

Publication: Hurley,D.E. 1957: Studies on the New Zealand  
amphipodan fauna No. 13 Sandhoppers of the genus .  
*TRANS. R. SOC. N.Z.:* 84:359-389

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Project funded by: TFBIS (Terrestrial and Freshwater Biodiversity Information System)

*(The pages of the publication follow this cover sheet)*

# Studies on the New Zealand Amphipodan Fauna

## No. 13. Sandhoppers of the Genus *Talorchestia*\*

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[Received by the Editor, August 29, 1955]

### Abstract

EIGHT species of *Talorchestia* are described. Three are new to science. A key is given to the New Zealand species, and their distribution is briefly discussed.

### INTRODUCTION AND ACKNOWLEDGMENTS

THE genus *Talorchestia* is one of the best known genera of amphipods since it includes many of the common species of "sandhoppers", a group of crustaceans with which most people are familiar. Species of the genus are essentially, although not always, confined to the narrow littoral fringe where they act as scavengers on decaying plant and animal material. They are normally found in great numbers under decaying algae which collects about high-tide level. This makes them relatively easy to find although their agility may make them difficult to collect.

I wish to express my thanks to Professor E. Percival and the Canterbury University College Council and Library for the use of literature and specimens belonging to the Chilton Collection; and to Professor L. R. Richardson, of the Department of Zoology at Victoria University College, under whose supervision this work was carried out. I am especially grateful to Mr. John McIntyre, of the Zoology Department, Canterbury University College, for many interesting discussions and much helpful information. In particular, he has supplied part of the distributional and ecological data given below. Certain aspects which I would otherwise have attempted to treat a little more fully have been omitted in deference to a much more comprehensive treatment in a forthcoming paper by Mr. McIntyre.

### Genus TALORCHESTIA Dana

Dana, 1852: 310.  
Stebbing, 1906: 543.  
Chilton, 1917: 293.  
Shoemaker, 1942: 187.  
Reid, 1947: 15.

"Like *Orchestia*, except that gnathopod 1 in the female is simple, instead of subchelate. Peraeopod 2 usually has the inner margin of the finger more sharply constricted than in allied genera"—Stebbing, 1906.

*Talorchestia* belongs to the Family *Talutridae*. A key to the genera of this family has been given in an earlier paper (Hurley, 1954).

Stebbing's diagnosis of the genus sometimes becomes difficult to apply in practice since the gnathopods may be intermediate between simple and subchelate in some species. Shoemaker, commenting on *Talorchestia*, says that "the dividing line between *Orchestia* and *Talorchestia* is so very hazy that at times it is difficult to decide into which of these two genera a species should be placed." Reid (1947) considers the presence or absence of a palm in the female first gnathopod so indefinite a criterion

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\* This paper is part of a study carried out at Victoria University College, Wellington, New Zealand, during the tenure of a New Zealand Research Fund Fellowship.

that he has abandoned it. Should this criterion be replaced and, if so, how? Or should the two genera be united?

There are undoubtedly some species which are more or less intermediate between *Orchestia* and *Talorchestia*. These are almost without exception those showing terrestrial tendencies. The typical littoral species are easily separated. For this reason, I believe the two genera should be kept separate. It seems to me that we are here dealing with two closely allied genera showing considerable degree of convergence, and that relationships are better indicated by retaining both genera.

Where the first gnathopod is intermediate, the other characteristic which Stebbing gives for *Talorchestia*, the constriction of the second peraeopod dactylos, usually holds. Apart from these two characteristics, there seem to be no others which will apply to more than a few species. Chilton's fairly extensive diagnosis of the genus is applicable to the three species which he described from New Zealand, but is not universally applicable. Most of the characteristics which have been used to separate the genera in accounts of small faunas are unsatisfactory when applied to the genera as a whole.

The situation seems to be this. There is a definite *Orchestia* complex and a definite *Talorchestia* complex. These can easily be distinguished by one or both, usually both, of Stebbing's characteristics. Between these there is an intergrading series which can be assigned to one or other of the typical complexes on whichever characteristic is present, and on general facies. In general, the truly terrestrial species belong to *Orchestia* (in which I include *Parorchestia*), and *Talitrus*.

It may be preferable to reword the generic diagnosis after Chilton (1917). "Like *Orchestia*, except that gnathopod 1 in the female is simple instead of being subchelate. Peraeopod 2 has the finger notched or otherwise modified and differing from that of peraeopod 1."

Stephensen (1948) lists the species of *Talorchestia* as then known. To these should be added *T. marcuzzi* Ruffo (1950).

I have omitted *Talorchestia patersoni* Stephensen (1938) from this paper because I consider it a species of *Orchestia*. It resembles *Orchestia* species more closely in general facies, the second peraeopod dactylos is not markedly constricted, and the gnathopods are neither definitely subchelate nor definitely simple. In habitat, it is truly terrestrial, being a leafmould inhabitant.

KEY TO NEW ZEALAND SPECIES OF TALORCHESTIA

- |   |                                |
|---|--------------------------------|
| 1. Carpus of peraeopod 5 in adult male expanded to form large cup or flattened oar-shaped blade   | 2                              |
| Carpus of peraeopod 5 in adult male not expanded as above   | 4                              |
| 2. Gnathopod 1, male, carpus posterior margin lacks pellucid process; Pr. 5, adult male, carpus expanded in blade-like process, width $\frac{1}{2}$ length, Pr. 3-5 have lily-shaped spines, epimeral plates have no spines anteriorly or ventrally     | <i>T. spadix</i> , n.sp.       |
| Gnathopod 1, male, carpus posterior margin has pellucid process; Pr. 5, adult male, carpus expanded in large cup-shaped process, at least as wide as long, Pr. 3-5, spines normal; epimeral plates have anterior and ventral margins and surface spined | 3                              |
| 3. Maxilliped has long terminal spine on carpus; Pr. 1 sideplate is deeper than wide, ventral margin of uropod 1 is spined along entire length; uropod 3 ventral margin is setose; gills are Y-shaped and slender                                       | <i>T. chathamensis</i> , n.sp. |
| Maxilliped has no long terminal spine on carpus, sideplate of Pr. 1 is wider than deep; uropod 1 peduncle has 3 spines ventrally, gills anchor-shaped   | <i>T. telluris</i> (Bate)      |
| 4. Epistome of upper lip strongly spined; gnathopods and peraeopods all very strongly spined on surfaces and margins; Pr. 4 and 5 slender, not modified in adult male,  |                                |

- Gn. 2, male, palm oblique, broad rectangular process near dactylos, prominent acute defining tooth  
These characteristics not combined as above
5. Epimeral plates subrectangular, posterodistal angle sharp and with strong spine; uropod 3 ramus has terminal brush of spines; Pr. 4, male, carpus not strongly thickened; maxilla 1 has one-segmented palp  
Maxilla 1 palp of 2 segments; other characteristics not combined as above
6. Pr. 1 sideplate deeper than wide; Pr. 3, anterior lobe of sideplate as large as posterior; Pr. 4, male, carpus linear; epimeral plates all distally rounded  
Pr. 1 sideplate as wide as deep; Pr. 4, male, carpus greatly and irregularly thickened, epimeral plates not all distally rounded
7. Gn. 2, sideplate widening distally, as wide as deep; Pr. 3, anterior lobe of sideplate much larger than posterior; Gn. 2, male, palm proximally excavate, distally convex, small tooth near dactylos hinge  
Gn. 2, sideplate has lateral margins parallel, is deeper than wide; Pr. 3, anterior lobe of sideplate as large as posterior; Gn. 2, male, palm has conical tooth near dactylos bearing coronet of spines
- T. quoyana* (M.-Edw.) 5
- T. dentata* (Filhol). 6
- T. kirki* n.sp. 7
- T. cookii* Filhol.
- T. tumida* G. M. Thomson

*Talorchestia quoyana* (Milne-Edwards), 1840. (Figs 1-25).

*Taltrus brevicornis* & *Orchestia quoyana* Milne-Edwards, 1840: 15, 19, vol. 3.

*Talorchestia quoyana*, Thomson & Chilton, 1886: 146

Stebbing, 1906: 547.

Chilton, 1917: 294-296, figs 1-5b.

Stephensen, 1935: 11

Stephensen, 1948: 13

Chilton, 1927: 175

*Orchestia quoyana* Thomson, 1899: 202.

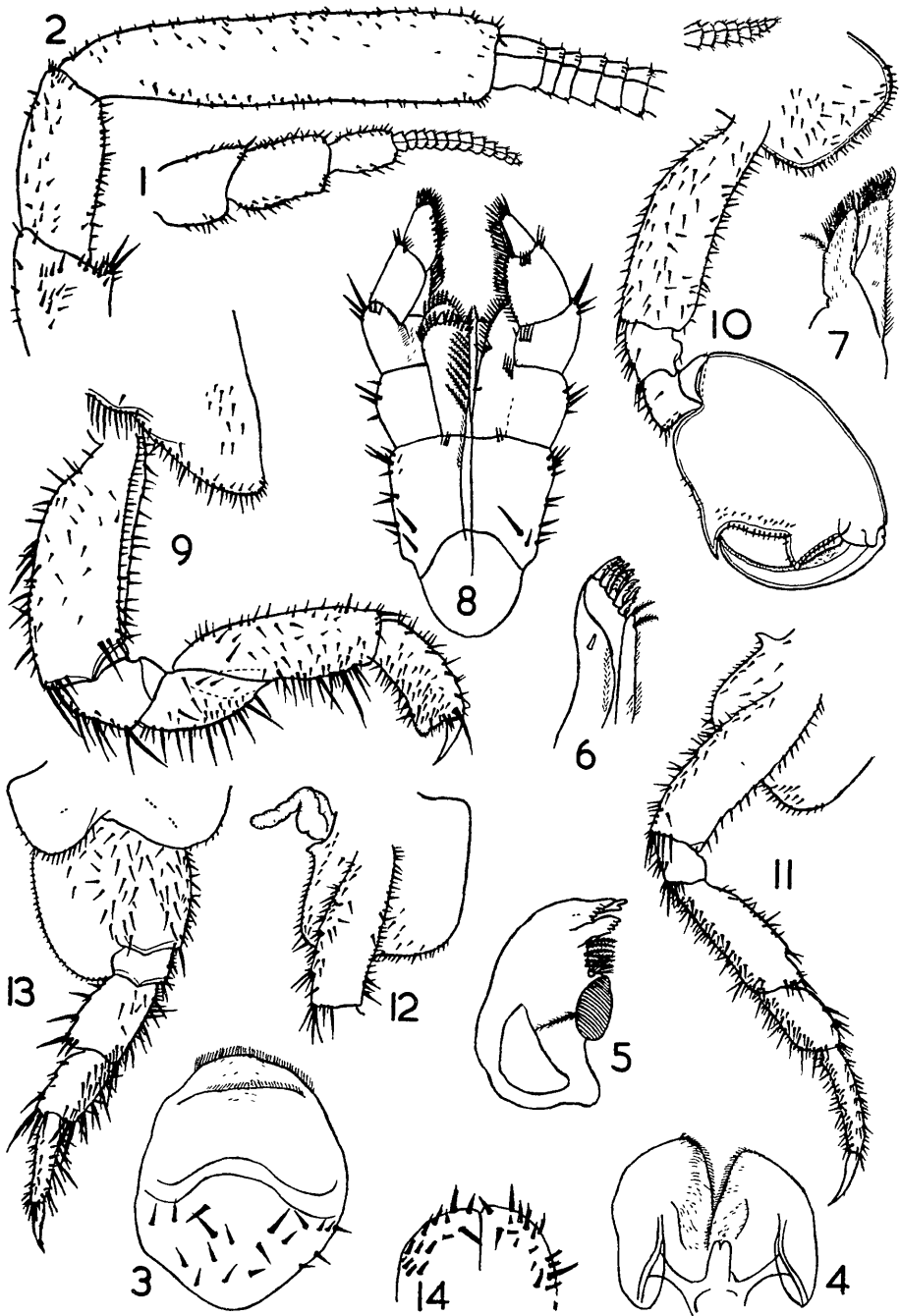
DESCRIPTION OF MALE

Length 20 mm, depth 5 mm Eyes round, black, apart.

ANTENNAE *First*: Reaches  $\frac{2}{3}$  along 5th peduncle segment of antenna 2. Peduncle 3rd segment  $\frac{2}{3}$  length 2nd; 2nd as long as 1st; all marginally spined. Flagellum as long as last 2 peduncle segments, of 9-12 distally spined segments. *Second*: Reaches about  $\frac{1}{3}$  length of body; 4th peduncle segment  $\frac{1}{2}$  length 5th; both spined on margins, end and surface, especially 5th; Flagellum as long as peduncle, of 29 segments, segments distally spined, wider than long.

MOUTHPARTS. *Upper Lip*: Epistome strongly spined. *Lower Lip*: Inner lobes rudimentary; end and inner margins of principal lobes strongly setose *First Maxillae*: Inner plate the shorter, lateral margins finely bristled; outer plate has minute palp with rudimentary 2nd segment *Second Maxillae*: Inner plate slightly the shorter, long setae distally, plate surfaces finely bristled. *Mandibles*: Molar process has long plumose seta distally, small tuft of setae proximally; spine rows of 4-6 setose spines; right mandible has U-shaped lower article with fimbriated margin to cutting edge. *Maxilliped*: Inner plate has 3 stout teeth distally; setulose spines on either side of teeth, between and below them and halfway down cleft; 2 spines at basos insertion Outer plate reaches almost  $\frac{1}{2}$  along carpus, outer distal and inner margins spined, spines on latter to a little below end of inner plate. Basos, ischium and merus all have strong spines on outer margins, shorter ones below merus and carpus inner proximal angles, a few stout spines on carpus distal angle; carpus and propod inner margins and propod distal margin have fields of fine spines; propod narrower than carpus and merus; dactylos absent.

GNATHOPODS. *First*: Sideplate subsquare, spined ventrally, posteriorly and on surface. Basos width  $\frac{1}{2}$  to  $\frac{2}{3}$  length; surface and posterior margins strongly spined. Ischium posterior margin about  $\frac{1}{3}$  basos length, strongly spined; merus subtriangular, anterior margin as long as ischium posterior, contiguous with proximal  $\frac{1}{2}$  of carpus posterior margin, surface and posterior margins strongly spined. Carpus margins subparallel, surface and margins strongly spined, almost twice merus length. Propod as long as carpus posterior margin, free posterior margin widens distally, posterodistal angle somewhat lobed, forming transverse palm, strongly spined; long narrow curved dactylos overlaps end of palm, a long thick spine below dactylos base. *Second*: Sideplate subsquare, strongly spined, excavate posteriorly Basos narrowing proximally, width  $\frac{1}{3}$  length, margins and surface spined; ischium subsquare, posterior surface and margin spined.



