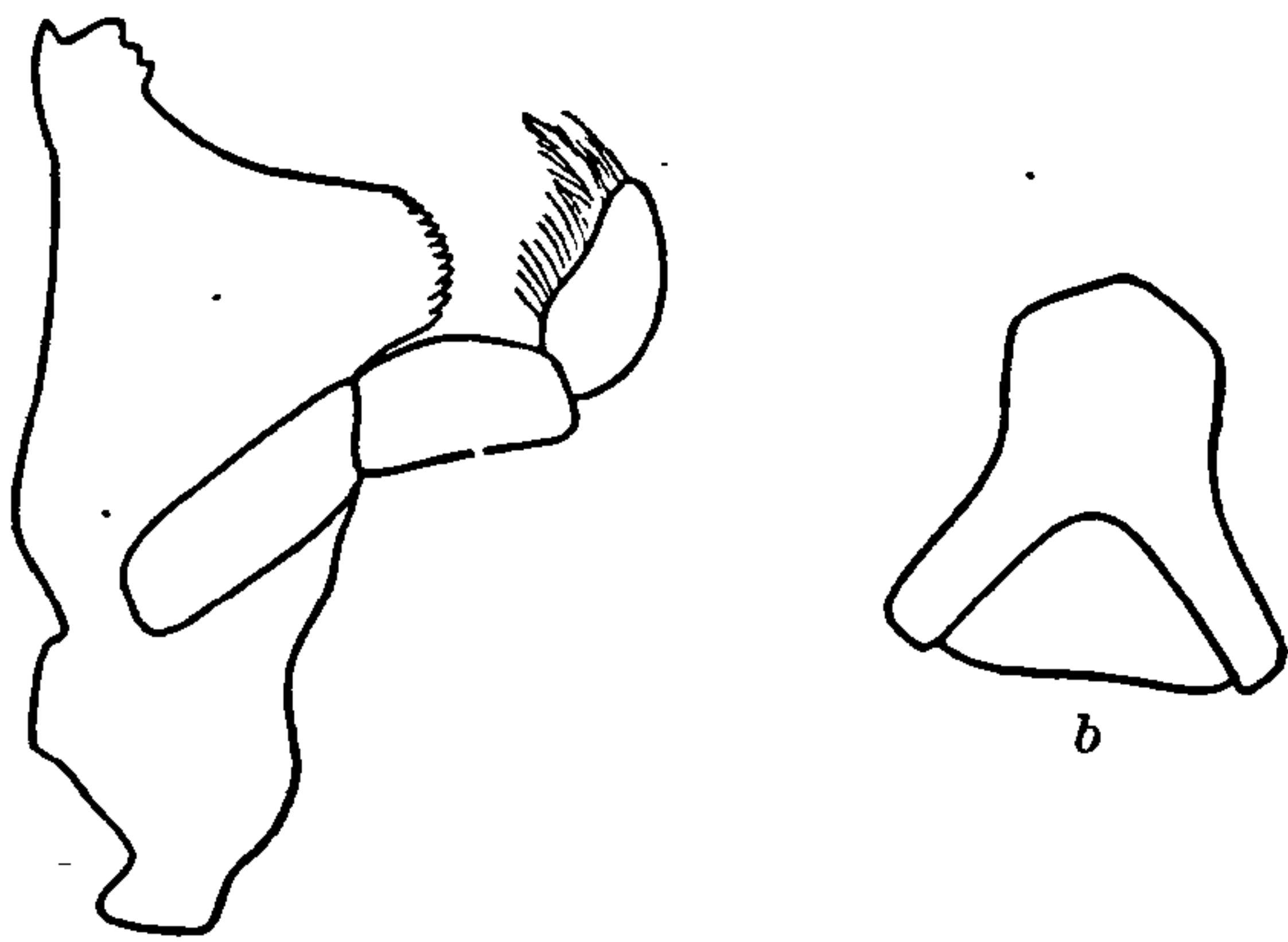


FIG. 293.—SPHÆROMA QUADRIDENTATUM. *a*, MANDIBLE. $\times 41$. *b*, FRONTAL LAMINA AND CLYPEUS. $\times 23$. *c*, MAXILLIPED. $\times 41$.

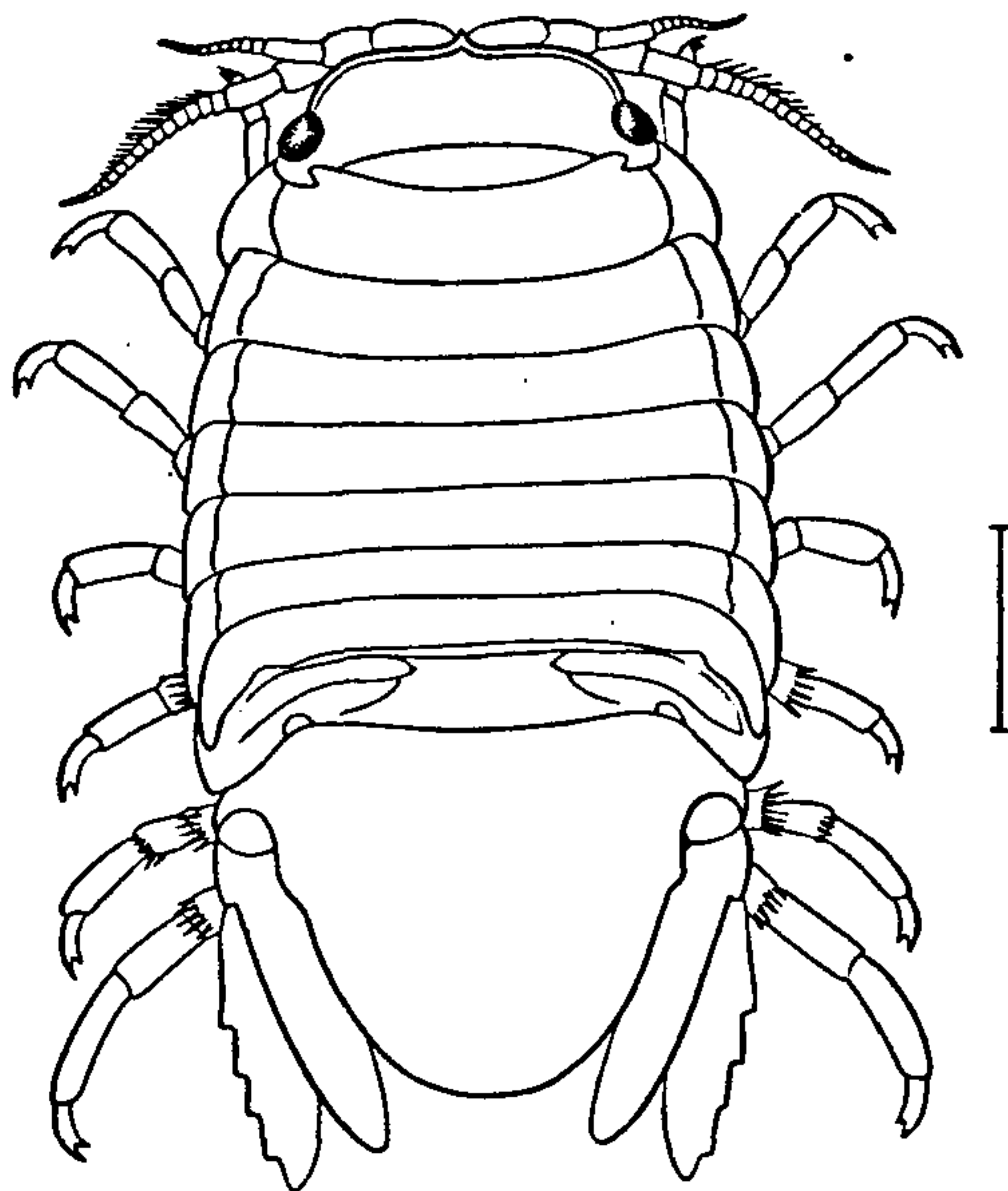


FIG. 292.—SPHÆROMA QUADRIDENTATUM (AFTER HARGER).

Head twice as wide as long, $1\frac{1}{2}$ mm. : 3 mm., with a frontal border arising between the eyes and produced in a small median point. The eyes are small, round, composite, and situated in the post-lateral angles of the head. The first pair of antennæ have the basal article elongate; the second article is half as long as the first; the third is twice as long as the second. The flagellum is composed of twelve articles. The first antennæ extend to the middle of the first thoracic segment. The basal article of the second antennæ is inconspicuous; the second is short; the third is twice as long as the second; the fourth and fifth are subequal and each is a little longer than the third. The flagellum is composed of fifteen articles. The second antennæ extend to the posterior margin of the second thoracic segment. The maxilliped has a palp of five articles.

The palp of the mandible is composed of three articles. The frontal lamina is large and conspicuous and has the anterior margin broadly triangulate, the post-lateral angles produced.

The segments of the thorax are about equal in length. The epimera are not distinct from the segments, but the place of coalescence is indicated by a light longitudinal area on either side of the segment. The post-lateral angles of the lateral parts of all the segments is drawn out into a narrow and somewhat acute process, more pronounced in the first four segments.

The abdomen is composed of two segments. The first segment has three suture lines indicating several partly coalesced segments. The terminal segment is long and widely rounded posteriorly. The anterior portion is convex. The fixed inner branch of the uropoda extends a little beyond the extremity of the terminal abdominal segment and has its margins smooth. The outer movable branch is as long and wide as the inner branch and has three or four teeth on its outer margin.

The legs are all ambulatory in character.

SPHÆROMA DESTRUCTOR Richardson.

Sphæroma destructor RICHARDSON, Proc. Biol. Soc. Wash., XI, 1897, pp. 105-107; American Naturalist, XXXIV, 1900, p. 223; Proc. U. S. Nat. Mus., XXIII, 1901, p. 534.

Sphæroma tenebrans STEBBING (part), Spolia Zeylanica, II, Pt. 5, 1904, pp. 16-21.

Locality.—St. Johns River, Palatka, Florida. (Fresh water.)

Bored holes in piers on St. Johns River. Sections of the wood show that the diameter had been reduced during a period of eight years from 16 inches to $7\frac{1}{2}$ inches. The whole surface of the wood was bored with holes averaging in size about 5 mm. in diameter, and in an end section the holes were arranged in concentric rings between the rings of annual growth, showing the little animal's preference for the soft pine. Very strong mandibles projecting beyond the labrum most conspicuously provide a perfect equipment for this destructive work.

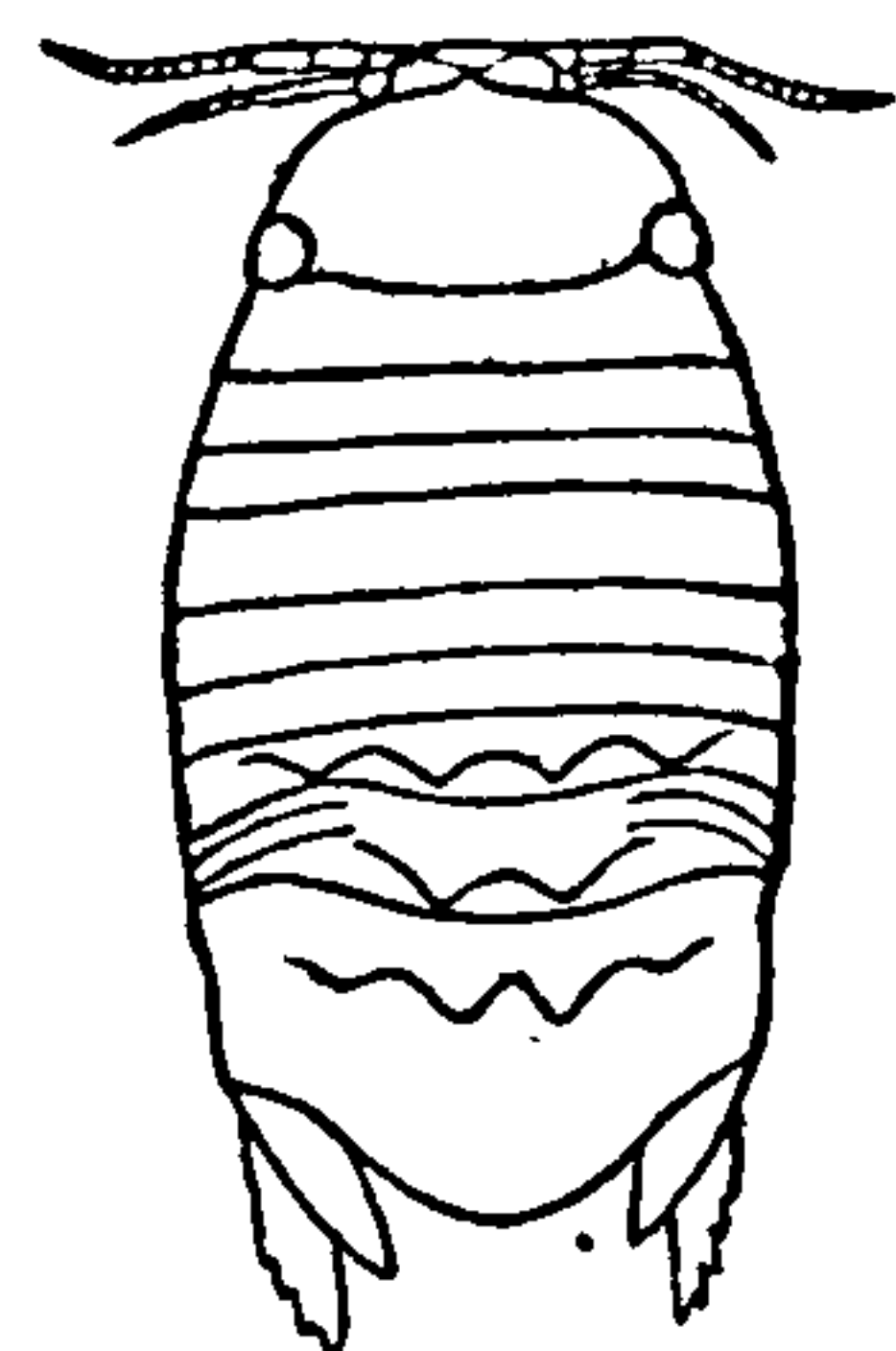


FIG. 294.—SPHÆROMA DESTRUCTOR. DORSAL VIEW. $\times 3$.

Head twice as broad as long, having a small median projection. Eyes lateral and posteriorly situated. The first pair of antennæ, with a flagellum composed of eight articles, reach the posterior margin of the head; the second pair of antennæ extend to the post-lateral angle of the first thoracic segment; its flagellum is twelve jointed.

The first and fourth thoracic segments are of equal length and are one and a half times longer than the other thoracic segments. The

epimeral parts are not distinct from the segments, are quite broad, and terminate laterally in acute angles, which point downward. The seventh thoracic segment bears four tubercles situated in a transverse line.

The abdomen is composed of two distinct segments, on the first of which are two tubercles, one on either side of the median line. Suture lines at the sides of this segment indicate three coalesced segments. The terminal segment is triangularly shaped and rounded posteriorly with an upcurved margin, which extends all around the terminal half of the segment. The whole surface of the abdomen is thickly tuberculated with low but distinct tubercles, each one surmounted with a small tuft of stiff hairs or bristles. On the anterior part four large tubercles are situated in a transverse line, the two center ones being somewhat closer to each other than



FIG. 295.—SPHÆROMA DESTRUCTOR. MANDIBULAR APPENDAGE. × 10.

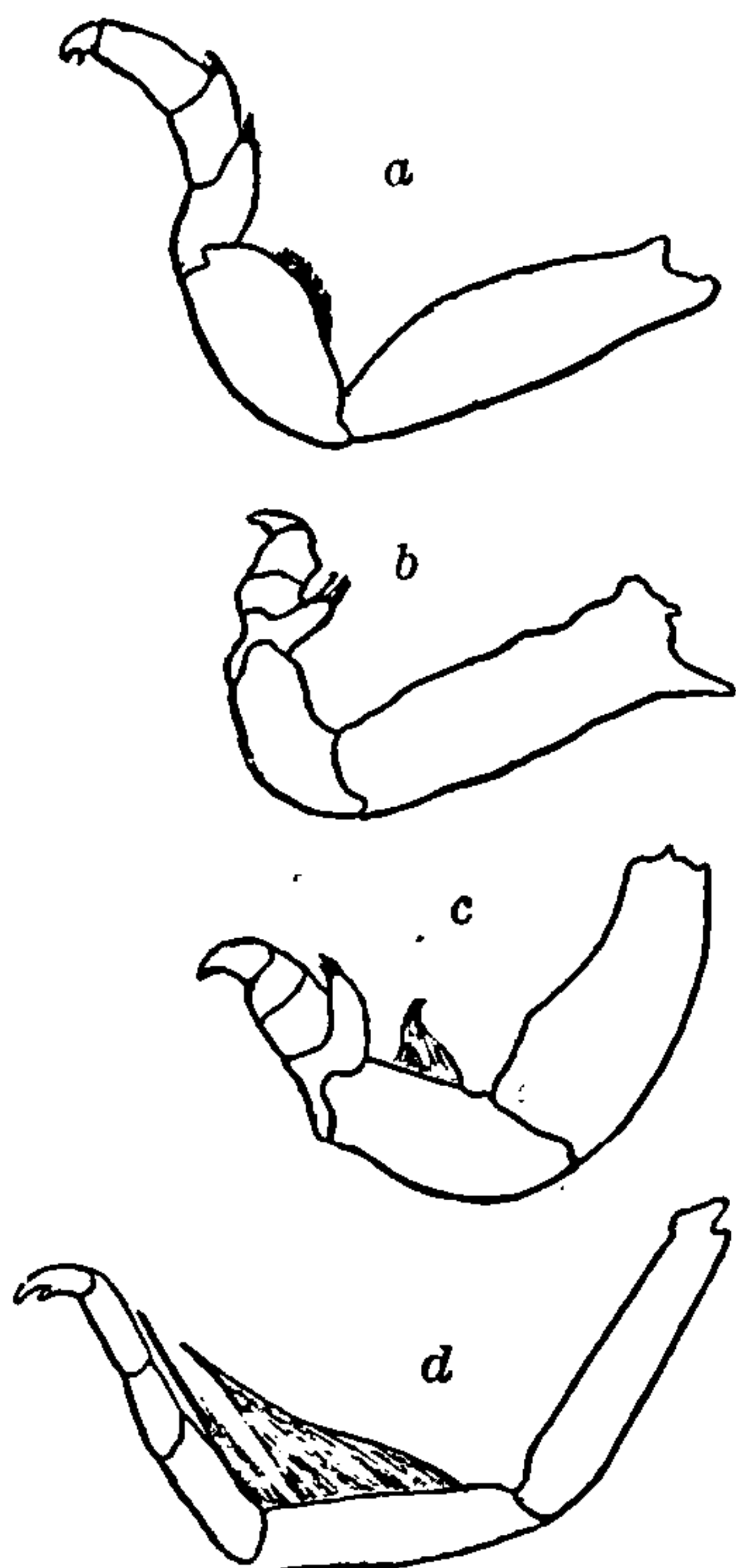


FIG. 296.—SPHÆROMA DESTRUCTOR. × 10. *a*, LEG OF SECOND PAIR. *b*, LEG OF FOURTH PAIR. *c*, LEG OF FIFTH PAIR. *d*, LEG OF SIXTH PAIR.

to the lateral ones. The uropoda extend beyond the extremity of the abdomen, the outer branch being the longer. Both are pointed and similar in shape. The outer edge of the exopodite is provided with four teeth, while that of the endopodite is smooth.

The legs of this species are in three series, according to structure, the first three pairs being alike, the fourth and fifth similar, and the sixth and seventh similar. The legs of the first series are long and slender (fig. 294 *a*), with the second joint or basis nearly cylindrical in shape. The ischium is nearly as long as the basis, and this joint, as well as the merus, is furnished with long straight hairs. The carpus and propodus are likewise long and slender. In the first pair the carpus is minute. The legs of the second series, the fourth and fifth pairs, are stout and short, being similar in general form, though differing somewhat in relative proportions. The basis is about half the

length of the entire leg, while the joints following the ischium are very short. In the third series the legs are nearly as long as those of the first series, but differ in size and shape. They are stouter and not cylindrical.

The whole surface of the body is punctate, and has minute transverse rugæ between the points of depression. In color it is a dark brown, shaded on the edges with a lighter brown.

Type.—Cat No. 19857, U.S.N.M.

Spence Bate^a describes a species of *Sphæroma*, *Sphæroma vastator*, which was procured "from a piece of wood which had formed part of a railway bridge over one of the backwaters of the West Coast of the Indian Peninsula." The wood is described as being "honey-combed with cylindrical holes, in many of which the animal was rolled up like a ball." Notwithstanding the close resemblance in habits and appearance of this species, as described and figured, to the present one, there are four points of difference:

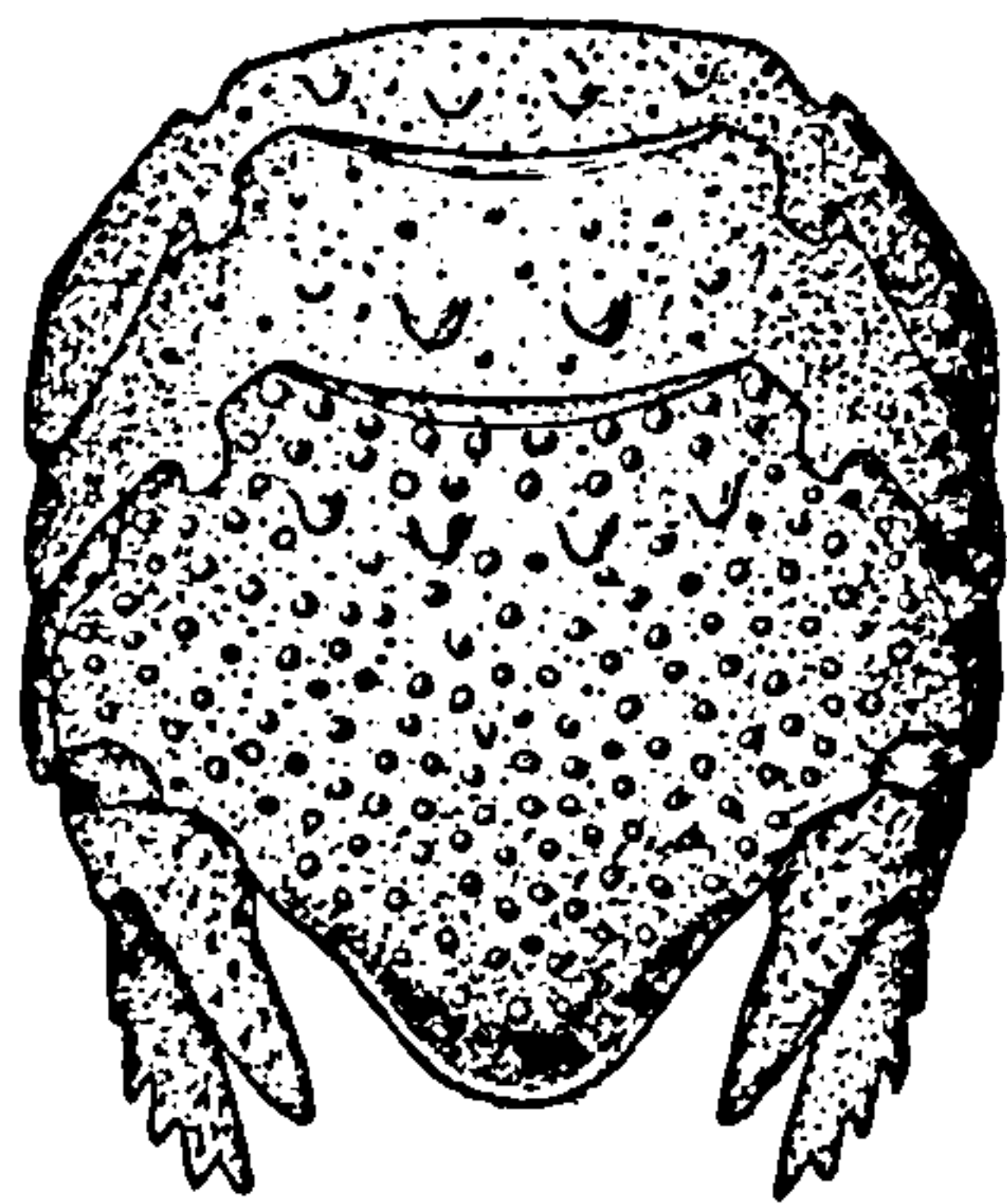


FIG. 297.—SPHÆROMA DESTRUCTOR. ABDOMEN WITH UROPODA AND LAST SEGMENT OF THORAX.

I. *The number and arrangement of the tubercles in the two species.*—In *S. vastator* four tubercles are described on each of the last three segments of the thorax, and only two are figured on the anterior portion of the pleon. In the species under discussion, how-

ever, there are four tubercles on the seventh segment of the thorax.

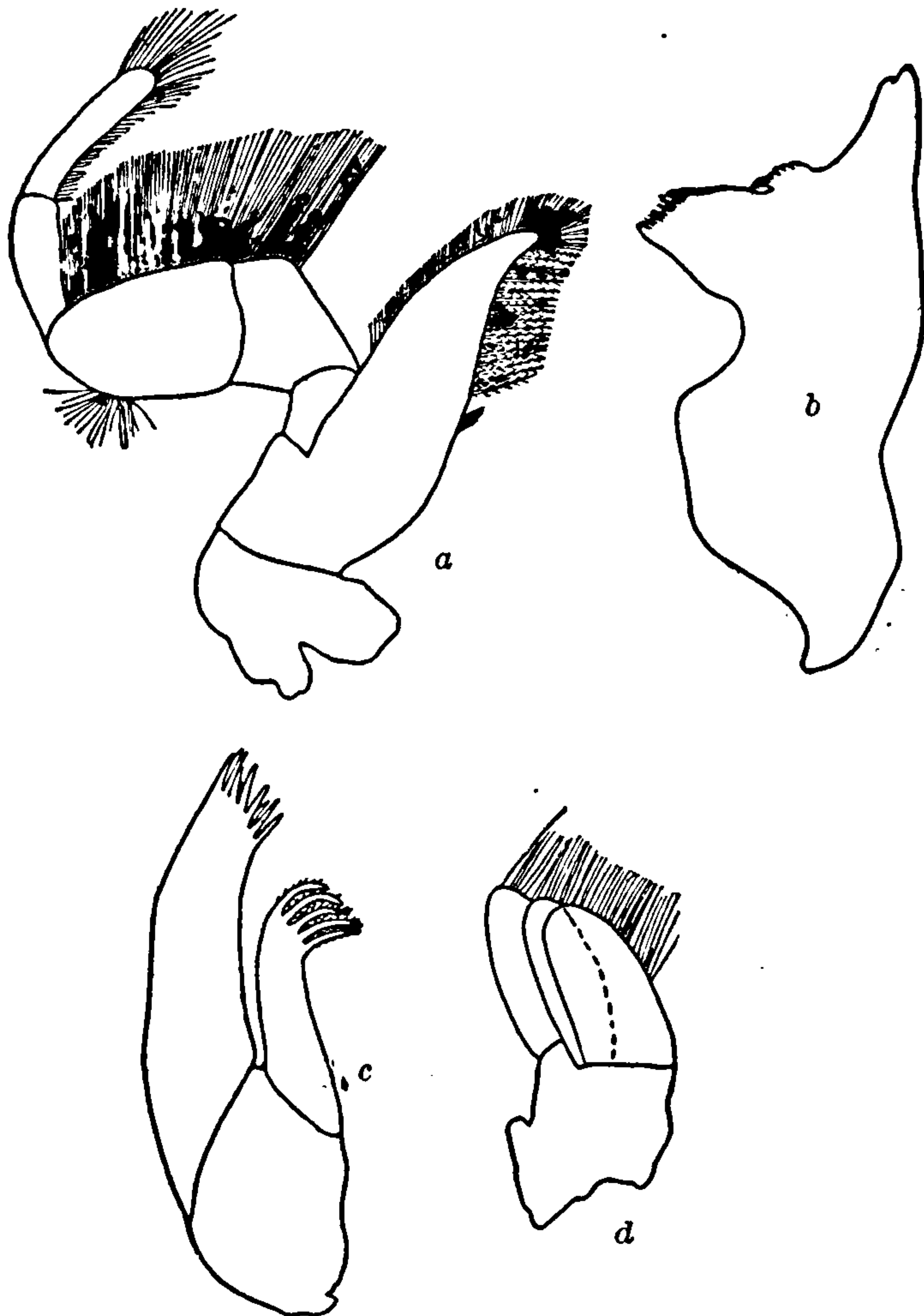


FIG. 298.—SPHÆROMA DESTRUCTOR. *a*, MAXILLIPED. $\times 27\frac{1}{2}$. *b*, MANDIBLE (PALP OMITTED). $\times 27\frac{1}{2}$. *c*, FIRST MAXILLA. $\times 27\frac{1}{2}$. *d*, SECOND MAXILLA. $\times 27\frac{1}{2}$.

ever, there are four tubercles on the seventh segment of the thorax.

^a Ann. of Nat. Hist. (3), XVII, p. 28, pl. II, fig. 4.

only, and six on the abdomen, two on the first abdominal segment, and four on the anterior portion of the terminal segment.

II. *The structure of the feet.*—In *S. vastator* the legs of the first three pairs are not proportionately as long as those of the present species. The merus is differently shaped, not being cylindrical in that species, and is relatively shorter. Although Spence Bate mentions no dissimilarity in structure in the legs of the fourth and fifth pairs, still a difference is shown in the cut in the formation of the merus. With our species the difference in these two pairs of legs is merely in proportion. There is a greater resemblance in the sixth and seventh pairs of legs of the two species.

III. *The upcurved margin of the posterior half of the terminal segment of the abdomen.*

IV. *The presence of numerous tubercles furnished with bristle-like hairs upon the abdomen.*

Neither of these points are mentioned in the description of *Sphæroma vastator*.

In a recent paper, "Gregarious Crustacea from Ceylon," Rev. T. R. R. Stebbing^a places *Sphæroma destructor* from Florida in the synonymy of *Sphæroma tenebrans* Bate from Brazil, and also refers to that species *Sphæroma vastator* Spence Bate from Madras, and considers specimens sent him from Ceylon as belonging to that species.

In the above description I have pointed out the differences between *Sphæroma destructor* and *Sphæroma vastator*. It remains to point out the differences which exist between *Sphæroma destructor* and the specimens which Dr. Stebbing had from Ceylon.

The specimens from Florida have the abdomen "thickly tuberculate with low but distinct tubercles, each one surmounted with a tuft of small hairs or bristles." Stebbing says, in reference to this character, that this feature is not of the highest importance, and in some of his specimens can not easily be discerned. In the Florida specimens these tufts are most conspicuous and very apparent in all the specimens. Stebbing further states that in a dorsal view of *Sphæroma destructor* they are not even indicated in the figure. The drawing was merely an outline drawing, not a finished one, and the statement of the tuberculate character of the abdomen was made in the text. The above illustration (fig. 295) fully shows this point as well as the difference, in this respect, between the specimens from Florida and those of Stebbing. Neither in the text nor in the figure is there any indication of tubercles on the abdomen of Stebbing's specimens.

The specimens from Florida have the inner plate of the first maxillæ tipped with five strong plumose setæ and occasionally a sixth one that is feeble; on the outer plate are eleven spines. Stebbing's

^a *Spolia Zeylanica*, II, Pt. 5, 1904, pp. 16-21.

specimens have three strong plumose setæ and one that is feeble on the inner plate, and nine spines on the outer plate of the first maxillæ.

The terminal abdominal segment in Stebbing's specimens has the sides near the apex incurved. In the Florida specimens the sides are straight.

The outer branch of the uropoda in *S. destructor* has four teeth on the exterior margin, and a slight indication of a fifth in some specimens. There are never six teeth, and the fifth one is never well developed and strong as the four, which are constant in size and number. Stebbing says that this number is also found in the Ceylon specimens, the precise number being immaterial, but later, in pointing out the affinity of *Sphæroma felix* Lanchester, with the species in question, refers to the outer ramus in *Sphæroma felix* as having eight small teeth on the outer margin, this being a character to be considered in separating the species.

The second, third, and fourth segments of *Sphæroma destructor* are each crossed by a transverse ridge. In Stebbing's specimens only the fourth segment has a transverse ridge.

The apical tooth of the mandibles is sub-bifid in the Florida specimens.

SPHÆROMA PENTODON Richardson.

Sphæroma pentodon RICHARDSON, Harriman Alaska Exp. Crust., X, pp. 214-215; Proc. U. S. Nat. Mus., XXVII, 1904, pp. 659-660—HOLMES, Proc. Cal. Acad. Sciences (3), III, 1904, pp. 323-324, pl. xxxvii, fig. 43.

Localities.—Sausalito, San Francisco Bay, California. Found in mud flat.

