GAMMARIDEAN AMPHIPODA (Crustacea) IN THE COLLECTIONS OF BISHOP MUSEUM

BY

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INTRODUCTION

Knowledge of gammaridean amphipods in the Hawaiian Islands in the north-central Pacific Ocean is scanty. Thus I was pleased when, through the courtesy of Dr. Charles H. Edmondson of Bernice P. Bishop Museum, I was permitted to examine the Hawaiian collections of gammaridean amphipods in the Museum.

I wish to acknowledge the Allan Hancock Foundation for the use of laboratory space and equipment, and the kindness of Dr. John S. Garth of that institution for his aid in preparing this paper. Representatives of most of the species reported upon herein have been deposited in the Hancock Foundation collections. The rest of the material and the type specimens are in the collections of Bishop Museum.

DISCUSSION

Records of gammaridean amphipods from the Hawaiian Islands have been made by Dana (1853), Stebbing (1900), Miller (1924), Chilton (1924), Schellenberg (1938), Shoemaker (1947), and Edmondson (1951). Dana describes the new species *Orchestia pickeringii, O. hawaiensis* [now *Parorchestia*], and *Allorchestes hawaiensis* [now *Hyale*]. Schellenberg describes the new species *Pontharpinia centralis, Pontogeneia pacifica, Maera pacifica, Hyale honoluluensis, Parhyalella pietschmanni, Lembos intermedius,* and *Grubia hawaiensis.* Edmondson describes the new species *Elasmopus calliactis.* Hawaiian records of species described from elsewhere have been made by the other authors listed.

Following is a list of the 39 species now known from the Hawaiian Islands. Those recorded herein for the first time are marked with an asterisk.

Pontharpinia centralis Schellenberg (1938)
Stenothoe valida (Dana), Schellenberg (1938) and Chilton (1924) [probably *S. gallensis* Walker]
**Stenothoe gallensis* Walker
Amphilochus marionis Stebbing, Schellenberg (1938)
Pontogeneia pacifica Schellenberg (1938)

* Contribution No. 151 from the Allan Hancock Foundation, University of Southern California.

Eusiroides diplonyx Walker, Schellenberg (1938)
Elasmopus calliactis Edmondson (1951)
Elasmopus ecuadorensis hawaiensis Schellenberg (1938)
**Elasmopus pectenicrus* (Bate)
**Elasmopus rapax* Costa
Maera insignis (Chevreux), Schellenberg (1938)
Maera pacifica Schellenberg (1938)
Maera quadrimana (Dana), Schellenberg (1938)
Melita fresneli (Audouin), Schellenberg (1938)
**Ceradocus hawaiensis*, new species
**Lembos aequimanus* Schellenberg
Lembos intermedius Schellenberg (1938)
Hyale affinis Chevreux, Schellenberg (1938)
**Hyale ayeli*, new species
**Hyale bishopae*, new species
Hyale hawaiensis (Dana, 1853)
Hyale honoluluensis Schellenberg (1938)
**Orchestia kaalensis*, new species; terrestrial
Orchestia pickeringi Dana (1853); terrestrial
**Parhyale inyacka* (K. H. Barnard)
Parhyalella pietschmanni Schellenberg (1938)
Parorchestia hawaiensis (Dana, 1853); terrestrial
**Ampithoe orientalis* Dana
**Ampithoe ramondi* Audouin
**Cymadusa filosa* Savigny
Cymadusa hawaiensis (Schellenberg, 1938)
**Cymadusa oceanica*, new species
**Paragrubia vorax* Chevreux
**Photis hawaiensis*, new species
Corophium acherusicum Costa, Shoemaker (1947)
Ericthonius brasiliensis (Dana), Schellenberg (1938)
Podocerus brasiliensis (Dana), Schellenberg (1938)
Chelura insulae Calman, Miller (1924)
**Colomastix pusilla* Grube

In addition to the above list, *Orchestia gambierensis* Chevreux was found in the Bishop Museum collections, from Tahiti.

Most of the amphipods collected in the Hawaiian Islands have been intertidal and shallow-water species, for the deeper benthos has not been sampled to any extent. No zoogeographical conclusions may be reached concerning this fauna as yet, owing to the few species known, except that several cosmopolitan species and Indo-Pacific elements have not been restricted from this area. No truly endemic species can be cited, because in most of the rest of the Indo-Pacific region, this group of animals is too little known. Marine species which have not been recorded elsewhere than the Hawaiian Islands are the following: *Pontharpinia centralis, Elasmopus calliactis, E. ecuadorensis hawaiensis, Ceradocus hawaiensis, Lembos intermedius, Hyale ayeli, H. bishopae, H. honoluluensis, Parhyalella pietschmanni, Cymadusa hawaiensis, C. oceanica,* and *Photis hawaiensis.*

SYSTEMATICS

Order AMPHIPODA

Suborder GAMMARIDEA

FAMILY STENOTHOIDAE

Stenothoe gallensis Walker (fig. 1).

Stenothoe gallensis Walker, Rept. on Ceylon pearl oyster fisheries, Suppl. Rept. **17**: 261-262, pl. 3, fig. 19, 1904; Linn. Soc. London, Trans. (Zool.) II, **12** (4): 331, 1909.—Barnard, S. African Mus., Ann. **15** (3): 154-155, 1916.—Schellenberg, Zool. Soc. London, Trans. **22** (35): 640-641, 1928; Fisheries Res. Directorate, Egypt, Notes and Mem. **18**: 9-10, 1936.—Barnard, John Murray Exped. 1933-34, Sci. Rept. **4** (6): 153-154, 1937.—Monod, Inst. Egypt, Mem. **34**: 13, 1937.—Ruffo, Mus. Civ. Stor. Nat., Ann. **60**: 131, 1938.—Reid, Atlantide **2**: 228-230, fig. 27, 1951.

Probolium polyprion, Catta, Ann. Sci. Nat., Zool. VI, **3** (1): 15-27, pl. 2, fig. 1, 1876 [not Costa, 1853].

Stenothoe cattai Stebbing, Das Tierreich **21**: 195, 1906.—Schellenberg, Beiträge Kennt. Meeresfauna Westafrikas **3** (4): 132-134, 1925.—Rudwick, Ann. Mag. Nat. Hist. XII, **4**: 149, 152, 1951.—Reid, Atlantide **2**: 230-231, fig. 28, 1951.

Stenothoe crenulata Chevreux, Mus. Hist. Nat. Paris, Bull. **6**: 412-413, 1907; Soc. Zool. France, Mém. **20**: 471-475, figs. 1-3, 1908.—Shoemaker, N. Y. Acad. Sci. **15** (2): 237, fig. 2, 1935.

? *Stenothoe spinimana* Chevreux, Soc. Zool. France, Mém. **23** (3): 197-199, fig. 7, pl. 12, figs. 1-12, 1911.

? *Stenothoe valida,* Chilton, New Zealand Inst., Trans. and Proc. **55**: 270, 1924.—Schellenberg, Kl. Sv. Vet.-Akad., Handl. III, **16** (6): 21, 1938 [not Dana, 1851].

Not *Stenothoe gallensis,* Barnard, S. African Mus., Ann. **20** (5): 344-345, 1925.

Oahu: Kaneohe Bay, May 28, 1935, 4 specimens; July 10, 1935, on test board since June 13, 1935, 8 specimens; Aug. 16, 1935, on wood float of six metal plates, since July 10, 1935, 5 specimens; Aug. 23, 1935, on float of seven suspended metal plates, since Aug. 1, 1935, 97 specimens; Oct. 4, 1935, on float with six masonite panels, since Sept. 18, 1935, 10 specimens; Aug. 15, 1936, 7 specimens; Jan. 15, 1937, 46 specimens. Pearl Harbor, Apr. 15, 1948, drydock, 18 specimens; Feb. 18, 1950, 5 specimens. Station 2-B, one-half mile off entrance of Pearl Harbor, west side of channel, on iron buoy 15 feet deep, Jan. 24, 1944.

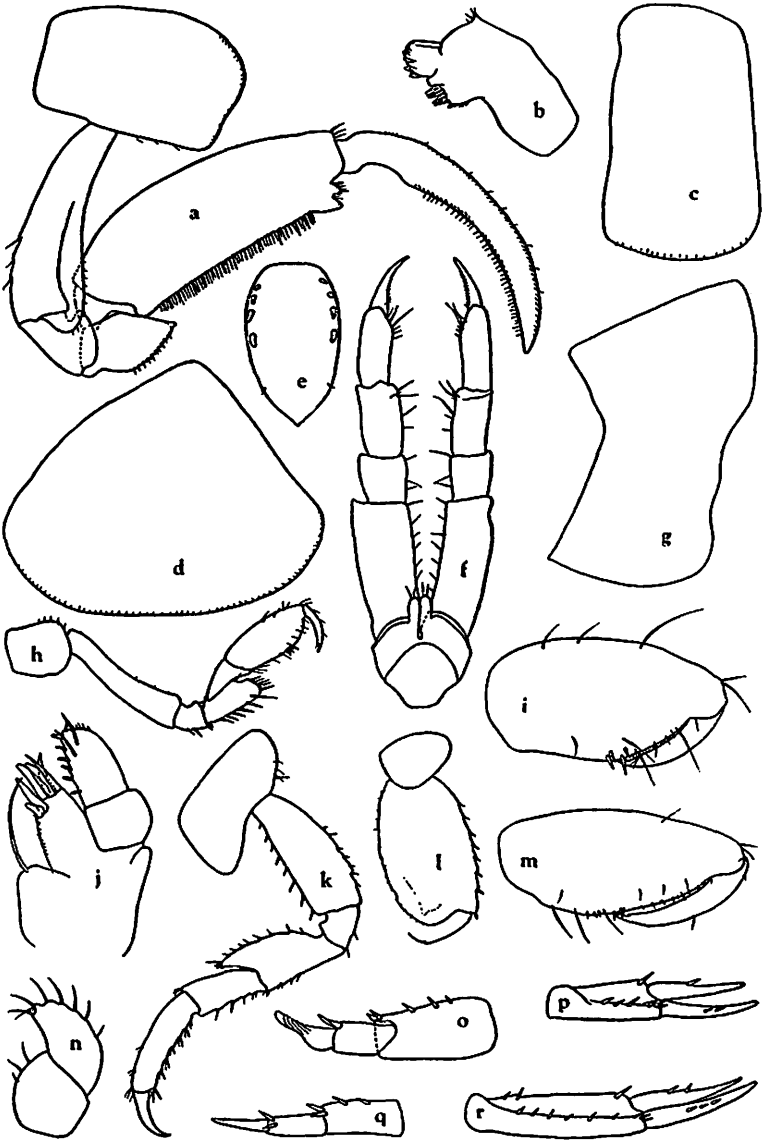

FIGURE 1.—*Stenothoe gallensis*, Kaneohe Bay, 1935. a-h, j-l, n-p, r, male, 5 mm.: *a*, gnathopod 2; *b*, mandible; *c*, coxa 3, right; *d*, coxa 4, right; *e*, telson; *f*, maxilliped; *g*, pleon segment 3, right; *h*, gnathopod 1; *j*, maxilla 1; *k*, peraeopod 3; *l*, peraeopod 5; *n*, maxilla 2; *o*, uropod 3; *p*, uropod 2; *r*, uropod 1. i, m, q, female, 3 mm.: *i*, end of gnathopod 1; *m*, end of gnathopod 2; *q*, uropod 3.

Distribution: Caribbean Sea, Mediterranean Sea, Ceylon, Gambier [Mangareva] Archipelago, Hawaiian Islands.

The structure of the third uropods in the Hawaiian material shows a sexual dimorphism. The males exhibit the typical geniculate and crenulate condition of article 2 as described by Catta (1876) and Walker (1904), whereas in the females this article is styliform and smooth, similar to both sexes of *Stenothoe valida* Dana. It is questionable whether Chilton (1924) and Schellenberg (1938) had more than the females of *S. cattai* which they referred to *S. valida.* I have discussed the difference between the two species, referring to *S. gallensis* as *S. cattai* (1953).

Reid's *S. cattai* (1951) probably is the juvenile stage of *S. gallensis.* K. H. Barnard's reference (1925) to *S. gallensis* shows that it is similar to the *"Stenothoe valida"* described by Kunkel (1910) from Bermuda. These two references probably should be designated as a new species. *S. spinimana* Chevreux (1911) probably is the female of *S. cattai.*

Family PONTOGENEIIDAE

Pontogeneia pacifica Schellenberg, Kl. Sv. Vet.-Akad., Handl. III, **16** (6): 35-37, fig. 17, 1938.—Ruffo, Mus. Civ. Stor. Nat., Ann. **60**: 158-159, 1938.

Oahu: Hanauma Bay, May 15, 1946, 7 specimens, Waianae shore, July 17, 1951, 20 specimens. Point of land near Kualoa, Nov. 24, 1951, coll. Donald Bates, 5 specimens. Waimanalo, Apr. 10, 1951, coll. C. H. Edmondson, 8 specimens; same, Apr. 17, 1951, 4 specimens; same, June 5, 1951, 40 specimens.

Distribution: The Hawaiian Islands and "Mar Rosso, Isola Mandola, Golfo di Arafali" (Ruffo).

Family GAMMARIDAE

Ceradocus (Denticeradocus) hawaiensis, new species (figs. 2, 3).

Male. Head about as long as first two body segments combined, lateral lobes subquadrate in outline, defined below by a constricted sinus. Eyes large, irregular in outline.

Antenna 1 about the length of the head and first six body segments combined, first two articles of peduncle subequal in length, article 3 one-third as long as article 2, flagellum not as long as peduncle, composed of up to 12 articles, accessory flagellum composed of six articles.

Antenna 2 shorter than 1, article 5 of peduncle about two-thirds as long as 4, flagellum as long as article 4, composed of nine to 10 articles.

Mandible: accessory plate on right side with four prongs and two accessory teeth, on left with four serrate teeth, spine row with eight spines; article 1 of palp produced acutely on inner edge, article 3 of palp about one-fourth as long as 2.

Maxilla 1: inner edge and outer apical edge of inner plate densely setose, outer plate with nine serrate spines, apex of palp article 2 with 13 slender setae.

Maxilla 2: inner plate densely setose along inner edge and apex.

Maxilliped: apex of inner plate broadly truncated, armed with short, plumose setae, inner edge of outer plate lined with stout, minutely serrated spines; palp article 4 armed apically with a spine.

Gnathopod 1: coxa produced forward acutely, articles 5 and 6 subequal in length, palm of article 6 oblique, convex, not sharply defined, posterior edge of article 6 setose and armed with three spines, article 7 long, curved, overlapping palm. Palm minutely serrated and lined with bifurcated spinules.

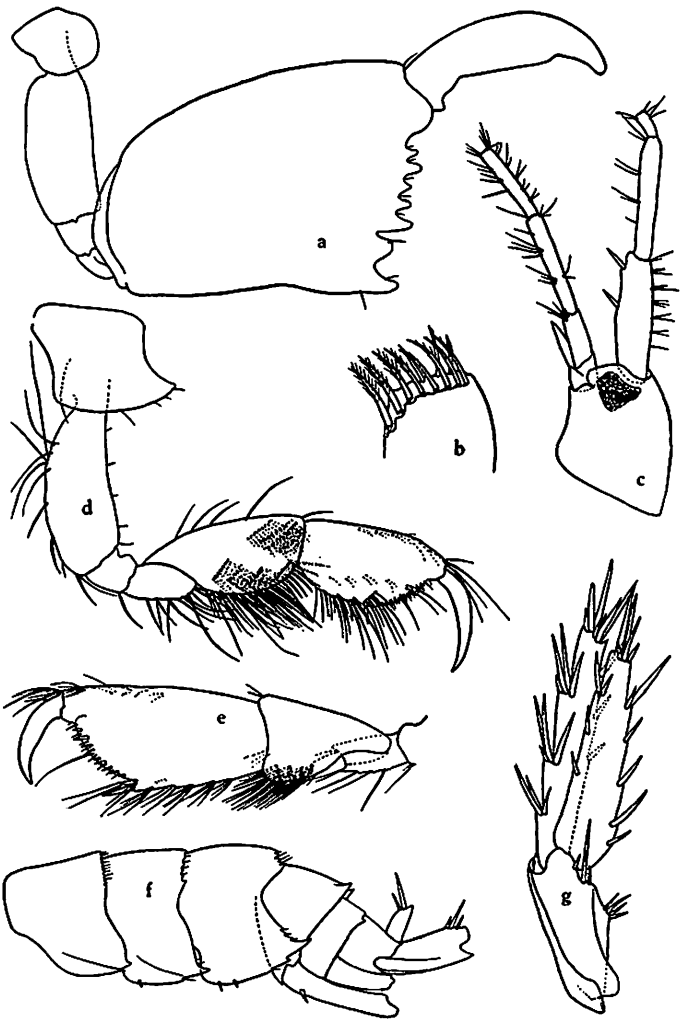

FIGURE 2.—*Ceradocus* (*Denticeradocus*) *hawaiensis*, Hanauma Bay, Feb. 1937, male, 5 mm.: a, gnathopod 2, right; b, maxilliped, apex of inner plate; c, head, left side; d, gnathopod 1; e, gnathopod 2, left; f, pleon; g, uropod 3.