TEXT-FIG. 1.—*Talorchestia quoyana* (Milne-Edwards). Male 1—Antenna 1. 2—Antenna 2. 3—Upper lip. 4—Lower lip. 5—Left mandible. 6—Maxilla 1 7—Maxilla 2. 8—Maxilliped. 9—Gnathopod 1. 10—Gnathopod 2. 11—Peraeopod 1, 12—Peraeopod 2, sideplate and basos, 13—Peraeopod 3 14—Telson.

Merus subrectangular, slightly longer and narrower than ischium. posterior and free distal margin spined, 1 or 2 spines on surface. Carpus crescentic.  $\frac{1}{2}$  merus size. only anterior margin free. Propod greatly expanded, subovate, spined oblique palm more than  $\frac{1}{2}$  length posterior margin, defined distally by large tooth, 2nd large tooth about  $\frac{1}{3}$  along palm, palm between teeth slightly convex; curved stout dactylos not overreaching palm

PERAEOPODS. *First*. Sideplate subrectangular, spined ventrally and posteriorly and on surface, posteriorly excavate. Basos width  $\frac{1}{3}$  length, widest medially, margins and surface spined. Ischium subsquare, narrower than basos, posterior margin spined. Merus piriform, about  $\frac{2}{3}$  basos length, margins and posterior surface strongly spined. Carpus as wide,  $\frac{1}{2}$  merus length, similarly spined. Propod  $\frac{1}{2}$  carpus width, twice length, dactylos-shaped, margins and surface spined; long narrow dactylos slightly curved. *Second*. Shorter than 1st. Sideplate subsquare. Dactylos inner margin notched, with spine. *Third*. Much the smallest. Sideplate lobes ventrally spined, especially posterior; anterior lobe the larger; basos expanded, ovate, margins and surface spined. Otherwise like Pr. 1, but shorter and reverted. *Fourth*. Longer than Pr 5. Basos ovate, longer than wide, many short stout spines on anterior margin and surface; smaller spines on crenulate posterior margin; spines on anterior margins of segments much finer and more numerous than on posterior. *Fifth*. Basos as wide as long, ovate; margins spined, anterior the more strongly so, posterior serrate with small spines, anterior surface spined; anterior margins of other segments with many long fine spines, posterior margins also spined. Propod very long and narrow, spined all over; long, narrow, barely-curved dactylos has spined inner margin

EPIMERAL PLATES. First subtriangular with only barest indications of posterodistal angle, spined either side; 2nd and 3rd subsquare with a few spines on rounded anterodistal angles, more on straight posterior margins.

PLEOPODS. All biramous, segments barely indicated by paired plumose setae, peduncles strongly spined.

UROPODS. *First*. Peduncle as long as rami, both dorsal margins and ventral margin of peduncle spined, rami strongly spined dorsally and distally. *Second*. Rami longer than peduncle, both dorsal margins and anterior surface of peduncle spined; rami strongly spined dorsally and at end, 2-3 spines ventrally on inner ramus. *Third*. Ramus narrower and longer than peduncle, both strongly spined dorsally and distally. *Telson*: As wide as long, slightly emarginate, margins and surface strongly spined.

#### DESCRIPTION OF FEMALE

ANTENNAE. *First*: Flagellum of 8 segments. *Second*: Flagellum of about 27 segments, not as stout as male.

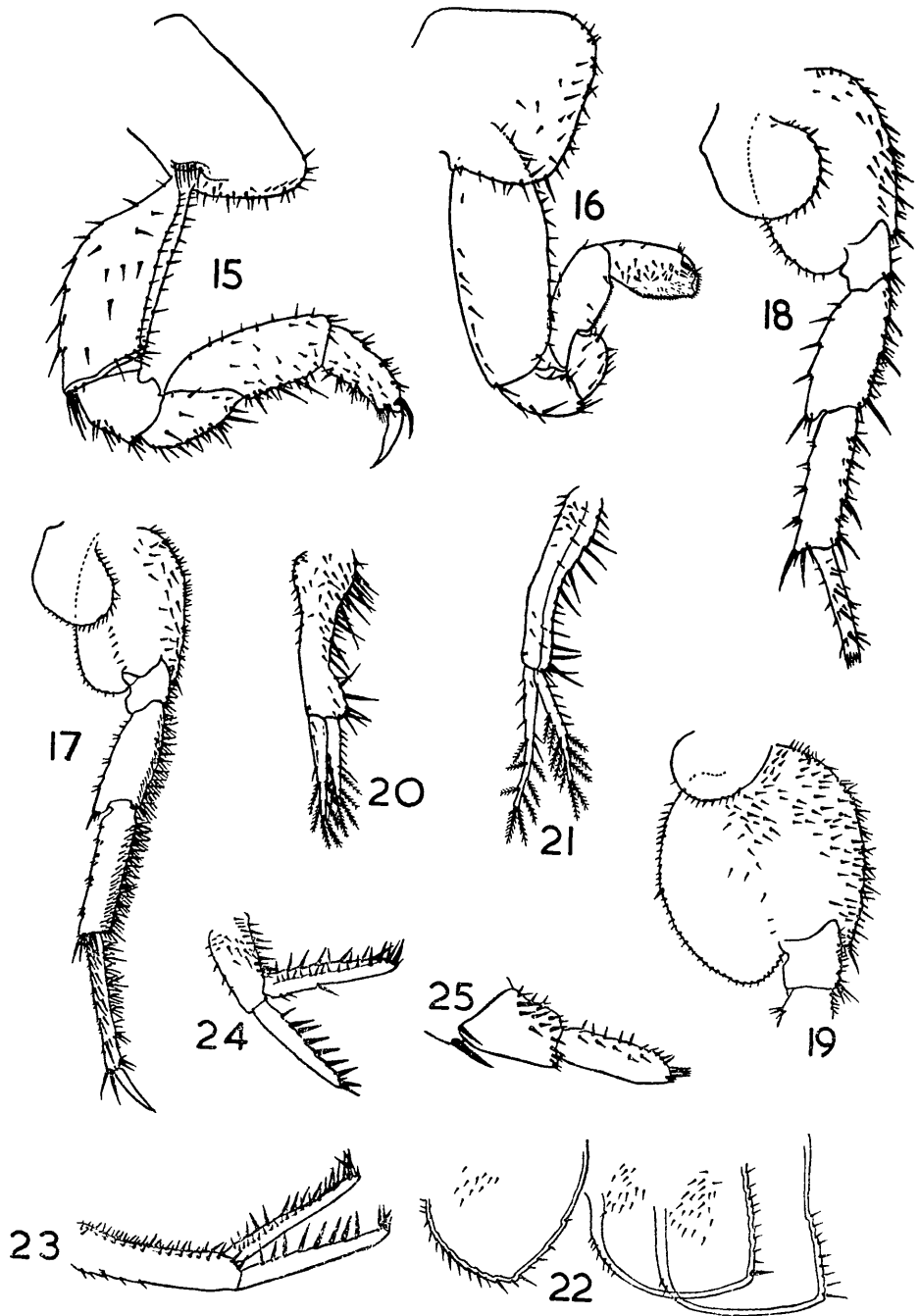
GNATHOPODS. *First*: Ischium subrectangular, spined posteriorly. Merus longer. Propod narrowing to dactylos, little more than  $\frac{1}{2}$  carpus anterior margin length. Dactylos more than  $\frac{1}{2}$  propod, strong spine on anterodistal angle of propod, spine rather dactylos-like. *Second*: Basos margins and surface spined; ischium about  $\frac{1}{3}$  basos length, narrower than long, margins spined. Merus as large, surface strongly spined; anterior margin contiguous with proximal  $\frac{1}{4}$  of carpus posterior margin. Carpus nearly three times merus length, spines on anterior margin, a few distally on scabrous posterior. Propod ovate, slightly shorter than carpus, posterior surface produced in scabrous pellucid lobe past small oblique palm and short curved dactylos; many small spines across surface medially from posteroproximal angle to palm; palm has about 10 small spines, about 5 spines at dactylos outer base

PERAEOPODS. Third to fifth not as profusely spined as in male in distal segments

LOCALITIES. Lyall Bay, Wellington, coll. W. H. Dawbin, 1947 (hypotypes): Orouiti Beach, East Coast, coll. January, 1951, D. E. H.; Sandfly Bay, Otago Peninsula, ocean side of dunes, 9 males, 4 females, up to 20 mm, 6 November, 1953, coll. D. E. H.; Kaikorai Stream mouth, seaward side, Dunedin, October, 1953, coll. D. E. H.; Brighton Beach, Dunedin, October, 1953, coll. D. E. H.; "sandy beaches all round New Zealand", Chilton (1917); "found on all the ocean sand beaches of New Zealand which have been examined, from Spirits Bay, North Auckland, to Oreti Beach, Invercargill", McIntyre (unpublished MSS.).

HYPOTYPES. Slides 1 (male), 5 (female), personal collection.

REMARKS. Thomson (1899) gives full New Zealand references for this species to that date. The species is notable for its profuse and strong spination. Adult males are easily distinguished by the shape of the second gnathopod, the absence of thickening or dilation of the 4th and 5th peraeopods, and the thickening of the second antennae peduncle segments.



TEXT-FIG. 2—*Talorchestia quoyana* (Milne-Edwards). 15—Gnathopod 1, female. 16—Gnathopod 2, female. 17—Pereopod 4, male. 18—Pereopod 4, female. 19—Pereopod 5, male. 20—Pleopod 1. 21—Pleopod 2. 22—Epimeral plates 1-3. 23—Uropod 1. 24—Uropod 2. 25—Uropod 3.

**Talorchestia cookii** Filhol. (Figs. 26–48.)*Talorchestia cookii* Filhol, 1885: 459–460, pl. 53, fig. 4*Talorchestia tumida*, Chilton, 1917: 296–299, figs. 6–13, non Thomson

## DESCRIPTION OF MALE

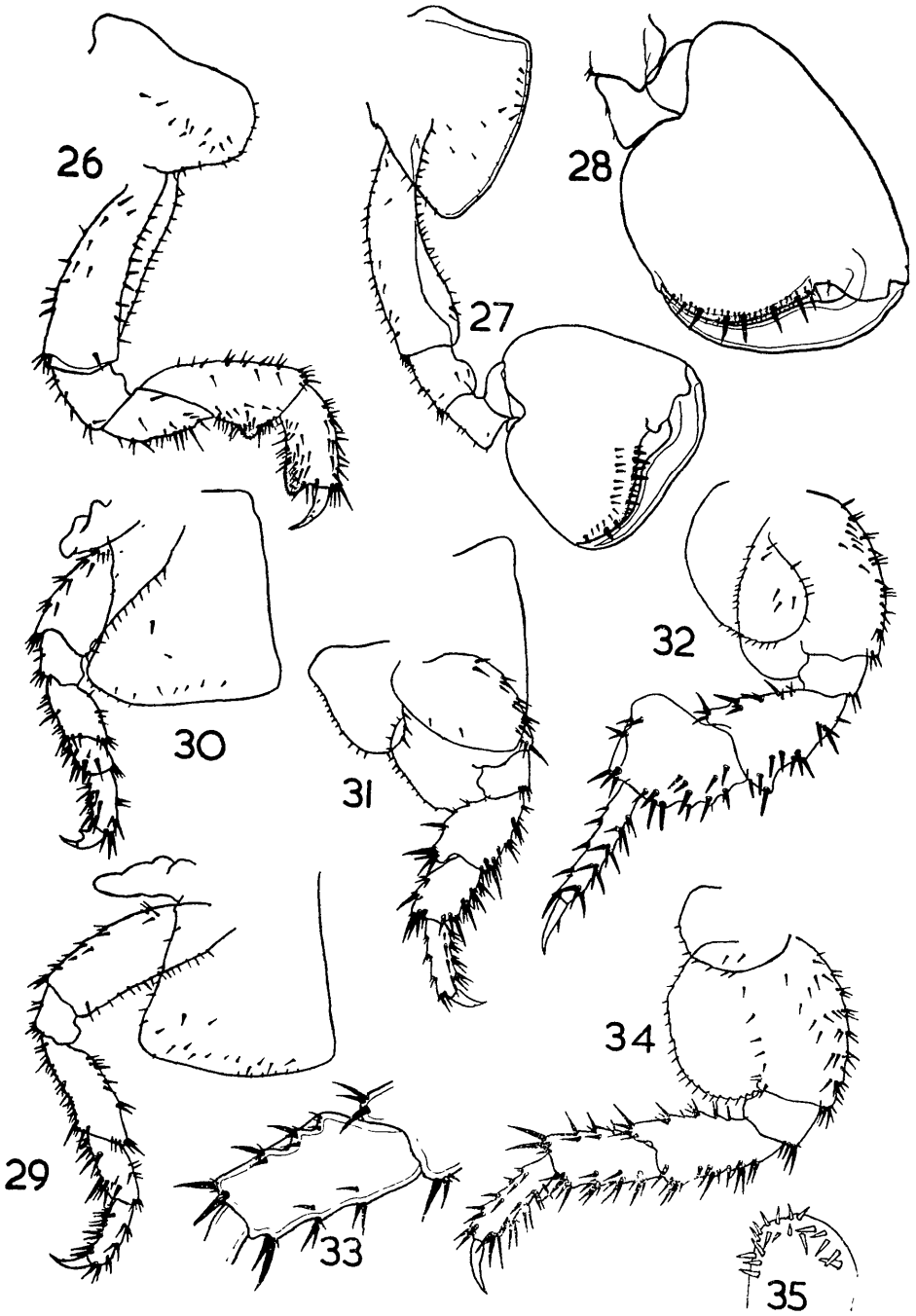
**ANTENNAE.** *First:* Peduncle longer than 6-segmented flagellum; flagellar segments longer than wide, short setae on distal angles; peduncle, 2nd segment as long as 3rd, shorter than 1st, has a few stout end and marginal spines, as also 3rd; 1st segment has a few weaker end spines, a few small surface spines. *Second:* Peduncle slightly longer than flagellum; flagellum of 15 segments, segments wider than long, have 4 equidistant groups of strong setae distally, end segment tufted. Peduncle, 3rd segment  $\frac{1}{2}$  length 4th, 4th  $\frac{1}{2}$  5th; 3rd and 4th have strong spines superiorly and distally; 4th has distal  $\frac{1}{2}$  of inferior margin also spined, 5th has strong spine groups on both margins.