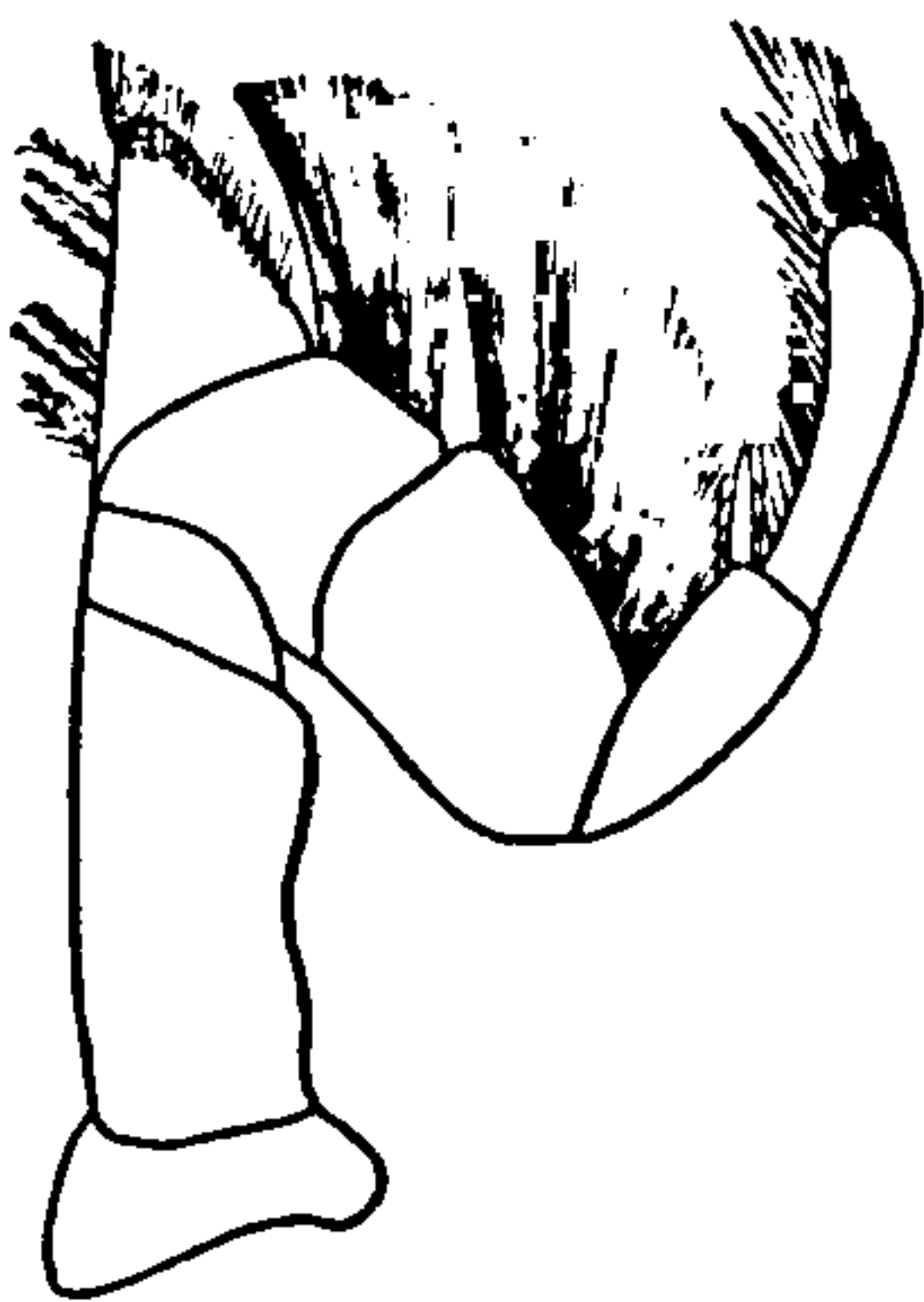


FIG. 299.—SPHÆROMA PENTODON. MAXILLIPED. $\times 27\frac{1}{2}$.

Body elliptical in outline; color dark brown; surface minutely but densely granular.

Head situated transversely, with a prominent ridge on the anterior margin. Eyes placed post-laterally, and composed of many ocelli. First pair of antennæ extend to the posterior margin of the head; flagellum eight-jointed. Second pair of antennæ reach the middle of the second thoracic segment; flagellum composed of fifteen joints.

Segments of the thorax about equal in length, with the exception of the first, which is somewhat longer than any of those following. The lateral parts, which are not distinctly separated from the dorsal portion of the segments, are drawn out in acute processes in the first three segments. Those of the following segments are more nearly regular in outline.

The abdomen is somewhat broader than the thorax, although this expansion of the abdomen does not show in a dorsal view. The first

segment is about equal in length to the last thoracic segment, and is marked on either side by two suture lines indicative of coalesced segments. The terminal segment is entire, and not produced, being evenly rounded in outline. The anterior portion of the segment is convex, with a longitudinal series of four small tubercles on either side of the median line, the two series being close together. The posterior extremity of the segment is marked by a prominent transverse elevation.

The inner immovable branch of the uropoda is narrow, elongate, and pointed posteriorly; it extends to the extremity of the abdomen. The outer mobile branch is provided on the lateral margin with five strong teeth. Both branches are of equal length.

The first three pairs of legs are slender, and are furnished with long hairs. The other four pairs are somewhat stouter.

Ten specimens were collected at Sausalito, California, by Dr. Ritter and party.

This species is perhaps more closely allied to *Sphæroma sieboldii* Dollfus^a from Japan than it is to any of the known species of the genus from the Pacific coast of North America. It differs, however, from that species in having a prominent transverse elevation on the posterior portion of the terminal segment, while in *S. sieboldii* the posterior part of the segment is distinctly concave; in having five teeth on the lateral margin of the outer uropod, while in *S. sieboldii* there are seven; in having fifteen joints to the flagellum of the second pair of antennæ, while this organ in *S. sieboldii* has a flagellum composed of only ten joints; in having two longitudinal series of four small tubercles, one on either side of the median line on the terminal abdominal segment, while in *S. sieboldii* the granulations on the caudal segment form, in the middle, two divergent lines; and in having the body covered with minute granulations, while in *S. sieboldii* the granulations are strong and more prominent.

The type is in the Museum of the University of California. The cotype is in the U. S. National Museum, Cat. No. 28768.

49. Genus EXOSPHÆROMA Stebbing.

Second, third, and fourth articles of the palp of the maxillipeds produced into lobes.

The outer branch of the uropoda is not denticulate on the exterior margin.

Characters otherwise as in the genus *Sphæroma* Latreille.

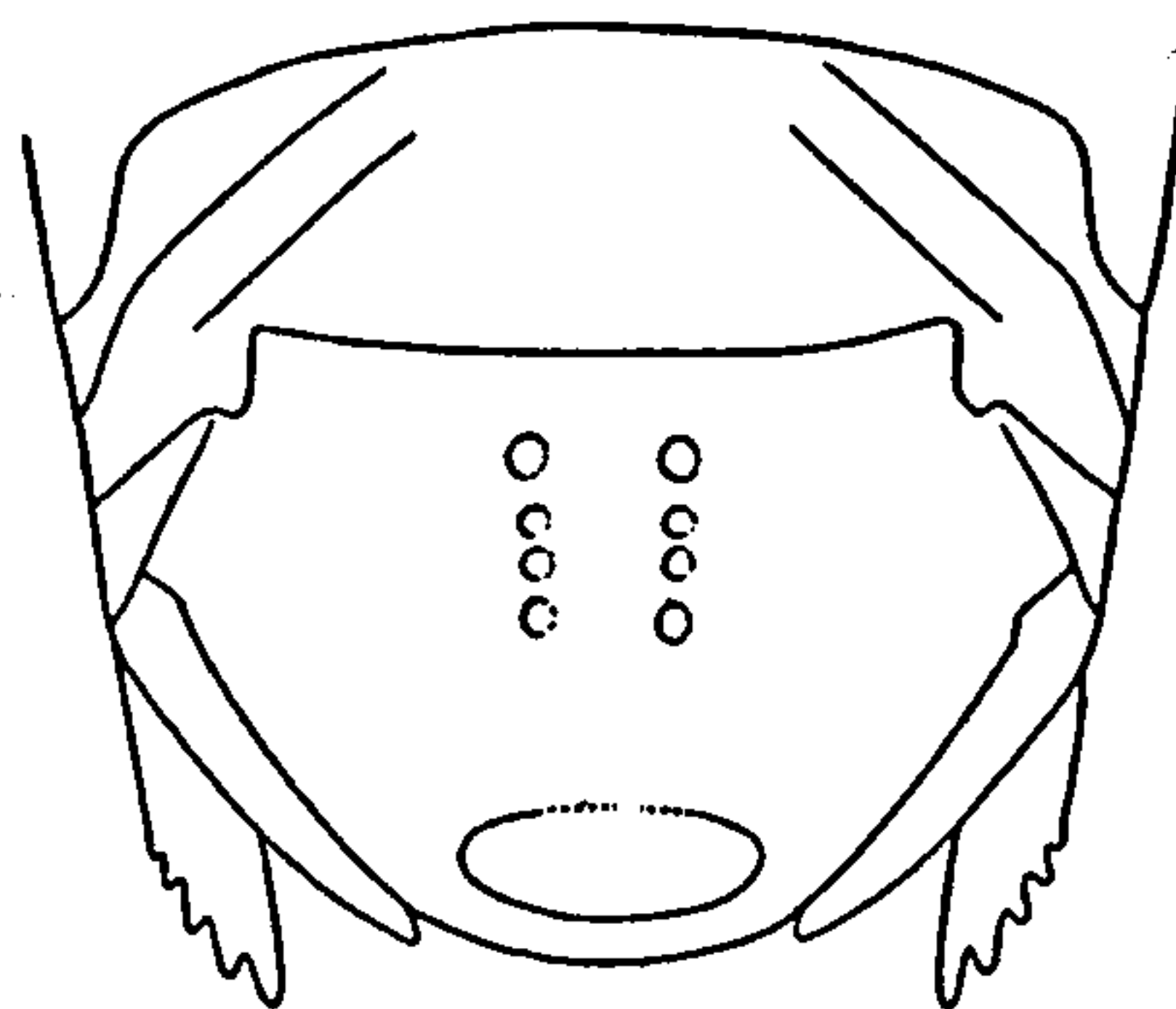


FIG. 300.—SPHÆROMA PENTODON.
ABDOMEN. × 8.

^a Notes from the Leyden Museum, XI, 1889, pp. 93, 94, pl. v.

ANALYTICAL KEY TO THE SPECIES OF THE GENUS EXOSPHEROMA.

- a. Body widening gradually from the head backward. Thorax transversely ridged and provided with three longitudinal rows of small tubercles. Branches of uropoda very large, expanded.....*Exosphæroma amplicauda* (Stimpson)
- a'. Body not increasing in width from the head backward. Surface of thorax smooth. Branches of uropoda not expanded.
- b. Extremity of terminal abdominal segment produced in a rhomboid process.
Exosphæroma rhomburum (Richardson)
- b'. Extremity of terminal abdominal segment not produced in a rhomboid process.
- c. Surface of abdomen with tubercles.
- d. Abdomen posteriorly ending in a triangular apex, on either side of which is a small tooth.
- e. With three tubercles at base of terminal abdominal segment. Outer branch of uropoda not longer than inner branch and both shorter than terminal segment of abdomen. Outer branch not acutely produced.
Exosphæroma yucatanum (Richardson)
- e'. With two tubercles at base of terminal abdominal segment. Outer branch of uropoda extending beyond the inner branch, a distance equal to half the length of the inner branch. Outer branch very acute at extremity.....*Exosphæroma faxoni*, new species
- d'. Abdomen posteriorly rounded. With eight tubercles, six on terminal segment and two on preceding segment.
Exosphæroma octoncum (Richardson)
- c'. Surface of abdomen without tubercles.
- d. Outer branch of uropoda smooth on exterior margin.
- e. Outer branch of uropoda half as long as inner branch and half as wide.
Exosphæroma thermophilum (Richardson)
- e'. Outer branch of uropoda more than half as long as inner branch.
- f. Outer branch four-fifths as long as inner branch and half as wide.
Exosphæroma dugesi (Dollfus)
- f'. Outer branch two-thirds as long and as wide as inner branch.
Exosphæroma oregonensis (Dana)
- d'. Outer branch of uropoda crenulated on exterior margin.
Exosphæroma crenulatum (Richardson)

EXOSPHEROMA AMPLICAUDA (Stimpson).

Sphæroma amplicauda STIMPSON, Bost. Jour. Nat. Hist., VI, 1857, p. 510.—
RICHARDSON, Proc. U. S. Nat. Mus., XXI, 1899, p. 835; Ann. Mag. Nat. Hist. (7), IV, 1899, p. 179; Amer. Naturalist, XXXIV, 1900, p. 222.

Localities.—Tomales Bay, California; Kyska Harbor, Alaska; north coast of Amchitka, Alaska; Monterey Bay, California.

Found in low water on beach.

Body narrower anteriorly than posteriorly, gradually increasing in width from the head to the abdomen, a little more than one and a half times longer than broad, 5 mm.: 8 mm.

Head a little more than twice as wide as long, with a frontal border arising between the eyes, which is produced in a small median point. The eyes are small, round, composite, and situated in the post-lateral angles of the head. The first pair of antennæ have the basal article long and equal in length to the third; the second article is half as long as either of the other two. The flagellum is composed of five

articles. The first antennæ extend to the posterior margin of the head. The second antennæ have the first two articles very short and equal in length; the third and fourth are about equal in length and each is twice as long as the second; the fifth article is one and a half times longer than the fourth. The flagellum is composed of nine articles. The second antennæ extend almost to the posterior margin of the first thoracic segment. The maxilliped has a palp of five articles. The mandible has a palp of three articles.

The first segment of the thorax is a little longer than any of the others. The lateral parts of all the segments are bent downward, forming an angle with the dorsal portion. The epimera are not distinct from the segments, but are indicated by a faint line on either side of the segment a little distance within the place where the lateral part of the segment forms the angle with the dorsal part.

The abdomen is composed of two segments. The first segment has three suture lines on either side, indicating three coalesced segments. The terminal segment is triangular in shape with apex rounded. The uropoda are very large, both branches extending to the tip of the abdomen, and being of equal width. The outer movable branch is

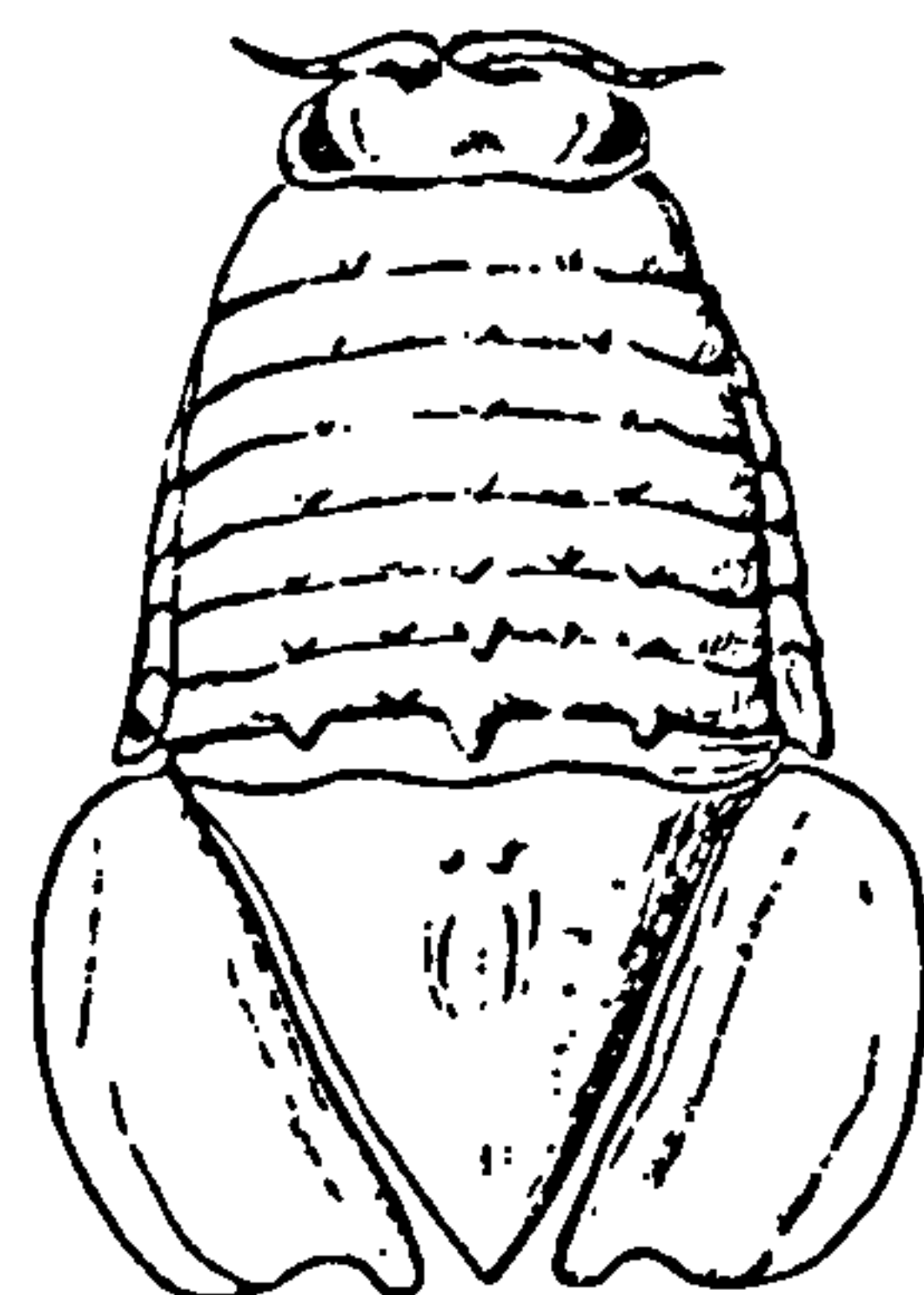


FIG. 301.—EXOSPHEROMA AMPLEXICAUDA (AFTER STIMPSON). $\times 8$.

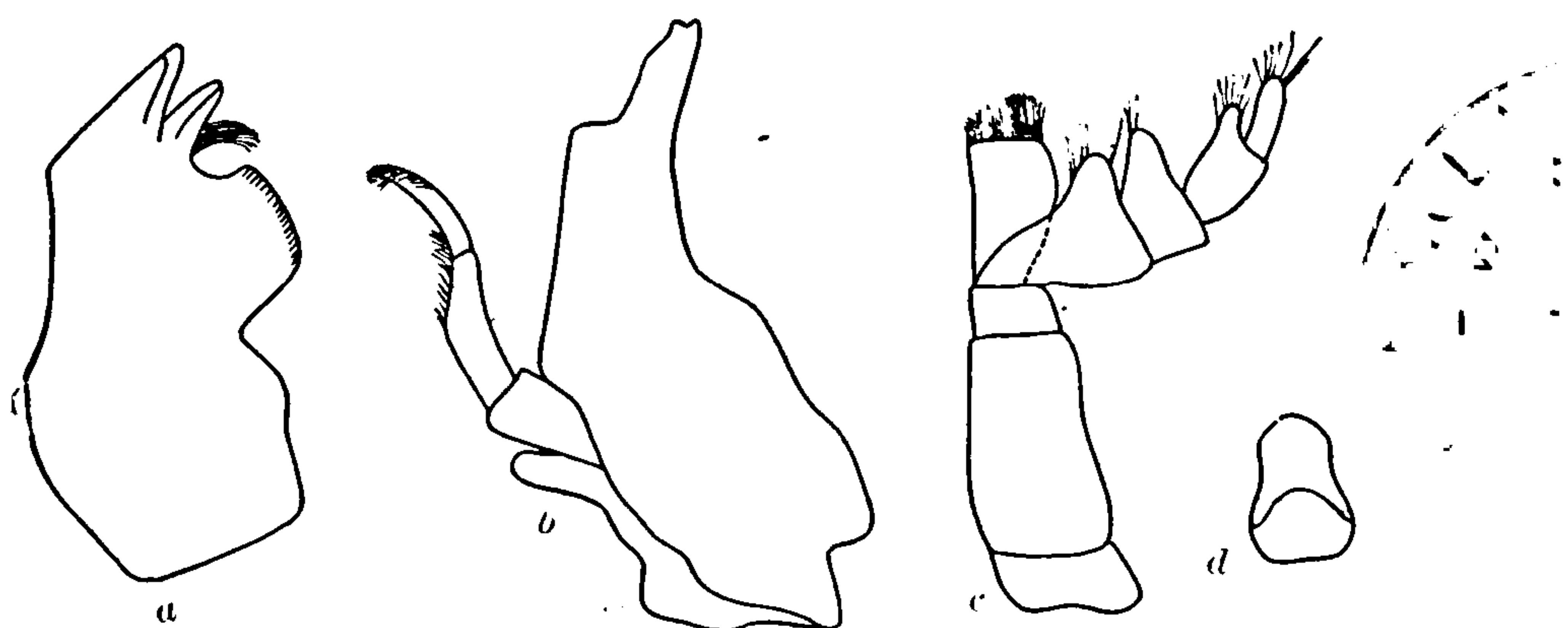


FIG. 302.—EXOSPHEROMA AMPLEXICAUDA. *a, b*, MANDIBLES. $\times 51\frac{2}{3}$. *c*, MAXILLIPED. $\times 51\frac{2}{3}$. *d*, FRONTAL LAMINA AND CLYPEUS. $51\frac{2}{3}$.

rounded posteriorly. The inner immovable branch has the outer post-lateral angle rounded, the inner one produced.

The last three segments of the thorax and the first segment of the abdomen have rudiments of tubercles on their posterior margins. In the specimens examined there are no tubercles on the anterior segments, which may be due to size, all the specimens being very small. There are also four tiny tubercles arranged in two longitudinal series of two, one on each side of the median line at the base of the terminal segment. The legs are all ambulatory.

EXOSPHEROMA RHOMBURUM (Richardson).

Sphæroma rhomburum RICHARDSON, Proc. U. S. Nat. Mus., XXI, 1899, pp. 835-836; Ann. Mag. Nat. Hist. (7), IV, 1899, p. 179; American Naturalist, XXXIV, 1900, p. 222.

Locality.—Monterey Bay, California.

Surface of body punctate; color, whitish yellow.

Head small. First pair of antennæ reach almost to the posterior margin of the first thoracic segment. Second pair of antennæ extend quite to the posterior margin of the first thoracic segment. Eyes situated post-laterally.

Thoracic segments equal in length. Epimera broad and short, extending downward, forming an angle with the segments.

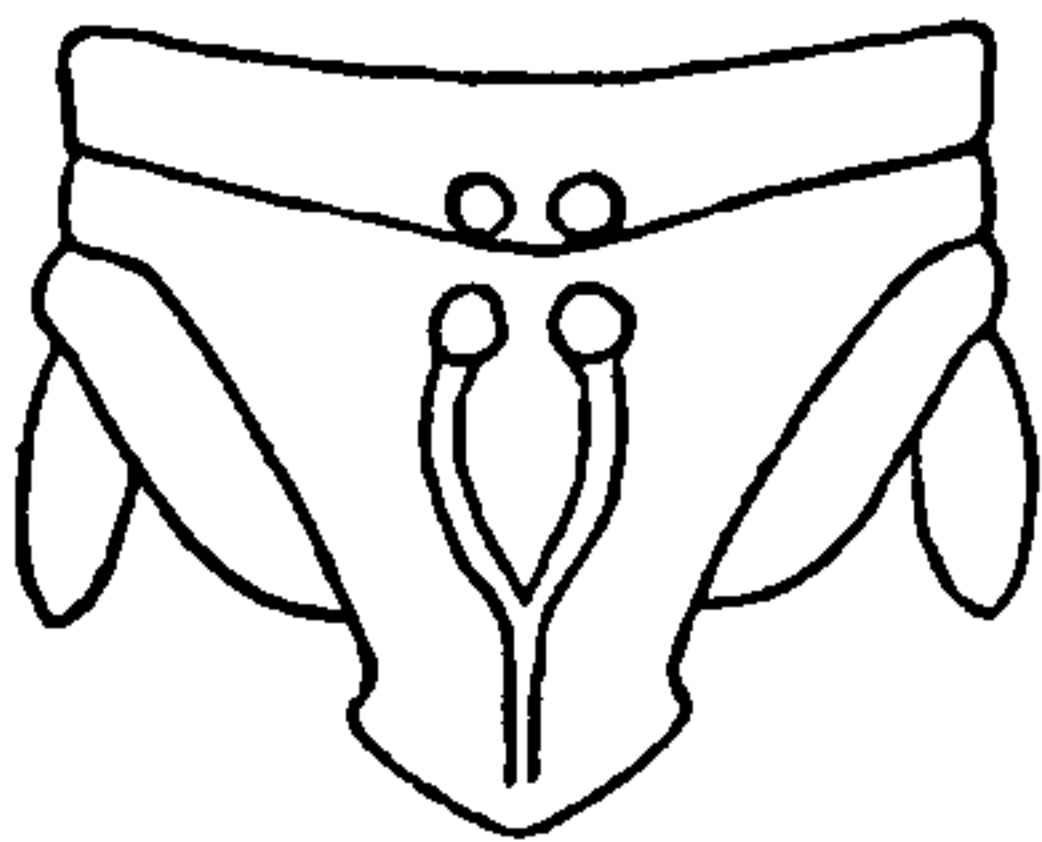


FIG. 303.—EXOSPHEROMA RHOMBURUM. ABDOMEN. $\times 13\frac{1}{2}$.

First abdominal segment as long as any of the thoracic segments, crossed by suture lines and surmounted by two tubercles, close together, one on either side of the median line. Terminal segment with its extremity produced in a process rhomboid in shape,

and with sides infolded, forming a kind of funnel-like opening when seen from beneath. At the base of this segment are two tubercles, which are continuous with two longitudinal ridges in the center of the segment. These ridges unite near the extremity, and continue as one median ridge. The uropoda are shorter than the terminal segment; the outer branch is more lanceolate in shape; both are of equal length.

Two specimens were taken at Monterey Bay, California, by Mr. Heath.

Type.—Cat. No. 22573, U.S.N.M.

This species is similar to *S. (?) egregium* Chilton, from Akaroa, but differs in the presence of two tubercles on the first abdominal segment, in the presence of two tubercles and two longitudinal ridges uniting in a single ridge on the terminal segment, and in the equality in length of the two branches of the uropoda.

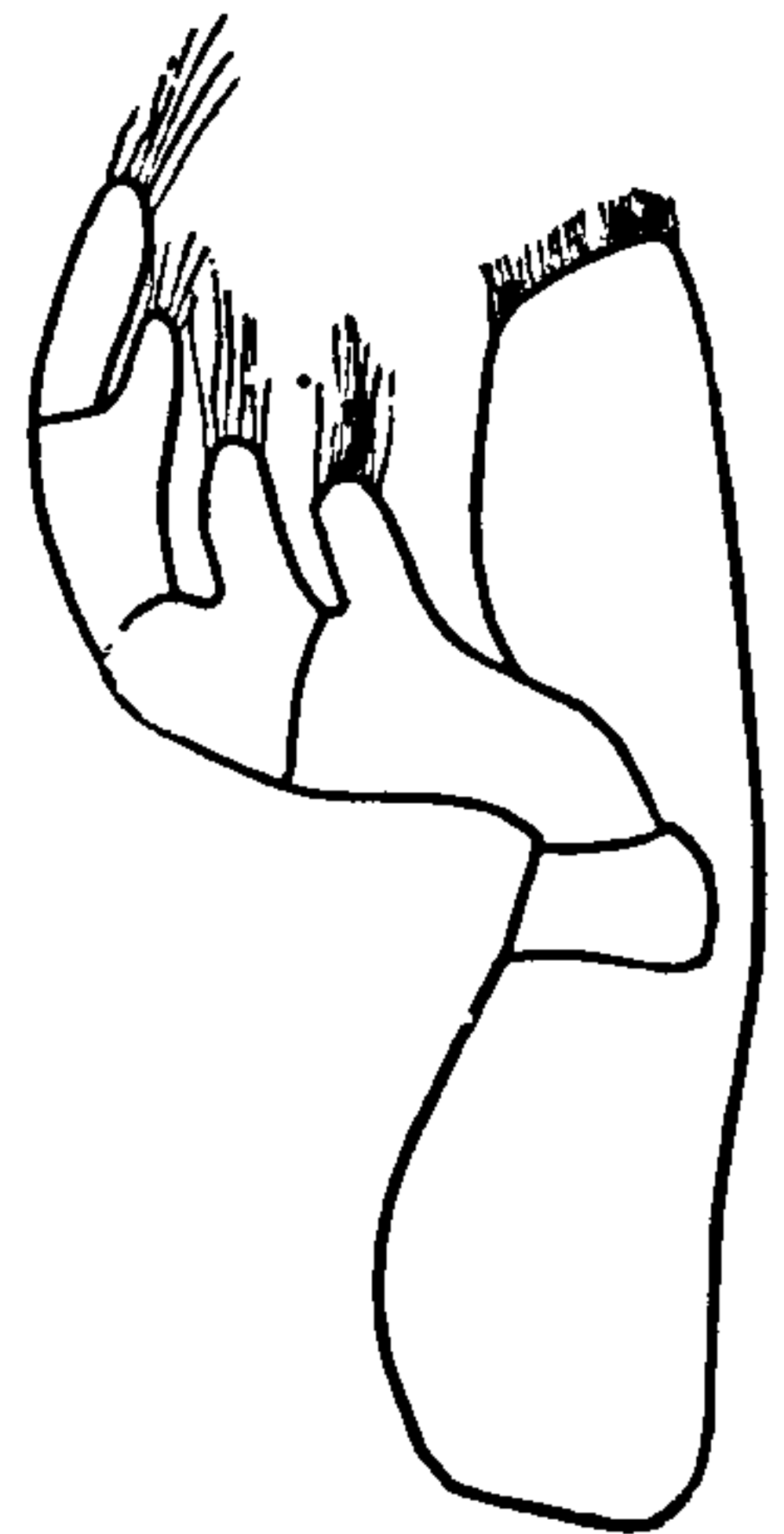


FIG. 304.—EXOSPHEROMA RHOMBURUM. MAXILLIPED. $\times 51\frac{1}{2}$.

EXOSPHEROMA YUCATANUM (Richardson).

Sphæroma yucatanum RICHARDSON, Proc. U. S. Nat. Mus., XXIII, 1901, p. 534.

Locality.—Cape Catoche, Yucatan.

Depth.—24 fathoms.

Head transverse; eyes situated at the extreme post-lateral angles.

First pair of antennæ short, reaching the posterior margin of the head; flagellum six-jointed. Second pair of antennæ, with a flagellum composed of ten joints, extend to the posterior margin of the second thoracic segment.

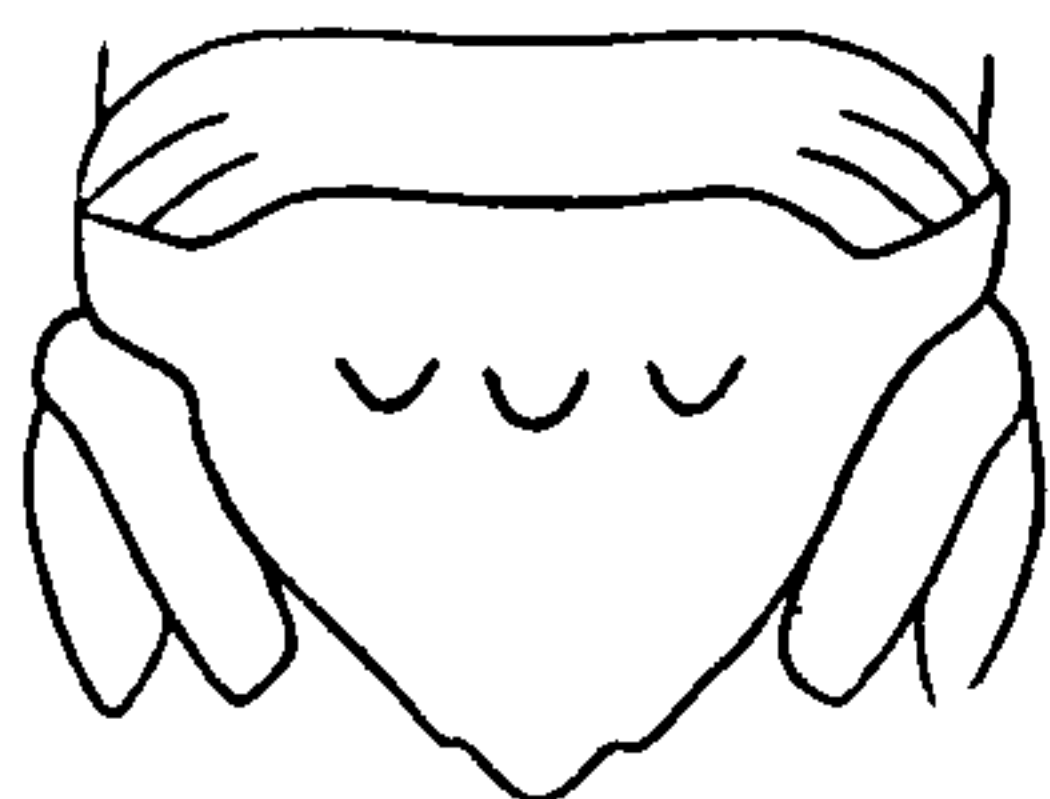


FIG. 305.—EXOSPHEROMA YUCATANUM. ABDOMEN.

First thoracic segment longer than any of the following segments, its post-lateral angles produced. The remaining segments of equal length; epimera produced laterally into acute processes.

First abdominal segment with suture lines. Last segment terminating posteriorly in an obtuse point, on either side of which is a small tooth. The base of the segment bears three low tubercles, one in the median line and one on either side. The uropoda are short, not reach-

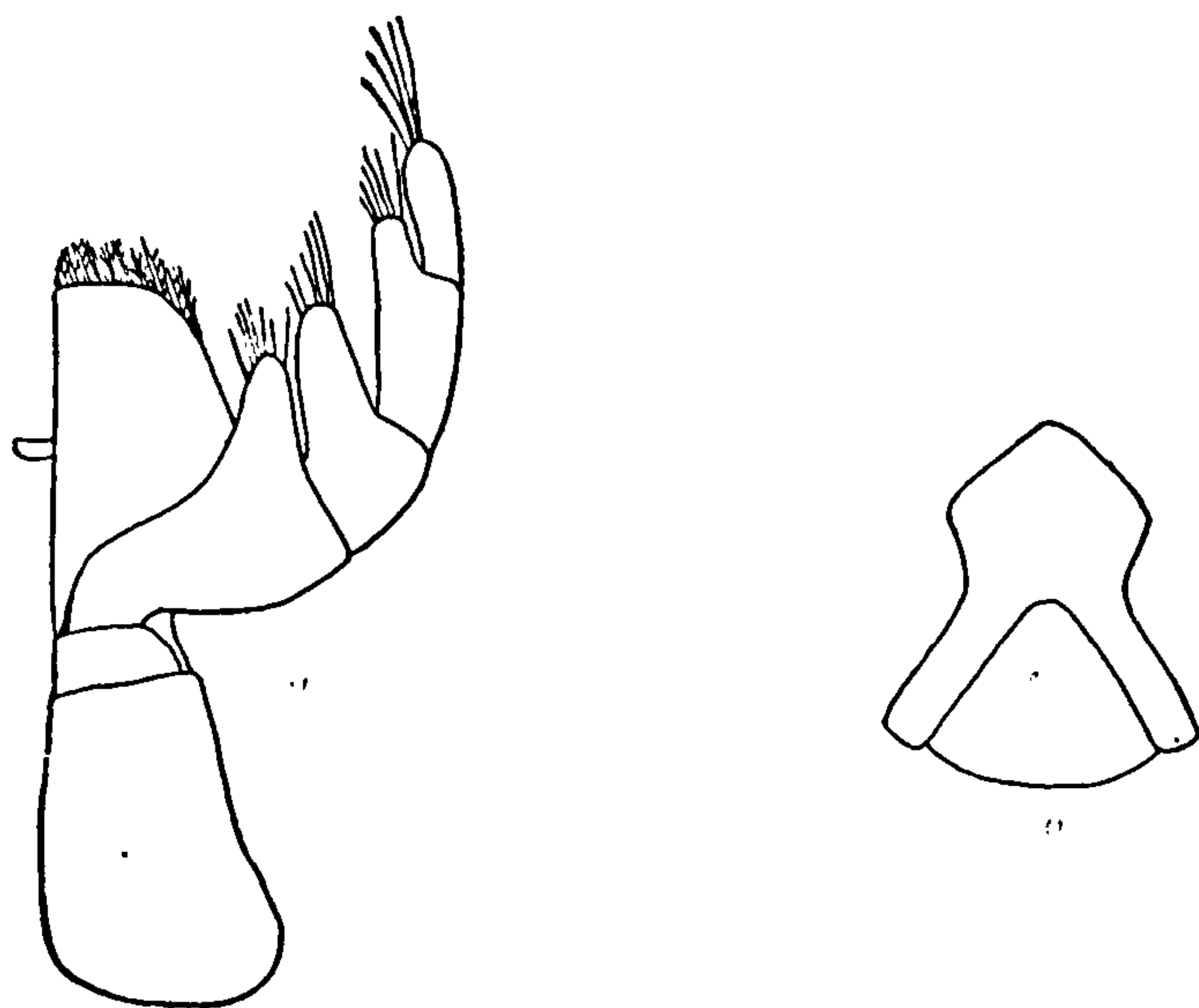


FIG. 306.—EXOSPHEROMA YUCATANUM. a, MAXILLIPED. $\times 77\frac{1}{2}$. b, FRONTAL LAMINA AND CLYPEUS. (DIAGRAMMATIC.)

ing the post-lateral teeth. Both branches are equal in length and width, the outer branch pointed, the inner branch truncate.

