

## SOME LITTORAL HARPACTICOID COPEPODS, INCLUDING FIVE NEW SPECIES, FROM WELLINGTON, NEW ZEALAND

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### ABSTRACT

Seven species of littoral harpacticoid copepods are recorded from the Wellington coast of central New Zealand. Amongst these are five new species, one in each of the genera *Scutellidium*, *Eupelte*, *Amphiascus* and two in *Porcellidium*. *Amphiascopsis cinctus* (Claus, 1866) and *A. south-georgiensis* (Lang, 1936) are recorded and figured.

### INTRODUCTION

Knowledge of the New Zealand harpacticoid copepod fauna is slight, as only about 48 species, excluding pelagic forms, have been recorded (Thomson 1878, 1882, 1894, 1913; Thomson and Anderton 1921; Brady 1899; Sars 1905; Lang 1933, 1934; Bradford 1967).

Collections were made from intertidal seaweeds taken at Island Bay, Wellington, during the winter of 1969 and the summer of 1969-70. Seven of the more plentiful species have been worked up for the present paper, five of them proving to be undescribed.

The terminology of Lang (1948) has been used. The animals were stained with Chlorazol Black or Lignin Pink before dissection; the dissected parts were mounted in "Euparal" and examined by phase contrast. All drawings were made from camera lucida projections.

The swimming leg seta and spine formula has been based on the system of Lang (1948). Where applicable, measurements for the first antenna segments have been taken along the anterior edge. Total length measurements were from the anterior edge of the rostrum to the posterior border of the caudal rami.

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## SYSTEMATICS

## Family TISBIDAE Stebbing, 1910

Genus *Scutellidium* Claus, 1866

To those species mentioned by Lang (1948) the following have since been added: *S. arthuri* var. *magnum* Monk, 1941; *S. purpurocincta* Monk, 1941; *S. lamellipes* Monk, 1941; *S. intermedium* (Nicholls, 1941); *S. cockburni* (Fairbridge, 1944); *S. loureiroi* Jakobi, 1954; *S. dentipes* Vervoort, 1964; *S. armatum* (Wiborg, 1964 as *Scutellopsis*); *S. ringueleti* Pallares, 1969; *S. stingosum* Pallares, 1969; and *S. deseadensis* Pallares, 1969.

Lang (1965) thinks that *S. arthuri* var. *magnum* and *S. purpurocincta* are probably not specifically different from *S. arthuri* and that *S. lamellipes* could be attributed to *S. longicauda*

One further species is added to this genus.

*Scutellidium spinatum* sp. nov.

Figs 1-4

? *S. tisboides*, Thomson, 1882

**FEMALE:** Total length 0.75 mm. *Body* compressed dorso-ventrally. Thoracic segment 5 narrowed to about the width of the abdomen and has rounded lateral borders with a posterior row of spines. *Rostrum* plate-like, not visible from above because it points downwards and backwards. It has a central anterior depression with two groups of long hairs on the rounded anterior borders, and a sensory hair in a pit on each side of the depression. *Line of fusion* between abdominal segments 1 and 2 distinct in dorsal and lateral aspects as a chitinous ridge. *Anal segment* small, operculum almost rectangular and with a smooth edge. *Caudal rami* cylindrical, as long as wide, with 2 strong apical setae and 6 additional marginal setae, 3 of which appear on the dorsal surface.

*Antenna 1* is 9-segmented, with small conical process bearing an aesthetasc on segment 4. *Antenna 2* basis longer and wider than endopod segment 1, and bears a few small spines and hairs, and one short plumose seta. Distal endopod segments with scattered groups of spines and nine appendages, the outermost being bifurcate. Outer margin of distal segment bordered by hairs. Exopod 4-segmented, arises from basis and has 2, 1, 1, and 3 plumose setae on segments 1-4.

*Mandible*, *maxilla 1*, and *maxilla 2*, identical to those of *S. arthuri*. *Maxilliped* basis with 2 inner edge setae, one very small and comb-shaped, the other long and long-plumose. Endopod segment 1 broadly flattened with 3 distinct rows of spines, varying in size, also 1 proximal and 1 distal marginal spine. Segment 2 with 1 strong toothed claw, 2 long geniculate setae, and 2 smaller plumose setae.

*Leg 1* with both endopod and exopod 3-segmented. Basis with numerous small spines at the base of the endopod. Exopod segment 1 with 2 longitudinal rows of hairs and a distal, densely hairy spine with 3 or 4 small spinules at its base. Segment 2 with proximal, densely hairy spine lying in close proximity and of equal length to distal spine of preceding segment. On inner edge of segment 2 there is a long plumose seta with hairs at its base. Last exopod segment (3) very short with 4 strong, densely hairy spines and 2 plumose setae.

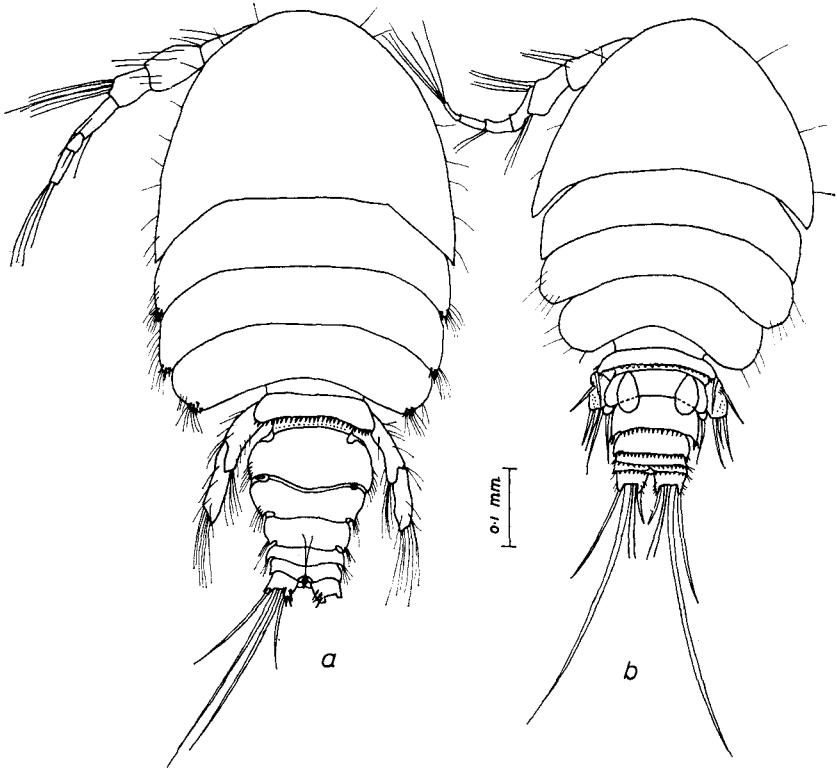


FIG. 1—*Scutellidium spinatum* sp. nov. (a) ♀ dorsal view; (b) ♂ dorsal view.

The 3 exopod segments together nearly reach distal border of the endopod segment 1. Endopod segment 1 broad with one long, plumose seta on the inner margin. Outer edge of segment 2 with a few hairs and a single plumose seta on distal inner margin. Segment 2 shorter than first. Segment 3 reduced with two strong densely hairy terminal spines and two plumose setae attached at inner distal corner.

*Leg 2* basis with a long plumose seta reaching nearly to the distal extremity of the exopod. Exopod segment 1 broadly flattened, with inner plumose seta and smaller outer plumose seta. Segment 2 much narrower than first, with inner plumose seta. Distal segment with 2 inner plumose setae, 2 terminal toothed spines and 3 lateral toothed spines. Endopod 3-segmented, with long hairs on outer margin: segment 1 with 1 long plumose seta; segment 2 larger, with 2 long plumose setae; segment 3 (distal) smaller, with 5 plumose setae and a spine. *Legs 3 and 4* without distinctive features except that leg 4 exopod has what appears to be very small spinules on the surface of segments 2 and 3.

The seta and spine formulae are as follows:

	Exopod	Endopod
Leg 2	1:1:223	1:2:122
Leg 3	1:1:323	1:2:321
Leg 4	1:1:323	1:2:221

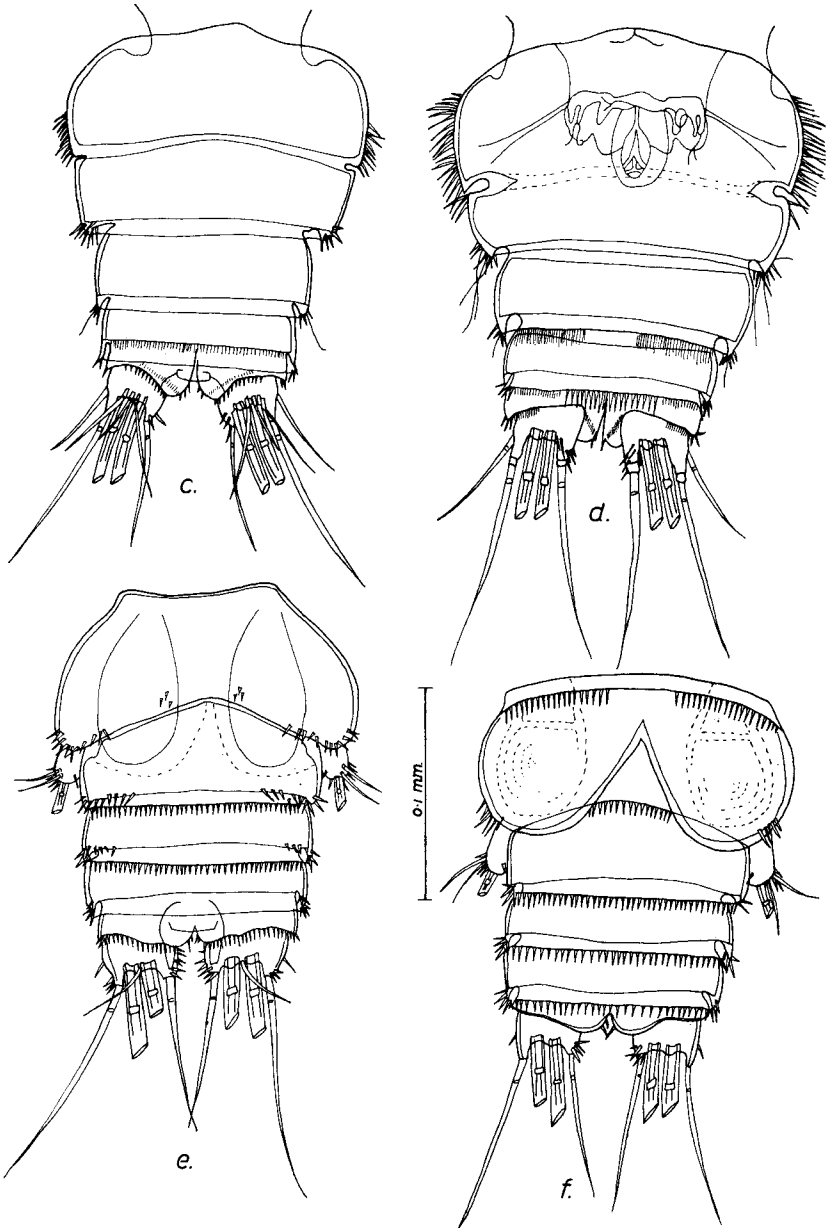


FIG. 2.—*Scutellidium spinatum* sp. nov., ♀: (c) dorsal abdomen; (d) ventral abdomen; ♂: (e) dorsal abdomen; (f) ventral abdomen.

*Leg 5* elongate, extending beyond the line of fusion of abdominal somites 1 and 2. Both lobes of baseopod of almost equal development, extending one-sixth the length of the exopod; external lobe has 3 naked setae, the middle one of which is longest and extends almost to the terminal edge of the exopod; internal lobe with a single long naked seta extending past the exopod. Baseopod supplied with numerous spines. Exopod nearly 3 times as long as wide with 2 marginal, 1 smaller subterminal and 2 terminal naked setae. Five or six groups of spines occur on the outer anterior surface.

*Colour* of the live animal is light brown.