**MOUTHPARTS.** *Upper Lip:* Setose, not spined. *First Maxillae:* Palp of 2 segments, rudimentary *Maxilliped:* Inner plate has 3 strong teeth distally; triangular field of setulose spines below teeth on both surfaces, much more extensively on inner, long setulose spines down cleft to basos; outer margin has 4 setulose spines outside distal teeth. Outer plate very bluntly pointed, reaches nearly  $\frac{1}{2}$  along carpus; outer margin has row of setulose spines distally; inner has very numerous herring-bone tipped spines to ischium. Basos has strong marginal and end spines; 3 or 4 strong spines on ischium distal angle; several strong spines on merus outer distal margin and end, inner margin is about  $\frac{1}{2}$  length of outer. Carpus as wide as, or wider than, long; inner surface expanded in flattened wing slightly farther distally than rest of carpus; wing has distally 3 or 4 strong spines; inner margin has short spines most of length. Propod much narrower, as long, narrowing somewhat to bluntly rounded tip; a few small surface spines; inner and end margins have strong spines almost entire length; dactylos rudimentary, square, scale-like, has spines distally and around base.

**GNATHOPODS.** *First:* Sideplate, anterior margin slightly concave, ventral rounded with a few small marginal spines; posterior margin and surface sparsely spined. Basos constricted proximally, posterior and both anterior margins spined, a few spines on posterior surface, posterodistal angle strongly spined. Ischium subrectangular, longer than wide, posterior margin spined. Merus posterior margin  $\frac{1}{2}$  basos length, convex and strongly spined, a few surface spines, anterior margin contiguous with proximal  $\frac{1}{2}$  of carpus posterior margin. Carpus  $\frac{3}{4}$  basos length; anterior margin slightly convex, strongly spined; posterior margin and surface strongly spined, free margin expanded medially to small scabrous pellucid lobe guarded by spines. Propod  $\frac{3}{4}$  carpus length, widening slightly distally, greatest width  $\frac{1}{2}$  length; anterior margin slightly convex, both strongly spined; posterior surface spined, distal surface widened in scabrous pellucid lobe, forming slightly concave palm; group of fine spines  $\frac{1}{2}$  along each side of palm; palm  $\frac{1}{2}$  length of long curved overlapping dactylos; dactylos  $\frac{1}{2}$  propod length, 3 short stout marginal spines on inner margin proximally. *Second:* Sideplate widening greatly distally, ventrally convex; ventral and posterior margins and surface have short spines; posterior margin straight, almost imperceptibly excavate. Basos concave, margins have numerous short spines; distal width  $\frac{1}{2}$  to  $\frac{1}{4}$  length; posterodistal angle spined, anterodistal naked. Ischium  $\frac{1}{2}$  basos length, posterior margin spined, anterior expanded distally in shallow lobe. Merus subrectangular, slightly shorter than ischium, sparsely spined; anterior margin contiguous with small subrescentic carpus. Propod distally as wide as convex anterior margin is long, wider than posterior margin is long; palm transverse, sinuous, concave near dactylos hinge and convex posteriorly; row of spines marginally, a second parallel row along surface below palm; long curved dactylos just reaches end of propod, has inner thickening near base; small stout characteristic projection on palm just inside dactylos hinge.

**PERAEOPODS** *First:* Sideplate widening so distally as wide as deep, margins more or less straight, posterior and ventral margins and surface spined, minutely excavate. Basos margins spined, constricted proximally. Ischium  $\frac{1}{4}$  basos length, posteriorly spined. Merus  $\frac{1}{2}$  basos length, margins strongly spined, anterior convex, spines more numerous posteriorly. Carpus slightly narrower,  $\frac{3}{4}$  merus length; anterior margin spined medially and distally; posterior strongly spined all along. Propod as long, narrower, has strong marginal spines, mostly posteriorly. Dactylos stout, curved,  $\frac{1}{2}$  propod length. *Second:* Posterior margin of sideplate concave; segments proportionately shorter than in Pr. 1; short, stout dactylos has spur  $\frac{1}{2}$  along inner margin, otherwise like Pr. 1. *Third:* Sideplate anterior lobe subtriangular, much the larger, reaches end of basos, posterior subtriangular but ventrally rounded, slightly longer than  $\frac{1}{2}$  anterior lobe, has about 3 medium-length spines on short anterior margin, minute spines on posterior becoming progressively larger distally. Basos expanded, ovate, as wide as long, anterior margin has about 5 groups of strong spines; posterior about 14 short spines. Ischium small, spined anterodistally. Merus piriform; length  $\frac{3}{4}$  basos, greatest width  $\frac{3}{4}$  length, about 4 groups of strong spines on margins, more numerous anteriorly. Carpus similar,  $\frac{3}{4}$  merus length, narrower, 3 groups of strong spines posteriorly, 4 groups anteriorly. Propod slightly longer,  $\frac{1}{2}$  width,





TEXT-FIG. 3—*Talorchestia cookii* Filhol Male. 26—Gnathopod 1 27—Gnathopod 2. 28—Gnathopod 2, immature 29—Peraeopod 1 30—Peraeopod 2 31—Peraeopod 3 32—Peraeopod 4 33—Peraeopod 4, carpus of immature male 34—Peraeopod 5. 35—Telson.

margins spined; dactylos as in Pr 1 *Fourth*: Sideplate ovate, reaching  $\frac{3}{4}$  along basos; about 13 spines anteriorly and posterodistally. Basos widest distally, nearly as wide as long; anterior margin strongly spined, a few spines on surface; about 12 small spines proximally on posterior margin. Ischium small, wider than long, anterodistal angle spined; merus subtriangular, length  $\frac{3}{4}$  basos, distally nearly as wide as long and more than twice proximal width, margins strongly spined, a few surface spines. Carpus expanded, nearly as long as merus; medially as wide as long; 4 spined corrugations anteriorly, strong spines on anterior surface; posterior margin V-shaped, proximal  $\frac{1}{2}$  free, distal  $\frac{1}{2}$  has 3 groups of strong spines. Propod as long as basos, straight and narrow, strong spines on margins; dactylos slender, almost  $\frac{1}{2}$  propod length. *Fifth*: Sideplate small, has about 6 spines ventrally. Basos ovate, greatest width slightly more than length; anterior margin and surface have numerous strong spines; a longitudinal row on surface medially; posterior margin strongly convex, not markedly crenulate, has about 24 long fine marginal spines. Merus  $\frac{3}{4}$  basos length, widening distally, distal width  $\frac{1}{2}$  length; margins strongly spined. Carpus slightly shorter and narrower, about 4 groups of strong spines on each margin. Propod as long as carpus,  $\frac{1}{2}$  its width; linear, margins strongly spined, dactylos as in Pr. 4.

**EPIMERAL PLATES.** *First*: Subtriangular, anterior margin has about 5 strong spines; posterior sinuous, about 3 minute well-spaced spines. *Second*: Comparatively narrow, anterior margin rounding to ventral, has 7 or 8 strong spines, a few on anterior surface, posterior margin straight, has about 5 small marginal spines. *Third*: Subrectangular, anterodistal angle rounded broadly, anterior margin has about 5 strong spines, ventral none; posterior slightly concave with about 9 small spines, anterior surface also spined.

**PLEOPODS** Rami as long as peduncles, which have strongly spined outer margins; inner margin and surface proximally spined in 1st and 2nd, 3rd has row of spines down inner margin; 2 coupling spines; outer margin of 2nd and to lesser degree 3rd pleopod finely bristled between spines; rami have about 6 to 8 superficial segments with paired long plumose setae; inner have 2 or 3 spines on surface proximally, outer 2 to 4 small spines proximally on outer margin.

**UROPODS** *First*: About 5 spines on peduncle ventral surface. Outer ramus has about 8 strong dorsal and end spines; inner 2 dorsal rows of about 4 spines each, 2 at end. *Second*: Rami slightly longer than peduncle, outer has about 6 stout marginal and end spines; inner about 10 spines on margins and end. *Third*: Peduncle subglobular, 3 or 4 distal spines, ramus longer, cylindrical, has end row of 3 or 4 long and 2 short spines, 9 or 10 spines on upper distal surface. *Telson*. Slightly emarginate, ovate, strongly spined.

#### DESCRIPTION OF FEMALE

**ANTENNAE.** *Second*: Flagellum has 13 segments

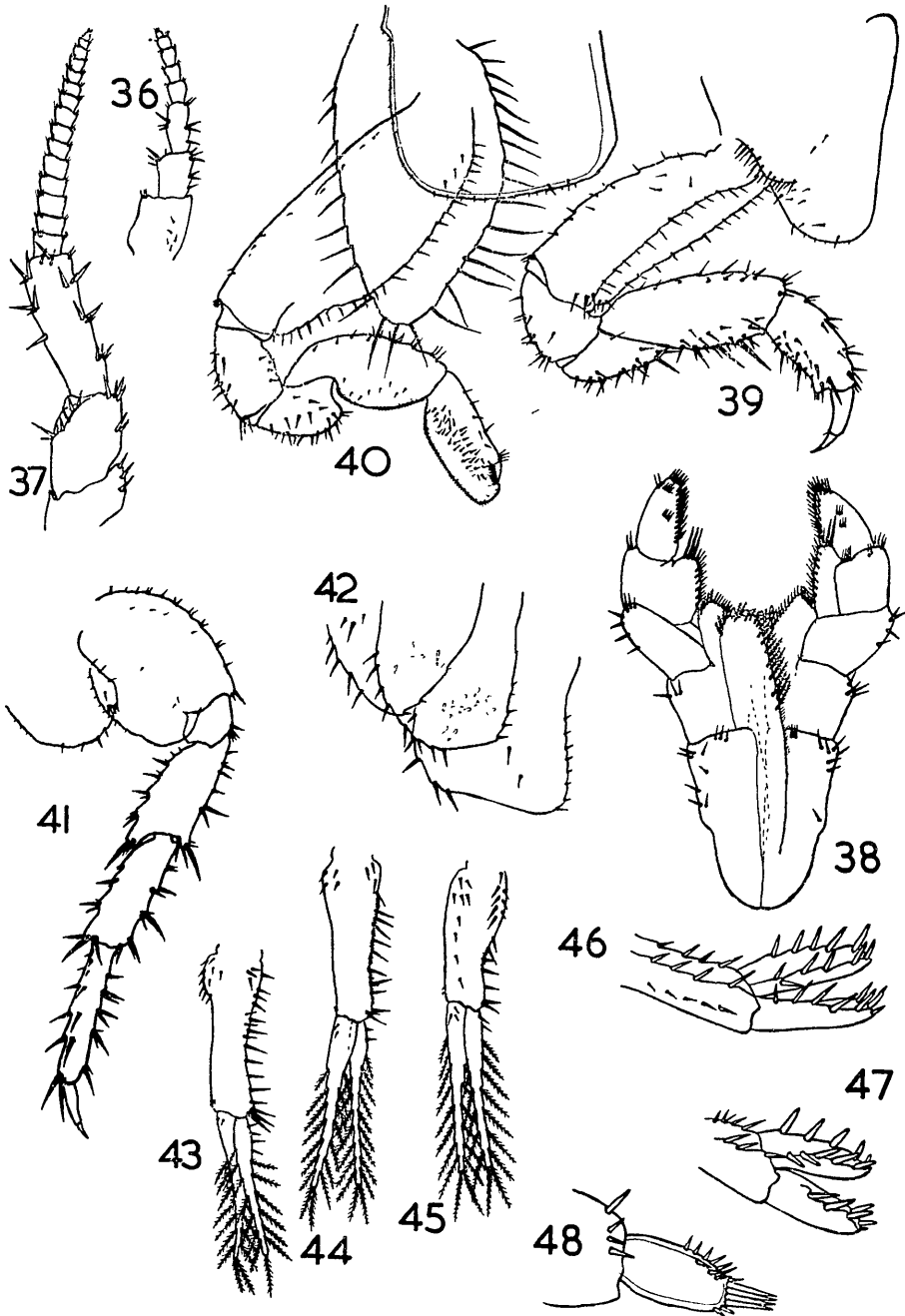
**GNATHOPODS** *First*: Carpus nearly basos length, posterior free margin and surface have strong spines but lack scabrous pellucid lobe of male. Propod slightly more than  $\frac{1}{2}$  carpus length, narrowing a little distally; posterodistal angle a little produced in small seta-tipped lobe forming what could be regarded as a small palm, Strong curved dactylos more than  $\frac{1}{2}$  propod length. *Second*: Sideplate subsquare, ventral and posterior margins and surfaces sparsely spined. Basos widest medially, width not quite  $\frac{1}{2}$  length, a few spines on straight posterior margin; sinuous anterior margin has regular small spines. Ischium subrectangular, width  $\frac{1}{2}$  length, length  $\frac{1}{2}$  basos, margins spined. Merus subrectangular, width  $\frac{1}{2}$  length, length  $\frac{1}{3}$  basos, margins and surface spined, anterior margin contiguous with proximal  $\frac{1}{3}$  of carpus posterior margin. Carpus  $\frac{1}{2}$  basos length, margins strongly convex, anterior spined; free  $\frac{2}{3}$  of posterior margin expanded to scabrous pellucid area with a few minute spines on surface. Propod  $\frac{2}{3}$  carpus length, anterior margin straight, spined; posterior expanded in scabrous pellucid lobe distally past small oblique palm; median surface of propod has numerous small spines; palm has small spines. Small stout curved dactylos as long as palm.

**PERAEPODS** *First*: Sideplate subrectangular. *Fourth*: Merus proportionately narrower than in male. Carpus as long as merus, slightly narrower, widening very little distally, spined like merus. Otherwise peraeopods as in male, segments a little less spinous.

**LOCALITIES** "On the shores of Cook Strait, in Massacre Bay, and on the West Coast of the South Island at Hokarita" (Filhol); Puysegur Point; Bluff; Waipapa Point; Golden Bay; Stewart Island; Green Islets; Kaikoura; Preservation Inlet; Riverton; Moeraki; (these Chilton Collection references); "shingle beaches of South Island," McIntyre (unpublished MSS)

**HYPOTYPES** Tray 36, Slides M<sub>1</sub>-M<sub>5</sub>, male; B<sub>1</sub>-B<sub>3</sub>, female, Moeraki, Chilton Collection. Also: Slides C.16, male, C.17, female.

