

Gammaridean Amphipoda
of Australia, Part V:
Superfamily Haustorioidea

J. LAURENS BARNARD
and
MARGARET M. DRUMMOND

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ABSTRACT

Barnard, J. Laurens, and Margaret M. Drummond. Gammaridean Amphipoda of Australia, Part V: Superfamily Haustorioidea. *Smithsonian Contributions to Zoology*, number 360, 148 pages, 58 figures, 1 table, 1982.—New genera and species in the superfamily Haustorioidea are described. The Haustorioidea are reorganized by rejection of the Pontoporeiidae and the description of new families Urohaustoriidae, Zobrachoidae, and Condukiidae; the Haustoriidae, Phoxocephalidae, and Platyschnopidae are rediagnosed to fit this haustorioid pattern. The described species of *Urohaustorius* are clarified (9 new species) and the new genera *Gheegerus* (1 new species), *Narunius* (1), *Tuldarus* (2), *Tottungus* (1) and *Dirimus* (1), with affinities to *Urohaustorius*, are established. The Zobrachoidae are established to contain *Zobracho* and the new genera *Bumeralius* (1) and *Prantinus* (1). The new genus *Condukius* (1) is assigned to a new family of its own. The Urothoidae are defined to include *Urothoe*, *Urothoides*, *Carangolia*, and *Cunicus*.

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Gammaridean Amphipoda of Australia, Part V: Superfamily Haustorioidea

*J. Laurens Barnard
and Margaret M. Drummond*

Introduction

Marine taxa of the families Urohaustoriidae, Zobrachoidae, and Condukiidae are treated herein. This continues our studies of those gammaridean groups in Australia needing report most urgently because of their value to other biologists involved in impact surveys, monitoring programs, and population ecology.

The haustorioid groups are especially important because of their diversity, abundance of individuals and obscure taxonomy. As in parts III and IV the bulk of our material originates from the various surveys conducted by the Marine Studies Group in Melbourne, but an increasing percentage of specimens is coming from other institutions launching major studies of the marine environment in New South Wales and Queensland.

ACKNOWLEDGMENTS.—The first author is especially indebted to Dr. F.H. Drummond, The University of Melbourne, for his gracious hospitality and many kindnesses to him during stays in Melbourne in 1971, 1976, and 1980, helping with accommodations, field trips and valuable information; gratitude must be expressed also to Dr. and Mrs. Jerry D. Kudenov of the Marine

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In Brisbane, Prof. W. Stephenson of the University of Queensland gave full access to his valuable material, laboratory and hospitality, and Mr. Ronald Munroe of the Queensland Museum provided access to other valuable specimens.

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Most of the materials used in this study have come from benthic surveys in Western Port (1964–1965 and 1973–1974) and in Port Phillip Bay (1971–1973). Acknowledgment and appreciation to organizations and individuals have been expressed more fully in a previous publication (Barnard and Drummond, 1978).

Thanks are also due to the South Australian Museum, for the courtesy of Wolfgang Zeidler, curator of Crustacea, and to the National Museum of Victoria, for the loan of type material; to Dr. Phillip Gibbs of the New South Wales State Fisheries Department for material from the Estuarine Benthic Survey; and to Dr. Deborah Dexter, Visiting Scientist at the Department of Zoology, University of Sydney, 1980–1981, who very kindly loaned to us some most useful material from her New South Wales beach sands collection.

In the laboratory in Melbourne, Danuta Karpow's technical assistance has been much appreciated.

Dr. Alistair Gilmour, formerly Officer-in-Charge of the Ministry for Conservation in Victoria's Marine Studies Group and Dr. Leon Collett, also of that Group, have supported this study

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We thank Dr. Thomas E. Bowman and Dr. A.A. Fincham for suggestions to improve the manuscript. We also are indebted to Jack Korytowski, our editor, for the many improvements that he made to our work.

METHODS.—These fossorial taxa are treated by the same methods and naming of taxa employed by Barnard and Drummond (1978) for the Phoxocephalidae, with the following emphasis or distinction.

Spine and setal formulas read from proximal to distal except in the case of article 3 of the mandibular palp and of article 5 of pereopods 3 and 4 where they progress round the margin of the article from anterior proximal to posterior proximal.

Haustorioids are among the most setose of amphipods and the setae are of many kinds. Some are broad, short, and stiff and are called "spines," but other short blunt setae appear flexible or bent; some are naked, blunt, and short and often are inserted into second antennae by large basal bulbs; other short setae are distally hairy or pubescent and called "penicillate"; still others are more evenly and sparsely hairy and called plumose and these often are highly elongate and flexible. We had difficulty, especially on article 1 of antenna 1, distinguishing between spines and setae because the main row often has elements too short and stout to be considered setae but too bent or slightly flexible to be called spines; we often use word combinations such as "spine-setae" or "fine spines" to catalog the infinite degree between extremes. Regardless of the appearance of illustrations, the text description of spines is to be accepted. We use the following code of abbreviations for setal formulas: E = long seta, often plumose; e = short seta; P = penicillate seta; p = penicillate setule; S = large spine; s = small spine. A setule is a very small seta, especially the small elements found on the telson.

"Glassy" spines are rodlike, stiff, untapering or weakly tapering, often bifid spines attached to the posterior margin of article 4 on antenna 2 in Zobrachoidae and Urohaustoriidae; they do not occur in the facial armament and so are excluded from any formulas; a code letter is therefore not used for them.

Marginal spines on palp article 3 of the mandible are cited in setal formulae in 4 groups: dorsal (outer), apical, ventral (inner), any subapical facial spines.

Thoracic appendages (legs 1-7) are termed "gnathopods 1-2" followed by "pereopods 3-7"; other specialists may call these all "pereopods 1-7" and not distinguish gnathopods 1-2 as separate entities. Setation patterns on article 2 of legs 1-4 are so complex and variable that they have been omitted.

Spine and setal formulas on pereopods 3-4 are cited as in the following example: "5, 4, 2-1-1, 7 + 6 + 1," in which "5" and "4" refer to large apicoanterior setae on the outer face of articles 4 and 5; the formula "2-1-1" refers to posterior spination on article 5, from distal to proximal, the distal spine position being counted as paired; "7 + 6 + 1" refers to the spines on article 6, with 7 lateral, 6 medial, and 1 intercalated between the other rows.

Pleopodal formulas: peduncular formulas are presented generally as "2 and 1, 2 and 0, 2 and 1" referring to the presence of 2 coupling hooks on pleopods 1-3 plus an additional straight spine on pleopods 1 and 3. Segmental formulas, cited as 20-15, 18-12, 20-13, refer to segments on the outer and inner ramus of the 3 pairs of pleopods. Basal setal formulas follow the same pattern citing the number of setae on the basal articles of the rami; for example, the formula "7-2-5-1" means 7 lateral setae on article 1 of the outer ramus, 2 medial setae on the same article, 5 lateral setae on article 1 of the inner ramus and 1 medial seta on the same article; formulas for pleopods 2 and 3 then follow.

The armament formulas on the lateral margin of article 1 on the outer ramus of uropod 1 and on the antennae, proceed from proximal to distal.

Telsonic setal formulas cite one side of the telson from base to apex, for example, "2P, 1, P, 2" refers to a pair of penicillate setules on the basolateral margin followed by a marginal seta, a penicillate seta and two apical setae; the total setae of the telson are normally double the formula. These armaments are usually very small but use of small letters is reserved for elements only in context and not in comparison to other appendages.

Cuticular structures such as bulbar setules and faint patterns of scales have been of so little value in this study that they are largely ignored in the descriptions but occasionally are illustrated.

Unknown characters are enclosed in bracket.

ORGANIZATION OF ILLUSTRATIONS.—Each figure has one master specimen on which no subscript lower case labels are placed to the left of the capital letters denoting the kind of appendage. Subsidiary specimens are marked with such labels which are described in each legend.

DEFINITION OF TERMS.—Several concepts require explanation to enable use of terminology that saves space and provides instant recognition of a morphological state.

Antenna 1 of *Haustorius* Form: Peduncle stout, short, articles 1-3 progressively shorter, article 3 never elongate, flagella elongate (Figure 2: A1).

Antenna 1 of *Urothoe* Form: Peduncle slender, one or more articles elongate, article 3 usually elongate, flagella short (Figure 55: A1).

Antenna 2 of *Haustorius* Form: Article 4 of peduncle broadly expanded, article 5 significantly shorter and narrower than article 4 (Figure 2: A2).

Antenna 2 of *Urothoe* Form (and also of *pontoporeia* form): Article 4 of peduncle normally rectilinear, article 5 not significantly shorter or narrower than article 4 (Figure 55: A2).

Pereopod 5 of *Haustorius* Form: Articles 4 and 5 expanded but article 4 dominant (Figure 4: P5). Alternative is "pereopod 5 not of *haustorius* form."

Uropod 3 of Ordinary *Haustorioid-Phoxocephalid* Kind: Peduncle short and broad from

dorsal view, outer ramus longer than peduncle, with 2 articles, first article dominant and usually laterally armed, article 2 with apical armaments; inner ramus variable, in female often very short and poorly armed, but in male as long as outer ramus and strongly setose; outer ramus in male also strongly setose (Figure 17: R3).

Owing to the large size of the posterior pereopods in many haustorioids, a small increase in body length results in a great increase in massiveness of the specimens; hence, our attribution of the terms "superadult" or "senile" may appear strange in terms of the small increment in body size of specimens so designated.

Names of new taxa are taken from aboriginal words as follows: *barinius*, summit; *buchalius*, upright; *Bumeralius*, spirit; *cangellus*, good; *Condukius*, spirit; *Divimus*, spirit; *garbalius*, thin forehead; *Gheegerus*, west wind; *gunni*, digging tool; *karkan*, spear; *merkanius*, strange; *Narunius*, spirit; *parnggius*, deep water; *pentinus*, withered; *perkeus*, steep; *Prantinus*, jump with fright or wonder; *pulcus*, toed; *talanggi*, linguiform; *tallerkus*, thistle; *tarlitus*, small; *Tottungus*, evanescent; *Tuldarus*, astral; *tungus*, tarsal; *wingaro*, oculate; *yurus*, cloudy. All of the above names are masculine.

TEXT ABBREVIATIONS

AM	The Australian Museum, Sydney
CPBS	Crib Point Benthic Survey, Western Port (stations in Barnard and Drummond, 1978)
EBS	New South Wales State Fisheries Estuarine Benthic Survey (Botany Bay, Jervis Bay, Lake Macquarie, Merimbula)
HDWBS	Hunter District Water Board Survey
NMV	National Museum of Victoria, Melbourne
PPBES	Port Phillip Bay Environmental Study (stations in Barnard and Drummond, 1978)
QM	Queensland Museum
QUBS	University of Queensland Benthic Survey
SAM	South Australian Museum, Adelaide
SBS	Australian Museum Shelf Benthic Survey
WPBES	Westernport Bay Environmental Study

FIGURE ABBREVIATIONS

(used in specimen drawings)

A	antenna	C	head
B	prebuccal from lateral	D	dactyl of pereopod

E	coxa	U	upper lip from anterior
F	accessory flagellum	V	palp
G	gnathopod	W	pleon (pleonites 1-3 bearing epimera; pleonites 4-6, also referred to as urosomites 1-3, comprising urosome; often shown with attached structures: telson and uropods 1-3)
H	peduncle	X	maxilla
I	inner plate or ramus	Y	see legend under illustration
J	right lacinia mobilis	Z	see legend under illustration
K	spine, seta, or denticle		
L	lower lip		
M	mandible		
N	molar		
O	outer plate or ramus		
P	pereopod		
Q	cuticle		
R	uropod		
S	maxilliped		
T	telson		

Lower case letters on the left side of labels denote specimens cited in the legends and voucher material in the text; lower case letters on the right side of labels (or affixed to the drawings as is often the case with "e" and "s") indicate the following:

a	alternate view	l	lateral
d	dorsal	o	opposite
e	broken	s	setae removed
f	flat	r	right
i	medial	v	ventral
j	unenlarged	y	enlarged

Superfamily HAUSTORIOIDEA Stebbing, 1906

Furnished with various fossorial (digging and mud roiling) adaptations in form of extremely setose antennae and appendages. Pereopod 5 of special haustorius form (if not, rostrum cylindrical), article 4 dominant, with strong facial spination on articles 4-5 (or progressively losing spination in derived forms otherwise clearly connected incrementally to plesiomorphic forms). Uropod 3 of gammarid form (or progressively modified, especially *Japara* Barnard and Drummond, 1978), outer ramus dominant, 2-articulate, if peduncle appearing elongate then rami shortened. Accessory flagellum present, 2+ articulate. When entire, telson never longer than broad and lamelliform; otherwise telson cleft. If rostrum present then dorsoventrally flattened and visorlike or thick, cylindrical and extended for-

ward without basal pediculation. Mandibular palp 3-articulate.

If article 1 of flagellum on antenna 1 elongate then gnathopods subchelate. Mouthpart field quadrate (not conically grouped) from lateral view, mouthparts not styliform. Mandibles with incisor, otherwise not of pardaliscid form. If molar weak then either of gnathopods 1–2 subchelate. Outer plate of maxilliped well developed, its articular base not elongate, inner plates if partially fused, remaining broad, palp 3+ articulate. If coxa 1 small, coxa 2 never as much as 4 times longer or 10 times greater in area, coxa 2 never larger than coxae 3 or 4. Gnathopods never carpochele, together not of liljeborgiid form, article 3 not elongate. If partially fused together, urosomites not of tall form found in dexaminids or ampeliscids.

CLASSIFICATION IN HAUSTORIOIDEA

In restricted terms and in modern context, haustorioid amphipods were first segregated at family level by Dana (1853), who instituted a family Pontoporeiidae without definition but with the inclusion of the following genera (spellings here corrected): *Pontoporeia*, *Priscillina*, *Argissa*, *Bathyporeia*, *Urothoe*, *Phoxocephalus*, *Harpinia*, and *Lepidactylis*. Stebbing (1906) removed *Argissa* to the Argissidae and *Phoxocephalus* and *Harpinia* to the Phoxocephalidae and used the name of the oldest genus, *Haustorius*, as the family root, thus constituting Haustoriidae with *Bathyporeia*, *Platyischnopus*, *Haustorius*, *Cardenio*, *Priscillina*, *Pontoporeia*, *Urothoe*, and *Urothoides*. In recent times *Cardenio* has been removed to the Synopiidae (Tironidae) and *Platyischnopus* has been made the type of a new family, Platyischnopidae (see Barnard and Drummond, 1979). We do not believe *Pontoporeia* and *Haustorius* are confamilial and we therefore remove *Pontoporeia* and its cohorts to Gammaroidea.

Bousfield (1965) reinstated Pontoporeiidae as a subfamily, Pontoporeiinae, to distinguish its components, *Pontoporeia*, *Amphiporeia*, *Bathyporeia*, *Priscillina*, *Haustoriopsis*, and *Urothoe*, from the

Haustoriinae, which included *Haustorius*, *Eohaustorius*, *Protohaustorius*, *Parahaustorius*, *Neohaustorius*, *Pseudohaustorius*, and *Acanthohaustorius*. The genera *Cardenio*, *Urohaustorius*, *Urothoides*, *Platyischnopus*, and *Phoxocephalopsis* were left unordered; *Haustoriopsis* has since been removed to the Dexaminidae (see J. L. Barnard, 1972); and, as mentioned above, *Cardenio* and *Platyischnopus* have been re-aligned.

There is little doubt that the Haustoriinae, sensu stricto, represent a very distinct and tightly defined cluster of genera from the Atlantic shorelines. They share such unusual characters as absence of a maxillipedal dactyl and absence of mandibular lobes on the lower lip. All have very broad bodies and are immensely setose, with powerful fossorial mechanisms. There is great uniformity in thoracic appendages, pereopods 6 and 7 having a very stable, almost unique morphology (see Bousfield, 1965). They exhibit a uniform combination of other characters, some of which do occur in non-haustoriin taxa, but not in the following combination: short, broad head of non-gammarus form; haustorius-type antennae; reduced accessory flagellum; medial sides of maxillae and maxillipeds strongly setose (maxilla 1 and maxillipeds often with basal baler lobes); biarticulate palp of maxilla 1, enlarged outer plate of maxilla 2; short, blunt mandibular incisors; simple gnathopod 1; parachelate gnathopod 2; deeply lobate article 5 of pereopods 3 and 4; haustorius-type pereopod 5 dominated by pereopods 6 and 7; especially expanded article 4 of pereopod 6; minute (or absence altogether of) dactyls 3–7; short, broad pleopodal peduncles; spinose, clavate or styliform rami on uropod 1; linguiform setose rami on uropod 2; heavy armament at the joint of articles 1 and 2 of uropod 3; and setose apex of article 2. In addition epimeron 1 is well developed and epimeron 3 the dominant side-plate. Brood plates, in contrast to the narrow form of most antiboreal taxa, are slightly expanded. Haustoriin telsons are more or less similar, with a propensity for strongly gaping but shallow apical cleavage and often a narrow base. There is a tendency to ventral flexion of the

urosomes, a condition not observed in pontoporeiids or in any antiboreal genera.

If one confines the pontoporeiid group to *Pontoporeia*, *Amphiporeia*, and *Bathyporeia*, a great contrast to haustoriids is evident. The head is of the normal gammarus-form typical of basic gammarids; the body is of the slender gammarus-form, with the urosome, though slightly reduced in size, unflexed; antenna 1 is of the gammarus- or urothoe-form; the lower lip bears mandibular lobes; pereopod 5 is not of the haustorius form; the pleopods have elongate peduncles; uropod 2 has styliform or lanceolate rami bearing spines; and the form of pereopods 5-7 and gnathopods is variable. Other characters in common include very short accessory flagellum, medial setation on maxillae and maxillipeds and more or less ordinary gammarid telson. *Priscillina* can be admitted to the Pontoporeiinae on the basis of maxillae, lower lip, pereopod 5, pleopods, uropods, brood plates (broad), and telson (though poorly cleft); but the accessory flagellum is longer than in the other genera and the head bears a sharp ventral cheek as in *Urothoe*.

Haustroriinae and all other haustorioid taxa, including *Urothoe*, *Urothoides*, *Carangolia*, *Cunicus*, *Phoxocephalopsis*, *Zobracho*, *Bumeralius*, *Gheegerus*, *Prantinus*, *Dirimus*, *Narunius*, *Urohaustorius*, *Tuldarus*, and *Tottungus* differ from Pontoporeiinae in the haustorius form of pereopod 5, the short peduncles of the pleopods, and the presence of thick posterior spines on article 5 of pereopods 3-4, but in the haustoriids article 5 is broadly expanded and the spines occur in 2 distinct rows. Except for Haustroriinae and *Phoxocephalopsis*, all genera have these spines in a distinct pattern: a pair of distal spines and one or more posterior marginal spines.

If *Phoxocephalopsis* is held in abeyance, the non-haustoriid genera are divisible into two large groups, the *Urothoe* group with urothoe antenna 2, and the *Urohaustorius* group with haustorius antenna 2. The *Urothoe* group is further characterized by the large ventral cheek on the head and the *Urohaustorius* group by the presence of a special set of numerous glassy, untapering setal-

spines occurring ventrally and ventro-facially on article 4 of antenna 2. When rami of uropods 1, 2 are present and well developed they are linguiform and setose in the *Urohaustorius* group and styliform-lanceolate and spinose in the *Urothoe* group. Most members of the *Urohaustorius* group have the inner rami of the pleopods significantly shorter than the outer. In the genus *Urothoe* (but unknown for others of its group) the rami are subequal. All members of the *Urohaustorius* group are also characterized by the dominance of epimeron 2.

In these terms the *Urothoe* group includes *Urothoides*, *Carangolia*, and *Cunicus*, and the *Urohaustorius* group includes *Zobracho*, *Bumeralius*, *Narunius*, *Prantinus*, *Gheegerus*, *Dirimus*, *Tottungus*, and *Tuldarus*. Within the *Urohaustorius* group a subdivision based on simple and subchelate gnathopod 1 and discreteness of epimeron 1 can be made, with the subchelate gnathopod 1 and discrete epimeron 1 being found in *Zobracho*, *Bumeralius*, and *Prantinus*. In *Prantinus*, however, epimeron 1 is least discrete and approaches the condition found in *Urohaustorius* and its allies.

Antenna 1 of all members of the *Urothoe* group is of the urothoe form, and of all members except *Prantinus* of the *Urohaustorius* group is of the haustorius form. *Prantinus* remains more strongly associated with the *Urohaustorius* group than with the *Urothoe* group on the basis of antenna 2 and the rami of uropods 1-2.

Phoxocephalopsis is enigmatic. It combines the *Haustrorius* antennae 1-2, maxillary palp, pereopod 5, and uropods 1 and 2 with the *Urohaustorius* kind of maxillipeds and other mouthparts (except palp of maxilla 1), pereopods 3-4, pereopods 6-7, epimera, and telson. It cannot be grouped with *Urothoe* because of antennae 1-2 and uropod 2. The head cheek is moderate and the special glassy spines of antenna 2 are absent. It would appear to be a plesiomorphic form standing ancestral both to the *Urohaustorius* group and the Haustroriinae. It deserves familial rank.

All members of the greater *Urothoe-Urohaustorius* group occur in the southern hemisphere except for several species of *Urothoe* that have penetrated

the northern hemisphere and generally live in its cooler waters or in the tropical waters of southern and eastern Asia. All pontoporeiins and haustoriins are centered on the north Atlantic Ocean.

Pontoporeiins and haustoriins bear widened brood plates whereas all known urothoin-urohaustoriin taxa have narrow brood plates.

EVOLUTIONARY PATTERN IN HAUSTORIOIDEA

FIGURE 1

The details given in the classificatory section suggest the broad outlines of an evolutionary pattern. The various groups are raised to family level.

The pontoporeiids would appear to be the most primitive of the group but this is not to suggest that they are ancestral to the others. The differences are so strong that one may not conclude that any evolutionary flow has occurred between pontoporeiids and other haustorioid groups. Pontoporeiids are very close to the Pontocaspian gammaroids (see discussion in Barnard and Drummond, 1978) but differ in the enfeeblement of the gnathopods and the somewhat enlarged mandibular molars with relatively weaker triturative states and the loss of coxal gill 7. The pontoporeiids are so close to the Pontocaspian gammaroids that they probably do not deserve more than minor classificatory disjunction from the "Pontogammaridae" (family considered invalid; see Barnard and Barnard, in press). Whatever intergradation could be suggested to occur between pontoporeiids and the remaining haustorioids can be seen in *Priscillina*, on which antenna 2 is weakly of the haustorius form, with a few facial spines and reduced article 5 and on which a pointed ventral cephalic cheek occurs similar to, but possibly not homologous with, that found in *Urothoe*. *Priscillina* also resembles the urothoids in the blunted mandibular incisors. In contrast to *Priscillina*, antenna 1 and pereopods 5-7 are very distinctive in urothoids. Pleopodal peduncles of *Priscillina* (new observation) are somewhat intermediate in their elongation between those of *Pontoporeia* and *Urothoe*.

The urothoids, comprising *Urothoe*, *Urothoides*, *Carangolia*, and *Cunicus* (and probably more genera to be separated out of *Urothoe*), differ from pontoporeiids in the special form of antenna 1, on which one or more articles are elongate, especially article 3, and on which the flagella are very short; the weak medial setation of maxilla 1; and the special haustorius form of pereopod 5, on which articles 4-5 are broadened but article 4 is dominant. In the most primitive urothoids the lateral faces of these articles are densely spinose but in some of the more apomorphic species, such as *Urothoe elegans*, many of the spines are lost and article 4 scarcely dominates article 5. The biarticulate palp of maxilla 1, typical of pontoporeiids, is retained. Articles 5 and 6 of pereopods 3-4 exhibit a pattern of spination not found in pontoporeiids. Fully developed facial armaments, in ranks, are developed on article 4 of antenna 2. Like *Bathyporeia* of the Pontoporeiidae, many urothoids have strong sexual dimorphism in antenna 2, the flagellum of the male becoming elongate and calceoli being developed on the peduncle and the flagellum. The head of urothoids is recognizable because of the ventral protrusion of a sharp cheek similar to that of *Priscillina*.

A more or less orderly progression in the development of the urothoid kind of pereopods 3-4 through the Phoxocephalidae may be seen; the primitive phoxocephalid has an elongate article 6 and poorly spined article 5, whereas such advanced taxa as *Yammacoona* and *Kotla* (Barnard and Drummond, 1978) have the strongly spined article 5, though article 6, with its similar spination pattern, never becomes as broad as in urothoids. Those genera also have a severely reduced rostrum, dorsoventrally extended head, and urothoid antenna 1; and retain the biarticulate palps of maxilla 1. One might visualize an ancestor of *Kotla* as a simultaneous ancestor of *Urothoides*, in which case gnathopodal enfeeblement and slight lessening of distinctions between pereopods 6 and 7 would have to ensue in the urothoid group.

Because it would be difficult to derive other haustorioids from the same point as *Kotla*, the support for manifold derivation (polyphyly) of

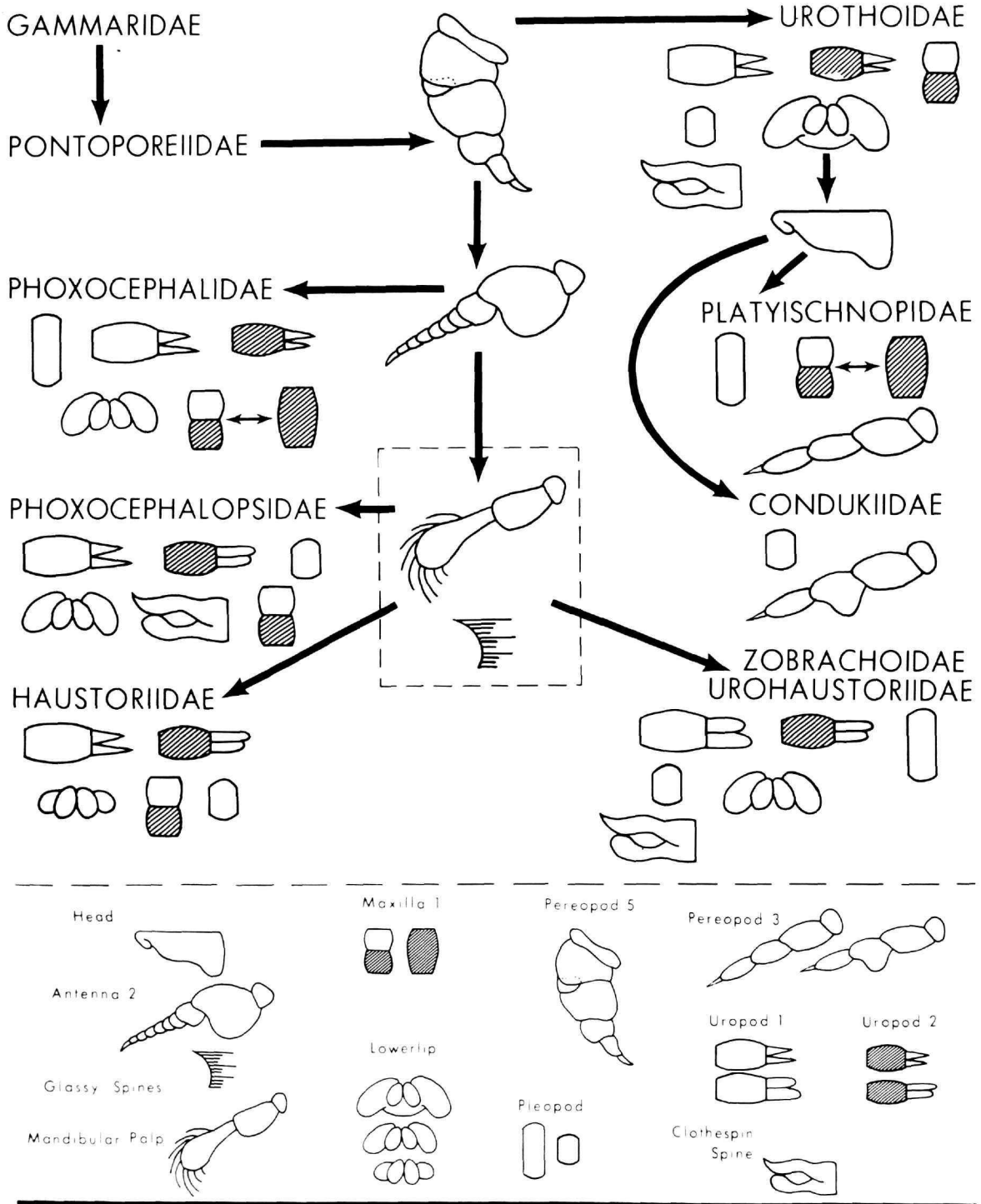


FIGURE 1.—Evolutionary deployment in various families of the hypothetical haustorioid group.

the various groups of haustorioids is amplified. The zobrachoid-urohaustoriid line would have a better starting point near the primitive end of the phoxocephalid scale, but again article 6 of pereopods 3–4 would develop convergently.

All remaining haustorioids are characterized by the haustorius antenna 2, in which article 4 is expanded and article 5 is greatly inferior. All except *Prantinus* are also characterized by the haustorius antenna 1, which resembles that of pontoporeiids, but in which the accessory flagellum is enlarged. At this point one must dispose of the Phoxocephalidae, because the primitive members and the majority of Phoxocephalidae are characterized by the combination of haustorius antennae 1–2, and pereopod 5. Like *Bathyporeia* and *Urothoe* many of the taxa have the elongate, sexually dimorphic male antenna 2. Unlike pontoporeiids, urothoids, and other haustorioids, several phoxocephalids retain enlarged gnathopod 2, a possible mark of their ancestry in gammarids. The short wrist of this phoxocephalid gnathopod 2 is unlike that of gammarids, however, and may indicate a secondary evolutionary development. Though most phoxocephalids have enfeebled gnathopods and small, non-triturative mandibular molars, several genera retain much better-developed tritulative mandibular molars than do any haustorioids outside of the pontoporeiids. This exceptional molar is much more acetabular than any found in gammarids. Urothoids and phoxocephalids share much in common, including a slight propensity in *Urothoe* for the development of a visorlike rostrum, the characteristic plesiomorph of phoxocephalids. Nevertheless, Barnard and Drummond (1978), on the basis of the more plesiomorphic gnathopods and mandibles of phoxocephalids, preferred not to derive phoxocephalids from urothoids. There is a possibility that these had a common ancestor, but no idea of straight-line derivation can be entertained. Urothoids retain the unusual palp of maxilla 1 found in pontoporeiids and in the sensu stricto Haustoriidae, in which, quite unlike most amphipods, and especially unlike gammarids and phoxocephalids, article 1 is elongate. Occasional

phoxocephalids possess a urothoid antenna 1, though rarely with article 3 as elongate as in urothoids.

The next most apomorphic group would appear to be the provisional “urohaustoriids,” comprising *Zobracho*, *Bumeralius*, *Prantinus*, *Gheegerus*, *Narunius*, *Urohaustorius*, *Tuldarus*, *Dirimus*, and *Totungus*. Actually this group stands opposite the Haustoriidae in apomorphy. Its uropods 1–2 and maxilla 1 are much more specialized than those of the haustoriids, whereas in haustoriids pereopods 6–7, uropod 3, and mouthparts other than maxilla 1, show greater specialization than in the Urohaustoriidae. Neither group could be derived from the other without severe evolutionary reversals in various characters, though they can be visualized to have a common ancestor.

All urohaustoriids are characterized by the linguiform setose rami of uropods 1–2; this kind of ramus in Haustoriidae occurs only on uropod 2. Urohaustoriids are also characterized by the unarticulate palp of maxilla 1, the clustering of the glassy spines on article 4 of antenna 2, the dominance of epimeron 2, the presence of large or easily visible elements forming an armament row on the outer face of article 1 on antenna 1 (only remnants occurring in Haustoriidae), the specific form of pereopods 6–7, (articles 4–5 poorly expanded and article 4 on pereopod 6 not hugely dominant), the presence of clothespin spines on the inner rami of the pleopods, and by the absence (therefore normalcy) of various other characters to be mentioned specifically for Haustoriidae below. Some urohaustoriids also bear the clothespin spines on the pleopods; these may be a primordial attribute lost by Haustoriidae.

Urohaustoriids are divisible into 2 groups: those without palm on gnathopod 1, which are typical of *Urohaustorius* and its allies; and those with subchelate gnathopod 1, like *Zobracho*, *Bumeralius*, and *Prantinus*. These 3 are segregated into the family Zobrachoidae but otherwise they stand close to Urohaustoriidae. One assumes that subchelate gnathopod 1 is the plesiomorphic state and that urohaustoriids are therefore highly apomorphic; but *Prantinus* is so divergent and apo-

morphic in other attributes that it may have to be split away into a group of its own. Antenna 1 of *Prantinus* is of the urothoe form but in most other features *Prantinus* resembles *Zobracho*. *Prantinus* differs from any urothoid in the incisor and molar of the mandible, the dominance of epimeron 2, and in characters of the inner plate and palp of maxilla 1.

Because *Cunicus* is so divergent, with its unusual uropods 1–2, composed only of setose peduncles, the urothoids cannot be limited by the character of styliform rami on uropod 1. One infers that an hypothetical evolutionary step occurs between styliform spinose rami and the loss of rami (with attendant linguiform-setose peduncles). This might be represented by a stage similar to that seen in *Prantinus*, where the linguiform rami have lost all but 1 apical seta.

Haustoriids are probably the most specialized of the haustorioids because of numerous oddities in the mouthparts rarely encountered in other amphipods. Although they retain a biarticulate palp on maxilla 1 and strongly setose medial edges of maxillae and maxillipeds, many species develop baler lobes basally on maxilla 1 and the maxillipeds. Palp article 4 of the maxilliped is absent and article 3 is strongly geniculate. The outer plate of maxilla 2 is often greatly enlarged. The lower lip lacks mandibular lobes. The mandibular incisors are blunted and palp article 3 of the mandible retains at least 3 kinds of setae in 2, 3, or 4 groups (interpretive). The apical setae on palp article 3 are not awned as in most urohaustoriids; most are simple or weakly hooked apically, though the inner basal members of the apical group often are bilaterally serrate and apically sheathed (new observations) and the inner basal margin bears a row of setae that are strongly serrate bilaterally. This kind of seta is not found in the urohaustoriids, where the setae of palp article 3 are mixed between awned and simple, and no special inner basal row is present.

Haustoriids further differ from urohaustoriids in the loss of all but remnants (minute penicillate setules) in the armament row on article 1 of antenna 1; the shortened accessory flagellum (also

weakly occurring in the urohaustoriid, *Tottungus*); the evenly spread, tandemly spaced, simple glassy spines on article 4 of antenna 2 (bifid and clustered in urohaustoriids); the absence of button combs (Figure 21: *QG1t*, arrow) on the gnathopods; the development of a large posterior lobe on article 5 of pereopods 3–4; the extreme vestigiality of dactyls on all of pereopods 3–7 (represented only by a small button and seta appearing as a bulbar setule, new observation); the full flattening of article 6 on pereopods 3–4, with the resultant wide spacing in the spine rows; the broader brood plates; the special character of pereopods 6–7; the longer inner rami of the pleopods and the absence of clothespin spines on these inner rami; the lack of dominance by epimeron 2; the clavate or rodlike rami of uropod 1 (not linguiform); and the rodlike rami of uropod 3, with multispinosetation apically on both rami and on article 1 of the outer ramus.

To some extent the general form of the telson in haustoriids is distinct from that in urohaustoriids, but the telson in the latter is so variable that the differences are subjective.

Once the distinctions between haustoriids and urohaustoriids, as noted above, can be visualized, the primitive position of *Phoxocephalopsis*, from antiboreal South America, is apparent (Figure 1). Several of its attributes were not described precisely but the description and figures of Schellenberg (1931) and a new analysis (page 15) are adequate to distinguish the genus from urohaustoriids, urothoids, and haustoriids. Although the palp of maxilla 1 is biarticulate, and uropods 1–2 are much like haustoriids, *Phoxocephalopsis* is far more similar to urohaustoriids than to haustoriids. Epimeron 2 is weakly dominant, the rami of uropod 3 are not rodlike, article 5 of pereopods 3–4 is not grossly expanded as in haustoriids, all pereopodal dactyls are well developed, pereopods 6–7 resemble those of urohaustoriids more closely than of haustoriids, and the maxillae and maxillipeds are almost naked medially. The accessory flagellum, however, is somewhat short. The fine structure of the mandibles mixes urohaustoriid incisors, laciniae mobiles, and rakers, with haustoriid molarial texture and condition of palpar

spines. The lower lip bears mandibular lobes. The gnathopods resemble those of urohaustoriids.

Phoxocephalopsis differs from urothoids in the haustorius form of the antennae but the cephalic cheek is weak. Schellenberg appropriately named the genus for its resemblance to phoxocephalids in rostrum, but pereopod 7 is not of the phoxocephalid form, epimeron 2 is dominant, and, unlike phoxocephalids, palp article 2 of the maxillipeds is expanded.

If a rule of evolutionary irreversibility is adopted then none of the known haustorioids represents a perfect intergrade among the several groups, Pontoporeiidae, Phoxocephalidae, Urothoidae, Phoxocephalopsidae, Urohaustoriidae, Zobrachoidea, and Haustoriidae. These intergrades, lying in the crotches of an evolutionary tree, must be hypothesized. Examples of necessary reversal in evolutionary trends, as a step towards Urohaustoriidae, may be cited as: the need for reversal in urothoid antenna 1 to the pontoporeiid-haustoriid condition; the reversal of dominance in epimeron 2 as a step between Phoxocephalopsidae and Haustoriidae; the reversal in linguiform rami of uropods 1–2 towards the styliform spinose condition as a step between Urohaustoriidae and Urothoidae; the redevelopment of mandibular lobes on the lower lip; and the creation of a fourth palp article on the maxillipeds of Haustoriidae as a step towards Urohaustoriidae.

The minimum morphologic state of the most primitive haustorioid (discounting Pontoporeiidae) would require styliform rami of uropods 1–2, subchelate gnathopod 1, antenna 1 of the haustorius form, antenna 2 of the urothoid-gammarid form, maxilla 1 with biarticulate palp, maxillipeds with dactyls, and pereopod 5 of the haustorius form. If Phoxocephalidae are to be included in the scheme and if their so-called plesiomorphic states in gnathopods and molar are to be accepted as truly primitive and not secondarily derived, then a primitive member would require fully triturative molars and enlarged gnathopod 2. One would then assume that the special pereopod 7 and rostrum of Phoxocephalidae and *Zobracho* are secondary developments, as

are the cheeks of urothoids, the linguiform uropodal rami of urohaustoriids, and the odd first antennae of urothoids and *Prantinus*. No living pontoporeiid fits this pattern.

Platyischnopids, like harpiniins within the Phoxocephalidae, have a modified haustorius pereopod 5. Articles 2, 4, and 5 are poorly expanded, and articles 4–5 poorly spined facially. In other respects (the special form of the incisors, resembling apomorphic phoxocephalids, the shape of coxa 4, maxilla 1 generally, epimera, uropods, and to some degree the chelate gnathopods), platyischnopids bear close resemblance to members of the Phoxocephalinae, one of the most advanced groups of the Phoxocephalidae. The definition of Platyischnopidae could be simplified to the statement: “Phoxocephalids with cylindrical rostra.” The special form of the mandibular incisor cannot be accorded absolute homology to that of phoxocephalids because the same kind of incisor crops up in Oedicerotidae (for example, *Synchelidium*) and may be polyphyletic.

Condukiids disturb the tight definition of Haustorioidea, because, like Pontoporeiidae (now assigned to Gammaroidea), pereopod 5 is not of the haustorius form, rather it is a replica of the combined formation found on pereopods 6–7 in haustoriids, with article 5 greatly dominant and facial spines severely reduced.

A discussion of hypothetical states and trends, reversible or not, could go on endlessly. Suffice it to say that the final absurdity is the lack of proof that the haustorioid pereopod 5 is not a replicatory character of convergence, with several origins. Until this can be determined there is little point in attempting to trace exact evolutionary webs by supposition of missing links.

In summary, we have cast doubt on the monophyletic state of pontoporeiids and other haustorioids and must suggest that pontoporeiids be closely allied to the “Pontogammaridae” (including “Compactogammarinae”), while provisionally the Haustorioidea may encompass Urothoidae, Phoxocephalopsidae, Urohaustoriidae, Zobrachoidea, Phoxocephalidae, Platyischnopidae, and Condukiidae. The latter two groups may require their own superfamily.

Key to Families of Haustorioidea

1. Rostrum cylindrical 2
 Rostrum not cylindrical or absent 3
2. Article 5 of pereopods 3-4 strongly produced posteriorly, peduncles of pleopods wider than long or as wide as long. **Condukiidae**, new family
 Article 5 of pereopods 3-4 unproduced posteriorly, peduncles of pleopods longer than wide **Platyischnopidae**
3. Head with sharp ventral cheek 4
 Head lacking sharp ventral cheek 5
4. Antenna 1 with article 3 at least half as long as article 1, mandibular molars large and pubescent, incisors broad and almost toothed, peduncles of pleopods not longer than wide **Urothoidae** (part)
 Antenna 1 with article 3 very short, mandibular molars tritulative or not, but not large nor pubescent, incisors broad but 3-4 toothed, peduncles of pleopods longer than wide **Phoxocephalidae** (part)
5. Pereopod 7 of characteristic phoxocephalid form **Phoxocephalidae** (part)
 Pereopod 7 not of phoxocephalid form 6
6. Rami of uropod 1 styliform and either naked, spinose, or rami absent; palp of maxilla 1 biarticulate 7
 Rami of uropod 1 linguiform and setose, palp of maxilla 1 unarticulate 9
7. Rami of uropod 2 linguiform and setose, palp of maxilliped 3-articulate **Haustoriidae**
 Rami of uropod 2 rodlike and spinose or rami absent, palp of maxilliped 4-articulate 8
8. Antennae of haustoriid form, article 1 of antenna 1 short, of antenna 2 broadly expanded **Phoxocephalopsidae**
 Antennae of urothoid form, article 1 of antenna 1 elongate, article 4 of antenna 2 poorly expanded **Urothoidae** (part)
9. Gnathopod 1 subchelate **Zobrachoidea**, new family
 Gnathopod 1 simple **Urohaustoriidae**, new family

PHOXOCEPHALIDAE

DIAGNOSIS.—Rostrum forming huge anterior visor, not cylindrical, reduced in apomorphic genera, cheek occasionally well developed. Antenna 1 of haustorius form, apomorphically of urothoe form, accessory flagellum rarely elongate. Antenna 2 of modified urothoe form, article 5 often very small but spines on face of article 4 organized into ranks, ventral margin lacking glassy spines of haustorius form, flagellum usually longer than article 4 of peduncle, often greatly enlarged in

male, and antenna 2 then bearing calceoli. Prebuccal complex rarely massive, upper lip usually dominant. Mandibles bearing short, broad incisors usually with 3 teeth, 1 tooth widely disjunct, laciniae mobiles present on both sides and unlike each other, rakers numerous and usually serrate, molar variable, fully tritulative to vestigial and poorly spinose, accessory chopper weak or absent, palp 3-articulate, at most with several outer setae, usually with very few, most other spines concentrated on inner apical level, spines not awned. Lower lip with discrete inner lobes and strong

mandibular extensions. Maxilla 1 with 1–2 articulate palp, setosity of inner plate variable. Maxilla 2 ordinary, inner plate poorly setose medially and facially. Maxillipeds with unexpanded bases, plates variable, outer spinose, palp 4-articulate, article 2 not expanded in form of other haustorioids, article 4 variable, unguiform to clavate. No baler lobes on mouthparts.

Coxae 1–4 evenly integrated by stepped enlargement from coxa 1 onwards, coxa 4 dominant, coxa 1 large, coxa 3 not produced posteroventrally. Coxal gills on pereonites 2–7, brood plates slender.

Gnathopods variable. Article 5 of pereopods 3–4 slightly expanded, not deeply lobate, with or without thick posterior spines, article 6 usually narrow and elongate, rarely expanded; dactyls of pereopods 3–7 usually well developed; pereopod 5 of haustorius form becoming modified apomorphically (losing breadth and spination); pereopods 6–7 not alike; pereopod 6 large, with subovately expanded article 2; pereopod 7 smaller, with expanded, shieldlike article 2; apical articles much shortened and stenopodous. No pereopod with underslung articulation.

Pleopod 2 not inferior; peduncles of pleopods longer than broad, coupling hooks of haustorius form; inner rami subequal to outer, lacking clothespin spines. Epimeron 1 well developed; epimeron 3 dominant in size and setation.

Urosomites ordinary to slightly modified (spiked or fused). Rami of uropods 1–2 styliform, spinose; uropod 3 usually of ordinary haustorioid-phoxocephalid kind, outer ramus dominant, usually 2-articulate, peduncle slightly elongate, rami poorly setose apically; or uropod 3 variable, with occasional modifications and reductions.

Telson long to short, cleft. Sexual dimorphism often strong in antennae, urosome, uropod 3.

TYPE GENUS.—*Phoxocephalus* Stebbing.

COMPOSITION.—47 genera (Barnard and Drummond, 1978).

PLATYISCHNOPIDAE

DIAGNOSIS.—Rostrum strong, cylindrical, with subapical ventral retrorse process, cheek poorly

developed. Antenna 1 of haustorius form or urothoe form (typical), flagella elongate. Antenna 2 of urothoe form, article 5 slightly to strongly shorter and slightly narrower than article 4, latter without major facial armament, ventral margin with 1 kind of armament, either setae or glassy spines, flagellum often greatly elongate in male and antenna 2 then bearing calceoli. Prebuccal complex massive, upper lip dominant, epistome scarcely evident. Mandibles bearing short, broad, phoxocephalid-like incisors with 3 main teeth or stubby modifications thereof, 1 of these widely disjunct; lacinae mobiles present on both sides, alike or not, rakers moderately numerous and serrate, molar of medium size, not triturative, bearing spinules, lacking accessory chopper; palp 3-articulate, article 3 lacking outer setae, all spines concentrated on apical bevel. Lower lip with discrete inner lobes, mandibular extensions of outer lobes well developed. Maxilla 1 with unarticulate palp, inner plate with fewer than 5 setae. Maxilla 2 ordinary or outer plate enlarged, inner plate with poorly developed oblique facial row of setae. Maxillipeds with unexpanded bases, poorly enlarged plates, outer spinose; palp 4-articulate, article 2 wide but not differentially expanded, article 4 unguiform, with or without nail. No baler lobes on any maxillae or maxillipeds.

Coxae variable but coxa 4 strongly dominant and posterodorsally excavate, thus with posteriorly directed lobe, coxa 3 rectangular, or ventrally narrow, coxae 1–2 of various dimensions. Coxal gills on segments 2–6, 3–7, or 2–7; brood plates slender.

Gnathopods feeble or slightly enlarged, alike or not, wrists more or less elongate, hands elongate or not, strongly or weakly chelate. Article 5 of pereopods 3–4 narrow, with sparse posterior spination; dactyls of pereopods 3–7 well developed or pereopod 5 weakly of haustorius form, articles 2, 4, occasionally 5, expanded, articles 4–5 with weakly developed facial spination; pereopods 6–7 more or less alike but pereopod 7 larger, article 2 usually of modified phoxocephalid form, article

4 of pereopods 6–7 expanded; no pereopod with underslung articulation.

Pleopod 2 not inferior. Peduncles of pleopods much longer than wide, coupling hooks of haustorius kind; inner rami as long as outer (or very nearly), bearing multiple clothespin spines with small inner barbs. Epimeron 1 well developed; epimeron 2 often dominant in size.

Urosomites ordinary. Rami of uropods 1–2 styliform or rodlike, spinose; uropod 3 of phoxocephalid form but inner ramus very small to moderate in size, article 2 of outer ramus small to greatly elongate, apices of rami poorly setose.

Telson variable, cleft to entire. Sexual dimorphism occurring on antenna 2 and uropod 3.

TYPE GENUS.—*Platyischnopus* Stebbing.

COMPOSITION.—*Tomituka* Barnard and Drummond, *Indischnopus* Barnard and Drummond, *Yurokus* Barnard and Drummond, *Tittakunara* Barnard and Drummond; and undescribed American genera. (See Barnard and Drummond, 1979.)

RELATIONSHIP.—Platyischnopids have so many characters in common with the subfamily Phoxocephalinae (Phoxocephalidae) that one might derive them from an ancestor common to that group. The structure of the mandibular incisors and the pattern of spine distribution on the mandibular palp, plus the shape of coxa 4 suggest this affinity. Article 2 of pereopod 7 has faint similarity to that of phoxocephalids but the remainder of the appendage is much stouter and more elongate than in phoxocephalids. The unusual head is a distinguishing mark.

See "Condukiidae" for further comments.

UROTHOIDAE

DIAGNOSIS.—Rostrum weak, head short, ventral cheek strongly developed and projecting ventrally. Antenna 1 of urothoe form, articles 1–3 elongate, geniculate, flagella short. Antenna 2 of urothoe form, article 4 scarcely expanded, with spines in seriate ranks, ventral margin with 2 kinds of setae, plumes, and penicillates, ventral glassy spines poorly developed or absent, article 5 slightly shorter and narrower than article 4,

flagellum variable, usually short in female but in male often greatly elongate as in *Bathyporeia* or phoxocephalids, and flagellum, plus part of peduncle, often furnished with calceoli. Prebuccal complex massive, epistome scarcely distinct, upper lip dominant. Mandibles bearing stubby, poorly toothed incisors; laciniae mobiles present on both sides and unlike each other, rakers poorly developed to absent; molar large, minutely fuzzy, almost non-tritulative, lacking significant accessory chopper; palp 3-articulate, article 3 with outer setae, setae simple. Lower lip with discrete inner lobes, mandibular extensions of outer lobes well developed. Maxilla 1 with biarticulate palp, inner plate with fewer than 5 setae. Maxilla 2 ordinary, inner plate with well-developed medial to submarginal row of setae. Maxillipeds with unexpanded bases, normally enlarged plates, outer spinose; palp 4-articulate, article 2 expanded, article 4 unguiform to clavate, usually setose, apical nail usually poorly developed. No baler lobes on any maxillae or maxillipeds.

Coxae variable, either of ordinary gammarid form, or coxa 1 very small, or coxa 3 dominant and/or bearing posteroventral lobe, plus other variations. Coxal gills on segments 2–5 or 2–6; brood plates slender.

Gnathopods feeble, grossly alike in proportions, wrists elongate, but otherwise highly variable in degrees of palmar development and chelateness, article 3 short. Article 5 of pereopods 3–4 broad, slightly expanded, not deeply lobate, with thick posterior spines; dactyls of pereopods 3–5 well developed, those of pereopods 6–7 variable but usually well developed; pereopod 5 of haustorius form, articles 2, 4, and 5 expanded, articles 4–5 with extensive facial rows of spines in primitive members but declining in apomorphic taxa; pereopods 6–7 alike, or pereopod 7 developed in phoxocephalid fashion, article 2 broadly expanded and posteroventrally lobate, remainder of articles thin, whole appendage somewhat shortened in comparison to pereopod 6.

Pleopod 2 apparently not inferior; peduncles of pleopods slightly to significantly wider than long, coupling hooks paired on each pleopod; inner

rami usually inferior, usually not bearing clothespin hooks (only several species in 2 genera examined). Epimeron 1 strongly developed; epimeron 3 dominant in size and usually in setation.

Urosomites ordinary. Rami of uropods 1–2 styliform and spinose or rami absent; peduncles usually only spinose, but 1 genus with linguiform and setose peduncles lacking rami; uropod 3 of ordinary haustorioid-phoxocephalid kind, outer ramus dominant, 2-articulate, peduncle short, flat, expanded; rami poorly setose apically.

Telson variable. Antenna 2 with strong sexual dimorphism in several taxa.

TYPE GENUS.—*Urothoe* Dana.

COMPOSITION.—*Urothoides* Stebbing (see Barnard and Drummond, 1979); *Carangolia* J.L. Barnard; *Cunicus* Griffiths.

RELATIONSHIP.—Though 1 genus of Urothoidae, *Urothoides*, bears the proper formula of pereopods 6–7 to be classified as a phoxocephalid, the presence of a large ventrally extended cephalic cheek shows its affinities to *Urothoe*, on

which pereopods 6–7 are not of the phoxocephalid form. The mandibles of urothoids are unlike those of phoxocephalids and though urothoids have a small rostrum (smaller than *Zobracho*), they never bear the fully developed rostrum of plesiomorphic phoxocephalids. One may entertain the suggestion that urothoids could be descended from phoxocephalids by alterations in molar, rostrum, and cephalic cheek by intergrading them through *Urothoides* (which bears phoxocephalid pereopods), but the reverse direction would be highly unlikely. So-called primitive phoxocephalids bear enlarged gnathopod 2 and fully triturative molars; one would doubt that such conditions could be descended from urothoids (Barnard and Drummond, 1978). The majority position of the haustorius antenna 1, not only in the haustorioids but in the pontoporeiids and the pontogammarids, suggests that it represents the plesiomorphic state, whereas the rarer urothoid antenna 1, present in urothoids, *Prantinus*, certain platyischnopids, and occasional phoxocephalids, is apomorphic.

Key to Genera of Urothoidae

- | | |
|---|-------------------|
| 1. Pereopod 5 of phoxocephalid form | Urothoides |
| Pereopod 5 not of phoxocephalid form | 2 |
| 2. Uropods 1–2 lacking rami | Cunicus |
| Uropods 1–2 bearing rami | 3 |
| 3. Telson and uropod 3 stubby, very short | Carangolia |
| Telson and uropod 3 of normal length | Urothoe |

PHOXOCEPHALOPSIDAE

DIAGNOSIS (new observations on South American material in italics).—Rostrum of moderate size, broad; cheek weak. Antenna 1 of haustorius form, article 1 short, *main setal row strong*, article 2 as long as article 1, article 3 shorter, primary flagellum elongate, accessory flagellum short. Antenna 2 of haustorius form, article 4 expanded, article 5 shorter and narrower than article 4, these articles furnished with 1 or more longitudinal rows of facial armaments, ventral margin with long setae, *and 2 other kinds but none glassy*; flagellum longer than article 4 of peduncle. *Epistome and*

upper lip distinct. Mandibles with stubby, sparsely but distinctly toothed incisors, laciniae mobiles diverse, rakers sparse and widely separate, molar of medium size, triturative, choppers weak; palp 3-articulate, article 3 with urohaustoriid setal distribution, setae hooked but unawned. Lower lip with mandibular lobes moderately well developed. Maxilla 1 with biarticulate palp, inner plate small and with one seta. Maxilla 2 ordinary, inner plate with oblique facial row of setae. Maxillipeds with unexpanded bases and no baler lobes, with normally enlarged plates, outer spinose; palp 4-articulate, article 2 expanded, article 4 clavate, multisetose.

Coxae 1-4 apparently evenly integrated by stepped enlargement from coxa 1 onwards, coxa 4 dominant, coxa 1 *medium and slightly tapering*, coxae 3-4 not (type) or distinctly (other species) produced posteroventrally. *Coxal gills 2-6; brood-plates slender.*

Gnathopods feeble, grossly alike in proportions, wrists elongate, but gnathopod 1 almost simple, gnathopod 2 minutely subchelate, article 3 short. Article 5 of pereopods 3-4 broad, slightly expanded, not deeply lobate, with thin posterior spines; dactyls of pereopods 3-7 well developed; pereopod 5 of haustorius form, articles 2, 4, and 5 expanded, articles 4-5 with extensive facial rows of spines; pereopods 6-7 alike, articles 5-6 weakly expanded; no pereopod with underslung articulation.

Pleopods *like urohaustoriids but pleopod 3 inferior (not 2)*. Epimeron 1 fully developed and setose; epimeron 2 weakly dominant in setation and size. Urosomites *ordinary*. Rami of uropod 1 styliform, naked; of uropod 2 rod-like and spinose or with several setae; uropod 3 of ordinary haustorioid-phoxocephalid kind, neither ramus dominant, both leaflike, article 2 on outer ramus very small and poorly setose.

Telson short, broad, deeply cleft. [Sexual dimorphism unknown.]

TYPE GENUS.—*Phoxocephalopsis* Schellenberg.

COMPOSITION.—Unique.

RELATIONSHIP.—*Phoxocephalopsis* differs from urothoids in the antennae. It lies in position ancestral both to Zobrachoidae-Urohaustoriidae and Haustoriidae, and at present appears to be the most primitive living haustorioid known. Despite this assertion it has several apomorphic characters, such as the simple gnathopod 1 and dominant epimeron 2. One might consider *Zobracho* as more primitive because of its subchelate gnathopods; *Phoxocephalopsis*, in contrast to *Zobracho*, retains more or less plesiomorphic uropods 1-2 and first maxillary palp. Except for epimeron 2 and the poorly setose maxillae and weak raker system, it could form a plausible ancestor to the Haustoriidae, which have many more numerous modifications in mouthparts and pereopods. *Phoxo-*

phalopsis cannot be derived from any zobrachoid or urohaustoriid without evolutionary reversal to normalcy in uropods 1-2.

***Phoxocephalopsis* Schellenberg**

Phoxocephalopsis Schellenberg, 1931:69 [*Phoxocephalopsis zimmeri* Schellenberg, 1931, monotypy].

DIAGNOSIS.—With the characters of the family.

COMPOSITION.—The type-species and provisionally *P. deceptionis* Stephensen, 1947.

REMARKS.—The second species of the genus, *P. deceptionis*, differs from the type-species due to the presence of 3 setae on the inner plate of maxilla 1, the weaker dominance of epimeron 2 with epimera 1-3 all strongly setose, the parachelate gnathopod 2 (opposed to subchelate), the posteroventrally produced coxa 3, and the styliform and spinose outer ramus of uropod 2. These may require *deceptionis* to be removed to a new genus.

The type-species is amplified below, by presentation of new data confined mainly to information of generic importance.

***Phoxocephalopsis zimmeri* Schellenberg**

Phoxocephalopsis zimmeri Schellenberg, 1931:70-73, fig. 36.

MATERIAL.—Falkland Islands, Port Stanley, No. 91, 15 Mar 1927, from mullet: female "w," 4.96 mm; female "y," unmeasured.

DESCRIPTION OF FEMALE (female "w," 4.96 mm).—Cephalic cheek of medium size. Eyes small but with 5 ommatidia and pigment granules.

Length ratio of articles 1-3 of antenna 1 about 36:40:33, main armament row on article 1 containing about 10 long and short setae, article 2 with both spines and setae facially, article 3 thin and poorly setose. Article 3 of antenna 2 with 4 + 1 short spine-setae; article 4 with dorsofacial row of many spines in small groups, ventral margin with 3 kinds of setae (long plumose bulbar penicillates, and short smooth spines), no glassy bifid spines; article 5 also with dorsofacial spines.

Mandibular incisors weakly extended, right

and left with 4 sharp and 2-3 blunt teeth respectively; right lacinia mobilis large, splayed, bifid, apical branch sharp and smooth, proximal branch slightly blunter and on proximal edge pectinate almost to base, left lacinia mobilis short, broad, pointed, with weak subapical sharp tooth (thus technically bifid); right rakers 2, left 3, these widely spaced, bifid and/or pectinate; molars large, subcolumnar, triturative, choppers not strongly distinct; palp article 1 elongate, article 2 thin, well setose on inner face, article 3 of urohaustoriid form but setae hooked apically, not awned, setal formula on right = 7-1-5-1.

Mandibular lobes of lower lip intermediate in extension between urohaustoriids and haustoriids; inner lobes present. Inner plate of maxilla 1 thin and leaflike, with 1 stiff but curved medial seta, outer plate with 11 spines; palp very short, broad, 2-articulate, article 2 slightly shorter than 1, with 2 apical and 1 subapical setae. Plates of maxilla 2 extending equally, subequally broad, inner with strong oblique facial row of setae. Maxillipeds typically urohaustoriid, inner with 3 main apical spines and inner and apical setae, outer slightly larger than inner, medially spined; article 2 of palp expanded, with longitudinal facial row of setae, article 3 thinner, clavate, with facial row of setae, dactyl small, thin, rod-shaped or weakly clavate, apically setose. No basal balers on mouthparts.

Coxae 1-4 progressively larger, sizes not strongly disjunct, coxae 1-2 tapering weakly and poorly setulose, coxa 3 blunt, scarcely produced at posteroventral corner, there with 6-7 setae, coxa 4 of elongate ordinary form bearing weak posterodorsal excavation, with long posteroventral and short posterior setae. Gnathopod 1 simple, gnathopod 2 subchelate but not parachelate, otherwise of urohaustoriid form, thus bearing long setal brushes posteriorly on articles 2-3, and with elongate wrists, and facial apical setal row on hands.

Pereopods 3-4 of mainly urohaustoriid form, armament formula on pereopod 3 = 5, 3, facial setae plus posterior spines, 6 + 5 + 1, thus differing from urohaustoriids in presence of facial setae and long posterior spines on article 5 (instead of

spines forming pairs between face and margin); dactyls of pereopods 3-7 well developed, simple or bearing very weak facial tooth near apex, dactyl of pereopod 5 lacking major spines. Pereopods 6-7 dominating pereopod 5, otherwise of normal urohaustoriid form, article 2 of pereopod 5 with weak medial brush; coxa 5 lacking major setae. Coxal gills 2-6, gill 2 dominant. Brood plates thin.

Pleopods of generally urohaustoriid form but pleopod 3 inferior instead of pleopod 2; coupling hook formulas = 2 + 1, 2 + 1, 0 + 1, inner rami weakly inferior on all pleopods, with basal clothespin spine, peduncles short and broad, facial setae sparse or absent. Epimeron 2 strongly dominant (much more so than in *deceptionis*), epimeron 1 well developed, both epimera 1-2 strongly setose, lacking posteroventral tooth; epimeron 3 smaller, poorly setose, with weak ventral tooth near posterior margin. No dorsal wings on pleonites 1-3.

Rami of uropod 1 styliform, sharply pointed, inner about half as long as outer, neither with major setae or spines apparent at low power; rami of uropod 2 rodlike or sublinguiform, extending equally, each with 3-4 long apical setae and 1-3 subapical setae either dorsal (on outer ramus) or medial (on inner ramus). Armament formulas on peduncles of uropod 1: lateral = e-E-EE-EEE, dorsolateral = SS, medial = S-S, dorsal = E; on uropod 2, dorsolateral = S-S-S-S, dorsal = 0, medial = sSs. Uropod 3 ordinary, peduncle short and broad, apicoventral margin with 6 lateral and 5 middle spine-setae, dorsolaterally with 2 spine-setae; rami broad and flat, article 2 on outer ramus about 33% as long as article 1, with 2 long and 1 short apical setae, lateral armament formula = SS-SS, medial = e-ES-SS; inner ramus as long as article 1 of outer ramus, lateral armaments = S, medial = E-ES-ES-ES.

Telson broader than long, cleft almost to base, armament formula = s-pp-s-s-p-s on each lobe, penicillate setules listed above paired but fully lateral.

DISTRIBUTION.—South America, south from mouth of Rio de La Plata, and Falkland Islands, 4-40 m.

ZOBACHOIDEAE, new family

DIAGNOSIS.—Rostrum well developed (for haustorioids), cheek poorly developed. Antenna 1 variable, article 1 short (typical) or elongate (apomorphic), articles 2–3 progressively shorter (typical) or elongate (apomorphic), flagella elongate (typical) or not (apomorphic), articles of peduncle weakly (typical) to strongly geniculate. Antenna 2 of haustorius form, article 4 expanded (pleisiomorphic) or weakly so (apomorphic), article 5 shorter and narrower than article 4, these articles furnished with 1 or more longitudinal rows of facial armaments, ventral margin of article 4 with at least 3 kinds of setae: (1) elongate plumes, (2) shorter and stiffer glassy spines set in clusters and, (3) bulbar-based penicillate setules; flagellum longer than article 4 of peduncle. Prebuccal complex massive, upper lip usually dominant. Mandibles bearing elongate strongly toothed incisors, laciniae mobiles present on both sides and unlike each other, rakers almost simple and numerous (4 or more), molar large, strongly extended, weakly tritulative but with several strong cusps, usually 1 of these forming accessory chopper; palp 3-articulate, article 3 with numerous outer setae, setae awned (apomorphic) or not (typical and plesiomorphic). Lower lip with discrete inner lobes, mandibular extensions of outer lobes well developed. Maxilla 1 with uniarticulate palp, inner plate with more than 5 setae. Maxilla 2 ordinary, inner plate with oblique facial row of setae but poorly developed. Maxillipeds with unexpanded bases, normally enlarged plates, outer spinose; palp 4-articulate, article 2 expanded, article 4 clavate, multisetose. No baler lobes on maxillae or maxillipeds.

Coxa 2 small to medium, larger than coxa 1 and forming stepped intergrade between coxa 1 and coxa 3, coxa 4 dominant, coxa 3 lacking deep

posteroventral lobe. Coxal gills on segments 2–6 or 2–5. Brood plates slender.

Gnathopods feeble, subchelate, grossly alike in proportions, wrists elongate, article 3 short. Article 5 of pereopods 3–4 broad, slightly expanded, not deeply lobate, with thick posterior spines; dactyls of pereopods 3–5 well developed, those of pereopods 6–7 variable; pereopod 5 of haustorius form, articles 2, 4, and 5 expanded, articles 4–5 with extensive facial rows of spines; pereopods 6–7 alike, articles 5–6 weakly expanded; no pereopod with underslung articulation.

Pleopod 2 usually inferior in size, articulation, or setation; peduncles of pleopods not longer than wide, inner rami inferior; coupling hooks paired on each pleopod, usually inner rami bearing one basal clothespin spine. Epimeron 1 moderately to strongly developed; epimeron 2 dominant in setation, often dominant in size.

Urosomites ordinary, though often furnished with lateral teeth. Rami of uropods 1–2 linguiform, setose (not spinose); uropod 3 of ordinary haustorioid-phoxocephalid kind, outer ramus dominant, 2-articulate, peduncle short, flat, expanded; rami poorly setose apically.

Telson variable in length, deeply cleft. Sexual dimorphism weak.

TYPE GENUS.—*Zobracho* J.L. Barnard.

COMPOSITION.—*Bumeralius*, new genus; *Prantinus*, new genus.

RELATIONSHIP.—Zobrachoids differ from urothoids in the absence of a ventral cephalic cheek, in the full development of the haustorius antenna 2, especially in the ventral armament, and in the dominance of epimeron 2. Zobrachoids bear linguiform rami of uropods 1–2, in contrast to urothoids (but 1 genus of urothoid lacks rami). *Prantinus* is furnished with a urothoid antenna 1, but antenna 2, though not fully expanded, lacks seriate ranks of spines, bears the ventral spination diversity not typical of urothoids, and has epimeron 2 dominant.

Key to Genera of Zobrachoidae

1. Antenna 1 of urothoe form ***Prantinus***, new genus
- Antenna 1 of haustorius form 2

2. Telson elongate, rami of uropods 1-2 with many medial setae, no basoventral setae **Zobracho**, new genus
 Telson short, rami of uropods 1-2 lacking medial setae, bearing basoventral setae **Bumeralius**, new genus

Zobracho J.L. Barnard

Zobracho J.L. Barnard, 1961:74.

DIAGNOSIS.—Rostrum strong. Peduncle of antenna 1 short, stout, articles 2 and 3 progressively slightly (2) and greatly (3) shortened, not geniculate, both flagella elongate. Antenna 2 of haustorius form, article 4 expanded, article 5 small, articles 4-5 with facial armaments, article 4 with long ventral setae and subventral clusters of simple setae. Mandibular incisors slightly extended, of ordinary thickness, toothed; right and left laciniae mobiles not alike, right, if present, not distinct from raker row; rakers simple, 4 or more; molar elongate, very weakly triturrative, with cuspidate (or spinate) accessory chopper; setae of palp article 3 not awned, instead, minutely pectinate. Mandibular lobes of lower lip well developed. Inner plate of maxilla 1 broad, multisetose, outer plate with 11 spines; palp of ordinary length, uniaarticulate. Inner plate of maxilla 2 with weakly submarginal oblique row of setae. Maxillae and maxillipeds lacking baler lobes. Outer plate of maxilliped with spines; palp article 2 weakly expanded, article 3 of ordinary length, dactyl clavate, multisetose.

Coxae 1-4 progressively larger, coxa 1 very small but only partially hidden by following coxae, neither coxae 3 or 4 extended posteroventrally; coxae 2-6 with simple gills; brood plates 4 pairs, slender.

Gnathopods small, alike, wrists elongate, hands mitelliform, subchelate, palms well marked and transverse. Dactyls of pereopods 3-7 distinguishable, those of pereopods 3-5 large, those of pereopods 6-7 small, dactyl of pereopod 5 bladeliike, unarmed. Article 2 of pereopods 5-7 expanded, pereopod 5 of haustorius form, distal articles of pereopods 6-7 not underslung, only moderately widened, pereopods 6-7 otherwise similar, dominating pereopod 5.

Peduncles of pleopods wider than long, pleopod 2 inferior, inner rami moderately shorter than outer. Epimeron 1 strongly distinct and multisetose, epimeron 2 dominant in size and setation. Urosomite 1 scarcely produced and poorly setose ventrally; peduncles of uropods 1-2 setose laterally, rami linguiform, multisetose. Uropod 3 of ordinary form, outer ramus dominant and biarticulate, article 2 with 4 or more small or thin setae. Telson elongate, longer than broad, deeply cleft.

DESCRIPTION.—Eyes present. Dorsolateral surface of article 1 on antenna 1 furnished with numerous elongate setae, many forming transverse apical row, no longitudinal row of armaments; article 2 densely setose dorsolaterally, setae divisible into groups; article 3 poorly setose. Article 3 of antenna 2 short, densely setose; dorsal margin of article 4 scarcely setose or with dense short setae, of article 5 with dense short setae; flagellum scarcely longer than article 4 of peduncle. Calceoli present on antenna 2 in male.

Right lacinia mobilis indistinguishable from raker row, left slender, bifid. Lower lip lacking cones. Inner plate of maxilla 1 with long setae on medial, apical and lateral margins; several spines on outer plate weakly bifid. Inner plate of maxilliped with 3 stout apical spines (type-species unknown).

Coxae 1-2 both poorly setose (type-species) or coxa 2 strongly setose. Gill 2 dominant, gill 5 much larger than posterior lobe of coxa 5, gill 6 very small. Gnathopods 1-2 lacking surficial button combs (see *Urohaustorius*).

Pereopods 3-4 lacking secondary facial row of spines on article 5, except most distal spine on margin with facial partner.

Uropods 1-2 lacking huge dorsal setae on peduncles; outer rami setose both laterally and medially, no basoventral setae.

TYPE-SPECIES.—*Zobracho canguro* J.L. Barnard, 1961 (original designation).

COMPOSITION.—Unique.

RELATIONSHIP.—Of the genera bearing haus-torius-like pereopod 5 combined with uniaarticulate first maxillary palp, this genus appears to stand in the primitive position. This is also reflected in the large rostrum and broad, unmodified, multisetose inner plate on maxilla 1. Genera such as *Phoxocephalopsis* and those in the *Urothoe* group retain the plesiomorphic maxilla 1 with 2-articulate palp and most of these also have at least uropod 1 with nonlinguiform rami. *Zobracho* would appear to be a very close antecedent to *Bumeralius*.

***Zobracho canguro* J.L. Barnard**

Figures 2-6

Zobracho canguro J.L. Barnard, 1961:75, figure 43.

DESCRIPTION OF MALE (male "m," 6.25 mm).—Head about as long as wide, rostrum about 44% as long as remainder of head. Primary flagellum of antenna 1 with 11 articles, articles 3-10 with long aesthetascs in groups of 3 usually; accessory flagellum 10-articulate. Article 3 of peduncle on antenna 2 with about 10 facial setae; facial formula of thin spines on article 4 = 6-9-12-many; on article 5 = many; distomedial face of article 5 with 2 (1) + ?1 rudimentary large flask-shaped calceoli, each of many compartments; flagellum with 11 articles, first 3 bearing similar calceoli.