**MALE:** Total length 0.50 mm. *General body shape* like female. *Rostrum* as in female, but smaller and with the anterior border more convex. *Genital segment* the widest of the whole abdomen. *Anal operculum* rectangular and naked. *Caudal rami* cylindrical, slightly wider than long, with 5 setae; 2 strong, 1 at each disto-lateral corner, and 1 dorsal. Lateral marginal seta in female replaced by a single spine in the male.

*Antenna 1* is 9-segmented. Segment 2 as long as succeeding four segments together. Segment 4 with aesthetasc. Segment 5 small and indistinctly separate from the fourth.

*Legs 1-4* as in female, but a little shorter overall. *Leg 2* exopod, first segment slightly narrower than in female. *Leg 5* small, exopod elongate, rectangular, reaching to the border between abdominal segments 1 and 2. Inner margin of exopod naked; outer margin with spines, one lateral and two subterminal plumose setae, and a naked apical seta which extends to the border between abdominal segments 4 and 5. Baseopod small with reduced external lobe carrying a few spines and a seta which extends just past the apex of the exopod.

*Leg 6* lobate and extending just over half way down abdominal segment 2. It has one long apical seta which extends to the furca, and two short setae on the dorsal surface.

*Colour* of the live animal light-brown, as in female, but a little more transparent.

**HOLOTYPE:** Holotype female is deposited in the collection of the New Zealand Oceanographic Institute\*, Wellington (Reg. No. 69).

**PARATYPES:** A pair of female specimens have been deposited at the Dominion Museum, Wellington (Z.Cr.1864) and the British Museum (Natural History) (BMNH 1969.12.1.2.). The remaining five female and four male paratypes have been deposited in the NZOI collection, Wellington (Reg. Nos P126 and P125).

**TYPE LOCALITY AND MATERIAL:** The type material came from one sample collected in June 1969 at Island Bay, Wellington, New Zealand, associated with *Corallina officinalis* in mid-littoral pools (NZOI Sta. Z 2319). Total length of the females was 0.62-0.78 mm and of the males 0.48-0.53 mm. Descriptions and drawings have been made from the paratype specimens.

**DISCUSSION:** This species belongs to a group of copepods in the genus *Scutellidium* the females of which have their caudal rami broader than long, endopod segment 1 of leg 1 longer than the exopod, endopod segment 2 of legs 3 and 4 with two setae, female leg 5 exopod with at least three normal setae terminally situated and leg 1 endopod segment 2 internal seta medially or distally situated (i.e., *S. idyoides*, *S. australe*, *S. arthuri*, *S. cockburni*, *S. dentipes*, *S. ringueleti*, *S. spinatum*). Of these, only *S. cockburni*, *S. ringueleti* and *S. spinatum* have a short external

\*Hereafter referred to as NZOI.



FIG. 3—*Scutellidium spinatum* sp. nov., ♀: (g) antenna 1; (h) antenna 2; (i) mandible; (j) mandible cutting edge; (k) ♂ leg 5; (l) ♀ maxilla 1; (m) ♂ leg 6; (n) ♂ antenna 1; (o) ♀ maxilliped; (p) ♀ maxilla 2.

seta on leg 1 exopod segment 1, but *S. spinatum* and *S. ringueleti* have antenna 1 segment 2 longer than segment 3 and segment 3 of antenna 2 exopod has one seta, whereas *S. cockburni* has segment 3 longer than segment 2 and segment 3 of antenna 2 exopod is without a seta.

*S. spinatum* and *S. ringueleti* are very closely related but differ in the following points:

	<i>Scutellidium spinatum</i>	<i>S. ringueleti</i>
Range of body length		
Females	0.62–0.78 mm	0.76–0.90 mm
Males	0.48–0.53 mm	0.65–0.70 mm
Shape of rostrum	Base as broad as distal part, setae terminal.	Base broader than distal part, setae not terminal.
Spination of first endopod segment of maxilliped	Two marginal spines and three rows of spinules.	No marginal spines, and one row of spinules.
P <sub>2</sub> setae on basis	Does not reach to end of exopod.	Extends beyond end of exopod.
P <sub>5</sub> ♀, subterminal seta of exopod	Two-thirds length terminal seta.	Half length terminal seta.
P <sub>5</sub> ♂, spination of exopod	With rows of small spinules at its base.	Without small rows of spinules.

Thomson's (1882) drawings of *S. tisboides* appear to be more like *S. spinatum* than *S. idyoides* with which it has been tentatively synonymised (Lang 1948). This is shown in the comparable length of setae on the exopod third segment of leg 1 between *S. tisboides* and *S. spinatum*. The first endopod segment of leg 1 is also less expanded in *S. idyoides* than in the former species. Some doubt is cast as to the number of segments in the exopod of antenna 2. Thomson figures four indistinct segments but states that "four joints were present". Brady (1883) figures three but admits that four segments may exist.

The specific name (*spinatum*) refers to the generally spinose nature of this copepod.

#### Family PORCELLIDIIDAE Sars, 1904

#### Genus *Porcellidium* Claus, 1860

To the species mentioned by Lang (1948) the following have since been added: *P. echinophilum* Humes and Gelerman, 1962; *P. malleatum* Vervoort, 1964; *P. tristanense* Wiborg, 1964; *P. rubrum* Pallares, 1966; *Porcellidium* sp. Ummerkutty, 1966; *P. trisetosum* Geddes, 1968; *Porcellidium* sp. Gamo, 1969.

Two further species are added to this genus.

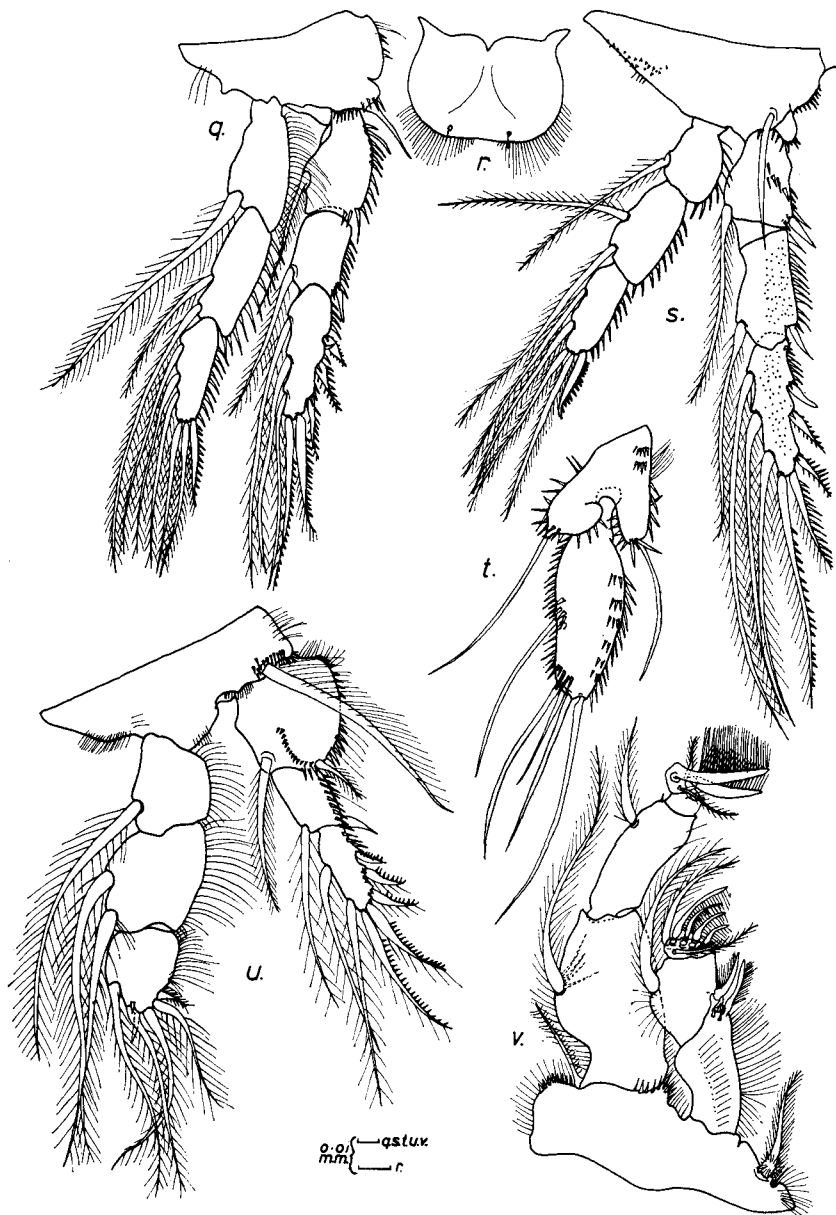


FIG. 4.—*Scutellidium spinatum* sp. nov., ♀: (q) leg 3; (r) rostrum, dorsal view; (s) leg 4; (t) leg 5; (u) leg 2; (v) leg 1.



**Porcellidium dilatatum** sp. nov.

Figs 5-7

**FEMALE:** Total length 0.92 mm. *Body* broadly ovoid, shaped like a shield and strongly dorso-ventrally compressed. Head and first thoracic segment fused. *Rostrum* distinctly prominent and visible from above: triangular with a truncated anterior border, slightly convex. *Thoracic segments* 2 and 3 large and with a distinct hyaline frill laterally. Segment 4 visible dorsally but with undeveloped epimeral plates. Segment 5 narrow. *Abdominal segments* fused, almost semi-circular in outline, expanded laterally into wings which are equal in length to the caudal rami. Anal complex with a U-shaped bare anal operculum. Dorsal surface of abdomen with small delicate hairs; spines along the posterior border. *Caudal rami* slightly expanded distally, 4 times as long as distal width. Distal border of ramus truncated, but slightly rounded with three spines and one seta. Dorsal surface bears 2 closely placed proximal setae. The whole carapace has a characteristic pitted appearance which is most conspicuous on the head and abdomen.

*Antenna 1* is 6-segmented, segment 4 without conical process and bears aesthetasc. *Antenna 2* coxa bare. Basis larger than endopod segment 1 and bearing two rows of spines. Endopod segment 2 with 4 appendages and a single bifurcate seta. Exopod arises from basis, 1-segmented with 6 strong plumose setae.

*Mandibular praecoxa* elongate and narrow with a small cutting edge, ventral margin has a protuberance characteristic of this genus. Palp greatly developed. Coxa and basis fused with 9 marginal, and 1 appendicular seta. Both the endopod and exopod are well developed and unsegmented with 4 and 5 strong densely hairy setae respectively. *Maxilla 1*, *maxilla 2* and *maxilliped* resemble those of other species, except that *maxilla 2* has a short comb-shaped spinose seta on the fused basis and basal endite, instead of an elongate one, and the *maxilliped* coxa and basis is modified into a large strongly chitinised structure.

*Leg 1* endopod segment 1 with inner seta proximally inserted. Surface of the endopod segment 1 elaborately ornamented with hairs, spinules and a distinct spinose cushion extending from the outer border to over the mid-line of the segment. Endopod segment 2 small with two densely hairy spines. Exopod 3-segmented, as in other species of *Porcellidium*. *Legs 2-4* as in *P. viride* (Philippi) but the endopod segment 1 of leg 2 is more elongate than that of *P. viride*. The seta and spine formulae are as follows:

	Exopod	Endopod
Leg 2	1:1:223	1:2:121
Leg 3	1:1:323	1:2:221
Leg 4	1:1:323	1:1:121

*Leg 5* baseopod poorly developed, but the external process bears, on the ventral side, a long spinose seta, and dorsally, a smaller naked seta. A row of hairs exists along the ventral surface of the baseopod. Exopod large and lanceolate, reaching almost to the posterior margin of the abdomen. Exopod has a longitudinal keel, the distal end of which bears 3 or 4 long spinules. Half way along the external margin there is a short spiniform seta; whole external margin lined with acute spinules.

*Ovisac* (bearing 14 eggs) covered wholly by the abdomen, and is set in the ventral abdominal concavity.

*Colour* of the live animal is yellow.

