

SMITHSONIAN MISCELLANEOUS COLLECTIONS

VOLUME 91, NUMBER 19

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REPORTS ON THE COLLECTIONS OBTAINED BY THE FIRST
JOHNSON-SMITHSONIAN DEEP-SEA EXPEDITION
TO THE PUERTO RICAN DEEP

NEW PARASITIC COPEPODS

(WITH THREE PLATES)

BY

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Among the valuable collections obtained during the first Johnson-Smithsonian Deep-Sea Expedition was one made up of the copepods parasitic upon the fish of the region just north of Puerto Rico. Although this included but a few species, the number of specimens was unusually large and the collection proved interesting for several reasons. In the first place it came from a region upon the fish parasites of which there have been up to the present time no available data. Again, the present collection contains an exceptionally large number of males and with reference to that sex supplies information hitherto unknown and much desired. We find here for the first time authentic males of *Nesippus crypturus*, females of which were described 70 years ago. The males of *Pandarus cranchii* are larger than any previously reported and the three largest ones are covered with blotches of the same dark pigment that characterizes the mature female. Three specimens of a male *Specilligus curticaudis*, first described by Dana 80 years ago as a new genus and species, are now found to be simply the copepodid stage of the male of *Pandarus cranchii*. Finally, three new species were found and are here described, and three other species, already known, were taken from unnamed shark hosts, *Alebion carchariac* Krøyer, *Perissopus communis* Rathbun, and *Krøyeria gracilis* Wilson.

CALIGUS LOBATUS n. sp.

Plate I, figs. 1-10

Occurrence.—A dozen females and two males were taken from the outside surface and gills of a pilotfish, *Naucrates ductor*.

Type.—A single female, U.S.N.M. no. 64059. The other specimens become paratypes, U.S.N.M. no. 64060.

The female.—Carapace ovate, considerably less than half the entire length and strongly narrowed anteriorly, with convex lateral margins and broadly rounded posterior lobes. Frontal margin with a shallow median depression but no incision, the two frontal plates combined less than half the width of the carapace. Lunules large, nearly circular, comparatively close together and scarcely projecting beyond the frontal margin. Posterior sinuses narrow, median lobe less than half the entire width and projecting but little behind the lateral lobes. Free thorax segment small, two-thirds as wide as the median lobe of the carapace, its lateral margins projecting for the attachment of the fourth legs. Genital segment ovate, one-third longer than wide, narrowed anteriorly and widest considerably behind the center, with strongly convex lateral margins and broadly rounded posterior lobes, which reach beyond the center of the basal abdominal segment. Abdomen two-segmented, two-thirds as long as the genital segment, the two segments about the same length and width, with straight and parallel sides. Caudal rami small, parallel, slightly widened at their distal end, each armed with five short setae.

First antennae with a stout basal segment and a short and slender terminal segment. Second antennae rather stout, the strong terminal claw bent into a half circle and armed with a large spine on its inner surface near the base (fig. 3). First maxilla of the usual pattern; second maxilla long and slender, the proximal segment enlarged at its base, the distal segment with a knifelike process on its inner margin beyond the center, and tipped with two unequal curved claws. Maxilliped stout, the basal segment with a tiny spine on its inner surface, the terminal claw curved into a semicircle and sharply pointed (fig. 5).

First legs with a rudimentary two-segmented endopod on the posterior margin of the basipod (fig. 8); the exopod is two-segmented, the terminal segment without the usual setae on its posterior margin. The furca has an elongated **U**-shape, the prongs nearly parallel and about as long as the basal portion. Second and third legs of the customary pattern, but with exceptionally long setae; fourth legs three-segmented, the basal segment longer than the other two combined, the middle segment the shortest. The basal and second segments each carry a spine at the outer distal corner, the terminal segment has three spines on its outer margin and one at the tip. Each of these spines has at its base a small semicircular lamina fringed with hairs. No rudimentary fifth legs can be detected anywhere on the genital segment. Total length 4.50 to 4.75 mm. Length of carapace 2 mm, width 1.90 mm. Length of genital segment 1.65 mm. Length of abdomen 1.16 mm.