Right and left mandibular incisors with 3 teeth, right rakers 8 (including lacinia mobilis) plus 2 rudimentaries, left 7 plus 2 rudimentaries, chopper on molar with 3 cusp-spines; article 1 of palp scarcely elongate, article 3 slightly shorter than article 2, latter of medium setosity, spine formula on right and left article 3 = 9-1-6-1. Inner plate of maxilla 1 with 2 short appressed apicomedial setae (marking apex of longitudinal facial ridge), 7 long laterals and 3 long medials; outer plate with 11 spines; palp with 2 stout and 1 thin apical setae. Inner plate of maxilliped with 11 submarginal medial setae continued in crescent to api-

colateral margin, 3 stout apical teeth, most distal disjunct, medial margin of outer plate with short thin spines in tandem, then notch bearing seta, 1 more spine on protrusion, then several thin setae in tandem more distally, apex with 5 medium setae; article 2 of palp with apical group of thin facial setae, article 3 with setal ranks facially, lateral margin with group of 4 setae.

Coxa 1 very short, wide, hatchet-shaped, posteroventrally extended, with 1 long posteroventral seta and many marginal setules; coxa 2 much larger than coxa 1, elongate, weakly truncate apically, bearing 9 long apical setae; coxa 3 slightly larger than coxa 2, with 10 long apical setae (some medium in length); coxa 4 with about 8 medium ventral setae, posterior margin with about 19 medium and short mixed setae; coxa 5 distinctly bilobed. Gnathopods 1 and 2 similar, feeble, subchelate; hands with short, almost transverse palms, slightly humped on gnathopod 2; article 3 very short, with numerous posterior setae; wrists much longer than hands (relatively longer on gnathopod 2 than gnathopod 1), both strongly setose posteriorly and with medial facial setae in groups; article 6 with well-defined lateral facial crescent of long strong setae distad.

Setal and spine formulas on pereopod 3 = 8, 12, 2-1-1-1, 6 + 4 + 1; on pereopod 4 = 6 (plus 4 on anterior margin), 11, 2-1-1-1, 6 + 5 + 1, article 4 especially small; posterior margin of article 5 on pereopods 3-4 with groups of serrations. Article 2 of pereopod 5 densely setose posteriorly, of pereopod 6 of lesser density, of pereopod 7 scarcely setose; pereopod 5 with brush of mediofacial setae posteroventrally, dactyl long, naked (except for regular basofacial setule), bladellike, with small anterodistal notch and tooth, dactyls of pereopods 6-7 shorter than adjacent spines; dactyls of pereopods 3-4 also with tooth and notch. Medial apex of article 6 on pereopod 7 softly castellate.

Pleopod 2 inferior; peduncles of all pleopods with sets of 2-5 setae anteriorly, spine formulas all = 2 and 1, coupling hooks like those of *Urohaustorius*; each inner ramus with 2 basal clothespin spines; segmental formulas = 22-15, 20-15,



FIGURE 2.—*Zobracho canguro* J.L. Barnard, male "m," 6.25 mm (*h* = female "h," 6.26 mm; *k* = juvenile "k," 4.36 mm).

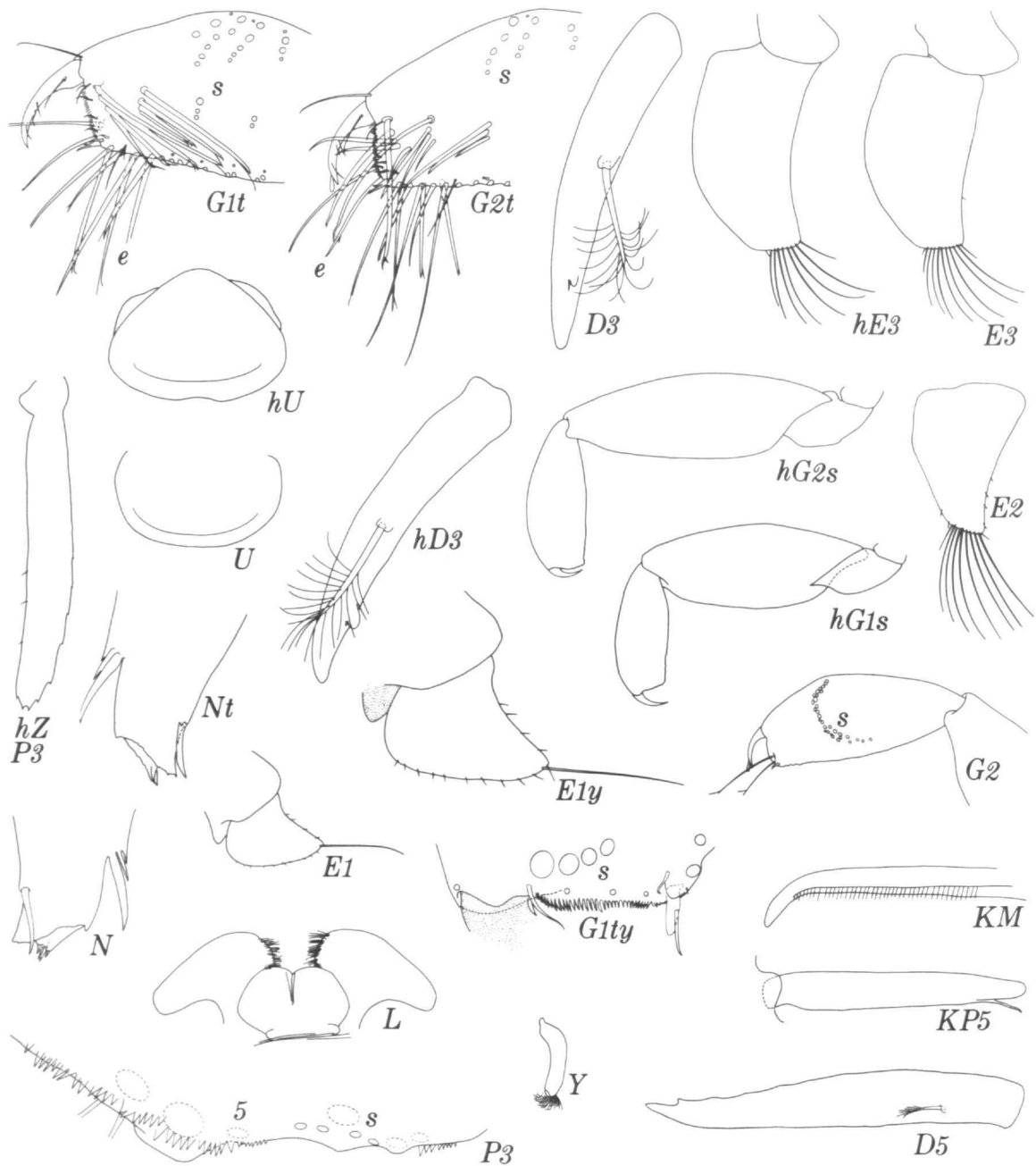


FIGURE 3.—*Zobracho canguro* J.L. Barnard, male "m," 6.25 mm (*h* = female "h," 6.26 mm; *Y* = penial process; *Z* = brood lamella).

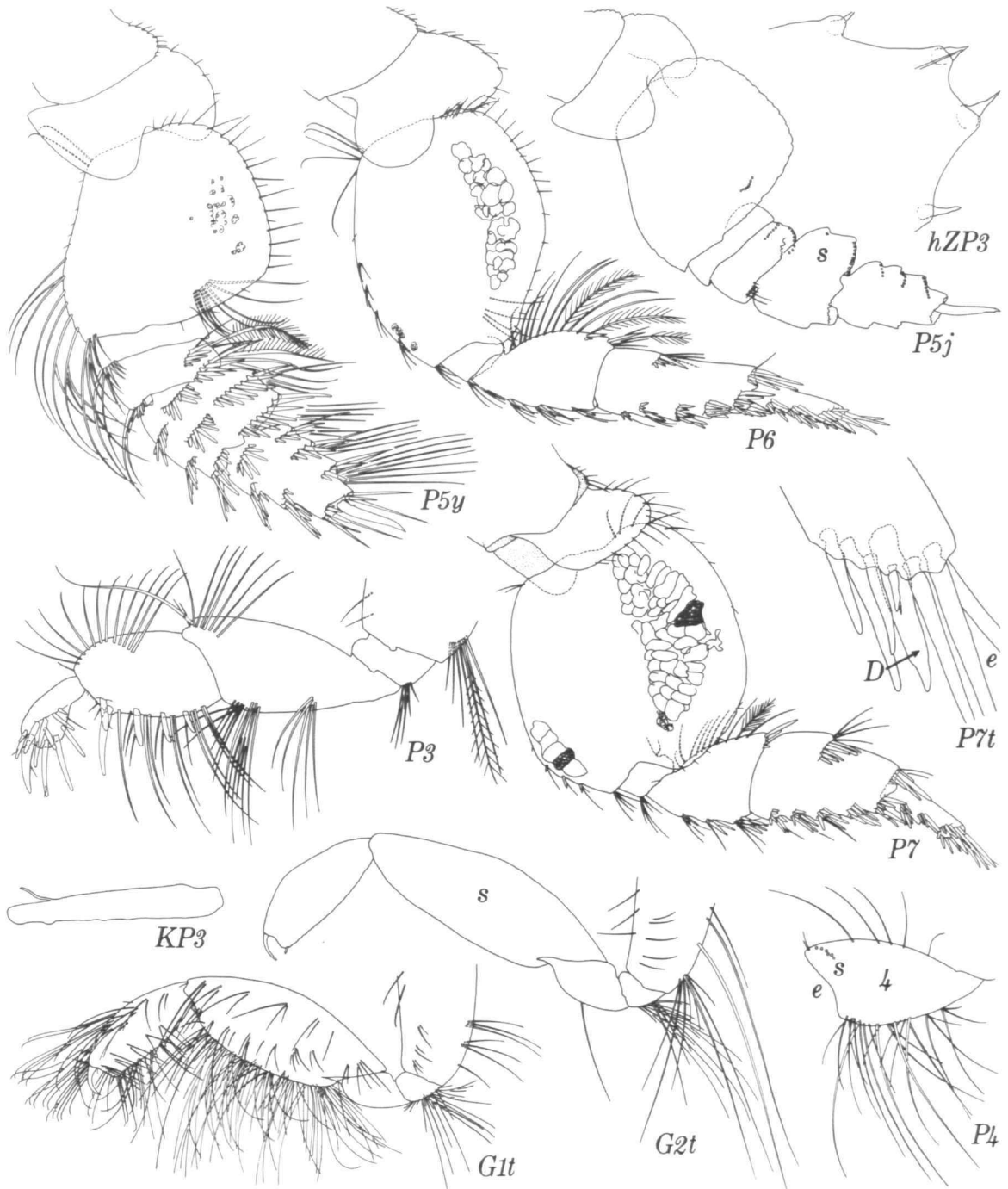


FIGURE 4.—*Zobracho canguro* J.L. Barnard, male "m," 6.25 mm (*h* = female "h," 6.26 mm; *Z* = brood lamella).

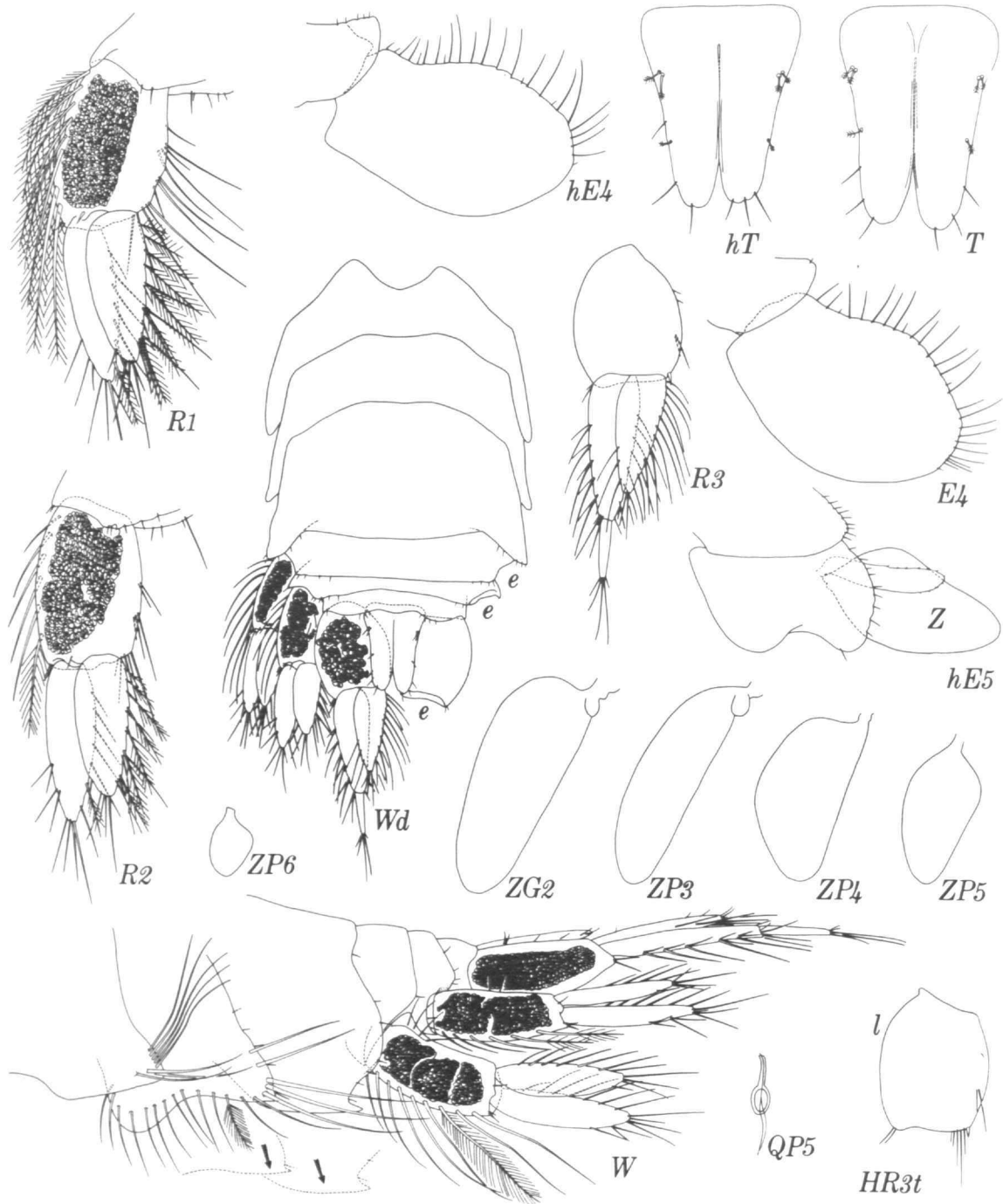


FIGURE 5.—*Zobracho canguro* J.L. Barnard, male "m," 6.25 mm (*h* = female "h," 6.26 mm; *Z* = gill).

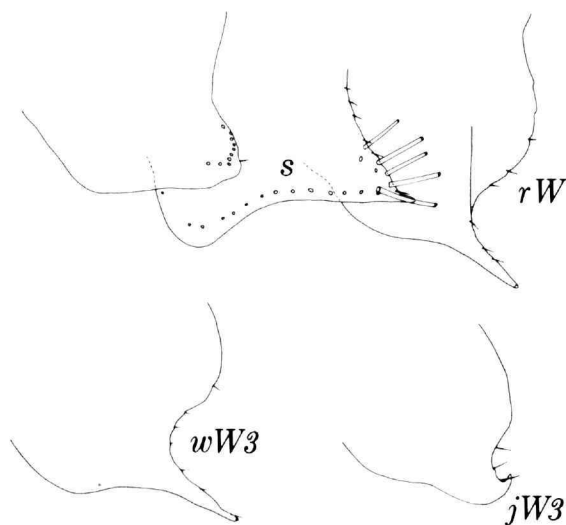


FIGURE 6.—*Zobracho canguro* J.L. Barnard (*j* = juvenile “j,” 4.2 mm; *r* = male “r,” 7.0+ mm; *w* = female “w,” 8.0+ mm).

20–16; basal setal formulas = 12–2–3–5, 7–2–2–4, 9–2–2–5.

Epimeron 1 fully developed, extended in adze-form posteroventrally, bearing posterior row of 5 setae closely crowded, 1 seta near posteroventral corner and 2 other facial setae in horizontal row near posterior corner; epimeron 2 sharply produced posteroventrally, ventral margin concave, posterior margin and corner with 5 large setae and 4–5 setules, ventral margin with 14 thin setae; epimeron 3 with sharp posteroventral tooth, bulging posteriorly above sinus, margin setulate.

Lateral margin of peduncle on uropod 1 with 8–9 setae and 2 apical setules, of uropod 2 with 6 setae and 2 setules, no dorsal setae; peduncles with 4 and 3 groups of 1–4 setae each on medial margin; peduncles of uropods 1–3 densely packed with glandular tissue; outer rami of uropods 1–2 each with 3–4 lateral setae (paired on uropod 2), apices with 4, medial margins with 7 setae; inner rami each with 1 lateral seta, apices with 4, medial margins with 8 and 7 groups of 1–3 setae each; these setae much weaker than in *Urohaustorius*; inner rami slightly shorter than outer rami.

Uropod 3 weakly elongate, peduncle naked laterally, with 2 apicolateral setules, with pair of small setae medially, 1 apicomедial spine, and row of 5 small setae on ventral margin; inner ramus reaching M. 80 on article 1 of outer ramus, with setae medially, apically, and apicolaterally; article 1 of outer ramus with pairs of lateral setae but simply setose medially, article 2 elongate, 0.42, bearing 5 weak apical setae (some long, others short). Urosomal glands other than those in peduncles of uropods not apparent.

Telson elongate, deeply cleft, slightly broadened at base, setal formula variable, = 2P, 0–1, P, 2–3, apical setae variable in placement.

Cuticle with very sparse bulbar setules and extremely faint but dense pebbling.

DESCRIPTION OF FEMALE (female “h,” 6.26 mm).—Like male except as follows: Eyes smaller than in male. Primary flagellum of antenna 2 with 9 articles, accessory flagellum with 8, aesthetascs shorter than in male and only 1 per article. Several facial setae on article 4 of antenna 2 thicker than in male; flagellum of antenna 2 with 11 articles. Right mandibular rakers 8 plus 3 rudimentaries, left 7 plus 3 rudimentaries, formula on palp article 3 = 8–1–6–1. Inner plate of maxilla 1 with 2–3 medial setae, 2 apical, 5–6 lateral setae. Inner plate of maxilla 2 with 11 setae in oblique row (including 1 medial seta).

Coxae 1–2 like male; coxae 3–4 slightly more elongate (illus.). Hand of gnathopod 2 stouter and less tapering than in male (illus.).

Formulas of pereopod 3 = 6, 10, 2–1–1–1, 6 + 5 + 1; of pereopod 4 = 5, 10, same, same. Setae on coxae and article 2 of pereopods 5–6 longer than in male.

Epimeron 2 with 12 ventral setae, 3 at posteroventral corner (as in male) and 3 above that group with dorsalmost very discontinuous.

Uropods 1–2 similar to male, generally with 1 fewer seta or group of setae in each category, with only 1 apicolateral setule on peduncles. Peduncle of uropod 3 with 3–4 apicolateral setules, ventromedial spine and setae longer than in male, apical setae on article 2 of outer ramus longer than in

male, rami otherwise slightly less setose than in male.

DESCRIPTION OF JUVENILE (juvenile "k," 4.36 mm).—Eyes very weak, with only 5–6 ommatidia each. Right mandibular rakers 7 plus 2 rudimentaries, left with 6 plus 2 rudimentaries; molars with only 2 distinct cusps on choppers; each palp article 3 = 5–1–5–1. Epimeron 1 with 1 posterior medium seta and 1 setule at corner. Epimeron 2 with 3 ventral setae, corner with 1 large seta, indented, and 1 setule, posterior margin with 1 large, 1 small seta. Telson with either 1 or 2 long setae on each side.

OBSERVATIONS.—All lateral setae of peduncle but few medial setae on rami of uropod 2 plumose.

SPECIMENS FROM NEW SOUTH WALES.—Much larger than those from Victoria, largest in the collection measuring nearly 10 mm in length.

In haustorioids generally, and particularly in zobrachoids, a small increase in length, as measured from tip of rostrum to base of telson, results in a disproportionately large increase in the massiveness of the individual; and in a specimen 9 mm long the appendages are so very much larger than those of the biggest in the Victorian collection (6.93 mm) that it appears, at first sight, unlikely to belong to the same species. Careful examination of a number of dissected specimens, however, has revealed no differences that could not be ascribed to the greater size of the New South Wales specimens. Setae and spine-bearing appendages in general are, as might be expected, more setose or spinose; but a significant exception to this is coxa 1 which, in juveniles and adults alike, bears, as in Victorian specimens, a single apical seta. Subtleties of coxal shape, emphasized and accentuated by larger size, contribute to the appearance of dissimilarity; but small differences between male and female article 2 of pereopods 5–7 are the same as in Victorian specimens.

The most striking difference between New South Wales and Victorian specimens is found in the "cusp" of epimeron 3; long, stout, and straight in the New South Wales collection, but short and

up-turned in every Victorian specimen except female "p," where it has become straight.

Examination of a single sample (through the courtesy of Dr. Deborah Dexter, 1981) from New South Wales, containing individuals at all stages of development, suggests the possibility that the Victorian specimens may not have reached the terminal stage.

The epimeral cusp in New South Wales juveniles is small and inturned, as in Victorian specimens; article 2 of the outer ramus of uropod 3 is much longer, relative to article 1, than it is in the adult, and the inner ramus is considerably shorter than article 1 (a typical haustorioid juvenile character). The number of coxal setae in juveniles is small and increased with increasing size. But juveniles of about 5 mm have 4–5 setae on coxa 2, though only 1 on coxa 1. In the largest female in the sample, 9 mm, with setose brood plates (assumed terminal), article 2 of the outer ramus of uropod 3 is little more than 0.25 as long as article 1, and the inner ramus reaches beyond the apex of that article.

The condition of uropod 3 (illus.) and the small upturned epimeral cusp of the holotype suggests that it is not a terminal male. Female "p," with setose brood plates has, compared with the holotype, a shorter (0.33) article 2 of the outer ramus of uropod 3 and a longer inner ramus; the cusp is straight though short. It is closer in general form to the large New South Wales specimens, but, judging by uropod 3, it is possible that this, too, may be subterminal.

ILLUSTRATIONS.—Left mandibular palp article 2 not flattened. Lateral face of hand on gnathopod 1 like gnathopod 2. Fully delineated pereopod 5 of Figure 4 enlarged; other pereopod 5, lacking setae, magnified to same degree as pereopods 6–7 and marked with positions of medial setae.

HOLOTYPE.—See J.L. Barnard (1961); coxa 1 with 2 apical setae and coxa 2 with only 2 apical setae; the small count on coxa 2 is bridged by various intermediate specimens.

VOUCHER MATERIAL.—CPBS 35S/1: male "m," 6.25 mm (illus.); WPBES 1726/3: female

"h," 6.26 mm (illus.); CPBS A4/5: female "p," 6.93 mm; juvenile "k," 4.36 mm (illus.); AM SBS Transect 2.09.03.05 (2 specimens); AM P.24856: female "w," 8.0+ mm (illus.); AM P.24857: male "r," 7.01+ mm (illus.); AM P.23375: juvenile "j," 4.2 mm (illus.).

REMARKS.—Specimens from New South Wales may merit specific status. Additional collections from Victoria containing adults could clarify the relationship.

MATERIAL.—CPBS, 11 samples from 9 stations (16); WPBES, 1 sample (1); AM HDWBS and SBS, 43 samples from 18 stations (158).

DISTRIBUTION.—Great Australian Bight, 875 m; Victoria, Western Port, confined to channel stations (not taken in Port Phillip); NSW, 16 km south to 3 km north of Hunter River, intertidal to 28 m, sandy beaches and off shore. Fine to coarse sand.

Bumeralius, new genus

DIAGNOSIS.—Rostrum weak. Peduncle of antenna 1 short, stout, articles 2 and 3 of peduncle progressively shortened, geniculate between articles 1 and 2, both flagella moderately long. Antenna 2 of haustorius form, article 4 expanded, article 5 small, articles 4–5 with facial armaments, article 4 with long ventral setae and subventral clusters of bifid setae. Mandibular incisors not extended, thick, toothed; right and left laciniae mobiles not alike; rakers simple, 3 or more; molar elongate, weakly triturative, with cuspidate accessory chopper; setae of palp article 3 awned. Mandibular lobes of lower lip well developed. Inner plate of maxilla 1 slender, multisetose, outer plate with 11 spines, palp short, uniarticulate. Inner plate of maxilla 2 with fully submarginal oblique row of setae. Maxillae and maxillipeds lacking baler lobes. Outer plate of maxilliped with spines, palp article 2 expanded, article 3 elongate, dactyl clavate, multisetose.

Coxae 1–4 progressively larger, coxae 1–2 small but only partially hidden by following coxae, neither coxae 3 or 4 extended posteroventrally;

only coxae 2–5 with simple gills; brood plates 4 pairs, slender.

Gnathopods small, almost alike, wrists elongate, hands mitelliform, subchelate, palms well marked. Dactyls of pereopods 3–7 distinguishable, those of pereopods 3–5 large, those of pereopods 6–7 small, dactyl of pereopod 5 bladelike, unarmed. Article 2 of pereopods 5–7 expanded, pereopod 5 of haustorius form, distal articles of pereopods 6–7 not underslung, only moderately widened, pereopods 6–7 otherwise similar, dominated by pereopod 5.

Peduncles of pleopods wider than long, pleopod 2 inferior, inner rami moderately shorter than outer. Epimeron 1 scarcely differentiated, epimeron 2 dominantly setose. Urosomite 1 scarcely produced and poorly setose ventrally. Peduncles of uropods 1–2 setose laterally, rami linguiform, bearing only 1 apical seta each except for outer ramus of uropod 2. Uropod 3 of ordinary form, outer ramus dominant and biarticulate, article 2 with 2 apical setae. Telson short, broader than long, deeply cleft.

DESCRIPTION.—Eyes indistinct or absent, ocular ganglia visible. Dorsolateral surface of article 1 on antenna 1 furnished with numerous elongate setae, not organized into distinct longitudinal row; article 2 densely setose dorsolaterally, groups indistinguishable; article 3 poorly setose. Article 3 of antenna 2 short, densely setose; dorsal margin of article 4 scarcely setose, of article 5 strongly setose; flagellum longer than article 4 of peduncle. No calceoli.

Right lacinia mobilis thin, narrow; left broader, both bifid. Lower lip with 1 cone on each lobe. Inner plate of maxilla 1 with mostly short apical setae, excavate medial margin bounded proximally by large seta; most spines on outer plate weakly bifid and/or marginally pectinate. Inner plate of maxilliped with 3 stout apical spines.

Coxae 1–2 strongly setose. Gill 2 dominant, gill 5 much larger than posterior lobe of coxa 5. Gnathopod 1 bearing surficial button-combs (see "*Urohaustorius*," Figure 21 *QGIt*).

Pereopods 3–4 with extensive secondary facial

row of spines on article 5 in addition to normal posterior spines.

Uropods 1-2 lacking huge dorsal setae on peduncles; outer rami of both pairs usually with group of basomedial setae, medial margin of peduncle on uropod 2 almost naked.

TYPE-SPECIES.—*Bumeralius buchalius*, new species.

COMPOSITION.—Unique.

RELATIONSHIP.—*Bumeralius* is considered to be descended from a morphotype like *Zobracho* J.L. Barnard (1961), as shown by the shortened telson and sparser and more specialized setation on the rami uropods 1-2. Of lesser importance is the narrowed inner plate of maxilla 1 with specialized setation pattern, the shorter palp of maxilla 1, a slightly stronger distinction between the hands of gnathopods 1 and 2, the lesser dominance by the epistomal part of the prebuccal complex, and the smaller rostrum.

Bumeralius buchalius, new species

FIGURES 7-12

DESCRIPTION OF HOLOTYPE MALE (male "o," 5.60 mm).—Head about 85% as long as wide, rostrum about 21% as long as remainder of head. Primary flagellum of antenna 1 with 8 articles, first 5 each with long aesthetasc, accessory flagellum 5-articulate. Article 3 of peduncle on antenna 2 with about 14 facial setae; facial formula of thin setae on article 4 = 9-10-many, on article 5 = many; flagellum with 10 articles, at least 2 setae on each article elongate; no calceoli observed on articles of peduncle or on flagellum.

Right incisor with at least 3 teeth, left with 2, right rakers 3, left 5 plus 1 rudimentary, chopper on molar with 2-3 cusps; article 1 of palp weakly elongate, articles 2 and 3 subequal in length, article 2 sparsely setose, spine formula on right article 3 = 16-1-9-1, on left = 15-1-8-1. Inner plate of maxilla 1 with 2 short apical setae, 2 longer laterals, 1 longer apicomedial, 1 elongate mediobasal; outer plate with 11 spines; palp with 2 apical setae and 1 disjunct apicomedial seta.

Inner plate of maxilliped with 6 submarginal medial setae, medial margin of outer plate with ragged mixture of spines and groups of small setae, apex naked, apicolateral margin with 1 seta; article 2 of palp with row of 8 facial setae, article 3 with row of 5 (or 6 counting 1 near apex) facial setae.

Coxa 1 short, wide, blunt, bearing 23 small setae densely crowded; coxa 2 of skewed pyriform shape, with distoventral extension, anterior margin with 20 short to medium thin setae, ventral apex with 8 longer plumes, posterior margin with 3 shorter plumes; coxa 3 with 6 ventral and 11 posterior plumes; coxa 4 with 7 ventral and about 32 posterior setae of mixed sizes and plumosities; coxa 5 very short, unlobed or scarcely lobed. Gnathopods with posterior setal brushes on articles 2-3; palm of gnathopod 1 slightly oblique, that of gnathopod 2 transverse, margins distinctive (see illustrations); hand of gnathopod 2 smaller than that of gnathopod 1.

Setal and spine formulas on pereopod 3 = 8, 13, 8 facial + 5 posterior, 7 + 4 + 1; on pereopod 4 = 8, 10, 7 facial + 6 posterior, 7 + 4 + 1; margins of articles smooth; dactyls of pereopods 3-4 lacking subapical ornament. Article 2 of pereopods 5-7 densely setose posteriorly, that of pereopod 5 with posteroventral brush of mediofacial setae, of pereopod 7 with posterodorsal hook; dactyl of pereopod 5 long, almost naked, blade-like, with small anterodistal notch or tooth, dactyls of pereopods 6-7 not longer than adjacent spines; medial apex of article 6 on pereopod 7 with pectinate invagination.

Pleopod 2 inferior; peduncles of dominant pleopods with rows of 4-5 and upwards to 10 long setae, spine formulas of pleopods 1-3 = 2 and 2, 2 and 0, 2 and 2, coupling hooks like those of *Urohaustorius*; each inner ramus with basal clothespin spine; segmental formulas of pleopods = 25-16, 18-12, 22-19 (inner proliferate); basal setal formulas = 21-2-3-3, 13-0-1-1, 13-(3-4)-4-5.

Epimeron 1 obsolescent, bearing 1 posteroventral setule; epimeron 2 produced posteroventrally like adze, with subventral horizontal row of 8-9

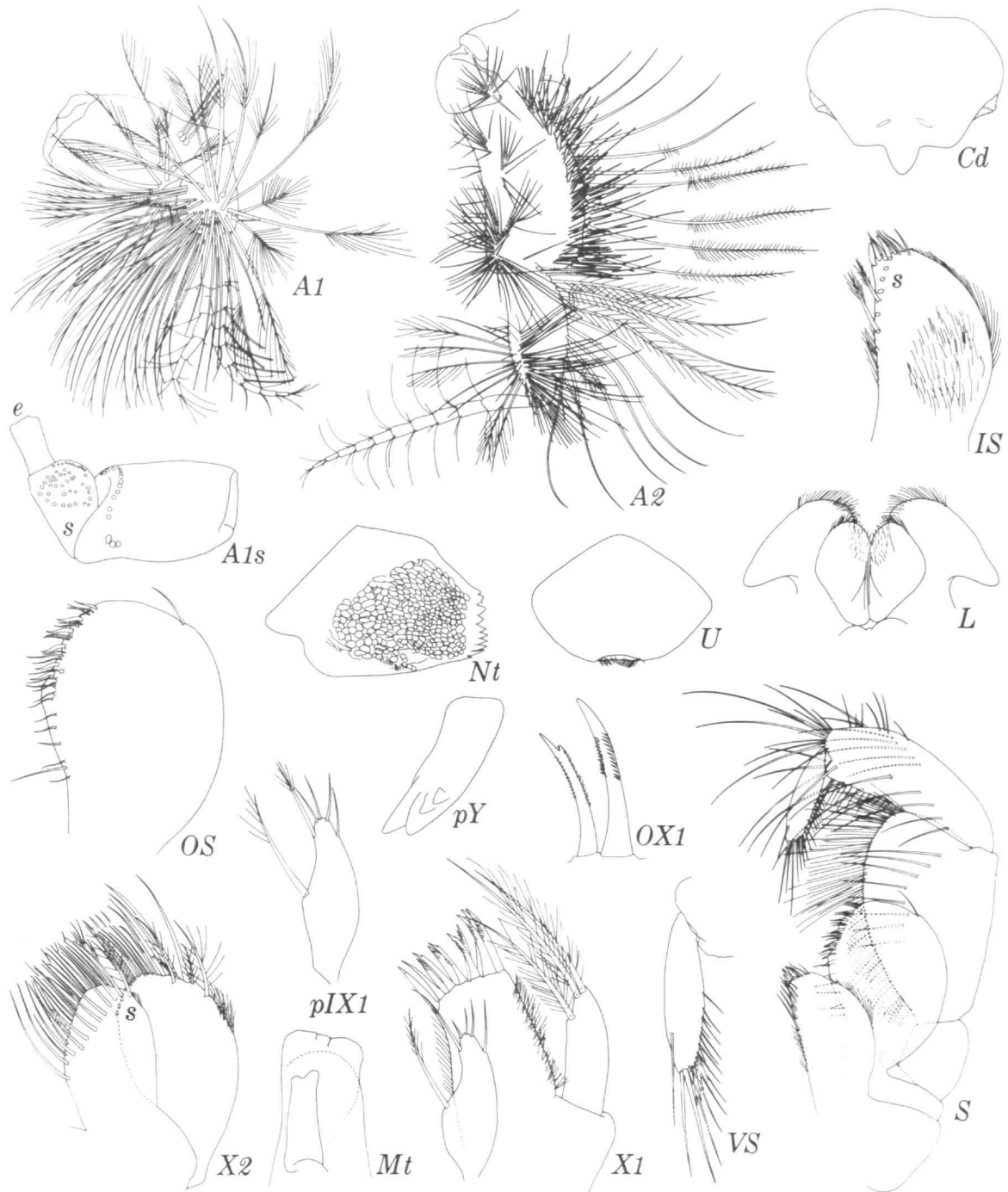


FIGURE 7.—*Bumeralius buchalius*, new species, holotype, male "o," 5.60 mm (*p* = female "p," 4.43 mm; *Y* = left lacinia mobilis).

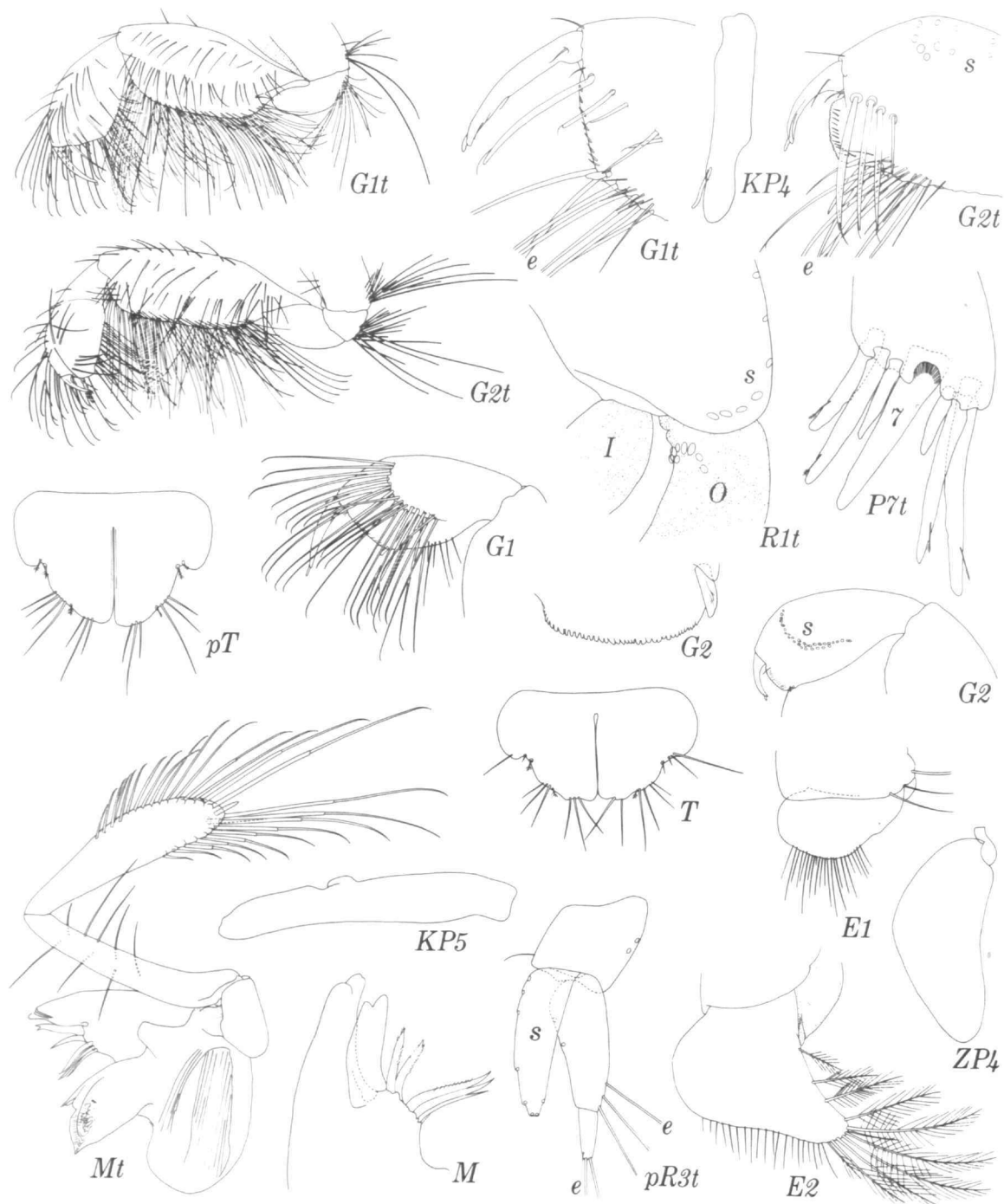


FIGURE 8.—*Bumeralius buchalius*, new species, holotype, male "o," 5.60 mm (*p* = female "p," 4.43 mm; *Z* = gill).

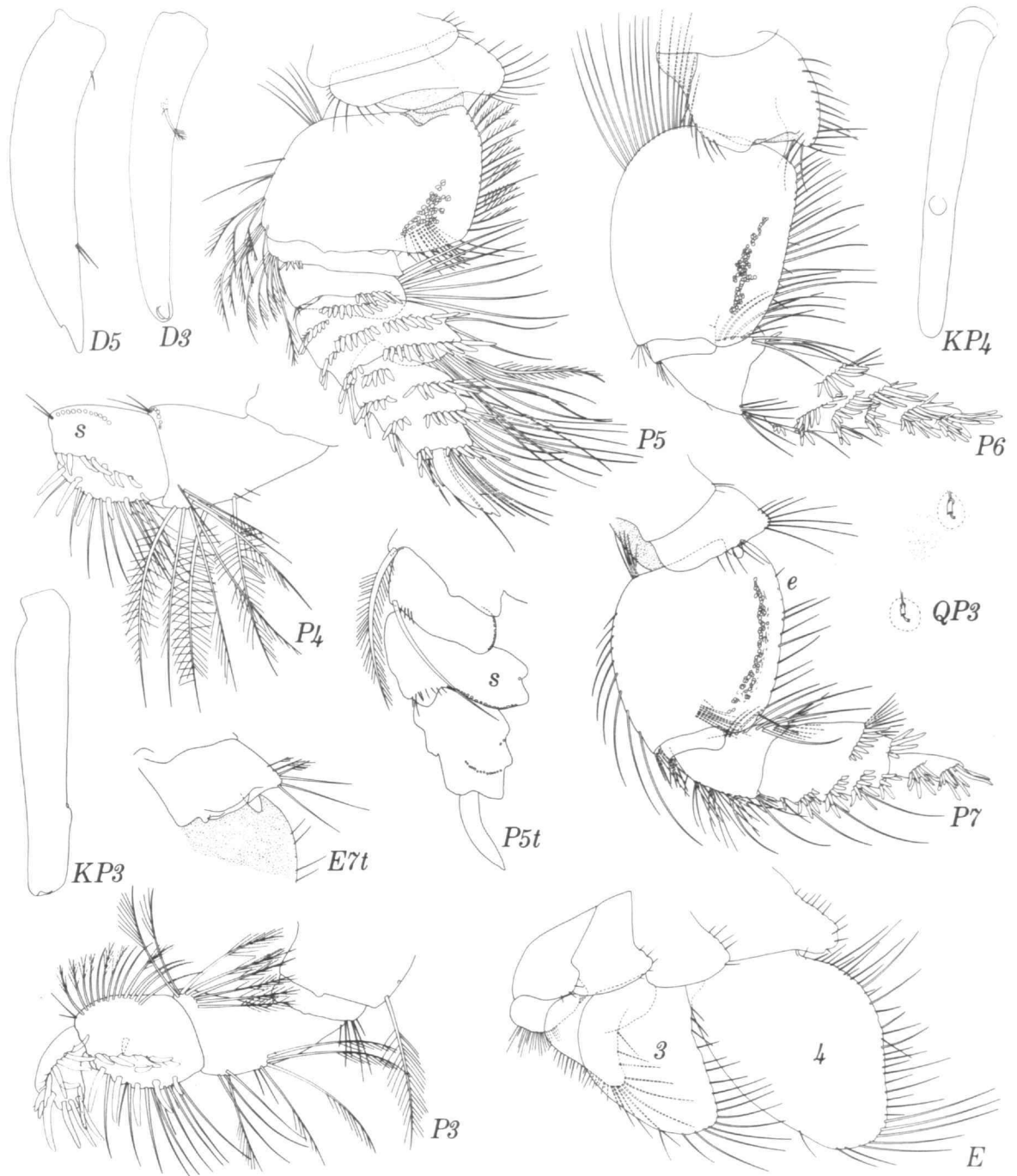


FIGURE 9.—*Bumeralius buchalius*, new species, holotype, male "o," 5.60 mm.

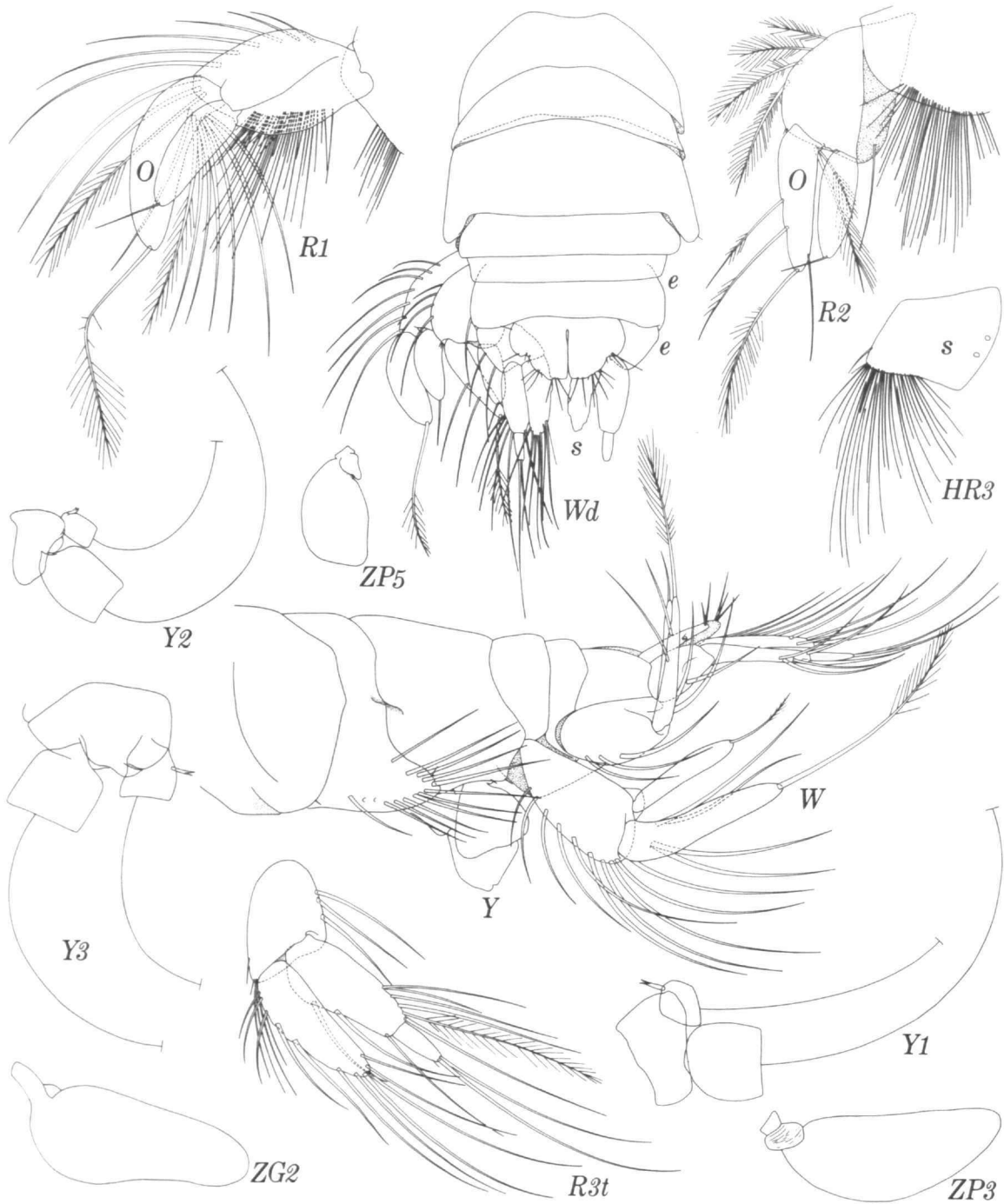


FIGURE 10.—*Bumeralius buchalius*, new species, holotype, male "o," 5.60 mm (Y = pleopod; Z = gill).

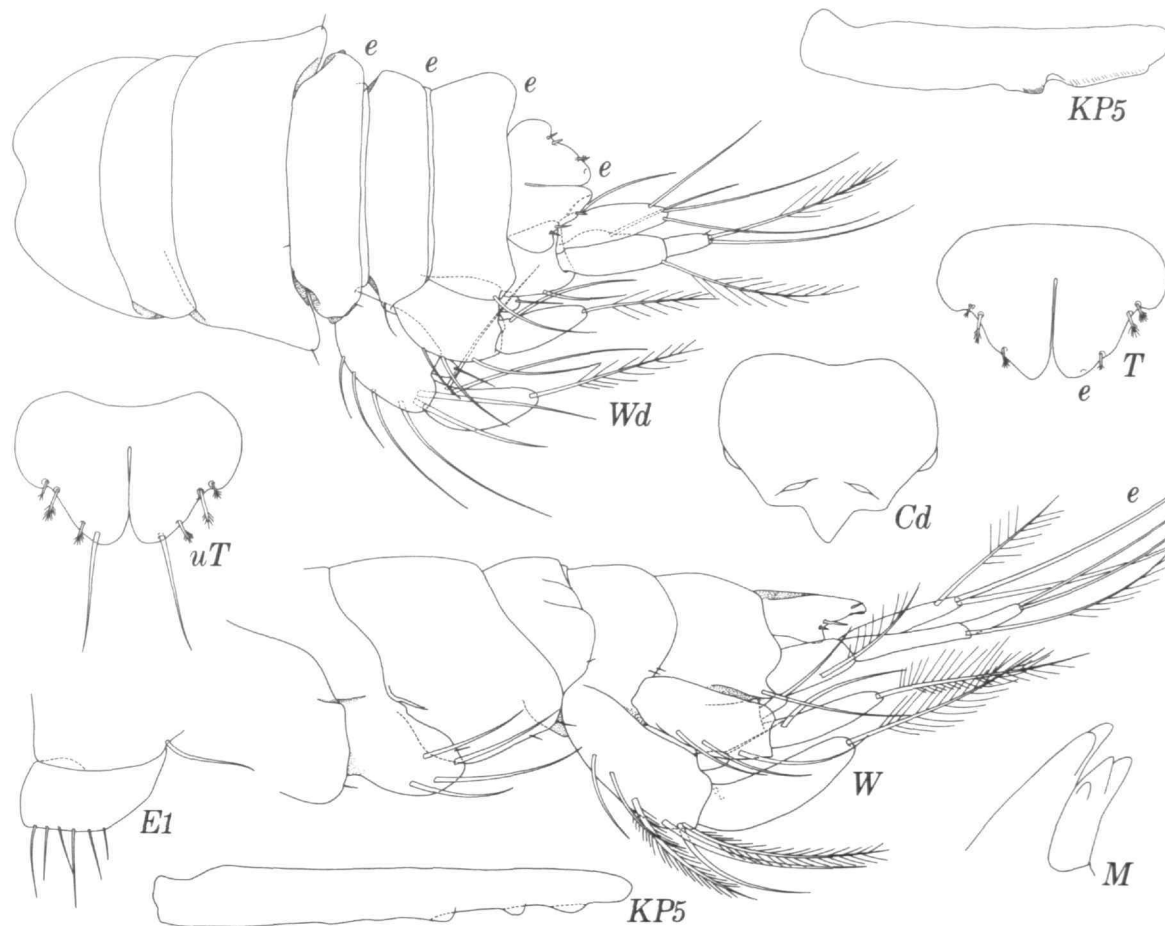


FIGURE 11.—*Bumeralius buchalius*, new species, unlabeled = juvenile "j," 2.97 mm (*u* = juvenile "u," 2.54 mm).

setae, posterior submarginal row of 4–5 setae, posterior margin with setule; epimeron 3 with posterior hump strongly ventrad, posterior and ventral margins weakly sinuous, posteroventral corner softly rounded, margins bearing only few setules.

Lateral margin of peduncle on uropod 1 with 9 setae, extending to venter, of uropod 2 with 4, not extending to venter and with naked gap to apex bearing 2 setules, no dorsal setae; medial margin of uropod 1 densely setose, of uropod 2 with 1 seta; outer rami of uropods 1–2 each with elongate apical plume, inner rami with shorter

stiffer seta, outer ramus of uropod 2 with 2 lateral plumes, all other ramal margins naked; outer ramus of uropod 1 with 8 long plumes in subbasal, ventral, and medial cluster, uropod 2 with 2 in same position; inner rami about 70% as long as outer. Uropod 3 short, peduncle with 3 large lateral setae, 1 medial setule, dense apicoventral setae; inner ramus reaching article 1 apex of outer ramus, with 7 medial, 3 apical, and 1 lateral setae; article 1 of outer ramus with 6 lateral setae in 5 groups, mostly crowded distally, medial margin with 3 widely spread setae, article 2 elongate, 0.48, bearing 2 long apical setae and 1 apicomедial setule. Urosomal glands not apparent.

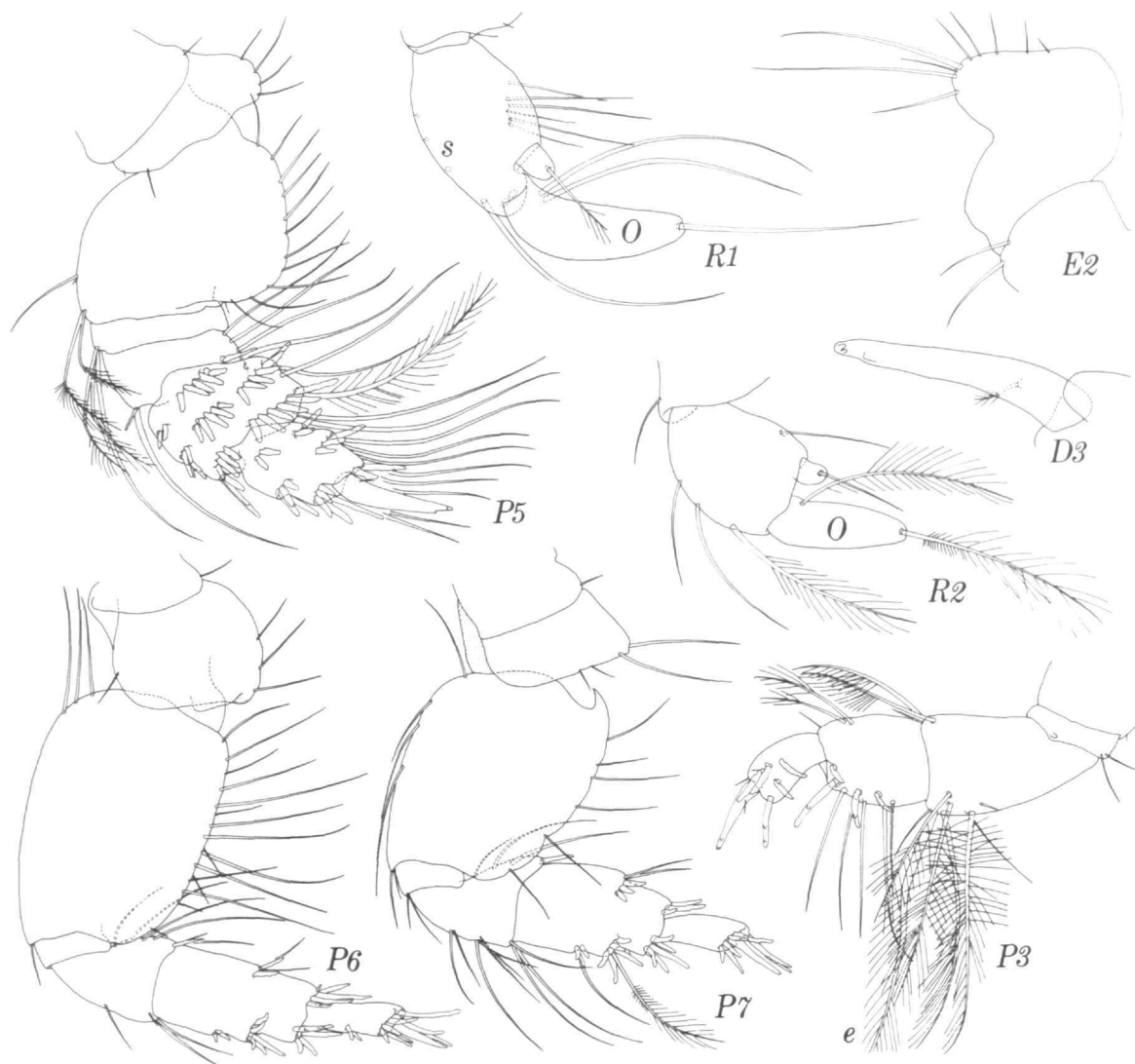


FIGURE 12.—*Bumeralius buchalius*, new species, juvenile "j," 2.97 mm.

Telson very broad, deeply cleft, ungaping, with moderately developed lateral alae, setal formula = 1-2, 2P, 3-4, P, 2-3.

DESCRIPTION OF FEMALE.—Female "p," 4.43 mm: Antenna 1 like male but long setae fewer, primary flagellum with 8 articles, accessory with 7. Antenna 2 like male but facial setae slightly fewer, flagellum with 9 articles. Right mandible

with fourth raker rudimentary, left with fifth raker rudimentary; left lacinia mobilis with 4 teeth (illus.); spine formula on right palp article 3 = 12-1-7-1, on left = 13-1-6-1. Setae on inner plate of maxilla 1 more elongate than in male (illus.). Outer plate of maxillipedal palp with only 4 medial spines plus setal groups, article 2 of palp with 6 facial setae, article 3 with either 5 or

6 facial setae. Setae of coxa 3 more numerous than in male. Brood plates 4 pairs, narrow and setose. Setae of gnathopod 1 fewer than in male. Setal and spine formulas on pereopod 3 = 6, 8, 5 facial + 5 posterior, 5 + 3 + 2!; on pereopod 4 = 5, 6-7, 5 facial + 6 posterior, 5 + 3 + 1. Article 2 of pereopod 5 with only 2 anterodorsal setae, article 4 with only 2 spines in row, other spines almost as numerous as in male; rows of spines on article 5 of pereopod 6 shorter and sparser than in male, dactyl thinner and longer.

Pleopods differing from male as follows: segmental formulas = 20-12, 16-10, 20-16, basal setal formulas = 15-2-3-4, 11-0-1-1, 12-2-3-5. Epimeron 2 with 7 ventral, 3 upper oblique long setae; epimeron 3 with 2 posteroventral and 1 anteroventral setules.

Uropod 1 with 8 lateral peduncular setae, outer ramus with 6 basomedial setae; uropod 2 with 3 lateral peduncular setae and 2 apical setules, 1-2 medials, outer ramus with 1-2 lateral setae, 1 basomedial; peduncle of uropod 3 with 2 lateral setae, otherwise see illustration. Telsonic setal formula = 2P, 3-4, P, 3 (see illustration).

Female "a," 4.89 mm: Outer ramus of left uropod 3 with 3 apical setae on article 2, third seta actually apicolateral. Telsonic setal formula = 2P, 3, P, 2.

ILLUSTRATIONS.—One spine on face of article 5 on pereopod 3 unemergent, marked in dots; all setae of uropod 1 plumose but apicalmost setae of rami only plumose terminally; some setae of uropod 2 poorly plumose.

DESCRIPTION OF JUVENILE.—Juvenile "j," 2.97 mm: Like adult, but with the juvenile characteristics of much fewer spines and setae. Head about 87% as long as wide, rostrum about 24% as long as remainder of head. Primary flagellum of antenna 1 with 5 articles, accessory flagellum with 4-5 articles. Facial formula of thin setae on article 4 of antenna 2 = 3-15, on article 5 = 8; flagellum with 7 articles.

Right incisor weakly bifid, left with 3 teeth; right rakers 3, left 4; chopper on molar with 2 cusps and hump; left lacinia mobilis with 3 teeth; article 2 of palp with 1 seta, spine formula on left

palp article 3 = 6-1-4-1. Cones of lower lip very large. Inner plate of maxilla 1 with 2 short apical setae, no laterals, 1 longer apicomedial, 1 elongate mediobasal; outer plate with 9 spines. Inner plate of maxilla 2 with 5 setae in oblique row. Inner plate of maxilliped with 3 apical stout spines and 4 submarginal medial setae, outer plate with 3 medial spines and groups of 2, 3, and 2 setae, apex naked; article 2 of palp with row of 4 facial setae, article 3 with row of 3 facial setae, article 4 with 2 apical setae, 1 dorsal, and 3 small setae on inner margin.

Coxa 1 with 6 setae, coxa 2 short, deeply incised posteriorly, bearing 5 anterior setae, 3 apical (long and short) and 1 posterior marginal; coxa 3 with 9 setae, coxa 4 with 12 setae. Gills like adult.

Gnathopods approximately like adult but less setose, article 5 slightly thinner, medial face of hand with only 1 enlarged seta near dactyl, palm of gnathopod 1 with only 3 small spinules, of gnathopod 2 with only 5 small spinules.

Setal and spine formulas on pereopod 3 = 2, 2, 1 facial + 3 posterior, 3 + 1 + 1; pereopod 4 = same. Pereopod 5 lacking brush of mediofacial setae on article 2, dactyl lacking any setae, pereopods 5-7 otherwise similar to adult, dactyl of pereopods 3-4 with weak subapical acclivity-tooth; medial apex of article 6 on pereopod 7 only with pectinate invagination; article 2 with posterodorsal hook.

Peduncular spine formulas of pleopods 1-3 = 2 and 0, 2 and 0, 2 and 1, each inner ramus with basal clothespin spine; segmental formulas of pleopods 1-3 = 12-8, 10-5, 13-8; basal setal formulas = 10-1-1-2, 5-0-1-1, 7-1-1-2, pleopod 2 scarcely inferior.

Epimeron 1 obsolete, bearing 1 posteroventral setule; epimeron 2 produced posteroventrally like adze, with ventral row of 2 setae, posterior row of 2 setae, posterior margin with 1 setule; epimeron 3 with hump and posteroventral corner amalgamated as broadly rounded outline.

Lateral margin of peduncle on uropod 1 with 6 setae extending to venter, on uropod 2 with 3 not extending to venter and with gap to naked apex, medioventral face of peduncle with 6 setae,

or uropod 2 with 1 seta; outer rami of uropods 1–2 each with elongate apical plume, inner rami with shorter stiffer almost naked seta, all rami otherwise naked marginally; outer ramus of uropod 1 with 2 long basal plumes, of uropod 2 with 1 in same position, inner rami about 20% as long as outer. Uropod 3 somewhat elongate, peduncle with 1 large lateral seta, 1 setule medially, sparse (5–6) apicoventral setae, inner ramus with 3 setae, article 1 of outer with 1 apicolateral and 1 mid-medial setae, article 2 elongate, bearing 2 long apical setae and 1 apicomедial setule. Urosomal glands not apparent.

Telson very broad, deeply cleft, ungaping, with moderately developed lateral alae, setal formula = 2P, P, 0–1.

Juvenile “u,” 2.54 mm: Epimeron 2 with only 1 posterior seta and setule, 1 facial seta on ventral row; epimeron 3 with only 1 setule (posteroventral corner); peduncle of uropod 1 with 4 lateral setae, outer rami of uropods 1–2 each with 1 basomedial seta, peduncle of uropod 2 with 1 lateral seta; peduncle of uropod 3 with only 3 ventrodiscal setae, article 1 of outer ramus with only 1 seta situated apicolaterally, inner rami with 4 setae (2 apical, 2 basomedial); telson illustrated.

Juvenile “h” (larger size): Inner ramus of uropod 1 about 34% as long as outer, of uropod 2 about 55% as long as outer ramus.

HOLOTYPE.—NMV, male “o,” 5.60 mm (illus.).

TYPE-LOCALITY.—WPBES 1715, Western Port, Victoria, 10 Jan 1974, intertidal, coarse sand.

VOUCHER MATERIAL.—AM MER 3D, Merimbula, NSW: female “p,” 4.43 mm (illus.); juvenile “j,” 2.97 mm (illus.), juvenile “u,” 2.54 mm (illus.); MER 37B: juvenile “h,” larger size; CPBS C6/1: female “a,” 4.89 mm, and young female “g,” 3.70 mm, with half-grown, unsetose brood plates.

REMARKS.—The condition of rami on uropods 1–2 in large juvenile “h” seems to confirm the transition from small juveniles to adults. Generally the inner rami of uropods 1–2 in small juveniles is about 20% of the length of outer rami and in adults about 70%. The rami of juvenile “h,”

34% and 55% respectively on uropods 1–2 seems to bridge this gap.

MATERIAL.—CPBS, 1 sample (1); WPBES, 1 sample (1); AM Merimbula, (Day samples) 2 samples (9).

DISTRIBUTION.—Victoria and New South Wales, intertidal.

Prantinus, new genus

DIAGNOSIS.—Rostrum short and broad but head extended strongly anteriorly from antennal notch. Peduncle of antenna 1 elongate, thin, articles 2 and 3 about 70% and 45% as long as article 1, strongly geniculate, both flagella short, scarcely longer than article 3 of peduncle. Antenna 2 of weak haustorius form, article 4 weakly expanded but bearing 3 kinds of armaments, long ventral setae, subventral clusters of non-bifid but apically sheathed spines and facial armament row; article 5 much smaller than article 4. Aesthetascs simple. Mandibular incisors extended, toothed; right and left laciniae mobiles not alike; rakers serrate, numerous on each mandible; molar small, thin, extended, with 2 main and 2 subsidiary apical cusps plus whiplike seta; setae of palp article 3 not awned, apically hooked. Mandibular lobes of lower lip well developed. Inner plate of maxilla 1 of medium size, moderately setose, outer plate with 10 spines, palp short, unarticulate. Inner plate of maxilla 2 with weakly submarginal row of setae. Maxillae and maxillipeds lacking baler lobes. Inner plate of maxilliped ordinary in female, unusually small in male; outer plate spinose; palp article 2 weakly expanded, article 3 not extraordinarily elongate, slightly expanded apically, dactyl unguiform, elongate, bearing apical nail and subsidiary setae.

Coxae 1–4 progressively larger, coxae 1–2 small, subequal in size, coxa 3 shaped like tear drop, not greatly enlarged, and not covering anterior coxae, coxa 4 not greatly enlarged, subovate; coxae 2–5 with simple gills; brood plates 4 pairs, slender.

Gnathopods small, grossly alike, wrists elongate, hand somewhat smaller, more mitelliform,

subchelate, but palm more transverse on gnathopod 2 than on gnathopod 1. Dactyls of pereopods 3–7 distinguishable, those of pereopods 3–5 large, those of pereopods 6–7 very small; dactyl of pereopod 5 lacking spines. Article 2 of pereopods 5–7 expanded less strongly on pereopods 6–7 than on pereopod 5; latter of haustorius form; distal articles of pereopods 6–7 not underslung, only moderately widened; pereopods 6–7 otherwise similar, not dominating pereopod 5.

Peduncles of pleopods wider than long, pleopod 2 slightly inferior, inner rami shorter than outer. Epimeron 1 poorly differentiated, epimeron 2 dominantly setose. Urosomite 1 weakly produced and strongly setose ventrally. Rami of uropods 1–2 styliform, each bearing only 1 apical plumose seta; peduncle of uropod 1 in male strongly setose laterally, of uropods 1–2 in female weakly spinose apicolaterally. Uropod 3 of ordinary form; outer ramus biarticulate and dominant in female, inner ramus dominant in male; article 2 of outer ramus with 2 large and 1 minute apical setae. Telson short, broader than long, deeply cleft.

DESCRIPTION.—Eyes weak to indistinct in female and juveniles, well developed in male, ocular ganglia visible. Dorsolateral surface of article 1 on antenna 1 furnished with small poorly organized group of setae; article 2 moderately setose dorsolaterally; article 3 poorly setose. Article 3 of antenna 2 short, moderately setose, flagellum much longer than article 4 of peduncle. No calceoli yet observed.

Right lacinia mobilis bifid, left broader and trifid. Lower lip with inner lobes almost completely fused together, cones on outer not apparent. Inner plate of maxilla 1 with apical setae both medial and lateral; several spines on outer plate either bifid or with accessory spine. Inner plate of maxilliped with 3 stout apical spines.

Coxa 1 poorly setose, coxae 2–4 moderately setose. Gill 4 dominant, gill 5 larger than posterior lobe of coxa 5. Gnathopod 2 lacking surficial buttons (see “*Urohaustorius*”).

Pereopods 3–4 lacking extensive secondary facial rows of spines on article 5.

Uropods 1–2 in male with sparse dorsal setae, medial margins of peduncles strongly setose in both sexes.

TYPE-SPECIES.—*Prantinus talanggi*, new species.

COMPOSITION.—Unique.

RELATIONSHIP.—*Prantinus* forms an evolutionary cluster of its own because of the combination of a urothoe antenna 1 with a weakly expanded antenna 2 of the haustorius form. It has many similarities to *Zobracho* and could be interpreted as being a descendent in which antenna 1 has diverged and the telson become short; otherwise it resembles *Zobracho* in the head and subchelate gnathopods. The rami of uropods 1–2 are unique to the greater haustorioid complex of genera, though an intermediate stage between the linguiform kind of rami in *Urohaustorius* and those of *Prantinus* are present in *Bumeralius*. The latter genus also could be visualized as an intergrade between *Zobracho* and *Prantinus* because of similarities to *Prantinus* in apical armament on article 2 of the outer ramus on uropod 3, the setose condition of the inner plate on maxilla 1, the shapes of coxae, mandibular molar, epimeron 2, pereopodal dactyls, head and telson; but *Bumeralius* has the typical antenna 1 of the urohaustorius form.

The first antenna resembles that in the *Urothoe* group of genera. *Prantinus* differs from *Urothoe*, *Urothoides*, and *Carangolia* in the absence of a ventrolateral cephalic cheek, the uniarticulate palp of maxilla 1 and the setose (rather than spinose) rami of uropods 1–2 (albeit each bears only 1 seta). Antenna 2 appears to be of more characteristic haustorius form in *Prantinus* than in those other taxa though antenna 2 of many species of *Urothoe* is poorly known.

Prantinus appears to lie in a non-direct plesiomorphic position from South African *Cunicus*, though *Prantinus* possesses some of the strange character of that taxon. *Cunicus* has somewhat similar coxae, and the mandibular molar appears to be reduced to a single spine. *Cunicus*, however, has the sharp cephalic cheek and biarticulate palp of maxilla 1 found in the urothoid group, and furthermore, apomorphically has lost the rami of uropods 1–2; has a poorly developed

inner plate of maxilla 1; weak dactyl of the maxillipedal palp; and specializations in antenna 2, pereopod 5, and the hands of the gnathopods.

***Prantinus talanggi*, new species**

Figures 13-18

DIAGNOSIS.—With the characters of the genus.

DESCRIPTION OF FEMALE.—Holotype female "o," 7.19 mm: Head about 85% as long as wide, rostrum about 16% as long as remainder of head (rostrum measured only from final acclivity; head, however, extended forward from antennal notch), eyes represented by granular tissue patches, no distinct ommatidia, ocular ganglia visible. Facial formula of setae on article 1 of antenna 1 = about 5 pairs of long to short setae in irregular sets; on article 2, scattered; primary flagellum with 6 articles, aesthetasc formula = 1-3-3-1-1-0; accessory flagellum of 7 articles. Article 3 of antenna 2 with 6 large plumes; lateral face of article 4 with mixture of short spines (21), long plumose setae (10) and penicillate setae (3); of article 5 with 5 plumes and 1 penicillate seta; flagellum of 9 articles. Each mandibular incisor with 3 teeth; right rakers 11, left 12 plus 1 hairlike rudimentary; each molar with large main cusp bearing long thin basal accessory cusp and apposing minor cusp on each side more apical, plus articulate whiplike seta from base opposite to largest accessory cusp; article 3 of palp slightly longer than article 2, latter with 3 inner apical setae and 4 facial setae in tandem, spine formula on right and left article 3 = 5-1-6-1. Inner plate of maxilla 1 not attenuate, bearing 3 apicolateral setae, 1 smaller seta directly at apex, pair of mediofacial setae; outer plate with 10 spines; palpal setae all apical. Inner plate of maxilliped with 3 stout teeth, 2 medial and 2-3 apical setae; outer plate with about 6 apical and lateral setae; palp article 2 with 3 apicofacial setae, article 3 with pair of facial setae.

Coxa 1 broadly subrectangular, bearing 1 long ventroposterior plume and several marginal setules; coxa 2 deeper, with 7 long plumes and

several setules; coxa 3 almost tear-drop shaped, with 14 plumes mostly posterior and several setules; coxa 4 with about 17 ventral and 10 posterior setae, long and plumose to short and poorly plumose.

Setal and spine formulas on pereopod 3 = 6, 8, 2-1-1-1-1, 7 + 3 + 1; on pereopod 4 = 5, 7, 2-1-1-1-1, 7 + 3 + 1; margins of articles 5-6 not serrate. Article 2 of pereopods 5-7 densely setose posteriorly; dactyl of pereopod 5 with small anterior tooth.