**MALE:** Total length 0.63 mm. *Body* a little less slender, ovoid, but with a more pointed posterior border than the female and a truncated anterior border. Whole animal much flatter than in the female. Head with rounded lateral anterior corners. Whole body pitted as in female and with delicate hairs on

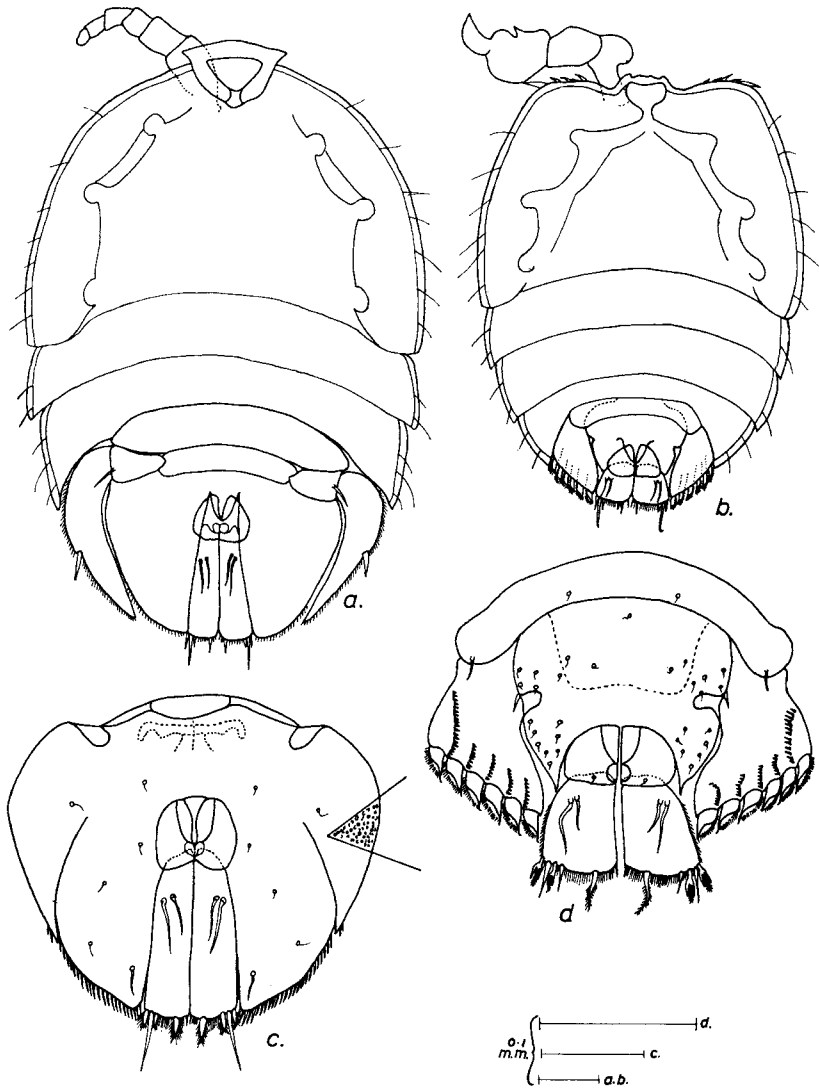


FIG. 5—*Porcellidium dilatatum* sp. nov. (a) ♀ dorsal view; (b) ♂ dorsal view; (c) ♀ dorsal abdomen; (d) ♂ dorsal abdomen and leg 5.



FIG. 6—*Porcellidium dilatatum* sp. nov.. ♀ : (e) antenna 1; (f) antenna 2; (g) mandible; (h) maxilla 1; (i) maxilla 2; (j) maxilliped; (k) leg 1; (l) leg 2; ♂ : (m) leg 2 endopod; (n) antenna 1.

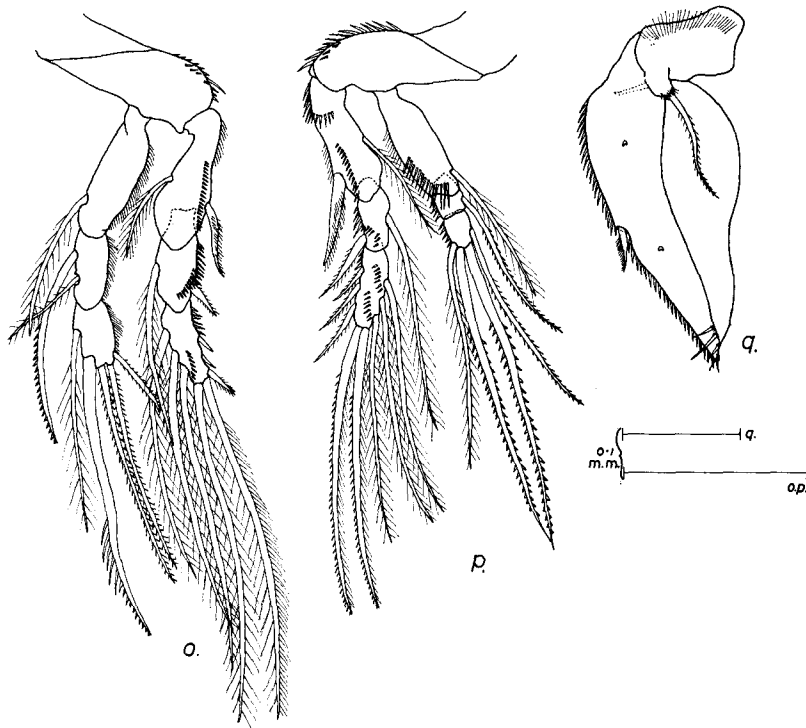


FIG. 7.—*Porcellidium dilatatum* sp. nov., ♀: (o) leg 3; (p) leg 4; (q) leg 5.

the dorsal surface. Both male and female have an internal system of chitinised trabeculae visible through the integument. *Rostrum* represented by corrugated frontal border. *Thoracic segments* 2 and 3 of equal size, segment 4 narrower, segment 5 quite small. Thoracic segments 2-4 with well developed epimeral plates. *Abdominal segments* fused, only slightly expanded. *Anal operculum* bare and U-shaped as in female. *Caudal rami* shorter and stouter than the female, almost as wide distally as long. Internal margin straight, outer margin curved so that base is narrow. Posterior margin bears 5 setae, of which the 2 outer are forked. There are 2 adjacent setae on the proximal dorsal surface.

*Antenna 1* is 4-segmented; segment 1 with groups of dense spines and a single short seta; segment 2 stout with numerous marginal setae; segment 3 larger and lobate, bearing laterally, a conical projection from which arises an aesthetasc. Segment 4 very mobile. The first three segments are all heavily chitinised; the fourth of normal structure.

*Legs 1-4* as in the female, but the endopod of leg 2 bears only 2 plumose setae on the distal segment compared to 4 in the female. All male legs are slightly smaller than those of the female. *Leg 5* baseoendopod undeveloped, site of attachment to exopod represented by a small seta. Exopod flipper-shaped with 6 large tooth-like spines on the posterior margin; the whole structure reaches just over half way down the caudal rami. Dorsal surface of exopod with 5 distinct rows of spinules, arising between the marginal spines.

*Colour* of the live animal yellow, as in female, but body slightly more transparent.

**HOLOTYPE:** Holotype female is deposited in the NZOI collection, Wellington (Reg. No. 71).

**PARATYPES:** One male deposited in NZOI collection (Reg. No. P129). Pairs (1 male and 1 female) in: Dominion Museum, Wellington (Z.Cr.1863); British Museum (Natural History) (BMNH 1969.12.1.1.); U.S. National Museum (USNM 128136); NZOI collection (Reg. No. P130).

**TYPE LOCALITY AND MATERIAL:** The type material was taken in a net from amongst various sub-littoral seaweeds at Island Bay, Wellington, in January 1970 (NZOI Sta. Z 2320). Extreme length of the females was 0.82–0.95 mm and of the males 0.57–0.65 mm. Descriptions and drawings have been made from the paratype specimens. Some males were taken which were attached by their prehensile antenna 1 to the fifth legs of immature females.

### **Porcellidium erythrum** sp. nov.

Figs 8, 9

**FEMALE:** Total length 0.57 mm. *Body* generally as in other *Porcellidium* species. *Abdominal segments* fused, roughly semicircular in outline, expanded laterally into wings which have shallow clefts in the distal postero-lateral borders. *Caudal rami* more or less rectangular, not much longer than broad, and barely protruding beyond the posterior abdominal border. Distal border of ramus with 3 narrow spines, 1 longer seta and 1 spiniform seta; the dorsal surface bears two setae.

*Antenna 1* is 6-segmented, segment 4 with short but distinct conical process bearing an aesthetasc. Final segment small. *Antenna 2* coxa bare. Basis rectangular with a few small spines on the distal junction with the endopod segment 1. Endopod segment 2 with 3 geniculate setae, 1 bifurcate seta, a short stout subterminal spine and a shorter seta. Numerous hairs and short spinules also occur on the margins. The 1-segmented exopod arises from the basis, and bears 3 lateral and 3 terminal plumose setae.

*Mandibular praecoxa* elongate with a small narrow cutting edge, and 3 or 4 ventral projections. Palp greatly developed. Coxa and basis fused with 9 marginal and 1 appendicular setae. Endopod with 4, exopod with 5, large densely hairy setae. *Maxilla 1 and 2* as in *P. dilatatum*. *Maxilliped* smaller than *P. dilatatum*, with the coxa modified with numerous long hairs on its margin, and a single long seta. Basis with strong hairy internal process and a distal clawed seta. Endopod small with 2 setae similar to that on the basis.

*Leg 1* basis with large, long, densely hairy spine reaching to the distal border of the exopod segment 1. Endopod segment 1 with its inner seta proximally inserted, anterior surface of segment with hairs and 2 spinose cushions. Endopod segment 2 larger than in *P. dilatatum*. *Legs 2–4* as in *P. dilatatum* but the shape of many segments differs slightly and the distal segment of the endopod of leg 3 has one less terminal seta than *P. dilatatum*. The seta and spine formulae are as follows:

	Exopod	Endopod
Leg 2	1:1:223	1:2:121
Leg 3	1:1:323	1:2:211
Leg 4	1:1:323	1:1:121

*Leg 5* baseopod poorly developed, external process bears dorsally a short naked seta and ventrally a long plumose seta which reaches almost to the distal border of the exopodite. There are also 2 tufts of spines on the baseopod ventral surface. Exopod large and lanceolate with a longitudinal keel separating an outer heavily chitinised part from an inner membranous portion. Outer part bears 3 long spines distally, has a densely spinulated margin and a large spiniform seta about half way down its length.

*Colour* of the live animal is blood-red.