The male.—Carapace more than half the entire length and a little longer than wide, narrowed anteriorly less than in the female. Frontal margin with no trace of a median depression or incision; posterior sinuses small and shallow. Median lobe more than half the width of the carapace and projecting considerably behind the lateral lobes, with an evenly rounded posterior margin. Free segment short, its lateral margins scarcely projecting at all for the attachment of the fourth legs. Genital segment narrow, not much wider than the free segment and almost twice as long as wide, without any trace of posterior lobes. Abdomen two-segmented, the distal segment twice as long as the proximal, both segments of the same width, which is half that of the genital segment. Caudal rami longer than wide, enlarged posteriorly and each armed with five setae, three of which are three times the length of the ramus while the other two are much shorter.

Appendages like those of the female, but the terminal claw of the second antenna has two spines on its inner margin and that of the maxilliped has one spine on the inner margin near the base. The fourth swimming legs nearly reach the posterior margin of the genital segment and their armature is like that in the female.

Total length 4.2 mm. Carapace 2.3 mm long, 1.9 mm wide.

Remarks.—The posterior lobes of the genital segment in the female are exceptionally long and wide, and the specific name alludes to this. When taken in connection with the two abdominal segments of equal length, they furnish a quick identification of the species. The identity can then be confirmed by the structure of the second antennae, the furca, and the first and fourth swimming legs.

NESIPPUS CRYPTURUS Heller, new male

Plate 1, figs. 11, 13, 14; plate 3, figs. 28-32

Occurrence.—More than 60 females were taken from the gills and throats of two large sharks, and nearly as many males from the outer skin and fins of the same hosts. The females were described 70 years ago by Heller but these are the first males to be found. Males, U.S.N.M. no. 64057; females, U.S.N.M. no. 64058.

The male (fig. 28).—Width of the cephalothorax one-half greater than its length on the midline; frontal plates distinct but rather narrow; posterior lobes broadly rounded and short, not reaching the center of the lobes of the second segment. Second, third, and fourth segments the same length but diminishing considerably in width. Second segment with well-rounded lateral lobes reaching almost to the posterior margin of the third segment, fourth segment much

narrower than the genital segment and without dorsal plates. Genital segment nearly as long as the three free thorax segments combined, narrowed anteriorly and widened posteriorly, the posterior corners distinctly bilobed, the inner lobes projecting backward on either side of the abdomen. Spermatophore receptacles large and elliptical, each containing a single spermatophore with a long coiled tube.

Appendages like those of the female with the usual sexual modifications. In the first maxilla (fig. 13) the tip on the anterior margin projects strongly and its two segments are much larger than in the female; the ventral palp also forms a distinct lobe with the two processes on its upper margin. The second maxilla is exactly like that of the female except that its terminal claw is not as sharply pointed (fig. 14). In the maxilliped just inside the cup-shaped prominence on the distal margin of the end segment are two hemispherical protuberances with rough surfaces (fig. 30). When the claw shuts down, it lies between these protuberances with its tip inside the cup and is thus held rigidly in place.

The arrangement of the spines and setae on the swimming legs is as follows. First exopod 1-0, 4-3; endopod 0-1, 0-3. Second exopod 1-1, 4-4; endopod 0-1, 0-5. Third exopod 1-1, 3-6; endopod 0-0, 0-7. Fourth exopod 4-4; endopod 0-4.

Total length 5 to 6.5 mm. Width of cephalothorax 3 to 4 mm, length on the midline 2.38 mm.

Remarks.—Heller's description and figures of the female of this species show that he did not have fully matured specimens, and no other author has even mentioned the species except Bassett-Smith. As the females carrying egg strings differ somewhat from Heller's immature specimens, a new description will be published later.

NESIPPUS GRACILIS, n. sp.