Gnathopod 2 of two types, one side larger than the other: (1) larger gnathopod with article 5 very short, cup-shaped, article 6 very large, palm nearly straight, very slightly oblique, grossly serrated into large teeth, three to four of smaller ones near finger hinge and the two large ones between smaller ones, the palm with a large defining tooth; (2) smaller gnathopod with article 6 small, one and one-half times as long as article 5, similar to gnathopod 1 except that palm is defined by two large spines and article 7 fits palm.

Peraeopod 1 slightly larger than 2. Peraeopods 3-5 successively slightly longer, posterior edges of article 2 slightly serrated, more strongly so in peraeopod 5 than in peraeopod 3; lower posterior corner of article 2 slightly and subacutely produced.

Uropod 1 reaches beyond end of uropod 2 to middle of rami of uropod 3; outer ramus of uropod 1 slightly shorter than inner ramus, the latter subequal in length to peduncle.

Uropod 2: inner ramus slightly longer than peduncle, outer ramus slightly shorter than inner.

Uropod 3: rami broad, heavily spinose, longer than peduncle.

Telson: apices of lobes acute, each lobe armed with two apical spines and two lateral setae.

Pleon segments 1 and 2 dorsally serrated on posterior edge, postlateral corner sharply produced, lower edge of epimera with a small tooth from which an oblique ridge ascends on lateral surface. Pleon segment 3 serrated postdorsally, the largest tooth being lateralmost, lower posterior edge with three serrations, below which it is produced into a large, acute tooth. Lower edge with two smaller teeth but no lateral ridge. Pleon segment 4 produced postdorsally into two large, lateral teeth, otherwise not serrated. Pleon segment 5 with two small, postlateral teeth, one on each side.

Female. Differs from male only in presence of brood plates.

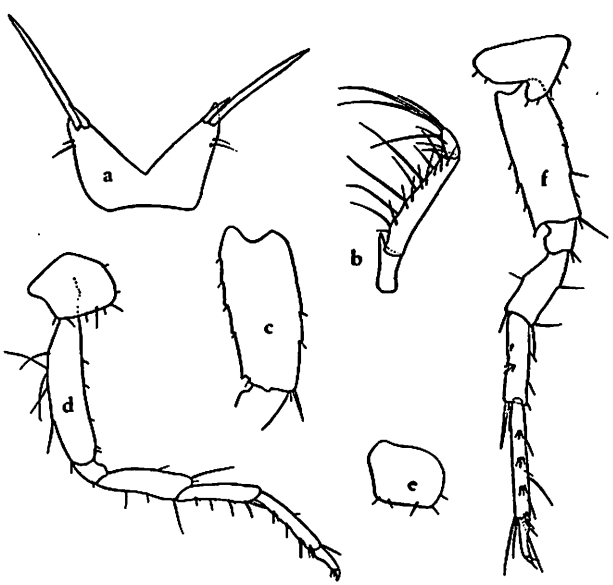

FIGURE 3.—*Ceradocus* (*Denticeradocus*) *hawaiensis*, Hanauma Bay, Feb. 1937, male, 5 mm.: a, telson; b, palp of mandible; c, article 2 of peraeopod 5; d, peraeopod 1; e, coxa 4, right; f, peraeopod 3.

Types: Bishop Mus. coll., cat. no. 6032, holotype, male, 4 mm.; paratype, male, 5 mm.; allotype, female, 5 mm. The largest specimen available is a male, 6 mm. in length.

Type locality: Hanauma Bay, Oahu, Feb. 1937.

The types and five other specimens are from the type locality.

In Sheard's key to the subgenus *Denticeradocus* (1939), one might place this species in the section entitled " pleon segments 3 and 4: evenly dentate" although it has only two teeth on each of these segments. At present, the species appears most closely related to *C. (D.) paucidentatus* J. L. Barnard (1952) which also has only one or two teeth on pleon segment 4 and one tooth on segment 5. The new species differs from it in the large lateral teeth of segment 4 [these are small and medial in *C. (D.) paucidentatus*] and two teeth on segment 5 (one in *paucidentatus*) plus differences in the second gnathopods, peraeopods 3 to 5, and the presence of dorsal serrations on pleon segments 1 to 3 in the present species. This species differs from all other denticeradocids in the paucity of dentition on pleon segments 4 and 5.

Elasmopus calliactis Edmondson, B. P. Bishop Mus., Occ. Papers **20** (13): 189-191, fig. 3, 1951.

Oahu: Hanauma Bay, Feb. 1937, 1 specimen.

Distribution: Known only from the Hawaiian Islands.

Elasmopus pectenicrus (Bate). (See figure 4.)

Moera pectenicrus Bate, Brit. Mus. Cat. Amphip. Crust., 192, pl. 34, fig. 8, 1862.

Elasmopus pectenicrus, Barnard, S. African Mus., Ann. **15** (3): 197-199, pl. 28, fig. 33, 1916.—Schellenberg, Zool. Soc. London, Trans. **22** (35): 647-648, 1928.—Shoemaker, N. Y. Acad. Sci. **15** (2): 238-239, 1935.—Schellenberg, Fisheries Res. Directorate, Egypt, Notes and Mem. **18**: 13, 1936.—Pirlot, Siboga-Exped., Monogr. **33e**: 312-313, 1936.—Barnard, John Murray Exped. 1933-34, Sci. Rept. **4** (6): 161, 1937.—Schellenberg, Kl. Sv. Vet.-Akad., Handl. III, **16** (6): 55, 1938.—Ruffo, Mus. Civ. Stor. Nat., Ann. **60**: 136, 162-163, 1938.—Schellenberg, Rev. Zool. Bot., Africa **32** (1): 124, 1939.—Barnard, S. African Mus., Ann. **32** (5): 461, 1940.—Rudwick, Ann. Mag. Nat. Hist. XII, **4**: 149, 152, 1951.—Reid, Atlantide **2**: 236-237, fig. 32, 1951.

Elasmopus serrula Walker, Rept. on Ceylon pearl oyster fisheries, Suppl. Rept. **17**: 277-278, pl. 8, fig. 37, 1904; Linn. Soc. London, Trans. (Zool.) II, **12** (4): 336, 1909.

Elasmopus brasiliensis, Stebbing, Das Tierreich **21**: 443, 1906; S. African Mus., Ann. **6**: 446-447, 1910 [part, not Dana, 1853].

Elasmopus pectinicrus, Gravely, Madras Govt. Mus., Bull., new ser., Nat. Hist. Sect. **1** (1): 123, 1927.

Oahu: Stations 2-B, C, D, E, one-half mile off entrance of Pearl Harbor, west side of channel, on iron buoys suspended at depths of 15, 30, 45, and 60 feet, respectively, Jan. 24, 1944. Pearl Harbor, Sept. 12, 1937, on bottom of lighter, 12 specimens; Apr. 15, 1948, from drydock no. 4, 28 specimens, coll. C. H. Edmondson; Feb. 18, 1950, 6 specimens.

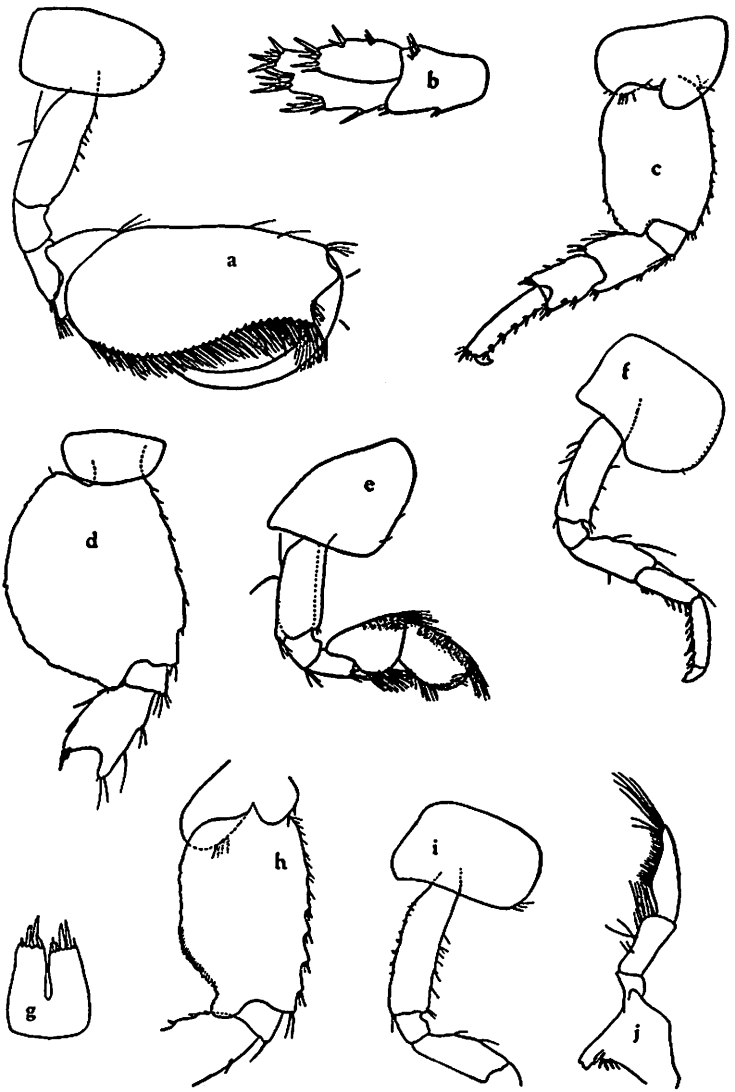

FIGURE 4.—*Elasmopus pectenicrus*, station 2-B, Oahu, male, 9 mm.: a, gnathopod 2; b, uropod 3; c, peraeopod 3; d, peraeopod 5; e, gnathopod 1; f, peraeopod 2; g, telson; h, peraeopod 4; i, peraeopod 1; j, mandible.

Distribution: Although not yet recorded from the Mediterranean Sea, this species otherwise appears to be cosmopolitan in the tropical regions, including the Caribbean Sea, the Red Sea, and the Indian and tropical Pacific Oceans. This is the first record of this species from the Hawaiian Islands.

K. H. Barnard (1916) noted the principal characteristics which separate this species from *Elasmopus brasiliensis* (Dana). Probably the most distinctive character which affords easy separation of the two species is the serrated condition of the lower part of the second article on the fifth pair of peraeopods.

Elasmopus rapax Costa (fig. 5).

Elasmopus rapax Costa, Rend. Soc. Reale Borbonica, Accad. Sci., Naples, new ser. **2**: 175, 1853.—Norman, Ann. Mag. Nat. Hist. VI, **4**: 124-125, pl. 11, figs. 1-8, 1889 [with synonymy].—Della Valle, Fauna Flora Golfes Neapel, Monogr. **20**: 736-737, pl. 22, figs. 16-22, 1893.—Sars, Crustacea Norway, Amphipoda **1**: 521-522, pl. 183, 1895.—Walker, Fauna Geog. Maldive Laccadive Archs. **2**, Suppl. 1: 928, 1905.—Stebbing, Das Tierreich **21**: 444, 1906.—Walker, Linn. Soc. London, Trans. (Zool.) II, **12** (4): 335, 1909.—Kunkel, Connecticut Acad. Arts Sci., Trans. **16**: 51-54, fig. 19, 1910.—Pearse, U. S. Nat. Mus., Proc. **43**: 370-371, 1912.—Chevreux, Soc. Zool. France, Mém. **23** (3): 225-226, 1911.—Chilton, Jour. Zool. Res. **2** (1): 17-18, 1917.—Shoemaker Univ. Iowa, Studies Nat. Hist. **9** (5): 100, 1921.—Spandl, Denk. K. Akad. Wiss. Wien Math.-Nat., Kl. **99**: 54, 1924.—Chevreux and Fage, Faune de France **9**: 244-246, figs. 255, 256, 1925.—Chevreux, Soc. Zool. France, Bull. **50**: 307, 1925.—Schellenberg, Deutsche Südpolar-Exped. **18**: 364, 1926.—Stephensen, Dansk Nat. Foren. Vidensk., Meddel. **84**: 115, 1927.—Schellenberg, Zool. Soc. London, Trans. **22** (35): 647, 1928.—Stephensen, Tierwelt Nord-Ostsee, Leipzig **14** (10, f): 142, fig. 35, *251,* 1929.—Schellenberg, Further zool. results Swedish Antarct. Exped. 1901-03, **2** (6): 203, 1931.—Oldevig, Götebergs K. Vetenskaps-Vitter.-Samh., Handl. B, **3** (4): 195, 1933.—Shoemaker, Am. Mus. Nov. **598**: 15, fig. 8, 1933.—Schellenberg, Zool. Jahrb., Abt. Syst. **67**: 232, 1935.—Shoemaker, N. Y. Acad. Sci. **15** (2): 238, 1935.—Cecchini and Parenzan, Sta. Zool. Napoli, Pubb. **14** (2): 201-203, fig. 35, 1935.—Maccagno, Mus. Civ. Stor. Nat., Ann. **59**: 184, 1936.—Schellenberg, Fisheries Res. Directorate, Egypt, Notes and Mém. **18**: 13, 1936.—Fischetti, Mus. Lab. Zool. Anat. Comp. Genova, Boll. **17** (96): 6, 1937.—Ruffo, Mus. Civ. Stor. Nat., Ann. **60**: 134-135, 1938.—Schellenberg, Kl. Sv. Vet.-Akad., Handl. III, **16** (6): 52-53, 1938.—Pirlot, Mus. Roy. Hist. Nat. Belg., Mém. II, **15**: 61, 1939.—Shoemaker, Smithsonian Misc. Coll. **101** (11): 12, 1942.—Rudwick, Ann. Mag. Nat. Hist. XII, **4**: 149, 152, 1951.—Reid, Atlantide **2**: 236, 1951.

Elasmopus rapax var. *dentipalma* Walker, Ann. Mag. Nat. Hist. VIII, **17**: 345-346, fig., 1916.

Elasmopus rapax forma *barbata* Schellenberg, Beiträge Kennt. Meeresfauna Westafrikas 3 (4): 155-156, 1925.

Elasmopus rapax subsp. *barbatus* Schellenberg, Rev. Zool. Bot. Africa **32** (1): 124-125, figs. 1-4, 1939.

Oahu: Kaneohe Bay, Jan. 15, 1937, 11 specimens; same, Sept. 6, 1936, 1 specimen. Waianae shore, Feb. 8, 1951, 3 specimens. Pearl Harbor, Jan. 5, 1948, 2 specimens; same, Apr. 28, 1948, 26 specimens, coll. C. H. Edmondson; same, June 16, 1950, 6 specimens. Honolulu Aquarium, from cement overflow gutter exit of fish tanks, Feb. 28, 1950, 16 specimens.

This is the first record of this species from the Hawaiian Islands. Otherwise, it is a cosmopolitan tropical and temperate species.

