J. LAURENS BARNARD

Gammaridean Amphipoda from a Deep-Sea Transect off Oregon

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ABSTRACT

Barnard, J. Laurens. Gammaridean Amphipoda from a Deep-Sea Transect off Oregon. *Smithsonian Contributions to Zoology,* 61:1–86, 1971. Gammaridean Amphipoda from depths between 30 and 2,900 meters off Oregon comprise 97 species, of which 16 are new. *Halicella* and *Lepidepecreoides* are reported for the first time from the Northern Hemisphere, and taxonomic problems in *Hippomedon* and Pardaliscidae are discussed. New species occur in the genera *Anonyx, Bathymedon, Byblis, Epimeria, Halice, Halicella, Harpiniopsis, Hippomedon, Lepidepecreoides, Paraphoxus, Pardaliscella, Pardisynopia, Pleusymtes,* and a new genus of Oedicerotidae.

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Introduction

Gammaridean Amphipoda collected in samples (Appendix) from depths of 30 to 2,900 meters seaward from the mouth of the Columbia River are reported on herein. The materials were collected from the sea bottom by means of two kinds of anchor dredge and include ninety-seven species of identifiable gammarideans with sixteen new species and one new genus. The samples are divisible into seven depth classes shown in Table 1 with a list of species from each depth class.

The genera *Halicella* and *Lepidepecreoides,* heretofore known only from antarctic waters, have now been discovered in the Northern Hemisphere. Problems in the identification of the genus *Hippomedon* and in the classification of the Pardaliscidae are discussed.

Sublittoral, bathyal, and abyssal depths off Oregon represent nearly virgin territory in records of Amphipoda, so that almost every species reported here represents a large range extension either northward from southern California or southward from circumboreal waters.

Ampeliscidae

Ampelisca agassizi (Judd)

Byblis agassizi Judd, 1896, pp. 599–603, figs. 9–11.
Ampelisca compressa Holmes, 1903, p. 273; 1905, pp. 480–481, fig. (no number).—J. L. Barnard, 1960a, pp. 31–32; 1966b, p. 15.
Ampelisca agassizi.—Holmes, 1905, pp. 481–482, fig. (no number).—Mills, 1967, pp. 643–645, fig. 3.
Ampelisca vera J. L. Barnard, 1954a, pp. 23–26, pls. 14–16; 1954b, p. 3, pl. 1: figs. k, l.

MATERIAL.—Stations 1 (93), 2 (1), 11 (8), 22 (1), 37 (1), 38 (1), 45 (3), 46 (2), 54 (3), 61 (3), 72 (12), 75 (3), 1001 (9).

DISTRIBUTION.—Atlantic Ocean from southern Nova Scotia to Caribbean Sea, 1–450 m; eastern Pacific Ocean from Queen Charlotte Islands to Ecuador, 1–266 m.

Ampelisca brevisimulata J. L. Barnard

Ampelisca brevisimulata J. L. Barnard, 1954a, pp. 33–35, pls. 23–24; 1954b, p. 7; 1964a, p. 212; 1966b, p. 15; 1967b, p. 3.

MATERIAL.—Station 63 (1).
DISTRIBUTION.—Caribbean Sea, 9–38 m; eastern Pacific Ocean from Oregon to Panama, 11–172 m.

Ampelisca cristata Holmes

Ampelisca cristata Holmes, 1908, pp. 507–508, figs. 16–17.—J. L. Barnard, 1954a, pp. 26–29, pls. 17–18; 1954b, pp. 3–4, pl. 1: figs. a–g; 1959a, p. 18; 1964a, p. 213; 1966b, p. 15; 1967b, p. 4.

MATERIAL.—Station 70 (5).
DISTRIBUTION.—Oregon to Ecuador, 6–152 m; Caribbean Sea, 9–42 m.

Ampelisca eschrichti Kroyer

FIGURES 1-2

Ampelisca Eschrichtii Krøyer, 1842, p. 155.—Sars, 1895, pp. 174–176, pl. 61: fig. 1.—Stephensen, 1925, pp. 139–141.
Ampelisca eschrichtii.—Stebbing, 1906, p. 100.—Shoemaker,

J. Laurens Barnard, Division of Crustacea, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560

TABLE 1.—*Bathymetry of Amphipoda in the Oregon transect*

30–100 meters *72 samples*	*150–225 meters* *23 samples*	*400 meters* *4 samples*
Ampelisca agassizi	Ampelisca agassizi	Ampelisca agassizi
Ampelisca cristata	Ampelisca brevisimulata	Ampelisca eschrichti
Ampelisca hancocki	Ampelisca hancocki	Ampelisca macrocephala
Ampelisca macrocephala	Ampelisca macrocephala	Byblis bathyalis
Anonyx adoxus	Ampelisca pugetica	Eriopisa elongata
Anonyx carinatus	Anonyx carinatus	Harpiniopsis emeryi
Anonyx comecrudus	Anonyx comecrudus	Harpiniopsis excavata
Aoroides columbiae	Bathymedon covilhani	Heterophoxus oculatus
Argissa hamatipes	Bathymedon pumilus	Liljebogia cota
Eohaustorius sencillus	Byblis veleronis	Paraphoxus oculatus
Hippomedon denticulatus	Calliopius laeviusculus	Pardaliscella yaquina
Hippomedon wecomus	Centromedon pavor	Photis chiconola
Megaluropus longimerus	Halicella halona	Protomedeia prudens
Melita desdichada	Haploops tubicola	
Monoculodes emarginatus	Harpiniopsis fulgens	
Monoculodes spinipes	Heterophoxus oculatus	
Orchomene minuta	Hippomedon denticulatus	
Pachynus barnardi	Lepidepecreum garthi	
Paraphoxus daboius	Listriella albina	
Paraphoxus epistomus	Listriella goleta	
Paraphoxus fatigans	Metaphoxus frequens	
Paraphoxus obtusidens	Microjassa ?litotes	
Paraphoxus vigitegus	Monoculodes emarginatus	
Photis brevipes	Nicippe tumida	
Protomedeia prudens	Orchomene decipiens	
Protomedeia zotea	Orchomene pacifica	
Synchelidium shoemakeri	Pachynus barnardi	
Westwoodilla caecula	Paraphoxus bicuspidatus	
	Paraphoxus epistomus	
	Paraphoxus oculatus	
	Pardaliscella symmetrica	
	Pleusymptes coquilla	
	Protomedeia prudens	
	Rhachotropis clemens	
	Socarnoides illudens	
	Westwoodilla caecula	

1930, pp. 27–28; 1931, pp. 9–10.—J. L. Barnard, 1967b, pp. 5–6, fig. 1*o*.

Ampelisca eschrichti.—Stephensen, 1933, pp. 23–24, fig. 9 (map); 1935, pp. 121–123.

Ampelisca eschrichti eschrichti.—Gurjanova, 1955, p. 170, fig. 169.

MATERIAL.—Station 11 (1).

DISTRIBUTION.—Circumpolar in Northern Hemisphere with southern limit in Pacific Ocean near Morro Bay, California, sublittoral and bathyal.

Ampelisca hancocki J. L. Barnard

Ampelisca hancocki J. L. Barnard, 1954a, pp. 37–38, pl. 26; 1964a, p. 213; 1966b, p. 15; 1967b, p. 6.

MATERIAL.—Stations 65 (1), 72 (2).

DISTRIBUTION.—Oregon to Costa Rica, 9–200 m.

Ampelisca macrocephala macrocephala Liljeborg

Ampelisca macrocephala Liljeborg, 1852, pp. 7–8.—Sars, 1895, pp. 172–173, pl. 60.—Holmes, 1908, p. 510.—Stephensen, 1925, pp. 141–142.—?Gurjanova, 1951, pp. 308–309, fig. 171.—J. L. Barnard, 1954a, pp. 41–43, pl. 29; 1960a, p. 28; 1964a, p. 214; 1966b, p. 15; Mills, 1967, pp. 640–642, fig. 2.

Ampelisca latipes Stephensen, 1925, p. 142, fig. 42.

MATERIAL.—Stations 1 (3), 2 (6), 21 (2), 22 (2), 31 (2), 37 (5), 38 (3), 45 (4), 46 (4), 52 (1),

TABLE 1.—*Continued*

600 meters *5 samples*	*800 meters* *22 samples*	*1200–1420 meters* *5 samples*
Ampelisca macrocephala	Ampelisca macrocephala	Eriopisa elongata
Byblis barbarensis	Bathymedon covilhani	Harpiniopsis petulans
Byblis crassicornis	Bathymedon flebilis	*2000–2900 meters* *18 samples*
Halice ulcisor	Bathymedon pumilus	Bathymedon sp. A
Harpiniopsis excavata	Bathymedon vulpeculus	Byblis crassicornis
Harpiniopsis percellaris	Byblis barbarensis	Epimeria cora
Heterophoxus oculatus	Byblis tannerensis	Haploops lodo
Liljeborgia cota	Byblis thyabilis	Harpiniopsis emeryi
	Dulichia remis	Harpiniopsis excavata
	Finoculodes omnifera	Harpiniopsis galera
	Halice ulcisor	Harpiniopsis naiadis
	Harpiniopsis epistoma	Harpiniopsis percellaris
	Harpiniopsis excavata	Harpiniopsis triplex
	Harpiniopsis fulgens	Hippomedon tracatrix
	Harpiniopsis percellaris	Lepidepecreoides nubifer
	Heterophoxus oculatus	Liljeborgia cota
	Liljeborgia cota	Monoculodes recandesco
	Monoculodes glyconica	Paraphoxus oculatus
	Nicippe tumida	
	Pachynus barnardi	
	Pardisynopia lolo	
	Rhachotropis clemens	
	Rhachotropis distincta	

53 (2), 60 (1), 61 (20), 63 (3), 65 (2), 70 (2), 71 (3), 72 (24), 73 (6), 74 (1), 75 (2), 1001 (24).

DISTRIBUTION.—North Atlantic Ocean and northeastern Pacific Ocean, 5–1,686 m.

Ampelisca macrocephala unsocalae J. L. Barnard

Ampelisca macrocephala unsocalae J. L. Barnard, 1960a, pp. 28–30, fig. 7; 1966a, pp. 53–54; 1967a, p. 6.

MATERIAL.—Stations 3 (1), 8 (1), 11 (1), 19 (1), 23 (3), 40 (1), 47 (1), 58 (4), 76 (4).

The head of these specimens, especially that of station 19 and other specimens from depths between 500 and 800 m, is less convex below and is more like the typical subspecies, but the corneal lenses are absent. Antenna 1 reaches nearly to the end of article 5 of the peduncle of antenna 2. One must reemphasize that the Pacific Ocean specimens of *A. macrocephala* have article 2 of antenna 1 longer than in Atlantic specimens.

DISTRIBUTION.—Oregon to middle Baja California, 400–1,720 m.

Ampelisca pugetica Stimpson

Ampelisca pugetica Stimpson, 1864, pp. 158–159.—J. L. Barnard, 1954a, pp. 49–51, pls. 35–36 [including synonymy]; 1960a, p. 31, fig. 9; 1964a, p. 215; 1966b, p. 16; 1967b, p. 8.

MATERIAL.—Stations 2 (1), 21 (3), 37 (1), 46 (5), 53 (2), 54 (1), 63 (1), 73 (1), 74 (1).

DISTRIBUTION.—Puget Sound, Washington, to Baja California, 0–225 m (not including f. *macrodentata* and Caribbean records).

Ampelisca species

MATERIAL.—Station 30 (1), 50 (1 fragment).

Byblis barbarensis J. L. Barnard

Byblis barbarensis J. L. Barnard, 1960a, p. 34, fig. 11; 1966a, p. 57.

REMARKS.—Males have antenna 2 longer than the body, whereas females have it about three-fourths as long as body.

MATERIAL.—Stations 3 (2), 8 (3), 24 (1), 32 (2), 77 (2).

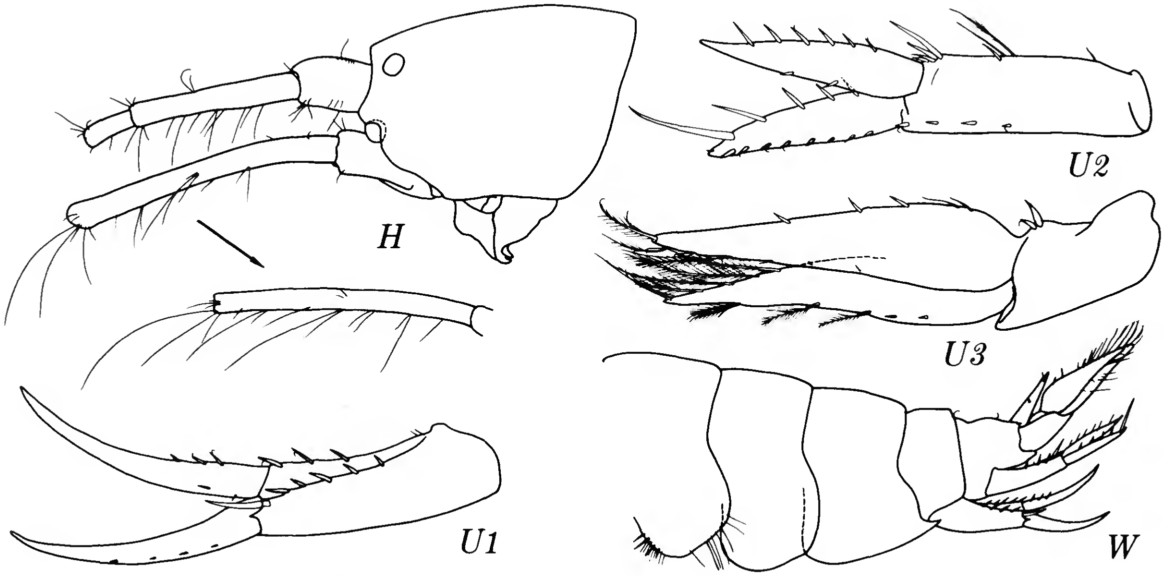

FIGURE 1.—*Ampelisca eschrichti* Krøyer, female, 10.8 mm, Oregon 11.

DISTRIBUTION.—Bathyal of Oregon (these records) and California, 496–1,225 m.

Byblis bathyalis J. L. Barnard

Byblis bathyalis J. L. Barnard, 1966a, p. 58, figs. 3, 4.

MATERIAL.—Station 42 (1).

DISTRIBUTION.—Oregon and California bathyal depths, 400–950 m.

Byblis crassicornis Metzger

Byblis crassicornis Metzger, 1875, pp. 297–298, pl. 6: figs. 9, 9*a*, 9*b*.—Sars, 1895, pp. 188–189, pl. 66: fig. 1.—Stebbing, 1906, p. 114.—Stephensen, 1925, p. 149; 1935, pp. 134–135.—Gurjanova, 1951, p. 319, fig. 185.

MATERIAL.—Station 76 (2 juveniles ?), 82 (1).

DISTRIBUTION.—Circumboreal, 188–2,798 m.

Byblis thyabilis, new species

FIGURES 3-4

DIAGNOSIS.—Antenna 1 exceeding peduncle of antenna 2 by length equivalent to 1.5 times length of article 5 of antenna 2 peduncle; article 2 of antenna 1 more than twice as long as article 1; antenna 2, 90 percent as long as body (including head); corneal lenses large, ventral pair occupying ventral margin of head posterior to sharp anteroventral cephalic cusp; coxa 4 with long, sharp posterior lobe; pereopod 2 not enlarged and elongated like *B. lepta* (Giles); pereopod 3 with strongly bilobate posterior margin on article 2; pereopod 4, article 2 posteroventrally rounded; article 5 of pereopods 3–4 not distally extended; article 7 of pereopod 5 more than half as long as article 6, articles 5–6 subequal in length; facing edges of rami on uropod 3 multiserrate and slightly excavate; telson cleft almost halfway, apices strongly truncate; pleonal epimera 1–2 sparsely setose ventrally.

HOLOTYPE.—USNM 127133, female, 9.2 mm.

TYPE-LOCALITY.—Station 78, 44°40.1′N, 125° 06.7′W, 800 m, 18 June 1964.

MATERIAL.—Seventeen specimens from the type-locality.

RELATIONSHIP.—This species belongs with a group of species confined to cold waters of the North Pacific and North Atlantic and is defined by the following combination of characters: telson cleft more than one-third its length; head with distinct antennal point; antenna 1 as long as or longer than peduncle of antenna 2; apposing margins of rami of uropod 3 multiserrate (with more than 1 serration); ventral corneal lens if present not hidden from lateral view; article 5 of pereopods 3–4 unproduced distally; pereopod 2 not grossly different from pereopod 1; article 2 of antenna 1 at least twice as long as article 1; articles 5–6 of pereopod 5 subequal in length. The following species plus *B. thyabilis* belong with this group: *B. affinis* Sars, *B. bathyalis** J. L. Barnard, *B. barbarensis** J. L. Barnard, *B. erythrops* Sars, ?*B. japonica* Dahl (head not confirmed), *B. serrata* Smith and *B. tannerensis** J. L. Barnard. Species marked with asterisks occur in waters off California and Oregon.

Byblis thyabilis has its closest affinities with *B. bathyalis* from nearby California bathyal depths but differs primarily in its longer antenna 1; perhaps the two species are simply races or members of a cline within one epigenotype. Most of the other species in this group differ from each other in only a few mainly quantitative characters, so it is at present impossible on morphological grounds to determine what constitutes a valid species because so few collections of the California-Oregon species are available for study of variations.

Byblis thyabilis differs from all other members of its species-flock apparently in the presence of sparse setae on the ventral margins of epimera 1–2.

From *B. tannerensis* it differs in the presence of corneal lenses and the more strongly truncate telsonic apices.

Explanation of figures (except Figures 8 and 19)

A, antenna 1; B, labrum (upper lip); C, coxa; D, dactyl of pereopod; E, epimeron (a); F, accessory flagellum; G, labuim (lower lip); H, head; I, inner plate; J, epistome; K, eye; L, pereopod (leg); M, mandible; N, gnathopod; O, outer plate; P, palp; Q, mandibular molar; R, ramus; S, maxilliped; T, telson; U, uropod; V, urosome; W, pleon; X, maxilla; Y, prebuccal complex; Z, mandibular incisor; *a*, anterior; *b*, broken; *c*, specimen no. 2; *d*, dorsal; *e*, dactyl; *f*, female; *g*, gland; *i*, inner; *j*, juvenile; *k*, skin; *l*, left or lateral; *m*, male; *n*, specimen no. 3; *o*, outer; *p*, posterior; *q*, calceolus; *r*, right (medial); *s*, setae removed; *t*, spine; *u*, half (½); *v*, ventral; *w*, palm; *x*, specimen no. 4; *y*, oblique; *z*, dissected.

From *B. affinis* it differs in the stronger serrations on uropod 3 and longer antenna 2.

From *B. erythrops* it differs in the larger corneal lenses and slightly shorter antenna 1.

From *B. barbarensis* it differs in the presence of corneal lenses, the shorter antenna 2, longer antenna 1, relatively smaller gnathopods, and the more strongly bilobed margin of article 2 on pereopod 3.

Byblis minuticornis (Sars, 1885) differs from *B. thyabilis* in the short first antenna that scarcely reaches farther than articles 1–4 of antenna 2. *Byblis serrata* Smith (1873) (see Holmes, 1905; Kunkel, 1918; Judd, 1896), heretofore considered the senior synonym of *B. minuticornis*, differs from *B. minuticornis* in the multiserrate rami of uropod 3, in the presence of eyes, and the long antenna 1 reaching the end of the peduncle of antenna 2. The male of *B. serrata* has a shortened article 2 of antenna 1 (Kunkel, 1918), but the female fits the group characters noted above. *Byblis thyabilis* differs from *B. serrata* mainly in the very sharp and elongate lobe of coxa 4.

The head of *B. japonica* Dahl appears to have a rounded anteroventral corner like *B. veleronis* J. L. Barnard.

DISTRIBUTION.—Oregon, 800 m.

Byblis veleronis J. L. Barnard

Byblis veleronis J. L. Barnard, 1954a, pp. 52–54, pls. 37–38; 1964a, p. 216; 1966a, p. 59; 1966b, p. 16.

MATERIAL.—Stations 10 (1), 21 (1), 22 (4), 37 (1), 46 (3), 53 (5), 54 (1). The telson of specimens from Oregon 53 is cleft only one-third its length.

DISTRIBUTION.—Oregon to Gulf of California, 31–422 m.

Haploops lodo J. L. Barnard

FIGURE 5

Haploops lodo J. L. Barnard, 1961b, pp. 67–69, fig. 38; 1964e, p. 18, fig. 13.

MATERIAL.—Station 6 (1).

The specimen at hand is 4.2 mm long, sex uncertain. It differs from the Panamanian specimens originally described in the narrower article 2 of pereopods 3–5 and the many fewer setae on those pereopods. The anterior edge of article 2 on pere-

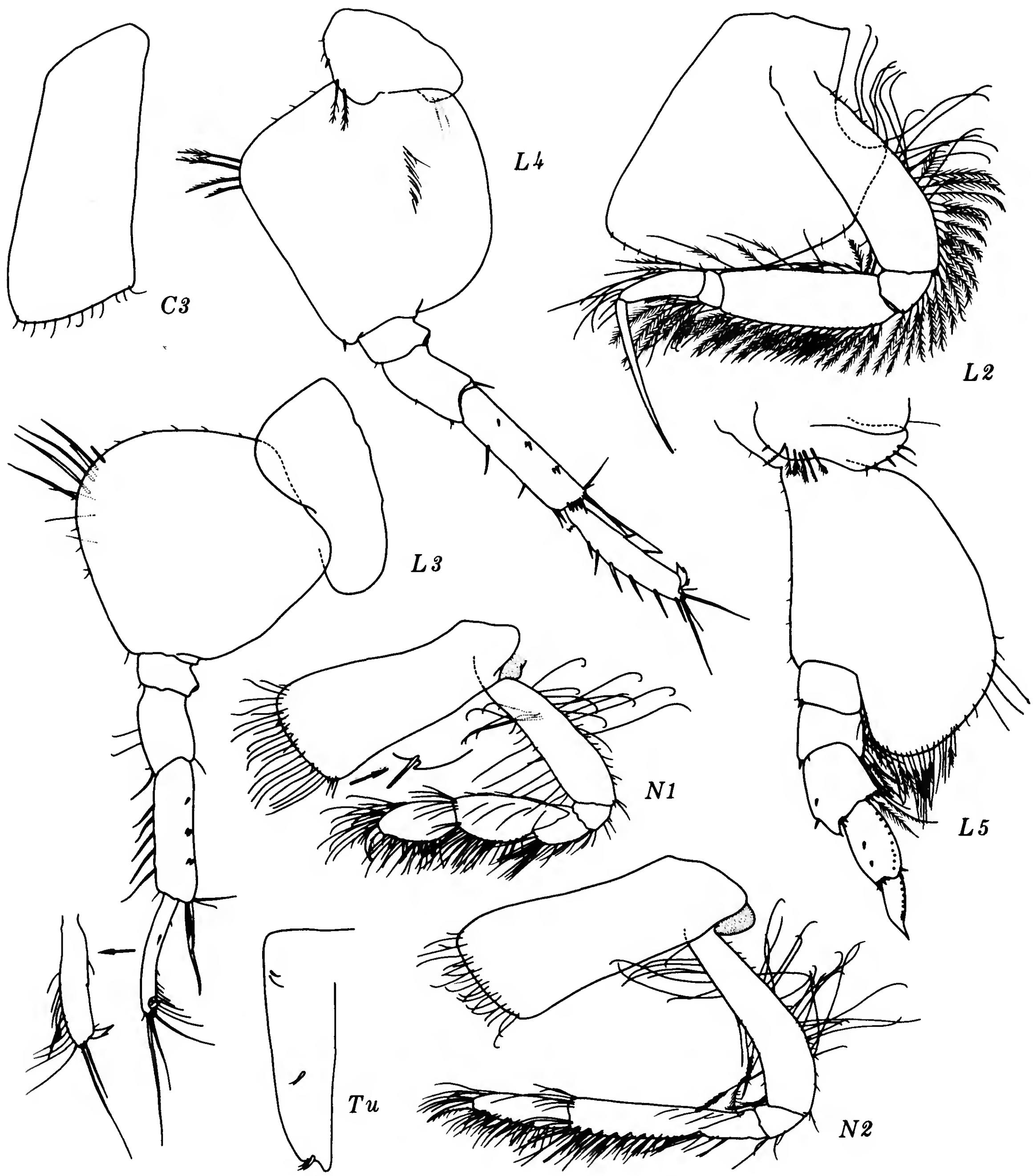

FIGURE 2.—*Ampelisca eschrichti* Krøyer, female, 10.8 mm, Oregon 11.

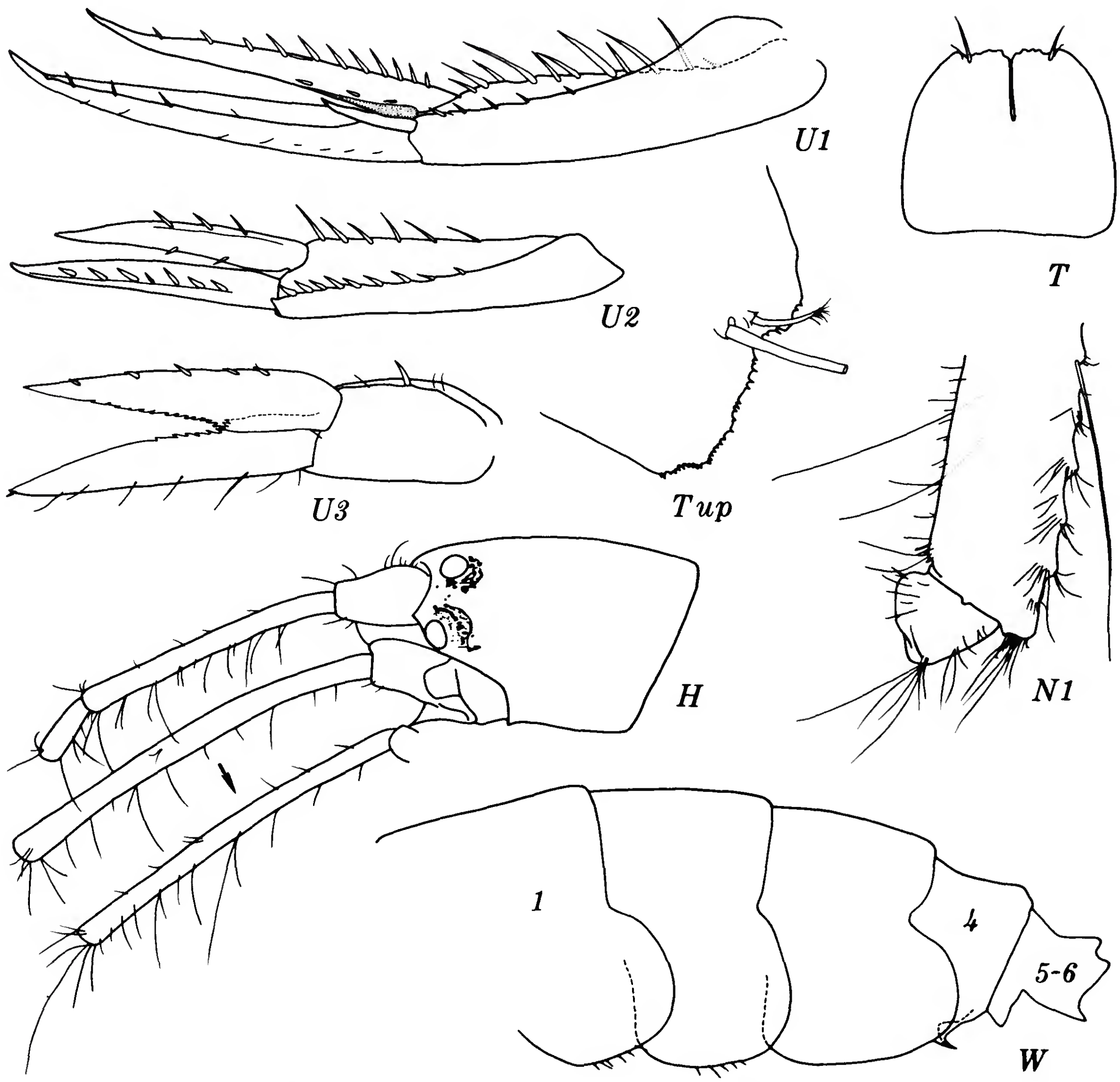

FIGURE 3.—*Byblis thyabilis,* new species, holotype, female, 9.2 mm, Oregon 78.

opod 3 has only one large submarginal seta, pereopod 4 has 4 setae, and pereopod 5 has only 2 posterior and 1 posteroventral setae on article 2. Uropod 3 is very weakly setose. Pleonal epimeron 3 is intermediate between the extremes represented by Barnard (1961a and 1964a).

DISTRIBUTION.—Oregon, 2,600 m; Gulf of Panama region, 1,749–3,570 m.

Haploops tubicola Liljeborg

Haploops tubicola Liljeborg, 1856, pp. 135–136.—Sars, 1895, pp. 192–194, pl. 67.—Stebbing 1906, p. 117.—Holmes, 1908, p. 518, fig. 26.—Stephensen, 1925, pp. 150–151; 1933, p. 25; 1935, pp. 135–137; 1944b, pp. 49–50.—J. L. Barnard, 1960a, p. 35.—Kanneworff 1966, pp. 184–191, figs. 1, 2, and parts of 5, 6.

Haploops spinosa Shoemaker, 1931, pp. 13–18, figs. 5, 6.—J. L. Barnard, 1966a, pp. 59–60, figs. 7, 8.

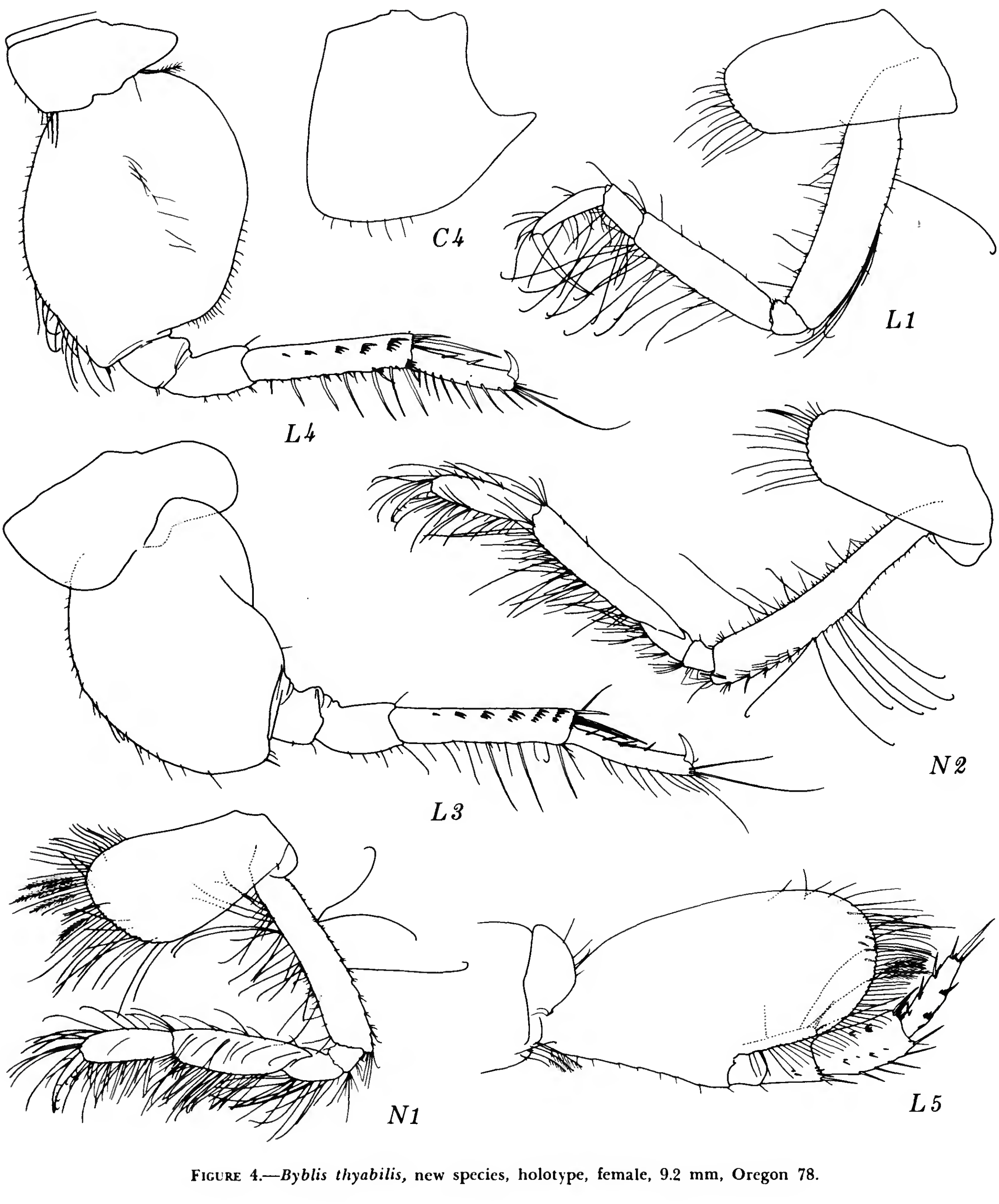

FIGURE 4.—*Byblis thyabilis*, new species, holotype, female, 9.2 mm, Oregon 78.

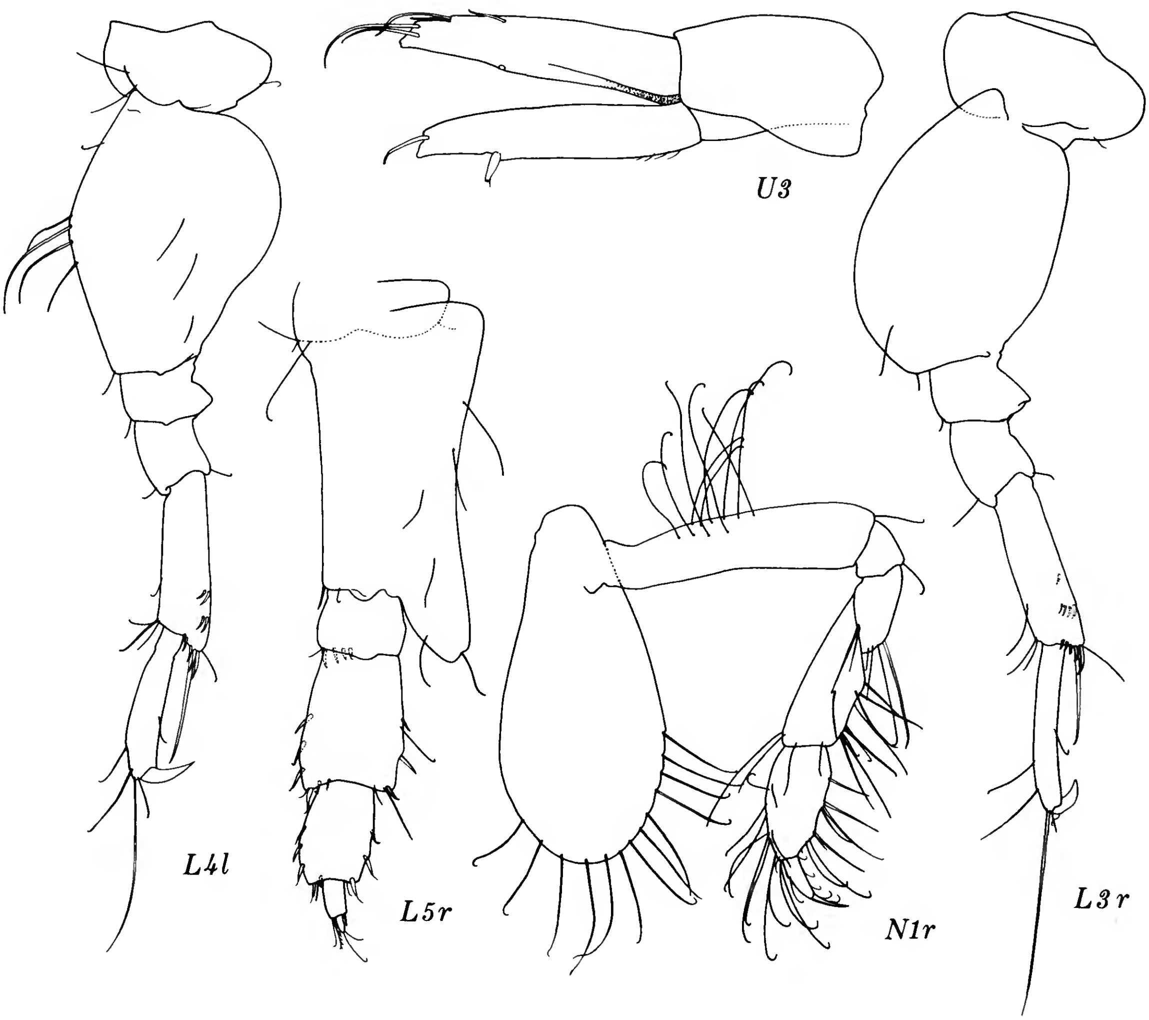

FIGURE 5.—*Haploops lodo* J. L. Barnard, ?male, 4.2 mm, Oregon 6.

MATERIAL.—Station 46 (1).

DISTRIBUTION.—Circumpolar, circumboreal; in the eastern Pacific from Oregon to southern California, 88–225 m.

Argissidae

Argissa hamatipes (Norman)

Syrrhoë hamatipes Norman, 1869, p. 279.

Argissa typica Boeck.—Sars, 1895, pp. 141–142, pl. 48.

Argissa Stebbingi Bonnier, 1896, pp. 626–630, pl. 36: fig. 4.—Chevreux and Fage, 1925, p. 90, figs. 81–82.

Argissa hamatipes.—Stebbing, 1906, p. 277.—Shoemaker, 1930, pp. 37–40, figs. 15–16.—Stephensen, 1935, p. 140.—Gurjanova, 1962, pp. 392–393.—J. L. Barnard, 1962c, p. 151; 1964a, pp. 218–219.—Nagata, 1965a, pp. 154–155, fig. 7.—J. L. Barnard, 1966a, p. 61; 1967a, pp. 14–15, fig. 1*d*-*i*.

MATERIAL.—Station 1001 (1).

DISTRIBUTION.—Subarctic to warm-temperate, 4–1,720 m.