**REMARKS.** Stebbing's descriptions of *Talorchestia tumida* (Stebbing, 1887, 1906), based on specimens received from G. M. Thomson, make it clear that the specific name *tumida* was first applied to specimens having the palm, as Chilton says, "more



TEXT-FIG. 4.—*Talorchestia cookii* Filhol 36—Antenna 1, male 37—Antenna 2, male 38—Maxilliped 39—Gnathopod 1, female. 40—Gnathopod 2, female. 41—Peraeopod 4, female. 42—Epimeral plates. 43—Pleopod 1 44—Pleopod 2 45—Pleopod 3 46—Uropod 1. 47—Uropod 2. 48—Uropod 3.

like that shown by Stebbing (1887)". The Chilton Collection contains specimens from several localities showing differences from those described by Stebbing, and others obviously conspecific with Stebbing's material. I consider there are sufficient differences to regard the specimens from Moeraki, New Zealand, as a distinct species. I have described these above. It would appear to be on these that Chilton (1917) based his description and figures of *Talorchestia tumida*.

Distinctive characteristics are the palm of the second gnathopod in the male which is excavate anteriorly and is not strongly toothed as in *T. tumida* G. M. Thomson; the sideplates, particularly those of peraeopod 3; and the uropods.

There is a suggestion of a palm in the female first gnathopod on which the species could be classed as *Orchestia*, but in view of the obviously close affinities with other *Talorchestia* species, and the shape of the second peraeopod dactylos, I do not consider that this would be a natural classification.

Chilton remarks that most of his specimens were found "near highwater mark," whereas Thomson records *T. tumida* "on sandy beaches and sandhills, usually at some distance from the sea". This appears to be a true distinction in habitat between *T. tumida* and *T. cookii*.

Filhol's descriptions and figures are on the sparse side, but the specimens described above agree satisfactorily with what he does give.

**Talorchestia tumida** G. M. Thomson, 1885. (Figs 49-70.)

*Talorchestia tumida* G. M. Thomson, 1885: 577.

Thomson and Chilton, 1886: 145.

Stebbing, 1886: 5.

Stebbing, 1887: 202, pl. 39, fig. A.

G. M. Thomson, 1889: 260, pl. 13, fig. 4-8.

Chilton, 1892: 259.

Stebbing, 1906: 550 (with synonymy).

Chilton, 1917: 296-299 (partim).

Chilton, 1927: 175.

Stephensen, 1935: 12.

Stephensen, 1948: 13.

Paviour-Smith, 1956: 533, 552

*Orchestia gammarellus* Della Valle, 1893: 501 (partim).

*Orchestia tumida* G. M. Thomson, 1899: 203

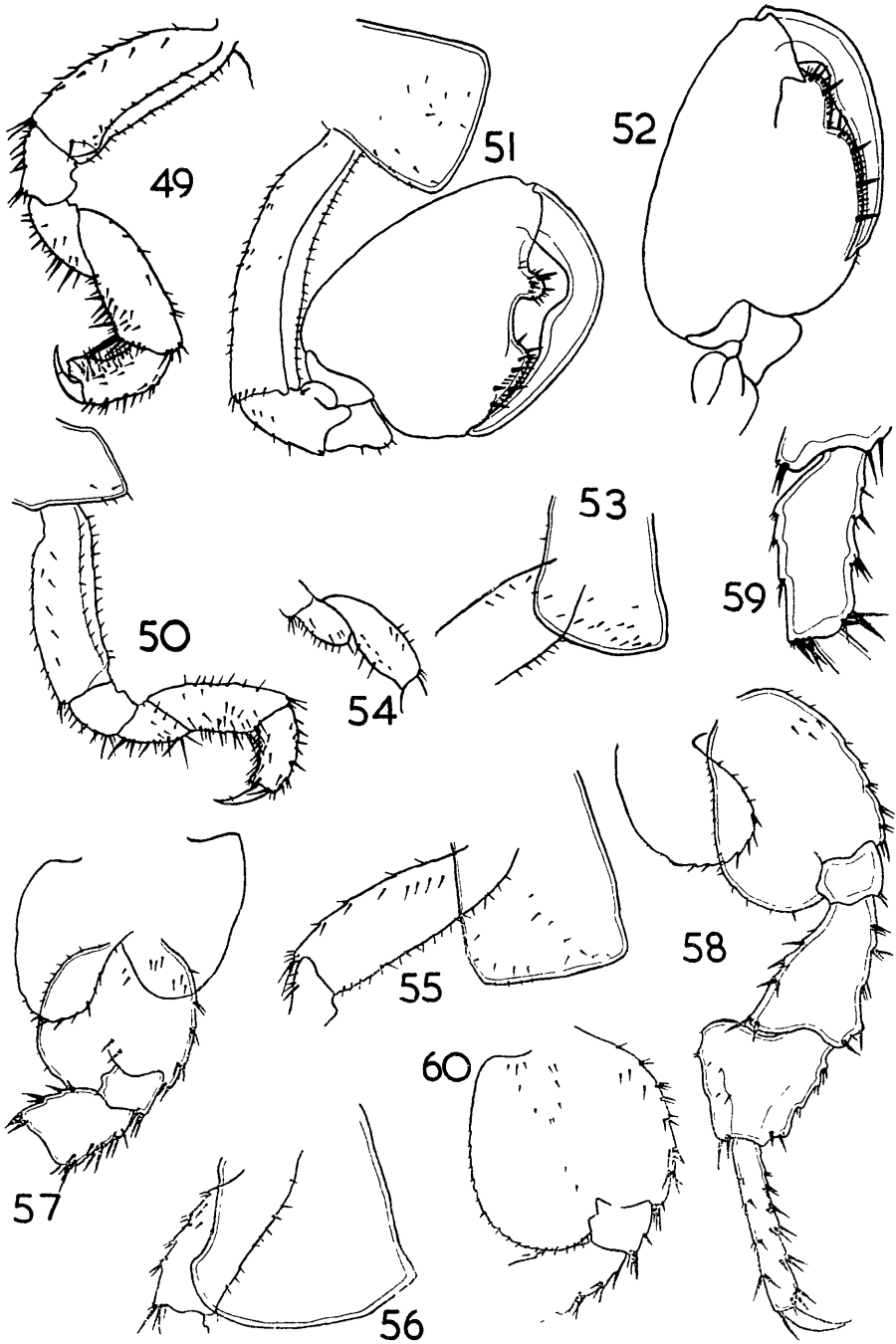
#### DESCRIPTION OF MALE

Length, 9 mm, depth, 5 mm; width,  $5\frac{1}{2}$  mm. Colour in spirit, orange-yellow. Body very tumid. Like *T. cookii* except for following characteristics.

**ANTENNAE.** *First:* Reaches just past end of 4th segment of antenna 2 peduncle. Flagellum of 6 segments. *Second:* Flagellum of about 17 segments in male, 15 in female.

**GNATHOPODS.** *First:* Free portion of carpus posterior margin strongly spined, slightly convex, lacks pellucid process. *Second:* Sideplate deeper than wide, margins subparallel. Basos slightly concave, width  $\frac{1}{2}$  length, margins spined. Ischium  $\frac{1}{3}$  basos length, 3 or 4 spines on posterior margin, a few minute spines on surface, anterior margin distally expanded in convex lobe. Merus small, about  $\frac{2}{3}$  carpus length; masked by ischium so as to appear V-shaped, a few minute spines on posterior margin; anterior margin contiguous with equally small cup-shaped carpus. Propod anterior margin convex, as long as basos, greatest width about  $\frac{2}{3}$  length; more ovate than in *T. cookii*; posterior free margin very short, less than  $\frac{1}{2}$  anterior margin; oblique palm has conical tooth near inside hinge of dactylos, tooth has "coronet" of spines; palm then deeply excavate  $\frac{1}{3}$  of length, outer  $\frac{1}{3}$  of palm raised in strongly spined convex margin. Dactylos as long as palm, curved, strongly thickened  $\frac{1}{2}$  along inner margin opposite median concavity of palm; tip impinging on palm in shallow granulated groove.

**PERAEOPODS.** *Second:* Like *T. cookii* but anterior angle of sideplate very sharp. *Third:* Sideplate anterior lobe as large as posterior, neither reaching more than  $\frac{1}{2}$  down basos. Anterior lobe lacks spines; posterior has about 8 on anterior and end margins, 2 or 3 minute spines on posterior. *Fourth:* Basos much wider distally, greatest width more than  $\frac{2}{3}$  length; length  $\frac{3}{4}$  basos. Carpus as wide as long, more than  $\frac{1}{2}$  basos length, anterior margin has 4 corrugations, each with group of small spines; posterior margin V-shaped, proximal portion without spines, is slightly shorter than distal portion, a few minute spines on distal portion and surface, 2 long spines on distal angle. Propod slightly longer than merus.



TEXT-FIG 5—*Talorchestia tumida* G. M. Thomson 49—Gnathopod 1, male 50—Gnathopod 1, female 51—Gnathopod 2, male 52—Gnathopod 2, immature male. 53—Gnathopod 2 sideplate, female. 54—Gnathopod 2 carpus and merus, female 55—Pereopod 1, female. 56—Pereopod 2 57—Pereopod 3 58—Pereopod 4, male 59—Pereopod 4, carpus of immature male. 60—Pereopod 5 basos

**EPIMERAL PLATES.** *First:* Ovate, anterior margin rounding almost imperceptibly to posterior; about 6 strong spines on anterior margin, a few on surface; posterodistal angle has strong spine; posterior margin convex, has 2 or 3 minute spines. *Second:* Deeper than wide, anterior margin rounding to ventral, about 12 strong marginal spines; posterodistal angle not pronounced; posterior margin slightly convex, has about 5 small to minute spines. *Third:* Shallow, anterior margin rounding to ventral, has about 4 spines; posterodistal angle reasonably distinct, a few small or minute spines on posterior margin.

**PLEOPODS.** Peduncle outer margin spined, throughout length in 1st, to lesser degree in 2nd and 3rd, all spined proximally on surface; 1st has about 6 small stout spines on inner margin proximally; 2 coupling spines; inner ramus the longer; outer margin of outer ramus has 2-5 small stout spines proximally, inner margin of inner ramus 1 or 2 spines; rami have about 10 segments; each with pair of plumose setae.

**UROPODS** *First:* Peduncle longer than rami; both dorsal margins strongly spined, numerous spines on ventral margin. Inner ramus has about 6 long spines on each dorsal margin, 4 end spines; outer about 5 each long marginal and 2 short end spines. *Second:* Rami as long as peduncle, peduncle outer dorsal margin has about 3 strong spines, surface has numerous small spines, a few on inner margin; inner ramus has about 14 spines dorsally and at end, outer about 7 marginal and end spines. *Third:* Peduncle has 4-5 small dorsal spines; ramus longer, narrower, cylindrical; about 14 short and long spines on end and upper distal margin.

#### DESCRIPTION OF FEMALE

**GNATHOPODS.** *First:* As in *T. cookii*. *Second:* Sideplate deeper than wide, slightly narrowed proximally, surface spined; posterior margin has a few spines. Carpus margins convex, about 3 spines on each; a few on surface; posterior margin not expanded in scabrous pellucid lobe as in *T. cookii*, otherwise similar.

**PERAEOPODS** *First:* Sideplate subrectangular, deeper than wide.

**LOCALITIES.** Purakanui, near Dunedin, "in sandbanks, among roots of littoral plants, many yards from high-water mark. Each specimen inhabiting a hole of its own. When taken out they leap with vigour" (Thomson, 1885). Stewart Island, coll. G. M. Thomson; Rabbit meadow, Allen's Bay, Otago Peninsula, coll. April, 1953, K. Paviour-Smith; Sandfly Bay, Otago Peninsula, stream side of dunes, 6/11/53, 6 males, 15 females, mostly immature, coll. D. E. H.; "sand-dune hopper, on and behind sandhills at Warrington, Oreti, Invercargill and Stewart Island", McIntyre (unpublished MSS).

**HYPOTYPES.** Slides C.18, male; C.19, female, Chilton Collection.

**REMARKS.** The specimens described above from Stewart Island are undoubtedly identical with those described by Thomson and Stebbing. The distinctive characteristics include the male second gnathopod with its palmar process "beset with three or more rows of spines of different sizes which form a sort of coronet around the process". Other points are the shape of the 3rd peraeopod sideplate, the epimeral plates, the pleopods, and the first and second uropods.

***Talorchestia kirki*, n.sp.** (Figs. 71-80.)

? *Talorchestia tumida*, Young, 1929: 155, non G. M. Thomson.