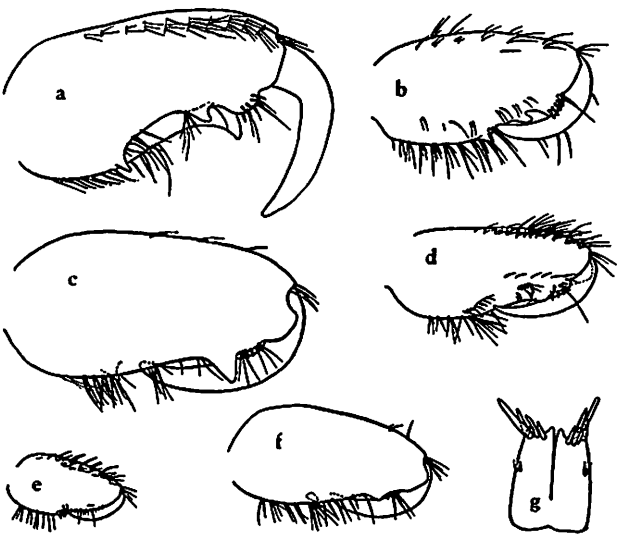

FIGURE 5.—*Elasmopus rapax*. a, c, male, 8 mm. Pearl Harbor, Jan. 5, 1948: *a*, articles 6-7 of gnathopod 2, lateral view; *c*, articles 6-7 of gnathopod 2, medial view. b, g, female, 8 mm., Honolulu Aquarium, Feb. 28, 1950: *b*, articles 6-7 of gnathopod 2, lateral view; *g*, telson. d, f, male, 7 mm., Pearl Harbor, Jan. 5, 1948: *d*, articles 6-7 of gnathopod 2, medial view; *f*, articles 6-7 of gnathopod 2, lateral view. e, male, 4 mm., Pearl Harbor, Jan. 5, 1948, articles 6-7 of gnathopod 2, medial view.

A graded series of male second gnathopods is figured to show the change in form of the palmar teeth from the 4 mm. to the 8 mm. stages. Sars' figures of this species (1895) correspond to the male palm in material 5 to 7 mm. long from the Hawaiian Islands, where a lateral view shows the palm to be even except for the spinate protuberance near the finger hinge. Older males (8 mm.)

have a large, acute tooth behind this prominence. This condition is figured also by Walker (1916).

The other two teeth on the medial palmar surface of gnathopod 2, one near the spinose protuberance and the other at the defining limit of the palm, are present in males above 5 mm. in size but are absent or indicated only by ridges in juvenile material below 5 mm. in size.

I do not believe that the present male material needs subspecific or varietal designation (as was done by Walker in 1916). I believe, rather, that these specimens are more mature than others collected and figured (as by Sars in 1895) from Norway. In some unpublished studies on variation in North American amphipods I have seen that animals collected in colder waters, though larger in size than members of the same species in warmer waters, fail to exhibit the completely developed male secondary sexual characteristics, particularly with regard to the second gnathopods. Thus, I contend that ecologic conditions restrict or promote the complete development of these taxonomic characters. It must be remembered that with the specimens in question the full development of male secondary sexual characteristics occurs at some time after (perhaps several instars) the attainment of the ability to reproduce.

Another series of specimens, which was collected in the Honolulu Aquarium, showed several unusual features. The males were identical to Sars' figures (1895) except that the telsonic apices were deeply incised, the two points of each apex extending the same distance (see my figure 5), the third uropods were more heavily spinose and the second articles of the last three pairs of peraeopods were lined with long setae. The female representatives in this collection (three ovigerous specimens) possessed second gnathopods identical to those of the males (see my figure 5) in contrast to previous accounts of the species and materials from Oahu and California examined by me. I consider these specimens to be either genetic or ecologic variants of *Elasmopus rapax*. Investigation into the life history of this species is warranted.

Maera insignis (Chevreux).

Elasmopus insignis Chevreux, Soc. Zool. France, Mém. **14**: 406-412, figs. 24-31, 1901; op. cit. **20**: 182, 1908.—Walker, Linn. Soc. London, Trans. (Zool.) II, **12** (4): 336,1909.

Elasmopus indicus, Pirlot, Siboga-Exped., Monogr. **33e**: 326, 1936.

Maera insignis, Schellenberg, Kl. Sv. Vet.-Akad., Handl. III, **16** (6): 50-52, fig. 24, 1938.

Oahu: Kawela Bay, Sept. 2-7, 1948, on seaweed, coll. C. H. Edmondson, 50 specimens. Waikiki Beach, May 3, 1943, from bottom of small boat, 4 specimens; same, Feb. 24, 1944, 5 specimens; same, Nov. 24, 1951, coll. Don-

ald Bates, 2 specimens. Honolulu Harbor, Apr. 3, 1948, 9 specimens. Waianae shore, Feb. 8, 1951, coll. C. H. Edmondson, 41 specimens; same, July 17, 1951, 6 specimens. Hanauma Bay, Sept. 22, 1945, 10 specimens. Waimanalo, Apr. 10, 1951, 24 specimens; same, Apr. 17, 1951, 40 specimens; same, June 5, 1951, 13 specimens; same, July 17, 1951, 8 specimens. Diamond Head, Nov. 24, 1951, coll. Donald Bates, 2 specimens. Point of land near Kualoa, Nov. 24, 1951, coll. Donald Bates, 9 specimens.

Distribution: Tropical Indo-Pacific seas.

Maera quadrimana (Dana).

Gammarus quadrimanus Dana, U. S. Expl. Exped. **14**: 955-956, pl. 65, fig. 9, 1853.

Maera quadrimana, Schellenberg, Kl. Sv. Vet.-Akad., Handl. III, **16** (6): 45-48, figs. 21-22, 1938.

Oahu: Waimanalo, Apr. 17, 1951, 4 specimens; Kawela Bay, Sept. 2-7, 1948, 4 specimens.

Distribution: Tropical Pacific Ocean.

Melita fresneli (Audouin).

Gammarus fresnelii Audouin, Descr. Egypte, Hist. Nat. **1** (4): 93, pl. 11, fig. 3, 1826.

Melita fresnelii, Walker, Linn. Soc. London, Trans. (Zool.) II, **12** (4): 334, 1909.—Kunkel, Connecticut Acad. Arts Sci., Trans. **16**: 31-34, fig. 11, 1910.—Stebbing, Australian Mus., Mem. **4** (2): 596-597, 642, 1910. —Pearse, U. S. Nat. Mus., Proc. **43**: 371, 1912.—Barnard, S. African Mus., Ann. **15** (3): 189-190, pl. 28, fig. 32, 1916.—Chilton, Biol. res. fish. exper. F. I. S. "Endeavour," 1909-14, **5**: 70, 1921.—Spandl, Denk. K. Akad. Wiss. Wien Math.-Nat., Kl. **99**: 53, fig. 19, 1924.—Hale, Roy. Soc. S. Australia, Trans. and Proc. **51**: 314, 1927.—Schellenberg, Zool. Soc. London, Trans. 22 (35): 644-646, 1928.—Shoemaker, N. Y. Acad. Sci. **15** (2): 239-240, 1935.—Pirlot, Siboga-Exped., Monogr. **33e**: 304-305, 1936.—Barnard, John Murray Exped. 1933-34, Sci. Repts. **4** (6): 159, 1937.—Pirlot, Mus. Roy. Hist. Nat. Belg., Mém. II, **15**: 76, 1939.— Shoemaker, Biol. Soc. Washington, Proc. **54**: 187, 1941.—Hewatt, Ecol. Monogr. **16**: 204, 1946.—Rudwick, Ann. Mag. Nat. Hist. XII, **4**: 149, 152, 1951.

Melita Australis Haswell, Linn. Soc. N. S. W., Proc. **4** (3): 264, pl. 9, figs. 6-7, 1879; Cat. Australian Crustacea, 252, 1882.

Dulichiella spinosa Stout, Laguna Marine Lab., first Ann. Rept., 141-143, figs. 79-80, 1912.

Melita fresnelii var. *subchelata* Schellenberg, Beiträge Kennt. Meeresfauna Westafrikas 3 (4): 153-154, 1925.

Melita fresneli, Schellenberg, Kl. Sv. Vet.-Akad., Handl. III, **16** (6) : 64-65, 1938.

Melita fresnelli, Reid, Atlantide 2 : 242-243, fig. 37, 1951.

Oahu: Kaneohe Bay, Aug. 15, 1936, 7 specimens; same, Sept. 6, 1936, 36 specimens.

Distribution: Cosmopolitan in tropical and subtropical seas.

FAMILY TALITRIDAE

Hyale affinis Chevreux (fig. 6).

Hyale affinis Chevreux, Mus. Hist. Nat. Paris, Bull. **6** : 415-416, 1907; Soc. Zool. France, Mém. **20** : 503-506, figs. 21-22, 1908.—Schellenberg, Kl. Sv. Vet.-Akad., Handl. III, **16** (6) : 67-68, 1938.

Jarvis Island: 1935, coll. Toomey and Graf., 5 specimens.

Oahu: Waimanalo Bay, Nov. 24, 1951, coll. Donald Bates, 40 specimens; small inlet near Waimea, Nov. 24, 1951, coll. Donald Bates, 10 specimens.

Distribution: Tropical Pacific.

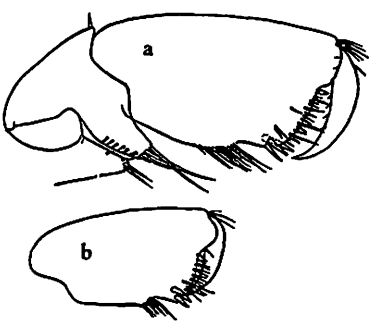

FIGURE 6.—*Hyale affinis,* Waimanalo Bay, Nov. 24, 1951, female, 6 mm.: a, end of gnathopod 2; b, end of gnathopod 1.

Specimens at hand range from 5 to 7 mm. in length, larger than those described by Chevreux, and corresponding morphologically to those figured by Schellenberg from Laysan. The female gnathopods are figured here to show the development of a setose protuberance on the posterior margins of the sixth articles in both appendages. The seventh articles of peraeopods 1 to 5 are minutely pectinate on their inner edges, the degree of this ornamentation decreasing progressively from the front to the rear members.

Hyale ayeli, new species (fig. 7).

Male. Head longer than second body segment, eyes nearly round, black in alcohol. Antenna 1 about two-thirds as long as antenna 2, articles 1-3 successively slightly shorter, flagellum 1.5 times as long as peduncle.

Antenna 2 not half as long as body, article 5 of peduncle longer than 4, flagellum long, with about 17 articles. Last two peduncular articles and first few flagellar articles armed with thick tufts of setae on ventral edges.

Mandible: accessory plate present on both sides; left mandible with one spine, right with six spines in spine row.

Maxilla 1: inner plate not as long as outer, armed with two stout, plumose setae, outer plate with nine serrated spines, palp reaching slightly beyond end of outer plate, armed apically with two setules.

Maxilla 2: plates slender, subequal in size, inner plate with a long seta on inner edge, both apices armed with stout setae.

Maxilliped: inner plate armed with three short, stout spines, outer plate reaching middle of palp article 2, armed with a submarginal row of short setae; palp stout, article 4 falcate, slightly longer than article 3.

Gnathopod 1: article 6 longer than 5, rectangular; palm convex, slightly oblique, defined by two stout spines, article 7 fitting palm.

Gnathopod 2: article 3 with a rounded, anterior lobe, article 6 large, narrowing slightly at distal end, palm oblique, not defined by a spine, lined with short spinules; article 7 stout basally, strongly curved.

Peraeopod 1 larger than 2, article 6 with a large, blunt, posterodistal spine.

Peraeopods 3-5 successively larger, posterior edges of article 2 armed with setules, posterior edges of article 6 smooth, article 7 of all peraeopods smooth except for a small seta.

Uropod 1: rami subequal in length, as long as peduncle, outer armed with spines only at apex, inner with two spines on inner edge; spine at apex of peduncle may be one-half as long as outer ramus.

Uropod 2: outer ramus slightly shorter than inner, the latter longer than peduncle, spinal armature similar to uropod 1.

Uropod 3: ramus as long as peduncle, apex of ramus armed with six spines, apex of peduncle with three spines.

Telson as figured. Posteroventral corner of third pleonal epimera produced slightly. Body segments not carinated.

Female. Similar to male except for gnathopod 2, which is similar to gnathopod 1 but larger.

Type: Bishop Mus. coll., cat. no. 5941, holotype, male, 9 mm.

Type locality: Point of land near Kahuku, Oahu, shore collecting, formalin washings from algae, Nov. 24, 1951, coll. Donald Bates.

Oahu: Hanauma Bay, 36 specimens; small inlet near Waimea, 40 specimens; the type locality, 34 specimens; all stations made by Donald Bates, Nov. 24, 1951, formalin washings of algae.

Distribution: Known only from the Hawaiian Islands.

This species belongs with that group of the genus characterized by the following points: body not carinate, antenna 2 shorter than body, article 6 of male gnathopod 2 with palm distinct from hind margin, peraeopods 4 to 5 with article 6 smooth behind, antenna 2 slender, flagellum with more than 14 articles, article 6 of peraeopods 1 to 5 with an enlarged distal spine.

In this group of species are *Hyale affinis* Chevreux, *H. hawaiensis* (Dana), and *H. media* (Dana). The new species differs from the other members of this group by the thickly setose second antennae.

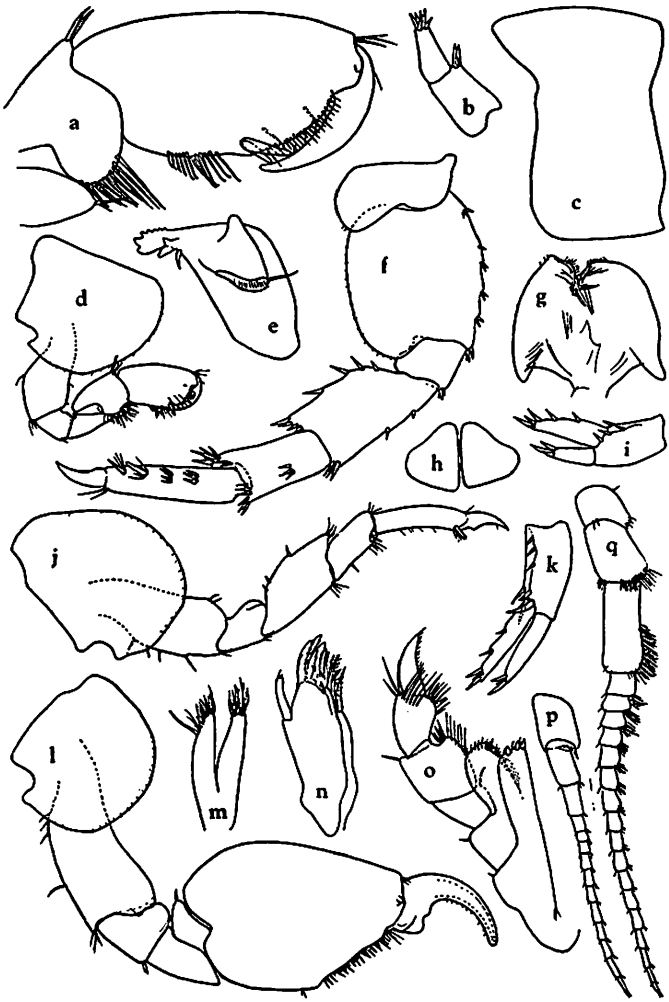

FIGURE 7.—*Hyale ayeli*, Waimea, Nov. 24, 1951. a, female, 6 mm., end of gnathopod 2. b-q, male, 8 mm.: *b*, uropod 3; *c*, pleon segment 3, left; *d*, gnathopod 1; *e*, mandible; *f*, peraeopod 3; *g*, lower lip; *h*, telson; *i*, uropod 2; *j*, peraeopod 1; *k*, uropod 1; *l*, gnathopod 2; *m*, maxilla 2; *n*, maxilla 1; *o*, maxilliped; *p*, antenna 1; *q*, antenna 2.

Hyale bishopae, new species (fig. 8).

Male. Head slightly longer than first body segment, eyes oval, black in alcohol.

Antenna 1 as long as head and first body segment combined, reaching slightly beyond end of peduncular article 2 of antenna 2, articles 2 and 3 subequal in length, shorter than 1, flagellum not twice as long as peduncle.

Antenna 2 stout, slightly longer than antenna 1, less than one-half as long as body, article 4 three-fourths as long as 5, flagellum as long as peduncle, sparsely setose.

Mandible: accessory plate present on both sides, spine row with three spines on right and two on left mandible.