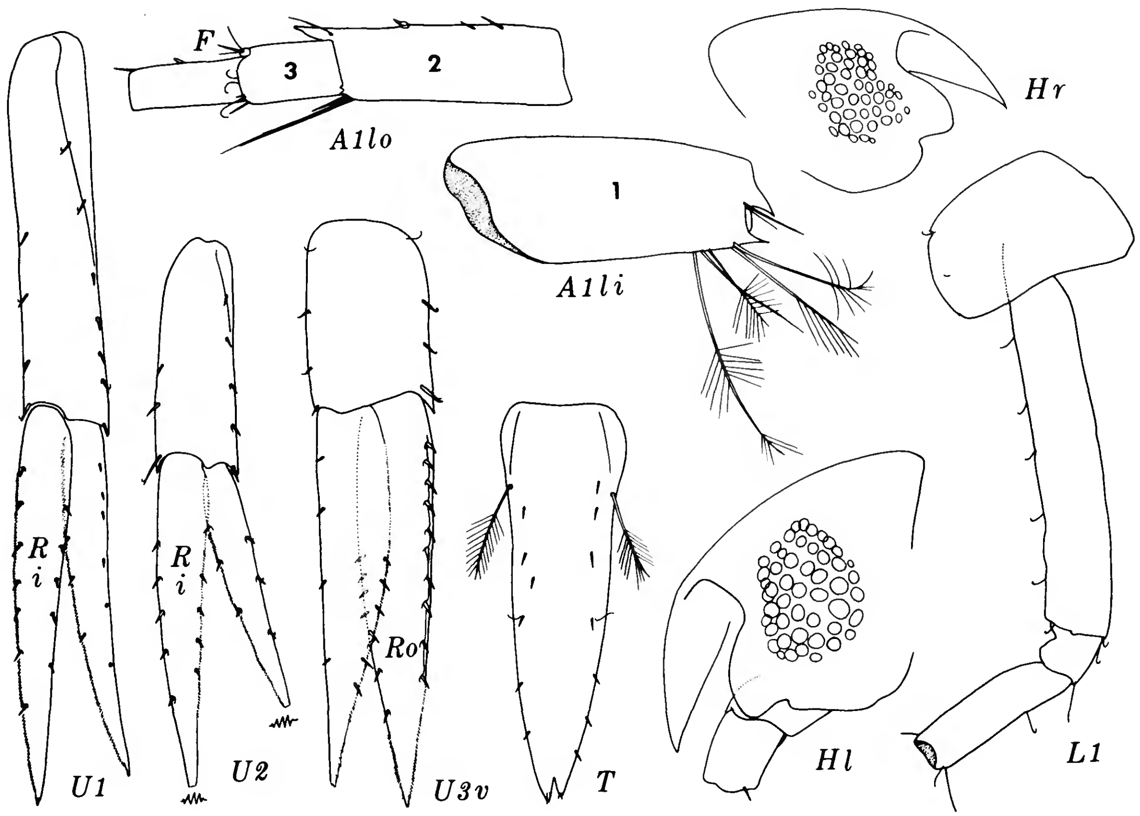

FIGURE 6.—*Rhachotropis clemens* J. L. Barnard, male, 3.3 mm, Oregon 46.

Eusiridae

Calliopius laeviusculus (Kroyer)

Calliopius laeviusculus (Krøyer).—J. L. Barnard, 1954b, p. 8, pl. 8 (with references).

MATERIAL.—Station 29 (12).

DISTRIBUTION.—A species of the north Atlantic recorded in the northeastern Pacific Ocean from Vancouver Island to Oregon, 0–175 m.

Rhachotropis clemens J. L. Barnard

FIGURES 6-7

Rhachotropis clemens J. L. Barnard, 1967a, pp. 16–18, fig. 5.

MATERIALS.—Stations 22 (3), 46 (2). Oculate.

REMARKS.—These specimens, from 200–225 m, have eyes, unlike the type material, and they have fewer spines on the pereopods, but with a length of only 3.0–3.3 mm, in contrast to the type material of about 4.5 mm, they would be expected to have fewer spines. The type material came from a depth of 791–842 m and this subphotic depth is usually associated with blind populations.

MATERIAL.—Station 78 (1). Anoculate.

DISTRIBUTION.—Oregon to Baja California, 200–791 m.

Rhachotropis distincta (Holmes)

Gracilipes distincta Holmes, 1908, pp. 529–531, fig. 35.
Rhachotropis distincta.—Shoemaker, 1930, pp. 98–105, figs. 41–44.—Stephensen, 1944a, p. 18.—Birstein and Vinogradov 1955, p. 276.

MATERIAL.—Stations 55. (1), 78 (1).

DISTRIBUTION.—North Atlantic and North Pacific Oceans, bathyal depths, generally 387–1,240 m.

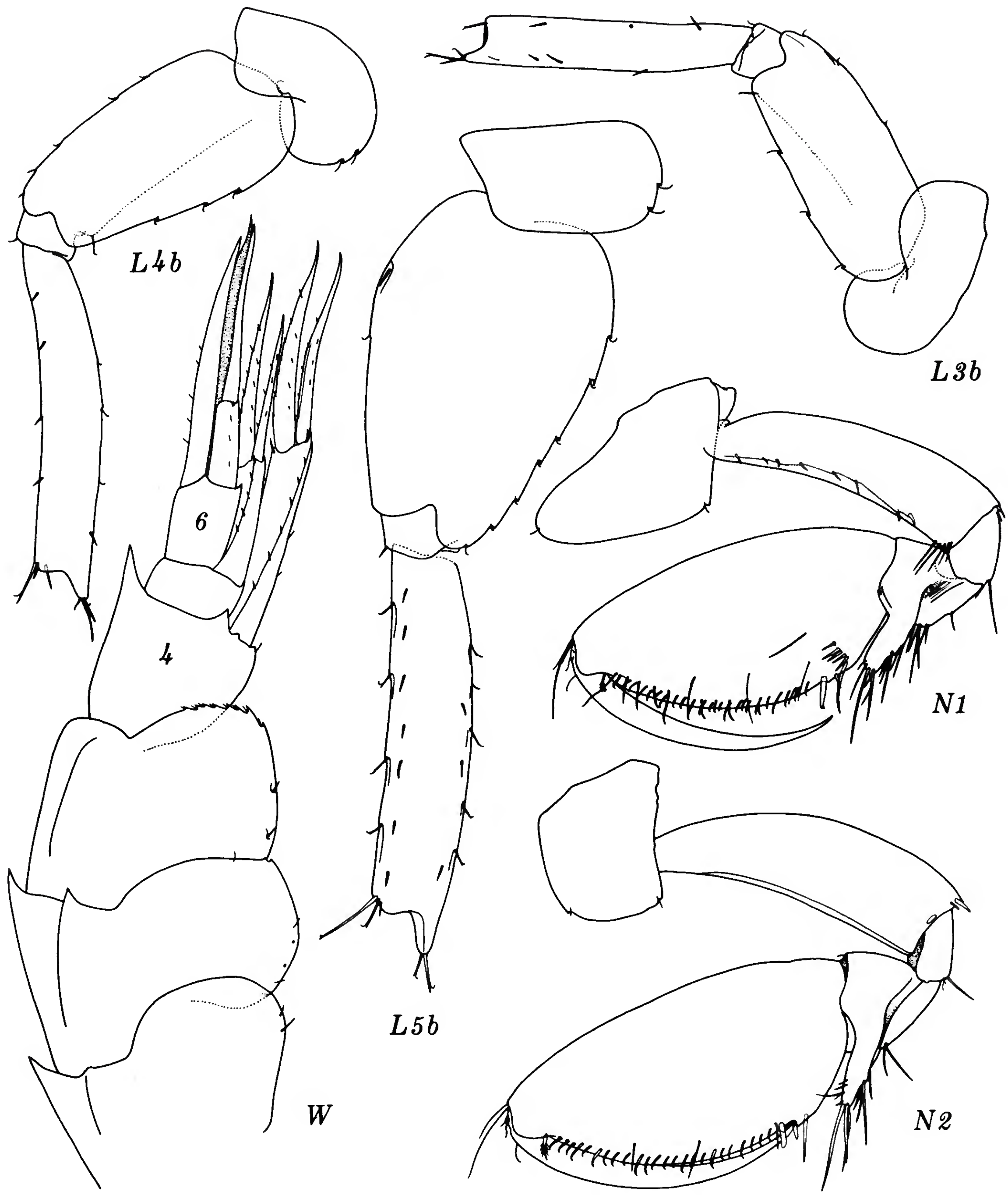

FIGURE 7.—*Rhachotropis clemens* J. L. Barnard, male, 3.3 mm, Oregon 46.

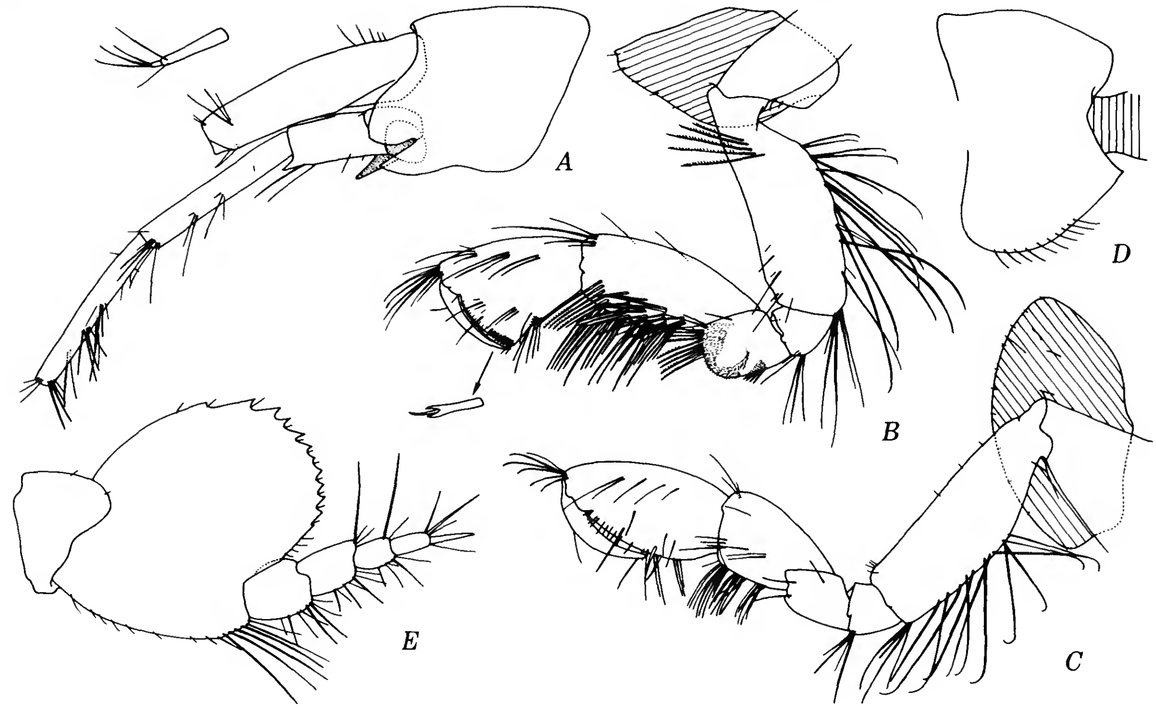

FIGURE 8.—*Eriopisella elongata* (Bruzelius), female, 10.2 mm, Oregon 11: A, head and accessory flagellum offset; B,C, gnathopods 1, 2 (medial right). *Harpiniopsis naiadis* J. L. Barnard, male, 4.2 mm, Oregon 36: D, pleonal epimeron 3, left. *Harpiniopsis excavata* (Chevreux), female, 5.5 mm, Oregon 35: E, pereopod 5.

Rhachotropis inflata (Sars)

Tritropis inflata Sars, 1882, pp. 104–105, pl. 5: figs. 7*a-c*.
Rhachotropis tumida Sars.—Sars, 1895, pp. 430–431, pl. 152.
Rhachotropis inflata.—Stebbing, 1906, p. 351.—Shoemaker, 1930, p. 105.—Stephensen, 1940b, pp. 288–289; 1944b, p. 98.—Gurjanova, 1951, pp. 713–714, fig. 497.

MATERIAL.—Station 72 (1).

DISTRIBUTION.—North Atlantic, sublittoral; Oregon, 100 m.

Gammaridae

Eriopisa elongata (Bruzelius)

FIGURES 8A-C

Eriopis elongata Bruzelius, 1859, p. 65, pl. 3: fig. 12.
Eriopisa elongata.—Sars, 1895, pp. 515–516, pl. 181: fig. 2.—Stephensen, 1940b, pp. 302–303.—Gurjanova, 1951, pp. 744–745, fig. 514.—Nagata, 1965b, pp. 303–304.

MATERIAL.—Stations 11 (one female), 12 (1).

The female specimen, 10.2 mm long, from station 11, differs from the male described by Sars (1895) in its smaller gnathopod 2 (see figure) and in the somewhat less oblique palm of gnathopod 1; but the main taxonomic differences are the larger notch separating the 2 lobules of the lateral cephalic lobe and the larger ventral lobule in the Oregon specimen. The body segments of the Oregon specimen are more strongly telescoped together than in the specimen figured by Sars, resulting in the loss of gaps between the coxae.

DISTRIBUTION.—Iceland and Europe from Porsangerfjord, Northern Norway, to Naples and Algeria in the Mediterranean, depths usually 100–800 m. This is the first record of this species from the Pacific Ocean. Oregon: 400 and 1,200 m.

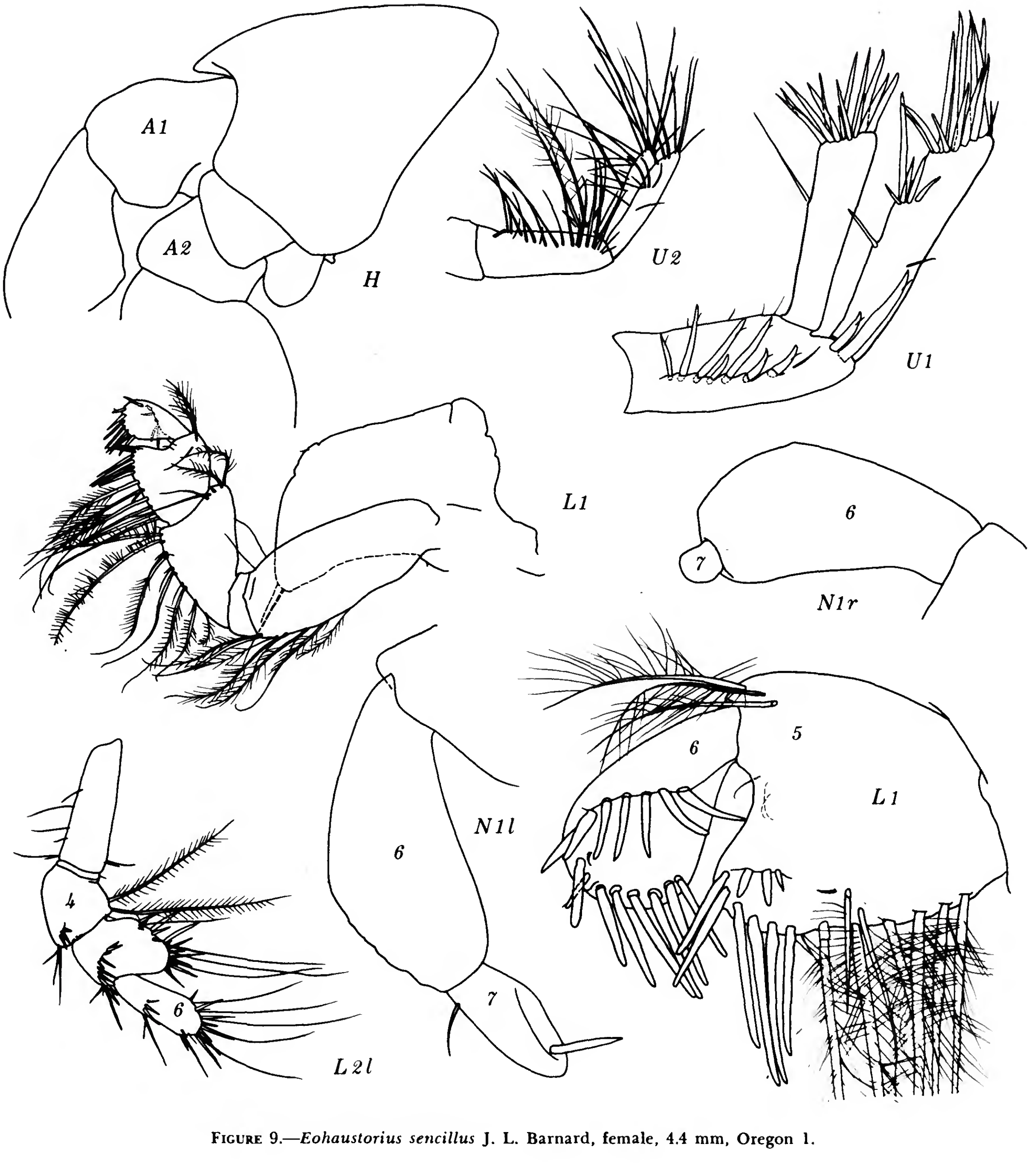

FIGURE 9.—*Eohaustorius sencillus* J. L. Barnard, female, 4.4 mm, Oregon 1.

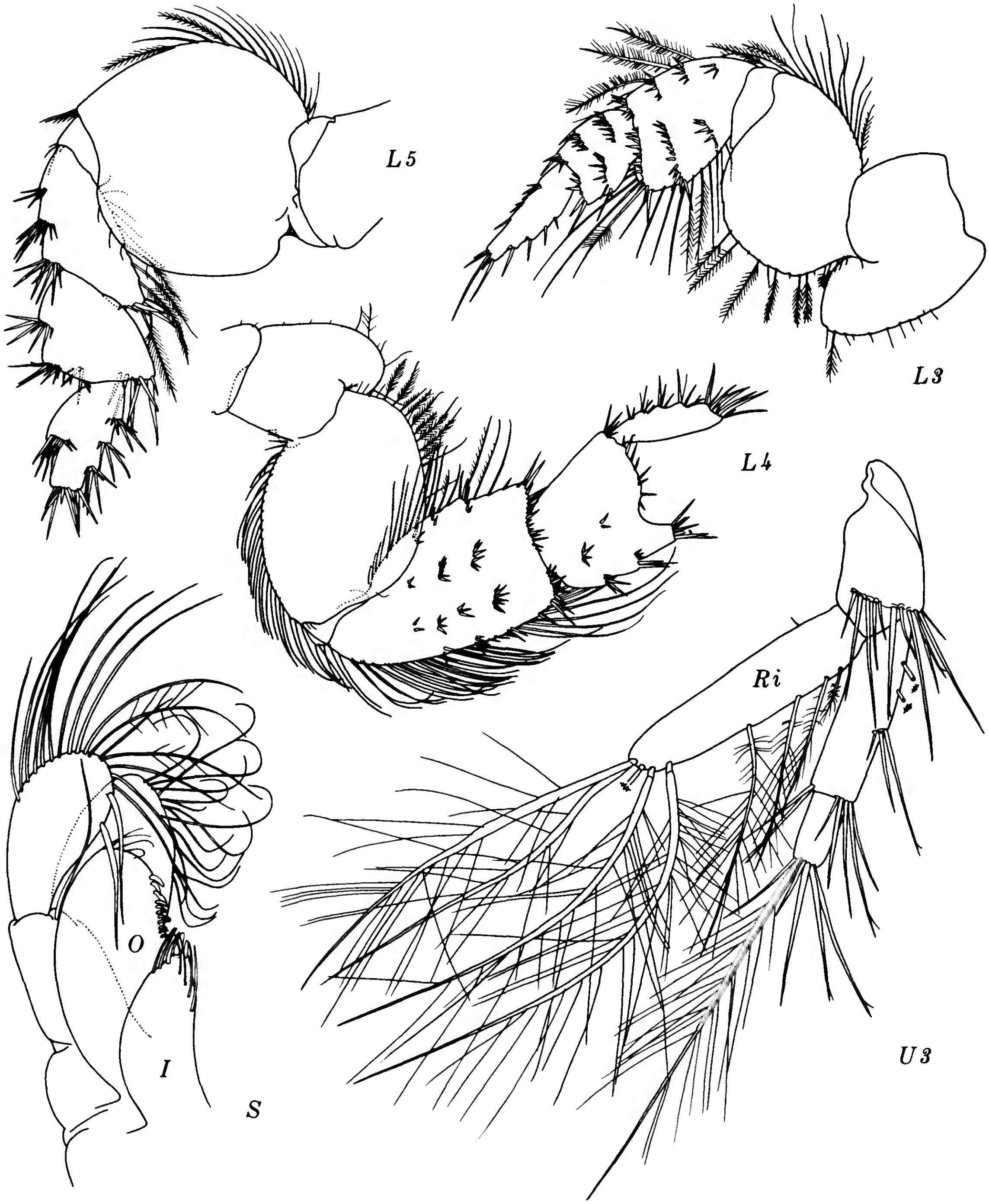

FIGURE 10.—*Eohaustorius sencillus* J. L. Barnard, female, 4.4 mm, Oregon 1.

Megaluropus longimerus Schellenberg

Megaluropus longimerus Schellenberg, 1925, pp. 151–153, fig. 14.—J. L. Barnard, 1962b, p. 103, figs. 20, 21; 1964a, p. 224; 1966b, p. 19.

MATERIAL.—Station 70 (13).
DISTRIBUTION.—Nigeria; Oregon to Baja California, 9–108 m.

Melita desdichada J. L. Barnard

Melita desdichada J L. Barnard 1962b, p. 110, fig. 22; 1964a, p. 224; 1966b, p. 19.

MATERIAL.—Stations 72 (1), 1001 (1).
DISTRIBUTION.—Oregon to Baja California, 10–108 m.

Haustoriidae

Eohaustorius sencillus J. L. Barnard

FIGURES 9-10

Eohaustorius sencillus J. L. Barnard, 1962f, pp. 249–252, figs. 1–2; 1966b, p. 19.

MATERIAL.—Station 1 (28).
The figured specimen has an aberrant right gnathopod 2, with the dactyl shortened and lacking an apical spine. The left gnathopod 1 is normal. Figures of other parts are presented in finer detail than in the original description.
DISTRIBUTION.—Oregon to Point Conception, California, shallow water to 30 m.

Isaeidae

Aoroides columbiae Walker

Aoroides columbiae Walker, 1898, p. 285, pl. 16.—Thorsteinson, 1941, pp. 83–84, pl. 6: figs. 65–66.—J. L. Barnard, 1954a, pp. 24–26, pl. 22; 1959a, p. 33.—Nagata, 1960, p. 175, pl. 16: fig. 94.—J. L. Barnard, 1961a, p. 180; 1964a, pp. 217–218; 1966b, p. 17, 1969b, pp. 89–90.

MATERIAL.—Station 1 (1), 42 (?1), 61 (3), 1001 (3).
DISTRIBUTION.—Puget Sound to Baja California, 0–180 m (possibly 400 m, questionable specimen herein); Japan.

Photis brevipes Shoemaker

Photis brevipes Shoemaker, 1942, pp. 25–27, fig. 9.—J. L. Barnard, 1962a, pp. 31–33, fig. 11; 1964a, pp. 240–241; 1966b, p. 20; 1969a, pp. 148–151.
Photis californica.—J. L. Barnard, 1954a, pp. 26–27, pls. 23–24 [not Stout, 1913].

MATERIAL.—Stations 51 (3), 71 (1), 72 (8), 1001 (3).
DISTRIBUTION.—Oregon to Baja California, 0–150 m.

Photis species

Juveniles and females in the following samples have not been identified specifically: Stations 1, 29, 37, 49, 50, 61, 70, 73.

Photis cf. *chiconola* J. L. Barnard

Photis chiconola J. L. Barnard, 1964c, p. 327, fig. 9.

MATERIAL.—Station 42 (1). Identification uncertain.
DISTRIBUTION.—Monterey Bay, California, 1,381–1,556 m.

Protomedeia cf. *articulata* J. L. Barnard

Protomedeia articulata J. L. Barnard, 1962a, pp. 48–50, fig. 21; 1966a, p. 83; 1966b, p. 20.

MATERIAL.—Station 53 (1). Identification uncertain.
DISTRIBUTION.—California, 18–906 m.

Protomedeia (?) *prudens* J. L. Barnard

FIGURES 11-12

Protomedeia (?) *prudens* J. L. Barnard, 1966a, p. 83, fig. 36.
MATERIAL.—Stations 73 (4), 75 (1), 1001 (1).
Protomedeia prudens and *P. penates* J. L. Barnard (1966b) are very similar, the former occurring in deep waters off western America and the latter in shallow water of Tomales Bay, California. *Protomedeia penates* has a thickened article 4 of pereopods 1–2, an obliquely rounded posteroventral corner of pleonal epimeron 2, larger coxae and stouter and shorter fifth articles of gnathopods 1–2 than does *P. prudens*. The material at hand especially fits the description of *P. prudens* in its slightly protruding epimeron 2 and the narrow article 4 of pereopods 1–2. Parts previously unknown for *P. prudens* are illustrated here: especially pereopods 3–5 and the female gnathopods.

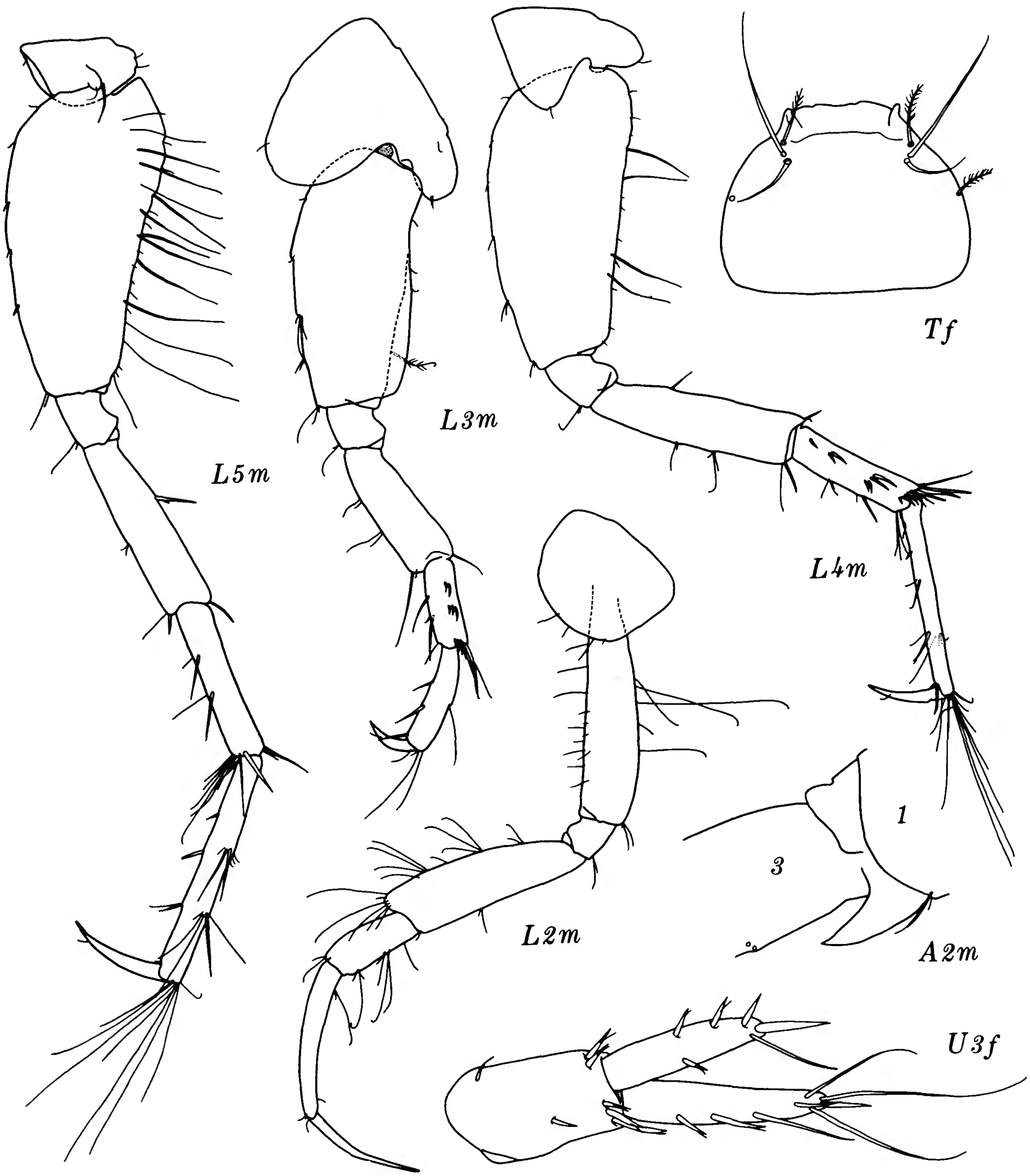

FIGURE 11.—*Protomedeia prudens* J. L. Barnard, male, 4.5 mm; female, 4.0 mm, Oregon 73.

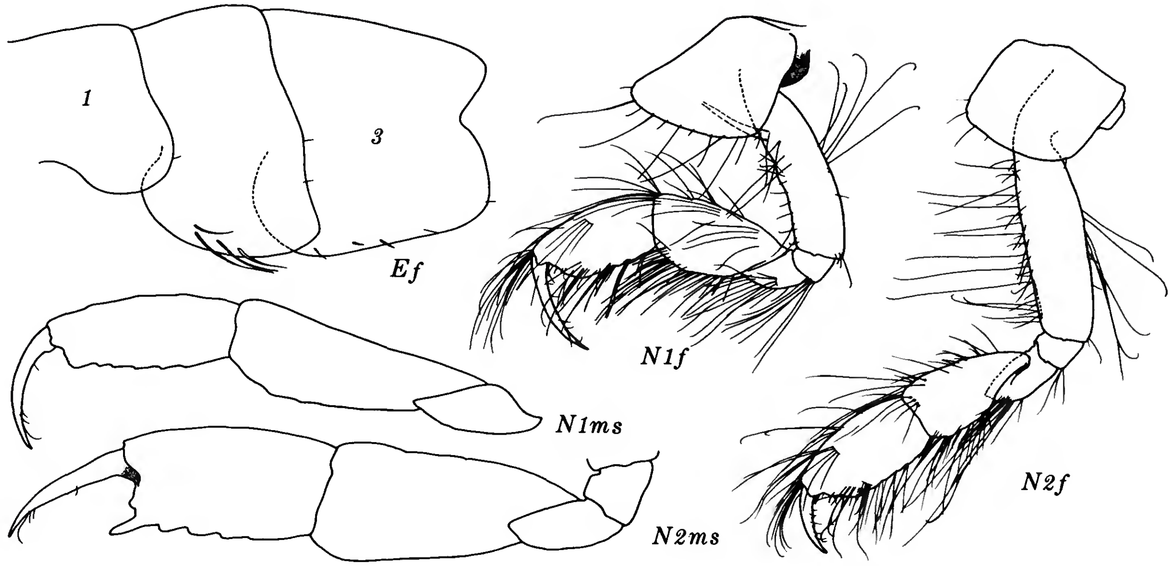

FIGURE 12.—*Protomedeia prudens* J. L. Barnard, male, 4.5 mm; female, 4.0 mm, Oregon 73.

DISTRIBUTION.—Oregon to southern California, 121–400 m.

Protomedeia zotea J. L. Barnard

Protomedeia (Cheirimedeia) zotea J. L. Barnard, 1962a, pp. 50–52, fig. 22.

MATERIAL.—Station 59 (1).

DISTRIBUTION.—Oregon to Monterey Bay, California, 28–50 m.

Protomedeia species

Juveniles and females in the following samples have not been identified specifically: Stations 1, 51, 52, 63, 72.

Ischyroceridae

Microjassa ?litotes J. L. Barnard

Microjassa litotes J. L. Barnard, 1954c, pp. 127–130, pls. 35, 36; 1969b, pp. 163–164.
Ischyrocerus litotes.—J. L. Barnard, 1962a, pp. 53–56, figs. 23–24; 1964a, pp. 226–227; 1966b, pp. 21–22.

MATERIAL.—Station 65 (?1).

This strange specimen has a short coxa 5 like that of *M. litotes* but gnathopod 2 is like that of *M. claustris* J. L. Barnard (1969b). The possibility of synonymy between these taxa must be studied when a wider diversity of materials is available. The lateral cephalic lobes of this specimen are much sharper than shown for *M. litotes.*

DISTRIBUTION.—Monterey Bay, California, to Baja California, 0–157 m.

Liljeborgiidae

Liljeborgia cota J. L. Barnard

Liljeborgia cota J. L. Barnard, 1962b, pp. 83–86, figs. 8–9; 1966a, p. 64; 1967a, pp. 34–35, fig. 1*j-o*.

MATERIAL.—Stations 5 (1), 11 (1), 41 (1), 47 (1), 75 (?1).

The specimen from station 75 has the pleonal tooth formula as follows, numbers indicating segments and 0 and + indicating presence or absence of a dorsal tooth: 1=0, 2=+, 3=0, 4=+, 5=+. This is the fomula characteristic of *L. epistomata* K. H. Barnard (1932), a species from high latitudes of the Southern Hemisphere. But the specimen at hand differs in many other characters from *L. epistomata,* for example, the absence of an epistomal process and the poorly cleft telson. Except for the tooth formula and shorter antennae and poorly developed gnathopods, this specimen fits the characters of *L. cota*. This species has already been shown to be extraordinarily variable in the references cited.

DISTRIBUTION.—Oregon to Baja California, 366–2,000 m.

Listriella albina J. L. Barnard

Listriella albina J. L. Barnard, 1959b, pp. 25–26, figs. 11–12; 1964a, p. 228; 1966a, p. 65, fig. 12.

MATERIAL.—Stations 53 (2), 74 (1).

DISTRIBUTION.—Oregon to Baja California, 16–721 m.

Listriella goleta J. L. Barnard

Listriella goleta J. L. Barnard, 1959b. pp. 20–22, figs. 5–7; 1964a, p. 229; 1966a, p. 66; 1966b, p. 22.

MATERIAL.—Station 45 (1).

DISTRIBUTION.—Oregon to Baja California, 12–459 m.

Lysianassidae

Anonyx adoxus Hurley

Anonyx adoxus Hurley, 1963, pp. 108–112, figs. 35–36.—J. L. Barnard, 1966b, pp. 23–24, fig. 4.

MATERIAL.—Station 71 (female, 8.7 mm).

REMARKS.—The unexpanded, hemispherical shape of coxa 1 is remarkable for a member of this genus and makes this species easily recognized. The specimen at hand agrees closely with Hurley's drawings and description. A few points, perhaps insignificant, may be added: pleonite 4 has its dorsal surface noticeably truncate, pleonal epimeron 1 takes the form of *A. lilljeborgi* Boeck [Gurjanova, 1962, fig. 70B], the coupling spine of pereopods 1–2 resembles that for pereopod 2 of *A. comecrudus*, new species, and coxa 4 resembles that of *Tryphosa horingi* as figured by Sars (1895, pl. 27: fig. 2, male).

The distal spine on the outer ramus of uropod 2 sits in a slightly enlarged notch, but the larger incision occurs on the inner ramus of uropod 2, not the outer as stated by Hurley. The dark eyes are small and form an elongate oval on the specimen at hand. Primary gills are striated but in no respect are they pleated; conical accessory gills occur only on pereopods 3 and 4, but pereopods 1–2 have similar conical thickenings on one margin of the primary gill. The gill of pereopod 5 is small and has only a basal swelling marking a presumed accessory gill.

DISTRIBUTION.—Oregon to Monterey Bay, California, 18–98 m.

Anonyx carinatus (Holmes)

Lakota carinata Holmes, 1908, pp. 498–500, fig. 9.—Thorsteinson, 1941, p. 56, pl. 2: figs. 16–17.—Gurjanova, 1962, pp. 302–303, fig. 100.

Anonyx carinatus.—Hurley, 1963, pp. 103–108, figs. 32-34.—J. L. Barnard, 1966a, p. 66; 1966b, p. 25; 1967a, p. 51.

MATERIAL.—Stations 31 (1), 46 (1), 72 (9), 1001 (4).

DISTRIBUTION.—Gulf of Alaska to border of Mexico and California, 15–225 m.