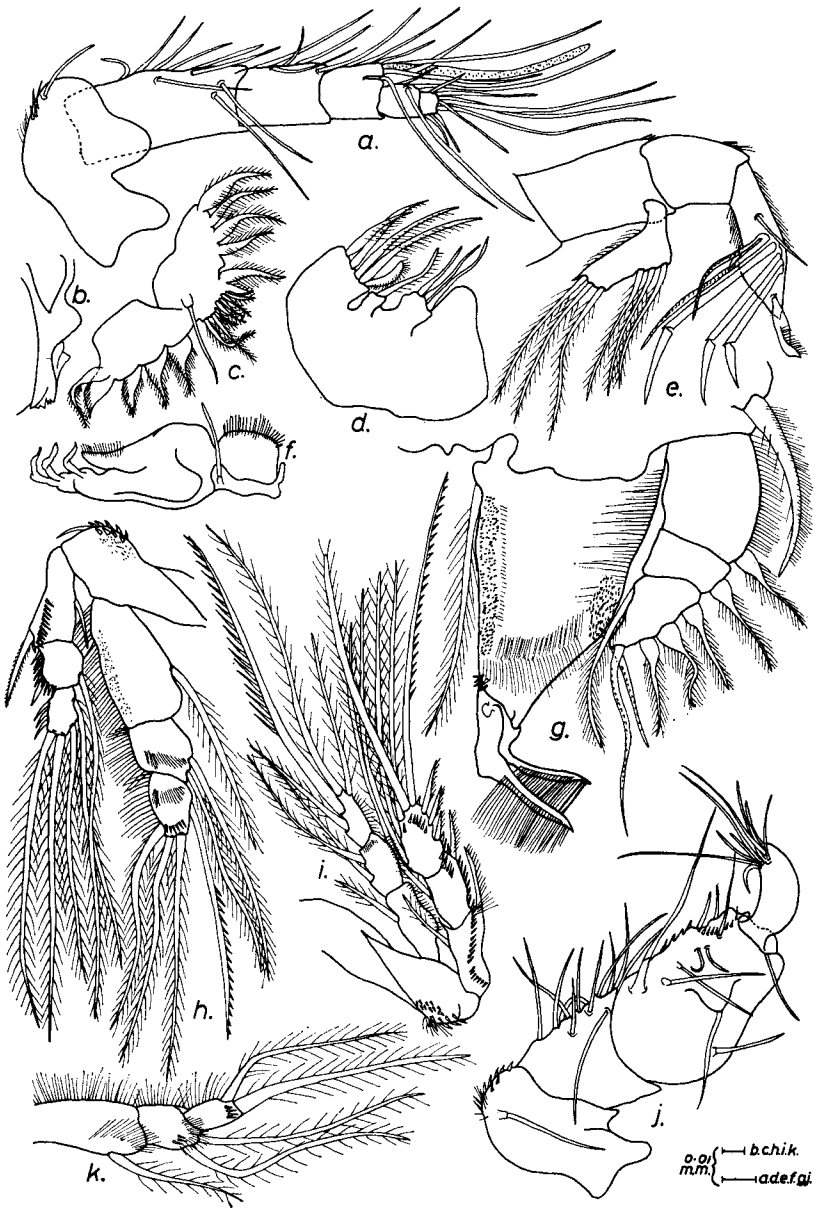


FIG. 8—*Porcellidium erythrum* sp. nov., ♀: (a) antenna 1; (b) mandible cutting edge; (c) mandibular palp; (d) maxilla 2; (e) antenna 2; (f) maxilliped; (g) leg 1; (h) leg 2; (i) leg 3; ♂: (j) antenna 1; (k) leg 2 endopod.

**MALE:** Total length 0.48 mm. *Body* shape generally that of the genus, fairly narrow and with a truncated anterior border; whole animal flatter than the female. *Rostrum* small. *Abdominal segments* fused, only slightly expanded. *Caudal rami* shorter and stouter than the female, almost square, and bearing 5 long thin spines on the posterior border and 2 long setae on the dorsal surface.

*Antenna 1* like that of *P. dilatatum*. The aesthetasc could not be seen on conical process of segment 3 as this limb was not well mounted. Segment 4 short and narrow.

*Legs 1-4* as in the female, except the endopod of leg 2 bears only 2 setae on the distal segment. *Leg 5* baseoendopod undeveloped. Exopod flipper-shaped with 6 stout spiniform setae on the posterior margin. Dorsal surface with 6 distinct rows of spinules. Exopod, excluding posterior spines, reaches three-quarters of the way down the caudal rami.

*Colour* of the live animal is blood-red.

**HOLOTYPE:** Holotype female is deposited in the NZOI collection, Wellington. (Reg. No. 75.)

**PARATYPES:** A male and two female paratype specimens deposited in the NZOI collection (Reg. Nos P 140 and P 141 respectively).

**TYPE LOCALITY AND MATERIAL:** Type material was taken in a net from amongst various sub-littoral seaweeds at Island Bay, Wellington, in January 1970 (NZOI Sta. Z 2320). Length of the four females obtained was 0.55-0.57 mm. Only one male was taken.

Descriptions and drawings have been made from the paratype specimens.

**DISCUSSION:** The two new species belong to a group of *Porcellidium* that have caudal rami in the female which taper slightly towards the anal segment with straight lateral borders and a posterior edge which is cut off squarely, fifth legs which do not meet posterior to the caudal rami and the inner seta on leg 1 endopod proximally inserted (i.e., *P. viride*, *P. echinophilum*, *P. tristanense*, *P. rubrum*, *P. trisetosum*, *P. dilatatum*, and *P. erythrum*).

In this group, *Porcellidium dilatatum* is unique in having long tapering caudal rami with the 2 dorsal setae placed adjacent to one another on the proximal one-third of the rami. Of the males in the above group, the caudal rami of *P. dilatatum* are most like those of *P. tristanense* in having the 2 dorsal setae placed very close together. But the caudal rami differ; the distal width in *P. tristanense* is greater than the length whereas in *P. dilatatum* the distal width of the caudal rami is barely greater than its length.

*Porcellidium erythrum* is similar to *P. rubrum*, especially in the shape and setation of the caudal rami and in having a laterally notched abdomen, but female *P. rubrum* differ from female *P. erythrum* chiefly in having the seta and spine formula 1:2:221 on leg 3 endopod, an extra seta proximally on antenna 2 exopod, the whole body wider in relation to length, and leg 5 extending well past the lateral notches in the abdomen. As in the female, male *P. erythrum* leg 3 and antenna 2 differ from those of male *P. rubrum*: *P. erythrum* has the dorsal setae of the caudal rami on the external one-third of the branch, whereas these setae are placed more towards the mid-line in *P. rubrum*.

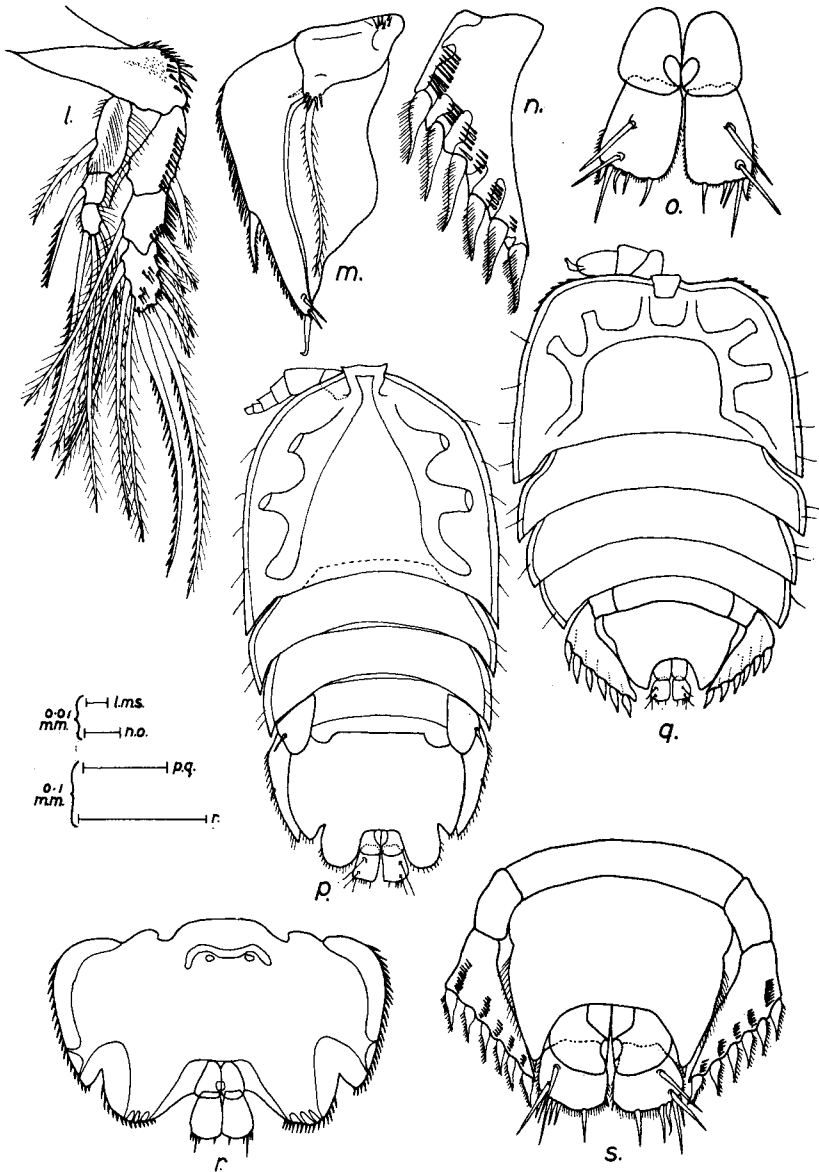


FIG. 9.—*Porcellidium erythrum* sp. nov. (l) ♀ leg 4; (m) ♀ leg 5; (n) ♂ leg 5; (o) ♀ caudal rami; (p) ♀ dorsal view; (q) ♂ dorsal view; (r) ♀ ventral abdomen; (s) ♂ dorsal abdomen.



The description of the poorly known *Porcellidium fulvum* Thomson, 1882, from Otago Harbour, has been compared with *P. dilatatum* and *P. erythrum*. The shape of the anterior head of male *P. fulvum* is not like that of either of the other two species, and the abdomen of female *P. fulvum* is more like that of *P. erythrum* but does not have the conspicuous postero-lateral abdominal notches of *P. erythrum*.

The specific names refer to the caudal rami which widen distally (*dilatatum*) and to the red colour of the living copepod (*erythrum*).

#### Family PELTIDIIDAE Sars, 1904

#### Genus *Eupelte* Claus, 1860

Lang (1948) figured the monotypic *Eupelte gracilis* Claus, 1860 but another species has since been added, *E. tristanensis* Wiborg, 1964. A third species is here described.

#### *Eupelte regalis* sp. nov.

Figs 10-12

**FEMALE:** Total length 0.65 mm. *Body* shield-shaped tapering posteriorly, dorso-ventrally compressed and arched along mid dorsal line. Whole dorsal body surface pitted. *Head* and thoracic segment 1 fused. Head produced ventrally to form a cover to parts of the oral appendages. *Rostrum* anterior border truncated with a crown-like hyaline field. *Thoracic segments* 2-4 large and of equal size, with broadly flattened epimeral plates. Segment 5 smaller with much reduced epimeral plates. *Abdominal segments* 1 and 2 partially fused; line of fusion visible from above. Segments 3 and 4 narrow posteriorly. *Anal segment* small with V-shaped anal operculum. All posterior segment borders with strong serrations, spines also on lateral margins. *Caudal rami* slightly longer than wide with 4 posterior marginal setae and 1 postero-lateral knife-shaped seta. Dorsal surface with 2 extra setae, ventral surface with small scattered spinules.

*Antenna 1* is 7-segmented. Segment 4 with short conical process bearing an aesthetasc and 5 setae. *Antenna 2* coxa bare, basis rectangular and bearing a plumose seta and the exopod. Endopod segment 1 bare, slightly longer than basis. Endopod segment 2 with 4 geniculate setae, 2 short thin setae and 2 strong claw-like processes. Exopod 2-segmented, segment 1 with 1, segment 2 with 1 lateral and 2 terminal plumose setae.

*Mandible and maxilla 1* damaged in preparation. *Maxilla 2* with flattened praecoxa, bearing 3 endites, each with 3 plumose setae. Basal endite narrow bearing 1 strong spiniform seta and 1 smaller naked seta. Endopod almost completely reduced and represented by 3 narrow setae on the margin of the basal endite. *Maxilliped* chelate; coxa elongate, basis bearing a short plumose seta. Endopod flattened and oval, bearing a strong curved spine and a shorter stout spiniform seta. Numerous spines occur on the palm and the outer margin of the endopod.