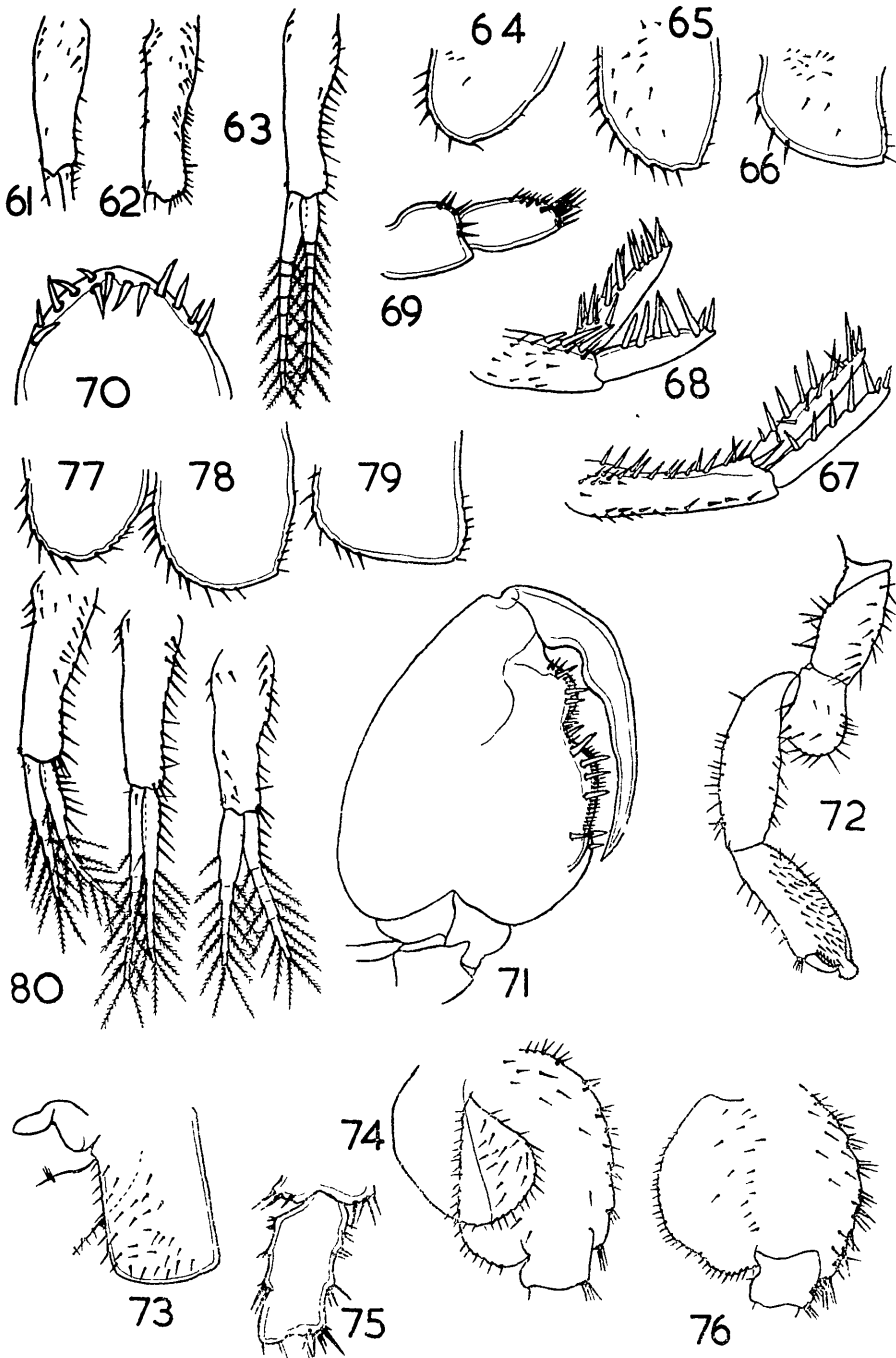
#### DESCRIPTION OF MALE

Like *Talorchestia tumida* except as below:

**GNATHOPODS** *Second:* Sideplate subrectangular. Basos, surface spined. Palm as in *T. tumida* but median process much wider and shallower, and median excavation of palm has strong spines.

**PERAEOPODS.** *First:* Sideplate subrectangular, deeper than wide. *Third:* Sideplate anterior lobe as large as posterior, not reaching quite so far distally; posterior lobe strongly spined anteriorly and distally, posterior margin has minute spines. *Fourth:* Sideplate strongly spined, has about 20 spines. Basos posterior margin has numerous spines, is straight most of length but distally convex, slightly wider distally. Carpus linear, strongly spined. *Fifth:* Basos ovate, wider than long; anterior margin strongly spined; posterior more strongly spined than in *T. tumida* (about 34 spines against 20), margin crenulate.

**EPIMERAL PLATES** *First:* Distally rounded, angles absent, 7 long spines anteriorly, about 2 small and 3 minute spines posteriorly. *Second:* Deeper than wide, ventrally rounded; posterodistal angle almost imperceptible. Anterior and distal margins have about 12 long spines; posterior is slightly convex, has about 6 small or minute spines. *Third:* Anterior margin has 7 long spines, rounds to straight ventral margin; posterodistal angle rounded, posterior margin sigmoid, has 7 small spines.



TEXT-FIG 6—*Talorchestia tumida* G. M. Thomson. 61—Pleopod 1. 62—Pleopod 2. 63—Pleopod 3. 64-66—Epimeral plates 1-3. 67—Uropod 1. 68—Uropod 2. 69—Uropod 3. 70—Telson *Talorchestia kirki* n. sp. 71—Gnathopod 2, male. 72—Gnathopod 2, female. 73—Peraeopod 1 sideplate, male. 74—Peraeopod 4, basos, male. 75—Peraeopod 4 carpus, male. 76—Peraeopod 5 basos, male. 77-79—Epimeral plates 1-3. 80—Pleopods 1-3.

**PLEOPODS** *First*: Outer ramus outer margin has about 7 strong spines proximally, inner ramus has 3 on inner margin, rami have about 6 superficial segments, segments have long plumose setae. *Second*: Outer ramus has 5 long spines on outer margin, about 7 superficial segments. *Third*: Outer ramus has 3 spines proximally on outer margin, about 6 or 7 superficial segments.

**UROPODS** *First*: Short spines on ventral margin and surface.

#### DESCRIPTION OF FEMALE

Length 14 mm, depth 5 mm; width  $4\frac{1}{2}$  mm. Broodpouch has 9 ova.

**GNATHOPODS** *Second*: Sideplate subrectangular; deeper than wide, is strongly spined centrally, posteriorly and on surface. Basos width  $\frac{1}{3}$  to  $\frac{1}{4}$  length, margins spined, anterior convex. Ischium  $\frac{1}{3}$  basos length, margins strongly spined and convex; ovate merus  $\frac{1}{2}$  ischium length, numerous spines on free posterior margin. Carpus margins spined, anterior convex, posterior almost straight; no pellucid expansion; length  $\frac{1}{2}$  basos. Propod as long, about 6 spines regularly along straight anterior margin, group of finer spines on outer dactylos hinge; posterior margin expanded in scabrous pellucid lobe, produced past small oblique palm, palm slightly longer than short aquiline-tipped dactylos; posterior surface of lobe strongly spined.

**LOCALITIES.** Chatham Islands, coll. Kirk; "oceanic sandhopper, burrowing in supralittoral sand," McIntyre (unpublished MSS.); ? Okawa Beach, coll. Archey (Young, 1929).

**TYPES** Slides C.20, male; C.21, female.

**REMARKS.** In the shape of the male second gnathopod, this species resembles an immature stage of *T. tumida*, and were it not for other differences, one would be tempted to class the specimens as *T. tumida*. However, because of differences in the epimeral plates and pleopods, the spination of the basos of the fourth and fifth peraeopods, and the second gnathopods—these appear to be mature specimens—I have described them as a new species known only from the Chatham Islands. Judging from the shape of the epimeral plates, *T. kirki* would appear to have speciated later than *T. tumida*, the noticeably semicircular outline being unusual in the New Zealand species of the genus. The close resemblance to younger stages of *T. tumida* suggests speciation by neoteny

#### *Talorchestia telluris* (Bate), 1862 (Figs. 81–107)

*Orchestia telluris* Bate, 1862: 20, pl. 3, fig. 6; pl. 4, fig. 4  
Miers, 1876: 122.

G. M. Thomson, 1881: 209

Thomson & Chilton, 1886: 145.

*Orchestia gammarellus* Della Valle, 1893: 500 (partim).

*Talorchestia telluris* Stebbing, 1906: 551

Chilton, 1917: 299–302 (partim); Figs. 14–16.

Chilton 1927: 175.

Stephensen, 1935: 12

Stephensen, 1948: 13.

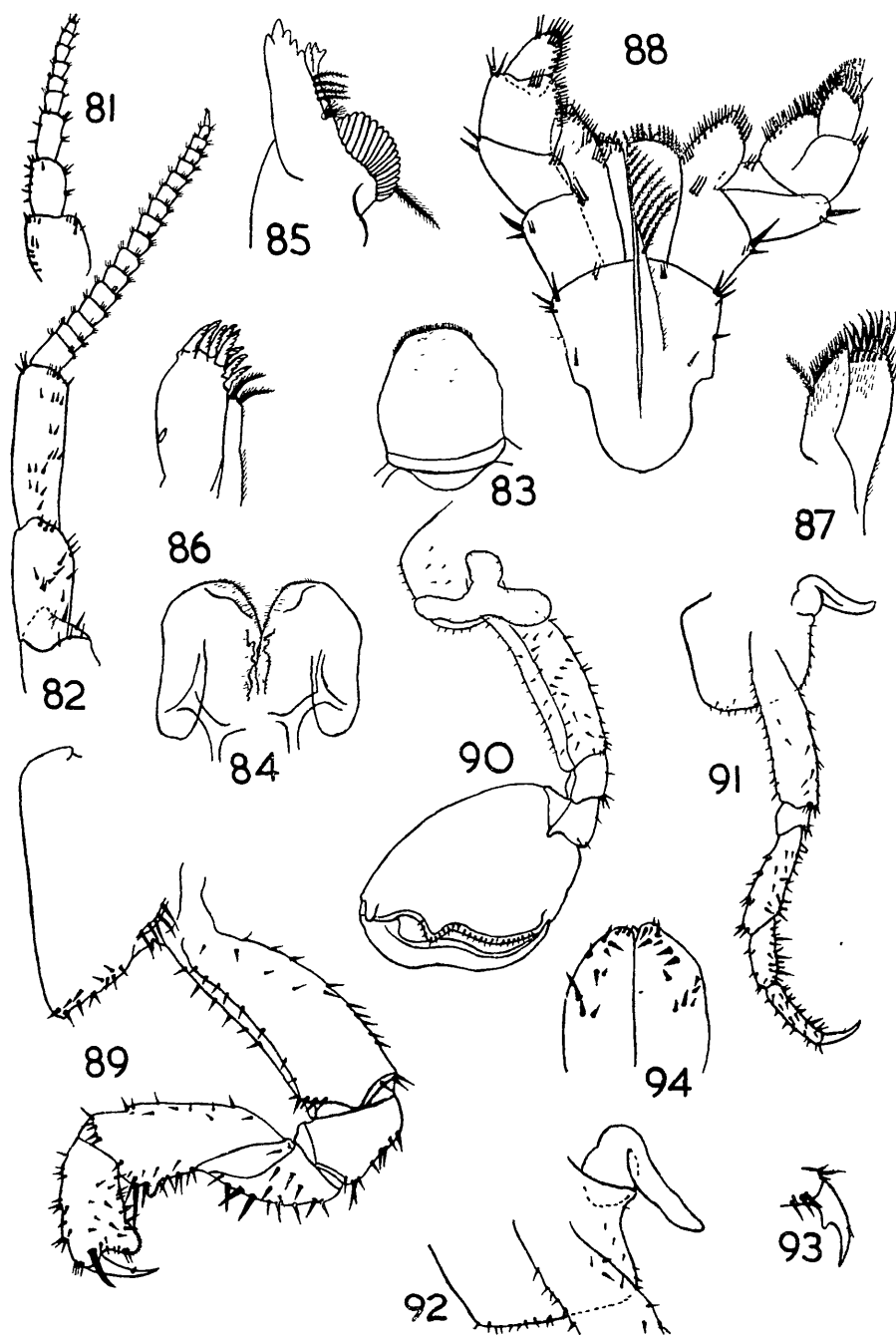
#### DESCRIPTION OF MALE

Colour in spirit white with orange mottling. Length,  $11\frac{1}{2}$  mm; depth, 3 mm; width, 2 mm. Eyes  $\frac{1}{2}$  length of head, round, black, apart. Like *T. cookii* where not otherwise stated.

**ANTENNAE.** *First*: Length  $1\frac{1}{4}$  mm, reaches  $\frac{1}{2}$  along 5th peduncle segment of antenna 2. Flagellum of 6 segments, as long as 2nd and 3rd peduncle segments combined; flagellar segments longer than wide, groups of several strong setae on inferior and superior distal angles, end segment tufted. Peduncle segments successively narrower and slightly shorter than those preceding, 2nd and 3rd segments with pair of spines inferomedially. *Second*: Flagellum as long as peduncle, of 17 segments, last one tufted, others with 4 equidistant groups of strong setae around end margins, segments wider than long. Peduncle, 3rd segment  $\frac{2}{3}$  length 4th, inferior  $\frac{1}{2}$  of distal margin spined; 4th  $\frac{2}{3}$  length 5th, distal margin and surface spined inferiorly; 5th has groups of short spines on surface and distal margin.

**MOUTHPARTS.** *Upper Lip*: Distal margin tending to be straight. *Maxilliped*: Inner plate outer distal angle rounded, 3 stout end teeth; 5 or 6 marginal setulose spines outside outermost tooth, setulose spines on outer surface between teeth and in triangular field across distal angle; inner surface has row of about 9 increasingly longer setulose spines down cleft to basos, below that margin strongly bristled. Outer plate bluntly pointed distally, about 6 setulose spines





TEXT-FIG. 7.—*Talorchestia telluris* (Bate). Male. 81—Antenna 1 82—Antenna 2 83—Upper lip. 84—Lower lip. 85—Mandible. 86—Maxilla 1. 87—Maxilla 2. 88—Maxilliped. 89—Gnathopod 1. 90—Gnathopod 2. 91—Peraeopod 1 92—Peraeopod 2. 93—Peraeopod 2, dactylos. 94—Telson.