Anonyx comecrudus, new species

FIGURES 13-14

DIAGNOSIS.—Lateral cephalic lobes slightly falciform, eyes flasklike, black; upper lip forming a blunt, medium-size lamella projecting anterior to epistome; coxa 1 expanded distally, anterodistal margin slightly beveled, coxa 2 not expanded distally, coxa 4 with posterior lobe very slender for genus, bilobation of coxa 5 weak; article 6 of gnathopod 1 tapering strongly, posterior margin broadly concave, palm very short, transverse, defined by 2 spines, margin minutely serrate, dactyl overlapping palm by 50 percent of dactyl length, inner margin of dactyl with 1 seta (not counting mediodistal setae); article 6 of gnathopod 2 slender, almond shaped, scarcely tapering distally, palm slightly protuberant, dactyl not fully covering palm; distal locking spines of pereopods 1–2 variable, spine of pereopod 1 usually small and almost simple but occasionally like that of pereopod 2; spine of pereopod 2 enlarged, weakly hooked, terminally blunt, one side with flat lateral excavation bearing weak or strong proximal flake, occasionally spine nearly simple like that of pereopod 1; stenopodous articles of pereopods 3–5 very slender, articular morphology as shown in figures; rami and peduncles of uropods 1–2 extremely spinose, outer rami each with subdistal, slightly striated lateral spine, inner ramus of uropod 2 subequal to outer ramus, with deep subterminal notch defining bulb armed with one spine; inner ramus of uropod 3

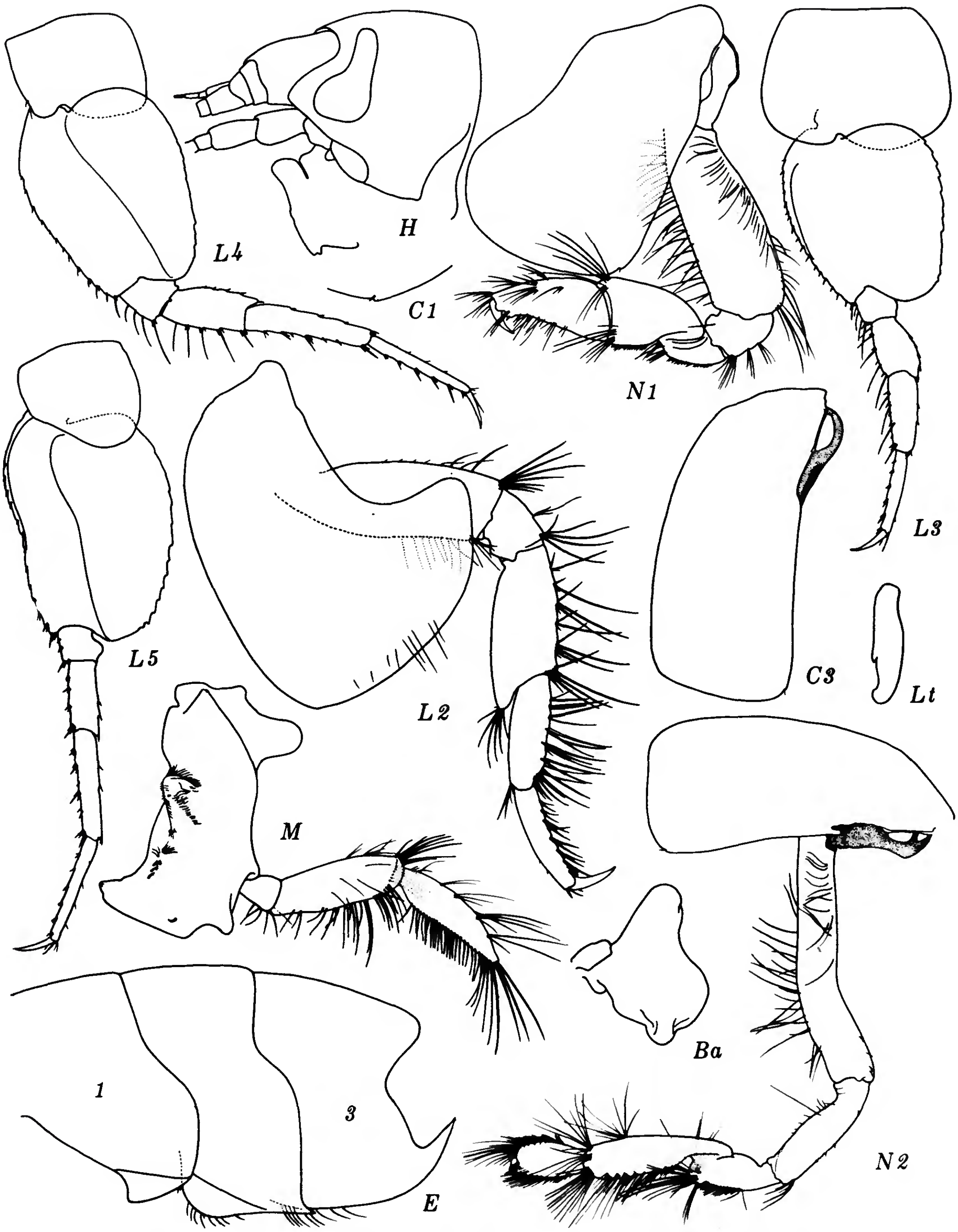

FIGURE 13.—*Anonyx comecrudus*, new species, holotype, male, 2.7 mm, Accession 261296.

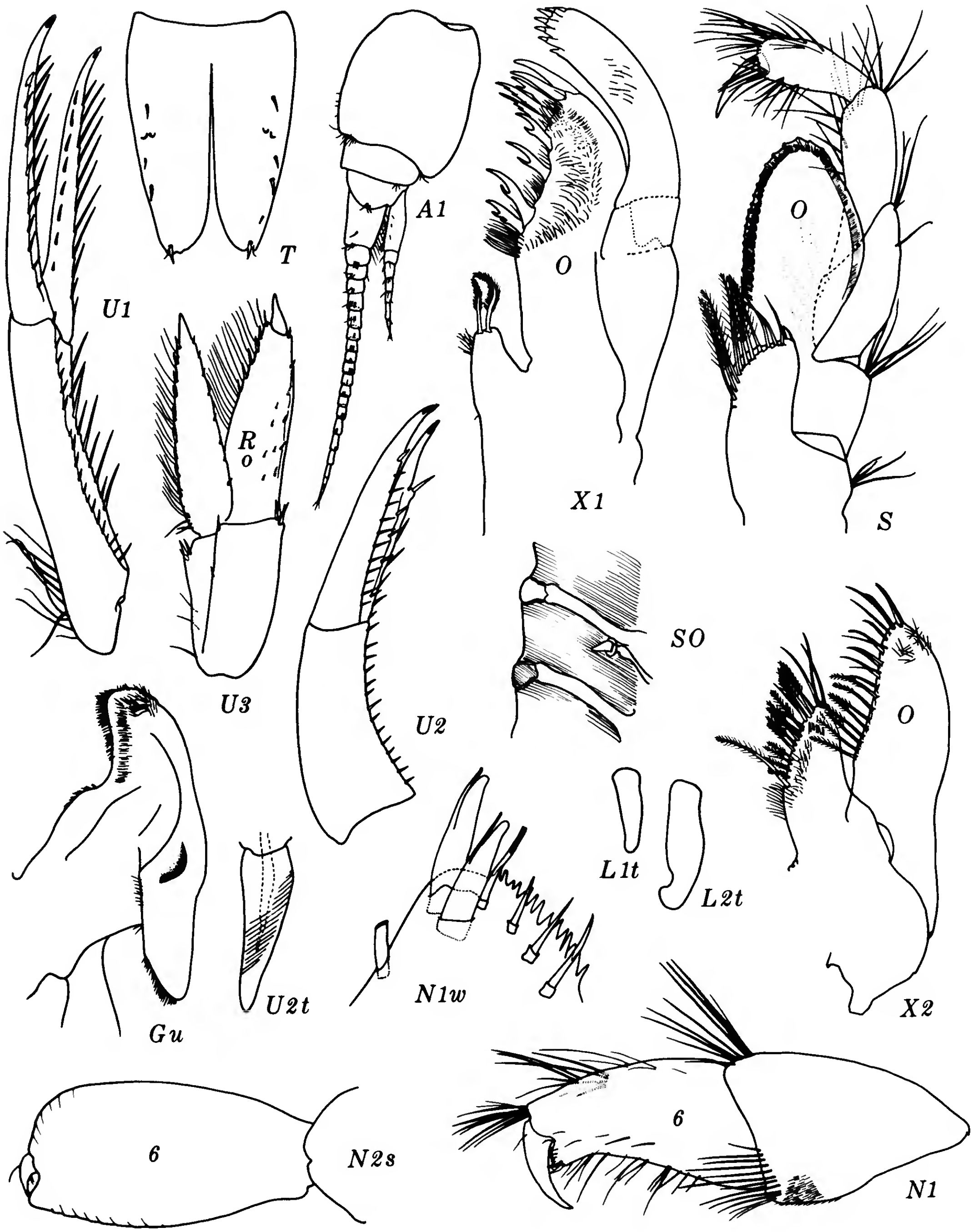

FIGURE 14.—*Anonyx comecrudus*, new species, holotype, male, 2.7 mm, Accession 261296.

slightly exceeding article 1 of outer ramus, article 2 of outer ramus stunted, medial margins of rami densely setose, all margins except outer margin of outer ramus strongly spinose, outer ramus with dispersed ventral spines; telson of medium width, with dorsal spines; anteroventral corner of pleonal epimeron 3 produced forward, widely conical, posteroventral corner sub-rounded; posteroventral corner of epimeron 2 with slender, medium-size tooth, of epimeron 3 with long, slender tooth, epimeron 3 unnotched and not posteroventrally expanded; urosomite 1 with dorsal saddle and slight hump as in *A. makarovi* Gurjanova.

Holotype.—USNM 127137, male, about 27 mm.

Type-locality.—USNM Accession Number 261296, 124°05′W, 44°50′N, Oregon, 80–120 m, sandy sediment, 10 July 1965, collector Ford A. Cross.

Material.—Accession Number 261296 (7); Stations 63 (1), 72 (?2).

Remarks.—Accessory gills of gnathopod 2 and pereopod 1 are absent or rudimentary, the accessory gill of pereopod 3 is a well-developed cone about one-fourth as long as the primary gill, that of pereopod 4 is half as long as the primary gill and that of pereopod 5 is a large basal lump on the primary gill. The primary gill of pereopod 4 is only half as long as that of pereopod 3, and that of pereopod 5 is only one-third as long as the gill of pereopod 3. Only one definite female is present in the materials; brood lamellae are rudimentary and no other morphological distinctions from males are apparent. The variability in locking spines of pereopods 1–2 is disturbing because the peculiar shapes these spines take in various known species would make them a highly useful adjunct for rapidly identifying otherwise broken specimens and/or juveniles lacking full development of other characters.

Gurjanova (1962) has shown *Anonyx* to be so diverse that an extremely detailed diagnosis of a species is now necessary and may become even more detailed with further discoveries.

Anonyx comecrudus appears to have close affinities with *A. makarovi* Gurjanova (1962), but uropod 2 of *A. comecrudus* is highly distinct because of its dense spination and the full development of the notch on the inner ramus. The eyes of *A. comecrudus* are much more strongly flask shaped than they are in *A. makarovi,* and article 2 of the outer ramus of uropod 3 is much shorter.

Epimeral plates of the two species are very similar to each other, but the tooth of epimeron 3 is slightly more slender and that of epimeron 2 slightly stouter in *A. comecrudus* than in *A. makarovi.* The congruence in other characters between the two species is very strong, even though minute differences occur in various shapes, such as coxae 1 and 2, pereopods 3–5 and the lobe of the upper lip.

On first appearance *A. comecrudus* has gross concordance with *A. laticoxae* Gurjanova (1962), especially in light of the differences noted between *A. comecrudus* and *A. makarovi.* Uropod 3 of the latter two species is very similar and the eyes of *A. laticoxae* are broadly expanded ventrally, although the sharpest portion of the expansion occurs posteriorly and not anteriorly as in *A. comecrudus.* The two species are similar in overall generalities such as gnathopods 1 and 2, pleonal epimera, pereopods, and spination of uropod 2, but there are numerous details of difference between the two taxa. In *A. comecrudus,* the labral lobe is more strongly produced, the tooth of epimeron 3 is longer and that of epimeron 2 shorter, the dactyl of gnathopod 1 overlaps the palm more strongly, the posterior lobe of article 5 on gnathopod 1 seems to be broader (Gurjanova's two views of this in *A. laticoxae* are incongruous), the locking spine of pereopod 2 is usually complex, the inner ramus of uropod 2 has a notch and enlarged spine, and coxa 1 is less adze shaped than it is in *A. laticoxae.*

Anonyx comecrudus falls to *A. compactus* Gurjanova in Gurjanova's key but the thinner tooth of pleonal epimeron 3, the stronger labral lobe, longer pereopods 3–5, and different shape of locking spines on pereopods 1–2 serve to distinguish *A. comecrudus.*

Distribution.—Oregon, 80–150 m.

Centromedon pavor J. L. Barnard

Figures 15-16

Centromedon pavor J. L. Barnard, 1966b, p. 24, fig. 5.

Diagnosis.—Lateral cephalic lobe blunt in comparison with *C. pumilus* (Liljeborg); article 1 of antenna 1 extremely stout, about 0.67 times as broad as long; maxillipedal palp lacking article 4;

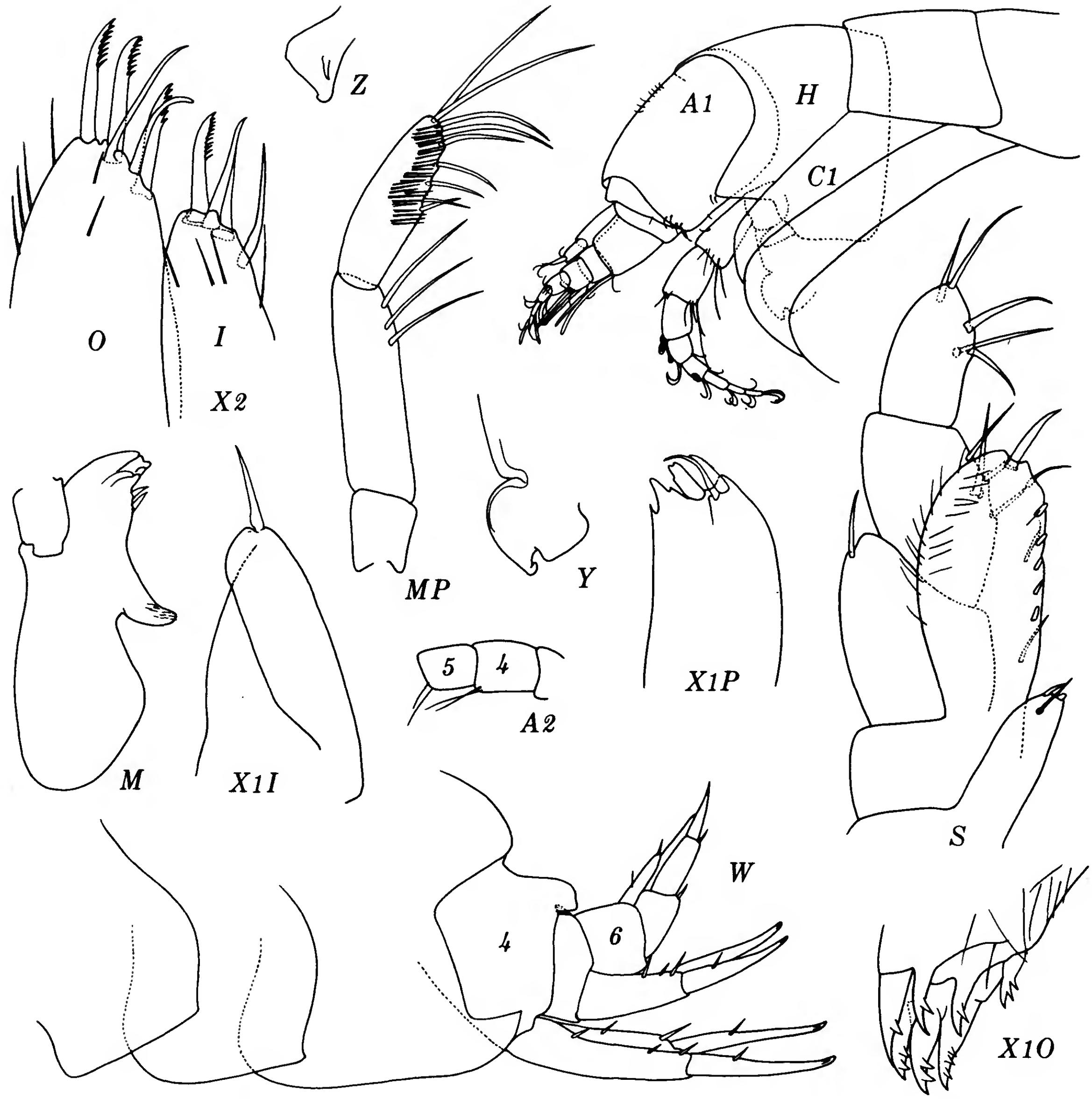

FIGURE 15.—*Centromedon pavor* J. L. Barnard, holotype, male, 2.6 mm, Oregon 10.

dactyls of pereopods 1–2 about 1.16 times as long as sixth articles; dactyl of pereopod 3 as long as article 6, lobe of article 2 narrow and extending well below end of article 3; lobe on article 2 of pereopod 5 evenly rounded below.

MATERIAL.—Station 10 (male, 2.6 mm); *Velero* 6477 (1 paratype).

REMARKS.—This species differs significantly from *C. pumilus* (see Sars, 1895, pl. 34: fig. 2) in the absence of palp article 4 on the maxilliped (a character overlooked in the original description), in the thick base of antenna 1, the long dactyls of pereopods 1–2, and the much shorter cephalic lobe. Gnathopod 2 is stouter than that of *C. pumi-*

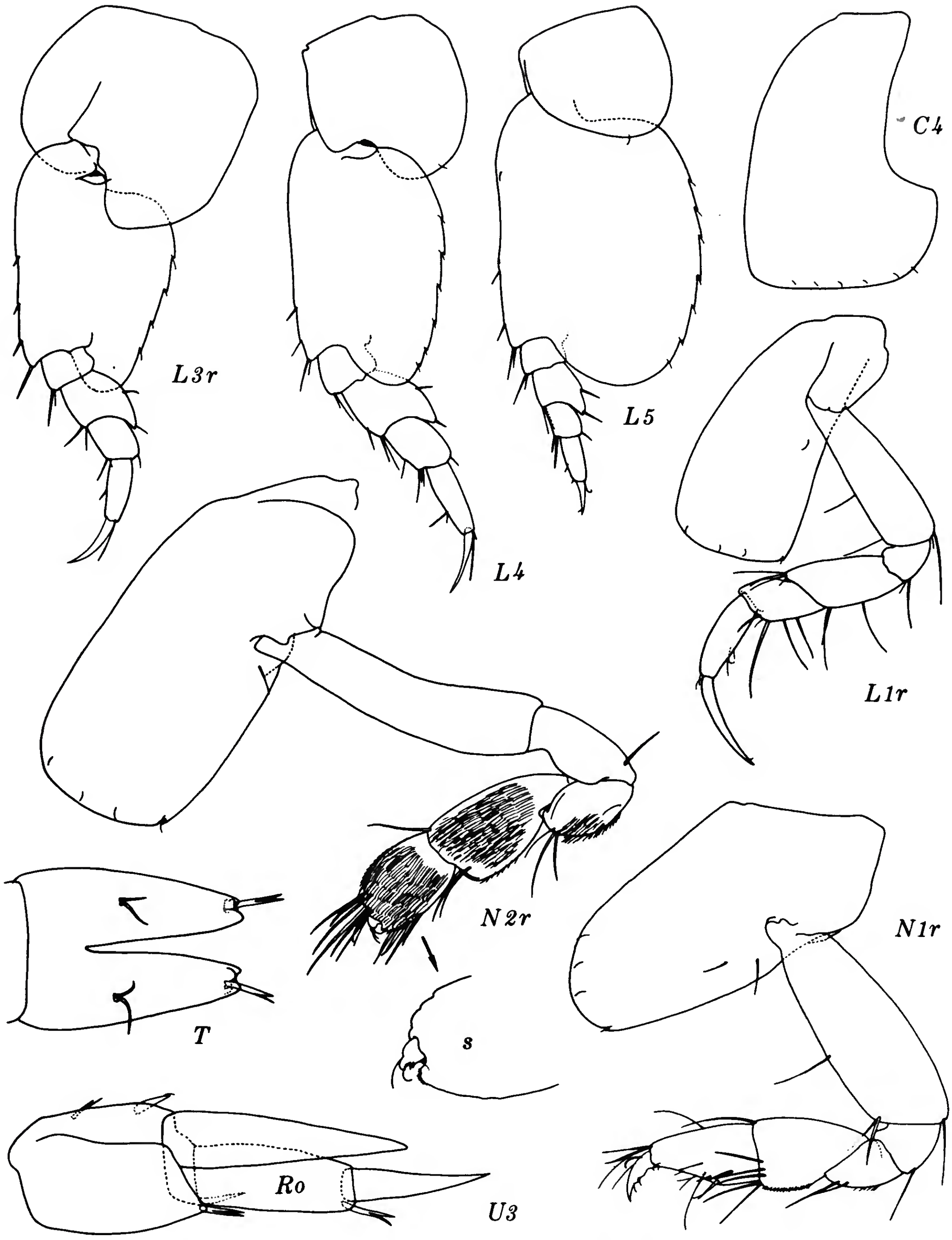

FIGURE 16.—*Centromedon pavor* J. L. Barnard, holotype, male, 2.6 mm, Oregon 10.

lus. The right mandibular molar bears a short spine, absent on the left mandible.

DISTRIBUTION.—Oregon to Monterey Bay, California, 84–200 m.

Hippomedon Boeck and the *H. denticulatus-propinquus* Complex

Gurjanova (1962) has demonstrated the wide morphological diversity in this genus; more than 40 species are now known and half occur in the north boreal region. Numerous character variables have been used by Gurjanova in distinguishing these species, and they are of primarily quantitative character (thus involving subtlely different shapes of parts), or of "minor" nature, in the form of the presence or absence of specific setae or minute sculpture. Distribution of many of the species is poorly known and few have been studied in any detail for intrademic or interdemic variations. The problem of identification comes into sharp focus for the student of temperate zones faced with the probability that cold-water hippomedons occur at the margins of their shallow-water distribution in midlatitudes and therefore may be the extreme members of a cline in which body size, as well as morphological shapes, is either variable or abnormal. Thus, Barnard (1964b) identified various individuals of *Hippomedon* found on the coastal shelf of southern California as a single species and suggested the possibility that *H. propinquus* Sars is the juvenile form of *H. denticulatus*. Almost all of the individuals were of the *H. propinquus* "phase," and a minority exhibited the transformed *H. denticulatus* phase in which pleonal epimeron 3 had a small notch.

These may also be individuals of a dwarf southern race of *H. denticulatus* which, because of thermal response, do not reach a body size in adults that is positively correlated with the development of the epimeral notch. A few individuals of this population from southern California do reach sufficient adult size for the appearance of the notch and individuals in the intertidal zones of Coos Bay, Oregon, and Albion, California, do develop the notch very strongly. The Albion population is the southernmost record of *H. denticulatus* from intertidal levels in the eastern Pacific Ocean. These individuals appear to be assignable to the east Siberia-Alaska subspecies *H. denticulatus orientalis*, which differs from the typical north Atlantic subspecies in the elephantine uropod 3, the shortness of the epimeral notch, and the shape of the epimeral tooth, although other characters do not conform, e.g., flagellar article 1 of the primary flagellum on antenna 1 is as elongate as in north Atlantic populations. Whether the two subspecies should be split further into micro-races or whether a Rassenkreis of geographic races occurs in both oceans is open to review and is an insoluble problem until larger suites of materials become available outside of east Siberia and northeastern Atlantic shores.

Typical *Hippomedon denticulatus* is one of the few described (see remarks under *H. denticulatus orientalis*) species of the genus with a fully developed epimeral notch and thus, all other characters being in general conformity, should be readily recognizable and good material for study of variation. Gurjanova has described two subspecies of *H. denticulatus*, the typical member of the high North Atlantic and *H. d. orientalis*, a member of the high Pacific basin. The two subspecies differ in at least a dozen characters of relatively strong degree, indeed more characters than differentiate many other species-pairs in the genus. The Smithsonian collections possess only four specimens of *H. denticulatus*, one from Kiel Bay, Germany, and three from Pacific Alaska. The German specimen is a fully developed member of the typical Atlantic subspecies, and the Alaskan individuals are clearly members of *H. d. orientalis*, even though they differ in several details from the subspecies described from the Asiatic side of the Bering-Pacific region. They differ among themselves to the extent other species of *Hippomedon* might, but all are clearly of the *denticulatus* facies in the presence of a fully developed epimeral notch. All are fully adult. The Smithsonian collections possess no juveniles of *denticulatus* but do have numerous specimens identified as *H. propinquus*. This situation is only a vague support of the thesis that *H. propinquus* may represent nongerontic *H. denticulatus*, or that *H. denticulatus* juvenile morphology is so similar to that of adult *H. propinquus* that the two species have not yet been properly distinguished in that phase. The variation encountered in the three specimens of Alaskan *H. denticulatus*, each from a different locality, suggests that considerable interdemic differences occur; such differences may be reflected in juvenile stages, and therefore some of the known species of *Hippomedon* that resemble *H. propinquus* may turn out to be demic representatives of juvenile *H. denticulatus.*

The following treatment of hippomedons from Oregon, California, and Washington thus suffers from lack of *H. propinquus*-like specimens from Alaskan shores which might provide some means, by geographic increments, of tracing the relationships of the southern materials to those of east Siberia. There is some logic in suggesting, however, that the materials identified by Barnard (1964b) as "*H. denticulatus* and *H. propinquus*" and those by Hurley (1963) as *H. subrobustus* and *H. zetesimus* form a complex of phenotypes of a single species. Hurley has noted the strong resemblance of his species to *H. propinquus* and *H. denticulatus* but was obliged to provide new names for each without further evidence as to geographic linkages. To a limited extent I am able to show a considerable polymorphy in the giant forms of *H. denticulatus orientalis* in the Alaskan region and from that slim evidence suggest that the three *propinquus*-forms of Hurley and Barnard plus a new form to follow represent morphs of a common epigenotype. To maintain some degree of clarity, I return to classical nomenclature and describe the new form within *H. propinquus.*

Hippomedon coecus (Holmes)

Tryphosa coeca Holmes, 1908, pp. 496–497, figs. 7–8.
Hippomedon (?) *coecus*.—Gurjanova, 1962, pp. 96–97, fig. 21.
Hippomedon coecus.—Hurley, 1963, pp. 136–137.

NOTES ON HOLOTYPE.—Hurley (1963) has reported partially on the poorly elucidated holotype of this species, from Monterey Bay, California. I have examined the type once again and must add some further details in light of various new species described from Oregon.

There is no doubt that *H. coecus* is a member of *Hippomedon* in view of the small head and the stout spines on the outer lobe of maxilla 1, the gnathopods, the pleonal epimera, and the characteristic maxillipeds. The holotype is in poor condition, consisting of two type slides in deteriorating condition, a carcass with head, and portions of pereopods detached in alcohol.

Eyes are absent (although a faint clear space with an internal diffuse spot is present) ; the lateral cephalic lobes are sharp and more strongly projecting than in *H. pacificus* Gurjanova (1962) ; essentially no antennal notch is present; coxae 1–3 each have a posteroventral notch, coxa 4 is not serrate but otherwise resembles that of *H. subrobustus* Hurley; gnathopods, pereopod 1 and antenna 1 are as figured by Holmes; uropod 1 with 2 spines and uropod 2 with 1–2 spines on outer rami; inner ramus of uropod 1 with 1 spine, inner ramus of uropod 2 lacking spines; pleonal epimeron 1 with subquadrate but smoothly rounded posteroventral corner, epimeron 2 with very weak tooth, one-third as long as that shown for *H. wecomus,* epimeron 3 with tooth similar to that of *H. wecomus,* new species, but with a very minute notch on the dorsal base of the tooth; antenna 1 as drawn by Holmes and lacking a distal spine on article 1 of the primary flagellum; pereopods 3 and 5 generally resembling those of *H. pacificus* Gurjanova (1962) but posterior serrations of article 2 smaller and more numerous by about 30 percent; pereopod 4 generally similar but anterior and posterior margins of article 2 nearly parallel as in *H. wirketis* Gurjanova (1962) and serrations continuing down to terminus of posterior margin; thus article 2 of pereopod 5 definitely tapering distally; body covered with sculpture like that of *H. pacificus,* polygons each with a central sharp scale or spine; uropod 3 poorly preserved but article 2 of outer ramus determined to be 45 percent as long as article 1 of outer ramus.

Hippomedon coecus seems to be a blind relative of *H. pacificus.* The interantennal cephalic lobe appears to be slightly larger on *H. coecus* than on *H. pacificus,* article 2 of pereopod 4 does not taper distally, pleonal epimeron 3 has a rudimentary notch above the tooth (easily overlooked under low-power microscopy), gnathopod 2 of *H. coecus* does not have the small distal bulbosity of article 5 (but it is poorly preserved), the telsonic lobes are slightly wider distally and each apex has a distinct evagination in which the spine occurs and article 2 of the outer ramus of uropod 3 is much longer than it is in *H. pacificus.*

Hippomedon coecus also has affinities with *H. denticulatus orientalis* Gurjanova (1962) because of the very rudimentary epimeral notch. The pereopods are almost precisely identical to those of

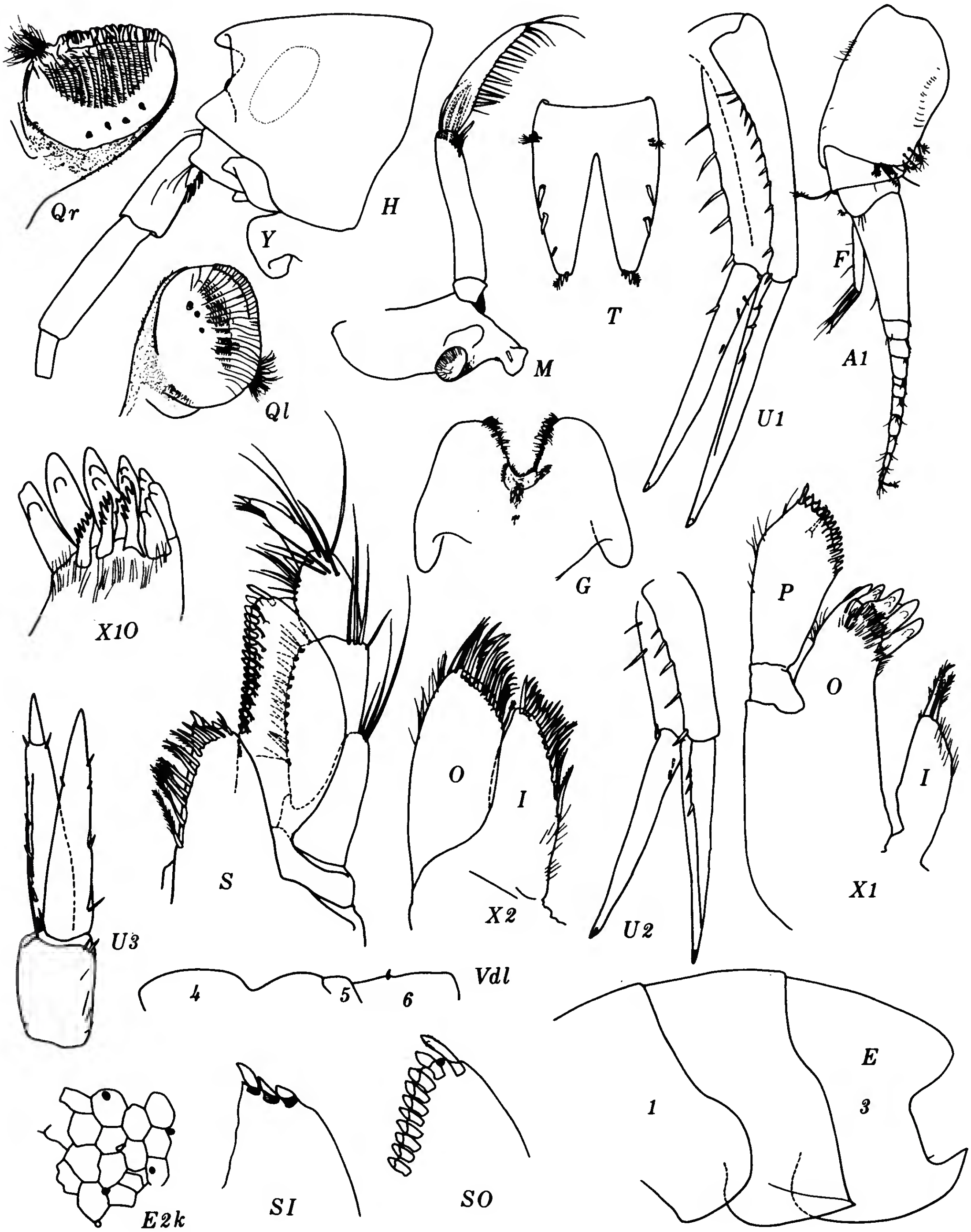

FIGURE 17.—*Hippomedon denticulatus* (Bate) (f. *subrobustus* Hurley), female, 9.3 mm, Oregon 72.

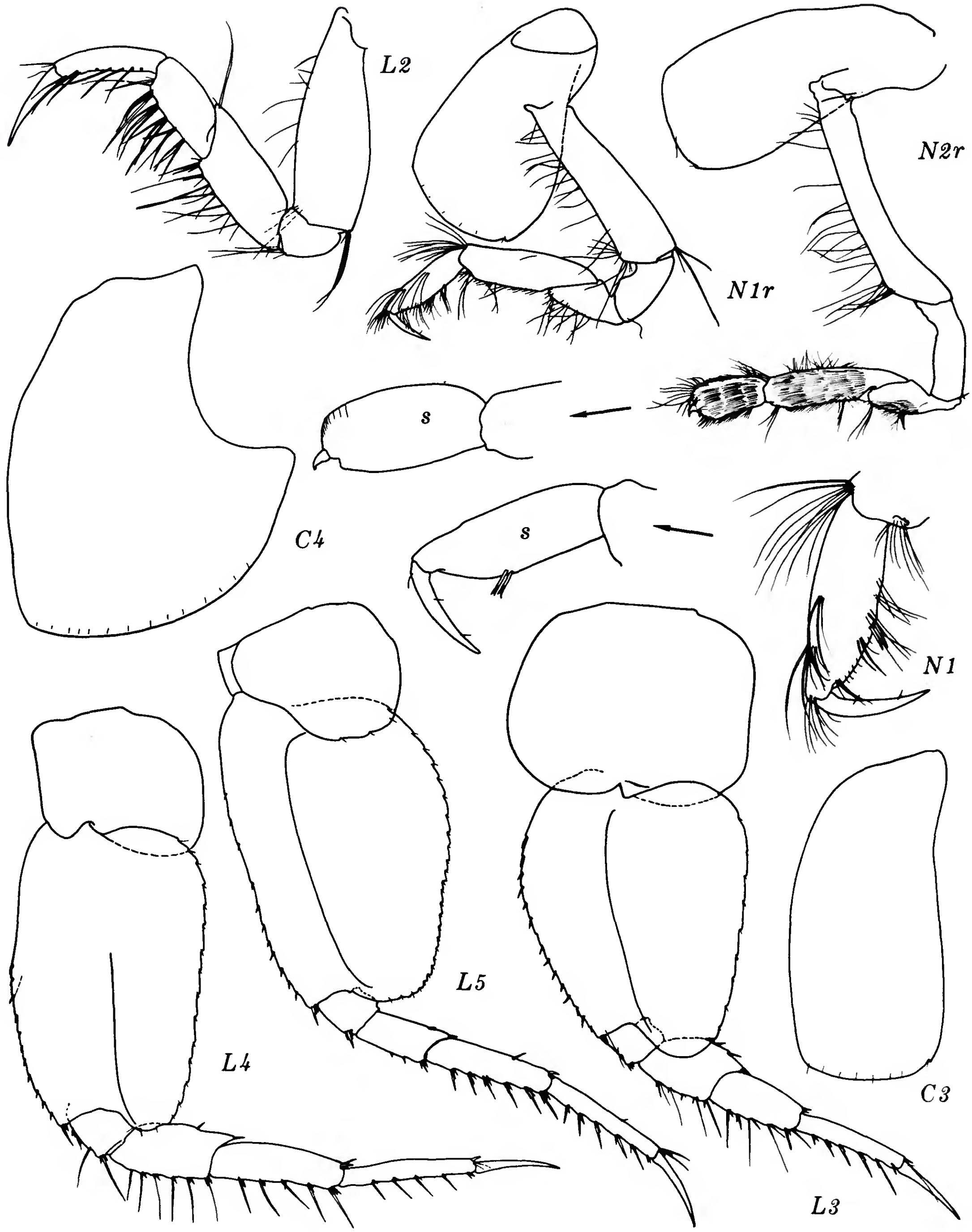

FIGURE 18.—*Hippomedon denticulatus* (Bate) (f. *subrobustus* Hurley), female, 9.3 mm, Oregon 72.

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H. d. orientalis, in contrast to *H. pacificus.* Of course eyes are absent or are completely unapparent in *H. coecus.* The dorsal crest and distal projection on article 1 of antenna 1 are not nearly as strong as in *H. d. orientalis,* and article 2 of the outer ramus of uropod 3 is highly elongate in comparison to *H. d. orientalis.* The palm of gnathopod 1 of the latter is weakly defined in comparison to *H. coecus.*

Hippomedon denticulatus (Bate) (forma *subrobustus* Hurley) (from Oregon)

FIGURES 17-18

Hippomedon subrobustus Hurley, 1963, pp. 140–144, figs. 46–47.

DESCRIPTION OF FORM.—Eyes nearly indistinguishable as a whitish reflection so outlined in figure; dorsal keel of antenna 1 peduncle low, article 1 of primary flagellum elongate and nearly as long as peduncle; coxa 1 of the distally expanded form as in *H. denticulatus,* articles 3–4 of gnathopod 1 subequal in length, article 6 thin, subrectangular, not distally expanding, palm very oblique but shorter than posterior margin of article 6 and defined by 2 bifid locking spines; articles 5–6 of gnathopod 2 slender, 5 not differentially lobed posteriorly, 6 scarcely expanding distally, dactyl attached in middistal margin of article 6, palm transverse and set back from attachment plane of dactyl; coxa 5 with ventral lobes equal in extent to each other; setae on pereopods 1–2, article 5, not thickened; article 6 of pereopod 3 with medium-size distal seta at base of dactyl on posterior margin; article 2 of pereopod 5 tapering slightly but not grossly, evenly serrate posteriorly and ventrally on posterior lobe; peduncular margins of uropods 1–2 strongly spinose, outer rami with 3 marginal spines each, inner ramus of uropod 1 with 1 dorsal and 3 midventral spines, of uropod 2 with 1 or 2 midventral spines; rami of uropod 3 of the "thin" kind, inner reaching middle of article 2 of outer ramus, apposing marginal spines almost evenly distributed; telsonic lobes each with a pair of plumed basal setae and 2 or 3 lateral spines, 2 or 3 apical spines and each apex with one plumed seta; pleonal epimeron 1 with nearly quadrate, scarcely projecting, anteroventral corner, epimeron 2 with weak posteroventral tooth, 3 with nearly typical "strong" tooth and no sinus; minute sculpture on integument varying from regular hexagons enclosing a small spine in about every third plat to very irregular polygons with spines irregularly distributed; accessory sausage-shaped gills 1 on pereopod 3, 2 long and 2 short on pereopod 4.

MATERIAL.—Station 72 (ovigerous female, 9.3 mm; male, 5.7 mm).

RELATIONSHIPS.—The thin gnathopod 1, article 6, demonstrates a relationship to Gurjanova's drawing of typical *H. denticulatus* and to Hurley's *H. subrobustus;* probably the Oregon individual is rightly called *H. subrobustus* even though the posterior lobe of pereopod 5, article 2 is distally broader than on *H. subrobustus;* the latter has no eyes but the dim eyes of the present individual scarcely qualify. Indeed, the presence of eyes, even though emphasized by Gurjanova, is often of weak specific value in marine amphipods.

The 5.7 mm male has only 1 article on the accessory flagellum.

In the Oregon specimen the small spines on the proximoposterior border of article 4 on antenna 2 are better developed than in Hurley's material, and the long seta near the dactyl of pereopod 3 is shorter. Hurley points out the resemblance of this form to *H. pacificus* Gurjanova (1962); there are small differences in article 6 of gnathopods 1 and 2 and the taper of pereopod 5, article 2, is more exaggerated than in Oregon-California material. The major difference of *H. propinquus* Sars in Oregon-California from populations of east Siberia is the greater expansion of coxa 1, a character used by Sars and Gurjanova in distinguishing *H. denticulatus* from *H. propinquus. Hippomedon pacificus* also has this expanded coxa and thus Oregon-California specimens may belong with that species, although *H. pacificus* differs from *H. propinquus* and typical *H. denticulatus* in the shortness of article 1 of the primary flagellum on antenna 1. By just considering these few characters, the reader may understand the difficulty of attempting to assign names to various hippomedons because of the mixture of characters that occurs from population to population.