*Leg 1* coxa with marginal hairs and a group of spines. Basis bears 2 plumose setae, the longer of which occurs at the base of the endopod. Exopod segment 1 roughly triangular with a single naked outer seta. Exopod segment 2 only one and a half times as long as segment 1, and bears a distal internal seta and an external spine. Segment 3 small, partially fused with segment 2, rectangular and bearing 4 densely hairy spines and 1 thin seta. Endopod segment 1 with hairs on the outer margin and an inner plumose seta; segment 2 also with

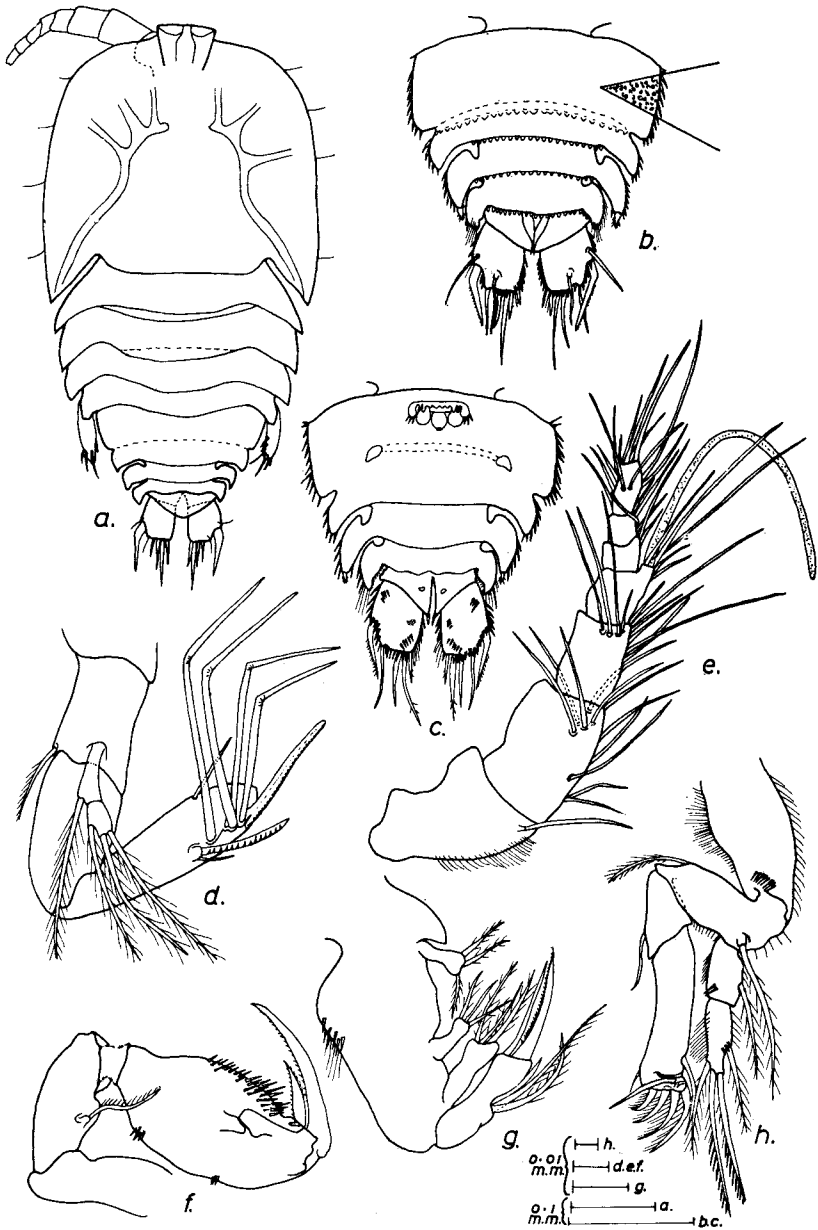


FIG. 10—*Eupelte regalis* sp. nov., ♀: (a) dorsal view; (b) dorsal abdomen; (c) ventral abdomen; (d) antenna 2; (e) antenna 1; (f) maxilliped; (g) maxilla 2; (h) leg 1.

external marginal hairs but with 1 internal lateral, 1 external lateral and 2 terminal plumose setae.

*Legs 2-4* seta and spine formulae are as follows:

	Exopod	Endopod
Leg 2	0:1:223	1:2:121
Leg 3	0:1:323	1:2:221
Leg 4	0:1:223	1:2:221

*Leg 5* baseoendopod bi-lobed. Outer lobe with 1 seta and a row of spines on the outer margin. Inner lobe large, inserted on anterior surface of baseoendopod, with a small seta near its base and four longer setae distally. Exopod flattened and elongate, with 2 outer, 2 inner and 1 larger terminal densely hairy setae. Outer margin spinose. Exopod, excluding setae, extends almost to the posterior border of the abdominal segment 2.

*Colour* of the live animal is olive-brown.

**MALE:** Total length 0.53 mm. *Body* generally shaped like female, apart from 2 small spines on the anterior margin of the prosome. *Rostrum* as in female. *Genital segment* the widest, but whole abdomen not tapering as much as in the female. *Anal segment* with V-shaped anal operculum. *Abdominal segments* all with strong serrations and spines on lateral margins. *Caudal rami* more square than the female, with 2 setae on the dorsal surface, 4 on the posterior margin and 1 postero-lateral knife-shaped seta.

*Antenna 1* is 6-segmented, segments 1-4 heavily chitinised, segment 3 small and bearing an aesthetasc, as does segment 4; segment 5 with a pad of spinules on outer proximal border. Segment 6 distinctly separate from segment 5 and bearing 1 short and 2 long claws and 9 setae.

*Maxilliped* as in female but only one group of longer spines exists on the outer margin of the endopod.

*Legs 1, 3 and 4* as in female. *Leg 2* endopod has segments 2 and 3 narrower, with an additional inner seta to the distal segment. *Leg 5* similar to that of *E. gracilis* male; small, exopod rectangular and much shorter than female. Exopod bears 2 terminal and 1 subterminal knife-shaped setae. Another small seta exists on the dorso-lateral surface. Minute spinules form 6 groups on the ventral surface. Baseoendopod slightly larger than exopod with a long inner plumose and a shorter naked dorsal seta. *Leg 6* represented by 2 setae arising from a socket in the junction between the genital and abdominal segment 2.

*Colour* of living animal olive-brown, slightly darker than the female.

**HOLOTYPE:** Holotype female whole mount deposited in the NZOI collection, Wellington (Reg. No. 76).

**PARATYPES:** Two female and three male paratypes (dissected) deposited in the NZOI collection, Wellington (Reg. No. P 142).

**TYPE LOCALITY AND MATERIAL:** The type material was taken in a net from amongst various sub-littoral seaweeds at Island Bay, Wellington, in January 1970 (NZOI Sta. Z 2320). Total lengths of the female specimens were 0.64-0.67 mm; those of the males 0.53-0.57 mm. Descriptions and drawings have been made from the holotype and paratype specimens.

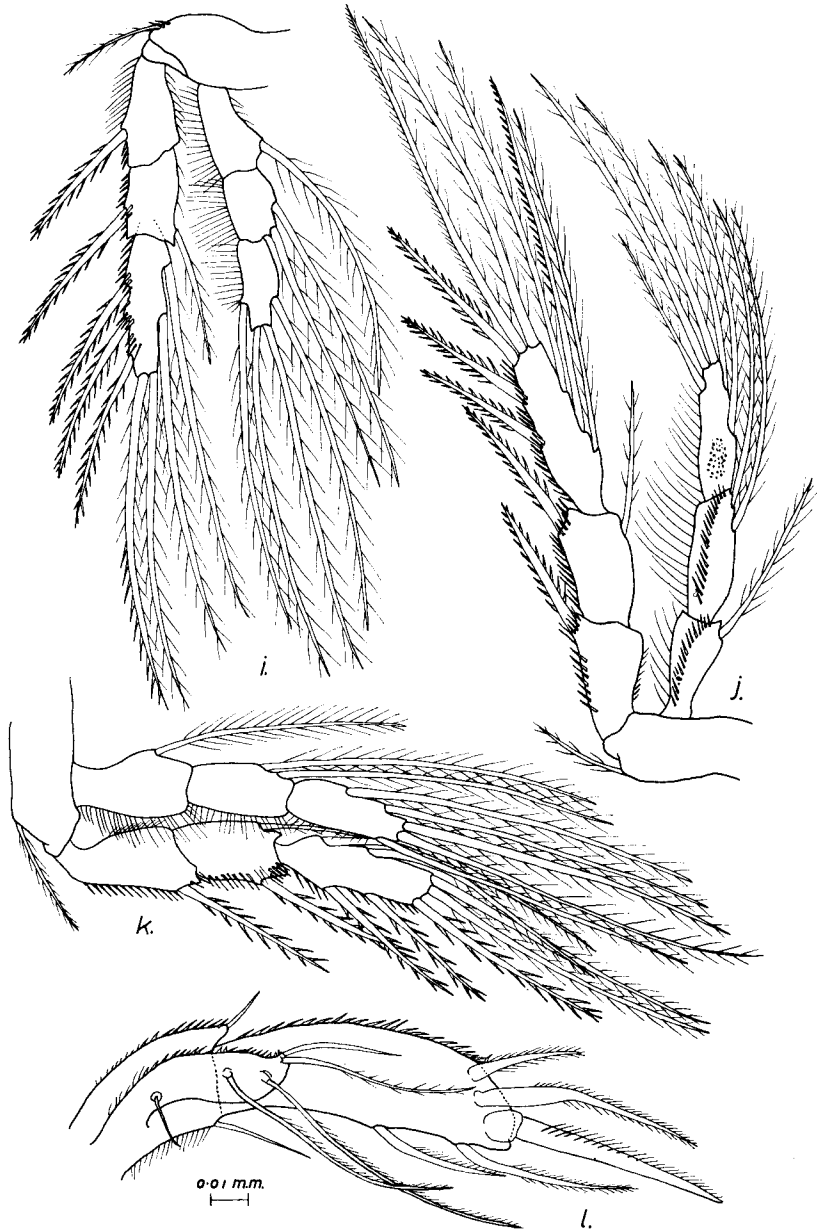


FIG. 11—*Eupelte regalis* sp. nov., ♀: (i) leg 2; (j) leg 3; (k) leg 4; (l) leg 5.

DISCUSSION: The main differences between females of all described species of *Eupelte* are shown below:

	Leg 5 setae				Antenna 1 segments	Caudal rami setae	Leg 1 endopod setae
	Exopod			Baseoendopod Total No.			
	Int.	Term.	Ext.				
<i>E. gracilis</i> Claus, 1863	0	1	3	1	9	4-5	5
<i>E. gracilis</i> according to Monard, 1928	2	1	3	1	9	4	5
<i>E. tristanensis</i> Wiborg, 1964	0	1	4	5	9	7	3
<i>E. regalis</i> n.sp.	2	1	2	7	7	7	5

Although *Eupelte regalis* and *E. tristanensis* both have seven setae on the caudal rami, in *E. tristanensis* three of the terminal setae are very short and spiniform, whereas in *E. regalis* these setae are more elongate and slender; also, on the endopod of leg 2, *E. tristanensis* has one seta on segment 1 and two internal lateral setae on segment 3.

It is possible that previous descriptions of *E. gracilis* represent two separate species (Claus 1863; Monard 1928).

The specific name (*regalis*) refers to the crown-like appearance of the rostrum.

#### Family DIOSACCIDAE Sars, 1906

#### Genus *Amphiascus* Sars, 1905

Lang (1948) reviewed the species of *Amphiascus*. Since then several species have been attributed to *Amphiascus*. Lang (1965) pointed out that a number of these in fact belong to other genera and only *A. demersus* Nicholls, 1939; *A. graciloides* Klie, 1950; *A. paracaudalespinosus* Roe, 1958; *A. humphriesi* Roe, 1959 and *A. ampullifer* (Humes, 1953, as *Mesamphiascus*) belong to the genus *Amphiascus*, even if some are doubtfully distinct species. Lang himself described *A. undosus* Lang, 1965, and Marcus (1966) described *A. polapinqvus*.