Surface of body smooth; color bluish.

One specimen was taken at Cape Catoche, Yucatan.

Type.—Cat. No. 23905, U.S.N.M.

EXOSPHEROMA FAXONI, new species.

Body ovate, nearly twice as long as wide, $2\frac{1}{2}$ mm. : $5\frac{1}{2}$ mm.

Head twice as wide as long, 1 mm. : 2 mm., with the anterior margin rounded and produced in a small median point. There is a marginal

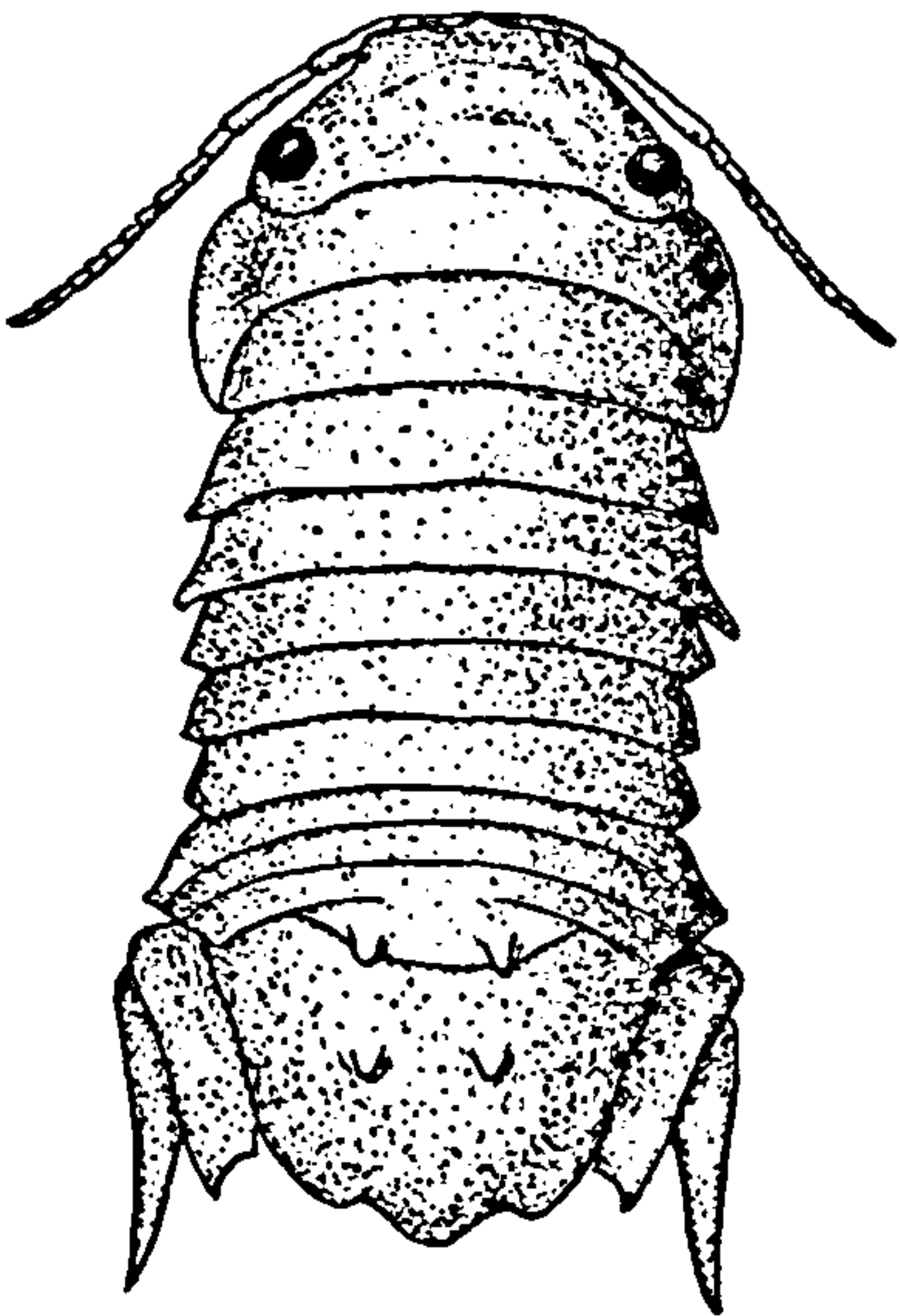


FIG. 307.—EXOSPHEROMA FAXONI.
× 10.

border extending across the anterior portion of the head as far as the second article of the first antenna on either side. Eyes small, round, composite and situated in the post-lateral angles of the head. The first pair of antennæ have the first article long and stout; the second article is half as long as the first; the third is one and a half times as long as the second. The flagellum is composed of twelve articles and extends to the post-lateral angle of the first thoracic segment. The second pair of antennæ have the first article short and almost inconspicuous; the second article is about twice as long as the first; the third is about one and a half times as long as the second; the fourth is one and

a half times as long as the third; the fifth is one and a half times as long as the fourth. The flagellum is composed of twelve articles and extends a little beyond the flagellum of the first pair of antennæ.

The first segment of the thorax is a little longer than any of the others, which are subequal. The post-lateral angles of the first segment are produced backward in a long process on either side, extending to the posterior margin of the second thoracic segment and having the extremities truncate. These processes extend laterally some distance beyond the lateral margins of the second segment. The following six segments have the epimera separated by faint lines from the segments and produced in acute points directed laterally. Those of the fifth segment extend laterally some distance beyond those of the other segments.

The abdomen is composed of two segments. The first segment is twice as long as the last thoracic segment and has two small tubercles on the posterior margin, one on either side of the median line. Lateral to these the posterior margin is produced backward in a small point on either side. There are three suture lines on either side of this seg-

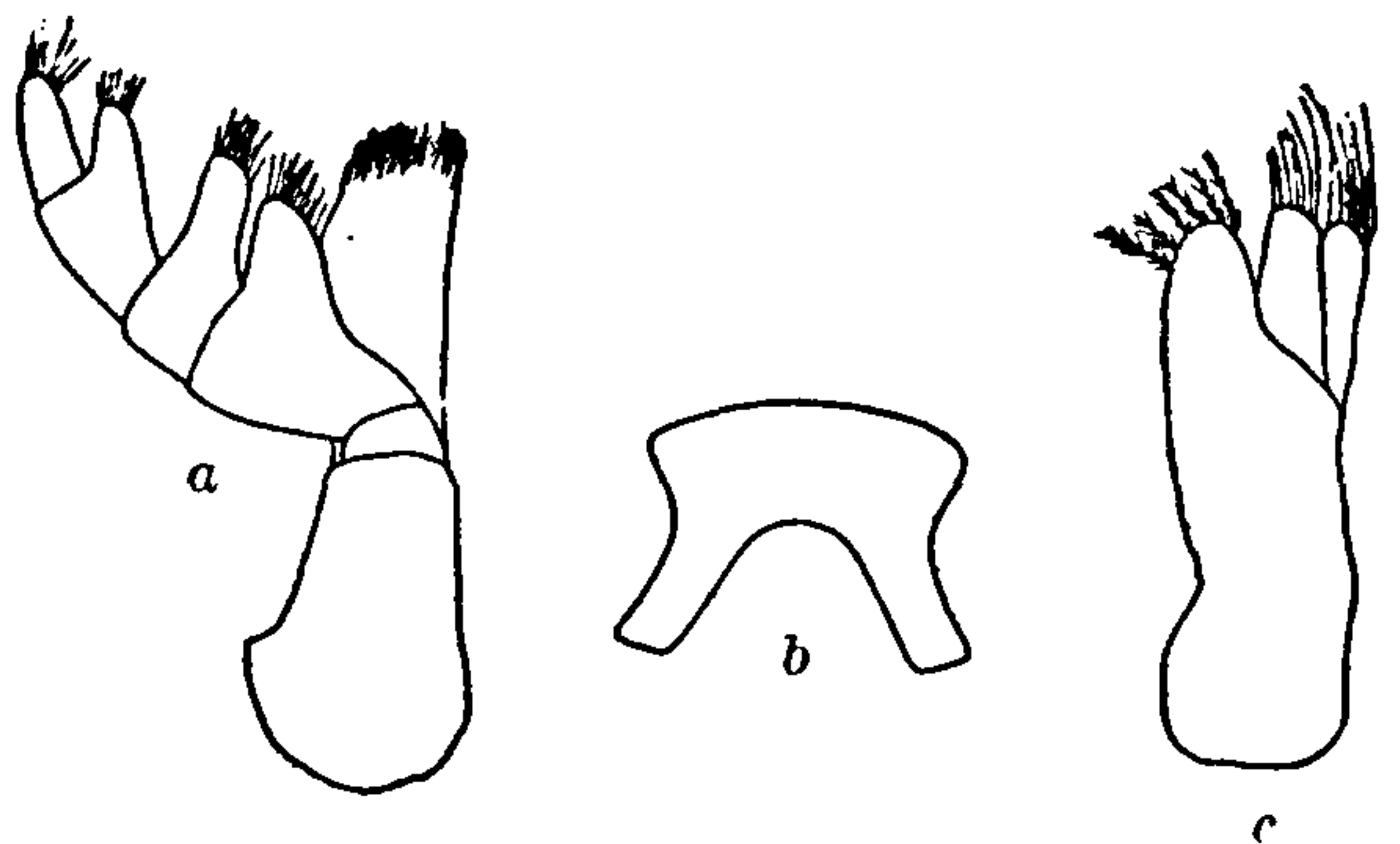


FIG. 308.—EXOSPHEROMA FAXONI. *a*, MAXILLIPED. × $51\frac{1}{2}$. *b*, FRONTAL LAMINA. × $27\frac{1}{2}$. *c*, SECOND MAXILLA. × $51\frac{1}{2}$.

ment, indicating partly coalesced segments. The terminal segment has two tubercles situated on the convex dorsal surface, one on either side of the median line, about the middle of the segment. This segment terminates posteriorly in three small teeth, one median and one lateral to this on either side. The inner fixed branch of the uropoda does not extend beyond the tip of the terminal abdominal segment. The outer post-lateral angle is very acute. The outer branch of the uropoda is very long and extends beyond the inner branch a distance equal to half the length of the inner branch. It terminates in a long acute extremity.

Only one specimen of this species was taken in Florida by Prof. A. S. Packard.

The type is in the Museum of Comparative Zoology at Harvard College. Cat. No. 6732, M. C. Z.

This species is named for Prof. W. S. Faxon, who very kindly assisted me by letting me have for examination the collection in the Museum of Comparative Zoology at Harvard University.

EXOSPHEROMA OCTONCUM (Richardson).

Sphaeroma octoncum RICHARDSON, Proc. U. S. Nat. Mus., XXI, 1897, p. 836; Ann. Mag. Nat. Hist. (7), IV, 1899, p. 180; American Naturalist, XXXIV, 1900, p. 223.

Locality.—Monterey Bay, California.

Body with all the thoracic segments, except the first, marked with four conspicuous brown spots, two on either side of the median line, and with two spots on the first abdominal segment, one on either side of the median line.

Head small. First pair of antennæ reach almost to the posterior margin of the first thoracic segment. Second pair extend fully to the posterior margin of the first segment.

Thoracic segments subequal. Epimera broad and extending downward, forming an angle with the segments.

First abdominal segment with two low tubercles close together, situated one on either side of the median line; terminal segment triangular, with apex narrowly rounded and sides slightly infolded, forming a small opening when seen from below. Six low tubercles are situated on this segment, two in longitudinal series on either side of the median line—the lower ones being a little farther apart than the upper ones—and one on either side of the series. The uropoda do not reach

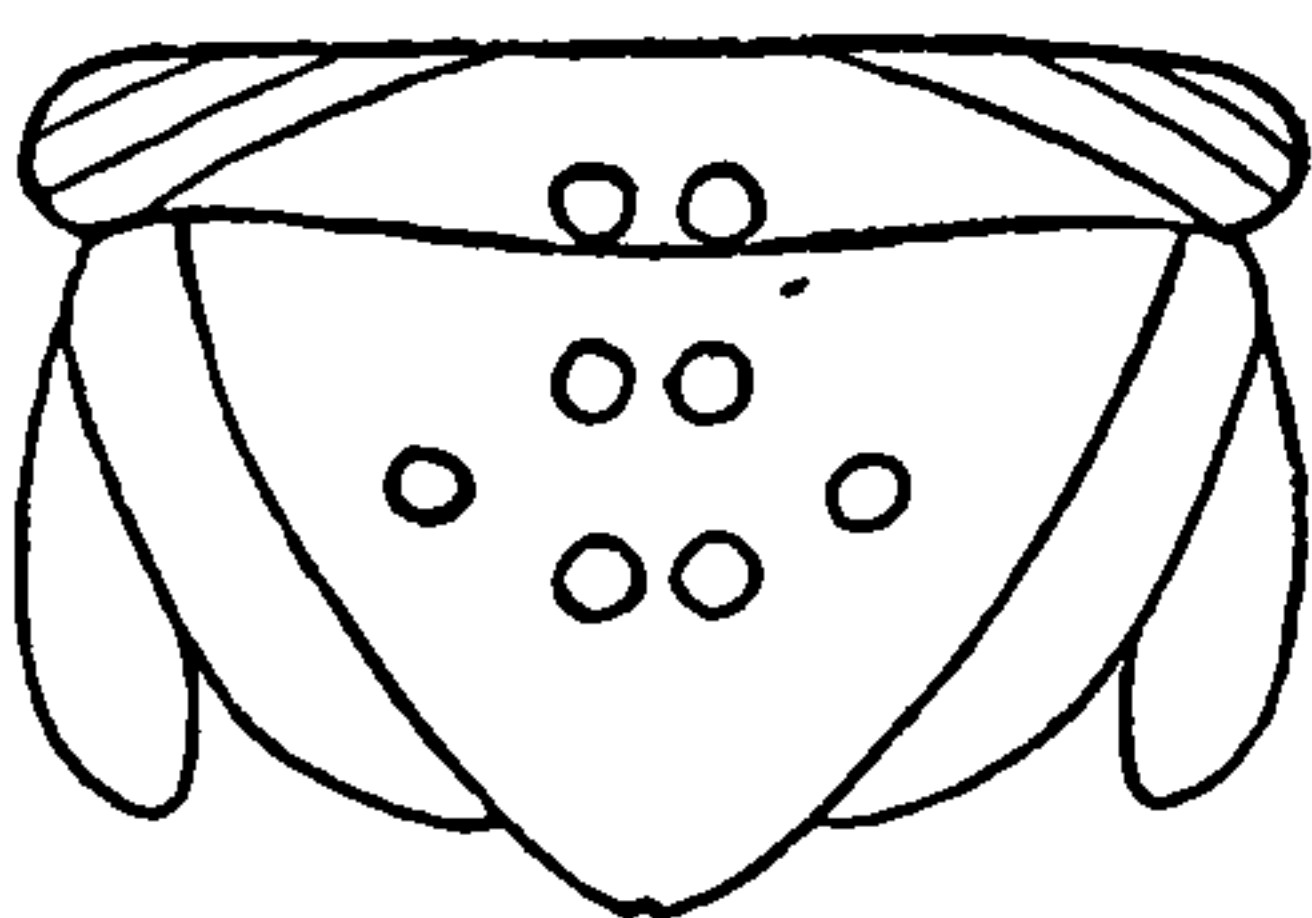


FIG. 310.—EXOSPHEROMA OCTONCUM. ABDOMEN. $\times 13\frac{1}{2}$.

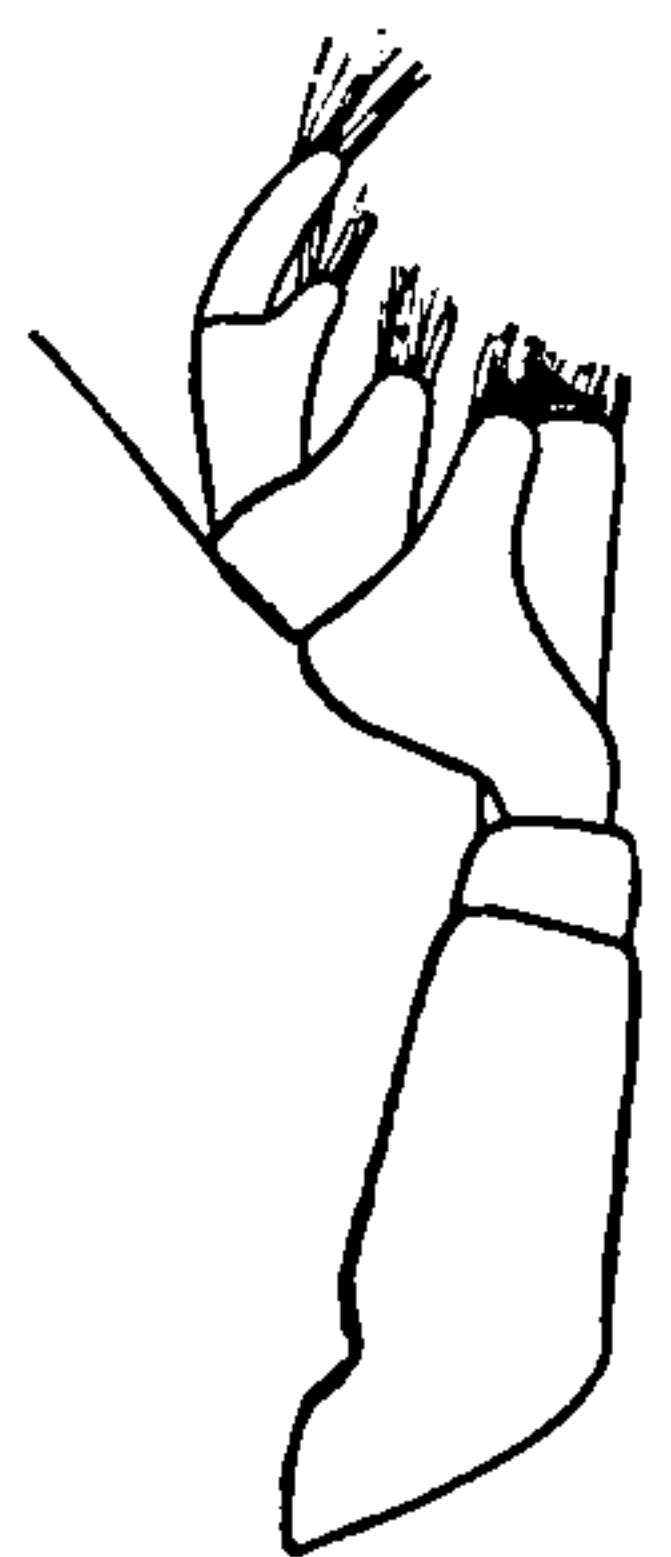


FIG. 309.—EXOSPHEROMA OCTONCUM. MAXILLIPED. $\times 51\frac{1}{2}$.

the extremity of the abdomen by some little distance. The outer branch is the shorter and is broadly rounded posteriorly. The inner branch is more pointed at the extremity.

Five individuals of this species were sent by Mr. Heath from Monterey Bay, California.

Type.—Cat. No. 22574, U.S.N.M.

EXOSPHEROMA THERMOPHILUM (Richardson).

Sphaeroma thermophilum RICHARDSON, Proc. U. S. Nat. Mus., XX, 1897, pp. 465-466; Amer. Naturalist, XXXIV, 1900, p. 223.

Locality.—New Mexico, near Socorro, in a warm spring.

Head nearly three times as broad as long, with its anterior margin widely rounded. Eyes round and post-laterally situated. The first pair of antennæ, with a flagellum of eight articles, extend to the middle of the first thoracic segment. The second pair of antennæ reach the posterior margin of the first thoracic segment; the flagellum consists of eleven articles.

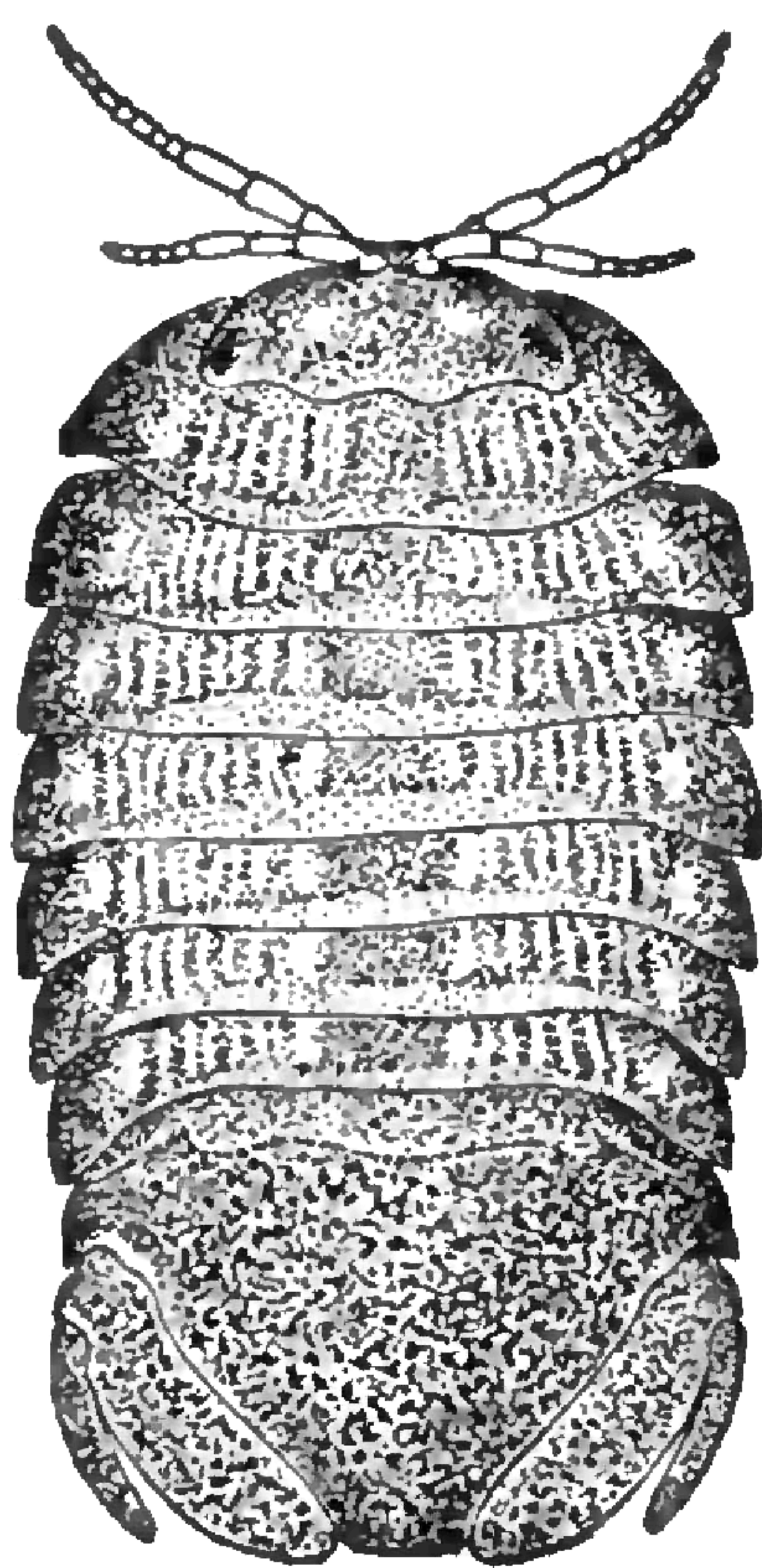


FIG. 311.—EXOSPHEROMA THERMOPHILUM. $\times 4\frac{1}{2}$.

The thoracic segments are all similar with the exception of the first, which extends laterally around the head, almost touching the peduncle of the first pair of antennæ with its anterior angle. The epimeral parts are continuous with the segments, with no indication of a separation from them.

The abdomen is formed of two distinct segments, the first of which is partly covered by the last thoracic segment, the second is subtriangular, rounded posteriorly. The internal lamella of the uropods is moderately broad, well rounded, and extends to the posterior edge of the last abdominal segment. The external lamella is half as long and half as broad as the internal one, and is more pointed at its extremity.

The body is oblong-ovate with almost parallel sides. Its surface is entirely smooth.

The grayish-brown color of the body is everywhere marked with small black spots and lines, which run together, forming a broad, black band in the center of each one of the thoracic segments. All the exposed edges of the body are tinged with a bright orange.

This species can readily be distinguished from *Exosphæroma dugesi*, to which it is closely related, by the absence of hairs on the body,

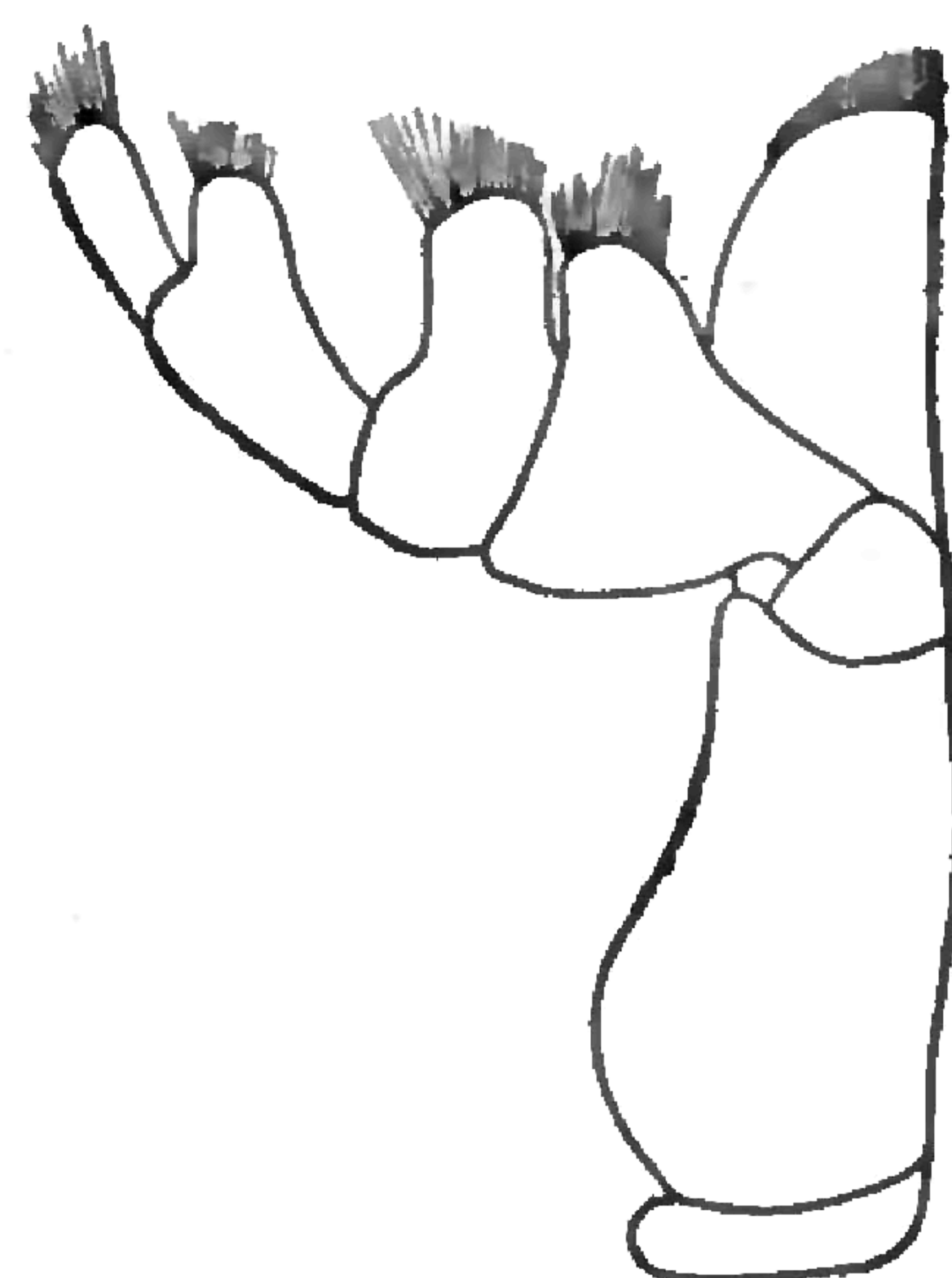


FIG. 312.—EXOSPHEROMA THERMOPHILUM. MAXILLIPED. $\times 38\frac{1}{2}$.

by the relative length of the uropods, the outer branch being only half as long as the inner one, while in *Exosphæroma dugesi* both branches are of nearly equal length, and by the difference in color.

Type.—Cat. No. 19609, U.S.N.M.

EXOSPHEROMA DUGESI (Dollfus).

Sphæroma dugesi DOLLFUS, Bull. Soc. Zool. France, XVIII, 1893, p. 115, figs. 1-2.

Locality.—Mexico (fresh water); Eaux thermales d'Aguas-Calientes, état d'Aguas Calientes; Mexico.

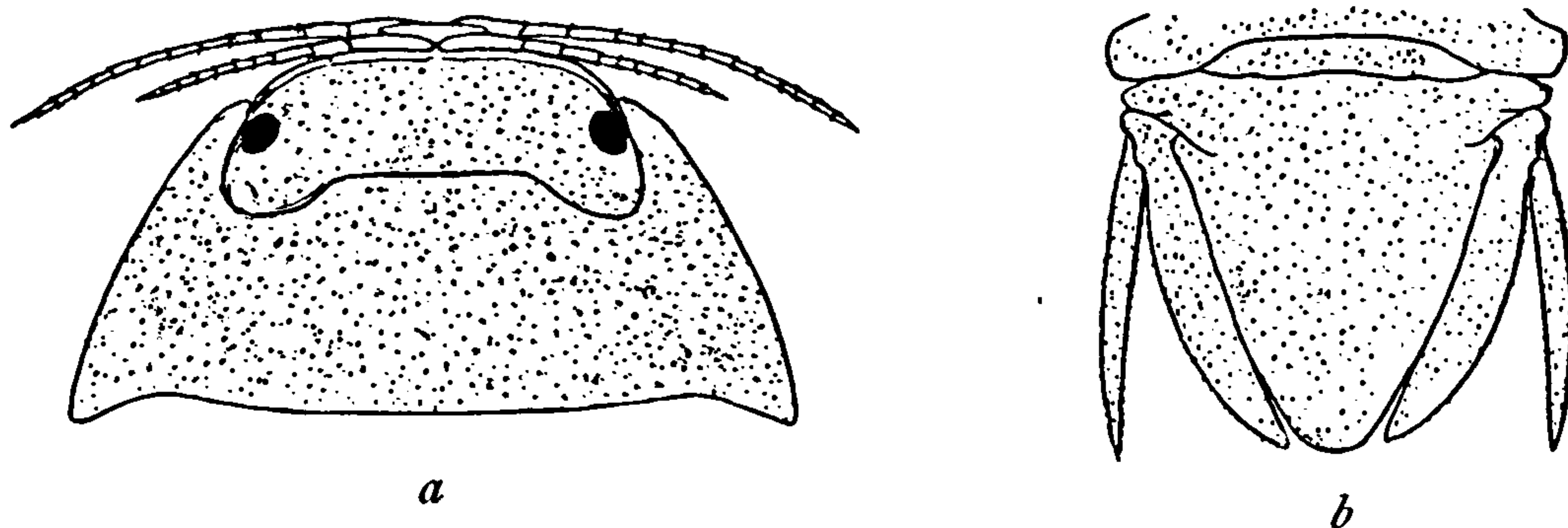


FIG. 313.—EXOSPHEROMA DUGESI (AFTER DOLLFUS). *a*, HEAD AND FIRST THORACIC SEGMENT. *b*, ABDOMEN AND UROPODA.

Body ovate, twice as long as wide, 6 mm.: 12 mm.

Head twice as wide as long, 2 mm.: 4 mm., with a frontal border arising between the eyes and produced in a small median point.

