

Gammaridean Amphipoda
of Australia,
Part II

J. LAURENS BARNARD

SMITHSONIAN CONTRIBUTIONS TO ZOOLOGY • NUMBER 139

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Part II

J. Laurens Barnard



SMITHSONIAN INSTITUTION PRESS

City of Washington

1974

ABSTRACT

Barnard, J. Laurens. Gammaridean Amphipoda of Australia, Part II. *Smithsonian Contributions to Zoology*, number 139, 148 pages, 83 figures, 1974.—The following taxa from shallow waters are considered: Amphilochidae: *Austropheonoides* J. L. Barnard and a new genus, *Moolapheonoides*; Dexaminidae: *Atylus* Leach and *Syndexamine* Chilton; Gammaridae: *Elasmopus* Costa, *Nuuanu* J. L. Barnard and a new genus, *Cottesloe*; Hyalidae: *Allorchestes* Dana and *Hyale* Rathke; Leucothoidae: *Leucothoe* Leach, *Leucothoella* Schellenberg and *Leucothoides* Shoemaker; Stenothoidae: *Ausatelson* J. L. Barnard, *Raumahara* J. L. Barnard, *Stenothoe* Dana and two new genera, *Chucullba* and *Wallametopa*.

New species of *Austropheonoides*, *Moolapheonoides*, *Ausatelson*, and *Raumahara* confirm their validity as multispecific genera. Rarity of specimens in Australia of the ordinarily common *Elasmopus* is further explained not only by the diversity of species in the competitive genus *Mallacoota* J. L. Barnard but in the presence of two species in *Cottesloe*. The latter genus is closely related to if not antecedent to *Nuuanu*, a genus composed of incipient interstitial species.

In warm-temperate Australia *Stenothoe* has several sibling species, thus adding to the examples of genera with sibling species described in Part I of this series. *Wallametopa* may be antecedent to *Parametopa* of the Mediterranean Sea. *Allorchestes* is reorganized on a world basis, reduced to 5 species and the others transferred to *Hyale*. Two new species of *Leucothoides* are described to boost this genus to 4 species and to separate all Pacific specimens specifically from Atlantic taxa.

OFFICIAL PUBLICATION DATE is handstamped in a limited number of initial copies and is recorded in the Institution's annual report, *Smithsonian Year*. SI PRESS NUMBER 4769. SERIES COVER DESIGN: The coral *Montastrea cavernosa* (Linnaeus).

Library of Congress Cataloging in Publication Data

Barnard, Jerry Laurens, 1928—

Gammaridean Amphipoda of Australia.

(Smithsonian contributions to zoology, no. 139)

Bibliography: p.

I. Amphipoda—Australia. I. Title. II. Series: Smithsonian Institution. Smithsonian contributions to zoology, no. 139.

QL1.S54 no. 139 [QL444.A5] 591'.08s [595'.371] 73-1022

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C., 20402 - Price \$2.20 (paper cover)

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Gammaridean Amphipoda of Australia, Part II

J. Laurens Barnard

Introduction

The taxa listed in the abstract and table of contents of this paper conclude the initial treatment of nondomicolous epifaunal Gammaridea in five collections from warm-temperate Australia. Future volumes will treat domicolous families, fossorial genera, and all taxa from tropical Australia. This treatment is not at present complete as materials in poor condition are being reserved in hopes that future collecting trips will capture specimens in good condition. The immense Australian marine environment has scarcely been tapped in this study of gammarideans. Five collections provide the main material at hand as specified in Part I (pp. 325-327): Victorian Fisheries (VicFish); South Australian Museum (SAM); National Museum of Victoria (NMV); Western Australian Museum (WAM); and the collections in Western Australia of J. L. Barnard (JLB) as supplemented by Shirley M. Slack-Smith. The collections of The Australian Museum, Sydney (AM) are being used at this time only to clarify the nomenclature of species found in the other collections. Until I can return to Australia for extended periods of time this peculiar method of operation must suffice to advance this study.

ACKNOWLEDGMENTS.—I am indebted to Mrs. Margaret M. Drummond and Dr. Alistair J. Gilmour of Victorian Fisheries and Wildlife, Mel-

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bourne, for supplying materials from the Western Port survey; to Mr. Scoresby A. Shepherd of the South Australian Museum, Adelaide, for materials of his surveys in that state; to Dr. Ray George and Mrs. Shirley M. Slack-Smith for specimens collected under the auspices of the Western Australian Museum, Perth; to Dr. D. J. G. Griffin, Miss Elizabeth Pope, and Mrs. Jane Holloway of The Australian Museum in Sydney, who have given much of their time to permit me to examine many specimens in that museum; to Mr. John McNally of the National Museum of Victoria in Melbourne for continuing permission to utilize their materials from Port Phillip; to Dr. Peter Stanbury of Macleay Museum, University of Sydney, for his help in clarifying specimens in that museum.

At the Smithsonian Institution I am especially indebted to Dr. R. S. Cowan, Director of the National Museum of Natural History, for encouragement to continue this series; to Dr. I. E. Wallen, former Director of Environmental Sciences for his support; to Dr. R.B. Manning, former Chairman of Invertebrate Zoology, Mrs. Montague Smith, his secretary, and Mr. R. H. Brown, technical administrator, for their many aids in my behalf. Dr. Thomas E. Bowman has offered many helpful suggestions.

Part of this report was written while I was assigned to the laboratories of Dr. J. R. Hendrickson, University of Arizona, Tucson, and I must thank him, Dr. N. A. Younggren, and Dr. A. R. Mead for their many courtesies.

Dr. Torben Wolff of Universitetets Zoologiske Museum, Copenhagen, kindly loaned me comparative materials of *Allorchestes*.

PROCEDURES AND STATION LIST.—New generic and specific names generally have roots from aboriginal languages. All new specific names are cited as nouns in apposition to their generic names, except for *Leucothoe assimilis*. Part I of this series explains other descriptive methods.

The station list remains similar to that cited in Part I (pp. 325–327) of this series except for the addition of samples noted in Appendix I. Non-metric citations are conserved (Barnard, 1972a:3).

ILLUSTRATIONS.—A capital letter on the figures designates a part and a lowercase letter modifies the description of the part. All other letters are explained in the particular figure legend. A=antenna, B=labrum (upper lip), C=coxa, D=dactyl of pereopod, E=epimeron, F=accessory flagellum, G=labium (lower lip), H=head, I=inner plate or inner ramus, J=epistome, K=eye, L=palp, M=mandible, N=gnathopod, O=outer plate or outer ramus, P=pereopod, 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=setae, d=brood plate, e=dactyl of gnathopod, f=female, h=holotype, i=inner, j=juvenile, k=cuticle, l=left, m=male, n=right lacinia mobilis, o=opposite or other side, p=gill, q=telsonic setal pits, r=right, s=setae removed, t=spine, u=flattened, v=ventral, w=palm.

BIOGEOGRAPHIC REMARKS.—In the taxa considered herein, no significant modifications of conclusions given in Part I by Barnard (1972a) are observable. The genera *Ausatelson* and *Austropheonoides* are now found to be multispecific, thus reinforcing their generic status and the high degree of adaptive radiation found in other Australian taxa. The thaumatelsonins are further diversified by the description of new taxa. *Stenothoe* and *Hyale* are found to have several sibling species. *Hyale* is not as diverse in these collections as expected but despite large quantities of material is still poorly explored in terms of geography and habitat. Yet one more species of *Syndexamine*, another genus of high adaptation, is described.

The discovery of a species of *Leucothoella*, a tropical genus heretofore unique, in warm-temper-

ate Australia, enforces the opinion that warm-temperate Australia is an "ends-of-the-earth" outpost conducive to invasion by certain tropical genera barred elsewhere from invading warm to cool temperate shores because of heavy competition from boreal faunas. Warm-temperate Australia, like New Zealand, is, however, an especially favorable habitat for ascidians, and *Leucothoella* is probably associated with those organisms. *Leucothoella* may, therefore, simply be an indirect evolutionary success in Australia because of biosubstrate diversity.

The materials of *Elasmopus* are not as diverse and numerous on Australian shores as in other seas. *Elasmopus* is usually abundant in warm-temperate places like California and Japan, but in Australia *Elasmopus* appears to be under heavy pressure of competition from the diverse and abundant members of *Mallacoota*, described by Barnard (1972a:243–253). *Parelasomopus* also occupies niches from which species of *Elasmopus* may be excluded. In Australia and apparently in New Zealand, *Elasmopus* is unusual in having bizarre morphological attributes such as pleonic crests or highly modified gnathopods, suggesting again that *Elasmopus* survives by mimicking species of *Mallacoota* and *Parelasomopus*.

Besides *Mallacoota*, the type-species of a new genus, *Cottesloe*, appears also to be a competitor of *Elasmopus*. This unusual species externally resembles the New Zealand *Elasmopus neglectus* Chilton in the dorsal crest of pleonite 4; but otherwise is classified in the *Melita-Eriopisa* group of Gammaridae with heavily setose maxillae and reduced inner rami of uropod 3.

An interesting evolutionary sequence is revealed in the progression from *Cottesloe berringar* (type-species) to *C. merringannee*, then to *Nuuanu mokari* and finally to *N. numbadi* of Australia and *N. amikai* of Hawaii. In its morphology, *C. berringar* appears almost typical of nestling amphipods, whereas the several species of *Nuuanu*, especially the latter two, have characteristics one associates with interstitial taxa, though the writer considers the species of *Nuuanu* to be only incipient members of the cryptozoa. The ecology of these species is presently unknown but should prove illuminating to psammozologists.

The world composition of *Allorchestes* is heavily revised. The genus is reduced to a few species by

transferring many species to *Hyale* on the basis of telson, uropod 3, and maxilla 1. This process constricts *Allorchestes* to the Pacific basin, with three species in the cold and warm-temperate North Pacific and two species in similar climates of Australia and New Zealand. Despite an apparent tropical disjunction the northern and southern species appear very similar to each other. This is the first reasonably well-defined similarity of this sort between amphipods of Australia and the North Pacific Ocean, though others as mentioned in Part I of this study may be found. No judgment as to the original center of the genus can be made as no primitive characters can yet be detected.

Some degree of sibling speciation is found in *Hyale*, but the main impact of the study on this genus is the wide distribution attributed to *Hyale rubra* (Thomson) now definitely found in New Zealand, Australia, and Hawaii with descendent siblings (perhaps subspecies) in California and Japan. The breadth of the tropics remains unexplored in this context, although Schellenberg's

(1928) identification of *H. nigra* (Haswell) in the Red Sea suggests affinity with *H. rubra*. *Hyale nigra* is found to be a good species distinct from *H. rubra*, so that the nomenclature of this group of species and their siblings may perhaps now be rapidly stabilized.

AMPHILOCHIDAE, CYPROIDEINAE

Austropheonoides J. L. Barnard

Austropheonoides J. L. Barnard, 1972a:18

Two new species from South Australia are added herein to the type-species from Western Australia. They are extremely similar in overall appearance but differ mainly in characters of the gnathopods. Even the shape of the abutted margin on coxa 3 is similar among the several species. The following key and diagnoses to the species omit similarities to the type-species. If no mention is made of attributes illustrated or discussed for the type-species in Barnard (1972a) then the similarities are complete.

Key to Species of *Austropheonoides*

- 1. Projection on article 5 of gnathopod 2 reaching fully along article 6 to level of palm, article 6 of gnathopod 1 with only one posterior spine, that spine located at base of dactyl and matching appearance of dactyl, latter nodulate, articles 5-6 of gnathopod 1 nearly naked ...
 *A. takkure*, new species
- Projection on article 5 of gnathopod 2 reaching halfway along article 6, article 6 of gnathopod 1 with two or more posterior setae, none matching dactyl, latter not nodulate, articles 4-5 of gnathopod 1 heavily setose 2
- 2. Dactyl of gnathopod 1 with subapical fixed teeth, outer plate of maxilla 2 apically truncate
 *A. mundoe*
- Dactyl of gnathopod 1 with subapical articulate spinules or setae, outer plate of maxilla 2 apically rounded *A. mallee*, new species

***Austropheonoides mallee*, new species**

FIGURE 1 upper

DIAGNOSIS.—Article 2 of mandibular palp short and stout; outer plate of maxilla 2 apically rounded; dactyl of maxilliped short; article 6 of gnathopod 1 with 3-7 posterior setae, none enlarged, none matching dactyl, latter with many subapical articulate spinules, articles 4-5 heavily setose; projection on article 5 of gnathopod 2 reaching halfway along article 6, latter with posterior spines, palmar spine at base of dactyl large and nodulate or serrate, dactyl with inner tooth; article 2 of gnathopods and pereopods 1-2 with very sparse, extremely minute

setae; article 4 of pereopods 1-2 tapering apically, dactyls of pereopods 1-5 with strong distal acclivity.

HOLOTYPE.—SAM, juvenile (unsexed), 3.1 mm.

TYPE-LOCALITY.—Shepherd 9, Pearson Islands, South Australia, Station B, 15 feet, algae on horizontal face, 8 January 1969.

REMARKS.—Though the specimens forming the basis of this new species are slightly subadult, the characteristics are sufficiently divergent from other species of the genus that the specimens could not be representative of stages in the development of the other species. The well-developed basodactylar spine of gnathopod 2 and the numerous posterior



FIGURE 1.—Upper, *Austropheonoides mallee*, new species, holotype, juvenile, 3.1 mm, Shepherd 9; j=juvenile, 2.6 mm, Shepherd 49. Lower, *Austropheonoides takkure*, new species, holotype, senile adult, 4.8 mm, Shepherd 9.

setae of article 6 on gnathopod 1 suggest a distinctive course of development in this species. The dorsal crest of urosomite 1 is slightly flatter than in the type-species; details of the maxillipeds shown in the figures also differ; the maxillipedal palp of this species and *A. takkure* is stouter than in *A. mundoe*.

MATERIAL.—Shepherd 9 (3), 22 (1), 49 (1).

DISTRIBUTION.—Pearson Islands, South Australia, 5–35 m.

Austropheonoides mundoe J. L. Barnard

Austropheonoides mundoe J. L. Barnard, 1972a:18, figs. 2, 3

DIAGNOSIS.—Article 2 of mandibular palp short and stout, shorter than article 3; outer plate of maxilla 2 apically truncate; dactyl of maxilliped elongate; article 6 of gnathopod 1 with one or two posterior setae, none enlarged, none matching dactyl, articles 4–5 setose, dactyl with fixed conical teeth; projection on article 5 of gnathopod 2 reaching halfway along article 6, latter with posterior spines, palmar spine at base of dactyl medium and simple, dactyl with slight inner bulge; article 2 of gnathopods and pereopods 1–2 heavily setose anteriorly; article 4 of pereopods 1–2 not tapering apically, dactyls of pereopods 1–5 with weak distal acclivity.

DISTRIBUTION.—Western Australia, intertidal.

Austropheonoides takkure, new species

FIGURE 1 lower

DIAGNOSIS.—Article 2 of mandibular palp elongate, nearly as long and as thin as article 3; outer plate of maxilla 2 apically truncate; dactyl of maxilliped short; article 6 of gnathopod 1 posteriorly naked except for spine near base of dactyl, that spine highly enlarged, curved and matching appearance of dactyl, latter nodulate, articles 4–5 nearly naked; projection on article 5 of gnathopod 2 reaching fully along article 6 to level of palm, article 6 without posterior spines, palmar spine at base of dactyl small to medium and simple, dactyl simple; article 2 of gnathopods and pereopods 1–2 with very sparse, extremely minute setae; article 4 of pereopods 1–2 tapering apically, dactyls of pereopods 1–5 with strong distal acclivity.

HOLOTYPE.—SAM, senile adult [no sexual indicators], 4.8 mm.

TYPE-LOCALITY.—Shepherd 9, Pearson Islands, South Australia, Station B, 15 feet, algae on horizontal face, 8 January 1969.

REMARKS.—A juvenile, 2.1 mm long, confirms that the characteristics of the adult are not a result of its senility. The apical margin of the outer plate of the adult maxilliped is more finely serrate than in the type-species (Figure 1). The dorsal crest on urosomite 1 is slightly flatter than in the type-species.

MATERIAL.—Shepherd 9 (1), 24 (1), 30 (1).

DISTRIBUTION.—Pearson Islands, South Australia, 5–15 m.

Moolapheonoides, new genus

DIAGNOSIS.—Mandible with 3-articulate palp; antenna 1 with accessory flagellum; palp of maxilla 1 uniaarticulate; outer plate of maxilliped reaching nearly to end of palp article 2; gnathopod 1 weakly subchelate, palm short, transverse, dactyl much shorter than rectangular article 6, article 5 strongly produced along article 6; gnathopod 2 with palm nearly transverse, weakly chelate, with article 5 weakly produced along article 6; article 2 of pereopod 3 thin, rectilinear, article 2 of pereopods 4–5 broadly expanded and ovate or subrectangular; pleonite 3 with slight posterodorsal process; pleonite 4 elongate and bearing broad dorsal keel not strongly overlapping following segments, pleonites 5 and 6 of equal length; telson short, horizontally ovate, reaching apex of peduncle on uropod 3; outer ramus of uropod 3 slightly more than half as long as inner ramus.

TYPE-SPECIES.—*M. kadee*, new species.

COMPOSITION.—*M. poontee*, new species; *M. coocoo*, new species.

REMARKS.—This genus intergrades *Austropheonoides* J. L. Barnard (1972a) and *Narapheonoides* J. L. Barnard (1972a); it has the mandibular palp and article 2 of pereopod 4 found in *Austropheonoides*, but the first gnathopod of *Narapheonoides*. *Moolapheonoides* appears central to the other two genera in the sense that the latter two have modifications that could not have been reversed to give a line of descent to the other genera, whereas *Moolapheonoides* could have been antecedent to either or both of the other genera. *Narapheonoides*

lacks a mandibular palp and has article 2 of pereopod 4 distally tapered; the latter in *Moolapheonoides* does not taper but in two species does lack the midlateral ridge on article 2, which is found in *Austropheonoides*. Gnathopod 1 of *Austropheo-*

noides is highly modified in terms of the elongation and simplicity of article 6 and the presence either of long setae or immensely thickened and elongate spines, unlike *Moolapheonoides* and *Narapheonoides*.

Key to Species of *Moolapheonoides*

1. Article 3 of pereopods 1-5 elongate, article 2 of pereopod 5 broad and scarcely extended ventrally, keel of pleonite 4 dorsally flat..... *M. coocoo*, new species
Article 3 of pereopods 1-5 not elongate, article 2 of pereopod 5 relatively narrow, deeply extended ventrally, keel of pleonite 4 dorsally convex..... 2
2. Gnathopod 2 with posterior spine on article 6 (besides defining spines), gnathopod 1 with three or four posterior spines on article 6, medial margin of outer plate on maxilliped ragged, article 2 of pereopod 4 without lateral ridge, ocular lobe narrow.....
..... *M. poontee*, new species
Gnathopod 2 with no posterior spine on article 6 (besides defining spines), gnathopod 1 with one or two posterior spines on article 6, medial margin of outer plate on maxilliped smooth, article 2 of pereopod 4 with lateral ridge, ocular lobe broad..... *M. kadee*, new species

Moolapheonoides kadee, new species

FIGURE 2, 3

DIAGNOSIS.—Lateral cephalic lobe broad, almost evenly truncatoconcave, ventral margin of head even; eye small; accessory flagellum elongate; apex of palp on maxilla 1 with four spines and long spout; medial margin of outer plate on maxilliped smooth; article 2 of gnathopod 1 with about eight setae, numbers 2 and 4 long, article 6 with one or two posterior spines (besides defining spines); palm of gnathopod 2 evenly excavate, dactyl with only one spine, hand without posterior spines (except defining spines); article 2 of pereopods 1-2 poorly setose, article 3 of pereopods 1-5 not elongate, article 2 of pereopods 4-5 ovato-rectangular, similar, with lateral ridge, well produced below; small dorsal tooth on pleonite 3 not observed (possibly blunted by damage); dorsal keel of pleonite 4 high and convex; telson with single sublateral setule apicad each side.

DESCRIPTION.—Following characters illustrated (Figures 2, 3) and distinctive among the three known species: mandibular palp, outer plate of maxilla 1, plates of maxilla 2, inner plate of maxilliped; following characters as illustrated for one or another species similar among all three species: bodies, incisors, lacinia mobili, and molars of mandibles; inner plate of maxilla 1; palp of maxilliped; epimera 1-3; apices of pereopods 3-5 unknown in

M. kadee, of pereopods 1-5 unknown in *M. poontee*, of pereopods 2-5 unknown in *M. coocoo*; antennae similar to *Austropheonoides mundoe*, gland cone more bulbous in *M. poontee* and *M. coocoo* than in *M. kadee*; uropods of *M. kadee* poorly preserved but proportions as follows (cf. Figures 4, 5, 6): rami of uropod 1 extending equally, outer ramus of uropod 2 about 0.75 times as long as inner, length ratios of peduncle and rami on uropod 3 as follows: inner ramus=100, outer ramus=56, peduncle=74, article 2 of gnathopod 2 with five anterior marginal spines or setae and article 2 slightly thicker than shown for gnathopod 1; coxae 1-2 inadequately observed.

HOLOTYPE.—SAM, juvenile, 2.67 mm.

TYPE-LOCALITY.—Shepherd 49, Pearson Islands, South Australia, Station A, 20-25 m, in algae, horizontal face, 7 January 1969.

REMARKS.—The holotype of this species is apparently a juvenile, though it is as large as adults of the other species and the number of accessory, facial spinules on the dactyl of gnathopod 1 exceeds that in the other species; it may therefore be a male, although I could not find penial processes.

MATERIAL.—Shepherd 49 (1); VicFish 558 (specimen, 2.55 mm, with two posterior spines on article 6 of gnathopod 1).

DISTRIBUTION.—Western Port, Victoria, shallow water; Pearson Islands, South Australia, 20-25 m.

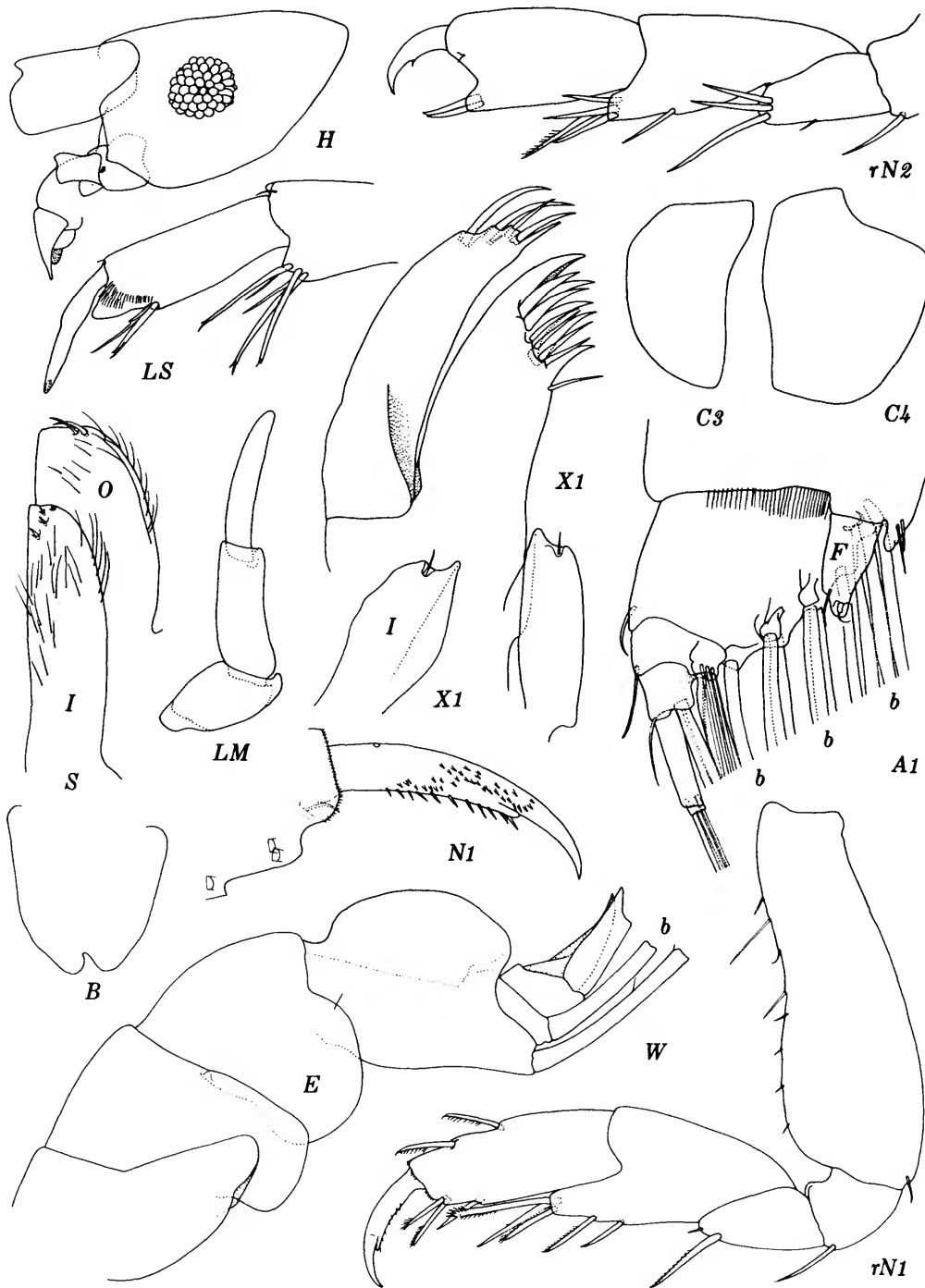


FIGURE 2.—*Moolaphemonoides kadee*, new species, holotype, juvenile, 2.67 mm, Shepherd 49.

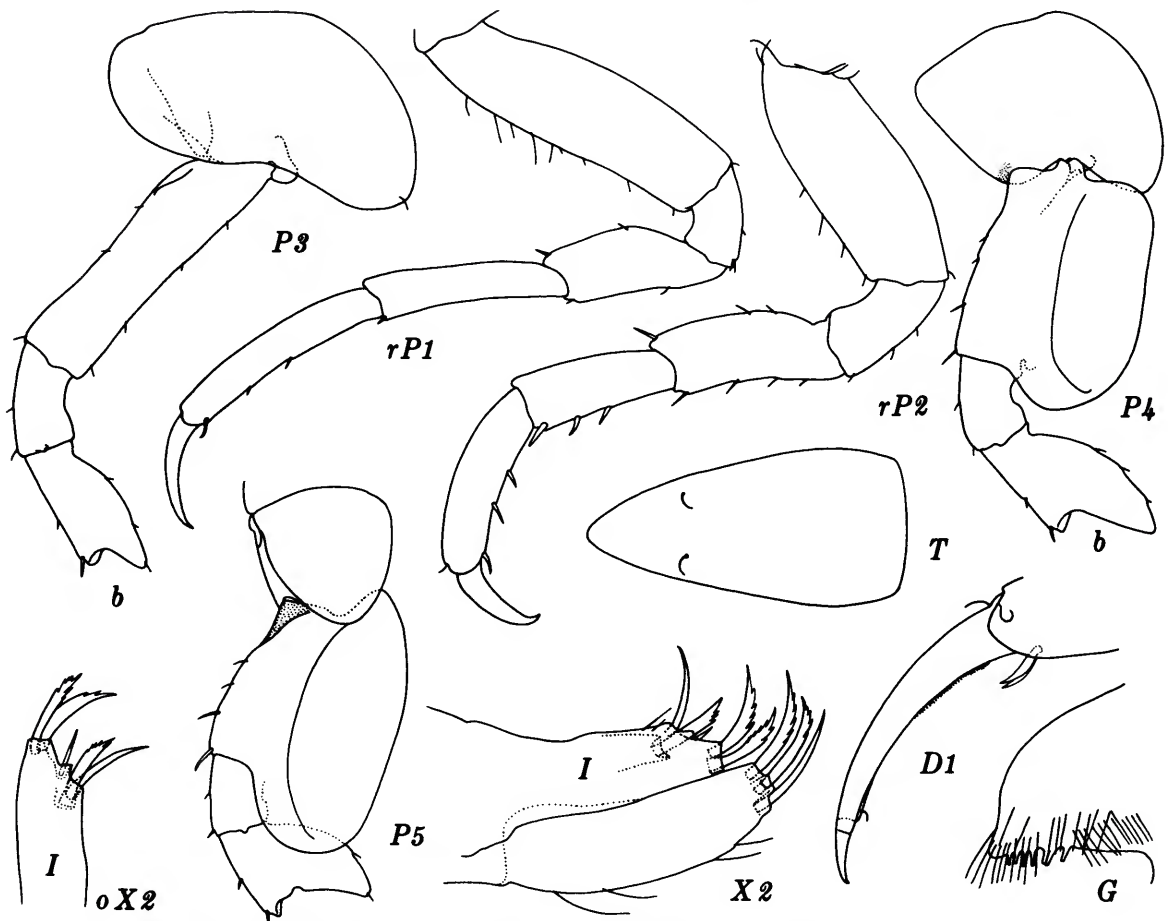


FIGURE 3.—*Moolapheonoides kadee*, new species, holotype, juvenile, 2.67 mm, Shepherd 49.

Moolapheonoides cocoo, new species

FIGURE 4

DIAGNOSIS.—Lateral cephalic lobe narrow, unevenly truncatoconcave, upper limb projecting farther than lower; eye small; accessory flagellum not highly elongate, ratio of length to width, 16:11, bearing two setules and one seta; apex of palp on maxilla 1 with three large and one small spines and obsolescent spout; medial margin of outer plate on maxilliped smooth, finely pectinate; article 2 of gnathopod 1 with 8–13 anterior setae, several elongate, article 6 with two or three posterior spines; palm of gnathopod 2 unevenly excavate, bearing process besides defining process, dactyl with

several spines, hand with one posterior spine; article 2 of pereopods 1–2 densely setose anteriorly, article 3 of pereopods 3–5 elongate, article 2 of pereopod 4 ovato-rectangular, relatively narrower than in *M. poontee*, new species, lacking lateral ridge; article 2 of pereopod 5 broadly trapezoidal, lower part expanding, with protuberant postero-ventral corner, ventral extension broad but shallow; small dorsal tooth sharply produced on pleonite 3; dorsal keel of pleonite 4 low and nearly evenly truncate; telson with pair of sublateral setules apicad each side.

DESCRIPTION.—See "Description" of *M. kadee* new species (p. 6) for similarities; palp of maxilliped like that of *M. kadee* but article 2 narrower;

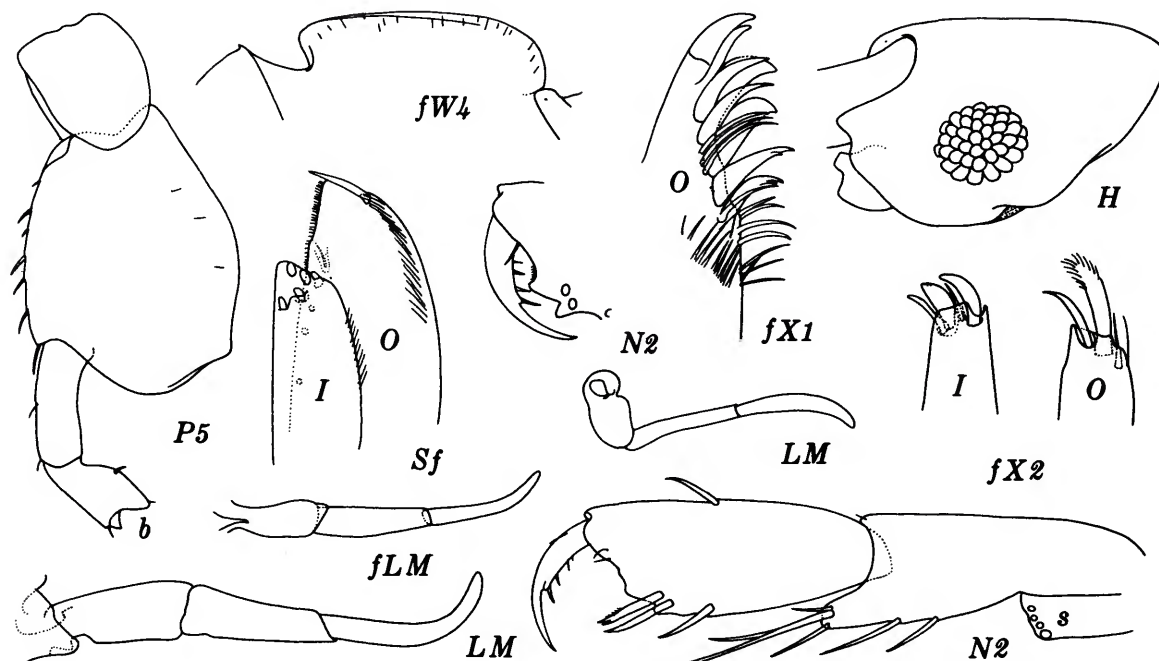


FIGURE 4.—*Moolapheonoides coccoo*, new species, holotype, female, 2.45 mm, VicFish 208; f=female, 3.25 mm.

cleft of upper lip slightly deeper than in *M. poontee* (Figure 6); inner lobes of lower lip delineated, otherwise shape of lower lip like that of *M. poontee*; coxa 1 not observed; coxa 2 like that of *M. poontee*; spine near base of dactyl on gnathopod 1 slightly larger than in *M. poontee*, article 4 with only one long, one short spines, article 5 with only three posterior and three apical spines; article 3 of gnathopods and pereopods 1-2 not elongate; articles 5-7 of pereopod 1 as shown for *M. kadee* but article 6 with only one posterior spine besides locking spines; coxa and article 2 of pereopod 3 similar to that of *M. poontee*; uropods 1-3 as shown for *M. poontee* but extension of peduncle on uropod 3 sharper; largest specimen available, female, 3.25 mm, VicFish 208, with 12-13 anterior setae on article 2 of gnathopods 1-2, dactyl of gnathopod 1 with seven facial and six small outer marginal spines.

HOLOTYPE.—NMV, female, 2.45 mm.

TYPE-LOCALITY.—VicFish 208, Western Port, Victoria, Station 25S-1-3, 30 feet, 23 February 1965.

REMARKS.—This species has several unusual differences from the other two known species, the

elongate article 3 of pereopods 3-5, the odd shaped article 2 of pereopod 5, the lower and flatter keel of pleonite 4, the process on the palm of gnathopod 2 and the exceptionally falcate article 3 of the mandibular palp; the figure of the mandibular palp from the holotype is drawn while the palp is attached to the mandible and the mandible to the head; the other two drawings, from specimen *f*, show two aspects of the same palp.

MATERIAL.—VicFish 208 (2), 283 (1).

DISTRIBUTION.—Western Port, Victoria, shallow water.

Moolapheonoides poontee, new species

FIGURES 5, 6

DIAGNOSIS.—Lateral cephalic lobe narrow, almost evenly truncatoconcave, ventral margin of head even; eye large; accessory flagellum elongate; apex of palp on maxilla 1 with three spines and medium spout; medial margin of outer plate on maxilliped ragged; article 2 of gnathopod 1 with numerous long and short setae, article 6 with three or four posterior spines; palm of gnathopod 2 evenly exca-

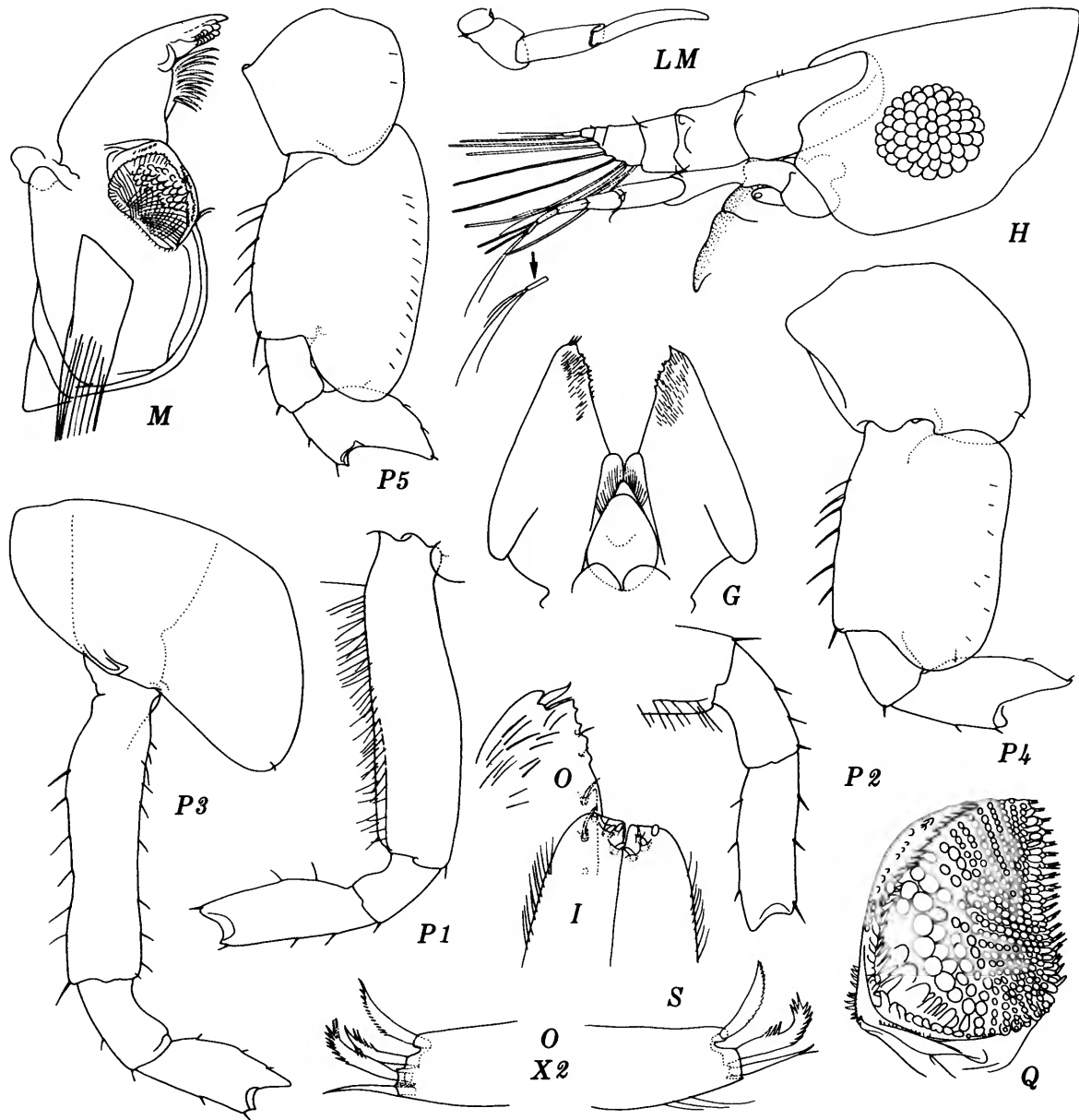


FIGURE 5.—*Moolapheonoides poontee*, new species, holotype, female, 3.12 mm, VicFish 554.

vate, dactyl with several spines, hand with one posterior spine; article 2 of pereopods 1-2 densely setose anteriorly, article 3 of pereopods 1-5 not elongate, article 2 of pereopods 4-5 ovato-rectangular, similar, 5 with lateral ridge, 4 without, article 2 well produced below; usually small dorsal tooth

sharply produced on pleonite 3; dorsal keel of pleonite 4 of medium height, convex; telson with pair of sublateral setules apicad each side.

DESCRIPTION.—See "Description" of *M. kadee*, new species (p. 6), for similarities.

HOLOTYPE.—NMV, female, 3.12 mm.

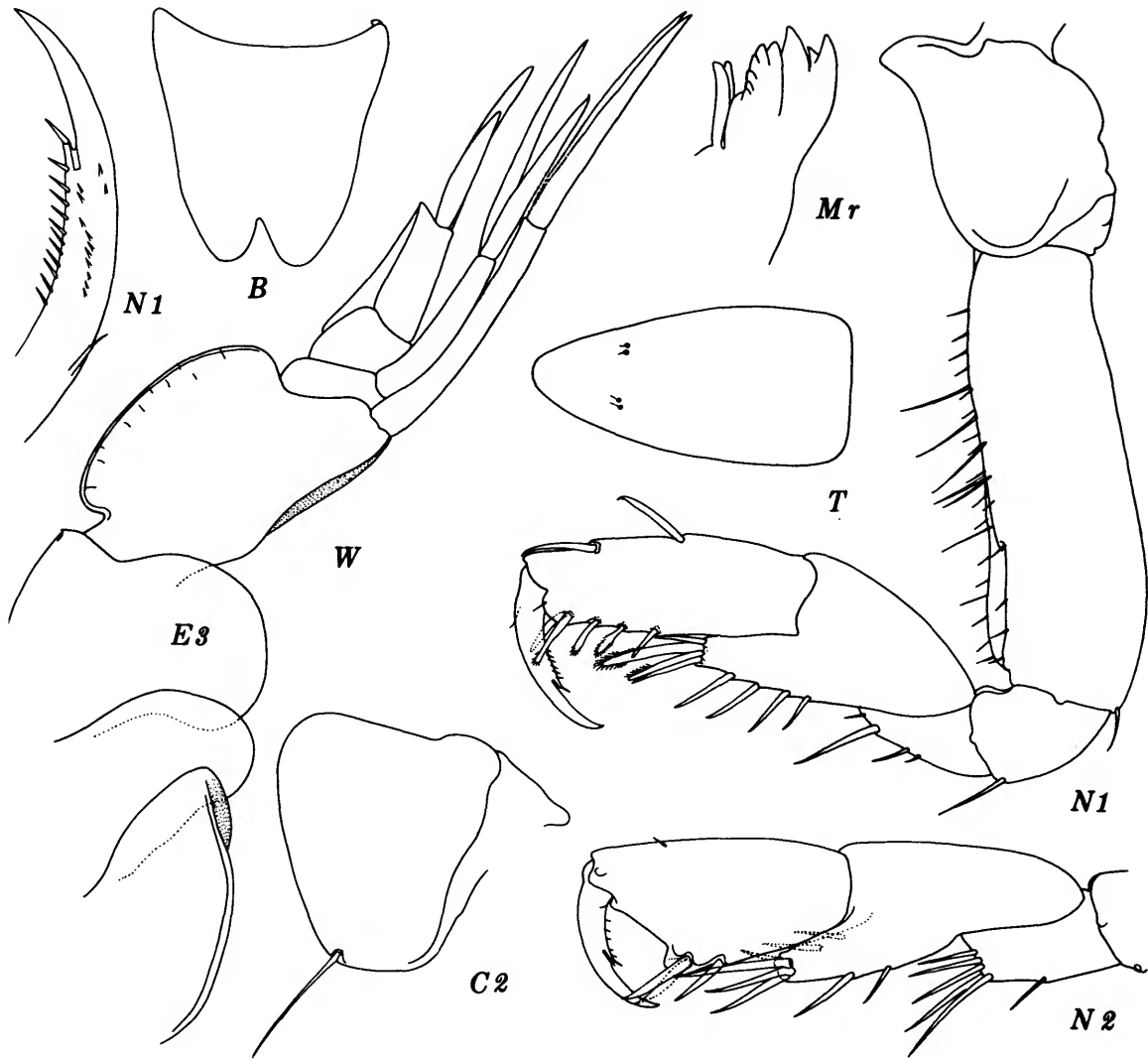


FIGURE 6.—*Moolapheonoides poontee*, new species, holotype, female, 3.12 mm, VicFish 554.

TYPE-LOCALITY.—VicFish 554, Western Port, Victoria, Station 31S-367-3, 52 feet, 20 March 1967.

REMARKS.—The largest-known specimen from VicFish 556 is a female, 3.9 mm long.

MATERIAL.—VicFish 554 (1), 555 (1), 556 (1), 571 (2).

DISTRIBUTION.—Western Port, Victoria, shallow water.

DEXAMINIDAE

Atylus Leach

At least five species of this genus occur in Australia but material of only one species, *A. homochir* Haswell (as interpreted by Stebbing, 1888), is in a condition adequate for description. Three other new species, each with one specimen are present in

the collections. *Atylus minikoi* Walker has also been reported from Carnac Island, Australia, by Chilton (1922), but his material is clearly not *A. minikoi* because the urosomal teeth are entirely distinct. Collections of this genus are very sparse at present; I am puzzled by the large number of described species in the literature and the low frequency of occurrence of the few species I have ever collected in the past two decades.

Atylus homochir Haswell

FIGURES 7-9

Atylus homochir Haswell, 1885:101, pl. 13: figs. 5-7.—Stebbing, 1888:908-913, pl. 74.

DIAGNOSIS.—Body of nototropis category, flexible, poorly calcified, pleonites unthickened, pereonite 7 and pleonites 1-3 with sharp, thin, small postero-dorsal tooth, pleonite 4 with dorsal notch bounded

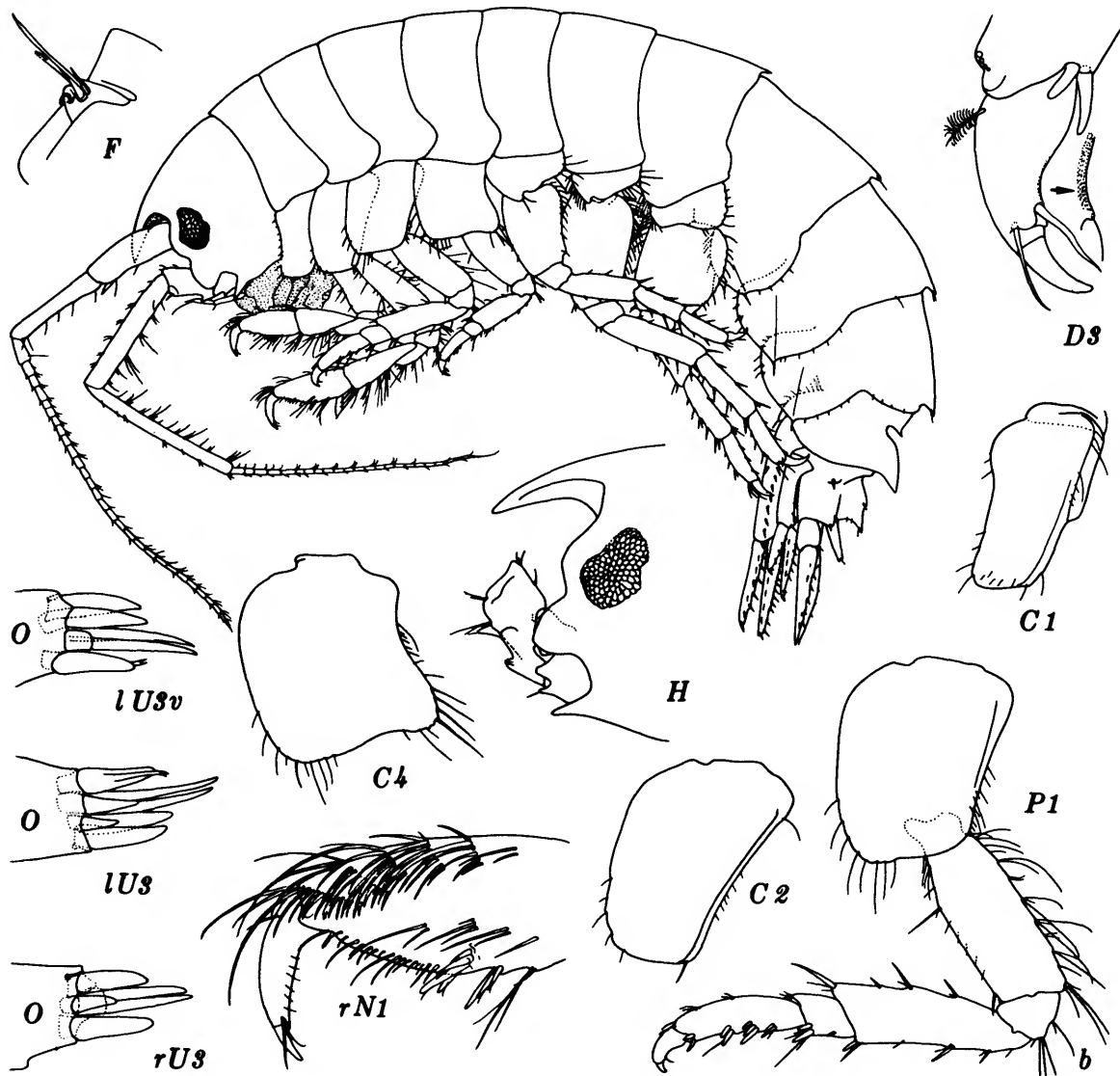


FIGURE 7.—*Atylus homochir* Haswell, female, 11.5 mm, VicFish 291.

anteriorly by small sharp tooth, then rising from saddle to large posterodorsal tooth, pleonites 5-6 (fused) with dorsal notch bounded anteriorly by vertical hump, posteriorly rising from saddle to large posterodorsal tooth, dorsal margin with pair of spinules, posterolateral wing at base of telson with two spinules, ridge marking remnant of articulation between pleonites 5-6 with one spinule; epimera 1-3 with lateral ridge, each with minute posteroventral tooth bearing large spine; rostrum thin, long, sharp, lateral cephalic lobe rounded at

eye, then produced below into adze-shaped process, marked below by deep concavity and long sharp tooth at anteroventral corner; posteroventral corner of article 2 on pereopods 3-4 unproduced, on pereopod 5 with weak notch and shallow lobe not extending below apex of article 2; pereopods not prehensile; mandible with 3-articulate palp; article 1 of antenna 1 with large tooth posterodistally.

DESCRIPTION.—Right molar with long seta on midmargin; upper lip asymmetrically rounded; cuticle covered sparsely with setules and on thickened

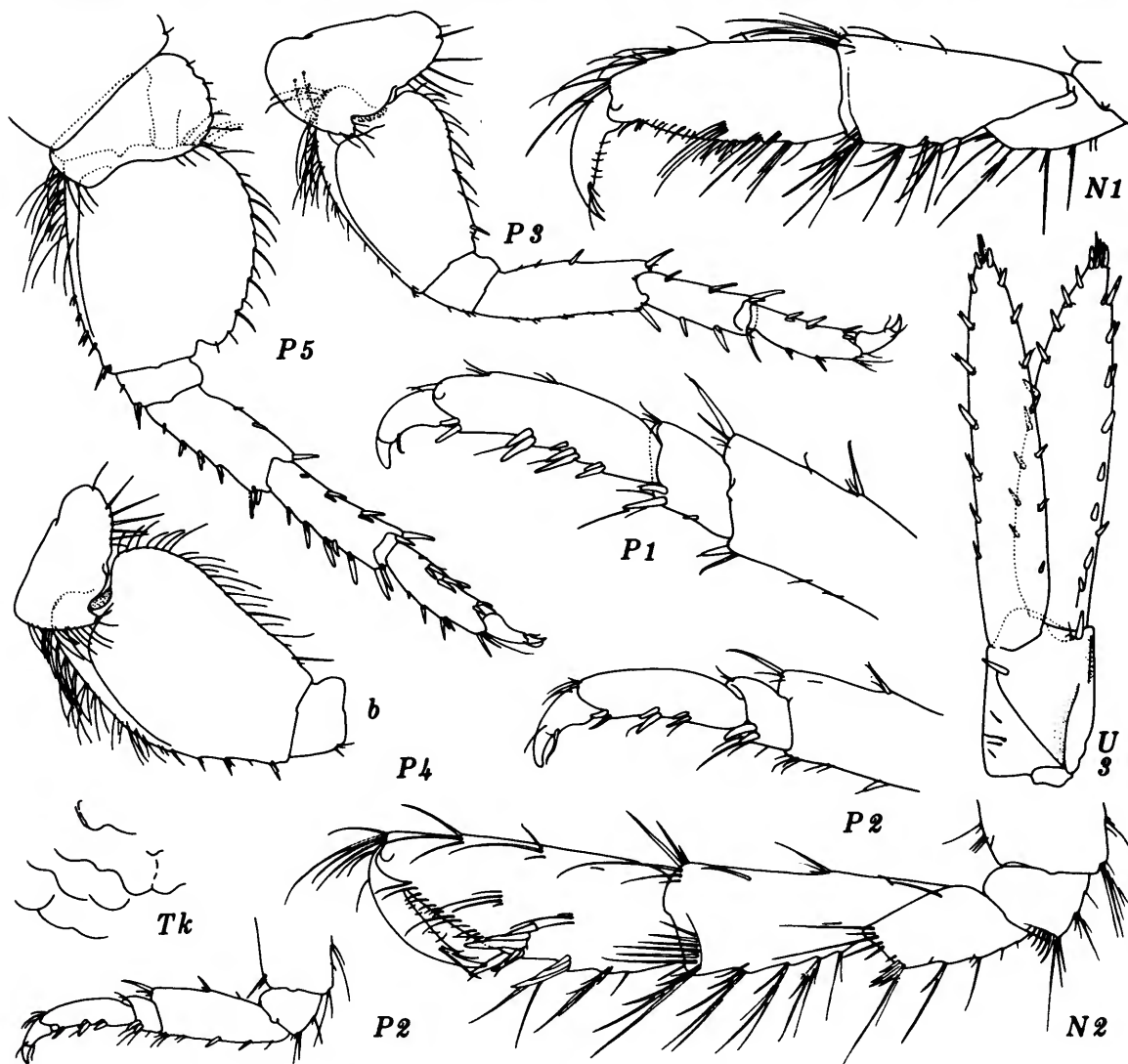


FIGURE 8.—*Atylus homochir* Haswell, female, 11.5 mm, VicFish 291.

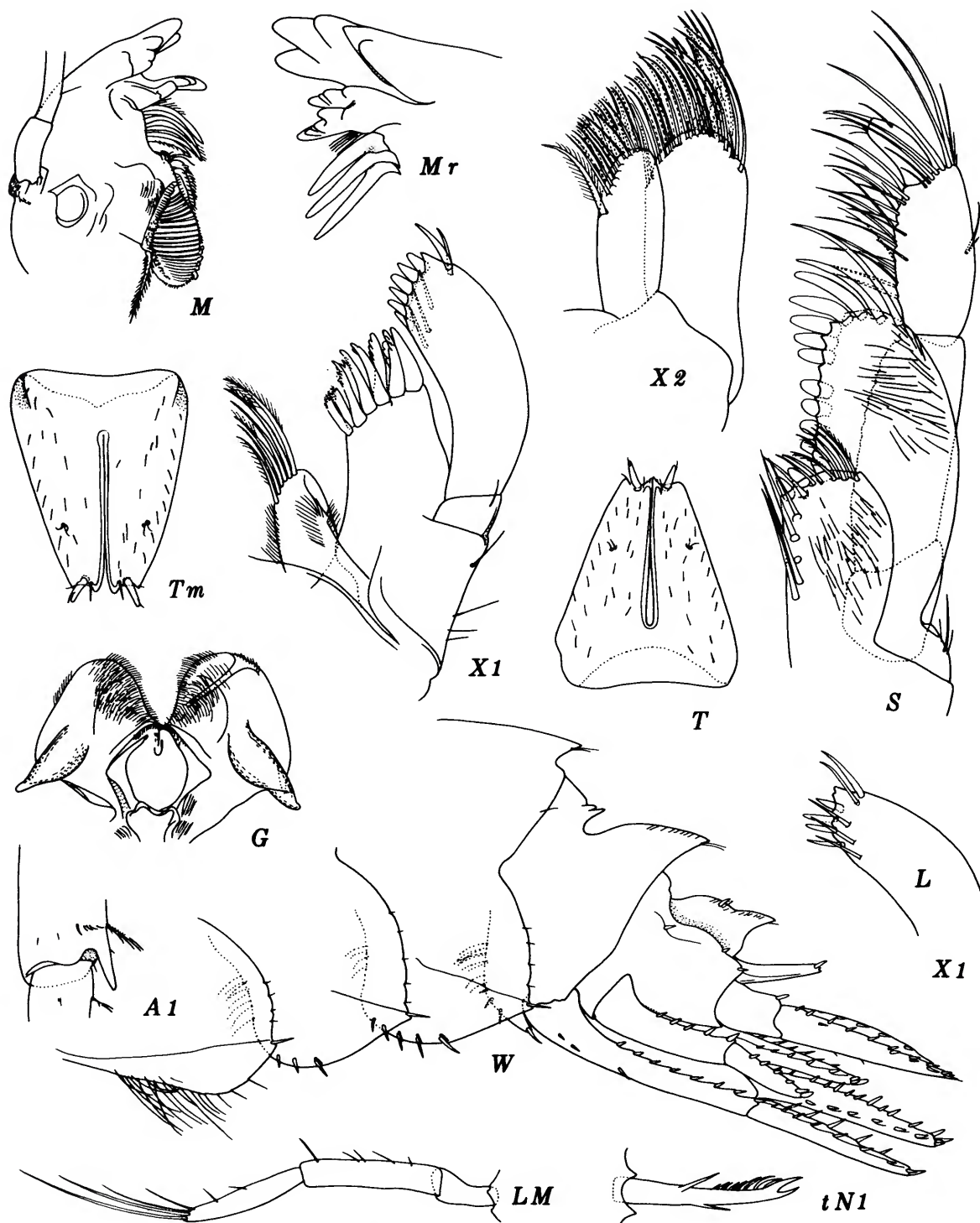


FIGURE 9.—*Atylus homochir* Haswell, female, 11.5 mm, VicFish 291; m=male, 9.0 mm, VicFish 295.

portions of urosome and base of telson covered with weak polygonal structure, polygons largely interrupted; tooth on pereonite 7 absent in juvenile, 3.0 mm, but present on juvenile, 4.0 mm; outer ramus of uropod 3 with minute, cuboid article 2 hidden among apical spines; branchiae flat, broad, spatulate, undivided.

MALE.—Antennae slightly longer than in female, antenna 1 about 65 percent as long as body, antenna 2 about 75 percent as long as body, bundles of setules present on ventral margins of articles 1–2 on antenna 1, and on dorsal margins of articles 3–5 of antenna 2; article 2 of antenna 1 about 1.3 times as long as article 1.

VARIATIONS.—AM G.927, 21 specimens: Nine of these specimens, 6.0 to 11.0 mm long, have the ordinary sharp dorsal teeth of pleonites 1–3 and pereonite 7 whereas 12 specimens, 5.5 to 9.5 mm long, lack the sharp teeth, having the posterodorsal corner of the pleonite (from lateral view) elevated slightly and squared off or blunted. Both groups of specimens contain ovigerous females. Neither group bears the distoventral tooth on article 1 of antenna 1, except for one specimen bearing a rudimentary tooth. The dorsal saddle on pleonites 5–6 (fused) is deeper and article 2 of pereopods 4–5 is narrower and the rostrum shorter and blunter than in the illustrated material.

REMARKS.—Stebbing (1888) did not see Haswell's original material. Haswell did not see the teeth on pereonite 7 and pleonites 1–3 if indeed Stebbing and I have Haswell's species. However, one of Haswell's specimens in the Australian Museum matches the specimens Stebbing and I have (see Appendix).

Chilton's (1912) record of this species, from South Africa, differs from Stebbing's (1888) analysis on sufficient points to be considered a distinct species.

Atylus homochir has been said to be close to *A. swammerdammi* (Milne Edwards), but it actually is seen to be highly distinct from various Atlantic species of *Atylus* now that we can compare it with species from the North Pacific Ocean described since 1938. *Atylus homochir* appears closest to *A. bruggeni* (Gurjanova, 1938) which has a slight cephalic tooth, similar pereopod 5 and similar urosomal teeth but which differs in the absence of the extra cephalic lobe, the presence of dorsal

teeth on pereonites 2–6, and the weakly shortened outer ramus of uropod 2.

Atylus granulatus (Walker, 1904) may be closely similar to *A. homochir* but that species is poorly described; it has granulate cuticle unlike *A. homochir*.

Atylus homochir appears to differ from all known species of the genus in the presence of one of the following three characters: the large anteroventral cephalic tooth, the weakness of the posteroventral lobe on article 2 of pereopod 5, and the large size of the dorsal tooth complex on pleonites 5–6 (fused).

MATERIAL.—See Appendix; Western Port, Victoria, VicFish, 16 samples (24); AM G.927, Jervis Bay, N.S.W., collector T. Whitelegge, before October 1893 (1).

DISTRIBUTION.—Type-locality, Port Stephens; Port Phillip (Stebbing, 1906); Melbourne, 33 fms (Stebbing, 1888); Western Port.

Syndexamine Chilton

Syndexamine mullauna, new species

FIGURE 10

DESCRIPTION OF FEMALE.—Antenna 1 extending much farther than antenna 2, both pairs of antennae short, antenna 1 thick, article 1 bearing one medium ventral spine and a setule, article 2 scarcely shorter than 1, flagella of antennae very short; spines on articles 4–5 of antenna 2 medium to small; lateral cephalic lobes broad and slightly incised, anteroventral cephalic margin with strong bulge supporting base of antenna 2; upper lip rounded below; mandibles very thick, incisors un-toothed, right mandible with two spines, left with three, each molar with ragged seta, short ordinary setae on right, essentially no setae on left except main ragged member, molars scarcely triturative; each outer lobe of lower lip with medium cone (half as long as in *S. wane* J. L. Barnard, 1972a), mandibular lobes broad, blunt, short; inner plate of maxilla 1 with two setae in tandem on subapical medial margin, outer plate with 11 spines, apex of palp with two weak cones and four setae; inner plate of maxilla 2 with numerous facial setules, first proximal main seta not divorced from next distally, lobes like those in *S. wane* except inner

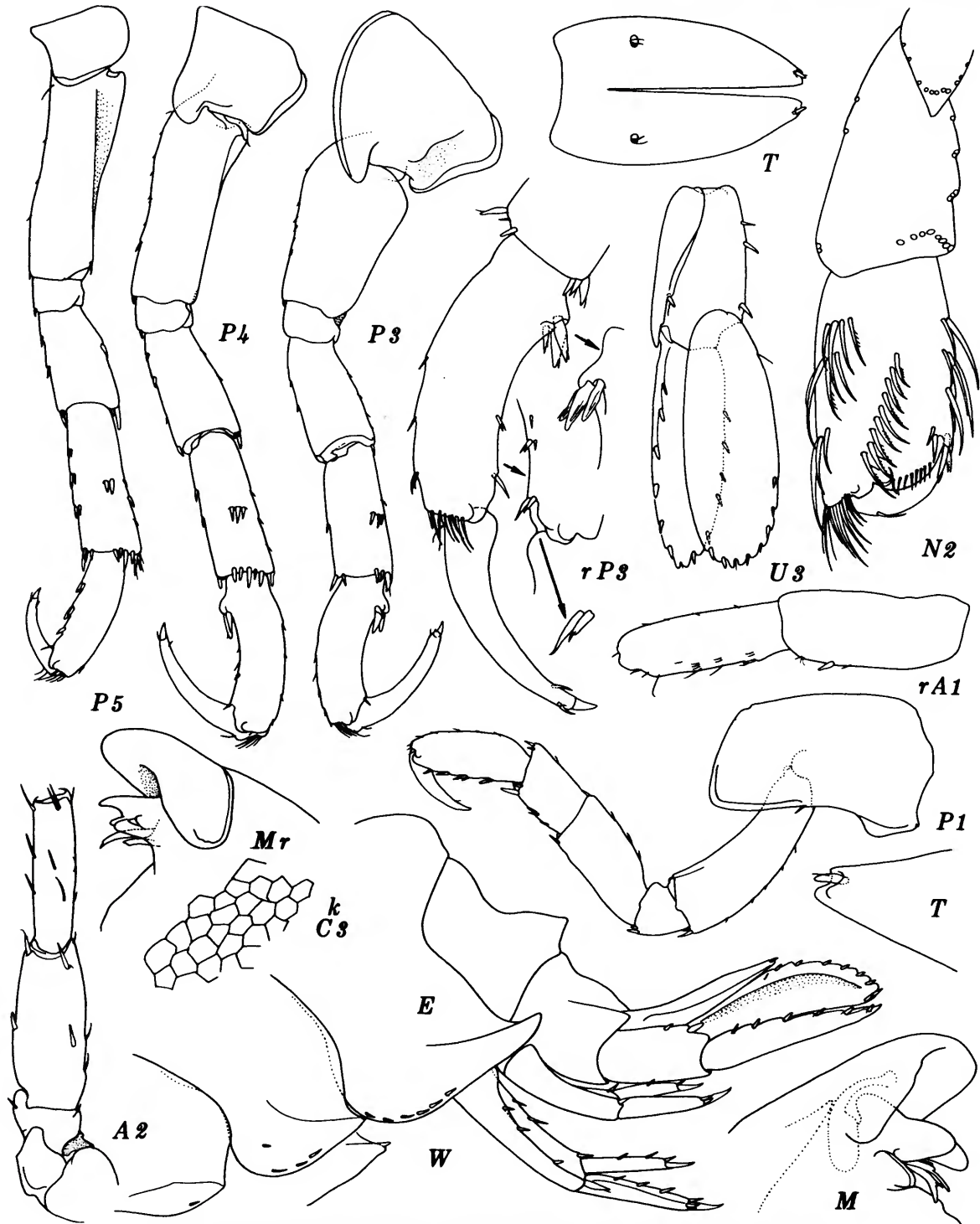


FIGURE 10.—*Syndexamine mullauna*, new species, holotype, female, 4.1 mm, Shepherd 9.

plate slightly enlarged; maxilliped like that of *S. wane*; coxa 2 with one posterior seta, coxa 3 with one thin posterior spine, coxa 1 with concave anterior margin and slightly upturned anteroventral corner; gnathopod 1 like that of *S. wane*, palm nearly transverse but convex, gnathopod 2 like gnathopod 1, with similar obliquity to palm; pereopods 1-2 stout, spines small, posterior margin of article 6 weakly notched, article 6 thus not appearing prehensile; pereopods 3-5 with article 2 thin and rectangular, remaining articles of pereopods as short and stout as in *S. wane*, pereopods 3-4 with heavily prehensile appearance as active margin of article 6 bearing button-hook protuberance near base armed with three stout spines, remainder of margin nearly smooth and slightly excavate, article 6 of pereopod 5 like that of pereopods 1-2, dactyls very long, article 2 of pereopods 4-5 with weak posterodorsal ala, dactyls with main marginal seta free but recumbent; inner rami of uropods 1-2 distinctly shorter than outer, outer ramus of uropod 2 lacking dorsal spine; uropod 3 with rami bearing many heavy spines, apices rounded, one or more spines apically, outer ramus as long as inner; telson of medium width, each apex bearing one spine; pleonal epimera 1-3 with lateral ridge and weak tooth on 1-2, strong on epimeron 3, epimeron 2 with one spine above ventral spines; pleonite 3 protuberant dorsally, pleonite 4 with large, vertically erect protuberance; cuticle bearing moderately strong polygons.

Other details in comparison to *S. wane*: Body appearance similar, inner plate of maxilliped with three medial setae instead of two; two seta-aesthetascs of accessory flagellum longer than in *S. wane*; antenna 1 with stout aesthetascs and apically tubular setae as in *S. wane*; coxa 1 with three mediofacial setae; palms of gnathopods weakly and very finely wavy, dactyls bearing weak subdistal facial setules (unlike *S. wane* but normal to dexaminids), nine setae in oblique mediofacial row on hands of gnathopods, dorsal setae in three sets, large gap be-

tween sets 1 and 2, on gnathopod 1 these sets, distal to proximal, bearing five, five, and four setae, on gnathopod 2 bearing three, four, and four setae; ventral spines on epimera 1-3=one, three, six; dorsolateral ridges of urosomites 2-3 (fused) lacking spines. Male unknown.

HOLOTYPE.—SAM, female, 4.1 mm. Unique.

TYPE-LOCALITY.—Shepherd 9, Pearson Islands, South Australia, Station B, 15 feet, algae on horizontal face, 8 January 1969.

REMARKS.—Only one specimen is available but it is so clearly distinct from other species of *Syndexamine* that I am reasonably certain it is not simply an aberrant phenotype. It resembles *S. wane* J. L. Barnard (1972a) especially in the body form, fairly heavy chitin and especially in the absence of incisorial teeth. *Syndexamine mullauna* differs from *S. wane* in the weak spines of the antennae, the polygonal surface of the body chitin lacking setules, the shorter cones on the lower lip, more oblique palm of gnathopod 2 and far more numerous setae on the oblique row of the hand, the presence of weak posterior setae-spines on coxae 2-3, but especially in the sixth articles of the pereopods which have a completely different configuration than that found in *S. wane*; pereopods 1-2 and 5 have very weak spines and no prehensile appearance whereas pereopods 3-4 have a strongly prehensile appearance distinct from *S. wane* in the button-hook arrangement of protuberance and spines; the dorsolateral ridges on urosomites 2-3 (fused) lack spines, the rami of uropod 3 extend equally, and the apices are evenly rounded.

DISTRIBUTION.—Pearson Islands, South Australia, 5 m.

GAMMARIDAE

Elasmopus Costa

Specimens of this genus are rare in the five collections at hand; apparently in Australia this genus is under competition from the dominant species of *Mallacoota*, *Cottesloe*, and *Nuuanu*.

Key to Three Species of *Elasmopus* from Australia

(Including females and large juveniles)

1. Hand of gnathopod 1 lacking medial comb row of setae..... *E. yunde*, new species
Hand of gnathopod 1 bearing medial comb row of setae..... 2
2. Epimeron 3 with lateral ridge, apices of telson excavate, pereopodal dactyls lacking castellae..... *E. menurte*, new species
Epimeron 3 lacking lateral ridge, apices of telson truncate, pereopodal dactyls with three large castellae..... *E. bollonsi*

All views of the mandibular palp drawn separately herein (Figures 13, 15, 16) are viewed from the left obverse side.

Elasmopus bollonsi Chilton

FIGURES 11-13

Elasmopus bollonsi Chilton, 1915:328-330, figs. 11, 12.

DIAGNOSIS OF MALE.—Accessory flagellum 4-articulate, antennae heavily setose; eyes medium in size,

ommatidia numerous, poorly pigmented (in alcohol); mandibular palp normally falcate; article 5 of gnathopod 1 scarcely shorter than article 6, hand with medial comb row; right and left male gnathopod 2 highly dissimilar, either right or left grossly enlarged, articles 2-3 lacking lobes, articles 4-5 forming halfmoon tightly appressed proximally to article 6, posterior lobe of article 5 lacking setae, article 6 immensely enlarged, elongate, palm and posterior margin essentially confluent, palmar limit marked by shallow pocket receiving apex of

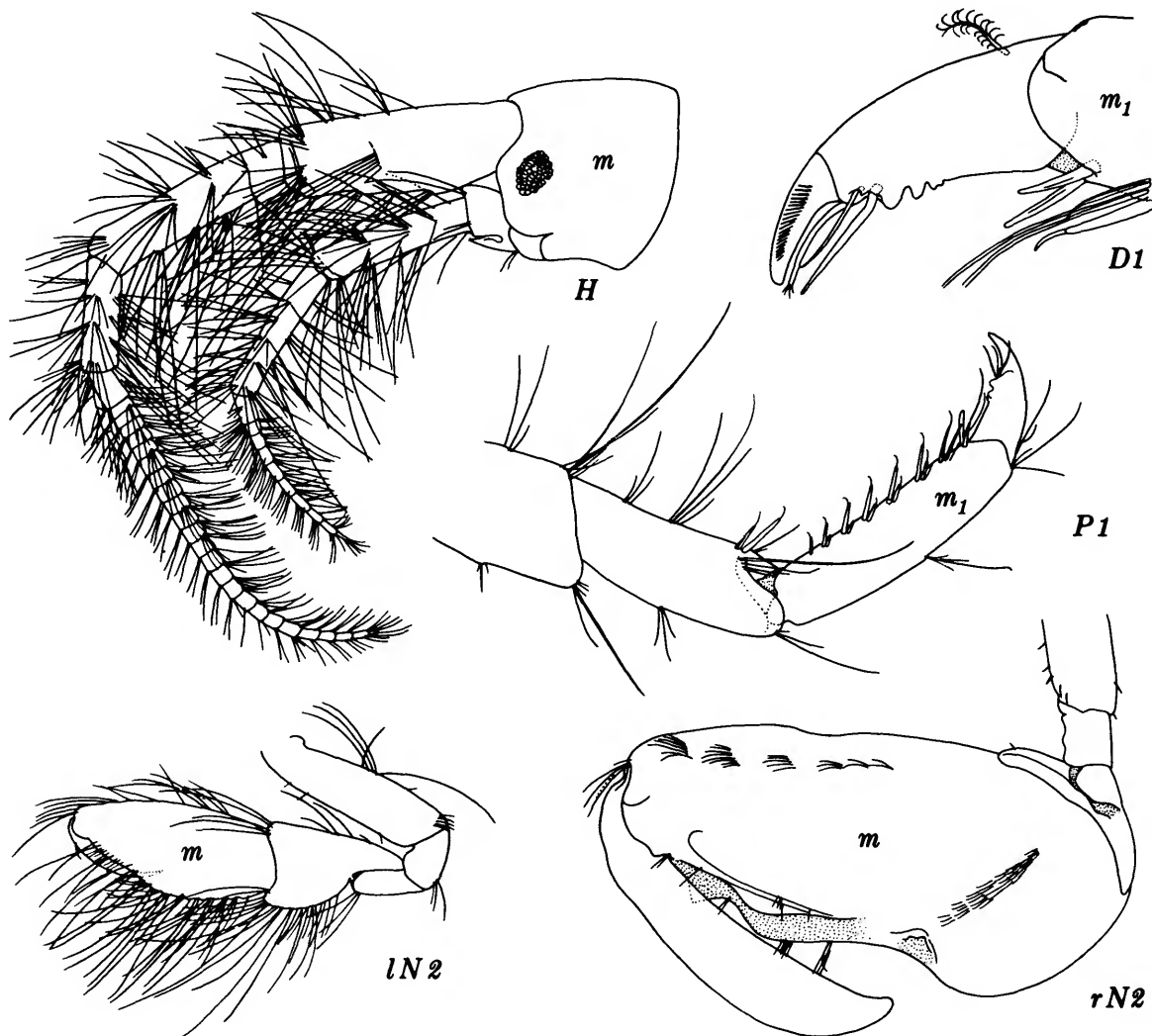


FIGURE 11.—*Elasmopus bollonsi* Chilton, *m*=male, 8.2 mm, Shepherd 11; *m*₁=male, 8.9 mm, Pt. Peron.

dactyl, palm bisinuate laterally, with medial ridge bearing hump, medial face bearing normal sets of anterior setae, posterior sets confined to weak row set well in from proximoposterior margin, dactyl thickening towards mark 80, then tapering; small gnathopod 2 of form similar to juveniles or females, article 5 about two-thirds as long as article 6, posterior lobe broad and extended distalwards, hand elongate, oblique palm slightly shorter than posterior margin of hand, palm weakly excavate near apex of dactyl, defined by one medial, one marginal spines; locking spines of pereopods 1-2 unequal to each other in size, nearly simple, dactyl with about three large inner castellae, then thick seta, two thinner setae, nail strongly marked and facially striped; locking spines of pereopods 3-5 equal to each other in size; pereopods 3-5 with long setae on several articles, especially posterodistal

margin of article 6, article 2 of pereopod 4 especially rectangular, of pereopod 3 weakly so, of pereopod 5 weakly ovate, posterior margins poorly serrate, posteroventral lobe of pereopod 5 reaching only halfway along article 3; pleonal epimera 1-2 with lateral ridge, posteroventral corners of epimera 1-3 with small tooth and weak sinus, posterior margins weakly serrate (notched), ventral margins with three or four spines, no pairs; urosomites simple; rami of uropods ordinarily spinose; inner ramus of uropod 3 extending about 60 percent along outer ramus, both rami narrowly truncate and moderately spinose apically, outer with tiny article 2 bearing two setae; telson broader than long, deeply cleft, each apex truncate and bearing two or three long spines.