Peduncular spine formulas of pleopods 1-3 = 2 and 1, 2 and 0, 2 and 0; segmental formulas = 18-10, 13-6, 17-12 (inner proliferate); basal setal formulas = 11-2-3-6, 1-1-1-1, 11-2-2-7.

Epimeron 1 sinuous posteroventrally; epimeron 2 extended posteroventrally, with 6 marginal posteroventral setae, 1 facial seta near corner and row of 3 facial setae more dorsally; epimeron 3 rounded-quadrate.

Apicolateral corner of peduncle on uropod 1 with 3 small spines (one hidden in illustration), of uropod 2 with 4 spines; medial margin of each with 7 and 5 setae in tandem respectively; dorsal setae = 0 and 0, setae of rami = 1-1 and 1-1; inner rami extending 87% and 83% along outer. Apicolateral corner on uropod 3 peduncle with 6 plumes, medial margin with 4 plumes in 3 groups, ventromedial apical with about 5 mixed setae, spine formula on lateral margin of article 1 on outer ramus of uropod 3 = 0, medium plumose setae = 2-2.

Telson about 1.4 times as wide as long, weakly alate laterally, cleft about 0.75 of its length, each apex with 6 long to short plumes (almost penicillate in smaller members), each side with 2 small penicillate setules.

Glands discernible only in pereopods 6-7.

Female "q," 6.87 mm: Peduncles of uropods 1-2 with 2 and 1 dorsal setae.

DESCRIPTION OF MALE.—Male "m," 6.22 mm: Eyes large (illus.). Antenna 1 (illus.), shorter and stouter than in female, article 2 broadened apically, article 3 densely furnished with aesthetascs; formula on aesthetascs on primary flagellum = 0-1-3-1-1-0; accessory flagel-

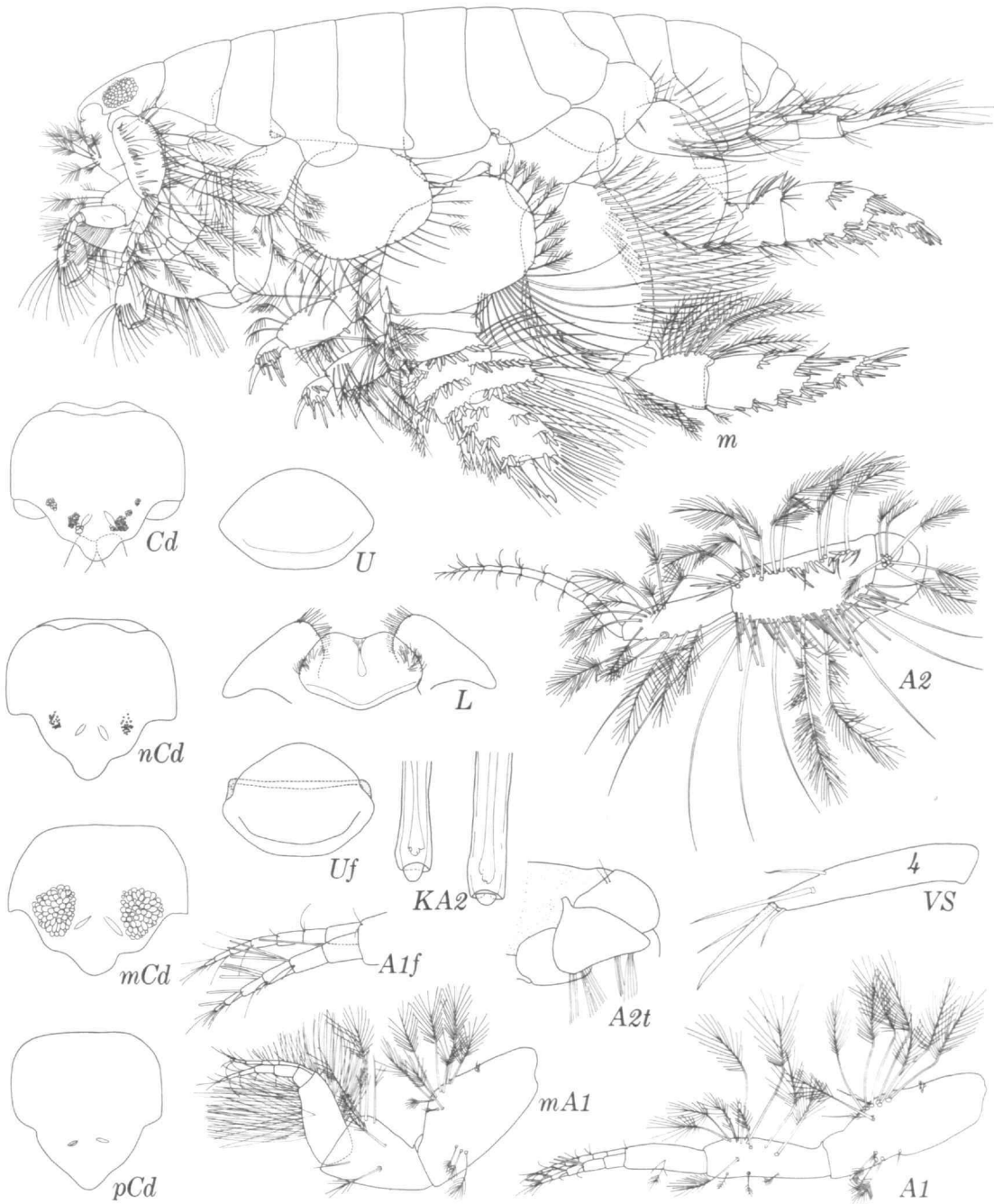


FIGURE 13.—*Prantinus talanggi*, new species, holotype, female "o," 7.19 mm (*m* = male "m," 6.22 mm; *n* = male "n," 6.02 mm; *p* = juvenile "p," 3.23 mm).

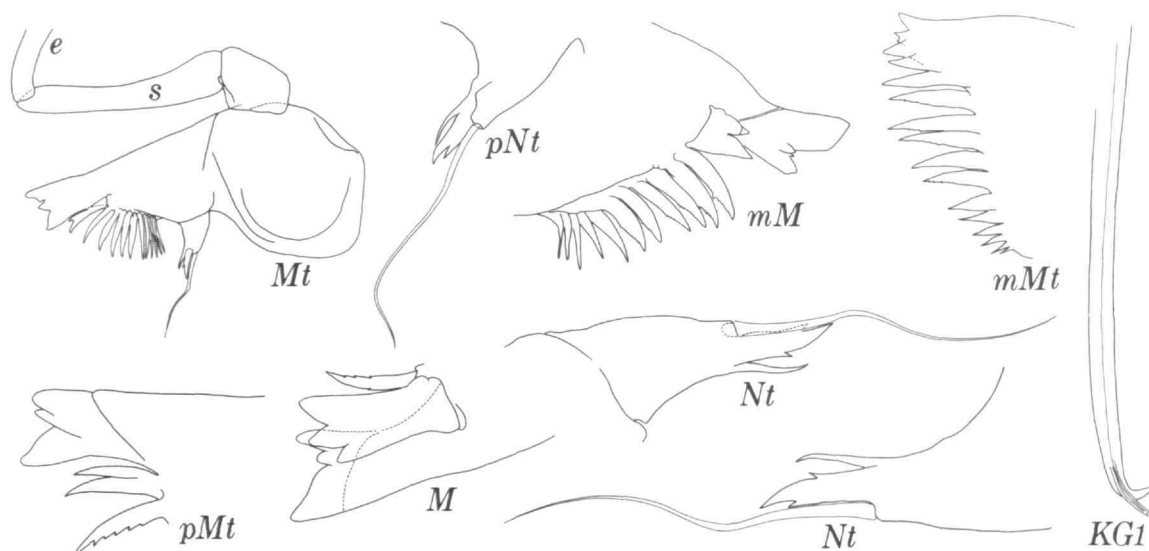


FIGURE 14.—*Prantinus talanggi*, new species, holotype, female "o," 7.19 mm (*m* = male "m," 6.22 mm; *p* = juvenile "p," 3.23 mm).

lum with 6 articles. Antenna 2 generally as in female. Mouthparts, except for upper and lower lips, distinctive, generally degenerative; right lacinia mobilis indistinct from rakers; left short, deeply bifid; each palp article 3 spine formula = 4-1-5-1, each article 2 with 5 setae (illus.); maxillae stunted (illus.); inner plate of maxilliped stunted (illus.), outer plate not as well developed as in female, facial setae on article 3 of palp longer than in female.

Coxa 2 with 6 setae, coxa 3 with 12 setae (elongate only); gnathopods as in female.

Armament formulas of pereopod 3 = 5, 7, 2-1-1-1-1, 6 + 3 + 1; of pereopod 4 = 4, 5, 2-1-1-1, 6 + 3 + 1. Pereopods 5-7 illustrated; article 2 of pereopod 5 with denser anterodorsal setulation than in female; unlike female, article 2 of pereopods 6-7 lacking almost all fully marginal setation, medifacial row much better developed.

Pleopods illustrated, noting pleopod 2 better developed than in female.

Epimera 1-2 better developed than in female (illus.), epimeron 2 with numerous ventral and facial setae.

Uropods 1-3 (illus.) more setose than in female;

peduncle of uropod 1 with 4 lateral and 2 dorsal setae, apicolateral corner with only 1 spine and setule; of uropod 2 with 1 dorsal seta and apicolateral armaments elongate and plumose; all setae of peduncle on uropod 3 smaller than in female but rami much more setose, inner ramus enlarged, formula of short setae laterally on article 1 of outer ramus = 1-1-1-1-1-1, of long setae = 1-1-1-1-1-1.

Telson (illus.) lacking alate appearance, appearing tumid, setae shorter than in female.

Male "n," 6.02 mm: Eyes poorly developed (illus.). Flagella of antenna 1 with 5 and 6 articles. Article 3 of antenna 2 with 5 plumes, armament row on article 4 with 10 plumes, 13 spines, and 3 penicillates; article 5 with 7 plumes in arc, no calceoli; flagellum of 7 articles. Right and left rakers = 10 plus 2 rudimentaries and 9 plus 2 rudimentaries; palp article 2 with 4 setae, 2 of these apical; setal formula on each palp = 3-1-4-1. Maxillae, maxillipeds, and gnathopods like female except maxilla 1 with 11 spines on 1 outer plate, 10 on other. Coxae 1-3 illustrated. Spine and setal formulas on pereopod 3 = 5, 7, 2-1-1-1-1, 7 + 3 + 1; on pereopod 4 = 4, 5, 2-1-1-1,

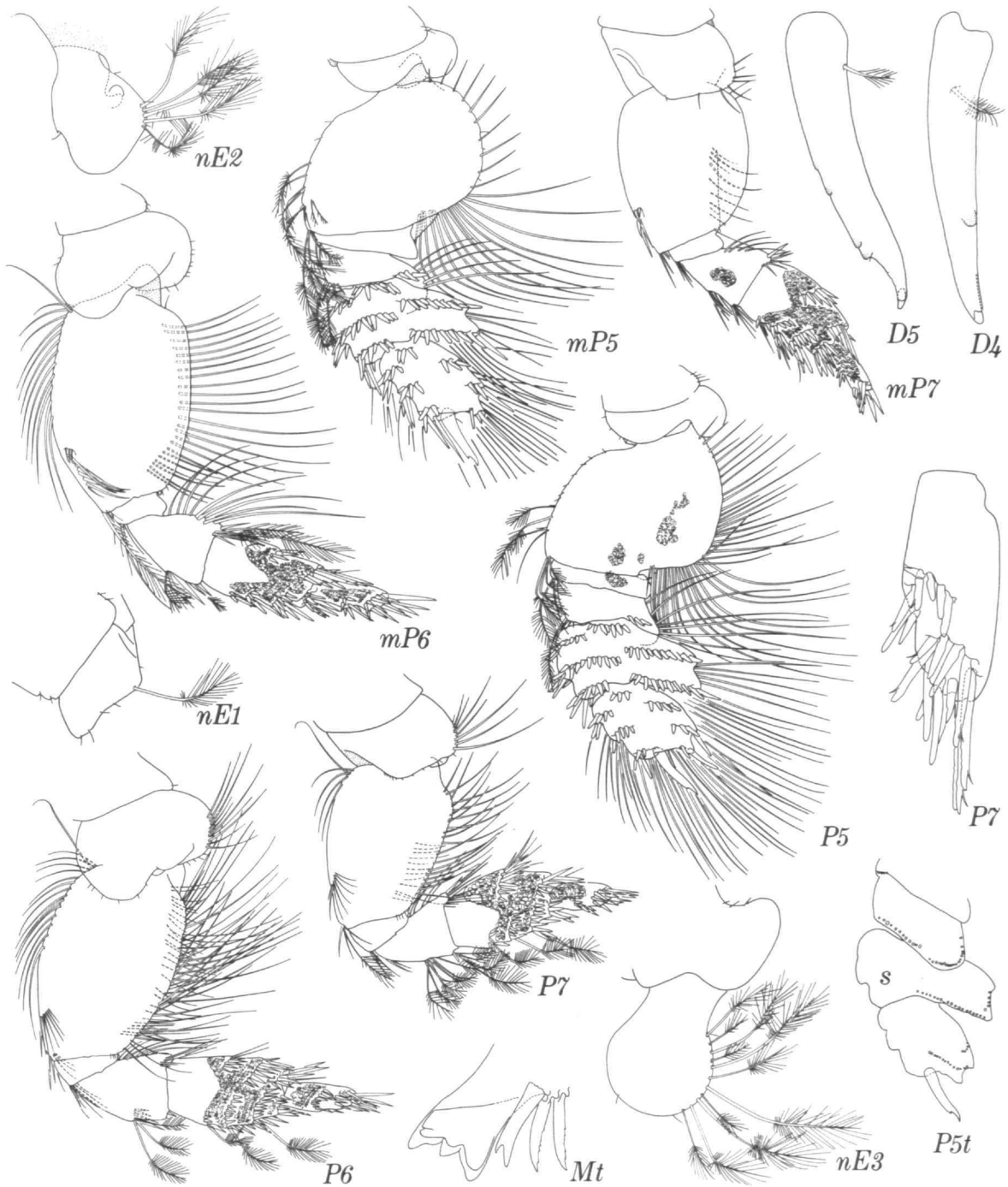


FIGURE 15.—*Prantinus talanggi*, new species, holotype, female "o," 7.19 mm (*m* = male "m," 6.22 mm; *n* = male "n," 6.02 mm).

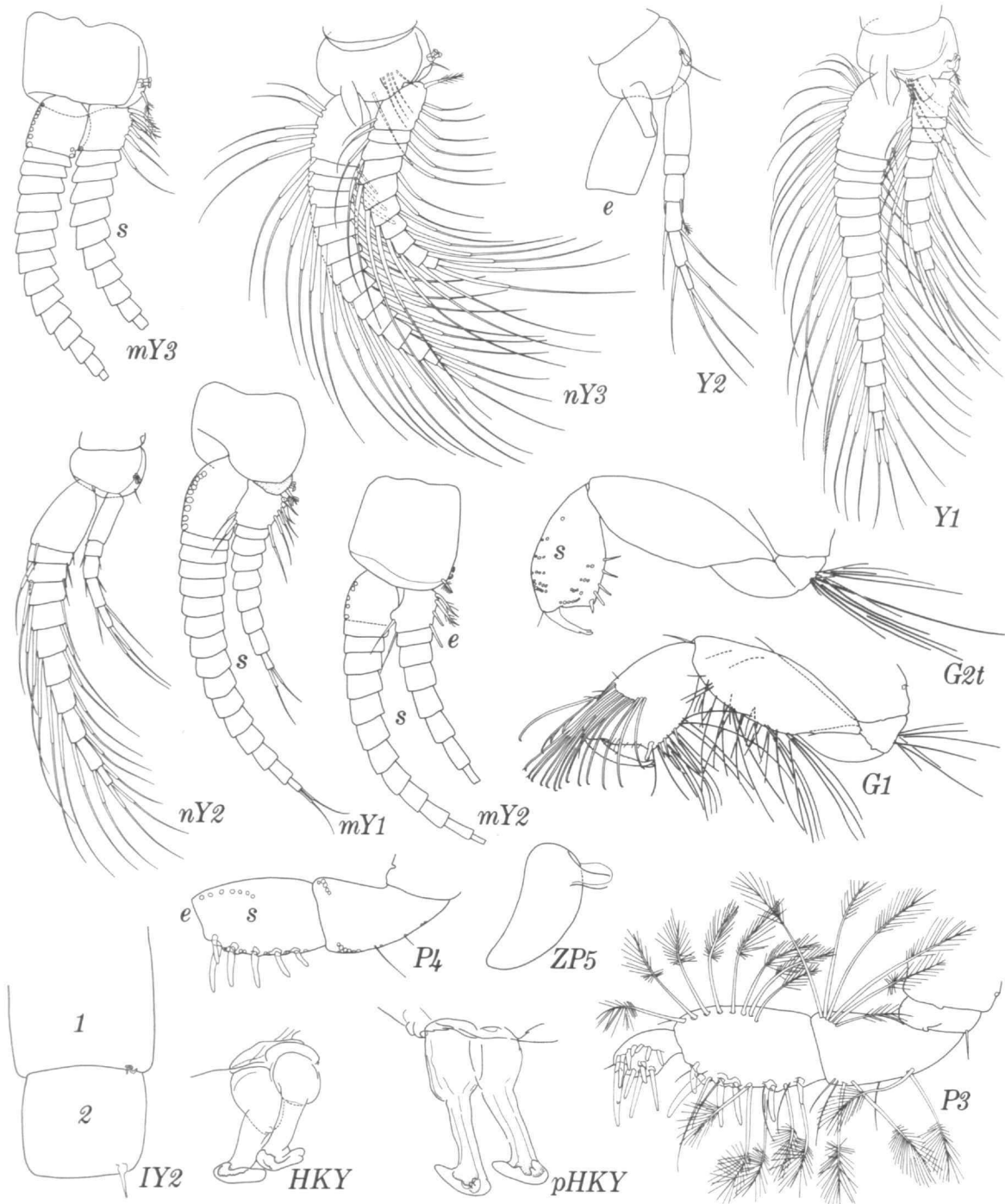


FIGURE 16.—*Prantinus talangi*, new species, holotype, female "o," 7.19 mm (*m* = male "m," 6.22 mm; *n* = male "n," 6.02 mm; *p* = juvenile "p," 3.23 mm; Y = pleopod; Z = gill).

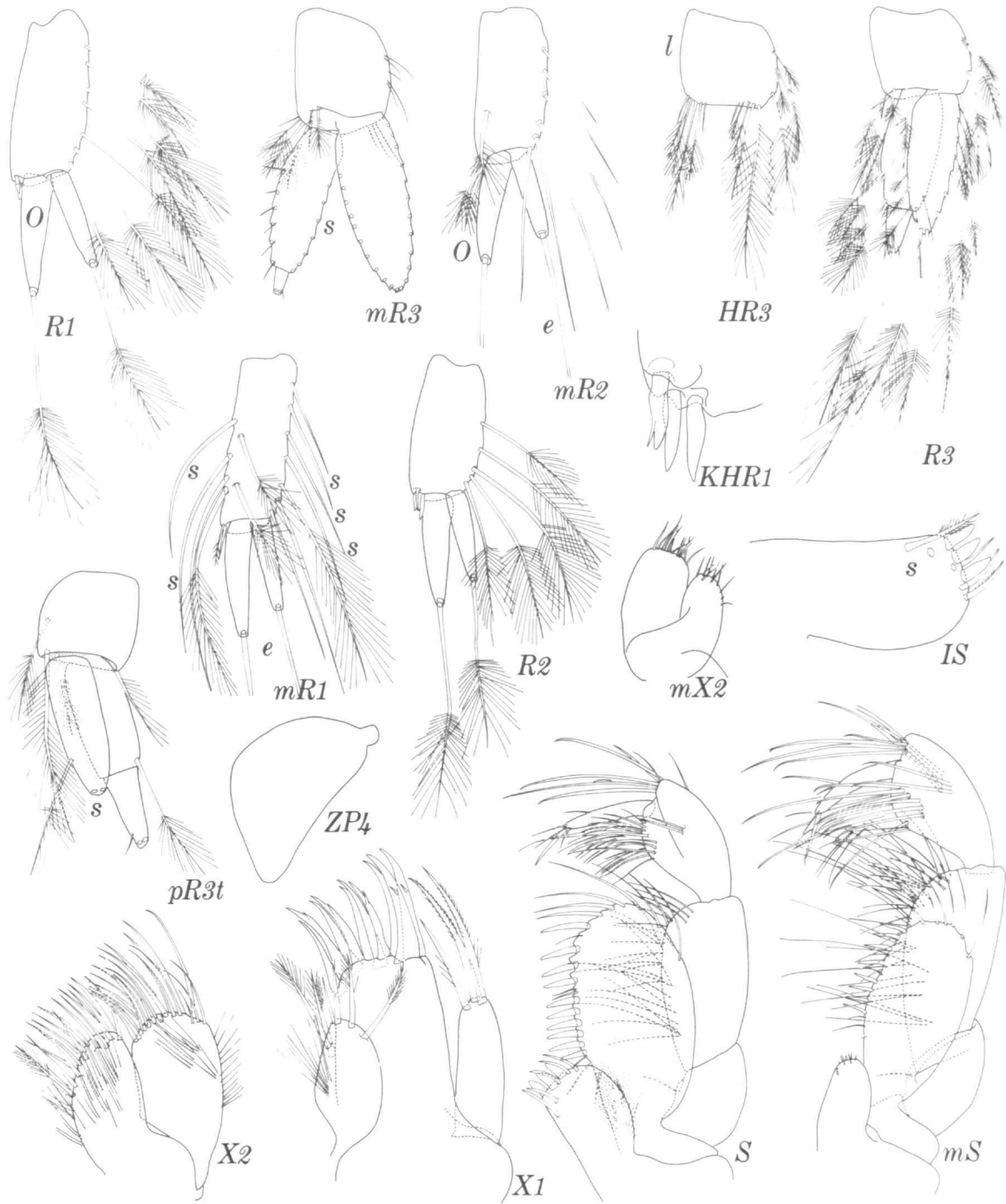


FIGURE 17.—*Prantinus talanggi*, new species, holotype, female "o." 7.19 mm (*m* = male "m," 6.22 mm; *p* = juvenile "p," 3.23 mm, Z = gill).

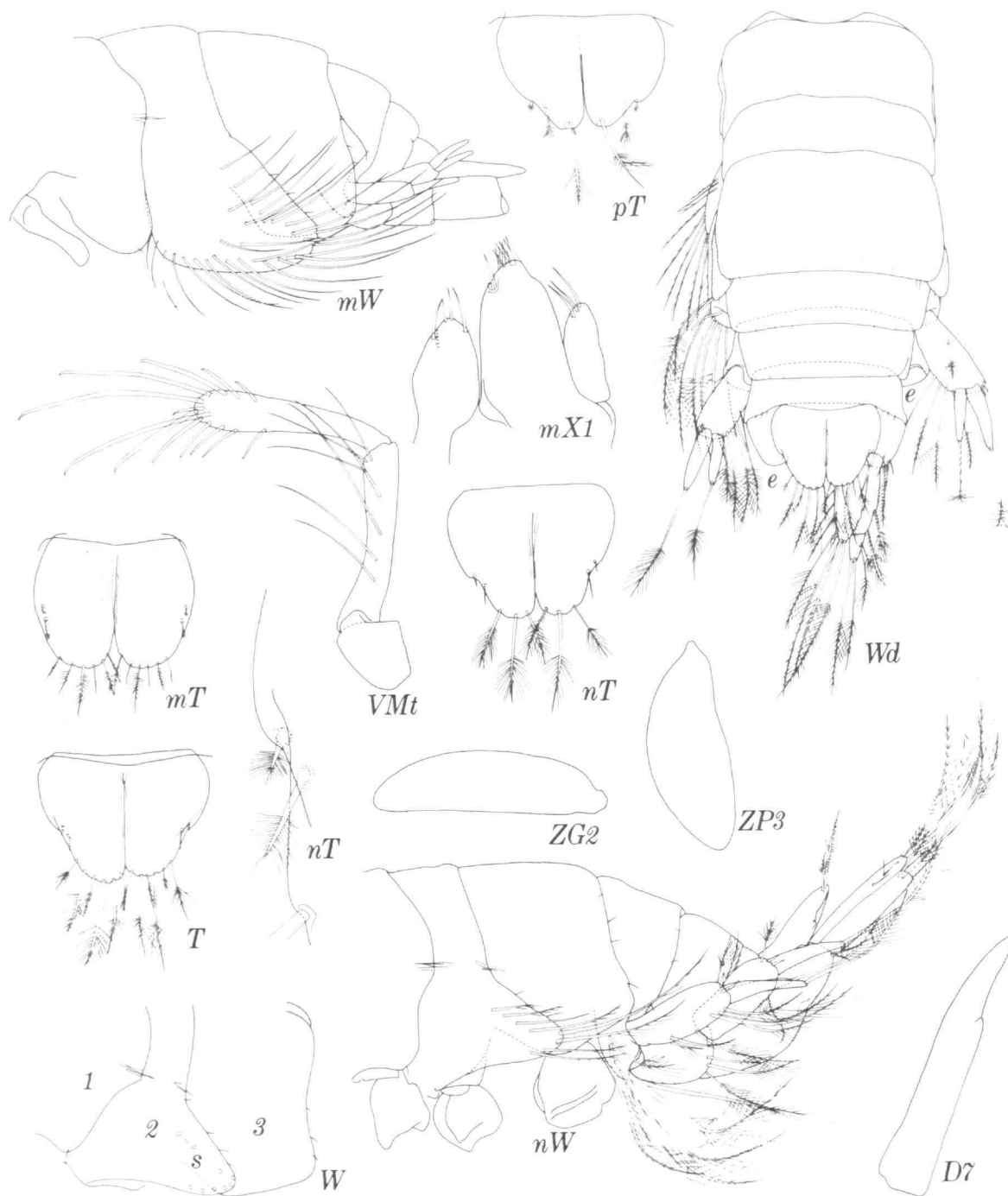


FIGURE 18.—*Prantinus talanggi*, new species, holotype, female "o," 7.19 mm (*m* = male "m," 6.22 mm; *n* = male "n," 6.02 mm; *p* = juvenile "p," 3.23 mm; Z = gill).

6 + 3 + 1. Pereopods 5–7 like female. Pleopods 2–3 illustrated. Epimeron 2 (illus.) with 4 posteroventral and 4 facial setae. Apicolateral corner of peduncles on uropods 1–3 with 2, 2, and 5 elements, like female in morphology; medial edges of peduncles with 7, 5, and 2 elements; ventromedial setae of uropod 3 = 4; formula of short setae on article 1 of outer ramus on uropod 3 = 1–1, long setae = 0–1. Telson (illus.) with only 3 apical setae on each lobe.

DESCRIPTION OF JUVENILE (juvenile “p,” 3.23 mm).—Only ocular ganglia visible (illus.). Primary and accessory flagella of antenna 1 with 5 and 4 articles, formula of aesthetascs on primary = 0–2–1–1–0. Armament row on article 4 of antenna 2 with 7 plumes, 3 spines, and 2 penicillates; article 5 with 3 plumes; article 3 with 3 plumes; flagellum with 5 articles.

Mandibular molar with only 3 cusps (illus.), right lacinia mobilis deeply bifid (illus.); right rakers 7 plus rudimentary; spine formula on each palp article 3 = 2–1–3–0; palp article 2 with only 2 setae. Inner plate of maxilla 1 with 2 apical and pair of medial setae only; outer plate with 9 spines. Inner plate of maxilla 1 with only 1 seta in medial row. Following like adult female but with fewer armaments: upper and lower lips, maxilliped, gnathopods.

Coxa 2 with 2 long setae; coxa 3 with 4 long; coxa 4 with 10 long setae; coxae 6–7 each with only 2 long posterior setae.

Spine and setal formulas of pereopod 3 = 2, 2, 2–1, 3 + 1 + 1; of pereopod 4 = 2, 2, 2–1, 2 + 1 + 1. Setae of pereopods 5–7 much fewer than in adult. Epimeron 2 with 2 ventral and 1 facial setae.

Peduncular spine formulas of pleopods 1–3 = 2 and 0, 2 and 0, 2 and 0; segmental formulas = 8–5, 6–3, 8–6; basal setal formulas = 8–1–1–3, 1–1–1–1, 6–1–1–3; inner ramus of pleopod 2 lacking basal clothespin spine.

Apicolateral corners of peduncles on uropods 1–2 naked; medial setae, 2 and 1 only. Uropod 3 (illus.) with article 2 on outer ramus elongate, article 1 with only 1 lateral seta. Telson (illus.)

with only 1 long and 1 very short apical setae tightly contiguous.

OBSERVATIONS.—Lateral penicillate setule pairs on telson attached ventrally (not dorsally as in other haustorioid taxa).

NSW specimens smaller than Victorian. Coxa 1 slightly more deeply emarginate ventrally; article 2 of pereopod 7 with posteromedial facial ridge more pronounced.

ILLUSTRATIONS.—Antenna 1 of holotype drawn with twist towards apex commencing at base; maxilla 1 enlarged much more than maxilla 2, whereas maxillae of male “m” drawn to same magnification; gills poorly preserved, perhaps reconstructed with slight inaccuracies. Uropods 1–2 of “n” projecting laterally and dorsally as in most specimens, not flattened or altered in this view.

HOLOTYPE.—NMV, female “o,” 7.19 mm (illus.).

TYPE-LOCALITY.—CPBS C6/4, Western Port, Victoria, 30 Mar 1964, 10.2 m, fine sand.

VOUCHER MATERIALS.—Type-locality: male “n,” 6.02 mm (illus.), juvenile “p,” 3.23 mm (illus.); CPBS A3/5: female “q,” 6.87 mm; CPBS 25N/3: male “m,” 6.22 mm (illus.); AM P.23327 OHDWBS, off Newcastle, NSW, transect 06.03.03.04: female “t,” 5.43 mm.

MATERIAL.—CPBS, 3 samples from 3 stations (10); WPBES 1 sample (1); AM HDWBS 4 samples (4).

DISTRIBUTION.—Victoria, Western Port; NSW, offshore from Burwood Beach, 16 km south of Hunter River; 10–28 m, sand.

UROHAUSTORIIDAE, new family

DIAGNOSIS.—Rostrum weak, head short, cheek poorly developed. Antenna 1 of haustorius form, article 1 short, articles 2–3 progressively shorter, weakly geniculate or not, flagella elongate, usually subequal to peduncle. Antenna 2 of haustorius form, article 4 expanded, article 5 shorter and narrower than article 4, these articles furnished with 1 or more longitudinal rows of facial armaments, ventral margin of article 4 with at

least 3 kinds of setae: (1) elongate plumes, (2) shorter and stiffer glassy spines set in clusters or ranks, and (3) usually bulbar-based penicillate setules; flagellum subequal to or longer than article 4 of peduncle. Prebuccal complex massive, upper lip usually dominant and epistome scarcely distinct. Mandibles bearing elongate, poorly toothed incisors; laciniae mobiles present on each side, diverse; rakers distinct, usually serrate, but few in number; molar large and weakly triturative, usually furnished with accessory chopper; palp 3-articulate, article 3 with numerous outer setae, most setae awned. Lower lip with discrete inner lobes, mandibular extensions of outer lobes well developed. Maxilla 1 with uniarticulate palp, inner plate with fewer than 5 setae. Maxilla 2 ordinary, inner plate with oblique but poorly developed facial row of setae. Maxillipeds with unexpanded bases, normally enlarged plates, outer spinose; palp 4-articulate, article 2 expanded, article 4 clavate, multisetose. Maxillae and maxillipeds lacking baler lobes.

Coxa 2 very small, not forming stepped intergrade between coxae 1 and 3; coxa 3 dominant or not dominated by coxa 4, broadly extended posteroventrally. Coxal gills on segments 2-5. Brood plates slender.

Gnathopods feeble, grossly alike in proportions, wrists elongate, but gnathopod 1 simple, gnathopod 2 subchelate or minutely parachelate; article 3 short. Article 5 of pereopods 3-4 broad, slightly expanded, not deeply lobate, with thick posterior spines; dactyls of pereopods 3-5 well developed, those of pereopods 6-7 variable; pereopod 5 of haustorius form, articles 2, 4, and 5 expanded, articles 5 and 6 with extensive facial rows of spines; pereopods 6-7 alike, articles 5-6 weakly expanded; no pereopod with underslung articulation.

Pleopod 2 usually inferior in size, number of articles or setation; peduncles of pleopods not longer than wide, coupling hooks paired; inner rami inferior, each usually bearing 1 clothespin spine.

Epimeron 1 scarcely developed; epimeron 2 dominant in setation, often dominant in size.

Urosomites ordinary, though often furnished with lateral teeth. Rami of uropods 1-2 linguiform, setose (not spinose); uropod 3 of ordinary haustorioid-phoxocephalid kind, outer ramus dominant, 2-articulate, peduncle short, flat, expanded, rami poorly setose apically.

Telson variable. Sexual dimorphism weak.

TYPE GENUS.—*Urohaustorius* Sheard.

COMPOSITION.—*Gheegerus*, new genus; *Narunius*, new genus; *Tuldarus*, new genus; *Tottungus*, new genus; *Dirimus*, new genus.

Relationship.—This family differs from the Urothoidea in the poor development of the ventral cephalic cheek, the full development of the haustorius antenna 2, and in the dominance of epimeron 2. All taxa have linguiform and setose rami on uropods 1-2 whereas urothoids have styliform and spinose rami. The urothoid *Cunicus* upsets easy recognition and clear distinction between the 2 groups because the rami of uropods 1-2 are absent and the peduncles are linguiform and setose.

Distinguishing characters of Haustoriidae are listed with the diagnosis of that family below.

Phoxocephalopsidae bear styliform or rod-shaped spinose rami on uropods 1-2.

Urohaustoriidae differ from Zobrachoidae in the simple gnathopod 1; the great reduction in size of coxa 2 (and, in all but one case, of coxa 1); enlargement and posteroventral extension of coxa 3; almost full loss of epimeron 1; to a lesser degree the uniformly small rostrum or simple outline dorsally of the head; the small number of setae on the palp of maxilla 1; reduction in the extension and cuspidation of the mandibular molar; and generally the reduction in size of article 2 on the outer ramus of uropod 3.

Prantinus of the Zobrachoidae intergrades some of these characters slightly. Epimeron 1, for example, is not as well developed as in other zobrachoids; article 2 on the outer ramus of uropod 3 is not as greatly elongate; but on the other hand the mandibular molar is extremely cuspidate and the head is strongly rostrate or, at least, extended forward dorsally.

Key to Genera of Urohaustoriidae

1. Dactyl of pereopod 5 spinose 2
 Dactyl of pereopod 5 not spinose 4
2. Antennae bearing supernumerary oar-shaped setae, article 2 of pereopods
 6-7 narrow or strongly tapering distally **Narunius**, new genus
 Antennae lacking supernumerary oar-shaped setae, article 2 of pereopods
 6-7 fully expanded, not tapering distally 3
3. Coxa 3 large, coxa 4 small **Urohaustorius**
 Coxa 3 small, coxa 4 large **Gheegerus**, new genus
4. Coxae 1 and 2 of equal size, right and left laciniae mobiles of subequal
 size, thin, epimeron 2 about equal in size to epimeron 3, lacking
 setae **Dirimus**, new genus
 Coxa 1 larger than coxa 2, left lacinia mobilis much broader than right,
 epimeron 2 either larger than or more setose than epimeron 3 5
5. Gnathopod 2 subchelate, dactyls of pereopods 5-7 setose in
 female **Tottungus**, new genus
 Gnathopod 2 parachelate, dactyls of pereopods 5-7 not setose in
 female **Tuldarus**, new genus

Urohaustorius Sheard

Urohaustorius Sheard, 1936:445-446.

DIAGNOSIS.—Rostrum weak. Peduncle of antenna 1 short, stout, articles 2 and 3 of peduncle progressively shortened, weakly geniculate, both flagella elongate. Antenna 2 of haustorius form, article 4 expanded, article 5 small, articles 4-5 with facial armaments, article 4 with long ventral setae and subventral clusters of bifid setae. Aesthetascs linear. Mandibular incisors extended, thin, essentially untoothed; right and left laciniae mobiles not alike; rakers usually serrate, 2 on right mandible, 3 on left; molar broad and bulky, not strongly extended, with weak tritulative surface and cuspidate accessory chopper; setae of palp article 3 awned. Mandibular lobes of lower lip well developed. Inner plate of maxilla 1 small, slender, poorly setose; outer plate with 11 spines; palp slightly shortened, uniaarticulate, palpar setae attached in 2 sets. Inner plate of maxilla 2 with weakly submarginal oblique row of setae. Outer plate of maxilliped with spines; palp article 2 expanded, article 3 elongate, dactyl clavate, multisetose. Maxillae and maxillipeds lacking baler lobes.

Coxae 1-4 not progressively larger, coxae 1-2 very small, usually equal in size, most of coxa 2 hidden by coxa 3, latter much larger than coxa 4 and hatchet-shaped, extended posteroventrally; coxae 2-5 each with simple gill; brood plates 4 pairs, slender.

Gnathopods small, dissimilar, gnathopod 1 simple, gnathopod 2 weakly chelate (parachelate), wrists elongate, hand of gnathopod 2 weakly mitelliform. Dactyls of pereopods 3-7 distinguishable; those of pereopods 3-5 large, of pereopods 6-7 variable, large to vestigial; dactyl of pereopod 5 large and spinose. Article 2 of pereopods 5-7 expanded; pereopod 5 of haustorius form; distal articles of pereopods 6-7 not underslung, only moderately widened, pereopods 6-7 otherwise similar, weakly dominating pereopod 5.

Pleopod 2 inferior, peduncles of pleopods short, wider than long, inner rami moderately shorter than outer. Epimeron 1 scarcely differentiated, epimeron 2 dominantly setose. Urosomite 1 scarcely produced and poorly setose ventrally. Rami of uropods 1-2 linguiform, though inner rami often reduced or vestigial, marginally setose; peduncle of uropod 1 strongly setose laterally; of uropod 2 spinose or poorly setose laterally. Uro-

pod 3 of ordinary form, outer ramus dominant and biarticulate, article 2 with 2 large apical setae. Telson short, broader than long, or not greatly longer than broad, cleft to entire.

DESCRIPTION.—Eyes indistinct or very poorly discernible, ocular ganglia visible. Dorsolateral surface of article 1 on antenna 1 furnished with longitudinal row of armaments; article 2 densely setose dorsolaterally, groups distinguishable, article 3 poorly setose. Article 3 of antenna 2 short, poorly setose, flagellum much longer than article 4 of peduncle.

Right lacinia mobilis linguiform; left broader and usually bifid; article 3 of mandibular palp shorter than article 2. Lower lip usually with 1 cone on each outer lobe. Inner plate of maxilla 1 with very few short apical setae and one large apicomedial seta; spines on outer plate 11, mostly bifid. Inner plate of maxilliped with 2 stout apical spines (a third false spine marked by plumes). Coxae 1–2 usually poorly setose. Gill 2 dominant, gill 5 rarely larger, often much smaller than posterior lobe of coxa 5. Gnathopod 2 bearing surficial button combs.

Pereopods 3–4 lacking extensive secondary facial rows of spines on article 5.

Uropods 1–2 with huge dorsal setae on peduncles, rami lacking basoventral setae, medial margins of peduncles usually heavily setose.

TYPE-SPECIES.—*Urohaustorius halei* Sheard, 1936 (original designation).

COMPOSITION.—*Urohaustorius vercoi* Sheard, *U. metungi* Fearn-Wannan, and the following new species: *U. pulcus*, *U. pentinus*, *U. merkanius*, *U. wingaro*, *U. parmnggius*, *U. yurrus*, *U. urungari*, *U. perkeus*, and *U. gunni*.

RELATIONSHIP.—Apart from the uniarticulate palp of maxilla 1, *Urohaustorius* retains relatively ordinary mouthparts but is 1 of the most specialized taxa in terms of coxae. The first 2 coxae are very small (except for *U. gunni*, with enlarged coxa 1), but coxa 3 is the largest of any and is strongly extended posteroventrally. Rami of uropods 1–2 are linguiform and setose (apart from several species with reduced inner rami). Gnathopod 1 is simple as in the Haustoriidae.

Urohaustorius may bear closest superficial resemblance to the Haustoriidae, but differs in the uniarticulate palp of maxilla 1, retention of mandibular lobes on the lower lip, the extended and toothed mandibular incisors, retention of the maxillipedal dactyls, greatly reduced setation on the inner plate of maxilla 1, presence of an organized dorsolateral row of armaments on article 1 of antenna 1, the longer accessory flagellum, absence of a secondary facial row of armaments on article 4 of antenna 2, strongly reduced coxae 1–2 and dominant coxa 3, the unlobate article 5 of pereopods 3–4 bearing dominant posterior spination and no facial armaments, the strongly discernible dactyls of pereopods 3–5, the close similarity of pereopods 6–7 between themselves, dominance of epimeron 2, the fully linguiform rami of uropod 1, presence of long lateral setae on the peduncle of uropod 1 (contrasted to short spines), lack of dominance in article 2 on the outer ramus of uropod 3 and reduction of apical setation on that article to a set of 2 elongate setae, other normal shapes and setation of uropod 3, and the general appearance of the telson, which in *Haustorius* has a gaping cleft and manifold basolateral setal brushes.

The loss of prehensility of gnathopod 1 and dominance of coxa 3 distinguish *Urohaustorius* from the otherwise similar *Zobracho*, *Bumeralius*, and *Prantinus*.

Urohaustorius differs from *Narunius* primarily in the true dominance by coxa 3.

IDENTIFICATION OF CRYPTIC SPECIES.—A general description section is attached to *U. merkanius*, *U. wingaro*, *U. parmnggius*, *U. yurrus*, and *U. urungari* because these were presumed to be cryptic sibling species of greater than normal difficulty in recognition. We now believe that 5 species are involved but that they are incompletely segregated by morphological characters and differ from each other in different habitats by varying degrees of character expression.

It is impossible to identify many of these juveniles satisfactorily.

THE *pulcus* COMPLEX OF UROHAUSTORIUS.—At least 9 major morphs occur in this collection of

specimens from diverse sources. These morphs are *U. pulcus*, *U. pulcus* morph 872, *U. pentinus*, *U. merkanius*, *U. wingaro*, *U. parnggius*, *U. yurrus*, *U. urungari*, and *U. species M*. We believe the complex is morphologically too diverse to embody a single species, even though it has been found impossible to make perfect typological groupings within it. Because over 95% of the specimens do fall into definable groups (which we assume to be incipient species), however, we have called most of the morphs separate species as a practical recourse for ecologists seeking identifications in a gross survey. Perfect typological groupings would require a very large number of species to be separated from the specimen pool, but coalescence of variants into a few species requires acceptance of several unusual replicates ("mutants") that would have to be assigned to different species, depending on characters other than the mutant. For example, the presence of subsidiary setules on the dactyl of pereopod 5 would require such specimens to be considered as "mutant" (phenotypic) forms occurring in 2 different species; or the ventral displacement of basal elements in the main armament row on article 4 of antenna 2 would require allocation of such specimens to two different species.

More than 95% of our adult specimens could be divided into 3 species based on degree of telsonic cleavage; deeply, moderately, or not cleft. But this result is clearly unsatisfactory as specimens with uncleft telson are divisible into those with or without double spination on the dactyl of pereopod 5. If search for subdivisions were to stop at this point, four reasonably well-defined species could be proposed (*pulcus*, *pentinus*, *merkanius*, *parnggius*). Two other kinds of clear alternative character expressions do occur: (1) ventral displacement of elements in the main armament row on article 4 of antenna 2; and (2) presence or absence of accessory setules adjacent to the spines on the dactyl of pereopod 5 in specimens otherwise having only single spines in tandem. Character 2 represents a perfect intermediate between specimens with single spines and doubled spines on the dactyl of pereopod 5 because there is no

intermediacy in size of the setules (see female "t" of morph 872, an exception, page 60.) No intermediates between even and displaced armaments on antenna 2 have been found.

When specimens with displaced armament on antenna 2 (*U. wingaro* and *U. parnggius*) are pooled together, the degree of telsonic cleavage is found to be more than slightly variable; but when specimens with accessory setules on dactyl 5 are pooled (morph 872) a much larger variability in telsonic cleavage is found in the aggregate, the degree extending from well cleft to poorly cleft. This would suggest that either (1) degree of clefting is a poor specific character (variable), or (2) that presence of accessory setules is a replicative (mutant or recombinant) character in 2 species. But degree of cleavage (already) accounts for 95% accuracy in classifying specimens and is a major character of value in other species groups of the genus and other genera of the family group.

More divisions are possible. Specimens with 2 long proximal plumose setae in the armament row on article 1 of antenna 1 (morph M) are rare and mostly confined to 1 sample but we have found this condition also in a specimen of *U. metungi* outside this specific complex and also in 2 probable *U. pulcus* juveniles.

Several of the so-called species have correlative or associative characters confirming more or less that each is a definitive species; these characters are discussed in their respective places.

Couplets 3-12 of Key I to *Urohaustorius* are written in such a way that *U. pulcus* is situated last and represents the primary name to be applied to this complex. Taxonomists wanting to divide the complex into its parts can decide where in other couplets to make the division: for example, couplets 5-6 can be ignored but the specimens remain divisible into species in couplets 7-12; or couplets 7-8 can be ignored and the specimens still remain divisible into grosser species in couplets 9-12; couplet 9 could then be ignored and the specimens would be divisible into 2 species; or couplet 10 could be ignored and the specimens called *U. pulcus*.

We interpret the material to represent 7 good

species (*pulcus*, *pentinus*, *merkanius*, *parnggius*, *wingaro*, *yurru*, and *urungari*), and 1 potential species (species M), plus a replicate morph, (872), assignable to *pulcus*; but we recognize that few juveniles and only 95% of the adults can be identified satisfactorily. Gene flow is therefore apparent among the species, represented either by commonly occurring hybridization or by genetic recombinations occurring frequently, themselves reminiscent of earlier hybridization. Gene flow is sufficiently sluggish and adequately selected against by environmental benefits to certain morphs in a degree permitting maintenance of ecophenotypes, if not ecogenotypes. There is also weak evidence that clines may occur, for example,

in spine doubling on pereopod 5, but to some degree these geographic clines are controlled by sediment conditions and not by temperature. We note that appropriate Queensland sediments are probably coarser than Victorian sediments so that an increase in value for doubled spines and larger bodies would occur in Queensland, which goes counter to thermal clines. Such counter selection may therefore make for a very complex specific morphology.

We have constructed 3 different keys to the species of the genus so that an identifier can have 3 different starting places. Specimens that fail the test 2 or 3 times must be considered as possible undescribed taxa, but study of descriptions may demonstrate close affinities.

Key I to Selected Species of Adult *Urohaustorius*

(*U. vercoi* omitted)

1. Rami of uropods 1–2 subequally extended 2
 Inner rami of uropods 1–2 much shorter than outer rami 4
2. Coxa 1 much larger than coxa 2, forming long anterior curved hook,
 coxa 7 with long posterior spike ***U. gunni***, new species
 Coxa 1 not larger than coxa 2, coxa 7 lacking spike 3
3. Telson with simple marginal setae in addition to penicillate setules,
 posterior setae on article 4 of pereopod 6 not continuous to apex, small
 gap occurring between ultimate setae and spine at corner, dactyl of
 pereopod 5 with some spines in pairs ***U. halei***
 Telson without simple marginal setae, otherwise only with 6 penicil-
 late setules, posterior setae on article 4 of pereopod 6 continuous
 to apex, no small gap occurring between ultimate seta and spine
 at corner, dactyl of pereopod 5 with all spines set singly in tandem
 ***U. metungi***
4. Dactyls of pereopods 6–7 vestigial, coxae 1–2 rectangular and well setose
 ***U. perkeus***, new species
 Dactyls of pereopods 6–7 well developed, coxae 1–2 triangular or trape-
 zoidal, poorly setulose 5
5. Dactyl of pereopod 5 with some spines or elements set in pairs 6
 Dactyl of pereopod 5 with all spines set singly in tandem 7
6. Dactyl of pereopod 5 with at least one spine position paired by second
 spine ***U. merkanius***, new species
 Dactyl of pereopod 5 with at least one spine position paired by accessory
 setule ***U. pulcus***, morph 872
7. Proximal part of main armament row on article 4 of antenna 2 displaced
 ventrally 8
 Armament row on article 4 of antenna 2 evenly oblique 9

8. Telson weakly cleft *U. wingaro*, new species
 Telson entire *U. parnggius*, new species
9. Armament row on article 1 of antenna 1 with 2 long setae proximally;
 article 2 of pereopod 6 narrow *U. species M*
 Armament row on article 1 of antenna 1 with 0–1 simple seta, article 2
 of pereopod 6 broad 10
10. Telson entire, glandular (male sternite 6 with blunt transverse
 process(es)) 11
 Telson weakly to strongly cleft, not glandular (male sternite 6 with sharp
 axial process) 12
11. Telson of tall extended form, (male sternite 6 with central broad ridge,
 bilaterally humped) *U. urungari*, new species
 Telson of broad unextended form, (male sternite 6 with central mound
 only) *U. yurrus*, new species
12. Telson deeply cleft, article 2 of pereopod 7 with proximoposterior setae
 *U. pulcus*, new species
 Telson weakly cleft, emarginate, article 2 of pereopod 7 with stout
 proximoposterior spines *U. pentinus*, new species

Key II to Selected Species of Adult *Urohaustorius*

(*U. vercoi* and *U. pulcus*, morph 872, omitted)

1. Armament row on article 1 of antenna 1 with some stout spines 2
 Armament row on article 1 of antenna 1 with fine setae or medium
 spines only 4
2. Cleft of telson forming deep split *U. pulcus*, new species
 Cleft of telson obsolescent or absent 3
3. Telson excavate *U. pentinus*, new species
 Telson entire 9
4. Basal pair of elements in armament row on article 1 of antenna 1
 plumose *U. species M*
 Basal pair of elements in armament row on article 1 of antenna 1 simple
 5
5. Basal part of armament row on article 4 of antenna 2 evenly oblique
 6
 Basal part of armament row on article 4 of antenna 2 displaced ventrad
 10
6. Armament row on article 4 of antenna 2 mixing spines and setae
 *U. merkanius*, new species
 Armament row on article 4 of antenna 2 consisting of setae only 7
7. Telson cleft, setae of coxa 1 dense, inner rami of uropods 1 and 2
 significantly shortened *U. perkeus*, new species
 Telson entire, setae on coxa 1 sparse, inner rami of uropods 1 and 2
 extending subequally 8

8. Coxa 1 sickle shaped ***U. gunni***, new species
 Coxa 1 ordinary 11
9. Telson of tall extended form, (male sternite 6 with central broad ridge,
 bilaterally humped) ***U. urungari***, new species
 Telson of broad unextended form, (male sternite 6 with central mound
 only) ***U. yurrus***, new species
10. Telson weakly cleft ***U. wingaro***, new species
 Telson entire ***U. parnggius***, new species
11. Telson with simple marginal setae in addition to penicillate setules,
 posterior setae on article 4 of pereopod 6 not continuous to apex, small
 gap occurring between ultimate setae and spine at corner, dactyl of
 pereopod 5 with some spines in pairs ***U. halei***
 Telson without simple marginal setae, otherwise only with 6 peni-
 cillate setules, posterior setae on article 4 of pereopod 6 continuous
 to apex, no small gap occurring between ultimate seta and spine
 at corner, dactyl of pereopod 5 with all spines set singly in tandem
 ***U. metungi***

Key III to Selected Species of Adult *Urohaustorius*

(*U. vercoi* and *U. pulcus*, morph 872, omitted)

1. Telson cleft or emarginate 2
 Telson entire 5
2. Coxa 1 with long setae, tooth of epimera 1-2 large, dactyls of pereopods
 6-7 vestigial ***U. perkeus***, new species
 Coxa 1 with small setules, tooth of epimera 1-2 small or absent, dactyls
 of pereopods 6-7 ordinary 3
3. Proximal part of main armament row on article 4 of antenna 2 displaced
 ventrad, male sternite 6 with blunt process
 ***U. wingaro***, new species
 Armament row on article 4 of antenna 2 even, oblique, male sternite 6
 with sharp tooth 4
4. Cleft of telson deep, article 2 of pereopod 7 with long proximoposterior
 setae ***U. pulcus***, new species
 Cleft of telson obsolescent, article 2 of pereopod 7 with proximoposterior
 stout spines ***U. pentinus***, new species
5. Rami of uropods 1-2 extending subequally, apicolateral armament on
 peduncle of uropod 3 of thin elements 6
 Inner ramus of uropods 1-2 shortened strongly, apicolateral armament
 on peduncle of uropod 3 of thick elements 8
6. Coxa 1 forming long curved spike ***U. gunni***, new species
 Coxa 1 rectangular, short 7
7. Article 4 of pereopod 6 with gap in posterior armaments, telson with
 both penicillate and simple setules ***U. halei***
 Article 4 of pereopod 6 lacking gap in posterior armaments, telson with
 only penicillate setules ***U. metungi***

8. Proximal part of main armament row on article 4 of antenna 2 displaced ventrad, setae on posterior margin of article 2, pereopod 7 widely spread *U. parnggius*, new species
 Armament row of article 4 of antenna 2 evenly oblique 9
9. Article 2 of pereopod 6 narrow, first 2 setae in armament row of article 1 on antenna 1 plumose *U. species M*
 Article 2 of pereopod 6 broad, first 2 setae in armament row of article 1 on antenna 1 simple 10
10. Epimera 2-3 with medium posteroventral tooth, male sternite 6 with sharp ventral spike *U. merkanius*, new species
 Tooth of epimera 2-3 obsolescent or absent, process on male sternite 6 blunt 11
11. Telson short and broad, spines predominating in main armament row on article 4 of antenna 2, male sternite 6 process median, blunt *U. yurus*, new species
 Telson tall, setae predominating in main armament row on article 4 of antenna 2, male sternite 6 process transverse, bilaterally humped *U. urungari*, new species

Urohaustorius pulcus, new species

FIGURES 19-23

DIAGNOSIS.—Dorsolateral armament rows on articles 1 and 2 of antenna 1 and article 4 of antenna 2 mixing spines and setae. Armament row on article 4 of antenna 2 even. Accessory flagellum reduced. Main flagellar articles of male antenna 1 thickened, aesthetascs 2—many per article and present on article 1, article 5 of male not bulbous. Coxa 1 not larger than coxa 2, both bearing only tiny setules. Spines on dactyl of pereopod 5 set singly in tandem. Dactyls of pereopods 6-7 well developed. Article 2 of pereopod 7 with 3 stout posterior setae and weak scattered setules. Male pereonal sternite 6 with curved, apically acute, posteriorly directed ventral tooth. Epimeron 2 bearing small tooth and 3-8 facial setae in horizontal row. Tooth of epimeron 3 obsolescent. Inner rami of uropods 1-2 much shorter than outer rami. Dorsolateral margin of peduncle on uropod 2 with stout spines. Apicolateral corner of peduncle on uropod 3 with stout spines, outer ramus with setae and spines laterally on article 1. Telson distinctly cleft, forming slit, bearing 2-3 apical setae on each half.

DESCRIPTION OF FEMALE.—Holotype female

“a,” 3.72 mm: Head about 70% as long as wide, rostrum about 14% as long as remainder of head. Primary flagellum of antenna 1 with 10 articles, 1 aesthetasc (rarely 2) on articles 4-9; accessory flagellum 8-articulate; facial formula of article 1 on antenna 1 = E, 4S, E, 3S, 2P. Article 3 of antenna 2 with 3 facial setae; main armament row on article 4 in 2 weakly divided sections of 11 and 18, spines dominant; on article 5 = 24; article 5 = 45% as wide as long, about 70% as long as article 4; flagellum of 12 articles. Right incisor simple, left with 2 teeth, choppers on molars with 4 cusps; formula on right palp article 3 = 9-1-3-1, (left aberrant, see illustration). Inner plate of maxilla 1 with 1 short apical seta, 1 large apicomedial seta; outer plate with 11 spines (only 9 shown in illustration). Inner plate of maxilla 2 with medial setae. Inner plate of maxilliped with 7 medial setae, outer plate with 1 apicolateral seta, palp article 2 with 7 setae in facial row, article 3 with 2 setae in facial row.

Coxa 1 broadly subtriangular; coxa 2 similar but apex blunter; coxa 3 with 7 ventral setae all in posterior half, posterior margin with 2 setae both ventrad; coxa 4 with 7 ventral and 8 posterior setae.

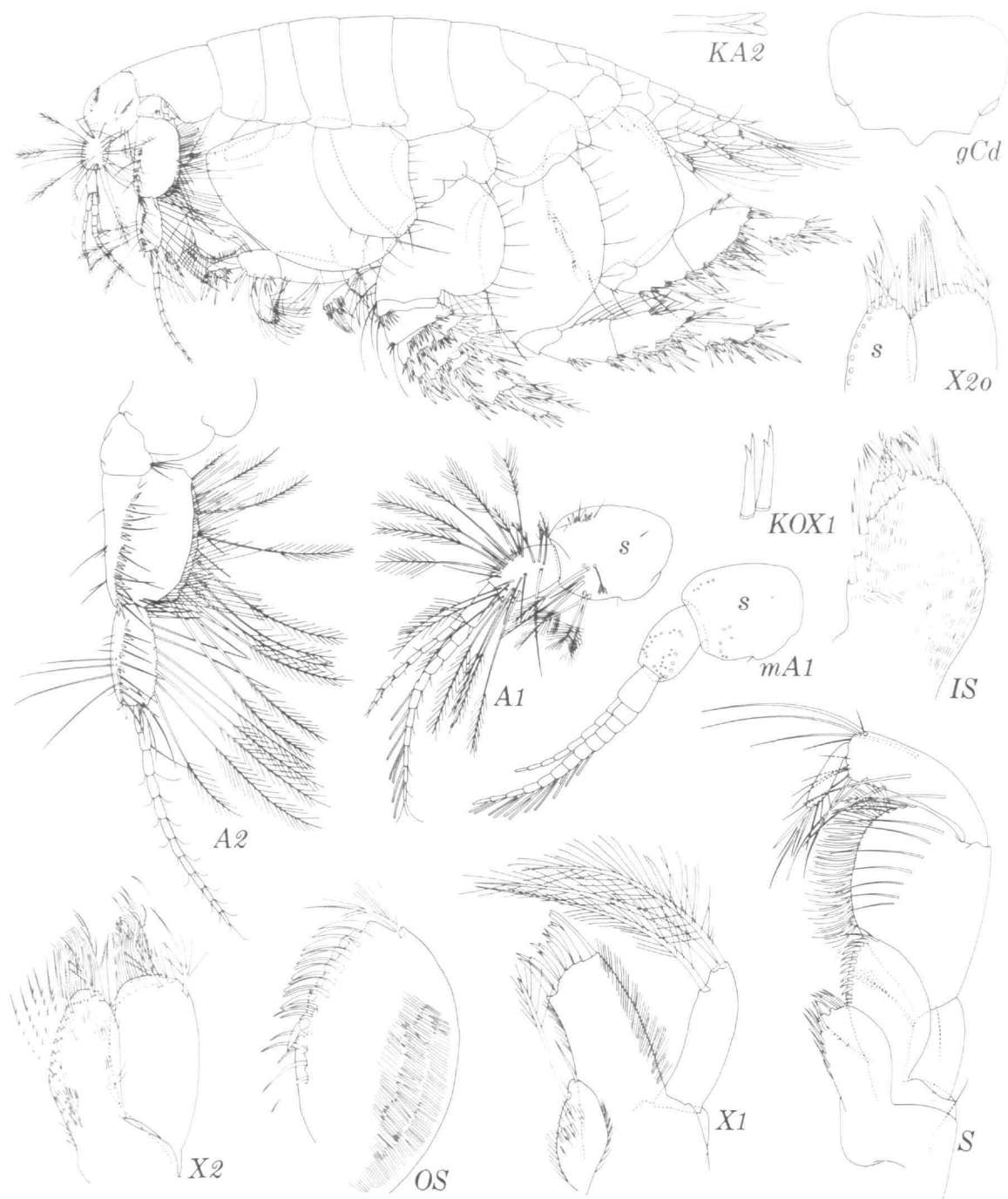


FIGURE 19.—*Urohaustorius pulcus*, new species, holotype, female "a," 3.72 mm (*g* = male "g," 3.97 mm; *m* = male "m," 3.60 mm).

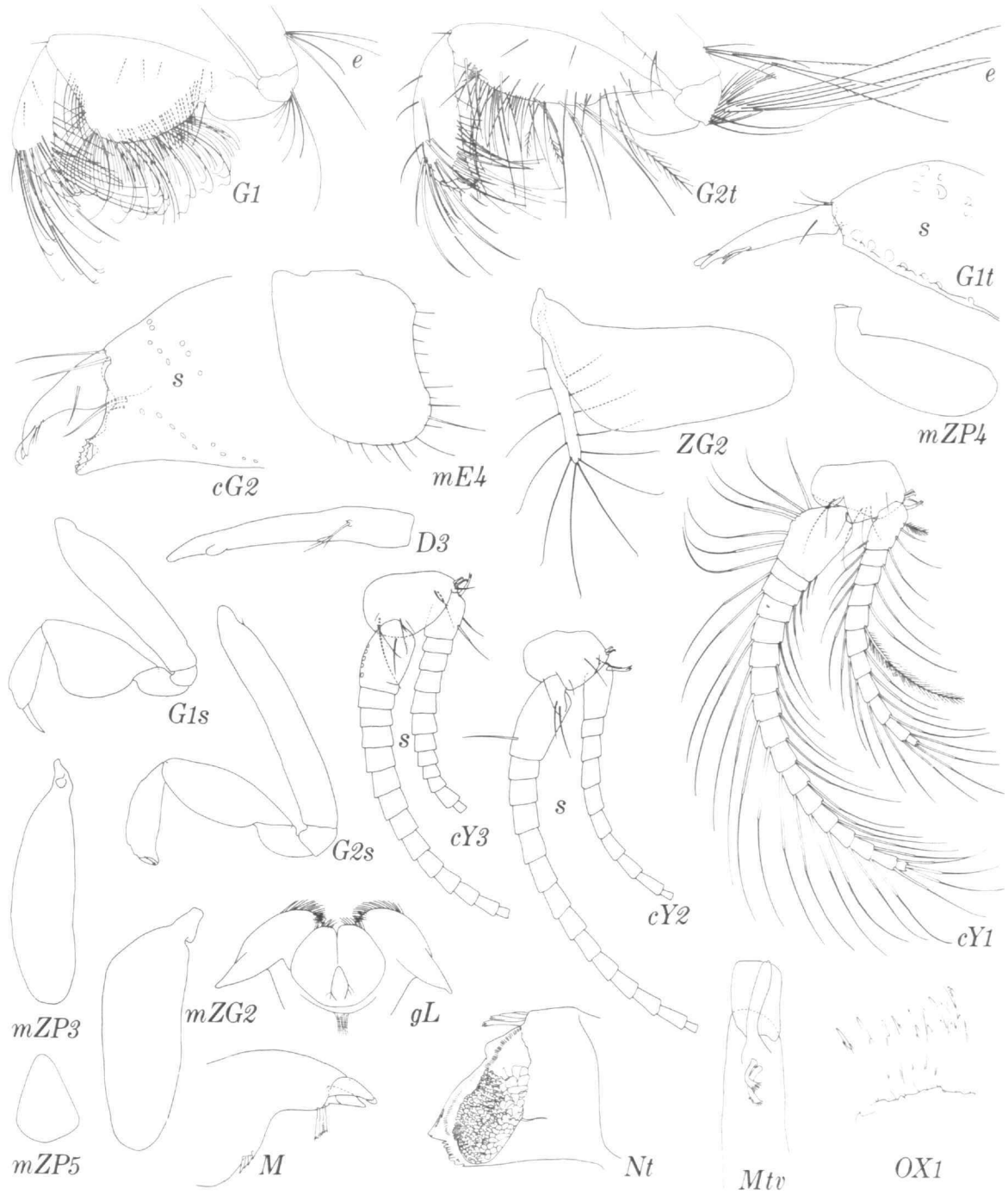


FIGURE 20.—*Urohaustorius pulcus*, new species, holotype, female "a," 3.72 mm (c = female "c," 3.62 mm; g = male "g," 3.97 mm; m = male "m," 3.60 mm; Y = pleopod, Z = gill).

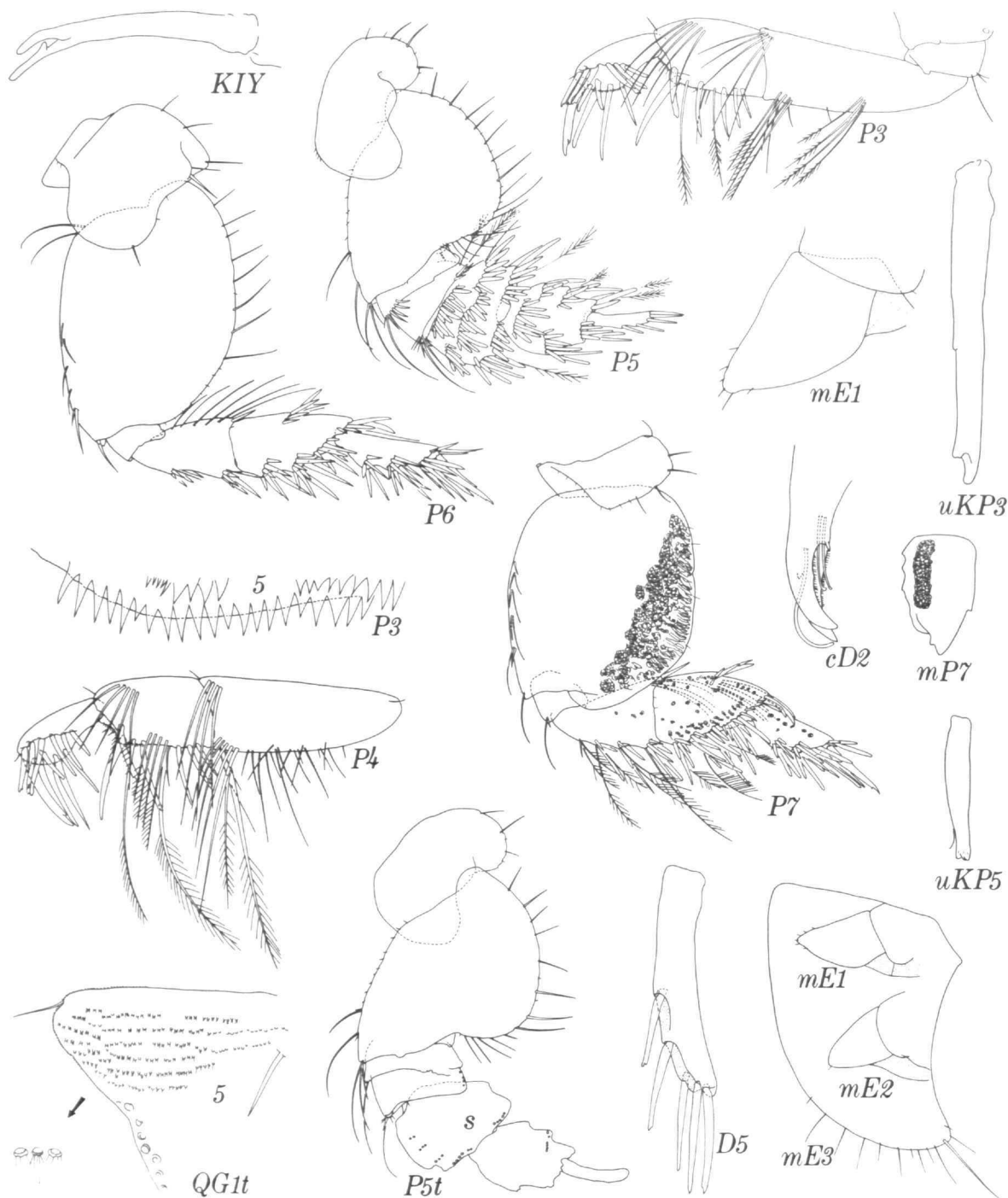


FIGURE 21.—*Urohaustorius pulcus*, new species, holotype, female "a" 3.72 mm (c = female "c," 3.62 mm; m = male "m," 3.60 mm; u = female "u," size unknown; Y = pleopod).

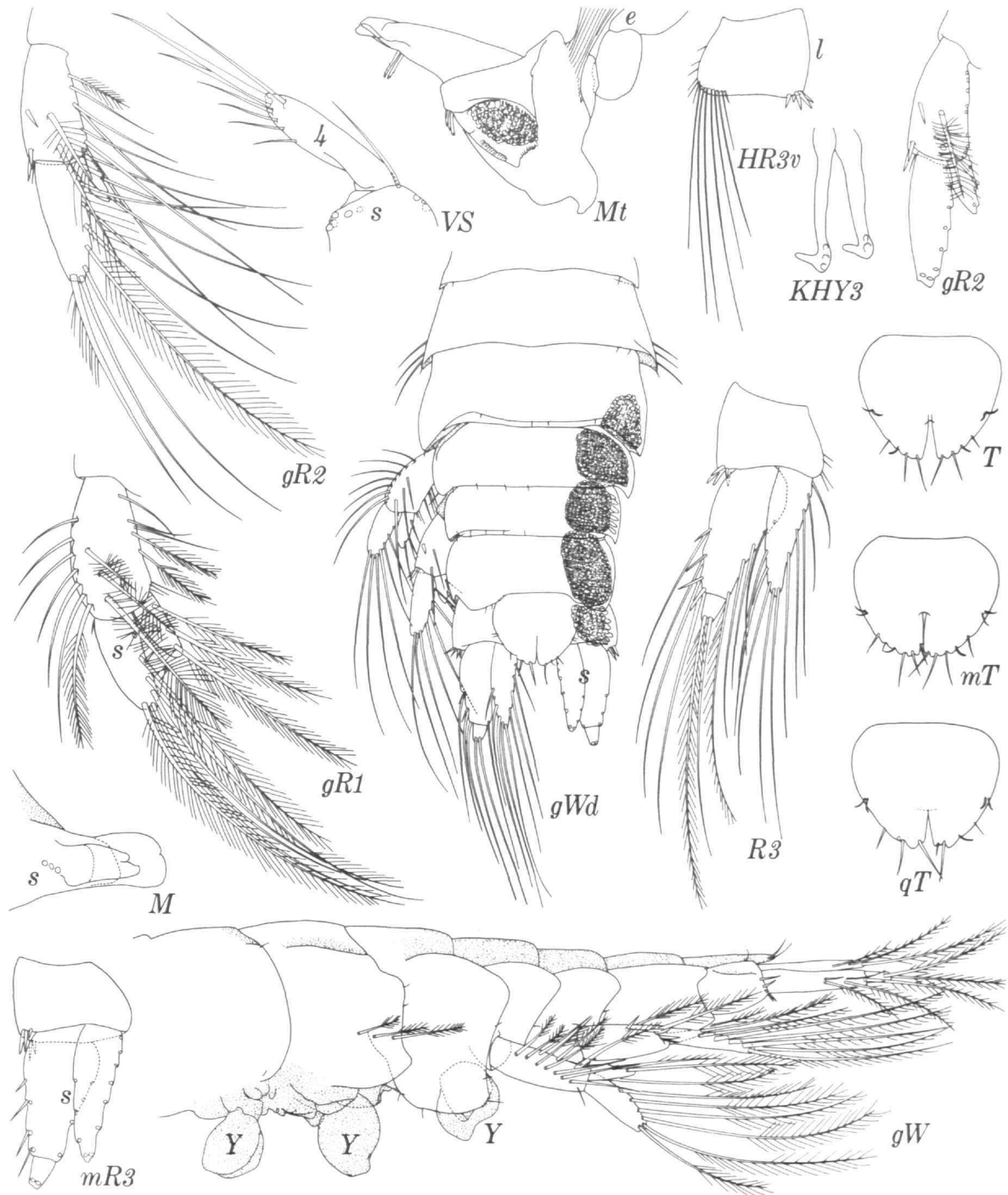


FIGURE 22.—*Urohaustorius pulcus*, new species, holotype, female "a," 3.72 mm (*g* = male "g," 3.97 mm; *m* = male "m," 3.60 mm; *q* = female "q," 3.48 mm; *Y* = pleopod).