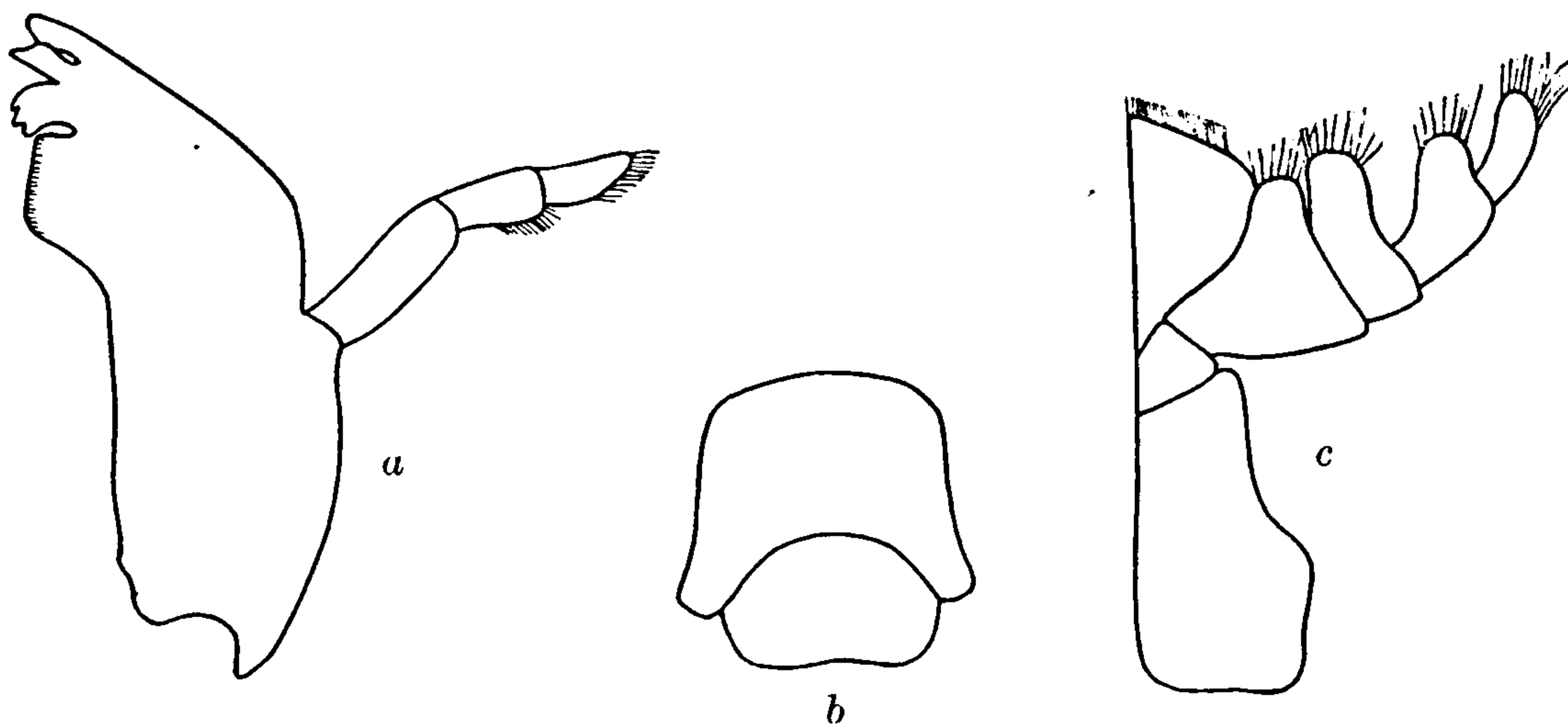


FIG. 314.—EXOSPHEROMA DUGESI. *a*, MANDIBLE. $\times 41$. *b*, FRONTAL LAMINA AND CLYPEUS. $\times 23$. *c*, MAXILLIPED. $\times 41$.

Eyes small, round, composite, and situated in the post-lateral angles of the head. The basal article of the first pair of antennæ is long; the second is half as long as the first; the third is one and a half times longer than the second. The flagellum is composed of eight articles. The first antennæ extend to the middle of the first thoracic segment.

The basal article of the second antennæ is very short; the second and third are longer than the first and subequal; the fourth and fifth are about equal and each is one and a half times longer than the third. The flagellum is composed of twelve articles. The second antennæ extend a little beyond the posterior margin of the first thoracic segment. The maxilliped has a palp of five articles. The palp of the mandibles is composed of three articles. The frontal lamina is large and conspicuous, and has the anterior division wide and long, with the post-lateral or ventral angles drawn out, giving it somewhat of a horse-shoe shape. The clypeus is transversely oblong, and fits into the concavity of the posterior part of the frontal lamina; its posterior margin is fringed with cilia.

The segments of the thorax are equal in length. The epimera are not distinct from the segments. The lateral margins are nearly straight.

The abdomen is composed of two segments. The first segment is about as long as the last thoracic segment and has one suture line on either side. The terminal segment is triangular, with the apex bluntly rounded. The inner fixed branch of the uropoda is as long as the terminal segment. The outer moveable branch is about half as wide as the inner branch, is very pointed at its extremity, and when folded is not quite as long as the inner branch, being 1 mm. shorter. The length of the inner branch is 5 mm.; that of the outer branch is 4 mm.

The legs are all ambulatory.

EXOSPHEROMA OREGONENSIS (Dana).^a

Sphæroma oregonensis DANA, Proc. Acad. Nat. Sci. Phila., VII, 1854-55, p. 177; U. S. Expl. Exp. Crust., XIV, 1853, p. 778, pl. LI, fig. 4.—STIMPSON, Bost. Jour. Nat. Hist., VI, 1857, p. 509.

Sphæroma olivacea LOCKINGTON, Proc. Cal. Acad. Sci., VII, 1877, Pt. 1, p. 45.

Sphæroma oregonensis RICHARDSON, Proc. U. S. Nat. Mus., XXI, 1899, p. 836; Ann. Mag. Nat. Hist., (7), IV, 1899, p. 180; American Naturalist, XXXIV, 1900, p. 223; Harriman Alaska Exp. Crust., X, 1904, p. 214; Proc. U. S. Nat. Mus., XXVII, 1904, p. 659.

Localities.—Pacific Grove to Alaska; Popof Island (from fresh water), Yakutat, and Glacier Bay, Alaska; Grenville Channel and Lowe Inlet, British Columbia; Angel Island, San Francisco Bay, California (Lockington Coll.); Gulf of Georgia; Alert Bay and Kadiak, Alaska;

^a The following description of Dana's, although concise, gives most of the essential characters of the species: Corpus læve. Segmentum caudale breve, posticè latisimè rotunatum, supra læve. Styli caudales abdomen non superantes, lamellâ internâ multo longiore quam externa, fere obtusâ, externa obtusâ. Flagella antennarum 1 marum 2 darumque 12-14 articulata.

Body smooth. Caudal segment short, very broadly rounded behind, smooth above. Caudal stylets not reaching beyond line of extremity of abdomen; inner lamella much the longer, nearly obtuse; outer obtuse. Flagella of antenna of both pairs twelve to fourteen jointed. Length of body four and a half lines.

near Wrangell, Alaska; Puget Sound; Kyska Harbor, Alaska; Monterey Bay, California; Middleton Island; Unalaska; Sitka, Alaska; Bering Island; Sanborn Harbor, Nagai Island; Saginaw Bay, Alaska; North Grebnitzky.

Found on beach at low tide; 10-12 fathoms, in gravel, sand, and stones; rocky beach under stones; in mud.

Body ovate, twice as long as wide, 4 mm.: 8 mm.

Head three times as wide as long, 1 mm.: 3 mm., with the frontal margin bi-sinuate, or excavate on either side of a small median point. Eyes small, round, composite, and placed in the post-lateral angles of the head. The first antennæ have the basal article large; the second article

is half as long as the first; the third is one and a half times longer than the second. The flagellum is composed of thirteen articles. The first antennæ extend to the posterior margin of the head. The second antennæ have the basal article very short and almost inconspicuous; the second article is about three times as long as the first; the third

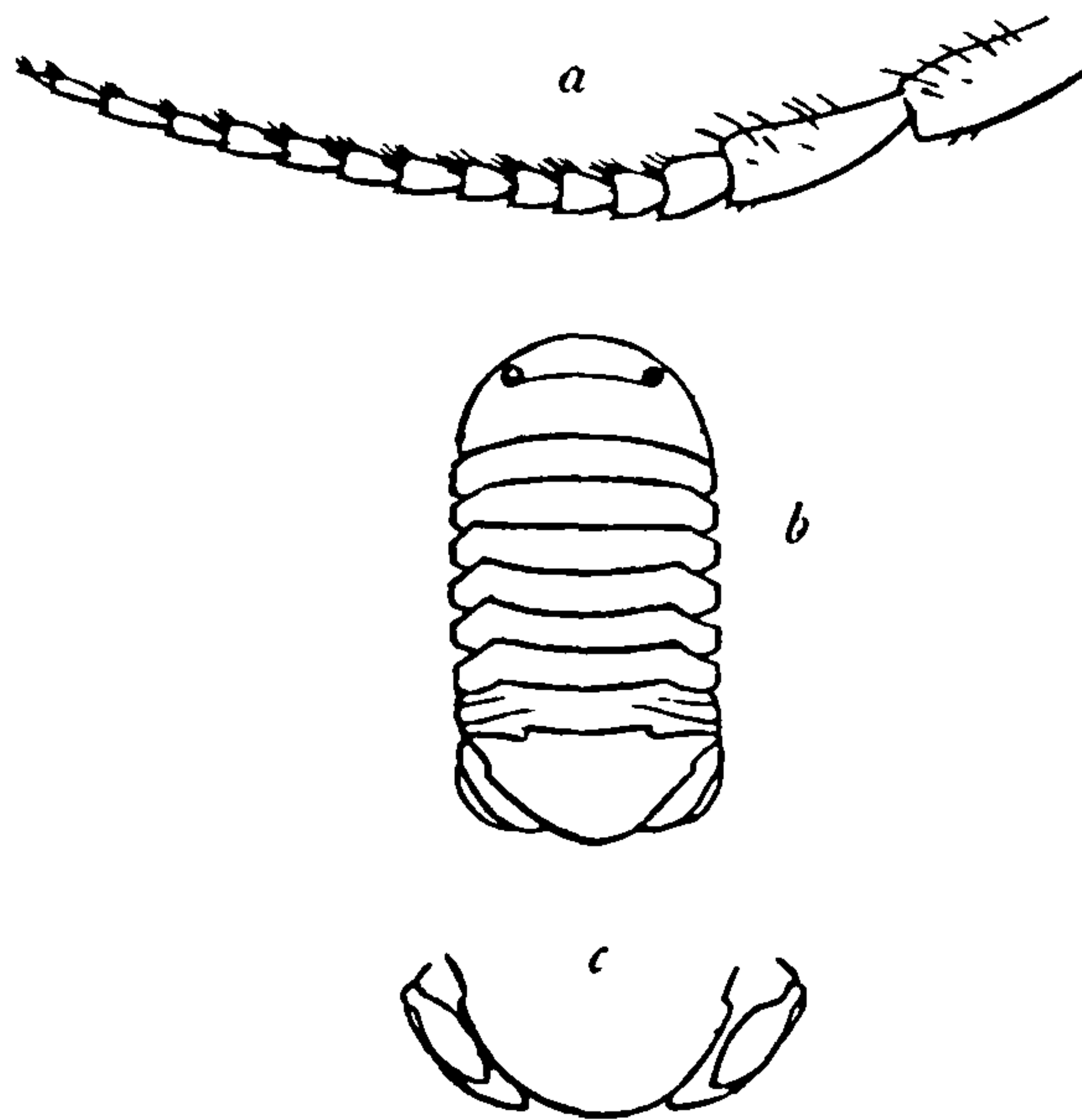


FIG. 315.—EXOSPHEROMA OREGONENSIS (AFTER DANA). *a*, SECOND ANTENNA. *b*, GENERAL FIGURE. *c*, ABDOMEN (UNDERSIDE). (ALL ENLARGED.)

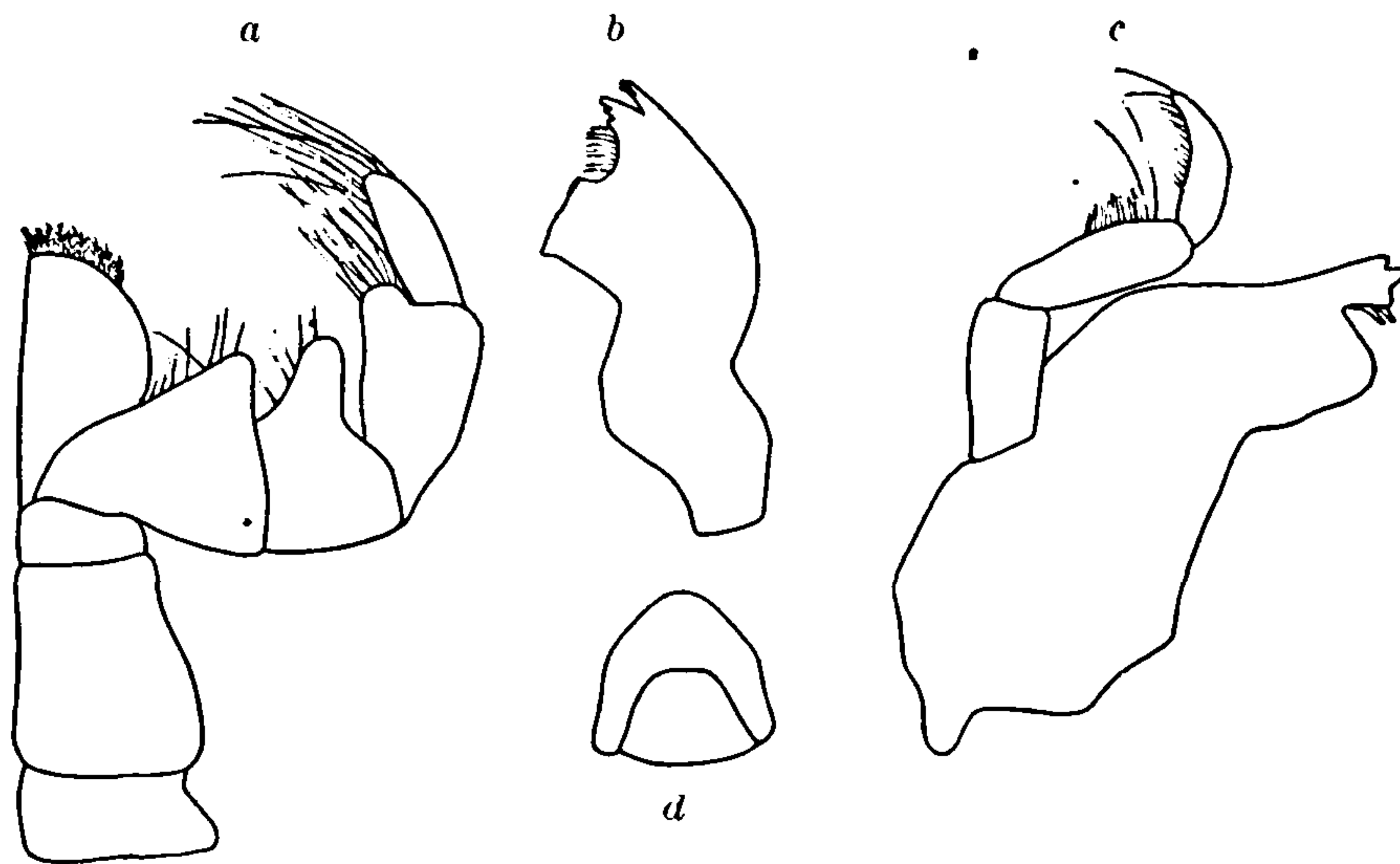


FIG. 316.—EXOSPHEROMA OREGONENSIS. *a*, MAXILLIPED. $\times 51\frac{2}{3}$. *b*, MANDIBLE, PALP REMOVED. $\times 51\frac{2}{3}$. *c*, MANDIBLE WITH PALP. $\times 51\frac{2}{3}$. *d*, FRONTAL LAMINA AND CLYPEUS. $\times 51\frac{2}{3}$.

is about as long as the second; the fourth is nearly twice as long as the third; the fifth is as long as the fourth. The flagellum is composed of thirteen articles. The second antennæ extend to the posterior margin of the second thoracic segment. The maxilliped has a palp of five articles. Mandibles with a three-jointed palp.

The first segment of the thorax is a little longer than any of those following. The epimera are not distinct from the segments, but can be distinguished from the segment by a faint line on either side. They are laterally produced into a rather acute process on either side.

The abdomen is composed of two segments. The first segment has three suture lines on either side indicating three partly coalesced segments. The terminal segment is round posteriorly. The inner immovable branch of the uropoda is as long as the terminal segment, and is narrowly rounded at the extremity. The outer branch is two-thirds the length of the inner branch and is rounded posteriorly.

The legs are all ambulatory.

EXOSPHEROMA CRENULATUM Richardson.^a

Sphaeroma crenulatum RICHARDSON, Trans. Conn. Acad. Sciences, XI, 1902, pp. 292-293, pl. XXXIX, fig. 40.

Locality.—Bermudas.

Surface of body smooth. Color, light brown, with markings of black.

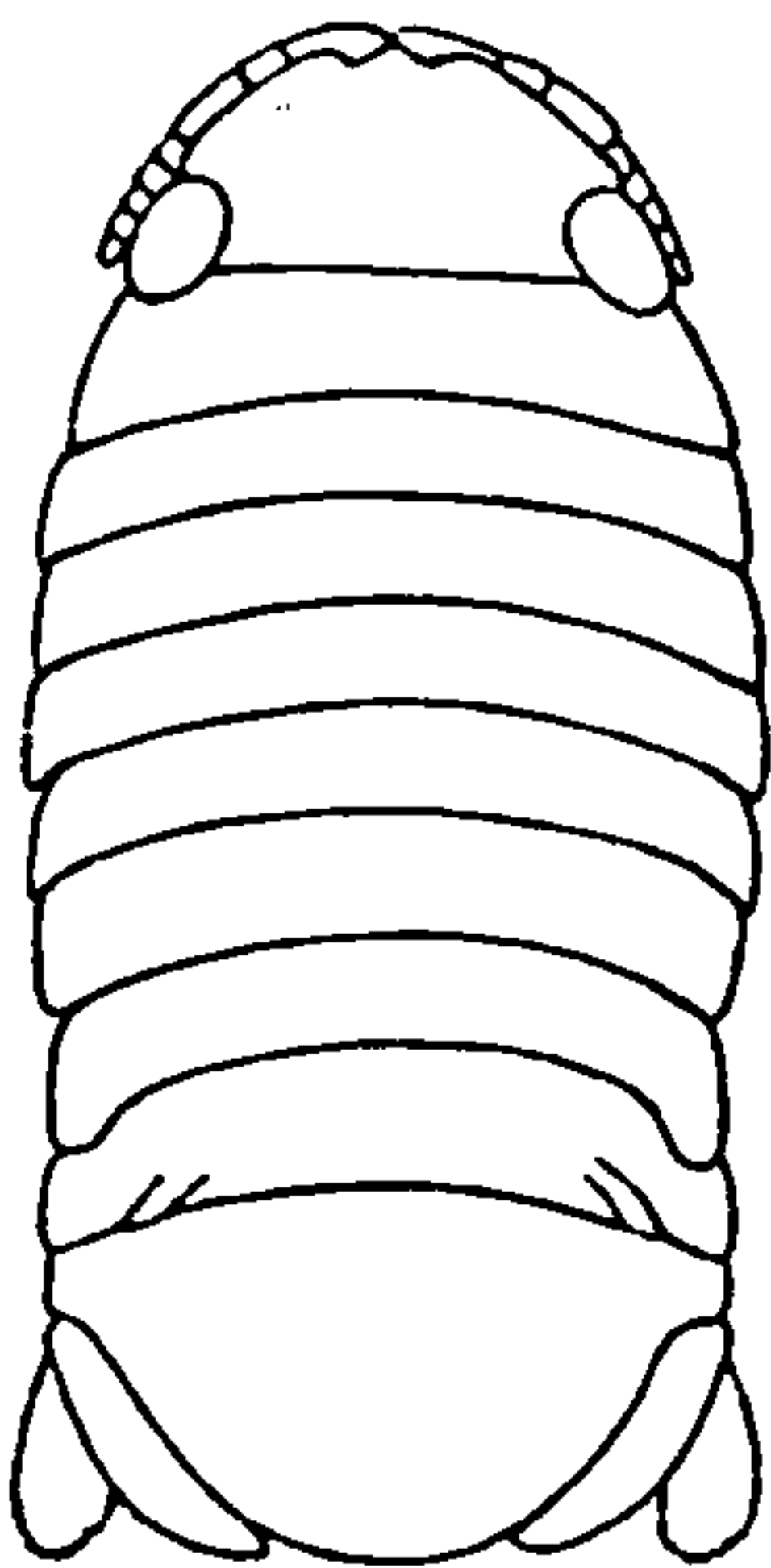


FIG. 317.—EXOSPHEROMA CRENULATUM.

Head rounded in front with small median point, on either side of which is a small excavation. Eyes situated post-laterally.

First pair of antennæ with the first joint of the peduncle long; second joint half as long as first; third joint equal in length to first; flagellum of five joints reaches the post-lateral margin of the head.

Second pair of antennæ extend to the middle of the first thoracic segment.

Thoracic segments subequal. Lateral margins straight. Epimera not distinctly separated from segments.

First abdominal segment long, a little longer than any of the thoracic segments, with two suture lines. Terminal segment very convex, surface smooth, posterior margin widely rounded. Uropoda not extending beyond tip of terminal segment. Inner branch somewhat pointed at its extremity, margin smooth. Outer branch widely rounded and crenulate on the posterior edge.

Legs similar, all ambulatory, with small curved dactyli.

A number of specimens were collected at the Bermudas in 1876-77, by Dr. George Brown Goode.

Type in Peabody Museum, Yale University. Cat. No. 3250.

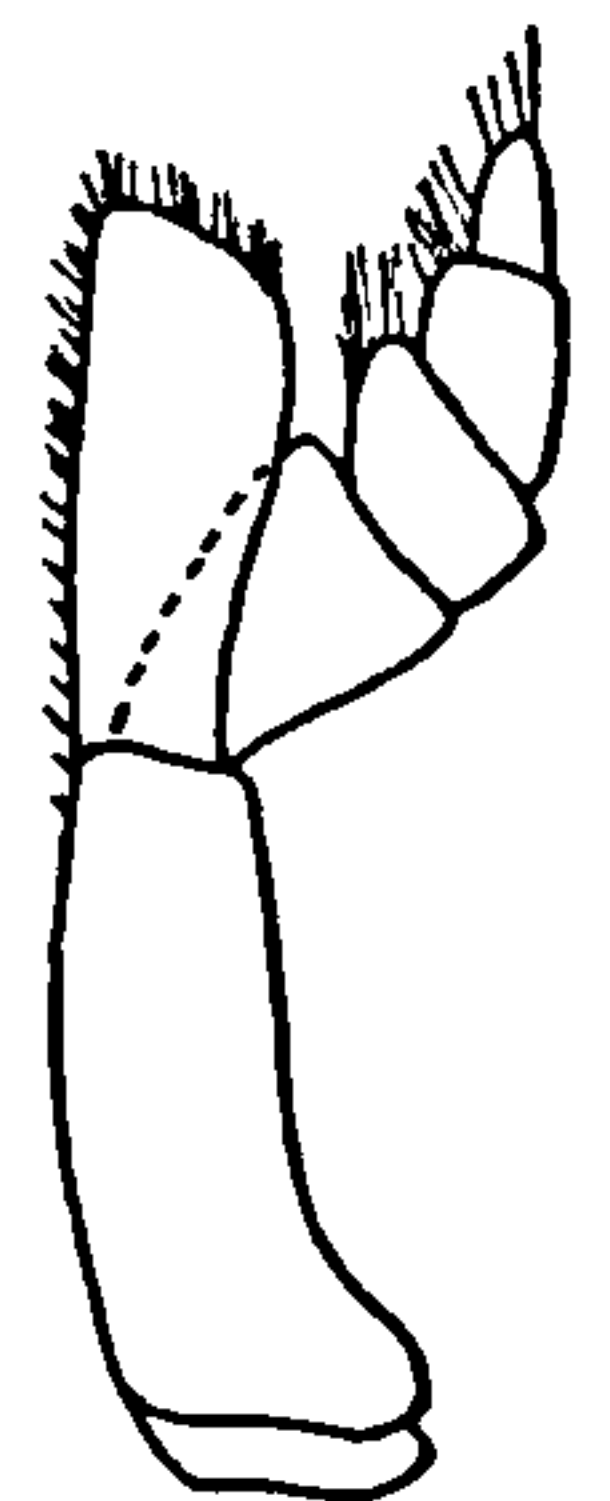


FIG. 318.—EXOSPHEROMA CRENULATUM. MAXILLIPED. $\times 77\frac{1}{2}$.

^aThis species is intermediate between *Sphaeroma* and *Exospheroma*. The second, third, and fourth articles of the palp of the maxillipeds are but little produced. Stebbing mentions another species, *Sphaeroma globicauda* Dana, which is also intermediate between *Sphaeroma* and *Exospheroma*, The Fauna and Geography of the Maldive and Laccadive Archipelagoes, II, Pt. 3, 1905, p. 710.

50. Genus DYNAMENE Leach.

Abdomen composed of two segments, the first of which is formed by the fusion of several coalesced segments. The terminal segment is emarginate posteriorly, without a lobe within the emargination.

The branches of the uropoda are similar, both being salient; they are alike in the two sexes. The inner immovable branch is fixed to the side of the abdomen. The outer branch is movable and capable of folding under the inner branch.

The second, third, and fourth articles of the palp of the maxillipeds are produced into lobes.

Legs all ambulatory.

Sexes alike.

Inasmuch as the male is known in four of the species of this genus and as the male and female are alike, I am not willing to unite *Cilicæa* and *Dynamene* in a single genus *Dynamene*, the males of *Cilicæa* being unlike the females as is the opinion of Prof. S. J. Holmes and Dr. H. F. Moore, the former considering *Dynamene tuberculosa* the female of *Cilicæa cordata* and the latter supposing *Dynamene bermudensis* to be the female of *Cilicæa caudata*.

ANALYTICAL KEY TO THE SPECIES OF THE GENUS DYNAMENE.

- a. Posterior extremity of terminal segment of abdomen with a heart-shaped opening immediately above the terminal excavation..... *Dynamene perforata* Moore
- a'. Posterior extremity of terminal segment of abdomen without heart-shaped opening above the terminal excavation.
 - b. Surface of abdomen smooth *Dynamene glabra* Richardson
 - b'. Surface of abdomen with tubercles or longitudinal ridges.
 - c. Surface of abdomen with tubercles.
 - d. Basal part of terminal segment of abdomen with three tubercles.
 - Dynamene angulata* Richardson
 - d'. Basal part of terminal segment of abdomen with four small tubercles.
 - Dynamene moorei*, new species
 - c'. Surface of abdomen with longitudinal ridges.
 - d. Surface of terminal segment of abdomen with three longitudinal ridges.
 - Front of head produced in a quadrangular process. First two articles of peduncle of the first antennæ flattened and dilated.
 - Dynamene dilatata* Richardson
 - d'. Surface of terminal segment of abdomen with four longitudinal ridges.
 - Front of head not produced. First two articles of peduncle of second antennæ not flattened and not greatly dilated.
 - Dynamene benedicti* Richardson

DYNAMENE PERFORATA Moore.

Dynamene perforata MOORE (male), Bull. U. S. Fish Commission, XX, Pt. 2, 1902, pp. 173-174, pl. x, figs. 9, 11-19.—RICHARDSON (male), Trans. Conn. Acad. Sci., XI, 1902, pp. 291-292, pl. XXXIX, fig. 39.

Localities.—Culebra, Porto Rico; Bermudas. Found on mangrove roots.

Head broader than long; eyes situated post-laterally. First pair of antennæ with the first two peduncular joints large, the second half as long as the first; the third joint long and slender, twice as long as second joint; flagellum consists of seven joints. The first two peduncular joints of the second pair of antennæ are of equal length; the following three are of equal length and longer than the first two; the flagellum consists of about seven joints, and extends to the posterior margin of the third thoracic segment.

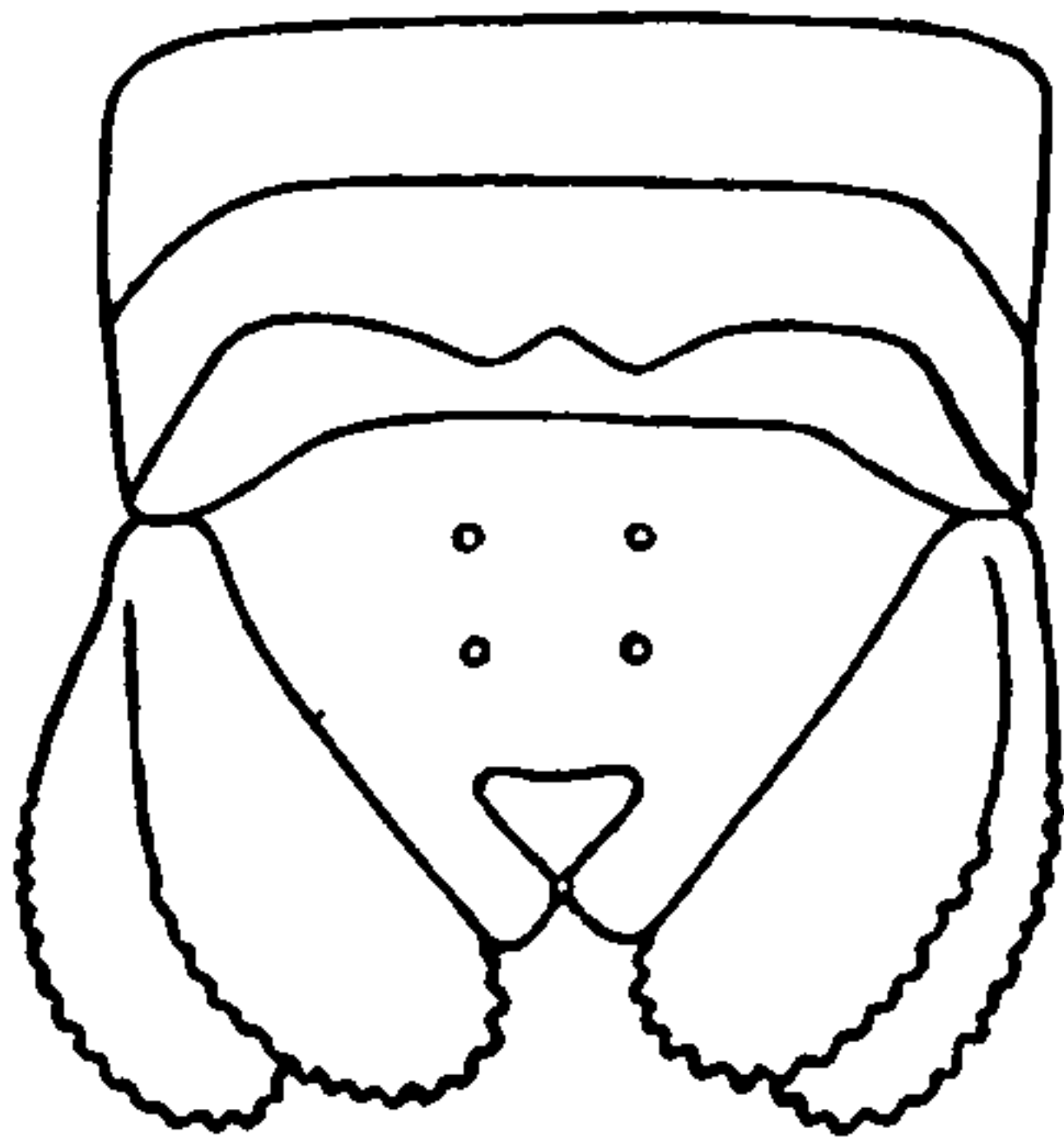


FIG. 319.—DYNAMENE PERFORATA. LAST TWO THORACIC SEGMENTS AND ABDOMEN.

The thoracic segments are of equal length, with the exception of the first, which is slightly longer. The seventh segment is produced backward in two rounded lobes, one on either side of the median line, and close together.

The first abdominal segment has two suture lines at either side, indicative of coalesced segments. The terminal segment is very con-

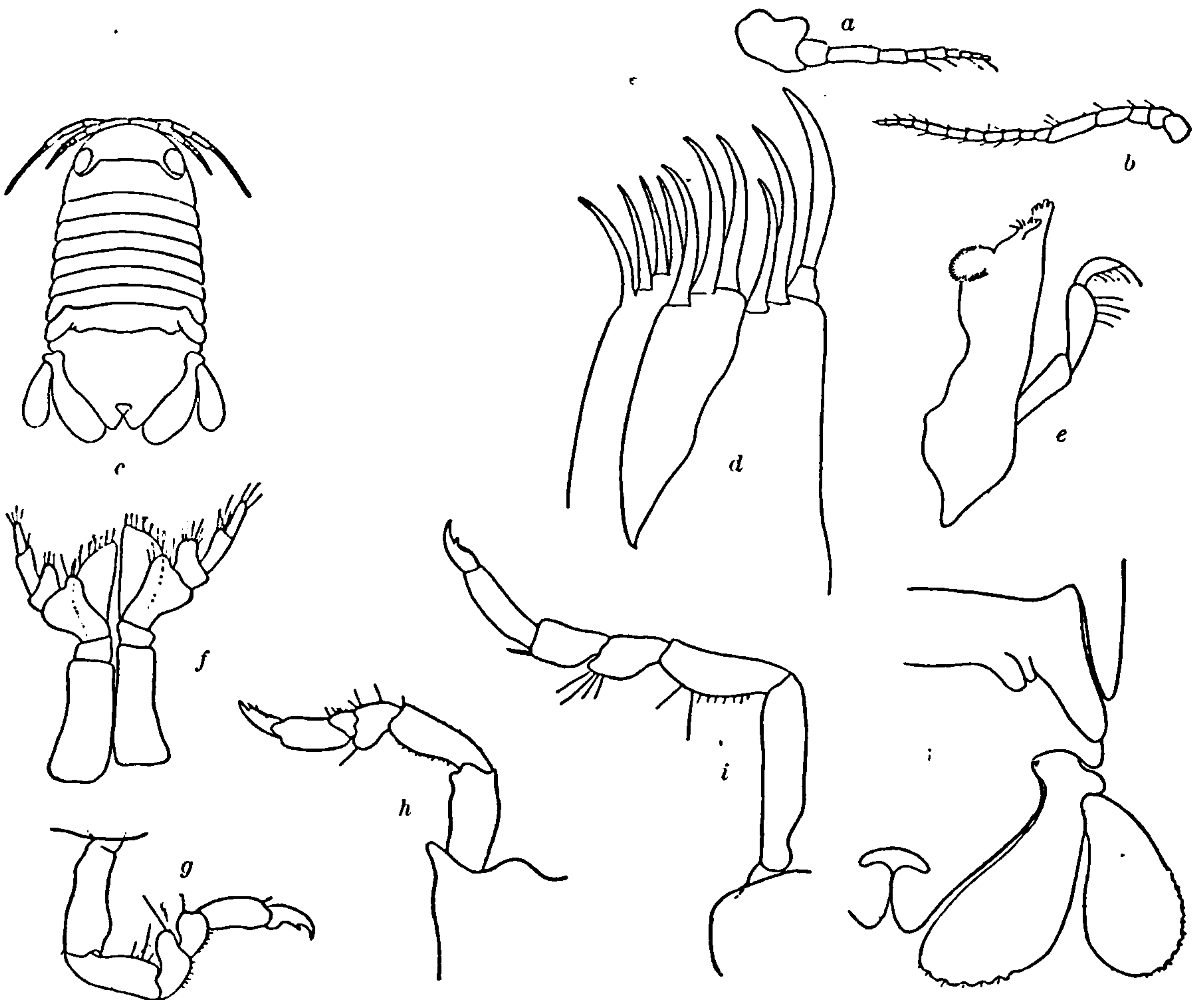


FIG. 320.—DYNAMENE PERFORATA (AFTER MOORE). *a*, FIRST ANTENNA. *b*, SECOND ANTENNA. *c*, MALE. *d*, TIP OF MAXILLA. *e*, MANDIBLE. *f*, MAXILLIPEDS. *g*, FOURTH LEG. *h*, FIRST LEG. *i*, SEVENTH LEG. *j*, PART OF TERMINAL SEGMENT OF ABDOMEN WITH UROPOD.

vex at the base, and has four small tubercles, forming a square on the convexity. Its apex has a heart-shaped opening, formed by the pro-

longation of the lateral margins, which prolongations meet anteriorly and are divergent posteriorly, so that a triangular excavation is formed on the posterior end of the segment immediately below the heart-shaped opening.

