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REPORT

ON SOME

PARASITIC COPEPODA

COLLECTED BY

PROFESSOR HERDMAN, AT CEYLON, IN 1902.

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[WITH FIVE PLATES.]

OF this small collection of Parasitic Copepods* obtained by Professor HERDMAN and Mr. HORNELL at Ceylon it can be said with even greater emphasis than was declared by Rev. T. R. R. STEBBING of the Isopods from the same locality: "The interest of the present collection is not to be measured by the number of species, or the number of specimens, still less by the size of the animals."†

There were only five vials of the Parasitic Copepods, and yet from these were obtained four new species, two of which were the types of new genera. There were also two other species which had been previously described, but both of which were founded on a single sex and on a very limited number of specimens. Neither of these had been seen since originally described forty years ago. Of one of them the male sex is here added for the first time, while of the other many supplementary details of structure are given.

There was thus not a single species in the small collection which did not present something new and interesting—a truly remarkable record.

* The main report on the large collection of free and a few parasitic Copepoda, by the late Mr. I. C. THOMPSON and Mr. ANDREW SCOTT, will be found in Part I. of this work (1903) at p. 227.

† Part IV. of this Report, Supplementary Report XXIII, "On the Isopoda," 1905.

DESCRIPTION OF THE SPECIES.

FAMILY: CALIGIDÆ.

SUB-FAMILY: CALIGINÆ.

Lepeophtheirus brachyurus, HELLER—Plate I., figs. 1 to 10.

This species was briefly described by HELLER in the 'Reise der Novara,' 1865, and has not been seen by any other investigator since. HELLER'S specimens were obtained near Java upon the gills of the same host as the present Ceylon specimens.

The following description, and the figures given on Plate I., supplement as well as corroborate HELLER'S original diagnosis :—

Female.—Carapace ovate, considerably narrowed and rounded anteriorly, widened and emarginate posteriorly. The length of the carapace is more than twice that of the rest of the body, but is a little less than its width. The grooves on the dorsal surface are distinct, with the cross-bar of the H about in the centre of the carapace, while the anterior and posterior halves of the lateral grooves are inclined like the sides of an hour-glass. The frontal plates are narrow, scarcely more than one-third the width of the carapace, with a deep but narrow central incision. The eyes are moderately large and placed far forward, about one-fifth the length of the carapace from its anterior margin. The thoracic area is large and wedge-shaped, three-quarters of the width of the carapace and slightly concave at its posterior margin, less than half the width and slightly convex at the anterior margin.

The fourth or free thorax segment is very short and concealed in dorsal view by the overlapping carapace. The genital segment is transversely elliptical, one-third wider than long, with evenly rounded sides and a nearly straight posterior margin. The fifth legs are visible at the posterior corners.

The abdomen is short and narrow, one-fourth the length and one-fifth the width of the genital segment, one-jointed, with the posterior margin wedge-shaped. The anal laminæ are minute, fastened to the sides of the wedge, and each armed with three plumose setæ and a small spine.

The egg-cases are about the same length as the entire body and as wide as the abdomen. The eggs are of medium thickness, about 70 in each string.

Of the appendages, the first antennæ are short and unusually wide, a considerable portion of the basal joint being concealed beneath the edge of the carapace. The terminal joint is only about half the length of the basal and carries a tuft of spines at its tip. The second antennæ are stout and of the usual form, with a long terminal claw bent abruptly near the tip (fig. 2).

The first maxillæ are very small and rudimentary; the basal portion is swollen and

circular, while the terminal part is slender and curved. The second maxillæ are short and simple, broadly triangular, with a narrow, pointed, and more or less curved tip. The rudimentary exopod appears as a large papilla upon the basal portion of the appendage, which is fused with the ventral surface of the carapace. These appendages are quite small, less than half the length of the mouth-tube, and are attached at some little distance to the right and left of the base of the latter. The mouth-tube itself is short and wide, somewhat triangular, with a broadly rounded tip; the mouth opening is terminal with a scanty fringe of hair (fig. 3).

First maxillipeds of the usual pattern; second pair enlarged and stout, the terminal claw strongly curved and less than half the length of the basal joint, with an accessory spine on its ventral surface near the base. Basal joint much swollen and furnished at the centre of its anterior margin with a large and stout process projecting diagonally outwards. The under surface of this process is grooved, and into this groove fits the tip of the terminal claw (fig. 4).

The furca is slender, the basal portion longer and wider than the terminal and with a large elliptical lumen, the branches slender and divergent with rounded points.

The swimming legs are of the usual pattern, but the basal joint of the second pair is very narrow. The basal apron of the third legs is also short and narrow, but it is attached so far back and the free segment is so short that it overlaps a little the genital segment. Another feature not noted by HELLER is the fact that the dorsal surface of the apron of these third legs projects backward between their rami as a rounded knob, as long as the rami themselves. These latter are small, well separated, and each is two-jointed (figs. 6 to 9).

The fourth legs are small and rudimentary, and are entirely concealed beneath the apron of the third legs, another fact not noted by HELLER. They contain only two joints of about the same length, the terminal one carrying three spines, of which the inner one is twice as long as the others.

The ovaries are rather small and triangular and are situated just behind the eyes at some distance from each other. The oviduct is coiled very regularly in the sides of the genital segment, as can be seen in fig. 10. The cement glands are comparatively wide and reach forward nearly to the anterior margin of the segment. Their anterior half is curved in toward the mid-line and is occupied by about eighteen large cells, the last two or three of which at either end diminish abruptly in size. The posterior half is even a little wider than the anterior and is filled with a homogeneous mass, in which there is no distinction of cells or ducts. The semen receptacle is bent in a half circle, the convex side forward, and is about the same diameter throughout. The vulvæ open near together on either side of the median line.

The colour of the preserved specimens is a uniform light yellowish gray, without pigment spots or lines.

Total length 4·5 millims., length of carapace 3 millims., width of same 3·35 millims.,

length of genital segment 1 millim., length of abdomen 0·5 millim., length of egg-sacs 4·4 millims.

There were two specimens of this species, both females, obtained from the gills of a puffer, *Tetrodon stellatus*. They may be easily distinguished from other species of the genus by the relatively large size of the carapace compared with the rest of the body, by the correspondingly diminutive size of the fourth segment and the abdomen, and by the rudimentary fourth legs, which are entirely concealed in both dorsal and ventral view. The large rounded spine which projects between the rami of the third legs is also peculiar to this species.

Lepeophtheirus æsopus,* n. sp.—Plate I., figs. 11 to 19.

Female.—Carapace ovate, considerably narrowed anteriorly, and a little more than two-fifths the entire length. Frontal plates prominent, but less than half the width of the carapace. Eyes large and placed well forward. Thoracic area exceptionally small, one-third the length and three-fifths the width of the carapace, its anterior and lateral margins forming nearly a perfect half circle, its posterior margin slightly re-entrant. Lateral lobes broad, blunt and short, leaving a wide sinus between the carapace and the genital segment, which is entirely filled by the large basal joints of the third and fourth pairs of swimming legs.

The fourth or free thoracic segment is transversely elliptical and widened considerably through the bases of the fourth legs. The genital segment is quadrate, two-thirds the size of the carapace, and a little wider anteriorly than posteriorly, with evenly rounded corners.

The abdomen is narrow, only one-sixth the width of the genital segment and less than half its length. It is indistinctly three-jointed, the middle joint larger than the other two, which are about the same size. The groove separating the terminal joints is distinct and can be traced the entire width of the abdomen, but the basal groove can be seen only at the margins, and it is not certain that the abdomen is really jointed there. The anal laminæ are narrow, three times as long as wide and pointed at the tips where each is armed with four small setæ. The egg-strings are wider than the abdomen and three-quarters of the entire length; the eggs are large, 50 or 60 in each string.

Of the appendages, the second antennæ have a large basal joint and a very slender terminal claw, which is bent sharply at right angles near its tip. The basal joint is re-enforced by a stout spine, pointing backward (fig. 12).

The first maxillæ are small and well curved, the basal half fused to the ventral surface of the carapace and only the tip free. As an offset to this, the second pair are exceptionally large and stout, with a broad, triangular base and a long, straight, and pointed tip which reaches far beyond the end of the mouth-tube. Each maxilla

* *Æsopus*, different footed, each pair of legs differing considerably from the ordinary type in this genus.

This species was also found upon Tetrodon stellatus.

is two-jointed and is actually longer and wider than the mouth-tube. Upon the basal joint, which is fused to the carapace, appears the rudimentary exopod in the form of a small papilla bearing two setæ. It is situated near the centre of the basal joint and close to the endopod. The endopod itself is simple as in the genus *Caligus*, and not bifurcate as in many species of *Lepeophtheirus* (fig. 13).

The first maxillipeds are of the usual pattern, but the outer terminal claw is lengthened so that the two cross each other from opposite sides of the body when the appendages are at rest. The second maxillipeds are small and weak, the terminal claw only half the length of the basal joint, and slender (fig. 14). No trace of any furca could be found.

The first swimming legs are small and weak; the three terminal claws are of nearly the same length, as is also the seta at the inner corner. The basal joint of the second legs is exceptionally narrow, being but little wider than the connecting piece across the centre of the body; the rami are of the usual pattern. The rami of the third legs are so close together as to be in actual contact at their bases, but the exopod stands out at right angles to the basal apron, while the endopod is closely appressed to the margin of the latter. The exopod is three-jointed, the joints of about the same size; this gives it considerable length, which, together with its position, makes it unusually prominent. The basal joint also bears on its inner margin a wide circular lamina, which extends outward to the tip of the terminal joint and inward to overlap the endopod; this latter is of the usual form (figs. 15 to 18).

The fourth legs are also exceptional in having a stout and swollen basal joint and three small and weak terminal joints. The second joint also, instead of being cut off diagonally at the distal end as in other species, is cut squarely across.