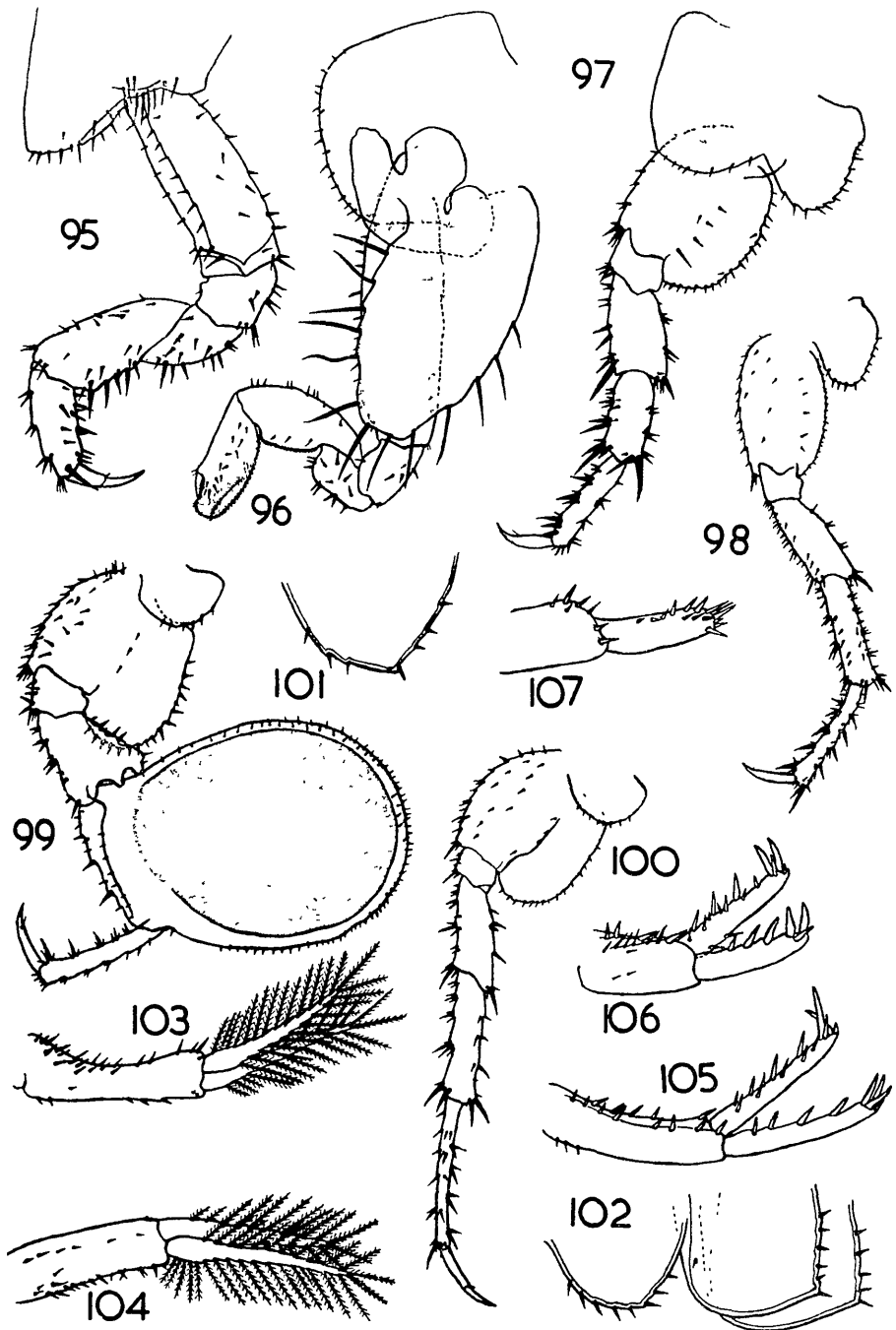
on outer distal margin, inner margin has strong rows of marginal spines almost to end of inner plate, below these a further marginal group of several spines; group of 3 serrate-tipped surface spines at proximal merus level. Basos has a few stout marginal spines. Ischium, merus and carpus each 2 or 3 spines on outer distal angles; merus wider than long, about 3 spines on inner distal angle; carpus subsquare, strongly marginal field of serrate-tipped spines on inner margin distal  $\frac{2}{3}$ ; about 4 spines below propod inner proximal angle; propod longer than wide, serrate-tipped spines on inner margin distal  $\frac{2}{3}$  completely masking end; obliquely transverse row of about 5 strong spines on surface just below end. Dactylos not apparent.

**GNATHOPODS** *First*: Sideplate subtriangular, strong spines on ventral margin. Basos posterior margin convex, width  $\frac{1}{2}$  length, posterior and both anterior margins have strong spines, also distal angles and proximal surface. Ischium about  $\frac{1}{2}$  basos length; merus subtriangular, strong spines on posterior surface and margin; carpus subtriangular, posterior and distal margins spined strongly, one particularly long spine reaching almost to end of propod, a small scabrous pellucid lobe medially on posterior margin. Propod  $\frac{2}{3}$  basos length, anterior margin has about 5 groups of short spines; posterior margin and surface with strong spines, posterodistal angle expanded in scabrous lobe: a strong curved spine extending anteriorly from dactylos base, palm  $\frac{1}{2}$  propod width, not clearly defined, has a few small spines. Dactylos considerably longer than palm, slender, curved. *Second*: Sideplate subsquare, spined ventrally and posteriorly, posteriorly excavate. Gills anchor-shaped. Basos proximally constricted, posterior margin convex, spined; both anterior margins and surface spined. Ischium subrectangular, has spine medially on posterior margin, posterodistal angle a few small spines. Merus has 2 or 3 minute spines on margins and surface. Carpus triangular,  $\frac{1}{2}$  merus size. Propod as long as basos, greatly expanded, greatest width  $\frac{2}{3}$  length, ovate; palm oblique, nearly twice length of posterior free margin; triangular tooth near dactylos base, palm has small stout spines; long dactylos slightly expanded medially.

**PERAEOPODS** *First*: Sideplate subsquare or slightly wider than deep, spined posteriorly and ventrally, posteriorly excavate. Basos width  $\frac{1}{2}$  length, margins spined, a few surface spines. Ischium small, subsquare, posterodistal angle spined. Merus  $\frac{2}{3}$  basos length, widening slightly distally, margins and posterior surface spined. Carpus  $\frac{2}{3}$  basos length, a few spines anteriorly, posterior margin and surface have strong spines. Propod slightly longer than basos, margins and surface spined. Dactylos long, curved at tip, single spine on inner margin. *Second*: Sideplate trapezoid, wider than deep. Short stout dactylos has notched inner margin. Segments slightly shorter than in Pr. 1, otherwise the same. *Third*: Sideplate anterior lobe much the larger, posteriorly and ventrally spined. Posterior lobe strongly spined posteriorly, spines continuing a little anteriorly. Basos nearly as wide as long, anterior margin has a few single spines, posterior has many short stout spines, is convex, surface has a few medial spines. Ischium anterodistal angle strongly spined. Merus stout, width  $\frac{1}{2}$  length, length slightly more than  $\frac{1}{2}$  basos; widening slightly distally, anterior margin has about 4 groups of 2 or more spines, distal ones almost  $\frac{1}{2}$  merus length; posterior has similar groups of shorter spines. Carpus as long as merus, narrower, linear, somewhat similarly spined, distal spines almost  $\frac{1}{2}$  propod length. Propod slightly longer than merus, width  $\frac{1}{2}$  length, 4 or 5 groups of spines on each margin, the strongest anteriorly. Dactylos more than  $\frac{1}{2}$  propod length, stout, slightly curved, single seta on inner margin. *Fourth*: Sideplate spined ventrally and posteriorly. Basos width  $\frac{2}{3}$  length, anterior margin and surface have strong spines, posterior many short stout ones. Ischium subsquare, anterodistal angle spined. Merus  $\frac{2}{3}$  basos length, width  $\frac{1}{2}$  length, a few spines posteriorly and on distal angle, anterior margin and surface have numerous strong spines. Carpus linear, slightly longer than merus, margins have several groups of spines, strongest spines anteriorly. Propod as long, margins almost serrate with groups of short to very long spines. Dactylos as in Pr. 3. *Fifth*: Basos slightly wider than long, extends down posteriorly to overlap most of merus margin; anterior margin and surface have numerous short stout spines; posterior has fewer but stronger spines than in Pr. 4; margins convex, especially posterior. Ischium small, wider than long, strongly spined anteriorly. Merus stout, subtriangular, widening to  $\frac{2}{3}$  length, margins spined and irregular. Carpus as long as basos, both anterior margins have a few spines, posteriorly expanded to tremendous oval cup, between 2 and 3 times as wide across as carpus anterior margins are long and not quite twice greatest length of cup; posterior margin of cup has numerous small spines. Cups form compact sphere when both peraeopods opposed. Propod and dactylos as in Pr. 4.

**EPIMERAL PLATES** *First*: Anterior margin has about 5 strong spines, posterior 3, angle not strongly defined. *Second*: Subrectangular, anterodistal angle rounded, one spine set back a little from anterior margin; posterodistal angle right-angled, posterior margin straight, has about 6 stout spines. *Third*: Posterior margin has about 5 spines.

**PLEOPODS** Ram1 as long as peduncles, non-segmented, but have paired marginal plumose setae. Peduncle outer margin and outer  $\frac{1}{2}$  of surface have numerous spines: 1st pleopod inner margin has 2 proximal and 3 distal spines, 2nd pair have 3 distal spines; 3rd have row of spines on inner surface.



TEXT-FIG 8—*Talorchestia telluris* (Bate) 95—Gnathopod 1, female. 96—Gnathopod 2, female. 97—Pereopod 3, male. 98—Pereopod 4, male 99—Pereopod 5, male. 100—Pereopod 5, female. 101—Epimeral plate 1, female. 102—Epimeral plates 1-3, male. 103—Pleopod 1, male. 104—Pleopod 2, male. 105—Uropod 1. 106—Uropod 2 107—Uropod 3.

**UROPODS** *First*: Rami as long as peduncle, peduncle central margin has 3 spines proximally, both dorsal margins have several strong spines. Inner ramus has 2 marginal rows of about 4 and 6 spines dorsally, about 4 spines at end; outer ramus has about 4 dorsal and 4 end spines. *Second*: Rami as long as peduncle, peduncle has two dorsal rows of several spines, a few slender surface spines. Outer ramus has 3 dorsal spines and 4 end spines; inner has 2 dorsal rows of about 3 and 7 spines, 4 end spines, 2 spines proximally on ventral margin. *Third*: Peduncle as long as ramus, about 7 spines distally, ramus long and cylindrical, end and distal  $\frac{1}{2}$  of dorsal margin strongly spined. *Telson*: Distally rounded and emarginate, surface and distal margin strongly spined.

#### DESCRIPTION OF FEMALE

Length, 9 mm, depth, 2 $\frac{3}{4}$  mm, width, 2 mm. Broodpouch has 8 ova.

**ANTENNAE** *First*: Length about 1 mm, just reaching past 4th peduncle segment of antenna. 2. Flagellum of 9 segments, 1st twice length of 2nd and 3rd. Peduncle, distal margins of 1st and 2nd segments spined, a few spines on surface of 2nd, 3rd spined superiorly and distally, a few spines on inferior margin distally. *Second*: Flagellum of 14 segments. Peduncle 5th segment spined marginally and distally. Length, 3 mm.

**GNATHOPODS** *First*: Ischium subrectangular, a few spines on posterior margin and surface. Merus slightly more than  $\frac{1}{2}$  basos length, carpus width nearly  $\frac{1}{2}$  length, nearly as long as basos, margins and surface spined, spines long and stout posteriorly. Propod narrower, as long as merus, narrowing distally to long curved dactylos, margins and surface spined, long curved spine below dactylos at least  $\frac{1}{2}$  dactylos length, dactylos  $\frac{2}{3}$  propod length. *Second*: Basos width  $\frac{1}{2}$  length, anterior margin spined, row of spines along posterior surface just inside margin. Broodplate large, ovate, width slightly more than  $\frac{1}{2}$  length, has long marginal setae, reaches almost to ischium. Ischium has a few spines posteriorly, 1 anteriorly; merus subrectangular, spines on margins and surface, anterior margin contiguous with proximal  $\frac{1}{2}$  of carpus posterior margin; as long as ischium,  $\frac{1}{4}$  basos length. Carpus  $\frac{1}{2}$  basos length, subtriangular, a few spines on anterior margin, posterior expanded to narrow pellucid flange with barely scabrous margin, about 3 spines along flange base. Propod slightly shorter than carpus, posteriorly produced somewhat past dactylos in scabrous pellucid lobe, double row of small spines down surface medially to short oblique palm. Palm minutely denticulate, has a few short spines; stout short dactylos is aquiline-tipped.

**PERAEPODS** *Fifth*: Basos as wide as long; merus width  $\frac{1}{2}$  length, length  $\frac{3}{4}$  basos; anterior margin more strongly spined than posterior. Carpus nearly as long as basos, narrower than merus, similarly spined, linear. Propod even narrower, as long as basos, long strong spines on margins. Long slightly curved dactylos more than  $\frac{1}{2}$  propod length.

**UROPODS** *First*: Peduncle ventral margin has 2 spines. *Second*: Inner ramus has only 1 ventral spine; outer has 2 spines dorsally. *Third*: Peduncle has 4 or 5 stout spines.

**EPIMERAL PLATES** *First*: Anterior margin has only 3 spines, posterior 4.

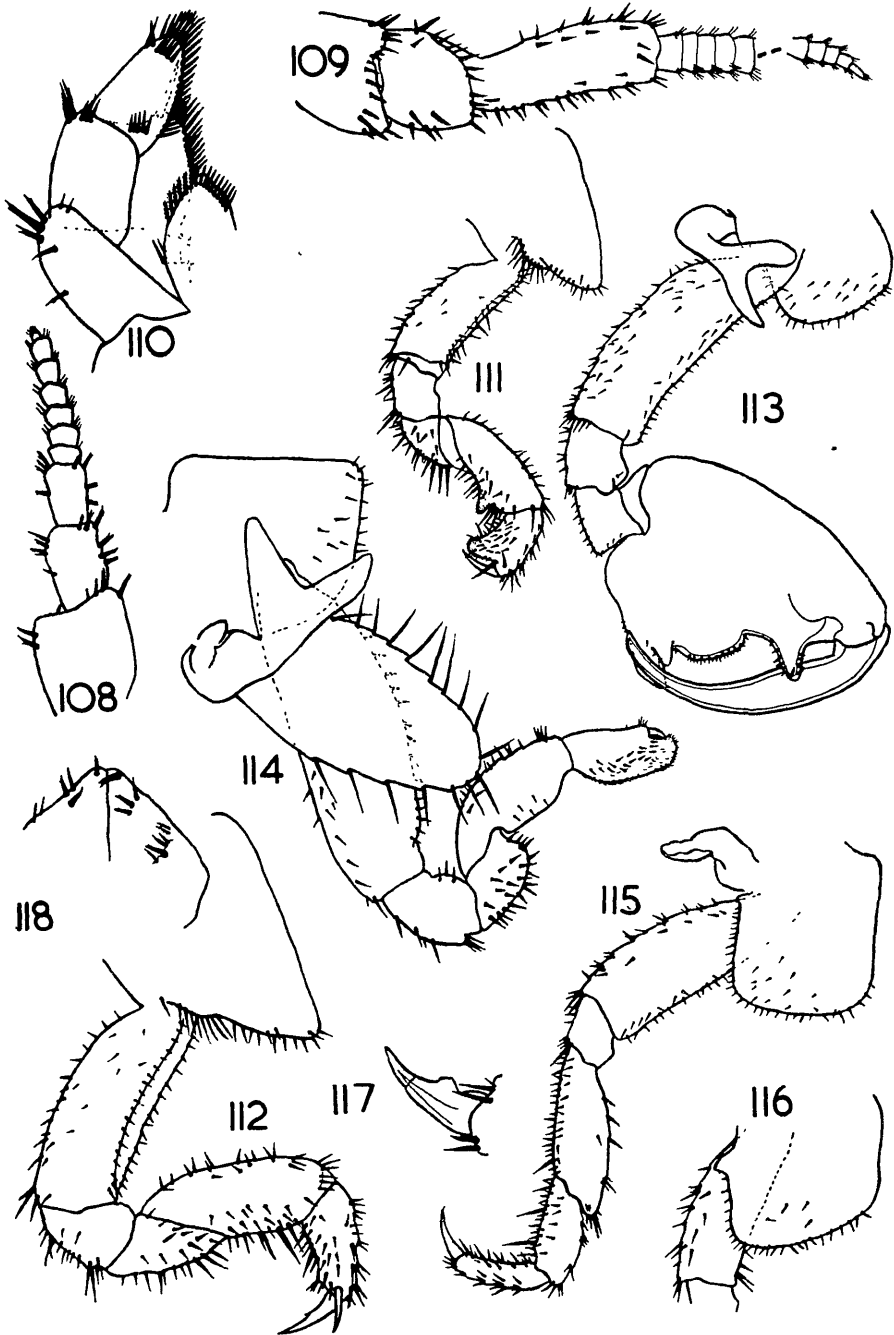
**LOCALITIES**. Waiwera, Auckland (Chilton); Orouiti Beach, East Cape, 10/1/51, coll. D. E. H.; Kaikorai Stream mouth, stream side of dunes near St Kilda, Dunedin, Oct, 1953, coll. D. E. H.; "under estuarine conditions throughout New Zealand, near creek mouths, inside sand spits enclosing estuaries, and around temporary lagoons, enclosed or partly enclosed by sand dunes," McIntyre (unpublished MSS.).