FEMALE.—Gnathopod 2 like small version of male gnathopod 2 but palm not excavate, article 5

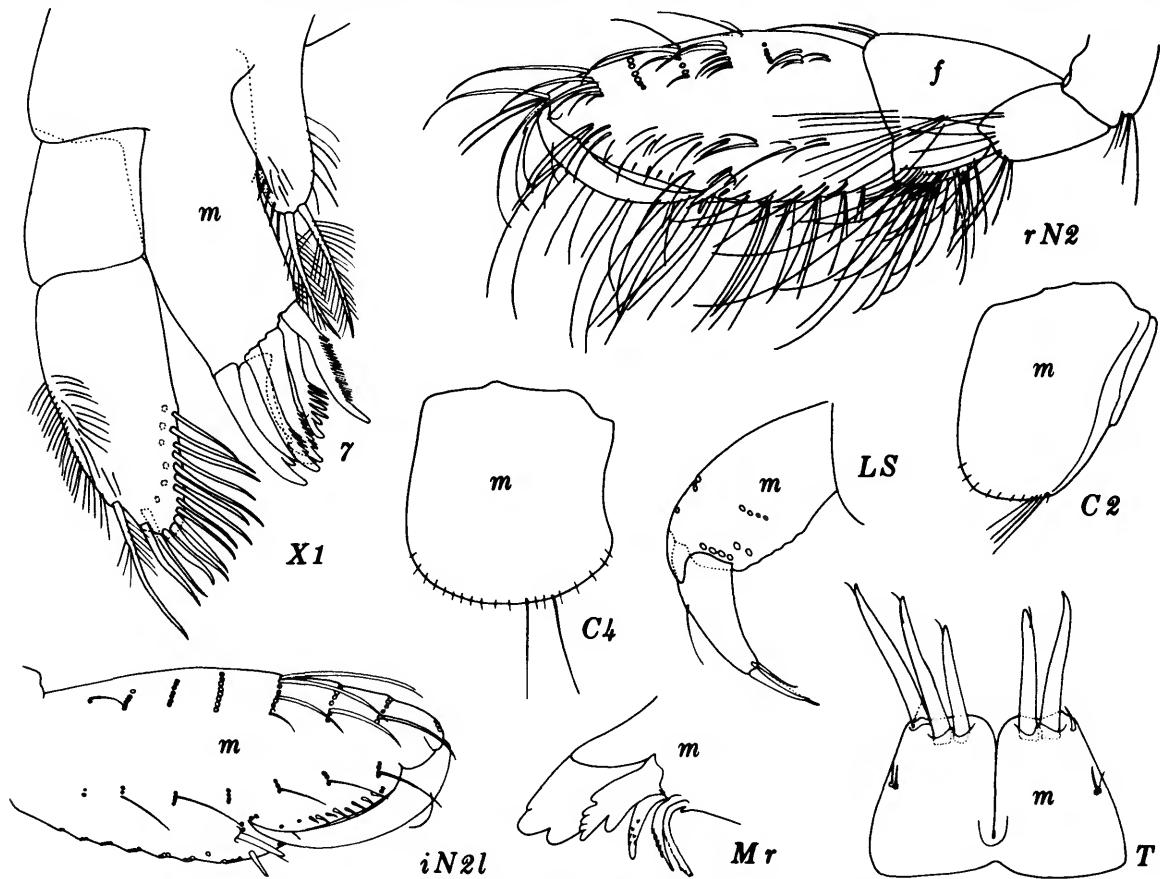


FIGURE 12.—*Elasmopus bollonsi* Chilton, m=male, 8.2 mm, Shepherd 11; f=female, 6.6 mm, Shepherd 18.

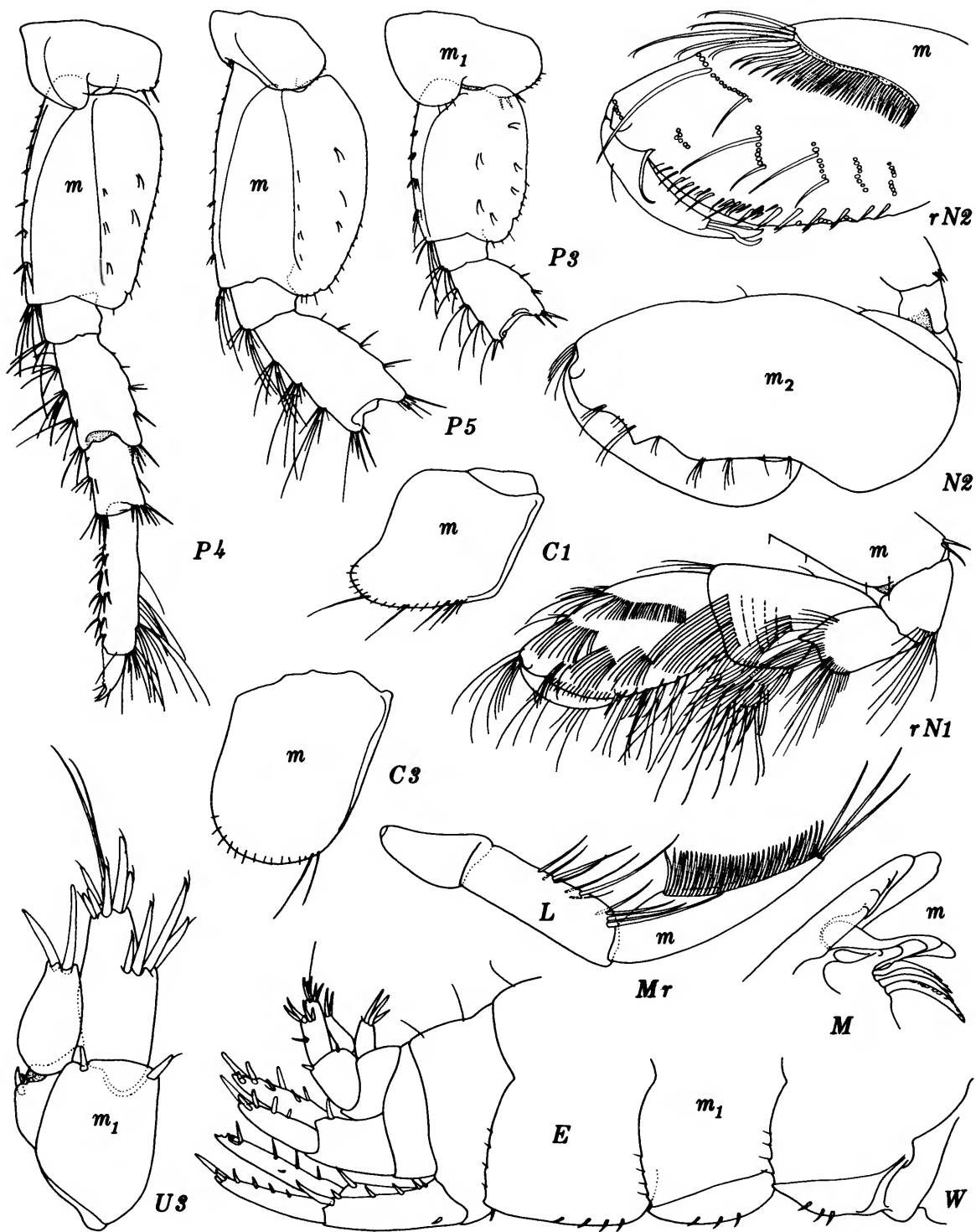


FIGURE 13.—*Elasmopus bollonsi* Chilton, m =male, 8.2 mm, Shepherd 11; m_1 =male, 8.9 mm, Pt. Peron; m_2 =male, 6.5 mm, Shepherd, 43.

shorter and posterior lobe not distally extended; antennae less setose than in male.

PLEOPODS.—Especially small for species of *Elasmopus*, about as long as height of pleonite (generally 1.5 times or longer in normal members of genus).

ILLUSTRATIONS (Figures 11–13). — Mouthparts generally like those shown for *E. yunde*, new species, but upper lip slightly more truncate ventrally, and mandibular lobes of lower lip slightly sharper; maxilla 1 and palp articles 3–4 of maxilliped distinct and illustrated for *E. bollonsi*.

REMARKS.—No significant differences from New Zealand specimens can be found.

MATERIAL.—Shepherd 11 (1), 18 (1), 43 (1); JLB Australia 13 (1); Slack-Smith 2 (1); WAM, Pt. Peron, 27 November 1946, weed washing (1).

DISTRIBUTION.—New Zealand; warm-temperate Australia; depth, 0–110 m.

Elasmopus menurte, new species

FIGURES 14, 15

DIAGNOSIS OF MALE.—Accessory flagellum 4-articulate; antennae normally setose; eyes medium in size, ommatidia numerous, heavily pigmented, with deep purple core (in alcohol); mandibular palp very stout, articles 2–3 with facial setae; article 5 of gnathopod 1 slightly longer than article 6, hand

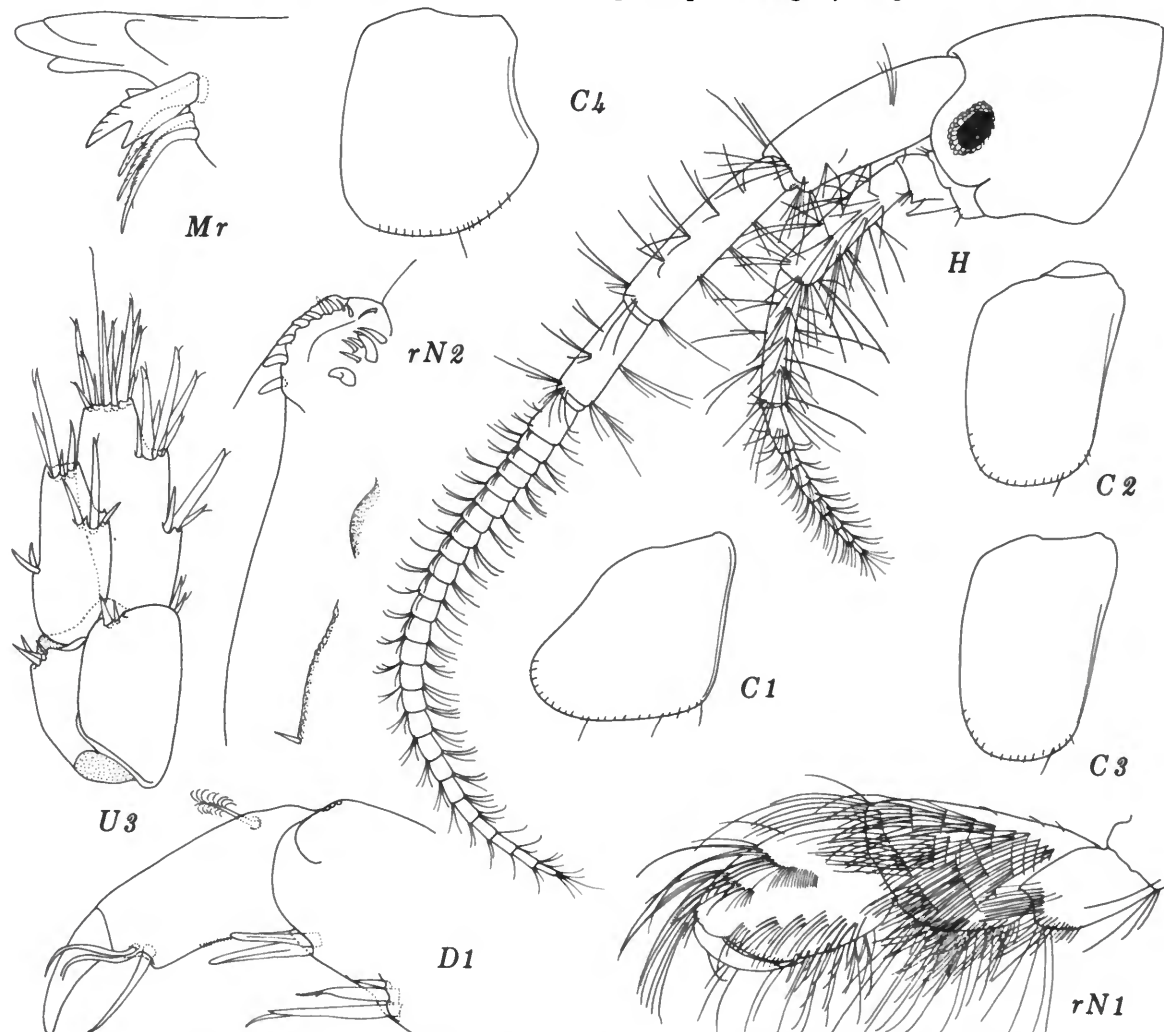


FIGURE 14.—*Elasmopus menurte*, new species, holotype, male, 10.2 mm, JLB Australia 5.

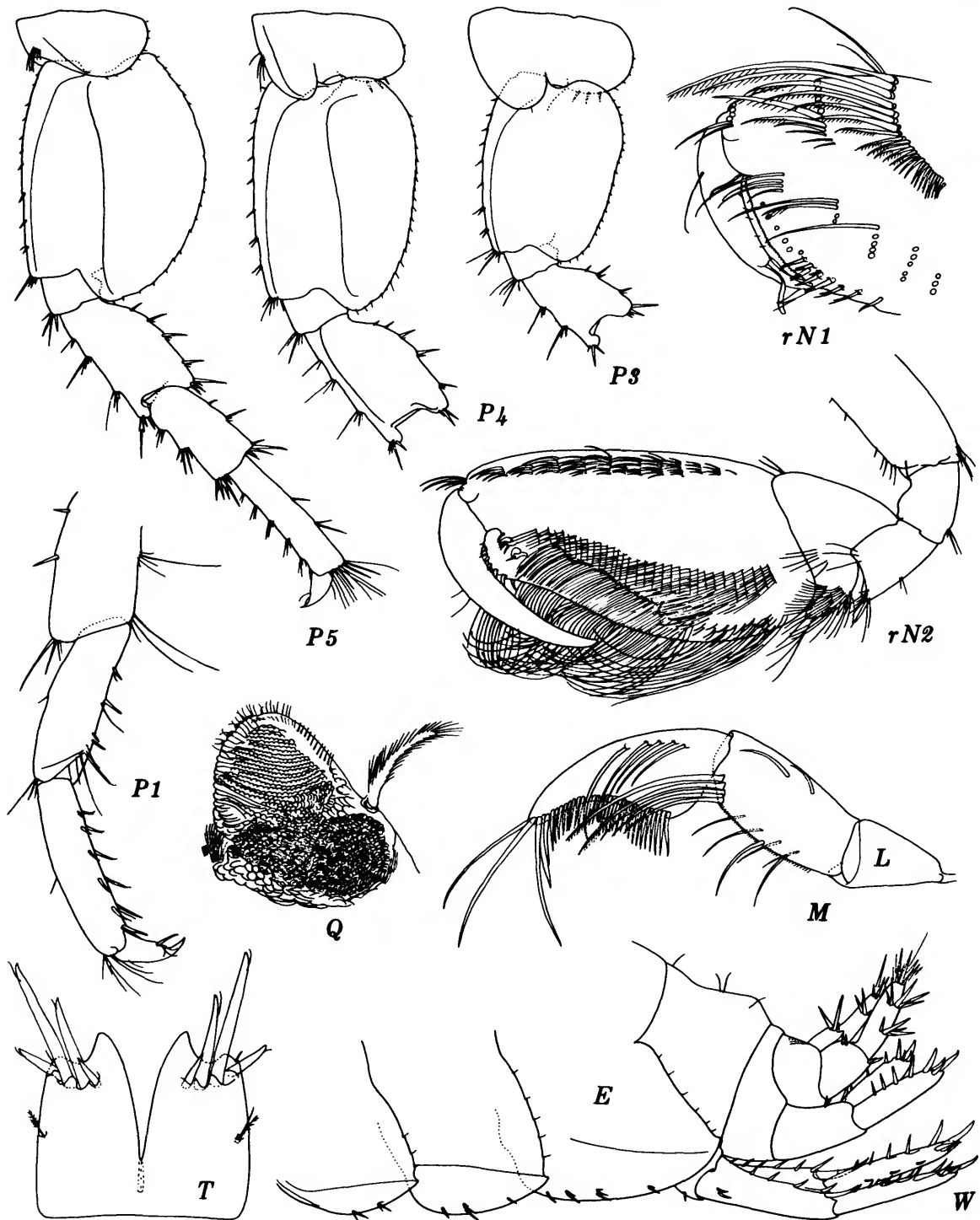


FIGURE 15.—*Elasmopus menurte*, new species, holotype, male, 10.2 mm, JLB Australia 5.

with medial comb row; articles 2 and 3 of gnathopod 2 lacking lobes, article 5 short, bearing narrow, setose posterior lobe, article 6 elongate and tapering, palm and posterior margin of hand confluent, densely setose, distal end of palm bearing low, spinose protrusion, medial face of hand with ridge hidden by setae, distal end of ridge with hump, proximal end of ridge with spine near closed apex of dactyl; locking spines of pereopods 1-2 slightly unequal in size, nearly simple, dactyl ordinary, bearing one stout inner seta and two other setae (one split apically); locking spines of pereopods 3-5 equal to each other in length; long setae on pereopods 3-5 sparse, article 2 of pereopods 3-5 ovato-rectangular, of pereopod 5 ovate, posterior margins poorly serrate, posteroventral lobe on article 2 of pereopod 5 extending to apex of article 3; pleonal epimera 1-3 with lateral ridge, posteroventral corners with small tooth and weak sinus, epimeron 3 especially long (anteroposteriorly) posterior margins of epimera weakly notched, formulae of ventral spines on epimera 1-3, anterior to posterior, epimeron 1=2-2, epimeron 2=1-3-1, epimeron 3=1-2-3-2; urosomite 1 with low, triangular dorsal hump; rami of uropods ordinarily spinose; inner ramus of uropod 3 extending about 70 percent along outer ramus, both rami narrowly truncate and heavily or moderately spinose apically, outer with tiny article 2 bearing two setae; telson broader than long, deeply cleft, each apex strongly excavate, medial limb longer than lateral limb, each apex with two long and two short spines.

JUVENILES (3.6 mm).—Urosomite 1 lacking dorsal crest but crucial characters of adult male represented properly as follows: ridge of epimeron 3, comb row of gnathopod 1, shape of mandibular palp article 3 and presence of one facial seta; inner ramus of uropod 3 short; rami of uropods 1-2 with two dorsal spines each; each apex of telson with two spines, midlimb of excavation elongate.

ILLUSTRATIONS.—Mouthparts generally like those of *E. yunde*, new species, (Figure 16) but following parts distinct and illustrated herein (Figures 14-15); right lacinia mobilis and incisor, palp and molar of mandible, note group of palmate setae on molar (like *Cottesloe*, new genus, p. 27); left mandibular incisor and lacinia mobilis as shown for *E. bollonsi*; maxilla 1 like that of *E. yunde* but basolateral corner of segment bearing outer plate

with two long and two short setae (at base of palp) and inner plate of right side bearing three setae, third seta slightly mediad; process on palp article 3 of maxilliped slightly larger than shown for *E. yunde* and both main plates with sparse facial hairs.

HOLOTYPE.—WAM 129-71, male, 10.2 mm.

TYPE-LOCALITY.—JLB Australia 5, west of Bunker Bay, Cape Naturaliste, intertidal, wash of algae and rocks, 2 September 1968.

RELATIONSHIP.—This species is so close to *E. japonicus* Stephensen (1932) that it may deserve only subspecific status; *E. menurte* differs from *E. japonicus* in the much lower crest of urosomite 1 and in the broad apical excavation of each telsonic lobe with the medial limb extending much farther than the lateral limb.

Elasmopus menurte has affinities with *E. neglectus* Chilton (1915), from New Zealand. Only *E. menurte*, *E. japonicus*, and *E. neglectus* have a crest on urosomite 1 now that other crested species of *Elasmopus* have been removed to *Mallacoota* J. L. Barnard (1972a). *Elasmopus menurte* differs from *E. neglectus* in the very stout article 3 of the mandibular palp, the presence of only one cone on each lobe of the lower lip, the stouter and more evenly rectangular hand of gnathopod 1, with a shorter comb row, the evenly tapering dactyl of male gnathopod 2, the absence of castellations on pereopods 4-5, the smaller dorsal hump of urosomite 1, the presence of a lateral ridge on epimeron 3 and the shape of the telsonic apices, which in *E. neglectus* have the lateral limb longer than the medial limb, and which in *E. neglectus* have a subsidiary set of lateral, subapical spines.

MATERIAL.—The type-locality, the holotype and two juveniles, 3.6 mm long.

DISTRIBUTION.—Southwestern Australia, intertidal.

Elasmopus yunde, new species

FIGURES 16-18

DIAGNOSIS OF MALE.—Accessory flagellum 2-articulate; antennae normally setose; eyes medium in size, ommatidia sparse, poorly pigmented, weakly eosin; mandibular palp normally falcate; article 5 of gnathopod 1 shorter than article 6, hand lacking comb row; articles 2 and 3 of gnathopod 2 lacking

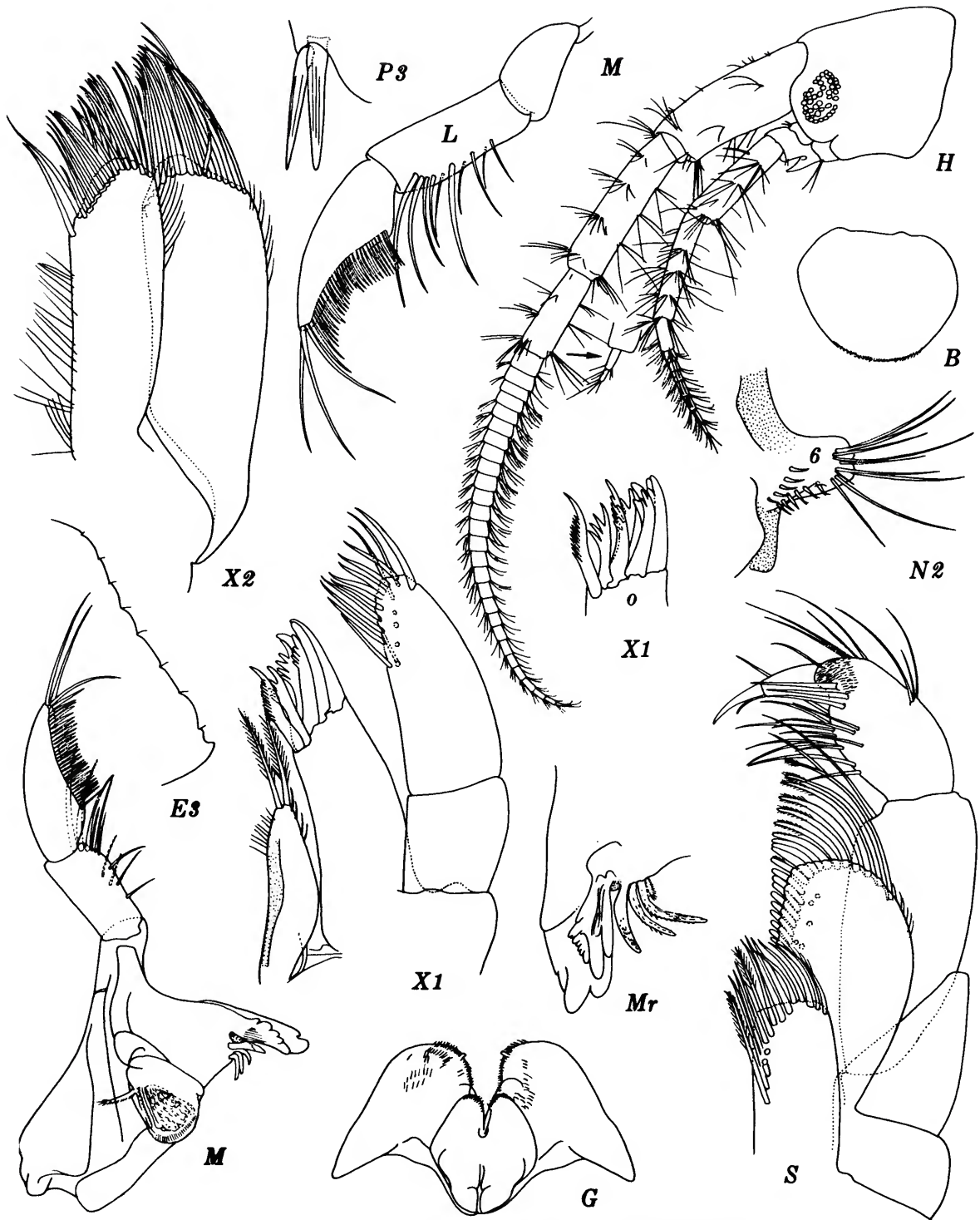


FIGURE 16.—*Elasmopus yunde*, new species, holotype, male, 4.8 mm, Pt. Peron.

lobes, article 5 short, bearing narrow but relatively short, setose posterior lobe, article 6 elongate and strongly tapering, palm and posterior margin of hand confluent, densely setose, distal end of palm bearing strong, subtruncate protrusion, medial face of hand with ridge hidden by setae, weak lobe hidden by setae, latter placed proximal to apex of dactyl when closed; posterodistal end of article 6 on pereopods 1-2 with two locking spines, one smaller than other and slightly curved, larger with one striation (cleft), dactyl subapically constricted, bearing one long, medium stout spine and two stout setules; locking spines of pereopods 3-5 equal

to each other in length, straight, with few striations; pereopods 3-5 lacking long setae, article 2 of pereopods 3-4 rectangular, posterior margin straight, posteroventral lobe even, reaching to apex of article 3, article 2 of pereopod 5 generally narrow, posteroventral lobe slightly exceeding apex of article 3, posterior margin almost evenly convex, posteroventral slope heavily castelloserrate; pleonal epimera 1-2 with lateral ridge, posteroventral corners of epimera 1-3 with small tooth and weak sinus, epimeron 3 especially long (anteroposteriorly) posterior margin weakly convex, notched and setulose, formulae of ventral spines on epimera, anterior

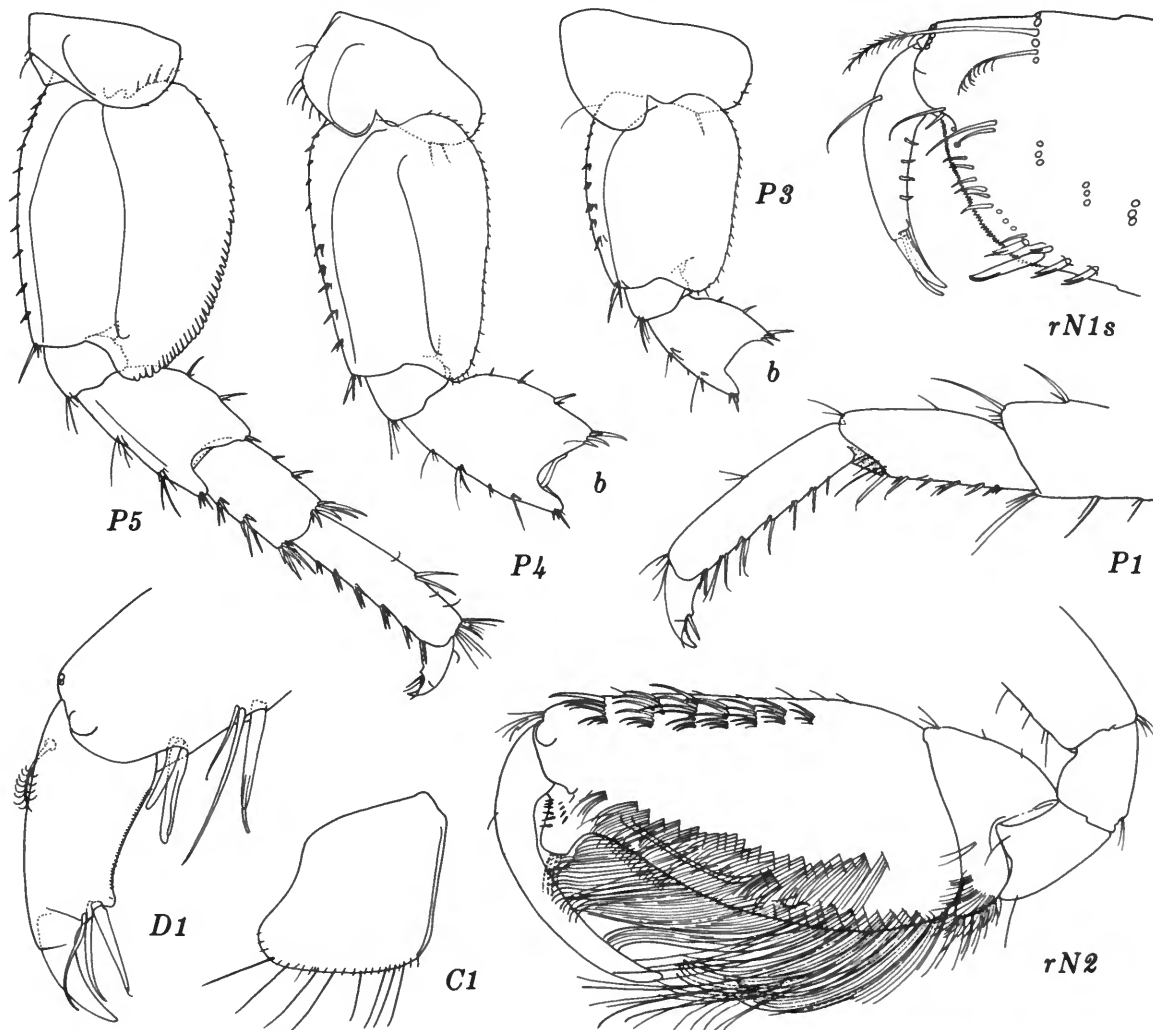


FIGURE 17.—*Elasmopus yunde*, new species, holotype, male, 4.8 mm, Pt. Peron.

to posterior, epimeron 1=1, epimeron 2=1-2-2, epimeron 3=1-1-2; urosomites simple; rami of uropods ordinarily spinose; inner ramus of uropod 3 extending about 70 percent as far as outer ramus, both rami truncate and heavily spinose apically, outer with tiny article 2 bearing two setae; telson broader than long, deeply cleft, each apex evenly excavate, limbs sharp, each apex with two long and one short spines.

FEMALE.—Gnathopod 2 as illustrated. Sexes distinguishable at length of 3.0 mm but castellations of pereopod 5 not appearing until length of 4.5 mm, based on specimens in JLB Australia 14.

HOLOTYPE.—WAM 130-71, male, 4.8 mm.

TYPE-LOCALITY.—Point Peron, Western Australia, presumably intertidal, weed washing, 27 November 1946.

RELATIONSHIP.—This species differs from *Elasmopus crassimanus* (Miers, 1884) in the hand of male gnathopod 2, which in *E. crassimanus* is said to have a low, broad tooth near the base of the dactyl, another hump on the face of the hand where the apex of the dactyl closes on the hand and two spines between the two humps.

Elasmopus yunde is similar to *E. antennatus* (Stout) from California but differs in the castelloserrate pereopod 5 and the larger tooth on the hand of male gnathopod 2.

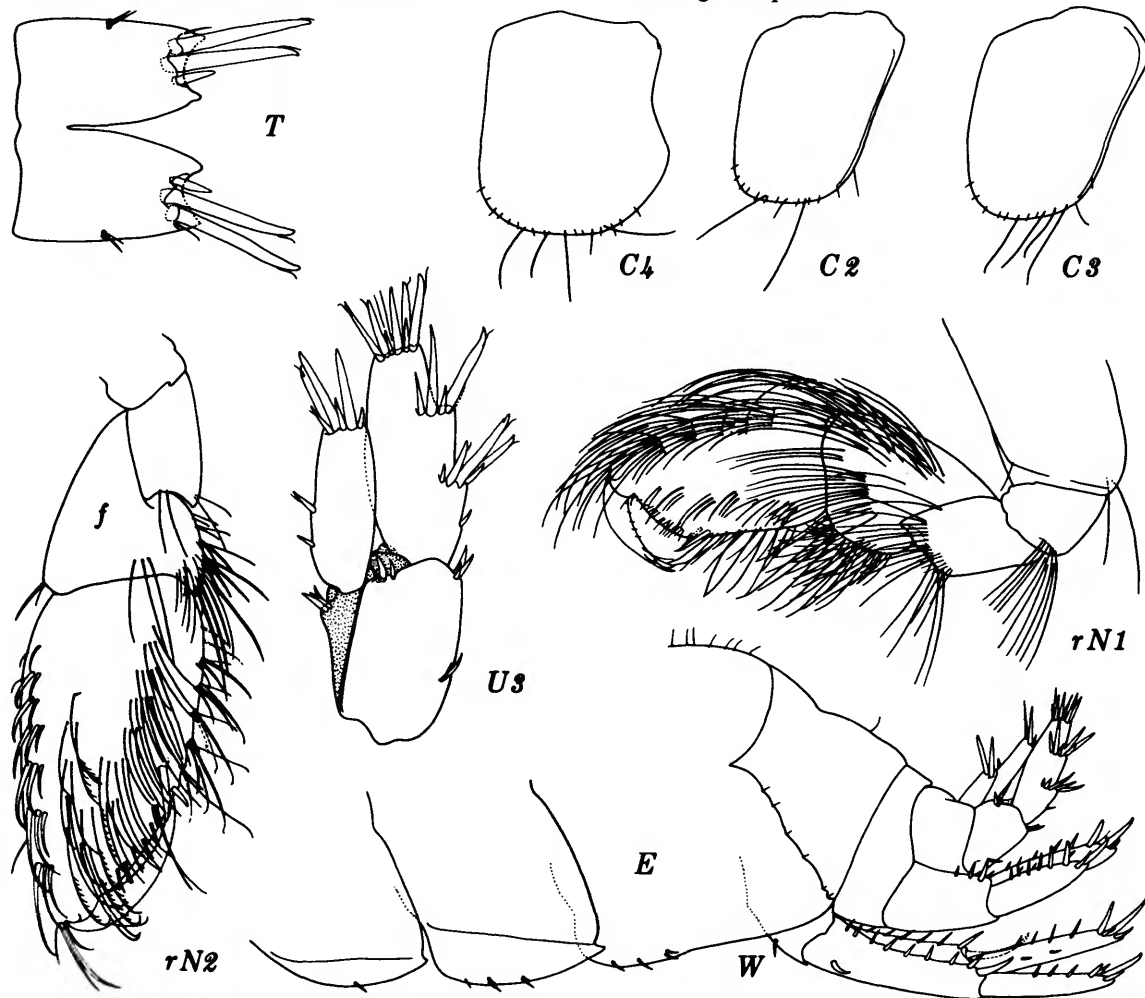


FIGURE 18.—*Elasmopus yunde*, new species, holotype, male, 4.8 mm, Pt. Peron; f=female, 7.1 mm.

The condition of the hand on male gnathopod 2 and the shortened inner ramus or uropod 3 suggest affinities with *E. ecuadorensis* Schellenberg and *E. e. hawaiiensis* Schellenberg. *Elasmopus yunde* differs from both subspecies in the castelloserrate pereopod 5. The typical subspecies of *E. ecuadorensis* has a poorly cleft telson with blunt, stubby apices.

Elasmopus pecteniscrus (Bate) has the significant castelloserrations on pereopod 4, not pereopod 5 as in *E. yunde*.

Elasmopus buchneri Spandl has an elongate article 6 on gnathopod 1 in both sexes, a weak hump on male gnathopod 2 and no castelloserrations on pereopod 5.

Elasmopus perditus Reid, from West Africa, is very close to *E. yunde* but lacks castelloserrations on pereopod 5; many features of Reid's species need description.

Elasmopus gracilis Schellenberg has a long, sinuous dactyl on male gnathopod 2, no process on the palm and no castellations on pereopod 5.

MATERIAL.—The type-locality (2); JLB Australia 10 (14); Slack-Smith 5 (13).

DISTRIBUTION.—Western Australia, between Point Peron and Cottesloe, intertidal.

Cottesloe, new genus

DIAGNOSIS.—Anteroventral cephalic notch present; antenna 1 longer and stouter than antenna 2, not geniculate, accessory flagellum exceeding three articles; upper lip entire; mandibles basic, palp article 3 weakly falcate and pectino spinose on inner margin; inner lobes of lower lip weak to absent; inner plate of maxilla 1 large, medial margin fully setose; inner plate of maxilla 2 fully setose on medial margin and bearing submarginal oblique row of setae; palp of maxilliped 4—articulate, article 4 dactyliform, article 3 apically unlobed; gnathopod 1 ordinary, subchelate, hand lacking medial comb row, bearing large bifid spines near palm, gnathopod 2 enlarged, sexually dimorphic, article 4 with

tooth, setae not pinnate; uropod 3 biramous, rami short, inner very short, article 2 of outer ramus visible; telson deeply cleft, short; either or both of pleonites 5–6 with dorsal spines; cuticle villose.

TYPE-SPECIES.—*Cottesloe berringar*, new species.

RELATIONSHIP.—*Cottesloe* differs from *Elasmopus* Costa in the heavily setose inner plates of the maxillae, and, except for *E. neglectus* Chilton and *E. japonicus* Stephensen, the presence of a dorsal process on pleonite 4. The dorsal spines of pleonites 5–6 on *Cottesloe* also constitute a difference.

Cottesloe differs from *Mallacocta* J. L. Barnard in the setiferous inner plates of the maxillae and the falcate and pectinospinose article 3 on the mandibular palp.

Ceradocopsis Schellenberg has a straight and poorly spinose article 3 on the mandibular palp, lacks a cephalic notch and lacks dorsal armaments on the urosome.

Elasmopoides Stebbing appears to be a product of the *quadrimana* group in *Maera*; it differs from *Cottesloe* in the equally extended antennae 1–2, the curved but not falcate mandibular palp article 3, well-developed inner lobes on the lower lip and the basally separate lobes of the telson.

Ceradocoides Nicholls has an unemarginate coxa 4, a telson cleft only halfway, sharp triangular carinae on pleonites 4 and 5; the mandibular palp is unknown and relationships to *Cottesloe* are cloudy.

The deep-sea *Metaceradocoides* Birstein and Vinogradova is unusually close to *Cottesloe* but has an elongate telson, feeble gnathopod 2 in the male, and small but distinct inner lobes on the lower lip.

Anelasmopus Oliveira lacks dorsal armaments on the pleon and has a poorly setose inner plate of maxilla 2, the terminal setae extending about halfway medioproximally, a submarginal setal row being absent.

Liagoceradocus J. L. Barnard has a small gnathopod 2 in the male, elongate rami on uropod 3, stubby article 4 on the maxillipedal palp, unexcavate coxa 4, and no dorsal armaments on the pleon.

Key to Species of *Cottesloe*

- Epimeron 1 with large anteroventral tooth, only pleonite 4 with large dorsal tooth, article 2 of pereopods 3–4 not castellate, epimeron 2 not extended, eyes dense *C. berringar*, new species
 Epimeron 1 lacking anteroventral tooth, only pleonites 1–2 with small dorsal tooth each, article 2 of pereopods 3–4 castellate, epimeron 2 extended posteroventrally, eyes diffuse
 *C. merriganee*, new species

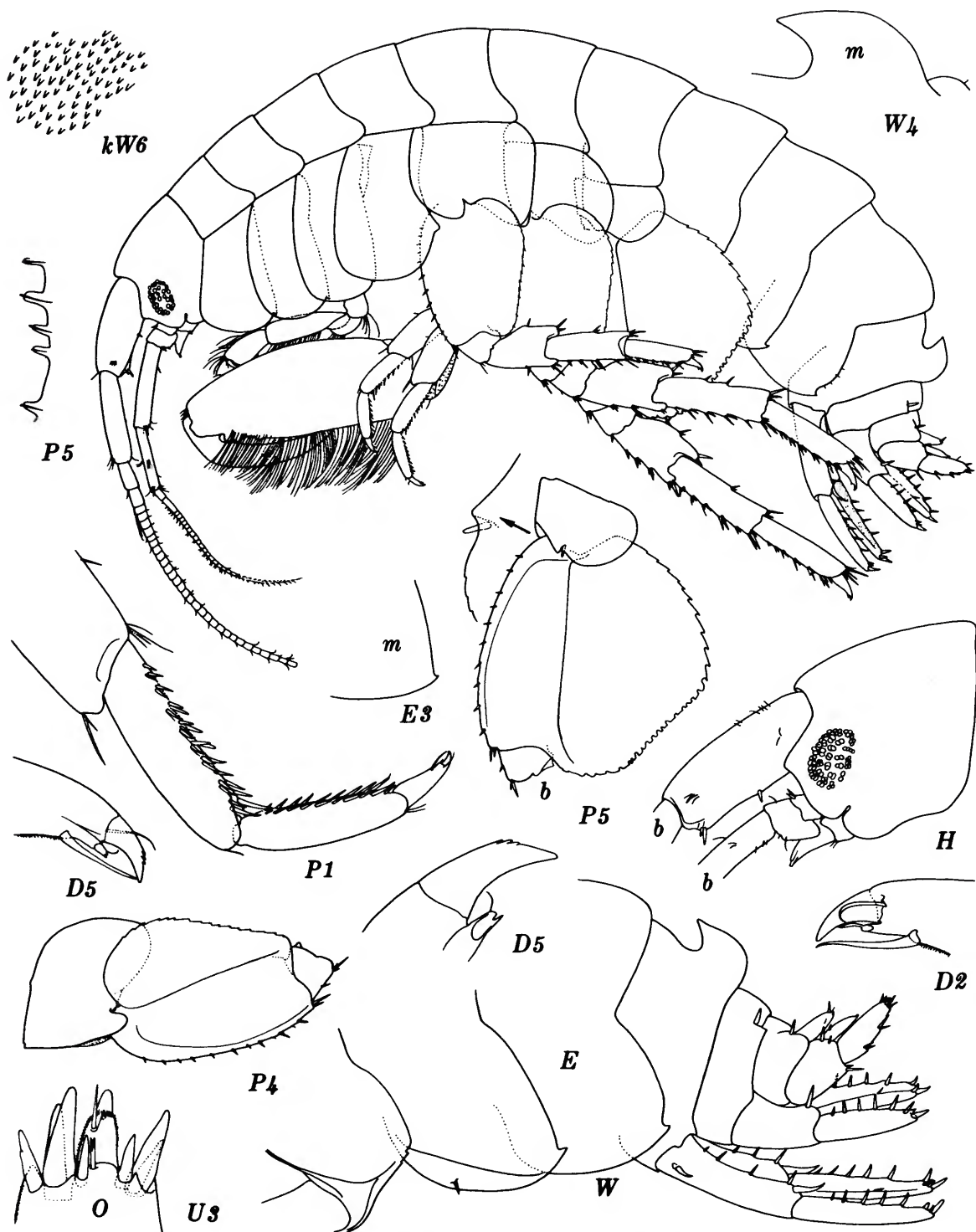


FIGURE 19.—*Cottesloe berringar*, new genus, new species, holotype, male, 13.3 mm, Cottesloe;
 m=male, 8.2 mm, VicFish 573.

Hornellia Walker has transversely serrate pleonites and a nonfalcate article 3 of the mandibular palp.

Cottesloe berringar, new species

FIGURES 19-21

DESCRIPTION.—Lateral cephalic lobe with mammilliform hump dorsally; ommatidia of eyes sparse; ventral margin of article 1 on antenna 1 with one spine at mark 55, and one or two spines at apex; accessory flagellum 6-7 articulate; article 1 of mandibular palp half as long as article 2, article 3 scarcely shorter than article 2; inner plate of maxil-

iped with long apicolateral cone, outer plate with several apicomedial cones; article 5 of male gnathopod 1 elongate, shorter and stouter in females and juveniles; female gnathopod 2 slender, elongate, palm highly oblique; male gnathopod 2 with elongate hand, palm occupying all of posterior margin, heavily setose on margin, part of posteroproximal hand slightly flattened or weakly hollowed, covered with extremely fine "hairs," palm with pair of distal teeth and one tooth slightly proximal, no defining tooth, dactyl reaching slightly more than halfway along palm, with scarcely perceptible hump near mark closing on distal tooth pair, in young males teeth absent, marked only by articulate

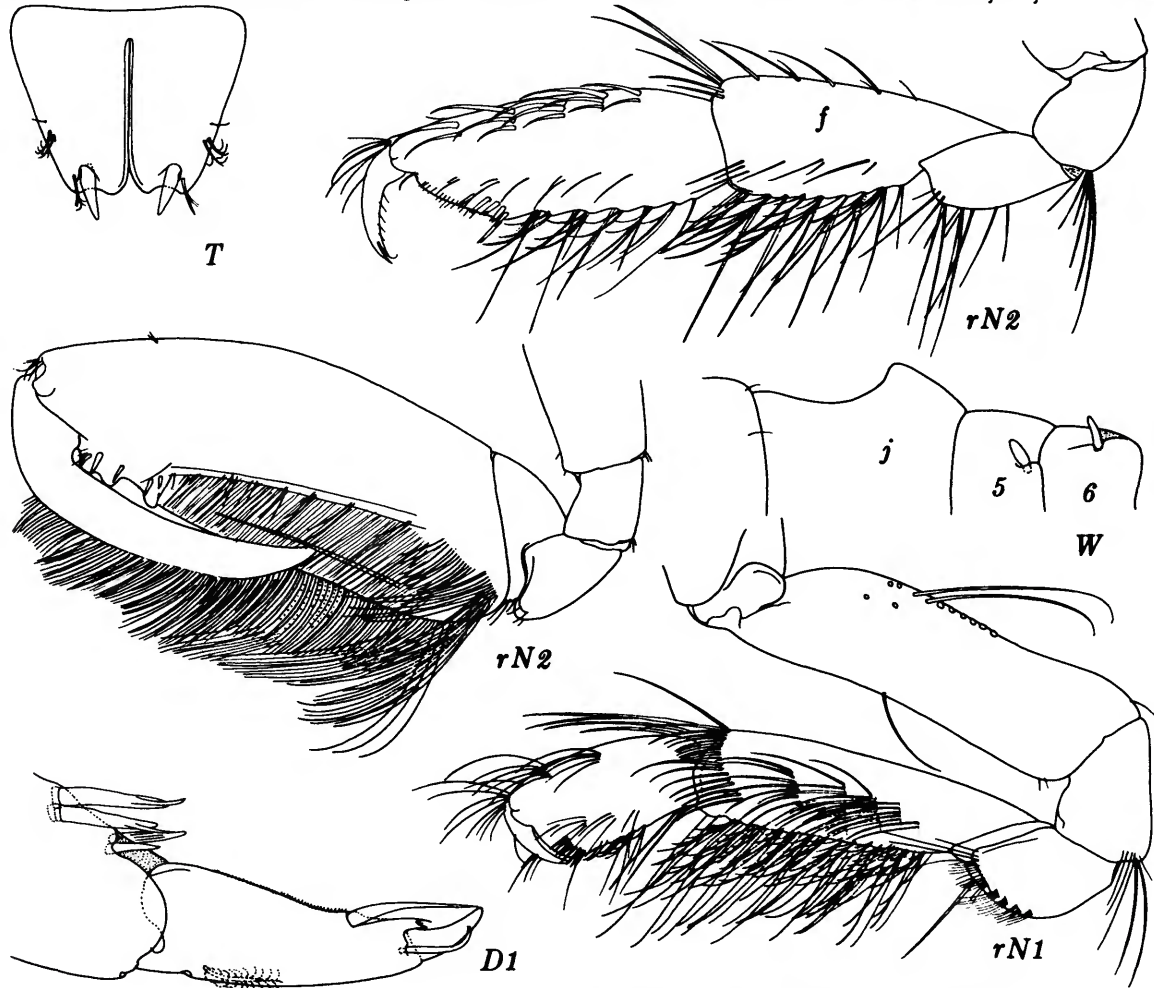


FIGURE 20.—*Cottesloe berringar*, new genus, new species, holotype, male, 13.3 mm, Cottesloe; f=female, 9.9 mm, Cottesloe; j=juvenile, 3.4 mm, VicFish 574.

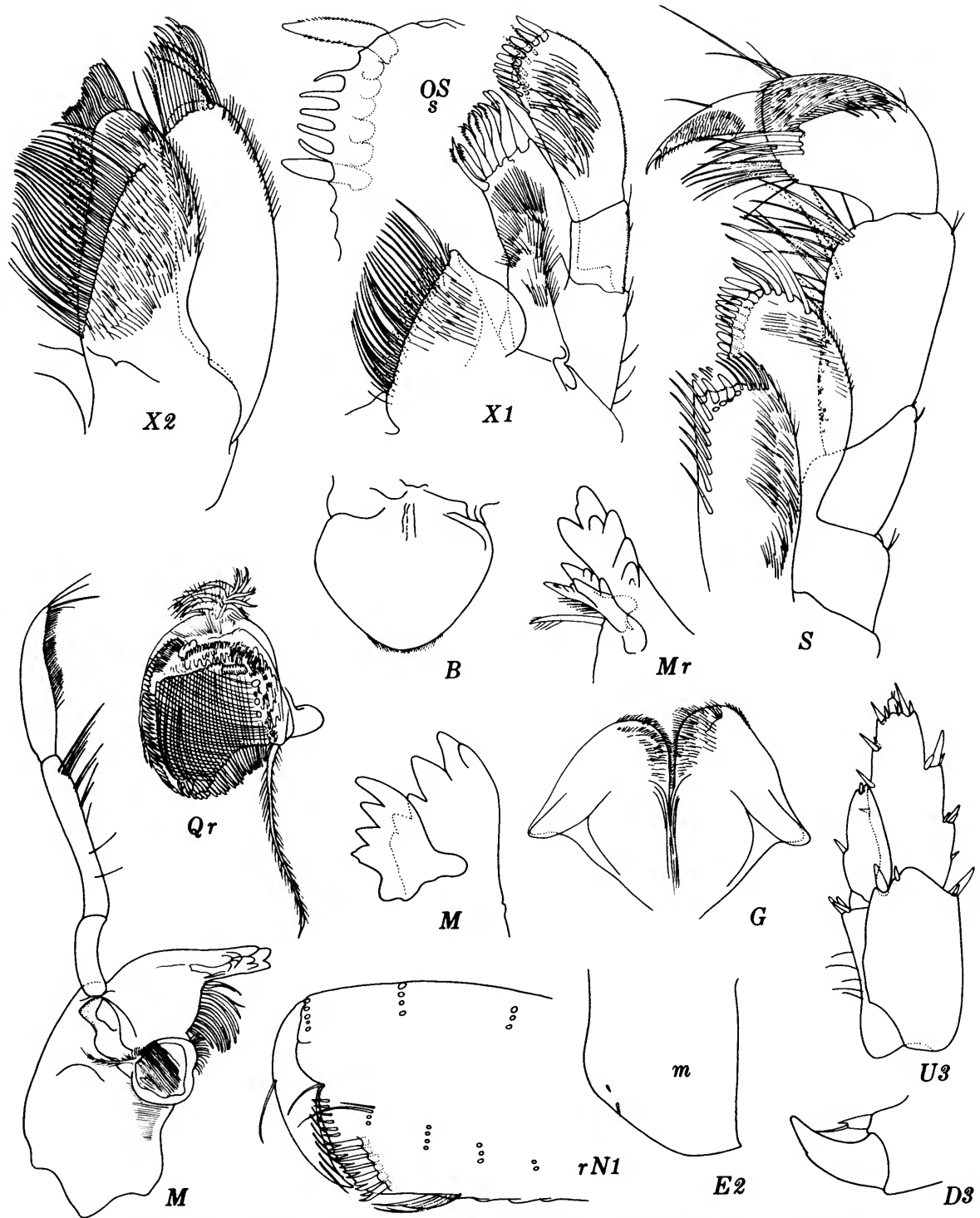


FIGURE 21.—*Cottesloe berringar*, new genus, new species, holotype, male, 13.3 mm, Cottesloe;
m=male, 8.2 mm, VicFish 573.

spines; pereopods 1–5 with densely spinose article 6, dactyls with large inner seta proximal to distal spine, setule on face at base of distal spine, inner margin at base of spine with ragged spout bearing setule and meatus, inner margin of dactyl weakly pectinate, pair of locking spines with one medium and one small member, larger weakly striate, locking spines smaller than next adjacent pair of spines, article 2 of pereopods 3–4 ordinary, of pereopod 5 broadly expanded, posteroventrally oblique and castellate; uropod 1 with enlarged spine both apicomediaally and apicolaterally on peduncle; outer ramus of uropod 3 about as long as peduncle, article 2 very small and bearing fused apical spine, spinule and setule, inner ramus reaching about halfway along outer, apical bifidation bearing small spine; telson broader than long, cleft more than three-fourths, apices broad, weakly bilobed, each bearing stout spine and setule, each lobe with pair of lateral setules and small setule proximally; epimeron 1 with large, curved anteroventral tooth, 2 serrations on ventroposterior margin, no tooth at corner, epimeron 2 with lateral ridge, one anteroventral spine on face, sharp, small tooth at posteroventral corner, posterior margin weakly convex, epimeron 3 with convex posterior margin, posteroventral sinus and weak, sharp tooth, no spines, no ridge; pleonite 4 with large, reverted dorsal tooth, pleonites 5 and 6 each with dorso-lateral ridge and spine on each side; cuticle smooth but internally alveolar except on body postero-dorsally, with dense villosities or minute shagreen on telson and palp of maxilla 1.

WESTERN PORT SPECIMENS.—Largest about 8.5 mm; epimeron 2 lacking ridge, with two anteroventral spines on face, with perceptible angle between anterior and posterior parts of ventral margin, posteroventral tooth of epimera 2–3 small; juveniles as small as 4.0 mm long easily recognizable, several juveniles 3.0 mm also with normal tooth on pleonite 4 but one juvenile, 3.4 mm, VicFish 574 (Figure 20W γ) with poorly developed tooth; ommatidia of juveniles very scarce; sexual distinctions noted at length of 4.5 mm.

HOLOTYPE.—WAM 136–71, male, 13.3 mm.

TYPE-LOCALITY.—Cottesloe, near Perth, Western Australia, February 1925, presumably intertidal.

REMARKS.—There is an outward resemblance of this species to *Elasmopus neglectus* Chilton (1915),

from New Zealand, but *Cottesloe* has the heavily setose maxillae of the *Melita*-group and further differs from *E. neglectus* in the reduced inner ramus of uropod 3, the strong hook shape of the process on the pleonite 4, the expanded article 2 of pereopod 5, the presence of spines on pleonites 5–6, the elongate article 1 of mandibular palp and the elongate gnathopod 1.

MATERIAL.—The type-locality (2); WAM, Cottesloe, May, 1926, 11049–11058 (2); Port Phillip 76 (3); Western Port, VicFish, 8 samples (22); Slack-Smith 1 (1).

DISTRIBUTION.—Warm-temperate Australia, shallow water.

Cottesloe merriganee, new species

FIGURES 22, 23

DESCRIPTION.—Lateral cephalic lobe evenly and softly quadratiform; ommatidia of eyes sparse; ventral margin of article 1 on antenna 1 with one spine at mark 60 and one spine at apex; accessory flagellum 3–articulate; article 1 of mandibular palp half as long as article 2, article 3 slightly longer than article 2; inner plate of maxilliped with lateral cone, outer plate with two long medial cones; article 5 of male gnathopod 1 slightly elongate; female gnathopod 2 like illustration for *C. berringar* but article 3 elongate (see Figure 23fN2), and articles 4–6 weakly stouter and palm with only two bifid spines medially; male gnathopod 2 with elongate hand, palm occupying all of posterior margin, heavily setose on margin, part of distoposterior hand slightly flattened, covered with extremely fine “hairs,” palm with small group of spines near base of dactyl, posterior margin with four large spines set on weak acclivities, no defining tooth, dactyl not reaching halfway along palm, apically blunt, inner margin with small stout setules; pereopods 1–5 with densely spinose article 6, dactyls with large inner seta proximal to distal spine, setule on face at base of distal spines, inner margin at base of spine with setule but no spout, inner margin of dactyl weakly pectinate, locking spines comprising two medium members smaller than next adjacent spines; article 2 of pereopods 3–5 deeply castellate posteriorly, article 2 of pereopods 3–4 slightly concave posteriorly, of pereopod 5 broadly expanded; uropod 1 with enlarged spine

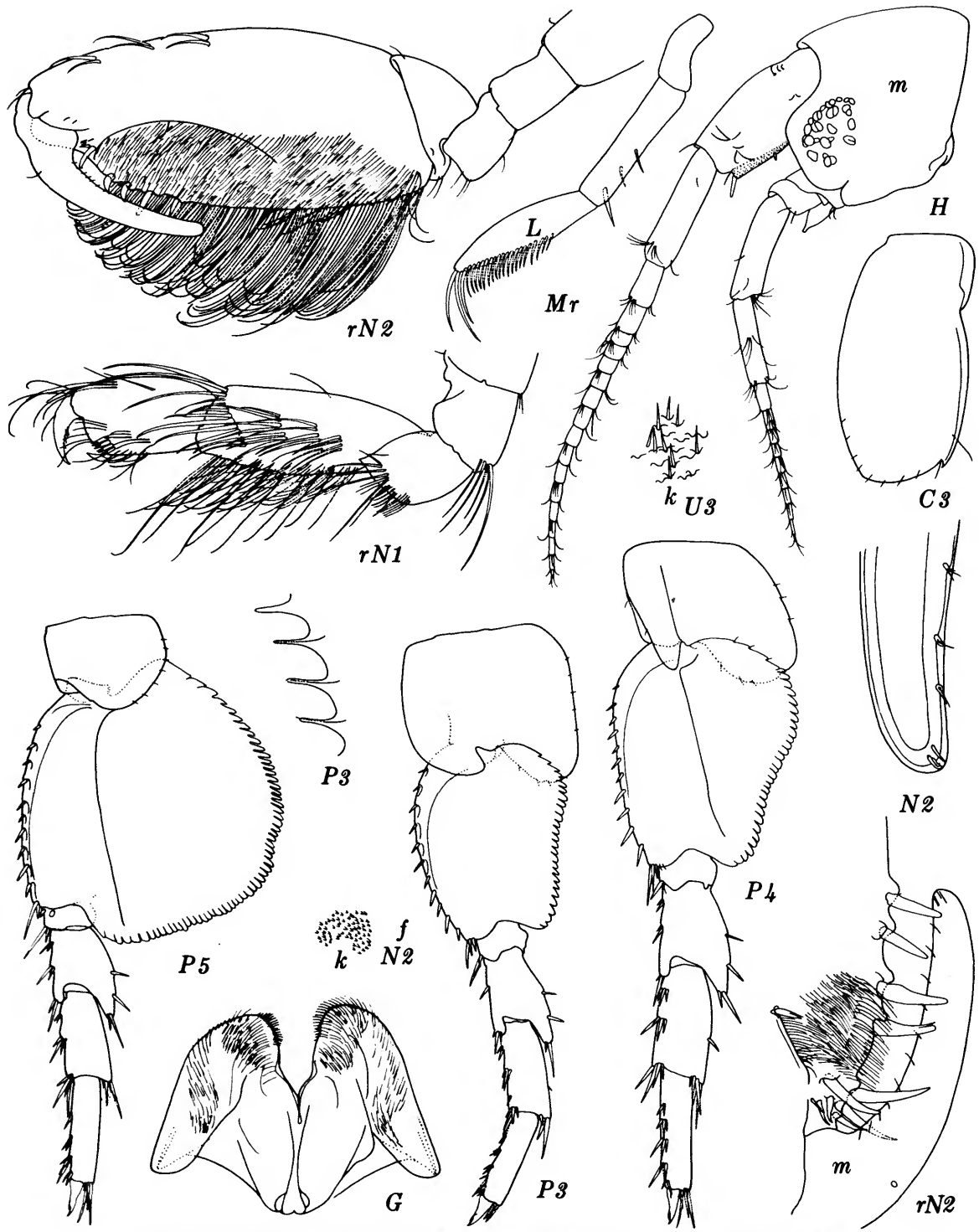


FIGURE 22.—*Cottesloe merrigannee*, new species, holotype, male, 5.7 mm. VICTISH 582; *m*= male, 4.4 mm; *f*=female, 5.2 mm.

both apicomediaally and apicolaterally on peduncle; outer ramus of uropod 3 about as long as peduncle, article 2 of medium size and bearing fused apical spine, inner ramus reaching about 60 percent along outer, simple apex bearing spinule; telson broader than long, cleft more than three-fourths, apices broad, weakly concave, each bearing stout spine and setule, each lobe with pair of apicolateral setules; epimeron 1 rounded anteroventrally, one seta ventrofacially, small tooth posteroventrally, epimeron 2 lacking facial ridge, with facial row of two spines and two setae, posteroventral corner

sharp and strongly extended, epimeron 3 naked, with weak posteroventral tooth and weakly sinuous posterior margin; pleonite 4 with weak dorsal hump, pleonite 5 with lateral cusp and spine on each side, pleonite 6 with erect cusp, no spines; pereonite 7 and pleonites 1-2 each with small sharp posterodorsal tooth; cuticle heavily shagreened with articulate setules or sharp articulate scales and villosities, generally lanceolate but terete on epimera and clavate on coxae, poorly developed on articles 5-7 of pereopods 3-5 and on peduncles of antennae, absent on flagellum of an-

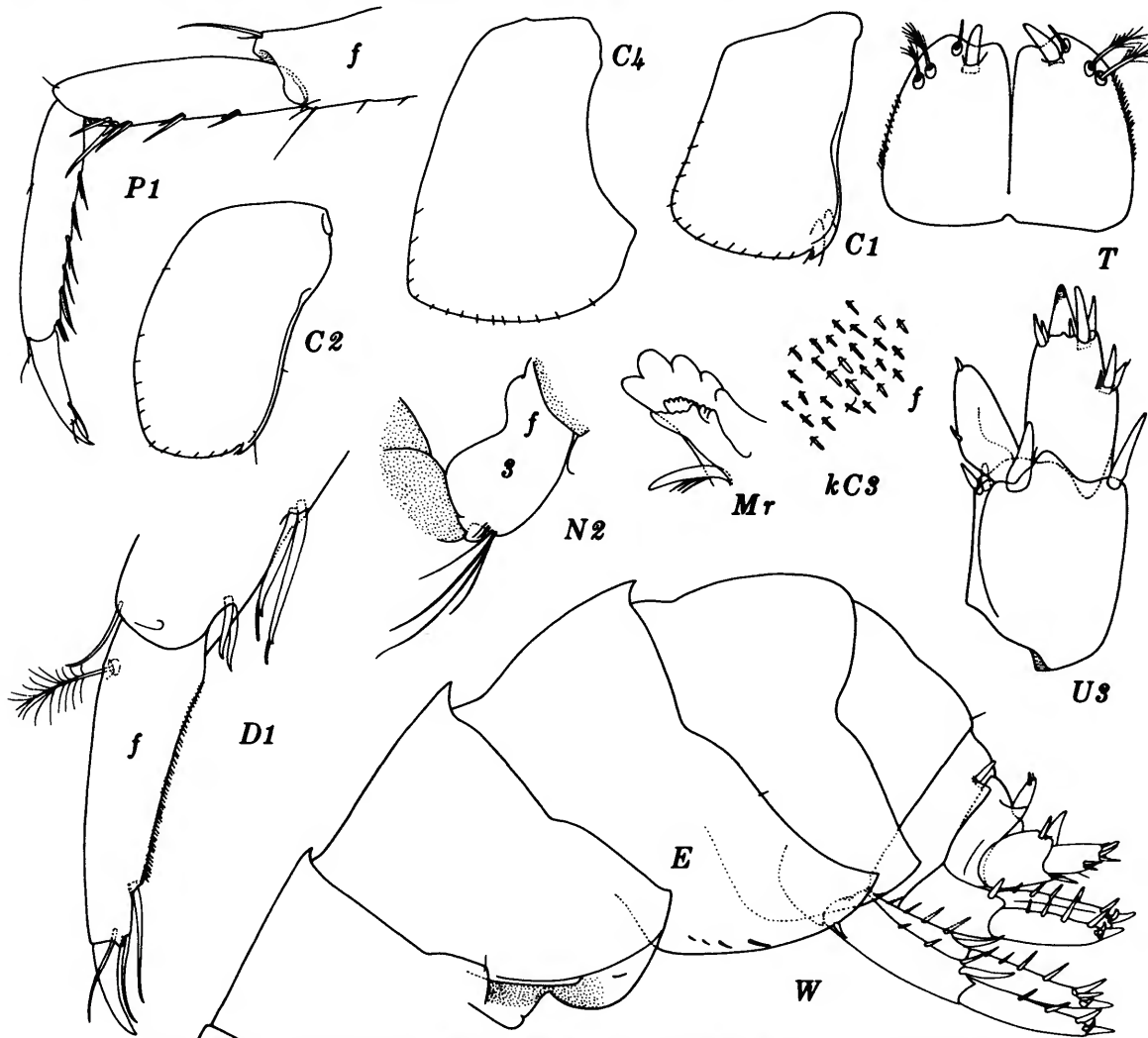


FIGURE 23.—*Cottesloe merringannee*, new species, holotype, male, 5.7 mm, VicFish 582; f=female, 5.2 mm.

tenna 2 and on flagellum of antenna 1 except articles 1-4; cuticle on gnathopods 1-2 (beyond coxae) with minute papillae, on pereopods 1-2 with papillae and sparse setules formed into striae.

JUVENILES.—Tooth on pereonite 7 absent on individuals 2.5 mm or smaller, occasionally absent on individuals of length up to 4.0 mm.

ILLUSTRATIONS.—Following parts as shown for *C. berringar*: ventral margin of upper lip, mandibular spines, incisor and lacinia mobilis of left side, mandibular molars, maxillae 1-2, and maxilliped, except article 3 of palp with only one subterminal seta; incisor and lacinia mobilis of right mandible illustrated; enlarged view of medial face of gnathopod 1 as shown for *C. berringar*, except palm defined by only four bifid spines.

HOLOTYPE.—NMV, male, 5.7 mm.

TYPE-LOCALITY.—VicFish 582, Western Port, Victoria, Station 11S-1-1+2, 9 feet, 11 inches, 17 March 1965.

RELATIONSHIP.—This species differs from the type-species, *C. berringar*, new species, in numerous characteristics, some of which follow: in the presence of dorsal teeth on pereonite 7 and pleonites 1-2 and none on pleonite 4, the absence of a spine on pleonite 6, the extended posteroventral corner of epimeron 2, the fewer ommatidia of a larger eye resembling that seen in *Nuuanu*, the tendency for antenna 1 to appear as in *Nuuanu* but not geniculate, the relatively short articles 5-6 of gnathopod 1, details of gnathopod 2, the more elongate dactyls and spines of pereopods 1-2 and the heavy castellations on article 2 of pereopods 3-5.

MATERIAL.—Western Port, Victoria, VicFish, 15 samples (30).

DISTRIBUTION.—Western Port, Victoria, shallow water.

Nuuanu J. L. Barnard

Nuuanu J. L. Barnard, 1970:166.

DIAGNOSIS.—Anteroventral cephalic notch present; antenna 1 longer and stouter than antenna 2, geniculate at apex of article 1; accessory flagellum exceeding two articles; upper lip entire; mandibles basic, palp article 3 weakly falcate and pectinoseiferous on inner margin; inner lobes of lower lip weak to absent; inner plate of maxilla 1 large, medial margin fully setose; inner plate of maxilla 2 fully setose on medial margin and bearing sub-

marginal oblique row of setae; palp of maxilliped 4-articulate, article 4 dactyliform, article 3 apically unlobed; gnathopod 1 ordinary, subchelate, hand lacking medial comb row, bearing large bifid spines near palm; gnathopod 2 enlarged, sexually dimorphic, setae not pinnate, article 4 with tooth; uropod 3 biramous, rami short, inner ramus very short, article 2 of outer ramus visible; telson deeply cleft; pleonites 5-6 with dorsal spines; cuticle not villose.

TYPE-SPECIES.—*N. amikai* J. L. Barnard (1970).

REMARKS.—With the discovery in Australia of two more species of this Hawaiian genus in one of which coxa 3 is reduced in size, one must consider whether the family Argissidae, with similarities to *Nuuanu*, is valid, or whether *Nuuanu* should be assigned to Argissidae instead of Gammaridae. Argissidae are monogeneric. The type-genus, *Argissa*, differs from *Nuuanu* in the regular and elongate inner ramus of uropod 3, the elongate telson, the thin mandibular palp with elongate article 3, slightly stronger inner lobes of the lower lip, poorly setose inner plate of maxilla 1, weakly triturative but strongly projecting mandibular molar and lack of sexual differentiation in gnathopod 2. None of these characters is of strong familial distinction in the present context. Coxa 2 of *Argissa* is also shortened as is coxa 3. The eyes of *Argissa* have been a good familial characteristic because they are formed of four ommatidia, arranged in a wheel of spokes; but *Nuuanu*, with a few more ommatidia, has nearly the same arrangement. Article 2 of pereopods 3-5 on *Argissa* is narrower and smoother posteriorly than in *Nuuanu*. *Argissa* cannot be a direct descendent of *Nuuanu* because of specializations in *Nuuanu* such as uropod 3. But one may visualize an ancestor of *Nuuanu* that could also have been an ancestor of *Argissa*.

The validity of Beaudettiidae (Barnard, 1965) a tropical taxon with a single genus and species is also highly doubtful; the inner ramus of uropod 3 on both *Beaudettia* and *Nuuanu* share similarities; *Beaudettia* is apparently a descendent of some species of *Elasmopus* in which the mandibular palp has been lost, the inner ramus of uropod 3 reduced and the telsonic lobes nearly coalesced. The telson of *Nuuanu* shows a tendency to reduction in size but remains cleft to the base; the shortening of the inner ramus on uropod 3 of *Nuuanu* reduces the importance of this in *Beaudettia*.

Key to Species of *Nuuanu*

1. Pleonites 1-2 untoothed, telson as long as broad, outer ramus of uropod 3 as long as peduncle *N. mokari*, new species
 Pleonites 1-2 each with dorsal tooth, telson much longer than broad, outer ramus of uropod 3 shorter than peduncle 2
2. Cephalic slit gaping, articles 1-3 of antenna 2 processiferous *N. numbadi*, new species
 Cephalic slit not gaping, articles 1-3 of antenna 2 not processiferous *N. amikai*

The family Beaudettiidae should be abolished and possibly the family Argissidae should be reduced in prominence, perhaps to subfamilial level under the Gammaridae. However, these questions require consideration of a monographer of the Gammaridae who will be faced with the problem of whether Gammaridae should be split into a number of families or subfamilies.

DESCRIPTION.—Lateral cephalic lobe extended, sharp, slightly attenuate and apically upturned; ommatidia of eyes sparse; ventral margin of article 1 on antenna 1 naked, dorsodistal corner sharper in male than in female; accessory flagellum 3-articulate; article 1 of mandibular palp less than half as long as article 2, article 3 nearly 60 percent as long as article 2; inner plate of maxilliped with one lateral cone, outer plate with one medial cone; coxa 3 much shorter than neighboring coxae; article 5 of male gnathopod 1 not elongate; female gnathopod 2 slender, elongate, palm highly oblique;

Nuuanu mokari, new species

FIGURES 24-26

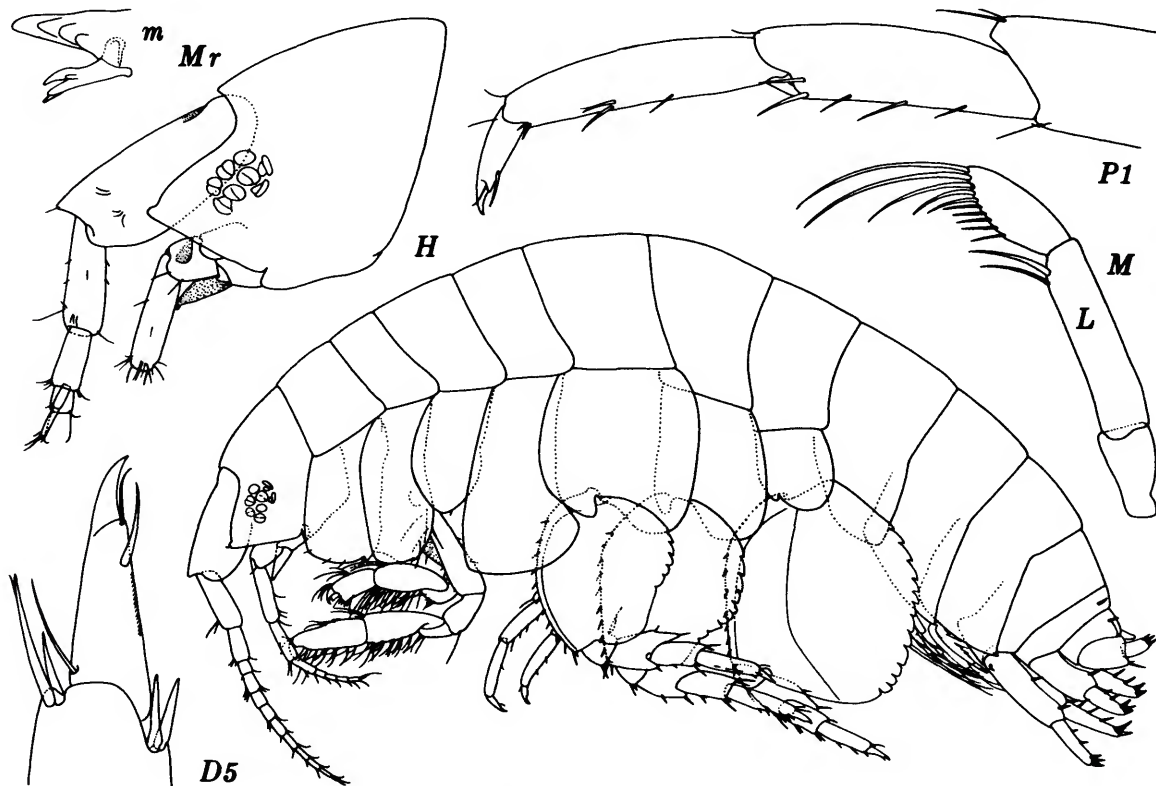


FIGURE 24.—*Nuuanu mokari*, new species, holotype, female, 3.2 mm, VicFish 209; *m*=male, 3.9 mm.