DISTRIBUTION.—Oregon to Baja California, 80–250 m.

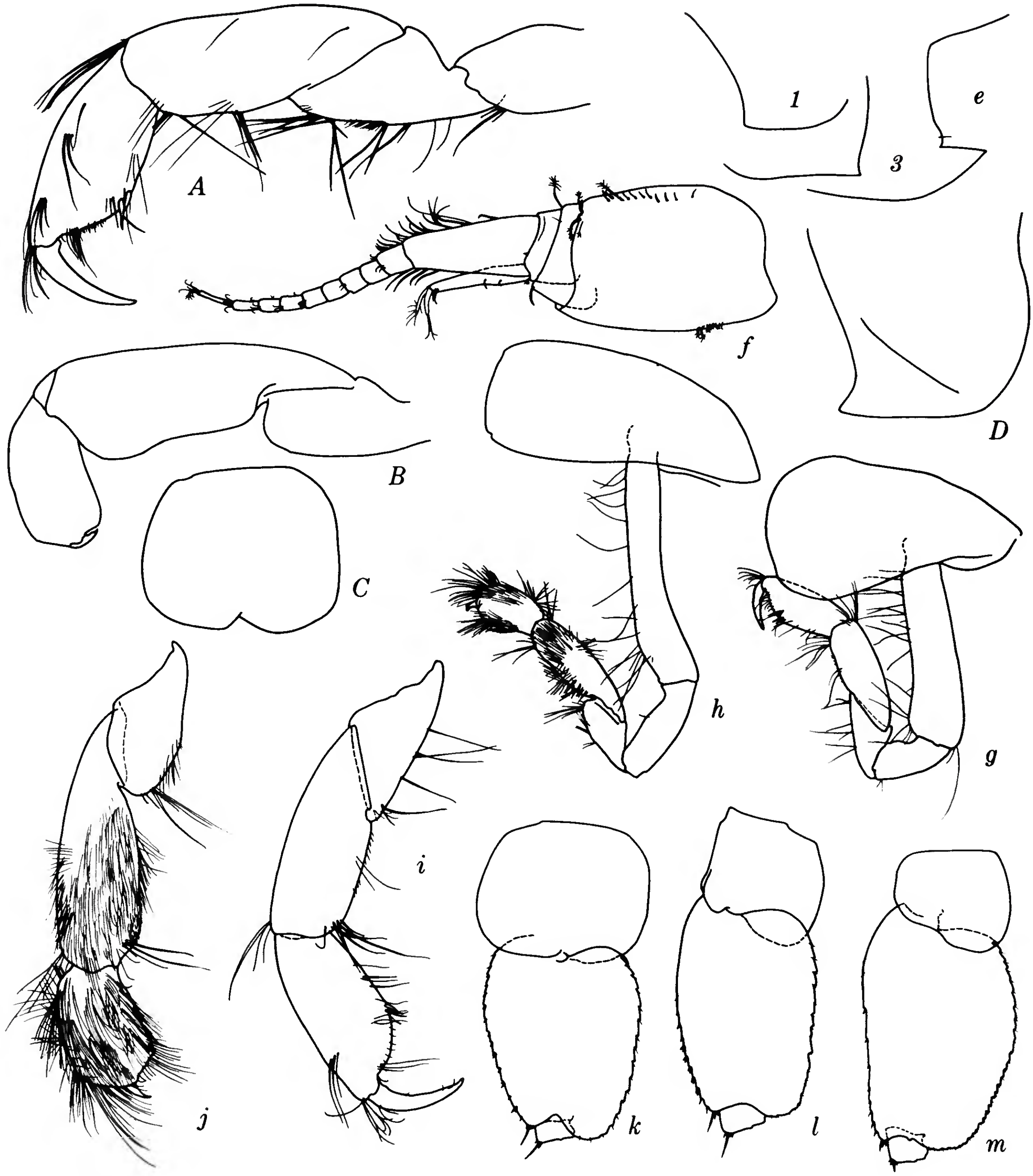

FIGURE 19.—*Hippomedon denticulatus orientalis* Gurjanova, ?female, 15 mm, Dall 1204: A,B, gnathopods 1,2, latter with setae removed; C, coxa 5; D, pleonal epimeron 1. *Hippomedon denticulatus* (Bate) (*propinquus* stage), female, 6.3 mm, *Velero* 5565: *e*, pleonal epimera; *f*, antenna 1; *g,h*, gnathopods 1,2; i,j, gnathopods 1,2, enlarged; *k,l,m*, bases of pereopods 3,4,5.

Hippomedon denticulatus orientalis Gurjanova (of Alaska)

FIGURES 19A-D

Hippomedon denticulatus orientalis Gurjanova, 1962, pp. 104–107, fig. 22.

MATERIAL.—Unalaska, year 1874, between Pinnacle and Ulakhla, 16 fms, W. H. Dall 1204 (1 specimen, 15 mm); Kyska Harbor, 10 fms, W. H. Dall 1037 (one specimen, 19 mm); Unalaska, 55°10′00″N, 160°18′00″W, 48 fms, 31 July 1888, *Albatross* 2847 (1 specimen, 11 mm).

REMARKS.—The 15-mm specimen has been used as a model comparator to Gurjanova's description of this subspecies, and though it definitely belongs with the *orientalis* concept, as contrasted to the typical Atlantic subspecies, the Alaskan form differs from *H. d. orientalis* in the following ways: article 6 of gnathopod 1 has parallel sides, neither tapering nor expanding distally; article 6 of gnathopod 2 is scarcely expanded, especially distally, the palmar area is very distinct and thus resembles the Atlantic subspecies; the lobes of coxa 5 are almost evenly extended ventrally; article 2 of pereopod 4 tapers slightly; the posterior margins of the sixth articles on pereopods 4–5 have 1 or 2 spines; the rami of uropods 1–2 are very poorly spinose, a condition not mentioned by Gurjanova but one in strong contrast to the Atlantic subspecies; thus each ramus of uropod 1 has 2 marginal spines and only the inner ramus of uropod 1 has 1 marginal spine, the outer ramus being naked; the outer ramus of uropod 2 is markedly narrower than the inner; uropod 3 is elephantine like *H. d. orientalis* and the inner ramus medial margin has 2 basal and 2 distal spines, the lateral margin 1 distal spine; the outer ramus medial margin has 3 distal spines and the lateral margin has 2 midproximal spines; the telson has 3 lateral spines on each lobe and each side has 2 basal plumose setae; pleonal epimeron 1 has a strong anteroventral projection not mentioned by Gurjanova; gill formulas of pereopods 3 and 4 are reversed from normal, as pereopod 3 has 1 accessory appendage and pereopod 4 has 2 accessory lobes.

The 19-mm specimen resembles the 15-mm specimen, but pleonal epimeron 1 is scarcely produced anteroventrally, and the uropodal rami are much more spinose: for example, the outer rami of uropods 1–2 have 4 and 3 spines each and the medial margins of the outer and inner rami of uropod 3 have 6 and 8 spines, respectively.

The 11-mm specimen has pleonal epimeron 1 like that of the 15-mm specimen, article 6 of gnathopod 1 slightly expands distally, the rami of uropod 2 have no spines, and the rami of uropod 1 have 1 spine each.

The weak antennal crest, the relatively short conjoint article 1 of the flagellum on antenna 1, the weakly tilted short tooth and weak notch on pleonal epimeron 3, and the broad rami of uropod 3 continue to be good characters of the subspecies *H. d. orientalis* even though regional and demic variations occur within the *orientalis* population.

In searching for specimens of *H. denticulatus* in Smithsonian collections, I discovered one so labeled from Lambray Deep, Ireland, which apparently is a new species, combining the deep epimeral notch of *H. denticulatus* with the characters of *H. serratus* Holmes, western Atlantic Ocean. Numerous other minor character differences occur in this individual and warrant its description as a new species, hopefully a task that can someday be accomplished. The purpose in mentioning it is to point out that the peculiarity of "deep" epimeral notching is not confined to *H. denticulatus* and that another species of *Hippomedon* must be added to the European fauna. The characteristic antennae and gnathopod 1 of *H. serratus* serve to distinguish that form from *H. denticulatus*, and characters of pereopod 5 alone serve to distinguish the species from *H. denticulatus* and *H. serratus*.

Hippomedon denticulatus (Bate) (*propinquus* shelf form of California)

FIGURES 19E-M

Hippomedon denticulatus (Bate).—J. L. Barnard, 1964b, pp. 80–82, 1966b, p. 24.

MATERIAL.—Reexamination of portions quoted by J. L. Barnard (1964b); figured specimen female, 6.3 mm ovigerous, from *Velero* station 5565 (Allan Hancock Foundation); and male 6.7 mm, Puget Sound, Washington, coll. Dr. U. Lie, St. III, Sec. I, H_2 29 IV, 1963, Depth 17.

REMARKS.—These individuals compare strongly with *H. denticulatus* forma *subrobustus* as represented by the Oregon individual only but differ mainly in gnathopod 1 having article 5 relatively shorter and article 6 larger, both articles broader and longer and with the palm better developed. Gnathopod 2 has article 6 stouter and distally expanded but the palm is similar to *H. d. subrobustus.* Minor details vary: in the figured specimen on the telsonic lobes the medial spine is replaced by a setule; the uropods have more peduncular spines but the inner ramus of uropod 1 has 2 medial and 3 lateral marginal spines, and the outer ramus has only 2 lateral spines; the outer ramus of uropod 2 has 2 and the inner ramus 1 spine; the inner ramus of uropod 3 has 2 basal and 2 other spines on the medial margin and 2 spines on the lateral margin; the outer ramus of uropod 3 has 1 distal spine on the medial margin and 1 basal and 1 distal spine on the lateral margin. On some of articles 5 and 6 of pereopods 3–4 there are 1 or 2 posterior spines; the posterior lobe of article 2 on pereopod 3 is longer than on *H. d. subrobustus.* Minute integumental sculpture is similar. Adult organisms such as that figured have a small notch near the base of the tooth on pleonal epimeron 3, whereas subadults smaller than 4 mm do not. Subadults thus are in the *H. propinquus* phase and scarcely differ from the broader concept of *H. propinquus* except for the broad coxa 1. It is therefore difficult to determine whether the present population is a dwarf southern race of *H. denticulatus* and distinct from *H. propinquus* f. *subrobustus.*

If this form is to be identified with *H. denticulatus* then it must remain distinct from the Alaska-Siberia *H. denticulatus orientalis* primarily on the basis of the slender uropod 3.

The male from Puget Sound has only 1 dorsal spine on each ramus of uropod 1, one lateral on the inner ramus, and uropod 2 has 2 spines on the outer ramus and none on the inner.

Hippomedon denticulatus (Bate) (*propinquus* of northwestern Atlantic Ocean)

FIGURE 20

MATERIALS.—Listed in Shoemaker (1930).

REMARKS.—These western Atlantic specimens are more typical of *H. propinquus* Sars from the northeastern Atlantic Ocean than are the northeastern and eastern Siberian subspecies erected by Gurjanova (1962). The western Atlantic specimens do differ in three characters from the northeastern Atlantic literature: (1) the broader coxa 1, which is atypical of any *propinquus* in the Eastern Hemisphere; (2) the presence of palmar locking spines on gnathopod 1, which is a character noted for the Siberian subspecies; and (3) adult individuals approximately 8 mm or larger (ovigerous females) have a small notch at the base of the tooth on pleonal epimeron 3; the notch is smaller than that found in the southern California shelf form. Coxa 1 is not quite as fully expanded as in northeastern Pacific forms. The absence of palmar locking spines on gnathopod 1 of northeastern Atlantic or Barentsian *H. propinquus* is not entirely correct if *H. squamosus* Stebbing (1894) is a synonym of *H. propinquus,* which it has always been considered since Stebbing (1906), for Stebbing described and illustrated one locking spine; if he intended to describe only one side of a bilateral situation there would be two spines shown. These are very easily lost in preserved material.

One peculiar feature that should be noted for the western Atlantic form and *H. denticulatus orientalis* of Alaska is that the tiny spines of the cuticular sculpture do not appear to penetrate through the external surface even though they clearly show through it. In the smaller or more weakly chitinized forms of Oregon and California these spinules distinctly emerge from the surface.

A significant feature of the western Atlantic materials is the presence of a single telsonic spine on each lobe as illustrated by Sars (1895).

Hippomedon denticulatus in its fully adult (gerontic?) form has not been reported from the northwestern Atlantic, and no specimens of it exist in the Smithsonian collections even though over 40 lots of the *propinquus* form have been assembled since 1873. Perhaps the western Atlantic race never transforms into the fully differentiated ?gerontic.

Hippomedon denticulatus (Bate) (form with gaped gnathopod 2)

FIGURE 21

DESCRIPTION.—Lateral cephalic lobes strong, moderately stout for genus, apically blunt; eyes

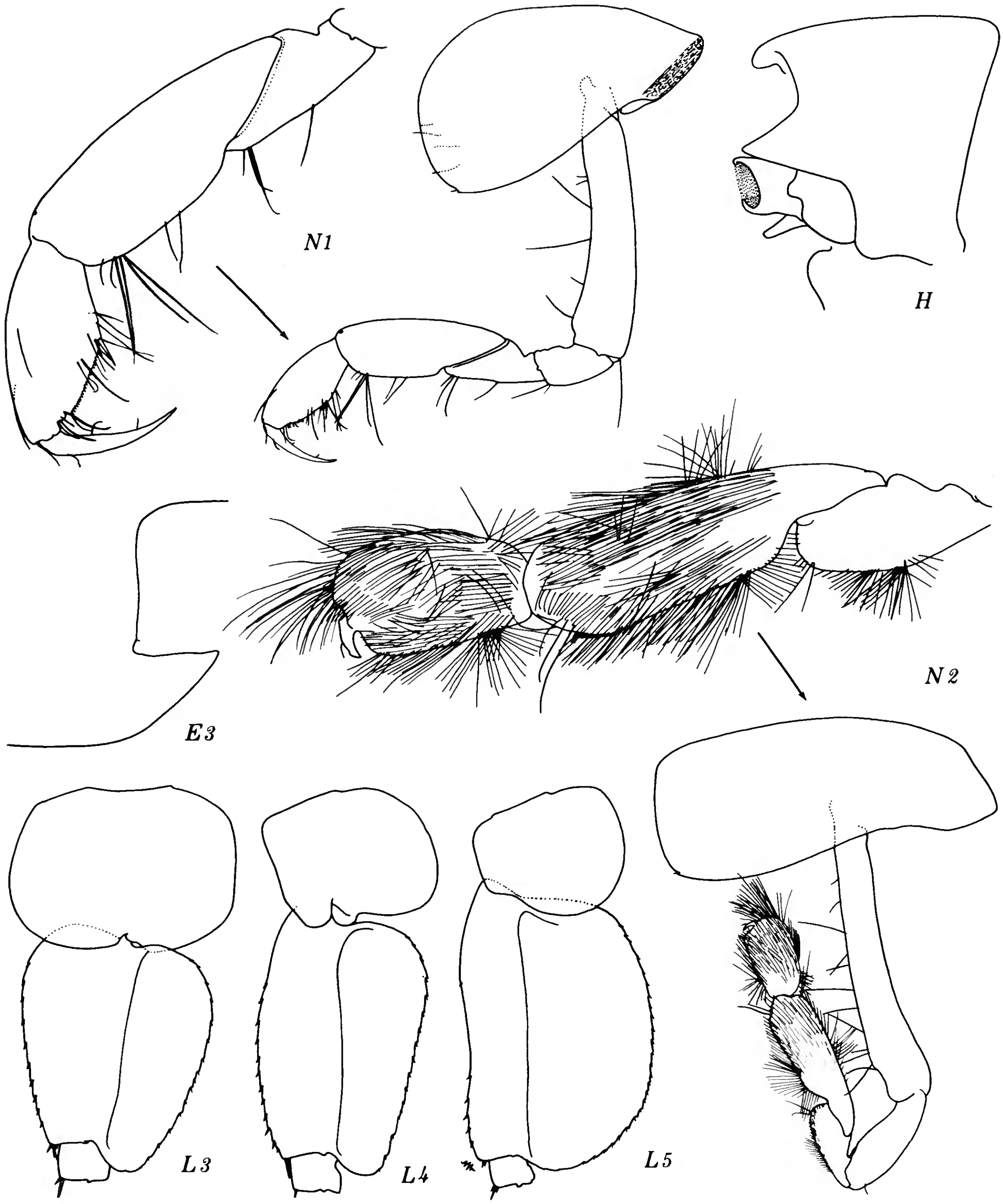

FIGURE 20.—*Hippomedon denticulatus* (Bate) (of western Atlantic), female, 8.5 mm, Location

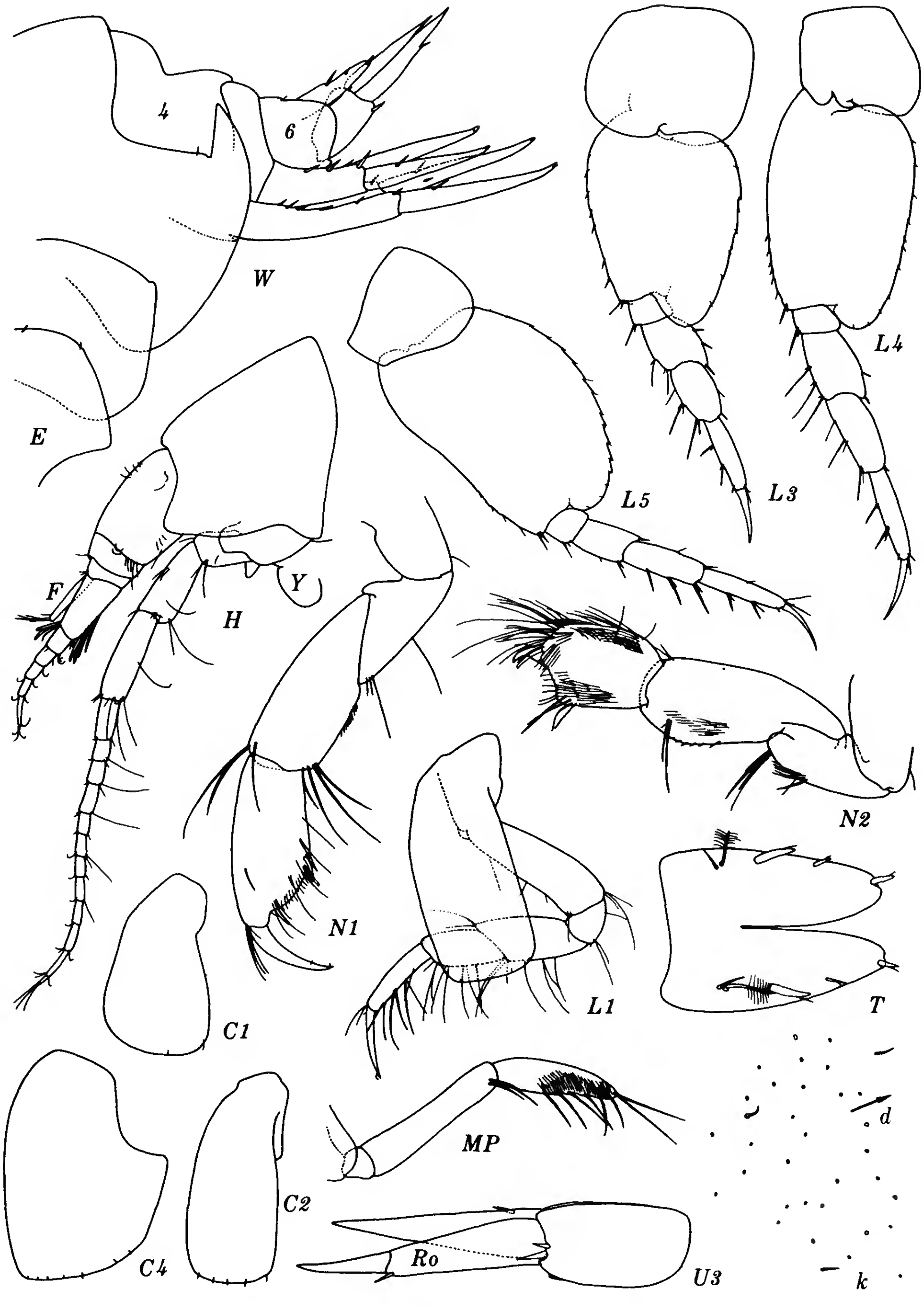

FIGURE 21.—*Hippomedon denticulatus* (Bate) (form with gaped gnathopod 2), female, 4.8 mm, Oregon 52.

absent; dorsal carina of antenna 1 obsolete, peduncle of medium stoutness, article 1 of primary flagellum about 60 percent as long as article 1 of peduncle, bearing 3 distal setae concealed among aesthetascs, accessory flagellum 2-articulate or bearing tiny third article; coxae 1–2 bearing weak posteroventral notch, posteroventral lobe of coxa 4 broad; article 6 of gnathopod 1 about 80 percent as long as article 5, anterior and posterior margins nearly perfectly parallel, palm oblique but strongly defined by 2 spines, dactyl fitting palm but lacking inner teeth; article 5 of gnathopod 2 weakly lobate, not distally narrowed, palm long, weakly concave, dactyl very short and projecting from middle of apex on article 6; posterior setae on articles 5–6 of pereopods 1–2 of medium thickness but not as strong as in *H. subrobustus* Hurley; dactyls of pereopods with weak distal hoods; article 2 of pereopod 3 pyriform, tapering distally, article 2 of pereopod 4 scarcely tapering, of pereopod 5 with weak posteroventral bevelment, posterior margins of all second articles moderately serrate; peduncles of uropods 1–2 moderately spinose, each ramus of uropod 1 with 1 dorsal spine, outer ramus of uropod 2 with 1 spine, inner ramus naked; uropod 3 slender, rami tapering evenly, inner ramus reaching midway along article 2 of outer ramus, latter article exceeding 55 percent length of article 1, inner ramus with 1 basomedial spine, outer ramus with 1 distolateral spine on article 1; telson deeply cleft, of medium breadth, each lateral margin with 2 spines and a pair of setae, apices weakly incised and each bearing 1 small spine; pleonal epimeron 1 anteroventrally quadrate, posteroventrally rounded, epimeron 2 with obsolescent posteroventral tooth, epimeron 3 with weak sinus above large posterior tooth; urosomite 1 with weak dorsal saddle and obsolescent crest, urosomites 2–3 stairstepping normally downward; integument covered with scattered sharp setae and numerous blunt, imbedded setae.

Head lacking coniform keel between antennae. Mouthparts like *H. denticulatus* (Bate) (see Sars, 1895, pl. 20) except for mandibular palp figured herein and article 4 of maxillipedal palp with apical nail-spine.

Male unknown. Female-like specimen figured, 4.8 mm long, sexual characters not evident.

MATERIAL.—Stations 52 (1), 72 (1), 1001 (1).

RELATIONSHIP.—This form of *H. denticulatus* (Bate) or *H. propinquus* Sars is analogous to *H. p. eous* Gurjanova (1962) in the expanded hand and gaping palm of gnathopod 2, but the form from Oregon differs from *H. propinquus eous* in the slightly broader hand of gnathopod 1, the smaller serrations on article 2 of pereopods 3–5, the more symmetrical taper of article 2 on pereopod 5, and in the presence of the epimeral notch on epimeron 3. This phenotype of *H. denticulatus* is one more link in the evidence suggesting that the forms and subspecies known for *H. denticulatus* and *H. propinquus* should all be united under one name.

DISTRIBUTION.—Oregon, 100–150 m.

Hippomedon (?) tracatrix, new species

FIGURES 22-23

DIAGNOSIS.—Head rather small but lateral cephalic lobe quite long, strongly projecting, well delineated dorsally, narrow, acute; eyes absent; article 1 of antenna 1 barrel shaped, lacking a distal tooth, or dorsal crest, article 1 of flagellum about two-thirds as long as article 1 of peduncle; epistome and upper lip flat anteriorly, separated by a deep incision; article 3 of mandibular palp about 65 percent as long as article 2, of intermediate stoutness, medial edge setose along three-fourths of its length; mandibular molar small for the genus, poorly projecting, teeth and ridges numerous but not strongly developed, molar bearing a plumose seta; coxa 1 slightly shorter than 2, slightly tapering distally, essentially the taper occurring as posterior bevelment, distal end rounded; article 6 of gnathopod 1 slightly longer than 5, palm oblique but well defined and shorter than posterior margin of article 6; gnathopod 2 subchelate, dactyl of intermediate length; coxa 4 very poorly developed for the genus, posterior edge concave but posteroventral lobe scarcely defined; posterior lobe of article 2 of pereopod 5 scarcely tapering distally, broad ventrally, posterior serrations large and numerous for the genus; pleonal epimeron 1 with anteroventral quadrate lobe, posteriorly rounded, epimeron 2 rounded anteroventrally, with rudimentary posteroventral tooth, epimeron 3 rounded anteroventrally, with intermediate-size posteroventral tooth slightly up-

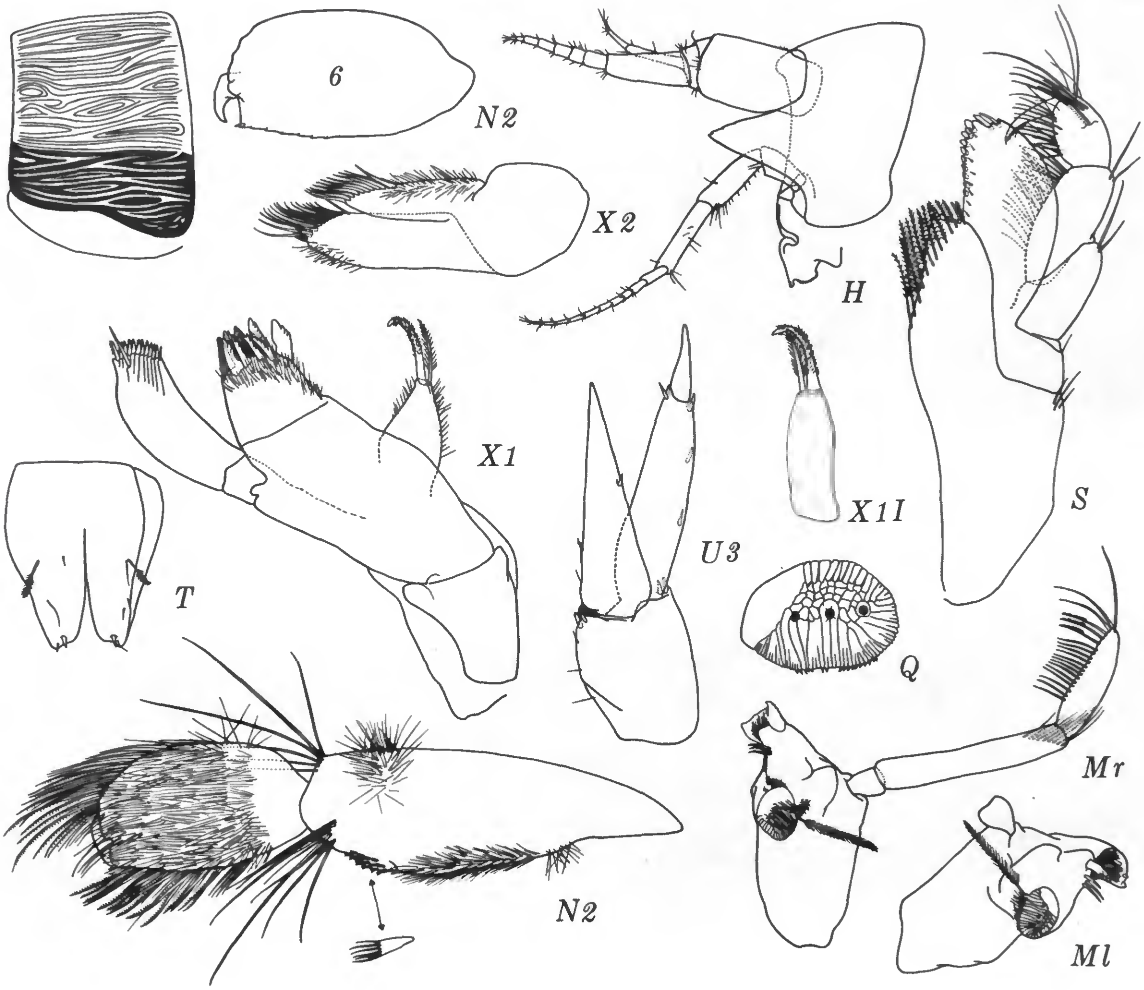

FIGURE 22.—*Hippomedon (?) tracatrix,* new species, holotype, female, 7.4 mm, Oregon 81. Sculpture of pereonite 1 in upper left corner.

turned; pleonite 4 with large, erect, triangular crest, acute; inner ramus of uropod 3 as long as article 1 of outer ramus, article 2 of outer ramus about 35 percent as long as article 1; telson short for the genus, thus rather broad, cleft about five-eighths its length, each apex rather broad and armed with a spine and a setule; body with faint striation-sculpture.

HOLOTYPE.—USNM 127135, female, 7.4 mm. Unique.

TYPE-LOCALITY.—Station 81, 44°38.1′N, 125°35.0′W, 2,800 m, 11 August 1964.

RELATIONSHIP.—Because of the cutoff condition of coxa 1, this species resembles *Hippomedon tasmanicus* J. L. Barnard (1961b) more than any of the other known species. In its gnathopod 2, palm of gnathopod 1, and the third pleonal epimeron it also resembles *H. tasmanicus,* but it differs by the more clearly defined lateral cephalic lobe, the erect, acute dorsal crest of pleonite 4, the inverse

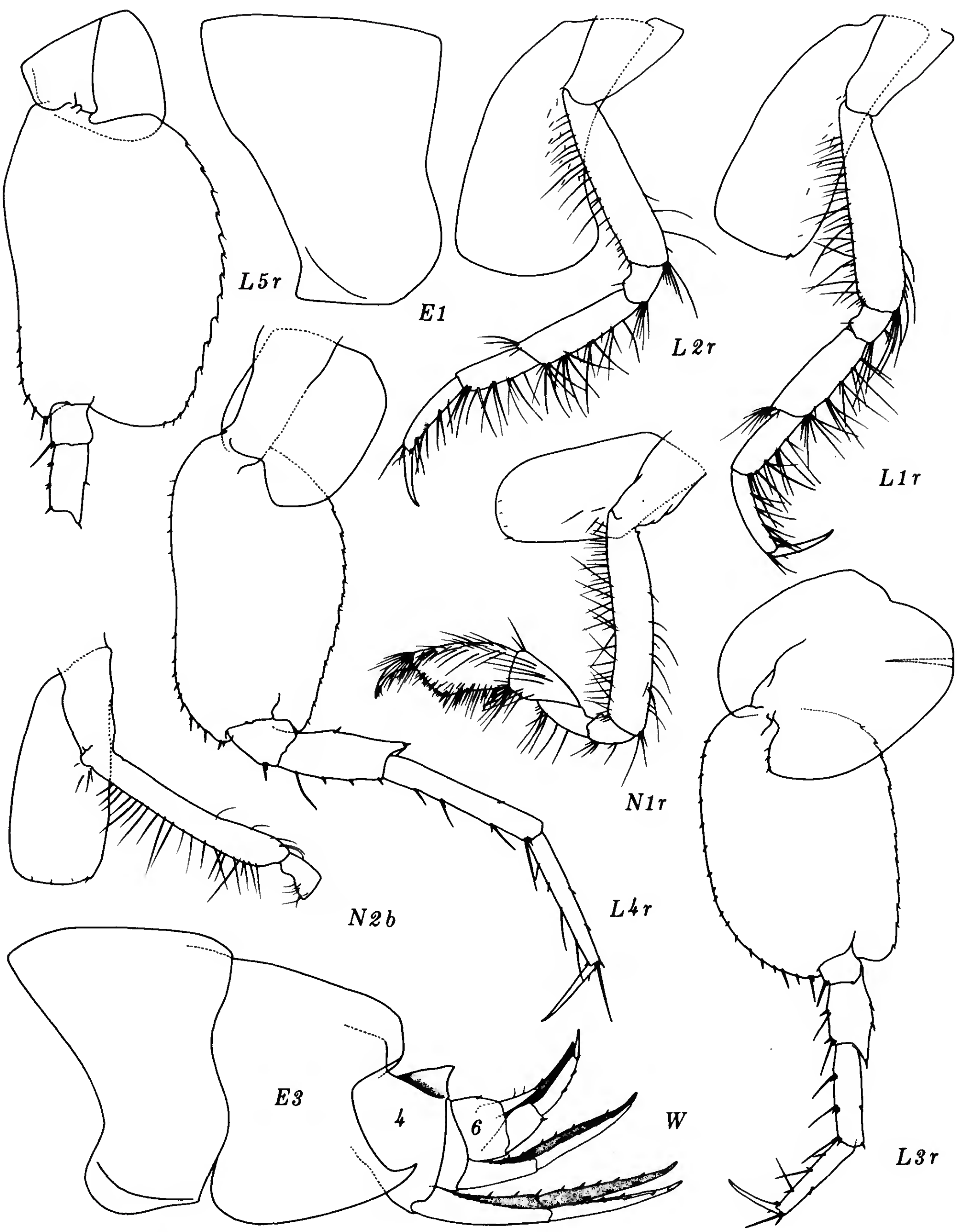

FIGURE 23.—*Hippomedon* (?) *tracatrix*, new species, holotype, female, 7.4 mm, Oregon 81.

relationship of the lengths of articles 5 and 6 of gnathopod 1, the slightly different shapes of the second articles of pereopods 3–5, the shorter telson, and the pattern of the chitin surface.

This species is outside of the mainstream of the genus *Hippomedon* in the slightly tapered coxa 1 and the development of a dorsal crest on pleonite 4 and in the very short article 5 of gnathopod 1 and the smallness of that gnathopod; the upper lip does not project in front of the epistome. But *H. tracatrix* resembles *Uristes typhlops mediator* J. L. Barnard (1962d) from the South Atlantic Ocean and differs from that subspecies in the thinner tooth of epimeron 3, the sharper ocular lobe, and the slightly shorter article 5 of gnathopod 1. *Hippomedon tracatrix* differs from *Uristes t. typhlops* in the very small gnathopod 1 with short article 5, the slightly elongate inner plate of maxilla 2, and the distally narrowed coxa 1. Coxa 1 is not certainly known in *U. t. typhlops;* and *U. t. mediator* may actually represent a distinct species in a distinct subgenus (or genus) from *U. t. typhlops*.

Hippomedon tracatrix also resembles *Paracentromedon carabicus* J. L. Barnard (1964e) but has a longer article 3 on the mandibular palp, a stronger mandibular molar, a slightly narrowed coxa 1, stronger anteroventral protrusion on epimeron 1, a thinner tooth on epimeron 3 and lacks serrations on that ventral margin, and finally has a much shorter article 5 of gnathopod 1.

Elimedon cristatus J. L. Barnard (1962d) is another species having resemblance to *H. tracatrix,* but the latter differs from the former in the longer article 3 of the mandibular palp, the shorter article 5 of gnathopod 1, the tapered coxa 1, and a shorter telson.

From *Hippomedon concolor* J. L. Barnard (1961b), *H. tracatrix* differs in the longer and sharper ocular lobe, the thinner tooth on epimeron 3, the tapered coxa 1, and the longer, sharper ocular lobe.

The species *carabicus, cristatus,* and *concolor* all have the sharp dorsal crest of pleonite 4 and thus resemble *H. tracatrix,* whereas most other species of *Hippomedon* lack the crest and/or have an untapered coxa 1.

DISTRIBUTION.—Oregon, 2,800 m.

Hippomedon wecomus, new species

FIGURES 24–25

DIAGNOSIS.—Lateral cephalic lobes strong, moderately stout for genus, subacute; eyes faint, composed of ommatidia within weak capsule, oval, located on side of head, lacking horny lens; dorsal carina of antenna 1 obsolete, peduncle slender, article 1 of primary flagellum only one-third as long as article 1 of peduncle, lacking distal spine or spines, accessory flagellum 4-articulate, article 1 not elongate; coxae 1–3 each with posteroventral notch, coxa 4 with 3–4 posteroventral serrations, posteroventral lobe of coxa 4 broad; article 6 of gnathopod 1 about three-fourths as long as article 5, anterior and posterior margins nearly perfectly parallel, palm oblique but strongly defined from posterior margin of article 6 by 2 spines (1 drawn in figure), dactyl fitting palm and bearing subdistal inner tooth and narrow distal hood; article 5 of gnathopod 2 with strong posterodistal tuberosity, article 6 subovate, narrow distally, palm short, slightly protuberant; posterior setae on articles 5–6 of pereopods 1–2 thin; dactyls of all pereopods with weak distal hoods; article 2 of pereopod 3 tapering distally, of pereopods 4–5 not tapering distally, posterior margins of all second articles moderately serrate; peduncles of uropods 1–2 strongly spinose, rami of uropod 1 each with 1–2 marginal spines, outer ramus of uropod 2 with 2–3 spines, inner naked; uropod 3 slender, rami tapering evenly, inner ramus reaching midway along article 2 of outer ramus, latter article exceeding 35 percent length of article 1, opposite margins of rami evenly spinose, with 3 (inner) and 5 (outer) spines each; telson deeply cleft, lobes of medium breadth, each lateral margin with 2 spines and pair of setae, apices each incised and bearing 2 medium-size spines; pleonal epimeron 1 with minute point posteroventrally, epimeron 2 with medium-size, slender tooth, epimeron 3 with plain blunt tooth of medium length, lacking dorsal sinus; urosomite 1 with weak dorsal saddle and obsolescent crest, urosomites 2–3 stair-stepping normally downward; integument covered with weak irregular polygonal structure, scarcely alveolar, bearing very rare tiny spines not oriented to alveoli (similar to *H. boreopacificus* Gurjanova, 1962), but spinules even more rare.