Plate 2, figs. 15-27; plate 3, fig. 33

Occurrence.—Three females and six males of another species of *Nesippus* were obtained from the same hosts in company with the preceding specimens. They are smaller in size and quite different in structural details, and since in the female the genital segment, like that of *crypturus*, has long and broad posterior lobes which conceal the abdomen and caudal rami in dorsal view, the specimens cannot be referred to any described species but must be established as new.

Types.—Females, U.S.N.M. no. 64055; cotypes: males, U.S.N.M. no. 64056.

The female.—Cephalothorax, including the posterior lobes, less than half the entire length (42 percent) and a little wider than long, the frontal margin strongly curved and emarginate at the center, the posterior corners produced into short lobes narrowed distally. Second and third segments slightly fused centrally but completely separated laterally. The posterior corners of the second segment each carry a rectangular lobe projecting diagonally backward inside the carapace lobes and reaching beyond the tips of the latter. The third segment is considerably narrower than the second but its posterior corners are slightly prominent. The fourth segment carries a pair of fused dorsal plates, the combined width of the plates and segment being equal to that of the third segment and a little more than half that of the genital segment. These plates are semicircular in outline and cover the posterior portion of the dorsal surface of the segment. In front of them the anterior part of the segment is narrowed into a short neck, which is the same width as the narrowed posterior portion of the third segment (fig. 15).

The outline of the genital segment is an elongated ellipse, twice as long as wide, divided in front of the center by lateral sinuses and a ventral groove into two unequal portions. The anterior portion is narrowed into a short neck behind the fourth segment, which is the same width as the neck between the third and fourth segments and gives the latter segment a peculiar isolated appearance. The corners of this anterior portion of the genital segment are narrowly rounded. The posterior portion of the segment is twice the length of the anterior and a little wider, with parallel lateral margins and broadly rounded posterior lobes. The sinus between the lobes is wider and deeper than in *crypturus* and shows a little of the abdomen at its base. Otherwise the abdomen and caudal rami are completely concealed in dorsal view, since the lobes reach far behind the tips of the rami.

The abdomen is quadrangular in outline with small circular lobes at its anterior corners, one-jointed, and attached to the ventral surface of the genital segment in front of the base of the posterior sinus. The caudal rami are small and curved in toward each other, the two together about as large as the abdomen. The posterior end of each ramus is triangularly tapered, with two terminal setae at the apex of the triangle and one at each lateral corner.

The appendages are similar to those of *crypturus*, with the following differences. The second antenna (fig. 17) has a shorter and stouter terminal claw, which is considerably enlarged and distinctly segmented near its base. The first maxilla (fig. 18) has a single

minute segment instead of two at its apex, and the rudimentary palp is made up of three fingerlike processes without setae. The second maxilla (fig. 19) has a shorter second segment, and the terminal claw, instead of being cylindrical and uniformly curved for its entire length as in *crypturus*, is flattened and bent at right angles near the tip. In the maxilliped the terminal claw has its basal three-fifths enlarged into an elliptical pad from which projects the slightly curved distal two-fifths, the tip of which fits into the cup. The basal pad carries on its lateral surface a process terminating in a small curved accessory claw (fig. 20).

The arrangement of the spines and setae on the swimming legs is as follows. First exopod 1-0, 4-3; endopod 0-0, 0-3. Second exopod 1-1, 4-5; endopod 0-1, 0-7. Third exopod 1-1, 4-4; endopod 0-1, 0-4. Fourth exopod 5-0; endopod 1-0. The fourth exopod is twice the length of the endopod, and its five coarse spines are bunched around its tip. The fifth legs are each replaced by two small spines on the ventral surface of the posterior lobes of the genital segment and are very difficult to discern.

Total length of female 5.6 mm. Length of cephalothorax, including the posterior lobes, 2.60 mm. Width of cephalothorax 2.90 mm. Length of genital segment 3.10 mm; width of same 1.63 mm.