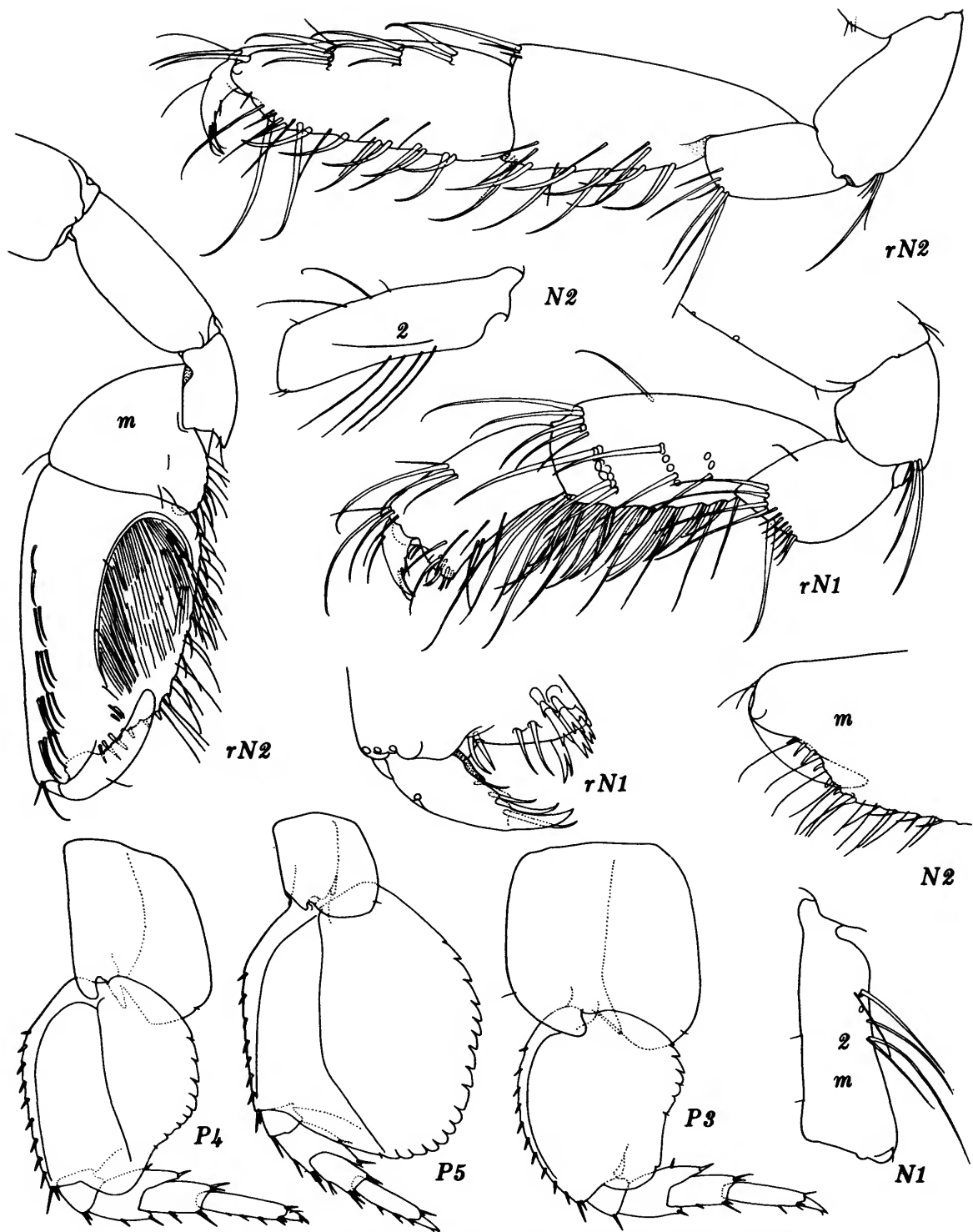


FIGURE 25.—*Nuuanu mokari*, new species, holotype, female, 3.2 mm, VicFish 209;
 m=male, 3.9 mm.

article 3 of gnathopod 2 in both sexes and on gnathopod 1 of male elongate; male gnathopod 2 with elongate hand, palm short, spinose, distinct from posterior margin, latter moderately setose and spinose, part of posteroproximal hand slightly flattened or weakly hollowed, covered with extremely fine "hairs," dactyl fitting palm, short, blunt; pereopods 1-2 with poorly spinose article 6, dactyls with large inner seta proximal to distal spine, setule on margin at base of spine, inner margin of dactyl weakly pectinate, locking spines equal to each other in length, simple, smaller than next adjacent pair of spines only on pereopods 1-2; article 2 of pereopods 3-4 with excavate posterior

margins, partially castellate, of pereopod 5 broadly expanded, posterior margin nearly vertical and straight, castellate, stenopodous part of appendage extremely short; uropod 1 with medium spine both apicomediaally and apicolaterally on peduncle; outer ramus of uropod 3 only 60 percent as long as peduncle, article 2 small and bearing fused apical spine, inner ramus reaching about halfway along outer; apically slit telson broader than long, fully cleft, apices tapering, each bearing stout spine and three setules and one tiny sublateral seta near middle; epimeron 1 simple, with weak subventral ridge, epimeron 2 with slit pocket ventrally, slightly extended and bearing sharp tooth posteroventrally,

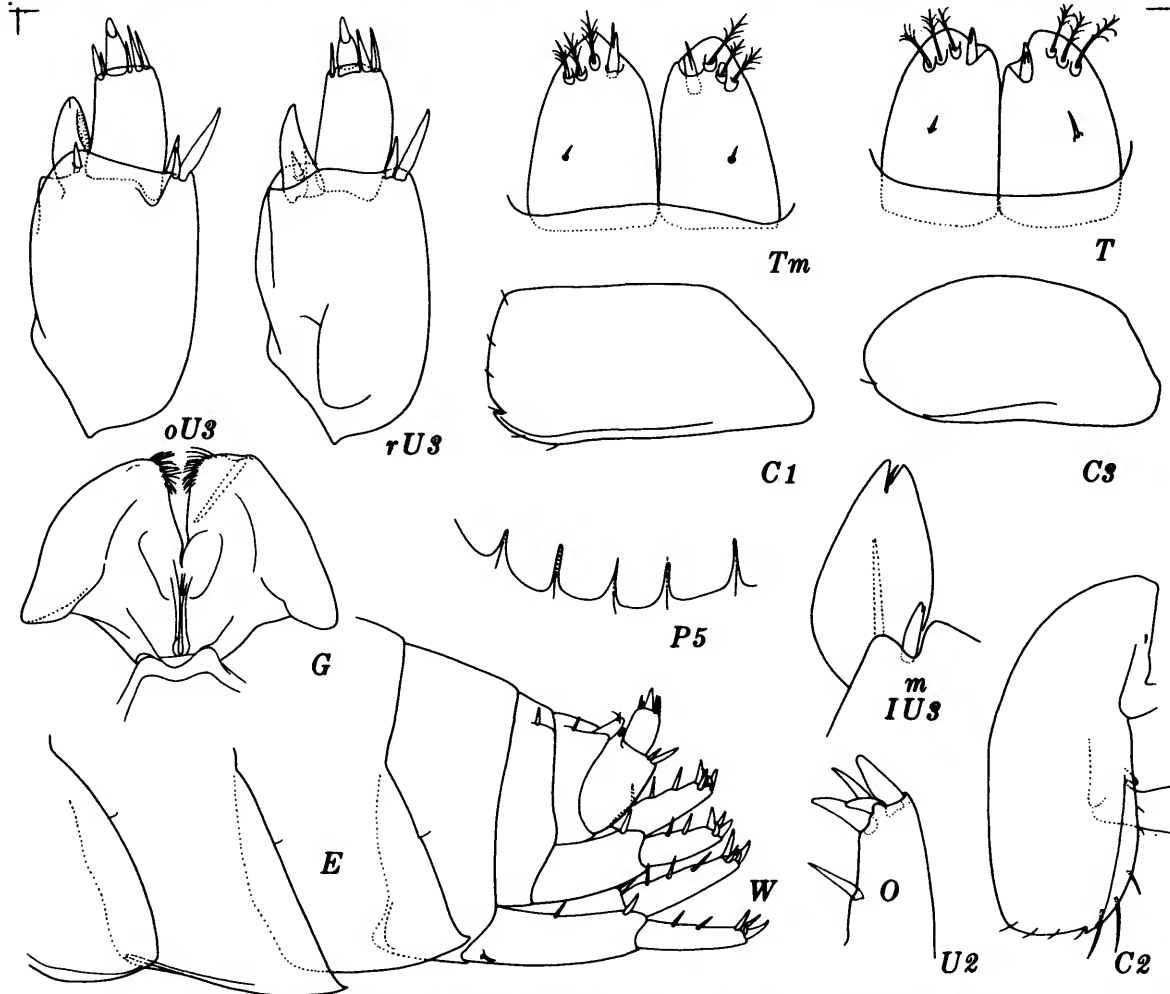


FIGURE 26.—*Nuanu mokari*, new species, holotype, female, 3.2 mm, VicFish 209; m=male, 3.9 mm; r=right inner; o=left outer.

epimeron 3 with medium blunt tooth; pleonite 4 flush dorsally, pleonites 5–6 with spine and ridge on each side; cuticle sparsely and finely granular.

ILLUSTRATIONS.—Palp of mandible, lower lip, and right apex of mandible figured (Figures 24, 26); plates of maxilliped described above; upper lip and maxillae like those of *N. amikai* J. L. Barnard (1970) or of *Cottesloe berringar*, new species.

HOLOTYPE.—NMV, female, 3.2 mm.

TYPE-LOCALITY.—VicFish 209, Western Port, Victoria, Station 26S-3-3, 33 feet, 26 February 1965.

RELATIONSHIP.—The diagnosis lists the differences between the type-species and *N. mokari*. The most striking difference is the short coxa 3 of *N. mokari*, a character of rare occurrence in Gammaridea (i.e., Argissidae, and *Megaluropus* in Gammaridae). The close correspondence of most characteristics between the two species suggests they are congeneric. The type-species from Hawaii was an unknown quantity at its erection because its morphological and biogeographic affinities could not be stated but now they are seen to be with *N. mokari* of Australia. The Australian species appears to be more highly advanced than the Hawaiian species so that one must now look for other species in this genus in the tropics between Australia and Hawaii; the youthfulness of Hawaii suggests that an ancestor of *N. amikai* may yet be living if, indeed, *N. amikai* itself does not inhabit islands southwest of Hawaii.

MATERIAL.—VicFish, 26 samples (57)

DISTRIBUTION.—Western Port, Victoria, shallow water.

Nuuanu numbadi, new species

FIGURES 27, 28

DESCRIPTION OF FEMALE.—Lateral cephalic lobe broad, weakly mammilliform, anteroventral notch gaping; ventral margin of article 1 on antenna 1 with spine at mark 55 and another at mark 70; accessory flagellum 3-articulate; basal articles of antenna 2 processiferous; article 1 of mandibular palp half as long as article 2, article 3 about 80 percent as long as article 2; inner plate of maxilliped with one lateral cone, outer plate with three medial cones; article 5 of male gnathopod 1 not elongate; female gnathopod 2 stout (relative to other species in *Cottesloe* and *Nuuanu*), article 5 especially stout; adult male gnathopod 2 unknown;

pereopods 1–2 with poorly spinose article 6, dactyls with large inner seta proximal to distal spine, setule on face at base of distal spine, inner margin at base of spine with weak extension armed with setule, inner margin of dactyl weakly pectinate, pair of locking spines simple, small, one spine smaller than another, locking spines on pereopods 1–2 smaller than next adjacent spines, on pereopods 3–5 equal in size to next adjacent spines; article 2 of pereopods 3–4 weakly excavate posteriorly, castellate, of pereopod 5 broadly expanded and castellate; uropod 1 with medium spine on peduncle apicolaterally, enlarged spine apicomediaally; outer ramus of uropod 3 longer than peduncle, article 2 small and bearing fused apical spine and setule, inner ramus reaching about 40 percent along outer ramus, apically simple; telson slightly longer than broad, cleft 80 percent its length, each lobe with tapering, notched apices bearing one long spine, occasionally accessory spinule and pair of subapical and lateral setules; epimeron 1 simple, with lateral ridge and ventral setule, epimeron 2 with ridge, two ventral spines, and one ventral setule, strongly extended posteroventrally, apically sharp but no separate tooth present, epimeron 3 with sharp medium posteroventral tooth, posterior margin weakly convex; pleonite 4 flush dorsally, pleonites 5–6 with spine and cusp on each side; cuticle finely and sparsely granular.

HOLOTYPE.—NMV, female, 5.8 mm.

TYPE-LOCALITY.—VicFish 615, Western Port, Victoria, Station 26S-3-1+2, 34½ feet, 9 March 1965.

ILLUSTRATIONS.—Maxilliped described above; following parts like those in *Cottesloe berringar*: upper lip; maxilla 2; maxilla 1, except apices of palp with either seven or eight apical spines and either three or four subapical facial spines; molars of mandibles; lower lip like that illustrated for *N. mokari* (Figure 26); mandibular palp and apex of right mandible illustrated; left mandible with 10 spines, right with 8.

RELATIONSHIP.—*Nuuanu numbadi* is so similar to *N. amikai*, the type-species from Hawaii, that comparisons only with that species are presently necessary. The two species share the following characters not found in similar combination in the other known species of *Nuuanu* and *Cottesloe*: the elongate telson, elongate outer ramus of uropod 3, setosity of coxae (these are not heavily setose but

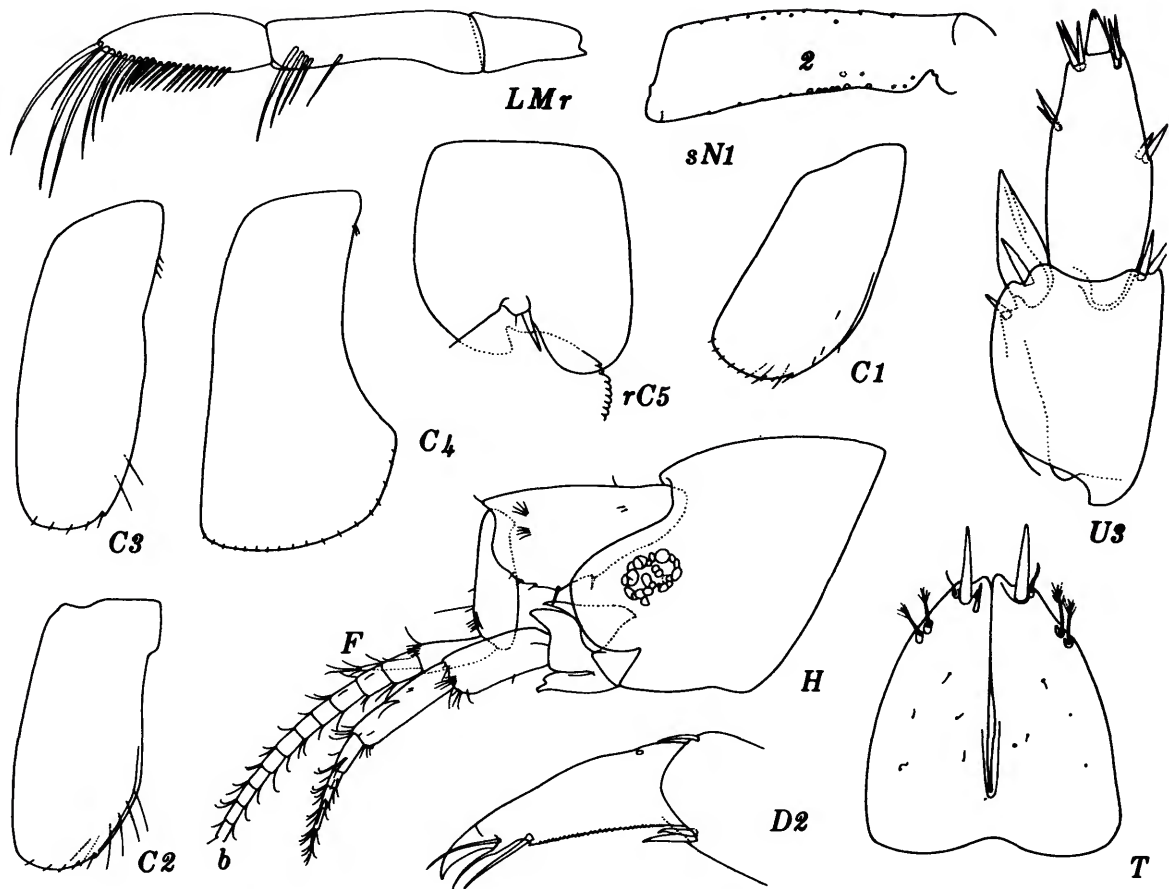


FIGURE 27.—*Nuuanu numbadi*, new species, holotype, female, 5.8 mm, VicFish 615.

slightly more so than in other species). *Nuuanu numbadi* differs from *N. amikai* in the gaping cephalic slit and the processiferous articles at the base of antenna 2; this is a small number of significant characters considering the diversity seen in other species of *Nuuanu* and *Cottesloe*.

MATERIAL.—Western Port, Victoria, VicFish, 4 samples (5).

DISTRIBUTION.—Western Port, Victoria, shallow water.

Analysis of Relationships in *Nuuanu* and *Cottesloe*

When I first discovered specimens of *Nuuanu* in Australian collections I was observing *N. mokari*,

a new species clearly congeneric with *Nuuanu*. Later I found specimens of *Cottesloe berringar*, new species, and immediately placed them in this newly erected genus, noting the close relationships to *Nuuanu* but deciding that the characters of pleonite 4 and epimeron 1 alone justified the separation. *Nuuanu numbadi*, new species, proved to be extremely close to the type-species, *N. amikai*, and only after that discovery did I find *Cottesloe meringannee*, a new species showing the extremely close relationships between *Nuuanu* and *Cottesloe*.

The two genera have numerous characters in common divisible into two lists, the first of general characteristics often replicated in pairs and triads of other gammaridean genera, the second list of

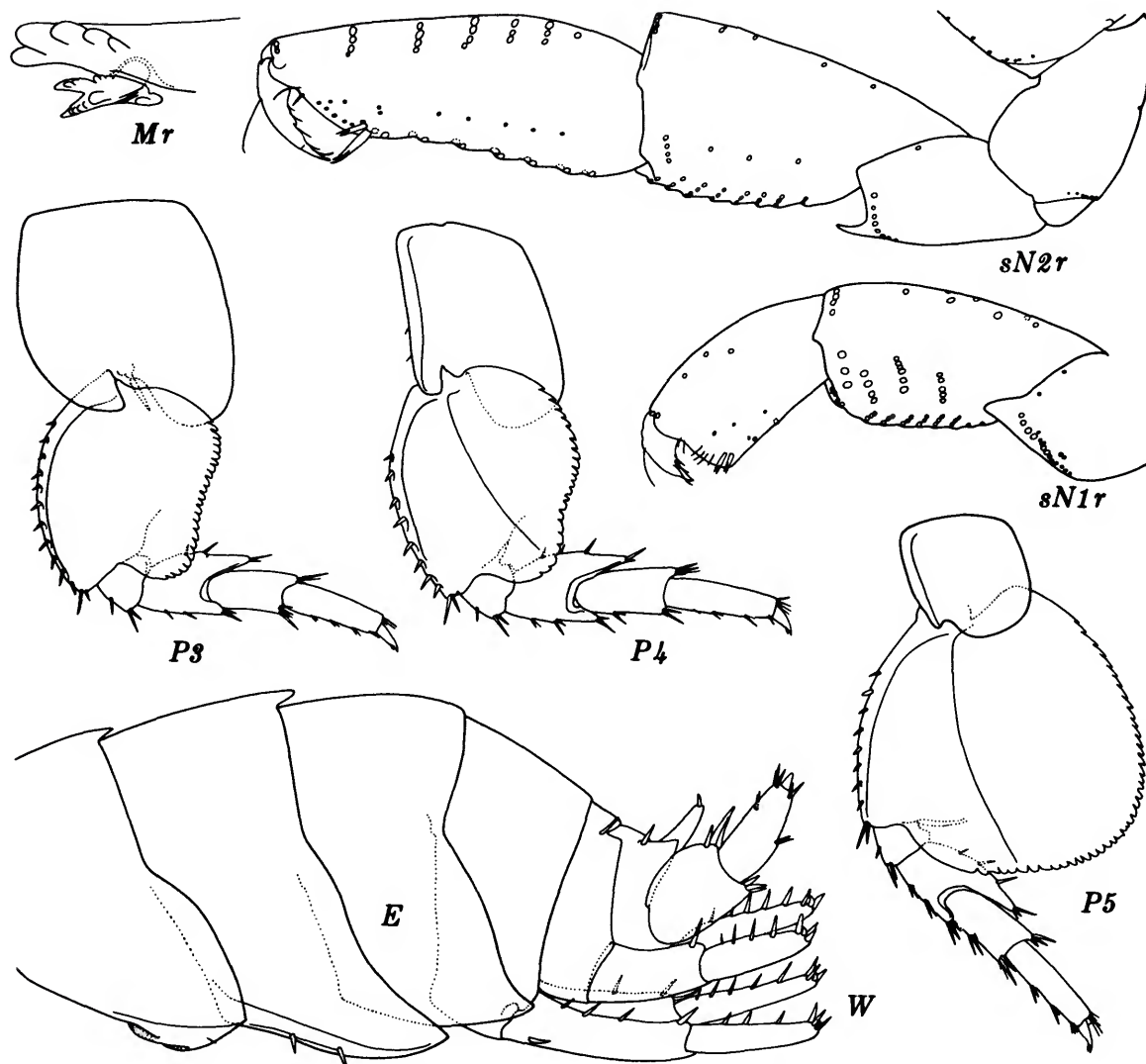


FIGURE 28.—*Nuuanu numbadi*, new species, holotype, female, 5.8 mm, VicFish 615.

highly unusual characters rarely seen in other genera of Gammaridae and which indicate a very close relationship between *Nuuanu* and *Cottesloe*. List 1: mandibular palp, incisors, lacinia mobili, generalities of molars, lower lip, setosity of maxillae, generalities of maxillipeds (size of plates, shape of palp), appearance of gnathopods, antennae, apices of pereopods, uropods, cephalic slit. List 2: cones on plates of maxilliped, falcate apical spine of

rami on uropods 1–2, usually extended epimeron 2, strongly bifid spines on gnathopod 1, presence and special placement of spines on pleonites 5–6, base of uropod 3 overriding pleonite 6, uropod 3 appearing attached lateral to that segment.

The type-species of *Cottesloe*, *C. berringar*, is highly distinct from any species of *Nuuanu* in the presence of a large and erect dorsal tooth on pleonite 4, a large hook on epimeron 1, well-formed

eyes with numerous ommatidia, nongeniculate antenna 1, uncastellate pereopods 3-5, unextended epimeron 2, heavily villose cuticle, strongly spinose article 6 of pereopods 1-2, and the absence of a tooth on article 4 of gnathopod 2. *Cottesloe berringar* is a morphotype highly distinct from a comparable morphotype composed of *N. amikai* and *N. numbadi* in the nonelongate telson and non-elongate outer ramus of uropod 3 and the poorly setose coxae. *Cottesloe merringannee* intergrades the two genera by possession of weak eyes, intermediate setosity of coxae, castellate pereopods, a dorsal tooth formula similar to that in the type of *Nuuanu*, and extended epimeron 2. *Nuuanu mokari* further bridges the two genera in that it generally has characters of the morphotype of *Nuuanu* but has poorly setose coxae, and no teeth on any pleonite. On the surface one appears to observe a continuous evolutionary sequence from *C. berringar*, through *C. merringannee* to *N. mokari* and finally to the very advanced *N. numbadi* and *N. amikai*.

Three very qualitative and one weakly quantitative characters appear to distinguish the two genera, despite the numerous intergradations. *Cottesloe* appears justified as a genus on the heavily villose cuticle, the nongeniculate antenna 1 and the absence of a tooth on article 4 of gnathopod 2 and differs from *Nuuanu* in the more heavily spinose article 6 of pereopods 1-2 though the latter character is weakly intergraded by *Nuuanu numbadi*.

Cottesloe berringar appears to be the most primitive representative of the group in its well-formed eyes and absence of castellations on the pereopods. The two extremes, *C. berringar* and *N. amikai* suggest two ecological extremes, the former a fully nestling species, the latter an incipient member of the interstitial fauna. These extremes are reflected in degradation of eyes, elongation of uropod 3, loss of cuticular roughness, elongation of telson, extension of epimeron 2, loss of spines on pereopods, streamlining of dorsal body surface and loss of coxal setae. Other evolutionary trends are enigmatic, such as development of pereopodal castellations and geniculation of antenna 1. The intermediate niche positions suggested by the morphology of *C. merringannee* and *N. mokari* should prove highly interesting to ecologists.

Cottesloe berringar appears superficially to be a species of *Elasmopus* in terms of mandibular palp,

short antenna 2, short outer ramus of uropod 3 (from lateral view the shortness of the inner ramus is overlooked and the presence of a second article on that ramus goes unnoticed until magnification is greatly increased) but the highly setose maxillae are completely foreign to the *Elasmopus-Maera* group of Gammaridae and suggest affinities with the *Melita-Eriopisa* group. The short inner ramus of uropod 3 confirms this suggestion. The robust body of *C. berringar* is generally contrary to the more graceful bodies of amphipods in the *Melita-Eriopisa* group; all known species of *Nuuanu* have that gracefulness.

The short outer ramus of uropod 3 is contrary to the highly elongate condition found in the several genera of *Melita-Eriopisa* (including *Eriopisella*, *Melitoides*, and *Netamelita*, the latter probably synonymous with *Eriopisella*). The slight elongation seen in the advanced species of *Nuuanu* suggests an evolutionary trend from shortness to elongation. This, plus the trend to body gracefulness, suggests that *C. berringar* may be the most primitive surviving member of the ancestral pool of the *Melita-Eriopisa* group since it has the robust body, short ramus, and fully developed eyes.

HYALIDAE

All species studied for this report have a weak ventral cradle on pereonite 1 resembling that fully developed cradle often seen in species of Eophliantidae; this appears to be one more confirmation of the close relationship of Eophliantidae to Hyalidae, or at least to talitroideans.

Allorchestes Dana, emended

Allorchestes Dana, 1849:136; 1852:205.—Stebbing, 1906:581.
Aspidophoreia Haswell, 1880a:101.

DIAGNOSIS.—Talitroidean and hyalid with palp of maxilla 1 vestigial; article 4 of maxillipedal palp unguiform; gnathopods of both sexes subchelate, male gnathopod 2 larger than 1, female gnathopod 2 generally similar to gnathopod 1; uropod 3 with one ramus, apical armament weak; telson broad, rectangular, partially cleft but lobes not divergent.

TYPE-SPECIES.—*A. compressus* [sic] Dana (1852); type-species of *Aspidophoreia*=*A. diemenensis*, apparently conspecific with *A. compressus*.

REMARKS.—This genus is reorganized to include only those species bearing a broad, rectangular telson with truncate posterior margin, slightly cleft, but lobes not divergent and with vestigial palp of maxilla 1. The presence or absence of a long posterior lobe on article 5 of male gnathopod 2 is discounted as a generic character. All species of *Allorchestes* so far known bear that long lobe but many species (below) are transferred to *Hyalé* either because of their elongate palp on maxilla 1 or their fully cleft telson with triangular and divergent lobes. Although the telsons are known, the maxillary palps are not known for all of the species rejected from *Allorchestes*; the apical spines or setae of uropod 3 are very weak in *Allorchestes*.

The development of a posterior lobe on article 5 of male gnathopod 2 is really a lost attribute in most species of *Hyalé*. In the juveniles this lobe is present, but as the male gnathopod enlarges the

lobe is lost, apparently in varying degrees (see Shoemaker, 1956 for *Parhyale*), according to instar, but possibly more frequently during one ecdysis. The consistencies of telson and first maxillary palp appear to be a far better definition of *Allorchestes* than the gnathopodal lobe, but this greatly reduces the number of known species of *Allorchestes* and adds a further diversity to *Hyalé*.

VALID SPECIES OF *Allorchestes* [See Barnard (1958 or Stebbing (1906) for references before 1958].—*angusta* Dana (= *malleolus* Stebbing), *bellabella*, new species, *carinata* Iwasa, *compressa* Dana, *novizealandiae* Dana.

REJECTED SPECIES TRANSFERRED TO *Hyalé*.—*anceps* J. L. Barnard (1969b), *aquilinus* Costa, *chelonitis* Oliveira, *furcata* Reid, *humilis* Dana, *inquirendus* K. H. Barnard, *littoralis* Stimpson, *ornata* Reid, *plumicornis* (Heller), *tristanensis* MacNae.

Key to the World Species of *Allorchestes*

1. Male gnathopod 1 with medium to small spines near palm on medial face of hand..... 2
 - Male gnathopod 1 with one or two enlarged spines on medial face of hand, at least one spine strongly submarginal 3
2. Male gnathopod 1 with axial protrusion on palm, dactyl heavily overlapping palm *A. novizealandiae*
 - Male gnathopod 1 with straight palm, dactyl fitting palm..... *A. compressa*
3. Dactyl of male gnathopod 1 heavily inflated, palm protrusive (pleonites dorsally carinate) *A. bellabella*, new species
 - Dactyl of male gnathopod 1 weakly inflated or slender, palm straight (peronites dorsally carinate or not) 4
4. Dactyl of male gnathopod 1 much shorter than palm, apically bifid, pleonites dorsally flush *A. angusta*
 - Dactyl of male gnathopod 1 fitting palm, apically simple, pleonites dorsally carinate *A. carinata*

Allorchestes angusta Dana

Allorchestes angustus Dana, 1856:177.—Barnard, 1952:20–23, pl. 5: figs. 2–6.

Allorchestes malleolus Stebbing, 1899:409–410, pl. 33A.—Iwasa, 1939:285–288, figs. 20–22, pl. 20.

Allorchestes vladimiri Derzhavin, 1937:95–96, pl. 5: fig. 2.—Gurjanova, 1951:822, fig. 575.

Not *Allorchestes angustus* J. L. Barnard, 1954:21–23, pl. 21 [= *A. bellabella*, new species].

DIAGNOSIS.—Mature male gnathopod 1 with hammer-shaped hand protruding at palmar corner, dactyl much shorter than palm, weakly striate, not heavily swollen, with bifid apical nail (or nail

actually with outer accessory tooth), medial face of hand with submarginal falcate spine divorced from palmar corner, second spine simple, blunt, elongate, highly submarginal, set inward from middle of palm and usually pointing anteriorly; posteroventral protrusions of epimera 2–3 of medium extent; body not dorsally carinate; cuticle with ordinary bulbar setules, no plaques; spines of pereopods 3–5 sharp, elongate; inner ramus of uropod 1 with two dorsal spines.

DISTRIBUTION.—Southern Japan north and east to Alaska and Pacific America south to southern California.

Allorchestes bellabella, new species

Allorchestes angustus J. L. Barnard, 1954:21-23, pl. 21 [not Dana].

NOMENCLATURE.—Named for a tribe of American Indians in western Canada.

DIAGNOSIS.—Mature male gnathopod 1 with weakly hammer-shaped hand bearing long tooth projecting distally from palmar corner, dactyl overlapping palm, moderately to heavily striate, strongly swollen, with simple, short apical nail, medial face of hand with one or two medium to large spines, terminal male with one large spine located posteriorly but highly proximal to protrusion, second spine seen in juvenile male apparently lost in adult, spines simple (weakly striate); posteroventral protrusions of epimera weak to obsolete; body dorsally with weak posterior crest; cuticle with complex alae surrounding bulbar setules, chitinous surface granular; spines of pereopods 3-5 blunt, short.

HOLOTYPE.—USNM 140995, male, 12.4 mm.

TYPE-LOCALITY.—Kyaska Harbor, Alaska, beach, W. H. Dall, 1873.

MATERIAL.—Smithsonian collections, full data cataloged in the National Museum of Natural History (USNM): Bering Island, 4 collections by L. Stejneger, 29-30 December 1882 (22), one collection from crop of *Simorhynchus pusillus* [old name of *Aethia pusilla* (Pallas), Least Auklet]; Izemlek Bay, Unimak Island, Alaska, from duck's stomach 29 June 1925 (3); Kyska Harbor, Alaska, beach, W. H. Dall (7).

Full description and illustration of this species is in preparation for *Smithsonian Contributions to Zoology*.

DISTRIBUTION.—Bering Island to Cape Arago, Oregon, intertidal and neritic ("planktonic").

Allorchestes carinata Iwasa

Allorchestes malleolus carinatus Iwasa, 1939:288-289, figs. 23, 24, pl. 21.

DIAGNOSIS.—Mature male gnathopod 1 with ordinary or weakly hammer-shaped hand scarcely protruding at palmar corner, dactyl fitting palm, weakly striate, not heavily swollen, with simple apical nail, medial face of hand with two medium to small spines resembling each other, one spine

near palmar corner, other spine situated submarginally from middle of palm and pointing distalwards, neither spine elongate; posteroventral protrusions of epimera 2-3 of medium extent; body dorsally carinate posteriorly; cuticle with abnormal immersed setules bearing small plaque apically, chitinous surface granular; spines of pereopods 3-5, blunt, short; inner ramus of uropod 1 with two dorsal spines.

REMARKS.—This so-called subspecies is raised to full rank since it is apparently sympatric with *A. angusta* (= *A. malleolus*) and cannot, therefore, be a subspecies of either.

MATERIAL.—Universitetets Zoologiske Museum, København: Melne Bay, Simushir Island, Kurile Islands, 23 June 1906, Steamer "Albatross" (1); Smithsonian collections: St. Paul Island, Alaska, C. H. Townsend (50); Bering Island, L. Stejneger (3).

DISTRIBUTION.—Kurile Islands and Bering Sea, presumably intertidal or very shallow water.

Allorchestes compressa Dana

FIGURES 29-32

Allorchestes compressa Dana, 1852:205.

Allorchestes australis Dana, 1852:206; 1853:892, pl. 60: fig. 7.

Allorchestes gaimardii Dana, 1853:884, pl. 60: fig. 1.

Aspidophoreia diemenensis Haswell, 1880a:101-102, pl. 6: fig. 2.

Allorchestes compressus.—Stebbing, 1899:410-412, pl. 33B; 1906:581-582.—?Stephensen, 1927:351; 1938:261.

DIAGNOSIS.—Mature male gnathopod 1 with hammer-shaped hand protruding at palmar corner, dactyl fitting palm or slightly shortened, strongly striate, not heavily swollen, with simple apical nail, medial face of hand near palmar corner with up to seven medium-to-small defining spines in group, no spine discontinuous; posteroventral protrusions of epimera of medium extent to obsolete; body dorsally smooth; cuticle with complex alae surrounding bulbar setules; spines of pereopods 3-5 sharp, slender; inner ramus of uropod 1 with two dorsal spines.

REMARKS.—If this species comprises Dana's two main variants known as *compressus-australis* and *gaimardii*, Haswell's *diemenensis* and *crassicornis* plus material described by Stebbing (1906) and two extreme groups reported herein, then it is a highly

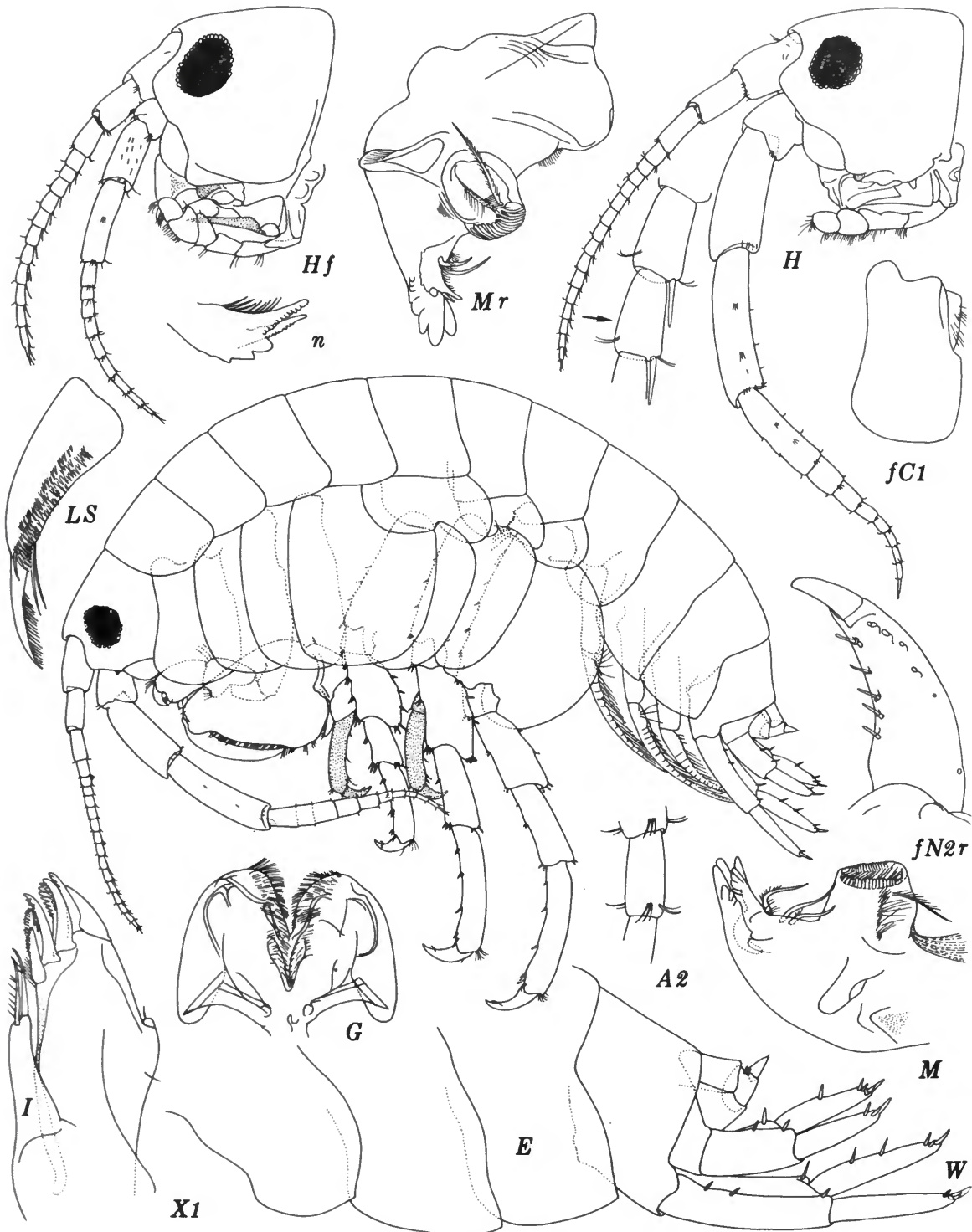


FIGURE 29.—*Allorchestes compressa* Dana, subspecies W, male, 8.5 mm, JLB Australia 7; f=female, 7.9 mm.

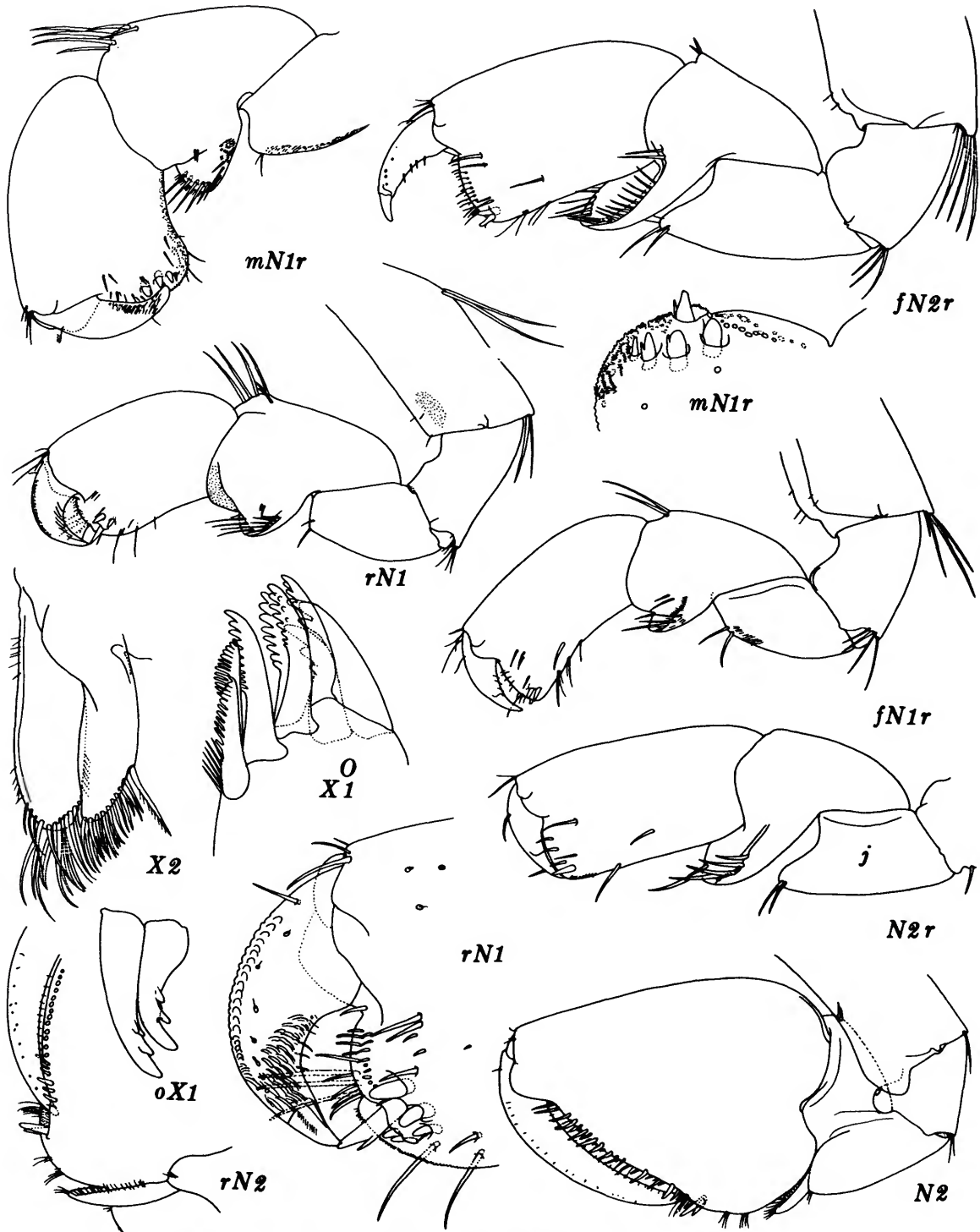


FIGURE 30.—*Allorchestes compressa* Dana, subspecies W, male, 8.5 mm, JLB Australia 7;
 f=female, 7.9 mm; j=juvenile, 2.6 mm; m=male, 10.3 mm, Pt. Peron.

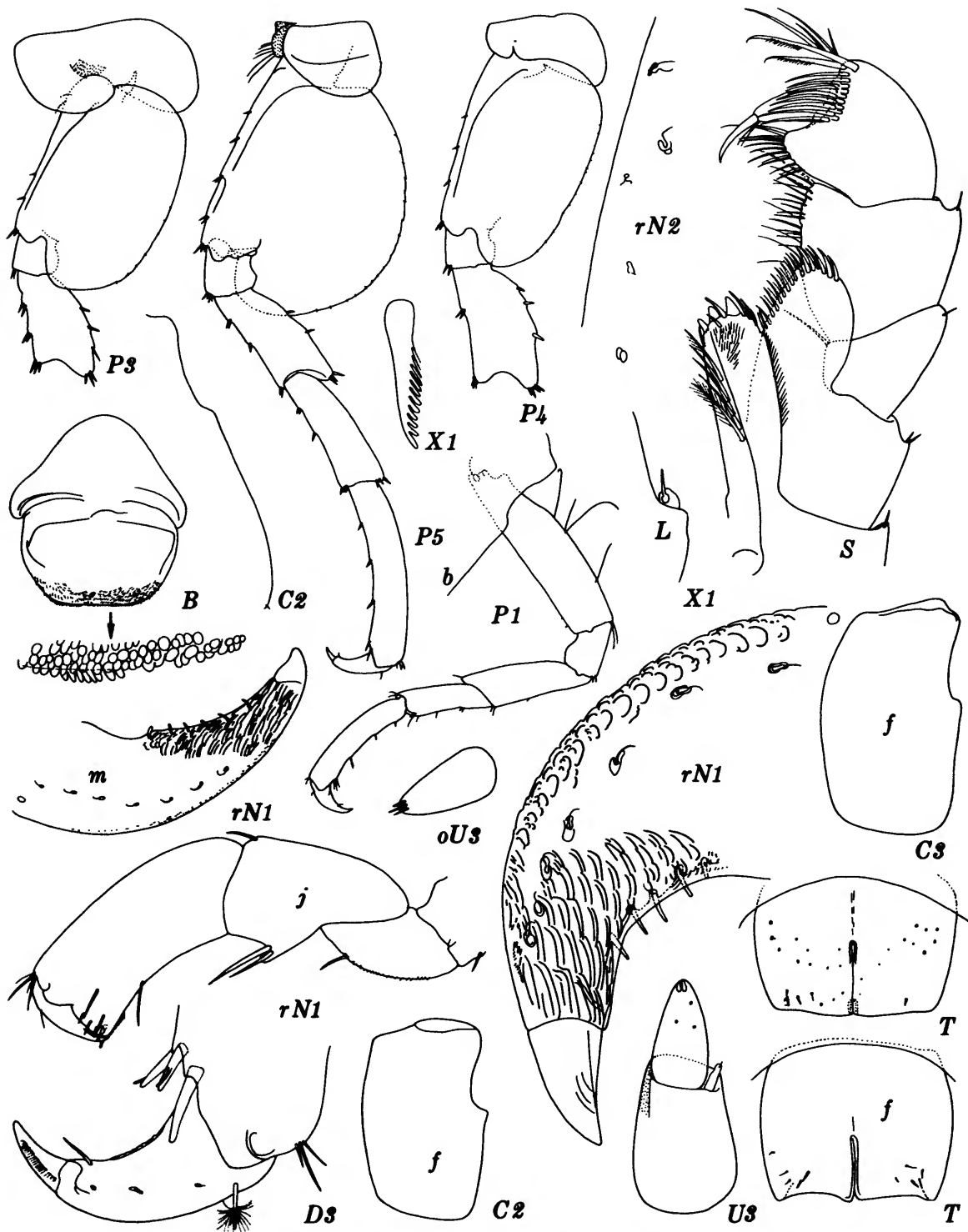


FIGURE 31.—*Allorchestes compressa* Dana, subspecies W, male, 8.5 mm, JLB Australia 7;
 f=female, 7.9 mm; j=juvenile, 2.6 mm; m=male, 10.3 mm, Pt. Peron.

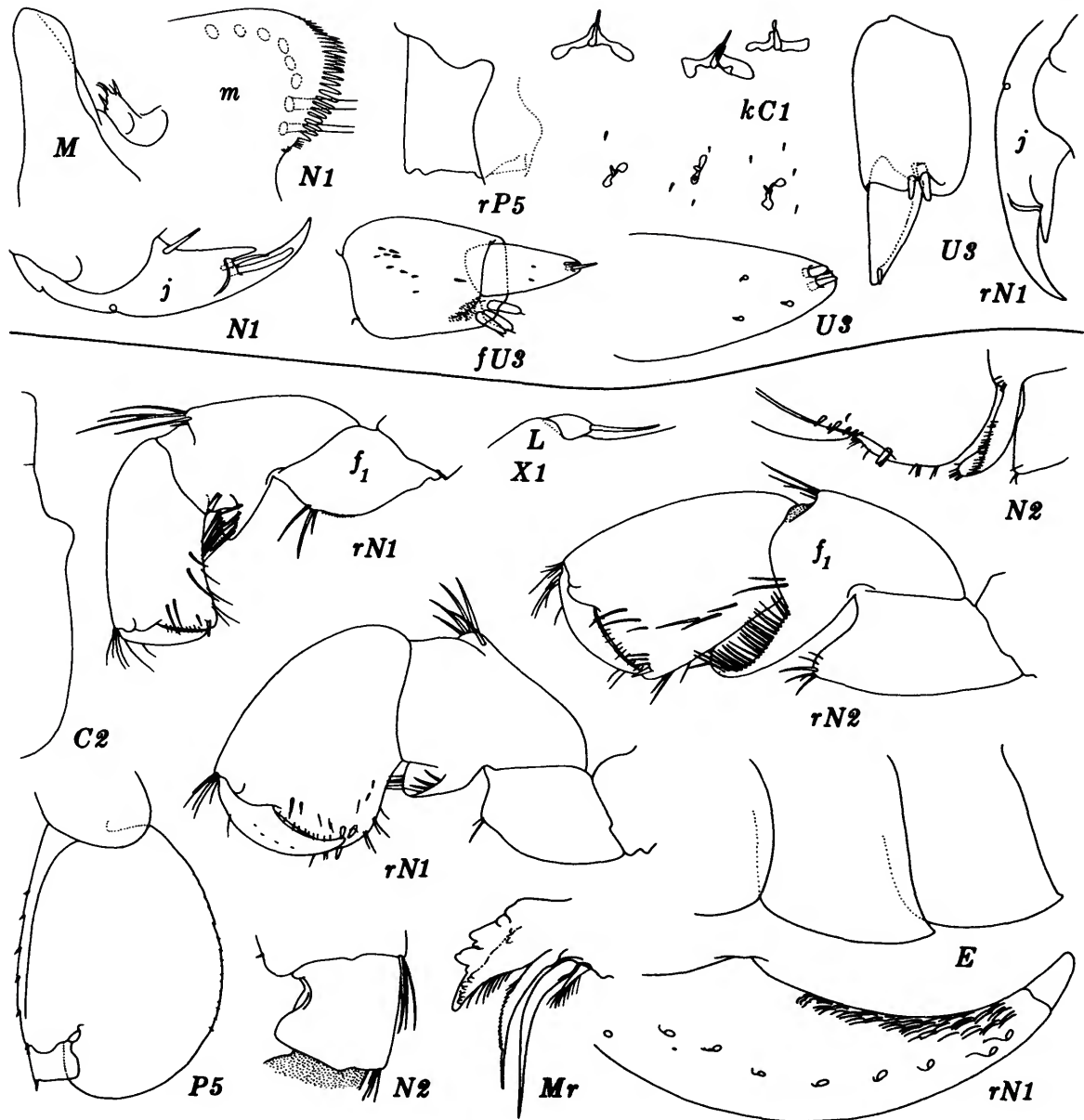


FIGURE 32.—*Allorchestes compressa* Dana, *Upper*, subspecies W, male, 8.5 mm, JLB Australia 7; *f*=female, 7.9 mm; *j*=juvenile, 2.6 mm; *m*=male, 10.3 mm, Pt. Peron. *Lower*, subspecies V, male, 11.3 mm, Port Phillip 73; *f*₁=female, 11.2 mm.

variable species possibly divisible into subspecies. The groups at hand, from Victoria and southwestern Australia, are defined subspecifically below but are not named because priorities are unknown;

the varieties described by Dana and Haswell possess Latin names available for subspecific designation. This species must be studied in far greater detail than is now possible, owing to a limited geographic

distribution of my material, in order to determine whether the subspecific characters selected have allopatric correlations.

The specimens I have from Victoria fit Dana's *A. gaimardii* closely; the illustrations of that species clearly mark the unusual antenna 2 of this species in general. Dana's *A. compressa* has article 4 of pereopods 3-5 much broader and more extended than in *A. gaimardii* or any of my materials. Stebbing (1906) obviously had specimens in hand for his description; he described the apical tumidity of the hands on male gnathopod 1 and female gnathopods 1-2 characteristic of my Victorian material but also described the apicoanterior process on article 2 of male gnathopod 2 which fits alternatively my material from Western Australia and not the Victorian specimens. This is a clue to the possibility that all of these characteristics are subject to phenotypic variability; hence no attempt to name subspecies is prudent.

The telson is not cleft to the base as stated by Haswell and Stebbing but instead has a chitinous thickening or invagination proceeding on the midline from the cleft to the base which makes the telson appear as if it were fully cleft.

In the following description and diagnoses the two subspecies in hand are referred to as v for Victorian and w for Western Australian.

Allorchestes compressa subspecies V

FIGURE 32 lower

DIAGNOSIS.—Hand of male gnathopod 1 and female gnathopods 1-2 apically tumid, dactyl of gnathopod 1 lacking outer facial ridges; article 2 of pereopod 5 evenly rounded ventrally; epimera 2-3 with medium strong posteroventral cusp; flagellum of female antenna 2 about 1.8 times as long as articles 4-5 of peduncle together.

MATERIAL.—Port Phillip 73 (50).

Allorchestes compressa subspecies W

FIGURES 29-31, 32 upper

DIAGNOSIS.—Hand of male gnathopod 1 and female gnathopods not apically tumid, dactyl of male gnathopod 1 with numerous outer facial ridges; article 2 of pereopod 5 asymmetrically

rounded ventrally; epimeron 3 sharply quadrate posteroventrally, epimeron 2 with extremely weak posteroventral tooth; flagellum of female antenna 2 about 1.25 times as long as articles 4-5 of peduncle together.

MATERIAL.—JLB Australia 5 (1), 7 (7.5 × 10⁶ specimens, examined 50), 8 (3); WAM, Pt. Peron, 25 November 1946 (4); Cottesloe, February 1925 (36); North Beach, 6 June 1927 (23); Twilight Cove, out of washed up sponge, Mrs. Loney, 5 June 1966 (40+).

GENERAL DESCRIPTION OF MALE.—Eyes subcircular, black; lateral cephalic lobe extended, broad and obliquely truncate; antenna 1 extended to apex of peduncle on antenna 2, flagellum about 1.5 times as long as peduncle, aesthetascs weak; antenna 2 of medium length, articles 3-5 of peduncle stout, poorly armed laterally, flagellum thick, about as long as peduncle, base conjoint in terminal adults; margins of upper lip largely papillate; palp of maxilla 1 in typical subspecies longer and with longer apical spine than in *A. compressa* w; palp article 3 of maxilliped with one main apical row of setae, article 4 with one main apical spine; posterior acclivities of anterior coxae weak, softly rounded; article 2 of gnathopod 1 apically simple, lacking vertical ridge on either face, article 4 unproduced, lobe of article 5 shallow, broad, set proximally, palm smooth (minutely), transverse, defined by one lateral spine and two or three large mediofacial spines, hand with two or three groups of weak posterior setae; gnathopod 2 with anterodistal process on article 2 in *A.c.* w but not *A.c.* v, anterior lobe on article 3 stronger in *A.c.* w than *A.c.* v, palm about 1.5 times as long as posterior margin of hand, palm lined with short spines, unsculptured, posterior margin of hand poorly setose, palm defined by spine group, dactyl ordinary, apex inserted into palmar pocket; dactyls of pereopods with apical nail, weak setule near base of nail, inner margin of dactyl weakly castellate, locking spine one in number, simple, large, blunt, first pair of marginal spines on article 6 very close to locking spine; peduncle of uropod 1 with two or three basolateral spines, long gap, then small apicolateral spine, apicomедial spine small, outer rami of uropods 1-2 without dorsomarginal spines, inner rami with dorsal spines; peduncle of uropod 3 expanded from lateral view, bearing two apical

spines, ramus bearing two or three short apical spines (*A.c. w*) or one or two spines and up to three setae (*A.c. v*); telson almost sharply rectangular, broader than long, cleft halfway; cuticle bearing numerous alate pits with short setule, pits extremely small.

FEMALE.—Antenna 1 like that of male but antenna 2 short, peduncle not strongly thickened, base of flagellum not conjoint; article 2 of gnathopod 1 with apicofacial ridge; lobe of article 5 weaker and sharper than in male, hand nearly parachelate, dactyl more slender than in male and lacking ridges (but bearing circular setule pits as in male); gnathopod 2 resembling gnathopod 1 but article 4 bluntly extended, lobe of article 5 large and long, hand broad; uropod 3 generally with three peduncular spines; posterior margins of lobes on telson slightly excavate.

VARIATIONS.—The largest male of *A.c. v* is 16 mm long, of *A.c. w*, 10.3 mm. In the large males of *A.c. v* the subsidiary piece on the right mandibular lacinia mobilis is less prominent than in males the same maximum size of *A.c. w*. The left mandible of those large males has three additional rudimentary spines besides the regular three and on the right one extra rudimentary spine is present. In *A.c. v*, the peduncle of uropod 1 has up to four subbasal spines, and the rami of uropods 1 and 2 have up to three and two dorsal spines, respectively. The smallest specimen at hand of *A.c. v* is 5.7 mm so that knowledge of juveniles is lacking.

The largest male of *A.c. w* at hand, 10.3 mm long from Pt. Peron, 25 November 1946, has a widely expanded hand, the dactyl much shorter than the palm and lacking outer dactylar ridges as in subspecies *v*; but other smaller males of that sample have the ridges normal to subspecies *w*.

On pereopods 3–5 the first pair of spines next to the locking spine is fully developed and in large adults one or two setae occur on either side of the spines; on pereopods 1–2 the first armament next to the locking spine is a single spine with one or two setae on either side.

Articles 2 and 3 of male gnathopod 2 have no mediofacial lobes, only laterofacial lobes. Pereopod 2 is slightly shorter than pereopod 1. Female gnathopod 1 has only one posterior seta on article 2 and article 4 is weakly fuzzy on the outer margin. The medial face of the peduncle on uropod 3 bears

weak spinules, more on the female than on the male. The fuzz on the outer proximal setule of the pereopodal dactyls may be blue-green algae. The cuticular pits are alate mainly on the coxae and are of irregular or subcircular form in other places. They may be antecedent to those pits so prominently developed on species of Ceinidae.

Juveniles of *A.c. w* about 2.6 mm long have five flagellar articles on antenna 1, six on antenna 2, with the first article elongate on antenna 2; eyes dark; acclivities on coxae 1–3 rudimentary; peduncle of uropod 3 with only one spine and the inner rami of uropods 1–2 with only one dorsal spine. Article 6 of gnathopod 1 is relatively elongate compared with adults, article 2 has no midposterior setae; article 2 on gnathopod 2 has two posterior setae in tandem. Otherwise, juveniles are generally recognizable as this species.

In the few available specimens of *A.c. v* the hand of gnathopod 1 has a basal sleeve extending the hand at an angle not occurring in *A.c. w*; whether this is a characteristic of living specimens is unknown.

DISTRIBUTION.—Jervis Bay, Western Australia, south and east to Tasmania, north to Illawarry, New South Wales; ?Campbell Island; ?Auckland Islands.

Allorchestes novizealandiae Dana

Allorchestes novizealandiae Dana, 1852:207; 1853:894, pl. 61: fig. 1.—Hurley, 1957:927–931, figs. 147–169 [with synonymy].

DIAGNOSIS.—Mature male gnathopod 1 with rectangular hand bearing thick protrusion pointing distally, dactyl strongly overlapping palm, striate (“scaled”), slender, apically simple, medial face of hand on protrusion with row of small spines; posteroventral protrusions of epimera of medium extent; body dorsally smooth; cuticle unknown; spines of pereopods 3–5 sharp and slender; inner ramus of uropod 1 with two dorsal spines.

DISTRIBUTION.—New Zealand and Chatham Islands.

Hyale Rathke

The key to species from southern Australia is confounded by the absence of information on many attributes of *H. humilis* (Dana) and *H. ma-*

roubrae Stebbing, but a few characters have been found in the descriptions of each sufficient to place them at the head of the key in an unnatural dichotomy.

In other publications I have described *Hyale* as bearing two apical locking spines on article 6 of pereopods 1-5. In reality, however, only the distal-most spine is a true locking spine as it is apically simple, and lacking a trigger, whereas the next

proximal spine, often joining the locking spine to form a simulated pair of locking spines, usually bears a setular trigger and is, therefore, presumably a member of the regular series of marginal spines on article 6. However, this second locking spine is occasionally smaller or larger than other members of its class and, therefore, can be considered in many species to have some function complementary to the distal-most true locking spine.

Key to Species of *Hyale* from Southern Australia

1. Distal locking spine of pereopods 1-5 fusiform, palm of gnathopod 1 transverse, dactyl of male gnathopod 2 as long as palm and posterior margin of hand together..... *H. maroubrae*
Distal locking spine of pereopods 1-5 not fusiform, palm of gnathopod 1 usually slightly to strongly oblique, dactyl of male gnathopod 2 shorter than palm and posterior margin of hand together 2
2. Posterior margin of hand on male gnathopod 2, proximal to palm, with deep acclivity armed with long setae..... *H. humilis*
Posterior margin of hand on male gnathopod 2 naked or with very weak acclivity bearing two or fewer small armaments..... 3
3. Peduncle of uropod 1 lacking enlarged apical spine..... 4
Peduncle of uropod 1 with enlarged apical spine, medial or lateral..... 5
4. Anterior coxae with obscure acclivities, cuticle with lunate pits *H. loorea*, new species
Anterior coxae with sharp acclivities, cuticular pits not distinctly lunate
..... *Hyale* species of Australia, *H. media* of New Zealand
5. Enlarged spine of peduncle on uropod 1 medial 6
Enlarged spine of peduncle on uropod 1 lateral..... 9
6. Uropod 3 short, ramus as long as peduncle, ramus naked on dorsal margin [antenna 2 of adults densely setose]..... 7
Uropod 3 elongate, ramus 1.5 times as long as peduncle, ramus with two dorsal marginal spines in tandem..... *H. grandicornis ruficola*
7. Marginal setule on dactyl of pereopods 1-5 very stout, distal-most locking spine at base of dactyl larger than next proximal spine..... *H. crassicornis*
Marginal setule on dactyl of pereopods 1-5 very thin, distal-most locking spine at base of dactyl smaller than next proximal spine (distal-most becoming obsolescent and wire-like in adults) 8
8. Posteroventral tooth of epimera 2-3 obsolescent..... *H. media*
Posteroventral tooth of epimera 2-3 strong and sharp..... *Hyale* species of Australia
9. Gnathopod 1 linear, hand narrow, dactyl greatly overlapping vestigial palm.....
..... *H. wilari*, new species
Gnathopod 1 of ordinary form in *Hyale*..... 10
10. Palm of male gnathopod 2 sculptured, hand of male gnathopod 1 apically expanded *H. yake*, new species
Palm of male gnathopod 2 smooth, hand of male gnathopod 1 not apically expanded 11
11. Locking spines (apical pair) on pereopods 3-5 equal to each other in size..... 12
Locking spines (apical pair) on pereopods 3-5 unequal to each other in size..... 13
12. Male maxillipedal palp with immense terminal seta, palm of male gnathopod 1 with defining cusp..... *H. kandari*, new species
Male maxillipedal palp with medium terminal seta, palm of male gnathopod 1 undefined by cusp *H. nigra*
13. Main marginal dactylar seta on pereopods 1-5 small and terminad, tooth of epimera 2 and 3 medium in size..... *H. rubra*
Main marginal dactylar seta on pereopods 1-5 large and near middle of dactyl, teeth of epimera 2-3 obsolescent or absent..... *H. longicornis*

NOTE: *Hyale media* and *Hyale* species of Australia are cited twice in the key, couplets 4 and 8, because value judgment is difficult on uropodal spination.

Hyale crassicornis (Haswell)

FIGURES 33-35

Allorchestes crassicornis Haswell 1880b:252, pl. 7: fig. 5; 1885:1, pl. 10: figs. 2-5.

DESCRIPTION OF MALE.—Lateral cephalic lobe broad and rounded in oblique plane, eyes medium, black; antenna 1 extending more than halfway along flagellum of antenna 2, weakly setose; antenna 2 of medium length, peduncle thick, article 5 and first 7-9 flagellar articles heavily setose posteriorly, flagellum basally thick; upper lip with unusually long setules; maxilla 2 similar to that figured for *Allorchestes compressa*; main apical spine and marginal setae of article 4 on maxillipedal palp small; article 2 of gnathopod 1 without apical ridges or processes, with one stout midposterior spine, article 3 with extended anterior lobe, article 4 with quadrate posterodistal angle, broad lobe of article 5 deeply serrate and spinose, hand expanding apicad, posterior margin lined with setae on distal half, palm slightly oblique, smooth, defined by one spine (outer and inner), dactyl fitting palm, minutely ridged on faces near inner margin; gnathopod 2 with weak ridge apicomediaally on article 2, anterodistal corner rounded, articles 3-4 poorly lobate, article 5 with short-lobed form of genus, palm oblique and well defined, about equally as long as posterior margin of hand, unsculptured, dactyl simple, fitting palm, weakly ridged on inner margin, posterior margin of hand poorly armed; acclivities of anterior coxae of medium extent, projecting, softly pointed, poorly developed on coxa 1; pereopod 2 scarcely smaller than pereopod 1; article 6 of pereopods small for genus, article 4 poorly expanded, article 2 of pereopod 5 of medium breadth and ventral extension, subtruncate obliquely below, each pereopod with one distal locking spine, straight, nearly unridged, then one smaller spine closely adjacent and surrounded by setae, dactyl with apical nail and enlarged inner setule near middle, setule smooth, inner margin of dactyl smooth; epimeron 1 with weak posteroventral notch, epimeron 2 with medium, softly rounded posteroventral extension, epimeron 3 with weak extension, epimera 1-2 each with lateral ridge; peduncle of uropod 1 with enlarged spine apicomediaally, outer spine small, outer rami of uropods 1-2 with two or three dorsal

spines, inner ramus of uropod 1 with one spine, of uropod 2 with three dorsal spines; peduncle of uropod 3 widely expanded, with one main spine, ramus longer than peduncle, 1.75 times as long as broad, broadly and obliquely truncate, bearing about five spines, none discontinuous; telson ordinary but not fully cleft, lobes asymmetrically triangular but not strongly divergent (pressed together in figure), with several medium apical setae; cuticular pits mainly on coxae, very small, some bearing tiny setules.

FEMALE.—Antennae like those of male but more weakly developed in thickness and setation; article 2 of gnathopod 1 with weak medial ridge, article 4 heavily setose compared with male, hand not as widely expanded as in male but posterior margin heavily sinuous; gnathopod 2 like gnathopod 1 but hand broader, article 2 with extended anteroventral corner; ridges weak on dactyl of gnathopod 2, absent on gnathopod 1; article 2 of gnathopod 1 with one large, stout and three small midposterior setal spines, of gnathopod 2 with two short stout spines.

REMARKS.—This material is so close to *H. iole* J. L. Barnard (1970) from Hawaii that the latter can only be relegated to subspecific level and may not actually deserve this distinction. *Hyale iole* differs from *H. crassicornis* in the presence of subterminal facial spines on the ramus of uropod 3; the presence of weak castellations on the dactyls of the pereopods; the lack of apical expansion of the hands on male gnathopod 1 and female gnathopod 2; and the bluntness of the dactyl on gnathopod 1.

This species bears little resemblance to other known species with a large setule on the pereopodal dactyls, except *H. grandicornis* (Krøyer) which has spiral striations on the setule, a medium sized inner spine on uropod 1 and at least one dorsally disjunct spine on the ramus of uropod 3.

Hyale crassicornis closely resembles *H. barnardi* Chevreux (1925) from Senegal; the inner spine on uropod 1 peduncle is not specifically mentioned for that species, but *H. crassicornis* differs in at least one character, the presence of dorsal spines on the outer rami of uropods 1-2. *Hyale barnardi* has a weak but definite setation on antenna 2 resembling *H. crassicornis*.

MATERIAL.—JLB Australia 5 (8); AM P 3393, Kiama, New South Wales (1); P 5629, Head of

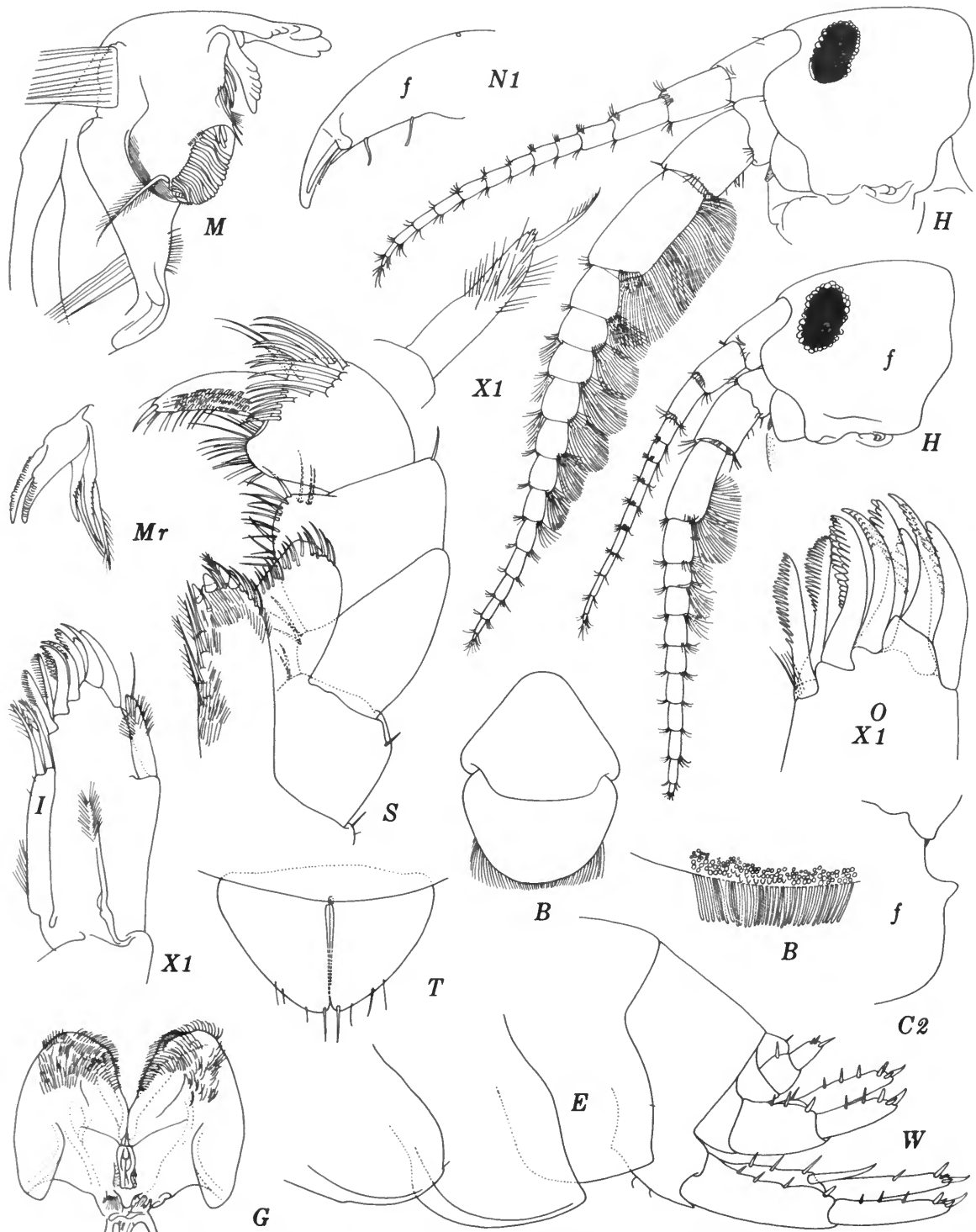


FIGURE 33.—*Hyale crassicornis* (Haswell), male, 7.7 mm, JLB Australia 5; f=female, 7.5 mm.