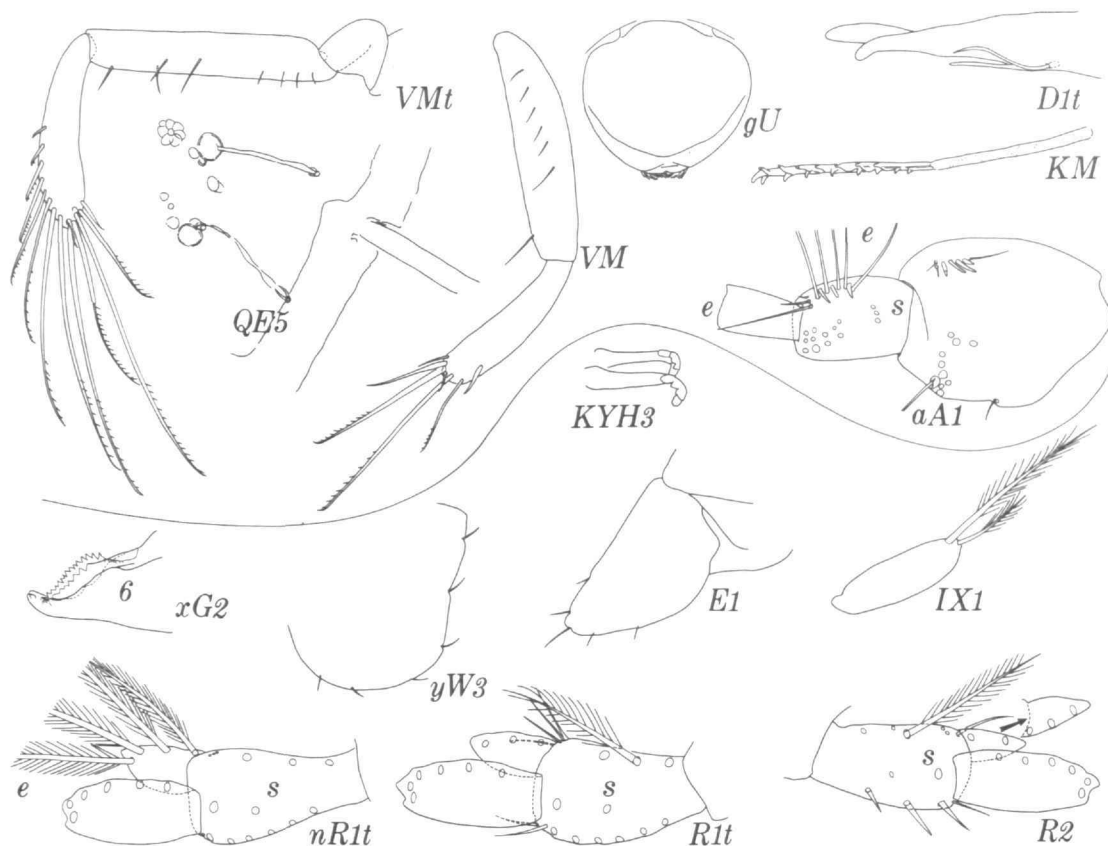


FIGURE 23.—Upper: *Urohaustorius pulcus*, new species, holotype, female "a," 3.72 mm (*g* = male "g," 3.97 mm; *a* = male "a," 2.98 mm, morph 872 (=aberrant)). Lower: *Urohaustorius pentinus*, new species, holotype, female "w," 2.28 mm (*n* = male "n," 2.54 mm; *x* = female "x," 2.06 mm; *y* = female "y," 2.08 mm; *Y* = pleopod).

Setal and spine formulas on pereopod 3 = 5, 5, 2-1-1-1-1, 6 + 5 + 1; pereopod 4 = 4, 5, 2-1-1-1-1, 6 + 4 + 1; posterior margin of articles 5-6 with partially doubled row of mostly large even serrations. Article 2 of pereopods 5-7 progressively with medium to sparse setal densities posteriorly, article 2 of pereopod 5 lacking mediofacial brush, dactyl with 5 spines in tandem.

Peduncular spine formulas of pleopods 1-3 = 2 and 1, 2 and 0, 2 and 1; segmental formulas = 17-11, 14-10, 14-12 (inner proliferate); basal setal formulas = 7-2-2-4, 2-1-1-1, 6-2-1-3.

Epimeron 2 with 4 setae in horizontal facial row.

Lateral margin of peduncle on uropod 1 with 7 setae, apicolateral corner with 1 setule; of uropod 2 with 1 disjunct lateral spine and pair of apicolateral spines plus setule, dorsal setae = 3 and 3; setae of rami = 8-3 and 8-3, inner rami extending 60% and 47% along outer. Apicolateral corner of peduncle on uropod 3 with 5 spines, medial margin with 6 weak setae in tandem, ventromedial apical row(s) with about 8 mixed setae, spine formula on lateral margin of article 1 on outer ramus = 1-1-1-1, setal formula = 1-1-1-1.

Telson about 0.87 as wide as long, cleft about 0.30 of its length, setal formula = 2P, 1, P, 2.

Lateral gland clusters well developed in pleonites 3-6, more weakly developed in peduncle of uropod 3.

Female "q," 3.48 mm: Spine formulas on article 6 of pereopod 3 = 5 + 5 + 1; of pereopod 4 = 5 + 4 + 1; telson illustrated, formula same as holotype but appearance distinctive.

DESCRIPTION OF MALE.—Male "m," 3.60 mm: Like female except in following proportions and counts: Primary flagellum of antenna 1 thicker; article 4 of antenna 2 slightly narrower; flagellum of antenna 2 with 10 articles; both choppers of mandibular molars with 5 cusps; right palp article 3 formula = 9-1-3-1, left = 8-1-3-1; inner plate of maxilla 2 with 6 setae in oblique row, outer plate with 2 apicolateral small setae outside enlarged seta; spine formula of article 6 on pereopod 3 = 5 + 5 + 1; on pereopod 4 = 5 + 4 + 1, article 5 on pereopod 4 with 4 anterodistal setae; gill of coxa 5 scarcely larger than posterior lobe; inner ramus of uropod 1 with 4 setae; ventromedial apex of peduncle on uropod 3 with 11 setae. See also illustrations of antenna 1, coxa 1, coxa 4, telson (formula = 3, P, (1-2), 2P).

Male "w," 3.56 mm: Apicolateral corner of peduncle on uropod 3 with 4 spines and setule. Primary flagellum with 13 articles, proximal 5 thickened; aesthetasc formula = 4-5-5-5-5-5-5-5-2-2-0. (Only long aesthetascs are included in the formula; the terminal 1 (0) is rudimentary.) Article 5 of antenna 2 about 74% as long as article 4, about 54% as wide as long.

OBSERVATIONS.—Although the most common number of spines on outer plate of maxilla 1 is 11, some specimens examined for this character have 10 on 1 side and 11 on the other.

HOLOTYPE.—NMV, female "a," 3.72 mm (illus.).

TYPE-LOCALITY.—CPBS A6/2B, Western Port, Victoria, 28 Aug 1964, 10.6 m, sand and weed.

VOUCHER MATERIAL.—Type-locality: female "c," 3.62 mm (illus.); female "u," 3.53 mm; male "g," 3.97 mm (illus.); male "m," 3.60 mm (illus.); CPBS 34S/1272: female "q," 3.48 mm (illus.); CPBS 24N/1: male "w," 3.56 mm.

RELATIONSHIP.—Although this is not the type-species of the genus, it is used as the model plesiomorph because of its deeply cleft telson combined with easily visible dactyls of pereopods 6-7, unpaired spines on the dactyl of pereopod 5, mixture of spines and setae in the facial rows on antennae 1-2, and the absence of any other "distinctive" features, such as huge teeth on epimera or coxae. Because the rami are subequal, the type-species, *U. halei*, has much more primitive uropods 1-2, but *U. halei* also has doubled spination on the dactyl of pereopod 5, somewhat bizarre epimera, and an unleft telson.

MATERIAL.—CPBS, 36 samples from 17 stations (148); WPBES, 4 samples from 4 stations (9); PPBES, 5 samples from 4 stations (15); EBS, 1 sample (4).

DISTRIBUTION.—Victoria, Port Phillip Bay to Port Macquarie, NSW, 2.8-16 m, sand, and gravel, sand and mud, sand and weed.

Urohaustorius pulcus, morph 872

FIGURES 23 (part), 27 (part)

DIAGNOSIS.—Like *U. pulcus*, but dactyl of pereopod 5 with 1 or more setules paired with single spines in tandem; article 2 of pereopod 7 with 1 strong spine-seta posteroproximally and 1 weaker seta near midmargin; telson generally cleft $\frac{1}{3}$, with gaping lobes, but occasionally specimen with telson cleft about $\frac{1}{8}$; some males (presumably adult) with more than 2 aesthetascs per article on main flagellum of antenna 1; usually 1 telsonic seta almost perfectly apical on each lobe.

REMARKS.—Owing to the inconsistency of the material, these specimens are difficult to treat as a species. Unlike *U. merkanus*, in which consistency of spine-doubling is high on the dactyl of pereopod 5, a large percentage of morph 872 specimens shows the identificatory character only on 1 side or the other. The character may appear only when a damaged or broken dactyl regenerates. However, it has appeared associated with unleft telson only once, suggesting it is not a regenerative character. Certain specimens of

morph 872, resembling *U. pentinus* in the poorly cleft telson, cannot be assigned to that species on account of the presence of setae (not stout spines) on article 2 of pereopod 7, and the narrower outer ramal articles of uropod 3. They might be hybrids between *U. merkanius* and *U. pulcus*, in which the second spine of a pair is represented only by a setule but in which the telsonic expression is variable or a mixture of conditions between parents.

The evenness of the armament row on article 4 of antenna 2, the posterior margin of article 2 of pereopod 7, and the shape of uropod 3 separate morph 872 from *U. wingaro*, and also from *U. parnggius*. If they are hybrids, one of these two might be a parent.

Morph 872 differs from most specimens of *U. pulcus* in the posterior setation on article 2 of pereopod 7 but a few specimens of *U. pulcus* have been found with a similar formula. The gaping telson of morph 872 is matched in large males of *U. pulcus* bearing well-broadened articles of the main flagellum. The real distinction from *U. pulcus* lies in the presence of spines and setae on the dactyl of pereopod 5.

The single specimen (female "l"), with uncleft telson bearing setules on the dactyl of pereopod 5, is an apparent anomaly as it is the only such specimen in 200 of the *U. merkanius* complex. Morph 872 has been recovered from CPBS stations 24N (in samples taken years apart, in 1965 and 1972), 24S and 26 N, as well as from EBS station 366, Lake Macquarie, NSW, thereby demonstrating its ecological stability. This would suggest a high level of genetic integrity.

VARIABILITY.—Most of the specimens assigned to this category are listed below, with notes on anomalies and variables, mostly to show the difficulty in treating this material as a cohesive representation of a species.

Male "a," 2.98 mm, 1 dactyl 5 with only 5 spines, other with 5 spines and setule paired to second proximal spine, telson entire or irregularly emarginate, but not *U. pentinus* or *U. pulcus* because uropod 3 of *pulcus* form and pereopod 7 conformative to 872 form. CPBS 24N/4.

Male "b," 2.70 mm, each dactyl 5 with 1 seta accessory to proximalmost spine; telsonic cleft gaping; primary flagellum thick. CPBS 24N/1.

Male "d," 2.48 mm, only 1 dactyl 5 present, bearing 1 setule, pereopod 7 conformative, telsonic formula with supernumerary short seta. CPBS 24N/1.

Male "m," 3.65 mm, left dactyl 5 with 4 spines and 2 setules (terminal and secondmost proximal), primary flagellum slightly thickened, telson poorly cleft but each lobe with thick, fully terminal spine-seta, outer ramus of uropod 3 with only lateral spines (not setae), peduncle of uropod 2 with 5 lateral spines = 1-1-1-1+1. EBS 366.

Male "p," 2.55 mm, dactyl 5 with 4 spines, second most proximal with small accessory spinule, telson gaping. CPBS 24N/872.

Male "q," 2.70 mm, dactyl 5 with 4 spines, 3 setules, primary flagellum thick, telson gaping. CPBS 24N/872.

Female "c," unmeasured, dactyls of pereopod 5 missing but telson deeply cleft and pereopod 7 conformative. CPBS 24N/1.

Female "e," ovigerous, 2.80 mm, dactyls of pereopod 5 missing, telson deeply cleft, pereopod 7 conformative. CPBS 24N/1.

Female "g," unmeasured, dactyl 5 with 4 spines, setule on second proximal and terminal only, pereopod 7 conformative, telson deeply cleft, gaping. CPBS 24N/872.

Young female "k," 2.05 mm, dactyl 5 with 3 spines, 1 accessory spinule between apical and next proximal spine, telson cleft. CPBS 24N/872.

Female "l," 2.90 mm, each dactyl 5 with 4 spines, 2 proximal spines, each with accessory setule, but 1 side with third setule; telson abnormal, entire. CPBS 24N/872.

Young female "t," 2.45 mm, dactyl 5 with 4 spines: 2 setae on 1 side, 1 terminal seta on other side; telson gaping (damaged). CPBS 26N/2.

Female "u," unmeasured, dactyl 5 damaged, all but 1 spine lost, 3 setules present, telson cleft, pereopod 7 conformative, CPBS 24S/3.

Stations 967, 973, 975 (11 samples, received for examination after above analysis). Most of the 44

individuals of both sexes conform to the general pattern of morph 872, having gaped telsonic lobes with apical setae and 1 or more setae in the dactylar armament of pereopod 5. In a few specimens the "setae" are thickened and spinelike, though thinner and shorter than the spine they accompany. In female "r," from sample 975/2, both setae and additional spines are present. PPBES.

VOUCHER MATERIAL.—CPBS 24N/1: female "h," 2.55 mm; CPBS 24N/4: male "a," 2.98 mm (illus.); CPBS 24N/872: female "l," 2.90 mm (entire telson); male "n," 2.70 mm (illus.); PPBES 975/2: female "r"; EBS 366: male "m," 3.65 mm. Others cited under "variability" are also labelled and segregated but are subsidiary.

MATERIAL.—CPBS, 5 samples from 3 stations (15); PPBES, 11 samples from 3 stations (44); EBS, 1 sample from 1 station (2).

DISTRIBUTION.—Victoria, Western Port to Port Macquarie, NSW, 2–13 m, sand, sand and shell, sand and some mud.

Urohaustorius pentinus, new species

FIGURES 23 (part), 24

DIAGNOSIS.—Dorsolateral armament rows on articles 1 and 2 of antenna 1 and article 4 of antenna 2 mixing spines and setae. Armament row on article 4 of antenna 2 even. Accessory flagellum reduced. Main flagellar articles of male antenna 1 thickened, aesthetascs 2—many per article, sometimes present on basal articles, article 5 of young male not bulbous. Coxa 1 not larger than coxa 2, both bearing only tiny setules. Spines on dactyl of pereopod 5 set singly in tandem. Dactyls of pereopods 6–7 well developed. Article 2 of pereopod 7 with 2–3 stout posteroproximal spines and scattered setules. Male sternite 6 with apically blunt posteriorly directed ventral process. Epimeron 2 bearing small tooth and 3–4 facial setae in horizontal row. Tooth of epimeron 3 obsolescent. Inner rami of uropods 1–2 much shorter than outer rami. Dorsolateral margin of

peduncle on uropod 2 with stout spines. Apicolateral corner of peduncle on uropod 3 with stout spines; article 1 of outer ramus broad, with lateral spines and setae, article 2 short and broad. Telson emarginate, occasionally almost truncate, apically scalloped, setae attached between scallops.

DESCRIPTION OF FEMALE.—Holotype female "w," 2.28 mm: Many characters very similar to *U. pulcus* and therefore illustrations reduced. Head about 70% as long as wide, rostrum about 14% as long as remainder of head. Primary flagellum of antenna 1 with 7 articles, accessory flagellum 5-articulate. Facial formula of mixed spines and setae on article 1 of antenna 1 = E, 5S, 2P; on article 4 of antenna 2 = 21, divided weakly into 2 groups, spines dominant; on article 5 = 14; flagellum with 7 articles. Article 5 of antenna 2 about 43 percent as wide as long, 63% as long as article 4. Right incisor simple, left with 2 teeth, choppers on molars with 3 cusps; formula on right palp = 8–1–3–1. Inner plate of maxilla 1 with 1 short apical seta, 1 large apicomedial seta tightly adjacent to apical seta; outer plate with 11 spines. Inner plate of maxilla 2 with 4 setae in weakly submarginal row. Inner plate of maxilliped with 7 medial setae, outer plate with 1 apicolateral seta; palp article 2 with 6 setae in facial row, article 3 with 2 setae in facial row.

Coxa 1 broadly subtriangular, apex blunt; coxa 2 similar; coxa 3 with 5 long ventral setae, none posteriorly; coxa 4 with 5 ventral and 5 posterior setae. Gills like *U. pulcus*.

Gnathopods like those of *U. pulcus* but article 5 of gnathopod 2 stouter.

Setal and spine formulas on pereopod 3 = 4, 5, 2–1–1, 4 + 4 + 1; on pereopod 4 = 3, 4, 2–1–1, 4 + 5 + 1, serrations like *U. pulcus*. Article 2 of pereopods 5–7 progressively with medium to sparse setal densities posteriorly, article 2 of pereopod 5 lacking mediofacial brush, dactyl with 3 spines in tandem; article 2 of pereopod 7 with dorsoposterior armament in form of thickened spines; shape of article 2 on pereopod 7 distinctive (Figure 24 P7).

Peduncular spine formulas of pleopods 1–3 = 2 and 1, 2 and 0, 2 and 1; segmental formulas =

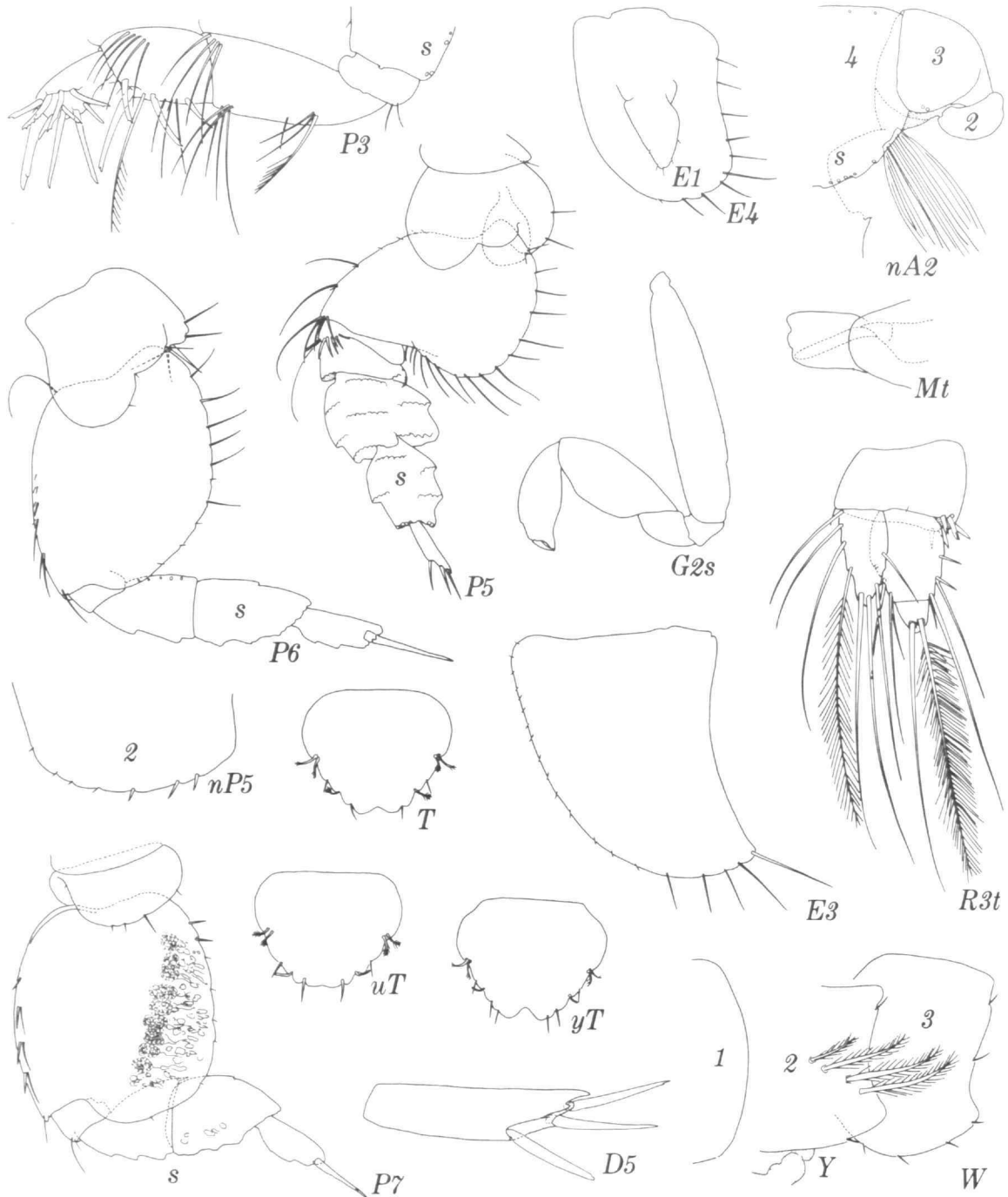


FIGURE 24.—*Urohaustorius pentinus*, new species, holotype, female "w," 2.28 mm (*n* = male "n," 2.54 mm; *u* = male "u," 1.88 mm; *y* = female "y," 2.08 mm).

15-10, 13-9, 13-11; basal setal formulas = 8-1-1-3, 6-1-1-2, 7-1-1-2.

Epimeron 2 with 4 setae in oblique facial row.

Peduncle of uropod 1 with 6 lateral marginal setae and 2 apicolateral setules; of uropod 2 with 3 evenly distributed lateral spines and 1 apicolateral setule; dorsal setae = 2 and 2; setae of rami = 6-3 and 6-3; inner rami extending 50% and 50% along outer. Apicolateral corner of peduncle on uropod 3 with 5 spines, medial margin naked, apicomедial corner with 1 setule, ventromedial apical row(s) with 5 mixed setae; spine-seta formula on lateral margin of article 1 on outer ramus = S-SE-SE.

Telson about 1.2 times as wide as long, cleft obsolete, setal formula = 2P, 1, P, 1.

Lateral gland clusters well developed in pleonites 3-5, weak in pleonite 6 and peduncle of uropod 3.

Female "y," 2.08 mm: Article 4 of antenna 2 with 19 facial elements (6 and 13); coxa 4 with 4 ventral and 2 posterior setae, coxa 5 with 3 posterior setae (2 in holotype), coxa 6 with 2 anteroventral setae (1 in holotype), 1 posteroventral seta (2 in holotype); epimeron 2 with 3 facial setae; epimeron 3 with main posteroventral setule slightly above corner (holotype with this setule below corner); apicolateral corner of peduncle on uropod 3 with 4 spines; telsonic formula = 2P, 1, P, 2 (illus.).

Female "x," 2.06 mm: Coxa 3 with only 3 setae; dactyl of pereopod 5 with only 2 spines; article 2 of pereopod 7 with 3 dorsoposterior spines; telson with same setule formula as holotype but cleft like female "y."

DESCRIPTION OF MALE (male "n," 2.54 mm).—Like female but with following variations, mostly nonsexual: Primary flagellum of antenna 1 with 8 articles, these scarcely thickened and not proliferate; accessory flagellum 5-articulate. Article 4 of antenna 2 with 8 and 11 elements, article 5 about half as wide as long, and 70% as long as article 4, with 11 elements; flagellum with 7 articles. Each molarial chopper with 3 cusps; right and left formulas of palp article 3 = 7-1-3-1 and 7-1-2-1. Coxa 3 with only 5 setae, anterior

lobe of coxa 6 with 2 setules. Spine and setal formulas of pereopod 3 = 4, 4, 2-1, 4 + 4 + 1; of pereopod 4 = 3, 4, 2-1-1, 4 + 4 + 1. Dactyl of pereopod 5 with 3 spines; article 4 of pereopod 6 with only 4 posterior setae; article 2 of pereopod 7 with 3 posterodorsal spines. Formula of segments on rami of pleopods 1-3 = 15-11, 13-9, 13-10 (inner proliferate), setal counts not distinctive. Epimeron 2 with 4 facial setae; epimeron 3 as stated for female "x." Uropods 1-2 like female but inner ramus of uropod 1 with 4 setae (illus.) and peduncle of uropod 2 with only 1 lateral spine and 1 dorsal seta. Apicolateral corner of peduncle on uropod 3 with 4 spines and 1 setule. Telson like holotype.

INTERSEXES.—Four specimens (2.0-2.63 mm) from the type-locality have short penial processes and partly grown brood plates without setae.

HOLOTYPE.—NMV, female "w," 2.28 mm (illus.).

TYPE-LOCALITY.—CPBS 12S/4, Western Port, Victoria, 18 Mar 1965, 2.8 m, fine sand, some mud and weed.

VOUCHER MATERIAL.—Type-locality: male "n," 2.54 mm (illus.); male "q," 2.27 mm; male "u," 1.88 mm (illus.); female "x," 2.06 mm (illus.); female "y," 2.08 mm (illus.); 2 intersexes, 2.0 mm and 2.63 mm.

RELATIONSHIP.—This species is much smaller than *U. pulcus* and the telson is emarginate rather than cleft, with shorter, finer armament. The presence of 2-3 stout proximoposterior spines on article 2 of pereopod 7 is in contrast to the setae found in *U. pulcus*; the shape of article 2 is rather different. Both articles of the outer ramus of uropod 3 are, by comparison, relatively shorter and broader than those of *U. pulcus*. Setae on the inner plate of maxilla 1 are more closely contiguous.

MATERIAL.—CPBS, 30 specimens from 1 sample.

DISTRIBUTION.—Victoria, Western Port, 2.8 m, fine sand, some mud, weed.

Urohaustorius merkanius, new species

FIGURES 25 (part), 26 (part)

DIAGNOSIS.—Dorsolateral armament rows on articles 1 and 2 of antenna 1 composed of thin elements; on article 4 of antenna 2 mixing spines and setae. Armament row on article 4 of antenna 2 even. Accessory flagellum not reduced. Main flagellar articles of only terminal male antenna 1 thickened, usually aesthetascs 2 per article and usually absent on articles 1–3, article 5 of male not bulbous. Coxa 1 not larger than coxa 2, both bearing only tiny setules. Spines on dactyl of pereopod 5 set in pairs on at least 1 locus. Dactyls of pereopods 6–7 well developed. Article 2 of pereopod 7 with 2 long posteroproximal setae, sometimes a third towards midmargin, and setules. Male sternite 6 with narrow, acute, posteriorly directed ventral tooth. Epimeron 2 bearing medium tooth, with about 3 facial setae in horizontal row. Tooth of epimeron 3 medium. Inner rami of uropods 1–2 much shorter than outer rami. Dorsolateral margin of peduncle on uropod 2 with or without spines. Apicolateral corner of peduncle on uropod 3 with stout spines, outer ramus with setae, with or without spines laterally on article 1. Telson entire, distally crenulate.

ADDITIONAL CHARACTERS.—Article 5 of antenna 2 oblong in adult females, more clavate in males, peduncle of uropod 1 more than half as wide as long.

GENERAL DESCRIPTION.—In contrast to *U. parnggius*, the majority of adult specimens of *U. merkanius* with (1) more numerous spines (of medium thickness and length) on article 1 of antenna 1 (generally 5–8 elements); (2) primary flagellum of male antenna 1 with slender articles bearing only 2 aesthetascs each, and these absent on articles 1–3 (except on 1 male, P.23354, 1500 m E of Belmont Beach, NSW, presumably terminal); (3) article 4 of antenna 2 with facial armament evenly aligned; (4) dactyl of pereopod 5 broad, with spines doubled at 1 or more loci; (5) posterior margin on article 2 of pereopod 7 with fewer long setae, generally 2 (less commonly 3), confined to proximal half; (6) peduncle of uropod

1 stout and stumpy, more than half as broad as long; (7) ordinary shape of article 2 on outer ramus of uropod 3; and (8) sternal tooth on male pereonite 6 distally attenuate and acutely pointed.

DESCRIPTION OF MALE.—Holotype male “o,” 3.49 mm (Western Port; probably not terminal): Head about 70% as long as wide, rostrum about 15% as long as remainder of head. Primary flagellum of antenna 1 with 10 unthickened articles, 2 aesthetascs each on articles 4–8, 1 on article 9; accessory flagellum 7-articulate; facial formula of mixed spines and setae on article 1 of antenna 1 = 5E, 2P; on article 4 of antenna 2 = 2P, P, SSESEES–PSSESESESESESESS; on article 5 = 4SESESESESESESESE; spines dominant only on antenna 2; article 3 with 5 facial setae; article 5 about 68% as wide as long, 61% as long as article 4; flagellum with 9 articles. Right incisor simple, left with 2 teeth, choppers on molars with 4–5 cusps; formula on right palp article 3 = 8–1–3–1, left = 7–1–3–1. Inner plate of maxilla 1 with 1 short apical seta, 1 large apicomedial seta; outer plate with 11 spines (several with 3 side teeth instead of 2 as shown for *U. pulcus*). Inner plate of maxilla 2 with 6 setae in medial row. Inner plate of maxilliped with about 6 medial setae, outer plate with 1 apicolateral seta, palp article 2 with 6 setae in facial row, article 3 with 2 setae in facial row.

Coxa 1 broadly subtriangular; coxa 2 similar but apex blunter; coxa 3 with 9 ventral setae all in posterior half, posterior margin with 2 setae both ventral; coxa 4 with 7 long ventral setae and 10 mixed posterior setae.

Setal and spine formulas on pereopod 3 = 4, 5, 2–1–1–1–1, 5 + 5 + 1 (= aberrant case, normal = 6 + 5 + 1); on pereopod 4 = 3, 5, 2–1–1–1–1, 6 + 5 + 1, posterior margin of articles 5–6 with broken row of serrations. Article 2 of pereopods 5–7 progressively with medium to sparse setal densities posteriorly, article 2 of pereopod 5 lacking mediofacial brush, dactyl with 5 spines in tandem plus 2 partners. Pereonal sternite 6 with acute midventral projection posteriorly directed

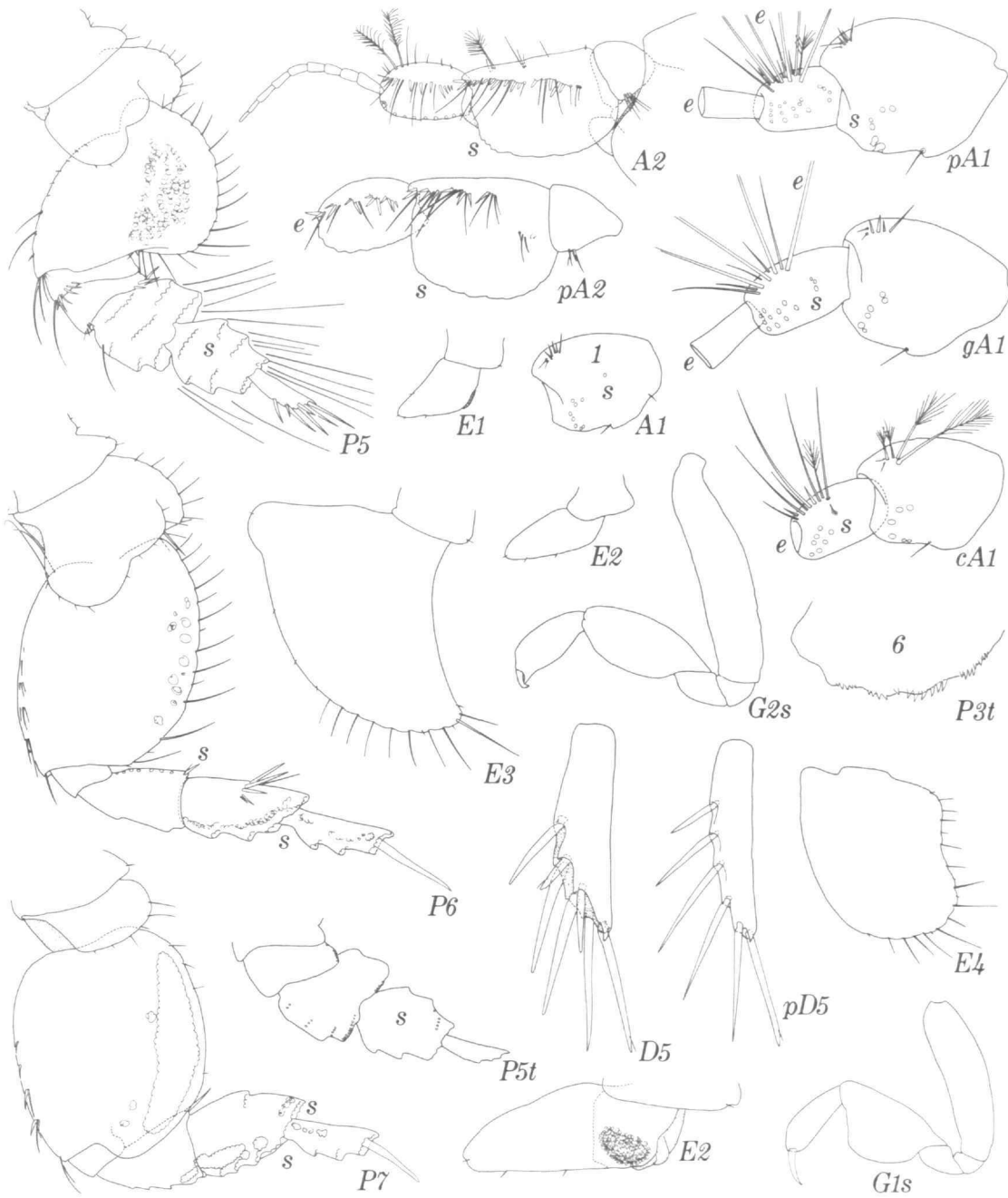


FIGURE 25.—*Urohaustorius merkanius*, new species, holotype, male "o." 3.49 mm. *U. parnggus*, new species (*p* = holotype, male "p," 3.32 mm). *U. yurus*, new species (*g* = female "g," 2.20 mm). *U.* species M (*c* = female "c," 1.90 mm).

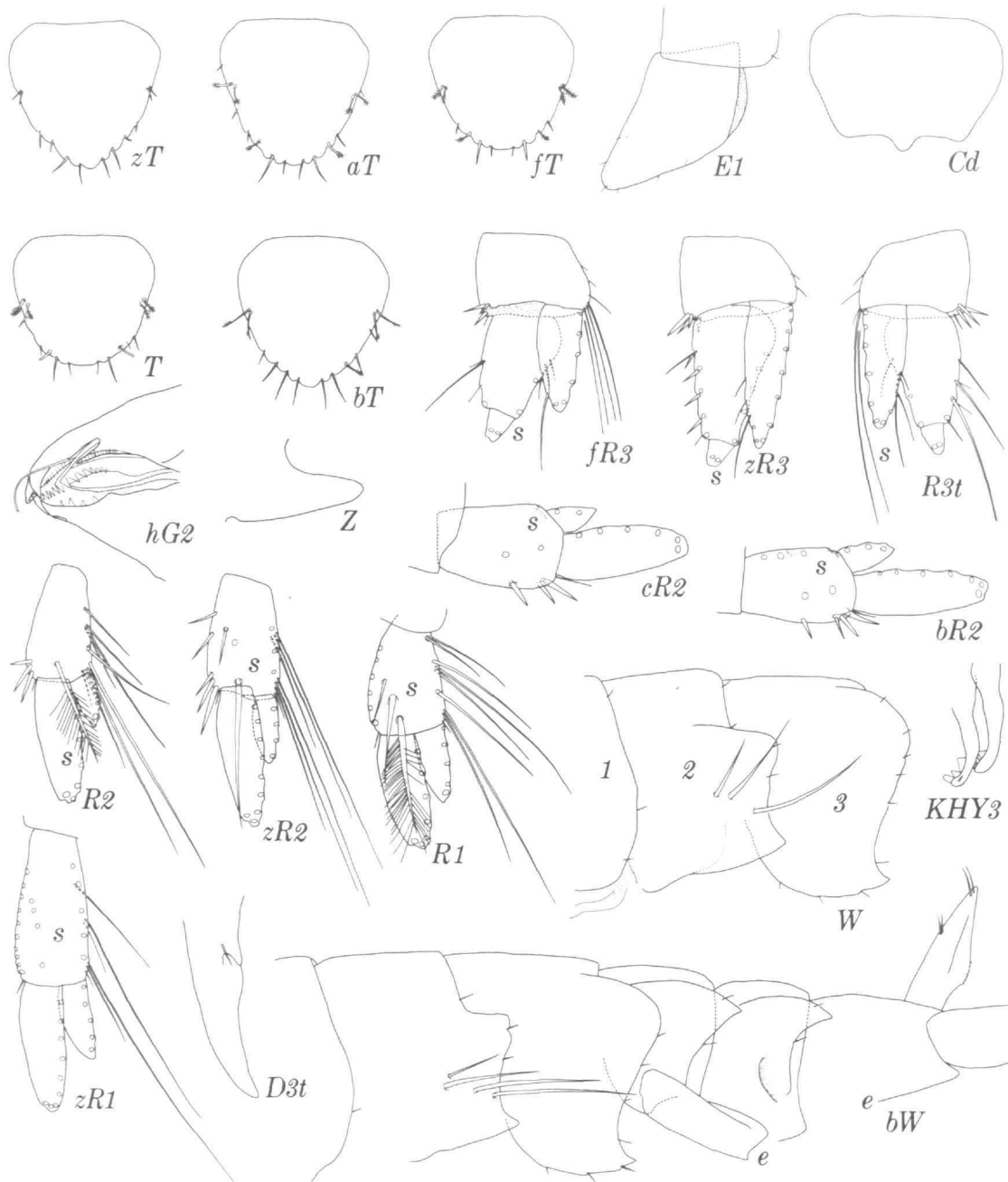


FIGURE 26.—*Urohaustorius merkanius*, new species, holotype, female "o," 3.49 mm (*a* = female "a," 3.47 mm; *b* = male "b," 3.29 mm; *f* = female "f," 3.42 mm; *h* = female "h," 3.26 mm). *U. parnggius*, new species (*z* = female "z," 3.79 mm). *U.* species M (*c* = female "c," 1.90 mm). *Y* = pleopod, *Z* = male sternal spike.

(illus.). Article 2 of pereopod 7 with 3 posterior marginal setae.

Peduncular spine formulas of pleopods 1-3 = 2 and 1, 2 and 0, 2 and 1; segmental formulas = 17-12, 15-11, 15-13 (inner proliferate); basal setal formulas = 11-2-4-5, 5-0-2-0, 7-2-1-3.

Epimeron 2 with 3 setae in horizontal row.

Peduncle of uropod 1 stumpy, more than half as wide as long, with 6 setae, apicolateral corner with 1 setule; on uropod 2 with 3 apicolateral spines closely contiguous, plus 1 setule; dorsal setae = 3 and 1; setae of rami = 7-5 and 7-4, inner rami extending 65% and 42% along outer. Apicolateral corner on peduncle of uropod 3 with 4 spines, medial margin with 2 weak setae in tandem, ventromedial apical row(s) with 10 mixed setae (rows distinct, 7 and 3), spine/seta formula on lateral margin of article 1 of outer ramus = Ee-Ec-Ee; article 2 of outer ramus about 80% as wide as long, about 28% as long as article 1.

Telson about 0.95 as long as wide, entire, extreme apex flat, basally glandular; setal formula = 2P, 1, 1, P, 1, 1.

Lateral gland clusters well developed in pleonites 3-6, more weakly developed in peduncle of uropod 3.

Male "b," 3.29 mm (Towra Point, Botany Bay, NSW): Armament of articles 4-5 of antenna 2 ordinary; formula of article 4 = PP-SE-PSSSE-SEESS-PSEESESESESESS. Dactyls of pereopod 5 stout, right with 1, left with 2 spines doubled. Posterior margin of article 2 on pereopod 7 with 3 setae, confined proximally. Epimeron 2 with 3 facial setae on right, 4 on left (illus.). Peduncle of uropod 1 more than half as broad as long, with 6 lateral setae; inner ramus unusually short (only 56% as long as outer). Peduncle of uropod 2 with 3 apicolateral spines and 1 lateral spine (illus.); dorsal peduncular setae = 3 and 2; ramal setae = 7 and 4, 7 and 3. Lateral spine-seta formula on outer ramus of uropod 3 = ES, ES, Ee, Ee/ES, Ee, Ee, Ee. Telson (illus.) apically peaked, basally glandular; formula = 2P, 1, 1, P, 1, 1/2P, 1, P, 1, 1.

Male "p," 4.05 mm (offshore, 1500 m E of

Belmont Beach, 16 km S of Hunter R, NSW): Article 1 of antenna 1, formula = 5 + 2P. Article 4 of antenna 2 formula = PP-ESP-SSSESESS-PSEESESESESESS; of article 5 = SSSE-S-ESS-EESESESS. Dactyl of pereopod 5 stout, spine formula = 2-2-1-1-1/1-2-2-1-1-1. Article 2 of pereopod 7 with 2 proximal posterior marginal setae. Inner ramus of uropod 1 on left side unusually long, 77% as long as outer. Peduncle of uropod 2 with 1 long dorsal seta, 3 lateral and 3 apicolateral strong spines. Left and right spine-seta formula for outer ramus of uropod 3 = Ee, Ee, Ee, Ee/ES, Ee, ES, Ee, Eee. Telson tending to asymmetry at apex, basally glandular; formula = 1, 2P, 1, 1, P, 1, 1/2P, 1, 1, P, 1, 1.

Male "q," unmeasured, ~4 + mm (offshore 1500 m E of Belmont Beach, NSW): The only specimen of *U. merkanius* with thickened basal articles and many aesthetascs on main flagellum of antenna 1 and reduced accessory flagellum. Article 1 of antenna 1 with 6 spines + 2 penicillates; article 2 with 7 fine spines, all short except 2 distal; main flagellum of 12 articles, aesthetasc formula = 4, 4, 5, 4, 5, 5, 5, 4, 3, 1, 0; accessory flagellum of 7 very thin articles. Article 3 of antenna 2 with 5 setae; article 4 with normal *U. merkanius* arrangement of armament, facial formula = PPEEP-SSESESESS-P-SSESESESESESS; article 5 about 63% as wide as long, 64% as long as article 4; formula = SSESESESESESS. Dactylar spine formula for pereopod 5 = 1, 2, 2, 2, 1, 1/1, 3, 3, 1, 1. Article 2 of pereopod 7 with 2 posterior setae confined to proximal 1/3 of margin. Epimeron 2 and 3 each with small cusp and excavate margin; epimeron 2 with 5 setae in irregular oblique-horizontal alignment and 1 ventrally, smaller, below the middle seta. Peduncular spine formulas for pleopods 1-3 = 2 and 1, 2 and 0, 2 and 0; segmental formulas = 18-14, 16-12, 15-14; basal setal formulas = 8-1-2-3, 5-1(setule)-1-1, 6-1+2(setules)-1-3. Peduncle of uropod 2 with 2 lateral marginal spines close together, and 3 apicolateral in close tandem. Peduncle of uropod 3 with 4 spines + 1 setule on dorsolateral apex; lateral marginal formula of outer ramus on left

side = eS, ES, ES, Ee, Ee; article 2 extremely short, 16% as long as article 1, and 75% as wide as long. Telson longer than wide, extreme apex flat, basally glandular; telsonic formula = 2P, 1, 1, P, 1, 1/2P, 1, 1, P, 1, 1 (very short).

DESCRIPTION OF FEMALE.—Female “f,” 3.42 mm: Like male but with following variables: Primary flagellum of antenna 1 with 9 articles, accessory flagellum with 6 articles, article 1 of peduncle with 5 thin setae plus 2 penicillate setae in armament row. Antenna 2 as shown for female of *U. pulcus*, article 5 about 48% as wide as long, 62% as long as article 4, facial armament formula = PP-SE-PSEES-EESS-PSSESESESESESS; formula on article 5 = SEESS-EESESESS. Spine formula on posterior margin of article 5 of pereopod 3 = 2-1-1; on article 6 of pereopod 4 = 5-4-1; otherwise like holotype. Fifth dactylar spine formula = 2, 2, 1, 1, 1/1, 2, 2, 1, 1. Brood plates thin, well setose. Uropod 1 peduncle with only 2 dorsal setae, inner ramus with only 3 setae; rami of uropod 2 with 7 and 3 setae. Ventromedial setae on peduncle of uropod 3 in rows of 11 and 1. Telson basally glandular, apical crenulation barely convex; setal formula = 2P, 1, P, 1, 1/2P, 1, P, 1, 1.

Female “a,” 3.47 mm (Lake Macquarie Salts Bay, NSW): Antennal armament in general conforming to that of Victorian specimens; article 4 of antenna 2 formula = P-EE-PSSESESESEES-PSESESESESESESS. Right and left dactyls of pereopod 5 stout, each with 2 spines doubled. Posterior margin of article 2, pereopod 7 with 2 proximal setae. Peduncle of uropod 1 more than half as wide as long; inner ramus on left side unusually long (75% as long as outer). Peduncle of uropod 2 without spines. Telson apically convex, basally glandular; formula = 2P, 1, 1, 1, 1/2P, 1, 1, P, 1, 1 (illus.).

Female “m,” unmeasured (1500 m E of Burwood Beach, NSW): With slightly depressed telsonic apex and telsonic formula as in male “p.”

Female “c,” unmeasured, and juvenile “j,” 2.35 mm (Merimbula, NSW): Both with telsonic apex depressed. Dactyl of pereopod 5 with no

spines doubled on either side (juvenile only). Otherwise these conform to *U. merkanius* diagnosis.

REMARKS.—Though there are recognizable differences between Victorian and NSW forms of *U. merkanius* as discussed below, they do not, on present evidence, appear to be of specific significance because of their extreme variability. All Victorian specimens come from 1 sample, WPBES 1714 (100% sand), just off the southwest tip of French Island. Only 1 adult of the 71 Victorian specimens lacks spine doubling on at least 1 locus of the dactyl on pereopod 5; while, of the 17 subadults in the sample, 10 lack doubling, 6 have 1 spine doubled on each dactyl (bilateral), and 1 has doubling on 1 dactyl only. Spines are not doubled on juveniles. Article 2 of pereopod 7 most commonly bears 2 long setae proximally, though occasionally 3 are present, as in the holotype. The telson, in both NSW and Victorian forms, shows some variation in precise configuration, width to length ratio, and in the number of marginal setae, but the extreme apex is not as a rule peaked, and the apical crenulation is usually flat or very weakly convex, and occasionally, particularly in subadults, even slightly depressed. Though the number and length of telsonic setae varies, the true apex, whether convex, flattened or depressed, is usually flanked by 2 very short, thin setae, next to which, more laterally on each half of the telson is at least 1 much longer, stouter spine-seta, as illustrated in male holotype and female “f,” both from Victoria, and female “a” from Lake Macquarie, NSW. The condition in male “b,” from Botany Bay, is uncommon in either collection because the 2 apical setae are as long as the 2 subapical, and the apical crenulation itself is strongly convex (as in *U. parnggius*).

The offshore NSW individuals (28 males, 14 females, and 3 juveniles) from 28 samples are, generally, larger than those from Victoria, with an accompanying increase in the number of spines and setae on some plates and appendages, though article 2 of pereopod 7 carries only 2 posterior marginal setae. On the dactyl of the fifth pereopod there are sometimes not 2 but 3

spines at the same locus, and the total number on any dactyl is variable, as in the Victorian collection. Although no adult Victorian specimen bears lateral spines on the peduncle of uropod 2 or on article 1 of the outer ramus of uropod 3, some of the NSW individuals do carry such spines. All NSW adults examined, of both sexes, bear at least 1 lateral spine on the peduncle of uropod 2; and in 18 of them, mostly males, the outer rami of uropod 3 also carry some spines as well as setae, approaching in this respect the condition characteristic of *U. parnggius*. The spination of these NSW individuals is, however, vagarious. Spination is so erratic in occurrence and irregular in distribution and numbers that no set pattern can be discerned. No ramus has a spine at each locus (unlike the stable condition found in *U. parnggius*, where only the apex bears setae alone). In only 11 of 42 adults examined are spines present on both right and left rami, and then not necessarily in corresponding number or position.

Article 2 on the outer ramus of uropod 3 is shorter, compared with article 1, in NSW specimens, than in the smaller Victorian specimens, though it is still of about the same length-breadth proportions. It has been observed in *Urohaustorius* species that article 2 of uropod 3 is relatively longer in smaller specimens, such as juveniles and young subadults, than in the normally larger adults of the same species.

The single adult female from Tasmania bears 1 lateral peduncular spine on uropod 2, but resembles the Victorian form in the absence of spines on uropod 3.

NSW estuarine specimens from Merimbula, Botany Bay, and Lake Macquarie resemble the offshore form in spination.

The male sternal process appears to be more attenuate in the NSW specimens, but this may well be artifact due to different preservational techniques.

The occasional absence of the seta accompanying the coupling hooks on the third pleopod of some of the NSW males shows no pattern in relation to other characters, except that it seems to occur only in large males (though not in all

large males) and the seta is not present on the only male with modified antenna 1, which is not among the largest of them. It may be lost at maturity.

HOLOTYPE.—NMV, male "o," 3.49 mm.

TYPE-LOCALITY.—WPBES 1714, Western Port, Victoria, 10 Oct 1974, 0.3 m, sand.

VOUCHER MATERIAL.—Type-locality: female "f," 3.42 mm (illus.); male "g," 3.30 mm; female "h," 3.26 mm (illus.); EBS 148: male "b," 3.29 mm (illus.); EBS 366: female "a," 3.47 mm; HDWBS: male "p," 4.05 mm; male "q," unmeasured ~4.0 mm; female "m," unmeasured; Day and Kudenov coll., Merimbula NSW, female "c," unmeasured, and juvenile "j," 2.35 mm.

RELATIONSHIP.—This species is easily distinguished from *U. pulcus* and *U. pentinus* in the doubling of spines on the dactyl of pereopod 5; and, unlike all specimens of *U. pulcus* and most specimens of *U. pentinus*, the uncleft telson affords a good distinguishing mark. In occasional specimens of *U. pentinus* the telson is so nearly entire that other characters, such as the presence of stout spines on antenna 1, the shape and armament of uropod 3, the posterior margin of article 2 of pereopod 7, and the dactylar spination of pereopod 5, may be used to distinguish the species.

Absence of uropodal spines in the Victorian form of *U. merkanius* at first appeared to segregate the species clearly from *U. parnggius*, but the erratic and variable occurrence of spines in the NSW specimens renders the character valueless in this respect. It should also be borne in mind that all the Victorian specimens in hand come from a single sample, and that additional material from other localities could alter the present picture.

Critical characters differentiating both Victorian and NSW forms of *U. merkanius* from *U. parnggius* are: (1) the arrangement of armament on article 4 of antenna 2; (2) the presence or absence of additional spines at 1 or more loci on the dactyl of pereopod 5; and (3) the distribution of posterior marginal setae on article 2 of pereopod 7. The consistent occurrence, in combination,

of the sharp dorsoventral disjunction between the most proximal group of elements and the main section of the armament row on article 4 of antenna 2, the single tandem arrangement of dactylar spines on pereopod 5 (despite the large body size), and the wide, even spread of setae over the whole posterior margin of article 2 on pereopod 7 (characters that have not been observed together or severally in *U. merkanius*), offer good grounds for assigning *U. parnggius* to a separate species.

In the open sea of Victoria and increasingly more prominent towards Queensland, morphs or sibling species prevail (*U. parnggius*, *U. yurru*, *U. urungari*) in which dactylar spines of pereopods are arranged singly, in tandem.

MATERIAL.—WPBES, 1 sample (71); T. Walker (Tasmania), 1 sample (1); EBS, 2 samples (8); Day and Kudenov coll., Merimbula NSW (2); HRDWB, 28 samples (44).

DISTRIBUTION.—Victoria, Western Port, to Lake Macquarie, NSW, embayment and offshore, 0.3–28 m, fine sand, coarse sand, mud and gravel.

Urohaustorius wingaro, new species

FIGURE 27 (part)

DIAGNOSIS.—Dorsolateral armament rows on articles 1 and 2 of antenna 1 bearing only thin elements; article 4 of antenna 2 mixing spines and setae. Armament row on article 4 of antenna 2 with sharp dorsoventral disjunction between most proximal group of elements and main section. Accessory flagellum reduced. Main flagellar articles of male antenna 1 thickened, anethetasc 2—many per article and present but usually absent on article 1, article 5 of male bulbous. Coxa 1 not larger than coxa 2, both bearing only tiny setules. Spines on dactyl of pereopod 5 set singly in tandem. Dactyls of pereopods 6–7 well developed. Article 2 of pereopod 7 with 3 long posterior setae. Male sternite 6 with broad rounded projection. Epimeron 2 bearing small tooth, with 2–3 facial setae in horizontal row. Tooth of epimeron

3 small. Inner rami of uropods 1–2 much shorter than outer rami. Dorsolateral margin of peduncle on uropod 2 with stout spine(s). Apicolateral corner of peduncle on uropod 3 with stout spines; outer ramus with setae and spines laterally on article 1. Telson weakly to moderately cleft, lobes gaping, bearing only 1 truly apical seta on each lobe. Telsonic formula = 2P, 1, P, 1.

ADDITIONAL CHARACTER.—Lateral elements of article 1 on outer ramus of uropod 3 longer than in *U. pulcus* and *U. pentinus*.

GENERAL DESCRIPTION.—In contrast to *U. pulcus*, body size of *U. wingaro* at maturity much smaller (about 1.75 mm compared to 3.00 mm) and article 2 of outer ramus on uropod 3 squat and stout; in contrast to both *U. pulcus* and *U. pentinus*, armament group on article 1 of antenna 1 lacking spines; in contrast to *U. merkanius*, peduncle and outer ramus of uropod 3 with lateral spines; and in contrast to *U. perkeus*, coxa 3 poorly setose.

DESCRIPTION OF MALE.—Holotype male “a,” 1.93 mm: Head about 75% as long as wide, rostrum about 12% as long as remainder of head. Primary flagellum of antenna 1 with 7 unthickened articles, aesthetasc formula (proximal to distal) = 0–1–2–3–2–1–0, accessory flagellum 5-articulate. Facial formula of mixed spines and setae on article 1 of antenna 1 = E, S, E, 2P; on article 4 of antenna 2 in 4 sections, displaced at second, as follows: P, P, EEP ↑ EEE–SEES–SSE–SESS; article 5 swollen, 66% as wide as long, 66% as long as article 4, formula = SSESESESS; spines dominant only on antenna 2; article 3 of antenna 2 with 2 facial setae; flagellum with 6 articles. Right incisor simple (but actually with 6 microcusps in waves), left simple, choppers on molars with 3 cusps; formula on right palp article 3 = 7–1–3–1, left (broken). Inner plate of maxilla 1 with 1 apical seta, 1 medium apicomedial seta; outer plate with 11 spines. Inner plate of maxilla 2 with 4 setae in medial row. Inner plate of maxilliped with 3 medial setae, outer plate with 1 apicolateral seta; palp article 2 with 3 setae in facial row, article 3 with 2 setae in facial row.

Coxa 1 broadly subtriangular; coxa 2 similar

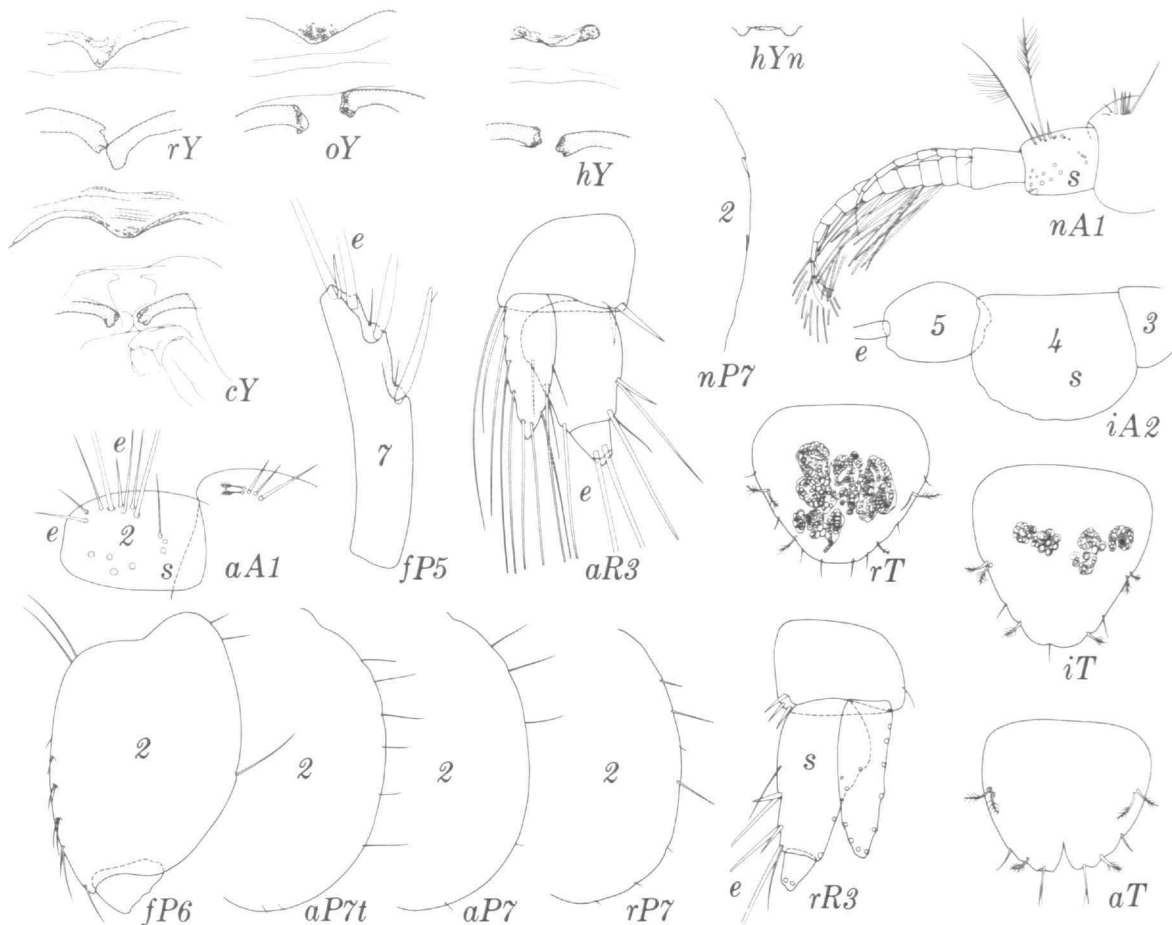


FIGURE 27.—Various species of *Urohaustorius*: Y = ventral view of male apparatus; P = profile of same. *U. wingaro*, new species, holotype, male "a," 1.93 mm (c = male "c" 1.70 mm). *U. pulcus* morph 872 (f = female "f," 2.90 mm; n = male "n," 2.70 mm). *U. urungari*, new species, holotype, male "i," 2.40 mm (h = male "h," 2.55 mm). *U. yurus*, new species, holotype, male "r," 3.00 mm (o = male "o," 2.28 mm).

but apex blunter; coxa 3 with 3 ventral setae all in posterior half, posterior margin with 1 setule near corner; coxa 4 with 1 long ventral seta, 2 short setae, 2 setules and 4 posterior setules.

Setal and spine formulas on pereopod 3 = 3, 4, 2-1-1, 5 + 4 + 1; pereopod 4 = 3, 4, 2-1-1-1-1, 5 + 4 + 1; posterior margins of articles 5-6 with broken row of serrations. Article 2 of pereopods 5-7 progressively with medium to sparse setal densities (= 7, 6, 3 long and 5, 3, 2 short setae on each article); article 2 of pereopod 5 lacking

mediofacial brush, dactyl with 4 spines in tandem. (Note right pereopod 7 article 2 with 6 long widely spread setae and no short setae.)

Peduncular spine formulas of pleopods 1-3 = 2 and 1, 2 and 0, 2 and 1; segmental formulas = 15-10, 12-8, 13-10 (inner not proliferate); basal setal formulas = 7-2-1-3, 2-1-1-1, 6-0-2-3.

Epimeron 2 with 3 setae in horizontal row.

Lateral margin of peduncle on uropod 1 with 6 setae, apicolateral corner with 1 setule; of uropod 2 with 2 apicolateral closely contiguous spines

but no setule, plus 1 lateral spine; dorsal setae = 2-3 and 1; setae of rami = 8-3 and 7-2; ventral peduncular medial setae = 1-2-1 and 3-2 (distal to proximal); inner rami extending 50% and 50% along outer. Apicolateral corner of peduncle on uropod 3 with 2 spines (plus or minus a seta), medial margin with no setae, ventromedial apical row with 6 mixed setae, spine formula on lateral margin of article 1 on outer ramus = SE-Ee.

Telson about 1.1 times as wide as long, cleft about 0.20 of its length, setal formula = 2P, 1, P, 1.

Lateral gland clusters well developed in pleonites 3-6, strongly in peduncle of uropod 3 and weakly in pleonites 1-2.

PPBES male "b," 2.05 mm: With a few more antennal armament elements than those from Western Port; article 5 of antenna 2 swollen; article 4 of pereopod 4 with only 3 apicodistal long setae; pleopodal spine formulas = 2 and 1, 2 and 0, 2 and 0; segmental formulas = 14-9, 12-8, 13-10; basal setal formulas = 5-2-1-3, 3-0-0-1, 5-0-1-2; telsonic formula = 2P, 1, P, 1.

PPBES male "x," 2.15 mm: The only male specimen found with thickened main flagellar articles (3 basal), and proliferation of aesthetascs on antenna 1 (formula = 3, 3, 4, 5, 5, 5, 1, 0), accessory flagellum reduced; article 5 of antenna 2 not as swollen as in other males, 55% as wide as long and 67% as long as article 4; facial formula for article 4 = P, EP ↑ EEE-PSEESESESESS, for article 5 = SEES-ESSEES. Spine-seta formula for pereopod 3 = 3, 4, 1(2)-1-1-1, 4 + 4 + 1; for pereopod 4 = 3, 3, 2-1-1, 4 + 4 + 1 on 1 side, 3, 3, 2-1-1-1, 4 + 4 + 1 on the other. Dactyl of pereopod 5 with 3 spines. Peduncular formulas for pleopods 1-3 = 2 and 1, 2 and 0, 2 and 0. Epimeron 2 with 3 setae. Peduncle of uropod 3 with 3 apicolateral spines. Telsonic formula = 2P, 1, P, 1.

Male "s," 1.75 mm: Telson weakly incised (like illustration of holotype) and peduncle of uropod 2 with 1 fully lateral spine besides apicolateral spine, uropod 3 stubby, but articles 1-2 of antenna 1 without stout elements, short elements thin, article 2 of pereopod 7 with 3-4 posterodor-

sal stiff, stout but elongate setae, about 2-3 times as long as those illustrated for holotype of *U. pentinus*.

Male "m," 1.77 mm: Telson moderately cleft, closely similar to that of *U. pulcus* but article 2 of pereopod 7 with enlarged setal-spines (illus.); uropod 3 stubby, uropod 2 with 2 lateral spines (one apical, one fully lateral); epimeron 2 with 2 facial setae; articles 1-2 of antenna 1 with no fully thickened short spines. Note striate callus on medial surface of article 5 on antenna 2 (illus.), possibly typical of males in Urohaustoriidae.

Males "m" and "s" conform to description of holotype, antenna 1 flagellum of each with 6 articles, accessory flagellum with 4; no aesthetasc on basal article. Article 4 of antenna 2 in both with dorsally displaced spine-seta row, formula the same for each = SES-SES-ESESS. Spine formula for pleopods 1-3 = 2 and 1, 2 and 0, 2 and 1.

REMARKS.—In all 5 Western Port males examined, basal articles of antenna 1 are not noticeably thickened and article 5 of antenna 2 is stout and swollen, not less than 66% as wide as long. Probably none is a mature male.

DESCRIPTION OF FEMALE.—Female "p," 1.62 mm: Formula on article 1 of antenna 1 = E, E, 2P; all elements on article 2 thin, 4 of these short and not plumose; primary flagellum with 6 articles, accessory flagellum with 4; aesthetasc formula = 0-1-2-1-1-0. Article 3 of antenna 2 with 1 facial spine-seta, formula on article 4 = SE ↑ EE-PSES-SESESS; article 5 half as wide as long, 70% as long as article 4, formula = SES-ESES; flagellum with 6 articles.

Long setae on coxa 3 = 4 ventral; on coxa 4 = 2 ventral, 2 posterior. Element formulas on pereopod 3 = 3, 5, 2-1-1, 4 + 4 + 1; on pereopod 4 = 3, 4, 2-1-1-1, 4 + 4 + 1. Setae of article 2 on pereopod 5 = 10 long and 2 setules; on pereopod 6 = 7 long and 3 setules; on pereopod 7 = 3 long stout setae and 1 setule in upper half, 3 setules in lower half.

Epimeron 2 with 2 horizontally aligned setae.

Peduncular spine formulas of pleopods 1-3 = 2 and 1, 2 and 0, 2 and 1; segmental formulas =

13-9+, 11-7, 7+ -9; basal setal formulas = 4-1-2-3, 1-1-1-1, 5-0-1-3.

Peduncle of uropod 1 with 5 lateral setae, 1 dorsal seta, 1 apicolateral setule, rami with 6 and 4 setae; peduncle of uropod 2 with 1 apicolateral spine, no lateral spines, 1 dorsal seta, rami with 6 and 2 setae. Telsonic formula = 2P, 1, P, 1. (Uropod 3 and telson later lost in dissection.)

PPBES female "g," 1.5 mm: With setose brood plates. Facial formula for main spine-seta row on article 4 of antenna 2 = E-ES ↑ SES-SESESS on 1 side, SS-PSES ↑ SES-SESESS on the other; formula for article 5 = SESESES. Article 4 of pereopod 4 with only 3 long setae apicodistally. Dactyl of pereopod 5 with 2 spines on right, 3 on left. Pleopodal peduncular formulas for pleopods 1-3 = 2 and 1, 2 and 0, 2 and 1; segmental formulas = 13-5+, 11-7, 12-6+; basal setal formulas = 4-1-1-2, 1-0-1-1, 5-0-1-2 (5-0-2-3). Telsonic formula = 2P, 1, P, 1.

Adult specimens of both sexes from Port Phillip Bay conform to the specific diagnosis. They are slightly larger than those from Western Port (slightly over 2 mm), and most of the individuals examined have 3 dactylar spines on pereopod 5. In none of the 10 males examined for the character could a seta be detected accompanying the coupling hooks on the peduncle of the third pleopod, although this seta is present in females. In both sexes there are only 3 long apicodistal setae on article 5 of pereopod 4, compared with 4 in Western Port specimens.

HOLOTYPE.—NMV, male "a," 1.93 mm (illus.).

TYPE-LOCALITY.—CPBS 12S/1, Western Port, Victoria, 18 Mar 1965, 2 m, muddy sand, weed.

VOUCHER MATERIAL.—CPBS 01N/3: male "m," 1.77 mm; CPBS 01N/4: female "p," 1.62 mm; male "s," 1.75 mm; CPBS 24N/872: male "c," 1.70 mm (illus.); PPBES 919/2: female "g," 1.5 mm; PPBES 920/5: male "b," 2.05 mm; male "x," 2.15 mm.

RELATIONSHIP.—*Urohaustorius wingaro* has characters in common with both the *U. pulcus-U. pentinus* group (defined as couplet 12 of "Key I," page 51) and with the *U. merkanus-U. parnggius* group (page 52, couplet 5). The cleft telson and

the presence of spines on the peduncle and outer ramus of uropod 3 associate it particularly with *U. pulcus*, and especially with morph 872, whereas the absence of stout spines in the armament of antenna 1 is characteristic of *U. merkanus*. The cleft telson and the fact that it is very small at maturity might suggest that *U. wingaro* is a neotenic form of *U. pulcus*; and the absence of stout spines on antenna 1 might support this view because in small juveniles of *U. pulcus* they are also absent. However, in such juveniles uropod 3 is more or less linguiform; article 1 of the outer ramus is without lateral marginal spines, and is not stout; article 2 is narrow and even longer, relative to article 1, than it is in the adult. Uropod 3 of *U. pulcus*, therefore, is essentially different from that of *U. wingaro* (with its short squat spinose uropod 3).

U. wingaro is much closer in size to *U. pentinus*, which it also resembles in the shape of uropod 3 and in the presence of spines on the outer ramus and peduncle. But *U. pentinus*, even though of small size, has well-developed stout spines in its antennal armament; stout posteroproximal marginal spines on article 2 of pereopod 7 in place of the long setae of *U. wingaro*; and its telson apically scalloped and emarginate, not smooth and cleft. The second antenna of nonterminal(?) males of *U. pulcus* and *U. pentinus* is similar in shape to that of the female, whereas in *U. wingaro* the male article 5 is swollen. Adults of *U. wingaro* closely resemble juveniles of *U. perkeus* in general appearance, but may be distinguished by the larger number and even spread of posterior marginal setae on article 2 of pereopod 7 and the more setose coxa 3 of that species.

U. wingaro and *U. parnggius* are the only 2 species described in the genus with distinctive dorsoventral disjunction between the most proximal and the main sections of the armament row on article 4 of antenna 2. In both, article 5 of the subadult male antenna 2 is swollen and shorter than that of the female. *U. parnggius*, however, is very much larger (3.00-3.79 mm) than the tiny *U. wingaro*, its telson is entire; the posterior margin of article 2 on pereopod 7 has setae spread over

the entire length; and the arrangement of molarial cusps is rather different (see *U. parnggius*).

The consistent combination of characters of antennae, pereopod 7, uropod 3, and telson make *U. wingaro* relatively easy to identify and suggest that it is a valid species.

MATERIAL.—CPBS, 4 samples from 3 stations (6); PPBES, 21 samples from 11 stations (85).

DISTRIBUTION.—Victoria, Western Port and Port Phillip Bay, 2–12 m, sand, muddy sand, sandy silt, silty clay.

Urohaustorius parnggius, new species

FIGURES 25 (part), 26 (part)

DIAGNOSIS.—Dorsolateral armament rows on article 1 of antenna 1 mixing long and short elements of medium thickness; article 4 of antenna 2 mixing spines and setae. Article 2 of antenna 1 with fine spines only. Armament row on article 4 of antenna 2 with sharp dorsoventral disjunction between most proximal group of elements and main section. Accessory flagellum reduced in terminal male only. Main flagellar articles of male antenna 1 thickened in terminal male only, aesthetascs 2–6 per article, usually absent on article 1 except in terminal male; article 5 of male antenna 2 bulbous. Coxa 1 not larger than coxa 2, both bearing only tiny setules. Spines on dactyl of pereopod 5 set singly in tandem. Dactyls of pereopods 6–7 well developed. Article 2 of pereopod 7 with 4–7 medium to long, widely spread posterior setae, most distal usually directed dorsad. Male sternite 6 with short erect blunt tooth. Epimeron 2 bearing medium tooth, with 3–4 facial setae in horizontal row. Tooth of epimeron 3 medium. Inner rami of uropods 1–2 much shorter than outer rami. Dorsolateral margin of peduncle on uropod 2 with stout spines. Apicolateral corner of peduncle on uropod 3 with stout spines, outer ramus with setae and spines laterally on article 1. Telson entire, peaked at apex (armament not diagnostic).