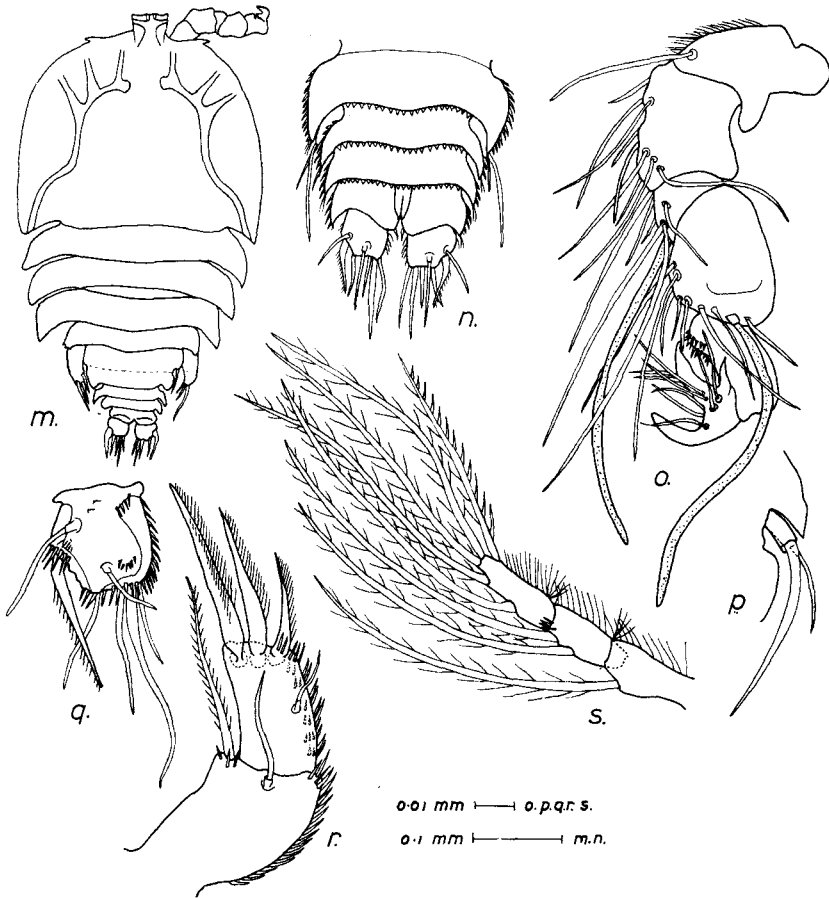


FIG. 12—*Eupelte regalis* sp. nov., ♂: (m) dorsal view; (n) dorsal abdomen; (o) antenna 1; (p) leg 6; (q) caudal rami; (r) leg 5; (s) leg 2 endopod.

Lang (1948) divided *Amphiascus* into the following groups, which now contain the listed species:

<i>minutus</i> group	<i>varians</i> group	<i>pacificus</i> group	<i>amblyops</i> group
<i>A. minutus</i> <i>A. tenuiremis</i> <i>A. brevis</i> <i>A. congener</i> <i>A. caudaespinosus</i> <i>A. hirtus</i> <i>A. ultimus</i> <i>A. gracilis</i> <i>A. demersus</i> <i>A. paracaudaespinosus</i> <i>A. graciloides</i>	<i>A. varians</i> <i>A. perplexus</i> <i>A. propinquus</i> <i>A. tenellus</i> <i>A. polaris</i> <i>A. angustipes</i> <i>A. gauthieri</i> <i>A. ampullifer</i> <i>A. polapinquus</i>	<i>A. pacificus</i> <i>A. parvus</i> <i>A. sinuatus</i> <i>A. humphriesi</i> <i>A. undosus</i>	<i>A. amblyops</i>

A new species in the *varians* group is added to this genus.

### *Amphiascus lobatus* sp. nov.

Figs 13-15

**FEMALE:** Total length 0.77 mm. *Body* moderately slender, tapering slightly posteriorly. No distinct separation between anterior and posterior body. Back in lateral aspect smoothly curved, sides produced to shield oral appendages. *Rostrum* prominent, reaching the junction of antennular segments 2 and 3, with 2 sensory setae almost a third of the length back from the tip. Tip slightly squared, pointing forwards and downwards. Rostrum separated from head by a slight groove. *Abdomen* with distinctive ornamentation; genital segment squareish, not swollen, line of fusion between first and second somites distinct dorsally and laterally. *Anal operculum* triangular and bare. *Caudal rami* wider than long.

*Antenna 1* is 8-segmented, segment 4 with large conical process with aesthetasc and 4 setae. Final segment as long as preceding two together, segments 3 and 4 (including the conical process) slightly longer than the 4 distal segments. *Antenna 2* strongly built. Coxa small and bare. The three segments of the exopod bear respectively 1, 1, and 3 setae. The distal segment bears 1 seta laterally and 2 accompanied by a group of spines at its apex; one of the terminal setae is long and plumose, the other short and naked. Basis with 4 long spines near insertion of exopod and 1 marginal seta towards distal end of segment. Endopod with 8 appendages, the outer bifurcate, and a few long spines along the inner proximal border.

*Mouth parts* generally like those of *A. undosus* but mandible has exopod segment 1 with two setae and endopod has five terminal setae; maxilla 1 basis has five setae and maxilliped endopod segment 1 has an additional longitudinal row of small spinules.

*Legs 1-4* as in other members of the *varians* group, seta and spine formulae:

	Exopod	Endopod
Leg 2	1:1:223	1:2:121
Leg 3	1:1:223	1:1:321
Leg 4	1:1:323	1:1:221

*Leg 5* baseoendopod broadly triangular, inner expansion reaching just over halfway down the exopod and bearing a large hyaline field on the outer posterior margin. Exopod subovate with large, distinctly squareish, hyaline field on inner margin. Baseoendopod with 6 setae (inner lobe with 3 plumose, 1 spinose,

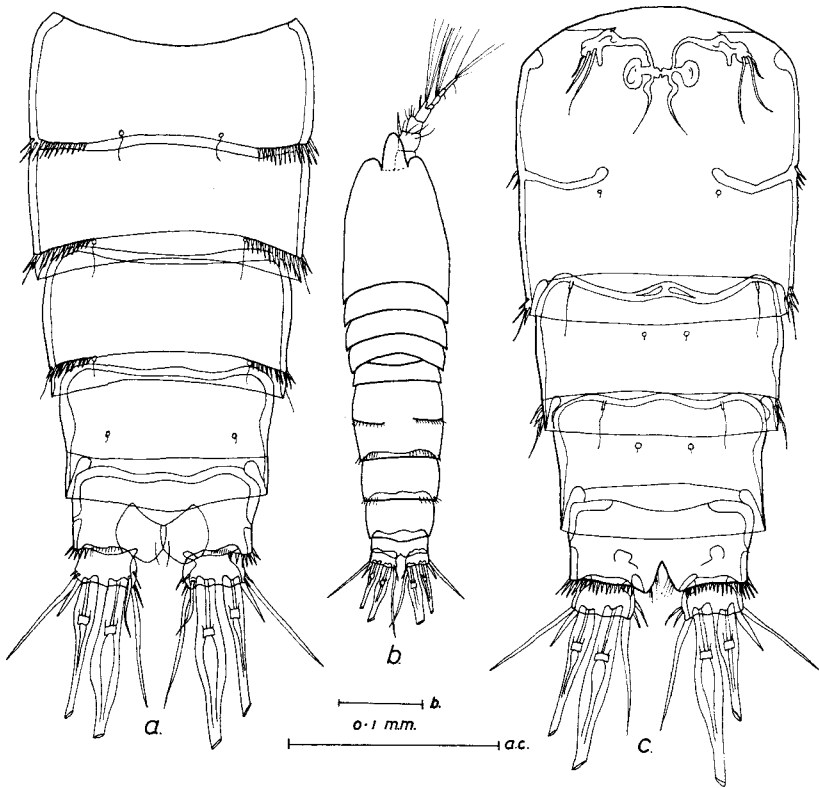


FIG. 13—*Amphiascus lobatus* sp. nov., ♀: (a) dorsal abdomen; (b) dorsal view; (c) ventral abdomen.

and 1 naked) of which the outermost but one is the longest; exopod with 6 setae of which 2 are plumose, the others naked.

*Colour* of the live animal light brown.

**MALE:** Total length 0.54 mm. *Body* somewhat smaller and more slender than female. Thoracic segments 2 and 3 same size, segment 4 somewhat smaller, segment 5 slightly separated from segment 4. Sperm sacs visible through integument of genital segment.

*Antenna 1* is 8-segmented, segment 2 largest, segment 4 with aesthetasc arising from very short conical process.

*Leg 1* generally as in female with a few differences; inner edge of basis modified with 3 strong spines and a short proximal conical projection. There are long spines at the base of the endopod which itself is shortened and thickened compared with the female leg 1. *Leg 2* coxa basis and exopod as in female, but endopod modified into 2 segments. Segment 1 broad with inner plumose seta and distal toothed process. Segment 2 with 3 inner plumose setae, the distal one longest, while the outer edge of the segment extends into a long





FIG. 14—*Amphiascus lobatus* sp. nov., ♀: (d) rostrum; (e) antenna 1; (f) maxilliped; (g) antenna 2; (h) maxilla 2; (i) exopod antenna 2; (j) mandible; (k) maxilla 1; (l) ♂ antenna 1; (m) ♂ basis leg 1.

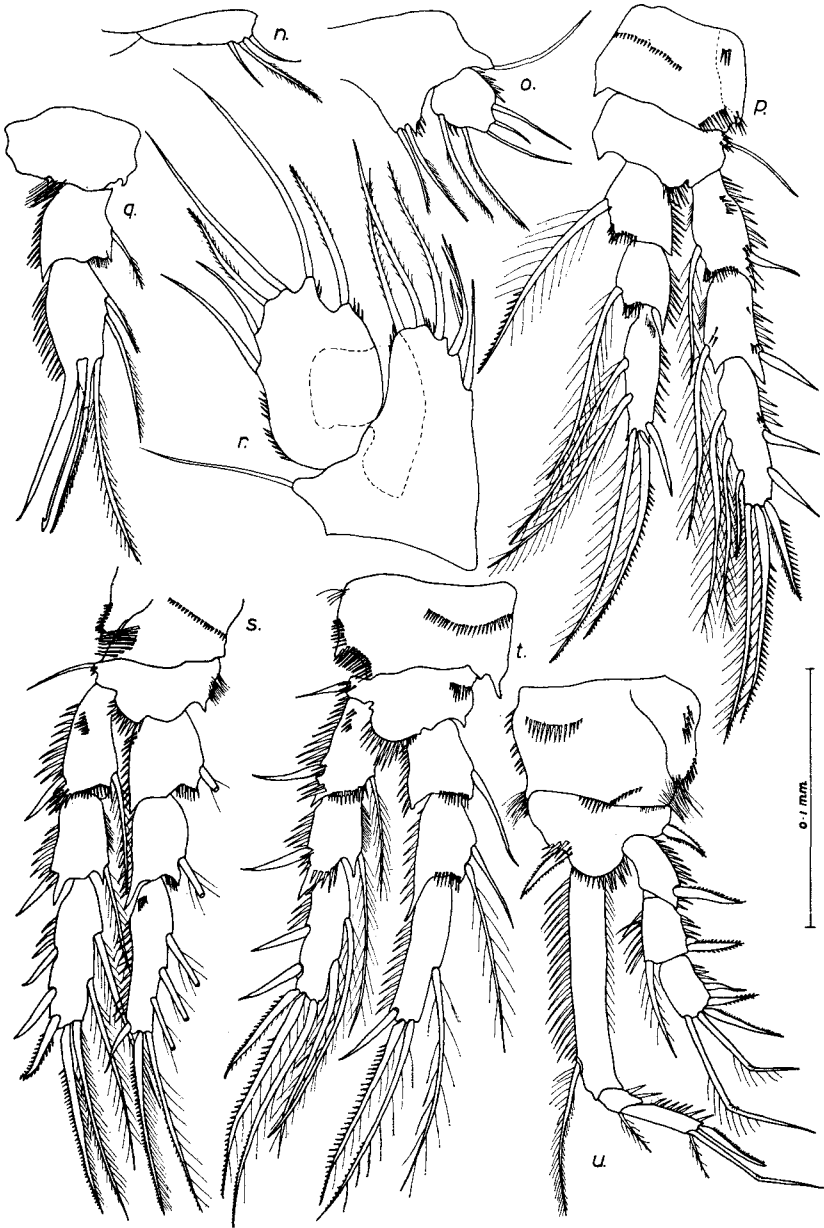


FIG. 15—*Amphiascus lobatus* sp. nov. (n) ♂ leg 6; (o) ♂ leg 5; (p) ♀ leg 4; (q) ♂ leg 2 endopod; (r) ♀ leg 5; (s) ♀ leg 3; (t) ♀ leg 2; (u) ♀ leg 1.

knife-like projection. At the base of this projection are 2 slender setae, the innermost plumose and the outer with its distal tip modified into a barb.