The two branches of the uropoda are similar in shape and size. They are large, very much expanded, rounded posteriorly, with margins distinctly crenulate or denticulate, and extend some distance beyond the tip of the terminal abdominal segment.

The color is brown, with markings of black. Surface smooth, with the exception of the abdomen, which is very granular.

Several specimens differ from the specimen described in not having the seventh thoracic segment produced in lobes, and are without the four small tubercles at the base of the terminal segment. Several differ in having the uropoda not longer than the terminal segment.

Both sexes are known, the male and female being alike in every respect; in the male the inner branch of the second pleopods carries a stylet.

Cotypes are in the Peabody Museum, Yale University. Cat. No. 3204.

DYNAMENE GLABRA Richardson.

Dynamene glabra RICHARDSON, Proc. U. S. Nat. Mus., XXI, 1899, p. 834; Ann. Mag. Nat. Hist. (7), IV, 1899, p. 178; American Naturalist, XXXIV, 1900, p. 224.—HOLMES, Proc. Cal. Acad. Sci. (3), III, 1904, No. 11, p. 304.

Localities.—Monterey Bay, California; Mendocino County, California; San Diego, California.

Body oval; surface smooth.

Head small; eyes situated post-laterally. First pair of antennæ extend to the eye; first joint oblong; second joint short, half as long as first; flagellum consists of six articles. Second pair of antennæ extend to the posterior margin of the first thoracic segment; flagellum consists of about ten articles.

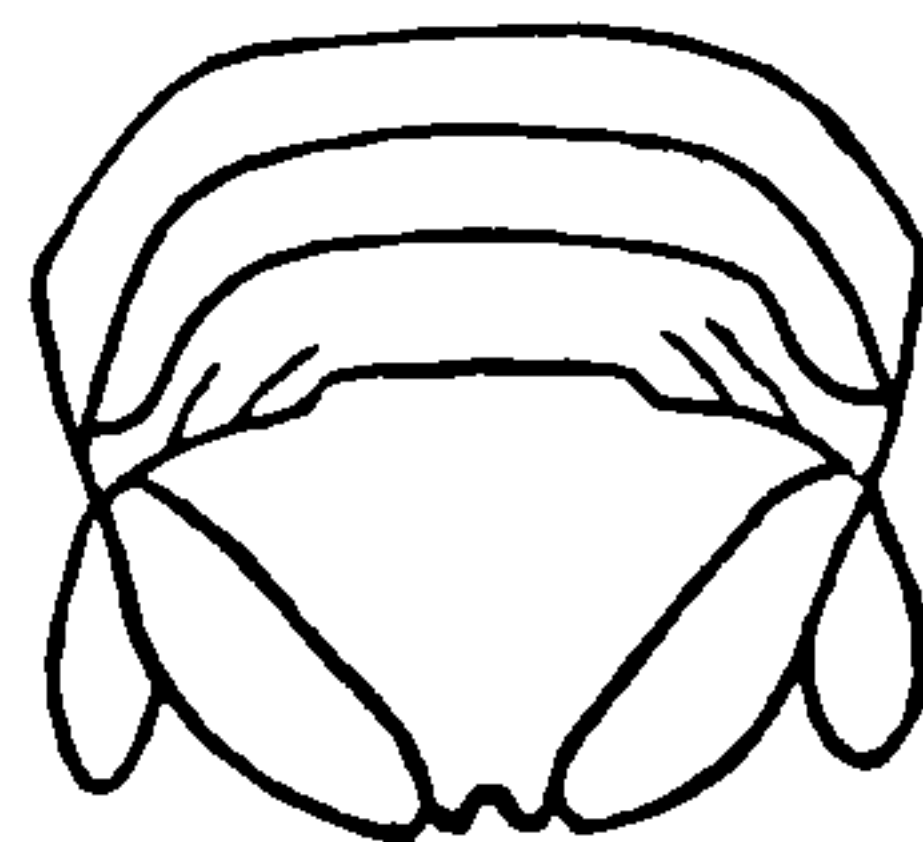


FIG. 321.—DYNAMENE GLABRA. ABDOMEN AND LAST TWO THORACIC SEGMENTS. $\times 13 \frac{1}{2}$.

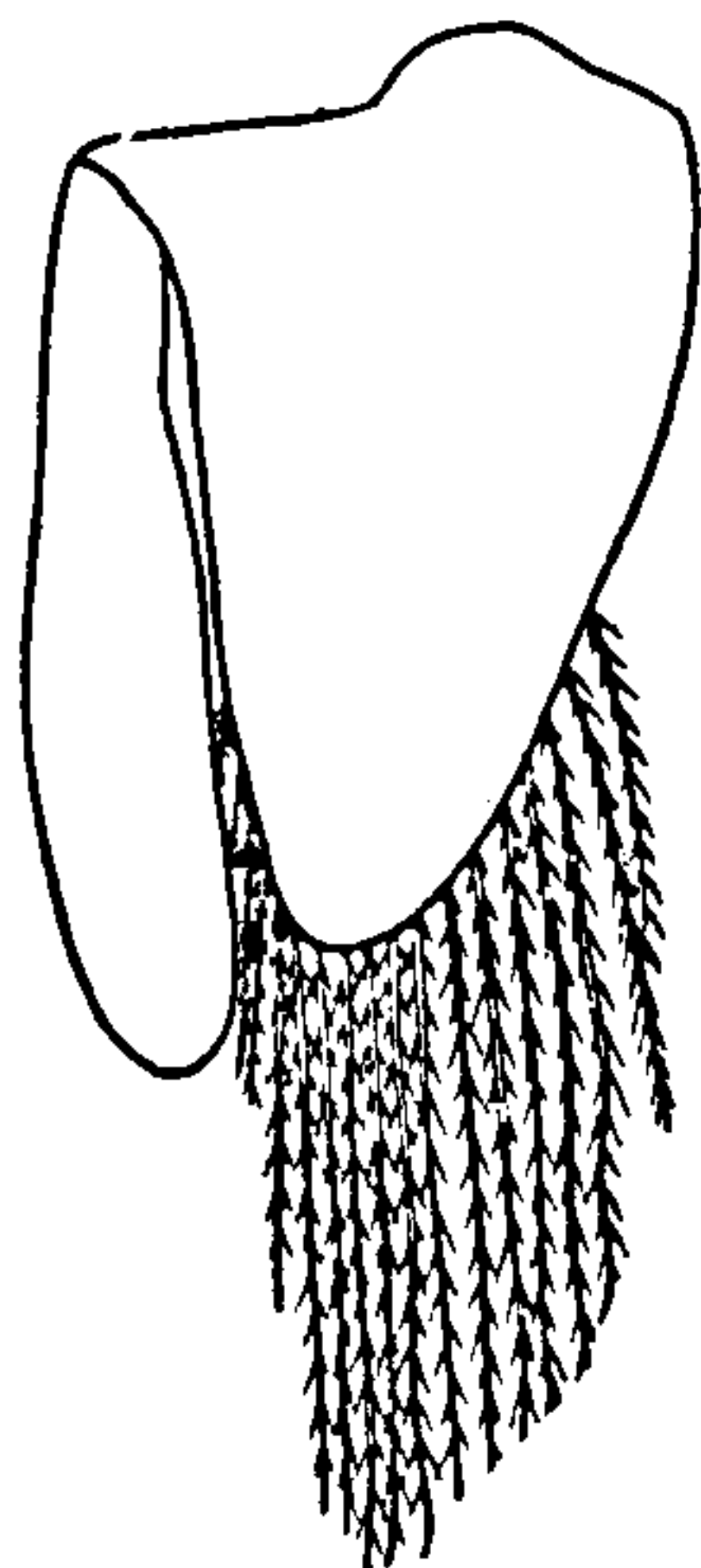


FIG. 322.—DYNAMENE GLABRA. SECOND PLEPOD OF MALE. $\times 51 \frac{1}{2}$.

The thoracic segments are subequal; the first is a little longer than any of the others.

The penultimate abdominal segment consists of several coalesced segments, as indicated by the suture lines. The terminal segment is triangular, with a small median excavation at its extremity. The lower part of this segment is quite flat, the slope being gradual from the convex upper part or base of the segment to the extremity. The surface is perfectly smooth. The inner branch of the uropoda is large and rounded posteriorly; the outer branch is small, though similar in shape, and is much shorter than the inner branch.

A number of specimens were collected by Mr. Heath at Monterey Bay, California, at the surface.

Type.—Cat. No. 22571, U.S.N.M.

Both sexes of this species are known, the two forms resembling each other in every respect, with the exception that in the male there is a stylet on the inner branch of the second pair of pleopods.

Prof. S. J. Holmes writes that the sexes do not show any marked dimorphism. He also admits the following:^a "An examination of several specimens of the species showed that the males present no appreciable external differences from the females except that, as a rule, they are of somewhat larger size."

Specimens of both sexes are in the collection of the U. S. National Museum. The inner branch of the second pleopod of the male is figured.

DYNAMENE ANGULATA Richardson.

Dynamene angulata RICHARDSON, Proc. U. S. Nat. Mus., XXIII, 1901, pp. 534-535.

Locality.—No Name Key, Florida.

Found among algæ at low tide.

Surface of body smooth; color yellow.

Head large, with small median point on its anterior margin. First pair of antennæ reach the posterior margin of the second thoracic segment; flagellum composed of nine joints. Second pair of antennæ reach the posterior margin of the fourth thoracic segment; flagellum composed of thirteen joints.

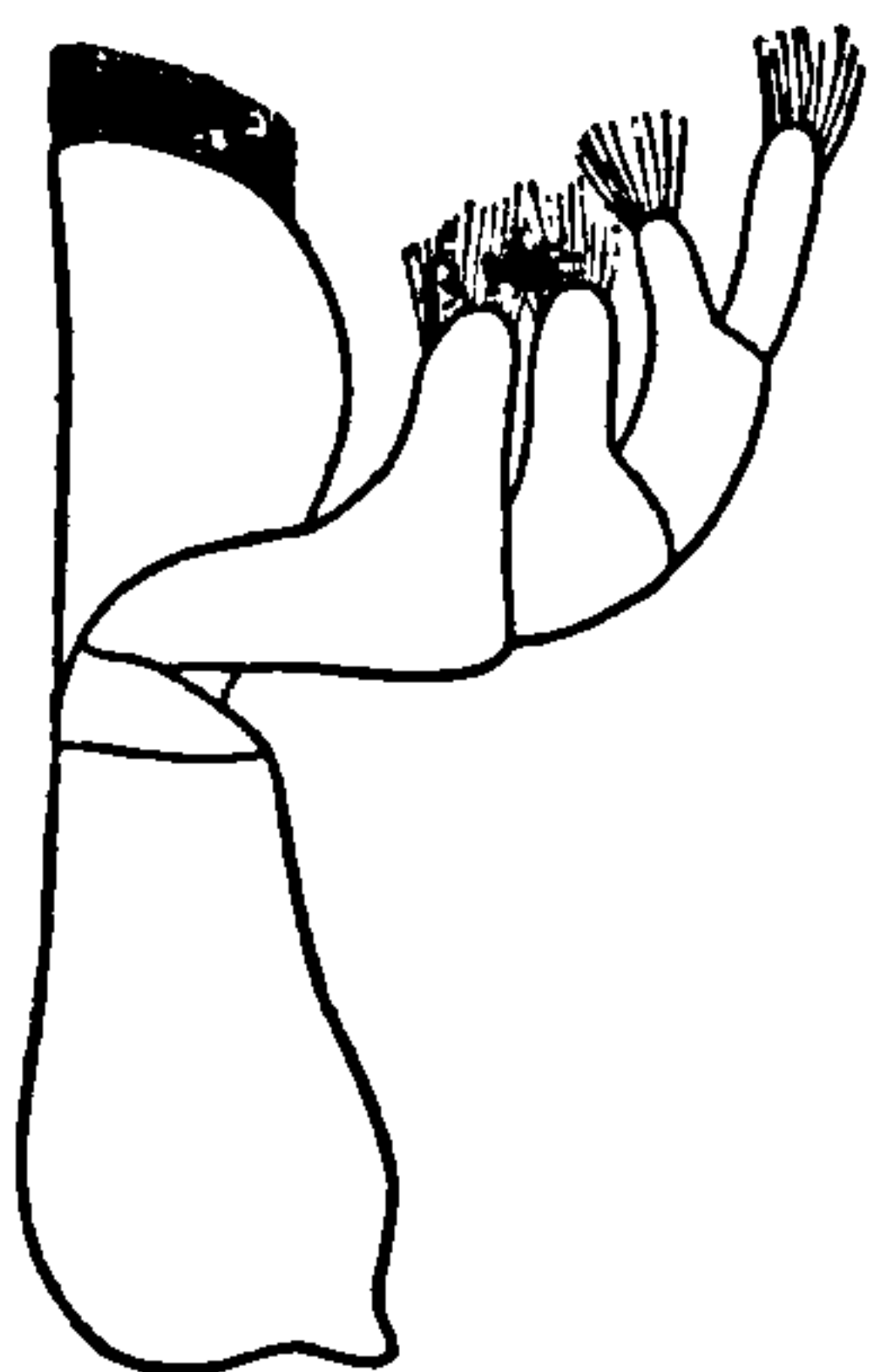


FIG. 323.—DYNAMENE ANGULATA. MAXILLIPED. $\times 51\frac{1}{2}$.

The thoracic segments are subequal in length, the first being a little longer than any of the others. The epimera are broad and short, with acute lateral angulations.

The first abdominal segment bears suture lines indicative of coalesced segments. There are three small tubercles in a transverse row, one median and one on either side. The terminal segment is subtriangular, with the extremity produced and deeply excavate, the excavation being like an inverted V. At the base of this segment are three large tubercles in a transverse row, the median one being long and very acute, the lateral ones rounded. The branches of the uropoda are similar in shape, the outer one being somewhat longer; they are obliquely truncated with the outer posterior angles acutely produced and do not quite reach the tip of the abdomen.

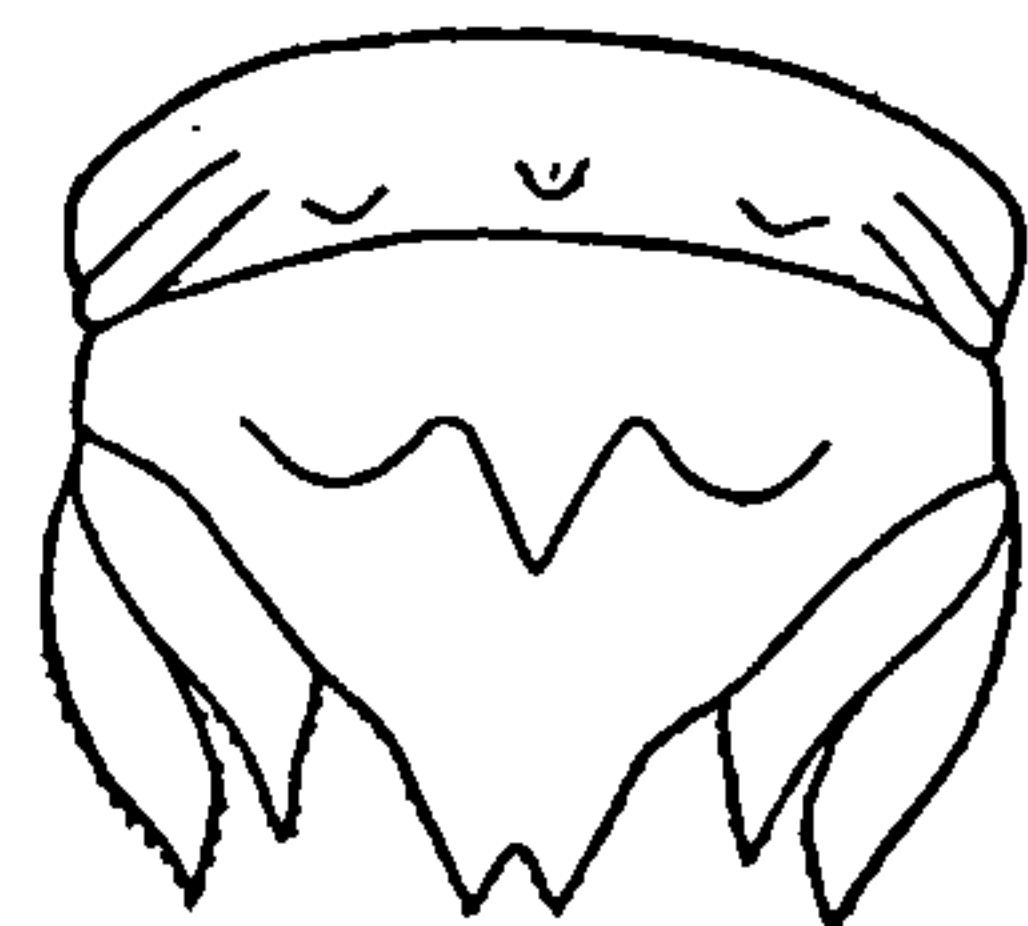


FIG. 324.—DYNAMENE ANGULATA. ABDOMEN.

Specimens were found by Mr. Henry Hemphill at No Name Key, Florida.

Type.—Cat. No. 23906, U.S.N.M.

^a Proc. Cal. Acad. Nat. Sci. (3), III, No. 11, 1904, p. 304.

DYNAMENE MOOREI, new species.

Dynamene perforata MOORE (female), Bull. U. S. Fish Commission, XX, Pt. 2, 1902, pp. 173-174, pl. x, fig. 10.—RICHARDSON (female), Trans. Conn. Acad. Sci., XI, 1902, pp. 291-292.

Localities.—Culebra, Porto Rico; Bermudas.

Found on mangrove roots.

This species is what Dr. Moore considered to be the female of *Dynamene perforata*. Upon examining the specimens of *Dynamene perforata* (females) I found one to be a male.^a

Body oblong-ovate, about twice as long as wide, 2 mm.: 4 mm.

Head about twice as wide as long, with the frontal margin rounded and produced in a small median point. Eyes large, composite, and situated in the post-lateral angles of the head. First pair of antennæ have the first and third articles of the peduncle about equal in length; the second shorter than either. The flagellum of eight articles extends to the posterior margin of the first thoracic segment. The second pair of antennæ, with a flagellum of twelve articles, extends to the posterior margin of the second thoracic segment.

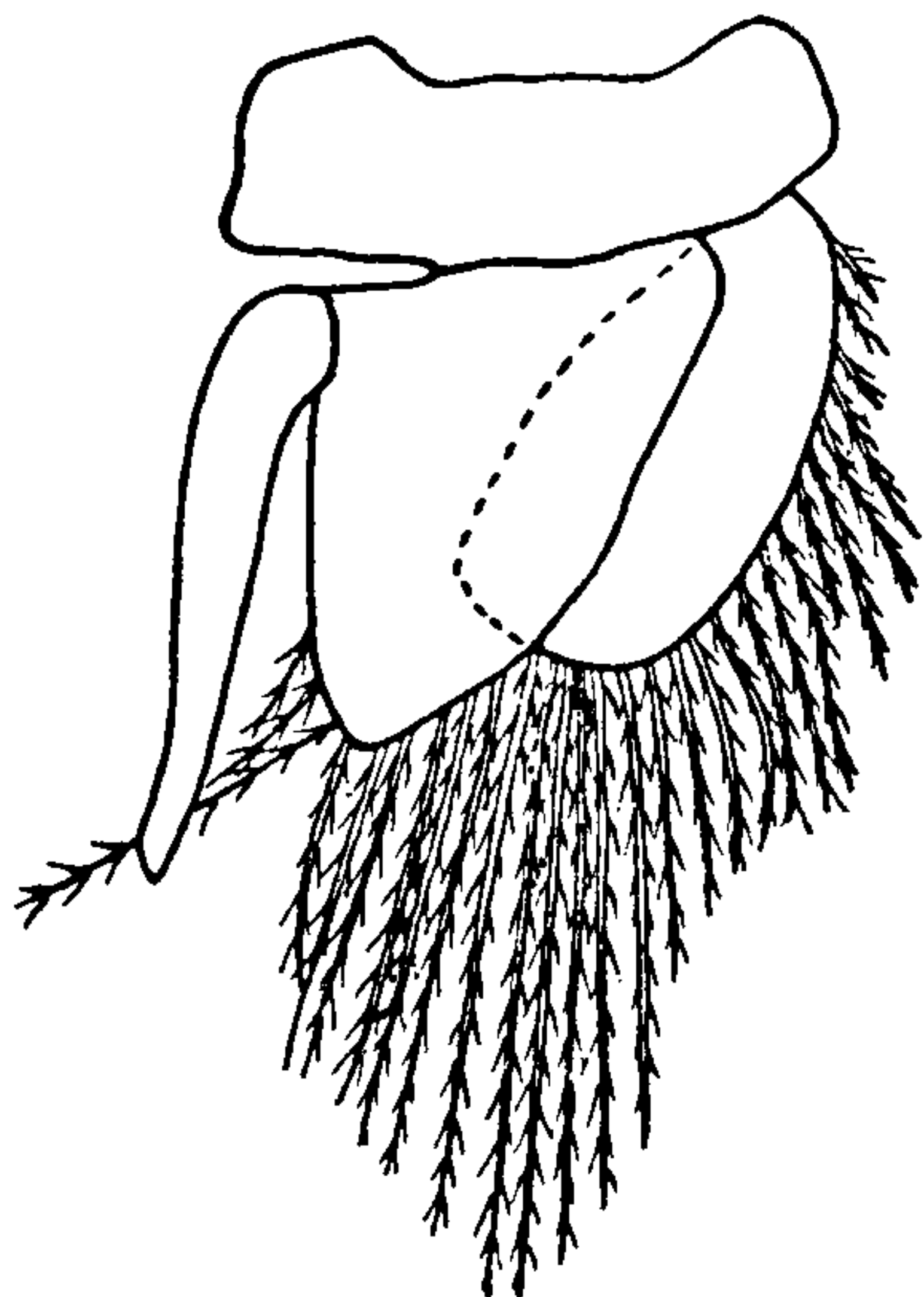


FIG. 326.—DYNAMENE MOOREI.
SECOND PLEPOD OF MALE.
× 77½.

The first segment of the thorax is about one and a half times longer than any of the following segments, which are subequal. The seventh segment is produced backward in two small, rather obscure points, close together, one on either side of the median line.

The abdomen is composed of two segments. The second or terminal segment bears four small, rather obscure tubercles on the anterior convex portion. This segment is somewhat triangular in shape, with the apex notched and the sides folded under, forming a kind of funnel-shaped extremity.

The uropoda are large and broad, similar in shape and size, with the extremities rounded and the exterior margins crenulate. They extend but little beyond the extremity of the abdomen.

Both sexes of this species are known, the males and females being similar.

This species is named for Dr. H. F. Moore.

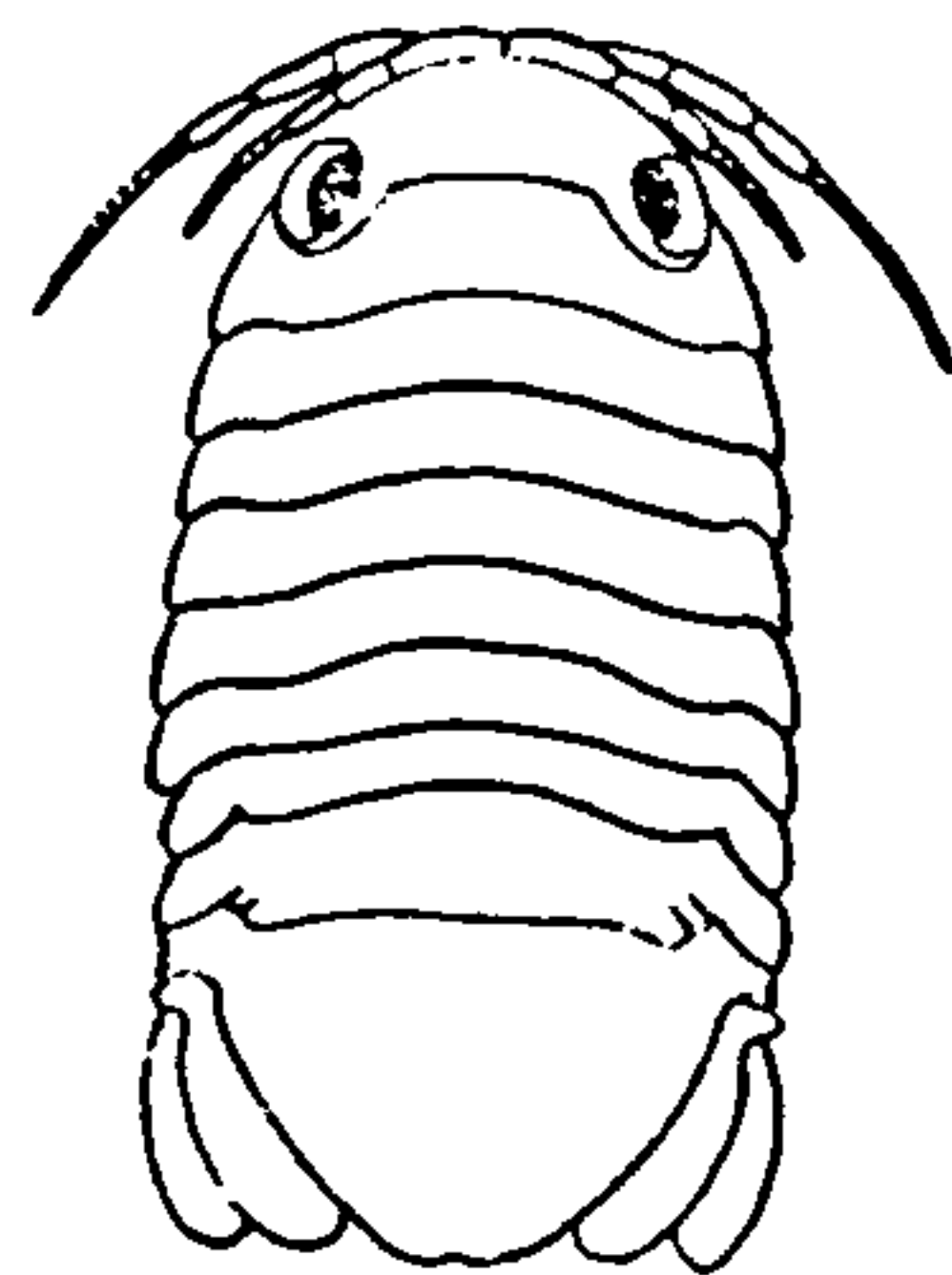


FIG. 325.—DYNAMENE MOOREI (AFTER MOORE).

^aSince my manuscript was sent to press, Doctor Hansen has returned specimens of *Dynamene perforata* Moore, which he borrowed from the U. S. National Museum. Two specimens, considered by Dr. H. F. Moore to be the females of that species, were sent him. I am gratified to find that he has labeled one "immature male," and the other "adult male."

DYNAMENE DILATATA Richardson.

Dynamene dilatata RICHARDSON, Proc. U. S. Nat. Mus., XXI, 1899, pp. 832-833; Ann. Mag. Nat. Hist. (7), IV, 1899, pp. 175-176; American Naturalist, XXXIV, 1900, p. 223.

Locality.—Monterey Bay, California.

Body oval; surface very granular; color yellow.

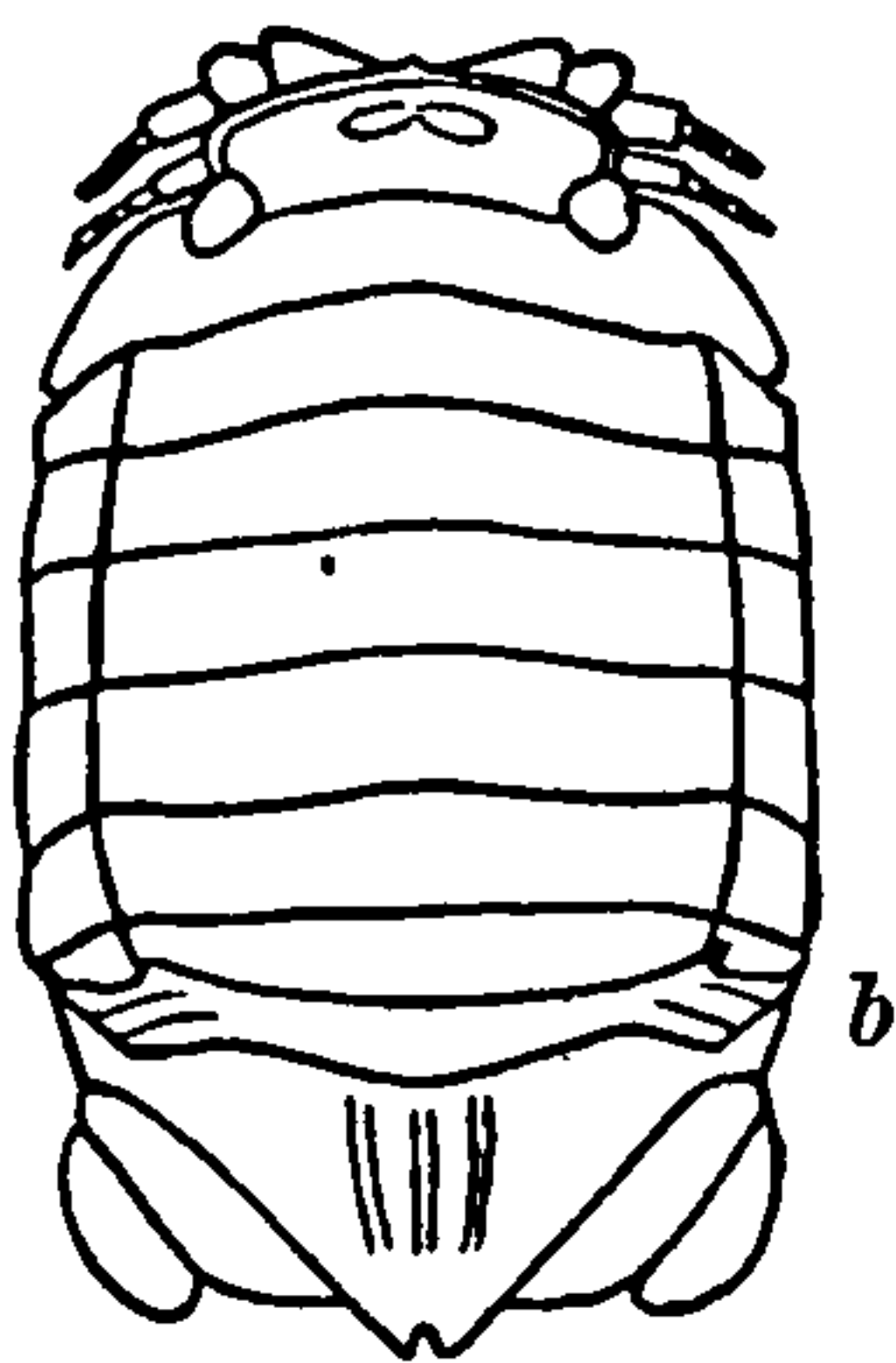
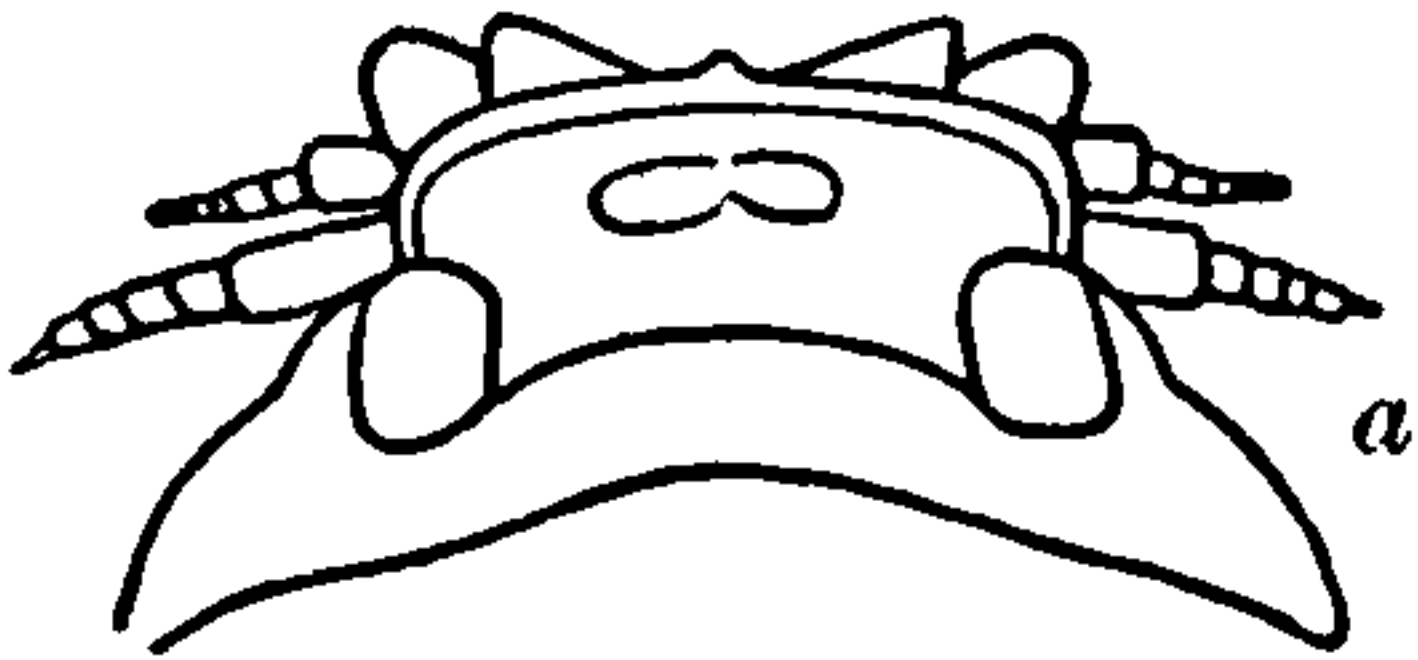


FIG. 327.—DYNAMENE DILATATA.
a, HEAD AND FIRST THORACIC SEGMENT. $\times 13\frac{1}{2}$. b, DORSAL VIEW. $\times 10\frac{3}{4}$.