ADDITIONAL CHARACTER.—Peduncle of uropod 1 less than half as wide as long.

GENERAL DESCRIPTION.—In contrast to *U. merkanius*, adult specimens have (1) fewer and narrower spine-setae on article 1 of antenna 1, generally only 4, alternating longer and shorter; (2) main armament row on article 4 of antenna 2 with sharp vertical displacement proximally; (3) narrower dactyl of pereopod 5, and spines on this article not doubled; (4) more and evenly spread posterior marginal setae on article 2 of pereopod 7, instead of 2 or 3 confined proximally as in *U. merkanius*; (5) narrower peduncle of uropod 1, at least twice as long as wide; (6) squatter article 2 of uropod 3; (7) peaked telson (usually, but not in holotype).

DESCRIPTION OF MALE.—Holotype male “p,” 3.32 mm (probably subterminal): Armament on article 1 of antenna 1 (= 4E, 2P) consisting of 4 elements of moderate thickness and length, longer alternating with shorter, + 2 penicillates (illustrated); article 2 setose, with 6 fine spines, 1 apical spine elongate; flagellum of 9 unthickened articles, aesthetasc formula = 0, 0, 1, 2, 2, 2, 2, 1, 0; accessory flagellum of 6 articles, not reduced. Basal group of facial spines and setae on article 4 of antenna 2 shifted ventrad (illus.); formula = P, P, EE, P ↑ S-PSESSEES-ESESSESS (disjunct at arrow); article 5 swollen, 68% as wide as long, 63% as long as article 4, facial formula = 3S + 3S-EES-ESS-ESS.

Mouthparts of ordinary *Urohaustorius* form; 4 cusps on molarial chopper set on lateral protuberance very distally, reaching chopper surface; left mandibular palp article 3 formula = 7-1-3-1.

Outer plate of maxilla 1 with 11 spines; inner plate narrow, with 1 short, truly apical seta, 1 long subapical. Inner plate of maxilla 2 with 6 setae in medial row; outer with 1 apicomedial seta and 2 apicomedial rows of 7 and 9. Article 2 of maxillipedal palp with 6 setae in facial row.

Article 6 of gnathopod 2 only 66% as long as article 5.

Coxa 3 with 5 long ventral and 2 posterior setae; coxa 4 with 5 long setae.

Spine and setal formula of pereopod 3 = 4, 5, 2-1-1, 5 + 4 + 1; of pereopod 4 = 4, 5, 2-1-1-1-

1-1, 6 + 5 + 1. Dactyl of pereopod 5 narrow, with 6 spines in tandem (illus.). Article 2 of pereopod 7 with 6 long posterior marginal setae evenly spread. Sixth pereonal sternite with blunt tooth.

Formulas of pleopods 1-3 = 2 and 1, 2 and 0, 2 and 1; segmental formulas = 17-13, 14-11, 14-13; basal setal formulas = 9-1-2-3, 3-0-1-1, 7-0-2-3.

Epimeron 2 with 5 (left) and 4 (right) setae. (Illustration from male "q.")

Peduncle of uropod 1 subequal to outer ramus, with 8 lateral and 4 dorsal setae. Right peduncle of uropod 2 with 3 lateral spines in tandem, a long plume and 3 apicolateral spines, as well as 3 dorsal setae; left with 2 large lateral spines and a tightly contiguous third, no plume, and 3 apicolateral spines; setae on rami of uropods 1 and 2 = 8-5 and 8-3. Uropod 3 stout; peduncle with 4 apicolateral spines and one setule and 8-9 long setae towards medial distoventral margin; outer ramus lateral marginal formula = S, ES, ES, Ee, article 2 very short (about 17% as long as article 1) set at an angle directed outwards. Peduncles of uropods 1 and 2 scarcely, of uropod 3 heavily, glandular.

Telson entire, about as tall as broad, less sharply narrowed towards apex than usual in this species; telsonic formula = 2P, 1, P, 1, 1/2P, 2, P, 1, 1.

Male "s," 3.00 mm: Generally resembling the holotype, but presumed terminal male, with antenna 1 modified. Main flagellum of antenna 1 with 11 articles, accessory flagellum reduced, with 6 thin articles; aesthetasc formula = 2, 2, 6, 5, (6), 5, 6, 4, 4, 4, 1, 0; article 2 with 5 fine, short to medium spines plus 2 elongate apical fine spines. Article 5 of antenna 2 relatively longer and narrower than in other (presumed subterminal) males, nearly 70% as long as article 4 and 52% as wide as long; article 4 about 80% as wide as long, facial formula = P, P-EP ↑ 3ES-PSSE-SESS-ESESESS. Only 1 dactyl of pereopod 5 present, with 5 spines in tandem. Article 2 of pereopod 7 with 7 evenly spread, posterior marginal setae, most distal longest, and dorsally di-

rected. Pereonite 6 with stout, blunt non-attenuate mid-sternal process. Peduncle of uropod 1 longer than outer ramus, less than half as wide as long; lateral marginal formula for article 1 = SE, SE, EE; article 2 very short, as broad as long, about 15% as long as article 1. Telson as wide as tall, apically narrow, formula = 1, 2P, 1, P, 1, 1, 1/2P, 1, P, 1, 1, 1.

Male "o," 3.50 mm: Resembling holotype. Article 2 of antenna 1 with 4 fine spines and 1 long apical spine; flagellum of 9, accessory flagellum of 7 articles. Article 4 of antenna 2 about 82% as wide as long, facial formula = P, P, 3EP ↑ 6E-PSESESESESESS; article 5 slightly swollen, about 60% as wide as long and 73% as long as article 4, flagellum of 9 articles, formula = 7S-ESS-ESS-ESS. Telsonic formula = 2P, 1, P, 1, 1/2P, 1, P, 1, 1.

DESCRIPTION OF FEMALE.—Female "f," unmeasured: Resembling male. Article 1 of antenna 1 with additional spine (=5) + 2P; article 2 with 5 medium-short fine spines; main flagellum of 9, accessory flagellum of 6, articles; aesthetasc formula = 0, 0, 0, 2, 2, 2, 1, 1, 0. Facial formula for article 4 of antenna 2 = PEE(?P) ↑ EEE, S-PEE, ES-ESES-ESSESESS; article 5 about 48% as wide as long and 75% as long as article 4, formula = 6S-3S-ESS-ESS; flagellum of 8 articles. Spine and setal formulas of pereopod 3 = 4, 5, 2-1-1-1, 6 + 5 + 1; of pereopod 4 = 4, 5, 2-1-1-2, 6 + 5 + 1. Only complete dactyl of pereopod 5 with 5 spines in tandem. Article 2 of pereopod 7 on each side with 5 long posterior marginal setae, fully spread. Epimeron 3 posteriorly with short, acute cusp. Peduncle of uropod 2 with 3 lateral spines close together in uneven tandem and 3 apicolateral in close tandem. Inner ramus of uropod 3 as long as article 1 of outer ramus; article 2 of outer ramus only about 15% as long as article 1. Telson taller than wide, apically peaked, entire, nonglandular; formula = 2P, 1, 1, P, 1/2P, 1, P, 1, 1, 1.

Female "z," 3.79 mm: Fifth dactyls missing from both right and left sides, but other characters conforming to specific diagnosis.

Article 1 of antenna 1 with 4 thin spines + 2 penicillates in armament row; article 2 with only

3 very fine spines, no very long apical; primary flagellum of 9 articles, accessory of 7. Facial formula on article 4 of antenna 2 = P, P-4E ↑ 5E-PSEEESESESESS, strong dorsoventral disjunction at arrow between most proximal and main armament groups; article 3 with 3 setae; article 5 normal; flagellum of 8 articles. Large medial seta on inner plate of maxilla 1 not set into notch. Spine and setal formulas on pereopod 3 = 4, 5, 2-1-1, 6 + 6 + 1; on pereopod 4 = 4, 5, 2-1-1-1, 6 + 5 + 1. Setae numerous on coxae 3-4. Article 2 of pereopod 7 with 5 setae evenly spread, distalmost dorsally directed. Epimeron 2 with 4 setae. Peduncular formulas of pleopods 1-3 = 2 and 1, 2 and 0, 2 and 1; segmental formulas = 18-4, 15-10, 15-13; basal setal formulas = 6-2-3-3, 2-1-1-1, 6-0-1-3. Urosomal glands as shown for holotype of *U. merkanius*. Peduncle of uropod 1 longer than outer ramus, less than half as wide as long; outer ramus spinose, formula = ES, ES, ES, Ee. Telson entire, strongly peaked apically, formula = 2P, 1, P, 1, 1/2P, 1, P, 1, 1.

HOLOTYPE.—NMV, male "p," 3.32 mm (illus.).

TYPE-LOCALITY.—WPBES 1742/5, western entrance, Western Port, Victoria, 25 Nov 1974, 10 m, coarse-very coarse sand.

VOUCHER MATERIAL.—Type-locality: male "u," 2.92 mm; male "q," 3.56 mm; WPBES 1743/1: female "f," unmeasured; CPBS, 24S/1: female "z," 3.79 mm (illus.); HDWBS NSW, AM P.23352: male "s," 3.00 mm; AM P.23362: male "o," 3.50 mm.

RELATIONSHIP.—*Urohaustorius parnggius* appears to be aligned with the *U. merkanius* group of species by virtue of the uncleft telson and lack of short, thick spines on articles 1 and 2 of antenna 1; and as in *U. merkanius*, article 5 of antenna 2 in (subterminal?) males is broader and rounder than that of the female. However, the single tandem alignment of spines on the dactyl of pereopod 5, the sharp disjunction of the proximal end of the main armament row on article 4 of antenna 2, and the full spread of posterior marginal setae on article 2 of pereopod 7 segregate it from *U. merkanius*; and the 2 latter characters from *U. yurrus* and *U. urungari*. The dactylar spination of pereopod 5 is characteristic of the *U. pulcus* group, but the entire telson, lack of thick spines on article 2 of antenna 1, and armament of article 4 of antenna 2 clearly distinguish *U. parnggius* from *U. pulcus* and *U. pentinus*. The sharp displacement of the proximal portion of the main armament row on article 4 of antenna 2 is a character found elsewhere only in *U. wingaro* of all the *Urohaustorius* species described. From this species, however, *U. parnggius* differs not only grossly in size, but in its entire telson (compared with the gaping cleft in *U. wingaro*), and in the greater number and full spread of the posterior marginal setae on article 2 of pereopod 7.

MATERIAL.—CPBS, 1 sample (1); WPBES, 2 samples from 2 stations (4); HDWBS, NSW, 2 samples (2).

DISTRIBUTION.—Victoria, Western Port to southern NSW, 10-18 m, fine to coarse sand.

Urohaustorius yurrus, new species

FIGURES 25 (part), 27 (part)

DIAGNOSIS.—Dorsolateral armament rows on articles 1 and 2 of antenna 1 and article 4 of antenna 2 mixing spines and setae. Armament row on article 4 of antenna 2 even. Accessory flagellum not reduced. Main flagellar articles of male antenna 1 thickened, aesthetascs 2-5 per article and present on basal articles, article 5 of male not bulbous. Coxa 1 not larger than coxa 2, both bearing only tiny setules. Spines on dactyl of pereopod 5 set singly in tandem. Dactyls of pereopods 6-7 well developed. Article 2 of pereopod 7 with 2 (rarely 3) posteroproximal setae. Male sternite 6 with short, broad, blunt ventral protuberance. Epimeron 2 bearing blunt, small to obsolescent tooth, with 2-3 facial setae in horizontal row. Tooth of epimeron 3 small to obsolescent. Inner rami of uropods 1-2 much shorter than outer rami. Dorsolateral margin of peduncle on uropod 2 with stout spine(s). Apicolateral corner of peduncle on uropod 3 with stout spines, outer ramus with setae and spines laterally on article 1. Telson entire, bearing short apical setules.

GENERAL DESCRIPTION.—In contrast to *U. urungari*, more and stouter spines on article 1 of antenna 1, especially in female (generally E, 3S, 2P); more spines on article 4 of antenna 2, especially in female; much narrower article 5 of antenna 2 in males, both adult and subadult; narrower article 6, and longer and thinner dactyl, of pereopod 5; different form of male process on sternite 6; article 2 of pereopod 7 with most commonly 2 (exceptionally 3) proximoposterior marginal setae, in contrast to the usual 3 (occasionally 2) in *U. urungari*; greater number of spines (usually 4, even in subadults) on the posterodorsal corner of uropod 3 peduncle (*U. urungari* = 2, exceptionally, 3); presence of spines as well as setae on outer ramus of uropod 3 in females as well as males; more sharply angled bulge medially at base of outer ramus; less massively glandular, shorter, and apically much more broadly rounded telson, reaching less than half way along the outer ramus of uropod 3.

DESCRIPTION OF MALE.—Holotype male "r," 3.00 mm: Probably subterminal; head about 70% as long as wide, rostrum about 23% as long as remainder of head. Primary flagellum of antenna 1 with 10 articles, aesthetasc formula = 0-0-1-2-2-2-2-2-1-0; accessory flagellum 7-articulate, not shortened; all short elements on article 2 of antenna 1 very thin. Facial formula of mixed spines and setae on article 1 of antenna 1 = E, 3S, 2P; on article 4 of antenna 2 = P, PSE-PSESESESE-SESESESESESESESESESESS; on article 5 = SESESESESESESS; article 5 of antenna 2 about 72% as long as article 4, 40% as wide as long; article 3 with 3 facial setae; flagellum 9-articulate.

Right incisor simple, left with 2 weak teeth, choppers on molars with 4 cusps; formula on right and left third palpal articles = 1-3-6-1. Inner plate of maxilla 1 with 1 short apical seta, 1 large apicomedial seta; outer plate with 11 spines. Inner plate of maxilla 2 with 3 medial setae. Inner plate of maxilliped with 4 medial setae, outer plate with 1 apicolateral seta; palp article 2 with 5 setae in facial row, article 3 with 2 setae in facial row.

Coxa 1 broadly subtriangular; coxa 2 similar, but apex blunter; coxa 3 with long ventral setae all in posterior half, posterior margin naked; coxa 4 with 2 long ventral setae, 3 setules and 4 long or medium posterior setae and 5 setules.

Setal and spine formulas for pereopod 3 = 3, 5, 2-1-1-1, 5 + 4 + 1; on pereopod 4 = 3, 4, 2-1-1-1-1-1, 4 + 4 + 1; posterior margin of articles 5-6 with single row of mostly even large serrations. Article 2 of pereopods 5-7 with progressively medium to sparse setal densities posteriorly, long setae = 8-4-2 respectively; article 2 of pereopod 5 lacking mediofacial brush, dactyl with 5 spines in tandem.

Peduncular spine formulas on pleopods 1-3 = 2 and 1, 2 and 0, 2 and 1; segmental formulas = 17-11, 14-10, 14-12 (not proliferate); basal setal formulas = 8-1-2-3, 2-1-1-1, 5-1-1-2.

Epimeron 2 with 3 setae in left horizontal row, 2 in right.

Lateral margin of peduncle on uropod 1 with 7 setae, apicolateral corner with 1 setule; of uropod 2 with 1 disjunct lateral spine and 2 apicolateral spines; dorsal setae = 1 and 2; setae of rami = 7-5 and 8-3; inner rami extending 58% and 50% along outer. Apicolateral corner of peduncle on uropod 3 with 3 spines (1 fewer than normal for this species), medial margin with 1 weak seta; ventromedial apical row with about 8 mixed setae; spine formula on lateral margin of article 1 of outer ramus = e, SE, SE, Ee; article 2 about 23% as long as article 1.

Telson about 1.1 times as wide as long, entire, broadly rounded apically; telsonic formula = 1, 2P, 1, P, 1, 1.

Lateral gland clusters well developed in pleonites 3-6, uropod 3 and telson.

Male "p," 2.38 mm: Presumably terminal adult. Modified first antenna of 10 articles, basal 4 or 5 thickened, aesthetascs long, formula = 5, 4, 4, 5, 5, 5, 4, 2, 2, 0; reduced accessory flagellum of 6 thin articles. Article 1 of antenna 1 with 1 thin spine (spine-seta?) and 2 short, thicker spines + 2P; fine dorsal spines on article 2 = 6 short to medium + 2 long apical. Article 5 of antenna 2 half as wide as long, 70% as long as article 4;

facial spine-seta formula for article 4 = P, P, E, P-SESESS-PSESESESESESS/P, SESESS-PSSESESESESS; for article 5 = SSE, SSE, SE, SE, SS/SESESESESESS. Most proximal seta of maxillary palp distinctly disjunct from 2 apical. Setal and spine formula for pereopod 3 = 3, 5, 2-1-1-1, 4 + 4 + 1; for pereopod 4 = 3, 5, 2-1-1-2, 4 + 4 + 1.

Dactyl of pereopod 5 with 4/5 spines in tandem, most proximal disjunct. Sternal projection well developed, short, broad-based, blunt. Pereopod 7 with 2 proximal setae on posterior margin. Peduncular spine formulas of pleopods 1-3 = 2 and 1, 2 and 0, 1 (!) and 0; segmental formulas = 14-10 (proliferating), 11(+)-9, 12-10; basal setal formulas = 3(+)-2-1-3, 4-1-0-1, 5-1-1-3. Epimeron 2 with blunted cusp, 3 large facial setae in horizontal row plus 2 much shorter setae, 1 dorsal, 1 ventral, to the third seta. Epimeron 3 with well-developed small cusp, 3 ventral marginal setae, posteriorly excavate, posterior margin with 3 setules.

Peduncle of uropod 1 with 6 lateral, 6 medial, and 3 large dorsal setae; outer ramus with 2 clear apical and 1 subapical setae, in addition to marginals. Peduncle of uropod 2 with 2 midlateral spines closely juxtaposed and 2 apical spines in close tandem; outer ramus, in addition to marginals, with 1 clear central apical and 2 subapical setae, 1 on each side. Peduncle of uropod 3 with 4 apicolateral spines; lateral spine-seta formula on article 1 of outer ramus = ES, ES, Ee/ES, ES, Ee; article 2 about 20% as long as article 1 and 80% as wide as long. Telson about as wide as long, broadly rounded, glandular, extending about 20% along outer ramus of uropod 3; telsonic formula = 2P, 1, P, 1, 1/2P, 1, P, 1.

Male "o," 2.28 mm (sternite illustrated): Antenna 1 flagellum of 10, accessory flagellum of 7, articles; aesthetasc formula = 0-0-2-2-2-2-1-1-0/0-0-1-2-2-2-2-1-1-0. Article 5 of antenna 2 about 40% as wide as long and 48% as long as article 4; flagellum of 8 articles. Epimeron 2 with blunt cusp and 2 horizontal setae. Epimeron 3 with strong cusp.

Subadult male "s," 2.05 mm: With short pen-

ial processes and small sternite 6 projection. Antenna 1 flagellum of 8 articles; accessory of 5; aesthetasc formula = 0-2-2-2-2-1-1-0. Article 5 of antenna 2 about 45% as wide as long and 74% as long as article 4. Article 2 on outer ramus of uropod 3 about 34% as long as article 1. Telson 84% as tall as wide; formula = 2P, 1, P, 1.

DESCRIPTION OF FEMALE.—Ovigerous female "n," 2.40 mm: Formulas on article 1 of antenna 1 = E, 3S, 2P/E, 2S, 2P; all elements on article 2 very thin, 3 of them short; flagellum of 7 articles; accessory of 5; aesthetascs very long but no more than 2 per article. Article 3 of antenna 2 with 2 facial spines; formula for article 4 (even) = P, P, E-PSSESESS-PSESESESESESESS; on article 5 = SSESESESESESS.

Coxa 3 with 6 long ventral setae, 1 posterior. Coxa 4 with 4 long ventral setae, 4 posterior. Formula for pereopod 3 = 3, 3, 2-1-1, 4 + 4 + 1; for pereopod 4 = 3, 4, 2-1-1-1, 4 + 4 + 1. Dactyl of pereopod 5 with 4 spines in tandem, article 2 with 7 long posterior setae; of pereopod 6 with 4; of pereopod 7 with 2 posterodorsal marginal setae, slightly thickened.

Epimeron 2 with 2 setae.

Uropod 1, lateral setae of peduncle = 6 + 2 setules, dorsal = 2; rami = 6 and 4, left side damaged. Uropod 2 peduncle with 1 small midlateral spine plus 2 others of normal size, including apical, all 3 in tandem; dorsal setae = 2(1); ramal setae = 6 and 3. Peduncle of uropod 3 with 4 apicolateral spines: inner ramus like male; lateral spine-seta formula = ES, EE, Ee/S, ES, Ee, spines very fine, not short and thick. Telson almost as long as broad, formula = 2P, 1, P, 1.

Ovigerous female "g," 2.20 mm: Closely resembling the above, but with 1 short plumose seta fewer on article 2 of antenna 1 (illus.); 7 marginal setae on outer ramus of uropod 1; 1 lateral and 1 apical spine and 2 apical setae on right peduncle of uropod 2; 3 apical spines on left peduncle of uropod 3, 4 on right; spine-seta formula of outer ramus of uropod 3 = ?-ES-EE/S-Ee-Ee.

Female "m," 2.90 mm. With brood young. This specimen is much larger than other oviger-

ous females in the collection but conforms to the specific requirements. Armament row on article 1 of antenna 1 consisting of 2 fine spines (?spine-setae) and 2 thick short spines + 2P; 5 very fine spines on article 2 confined to distal 1/3 of article, 2 apical spines very long; main flagellum of 8 articles; unreduced accessory flagellum of 7; aesthetasc formula = 0-0-2-1-2-2-2-0. Formula of even armament row on article 4 of antenna 2 = P, P, EE-SESESES-PSEESE-3SESESESS; article 5 formula = 3SESES-ESESESSES. Dactyl of pereopod 5 with 5 spines in tandem. Epimeron 2 with 2 setae. Peduncle of uropod 1 with 7 lateral and 2 dorsal setae. Left peduncle of uropod 2 with 1 stout lateral spine and 2 apical spines, and in addition, more proximally, 2 short, middorsal spines, 1 of moderate thickness, 1 very fine; right peduncle with 2 midlateral marginal spines in tandem, and in addition 2 short, proximodorsal spine-setae. Ramal setae on uropods 1-2 = 9-6 and 8-4. Peduncle of uropod 3 with 3 apicolateral spines on left side; right side damaged, with 2; article 1 of outer ramus with sharply angled, basal, medial bulge, lateral setal formula = EE, ES, Ee/EE, E, (E)e, spines very fine; article 2 about 17 percent as long as article 1. Telson sparsely glandular, broadly and evenly rounded apically, reaching about 20% along outer ramus; telsonic formula = 1, 2P, 1, P, 1/1, 2P, 1, P, 1.

BROOD JUVENILES (about 0.75 mm).—Notes based on both juveniles in brood pouch of female "m": Primary flagellum of antenna 1 with 4 articles, aesthetascs elongate; accessory flagellum 3-articulate; peduncular setae sparse. Article 3 of antenna 2 with 1 long seta and 1 setule; article 4 with 2 long spines and 1 penicillate setule on apical corner, ventral apex with 1 long plume, no facial armaments; article 5 with 1 long and 1 penicillate setule at ventral apex, dorsal apex with 1 long spine and 1 thin seta, no facials. Articles 4 and 5 of pereopods 3 and 4 lacking facial setae, article 4 with 1-2 apicoposterior setae, article 5 with 1 pair of apicoposterior spines only; formula on article 6 = 1 + 1 + 0; dactyl much more elongate than in adult, spines highly serrate. Dactyls of pereopods 3-7 very elongate

and with large sharp subapical thorn; no spines on dactyl of pereopod 5. Articles 4-6 of pereopod 5 with apical sets of spines, but none set facially. Inner rami of uropods 1-2 shorter than in adult, each with only 1 apical seta, peduncle of each with only 1 apicomedial seta total.

HOLOTYPE.—NMV, male "r," 3.00 mm (illus.).

TYPE-LOCALITY.—QM W.6386, station 58, Middle Banks, Moreton Bay, Queensland, coll. S. Cook, Sep 1972, 15.5 m, mud.

VOUCHER MATERIAL.—Type-locality: male "p," 2.38 mm; female "n," 2.40 mm; subadult male "s," 2.05 mm; QM W.6390: male "o," 2.28 mm (illus.); QM W.6384: female "m," 2.90 mm; brood juveniles, ~0.75 mm; female "g," 2.20 mm (illus.).

RELATIONSHIP.—Distinctions between *U. yurrus* and *U. urungari* have already been enumerated in the "General Description." These 2 species are very close. They occur sympatrically in some situations. Some of their distinctive characters must be regarded as somewhat subjective (e.g., shapes of articles), and there are overlapping characters such as setation of article 2 of pereopod 7, where *U. yurrus* has most commonly 2 (but exceptionally 3), and *U. urungari* 3 (exceptionally 2) proximoposterior setae. The most important distinguishing characters are: shape of the protuberance on sternite 6 of the male; shape of article 5 of male antenna 2; and shape of the telson.

In the collections there is no male of *U. urungari* in which the flagellum of antenna 1 is modified by thickening of basal articles and proliferation of aesthetascs and so we cannot compare the 2 species in that terminal stage of development. All males of the 2 species in hand show a difference in shape of article 5 on antenna 2.

In all males of *U. yurrus*, whether with antenna 2 modified or not, article 5 is cylindrical to ovoid in shape and about half as wide as long; in all 29 males of *U. urungari* this article is bulbous and more than half as wide as long. No juvenile or subadult male of *U. yurrus* examined shows a structure similar to that of *U. urungari* on the sixth sternite. Juvenile males of *U. yurrus* have a poorly

developed, wide-based, bluntly conoid process with no indication of the low, bilobed protuberance characteristic of *U. urungari*. Segregation on the basis of telson shape alone shows that (1) those individuals with broad, evenly rounded telsons also have only 2 setae on article 2 of pereopod 7; (2) article 6 of pereopod 5 is narrower and the dactyl relatively longer than that of *U. urungari*; (3) the peduncle of uropod 3 has 4 apicolateral spines; and (4) the armament of antenna 2 is predominantly spinous (particularly noticeable in the female). The alignment of the armament row on article 4 of antenna 2 and the setation of article 2 of pereopod 7 differentiates both species from *U. parnggius*; and the entire telson separates them from the clefted telson species such as *U. pulcus*, *U. wingaro*, and *U. perkeus*. The sporadic occurrence in both species of doubling or pairing of dactylar spines on pereopod 5 is a further indication of a close relationship to *U. merkanius* already obvious.

U. yurrus so closely resembles *U. merkanius* that it might be regarded as a neotenic estuarine morph of that species. The usual simple tandem arrangement of the dactylar spines on pereopod 5 of *U. yurrus* is no bar to such a theory because in small subadults and juveniles of *U. merkanius* no doubling of these spines has been observed, and some doubling in adults of *U. yurrus* and *U. urungari* has been noted below (page 82). Apart from this character, consistent distinctions between *U. yurrus* and *U. merkanius* are to be found in

1. The shape and setation of the telson. In *U. yurrus* the telson is broadly arched, and reaches less than halfway along the outer ramus of uropod 3; in *U. merkanius* the apex is much narrower. Adults and subadults of *U. yurrus* have only simple seta between groups of penicillate setules. They lack the second apicolateral pair of long stout spine-setae, one on each side of the midpair. In contrast, *U. merkanius* has 2 simple setae there. In female "x," the apicolateral seta on each side is already well developed, although the brood plates are only about 1/3 grown and the 2 apical setae are small.

2. The shape of article 5 on antenna 2 in the male. This is cylindrical to ovoid in both adults and subadults of *U. yurrus*, and less than half as wide as long, but bulbous in all males of *U. merkanius* examined except for the single adult with modified antenna 1, in which it is narrower.

3. Shape of the male process on sternite 6; short, broad, and bluntly conoid in both adults and subadults of *U. yurrus*; fairly long, narrow, hooked, and apically acute in *U. merkanius*.

MATERIAL.—Queensland, Moreton Bay, Middle Banks, 104 specimens from 5 stations.

DISTRIBUTION.—Queensland, Moreton Bay, Middle Banks, 6–15 m, sand, mud.

Urohaustorius urungari, new species

FIGURE 27 (part)

DIAGNOSIS.—Dorsolateral armament rows on articles 1 and 2 of antenna 1 and article 4 of antenna 2 mixing thin spines and setae. Armament row on article 4 of antenna 2 even. Accessory flagellum not reduced. Main flagellar articles of male antenna 1 not thickened, aesthetascs 2 per article and sometimes present on basal articles, article 5 of male bulbous. Coxa 1 broader but not longer than coxa 2, both bearing only tiny setules. Spines on dactyl of pereopod 5 usually set singly in tandem. Dactyls of pereopods 6–7 well developed. Article 2 of pereopod 7 with 3 long stout posteroproximal setae and several setules. Male sternite 6 with low transverse bilaterally lobed, bulbous ridge or flap. Epimeron 2 bearing small to obsolete tooth, with 2–4 facial setae in jagged horizontal row. Tooth cusp of epimeron 3 obsolete to small. Inner rami of uropods 1–2 much shorter than outer rami. Dorsolateral margin of peduncle on uropod 2 with stout spine(s). Apicolateral corner of peduncle on uropod 3 with stout spines; outer ramus with setae and spines laterally on article 1. Telson entire, apex extended, apical setules short.

GENERAL DESCRIPTION.—In contrast to *U. yurrus*, fewer and finer spines on article 1 of antenna 1, especially in female (generally 2E + 2P in

female, 3E + 2P in male); fewer spines and more setae on article 4 of antenna 2, especially in female; bulbous, not cylindrical, article 5 of antenna 2 in the (nonterminal?) male; broader article 6 and relatively shorter, stouter dactyl of pereopod 5; 3 (exceptionally 2) posterodorsal setae on article 2 of pereopod 7 (*U. yurrus*, 2, exceptionally 3); only 2 (rarely 3) apicolateral spines on peduncle of uropod 3 (*U. yurrus* 4); basal bulge on outer ramus of uropod 3 less angularly defined; telson taller and apically narrower, reaching farther (at least halfway) along the outer ramus of uropod 3.

DESCRIPTION OF MALE.—Holotype male “i,” 2.40 mm: Head about 65% as long as wide, rostrum about 11% as long as remainder of head. Primary flagellum of antenna 1 with 8 articles, formula of aesthetascs = 0-0-2-2-2-1-1-0; accessory flagellum 5-articulate. Facial formula of mixed spines and setae on article 1 of antenna 1 = E, S, 2P; on article 4 of antenna 2 = P, P, E, P-ESEES-PSSEEESESESESS; on article 5 = SESESESESS; article 3 with 3 facial setae (2 setae and setule); flagellum with 6 articles.

Right incisor simple, left with 2 extremely weak teeth; choppers on molars with 3-4 cusps; formula on right palp article 3 = 6-1-3-1, on left (= missing). Inner plate of maxilla 1 with 1 short apical seta, 1 large apicomedial seta; outer plate with 11 spines. Inner plate of maxilliped with 3 medial setae, outer plate with 1 apicolateral seta; palp article 2 with 4 setae in facial row, article 3 with 2 setae in facial row.

Coxa 1 broadly subtriangular; coxa 2 similar but apex blunter; coxa 3 with 4 ventral setae, 11 in posterior half, posterior margin with 1 seta ventrad; coxa 4 with 4 ventral and 1 posterior setae.

Setal and spine formulas on pereopod 3 = 3, 5, 2-1-1-1, 5 + 4 + 1; on pereopod 4 = 4, 4, 2-1-1-1-1-1, 5 + 4 + 1; posterior margin of articles 5-6 with single row of mostly medium, even serrations. Article 2 of pereopods 5-7 progressively with medium to sparse setal densities posteriorly (8-8-3), article 2 of pereopod 5 lacking mediofacial brush, right dactyl with 4 spines in

tandem, left with 5 spines, 2 of these forming pair!

Peduncular spine formulas of pleopods 2-3 (pleopod 1 missing) = 2 and 0, 2 and 1; segmental formulas = 12-8 and 13-12 (inner proliferate on pleopod 3); basal setal formulas = 4-0-1-1 and 7-1-2-3 (see specimen “j” below for complete pleopodal formula).

Epimeron 2 with 4 setae in horizontal facial row.

Peduncle of uropod 1, lateral margin with 6 setae, apicolateral corner with 1 setule; of uropod 2 with 1-2 disjunct lateral spines and 1-2 apicolateral spines plus setule, dorsal setae = 2 and 2, setae of rami = 7-4 and 7-4, inner rami extending 60% and 60% along outer. Peduncle of uropod 3 short and stubby, more than half as wide as long, subequal to, or shorter than, outer ramus, apicolateral corner with 2-3 spines, medial margin naked, ventromedial apical row with 9 mixed setae, article 2 of outer ramus about 33% as long as article 1, about 80% as wide as long, armament formula on lateral margin of article 1 = S-E(S[?])-Ec/ES-Ec.

Telson about 1.0 times as wide as long, entire, setal formula = 2P, 1, P, 1 (midapical).

Lateral gland clusters well developed in pleonites 3-6, more weakly developed in peduncle of uropod 3, weak to moderately developed in telson.

Male “j,” 275 mm: With well-developed sternite 6 process (illus.). Facial formula on article 1 of antenna 1 = 3E + 2P. Spine-seta formula for article 4 of antenna 2 = P, P-EE-P-ESEES-PSEEESESESESS; for article 5 = SESESESESS; flagellum of 6 articles. Dactyl of pereopod 5 with 5 spines in tandem, left side slightly abnormal, with spines 2 and 3 short. Article 2 of pereopod 7 with 3 dorsoposterior setae. Epimeron 2 with 3 facial setae (2 + 1 socket); epimeron 3 with tiny cusp and slightly excavate posterior margin. Peduncular spine-seta formulas for pleopods 1-3 = 2 and 1, 2 and 0, 2 and 1; segmental formulas = 15-10, 12-9(8), 13-12 (inner proliferate); basal setal formulas = 8-1-2-3, 3-1-1-1, 7-1-1-3. Peduncle of uropod 3 with 3 apicolat-

eral spines, lateral marginal formula for outer rami = ES, Ee/ES, Ee. Telson barely taller than wide, apex flattened, setal formula = 2P, 1, P, 1/2P, 1, P, 1.

Male "h," 2.55 mm: Article 1 of antenna 1 formula = E (long) EE + 2P. Spine-seta formula on article 4 of antenna 2 = P, P-EE-PSEES-PEESEEEEESEESS; on article 5 = SSES-ESE-SESS; flagellum of 6 articles. Dactyls on right and left fifth pereopods each with 5 spines, none doubled, though in 3 groups, 2-1-2 on 1 side. Article 2 of pereopod 7 with 3 dorsoposterior setae. See illustrations for sternite 6. Peduncle of uropod 3 with 3 spines; lateral marginal spine-seta formula of article 1 = ES, Ee/ES, Ee. Telson barely taller than wide, peaked; telsonic formula = left 2P, 1, P, 1 (unpaired mid apex)/right 1, 2P, 1, P.

DESCRIPTION OF FEMALE.—Large, ovigerous female "g," unmeasured, with 2 eggs in brood pouch: Setal formula on article 1 of antenna 1 = 2E + 2P; spines on article 2 all very fine, 1 short, 2 medium, 1 long, all distal; flagellum ordinary, with 7 articles; accessory flagellum with 5 articles. Spine-seta row on article 4 of antenna 2 even, formula = P, P, EE, P-5E-PEE-ES3ESS (extreme reduction of spines); article 5 tending to ovate in shape, about 60% as wide as long, 60% as long as article 4, formula = S3eS3ESEESS (abnormally large number of elements due to increased number of setae). Right and left dactyls of pereopod 5 each with 6 spines, distal 2 "paired" (see note on p. 80) on each side. Right pereopod 7 with 3 dorsoposterior setae on article 2, left missing. Posteroventral cusps on epimera 2 and 3 obsolete. Epimeron 2 with 4 setae in jagged row. Peduncular spine/seta formulas for pleopods 1-3 = 2 and 1, 2 and 0, 2 and 1; segmental formulas = 17-12, 14-9, 16-15 (inner ramus proliferate on both sides); basal setal formulas = 8-(1 + 1 setule)-1-3, 2-0-1-1, 7-0-2-(2 + 1 setule). Peduncle of uropod 1 subequal in length to outer ramus, much more than half as wide as long, with 8 lateral setae, 1 apicolateral setule, and 2 large facial setae, in addition to ordinary medial armament; peduncle of uropod 2 with large dorsal

seta, laterally with 1 midmarginal spine and 2 apicolateral spines plus 1 spinule. Outer rami of first and second uropods with triad of setae at apex and 6 medial setae; inner rami of both uropods about 60% as long as outer, each with 5 medial setae. Peduncle of uropod 3 glandular, with 2 apicolateral spines; inner ramus extending beyond apex on article 1 of outer ramus; formula for lateral margin of article 1 = Ee, Ee/Ee, E; article 2 about 30% as long as article 1. Telson slightly taller than wide, heavily glandular, apically narrow, setation symmetrical; formula = 2P, 1, P, 1/2P, 1, P, 1.

Female "n," 2.60 mm: Article 1 of antenna 1 with formula = E (long) + 2E + 2P; article 2 with 4 very fine spines, 1 short, 2 medium, 1 long, all distal; flagellum of 7 articles, aesthetascs very long, formula = 0-0-2-2-1-1-0; accessory flagellum of 5 articles. Spine-seta formula on article 4 of antenna 2 = P-P-E-P-4ES-PSES3E SESESS; article 5 cylindrical, though very slightly broader towards distal apex, apex itself slightly rounded, spine-seta formula = SSEESEESS. Setal and spine formulas on pereopod 3 = 5, 5, 2-1-1-1, 4 + 4 + 1; on pereopod 4 = 4, 5, 2-1-1-1, 4 + 4 + 1. Article 6 of pereopod 5 about 75% as wide as long, only 1 dactyl present, with 5 spines in tandem. Article 2 of pereopod 7 with 3 dorsoposterior setae. Cusps obsolete on epimera 2 and 3; epimeron 2 with 2 and 3 setae. Peduncular spine and seta formulas for pleopods 1-3 = 2 and 1, 2 and 0, 2 and 1; segmental formulas = 15-11, 13-9, 15-13 (inner proliferate); basal setal formulas = 8-1-2-3, 3-0-0-1, 6-0-2-2. Peduncle of uropod 1 bearing 6 (7) lateral, 2 large dorsal, and 5 medial setae, 1 medioapical medium-length seta plus 1 setule; outer and inner rami each with 5 medial marginal setae. Peduncle of uropod 2 with 1 midlateral spine, 2 spines plus 1 spinule on apex, and 1 large dorsal seta. Outer rami of first and second uropods broad apically, with a triad of setae. Peduncle of uropod 3 with 2 apicolateral spines; article 1 of outer ramus on left side with 1 lateral marginal spinule, lateral margin on right side naked; article 2 of outer ramus unusually long, about 45% as long as article 1; inner ramus

extending beyond apex of article 1. Telson about as wide as tall, glandular, asymmetrically setose; telsonic formula = 2P, 1, P, 1, 1 (midapical)/1, 2P, 1, P.

Female "v," 2.75 mm: With symmetrically setose, tall, flat-apexed, sparsely glandular telson, conforming to diagnosis and description of *U. urungari*, but outer ramus of uropod 3 bearing spines as well as setae (only known female so equipped); formula for lateral margin of article 1 = ES, Ee/s, ES, Ee. Spine-seta formula for article 4 of antenna 2 = P, P, P-EEEEES-PSEEE-SEESESESS. Left dactyl of pereopod 5 with 4 spines, right abnormal or damaged. Article 2 of pereopod 7 with 3 dorsoposterior setae. Epimeron 2 with 2 setae. Outer rami of uropods 1 and 2 apically broad with 3 setae almost side by side. Peduncle of uropod 3 with 2 apicolateral spines.

Female "f," 2.66 mm: Formula on article 1 of antenna 1 = E (long), E, 2P; all elements on article 2 very thin. Article 3 of antenna 2 with 1 facial setal spine, formula on article 4 (even) = P, P, P, P-ESEE-PEESEE-ESESESS, setae dominant, on article 5 = SEESESESS, article 5 ovate (not bulbous form of male).

Dactyl of pereopod 5 with 5 spines in tandem; article 2 of pereopod 6 of thin form.

Peduncular spine formula of pleopod 1 = 2 and 1, segmental formula = 14-10, setal formula of rami = 7-1-2-3 (to substitute for missing male pleopod 1); other female pleopods badly damaged.

Uropod 1 peduncle lateral setae = 6, dorsal = 2, rami = 8 and 4; uropod 2 peduncle lateral = 1 spine, apicolateral = 2 spines and setule, dorsal setae = 2; ramal setae = 7 and 4. Uropod 3 peduncle apicolateral spines = 2, inner ramus like male; setae formula on lateral article 1 of outer ramus = e-E.

Telson as long as broad, armament formula = 2P, 1, P, 1 (unpaired middle).

REMARKS.—Many characters, such as numbers and arrangement of spines and setae on appendages and exact configuration of structures such as the telson, are variable in this species. Individual abnormalities and malformations are not uncom-

mon (e.g., dactyl of pereopod 5). There are isolated exceptions in almost all the characters generally used in the diagnosis of the species. However, characters of importance in the genus *Urohaustorius*, which are consistently stable in *U. urungari*, are: absence of stout spines in the armament of antenna 1; preponderance of setae over spines on article 4 of antenna 2 in the female; bulbous (sometimes almost spherical) shape of article 5 of antenna 2 in the male (terminal male probably unknown); absence of typical *U. merkanius* kind of spine-doubling on the dactyl of pereopod 5; unique form of the protuberance on sternite 6 in males; absence of any long spine-seta on the telsonic apex.

In all males in the collection article 5 of antenna 2 is bulbous, and more markedly so in the smaller individuals with an ill-defined sternite 6 process. In *U. merkanius*, *U. parnggius*, and *U. wingaro* (all with bulbous article 5 in subterminal males) this article is more slender in such males as have been found with modified antenna 1, which are assumed to be at the terminal stage. This suggests that there may well be such a terminal stage in *U. urungari*, though it is, as yet, unknown.

Spines on the dactyl of pereopod 5 are relatively longer and more slender than those of *U. merkanius* or *U. parnggius*. The most proximal spine is often shorter and decidedly disjunct; where there are 5 spines present (the most usual condition in adults), the remaining distal 4 are frequently in 2 groups. In cases where "pairing" or "doubling" has been observed, as in some large individuals and ovigerous females, it is, except in 1 recorded instance, the 2 most distal spines that are affected. Instead of being close together in tandem, they have assumed the "doubled" position of being almost side by side horizontally. This condition has involved simply a slight change in position, and the paired spines are of equal length, and not, as they are in *U. merkanius*, in groups comprising 1 long spine plus 1 or more shorter elements.

Females of *U. urungari* do not normally bear spines laterally on article 1 of the outer ramus on

uropod 3 (female "v" is the only exception noted), and frequently have no armament at all on this article except at the apex. Even in ovigerous females there may be only a simple spine-seta laterally, not accompanied by a long plumose seta. Most commonly there are only 2 apicolateral spines, rather slender, on the peduncle of uropod 3. In a few large specimens of both sexes 3 spines have been observed on 1 side (as on the holotype) or both; but never 4 spines, as in *U. yurrus*.

Although some individuals have a bilaterally symmetrical telson with a pair of setae, 1 on each side of the apical midline, there is a strong tendency in this collection of *U. urungari* towards loss of 1 seta of the apical pair. In some specimens the seta remaining retains its original position, creating apical asymmetry; in others it has become truly median. Deviations in apical setation have not so far been found to be associated with any distinctive character, and occur in both sexes.

HOLOTYPE.—NMV, male "i," 2.40 mm (illus.).

TYPE-LOCALITY.—QM W.6386, station 58, Middle Banks, Moreton Bay, Queensland, Sep 1972, 15 m, mud.

VOUCHER MATERIAL.—Type-locality: male "h," 2.55 mm (illus. sternite, 2 figs.); female "n," 2.60 mm; female "g," unmeasured; male "k," 2.40 mm; male "l," 2.68 mm; QM W.6383: male "j," 2.75 mm; QM W.6385: female "f," 2.66 mm; QM W.6392: female "v," 2.75 mm; QM W.6387: female "o," 2.45 mm.

RELATIONSHIP.—The unique form of the male process on sternite 6 of *U. urungari* is the most important factor in its segregation from all other species of *Urohaustorius*. Many of the other differences between *U. urungari* and *U. yurrus*, though consistent, are subtle: telsonic configuration; armament on article 4 and shape of the male article 5 of antenna 2; shape of article 6 and the dactyl of pereopod 5; setation of article 2 of pereopod 7. Characters, such as setation and shape of the telson and the exact spine/seta ratio on article 4 of antenna 2, are variable in both species (though spines predominate on article 4 of antenna 2 in *U. yurrus* and setae in *U. urungari*); and there is a very small degree of overlap in some characters

(pages 79, 80). These criteria are difficult and laborious to use in practical identification of ecological survey material; and of course with limited material we cannot assume that they are valid specific differences. Nevertheless, they have been replicated to our satisfaction, and there are only a very few individuals in the collection that cannot be confidently assigned, on the basis of these criteria, to 1 group or the other.

MATERIAL.—Queensland, Moreton Bay, Middle Banks, 48 specimens from 6 stations.

DISTRIBUTION.—Queensland, Moreton Bay, Middle Banks, 6–15 m, mud, sand.

Urohaustorius species M

FIGURES 25, 26 (part)

Known as the Malabar form, 4 specimens from the Australian Shelf Benthic Survey off Malabar, NSW, cannot be firmly identified with any of the foregoing species in *Urohaustorius*. These specimens, all females, appear, apart from the entire telson, to have more in common with *U. pulcus* and *U. pentinus*, and particularly the latter, than with the *U. merkanius* group. The largest specimen, female "x," 2.31 mm, has a broad telson narrowing towards the apex, whereas the other 3 specimens have the ordinary, mostly rounded, broad telson; but in all 4 specimens the telson is apically flattened. The presence of several short stout spines on article 2 of antenna 1 appears to separate these specimens from either *U. merkanius* or *U. parnggius*, and the absence of doubled spine positions on the dactyl of pereopod 5 and the spinous article 1 on the outer ramus of uropod 3 remove the specimen from *U. merkanius* (unless they are neotenous adults). The normal spination pattern on article 4 of antenna 2 distinguishes the specimens from *U. parnggius* and *U. wingaro*.

Distinctive characters of this morph are (1) narrow article 2 of pereopod 6; (2) presence of 2 very long, stout, plumose setae at the proximal end of the spine group on article 1 of antenna 1.

The inconsistency of the armament formulas on article 1 of antenna 1 is, however, anomalous,

as seen in the following tabulation of female specimens.

Specimen	Antenna 1	Opposite antenna 1
"x"	2E(long), 2S, 2P	E(short), 3S, 2P
"c"	2E, 2S, 2P	2E(long), 2E(short), 2P
"y"	2E, S, 2P	E, 3S, 2P
"d"	2E, 2S, 2P	2E, 2S, 2P

Only female "d" appears to be normal and consistent with expectation in stability. One proximal long seta has been observed in a specimen of *U. metungi* (illus.); and 2, as in the Malabar form, in 2 juveniles of what is probably *U. pulcus* from Western Port, and in a sample of brood young of *U. yurus* from Queensland. In *U. perkeus* article 1 carries only such long setae. We consider the possibility that this is a juvenile character and that specimens of *U. species M* are mutant neotenes. More specimens are awaited.

DESCRIPTION OF FEMALE.—Female "c," 1.90 mm: Armament row on article 1 of antenna 1 = 2E, 2e, 2P/2E, 2S, 2P. Armament row on article 4 of antenna 2 with all elements aligned, formula = P, PEE-PSESS-PSESESESESESS. Dactyl of pereopod 5 with 3 spines in tandem. Epimeron 2 with 4 setae; tooth of epimeron 3 sharp. Uropod 1 as in typical specimens of *U. merkanius*; peduncle with 5 lateral and 3 dorsal setae; inner ramus not as short as usual. Peduncle of uropod 2 with either 1 or 2 apicolateral spines and 1 lateral spine; inner ramus shorter than in *U. merkanius*; setae on rami of uropods 1 and 2 = 6 and 3, 6 and 2. Apicolateral corner on peduncle of uropod 3 with 4 spines; article 1 of outer ramus with only 2 sets of armaments. Telson truncate as in specimen "u" of *U. pentinus* but not distinctly excavate; setal formula = 2P, 1, P, 1.

Superfemale "x" of dwarf form, 2.31 mm: Armament row on article 1 of antenna 1 with 2 long plumes, 4 short spines, 2 penicillate setules. Armament row on article 4 of antenna 2 with all elements aligned, formula = P-PEE-PSESEESS-PSESESESESESESS; article 5 = 3SESESESESEES. Dactyl of pereopod 5 with 4 spines in tandem. Epimeron 2 with 4 setae. Peduncle of uropod 2 with 3 apicolateral spines and

1 lateral spine. Telson entire, formula = 2P, 1, P, 1.

VOUCHER MATERIAL.—AM SBS E2S3 and E2S4, female "x," 2.31 mm; female "c," 1.90 mm (illus.); female "d," 1.75 mm; female "y," 1.73 mm.

MATERIAL.—SBS, 2 samples (4).

DISTRIBUTION.—NSW, off Malabar, ~20 fathoms (37 m), coarse sand.

Urohaustorius perkeus, new species

FIGURES 28, 29

DIAGNOSIS.—Dorsolateral armament rows on articles 1 and 2 of antenna 1 and article 4 of antenna 2 comprising only thin setae. Armament row on article 4 of antenna 2 even. Accessory flagellum not reduced. Main flagellar articles of male antenna 1 not thickened, aesthetascs 2–3 per article and occasionally present on article 1; article 5 of male not bulbous. Coxa 1 not larger than coxa 2; coxa 1 densely, coxa 2 sparsely setose. Spines on dactyl of pereopod 5 set singly in tandem. Dactyls of pereopods 6–7 vestigial. Article 2 of pereopod 7 with widely spread posterior setae. Male sternite 6 lacking ventral tooth. Epimeron 2 bearing large tooth, with 5–6 facial setae in vertical row(s). Tooth of epimeron 3 large. Inner rami of uropods 1–2 much shorter than outer rami. Dorsolateral margin of peduncle on uropod 2 with apical spines. Apicolateral corner of peduncle on uropod 3 with stout spines; outer ramus with only setae laterally on article 1. Telson distinctly cleft, forming slit (apical setae not diagnostic).

DESCRIPTION OF FEMALE.—Holotype female "f," 3.85 mm (Victoria): Head about 67% as long as wide, rostrum about 12% as long as remainder of head, narrow and sharp. Primary flagellum of antenna 1 with 8 articles, articles 2–4 with 2 aesthetascs each, articles 5–7 with 1 aesthetasc each, accessory flagellum 6-articulate. Facial formula of setae on article 1 of antenna 1 = 4 plumes (long to short) + 2 penicillates; on article 4 of antenna 2 = P, PPEE-P5E-P7E-7E

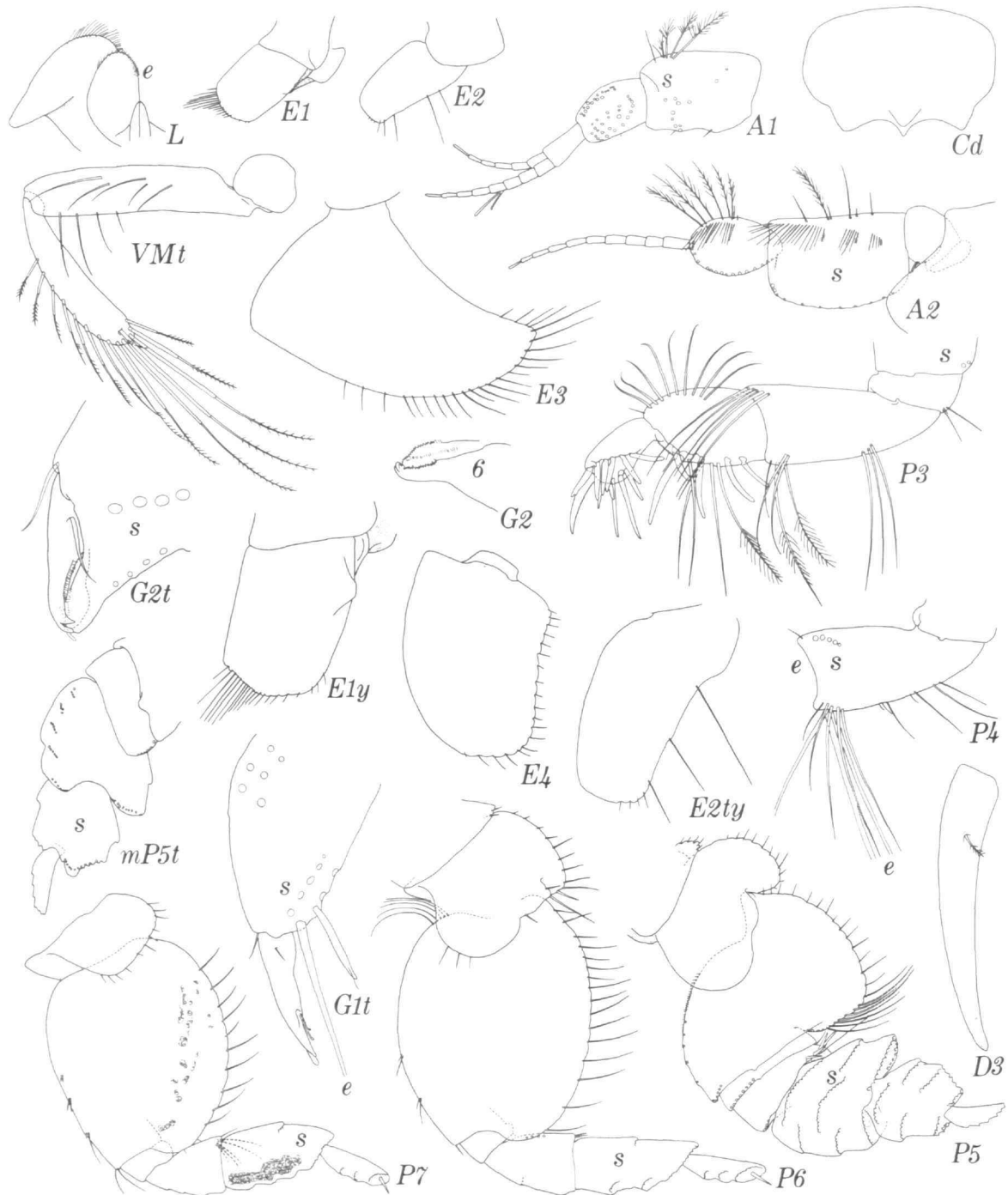


FIGURE 28.—*Urohaustorius perkeus*, new species, holotype, female "f," 3.85 mm (*m* = male "m," 3.42 mm).

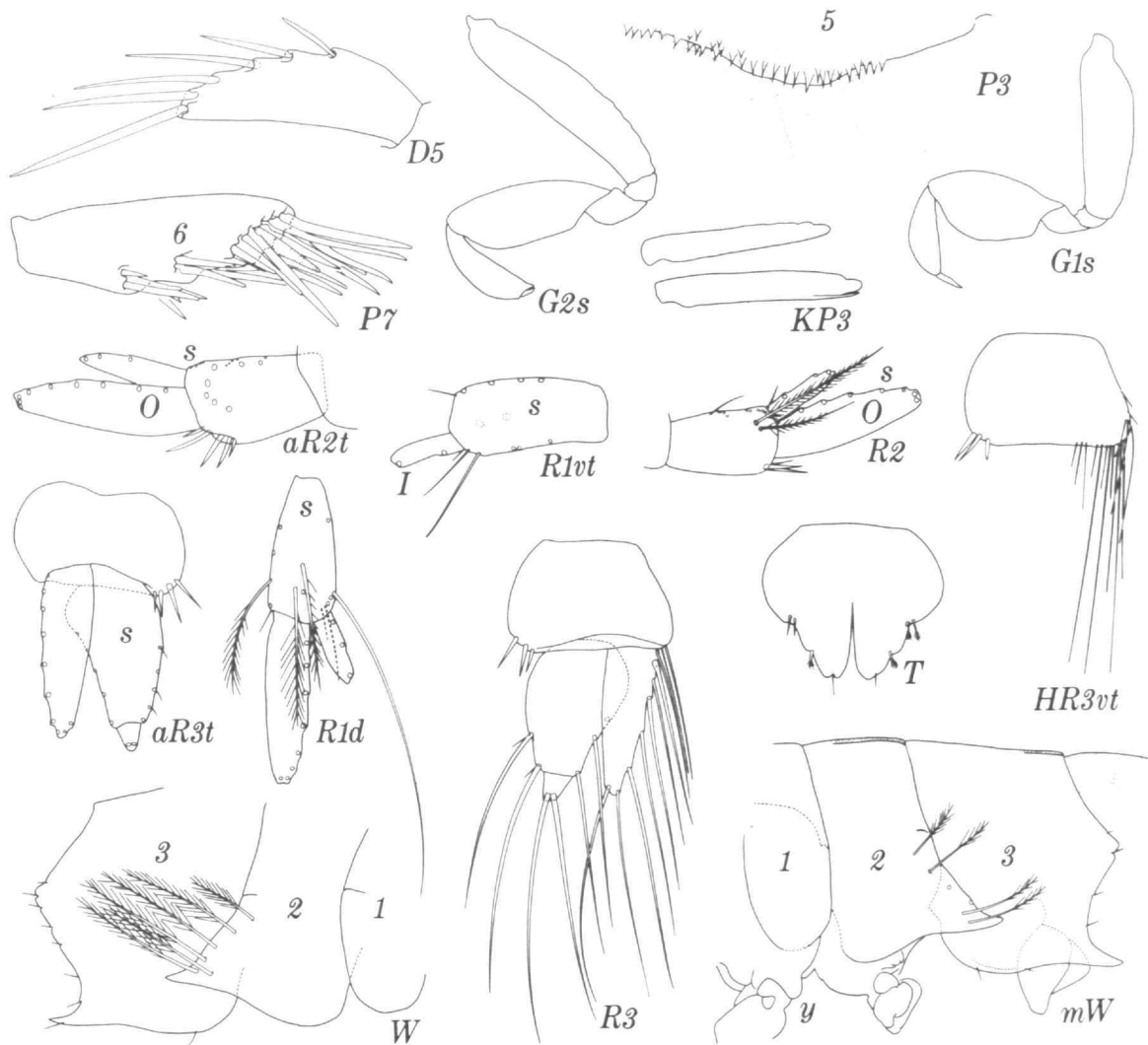


FIGURE 29.—*Urohaustorius perkeus*, new species, holotype, female "f," 3.85 mm (a = female "a," 5.20 mm; m = male "m," 3.42 mm).

or PE, PEE-P5E-P6E-8E, article 5 clavate, about 66% as wide as long (distal measurements), about 58% as long as article 4, facial spine-setae = 16 and 15 plus 6 submarginally at apex almost continuous with dorsal armaments; article 3 with 3 facial setae; flagellum with 10 articles. Right incisor simple, left with 2 teeth, choppers on molars with 4 cusps; formula on right palp article 3 = 10-1-3-1, on left = 9-1-2-2 (apparently

aberrant). Inner plate of maxilla 1 with 1 short apical seta, 1 large apicomedial seta; outer plate with 11 spines. Inner plate of maxilla 2 with 7 setae in medial row. Inner plate of maxilliped with 7 medial setae, outer plate with 1 apicolateral seta; palp article 2 with 8 setae in facial row plus 1 apical facial seta, article 3 with 2 setae in facial row. Coxa 1 subrectangular; coxa 2 similar but narrower and slightly tapering, coxa 1 densely

setulose ventrally, about 9 of these setules elongate, coxa 2 weakly setulate ventroposteriorly, posterior margin with 3 long thin setae; coxa 3 with 20 ventral setae, mostly in posterior half, posterior margin with 4 setae; coxa 4 with 6 ventral and 13 posterior setae, all short. Gill of coxa 5 much larger than posterior lobe.

Setal and spine formulas on pereopod 3 = 5, 9, 2-1-1-1, 6 + 4 + 1; pereopod 4 = 5, 8, 2-1, 6 + 4 + 1, posterior margin of articles 5-6 with row(s) of medium serrations. Article 2 of pereopods 5-7 equally setose posteriorly in medium densities; article 2 of pereopod 5 lacking mediofacial brush, bearing numerous anterior prickles, dactyl with 6 spines in tandem.

Peduncular spine formulas of pleopods 1-3 = 2 and 1, 2 and 0, 2 and 1, segmental formulas = 20-14, 19-13, 18-13, basal setal formulas = 11-2-2-3, 7-2-2-2, 9-0-2-3.

Epimeron 2 with 5 setae in vertical row and 1 seta on ventral row.

Lateral margin on peduncle of uropod 1 with 4 setae, apicolateral corner with 1 setule; of uropod 2 with pair of spines and setule at apicolateral corner; dorsal setae = 3 and 2; setae of rami = 8-3 and 7-3, inner rami both extending 50% along outer. Apicolateral corner of peduncle on uropod 3 with 3 spines, medial margin with 2 setae in tandem and group of 3, ventromedial apical row(s), with 11 mixed setae; spine formula on lateral margin of article 1 on outer ramus = Ee-Ee/Ee-Ee.

Telson about 1.15 times as wide as long, cleft about halfway, setal formula = 2P, P, 1/2P, P, 1.

Lateral gland clusters well developed in pleonites 4-6, more weakly developed in peduncle of uropod 3.

Giant female "a," 5.20 mm (New South Wales): Primary flagellum of antenna 1 with 9 articles, accessory flagellum with 8 articles, armament row on article 1 of peduncle with 5 plumes and 2 penicillates. Facial armament formula on article 4 of antenna 2 = PE-3EP-P5E-E-PE \times 17; article 5 = E \times 18 plus 5 apical; article 3 with 9 facial spine-setae; flagellum with 11 articles. Right molarial chopper

with 6 cusps; right palp 3 formula = 11-1-3-1. Coxa 1 with 15 setae in anterior long setal group, 11 in posterior short setal group, posterior margin with 1 seta; coxa 2 with 10 ventral setules, 7 posterior setae (2 ventralmost short); coxa 3 with 28 long ventral setae and 5 posterior setae; coxa 4 with 9 ventral and 31 posterior setae. Spine and setal formulas on pereopod 3 = 6, 10, 2-1-1-1-1, 6 + 4 + 1; on pereopod 4 = 6, 8, 2-1-1-1, 6 + 4 + 1. Dactyl of pereopod 5 with 9 spines in tandem. Epimeron 2 with 5 setae along posterior margin and row of 4 in vertical facial row. Peduncle of uropod 1 with 6 lateral setae, of uropod 2 with 5 apicolateral spines (illus.), dorsals = 6 and 7, setae of rami = 10-5 and 9-3. Uropod 3 illustrated. Telsonic setal formula = 2P, 1, P, 1 on right side, but left side like holotype. Lateral glands are present in pleonite 3, otherwise like holotype.

Female "g," 4.26 mm (Queensland): Primary flagellum of antenna 1 with 8 articles, accessory flagellum with 6 articles. Facial setal formula of article 4 on antenna 2 = 1-3-6-13; flagellum 9-articulate. Dactyl of pereopod 5 with 7 spines in tandem. Epimeron 2 with 5 setae, ventralmost small and offset anteriad. Peduncle of uropod 1 with 4 lateral and 3 dorsal setae; rami with 7 and 3 setae. Peduncle of uropod 3 like female "a" apicolaterally; article 1 of outer ramus with 3 lateral sets of armaments.

DESCRIPTION OF MALE (male "m," 3.42 mm, Victoria).—Generally like female with following variations: Flagella of antenna 1 with 7 and 6 articles. Article 3 of antenna 2 with 1 plumose and 3 simple facial setae; facial formula of article 4 = PE-PEE-P4E-PE \times 12; article 5 ovoid, about 65% as wide as long, 60% as long as article 4, facial formula = 16E and 8E apically; flagellum with 10 articles. Formulas of right and left mandibular palp article 3 = 10-1-3-1 and 11-1-3-1. Inner plate of maxilla 2 with 7 setae in medial row. Article 2 of maxillipedal palp with 8 setae in facial row, 3 of these tightly clumped proximally. Anteroventral edge of coxa 1 slightly excavate. Spine and setal formulas of pereopod 3 = 4, 8, 2-1-1-1, 6 + 4 + 1; of pereopod 4 = 4, 7,

2-1, 5 + 4 + 1. Epimeron 2 with 5 setae in vertical row and 1 seta on posterior margin. Peduncle of uropod 1 with 5 lateral setae, of uropod 2 like holotype; setae of rami = 6-2 and 7-3; inner ramus of uropod 3 slightly more elongate than in female.

HOLOTYPE.—NMV, female "f," 3.85 mm (illus.).

TYPE-LOCALITY.—CPBS 24N/872, Western Port Bay, Victoria, Crib Point resample survey, Aug 1972, 9 m, sand.

VOUCHER MATERIAL.—Type-locality: male "m," 3.42 mm (illus.); male "h," 2.99 mm; AM P.23297: female "a," 5.20 mm (illus.); AM P.23300: male "p;" QM W.6386: female "g," 4.26 mm.

RELATIONSHIP.—The deep cleft of the telson suggests comparison of the species is best made to *U. pulcus*, the model of the genus. *Urohaustorius perkeus* differs from that model in the alate telson, larger teeth of epimera 1-2, vertical alignment of setae on epimeron 2, the rectangular and setose coxae 1-2, the shortened setae of coxa 4, the weak dactyls of pereopods 6-7, the absence of thick spines in the armament rows of the antennae; and more minor characters, including the presence of anterior prickles on article 2 of pereopod 5, the lack of proximolateral spines on the peduncle of uropod 2 (apical only), the better posterior setation on article 2 of pereopods 6-7, the lack of a dactylar tooth on pereopods 3-4, and the broader spread of facial setae on article 4 of pereopods 3-4.

MATERIAL.—CPBS, 3 samples from 1 station (8); WPBES, 1 sample (3); PPBES, 20 samples from 10 stations (136); Bass Strait, 1 sample (7); AM HRDWB, 21 samples (27); QM 5 samples (56).

DISTRIBUTION.—Victoria, Western Port Bay to Moreton Bay, Queensland, open sea and embayment, 2-26 m, fine and coarse sand, silty sand.

Urohaustorius halei Sheard

FIGURES 30-33 (part)

Urohaustorius halei Sheard, 1936:446-449, fig. 1.

DIAGNOSIS.—Dorsolateral armament rows on

articles 1 and 2 of antenna 1 and article 4 of antenna 2 bearing only thin setae. Armament row on article 4 of antenna 2 even. Accessory flagellum not reduced. Main flagellar articles of male antenna 1 not thickened, aesthetascs 2 per article but usually absent on article 1; article 5 of male antenna 2 not bulbous. Coxa 1 not larger than coxa 2, both bearing only tiny setules. Spines on dactyl of pereopod 5 usually set in pairs on at least 1 locus. Dactyls of pereopods 6-7 vestigial. Article 2 of pereopod 7 with several medium proximoposterior setae. Male sternite 6 with long, narrow, acute, posteriorly directed, midventral tooth. Epimeron 2 lacking or bearing small cusp, with 4-9 facial setae in 1-2 vertical rows. Tooth of epimeron 3 small to large. Inner rami of uropods 1-2 scarcely shorter than outer rami. Dorsolateral margin of peduncle on uropod 2 without spines. Apicolateral corner on peduncle of uropod 3 with thin setae, outer ramus with only setae laterally on article 1. Telson entire, bearing both penicillate and nonpenicillate setae.

ADDITIONAL CHARACTER.—Proximalmost seta in row on article 1 of antenna 1 not plumose.

ADDITIONAL DIAGNOSIS DIFFERENTIATING THIS SPECIES FROM *U. metungi*.—Apex of coxa 1 twisted, thus giving subquadrate appearance from medial view. Coxae 3-4 narrower than in *U. metungi*, posteroventral apex of coxa 3 sinuous, posterior margin of coxa 4 sinuous. Article 6 of pereopod 5 with supernumerary spine group posteriorly (commonly 4 posterior and 3 anterior groups). Article 4 of pereopod 6 lacking setae distally (small gap without setae). Posterodorsal cusps of urosomites 1-2 more pointed than in *U. metungi*, with weak seta apically. Outer ramus of uropod 2 usually with lateral marginal setae or setules. Cuticle of telson lacking large scattered setules (at least any setules present few and small).

DESCRIPTION OF MALE.—Paratype male "e," 3.55 mm (South Australia): Head about 75% as long as wide, rostrum about 10% as long as remainder of head. Primary flagellum of antenna 1 with 7 articles, articles 2-4 with 2 aesthetascs each, articles 5-6 with 1 aesthetasc each; accessory flagellum 6-articulate. Facial formula of se-

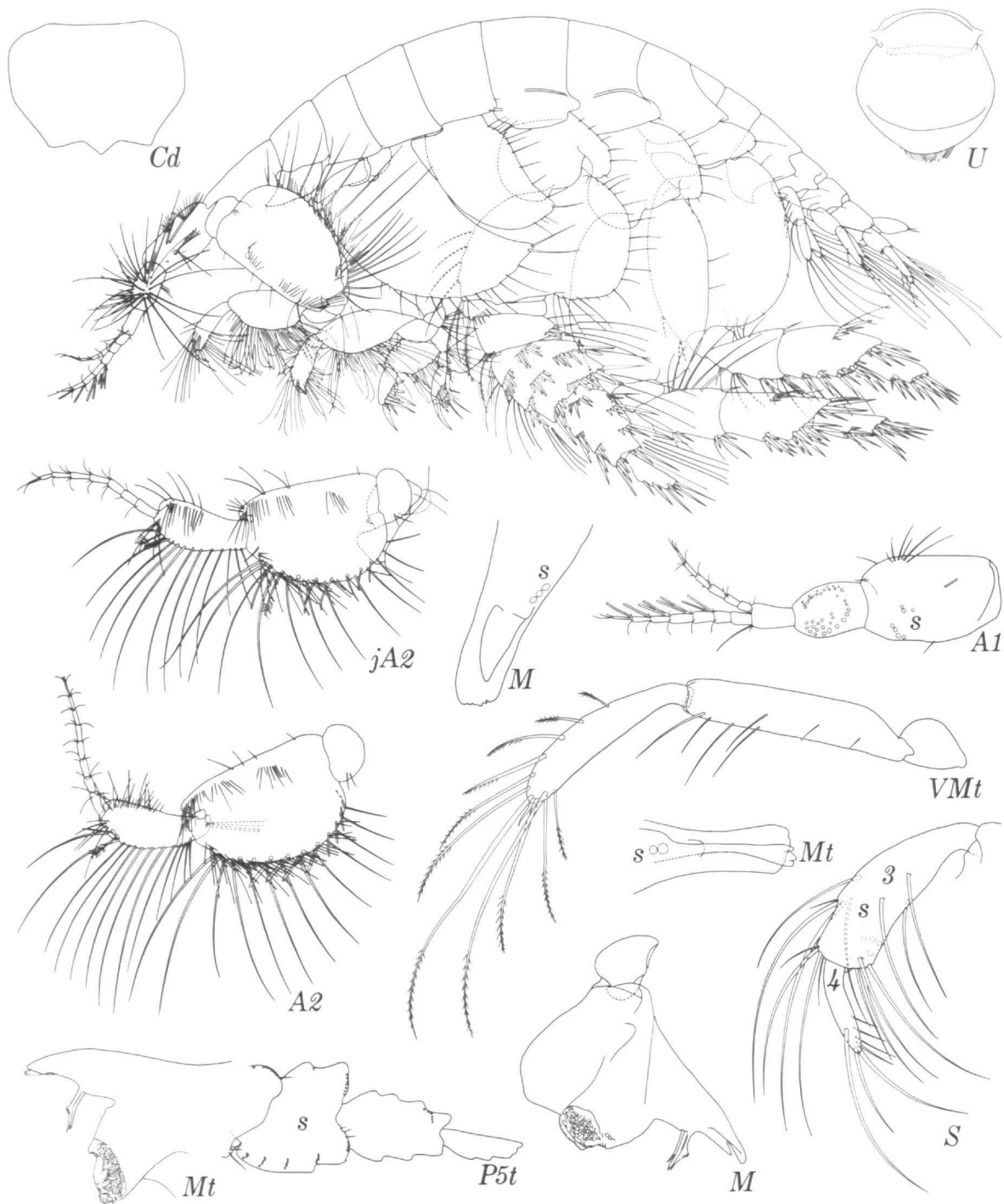


FIGURE 30.—*Urohaustorius halei* Sheard, paratype, male "e," 3.55 mm (*j* = paratype male "j," 3.38 mm).