The male.—Cephalothorax wider than long and more than half the entire length including the posterior lobes. The frontal margin is strongly curved and emarginate at the center; the posterior lobes are short and narrowly rounded. The second segment is longer than either the third or fourth and without lateral lobes. The third and fourth segments are transversely elliptical with strongly convex lateral margins. The genital segment is as wide as the fourth segment and one-fourth longer, with convex lateral margins and short posterior lobes. The abdomen is one-segmented, very short on the lateral margins and twice as long on the midline, with the posterior corners obliquely truncated. The caudal rami are circular, each a third as large as the abdomen, with four curved setae of about the same length.

The appendages are like those of the female, with a few modifications. The basal portion of the terminal claw of the second antenna is relatively larger and the basal pad on the terminal claw of the maxilliped is longer and wider (fig. 33). The arrangement of the spines and setae on the first three pairs of legs is exactly the same as in the female, but the setae are relatively much larger and their plumes longer and denser. In the fourth legs the exopod has four spines and four setae and the endopod has three terminal setae and one on the

inner margin near the tip, with no spines. Each fifth leg consists of a fingerlike process tipped with a seta and another seta in front of the base of the process. These fifth legs stand out from the ventral surface of the genital segment in such a way that they are invisible in dorsal view. The drawing in figure 27 was made under a cover glass, which turned the fifth leg sidewise and made it appear to project beyond the lateral margin of the segment.

Total length of male 4 to 5 mm. Length of cephalothorax 2.50 mm; width of same 2.60 mm.

Remarks.—Superficially, in size and general appearance the females are so similar to *Nesippus occultus* that they were first referred to that species. The males, however, are extremely dissimilar, and on closer examination the females revealed sufficient differences to constitute a new species. The distinctive characters are the rectangular lobes of the second thoracic segment, the isolated appearance of the fourth segment, the slenderness of the genital segment and the length of its posterior lobes, and the structural details of the appendages. If the number of specimens obtained is any criterion, *gracilis* is a much rarer species than *crypturus*.

KRØYERIA DISPAR, n. sp.

Plate 3, figs. 34-42

Occurrence.—Three females belonging to this new species were obtained from the gills of an unnamed shark.

Type.—U.S.N.M. no. 64053; paratypes, U.S.N.M. no. 64054.

The female.—Carapace one-half wider than long; cephalic area triangular with all three sides convex, the base forming the frontal margin and projecting in front of the lateral area. Posterior lobes short and broadly rounded, slightly reentrant on the outer margin near the tip and not quite reaching the posterior margin of the median lobe. Styliform process straight and stout, just reaching the posterior margin of the second segment. Second, third, and fourth segments about the same length and width, which is less than half the width of the carapace. Each of these segments carries a pair of dorsal plates, and there is a fourth pair on the median lobe of the carapace. These plates are small and closely adherent to the dorsal surface; those of each pair meet on the midline, are of a different shape from the other pairs, and are much smaller than the surface to which they are attached.

The fused fifth and genital segment is slightly narrower than the fourth segment anteriorly and is tapered posteriorly to the width of

the abdomen. It is six times as long as wide and its lateral margins are nearly straight. The abdomen is one-sixth as long and less than half as wide as the fused segment; it is made up of two segments, the basal one-half as long again and a little wider than the terminal segment. The caudal rami are longer than the terminal segment, four times as long as wide, and nearly parallel.

The first antennae are entirely concealed in dorsal view, six-segmented and sparsely armed with spines without any setae; the second antennae are tipped with a stout chela. The movable claw of the chela has a minute spine on its inner margin near the base, and the rigid finger is hollowed for the reception of the tip of the claw. The first maxilla is two-segmented, the terminal segment twice as long as the basal, bent abruptly near its proximal end and armed in the angle of the bend with a small process tipped with a seta. At the tip of the maxilla are two long unequal spines, which are rather stout and slightly curved. The second maxilla is three-segmented, the basal segment stout, the second segment very short and the third segment enlarged distally and tipped with two stout curved claws. This third segment is as long as the other two combined, and its enlarged tip forms beneath the bases of the claws a lobe which is covered with small spines. Behind the bases of the claws on the lateral and dorsal surfaces of the segment are fringes of long hairs. The basal segment of the maxilliped has a large rounded protuberance on its inner margin at the center, and an angular process at the distal end outside the base of the claw. The latter is stout, considerably enlarged at its base and bent abruptly at right angles over the apex of the protuberance on the basal segment.