Head rugose, with its anterior margin produced in a quadrangular process, having a small median projection, rounded antero-lateral angles and a thickened edge. First pair of antennae extend to the posterior margin of the head, first two joints flattened and enlarged; first joint oblong, second joint triangular, and half as long as preceding joint; third joint small, as long as second, but half as wide; flagellum six-jointed. Second pair of antennae are but little longer than first pair and do not reach the posterior margin of the first thoracic segment.

The thoracic segments are of equal length. The epimera are square or oblong, with straight lateral margins.

The penultimate abdominal segment is short, and crossed with suture lines. The terminal segment is triangular with a small rounded notch at the apex. There are three longitudinal ridges on the segment, one in the median line, and one on either side of it. The uropoda are short, not reaching the extremity of the abdomen, and regularly rounded.

The legs are slender; the first two pairs are covered with long hairs and extend in an anterior direction, the other five pairs extend in a posterior direction.

The type and only specimen was collected by Mr. Heath at Monterey Bay, California, at the surface. Cat. No. 22568, U.S.N.M.

DYNAMENE BENEDICTI Richardson.

Dynamene benedicti RICHARDSON, Proc. U. S. Nat. Mus., XXI, 1899, p. 834; Ann. Mag. Nat. Hist. (7), IV, 1899, p. 177; American Naturalist, XXXIV, 1900, p. 224.

Locality.—Monterey Bay, California.

Body oblong, oval; surface minutely granular; color dark gray.

Head with small median point. Eyes situated post-laterally. First pair of antennae extend to the middle of the first thoracic segment;

first joint of peduncle longest; second and third joints about equal in length; flagellum consists of six joints. Second pair of antennæ extend to the posterior margin of the second thoracic segment; flagellum consists of about eleven joints.

The thoracic segments are of equal length. The epimera are square with rounded posterior angles.

The penultimate abdominal segment is crossed by suture lines, indicative of coalesced segments. The terminal segment is triangular, terminating posteriorly in two teeth separated by a narrow, rounded, funnel-shaped sinus. This segment is very convex, and bears two longitudinal ridges on either side of the median line. The uropoda do not exceed in length the extremity of the terminal segment. Both branches are rounded posteriorly and are similar in shape and size.

The type was collected by Mr. Heath at Monterey Bay, California, at the surface. Cat. No. 22570, U.S.N.M.

This species is named for Dr. James E. Benedict, assistant curator in the Division of Marine Invertebrates, U. S. National Museum.

Both sexes of this species are known, and are in the collection of the U. S. National Museum. The male and female are alike in every respect, with the exception that the inner branch of the pleopoda in the male is provided with a stylet.

31. Genus PARADYNAMENE, new genus.

Second, third, and fourth articles of the palp of the maxillipeds not produced into lobes. First article of the peduncle of the first antennæ with a long process at the upper end, which is acutely produced, and extends to the extremity of the second article.

Characters otherwise as in the genus *Dynamene*.

Both sexes are known, the male and female being similar, but the male is larger.

PARADYNAMENE BENJAMENSIS, new species.

Body oblong-ovate, twice as long as wide, 5 mm.: 10 mm.

Head wider than long, 2 mm.: 3 mm., with the anterior margin widely rounded and produced over the basal articles of the antennæ, so as to entirely conceal them. The eyes are small, round, composite, and situated in the post-lateral angles. The first pair of antennæ have the first or basal article large and elongated, with a long acutely ter-

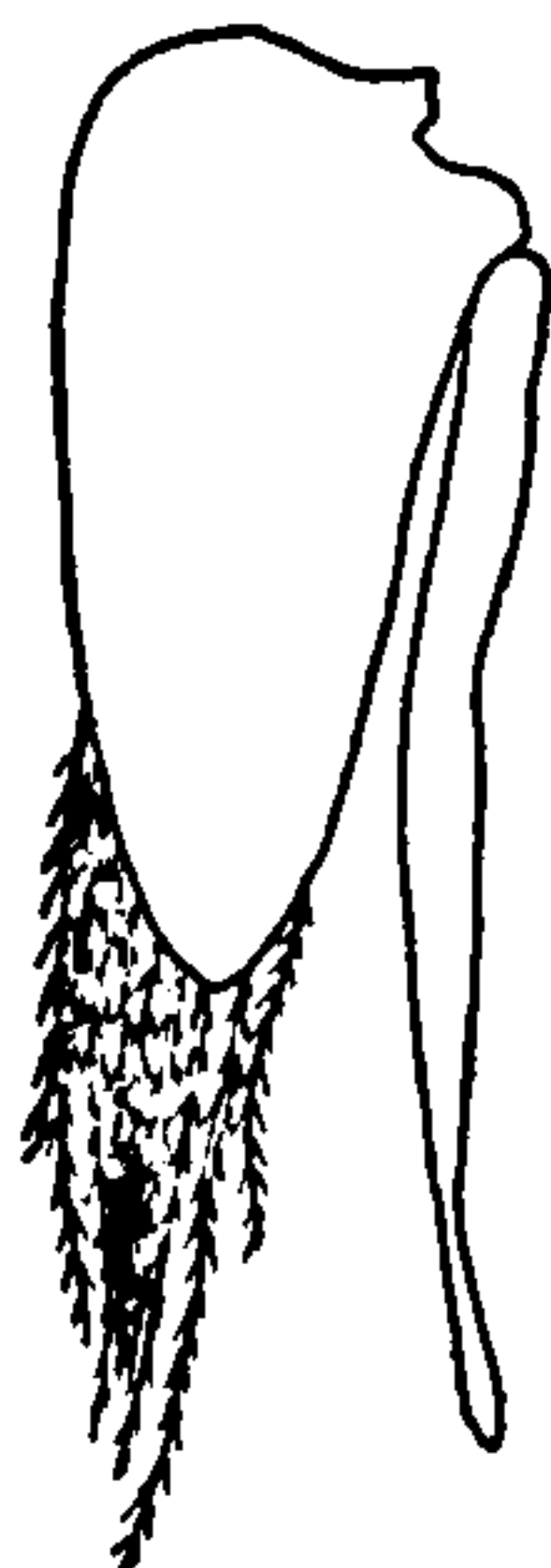


FIG. 328.—DYNAMENE BENEDICTI. SECOND PLEOPOD OF MALE (INNER BRANCH). $\times 51\frac{1}{2}$.

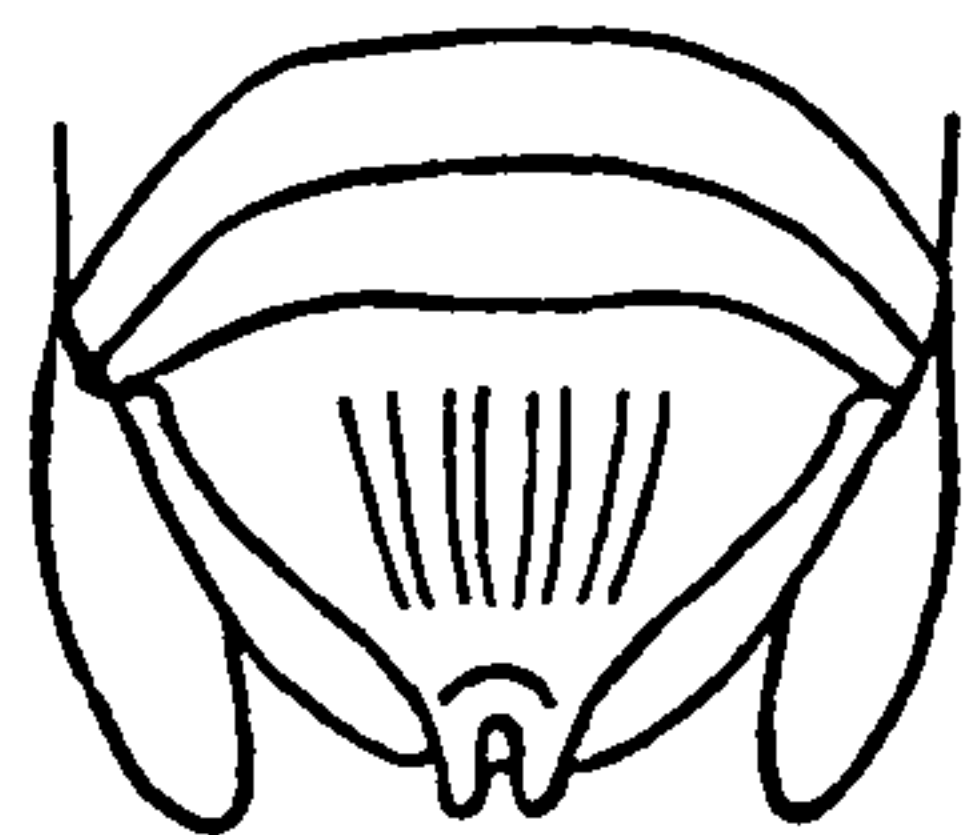


FIG. 329.—DYNAMENE BENEDICTI. LAST THORACIC SEGMENT AND ABDOMEN. $\times 13\frac{1}{2}$.

minating process at the upper end, half the width of the article and extending to the extremity of the second article; the second article is half as long as the first article (not including this process); the third article is half as wide as the second, which is equal in width to the first, and is about one-half as long as the second, and hardly to be distinguished from the articles of the flagellum. The flagellum is composed of about ten articles, and extends to the posterior margin of the first thoracic segment. The second pair of antennæ have the first article very short; the second and third are subequal and each is about twice as long as the first; the fourth and fifth are subequal and each is a little longer than the third. The flagellum is composed of fourteen articles and extends to the posterior margin of the second thoracic segment.

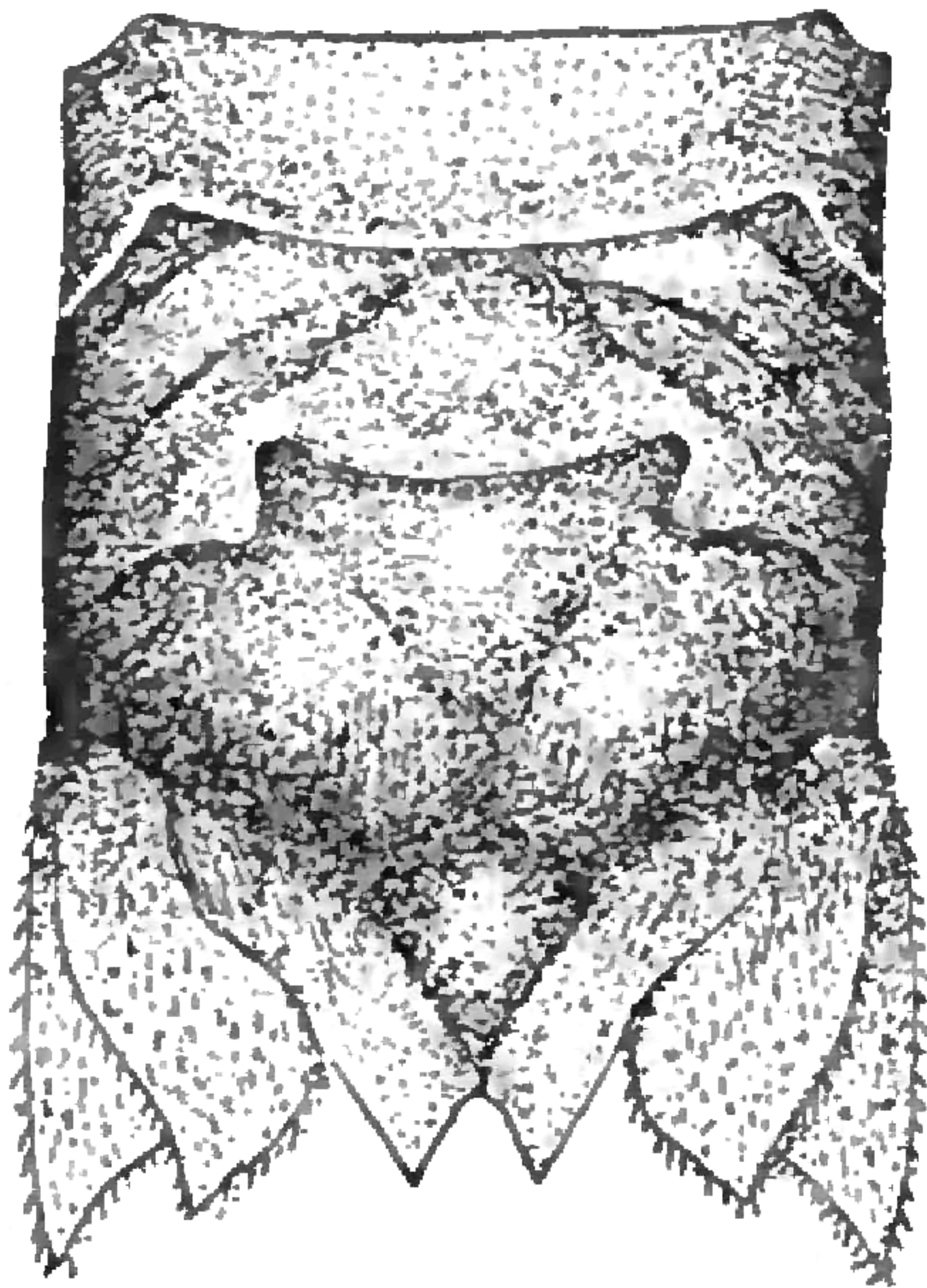


FIG. 330.—PARADYNAMENE BENJAMENSIS. ABDOMEN AND LAST THORACIC SEGMENT OF MALE. $\times 4$.

The first segment of the thorax is about twice as long as any of the following segments, which are subequal. The lateral margins of the body are straight. The epimera are separated on all but the first segment by faint lines.

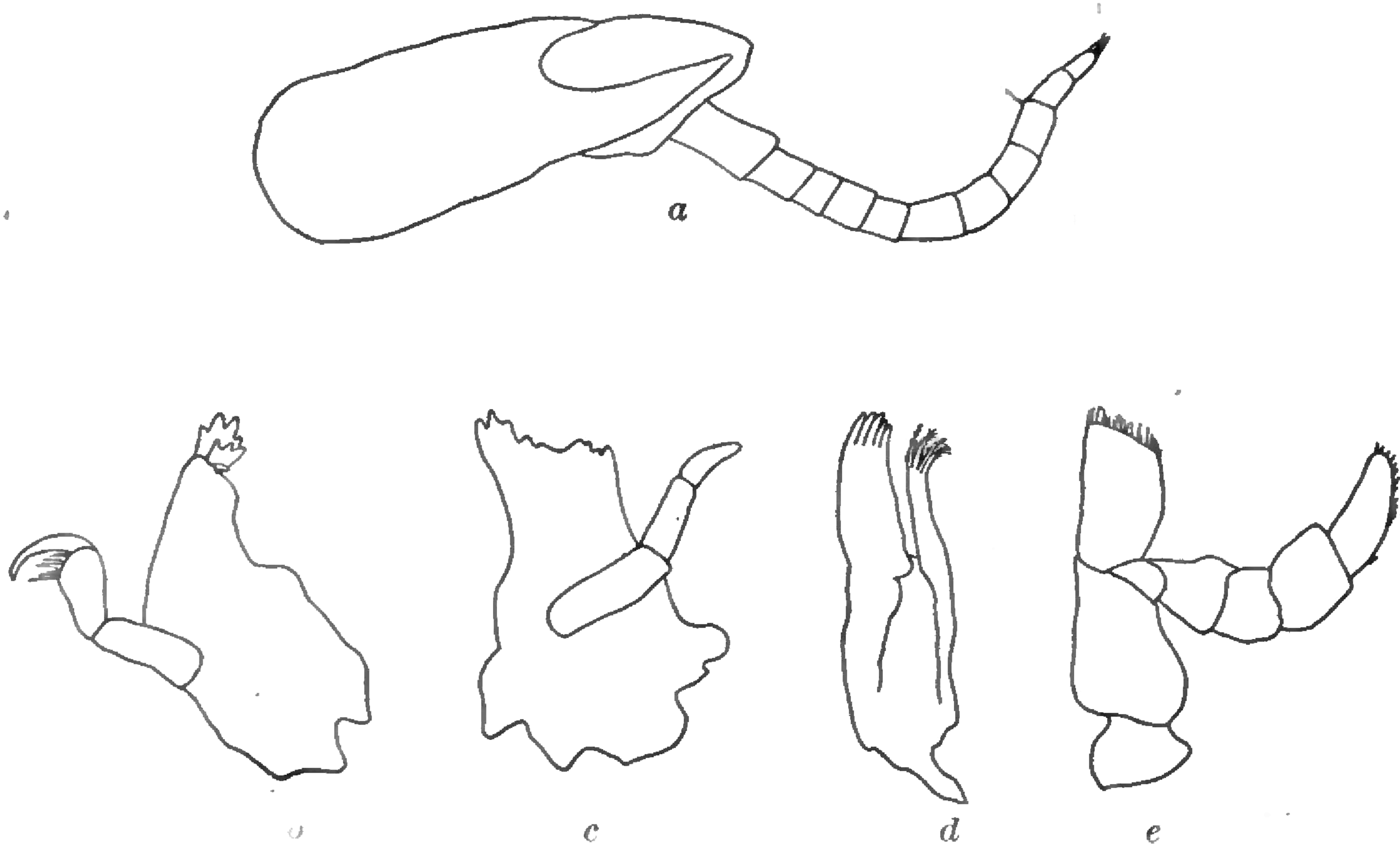


FIG. 331.—PARADYNAMENE BENJAMENSIS. *a*, FIRST ANTENNA. $\times 27\frac{1}{2}$. *b*, *c*, MANDIBLES. $\times 27\frac{1}{2}$. *d*, FIRST MAXILLA. $\times 27\frac{1}{2}$. *e*, MAXILLIPED. $\times 27\frac{1}{2}$.

The abdomen is composed of two segments. The first segment is two and a half times longer than the last thoracic segment, and has three suture lines on either side indicating partly coalesced segments. It is produced backward in a small point on either side. The second

or terminal segment has the convex anterior portion surmounted with two very inconspicuously small tubercles, one on either side of the median line. Its posterior extremity has a deep rounded excavation, almost quadrangular in shape. The uropoda are longer than the terminal abdominal segment. The inner branch has the outer post-lateral angle produced in an acute point, the inner angle being rounded. The outer branch is longer than the inner branch, and terminates in an acutely pointed extremity.

The male differs from the female in its much larger size, being 18 mm. long and 7 mm. wide; in the more granular surface of the abdomen and its V-shaped rather than rounded excavation, and in having two depressed lines converging to a point just anterior to the V-shaped excavation, the apex of the point meeting the apex of the V-shaped excavation.

Four females and one male come from the gulf weed. Collector unknown.

Types in the Museum of Comparative Zoology at Harvard University. Cat. No. 6733, M.C.Z.

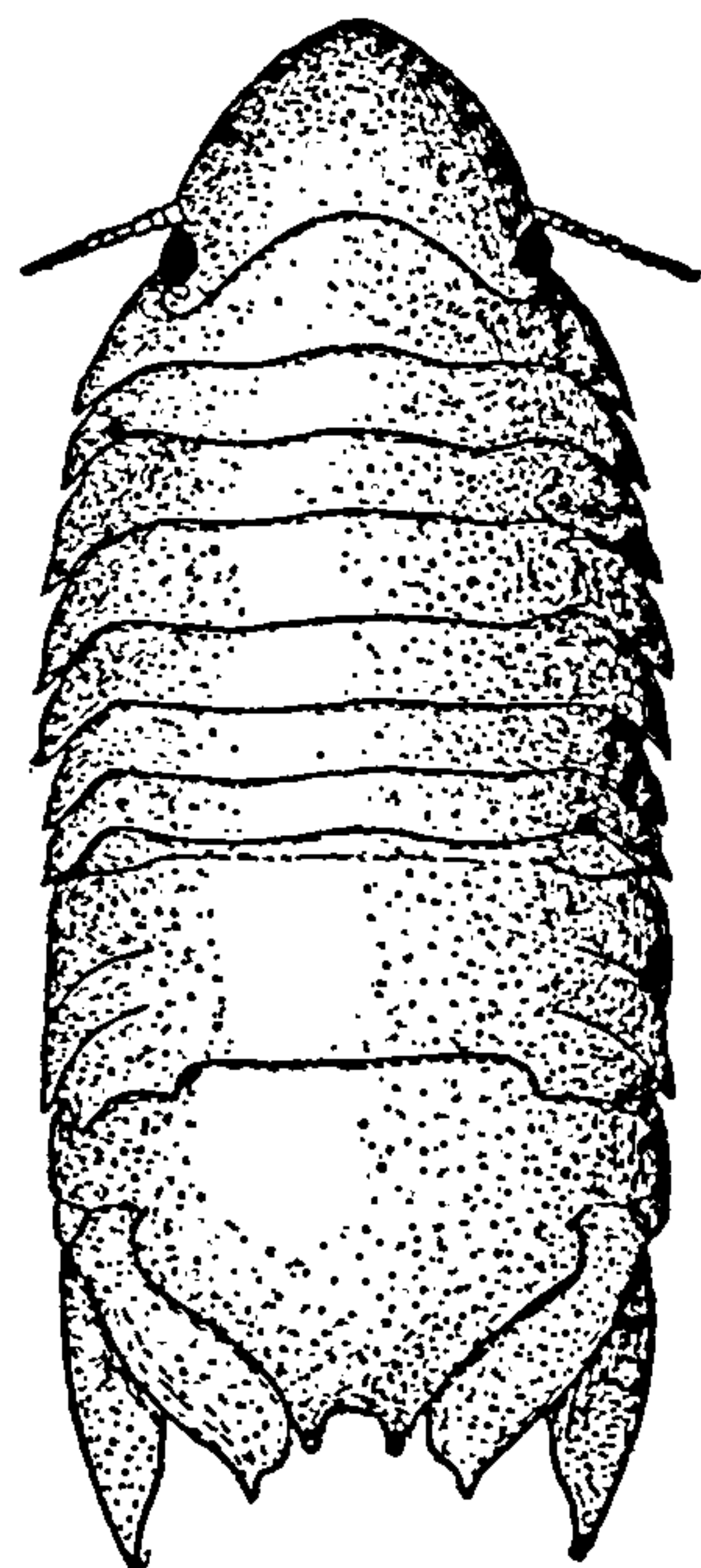


FIG. 332.—PARADYNAMENE BENJAMENSIS. FEMALE (DORSAL VIEW). $\times 5\frac{1}{2}$.

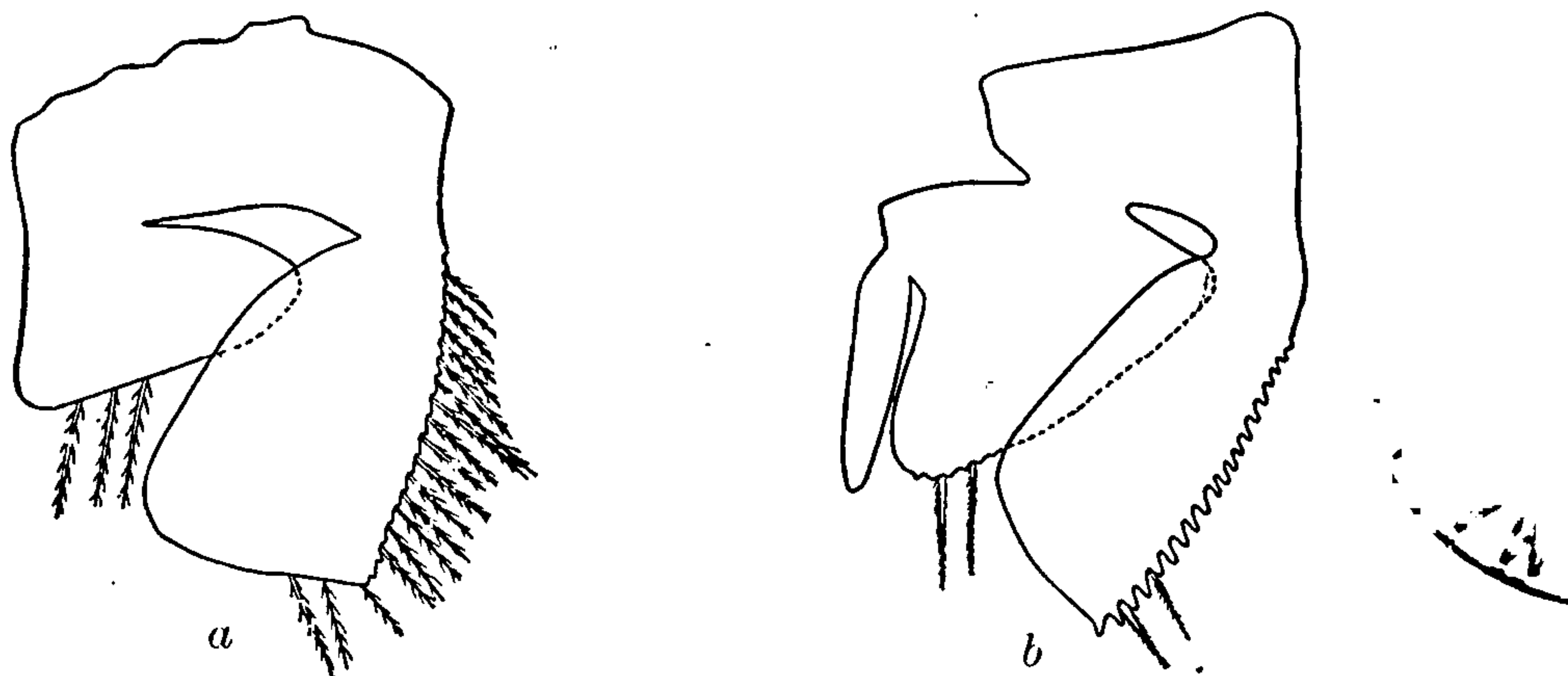


FIG. 333.—PARADYNAMENE BENJAMENSIS. *a*, FIRST PLEOPOD OF MALE. $\times 15\frac{1}{2}$. *b*, SECOND PLEOPOD OF MALE. $\times 15\frac{1}{2}$.

This species is named for Dr. Marcus Benjamin, editor of the Proceedings of the U. S. National Museum.

52. Genus CILICÆA Leach.

Last two segments of thorax of equal length.

Abdomen composed of two segments, the first of which is usually produced (at least in the male) in a long process directed backward. The last segment of the abdomen has a median posterior emargination, with or without teeth.

Maxillipeds with the second, third, and fourth articles of the palp produced into lobes.

Branches of the uropoda unlike in the male, the outer branch being incapable of folding under the inner branch; only the outer branch salient.

In the opinion of Dr. H. F. Moore and Prof. S. J. Holmes the males and females are unlike, the female being similar to the female of the genus *Dynamene*.

All the species which I have referred to this genus are without the long median spine or process of the first abdominal segment characteristic of the type species, *C. latreilli* Leach. The species of this genus described by Haswell^a and Miers^b also have the long spine. Haswell figures one specimen, which he supposes to be the female of *C. spinulosa* or of *C. hystrix*, which lacks the dorsal spine on the first abdominal segment, but in which the uropoda are similar to those of the male.

Miers says that the females of *Cilicæa latreilli* differ from the male in lacking the spine on the first segment of the abdomen and in having the uropoda with the inner branch produced and the outer branch short, resembling the uropoda of *Cymodoce*.

Milne Edwards^c places *Cilicæa caudata* (Say) in the section of the genus *Næsa*, corresponding to *Cilicæa* Leach. It may be that a new genus will be required for these forms which lack the spine on the first abdominal segment, but until more is known about the sexes I shall, for the present, not remove them from the genus *Cilicæa*, where I originally placed them.

Whitelegge^d refers to the genus *Cilicæa* several species in which the male has the first abdominal segment not produced in a long process.

ANALYTICAL KEY TO THE SPECIES OF THE GENUS *CILICÆA*.

- a. Surface of body densely granulated.
 - b. Terminal sinus of last abdominal segment without tooth on either side of the lateral angles of the sinus..... *Cilicæa linguicauda* Richardson
 - b'. Terminal sinus of last abdominal segment with a tooth on either side of the lateral angles of the sinus..... *Cilicæa granulosa* Richardson
- a'. Surface of body not granulated.
 - b. Terminal segment of abdomen with three sinuses in a longitudinal series, each opening into the other, the two upper sinuses being heart-shaped. Outer branch of uropoda armed with four spines or teeth, and extending but little beyond the tip of the abdomen..... *Cilicæa cordata* Richardson
 - b'. Terminal segment of abdomen with one sinus. Outer branch of the uropoda unarmed, and extending much beyond the tip of the abdomen.

^aProc. Linn. Soc. New South Wales, VI, 1881, pp. 183-186.

^bZool. Collections of the *Alert*, 1884, pp. 308-310.

^cHist. Nat. Crust., III, 1840, pp. 218-219.

^dAustral. Mus. Mem., IV, 1901, pp. 201-246.

- c. Sinus with teeth.
- d. Sinus with four or six teeth.
- e. Sinus with six teeth. Medium tubercle at base of terminal segment double.....*Cilicæa gilliana* Richardson
- e'. Sinus with four teeth. Medium tubercle at base of terminal segment single.....*Cilicæa caudata* (Say)
- d'. Sinus with three teeth.....*Cilicæa sculpta* (Holmes)
- e'. Sinus without teeth.....*Cilicæa carinata* Richardson

CILICÆA LINGUICAUDA Richardson.

Cilicæa linguicauda RICHARDSON, Proc. U. S. Nat. Mus., XXIII, 1901, pp. 536-537.

Locality.—Cape Catoche, Yucatan.

Depth.—24-25 fathoms.

Head subtriangular in shape; frontal margin with a small median point; eyes post-laterally situated. The first pair of antennæ reach the posterior margin of the first thoracic segment; the second pair touch the fourth segment.

The first segment of the thorax is a little longer than any of the others, which are similar in size. The epimera are distinct from the segments, and are produced into acute points, with the exception of the last, which has the epimera quite rounded.

The abdomen is composed of two segments, the first of which gives indication of three coalesced segments, and has a small tooth on each side on its post-lateral margin. The last segment is swollen anteriorly, and bears three low tubercles on this portion. The extremity of the abdomen is marked by a sinus, almost completely filled by a single large tooth, which is posteriorly triangular and extends beyond the lateral teeth formed by the sinus. This central tooth bears a small, pointed tubercle near its base. The uropoda are slightly incurved, and are somewhat longer than the abdomen.



FIG. 334.—CILICÆA LINGUICAUDA. ABDOMEN.

The color is a dull yellow.

The lower part of each thoracic segment is densely granulated, as well as the whole surface of the abdomen. The edges of the segments and the uropoda are fringed with hairs.

Type.—Cat. No. 23908, U.S.N.M.

CILICÆA GRANULOSA Richardson.

Cilicæa granulosa RICHARDSON, Proc. U. S. Nat. Mus., XXI, 1899, p. 841; Ann. Mag. Nat. Hist., (7), IV, 1899, pp. 186-187.

Locality.—Cerro Island, Lower California.

Depth.—20 fathoms.

Surface of body densely granulated; granules large and close together.

Head with anterior margin thickened, and produced in a small median point, on either side of which the margin is lobed. Eyes

situated post-laterally. First pair of antennæ extend to the posterior margin of the first thoracic segment; first joint of peduncle, oblong; second joint, short. Second pair of antennæ extend to the posterior margin of the third thoracic segment.

The first thoracic segment is longer than any of the following segments. The epimera are twice as broad as long.