Maxilla 1: inner plate reaching about two-thirds along outer plate, armed with two plumose setae which reach to bases of spines on outer plate, the latter with nine spines. Palp reaching slightly beyond bases of spines on outer plate, tipped with a long seta.

Maxilla 2 similar to that of *H. ayeli*.

Maxilliped: inner plates with three stout, apical spines each, apical outer edges and inner edges armed with stout, plumose setae; outer plate with short setae on apical outer and inner edges. Rest of appendage similar to *H. ayeli*.

Gnathopod 1: article 6 with palm slightly oblique, defined by two spines, article 7 longer than palm.

Gnathopod 2: article 6 large, oval, palm oblique, short, defined by two spines, article 7 fitting palm.

Peraeopod 1 larger than 2, article 6 lacking an enlarged distal spine. Peraeopods 3-5 successively larger, sixth articles smooth behind, seventh articles smooth except for a small seta each.

Uropod 1: rami subequal, slightly shorter than peduncle, outer ramus armed with three marginal spines, inner with one spine, mediodistal edge of peduncle with a short spine.

Uropod 2: rami subequal, longer than peduncle, each armed with two marginal spines.

Uropod 3: distal end of peduncle armed with a spine, ramus longer than peduncle, armed with a spine midway along its upper edge, apex with six spines. Telson as figured.

Pleonal epimera 3, posterior edge slightly convex, posteroventral corner slightly produced, ventral edge strongly convex. Body segments smooth dorsally.

Female. Gnathopod 1 similar to that of male, gnathopod 2 larger than 1, article 5 with a slender posterior lobe, article 6 with two spines defining palm.

Type: Bishop Mus. coll., cat. no. 5944, holotype, male, 8.5 mm.

Type locality: Hanauma Bay, Oahu, formalin washings of algae, Nov. 24, 1951, coll. Donald Bates; 7 specimens from type locality examined.

Distribution: Known only from the Hawaiian Islands.

This species belongs with a group of species in the genus characterized by the following points: body not carinate, antenna 2 less than one-half as long as body, male gnathopod 2 with palm distinct from hind margin, antenna 2 stout, sparsely setose. To this group belong the following species: *Hyale pontica* Rathke, *H. grimaldi* Chevreux, *H. grandicornis* (Krøyer), *H. trifoliadens* Kunkel, *H. perieri* (Lucas), and *H. crassicornis* (Haswell). *H. bishopae* differs from most of these species by a combination of the following characters: antenna 2 with flagellar articles short and broad, male gnathopod 1 with article 6 widened distally, article 7 of peraeopods 1 to 5 not pectinate, ramus and peduncle of uropod 3 subequal in length, article 6 of peraeopods 1 to 5 lacks enlarged distal spine.

I am unable to distinguish the new species from *H. crassicornis* (Haswell) but hesitate to unite the present material with that species, owing to its poor description and figures and the lack of comparative materials.

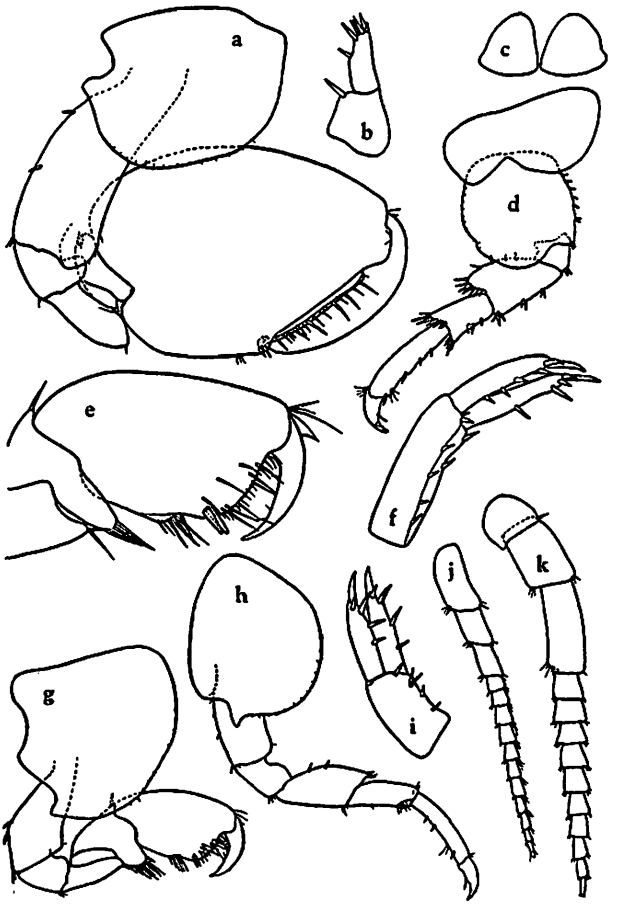

FIGURE 8.—*Hyale bishopae,* Hanauma Bay, Nov. 24, 1951. a-d, f-k, male, 7.5 mm.: *a,* gnathopod 2; *b,* uropod 3; *c,* telson; *d,* peraeopod 3, reduced in size; *f,* uropod 1; *g,* gnathopod 1; *h,* peraeopod 2, reduced in size; *i,* uropod 2; *j,* antenna 1; *k,* antenna 2. e, female, 6 mm., end of gnathopod 2.

Hyale honoluluensis Schellenberg, Kl. Sv. Vet.-Akad., Handl. III, 16 (6): 69-71, figs. 35 b, c, 1938.

Jarvis Island: 1935, coll. Dr. Coman, 11 specimens.

Oahu: Waimanalo, Apr. 10, 1951, 32 specimens; Apr. 17, 1951, 16 specimens; June 5, 1951, 8 specimens; July 17, 1951, 8 specimens. Kawela Bay, Sept. 2-7, 1948, 7 specimens. Point near Kualoa, Nov. 24, 1951, formalin washings of algae, 9 specimens, coll. Donald Bates. Diamond Head, Nov. 24, 1951, 80 specimens, coll. Donald Bates.

Distribution: Known only from the Hawaiian Islands.

Orchestia gambierensis Chevreux (fig. 9).

Orchestia gambierensis Chevreux, Soc. Zool. France, Mém. **20**: 491-494, figs. 12, 13, 1908.

Orchestia gambariensis (*sic*), Stephensen, B. P. Bishop Mus., Occ. Papers **10** (23): 5, 1935.

Tahiti: Point Venus, Apr. 5, 1933, coll. C. H. Edmondson, 22 specimens.

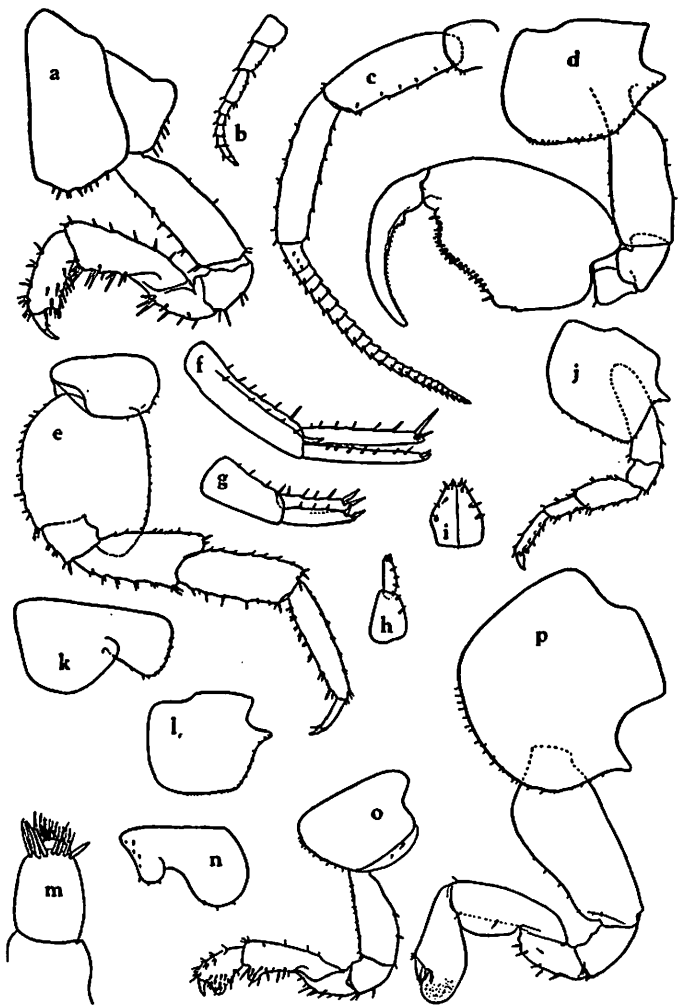

FIGURE 9.—*Orchestia gambierensis*, Point Venus, Tahiti, Apr. 5, 1933. **a, p**, female, 10 mm.: *a*, gnathopod 1; *p*, gnathopod 2. b-o, male, 12 mm.: *b*, antenna 1; *c*, antenna 2; *d*, gnathopod 2; *e*, peraeopod 5, reduced in size; *f*, uropod 1; *g*, uropod 2; *h*, uropod 3; *i*, telson; *j*, peraeopod 2; *k*, coxa 5; *l*, coxa 3; *m*, end of palp of maxilliped; *n*, coxa 6; *o*, gnathopod 1.

Distribution: Tuamotus; Mangareva, Rikitea, under stones and algae on shore; Tahiti.

Orchestia kaalensis, new species (fig. 10).

Male. Head about one and one-half times as long as first peraeon segment, eyes moderately large, black, separated dorsally by a width less than their greatest diameters.

Antenna 1 reaching to end of peduncular article 4 of antenna 2, flagellum shorter than peduncle, composed of four articles, each successively slightly shorter; a minute fifth article is attached to the end of the fourth article.

Antenna 2 as long as head and first five peraeon segments combined, peduncle slender, cylindrical, article 5 slightly longer than 3 and 4 combined, flagellum slightly longer than peduncle, with 20 articles.

Palp of maxilliped with a minute, scale-like, fourth article.

Gnathopod 1: article 4 not produced apically, article 5 produced into a conical, posterodistal lobe, article 6 widened distally, with a postpalmar lobe, article 7 not as long as palm.

Gnathopod 2: article 6 widened distally slightly, ovate, palm oblique, slightly convex, armed with spinules, article 7 longer than palm, apex attenuated and fitting into a mediopalmar groove.

Peraeopods 3-5: anterior lobe of fifth coxa as deep as coxa 4; second articles of peraeopods 3-5 expanded, posterior edges with five to eight shallow serrations, more strongly so on peraeopod 5; articles 4-5 not incrassated; peraeopod 5 slightly longer than 4.

Uropod 1: outer ramus with marginal and apical spines.

Uropod 3: peduncle longer than ramus, armed with four spines, apex of ramus armed with two large and two small spines.

Telson oval, longer than broad, with a minute medial fissure, each side armed with five spines.

Pleopods well developed, about as long as height of pleon segments. Pleon epimerae 1-3, each with five to nine serrations on lower halves of posterior margins, lower corners acutely produced; body segments smooth dorsally.

Female. Gnathopod 1, article 6 lined with strong spines on posterior edge, palm short, transverse, armed with spinules. Gnathopod 2, article 6 armed with a row of short setae.

Type: Bishop Mus. coll., cat. no. 6028, holotype, male, 10 mm.

Type locality: Mount Kaala, Oahu, Mar. 4, 1917, coll. J. C. Bridwell. Two collections were examined from the type locality, about 3,000 feet altitude, from moss on the ground and in trees, Mar. 4, 1917; 18 specimens in all.

Distribution: Known only from Mount Kaala, Oahu.

This species is most closely related to *Orchestia grillus* (Bosc) and *O. selkirki* Stebbing. It differs from both of them by the slender sixth article of the female second gnathopod, and by the few articles (four) to the flagellum of antenna 1. The above two species have seven to eight articles to the superior flagellum. From *O. pickeringi* Dana, the only other *Orchestia* known from the Hawaiian Islands, this species differs by the presence of marginal spines on the outer ramus of uropod 1, among other characters.

Orchestia pickeringi Dana (fig. 11).

Orchestia Pickeringii Dana, U. S. Expl. Exped. 14: 882-883, pl. 59, fig. 9, 1853.

Orchestia pickeringii, Stebbing, Fauna Hawaiiensis 2 (5): 528-529, pl.

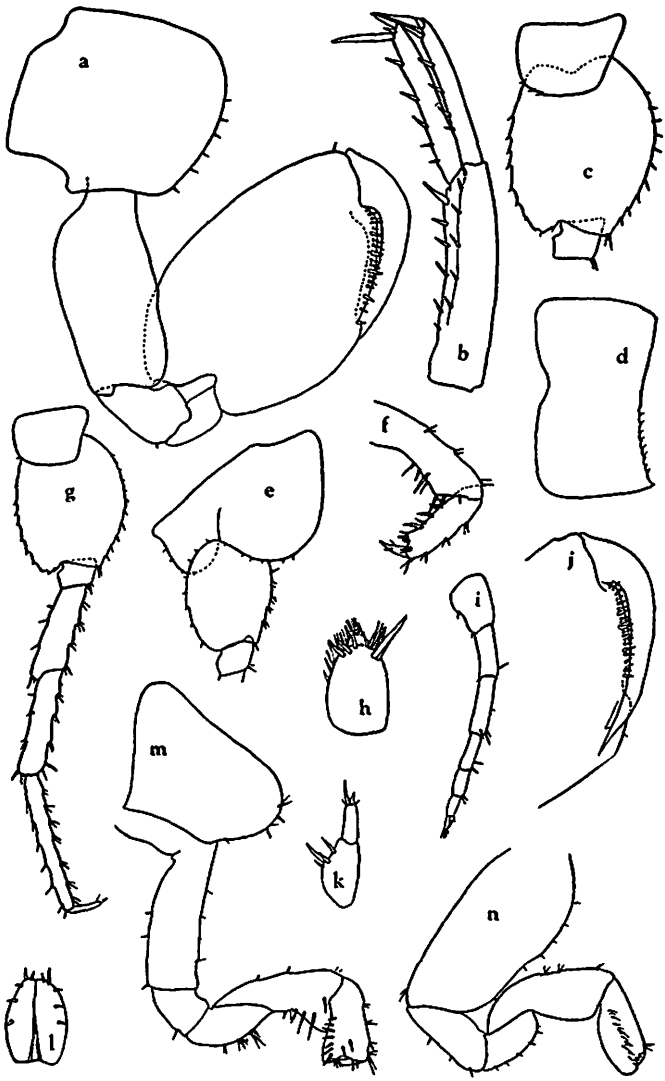

FIGURE 10.—*Orchestia kaalensis.* Mount Kaala, Oahu, Mar. 4, 1917. a-e, g-m, male, 10 mm.: *a*, gnathopod 2; *b*, uropod 1; *c*, upper part of peraeopod 5, reduced in size; *d*, pleon segment 3; *e*, peraeopod 3, reduced in size; *g*, peraeopod 5, reduced in size; *h*, end of palp of maxilliped; *i*, antenna 1; *j*, gnathopod 2, medial side of palm; *k*, uropod 3; *l*, telson; *m*, gnathopod 1. f, n, female, 10 mm.: *f*, gnathopod 1; *n*, gnathopod 2.

21 B, 1900; Das Tierreich 21: 538, 1906; Australian Mus., Mem. 4 (2): 645, 1910.

Orchestia pickeringi, Stephensen, B. P. Bishop Mus., Occ. Papers 10 (23): 8, 1935.

Oahu: Mount Kaala, with *Astelia* at about 2,800 feet altitude, Mar. 4, 1917, coll. J. C. Bridwell, 13 specimens.