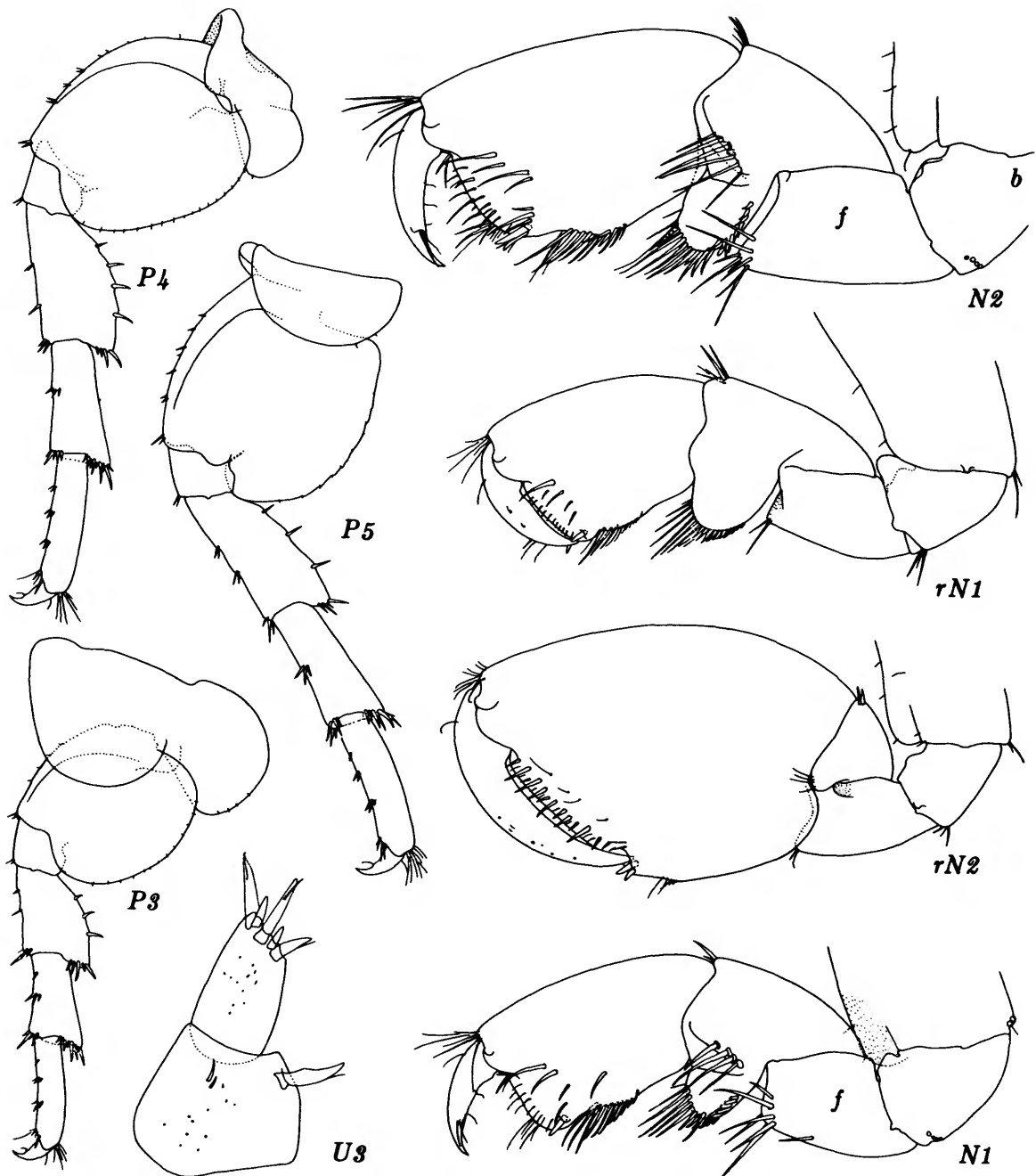


FIGURE 34.—*Hyale crassicornis* (Haswell), male, 7.7 mm, JLB Australia 5; f=female, 7.5 mm.

Wallis Lake, 14 miles from Tuncurry, N.S.W., collected by J. R. Kinghorn [no date] (6); Merim-

bula, N.S.W., 2 September 1971, holdfast of *Ecklonia*, coll. M. Drummond (304).

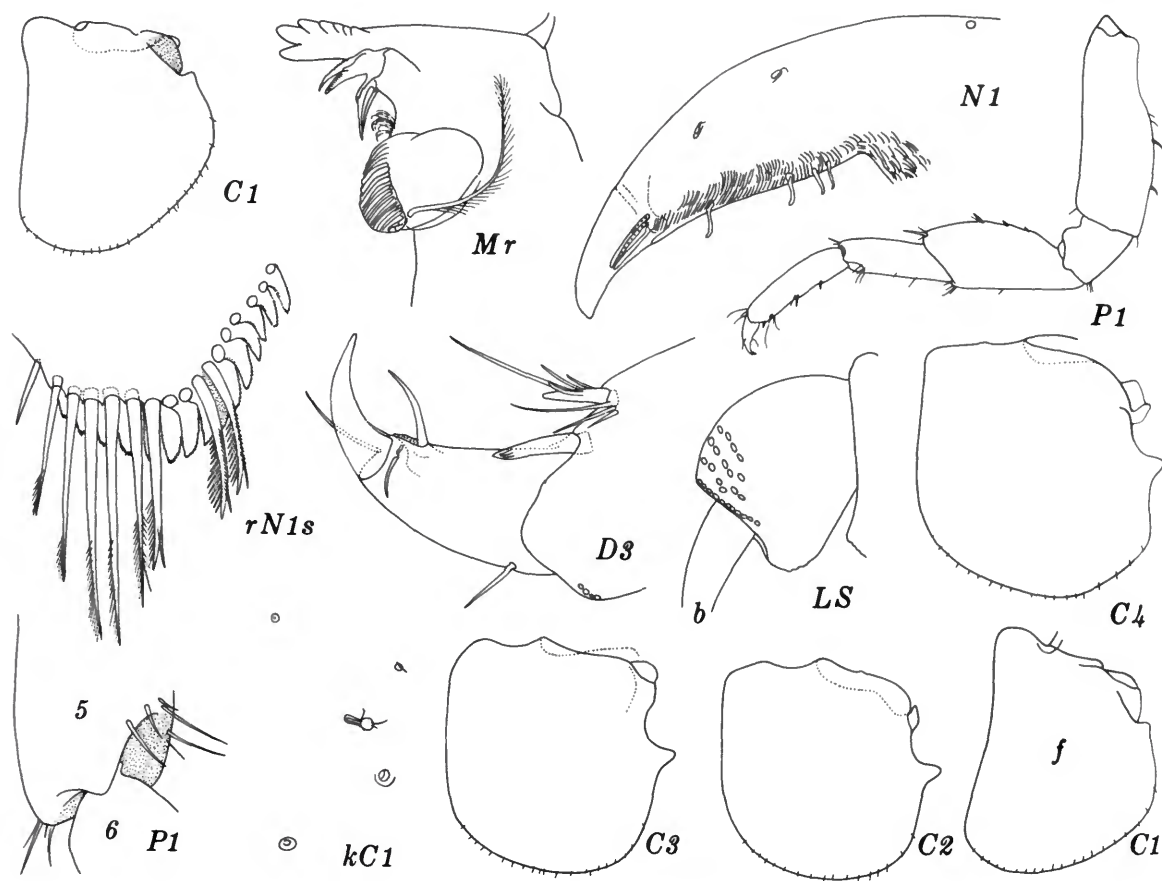


FIGURE 35.—*Hyale crassicornis* (Haswell), male, 7.7 mm, JLB Australia 5; f=female, 7.5 mm.

DISTRIBUTION.—Kiama, New South Wales to Cape Naturaliste, Western Australia, intertidal.

***Hyale grandicornis rupicola* (Haswell)**

Allorchestes rupicola Haswell, 1880b:250-251, pl. 8: fig. 1; 1885:2, pl. 10: figs. 9-12.

MATERIAL.—Australian Museum, G 5419 TYPE Port Jackson; P 3398, Port Jackson, 1 specimen.

REMARKS.—In the Australian fauna of *Hyale*, as so far studied, the so-called type-specimen of this species is highly distinct because the elongate ramus on uropod 3 bears two dorsal spines in tandem on the midmargin disjunct from the apical spines; on the specimen from AM P 3398 only one disjunct spine is present and it is highly terminad.

The ramus is thin and nearly twice as long as the peduncle. Uropod 1 has a small apicolateral spine on the peduncle and an apicomedia spine of medium enlargement. The telson is typical of *Hyale* as herein defined. The dactyls of the pereopods have a stout seta near the middle as in *H. crassicornis*, and the locking spines of pereopods 3-5 are composed of a long (longer than in any other species presented herein), straight, poorly striate spine, adjacent to which is a shorter straight spine surrounded by setae. On pereopods 1-2 the distal locking spine is as short as the next spine. Coxal acclivities are sharp and well developed, coxa 4 with a double sinuation posterodorsally. All rami of uropods 1-2 are well spinose. The antennae are short, articles 4-5 of antenna 2 being slightly

thickened. The ocular lobe is broadly and evenly truncate. Epimera 1-3 resemble those of *H. crassicornis* but the tooth on epimera 2-3 is sharper. The maxilliped is normal, and the palp of maxilla 1 reaches the base of the spines on the outer plate. Article 2 of pereopod 5 is normally broad. Gnathopod 2 of the male is ordinary, with oblique unsculptured palm scarcely defined by a weak protrusion and the posterior margin of the hand bearing only a pair of setae. The hand and dactyl of gnathopod 1 resemble Figure 44rNI herein, except that the posterior setal row on the hand is shorter.

Because of the large dactylar seta on pereopods 1-5, *Hyale rupicola* appears closest perhaps to *H. crassicornis* of the Australian fauna but differs from that species in the absence of dense setal tufts on antenna 2, a somewhat more elongate telson, sharper epimeral teeth, much longer ramus with disjunct spines on uropod 3 and smaller apico-medial spine on the peduncle of uropod 1. The hand of gnathopod 1 is narrower and the row of posterior setae on the hand is more compact.

Hyale rupicola is probably a synonym of *Hyale grandicornis* forma *novaezealandiae* (Thomson) from New Zealand as portrayed by Hurley (1957). I am convinced from this study of Australian *Hyale* that *H.g.* forma *novaezealandiae* and *H.g.* forma *thomsoni* as described by Hurley (1957) are distinct species, but that *H.g. novaezealandiae* and *H.g. rupicola* could probably stand as subspecies of a common stem. *Hyale g. novaezealandiae* differs from *H.g. thomsoni* in the long ramus of uropod 3 bearing disjunct dorsal spines, the great size of the dactylar seta on the pereopods and the fully developed row of spines on the outer rami of uropods 1-2.

No adult female of *H.g. rupicola* has been seen so I cannot state whether the female gnathopod 2 is as enlarged as it is in *H.g. novaezealandiae*.

Hyale g. rupicola differs very slightly from *H.g. novaezealandiae* in (1) the full development of both disjunct spines on uropod 3 and (2) in the less stout hand of male gnathopod 2.

The type-locality of *H. grandicornis* is in middle Chile so that application of subspecific names to Australian and New Zealand materials is justified on geographic reasons. If recent experiences in differentiating South American and Australian

species hold true in *Hyale* we should expect to find significant and consistent differences from Australian-New Zealand morphs in the population of warm-temperate Chile.

DISTRIBUTION.—Port Jackson; Botany Bay; Port Denison, Australia.

Hyale humilis (Dana)

Allorchestes humilis Dana, 1852:206; 1853:890, pl. 60: fig. 6a-c.

?*Allorchestes humilis* Stebbing, 1899:413-414, pl. 33D [from Sakhalin, possibly distinct on geographic grounds].

Allorchestes humilis is obviously a species of *Hyale* despite the absence of information on the telson and the presence of a full lobe on article 5 of male gnathopod 2. Apparently Dana figured a young male, one transforming to adult condition. But this must remain conjectural until the vicinity of Port Jackson can be thoroughly explored and a specimen matched to Dana's figures. The elongate palp of maxilla 1 places *A. humilis* in *Hyale*. Stebbing's (1899) portrayal of this species from Sakhalin fits the description of Dana but the long geographic separation dictates caution in accepting Stebbing's identification. Haswell (1885) mentioned *A. humilis* as a possible young stage of his *A. rupicola*. Gnathopod 2 is reminiscent of Hurley's (1957) Figure 9 showing a female gnathopod 2 of *Hyale grandicornis* forma *novaezealandiae*.

DISTRIBUTION.—Port Jackson.

Hyale kandari, new species

FIGURES 36, 37

DESCRIPTION OF MALE.—Lateral cephalic lobe broad, truncate almost vertically, slightly excavate, eyes medium, clear in alcohol (perhaps faded); antenna 1 extending nearly halfway along antenna 2, aesthetascs poorly developed, flagellum thin to medium in thickness; antenna 2 elongate, between 55 and 65 percent as long as animal, peduncle of medium stoutness, setation of flagellum very weak; setation on upper lip short; mandibular molar moderately to weakly tritritative, both sides with medium to long seta, right lacinia mobilis with three distinct pieces, incisors well toothed, right mandible with two spines, left with three; lower lip like that of *Hyale yake*, new species, but mandi-

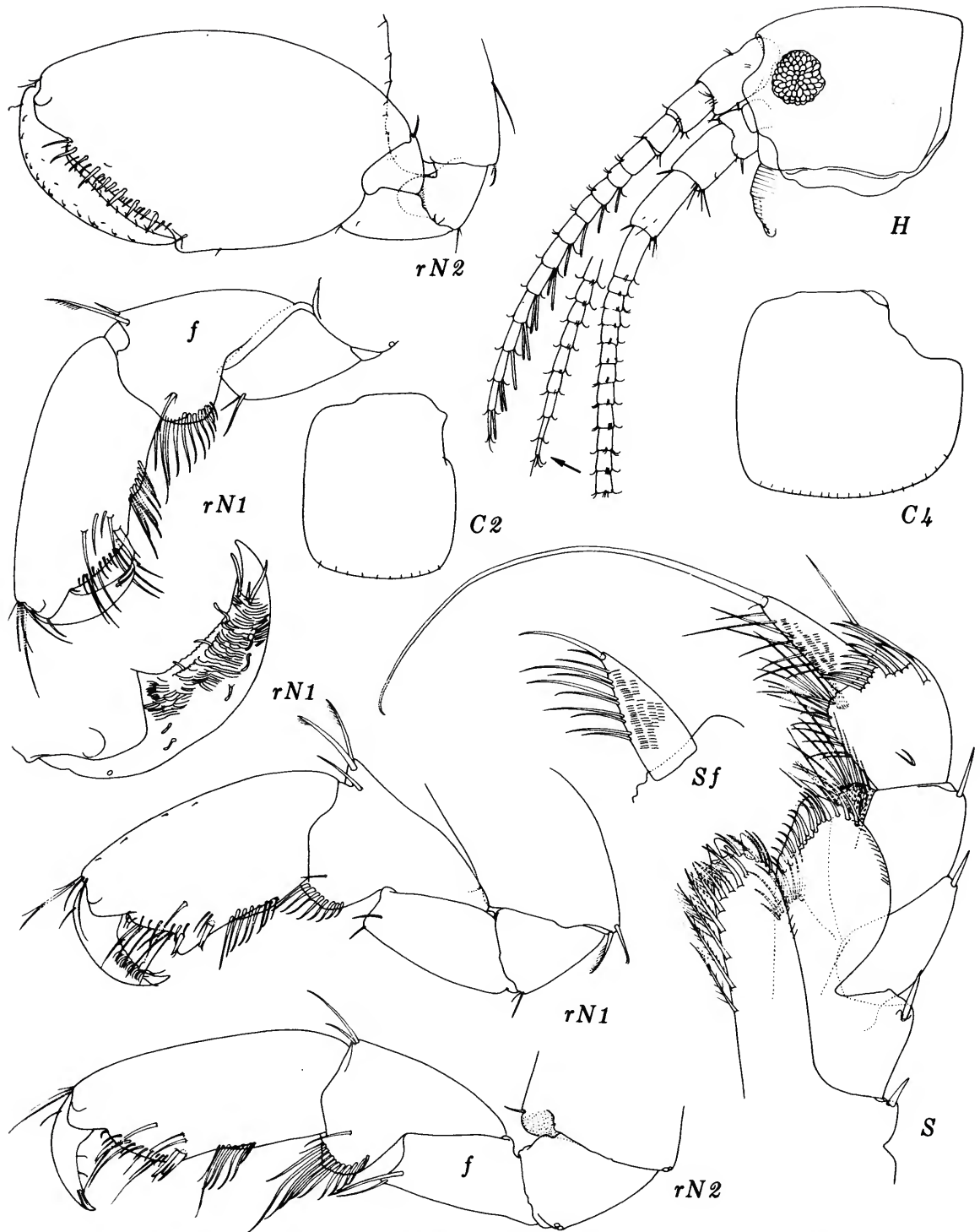


FIGURE 36.—*Hyale kandari*, new species, holotype, male, 5.2 mm, VicFish 570; f=female, 5.9 mm, VicFish 566.

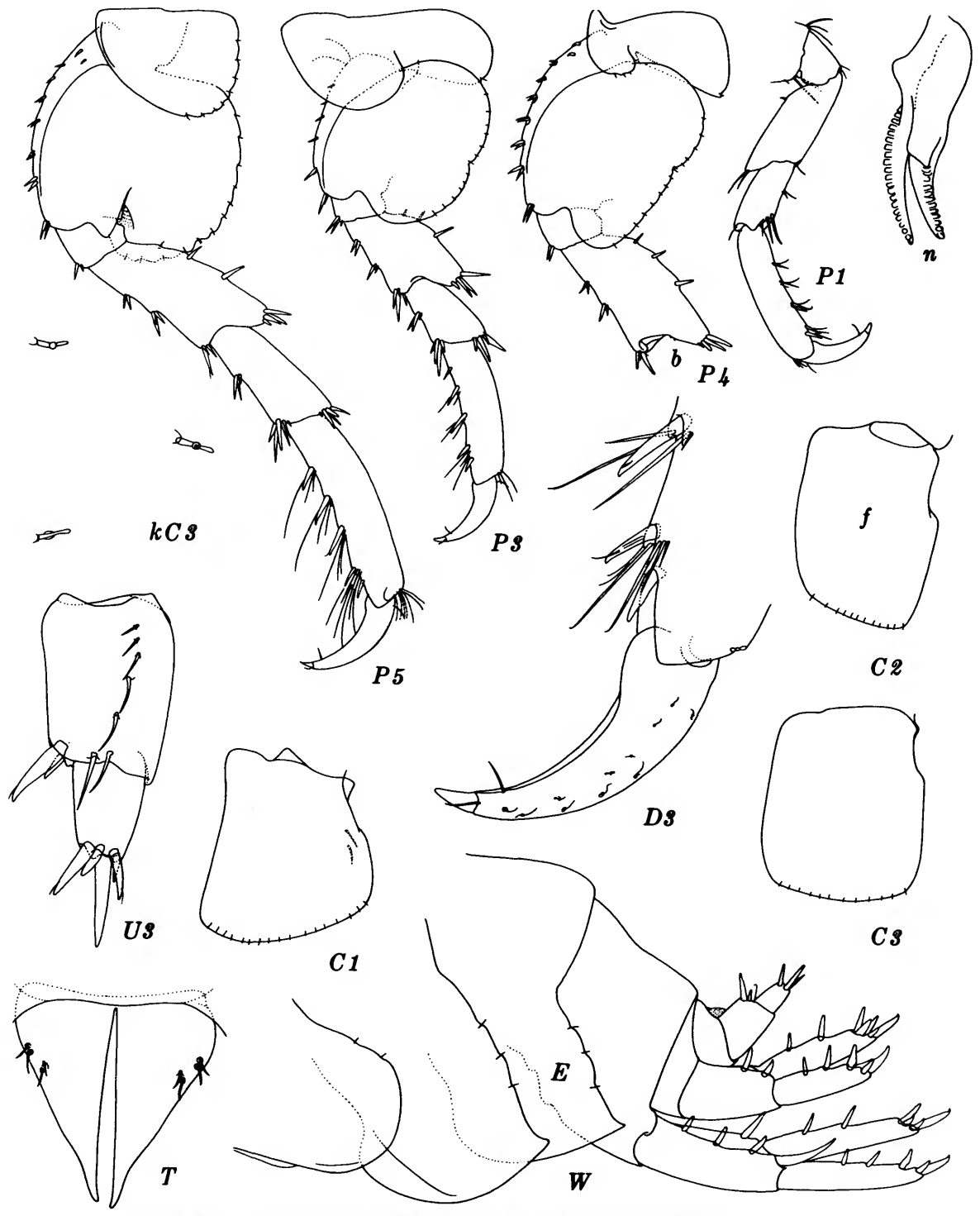


FIGURE 37.—*Hyale kandari*, new species, holotype, male, 5.2 mm, VicFish 570; f=female, 5.9 mm, VicFish 566.

bular lobes softly truncate; maxilla 1 like that of *H. crassicornis* but palp extending halfway along spines of outer plate and apex with seta plus sharp cone; maxilla 2 like that of *A. compressa* but inner plate more pointed; maxilliped of subgenus *Lelehua* (Barnard, 1970), apex of palp with immense flagellar seta, palp article 2 with medial lobe, outer margins of 4 articles of maxilliped each with heavy spine; article 2 of gnathopod 1 naked posteriorly, apicomedial ridge absent, anterior lobe of article 3 weak, article 4 with posterodistal angle nearly 90 degrees, broad lobe of article 5 ordinary but anterodistal margin extended and spinose, article 6 of ordinary stoutness, subrectangular, posterior margin weakly sinuous and setose along much of middle part, palm oblique, heavily defined by large cusp, dactyl fitting palm and weakly striate; article 2 of gnathopod 2 with one posterior seta, weak ridge apicomediaally, anterodistal corner broadly rounded, article 3 with even anterior lobe, articles 4-5 small, article 4 bulbous posterodistally, article 5 with short-lobed form of genus, palm oblique and about as long as naked posterior margin of hand, palm even, defined by broad cusp, dactyl simple, fitting palm; acclivities of anterior coxae weak, softly rounded, doubly produced on coxa 4; pereopod 2 slightly smaller than pereopod 1; pereopods 3-5 ordinary, article 4 poorly expanded, article 2 of pereopod 5 broad, evenly rounded posteroventrally, serrations large, each pereopod with one small, simple distal locking spine, then similar spine contiguous, this distal pair not far removed but smaller than next adjacent spine, locking spines and other spines on article 6 of pereopods 4-5 (especially) with long setae, on pereopods 1-3 these setae generally not longer than spines, dactyl with apical nail strongly marked with cleft, erect thin setule proximal to cleft, facial setule at base of cleft, inner margin of dactyl smooth; epimeron 1 rounded posteroventrally, epimera 2-3 with medium sharp posteroventral tooth, all epimera more or less convex and notched posteriorly; peduncle of uropod 1 with enlarged spine apicolaterally, other spines evenly distributed, medial spine of medium size, inner and outer rami of uropods 1-2 with two dorsal spines, peduncle of uropod 3 ordinary, with two main spines, one small, ramus much shorter than peduncle but longer than broad, roughly truncate, bearing about five apical spines,

none discontinuous; telson very long, cleft nearly to base, lobes asymmetrically triangular, with no apical setae, two pairs of lateral setules; cuticle weakly armed, small bulbous setules apparently emerging from invisible pits, surface between pits smooth.

FEMALE.—Antennae and head like those of male; dactyl of maxilliped of ordinary form, apical seta short to medium in length; anterior coxae narrower and taller than in male; gnathopod 2 like gnathopod 1 but more elongate, article 4 produced apicoposteriorly, article 2 weakly expanded apically; setae on pereopods 4-5 scarcely longer than spines.

YOUNG MALES (4.5 mm).—Gnathopod 2 fully developed but palmar defining tooth on gnathopod 1 rudimentary, apical seta on maxilliped of medium length, pereopods 4-5 with long setae.

HOLOTYPE.—NMV, male, 5.2 mm.

TYPE-LOCALITY.—VicFish 570, Western Port, Victoria, Station 03S-5-1+2, 7 feet, 7 inches, 13 April 1965.

RELATIONSHIP.—The elongate apical seta of the maxilliped is characteristic of the subgenus *Lelehua* described by Barnard (1970) for *Hyale waimea* from Hawaii. *Hyale kandari* is not remote from *H. waimea* but the latter is more ornamented in terms of the deeply excavate palm of male gnathopod 2, the heavy slit-setules of the cuticle, the uneven locking spines of the pereopods (the two distal-most spines) and the broad article 4 of pereopods 3-4. *Hyale waimea* also lacks the palmar defining tooth of gnathopod 1 found in *H. kandari*.

Relationship to *H. carinata* (Bate) (in Chevreux and Fage, 1925) another possible member of *Lelehua*, is possible, but *H. carinata* is also very unusual in its short antenna 2 and broadened article 4 on pereopods 3-4.

Hyale kandari is actually very close to *H. rubra* and the main problem in Australia is how to tell the two species apart in young stages. Apparently the most reliable character is the equal size of the locking spines of the pereopods in *H. kandari*. The young of *H. kandari* also have the thin and evenly rectangular hands of gnathopod 1. Both sexes have fewer aesthetascs than does *H. rubra*, the telson is elongate, and the male has a defining cusp on gnathopod 1. *Hyale yake* is a close neighbor of *H. kandari*, the two new species sharing the elongate telson and long palp of maxilla 1; their further distinctions may be seen in the key to the species.

MATERIAL.—Western Port, Victoria, VicFish, 8 samples (43).

DISTRIBUTION.—Western Port, Victoria, shallow water.

Hyale longicornis (Haswell)

Allorchestes longicornis Haswell, 1880b:251–252, pl. 7: fig. 4; 1885:1, pl. 10: figs. 6–8.

MATERIAL.—AM, P 3394, Kiama, New South Wales, 1 specimen; Macleay Museum, Kiama, 3 specimens [possibly all from same lot]; P 3395, Port Denison, Queensland, under stones [no date] (1) [previously mislabeled *Allorchestes longicauda*]; P 5091, Wylies Surf Baths, Coogee, N.S.W., 16 December 1920, collected by McNeill and Livingstone (6).

REMARKS.—Antenna 2 long, as shown by Haswell, gnathopod 2 ordinary as shown by Haswell; maxilliped palp article 4 with stout apical nail, apparently few other marginal setae, article 3 of palp with thumb and heavy setation similar to *H. hirtipalma* (Dana) (see Hurley, 1957, fig. 128); coxal acclivities sharp and of medium extent; male gnathopod 1 about as stout as in *H. rubra* (Thomson) (p. 67) but posterior setae of hand confined to sinuation near middle of margin; dactyl of pereopods 1–5 with very stout setae near middle inner margin, pereopods 3–5 with pair of straight locking spines closely set together, distal member long and simple, proximal member scarcely half as long as distal member and bearing setular trigger, pereopod 1 with both spines of short variety, pereopod 2 with short distal spine hidden amongst four extremely stout and apically hooked setae, proximal member highly disjunct and free of setae; adults with groups of posterior setae on article 6 of pereopods 3–5; epimeron 2 with nearly straight posterior margin, posteroventral corner rounded, epimeron 3 with bulging posterior margin, posteroventral protrusion very weak and rounded, both epimera with heavy acclivities; peduncle of uropod 1 with enlarged spine apicolaterally; peduncle of uropod 2 with four spines in tandem occupying distal two-thirds of dorsal margin; uropod 3 short, ramus scarcely as long as peduncle, latter with one apical spine, ramus with several thin apical spines,

none disjunct; telson short, turgid, very tall but otherwise typical of *Hyale*.

VARIATION.—AM, P 3395: Adult male with tuft of setae on posterior margin of hand on gnathopod 2 as described for *Hyale humilis* (Dana); possibly *H. humilis* and *H. longicornis* are synonymous; see key to *Hyale*.

This species has the enlarged seta on the dactyls of the pereopods as seen in *H. crassicornis* and *H. rupicola*. *Hyale longicornis* differs from *H. crassicornis* in the absence of setular tufts on antenna 2, the straight posterior margin of epimeron 2 and the midmarginal placement of the posterior setae on the hand of gnathopod 1 (at least in the male). *Hyale longicornis* differs from *H. rupicola* in the ordinary uropod 3, straight posterior margin of epimeron 2 and the enlarged spine on the apicolateral margin of the peduncle on uropod 1. These comments suffice to retain *H. longicornis* as a valid species until fresh materials can be thoroughly illustrated.

DISTRIBUTION.—Kiama, New South Wales.

Hyale loorea, new species

FIGURES 38–40

DESCRIPTION OF MALE.—Lateral cephalic lobe broad, truncate obliquely, eyes medium, black; antenna 1 extending more than halfway along antenna 2, aesthetascs moderately developed, flagellum stout; antenna 2 about 40 percent of body length, peduncle of medium stoutness, setation of flagellum weak; upper lip as shown for *H. rubra* (Figure 46); mandibular molar with triturative surface of medium extent, molarial seta short on right side, long on left side, right lacinia mobilis with only two branches; lower lip as shown for *H. crassicornis* (Figure 33); maxilla 1 as illustrated (Figure 38); maxilla 2 similar to that of *Allorchestes compressa* but inner plate slightly more pointed; inner plate of maxilliped as shown for *H. rubra* (Figure 43), but three apical spines longer and sharper, lateralmost spines on edges of articles stouter, palp article 2 with only one spine, apical nail and other setae of palp article 4 of medium length, article 2 of gnathopods 1–2 with one short posterior setal spine, gnathopod 1 with short apico-medial ridge on face, anterior lobe of article 3 weak, article 4 with rounded posterodistal margin,

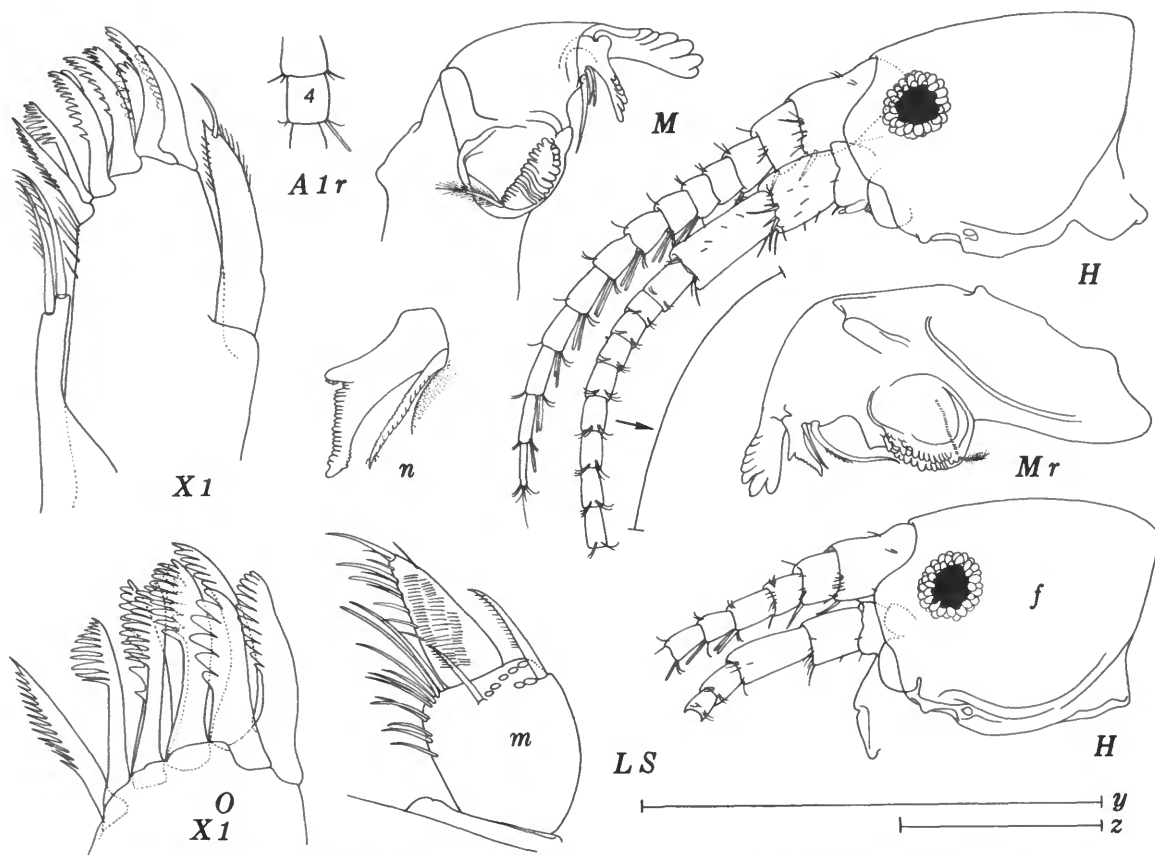


FIGURE 38.—*Hyale loorea*, new species, holotype, male, 3.5 mm, JLB Australia 5; *m*=male, 4.5 mm, JLB Australia 3; *f*=female, 4.0 mm; *y*=remainder of *f* antenna 2; *z*=remainder of *f* antenna 1.

broad lobe of article 5 ordinary, hand elongate, not sinuous posteriorly, with short row of three or four posterior setae, palm oblique, sinuous, minutely crenulate, defined by one spine (outer and inner), inner defining spine placed near middle of palm and highly submarginal, dactyl weakly overlapping palm, densely ridged on face near inner margin; article 2 of gnathopod 2 with strong apicomedial lobe, stronger and distally extended apicolateral lobe, article 3 with medium rounded anterior lobe, article 4 apically bulbous, article 5 with cryptic posterior lobe, palm oblique and well defined, much shorter than posterior margin of hand, sculptured, from medial aspect one main hump near middle of palm connected by web to hump near base of dactyl, only one hump seen from lateral view, dactyl simple, fitting palm, unridged, with setules

on inner margin, posterior margin of hand poorly armed, anterior margin convex; acclivities of anterior coxae obsolescent, coxa 4 not considered doubly produced because dorsal extension so near dorsal margin; pereopod 2 slightly smaller than pereopod 1; article 6 of pereopods slightly enlarged, article 4 poorly expanded, article 2 of pereopod 5 broad, ventral extension rounded, each pereopod with one distal locking spine, then larger spine immediately contiguous, the two spines forming distal pair far removed from next adjacent spine, distal spines moderately ridged, joined by three setules on each side of pereopod, dactyl with scarce evidence of distal nail but marked with strong cleft, erect thin setule just proximal to cleft, inner margin of dactyl smooth, faces very finely ridged; epimeron 1 with small posteroventral notch, epi-

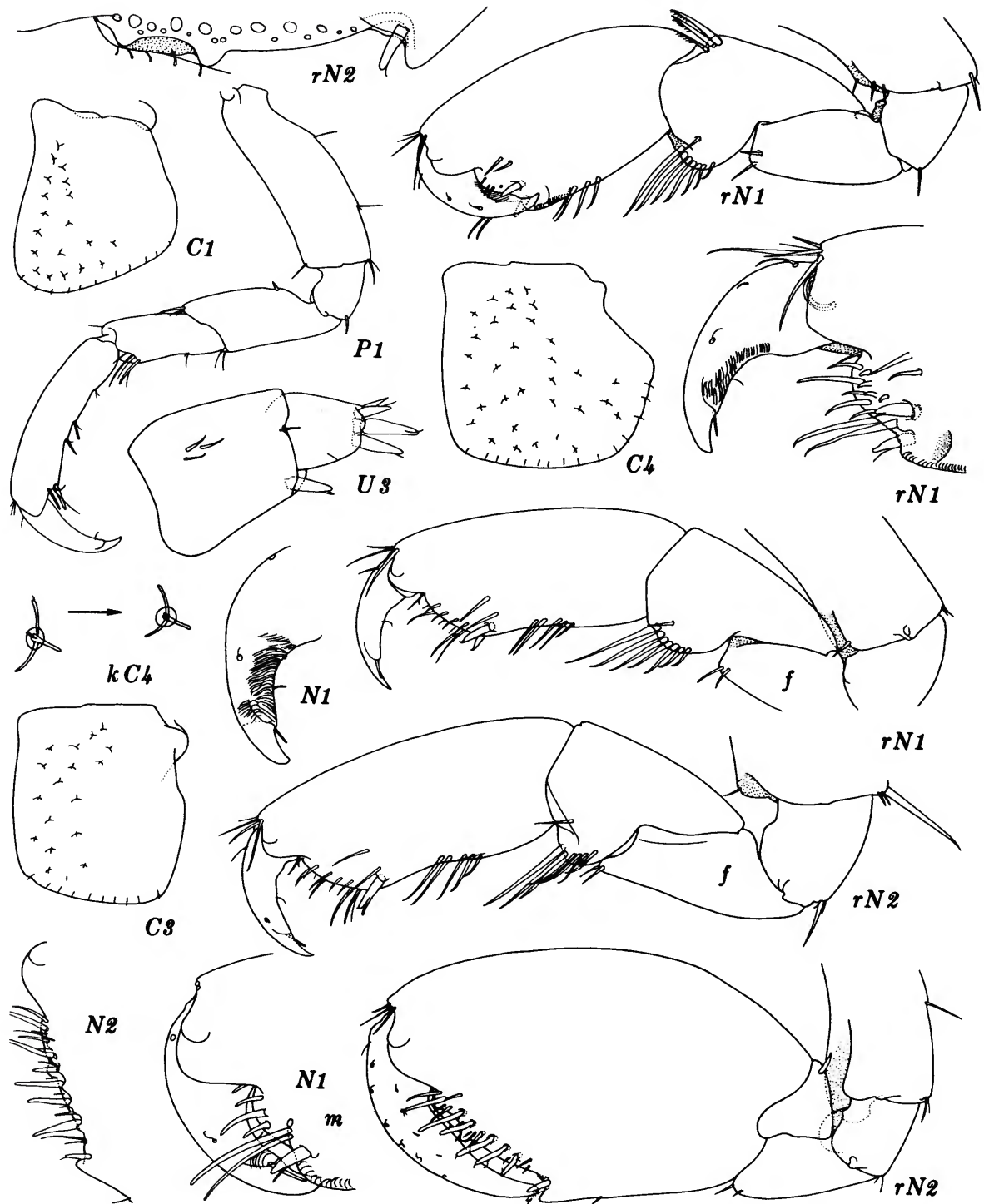


FIGURE 39.—*Hyale loorea*, new species, holotype, male, 3.5 mm, JLB Australia 5; *m*=male, 4.5 mm, JLB Australia 3; *f*=female, 4.0 mm.

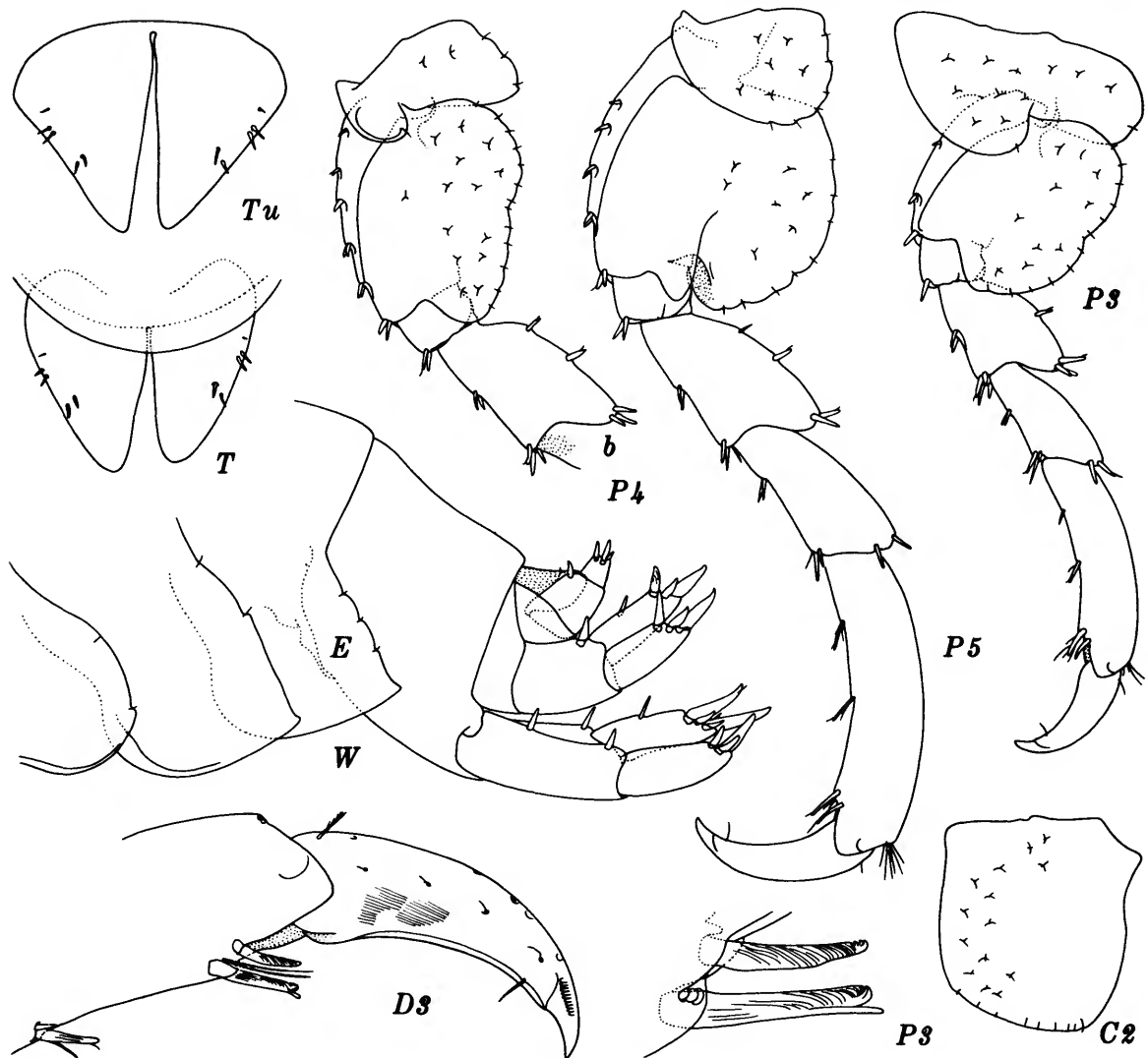


FIGURE 40.—*Hyale loorea*, new species, holotype, male, 3.5 mm, JLB Australia 5.

mera 2-3 with small soft tooth, epimera 1-2 with lateral ridge; peduncle of uropod 1 with ordinary small spines apically on both lateral and medial sides, peduncle with one basal spine, outer rami of uropods 1-2 lacking dorsal spines, inner rami with one spine each; peduncle of uropod 3 moderately expanded, with one main spine, ramus much shorter than peduncle, scarcely longer than broad, roughly truncate, bearing four apical spines, none discontinuous; telson ordinary but not fully cleft, lobes asymmetrically triangular, slightly divergent,

with no apical setae, several lateral setules; cuticle of coxae and bases of pereopods 3-5 with very conspicuous lunate pits each bearing stiff setule, surface between pits smooth.

MALE FROM SOUTH AUSTRALIA.—5.1 mm, Shepherd 30: Outer rami of uropods 1-2 with one dorsal spine; palmar sculpture of gnathopod 2 not as well developed as in specimens from Western Australia; calloused area on palm of gnathopod 2 very conspicuous, appearing covered with mohair.

Juvenile, 3.3 mm, with one dorsal spine on outer

ramus of uropod 1, outer ramus of uropod 2 naked dorsally.

FEMALE.—Antennae like those of male in length but more weakly developed in thickness and setation; article 2 of gnathopod 1 with no posterior setae, hand narrower than in male, palm evenly convex, defining spines both in normal position, posterior row of setae on hand better developed, dactyl unridged; gnathopod 2 like gnathopod 1, article 2 with one small posterior seta; neither gnathopod with anterior spines on article 5 except rarely.

HOLOTYPE.—WAM 141-71, male, 3.5 mm.

TYPE-LOCALITY.—JLB Australia 5, west of Bunker Bay, Cape Naturaliste, Western Australia, intertidal, wash of algae and rocks, 2 September 1968.

RELATIONSHIP.—This species resembles *H. rubra* (Thomson) in its pereopods and *H. media* (Dana) in its uropod 1 but differs from both in the presence of cuticular lunules on the coxae and article 2 of pereopods 3-5 and in the sculpted palms of the male gnathopods. *Hyale media* has strong coxal acclivities. *Hyale rubra* has a strong apicolateral spine on the peduncle of uropod 1.

Because of the lunate cuticular pits this species bears comparison with *H. waimea* J. L. Barnard (1970) from the Hawaiian Islands. In *H. waimea* article 4 of the maxillipedal palp has the nail extended as a flagellum, the fourth article of pereopods 3-4 is widely expanded, the terminal male palm of gnathopod 2 is deeply excavate, the dactyl bears an inner hump, and uropod 1 has an enlarged apicolateral spine.

MATERIAL.—JLB Australia 3 (7), 5 (1), 6 (2); Shepherd 30 (16).

DISTRIBUTION.—Cape Naturaliste, Western Australia, and Pearson Islands, South Australia, 0-12 m.

Hyale maroubrae Stebbing

Hyale maroubrae Stebbing, 1899:405-406, pl. 32C.

DISTRIBUTION.—Maroubra Bay, New South Wales.

Hyale media (Dana)

Allorchestes media Dana, 1853:898, pl. 61: fig. 4.

Hyale media Stebbing, 1906:569.—Stephensen, 1949:37-41, figs. 16, 17.—Hurley, 1957:916-919, figs. 72-90.

DISCUSSION.—These specimens differ from those described by Hurley (1957) from New Zealand in the enlargement of the apicomedial spine on the peduncle of uropod 1 but otherwise the adults conform in the heavily setose flagella of antenna 2 and have one dense patch of setae on the inner margin of the apex of article 5 on antenna 2 but lack the one short posterior setal bundle in the middle of articles 4 and 5 of antenna 2. *Hyale media* is characterized by the epebic obsolescence of the distal locking spine on pereopods 1-5, that spine being reduced to a thin, nearly invisible wire, minutely armed with a corkscrew pattern. The only juvenile of this species I have seen, a young male, 4.5 mm, from AM P 12162, demonstrates that the distal locking spine is well developed in young of the species but is slightly shorter and thinner than the proximal locking spine. This juvenile male does not belong with *Hyale* species (q.v.) because of the obsolescent tooth on epimera 2-3 and the well-developed flagellar setae on antenna 2.

MATERIAL.—AM P 12162, Warrnambool, Victoria, November 1949, ex mat of algae, collected by E. Pope and I. Bennett (5).

DISTRIBUTION.—Southern two-thirds of world.

Hyale species of Australia

FIGURES 41, 42

RELATIONSHIP.—This species resembles *H. media* (Dana) but differs in the well-developed tooth on pleonal epimera 2-3. Because of its juvenility other relationships cannot be demonstrated.

DESCRIPTION OF YOUNG MALE (like female).—Lateral cephalic lobe broad, truncate vertically, eyes medium, black; antenna 1 extending along one-third of flagellum on antenna 2, aesthetascs long, sparse, flagellum of medium stoutness; antenna 2 of medium length and stoutness, setation of flagellum moderately strong; setation of upper lip ordinary; mandibular molar strongly tritirative, left lacking elongate seta, right lacinia mobilis with three distinct pieces; lower lip figured, mandibular lobes especially sharp; inner plate of maxilla 1 with acclivity between pair of setae weak (or absent and setae set evenly on end of plate), outer

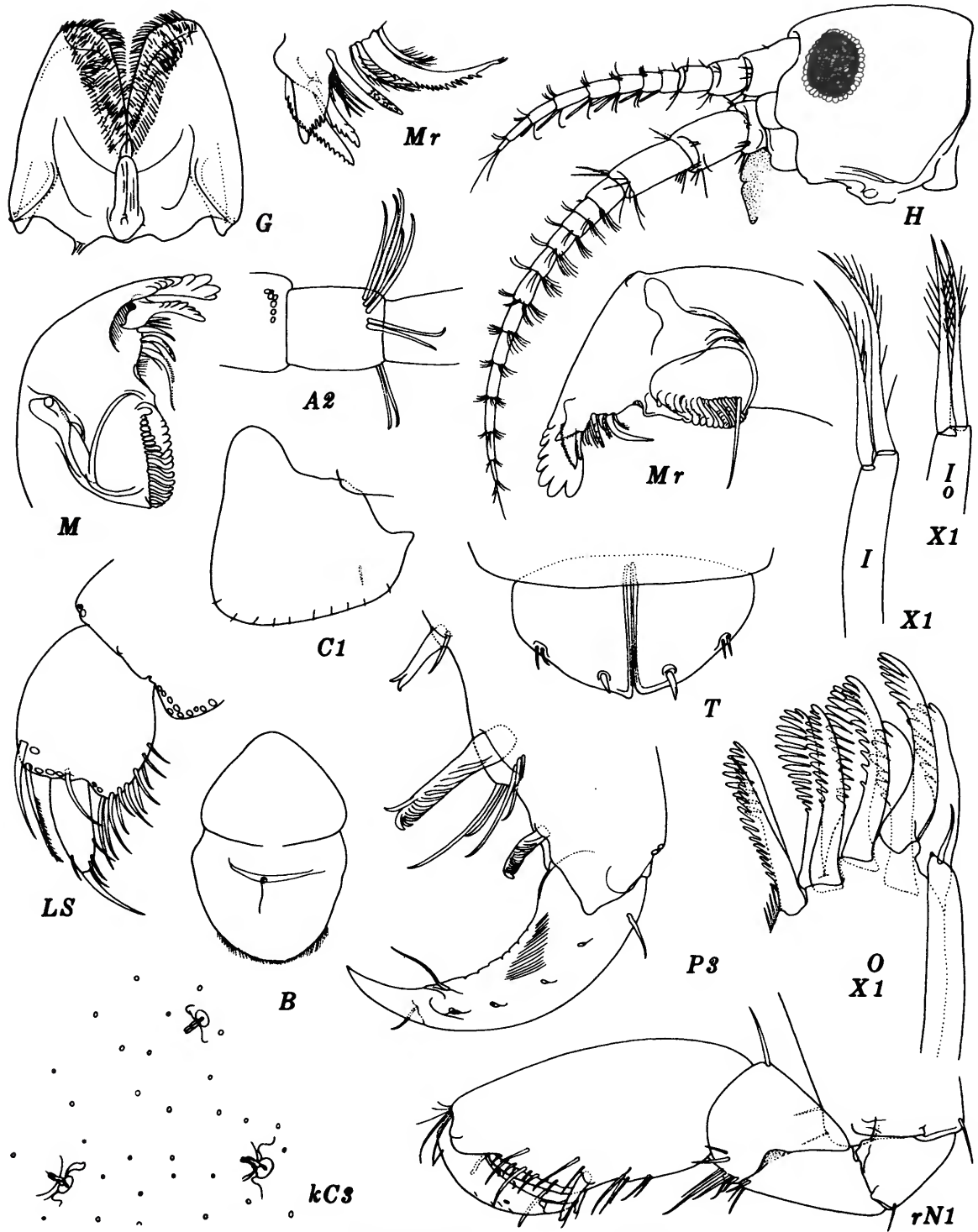


FIGURE 41.—*Hyale media* (Dana), young male, 4.6 mm, JLB Australia 3.

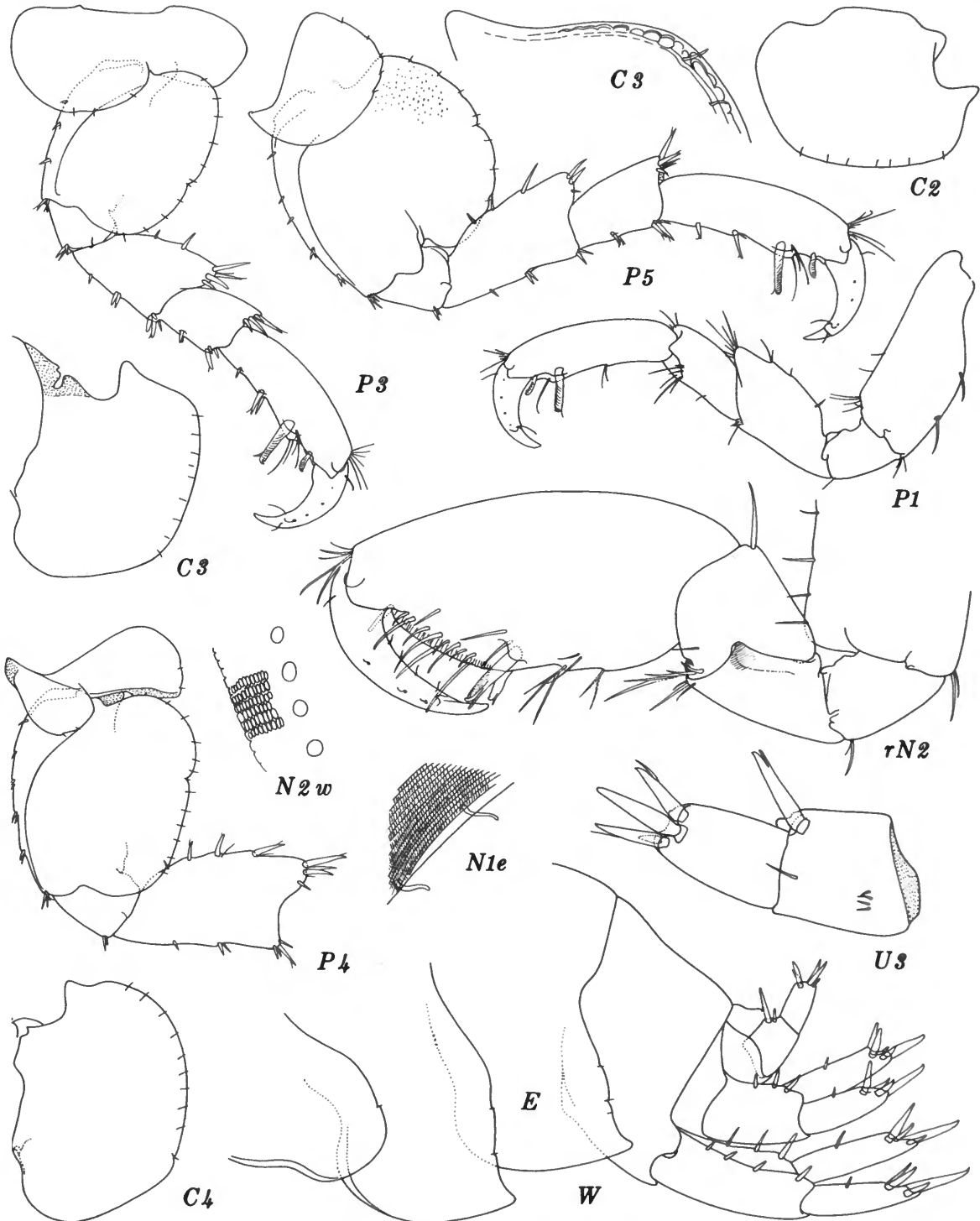


FIGURE 42.—*Hyale media* (Dana), young male, 4.6 mm, JLB Australia 3.

plate and palp figured; maxilla 2 ordinary; inner and outer plates of maxilliped as shown for *H. rubra* (Figure 43) dactyl short, apical nail strong, marginal setae sparse, dactylar faces lacking comb; article 2 of gnathopods 1-2 with two posterior spines in tandem, with weak apicomедial ridge, anterior lobe of article 3 weak, article 4 with extended posterodistal corner, narrow lobe of article 5 poorly extended, hand elongate, with two posterior acclivities bearing small setal groups, palm oblique, weakly castellate, with thick and deep callus bearing extremely fine striations composed of ovate nodules, palms defined by one spine (medial and lateral), dactyl fitting palm, finely striate longitudinally, striae long and unbroken, gnathopod 2 larger than 1; anterior coxae very short dorsoventrally, acclivities strong, projecting and subacute, coxal margins with especially heavy marginal sclerotization (see Figure 42C3); pereopod 2 scarcely smaller than pereopod 1; pereopods especially stout, articles 4-6 of pereopod 4 stouter than on pereopod 5, article 4 on all pereopods poorly expanded, article 2 of pereopod 5 broad but ventral extension rounded, each pereopod with one distal locking spine, then wide space and much larger spine, both strongly to moderately ridged and separated by wide space from next spine proximally, larger of distal spines much larger than ordinary marginal spines, setules joining this spine occupying space between it and distalmost spine, dactyl with nail scarcely marked, cleft weak and lunate, then face of dactyl with another lunate cleft of opposite orientation and not connected to inner margin of dactyl, first cleft with erect thin setule, inner margin of dactyl castellate, faces very finely striate as on dactyl of gnathopod 1; epimeron 1 with small posteroventral notch, otherwise rounded, epimera 2-3 with medium, softly rounded tooth, epimera 1-2 with lateral ridge; peduncle of uropod 1 evenly spinose, no enlarged spines, each ramus of uropods 1-2 with one dorsal spine; peduncle of uropod 3 slightly broadened and short, bearing one large major spine, ramus as long as peduncle, roughly truncate, bearing four apical spines, none discontinuous; telson very short and broad, almost fully cleft, lobes not gaping, each with strong apicolateral spine and pair of lateral setules; cuticle weakly armed, very small pits with incipient alae, with minute bulbous setules, surface

between pits with sparse nodules (or tiny spinules, at limit of magnification).

REMARKS.—These few specimens, not fully mature, clearly fit New Zealand *H. media* in generalities; if any characteristics of subspecific value occur they are not presently recognizable with the weak material at hand.

MATERIAL.—JLB Australia 3 (3).

DISTRIBUTION.—Southwestern Australia, intertidal.

Hyale nigra (Haswell)

Allorchestes niger Haswell, 1880c:319-320; 1885:2, pl. 11, figs. 1-3.

MATERIAL.—Australian Museum, P 3396, Port Jackson, 24 specimens; 7 specimens of similar lot also in Macleay Museum.

NOMENCLATURE.—This species and *Hyale rubra* (Thomson) have often been considered synonymous in the literature but these lots of material are distinct from *H. rubra* and both names should now be conserved.

REMARKS.—Antennae of medium length; ocular lobe broadly and concavely truncate; maxillipeds ordinary; acclivities of coxae nearly absent; gnathopod 1 with elongate hand bearing sinuous posterior margin, with long row of setae extending from mark 25 to mark 75, palm oblique, defined by articulate spine but no cusp or protrusion; male gnathopod 2 ordinary, palm oblique, defined by weak protrusion, posterior margin with weak acclivity and small seta (e) or spine; dactyl of pereopods 1-5 with weak subterminal setule, locking spines formed of pair of short, equally long, weakly striate spines set close together, distal spine straight and simple, proximal spine weakly curved apically and with weak outer setular trigger, these spines of size similar to other spines on article 6 of pereopods; epimera 2-3 with weak posterior sinuation and tooth as shown for epimeron 2 on Figure 48W; peduncle of uropod 1 with greatly enlarged apicolateral spine, apicomедial spine of medium size; peduncle of uropod 2 with three large spines in tandem near apex; uropod 3 short, ramus scarcely half as long as peduncle, latter with two apical spines, ramus with several stout apical spines, no disjunct spines; telson ordinary.

One of the large males in these lots has the dactyl of right gnathopod 1 strongly shortened.

These notes suffice to distinguish this species from *H. rubra* (Thomson) until fresh materials can be fully illustrated. The equality and shortness of the locking spines on the pereopods, the small teeth of the epimera and the extremely long row of posterior setae on the hand of gnathopod 1 are major characters differentiating *H. nigra*. The latter also has shorter second antennae and weaker coxal acclivities than does *H. rubra*.

DISTRIBUTION.—Port Jackson, Australia.

Hyale rubra (Thomson)

FIGURES 43-45

Nicea rubra Thomson, 1879:236, pl. 10B: fig. 3.

Hyale rubra.—Stebbing, 1906:572.—Hurley, 1957:910-913, figs. 30-50.

?*Hyale schmidti*.—Iwasa, 1939:278-280, fig. 17, pl. 17.

Hyale species [cf. *rubra*].—J. L. Barnard, 1970:268-271, fig. 178.

NOMENCLATURE.—Iwasa's identification of *H. schmidti* from Japan has many characters in common with *H. rubra*, such as the spine on the peduncle of uropod 1, long setae of article 4 on the maxillipedal palp, and general conditions of coxae, pereopods, and gnathopods. However, his material is probably subspecifically distinct in the poor armaments of the antennae, short apical nail of the maxillipedal palp, the better trituration surface of the mandibles (perhaps exaggerated), smaller teeth of epimera 2-3, and poorly developed double cuspid of coxa 4. Iwasa shows the left mandible with a molarial seta instead of the right as in the Australian specimens of *H. rubra*.

DESCRIPTION OF MALE.—Lateral cephalic lobe broad, truncate in slightly oblique plane, weakly excavate, eyes medium, black; antenna 1 extending almost halfway along flagellum of antenna 2, aesthetascs strongly developed, flagellum stout; antenna 2 elongate, about 55 percent of body length, peduncle of medium stoutness, setation of flagellum mostly basal and of medium extent; setation of upper lip ordinary; mandibular molar poorly trituration, left lacking elongate seta, right lacinia mobilis with three distinct pieces; lower lip as shown for *H. crassicornis*; maxilla 1 also like that species but seta of palp only two-thirds as long

and spines on outer plate with fewer and coarser serrations; maxilla 2 similar to that of *Allorchestes compressa* but inner plate slightly more pointed and inner row of setae occupying more of inner margin; palp article 3 of maxilliped with two long rows of setae and third short group, dactyl long, apical nail very long, inner margin of dactyl with long and short setae; article 2 of gnathopod 1 with one posterior spine, without apical ridges on faces, anterior lobe of article 3 weak, article 4 with weakly extended posterodistal corner, narrow lobe of article 5 ordinary, hand elongate, weakly sinuous on posterior margin, with row of posterior setae of medium length, palm oblique, smooth, defined by one spine (lateral and medial), dactyl weakly overlapping palm, densely ridged on faces near inner margin; article 2 of gnathopod 2 with two posterior spines, with weak ridge apicomediaally, anterodistal corner broadly expanded and lobately rounded, article 3 with strong, rounded anterior lobe, article 4 apically bulbous and extended, article 5 with short-lobed form of genus, palm oblique and well defined, equally as long as posterior margin of hand, unsculptured, dactyl simple, fitting palm, minutely ridged near inner margin and bearing setules on inner margin, posterior margin of hand poorly armed, anterior margin strongly convex; acclivities of anterior coxae weak, softly rounded, poorly developed on coxa 1, doubly produced on coxa 4; pereopod 2 scarcely smaller than pereopod 1; article 6 of pereopods of ordinary size, article 4 poorly expanded, article 2 of pereopod 5 broad, ventral extension therefore subquadrate, each pereopod with one distal locking spine, then larger spine immediately contiguous, the two spines forming distal pair far removed from next adjacent spine, distal spines moderately ridged, joined by three setules on each side of pereopod, dactyl with apical nail weakly marked but with strong cleft, erect thin setule just proximal to cleft, inner margin of dactyl weakly castellate, faces more minutely ridged than on dactyl of gnathopod 1; epimeron 1 smoothly rounded posteroventrally, epimera 2-3 with medium sharp tooth, epimera 1-2 with lateral ridge; peduncle of uropod 1 with enlarged spine apicolaterally, other spines evenly distributed, medial spine small, outer rami of uropods 1-2 with two or three dorsal spines, inner rami with two dorsal spines; peduncle of uropod 3 ordinary,

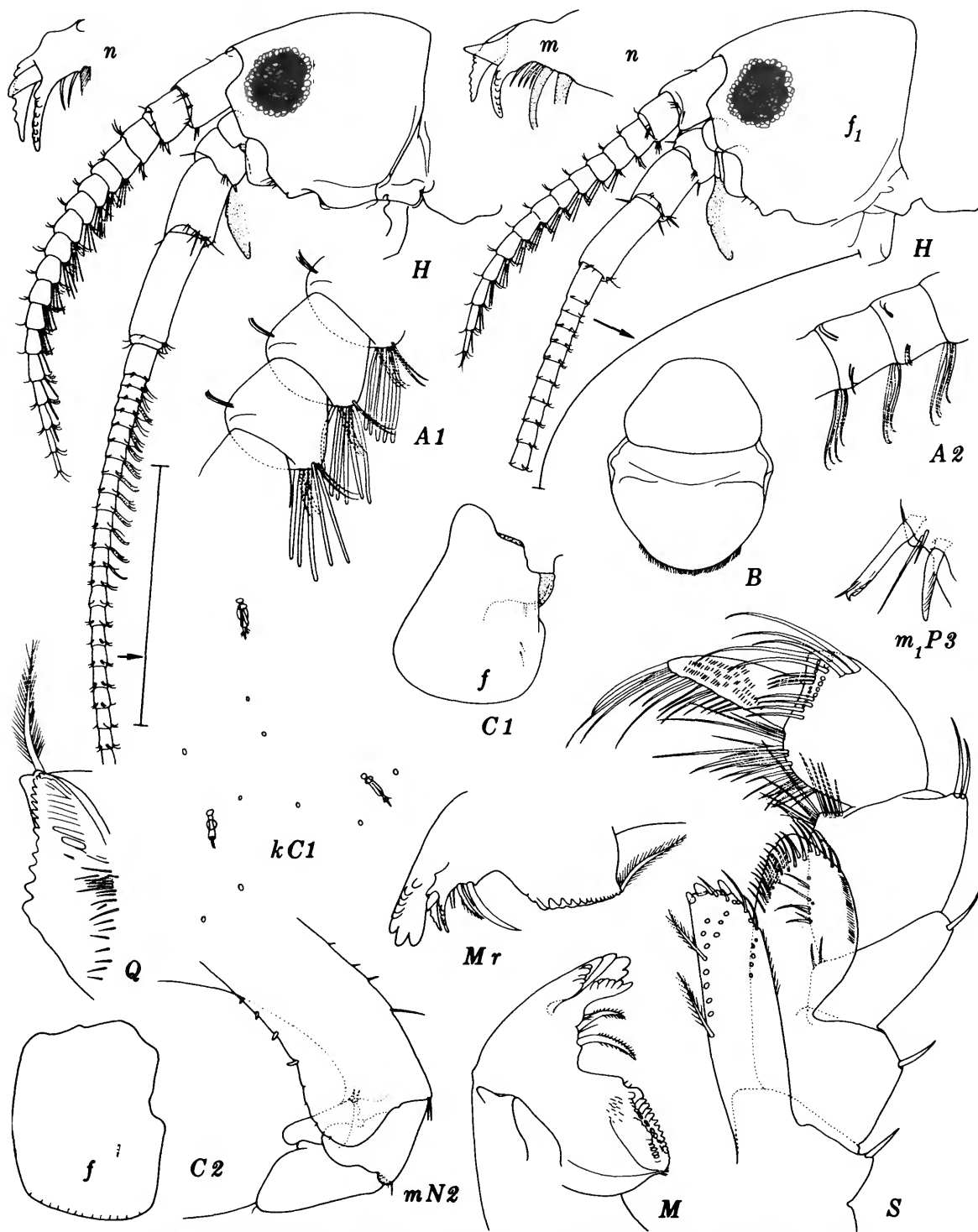


FIGURE 43.—*Hyale rubra* (Thomson), male, 8.12 mm, JLB Australia 12; *f*=female, 7.1 mm, JLB Australia 3; *m*=male, 8.10 mm; *f*₁=female, 5.8 mm; *m*₁=male, 5.1 mm, JLB Australia 2; arrows on *H* point to remaining lengths of antennae.

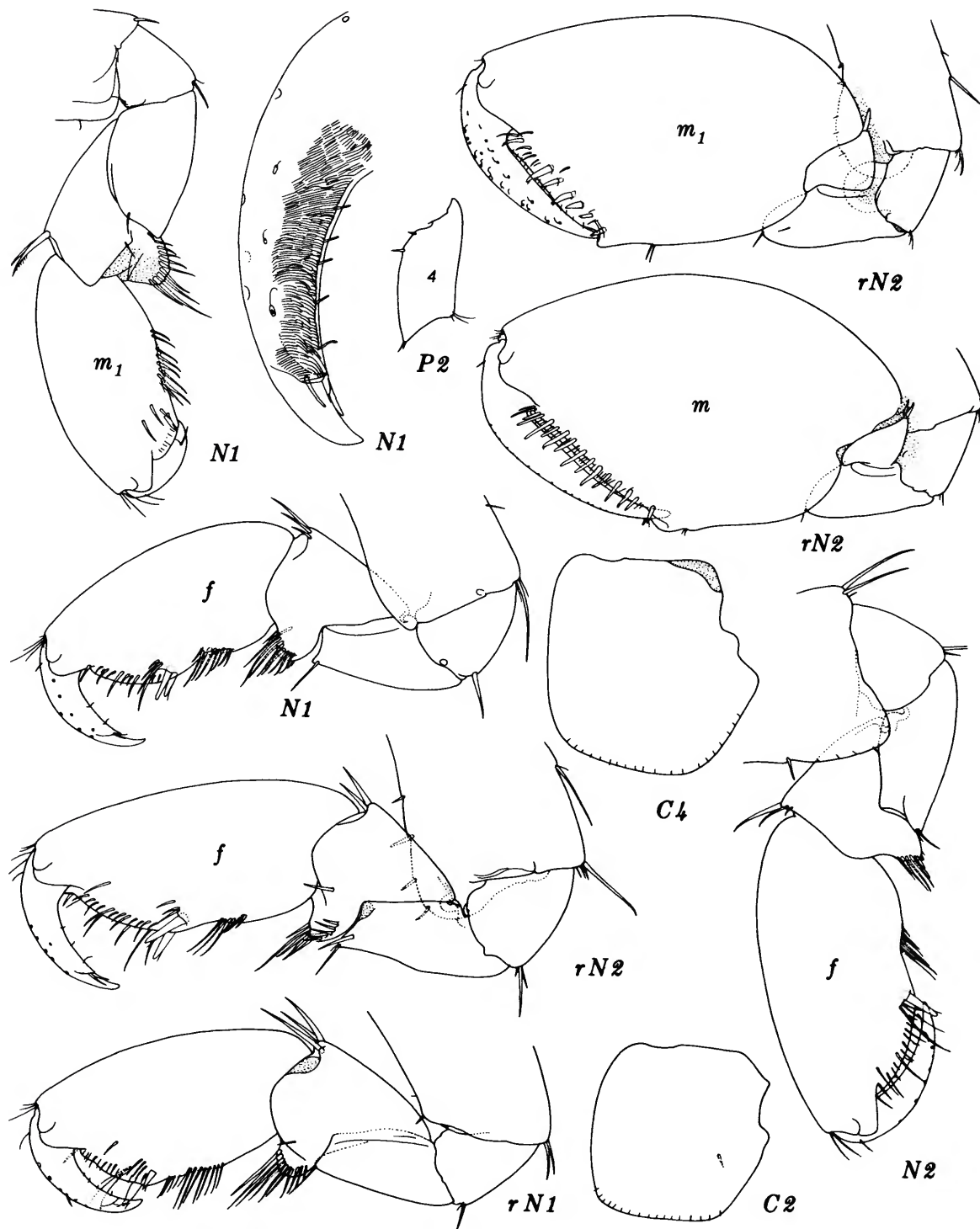


FIGURE 44.—*Hyale rubra* (Thomson), male, 8.12 mm, JLB Australia 12; f=female, 7.1 mm, JLB Australia 3; m=male, 8.10 mm, m₁=male, 5.1 mm, JLB Australia 2.

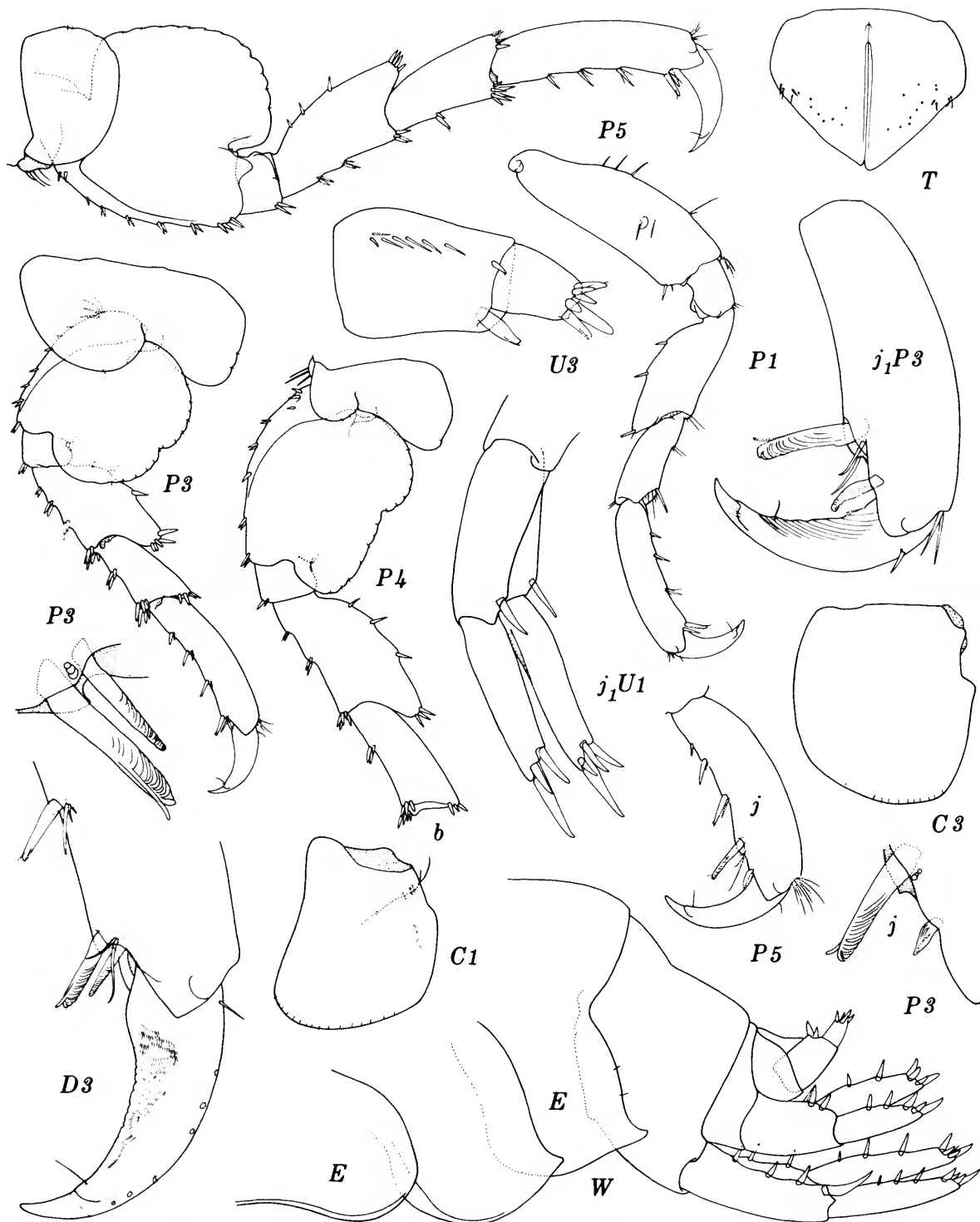


FIGURE 45.—*Hyale rubra* (Thomson), male, 8.12 mm, JLB Australia 12; *j*=juvenile, 3.7 mm, JLB Australia 3; *j₁*=juvenile, 1.22 mm.

with one main spine, ramus much shorter than peduncle but longer than broad, roughly truncate, bearing about six apical spines, none discontinuous; telson ordinary but not fully cleft, lobes asymmetrically triangular, weakly divergent, with no apical setae, several lateral setules; cuticle weakly armed, very small pits on coxae with minute bulbous setules, surface between pits with sparse nodules (barely visible under highest oil-immersion power).