**HYPOTYPES**. Slides 98, male; 99, female, Orouiti, personal collection.

**REMARKS**. The specimens here described were collected at Orouiti Beach, East Cape, North Island. They occurred in considerable numbers, burrowing in fine yellow sand around a stagnant pool well above high-tide mark. They were very active, many of them jumping into the pool when disturbed and swimming quite vigorously until they reached the shore. In contrast to *Talorchestia quoyana* which was found under high-tide seaweed nearby, the *T. telluris* were well away from seaweed.

The Kaikorai specimens were on the freshwater side of dunes fringing the entrance of a stream into the sea. This was the only place on the beach where I was able to find *T. telluris*. However, *T. quoyana* was present on the oceanic side of the dunes and right along the beach.

The expansion of the 5th peraeopod carpus, an extremely striking specific characteristic of the adult male seems to be an adaptation facilitating burrowing. Reid (1938) described the burrowing of *T. deshayesi*, briefly, as follows. The first gnathopods dig out the sand which accumulates beneath the head. The first peraeopods sweep it below the urosome, the 2nd and 3rd peraeopods brace the animal in its



TEXT-FIG 9—*Talorchestia chathamensis* n sp 108—Antenna 1, male 109—Antenna 2, male. 110—Maxilliped palp and plate 111—Gnathopod 1, male 112—Gnathopod 1, female 113—Gnathopod 2, male. 114—Gnathopod 2, female 115—Peraeopod 1, male 116—Peraeopod 2, male. 117—Peraeopod 2, male, dactylos. 118—Telson.

burrow, and the 4th and 5th push the animal forward. Finally, the urosome flicks the sand to the rear of the animal.

The expansion of the carpus in *T. telluris* is so constructed that when the pereopods are opposed, the cups form a sphere. In all of the specimens preserved from Orouiti, the cups are full of fine sand particles and have an abraded inner surface as would be expected if they were continually used for carrying sand. Possibly they are used in removing sand which has been placed under the urosome by the anterior limbs. Unfortunately, there was no opportunity at the time of collecting to observe the burrowing habits in life.

Other distinctive characteristics of *T. telluris* are the shape and spination of the pleopods; the fewer uropod spines and fewer spines on the anterior margins of the epimeral plates compared with other species of the genus; and the shape of the male second gnathopod.

### *Talorchestia chathamensis* n. sp. (Figs. 108–131.)

*Talorchestia telluris*, Chilton, 1917: 299–302 (partim), Figs. 17–18, non Bate.

#### DESCRIPTION OF MALE

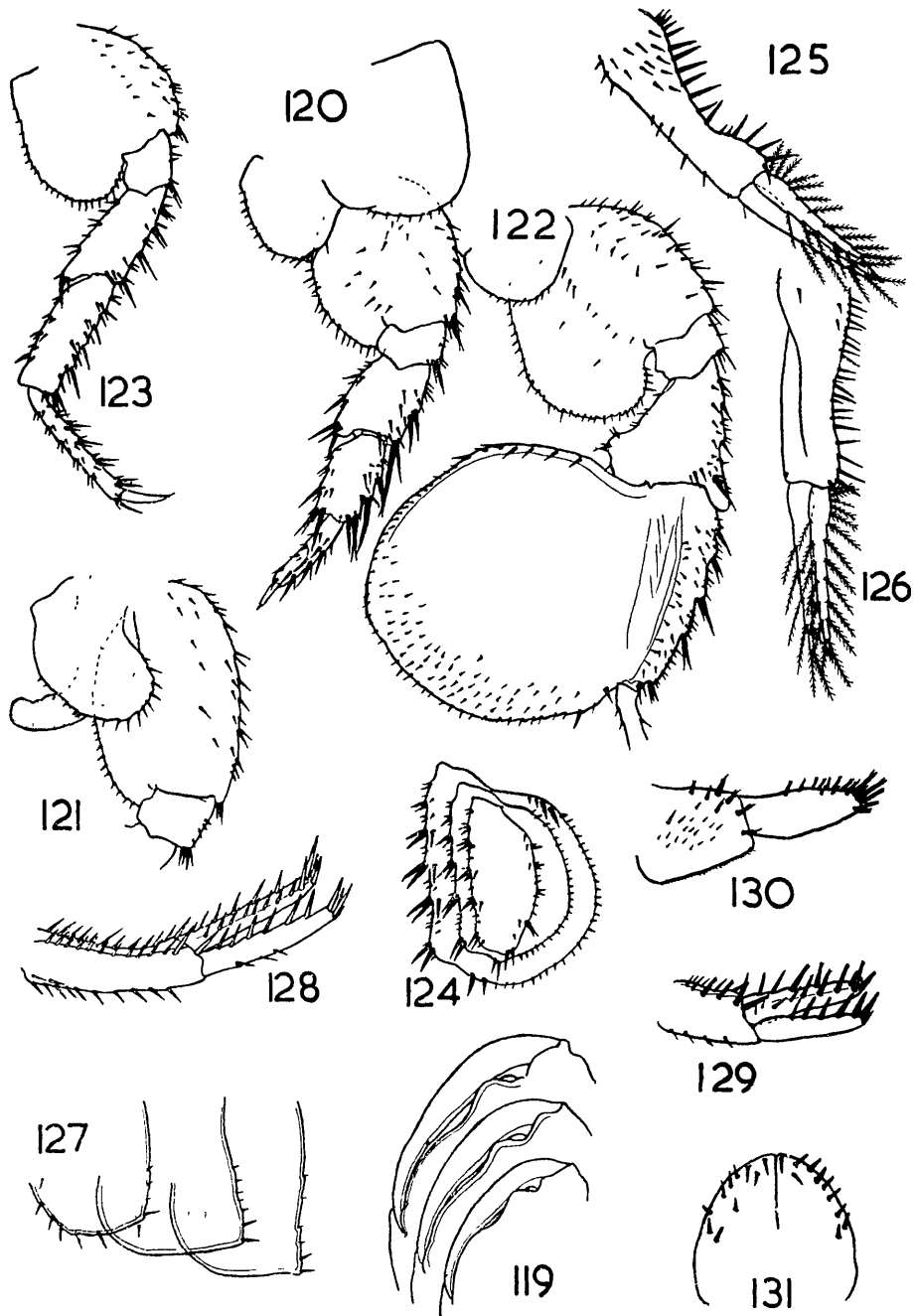
Length, 16 mm; depth,  $3\frac{1}{2}$  mm, width, 3 mm. Colour in spirit, white. Eyes round, black, apart,  $\frac{1}{2}$  length of head. Like *T. telluris* but distinguished as follows:

**ANTENNAE** *First*: Length  $1\frac{1}{2}$  mm, reaching past 4th peduncle segment of antennae 2, flagellum of 7 segments, segments wider than long, distal angles have groups of 2 or more short spines. Peduncle 2nd segment slightly longer than 3rd, slightly more than  $\frac{1}{2}$  length 1st, groups of seta-tipped spines on distal angles, 2nd and 3rd have 1 spine medially on inferior margin, 2 or more on superior. *Second*: Length  $3\frac{1}{2}$  mm, flagellum of 20 segments; peduncle 3rd segment as long as 4th strong seta-tipped spines distally on margins, 4th spined superiorly also, 5th has strongly spined margins, a few spines distally.

**MOUTHPARTS** *Maxilliped*. Merus has several marginal spines, carpus has long spine on inner distal angle concluding row of smaller spines on inner margin. spine reaches almost to end of propod.

**GNATHOPODS** *First*: Like *T. telluris* but more strongly spined, particularly basos margins and posterior margins of ischium and merus; dactylos reaches end of propod. *Second*: Sideplate deeper than wide, subrectangular, excavate posteriorly and high up, a number of fine spines on ventral surface. Gills slender, terminally Y-shaped. Basos slightly concave, width  $\frac{1}{2}$  length, numerous fine spines on posterior margin and surface; anterior margin and small field alongside have similar spines. Ischium subsquare, slightly narrower than basos, posterior margin and distal angle have fine spines, anterior margins form cup distally to receive propod. Merus as long, slightly narrower, short spines on posterior margin, a few very fine spines on surface; posterodistal angle rounded but sharp; anterior margin contiguous with small cup-shaped carpus on to which expanded ovate propod fits. Propod slightly longer than basos, width about  $\frac{3}{4}$  length, anterior margin convex, posterior not  $\frac{1}{2}$  length anterior, a few minute spines where dactylos impinges; produced distally in large projecting angle which defines palm, a small tooth on inner surface forming fork between which dactylos fits. Outer projection extends slightly past dactylos inner margin but dactylos tip extends over posterior propod margin. A further long narrow marginally-spined tooth extends distally about  $\frac{2}{3}$  along palm from posterior margin, between it and fork the palm is raised in shallow convexity with both margins spined. Dactylos long, curved, slightly thickened near innermost tooth of palm.

**PERAEPODS**. *First*: Sideplate subrectangular, deeper than wide, excavate posteriorly and high up. Basos width  $\frac{1}{2}$  length, many small marginal spines. Ischium has about 3 spines posteriorly; merus has a few on convex posterior margin, anterior has a field of numerous spines. Carpus narrower,  $\frac{3}{4}$  merus length, similarly spined, a few of the anterior spines very long. Propod as long, narrower, strongly spined. Dactylos tapering, more than  $\frac{1}{2}$  propod length. *Second*: Sideplate deeper than wide, trapezoid; segments shorter and broader than in Pr. 1; dactylos has spur on inner margin. *Third*: Sideplate anterior lobe spined ventrally, posterior lobe ventrally and posteriorly. Basos ovate, as wide as long, numerous stout spines on margins. Ischium wider than deep, subrectangular, anterior margin and distal angle spined; merus nearly as wide distally as long, posterior margin convex; margins have numerous stout long spines, the largest more than  $\frac{1}{2}$  carpus length. Carpus similarly spined, spines on anterior margin especially strong. Propod as long, not  $\frac{1}{2}$  carpus width, strongly spined. Dactylos  $\frac{1}{2}$  propod length, relatively straight. *Fourth*: Basos has single spines on posterior margin, groups on anterior, some on surface. Ischium anterior margin has a few spines, other segments longer and narrower than in Pr. 3 but similarly spined. *Fifth*: Basos wider than long, widest ventrally where posterior margin forms broadly rounded downward projection past ischium.



TEXT-FIG. 10—*Talorchestia chathamensis* n.sp. 119—Gnathopod 2, immature male, various stages. 120—Peraeopod 3. 121—Peraeopod 4. 122—Peraeopod 5, male. 123—Peraeopod 5, female. 124—Peraeopod 5, immature male, carpus, growth stages 125-126—Pleopod 1 and 3. 127—Epimeral plates 1-3. 128—Uropod 1. 129—Uropod 2. 130—Uropod 3. 131—Telson

posterior margin crenulate, has single spines Ischium subrectangular, anterior margin and distal angle spined. Merus subrectangular, thick, length about  $\frac{3}{4}$  basos, anterodistal angle produced downwards a little as blunt projection Carpus as long as basos is wide; anterior margin and surface have many small spines; posterior margin expanded to large hemispherical plate, width almost twice length of carpus, posterior margin of cup spined all around, largest spines on dorsal rim; many small spines on ventral surface Propod and dactylus long, narrow, as in Pr. 4.

**EPIMERAL PLATES** *First*: Anterior margin rounds to ventral, has about 5 marginal spines; posterior margin straight, has spine on distal angle, about 3 short marginal setae *Second and Third*: Deeper than wide, a few spines on anterior surface, posterior angle sharp, posterior margin straight, has 4 or 5 setae, 1 or 2 distal spines.

**PLEOPODS**. Biramous, peduncle longer than rami, rami unsegmented, with plumose setae. First pleopod, peduncle outer margin concave, with long spines, shorter spines on proximal surface, inner margin has 3 spines proximally, 2 distally. Second has fewer surface spines, none on inner margin; outer margin as before. Third has outer margin spines more numerous, hardly any on surface or on inner margin.

**UROPODS** *First*: Peduncle longer than rami, numerous spines on ventral and both dorsal margins; outer ramus has about 7 strong spines dorsally, 4 on end, about 3 medially on ventral margin; inner ramus has 2 rows of several spines, 3 long and 1 short spine at end *Second*: Peduncle, both dorsal margins have strong spines; ventral margin about 4 fine spines; inner ramus has 2 dorsal rows of spines; outer has 1 row. *Third*: Peduncle narrowing a little posteriorly, about 7 spines on dorsal and distal margins, numerous small spines on surface; ventral margin is strongly setose Ramus long and narrow, distal  $\frac{1}{2}$  of dorsal and end margins strongly spined. *Telson*: Subtriangular to ovate, distally emarginate, spined marginally, 2 small plumose setae medially on margin, these last normally difficult to see.