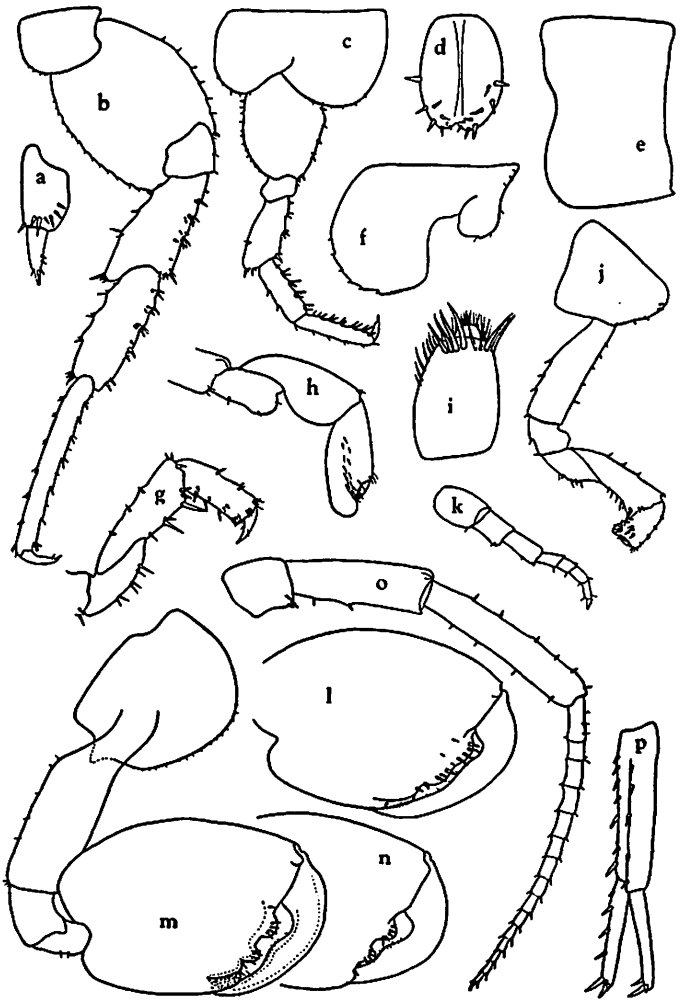

FIGURE 11.—*Orchestia pickeringi,* Mount Kaala, Oahu, Mar. 4, 1917. a-f, i-k, m-p, male, 13 mm.: *a,* uropod 3; *b,* peraeopod 5; *c,* peraeopod 3; *d,* telson; *e,* pleon segment 3, left; *f,* coxa 6; *i,* end of palp of maxilliped; *j,* gnathopod 1; *k,* antenna 1; *m,* gnathopod 2, medial view; *n,* gnathopod 2, lateral view; *o,* antenna 2; *p,* uropod 1. l, male, 10 mm., end of gnathopod 2, enlarged. g, h, female, 12 mm.: *g,* gnathopod 1; *h,* gnathopod 2.

Distribution: Known only from the Hawaiian Islands.

This species resembles *O. platensis* Krøyer, particularly in the shape of the palm of the male second gnathopod. It differs from Krøyer's species as described and figured by Iwasa (1939) and Stephensen (1944) by the slender second antennae and by the lack of strong serrations on the posterior edges of the third pleonal epimera.

Stebbing's record (1900) of *O. platensis* from the Hawaiian Islands differs from other descriptions of the species by the slender second antennae, but differs from the present material of *O. pickeringi* by the lack of the fourth article on the maxillipedal palp and the smooth palm of the male second gnathopod. I believe that Stebbing's material was simply the younger stages of *O. pickeringi,* with underdeveloped maxillipeds and gnathopods.

Parhyale inyacka (K. H. Barnard). (See figure 12.)

Hyale inyacka Barnard, S. African Mus., Ann. **15** (3): 233-234, pl. 28, fig. 4, 1916.—Chevreux, Soc. Zool. France, Bull. **50** (10): 370-372, fig. 17, 1926.—Stephensen, Zool. Jahrb., Abt. Syst. **64**: 441-446, figs. 3-4, 1933.

Parhyale fasciger, Fage and Monod, Archiv. Zool. Expér. Gén. Paris **78**: 105-108, figs. 3-7 b, 1936 [not Stebbing, 1897].

Parhyale inyacka, Barnard, S. African Mus., Ann. **32** (5): 472, 1940.—Stephensen, Studies fauna Curacao, Aruba, . . . **3** (11): 6-7, 1947.

Oahu: Kaneohe Bay, 1939, 140 specimens, coll. C. H. Edmondson. Honolulu Aquarium, from cement-lined gutter draining fish tanks, Apr. 1, 1950, 16 specimens; same, Nov. 1, 1950, 26 specimens.

Distribution: St. Thomas, Bonarie, Canary Islands, East Africa, Hawaiian Islands. This is the first record of this species from the Pacific Ocean.

The primary character distinguishing this species from *Parhyale fascigera* Stebbing (1897) is the presence of groups of spines on the posterior edges of the sixth articles of peraeopods 4 and 5. The principal discrepancy between the material at hand and that of Stephensen (1933) is the palmar spines of the first male gnathopod which are small and not removed from the palmar angle; otherwise the material compares favorably with the figures and descriptions cited above.

Parorchestia hawaiensis (Dana) (fig. 13).

Orchestia hawaiensis Dana, U. S. Expl. Exped. **14**: 880-882, pl. 59, fig. 8, 1853.—Bate, Brit. Mus. Cat. Amphip. Crust., 32-33, pl. 5, fig. 7, 1862.—Della Valle, Fauna Flora Golfes Neapel, Monogr. **20**: 509, 1893.

Parorchestia hawaiensis, Stebbing, Linn. Soc. London, Trans. (Zool.) II, **7**: 402, 1899; Fauna Hawaiiensis **2** (5): 529-530, pl. 21 C, 1900; Das Tierreich **21**: 588, 1906.—Stephensen, B. P. Bishop Mus., Occ. Papers **10** (23): 13, 1935.

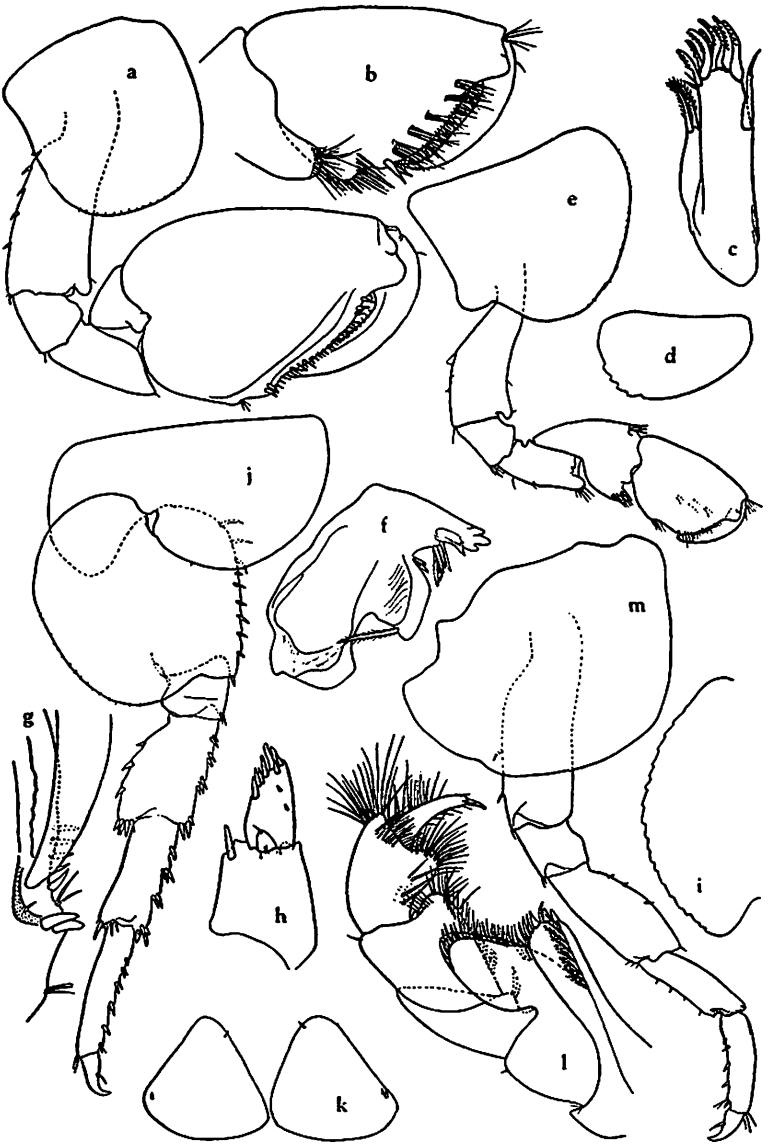

FIGURE 12.—*Parhyale inyacka,* Honolulu Aquarium, Apr. 1, 1950. a, c-m, male, 12 mm.: *a,* gnathopod 2; *c,* maxilla 1; *d,* coxa 7, right; *e,* gnathopod 1; *f,* mandible; *g,* palmar angle of gnathopod 2, greatly enlarged; *h,* uropod 3; *i,* peraeopod 5, posterior edge of article 2; *j,* peraeopod 3; *k,* telson; *l,* maxilliped; *m,* peraeopod 2. b, female, 10 mm., end of gnathopod 2, enlarged.

Oahu: Mount Kaala, Mar. 4, 1917, coll. J. C. Bridwell, 24 specimens.

Distribution: The Hawaiian Islands.

The sixth article of gnathopod 2 differs in shape between young and older males, in young animals being shorter and broader, whereas in older males (11-13 mm.) this article is longer and relatively narrower.

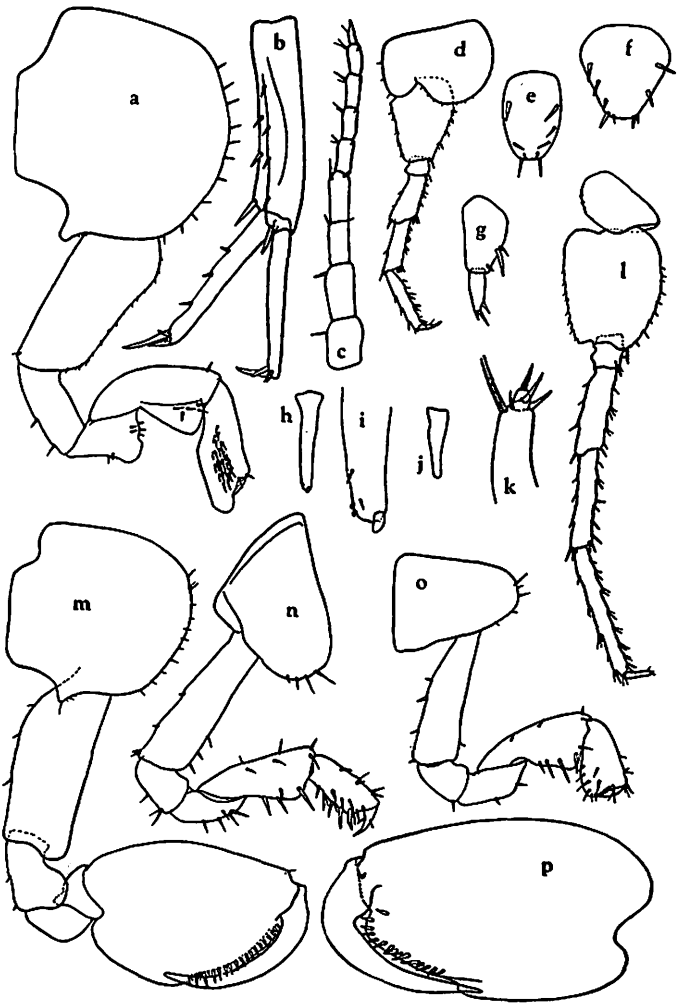

FIGURE 13.—*Parorchestia hawaiensis,* Mount Kaala, Oahu, Mar. 4, 1917, a, n, female, 8 mm.: *a,* gnathopod 2; *n,* gnathopod 1. b-e, g-m, o, male, 8 mm.: *b,* uropod 1; *c,* antenna 1; *d,* peraeopod 3; *e,* telson; *g,* uropod 3; *h,* pleopod 2; *i,* end of pleopod 2, enlarged; *j,* pleopod 3; *k,* end of palp of maxilliped; *l,* peraeopod 5; *m,* gnathopod 2; *o,* gnathopod 1. f, telson of another male, 8 mm. p, end of gnathopod 2, medial view of another male, 11 mm.

Baker's key to some species of *Parorchestia* should be emended to show that the telson of the present species has apical spinules. The material at hand differs from that previously described by having only five articles to the flagellum of antenna 1 instead of seven to nine flagellar articles. The third peduncular article of antenna 1 is considerably longer than either articles 1 or 2 but is not longer than these two combined.

Family AMPITHOIDAE

Ampithoe orientalis Dana (fig. 14).

Amphithoe (sic) orientalis Dana, U. S. Expl. Exped. **14**: 937-939, pl. 64, fig. 2, 1853.—Bate, Brit. Mus. Cat. Amphip. Crust., 246-247, pl. 42, fig. 9, 1862.

Ampithoe orientalis, Stebbing, Das Tierreich **21**: 641, 1906.

Male. Eye pigment absent in alcohol, lateral lobes of head subquadrate in outline. Antenna 1 nearly three-fourths as long as body, articles 1 and 2 of peduncle subequal in length, article 3 one-third as long as 2. Antenna 2 nearly one-half length of body, article 5 of peduncle slightly shorter than article 4, flagellum slightly longer than last two articles of peduncle.

Mandible: primary plate with nine teeth, accessory plate with six teeth, spine row with nine to 10 spines, palp small, article 3 two-thirds as long as 2, apex obliquely truncate, armed with five pectinate setae.

Lower lip typical of the genus.

Maxilla 1: inner plate small, conical, armed with one seta on medial edge, outer plate with nine spines, palp article 2 slender, apex with five spines and a seta.

Maxilla 2: inner edge of inner plate lined to base with setae, inner edge of outer plate lined halfway to base with setae.

Maxilliped: inner plate reaching nearly to end of palp article 1, rounded apex armed with setae and a stout spine; outer plate reaching beyond end of palp article 2, inner edge lined with slightly serrate spines. Apex of palp tipped with a spine.

Gnathopod 1: article 2 produced anterodistally into a shallow lobe, article 6 slightly longer than 5, palm transverse, palmar angle quadrate, article 7 stout, overlapping palm.

Gnathopod 2: article 2 not as strongly produced as in gnathopod 1, article 5 very short, article 6 elongate, as long as article 2, oval; palm oblique, not defined, with a protuberance near finger hinge; article 7 longer than article 6.

Peraeopods 1 and 2 similar and equal in size, article 2 broadly expanded, article 4 broadly produced anteriorly.

Peraeopods 3 to 5 successively longer; peraeopod 3, proximal anterior edge of article 2 armed with four stout spines, below which short setae line the article. Peraeopods 4 and 5 similar, article 2 not broadly expanded, posterodistal angle slightly produced, armed with two spines.

Uropods all extending the same distance. Uropod 1, rami shorter than peduncle, outer ramus nearly as long as inner.

Uropod 2: rami about as long as peduncle, similar to uropod 1 but without a ventral peduncular process.

Uropod 3: peduncle about twice the length of the rami, outer ramus armed with two recurved spines.

Telson triangular, apex rounded.

Pleon segment 3: posterior edge of epimera slightly convex, lower posterior corner rounded.

Female. Unknown.

Oahu: Kawela Bay, Sept. 2-7, 1948, on seaweed, coll. C. H. Edmondson, 4 males.

Distribution: Previously recorded by Dana from Manila, on floating kelp.