The second and third joints each carry a single spine at the outer distal corner, while the last joint is terminated by a row of three spines; the five are approximately of the same size.

No fifth legs are visible, but the genital segment bears upon its margin at each posterior corner three small spines which probably represent the rudiments of these legs.

The oviducts are not much coiled in the genital segment; the cement glands are narrow and nearly straight, situated on either side of the mid-line and close to it. In the specimen observed the spermatophores were long and narrow, and turned forward along the ventral surface of the genital segment. Each was curved away from its fellow like a pair of parentheses marks; the anterior ends almost touched each other, but the posterior ends, entering the vulvæ, were about the diameter of the abdomen apart (fig. 19).

Colour of the preserved specimen a uniform yellowish white, without pigment spots or lines.

Total length 5·75 millims., length of carapace 2·4 millims., width of same

2·4 millims., length of genital segment 1·95 millims., length of abdomen 0·92 millim., length of egg-sacs 4·2 millims.

SUB-FAMILY: TREBINÆ.

Trebius exilis,* n. sp.—Plate II., figs. 20 to 33.

Female.—Carapace ovate, one-seventh longer than wide, contracted anteriorly, and well arched. Transverse grooves separating the cephalic and thoracic portions of the lateral areas situated far forward, leaving the thoracic portion much the longer of the two. Eyes small, purplish red, and some little distance from the anterior margin. Frontal plates better developed than either *T. caudatus* or *T. tenuifurcatus*, but still less than half the width of the carapace.

Third thorax segment only a trifle wider than the fourth and considerably shorter. It projects backward, however, nearly its whole length beyond the lateral lobes of the carapace, just as the thoracic area does in some of the Caliginæ (*Caligus rapax*, *C. rufimaculatus*, &c.). Fourth segment considerably longer than the third, and widened through the bases of the fourth legs more than in either of the other two species, giving it a spindle shape.

Genital segment almost a perfect ellipse, the only deviation being anteriorly, where it is contracted into a short and narrow neck before joining the fourth segment. It is more than three-fifths the size of the carapace and shows no spines or processes at the posterior corners. The egg-strings are about the same width as the abdomen, but are from two and a half to three times its length, thus contrasting sharply with those of *T. caudatus* which are but a trifle longer than the abdomen. The eggs are of medium thickness, 40 to 50 in each string.

The abdomen, even including the anal laminæ, is one-half shorter than the genital segment instead of one-half longer as in *T. caudatus*. It is also made up of a single joint and is of the same diameter throughout. The anal laminæ are elongate, more than twice as long as wide, well separated at the base, but convergent toward the tips, where each carries four good-sized plumose setæ. As in *T. caudatus*, the outer seta is the shortest, the inner one next in length, while the two middle ones are considerably longer.

Of the appendages the first antennæ are relatively much longer than in *T. caudatus*, the basal joint is stouter and more heavily armed with plumose setæ, while the terminal joint is slender, not enlarged at the tip, and stands out prominently. The second antennæ are large and stout; the terminal claw is wider at the base than in *T. caudatus* and is relatively as long. But the abrupt bend is at the centre instead of near the tip, and this makes the claw appear shorter. There is also a long and slender hair on the inner margin of the claw near its base (fig. 22).

* *Exilis*, slender, beautiful.

The first maxillæ are straight, small, and weak, and they are fused to the ventral surface of the carapace throughout their entire length, not even the tips being free.

The second maxillæ are also very different from those of *T. caudatus*. They are two-jointed, the basal joint being fused to the ventral surface of the carapace, and carrying at its centre the rudimentary exopod. This is in the form of a good-sized papilla armed with two setæ of about the same length, and less than one-third the length of the endopod. The latter is elongate-triangular, extends for half its length beyond the tip of the mouth-tube, and is bluntly pointed at the end, without any trace of bifurcation.

The mouth-tube is not as long as in *T. caudatus*, but is jointed similarly at the centre of the upper lip, with deep lateral incisions. The bony framework shows some similarity to that of both *Lepeophtheirus hippoglossi* and *Caligus rapax*. There are in it two sets of rods hinged together at the centre just above the joint (fig. 23). In the basal half the rods are four in number arranged in the form of the letter M. The two outside ones (*a*) start from just behind the bases of the mandibles and run diagonally forward and inward until they nearly meet at the mid-line. These must be regarded as belonging to the framework of the lower lip, although they are buried in the tissues of the ventral surface of the carapace. From their inner ends two other rods (*b*) start and run parallel with each other on either side of the mid-line outward nearly to the jointing at the centre of the mouth-tube. These evidently belong to the framework of the upper lip. From the outer ends of the first pair, just behind the bases of the mandibles, a stout rod (*c*) runs along either side of the under lip, the two curving around and meeting on the mid-line at the tip of the lip. Near the joint in the mouth-tube each of these rods divides and sends a branch rod up to the upper lip, the branch ending in the lateral incision on either side. Articulating with the end of the branch at this incision is a long bone (*d*), shaped like the human femur, which sweeps inwards and forwards until it meets its fellow from the opposite side near the centre of the tip of the upper lip.

The upper lip is thus jointed near its centre, while the lower lip articulates directly with the ventral surface of the carapace. As the mouth-tube naturally points backward the upper lip is longer than the lower lip, and this jointing at its centre greatly facilitates the freedom of motion. The mouth-opening is a terminal transverse slit, heavily fringed with hairs. The mandibles are slightly curved towards their tips, where they are toothed on the inner margin. They pass out through the sides of the mouth-tube at the lateral incisions and articulate with the ventral surface of the carapace just in front of the bony framework.

The first maxillipeds are comparatively large and stout as in *T. caudatus*, but the basal joint is not as much enlarged, being a trifle smaller than that of the second pair. The two terminal claws are about the same diameter, but the inner one is almost twice the length of the outer. The second maxillipeds are much reduced in size as compared with those in the Caliginæ; the basal joint is stouter than in

T. caudatus, but the terminal claw is as short and weak as in the latter species. No spine could be seen on its inner margin in any of the specimens examined (fig. 25).

The furca is small, the length four times the width, the branches short, simple, divergent, and pointed, leaving a V-shaped sinus, only one-fourth or one-fifth the entire length.

The first swimming legs have a broad and well-rounded basal joint, carrying a small seta on its posterior margin. Both rami are two-jointed, the exopod nearly twice the length of the endopod. The basal joint of the exopod is considerably wider than the terminal, and somewhat swollen; the terminal joint is only half the length of the basal, is not bent at a right angle as in *T. caudatus*, and is armed with three short and stout spines on its distal end, and three plumose setæ, as long as the entire ramus, on its posterior margin. The basal joint of the endopod is also twice the length of the terminal, and somewhat swollen; the terminal joint is bent at a right angle and tipped with three stout plumose setæ.

Second swimming legs similar to those of *Lepeophtheirus* in the shape and arrangement of the joints and in the number and distribution of the spines and setæ.

The third swimming legs are like the second, but differ in a few particulars. The exopod carries three spines on the outer margin of the terminal joint; the basal and second joints of the endopod are much enlarged, while the terminal joint is reduced in size and carries only four plumose setæ.

The fourth swimming legs are very different from those of *T. caudatus*. The basal joint is larger than that of the second legs, and almost circular. The exopod is three-jointed and more than twice the length of the endopod; the three joints are about the same length, the two basal ones with a stout spine at the outer distal corner, and a single plumose seta on the inner margin. The terminal joint has three spines on its outer margin, the last one more than twice the length of the other two, and four spines on the inner margin. The endopod has only two joints of about the same size, the basal one carrying a single plumose seta on its inner margin, the terminal one tipped with three such setæ.

The fifth legs are small and close to the lateral margin on the ventral surface of the genital segment, a little in front of the posterior corners.

The cement glands are comparatively wide and reach forward almost to the anterior end of the segment; their component cells are narrow and fill the entire lumen of the glands. The sperm receptacle is a nearly straight tube of uniform width, reaching across from one oviduct to the other. The spermatophores are elongate-ellipsoidal, and are fastened close together on either side of the mid-line, their long diameters parallel with the body axis (fig. 31).

Total length 5·75 millims., length of carapace (including third thorax joint) 2·5 millims., width of same 2·1 millims., length of genital segment 1·57 millims., length of abdomen 1·1 millims., length of egg-strings 3·1 millims.

Colour of preserved material a uniform yellowish white without pigment spots or lines.

Male.—Carapace ovate and narrowed anteriorly, with grooves and markings on the dorsal surface like those of the female, but it is relatively larger, being more than half the entire length, and nearly as wide as long. The eyes are distinct and small, about one-third the distance from the anterior margin.

The second and third thorax segments are wider than in the female ; the fourth segment is the same width as the genital segment and only a trifle longer than the second and third segments. The genital segment is elliptical-oblong, one-fourth longer than wide, and not quite one-fifth of the entire length. Both the fifth and the sixth legs are visible dorsally, the former on the lateral margins at about the centre of the segment, the latter at the posterior corners.

The abdomen is two-jointed and at least one-half shorter than the genital segment ; the two joints are equal in size. The anal laminæ are narrow, but nearly as long as the entire abdomen, each tipped with four very long plumose setæ.

Appendages and colour as in the female.

Total length 2·75 millims., length of carapace (including third thorax segment) 1·4 millims., width of same 1·3 millims., length of genital segment 0·5 millim., length of abdomen (including anal laminæ) 0·6 millim.

Developmental stages.—Young females were obtained in two stages of development respectively 2·5 millims. and 3·5 millims. long.

In the former, the second thorax segment is not yet fused with the carapace, but is semilunar in shape, with the convex side projecting a little way into the posterior portion of the carapace. The lateral processes on this segment are nearly as large as the posterior lobes of the carapace (fig. 32).