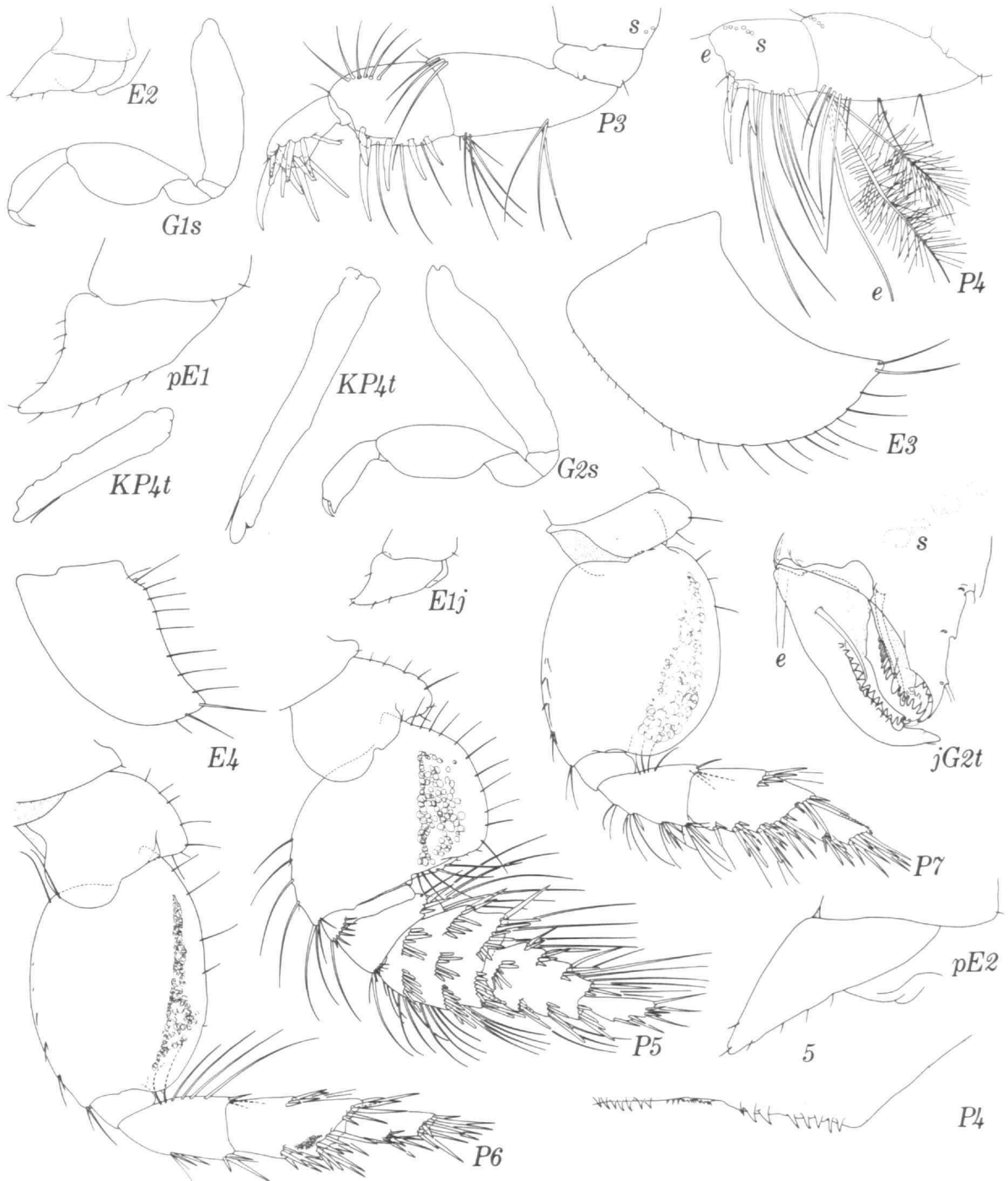


FIGURE 31.—*Urohaustorius halei* Sheard, paratype, male "e," 3.55 mm (*j* = paratype male "j," 3.38 mm; *p* = paratype female "p," 3.17 mm).

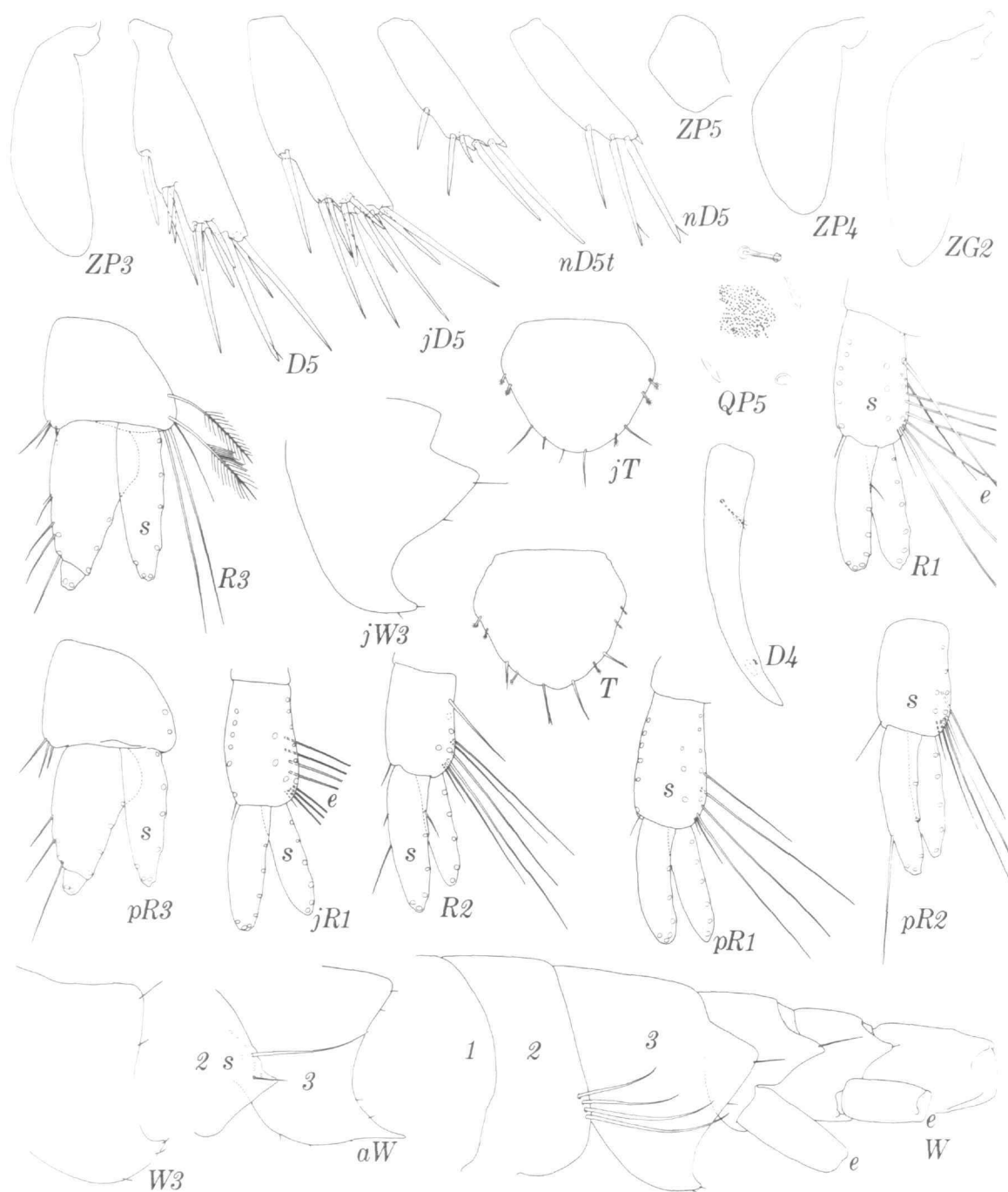


FIGURE 32.—*Urohaustorius halei* Sheard, paratype, male "e," 3.55 mm (*a* = female "a," 5.52 mm; *j* = paratype male "j," 3.38 mm; *n* = juvenile "n," 2.37 mm; *p* = paratype female "p," 3.17 mm; *Z* = gill).

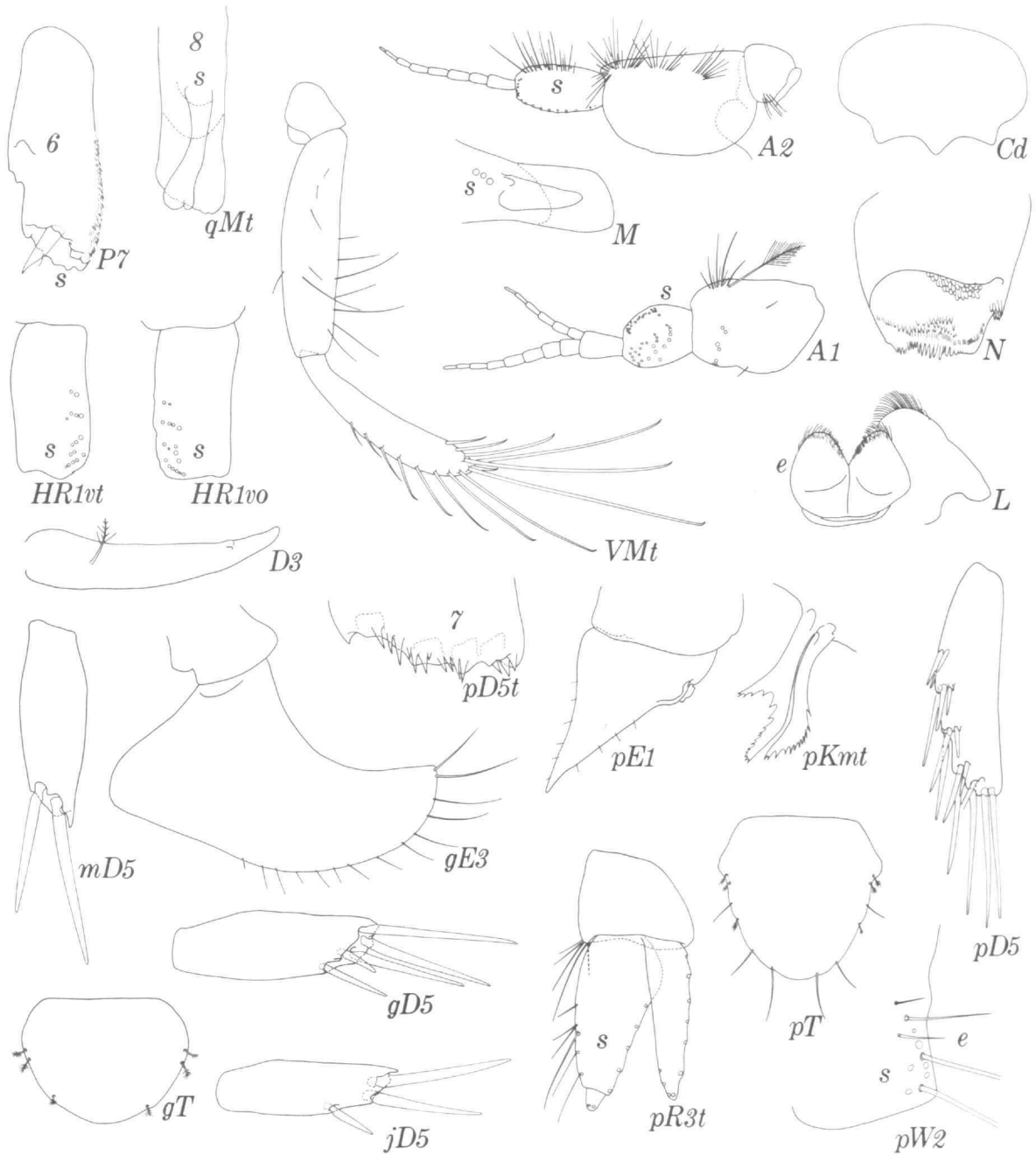


FIGURE 33.—Upper, *Urohaustorius metungi* Fearn-Wannan, male "t," 4.21 mm (*g* = female "gg," 4.03 mm; *j* = juvenile "j," 2.48 mm; *m* = juvenile "mm," 2.52 mm; *q* = paratype male "q," 3.87 mm). Lower, *Urohaustorius halei* Sheard, *p* = male "p," 6.73 mm.

tae on article 1 of antenna 1 = 6 + 1; on article 4 of antenna 2 = 10-7-15, on article 5 = 18; article 3 with 3 facial setae; flagellum with 8 articles. Right and left incisors simple, right lacinia mobilis trifold, left simple, choppers on molars with their several cusps welded together; formula on right and left palp article 3 = 7-1-3-1. Gland cones on lower lip absent. Inner plate of maxilla 1 with 1 short apical seta, 1 large apicomedial seta; outer plate with 11 spines. Inner plate of maxilla 2 with 6 setae in medial row. Inner plate of maxilliped with 7 medial setae, outer plate with 1 apicolateral seta; palp of article 2 with 7 setae in facial row, article 3 with 2 setae in facial row.

Coxa 1 broadly subtriangular, almost slipper-shaped; coxa 2 similar but apex not as attenuate; coxa 3 with 15 ventral setae mostly in posterior half, posterior margin naked; coxa 4 with 4 ventral and 11 posterior setae.

Setal and spine formulas on pereopod 3 = 3, 6, 2-1-1-1, 6 + 3 + 1; on pereopod 4 = 4, 6, 2-1-1, 5 + 4 + 1; posterior margin of article 5 with serrations of mixed sizes. Article 2 of pereopods 5-7 progressively with medium to sparse setal densities posteriorly; article 2 of pereopod 5 lacking mediofacial brush, dactyl with distal to proximal spine formula groups of 2-1-2-2-3-1.

Peduncular spine formulas of pleopods 1-3 = 2 and 1, 2 and 0, 2 and 1; segmental formulas = 20-14, 18-13, 17-14; basal setal formulas = 11-3-1-5, 6-1-3-3, 7-6-3-4.

Epimeron lacking tooth, with 4 setae in vertical posterior row; tooth of epimeron 3 small.

Lateral margin of peduncle on uropod 1 with 6 setae, extraordinary gap between ultimate and penultimate setae, apicolateral corner with 1 setule; of uropod 2 with only 1 apicolateral setule; dorsal setae = 3 and 3; setae of rami = 7-6 and 6-5, outer ramus of uropod 2 with 2 lateral setae additionally; inner rami extending 100% and 90% along outer. Apicolateral corner of peduncle on uropod 3 with 3 setae, medial margin naked, ventromedial apical row(s) with 7-8 setae; spine formula on lateral margin of article 1 on outer ramus = ee-e-Ee-Ee.

Telson about 1.1 times as wide as long, entire, setal formula = P, P, 1, P, 1.

Lateral and telsonic gland clusters not apparent (see female "a" for probable typical condition).

Paratype male "j," 3.38 mm (South Australia): Article 1 of antenna 1 with 7 setae in armament row, primary flagellum with 7 articles, accessory with 6. Formula in armament row on article 4 of antenna 2 = 6-5-16 (illus.), callus at joint between articles 4 and 5 not as strong as in paratype "e." Formula on right and left mandibular palp article 3 = 6-1-3-2; left lacinia mobilis also simple. Spine and setal formulas on pereopod 3 = 4, 5, 2-1-1, 6 + 3 + 1; on pereopod 4 = 4, 5, 2-1-1, 5 + 3 + 1. Right dactyl of pereopod 5 like male "e" but formula on left side = 2-1-2-2-2-1 (illus.). Epimeron 2 with 4 setae; tooth of epimeron 3 larger than paratype "e" (illus.). Peduncle of uropod 1 with 6 lateral setae (illus.), rami with 7 and 6 setae; outer ramus of uropod 2 with only 1 lateral seta. Telsonic setal formula like male "e" but telson less elongate. Pereonal sternite 6 with midventral hook.

Large male "g," 3.75 mm (Tasmania): Mouthparts not analyzed; Antenna 1 like male "e." Formula on article 4 of antenna 2 = 2-1-7-6-22; on article 5 = 20; medial surface of article 5 bearing fingerprintlike ridges on middle and apical calluses. Formula on article 6 of both pereopods 3-4 = 6 + 4 + 1. Formula on dactyl of pereopod 5 = 2-1-2-2-2-1-1. Setal formulas on rami of uropods 1-2 = 7-6 and 6-5.

Large male "w," 5.23 mm (New South Wales): Formula on dactyl of pereopod 5 = 3-2-2-2-3-2-1. Naked apicoposterior margin on article 4 of pereopod 6, typical of this species, longer than in illustration. Epimeron 2 with 5 setae (dorsalmost small); epimeron 3 with very long tooth as in *E. metungi* (like female "a," illus.). Setal formula on rami of uropods 1-2 = 9-7 and 8-7, outer ramus of uropod 2 with 4 lateral setae additionally; peduncle of uropod 1 with 6 lateral setae lacking extraordinary gap; of uropod 2 with 2 apicolateral setules; of uropod 3 with 4 apico-

lateral setae. Telsonic setal formula = P, P, 1, 1, P, 1.

Small male "r," 3.45 mm (Pambula Beach, NSW): About the size (3.45) of South Australian paratypes, with cusp of epimeron 3 better developed, though neither as long nor as straight as that on the very large specimens from New South Wales and Queensland ("a," illus.). Telsonic formula = P, P, 1, 1, P, 1.

Large male "pp," 6.73 mm (largest known specimen; Queensland): Armament formulas on article 1 of antenna 1 = 12 (no seta plumose); on article 4 of antenna 2 = 17-12-34; primary flagellum of antenna 1 with 10 articles, accessory with 9, flagellum of antenna 2 with 11 articles. Right mandibular incisor with 4 teeth, rakers unusual (illus.), formulas on right palp article 3 = 9-1-3-1, left = 7-1-3-1. Medial row on inner plate of maxilla 2 with 8 setae. Palp article 2 of maxilliped with 9 setae in facial row, article 3 with 2 and 1 additional apicomedia seta. Coxa 1 illustrated; coxa 2 also sharp. Spine and setal formulas on pereopod 3 = 4, 8, 2-1-1-1-1, 7 + 4 + 1, on pereopod 4 = 4, 8, 2-1-1-1-1-1, 7 + 4 + 1, posterior margin of article 4 with large tooth scales as on article 5 of younger specimens. Article 6 of pereopod 5 with 3 supernumary posterior spine groups instead of 1; formula on dactyl of pereopod 5 = 1-2-2-3-3-3-3 (illus.), also with marginal serrations on apex (illus.). Article 4 of pereopod 6 with large gap between last posterior seta and apex. Epimeron 2 with square posteroventral corner, face with 11 setae in 2 rows (illus.). Tooth of epimeron 3 large. Peduncle of uropod 1 with 8 lateral setae, extraordinary gap scarcely present, peduncle of uropod 2 with 1 apicolateral setule, dorsal setae = 4 and 1, setae of rami = 9-9 and 8-8, outer ramus of uropod 2 also with 3 lateral setae additionally. Peduncle of uropod 3 with 5 apicolateral setae and 3 large medial setae in tandem, otherwise see illustration (large medial setae omitted). Telson elongate (illus.) formula = 2P, 1, P, 1, 1.

DESCRIPTION OF FEMALE.—Paratype female "p," 3.17 mm (South Australia): Generally like male "e" with following variations: Armament

row of article 1 on antenna 1 = 5; of article 4 on antenna 2 = 2-6-5-17; on article 5 = 14. Primary flagellum of antenna 1 with 7 articles, accessory with 6 articles; flagellum of antenna 2 with 8 articles; article 4 of peduncle scarcely calloused.

Mouthparts not examined. Spine and setal formulas on pereopod 3 = 4, 5, 2-1-1, 5 + 4 + 1; on pereopod 4 = 4, 4, 2-1-1, 5 + 3 + 1. Brood plates normal, setose. Dactyl of pereopod 5 like male "e" but proximal spine shorter. Epimeron 3 like male "j" (elongate form), but ventral setule absent. Outer ramus of uropod 2 with 1 lateral seta at M. 75. Medium setal formula on lateral margin of article 1 on outer ramus of uropod 3 = e-Ee-Ee (illus.); ventral peduncular setae 6-7, none offset. Telson like male "j" but setae symmetrical.

Giant female "a," 5.52 mm (Queensland): Formula on dactyl of pereopod 5 = 3-2-2-2-2-2. Epimeron 2 with slightly produced posteroventral corner, with 9 setae in 2 rows (illus.); epimeron 3 with extremely elongate tooth (illus.). Peduncle of uropod 1 with 8 lateral setae lacking extraordinary gap, of uropod 2 with 1 apicolateral setule; dorsal setae = 3 and 1, setae of rami = 9-8 and 8-6, outer ramus of uropod 2 with 1 lateral seta additionally. Apicolateral corner of peduncle on uropod 3 with 3 setae. Telson unusually truncate apically, setal formula = P, P, 1, 1, P, 1, with inner glands with *U. metungi*.

Female "m," 4.12 mm (Queensland): Formula on dactyl of pereopod 5 = 3-2-3-1. Epimeron 2 with rounded posteroventral corner, with 9 setae in 2 cycles. Tooth of epimeron 3 elongate. Outer ramus of uropod 2 with 2 lateral setae. Brood plates with vestigial setae but internally showing next instar with normal setae.

Giant female "b," 5.72 mm (Queensland, specimen subsequently lost in transit): Outer ramus of uropod 2 with only 1 lateral seta positioned very apicad. Apicolateral corner of peduncle on uropod 3 with only 1 apicolateral seta.

DESCRIPTION OF JUVENILE (juvenile "n," 2.37 mm; Queensland).—Armament row on article 1 of antenna 1 = 3 long; primary and accessory flagella each with 6 articles. Spine and setal formulas of both pereopods 3-4 = 2, 4, 2-1-1, 5

+ 3 + 1. Dactyl of left pereopod 5 with 3 spines in tandem; of right side with formula of 1-1-2-1 (illus.).

Epimeron 2 with 2 setae; epimeron 3 well produced as illustrated for male "j." Peduncle of uropod 1 with 4 lateral setae, uropod 2 with 1 apicolateral setule, dorsal setae = 2 and 1, setae of rami = 5-4 and 4-4. Apicolateral corner of peduncle on uropod 3 with 1-2 setae. Telsonic formulas, right = P, P, 1, 1, P, left = P, P, P, 1.

TASMANIAN SPECIMENS.—Conforming well to paratypes of South Australia.

VICTORIAN SPECIMENS.—Conforming to paratypes.

NSW SPECIMENS.—Differing from those of South Australia in (1) much larger size (up to 5.0 mm) compared with 3.0+ mm; (2) much blunter and in largest specimens more heavily calcified coxa 1 with apex forming scoop; (3) narrower coxa 3 with distinctly sinuous apex; (4) leaf-shaped coxa 4, subtly distinct from paratypes; (5) more strongly setose lateral margin of outer ramus on uropod 2, with setae extending almost the entire length of the ramus; (6) more robust dactyls of pereopods 6-7; (7) more numerous setae elsewhere; (8) longer and more acute tooth of epimeron 3; (9) heavy armament of telson, asymmetrical in juveniles, symmetrical in larger adults.

QUEENSLAND SPECIMENS.—Conforming to *U. halei* diagnosis, except for enlarged tooth of epimeron 3, bridging gap between *metungi* and *halei*; much larger than paratypes and with (1) broader upper lip (also true of NSW); (2) broader, blunter coxae 2-4; (3) more robust dactyl of pereopods 6-7; (4) broader article 5 of pereopod 7; (5) weak beginning of division of setae into 2 groups; (6) longer, less upturned cusp on epimeron 3, with broader flatter sinus, thus closest to *U. metungi*.

LECTOTYPE.—SAM, originally designated in print as "type male 2.5 mm." Allotype female (C.2081) originally designated in print as "ovigerous type female, 1.9 mm."

TYPE-LOCALITY.—Sellick's Reef, Gulf of St. Vincent, South Australia, burrowing in sand on sandy patches on reef, M.M. Hale, Apl. (sic) 1936.

VOUCHER MATERIAL.—Paratypes (presumably from type-locality, newly labeled by us): male "e," 3.55 mm (illus.); male "j," 3.38 mm (illus.); female "p," 3.17 mm (illus.); female "q," 2.90 mm (measured by parabolic rather than straight-line method); Tasmania, Kingston Beach, 6 Feb 1975, T.M. Walker: male "g," 3.75 mm; MMD, Pambula Beach, NSW: male "r," 3.45 mm; AM P.23343: male "u," 5.04 mm; male "w," 5.23 mm; QM W.6386: female "a," 5.52 mm (illus.); female "m," 4.12 mm; juvenile "n," 2.37 mm (illus.); QM W.6384: female "b," 5.72 mm; QM W.6344: male "pp," 6.73 mm (illus.); QM 5508: male "nn" 4.91 mm.

RELATIONSHIP.—This species, together with *U. metungi* and *U. gunni*, form a group characterized by elongate inner rami of uropods 1-2, rounded epimeron 2 (except in huge seniles, and Queensland specimens), loss of tooth on dactyls of pereopods 3-4, thinness of armaments on antennae 1-2 and on apicolateral corner of peduncle on uropod 3, uncleft telson, poorly setose coxae 1-2 and lack of lateral spination on the peduncle of uropod 2, lack of lateral urosomal glands but the presence of glands in the telson. *Urohaustorius gunni* is easily recognized by the unusual, enlarged, and hooked coxa 1 and the spikes on pereonite 7 and coxa 7; however, *U. halei* and *U. metungi* are very difficult to segregate.

Generally *U. halei* differs from *U. metungi* in the doubling of spines on the dactyl of pereopod 5 and in the shorter tooth of epimeron 3. Large adults of *U. halei* often have the tooth of epimeron 3 almost as long as that of adults and juveniles of *U. metungi*. Presumably juveniles of *U. halei* (figure 32 "n", herein, from Queensland) have unpaired spines on the dactyl of pereopod 5. Juveniles from Queensland are almost as large as certain adults from Victoria, so that the distinctions will require an understanding of the instar sequences in various geographic areas. (See "Relationship" of *U. metungi*, page 102.)

Both species show variability in a number of characters for which only general discussion is needed. For example, the number of setae increases with body size in both species. Males of

both species have narrower dactyls on pereopod 5 than do females. Precise telsonic shapes vary from sample to sample and within samples.

MATERIAL.—South Australia, St. Vincent's Gulf, in sand on reef (holotype and many paratypes); Victoria, MMD samples, Back Beach, San Remo, Western Port (many), Wilson's Promontory, mouth of Tidal River (many); Tasmania, Walker sample, Kingston Beach, South end (2); New South Wales, HDWBS, 11 samples (22), 1 of these samples at Stockton Beach, 6 m, Nov 1975, 10 samples from 500 m E of Belmont Beach (offshore), 16 km S of Hunter River, 12–15 m, various transects, Aug 1975 to Feb 1976; MMD sample, Pambula surf beach (1); Queensland, 5 samples (42), 3 of these samples from Middle Banks, Moreton Bay, 1 from Moon Creek on Fraser Island and 1 from mouth of Noosa River, inside Noosa Bar, 12–15 m.

DISTRIBUTION.—South Australia, St. Vincent's Gulf to Moreton Bay, Queensland, littoral to 15 m, sand, sand and mud.

Urohaustorius vercoi Sheard

Urohaustorium vercoi Sheard, 1936:449, fig. 1 (part).

REMARKS.—The only specimen of this species we have found labeled as such in the South Australian Museum is called an "allotype" but it clearly is not the species Sheard described as *U. vercoi*; indeed it is not even in the genus *Urohaustorius*.

We have also looked in the Australian Museum, the Queensland Museum, the National Museum of Victoria, and the Western Australian Museum for Sheard's types, to no avail. Sheard's general amphipod materials became scattered even before his death, as shown by the fact that some of his specimens from South Australia have been found in the Australian Museum and the Western Australian Museum where he either sent or personally deposited them.

Urohaustorius vercoi is based on a skimpy description and figures, not enough to confirm its identity; however, the short inner rami of uropods

1–2, coupled with the elongate article 2 of gnathopod 2 and, we infer from Sheard's comparison to *U. halei*, an unclenched telson (or almost so if he did not notice a tiny invagination), suggests to us that the species lies near our new species, *U. pentinus*. However, Sheard (1936) noted or depicted the relative smallness of coxa 3 in comparison to coxa 4, and the strongly produced coxa 4 that would appear to be firm distinctions. The coxal sizes suggest our new genus and species, *Narunius tallerkus*, but the shape of coxa 4 and the proportions of rami of uropods 1–2 are not consistent with our species.

Urohaustorius metungi Fearn-Wannan

Figures 33 (part)–35

Urohaustorius metungi Fearn-Wannan, 1968:31–37, parts of figs. 1–3.

Diagnosis.—Dorsolateral armament rows on articles 1 and 2 of antenna 1 and article 4 of antenna 2 bearing only thin setae. Armament row on article 4 of antenna 2 even. Accessory flagellum not reduced. Main flagellar articles of male antenna 1 not thickened, aesthetascs 2 per article but usually absent on article 1, article 5 of male antenna 2 not bulbous. Coxa 1 not larger than coxa 2; both bearing only tiny setules. Spines on dactyl of pereopod 5 (usually) set singly in tandem. Dactyls of pereopods 6–7 vestigial. Article 2 of pereopod 7 with long posterodorsal setae and setules. Male sternites 5–6 each with ventral tooth. Epimeron 2 lacking cusp, commonly with 4 facial setae in vertical row. Tooth cusp of epimeron 3 huge. Inner rami of uropods 1–2 scarcely shorter than outer rami. Dorsolateral margin of peduncle on uropod 2 without spines. Apicolateral corner of peduncle on uropod 3 with thin seta(e); outer ramus with only setae laterally on article 1. Telson entire, bearing only penicillate setae.

ADDITIONAL CHARACTER.—Proximalmost seta in row on article 1 of antenna 1 plumose.

ADDITIONAL DIAGNOSIS DIFFERENTIATING THIS SPECIES FROM *U. halei*.—Apex of coxa 1 scarcely

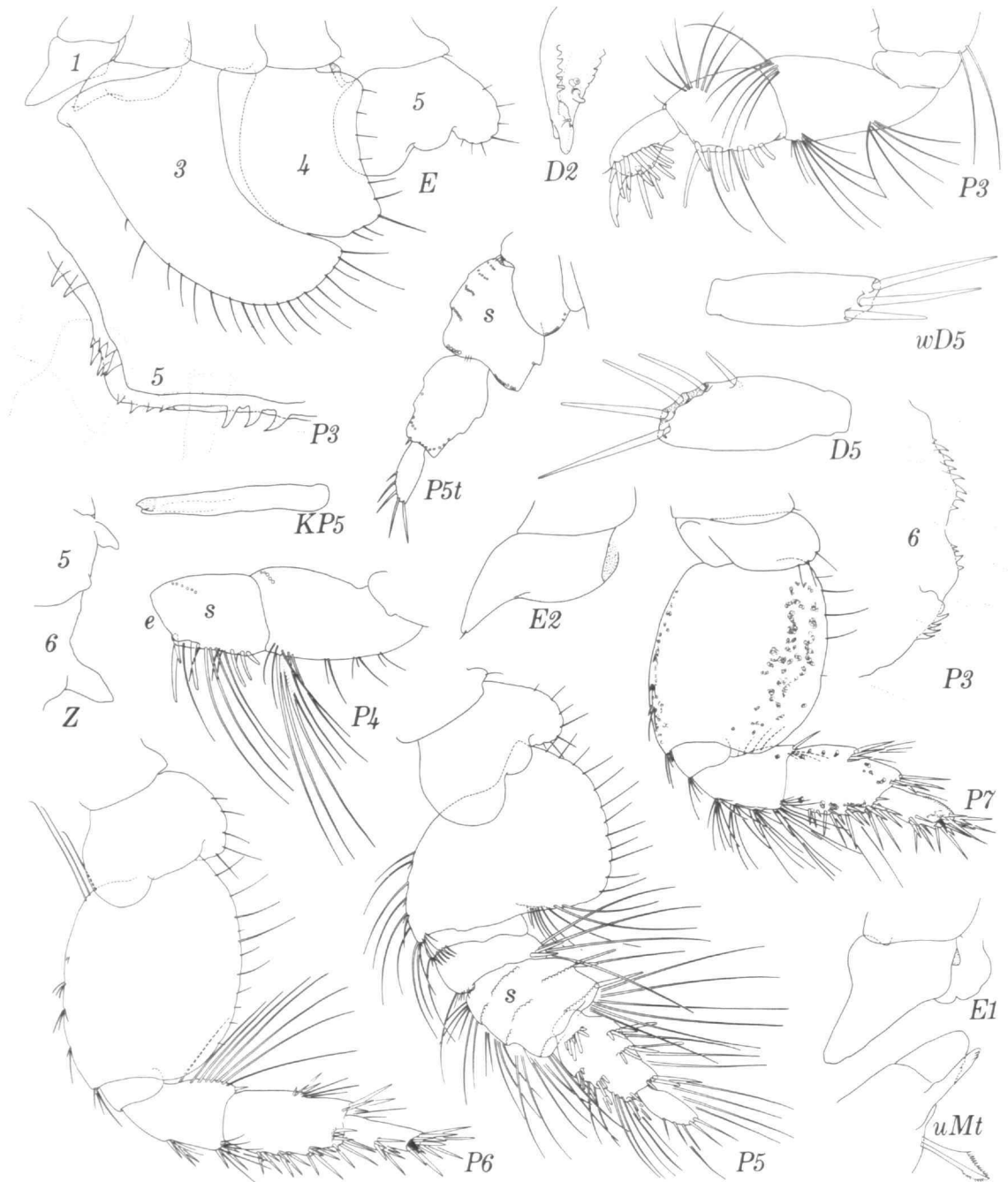


FIGURE 34.—*Urohaustorius metungi* Fearn-Wannan, male "t," 4.21 mm (*u* = male "u," 4.49 mm; *w* = female "w," 3.82 mm; *Z* = male sternites).

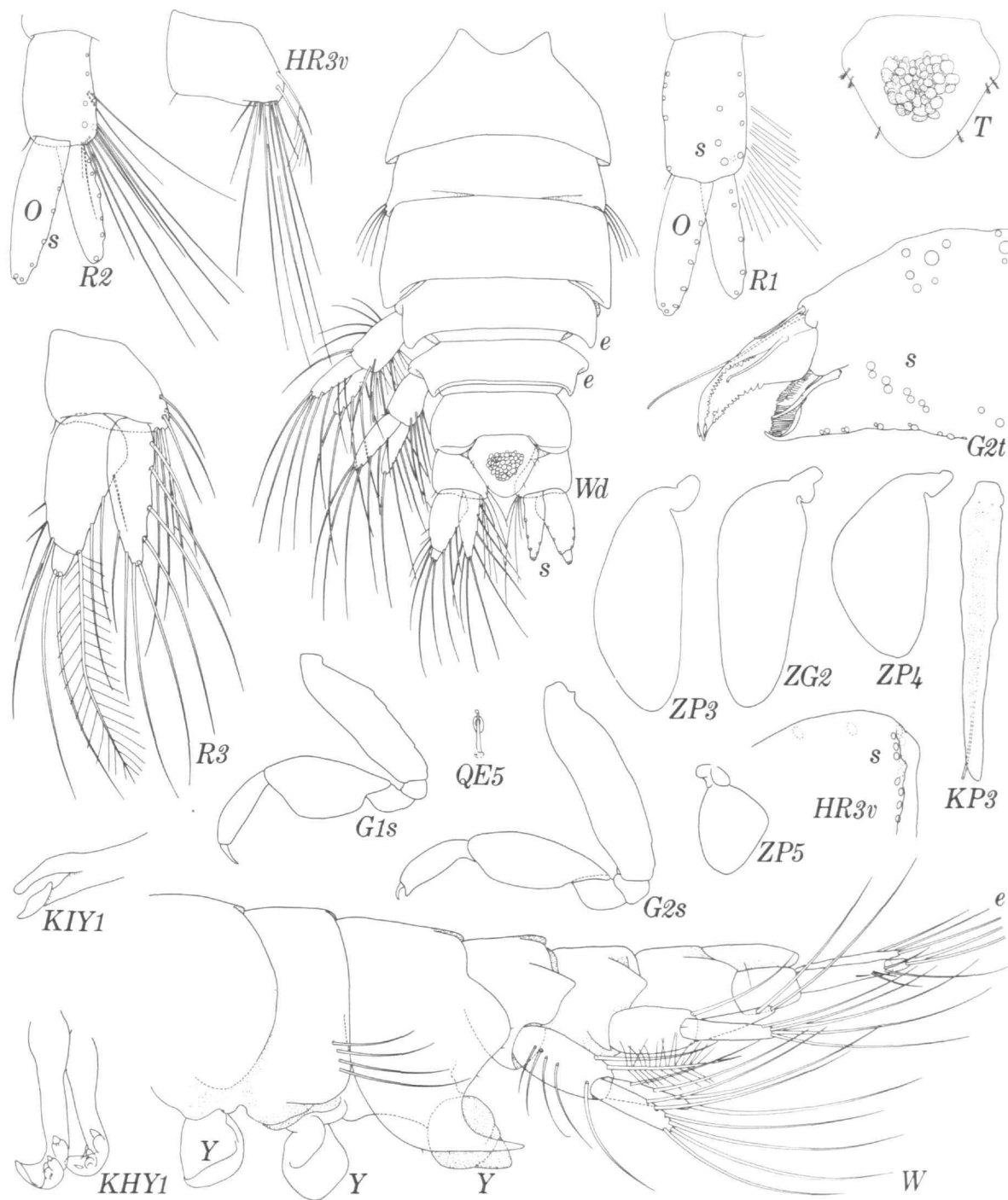


FIGURE 35.—*Urohaustorius metungi* Fearn-Wannan, male "t," 4.21 mm (Y = pleopod; Z = gill).

twisted or not. Coxae 3-4 broader than in *U. halei*, posteroventral apex of coxa 3 broad, not sinuous; posterior margin of coxa 4 concave; anterodistal corner of coxa 3 forming marked heel. Article 6 of pereopod 5 without supernumerary spine group posteriorly (commonly with 3 posterior and 3 anterior groups). Article 4 of pereopod 6 bearing setae continuously to apex. Posterodorsal cusps of urosomites 1-2 blunter than in *U. halei* and unarmed. Outer ramus of uropod 2 naked laterally. Cuticle of telson with scattered large setules varying from few in Victorian and most NSW specimens to many in some specimens from Queensland.

DESCRIPTION OF MALE.—Male "t," 4.21 mm (Mallacoota): Head 70% as long as wide, rostrum about 10% as long as remainder of head. Primary flagellum of antenna 1 with 8 articles, articles 2, 6-7 each with 1 aesthetasc, articles 3-5 with 2 each, accessory flagellum 6-articulate. Facial formula of setae on article 1 of antenna 1 = 1 plume and 9 other mixed setae; on article 4 of antenna 2 = 8-7-22; on article 5 = 16; article 3 with 5 facial setae; flagellum with 8 articles. Right and left incisors simple, right lacinia mobilis bifid, left simple, choppers on molars with their several cusps welded together, forming a cirlet of 13 badly worn cusps, formula on right palp article 3 = 9-1-4-1, on left = 9-1-3-1. Inner plate of maxilla 1 with 1 short apical seta, 1 large apicomедial seta; outer plate with 11 spines. Inner plate of maxilla 2 with 11 setae in medial row. Inner plate of maxilliped with 7 medial setae, outer plate with 1 apicolateral seta; palp article 2 with 7 setae in facial row, article 3 with 2 setae in facial row.

Coxa 1 broadly subtriangular; coxa 2 similar, apex somewhat more attenuate but not as sharp; coxa 3 with 19 ventral setae mostly in posterior half, posterior margin naked; coxa 4 with 3 ventral and 6 posterior setae.

Setal and spine formulas on pereopod 3 = 6, 6, 2-1-1-1-1, 7 + 4 + 1; on pereopod 4 = 5, 6, 2-1-1-1-1, 6 + 4 + 1; posterior margin of article 5 with interrupted groups and double groups of serrations. Article 2 of pereopods 5-7 progres-

sively with medium to sparse setal densities posteriorly; article 2 of pereopod 5 with mediofacial brush lacking or weakly developed, dactyl with 5 spines in tandem.

Pereonal sternites 5-6 each with midventral process.

Peduncular spine formulas of pleopods 1-3 = 2 and 1, 2 and 1, 2 and 1; segmental formulas = 22-16, 20-15, 18-17 (inner proliferate); basal setal formulas = 10-2-4-4, 9-1-4-4, 10-2-4-5.

Epimeron 2 lacking tooth, with 4 setae in vertical posterior row; tooth of epimeron 3 huge.

Lateral margin of peduncle on uropod 1 with 5 setae, extraordinary gap between ultimate and penultimate setae, apicolateral corner with one setule, of uropod 2 with only 1 apicolateral setule; dorsal setae = 3-4 and 2; setae of rami = 7-5 and 6-6; outer ramus of uropod 2 naked, inner rami extending 90% and 85% along outer. Apicolateral corner of peduncle on uropod 3 with 1 setule, medial margin with 2 long setae, ventromedial apical rows with 11 setae; spine formula on lateral margin of article 1 on outer ramus = 0, short setae = 1-1-0, medium setae = 0-1-1, long setae = 0-0-1.

Telson about 1.1 times as wide as long, entire, setal formula = 2P, P/2P, P.

Lateral gland clusters absent; telson with central gland cluster.

Paratype male "q," 3.87 mm (our designation from paratype lot, Lake King): Armament formula on article 1 of antenna 1 = 5; on article 4 of antenna 2 = 2-7-4-14; article 5 = 11; article 3 = 5. Formula on right and left mandibular palp article 3 = 7-1-3-1. Spine and setal formulas on pereopod 3 = 5, 6, 2-1-1, 5 + 3 + 1; same on pereopod 4 for last 2 numbersets. Dactyl of pereopod 5 with 4 spines. Peduncle of uropod 1 with 4 lateral setae; setae on rami of uropods 1-2 = 6-4 and 5-5. Inner ramus of uropod 3 with only 1 lateral and 3 medial setae, outer ramus lateral formula, short setae = e-Ee. Specimen like male "t" in other characters. Maxillipeds missing, pleopods and cuticle not examined, some spines on outer plate of maxilla 1 with more than 2 cusps.

Fearn-Wannan mentioned large eyes in male; paratype "q" shows eye capsules but no pigment.

Male "u," 4.49 mm (Mallacoota): Slightly better developed than male "t"; formula on right mandibular palp article 3 = 7-1-3-1. Formula on article 6 of pereopod 3 = 6 + 4 + 1; on pereopod 4 = 5 + 4 + 1. Epimeron 2 with 5 setae. Peduncle of uropods 1-2 each with 3 dorsal setae; setae on rami = 8-6 and 7-5.

Male "f," 4.39 mm (Tuross River, NSW): Like Victorian *U. metungi*, with 4 spines in tandem on dactyl of pereopod 5 and with elongate tooth on epimeron 3; dactyl of pereopod 5, however, not inflated.

DESCRIPTION OF FEMALE.—Female "w," 3.82 mm (Mallacoota): Generally like male but with following variations: Armament formulas on article 1 of antenna 1 = 6; on article 4 of antenna 2 = 5-4-13; on article 5 = 13; on article 3 = 4; flagellum of antenna 2 with 8 articles (flagella of antenna 1 imperfect). Spine formulas on articles 5 and 6 of both pereopods 3 and 4 = 2-1-1, 5 + 3 + 1. Dactyl of pereopod 5 with 3 spines in tandem (illus.). Brood plates normally setose. Epimeron 2 with 4 setae. Setae on rami of uropods 1-2 = 6-5 and 4-4. Lateral setal formula on article 1 of outer ramus = e-Ee. Lateral glands weakly developed in pleonites 3-6, peduncle and outer ramus of uropod 3, and strongly developed in telson.

Large female "h," 5.13 mm (Merimbula): Dactyl of pereopod 5 with 5 spines in tandem, most proximal very short. Epimeron 2 with 5 setae.

Female "a," 3.83 mm (Queensland, Maroochy River): Dactyl of pereopod 5 with 5 spines in tandem plus most proximal spine well disjunct.

Female "k," 4.66 mm (Merimbula): Dactyl of pereopod 5 thin (like *U. halei*), with 3 apical spines in tandem; telson almost as long as in male "pp" of *U. halei*.

Female "gg," 4.03 mm (Queensland): Smaller spine and setal counts; coxa 3 illustrated, variation also occurring in specimens of Victorian *U. metungi* and *U. halei*; dactyl of pereopod 5 formula = 1-1-2-1 (illus.), thus scarcely distinct from *U.*

metungi; epimeron 2 with 3 setae; tooth of epimeron 3 large; telson very short (illus.).

Juvenile female "mm," 2.52 mm (Queensland): Formula on dactyl of pereopod 5 = 1-1 (illus.). Epimeron 2 with 2 setae; tooth of epimeron 3 large. Peduncle of uropod 1 with 3 lateral setae, extraordinary gap present; dorsal setae of uropods 1-2 = 1 and 1; setae on rami = 4-3 and 3-2. Telson ordinary, shaped as in male "t" of Victorian *U. metungi* (bearing elongate tooth of epimeron 3).

DESCRIPTION OF JUVENILE (juvenile "j," 2.48 mm, Merimbula).—Dactyl of pereopod 5 with 2 apical and 1 anterior spines, all in tandem (illus.). Telson also elongate but apex truncate.

VARIATION IN SPINE DOUBLING.—About 10% of adults from New South Wales and Queensland show spine doubling on the dactyl of pereopod 5 (Table 1). Victorian specimens examined, including the holotype and paratype, do not. The data vaguely suggest that frequency of doubling increases towards Queensland and away from Victoria but is not statistically significant and must be reexamined from larger samples than we now have on hand.

Although in *U. halei* doubling occurs at 2 or more loci and trebling may occur at 1 or more loci, only 2 males of *U. metungi* (from Merimbula) show double doubling (2 loci doubled). All other examples are confined to a single locus, usually the secondmost proximal, and most frequently doubling occurs only on 1 side (either left or right pereopod 5).

Unfortunately specimens of *U. metungi* with doubled spination spoil what would otherwise be a facile way to distinguish this species from *U. halei*, at least in adult stages.

QUEENSLAND SAMPLES.—A degree of variation in individual size of adults was observed within samples and between samples but we have not been able to detect any further taxonomic divisions suggested by this allomorphy. Considerable variation in precise shape and setular equipment of the telson was also evident, shape ranging from quite tall (Noosa River) to broad and flattened (Serpentine Creek), though always with variation

TABLE 1.—Spine doubling on dactyl of pereopod 5 in *Urohaustorius metungi*

Location	No. of samples								Total doubling percentage
	Specimens	Males doubled 1 side	Males doubled 2 sides	Females doubled 1 side	Females doubled 2 sides	Males twice doubled	Females twice doubled		
<i>NSW</i>									
Merimbula	3	217	15	0	8	1	2	0	12
Tuross River	44	225	10	0	9	3	0	0	10
Georges River	3	41	4	1	2	4	0	0	27
Queens Lake	9	76	0	0	0	0	0	0	0
<i>Queensland</i>									
Jacksons Creek	4	104	3	0	2	0	0	0	5
Serpentine Creek	8	152	2	1	0	0	0	0	2
Noosa River	3	31	4	2	1	1	0	0	26
Maroochy River	3	11	1	0	0	0	0	0	9
Ninghi Creek	2	23	3	0	4	2	0	0	39
Culbottle River	2	7	2	1	1	0	0	0	57
<i>Totals</i>									
No. specimens		887							
Specimens doubling		88							
Percent doubling		10							

within samples. Specimens from QM W4499 (Serpentine Creek), with extremely broad flattened telson and very abundant subcuticular telsonic setules, intergrade through many stages to the Victorian holotype in which the telson is moderately tall and rounded and its setules small and sparse. Dactyls of pereopods 6 and 7 are more robust than in Victorian specimens and article 5 of pereopods 5 and 6 proportionally longer. Frequently the rami of uropod 2, particularly in males, appear to be less disparate in length than the rami of uropod 1.

TUROSS RIVER SAMPLES.—Compared with those from Queensland, Tuross River specimens tend to have a broader coxa 4, more heavily setose article 4 of pereopod 6 and a more attenuate cusp on epimeron 3. The shape of the telson

is commonly cordate compared with the more rounded forms from other samples.

MERIMBULA SAMPLES.—Telsons are extremely variable in shape.

HOLOTYPE.—NMV J.151, male, length unknown.

TYPE-LOCALITY.—Lake King, Tambo Bay.

VOUCHER MATERIAL.—Type-locality: paratype male “q,” 3.87 mm (illus.); QM W.4147: female “gg,” 4.03 mm (illus.); juvenile “mm,” 2.52 mm (illus.); AM P. 24906: male “f,” 4.39 mm; Malacoota Inlet, Hutchings and Kudenov coll., male “t,” 4.21 mm (illus.); same, Kudenov, first sample: female “w,” 3.82 mm (illus.); second sample: male “u,” 4.49 mm (illus.); AM, Merimbula 37B: female “h,” 5.13 mm; female “k,” 4.66 mm; juvenile “j,” 2.48 mm (illus.); QM W.4528: female “a,” 3.83 mm; and specimens from QM 5504 and 5531.

RELATIONSHIP.—At first this species was differentiated from *U. halei* by the undoubled spine sets on the dactyl of pereopod 5 coupled with the huge tooth of epimeron 3; but the first distinction was found to be false in a significant number of specimens and the second too difficult to practice with sure results. A very careful study was made hundreds of specimens that showed that the following characters reliably distinguish *U. metungi* from *U. halei*: (1) the plumose condition of the proximal seta in the main setal row of article 1 on antenna 1; (2) the lack of a small distal gap in the posterior setation of article 4 on pereopod 6; and (3) the absence of marginal nonpenicillate setae on the telson (only penicillate setules are present, whereas *halei* bears these penicillate setules plus ordinary simple setae). In addition, males of *metungi* have 2 blunt sternal teeth, 1 each on pereonites 5 and 6, whereas *halei* has only 1 curved pointed tooth on pereonite 6.

By dividing the species on these points, the confusion about spine doubling on the dactyl of pereopod 5 in a small percentage of *metungi* appears to be clarified: no doubling was found in type material of *metungi*, whereas infrequent doubling was found in NSW and Queensland specimens, mainly on either right or left sides and

usually just in the second most proximal spine set; but on both sides together in only 16 specimens.

MATERIAL.—Victoria, Lake King, holotype and paratypes; Mallacoota, Hutchings and Kudenov coll. (5), MMD coll. (30+). NSW, AM, Merimbula, Day and Kudenov coll., 3 samples (217); Tuross River, Eurobodalla Shire Estuary Survey, 44 samples (341); Pittwater, 2 samples (2); Wallaga Lake (1); EBS, Georges River, 5 samples (42); Queen's Lake, 9 samples (76); Queensland Museum, 24 samples (316).

DISTRIBUTION.—Victoria, Gippsland Lakes to Moreton Bay, Queensland, intertidal estuarine.

Urohaustorius gunni, new species

FIGURES 36, 37

DIAGNOSIS.—Dorsolateral armament rows on articles 1 and 2 of antenna 1 and article 4 of antenna 2 bearing only thin setae. Armament row on article 4 of antenna 2 even. Accessory flagellum not reduced. Main flagellar articles of male antenna 1 [unknown], aesthetascs [unknown], article 5 of male antenna 2 [unknown]. Coxa 1 much larger than coxa 2, extended ventrally and hooked forward, both coxae bearing only tiny setules. Spines on dactyl of pereopod 5 usually set singly in tandem, but occasionally in pairs. Dactyls of pereopods 6–7 vestigial. Article 2 of pereopod 7 sparsely armed posteriorly. Male sternites 5–6 [unknown]. Epimeron 2 lacking tooth, with about 6 facial setae in vertical row. Tooth of epimeron 3 small. Inner rami of uropods 1–2 about as long as outer rami. Dorsolateral margin of peduncle on uropod 2 without spines. Apicolateral corner on peduncle of uropod 3 with thin setae, outer ramus with only setae laterally on article 1. Telson entire [apical setae not diagnostic].

ADDITIONAL CHARACTERS.—Article 3 of antenna 2 with dorsoventral cusp; coxa 7 with spike.

DESCRIPTION OF FEMALE.—Holotype female "i," 5.37 mm (New South Wales): Head almost 75% as long as wide, rostrum about 18% as long

as remainder of head, sharp. Article 1 of antenna 1 with 8 (6) very fine dorsofacial setae, penicillates absent; article 2 with 3 long distal fine setae in addition to numerous strong plumose setae; primary flagellum 8-articulate, aesthetasc formula = 0, 0, 1, 2, 2, 1, 1, 0; accessory flagellum 7-articulate. Article 3 of antenna 2 with 4 facial setae and large sharp dorsal cusp; facial formula on article 4 = PE-P-14E-3E-8E-20E+, in several irregular rows submarginally; article 5 about 46% as wide as long, 62% as long as article 4, facial armament consisting of many submarginal setae, and a slightly disjunct set of 5 similar apicals, stout spines absent; flagellum with 9 articles. Right and left incisors weakly bifid, right lacina mobilis bifid, left simple, choppers on molars forming only simple hump; formula on right and left palp article 3 = 9-1-3-1. Inner plate of maxilla 1 with 1 short apical seta, 1 large apico-medial seta; outer plate with 11 spines, some with 3 side teeth. Inner plate of maxilla 2 with 8 setae in medial row. Inner plate of maxilliped with 7 medial setae, outer plate with 1 apicolateral seta, palp article 2 with 9 setae in facial row, article 3 with 2 setae in facial row.

Coxa 1 extended deeply and hooked forward; coxa 2 broadly subrectangular; coxa 3 with 22 ventral setae mostly in posterior half, posterior margin naked; coxa 4 with 7 ventral and 30+ posterior setae, mostly short. Apex of gnathopod 2 as illustrated for *U. metungi*.

Setal and spine formulas on pereopod 3 = 5, 8, 2-1-1-1-1-1, 7 + 4 + 1; on pereopod 4 = 5, 7, 2-1-1-1-1, 7 + 4 + 1, spines exceptionally smooth; posterior margin of article 5 with even, weakly interrupted serrations. Article 2 of pereopods 5–7 progressively with medium to sparse setal densities posteriorly, filled with leached glandular tissue (not shown in Illustrations), article 2 of pereopod 5 lacking mediofacial brush, dactyl spine formula = 1-1-3-1-1-1-1, article 2 of pereopod 7 with unusual sharp bevel postero-ventrally, posterior margin with 1 fine proximal seta and 2 setules. No sternal process present on pereonite 6. Brood plates normally setose.

Peduncular spine formulas of pleopods 1–3 =

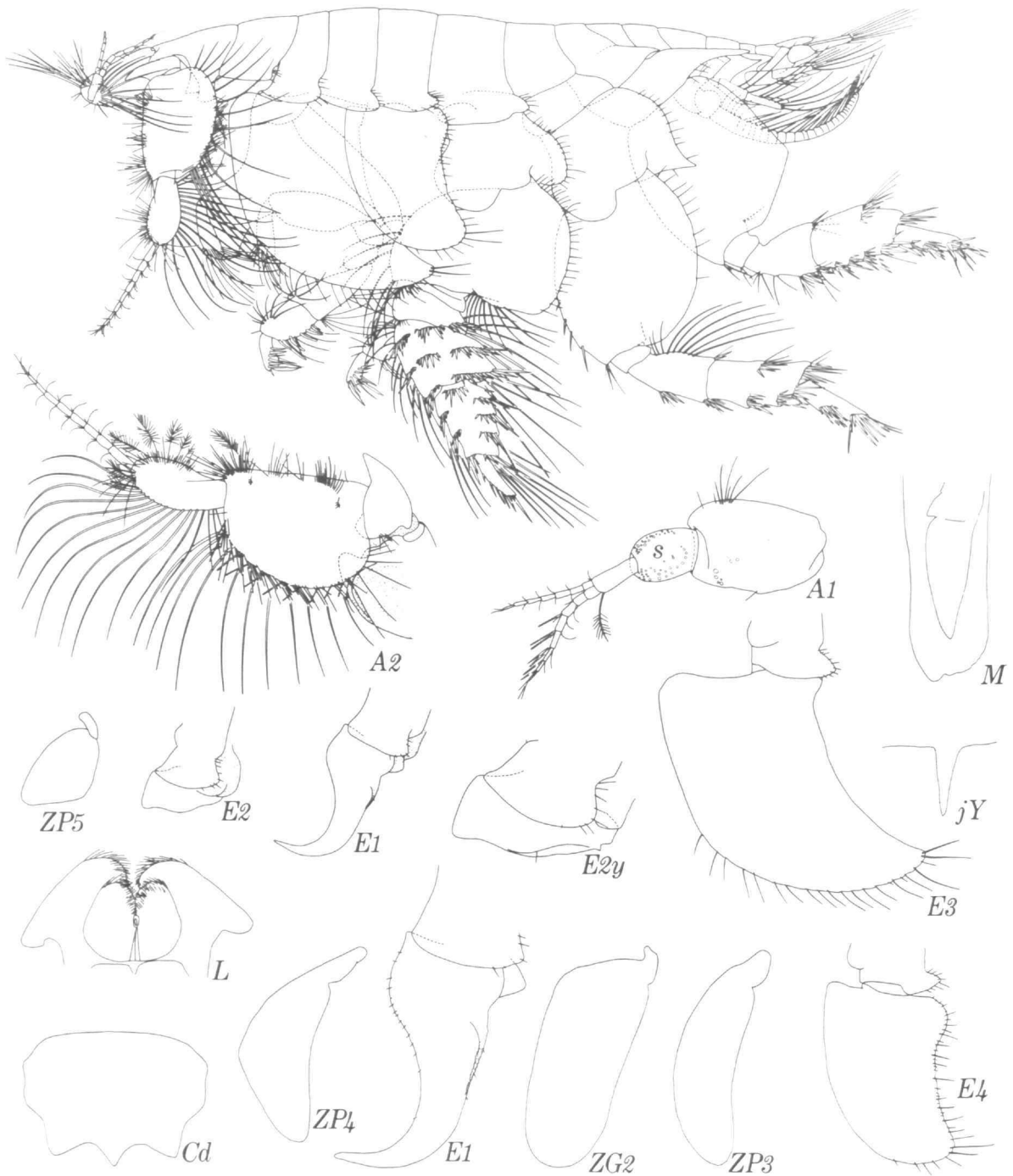


FIGURE 36.—*Urohaustorius gunni*, new species, holotype, female "i," 5.37 mm (*j* = young female "j," 3.66 mm; Y = sternal spike; Z = gill).

2 and 1, 2, and 0, 2 and 0; segmental formulas = 24-18, 21-13, 21-17; basal setal formulas = 15-3-5-4, 9-3-4-2 (or 8-1-3-1), 10-2-4-4.

Epimeron 2 lacking tooth, with 6 setae in vertical row directly on posterior margin; tooth of epimeron 3 small. Peduncle of uropod 1 about half as wide as long, subequal to or slightly longer than outer ramus, lateral margin with 8 setae, extraordinary gap between ultimate and penultimate setae, apicolateral corner with 1 setule; peduncle of uropod 2 much shorter than outer ramus, less than twice as wide as long, with only 1 apicolateral setule; dorsal setae = 3 and 2; setae of rami = 9-8 (or 7) and 8-6, outer ramus of uropod 2 with 2 lateral setae additionally; inner rami extending 100% and 98% along outer. Apicolateral corner of peduncle on uropod 3 with 3 setae, medial margin with 2 large setae in tandem, ventromedial apical rows with 12 setae; setal formula on lateral margin = ee-e-ee-Ee-Ee-Ee.

Telson about 1.15 times as wide as long, entire, setal formula = 2P, 2, P, 1.

Lateral and telsonic gland clusters not apparent.

Young female "j," 3.66 mm (New South Wales): Armament formulas on article 1 of antenna 1 = 5; on article 4 of antenna 2 = P, P, P7E-3E-4E-P7E-7E, in double row. Article 5 of antenna 2 long and ovoid, 45% as wide as long, 70% as long as article 4, facial armament = 17E + 6E apically; primary and accessory flagella of antenna 1 each with 7 articles on 1 side or 8 and 6 on the other, flagellum of antenna 2 with 9 articles. Formulas of mandibular palps = 7-1-3-1. Spine and setal formulas of pereopod 3 = 4, 6, 2-1-1-1-1, 7 + 3 + 1; of pereopod 4 = 4, 6, 2-1-1-1-(1), (6-7) + 4 + 1. Dactyl of pereopod 5 with 7 spines. Epimeron 2 with 4 setae. Uropod 1 with 6 lateral setae, gap weak, dorsal setae of uropods 1-2 = 3 and 1-2, setae of rami = 6-7 and 6-6. Peduncle of uropod 3 with only 2 apicolateral setae, ventrally with 8-9. Coxae, epimera, and pereopods checked, mouthparts not studied. Telsonic formula = 2P, 1, P, 1 on left side, right like holotype. Pereonite 6 with ventral spike (illus.).

Female "h," 4.10 mm: Sternal spikes absent.

HOLOTYPE.—AM P.23342, ovigerous female "i," 5.37 mm (illus.).

TYPE-LOCALITY.—16 km south of Hunter River, 500 m east of Belmont Beach, New South Wales, 33°02'36" S, 151° 40'56" E, 22 Aug 1975, 12 m, sand.

VOUCHER MATERIAL.—AM P.24926, female "h," 4.10 mm; AM P.23335, young female "j," 3.66 mm (illus.).

RELATIONSHIP.—This species appears to be an advancement from the *U. halei-metungi* group, in which coxa 1 has been grossly modified into a slipper spike and coxae 6-7 plus pereonite 7 are produced sharply posteriorly into extended alae. Epimeron 3 is unusual in the extreme loss of lateral definition, and the very close position of the setae to the posterior margin. Article 3 of antenna 2 is cuspidate dorsally. Article 2 of pereopod 7 is of very unusual shape.

MATERIAL.—HRDWB, 4 samples (4).

DISTRIBUTION.—New South Wales, 4-16 km south of Hunter River, 10-15 m (about 500-1500 m offshore), sand.

Gheegerus, new genus

DIAGNOSIS.—Rostrum weak. Peduncle of antenna 1 short, stout, articles 2 and 3 of peduncle progressively shortened, weakly geniculate; primary flagellum elongate, accessory flagellum somewhat shortened. Antenna 2 of haustorius form, article 4 expanded, article 5 small, articles 4-5 with facial armaments, article 4 with long ventral setae and subventral clusters of bifid setae. Aesthetascs simple. Mandibular incisors extended, thin, poorly toothed; right and left laciniae mobiles not alike; rakers usually serrate, 2 on right mandible, 3 on left; molar broad and bulky, not strongly extended, with weak triturative surface, with cuspidate accessory chopper; setae of palp article 3 awned. Mandibular lobes of lower lip well developed. Inner plate of maxilla 1 small, slender, poorly setose, outer plate with 11 spines; palp shortened, uniarticulate, palpar setae attached in 2 sets. Inner plate of maxilla 2 with weakly submarginal oblique row of setae.

Maxillae and maxillipeds lacking baler lobes. Outer plate of maxilliped with spines, palp article 2 expanded, article 3 elongate, dactyl clavate, multisetose.

Coxae 1–2 small, somewhat similar, subrectangular, well setose; coxa 3 much smaller than coxa 4, adze-shaped, posteroventrally extended; coxa 4 large, not posteroventrally extended, weakly excavate posterodorsally; only coxae 2–5 with simple gills; brood plates 4 pairs, slender.

Gnathopods small, dissimilar, gnathopod 1 simple, gnathopod 2 weakly chelate (parachelate), wrists elongate, hand of gnathopod 2 weakly mitelliform. Dactyls of pereopods 3–7 distinguishable, those of pereopods 3–5 large, of pereopods 6–7 vestigial; dactyl of pereopod 5 large and spinose. Article 2 of pereopods 5–7 expanded; pereopod 5 of haustorius form; distal articles of pereopods 6–7 not underslung, only moderately widened, pereopods 6–7 otherwise similar, weakly dominating pereopod 5.

Peduncles of pleopods short, wider than long, pleopod 2 inferior, inner rami moderately shorter than outer. Epimeron 1 scarcely differentiated, epimeron 2 dominantly setose. Urosomite 1 scarcely produced and poorly setose ventrally. Rami of uropods 1–2 linguiform, inner rami reduced, setose marginally; peduncle of uropod 1 strongly setose laterally, of uropod 2 naked or weakly setose laterally. Uropod 3 of ordinary form, outer ramus dominant and biarticulate, article 2 with 2 large apical setae. Telson short, broader than long, entire.

DESCRIPTION.—Eyes indistinct, ocular glands visible. Dorsolateral surface of article 1 on antenna 1 furnished with longitudinal row of armaments; article 2 densely setose dorsolaterally, groups distinguishable; article 3 poorly setose. Article 3 of antenna 2 short, poorly setose, flagellum much longer than article 4 of peduncle. Upper lip especially broad.

Right lacinia mobilis linguiform, left broader and bifid; article 3 of mandibular palp shorter than article 2. Lower lip with 1 cone on each outer lobe. Inner plate of maxilla 1 with 1 short apical and 1 large apicomedia setae; spines on

outer plate 11, mostly bifid. Inner plate of maxilliped with 2 stout, apical spines. Coxae 1–2 well setose. Gill 2 dominant, gill 5 about as large as anterior lobe of coxa 5. Gnathopods 1–2 bearing medial surficial button combs.

Pereopods 3–4 lacking secondary facial rows of spines on article 5.

Uropods 1–2 with huge dorsal setae on peduncles, rami lacking basoventral setae, medial margins of peduncles heavily setose. Telson with mid-apical seta (unusual).

TYPE-SPECIES.—*Gheegerus garbaisi*, new species.

COMPOSITION.—Unique.

REMARKS.—Antennal flagellar setae appear to be apically dilated, though not to such a marked degree as those of *Narunius*. Oil-immersion microscopy does not magnify the elements adequately for analysis.

RELATIONSHIP.—The small coxa 3 and large coxa 4 distinguish this genus from *Urohaustorius*. The untoothed epimeron 2 with vertical row of setae, uncleft telson and vestigial dactyls of pereopods 6–7 suggest an affinity with the group of species in *Urohaustorius* containing *U. halei*, *U. metungi*, and *U. gunni*. *Gheegerus* also differs from those species in the short inner rami of uropods 1–2 and the unusual presence of a midapical dominant seta on the telson. The broad upper lip of *Gheegerus* occurs in some species of *Urohaustorius*, especially in large specimens.

Gheegerus differs from *Bumeralius* in the presence of dactylar spines on pereopod 5 and the absence of basoventral setae on the outer rami of uropods 1–2.

A close affinity to *Narunius* is seen in the conformation of coxae 3–4 but *Narunius* bears special paddle-shaped antennal setae and narrowed article 2 of pereopods 6–7.

Tuldarus and *Tottungus* lack dactylar spines on pereopod 5; have coxa 3 dominant; and all setae on the palp of maxilla 1 are fully apical.

The diagnosis of the type-species follows that in *Urohaustorius* for comparative value.

***Gheegerus garbais*, new species**

FIGURES 38, 39

DIAGNOSIS.—Dorsolateral armament rows on articles 1 and 2 of antenna 1 and article 4 of antenna 2 composed of thin setae. Coxa 1 not larger than coxa 2, both bearing medium setae. Generic attributes in coxae 3 and 4. Spines on dactyl of pereopod 5 set singly in tandem. Dactyls of pereopods 6 and 7 vestigial. Epimeron 2 rounded, with several facial setae in vertical row. Tooth of epimeron 3 of medium size. Inner rami of uropods 1 and 2 much shorter than outer rami. Dorsolateral margin of uropod 2 peduncle naked or with thin setae. Apicolateral corner on peduncle of uropod 3 with thick spines. Telson entire, very broad, bearing dominant midapical seta.

DESCRIPTION OF FEMALE.—Holotype female "w," 2.42 mm (Victoria): Head about 75% as long as wide, rostrum about 10% as long as remainder of head. Primary flagellum of antenna 1 with 6 articles, formula of long aesthetascs = 0-1-1-1-1-0, accessory flagellum 5-articulate, thin, shortened. Facial formula of elongate setae on article 1 of antenna 1 = 5E, 3P; of shorter elements on article 4 of antenna 2 = PE-PE-2E-4E (first 2 sets ventrad); on article 5 = 10E; article 3 with 3 facial setae; flagellum with 6 articles. Right and left incisors weakly bifid, choppers on molars with 4 cusps; formula on right palp article 3 = 10-1-3-1, on left = 9-1-3-1. Inner plate of maxilla 1 with 1 medium apical seta, 1 large apicomedial seta; outer plate with 11 spines. Inner plate of maxilla 2 with 4 medial setae in submarginal row, outer plate with 1 stout and 1 small apicolateral setae. Inner plate of maxilliped with 4 medial setae, outer plate with 1 apicolateral seta; palp article 2 with 5 setae in facial row, article 3 with 2 setae in facial row, dactyl with 3 long setae, apical, apicolateral, and apicomedial, inner margin naked or with 1 setule.

Coxa 1 softly rounded apically, with 10 medium to short setae; coxa 2 rectangular, with 8 setae; coxa 3 with 5 long posteroventral setae, 3 shorter posterior setae and 7 medium to short

ventral setae anterior to elongate group; coxa 4 with 8 medium ventral setae, 8-9 mixed posterior setae.

Setal and spine formulas on pereopod 3 = 4, 6, 2-1-1-1, 5 + 3 + 1; pereopod 4 = 4, 6, 2-1-1, 5 + 3 + 1, margins lacking serrations. Article 2 of pereopods 5-7 moderately setose posteriorly, article 2 of pereopod 5 lacking mediofacial brush, dactyl with 4-5 spines in tandem.

Peduncular spine formulas of pleopods 1-3 = 2 and 1, 2 and 0, 2 and 1; segmental formulas = 16-10, 12-9, 14-13 (inner proliferate); basal setal formulas = 12-2-2-3, 7-1-1-1, 9-2-2-3.

Epimeron 2 with 4 setae in vertical posterior row.

Lateral margin on peduncle of uropod 1 with 3 setae, apicolateral corner with 1 setule, of uropod 2 with 1 long seta and 1 setule both apicolateral, dorsal setae = 1 and 1, setae of rami = 6-2 and 6-2, inner rami extending 46% and 56% along outer. Apicolateral corner of peduncle on uropod 3 with 2 spines, medial margin naked, ventromedial apical row with 6 mixed setae; lateral marginal formula of article 1 on outer ramus = Ee.