FEMALE.—Antennae like those of male in length but more weakly developed in thickness and setation; article 2 of gnathopod 1 with 0–1 posterior spines, article 4 more sharply extended than in male, hand narrower, posterior setae fewer but margin more sinuous; gnathopod 2 like gnathopod 1 but article 2 with long posterior spine paired with setule, apically lobed like male and somewhat weaker, ridges weak to absent on dactyls of gnathopods: maxillipedal palp article 4, with its armaments, slightly weaker than in male but apical spines definitely of elongate variety in this genus.

YOUNG MALE (about 5.0 mm).—Article 2 of gnathopod 1 with weak mediofacial ridge; anterior margin of hand on gnathopod 2 far less convex than in adult, palm shorter than posterior margin of hand, less oblique.

JUVENILES AND GROWTH STAGES.—Freshly hatched juveniles in broodpouch of female, 7.1 mm, JLB Australia 3, range in length from 1.16 to 1.27 mm; they are difficult to recognize as belonging to this species because the double cuspidation of coxa 4 is absent, the apicolateral spine of the peduncle on uropod 1 is dorsal and scarcely enlarged and the distal spination of the pereopods is like that seen in adults of *H. media* (Dana) (see Hurley, 1957); the apical locking spine is of ordinary size but the next adjacent spine is immensely enlarged relative to the dactyl; apparently during growth this spine becomes relatively smaller in relation to the dactyl and the apical locking spine; the two apical spines apparently also draw together but this occurs after the largest spine is no longer so prominent (see Figure 45jP5, 3.7 mm juvenile); eyes less strongly packed with pigment, two or 2.5 rows of peripheral ommatidia clear of pigment; apicolateral spine of peduncle on uropod 1 definitely enlarged in juveniles 1.6 mm long; rami of uropods 1–2 lacking dorsal spines in smallest juveniles, then inner ramus of

uropod 1 with one spine in juveniles 2.5 mm long, no other dorsal spines on rami, apex of uropod 3 with only two spines.

ABERRATIONS AND VARIATIONS.—Posterior margins of article 2 on pereopods 3–5 deeply notched owing to preservational defects occurring apparently at natalic seta; length of antenna 2 variable, generally 55 percent body length in both sexes but occasionally as short as 40 percent body length.

JLB Australia 2: Largest male, 5.1 mm (Figure 44m₁) and juveniles with spines on pereopods 1–5 less striate than in other samples, but these specimens otherwise fitting *H. rubra* in uropod 1; possibly referable to *H. yake*, new species.

Male, 13.2 mm, Pt. Peron, 25 November 1946: Largest male yet found; antenna 2 extremely short; article 2 of left pereopod 4 with posterior lobe resembling quadrate lobe of pereopod 5.

Male, 5.2 mm, Port Phillip 64: Left gnathopod 2 with dactyl reaching only two-thirds along palm.

AM, P 11281 (12): Maximum size, 6.0 mm long; pereopods 1–5 with proximal locking spine enlarged as in Figure 45 P5j, tooth of epimera 2–3 small; peduncle of uropod 3 with two spines; these specimens possibly neotenic or representative of a cryptic species.

REMARKS.—Specimens from Australia do not differ materially from those studied by Hurley (1957) in the type-locality of the species, New Zealand. The distal locking spines of the pereopods are perhaps more striate than in New Zealand specimens and the larger of the distal spines in adults is distinctly larger than more proximal spines in contrast to New Zealand specimens. The initial large size of these spines in juveniles resembles the condition of adults in *H. media* (Dana) (see Hurley, 1957) and, therefore, is a confusing characteristic. At least terminal juveniles of *H. media* can be recognized because the apicolateral spine on the peduncle of uropod 1 has not enlarged as it does early in the life history of *H. rubra* and the coxal acclivities are sharp and produced in *H. media*, perhaps not in hatched juveniles but certainly a few instars later; the long setae on article 4 of the maxillipedal palp also characterize *H. rubra* in young adults.

Hyale rubra differs from *H. grandicornis* (Krøyer) (see Hurley, 1957) in the small dactylar seta and absence of a disjunct spine on the ramus of uropod

3 as well as the enlarged apicolateral spine on the peduncle of uropod 1; the coxal acclivities of *H. grandicornis* are sharp and extended. *Hyale grandicornis* forma *thomsoni* Hurley (1957) appears to deserve full specific status as uropod 1 has a large apicolateral spine on the peduncle, the dactylar seta on the pereopods is medium to small, uropod 3 lacks a discontinuous spine and various articles of the pereopods are fuzzy. *Hyale thomsoni* Hurley should be investigated as a possible sibling of *H. rubra*.

Hyale rubra differs from *H. ayeli* J. L. Barnard (1970) from Hawaii in the presence of spines on the outer rami of uropods 1-2 and the unsculptured palm of male gnathopod 2. *Hyale* species J. L. Barnard (1970) appears definitely to be *H. rubra* in the Hawaiian Islands.

The general consistency in morphology of *H. rubra* from Australia to the Hawaiian Islands suggests that *H. frequens* (Stout), from California, variously assigned as a subspecies to *H. nigra* (Haswell) or *H. rubra* by J. L. Barnard is definitely a distinct entity, whether it be a subspecies or fully developed species. *Hyale frequens* has poorly developed apical setae on the maxilliped, poorly developed posterior setae on the female gnathopods, slightly shortened palms of gnathopod 1 and female gnathopod 2 so that the dactyl definitely overlaps the palm; and poorly developed distal spines on the pereopods, perhaps similar to those of New Zealand specimens. The short palm of male gnathopod 2 resembles the young adult male of Australia. The aesthetascs on antenna 1 of *H. frequens* are weaker than in *H. rubra* from the southwestern Pacific. *Hyale frequens* appears closest to *H. nigra* because of the equal locking spines on the pereopods.

MATERIAL.—A question mark on identifications indicates the material might be young of *H. yake*, new species, in the following list: Port Phillip 64 (8), 75 (12); Shepherd 7 (9), 8 (?1), 9 (21), 11 (2), 15 (13), 29 (4), 31 (87), 32 (11), 49 (1), 52 (2); JLB Australia 2 (8), 3 (63), 4 (2), 5 (12), 6 (6), 10 (9), 11 (21), 12 (19), 13 (25), 14 (44); Slack-Smith 2 (18), 5 (36); WAM, Pt. Peron, rock and seaweed washings, R. Kenny, 25 June 1946 (39); Pt. Peron, seaweed washing, 27 November 1946 (17); Pt. Peron, seaweed washings, 25 November 1946 (8); AM, P 12164, Sorrento, Victoria, ex algae, Novem-

ber 1949, collected by E. Pope and I. Bennett (21); P 11281, Harboard, Sydney, among *Tetraclita rosea* (barnacles), 9 November 1936, collected by E. Pope (12); P 12160, Nelsons Bay, Victoria, 11 August 1952, collected by E. Pope and I. Bennett (1).

DISTRIBUTION.—Warm-temperate of North and South Pacific Ocean: ?Japan; Hawaii, New Zealand, Australia.

Hyale wilari, new species

FIGURES 46-48

DESCRIPTION OF MALE.—Lateral cephalic lobe broad, truncate almost vertically, slightly excavate, eyes medium, purple (perhaps faded); antenna 1 extending along first several segments of flagellum on antenna 2, aesthetascs strongly developed, flagellum of medium thickness; antenna 2 elongate, as long as head and body together, peduncle of medium stoutness, setation of flagellum extremely weak; setation on upper lip short; mandibular molar moderately to weakly tritulative, both sides with medium to long seta, right lacinia mobilis with three distinct pieces, incisors scarcely toothed (unusual in genus); lower lip like that of *A. compressa* but mandibular lobes apically truncate; maxilla 1 like that of *H. yake*, new species, including spout on palp but three spines of outer plate grossly thickened and poorly toothed (Figures 46-48); maxilla 2 and apex of maxilliped illustrated (Figure 46), dactyl of maxilliped elongate, heavily setose, apical spine long, palp article 2 poorly expanded, article 3 strongly expanded apically, lateral margin of palp article 2 with one spine, one seta, of article 1 with small spine, of articles bearing outer plate and inner plate with one heavy short spine and one seta paired; article 2 of gnathopod 1 with one tiny posterior seta, apicomедial ridge obsolescent, anterior lobe of article 3 ordinary, but article 4 with posterodistal margin beveled, narrow lobe of article 3 weak, articles 5-6 unusually slender, article 6 linear, posterior margin sculptured, two broad lobes and third small lobe, setose, palm obsolete, dactyl very elongate in relation to breadth of article 6 and accented by absence of palm, dactyl weakly striate longitudinally; article 2 of gnathopod 2 with short pair of setae together, with strong ridge apicomедially, anterodistal corner

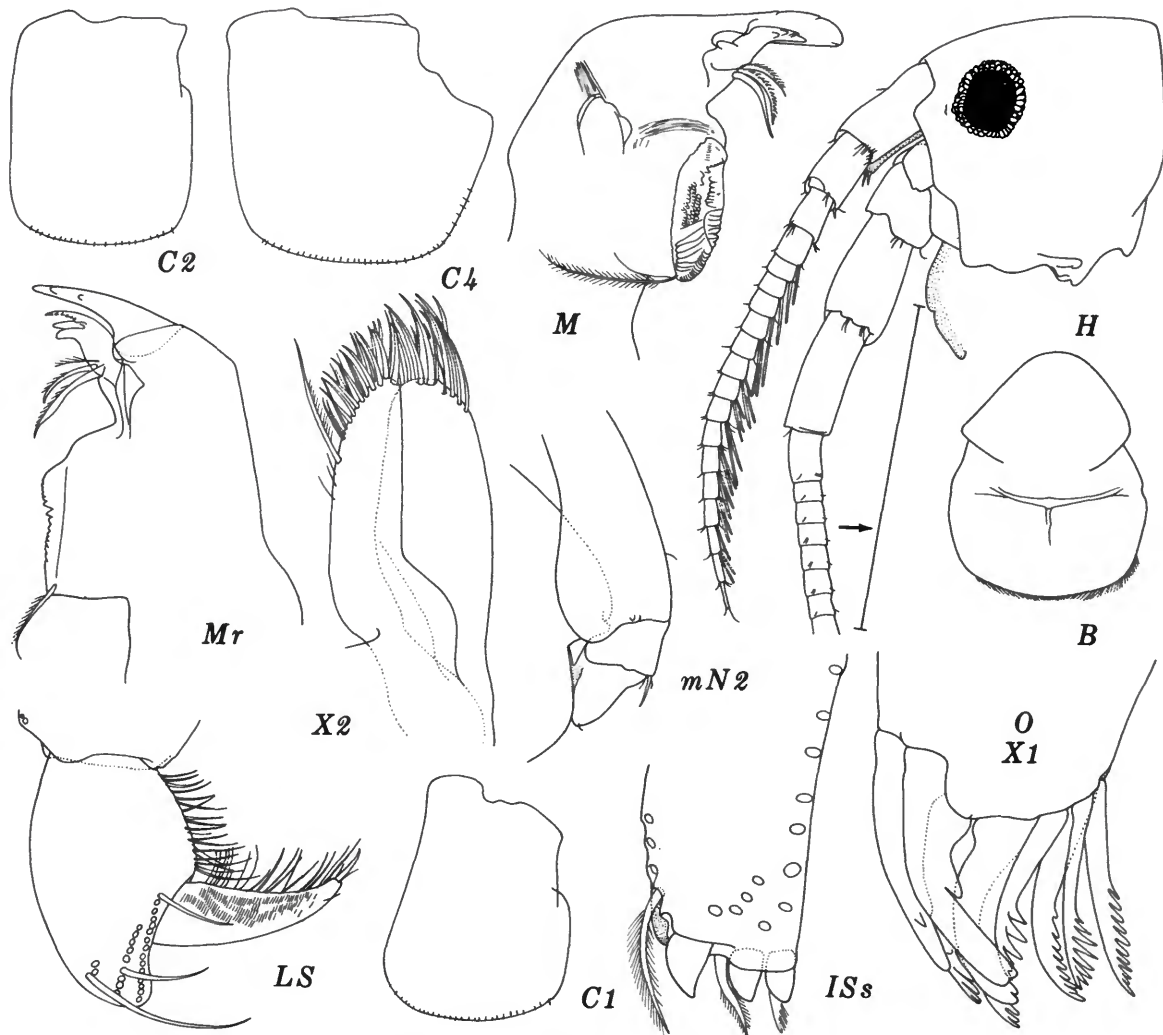


FIGURE 46.—*Hyale wilari*, new species, holotype, male, 8.00 mm, Shepherd 24; *m*=male, 8.71 mm, Shepherd 26; arrow on *H* points to line equaling one fourth of remainder of antenna 2.

broadly expanded and distally rounded, article 3 with narrow but extended and rounded anterior lobe, articles 4–5 small, article 4 bulbous posteriorly, article 5 with short-lobed form of genus, hand broadly expanded, palm oblique and sculptured, poorly defined, much longer than posterior margin of hand, dactyl with weak inner basal hump, thick apically, shorter than extended palm, poorly striate, inner margin setulate, posterior margin of hand naked, palmar sculpture composed of hollow in middle and weak, bifid tooth near base of dactyl;

acclivities of anterior coxae weak, softly rounded, doubly produced on coxa 4; pereopod 2 distinctly smaller than pereopod 1, article 5 of both with especially heavy posterodistal spine; pereopods 3–5 especially large, long and thick, pereopod 5 at least 60 percent as long as body (only 50–55 percent in other species discussed herein), article 4 poorly expanded, article 6 not disproportionate to other articles, article 2 of pereopod 5 broad, with rounded, narrowed and extended posteroventral lobe, each pereopod with one distal locking spine,

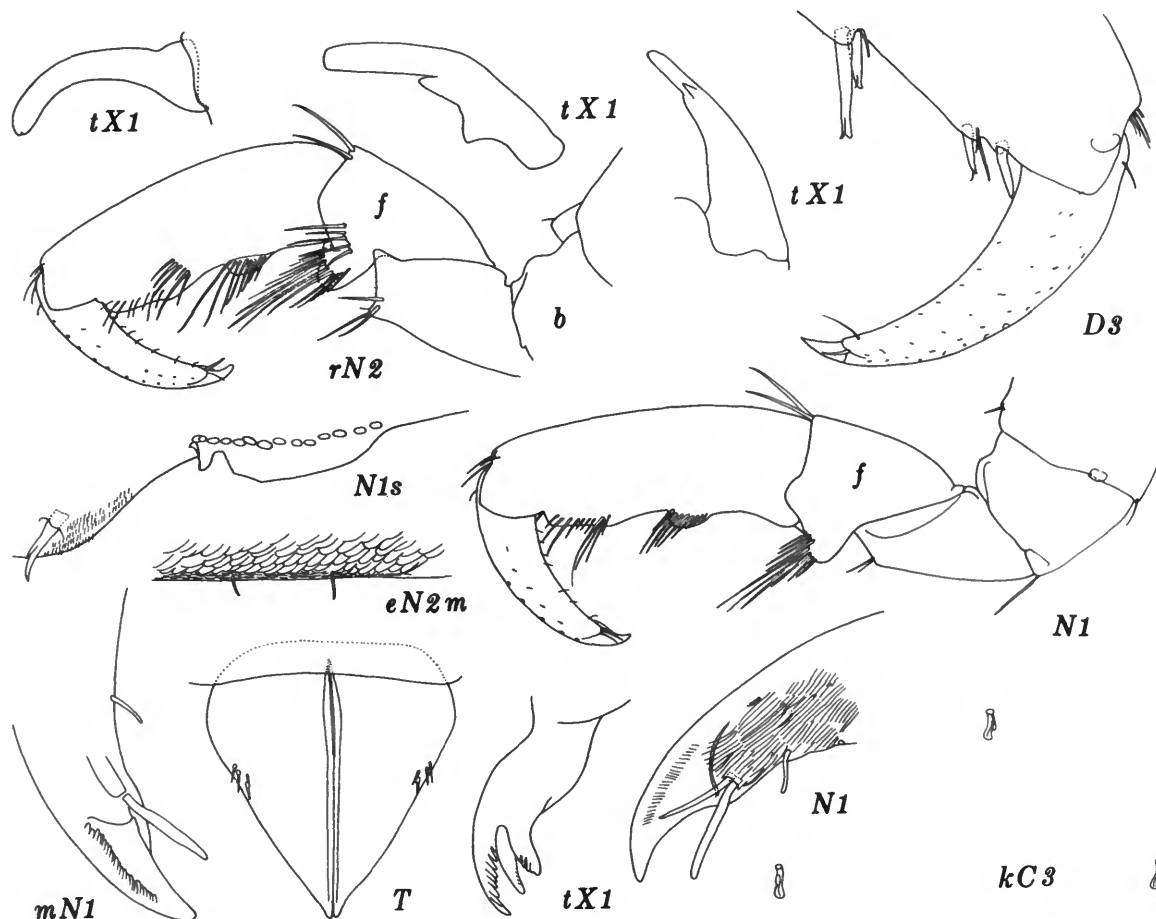


FIGURE 47.—*Hyale wilari*, new species, holotype, male, 8.00 mm, Shepherd 24; *m*=male, 8.71 mm, Shepherd 26; *f*=female, 9.70 mm.

small, poorly striate, then similar spine immediately contiguous, the two spines forming distal pair far removed from next adjacent enlarged pair of spines, locking spines joined by two setules on each side of pereopod, dactyl with apical nail strongly marked with cleft, erect thin setule just proximal to cleft, inner margin of dactyl smooth, ridges if present not resolved; epimeron 1 rounded postero-ventrally, with small notch, epimera 2-3 with soft, small tooth, all epimera with lateral ridge; peduncle of uropod 1 with enlarged spine apico-laterally, other spines evenly distributed, medial spine small, outer rami of uropods 1-2 with three or four dorsal spines, inner rami with four spines; peduncle of uropod 3 ordinary, with two main

spines, ramus much shorter than peduncle but much longer than broad, roughly truncate, bearing about five apical spines, none discontinuous; telson very long, cleft nearly to base, lobes asymmetrically triangular, with no apical setae, two pairs of lateral setules; cuticle weakly armed, small bulbous setules apparently emerging from invisible pits, surface between pits smooth.

FEMALE (9.8 mm).—Antennae and head like those of male but peduncle of antenna 2 even stouter (female much larger); dactyl of maxilliped longer than in male; proximal spine on each mandible split nearly to base, right lacinia mobilis of normal form for genus (compared with occasional abnormality in male, Figures 46-48); anterior

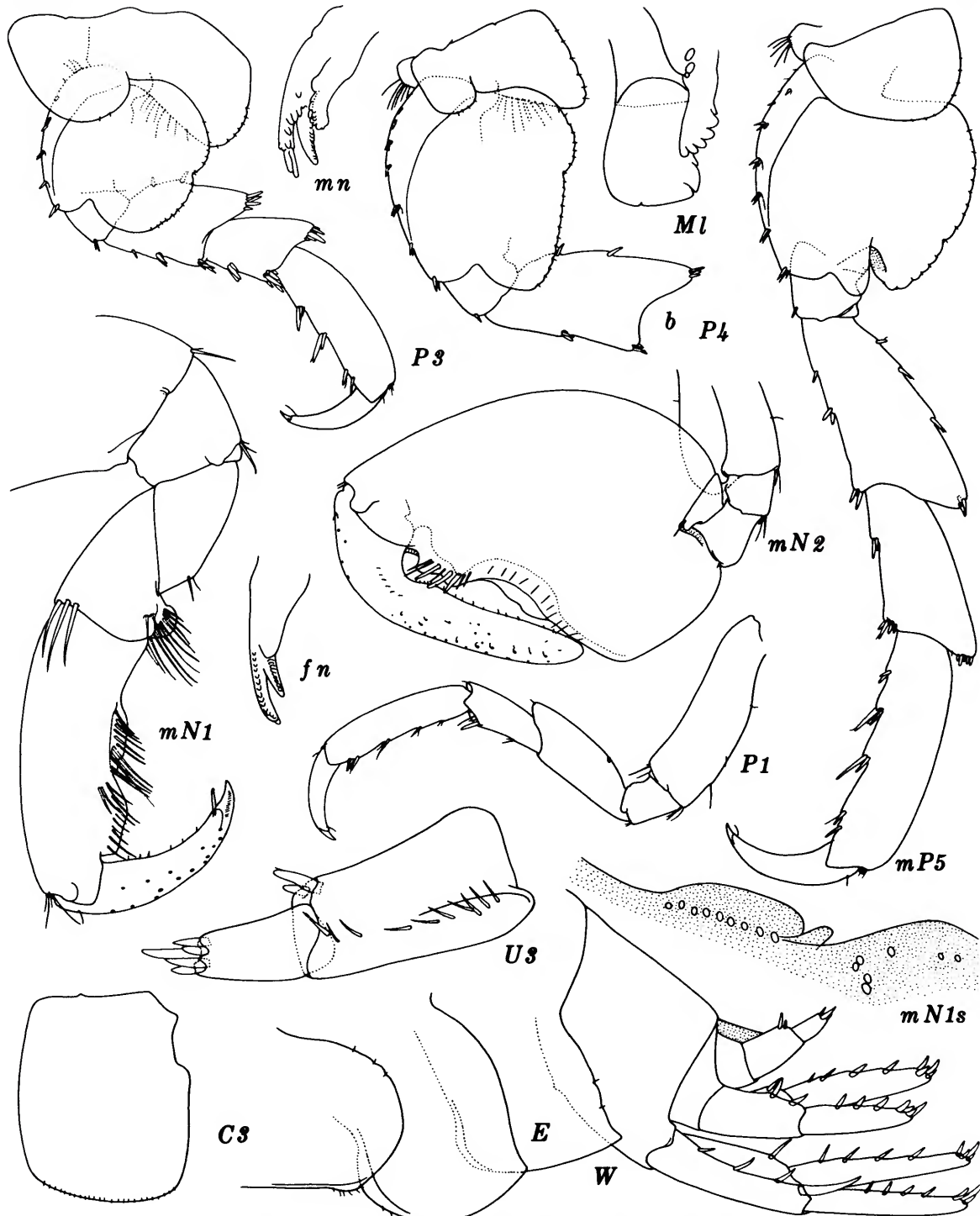


FIGURE 48.—*Hyale wilari*, new species (see legend of Figure 47).

coxae narrower and taller than in male; gnathopod 2 like gnathopod 1 but slightly smaller, article 4 produced apicoposteriorly, article 2 with weak, mammilliform, distolateral lobe; posterior spines of article 2 on gnathopods 1-2 like those of male.

HOLOTYPE.—SAM, male, 8.00 mm.

TYPE-LOCALITY.—Shepherd 24, Pearson Islands, South Australia, Station D, 50 feet, algae on horizontal face, 9 January 1969.

REMARKS.—Article 1 on antenna 2 is especially broad and plate-like in this species. The male holotype has an unusual right lacinia mobilis but other males and the one adult female at hand have ordinary lacinia mobili.

Gnathopod 1 of this species appears wholly unique in *Hyale*; the palm is essentially absent, the hand elongate and heavily sculptured on the posterior margin in resemblance to other species with weak, setose acclivities; the elongate dactyl completely dominates the hand. *Hyale carinata* (Bate) from the Mediterranean Sea has a linear hand and slightly elongate dactyl but the palm is distinct.

The configuration of antennae and uropods resembles that of *H. rubra* and *H. yake* but gnathopod 1 and the small locking spine of the pereopods distinguishes *H. wilari*; no small juveniles are present to answer the question as to whether gnathopod 1 is a postembryonic development and thus whether juveniles of *H. wilari* are difficult to distinguish from those of *H. rubra* and *H. yake*.

MATERIAL.—Shepherd 8 (1), 13 (4), 23 (2), 24 (4), 26 (3), 49 (1), 52 (1).

DISTRIBUTION.—Pearson Islands, South Australia, 12-50 m.

Hyale yake, new species

FIGURES 49, 50

DESCRIPTION OF MALE.—Lateral cephalic lobe broad, truncate vertically, eyes medium, purple (perhaps faded); antenna 1 extending one-third along flagellum of antenna 2, aesthetascs weakly developed, flagellum thin; antenna 2 elongate, about 55 percent of body length, peduncle of medium stoutness, setation of flagellum mostly basal and of medium extent; setation on upper lip slightly elongate; mandibular molar heavily tritritative, both sides with medium seta, right lacinia mobilis with three distinct pieces; lower lip and

maxillae figured, palpar apex of maxilla 1 with strong spout; (maxilla 2 strongly reduced in drawing compared with maxilla 1); inner and outer plates of maxilliped as shown for *H. rubra* but palp article 2 with only one lateral spine, dactyl long, apical nail long, marginal setae numerous and of medium length; article 2 of gnathopod 1 with two posterior spines in tandem, with weak apicomedial ridge, anterior lobe of article 3 weak, article 4 with strongly and subsharply extended posterodistal corner, narrow lobe of article 5 ordinary, hand strongly broadened, palmar slope extended onto posterior margin by expansion near posterior setae, palm defined by one spine, dactyl fitting that definition of palm but not extending onto expanded portion, palm weakly crenulate, dactyl very poorly and sparsely striate longitudinally; article 2 of gnathopod 2 with four posterior spines in tandem, with weak ridge apicomediaally, anterodistal corner broadly expanded and distally rounded, article 3 with strongly rounded anterior lobe, article 4 apically bulbous and extended, article 5 with short-lobed form of genus, palm oblique and sculptured, well defined, slightly shorter than posterior margin of hand, dactyl simple, fitting palm, inner margin slightly sinuous, poorly striate, setulate, posterior margin of hand poorly armed, anterior margin weakly convex and bearing two spines basally, palmar sculpture composed mainly of broad low, softly truncate callus near base of dactyl, callus finely striate; acclivities of anterior coxae weak, softly rounded, poorly developed on coxa 1, doubly produced on coxa 4; pereopod 2 scarcely smaller than pereopod 1, article 5 of both with especially heavy posterodistal spine; article 6 of pereopods of ordinary size, article 4 poorly expanded, article 2 of pereopod 5 broad but posteroventrally rounded, each pereopod with one distal locking spine, then larger spine immediately contiguous, the two spines forming distal pair far removed from next adjacent spine, distal spines moderately ridged, joined by three setules on each side of pereopod, dactyl with apical nail strongly marked with cleft, erect thin setule just proximal to cleft, inner margin of dactyl smooth, faces minutely ridged; epimeron 1 smoothly rounded posteroventrally, epimera 2-3 with small sharp tooth, all epimera with lateral ridge; peduncle of uropod 1 with enlarged spine apicolaterally, other

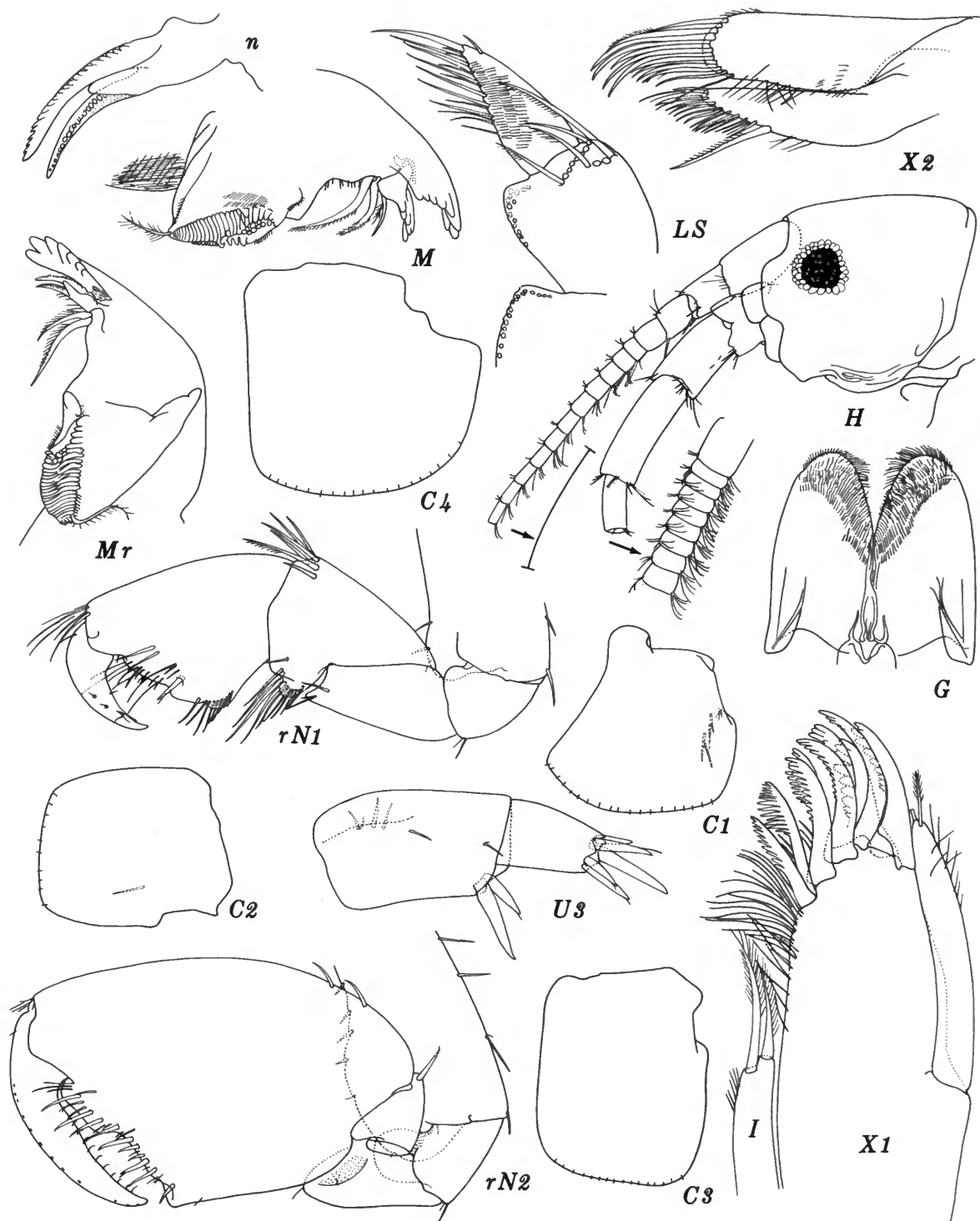


FIGURE 49.—*Hyale yake*, new species, holotype, male, 7.2 mm, Slack-Smith 1; on *H*, arrow from antenna 1 points to remaining length of appendage, arrow from antenna 2 points to flattened base of antenna 2 flagellum.

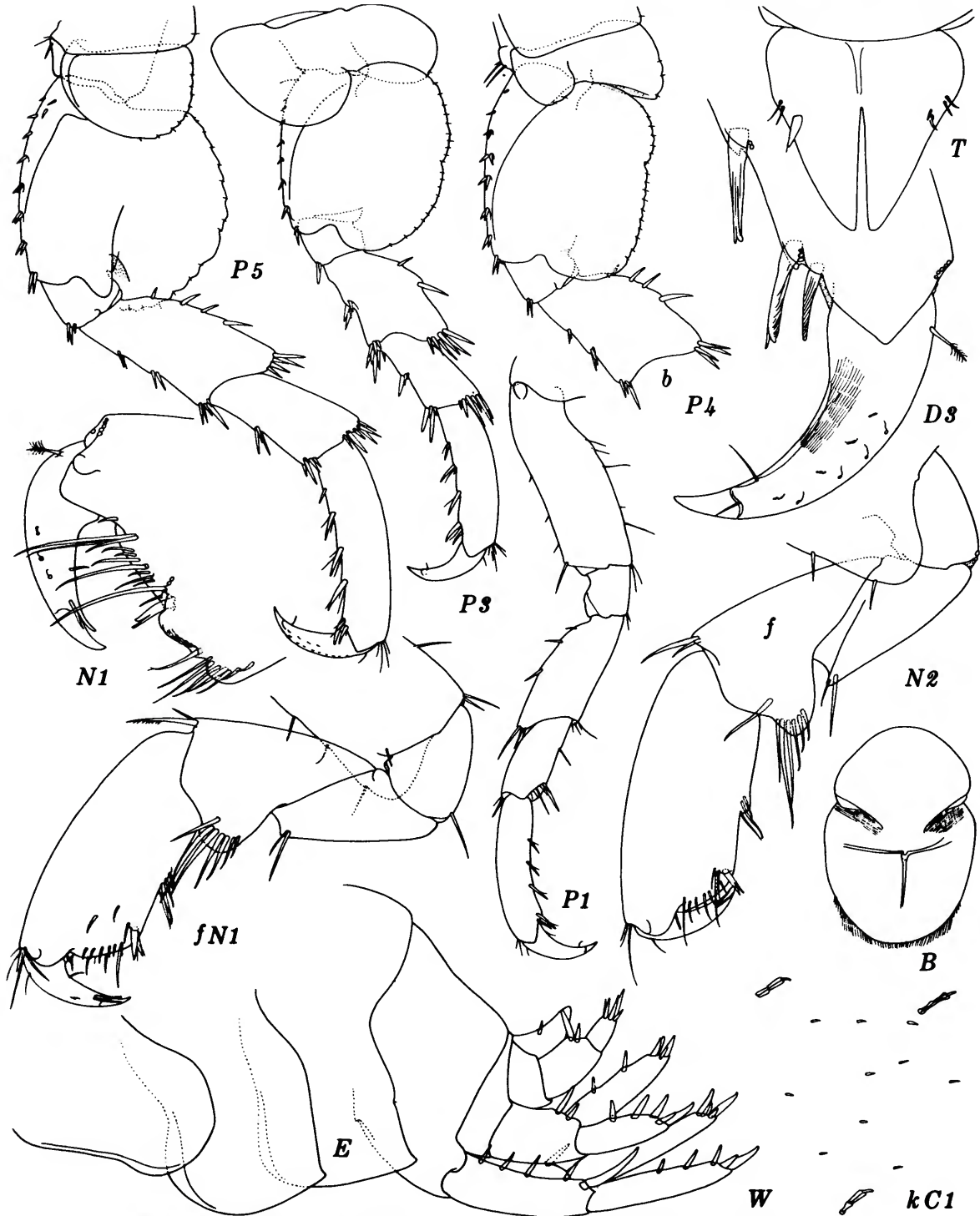


FIGURE 50.—*Hyale yake*, new species, holotype, male, 7.2 mm, Slack-Smith 1; *f*=female, 5.0 mm.

spines evenly distributed, medial spine small, outer rami of uropods 1-2 with two dorsal spines, inner ramus of uropod 2 also with two dorsal spines, of uropod 1 with only one dorsal spine; peduncle of uropod 3 ordinary, with two or three main spines, ramus much shorter than peduncle but longer than broad, roughly truncate, bearing about five apical spines, none discontinuous; telson very long, cleft only about 60 percent, lobes asymmetrically triangular, weakly divergent, with no apical setae, two pairs of lateral setules (holotype aberrantly with one spine replacing one set of setules); cuticle weakly armed, very small pits on coxae with minute bulbous setules, surface between pits with sparse nodules (or spinules, near limit of resolution on microscope).

FEMALE.—Antennae like those of male in length but articles 4-5 of peduncle slightly thinner; article 2 of gnathopod 1 with one or two posterior spines in tandem, of gnathopod 2 with one pair together composed of one large, one small; gnathopods more elongate than gnathopod 1 of male, article 4 of gnathopod 2 less extended than on gnathopod 1, lobe of article 5 broader and more extended than in male, hands very elongate, rectangular, with one strong, narrowly setose posterior acclivity, palms oblique, dactyls fitting palms.

HOLOTYPE.—WAM 140-71, male, 7.2 mm.

TYPE-LOCALITY.—Slack-Smith 1, Cheyne Beach, Western Australia, intertidal, on weedy rocks, 4 December 1968.

RELATIONSHIP.—Both this species and *H. rubra* could be attributed to the name *Allorchestes longicornis* (Haswell); gnathopod 2 of *H. yake* fits *A. longicornis* slightly better than does that of *H. rubra* but the palm of Haswell's drawings is somewhat obscured and no definite sculpture noted; presumably gnathopod 1 of a young male, transforming from the female stage, might fit the drawing of gnathopod 1 presented by Haswell (1880b, pl. 7: fig. 4), but this stage has not been identified in material at hand. *Hyale longicornis* (q. v.) appears to be adequately identified, however, from original material.

Several good characters separate this species from *H. rubra* in the terminal adults but juvenile stages may be very difficult to divide between the two species. Probably the elongate hands of the juvenile (like the female presumably) will provide the

means for identification; and the heavily tritritative molar and smaller epimeral teeth may provide clues to separation. In adult males *H. yake* differs from *H. rubra* in the sculptured palm of gnathopod 2, the widely expanded hand of gnathopod 1, the anteroventral point of coxa 1, the several spines on the peduncle of uropod 3.

Hyale yake differs from *H. ayeli* J. L. Barnard (1970), from the Hawaiian Islands, in the expanded palm of male gnathopod 1 and the weaker acclivities on the coxae.

This species appears to have closest affinities to *H. laie* J. L. Barnard (1970), from the Hawaiian Islands, in terms of male gnathopods but the palm of gnathopod 1 in *H. laie* has a strong defining tooth, the hands of the female gnathopods are not as elongate as in *H. yake*, and the telson is much shorter. Possibly these two species represent subspecies of a common epigenotype.

Hyale dollfusi Chevreux, from the Mediterranean Sea, appears to have no apicolateral spine on the peduncle of uropod 1 and the dactyl of the maxilliped is naked.

MATERIAL.—Shepherd 20 (6), 30 (?6); Slack-Smith 1 (6).

DISTRIBUTION.—West Island and Pearson Islands, South Australia 3-12 m; Cheyne Beach, Western Australia, intertidal.

LEUCOTHOIDAE

Leucothoe Leach

REMARKS.—*Leucothoe spinicarpa* (Abildgaard), described from the northeastern Atlantic, poses a severe problem to the nomenclatural taxonomist. This species has now been reported on numerous occasions throughout the world and all of the species of *Leucothoe* originally described from the southwestern Pacific have in the past six decades been synonymized with *L. spinicarpa*. Some of these synonymies are clearly erroneous: *L. brevidigitata* Miers (1884) from Thursday Island is a synonym of *Paraleucothoe novaehollandiae* (Haswell); *L. flindersi* Stebbing (1888), from Flinders Passage, heretofore synonymous with *L. brevidigitata*, is clearly distinct from *Paraleucothoe* on its short outer plate of the maxilliped; and *L. gracilis* Haswell (1880b) from Tasmania is a species of *Leucothoella*.

Leucothoe traillii Thomson (1882) from New Zealand, *L. commensalis* Haswell (1880b) from Australia and *L. diemenensis* Haswell (1880b) from Australia have been considered synonyms of *L. spinicarpa*; and even *L. tridens* Stebbing (1888) from New Zealand has been synonymized with *L. spinicarpa* on occasion; *L. miersi* Stebbing (1888) from South Africa also belongs in this group. There is no doubt that these species have numerous characters in common. Their general appearance is very similar. To the list of species belonging in this complex can be added these others from the Pacific Ocean: *L. hyhelia* J. L. Barnard (1965, 1970) from Micronesia and the Hawaiian Islands, and its biotic partner identified as *L. tridens* by J. L. Barnard (1970).

One or more small differences can be found between specimens collected in widely separated localities, such as between *L. hyhelia* in Hawaii and *L. commensalis* in Australia, or between the latter and *L. miersi* in South Africa. One finds a small difference in any group of specimens from the southwest Pacific if compared with Sars' (1895) excellent drawings of *L. spinicarpa* from Norway. Within any group of specimens one may also find variations in attributes; sometimes these variations occur in attributes that in other groups of specimens are fairly invariable so that variation of the total phenotype in a locality is inconsistent with the variation found in specimens from another locality far away. Within a locality two or more phenotypes may be recognized and imponderables about variations occurring within the growth cycle also are apparent.

Added to these morphological problems is one ecological fact of high impact: specimens of *Leucothoe* are usually found within an inquiline niche. They are usually found in the branchial chambers of ascidians, though occasionally they have been reported from sponges and by inference or negative evidence have been reported as free-living. Apparently this knowledge and the gross similarity of various populations within the *L. spinicarpa* complex has influenced taxonomists to attribute variations in *Leucothoe* to differences in hosts, since the genus apparently occupies a wide variety of ascidians.

This situation is highly interesting because the taxonomist is then suggesting by his nomenclatural

actions that a species with supposedly critical host relationships (at least to class level) has infested all seas with considerable ease, thus implying that the hosts must have supplied a transport mechanism. Perhaps fixed ascidians have indeed migrated the world around, carrying *Leucothoe* everywhere. *Ciona intestinalis*, an ascidian well known in harbors of the world, is reported to occur almost everywhere. Any protest against this assumption of world dispersal of *Leucothoe* in such tenuous circumstances cannot be very strong because the differences among the various species in the *L. spinicarpa* complex are minor in comparison to differences between *L. spinicarpa* and numerous other species of the genus. Here, the taxonomist is, of course, weighting the magnitude of a few differences, rather than treating all differences phenogramatically. But phenetical taxonomy is also a useless solution to the problem because the characteristics of one epigenotype do not evolve in harmony with the same characteristics of another epigenotype, whether the two types are siblings or not. Hence a phenotypical analysis of the *L. spinicarpa* complex would only give us a cluster of kinds of populations similar to one another and distinct from other clusters of leucothoids by some major or minor degree; the analysis would not tell us if these populations belong to one species or several, except by making a value judgment, i.e., choosing a set of values that defines a species in systematic practice. The taxonomist cannot, therefore, decide whether speciation has occurred in the *L. spinicarpa* complex on the evidence of minor character differences. One can only state that a superspecies is widely distributed in the world and suggest that a detailed ecogenetic analysis of the populations be conducted. Until results of such a study can be evaluated, the taxonomist must find some practical solution to the nomenclatural problem by avoiding the description of countless species on the one hand and avoiding the loss of information by simply identifying grossly similar specimens by the name, *L. spinicarpa* on the other. Some evidence of similarities in specimens far removed from the type-locality of *L. spinicarpa* should be presented. Since so few species have been named within this complex and they are largely separated from each other by great distances, there can be no harm in retaining these names as geographic indicators because they later

may be reduced to subspecific level if necessary or synonymized easily in the forthcoming computer systems. I, therefore, retain the local names already known for the *L. spinicarpa* complex despite the extraordinary similarity between *L. commensalis* of Australia and *L. hyhelia* of Micronesia and Hawaii.

The next problem concerns the possibility that several described species that are consistently distinct from the main body of the *L. spinicarpa* complex may be phenotypes of species in the *L. spinicarpa* group. In Micronesia, Hawaii, and New Zealand, *Leucothoe tridens* has been identified. It pairs closely with the local member of *L. spinicarpa*, whether that member is called *L. commensalis* or *L. hyhelia*. *Leucothoe tridens* differs mainly from the *L. spinicarpa* members in the most immediately seen characteristic, the sharp corner on the ocular lobe of the head. I have been inconsistent. (J. L. Barnard, 1965, 1970) in not comparing the Hawaiian and Micronesian specimens of this species to the New Zealand type, to find if any minor distinctions occur among the populations. I described *L. hyhelia* (paired with *L. spinicarpa*) as a separate species because its distinctions from the Atlantic *L. spinicarpa* appeared of a greater degree than those of specimens of *L. tridens* did from New Zealand and Micronesia. But now in three localities the obvious sibling *L. tridens* occurs sympatrically with the local member of the *L. spinicarpa* complex, suggesting that it is a mere phenotype. The sharp headed phenotype, however, apparently has not been found in the North Atlantic

and this alone suggests that *L. tridens* is a distinct species, although I have not yet studied it sufficiently to determine whether *L. tridens* is also a super-species like *L. spinicarpa*. I also recognize that if *L. spinicarpa* is indeed a simple, widespread species, then one of its phenotypes does not necessarily have to be expressed in part of its range to have any taxonomic significance of the kind implied in this systematic decision.

The word "ecotype," though degraded by some biologists, is very useful in the *Leucothoe* problem, for it can be used to imply phenotypical differences among populations of *Leucothoe* occupying distinct ascidian hosts. The problem for the ecogeneticist then is to determine whether potentially different ecotypes, such as *L. commensalis*, *L. diemenensis*, and *L. tarte*, new species, are interfertile or at least can arise from a single brood of one of the species according to which host is invaded. Of course, the ecotypes may require more than one generation of host occupation to differentiate if the hormones secreted by the host act only on the zygotes of the inquiline. Numerous other imponderables require investigation.

Another group of *Leucothoe* is composed of species with extremely short dactyl on gnathopod 1. Many of these also have the palm of gnathopod 2 defined readily by a limiting cusp, by a regular pattern of teeth ending abruptly, by a marked flattening or by being more transverse than in other species of *Leucothoe*. These species are: *L. alata* J. L. Barnard, *L. alcyone* Imbach, *L. dentitel-*

Key to Species of *Leucothoe* from Australia

(Based only on species identified herein)

1. Coxa 4 short, broad, unexcavate posteriorly..... *L. boolpooli*, new species
Coxa 4 long, excavate posterodorsally 2
2. Rostrum large, epimeron 3 with deep posteroventral sinus..... *L. assimilis*, new species
Rostrum medium to small, epimeron 3 lacking sinus 3
3. Antenna 2 and gnathopod 1 exceptionally stout (Figure 59)..... *L. tarte*, new species
Antenna 2 and gnathopod 1 not stout 4
4. Ocular lobe with cusp, cephalic keel with nearly twice lateral surface area as epistome, article bearing outer plate on maxilliped laterally alate..... *L. gooweera*, new species
Ocular lobe lacking cusp, cephalic keel similar in lateral surface area to that of epistome, article bearing outer plate on maxilliped not alate 5
5. Ventral margin of coxa 3 short, weakly convex, parallel to body axis, anteroventral corner of coxa 3 extending freely below coxa 2 (apex of article 5 on gnathopod 2 simple)
..... *L. commensalis*
Ventral margin of coxa 3 long, straight, oblique, anteroventral corner of coxa 3 overriding lateral face of coxa 2 (apex of article 5 on gnathopod 2 bifid) *L. diemenensis*

son Chevreux, *L. flindersi* Stebbing, *L. incisa* Robertson, *L. lihue* J. L. Barnard, *L. lilljeborgi* Boeck, *L. micronesiae* J. L. Barnard, *L. minima* Schellenberg, *L. minuscula* Schellenberg, and *L. pachycera* Della Valle. Possible members with longer dactyls are *L. ctenochir* K. H. Barnard and *L. rostrata* Chevreux. These species are similar to *Paraleucothoe novaehollandiae* (Haswell), which differs generically from *Leucothoe* only in the slightly elongate outer plate of the maxilliped. *Paraleucothoe* formerly was thought to lose the dactyl of gnathopod 1, but in specimens at hand the dactyl is always present, though very small in the largest adults. Adults of *Paraleucothoe* have an exaggerated tumidity and apical truncation on the apex of article 6 of gnathopod 1. Probably *Paraleucothoe* is a member of the species group of *Leucothoe* cited above but this does not refute its weak but consistent generic distinction. However, the outer plates of the maxillipeds in several of the species cited above have not been clarified. This is an example of the minor characteristics utilized in the taxonomy of leucothoids even at generic level.

Leucothoe assimilis, new species

FIGURES 51, 52

NOMENCLATURE.—*L. diemenensis* Haswell fits this species in the bifurcation of article 5 on gnathopod 2 but not in its slender pereopods 3–5 nor weakly in its coxae. Name "*assimilis*" used by ?Haswell in *laboratorium* but never formally established.

DESCRIPTION.—Lateral cephalic lobe softly truncate anteriorly, eyes broadly suborbicular but with ventral margin excavate, thus eyes broadly reniform; article 1 of antenna 1 with mediobasal margin weakly crenulate near posterodistal extension, article 2 about 0.90 times as long as article 1, article 3 about 0.25 times as long as article 1; gland cone of antenna 2 tapering and of medium length (from medial views); prebuccal parts of medium size, rostrum large, cephalic keel small, softly conical, epistome large, sharply conical, extending forward beyond cephalic keel; major cusp of upper lip elongate; lacinia mobilis on right mandible as broad as long, small; article 3 of palp about half as long as article 2, with two apical setae, one long, one short; mandibular lobes of lower lip

distolaterally inflated in adults; inner plate of maxilla 1 with one apical seta. ventromedial edge of outer plate with pair of scissor spines behind second projection (all these possibly salivary spouts); outer plate of maxilla 2 of ordinary width, bearing three medium spines; article of maxilliped bearing outer plate not alate or weakly so, apex of palp article 3 scarcely concave; coxa 1 with strong and sharp adz projecting forward, coxa 4 strongly projecting below coxae 1–2 but partially followed by coxa 3, coxa 4 tilted, with posteroventral corner pointed downwards, much of coxa 3 hidden; article 2 of gnathopod 1 with two or three anterior setae, base of article 5 ovate but asymmetrically, somewhat narrow, apical process (chela) about 1.6 times as long as basal, anterior margin of chela lined with minute setae, finely beaded, article 6 slender and almost even in juveniles, with basoposterior hump fitting excavation in chela of adults, article 6 about five times as long as broad (discounting hump), bearing four or five setae besides spine at base of dactyl, margin beaded, dactyl about 0.33 times as long as article 6, usually appearing stiff, basally inflated but also often evenly curved as in *L. commensalis*; gnathopod 2 with anterodistal setose projection on article 6 only in juveniles and females, palmar margin bearing low and wavy teeth, enlarged in male, process on article 5 fluted apically, apical spine larger in females and juveniles than in male, latter often with apical process bifid; article 2 of pereopods 3–5 especially broad, posterior serrations strong in small individuals, weaker in adults, article 2 strongly beveled on pereopods 3–5, article 4 of pereopods 3–5 lacking extra inner spines at apex of process; active margins of article 6 on pereopods 1–5 especially spinose compared to *L. spinicarpa* (Abildgaard); epimeron 1 setose anteroventrally and with small hump, epimeron 1 softly rounded posteroventrally, with tiny notch and tooth, epimeron 2 extended as sharp tooth, epimeron 3 with deep posteroventral sinus and sharp tooth, these absent in juveniles about 2.7 mm (none smaller observed in collections), epimeron 2 not highly variable in growth changes; uropod 3 missing; telson apex usually damaged but apparently blunt, simple.

VARIATIONS.—Hump on article 6 of gnathopod 2 generally weaker in females than in males; article 2 of pereopods 3–5 narrower and less strongly beveled

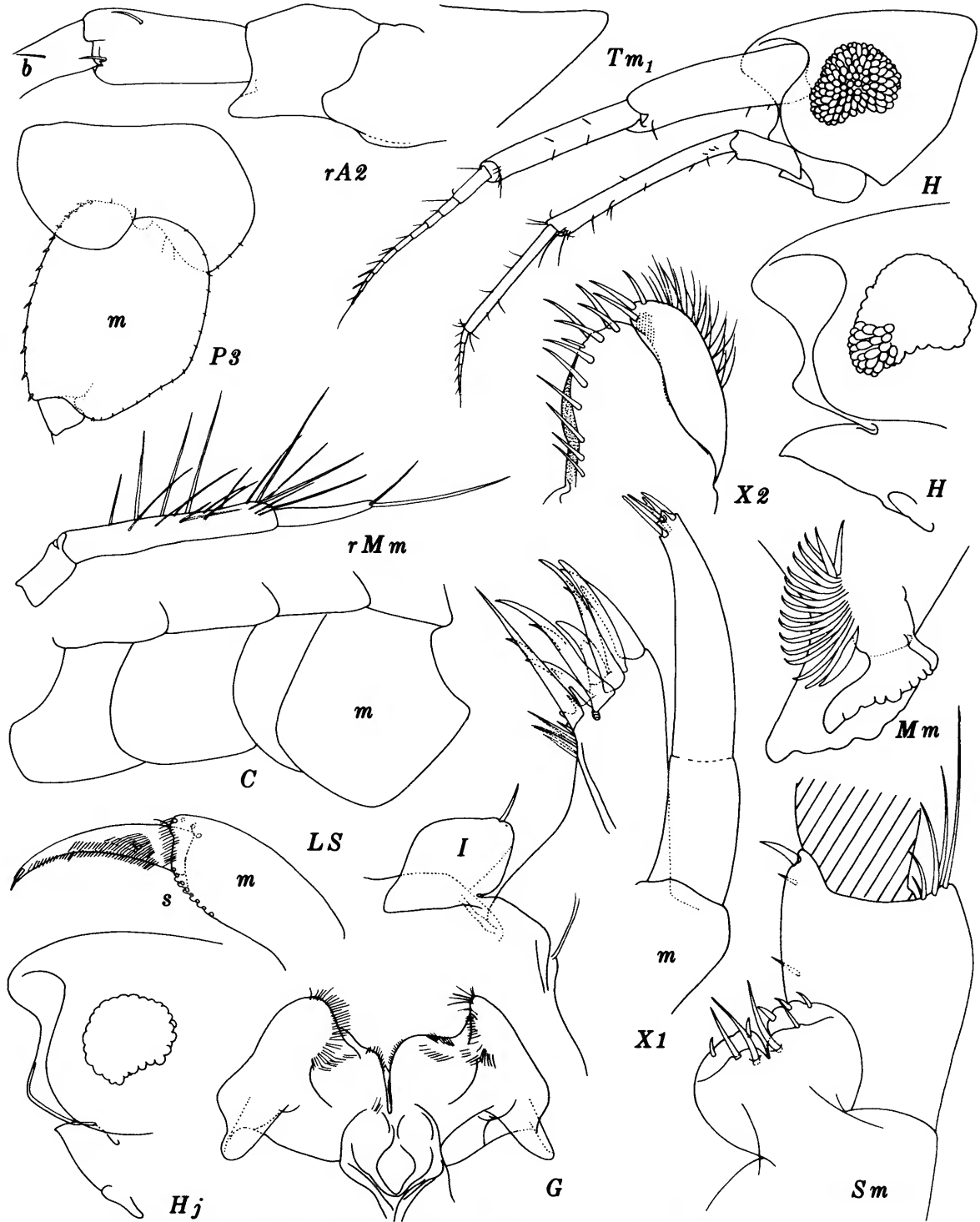


FIGURE 51.—*Leucothoe assimilis*, new species, male, 9.5 mm, VicFish 410; *m*=male, 9.2 mm, VicFish 457; *m*₁=male, 8.5 mm, VicFish 465; *j*=juvenile ?hybrid, 3.4 mm, VicFish 415.

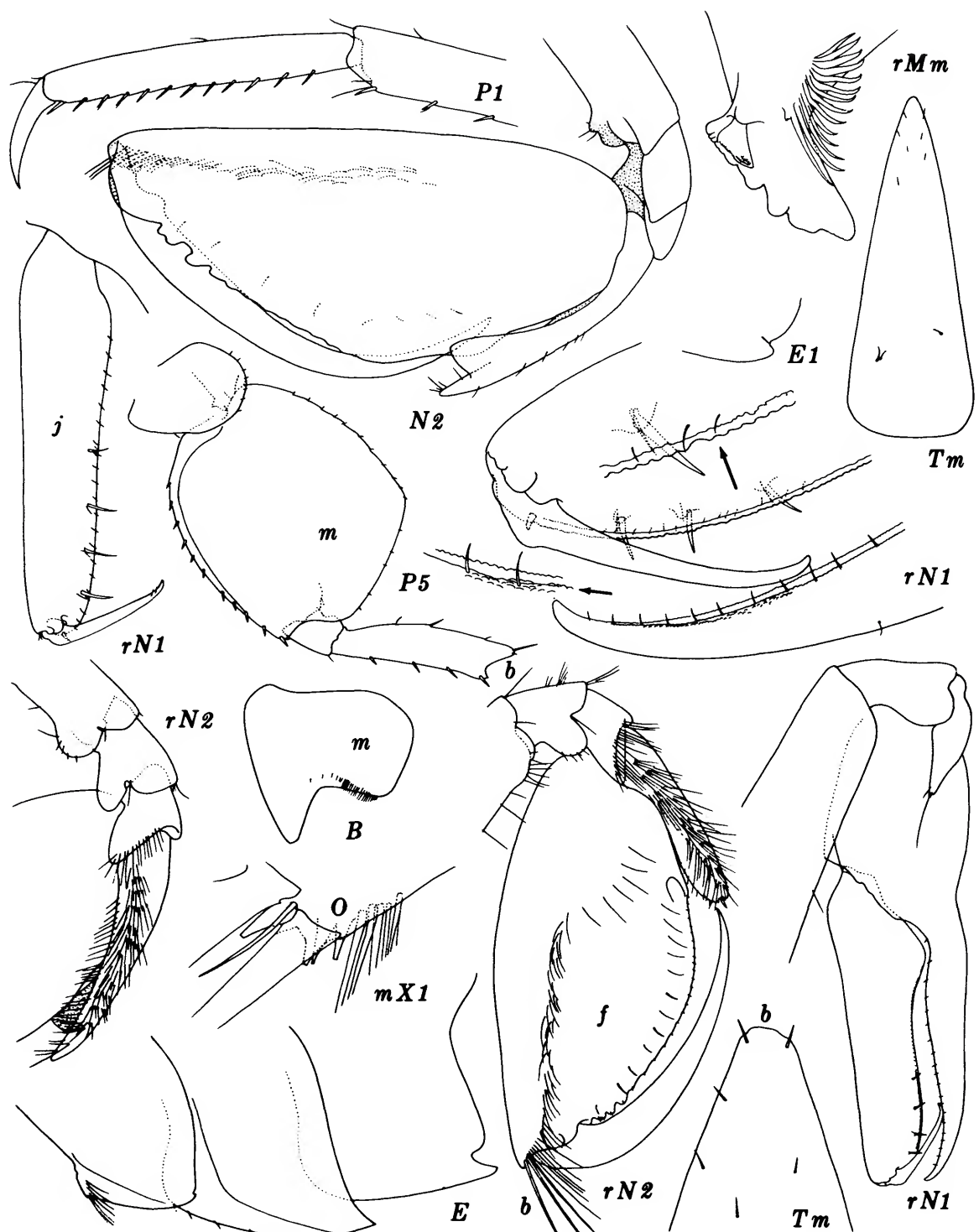


FIGURE 52.—*Leucothoe assimilis*, new species, male, 9.5 mm, VicFish 410; *m*=male, 9.2 mm, VicFish 457; *f*=female, 7.2 mm, VicFish 419; *j*=juvenile ?hybrid, 3.4 mm, VicFish 415.

in juveniles 5.0 mm and smaller; article 5 of antenna 2 usually very thin but rarely as thick as in *L. commensalis*; small juveniles, 3.0–4.0 mm occasionally with shortened dactyl of gnathopod 1 and especially thin article 6 (possibly juveniles of a cryptic species); right and left maxillae 2 often asymmetrical, left member with outer plate projecting as shown for *L. assimilis* (Figure 51 x 2) (and right with outer plate projecting flush as shown for *L. commensalis* (Figure 56x2), this condition highly variable both in *L. commensalis* and *L. assimilis*; submarginal setae of inner plates on maxillipeds as long in juveniles as in adults, these plates of *L. commensalis* like *L. assimilis* in juveniles, but in terminal *L. commensalis* submarginal setae shortened; chela of gnathopod 1 usually with four or five posterior setules in adults; proportions of uropods 1–2 slightly different from *L. commensalis*: outer ramus of uropod 2 projecting to mark 54–58 on inner ramus of uropod 1; dactyl of gnathopod 2 in terminal adults especially elongate.

Macleay Museum, Port Denison, one specimen: Upper lip projecting slightly farther than in Western Port specimens.

HOLOTYPE.—NMV, male, 9.5 mm.

TYPE-LOCALITY.—VicFish 410, Western Port, Victoria, station 200–5-1+2, 24 March 1965.

RELATIONSHIP.—Adults of this species differ from Australia's *L. commensalis* in the following characters: enlarged rostrum and epistome but prebuccal parts less massive overall; enlarged and broadly reniform eyes with posteroventral excavation; thin article 5 of antenna 2 (not universal); strong bevel on article 2 of pereopod 3; slightly elongate article 5 of gnathopod 1 with strong basal hump; beads on margin of chela on gnathopod 1; sharpness of anterior adz on coxa 1; lateral ridge on epimeron 2 generally more submarginal and setae present on anteroventral margin; hump on anteroventral margin of epimeron 1; smaller lacinia mobilis on right mandible; thinner, slightly longer and stronger apical taper on palp of maxilla 1; swollen flanges on mandibular lobes of lower lip in terminal adults; tilt of coxa 4 and configuration of coxae 3–4; sinus of epimeron 3 and consistency in shape of epimera 2–3 except in smallest juveniles; anterior truncation of ocular lobe.

In juveniles between 3.5 and 6.0 mm the differ-

ences holding best are those of epimeron 3, rostrum, epistome, epimeron 1, right mandible.

Leucothoe assimilis differs from Atlantic *L. spinicarpa* as figured by Sars (1895, pls. 100–101, labeled *L. articulosa*) in the broad and ventrally excavate eye but otherwise *L. assimilis* is very similar in its head structures to the Atlantic species; in the flanges on the mandibular lobes of the lower lip; in the sinus on epimeron 3; the hump of article 6 on gnathopod 1; and in the combined shape of coxae 3–4, although *L. spinicarpa* of the Atlantic also has the posteroventral corner projecting downwards because of tilt; Sars has not distinguished the right lacinia mobilis in his illustrations.

Leucothoe assimilis differs from *Leucothoe lilljeborgi* Boeck, from the North Atlantic, in the elongate telson and elongate dactyl of gnathopod 1. *Leucothoe incisa* Robertson from the North Atlantic has a small rostrum, short dactyl of gnathopod 1, unbeveled second articles of pereopods 3–5, weaker tooth of epimeron 2 and anterodorsally unexcavate coxa 1. Both of those species resemble *L. assimilis* in the deep sinus of epimeron 3.

MATERIAL.—VicFish, Western Port, 110 samples (196); Macleay Museum, Port Denison [labeled as *L. assimilis* = nomen nudum] relabeled by C. Chilton as *L. spinicarpa* (see Chilton, 1923, for notes on this specimen): AM, P 2474, off Manning River, N.S.W., 22 fms, station 28 (1).

DISTRIBUTION.—Western Port; New South Wales; Port Denison.

Specimens Intermediate between *L. commensalis* and *L. assimilis*

There is generally no difficulty in separating *Leucothoe assimilis* from *L. commensalis* because of easily seen gross differences in head, epimeron 3, article 2 of pereopod 3, gnathopod 1 and other features as detailed in remarks accompanying those species. Occasionally the rostrum of *L. commensalis* projects sharply and occasionally is slightly enlarged like that of *L. assimilis*; generally one may remove the antennae and see that no intergradation occurs between the species. *Leucothoe assimilis*, in specimens exceeding 3.5 mm, consistently has a sinus on epimeron 3.

Five specimens from VicFish 513, between 3.2 and 4.3 mm long and seven specimens from VicFish

415, 3.9–5.0 mm, appear to be hybrid swarms of these two species or between *L. assimilis* and *L. gooweera*. The strongest intermediate is a juvenile, 3.9 mm, from VicFish 415. The following characters are like those of *L. commensalis*: epistome-upper lip, gnathopods 1–2, pereopod 3 and epimeron 3; the following characters are like those of *L. assimilis*: head, rostrum, eye, right lacinia mobilis. The weakness of the prebuccal complex resembles that of *L. gooweera* (which may simply be neotenous adults of *L. commensalis*); the head of this 3.9 mm specimen lacks a cusp and is, therefore, like *L. commensalis*.

A specimen, 5.0 mm long, from VicFish 415 has the eye of *L. assimilis* and the rostrum is intermediate between *L. assimilis* and *L. commensalis*, but the following characters are like those of *L. commensalis*: epistome-upper lip, maxilla 1, right lacinia mobilis, gnathopods (but dactyl slightly elongate), article 6 of pereopods (few spines), coxae, article 2 of pereopod 3, and epimera.

A juvenile, 6.0 mm, from VicFish 512 has the following characters like those of *Leucothoe assimilis*: epistome and cephalic keel; eye, apex of mandibular palp and pereopod 3; whereas the following characters are like those of *L. commensalis*: rostrum, right lacinia mobilis, gnathopods 1–2 and epimera 1–3. A similar specimen is found in VicFish 510.

Another specimen, 4.3 mm, from VicFish 513 has a head and mandibular palp like those of *Leucothoe assimilis* but has other characteristics like those of *L. commensalis*. Other specimens in these two samples are far closer to the normal conditions of *L. assimilis* than to those of *L. commensalis*.

These rare exceptions among hundreds of specimens examined do not at present suggest that *L. assimilis* and *L. commensalis* are synonymous.

Leucothoe boolpooli, new species

FIGURES 53, 54

DESCRIPTION.—Lateral cephalic lobe rounded and weakly mammilliform, eyes broadly suborbicular but with ventral margin excavate; article 1 of antenna 1 with mediodistal margin weakly crenulate near posterodistal tooth, article 2 about 0.75 times as long as article 1, article 3 about 0.20 times

as long as article 1; gland cone of antenna 2 tapering and of medium length; prebuccal parts of medium size, rostrum of medium size, cephalic keel bisinuate, upper projection mammilliform, lower projection larger and apically truncate, strongly exceeding conical epistome; major cusp of upper lip not highly elongate; lacinia mobilis on right mandible longer than broad, article 3 of palp 0.75 times as long as article 2, with two short apical setae, one shorter than other, article 1 especially elongate, half as long as article 2; mandibular lobes of lower lip not distolaterally inflated; inner plate of maxilla 1 with one apical seta, ventromedial edge of outer plate with two pairs of scissor spines closely crowded, appearing as bundle of spines; outer plate of maxilla 2 of ordinary width, bearing three medium spines, inner plate with medial spine row especially short, not extending basally; article of maxilliped bearing outer plate alate, poorly setose facially, apex of palp article 3 slightly convex; coxae 1–4 projecting equally, their lower margins together forming weak crescentic curve, coxa 4 thus especially short and not posteriorly excavate, coxa 1 with subconical or submammilliform, apically tapering anterior projection, coxa 3 not tilted; article 2 of gnathopod 1 with one or two weak anterior setules, base of article 5 ovate, somewhat narrow, apical process (chela) about 1.3 times as long as base, anterior margin of chela lined with minute setae, lacking beads (except cuticular texture), article 6 slender, with weak basal constriction, about four times as long as broad, bearing eight setae besides spine at base of dactyl, margin heavily crenulate, projections not forming beads, dactyl about 0.38 times as long as article 6, evenly curved; gnathopod 2 (only male known) lacking strong anterodistal projection on article 6, palmar margin with low and wavy teeth, strong near base of dactyl, process on article 5 scarcely fluted apically, with apical spine, not bifid; article 2 of pereopods 3–5 narrow and poorly beveled, article 4 lacking inner spines on apex; active margins of article 6 on pereopods 1–5 with numerous but minute spines, dactyl with internal slit; epimeron 1 naked, with slight posteroventral tooth, epimeron 2 with medium, blunt tooth, epimeron 3 with convex posterior margin, weak sigmoid sinus and small posteroventral tooth; uropod 3 missing, inner

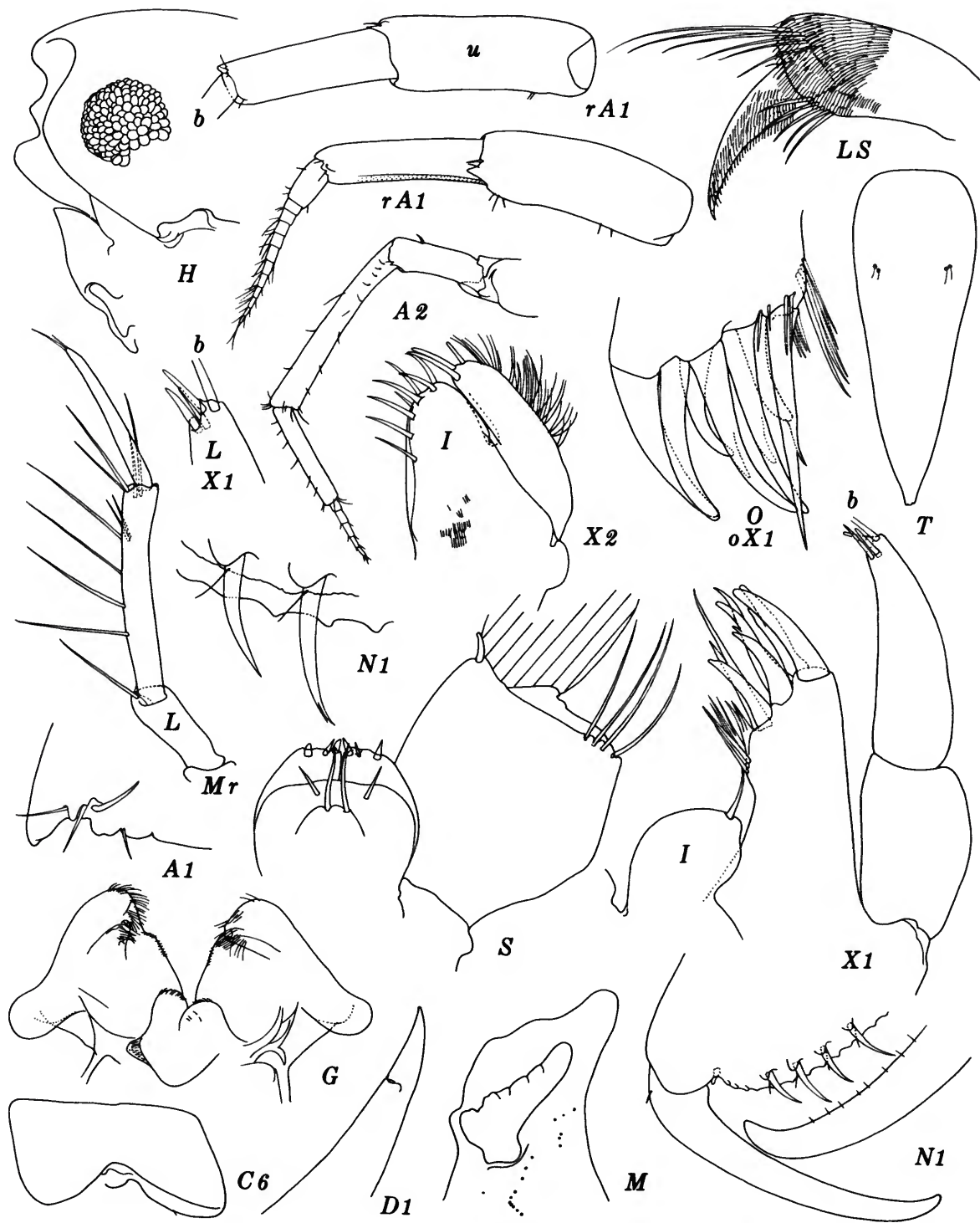


FIGURE 53.—*Leucothoe bootpooli*, new species, holotype, male, 11.7 mm, VicFish 395; dots on *M* are apices of raker spines.

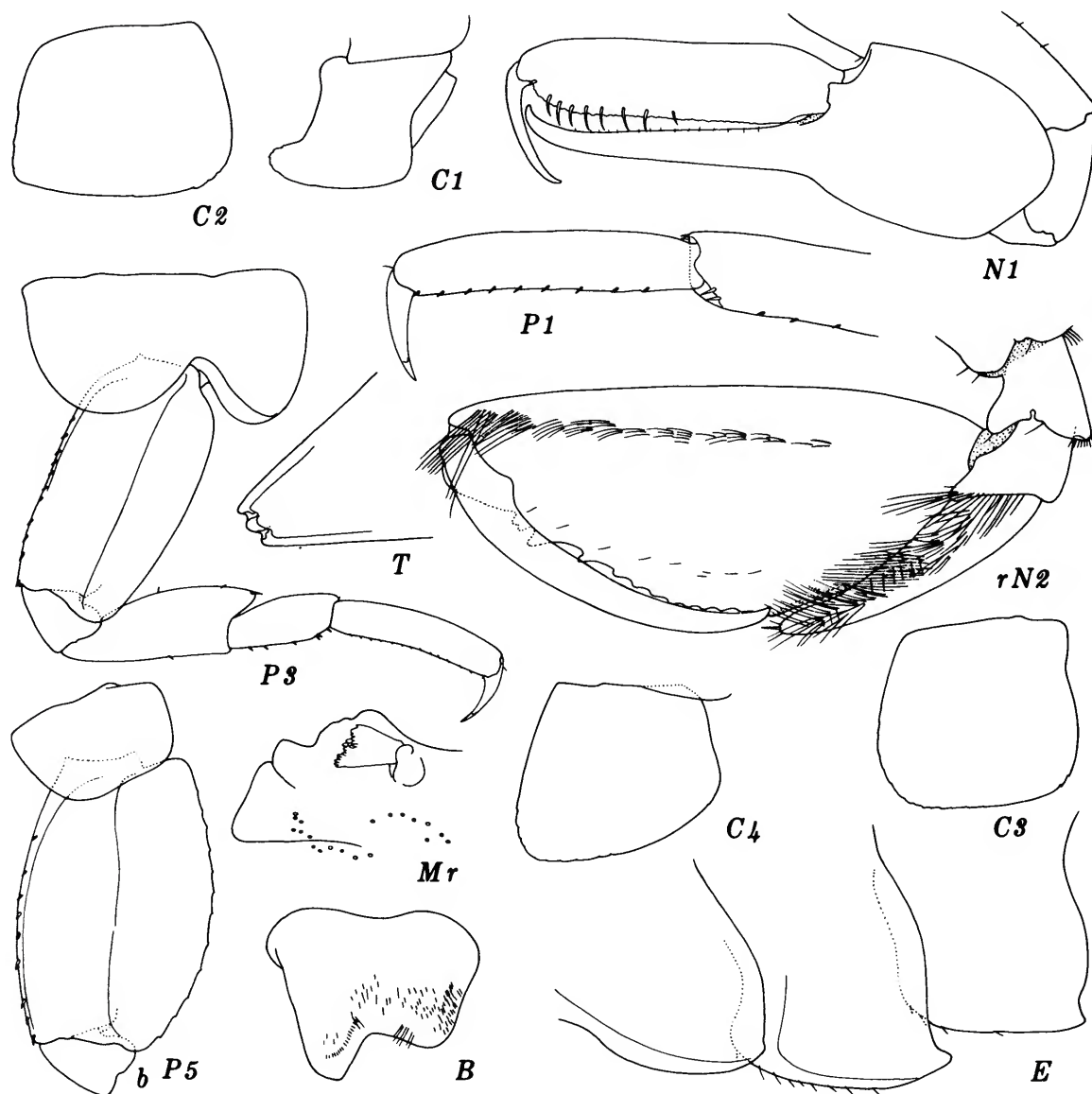


FIGURE 54.—*Leucothoe boolpooli*, new species, holotype, male, 11.7 mm, VicFish 395; dots on *Mr* are apices of raker spines.

ramus of uropod 2 extending only 0.75 times along rami of uropod 1, outer ramus only 0.60; apex of telson trifid.