The third segment is much narrower than the second, but is still wider than it is long. The fourth segment is considerably longer than wide and has a broad spindle shape. In the genital segment each of the posterior angles projects strongly sidewise, is well rounded, and armed with two stout spines. This makes the segment twice as wide across the posterior margin as across the anterior. The abdomen is also slightly wider at its posterior end.

The first antennæ are short and thick and are appressed closely to the margin of the carapace. The other appendages are similar to those of the adult except the swimming legs, in which the rami have but two joints instead of three.

In the later developmental stage the carapace has enlarged considerably, and the second thorax segment has widened with it (fig. 33). The longitudinal and transverse grooves on the dorsal surface of the carapace are now fully formed, so that the same areas are seen as in the adult. The third and fourth thorax segments are about the same as in the previous stage, but the genital segment has changed radically. It has widened into a broad acorn shape, as wide anteriorly as posteriorly, with the posterior corners projecting slightly backwards and showing the fifth

legs plainly at their tips. The abdomen has elongated and its sides are now parallel.

The appendages have assumed their final form, and the rami of the swimming legs have all become clearly three-jointed.

About ten specimens of this species were obtained from *Rhinoptera javanica*, including the two stages of early development. The species is of peculiar interest, because it is the only one besides KRÖYER'S original type (*T. caudatus*) of which a full description of even one sex could be obtained.

It confirms KRÖYER'S genus diagnosis in all but two particulars. The second maxillæ are not forked at the tip like those of *Lepeophtheirus*, but are simple and pointed like those of *Caligus*. Furthermore the endopod of the fourth legs, instead of being as large as the exopod, is reduced so much as to be rudimentary and contains only two joints. These two particulars furnished data which will at once distinguish the species from *T. caudatus*.

SUB-FAMILY: EURYPHORINÆ.

Dissonus,* n. gen.

First thorax segment fused with the head to form the carapace, which is semilunar in shape and about twice as wide as long.

Second, third, and fourth thorax segments free, each considerably wider than long, the second one only provided with lateral plates. Genital segment not much enlarged, without plates or processes, but with the entire ventral surface covered with stout spines. In the male the fifth legs are seen on the posterior lateral margins and the sixth pair at the posterior corners. Abdomen small, one-jointed in both sexes; anal laminæ of medium size and armed with large plumose setæ.

Egg-strings four-fifths of the entire length and not quite as wide as the abdomen. Eggs large, about forty in each string.

Antennæ and mouth-parts like those in the Caliginæ. Second maxillæ longer than the mouth-tube and bifurcate at the tip. First maxillæ and furca wanting. Mouth-tube short and triangular in shape with a rounded tip, jointed transversely near the centre. The four pairs of swimming legs biramose; rami of the first pair two-jointed, of the other pairs three-jointed; spines and setæ almost exactly like those in *Trebius*.

Dissonus spinifer,† n. sp.—Plate III., figs. 34 to 47.

Female.—Carapace transversely semilunar, twice as wide as long; the ventral surface around and outside of the second antennæ is raised somewhat, and beneath it

* *Dissonus*, disagreeing or different, *i.e*, not agreeing with any of the established genera.

† *Spinifer*, bearing spines (on the ventral surface of the genital segment).

can be seen the powerful muscles which move those appendages, and which radiate outward from the basal joint of the antennæ to the lateral margin of the carapace.

The dorsal surface has but a single pair of grooves, one on either side separating the lateral areas from the central cephalic area. Eyes moderately large, situated close to the anterior margin and in contact with each other on the mid-line, but not fused. In front of the eyes and on the very margin is a pair of elliptical spots, a little larger than the eyes and raised above the surrounding surface like a pair of lenses. These correspond exactly with the so-called "conspicilla" found by DANA in his *Specilligus curticaudis*, and which occur also in the males of other species belonging to the Pandarinæ. They have also been noted by KRÖYER in the male of *Trebius caudatus*, but are not found in the male of the new species of *Trebius* just described. In the present genus they are much farther forward and nearer together, being just in front of the supra-œsophageal ganglion.

The second, third, and fourth thorax segments are free and diminish regularly in size. The second segment is the same width as the body of the carapace and its lateral plates are as wide as the lateral lobes of the carapace. The third and fourth segments are considerably narrowed, but even the fourth is more than twice as wide as long, and the basal joints of the legs attached to both these segments closely resemble in dorsal view the lateral lobes of the carapace and the lateral plates on the second segment.

The genital segment is quadrangular, a little wider than long, and a little narrower than the fourth segment. The processes at the posterior corners are very small, and the fifth legs are almost invisible dorsally. The entire ventral surface of the genital segment is covered with stout scattered spines which point diagonally backward. These are thickest along the sides and must furnish a very effective preventative against slipping, as in the genus *Argulus*.

The abdomen is three-eighths the length of the genital segment, one-fourth wider than long, and one-jointed, with a shallow anal fissure. The anal laminæ are quadrangular-oblong, of medium size, each armed with four large plumose setæ. Three of these are terminal, while the other comes out of the lateral margin near the anterior end.

Of the appendages, the anterior antennæ are large and prominent, two-jointed, with the joints about the same length, but the basal one considerably thickened. Each antenna is one-fourth longer than the frontal plate from whence it comes. The setæ and spines are similar to those in the Caliginæ. The second antennæ are stout and of the same pattern as in *Caligus*. The terminal claw fits into a small pocket made for its reception in the ventral surface of the carapace near the margin (fig. 37).

The first maxillæ and furca are entirely lacking. The mandibles are slender, three-jointed, and armed with hook-like teeth along the inner margin of the slightly curved terminal joint. The mouth-tube is triangular, with a narrow and well-rounded tip; the mouth-opening is terminal and quadrilateral, with a heavy fringe of hairs.

The bony framework is peculiar in its structure, although in some particulars it shows a resemblance to *Caligus rapax* and other Caliginæ. There is in the lower lip a rod (*a*, fig. 38) along either edge, the two meeting in the centre at the distal end. The bases of these rods articulate on the ventral surface of the carapace together with the mandibles. From these articulations a short rod (*b*) extends forward and inward on either side along the ventral surface of the carapace.

From the inner ends of these rods another pair extend upward and inward along the upper lip to the lateral incision opposite the joint (*c*). From these incisions radiate four pairs of rods, three of which (*d*) are in the upper lip, while the fourth pair (*e*) extend downwards on either side to the rod that runs along the edge of the lower lip. Of the three pairs in the upper lip two extend inward side by side, one above and one below the joint, and meet on the mid-line. The lateral incisions at the joint are deeper than in any of the Caliginæ or in *Trebius*, and the mouth-tube must be very flexible.

The second maxillæ are large and powerful; although attached opposite the base of the mouth-tube they reach well beyond its tip. The basal portion of each maxilla is enlarged and flattened, and is about one-third of the entire length. The terminal portion is narrowed abruptly and then tapers gradually to a blunt point, being curved first inward toward the mouth-tube and then outward away from it. At the tip each maxilla is divided into two branches, of which the outer one is the longer and the larger. At the end of the basal portion, where it is abruptly narrowed, there is on the ventral surface a large papilla, from whose summit arise three spines, the outer one twice the length of the other two. These represent the rudiments of the exopod of the maxilla (fig. 39).

The first maxillipeds are of the pattern common to the Caliginæ, the terminal joint two-thirds the length of the basal joint and tipped with two claws, the outer of which is three times as long as the inner.

The second maxillipeds are greatly enlarged, the basal joint stout and swollen and nearly twice the length of the strongly curved terminal claw. On the proximal half of the ventral surface of the basal joint the integument forms a sort of pad with raised edges and a more or less corrugated surface. The distal edge of this pad is raised into a stout knob, down behind which the tip of the terminal claw shuts when closed.

All four pairs of legs are biramose, the rami of the first pair two-jointed, of the other pairs three-jointed. In the first pair the exopod is a little more than twice the length of the endopod. Its basal joint is three times as long as the terminal one, is heavily fringed with hairs along its posterior margin, and ends in a stout spine. The terminal joint is nearly spherical and is attached at right angles to the basal joint, not at the tip, but some distance back on the posterior border. It is armed, as in the Caliginæ, with three terminal spines, three rowing setæ, and a smaller seta at the inner distal corner. The endopod joints are about the same size, the

terminal one armed with four spines on the outer margin and three rowing setæ on the inner.

The second, third and fourth swimming legs are as in other Euryphorinæ and the Trebinæ, particularly in the form of the second joint of the endopod and in the number and arrangement of the spines and setæ. The following table represents the arrangement of spines and setæ on each joint :—

Second legs,	exopod . . .	2–1,	1–1,	1–5.
,,	endopod . . .	0–1,	0–2,	0–6.
Third legs,	exopod . . .	1–1,	1–1,	3–5.
,,	endopod . . .	0–1,	0–2,	1–4.
Fourth legs,	exopod . . .	1–1,	1–1,	3–5.
,,	endopod . . .	0–1,	0–2,	1–3.

The fifth legs appear as small papillæ at the posterior corners of the genital segment, each armed with three setæ.

Of the reproductive organs the cement glands are rather small, broadly club-shaped, and they reach but little in front of the centre of the genital segment. The component cells are of medium size and there are about twelve in each gland. The semen receptacle is very close to the posterior margin ; it is considerably curved, with the concave side directed forwards. The ends are slightly enlarged and from each a duct runs forward and empties into the oviduct anterior to the opening of the cement gland.

Colour of preserved specimens a uniform yellowish white without pigment spots or lines.

Total length 3 millims., length of carapace 0·85 millim., width of same 1·75 millims., length of free thorax 1·1 millims., length of genital segment 0·71 millim., of abdomen 0·34 millim., of egg-strings 2·35 millims.

