SMITHSONIAN MISCELLANEOUS COLLECTIONS
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# NOTES ON SOME AMERICAN FRESH-WATER AMPHIPOD CRUSTACEANS AND DESCRIPTIONS OF A NEW GENUS AND TWO NEW SPECIES

By CLARENCE R. SHOEMAKER

*Assistant Curator, Division of Marine Invertebrates*
*United States National Museum*

Some of the early descriptions of American fresh-water amphipods are so unintelligible and the figures so meager or incorrect that the true status of these species remains in doubt until subsequent authors redescribe and figure them in greater detail from specimens from the type localities. *Stygobromus vitreus,* described by Prof. E. D. Cope from Mammoth Cave, Ky., in 1872, was redescribed and figured by Prof. S. I. Smith in 1888 and placed in the genus *Crangonyx.* I am here describing and figuring this species in greater detail than did Professor Smith and am leaving it in its original genus, *Stygobromus.*

Prof. A. S. Packard in 1881 described *Crangonyx antennatus* from Nickajack Cave, Shellmound, Tenn., and it was later redescribed and figured by Dr. W. P. Hay, who placed it in the genus *Niphargus.* As this genus does not occur in America, I have examined specimens studied by Dr. Hay and find that they belong in the genus *Crangonyx.* I have, therefore, redescribed and figured the species in detail.

Ada L. Weckel in 1907 described a species, *Gammarus caecus,* from a cave in Cuba. The species has ever since remained a mystery and, as it could not, from the structure of the gnathopods, be a *Gammarus,* I have therefore examined her material and find that it is not a *Gammarus,* but represents a new genus, which I am designating *Weckelia.*

In 1931 some amphipods were taken from a slightly brackish pond on the island of Curaçao, which Dr. K. Stephensen [1] placed in a new genus, describing them as *Metaniphargus curasavicus.* The United States National Museum in 1937 received from Harry A. Beatty some amphipods taken on the island of St. Croix, which, upon study, were found to belong to Dr. Stephensen's genus and to represent a new species. I am describing this species as *Metaniphargus beattyi* in honor of its discoverer.

[1] Stephensen, K., Zool. Jahrb. Syst., vol. 64, Nos. 3/5, p. 426, figs. 6-8, 1933.

At the present time there is much active interest in cave explorations, and the cave faunas are receiving their share of attention. As a result, many new and interesting animals are being discovered. Kenneth Dearolf, in 1937 and 1938, while exploring caves in Pennsylvania, collected some rather large amphipods which he sent to the National Museum for identification. These specimens represent a new species which I am describing and naming *Crangonyx dearolfi*.

In 1938 I described the species *Synpleonia pizzini* from the District of Columbia, but gave no figures. I am, therefore, giving a few further notes on this species and adding figures.

New species of American fresh-water Amphipoda are being frequently discovered, and undoubtedly new genera will come to light, so it is scarcely possible at the present time to form a key that will remain effective very long. However, it may prove useful to present in key form our present knowledge of the families and genera of such of these animals as are known to occur in America. I am therefore giving such a key.

The four families *Corophiidae, Talitridae, Haustoriidae,* and *Gammaridae* are represented in the fresh waters of America.

KEY TO THE FAMILIES OF AMERICAN FRESH-WATER AMPHIPODA

1. Body dorso-ventrally depressed; antenna 2 very strongly developed; gnathopod 2 simple; telson very short and entire.....**Corophiidae**
   Body laterally compressed; antenna 2 not strongly developed; gnathopod 2 subchelate; telson entire or cleft.....2
2. Antenna 1 shorter than antenna 2 and without accessory flagellum; mandible without palp; maxilla 1 with small 1-jointed palp; uropod 3 with a single ramus; telson small and entire.....**Talitridae**
   Antenna 1 with accessory flagellum; mandible with palp; maxilla 1 with 2-jointed palp; uropod 3 with or without rami; telson entire or cleft....3
3. Antenna 1 shorter than antenna 2, flagellum in female very short, in fully developed male very long; peraeopod 5 much shorter than 4 with second joint greatly expanded; telson deeply cleft.....**Haustoriidae**
   Antenna 1 either longer or shorter than 2, but with both antennae rather long and slender; accessory flagellum very short, consisting of one or two short joints, or well developed and consisting of from three to seven joints; peraeopods more or less slender with second joint of peraeopods 3 to 5 only moderately expanded; peraeopod 5 longer or very little shorter than 4; telson entire or cleft.....**Gammaridae**

## Family COROPHIIDAE

This family is represented by the genus *Corophium* and the species *C. spinicorne* Stimpson,[2] which, although described from San Fran-

[2] Stimpson, Wm., Boston Journ. Nat. Hist., vol. 6, p. 514, 1857.

cisco Bay, Calif., has been taken from the water supply of the city of San Francisco.

## Family TALITRIDAE

The genus *Hyalella* is the only one of the family occurring in the fresh waters of America. The species *H. azteca* (Saussure),[3] described from Vera Cruz, Mexico, is widely distributed in North and South America, and occurs also in the form *inermis* Smith,[4] which lacks the dorsal teeth. Many species of this genus have been described from South America, but it is very probable that a number of them will prove to be synonyms of *H. azteca*. I have examined specimens of *H. ornata* described by Prof. A. S. Pearse[5] from Vera Cruz, Mexico, and find that it is a synonym of *H. azteca* (Saussure).

## Family HAUSTORIIDAE

This family is represented by the genus *Pontoporcia* and by the species *P. affinis* Lindstrom,[6] which inhabits the cold lakes of the northern United States and Canada. Two species, *P. hoyi*[7] and *P. filicornis*,[8] were described by Prof. S. I. Smith, the former from Lake Superior and the latter from Lake Michigan. He at first believed *P. hoyi* to be identical with *P. affinis* of the Scandinavian lakes, but subsequently decided that it represented a new species. The studies of Sven G. Segerstrale[9] have proved conclusively that *P. hoyi* is identical with *P. affinis* and that *P. filicornis* is the final and mature sexual stage of the male of *P. affinis*. *P. kendalli*, described by Arthur H. Norton[10] in 1909 from a specimen taken in the river below the lock dam in Chamberlain Lake, Me., is also considered by Segerstrale to be a synonym of *P. affinis*. The form *P. filicornis*, described by Adamstone[11] in 1928 from Lake Ontario and Lake Nipigon, is re-

[3] Saussure, Henri de, Mem. Soc. Phys. et Hist. Nat., Genève, vol. 14, p. 474, pl. 5, fig. 33, 1858.

[4] Smith, S. I., Rep. U. S. Geol. Surv. Terr., 1873, p. 609, pl. 1, figs. 1, 2, 1874.

[5] Pearse, A. S., 13th Rep. Michigan Acad. Sci., p. 109, fig. 2, 1911.

[6] Lindstrom, G., Öfv. Akad. Förh., vol. 12, p. 63, 1855.

[7] Smith, S. I., Rep. U. S. Fish Comm., 1872-73, vol. 2, p. 647, pl. 2, fig. 5, 1874.

[8] Idem, p. 649.

[9] Segerstrale, Sven G., Studien über die Bodentierwelt in Sudfinnländischen Kustengewässern III. Zur Morphologie und Biologie des Amphipoden Pontoporeia affinis, nebst einer Revision der Pontoporeia-Systematik. Soc. Scientiarum Fennica. Comm. Biol., vol. 7, No. 1, Helsingfors, 1937.

[10] Norton, A. H., Proc. Portland Soc. Nat. Hist., vol. 2, p. 247, fig. 1, 1909.

[11] Adamstone, F. B., Trans. Amer. Micros. Soc., vol. 47, No. 3, p. 366, pl. 52, 1928.

garded by Segerstrale to be the mature male of a special form of *P. affinis,* and he suggests that it be designated form *brevicornis.*

## Family GAMMARIDAE

Dr. A. Schellenberg has divided the related fresh-water genera of the Gammaridae into two sections, the *Gammarus* section and the *Crangonyx* section. As this family is represented in America by a number of fresh-water genera, I have followed his plan and grouped them under these sections, which may be characterized as follows.

### KEY TO THE SECTIONS OF THE GAMMARIDAE

Antenna 1, accessory flagellum of 3 to 7 joints; gnathopods 1 and 2 subchelate, either very similar or dissimilar, palms when armed bearing only simple spine teeth; urosome segments free and bearing single or groups of dorsal spines; without sternal gills; uropod 3 well developed, inner ramus sometimes greatly reduced; telson cleft to base or nearly so..**Gammarus** section

Antenna 1, accessory flagellum very small, rudimentary or consisting of one long and one short joint; gnathopods 1 and 2 subchelate, usually very similar and much alike in male and female, palms armed throughout with numerous notched spine teeth (except in gnathopod 1 of *Metaniphargus*) ; urosome segments free or coalesced and without groups of dorsal spines; uropod 3 usually reduced and inner ramus, when present, short or scalelike; sternal gills present or absent; telson entire, or slightly or deeply incised

**Crangonyx** section

### KEY TO THE GENERA OF THE GAMMARUS SECTION

1. Coxal gills with cylindrical appendages; gnathopod 1 of male larger than gnathopod 2, palm slightly oblique and armed throughout with many blunt, peglike teeth; uropod 3 with inner ramus very small

**Anisogammarus** [12]

Coxal gills without cylindrical appendages; gnathopod 1 of male smaller than gnathopod 2 ..... 2

2. Gnathopod 1 of male, palm long, very oblique, and armed with only one or two spine teeth in addition to those at palmar angle.....**Gammarus** [13]

Gnathopod 1 of male, palm short, slightly oblique and without true spine teeth .....**Weckelia**

The genus *Anisogammarus* is confined to the Pacific coasts of Asia and North America, the only American fresh-water species so far described being *A. ramellus* (Weckel),[14] recorded from California and Oregon.

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[12] Derjavin, A. N., The Gammaridae of the Kamchatka Expedition, 1908-1909. Russ. Hydrobiol. Zeitschr., vol. 6, Nos. 1-2, p. 8, 1927.

[13] Fabricius, J. C., Syst. Ent., p. 418, 1775.

[14] Weckel, Ada L., Proc. U. S. Nat. Mus., vol. 32, No. 1507, p. 38, 1907.

The genus *Gammarus* is widely distributed over North America and is represented by a number of species, but it does not occur in the West Indies or in South America.

The genus *Weckelia* has been found only in Cuba and it is represented by the single species *Weckelia caeca* (Weckel).

KEY TO THE GENERA OF THE CRANGONYX SECTION

1. Urosome segments coalesced....2
   Urosome segments not coalesced....4
2. Sixth and seventh mesosome segments bearing bifurcate lateral sternal gills **Synpleonia** [15]
   Sixth and seventh mesosome segments bearing simple lateral sternal gills..3
3. Telson entire....**Stygonectes** [16]
   Telson cleft....**Synurella** [17]
4. Uropod 3, peduncle without rami....**Apocrangonyx** [18]
   Uropod 3, peduncle with rami....5
5. Uropod 3, peduncle with one 1-jointed ramus....**Stygobromus**
   Uropod 3, peduncle with two rami, inner ramus short or scalelike....6
6. Uropod 3, outer ramus 2- or several-jointed....7
   Uropod 3, outer ramus 1-jointed....8
7. Coxal gill of gnathopod 2 with cylindrical appendage; palm of gnathopod 1 oblique and not short; inner ramus of uropod 3 very short..**Allocrangonyx** [19]
   Coxal gill of gnathopod 2 without cylindrical appendage; palm of gnathopod 1 slightly oblique and very short; inner ramus of uropod 3 nearly half the length of first joint of outer ramus....**Metaniphargus** [20]
8. Lateral sternal gills of sixth mesosome segment bifurcate; accessory flagellum of antenna 1 rudimentary....**Falklandella** [21]
   Lateral sternal gills of sixth mesosome segment simple; accessory flagellum of antenna 1 2-jointed....9
9. Uropod 3, outer ramus longer than peduncle; first four coxal plates deeper than their segments; lower posterior corners of the second and third metasome segments right-angled or sharply produced....**Crangonyx** [22]
   Uropod 3, outer ramus as long as, or shorter than, peduncle; first four coxal plates shallower than their segments; lower posterior corners of second and third metasome segments broadly rounding....**Bactrurus** [23]

With the exception of the genus *Falklandella,* which was described by Dr. A. Schellenberg from the Falkland Islands off the southeast

[15] Creaser, E. P., Occ. Pap. Mus. Zool., Univ. Michigan, p. 1, 1934.
[16] Hay, W. P., Proc. U. S. Nat. Mus., vol. 25, No. 1292, p. 430, 1902.
[17] Wrzesniowski, A., *in* Hoyer, Zeitschr. Wiss. Zool., Leipzig, vol. 28, p. 403, 1877.
[18] Stebbing, T. R. R., Trans. Linn. Soc. London, ser. 2, vol. 7, p. 422, 1899.
[19] Schellenberg, A., Mitt. Zool. Mus., Berlin, vol. 22, No. 1, p. 33, 1936.
[20] Stephensen, K., Zool. Jahrb., vol. 64, Nos. 3/5, p. 426, 1933.
[21] Schellenberg, A., Zool. Anz., vol. 91, Nos. 1/4, p. 82, figs. 1 and 7, 1930.
[22] Bate, Spence, Proc. Dublin Univ. Zool. Bot. Assoc., vol. 1, p. 237, 1859.
[23] Hay, W. P., Proc. U. S. Nat. Mus., vol. 25, No. 1292, p. 430, 1902.

coast of South America, and the genus *Metaniphargus* described by Dr. K. Stephensen from the island of Curaçao and now recorded from the island of St. Croix, all the genera of the *Crangonyx* section are confined to North America, but the genus *Crangonyx* occurs also in Europe, and the genus *Synurella* occurs also in Europe and Asia.

### STYGOBROMUS Cope, 1872

The genus *Stygobromus* was described by E. D. Cope in 1872 from specimens taken in Mammoth Cave, Ky., but his descriptions of the genus and the genotype, *S. vitreus,* were so unintelligible that subsequent students were not able to recognize the animal until S. I. Smith, in 1888, redescribed the species from specimens procured from the type locality, placing it, however, in the genus *Crangonyx.* Smith believed that *Stygobromus* was a synonym of *Crangonyx,* as Bate had erroneously described the third uropods of *Crangonyx* as uniramous.

In 1873 A. S. Packard[24] examined specimens from three wells in Orleans, Ind., and identified them as *Crangonyx vitreus.* S. I. Smith in 1875 examined Packard's specimens from the wells in Orleans and found them to be very different from Mammoth Cave specimens, stating that they were closely allied to *Crangonyx gracilis* from Lake Superior.

Dr. W. P. Hay, in 1897, in speaking of the Crustacea of the caves of Indiana, said that *Crangonyx vitreus* was represented in the collection by nearly a dozen small specimens which were taken from a wooden trough in Salt Petre Cave, Crawford County. In 1902[25] Hay said, "This species [*Crangonyx vitreus*] was observed in considerable numbers in Mammoth Cave, both in its type locality, Richardson's Spring, and in the Roaring River district in small pools."

Ada L. Weckel in 1907 gave a short description and figures of *Crangonyx vitreus,* which were made from specimens that were sent to her from the United States National Museum under the name *Crangonyx vitreus* Packard. In 1905 Prof. S. J. Holmes figured *Crangonyx vitreus* from specimens which were sent to him from the United States National Museum, but the specimens were evidently incorrectly identified, as his figures do not represent that species.

In 1913 Prof. A. S. Pearse recorded *Crangonyx vitreus* from a creek 80 miles north of Rampart House, Alaska. As this locality was

[24] Packard, A. S., 5th Ann. Rep. Peabody Acad. Sci., p. 95, 1873.

[25] Hay, W. P., Proc. U. S. Nat. Mus., vol. 25, No. 1285, p. 225, 1902.

so much farther north than any previous record and as the specimens were from a creek, I wished to examine them, but they could not be located at the museum of the University of Michigan. In 1917 Professor Pearse reported the species from a well at Randolph, Wis.

Dr. A. Schellenberg in 1936 recognized *Stygobromus,* giving a short characterization of the genus, and including in it the species *S. vitreus* Cope, *S. bifurcus* (Hay) and *S. putealis* (Holmes).

I have examined specimens of *Stygobromus* from Richardson's Spring, Mammoth Cave, Ky., and the characters of the genus may be given as follows: Blind. Antenna 1 longer than antenna 2. Accessory flagellum of antenna 1 2-jointed. Gnathopods 1 and 2 subchelate, 2 stronger than 1. Coxal plate 4 somewhat excavate behind. Second joints of peraeopods 3 to 5 moderately expanded. Mandible, molar well developed; cutting edge toothed; accessory plate well developed; three spines in spine row; palp short and stout, second and third joints subequal in length. Maxilla 1, inner plate bearing a few plumose setae; outer plate armed with seven serrate spine teeth; palp 2-jointed and bearing apical spines and setae. Maxilla 2, inner plate wider than outer and bearing an oblique row of plumose setae. Maxillipeds with inner and outer plates well developed; inner plate as long as, or longer than, outer and bearing two serrate spine teeth; outer plate without marginal teeth; palp 4-jointed, short and stout. Lower lip with mere suggestion of inner lobes; lateral lobes large and bluntly rounding. Simple stalked coxal gills and simple sternal gills present. Uropod 3 uniramous, ramus 1-jointed and shorter than peduncle. Telson short, about as long as wide, and distally slightly excavate or entire.

### STYGOBROMUS VITREUS Cope

FIGURES 1, 2

*Stygobromus vitreus* COPE, 1872, Amer. Nat., vol. 6, p. 422.
*Crangonyx vitreus* SMITH, 1874, Rep. U. S. Fish Comm., 1872-73 [1874], p. 656.
*Crangonyx vitreus* SMITH, 1875, Amer. Journ. Sci. and Arts, ser. 3, vol. 9, p. 476.
*Crangonyx vitreus* SMITH, 1888, Mem. Nat. Acad. Sci., vol. 4, pt. 1, p. 34, pl. 5, figs. 1-4.
*Crangonyx vitreus* HAY, 1897, Indiana Dep. Geol. and Nat. Res., 21st Ann. Rep., p. 206.
*Crangonyx vitreus* HAY, 1902, Proc. U. S. Nat. Mus., vol. 25, No. 1285, p. 225.
*Crangonyx vitreus* HAY, 1902, Proc. U. S. Nat. Mus., vol. 25, No. 1292, p. 429.
*Crangonyx vitreus* WECKEL, 1907, Proc. U. S. Nat. Mus., vol. 32, No. 1507, p. 49, fig. 13.
*Crangonyx vitreus* BANTA, 1907, The Fauna of Mayfields Cave, Ind., p. 80.
*Crangonyx vitreus* PEARSE, 1913, Occ. Pap. Mus. Zool., Univ. Michigan, No. 1, p. 3.

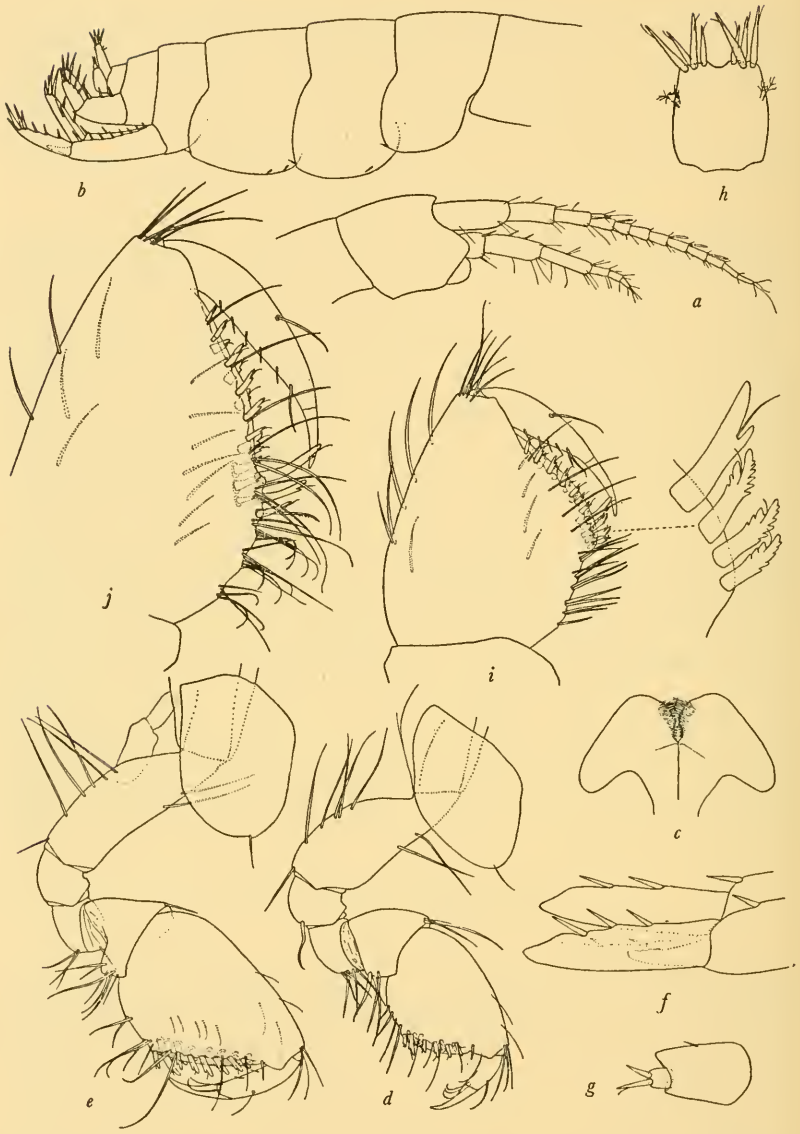


FIG. 1.—*Stygobromus vitreus* Cope. Male from Richardson's Spring, Mammoth Cave, Ky.: *a*, head and antennae; *b*, hind end of animal; *c*, lower lip; *d*, gnathopod 1; *e*, gnathopod 2; *f*, uropod 1; *g*, uropod 3; *h*, telson. Female from Buzzards Cave, Crystal Cave, Mammoth Cave, Ky.: *i*, gnathopod 1; *j*, gnathopod 2.


FIG. 2.—*Stygobromus vitreus* Cope. Male from Richardson's Spring: *a*, mandible; *b*, maxilla 1; *c*, maxilla 2; *d*, maxillipeds; *e*, peraeopod 1; *f*, peraeopod 2; *g*, peraeopod 3; *h*, peraeopod 4; *i*, peraeopod 5.

*Crangonyx vitreus* PEARSE, 1917, Occ. Pap. Mus. Zool., Univ. Michigan, No. 46, p. 8.
*Stygobromus vitreus* SCHELLENBERG, 1936, Mitt. Zool. Mus., vol. 22, No. 1, p. 37.

*Male.*—Head rather long; side lobe angularly produced and with narrowly rounding apex; without eyes. Antenna 1, peduncular joints successively shorter; flagellum very little longer than peduncle and composed of about nine joints, some of which carry slender sensory clubs; accessory flagellum shorter than first joint of primary flagellum and composed of two joints. Antenna 2 about half the length of antenna 1; fifth peduncular joint very little shorter than fourth; flagellum about as long as fifth peduncular joint and composed of about four joints.

Right mandible short, with about five teeth on cutting edge; accessory plate with 3-pronged cutting edge; three spines in spine row; molar rather prominent and bearing seta at inner corner; palp short and stout, second joint very little longer than third. Maxilla 1, inner plate with four plumose setae on the obliquely truncate distal margin; outer plate with seven serrate spine teeth; palp with four slender spines and one seta on distal edge, and fine setules on outer margin. Maxilla 2, inner plate wider, but slightly shorter than outer and bearing an oblique row of four plumose setae near inner margin; outer plate with the usual distal spines, and with fine setules on outer margin. Maxillipeds short and stout, inner plate narrower but a little longer than outer, armed distally with two serrate teeth and a few short spines; outer plate with inner distal angle slightly produced, inner margin without teeth but bearing a submarginal row of about seven spines; palp short and stout and bearing rather few spines, outer margin of third joint equal in length to outer margin of second, fourth joint bearing a long slender nail at the base of which are two spinules. Lower lip without inner lobes, side lobes large and broadly rounding distally.

Gnathopod 1 shorter than, and not as stout as, gnathopod 2, second joint a little longer than the sixth; fifth joint about half the length of sixth; sixth joint about a third longer than wide with front and hind margins slightly convex, palm oblique, slightly convex, about as long as hind margin of joint, defined by an evenly rounding curve, and armed on outside and inside margins with a few notched spine teeth; seventh joint fitting palm and bearing a long nail and several setae. Gnathopod 2, second joint about as long as sixth joint; fifth joint less than half the length of sixth; sixth joint, palm oblique, slightly convex, slightly longer than hind margin of joint, defined by a blunt angle, and armed on outside and inside margins with eight

notched spine teeth; seventh joint fitting palm and bearing a long nail and several setae.

Peraeopods 1 and 2 equal in length and bearing very few spines, which are placed singly and not in groups; nail of seventh joint very long. Peraeopod 3 about as long as 2; second joint almost as wide as long, lower hind lobe dipping very slightly; remaining joints rather short and stout; seventh joint short with prominent nail. Peraeopods 4 and 5 about equal in length and longer than 3; second joint considerably expanded with lower hind lobe dipping very little; seventh joint proportionately longer than in peraeopod 3.