Telson about 1.33 times as wide as long, uncleft, with midapical seta (unusual), lateral formula = P, P, P.

Gland clusters not apparent in urosome or pereopods 5-7.

Female "g," 2.28 mm: Article 1 of antenna 1 with 5 long setae and 1 penicillate; primary flagellum with 6 articles, aesthetasc formula = 0-1-2-1-1-0. Formula on article 4 of antenna 2 = P-P-PE-PE-4E; article 5 = 4E, 5E (and 5 in apical vertical row); flagellum with 6 articles. Peduncle of uropod 1 with 3 lateral setae; of uropod 2 with 1 thin lateral seta and 1 apicolateral seta; setae of rami = 6-2 and 6-2. Telsonic formula = 1 midapical seta and 1, 1, P, P, P, or 1, P, P, P, (illus.).

Female "p," 2.12 mm: Formula on article 4 of antenna 2 = PE-PE-PE-4E. Article 1 on outer ramus of uropod 3 with additional lateral seta. Telsonic formula = apical seta and 1, P, P, P.

DESCRIPTION OF JUVENILE (juvenile "z," 2.11

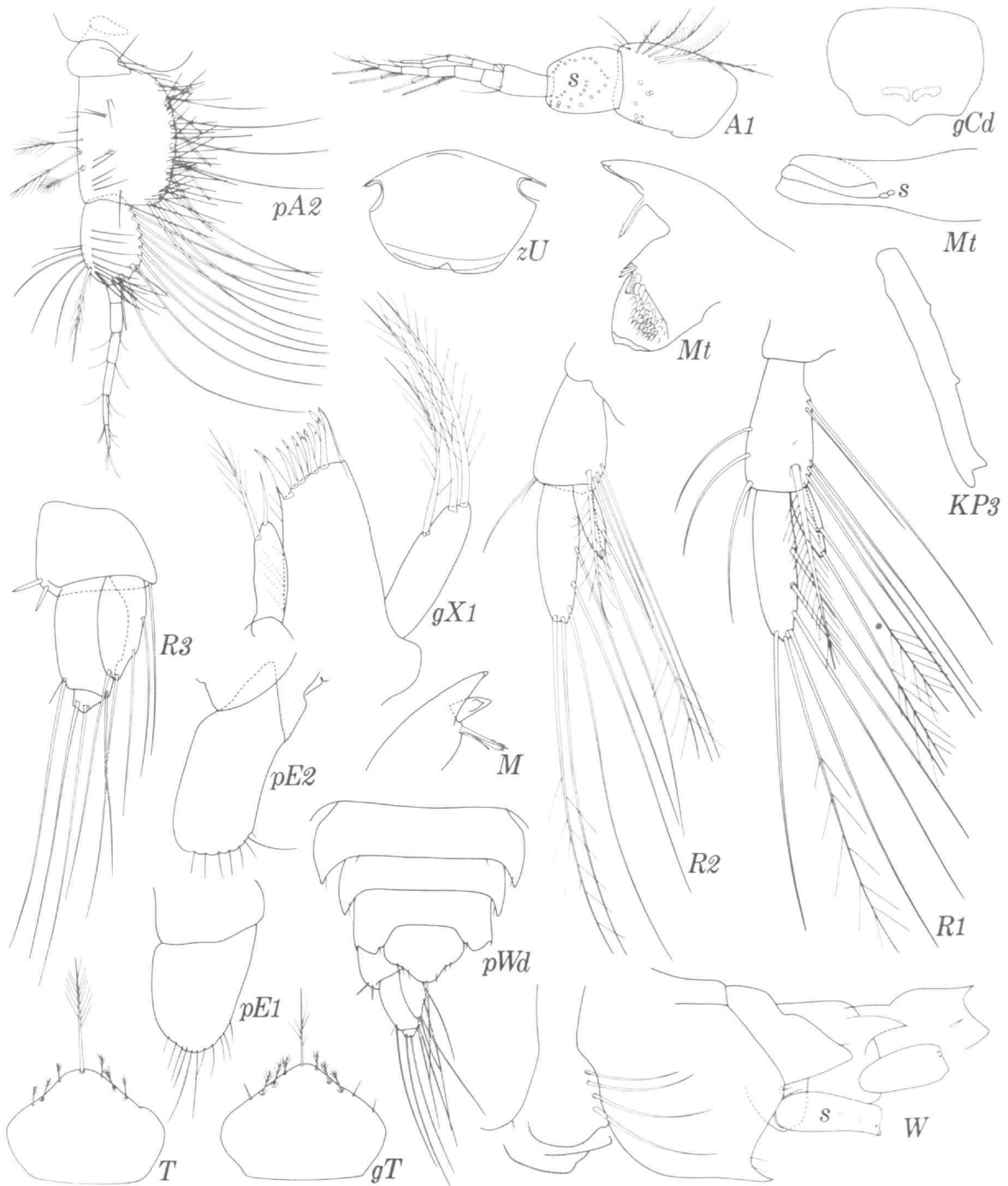


FIGURE 38.—*Gheegerus garbanius*, new species, holotype, female "w," 2.42 mm (*g* = female "g," 2.28 mm; *p* = female "p," 2.12 mm; *z* = juvenile "z," 2.11 m).

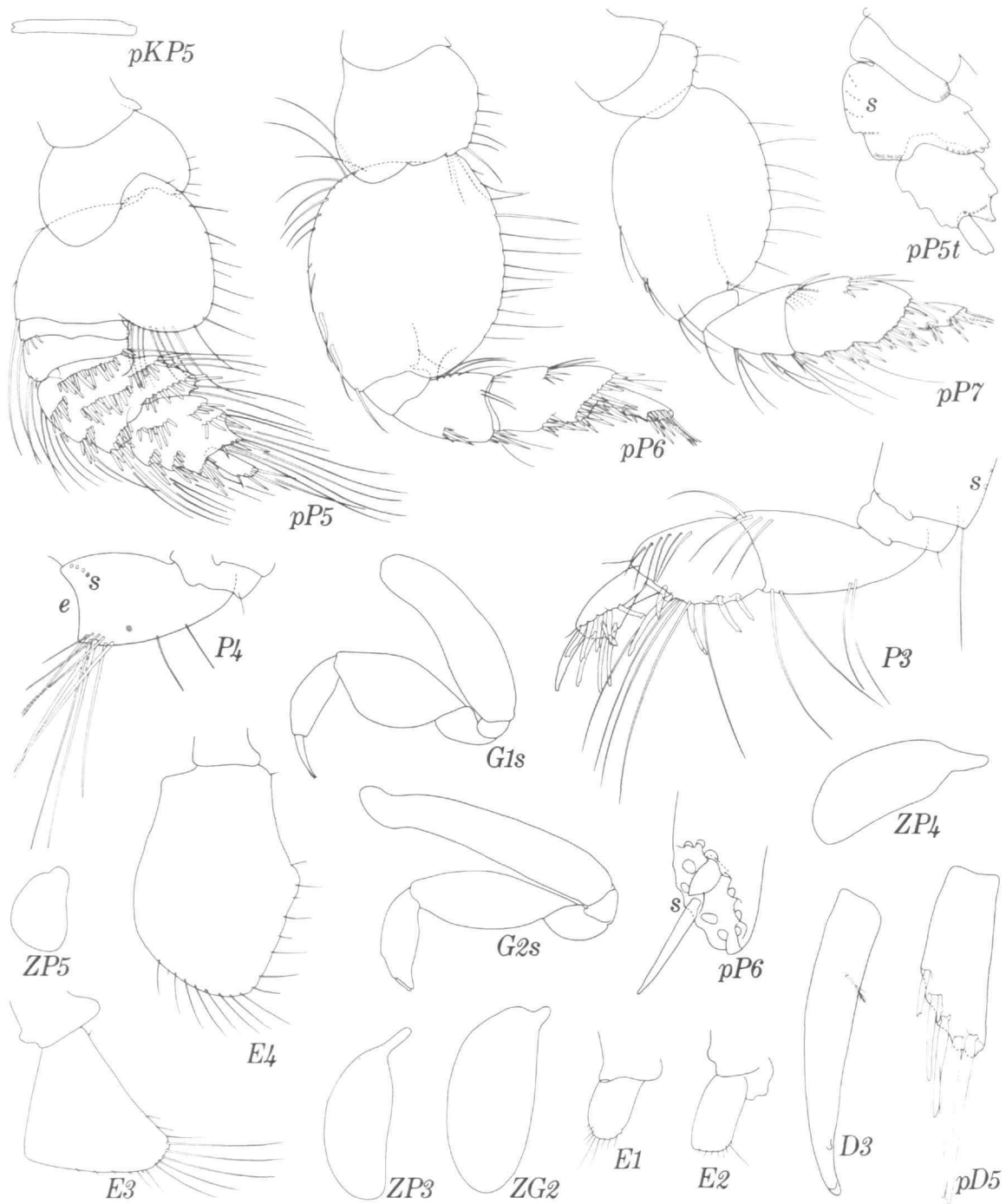


FIGURE 39.—*Gheegerus garbais*, new species, holotype, female “w,” 2.42 mm (*p* = female “p,” 2.12 mm; *Z* = gill).

mm).—Formula on article 1 of antenna 1 = 3E and 2P; primary flagellum with 6 articles, aesthetascs like female "g"; accessory flagellum 4-articulate. Formula on article 4 of antenna 2 = PE-PE-P-4E, on article 5 = 9; flagellum 6-articulate. Epimeron 2 with 3 setae. Peduncle of uropod 1 with 2 lateral setae, of uropod 2 with 1 small, apicolateral seta; dorsal setae = 1 and 1; setae of rami = 6-2 and 5-1. Telsonic formula = 1 apical seta and P, P, P.

ILLUSTRATIONS.—Mouthparts generally like *Urohaustorius pulcus*, except where noted.

HOLOTYPE.—NMV, female "w," 2.42 mm (illus.).

TYPE-LOCALITY.—QM W.6385, station 15 QUS, Middle Banks, Moreton Bay, Queensland, Sep 1972, 6.7 m, sand.

VOUCHER MATERIAL.—Type-locality: female "g," 2.28 mm (illus.); female "p," 2.12 mm (illus.); juvenile "z," 2.11 mm (illus.) and 3 other specimens.

MATERIAL.—1 sample (7).

DISTRIBUTION.—Queensland, Moreton Bay, 6.7 m, sand.

Narunius, new genus

DIAGNOSIS.—Rostrum weak. Peduncle of antenna 1 short, stout, articles 2 and 3 of peduncle progressively shortened, scarcely geniculate, both flagella elongate. Antenna 2 of haustorius form, article 4 expanded, article 5 small, articles 4-5 with facial armaments, article 4 with long ventral setae and subventral clusters of bifid setae. Aesthetascs simple, flagellar setae paddle-shaped. Mandibular incisors overextended, thin, essentially untoothed; right and left laciniae mobiles not alike; rakers serrate, 2 on right mandible, 3 on left; molar broad and bulky, not strongly extended, with weak triturative surface, with cuspidate accessory chopper; setae of palp article 3 awned. Mandibular lobes of lower lip well developed. Inner plate of maxilla 1 small, slender, poorly setose, outer plate with 11 spines, palp slightly shortened, uniaarticulate, palpar setae attached in 2 sets. Inner plate of maxilla 2 with

weakly submarginal oblique row of setae. Maxillae and maxillipeds lacking baler lobes. Outer plate of maxilliped with spines, palp article 2 expanded, article 3 elongate, dactyl clavate, multisetose.

Coxae 1-2 small, 3-4 larger, coxae 1-2 about equal in size, most of coxa 2 hidden by coxa 3, latter subequal in size to coxa 4 and hatchet shaped, extended posteroventrally; only coxae 2-5 with simple gills; brood plates 4 pairs, slender.

Gnathopods small, dissimilar, gnathopod 1 simple, gnathopod 2 weakly chelate (parachelate), wrists elongate, hand of gnathopod 2 weakly mitelliform. Dactyls of pereopods 3-7 distinguishable, those of pereopods 3-5 large, those of pereopods 6-7 small, dactyl of pereopod 5 large and spinose. Article 2 of pereopod 5 expanded; pereopod 5 of haustorius form, distal articles of pereopods 6-7 not underslung, only moderately widened; pereopods 6-7 otherwise similar, not dominating pereopod 5; article 2 of pereopod 6 narrow, of pereopod 7 expanded proximally, narrowed distally.

Peduncles of pleopods short, wider than long, pleopod 2 inferior, inner rami moderately shorter than outer. Epimeron 1 scarcely differentiated, epimeron 2 dominantly setose. Urosomite 1 scarcely produced and poorly setose ventrally. Rami of uropods 1-2 linguiform, marginally setose; peduncle of uropod 1 strongly setose laterally, of uropod 2 poorly setose laterally (weak and sparse setae). Uropod 3 of ordinary form, outer ramus dominant and biarticulate, article 2 with 2 large apical setae. Telson short, broader than long, weakly cleft.

DESCRIPTION.—Eyes indistinct or poorly discernible, ocular ganglia visible. Dorsolateral surface of article 1 on antenna 1 furnished with longitudinal row of armaments; article 2 densely setose dorsolaterally, groups distinguishable, article 3 poorly setose. Article 3 of antenna 2 short, poorly setose, flagellum much longer than article 4 of peduncle.

Right lacinia mobilis linguiform, left broad, simple. Lower lip with 1 cone on each outer lobe. Inner plate of maxilla 1 with very few short apical

setae and 1 large apicomedial seta; spines on outer plate mostly bifid or trifid. Inner plate of maxilliped with 2 stout apical spines. Coxae 1-2 well setose. Gill 2 dominant, gill 5 smaller than posterior lobe of coxa 5. Gnathopod 2 bearing surficial button combs.

Pereopods 3-4 bearing secondary facial row of spines on article 5.

Uropods 1-2 with huge dorsal setae on peduncles, rami lacking basoventral setae, medial margins of peduncles heavily setose.

TYPE-SPECIES.—*Narunius tallerkus*, new species.

COMPOSITION.—Unique.

RELATIONSHIP.—This genus is very similar to *Urohaustorius* but differs in the relatively greater size of coxa 4 compared with coxa 3; the narrowing of article 2 on pereopods 6-7; the development of weak secondary facial spination on article 5 of pereopods 3-4; and in the distinctive paddle-shaped flagellar setae, occurring on both antennae 1-2. Like *Urohaustorius perkeus*, coxae 1-2 are well setose but otherwise *U. perkeus* and *N. tallerkus* have many distinctions.

For the sake of comparison to species in *Urohaustorius*, the diagnosis of *N. tallerkus* follows the formula for *Urohaustorius*.

Narunius tallerkus, new species

FIGURES 40-43

DIAGNOSIS.—Telson distinctly cleft, emargination weak and gaping. Apicolateral corner of peduncle on uropod 3 with thin setae. Inner rami of uropods 1-2 much shorter than outer rami. Dorsolateral margin of peduncle on uropod 2 with small setae. Spines on dactyl of pereopod 5 set singly in tandem. Dactyls of pereopods 6-7 weak. Dorsolateral armament rows on articles 1-2 of antenna 1 and article 4 of antenna 2 composed of thin setae. Epimeron 2 rounded, with 7+ facial setae in vertical row. Tooth of epimeron 3 obsolescent. Coxa 1 not larger than coxa 2; coxae 1-2 bearing only tiny setules; otherwise with generic attributes in paddle setae, coxa 3, pereopods 3-4 and 6-7.

DESCRIPTION OF FEMALE.—Holotype female "p," 3.36 mm (New South Wales): Head about 65% as long as wide, rostrum about 10% as long as remainder of head. Primary flagellum of antenna 1 with 9-10 slightly thickened articles, each ringed with numerous deeply curved thin setae, each paddle-shaped at apex, plus normal aesthetasc formula = 0-0-2-2-2-2-2-1-1-0; flagellum 9-articulate. Facial formula of setae on article 1 of antenna 1 = 6 (mixed setae); on article 4 of antenna 2 = 3-7-5-26; on article 5 = 17; article 3 with 10 facial setae; flagellum with 11 articles also furnished with paddle setae. Right and left incisors apically simple, with greatly subapical boss, choppers on molar with 3 cusps; formula on right palp article 3 = 16-1-3-1, on left = 15-1-3-1. Inner plate of maxilla 1 with 1 short apical seta, 1 large apicomedial seta; outer plate with 11 spines. Plates of maxilla 2 more slender than in *Urohaustorius*. Inner plate of maxilliped with 6 medial setae, apical spines shorter than in *Urohaustorius*, outer plate with 1 apicolateral seta, palp article 2 with 7 setae in facial row, article 3 with 4 setae in facial row and 5 ventrolateral row; palp article 4 as in *U. pulcus*.

Coxae 1-2 each in form of parallelogram, strongly setose ventrally; coxa 3 with most of ventral margin from anterior edge to M. 90, furnished with numerous short setae (unlike *Urohaustorius*), then 5 long ventral setae, posterior margin with 10 setae; coxa 4 with 10 long ventral setae and 11 posterior setae. Setae of brood plates vestigial.

Wrists of gnathopods anteriorly hirsute.

Setal and spine formulas on pereopod 3 = 9, 8, 2-1-2-2-1-1, or 2-1-1-2-1-1, 6 + 4 + 1, or 5 + 4 + 1 (note 1 of 4 = seta); on pereopod 4 = 8 and 2 anterior, 7, 2-1-2-2-1, or 2-1-2-1-1-1, 5 + 4 + 1, posterior margin of articles 5-6 with partially doubled row of mostly large even serrations (like *U. pulcus*). Article 2 of pereopods 5-7 densely setose posteriorly; article 2 of pereopod 5 with mediofacial duplicate row of setae even denser than on posterior margin, anterior margin densely prickled, dactyl with 7 spines in tandem.

Peduncular spine formulas of pleopods 1-3 =

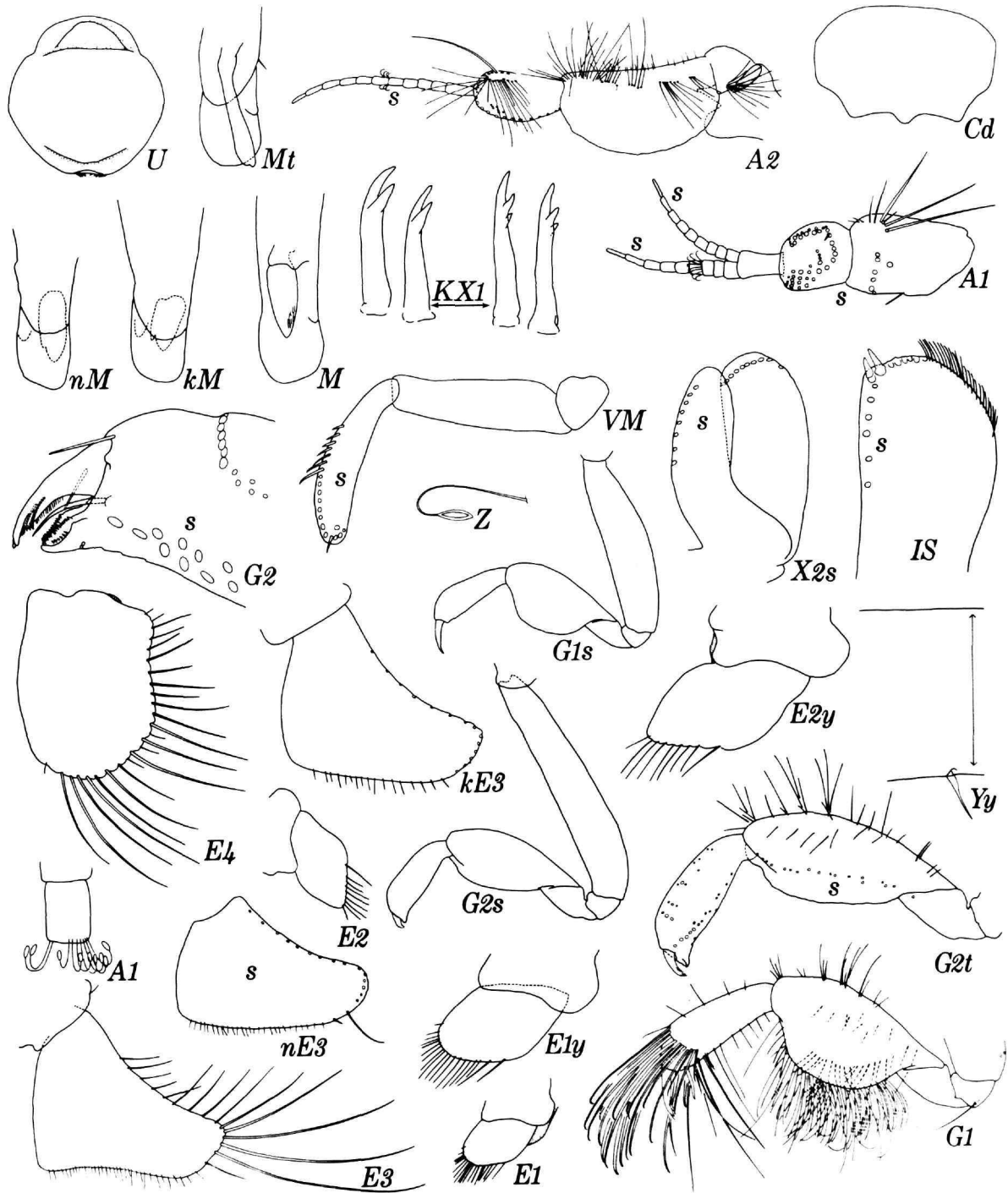


FIGURE 40.—*Naranius tallerkus*, new species, holotype, female "p," 3.36 mm (*k* = male "k," 2.49 mm; *n* = female "n," 2.73 mm; *Y* = brood plate; *Z* = aesthetasc).

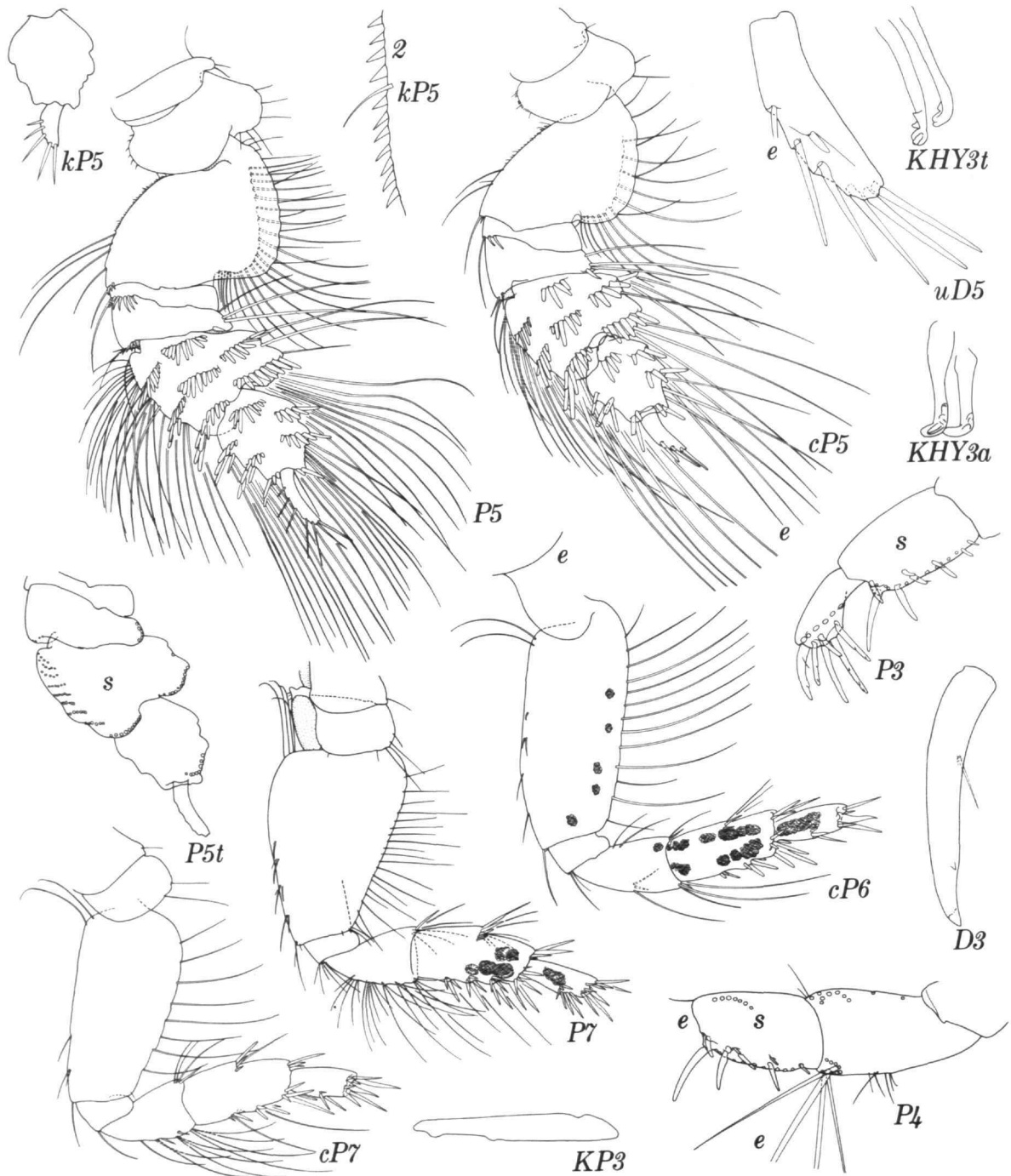


FIGURE 41.—*Naranius tallerkus*, new species, holotype, female "p," 3.36 mm (*c* = juvenile "c," 1.48 mm; *k* = male "k," 2.49 mm; *u* = female "u," 3.84 mm; Y = pleopod).

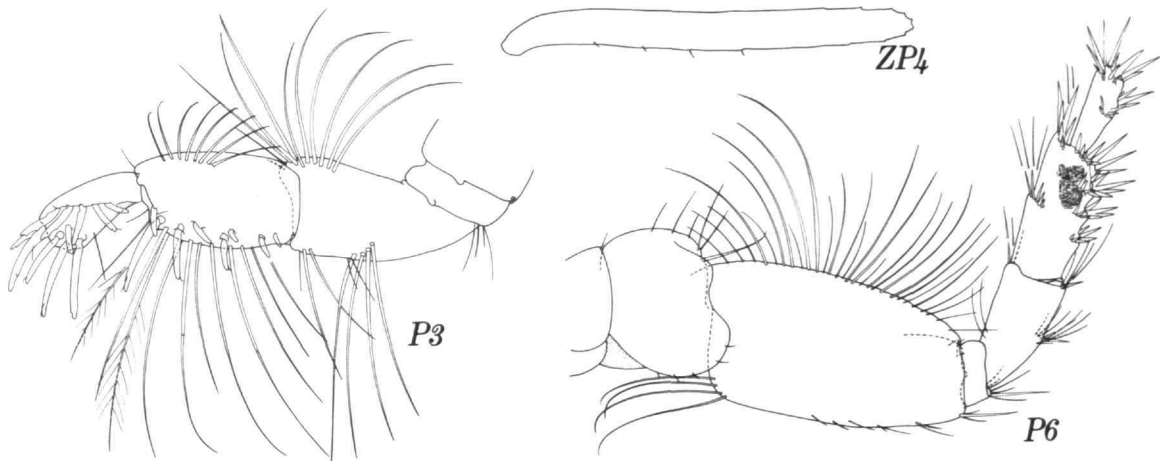


FIGURE 42.—*Narunius tallerkus*, new species, holotype, female "p," 3.36 mm (Z = brood plate).

2 and 1, 2 and 0, 2 and 1; segmental formulas = 22-14, 17-11, 20-17 (proliferate); basal setal formulas = 14-3-4-4, 5-1-1-1, 11-2-5-4.

Epimeron 2 with 7 large and 1 small setae in vertical facial row.

Lateral margin of peduncle on uropod 1 with 6 setae and weakly extraordinary gap between ultimate and penultimate setae, apicolateral corner with 1 setule; of uropod 2 with 3 short wiry setae, apicolateral corner with 2 similar setae; dorsal setae = 3 and 1; setae of rami = 9-6 and (9-10)-5, inner rami extending 70% and 65% along outer. Apicolateral corner of peduncle on uropod 3 with 2 setules, medial margin with 4 setules in tandem, ventromedial apical rows with about 21 mixed setae; setal formula on lateral margin of article 1 on outer ramus (right side with additional long seta as shown by dots in illustration); formula = e-e-e-E-E-E-Ee.

Telson about 1.2 times as wide as long, cleft about 0.14 of its length, setal formula = 2P, 2, P, 2.

Lateral gland clusters developed only very weakly in pleonite 4.

Female "y," 2.79 mm (Victoria): Formulas of armament rows on article 1 of antenna 1 = 3 + 2 tiny distals; on article 4 of antenna 2 = 4-4-2-5-17; on article 5 = 14+; flagellar articles on

antenna 1, primary = 9, accessory = 8, antenna 2 = 9. Left lacinia mobilis weakly bifid; formula on right and left palp article 3 = 12-1-3-1. Ventral margin of coxa 3 almost straight. Spine and setal formulas on pereopod 3 = 8, 7, 2-1-2-1-1, 5 + 4 + 1; on pereopod 4 = 9 (= 2 anterior), 7, 2-1-2-1-1, 4 + 3 + 1. Dactyl of pereopod 5 with 6 spines. Epimeron 2 with 7 setae. Peduncle of uropod 1 with 6 lateral setae; of uropod 2 naked (1 apical setule only); dorsal setae = 3 and 1; setae of rami = 9-6 and 8-3. Article 1 on outer ramus of uropod 3 with 8 long lateral setae. Brood plates like holotype.

Female "f," 2.94 mm (Botany Bay): Epimeron 2 with 8 setae. Telsonic formula = 2P, 1, P, 2; brood plates of normal form, with elongate setae.

Female "n," 2.73 mm (New South Wales): Left lacinia mobilis weakly bifid (illus.). Serrations on articles 5-6 of pereopods 3-4 very weak; telsonic formula = 2P, 1, P, 1 (illus.), shape unusual.

Female "u," 3.84 mm (Queensland): Dactyl of pereopod 5 with 6 spines in tandem, plus 1 facial spine paired with spine 5 (illus.). Epimeron 2 with 8 large and 2 tiny setae. Peduncle of uropod 1 with 7 lateral setae; outer ramus like holotype; peduncle of uropod 2 with only 2 api-

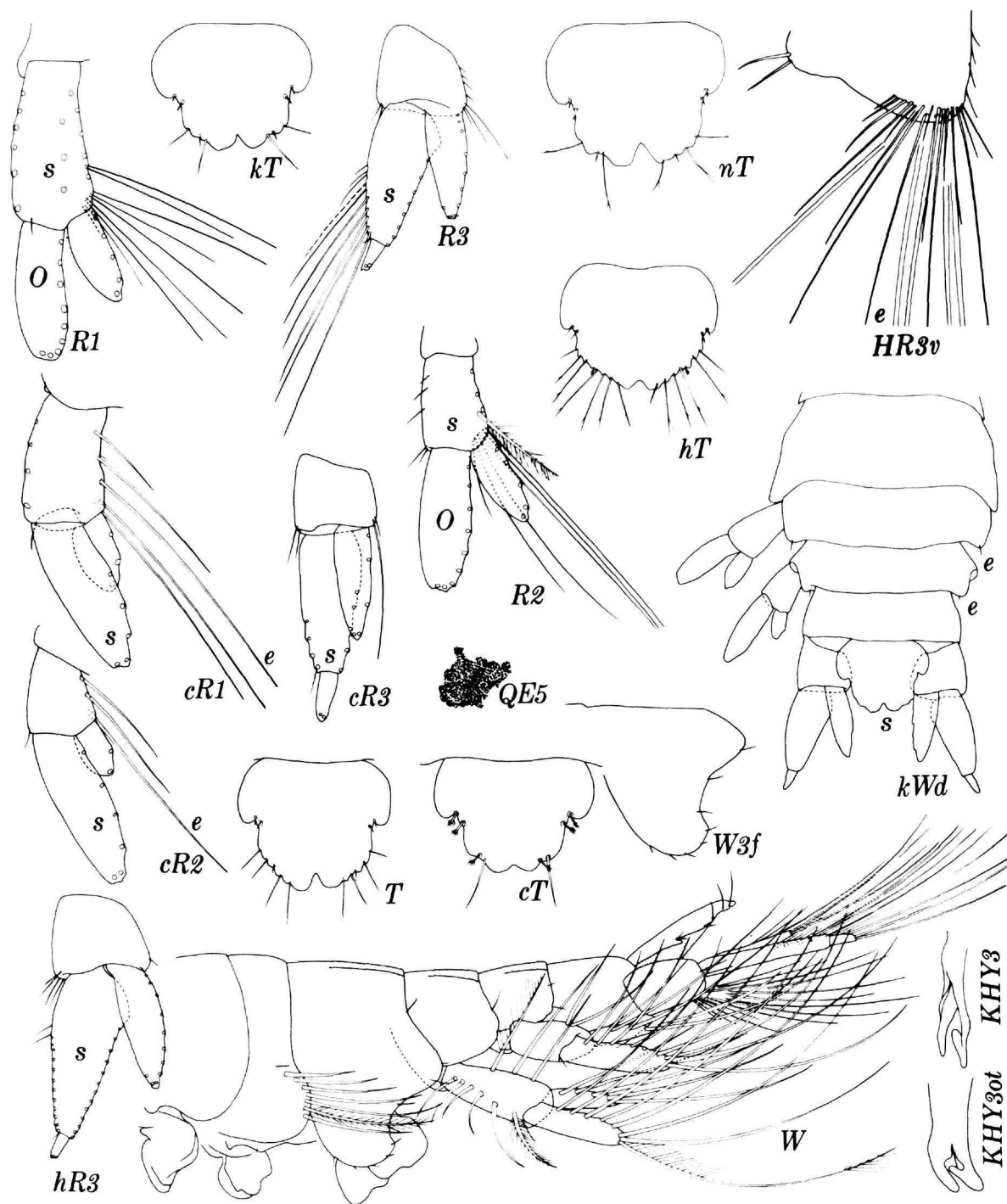


FIGURE 43.—*Naranius tallerkus*, new species, holotype, female "p," 3.36 mm (*c* = juvenile female "c," 1.48 mm; *h* = male "h," 3.54 mm; *k* = male "k," 2.49 mm; *n* = female "n," 2.73 mm; *Y* = pleopod).

colateral setules. Telsonic setal formula = 2P, 3, P, 3 or 2P, 2, P, 3.

Female "x," 3.41 mm (Queensland): Dactyl of pereopod 5 like female "u."

DESCRIPTION OF MALE.—Male "k," 2.49 mm (New South Wales): Formulas of armaments on article 1 of antenna 1 = 4; on article 4 of antenna 2 = 3-4-4-14; on article 5 = 8; dorsal article 4 also with short setae as in female; flagellar formulas, antenna 1 primary flagellum = 9, accessory flagellum = 7, antenna 2 = 8, primary flagellum thickened as in female. Proximal hump on mandibular incisors obsolescent; formula on right palp article 3 = 10-1-3-1, on left = 11-1-4-1. Mandibular lobes of lower lip blunter than in female (female like *U. pulcus* illustration). Maxilla 2 like female but with 6 setae in medial setal row. Inner plate of maxilliped like female, including apical spines; palp article 2 with 5 facial setae; article 3 with 3 facial and 3 ventrolateral setae or facial row composed of 3 basal and 1 distal members; dactyl with 6 setae. Coxae 1 with 11 setae; coxa 2 with 6 setae; coxa 3 illustrated, more elongate than in female. Formulas for both pereopods 3-4, posterior article 5 = 2-2-1-1, article 6 = 4 + 3 + 1; articles 5-6 lacking serrations on pereopod 3, weakly developed on pereopod 4. Dactyl of pereopod 5 shorter than in female, with 5 spines (illus.); article 2 with fewer submarginal setae. Article 4 of pereopod 6 also like female, with only 2 posterior setae; posteroventral corner of coxa 7 with only 1 long seta. Epimeron 2 with 4 setae; epimeron 3 with only 2 ventral setules total. Peduncle of uropod 1 with 5 lateral setae, of uropod 2 with 1 midlateral setule and 1 apical setule; dorsal setae = 2 and 1, setae of rami = 7-4 and 7-2. Formula of lateral small setae on article 1 of outer ramus on uropod 3 = Ee-E-E-E-Ee. Telsonic formula = 2P, 1, P, 1 (illus.).

Male "h," 3.54 mm (robust): Primary flagellum of antenna 1 with 11 articles, accessory flagellum with 10, flagellum of antenna 2 with 12 articles; armament formula on article 4 of antenna 2 = 5-9-8-21. Right molarial chopper with at least 7 cusps; formula on right mandibular

palp article 3 = 15-1-3-1. Coxa 3 with 8 long ventral and 13 posterior setae. Coxa 4 with 29 plumose setae total plus simple anteroventral seta. Spine and setal formulas on pereopod 3 = 11, 9 (and 2 anterior), 6 + 5 + 1; of article 6 on pereopod 4 = 11-14, 10, 5 + 5 + 1. Gill of pereopod 5 about as large as posterior lobe of coxa 5. Dactyl of pereopod 5 with 7 spines in tandem and facial spine forming pair with spine 5. Epimeron 2 with 14 setae (possibly more, badly occluded). Peduncle of uropod 1 with 7 lateral setae, of uropod 2 with 4 lateral setae, setae of rami = 9-6 and 10-6. Venter of peduncle on uropod 3 with 21 setae, uropod 3 otherwise illustrated. Telsonic setal formula = 4, P, 2-3, 2P (illus.).

Juvenile female "c," 1.48 mm (Western Port): Armament formulas of article 1 on antenna 1 = 3; on article 4 of antenna 2 = 1-1-2-1-2-8; article 5 = 6 (highly distal); article 3 = 3; flagellar articles, primary of antenna 1 = 7, accessory = 6, antenna 2 = 6, aesthetascs of primary flagellum on antenna 1 = 0-1-2-2-1-1-0. Right lacinia mobilis bifid, left weakly bifid, chopper cusps = 3, very elongate; formula on right and left palp article 3 = 7-1-3-1. Medial row on inner plate of maxilla 2 with 4 setae. Palp article 2 of maxilliped with 4 facial setae, article 3 with 2 and 3 ventrolateral setae, article 4 with 5 setae (2 long apical, 1 long subapical, 2 short marginal). Coxa 1 with 7 setae; coxa 2 with 4 setae; coxa 3 with 14 short ventral setae, 5 long posteroventrals, and 3 dorsoposterior setae; coxa 4 with 11 long setae plus 1 anteroventral setule. Spine and setal formulas on pereopod 3 = 3, 3, 2-1-1, 3 + 2 + 1; pereopod 4 = 4, 2, 2-1-1, 3 + 2 + 1, spines with large sharp cusps. Pereopods 5-7 illustrated (pereopod 6 composite of right and left). Epimeron 2 with 3 setae. Uropods 1-3 and telson illustrated, uropod 3 with 2 short medial setae on peduncle and 7-8 ventral setae.

HOLOTYPE.—AM, female "p," 3.36 mm (illus.).

TYPE-LOCALITY.—EBS 148, 500 yards (455 meters) off Towra Point, New South Wales, 30 Nov 1972, 3 m, sand and shell grit.

VOUCHER MATERIAL.—Type-locality: male

"k," 2.49 mm (illus.); female "n," 2.73 mm (illus.); female "a," 2.72 mm; male "v," 2.38 mm; EBS Botany Bay 1025: female "f," 2.94 mm; CPBS A6/5: juvenile female "c," 1.48 mm (illus.); CPBS 26 N/2: female "y," 2.79 mm; AM P.23293: male "h," 3.54 mm (illus.); QM W.6384: female "u," 3.84 mm (illus.); female "x," 3.41 mm (illus.).

MATERIAL.—CPBS, 4 samples from 4 stations (4); PPBES, 17 samples from 8 stations (172); EBS, 2 samples from 2 stations (5); AM, 2 samples (2); QM, 3 samples (12).

DISTRIBUTION.—Victoria, Western Port and Port Phillip Bay to Moreton Bay, Queensland, 3–22 m, sand, silty sand, sand and shell, sand and weed.

Tuldarus, new genus

DIAGNOSIS.—Rostrum weak. Peduncle of antenna 1 short, stout, articles 2 and 3 of peduncle progressively shortened, weakly geniculate, primary flagellum elongate, accessory flagellum well developed or weak. Aesthetascs simple. Antenna 2 of haustorius form, article 4 expanded, article 5 small, articles 4–5 with facial armaments, article 4 with long ventral setae and subventral clusters of bifid setae. Mandibular incisors overextended, thin, essentially untoothed; right and left laciniae mobiles not alike; rakers serrate or not, 1–2 on right mandible, 2–3 on left, 1 raker on each side often rudimentary; molar broad and bulky, not strongly extended, with weak triturative surface, accessory chopper poorly developed; setae of palp article 3 awned. Mandibular lobes of lower lip well developed. Inner plate of maxilla 1 small, slender, poorly setose, outer plate apparently with 10 spines; palp slightly shortened, uniaarticulate, palpal setae attached in 1 apical set. Inner plate of maxilla 2 with weakly submarginal oblique row of setae. Maxillae and maxillipeds lacking baler lobes. Outer plate of maxilliped with spines, palp article 2 expanded; article 3 elongate, dactyl clavate, multisetose.

Coxae 1–2 very small but coxa 1 larger than coxa 2; coxa 3 larger than or subequal in size to

coxa 4, coxa 3 hatchet-shaped and extended posteroventrally; only coxae 2–5 with simple gills; brood plates 4 pairs, slender.

Gnathopods small, dissimilar, gnathopod 1 simple, gnathopod 2 weakly chelate (parachelate), wrists elongate, hand of gnathopod 2 weakly mitelliform. Dactyls of pereopods 3–7 distinguishable, large, dactyl of pereopod 5 lacking spines but occasionally bearing apical setae. Article 2 of pereopods 6–7 narrow (type) to strongly expanded; of pereopod 5 strongly expanded, latter of haustorius form, distal articles of pereopods 6–7 not underslung, only moderately widened, pereopods 6–7 otherwise similar, weakly dominating pereopod 5.

Peduncles of pleopods short, wider than long, pleopod 2 inferior, inner rami moderately shorter than outer. Epimeron 1 scarcely differentiated, epimeron 2 dominantly setose. Urosomite 1 scarcely produced and poorly setose ventrally. Rami of uropods 1–2 linguiform, though inner rami often reduced or vestigial, marginally setose; peduncle of uropod 1 strongly setose laterally, of uropod 2 generally lacking long setae laterally. Uropod 3 of ordinary form, outer ramus dominant and biarticulate, article 2 with 2 large apical setae. Telson short, broader than long or not greatly longer than broad, entire.

DESCRIPTION.—Eyes indistinct or poorly visible or occasionally well developed, ocular ganglia visible. Dorsolateral surface of article 1 on antenna 1 furnished with longitudinal row of armaments; article 2 densely setose dorsolaterally, groups distinguishable; article 3 poorly setose. Article 3 of antenna 2 short, poorly setose, flagellum much longer than article 4 of peduncle.

Right lacinia mobilis linguiform, left broader and often bifid. Lower lip usually with 1 cone on each outer lobe. Inner plate of maxilla 1 with very few short apical setae and 1 larger apico-medial seta; spines on outer plate mostly bifid. Inner plate of maxilliped with 2 stout apical spines. Coxae 1–2 poorly setose. Gill 2 dominant, gill 5 rarely larger, often much smaller than posterior lobe of coxa 5. Gnathopod 2 bearing surficial button combs.

Pereopods 3-4 lacking extensive secondary facial rows of spines on article 5.

Uropods 1-2 lacking huge dorsal setae on peduncle, rami lacking basoventral setae, medial margins of peduncles usually heavily setose.

TYPE-SPECIES.—*Tuldarus cangellus*, new species.

COMPOSITION.—*Tuldarus barinius*, new species.

RELATIONSHIP.—This genus differs from *Urohaustorius* in the absence of large stiff spines on the dactyl of pereopod 5 and the fully apical position of all setae on the palp of maxilla 1. These small differences are reinforced by the tendency for the inner ramus of uropods 1-2 to become fused to the peduncle or lost entirely; for 1 of the mandib-

ular rakers to exist in rudimentary form; and for the tendency towards complete domination by spines in the armament row on article 4 of antenna 2. The type-species is characterized by loss of dominance by coxa 3 and by article 2 on pereopods 6-7; while the second species is characterized by total loss of inner rami on uropods 1-2.

The type-species of *Tuldarus* weakly replicates some tendencies seen in *Narunius*, such as the narrowed article 2 of pereopods 6-7 and the small coxa 3, but *Tuldarus* differs from *Narunius* in the absence of stout dactylar spines on pereopod 5 and of the special oared setae on the antennae.

Key to Species of *Tuldarus*

- Inner rami of uropods 1-2 half as long as outer rami *T. cangellus*, new species
 Inner rami of uropods 1-2 absent *T. barinius*, new species

Tuldarus cangellus, new species

FIGURES 44-46 (part)

DIAGNOSIS.—Inner rami of uropods 1-2 articulate, about half as long as outer rami. Article 2 of pereopods 6-7 of narrow form (see illustrations). Tooth of epimera 1-2 sharp and attenuate. Dactyls of pereopods 3-4 with accessory tooth vestigial. Posterior lobe of coxa 3 sharp, attenuate, coxa 4 also with attenuate posteroventral lobe.

DESCRIPTION OF MALE.—Holotype male "i," 4.12 mm: Head about 60% as long as wide, rostrum about 7% as long as remainder of head. Primary flagellum of antenna 1 with 12 articles furnished densely with long aesthetascs in formula from proximal to distal: 5-5-6-6-6-6-5-5-3-2-0, accessory flagellum 7-articulate. Facial formula of armaments on article 1 of antenna 1 = 5 setae, on article 2 = 4 spines and 11 setae, on article 4 of antenna 2 = mixture of 14 spines, 9 setae, 2 penicillates, on article 5 = mixture of 4 spines and 6 setae (not counting transverse apical row), article 3 with 2 facial spine-setae; flagellum with 8 articles. Right incisor simple, left weakly bifid; right lacinia mobilis weakly trifid, left bifid;

right rakers = 1 plus 1 rudimentary, left = 2 plus 1 rudimentary; chopper humps simple; palp article 2 thin, with only 2 setae, formula on right and left article 3 = 6-1-3-1. Inner plate of maxilla 1 with 1 apical seta, 1 large apicomedial seta; outer plate apparently with 10 spines, several with as many as 3 lateral cusps. Inner plate of maxilla 2 with 5 setae in medial row. Inner plate of maxilliped with 6 medial setae, outer plate with 1 apicolateral seta; palp article 2 with 3 setae in facial row, article 3 with 2 setae in facial row, dactyl with 3 long and 3 short setae.

Coxa 1 slipper-shaped, attenuate but apically rounded; coxa 2 much shorter, broad, subrectangular; coxa 3 not much larger than coxa 4, with 3 long ventral setae near posterior corner; coxa 4 with 2 long ventral setae and 9 mixed posterior setae.

Setal and spine formulas on pereopod 3 = 5, 2, 2-1-1-1, 4 + 2 + 1; pereopod 4 = 5, 2, 2-1-1-1, 4 + 3 + 1, note absence of posterior setae on article 5 of pereopod 3, posterior margin of article 5 with single row of serrations similar to *U. pulcus*. Article 2 of pereopods 5-6 with sparse setal densities, of pereopod 7 with few weak setules, pos-

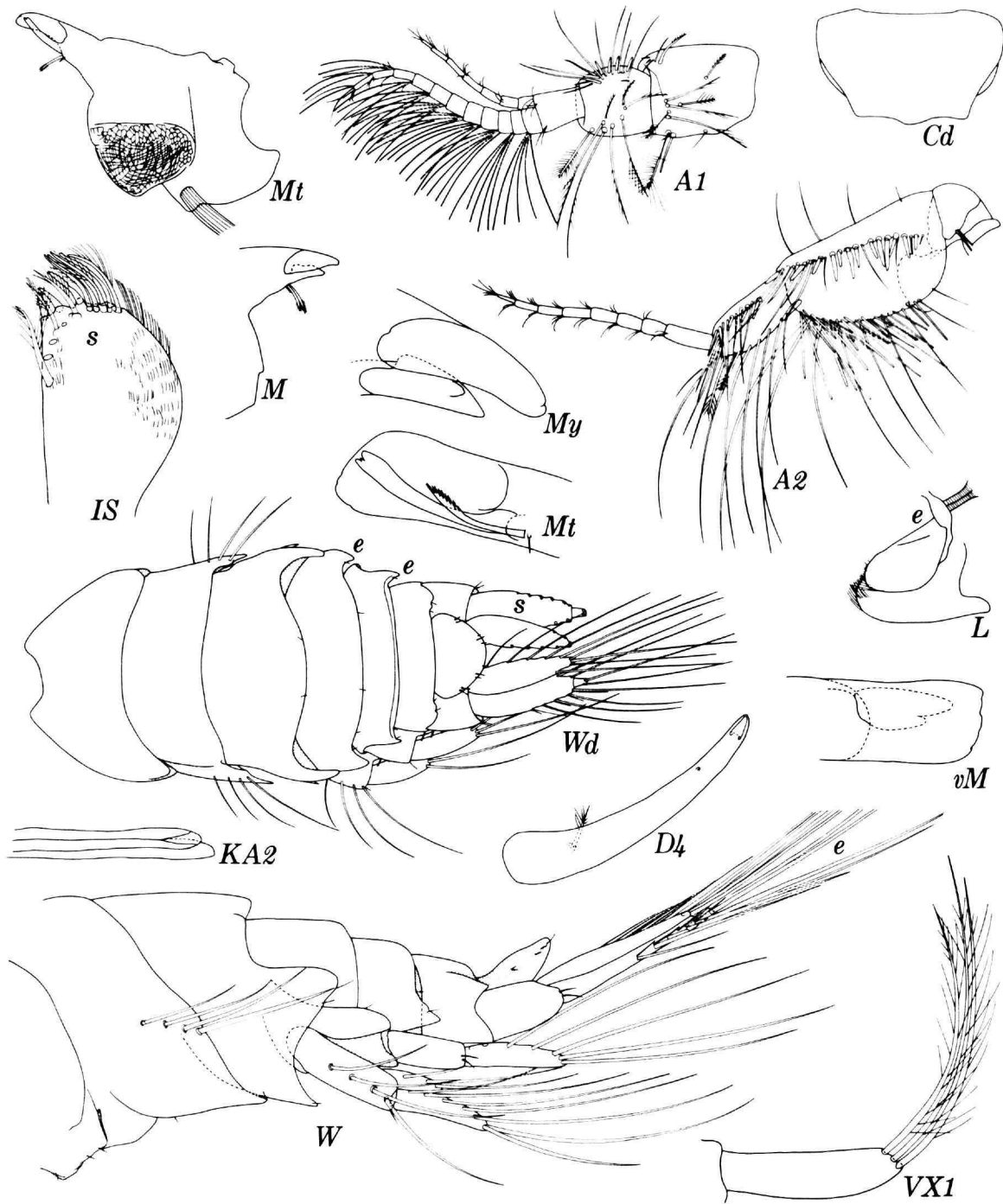


FIGURE 44.—*Taldarus cangellus*, new species, holotype, male "i," 4.12 lmm (*v* = male "v," 3.96 mm).

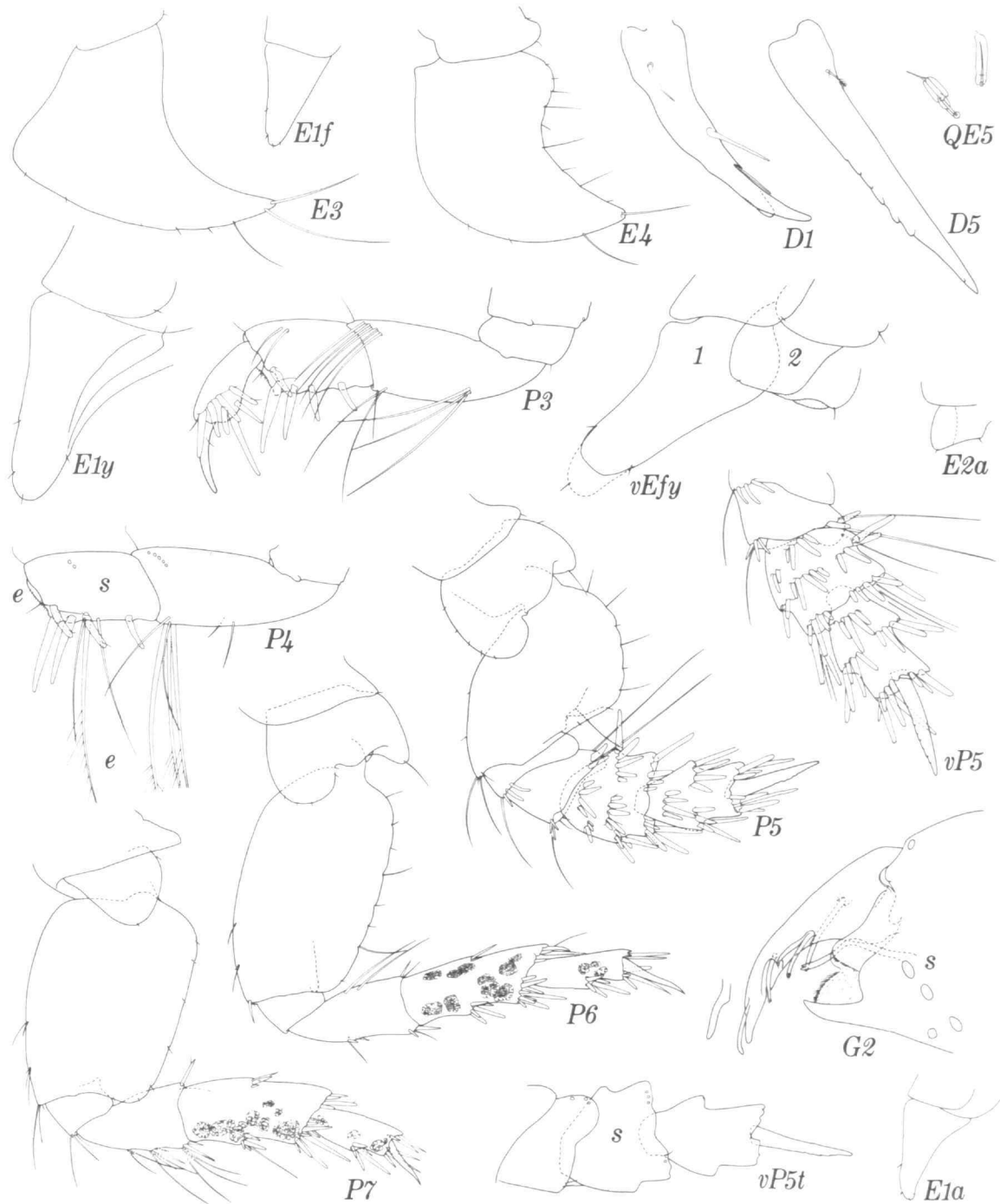


FIGURE 45.—*Tuldarus cangellus*, new species, holotype, male "i," 4.12 mm (*a* = posterior margin rolled inward; *v* = male "v," 3.96 mm).

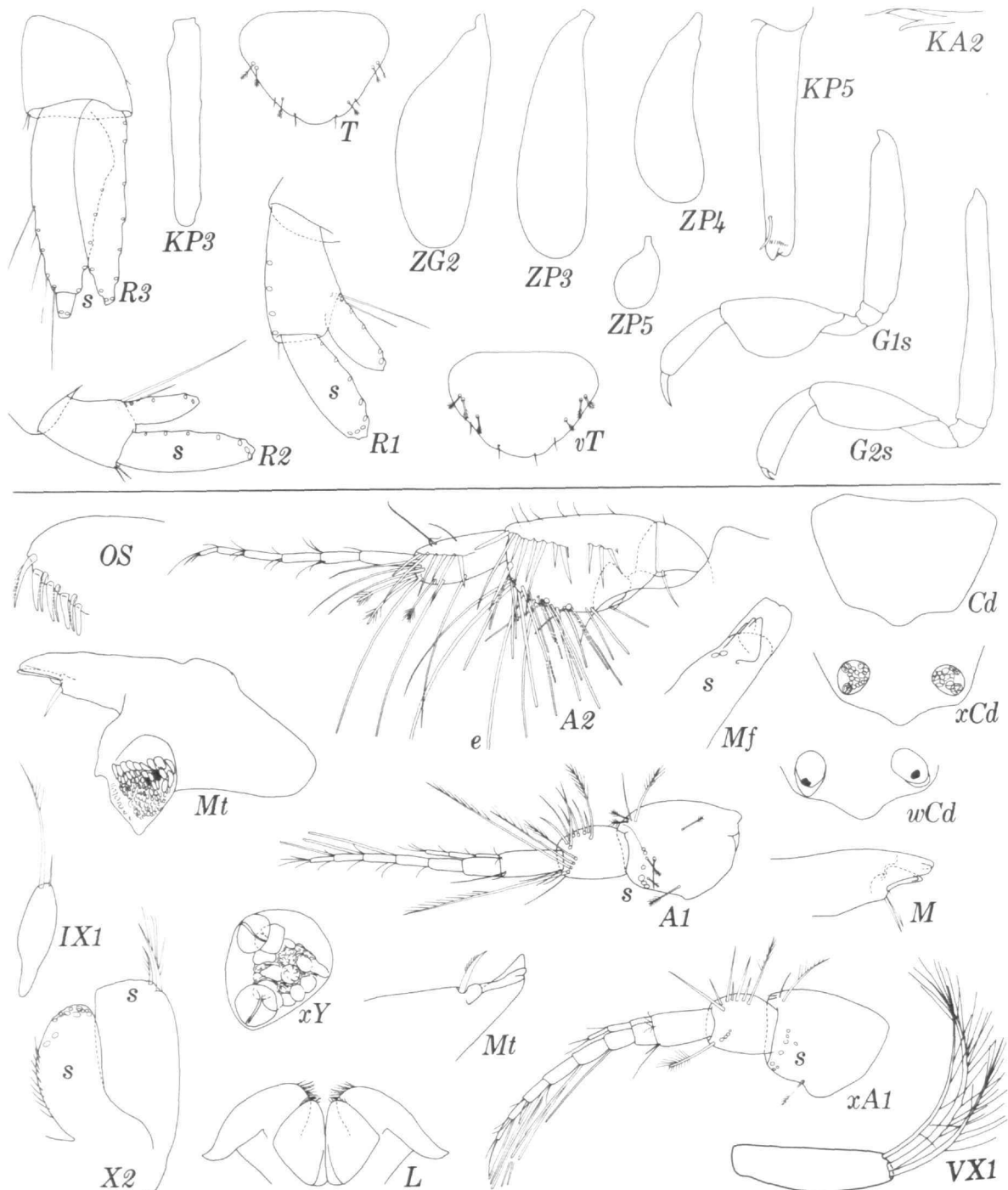


FIGURE 46.—Upper: *Tuldarus cangellus*, new species, holotype, male “i,” 4.12 mm (v = male “v,” 3.96 mm; Z = gill). Lower: *Tuldarus barinius*, new species, holotype, female “r,” 1.78 mm (w = female “w,” 1.62 mm; x = male “x,” 1.65 mm; Y = eye).

teroverventral lobe on pereopod 7 weak, on pereopod 6 obsolescent; dactyl of pereopod 5 with several anterior humps.

Peduncular spine formulas of pleopods 1-3 = 2 and 1, 2, and 0, 2 and 0; segmental formulas = 16-10, 16-9, 14-9; basal setal formulas = 9-2-2-2, 4-1-1-2, 4-2-2-2.

Epimeron 2 with 4 setae in horizontal but weakly oblique row.

Lateral margin on peduncle of uropod 1 with 4-5 setae and 1 apicolateral setule, of uropod 2 with 2 apicolateral setules only; dorsal setae absent; setae of rami = 8-5 and 7-4; inner rami extending 67% and 60% along outer. Apicolateral corner of peduncle on uropod 3 with 2 setules, medial margin with 1 setule, ventromedial apical row with 5-6 setae; formula on lateral margin of article 1 on outer ramus = ee-Ee-Ee-Ee-Ee; uropod 3 especially slender.

Telson about 1.3 times as wide as long, apex convex, setal formula = 2P, 1, P, 1/2P, 1, P, 1, distalmost P seta submarginal.

Urosomal and telsonic glands not discernible.

Male "v," 3.96 mm: Rostrum slightly sharper and more protuberant than in holotype. Primary flagellum of antenna 1 with 11 articles, accessory with 6. Article 4 of antenna 2 with 23 elements in armament row, formula = P, S, P, S, P, SS-SESSS-P-SE-SESE-SEES; flagellum with 8 articles. Spine and setal formulas on pereopod 3 = 5, 2, 2-1 or 2-1-1, 4 + 3 + 1; pereopod 4 = 5, 2 or 3, 2-1, 4 + 3 + 1. Article 5 of pereopod 6 with combed apex as on articles 5-6 of pereopods 3-4. Uropod 1 with 4 lateral setae; setae on rami of uropods 1-2 = 7-5 and 6-4. Setal placement on telson somewhat aberrant (illus.).

DESCRIPTION OF FEMALE (female "z," 3.31 mm): Brood plates small and lacking setae; article 1 of antenna 1 with 2 long and 1 short plumose setae + 2P; article 2 with 2 short stout spines, 4 long slender simple setae, and 5 long plumose dorsolateral setae; aesthetascs short (about twice as long as flagellar articles), formula on primary flagellum = 0-1-2-2-2-1-1-0; accessory flagellum not reduced, 5-articulate; dactyl on pereopod 5 with 1 long subapical seta (unlike

male); epimeron 2 with 3 facial setae; lateral marginal formula on article 1 of outer ramus on uropod 3 = e-Ee-Ee; formula on telson = 2P, P, 1/2P, P, 1, 1.

ILLUSTRATIONS.—Pereopod 5 of holotype composite of right and left sides, pereopod 5 of male "v" thus illustrated for confirmation; posterior and apical margins of coxa 1 curled, difficult to flatten, coxa 1 of holotype shown with 3 posterior edges as fully rolled, partially unrolled in situ, and flattened drastically; coxa 1 of male "v" shown as apically rolled with flattened extension in hatched line.

HOLOTYPE.—NMV, male "i," 4.12 mm (illus.).

TYPE-LOCALITY.—CPBS 51N, Western Port, Victoria, 30 Mar 1965, 16.5 m, sand and mud.

VOUCHER MATERIAL.—Type-locality, male "v," 3.96 mm (illus.); AM P.23326, female "z," 3.31 mm.

RELATIONSHIP.—The second species, to follow, is compared with this, the model of the genus.

MATERIAL.—CPBS, 4 samples from 3 stations (4); AM 1 sample (1).

DISTRIBUTION.—Victoria, Western Port to New South Wales, 3.5 km S of Hunter River, 11-28 m, sand, sand and mud.

Tuldarus barinius, new species

FIGURES 46 (part)-48

DIAGNOSIS.—Inner rami of uropods 1-2 absent. Article 2 of pereopods 6-7 of broad form (see illustrations). Tooth of epimera 1-2 blunt and not attenuate. Dactyls of pereopods 3-4 with sharp accessory tooth. Posterior lobe of coxa 3 blunt, not attenuate; coxa 4 lacking posteroventral lobe.

DESCRIPTION OF FEMALE.—Holotype female "r," 1.78 mm: Head about 70% as long as wide, rostrum about 10% as long as remainder of head. Primary flagellum of antenna 1 with 6 articles furnished sparsely with long aesthetascs in formula: 0-0-1-1-1-0; accessory flagellum 3-articulate. Facial formula of armaments on article 1 of antenna 1 = 4 setae; on article 2 = 8 setae or

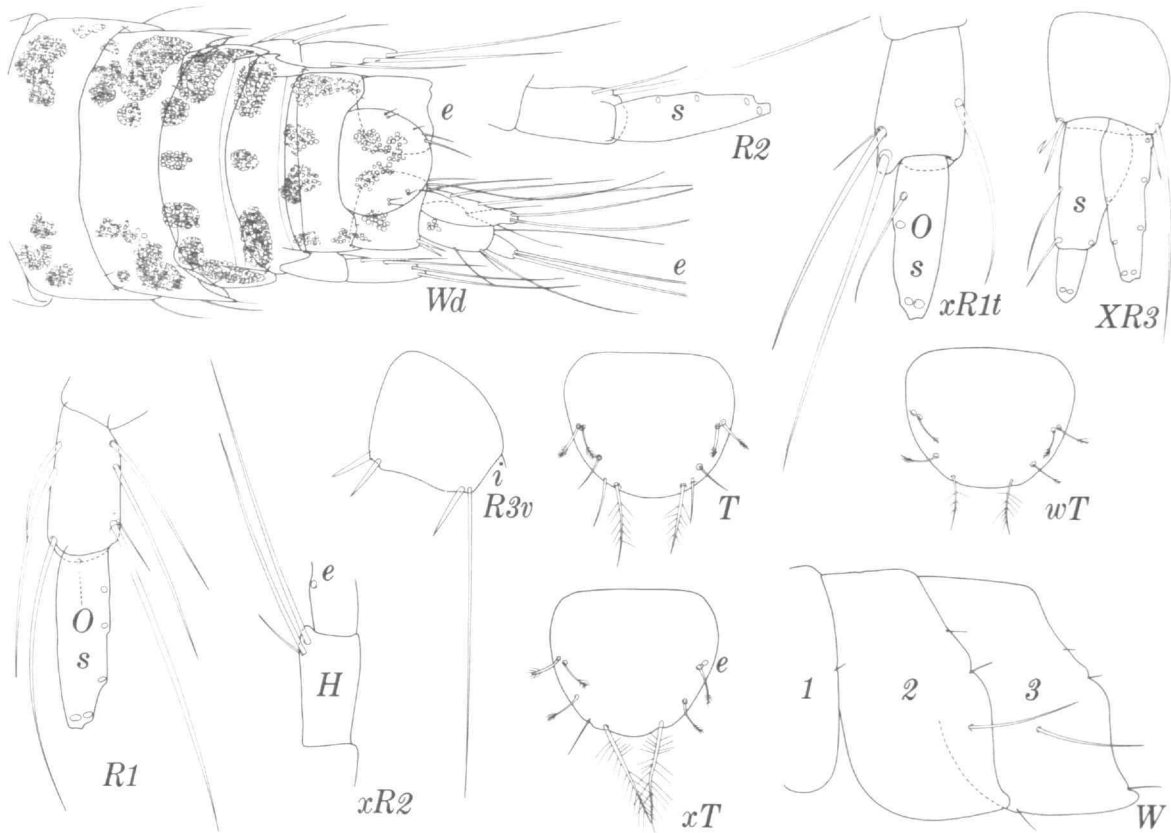


FIGURE 48.—*Tularus barinius*, new species, holotype, female "r," 1.78 mm (*w* = female "w," 1.62 mm; *x* = male "x," 1.65 mm).

spine-setae, no distinctly thick spines; on article 4 of antenna 2 = mixture of 10 spines, 1 seta and 2 penicillates in 2 groups; on article 5 = 6 spine-setae; article 3 with 1 seta; flagellum with 6 articles. Right incisor simple, left bifid; right lacinia mobilis bifid, left weakly trifid; right rakers = 1, left = 2; chopper humps simple; palp article 2 stout with 1 seta, formula on left palp article 3 = 5-1-2-1 (right broken). Inner plate of maxilla 1 with 1 apical seta, 1 large and closely contiguous apicomedial seta; outer plate apparently with 10 spines. Inner plate of maxilla 2 with 2 setae in medial row. Inner plate of maxilliped with 4 medial setae; outer plate lacking apicolateral seta (illus.); palp article 2 with 2 setae in facial row set near apex, article 3 lacking facial

setae, dactyl with only 1 of short marginal seta-group.

Coxa 1 slipper-shaped, apically rounded but not attenuate; coxa 2 much shorter, weakly ovate; coxa 3 much larger than coxa 4, with only 1 long seta situated at blunt posteroventral corner, ventral margin lined sparsely with setules; coxa 4 with 4 ventral setules, naked posteriorly; brood plates slender.

Setal and spine formulas on pereopod 3 = 3, 0, 2-1, 3 + 3 + 1; pereopod 4 = 4, 3, 2-1, 3 + 3 + 1, posterior margin of article 5 with densely packed serrations. Article 2 of pereopods 5-7 almost evenly but moderately setose, setae on pereopod 7 mostly short, posteroventral lobe on

pereopods 6-7 broad but very shallow; dactyl of pereopod 5 very finely serrate anteriorly.

Peduncular spine formulas on pleopods 1-3 = 2 and 0, 2 and 0, 2 and 0; segmental formulas = 9-6, 9-6, 9-5; basal formulas = 6-2-1-2, 3-1-1-1, 4-1-1-2.

Epimeron 2 with 1 facial seta midposteriorly; epimeron 3 with 1 facial seta in middle of plate.

Lateral margin on peduncle of uropod 1 with 3 setae, extraordinary gap between ultimate and penultimate, apicolateral setule set far ventrally; of uropod 2 naked laterally, dorsal setae absent, setae of rami = 5-0 and 4-0, inner rami absent. Apicolateral corner of peduncle on uropod 3 with 2 thin spines, apicomedial corner with 1 long seta, 1 short spine together forming medial and ventral armaments; spine formula on lateral margin of article 1 of outer ramus = e-Ee; uropod 3 especially slender.

Telson nearly 1.2 times as wide as long, apex weakly convex, setal formula = 2P, P, 1, 1, distalmost P seta submarginal.

Glands dispersed in pleonites 1-6, telson and uropod 3.

Female "w," 1.62 mm: Posterior margin of coxa 4 straight. Basalmost medial peduncular seta on uropod 1 absent. Ramus of uropod 2 with 3 setae. Telsonic setal formula = 2P, P, 1 (illus.).

DESCRIPTION OF MALE (male "x", 1.65 mm).—Formula of aesthetascs on primary flagellum of antenna 1 = 0-1-2-3-1-1-0. Facial formula of armaments on article 4 of antenna 2 = 10 spines, 3 setae, and 4 penicillates; on article 5 = 3 spines and 2 setae. Formula on mandibular palp article 3 = 5-1-2-1. Spine and setal formulas on pereopod 3 = 3, 0, 2-1, 3 + 3 + 1, pereopod 4 = 4, 3, 2-1, 3 + 3 + 1. Ramus of uropod 2 with 3 setae. Telsonic setal formula = 2P, P, 1-2 (illus.).

OBSERVATIONS.—Ventral margin of upper lip naked. Eye capsules well developed in both sexes, in female with tiny ommatidium in each capsule, in male moderately packed with at least 2 pairs of ommatidia plus other tissue possibly embryonic ommatidia or other receptor cells, eyes reflecting violet light at far distance, on closer view ommatidia appearing pink.

HOLOTYPE.—NMV, female "r," 1.78 mm (illus.).

TYPE-LOCALITY.—CPBS 25S/5, Western Port, Victoria, 25 Feb 1965, 9 m, muddy sand.

VOUCHER MATERIAL.—CPBS 31E/1: female "b," 1.57 mm (illus.); female "w," 1.62 mm (illus.); male "x," 1.65 mm (illus.).

RELATIONSHIP.—This species differs from the type-species, *T. cangellus*, in the absence of inner rami on uropods 1-2, the smaller and blunter teeth of epimera 2-3, the presence of a midfacial seta on epimeron 3, the blunt posteroventral lobe of coxa 3, and the absence of a posteroventral lobe on coxa 4, the broader article 2 on pereopods 6-7, the stronger accessory tooth on the dactyls of pereopods 3-4, the denser anterior serrations on the dactyl of pereopod 5, the absence of facial setae on article 5 of pereopod 3, and the less attenuate coxa 1.