Male.—Similar to the female in general appearance and in most of the details of structure. Carapace transversely semilunar, a little more than twice as wide as long. Second, third and fourth thorax segments diminishing slightly in width, but increasing in length, the fourth segment nearly one-half longer than the second. Second segment the only one furnished with lateral plates, but the large basal joints of the third and fourth legs have all the appearance of lateral plates in dorsal view, as in the female.

Genital segment elongate-spindle-shaped, one-third longer than wide, with evenly rounded sides ; the anterior margin re-entrant, the posterior one nearly squarely truncated. Two pairs of rudimentary legs are visible, one pair on the lateral margin about one-fourth the distance from the posterior end, and the other pair at the posterior corners.

Abdomen not as wide as in the female, the anal laminæ a little smaller, but the plumose setæ considerably larger.

Of the appendages, the second antennæ are especially large and stout; their terminal claw is bent abruptly at a right angle one-third its length from the tip, and is armed on the inner margin of the basal third with a long curved and sharp spine, a short and blunt one, and a long slender hair (fig. 36). The second maxillæ are similar to those of the female but larger and more powerful. The outer branch at the tip is nearly twice as long as the inner, while the three spines which make up the rudimentary exopod are much larger and stouter. The maxillipeds and legs are the same as in the female. The ventral surface of the genital segment is also covered with spines, larger and rather more numerous than in the female (fig. 47).

Total length 3 millims., length of carapace 0·8 millim., width of same 1·9 millims., length of free segments 1·08 millims., of genital segment 0·8 millim.

This new genus is very interesting since it stands as a connecting link between the Euryphorinæ and the Pandarinæ. At first sight it would be taken for a *Nogagus* species, showing that which was so long sought after, a mature female with her egg-strings. But the description just given excludes it from that genus. The dorsal aspect, to be sure, is very similar to that of a typical *Nogagus*; the carapace is perhaps a little too short, but the free segments, the genital segment, and the abdomen are almost identical with those in some species of *Nogagus*. When we examine the ventral surface and the appendages, however, we find radical differences.

First there are no traces of sucking disks which are found in all the species of *Nogagus*. The mouth-tube, mandibles and second maxillæ are like those found in the Euryphorinæ and quite different from the typical form of the Pandarinæ.

The mouth-tube is short and broadly rounded at the tip instead of being narrow and pointed. The mandibles are curved at the tip, toothed on the concave border, and come together end to end, instead of being straight, with the toothed margins interlocked for their entire length. The second maxillæ are very long, pointed, and bifurcate at the tip, with a well defined exopod, instead of being short, triangular or broadly laminate, and without any trace of a second ramus.

The second maxillipeds have a simple swollen basal joint and an ordinary terminal claw unlike the distorted form in *Nogagus* with its swellings and knobs.

The swimming legs have three-jointed rami, except those of the first pair; a typical *Nogagus* has no ramus with more than two joints. We have here then a genus whose body-form is almost exactly like that of *Nogagus*, while its appendages are all modified and approach much nearer to those found on *Euryphorus*, *Alebion*, and *Dysgamus*. And since in any systematization, but more especially here among the Parasitic Copepods, the appendages are of more value than the body form in determining relationship, this genus must be placed with the Euryphorinæ.

It will be the only genus in the sub-family possessing three free thorax segments, but as it is an intermediate form, any close conformity to the characteristics of a single family could not be reasonably expected.

FAMILY: DICHELESTIIDÆ.

Cætrodes,* n. gen.

Body regions distinct. Head covered with a dorsal carapace which is obovate in shape, strongly arched and considerably widened anteriorly, narrower and rounded posteriorly. This posterior portion is flattened and projects far back over the thorax segments, but is not attached to them. Frontal margin turned under the carapace a little, carrying the base of the anterior antennæ back with it on the ventral surface.

At least four (probably five) free thorax segments, indistinctly separated and diminishing in width posteriorly, the fifth one sending back a wide lobe on either side of the genital segment. Genital segment small, transversely oblong, enclosed on three sides by the fifth segment.

Abdomen small, hemispherical, one-jointed. Anal papillæ longer than the abdomen, narrow, cylindrical, and terminating in a spine and a claw.

First antennæ five-jointed, slender, with very few setæ except on the terminal joint. Second pair stout, ending in a prehensile claw. Mouth-tube short and wide; mouth-opening terminal.

First maxillipeds rudimentary, attached close beside the second maxillæ and of about the same size. Second pair slender, two-jointed. Two pairs of biramose swimming legs, close together and just behind the second maxillipeds; rami linear and two-jointed. Egg-tubes longer than the body; eggs large and uniseriate.

Cætrodes pholas,† n. sp.—Plate IV., figs. 48 to 57.

Female.—Head wider than the rest of the body and two-fifths of the entire length; covered dorsally with a strongly arched carapace which is divided into right and left halves by a prominent ridge or rib at the centre. The posterior margin of this carapace is prolonged backward in the form of a thin flattened plate which covers the anterior half of the thorax segments.

With the point of a needle, or by sharply flexing the body, this plate may be lifted away from the thorax segments, and this shows that it is not attached to them in any way. There is no trace of the median rib in this posterior part of the carapace. The passage from the arched to the flattened portion of the carapace is very irregular and forms a broken line over the posterior margin of the head. At the centre there is a wide triangular sinus extending forward, with its point on the median line. On either side of this is a blunt, rounded projection extending backward, outside of which is a wavy line curving forward as it runs toward the margin. There are no traces of frontal plates or of eyes.

The thorax is composed of at least four (probably five) free segments, which are imperfectly separated from one another.

* *Cætrodes*, like a small round shield.

† *Pholas*, lurking in a hole or burrow.

The first two of these are very short and considerably narrower than the head; the third and fourth (fused) are longer and wider, and together are about three-fifths the size of the carapace shield. The fifth segment is shorter and narrower than the fourth. It is divided transversely into thirds, the two outer divisions extending backwards in the form of wide rounded lobes on either side of the genital segment and abdomen, the median division forming a shallow rounded sinus for the attachment of the genital segment.

The genital segment and abdomen together form a hemisphere about the size of one of the posterior lobes of the fifth segment. The abdomen is one-jointed and bears on its ventral surface, at the posterior margin, two large cylindrical anal papillæ. These are longer than the abdomen itself, and each is tipped with a claw and a spine. The claw, which is on the inside, is nearly as long as the papilla, stout, and abruptly curved near the tip, exactly like the prehensile claws on the second antennæ of the Caligidæ. The spine is only one-fourth as long as the claw, and straight (fig. 57).

Egg-tubes wider than the genital segment and one-third longer than the entire body; eggs large, about 30 in each tube.

The first antennæ are five-jointed, the joints diminishing in diameter towards the tip; the setæ are very scattered except on the third and last joints. The second antennæ have a stout and conical basal joint, and a slender, strongly-curved terminal claw.

The mouth-tube is short and wide, with a rather blunt tip, enclosing the slender mandibles which are toothed on their inner margins. The second maxillæ and first maxillipeds are about the same size and close together at the sides of the mouth-tube. Each is two-jointed, and is made up of a short and plump basal joint and a slender terminal spine. The maxillipeds, of course, are rudimentary when reduced to this size, and are similar to those found in *Pseudoclavella*, *Cycnus*, *Cybicola*, and other Dichelestiids (fig. 52).

The second maxillipeds are fairly developed and much resemble the first pair in the Caligidæ. They are two-jointed, the joints about the same length, the terminal one tipped with a short and straight claw.

There are only two pairs of swimming legs, both biramose, with the rami linear and two-jointed. In each pair the exopod joints are about the same length, while the basal joint of the endopod is much shorter than the terminal.

Owing to the habit which the species has of lying in a burrow, the oviducts open on the dorsal surface, on either side of, and quite near to, the mid-line. The ovaries and the internal portions of the oviducts fill the entire thorax and even project forward into the head. The external portions (egg-tubes) start out at right angles to the dorsal surface, and are thus lifted well above the edge of the burrow. They then curve over and lie in close contact with the surface of the fish's gill outside the burrow (fig. 48).

Colour of the entire animal, a deep reddish yellow, like that of the gill on which it lives. The two arched halves of the anterior portion of the carapace are almost white, and the uneven line, where the arched portion passes into the flattened plate, stands out prominently in consequence of the meeting of this white colour with the deep yellow.

Total length 1·15 millims.; length of carapace 0·9 millim.; length of head 0·5 millim., width of same 0·9 millim.; length of thorax 0·65 millim.; length of egg-strings 1·8 millims.

This Dichelestiid is particularly interesting on account of its peculiar burrowing habit. About fifteen specimens, all females, were obtained from the gill filaments of *Tetrodon stellatus*. After fastening themselves to the surface of the filament by the prehensile second antennæ, and, we strongly suspect, by the terminal hooks on the anal laminæ, these parasites in some way irritate the epithelium until it is raised into a broad fold or flap, entirely surrounding the Copepod's body and overlapping its margin on all sides. A small convex mound is thus formed, beneath the open centre of which lies the body of the parasite, its egg-tubes projecting freely and lying along the surface of the gill filament. The anterior margin of the head and the posterior extremity of the body, including the abdomen and anal laminæ, are burrowed under the edge of the epithelium fold and fastened by their prehensile hooks.

Apparently, therefore, the parasite can have no freedom of motion, but is fastened immovably in place. No similar case of burrowing is known to the author; there are, of course, many genera among the Chondracanthidæ and Lernæidæ which bury the head and neck in the flesh of their host. There are also genera of the Dichelestiidæ, such as *Anthosoma*, *Eudactylina*, and the like, whose prehensile claws irritate the epithelium of the host until it grows up in a fold over the claws themselves.

But so far as is known, this is the only case where the epithelium folds entirely surround the body, so that the latter is securely held in place by them. The result is that the body of the parasite lies in the bottom of a hole or burrow, with only a portion of its dorsal surface visible.

Hatschekia, ? n. sp.—Plate V., figs. 58 to 60.