Uropod 1 extending farther back than 2, peduncle produced distally below into a long narrow process, rami subequal in length and much shorter than peduncle. Uropod 2, peduncle armed above with three spines, outer ramus shorter than inner which is very little shorter than peduncle. Uropod 3 scarcely reaching end of telson, ramus about one-quarter as long as peduncle and armed distally with two spines. Telson nearly as wide as long, distal margin with a very shallow central excavation; each lobe armed with four spines, and either lateral margin bearing two plumose setules. Length, about 4 mm. Mesosome segments 2, 3, and 4 each bearing a single, cylindrical, median sternal gill. Mesosome segments 6 and 7 each bearing a pair of lateral sternal gills. Mesosome segment 7 is without coxal gills. The gill arrangement of the two sexes is alike.

*Female.*—Palm of gnathopod 1 bears at the rounding defining angle a long stout spine beyond which are three shorter spines which are both notched and serrate. Palm of gnathopod 2 bears at the defining angle a long stout spine, beyond which are two shorter spines which are notched only.

### WECKELIA, new genus

In 1907 Ada L. Weckel described the species *Gammarus caecus* from Modesta Cave, near Cañas, Cuba. Her description is very incomplete and she figures only the antennae and gnathopods. As Dr. A. Schellenberg has already remarked, the species could not possibly belong to the genus *Gammarus* from the character of the first gnathopods alone. I have examined the original fragmentary specimens and have formed a new genus for the reception of the species, which I here designate as *Weckelia* in honor of Miss Weckel, who most usefully, in 1907, brought together in one publication all the genera and species of fresh-water amphipods known at that time in North America.

The genus *Weckelia* may be characterized as follows: Without eyes. First antenna longer than second, with flagellum much longer than peduncle. Accessory flagellum of several joints. Second antenna with flagellum shorter than peduncle; gland cone prominent. Mandible with molar well developed; accessory plate present; several spines in spine row; palp reduced to one small joint. First maxilla, inner plate broad, bearing 12 or 13 plumose setae; outer plate bearing 9 spine teeth; palp 2-jointed. Second maxilla, inner plate a little wider than outer and bearing an oblique row of plumose setae. Maxilliped, inner plate armed distally with three spine teeth; outer plate bearing a row of spine teeth on inner margin; palp 4-jointed. Lower lips with inner lobes very small and indistinct; lateral lobes prominent. First gnathopod, in female, with fifth joint longer and wider than sixth; sixth joint narrow, with palm short and slightly oblique. Second gnathopod in female larger than first; fifth joint shorter, but wider than sixth; sixth joint narrowing distally and with palm very oblique. Coxal plates 1 to 4 much deeper than their segments, fourth excavate behind. Pleopods well developed. Urosome segments free, second segment bearing a single dorsolateral spinule on either side. Third uropods missing. Telson cleft to base, with lobes widely dehiscent. Gills simple. No sternal gills discernible.

*Genotype.*—*Gammarus caecus* Weckel.

### WECKELIA CAECA (Weckel)

FIGURES 3, 4

*Gammarus caecus* WECKEL, 1907, Proc. U. S. Nat. Mus., vol. 32, p. 47, fig. 12.

*Female.*—Head, lateral lobes rather small with evenly rounding lower corner. Antenna 1, second joint longer than first; third joint over one-third the length of second, flagellum composed (according to Weckel) of 20 to 30 joints; accessory flagellum 4-jointed, the last joint very small. Antenna 2 (according to Weckel) about two-thirds the length of antenna 1; fifth joint a little shorter than fourth; flagellum of about 13 joints. Mandible, molar well developed with a plumose seta on right but not on left molar; cutting edge toothed; accessory plate simple with toothed cutting edge; five spines in spine row; palp very small and consisting of only a single joint bearing apically two setae. Maxilla 1, inner plate very well developed, with the oblique edge bearing 12 or 13 plumose setae and a row of simple spinules; outer plate armed with 9 spine teeth; palp, second joint bearing distally an oblique row of about 8 short spines submarginal to which is an oblique row of 5 slender spinules. Maxilla 2, inner

plate with diagonal row of closely set plumose setae which curves inward considerably at the distal end. Maxillipeds, inner plate about as long as outer plate, bearing three spine teeth on distal margin and (in the specimen figured) two smaller teeth on the upper inner margin; outer plate armed with about five to seven spine teeth on inner margin; palp, fourth joint curved, bearing fine setules on inner edge and a short nail apically.

Gnathopod 1, coxal plate with side margins nearly parallel, lower corners evenly rounding and hind corner bearing two short spines; fifth joint longer and wider than sixth, expanded distally with the lower margin bearing a group of spines and a brush of very fine setules; sixth joint about twice as long as wide, slightly expanded distally, and bearing a few groups of spines; palm slightly oblique, convex, bearing a row of four submarginal spines on outside and five on inside; seventh joint curved and fitting palm. Gnathopod 2, coxal plate slightly expanded distally, lower margin evenly convex with the rounding hind corner bearing two or three short spines; fifth joint more expanded proportionately than that of gnathopod 1, but similarly armed; sixth joint widest proximally, palm very oblique with a slight concavity toward the long defining spine, bearing five or six submarginal spines on the outside, and merging imperceptibly into the convex hind margin of joint; hind margin bearing two groups of spines; seventh joint strong, slightly curved, and as long as palm.

Peraeopods 1 and 2 slender and much alike, seventh joint slightly curved and bearing a seta at the base of the nail. Peraeopods 3 to 5 much alike, second joint considerably expanded, front margin bearing short spines and the hind margin serrate with a seta at each serration; lower portion of all peraeopods missing. Coxal plate 3, lower margin convex and bearing two short spines at the rounding hind corner. Coxal plate 4, lower margin convex and bearing a few setules but no spines. Coxal plate 5 with hind lobe the deeper.

Metasome segment 1 with lower margin produced into two small teeth; segments 2 and 3 with lower hind angle scarcely at all produced, lower margins bearing one or two spinules, and hind margin bearing a single setule just above the lower angle. Pleopods all well developed. Urosome segment 2, hind margin with a subdorsal spine on either side. Uropod 1 bearing a prominent spine on lower margin of peduncle near the base; rami imperfect. Uropod 2, outer ramus equal in length to peduncle, inner ramus longer than outer. Weckel says that in uropods 1 and 2 the rami are about equal in length, but this apparently is not correct. Uropod 3 missing. Telson is about twice as wide as long, cleft to base with lobes very widely separated,


FIG. 3.—*Weckelia cacca* (Weckel). Female: *a*, front of head; *b*, antenna 1; *c*, antenna 2; *d*, mandible; *e*, mandibular palp; *f*, gnathopod 1; *g*, end of sixth joint of gnathopod 1 greatly enlarged; *h*, gnathopod 2; *i*, peraeopod 2; *j*, metasome segments; *k*, urosome and uropods 1 and 2; *l*, urosome segments 2 and 3 showing one of the dorsolateral spines; *m*, telson.


FIG. 4.—*Weckelia caeca* (Weckel). Female: *a*, maxillipeds; *b*, maxilla 1; *c*, maxilla 2; *d*, lower lip; *e*, coxal plate 3; *f*, coxal plate 5; *g*, peraeopod 3; *h*, peraeopod 4; *i*, peraeopod 5.

each lobe armed apically with two short spines and a plumose setule, and the lateral margins each bearing two plumose setules near the distal end. Length of female about 10 mm.

*Remarks.*—The specimen that I have figured and described is a female. Miss Weckel's figures and description are said to be of a male, and if this is correct the sexes are apparently alike.

### CRANGONYX ANTENNATUS Packard

FIGURES 5, 6

*Crangonyx antennatus* PACKARD 1881, Amer. Nat., vol. 15, p. 880, fig. 2; 1888, Mem. Nat. Acad., vol. 4, p. 36, figs.

*Eucrangonyx antennatus* STEBBING 1899, Trans. Linn. Soc. London, ser. 2, vol. 7, p. 423.

*Niphargus antennatus* W. P. HAY, 1902, Proc. U. S. Nat. Mus., vol. 25, p. 430, figs. 6 and 11; Weckel 1907, Proc. U. S. Nat. Mus., vol. 32, p. 36, fig. 6.

Professor Packard described this species from Nickajack Cave, Tenn., but, as was so often the case with early descriptions and figures, his description was not accurate enough for the recognition of the species. Dr. W. P. Hay in 1902 redescribed and figured the species from specimens which he took at various places in Nickajack Cave, and, believing that the outer ramus of the third uropods possessed a small second joint, placed the species in the genus *Niphargus*. Ada L. Weckel in 1907 redescribed and figured the species, but added nothing of importance. She followed Hay in figuring and describing the outer ramus of the third uropod as consisting of two joints, and retained the species in the genus *Niphargus*.

Recently I examined specimens of this species which were taken by Dr. Hay in Nickajack Cave and find that it is a *Crangonyx,* as it agrees with this genus in all characters. The outer ramus of the third uropod is considerably constricted at the last group of lateral spines which gives somewhat the appearance of forming a short second joint.

Packard gives the length of the species as 6 to 7 mm. Hay does not give the length of his specimens. Weckel, who presumably used specimens collected by Hay for study, gives the length as 10 mm. The largest specimens which I measured were about 8.5 mm.

*Female.*—Head rather long with prominent side lobes which have evenly rounding corners. No eyes were discernible in the specimens examined, but Packard and Hay figure very small, slightly pigmented eyes. Antenna 1 long; first joint of peduncle slightly shorter than the second, which is twice the length of the third. Antenna 2 short;

fourth joint slightly longer than fifth; flagellum about the length of the fifth peduncular joint and composed of eight joints.

Mandible with molar rather prominent; accessory plate with double serrate edge; eight spines in spine rows; palp with second and third joints about equal in length. Maxilla 1, inner plate with seven plumose setae; outer plate with seven serrate spine teeth; palp armed distally with six spines and several setae. Maxilla 2, inner plate wider than, but equal in length to, outer plate and bearing an oblique row of eight submarginal plumose setae. Maxilliped, inner plate a little longer than outer and armed distally with two teeth and a few setae; outer plate reaching to about the first third of the second joint of palp, bearing only short slender spines on inner margin and a few longer spines distally; palp rather short and stout; fourth joint slender and bearing a prominent nail. Lower lip with slight indications of inner lobes; side lobes very prominent. Coxal plates 2 to 4 are perhaps slightly deeper than their segments and broadly rounding below. Coxal plate 4 deeper than long. Packard speaks of the fourth plate being large and square, but it is no larger than is normal for the genus.

Gnathopod 1, second joint very little longer than the sixth; fifth joint a little over half the length of the sixth and bearing five groups of spines on the broadly rounding lower margin; sixth joint with palm oblique, slightly convex, defined by a stout spine beyond which is a short spine, and slightly longer than hind margin of joint; seventh joint fitting palm and bearing a few setae on inner edge. Gnathopod 2, second joint equal in length to sixth; fifth joint a little over half the length of the sixth and bearing on the broadly rounding lower margin five groups of spines; sixth joint twice as long as wide, palm very oblique, slightly convex, longer than the hind margin of joint and defined by a stout spine; seventh joint fitting palm and bearing a few short setae on the inner edge.

Peraeopods 1 and 2 subequal in length and much alike; seventh joint bearing a prominent nail at the base of which are two setae. Peraeopods 3 to 5 much alike in size and shape; second joint moderately expanded, oval, with lower hind margin forming a shallow lobe.

Metasome segments 1 to 3 with lower hind corner very slightly produced and lower margins bearing a few spinules. Uropod 1 extending back a little farther than 2, and uropod 2 a little farther than 3. Uropod 3, peduncle two-thirds the length of outer ramus; inner ramus bearing a single spine. Telson reaching to about the end of peduncle of uropod 3, cleft for about half its length with lobes widely separated and each lobe bearing three apical spines.

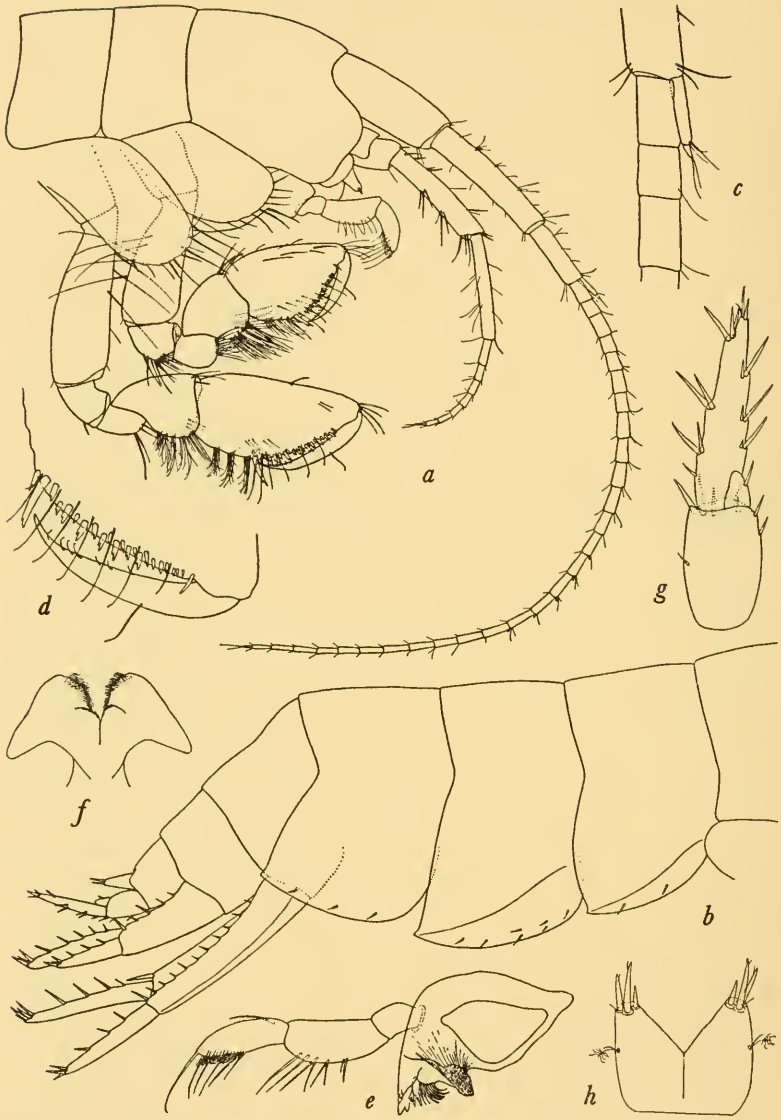


FIG. 5.—*Crangonyx antennatus* Packard. Female: *a*, anterior end of animal; *b*, posterior end of animal; *c*, accessory flagellum greatly enlarged; *d*, palm of gnathopod 1 greatly enlarged; *e*, mandible; *f*, lower lip; *g*, uropod 3; *h*, telson.

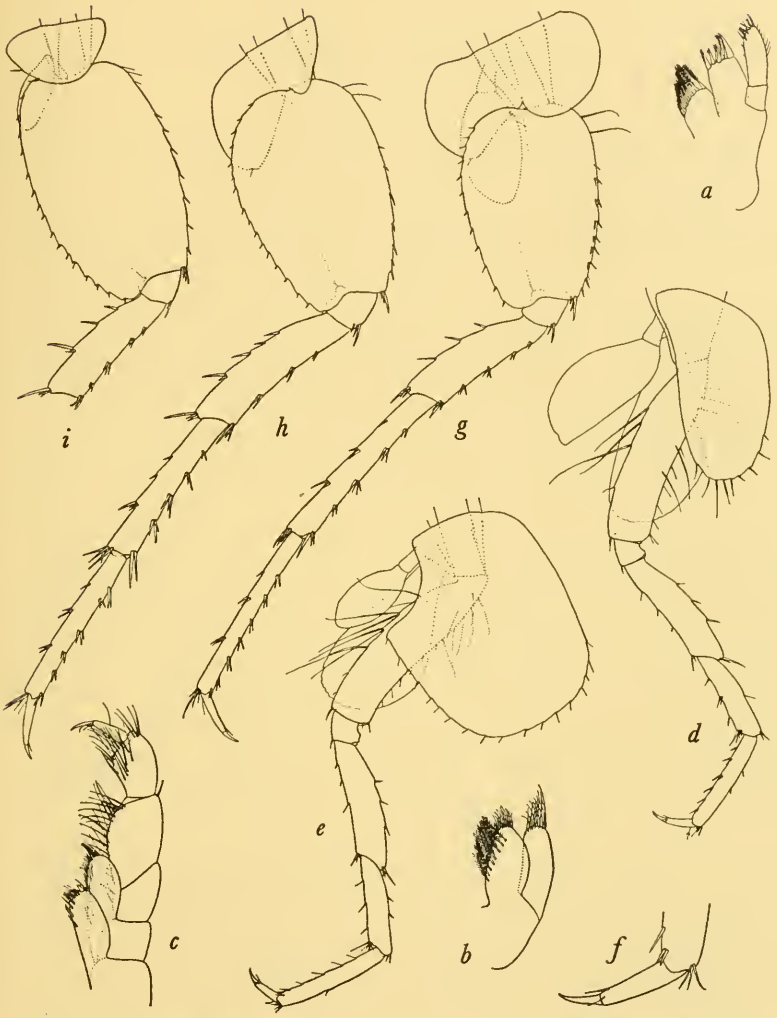


FIG. 6.—*Crangonyx antennatus* Packard. Female: *a*, maxilla 1; *b*, maxilla 2; *c*, maxilliped; *d*, peraeopod 1; *e*, peraeopod 2; *f*, seventh joint of peraeopod 2 greatly enlarged; *g*, peraeopod 3; *h*, peraeopod 4; *i*, peraeopod 5.

Mesosome segments 1 and 2 each bearing a simple, cylindrical, median sternal gill and mesosome segments 6 and 7 and metasome segment 1 each bearing a pair of simple lateral sternal gills. Length of female, from front of head to end of uropod 1, 8.5 mm.

### CRANGONYX DEAROLFI, new species

FIGURES 7, 8

*Male.*—Head with side lobes prominent and rounding. Eye small, indistinct, consisting of only a few elements, and with very little color. Antenna 1 about one-half the length of the body; first and second joints about equal in length, third joint half the length of the second; flagellum much longer than peduncle, and consisting of from 25 to 33 joints, accessory flagellum consisting of 1 long and 1 very short joint. Antenna 2 much shorter than 1, fifth joint a little shorter than the fourth; flagellum short and consisting of from 9 to 12 joints; fourth and fifth joints of peduncle and the joints of the flagellum, except the distal few, bear club-shaped sense organs.

Maxillipeds with inner lobes longer and broader than outer; inner lobes armed distally with four stout spine teeth and three or four setae, two smaller spines at inner distal corner, and three spines on the oblique inner margin; outer lobe with narrowly rounding apex, inner margin armed with five or six spine teeth and marginal setae; palp stout, third joint bearing a short distal lobe, fourth joint bearing a minute nail and a few marginal setules. Maxilla 1 with inner lobe rounding and bearing three or four plumose setae; outer lobe armed with seven spine teeth which are distally serrate; palp armed distally with seven slender spines and a few setae. Maxilla 2, inner lobe broader than outer, and bearing an oblique row of three submarginal plumose setae. Right mandible with 3 or 4 teeth on the cutting edge; accessory plate strongly toothed; 9 or 10 spines in spine row; molar long and concave and bearing fine teeth only on the lower margin; palp with third joint little shorter than second. Lower lip with inner lobes small and rather poorly defined, both inner and outer lobes bearing fine setae but no spine teeth.

Gnathopod 1, palm quite oblique, convex, armed with about 12 notched spine teeth between which are scattered smaller teeth, and defined by a very slight rounding angle. The curve of the defining angle is armed with a row of six short closely set curved marginal spines, and opposite these is a similar row of submarginal bifurcate spines on the inside surface. Some of the smaller marginal spines nearer the hinge of the seventh segment are rather complex, bearing

distally three or four sharp teeth and a seta. The hind margin of the sixth joint bearing several rows of setae, and the front margin several groups of setae. The seventh joint is of the same length and curvature as palm; inside margin bearing very fine setules, and the outer margin bearing longer ones. Gnathopod 2 much stouter than 1, with the very oblique, slightly convex palm nearly twice the length of the hind margin of the joint. Palm armed with about 12 notched spines between which are scattered smaller notched spines; the low, rounding defining angle bearing a long notched spine; 3 stout submarginal spines on inside surface of joint opposite the defining angle. Rear margin of joint bearing several groups of setae and the front margin with a few scattered setae. Seventh joint the length and curvature of palm, armed on inner margin with fine setules and on the outer margin with several longer ones.

Peraeopods 1 and 2 about equal in length and much alike in shape and armature; seventh joint bearing small nail and four setae on inner margin. Peraeopod 4 longer than 3 or 5 which are subequal in length. Hind margin of the second joint of peraeopods 3 and 5 is evenly convex, but that of 4 is nearly straight for the lower two-thirds. The seventh joint of peraeopods 3 to 5 bears four setae on the inner margin.

The first coxal plate is about twice as deep as wide; front margin concave with narrowly rounding lower front angle; lower margin evenly rounding without any posterior angle and sparsely beset with short setae. Second coxal plate longer than the first with lower margin evenly rounding and bearing a few short setae. Third coxal plate very much like the second. These first three coxal plates bear on the lower margin a group of three closely set setae which are about twice the length of the rest. The fourth coxal plate is nearly as wide as deep with short setae throughout the lower and hind margins, but without the group of three longer setae.

The three metasome segments with their lower posterior angles slightly produced, though in the male specimen that I have designated as the type the lower posterior corner of the third segment is rather evenly rounding with only a mere suggestion of the angle, but this undoubtedly is only an individual variation. The lower margins of segments 2 and 3 bear a row of short spines with a few spinules higher up. In the specimen figured the hind margin of segment 1 bears one setule, and that of segment 2 bears two setules, while that of segment 3 bears only one which is placed in a shallow notch.

Uropod 1 extending farther back than 2, and uropod 3 not extending back as far as 2. Uropod 2 possesses the sexual variation which

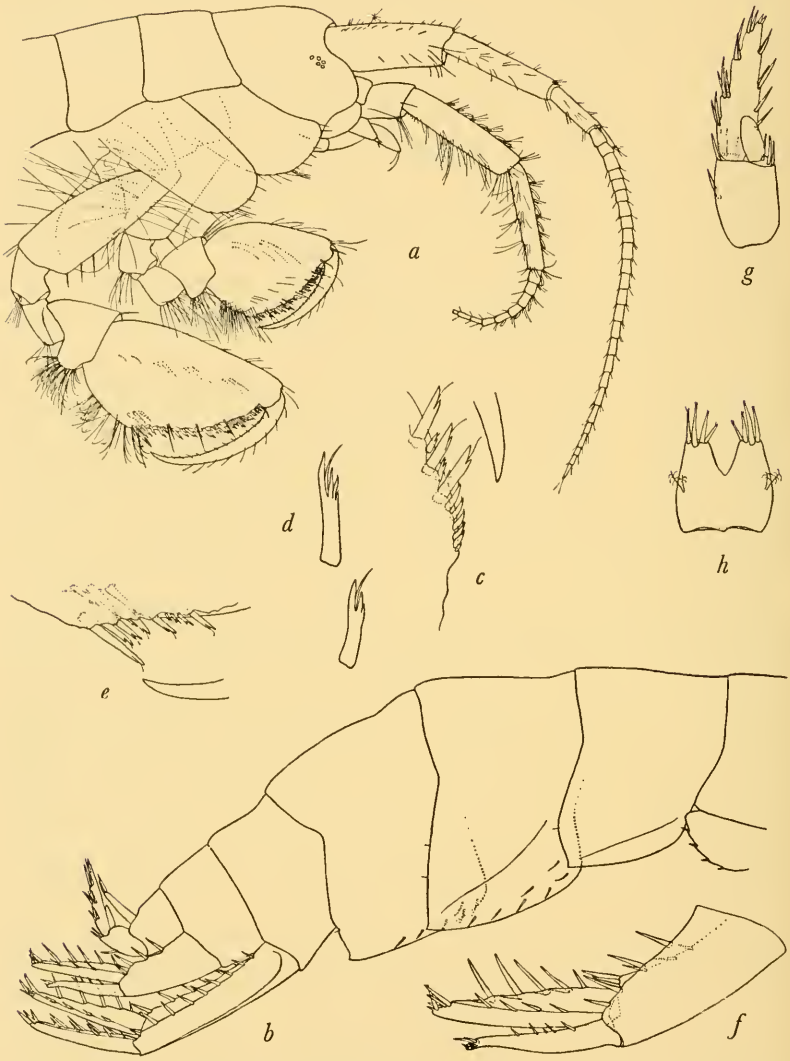


FIG. 7.—*Crangonyx dearolfi*, new species. Male: *a*, anterior end of animal; *b*, posterior end of animal; *c*, part of gnathopod 1 greatly enlarged; *d*, two of the palmar spines greatly enlarged; *e*, part of palm of gnathopod 2 greatly enlarged; *f*, uropod 2; *g*, uropod 3; *h*, telson.