HOLOTYPE.—NMV, male, 11.7 mm. Unique.

TYPE-LOCALITY.—VicFish 395, Western Port, Victoria, dredge, 12 August 1970.

REMARKS.—The body of this specimen is heavily calcified and the eye is difficult to see.

RELATIONSHIP.—In many of its characteristics this specimen fits *Leucothoe tridens* Stebbing (1888). It is characterized by the trifid telson, short anterior coxae, unexcavate coxa 4 and bipartite

cephalic keel but it differs from the Hawaiian specimens of *L. tridens* in the absence of a cusp on the ocular lobe, the stronger bisinuation of the cephalic keel, the narrower article 2 of pereopods 3-5, the narrower outer plate of maxilla 2 and the strong anterior projection of coxa 1. Epimeron 3 is sinuate and posteroventrally extended but this may be a feature of terminal adults as it is in Australian *L. commensalis*.

This species differs from *L. tridens* (the original description) in the following ways: broader upper lip; absence of ocular cusp; shorter article 5 of antenna 2; elongate articles 1 and 3 of mandibular palp; shorter dactyl of maxilliped; slightly narrower anterior process of coxa 1; the even proportions of articles 5 and 6 of gnathopod 1, which in *L. tridens* has article 6 more than twice as long as the base of article 5; more elongate article 6 of gnathopod 2; about 3 times as many spines on article 6 of pereopods 1-2; slightly more slender article 2 of pereopods 3-5, with smaller serrations; longer and more slender telson; and well-developed posteroventral teeth of epimera 2 and 3.

This Australian species appears closest to *L. miersi* Stebbing (1888) from South Africa as it differs from that species only in the following characters: the even proportions of articles 5-6 of gnathopod 1; the narrower article 2 of pereopods 3-5; the strong anterior projection of coxa 1; the elongate articles 1 and 3 of the mandibular palp; and the elongate, narrow lacinia mobilis of the left mandible.

DISTRIBUTION.—Western Port, Victoria, shallow water.

Leucothoe commensalis Haswell

FIGURES 55-57

Leucothoe commensalis Haswell, 1880b:261-262, pl. 10: fig. 3.

REFERENCES.—Because Chilton in several papers (especially 1923) synonymized *L. commensalis* and many other species of the genus with *L. spinicarpa* (Abildgaard) the references to *L. commensalis* will have to be sorted out by examining his reported materials.

DESCRIPTION.—Lateral cephalic lobe rounded, eyes ovate, suborbicular or slightly reniform, antennae 1-2 thin; article 1 of antenna 1 with medio-

distal margin untoothed, one tooth posterodistally; article 2 about 0.95 times as long as article 1, article 3 about 0.25 times as long as article 1; gland cone of antenna 2 long and tapering (from medial view); prebuccal mouthparts large, rostrum small, cephalic keel broad, sharp, epistome broad and sharp, not reaching as far as cephalic keel; major cusp of upper lip elongate; lacinia mobilis on mandibles much longer than broad, article 3 of mandibular palp about 0.55 times as long as article 2, with two long apical setae; mandibular lobes of lower lip distolaterally inflated in young, not in fully adult specimens; inner plate of maxilla 1 with one apical seta, ventromedial edge of outer plate with pair of scissor-spines; outer plate of maxilla 2 of ordinary width, bearing three long setae, one being blunt; article of maxilliped bearing outer plate not alate, apex of palp article 3 concave; coxa 1 with weak to strong, adz-shaped anterior projection, upper corner of projection soft or sharp, anterior margin truncate or slightly rounded, coxa 4 strongly projecting below anterior coxae; article 2 of gnathopod 1 with short anterior setae, base of article 5 broadly ovate but slightly asymmetrical, apical process (chela) about 1.5 times as long as basal, anterior margin of chela lined with extremely minute setae, no special beads, (except regular highly microscopic beads or nodules of chitin seen elsewhere on gnathopod), article 6 slender, four times as long as broad, bearing 5 to 13 setae besides spine at base of dactyl, margin minutely beaded, dactyl about 0.42 times as long as article 6; gnathopod 2 with anterodistal projection on article 6 armed with row of setae, palmar margin bearing low and wavy teeth, but teeth becoming fewer and enlarged in males and in senile adults, process on article 5 fluted apically, in medium adults with apical spine; article 2 of pereopods 3-5 broad, posterior serrations strong in small individuals, becoming relatively weaker in large adults, article 2 of pereopod 5 becoming broader in adults but weakly so in pereopods 3-4, ventroposterior margin becoming beveled, article 4 of pereopods 3-5 bearing one or more inner spines subapical to main distal spine; epimeron 1 setose anteroventrally, epimera 1-3 with posteroventral margins rounded in young specimens but epimeron 1 with extremely small notch and tooth, then in superadult specimens, 10.0 mm and longer, epimera 2-3 becoming

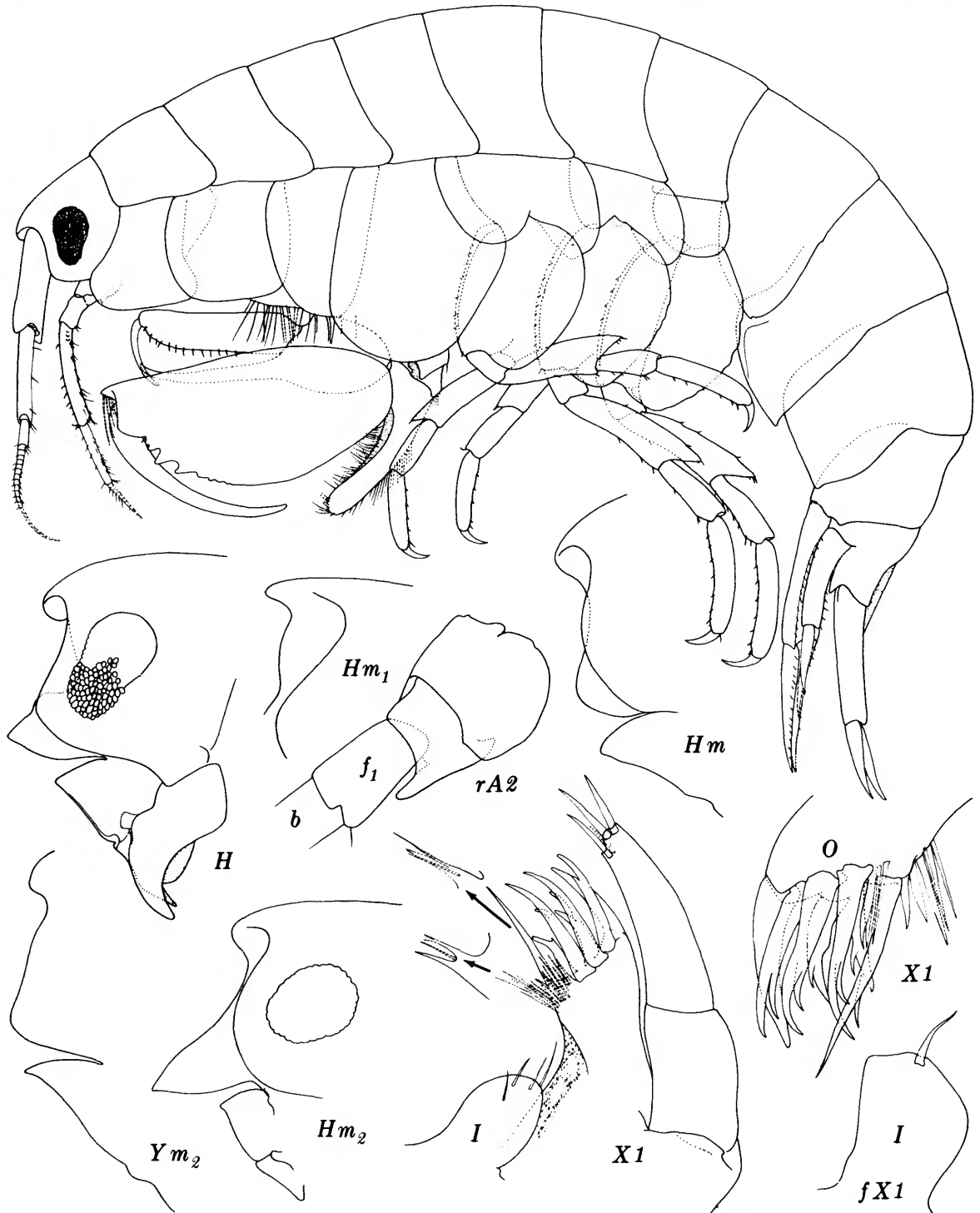


FIGURE 55.—*Leucothoe commensalis* Haswell (see combined legend of Figure 57).

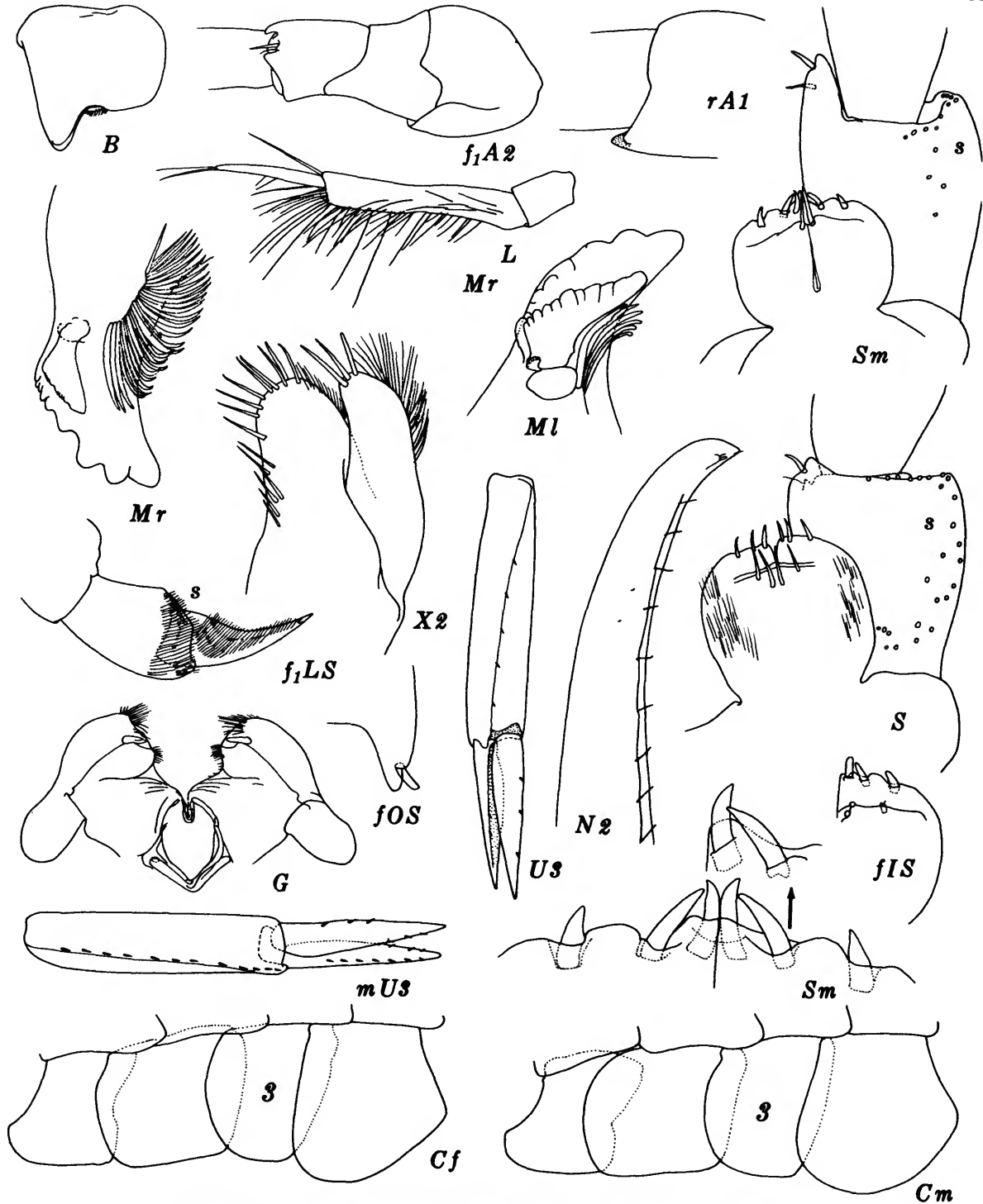


FIGURE 56.—*Leucothoe commensalis* Haswell (see combined legend of Figure 57).

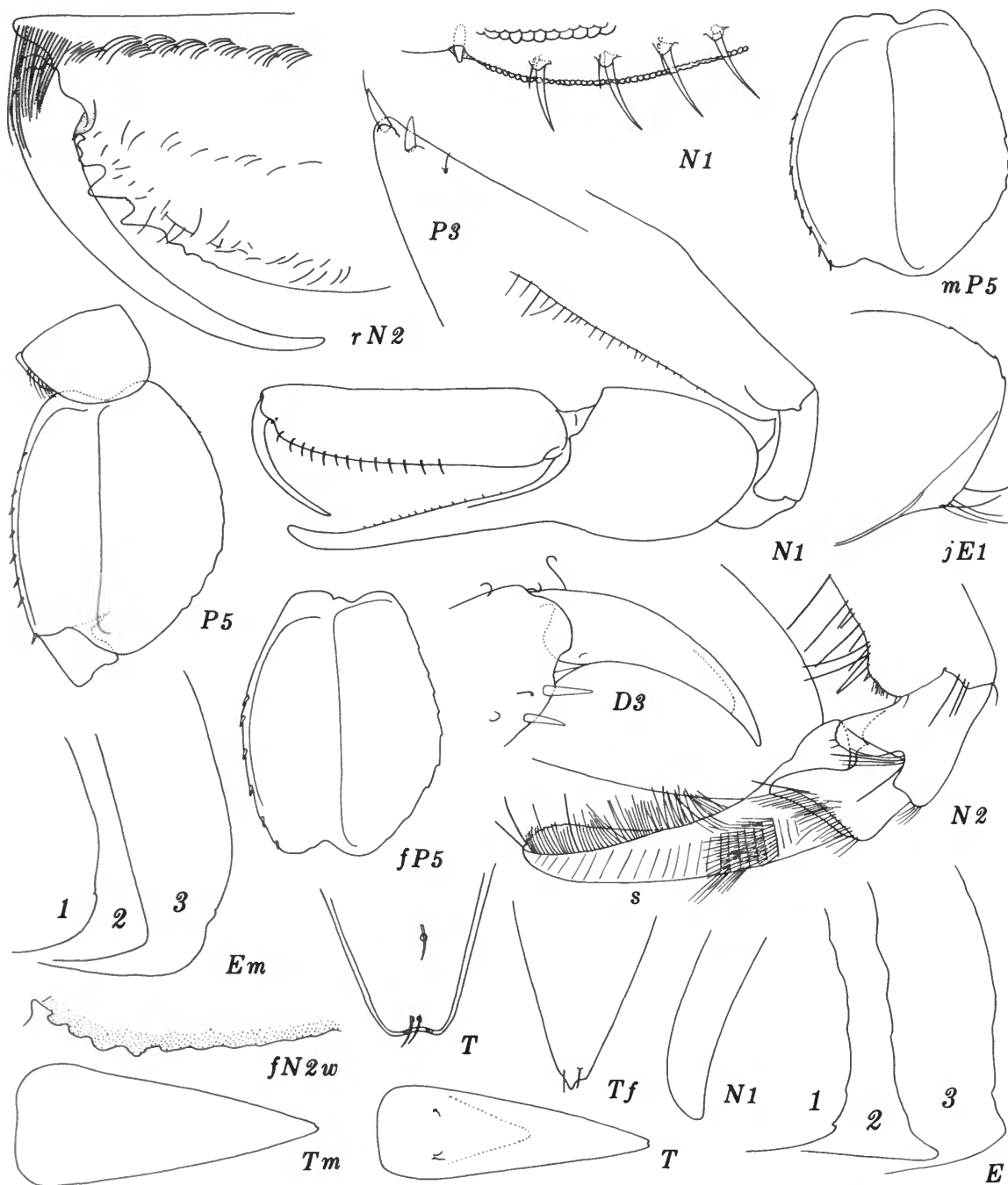


FIGURE 57.—*Leucothoe commensalis* Haswell, female, 16.4 mm, Cockburn S. Flats; *m*=male, 13.5 mm, Garden Island; *f*=female, 8.4 mm, Garden Island; *f*₁=female, 14.5 mm, Cockburn 92; *m*₁=male, 12.7 mm, VicFish 396; *m*₂=male, 10.5 mm, VicFish 506; *j*=juvenile, 6.2 mm, VicFish 398.

extended posteroventrally into tooth, extension stronger on epimeron 2; peduncle of uropod 3 elongate, rami only about 0.60 times as long as peduncle, rami generally with fewer than four spines, peduncle generally with fewer than seven spines; telsonic apex usually damaged or irregular in outline, very weakly trifid, with lateral wings obsolescent.

VARIATIONS.—Senile adult: Inner plate of maxilla 1 almost symmetrically ovate and bearing four setae, some facial, scissor-spines on ventromedial edge of outer plate apparently becoming fused together to form bifid process.

Male, 13.5 mm, NE Garden Island, 14 March 1959: Peduncle of uropod 3 less elongate, rami about 0.67 times as long as peduncle, outer ramus with 7 spines on lateral margin, peduncle with 12 spines (Figures 55–57). Also true of male 8.3 mm from Shepherd 23 (not illustrated): inner ramus 0.82 times as long as peduncle, outer ramus about 0.80, each ramus with 6 spines, peduncle with 12; upper produced corner of coxa 1 extremely sharp in this male; teeth of gnathopod 2 low and wavy; article 6 of pereopods 3–5 slightly widened.

Senile female, 16.4 mm, South Flats, Cockburn Sound, 20 February 1966: Epimeron 1 with usual long ridge and slightly underrolled ventral surface, margin heavily setose unlike any other specimen examined (Figure 57).

Senile adult (intersex), 15.0 mm, Port Phillip 87: Epimeron 3 like that of juveniles, lacking tooth, posterior margin softly rounded; article 6 of pereopods 3–5 with 17 to 19 spines (highest number yet found); article 2 of pereopod 4 strongly beveled, that on pereopod 3 slightly beveled.

Female, 8.4 mm, N.E. Garden Island (Figures 55–57): Spines on plates of maxilliped heavily eroded.

Juveniles, 4.0 mm (not illustrated): Coxa 1 with a poorly pointed adz-shaped process and the pocket to receive the apex of the dactyl on gnathopod 2 far more distinct than in adults.

Juveniles, 5.5–7.0 mm, Favourite Islands: Epimera 2–3 already developing posteroventral teeth; one specimen with dactyl of gnathopod 1 slightly shortened.

Juvenile (no sexual marks), 11.3 mm, South Flats, Cockburn Sound, (not illustrated): One

member of maxilla 2 with extremely thin outer plate, other member normal; possibly this is already a senile adult, as the inner plate of maxilla 1 has more than one seta, but article 2 of pereopod 5 is not fully beveled, the tooth of epimeron 2 is not fully developed and epimeron 3 lacks a tooth. The lobe on article 5 of gnathopod 2 is poorly setose but article 6 of pereopods 3–5 has 13–14 spines, and pereopods 1–2 have 14–16 spines, while the upper angle of coxa 1 is very sharp.

Juvenile, 11.3 mm, Cockburn Station, (not illustrated): Pereopods 1–2 have only four or five marginal spines on article 6; a strong contrast to the above individual of the same size. Article 6 of pereopods 3–5 missing.

Male, 10.5 mm, VicFish 506 (Figure 55): Cephalic keel especially enlarged and pointing downwards, eye suborbicular.

Specimens, 2, VicFish 403: Article 6 of gnathopod 1 thin as in *Leucothoe assimilis*; also specimens of VicFish 453, 461.

Male, 12.7 mm, VicFish 396 (Figure 55): Rostrum sharp.

Specimen, VicFish 412: Article 5 of antenna 2 as in *Leucothoe assimilis*.

TELSON.—The dorsal subbasal setal pairs are present or absent.

FIGURES.—Most of the figures are based on the senile adult but characteristics not conforming to these figures are drawn from smaller specimens as shown. The left mandible has 25 spines in the raker row but most of these have been omitted in the drawing. As an example of the maximum extension of the telson one notes that it reaches to spine 7 from the base of the peduncle of uropod 3 as shown for the 13.5 mm male of N.E. Garden Island.

REMARKS.—In *Leucothoe spinicarpa* of the north-eastern Atlantic figured by Sars (1895, pl. 100), both coxae 3 and 4 project together, the rami of uropod 3 are of the long variety, article 2 of pereopods 3–5 is of the narrow kind and slightly beveled, and the epistome projects anteriorly as far as the midcephalic keel. Like the material at hand the ommatidia are large.

Leucothoe miersi Stebbing (1888), from South Africa differs from the material in hand by the

very short article 3 on the mandibular palp and coxa 4 does not project beyond coxa 3; coxa 4 is very shallow (short from dorsal to ventral). Stebbing's comments regarding a comparison of a specimen of *L. commensalis* sent him by Haswell with *L. miersi* do not fit the material at hand significantly; Australian males have enlarged outer plates on the maxilliped and the spination and size of the inner plates of the maxillipeds do not appear to be distinct. Stebbing (1888:776) wrote that *L. commensalis* differs from *L. miersi* in the 8 broad teeth of the left lacinia mobilis but his figure (pl. 46m [right side]) of *L. miersi* shows 9–10 teeth similar in size to those on my Australian material. Stebbing also wrote that the peduncle of *L. commensalis* is relatively shorter than in *L. miersi* but his figure shows *L. miersi* with a uropod 3 like most specimens I have of *L. commensalis*. Coxa 3 of *L. miersi* is posteriorly beveled like that in the young specimen of *L. gooweera* (below).

MATERIAL.—VicFish, Western Port, 25 samples (71); Port Phillip 8 (1), 47 (2), 59 (3), 64 (3), 87 (1); Shepherd 8 (3), 13 (5), 23 (1), 27 (1), 50 (2), 52 (1); WAM, Cockburn 92, Cockburn Sound, Marine Group Naturalists' Club, 10 October 1958 (2); Cockburn 52, Same 31 May 1959 (1); Cottesloe, Victoria Street Cable Sta., W. H. Butler, 16 March 1961 (1); Favourite Is., Jurien Bay, R. W. George, 16–18 September 1964 (3); Garden Island, on old boom piles, P. B. Lenhard, 14 March 1959 (5); Cockburn Sound, South Flats, A. Jones, 20 February 1966 (2). Macleay Museum, Port Jackson (20+) [= *L. spinicarpa* as relabeled by Chilton, probably original Haswell material]; AM, G 5395, **TYPE**, Port Jackson, N.S.W. (4); P 2472, off Wollongong, N.S.W., 55–56 fms, Station 48, *Thetis* (1); P 2473, off Coogee, N.S.W., 49–50 fms, station 44, *Thetis* (1); P 3470, Port Jackson, N.S.W. (11); P 3472, Port Stephens, N.S.W. (8); P 5920 and E 6530, 40 miles west of Kingston, South Australia, 30 fms, before 1922, Coll. F.I.V. "Endeavour" (4); P. 5858, Port Jackson, N.S.W., before 1922 (2); P 10873, Port Darwin, N. Australia, from piles of rail pier, among marine growths, Pres[ented] Lieut. Surg. Paradise, before 1937 (12); P 11835, Wartime boom piles, Port Jackson, N.S.W., ex ascidians, coll. E. Pope before April 1948 (7).

DISTRIBUTION.—Australia.

Leucothoe diemenensis Haswell

Leucothoe diemenensis Haswell, 1880b:262–263, pl. 9: fig. 5.

MATERIAL.—Macleay Museum, "*Leucothoe* sp. Tasmania", 1 specimen.

REMARKS.—This specimen so closely fits Haswell's in toto drawing of *L. diemenensis* that one may presume it was Haswell's original material. It was seen by Chilton (1923) who relabeled it as *L. spinicarpa*. Haswell's drawing errs in two places: coxa 1 actually has a large anterodorsal excavation, the lobe thus formed projecting forward and being broadly truncate anteriorly; the anterodistal corner of coxa 3 is rounded and not pointed. The prebuccal complex resembles that of *L. commensalis*, the rostrum is of approximately the same size as that in *L. commensalis*, antenna 2 is thin, pereopods 3–5 have slightly narrower second articles with weakly beveled posterodistal margins; epimeron 2 has a medium tooth, epimeron 3 bulges moderately posteriorly and sweeps downward sinuously to an extremely weak tooth, the rami of uropod 1 extend equally, the outer ramus of uropod 2 is two-thirds as long as the inner ramus and uropod 3 is missing. Haswell's original figure is correct in the great breadth and distal bifidation of article 5 on gnathopod 2 and coxa 3 is very unusual in its great width (anterior to posterior), the short anterior margin and the extremely long and straight, but oblique ventral margin. Coxa 3 thus distinguishes *L. diemenensis* from *L. commensalis*, the bifidation on gnathopod 2 being of possible secondary importance because this has been found to occur in senile specimens of *L. assimilis*. Perhaps coxa 3 is also an aberrancy of a senile specimen of *L. commensalis* but the name *L. diemenensis* should remain valid until this can be demonstrated.

DISTRIBUTION.—Tasmania.

Leucothoe gooweera, new species

FIGURE 58

DESCRIPTION.—Lateral cephalic lobe bearing quadrate anterior corner; antennae 1–2 thin; article 1 of antenna 1 with one or two small blunt serrations or notches near main distoventral tooth, article 2 about 0.90 times as long as article 1, article 3 from 0.22 (adult) to 0.27 (young) times as long as article 1; gland cone of antenna 2 short and

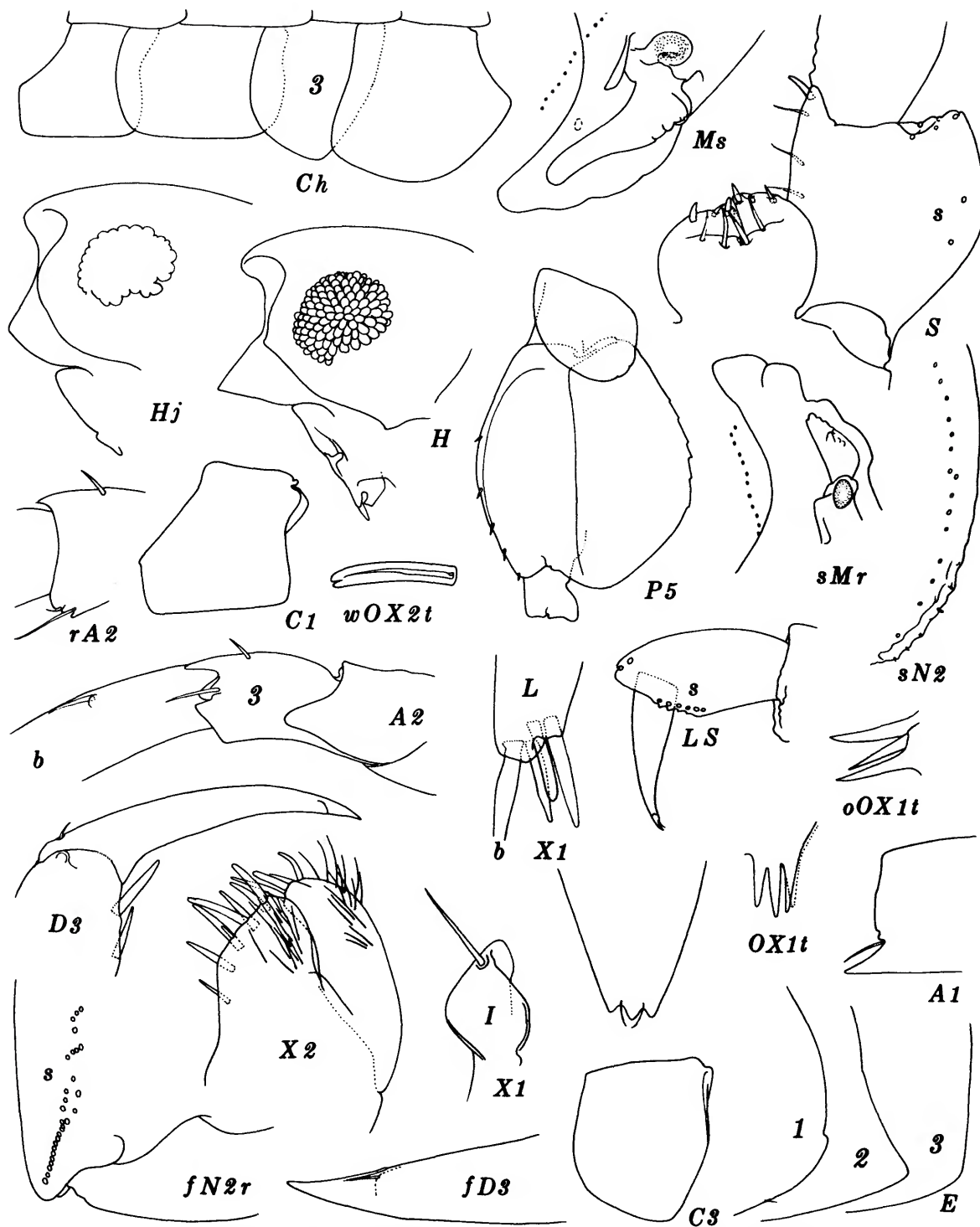


FIGURE 58.—*Leucothoe goowera*, new species, juvenile, 8.1 mm, Garden Island; f=female, 16.9 mm, Fremantle; j=juvenile, 4.3 mm, VicFish 513; h=holotype, ovigerous female, 15.6 mm, Geraldton; dots on *M* are apices of raker spines.

blunt in juvenile, long and tapering in adult; major cusp of upper lip elongate; lacinia mobilis on adult mandibles like those in *L. spinicarpa* (Abildgaard) but left member in juvenile scarcely toothed, incisor toothed in adult but poorly so in juvenile, article 3 of mandibular palp about 0.55 times as long as article 2, with one very elongate seta and one very short seta apically; inner plate of maxilla 1 with one apical seta, ventromedial edge of outer plate with triad or quartet of basally fused spines in the nonarticulate group; plates of maxilla 2 broad and fleshy, outer plate with three apical spines each with weak apical slit; article of maxilliped bearing outer plate highly alate, apex of palp article 3 slightly concave; coxa 1 with strongly truncate adz-shaped projection, upper corner of projection softly rounded on close view, coxa 3 with lower margin tilted to meet tangent of coxa 4, thus coxa 4 not projecting significantly below other coxae, coxa 3 posteriorly beveled in juvenile, not in adult; article 2 of gnathopod 1 poorly setose or heavily setose (variable), base of article 5 broadly ovate but slightly asymmetrical, apical process (chela) about 1.5 times as long as basal, anterior margin of chela lined with extremely minute setae, no special beads, article 6 slender, four times as long as broad, bearing six to nine setae besides spine at base of dactyl, margin minutely beaded, dactyl about 0.40 times as long as article 6; gnathopod 2 with anterodistal projection on article 6 armed with row of setae blending with main anterior setal stripe, palmar margin bearing very low and wavy teeth (male unknown), process on article 5 fluted apically and bearing or not bearing the usual small stout spine(s), process not apically bifid; article 2 of pereopods 3-5 broad, posteroventral margins beveled strongly on all members, posterior serrations strong in juvenile, weak in adults, article 4 of pereopods 3-5 with only one apical spine or one extra on pereopod 3 of juvenile; epimeron 1 with weak posteroventral notch on rounded margin, epimeron 2 with low, blunt posteroventral tooth and epimeron 3 subquadrate, with softly rounded posteroventral corner, notch absent; peduncle of uropod 3 not strongly elongate, rami about 0.80 times as long as peduncle, outer ramus with five dorsal spines, inner ramus with three spines on each margin, peduncle with nine spines; telson apex trifid, lobes projecting equally.

Other distinctions from *L. commensalis*: epistome and lower lip together from lateral view occupying much less space than in *L. commensalis*, epistome poorly projecting along midcephalic keel (cf. Figures 55 and 58); eye enlarged in juvenile and ommatidia enlarged (but not in Fremantle specimen, eyes circular, ommatidia small, compacted and heavily pigmented, if not black, despite many years in preservative); dactyl of pereopods 1-5 with internal sclerotic notch subapically (not in Fremantle specimen).

VARIATIONS.—Three rows of setae occur on the medial face of article 6 on gnathopod 2 in *L. commensalis*: an anterior row, a middle row, and a posterior row; the anterior row (dorsal) is composed of transverse groups of several setae, the middle row is sparse and bears setae in tandem, the posterior row is composed of setae scattered in a transverse band. In *L. gooweera* the anterior row is weak and bears only pairs of setae (about 7 groups, some singles), the row blending in with the main row on the distal projection; the middle row is weak in the juvenile (7 setae), absent in adults; the posterior row is very even and bears all setae in tandem, as many as 15.

The locking spine on pereopods 1-5 is enlarged in the juvenile, but in adults is the same size as the other marginal spines.

Epimera 1-2 are ventrally setose in the adults but only epimeron 1 in the juvenile has one ventral seta.

The main elongate seta on article 3 of the mandibular palp is shorter in the adult than in the juvenile; in the juvenile it is about 1.8 times as long as article 3 but it is scarcely longer than article 3 in the adult.

Only the specimen from Fremantle bears a uropod 3.

HOLOTYPE.—WAM 9-69, female, ovigerous, 15.6 mm.

TYPE-LOCALITY.—Geraldton, Northwest of Bluff Point, Western Australia, 70 fms, CSIRO Station 131, 22 August 1963.

REMARKS.—The following characters distinguish the three adult specimens of this species from *L. commensalis*: the ocular cusp, the short epistome, the tilted ventral margin of coxa 3 and lack of a jog between coxae 3 and 4, the alate maxilliped, stout maxilla 2 with bifid spines, the weak medial

setation on article 6 of gnathopod 2, and the disproportion between the two apical setae of the mandibular palp. The Fremantle specimen (Figure 58f) has some intergradation to *L. commensalis* (Figures 55–57) in the following characters which are distinct from *L. commensalis* on the other two specimens: the short gland cone, the internal dactylar notch of pereopods 1–5, the shortness of apical spines on the palp of maxilla 1 and the eyes as mentioned above. The juvenile alone has poorly toothed incisor and left lacinia mobilis.

In view of conditions on the Fremantle specimen one must raise doubt as to whether these specimens are distinct from *L. commensalis*. They are analogous to *Leucothoe tridens* of Hawaii identified by J. L. Barnard (1970), a species that is distinguished from Hawaiian *L. hyhelia* by the ocular cusp and a variety of other small characteristics. In fact, *L. hyhelia* is probably a race of *L. commensalis*, if not something less distinct; it is definitely of the *L. commensalis* facies. The so-called *L. tridens* of Hawaii also has the broad maxilla 2, shortened epistome, circular eyes with large ommatidia, similar epimera, but article 2 of pereopods 3–5 is much narrower and not beveled, coxa 3 is not ventrally tilted, and coxa 4 is ventrally beveled upward from the anterior end.

Leucothoe tridens was described from New Zealand, 1100 fms, by Stebbing (1888). Serrations on article 1 of antenna 1, the epistome and the basal part of the maxilliped are unknown or unclear. Apparently the base of the maxilliped is not alate, unlike that in *L. gooweera*. Coxa 1 of *L. tridens* projects anteriorly but is softly rounded and bears strong serrations; coxa 3 is not tilted; coxae 3 and 4 project together. The dactyl of gnathopod 1 is shorter than that in *L. gooweera* and article 2 of pereopods 3–5 is narrower and not beveled. The material at hand does not correspond well with *L. tridens* in maxilla 2 because the outer plate of *L. tridens* is narrower. Otherwise the material in hand corresponds well with *L. tridens* in mandibular palp article 3, the mandibles in general, the ocular lobe, telson, uropod 3, and the inner plate of maxilla 1.

Several juveniles in VicFish samples from Western Port, Victoria, have been provisionally identified as *L. gooweera* because of the small epistome, the

lack of ocular cusps, and because the remaining characters distinguishing *L. gooweera* from *L. commensalis* are matters of proportion or number (such as number of setae on the mandibular palp—one long, one short—but these specimens with only one seta). They cannot otherwise be readily distinguished from ordinary juveniles of *L. commensalis* with recognizably normal epistome.

MATERIAL.—VicFish, Western Port, 3 samples (15 juvs.); JLB Australia 5 (2 juvs.); WAM, Fremantle, jetty piles, October 1912 (1); Garden Island, on old boom piles, P. B. Lenhard 158, 14 March 1959 (1); Geraldton, NW of Bluff Pt., 70 fms ("F"), CSIRO Station 131, 22 August 1963 (27°40'S, 113°03'E) (1).

DISTRIBUTION.—Southwestern Australia from Geraldton to Fremantle; ?Western Port, Victoria.

Leucothoe tarte, new species

FIGURE 59

DESCRIPTION.—Lateral cephalic lobe rounded; eye broadly reniform; antennae 1–2 very thick, short; article 1 of antenna 1 with mediodistal margin untoothed, one tooth posterodistally, article 2 about 0.75 times as long as article 1, article 3 about 0.16 times as long as article 1; gland cone of antenna 2 very short and blunt; prebuccal parts of medium size, rostrum of medium size, cephalic keel bisinuate, lower projection larger, epistome sharp, slightly smaller in lateral surface area than cephalic keel, not reaching as far as keel; major cusp of upper lip elongate; lacinia mobilis on right mandible as broad as long and much shorter on left side than shown for *L. commensalis* (Figure 56M1) article 3 of mandibular palp about 0.60 times as long as article 2; lower lip like *L. tridens*; inner plate of maxilla 1 bearing one apical seta, ventromedial tooth on outer plate of maxilla 1 large and conical; outer plate of maxilla 2 of ordinary width, bearing two long sharp and one short, blunt apical setae, inner plate with setae extending to base; article of maxilliped bearing outer plate laterally subulate, apex of palp article 3 convex; coxa 1 with strong adz-shaped anterior projection, anterodorsal margin of projection sharply quadrate, coxa 4 not strongly projecting below anterior coxae; article 2 of gnathopod 1 with anterior setae, base of article 5 broadly and

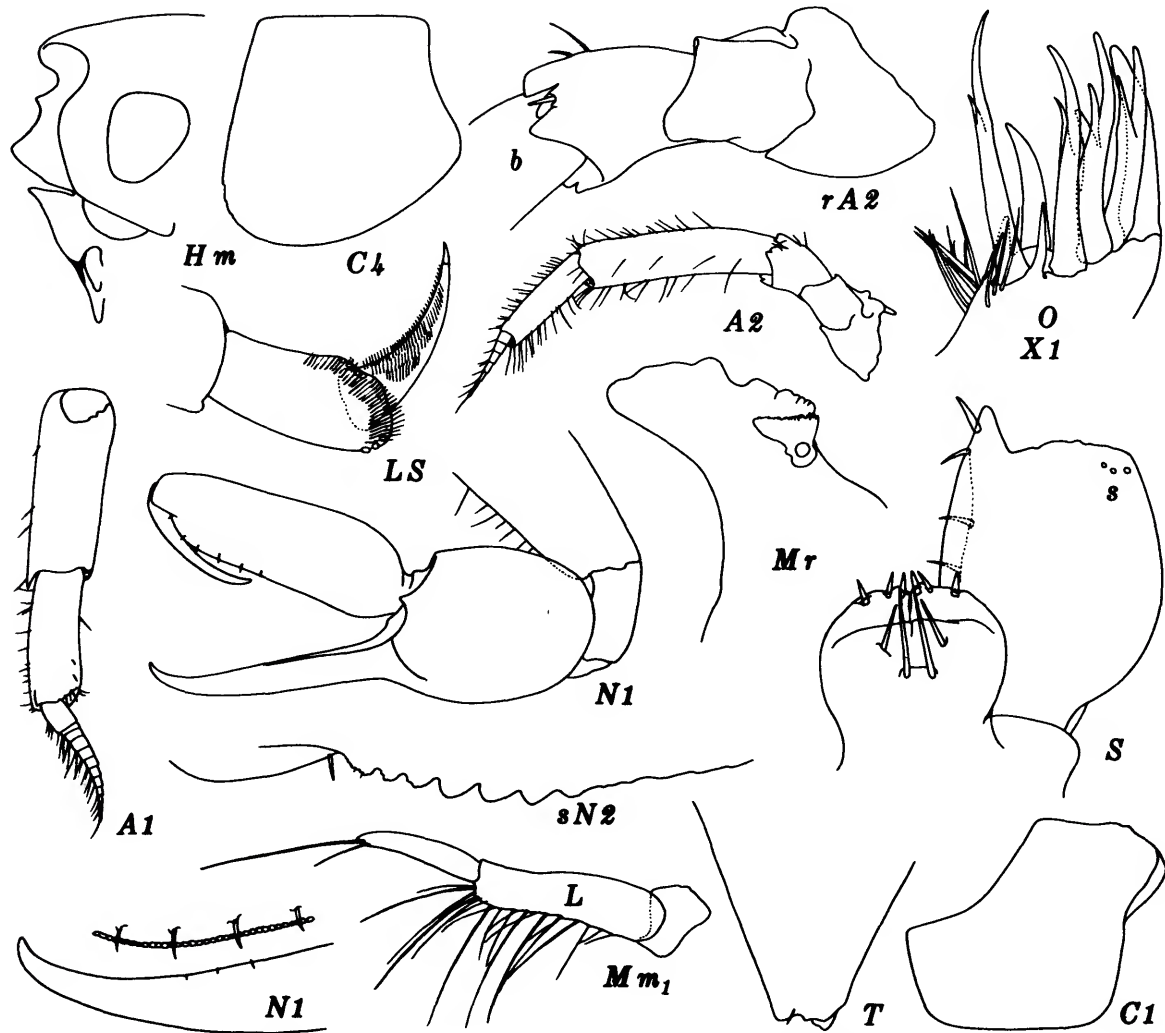


FIGURE 59.—*Leucothoe tarte*, new species, holotype, male, 14.0 mm, Port Phillip 30; *m*=male, 12.0 mm. *Leucothoe commensalis* Haswell, *m*₁=male, 13.5 mm, Garden Island [only mandibular palp].

symmetrically ovate, apical process (chela) about 1.33 times as long as basal, margins of chela smooth, article 6 stout, only 3.4 times as long as broad, bearing about five posterodistal setae besides spine at base of dactyl, margin minutely beaded as in *L. commensalis*, dactyl about 0.46 times as long as article 6; gnathopod 2 similar to *L. commensalis*, process on article 5 apically fluted, teeth on palm in male low and wavy, anterodistal corner of article 6 produced and bearing row of long setae; article

2 of pereopods 3–5 of slightly narrowed kind as shown for *L. commensalis* (Figure 57*fp*₅), article 4 bearing only one apical spine, article 6 like *L. commensalis*, spines small, numerous, dactyl with internal notch; epimeron 1 naked, with tiny posteroventral tooth (notch), epimeron 2 with medium tooth, epimeron 3 with posterior bulge and medium to small tooth (see Figure 55, total view of *L. commensalis*); peduncle of uropod 3 elongate, rami only 0.6 times as long as peduncle;

telson apically trifold, middle cusp not exceeding two lateral cusps.

HOLOTYPE.—NMV, male, 14.0 mm.

TYPE-LOCALITY.—Port Phillip 30, Area 58, Queenscliff Point, Lonsdale, 35–40 feet, 2 April 1959.

REMARKS.—This species is comparable to *L. commensalis* Haswell in the majority of its morphological characters. The characters distinguishing *L. tarte* are the very stout antennae, stubby gland cone, short lacinia mobili, somewhat alate and poorly setose basal article on the maxilliped, unexcavate apex of article 3 on the maxillipedal palp, the exceptionally strong quadration of coxa 1, unprojecting coxa 4, the tumid and symmetrical basal section of article 5 on gnathopod 1, the short smooth chela and short stout article 6, and the slightly narrowed second articles of pereopods 3–5 like small specimens of *L. commensalis*.

The so-called back side of the outer plate on maxilla 1 has a stout cone, unlike *L. commensalis*, which has either a bifid cone in senile adults or a tightly appressed pair of slender, knife-like spine-setae. The inner plate of maxilla 1 and the mandibular palp look like those in Figures 55/IX1 and 56LMr of *L. commensalis*, but article 3 of the mandibular palp is about 15 percent longer. Two pairs of small dorsal setae occur at mark 25 on the telson.

Only one collection of 22 specimens of this species has been discovered; all specimens are large and either definite males or similar to males but lacking penes. This strange situation suggests that *L. tarte* may actually be a phenotype of *L. commensalis* with characteristics modified by an ascidian host distinct from the presumed host of *L. commensalis*.

Chilton (1923:87) reports a probable specimen of this species from Spencer Gulf, South Australia.

MATERIAL.—The type-locality, 22 specimens.

DISTRIBUTION.—Port Phillip, Victoria.

Leucothoe species D

MATERIAL.—JLB Australia 5, juvenile, 1.9 mm.

REMARKS.—This specimen is obviously distinct from any species of *Leucothoe* known, as article 6 and the chela of gnathopod 1 are very elongate and slender, and article 6 has a small chela on which the short dactyl rests and which apparently

keeps the dactyl sprung open. The posterior margin of article 6 is finely combed. Article 2 of pereopods 3–5 is not broadly expanded. Epimeron 1 has a weak posteroventral notch, epimeron 2 has a broad, short tooth and epimeron 3 is weakly protuberant at the posteroventral corner and the posterior margin is slightly convex. This species is not a member of *Leucothoides*.

Leucothoella Schellenberg

Leucothoella gracilis (Haswell)

FIGURES 60, 61

Leucothoe gracilis Haswell, 1880b:263, pl. 10, fig. 2.

DESCRIPTION OF MALE.—Lateral cephalic lobe with weakly concave vertical margin, eyes small, morular, bleached to amber in alcohol; midcephalic keel long and sharp, epistome apicodorsally blunt and not extended; article 1 of antenna 1 with small apicoventral cusp and two ventral marginal spines, article 3 of antenna 2 with small ventrodistal notch; mandibular palp article 3 about 0.54 times as long as article 2, bearing two apical setae, article 2 with three marginal setae; anterior serrations of coxae 1–4 weak or obsolescent; outer ramus of uropod 2 with two apical spines, one dorsal subapical spine and comb row proximal to latter spine; telson with two setal pockets on middle of dorsal side, each pocket with major and minor opening leading to attachment for one large and one small seta, the large seta often missing.

FEMALE.—Like the male but teeth on gnathopod 2 palm low and wavy; outer ramus of uropod 2 lacking comb between two dorsal spines. Length, 3.15 mm.

REMARKS.—This species differs from the tropical type-species and only other known member of the genus in the elongate article 3 of the mandibular palp and in the presence of the dorsal setal pairs near the middle of the telson instead of subapically. In the drawing of the right mandible most of the raking spines are indicated by dots at their apices.

In specimens from Victoria the outer ramus of uropod 2 is longer than in specimens from Western Australia. It is two-thirds as long as the inner ramus in specimens from Victoria.

MATERIAL.—VicFish, Western Port, 7 samples

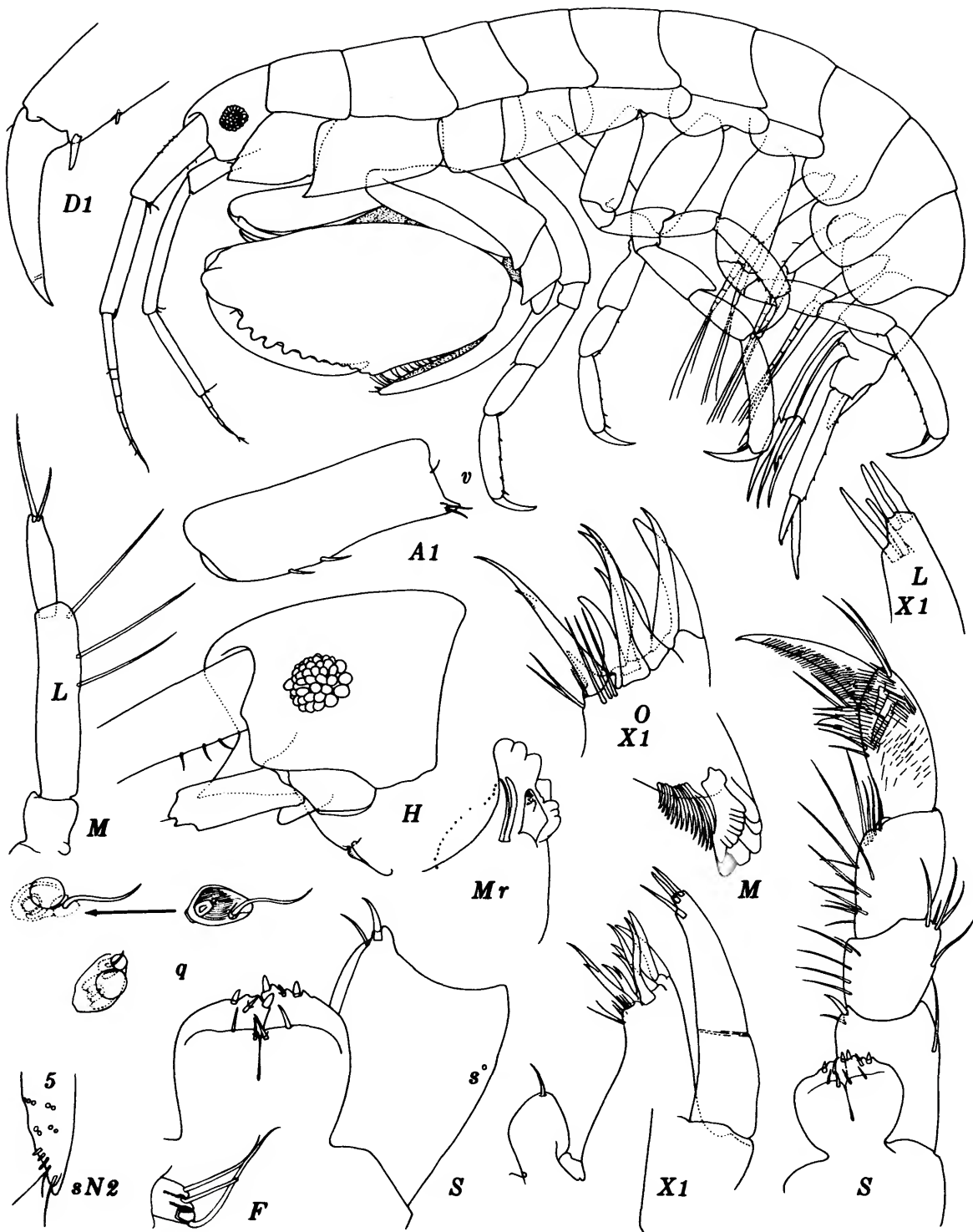


FIGURE 60.—*Leucothoella gracilis* (Haswell), male, 3.7 mm, Slack-Smith 2; arrow on *q* connects same setal pit at 2 levels of focus.

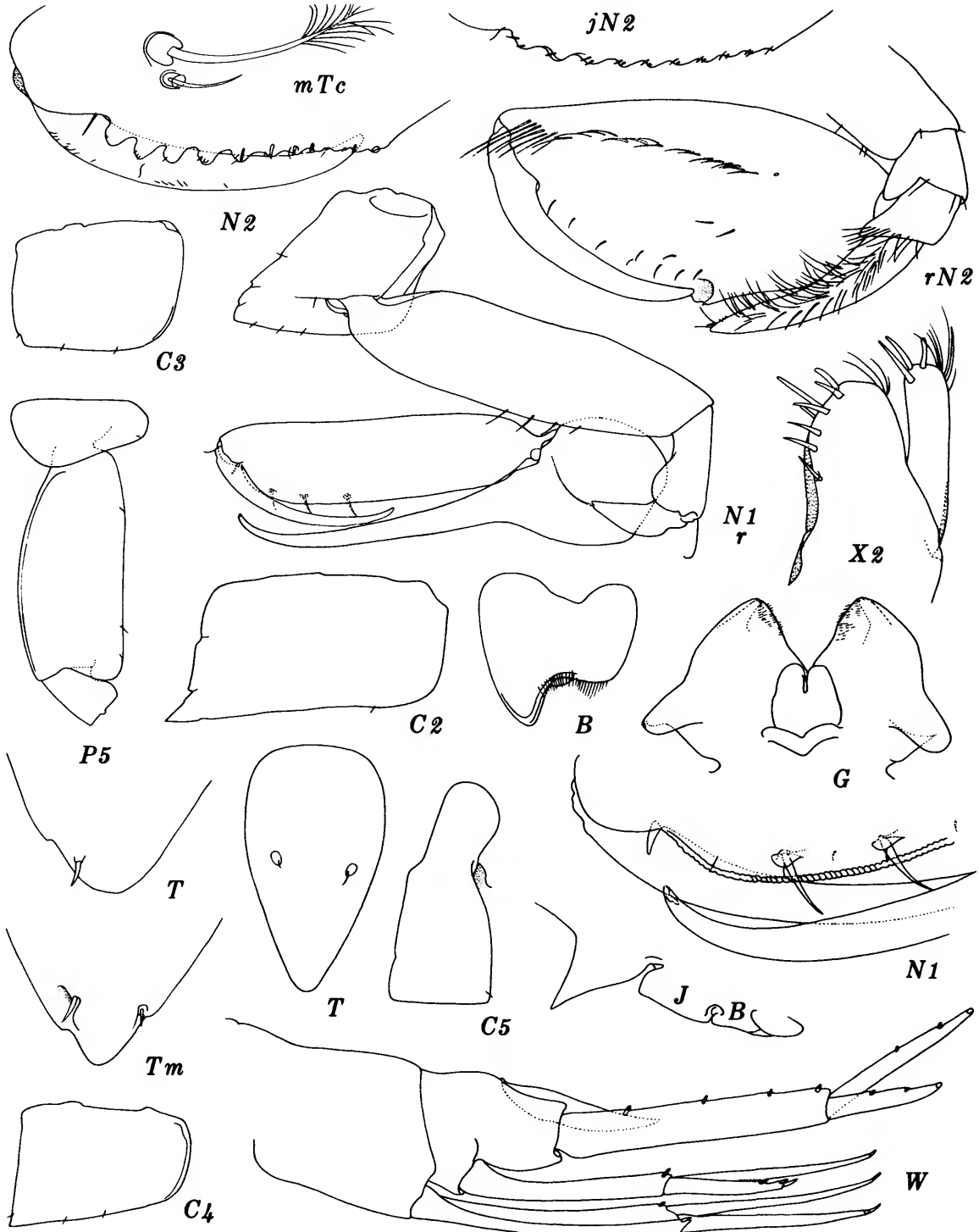


FIGURE 61.—*Leucothoella gracilis* (Haswell), male, 3.7 mm, Slack-Smith 2; m=male, 3.0 mm, VicFish 550; j=juvenile, 2.75 mm, VicFish 447.

(7); Shepherd 8 (1); JLB Australia 5 (1), 6 (1); Slack-Smith 2 (1).

DISTRIBUTION.—Tasmania; Victoria; South Australia; Western Australia north to Cape Naturaliste; 0–50 m.

Leucothoides Shoemaker

Leucothoides Shoemaker, 1933:249.

TYPE-SPECIES.—*L. pottsi* Shoemaker (1933).

Two species of this genus have been described, the type and *L. pacifica* J. L. Barnard, the latter not pertinent to this discussion because of its strong gnathopodal distinctions (see key, below).

Materials of this genus have been very sparse in world collections and because of gross similarities in gnathopods 1–2 little attention has been paid to possible specific differences. *Leucothoides pottsi* has been identified from the tropical Pacific Ocean far from the type-locality in the Caribbean and now specimens from southern Australia, distinct from *L. pottsi*, have suggested reevaluation of identifications from the tropical Pacific. The latter specimens also represent a distinct species. The holotype and original description and figures do not match each other perfectly, suggesting that two species may have been mixed together in the original study; other variants have now been found

in collections from the Caribbean deposited in the Smithsonian Institution. Specimens at hand are very small, poorly preserved, broken and few in number so that I cannot solve many problems nor put names on several apparent new species. Possible phenotypic and sexual variations cannot be resolved until extensive materials become available. The problem in *Leucothoides* appears of the same caliber as that seen in *Leucothoe*: whether or not we are dealing with a few widely distributed species employing marked phenotypy or whether or not numerous species actually exist. Presumably the species of this genus inhabit ascidian and poriferan hosts.

Shoemaker's holotype of *L. pottsi* differs from his description in the broadly rounded head and nonattenuate coxa 1. Specimens from nearby Loggerhead Key fit Shoemaker's Tortugan description reasonably but differ from his holotype in the removal of one setule on coxa 1 from the apex to the ventral margin and differ from the description in the nonattenuate coxa 1. Shoemaker's figured specimen (1933, fig. 3) cannot be found in Smithsonian collections, so that these discrepancies cannot be resolved. Another collection of specimens from *Albatross* 2406 differs from the holotype in the uneven distribution of spines on pereopods 1–2 and from Loggerhead specimens in the evenly

Key to Species of *Leucothoides*

1. Palm of male gnathopod 2 slightly convex, palm of female gnathopod 2 straight *L. pacifica*
Palm of male gnathopod 2 concave, gnathopod 2 probably identical in both sexes 2
2. Process on article 5 of gnathopod 1 extending only one-third along article 6; one apical spine then extending remaining two-thirds, total of three apical spines
 *Leucothoides* species 2 from Micronesia
Process on article 5 of gnathopod 1 extending two-thirds along article 6, one apical spine extending remaining one-third, total of two apical spines 3
3. Head with rounded anteroventral corner 4
Head with small protrusion at anteroventral corner 6
4. Articles 5–6 of gnathopod 1 not grossly serrate on apposing margins *L. yarrega*, new species
Articles 5–6 of gnathopod 1 grossly serrate on apposing margins 5
5. Spines on article 6 of pereopods 1–2 unevenly distributed *L. pottsi*
Spines on article 6 of pereopods 1–2 evenly distributed
 *Leucothoides* species Q from *Albatross* 2406
6. Coxa 1 with second distal seta on ventral margin, article 2 of pereopod 5 broad, serrations on posterior edge of article 2 minute, setules inconspicuous
 *Leucothoides* species V from Loggerhead Key
Coxa 1 with both distal setae on apex, article 2 of pereopod 5 of medium expansion, serrations on posterior edge of article 2 forming conspicuous scallops, strong setules deeply inserted *L. torrida*, new species

rounded cephalic lobe. Three or four species therefore may occur in the Caribbean Sea. Before Shoemaker's holotype is dissected one must assemble diverse materials of Caribbean *Leucothoides* and resolve the taxonomic distinctions, then connect the holotype to one of the species. Meanwhile the Australian and tropical Pacific specimens can clearly be described as new species; one other new species or highly aberrant specimen occurs in Micronesia suggesting that every specimen of *Leucothoides* must be examined very carefully before identification is confirmed (note 1 misidentified specimens in J. L. Barnard (1965), see p. 105 herein *Leucothoides* species 2 from Micronesia).

Leucothoides pottsi Shoemaker

Leucothoides pottsi Shoemaker, 1933 [only the holotype, not pp. 249-250, fig. 3].

DIAGNOSIS.—Head evenly and broadly rounded at anteroventral corner; coxa 1 not covering anteroventral corner of head or eye; both setules situated on apex of coxa 1, anteroventral part not attenuate; articles 5-6 of gnathopod 1 serrate on apposing margins but on article 6 all serrations fully marginal as far as can be determined; spines on article 6 of pereopods 1-2 unevenly distributed; article 2 of pereopod 5 of broad form, posterior margin weakly serrate, setules weak and moderately inserted.

MATERIAL.—The holotype, USNM 52325.

Leucothoides species

Leucothoides pottsi Shoemaker, 1933:249-250, fig. 3 [but not the holotype].

DIAGNOSIS.—Head "quadrate" at anteroventral corner; coxa 1 almost reaching anteroventral corner of head and covering part of eye; anteroventral part of coxa 1 attenuate, setules unknown; articles 5-6 of gnathopod 1 serrate on apposing margins but on article 6 all serrations fully marginal; spines on article 6 of pereopods 1-2 unknown (on pereopod 5 evenly distributed); article 2 of pereopod 5 of broad form, posterior margin weakly serrate, setules present but insertion unknown.

Leucothoides torrida, new species

FIGURES 62h, 63h

Leucothoides pottsi.—Schellenberg, 1938:26-28, fig. 13.—J. L. Barnard, 1965:492-493; 1970:211-213, fig. 138 [not Shoemaker].

DIAGNOSIS.—Head with mammilliform protrusion at anteroventral corner; coxa 1 not covering anteroventral corner of head, both setules situated on apex; articles 5-6 of gnathopod 1 serrate on apposing margins; spines on article 6 of pereopods 1-2 unevenly distributed; article 2 of pereopod 5 of narrow form, posterior margin heavily scalloped, setules deeply inserted.

Mouthparts generally like those of *L. pottsi* as illustrated by Shoemaker (1933), but outer plate of maxilla 2 narrow (see Figure 63X2h), inner plate poorly setose; apex of right mandible and plates of maxilliped illustrated.

HOLOTYPE.—USNM 105713, ?sex, 1.75 mm.

TYPE-LOCALITY.—Abbott 177-G-5, Falarik Islet, Ifaluk, Micronesia, from turtle grass and *Halimeda* beds, lagoon shelf off southwest tip, barely exposed at low tide, 27 October 1953.

MATERIAL.—The holotype and one specimen from Abbott 158-159, Ella Islet, Ifaluk (in Barnard, 1965).

DISTRIBUTION.—Micronesia; Hawaii.

Leucothoides yarrega, new species

FIGURES 62f, 62f., 63f

DIAGNOSIS.—Head evenly rounded at anteroventral corner; coxa 1 not covering anteroventral corner of head or eye; both setules of coxa 1 situated at apex; articles 5-6 of gnathopod 1 lacking gross serrations on apposing margins, some specimens with extraordinarily minute marginal serrations on article 6; spines on article 6 of pereopods 1-2 evenly distributed; article 2 of pereopod 5 of broad form, posterior margin weakly scalloped, setules deeply inserted.

Mouthparts generally like those of *L. pottsi* as illustrated by Shoemaker (1933); on Figure 63 spine bases of right mandible shown as circles, inner plate of maxilla 1 broad and truncate, maxilla 2 of broad form as in *L. pottsi*, inner plate of maxilliped flat, spinose apical margin long as in

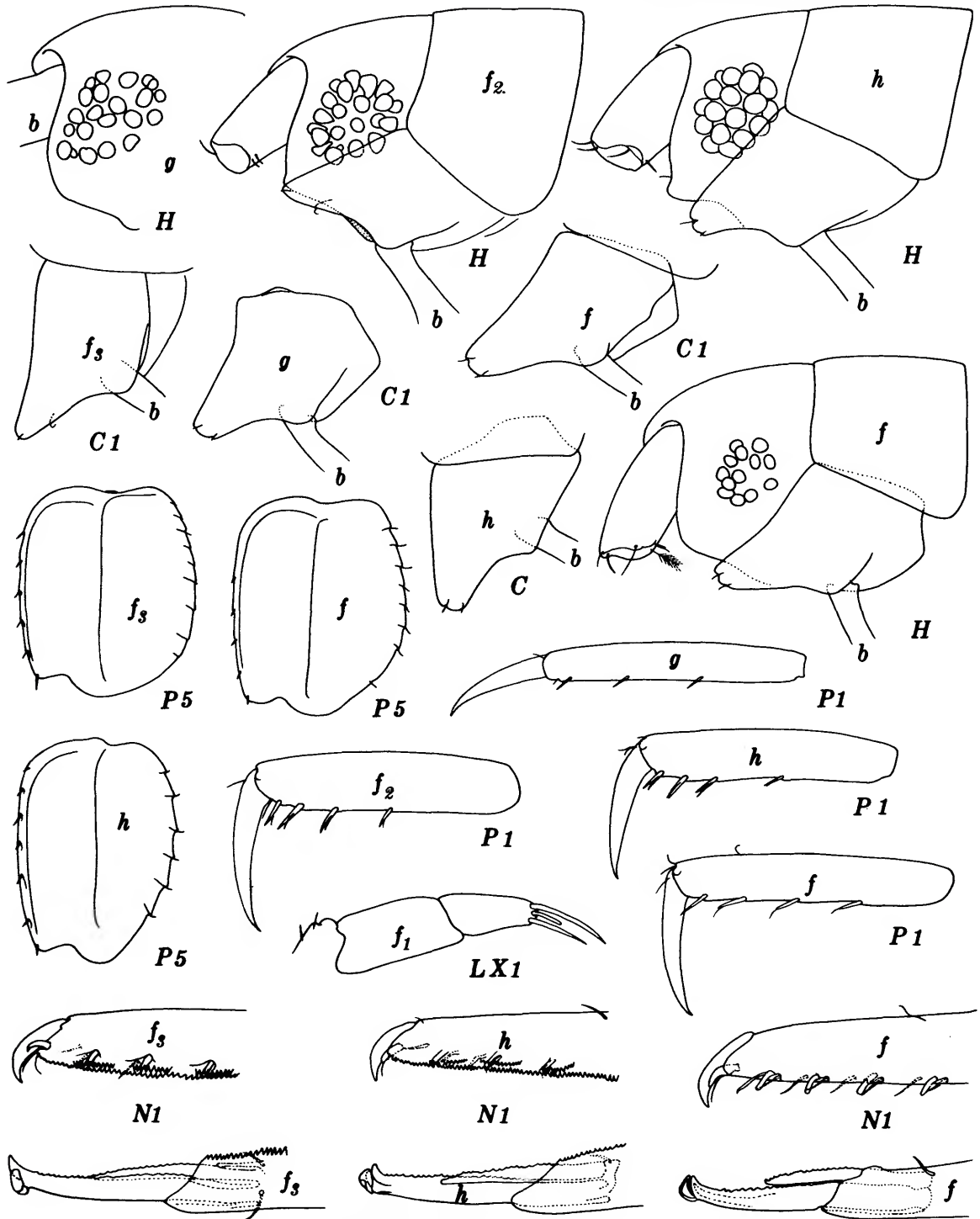


FIGURE 62.—*Leucothoides* species (see combined legend on Figure 63).

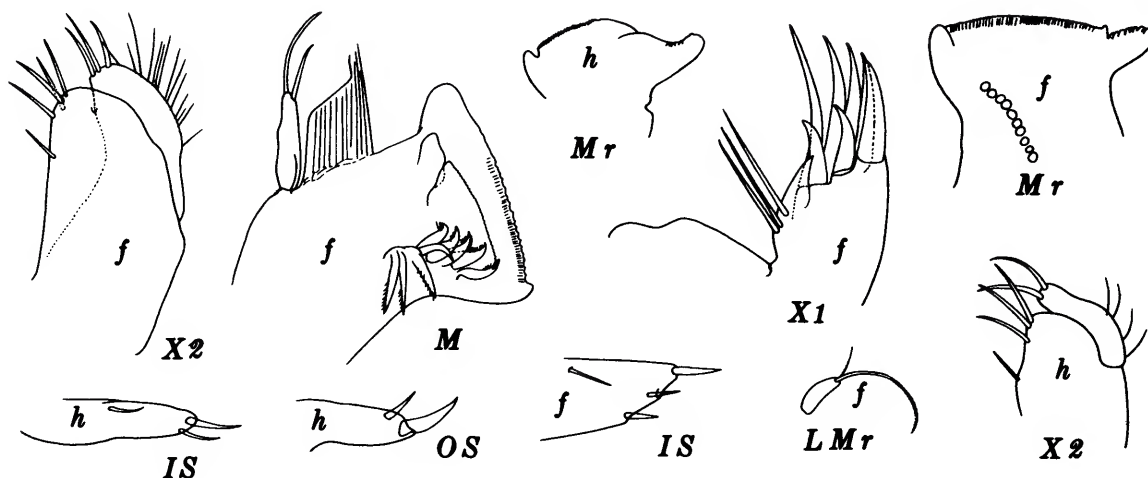


FIGURE 63.—Species of *Leucothoides*: *h*=*Leucothoides torrida*, new species, holotype, ?sex, 1.75 mm, Ifaluk; *f*=*Leucothoides yarrega*, new species, holotype, female, 2.05 mm, VicFish 512; *f*₁=female, 1.9 mm, VicFish 513; *f*₂=*Leucothoides* species V, Loggerhead Key, female, 2.22 mm; *f*₃=female, 2.32 mm; *g*=*Leucothoides* species Q, ?sex, 2.8 mm, Albatross 2406.

L. pottsi, bearing three spines, outer plate as shown for *L. torrida*.

HOLOTYPE.—NMV, female, 2.05 mm.

TYPE-LOCALITY.—VicFish 512, Western Port, Victoria, Station 41N-2-1+2, 42 feet, 30 March 1965.

MATERIAL.—Western Port, Victoria, VicFish, 4 samples (4).

DISTRIBUTION.—Western Port, Victoria.

Leucothoides species V from Loggerhead Key

FIGURES 62f2, 62f3, 63f2, 63f3

DIAGNOSIS.—Head with weak mammilliform protrusion at anteroventral corner; coxa 1 covering anteroventral corner of head and part of eye; one setule removed to ventral margin of coxa 1, other setule at apex; articles 5-6 of gnathopod 1 serrate on apposing margins; spines on article 6 of pereopods 1-2 unevenly distributed; article 2 of pereopod 5 of broad form, posterior margin weakly serrate, setular insertions deep and very weak.

Mouthparts like those shown by Shoemaker (1933) for *L. pottsi*.

MATERIAL.—Loggerhead Key, 10 August 1924, collected by W. L. Schmitt (2 females; *f*₂=female, 2.22 mm; *f*₃=female, 2.32 mm).

Leucothoides species Q from Albatross 2406

FIGURES 62g, 63g

DIAGNOSIS.—Head evenly and broadly rounded at anteroventral corner; coxa 1 not covering anteroventral corner of head or part of eye (as far as can be determined); both setules on coxa 1 situated at apex, anteroventral part of coxa 1 weakly attenuate; articles 5-6 of gnathopod 1 serrate on apposing margins; spines on article 5 of pereopods 1-2 evenly distributed; article 2 of pereopod 5 of broad form, posterior margin weakly serrate, setules unclear.

Differs from *L. pottsi* in uneven distribution of spines on pereopods 1-2.

Specimens are "mushy" and article 2 of pereopod 5 is covered with fibrous crystals, setules therefore poorly observed; position of head and coxa 1 also poorly observed.

MATERIAL.—Albatross 2406, Gulf of Mexico, 28° 46'00"N, 84°49'00"W, 26 fathoms, Blake trawl, coarse sand, 15 March 1885 (3 specimens; figured specimen, ?sex, 2.8 mm, denoted as "g").

Leucothoides species 2 from Micronesia

This species is characterized by the short process on article 5 of gnathopod 1. Only one specimen is

available. The characteristic may be an aberrancy but the specimen should not be destroyed by dissection in search of other characters until other material becomes available.

MATERIAL.—One specimen from Abbott 594, formerly identified as *L. pottsi* by J. L. Barnard (1965), specimen deposited in Smithsonian Institution. The two other specimens from this sample are apparently juveniles of *Leucothoe micronesiae* J. L. Barnard and are not *L. pottsi* as identified by Barnard (1965).

STENOTHOIDAE

Ausatelson J. L. Barnard

Ausatelson J. L. Barnard, 1972a:312.

The new species to be described below has a definite accessory flagellum composed of a very small cube bearing a reverted apical seta or aestheta. The accessory flagellum is tucked beneath the marginal chitin at the apex of article 3 on antenna 1. It is extremely small and scarcely resolvable

Key to Species of *Ausatelson*

- Coxa 4 with deep, narrow, crescent-shaped lateral pit; hump of pleonite 3 not protuberant; apical setae on mandibular palp closely appressed..... *A. ule*
 Coxa 4 with shallow, broad ventrolateral excavation extending nearly full length of coxa, crescentic pit absent but marked by closed chitin invagination; hump of pleonite 3 protuberant; apical setae on mandibular palp basally separate..... *A. kolle*, new species

under oil-immersion microscopy. Perhaps this feature was overlooked on the type-species although I searched for an accessory flagellum carefully on *A. ule*. In the diagnosis of *Ausatelson* the absence of an accessory flagellum must be altered to "accessory flagellum vestigial or absent"; in any respect this minor feature does not alter the basic distinction of *Ausatelson* from *Antatelson* J. L. Barnard.