The first abdominal segment is short and bears indications of three coalesced segments. There are three transverse elevations on this segment

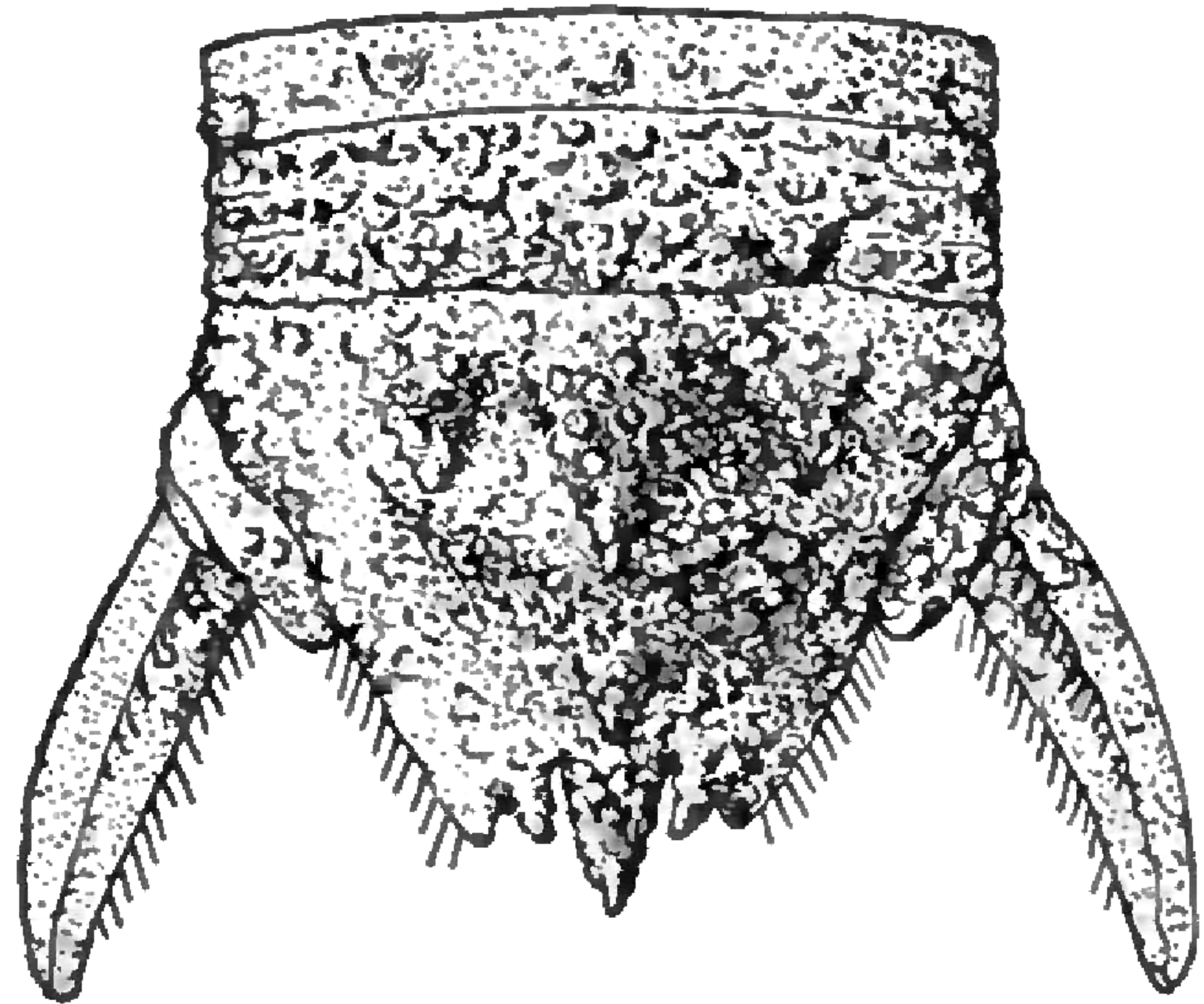


FIG. 335.—*CILICÆA GRANULOSA*. LAST THORACIC SEGMENT AND ABDOMEN. $\times 8$.

which are densely covered with granules. The terminal segment bears three transverse elevations at the base, the median one terminating in a spine. On its posterior margin is a quadrangular excavation, with a long median tooth, bearing a spine at its extremity. At the base of the tooth is a small elevation. On either side of the terminal excavation, a short distance up the lateral margin, is a small

spine. The fixed inner branch of the uropoda is small and short; the outer branch is long, blunt at the extremity, somewhat incurved, and reaches, when open, much beyond the terminal segment. The margins of the terminal segment, and the edges of the outer branch of the uropoda, are pubescent.

The legs are all simple, ambulatory.

One specimen from Cerros Island, Lower California, was collected by Mr. A. W. Anthony at a depth of 20 fathoms.

Type.—Cat. No. 22649, U.S.N.M.

CILICÆA CORDATA Richardson.

Cilicæa cordata RICHARDSON, Proc. U. S. Nat. Mus., XXI, 1899, pp. 839-840.

Dynamene tuberculosa RICHARDSON, Proc. U. S. Nat. Mus., XXI, 1899, p. 833.

Cilicæa cordata RICHARDSON, Ann. Mag. Nat. Hist. (7), IV, 1899, pp. 184-185.

Dynamene tuberculosa RICHARDSON, Ann. Mag. Nat. Hist. (7), IV, 1899, pp. 176-177.

Cilicæa cordata RICHARDSON, American Naturalist, XXXIV, 1900, p. 224.

Dynamene tuberculosa RICHARDSON, Am. Naturalist, XXXIV, 1900, p. 223.

Dynamene cordata HOLMES, Proc. Cal. Acad. Sci. (3), III, 1904, pp. 302-303.

Localities.—Catalina Island, California; Popoff Island; Monterey Bay, California; Aleutian Islands; Bodega Bay, California; Gualala, Mendocino County, California. Found in low water; dredged; in pink coralline at low tide.

Occurs on *Haliotis rufescens*.

Depth.—30 to 40 fathoms, in sandy mud.

On the authority of Prof. S. J. Holmes, who has collected specimens of this species, *Dynamene tuberculosa* and *Cilicæa cordata* represent

the two sexes of the same species. Similarity of habitat and coloration are the reasons he gives for this conclusion, together with the fact that all the specimens which he collected of the one were females and of the other males. An examination of the specimens at my disposition gives the same results in regard to the sexes. Still I place *Dynamene tuberculosa* with much hesitation in the synonymy of *Cilicæa cordata* as representing the female, inasmuch as several males of the genus *Dynamene* have been found which are in every respect similar to the females.

Description of male.—Body attenuated in front; color a faint yellow, profusely marked with a delicate pink tint.

Head with the anterior margin thickened, and slightly produced in front. Prominent median point triangularly shaped. Frontal margin broadly lobed on either side of median point. Eye situated at post-lateral angle of head. First pair of antennæ reach beyond the posterior margin of head; first joint of peduncle oblong; second joint very short; flagellum consists of about nine articles. The second pair of antennæ extend to the posterior angle of the third thoracic segment; the flagellum consists of about fifteen articles.

The thoracic segments are about equal in length, with the exception of the first, which is a little longer than any of the others. The epimera are very broad and drawn out to an apex, which is rounded. They are scarcely visible in a dorsal view, as they project downward laterally, forming an angle with the segments. The last thoracic segment is furnished with low tubercles on its posterior margin.

On the first abdominal segment are five double tubercles. The terminal segment of the body has three sinuses, one above another, the two upper openings being heart-shaped. Six teeth are grouped in series of two each, and are placed in such regularity as to give the appearance of a triple sinus.

At the base of the upper sinus is a large rounded tubercle, peaked at the top. Three double tubercles are also situated at the base of the abdomen. The inner branch of the uropoda is fixed and immovable;

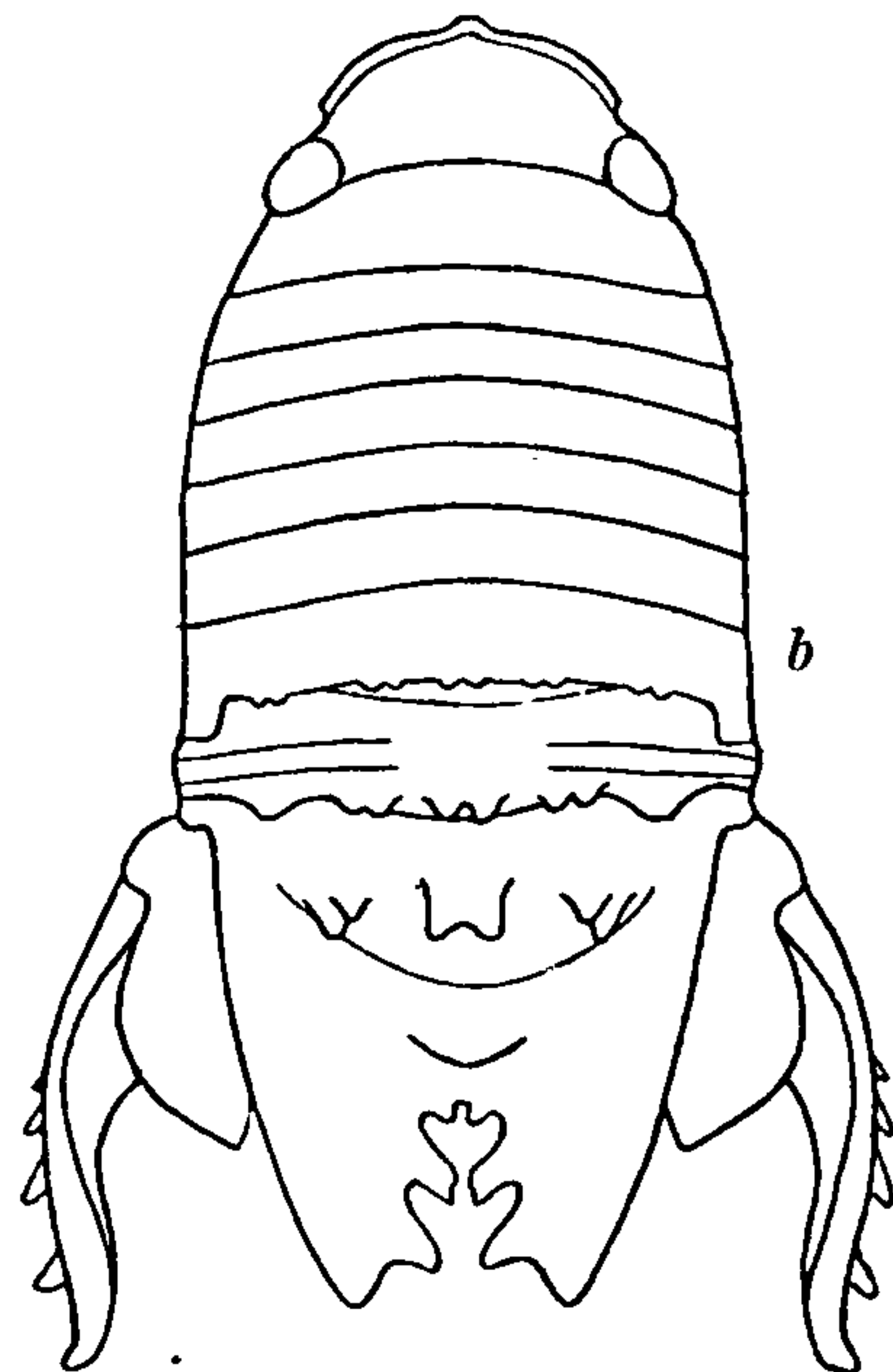
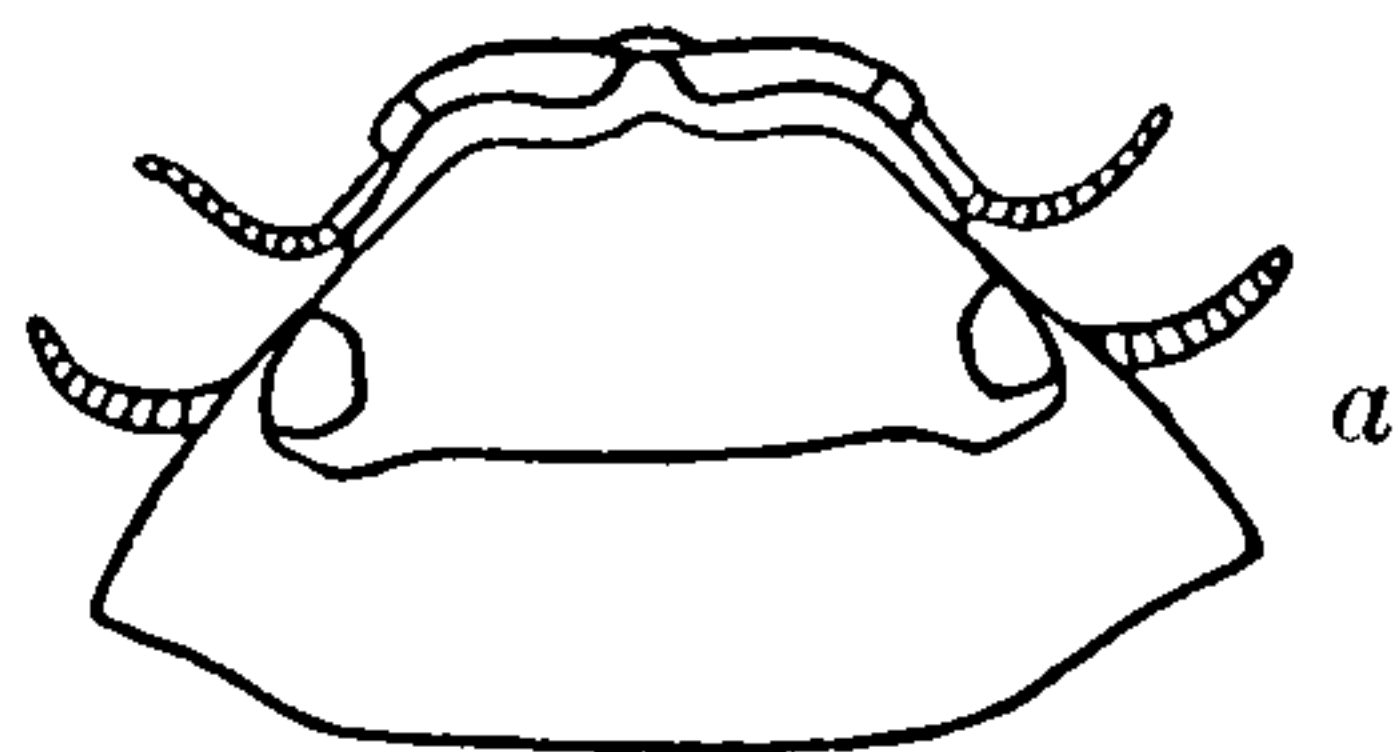


FIG. 336.—CILICÆA CORDATA (MALE).
a, HEAD AND FIRST THORACIC SEGMENT. b, DORSAL VIEW. × 8.

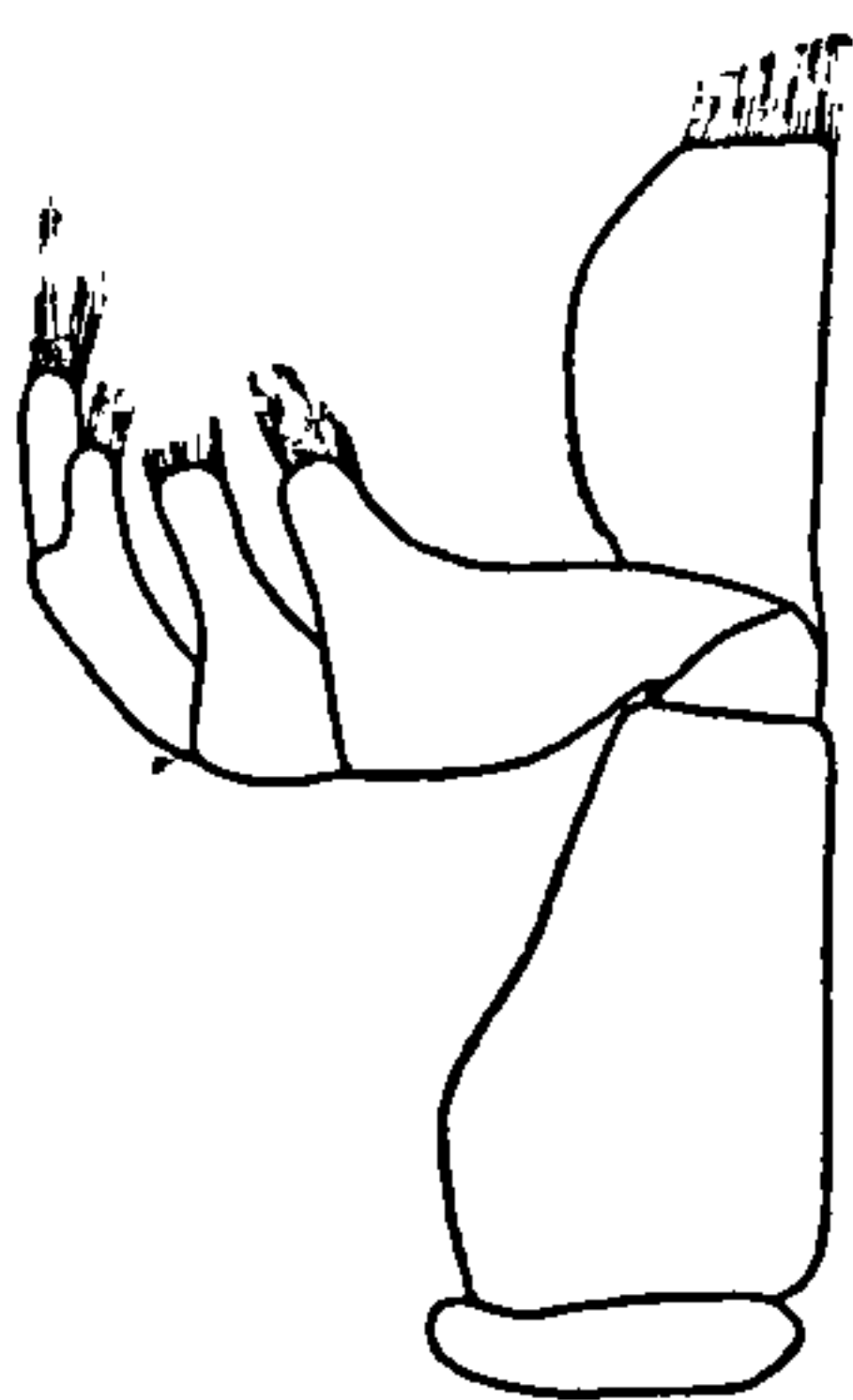


FIG. 337.—CILICÆA CORDATA. MAXILLIPED. × 27½.

it is broad and pointed at its extremity and extends two-thirds the length of the terminal segment. The outer branch is long and slender, broad and flattened above, more rounded and tapering at the extremity, somewhat incurved, and extends a little beyond the end of the abdomen. Its outer edge is crenulate and its under surface armed with four spines.

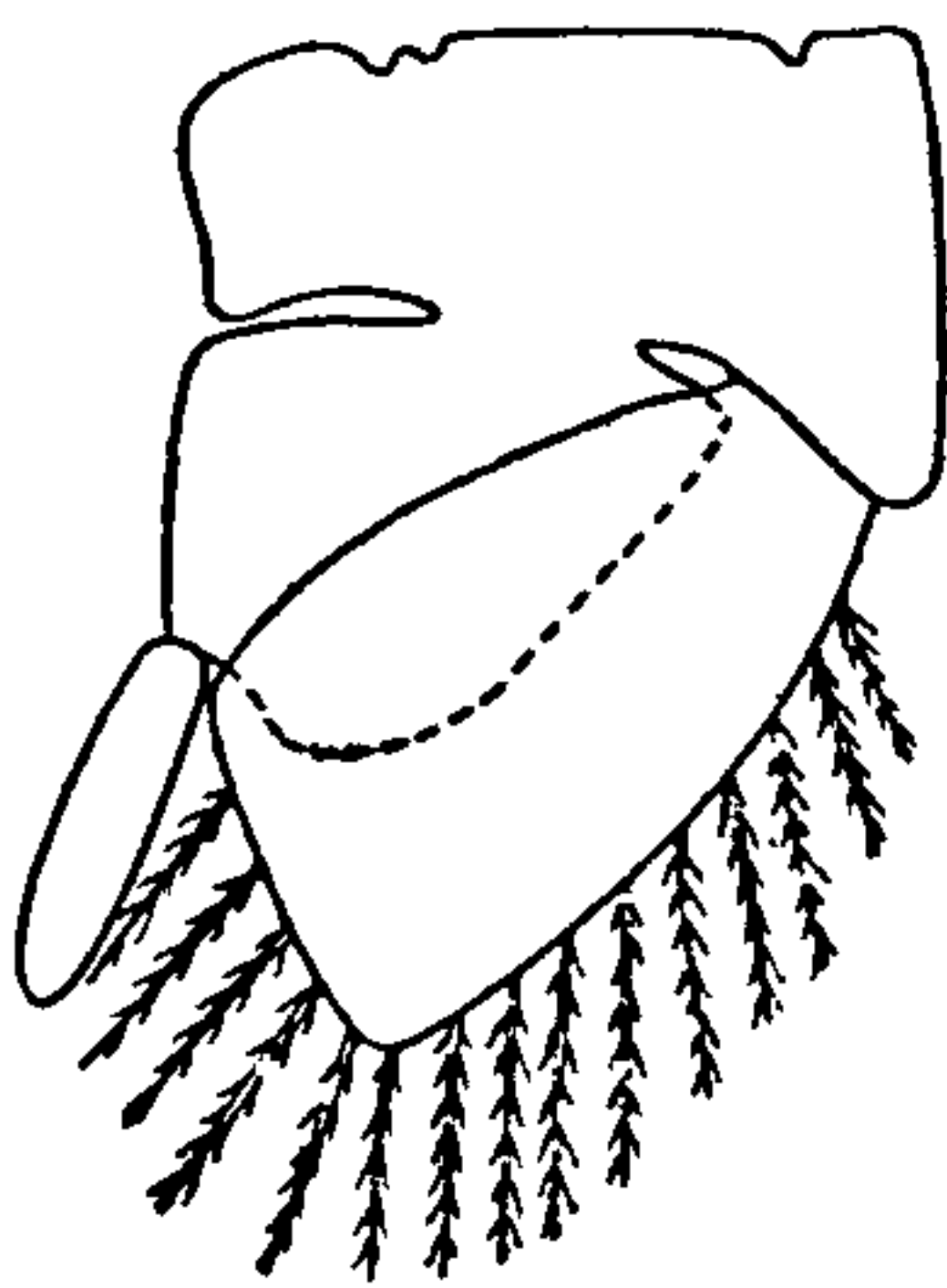


FIG. 338.—*CILICEA CORDATA*. SECOND PLEPOD OF MALE. $\times 15\frac{1}{2}$.

The legs are long and slender, all ambulatory, and with dactylus biunguiculate.

Two specimens were collected at Popoff Island (Aleutian Islands) by Dr. W. H.

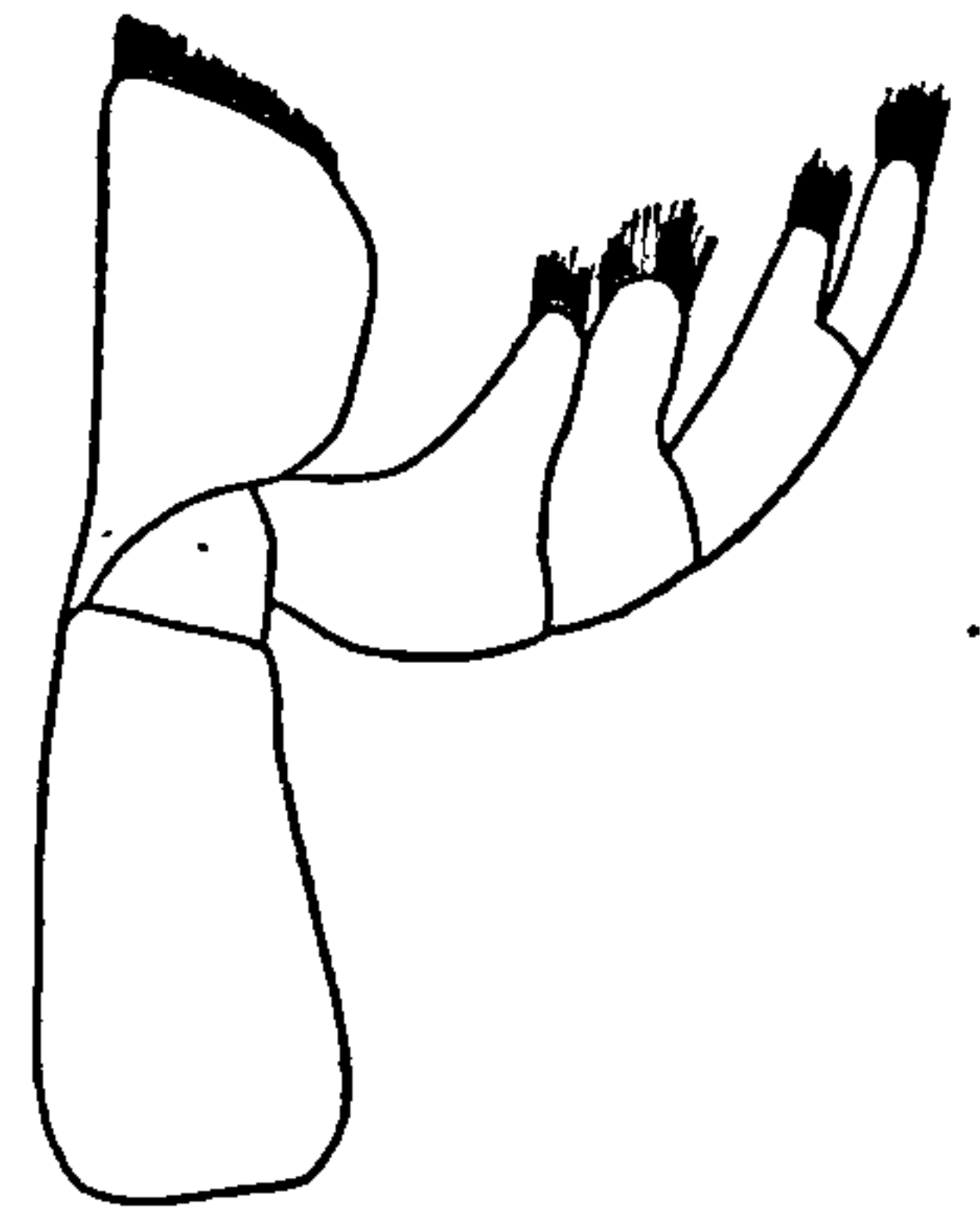


FIG. 339.—*CILICEA CORDATA* (FEMALE). MAXILLIPED. $\times 51\frac{3}{4}$.

Dall at low water.

Type.—Cat. No. 22575, U.S.N.M., Popoff Island.

Another individual was found at Catalina Island, California, by Dr. J. G. Cooper. In this specimen the sixth thoracic segment is also tuberculated. One specimen was found by Mr. Heath at Monterey Bay on the pink coralline at low tide, and is shaded with a delicate pink. In this specimen, on the seventh thoracic segment and the penultimate abdominal segment, the tubercles on either side of the median line of tubercles are single instead of double.

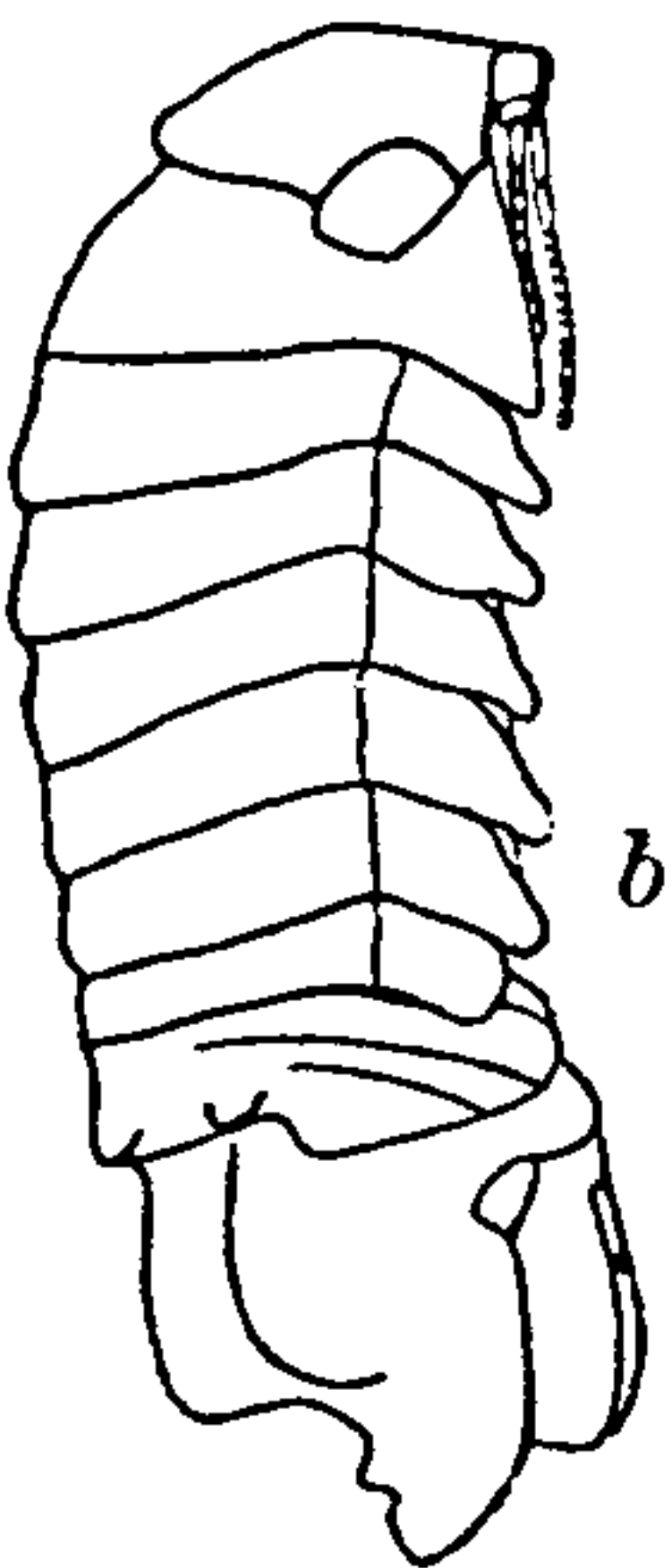
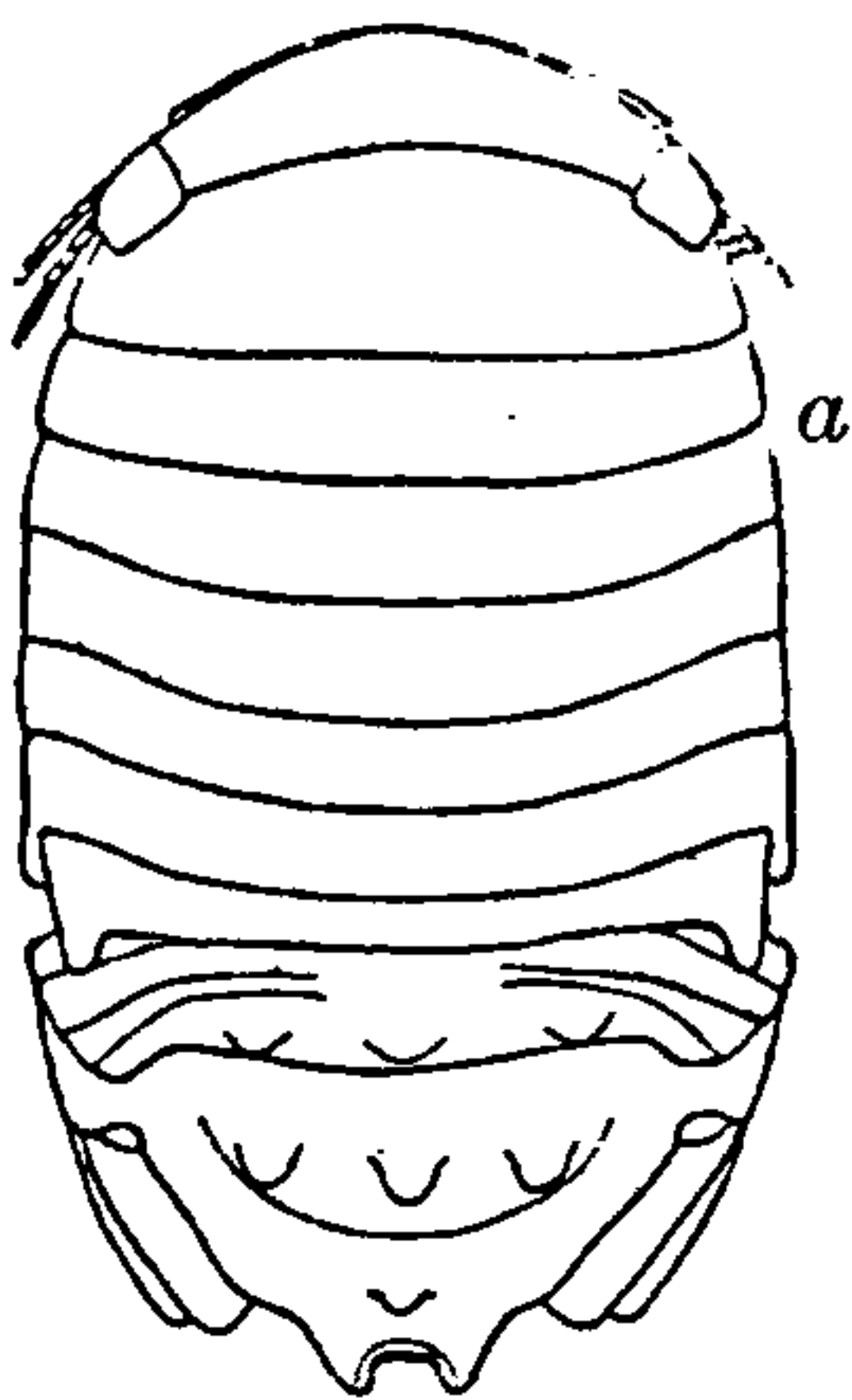


FIG. 340.—*CILICEA CORDATA* (FEMALE). $\times 8$. *a*, DORSAL VIEW. *b*, LATERAL VIEW.

Description of female.—Body oblong-ovate; color, light yellow, almost white; surface of abdomen tuberculated.

Head large, much broader than long, with a wide anterior margin, broadly curving on either side of a small median point. Eyes small, and situated at the extreme post-lateral angles of the head. The first pair of antennæ, composed of eight articles, reach beyond the middle of the first thoracic segment. The second pair of antennæ, composed of twelve articles, extend to the posterior angle of the first thoracic segment.

The first segment of the thorax is one and a half times longer than any of the other segments, which are about equal in length. The epimera, which are distinctly marked, and roundly produced at their posterior angles, are much broader than long.

The first abdominal segment is transversely crossed by three suture lines, indicated at the sides of the segment. Three small

tubercles are situated in a transverse line on the posterior margin of this segment. The terminal segment is subtriangular in shape, with a broad funnel-like excavation at its extremity, formed by the infolding of the lateral edges. The anterior part of the terminal segment is very convex, upon which elevation are situated three large tubercles in a transverse row, the center one being in the median line. At the base of the terminal excavation is also a small tubercle. Both branches of the uropoda are similarly shaped, being of the same width throughout their entire length, and rounded posteriorly. The outer branch is somewhat shorter than the inner branch; neither reach the extremity of the abdomen.