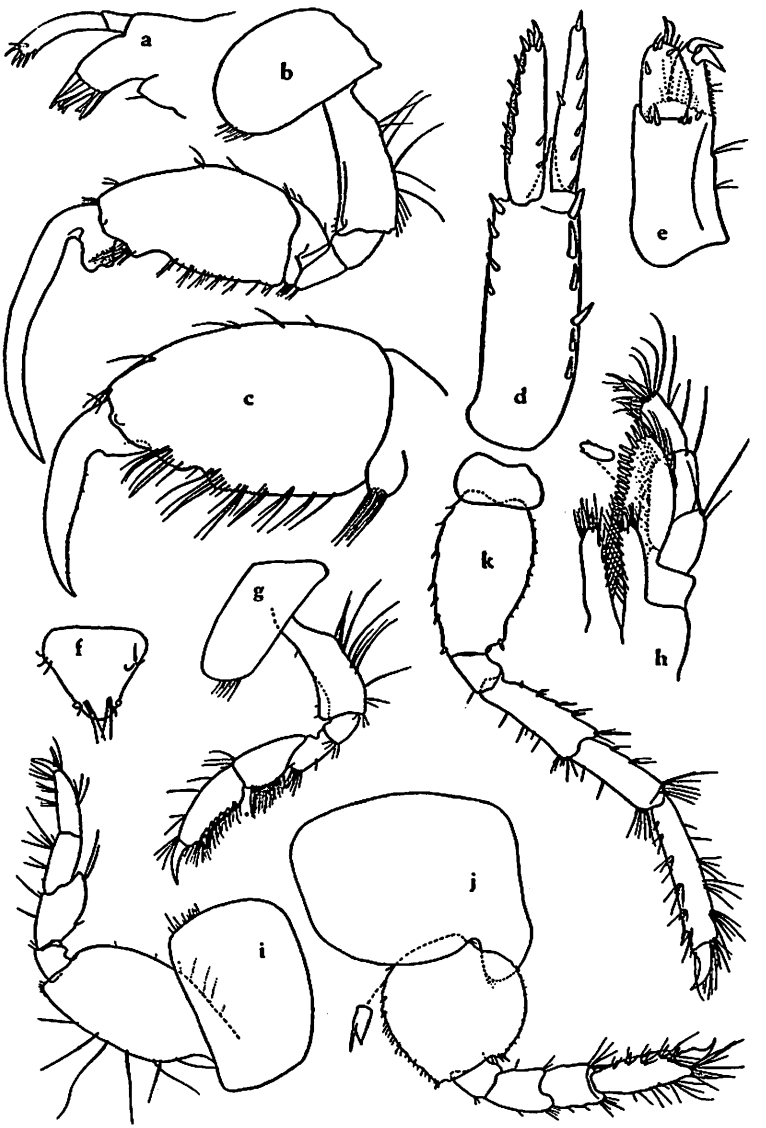

FIGURE 14.—*Ampithoe orientalis,* Kawela Bay, Sept. 2-7, 1948. a-b, d-k, male, 7 mm.: *a,* maxilla 1; *b,* gnathopod 2; *d,* uropod 1; *e,* uropod 3; *f,* telson; *g,* gnathopod 1; *h,* maxilliped; *i,* peraeopod 1; *j,* peraeopod 3; *k,* peraeopod 5. c, male, 5 mm., end of gnathopod 2.

This species is closely related to *Ampithoe eoa* Brüggen (1907), differing in the following points: (1) the subequal condition of the rami of uropod 1; (2) the presence of stout spines on the upper anterior edge of peraeopod 3.

A young male is figured to show the presence of a spine on the palm and the shortness of article 7 of gnathopod 2.

Ampithoe ramondi Audouin.

Amphithoë ramondi Audouin, Descr. Égypte, Hist. Nat. **1** (4): 93, pl. 11, fig. 6, 1826.—Ruffo, Mus. Civ. Stor. Nat., Ann. **60**: 146-147, 171-172, 1938.

Ampithoe ramondi, Schellenberg, Zool. Soc. London, Trans. **22** (35): 665-666, 1928.—Barnard, Indian Mus., Rec. **37** (3): 305, 1935.—Pirlot, Siboga-Exped., Monogr. **33f**: 346-347, 1938.—Shoemaker, Smithsonian Misc. Coll. **101** (11): 40, 1942.

Amphithoe ramondi, Schellenberg, Fisheries Res. Directorate, Egypt, Notes and Mem. **18**: 19, 1936; Kl. Sv. Vet.-Akad., Handl. III, **16** (6): 87, 1938.—Hewatt, Ecol. Monogr. **16**: 199, 204, 1946.

Ampithoë ramondi, Barnard, John Murray Exped. 1933-34, Sci. Repts. **4** (6): 170, 1937; S. African Mus., Ann. **32** (5): 480, 1940.

Amphithoe Vaillanti Chevreux, Soc. Zool. France, Mém. **14**: 418, 1901; op. cit. **23** (3): 260-261, pl. 20, figs. 1-4, 1911.—Chevreux and Fage, Faune de France **9**: 333-334, figs. 341, 342, 1925.—Poisson and Legueux, Soc. Zool. France, Bull. **51** (4): 318, 1926.—Cecchini and Parenzan, Sta. Zool. Napoli, Pubb. **14** (2): 224-225, fig. 50, 1935.—Fischetti, Mus. Lab. Zool. Anat. Comp., Genova, Boll. **17** (96): 5-6, 1937.

Amphithoe vaillanti, Miloslawskaja, Trav. Stat. Sci. Nat. Karadagh **4**: 65, figs. 20, 21, 53, 1931; op. cit. **5**: 128-130, fig. 27, 1939.—Reid, Atlantide **2**: 264-265, 1951.

Amphithoë vaillanti, Walker, Rept. on Ceylon pearl oyster fisheries, Suppl. Rept. **17**: 291, 1904.—Crawford, Jour. Marine Biol. Assoc. United Kingdom **21** (1): 104, 1936.

Ampithoe vaillantii, Stephensen, Rept. Danish Oceanog. Expeds. 1908-10, Biol. **2** (D, 1): 51-52, 1915.—Barnard, S. African Mus., Ann. **15** (3): 253-255, 1916.

Amphithoë intermedia Walker, Rept. on Ceylon pearl oyster fisheries, Suppl. Rept. **17**: 290-291, pl. 7, fig. 46, 1904; Linn. Soc. London, Trans. (Zool.) II, **12** (4): 341, 1909; Ann. Mag. Nat. Hist. VIII, **17**: 346, 1916.

Amphithoe intermedia, Chevreux, Soc. Zool. France, Mém. **20**: 515-516, fig. 29, 1908.—Shoemaker, Univ. Iowa, Studies Nat. Hist. **9** (5): 102, 1921.

Ampithoe intermedia, Stebbing, S. African Mus., Ann. **6**: 462, 1910.

Amphithoë lobata Walker, Linn. Soc. London, Trans. (Zool.) II, **12** (4): 342, pl. 43, fig. 9, 1909.

Ampithoe divisura Shoemaker, Tortugas Lab. Carnegie Inst. Washington, Papers **28**: 255-256, fig. 9, 1933.

Not *Ampithoe simulans* Alderman, Univ. Calif., Pub. Zoöl. **41** (7): 68-70, figs. 44-47, 1936.

Oahu: Kawela Bay, Sept. 2-7, 1948, on seaweed, coll. C. H. Edmondson, 6 specimens. Waimanalo, July 17, 1951, 2 specimens. Waianae shore, Feb. 8, 1951, coll. C. H. Edmondson, 3 specimens. Hanauma Bay, Feb. 1937, 1 specimen; same, May 15, 1946, 6 specimens.

Distribution: Cosmopolitan in tropical and subtropical seas. This is the first record of this species from the Hawaiian Islands.

Cymadusa filosa Savigny (fig. 15).

Cymadusa filosa Savigny, Anim. sans Vert. Napoli, Mem. **2**: 109, pl. 4, fig. 1 a, b, e, i, o, u, 1816.

Grubia filosa, Schellenberg, Zool. Soc. London, Trans. **22** (35): 666-668, fig. 206, 1928.—Shoemaker, N. Y. Acad. Sci. **15** (2): 245-249, figs. 4-5, 1935.—Barnard, John Murray Exped. 1933-34, Sci. Repts. **4** (6): 171-172, 1937.—Ruffo, Mus. Civ. Stor. Nat., Ann. **60**: 147, 172, 1938.

Amphithoe filosa, Audouin, Descr. Égypte, Hist. Nat. **1** (4): 93, 1826.

Amphithoë setosa Haswell, Linn. Soc. N. S. W., Proc. **4** (3): 270-271, 1879.—Chilton, Linn. Soc. N. S. W., Proc. **9** (4): 1040, 1885.

Grubia hirsuta Chevreux, Soc. Zool. France, Bull. **25**: 95-101, figs. 1-5, 1900; Soc. Zool. France, Mém. **23** (3): 261, 1911.—Schellenberg, Beiträge Kennt. Meeresfauna Westafrikas **3** (4): 186-187, 1925.—Chevreux and Fage, Faune de France **9**: 339-340, fig. 347, 1925.

Grubia longicornis Walker and Scott, Nat. Hist. Sokotra and Abd-el-Kuri . . . , Liverpool Mus., Sp. Bull., 226, 1903 [not seen].

Grubia setosa, Stebbing, Das Tierreich **21**: 644, 1906.—?Tattersall, Linn. Soc. London, Jour. (Zool.) **35**: 12-13, pl. 2, figs. 21-24, 1922.

Grubia coei Kunkel, Connecticut Acad. Arts Sci., Trans. **16**: 97-100, fig. 38, 1910.

Grubia compta, Pearse, U. S. Nat. Mus., Proc. **43**: 376, fig. 6, 1912 [not Smith, 1873].

Oahu: Kawela Bay, Sept. 2-7, 1948, 12 specimens, on seaweed, coll. C. H. Edmondson; Waimanalo, Apr. 10, 1951, 3 specimens; Hanauma Bay, Sept. 27, 1945, 18 specimens.

Distribution: Mediterranean Sea, Indian Ocean, Red Sea, Australia, Caribbean Sea, West Africa, and Bermuda; recorded here for the first time for the Hawaiian Islands.

The specimens at hand differ from Shoemaker's well-illustrated material (1935) by the particular paucity of setae on articles 4 and 5 of antenna 2, and on the male second gnathopod. This condition may be due to the juvenility of the material at hand.

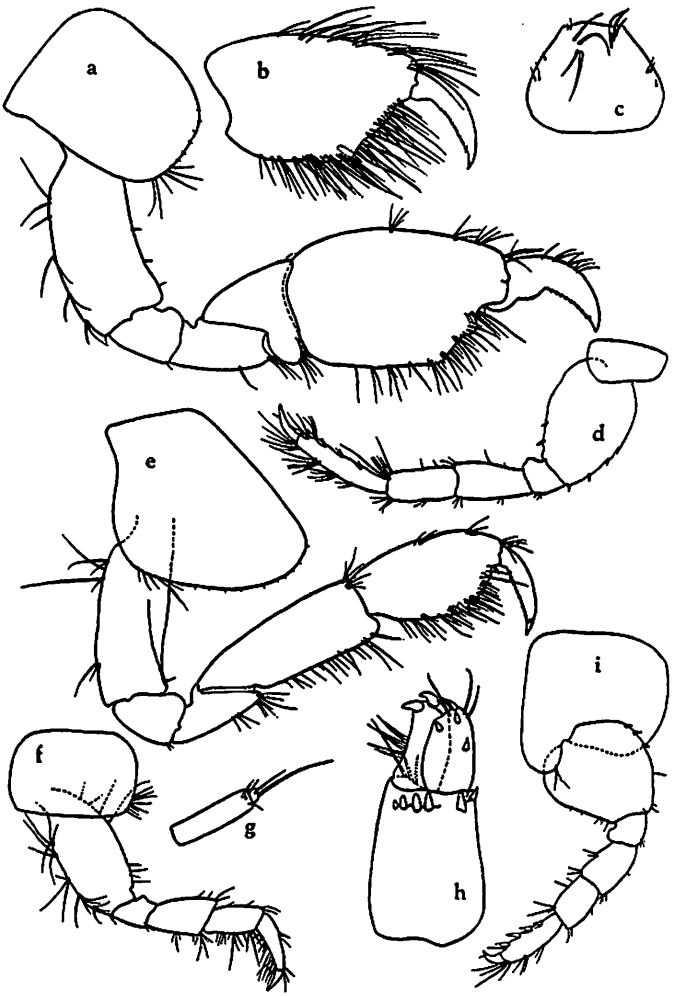

FIGURE 15.—*Cymadusa filosa*, Kawela Bay, Sept. 2-7, 1948. a, c-i, male, 9 mm.: *a*, gnathopod 2; *c*, telson; *d*, peraeopod 5; *e*, gnathopod 1; *f*, peraeopod 1; *g*, accessory flagellum, enlarged; *h*, uropod 3; *i*, peraeopod 3. b, female, 12 mm., end of gnathopod 2.

Cymadusa oceanica, new species (fig. 16).

Male. Head with lateral lobes short, broadly truncated, eye pigment not present (specimens in alcohol).

Antenna 1: articles 1 and 2 subequal in length, article 3 about one-third as long as 2; accessory flagellum composed of two articles, the second article minute.

Antenna 2 about four-fifths as long as 1, article 5 of peduncle three-fourths as long as article 4.

Mouthparts typical of the genus: mandible with seven spines in spine row, palp of maxilla 1 with seven apical spines, inner plate of maxilliped with one apical spine.

Gnathopod 1: article 6 about as long as 5, palm oblique, slightly convex, defined by a spine; article 7 long, overlapping palm, slightly serrated on inner edge.

Gnathopod 2: article 6 slightly longer than 5, palm nearly transverse, slightly concave, defined on inner surface by a spine; article 7 similar to that of gnathopod 1.

Peraeopod 3 armed with one spine on posterior edge of article 2, peraeopods 4-5 with three to four spines at this location.

Uropod 1: peduncle with an acute ventral process; outer ramus of first two uropods longer than inner.

Uropod 3: outer ramus armed with two recurved spines, rami shorter than peduncle.

Telson with rounded or slightly acute apex, not truncated.

Pleon segment 3: posterior edge of epimera convex, posteroventral corner subquadrate.

Female. Gnathopod 2 similar to but slightly larger than gnathopod 1 (which resembles the male first gnathopod), palm oblique, defined by a spine.

Types: Bishop Mus. coll., cat. no. 6026, holotype, male, 5.5 mm. in length; allotype, female, 6.8 mm. in length.

Type locality: Waimanalo, Oahu, July 17, 1951; 40 specimens from type locality; same station, June 15, 1951, 26 specimens.

Distribution: Known only from the Hawaiian Islands.

This species differs from *C. filosa* Savigny by the shortness of article 5 of the first gnathopod which is shorter than article 6. It is separated from *C. hawaiensis* Schellenberg (1938) by the presence of a distinct palm on the male second gnathopod and by the more rounded corners of the third pleonal epimera. From *C. microphthalma* Chevreux (1901), of which only the female is known, this species differs in the straight palm of gnathopod 2, in the unequal length of the first and second antennae, and in the rounded apical edge of the telson.

Paragrubia vorax Chevreux (fig. 17).

Paragrubia vorax Chevreux, Soc. Zool. France, Mém. **14**: 427-431, figs. 50-55, 1901.—Walker, Fauna Geog. Maldive Laccadive Archs. 2, Suppl. 1:930, 1905; Linn. Soc. London, Trans. (Zool.) II, **12** (4): 343, 1909.—Ruffo, Mus. Civ. Stor. Nat., Ann. **60**: 173-174, 1938.—Schellenberg, Kl. Sv. Vet.-Akad., Handl. III, **16** (6): 90, 1938.

Oahu: Kawela Bay, Sept. 2-7, 1948, 75 specimens, coll. C. H. Edmondson. Waikiki beach, on small boat, May 3, 1943, 6 specimens. Hanauma Bay, Feb. 1937, 45 specimens. Waianae shore, Feb. 8, 1951, 8 specimens, coll. C. H. Edmondson. Waimanalo, Apr. 17, 1951, 16 specimens; same, June 5, 1951, 4 specimens.

Distribution: Hawaii, Seychelle Islands, Fiji Islands, Coetivy, and Maldive and Laccadive Archipelagoes. Recorded here for the first time from the Hawaiian Islands.