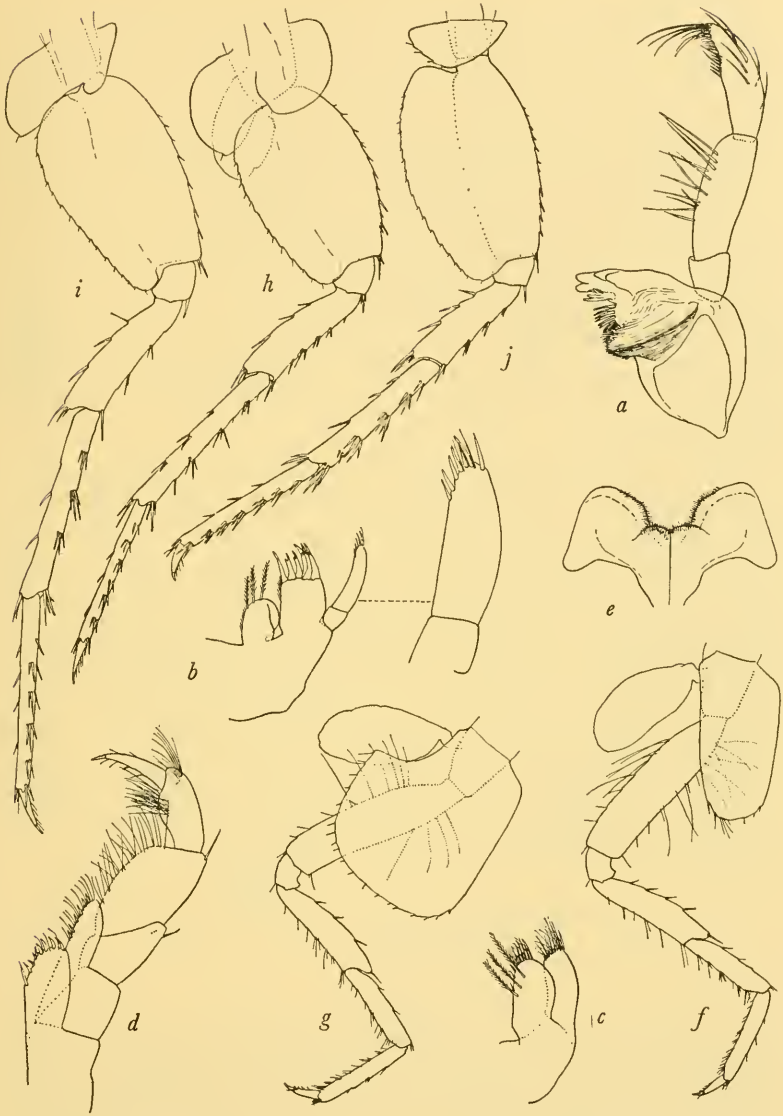


FIG. 8.—*Crangonyx dearolfi*, new species. Male: *a*, mandible; *b*, maxilla 1; *c*, maxilla 2; *d*, maxilliped; *e*, lower lip; *f*, peraeopod 1; *g*, peraeopod 2; *h*, peraeopod 3; *i*, peraeopod 4; *j*, peraeopod 5.

is usual in the genus *Crangonyx*. The outer ramus which is shorter and weaker than the inner ends in a narrowly rounding lobe which has a tendency to bend downward. The peduncle, which is equal in length to the inner ramus, bears four stout spines on outer margin, and five on the inner margin, the three at the distal corner being placed together. The outer ramus is armed on the outer edge with four slender spines, on the inner edge with two or three short spinules, and at the apex with a group of two long and three short spines. The inner ramus is armed on the inner margin with five stout spines, on the outer margin with four slenderer spines and distally with the normal group of spines. Uropod 3, peduncle about two-thirds the length of the outer ramus, which bears three groups of spines on the outer margin, four on the inner margin, and two short spines apically; inner ramus about one-third the length of the outer and without spines.

Telson reaching to about the middle of the inner ramus of uropod 3, as wide as long, cleft almost to center, a group of two plumose setae on lateral margins, and the lobes armed distally with four stout spines.

The second and third mesosome segments each bearing a single median cylindrical sternal gill. The sixth and seventh mesosome segments with the usual simple saclike lateral sternal gills and the first metasome segment with a pair of lateral sternal gills. The coxal gills of the last pair of peraeopods are not attached to the inside surface of the coxae, as is normally the case, but arise from the inside surface of the second joint near the upper margin. Length, male, 15 or 16 mm.

*Type*.—A male from Hobo Cave, Wernersville, Berks County, Pa., July 28, 1938, collected by Kenneth Dearolf, U.S.N.M. No. 78266.

Length of largest female from Hobo Cave, 22 mm.

### METANIPHARGUS BEATTYI, new species

FIGURE 9

In 1933 Dr. K. Stephensen (Zool. Jahrb., vol. 64, Nos. 3/5, p. 426, 1933) established the genus *Metaniphargus* from specimens which had been found "in a small pond, lately covered, at the well, at the border of the calcareous area" at Bak Ariba (Hato), Curaçao, in June 1931. It was of great interest to me, upon examining specimens taken from a well at Frederiksted, St. Croix, Virgin Islands, in 1937 by Mr. H. A. Beatty, to find that they belonged to the same genus as the specimens from Curaçao. Upon dissection and study, they proved, however, to represent a new species, which I now designate *Metaniphargus beattyi* in honor of Harry A. Beatty, an ardent collector who


FIG. 9.—*Metaniphargus beattyi*, new species. Male: *a*, anterior end of animal; *b*, accessory flagellum greatly enlarged; *c*, posterior end of animal; *d*, inner plate of maxilla 1; *e*, maxilliped; *f*, lower lip; *g*, distal end of gnathopod 1 greatly enlarged; *h*, distal end of gnathopod 2 greatly enlarged; *i*, seventh joint of peraeopod 2 greatly enlarged; *j*, distal end of peraeopod 3 greatly enlarged; *k*, peraeopod 4; *l*, peraeopod 5; *m*, pleopod 3; *n*, uropod 3; *o*, end of outer ramus of uropod 3; *p*, telson. Female: *q*, uropod 3.

has given many fine specimens of Crustacea to the United States National Museum.

*Male.*—Head, lateral lobes rather shallow and rounding; eyes absent. Antenna 1 nearly as long as body, first joint about equal in length to the second which is over twice as long as third; flagellum about twice as long as peduncle, and composed of about 26 joints, the distal third of which bear club-shaped sense organs; accessory flagellum composed of 1 long and 1 very short terminal joint, and not as long as the first joint of primary flagellum. Antenna 2 perhaps a little over half the length of antenna 1, fourth and fifth joints about equal in length, flagellum shorter than the peduncle and composed of about 11 joints which are without sense organs.

Right mandible as figured by Stephensen for *M. curasavicus*. Left mandible, first spine of spine row with distal end expanded, the following spines curved and plumose; molar without seta. Maxilla 1, inner plate broad and bearing 15 plumose setae; Dr. Stephensen says that in *M. curasavicus* the inner plate is narrow with 3 apical setae, which is very different from the present species. Maxilla 2 as figured by Stephensen for *M. curasavicus*. Maxilliped, inner plate a little shorter than outer and armed on distal margin with two spine teeth and a row of plumose spines; outer plate reaching nearly to the end of the second palp joint, and armed on the upper inner margin with a row of closely set spine teeth; third joint of palp nearly as long as second; fourth joint bearing nail and a row of very fine setules.

Gnathopod 1, fourth joint armed on the hind margin with a long, curved serrate spine; fifth joint longer but very little wider than sixth; sixth joint not quite twice as long as wide, palm transverse, slightly convex and very finely dentate, passing into the hind margin of joint by an evenly rounding curve which bears three notched spines; seventh joint as long as palm, but not fitting against it closely. Gnathopod 2 considerably stronger than 1, fifth joint shorter but about as wide as sixth; sixth joint long and oval, palm very oblique and passing gradually into the hind margin of joint, defined by two stout spines and a group of long slender spines, armed on outside margin with about seven notched spines and on the inside margin with five or six; seventh joint as long as the palm and fitting snugly against it when closed.

Peraeopods 1 and 2 slender and alike in size and structure; seventh joints straight and bearing two setae at the base of the short nail. Peraeopod 3 with second joint only moderately expanded as in *M. curasavicus;* seventh joint slender, very slightly curved, and bearing two setae at the base of the short nail. Peraeopods 4 and 5

have the fifth to seventh joints missing in all specimens, but the second, third, and fourth joints resemble those of peracopod 3. Coxal plates 1 to 5 about as deep as their segments, fourth not excavate behind; fifth as deep as fourth and with front lobe much deeper than hind lobe.

Metasome segments each with lower hind corner minutely produced. Uropod 1 reaching back slightly farther than 2, peduncle longer than rami and bearing a stout spine on lower margin about a third the distance from the base; outer ramus shorter than inner. Uropod 2, peduncle slightly longer than inner ramus which is longer than the outer ramus. Uropod 3 longer than 1 and reaching back much farther, peduncle about one-third as long as the first joint of outer ramus; outer ramus twice as long as inner, first joint bearing groups of marginal spines, and those of the inner margin each bearing a plumose seta; second joint about one-fourth the length of the first and bearing apically three minute setules; inner ramus slender and bearing marginal spines. Pleopods well developed. Pleopod 3, outer ramus with a low lobe or swelling on inner margin near the base. The gills are simple, large, and oval and attached to the coxal joints of gnathopod 2 and peracopods 1 to 4 by a well-developed stalk as in *M. curasavicus*. No sternal gills are present. Telson nearly twice as wide as long, cleft to base with each lobe bearing apically two spines, lateral margins very convex and each bearing a spine near the distal end. Length of male 5 mm.

The female is like the male except that the palm and seventh joint of gnathopod 2 are apparently a little shorter, and uropod 3 is a little shorter. Length of female about 5 mm.

Twelve specimens were taken at the type locality, Frederiksted, St. Croix, Virgin Islands, from slightly brackish spring water in a deep well. One of these specimens, a male, U.S.N.M. No. 80027, is the type.

### SYNPLEONIA PIZZINI Shoemaker

FIGURES 10, 11, 12

*Synpleonia pizzini* SHOEMAKER, 1938, Proc. Biol. Soc. Washington, vol. 51, p. 137.

The type locality for this species is a small spring known as Wetzel's Spring, on the side of a hill in Glover-Archbold Park just west of Georgetown, D. C. It is a blind subterranean species which occurs at the surface of the earth only where the underground waters emerge as springs, seepages, and wells. A fully mature female was taken from a well on an island in the Potomac River about a mile above

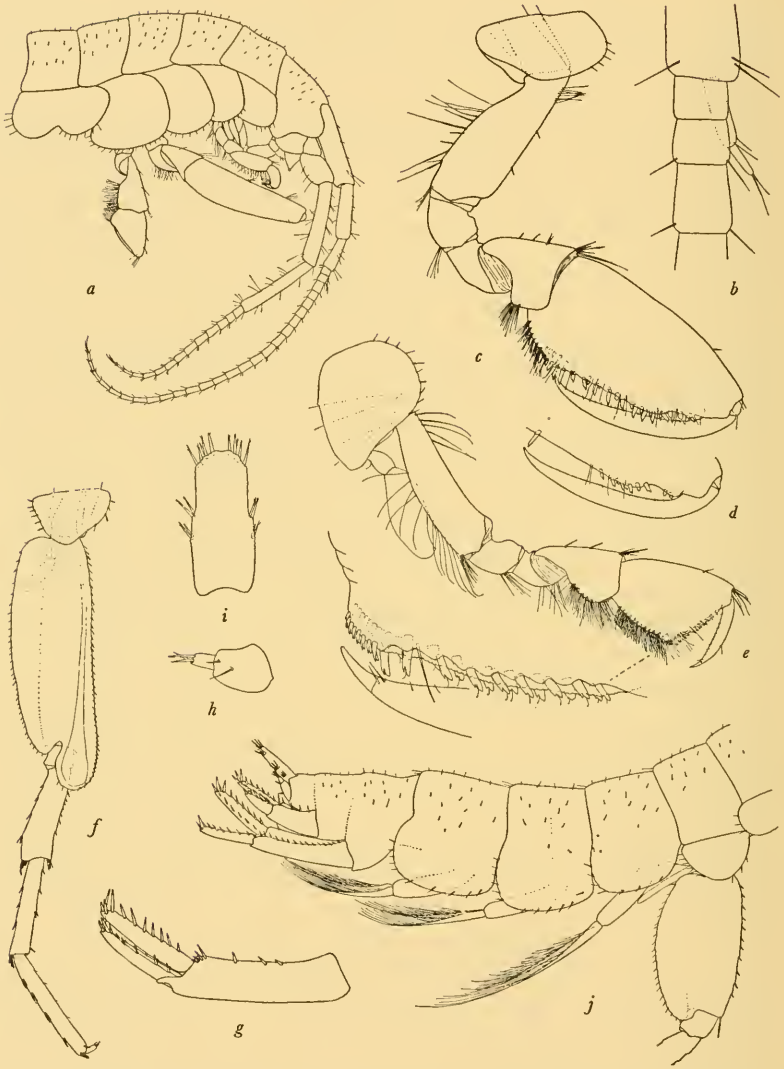


FIG. 10.—*Sympleonia pizzini* Shoemaker. Male: *a*, front end of animal; *b*, antenna 1; *c*, gnathopod 1; *d*, palm of gnathopod 1 of another male; *e*, gnathopod 2; *f*, peraeopod 5; *g*, uropod 1, inside view; *h*, uropod 3; *i*, telson. Female: *j*, hind end of animal.

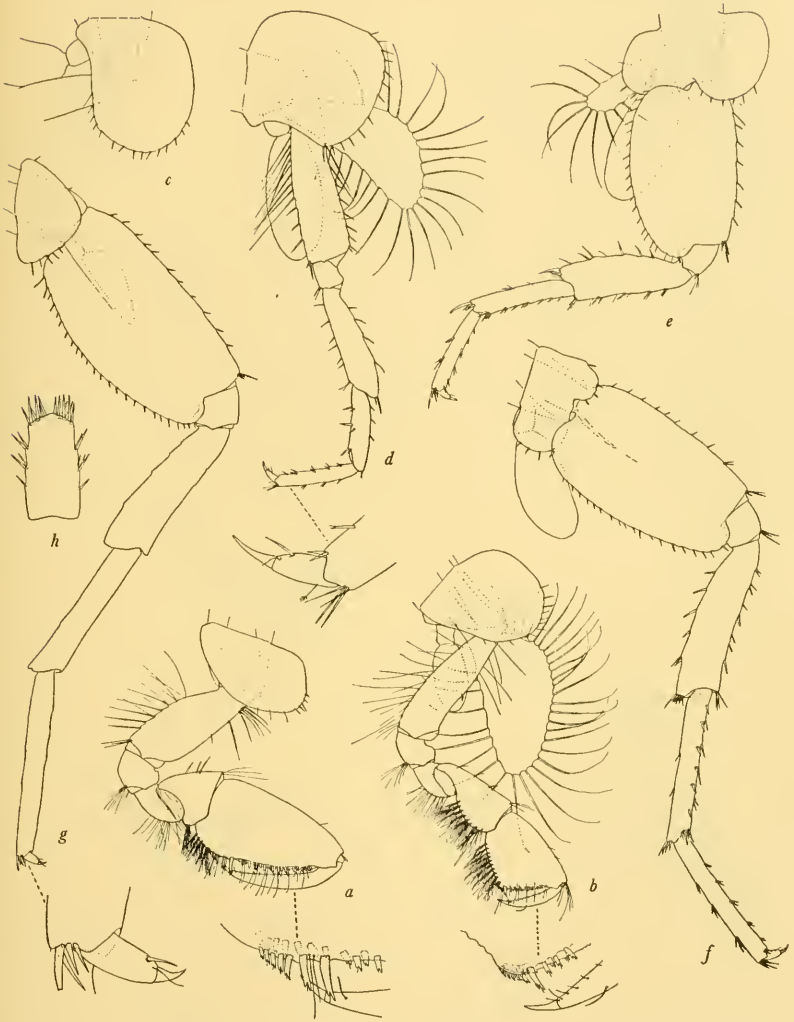


FIG. 11.—*Synpleonia pizzini* Shoemaker. Female: *a*, gnathopod 1; *b*, gnathopod 2; *c*, coxal plate of peraeopod 1; *d*, peraeopod 2; *e*, peraeopod 3; *f*, peraeopod 4; *g*, peraeopod 5; *h*, telson.

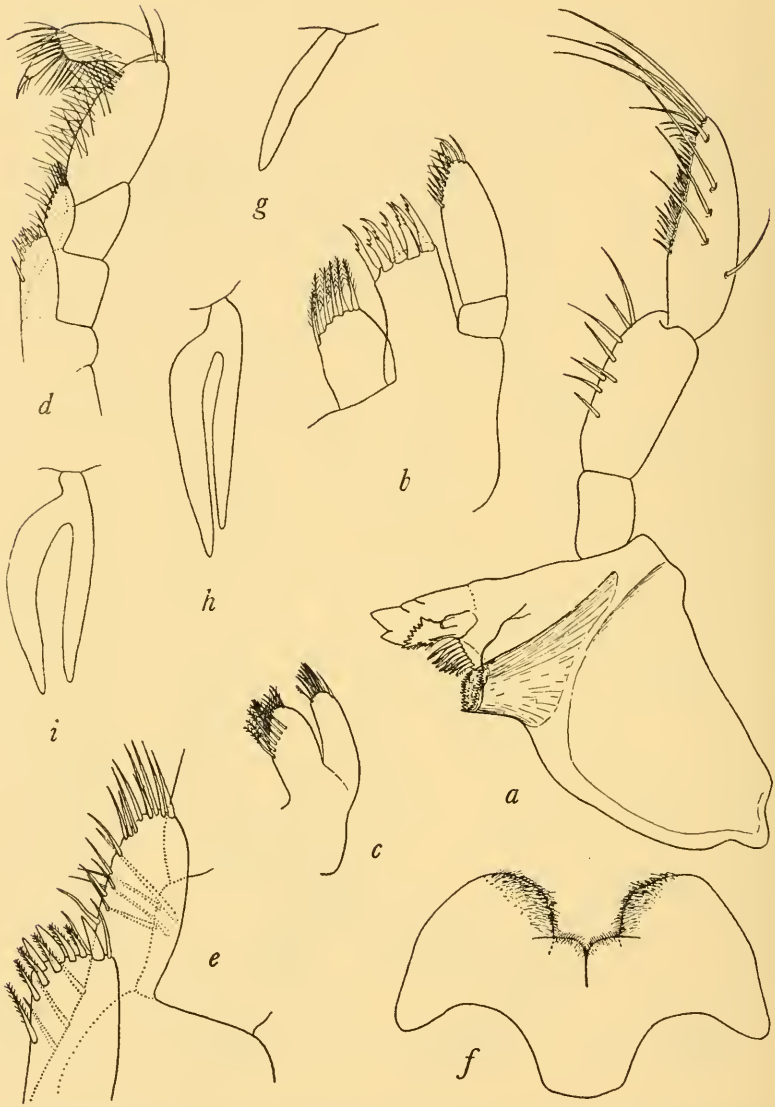


FIG. 12.—*Synpleonia pizzini* Shoemaker. Female: *a*, mandible; *b*, maxilla 1; *c*, maxilla 2; *d*, maxilliped; *e*, inner and outer plates of maxilliped, greatly enlarged; *f*, lower lip; *g*, median sternal gill of second thoracic segment; *h*, bifurcate lateral sternal gill of sixth thoracic segment; *i*, bifurcate lateral sternal gill of seventh thoracic segment.

Cabin John Bridge, Md. As this island is composed of rock and sand, it was thought that the well was supplied by seepage water from the river, until the discovery of this specimen of *Synpleonia pizzini* which proved that the water was derived from a subterranean vein.

*Synpleonia pizzini* has been taken in Virginia in a spring near Scott Run, and a spring at Bullneck Run, Fairfax County, and from a well the locality of which is not given. In Pennsylvania it has been taken in Refton Cave, and in the seepage of subterranean water in Lancaster County; at Johnson (Upper) Cave, Center County; at Barton Cave and Dulany Cave, Fayette County; and from a small walled spring new New Centerville, Chester County.

As far as known, this species appears to have a rather restricted range and has, up to the present time, been taken only in the District of Columbia, Virginia in the vicinity of Washington, and southern Pennsylvania. The genus *Synpleonia,* however, has a wide range and is represented by a number of species which are differentiated by rather obscure and subtle characters which are more difficult to express in words than in drawings. I am, therefore, figuring *S. pizzini,* in order that its characters may be presented in a more exact and graphic form.

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BY
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By CHARLES E. RESSER

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Middle Cambrian rocks crop out the full length of the Appalachian Valley. Throughout Maryland and Virginia as far south as the New River there is only the one outcrop belt next to the Blue Ridge. In it lithologic distinctions are hard to recognize, since all the beds are mainly limestone, and fossils are few and far between. Although it is believed that the full Middle Cambrian sequence is present, all the strata are grouped in the Elbrook formation. From the New River southwestward to central Alabama somewhat similar conditions obtain in the Blue Ridge belt, but faults bring up Cambrian beds to the west, forming numerous other outcrop belts. In some of them lithologic distinctions render it easy to recognize three formations.

As I pointed out in 1938 (p. 12), even though the type locality for the Maryville is in another belt to the southwest, it is customary to use the outcrop belt at Rogersville, Tenn., as the standard of comparison. There, not only the Rutledge and Rogersville formations, but also the Maryville, possess clear-cut lithologic characteristics, and their boundaries are so well defined that no doubt remains as to their identity and limits. Furthermore, both the Rutledge and Rogersville formations are fossiliferous, which eliminates confusion on that score.

Northwestward from the Rogersville region, with its ideal conditions, the shale constituents of the Rutledge practically vanish and the Rogersville becomes a limestone with very minor shale intercalations. Therefore, in the most western Cambrian outcrop belt of southwestern Virginia, the three Middle Cambrian formations lose their identity in the Honaker limestone, which is evidently equivalent to the Elbrook formation cropping out farther north and east. Southwestward from central Tennessee increase of shale content in the Middle Cambrian rocks of all the outcrop belts, except that of the Blue Ridge, causes the entire series to resemble, and become difficult to separate on lithologic grounds from, the Upper Cambrian Nolichucky

shale. Consequently, Middle and early Upper Cambrian beds are mapped as the Conasauga shale. In my opinion, however, after adequate base maps are supplied and the faunas are thoroughly studied, advantage can be taken of slight lithologic variations to distinguish the several formations now grouped in the Conasauga.

From this brief summary of distribution it is apparent that the Maryville formation is readily recognizable in typical limestone development between more shaly formations, only in certain outcrop belts from the New River in southwestern Virginia to central Tennessee. It should be added that, where the lithologic alterations take place and separate formations cannot be recognized, the total thickness remains about the same, indicating thereby that all formations are still represented. From the studies on which this paper is based, it is now possible to recognize the fact that the Maryville formation is represented in the Conasauga, and it is possible to refer rocks to it on the basis of faunal content.

At its type locality (Keith, 1895) the Maryville formation is described as consisting of 150 to 550 feet of massive blue limestone, with little change in appearance except for frequent earthy, siliceous bands and occasional grayish-blue mottled beds. In the Estillville quadrangle, where the name was first introduced, Campbell (1894) describes the formation as consisting of 550 to 650 feet of comparatively pure, heavy-bedded blue limestone, carrying large masses of chert in the southeastern part of the quadrangle. Little more has been written about the formation, chiefly because it has not been recognized except when found as a typical limestone development in the area previously outlined.

No organic remains, except calcareous algae, have been found in the Maryville formation where it is typically developed as a rather massive limestone. Algal deposits in any formation possess more or less pronounced characteristics, which permit their use in the same manner as any other fossils, but insufficient study has been given in most cases to render them useful for precise correlation. Thus far the algal deposits of the Maryville limestone have been used only in field work for tracing beds in limited regions. Size, shape, and characteristics of silicification are the criteria usually relied upon for this work. Since trilobites or other animal remains were not found in the heavy Maryville limestone beds, the impression went out that the formation is unfossiliferous, and for many years this idea prevented recognition of the fossils that were in hand from the formation. About 1934 faunas were reported from sections where all agreed that the containing beds represent the Maryville formation. From

then on thought was given to the possibility that correlation of fossils from beds with nontypical lithologic development would permit their reference to the Maryville. I hinted at this possibility in 1938 (p. 13) when I found that if the strike was crossed in a northwesterly direction at several places in the Coosa Valley, Ala., Rutledge and Rogersville fossils turned up in normal succession, and beyond them other faunas of presumably younger age, but still beneath the Nolichucky equivalents. At that time certain studies of western North American collections had not yet been made, and I could not be sure of my conclusions. In 1940 it was possible to prove the late Middle Cambrian age of these western faunas, thus providing a basis for further studies in the Appalachians.

Lithologic changes from the clearly defined formations of the Rogersville region to the Honaker limestone on the one hand, and to the Conasauga shale on the other, are not abrupt. In the one direction the limestone content increases at the expense of the shale constituents, while in the opposite direction conditions are reversed. To a worker in the Cambrian it is not strange, therefore, that animal remains were discovered in the Maryville formation where shaly elements are first introduced. Incidentally, it may be mentioned in passing that those of us who are accustomed to collecting from Cambrian rocks seldom search long for fossils in massive limestones or dolomites. Experience has taught us that fossils are to be had only in certain types of crystalline limestone, and almost universally in limestone nodules or thin irregular limestone layers in shale, or in thin shale layers between massive limestones. Massive shales also generally lack fossils, but if they do occur, they are abundant and usually include many examples of entire trilobites.

Furthermore, it is well not to forget that for many years numerous Nolichucky species were referred to the Maryville, and until they could be reassigned to their true stratigraphic position, they served merely to obscure the picture. A few linguloid brachiopods were reported from thin shale seams in the upper part of the Maryville limestone northwest of Morristown, and at a few other localities. These fossils are of so little value for correlation purposes that little attention was paid to them. In 1934 Hall and Amick found a small lot of fossils in thin shale bands in the Maryville along Forked Deer Creek, where it cuts through Copper Ridge west of Clinch Mountain (U. S. 25). These fossils were described by me in 1938. As they were recognized as being altogether new, they could not be used for correlation purposes, particularly since they were known from only one spot.