Ausatelson kolle, new species

FIGURE 64

DESCRIPTION.—Pereonite 4 greatly elongate, bulging dorsally but not protuberant as in *A. ule*; pereonite 5 with weak lateral ridge locking posterodorsal margin of coxa 4; rostrum of medium size; eyes colorless in alcohol; anterolateral corner of head quadrate; article 1 of antenna 1 with large anterodistal process, articles 2–3 subequal to each other in length, vestigial accessory flagellum present; antenna 2 with article 3 curving medially around front of head, article 5 longer than 4; epistome unproduced, upper lip bilobate slightly asymmetrically; mandible bearing 1-articulate palp with two apical setae basally separate, left lacinia mobilis deeply serrate, right smooth and minutely tuberculate; lower lip with one cone on each main lobe, mandibular processes of medium development; palp of maxilla 1 biarticulate, outer plate with six

spines, inner with one long seta; maxilla 2 very small, inner lobe very short; inner plates of maxilliped with two spines, palp article 4 without distinct nail but apex very sharp; coxa 4 with most of ventrolateral area deeply excavate and bounded above by strong elliptic margin, excavate portion of coxa 4 very thin, upper portion thick, internal crescentic chitinous thickening closed externally and not forming strong medial shelf; pereopod 2 smaller than 1 but not "much" smaller as in *A. ule*; gnathopod 1 with very oblique palm, defined by three stout spines in tandem, dactyl smooth; palm of gnathopod 2 weakly oblique but well defined by obsolescent hump and two especially elongate spines, palm minutely denticulate, dactyl smooth; article 2 of pereopods 3–5 rectilinear, dactyls of all pereopods with apical hook and comb row of pectinations; pleonal epimera 1–3 with softly quadrate posteroventral corners; pleonite 3 with strong dorsal protuberance, 4 not strongly ridged or rugose, pleonites 5 and 6 small and not distinct from one another except by internal sclerites; telson huge, vertically compressed, lateral surface area subequal to lateral surface area of pleonite 4; uropods 1–3 very slender and elongate, uropod 3 uniramous, ramus biarticulate, article 2 as long as article 1; lower part of coxa 4, apex of hump on pleonite 3 and lateral surface of telson bearing pits, each pit with setule, some pits forming craters at

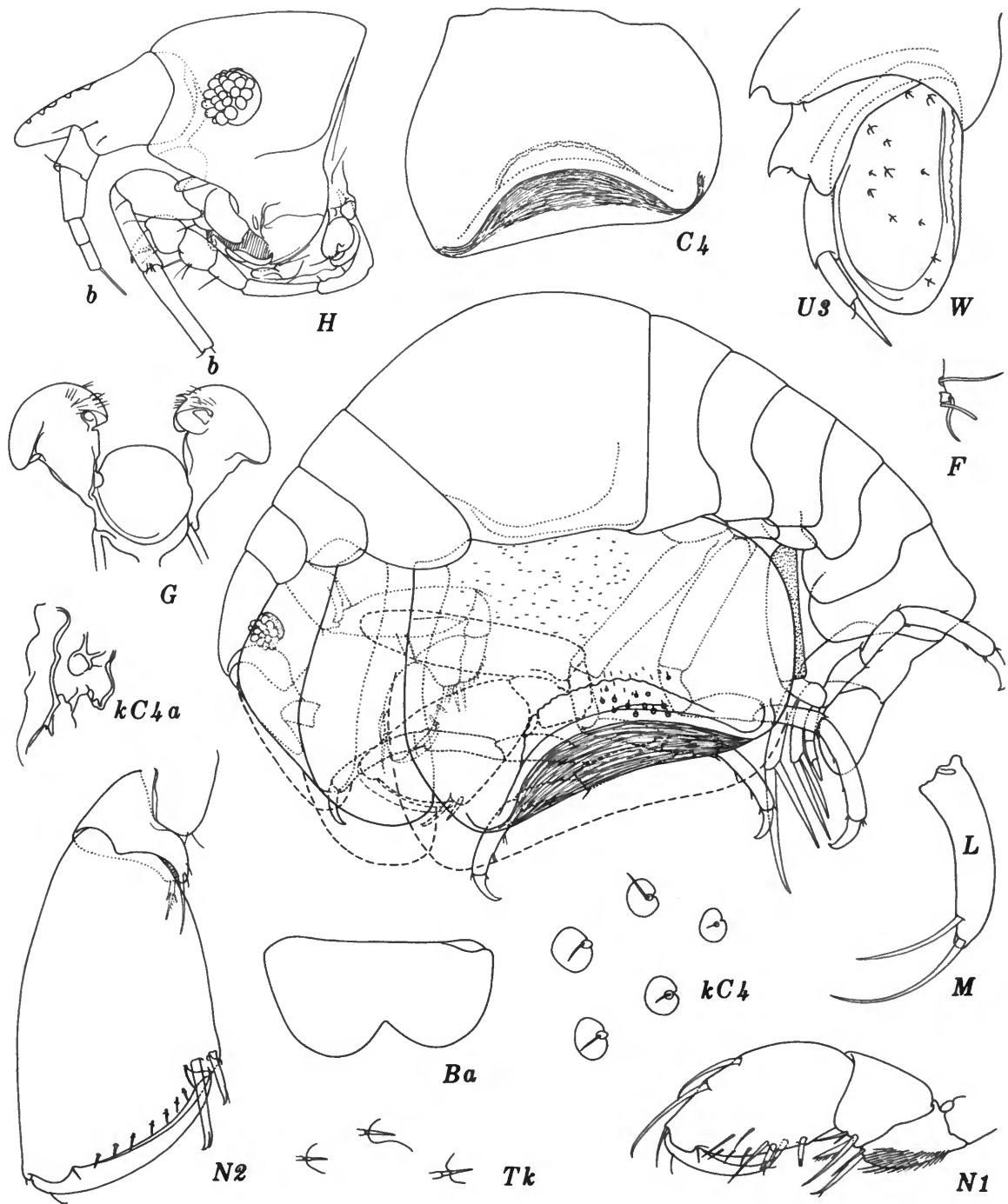


FIGURE 64.—*Ausatelson kolle*, new species, holotype, female, 2.5 mm, Shepherd 30.

heavily chitinized places, pits cordate but craters and pits generally far less abundant than in *A. ule*; body otherwise sparsely covered with setules in very small pits or pits decreasing in size to width of setule.

Description above comparable to that of *A. ule*, following notes representing additional points: Right and left mandibles with eight incisorial teeth, left lacinia mobilis with ten teeth; uropod 1 like that of *A. ule* but apicolateral peduncular margin with only one apical seta; uropod 3 with lateral seta at apex of article 1 and not on peduncle as in *A. ule*; mandibular palp more elongate than in *A. ule*; defining spines on gnathopod 2 more elongate; telson more circular from lateral view than in *A. ule*.

ILLUSTRATIONS.—The following parts conform so rigidly, except where noted in the descriptions, to views illustrated for *A. ule* that illustrations are not provided for *A. kolle*: mandibles, maxillae, maxillipeds, pereopods and their dactyls.

HOLOTYPE.—SAM, female, 2.5 mm, unique.

TYPE-LOCALITY.—Shepherd 30, Pearson Islands, South Australia, station B, 15–40 feet, algae, 8 January 1969.

RELATIONSHIP.—The main distinctions of this species from *A. ule* J. L. Barnard (1972a) are reflected in the key to the species of this genus. Besides those characteristics are the following: less protuberant pereonite 4, more circular telson, longer defining spines of gnathopod 2.

DISTRIBUTION.—Pearson Islands, South Australia, 5–12 m.

Chucullba, new genus

DIAGNOSIS.—Gnathopods 1–2 subchelate, similar to each other in size and shape, highly elongate, palms oblique but shorter than posterior margins of hands; mandible lacking palp (highly vestigial); palp of maxilla 1 biarticulate; antenna 1 bearing or lacking nasiform process on article 1; pereopods 3–5 with rectilinear article 2; pereonite 4 elongate; pleonites 5–6 coalesced basally; telson small, horizontally arranged but fleshy and tall, much smaller than pleonite 4, latter with dorsal enlargement, pleonite 3 dorsally normal; uropod 3 with one article; inner rami of uropods 1–2 shortened.

TYPE-SPECIES.—*Chucullba alla*, new species (here designated).

RELATIONSHIP.—The italicized portion of the diagnosis distinguishes this genus from *Parathaumatelson* Gurjanova, based on the unique species *Metopella nasica* Stephensen (1927) from the Auckland Islands. Two new species are described in *Chucullba*, one with, the other without, a nasiform projection on antenna 1. The usefulness of this as a generic character is thus diminished in other thaumatelsonin genera, and lessens the distinctions between *Thaumatelson* Walker and *Antatelson* J. L. Barnard (1972a). The two genera can now be maintained only on the dissimilarity between gnathopods 1–2 in *Thaumatelson* and their similarity in *Antatelson*.

The reduction of uropod 3 is unusual in Stenothoidae, only *Raumahara* showing a degree of reduction.

Key to Species of *Chucullba*

- Article 1 of antenna 1 with nasiform process; dactyls of pereopods not pectinate on inner margins *C. alla*, new species
 Article 1 of antenna 1 simple; dactyls of pereopods with strong pectinae on inner margins *C. warea*, new species

Chucullba alla, new species

FIGURES 65, 66

DIAGNOSIS.—Ocular lobe strongly projecting, triangular; article 1 of antenna 1 with large nasiform process; inner plate of maxilla 1 with seta; inner plate of maxilla 2 poorly developed but definitely projecting, bearing two setae, one of them apical; locking spines of pereopods with excavate tips;

dactyls of pereopods smooth except for inner sub-terminal recumbent setule; inner rami of uropods 1–2 of equal length and about 25 percent as long as outer ramus of uropod 1; epimeron 2 with weakly protuberant, softly quadrate posteroventral corner.

DESCRIPTION.—Midcephalic keel weakly protuberant and separated from softly conical epistome by distinct notch; pereopod 2 as large as pereopod 1,

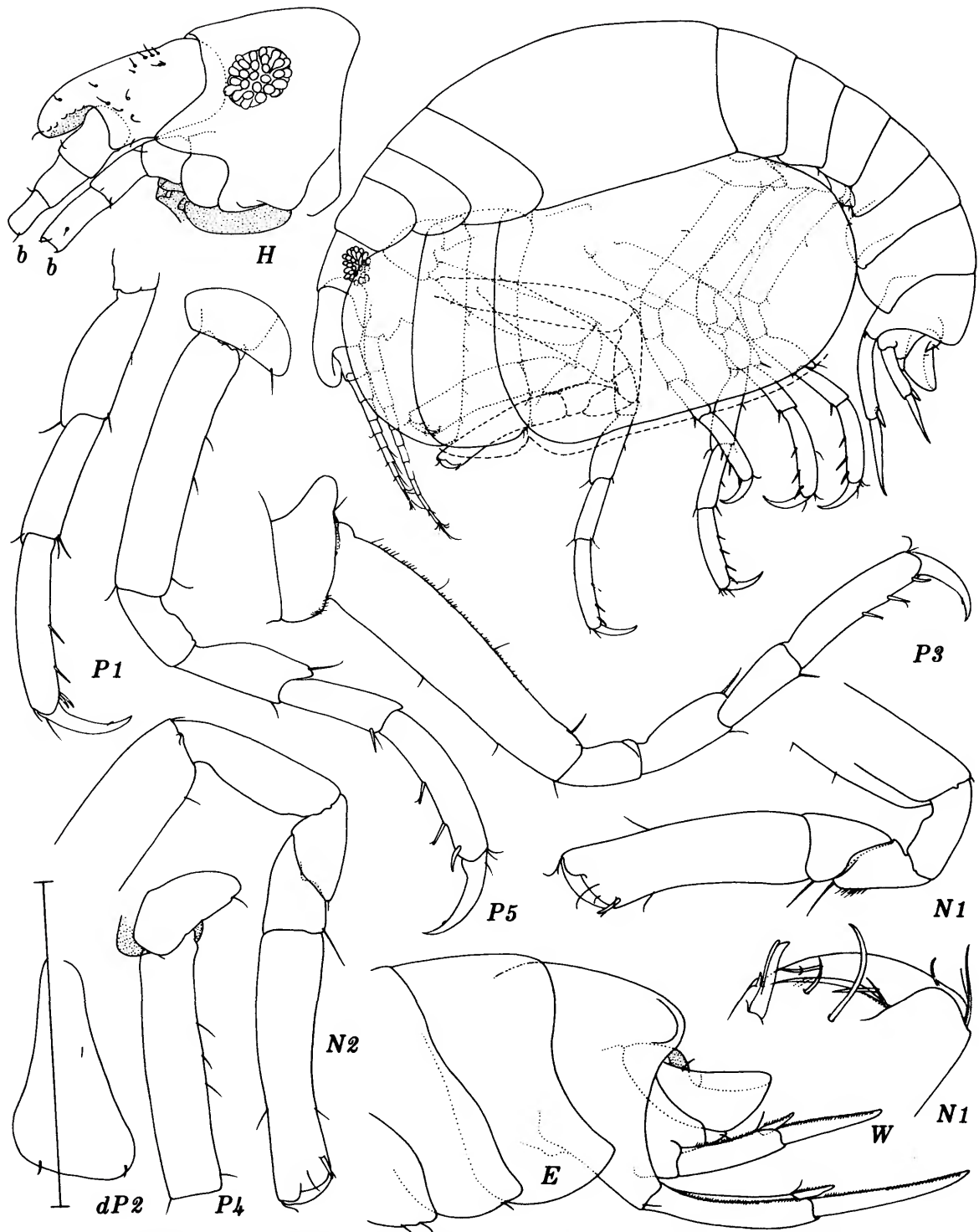


FIGURE 65.—*Chucullba alla*, new genus, new species, holotype, female, 1.41 mm, JLB Australia 13; scale on *dP2* is length of article 2.

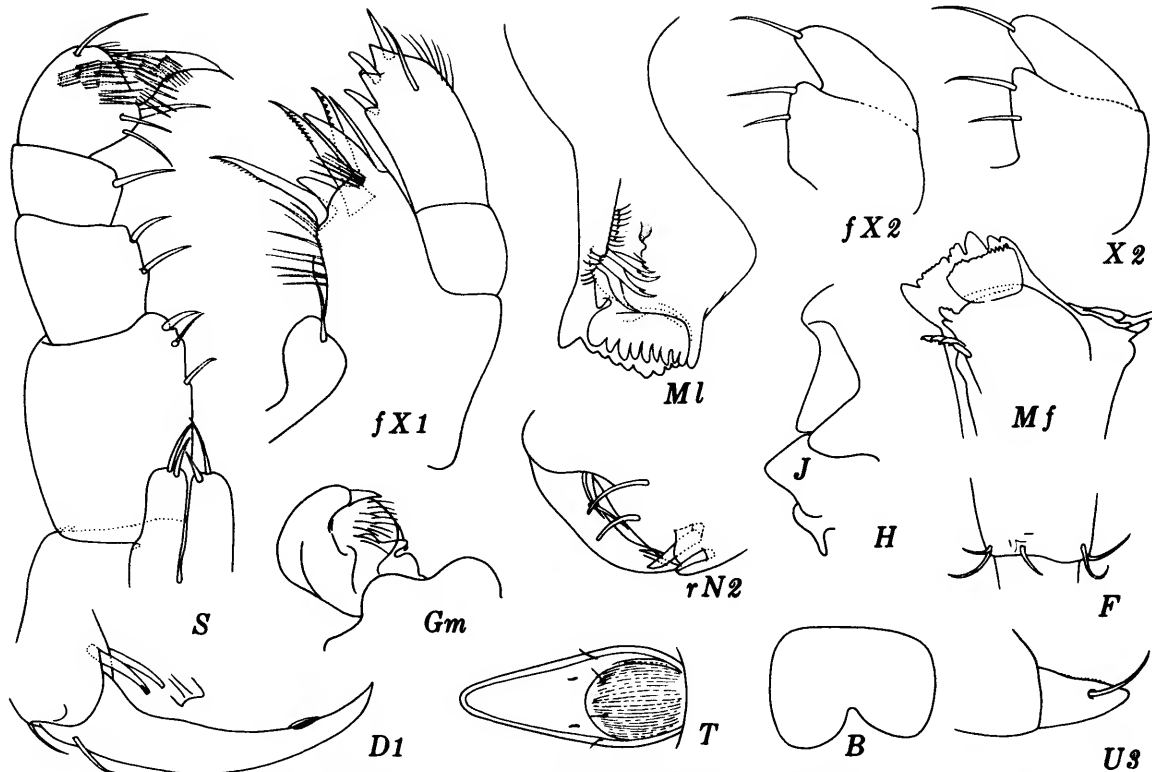


FIGURE 66.—*Chucullba alla*, new genus, new species, holotype, female, 1.41 mm, JLB Australia 13; f=female, 1.34 mm; m=male, 1.25 mm; G is half of lower lip.

article 6 with three posterior spines besides locking pair, article 5 with one posterior spine (no posterior spine on pereopod 1); other attributes in figures.

MALE.—Resembling female except for brood plates and penial processes; females easily recognized on slides observed by transmitted light as brood pouch projecting strongly dorsad to squeeze body cavity nearly to dorsal segmental margin; male “brood pouch” of normal dimensions.

HOLOTYPE.—WAM, 134-71, female, 1.41 mm.

TYPE-LOCALITY.—JLB Australia 13, Middleton Beach, Albany, Western Australia, intertidal, wash of sandy rocks, coralline algae, 30 September 1968.

REMARKS.—See *Chucullba warea* for comparisons.

MATERIAL.—JLB Australia 4 (1), 5 (11), 11 (10), 12 (26), 13 (30); Slack-Smith 2 (5).

DISTRIBUTION.—Western Australia, Cheyne Beach to Cape Naturaliste.

Chucullba warea, new species

FIGURES 67, 68

DIAGNOSIS.—Ocular lobe moderately projecting, mammilliform; article 1 of antenna 1 simple; inner plate of maxilla 1 lacking seta; inner plate of maxilla 2 poorly developed and scarcely projecting, medially truncate, bearing one midseta, not apical; locking spines of pereopods apically sharp; dactyls of pereopods strongly serrate on inner edges; inner rami of uropods 1-2 subequal in length, between 45 and 55 percent as long as outer ramus of uropod 1; epimeron 2 softly quadrate posteroventrally, not protuberant.

DESCRIPTION.—Midcephalic keel obsolescent, scarcely distinct from epistome except by weak acclivity; maxilla 1 like that of *C. alla* but inner plate lacking seta and article 2 of palp lacking facial seta; upper lip like that for *C. alla* (Figure 66B)

urosome drawn as if all normal chitinous edges present but uropod 3 probably fused to pleonite 6 and probably pleonites 5-6 also coalesced.

MALE.—Resembling female except for brood plates and penial processes.

HOLOTYPE.—WAM, 135-71, female, 1.19 mm.

TYPE-LOCALITY.—JLB Australia 5, west of Bunker Bay, Cape Naturaliste, Western Australia, intertidal, wash of algae and rocks, 2 September 1968.

RELATIONSHIP.—This species is distinguished

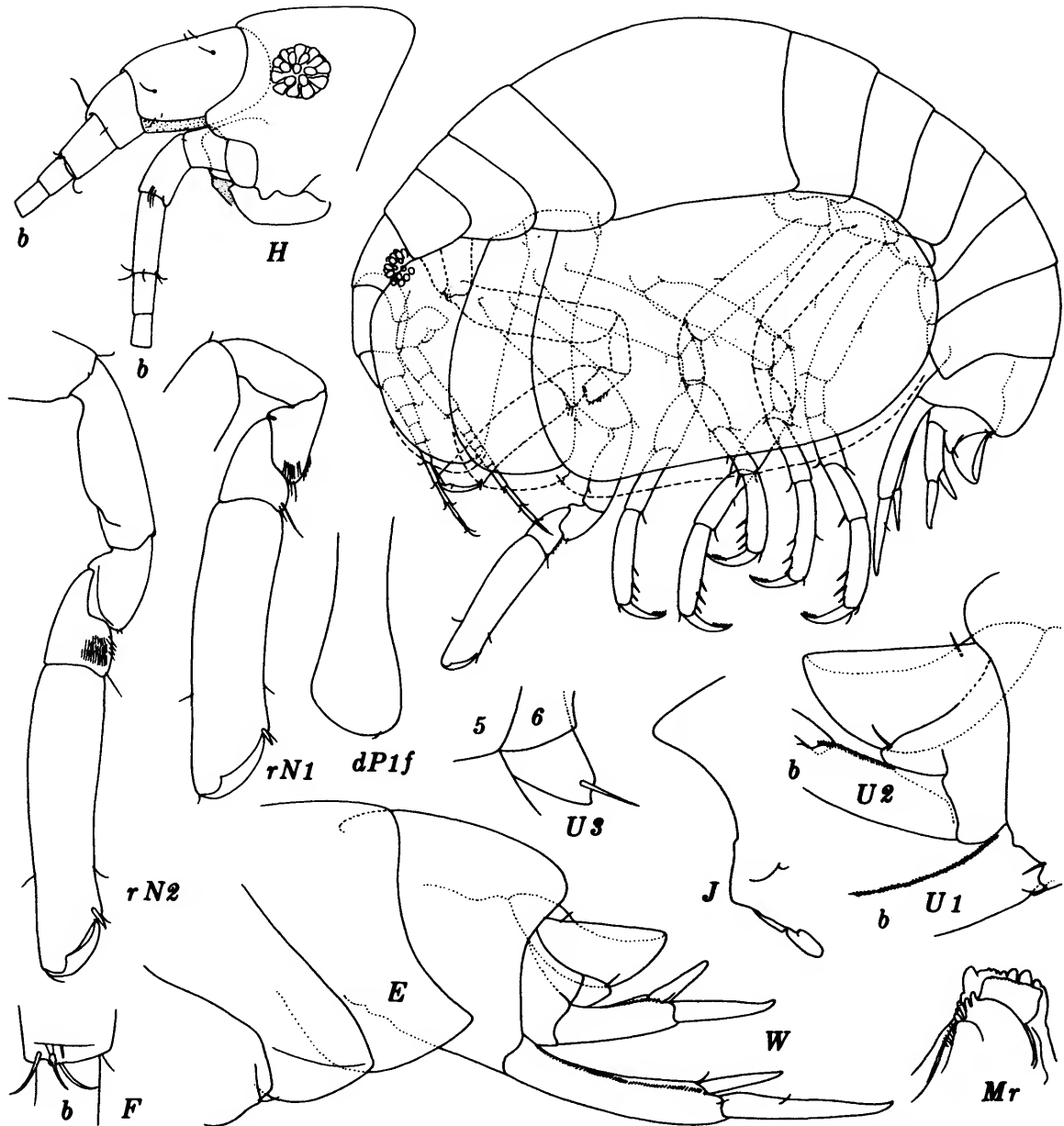


FIGURE 67.—*Chucullba warea*, new species, holotype, female, 1.19 mm, JLB Australia 5; f=female, 1.07 mm.

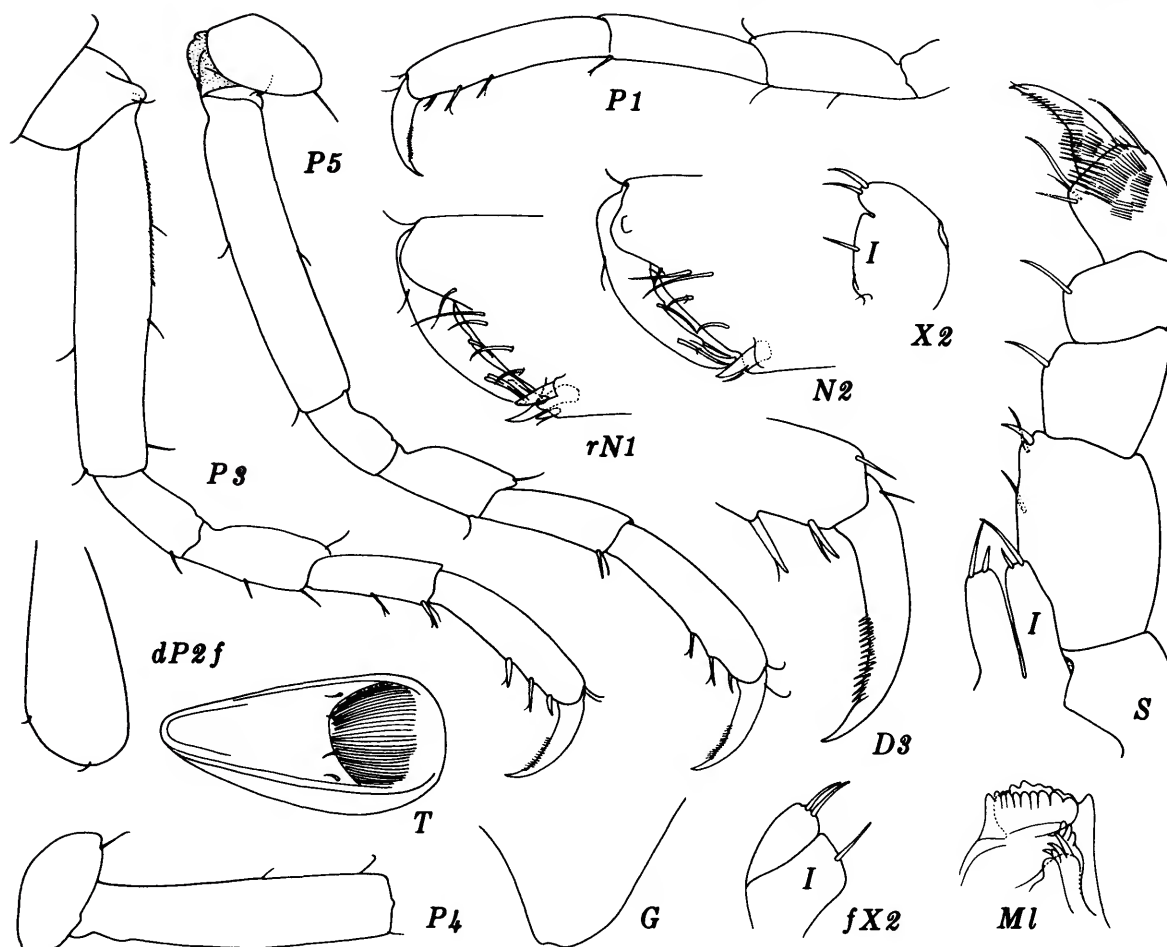


FIGURE 68.—*Chucullba warea*, new species, holotype, female, 1.19 mm, JLB Australia 5; f=female, 1.07 mm; G is mandibular lobe of lower lip.

from *C. alla* by each statement of the diagnosis. The presence of a nasiform process on article 1 of antenna 1 has heretofore been accorded generic value but the other close similarities of *C. alla* and *C. warea* do not warrant such division presently.

MATERIAL.—JLB Australia 5 (6).

DISTRIBUTION.—Cape Naturaliste, Western Australia.

Raumahara J. L. Barnard

Raumahara J. L. Barnard, 1972a:318

With the description of a new Australian species below, *Raumahara* now contains four species, *R.*

rongo J. L. Barnard (1972b), from New Zealand, *R. carinatum* (Shoemaker, 1955, from Alaska), the type-species *R. dertoo* J. L. Barnard (1972a) from Western Australia, and *R. noko*, new species. The diagnosis of the genus given by J. L. Barnard (1972a) is not adequate to demonstrate the diversity of species in this genus and perhaps several genera will be found within *Raumahara*, but presently any division seems unwise as several more southern species may be found and certain other problems arise. For example, the importance of a nasiform process on article 1 of antenna 1 is strongly lessened by the discovery of a new genus, *Chucullba*, in which one species has that process and

the second lacks it. This lessens the differences between *Raumahara* and *Prothauematelson*, as the latter has this process. The size and fleshiness of the telson also vary slightly in *Raumahara*, *R. dertoo* having the largest and the least dorsal depression of the telson. The dorsal extension of pleonite 4 also varies in *Raumahara*, *R. dertoo* having the greatest expression of this condition, but the new species, *R. noko*, also having a moderately extended pleonite 4. The large, 1-articulate palp of *Prothauematelson* remains a good character although certain species of *Raumahara* apparently have an extremely minute palp bearing a seta.

Two species, *R. dertoo* and *R. noko*, have chelate gnathopod 1 whereas the others have a subchelate gnathopod 1 with either transverse or oblique palm. *Raumahara rongo* differs from the two Australian species in the extremely long telson with numerous dorsal setules. *Raumahara dertoo* differs from *R.*

rongo and *R. noko* in the absence of a strongly produced midcephalic keel above the epistome. *Raumahara noko* has a bipartite accessory flagellum unlike *R. rongo* and *R. dertoo*. Where unmentioned, *R. carinatum* is unknown in these characters. Uropod 3 is not clearly 3-articulate in any species of *Raumahara* as the third segment is definitely a seta in *R. dertoo* and possibly a heavy spine in *R. noko* and *R. rongo*.

In the following characters *R. dertoo* differs strongly from the other species: midcephalic keel, uropod 3, telson, and the degree of extension on pleonite 4. It is linked to the other species, however, in its chelate gnathopod 1 by *R. noko* which has an enlarged chela on gnathopod 1; its accessory flagellum is also similar to that of other species.

Raumahara remains distinct from *Prothauematelson* in the simple article 1 of antenna 1 and the smallness of the telson.

Key to Species of *Raumahara*

- 1. Gnathopod 1 chelate 2
- Gnathopod 1 subchelate 3
- 2. Ocular lobe short, not reaching halfway along article 1 of antenna 1, article 3 of uropod 3 composed of thin, flexible seta..... *R. dertoo*
- Ocular lobe reaching more than halfway along article 1 of antenna 1, article 3 of uropod 3 composed of stout, inflexible spine..... *R. noko*, new species
- 3. Palm of gnathopod 1 oblique..... *R. carinatum*
- Palm of gnathopod 1 transverse..... *R. rongo*

***Raumahara dertoo* J. L. Barnard**

FIGURES 69, 70

Raumahara dertoo J. L. Barnard, 1972a:318, figs. 193, 194.

DIAGNOSIS.—Ocular lobe small, projecting less than halfway along article 1 of antenna 1; midcephalic keel obsolescent; article 2 of antenna 1 scarcely lobed; article 3 of antenna 2 of normal length; inner plate of maxilla 2 with apical seta; outer plate of maxilla 2 with basolateral seta; gnathopod 1 strongly chelate; pleonite 4 strongly extended dorsally; urosomite 3 scarcely distinct; segment 3 of uropod 3 composed of thin flexible seta; telson thick dorsoventrally, poorly setiferous.

MALE.—Like the female except for brood plates and penial processes.

REMARKS.—The upper lip figured on the epistome (Figure 69b) is not flattened. Pereopod 2 is slightly shorter than pereopod 1.

One juvenile, 1.0 mm, from JLB Australia 11, has shortened inner rami of uropod 2; the inner ramus is about 60 percent as long as the outer.

MATERIAL.—JLB Australia 5 (2), 11 (5), 12 (21), 14 (11).

DISTRIBUTION.—Western Australia, Cape Naturaliste to Albany.

***Raumahara noko*, new species**

FIGURES 71, 72

DIAGNOSIS.—Ocular lobe large, projecting more than halfway along article 1 of antenna 1; midcephalic keel moderately developed, apex mammiliform and separated from epistome by wide notch; article 2 of antenna 1 weakly lobed mediodorsally; article 3 of antenna 2 exceptionally short for genus; inner plate of maxilla 1 with apical seta; outer plate of maxilla 2 with basolateral seta; gnathopod

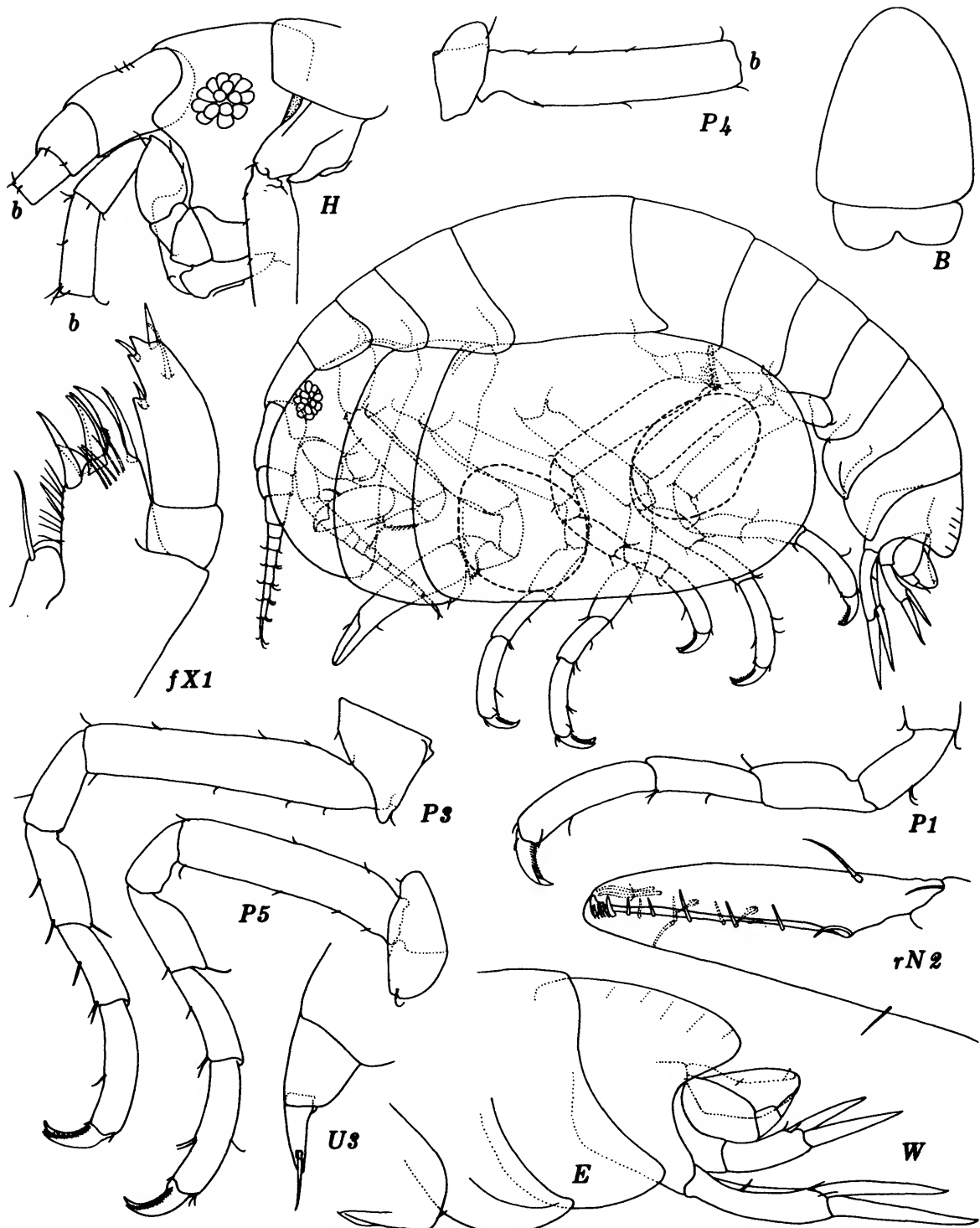


FIGURE 69.—*Raumahara dertoo* J. L. Barnard, female, 1.48 mm, JLB Australia 12; f=female, 1.47 mm, note 2 ovate eggs outlined in brood pouch.

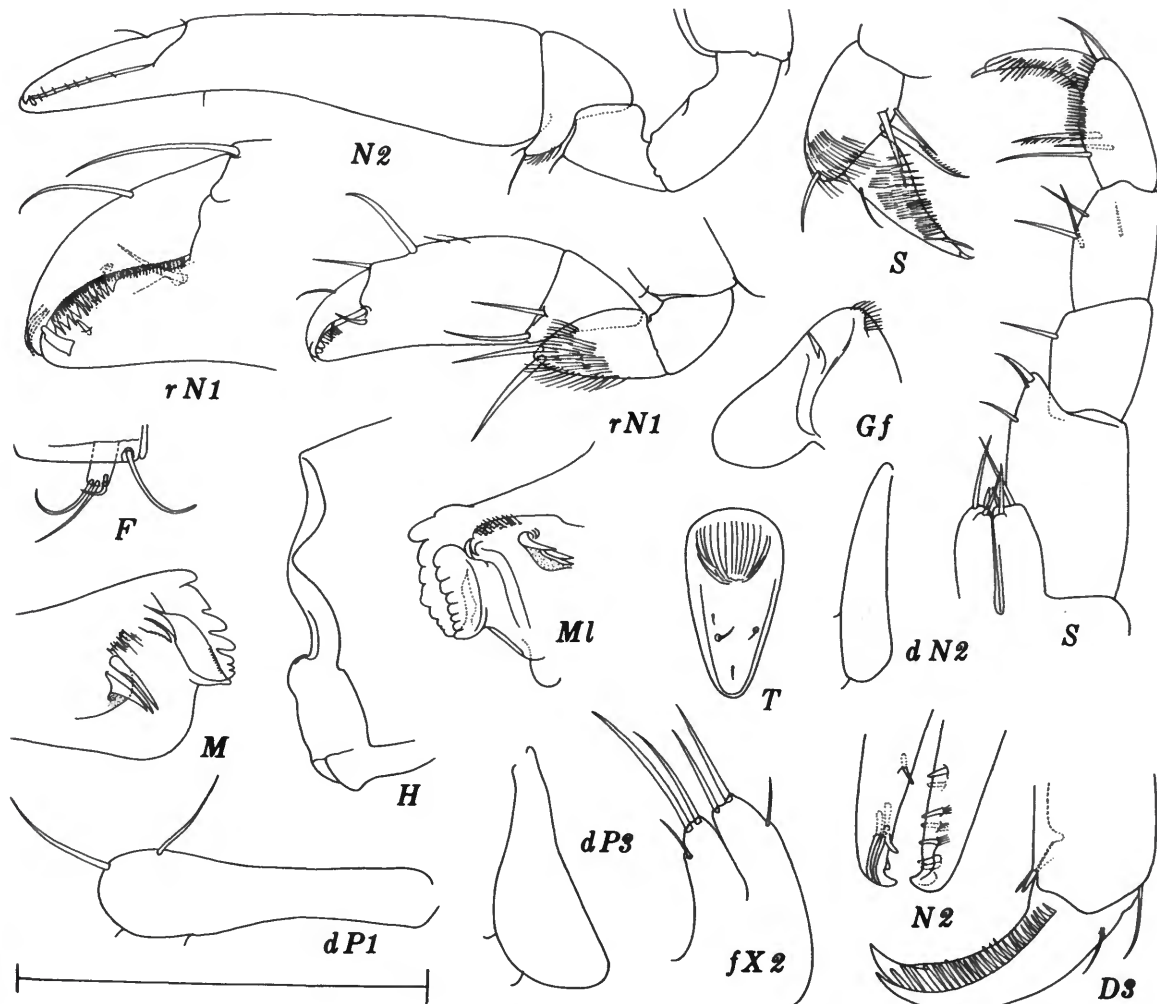


FIGURE 70.—*Raumahara dertoo* J. L. Barnard, female, 1.48 mm, JLB Australia 12; f=female, 1.47 mm; scale near *dP1* is length of article 2.

1 strongly chelate; pleonite 4 moderately extended dorsally; urosomite 3 very distinct; segment 3 of uropod 3 composed of heavy inflexible spine, article 2 also with apical setule; telson flat, poorly setiferous.

HOLOTYPE.—SAM, female, 1.60 mm. Unique.

TYPE-LOCALITY.—Shepherd 52, Pearson Islands, South Australia, Station B, 60–80 feet, in algae, 8 January 1969.

REMARKS.—The diagnosis is comparable to that written for *R. dertoo* and emphasizes the differences

in ocular lobe, article 2 of antenna 1, article 3 of antenna 2, pleonite 4, uropod 3, and telson.

Illustrations not presented for *R. noko* resemble those presented for *R. dertoo*: body, maxilla 1; pereopod 5 but articles 4–6 thinner and article 6 about 14 percent longer than in *R. dertoo*. Maxilla 2 is figured but the alternate side lacks the third subbasal seta on the inner plate.

DISTRIBUTION.—Pearson Islands, South Australia, 18–24 m.

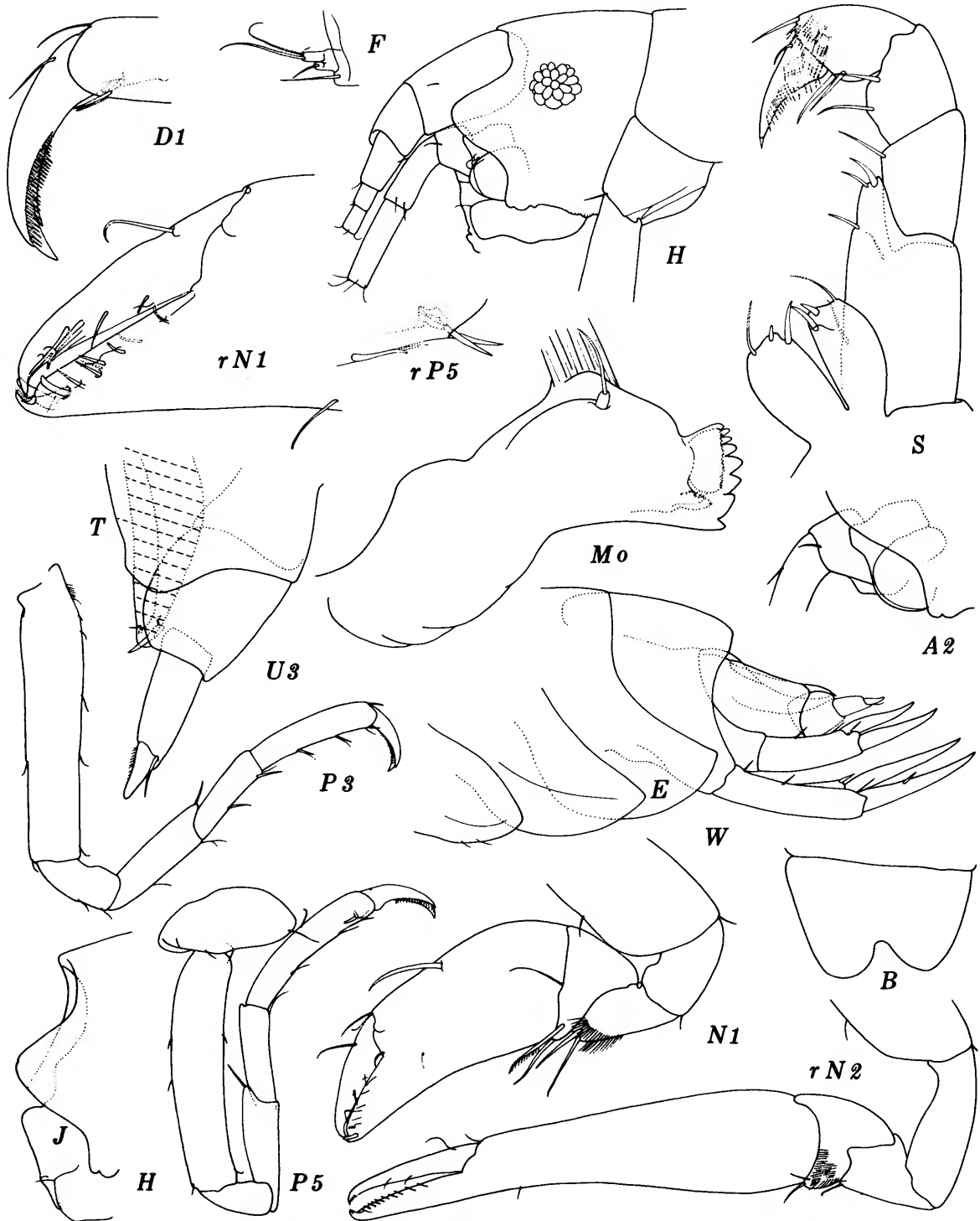


FIGURE 71.—*Kaumahara noko*, new species, holotype, female, 1.60 mm, Shepherd 52.

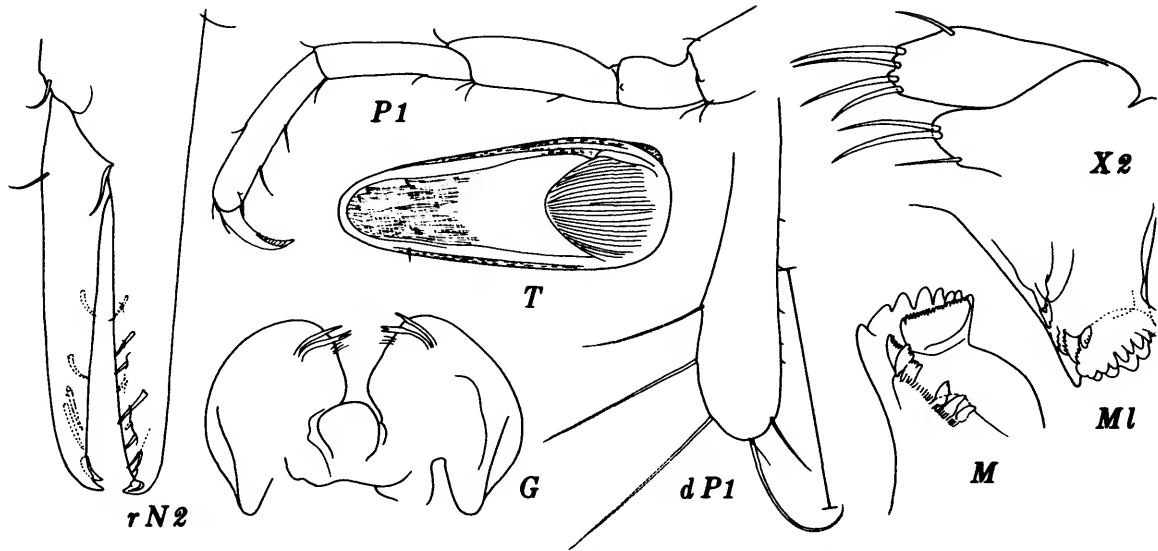


FIGURE 72.—*Raumahara noko*, new species, holotype, female, 1.60 mm, Shepherd 52; scale near *dP1* is length of article 2.

***Stenothoe* Dana**

REMARKS.—In the following species described from Australia the accessory flagellum is extremely small, mostly hidden under the apical margin of chitin on article 3 of antenna 1. The outer plate of maxilla 1 is consistently armed as shown for *S. allinga*, new species. The outer setae or setules described on the gnathopodal dactyls do not include the regular basal seta found on most gam-

marideans and also present on these species of *Stenothoe*.

A seta on the mandible represents the obsolescent palp but juveniles of several species also have a minute flabby article tipped with a seta.

Affinities of these species are difficult to ascertain because various characters have not been reported in described species; especially important is the condition of maxilla 2; this appendage is very distinctive in the group of species represented by *S.*

Key to Species of *Stenothoe* from Australia

1. Article 2 of pereopods 4-5 equally broad and similar in ovate dimensions, apices of pereopods 1-3 grossly similar to one another 2
- Article 2 of pereopod 4 narrower than article 2 of pereopod 5, pereopod 2 thicker, shorter and usually more spinose than pereopods 1 and 3 5
2. Peduncle of uropod 1 with long ventral tooth between rami *S. ?miersi* 3
- Peduncle of uropod 1 lacking tooth 3
3. Posterior margin of male coxa 2 excavate *S. valida* 4
- Posterior margin of male coxa 2 straight 4
4. Subapical setule on pereopodal dactyls thin and erect, outer ramus of uropod 2 shortened *S. quabara*, new species
- Subapical setule on pereopodal dactyls membranous and recumbent, rami of uropod 2 extending equally *S. allinga*, new species
5. Coxa 4 ventrally excavate, article 1 of uropod 3 with apical setule, inner rami of uropods 1-2 naked, articles 5-6 of pereopods 2, 4, 5, with granules *S. woka*, new species
- Coxa 4 ventrally convex, article 1 of uropod 3 with two apical spines, inner rami of uropods 1-2 spinose, articles 5-6 of pereopods 2, 4, 5 lacking granules *S. nonedia*, new species

gallensis, *S. valida*, and *S. miersi*.

The presence of dorsal marginal spines on article 1 of the ramus on uropod 3 is apparently a good taxonomic feature; an extra set of facial spines on that ramus also demonstrates that the specimens identified as *S. cattai* from the Mediterranean by Chevreux and Fage (1925) deserve a new name. The lengths and spination of rami on uropods 1-2, the shapes of the plates on the maxilliped, the beveling on the palp of maxilla 1 and the shape of the prebuccal mass also hold specific values.

Stenothoe allinga, new species

FIGURES 73, 74

DESCRIPTION OF FEMALE.—Lateral cephalic lobe strongly projecting, submammilliform, but subtruncate apically, anteroventral corner of head with rugose projection; prebuccal mass bulky, protuberant, epistomal and labral portions not distinct, epistomal part forming linguiform piece projecting forward from upper midcephalic keel, latter weakly conical, apically rounded; mediobasal part of article 1 on antenna 1 not strongly extended; accessory flagellum barrel-shaped, bearing one long seta and one small oval aesthetasc; lobes of upper lip long, subequally projecting, with middle gape; inner plate of maxilla 1 evenly ovate, lacking seta, palp with about seven or eight marginal spines extending mediobasally halfway or more, apicolateral margin of palp not beveled, article 1 tumid; inner plate of maxilla 2 subfalciform, bearing about three medial setae and pair of apical setal spines, outer plate thin and elongate, slightly curved inward, setal spines short; inner plates of maxilliped long, subrectangular, bearing 2-4 apical setae, outer plate of ordinary size, article bearing outer plate with several ventrolateral setae; coxae 1-4 of ordinary dimensions, ventral margin of coxa 4 convex; article 5 of gnathopod 1 with narrow but tumid posterior lobe, hand long, palm subtransverse, dactyl with one or two outer marginal setae at mark 50, inner margin lacking tooth, anteromedial margin of hand with several groups of one or two setae each, no transverse set; gnathopod 2 ordinary, article 4 with blunt posterodistal corner, palm oblique but well marked by shape from posterior margin, dactyl lacking tooth and bearing weak outer seta near mark 60; pereopods 1-2 not

grossly distinct from each other, pair of locking spines on all pereopods distinct from nearby marginal spines, apically blunt, dactyl with membranous and recumbent distal setule; article 2 of pereopods 4-5 equally broad, anterolateral facial ridge crowded toward anterior margin; peduncle of uropod 1 with crowded cluster of apicolateral spines, no distoventral tooth, rami equal to each other in extension, both spinose, outer with about four spines, inner with about two spines, peduncle of uropod 2 with pair of apicolateral spines, rami extending equally, outer with two spines, inner with none or one; peduncle of uropod 3 with one dorsomarginal spine, one apical spine, article 1 of ramus with pair of dorsodistal spines; telson long and slender, with three spines basolaterally on each side, no setules; epimera 1-3 each with small blunt posteroventral tooth, epimeron 1 with ventromarginal row of setules.

MALE.—Unknown.

HOLOTYPE.—WAM, 128-71, ovigerous female, 3.8 mm.

TYPE-LOCALITY.—JLB Australia 11, Middleton Beach, Albany, Western Australia, intertidal, wash of algae and rocks, 30 September 1968.

REMARKS.—The enlarged figure of the pleon has omitted the dorsal line of pleonite 6 coursing just below the upper margin of the spinose telson.

In terms of coxa 2, the equally extending rami of uropod 2, the absence of middorsal marginal spines on article 1 of the ramus on uropod 3, this species has affinities with the North Atlantic group of species typified by *S. monoculoides* (Montagu) and *S. brevicornis* Sars. *Stenothoe allinga* differs from those species in the bluntness of the ocular lobe and the presence of spines on the telson.

Stenothoe allinga differs from *S. aucklandicus* Stephensen (1927), in the extended ocular lobe, shorter palm of female gnathopod 2 lacking a mid-cusp and the spinier uropods 1-2.

Stenothoe haleloke J. L. Barnard (1970) from Hawaii and *S. tergestina* (Nebeski) (= *S. spinimana* Chevreux) from the Mediterranean differ from *S. allinga* in the presence of middorsal marginal spines on article 1 of the ramus of uropod 3, and in the poorly developed outer plate of the maxilliped.

Stenothoe allinga differs from *S. moe* J. L. Barnard (1972b), from New Zealand, in the extended and truncate ocular lobe, and the erect dactylar seta of pereopods 1-5.

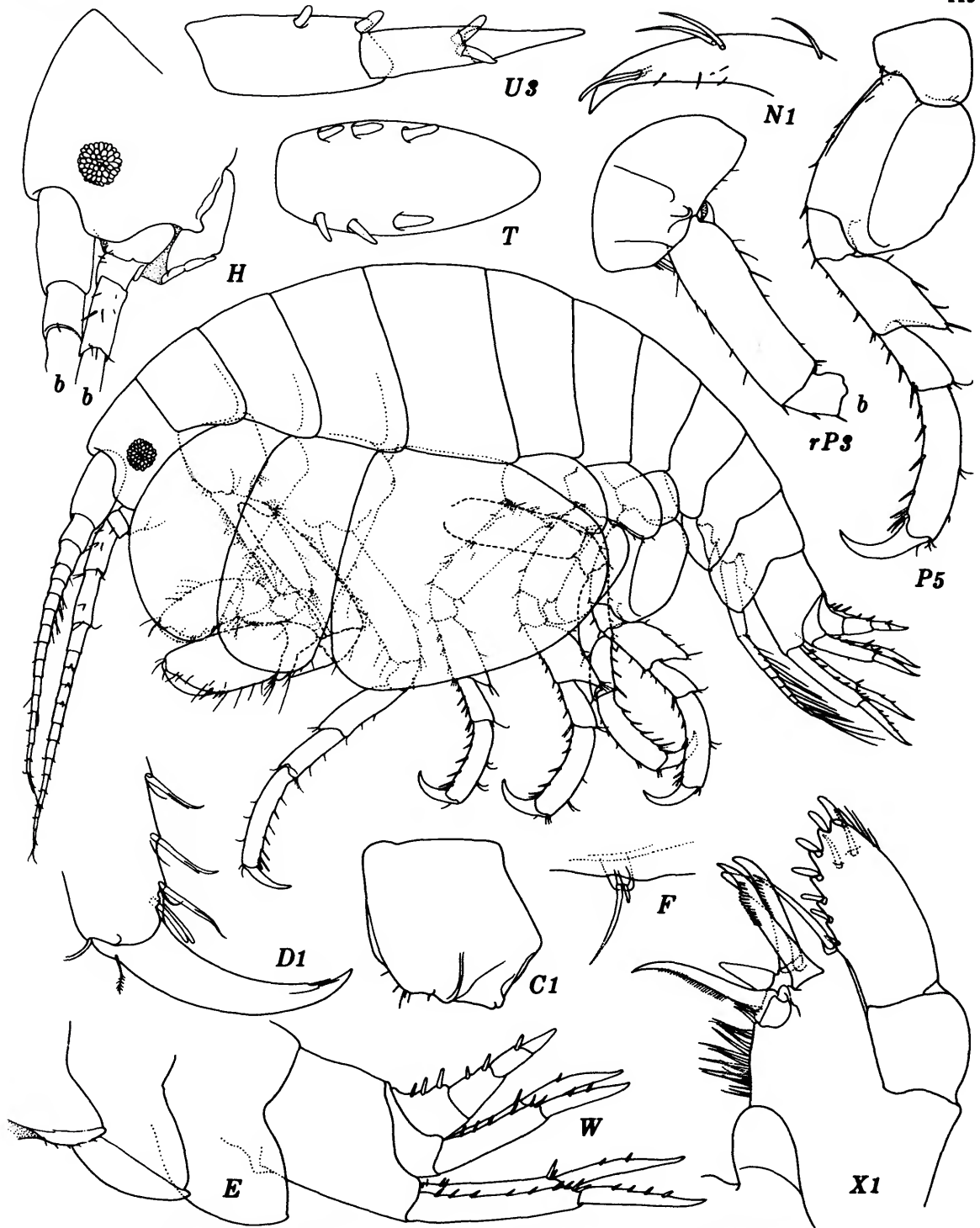


FIGURE 73.—*Stenothoe allinga*, new species, holotype, female, 3.8 mm, JLB Australia 11.

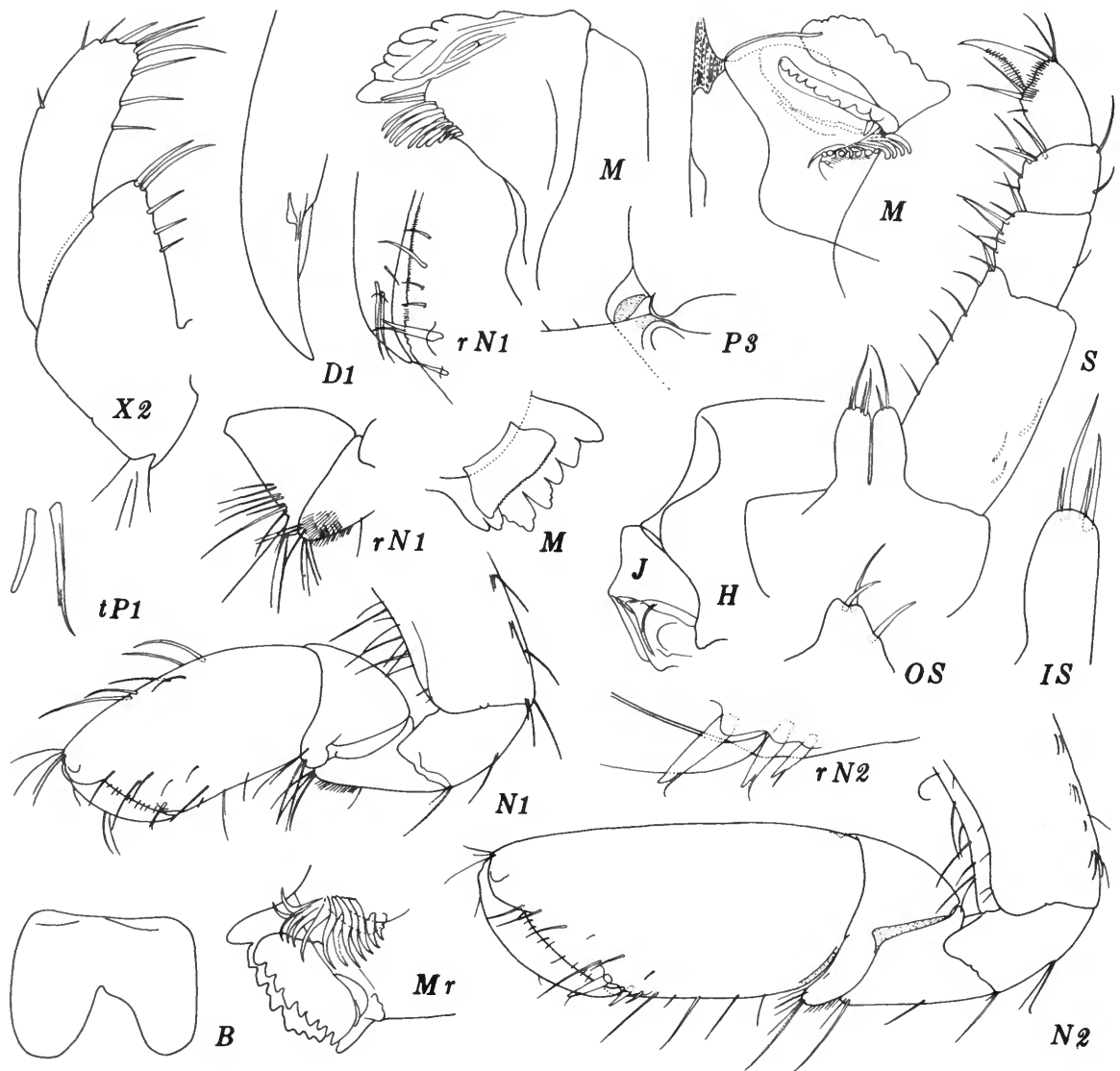


FIGURE 74.—*Stenothoe allinga*, new species, holotype, female, 3.8 mm, JLB Australia 11.

MATERIAL.—JLB Australia 11 (3), 12 (1), 13 (2).

DISTRIBUTION.—Middleton Beach, Albany, Western Australia, intertidal.

***Stenothoe ?miersi* (Haswell)**

FIGURES 75, 76

?*Montagua Miersii* Haswell, 1880c:323, pl. 24: fig. 4.

NOMENCLATURE.—Original material of this species is missing from either the Macleay Museum or The Australian Museum and only a few points of possible similarity to Haswell's description and figures can be made. If Haswell's original material remains missing and the species I have in hand is eventually found again in the type-locality, Port Jackson, then this species may as well be linked to Haswell's name.

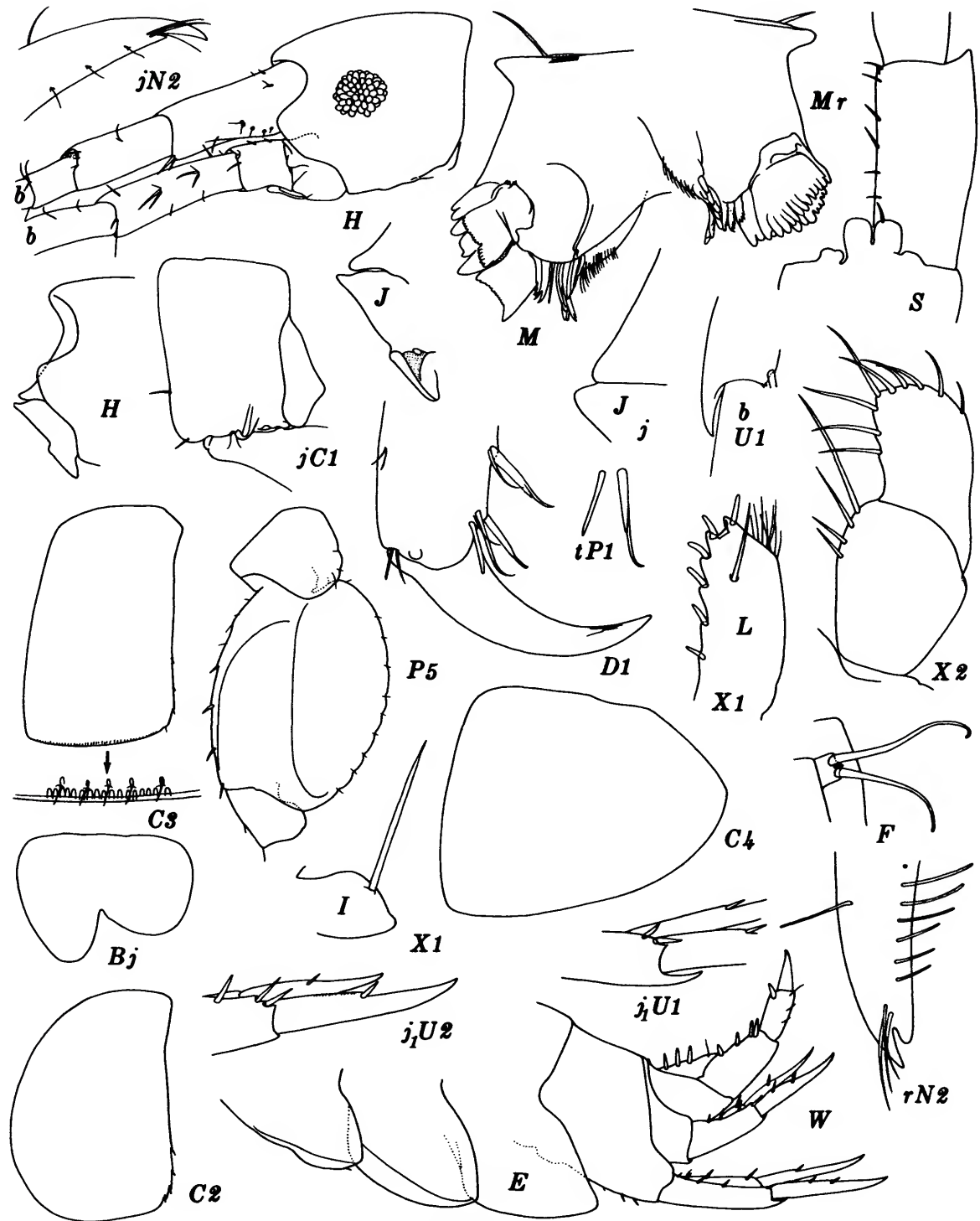


FIGURE 75.—*Stenothoe miersi* (Haswell), male, 3.55 mm, JLB Australia 11; *j*=juvenile, 2.25 mm; *j_i*=juvenile, 2.1 mm, JLB Australia 10.

Montagua longicornis Haswell (1880c:323, pl. 24: fig. 5) is not presently aligned to my material nor to *M. miersi* because of the large number of spines on the rami of uropods 1-2.

DESCRIPTION OF FEMALE.—Lateral cephalic lobe strongly projecting, submammilliform, but obliquely subtruncate apically, anteroventral corner of head smoothly quadrate; prebuccal mass not bulky, epistomal and labral parts separated by weak notch, epistomal part forming subconical, almost sharp lamella projecting in front of similarly sharp midcephalic keel; mediiodistal part of article 1 on antenna 1 not strongly extended; accessory flagellum nearly square, bearing two long aesthetascs; lobes of upper lip of ordinary length, projecting unequally; inner plate of maxilla 1 asymmetrically ovate, bearing one long stiff seta, palp with about six marginal spines extending mediobasally more than halfway, apicolateral margin beveled, article 1 tumid; inner plate of maxilla 2 scarcely projecting medially, appearing simply as setose margin, outer plate short, broad, setal spines of medium length; inner plates of maxilliped short, broad, bearing none or one apical setae, outer plate obsolescent, article bearing outer plate facially naked; coxae 1-4 of ordinary dimensions, ventral margin of coxa 4 convex; article 5 of gnathopod 1 with broad, scarcely projecting posterior lobe, hand long, palm strongly oblique and weakly marked from posterior margin of hand, dactyl with one to three large facial setae, inner margin with subapical tooth, anteromedial margin of hand with three or four setae in tandem, no groups; article 4 of gnathopod 2 extended subacutely beyond tangent of article 5, latter with shortened and very narrow posterior lobe, hand elongate, palm very oblique and not distinct from posterior margin of hand, moderately setose, in largest adults developing small cusp distalwards but retaining defining spine of juvenile, dactyl very long, extending proximally from defining spine, riding onto medial face of hand, apically notched, bearing one or two weak outer setae at marks 33 and 60; pereopods 1-2 not grossly distinct from each other, pair of locking spines on all pereopods distinct from nearby marginal spines, apically simple, slightly sharp or weakly blunt, dactyl with membranous and recumbent distal setule; article 2 of pereopods 4-5 equally broad, anterolateral facial ridge curving posteriorly away from anterior mar-

gin; peduncle of uropod 1 with sharp ventral tooth between rami, distolateral margin of peduncle with one spine or pair of spines crowded together, no ramus of uropods 1-2 shortened, outer generally with two spines, inner with one; peduncle of uropod 3 with two dorsomarginal spines in tandem and pair of distal spines, article 1 of ramus with one pair of dorsodistal spines; telson of medium length and breadth, with three spines basolaterally on each side, groups of distad setules irregularly arranged; epimera 1-3 each softly quadrate posteroventrally, epimeron 1 with one ventral setule.

MALE.—Coxa 3 narrower than in female, coxae 3-4 with weak ventral stridulation ridges, inner plate of maxilliped with two setae; gnathopod 2 with hand highly elongate and heavily setose and bearing deep distal notch guarded proximally by narrow tooth; uropod 3 like that of female, not rugose.

JUVENILE.—Article 1 of antenna 1 with only one long and thin spine; outer plate of maxilla 2 with six setae, inner plate with three setae; inner plate of maxilliped with two long setae, outer plates vestigial as in adult; each ramus of uropods 1-2 with one spine; telson with only two lateral spines on each side; lobe on article 5 of gnathopod 2 extending evenly to process of article 4, dactyl with inner tooth not formed into notch as in adult; accessory flagellum like that of adult.

RELATIONSHIP.—This species earlier was a synonym of *S. valida* Dana (see J. L. Barnard, 1953), but it can now be shown to be distinct from *S. valida*. The close relationship is best indicated by the odd shape of maxilla 2, shared also by *S. gallensis* Walker (= *S. cattai* Stebbing).

Stenothoe ?miersi differs from *S. valida* in the poor apical expansion of coxa 3 but the slight expansion present in *S. miersi* is a definite mark of affinity. Coxa 2 of *S. miersi* is of ordinary shape for *Stenothoe* and not posteroventrally sinuous as in *S. valida*, article 4 of pereopods 3-5 is poorly expanded and more like that of the specimens identified from Hawaii as *S. ?valida* by J. L. Barnard (1970). The sharp ventral tooth on the peduncle of uropod 1 distinguishes *S. miersi* from both *S. valida* and *S. gallensis*. The palmar ornament on male gnathopod 2 resembles that of *S. valida* more than that of *S. gallensis* and male uropod 3 does not have a rugose article 2. as in *S. gallensis*.

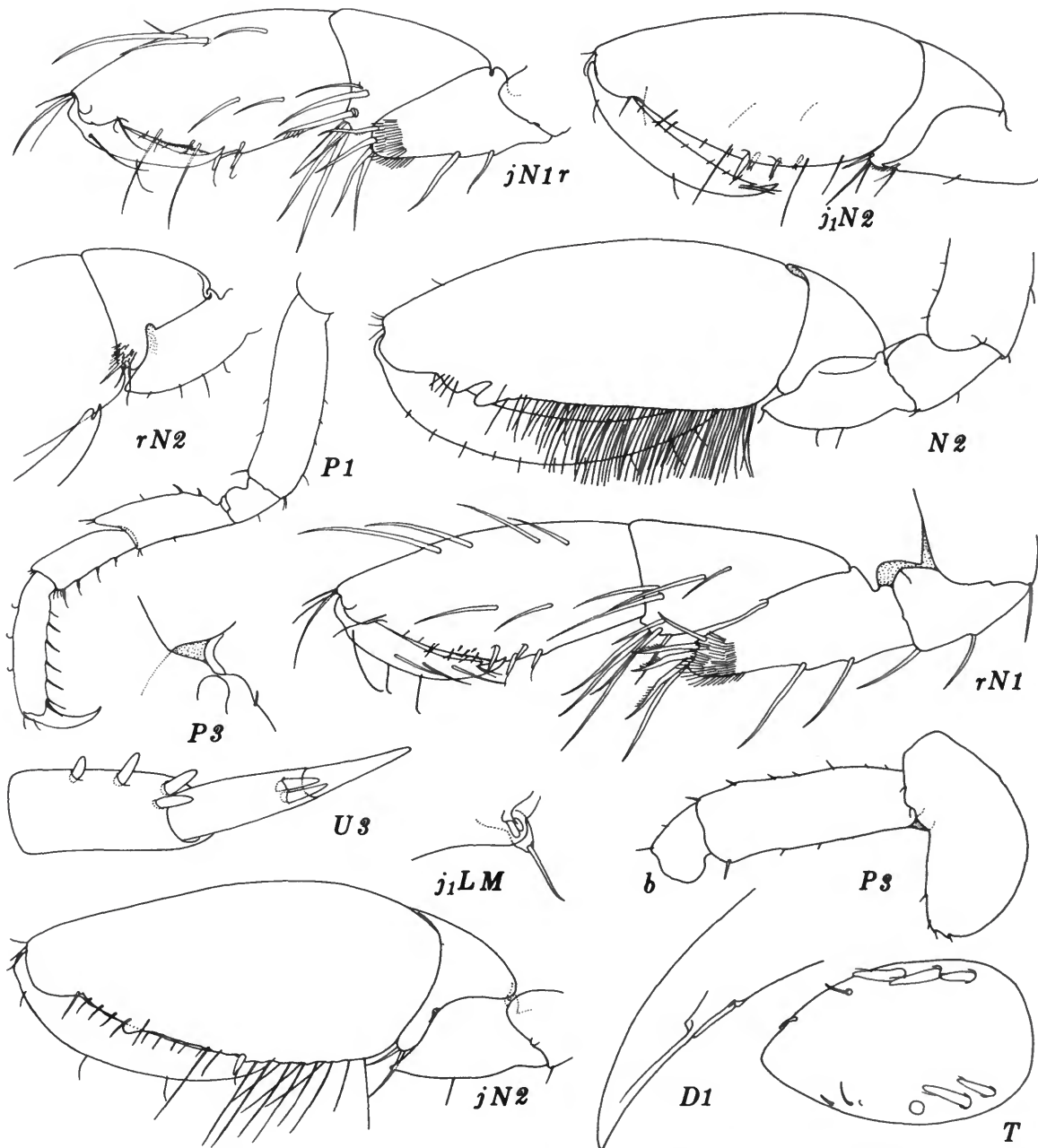


FIGURE 76.—*Stenothoe miersi* (Haswell), male, 3.55 mm, JLB Australia 11; *j*=juvenile, 2.25 mm; *j_i*=juvenile, 2.1 mm, JLB Australia 10.

The specimens identified by Chevreux and Fage (1925) as *S. cattai* should be given a new name; they differ from *S. valida*, *S. gallensis*, and *S. miersi*

in the presence of several middorsal and several facial spines on article 1 of the ramus of uropod 3. *Stenothoe adhaerens* Stebbing (1888) differs from

S. gallensis, *S. valida*, and *S. miersi* in the shortened outer ramus of uropod 2. It has the enlarged article 4 of pereopods 3-5 similar to that in *S. valida*; it also has the sinuous coxa 2.

Stenothoe ascidia (Pirlot) apparently also belongs to the *S. gallensis* group and, like *S. adhaerens*, has a shortened outer ramus of uropod 2; it also bears a long uniarticulate accessory flagellum, the reason Pirlot described his species as type of *Microstenothoe*. *Stenothoe ascidia* is not yet

distinguishable from *S. adhaerens* but the great geographic distance between them suggests they are probably distinct.

MATERIAL.—JLB Australia 10 (1), 11 (2).

DISTRIBUTION.—Port Jackson; southwestern Australia.