The four pairs of legs are biramose, each ramus three-segmented, and the arrangement of the spines and setae as follows: First exopod 1-1, 1-1, 2-5; endopod 0-1, 0-1, 0-6. Second exopod 1-1, 1-1, 2-5; endopod 0-1, 0-2, 0-6. Third exopod 1-1, 1-1, 2-4; endopod 0-1, 0-2, 0-6. Fourth exopod 1-1, 1-1, 1-4; endopod 0-1, 0-1, 0-4. Fifth legs lacking.

Remarks.—This species is unlike others of the genus in several particulars, whence its specific name. The carapace is exceptionally widened, the second maxillae and maxillipeds are more like those of *Krøyerina*, and the middle segment of the second and third endopods carries two setae. But the presence of well-developed stylets, the shape of the carapace, and the presence of dorsal plates on the free segments correspond with those features of the present genus.

EXPLANATION OF PLATES

PLATE 1

Caligus lobatus, n. sp., and *Nesippus crypturus*, new male

- FIG. 1. *Caligus lobatus*, dorsal view of female.
 FIG. 2. Dorsal view of male.
 FIG. 3. Second antenna, female.
 FIG. 4. Second maxilla.
 FIG. 5. Maxilliped.
 FIG. 6. Maxilliped, male.
 FIG. 7. Furca.
 FIGS. 8-10. First, second, and fourth swimming legs, female.
 FIG. 11. *Nesippus crypturus*, mouth tube and first maxillae, male.
 FIG. 12. Lateral view of first maxilla, female.
 FIG. 13. Lateral view of first maxilla, male.
 FIG. 14. Second maxilla, male.

PLATE 2

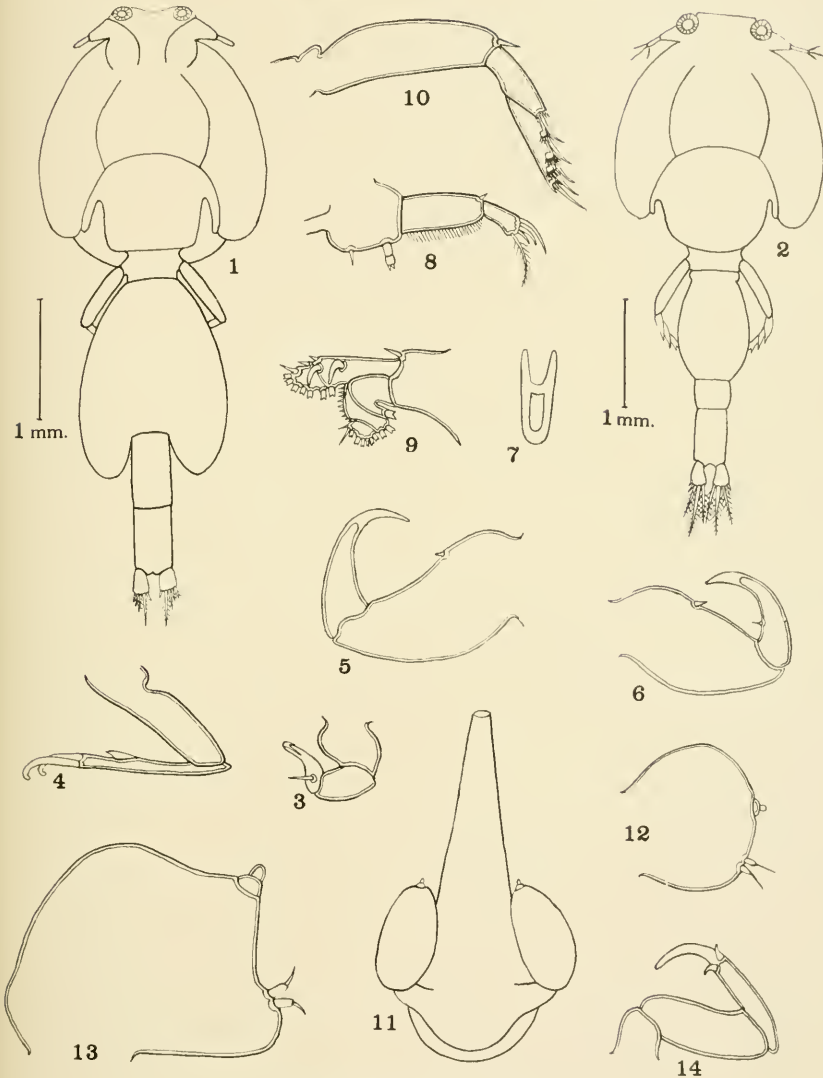
Nesippus gracilis, n. sp.