Step by step our understanding of the true stratigraphic position of the Rutledge, Rogersville, and Nolichucky species became clear, and fossils were being found in unquestioned Maryville, with the result that a direct approach to the problem was possible. After acquiring some knowledge of the late Middle Cambrian faunas in the Cordilleran region, and comparing them with those found definitely in the Maryville formation on Clinch Mountain, the idea that the *Olenoides* and possibly other faunas of the Conasauga shale were of the same age gained in appearance of validity. The fauna obtained from the railroad track east of Heiskell, Tenn., was relocated and the section reexamined. It seemed that these fossils came from the Maryville formation without reasonable doubt. At this point further field investigation was called for, and arrangements were accordingly made to examine the outcrops in the Cambrian belt at the western base of Clinch Mountain, beginning in the north with the Forked Deer Creek section and making traverses along all roads crossing the strike, until it could be proved what really happened to the beds clearly recognizable in the northern part of the belt. This work was carried out in May 1941.

Beginning with the Forked Deer Creek section, the roads across Copper Ridge were traversed one after another. It was rather easy to recognize the Rutledge, Rogersville, and Maryville formations, overlain by typical Nolichucky strata, in every section for at least 20 miles. Unfortunately, no fossils were found in the Maryville in these sections. Of course, not much success was expected in this direction, because only where rather deep new road cuts are made is it possible to pick up the softer fossiliferous beds in such deeply weathered rocks as are the rule in the region. For many more miles the outcrops are less satisfactory owing to the fact that the area is farther from the Clinch River, but it is possible to trace the existence of the several formations by topographic expression and from restricted, deeply weathered rock outcrops. No time was given to the search along this portion of Copper Ridge.

Investigations were then centered about the outcrops west of Knoxville. As previously stated, study of the collection obtained in 1885 from along the railway tracks east of Heiskell, 11 miles northwest of Knoxville, and for many years referred, along with other fossils in similar limestone, to the Nolichucky formation, had raised the question of its age. Reexamination of that section proved conclusively that this fauna occurs in the lower half of the Maryville formation, which here includes considerable shale. Next, the new face of the road cut on the Clinton Highway (U. S. 25W) near Bull Run, 13

miles west of Knoxville, was examined. There two faunas were found, adding the data necessary for the conclusive assignment of faunas from the Conasauga in northwestern Georgia and Alabama to the Maryville. Since the section along the highway west of Knoxville lies in the area in which the formations were mapped as Conasauga, it is only a small step to the reassignment of the faunas from Georgia and Alabama.

In Hall and Amicks' section on Forked Deer Creek the 455 feet of Maryville is composed almost entirely of limestone. Of this total thickness about 36 feet is described as shaly, about 12 feet is called impure, owing to argillaceous bands or mottling, and only about 30 feet is recorded as shale; even in the thin bands of shale, limestone lenses and layers are present. At several horizons mention is made of wavy lines. Downstream to the west of highway U. S. 25 the Rutledge is very well exposed, because the Clinch River cuts down the dip of the Rome shales against the Rutledge. Steep slopes above the limestone cliffs cause the soft Rogersville to crop out nearly everywhere, and above it the rather massive Maryville limestone. In Owl Hollow, about 1 mile west of the bridge over which route 25 crosses the Clinch River, the Rutledge is well exposed. Here it is a very dark blue massive limestone, irreglularly mottled with argillaceous shale, but has a conspicuous limestone layer about 40 feet thick. This limestone has the same wavy, banded and mottled appearance as the Rutledge limestone. In this section the lower 250 feet of the Maryville consists of heavy blue limestone, most of which is "wormy," or ribboned like the Rutledge. Above this about 50 feet of rock is more shaly, with bands up to 10 inches thick of almost pure argillaceous shale. Such shale bands appear again in augmented quantity in the upper part of the formation. Much of the limestone in the upper third of the formation is ribboned. The same conditions characterize the Notchy Creek and Puncheon Camp Creek sections farther west.

No other sections are available, owing to the deep weathering and lower relief between Puncheon Camp Creek and the railroad cut south of Heiskell, more than 30 miles to the southwest. The Heiskell section extends along the railway, beginning at the eastern edge of the flood plain of Bull Run, which is cut into the Rutledge and Rogersville. It was observed that shale content increases in the sections west of Clinch Mountain and Copper Ridge as one goes southwestward, which in part explains the wider stream valleys and the lowered ridges. At Heiskell the shale content has increased until the Maryville resembles the Rogersville and Nolichucky so much that it may be mistaken for either of them. Layers of limestone pebble conglomerate,

with the pebbles separated by matrix, and a few thin zones of edgewise conglomerate, were observed. Layers of oolitic limestone are rather common, one of them yielding the *Eteraspis* fauna.

Near Bull Run, 13 miles west of Knoxville on the Clinton road (U. S. 25W), recent widening of the highway has exposed a large face of the Maryville formation. About 370 feet of beds were measured. Unfortunately, the base is not exposed and one cannot be sure of the logical point at which to draw the Maryville-Nolichucky boundary. Although the rock in this cut is fresher than the outcrops usually to be seen, yet the limestone content is far less than the shale. Edgewise and pebble beds are common, and many of the limestone layers are clearly lenses. Oolitic beds are common. Nearly all the shale, whether in beds or as partings between limestone layers and lenses—without regard to the type of limestone—is micaceous and fucoidal, a condition which generally precludes the existence of fossils. About 40 feet above the base, as exposed, several small nodules yielded *Lingulella* species and *Alokistocare* cf. *projectum* Resser. A little more than 30 feet higher in the section the *Eteraspis* fauna occurs in the thin-bedded limestones with shale partings, associated with more massive, oolitic crystalline limestone, containing patches of *Girvanella*. The fossiliferous nodules and layers contain vaughnite in the form of pebbles and irregular masses, often sharply brecciated. Thus it will be observed that these faunas are found in the lower fourth of the formation as here exposed.

A similar section occurs on Spring Branch near Bakers Mill, about halfway between U. S. 25W and the Heiskell section.

We have now outlined the regional distribution of the Maryville formation where it can be recognized by lithologic characteristics, and have shown the faunal content where it undergoes lithologic change in one outcrop belt. This tracing along Copper Ridge has carried the formation into the typical Conasauga development. Future field work should enable us to trace the formation farther in the Copper Ridge, and into other belts as well, but sufficient data are now in hand to suggest the major Maryville faunas at least.

The faunal alignment seems to be somewhat as follows. Relying on the position of the *Alokistocare* and *Eteraspis* faunas in the Heiskell and Clinton road sections, it seems that they are in the lower third of the formation. On the other hand the *Perioura* fauna seems to occur in the lower part of the upper third. In the assignment of species to the Maryville from among those in the Conasauga of Georgia and Alabama, the only possibility is to take collections as a whole, when they contain forms known to represent the Maryville. On this basis the following lists are constructed.

TENNESSEE

Forked Deer Creek (lower part of upper third of formation):
*Deltophthalmus halli* Resser
*Lingulella* sp.
*Perioura masoni* Resser
*Proagnostus maryvillensis* Resser
Heiskell section (presumably lower third of formation):
*Acrotreta* sp.
*Eteraspis crassa* (Resser)
*Eteraspis glabra* (Walcott)
*Hyolithes* sp.
*"Olenoides"* sp. and a new trilobite genus
Bull Run, 13 miles northwest of Knoxville:
40 feet above base (as exposed)—
*Alokistocare* cf. *projectum* Resser
*Lingulella* sp.
About 30 feet higher—
*Alokistocare* cf. *americanum* (Walcott), and two other species
*Eteraspis glabra* (Walcott)
*"Olenoides"* sp.

GEORGIA

Livingston (loc. 89x); chert nodules and shale:
*Alokistocare americanum* (Walcott)
*Alokistocare georgense* Resser
*Alokistocare projectum* Resser
*Amecephalina coosensis* Resser
*Chancelloria drusilla* Walcott

ALABAMA

South of Yanceys Bend of Coosa River, near Blaine, 3 miles east of Center, Ala. (loc. 90x); cobbles in shale:

*Acrocephalops granulosa* Resser
*Acrothele bellula* Walcott
*Acrotreta kutorgai* Walcott
*Alokistocare americanum* Walcott
*Alokistocare angustatum* Resser
*Alokistocare blainense* Resser
*Alokistocare centerense* Resser
*Alokistocare lingulum* Resser
*Amecephalina bella* Resser
*Amecephalina convexa* Walcott
*Armonia elongata* Walcott
*Blainia centerensis* Resser
*Brooksella alternata* Walcott
*Ehmania smithi* (Walcott)
*Ehmaniella antiquata* (Salter)

*Eteraspis gregaria* (Walcott)
*Eteraspis paula* (Walcott)
*Hyolithes partitus* Resser
*Kochaspis coosensis* (Walcott)
*Laotira cambria* Walcott
*Lingulella hayesi* (Walcott)
*Micromitra alabamaensis* (Walcott)
*Olenoides curticei* Walcott
*Pelagiella blainensis* Resser

1 mile northeast of Moshat, about 5 miles southeast of Center, Cherokee County, Ala. (loc. 112); shale containing nodules:

*Acrocephalops insignis* (Walcott)
*Acrocephalops nitida* Resser
*Elrathia alabamensis* Resser
*Eteraspis paula* (Walcott)
*Euryrhachis ? centerensis* Resser
*Perioura typicalis* Resser

It is possible that other faunas in hand may belong in the Maryville besides these here given the new assignment.

If the foregoing faunal assignments are sound, the Maryville formation is to be regarded as more or less exactly equivalent to the Bloomington formation of the Wasatch region, the Marjum of the House Range, and the Eldon of the Canadian Rockies.

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SMITHSONIAN MISCELLANEOUS COLLECTIONS
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BY
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# AMPHIPOD CRUSTACEANS COLLECTED ON THE PRESIDENTIAL CRUISE OF 1938

By CLARENCE R. SHOEMAKER

*Assistant Curator, Division of Marine Invertebrates, U. S. National Museum*

The Presidential Cruise on the U.S.S. *Houston* to the eastern tropical Pacific and the Caribbean Sea in 1938 obtained a most interesting collection of Amphipoda through the indefatigable labors of Dr. Waldo L. Schmitt, the naturalist of the expedition, who had the most enthusiastic assistance of the ship's personnel throughout the cruise. The bulk of the material was obtained on the west coast of Lower California. At Magdalena Bay, Lower California, amphipods were found to be exceedingly abundant. When water was added to a half tubful of sand brought up with a boat dredge at station No. 3-38 an amazingly thick "scum" of amphipods rose to the surface. With a fine sieve a solid quart of these small crustaceans was skimmed off with little difficulty. The bulk of this material consisted of a new species, *Neomegamphopus rooscvelti,* which required a new genus for its reception. A total of 27 different species, belonging to 24 genera, appeared in this haul.

Other species were taken at Clipperton Island between 600 and 700 miles off the west coast of Mexico, at Cocos Island, and at the Galápagos Islands, which lie across the Equator. The discovery of *Orchestia marquesana* at Clipperton Island is of more than passing interest, as that locality is far to the northeast of its previously known occurrence. At first I thought a new but related species was involved, but soon found that the differences were due to the secondary sex characters found in the male. Dr. Stephensen, who described the species, possessed only females; both sexes are represented in the collection from the Presidential Cruise.

After passing through the Panama Canal, the *Houston* made a brief stop at Old Providence Island off the east coast of Nicaragua, where three species were obtained.

The collection comprises 27 genera, 36 species, and one variety. Included are 10 new species and one new variety, as follows:

*Orchomenella magdalenensis,* n. sp.
*Gitanopsis pusilloides,* n. sp.
*Microdeutopus schmitti,* n. sp.

*Photis spinicarpa,* n. sp.
*Photis brevipes,* n. sp.
*Eurystheus spinosus,* n. sp.
*Podocropsis dubia,* n. sp.
*Neomegamphopus roosevelti,* n. sp.
*Parajassa angularis,* n. sp.
*Microjassa macrocoxa,* n. sp.
*Eurystheus tenuicornis* var. *lobata,* n. var.

Following is a list of stations with species encountered:

Station No. 1-38. Cedros Island, off west coast of Lower California. Shore collecting, both north and south of cannery, east side of island. Amphipods from under drifted kelp on gravel beach to north, July 17, 1938.

| | No. of specimens |
|---|---|
| *Orchestia traskiana* Stimpson | Many |

Station No. 2-38. Cedros Island, off west coast of Lower California. Bottom sample in 24-25 fathoms, about one-fourth of the way from shore to anchorage, July 17, 1938.

| | No. of specimens |
|---|---|
| *Batea catharinensis* Müller | 1 |

Station No. 3-38. Magdalena Bay, Lower California, inside northern point of entrance to bay, between Belcher Point and anchorage, 10-15 fathoms; sandy, weedy bottom, July 18, 1938.

| | No. of specimens |
|---|---|
| *Orchomenella magdalenensis,* n. sp. | 6 |
| *Aruga dissimilis* (Stout) | 2 |
| *Ampelisca schellenbergi* Shoemaker | 20 |
| *Platyischnopus gracilipes* Schellenberg | 1 |
| *Gitanopsis pusilloides,* n. sp. | 34 |
| *Batea catharinensis* Müller | Many |
| *Maera simile* Stout | 2 |
| *Elasmopus rapax* Costa | 5 |
| *Orchestia traskiana* Stimpson | 1 |
| *Hyale frequens* (Stout) | 15 |
| *Lembos (Bemlos) macromanus* (Shoemaker) | Many |
| *Microdeutopus schmitti,* n. sp. | 11 |
| *Photis spinicarpa,* n. sp. | 16 |
| *Photis brevipes,* n. sp. | 30 |
| *Eurystheus tenuicornis* (Holmes) | 1 |
| *Eurystheus tenuicornis* var. *lobata,* n. var. | 25 |
| *Eurystheus spinosus,* n. sp. | 11 |
| *Neomegamphopus roosevelti,* n. sp. | Many |
| *Chevalia aviculae* Walker | 5 |
| *Ampithoe plumulosus* Shoemaker | 15 |
| *Ampithoe ramondi* (Audouin) | 16 |
| *Jassa falcata* (Montagu) | 3 |

| | No. of specimens |
|---|---|
| *Parajassa angularis*, n. sp. | 3 |
| *Microjassa macrocoxa*, n. sp. | 30 |
| *Ericthonius brasiliensis* (Dana) | Many |
| *Cerapus tubularis* Say | 2 |
| *Podocerus cristatus* (Thomson) | 12 |
| *Caprella scaura* Templeton | Many |

Station No. 4-38. Magdalena Bay, Lower California; filamentous green algae from deeper end of preceding dredge hauls, July 18, 1938.

| | No. of specimens |
|---|---|
| *Batea catharinensis* Müller | 30 |
| *Hyale frequens* (Stout) | 3 |
| *Lembos* (*Bemlos*) *macromanus* (Shoemaker) | Many |
| *Microdeutopus schmitti*, n. sp. | 1 |
| *Photis brevipes*, n. sp. | 1 |
| *Eurystheus tenuicornis* (Holmes) | 2 |
| *Eurystheus tenuicornis* var. *lobata*, n. var. | 1 |
| *Neomegamphopus roosevelti*, n. sp. | Many |
| *Ampithoe plumulosus* Shoemaker | 1 |
| *Microjassa macrocoxa*, n. sp. | 1 |
| *Podocerus cristatus* (Thomson) | 1 |
| *Caprella scaura* (Templeton) | Many |

Station No. 5-38. Cape San Lucas, Lower California. Off Punta Gorda, off rocky shore to west and San Jose del Cabo Bay, dredged in 6-10 fathoms, July 19, 1938.

| | No. of specimens |
|---|---|
| *Lembos* (*Bemlos*) *macromanus* (Shoemaker) | 1 |
| *Microdeutopus schmitti*, n. sp. | 1 |
| *Neomegamphopus roosevelti*, n. sp. | 6 |
| *Ampithoe plumulosus* Shoemaker | 4 |
| *Cerapus tubularis* Say | 2 |
| *Caprella scaura* (Templeton) | 4 |

Station No. 9-38. Clipperton Island. Shore collecting on rocks to south of landing place, July 21, 1938.

| | No. of specimens |
|---|---|
| *Elasmopus rapax* Costa | 2 |
| *Elasmopus spinidactylus* Chevreux | 15 |
| *Elasmopus gracilis* Schellenberg | 3 |
| *Ampithoe plumulosa* Shoemaker | 1 |

Station No. 14-38. Clipperton Island. Debris from two boobies' nests back from landing place, July 21, 1938.

| | No. of specimens |
|---|---|
| *Orchestia marquesana* Stephensen | Many |

Station No. 15-38. Sulivan Bay, James Island, Galápagos Islands. Shore and tide-pool collecting, 3 : 30 to 5 : 00 p.m., tide beginning to run out, July 24, 1938.

| | No. of specimens |
|---|---|
| *Ampelisca lobata* Holmes | 1 |
| *Colomastix pusilla* Grube | 1 |
| *Elasmopus rapax* Costa | 14 |

Station No. 16-38. Narborough Island, Galápagos Islands. Shore collecting, July 25, 1938.

| | No. of specimens |
|---|---|
| *Hyale hawaiensis* (Dana) | 6 |

Station No. 22-38. At anchorage off Gardner Bay, Hood Island, Galápagos Islands. Off gangway, dip net, 11 :00 p.m., July 27, 1938.

| | No. of specimens |
|---|---|
| *Hyperia bengalensis* (Giles) | 1 |

Station No. 28-38. Chatham Bay, Cocos Island. Bottom sample, August 3, 1938.

| | No. of specimens |
|---|---|
| *Podoceropsis dubia,* n. sp. | 23 |

Station No. 30-38. Old Providence Island, Caribbean Sea. Shore, reef, and tide-pool collecting, August 6, 1938.

| | No. of specimens |
|---|---|
| *Ampithoe ramondi* (Audouin) | 2 |

Station. Old Providence Island, Caribbean Sea, August 6, 1938.

| | No. of specimens |
|---|---|
| *Colomastix pusilla* Grube | 1 |
| *Elasmopus brasiliensis* (Dana) | 1 |

## GAMMARIDEA

## LYSIANASSIDAE

### ORCHOMENELLA MAGDALENENSIS, new species

FIGURE 1

Station 3. Magdalena Bay, Lower California, 6 specimens.

*Female.*—Head, lateral lobes produced, narrowing distally with apex narrowly rounding. Eye large, oval, and with little color. Antenna 1, flagellum composed of five joints; accessory flagellum of two joints. Antenna 2 a little longer than 1, third joint as long as fourth plus half of the fifth; fifth joint a little over half as long as the fourth; flagellum nearly as long as fourth and fifth joints together and composed of six joints.

The epistome projects considerably beyond the upper lip, and is triangular with narrowly rounding apex. Mandible with molar rather prominent; cutting edge with a tooth at outer corner; three spines in

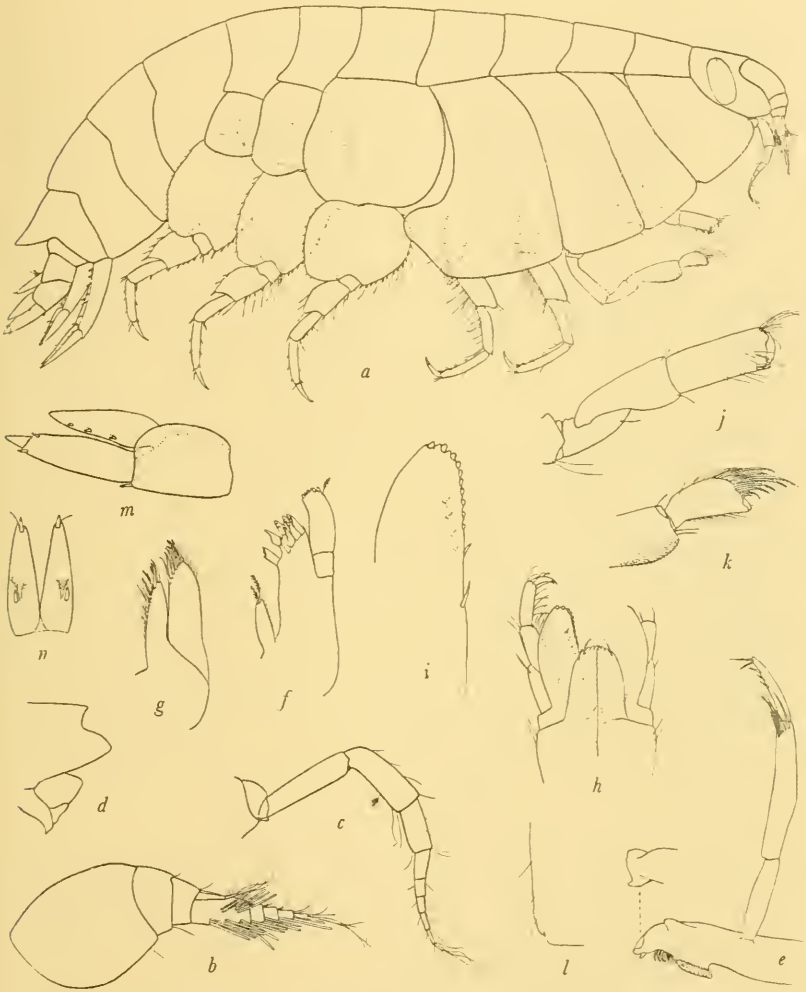


FIG. 1.—*Orchomenella magdalenensis*, new species. Female, *a*, entire animal; *b*, antenna 1; *c*, antenna 2; *d*, head showing epistome and upper lip; *e*, mandible; *f*, maxilla 1; *g*, maxilla 2; *h*, maxillipeds; *i*, outer plate of maxilliped; *j*, gnathopod 1; *k*, gnathopod 2; *l*, hind corner of coxal plate 3; *m*, uropod 3; *n*, telson.

spine row; palp with first joint nearly two-thirds as long as second and longer than third; second joint nearly twice as long as third. Maxilla 1, inner plate about half as long as outer, narrow and bearing

two plumose setae apically; outer plate bearing 11 serrate spine teeth; palp armed distally with 5 short, blunt spine teeth and a plumose seta. Maxilla 2, inner plate shorter and narrower than outer. Maxillipeds, inner plate reaching to the middle of the outer and armed distally with three blunt teeth; outer plate reaching nearly to the middle of the third joint of palp, apex and upper part of inner margin armed with short blunt teeth, outer surface bearing an oblique row of short spines which ends in two stout spines on inner margin; palp short and slender, third joint nearly as long as second; fourth joint over half the length of the third, curved and bearing a minute nail.

Coxal plates 1 to 4 much deeper than their segments; first coxal plate noticeably expanded below; second and third with sides nearly parallel; fourth deeply excavate with lower hind lobe prominent and obliquely truncate. Gnathopod 1 slender; second joint as long as the third, fourth, fifth, and sixth together; fifth joint a little wider than, but equal in length to, the sixth; sixth joint with margins parallel and a little over twice as long as wide; palm transverse; seventh joint fitting palm and bearing a tooth on inner margin. Gnathopod 2 very slender and much longer than 1; second joint about twice the length of the third which is equal in length to the fifth; sixth joint half the length of the fifth; seventh joint very short and weak.

Peraeopods 1 and 2 slender and subequal in length. Peraeopods 3 to 5 with second joints considerably expanded, that of 3 wider than long; fourth joints with lower hind corner somewhat produced. Metasome segment 1 with lower margin rounding; segments 2 and 3 with lower hind corner about right-angled. Urosome segment 1 produced backward dorsally into a prominent tooth. Uropod 1 projecting back about as far as 3. Uropod 3 with upper edge of peduncle produced into a thin convex lobe; outer ramus bearing only two short spines which are at the base of the second joint; inner ramus bearing three short spines on outer margin. Telson long and narrow, cleft almost to its base, with each lobe bearing an apical spine and a spine and two plumose setules on upper surface. Length, from front of head to end of uropod 3, about 6 mm.

*Type locality.*—Magdalena Bay, Lower California, dredged in 10-15 fathoms inside northern point of entrance to bay, July 14, 1938. Holotype, female, U.S.N.M. No. 79370.

This species conforms to the genus *Orchomenella* except in the proportions of the joints of the mandibular palp, and in the proportions of the joints of the peduncle of the second antenna. So far as I am aware, in no other species is the first joint of the mandibular palp

longer than the third, or the third joint of the peduncle of antenna 2 longer than either the fourth or fifth. I am, nevertheless, placing the species in *Orchomenella,* owing to its general conformity with that genus, rather than creating a new genus for it.

### ARUGA DISSIMILIS (Stout)

FIGURE 2

*Nannonyx dissimilis* STOUT, 1913, Zool. Jahrb., Abt. Syst., vol. 34, p. 638.

Station 3. Magdalena Bay, Lower California, 2 specimens.

This species was described by Vinnie Ream Stout from Laguna Beach, southern California. Although I have seen very few specimens of this species, she says,

> Perhaps the most common of the dwellers of the kelp from deep water was the species, *Nannonyx dissimilis,* n. sp., of which there were hundreds in one holdfast. Besides the fact of their numbers, these forms were rather conspicuous in the bright orange eggs of the females.

These two specimens constitute the second record of the occurrence of this species, and extend the range considerably to the south.

I have transferred this species to the genus *Aruga,* created by S. J. Holmes in 1908 to receive his California species *A. oculata,* as the mouth parts and appendage characters of *A. dissimilis* agree with those of *A. oculata.* I am, however, of the opinion that the genus *Aruga* may become a synonym of the genus *Lysianopsis* created by Holmes in 1905 for the reception of *L. alba* from southern New England, as the characters of the two genera appear to be much the same. The mouth parts of these two genera agree, including the first maxilliped, the inner plate of which bears two terminal plumose setae.