In general the young specimens at hand correspond to the description and figures of Chevreux (1901) based on specimens 6 mm. in length. However, large males up to 14 mm. in length show a transformation and enlargement of the first pair of gnathopods so that articles 5 and 6 become three to

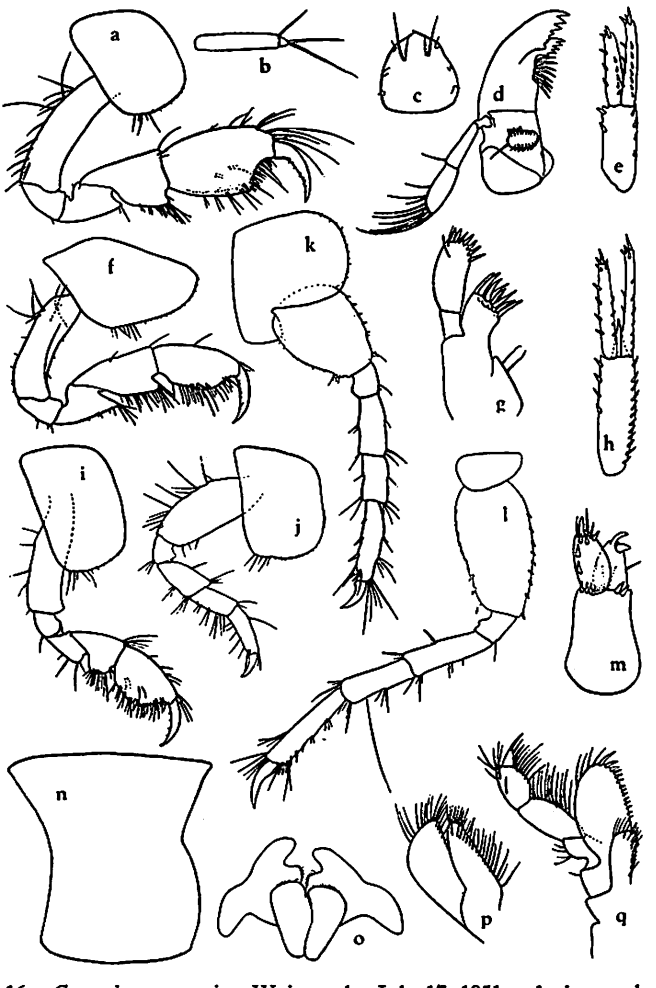

FIGURE 16.—*Cymadusa oceanica,* Waimanalo, July 17, 1951. a-h, j-q, male, 6 mm.: *a,* gnathopod 2; *b,* accessory flagellum, enlarged; *c,* telson; *d,* mandible; *e,* uropod 2; *f,* gnathopod 1; *g,* maxilla 1; *h,* uropod 1; *j,* peraeopod 1; *k,* peraeopod 3; *l,* peraeopod 5; *m,* uropod 3; *n,* pleon segment 3, left; *o,* lower lip; *p,* maxilla 2; *q,* maxilliped. i, female, 8 mm., gnathopod 2.

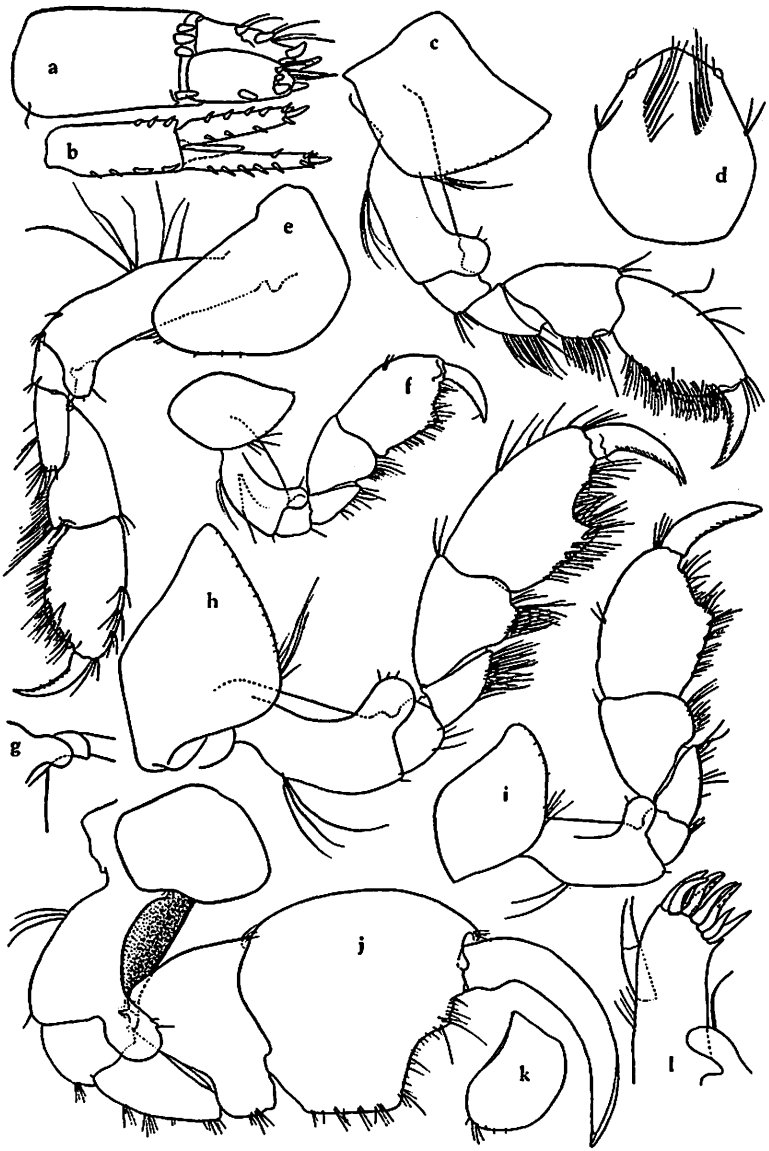

FIGURE 17.—*Paragrubia vorax*, Kawela Bay, Sept. 2-7, 1948. a, b, d, g, h, j, l, male, 12 mm.: *a*, uropod 3; *b*, uropod 1; *d*, telson; *g*, process of mandible and base of palp; *h*, gnathopod 1; *j*, gnathopod 2; *l*, maxilla 1. c, e, female, 13 mm.: *c*, gnathopod 1; *e*, gnathopod 2. f, male, 12 mm., gnathopod 1. i, female, 10 mm., gnathopod 1, abnormal. k, male, 7 mm., coxa 2.

four times as wide in relation to gnathopod 2, compared with young males in which the first gnathopod is only slightly larger than gnathopod 2. Article 6 of gnathopod 1 in the older specimens becomes broadly expanded, the palm being only slightly oblique and strongly concave. The palmar angle is nearly 90 degrees but is rounded broadly at the corner. Young males show a strong spine at the palmar angle, but this is lost in older males. The first coxa, subacutely produced forward in young males, becomes nearly straight anteriorly in older males and the inferoanterior angle becomes rounded.

Large females show no essential changes in the first and second gnathopods, the first coxa in all stages resembling the young male and a strong spine remaining on the palmar angle.

Of interest were two abnormal specimens dissected, and the first gnathopods of these are illustrated (fig. 17, *h, i*). The first specimen apparently was a male, lacking brood plates and being 12 mm. in length. The first coxa was produced forward acutely, as in young males; but the fifth and sixth articles were very slender, the palm being deeply excavated and the palmar angle acute and defined by a spine.

The second specimen, 10 mm. long, had brood plates. The first coxa was typical of the female but articles 5 to 6 of gnathopod 1 resembled those of a young male, although the palmar angle lacked a defining spine.

I suggest that these two specimens represent a retarded male and female respectively, probably resembling the intersexes described among amphipods by Sexton (1924) and Sexton and Reid (1951).

The inner plate of maxilla 1 was left undescribed by Chevreux (1901), and Walker (1909) described it as bearing one seta. This appendage is shown in figure 17, *l*.

Family AORIDAE

Lembos (Bemlos) aequimanus Schellenberg, Kl. Sv. Vet.-Akad., Handl. III, **16** (6) : 76-77, fig. 39, 1938.

Oahu: Waianae shore, Feb. 8, 1951, coll. C. H. Edmondson, 2 specimens. Waimanalo, Apr. 17, 1951, 3 specimens; same, June 5, 1951, 2 specimens. Kawela Bay, Sept. 2-7, 1948, 1 specimen. Hanauma Bay, Sept. 22, 1945, 8 specimens.

Distribution: Gilbert, Fiji, and Hawaiian Islands. Recorded here for the first time from the Hawaiian Islands.

Lembos (Bemlos) intermedius Schellenberg, Kl. Sv. Vet.-Akad., Handl. III, **16** (6) : 77-78, fig. 40, 1938.

Oahu: Kaneohe Bay, Mar. 20 to May 28, 1935, 6 specimens; Hanauma Bay, Feb. 1937, 1 specimen.

Distribution: Known only from the Hawaiian Islands.

FAMILY PHOTIDAE

Photis hawaiensis, new species (figs. 18, 19).

Male. Lateral lobes of head produced forward strongly and rounded in front; eyes oval, with many facets.

Antennae subequal in length; article 2 of antenna 1 longer than article 2, article 3 shorter than 1, flagellum as long as articles 1-2 combined; accessory flagellum rudimentary, armed with two setae.

Antenna 2: articles 4 and 5 of peduncle subequal in length, flagellum as long as these two articles combined.

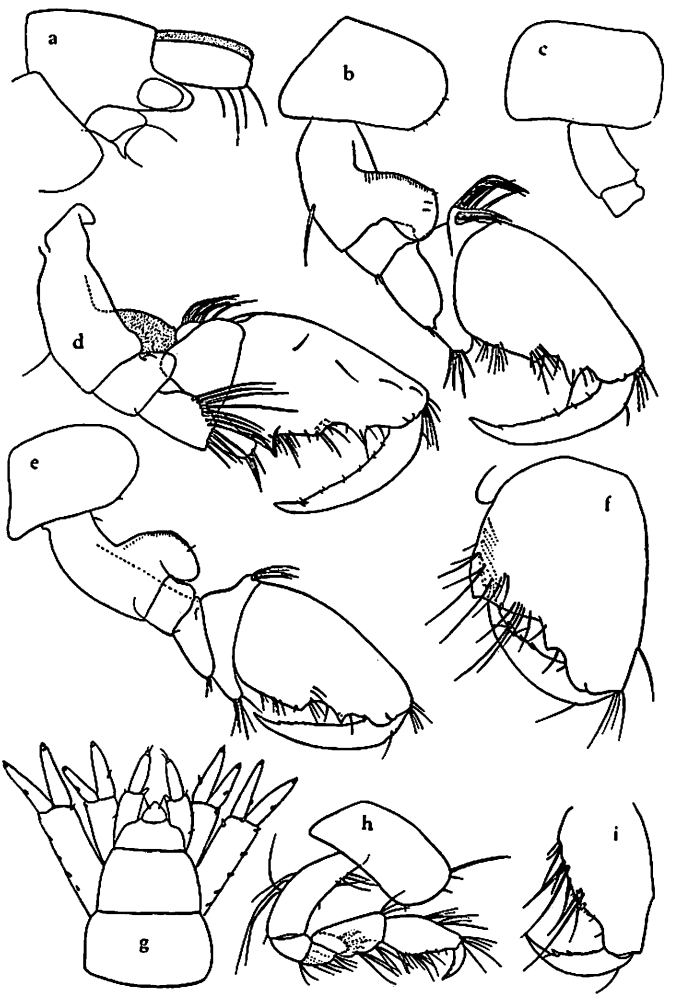

FIGURE 18.—*Photis hawaiensis,* Kaneohe Bay, Jan. 15, 1937. a, e, g-i, male, 3 mm.: *a,* head, lateral view; *e,* gnathopod 2; *g,* urosome, dorsal view; *h,* gnathopod 1; *i,* end of gnathopod 1, enlarged. b, d, male 3.2 mm.: *b,* gnathopod 2, lateral view; *d,* medial view. c, f, female, 2 mm.: *c,* coxa 2; *f,* end of gnathopod 2, enlarged.

Mouthparts typical of the genus: maxilla 1 with five spines and three setae on palp article 2, inner plate unarmed; inner plate of maxilliped with three apical teeth, outer plate with three stout and three slender teeth.

Gnathopod 1: anterior and posterior margins of coxa 1 parallel, lower edge rounded, coxa 1 nearly as long as coxa 3; article 6 of appendage slender, subequal in length to article 5, article 2 not produced distally, palm oblique, slightly convex, article 7 as long as palm, bearing two teeth on inner edge.

Gnathopod 2: article 2 produced into a large, anterodistal hump; article 5 cup-shaped, produced posteriorly into a rectangular, subdigitate, setose process; article 3 produced on medial surface; article 6 long, about one-half as wide as long, palm not distinct from hind margin, produced into an acute, medial cusp behind which is a shallow excavation, the posterior limb of which bears a small spine; posterior edge of palm bears an acute cusp visible only from the medial surface. Article 7 longer than palm, with one large and three small teeth on inner edge. Stridulating ridges appear on the large hump of article 2 and on the lower edges of both the third and fourth coxae.

Peraeopod 1 slightly larger than 2. Peraeopods 3-5 as figured.

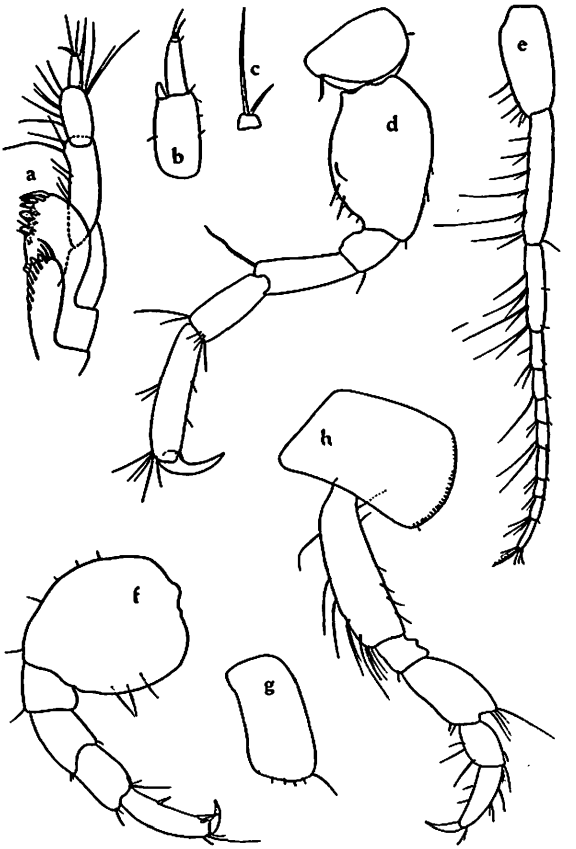

FIGURE 19.—*Photis hawaiensis,* Kaneohe Bay, Jan. 15, 1937. a-f, h, male, 3 mm.: *a,* maxilliped; *b,* uropod 3; *c,* accessory flagellum, enlarged; *d,* peraeopod 5; *e,* antenna 1; *f,* peraeopod 3; *h,* peraeopod 1. g, female, 2.5 mm., coxa 1.

Pleon segments as in *Photis reinhardi* Krøyer (Sars, 1895, pl. 202). Outer ramus of uropod 2 shorter than peduncle.

Female. Article 2 of gnathopod 2 only slightly produced anteriorly, the slight lobe rounded broadly and armed with a seta. Article 6 relatively broader and shorter than in the male, the palm less oblique and not excavated behind the cusp; the latter is not as pronounced as in the male. Article 7 not longer than palm. Antenna 2, flagellum shorter than articles 4 and 5 of peduncle.

Types: Bishop Mus. coll., cat. no. 6013, holotype, male, 3 mm.; allotype, female, 3.2 mm.

Type locality: Kaneohe Bay, Oahu, Jan. 15, 1937; 105 specimens from type locality; Kaneohe Bay, Sept. 6, 1936, 125 specimens.

Distribution: Known only from the Hawaiian Islands.

In large males (3 mm.) article 5 of gnathopod 2 is produced into a retruse process bearing stout, long setae.

This species is characterized by the following combination of factors: the very large process on article 2 of male gnathopod 2; the long, lateral head lobes; short outer ramus of uropod 3; the subdigitate process of article 5 of male gnathopod 2; coxa 1 as long as 3, with its margins parallel; palm of male gnathopod 1 very oblique; antenna 2 much shorter than body; and the lack of a protuberance on the inner margin of the male second gnathopodal finger.

The new species appears most closely related to *P. longimanus* Walker, differing in the process on article 2 of the male second gnathopod, and *P. longicaudata* (Bate and Westwood), differing principally in the longer lateral head lobes, and the more oblique palm of the male second gnathopod, with the finger nearly as long as article 6.

Family COROPHIIDAE

Corophium acherusicum Costa, Reale Accad. Sci. Napoli, Mem. 1: 232, 1857. —Crawford, Jour. Marine Biol. Assoc. United Kingdom 21 (2): 617-620, fig. 2 p, 1937.—Shoemaker, Washington Acad. Sci., Jour. 37 (2): 53, figs. 2, 3, 1947; op. cit. 39 (2): 76, 1949.—Reid, Atlantide 2: 269, 1951.

Oahu: Waikiki beach, from bottom of small boat, May 3, 1943, 11 specimens.