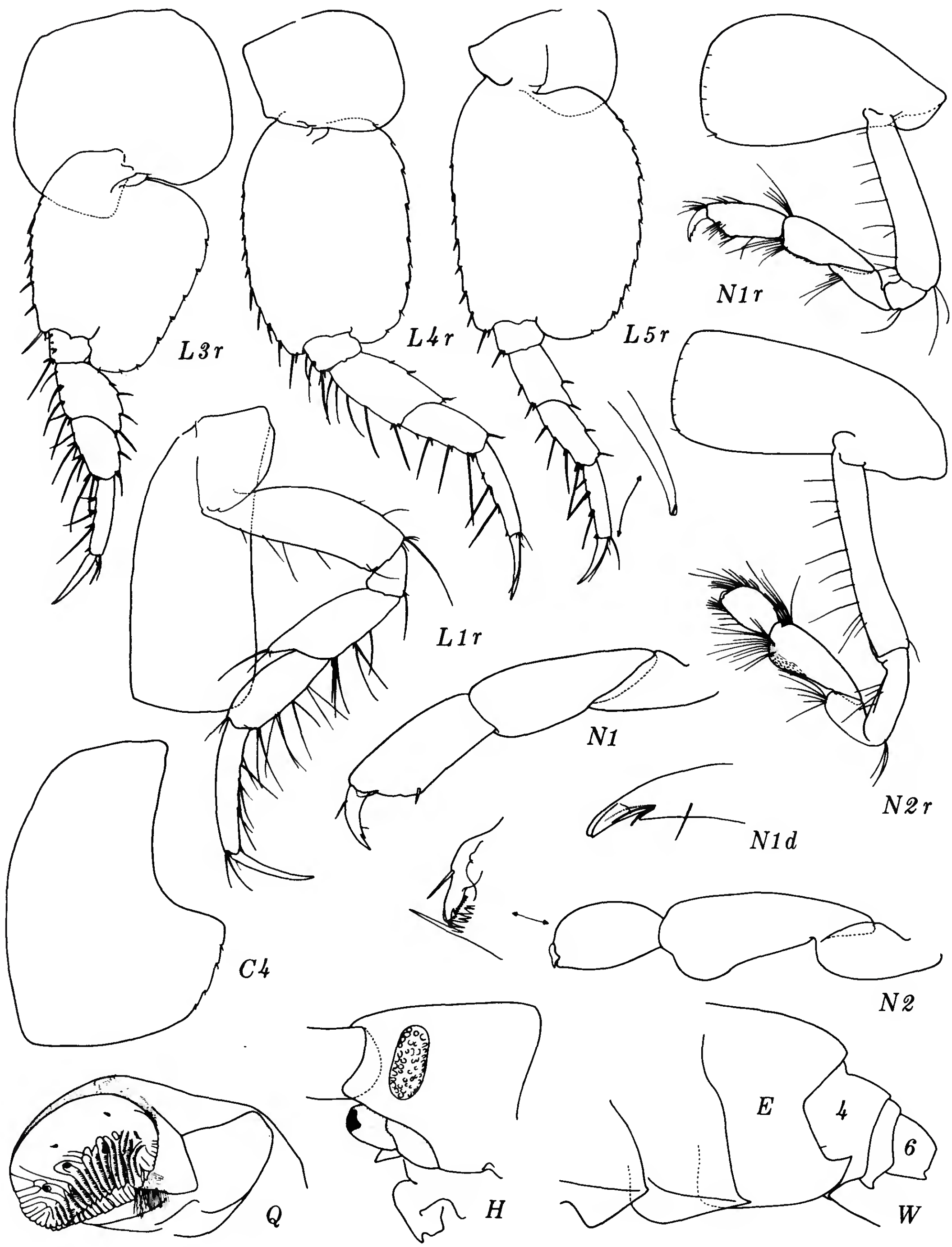

FIGURE 24.—*Hippomedon wecomus*, new species, holotype, female, 6.8 mm, Oregon 61.

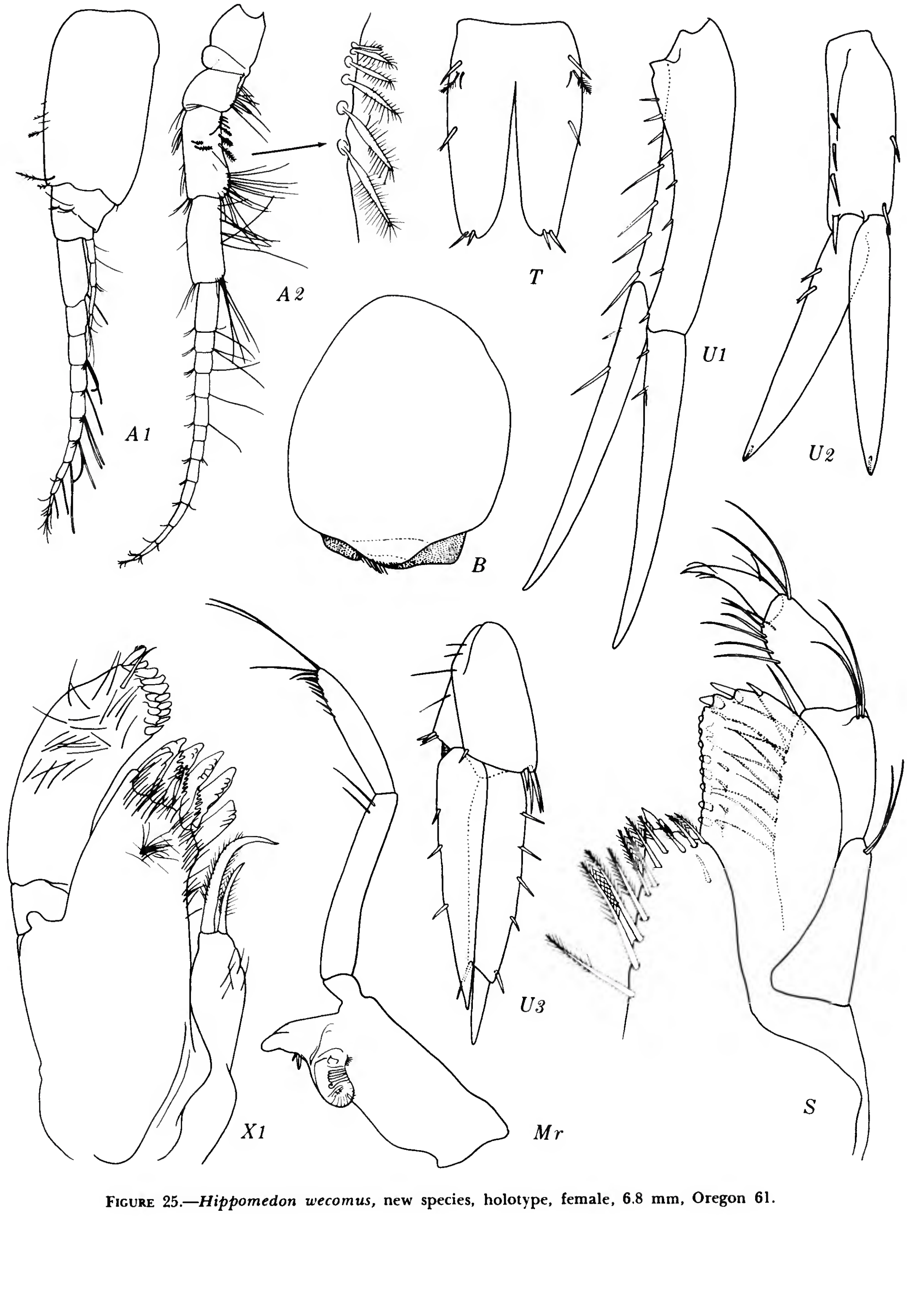

FIGURE 25.—*Hippomedon wecomus*, new species, holotype, female, 6.8 mm, Oregon 61.

Head with coniform keel between first antennae.

MALE.—One specimen bearing penial projections, otherwise like female in antennae, uropods, eyes, and other characters.

HOLOTYPE.—USNM 127130, female, 6.8 mm.

TYPE-LOCALITY.—Station 61, 44°43.8'N, 124° 18.1'W, 100 m, 25 March 1964.

MATERIAL.—Stations 60 (1), 61 (2), 71 (1), 1001 (2).

RELATIONSHIP.—This species has strong affinities with *Hippomedon minusculus* Gurjanova (1938, 1951, 1962) and may only be a subspecies joined to that entity. There seems to be considerable variation in spination of telson and uropod 3 in *H. minusculus* as taken from Gurjanova's two sets of figures (1938 and 1962) but *H. wecomus* differs, nevertheless, in the shorter article 2 of the outer ramus of uropod 3 and in the shortness of the telsonic spines. The tooth on pleonal epimeron 3 of *H. minusculus* is slightly larger than in *H. wecomus*. The dorsal configuration of the urosome of *H. wecomus* differs from that of *H. minusculus* in the distinct saddle-shaped depression of urosomite 1 and the regularity of the other segments, whereas *H. minusculus* lacks the depression and has a very short and low urosomite 3. *Hippomedon wecomus* has other characters of importance, which are not described for *H. minusculus*, that may have specific value: the serrations of coxa 4, the thin tooth of pleonal epimeron 2, the minute tooth of pleonal epimeron 1.

Hippomedon zetesimus Hurley (1963) resembles *H. wecomus* but differs in the elongate and strongly armed article 1 of the primary flagellum on antenna 1, the weak palm of gnathopod 1, the lack of a discrete bulbosity on article 5 of gnathopod 2, the absence of spines on the rami of uropod 2, and the minute honeycomb sculpturing of the integument. *Hippomedon subrobustus* Hurley (1963) has a strongly rounded and sloping posteroventral margin on article 2 of pereopod 5.

The differences among various species of *Hippomedon* are so minor that one may see resemblances of *H. wecomus* even to others not mentioned above. A brief mention of differences of the following species from *H. wecomus* is as follows: *H. boreopacificus* Gurjanova (1962) lacks eyes, has a sharper cephalic lobe, and more obliquely rounded posterodistal margin of article 2 on pereopod 5; *H. granulosus* Bulycheva (1955) has an almond-shaped, untapering article 6 on gnathopod 2, no tuberosity on article 5 of gnathopod 2, and a very granular integument; *H. wirketis* Gurjanova (1962) lacks eyes, has a sharper cephalic lobe, stouter uropod 3, densely setose anterior margin on article 2 of gnathopod 1, and a regular alveolar integument with a spinule in the center of each polygon; *Hippomedon propinquus propinquus* Sars (see Gurjanova, 1962) has a scarcely distinguishable palm on gnathopod 1, a strong dorsal crest on antenna 1, and an elongate article 1 on the primary flagellum.

DISTRIBUTION.—Oregon, 52–100 m.

Lepidepecreoides K. H. Barnard

Lepidepecreoides K. H. Barnard, 1932, p. 62.

DIAGNOSIS.—Lateral cephalic lobes sharp but short, head tall but often partially hidden by coxa 1 and appearing small; peduncular articles 2–3 of antenna 1 not longer than distal articles of flagellum but article 1 elongate; upper lip projecting in front of epistome and separated from it by weak invagination or tiny notch; mandibular palp 3-articulate, attached opposite molar, incisor smooth, molar triturative; lower lip and maxilla 2 ordinary; inner plate of maxilla 1 with 3 or fewer terminal setae, spines on outer plate thick, palp 2-articulate; maxilliped stout and short like typical members of *Hippomedon* Boeck; coxa 1 elongate and evenly rectangular, coxa 4 elongate and narrow, coxa 5 nearly as long as 4; gnathopod 1 subchelate, article 5 longer than 6, gnathopod 2 weakly chelate; article 2 of pereopod 3 with blunt posterior spur and weaker posteroventral spur; pleonal epimeron 3 lacking tooth; pleonite 4 with large dorsal tooth; uropod 2 without special notches on rami; uropod 3 of ordinary size, outer ramus 2-articulate; telson deeply cleft; pereonites 5–6 with sausage-shaped appendage on each gill.

TYPE-SPECIES.—*Lepidepecreoides xenopus* K. H. Barnard (1932), South Shetlands, South Georgia, Palmer Archipelago, 130–1,080 m.

RELATIONSHIP.—K. H. Barnard mentioned *Lepidepecreum* Bate and Westwood, *Lepidepecreella* Schellenberg, and *Lepidepecreopsis* Stephensen (= *Tryphosella* Bonnier) in his discussion of relationships, but *Lepidepecreoides* appears to have no special affinity with those genera and instead seems to have a few resemblances to *Hippomedon* Boeck. *Lepidepecreoides* differs from *Hippomedon* in the elongate coxa 5, the presence of a dorsal process on pleonite 4, the absence of a tooth on epimeron 3, and the gross spurs of pereopod 3. *Lepidepecreoides* differs from the majority of species in *Hippomedon* in the narrow coxa 4 and unexpanded coxa 1. It resembles *Hippomedon* in its overall aspect, its generally small head with sharp ocular lobes, the elongate article 1 on the flagellum of antenna 1, the outline of the prebuccal mass, the appendages on the gills, the elongate pereopods 3–5, shape of gnathopods 1–2, all of the mouthparts including the very stout and short maxillipeds, and in the uropods and telson.

Lepidepecreoides also has many characters in common with the odd members of *Uristes,* such as *U. perspinis* J. L. Barnard (1967a) and *U. lepidus* J. L. Barnard (1964e). But those species, like all of those in *Tryphosella* (= *Lepidepecreopsis*) have a short and tapering coxa 1, no teeth on pereopod 3 and pleonite 4, and have somewhat shortened fifth articles of gnathopod 1.

Lepidepecreoides nubifer, new species

FIGURES 26–27

DESCRIPTION.—Lateral cephalic lobes acute, slightly asymmetric, deeper below than above, well projecting; eyes absent; article 1 of antenna 1 rather slender for the genus, lacking keel or distal process, first peduncular article longer than flagellum, accessory flagellum 2-articulate; antenna 2 short, flagellum shorter than peduncle; anterior margins of epistome and upper lip from lateral view rather flat, demarcated by a notch; upper lip from anterior view with rounded and narrowly lobed ventral margin; coxa 4 slender and posteroventral lobe small; coxa 5 with subacute, slightly reverted anterior lobe; gnathopod 1 slender, article 6 scarcely expanded, anterior and posterior edges parallel, palm distinct, bounded by 2 spines; gnathopod 2 with well-developed dactyl attached about mediodistally to article 6, palm slightly chelate and broad; pereopod 3 shorter than 4, article 2 with 2 large processes, one slender, blunt horizontal posterior spur and a broader posteroventral process; article 2 of pereopod 5 with symmetrically convex posterior edge, posteroventral lobe rather narrow but poorly extended, posterior serrations of medium size; pleonal epimera 1–2 with bluntly projecting anteroventral margin, epimeron 3 with rounded-quadrate posteroventral corner, lacking process; pleonite 4 with large, erect, slightly reverted, acute dorsal process; telson long, lobes slender, acute, each armed distally with 2 (? or 1) spines.

Gills of pereonites 5 and 6 each with accessory sausage-shaped pendant lobe. Mouthparts not mentioned in diagnosis typical of the genus except where illustrated for minor details; outer lobe of maxilla 2 with 9 spines, 3 of which are small.

HOLOTYPE.—USNM 127132, male, 13.5 mm. Unique.

TYPE-LOCALITY.—Station 68, 44°38.3′N, 126° 01.0′W, 2,860 m, 21 May 1964.

RELATIONSHIP.—The type-species, *L. xenopus* K. H. Barnard (1932), differs from *L. nubifer* in the much shorter ocular lobes, the presence of a dorsal tooth on pleonite 3 as well as pleonite 4, a rudimentary anterior lobe on coxa 5, a narrowed posterior lobe on coxa 6 and in the presence of small teeth on coxae 1–3. In *L. xenopus* the posterior spur on pereopod 3 is long and sharp in juveniles and short and blunt in adults.

DISTRIBUTION.—Oregon, 2,860 m.

Lepidepecreum garthi Hurley

Lepidepecreum garthi Hurley 1963, pp. 53–58, figs. 15–17.

MATERIAL.—Stations 2 (1), 51 (2), 52 (1), 53 (1).

DISTRIBUTION.—Oregon to southern California, 30–225 m.

Orchomene decipiens (Hurley)

Orchomenella decipiens Hurley, 1963, pp. 127–130, figs. 43–44.—J. L. Barnard, 1966a, p. 70; 1966b, p. 25.
Orchomene species, J. L. Barnard 1964a, p. 231.

MATERIAL.—Stations 21 (2), 30 (1), 45 (1), 52 (1), 74 (2).

DISTRIBUTION.—Oregon to Baja California, 35–793 m.

Orchomene minuta (Kroyer)

Anonyx minutus Krøyer, 1846, pp. 23–30, pp. 42–43.
Orchomenella minuta.—Sars, 1895, pp. 66–67, pl. 24: fig. 1.—

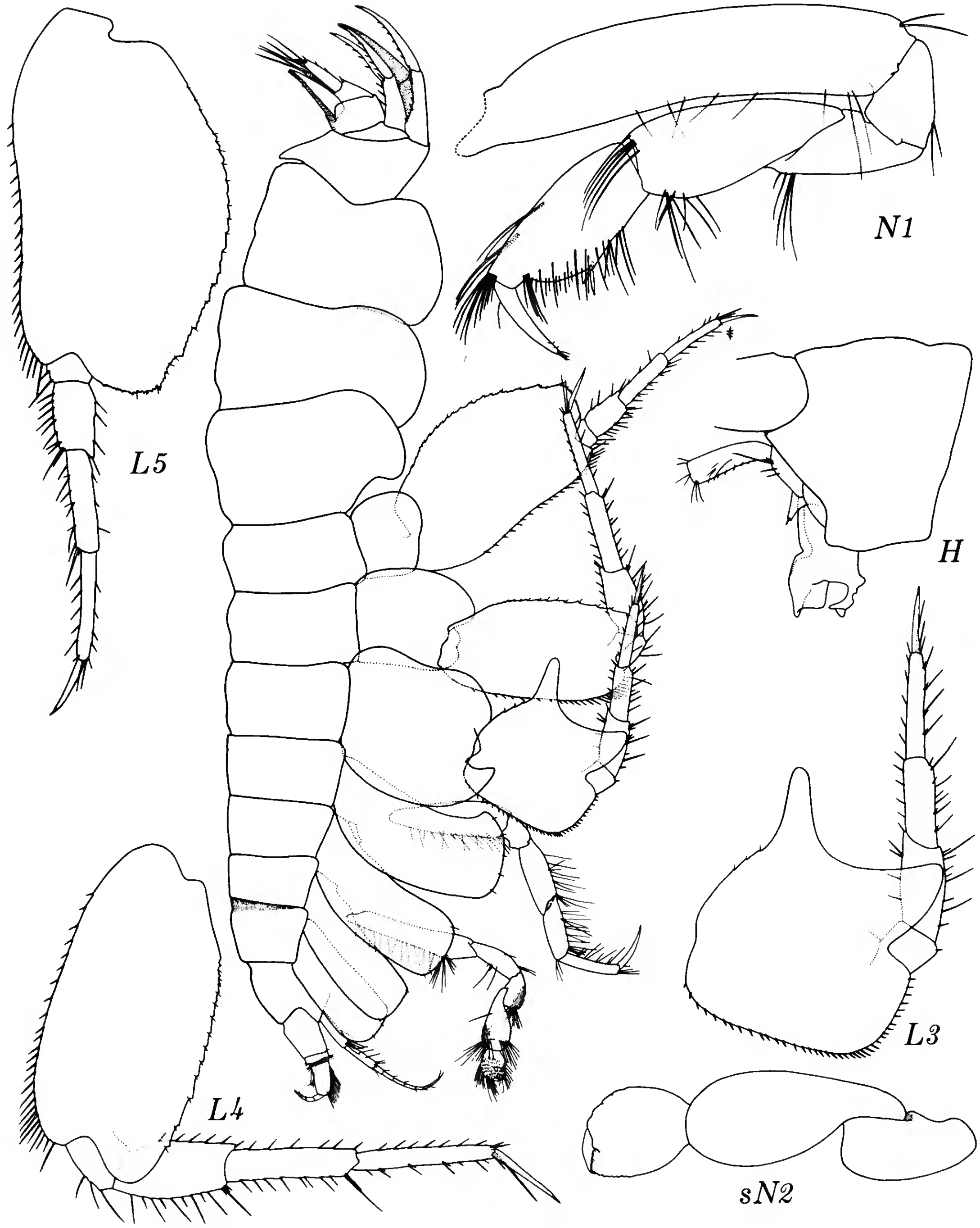

FIGURE 26.—*Lepidepecreoides nubifer*, new species, holotype, male, 13.5 mm, Oregon 68.

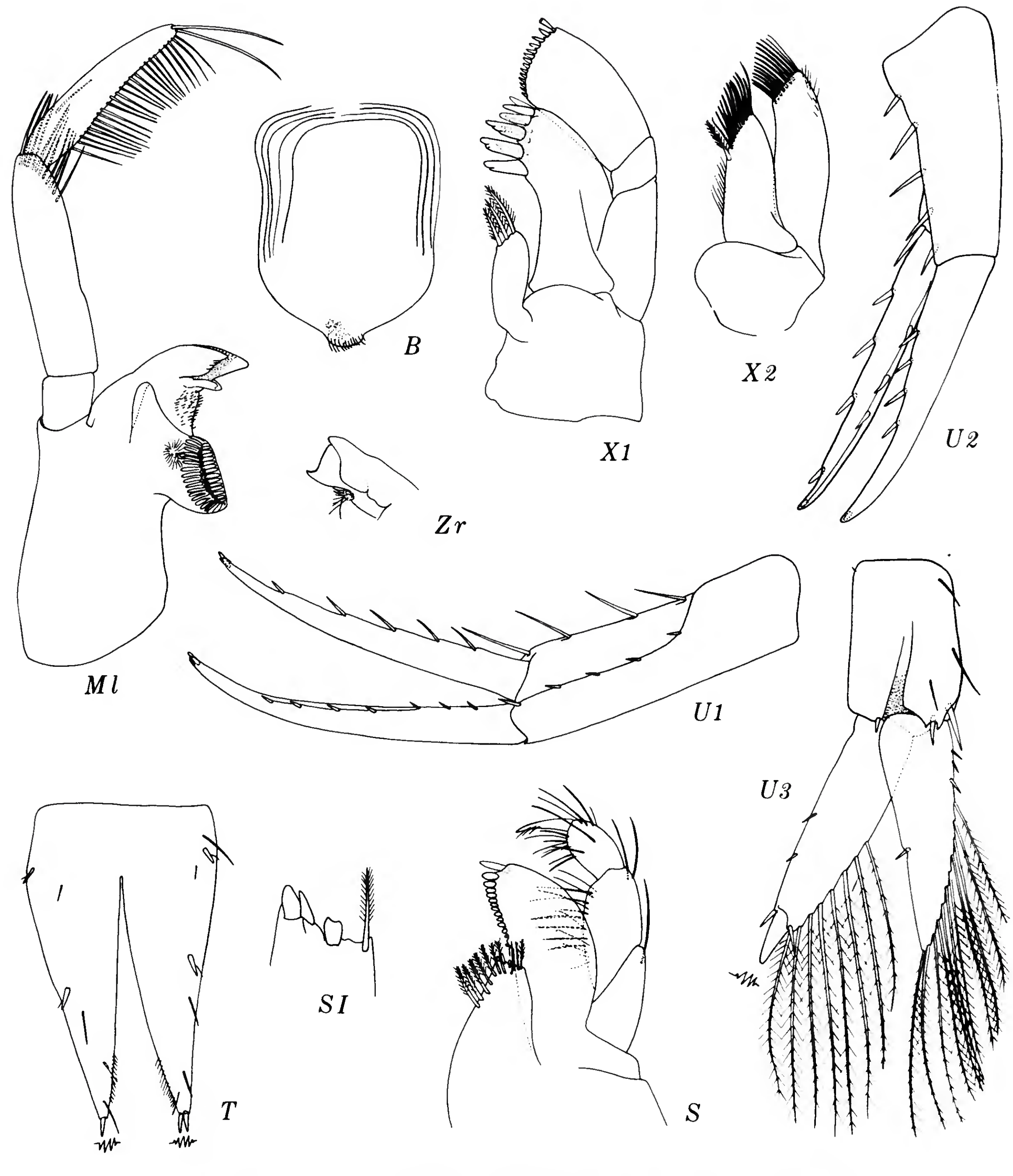

FIGURE 27.—*Lepidepecreoides nubifer*, new species, holotype, male, 13.5 mm, Oregon 68.

Shoemaker, 1930, pp. 12–13.—Stephensen, 1935, pp. 107–109.—Gurjanova, 1962, pp. 154–157, figs. 41–43.

DIAGNOSIS.—Eyes present, ommatidia compact; lateral cephalic lobes sharply pointed; article 1 of antenna 1 about 1.5 times as long as broad, not distinctly keeled dorsally, article 1 of flagellum equal to articles 2–3 of peduncle in length, accessory flagellum 4+-articulate; epistome broadly rounded and projecting in front of upper lip; coxa 1 unexpanded; coxa 5 with posterior lobe slightly longer than anterior, coxa 6 with elongate posterior lobe; article 5 of gnathopod 1 with rounded, unprojecting posterior lobe half as long as remainder of article, hand scarcely tapering distally, articles 5 and 6 subequal to each other in length, dactyl fitting palm; gnathopod 2 minutely chelate, articles 5–6 equal to each other in width, pereopods 1–2 with locking spines unmodified, normally small; pereopods 3–5 with article 2 symmetrically expanded, posterior lobe extending only to end of article 3, article 5 slightly shorter than article 4 (ratio of 7: 8, counting only anterior edge of article 4); inner ramus of uropod 3 reaching end of article 1 of outer ramus; telson cleft about two-thirds its length; pleonal epimeron 3 posteriorly smooth, minutely sinuous and posteroventral corner slightly extended and sharp; urosomite 1 with weakly rounded dorsal hump.

REMARKS.—Within this diagnosis, based primarily on the literature of the species as it is known in the Atlantic Ocean, the material from Oregon differs in the following characters: the equally projecting lobes of coxa 5; slightly elongate chela of gnathopod 2; a weak posterior bevelment of article 2 on pereopod 5 is slightly stronger; articles 4–5 of pereopods 3–5 are equal in length; posterior margins of article 2 on pereopods 3–5 slightly flattened; coxa 4 has the posteroventral margin of the posterior lobe more strongly beveled (not a character used in diagnosis); posterior lobe on article 5 of gnathopod 1 only one-third as long as remainder of article 5; anterior margin of coxa 1 slightly concave; article 1 of accessory flagellum elongate, equaling half the total length of the accessory flagellum; the lateral cephalic lobe is apically blunt like that of *O. groenlandica* (Hansen) (see Sars, 1895, pl. 26: fig. 1); eyes very weak, scarcely pigmented (in alcohol) and ommatidia sparse, poorly compacted.

The degree of difference in these characters appears to be of magnitude equivalent to that shown between Atlantic and Pacific specimens of *O. pinguis* (Boeck) by J. L. Barnard (1967a, p. 59). The character differences of cephalic lobes between Atlantic and Pacific specimens of *O. minuta* have the most serious taxonomic consequences of any, as they have been utilized as a major part of dichotomies in keys to species of the genus. *Orchomene minuta* and *O. pinguis* appear to be closely related; *O. minuta* has a much more broadly produced epistome than does *O. pinguis;* and *O. minuta* lacks serrations on pleonal epimeron 3, has a sharp posteroventral corner on pleonal epimeron 4, and a more slender article 5 on gnathopod 2.

MATERIAL.—Stations 61 (1), 72 (1), 1,001 (1).

DISTRIBUTION.—Circumboreal, 4–180 m.

Orchomene pacifica (Gurjanova)

Orchomenella pacifica Gurjanova, 1938, pp. 252–254, fig. 3; 1951, p. 287, fig. 155; 1962, pp. 174–177, figs. 52–53.—J. L. Barnard, 1964b, p. 92, fig. 13; 1966a, p. 70; 1966b, p. 25.

MATERIAL.—Stations 2 (1), 10 (1), 22 (1), 37 (1), 38 (1), 54 (1).

DISTRIBUTION.—Northwestern Pacific Ocean (Japan Sea, Okhotsk Sea), 29–129 m; Oregon to southern California, 46–421 m.

Pachynus barnardi Hurley

Pachynus barnardi Hurley, 1963, pp. 31–35, figs. 6–7.—J. L. Barnard, 1966a, p. 70; 1966b, p. 26.
Pachynus species, J. L. Barnard, 1964a, p. 232.

MATERIAL.—Stations 37 (1), 38 (1), 72 (7), 78 (2).

DISTRIBUTION.—Oregon to Baja California, 12–800 m, mainly 12–373 m.

Socarnoides illudens Hurley

Socarnoides illudens Hurley, 1963, pp. 79–85, figs. 22–24.

MATERIAL.—Station 64 (1).

DISTRIBUTION.—Oregon to southern California, 20–156 m.

Oedicerotidae

Bathymedon covilhani J. L. Barnard

Bathymedon covilhani J. L. Barnard, 1961b, p. 85, fig. 53; 1966a, p. 75, fig. 27; 1967a, p. 107.

MATERIAL.—Stations 3 (1), 10 (1), 20 (1), 23 (1).

DISTRIBUTION.—Oregon, 200–800 m; southern California to Panama, 549–1,720 m.

Bathymedon flebilis J. L. Barnard

Bathymedon flebilis J. L. Barnard, 1967a, pp. 107–109, fig. 49.

In its coxae, pereopods, and gnathopods, this specimen corresponds to that figured by Barnard (1967a) in contrast to *Bathymedon* species A described herein.

MATERIAL.—Station 25 (1 female).

DISTRIBUTION.—Oregon to Baja California, 800–2,398 m.

Bathymedon pumilus J. L. Barnard

Bathymedon pumilus J. L. Barnard, 1962e, pp. 351–353, fig. 1.

MATERIAL.—Stations 21 (1), 25 (1), 37 (3), 45 (1), 51 (1).

DISTRIBUTION.—Southern California, 73–183 m; Oregon 150–225 m, with one record of 800 m.

Bathymedon vulpeculus, new species

FIGURE 28

DIAGNOSIS.—Eyes absent; rostrum of medium length, slender, acute, nearly straight, reaching about halfway along article 1 of antenna 1 and being about twice as projected as lateral cephalic lobe; anteroventral cephalic margin below antennal sinus nearly vertical, dorsally produced into a short, narrow quadrate extension; epistome rounded in front; article 3 of first antennal peduncle less than half as long as article 1; coxa 1 strongly produced forward; palms of gnathopods longer than hind margins of sixth articles; article 5 of gnathopod 1 about 110 percent and article 5 of gnathopod 2 about 145 percent as long as their sixth articles, gnathopod 1 with massive, broad but short posterior lobe, gnathopod 2 with scarcely any but a broad distal lobe posteriorly; dactyl of pereopods 1–2 about as long as sixth article; pleonal epimera typical; telson short, apically rounded, poorly setose (setae missing, shown by sockets in drawing); body densely covered, especially posteriorly commencing about pereonal segments 4–5, with very minute, broadly triangular, ragged scales, general density shown by inset of pleonal epimera, scales so small as to be poorly resolved under oil-immersion but very dense and noticeable because of the fuzzy appearance of the posterior body.

HOLOTYPE.—USNM 127129, male, 4.8 mm. Unique.

TYPE-LOCALITY.—Station 25, 44°39.3′N, 128°57.4′W, 800 m, 24 January 1963.

RELATIONSHIP.—This species is closely related to *Bathymedon longimanus* (Boeck) (in Sars, 1895, pl. 117) but differs by the slightly convex, nonemarginate posterior end of the telson, has a narrow, quadrate lateral cephalic lobe differentiated from the anterolateral cephalic margin, evenly rounded outer lobes of the lower lip apically, instead of quadrate medial corners, the mandibular palp article 3 is nearly four-fifths as long as article 2 and bears about 17–18 marginal setae on the inner edge as well as the 4 apical setae (3 only seen in *B. longimanus*), the inner marginal setae extending proximally along the article about three-fourths of its length; otherwise the mouthparts, rostrum, gnathopods, and pereopods are similar to those of *B. longimanus.* The new species is also closely similar to *B. acutifrons* Bonnier (1896), a taxon that differs from *B. longimanus* primarily in its absence of eyes, and differs in the same characters as stated for *B. longimanus,* except that the lower lips of *B. acutifrons* and the new species are similar in the roundness of the apex (anterior) of the outer lobes.

Article 5 of gnathopod 2 is considerably longer in *B. vulpeculus* than in two other related species, *B. ivanovi* and *B. subcarinatus* (both Bulycheva, 1952). *Bathymedon roquedo* J. L. Barnard (1962e) has a slight resemblance in head and gnathopods to *B. vulpeculus,* but its rostrum is much stouter, bears distinct but poorly developed eyes, and has a less massive posterior lobe on article 5 of gnathopod 1.

Bathymedon species A

FIGURES 29–30

Cf. *Bathymedon flebilis* J. L. Barnard, 1967a, pp. 107–109, fig. 49.

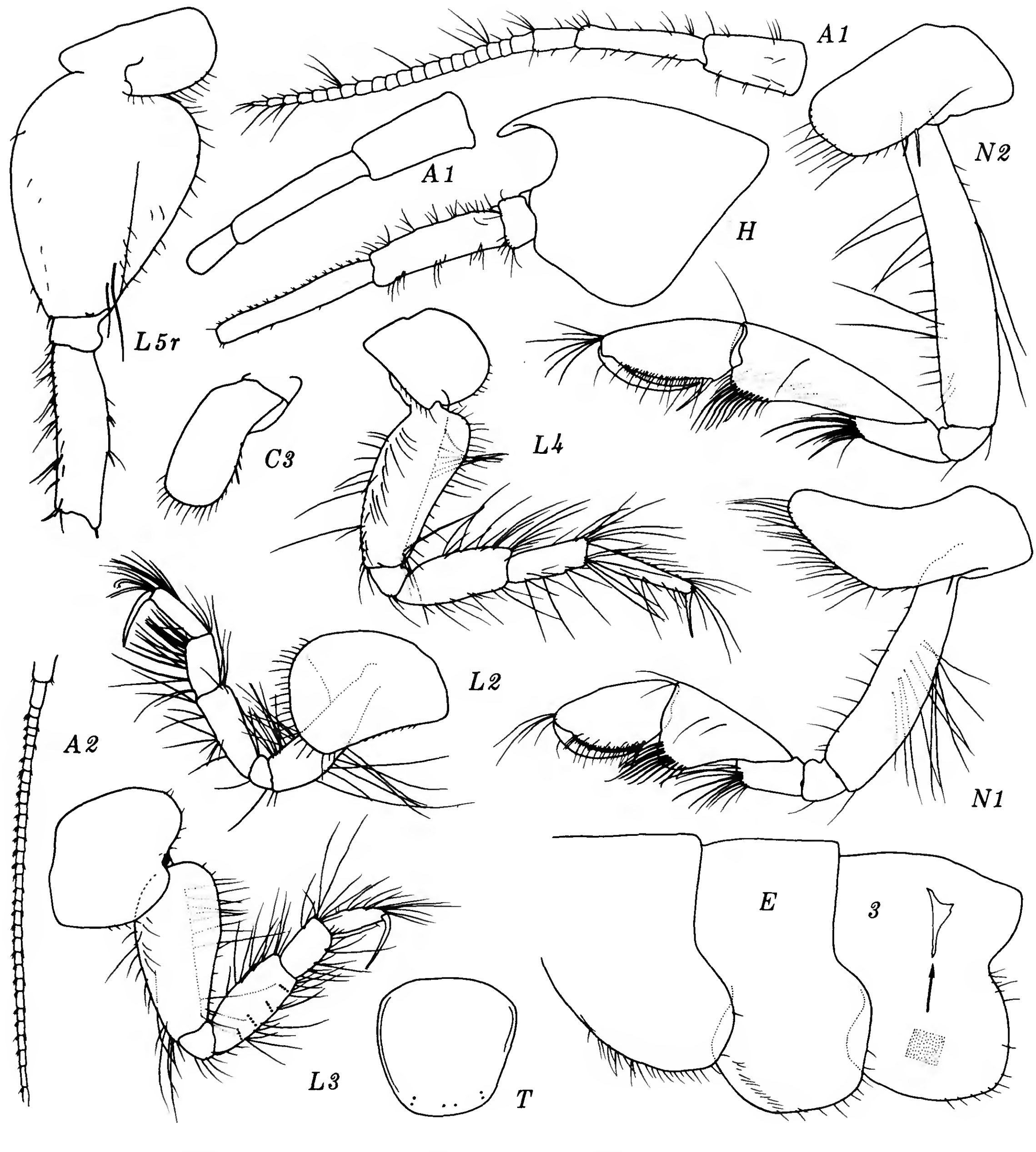

FIGURE 28.—*Bathymedon vulpeculus*, new species, holotype, male, 4.8 mm, Oregon 25.

MATERIAL.—Stations 7 (2), 35 (1).