Stenothoe nonedia, new species

FIGURES 77, 78

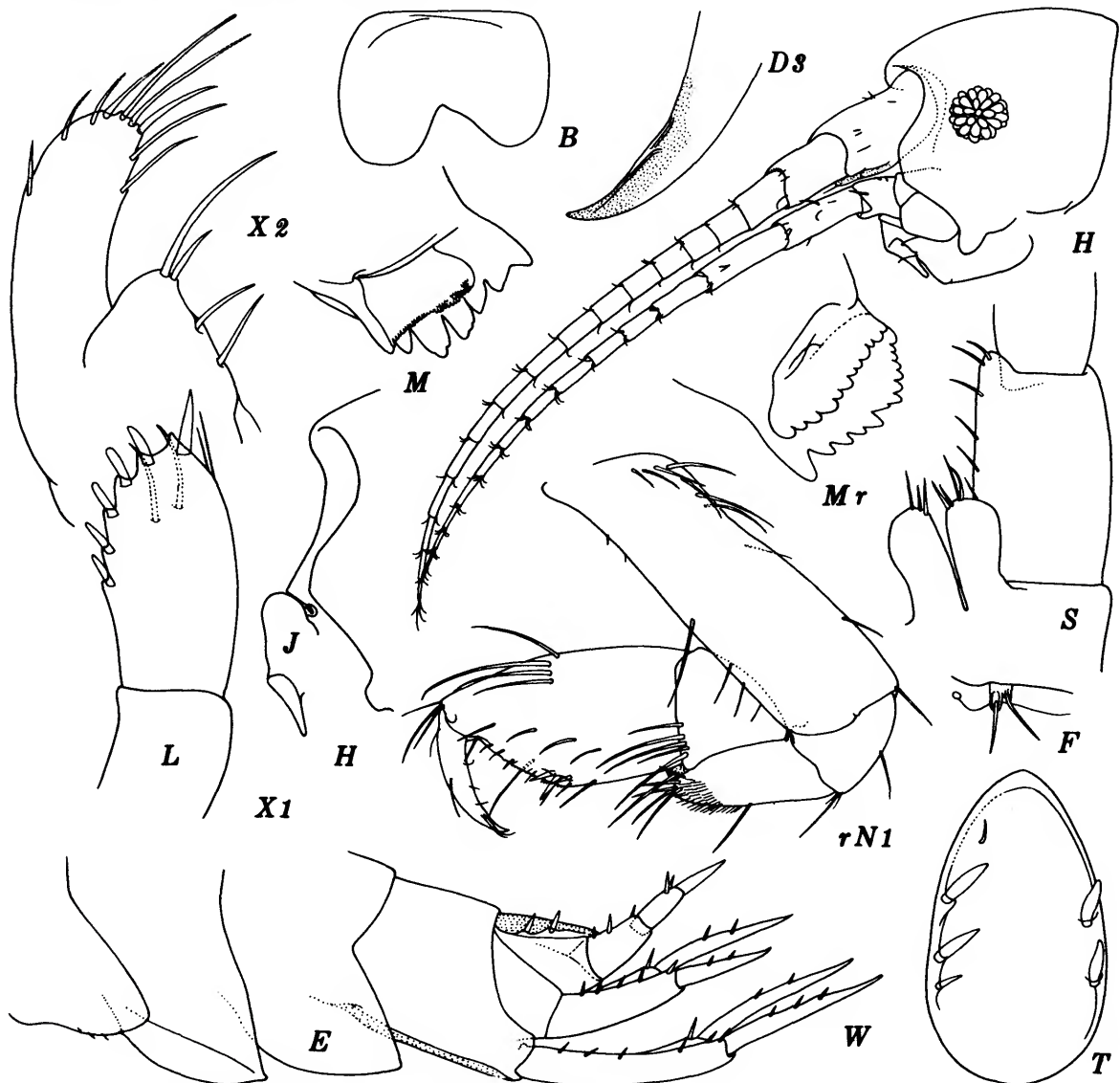


FIGURE 77.—*Stenothoe nonedia*, new species, holotype, female, 2.7 mm, JLB Australia 4.

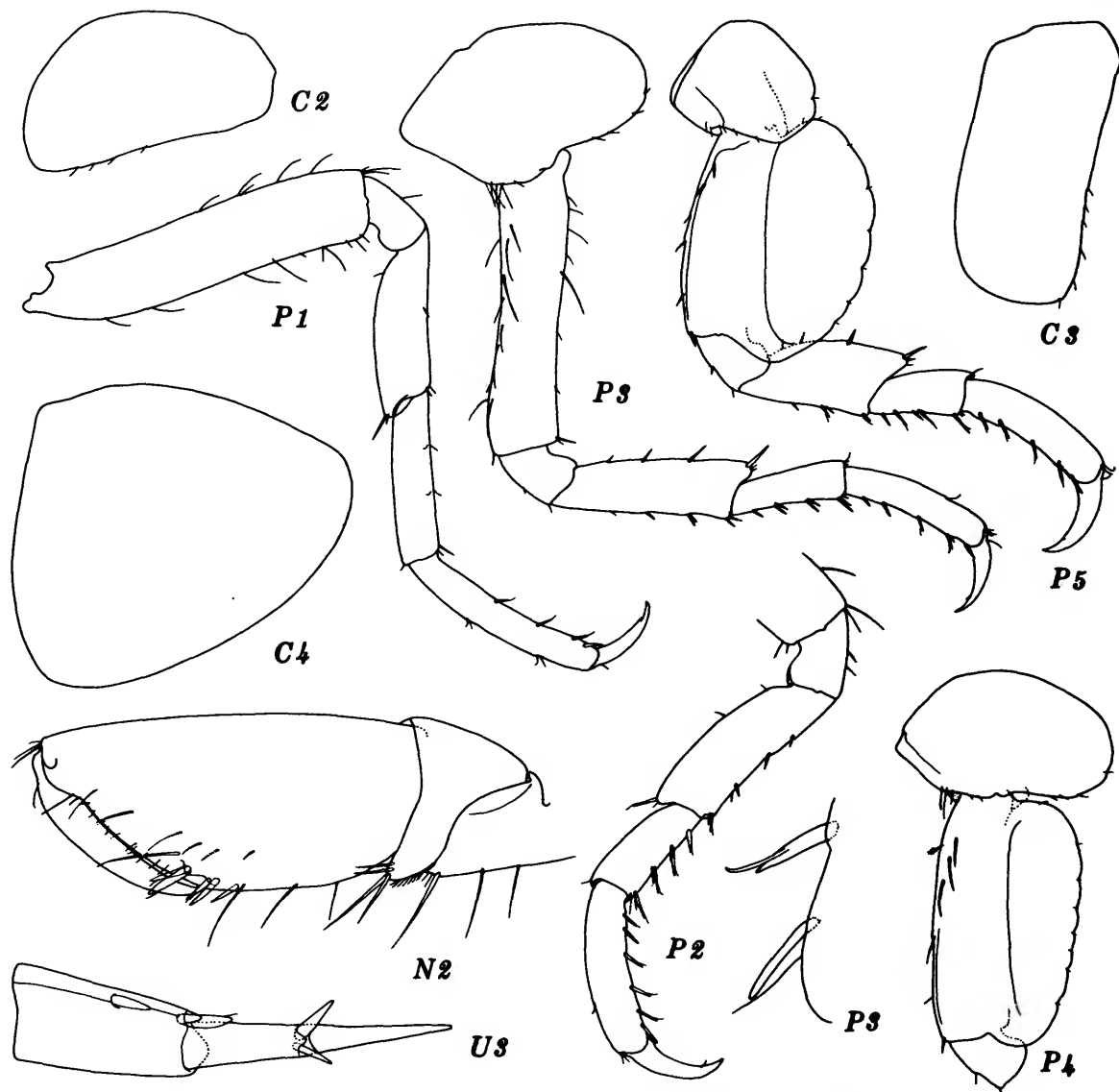


FIGURE 78.—*Stenothoe nonedia*, new species, holotype, female, 2.7 mm, JLB Australia 4.

DESCRIPTION OF FEMALE.—Lateral cephalic lobe weakly projecting, not mammilliform, apically truncate, anteroventral corner of head with strong, rugose projection; prebuccal mass moderately bulky, protuberant, epistomal and labral parts scarcely distinct, epistomal part forming rounded linguiform piece projecting strongly in front of scarcely extended, midcephalic keel; mediobasal part of article 1 on antenna 1 not strongly extend-

ed; accessory flagellum small, bipartite, bearing two sharp setules; lobes of upper lip ordinary, unequally projecting; inner plate of maxilla 1 asymmetrically ovate, bearing long seta, palp with six or seven marginal spines reaching halfway medio-basally, apicolateral margin not beveled, article 1 not swollen; inner plate of maxilla 1 weakly subfalciform, with two medial setae and pair of terminal setae, one elongate, outer plate long and thin,

curving medially, with some setae elongate; inner plates of maxilliped slightly elongate and widened apicalwards, bearing three or four apical setae, outer plate of ordinary size, article bearing outer plate lacking facial setae; coxae 1-4 of ordinary dimensions, ventral margin of coxa 4 convex; article 5 of gnathopod 1 scarcely lobate, article 5 triangular, hand short, palm oblique, dactyl with one outer seta, inner margin lacking tooth, anteromedial margin of hand with transverse row of three setae and one other seta; gnathopod 2 ordinary, article 4 with sharp posterodistal corner, palm oblique but well marked from posterior margin of hand, dactyl lacking tooth and outer seta; pereopod 2 grossly distinct from pereopod 1, stouter and shorter and more strongly spinose, pereopods 4-5 like pereopod 2 but pereopod 3 somewhat intermediate in stoutness and spination between pereopods 1 and 2, article 2 of pereopod 4 narrower than that of pereopod 5 but not strongly so, anterolateral ridge of pereopod 5 scarcely diverging from anterior margin, obsolescent on pereopod 4, pair of locking spines on all pereopods distinct from adjacent marginal spines, slightly blunted, dactyls of all pereopods with subdistal membranous setule tightly recumbent; peduncle of uropod 1 lacking ventral tooth, distolateral margin with two apical spines slightly crowded together, rami extending subequally, both spinose, outer ramus of uropod 2 shortened but both rami spinose; peduncle of uropod 3 with one or two dorsal marginal spines and one dorso-distal spine, article 1 of ramus with pair of distal spines; telson with two or three mediolateral spines on each side, with or without one or two distal setules; epimera 1 and 3 with softly quadrate posteroventral corner, epimeron 2 with small posteroventral cusp, epimeron 1 with about four ventral setules.

MALE.—Unknown.

JUVENILE (1.6 mm).—All rami of uropods 1-2 with one spine each except outer ramus of uropod 1 with two spines; telson with three spines on each side.

HOLOTYPE.—WAM 132-71, female, 2.7 mm.

TYPE-LOCALITY.—JLB Australia 4, Sugarloaf Rock, Cape Naturaliste, Western Australia, intertidal, wash of algae, mainly green *Caulerpa* species, 1 September 1968.

RELATIONSHIP.—This species resembles *S. woka*, new species, but coxa 4 is normal, pleonite 4 is not elongate and scarcely crested, the outer ramus of uropod 2, though short, has two spines in the adult (against 0 or 1), the peduncle of uropod 3 has three spines instead of one, article 1 of the ramus has two spines instead of a setule, the ocular lobe is produced only weakly, and granules are absent on the pereopods. Article 2 of pereopod 4 is wider and better ornamented than it is in *S. woka*.

Because article 2 of pereopod 4 is narrower than article 2 of pereopod 5, this species appears similar to *S. monoculoides* (Montagu) of the North Atlantic; the outer ramus of uropod 2 on *S. nonedia* is also slightly shortened as in *S. monoculoides* but the following distinctions hold for *S. nonedia*: article 4 of gnathopod 1 underrides article 5, the telson and rami on uropod 2 have spines and the ocular lobe is truncate.

MATERIAL.—JLB Australia 4 (2).

DISTRIBUTION.—Cape Naturaliste, Western Australia, intertidal.

Stenothoe quabara, new species

FIGURE 79

DESCRIPTION OF FEMALE.—Lateral cephalic lobe strongly projecting, not submammilliform, apex subtruncate, anteroventral corner of head softly quadrate, then projecting ventrally somewhat posterior to corner; prebuccal mass not bulky, epistomal and labral parts separated by weak notch, epistomal part forming small lamella projecting subconically, midcephalic keel projecting in form of strong and sharp cone slightly forward of epistome; mediolateral part of article 1 on antenna 1 not strongly extended; accessory flagellum weakly barrel-shaped, apparently bipartite, main portion with one long, one short aesthetasc, additional part with long, thick aesthetasc (but one-third size of ordinary flagellar aesthetasc); lobes of upper lip of ordinary size, projecting unequally; inner plate of maxilla 1 asymmetrically ovate, bearing one long stiff seta, palp with about seven marginal spines extending more than halfway basomedially, apicolateral margin beveled, article 1 not tumid; inner plate of maxilla 2 freely projecting, subfalcate, bearing about two medial setae and pair of apical spines, outer plate short, curved medially, some setal

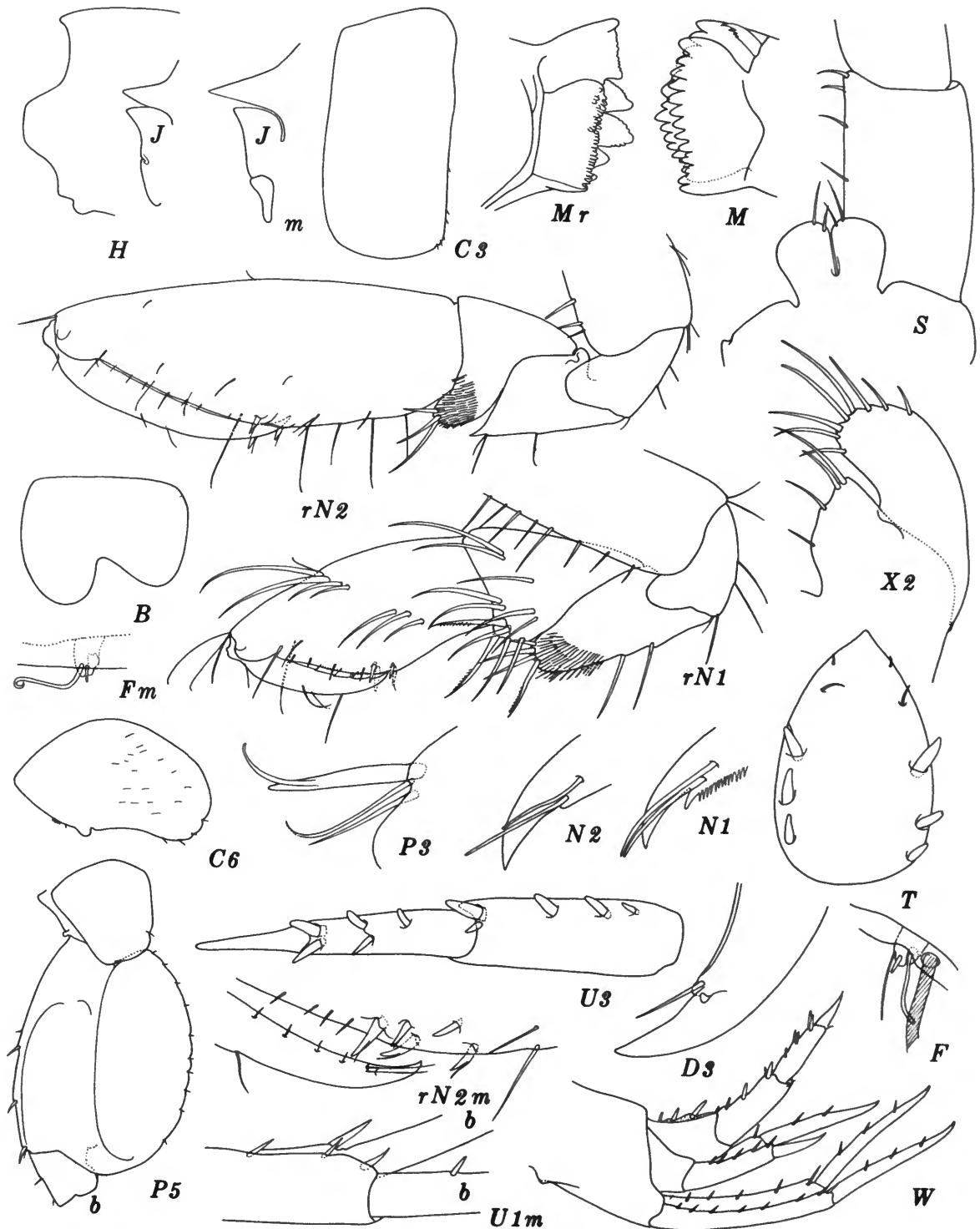


FIGURE 79.—*Stenothoe quabara*, new species, holotype, female, 3.0 mm, JLB Australia 11;
 m=male, 2.8 mm, JLB Australia 10.

spines long; inner plates of maxilliped of medium length, broad, each bearing two setae, outer plate slightly reduced from ordinary size, article bearing outer plate facially naked; coxae 1-4 of ordinary dimensions, ventral margin of coxa 4 convex; article 5 of gnathopod 1 with posterior lobe of medium breadth and scarcely projecting, hand long, palm strongly oblique and weakly marked from posterior margin of hand, dactyl with about two small facial setae (one outer, one inner), inner margin with subapical tooth, anteromedial margin of hand with group of four facial setae; article 4 of gnathopod 2 extended acutely, narrow posterior lobe of article 5 extending out to tooth of article 4, hand elongate, palm very oblique and scarcely distinct from posterior margin of hand, weakly setose, palm defined by one or two, long or short, medial spines and two lateral spines (long or short), dactyl simple, with about two outer setae scarcely facial; pereopods 1-2 not grossly distinct from each other, pair of locking spines on all pereopods composed of thin flexible setae directly adjacent to first regular marginal spine, dactyl with thin, erect distal setule; article 2 of pereopods 4-5 equally broad, anterolateral facial ridge curving posteriorly away from anterior margin at significantly ventrad level; peduncle of uropod 1 lacking ventral tooth, distolateral margin of peduncle usually with one spine, rarely (on holotype, on one side only), with pair of spines closely crowded together, rami of uropod 1 extending equally, each with about three spines, outer ramus of uropod 2 only half as long as inner and usually naked, rarely with one marginal spine, inner ramus with two spines; peduncle of uropod 3 with three dorsomarginal spines and pair of dorsodistal spines, article 1 of peduncle with one dorsal spine, then pair of spines, finally pair of distodorsal spines; telson short and broad, with three spines basolaterally on each side, four distal setules; epimera 1-3 each with small blunt posteroventral tooth, epimeron 1 with several ventral setules or one only.

MALE.—Eyes enlarged, with six rows of ommatidia (4 in female); midcephalic keel much longer and sharper than in female; anterofacial row of setae on hand of gnathopod 1 with five setae, dactyl with two facial and one outer setae; gnathopod 2 with three defining spines medially, dactyl with only one outer seta besides regular basal seta.

JUVENILE (1.7 mm).—Eyes with only three rows of ommatidia; locking spines of pereopods stouter

than in adult and more like those shown for *S. allinga* but dactyl with erect setae as in adult; outer ramus of uropod 1 with one spine, inner with none; peduncle of uropod 3 with two spines, apical position not paired, article 1 of ramus with only one pair of distal spines, no others; telson with two lateral spines on each side.

ILLUSTRATIONS.—The following characteristics have not been illustrated because they correspond to those shown herein for *S. allinga*: female eye, coxae 1, 2, 4, long setae of anterior margins on article 6 of pereopods 1-2 and posterior margins of pereopods 3-5, epimera; the following parts correspond to those shown for *S. ?miersi*: inner plate of maxilla 1, palp of maxilla 1 except for presence of two facial setae on palp and article 1 of palp not strongly swollen.

VARIATIONS.—The peduncle of uropod 3 and the telson commonly have the basal spine in each case absent in small adults.

HOLOTYPE.—WAM 131-71, female, 3.0 mm.

TYPE-LOCALITY.—JLB Australia 11, Middleton Beach, Albany, Western Australia, intertidal, wash of algae and rocks, 30 September 1968.

REMARKS.—This species differs from *S. allinga*, new species, in numerous characters of which the first list is not contained in the description: broader coxa 3, shape of coxa 7, facial ridge on pereopod 5, stouter and shorter spines on article 2 of gnathopod 2; and the second list which is contained in the description: anteroventral corner of head, epistome, shape of maxilla 2, shape of plates on maxilliped, gnathopod 1, locking spines and dactylar ornaments on pereopods, spine distribution on uropods 1 and 3 and the shortness of the outer ramus on uropod 2.

The short outer ramus of uropod 2 possibly denotes affinities of *S. quabara* to the North Atlantic group containing *S. marina* (Bate) and *S. microps* Sars, but *S. quabara* has a uniformly rectangular coxa 2, the second articles of pereopods 4-5 are precisely similar in outline, the hand of gnathopod 2 is elongate and not tumid, and the palm is not ornamented.

This species differs from *S. moe* J. L. Barnard (1972b), from New Zealand, in the short outer ramus of uropod 2.

MATERIAL.—Shepherd 7 (63), 9 (50+), 22 (1), 24 (20), 29 (50+), 30 (37), 52 (1); JLB Australia 3 (5), 6 (2), 10 (7), 11 (22), 12 (4), 13 (1); Slack-

Smith 2 (12), 5 (1).

DISTRIBUTION.—South Australia, Pearson Islands, 5–35 m; Western Australia, Cheyne Beach to Cottesloe (Perth), intertidal.

Stenothoe valida Dana

Stenothoe valida Dana.—Chilton, 1923:95–100, fig. 5 [in part, figures accepted, synonymy rejected].

Chilton synonymized many species with *S. valida* and his report of specimens of *S. valida* from Port Jackson may actually have concerned *S. miersi*, a distinct species (p. 120). His undocumented figures, however, show *S. valida*; they may have been taken from non-Australian specimens. The probability that *S. valida* occurs in Australia is high. The species apparently has been introduced from fouling matter carried on the hulls of ships into many ports of the world.

DISTRIBUTION.—?Port Jackson.

Stenothoe woka, new species

FIGURES 80, 81

DESCRIPTION OF FEMALE.—Lateral cephalic lobe strongly projecting, mammilliform, rounded apically, anteroventral corner of head with double rugose projection; prebuccal mass moderately bulky, protuberant, epistomal and labral parts weakly defined by notch, epistomal part forming blunt extension exceeding round hump of midcephalic keel; medio-distal part of article 1 on antenna 1 strongly extended; accessory flagellum apparently absent or represented by seta near subcuticular sclerites; lobes of upper lip ordinary, extending unequally; inner plate of maxilla 1 asymmetrically ovate, bearing one long seta, palp with five or six marginal spines extending less than halfway mediobasally, apicolateral margin of palp not beveled, article 1 not tumid; inner plate of maxilla 2 weakly subfalci-form, bearing about three medial setae and one long apical seta, outer plate thin and elongate, slightly curved inward, setal spines long; inner plates of maxilliped of medium length and breadth, subrectangular, bearing four apical setae, outer plate of ordinary size, article bearing outer plate lacking facial setae; coxae 1–3 of ordinary dimensions, coxa 4 large and posterodorsally extended, ventral margin excavate; article 5 of gnathopod 1

with narrow posterior lobe, hand long, palm oblique, dactyl with one outer seta, inner margin lacking tooth, anteromedial margin with group of three transverse setae and one other seta; gnathopod 2 ordinary, article 4 with blunt posterodistal corner, palm oblique but well marked by shape from posterior margin of hand, dactyl lacking tooth and outer setae; pereopod 2 grossly stouter and shorter than pereopod 1, articles 5–6 with posterior granules, pereopod 3 resembling pereopod 1, pereopods 4–5 stout and granulate like pereopod 2, article 2 of pereopod 4 much narrower than that of pereopod 5 but broader than article 2 of pereopod 3, lacking anterolateral facial ridge, article 2 of pereopod 5 with anterofacial ridge diverging from anterior margin, locking spine pair of all pereopods distinct from adjacent marginal spines, small on pereopods 1 and 3, large on pereopods 2, 4, 5, blunt or sharp respectively, distal setule of pereopods variable, recumbent and membranous on pereopods 2 and 5, thin and erect on pereopod 4, thick and slightly erect on pereopods 1 and 3, but seta often erect on pereopods 2 and 5; peduncle of uropod 1 lacking ventral tooth, distolateral margin with one apical spine, outer ramus slightly shortened, bearing two spines, inner ramus naked, outer ramus of uropod 2 slightly shortened, bearing one spine, inner ramus naked; uropod 3 with one large distal spine on peduncle, one distal setule on article 1 of ramus; telson long, narrow, bearing two spines basolaterally, distally with four setules; epimera 1–3 each with softly subquadrate posteroventral corner, epimeron 1 with weak posterior serrations, no ventral setules; pleonite 4 especially elongate and bearing dorsolateral crest on each side.

Dactyls of pereopods have tiny, scarcely resolvable notches (oil immersion) on the inner margins.

MALE.—Eyes and gnathopod 2 slightly larger than in female, defining spines of gnathopod 2 laterally three in number, dactyl of gnathopod 1 lacking outer seta.

JUVENILE (1.1 mm).—Spines are absent on rami of uropods 1–2, on all of uropod 3 and on the telson; the granules on pereopods 2, 4, 5 are very weak.

VARIATION.—Juvenile, 1.8 mm, Shepherd 3: the telson has one spine on each side, only the outer ramus of uropod 1 has a spine and the other rami

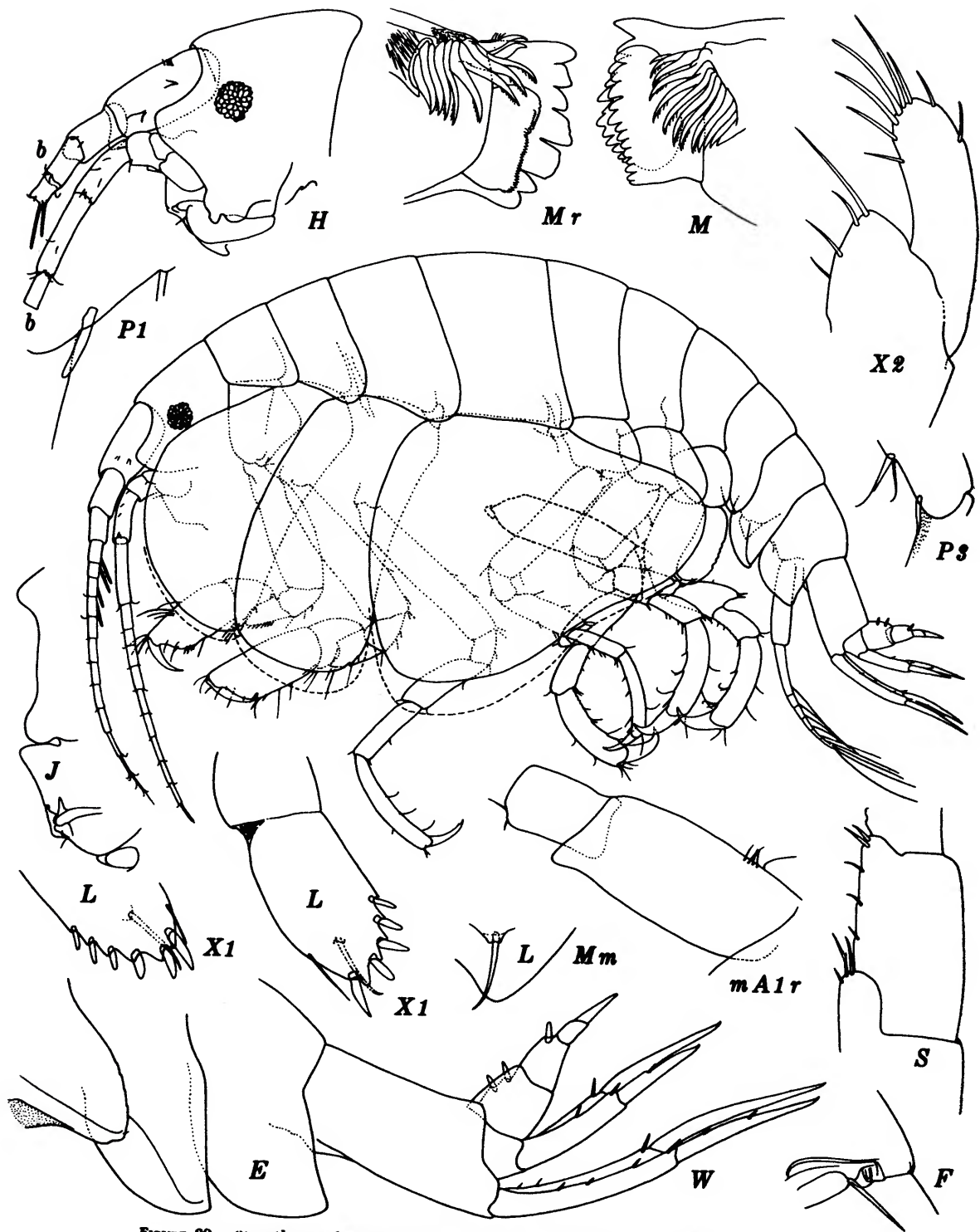


FIGURE 80.—*Stenothoe woka*, new species, holotype, female, 2.7 mm, JLB Australia 11;
m=male, 2.4 mm.

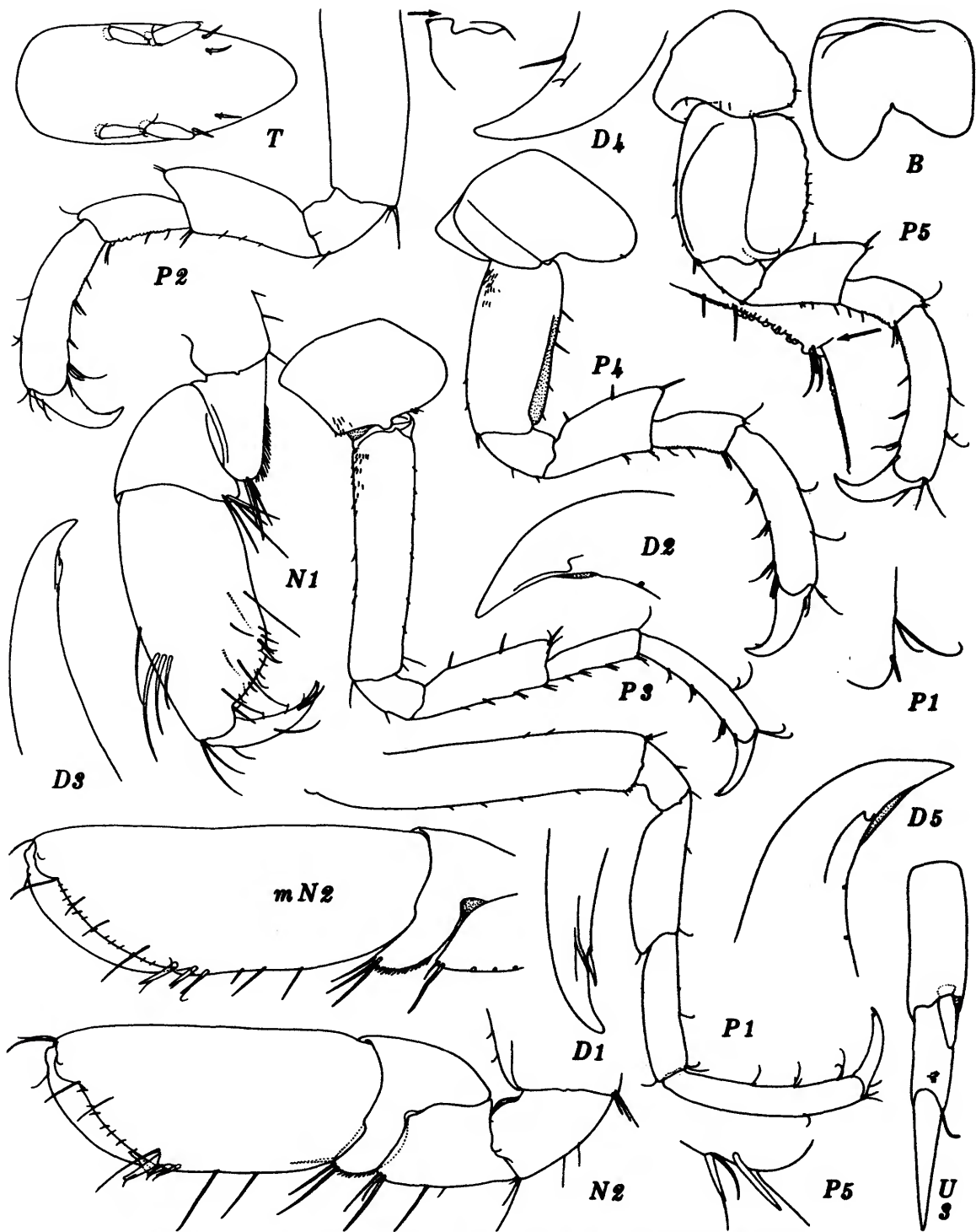


FIGURE 81.—*Stenothoe woka*, new species, holotype, female, 2.7 mm, JLB Australia 11;
 m=male, 2.4 mm.

of uropods 1-2 are naked, but the main aberrancy is that the outer ramus of uropod 2 is 85 percent as long as the inner ramus.

HOLOTYPE.—WAM 133-71, female, ovigerous, 2.7 mm.

TYPE-LOCALITY.—JLB Australia 11, Middleton Beach, Albany, Western Australia, intertidal, wash of algae and rocks, 30 September 1968.

REMARKS.—This species shows developments usually found in thaumatelsonins, such as elongate and ventrally excavate coxa 4 and the pygidization involved in the elongation of pleonite 3. The narrowing of article 2 on pereopod 4 also suggests generic differentiation from *Stenothoe* but other known species of *Stenothoe* also have this characteristic (*S. monoculoides* group of North Atlantic). Affinities of this species are otherwise unknown.

MATERIAL.—Shepherd 30 (1); JLB Australia 11 (35), 12 (3).

DISTRIBUTION.—Pearson Islands, South Australia, 5-12 m; Middleton Beach, Albany, Western Australia, intertidal.

Wallametopa, new genus

DIAGNOSIS.—Article 2 of pereopod 3 rectilinear, article 2 of pereopods 4 and 5 expanded; palp of maxilla 1 uniarticulate; mandible lacking palp; article 5 of gnathopod 1 highly elongate, hand short, narrow, palm absent, dactyl thick and short; gnathopod 2 much larger than gnathopod 1, hand ovate, palm oblique and fitting most of posterior margin of hand.

TYPE-SPECIES.—*W. cabon*, new species (here selected).

RELATIONSHIP.—The type-species of this genus fits *Parametopa* Chevreux in keys published by Shoemaker (1955) and J. L. Barnard (1969a) but differs in two important characters: the elongation of article 5 on gnathopod 1 and the enlarged gnathopod 2. *Wallametopa* appears to be more primitive than *Parametopa* in the possession of these characteristics and one might suggest that the warm-temperate Atlantic *Parametopa* is a descendant of organisms similar to *Wallametopa*.

Classification in Stenothoidae remains cloudy (J. L. Barnard, 1969a). Only three classes of characters have been used in this century to divide the family into genera (prior to the inclusion of Thau-

matelsonidae in Stenothoidae, see J. L. Barnard, 1972a). The classes of characters are the condition of the mandibular palp, first maxillary palp, and article 2 of pereopods 3-5. In the case of *Wallametopa* the keys of Shoemaker and Barnard usefully delineated the close relationship to *Parametopa* but did not show the observer that other genera, such as *Metopa* and *Stenothoe* have species with the odd gnathopod 1 seen in *Parametopa* and *Wallametopa*. The tendency to develop a linear gnathopod 1 is seen also in several other genera. The further relationships of *Parametopa* and *Wallametopa* await a monographic study of stenothoid genera in which an evaluation of the mouthpart structures in relationship to gnathopods and perhaps other characters can be made.

Wallametopa cabon, new species

FIGURES 82, 83

DESCRIPTION.—Rostrum sharp, lateral cephalic lobe apically truncate, slightly narrowed, midcephalic keel conical but apically blunt, epistome not reaching apex of keel, sharply delimited; eye large, antenna 1 about two-thirds as long as body, antenna 2 about half as long as body, occasionally longer; accessory flagellum minute, largely hidden under chitinous edge of article 3 of antenna 1; lobes of upper lip nearly equal to each other; spines of mandibles sparse; fused inner lobes of lower lip nearly cuboid, outer lobes tall and broad; inner plate of maxilla 1 naked, outer plate with six spines, apex of palm serrate and spinose, with strong subapical row of blunt setae; maxilla 2 with short plates, outer broad and subtruncate, inner subconical and shorter than outer; inner plates of maxilliped freely separate as in *Stenothoe allinga* (q.v.), outer plates slightly sharper than in *S. allinga* (see Figure 82OS), palp article 4 elongate, article 3 poorly spinose; coxa 2 rounded-trapezoidal apically, coxa 3 in male rounded apically and slightly tapered, rectangular and truncate in female, coxa 4 very broad (anteroposterior) in male, extended anteroventrally, narrower and unextended in female; stridulation ridges present on male coxa 4 and on female coxa 3 (female with 3 ridges); article 4 of gnathopod 1 short and weakly bulbous posterodistally, article 5 elongate and strongly setose posteroproximally, article 6 narrow, lacking palm, dactyl

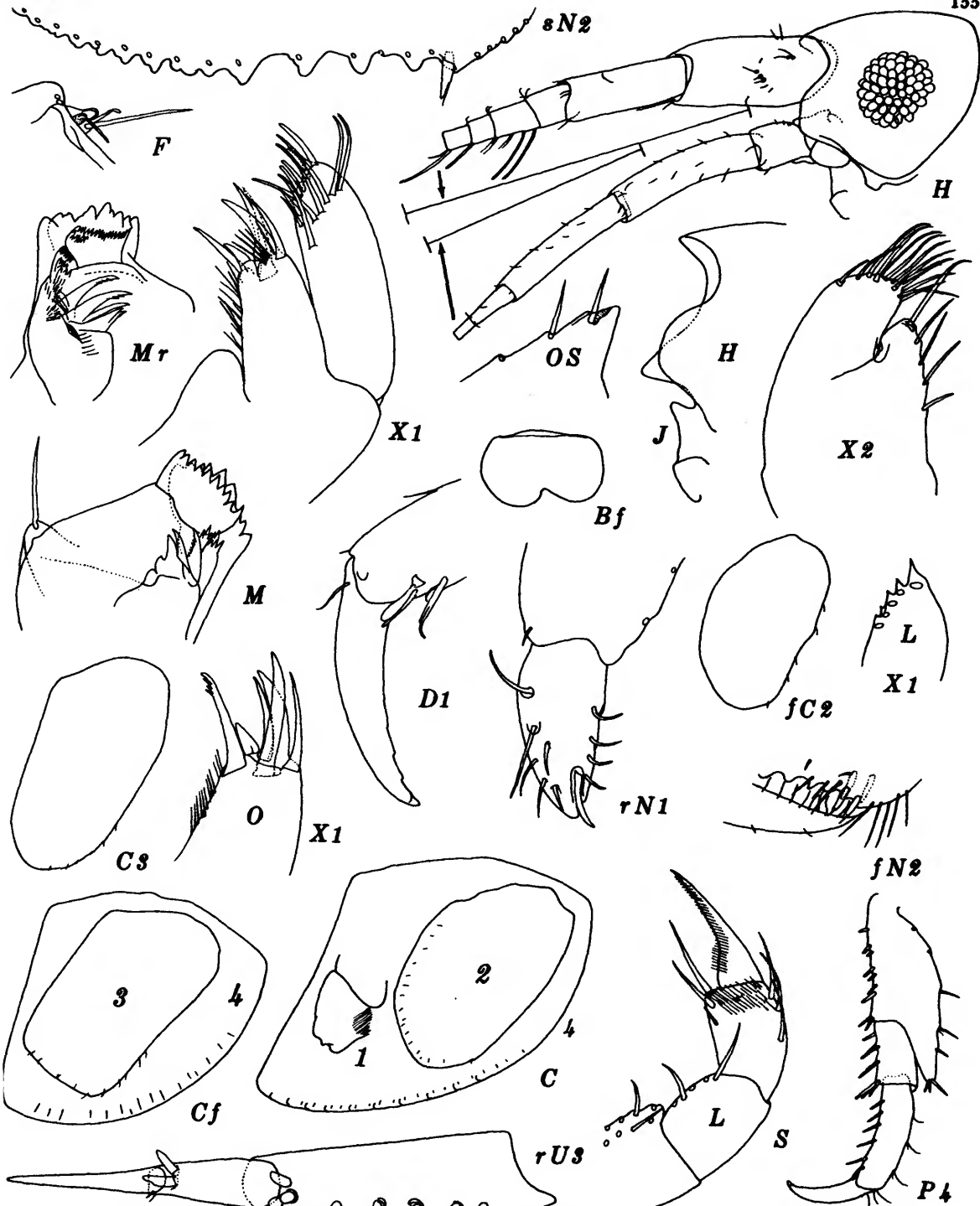


FIGURE 82.—*Wallametopa cabon*, new genus, new species, holotype, male, 2.56 mm, VicFish 475; f=female, 2.14 mm, VicFish 472; arrows on *H* point to remaining lengths of antennae.

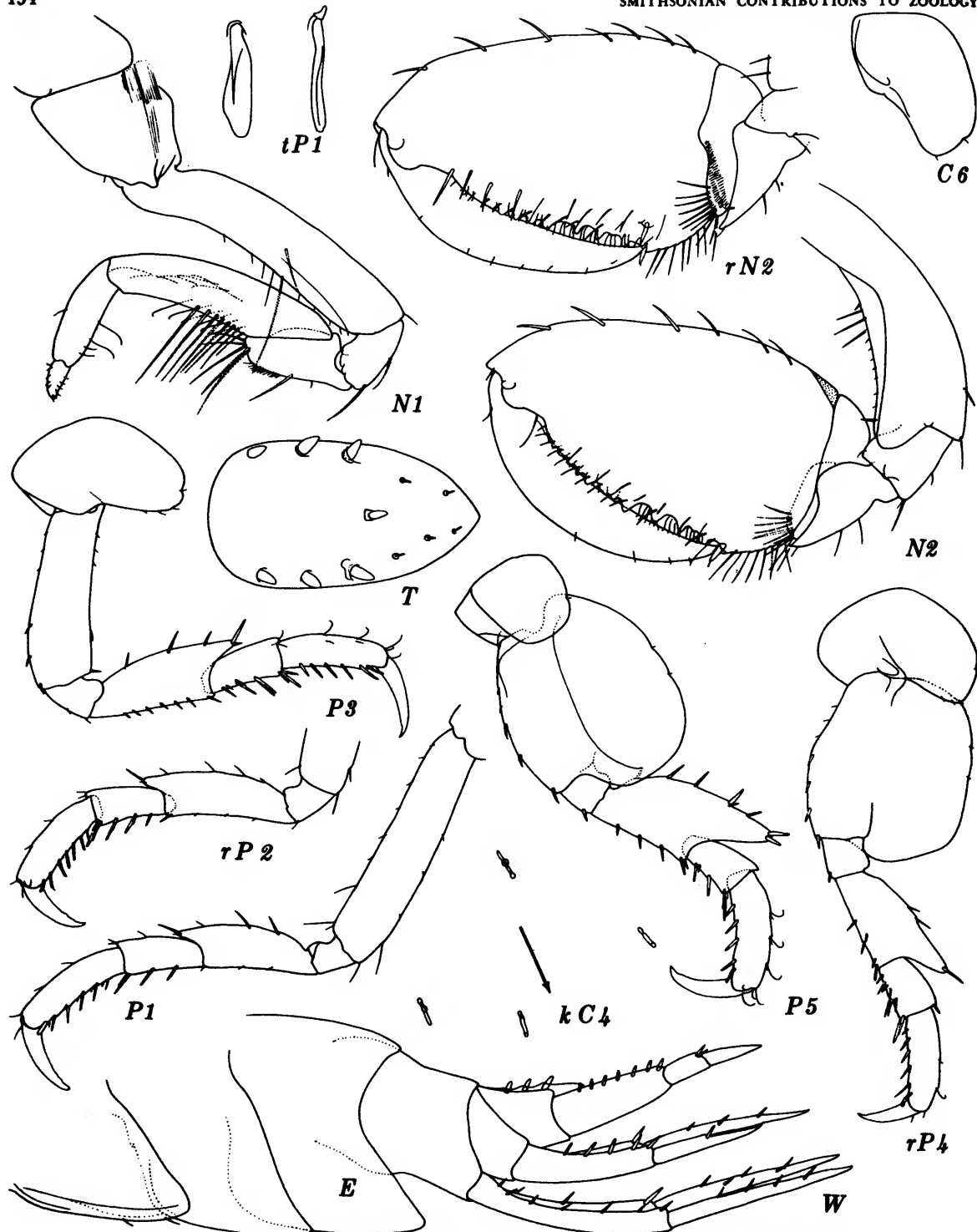


FIGURE 83.—*Wallametopa cabon*, new genus, new species, holotype, male, 2.56 mm, VicFish 475.

thick, stubby, apical bifidation bearing spine; gnathopod 2 enlarged, similar between the sexes, hand large, ovate, palm occupying most of posterior margin, toothed, defined by one marginal spine and one submarginal spine on medial face (one female with pair of spines in each position = aberration), dactyl fitting palm, setose on inner edge; pereopod 2 slightly smaller than pereopod 1 but not structurally distinct, posterior margins of articles 5-6 heavily spinose, locking spines of all pereopods in pairs, each member broadened towards apex, submembranous, edge of spine on medial side of pereopod presented sideways, dactyls with weak inner declivities, small apical spinule nearly fused with dactyl, no internal notches, no setae; article 4 of pereopods 3-5 not widely expanded, posterodistal process extending halfway along article 5 in pereopod 3, nearly fully in pereopods 4-5 (see Figure 83rP4, aberrant pereopod 4 with short process); epimera as illustrated; outer ramus of uropod 2 shorter than inner, bearing only one marginal spine; uropod 3 thin and elongate,

article 2 of ramus half as long as peduncle, article 1 of ramus slightly shorter than half, peduncle with five or six marginal spines, pair of spines transverse apically, formula generally four single marginal spines and terminal pair (one of which counted as marginal), article 1 of peduncle with pair of terminal spines; telson with three lateral spines on each side and one mediodorsal spine (unusual but consistent); cuticle with sparse setules, mainly on coxa 4.

ILLUSTRATIONS.—Uropod 3 drawn from dorsal side, spines pointing upwards towards observer; flagellum of antenna 1 with 12 articles, of antenna 2 with 11 articles.

HOLOTYPE.—NMV, male, 2.56 mm.

TYPE-LOCALITY.—VicFish 475, Western Port, Victoria, Station 300-769-3, 57 feet, 15 July 1969.

MATERIAL.—VicFish, Western Port, 7 samples (8).

DISTRIBUTION.—Western Port, Victoria, shallow water.

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Appendix 1

Station List (Supplement to Part I)

AM SAMPLES, SYDNEY

Numerous registered samples from The Australian Museum (AM) are presented in Appendix 2 and in the text, especially in the genus *Leucothoe*; each is fully specified in those places.

DRUMMOND SAMPLE, MERIMBULA, NEW SOUTH WALES

Holdfast of *Ecklonia*, 2 September 1971, collected by Margaret M. Drummond.

VICFISH SAMPLES, WESTERN PORT, VICTORIA

Collected by a team directed by Dr. Alistair E. Gilmour, Victorian Fisheries Department (VicFish), Melbourne; over 600 samples have now been collected and from these Mrs. Margaret M. Drummond has extracted specimens for study in Part II. A full station list will be published by Victorian Fisheries elsewhere. Holotypes from these collections are deposited in the National Museum of Victoria.

SHEPHERD SAMPLES, SOUTH AUSTRALIA

Collected by Mr. S. A. Shepherd, South Australian Museum, Adelaide. Arbitrary numbers are assigned to these samples for sorting efficiency. The samples listed below supplement those listed in Part I.

- Shepherd 20, West Island, station D342, 3-5 m, near jetty on algae, 13 October 1968.
Shepherd 32, Judith Cove, near Restless Point, West Island, station D238, 3-5 m, among brown algae, 5 November 1966.
Shepherd 43, Oedipus Point, West Island, station D286, 9 m, among red algae, 12 June 1967.
Shepherd 50, off Port Gawler, St. Vincent Gulf, station D375, 7-9 m, no date.

WAM SAMPLES, WESTERN AUSTRALIA

Collections of Western Australian Museum (WAM), Perth, arranged alphabetically by code word, all from Western Australia.

- Cockburn Sound, South Flats, A. Jones, 20 February 1966.
Cockburn, Sta. 52, 31 May 1959.
Cottesloe, February 1925 [presumed intertidal].
Cottesloe, May 1926, 11049-11058 [presumed intertidal].
Geraldton, northwest of Bluff Point, CSIRO station 131, 70 fms (128 m), 22 August 1963 (27° 40'S, 113° 03'E) [labels vary in extent of detail].
North Beach, 6 June 1927.
Point Peron, rock and seaweed washings, R. Kenny, 25 June 1946.
Point Peron, 25 November 1946.
Point Peron, weed washing, 27 November 1946.
Twilight Cove, out of washed up sponge, Mrs. Loney, 5 June 1966.

MACLEAY MUSEUM, SYDNEY

Several presumed types or original material of Haswell were found by Dr. Peter Stanbury and are specified in appropriate places, especially in Appendix 2.

EXTRANEOUS SAMPLES

Comparative materials deposited in Smithsonian Institution, Washington, D.C., and Zoologiske Museum, Copenhagen, are specified in their proper places, primarily in the genera *Allorchestes* and *Leucothoides*.

JLB AUSTRALIA SAMPLE, WESTERN AUSTRALIA

JLB Australia 7, west of Bunker Bay, Cape Naturaliste, intertidal, pile of beachwrack 2 m high by 50 m long, wash of about 6 liters resulting in 750,000 specimens of *Allorchestes*.

Appendix 2

Original Material of Australian Marine Gammaridea Described by Haswell

In August 1971 the writer visited The Australian Museum, Sydney, and the Macleay Museum at the University of Sydney to determine the status of Haswell's original materials of Australian Gammaridea described between 1880 and 1885. A note left in the Crustacean Catalogue of The Australian Museum by the late Dr. Keith Sheard in May 1951 states:

It is doubtful whether any of Haswell's actual Type specimens exist. After some years spent endeavouring to locate them I am certain that material labelled "type" represents spems. chosen by Haswell from material resembling the specimens described. I have examined several notes & letters to Chilton which suggest that the type specimens were in some cases destroyed by Haswell after description & in some cases lost in one or other of his moves. [P.T.O. [sic, no closing bracket].

Both Charles Chilton and Keith Sheard examined much of the material in The Australian Museum and the Macleay Museum; apparently certain specimens were loaned to Chilton in New Zealand and to Sheard in South Australia and Western Australia. Several of Haswell's specimens were dissected and mounted on permanent slides by Sheard and then labelled by him as "type"; these designations may suffice by ICZN rules as lectotypes. Chilton may also have done this but no actual case can be proved at present.

The earliest catalog cards concerning Haswell's material appear to have been written subsequent to 1904, others perhaps subsequent to World War I. The consistency of their handwriting and format suggests that a reorganization of Australian Museum material took place and that Haswell's original material was considered to be a part of the "old collection." Registration numbers were provided for these materials. Neither labels in vials nor catalog cards are written in Haswell's hand as compared to a letter he wrote in 1921 or 1922, even accounting for changes that might have occurred during the 40 years since he described the materials. Only a few lots of Haswell's presumed original ma-

terial were found in the Macleay Museum despite an exhaustive search by Dr. Peter Stanbury, curator of that institution. No card catalog is present there. In the last decade Macleay Museum and The Australian Museum have worked closely together to conserve Haswell's original materials. All presumed types, except the three lots mentioned, have been loaned indefinitely to The Australian Museum. Charles Chilton had apparently borrowed the lots found in Macleay Museum but the writing of original labels is not in Haswell's hand, Chilton having added labels to correct names according to his systematic investigations. Materials borrowed from Macleay Museum by Sheard subsequent to 1938 apparently were returned by him to The Australian Museum, although he returned to Macleay Museum materials of his study on *Ceradocus* from South Australia (1939). A few specimens borrowed from The Australian Museum by Sheard were never returned there according to notes added to catalog cards by F. A. McNeill "F. A. McN."

The writer concludes that Haswell did not select types at the time he wrote the manuscripts published between 1880 and 1885; he may have selected some at a subsequent time, perhaps in the first, second, or third decades of the 20th century, but another person wrote the cards and labels now joined with those specimens. Chilton and Sheard selected several specimens as "types" including several lots we would now consider as syntypes. There is no pertinent systematic reason now to legitimize any of these earlier actions by selecting lectotypes and asking ICZN to recognize them as having come from Haswell's material, nor should any neotypes be presently selected for the 20 species of which original materials are missing. The Gammaridea of Australia are presently being studied by at least four systematists and hopefully next decade we will have discovered and described the bulk of the shallow-water fauna on which Haswell worked. There may remain some insoluble problems re-

garding Haswell's missing species (such as *Dexamine Miersii*) at which time the experts may wish to suppress certain names by the lack of usage for 50 years or to flaunt this often inappropriate rule to conserve Haswell's names after type-localities have been thoroughly explored and his species found by a process of ecological elimination. Until the numerous problems regarding cryptosibling species in Australia have been solved with fresh material it would be inappropriate to select lectotypes or neotypes from syntypical material attributed to Haswell. At present there are few serious problems regarding Haswell's species. They can either be recognized through the materials yet remaining in the two museums in Sydney or determined from new collections made in the biotic provinces Haswell studied.

In the following compendium are presented the results of my investigations regarding Haswell's original materials. They are not exhaustive. The purpose of my visit to Sydney was to gain insight on the nomenclature of *Leucothoe* and *Hyale*, to determine for future reference in my studies the materials available and those which appear to be missing entirely in the event the "first reviser's rule" might apply in future gammaridean studies. I examined minutely only those specimens about which I had sufficient knowledge from studies of fresh material to make value judgments in nomenclature. Some of these judgments concern species already studied in Part I of this series, some concern species presented and elaborated on in this, Part II, and others concern species I intend presenting in Parts III and IV, etc. The species in the compendium below are arranged in alphabetical order in Haswell's original nomenclature, but missing materials are summarized at the terminus. In most cases the information on the cards in the catalog is presented alone to verify that the materials are available. Haswell did not select type-localities although most of his published descriptions contained material from only one locality which, *ipso facto*, is the type-locality. Systematists will probably consider the first locality of several listed for a few species as the type-locality by ordinal preference and if specimens from this locality are present I have not listed materials from others of Haswell's published localities. Few serious problems will occur in this method as very little of Haswell's materials are available from more than one locality.

The citations are quoted from the cards in The Australian Museum; certain changes in word order and punctuation have been made to standardize the presentation but the word "Collection" is abbreviated or spelled as cited on the cards. My comments are placed within brackets, including the modern name of the species. All materials are in The Australian Museum except where specifically noted. Old notes on the cards concerning the places where specimens and slides are located in the museum are omitted as these have all changed recently during a reorganization of the collections.

- Allorchestes crassicornis* [Hyale]. P. 3393 Kiama, N.S.W. Old Coll. 1 specimen [and 2 specimens in Macleay Museum]. [See text herein, Part II.]
- Allorchestes longicornis* [Hyale]. P.3394 Kiama, N.S.W. Old Coll. 1 specimen [and 3 specimens in Macleay Museum]. [See text herein, Part II.]
- Allorchestes niger* [Hyale]. P. 3396 Port Jackson. Old Coll. 24 specimens [and 7 specimens in Macleay Museum]. [See text herein, Part II.]
- Allorchestes rupicola* [Hyale *grandicornis rupicola*]. G. 5419 TYPE Port Jackson. Old Coll. 1 specimen; P. 3398 Port Jackson. Old Coll. 1 specimen; and 1 specimen in Macleay Museum [with 1 specimen of *Ceradocus* sp.] [See text herein, Part II.]
- Amaryllis brevicornis* [*A. macrophthalmus*]. G. 5417 TYPE Port Jackson. Old Coll. 5 specimens. Macleay Museum, Port Jackson, 2 specimens [one small specimen with deformed epimeron 3, other specimen with fully serrate epimeron 3; if serrate phenotype found to be good species, latter specimen could be selected as lectotype to vivify *A. brevicornis*].
- Amaryllis macrophthalmus*. Macleay Museum, Port Jackson, 5 specimens. [See text, Part I.]
- Ampelisca australis*. P. 3431 Port Jackson. Old Coll. 1 specimen.
- Amphithoe setosa* [*sestosa* on label]. [*Cymadusa*]. P. 3416 Rock Pools, Botany Bay, Old Coll. 1 specimen.
- Aspidophoreia diemenensis* [*Allorchestes compressa* Dana]. [New card.] G.5418 Tasmania Not returned after loan to K. Sheard, 1938. [See text herein, Part II.]
- Atylus homochir*. P. 3443 Port Stephens. Old Coll. 5 specimens. [See text herein, Part II.]
- Atylus megalophthalmus* [*Tethygeneia*]. G. 921 Jervis Bay. Old Coll. Not returned after loan to K. Sheard, 1938. [But type-locality is Port Jackson, hence this material not original.] [See text, Part I.]
- Atylus microdeuteropus* [*Gondogeneia*]. P.3444 Port Jackson. Old Coll. 30 specimens [actually only 25]. [See text, Part I.]
- Atylus monoculoides* [*Eusiroides*]. G. 5397 TYPES Port Stephens. Registered (Aug. 1905). 3 specimens.
- Colomastix Brazieri*. G. 5387 TYPE? [sic] Port Stephens? [sic] Old Coll. 2 specimens. [However, type-locality is published as Port Jackson so following specimen probably original material: P.3419 Port Jackson, Old Coll. 1 specimen.]

- Cyroidia lineata* [Paracyproidea]. P.3453 Port Jackson. Old Coll. 3 specimens.
- Cyroidia ornata*. G.5416 TYPE Port Jackson. 4 specimens.
- Cyrtophium dentatum* [*Podocerus cristatus* (Thomson)] P. 3423 Port Jackson. Old Coll. 3 specimens.
- Cyrtophium* (?) *hystrix* [*Laetmatophilus*]. P.3424 Port Stephens. Old Coll. 2 specimens. [However, published type-locality is Port Jackson.]
- Cyrtophium minutum*. P.3425 Port Jackson. Old Coll. 14 specimens.
- Cyrtophium parasiticum* [*Leipsuropus*]. G.5388 TYPE Port Jackson. Old Coll. 3 specimens.
- Eusirus dubius* [*Liljeborgia*]. [Recent card.] P.5861 Australia. Old Coll. 1 specimen.
- Glycerina tenuicornis*. G.5414 TYPES (2) Port Jackson. Not returned after loan to K. Sheard 1938. [However, published type-locality is Howick Group, N.E. Australia.]
- Haplocheira typica*. P.3428 (2) Port Jackson. Old Collection (Sept. 1912). 2 specimens indicated.
- Harmonia* [sic] *crassipes* [*Parapherusa*]. G.5394 TYPE Port Jackson. 2 specimens.
- Iphimedia ambigua* [correct genus unknown]. P.3468 Port Jackson. 1 specimen; P.3469 Broughton I. 1 specimen. [Type-locality not published in original description but Haswell (1882) lists Port Jackson.]
- Leucothoe commensalis*. G.5395 Port Jackson. Old Coll. 4 specimens. [See text herein, Part II.]
- Leucothoe diemenensis*. [Following specimen in Macleay Museum fits original figure very closely: *Leucothoe* sp. Tasmania. Label very old.] [See text herein, Part II.]
- Leucothoe novaehollandiae* [*Paraleucothoe*]. P.3471 (3) Port Jackson. Old Collection. (Sept. 1912); P.5857 Port Jackson. Old Collection. (Sept. 22) (2) [specimens]. [Type-locality not published in original description but Haswell (1882) lists Port Jackson.]
- Lysianassa australiensis* [*Waldeckia*]. P.3433 Port Jackson. Old Coll. 8 specimens [now composed of 7 specimens, fragment of posterior end and one slide]: "Port Jackson N.S.W. mth. parts. 1 micro slide (evidently remounted by K. Sheard) returned by K. Sheard . . . He has labelled it cotype & claims (in letter) it is an original Haswell slide. F.McN." [Slide writing: "Mouthparts of cotype Id K Sheard." Determined from my inspection as valid species of *Waldeckia* (see *Notes*, p 144).]
- Lysianassa nitens* [*Waldeckia*]. P.3435 CoTypes Port Jackson, N.S.W. O. Coll. 4 microslides (evidently remounted by K. Sheard). [Same comment by F.McN as on card for *L. australiensis*. Possible senior synonym of *Waldeckia chevreuxi* Stebbing (see *Notes*, p. 144). 4 microslides, body crushed on one slide, some parts present on other 3 slides. x = note about slides.]
- Megamoera diemenensis* [*Mallacoota*]. P.18498 Type ♂ 1 microslide (mth.parts) Tasmania. "I strongly suspect this specm. was originally borrowed by Sheard from Macleay Mus. F. McN." [See text, Part I.]
- Megamoera Mastersii* [*Maera*]. P.3487 TYPE Port Jackson, N.S.W. Old Collection (Sept. 1921). See also uropods pleon. mouthparts on 3 micr. slides. ". . . Sheard, 1938. . . seems to have ident. the spem. as Haswell's type"
- Megamoera sub-carinata* [*Mallacoota*] P.3493 COTYPES? [sic] (2) Port Denison Old Coll. (Sept. 1912). "Sheard . . . labelled the spems. as cotypes." [Sheard also labelled as "cotypes?" another lot: P.3503 (3) Port Molle. Type-locality published as Port Jackson followed by Port Stephens]. [A third card and lot are labelled: G.5390 Port Jackson (1) TYPE Reg'd. (Aug. 1905) and bear the labels "*Elasmopus subcarinatus*".]
- Megamoera suensis* [*Parelasmopus*]. P.18499 Sue Point, Torres Str. (believed to be the *Type* (fide, K. Sheard) . 1 specimen—mtd. on 7 microslides. O. Collection. [See *Notes*, p. 143; possibly in Macleay Museum originally.]
- Melita Australis* [*Melita appendiculata* fide literature]. [New card.] TYPES (5) G.5393 Port Jackson. Registered (Aug. 1905).
- Melita* (?) *Ramsayi* [*Ceradocus*]. [Recent card.] P.11242 *Moera ramsayi* COTYPES Port Jackson (4 slides) Old Collection (Dec. 1939) Id. K. Sheard 1939 "a further slide added to serics, Apr. '58. . . ." [Possibly in Macleay Museum originally; note high registration number.]
- Microdeuteropus chelifer* [homonym; = *Microdeutopus haswelli* Stebbing]; note by A.A. Myers in catalog: "only 1 specimen in existence, not same as specimen in British Museum". P.3497 Port Jackson. Old Coll. 1 specimen.
- Microdeuteropus Mortoni* [*Aora typica* Krøyer, but may need revivification when *Aora* revised]. P.3498 Port Jackson. Old Coll. 1 specimen.
- Microdeuteropus tenuipes* [*Aora typica* Krøyer, same comment as above]. G.5389 TYPE Port Jackson. Old Coll. 5 specimens.
- Moera crassipes* [*Gammaropsis*]. P.3473 Port Jackson (3) Old Collection (Sept. 1912) "Ident. revised by K. Sheard." [Type-locality is Port Jackson but following material also present: *Eurystheus crassipes* G.924 (3) Jervis Bay N.S.W. Coll. T. Whitelegge (Oct. 1893) "Exam. & ident. revised K. Sheard, who also seems to have recogn. these as Haswell's types." [This situation would be fully erroneous.]
- Moera dentifera* [*Gammaropsis*]. P.3476. Port Jackson, N.S.W. (9 spems. in 2 tubes—8 of them labelled as cotypes.) "(ret'd. in coupled [sic] state by K. Sheard after exam. of Aust. Mus. Coll. in 1945). This author had gathered together Amphipoda material at the time from various museums in Aust., & the cotypes above are thought to have been taken from the Macleay Mus. Coll."
- Moera hamigera* [*Maera*]. P.3477 Type ♂ 7 slides Port Jackson, N.S.W. " (evidently Sheard has decided this is Haswell's *Type*. F.A.McN." Another card without registration number states: "cotype ♂ 6 microslides Port Jackson, N.S.W. specimen exam . . . K. Sheard".]
- Moera spinosa* [*Ceradocus serratus* (Bate)] [Recent card] TYPE P.11241 pt. [sic] 10 slide [sic] Tasmania Old Collection (Dec. 1937) Ident. K. Sheard 1939.
- Moera viridis* [*Maera*]. [Recent card]. P.3485 TYPES ♀ & ♂ (7) Port Jackson. Old Collection (Sept. 1912) "Exam. K. Sheard who has labelled the specimens as Haswell's types. . . ." [Another recent card lists a cotype male on 4 microslides from Macleay Museum mounted by Sheard from Clark Is., Port Jackson; a further card, P.3484, has 1 cotype? from Port Denison.]

- Oedicerus arenicola* [*Exoedicerus fossor* (Stimpson)] G.5412
TYPE Port Jackson. Old Coll. 4 specimens.
- Oedicerus latrans* [Genus unknown]. P.3437 Bondi Bay (2)
Old collection (Sept. 1912). " (considered by K. Sheard not
to be this species. He states spems. do not agree with
published descr.)"
- Pherusa laevis* [*Pontogeneiella*]. G.5396 TYPE Kiama, N.S.W.
Old Collection (1905) (see also micro. slide of mouth
parts) *vide* K. Sheard. [See *Notes*, p. 143.]
- Phoxus Batei* [*Paraphoxus batei*, apparently a good species].
P.3438. Port Jackson. Old Coll. 2 specimens.
- Phoxus villosus* [*Paraphoxus*]. G.5413 TYPE. Port Jackson. Old
Coll. 1 specimen parts only 5 slides.
- Podocerus australis* [*Icilius*]. G.5386 TYPE Port Jackson. Old
Coll. 4 specimens.
- Polycheria brevicornis* P.3505 Port Jackson. Old Coll. 3 speci-
mens.
- Urothoe pinguis* [*Paraphoxus*¹]. G.5406 TYPE Bondi Bay. Old
Coll. 1 specimen (part) only 2 slides.

¹Mrs. Margaret M. Drummond and I have determined (May 1973) that this species should be retained in *Pontharpinia* Stebbing, a valid genus.

Xenocheira fasciata. TYPE mtd. Port Jackson N.S.W. "Sheard
has noted on slides ?Macleay Museum meaning he prob-
ably got the spem. from that place."

MISSING ORIGINAL MATERIAL OF HASWELL'S SPECIES

- Amphithoe cinerea*.
Amphithoe grandimanus.
Amphithoe quadrimanus.
Atylus lippus.
Dexamine Miersii [*Paradexamine*] [See text, Part I.]
Dexiocerella laevis [*Podocerus*].
Dexiocerella lobata [*Podocerus*].
Eusirus affinis [*Liljeborgia*].
Icilius punctatus.
Leucothoe gracilis [*Leucothoella*] [see text herein, Part II.]
Lysianassa affinis [Probably male of *Waldeckia nitens*].
Megamoera Boeckii [*Maera*].
Microdeuteropus australis [*Lemboides fide* A.A. Myers].
Moera approximans [*Gammaropsis*].
Montagua longicornis [*Stenothoe*].
Montagua Miersii [*Stenothoe*].
Neobule algicola [possibly female of *Allochestes compressa*
Dana].
Polycheria tenuipes.
Stegocephalus latus.
Wyvillea longimanus [*Jassa falcata* (Montagu)].

Appendix 3

Notes

Pareiasmopus suensis (Haswell)

Megamoera suensis Haswell, 1880c:335-336, pl.21: fig. 5.

MATERIAL.—Australian Museum, P. 18499, Sue Point, Torres Str. (believed to be the *Type* (*vide*, K. Sheard), 1 specimen—mtd. on 7 microslides. O. Collection. [A male].

REMARKS.—In Part I of this series I aligned *P. suensis* with *P. setiger* Chevreux on the basis of the literature. The specimen of *M. suensis* is extremely close to *P. setiger* but differs from the latter in the following minor ways, some of which appear to have specific significance in *Pareiasmopus*: the absence of dorsal body setae, the angular posterodistal margin of article 4 on gnathopod 1, the slightly more oblique palm bearing enlarged spines on male gnathopod 2, the presence of four ventral (against 2) spines on article 1 of antenna 1, the presence of four teeth on epimeron 3 occupying more marginal length than the three enlarged teeth on *P. setiger*. The mandibular palps on the slides of *P. suensis* are missing; possible specific values may occur on those palps as they do in other species of the genus. *Pareiasmopus suensis* has longer setae on the antennae than does *P. setiger*, but the following characteristics match those in *P. setiger*: coxa 1, epimera 1-2, articles 2, 4 and 5 of male gnathopod 2, and gnathopod 1. The posterior margins of epimera 1-2 (but not 3) are weakly acclivitous, each acclivity with one setule; epimeron 2 has one anterodistal spine on the face, epimeron 3 have four spines in tandem on the face near the ventral margin, the acclivities on article 2 of pereopods 3-5 appear slightly smaller than in *P. setiger*, article 4 of those pereopods has long setae but the distal articles are missing, coxae 2-3 are scarcely pointed anteroventrally and are weakly serrate ventrally, coxa 4 smooth ventrally, posterior lobe narrow, the lower lip bears one large cone on each outer lobe (but this appendage is poorly preserved on the slide), the accessory flagellum is 4-articulate, article 2 of antenna 1 apparently lacks spines, the

inner plate of maxilla 1 bears two large apical setae and the maxillipeds are missing.

Pareiasmopus suensis should remain distinct from *P. setiger* until a greater variety of materials from Australia can be compared with Chevreux' species.

DISTRIBUTION.—Sue Point, Torres Strait.

Pontogeneiella laevis (Haswell)

Pherusa laevis Haswell, 1880b:260-261, pl. 9: fig. 4.

MATERIAL.—Australian Museum, G.5396 TYPE, one specimen and microslide of mouthparts.

NOMENCLATURE.—If this species indeed belongs to *Pontogeneiella* then it and *Pontogeneiella levis* (Thomson) may be considered as homonyms; presumably Thomson's species has priority by a few months.

REMARKS.—The slide of mouthparts, including head and antennae, has been examined but not remounted; remounting will be necessary to observe the accessory flagellum; I did not have the equipment to do this delicate task nor the time to assemble it during my limited stay in Sydney. All gnathopods have been broken off distally from articles 2 to 5 but these are figured weakly in Haswell (1880b). Right antennae, the maxillipeds and all of thoracic somite 1 are missing; If inner lobes of the lower lip are present they have been obliterated and torn away from the outer lobes in the slide presumably mounted by K. Sheard. In other respects the species falls to *Pontogeneiella*.

MORPHOLOGICAL NOTES.—Antennae of medium length, articles of flagellum on antenna 1 short, with several long aesthetascs each, articles scarcely differing in width alternately; rostrum and eye crushed, rostrum apparently much shorter than in *P. levis* (Thomson); upper lip rounded from anterior view but lateral view of prebuccal mass unknown; incisor of mandible with at least two teeth, right lacinia mobilis thick, minutely bifid apically and with small tooth on midmargin facing incisor

[but observation possibly faulty], left lacinia mobilis long, slender, bifid half its length, each ramus weakly falcate, molar low, cuboidal, margins sharp, grinding margin scaliform, proximally setulose or setose (broken), remainder of flat molarial surface poorly tritulative, palp similar to that of *P. levis* (Thomson) (see J. L. Barnard, 1972b), article 2 with seven or more setae on distomedial margin, article 3 subfalcate but inner margin straight, setae evenly developed rather than being thickened and elongate apically, outer base of article 3 with bundle of about four setae; inner plate of maxilla 1 lined medially with setae from about mark 33 distalwards, apex of plate with two or three ragged cusps, apical seta if enlarged probably missing, outer plate with about nine spines, two of these towards outer margin with three large apicomedial teeth, remainder serrate for most of their length, palp with two articles, apex densely setose; inner plate of maxilla 2 with curving submarginal row of setae, latter thick towards apex, plates subequal to each other in width and length, densely setose apically; pereopods each with one locking spine, that spine straight, bifid nearly halfway, inner ramus of bifidation thinner than outer, apices sharp, dactyls of pereopods with apical nail bearing sleeve or flange more than halfway along outer margin; stout and sinuous, sharp seta at base of nail on inner margin, seta extending as far as outer sleeve; epimeron 1 rounded-beveled on posteroventral margin, epimeron 2 weakly bulging, with small tooth and weak sinus posteroventrally, epimeron 3 with medium posterior bulge and extremely minute posteroventral tooth; outer ramus of uropod 2 with one large and two medium upcurved apical spines, dorsal margin of ramus with ridge and two spines in tandem; peduncle of uropod 3 short and with one apicolateral spine, rami more than twice as long as peduncle, slender from lateral view, outer ramus with two spines in tandem near base on lateral margin, inner ramus setose along dorsomedial margin; telson elongate, reaching almost to middle of rami on uropod 3, cleft about two-thirds its length, medial margins of each lobe extending, by straight tangent to apex, outer margins curving outwards from apices, each apex with two large serrations each with setule.

Unless cryptosiblings are present in Australia this species should be easy to recognize in fresh

materials. At that time details on missing parts can be filled in. Apart from the recognition value in the generic characters of mouthparts the following combination of shapes and meristic characters is significant: palpal apex of maxilla 1, locking spines, pereopodal dactyls, outer ramus of uropod 2, telson, and epimera.

DISTRIBUTION.—Kiama Bay, New South Wales.

Waldeckia australiensis (Haswell)

Lysianassa australiensis Haswell, 1880c:323, pl. 18: fig. 3; 1885: 5, pl. 12: figs. 3,4.

MATERIAL.—Australian Museum, P.3433, eight specimens and one slide, presumably Haswell's original material.

REMARKS.—The mouthparts, including the prebuccal mass, fit the definition of *Waldeckia* Chevreux, but gnathopod 1 has a weak palm defined by one or two spines. Gnathopod 2 is as shown by Haswell, the hand slightly narrowing apically, the dactyl short; this character, figured by Haswell, adequately distinguishes this species from *W. chevreuxi* Stebbing and *L. nitens* Haswell. On pereopod 3, article 5 is almost fully enveloped posteriorly by a lobe of article 4. The right mandible is similar to that shown by Stebbing (1910) for *W. chevreuxi* but the apex of the molar is sharp from one view, blunt from another, and two tiny spines occur near the incisor. The left lacinia mobilis appears to be present and appears to have two adjacent spines. The outer plate of maxilla 1 has seven medium stout spines and three or four slightly smaller inner spines. Palp article 3 of the maxilliped is very thin.

No dissections of this material have been made in anticipation that fresh materials will be studied to determine the diversity of this genus in Australia before any final decision as to nomenclature is made.

DISTRIBUTION.—Port Jackson.

Waldeckia nitens (Haswell)

Lysianassa nitens Haswell, 1880b:255–256, pl. 8: fig. 5; 1885:4, pl. 12: figs. 1,2 [as *Anonyx*].

?*Lysianassa affinis* Haswell, 1880b:256 [probably the male].

?*Waldeckia chevreuxi* Stebbing, 1910:572–573, pl. 47a.

MATERIAL.—Australian Museum, P.3435, four slides.

REMARKS.—The body is crushed onto one of the four slides. General agreement with *Waldeckia chevreuxi* is found, especially in the significant shape of gnathopod 2. Maxilla 1 has eight large and three smaller inner spines on the outer plate. The mandible resembles that of *W. chevreuxi* but

the molar appears stouter and blunter. There is a possibility that numerous sibling species of *Waldeckia* occur in Australia, similar to the situation of *Parawaldeckia* in New Zealand (see J. L. Barnard, 1972b), so that final decisions on nomenclature should await a study of diverse fresh materials.

DISTRIBUTION.—Port Jackson; ?Wata Mooli, 54–59 fms.

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