## AMPELISCIDAE

### AMPELISCA LOBATA Holmes

*Ampelisca lobata* HOLMES, 1908, Proc. U. S. Nat. Mus., vol. 35, No. 1654, p. 517, fig. 25.

Station 15. Sulivan Bay, James Island, Galápagos Islands, 1 specimen.

This species was described by S. J. Holmes from a single specimen which was taken at *Albatross* station 4420, off San Nicolas Island, southern California. There are specimens of this species in the National Museum collection from Catalina Island, Corona Del Mar, and Monterey Bay, Calif., and one specimen from Vancouver Island taken north of Nanaimo. The present record from the Galápagos Islands extends the range about 3,000 miles southward.

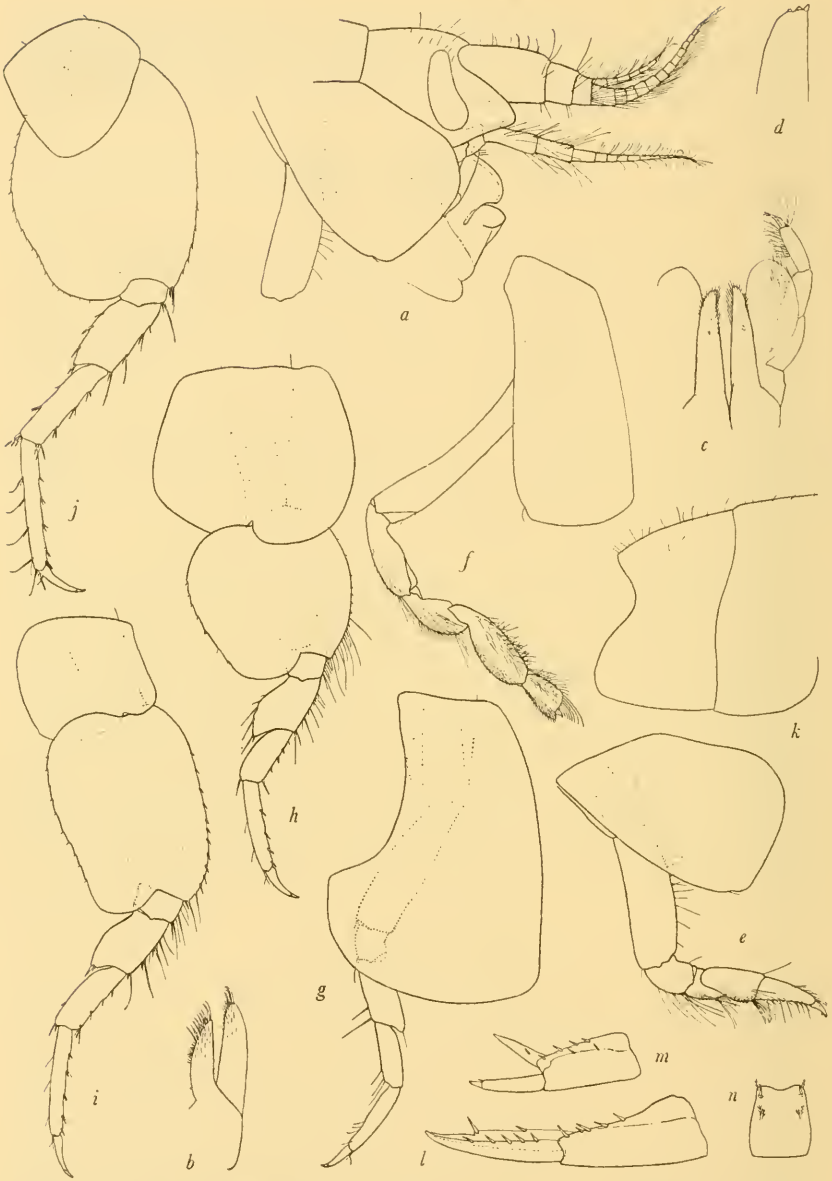


FIG. 2.—*Aruga dissimilis* (Stout). Female, *a*, head and antennae; *b*, maxilla 2; *c*, maxillipeds; *d*, end of inner plate of maxilliped showing the low teeth; *e*, gnathopod 1; *f*, gnathopod 2; *g*, peraeopod 2; *h*, peraeopod 3; *i*, peraeopod 4; *j*, peraeopod 5; *k*, second and third metasome segments; *l*, uropod 2; *m*, uropod 3; *n*, telson.

### AMPELISCA SCHELLENBERGI Shoemaker

*Ampelisca schellenbergi* SHOEMAKER, 1933, Amer. Mus. Nov., No. 598, p. 3, figs. 1, 2.

Station 3. Magdalena Bay, Lower California, 20 specimens.

This species was described from specimens taken by the *Albatross* at stations 2369-2374 in the Gulf of Mexico. There are also specimens in the National Museum collection from the west coast of Florida, the Dry Tortugas, and from off Yucatan. The present specimens are the first recorded from the west coast of America.

## HAUSTORIIDAE

### PLATYISCHNOPUS GRACILIPES Schellenberg

*Platyischnopus gracilipes* SCHELLENBERG, 1931, Gammariden und Caprelliden, Swedish Antarctic Exped., 1901-1903, vol. 2, No. 6, p. 63, fig. 33.

Station 3. Magdalena Bay, Lower California, 1 specimen.

This species was recorded by Schellenberg from Valparaiso, Chile, and Rio de Janeiro, Brazil. It is represented in the National Museum collection by a specimen taken by Dr. W. L. Schmitt at La Libertad, Ecuador, when traveling under the Walter Rathbone Bacon scholarship of the Smithsonian Institution in 1934, and by a specimen measuring 7 mm. taken off La Jolla, Calif.

## AMPHILOCHIDAE

### GITANOPSIS PUSILLOIDES, new species

FIGURE 3

Station 3. Magdalena Bay, Lower California, 34 specimens.

*Female.*—Head, rostrum rather short, not strongly curved or acute; lateral corners evenly rounding; eyes dark and rather prominent with the peripheral elements usually colorless. Antenna 1 a little shorter than 2; flagellum about half the length of the peduncle and composed of four or five joints. Antenna 2 with flagellum less than half the length of the peduncle and composed of six or seven joints. Upper lip unsymmetrically bilobed.

Mandible, molar very prominent, with what appears to be a chisel-like tooth at the front corner; cutting edge with many teeth; spine row with 11 serrulate spines; palp with third joint equal in length to the second. Left mandible with broad accessory plate having a finely toothed cutting edge. Maxilla 1, inner plate with one spinule; outer plate with seven spine teeth; palp broad, apex armed with two chisel-like teeth and two spinules. Maxilla 2, inner plate a little broader but

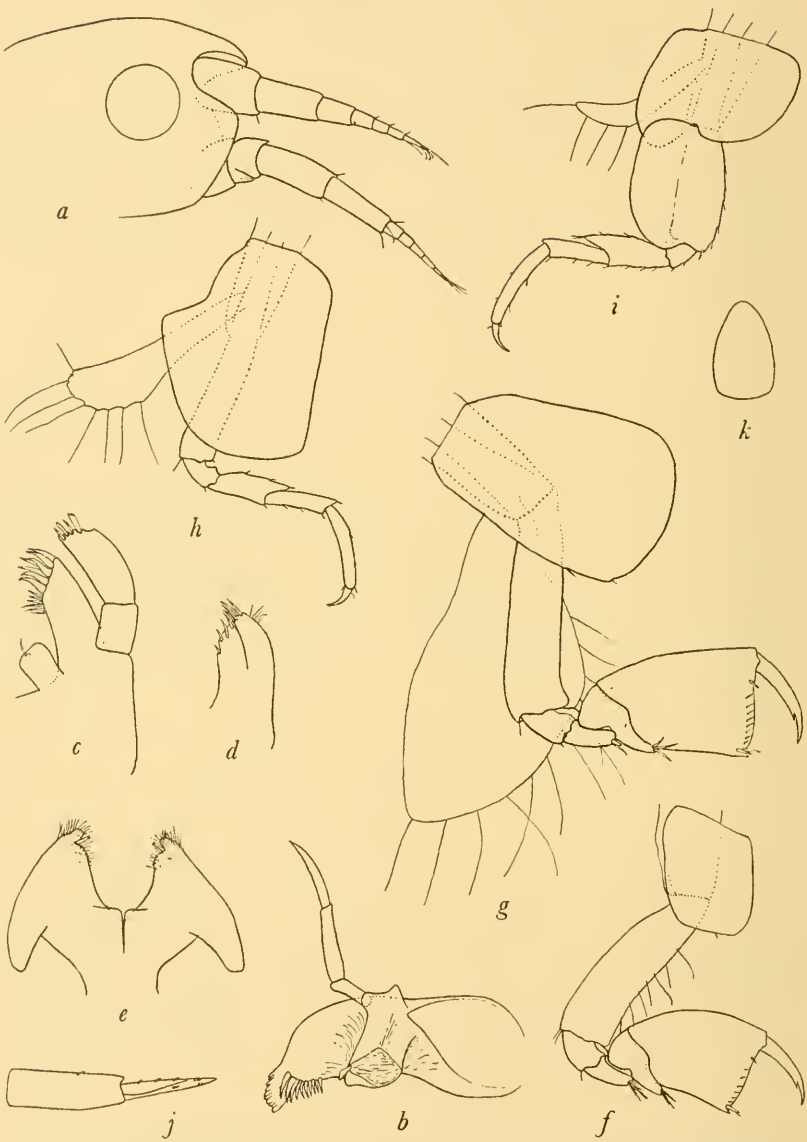


FIG. 3.—*Gitanopsis pusilloides,* new species. Female, *a,* head; *b,* mandible; *c,* maxilla 1; *d,* maxilla 2; *e,* lower lip; *f,* gnathopod 1; *g,* gnathopod 2; *h,* peraeopod 2; *i,* peraeopod 3; *j,* uropod 3; *k,* telson.

slightly shorter than outer, each plate armed with four spines. Lower lip with suggestion of inner lobes; outer lobes narrowing distally, apex forming a small lobe below which is a depression carrying a short blunt spinule; lateral lobes rather prominent and apically blunt.

Gnathopods 1 and 2 very much alike. Gnathopod 1, fifth joint with lower lobe rather short, extending a very short distance along the hind margin of the sixth, bearing three apical spinules but no marginal setae or spinules; sixth joint broadest distally, palm transverse, defined by a small tooth and a spine, slightly convex and minutely denticulate throughout; seventh joint fitting palm, smooth on inner margin except for a tooth near the apex. Coxal plate 1 very little deeper than the first joint of the gnathopod and about half the depth of coxal plate 2, sides nearly parallel and lower corners evenly rounding. Gnathopod 2 larger than 1 but otherwise the same.

Peraeopods all very slender. Peraeopods 1 and 2 alike but 2 a little the longer; fourth joint with lower front angle produced; seventh joint rather long, slender and curved and bearing no nail or setae. Coxal plates 2, 3, and 4 of about equal depth. Peraeopod 3 longer than 2; depth of coxal plate equal to the length of the second joint. Peraeopod 4 longer than 3 but about equal in length to 5. The metasome segments are as figured by Sars (pl. 76, fig. 2) for *Gitanopsis bispinosa,* but without the dorsal teeth.

Uropod 1 reaching back as far as uropod 3, outer ramus scarcely shorter than inner. Uropod 2 reaching nearly to the middle of the rami of uropod 1, outer ramus considerably shorter than inner. Uropod 3, outer ramus shorter than inner, which is a little shorter than the peduncle. Telson reaching to about the middle of the peduncle of uropod 3, sides convex and converging to the narrow, evenly rounding apex. Length of female 3 mm.

*Type locality.*—Magdalena Bay, Lower California, dredged in 10-15 fathoms inside northern point of entrance to bay, July 14, 1938. Holotype, female, U.S.N.M. No. 79373.

Though many specimens of this species were taken, all appear to be females. *G. pusilloides* is probably most closely related to *G. pusilla* Barnard. There are, however, several distinguishing characters. The outer plate of maxilla 1 carries 7 spine teeth, while in *G. pusilla* there are 14. The inner plate of maxilla 2 is armed with 4 spine teeth, but in *G. pusilla* there are said to be 10 on apical and inner margins. The inner ramus of uropod 3 is about four-fifths the length of the peduncle. Barnard (1916, p. 144) says of *G. pusilla,* "Third uropod, outer ramus shorter than inner, which is a little shorter than peduncle," but in his figure of the third uropod the inner ramus is scarcely half the length of the peduncle, which proportion I suspect is correct.

## COLOMASTIGIDAE

### COLOMASTIX PUSILLA Grube

*Colomastix pusilla* GRUBE, 1864, Arch. Naturg., Jahrg. 30, vol. 1, p. 206, pl. 5, fig. 2 a-b.

Station 15. Sulivan Bay, James Island, Galápagos Islands, 1 specimen, ♀.

Station. Old Providence Island, Caribbean Sea, 1 specimen, ♀.

This is a widely distributed species and has been recorded from the Mediterranean, North Atlantic, Ceylon, South Africa, and Red Sea. The present records are the first for the Caribbean Sea and the Galápagos Islands.

## BATEIDAE

### BATEA CATHARINENSIS Müller

*Batea catharinensis* MÜLLER, 1865, Ann. Mag. Nat. Hist., ser. 3, vol. 15, p. 276, pl. 10.

*Batea secunda* HOLMES, 1905, Bull. Bur. Fish. for 1904, vol. 24, p. 499, fig.

*Batea catharinensis* SHOEMAKER, 1926, Proc. U. S. Nat. Mus., vol. 68, No. 2626, art. 25, p. 2, figs. 1-4.

Station 2. Cedros Island, off Lower California, 1 specimen, ♀.

Station 3. Magdalena Bay, Lower California, many specimens.

Station 4. Magdalena Bay, Lower California, 30 specimens.

This species extends from Brazil northward to southern New England. The present record is the first for the west coast of America.

## GAMMARIDAE

### MAERA SIMILE Stout

*Maera simile* STOUT, 1913, Zool. Jahrb., Abt. Syst., vol. 34, p. 644.

Station 3. Magdalena Bay, Lower California, 2 specimens.

This species was described from specimens found in a large kelp holdfast which floated in to the breaker line from deep water at Laguna Beach, southern California.

The present record constitutes the second of the occurrence of this species.

### ELASMOPUS RAPAX Costa

*Elasmopus rapax* COSTA, 1853, Rend. Soc. Reale Barbonica, Acad. Sci., n. s., vol. 2, p. 175; SARS, 1895, Crustacea of Norway, Amphipoda, vol. 1, p. 521, pl. 183.

Station 3. Magdalena Bay, Lower California, 5 specimens.

Station 9. Clipperton Island, 2 specimens.

Station 15. Sulivan Bay, James Island, Galápagos Islands, 14 specimens.

*Elasmopus rapax* is a cosmopolitan inhabitant of the warm and temperate seas but has not heretofore been recorded from the west coast of America.

### ELASMOPUS SPINIDACTYLUS Chevreux

*Elasmopus spinidactylus* Chevreux, 1907, Mem. Soc. Zool. France, vol. 20, No. 4, p. 486, figs. 9, 10.

Station 9. Clipperton Island, 15 specimens.

This species was described by Chevreux from the Gambier Islands, and has since been recorded from the Tuamotu and Gilbert Islands. The present record from Clipperton Island extends the range of this species greatly to the northeast.

### ELASMOPUS BRASILIENSIS (Dana)

*Gammarus brasiliensis* Dana, 1853 and 1855, U. S. Explor. Exped., vol. 14, pt. 2, Amphipoda, p. 956, pl. 65, fig. 10.

Station. Old Providence Island, Caribbean Sea, 1 specimen.

Dana described this species from Rio de Janeiro, and there are specimens in the National Museum collection from the Gulf of Mexico and Florida. The present record is the first for the Caribbean Sea.

### ELASMOPUS GRACILIS Schellenberg

*Elasmopus gracilis* Schellenberg, 1938, Kungl. Svenska Vetensk. Akad. Handl., Tredje ser., vol. 16, No. 6, p. 59, fig. 31.

Station 9. Clipperton Island, 3 specimens, ♂.

This species was described from the Fiji Islands and Ellice Islands. The present specimens are about the size of the original specimens and they agree with the figures given by Schellenberg. This record from Clipperton Island is the second of the occurrence of this species.

## TALITRIDAE

### ORCHESTIA TRASKIANA Stimpson

*Orchestia traskiana* Stimpson, 1857, Proc. California Acad. Nat. Sci., vol. 1, p. 90.

Station 1. Cedros Island, off Lower California, many specimens.

Station 3. Magdalena Bay, Lower California, 1 specimen, ♂.

This species is common on the west coast of the United States but has not heretofore been noted from Lower California.

### ORCHESTIA MARQUESANA Stephensen

FIGURES 4, 5

*Orchestia marquesana* STEPHENSEN, 1935, B. P. Bishop Mus., Bull. 142, art. 3, p. 32, figs. 8-10.

Station 14. Clipperton Island, found among debris under two boobies' nests, July 21, 1938, many specimens.

Dr. Stephensen when describing this species had only the female, but both sexes occur in the specimens from Clipperton Island. I am therefore describing and figuring the male.

*Male.*—Eyes rather large, black. Antenna 1 reaching slightly beyond the end of the fourth joint of peduncle of antenna 2, flagellum slightly shorter than the peduncle. Antenna 2, flagellum much longer than peduncle. Mouth parts normal and as shown in the accompanying figures. Maxilla 1, inner plate with two plumose setae; outer plate with nine spine teeth. Maxillipeds, palp with small scalelike fourth joint which does not project beyond the apex of the third joint. Coxal plate 1 entirely hidden behind coxal plate 2, which is a little broader than deep and evenly rounding below. Coxal plates 4 and 5 of equal depth. Coxal plate 6 with deep hind lobe.

Gnathopod 1, fifth joint with a prominent hind lobe; sixth joint with the distal hind corner produced beyond the palm into a small lobe; palm transverse. Gnathopod 2, sixth joint robust; palm occupying nearly half the hind margin of joint and continuous with it; seventh joint a little longer than palm. Peraeopod 3 equal in length to peraeopod 2; second joint a little longer than wide and with a shallow lower hind lobe. Peraeopod 4, second joint considerably longer than wide and not greatly expanded. Peraeopod 5 equal in length to 4, second joint a very little longer than wide and having an almost square appearance, few serrations and spinules on hind margin.

Metasome segments 2 and 3 with lower hind corners slightly produced. The posterior lateral margins of metasome segments 1 to 3 bearing two or three shallow serrations. Pleopods with rami considerably reduced. Uropods 1 and 2 with rather few spines, the distal spines of uropod 1 being the longest. Uropod 3, ramus shorter than peduncle and bearing two small lateral spines and a group of spines apically; peduncle with three lateral spines. Telson a little longer than wide, cleft for about one-third its length with the lobes separated, a group of three lateral spines about one-third the distance from the end, two lateral spines near the apex, and two apical spines on each lobe. Length of largest specimens about 13 mm.

In the figure of the first gnathopod of the female given by Stephensen the palm appears to be slightly convex and slightly oblique. In the Clipperton Island specimens the palm is slightly concave, giving the

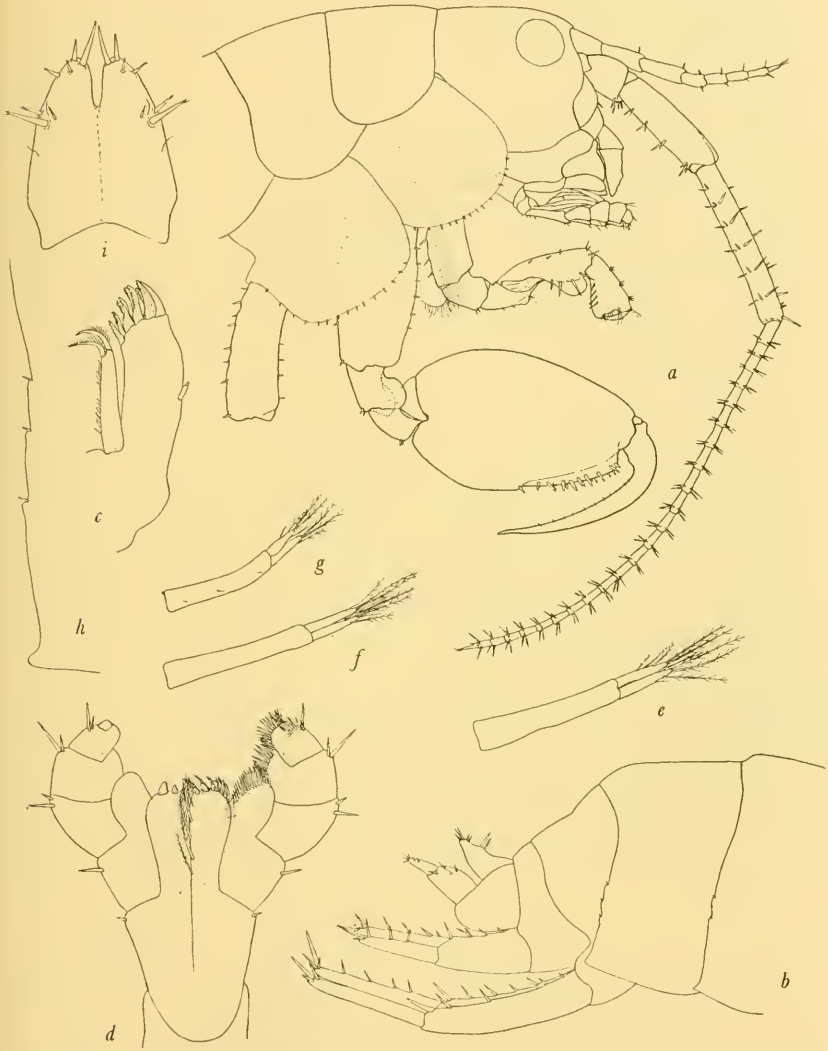


FIG. 4.—*Orchestia marquesana* Stephensen. Male, *a*, front end of animal; *b*, hind end of animal; *c*, maxilla 1; *d*, maxillipeds; *e*, *f*, *g*, pleopods 1, 2, and 3; *h*, hind margin metasome segment 3; *i*, telson.

palmar angle a lobular appearance. In Stephensen's figures the hind margins of the metasome segments bear many more serrations, the eyes appear smaller, and the pleopods are more reduced than in the

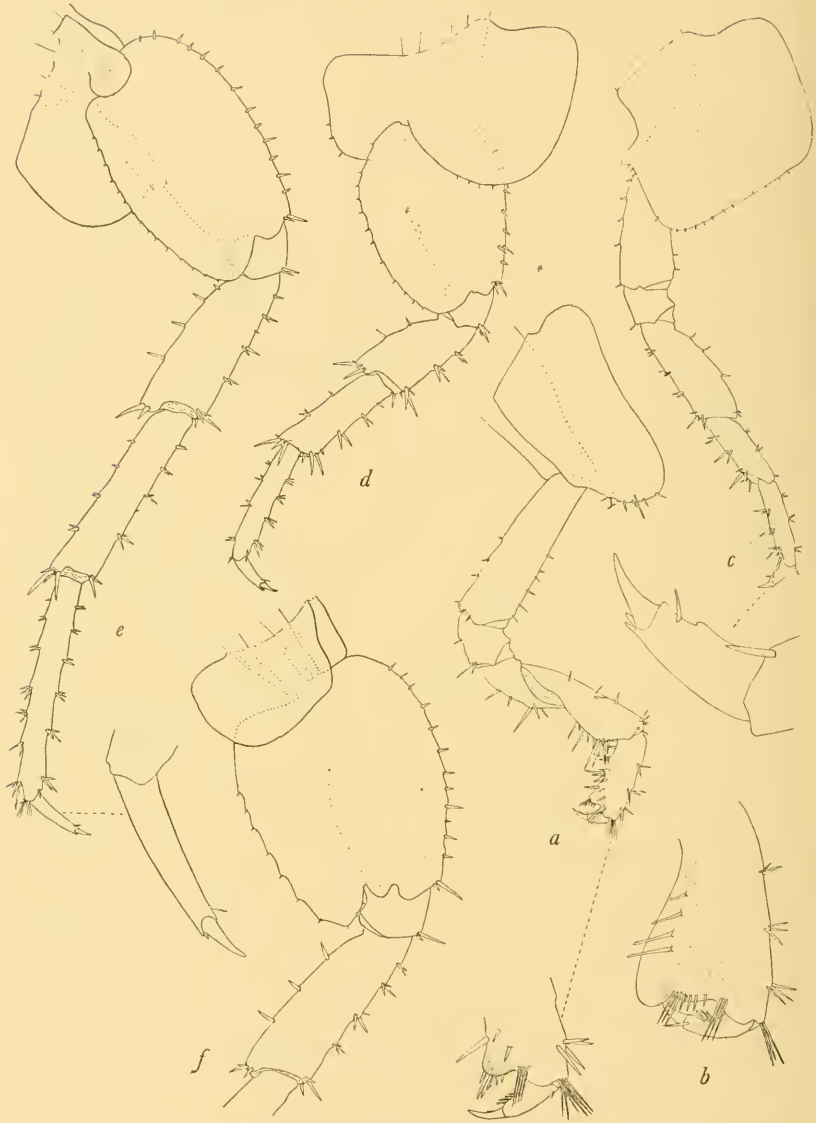


FIG. 5.—*Orchestia marquesana* Stephensen. Female, *a*, gnathopod 1. Male, *b*, sixth and seventh joints of gnathopod 1; *c*, *d*, *e*, *f*, peraeopods 2, 3, 4, and 5.

present specimens. I believe that in spite of these differences the Clipperton Island specimens belong to the species described from the Marquesas Islands and are *O. marquesana.*

These specimens were found in the debris under two boobies' nests, which were back from the beach well over 100 yards in a completely dry location, but the layer of debris in which the animals were found was moist.