A single specimen of a species belonging to this genus was obtained from the stomach of *Carcharias müller*i. It was a young female without egg-strings but with spermatophores, and was only a trifle over 1 millim. in length.

While it seems to be a new species unlike any thus far described, yet its small size, its poor condition, and the manifest fact that it is not a fully developed adult furnish sufficient reasons to prevent its establishment as a new species. The following description and the figures which accompany it must await future confirmation, therefore, before being finally established.

Female.—Head transversely elliptical, one-half wider than long, one-fifth the entire length. Thorax composed of two free joints and the genital segment. First

free joint a little narrower than the head, second joint and genital segment considerably wider. The latter sends out a blunt rounded process on either side of, and nearly as large as, the abdomen. No appendages are visible on these processes or elsewhere on the genital segment. Abdomen very small and nearly spherical, with a pair of minute anal papillæ, each of which ends in three small setæ. First antennæ slender and apparently six-jointed; second pair large and terminated by a stout prehensile claw. Mouth-tube short and narrow and bluntly rounded at the tip; second maxillæ and first maxillipeds in the form of two small papillæ on each side of the mouth-tube, each tipped with a single seta. Second maxillipeds slender, the terminal joint shorter than the basal. Two pairs of biramose legs placed close behind the second maxillipeds; basal joints rounded and flattened laminæ, rami linear and cylindrical; exopods two-jointed, endopods one-jointed. Spermatophores comparatively very large and attached by long delivery ducts.

Colour a pale yellow, the ovaries and internal oviducts showing a dark brown through the transparent integument.

Total length 1·07 millims.; length of free thorax 0·35 millim.; length of genital segment 0·5 millim., width of same 0·48 millim.

Family: LERNÆIDÆ.

Peniculus, Nordmann.

Head oval or elliptical, elongate, without horn-like processes, connected with the body by a short and narrow neck, which is made up of two distinct thorax segments. Body a fusion of several thorax segments, elongate, wider than the head, and sometimes prolonged posteriorly into two elongate flattened processes.

Abdomen small, consisting of a single joint and carrying minute anal papillæ, which are tipped with non-plumose setæ. Egg-strings filiform; eggs large and uniseriate.

First antennæ reduced to mere knobs; second pair large and chelate, projecting in front of the head and forming the chief organs of prehension. Mouth a simple tube projecting from the ventral surface of the head; mouth-parts entirely wanting, except a single pair of very rudimentary maxillipeds beside the mouth tube. Four pairs of rudimentary swimming legs; first two pairs placed close behind the head, third and fourth pairs some distance from them and from each other.

Male smaller than the female and with a shorter thorax; posterior processes also shorter than those of the female, but wider and truncate at the tip.

Peniculus furcatus, Kröyer—Plate V., figs. 61 to 66.

Female.—Head elliptical, slightly widened posteriorly, about twice as long as wide, with evenly curved sides. Posteriorly the head passes into a neck of about half its width, made up of three thorax segments which are distinctly separated on both the ventral and dorsal surfaces. The fourth and genital segments are fused, with no line

of demarkation except the position of the fourth legs on the ventral surface. This fused portion constitutes the body of the Copepod, which is nearly twice the width of the head, and twice as long as wide, with parallel sides.

The body widens sharply from the neck, its anterior corners well rounded, while its posterior corners are produced into a pair of wide, flattened processes, nearly as long as the rest of the animal, and either straight or slightly divergent, Along the sides, toward the centre, these processes often show incisions and grooves, very irregularly placed in different specimens and suggesting imperfect segmentation.

Between the bases of these processes lies the small abdomen, a little wider than the processes, and also a little wider than long. Its posterior corners are produced into short and rounded processes, similar to those on the genital segment but much smaller. Between these processes on the posterior margin are the tiny anal papillæ, each of which terminates in three non-plumose setæ. Of these latter, the inner and outer ones are considerably longer than the middle one (fig. 66).

The first antennæ are reduced to mere knobs, so rudimentary as to be invisible unless seen in profile and under the best conditions. The second pair are much enlarged and extend forward diagonally in front of the head. They are the organs of prehension and consist of an enlarged basal joint filled with strong muscles, and a stout terminal claw which is buried in the flesh of the host. The basal joints are united throughout their entire length, and are enlarged at the end into a double disc, from the edge of which on either side project the terminal claws. The mouth-tube is a simple hollow cone projecting but little from the ventral surface; the mouth-parts have all been aborted, with the exception of the second maxillipeds. These appear as tiny two-jointed appendages on either side of the base of the mouth-tube (fig. 64).

There are four pairs of rudimentary legs, the first three of which are close together on the thorax segments which form the neck, while the fourth pair are some distance farther back on the ventral surface. We may presume that the line of junction of the fourth and genital segments is just behind the bases of these legs. Each leg consists of a triangular basal lamina tipped with two minute, one-jointed rami scarcely larger than spines, and naked.

Colour a dark grey by reflected light, a greyish yellow by transmitted light. Under the latter conditions spots of dark pigment are seen along the sides of the head and neck, at the posterior end of the genital segment, and along the centre of the posterior processes. The two oviducts also show through the dorsal surface of the genital segment as two broad lines of dark brown, broken up into separate spherical eggs.

Total length 2·35 millims., length of head 0·35 millim., length of genital segment 0·79 millim., length of posterior processes 1 millim., length of egg-strings 0·6 millim., width of genital segment 0·4 millim.

Male.—Similar to the female, but with certain marked differences in the body

proportions. The head and free thorax segments are about the same, but the genital segment is relatively longer and narrower, being nearly half the entire length.

The posterior processes are only one-third as long as in the female, and are spathulate, being somewhat enlarged and strongly flattened at the tips. Their width at the tip is three-fifths of their length, while in the female it is less than one-seventh. The abdomen lacks the posterior processes, and is nearly hemispherical in shape; the anal papillæ are relatively larger, and their setæ, also non-plumose, a trifle longer.

Colour the same, except that there are no pigment spots on the posterior processes, and there are two narrow lines of pigment parallel to the sides of the genital segment in place of the wide broken lines of eggs seen in the female.

Total length 1·6 millims., length of head 0·35 millim., length of genital segment 0·71 millim., length of posterior processes 0·35 millim., width of genital segment 0·3 millim.

This species was founded by KRÖYER upon a single female obtained by exchange from the Vienna Museum. And KRÖYER himself states that this specimen was imperfect, so that the description given was necessarily incomplete. This original type specimen was obtained from a species of *Holacanthus* (*Tetrodon*) taken in the Indian Ocean.

The present lot of material is from the same region and was found on the same genus of fish (*Tetrodon*)—whether upon the same species or not, is impossible to tell, since KRÖYER does not name the species. The specimens include some twenty females and two males, nearly all of which are in excellent condition. We are thus justified in supplementing KRÖYER'S description, and in presenting a complete account of both sexes with accurate figures. A genus diagnosis is also here given for the first time (p. 206).

EXPLANATION OF THE PLATES.

PLATE I.—*Lepeophtheirus brachyurus*, HELLER, and *Lepeophtheirus æsopus*, n. sp.

Fig. 1. *Lepeophtheirus brachyurus*, dorsal view of female.
„ 2. First and second antenna and first maxilla.
„ 3. Mouth-tube and second maxillæ.
„ 4. Second maxilliped.
„ 5. Furca.
Figs. 6 to 9. First, second, third, and fourth swimming legs.
Fig. 10. Genital segment, ventral surface, showing cement glands and sperm receptacle.
„ 11. *Lepeophtheirus æsopus*, dorsal view of female.
„ 12. Second antenna and first maxilla.
„ 13. Mouth-tube and second maxillæ.
„ 14. Second maxilliped.
Figs. 15 to 18. First, second, third, and fourth swimming legs.
Fig. 19. Ventral surface of genital segment, showing cement glands and spermatophores.

PLATE II.—*Trebius exilis*, n. sp.

Fig. 20. Dorsal view of adult female.
„ 21. „ „ male.
„ 22. Second antenna of male.
„ 23. Mouth-tube and second maxilla.
„ 24. First maxilliped.
„ 25. Second maxilliped.
„ 26. Furca.
Figs 27 to 30. First, second, third, and fourth swimming legs.
Fig. 31. Ventral surface of genital segment, showing the cement glands and spermatophores.
Figs. 32 and 33. Dorsal views of young females in different stages of development.

PLATE III.—*Dissonus spinifer*, n. gen. et n. sp.