These specimens bear close resemblance to *B. flebilis* but differ in several minute details: the narrower second articles of pereopods 3–4, the ventrally emarginate coxae 3–4, the somewhat stouter article 5 of gnathapod 2 with its

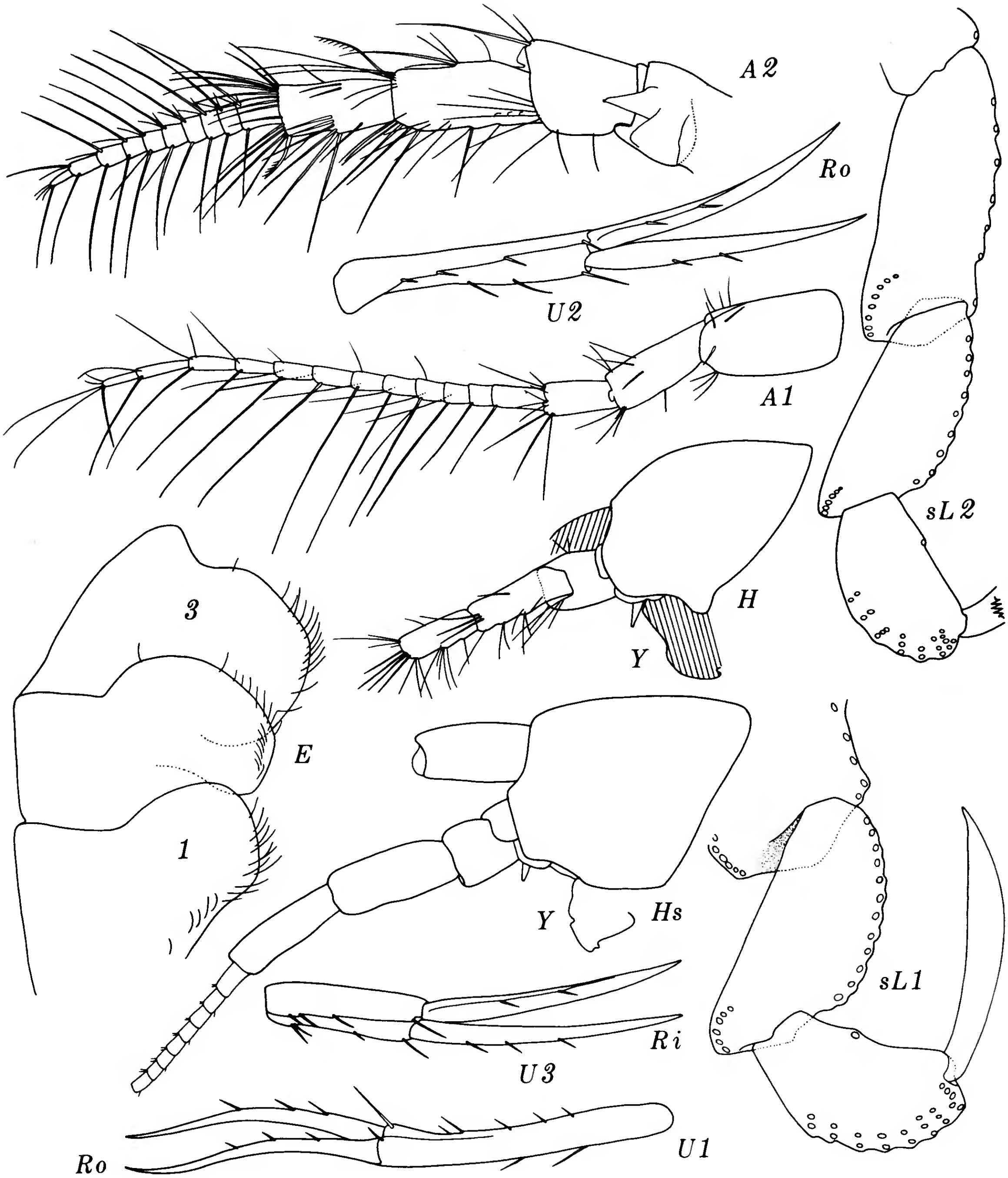

FIGURE 29.—*Bathymedon* species A, female, 4.0 mm, male, 5.5 mm, Oregon 7.

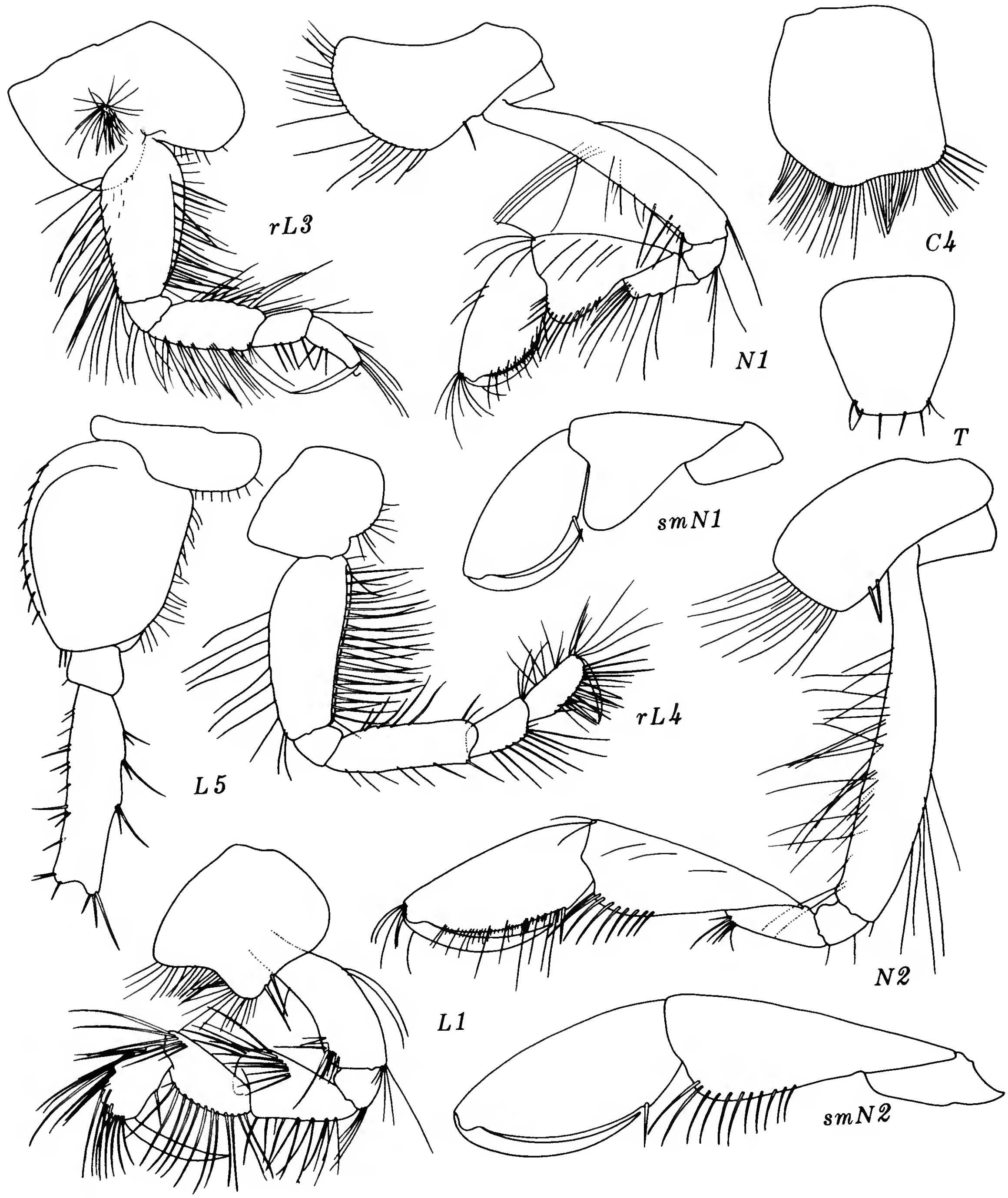

FIGURE 30.—*Bathymedon* species A, female, 4.0 mm, male, 5.5 mm, Oregon 7.

shorter posterior setal row and the undifferentiated lateral cephalic lobes. A male has antennae nearly as long as the body, the flagella being elongate.

The mouthparts of a female, 4.0 mm, correspond to those of *Bathymedon longimanus* (Boeck) (in Sars, 1895, pl. 117), but the outer lobes of the lower lip are broadly rounded distally, the inner plate of the maxilliped has one short, blunt distomedial spine mixed with the normal setae. The mandibular body has the typical callosity seen in *Bathymedon*.

DISTRIBUTION.—Oregon to Baja California, 1,748–2,800 m.

Finoculodes, new genus

DIAGNOSIS.—Rostrum distinct; upper lip rounded anteriorly from lateral view, not acute; mandibular molar small, lacking triturative surface, armed with a large articulated process, setulose; mandibular palp well developed, article 3 nearly as long as 2, both apically and marginally setose; lower lip with separate inner lobes defined at least by fold of chitin, maxillae and maxilliped resembling *Perioculodes longimanus* (Bate, in Sars, 1895); antenna 1 much shorter than 2, peduncle short, article 3 of peduncle very short, about half as long as article 2, article 2 shorter than 1, antenna 2 slender, about three-fourths as long as body; gnathopod 1 stouter and shorter than 2, both gnathopods with fifth articles supplied with very long posterior lobes guarding posterior edges of sixth articles and exceeding their palmar corners, palm of gnathopod 1 oblique, that of gnathopod 2 transverse; uropod 3 unknown.

TYPE-SPECIES.—*Finoculodes omnifera*, new species.

RELATIONSHIP.—This genus approximates *Perioculodes* Sars but differs principally by the distinct pair of inner lobes of the lower lip; in *Perioculodes* the lobes are fused into a distally convex plate. The long article 3 of the mandibular palp and the transverse palm of gnathopod 2 also may be of generic value. In gnathopods this genus resembles *Monoculopsis longicornis* (Boeck, in Sars, 1895, pl. 110), but that genus has a well-developed triturative molar and an elongate article 2 of the first antennal peduncle. In several ways this genus is more closely related to *Monoculopsis* than to *Perioculodes*, especially in the similarity of the very large coxae 4 and 5.

Finoculodes is closer to *Perioculopsis* Schellenberg (1925) in several ways than it is to *Perioculodes*. *Perioculopsis*, as based on a single female, was described as differing from *Perioculodes* in the short first antenna of the female, a third peduncular article shorter than the second, a posteriorly excavate telson and a truncate posteroventral edge of coxa 6. *Finoculodes* resembles *Perioculopsis* in all but coxa 6, a generic character of dubious value. In addition, *Finoculodes* resembles *Perioculopsis*, according to Schellenberg's description, in the presumably subequal articles 2–3 of the mandibular palp and the presence of their marginal setae. The lower lip of *Perioculopsis* was not mentioned by Schellenberg. *Finoculodes* is assumed to differ from *Perioculopsis* in its gnathopods in the same way as *Perioculodes* because Schellenberg described *Perioculopsis* as having gnathopods similar to *Perioculodes*. The major generic character of *Finoculodes* is therefore the transverse palm of gnathopod 2 and the greater dissimilarity in stoutness of article 6 of the two pairs. The lateral setal row of article 4 of pereopods 1 and 2 and presumably the very large coxae 4 and 5 are also characteristic of *Finoculodes*. Because the female of *Finoculodes* is unknown there may be an unknown antennal difference between it and *Perioculopsis*.

Arrhinopsis Stappers (1911; see Gurjanova, 1951) differs from *Perioculodes*, *Perioculopsis*, and *Finoculodes* primarily in the absence of a rostrum and from the first two genera in the unfused inner lobes of the lower lip. It thus resembles *Finoculodes* but it is characterized by the similarity between its two pairs of gnathopods.

Finoculodes omnifera, new species

FIGURE 31

DIAGNOSIS.—With the characters of the genus.

DESCRIPTION.—Head with decurved rostrum of medium length, acute, lateral cephalic lobes narrow, tapering, apically blunt; eyes absent; coxae 4 and 5 extraordinarily larger than coxae 1–3; pereopods 1–2 relatively simple, no articles expanded, dactyls about as long as sixth articles, posterior edges of articles 5–6 with especially stout setae, anterolateral surface of article 4 with a submar-

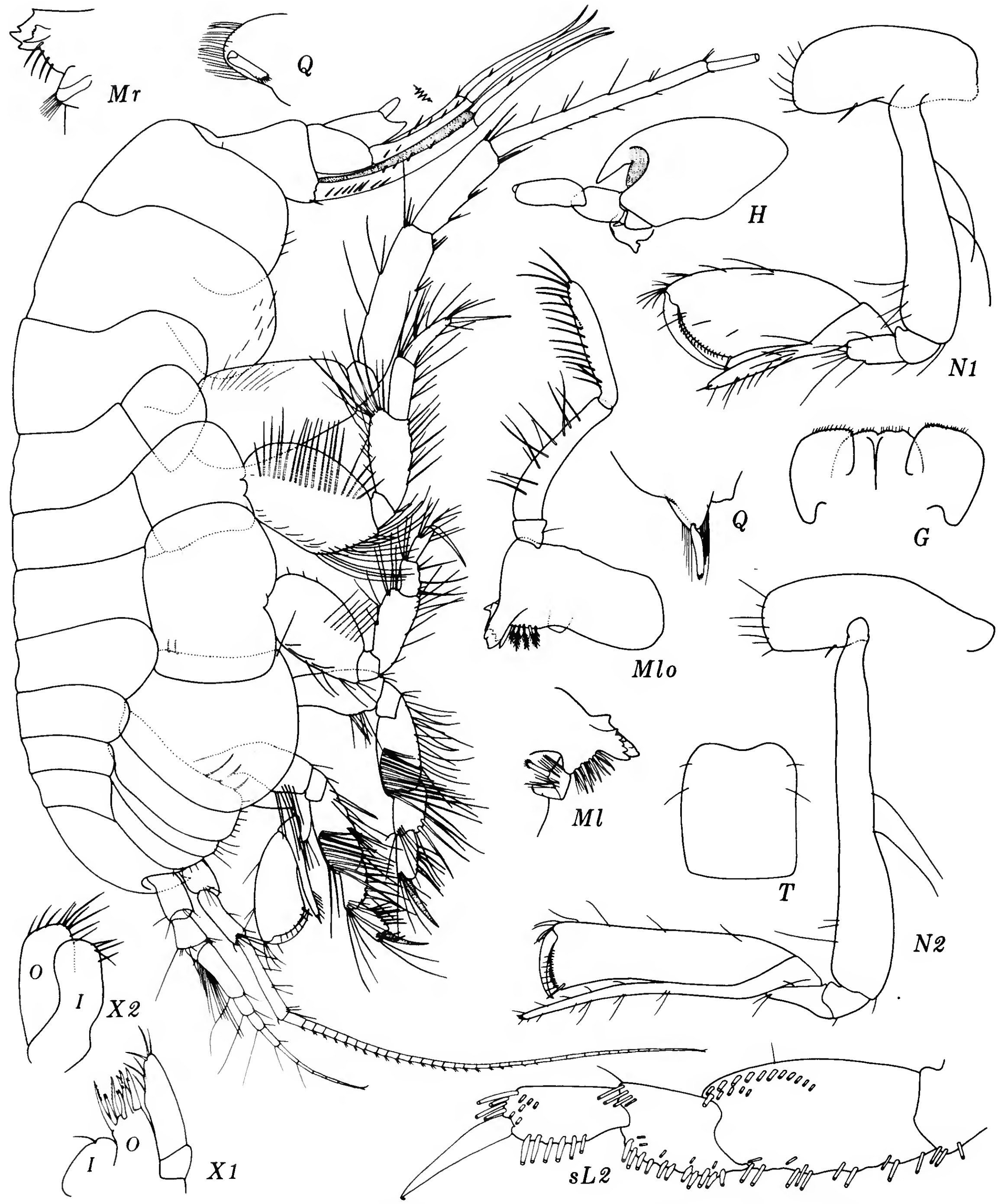

FIGURE 31.—*Finoculodes omnifera*, new genus, new species, holotype, male, 4.0 mm, Oregon 19.

ginal row of very long setae extending nearly half the articular length; posterior edges of second articles of pereopods 3–5 unusual in their lack of setae (they have not been broken off as no sockets are present), although the usual medial submarginal rows are present; pleonal epimera rounded typically and poorly setose; lobes of maxilla 2 poorly setose; lower lip illustrated with inner lobes squashed distally, normally with the appearance of the lower lip of *Monoculopsis longicornis* (see Sars, 1895, pl. 110) but inner lobes somewhat broader; molar process of mandible drawn in 3 views and conditions, difficult to resolve satisfactorily; telson distally excavate; outer plate of maxilla 1 with 7 spines, inner with 1 seta; maxilliped like that of *Perioculodes longimanus* (Bate) (see Sars, 1895, pl. 110: fig. 2).

HOLOTYPE.—USNM 127127, male, 4.0 mm. Unique.

TYPE-LOCALITY.—Station 19, 44°39.6′N, 124° 58.0′W, 800 m, 4 December 1962.

Monoculodes emarginatus J. L. Barnard

Monoculodes emarginatus J. L. Barnard, 1962e, pp. 361–363, fig. 4; 1964a, p. 234; 1966a, p. 76; 1966b, p. 26.

MATERIAL.—Stations 72 (2), 73 (1).

DISTRIBUTION.—Oregon to Baja California, 55–200+ m.

Monoculodes glyconica J. L. Barnard

Monoculodes glyconica J. L. Barnard, 1962e, p. 363, fig. 5; 1966a, p. 76.

MATERIAL.—Station 19 (1).

DISTRIBUTION.—Oregon to southern California, 226–800 m.

Monoculodes recandesco J. L. Barnard

Monoculodes recandesco J. L. Barnard, 1967a, pp. 116–118, fig. 55.

MATERIAL.—Station 67 (1).

DISTRIBUTION.—Oregon (this record) to Baja California, 2,398–2,800 m.

Monoculodes spinipes Mills

Monoculodes spinipes Mills, 1962, pp. 12–14, fig. 3.—J. L. Barnard, 1962e, pp. 368–369, fig. 10; 1966b, p. 26.

MATERIAL.—Stations 49 (1), 50 (1).

DISTRIBUTION.—British Columbia to Point Conception, California, 0–50 m.

Synchelidium shoemakeri Mills

Synchelidium shoemakeri Mills, 1962a, pp. 15–17, figs. 4, 6A.—J. L. Barnard, 1966a, p. 79; 1966b, p. 27; 1969b, p. 195.

MATERIAL.—Stations 61 (1), 72 (3).

DISTRIBUTION.—British Columbia to southern California, 0–183+ m.

Synchelidium species

Material in the following samples belongs to undescribed species, but the condition or sparsity of the specimens does not warrant description: Stations 1, 10, 22, 37, 49, 70.

Westwoodilla caecula (Bate)

Westwoodia caecula Bate, 1857, p. 140.
Halimedon Mølleri Boeck, 1871, p. 169–170.
Halimedon Mülleri.—Sars, 1895, pp. 327–329, pl. 115.
Halimedon acutifrons Sars, 1895, pp. 329–330, pl. 116: fig. 1.
Westwoodilla caecula.—Enequist, 1950, pp. 333–338, figs. 40–56.—Mills, 1962, pp. 5–9, fig. 1.—J. L. Barnard, 1962e, p. 370; 1964a, p. 235; 1966a, p. 80 (forma *acutifrons*); 1966b, p. 27.

MATERIAL.—Stations 52 (1), 53 (1), 65 (1), 72 (5).

DISTRIBUTION.—Circumboreal; northeastern Pacific Ocean especially between British Columbia and Baja California, 0 (north) to 266 m.

Paramphithoidae

Epimeria cora, new species

FIGURE 32

DIAGNOSIS.—Rostrum elongate, straight, as long as article 1 of antenna 1, lateral cephalic lobes small, mammilliform, anteroventral cephalic corner rounded-quadrate; eyes ovate, extremely faint, borne on obsolescent bulge; pereon scarcely carinate dorsally, only pereonite 7 with small, blunt posterodorsal tooth, pleonites 1–2 with slightly en-

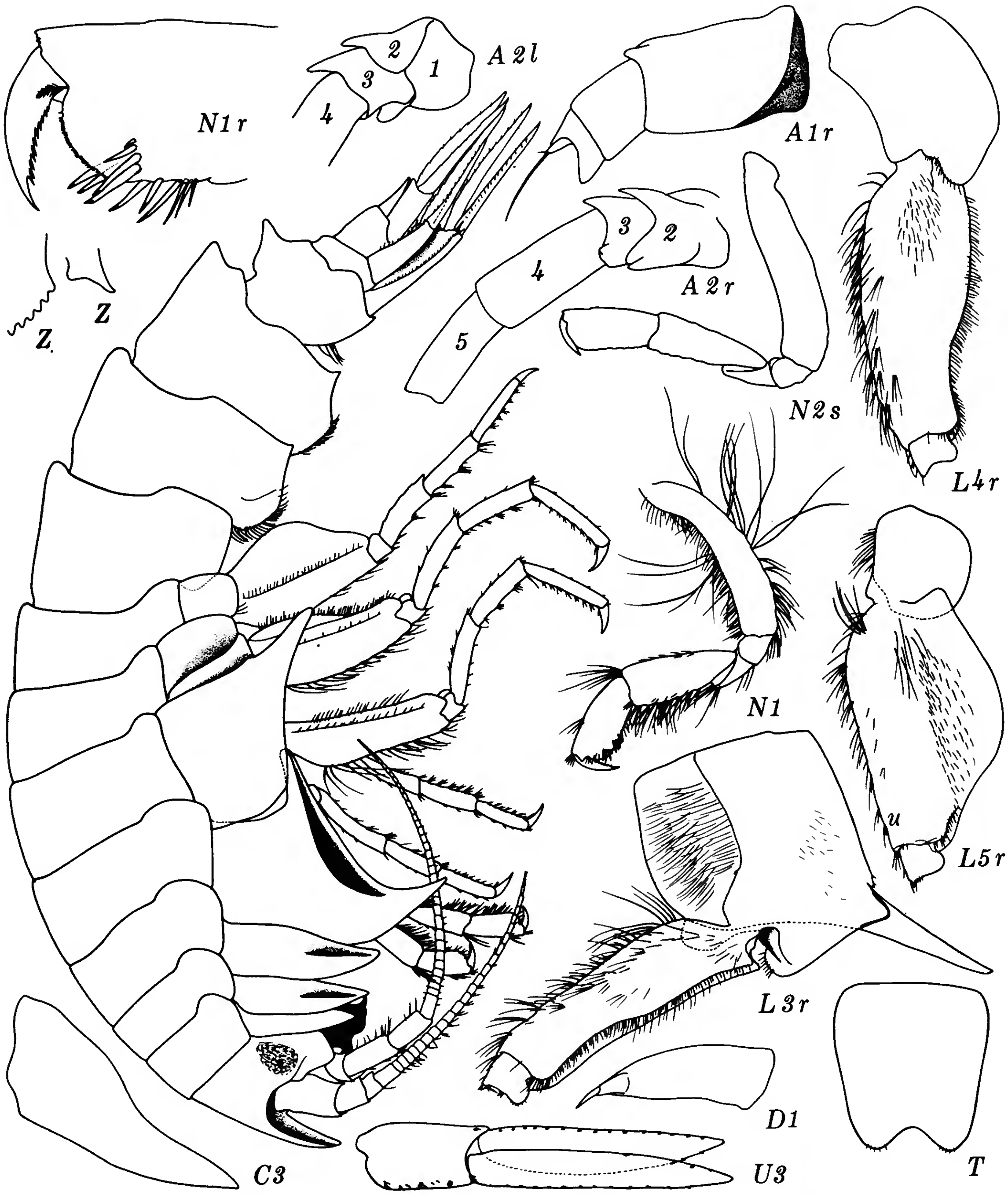

FIGURE 32.—*Epimeria cora,* new species, holotype, female, 17 mm, Oregon 83.

larged dorsal tooth, tooth of pleonite 3 subacute, short, tooth of pleonite 4 erect, slender, with deep notch anterior to it; posteroventral corner of pleonal epimeron 1 subquadrate, of epimera 2–3 with a small, acute tooth, posterior margin of epimeron 3 convex but lacking accessory tooth, lateral surface of epimeron 2 with ridge, epimeron 3 lacking ridge; crescentic curve of coxae 4–5 strongly developed, anteroventral cusp of coxa 4 slightly reverted, posteroventral tooth of coxa 5 of medium length, coxa 6 with lateral ridge terminating ventrally in blunt tooth; article 2 of pereopods 3–5 lacking jagged notches, each with lateral ridge; article 2 of pereopod 5 proximally dilated; telson short, deeply emarginate.

HOLOTYPE.—USNM 127136, female, ovigerous, 17.0 mm.

TYPE-LOCALITY.—Station 83, 44°21.3′N, 125° 13.9′W, 2,086 m, 14 August 1964.

MATERIAL.—Two specimens from the type-locality.

RELATIONSHIP.—This species has very close affinities with *Epimeria glaucosa* J. L. Barnard (1961b) and *E. subcarinata* Nagata (1963), and the three entities may be subspecies of a common stem. *Epimeria glaucosa* was described from the Tasman Sea and *E. subcarinata* from Japan. The differences among the three species are minor in comparison to differences among other species of *Epimeria: E. subcarinata* has a short rostrum, obsolescent teeth on pleonites 1 and 2, a very weak telsonic emargination, and slightly elongate telson; *E. glaucosa* has very sharp teeth on pleonites 1–2, a long rostrum, a weak telsonic emargination, and shortened telson; *E. cora* has medium teeth on pleonites 1–2, a long rostrum, strong telsonic emargination, and short telson. The lateral cephalic lobes of *E. glaucosa* and *E. subcarinata* are closer to each other than they are to *E. cora* in the sharpness of the angles, but *E. glaucosa* has a distinct ocular bulge marked off from the lateral cheek not seen in the other two species.

The condition of the lacinia mobilis in the right mandible may be of taxonomic value in this genus, but its condition in *E. glaucosa* and *E. subcarinata* is unknown. In the new species at hand the lacinia mobilis is a simple, bifid, and slightly gaping lamella; whereas in other species of *Epimeria* it has been shown to be multiserrate like the left lacinia mobilis.

Pardaliscidae

Various species of *Halice* Boeck were transferred to *Pardisynopia* by J. L. Barnard (1969a). *Halice* is well characterized by the presence of large dorsal teeth on one or more urosomites and the conjoint base of the primary flagellum on antenna 1 in both males and females. *Pardisynopia* has vestigial teeth on the urosomites and a segmented base of the flagellum on antenna 1. *Halice* and *Pardisynopia* differ from *Pardaliscella* Boeck, *Pardaliscoides* Stebbing, *Pardaliscopsis* Chevreux, and *Princaxelia* Dahl in the smoothness of the incisor of the right mandible, which in the other four genera has 3 or more large teeth or has the medial end of the incisor projecting strongly. Hence, the following two new species assigned provisionally to *Halice* and *Pardisynopia* are assumed to belong to the *Halice-Pardisynopia* group of species but, like *Halicoides nana* Birstein and Vinogradov (1960) and *H. indica* Birstein and Vinogradov (1964), combine characters of both *Halice* and *Pardisynopia*. The new species of *?Halice (ulcisor)* has urosomal teeth combined with a segmented flagellum; whereas the new species of *?Pardisynopia (lolo)* has a smooth urosome combined with a conjoint flagellar base. The two species of *Halicoides* mentioned above apparently fit the *Halice ulcisor* model. The Atlantic genus *Halicoides* Walker (1896) has never been clarified in a number of points. It definitely has a conjoint flagellar base, unlike Birstein's and Vinogradov's species, but the urosome was not described and presumably lacks teeth; hence *Halicoides anomala*, the type-species, would appear similar to *Pardisynopia lolo* described herein. *Halicoides anomala* was described by Walker as having a unique accessory flagellum in the form of nobs on article 2 of the peduncle; Walker mentioned their presence on both members of antenna 1. I do not believe that *H. nana* and *H. indica* can be retained in *Halicoides* but, like *H. ulcisor* and *P. lolo,* they fit no other genus, as they combine characters of *Halice* and *Pardisynopia*.

One is faced with the possibility of synonymizing *Halice* and *Pardisynopia* or creating two new genera to fit the character combinations between *Halice* and *Pardisynopia*. I hesitate in taking either step because of the problems outlined below.

1. A judgment on the generic value of the conjoint base of the flagellum on antenna 1 is difficult

to make and may be difficult to practice taxonomically. At least two species of Pardaliscidae—*Princaxelia abyssalis* Dahl (1959) and *Pardaliscopsis* (?) *tikal* J. L. Barnard (1967a)—have conjoint flagella in the males but not the females. Possibly subadults of *Halice* have segmented flagella, hence they would be difficult to classify as to genus. The literature is not clear on the sexual problems of this character, although a few species are definitely known to have conjoint flagella in both sexes and a few others to have segmented flagella in both sexes.

2. The presence or absence of dorsal teeth on the urosome is not an all-or-none situation. *Pardisynopia lolo* and the type-species *P. tambiella* J. L. Barnard (1961b) lack any vestiges of teeth, but *Pardisynopia tertia* (Stephensen, 1931) and *Pardisynopia synopiae* J. L. Barnard (1962b) have weak teeth and apparently the dorsal tooth (teeth) of *Halicoides nana* and *H. indica* is (are) weak.

Diagnoses of the genera *Halice, Pardisynopia,* and *Pardaliscella* are further emended in the following paragraphs in light of new species found in this study, but the characters of pereopods 4–5 have not been confirmed on several species now assigned to these genera. The characters mentioned distinguish the three genera among themselves, but they also are distinguished from other pardaliscid genera in the following combination of characters: mouthparts forming quadratiform field; mandibular palp present; maxilla 2 with 2 well-developed plates; pereopods simple; article 2 of antenna 1 not elongate; gnathopods 1–2 simple, articles 5–6 of equal width but of two extremes, very thin or moderately expanded but not with shape of those in *Nicippe,* dactyls simple and claviform; uropod 3 of normal size; telson cleft.

Halice: Telson deeply cleft; pereopod 5 as long as 4; urosome with dorsal teeth; article 1 of primary flagellum on antenna 1 conjoint and elongate; inner plate of maxilliped vestigial; gnathopods slender, article 6 slightly longer than 5.

Pardisynopia: Telson deeply cleft; pereopod 4 longer than 5; urosome with weak or no dorsal teeth; article 1 of primary flagellum on antenna 1 scarcely elongate, not distinctly conjoint; inner plate of maxilliped vestigial; gnathopods slender, article 6 slightly longer than 5.

Pardaliscella: Telson cleft halfway; pereopod 5 longer than pereopod 4; urosome dorsally smooth or teeth obsolescent, article 1 of primary flagellum scarcely elongate or not, and not clearly conjoint; inner plate of maxilliped conical and well developed (in familial context); gnathopods moderately stout, article 6 slightly shorter than 5.

Halice (?) *ulcisor,* new species

FIGURES 33–34

DIAGNOSIS OF FEMALE.—Head shorter than first 3 pereonites, lacking cowl, rostrum of medium size, reaching only halfway along mammilliform lateral lobe; accessory flagellum 4-articulate; article 1 of primary flagellum on antenna 1 slightly elongate, half as long as articles 2–3 of peduncle together; mandibular palp article 3 linear but very short, about 15 percent as long as article 2; inner plate of maxilla 1 apically subacute, bearing one long subterminal seta; coxae 1–4 tetragonal, 4 with softly rounded corners; article 6 of gnathopod 1 equal in length to article 6 on gnathopod 2, scarcely longer than article 5, article 6 tapering distally, gnathopod 1 sparsely setose, gnathopod 2 heavily setose; pereopods 1–2 of medium stoutness (see figures), pereopod 3 with rectolinear article 2, but article 2 slightly expanded on pereopod 4 and subovate and about 50 percent as broad as long on pereopod 5, pereopod 4 only slightly longer than 5; pleonal epimera 1–3 each with sinuous posterior margin and small, attenuate sharp projection at posteroventral corner; urosomites 1–2 with large sharp dorsal teeth; telson long, cleft nearly to base.

HOLOTYPE.—USNM 127122, female, 4.0 mm.

TYPE-LOCALITY.—Station 4, 44°38.8′N, 124° 54.9′W, 600 m, 22 June 1962.

MATERIAL.—Also Station 33 (1, sex unknown).

REMARKS.—This species, assigned provisionally to *Halice* combines characteristics of *Halice* and *Pardisynopia* (see "Pardaliscidae"). It has the dorsal urosomal teeth of *Halice* and the segmented flagellar base of antenna 1 of *Pardisynopia.* In *Halice* this species otherwise has affinities with *H. abyssi* (Boeck) (see Sars, 1895, pl. 145: fig. 2) but differs from that species in the basally segmented flagellum and the slightly shortened pereopod 5. The shortened article 2 of antenna 1 removes *H. ulcisor* from *Pardaliscoides* Stebbing.

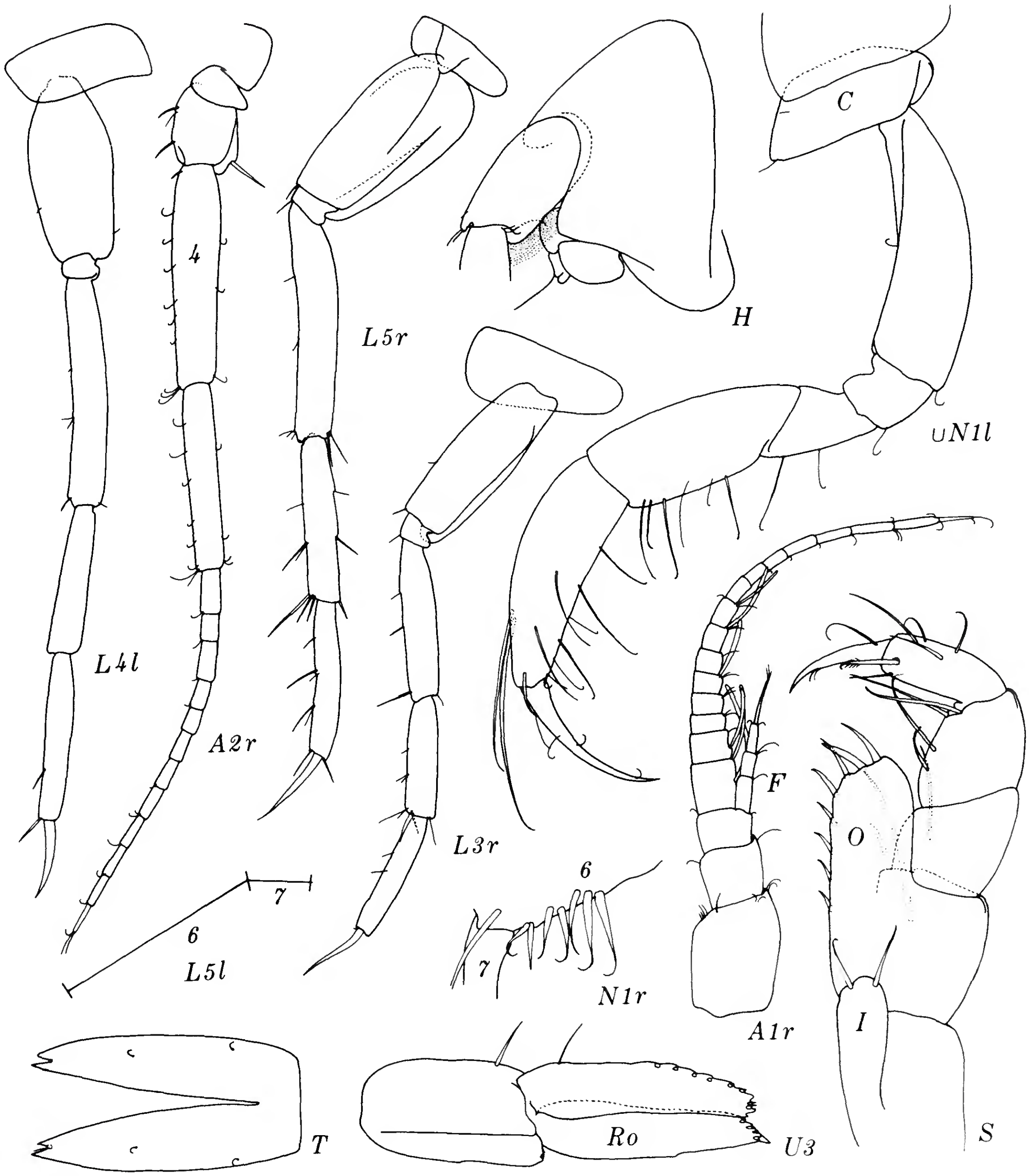

FIGURE 33.—*Halice* (?) *ulcisor*, new species, holotype, female, 4.0 mm; specimen, sex unknown ("U"), 4.3 mm, Oregon 4.

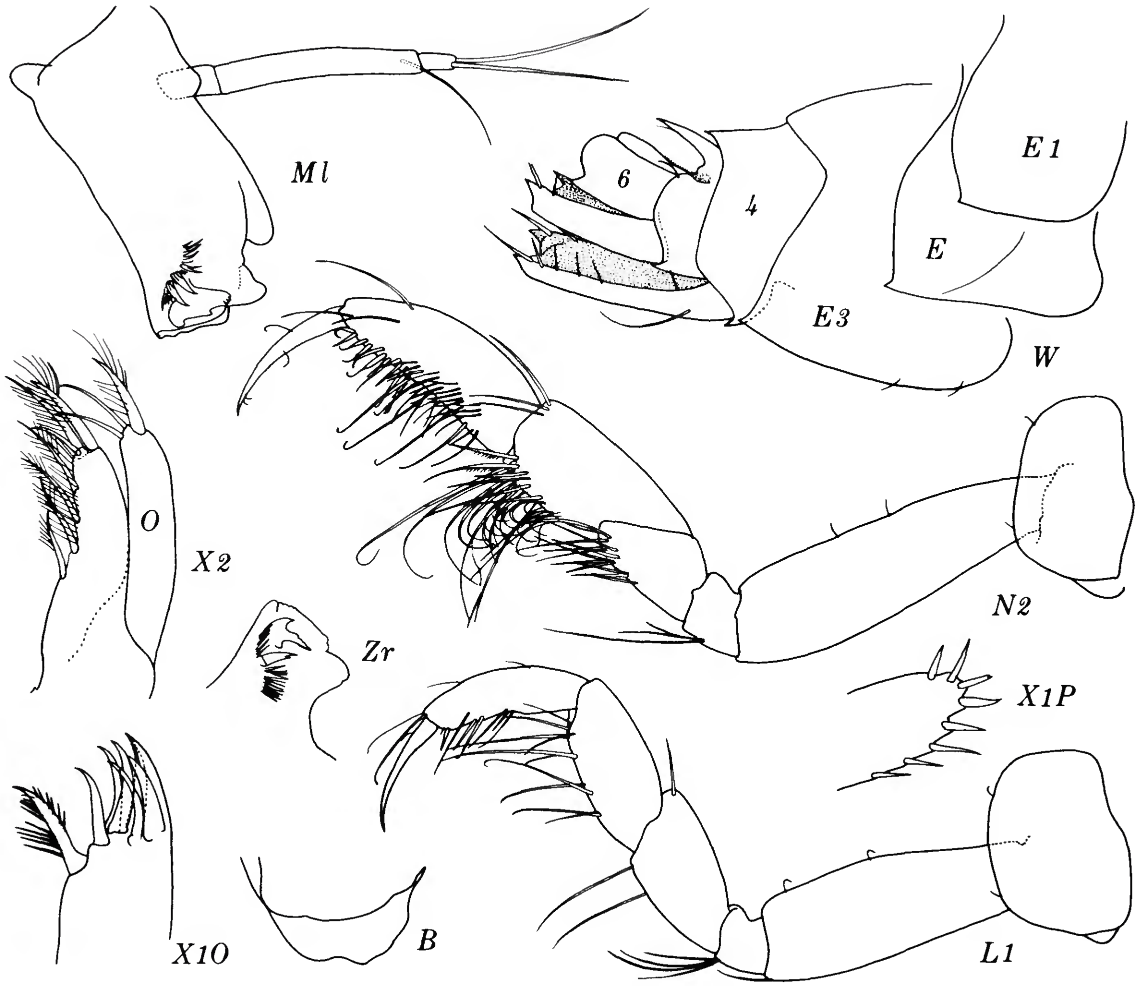

FIGURE 34.— *Halice* (?) *ulcisor*, new species, holotype, female, 4.0 mm; specimen, sex unknown ("U"), 4.3 mm, Oregon 4.