The genera *Orchestia* and *Parorchestia* do not possess any characters by which they can be justly separated. Stebbing (1906, p. 530) says of *Orchestia,* "The maxillipeds seem sometimes to have an obscure rudiment of the fourth joint of the palp, and the front lobe of side-plate 5 may be as deep as side-plate 4." Of the genus *Parorchestia* he says (1906, p. 557), "Like *Orchestia,* but maxillipeds with fourth joint of palp distinct, though very small, conical, and having a spine on the truncate apex."

Chilton (1909, p. 636-637), after quoting Stebbing's definition of *Parorchestia,* says,

> In *Orchestia,* however, the maxillipeds may, as Stebbing himself states, have an obscure rudiment of the fourth joint of the palp, and the presence or absence of this joint is therefore hardly sufficient to distinguish the two genera. At the same time, it is perhaps convenient to group the truly terrestrial species under a separate genus, and the species that I am acquainted with can, as a rule, be distinguished from species of *Orchestia* living on the sea-shore by the greater abundance of long slender spine-like setae on the antennae and the peraeopods, and by the more reduced condition of the pleopoda, especially the third pair.

Dr. Stephensen (1935, p. 32), in describing *Orchestia marquesana,* places it in *Orchestia,* though he states that the palp of the maxillipeds has a minute, scalelike fourth joint. It would seem then that there are no characters sufficiently distinct to warrant the retention of the two genera, and I therefore regard *Parorchestia* as synonymous with *Orchestia.* The characters which have been used to distinguish the two genera differ only in degree, not in kind.

### HYALE FREQUENS (Stout)

*Allorchestes frequens* Stout, 1913, Zool. Jahrb., Abt. Syst., vol. 34, p. 650.

Station 3. Magdalena Bay, Lower California ,15 specimens.

Station 4. Magdalena Bay, Lower California, 3 specimens.

Stout's specimens were taken at Laguna Beach, southern California, from tufts of coralline algae and from *Phyllospadix* between tides and also from tangles set below tides. The present specimens from Magdalena Bay were also found living among algae in 10-15 fathoms, and they constitute the second record of the occurrence of this species.

### HYALE HAWAIENSIS (Dana)

*Allorchestes hawaiensis* DANA, 1853 and 1855, U. S. Explor. Exped., vol. 14, pt. 2, Amphipoda, p. 900, pl. 61, fig. 5.

*Hyale brevipes* CHEVREUX, 1901, Mem. Soc. Zool. France, vol. 14, p. 400, figs. 15-18; SHOEMAKER, 1933, Amer. Mus. Nov., No. 598, p. 18, figs. 10-11.

*Hyale hawaiensis* SCHELLENBERG, 1938, Kungl. Svenska Vetensk. Akad. Handl., Tredje ser., vol. 16, No. 6, p. 66, fig. 34.

Station 16. Narborough Island, Galápagos Islands, 6 specimens.

Dana described this species from the Hawaiian Islands, and it has been pointed out by Schellenberg that Chevreux's *Hyale brevipes* described from the Seychelles Islands is a synonym of it. *Hyale stolzmani,* described by Wrzesniowski from the coast of Peru, I believe is also a synonym of *H. hawaiensis. H. hawaiensis* is represented in the National Museum collection by specimens from Peru and the west coast of America as far north as California.

*Hyale hawaiensis* appears to be a cosmopolitan species in the warm and temperate seas.

## AORIDAE

### LEMBOS (BEMLOS) MACROMANUS (Shoemaker)

*Bemlos macromanus* SHOEMAKER, 1925, Bull. Amer. Mus. Nat. Hist., vol. 52, art. 2, p. 36, figs. 10-13.

*Lembos (Bemlos) macromanus* SCHELLENBERG, 1938, Kungl. Svenska. Vetensk. Akad. Handl., Tredje ser., vol. 16, No. 6, p. 79.

Station 3. Magdalena Bay, Lower California, numerous specimens.

Station 4. Magdalena Bay, Lower California, numerous specimens.

Station 5. Cape San Lucas, Lower California, 1 specimen.

This species was described from Lower California without a definite locality, but, as indicated by specimens recently presented to the National Museum, it appears to be a common species on the coast of that peninsula. The single male recorded by Schellenberg was from the Philippine Islands, which bespeaks a wide range for the species.

### MICRODEUTOPUS SCHMITTI, new species [1]

FIGURE 6

Station 3. Magdalena Bay, Lower California, 11 specimens.

Station 4. Magdalena Bay, Lower California, 1 specimen.

Station 5. Cape San Lucas, Lower California, 1 specimen.

*Male.*—Head, side lobes rounding. Eye rather small, black, and composed of a few elements. Antenna 1 a little longer than 2, first

[1] Named in honor of Dr. Waldo L. Schmitt, the naturalist to the Presidential Cruise.

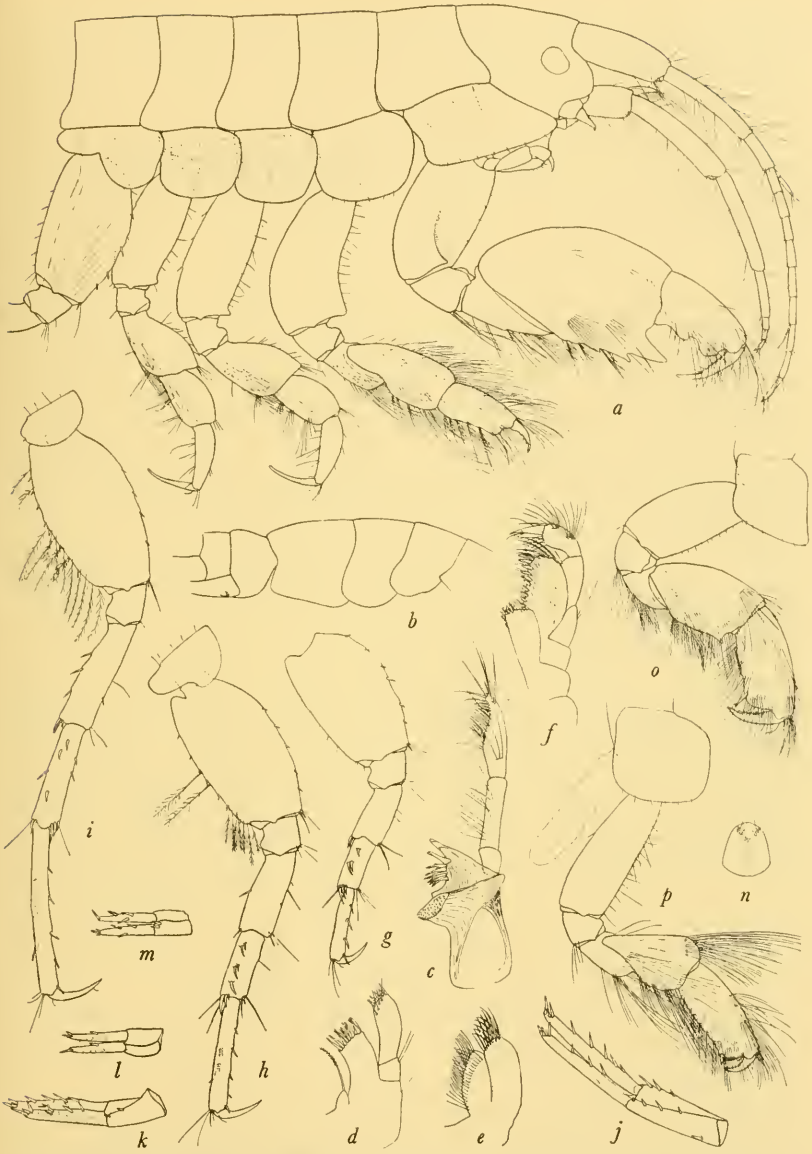


FIG. 6.—*Microdeutopus schmitti*, new species. Male, *a*, front end of animal; *b*, hind end of animal (on smaller scale than front end); *c*, mandible; *d*, maxilla 1; *e*, maxilla 2; *f*, maxilliped; *g*, peraeopod 3; *h*, peraeopod 4; *i*, peraeopod 5; *j*, uropod 1; *k*, uropod 2; *l*, *m*, uropod 3, from below and above; *n*, telson. Female, *o*, gnathopod 1; *p*, gnathopod 2.

and second peduncular joints about equal in length; third joint less than half the length of the second; flagellum about equal in length to the peduncle and composed of 9 or 10 joints; accessory flagellum consisting of 2 long and 1 very short joint. Several of the terminal flagellum joints carry long slender cylindrical sense organs. Antenna 2, fifth joint a little longer than fourth; flagellum about two-thirds the length of the fourth joint and composed of one long joint and three short joints, the three short joints each bearing a curved spine.

Mandible, molar prominent and bearing at its base near the insertion of the palp a prominent cone-shaped process; accessory plate narrow; six spines in spine row; second joint of palp shorter than third. Maxilla 1, inner plate small and bearing 1 long plumose seta; outer plate armed with 10 spine teeth; palp rounded distally and bearing 5 spine teeth and 4 setae. Maxilla 2, normal and much as figured by Sars for *M. anomalus* (pl. 191, fig. $m^2$), the diagonal row of setae on inner plate reaching nearly to the outer margin. Maxillipeds, inner plate bearing 3 teeth and the usual plumose setae; outer plate reaching nearly to the end of the second palp joint and armed on inner margin with 10 teeth; fourth joint of palp bearing nail at the base of which are several setules.

Gnathopod 1, strong and robust, second joint thick with the front margin excavate for the reception of the fifth joint when the limb is folded; fifth joint strongly developed with the hind margin produced distally into a forward-pointing tooth, back of which are two smaller teeth; sixth joint bearing two teeth on lower margin; seventh joint shorter than sixth, curved, with inner margin armed with five small teeth. Gnathopod 2, second joint strong, hind margin convex and the front margin concave; fifth joint longer and wider than sixth; sixth narrowing distally, palm transverse with evenly rounding defining angle and armed with exceedingly fine denticulations throughout; seventh joint overlapping palm and armed on inner margin with three small teeth; fourth, fifth, and sixth joints densely setose on their inner surfaces.

Peraeopods 1 and 2 very much alike, but 1 a little the stouter and longer; the lower inside surface of fourth joints densely clothed with long forward-pointing setae. Peraeopod 3 about equal in length to 2. Peraeopod 4 longer than 3, but shorter than 5. Coxal plate 1 produced forward to an evenly rounding, narrow, lower corner, lower margin nearly straight; coxal plate 2 deeper than 1 and deeper than the five following.

Metasome segments with lower hind corner narrowly rounding, segment 3 the longest. Uropod 1, peduncle about equal in length to outer ramus, which is a little shorter than inner; peduncle produced distally to a long upward-curved tooth. Uropod 2, peduncle shorter than outer ramus, which is shorter than the inner; peduncle produced distally into a long upward-curved tooth. Uropod 3 with outer ramus perhaps a little longer than inner. Telson reaching to end of peduncle of uropod 3, tumid, depressed along the central longitudinal dorsal surface, distal corners armed with three spinules and a seta, lateral margins slightly convex and converging toward the incised apex. Length of male 5 mm.

*Female.*—Much like the male except in gnathopods 1 and 2. Gnathopod 1, fifth joint as long as, but wider than, the sixth, lower front margin produced to a small tooth; sixth joint with front and hind margins about parallel, palm slightly oblique, defined by a broadly rounding curve at the base of which is a stout spine, palm minutely denticulate throughout; seventh joint overlapping palm and armed on inside margin with seven small teeth. The first coxal plate is neither so produced nor so long as in the male.

Gnathopod 2, fifth joint somewhat shorter, but much wider than sixth; sixth with front and hind margins about parallel, palm transverse, defined by an evenly rounding curve at the base of which is a stout spine, palm minutely denticulate throughout; seventh joint exactly fitting palm, and armed on inside margin with four small teeth. The second coxal plate is slightly deeper than the first and deeper than any of the following. Length of female 6 mm.

*Type locality.*—Magdalena Bay, Lower California, dredged in 10-15 fathoms inside northern point of entrance to bay, July 18, 1938. Holotype, male, U.S.N.M. No. 79375.

## PHOTIDAE

### PHOTIS SPINICARPA, new species

FIGURES 7, 8

Station 3. Magdalena Bay, Lower California, 16 specimens.

*Male.*—Head, lateral lobes moderately produced with front margin blunt and evenly rounding. Eye very small, round or slightly oval, black. Antenna 1 a little shorter than 2; flagellum consisting of about 10 joints. Antenna 2, flagellum consisting of from 12 to 14 joints. Mandible, molar strong and prominent; cutting edge toothed and very oblique; accessory plate simple, toothed; five spines in spine row, the two spines nearest molar being broadened and very much barbed

apically; palp with third joint over half the length of second, apically rounding and bearing groups of spines on inner and outer surfaces in addition to the inner marginal spines; second joint bearing a few scattered spines on inner margin. Maxilla 1, inner plate reduced to a


FIG. 7.—*Photis spinicarpa*, new species. Male, *a*, gnathopod 1; *b*, palm and seventh joint of gnathopod 1 greatly enlarged; *c*, gnathopod 2. Female, *d*, gnathopod 1; *e*, palm and seventh joint of gnathopod 2, greatly enlarged.

small conical lobe without setae; outer plate armed with 10 spine teeth; palp bearing on the obliquely truncate apex 6 spine teeth and 5 setae. Maxilla 2, outer plate wider and longer than inner; inner plate bearing, besides the inner marginal spines, a row of 25 closely set plumose

setae which begins at the upper center of the plate and runs diagonally down to the lower inner edge. Maxillipeds, inner plate reaching to the middle of outer plate and bearing three teeth on upper margin;

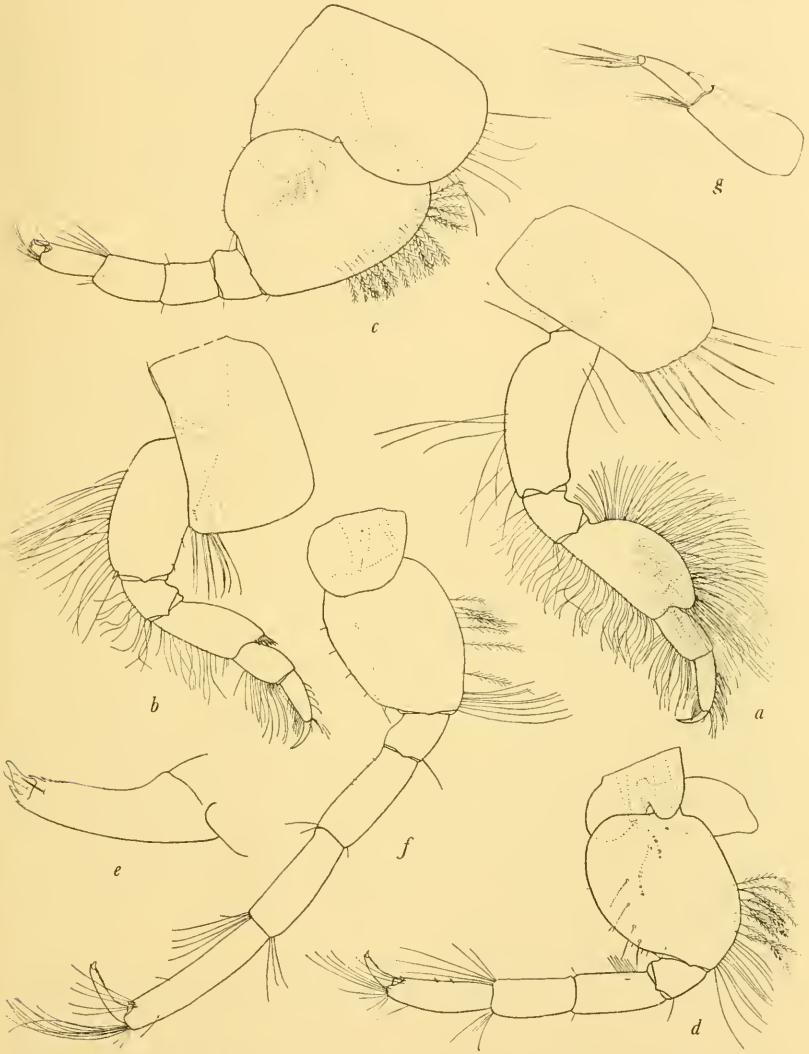


FIG. 8.—*Photis spinicarpa*, new species. Male, *a*, peraeopod 1; *b*, peraeopod 2; *c*, peraeopod 3; *d*, peraeopod 4; *e*, seventh joint of peraeopod 4 greatly enlarged; *f*, peraeopod 5; *g*, uropod 3.

outer plate reaching nearly to the end of second joint of palp and armed on upper inner margin and rounding distal margin with eight spine teeth and three curved pectinate spines; third joint of palp

short and narrow; fourth joint rather small and bearing a prominent nail. Lower lip with lateral lobes rather small and slender; inner lobes very large.

Gnathopod 1, coxal plate somewhat produced forward, the lower front corner forming a slight lobe; second joint rather short and thick with lower front inner margin produced into a broadly rounding lobe; fifth joint shorter than second and slightly longer than sixth and armed on upper proximal margin with a row of short stout spines; sixth joint narrowing distally, palm very oblique, concave, defined by a prominent angle on the inside of which is a stout spine, and crenulate throughout; seventh joint curved, bearing a row of fine teeth on inner margin and considerably overlapping palm.

Gnathopod 2, second joint short and stout and bearing at the lower front corner a narrow lobe which stands at a right angle to the joint; third joint bearing a narrow, downward-pointing lobe on front margin; fifth joint about two-thirds the length of sixth; sixth joint broadly oval and only a little longer than wide, palm oblique, deeply convex, crenulate throughout, and forming a produced angle with the hind margin, the produced angle bearing a stout spine on inner surface; seventh joint curved, bearing a row of fine teeth on inner margin and somewhat overlapping palm.

Peraeopod 1 longer and stouter than 2; second joint as long as third and fourth together; fourth joint considerably expanded and clothed with a dense armament of long plumose setae. Peraeopod 2 as shown in figure 8, *b*. Peraeopod 3, coxal plate slightly deeper than that of peraeopod 2; limb short and curved up over back of animal; second joint very much expanded. Peraeopod 4, second joint not as greatly expanded as in 3; limb curved backward from the third joint; seventh joint stout, armed on inner margin with a row of fine teeth becoming coarser as they approach the nail which bears several barbs on its outer base. Peraeopod 5 conspicuously longer than 4; second joint less expanded than that of 4; seventh joint long and prominent with armature similar to that of 4.

Uropod 1 extending back a little farther than 2. Uropod 3 extending back as far as 2 or perhaps a little farther. Uropod 3, longer ramus about two-thirds the length of peduncle, second joint cylindrical and very short and armed with a long spine and several long setae; shorter ramus a little over one-third the length of the longer and bearing a very small apical spinule. Telson broadly triangular. Length of male 7 mm.

*Female.*—The female is very much like the male in general appearance. The gnathopods are not so strong and robust as in the male.

Palm of the first gnathopod very oblique, slightly concave, and defined by a low, evenly rounding angle bearing a prominent spine; seventh joint armed on inside margin with a row of fine teeth, and considerably overlapping palm. Gnathopod 2, palm more concave than in gnathopod 1, but not as deeply concave as that of male; seventh joint armed on inner margin with strong serrations and somewhat overlapping palm. Length 7 mm.

*Type locality.*—Magdalena Bay, Lower California, dredged in 10-15 fathoms inside northern point of entrance to bay, July 18, 1938. Holotype, male, U.S.N.M. No. 80028.

### PHOTIS BREVIPES, new species

FIGURE 9

Station 3. Magdalena Bay, Lower California, 30 specimens.

Station 4. Magdalena Bay, Lower California, 1 specimen.

*Male.*—Head with lateral lobes very little produced. Eyes small, oval, black. Antenna 1 about equal in length to antenna 2, flagellum 6-jointed. Antenna 2, flagellum 6-jointed. Coxal plates 1 to 5 deeper than their segments; 1 and 2 not as deep as 3, 4, or 5 which are about equal in depth.

Gnathopods 1 and 2 short and stout. Gnathopod 1, second joint bearing a slightly produced lower front lobe; fifth joint shorter but equal in width to sixth; sixth joint, palm oblique and rather deeply excavate with a low protuberance near the seventh joint, defined by a prominent angle, submarginal to which is a prominent spine on the inner surface of the joint; the palm is very finely crenulate throughout; seventh joint armed distally on the inner margin with three forward-pointing spine teeth and proximally with a row of very fine, closely set teeth. Gnathopod 2 a little longer and much stouter than 1, second joint bearing a rather prominent lower front lobe; fifth joint short and narrowly produced between fourth and sixth; sixth joint nearly as wide as long, palm nearly transverse, deeply incised, forming a prominent defining tooth, and bearing a triangular tooth near the seventh joint; seventh joint short and stout and bearing a rounding protuberance near the center of the inner margin.

Peraeopod 1 very little longer than 2, second joint a little longer than third and fourth combined; fourth joint slightly expanded distally with lower front margin a little produced; fifth and sixth joints short and, combined, equal in length to the fourth. The third, fourth, and fifth joints bearing plumose setae on the hind margin; and the


FIG. 9.—*Photis brevipes*, new species. Male, *a*, gnathopod 1; *b*, gnathopod 2; *c*, peraeopod 1; *d*, peraeopod 2; *e*, peraeopod 3; *f*, peraeopod 4; *g*, peraeopod 5; *h*, uropod 1; *i*, uropod 3. Female, *j*, gnathopod 1.

fourth joint bearing plumose setae on the front and lower margins, those of the lower margin being very long and extending much beyond the sixth joint. Peraeopod 2 in general much like peraeopod 1, but does not bear so many plumose setae. Peraeopod 3 short and assuming the usual upward-pointing position characteristic of the genus *Photis;* the second joint is nearly circular, being as wide as long; the three following joints are very short and wide; the sixth joint is narrower, being twice as long as wide; the seventh joint is short with the bent apex and two small outer teeth found in this genus. Peraeopods 4 and 5 are about equal in length and are a little longer than 3. Peraeopod 4 assumes much the same position as peraeopod 3, though not pointing so sharply upward; the seventh joint is much like that of 3 and when closed against the end of the sixth joint forms a decided hook. Peraeopod 5 has the appearance and structure normal to the great majority of the Gammaridea as shown in figure 9, *g*.

Uropods 1 and 2 extending back about the same distance; uropod 3 extending back not quite so far as 2. Outer ramus of uropod 1 bears three spines on upper margin, while the inner ramus bears only one; the outer edge of the peduncle bears six spines, and the inner edge bears only one terminal spine. Outer ramus of uropod 2 bears two spines on upper margin and the inner ramus bears three; the peduncle bears two spines on outer edge and one terminal spine on inner edge. Telson normal and reaching to the middle of the peduncle of uropod 2. Length about 3 mm.

*Female.*—The female appears somewhat more robust than the male, but differs principally in the gnathopods. The palm of gnathopod 1 is very oblique and merges imperceptibly into the hind margin of the joint by an evenly rounding curve, but is defined by a stout spine; the palm is armed throughout with very fine, sharp, closely set teeth; the seventh joint is much like that of the male, but the inner margin bears two teeth instead of the three possessed by the male. Gnathopod 2 closely resembles gnathopod 1 of the male; the crenulate palm and the seventh joint like those of gnathopod 1 of the male, but the fifth joint is narrowly produced between the fourth and sixth as it is in gnathopod 2 of the male. Length about that of the male or a very little longer.

*Type locality.*—Magdalena Bay, Lower California, dredged in 10-15 fathoms inside northern point of entrance to bay, July 18, 1938. Holotype, male, U.S.N.M. No. 79360.

### EURYSTHEUS TENUICORNIS (Holmes)

FIGURE 10, *d, e*

*Gammaropsis tenuicornis* HOLMES, 1904, Harriman Alaska Exped., p. 239, fig. 124.

*Eurystheus tenuicornis* SHOEMAKER, 1931, Proc. U.S. Nat. Mus., vol. 78, No. 2861, art. 18, p. 5, figs. 3, 4.

Station 3. Magdalena Bay, Lower California, 1 specimen.

Station 4. Magdalena Bay, Lower California, 2 specimens.

This species was described by Holmes from Puget Sound, Wash., from a single male specimen which did not possess fully developed characters. *E. tenuicornis* inhabits the entire west coast of the United States and Lower California and was taken by the *Albatross* in the Gulf of California.

### EURYSTHEUS TENUICORNIS var. LOBATA, new variety

FIGURE 10, *a-c*

Station 3. Magdalena Bay, Lower California, 25 specimens.

Station 4. Magdalena Bay, Lower California, 1 specimen.

*Male.*—This variety is distinguished by the enlargement of the second joint of the first gnathopod and by its downward production into a broadly rounding lobe which is furnished with a dense brush of long forward-curving simple setae. The broadly triangular central dorsal tooth of the first urosome segment is produced upward and is curved forward toward the metasome. Length 8.5 mm.

The female does not differ materially from that of *Eurystheus tenuicornis*.

*Type locality.*—Magdalena Bay, Lower California, dredged in 10-15 fathoms inside northern point of entrance to bay, July 18, 1938. Holotype, male, U.S.N.M. No. 79376.