Individuals were found at Gualala, California, on *Haliotis rufescens*, by Dr. R. E. C. Stearns; also, one specimen at Catalina Harbor, California, and one at Popoff Island, Aleutian Islands, at low water, by Dr. W. H. Dall.

Type.—Cat. No. 22569, U.S.N.M. Popoff Island, Aleutian Islands.

CILICÆA GILLIANA Richardson.

Cilicæa caudata gilliana RICHARDSON, Proc. U. S. Nat. Mus., XXI, 1899, pp. 840-841; Ann. Mag. Nat. Hist. (7), IV, 1899, pp. 185-186; American Naturalist, XXXIV, 1900, p. 224.

Localities.—Catalina Island, California; Gualala, Mendocino County, California.

Depth.—30-40 fathoms in sandy mud.

Body slightly attenuated in front. Color, light brown with markings of black.

Head with anterior margin thickened and slightly produced. Large median point triangularly shaped, on either side of which the frontal margin of the head is broadly lobed. Eye situated at the posterior angles of the head. F

pair of antennæ reach beyond the posterior margin of the head; first joint of peduncle is oblong; second joint very small; flagellum

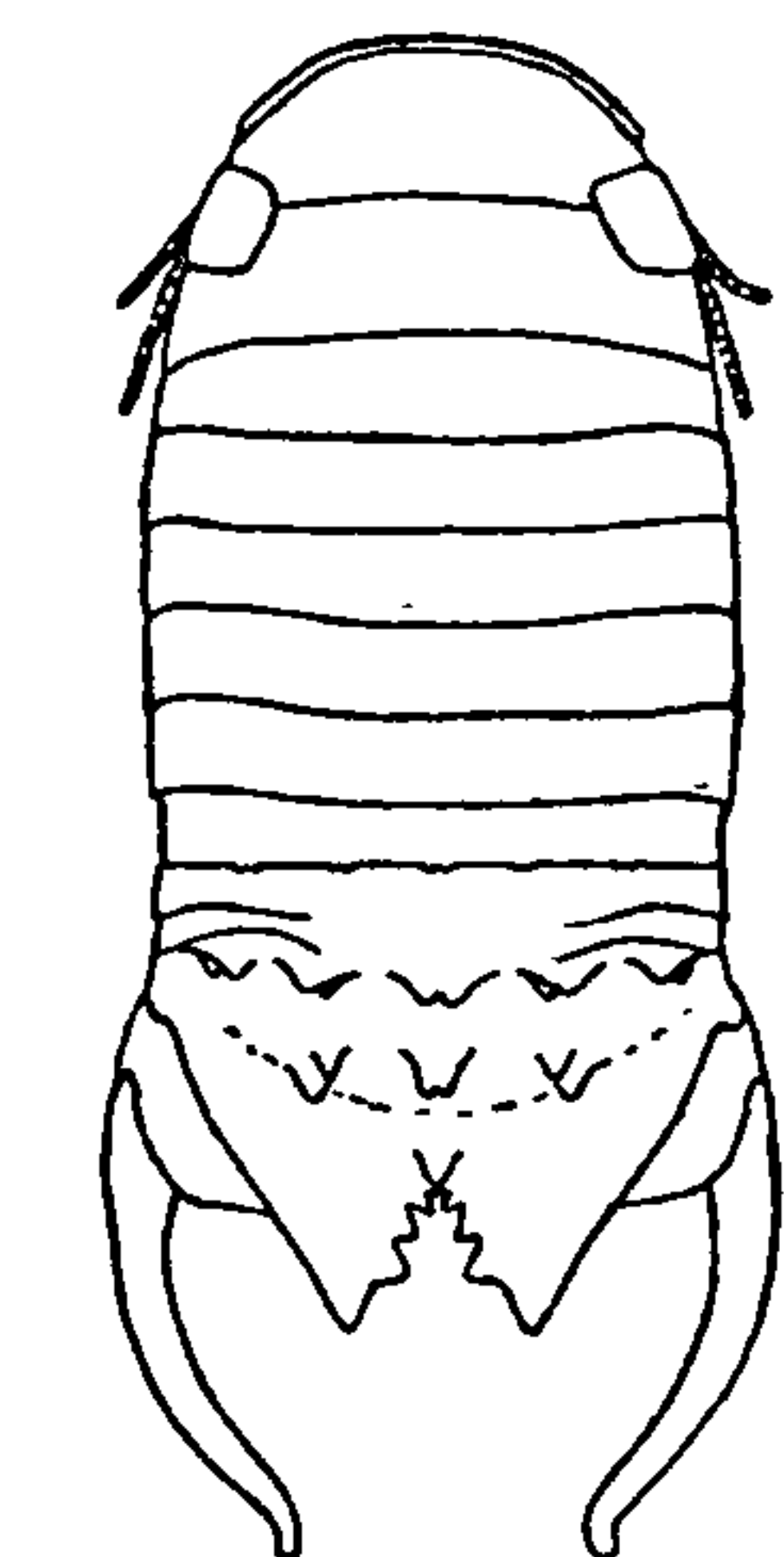


FIG. 341.—CILICÆA GILLIANA. $\times 8$.

consists of eight joints. The second pair of antennæ are broken in the specimens examined.

The thoracic segments are about equal in length, with short but very broad epimera, which extend downward laterally, forming an angle with the segments. The last segment is ridged with very low tubercles on its posterior margin.

The first abdominal segment has two suture lines, indicative of coalesced segments, and bears five double tubercles. The terminal segment has a large sinus, in which are situated six sharp teeth. At the base of the sinus is a large



FIG. 342.—CILICÆA GILLIANA. MAXILLIPED. $\times 51\frac{1}{2}$.

tubercle. Three double tubercles are also found at the base of the terminal segment. The inner branch of the uropoda is affixed to the sides of the abdomen and extends two-thirds of its length; it is triangularly pointed at its extremity. The outer branch is long and slender, almost cylindrical in shape, smooth, somewhat incurved, and extends much beyond the tip of the terminal segment.

The legs, all ambulatory, are slender with dactylus uniunguiculate. Specimens were dredged off Catalina Island, California.

Type.—Cat. No. 22576, U.S.N.M.

These specimens differ from *Cilicæa caudata* (Say), in the presence of six distinct teeth within the sinus of the terminal segment, while in that species there are but four; in the greater development of the spine at the base of the sinus, and in the median double tubercle at the base of the terminal segment.

This species is named in honor of Dr. Theodore Gill, the distinguished ichthyologist.

CILICÆA CAUDATA (Say).

Næsa caudata SAY, Jour. Acad. Nat. Sci. Phila., I, 1818, p. 482.—MILNE EDWARDS, Hist. Nat. Crust., III, 1840, p. 219.

Cymodocea caudata IVES, Proc. Acad. Nat. Sci. Phila., 1891, p. 188, pl. vi, figs. 11-14.

Cymodocea bermudensis IVES, Proc. Acad. Nat. Sci. Phila., 1891, p. 194.

Cilicæa caudata RICHARDSON, Proc. U. S. Nat. Mus., XXI, p. 841 (foot-note); Ann. Mag. Nat. Hist., (7), IV, 1899, p. 186 (foot-note); Proc. U. S. Nat. Mus., XXIII, 1901, p. 536.

Dynamene bermudensis RICHARDSON, Proc. U. S. Nat. Mus., XXIII, 1901, p. 534; Trans. Conn. Acad. Sci. XI, 1902, p. 291.

Cilicæa caudata RICHARDSON, Trans. Conn. Acad. Sci., XI, 1902, p. 291.—MOORE, Bull. U. S. Commissioner of Fish and Fisheries, XX, Pt. 2, 1902, p. 172, pl. x, figs. 5-8.

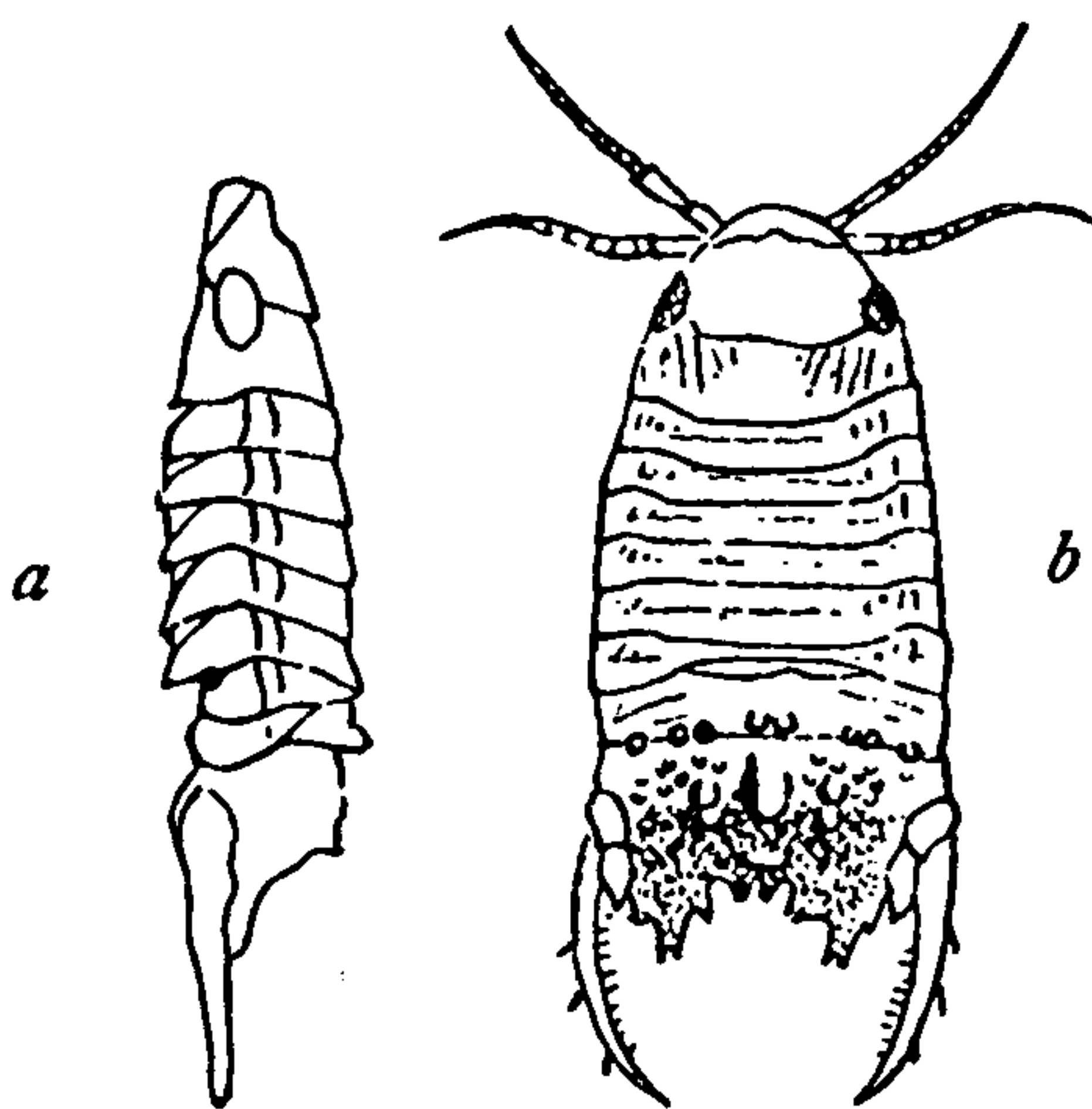


FIG. 343.—CILICÆA CAUDATA (AFTER IVES). *a*, LATERAL VIEW. $\times 4$. *b*, DORSAL VIEW. $\times 4$.

Localities.—Egg Harbor, New Jersey; Beaufort, North Carolina; No Name Key, Florida; between Salt Pond Key and Stock Island; Key West; Puntarassa; Sugarloaf Key; northwest end St. Martins Reef; Sarasota Bay, Florida; Cedar Keys, Florida; off Progreso and Cape Catoche, Yucatan;

Bermudas, at Harrington Sound, Castle Harbor, and the Flatts; Mayaguez, Boqueron Bay, Puerto Real, Arroyo, and Fajardo, Porto Rica; the Bahamas.

Depth.—Found on the surface; also at a depth of 1-12 feet; 25 fms. Among algæ and grass below low tide; from coral reefs.

On the authority of Dr. H. F. Moore, who has collected specimens of this species, *Dynamene bermudensis* represents the female of *Cilicæa caudata* (Say). The two forms are always found associated together. Only the female of the one is known and the male of the other. I unite the two with much hesitancy, for, inasmuch as the males of several species of *Dynamene* are known, the male of this form may not be the one referred to it by Doctor Moore.

Description of male.—Body very slightly increasing in width from the head to the abdomen, a little more than twice as long as wide from the anterior margin of the head to the extremity of the abdomen, 4 mm.: 9 mm. The uropoda extend 1 mm. beyond the tip of the terminal segment, making the entire length of the body with the uropoda 10 mm.

Head three times as wide as long, 1 mm.: 3 mm., with a frontal border arising between the eyes, and produced in a small median point.

The eyes are small, round, composite, and situated in the post-lateral angles of the head. The first pair of antennæ have the basal article long and stout; the second is half as long as the first and equally wide; the third is one and a half times as long as the second and about half as wide. The flagellum is composed of eight articles. The first antennæ extend to the posterior margin of the first thoracic segment. The second pair of antennæ have the basal article short; the second is about twice as long as the first; the third and fourth are about equal in length and each is a little longer than the second; the fifth is a little longer than the fourth. The flagellum is composed of fifteen articles. The second antennæ extend a little beyond the posterior margin of the second thoracic segment. The maxilliped has a palp of five articles. The palp of the mandibles is composed of three articles. The frontal lamina is large and conspicuous, the posterior portion forming a thick raised margin in the shape of an inverted v.

FIG. 345.—CILICÆA CAUDATA. MAXILLIPED. $\times 51\frac{2}{3}$.

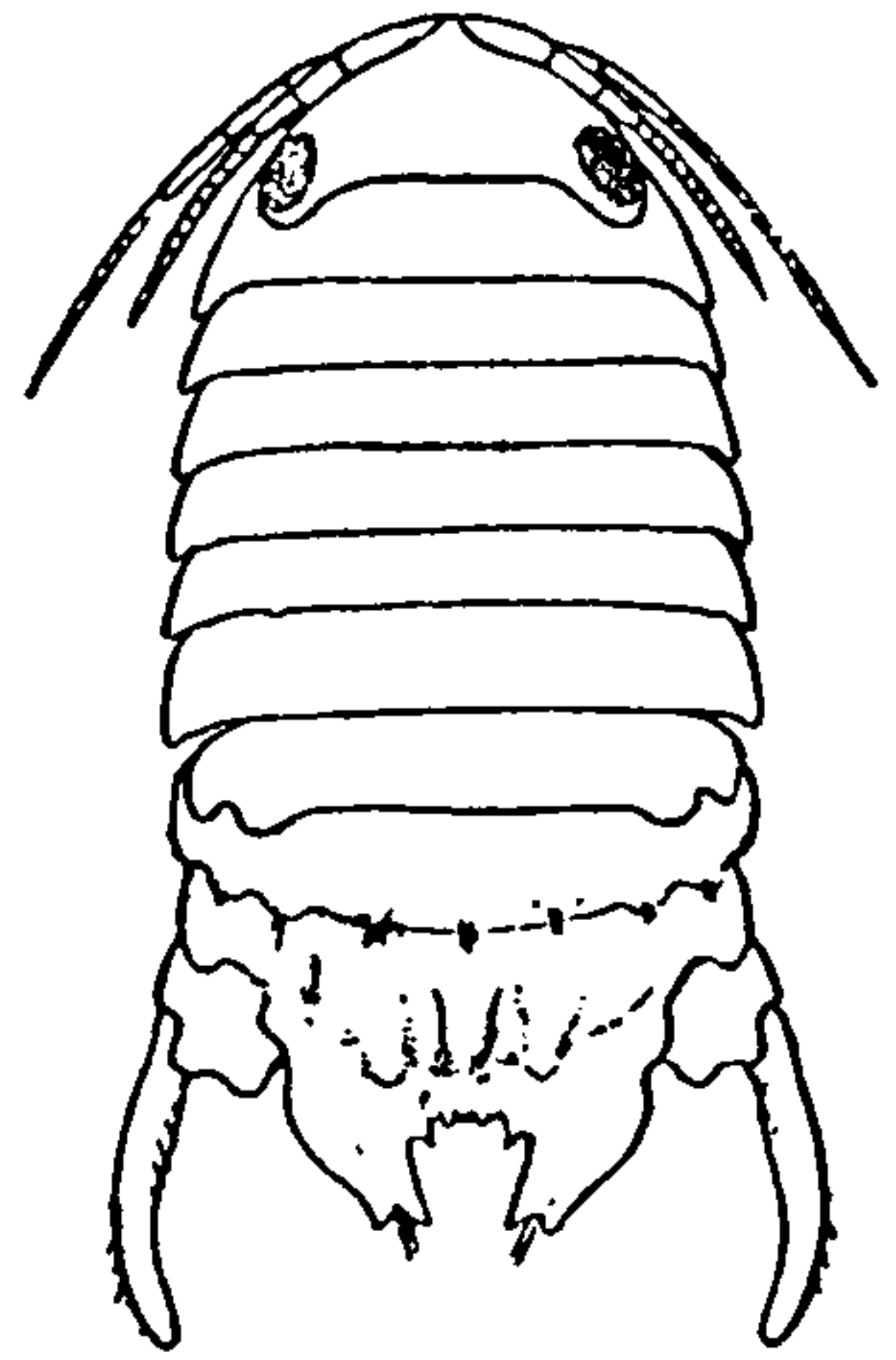
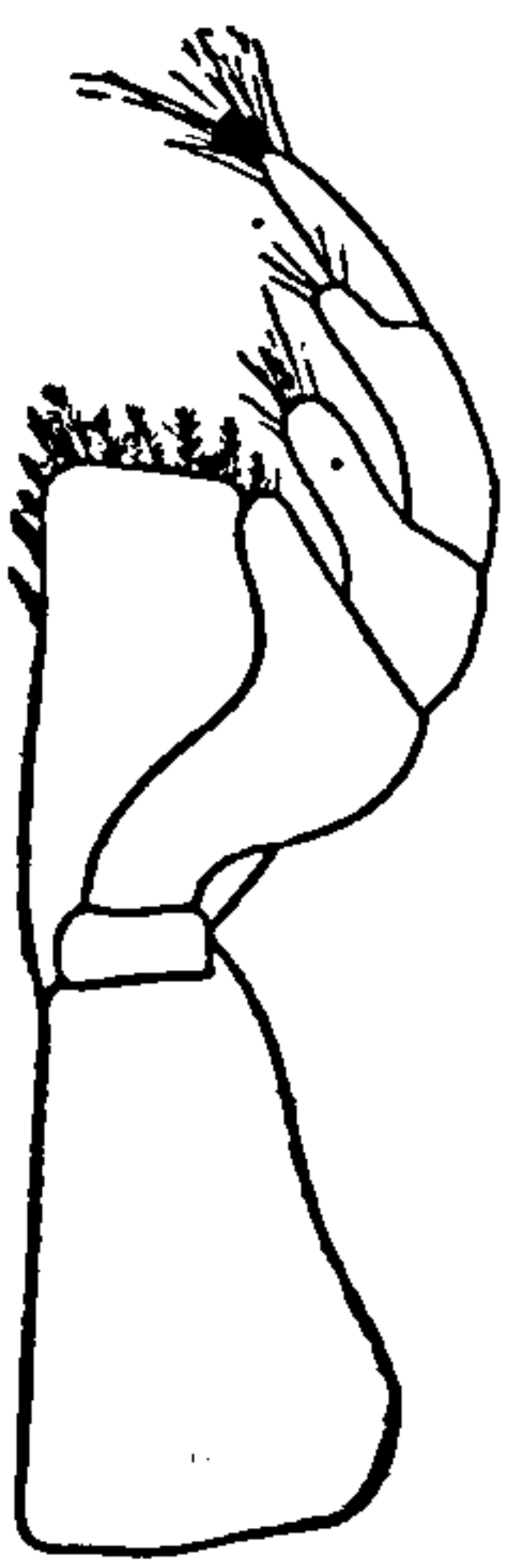


FIG. 344.—CILICÆA CAUDATA (MALE) (AFTER MOORE). $\times 53$.

The first segment of the thorax is nearly twice as long as any of those following. The lateral parts of all the segments are bent downward, forming an angle with the dorsal part of the segment. The epimera are not distinct from the segments, but are indicated by a depression on either side of the segment a little distance within the place where the lateral part of the segment bends downward. The

posterior extremity of the lateral margin or the outer post-lateral angle is slightly produced.

The abdomen is composed of two segments. The first segment has two suture lines on either side indicating partly coalesced segments. Its posterior margin has five low tubercles, two on either side of a

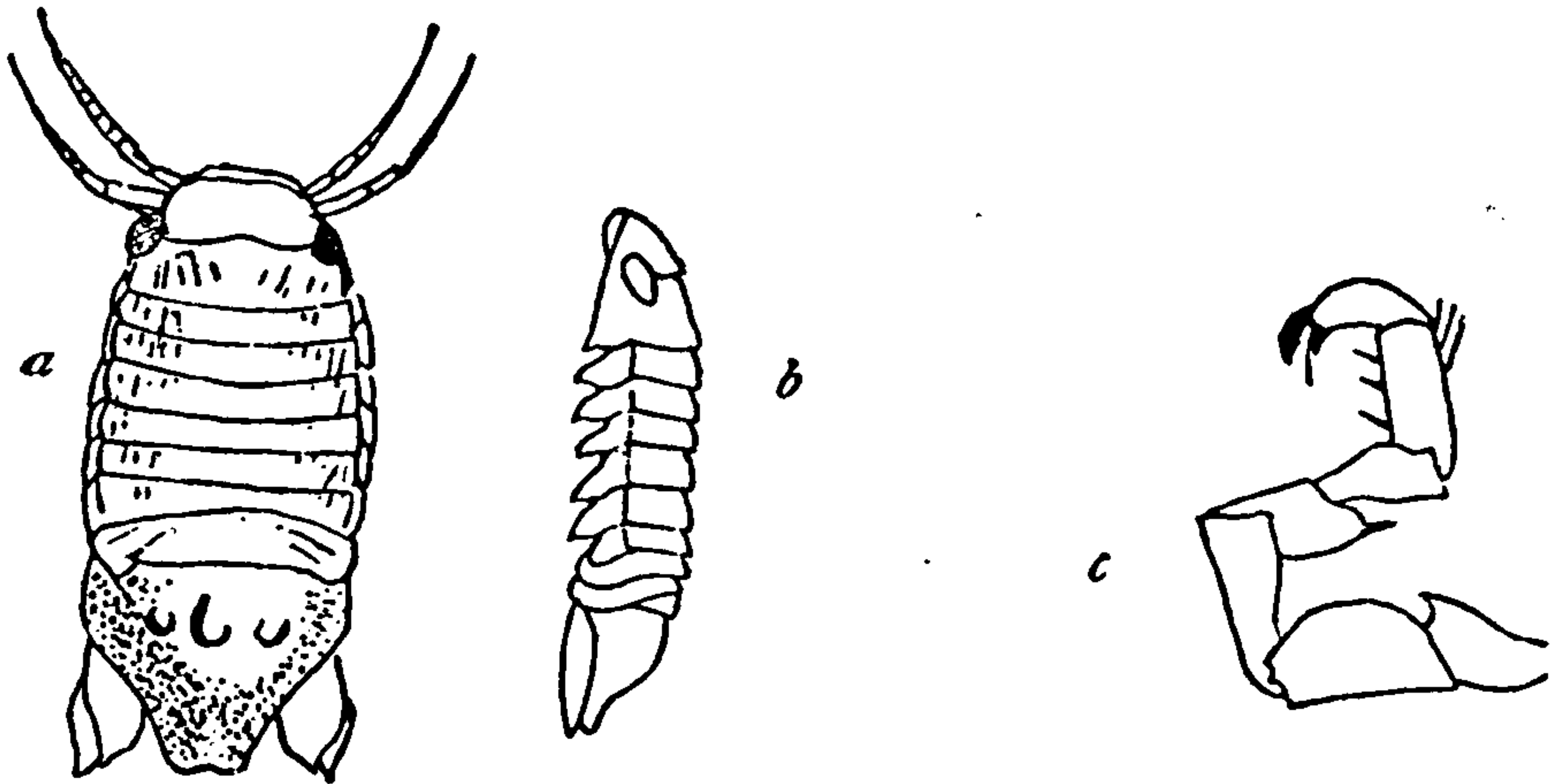


FIG. 346.—CILICEA CAUDATA (FEMALE) (AFTER IVES). *a*, DORSAL VIEW. $\times 4$. *b*, LEFT SIDE. $\times 4$. *c*, FOURTH LEG OF RIGHT SIDE.

median one, and each with a groove in the center from which extends a long movable spine-like bristle. The terminal segment has the convex anterior half provided with one large median tubercle with a groove in the center from which extends a bunch of hairs. On either side of this median tubercle is a row of two large tubercles in longitudinal series, the lower one in each series being

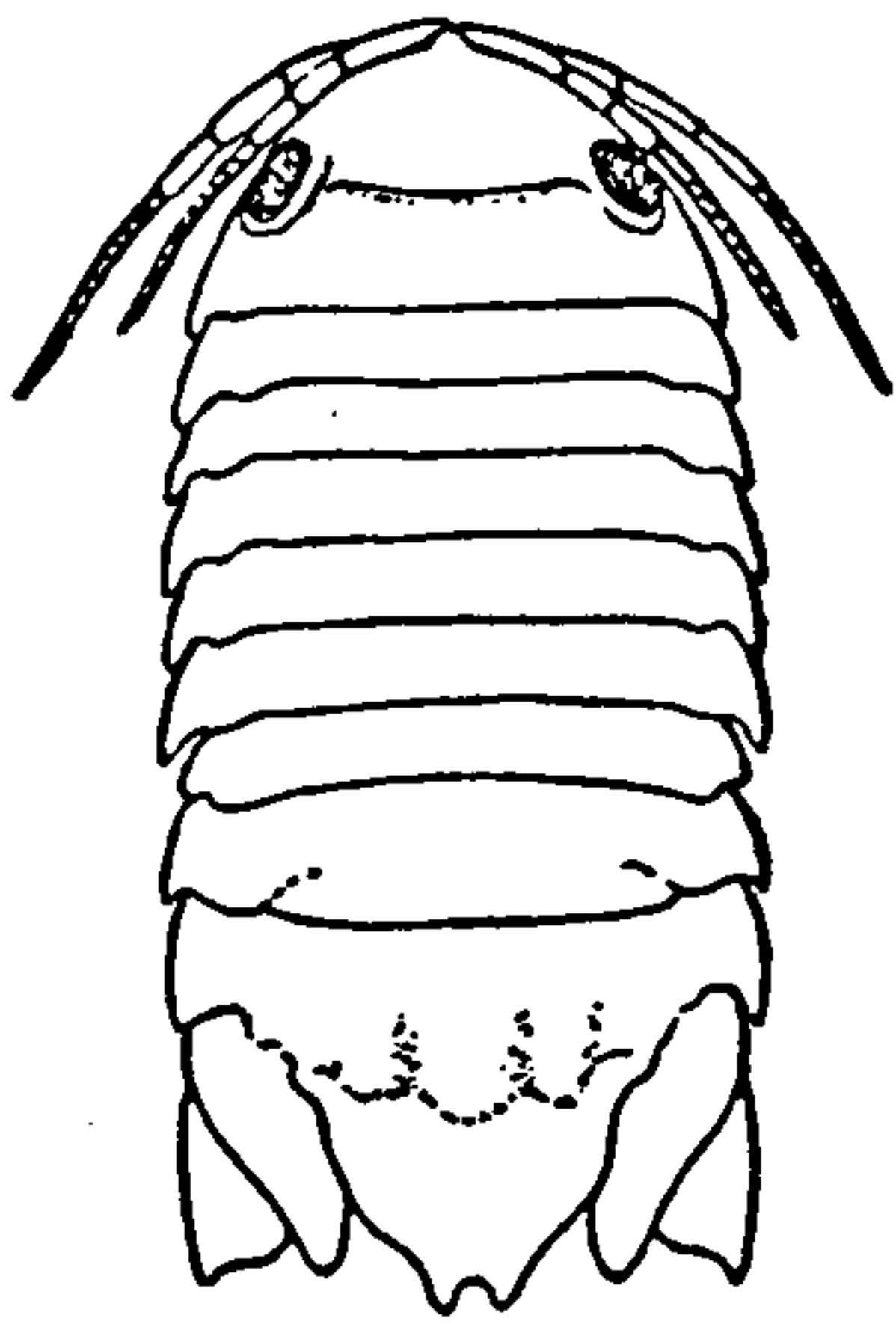


FIG. 347.—CILICEA CAUDATA (FEMALE) (AFTER MOORE). $\times 8$.

in a transverse line with the median tubercle. Below this transverse row of three tubercles and almost hidden by them are three small tubercles in a transverse row and much closer together than those directly above them. The posterior half of the terminal segment is deeply excavate, the post-lateral angles being very acute. Within the excavation are four acute teeth, two on either side of the center. The post-lateral angles have a small rudimentary tooth on the inner side near the extremity. The fixed immovable branch of the uropoda extends only half the length of the terminal segment. The outer movable branch is long

and narrow and is curved inward, so that when folded its extremity meets that of the branch of the opposite side in the median line of the body. The outer branch is furnished on its exterior margin with bunches of hairs scattered here and there.

The legs are all ambulatory. On each segment of the thorax there are seven bunches of a few hairs, forming seven longitudinal series on the thorax.

Description of female.—Body ovate, twice as long as wide, 3 mm.: 6 mm.

Head nearly three times as wide as long, 1 mm.: 3 mm., with a frontal border arising between the eyes and produced in a small median point. The eyes are small, round, composite, and situated in the post-lateral angles of the head. The first pair of antennæ have the basal article long and stout; the second article is less than half as long as the first and is of equal width; the third is twice as long as the second and half as wide. The flagellum is composed of ten articles. The first antennæ extend almost to the posterior margin of the first thoracic segment. The basal article of the second antennæ is very short; the second is twice as long; the third is one and a half times longer than the second; the fourth is a little longer than the third; the fifth is a little longer than the fourth. The flagellum is composed of twelve articles. The second pair of antennæ extend to the posterior margin

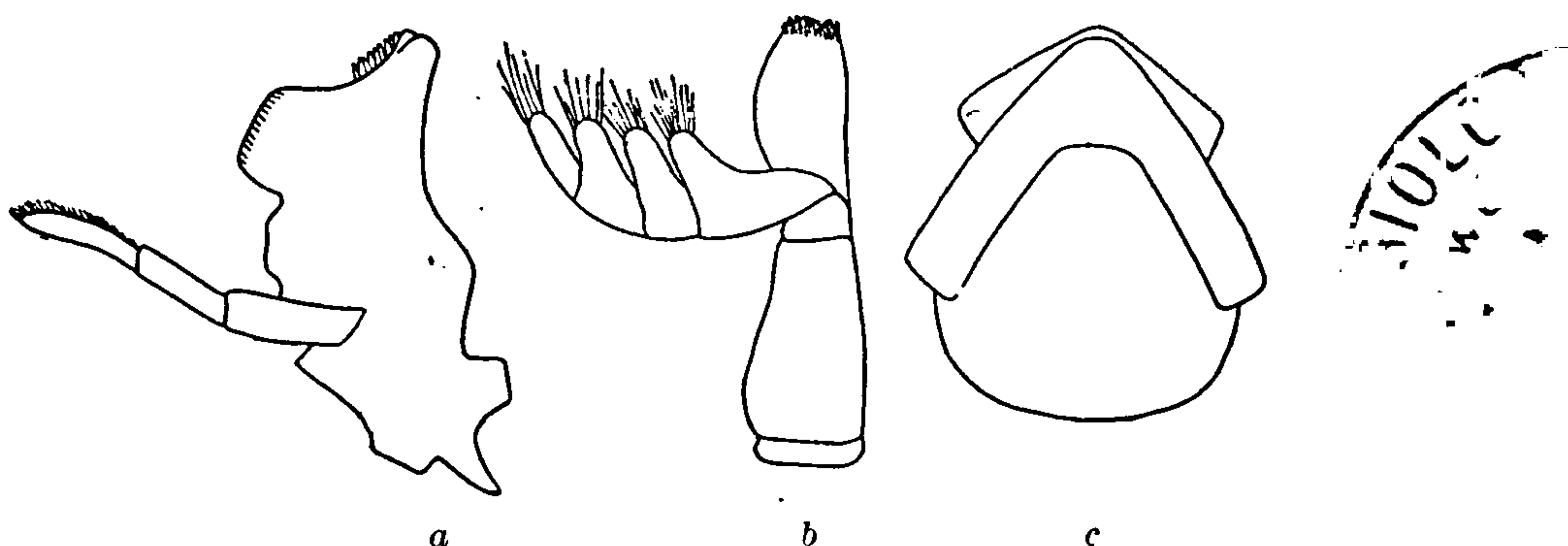


FIG. 348.—*CILICEA CAUDATA* (FEMALE). *a*, MANDIBLE. $\times 51\frac{1}{2}$. *b*, MAXILLIPED. $\times 51\frac{1}{2}$. *c*, FRONTAL LAMINA AND CLYPEUS. $\times 51\frac{1}{2}$.

of the second thoracic segment. The maxilliped has a palp of five articles. The palp of the mandibles is composed of three articles. The frontal lamina is large and conspicuous and has a V-shaped raised margin pointing anteriorly.

The first segment of the thorax is twice as long as any of the others. The epimera are not distinct from the segments, but a lighter area and a slight depression marks the place of coalescence. The lateral margins are straight, with the outer post-lateral angle slightly produced.

The abdomen is composed of two segments. The first segment is as long as the first thoracic segment, and has three suture lines on either side, indicating as many coalesced segments. The terminal segment has the anterior convex portion surmounted with three tubercles in a transverse row, the middle one being in the median longitudinal line. The shape of the segment is somewhat triangular, with the bluntly rounded apex produced, the sides of the extremity folding under to form a groove, which is incomplete on the ventral side. The immovable inner branch of the uropoda extends two-thirds the length