MATERIAL.—CPBS, 2 samples from 2 stations (5).

DISTRIBUTION.—Victoria, Western Port, 9-12 m, muddy sand.

Tottungus, new genus

DIAGNOSIS.—Rostrum weak, but head large and cowl-like. Peduncle of antenna 1 short, stout, articles 2 and 3 progressively shortened, weakly geniculate; primary flagellum elongate, accessory flagellum weak. Antenna 2 of haustorius form, article 4 expanded, article 5 small, articles 4-5 with facial armaments, article 4 with long ventral setae and subventral clusters of bifid setae. Aesthetascs simple. Mandibular incisors overextended, thin, essentially untoothed; right and left laciniae mobiles not alike; rakers usually serrate, 2 on right mandible, 3 on left, 1 raker usually rudimentary; molar broad and bulky, not strongly extended, with weak triturative surface, with simple accessory chopper; setae of palp article 3 awned. Mandibular lobes of lower lip well developed. Inner plate of maxilla 1 small, slender, poorly setose, outer plate with 11 spines, palp slightly shortened, uniarticulate, palpar setae attached in 2 sets. Inner plate of maxilla 2 with

weakly submarginal oblique row of setae. Maxillae lacking baler lobes, maxillipeds with weak baler lobe basally. Outer plate of maxilliped with spines; palp article 2 expanded, article 3 elongate, dactyl clavate, multisetose.

Coxae 1-2 small, coxa 1 larger than coxa 2; most of coxa 2 hidden by coxa 3; latter larger than coxa 4, adze-shaped, and extended postero-ventrally; only coxae 2-5 with simple gills; brood plates 4 pairs, slender.

Gnathopods small, dissimilar, gnathopod 1 simple, gnathopod 2 subchelate, wrists elongate, hand of gnathopod 2 weakly mitelliform. Dactyls of pereopods 3-7 distinguishable, large; dactyls of pereopods 5-7 in female with 1 or more elongate, subapical setae. Pereopod 5 of haustorius form, article 2 expanded; article 2 of pereopods 6-7 of only moderate width, distal articles not under-slung, only moderately widened; pereopods 6-7 otherwise similar, scarcely dominating pereopod 5.

Peduncles of pleopods short, wider than long, pleopod 3 inferior, inner rami moderately shorter than outer. Epimeron 1 scarcely differentiated, epimeron 2 dominantly setose. Urosomite 1 scarcely produced and poorly setose ventrally. Outer rami of uropods 1-2 linguiform, marginally setose, inner rami short, fused to peduncle; peduncle of uropod 1 strongly setose laterally, of uropod 2 with only 2 apicolateral setule. Uropod 3 of ordinary form, outer ramus dominant and biarticulate, article 2 with 3 large apical setae. Telson short, broader than long, entire.

DESCRIPTION.—Eyes indistinct or poorly discernible, ocular ganglia visible. Dorsolateral surface of article 1 on antenna 1 furnished with organized longitudinal row of armaments; article 2 with spines and plumose setae dorsolaterally; article 3 poorly setose. Article 3 of antenna 2 short, poorly setose, flagellum much longer than article 4 of peduncle.

Right lacinia mobilis linguiform, left broader. Lower lip with 1 cone on each outer lobe. Inner plate of maxilla 1 with very short apical setae and 1 large apicomedia seta; spines on outer plate mostly bifid. Inner plate of maxilliped with 2

stout apical spines. Coxae 1-2 poorly setose. Gill 2 dominant, gill 5 smaller than posterior lobe of coxa 5. Gnathopod 2 bearing surficial button combs.

Pereopods 3-4 lacking extensive secondary facial rows of spines on article 5.

Uropods 1-2 lacking huge dorsal setae on peduncles, rami lacking basoventral setae, medial margins of peduncles not heavily setose.

TYPE-SPECIES.—*Tottungus tungus*, new species.

COMPOSITION.—Unique.

RELATIONSHIP.—In evolutionary sequence this genus follows *Tuldarus* but differs in the development of 3 (instead of 2) apical setae on the outer ramus of uropod 3 and in the loss of parachelateness on gnathopod 2, the palm simply being subchelate. Other characters of unusual degree in this genus are the cowl-like head, the extra set of facial setae on article 5 of pereopods 3-4, and the extreme reduction in size of setae on coxae 3-4.

Tottungus tungus, new species

FIGURES 49-51

DIAGNOSIS.—With the characters of the genus; unique features being presence of 3 apical setae on outer ramus of uropod 3, loss of chelateness on gnathopod 2.

DESCRIPTION OF FEMALE.—Holotype female "d," 2.54 mm: Head about 85% as long as wide, rostrum about 10% as long as remainder of head. Primary flagellum of antenna 1 with 7 articles, formula of medium length, aesthetascs = 0-1-1-2-1-1-0; accessory flagellum 5-articulate. Facial formula of mixed spines and setae on article 1 of antenna 1 = 1 plumose seta, 2 spines, 2 penicillates; on article 4 of antenna 2 in 2 weakly divided sections of 10 each, spines dominant; on article 5 = 11 (omitting transverse apical set); article 3 with 1 seta; flagellum with 8 articles. Right and left incisors almost simple, formula on right and left palp article 3 = 4-1-2-1. Inner plate of maxilla 1 with 1 short apical seta, 1 large apicomedia seta tightly contiguous; outer plate with 11 spines, occasional spine with more than 2

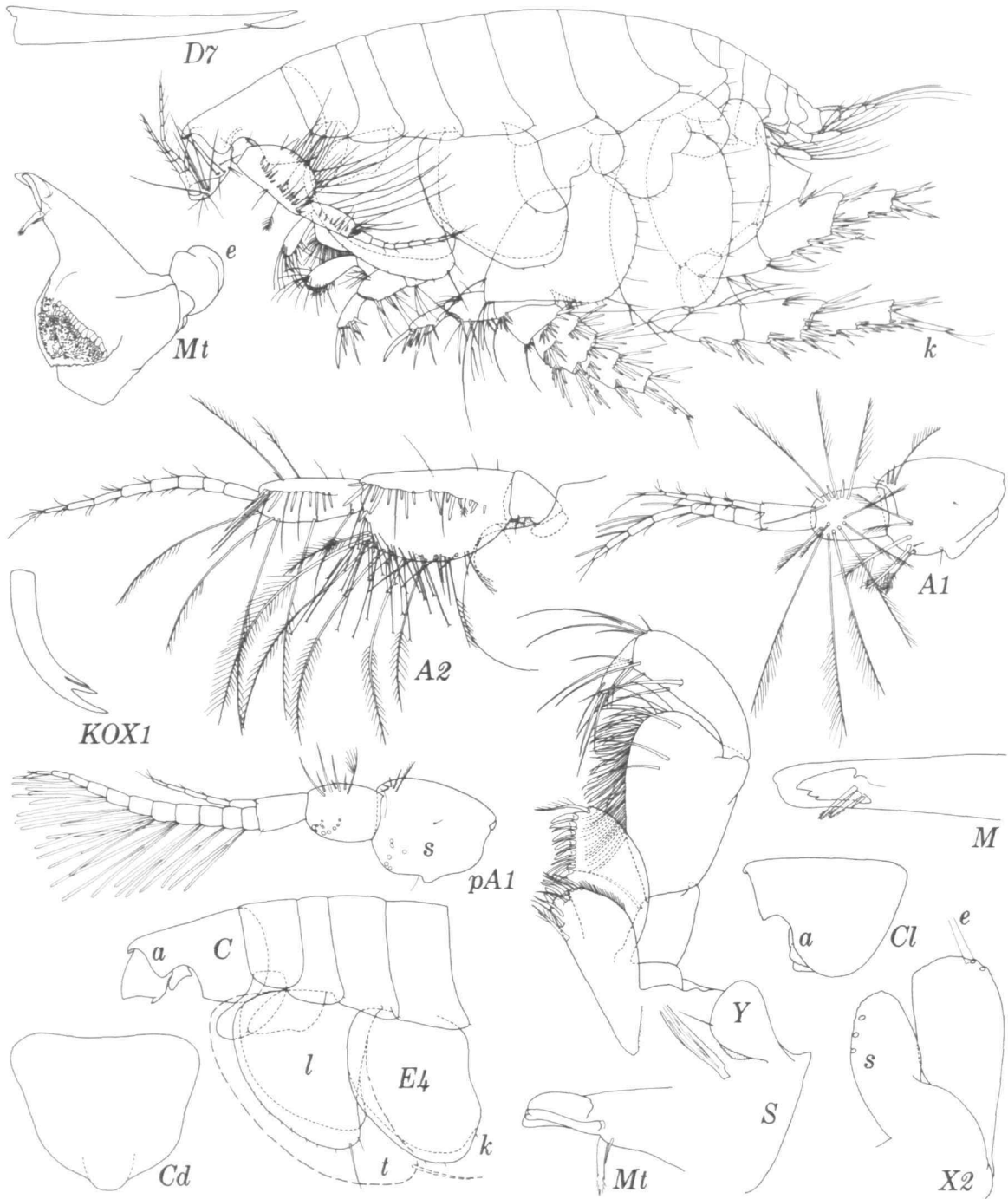


FIGURE 49.—*Tottungus tungus*, new species, holotype, female "d," 2.54 mm (*a* = angular edge rolled inwards; *k* = female "k," 2.60 mm; *p* = male "p," 2.60 mm; *Y* = baler lobe).

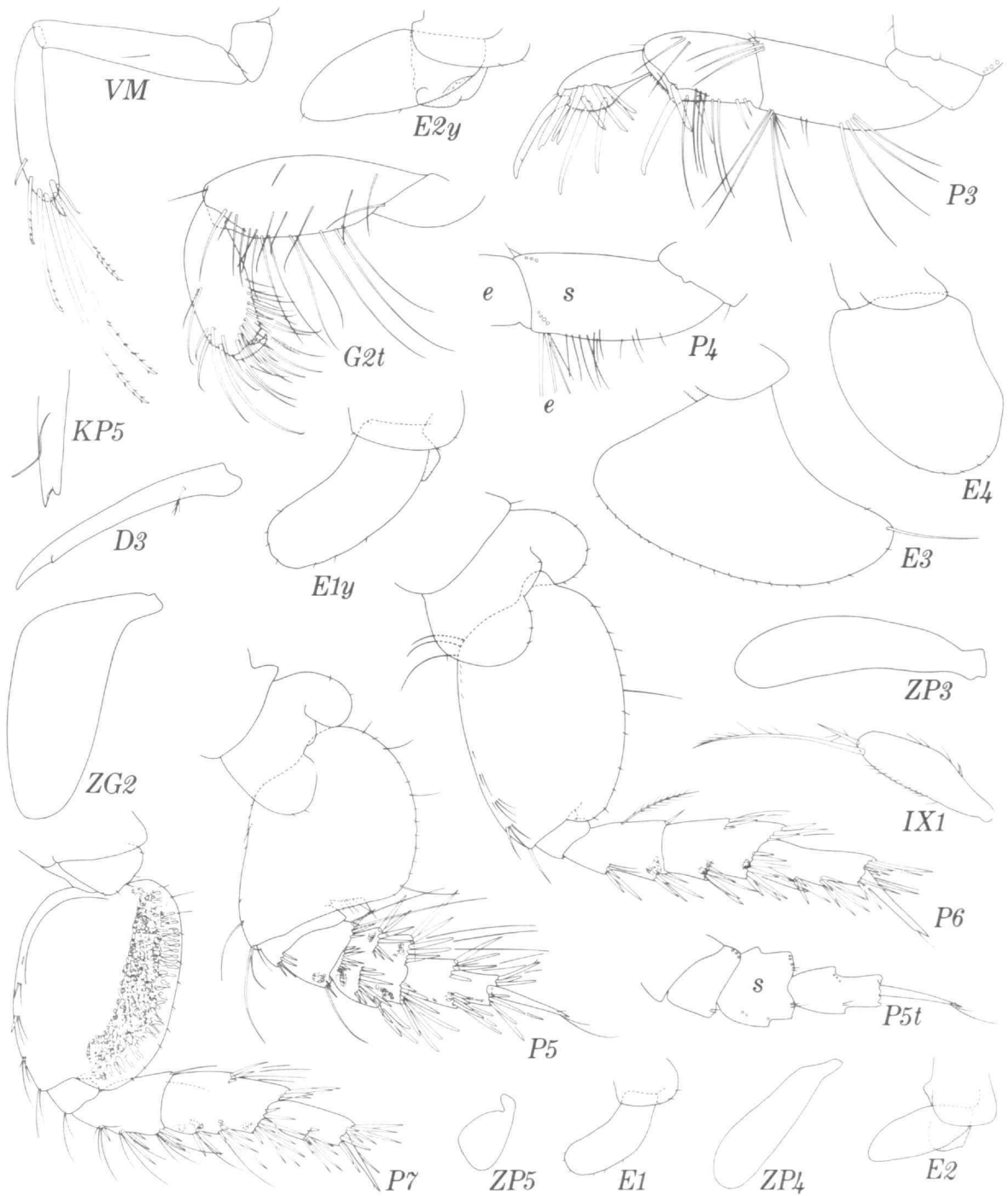


FIGURE 50.—*Tottungus tungus*, new species, holotype, female "d," 2.54 mm (Z = gill).

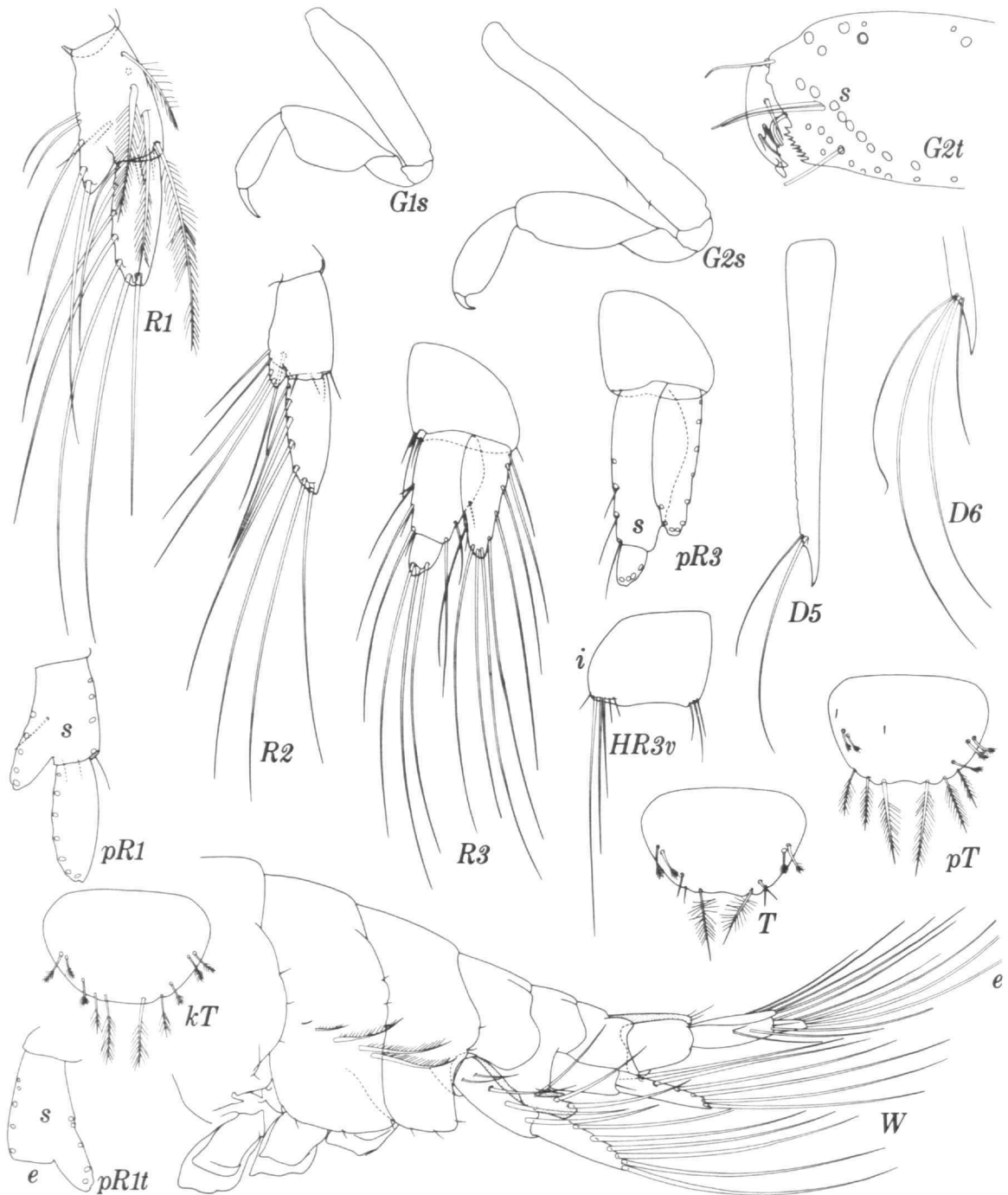


FIGURE 51.—*Tottungus tungus*, new species, holotype, female "d," 2.54 mm (k = female "k," 2.60 mm; p = male "p," 2.60 mm).

cusps. Medial row on inner plate of maxilla 2 with 3 setae. Inner plate of maxilliped with 4 medial setae; outer plate with 1 apicolateral seta; palp article 2 with 3 setae in facial row, article 3 with 1 facial seta; basal articles of maxilliped broadened and with weakly developed baler lobe bearing 1 seta.

Coxa 1 slipper-shaped, apically blunt, longer than coxa 2; latter broad, short; coxa 3 with long seta at posteroventral corner, ventral margin lined with small setules; coxa 4 with posteroventral bevel, ventral margin with several small setules, posterior margin naked.

Palm of gnathopod 2 with side by side double set of serrations.

Setal and spine formulas on pereopod 3 = 3, 3, 2-1, 4 + 4 + 1; pereopod 4 = 3, 4, 2-1, 4 + 4 + 1, posterior margin of article 5 with row of even serrations. Article 2 of pereopods 5-7 progressively with weak to weaker setal sizes posteriorly; article 2 of pereopod 5 with weak mediofacial brush of setae, dactyl with weak anterior serrations and 2 long subapical setae; dactyl of pereopod 6 with 4 subapical setae, of pereopod 7 with 1 subapical seta.

Peduncular spine formulas of pleopods 1-3 = 2 and 0, 2 and 0, 2 and 0; segmental formulas = 13-9, 12-8, 10-8; basal setal formulas = 7-1-2-2, 3-1-1-1, 1-1-1-1.

Epimeron 2 with small blunt posteroventral tooth and horizontal row of 5 setae, anteriormost seta small, or opposite side with only 4 large setae; epimeron 3 with quadrate posteroventral corner.

Lateral margin on peduncle of uropod 1 with 4-5 setae, 4 small apicoventral setae (perhaps homologous to apicolateral seta of other taxa), of uropod 2 only with 4 apicoventral setules, no dorsal setae; setae of outer rami = 7 and 7, inner rami represented by small peduncular projections bearing several long setae. Apicolateral corner of peduncle on uropod 3 with 4 setae, medial margin naked, apicomедial corner with 1 setule, ventromedial apical row with 5-6 mixed setae; formula on lateral margin of article 1 on outer ramus = Ee-Ee-Ee. Telson about 1.5 times as wide as

long, setal formula = 2P, P, 1, 1 plumose/2P, P, 1, 1 plumose.

Gland clusters indiscernible.

Female "k," 2.60 mm: Article 2 of antenna 1 with 7 long setae, no short spines, primary flagellum with 7 articles, accessory with 5. Spine and setal formulas of pereopod 3 = 2, 3, 2-1-1, 5 + 4 + 1; pereopod 4 = 3, 4, 2-1-1, 5 + 4 + 1. Outer ramus of uropod 2 with 6 setae. Telson illustrated.

DESCRIPTION OF MALE (male "p," 2.60 mm).—Primary flagellum of antenna 1 swollen, 11-12 articulate, formula of elongate aesthetascs = 4-4-4-5-5-5-5-5-2-1-0 or 3-2-3-3-3-6-5-5-4-2-1-0 (some omitted in illustration); setae on article 2 of peduncle smaller than in female. Left lacinia mobilis 4-toothed; formula on right palp article 3 of mandible = 4-1-2-1, left = 5-1-2-1. Spines on outer plate of maxilla 1 with only 2 branches. Spine and setal formulas on pereopod 3 = 3, 3, 2-1-1, 4 + 4 + 1; pereopod 4 = 4, 4, 2-1-1-1, 5 + 4 + 1. Dactyls of pereopods 5-7 lacking setae. Epimeron 2 with 5 facial setae. Medial peduncular processes (remnants of inner rami) on uropods 1-2 much larger than in female (illus.); outer ramus of uropod 2 with 7 setae. Outer ramus of uropod 3 with 4 apical setae (illus.); peduncle with 3 apicolateral setae. Telson weakly concave posteriorly, setal formula = 2P, 0, 3, plumose/2P, P, 3 plumose (illus.). Urosomal glands moderately developed in segments 1-3, absent or indiscernible in peduncle or uropod 3 and telson. Pereopodal glands well developed in articles 2, 5, 6 of pereopods 5-7 (some of these not discerned in female; see female illustrations).

JUVENILES.—Telson with broadly rounded apex, seta formula = 2P, P. Article 2 of outer ramus on uropod 3 with only 2 apical setae. Juveniles in brood pouch with article 2 on outer ramus of uropod 3 almost as long as article 1.

OBSERVATIONS.—Head much more cowllike than in other taxa of *Urohaustorius* group (see illustrations); article 5 of pereopods 3-4 with extra facial set of setae not occurring in other taxa of *Urohaustorius* group (see illustration).

Well-developed eyes seen in several males (illus.). Telson of several males such as male "h"

weakly cleft, joined in numerous transitional specimens to males with uncleft telson.

Dactylar setation in females variable, occasionally 1 or 2 of pereopods 5–7 lacking setae in certain individuals, but at least 1 of these pereopods always with dactylar setae. Article 2 on outer ramus of uropod 3 occasionally with 4 setae; occasionally third seta and always fourth seta appearing weakly lateral rather than apical. Inner rami of uropods 1–2 longer in juveniles than in adults. Most common formula of facial setae on article 1 of antenna 1 = long plumose seta, shorter seta, spine, 2 penicillate setules; also frequently occurring = long plumose seta, 2 spines, 2 penicillate setules (= holotype, *illus.*). Third seta on palp of maxilla 1 usually weakly disjunct but 1 female from CPBS 12S/2 with all setae flush as in *Tuldarus*.

HOLOTYPE.—NMV, female “d,” 2.54 mm (*illus.*).

TYPE-LOCALITY.—CPBS 12S/2, Western Port, Victoria, 18 Mar 1965, 2.1 m, muddy sand and weed.

VOUCHER MATERIAL.—Type-locality: female “k,” 2.60 mm (*illus.*); female “m,” 2.46 mm; male “p,” 2.60 mm (*illus.*); male “r,” 2.40 mm; male “q,” 2.41 mm; CPBS 25S/3: juvenile “j,” 1.2 mm; CPBS 26N/S: male “h,” 2.45 mm.

MATERIAL.—CPBS 27 samples from 16 stations (199); WPBES 14 samples from 10 stations (35).

DISTRIBUTION.—Victoria, Western Port, 2–23 m, fine to coarse sand, muddy sand, sand and shell, sand and weed.

Dirimus, new genus

DIAGNOSIS.—Rostrum weak but head large and cowl-like. Peduncle of antenna 1 short, stout, articles 2 and 3 of peduncle progressively shortened (but not much), weakly geniculate; primary flagellum elongate, accessory flagellum weak. Antenna 2 of haustorius form, article 4 expanded, article 5 small, articles 4–5 with facial armaments, article 4 with long ventral setae and subventral clusters of bifid setae. Aesthetascs simple. Mandibular incisors overextended, thin, es-

entially untoothed; right and left laciniae mobiles not alike; rakers serrate, 1 on right mandible, 2 on left; molar broad and bulky, not strongly extended, with weak triturative surface, and simple accessory chopper; setae of palp article 3 awned. Mandibular lobes of lower lip well developed. Inner plate of maxilla 1 small, slender, poorly setose, outer plate with 9 spines, palp shortened, uniarticulate, palpar setae attached in 1 set. Inner plate of maxilla 2 with weakly submarginal oblique row of setae. Maxillae lacking baler lobes, maxilliped with weak baler lobe basally. Outer plate of maxilliped with spines; palp article 2 expanded, article 3 elongate, dactyl clavate, multisetose.

Coxae 1–2 small, of similar size, most of coxa 2 hidden by coxa 3; latter larger than coxa 4, adze-shaped, and extended posteroventrally; only coxae 2–5 with simple gills; brood plates 4 pairs, slender.

Gnathopods small, dissimilar, gnathopod 1 simple, gnathopod 2 parachelate, wrists elongate, hand of gnathopod 2 weakly mitelliform. Dactyls of pereopods 3–7 distinguishable, large, dactyls of pereopods 5–7 with 1 or more elongate subapical setae. Article 2 of pereopods 5–7 expanded, pereopod 5 of haustorius form; distal articles of pereopods 6–7 not underslung, only moderately widened, pereopods 6–7 otherwise similar, scarcely dominating pereopod 5.

Peduncles of pleopods wider than long, pleopod 3 inferior (but scarcely so), inner rami moderately shorter than outer. Epimeron 1 scarcely differentiated; epimeron 2 not facially setose and scarcely dominating epimeron 3. Urosomite 1 scarcely produced and not setose ventrally. Outer rami of uropods 1–2 linguiform, marginally setose, inner rami short and almost fused to peduncles; peduncle of uropod 1 with 2 large setae laterally, of uropod 2 with only 1 apicolateral setule. Uropod 3 of ordinary form, outer ramus dominant and biarticulate, article 2 with 2 large apical setae. Telson short, very broad, entire.

DESCRIPTION.—Eyes distinct. Dorsolateral surface of article 1 on antenna 1 with weak armament row; article 2 densely setose dorsolaterally,

groups weakly distinguishable; article 3 poorly setose. Article 3 of antenna 2 short, poorly setose; flagellum much longer than article 4 of peduncle.

Right lacinia mobilis linguiform, slender; left thin and spike-like. Lower lip with 1 cone on each outer lobe. Inner plate of maxilla 1 with 1 apical and 1 enlarged medial seta; spines on outer plate mostly bifid. Inner plate of maxilliped with 1 stout geniculate apical spine and second much smaller straight spine. Coxae 1-2 poorly setose. Gill 2 dominant, gill 5 larger than posterior lobe of coxa 5. Gnathopod 2 lacking surficial button combs.

Pereopods 3-4 lacking extensive secondary facial rows of spines on article 5.

Uropods 1-2 lacking huge dorsal setae on peduncles, rami lacking basoventral setae, medial margins of peduncles not heavily setose.

TYPE-SPECIES.—*Dirimus tarlitis*, new species.

COMPOSITION.—Unique.

RELATIONSHIP.—This genus forms a close companion to *Tottungus* by sharing the cowllike head, baler lobes on maxilliped, the setose dactyls of pereopods 5-7 (in males as well as females), and numerous other similarities; but differs in several important characters. *Dirimus* has lost the fundamental urohaustoriid character of epimeron 2 in its loss of dominant facial setae and size dominance; it has a reduced row of organized armaments on article 1 of antenna 1 and no combs on gnathopod 2. Unlike *Tottungus*, the setae on the palp of maxilla 1 remain in 1 set, gnathopod 2 retains its typical parachelate condition and coxa 1 is not larger than coxa 2. Other differences include the further reduction in mandibular rakers, the retention of the normal 2 apical setae on article 2 of the outer ramus on uropod 3, the partially articulate inner rami of uropods 1-2, the thin left lacinia mobilis, the different apical armament on the inner plate of the maxilliped, and the much better-developed eyes.

Dirimus tarlitis, new species

FIGURES 52-54

DIAGNOSIS.—With the characters of the genus; unique feature being loss of setal and size domi-

nance of epimeron 2 and unusually broad and short telson.

DESCRIPTION OF FEMALE.—Holotype female "o," 2.22 mm: Head about 1.2 times as long as wide, rostrum about 10% as long as remainder of head. Primary flagellum of antenna 1 with 7 articles, formula of medium-length aesthetascs = 0-0-0-2-1-1-0; accessory flagellum 5-articulate. Facial formula on antenna 1 = 1 setule, 1 seta, 1 setule; on article 4 of antenna 2 in 2 sections of 6 and 9, spines dominant, on article 5 = 11; article 3 with 1 main seta; flagellum with 6 articles. Right and left incisors almost simple, formula on right and left palp article 3 = 3-1-2-1. Inner plate of maxilla 1 with 1 short apical seta, 1 large apicomедial seta; outer plate with 9 spines, occasional spine with much more than 2 cusps. Medial row on inner plate of maxilla 2 with 2 setae. Inner plate of maxilliped with 3 medial setae; outer plate with 1 apicolateral seta; palp article 2 with 2 setae in facial row, article 3 with 1 facial seta; basal articles of maxilliped broadened and with weakly developed baler lobe bearing 1 seta (as shown for *Tottungus tungus*).

Coxa 1 trapezoidal, not larger than coxa 2, both poorly setulose; coxa 3 with long seta at posteroventral corner, ventral margin lined with 2 medium setae and short setules, posterior margin naked.

Palm of gnathopod 2 slightly excavate, with 3 defining teeth (pair medially, 1 tooth laterally), no minute serrations except for weak row inside lateral tooth.

Setal and spine formulas on pereopod 3 = 3, 3, 2-1, 3 + 3 + 1; pereopod 4 = 5, 3, 2-1, 4 + 3 + 1; posterior margin of article 5 with row of even serrations. Article 2 of pereopods 5-7 with progressively weaker setal sizes posteriorly; article 2 of pereopod 5 without mediofacial brush of setae, dactyl with weak anterior hump-serrations and 2 subapical setae; dactyl of pereopod 6 with 4 subapical setae, of pereopod 7 with 3 subapical setae.

Peduncular spine formulas of pleopods 1-3 = 2 and 0, 2 and 0, 2 and 0; segmental formulas =

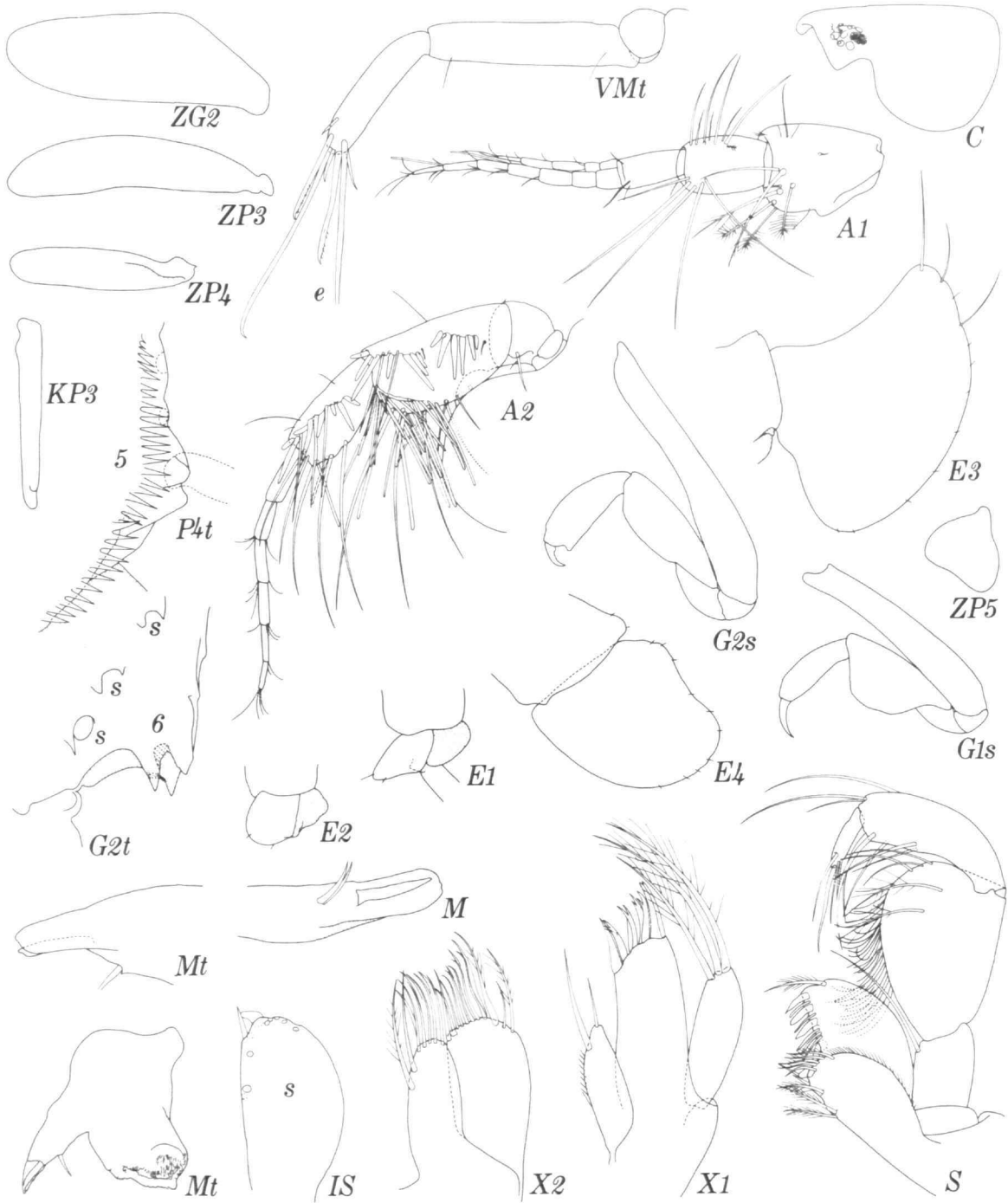


FIGURE 52.—*Dirimus tarlitus*, new species, holotype, female "o," 2.22 mm (Z = gill).

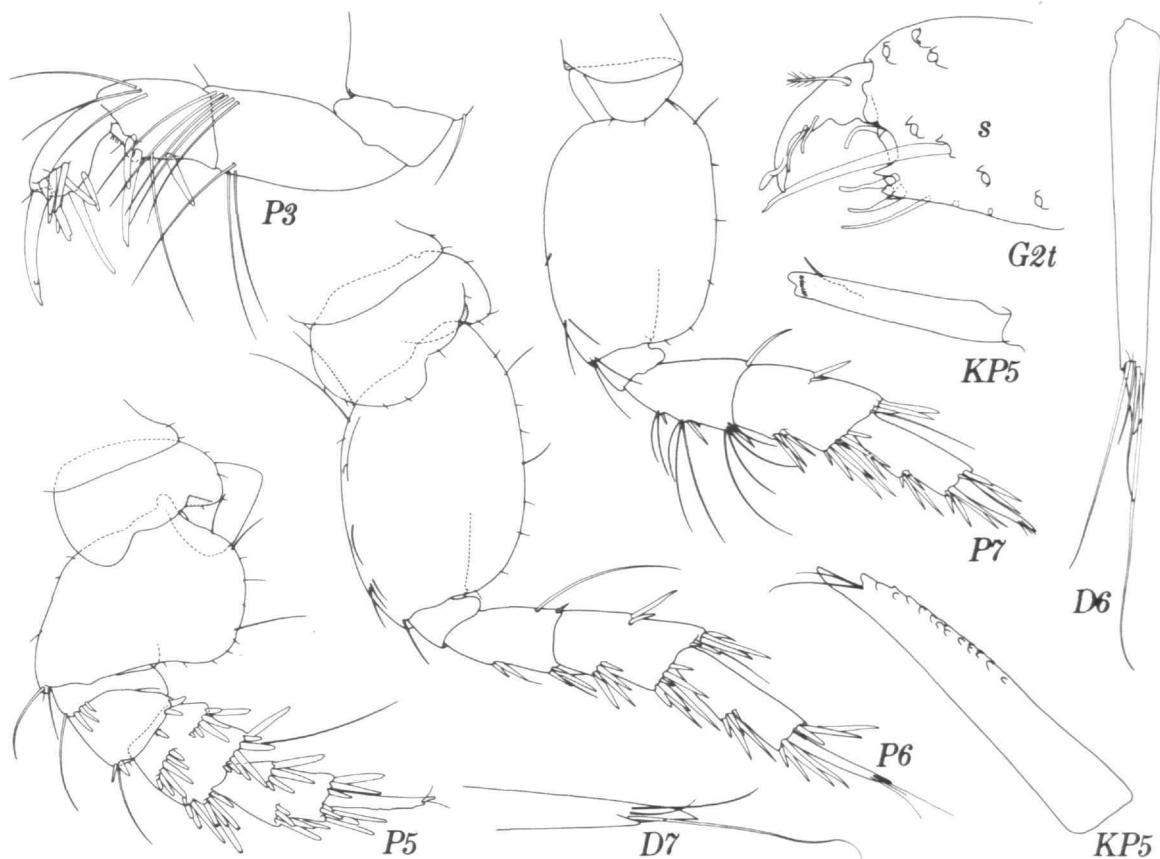


FIGURE 53.—*Dirimus tarlitis*, new species, holotype, female "o," 2.22 mm.

10-5, 9-7, 9-7; basal setal formulas = 6-2-2-2, 2-1-1-1, 5-1-1-1.

Epimera 2-3 of similar shape and size, lacking teeth and facial setae.

Lateral margin on peduncle of uropod 1 with 2 large setae, small setule at corner, 1 apicomedial seta; of uropod 2 only with apicolateral setule and 1 long medial seta (probably attached to root of inner ramus), no dorsal setae; setae of outer rami = 6 and 4; inner rami short and partially articulate, bearing 3 and 2 (3?) setae. Apicolateral corner of peduncle on uropod 3 with 2 setules, medial margin with 2 small setae, ventromedial apical row with 4-5 mixed setae, formula on lateral margin of article 1 on outer ramus = e-Ee-Ee.

Telson almost twice as wide as long, setal formula = 2P, P/2P, P.

Gland clusters indiscernible.

Female "t," 2.07 mm: Telsonic setal formula = 2P, 1, latter seta closely contiguous to its opposite partner, thus forming central pair (illus.).

DESCRIPTION OF MALE (male "p," 2.01 mm).—Like female but eyes slightly larger; telsonic setal formula = 2P, P, and 1 middle seta (illus.).

HOLOTYPE.—QUS, female "o," 2.22 mm (illus.).

TYPE-LOCALITY.—QMW.6383, Middle Banks, Moreton Bay, Queensland, Sep 1976, S. Newlands and S. Cook coll., depth and substratum unknown.

VOUCHER MATERIAL.—Type-locality: female

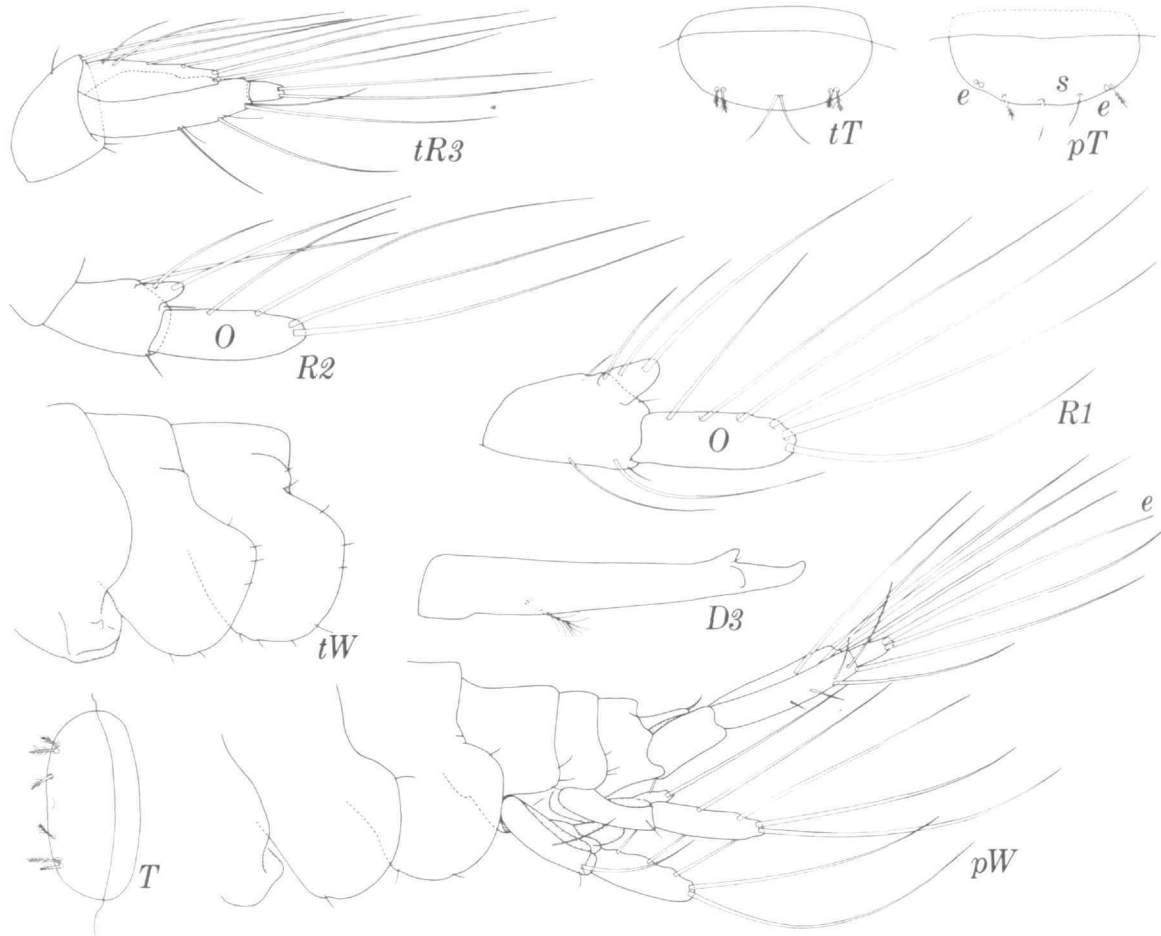


FIGURE 54.—*Dirimus tarlitus*, new species, holotype, female "o," 2.22 mm (*p* = male "p," 2.01 mm; *t* = male "t," 2.07 mm).

"m," 2.25 mm; female "n," 2.17 mm; male "p," 2.01 mm (illus.); male "s," 2.11 mm; QMW.6390: male "t," 2.07 mm (illus.).

MATERIAL.—QUS, 2 samples (6).

DISTRIBUTION.—Queensland, Moreton Bay, Middle Banks, 2–12 m, sand.

HAUSTORIIDAE

DIAGNOSIS.—Rostrum moderate to weak, head short, cheek poorly developed. Antenna 1 of haustorius form, article 1 short, articles 2–3 progressively shorter, weakly geniculate or not; primary

flagellum elongate, accessory flagellum short. Antenna 2 of haustorius form, article 4 expanded, article 5 shorter and narrower than article 4, these articles furnished with 1 or more rows of longitudinal facial ornaments, ventral margin of article 4 with at least 3 kinds of setae: (1) elongate plumes; (2) shorter and stiffer glassy spines set in tandem; (3) bulbar based penicillate setules; flagellum scarcely longer than article 4 of peduncle. Prebuccal complex massive, upper lip dominant, epistome scarcely distinct. Mandibles bearing stubby, poorly toothed incisors; laciniae mobiles present on both sides and weakly unlike each

other; rakers poorly serrate, numerous to few; molar large and very weakly triturative, usually fuzzy, often furnished with accessory chopper in form of articulate multifid spine; palp 3-articulate, article 3 with numerous outer setae, no setae of palp article 3 awned, apical group with mostly simple setae but proximal members bilaterally serrate, distinctive and disjunct set of inner basal, short and bilaterally serrate spines also present. Lower lip with discrete inner lobes, mandibular extensions of outer lobes absent. Maxilla 1 with biarticulate palp, inner plate usually triangular but always evenly and densely setose medially, lacking any lateral setae; baler lobes often present. Maxilla 2 usually with outer plate significantly enlarged, inner plate with fully developed medial row of setae. Maxilliped with expanded bases bearing baler lobes (usually), otherwise maxilliped with normally enlarged plates, outer spinose; palp 3-articulate, article 3 usually geniculate, article 2 expanded.

Coxae 1-4 evenly integrated by stepped enlargement from coxa 1 onwards, coxa 4 dominant, coxa 1 not extremely small, coxae 3-4 more or less weakly produced posteroventrally. Coxal gills on segments 2-6, brood plates slightly to moderately broadened.

Gnathopods feeble, grossly alike in proportions, wrists elongate, but gnathopod 1 simple (dactyl with nail = unusual); gnathopod 2 minutely parachelate; article 3 short. Article 5 of pereopods 3-4 broad and deeply lobate, with thick posterior or facial spines; dactyls of pereopods 3-7 vestigial, represented by tiny bulb bearing plusetule; pereopod 5 of haustorius form, articles 2, 4, and 5 expanded, articles 4-5 with extensive facial rows of spines; pereopods 6-7 not alike but not of phoxocephalid form; article 4 on pereopod 6 immensely dominant, article 2 subrectangular; article 2 on pereopod 7 immensely dominant, subcircular, articles 4-5 expanded, but together not as large as article 4 of pereopod 6; pereopods 6-7 occasionally with weakly developed under-slung articulation.

Peduncles of pleopods not longer than wide, inner rami not or scarcely inferior, pleopod 2 not

inferior; coupling hooks paired on each pleopod, inner rami lacking clothespin hooks.

Epimeron 1 well developed; epimeron 3 dominant in size, cuspidation or setation. Urosome flexing ventrad, urosomite 1 often becoming elongate, extending ventrally, and apicoventrally toothed. Rami of uropod 1 clavate or rodlike or weakly styliform, spinose; rami of uropod 2 linguiform or grossly rodlike, setose; uropod 3 with rodlike rami, outer ramus weakly dominant, 2-articulate, article 2 elongate, inner and outer rami and article 1 of outer ramus apically multiarmed.

Telson very short, broad, cleft gaping, base often constricted.

TYPE GENUS.—*Haustorius* Müller.

COMPOSITION.—*Lepidactylus* Say, *Eohaustorius* J. L. Barnard, *Protohaustorius* Bousfield, *Parahaustorius* Bousfield, *Neohaustorius* Bousfield, *Pseudohaustorius* Bousfield, *Acanthohaustorius* Bousfield. (See Bousfield, 1965, 1973).

RELATIONSHIP.—Haustoriids can be developed evolutionarily from a position antecedent both to the Zobrachoidae-Urohaustoriidae cluster and to the Phoxocephalopsidae. Haustoriids retain the primitive epimeral condition of most amphipods in that epimeron 3 is dominant, whereas the other groups mentioned have epimeron 2 dominant. Haustoriids also maintain, like Phoxocephalopsidae, the plesiomorphic uropod 1 bearing rod-styliform rami with spines, quite unlike the linguiform-setose rami of Zobrachoidae-Urohaustoriidae, which are very unusual and presumably apomorphic. The rami of uropod 2, however, are linguiform but the setae are far more numerous and not as regularly positioned as in the antibrachoid groups. Uropod 3 is distinctive and somewhat reminiscent of certain Eurasian freshwater gammarids.

The presence of baler lobes is a specialization superimposed on what otherwise are primitive maxillae in terms of medial setation; but the maxillipeds have progressed greatly through loss of the dactyl and geniculate substitution by article 3 of dactylar functions. Haustoriids retain many rakers in primitive forms, though several apomorphic genera show decline in numbers, as

in Urohaustoriidae. The presence of a special inner proximal row of spines on palp article 3 may be a carryover from the primitive gammarid condition; these do not occur in other haustorioids as far as known.

Gnathopods are very similar to those of Urohaustoriidae but lack surficial button combs on the faces of article 5 (observation new). The dactyl of gnathopod 1 bears a nail, a unique feature. All pereopodal dactyls are truly vestigial (e.g., as small as can be imagined and be observable). Article 5 of pereopods 3-4 is grossly lobate. Pereopods 6-7 are of quite distinctive morphology in comparison with zobrachoid-urohaustoriids. The pleopods differ in several ways from those in antiboreal taxa.

CONDUKIIDAE, new family

DIAGNOSIS.—Rostrum well developed, cylindrical, with anteroventral solid keel; head otherwise elongate, cheek poorly developed. Appendages fossorial, e.g., furnished with digging spines and roiling-filtrative setae. Antenna 1 partially of *Urothoe* form, article 1 short, articles 2-3 unusually elongate, geniculate; flagella short, similar and about as long as article 3 of peduncle. Antenna 2 slender, article 4 elongate, article 5 shorter than article 4, these articles furnished with long and medium setae, no rows of facial armaments; flagellum short, subequal to article 5 of peduncle. Prebuccal complex massive, epistome and upper lip distinct, latter dominant. Mandibles bearing incisors, laciniae mobiles, rakers and large weakly triturative molar; palp 3-articulate. Lower lip with appressed inner lobes partially fused together, mandibular lobes of outer lobes well developed. Maxilla 1 with small, moderately setose inner plate; outer plate with 6 spines; palp 2-articulate. Maxilla 2 ordinary, inner plate with oblique facial row of setae. Maxillipeds with widened and extended basal parts lacking baler lobes, outer plate bearing only setae, otherwise with normally enlarged plates and 4-articulate palp, dactyl of latter stubby or clavate and multisetose, lacking nail.

Coxae 1-4 progressively and evenly larger; coxa 1 small but not strongly hidden by following coxae; coxa 4 broad, platelike, with weak posterodorsal excavation; coxa 5 much shorter than coxa 4. Coxal gills on segments 2-6, brood plates unknown.

Gnathopods feeble, grossly alike in proportions but gnathopod 1 scarcely subchelate; gnathopod 2 minutely parachelate, wrists elongate, article 3 very short. Article 5 of pereopods 3-4 with large posterior lobe and thick spines; dactyls of pereopods 3-6 vestigial, dactyl of pereopod 7 small; pereopods 5-7 of similar dominance, article 2 grossly similar in expansion, articles 4-5 broadly expanded and platelike, bearing facial spine groups, though weak or absent in several places, article 6 much narrower and shorter and hanging as appendage to apex of article 5; article 5 of pereopod 7 underslung.

Peduncles of pleopods not longer than wide, rami of pleopods 1 and 3 extremely slender, with very few articles, those of uropod 2 weakly expanded basally, otherwise similar, with article 1 extremely elongate, only pleopod 2 with coupling hooks; essentially pleopod 2 dominant.

All epimera distinctly developed, epimeron 3 dominant. Urosome flexed ventralwards (on death), urosomite 1 greatly elongate by virtue of huge subpeduncular extension bearing pair of ventral teeth, urosomites 2-3 equally short; uropods 1-2 each biramous, rami sublanceolate (not linguiform), spinose (not setose, or setae, if present, very short); peduncle of uropod 3 scarcely elongate, inner ramus vestigial, outer ramus grossly dominant, article 2 well developed, apically truncate, and multiarmed.

Telson ordinary, slightly longer than wide, deeply cleft. Sexual dimorphism unknown.

TYPE GENUS.—*Condukius*, new genus.

COMPOSITION.—Unique.

RELATIONSHIP.—*Condukius* carries a mixture of characteristics found in the Haustoriidae, Urothoidae, Pontoporeiidae, and Platyischnopidae. For example, the rostrum resembles a primordial concept of the platyischnopid rostrum and the following appendages are so similar to those of

platyischnopids that a widened diagnosis could admit *Condukius*: pereopods 5–7, uropods 1–3, telson, epimera, lower lip, and maxilliped palp article 4. However, the following characteristics of *Condukius* are foreign to platyischnopids: the simple gnathopod 1, the general shape of gnathopod 2, and in most respects the parts of the mandibles, maxilla 1, maxilliped and pereopods 3–4.

The strange apical setae on the wrists of the gnathopods are also characteristic of several platyischnopids and alien to the other groups.

Condukius differs from both Urothoidae and Haustoriidae in the shape and spination pattern of pereopod 5 and in the rostrum, but pereopods 3–4 have features of the Haustoriidae. The outer plate of the maxilliped, in its lack of thick spines, resembles that of the Haustoriidae. *Condukius* differs from the Haustoriidae in the presence of mandibular lobes on the lower lip, the presence of maxillipedal palp article 4, an elongate telson, relatively normal spination on uropod 2 and distinctive antennae.

Condukius might be included within the Pontoporeiidae because of resemblances in telson, lower lip, uropods 1–2, and gnathopods, but differs in the rostral shape and antenna 1.

Provisionally, *Condukius* may be assigned to Platyischnopidae on the basis of rostrum and characteristic setae of the gnathopods but segregation in a distinct family on the basis of shapes in articles 4–5 of pereopods 6–7 (like Haustoriidae); shape of pereopods 3–4 (like Haustoriidae); the absence of thick spines on the outer plate of the maxilliped (like Haustoriidae); and the unusual mixture of pleopods; is a good alternative.

Condukius shares some of the unusual appearances found in *Cunicus*, now assigned to the Urothoidae. These similarities occur especially in antennae and mouthparts and the slight propensity in *Cunicus* to the development of a protruding rostral area; but *Cunicus* differs from *Condukius* greatly in that (1) the head is readily identifiable with the *Urothoe*-like head, with large cheek, and the antennae are attached at the apex of the false rostrum; (2) pereopod 5 is of the haustorius form;

pereopods 6–7 are of the urohaustorius form; (3) the rami of uropods 1–2 are absent, but the remaining peduncle is lamelliform and strongly setose.

***Condukius*, new genus**

DIAGNOSIS.—With the characters of the family, especially notable being: Platyischnopid-like rostrum, thin geniculate antennae lacking organized facial armaments, with elongate setae, articles 2–3 of antenna 1 elongate; relatively ordinary mandibles, coxae, and telson; feeble gnathopods with elongate wrists, if chelate not strongly so; vestigial dactyls on pereopods 3–7; gross lobation on article 5 of pereopods 3–4; evenness of pereopods 5–7, all with expanded articles 2, 4, and 5 bearing facial spines, pereopod 5 not of the haustorius form; unusual pleopods; ordinary uropods 1–2; niphargid-like uropod 3; flexed urosome with greatly attenuate urosomite 1.

TYPE-SPECIES.—*Condukius karkan*, new species.

COMPOSITION.—Unique.

***Condukius karkan*, new species**

Figures 55–58

DIAGNOSIS.—With the characters of the genus and family.

DESCRIPTION.—Body long and narrow, as in Platyischnopidae. Head 17% as long as total animal, narrow and elongate, not tall, with platyischnopid-like rostrum extending anteriorly; eyes indiscernible; antenna 1 attached in sinus behind rostrum, ventroanterior margin of head lacking sinus for insertion of antenna 2, cheek not ventrally extended.

Antenna 1 shorter than antenna 2, article 1 as long as wide, dorsofacial surface with 2 large setae; article 2 nearly 1.7 times as long as article 1, slender, with 2 large setae; article 3 slightly shorter than article 2 but elongate (in context to many similar genera), with midventral but facial circlet of 5 setae and 1 apicodorsal seta; flagella almost equally extended but only 1.25 times as

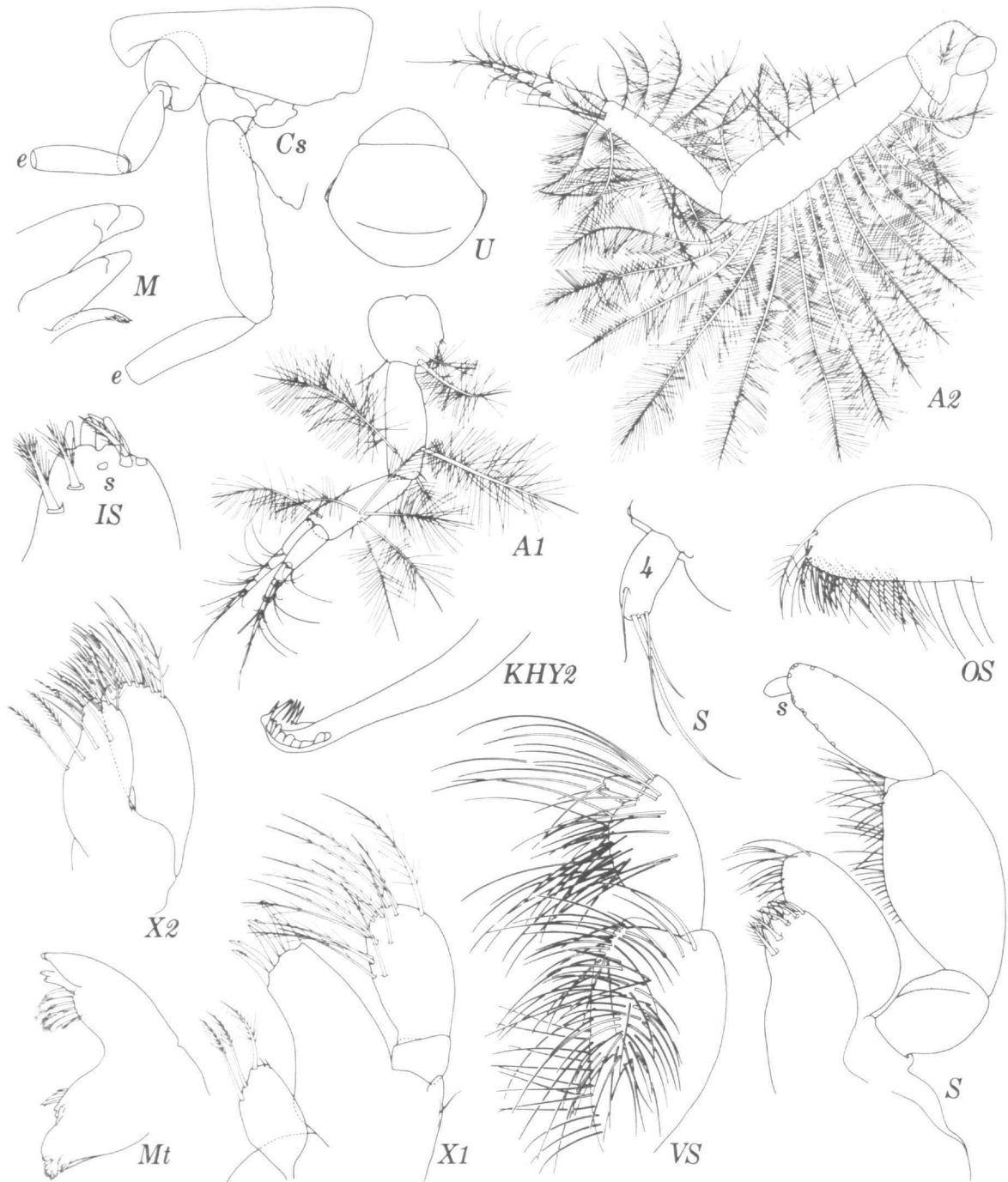


FIGURE 55.—*Condukus karkan*, new species, holotype, male "a," 8.41 mm (Y = pleopod).

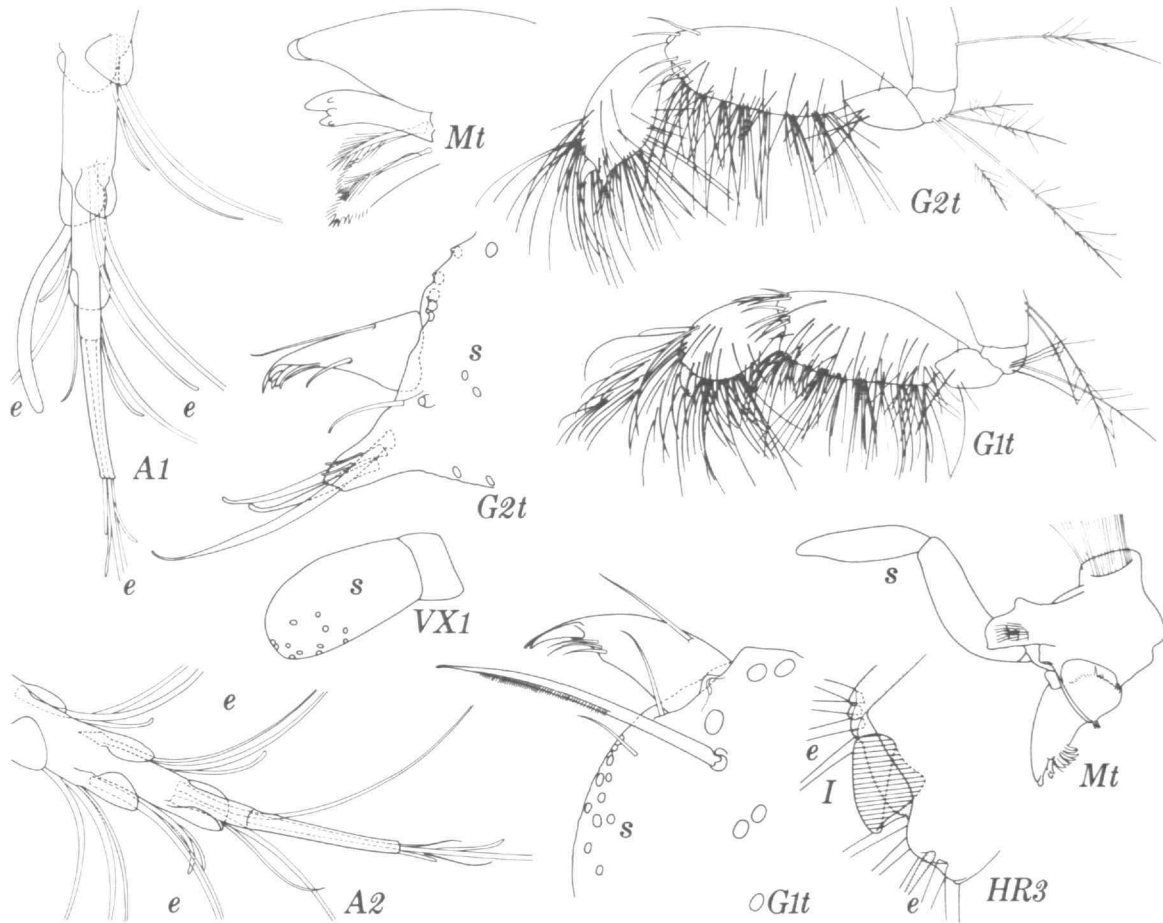


FIGURE 56.—*Condukus karkan*, new species, holotype, male "a," 8.41 mm.

long as article 3 of peduncle, primary flagellum 6-articulate, penultimate article short, other elongate, bearing pairs of hood scales apically except for ultimate article forming elongate tube; accessory flagellum 7-articulate, otherwise similar but penultimate article not shortened. Article 3 of antenna 2 with 2 setae; article 4 slender, ventral margin closely lined with elongate setae, dorsal margin with fewer and shorter setae, face with 2 setae at about M. 60; article 5 much shorter than article 4, ventral setae irregular and shortened, dorsal setae of medium size, apical face with several setae; flagellum almost as long as article 5 of peduncle, similar to flagella of antenna 1 (also bearing hoods and ultimate article tubelike).

Mandibular incisors short, right weakly bifid, left weakly trifid; right and left laciniae mobiles not grossly dissimilar, of moderate thickness, right bifid, with 3 other humps superimposed, left weakly bifid; rakers expanded and serrate, right with 5 plus 2 rudimentaries, plus intercalated plusetules, left with 6 plus 2 rudimentaries and plusetules; molars large, elongate, weakly triturative, bearing accessory choppers with 5 cusps; palps ordinary, all setae of article 2 concentrated on midmedial margin; article 3 formulas not of Urohaustoriidae format, apex of palp with definite bevel and all setae concentrated on this inner bevel, setae simple but apically hooked. Lower lip lacking cones.

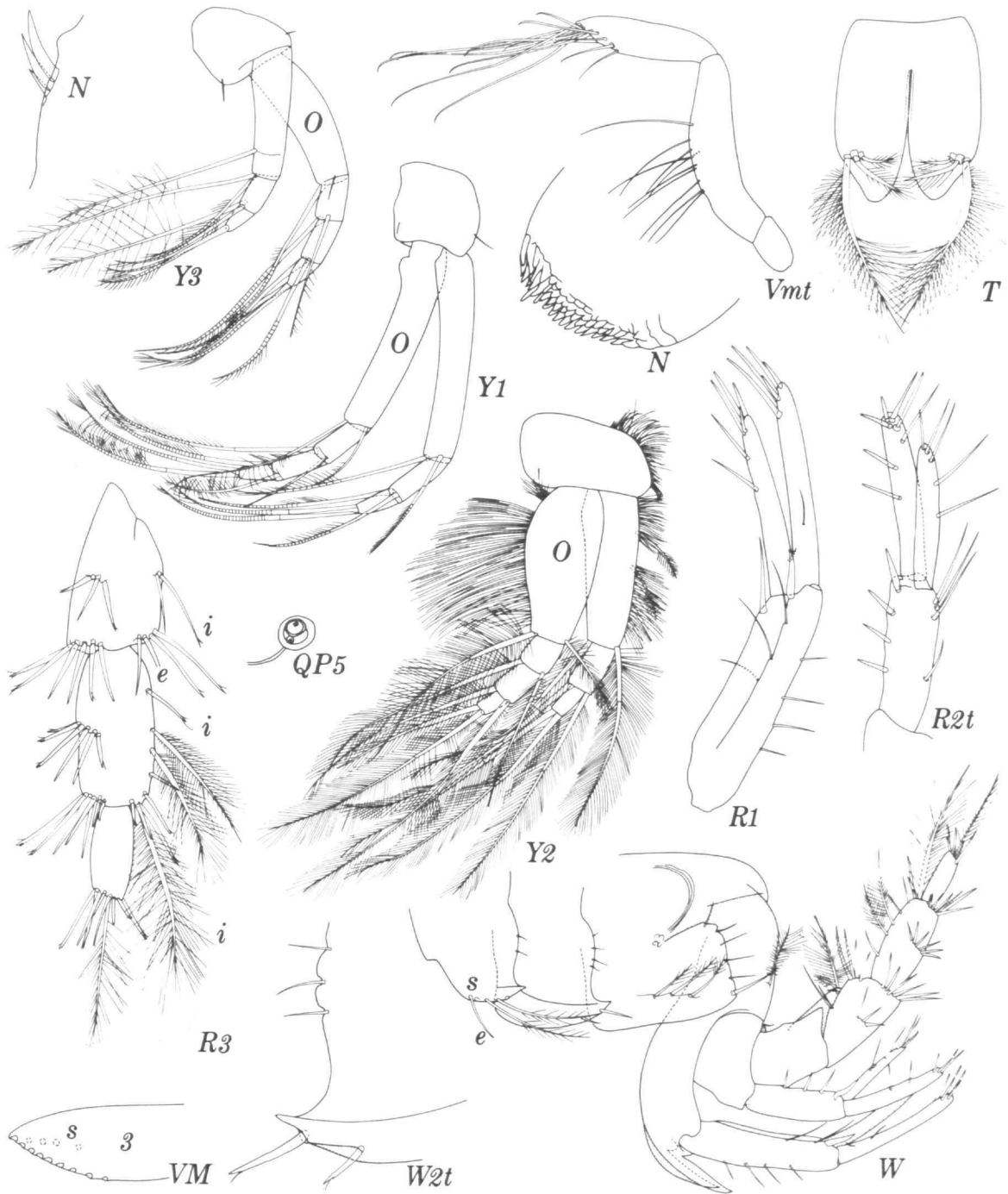


FIGURE 58.—*Condukus karkan*, new species, holotype, male "a," 8.41 mm (Y = pleopod).

Inner plate of maxilla 1 with 2 apicolateral setules, 1 large apical seta and 2 similar medial setae all in tandem: outer plate tapering apically, bearing only 6 spines, 2 of these bifid; palp biarticulate, article 1 short, article 2 elongate and broadly expanded (when flattened), multisetose apically, medially, and facially. Inner plate of maxilla 2 narrower and slightly shorter than outer plate, with mediofacial oblique row of 4 setae. Inner plate of maxilliped with 3 stout apical spines, oblique facial row of 5 setae; outer plate with medial and apical setae, no spines; palp attached geniculately to outer plate article, article 2 moderately expanded and densely setose medially and facially, article 3 attached to article 2 by narrowed base, then medially expanded and setose medially and facially, dactyl very small, clavate, with 3-4 apical setae.

Gnathopods densely setose, dactyls small, weak setal brush present on article 3. Article 4 of pereopod 3 with 4 large anterior setae, of pereopod 4 with only 1 seta, posterior margins respectively with 1-1 and 2-3; lobe of article 5 unornamented, with 2 apposing rows of spines, about 4 in each row (with aberration of seta replacing spine); article 6 elongate, beveled ventroapex with 2 rows of spines, 5-4 and 6-4 (perhaps actually 5-4-1 but single midspine difficult to interpret); dactyls vestigial, about as large as basal attachment circle of adjacent spine, bearing large setule. Coxa 5 ordinarily bilobed; coxa 6 with small anterior and deep posterior lobe; coxa 7 extremely short but wide; article 2 of pereopods 5-7 almost naked posteriorly; otherwise see illustrations.

Pleopods unusual (Figure 58: Y1, 2, 3); pleopods 1 and 3 lacking coupling hooks, only pleopod 2 attached to sternum in normal situation with peduncles set transversely, other pleopods with peduncles tilted inward, thus when flattened and illustrated rami appearing superimposed, as attached to sterna with rami curling backwards; ramal bases and peduncle of pleopod 2 with dense, filamentous setulation, other pleopods lacking this armament; segmental formulas =

4-3, 4-3 and 4-3 (inner with weakly indicated fourth article at apex of article 1).

Both epimera 1-2 with sharp, hooked, posteroventral tooth, posterior margin convex, armed with 2 and 4 setules; ventral margin of epimeron 1 with 5 setae; posterior part of ventral margin on epimeron 2 with 2 spines; epimeron 2 much larger than epimeron 1, each with weak to strong facial ridge. Epimeron 3 overall quadrate and somewhat brokenly but normally separated dorsally from segment; posterior and posterodorsal margin with 6 setae, ventralmost largest, ventral margin naked, face with horizontal row of 3 setae attached to scallop-ridge.

Urosomite 1 grossly extended ventrally, with 2 clothespinlike ventral teeth side by side (and asymmetrical); peduncle of uropod 1 with 3-4 ventrolateral setae, dorsally with 2-3 setae near apex and apical spine, medial apex with spine; outer ramus with 1 small dorsal seta near base, apex with 5 widely spread long to medium spines, inner ramus with 4 similar spines and 2 in tandem more proximally; peduncle of uropod 2 with 4 dorsolateral spines, apicalmost stoutest, medial margin with 4 spine-setae, 3 of these crowded distally, outer ramus with 2 middorsal spines and group of 5 long to medium apical and apicomедial spines, inner ramus with 2 midmedial spine-setae, apex with 3 shorter spine-setae.

Uropod 3 attached to urosomite 3 and outer ramus to peduncle apparently with ontogenetic dorsal face pointing laterally; inner ramus scarcely detectable; peduncle and article 1 of outer ramus with faciolateral groups of spines, new dorsal margins spinose and article 1 also with large setae, article 2 smaller than article 1, apex truncate and multispinose, bearing also 1 plumose seta. Telson with tapered apices, at beginning of taper each armed with transverse lateral set of 3 setae, lateralmost large and elongate, other medial members much smaller; basolateral margins naked.

ILLUSTRATIONS.—Armaments added in dots on uropods 1-2 representing those added from opposite member; pereopod 5 illustrated as composite of left articles 1-4 and converted right 5-7,

pereopod 6 with right and left armaments combined together for maximum count; gills 2-4 drawn at same magnification as those attached to pereopods 5-6; pleopods drawn from left posterior view, dotted setae showing additional members from right side.

HOLOTYPE.—NMV, male "a," 8.41 mm. Unique.

TYPE-LOCALITY.—WPBES 1745/1, Western Port, Victoria, 25 Nov 1974, 13 m, coarse-medium sand.

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