There are specimens of this variety in the National Museum collection from the following localities: *Albatross* station 2835, off Lower California, 26°42′30″ N., 113°34′15″ W., May 4, 1888, 5.5 fathoms, 3 specimens; San Diego, Calif., 10 fathoms, collected by Henry Hemphill in 1882, 8 specimens; La Jolla, Calif., from kelp holdfast washed up on beach after storm, March 4, 1938, collected by Olga Hartman, 8 specimens; Newport Bay, Calif., collected by G. E. MacGinitie from seaweed on rocks, December 29, 1932, many specimens; same locality, from among hydroids, etc., July 14, 1935, 4 specimens.

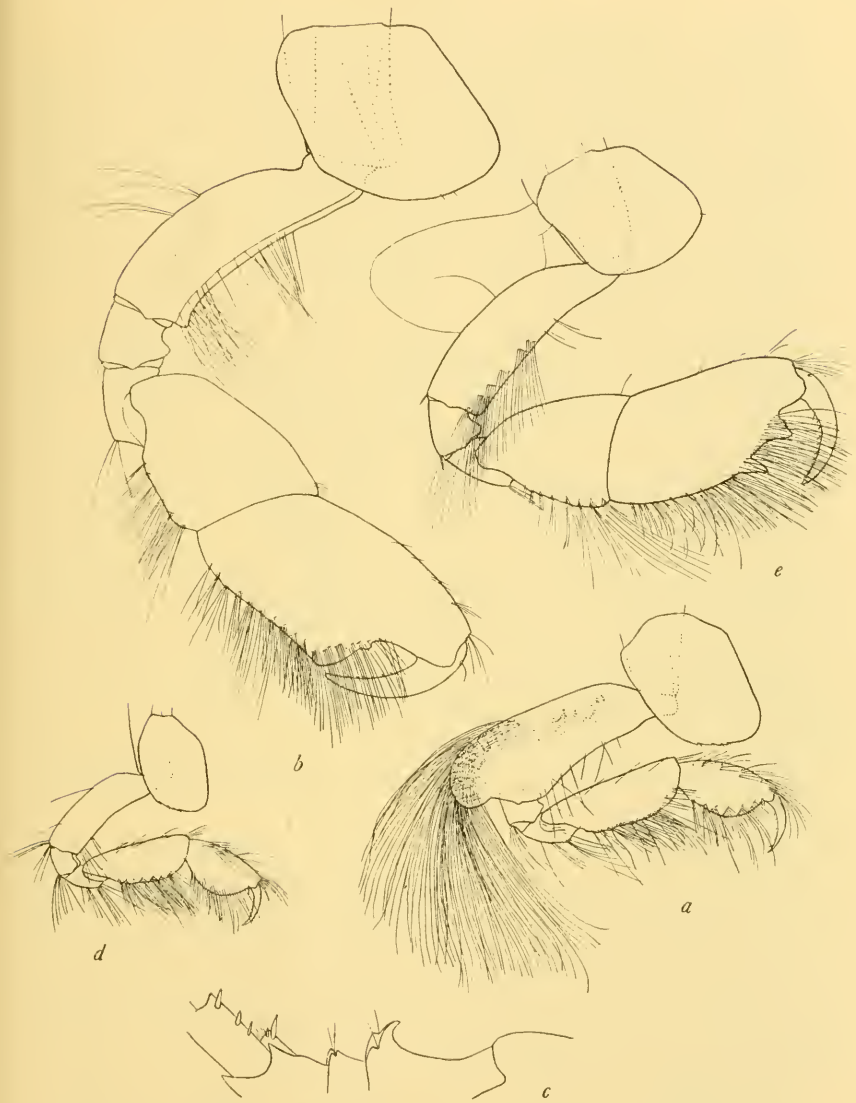


FIG. 10.—*Eurystheus tenuicornis* var. *lobata*, new variety. Male, *a*, gnathopod 1; *b*, gnathopod 2; *c*, urosome. *Eurystheus tenuicornis* Holmes; *d*, gnathopod 1; *e*, gnathopod 2.

### EURYSTHEUS SPINOSUS, new species

FIGURE 11

Station 3. Magdalena Bay, Lower California, 11 specimens.

*Male.*—Head with lateral lobes produced and rather sharply angular; eyes small, oval, and black. Antennae nearly equal in length, antenna 2 being perhaps a little the longer. Antenna 1, third joint of peduncle equal in length to the first, but shorter than second, flagellum not as long as second and third peduncular joints combined, and composed of six joints; accessory flagellum 3-jointed. Antenna 2, fourth and fifth joints equal in length, flagellum a little longer than fifth peduncular joint, and composed of five joints.

Mandibles with molar well developed. Right mandible with accessory plate bifurcate and toothed; three spines in spine row; third joint of palp shorter than second and distally truncate. Maxilla 1, inner plate triangular with acute apex and without setae; outer plate armed with 10 spine teeth; palp bearing distally 5 spine teeth and 4 setae. Maxilla 2, inner plate as wide as, but slightly shorter than, outer, distally broadly and evenly rounding, and bearing an oblique row of closely set setae near inner margin. Maxillipeds, inner plate not quite reaching the middle of outer plate, armed distally with three spine teeth, and bearing a spine tooth on inner margin near the upper angle; outer plate reaching a little beyond the middle of the second joint of the palp, inner margin armed with seven spine teeth, two of which are placed on the upper rounding angle; palp 4-jointed, the last joint being small, obliquely truncate and bearing distally three spines. Lower lip with inner lobes very prominent, and lateral processes very acute.

Gnathopod 1, second joint longer than fifth, fifth a little longer than sixth; sixth narrowing distally, palm defined by a slight angle and a spine, and bearing a low tooth near the hinge of the seventh joint; seventh joint longer than palm and armed on inner margin with a few minute teeth. Gnathopod 2, fifth joint as wide as, but shorter than, sixth; sixth joint with front and hind margins about parallel, palm oblique and equal in length to hind margin, bearing two low teeth and defined by a small tooth.

Peraeopods 1 and 2 alike, but 1 a little the longer. Peraeopod 3, coxal plate very large and as deep as the fourth; second joint greatly developed, being as wide as long; fourth joint considerably expanded, hind margin convex and bearing a conspicuous row of stout spines. Peraeopod 4 about as long as 3 but longer than peraeopod 5. Peraeopods 3 to 5 all strongly curved and extending up over the back.


FIG. 11.—*Eurystheus spinosus*, new species. Male, *a*, front half of animal; *b*, mandibular palp; *c*, mandibular spine row; *d*, maxilla 1; *e*, maxilla 2; *f*, maxilliped; *g*, lower lip; *h*, gnathopod 1; *i*, gnathopod 2; *j*, peraeopod 4; *k*, peraeopod 5; *l*, uropod 3; *m*, telson. Female, *n*, gnathopod 1; *o*, gnathopod 1 greatly enlarged; *p*, gnathopod 2.

Metasome segments with lower posterior corners broadly rounding with the indication of a very slight and broad posterior angle in the second. Uropod 2 reaching a little farther back than 1, but not as far as uropod 3. Uropods 1 and 2, inner ramus longer than outer. Peduncle of uropod 1 produced distally into an upward-curved tooth. Uropod 2 is without the peduncular tooth. Telson reaching to about the middle of the peduncle of uropod 3, about as broad as long, narrowing distally, slightly emarginate above and bearing two setules on either side of the center of the emargination. Length of mature male about 3 mm.

*Female.*—The female differs from the male principally in the second gnathopod and the third peraeopod. The palm is very oblique, has a single palmar tooth near the hinge of the seventh joint, and is defined by a right angle and a spine. Peraeopod 3 is not so robust as in the male, the second joint is not so much expanded, the fourth joint is little expanded and lacks the characteristic row of spines of the male, and the fifth and sixth joints are proportionately longer. Length about 3 mm.

*Type locality.*—Magdalena Bay, Lower California, dredged in 10-15 fathoms inside northern point of entrance to bay, July 18, 1938. Holotype, male, U.S.N.M. No. 79377.

### PODOCEROPSIS DUBIA, new species

FIGURE 12

Station 28. Chatham Bay, Cocos Island, 23 specimens.

*Male.*—Head about as long as first two body segments; lateral lobes produced but not acutely so; lower margin deeply incised for the insertion of antenna 2; eye rather large and placed on the lateral lobe. Antenna 1 shorter than 2, third peduncular joint longer than first and about two-thirds the length of the second; flagellum about as long as the second and third peduncular joints combined and composed of about 10 joints, the last 5 or 6 of which bear long, slender sensory organs. Antenna 2, third peduncular joint unusually elongate, fourth very little shorter than fifth; flagellum very nearly as long as the peduncle and composed of about 14 joints.

Mouth parts very nearly as figured by Sars for *Megamphopus cornutus* (pl. 200). Upper lip with lower margin evenly rounding. Mandible, molar prominent with the base near the insertion of the palp produced into a blunt rounding knob; accessory plate present on both right and left mandible; eight or nine spines in spine row; third joint of palp shorter than second. Maxilla 1, inner plate rather

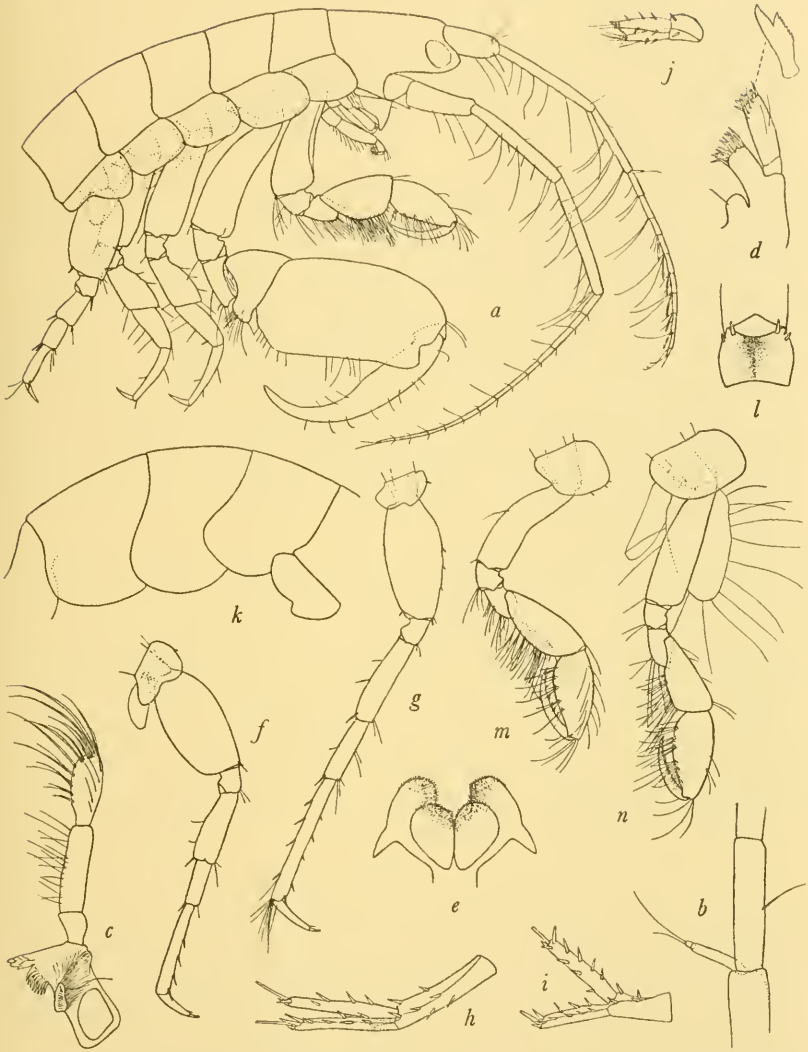


FIG. 12.—*Podoceropsis dubia*, new species. Male, *a*, front half of animal; *b*, antenna 1; *c*, mandible; *d*, maxilla 1; *e*, lower lip; *f*, peraeopod 4; *g*, peraeopod 5; *h*, uropod 1; *i*, uropod 2; *j*, uropod 3; *k*, metasome, on larger scale than front half of animal; *l*, telson. Female, *m*, gnathopod 1; *n*, gnathopod 2.

small, evenly rounding distally and bearing a single seta; outer plate armed with 10 spine teeth; palp armed distally with 2 simple spines between which are 3 serrate spine teeth. Lower lip with lateral lobes rather short and angular. Coxal plates all rather shallow; coxal plate 1 produced forward very slightly; coxal plate 2 the deepest, but little deeper than 1; coxal plates 3 and 4 successively shallower, 4 not as deep as 5.

Gnathopod 1, fifth joint as long as sixth, but wider; sixth rather narrow and converging distally, palm very long, without defining spine and not differentiated from short hind margin; seventh joint nearly as long as sixth and bearing a few setules on inner margin. Gnathopod 2 large and robust, fifth joint short, about one-third the length of sixth and produced behind into a small lobe; sixth joint strongly developed, front and hind margins about parallel, hind margin produced distally into a low rounding lobe, palm not defined; seventh joint stout, strongly curved distally and about equal in length to the hind margin of the sixth joint. The seventh joint does not appear to close against the sixth joint, but normally remains gaping as shown in figure 12, *a*.

Peraeopods 1 and 2 alike in structure, but 1 a little the larger; seventh joints rather short and glandular. Peraeopod 3 shorter than 2, second joint not much expanded. Peraeopod 4 longer than 3, but shorter than 5; second joint of 4 and 5 not much expanded, and their seventh joints much longer than in the preceding peraeopods.

Metasome segments much as figured by Sars for *M. cornutus* (pl. 200), all having their lower hind corners broadly rounding, and segment 3 being the longest. Uropod 1 projecting farther back than 2, which projects farther back than 3. Uropod 1, peduncle produced distally below into an upward-curving tooth, outer ramus a little shorter than inner. Uropod 2 without the peduncular tooth, outer ramus shorter than inner. Telson wider than long, reaching to about one-third the distance along the rami of uropod 3, sides convex, each distal corner bearing two short spinules and a long seta, and dorsal surface bearing a longitudinal depression. Length of male about 3 mm.

*Female.*—The female differs from the male only in the gnathopods. Gnathopod 1 is proportionately longer and slenderer; the fifth and sixth joints are equal in length and are longer and not as wide as in the male. Gnathopod 2 is much like gnathopod 1 of the male, the slight differences being shown by the figures. The palms of both gnathopods are without defining spines and are not differentiated from the hind margin of the joints. Length, female, 3 to 3.5 mm.

*Type locality.*—Chatham Bay, Cocos Island, taken in a bottom sample, mostly sand, August 3, 1938. Holotype, male, U.S.N.M. No. 79378.

*Remarks.*—This is an aberrant species and does not fit into any of the genera of the Photidae as characterized by Stebbing. It is nearest to *Podoceropsis* and *Megamphopus*. These two genera differ from each other in the relative length of the fifth and sixth joints of the second gnathopod of the male, being short in *Podoceropsis* and long in *Megamphopus*. In the present species the fifth joint is short in the male, but the sixth joint of gnathopod 2 in the female is not conspicuously wider than that of gnathopod 1, a character of *Podoceropsis* given by Stebbing. Gnathopods 1 and 2 of the female are much like those figured by Sars for *Megamphopus cornutus* (pl. 200). The very small accessory flagellum is like that of *Megamphopus*. The second coxal plate is the largest in both male and female, agreeing with *Megamphopus*. The mouth parts could be claimed by either *Podoceropsis* or *Megamphopus*. The mandible closely resembles that figured by Sars for *M. cornutus* (pl. 200). The inner plate of maxilla 1 is not obliquely truncate with the single seta at the apex of the somewhat produced corner as shown by Sars for *M. cornutus* (pl. 200) or *Podoceropsis excavata* (pl. 205), but is broadly and evenly rounding with the seta at the opposite corner from that shown by Sars.

In many characters *Podoceropsis dubia* bears a striking resemblance to *Megamphopus longidactylus* Chevreux (1925, p. 388), which is also an aberrant species and does not conform to either *Megamphopus* or *Podoceropsis*. The present species differs from *M. longidactylus* by having gnathopod 1 of the male much more robust, and the metacarpus of gnathopod 2 much wider than the carpus.

### NEOMEGAMPHOPUS, new genus

Body slender. Head with lateral lobes considerably projecting. Eyes well developed. Antennae 1 and 2 slender and 1 the shorter. Accessory flagellum very small, 2-jointed. Mandibular palp stout, third joint shorter than second and distally truncate. Maxilla 1, inner plate with 1 or 2 setae; outer plate with 10 spine teeth. Maxilla 2, outer plate broader and longer than inner, inner plate bearing oblique row of spinules. Maxillipeds, inner plate shorter than outer and bearing two teeth on truncate extremity; outer plate bearing a few teeth on inner edge and a few plumose spines and a few spine teeth on upper margin. Lower lip with very well-developed inner lobe. Gnathopod 1 in male the larger; fifth joint greatly developed with lower margin

produced forward into a tooth; sixth and seventh joints slender. Gnathopod 2 in male long and slender; sixth joint shorter than fifth and bearing the mere suggestion of a palm. Gnathopods 1 and 2 in female simple and much like gnathopod 2 of male. Side plate 4 not excavate behind. All peraeopods with second joint about equally expanded. Peraeopod 5 the longest. All uropods with outer ramus shorter than inner. Outer ramus of uropod 3 apparently with a very small indistinct second joint. Telson simple, tumid. Genotype, *Neomegamphopus roosevelti.*

### NEOMEGAMPHOPUS ROOSEVELTI, new species [2]

FIGURE 13

Station 3. Magdalena Bay, Lower California, many specimens.
Station 4. Magdalena Bay, Lower California, many specimens.
Station 5. Cape San Lucas, Lower California, 6 specimens.

*Male.*—Head about as long as the first two body segments; lateral lobes strongly produced and bearing the rather large oblique eye. Lower part of head cut far back for the insertion of antenna 2. Antenna 1, second joint longest; third a little shorter than first; flagellum about as long as second and third joints combined and composed of about 10 joints; accessory flagellum shorter than first joint of primary flagellum and composed of 1 long and 1 very short joint. Antenna 2 with third, fourth, and fifth joints increasing consecutively in length; flagellum not as long as fourth and fifth joints combined and composed of about 10 joints.

Mandibles with prominent molar; cutting edge rather narrow and toothed; accessory plate well developed and toothed; six serrate spines in spine row; palp stout with spines on upper and lower margins of second joint, and many long spines on extremity of third joint. Maxilla 1, inner plate obliquely truncate and bearing 1 or 2 simple setae; outer plate armed with 10 serrate spine teeth; palp with first joint short, second joint broad and long, and armed distally with several jagged, serrate teeth and five setules. Maxilla 2, outer plate much broader than inner; inner plate with spinules along the entire inner edge and an oblique row near inner edge. Maxillipeds, inner plate with two teeth at inner corner of truncate distal margin, and an oblique row of plumose setae on inner surface; outer plate reaching to about two-thirds the length of the second palp joint, inner

[2] I take great pleasure in naming this species for the Hon. Franklin D. Roosevelt, President of the United States of America, in appreciation of his interest in the biological collections of the U. S. National Museum.

margin armed with four spine teeth and the upper margin with two plumose spines and two slender spine teeth; second joint of palp slender and longer than the third and fourth combined, fourth joint


FIG. 13.—*Neomegamphopus roosevelti*, new species. Male, *a*, entire animal; *b*, accessory flagellum of antenna 1; *c*, mandible; *d*, maxilla 1; *e*, palp of left maxilla 1; *f*, end of palp of maxilla 1, enlarged; *g*, inner plate of left maxilla 1; *h*, maxilla 2; *i*, maxilliped; *j*, lower lip; *k*, telson and uropod 3; *l*, end of gnathopod 2, enlarged. Female, *m*, gnathopod 1; *n*, end of gnathopod 2.

without nail, but bearing four spinules at apex. Lower lip with very large, well-developed lobes and rather short, wide side lobes.

Coxal plates 1 and 2 larger than the rest, 3, 4, and 5 of equal depth, and 6 and 7 shallowest. Gnathopod 1 large and strong; first joint

long and slender; fifth joint with lower margin produced forward into a single pointed tooth above which is a narrow sinus; sixth joint much slenderer than fifth and bearing a prominent tooth near the proximal end; seventh joint curved and about two-thirds the length of the sixth. Fifth and sixth joints very hirsute. Gnathopod 2 slender and much longer than the peraeopods; fifth joint about as wide and as long as the second; sixth joint narrower than, and about two-thirds the length of, the fifth, with a very inconspicuous palm; seventh joint slender, slightly curved, bearing very fine serrations on inner margin and a small spine and two setae near the apex.

Peraeopod 1 somewhat longer than 2, the second joint much expanded. Peraeopod 3 shorter than 2. Peraeopod 4 longer than 3. Metasome segments 1 to 3 with the lower posterior corner broadly rounding. Urosome segments 1 and 2 each bearing two dorsal setae. Uropods all reaching back about the same distance. Peduncle of uropod 1 produced distally to a strong tooth. Uropod 3, outer ramus about as long as the peduncle. Telson tumid, a little wider than long, slightly indented when viewed directly from above, and bearing a small spine and two setae at either distal corner. Length of fully developed males 4.5 to 5 mm. from front of head to end of uropod 3. Females slightly smaller.

*Female.*—The female differs from the male only in the gnathopods and the first two coxal plates. The first two coxal plates are not larger or deeper than the three following. Gnathopods 1 and 2 are much like gnathopod 2 of the male, but the fifth joint is proportionately shorter. In gnathopod 2 the palm is even less conspicuous than in the male.

*Type locality.*—Magdalena Bay, Lower California, from filamentous green algae inside northern point of entrance to bay, 15 fathoms, sandy, weedy bottom, July 18, 1938. Holotype, male, U.S.N.M. No. 79298.

*Remarks.*—This genus cannot properly be assigned to any of the families as characterized by Stebbing in "Das Tierreich." It is a combination of the characters of the families Aoridae and Photidae. The large first gnathopod of the male closely resembles that of *Microdeutopus,* but the antennae, mouth parts, and head generally, are much more closely allied to those of *Megamphopus.* I am therefore naming this genus *Neomegamphopus* in order to call attention to its resemblance to the genus *Megamphopus,* and I am placing it in the family Photidae, to which I am of the opinion an emendation should be made in order to accommodate this genus having the first gnathopods larger than the second in the male.

### CHEVALIA AVICULAE Walker

*Chevalia aviculae* Walker, 1904, Rep. Pearl Oyster Fisheries, Gulf of Manaar, Suppl. Rep. 27, Amphipoda, p. 288, pl. 7, fig. 50; pl. 8, fig. 50.
*Neophotis inaequalis* Stout, 1913, Zool. Jahrb., Abt. Syst., vol. 34, p. 653.

Station 3. Magdalena Bay, Lower California, 5 specimens.

*Chevalia aviculae* was described from the Gulf of Manaar, between Ceylon and India in 1904. In 1909 Walker again recorded it from the Seychelles Islands. It was recorded from South Africa by Barnard in 1916. In 1921 I recorded it from Barbados, West Indies. Barnard recorded it in 1937 from the Red Sea and the south coast of Arabia.

Prof. A. S. Pearse in 1912 described the species *Chevalia mexicana* from the Gulf of Mexico, but this is undoubtedly a synonym of the earlier species, many of the characters of which appear to be rather variable.

In 1913 Vinnie Ream Stout described a new genus and species of amphipod, *Neophotis inaequalis,* from Laguna Beach, Orange County, Calif., but gave no figures. There are no specimens of her species extant, but her description leaves no doubt that she was dealing with *Chevalia aviculae* Walker which occurs in southern California.

The present record from Magdalena Bay is the first definite one for the west coast of America, as Miss Stout's species had not heretofore been recognized as a synonym of Walker's *C. aviculae.* The National Museum also possesses specimens of *Chevalia aviculae* from kelp holdfasts pulled up off South Coronado Island, northern Lower California, and from Corona Del Mar, Orange County, Calif.

## AMPITHOIDAE

### AMPITHOE PLUMULOSA Shoemaker

*Ampithoe plumulosa* Shoemaker, 1938, Journ. Washington Acad. Sci., vol. 28, No. 1, p. 16, fig. 1.

Station 3. Magdalena Bay, Lower California, 15 specimens.
Station 4. Magdalena Bay, Lower California, 1 specimen.
Station 5. Cape San Lucas, Lower California, 4 specimens.
Station 9. Clipperton Island (shore collecting), 1 specimen.

This species was described from a tide pool at La Jolla, southern California, in 1938, and its range was given as extending from Ecuador northward to Strait of Georgia, British Columbia. Clipperton Island, which lies between 600 and 700 miles off the west coast of Mexico, is a new locality for the species.

### AMPITHOE RAMONDI (Audouin)

*Amphithoe ramondi* Audouin, 1826, Descr. Égypte, Nat. Hist., vol. 1, pt. 4, p. 93; Savigny, Crustace et Arachnides de l'Egypte, pl. 11, fig. 6♀.

*Ampithoe ramondi* Schellenberg, 1928, Trans. Zool. Soc. London, vol. 22, pt. 5, p. 665.

*Ampithoe simulans* Alderman, 1936, Univ. California Publ. Zool., vol. 41, No. 7, p. 68, figs. 44-47.

Station 3. Magdalena Bay, Lower California, 16 specimens.

Station 30. Old Providence Island, Caribbean Sea, 2 specimens.

This widely distributed species varies considerably in the detail of several of its characters. The frontal lobes of the second and third joints of the first and second gnathopods and the palm of the second gnathopod of the male are particularly subject to variation. *Ampithoe vaillanti* (Lucas) described from the Mediterranean is now also considered a synonym of *A. ramondi* (Audouin).