Halicoides nana Birstein and Vinogradov (1960) and *H. indica* Birstein and Vinogradov (1964) appear to be congeneric with *Halice ulcisor* whatever that genus may be, presumably not *Halicoides* (see "Pardaliscidae"). *Halice ulcisor* differs from *H. nana* in the relatively equal lengths of pereopods 4–5 and from *H. indica* in the much stouter gnathopod 1. *Halice ulcisor* differs from both of those species in the bifid condition of the lacinia mobilis on the right mandible.

DISTRIBUTION.—Oregon 600–800 m.

Halicella halona, new species

FIGURES 35–37

DIAGNOSIS.—Palp of mandible vestigial; palp of maxilliped not exceeding outer plate; posterior margin of gnathopod 1 hand deeply excavate and defined by proximal spinose protrusion; pleonal epimeron 1 posteroventrally rounded, epimera 2–3 with weak posteroventral tooth.

DESCRIPTION.—Eyes absent; lateral cephalic lobe weakly pointed, article 1 of antenna 2 nearly con-

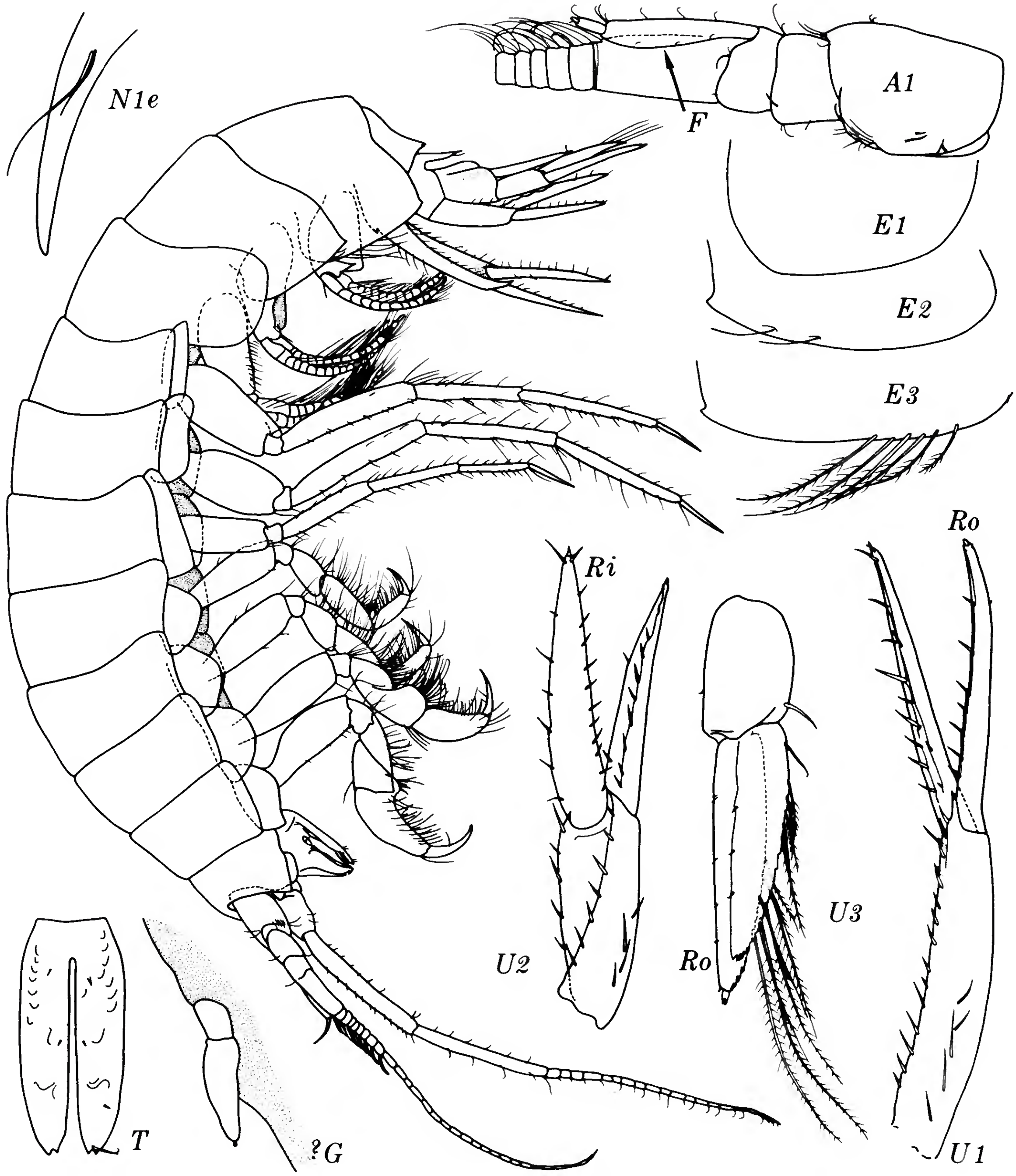

FIGURE 35.—*Halicella halona,* new species, holotype, male, 5.6 mm, Oregon 21.

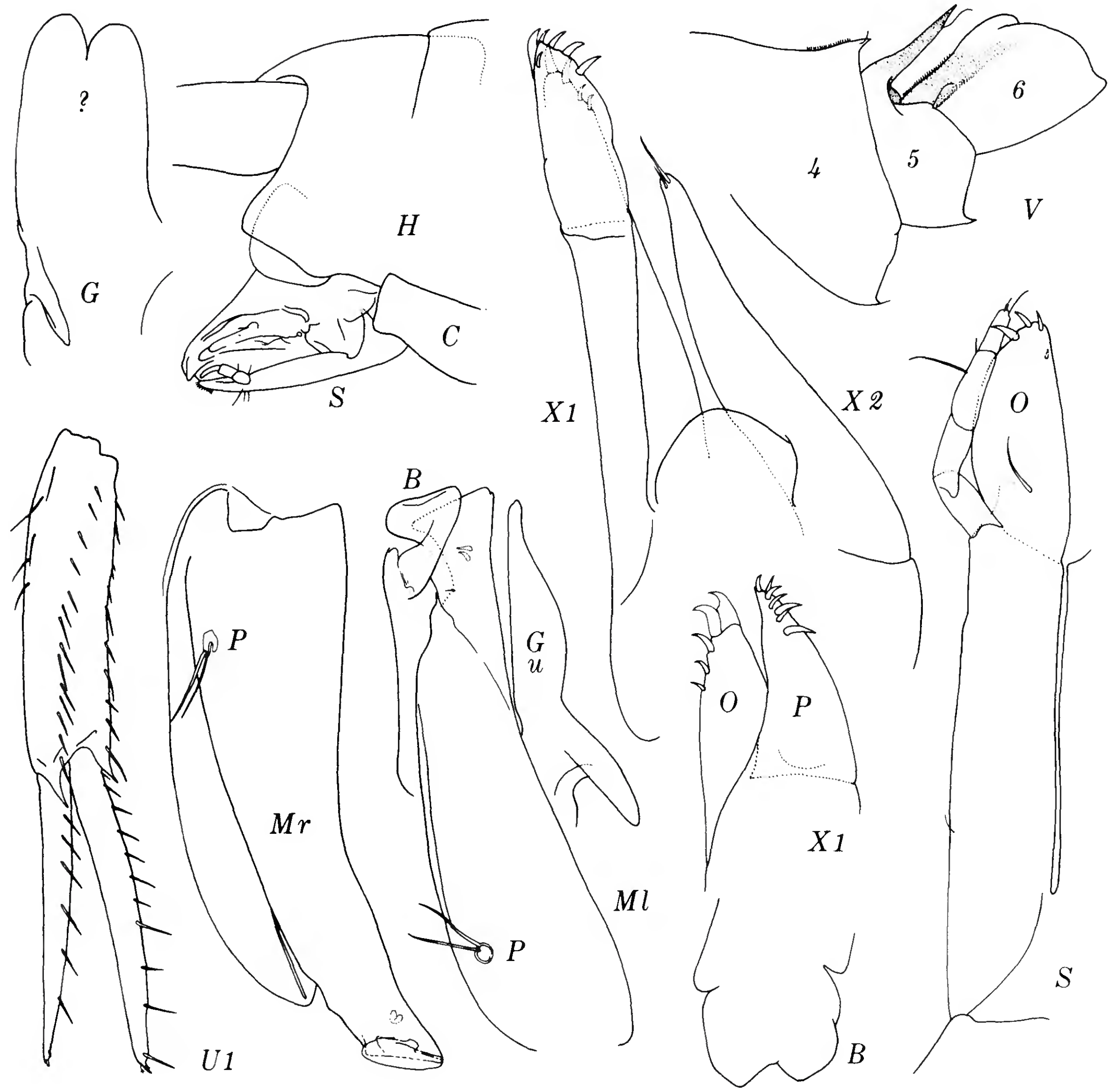

FIGURE 36.—*Halicella halona*, new species, holotype, male, 5.6 mm, Oregon 21.

cealed by cephalic lobe; primary articles of both flagella on antenna 1 equally elongate, accessory flagellum 3-articulate; upper lip apically incised; mandibular palp represented by tubercle bearing 2 setae, molar absent, spine row with 2 weak spines, incisor smooth; maxillae 1–2 apparently coalesced basally, no inner plates evident except for broad lamella connecting maxillae, maxilla 1 composed of outer plate bearing 5 hooks and 1-articulate palp with 7 spines, maxilla 2 composed of 1 elongate plate bearing 2 apical spinules; inner plates of maxilliped absent, outer plates long and attached to very elongate article, apex bearing 3 spines, medial margin with 1 submarginal spine, palp not exceeding outer plate, 4-articulate; gnathopod 2 simple, articles 5–6 subequal in length, article 5

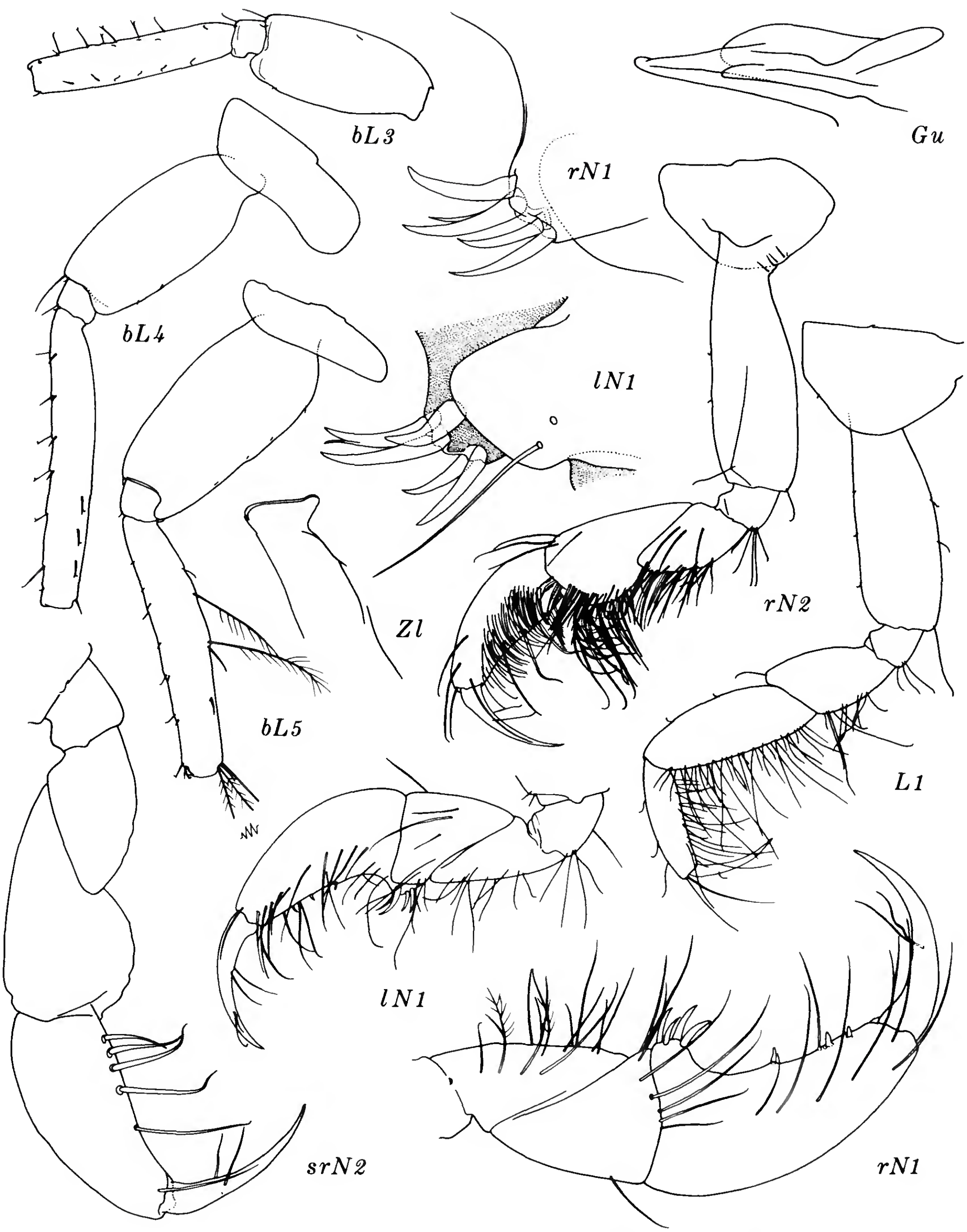

FIGURE 37.—*Halicella halona*, new species, holotype, male, 5.6 mm, Oregon 21.

longer than in gnathopod 1, gnathopod 2 more heavily setose than gnathopod 1, latter with excavate hand bearing few spinules; articles 4–5 of pereopods 1–2 weakly expanded; coxa 5 broadest; pereopod 3 much smaller than pereopods 4–5; urosomite 1 with short dorsal tooth, 5 with long thin tooth; uropods 1–2 with lateral and medial margins bearing distal cusp; outer ramus of uropod 2 with small article 2, inner ramus slightly shorter than outer; each apex of telson with one notch bearing spine.

HOLOTYPE.—USNM 127128, male, 5.6 mm. Unique.

TYPE-LOCALITY.—Station 21, 44°39.1'N, 124° 36.3'W, 200 m, 24 January 1963.

REMARKS.—The type-species of the genus, *Halicella parasitica* Schellenberg (1926), from Antarctica has a 3-articulate mandibular palp, and much smaller inner plates or longer palp on the maxilliped, suggesting that the Oregon species belongs in a genus of its own. The mouthparts remain partially enigmatical because maxillae 1–2 are so difficult to remove from the tightly conical mouthpart group that the relationships of plates are unclarified in the genus. The hand of gnathopod 1 in *H. parasitica* does not appear from Schellenberg's drawing to have an excavation marked with a proximal protrusion, but this character may vary with sexual maturity of the species. Each telsonic lobe of *H. parasitica* is tridentate and the primary flagellar articles of antenna 1 are not equivalent in length to each other. Epimeron 3 in *H. parasitica* has a rounded posteroventral corner and epimera 1–2 have sharp corners, in contrast to *H. halona*. Schellenberg apparently has not distinguished the lines separating the lateral cephalic lobe and article 1 of antenna 2.

Nicippe tumida Bruzelius

Nicippe tumida Bruzelius, 1859, pp. 99–101, pl. 4: fig. 19.—Sars, 1895, pp. 410–411, pl. 144, pl. 145: fig. 1.—Stephensen, 1931, pp. 215–216, chart 38.—Enequist, 1950, pp. 325–326, figs. 14, 15.—J. L. Barnard, 1959c, pp. 39–40, figs. 1–2; 1966a, p. 80; 1966b, p. 27.

MATERIAL.—Stations 8 (1), 17 (1), 18 (1), 19 (1), 22 (2), 23 (1), 24 (1), 25 (1), 29 (1), 32 (1), 52 (1), 54 (1), 63 (1), 73 (5), 78 (5).

DISTRIBUTION.—Possibly cosmopolitan, 34–1,367 m.

Pardaliscella symmetrica J. L. Barnard

Pardaliscella symmetrica J. L. Barnard, 1959c, pp. 40–42, figs. 3–4; 1966a, p. 80.

MATERIAL.—Stations 45 (1), 53 (1).

DISTRIBUTION.—Oregon to southern California, 92–1,749 m.

Pardaliscella (?) *yaquina*, new species

FIGURES 38–39

DESCRIPTION OF FEMALE.—Upper lip short, broad, weakly excavate, lobes shallow and symmetrical; rostrum of medium size (Figure 38H), subacute, lateral cephalic lobes scarcely projecting forward, broadly rounded; right mandibular incisor with 3 large blunt teeth, 1 bifid, lacinia mobilis bifid to base, 1 spine in spine row and a setose ridge occurring proximal to it; left mandible with about 4 weak incisorial protuberances and other serrations, lacinia mobilis broad, minutely serrate, 2 spines in spine row, with setose ridge proximal to it; mandibular palp long, articles 2 and 3 equal to each other in length; lower lip like that of *Pardaliscella boecki* (Malmgren) (in Sars, 1895, pl. 143: fig. 2); inner plate of maxilla 1 small, bearing 1 long seta; lobes of maxilla 2 very thin (Figure 39X2); palp article 4 of maxilliped with 2 long inner serrations, inner plate thin, outer plate broad (Figure 39s); coxae 1–4 much broader than long, posterior margins with mammilliform hump, coxa 5 largest of all, coxa 7 with subacute mammilliform hump posteriorly; gnathopods stout like those of *Pardaliscella* Boeck, articles 5 and 6 equal in length to each other on gnathopod 1 but article 5 longer than 6 on gnathopod 2, both gnathopods densely setose but 2 more so than 1 on article 5, article 6 with palmar area forming oblique line occupying most of posterior margin of hand and densely setose and setulose-striate, undefined, many spines biplumose, dactyls more than 80 percent as long as hands, grossly serrate on inner edges; article 2 of pereopods 1–2 tumid in middle, much wider than article 3, articles 4–5 weakly expanded, article 5 much longer than 4!, dactyls only about 60 percent as long as sixth articles; second articles of pereopods 1–5 attached near middle of coxae, pereopods 3–4 successively slightly longer but pereopod 5 much longer than 4, pereopods 3–5 with increas-

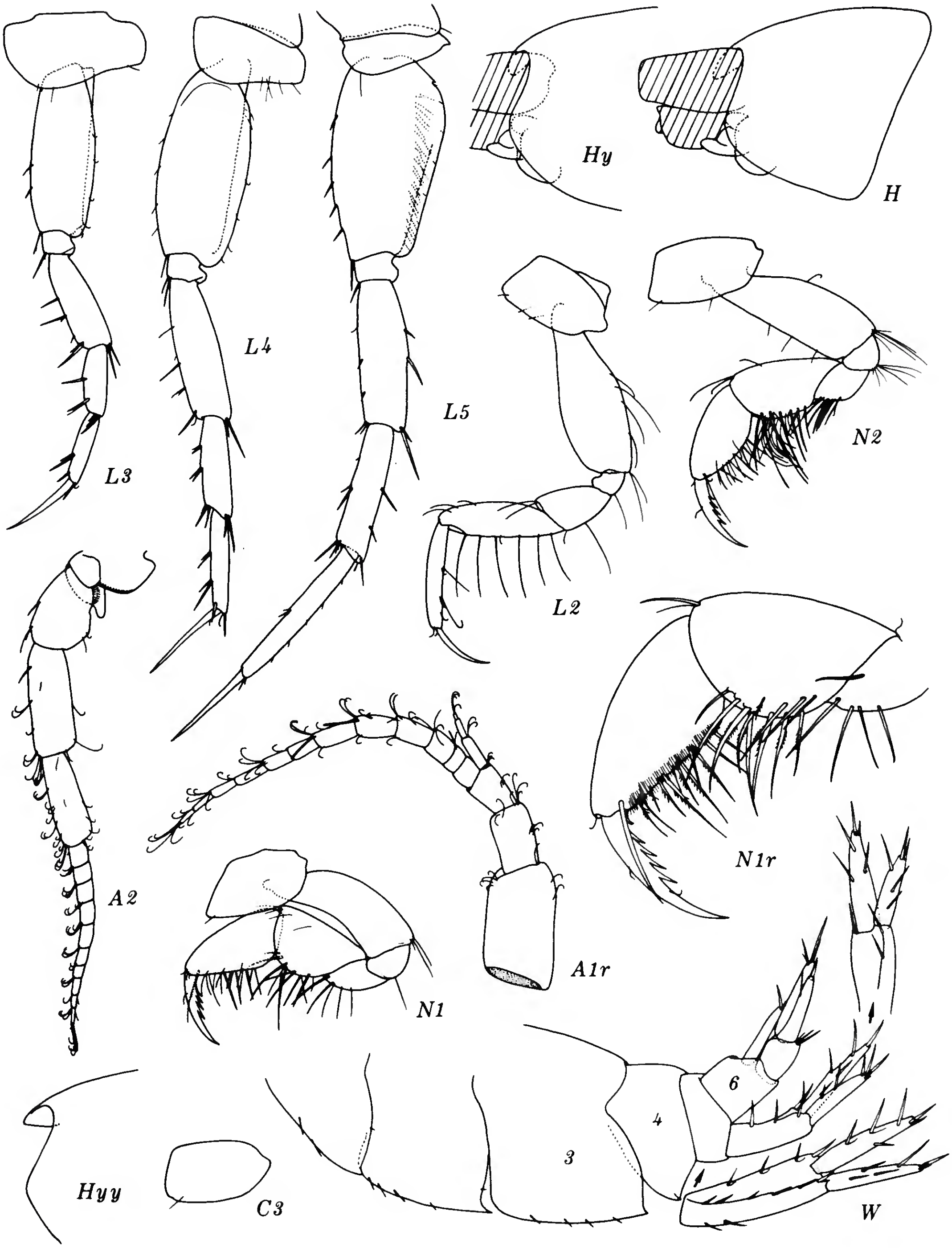

FIGURE 38.—*Pardaliscella* (?) *yaquina*, new species, holotype, female, 3.3 mm, Oregon 11.

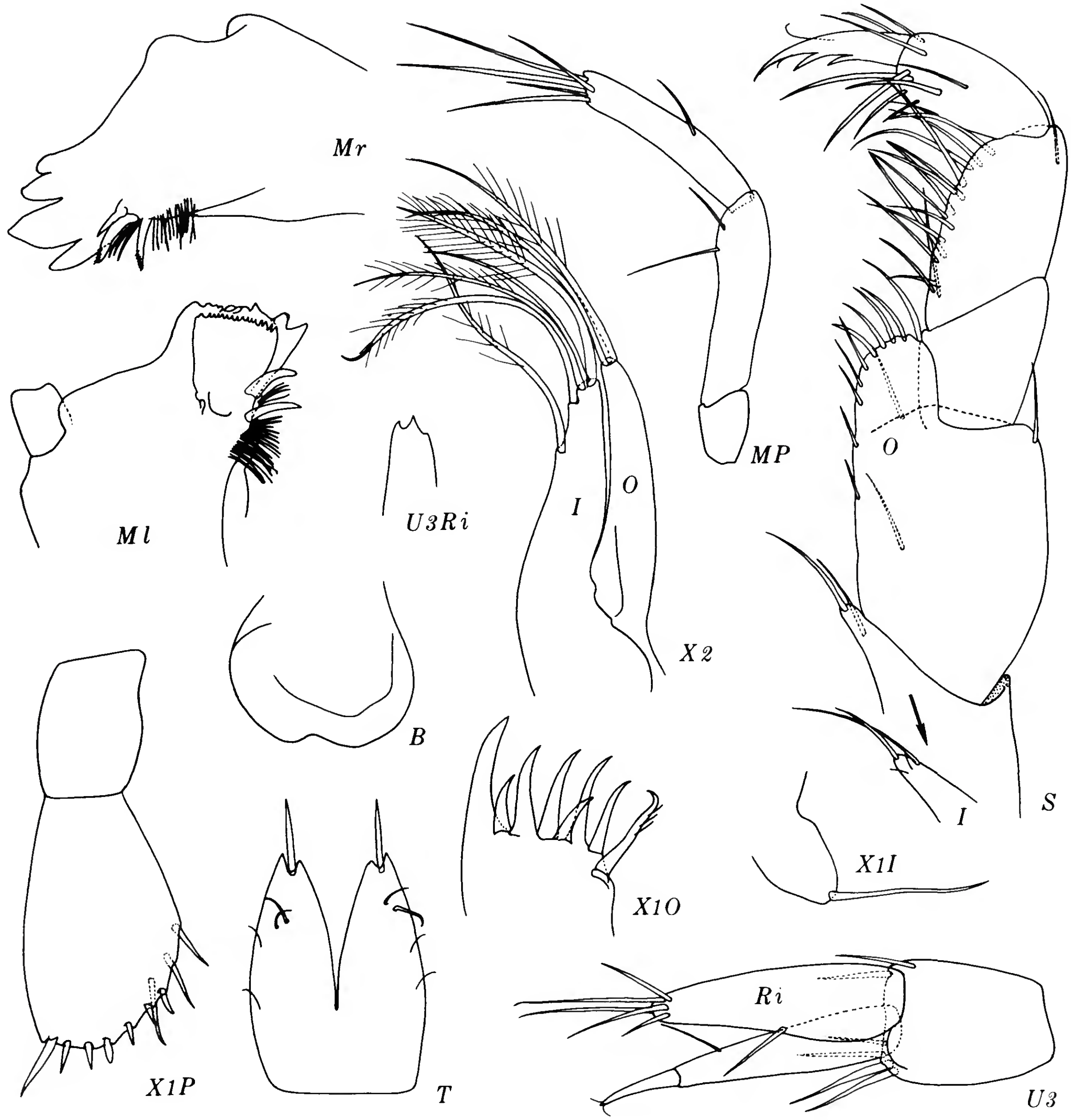

FIGURE 39.—*Pardaliscella* (?) *yaquina*, new species, holotype, female, 3.3 mm, Oregon 11.

ingly broadened article 2, that on pereopod 5 subpyriform; pleonites 4 and 5 each with very small posterodorsal tooth; pleonal epimera 1–3 with sharp posteroventral tooth, that on epimeron 2 largest, epimera 1–2 lacking lateral ridge; each of uropods 1–2 with equal rami, uropod 3 with biarticulate outer ramus, inner ramus apically spinose and reaching scarcely past end of article 1 on outer ramus; telson cleft about 60 percent its length, each apex narrow, notched and bearing 1 long spine; article 1 of primary flagellum on antenna 1 not elongate.

HOLOTYPE.—USNM 127125, female, 3.3 mm. Unique.

TYPE-LOCALITY.—Station 11, 44°38.6′N, 125° 50.0′W, 400 m, 4 October 1962.

RELATIONSHIP.—Five species of this genus have been described, but I doubt that *P. malygini* Gurjanova belongs in this genus because of its very thin gnathopods; the right mandible has not been described in that species, and it differs from other species in the very large tooth of pleonal epimeron 3. The broadly rounded epimeron 3 of *P. axeli* Stebbing and *P. boecki* (Malmgren) characterize those species. *Pardaliscella symmetrica* J. L. Barnard, a sympatriot of *P. yaquina,* has a sharply quadrate epimeron 3 and the telson is cleft only halfway. *Pardaliscella yaquina* resembles *P. lavrovi* Gurjanova in epimeron 3 but differs from that species in the deeper cleft of the telson.

DISTRIBUTION.—Oregon, 400 m.

Pardisynopia (?) *lolo,* new species

FIGURES 40–41

DIAGNOSIS.—Head shorter than first 3 pereonites, lacking cowl, rostrum large, subspatulate; accessory flagellum 2–3 articulate; article 1 of primary flagellum on antenna 1 slightly elongate, as long as articles 2–3 of peduncle together; mandibular palp article 3 linear, about 40–45 percent length of article 2; inner plate of maxilla 1 apically acute, bearing 1 medial seta; coxae 1–4 tetragonal, 4 with softly rounded corners; article 6 of gnathopod 1 much longer than article 5, equal to article 5 on gnathopod 2, article 6 tapering distally, gnathopod 1 sparsely setose, gnathopod 2 heavily setose; pereopods 1–2 of medium stoutness (see figures), pereopods 3–4 with rectolinear article 2, pereopod 5 with subovate article 2 about 65 percent as broad as long; pleonal epimera 1–3 each with sinuous posterior margin and small, attenuate, sharp projection at posteroventral corner; urosomites 1–2 smooth dorsally; telson long, cleft to base.

HOLOTYPE.—USNM 127126, male, 2.6 mm.

TYPE-LOCALITY.—Station 17, 44°39.7′N, 124° 58.0′W, 800 m, 4 December 1962.

MATERIAL.—Stations 9 (1), 17 (2).

RELATIONSHIP.—This species stands between *Halice* and *Pardisynopia* in the combination of smooth urosome and conjoint primary flagellum of antenna 1. The short article 2 of antenna 1 removes this species from *Pardaliscoides* Stebbing, and among known species of Pardaliscidae in the literature having *Halice-Pardisynopia* gnathopods, uropods, and telson, this species is unique. It especially differs from *P. synopiae* J. L. Barnard (1962b), *P. tambiella* J. L. Barnard (1961b), and *Halicoides anomala* Walker (1896) (see Chevreux and Fage, 1925) in the much narrower articles 4–5 of pereopods 1–2.

It differs from *P. anacantha* (K. H. Barnard, 1925) in the short article 3 of the mandibular palp.

Phoxocephalidae

Harpiniopsis emeryi J. L. Barnard

Harpiniopsis emeryi J. L. Barnard, 1960b, p. 334, pl. 69; 1966a, p. 84; 1967a, p. 133.

MATERIAL.—Stations 7 (3), 13 (?1), 36 (1), 42 (1), 67 (1).

DISTRIBUTION.—Oregon to Baja California, 344–2,800 m.

Harpiniopsis epistomata J. L. Barnard

Harpiniopsis epistomatus J. L. Barnard, 1960b, pp. 326–328, pls. 62–63.

Harpiniopsis epistomata.—J. L. Barnard, 1966a, p. 85; 1967a, p. 133.

MATERIAL.—Stations 8 (1), 18 (1), 20 (3), 23 (1), 79 (1).

DISTRIBUTION.—Oregon to Baja California, 371–1,626 m.

Harpiniopsis excavata (Chevreux)

Harpinia excavata Chevreux, 1887, pp. 568–570; 1900, pp. 37–38, pl. 6: fig. 1.—J. L. Barnard, 1960b, p. 353; 1962d, pp. 47–50, figs. 37–38; 1964e, pp. 18–21, fig. 16.

Harpiniopsis sanpedroensis J. L. Barnard, 1960b, pp. 328–330, pls. 64–65.

Harpiniopsis excavata.—J. L. Barnard, 1966a, p. 85; 1967a, p. 133.

MATERIAL.—Stations 5 (1), 8 (2), 11 (5), 13 (2), 18 (1), 35 (1), 39 (1), 42 (1), 44 (1), 66 (1), 69 (2), 77 (4), 82 (3).

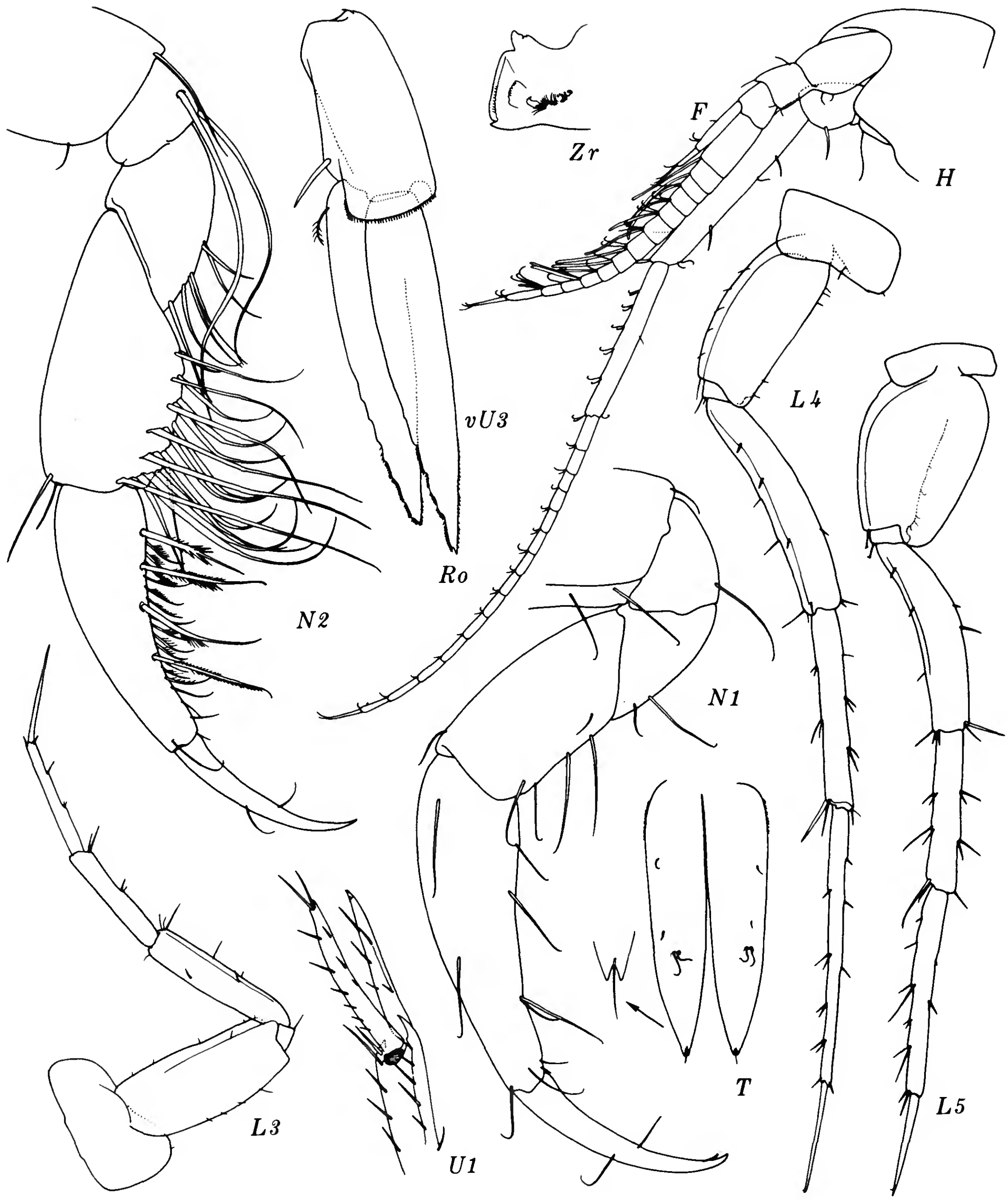

FIGURE 40.—*Pardisynopia* (?) *lolo*, new species, holotype, male, 2.6 mm, Oregon 17.

FIGURE 41.—*Pardisynopia* (?) *lolo*, new species, holotype, male, 2.6 mm, Oregon 17; male, 2.2 mm ("U"), Oregon 9.

The specimen from Oregon 35 has the typical configuration of teeth on pereopod 5 as shown by Chevreux (1900), but its pleonal epimeron 3 is not sinuate and the gland cone is long and subacute.

The specimen from Oregon 39 has an exceptionally large gland cone on antenna 2 but lacks a tooth on the anteroventral corner of the head near the gland cone.

One of the specimens from Oregon 13 has a vestigial gland cone, the elongate form of tooth on pleonal epimeron 3 and the *sanpedroensis*-form of pereopod 5.

The specimen from Oregon 42 has the typical head and pereopod 5, but pleonal epimeron 3 is nonsinuous and has the elongate form of posteroventral tooth.

The specimen from Oregon 5 is typical of the *sanpedroensis*-form of this species in all of the characters that were once used to distinguish it as a species: pereopod 5, head, gland cone, and pleonal epimeron 3.

DISTRIBUTION.—Midlatitudes of Atlantic Ocean and eastern Pacific Ocean, 400–5,110 m.

Harpiniopsis fulgens J. L. Barnard

Harpiniopsis fulgens J. L. Barnard, 1960b, p. 332, pls. 67–68; 1966a, p. 85; 1967a, p. 134.

MATERIAL.—Stations 2 (3), 8 (1), 25 (1), 30 (2), 31 (3), 37 (9), 46 (1).

This species differs from *H. similis* Stephensen (1925), a closely similar species in the Atlantic Ocean, in the presence of spines on the rami of uropods 1–2, in the subtruncate ventral margin of article 2 on pereopod 5, and the much longer article 6 of pereopod 4.

DISTRIBUTION.—Oregon to Baja California, 128–2,667 m.

Harpiniopsis galera J. L. Barnard

Harpiniopsis galerus J. L. Barnard, 1960b, p. 336, pls. 70–72; 1966a, p. 85.

MATERIAL.—Station 36 (?1); specimen of questionable identification.

DISTRIBUTION.—Southern California, 82–549 m; possibly Oregon, 2,800 m.

Harpiniopsis naiadis J. L. Barnard

FIGURE 8D

Harpiniopsis naiadis J. L. Barnard, 1960b, pp. 336–339, pl. 73; 1966a, p. 85; 1967a, p. 134, fig. 52*g,h*.

MATERIAL.—Stations 7 (1), 36 (1).

A strong possibility exists that this species is synonymous with *H. fulgens* J. L. Barnard (1960b). The two species differ in the following ways according to the original material: *H. naiadis* has a blunt and weak prolongation of pleonal epimeron 3, whereas *H. fulgens* has a sharp and moderately strong prolongation; *H. naiadis* has a weak cephalic tooth and *H. fulgens* has a strong tooth (see original figures for proportions); the spines on the peduncle of uropod 2 are slightly more elongate than in *H. naiadis*. Barnard (1967a) reports on specimens of *H. naiadis* with pleonal epimeron 3 somewhat intermediate between the extremes of the two species, and the specimens at hand from Oregon also have a slightly pointed attenuation on epimeron 3, but they have the small cephalic process and one or two setae on either ramus of uropod 2. Otherwise the length of setae on uropod 2 seems to be a character without much value in this case because the differences are relatively minor. The depth records of 2,800 m for the Oregon material far exceed 976 m reported for *H. naiadis* prior to Barnard (1967a) but are close to the maximum depth of *H. fulgens*, 2,667 m.

DISTRIBUTION.—Oregon to Baja California, 338–2,800 m.

Harpiniopsis percellaris, new species

FIGURE 42

DIAGNOSIS.—Anteroventral corner of head bearing a large acute tooth; epistome unproduced, anteriorly truncated; projection of gland cone obsolescent; article 2 of pereopod 5 produced posteroventrally downward to end of article 3, ventral edge horizontal, posteroventral corner produced into acute posteriorly projecting tooth (spur), above tooth posterior edge hemispherically incised, superior edge of excavation consistently with slight sinuosity and 2 setules, posteroproximal edge untoothed; outer ramus of uropod 1 bearing one seta, inner with 2, peduncle with one lateral, one medial distal setae; uropod 2 with about 8 long, marginal peduncular setae, rami naked.