*Legs 3 and 4* as in female.

*Leg 5* baseoendopods confluent, inner expansion reaching to about the middle of the exopod, with two apical plumose setae. Exopod roughly heart-shaped, slightly longer than wide, narrowed distally with 5 setae; 2 inner plumose and longest, 3 outer setae naked and shorter. *Leg 6* overlaps in the mid-line with leg 6 on opposite side, and bears 2 naked setae between which lies a longer plumose seta.

*Colour* as in female.

**HOLOTYPE:** Holotype female deposited in the NZOI collection, Wellington (Reg. No. 70).

**PARATYPES:** Six female and one male paratypes deposited in the NZOI collection, Wellington (Reg. Nos P 127 and P 128).

**TYPE LOCALITY AND MATERIAL:** Type material was taken in June 1969 at Island Bay, Wellington (NZOI Sta. Z 2319); the animals were associated with *Corallina officinalis* in mid-littoral pools. Drawings and descriptions were taken from six female and one male mounted paratype specimens; total lengths of the females were 0.76–0.79 mm, and of the males 0.52–0.54 mm; two females were ovigerous.

**DISCUSSION:** *Amphiascus lobatus* belongs in the *varians* group (Lang 1948), because the middle segment of leg 3 endopod has only one seta, the middle segment of leg 1 exopod has an inner seta, and seta and spine formulae agree with all other species in this group.

Of all other species in the *varians* group with six setae on the leg 5 exopod, leg 5 baseoendopod with the three inner setae spaced well apart, last four segments of antenna 1 at least as long as, or longer than, segments 3 and 4 together, and leg 5 baseoendopod reaching half way along the exopod (*A. angustipes*, *A. tenellus*, *A. propinquus*, *A. polaris*, and *A. ampullifer*), *A. lobatus* has a distinctive leg 5. The exopod is one and a half times as long as wide, the second inner seta on the baseoendopod is not plumose but is coarsely spinulate, and the hyaline field is of a characteristic shape (Fig. 15r). In the above five species the exopod is more slender, and the hyaline field and the second inner baseoendopod seta are not of the type found in *A. lobatus*.

The specific name (*lobatus*) refers to the lobed nature of the exopod of the female leg 5.

### Genus *Amphiascopsis* Gurney, 1927

#### *Amphiascopsis cinctus* (Claus, 1866)

Figs 16, 17

**MATERIAL:** Eight females from 0.92–1.2 mm total length and four males 0.59–0.65 mm total length. All specimens were found associated with *Corallina officinalis* in a mid-littoral pool at Island Bay, Wellington, New Zealand (NZOI Sta. Z 2319), during the summer of 1969–70.

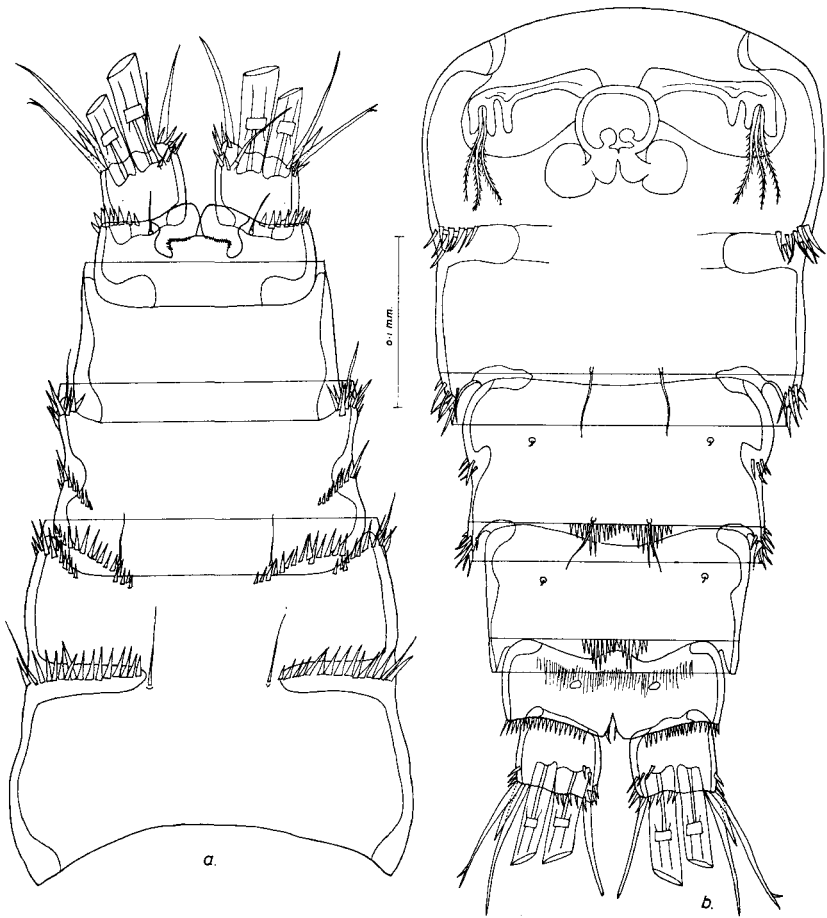


FIG 16—*Amphiascopsis cinctus* (Claus), ♀: (a) dorsal abdomen; (b) ventral abdomen.

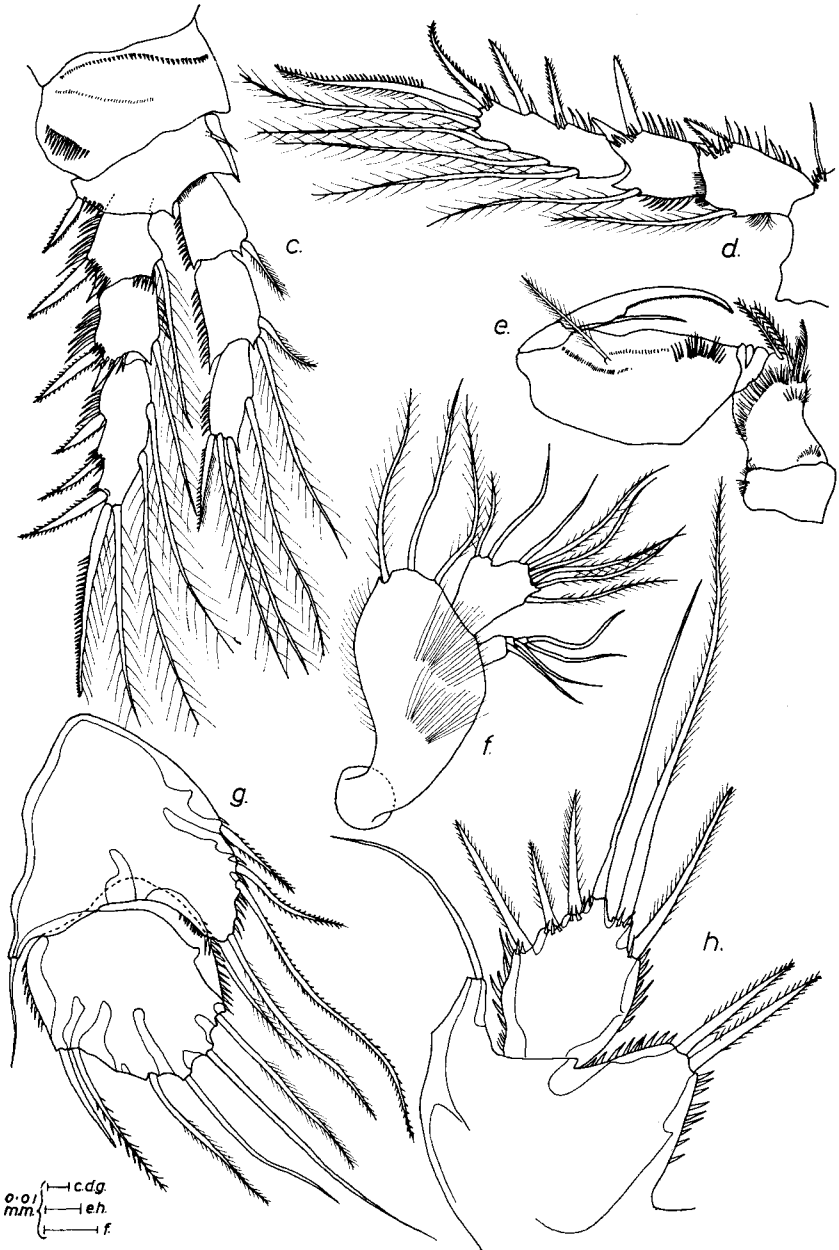


FIG. 17—*Amphiscopsis cinctus* (Claus), ♀: (c) leg 2; (d) leg 3 exopod; (e) maxilliped; (f) mandibular palp; (g) leg 5; (h) ♂ leg 5.

**DISTRIBUTION:** South Australia, Californian Pacific coast, North Atlantic, Mediterranean, East Indian coast, Caroline Islands, New Zealand (*see* Lang 1948, 1965; Vervoort 1964).

**DISCUSSION:** The eight specimens in my collection corresponded very well with the description of Californian specimens (Lang 1965, pp. 266–72). New Zealand specimens had a generally increased ornamentation on the bases of all legs with an increased number of spines and hairs on the inner margins of the exopodites (especially legs 3 and 4), additional groups of hairs and spines on the mandibular basis and maxilliped palm, a plumose maxilliped palm seta, and no minute spinule rows on the abdominal segments.

Colour of antenna 1, rostrum, head and last three abdominal segments was yellow, of the remainder purplish-brown.

Lang (1965) discusses the variability in this species and states that only culturing and crossing various forms will settle the question of whether there is more than one species. He also stresses the importance of completely illustrating and describing the body ornamentation of species belonging to *Amphiascopsis*.

***Amphiascopsis south-georgiensis*** (Lang, 1936)

Figs 18, 19

**MATERIAL:** A single ovigerous female specimen (0.98 mm) from the same location as *A. cinctus*.

**DISTRIBUTION:** South Georgia Islands and New Zealand. This species lives on algae at moderately shallow depths, but is not abundant among the algal epifauna.

**DISCUSSION:** My specimen agrees with Lang's (1948) description except that the total length is less than Lang's type specimen (1.2 mm) and the fifth leg is of slightly different shape. (Lang's original description (1936) omitted the inner seta on exopod segment 2 of male leg 1, but it appears in his later work (1948).)

Lang's (1936, 1948) diagrams of the female are scanty, so I have included additional drawings from my specimen of some of the more important structures.

Colour when alive was transparent light-blue for the head and thoracic segments, and abdomen yellowish.

This specimen was heavily parasitised by what appeared to be a species of the Ellobiopsidae. These parasites were not positively identified but appear to be similar to Jepps's (1937) description of *Ellobiopsis chattoni* (Caullery, 1910), a common ectoparasite of *Calanus finmarchicus*. Various workers (Fage, *in* Boschma 1949) have recorded ellobiopsid infestations from the South Pacific, but none agree with those found on *A. south-georgiensis*.