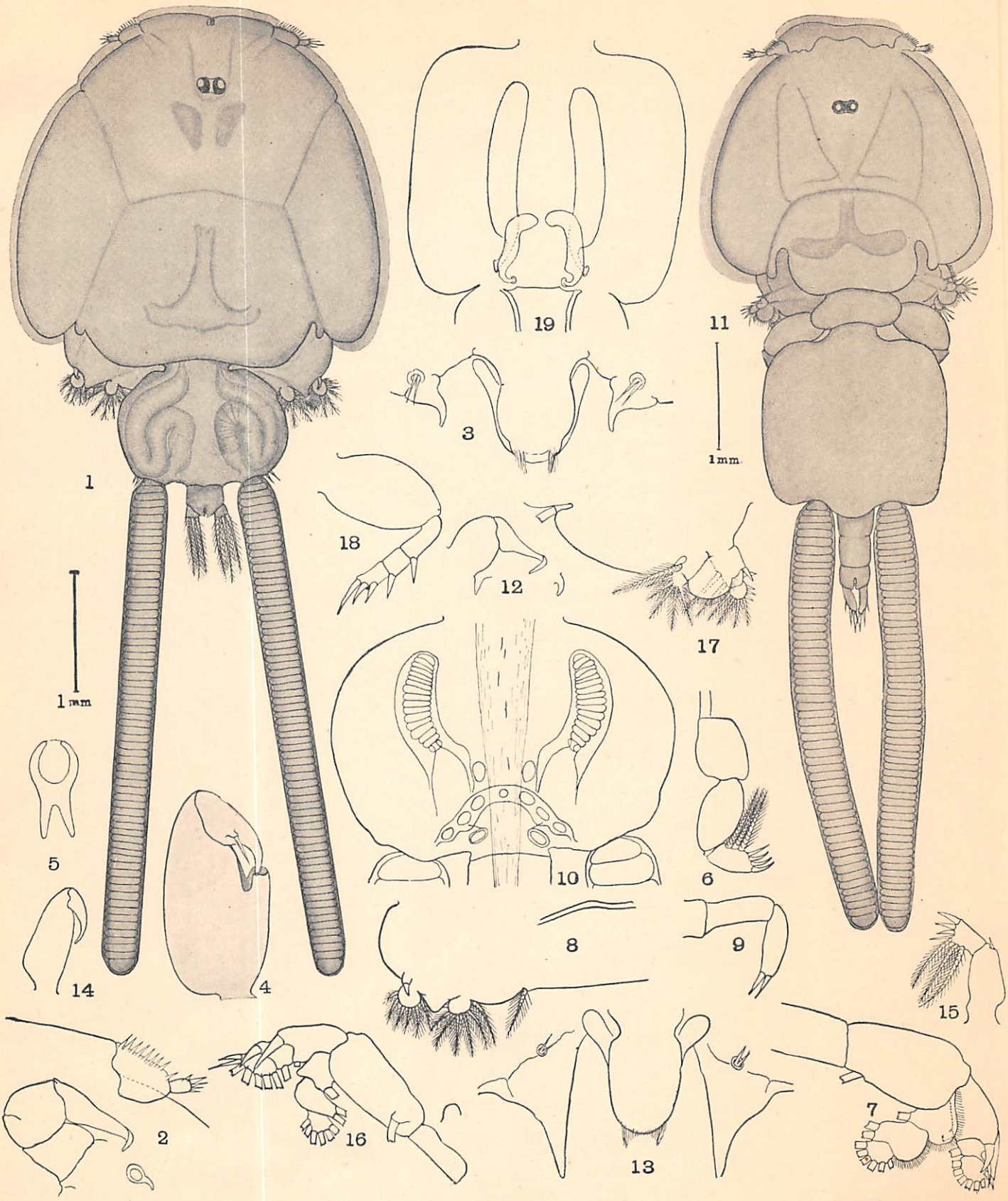
Fig. 34. Dorsal view of female.
„ 35. „ „ male.
„ 36. Second antenna of male.
„ 37. Ventral view of anterior part of carapace, showing relative size and position of antennæ and mouth-parts.
„ 38. Bony frame work of mouth-tube, and the second maxillæ.
„ 39. Second maxilla of male.
„ 40. Mandible.
Figs. 41 and 42. First and second maxillipeds.
„ 43 to 46. First, second, third, and fourth swimming legs.
Fig. 47. Ventral surface of genital segment of male.

PLATE IV.—*Cœtrodes pholas*, n. gen. et n. sp.

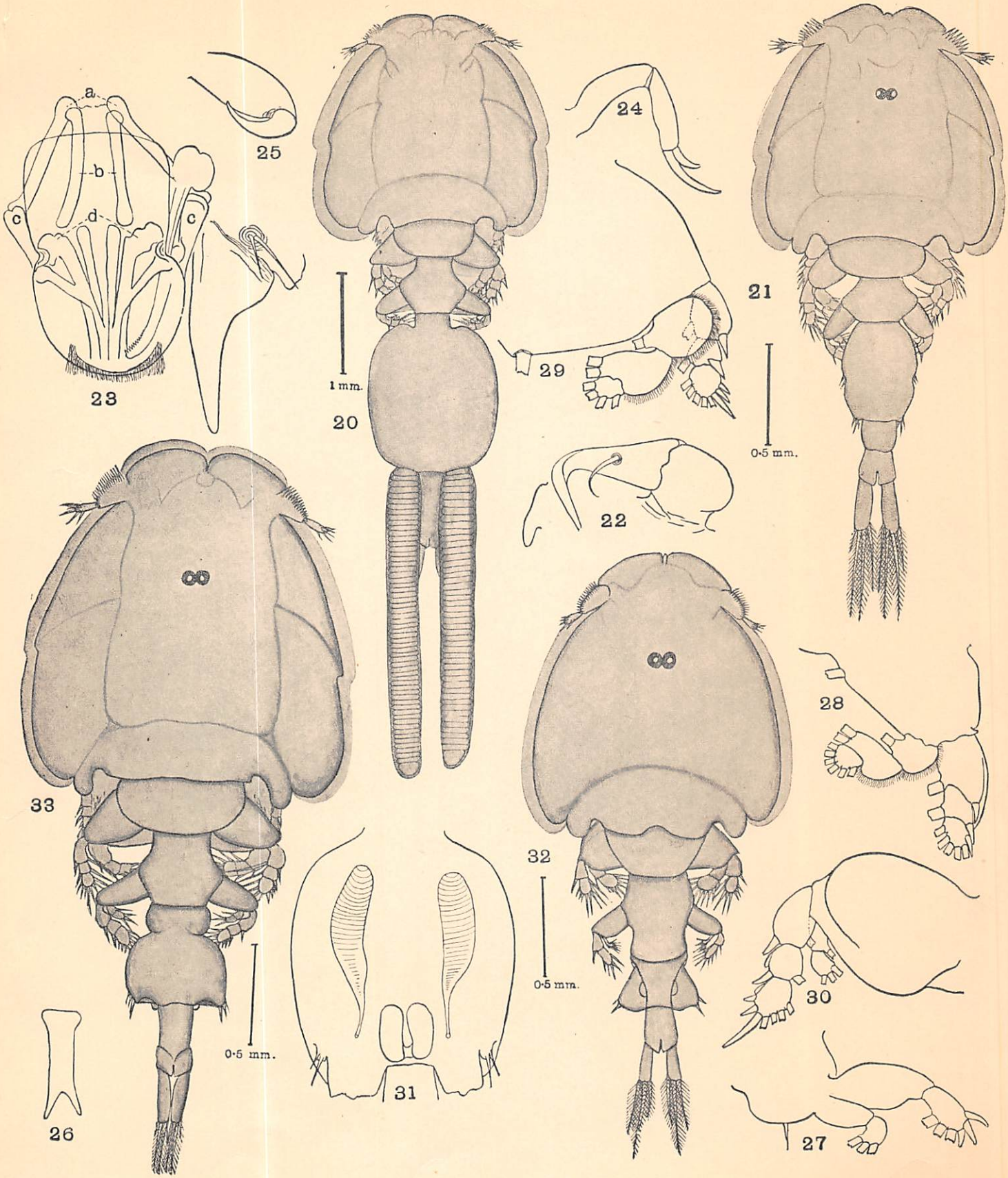
Fig. 48. Dorsal view of female in its burrow on a gill filament.
„ 49. „ „ same female removed from its burrow (enlarged).
„ 50. First antenna.
„ 51. Second antenna.
„ 52. Mouth-tube, second maxilla (*a*), and first maxilliped (*b*).
„ 53. Second maxilliped.
Figs. 54 and 55. First and second swimming legs.
„ 56 „ 57. Dorsal and ventral views of genital segment and abdomen.

PLATE V.—*Hatschekia* sp. and *Peniculus furcatus*, KRÖYER.

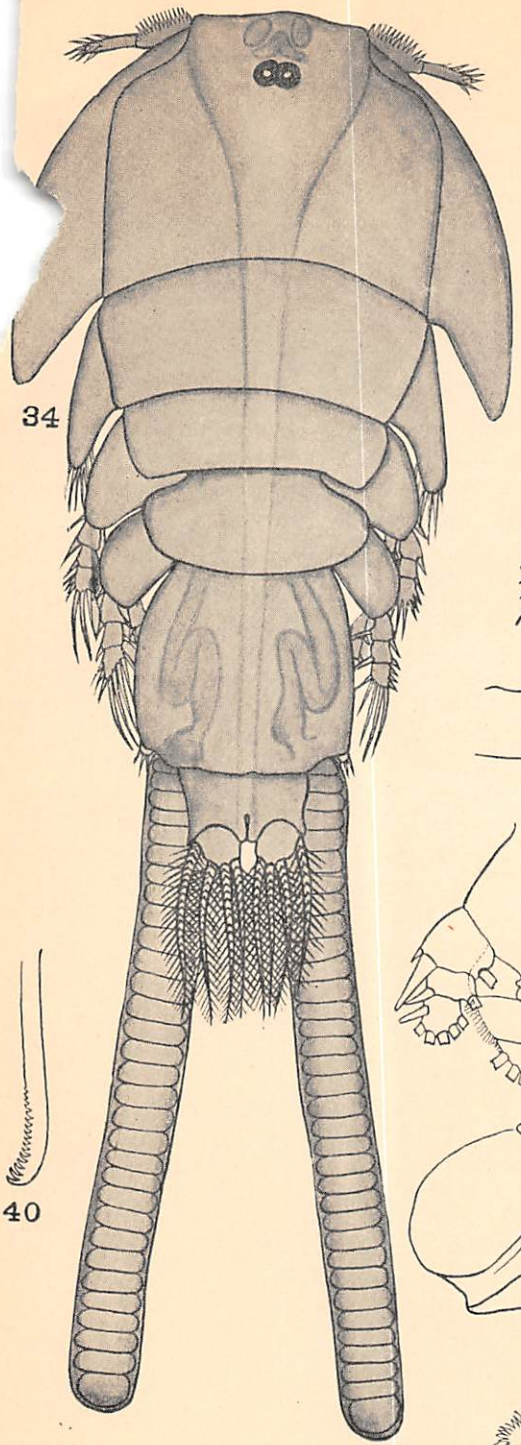
Fig. 58. Dorsal view of *Hatschekia* sp., female.
„ 59. Ventral view of head and first two thorax segments, showing (*a*) first antenna; (*b*) second antenna; (*c*) second maxilla; (*d*) first maxilliped; (*e*) second maxilliped; (*f*) first swimming leg; (*g*) second swimming leg.
„ 60. Ventral view of abdomen, showing anal papillæ and spermatophores.
„ 61. Dorsal view of female of *Peniculus furcatus*, KRÖYER.
„ 62. Ventral view of same, showing egg-cases.
„ 63. Dorsal view of male.
„ 64. Profile view of head, showing (*a*) rudimentary first antenna; (*b*) prehensile second antennæ; (*c*) rudimentary second maxillipeds.
„ 65. End view of fused second antennæ, showing the terminal claws.
„ 66. Ventral view of abdomen of female.