- FIG. 15. Dorsal view of female.
 FIG. 16. Dorsal view of male.
 FIG. 17. Second antenna, female.
 FIG. 18. First maxilla.
 FIG. 19. Second maxilla.
 FIG. 20. Maxilliped, male.
 FIGS. 21-24. First, second, third, and fourth swimming legs, female.
 FIGS. 25-27. First, fourth, and fifth legs, male.

PLATE 3

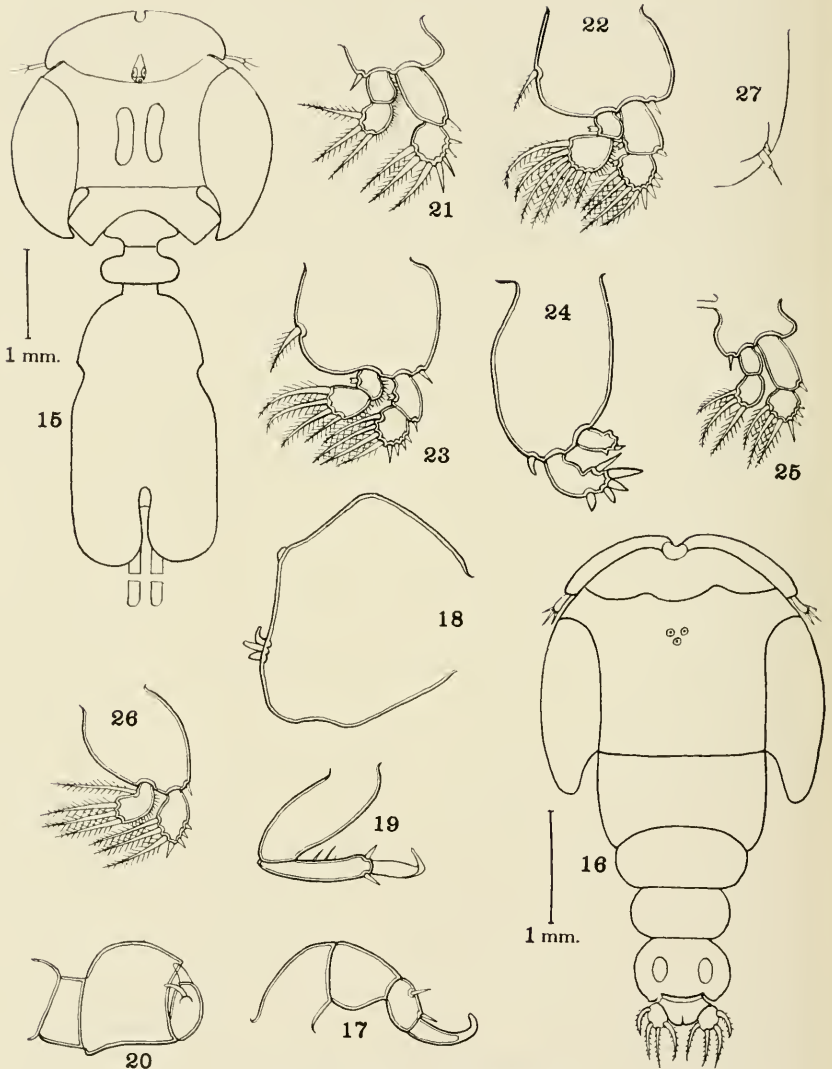
Nesippus crypturus, new male, and *Krøyeria dispar*, n. sp.