This species is cosmopolitan in the tropical and subtropical seas. It was described from the Mediterranean and has since been recorded from the Suez Canal; South Arabian coast; Gulf of Manaar, Indian Ocean; East Indies; North and South Pacific; Pacific coast of North America; tropical Atlantic; and South Africa.

## ISCHYROCERIDAE[3]

### JASSA FALCATA (Montagu)

*Cancer (Gammarus) falcatus* Montagu, 1808, Trans. Linn. Soc., vol. 9, p. 100, pl. 5, figs. 1-2.

*Podocerus falcatus* Sars, 1895, Crustacea of Norway. Amphipoda, vol. 1, p. 594, pl. 212.

*Jassa falcata* Sexton, 1911, Journ. Marine Biol. Assoc., vol. 9, No. 2, p. 212.

Station 3. Magdalena Bay, Lower California, 3 specimens.

*Jassa falcata* was described from the coast of England over 100 years ago, and since then it has been recorded from tropical and temperate waters around the globe. As the male appears to vary considerably at different stages of its development, the animal has been described under several different names by different authors (Sexton, 1911, p. 212). It was recorded by Chilton (1921, p. 89) from Juan Fernandez, but the present record is the first for the west coast of North America.

[3] I am using the family name Ischyroceridae created by Stebbing in 1899 in place of the name Jassidae, preoccupied by Fieber in 1866 for a family of Hemiptera (Shoemaker 1920, p. 22).

### PARAJASSA ANGULARIS, new species

FIGURES 14, 15

Station 3. Magdalena Bay, Lower California, 3 specimens.

*Male.*—Head with side lobes considerably produced. Eye oval and black. Antenna 1, first joint of peduncle slightly shorter than third, which is a little shorter than second; flagellum about half as long as peduncle and 6-jointed, each joint bearing a slender sense organ. Antenna 2 stouter but subequal in length to antenna 1, fourth joint of peduncle slightly shorter than fifth; flagellum about equal in length to fourth joint and consisting of one long and three shorter joints.

Epistome produced into a long sharp point. Mandible with molar rather prominent; only two toothed or serrate spines in spine row; palp rather long, third joint shorter than second. Maxilla 1, inner plate small, narrowly angular and without setae; outer plate armed with nine spine teeth; palp very large, armed distally with six serrate spine teeth and six or seven setae. Maxilla 2, outer plate longer and wider than inner. Maxillipeds, inner plate nearly as long as outer, armed distally with three serrate spine teeth, and bearing an inward-pointing spine on the outer surface near the inner margin; outer plate reaching to about the middle of the second joint of palp, armed on the inner margin with five simple spine teeth and a few setae; palp slender, third joint much shorter than second, fourth joint shorter than third and armed distally with four curved spines. Lower lip with inner lobes very large.

Gnathopod 1, coxal plate somewhat produced forward with sides converging distally; second joint longer than either fifth or sixth; fifth joint slightly shorter than sixth; sixth joint about twice as long as wide, palm slightly oblique, very finely serrate and defined by a well-marked angle, hind margin of joint bearing three notched spines and two groups of slender spines; seventh joint considerably overlapping palm, inner margin finely serrate, and bearing a prominent tooth near the apex. Gnathopod 2 large and strong; coxal plate longer than deep; second joint greatly expanded; third joint bearing a narrow front lobe; fifth joint bearing a broad posterior lobe; sixth joint very robust, about a third longer than wide with a short tooth near the middle of the hind margin, palm transverse, very short and defined by a right angle; seventh joint stout, closing partly on the inside surface of the sixth joint with the apex resting in the angle made by the marginal tooth and the hind margin of sixth joint, inner edge of seventh joint armed with about 12 very short blunt spines.

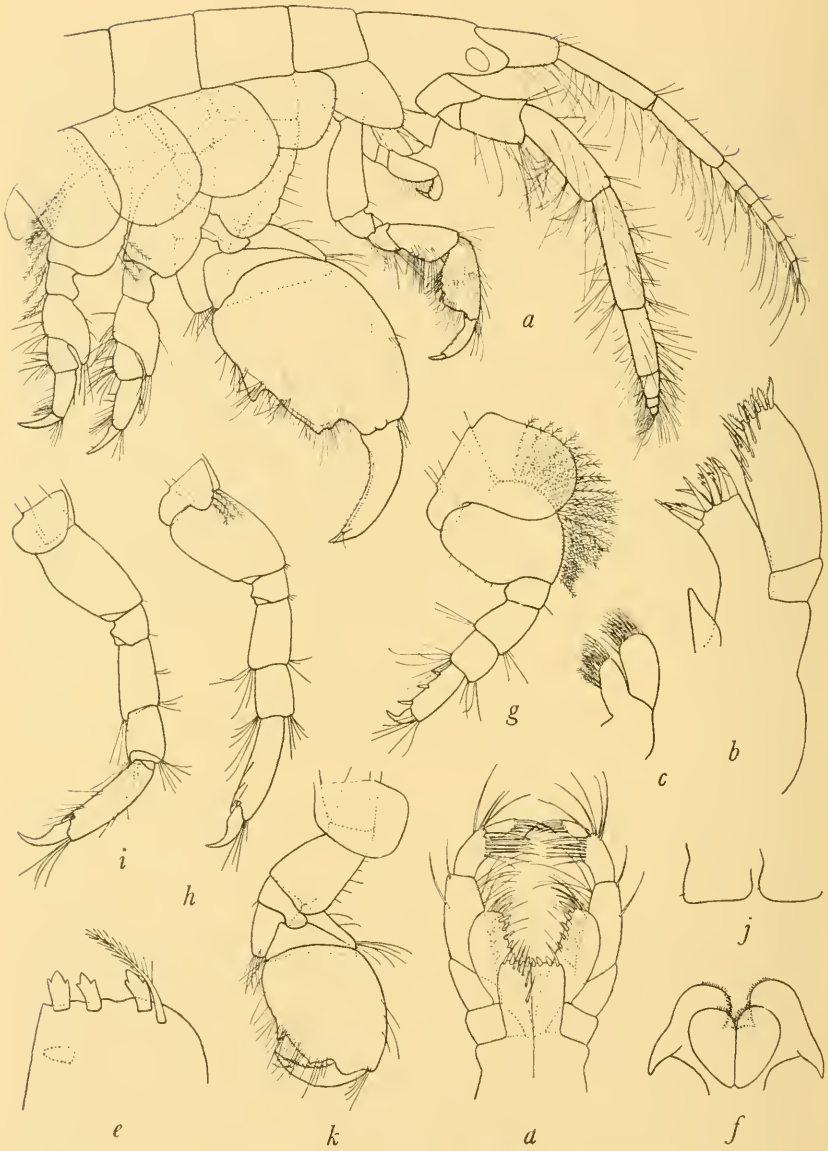


FIG. 14.—*Parajassa angularis*, new species. Male, *a*, front half of animal; *b*, maxilla 1; *c*, maxilla 2; *d*, maxillipeds; *e*, inner plate of maxilliped showing the three spine teeth; *f*, lower lip; *g*, peraeopod 3; *h*, peraeopod 4; *i*, peraeopod 5; *j*, second and third metasome segments. Female, *k*, gnathopod 2.

Peraeopods 1 and 2 subequal in length and very much alike in structure; second joint considerably expanded; fourth joint expanded and produced anteriorly into a downward-pointing lobe which reaches to the lower margin of the fifth joint. Peraeopod 3, coxal plate not quite as deep as those of peraeopods 1 and 2. Peraeopods 3 to 5 in-

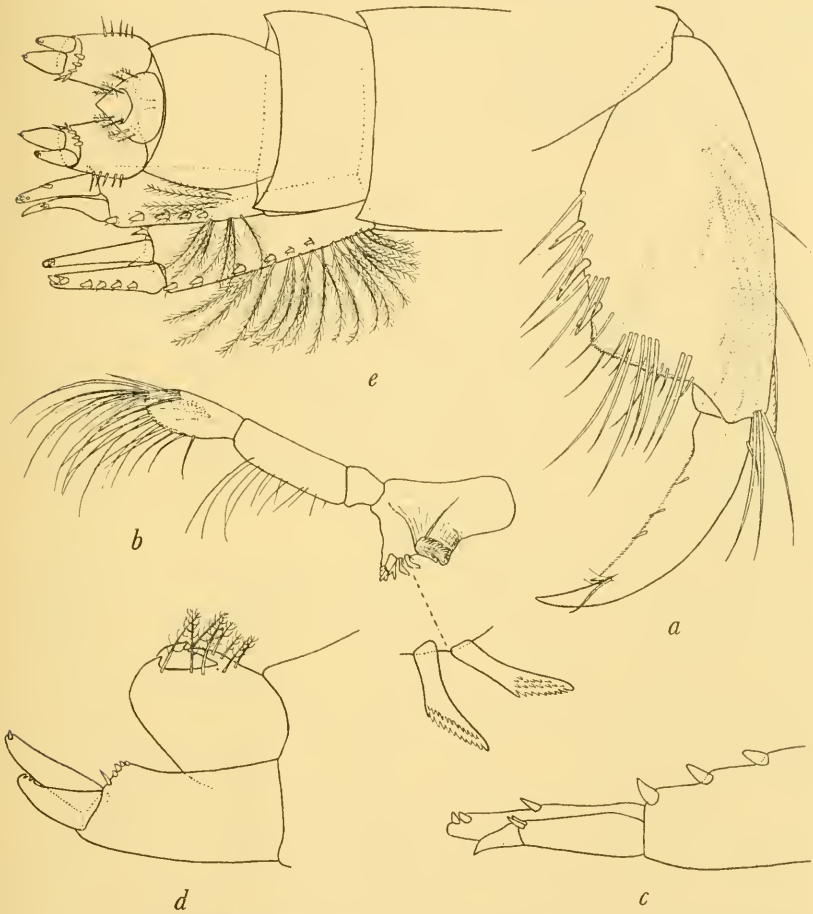


FIG. 15.—*Parajassa angularis*, new species. Male, *a*, gnathopod 1; *b*, mandible; *c*, uropod 2; *d*, uropod 3 and telson.

creasing in length consecutively and proportioned as shown in figure 14, *g-i*. Metasome segments with lower hind corners broadly rounding. Uropod 3 not extending back quite as far as 2. Uropod 2, outer ramus viewed from above curving outward, the distal quarter of ramus downward-pointing, transparent and having the appearance

of a second joint at the base of which are two small spines. Uropod 3, outer ramus shorter than inner and bearing apically three minute hooked spines. Telson triangular viewed from above, bearing two hooks near the apex and several plumose setules on upper surface. Length, from front of head to end of uropod 3, 4 mm.

*Female.*—Very much like the male, differing principally in gnathopod 2, which is much the same shape as in the male, but proportionally smaller. Length of the female is a little less than that of the male.

*Type locality.*—Magdalena Bay, Lower California, dredged in 10-15 fathoms inside northern point of entrance to bay, July 18, 1938. Holotype, male, U.S.N.M. No. 79379.

### MICROJASSA MACROCOXA, new species

FIGURES 16, 17

Station 3. Magdalena Bay, Lower California, 30 specimens.

Station 4. Magdalena Bay, Lower California, 1 specimen.

*Male.*—Head cut far back below for the insertion of the base of antenna 2; side lobes produced and angular. Eye rather large, colorless, but facets plainly visible. Antenna 1 short, second joint longest; flagellum 2-jointed, first joint very long; accessory flagellum 1-jointed. Antenna 2 more than twice as long as antenna 1, fifth joint longest; flagellum 2-jointed, first joint very long.

Right mandible, accessory plate toothed; two spines in spine row; molar well developed, with a little denticulate plate in a recess of the forward margin and a long seta attached to the inner margin; palp well developed, second joint longest; third joint narrower than second and distally truncate. Maxilla 1, inner plate undiscoverable or absent; outer plate bearing seven spine teeth; second palp joint long and armed distally with five spine teeth and a very oblique row of four setae. Maxilla 2, inner plate shorter and narrower than outer. Maxillipeds, inner plate about half the length of the outer, armed on apical margin with one spine tooth and on the under surface with one stout tooth which points toward the inner margin; outer plate with inner crenate margin bearing four spine teeth, apical margin bearing one curved spine tooth and three plumose or pectinate spines; third joint of palp bearing an oblique row of spines; fourth joint with long slender pectinate nail. Lower lip much as figured by Sars (pl. 212, *l*) for *Jassa falcata,* but inner lobes and side lobes very well developed.

Gnathopod 1, coxal plate not much deeper than its body segment, not as long as deep; second joint as long as the fifth and sixth joints

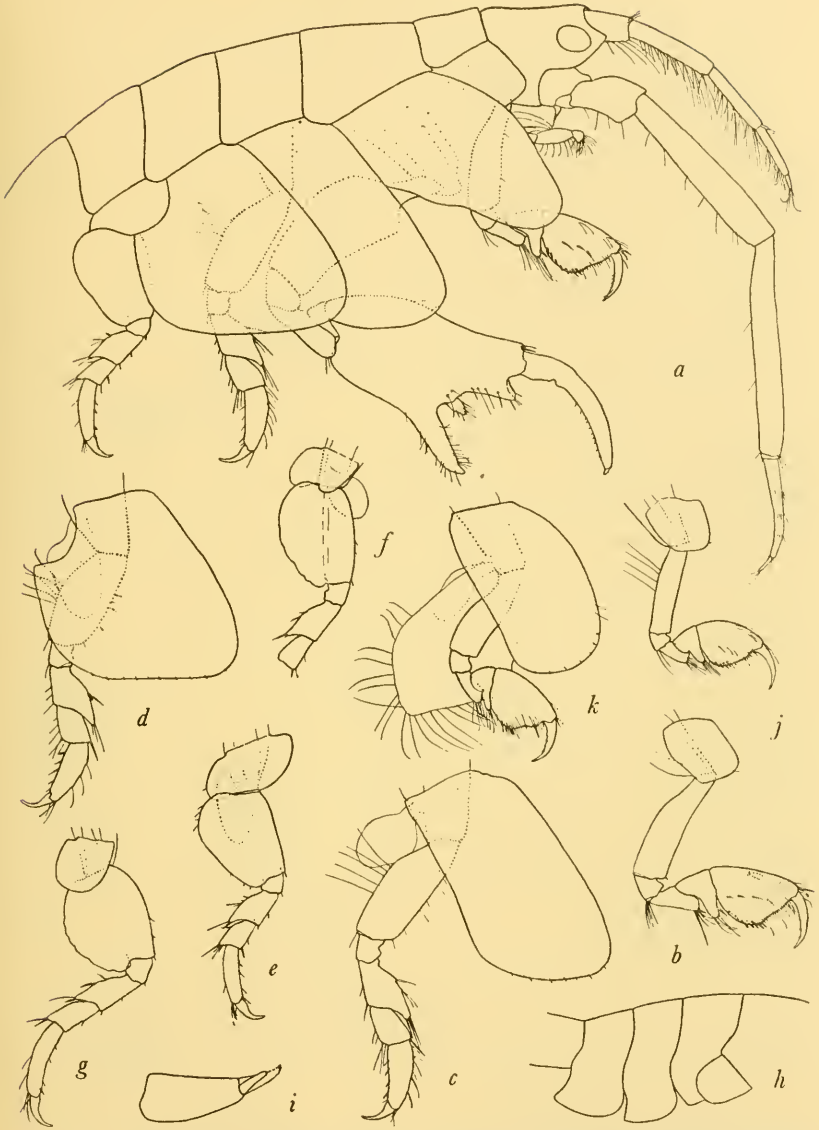


FIG. 16.—*Microjassa macrocoxa*, new species. Male, *a*, front half of animal; *b*, gnathopod 1; *c*, peraeopod 1; *d*, peraeopod 2; *e*, peraeopod 3; *f*, peraeopod 4; *g*, peraeopod 5; *h*, metasome; *i*, uropod 3, inside view of right. Female, *j*, gnathopod 1; *k*, gnathopod 2.

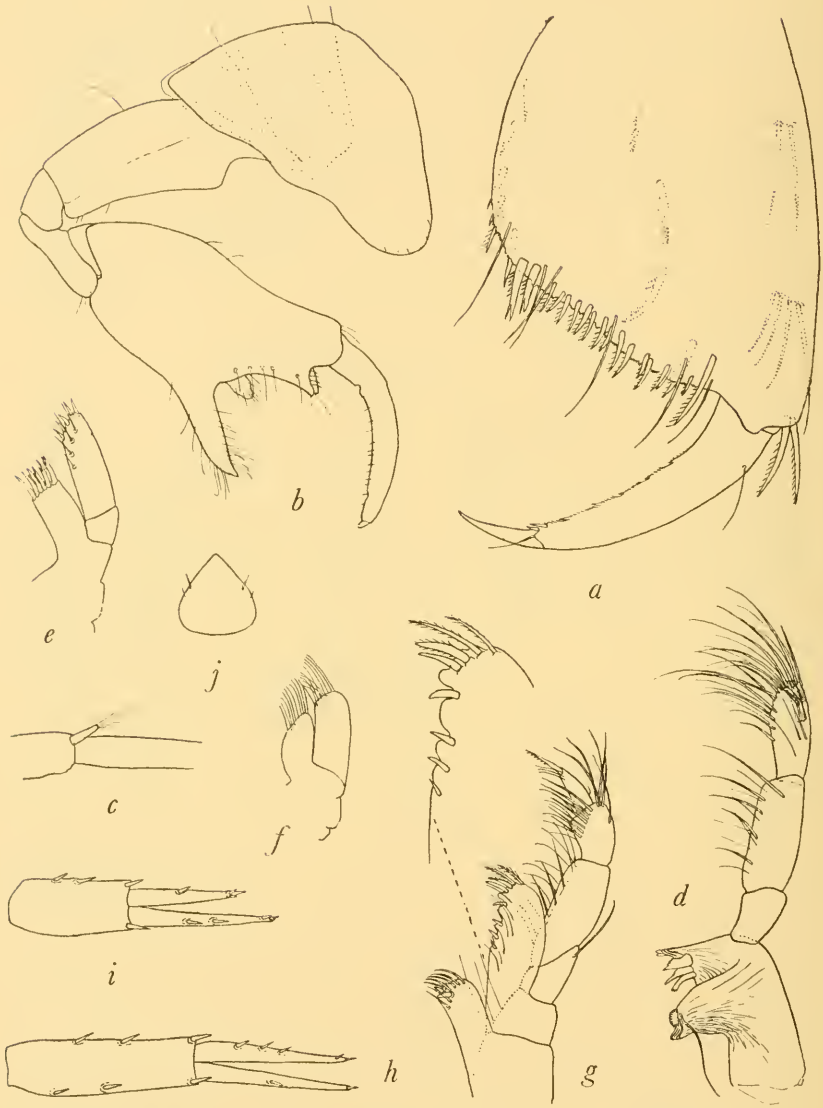


FIG. 17.—*Microjassa macrocoxa*, new species. Male, *a*, gnathopod 1, greatly enlarged; *b*, gnathopod 2; *c*, accessory flagellum; *d*, mandible; *e*, maxilla 1; *f*, maxilla 2; *g*, maxilliped; *h*, uropod 1; *i*, uropod 2; *j*, telson.

combined; sixth joint wider than fifth, palm oblique and passing into hind margin by a broadly rounding curve, but defined by two stout pectinate spines, edge of palm crenulate and serrulate; seventh joint with inner margin serrulate. Gnathopod 2, coxal plate strongly developed, not as long as deep, narrowing distally to the evenly rounding lower margin; second joint with proximal end very narrow, then becoming strong and widening abruptly, leaving the front margin deeply concave for the reception of the fifth and sixth joints when the limb is folded against the body; fifth joint very short, sixth joint powerful with hind margin produced distally into a long, strong tooth, palm greatly excavate with a short central tooth and a more prominent one near the distal hinge; seventh joint stout and bearing a minute nail, inner margin bearing a very low tooth preceded by a shallow indentation.

Peraeopod 1 rather short and stout, but a little longer than 2; coxal plate deeper than the preceding or following, twice as deep as long and a little wider distally. Peraeopod 2 much like 1, coxal plate about as deep as long and very deeply excavate behind. Peraeopod 3 shorter than 2. Peraeopods 4 and 5 about equal in length and longer than 3.

Metasome, segment 2 the deepest, the lower hind corner of segments 2 and 3 slightly produced. Uropods 1 and 2 slender; uropod 2 projecting a little farther back than 1, and uropod 3 perhaps a little farther back than 2. Outer ramus of uropod 1 very slightly shorter than inner; outer ramus of uropod 2 much shorter than inner. Uropod 3, peduncle twice as long as outer ramus which is longer than the inner; outer ramus bears very minute serrulations on upper margin near the apex. Telson reaches to about the center of the peduncle of uropod 3, about as wide as long with sides converging to the narrow, pointed apex. Length of male about 3.5 mm.; female a little smaller.

*Female.*—Antennae are shorter than in the male. Coxal plates are not quite as deep as in male. Gnathopod 1 much like that of male, but palm more oblique. Gnathopod 2 much like gnathopod 1 of male, but the palm more sinuous, and the coxal plate with front and hind margins about parallel.

*Type locality.*—Magdalena Bay, Lower California, dredged in 10-15 fathoms inside northern point of entrance to bay, July 18, 1938. Holotype, male, U.S.N.M. No. 79369.

## COROPHIIDAE

### ERICTHONIUS BRASILIENSIS (Dana)

*Pyctilus brasiliensis* Dana, 1853 and 1855, U.S. Explor. Exped., vol. 14, pt. 2, Amphipoda, p. 976, pl. 67, fig. 5, *a-h*.

*Ericthonius abditus* Sars, 1895, Crustacea of Norway. Amphipoda, vol. 1, p. 602, pl. 215.

*Ericthonius brasiliensis* Stebbing, 1906, Amphipoda. I. Gammaridea, Das Tierreich, p. 671.

Station 3, Magdalena Bay, Lower California, many specimens.

This is a cosmopolitan species, inhabiting the warm and temperate seas of the globe. It was recorded by Stimpson from San Francisco Bay as *Ericthonius rapax* in 1857. The species is rather variable and has been described by different authors under different names. *E. minax,* described by Smith from New England, and *E. disjunctus,* described by Stout from Laguna Beach, Calif., are synonyms of *E. brasiliensis* (Dana).

### CERAPUS TUBULARIS Say

*Cerapus tubularis* Say, 1817, Journ. Acad. Nat. Sci., Philadelphia, vol. 1, No. 4, pp. 50, 96, pl. 4, figs. 7-11.

*Cerapus tubularis* Kunkel, 1918, State of Connecticut State Geol. and Nat. Hist. Surv., Bull. 26, p. 160, fig. 48.

Station 3. Magdalena Bay, Lower California, 2 specimens.

Station 5. Cape San Lucas, Lower California, 2 specimens.

*Cerapus tubularis* was described by Say from Egg Harbor, N. J., and appears to be fairly common on the east coast of the United States. The animal constructs a slender, dark-colored tube, open at both ends, in which it lives and which it carries about. Prof. S. I. Smith (Trans. Connecticut Acad., vol. 4, pp. 269-277) has given a description and observations on the habits of this species. It has not heretofore been recorded from the west coast of America.

## PODOCERIDAE

### PODOCERUS CRISTATUS (Thomson)

*Cyrtophium cristatum* G. M. Thomson, 1879, Ann. Mag. Nat. Hist., ser. 5, vol. 4, No. 23, p. 331, pl. 16, figs. 9-15.

*Cyrtophium dentatum* Haswell, 1879, Proc. Linn. Soc. New South Wales, vol. 4, p. 342, pl. 22, fig. 5.

*Podocerus cristatus* Chilton, 1926, Trans. New Zealand Inst., vol. 56, pp. 513-515, fig. 2.

Station 3. Magdalena Bay, Lower California, 12 specimens.

Station 4. Magdalena Bay, Lower California, 1 specimen.

This species was described from New Zealand in 1879 and has since been recorded from Australia, South Africa, and West Africa. It is now recorded for the first time from the west coast of North America.

## CYAMIDEA

### CAPRELLIDAE

#### CAPRELLA SCAURA Templeton

*Caprella scaura* Templeton, 1836, Trans. Ent. Soc. London, vol. 1, pt. 3, p. 191, pl. 20, fig. 6.

*Caprella scaura* Barnard, 1925, Ann. South African Mus., vol. 20, No. 8, p. 371.

Station 3. Magdalena Bay, Lower California, many specimens.

Station 4. Magdalena Bay, Lower California, many specimens.

Station 5. Cape San Lucas, Lower California, 4 specimens.

This variable species was described from Mauritius and has since been recorded from the east coast of Asia, west coast of North and South America, east coast of South America, West Indies, east coast of North America, and South Africa.

## HYPERIIDEA

### HYPERIIDAE

#### HYPERIA BENGALENSIS (Giles)

*Lestrigonus bengalensis* Giles, 1887, Journ. Asiatic Soc. Bengal, vol. 56, pt. 2, p. 224.

*Hyperia bengalensis* Walker, 1904, Pearl Oyster Fisheries, Gulf of Manaar, Suppl. Rep. 17, Amphipoda, p. 235.

*Hyperia bengalensis* Pirlot, 1939, Résult. Camp. Sci., fasc. 102, p. 35.

Station 22. Off Gardner Bay, Hood Island, Galápagos Islands, 1 specimen.

As shown by Pirlot's synonymy, this small species has been described under many different names from widely separated localities. It has been recorded from the Mediterranean, Indian Ocean, East Indies, New Zealand, and North and South Atlantic. The present record is the first for the Galápagos Islands.

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