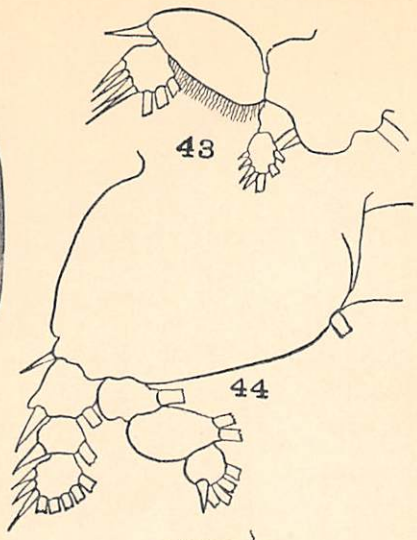


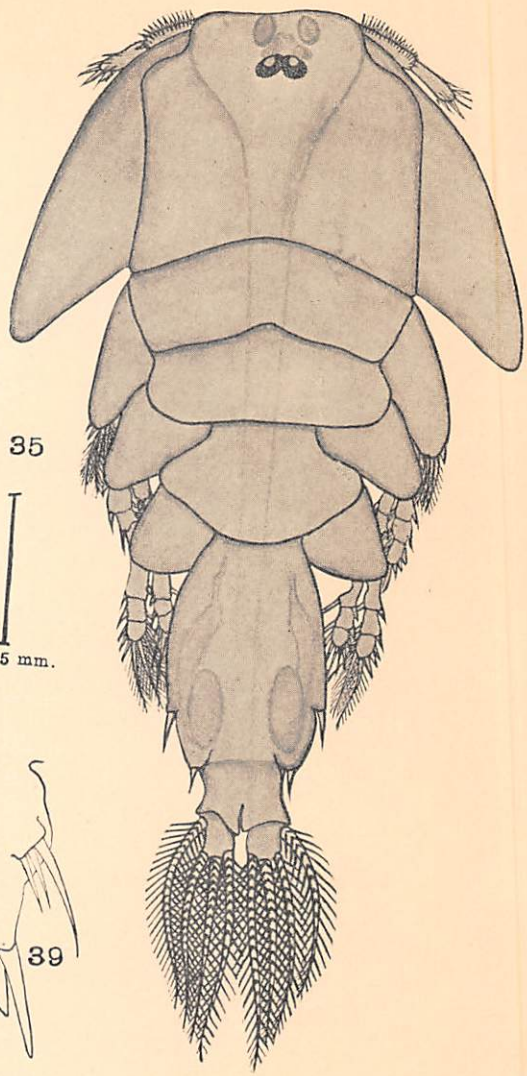
FIGS. 1—10, LEPEOPHTHEIRUS BRACHYURUS, HELLER.
FIGS. 11—19, LEPEOPHTHEIRUS AESOPUS, N.SP.

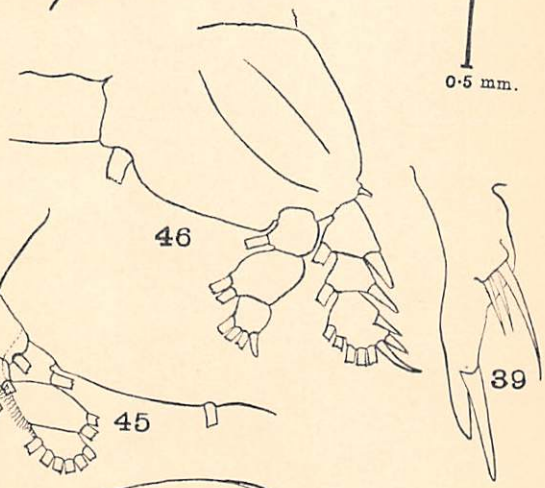


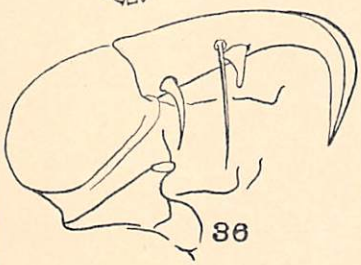
TREBIUS EXILIS, N.SP.