MALE.—With typical sexual dimorphism for *Harpiniopsis* (see Barnard, 1960b).

HOLOTYPE.—USNM 127124, female, 5.4 mm.

TYPE-LOCALITY.—Station 9, 44°40.3′N, 124°59.0′W, 800 m, 4 September 1962.

MATERIAL.—Stations 6 (2), 8 (5), 9 (2), 16 (2), 20 (2), 27 (1), 33 (1), 77 (1), 80 (1).

RELATIONSHIP.—This species bears remarkable resemblance to *Harpinia mucronata* Sars (1895, pl. 54: fig. 3) even though they are in different subgenera, but *H. percellaris* lacks ventral teeth on

FIGURE 42.—*Harpiniopsis percellaris,* new species, holotype, female, 5.4 mm, Oregon 9.

the primary spur of article 2 of pereopod 5, the excavation above that tooth is much larger, the gland cone is obsolescent, and the third pleonal epimeron lacks a lateral setal row. Within the eastern Pacific geographical area, *H. percellaris* bears closest similarity to *Harpiniopsis profundis* J. L. Barnard (1960b) but differs by pereopod 5 in its domination by a single large cusp and excavation, whereas *H. profundis* has a graded series of smaller cusps and no major excavation. This new species can be related to *H. gurjanovae* Bulycheva (see Gurjanova, 1951) that has similar elements in its fifth pereopod, with 1 large spur and excavation but appended with 2 additional dorsal teeth and 2 ventral teeth; the third pleonal epimeral tooth is much shorter. *Harpinia salebrosa* Gurjanova (1951) is in the same category as *H. gurjanovae*.

Distribution.—Oregon, 600–2,600 m.

Harpiniopsis petulans J. L. Barnard

Harpiniopsis petulans J. L. Barnard, 1966a, p. 86, fig. 39; 1967a, p. 134.

Material.—Station 56 (1).

Distribution.—Oregon to Baja California, 1,265–1,720 m.

Harpiniopsis triplex, new species

Figure 43

Diagnosis.—Anteroventral corner of head with a medium-size process; epistome not produced acutely; article 2 of pereopod 5 produced downward about to end of article 4, posterodistal edge not beveled, armed with 3 medium-size teeth, with 2 small proximal teeth, ventral edge with small serrations; third pleonal epimeron with sinuous ventral edge, posteroventral corner with a very long, upturned, acute tooth; outer ramus of uropod 1 slightly shorter than inner and unarmed, inner ramus with 5 setae; outer ramus of uropod 2 unarmed, inner ramus with 3 setae.

Holotype.—USNM 127123, female, 5.8 mm.

Type-locality.—Station 7, 44°36.4′N, 125°24.8′ W, 2,800 m, 13 August 1962.

Material.—Stations 5 (1), 7 (1), 28 (1), 82 (1).

Relationship.—This species bears closest resemblance to *Harpiniopsis profundis* Barnard (1960b) but differs by the shape of article 2 on pereopod 5; the posterodistal edge of article 2 in *H. profundis* is beveled and two of the teeth enclose a larger excavation than seen in this new species. The tooth of the third pleonal epimeron is larger in the new species and strongly upturned and the inner ramus of uropod 2 is setose unlike *H. profundis*.

Distribution.—Oregon, 2,000–2,800 m.

Heterophoxus oculatus (Holmes)

Harpinia oculata Holmes, 1908, pp. 521–523, fig. 28.
Harpinia affinis Holmes, 1908, pp. 523–524, fig. 29.
Heterophoxus pennatus Shoemaker, 1925, pp. 22–26, figs. 1–3.
Heterophoxus oculatus.—J. L. Barnard, 1960b, pp. 320–324, pls. 59–61; 1961b, p. 71; 1966a, p. 87; 1966b, p. 27.

Material.—Stations 2 (18), 10 (18), 11 (1), 21 (14), 22 (28), 29 (1), 30 (15), 31 (5), 37 (23), 38 (6), 45 (8), 46 (8), 51 (15), 52 (8), 53 (34), 54 (25), 58 (1), 62 (1), 63 (22), 65 (12), 73 (21), 74 (13), 75 (1), 76 (9), 78 (5), 79 (2).

Distribution.—Puget Sound, Washington, to Panama, 2–1,941 m.

Metaphoxus frequens J. L. Barnard

Metaphoxus frequens J. L. Barnard, 1960b, pp. 304–306, pls. 51–52; 1964a, p. 242; 1966a, p. 88; 1966b, p. 28; 1969b, p. 196.

Material.—Stations 10 (2), 29 (1), 30 (2), 31 (1), 37 (1).

Distribution.—Oregon to Isla Isabel, Mexico, 13–458 m.

Paraphoxus bicuspidatus J. L. Barnard

Paraphoxus bicuspidatus J. L. Barnard, 1960b, pp. 218–221, pls. 15–16; 1963, pp. 462–463; 1964a, p. 243, fig. 12; 1964b, p. 103; 1966a, p. 88; 1966b, p. 28.

Material.—Stations 38 (1), 52 (1), 65 (?4).

The male from station 38 is blind, has a long epistomal cusp, a small tooth on epimeron 3, and the rostrum is considerably narrower than in the material originally figured. The specimens from station 65 are blind or their eyes have 1–2 ommatidia only, the epistomes are of the elongate form, and the hands of the gnathopods are of the broad form in this genus.

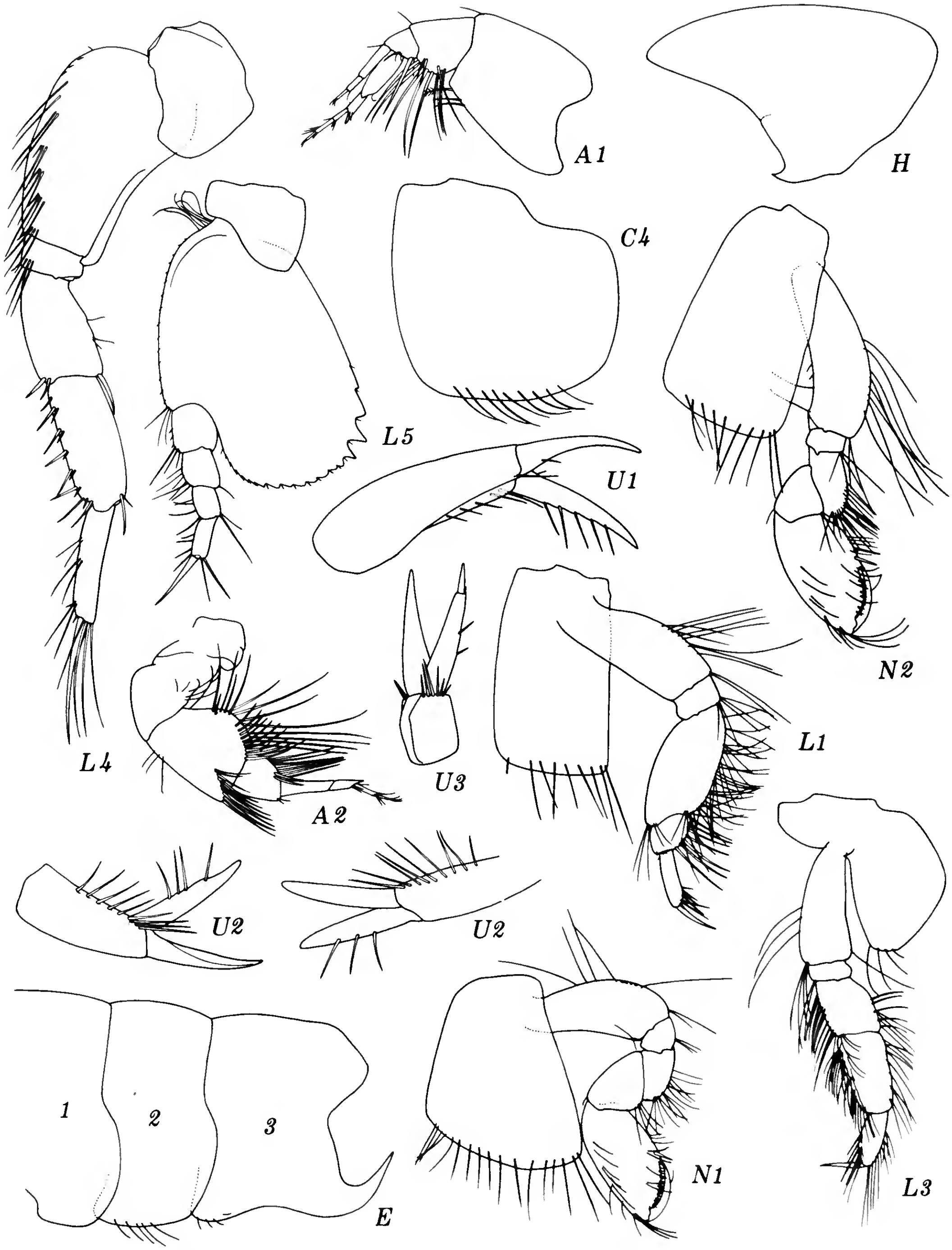

FIGURE 43.—*Harpiniopsis triplex*, new species, holotype, female, 5.8 mm, Oregon 7.

DISTRIBUTION.—Oregon to Baja California, 8–475 m.

Paraphoxus daboius J. L. Barnard

Paraphoxus daboius J. L. Barnard, 1960b, pp. 210–212, pls. 10–11; 1966a, p. 88.

MATERIAL.—Stations 72 (9), 1001 (18).

DISTRIBUTION.—Oregon to southern California, 77–813 m.

Paraphoxus epistomus (Shoemaker)

Pontharpinia epistoma Shoemaker, 1938, pp. 326–329, fig. 1.
Paraphoxus epistomus.—J. L. Barnard, 1960b, pp. 205–209, pls. 6–8; 1964a, p. 243; 1966a, p. 88; 1966b, p. 28.

MATERIAL.—Stations 61 (3), 62 (1), 72 (5).

DISTRIBUTION.—New Hampshire to South Carolina; Oregon to Panama, 0–507 m.

Paraphoxus fatigans J. L. Barnard

Paraphoxus fatigans J. L. Barnard, 1960b, pp. 209–210, pl. 9; 1964a, p. 244; 1966a, p. 88; 1966b, pp. 28–29, figs. 6–7.

MATERIAL.—Stations 1 (174), 61 (1), 72 (2).

These specimens are like kind 1 reported by Barnard (1966b) from Monterey Bay, but article 2 of pereopod 5 and articles 5–6 of gnathopods 1–2 are even broader than in the form from Monterey; the rostrum is consistently narrower and shorter than heretofore reported and is similar to that of *P. abronius* J. L. Barnard (1960b).

DISTRIBUTION.—Oregon to Baja California, 12–385 m.

Paraphoxus obtusidens (Alderman)

Pontharpinia obtusidens Alderman, 1936, pp. 54–56, figs. 1–13, 19.—J. L. Barnard, 1954b, p. 4.
Paraphoxus obtusidens.—J. L. Barnard, 1960b, pp. 249–259, pls. 33–37 (incl. *P. o. major*, pp. 259–261, pl. 32); 1964a, p. 244; 1964b, p. 105, chart 6; 1966a, p. 89; 1966b, p. 29.

MATERIAL.—Stations 1 (3, form *major*), 71 (1).

DISTRIBUTION.—Kurile Islands to Colombia, South America, 0–180 m.

Paraphoxus oculatus Sars

Paraphoxus oculatus Sars.—J. L. Barnard, 1960b, pp. 240–243, pls. 27–28 (with references); 1966a, p. 89.

MATERIAL.—Stations 5 (1), 6 (1), 11 (1), 46 (1), 67 (1).

DISTRIBUTION.—Circumboreal, 27–2,800 m; former depth maximum 1,135 m, extended herein to 2,800 m.

Paraphoxus vigitegus, new species

FIGURES 44–46

DIAGNOSIS.—Body of broad form; rostrum from dorsal view abruptly narrower than head, rostrum very narrow and short for genus; eyes vestigial in female, composed of 7–9 weakly aggregated ommatidia, very large in male, the color of eosin in alcohol, ocular ganglia very prominent in both sexes (solid black in figures); epistome strongly produced forward in a thin, acute, dorsally curled, and reverted cusp; gland cone of antenna 2 strongly developed; palp article 4 of maxilliped apically simple; gnathopods 1 and 2 with article 5 longer than 6, latter narrow on gnathopod 1, slightly stouter on gnathopod 2, palm transverse; ratios of articles 5–6 on gnathopod 1, 69 : 45, on gnathopod 2, 64 : 45. Pereopod 3: article 4 scarcely wider than article 2, both very stout, article 5 nearly as stout as 4, article 6 narrow and shorter than 5, ratio of widths of articles 2, 4, 5, 6 = 32 : 33 : 31 : 8; article 2 with large posteroproximal tooth. Pereopod 4: ratio of widths of articles 2, 4, 5, 6 = 43 : 26 : 18 : 7. Pereopod 5: article 2 slightly longer than broad, posteroventral margin truncate, slightly oblique, sweep point slightly exceeding distal end of article 4, posterior margin bearing 4–6 medium-size serrations resembling castellations. Uropods 1–2 stout, uropod 2 much smaller than 1, spines of peduncles short and stout and sharp, rami naked in females and juveniles, inner ramus with one marginal spine in adult male. Uropod 3 of female with very short inner ramus, about 30 percent as long as outer ramus, article 2 of outer ramus about one-seventh as long as article 1; male uropod 3 with subequal strongly setose rami. Telson slender, apices sinuously truncate, with 2–3 subterminal lateral notches and 1 or 2 short or long setae in each notch. Pleonal epimeron 3 with convex posterior margin in male, flat in female, posteroventral corner grossly rounded but with weak incisions, strongly setose; urosome large in female, small in male,

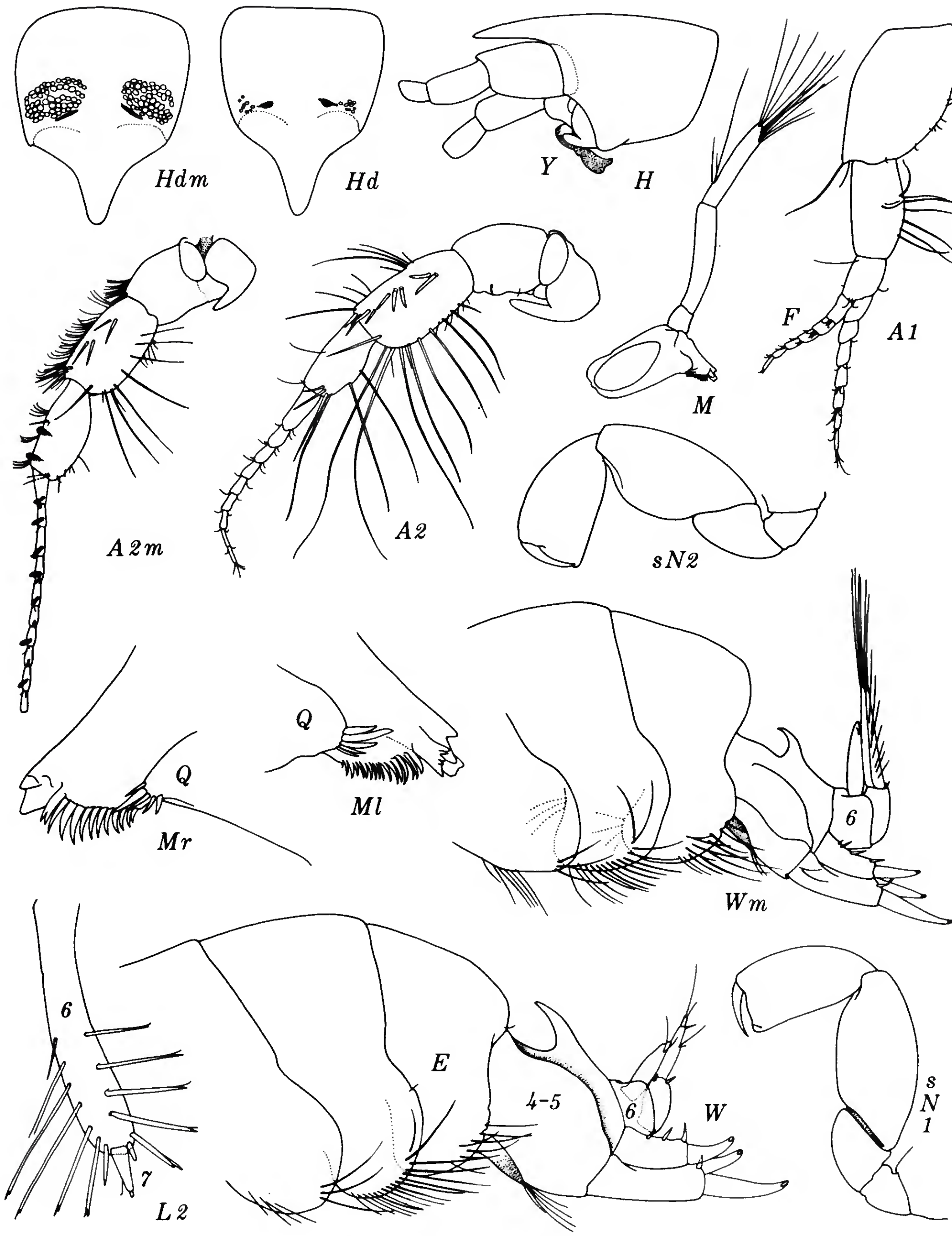

FIGURE 44.—*Paraphoxus vigitegus,* new species, holotype, female, 4.6 mm; male, 4.2 mm, Oregon 1.

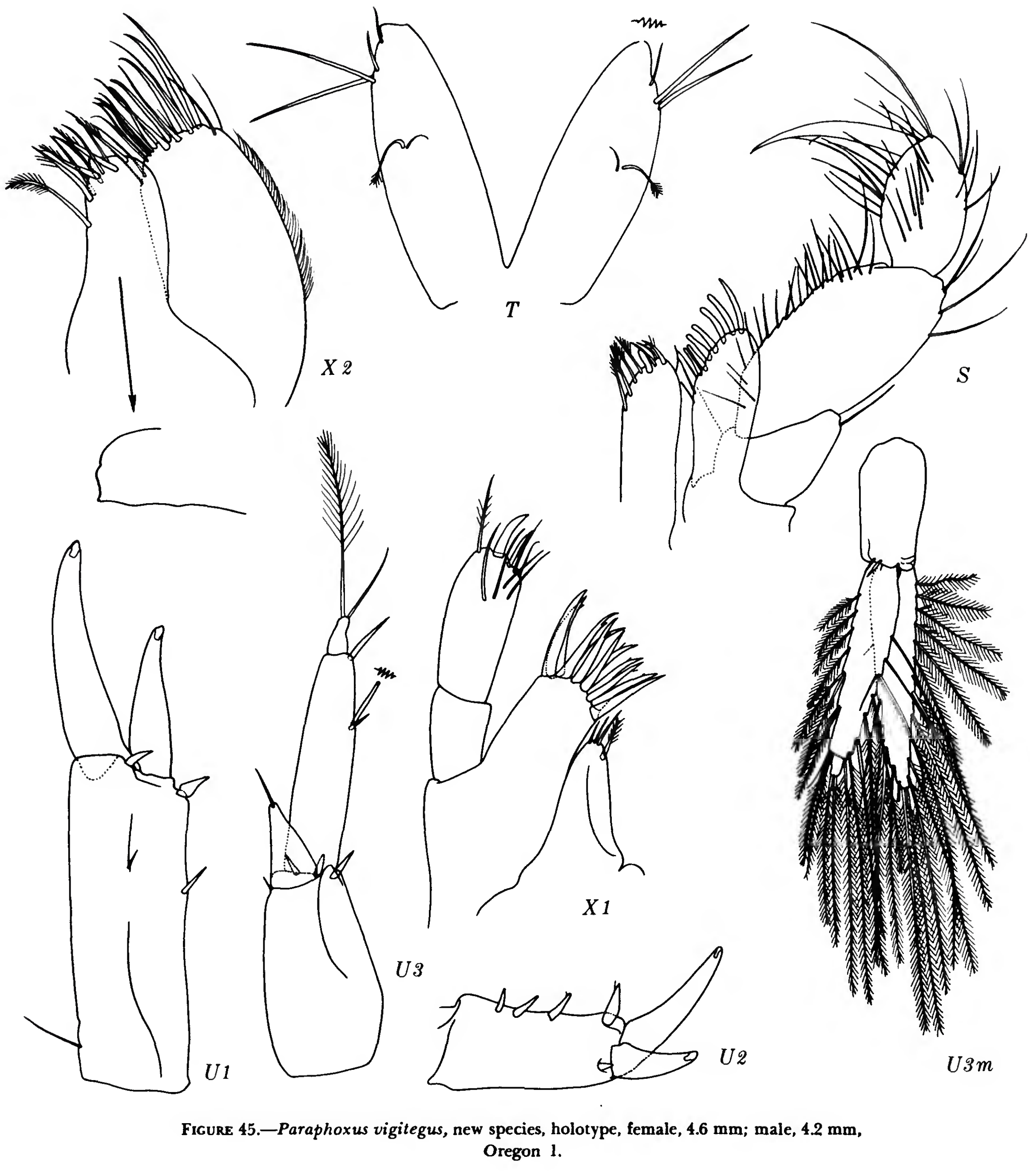

FIGURE 45.—*Paraphoxus vigitegus*, new species, holotype, female, 4.6 mm; male, 4.2 mm, Oregon 1.

urosomites 1–2 immovably coalesced, marked laterally with strong ridge lines differing in male and female (see figures), dorsal surface of presumed urosomite 2 with enormous, anteriorly reverted tooth, larger in female than in male.

HOLOTYPE.—USNM 127121, female, 4.6 mm.

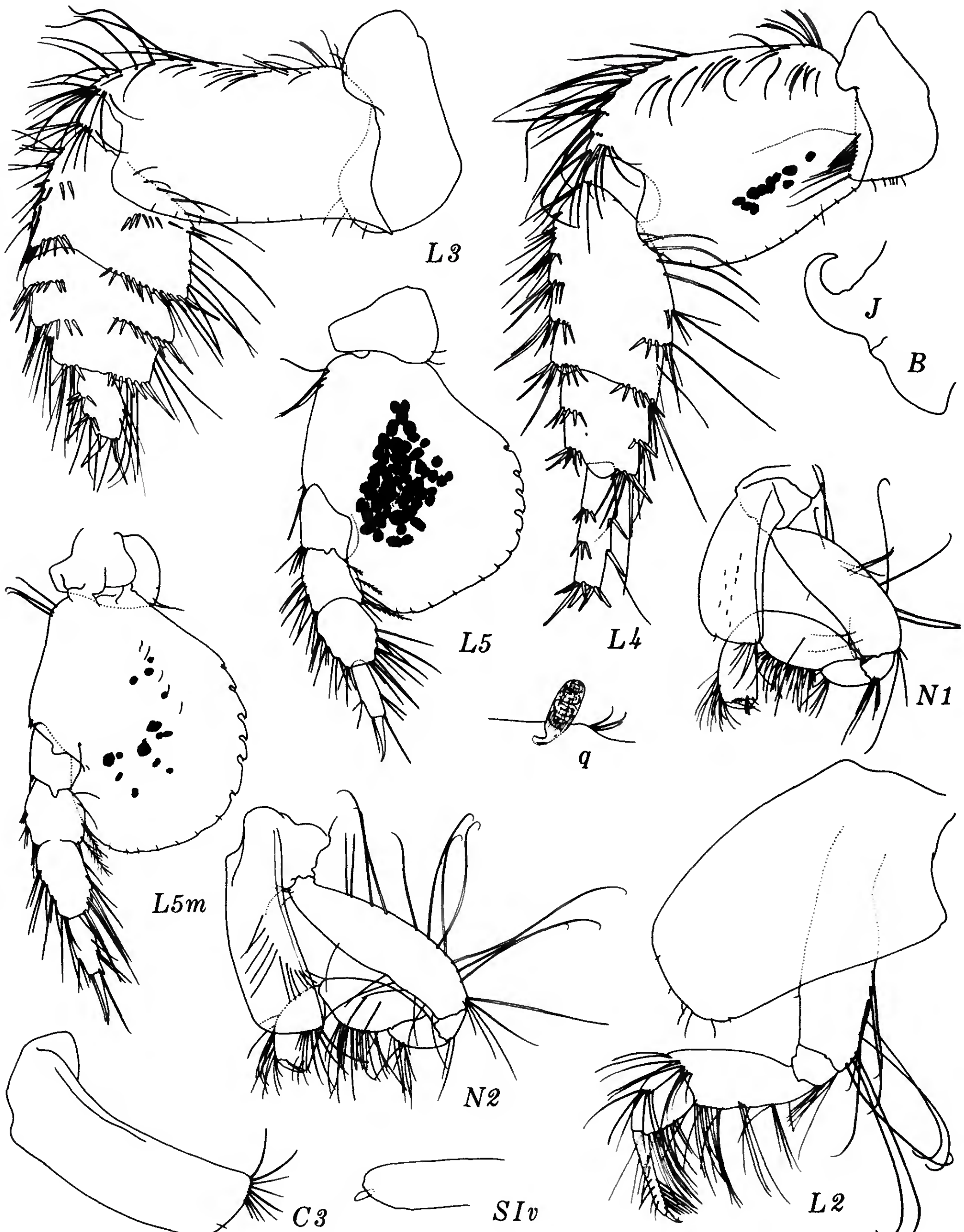

FIGURE 46.—*Paraphoxus vigitegus*, new species, holotype, female, 4.6 mm; male, 4.2 mm, Oregon 1.

TYPE-LOCALITY.—Station 1, 44°39.8′N, 124°59.0′ W, 30 m, 20 June 1962.

MATERIAL.—Twenty-three specimens from the type-locality.

RELATIONSHIP.—The development of a dorsal cusp on the urosomites is highly unusual in *Paraphoxus*, for only *P. cornutus* (Schellenberg, 1931), has been reported to have a large reverted dorsal cusp on urosomite 3. The coalescence of urosomites 1–2 is also of strong concern because it usually has familial or generic significance. In the present case, however, there is no other significant difference of the species from its congeners and there are strong resemblances to *P. fatigans* and other species of the genus.

Of its allopatric congeners, *Paraphoxus vigitegus*, new species, most resembles *P. fatigans* J. L. Barnard (1960b), mainly because of the shape of the head, the presence of an epistomal cusp, the conditions of gnathopods 1–2, pereopods 3–5, uropods, telson, and pleonal epimera. Besides the urosomal differences, *P. vigitegus* differs from *P. fatigans* by the curled condition of the epistomal cusp and the larger gland cone.

Paraphoxus vigitegus also has affinities with *P. abronius* J. L. Barnard (1960b) but differs by the curled epistomal cusp, the narrower hands of the gnathopods, the longer gland cone, a strongly distinct pereopod 5, strongly spinose uropods 1–2, and much smaller female eyes. *Paraphoxus daboius* J. L. Barnard (1960b) has very weak female eyes but differs from *P. vigitegus* by the broader gnathopodal hands, broader rostrum, uncurled epistomal process, and the presence of a normal urosome.

DISTRIBUTION.—Oregon, 30 m.

Pleustidae

Pleusymtes coquilla, new species

FIGURES 47–48

DIAGNOSIS.—Article 1 of antenna 1 with distal coniform process; body lacking dorsal teeth, humps, or carinae; gnathopods 1–2 relatively small, sixth articles subovate, palms convex, each with tiny medial cusp; pleonal epimera 2–3 with weakly sinuous posterior margins but each posteroventral corner with large tooth; coxae 1–3 each with 1–3 posteroventral serrations; dactyls of pereopods 1–5 elongate.

HOLOTYPE.—USNM 127131, female, 3.8 mm.

TYPE-LOCALITY.—Station 65, 44°38.5′N, 124° 35.7′W, 200 m, 18 May 1964.

MATERIAL.—Stations 63 (1), 65 (1), 73 (1), 74 (1).

RELATIONSHIP.—This species differs from *P. subglaber* (Barnard and Given, 1960) in the weaker sinuation and larger tooth of pleonal epimera 2–3, in the serrations of the coxae and the presence of an antennal tooth on article 1. From *P. glaber* (Boeck) (see Sars, 1895, pl. 126: fig. 1), *P. coquilla* differs by the larger teeth on epimera 2–3 and the longer dactyls of pereopods 1–5.

DISTRIBUTION.—Oregon, 150–200 m.

Podoceridae

Dulichia remis J. L. Barnard

Dulichia remis J. L. Barnard, 1964c, p. 332, fig. 12.

MATERIAL.—Station 24 (?1). Identification uncertain.

DISTRIBUTION.—Near Islands, Alaska, 482 fms; ?Oregon, 800 m.

Synopiidae

Syrrhoe crenulata Goës

Syrrhoe crenulata Goës, 1866, pp. 527–528, fig. 25.—Sars, 1895, pp. 390–391, pl. 136.—Stephensen, 1938, pp. 234–235.—Shoemaker, 1955, p. 39.

MATERIAL.—Station 51 (1).

DISTRIBUTION.—Circumboreal, about 10 to 300 m.

Syrrhoe longifrons Shoemaker

Syrrhoe longifrons Shoemaker, 1964, pp. 404–405, fig. 7.

MATERIAL.—Station 53 (1).

DISTRIBUTION.—British Columbia to Oregon, apparently 0–200 m.

Syrrhoe species O

MATERIAL.—Stations 81 (1), 82 (1).

A species to be described (Barnard, in preparation).

DISTRIBUTION.—Oregon, 2,798–2,800 m.

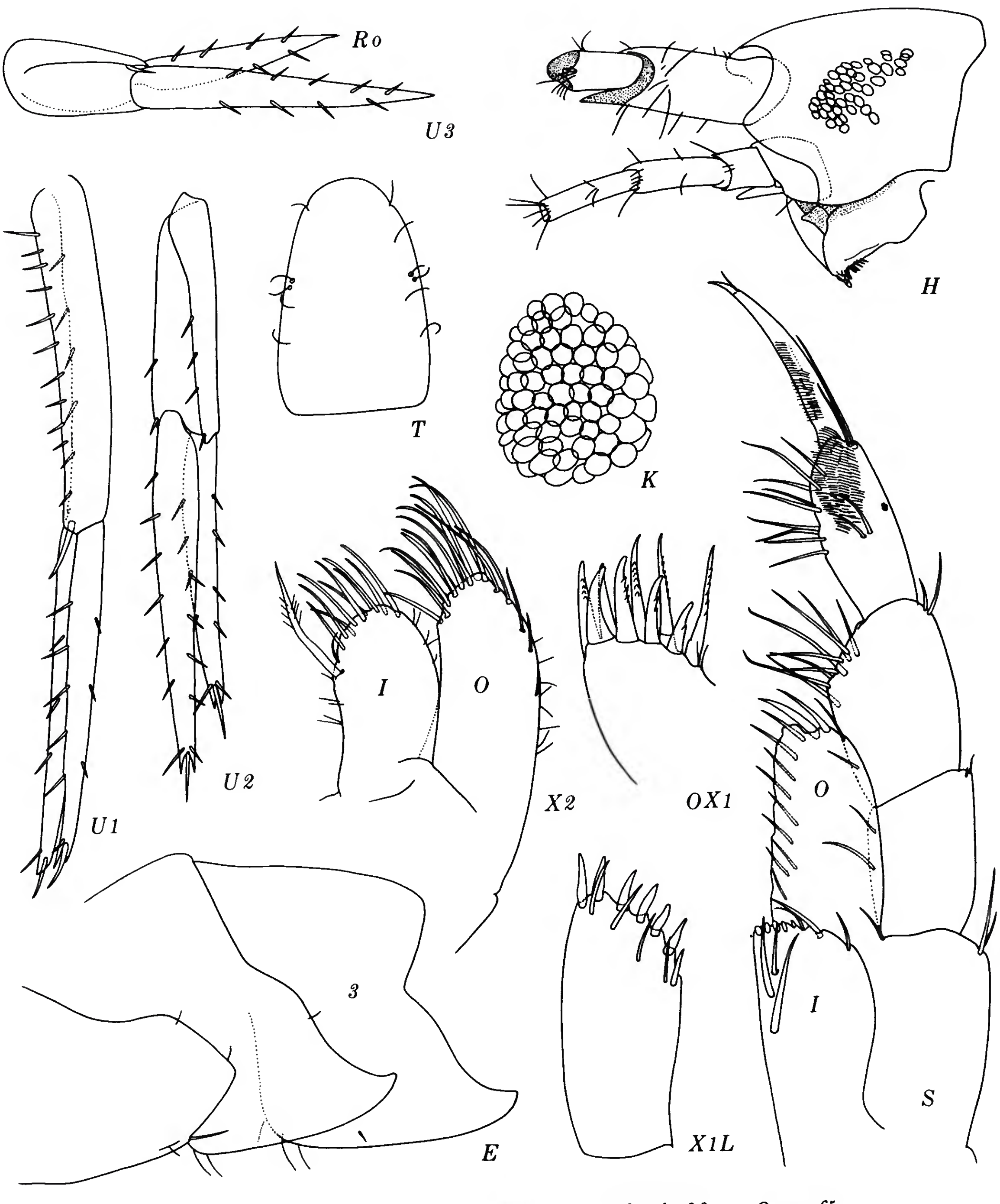

FIGURE 47.—*Pleusymtes coquilla*, new species, holotype, female, 3.8 mm, Oregon 65.

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Syrrhoites species C

MATERIAL.—Station 78 (1).

A species to be described (Barnard, in preparation).

DISTRIBUTION.—Oregon, 800 m.

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Appendix

Station List

Station	*Date* (mo., day, year)	*Depth* (*m*)	*Latitude* *N*	*Longitude* *W*
1	6.20.62	30	44°39.8′	124°05.9′
2	6.20.62	200	44°37.8′	124°36.9′
3	6.21.62	800	44°40.3′	124°59.0′
4	6.22.62	600	44°38.8′	124°54.9′
5	7. 6.62	2000	44°33.5′	125°14.6′
6	8.13.62	2600	44°38.8′	125°19.5′
7	8.13.62	2800	44°36.4′	125°24.8′
8	9. 4.62	800	44°40.3′	124°59.0′
9	9. 4.62	800	44°40.3′	124°59.0′
10	10. 4.62	200	44°38.7′	124°36.4′
11	10. 4.62	400	44°38.6′	125°50.0′
12	10. 4.62	1200	44°39.0′	125°10.0′
13	10. 4.62	2000	44°39.1′	126°19.5′
16	12. 4.62	800	44°39.4′	124°58.0′
17	12. 4.62	800	44°39.7′	124°58.0′
18	12. 4.62	800	44°39.6′	124°58.0′
19	12. 4.62	800	44°39.6′	124°58.0′
20	12. 5.62	800	44°39.8′	124°58.0′
21	1.24.63	200	44°39.1′	124°36.3′
22	1.24.63	200	44°39.3′	124°35.3′
23	1.24.63	800	44°40.3′	124°57.9′
24	1.24.63	800	44°39.3′	124°57.0′
25	1.24.63	800	44°39.3′	128°57.4′
27	1.25.63	2400	44°38.6′	125°20.1′
28	1.25.63	2800	44°39.0′	125°34.0′
29	1.25.63	175	44°39.3′	124°34.5′
30	4.26.63	200	44°39.1′	124°36.3′
31	4.26.63	200	44°39.1′	124°36.3′
32	4.27.63	800	44°40.0′	124°58.0′
33	4.27.63	800	44°40.0′	125°58.0′*
34	4.27.63	1420	44°39.1′	125°11.0′
35	6. 1.63	2800	44°39.3′	125°34.2′
36	6. 1.63	2800	44°40.6′	125°35.5′
37	6.15.63	200	44°38.6′	124°35.4′
38	6.15.63	200	44°39.2′	124°36.0′
39	6.16.63	800	44°38.7′	124°56.5′
40	6.16.63	600	44°34.2′	124°52.6′
41	6.16.63	600	44°32.9′	124°53.4′
42	6.16.63	400	44°38.3′	124°50.8′
44	8.15.63	2600	44°38.6′	127°28.2′
45	10.26.63	225	44°39.1′	124°36.3′
46	10.26.63	225	44°39.1′	124°37.7′
47	10.29.63	800	44°40.0′	125°05.0′
49	2.18.64	50	44°39.1′	124°09.9′
50	2.18.64	50	44°38.7′	124°09.8′

* *sic*, according to station records.

STATION LIST—*Continued*

Station	*Date* (mo., day, year)	*Depth* (*m*)	*Latitude* *N*	*Longitude* *W*
51	2.18.64	150	44°39.0′	124°33.1′
52	2.19.64	150	44°39.1′	124°33.2′
53	2.19.64	200	44°39.1′	124°35.7′
54	2.19.64	200	44°39.1′	124°35.7′
55	2.19.64	800	44°40.3′	124°56.6′
56	2.22.64	1400	44°39.1′	125°11.0′
58	3.23.64	800	44°39.1′	124°57.6′
59	3.25.64	50	44°39.1′	124°09.9′
60	3.25.64	100	44°44.5′	124°17.5′
61	3.25.64	100	44°43.8′	124°18.1′
62	3.26.64	150	44°45.5′	124°29.6′
63	3.26.64	150	44°45.5′	124°29.6′
64	5.18.64	156		
65	5.18.64	200	44°38.5′	124°35.7′
66	5.19.64	2865	44°38.5′	125°35.0′
67	5.19.64	2800	44°39.8′	125°57.6′
68	5.21.64	2860	44°38.3′	126°01.0′
69	5.21.64	2000	44°40.3′	125°13.7′
70	6.15.64	56	44°45.4′	124°07.1′
71	6.15.64	52	44°45.3′	124°09.0′
72	6.15.64	100	44°44.5′	124°17.9′
73	6.15.64	150	44°46.1′	124°29.7′
74	6.15.64	150	44°45.8′	124°26.6′
75	6.16.64	400	44°39.5′	124°50.8′
76	6.16.64	600	44°38.9′	124°54.0′
77	6.16.64	600	44°39.3′	124°54.4′
78	6.18.64	800	44°40.1′	125°06.7′
79	6.18.64	800	44°38.8′	124°57.5′
80	8.11.64	2600	44°39,1′	125°18.5′
81	8.11.64	2800	44°38.1′	125°35.0′
82	8.11.64	2798	44°40.1′	125°34.0′
83	8.14.64	2086	44°21.3′	125°13.9′
1001	6.15.64	100	44°44.6′	124°18.3′

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