Distribution: Cosmopolitan in tropical and temperate seas. Previously recorded from the Hawaiian Islands by Shoemaker (1947).

Ericthonius brasiliensis (Dana).

Pyctilus brasiliensis Dana, U. S. Expl. Exped. 14: 976-977, pl. 67, fig. 5, 1853.

Ericthonius brasiliensis, Walker, Linn. Soc. London, Trans. (Zool.) II, 12 (4): 343, 1909.—Stebbing, S. African Mus., Ann. 6: 463, 1910.—Kunkel, Connecticut Acad. Arts Sci., Trans. 16: 100-103, fig. 39, 1910. Bjorck, Lunds Univ. Årssk. N. F. II, 11 (7): 31, 1915; Ark. Zool.

10 (16) : 8, 1916.—Kunkel, Connecticut State Geol. Nat. Hist. Surv., Bull. 26 (1) : 163-165, fig. 49, 1918.—Chilton, New Zealand Inst., Trans. and Proc. 54 : 242-244, figs. 1-5, 1923.—Schellenberg, Beiträge Kennt. Meeresfauna Westafrikas 3 (4) : 187-188, 1925; Deutsche Südpolar-Exped. 18 : 384-385, 1926.—Stephensen, Dansk Nat. Foren., Vidensk. Meddel. 84 : 136, 1927.—Schellenberg, Zool. Soc. London, Trans. 22 (35) : 668-669, 1928.—Stephensen, Tierwelt Nord- Ostsee, Leipzig 14 (10, f) : 165, fig. 40, *304,* 1929.—Schellenberg, Further zool. results Swedish Antarctic Exped. 1901-03, 2 (6) : 257, 1931.—Oldevig, Göteborgs K. Vetenskaps-Vitter.-Samh., Handl. B, 3 (4) : 240-241, 1933.—Shoemaker, N. Y. Acad. Sci. 15 (2) : 249-250, 1935.—Schellenberg, Zool. Jahrb., Abt. Syst. 67 : 233, 1935; Fisheries Res. Directorate, Egypt, Notes and Mem. 18 : 21, 1936.—Moore, Liverpool Biol. Soc., Proc. and Trans. 50 : 127, 1937.—Fischetti, Mus. Lab. Zool. Anat. Comp. Genova, Boll. 17 (96) : 11, 1937.—Barnard, John Murray Exped. 1933-34, Sci. Repts. 4 (6) : 173, 1937.—Schellenberg, Kl. Sv. Vet.-Akad., Handl. III, 16 (6) : 90, 1938; Zool. Jahrb., Abt. Syst. 71 : 217, 1938.—Shoemaker, Biol. Soc. Washington, Proc. 54 : 188, 1941.—Hewatt, Ecol. Monogr. 16 : 199, 1946.—Rudwick, Ann. Mag. Nat. Hist. XII, 4 : 150, 153, 1951.—Reid, Atlantide 2 : 267-268, 1951.

Erichthonius brasiliensis, Sexton, Jour. Marine Biol. Assoc. United Kingdom, new ser. 9 (2) : 218, 1911.—Tattersall, Roy. Irish Acad., Proc. 31 (2) : 19, 1913.—Chevreux, Soc. Zool. France, Mém. 23 (3) : 262-263, 1911.—Chevreux and Fage, Faune de France 9 : 353-354, figs. 360-361, 1925.—Poisson and Legueux, Soc. Zool. France, Bull. 51 (4) : 320, 1926.—Chevreux, Soc. Zool. France, Bull. 50 (10) : 391, 1926.—Gurjanova, Inst. Sci. Expl. North (USSR), Trans. 37 : 51-52, 1928.—Cecchini and Parenzan, Sta. Zool. Napoli, Pubb. 14 (2) : 229-231, fig. 53, 1935.—Pirlot, Mus. Roy. Hist. Nat. Belg., Mem. II, 15 : 68, 77, 1939.—MacDonald, Roy. Irish Acad., Proc. 54 B (5) : 89, 1951.

Erichthonius abditus, Scott, Roy. Physical Soc. Edinburgh, Proc., new ser. 16 (4) : 171, 1906.—Norman, Nat. Hist. Soc. Northumberland, Trans. 3 (2) : 323, 1909.—Crawshay, Jour. Marine Biol. Assoc. United Kingdom, new ser. 9 (3) : 351, 1912.

Erichthonius disjunctus Stout, Zool. Jahrb., Abt. Syst. 34 (5/6) : 658-659, 1913.

Oahu : Waikiki beach, May 3, 1943, on bottom of small boat, 7 specimens. Pearl Harbor, Dec. 22, 1938, 12 specimens. One mile off shore of southwest coast, just north of Barbers Point, on iron buoy suspended to depth of 30 feet, Jan. 24, 1944, 22 specimens. Honolulu Harbor, from suspended Douglas fir block, since June 28, 1951, coll. July 10, 1951, 1 specimen.

Distribution : Cosmopolitan in tropical and temperate seas.

FAMILY PODOCERIDAE

Podocerus brasiliensis (Dana).

Platophium brasiliense Dana, U. S. Expl. Exped. **14**: 838-839, pl. 55, fig. 9, 1853.

Platophium synaptochir Walker, Rept. on Ceylon pearl oyster fisheries, Suppl. Rept. **17**: 296-297, pl. 8, fig. 52, 1904.

Podocerus brasiliensis, Schellenberg, Kl. Sv. Vet.-Akad., Handl. III, **16** (6): 94, 1938.—Rudwick, Ann. Mag. Nat. Hist. XII, **4**: 150, 153, fig. 3, 1951.—Barnard, J. L., So. Calif. Acad. Sci., Bull. **52** (3): 87, 1953 [with synonymy].

Podocerus braziliensis, Reid, Atlantide 2: 267, 1951.

Oahu: Kaneohe Bay, Mar. 20 to May 28, 1935, 16 specimens; June 13 to July 10, 1935, on board suspended in water, 7 specimens; July 10, 1935, on wooden block, 9 specimens; July 10 to Aug. 1, 1935, on wood float of six metal plates, 10 specimens; Aug. 1 to 23, 1935, on float of seven metal plates, 3 specimens; Sept. 18 to Oct. 4, 1935, on float of six masonite panels, 3 specimens; Jan. 15, 1937, 28 specimens. Pearl Harbor, Dec. 22, 1938, 14 specimens; Jan. 5, 1948, 5 specimens; Apr. 15, 1948, dry dock, 7 specimens; Feb. 18, 1950, 25 specimens; June 28 to July 10, 1951, on Douglas fir block, 8 specimens, Hanauma Bay, Feb. 1937, 22 specimens.

Distribution: Cosmopolitan in tropical and temperate seas.

FAMILY CHELURIDAE

Chelura insulae Calman, Ann. Mag. Nat. Hist. VIII, **5**: 182-184, pl. 5, figs. 1-6, 1910.—Miller, Univ. Calif., Pub. Zoöl. **26** (8): 159, pl. 12, figs. 1-2, 1924.

Oahu: Honolulu Harbor, May 14, 1949, 30 specimens.

Distribution: Christmas Island, Samoa, Hawaiian Islands. In addition, I have examined other materials of this species in collections of the U. S. National Museum, British Museum of Natural History, and Bishop Museum from the following localities: Caroline and Mariana Islands; Costa Rica (Limon) and Trinidad, in the Caribbean Sea.

FAMILY COLOMASTIGIDAE

Colomastix pusilla Grube (fig. 20).

Colomastix pusilla Grube, Archiv Naturgesch., Jahrgang 30, **1** (2): 206-209, pl. 3, figs. 3 a-f, 1864.—Graeffe, Arb. Zool. Inst. Univ. Wien Zool. Station, Trieste **13**: 24, 1902.—Walker, Rept. on Ceylon pearl oyster fisheries, Suppl. Rept. **17**: 299, 1904; Brit. Mus. (Nat. Hist.), Nat. Antarctic Exped. **3**: 38, 1907.—Kunkel, Connecticut Acad. Arts Sci.,

Trans. **16**: 21-23, fig. 7, 1910.—Chevreux, Soc. Zool. France, Mém. **23** (3): 202-203, 1911.—Pearse, U. S. Nat. Mus., Proc. **43**: 370, fig. 2, 1912.—Tattersall, Roy. Irish Acad., Proc. **31** (2): 8, 1913.—Stephensen, Rept. Danish Oceanog. Expeds. 1908-10, Biol. **2** (D, 1): 44-45, 1915.—Monod, Inst. Oceanog., Monaco, Bull. **427**: 23, 1923.—Chevreux, Soc. Zool. France, Bull. **50**: 300, 1925.—Barnard, S. African Mus., Ann. **20** (5): 346-347, 1925.—Chilton, Asiatic Soc. Bengal, Mem. **6** (10): 533-534, 1925.—Legueux, Soc. Linn. Normandie, Bull. VII, **9**: 37, 1927.—Schellenberg, Zool. Soc. London, Trans. **22** (35): 687, 1928.—Stephensen, Tierwelt Nord- Ostsee, Leipzig **14** (10, f): 104, fig. 25, 148, 1929; Zool. Faroes **2** (1): 7, 1929; Danish Ingolf-Exped. **3** (11): 206-207, 1931.—Barnard, John Murray Exped. 1933-34, Sci. Rept. **4** (6): 154, 1937.—Moore, Liverpool Biol. Soc., Proc. and Trans. **50**: 120, 1937.—Shoemaker, Smithsonian Misc. Coll. **101** (11): 12, 1942.

Colomastix crassimanus, Walker, Linn. Soc. London, Trans. (Zool.) II, **12** (4): 332, 1909.

Male. Head slightly longer than first body segment, lateral lobes short, obtuse, eye visible as several corneal lenses.

Antennae 1 and 2 subequal in length; peduncular articles of antenna 1 successively shorter, flagellum very short, composed of two articles armed with aesthetascs. Article 5 of antenna 2 shorter than 4, flagellum short, composed of three articles.

Mouthparts somewhat degenerated. Epistome large, triangular, attenuated distally. Labrum narrower, appearing to be composed of two linguiform lobes.

Mandible composed of a lobe bearing five spines and a molar process bearing two small tubercles. Palp absent.

Lower lip apparently a simple linguiform lobe, larger than labrum.

Maxilla 1 stubby, inner plate conical, armed with one spine, outer plate armed with three to four short spines, palp with one article armed with three spines.

Maxilla 2: plates appearing fused at their bases, outer one narrow, armed with two spines, inner plate broad and armed with several setules.

Maxilliped: inner plates fused, forming a small, conical plate; outer plates large, the segments bearing them foliaceous, plates truncated, each bearing a seta. Palp slender, article 3 longer than 2, article 4 shorter than 1, conical.

Gnathopod 1 poorly developed, coxa shallow, extending forward into an obtuse lobe, appendage slender, wrinkled, article 7 short, stout.

Gnathopod 2: coxa produced forward, article 5 short, lobed behind, article 6 long, oval, palm very oblique, not defined, article 7 curved, with obtuse apex.

Peraeopods 1-5 similar, the first two pairs longer than the last three pairs, the last three pairs with orientation reversed; article 6 longer than 4 or 5, article 4 longer than 5.

Urosome segment 3 indistinct, possibly represented by a minute sclerite at the base of the third uropods.

Uropods 1-3 similar, uropod 3 stouter than 1, rami as long as peduncle on first two pairs, longer than peduncle on third pair, inner rami serrated on inner edges on all uropods.

Telson triangular, but with apex rounded, unnotched.

Third pleonal epimera with lower posterior corner rounded, posterior edge convex.

Female. Gnathopod 1 with article 7 obscured in a group of equal-sized spines at the end of article 6. Gnathopod 2 more slender than in male, articles 5 and 6 subequal, article 6 without palm, posterior edge armed with several long setae, article 7 curved slightly.

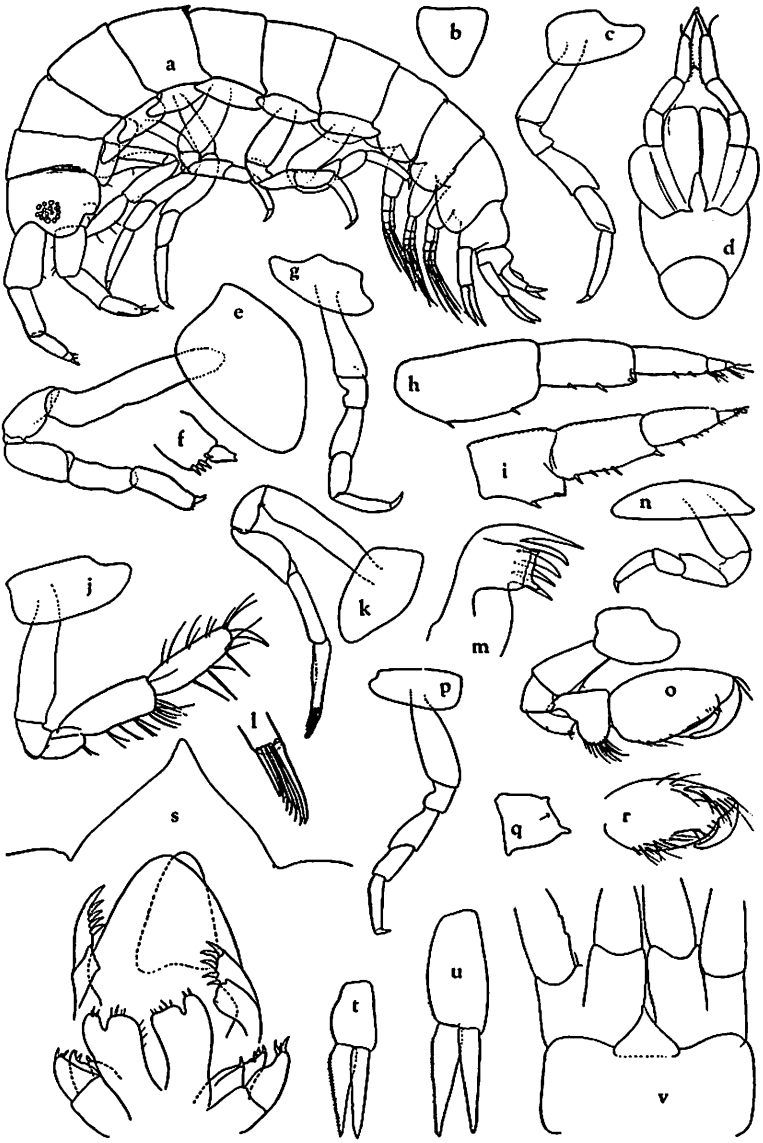

FIGURE 20.—*Colomastix pusilla,* Kaneohe Bay, Sept. 6, 1936. a, j-l, female, 3.5 mm.: *a,* lateral view of entire animal; *j,* gnathopod 2; *k,* gnathopod 1; *l,* end of gnathopod 1, enlarged. b-i, m-v, male, 2.8 mm.: *b,* telson; *c,* peraeopod 1; *d,* maxilliped; *e,* gnathopod 1; *f,* end of gnathopod 1, enlarged; *g,* peraeopod 4; *h,* antenna 1; *i,* antenna 2; *m,* mandible; *n,* peraeopod 3; *o,* gnathopod 2; *p,* peraeopod 5; *q,* molar of mandible, arrow indicating grinding surface; *r,* end of gnathopod 2, medial view; *s,* ventral view of mouthparts, maxilla 1 pulled lateralwards; *t,* uropod 3; *u,* uropod 1; *v,* ventral view of head, showing relative size of epistome.

Oahu: Kaneohe Bay, Sept. 6, 1936, 33 specimens.

Distribution: Cosmopolitan in tropical and temperate seas. Recorded here for the first time from the Hawaiian Islands.

The materials at hand represent the juvenile forms of this species, the ornamentation of the palm of male gnathopod 2 not being apparent.

The specimens differ from the figures of Della Valle (1893) in the foliaceous segment bearing the outer plate of the maxilliped, in the shorter outer plate of the second maxilla, in the different shape of maxilla 1, and in the lack of gross serrations on the second antennae. In general, the specimens correspond to other figures and descriptions where given in the synonymy above. The figures of Pearse (1912) show article 6 of female gnathopod 2 produced distally, and the telson is truncated. None of these differences is considered by the writer to have specific systematic value in this variable species, although subspecific variations should be studied further.

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