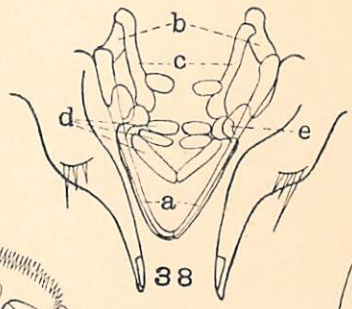


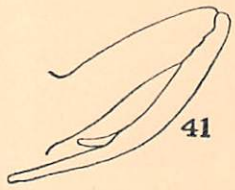


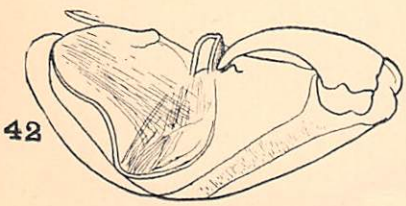


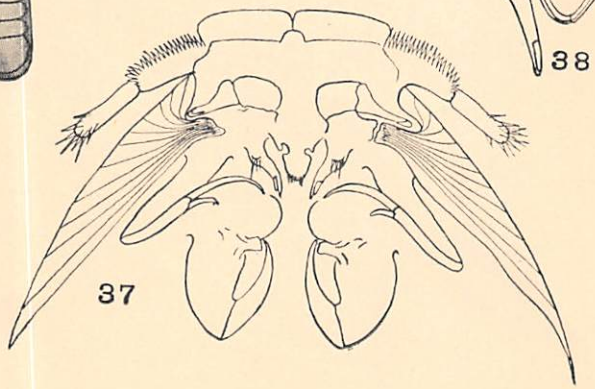


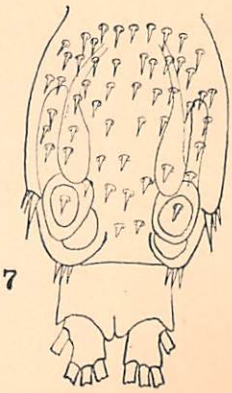




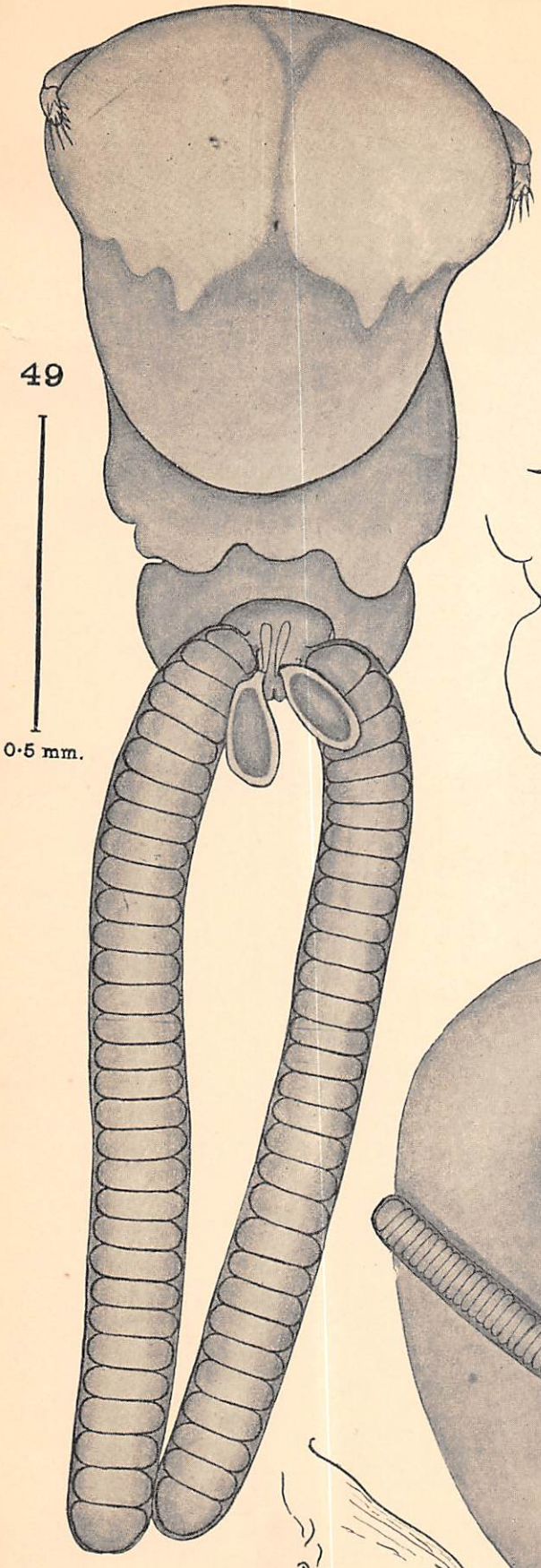


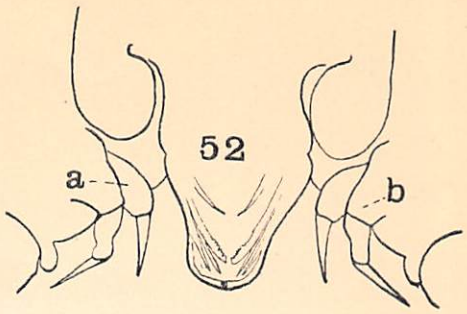


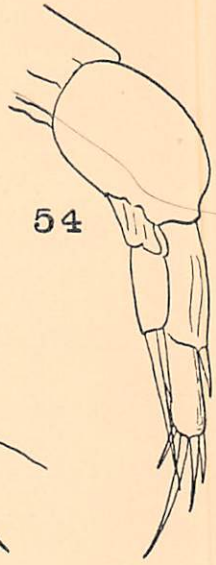


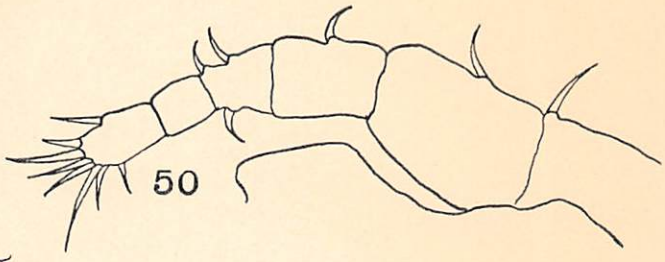


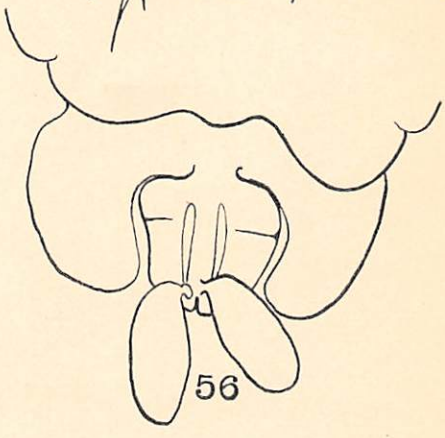
DISSONUS SPINIFER, N.GEN. & SP.

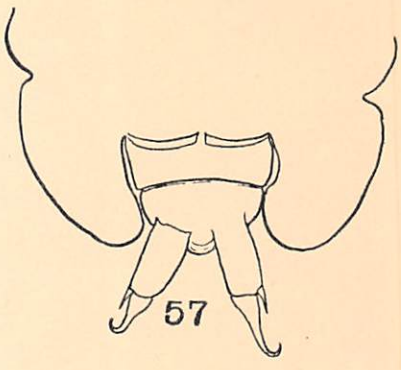


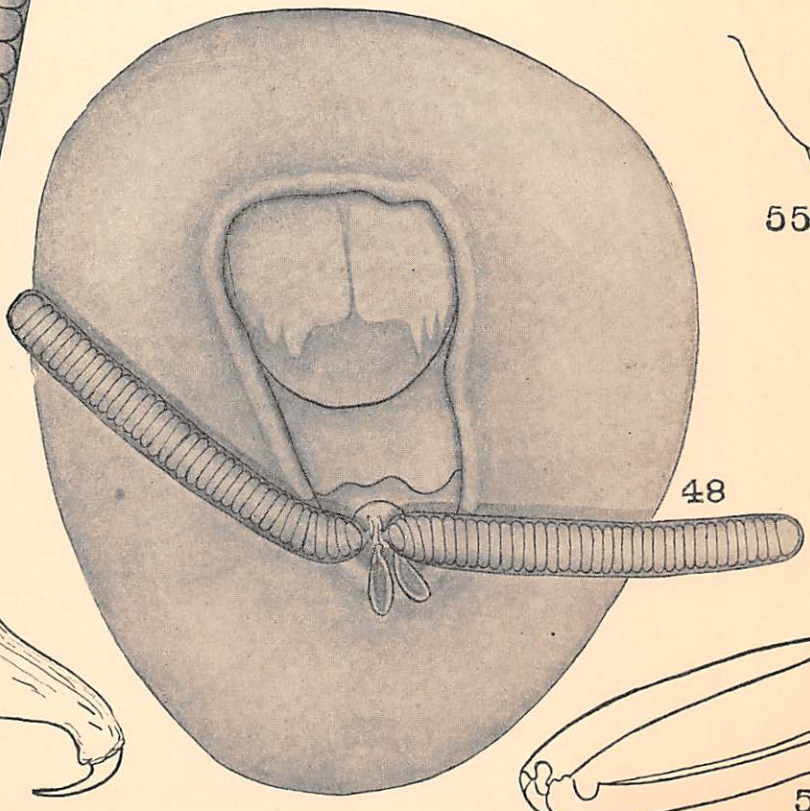


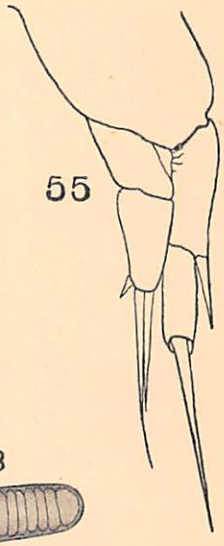


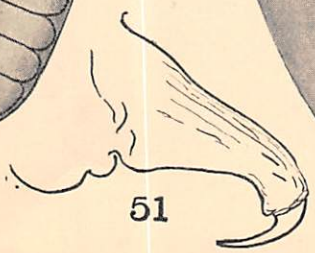


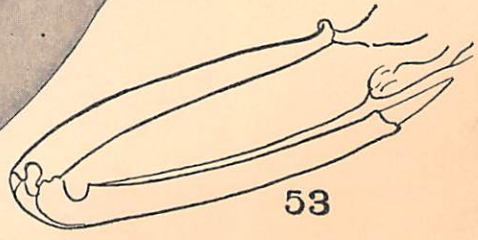












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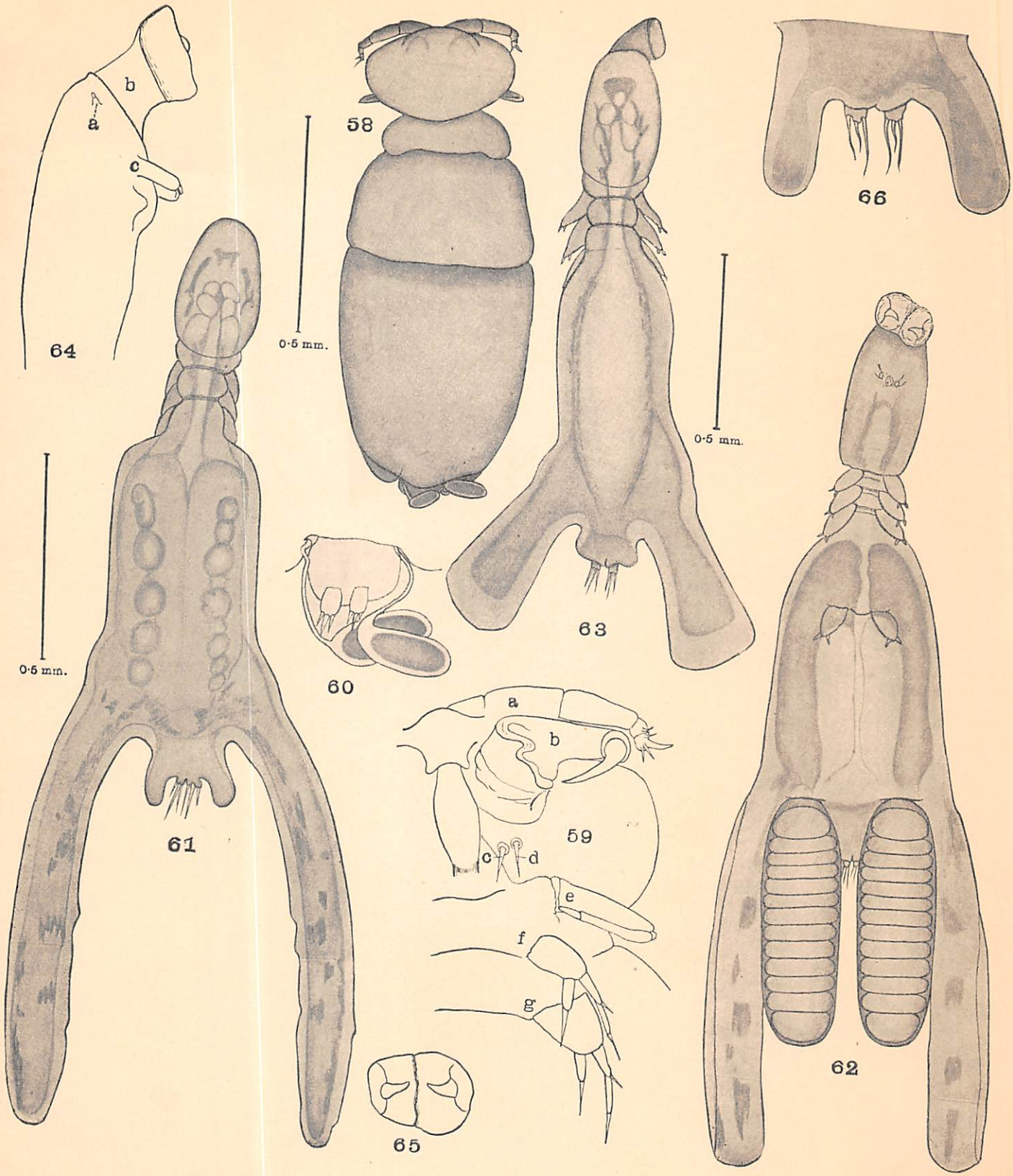

FIGS. 58—60, HATSCHEKIA SP.

FIGS. 61—66, PENICULUS FURCATUS, KRÖYER.