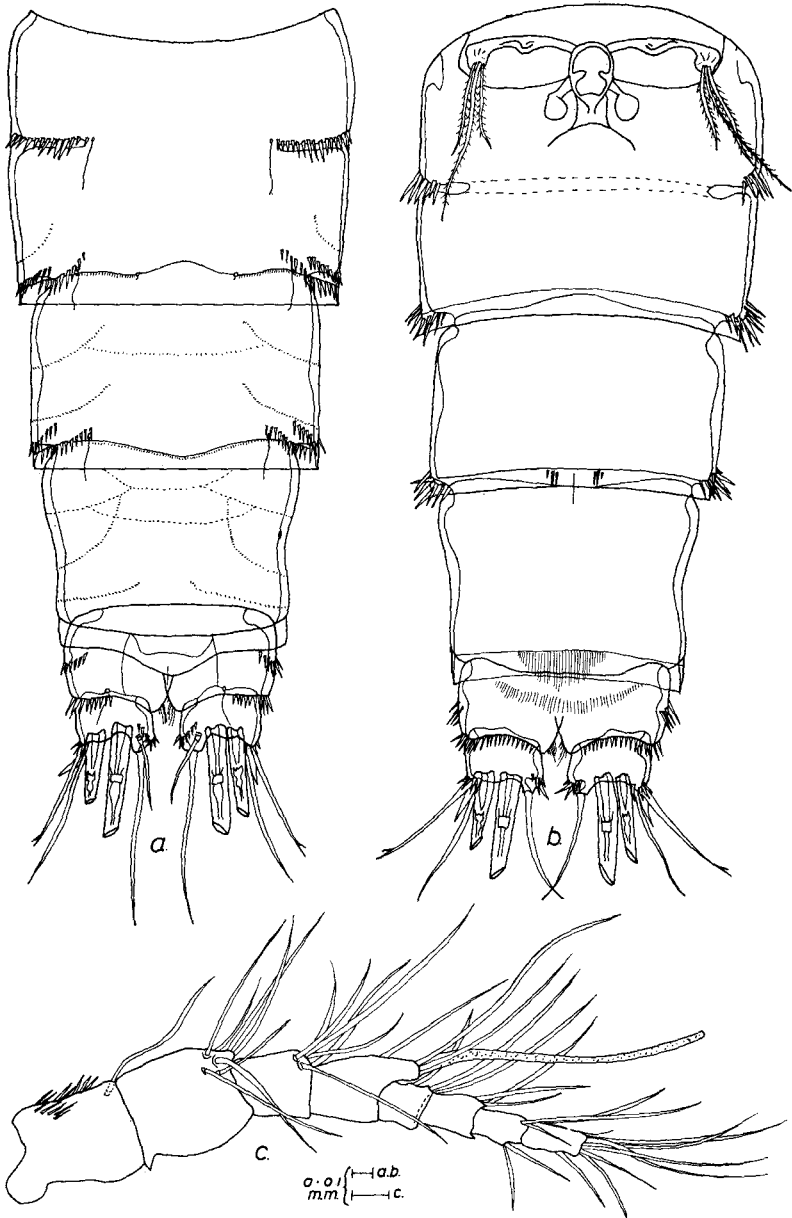


FIG. 18—*Amphiascopsis south-georgiensis* (Lang), ♀: (a) dorsal abdomen; (b) ventral abdomen; (c) antenna 1.

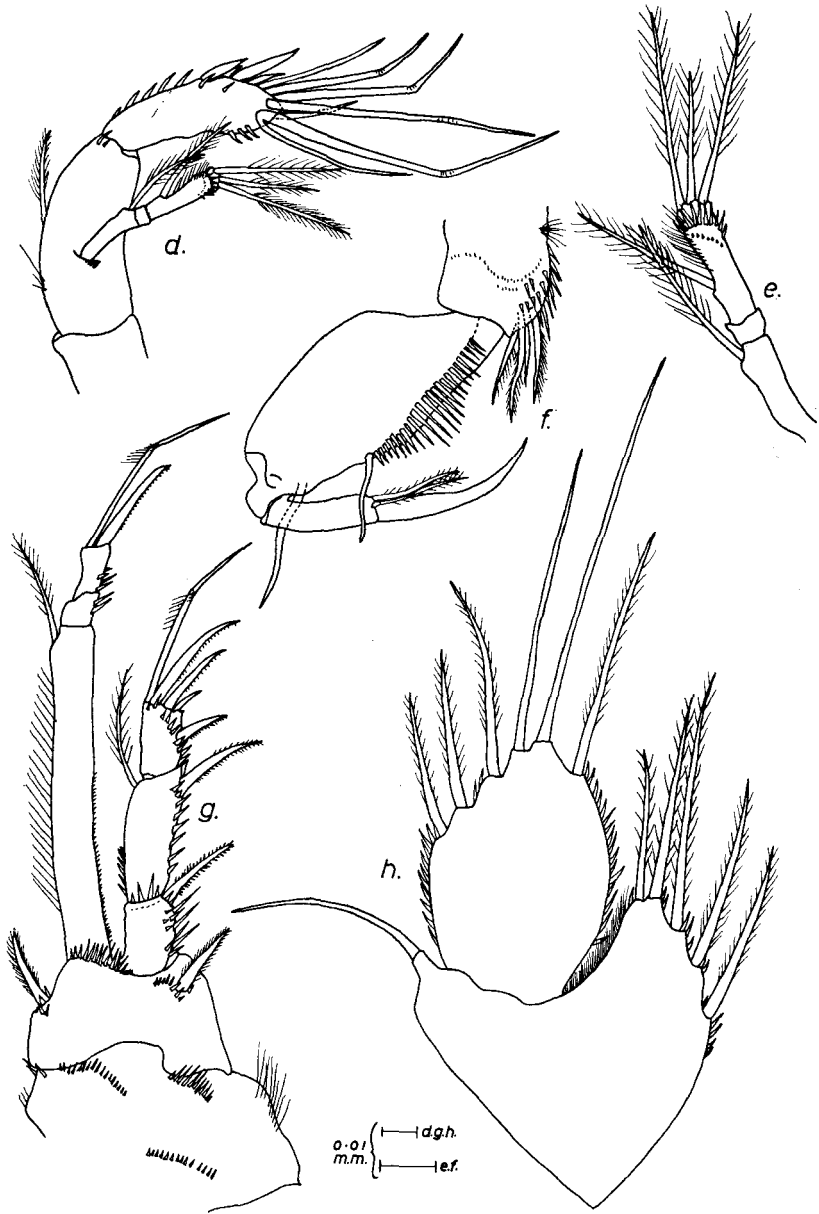


FIG. 19—*Ampsiacopsis south-georgiensis* (Lang), ♀: (d) antenna 2; (e) antenna 2 exopod; (f) maxilliped; (g) leg 1; (h) leg 5.



## ACKNOWLEDGMENTS

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## LITERATURE CITED

- BOSCHMA, H. 1949: Ellobiopsidae. *'Discovery' Rep.* 25: 281-314, pls 38-41.
- BRADFORD, J. M. 1967: The genus *Tigriopus* Norman (Copepoda : Harpacticoida) in New Zealand with a description of a new species. *Trans. R. Soc. N.Z., Zool.* 10 (6): 51-9.
- BRADY, G. S. 1883: Report on the Copepoda collected by H.M.S. *Challenger* during the years 1873-76. *Rep. Sci. Res. H.M.S. Challenger, Zool.*, 8: 1-142, 55 pls.
- 1899: On the marine Copepoda of New Zealand. *Trans. Zool. Soc. Lond.* 15 (2): 31-54, pls 9-13.
- CLAUS, C. 1863: "Die freilebenden Copepoden mit besonderer Berücksichtigung der Fauna Deutschlands, der Nordsee und des Mittelmeeres". Leipzig. 230 pp., 37 pls.
- FAIRBRIDGE, W. S. 1944: Marine Copepoda from Western Australia. Series II. *J. Proc. R. Soc. West. Aust.* 28: 209-11, 3 pls.
- GAMO, S. 1969: Notes on three species of harpacticoid Copepoda, *Porcellidium* sp., *Peltidium ovale* Thomson and A. Scott, and *Dactylopusia* (?) *platysoma* Thomson and A. Scott, from Tanabe Bay. *Publs Seto mar. biol. Lab.* 16 (5): 345-61.
- GEDDES, D. C. 1968: Harpacticoid copepods belonging to the families Porcellidiidae Sars, Peltidae Sars, and Tegastidae Sars. *Sarsia* 35: 9-56.
- HUMES, A. G. 1953: Two new semi-parasitic harpacticoid copepods from the coast of New Hampshire. *J. Wash. Acad. Sci.* 43 (11): 360-73.
- HUMES, A. G. and GELERMAN, P. H. 1962: A new species of *Porcellidium* (Copepoda, Harpacticoida) from a sea urchin in Madagascar. *Crustaceana* 4: 311-19.
- JAKOBI, H. 1954: *Especies Novas de Harpacticoida (Copepoda - Crustacea) Encontradas Em Algas Marinhas Do litoral Parana - Santa Catarina.* *Bolm. Inst. Oceanogr., S. Paulo.* 5: fasc. 1-2, 189-99, 6 pls.
- JEPPS, M. W. 1937: On the protozoan parasites of *Calanus finmarchicus* in the Clyde Sea area. *Q. Jl microsc. Sci.* 79 (316): 589-658, pls 25-28.
- KLIE, W. 1950: Harpacticoida (Copepoda) aus dem Bereich von Helgoland und der Kieler Bucht (Fortsetzung). *Kieler Meeresforsch.* 7 (1): 76-128.
- LANG, K. 1933: Zwei neue Brackwasserharpacticiden von den Macquarie-Inseln. *K. fysiogr. Sällsk. i Lund Förh.* 3: 1-14.
- 1934: Marine Harpacticiden von der Campbell-Insel und einigen anderen südlichen Inseln. *Acta. Univ. Lund. N.F. avd 2 Bd 30 (14):* 1-56.

- LANG, K. 1936: Copepoda Harpacticoida. *Further zool. Results Swed. Antarct. Exped.* 3 (3): 1-68.
- 1948: "Monographie der Harpacticiden". Stockholm, 2 vols, 1682 pp.
- 1965: Copepoda Harpacticoida from the Californian Pacific Coast. *K. svenska Ventenskakad. Handl.* 10 (2). 560 pp., 66 pls.
- MARCUS, A. 1966: Deux Harpacticoides nouveaux trouvés dans le faciès pierreux de la mer Noire (Agigea). *Trav. Mus. Hist. nat. "Grigore Antipa", Roumanie*, 6: 57-70.
- MONARD, A. 1928: Les harpacticoides marins de Banyuls. *Arch. Zool. Exp. et Gén.* 67: 260-443.
- MONK, C. R. 1941: Marine harpacticoid copepods from California. *Trans. Am. Microsc. Soc.* 60: 75-99.
- NICHOLLS, A. G. 1939: Marine harpacticoids and cyclopoids from the shores of the St. Laurent. *Canad. Natural.* 66 (not seen by author).
- 1941: Littoral Copepoda from South Australia (1) Harpacticoida. *Rec. S. Aust. Mus.* 6: 381-427.
- PALLARES, R. E. 1966: Sobre una nueva especie de *Porcellidium* (Copepoda Harpacticoida). *Physis, B. Aires* 26 (71): 113-20.
- 1969: El género *Scutellidium* en la ria Deseado (Crustacea; Copepoda). *Physis, B. Aires* 29 (78): 51-72.
- ROE, K. M. 1958: The littoral harpacticids of the Dalkey (Co. Dublin) area with descriptions of six new species. *Proc. R. Ir. Acad.* 59, B: 221-55.
- 1959: Some harpacticids from Lough Ine, with descriptions of two new species. *Proc. R. Ir. Acad.* 60, B: 277-89.
- SARS, G. O. 1905: Pacifische Plankton—Crustacean. II. Brackwasser-Crustacean von der Chatham-Inslen. *Zool. Jb., Abt. 1 (Syst.)* 21: 371-414, pls 14-20.
- THOMSON, G. M. 1878 (1879): On the New Zealand Entomostraca. *Trans. Proc. N.Z. Inst.* 11: 251-63, pl. 11.
- 1882: On the New Zealand Copepoda. *Trans. R. Soc. N.Z.* 15: 93-116, pls 5-11.
- 1894: Notes on some Crustacea from Macquarie Island. *Trans. R. Soc. N.Z.* 27: 210-4, pl. 14.
- 1913: The natural history of Otago Harbour and the adjacent sea. *Trans. R. Soc. N.Z.* 45: 225-51.
- THOMPSON, G. M. and ANDERTON, T. 1921: History of the Portobello Marine Fish Hatchery and Biological Station. *Bull. N.Z. Bd sci. Art.* 2. 131 pp.
- UMMERKUTTY, A. N. P. 1966: Studies on Indian copepods—16. On some rare and interesting copepods from south east coast of India. *J. mar. biol. Ass. India* 8 (2): 302-19.
- VERVOORT, W. 1964: Free living Copepoda from Ifaluk Atoll in the Caroline Islands. *Bull U.S. natn Mus.* 236. 431 pp.
- WIBORG, K. F. 1964: Marine copepods of Tristan da Cunha. *Results Norw. scient. Exped. Tristan da Cunha (51)*. 44 pp.