- FIG. 28. *Nesippus crypturus*, dorsal view of new male.
 FIG. 29. Second antenna.
 FIG. 30. Maxilliped.
 FIGS. 31-32. First and fourth swimming legs.
 FIG. 33. Maxilliped of male *Nesippus gracilis*.
 FIG. 34. *Krøyeria dispar*, dorsal view of female.
 FIG. 35. Second antenna.
 FIG. 36. First maxilla.
 FIG. 37. Second maxilla.
 FIG. 38. Maxilliped.
 FIGS. 39-42. First, second, third, and fourth swimming legs.



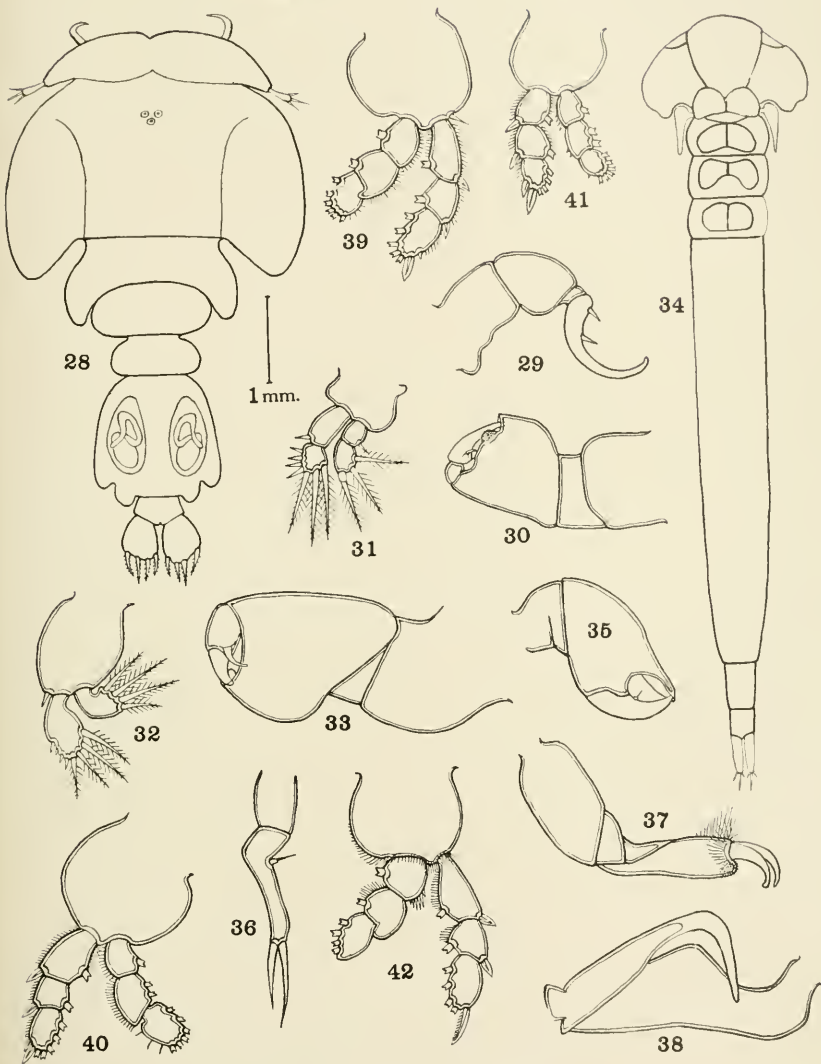
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