#### DESCRIPTION OF FEMALE

Length, 14 mm; depth, 3 mm; width, 3 mm. Length of 1st antennae,  $1\frac{1}{4}$  mm; second antennae,  $3\frac{3}{4}$  mm.

**GNATHOPODS**. *First*: As in female *T. telluris* but slightly more spinous *Second*: Sideplate anterodistal angle almost right-angled, gills terminally Y-shaped; somewhat more spinous than in *T. telluris*, otherwise similar

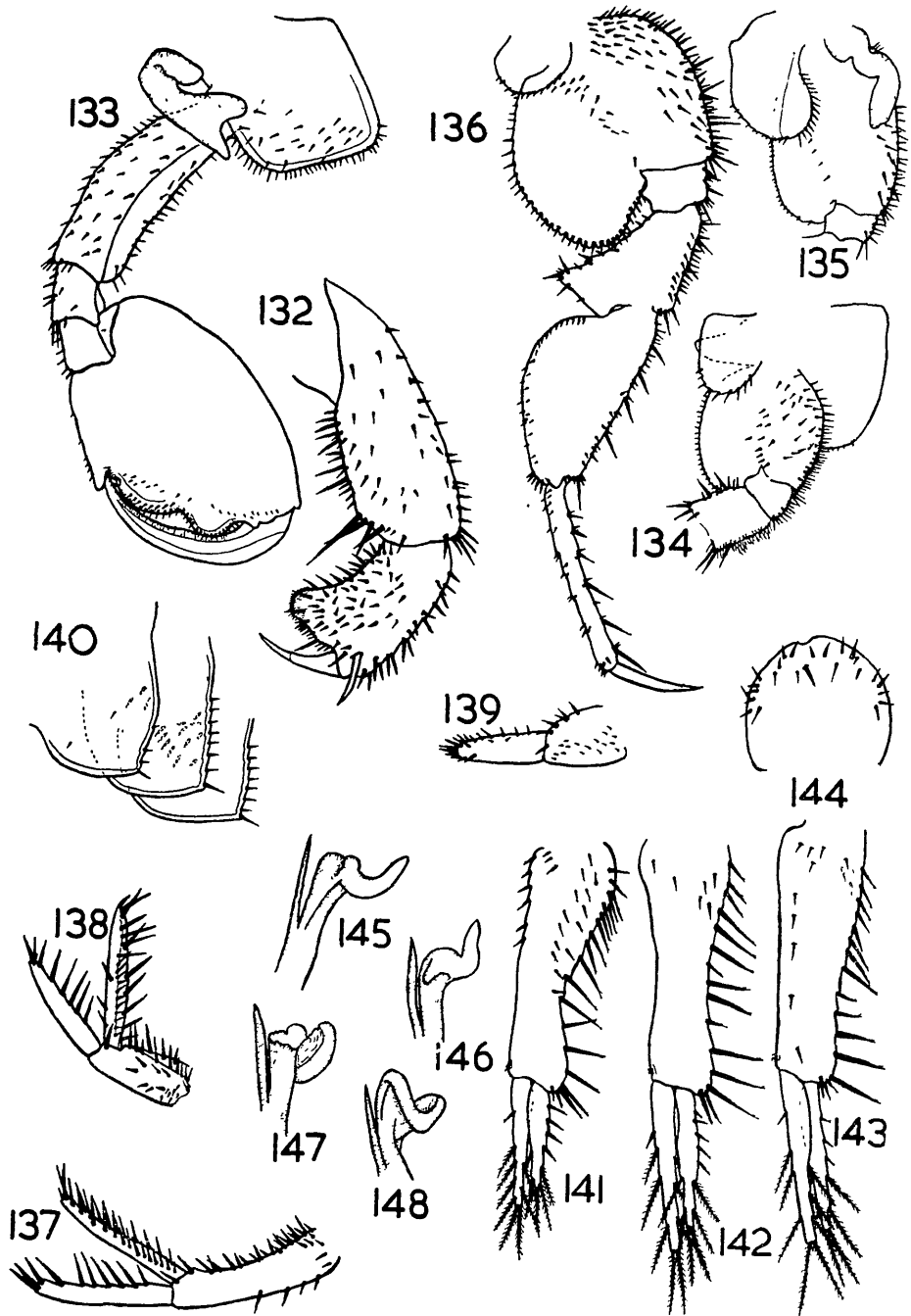
**LOCALITIES**. Chatham Islands, coll. H. F. Skey, April, 1908 (Chilton Collection), "burrows in supralittoral sand, . . . an oceanic sandhopper", McIntyre (unpublished MSS.).

**TYPES**. Slides C 11 (male); C.14 (female).

**REMARKS**. Chilton (1917) placed these Chatham Islands specimens in *Talorchestia telluris*, suggesting that they were only a variant form of *T. telluris* connected to the typical form by intermediate specimens from Waiwera. A comparison of specimens of the "first", or typical, form of *T. telluris* with the Chatham form reveals differences much more extensive than Chilton noted. In both forms, in animals of the same size but not necessarily the same age, the carpus of the fifth peraeopod is greatly expanded, but the distinctive forms of the male second gnathopods are well developed. This suggests that differences in gnathopod shape are not due to different stages of maturity within a single species, although the adult second gnathopods of *T. telluris* males are not markedly different from the juvenile second gnathopods of *T. chathamensis* males. There are, however, other differences also.

The general facies of *T. chathamensis* is much more spinous than *T. telluris*; the maxilliped carpus has a very obvious long end spine; the gills are much more slender and graceful than in *T. telluris*; peraeopod 1 sideplate is deeper and more rectangular; peraeopod 3 is comparatively shorter, broader and more spinous; the basos posterior margin of peraeopod 5 is more spinous and crenulate; the merus anterodistal angle is produced downwards like a thumb overlapping the carpus anterior margin; the carpus expansion has stronger spines on the upper margin, and the posterior margin and surface have many more very small spines; the pleopods have fewer superficial rami segments and plumose setae; the 1st uropod has spines right along the peduncle ventral margin and 3 on the outer ramus ventral margin; the 2nd uropod has 4 spines on the peduncle ventral margin and the 3rd has a setose ventral peduncle margin.





TEXT-FIG. 11 —*Talorchestia spadix* n. sp. Male. 132—Gnathopod 1. 133—Gnathopod 2. 134—Pereopod 3. 135—Pereopod 4. 136—Pereopod 5. 137—Uropod 1. 138—Uropod 2. 139—Uropod 3. 140—Epimeral plates. 141-143—Pleopods 1-3. 144—Telson. 145-148—Lily-shaped spines.

**Talorchestia spadix** n sp (Figs 132–148.)*Talorchestia telluris*, Chilton, 1917: 301–302 (partim), non Bate

## DESCRIPTION OF MALE

Length, 12 mm; width, 3 mm; depth, 4 mm. Eyes and colour as before; distinguished from *T. chathamensis* and *T. telluris* as follows:

**ANTENNAE** *First*: Length,  $1\frac{3}{4}$  mm. Flagellum of 8 segments, peduncle segments more spinous than in *T. chathamensis*; peduncle longer than flagellum, 1st segment as long as 2nd, 3rd slightly shorter. *Second*: Length, 7 mm. Spines on peduncle as in *T. chathamensis* but more numerous. Flagellum of 25 segments; 4th peduncle segment  $\frac{2}{3}$  length 5th, 3rd  $\frac{1}{2}$  length 5th

**MOUTHPARTS.** *Maxilliped*: Carpus posterior distal angle has up to 3 long spines.

**GNATHOPODS** *First*: Carpus posterior margin slightly convex, well-spined, not produced in scabrous pellucid lobe. *Second*: Sideplate barely excavate posteriorly. Gills coarsely Y-shaped. Propod ovate, greatly expanded, anterior margin between 2 and 3 times length of relatively straight posterior margin which has a few minute spines and is produced slightly to small blunt tooth with spines on inner margin. Palm oblique, sinuous, has strong row of short spines on each side, is produced in blunt tooth near inner dactylos base, remaining  $\frac{2}{3}$  of palm convex; row of minute spines across propod above palm. Dactylos stout, row of minute spines on surface, fits into small pocket at end formed by small granulated boss against which dactylos tip rests.

**PERAEPODS.** *Third* Sideplate anterior lobe much the larger; posterior has about 9 marginal spines, fewer than *T. chathamensis*. Basos posterior margin has many short stout spines, margin barely crenulate, has half as many spines again as *T. chathamensis*. Anterior margins of basos, ischium and merus have many fine peculiar lily-shaped spines, apparently sensory. These spines are distally broadened like the spadix of a lily, with spear-like process splitting off below head, but head assuming different shapes depending on aspect of spine. *Fourth*: Basos slightly wider distally than proximally, anterior margin has lily-shaped spines, these being also present on anterior margin of ischium, a few on carpus. Spines on basos posterior margin short, strong, regular, more than in *T. chathamensis* (about 36 against 24). Spines on sideplate margin also more numerous (about 26 against 17). *Fifth*: Basos posterior surface greatly expanded convexly; convex anterior margin strongly armed with lily-shaped spines, some normal and stronger bifurcate-tipped spines. Anterior and median surface areas spined; posterior margin has strong regular spines (more than 30) set back somewhat from strongly crenulate margin. Ischium and merus strongly spined anteriorly, lacking lily spines. Merus nearly  $\frac{1}{2}$  basos length, slightly wider than long; posterior margin V-shaped, almost right-angled, and strongly spined, proximal portion twice distal portion in width and as long as anterior margin. Anterodistal angle not produced downwards over carpus in thumb. Carpus expanded, as long as basos, straight, with about 5 long spines and numerous short, stout ones; posterior margin strongly convex; width slightly more than  $\frac{1}{2}$  length, stout spines marginally. Propod as long as carpus, slender and linear, strong spines anteriorly, small spines posteriorly. Dactylos slender, slightly curved,  $\frac{1}{2}$  propod length.

**EPIMERAL PLATES.** *First*: Ventral margin broadly convex, without spines, posterior slightly convex with about 4 spines. *Second and Third*: Anterior margin broadly rounding to ventral, naked; posterior angle almost right-angled; posterior margin slightly sinuous, has about 8 spines, the longest distally, up to 12 spines on anterior surface.

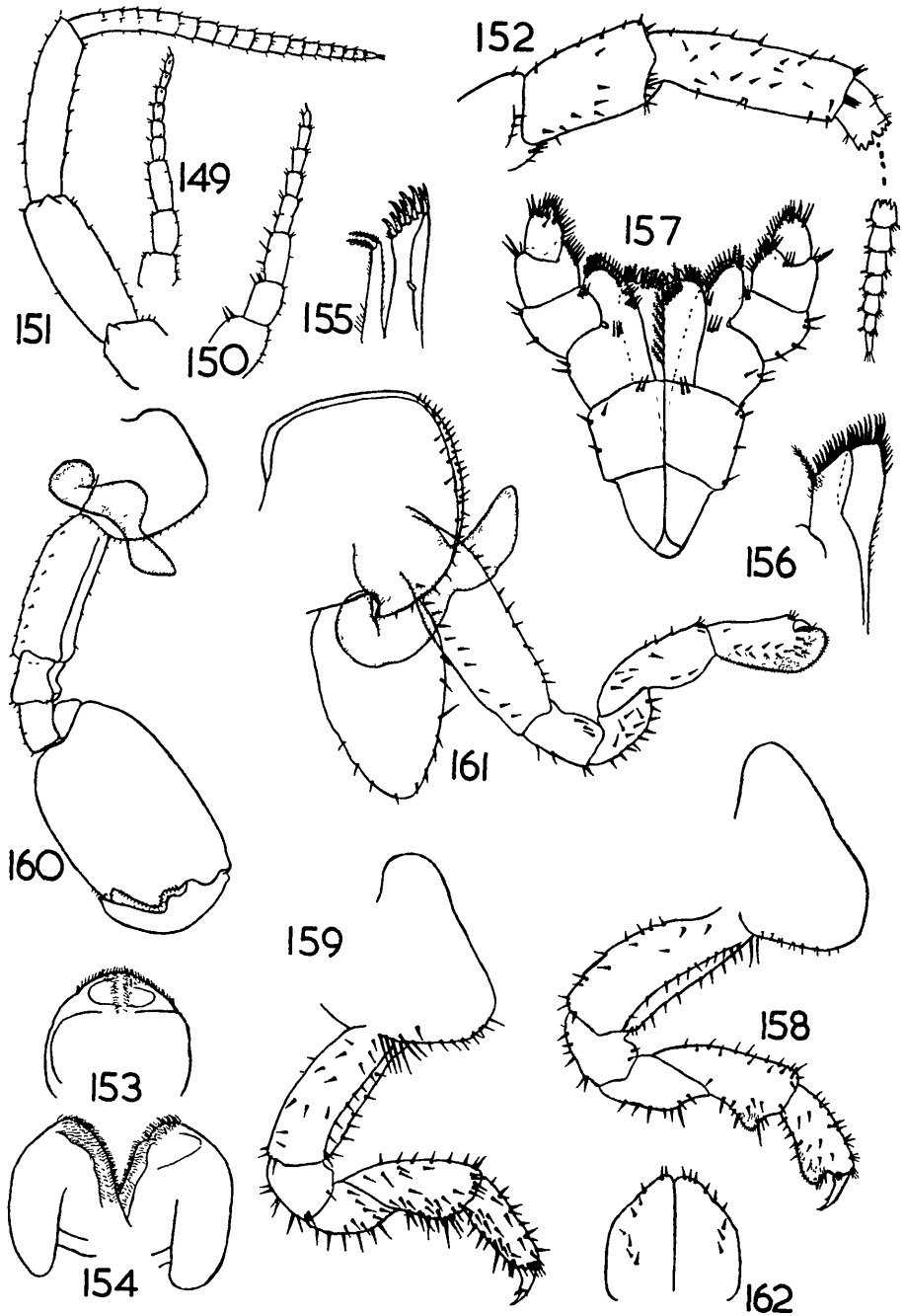
**PLEOPODS** Rami about  $\frac{1}{2}$  peduncle length, only superficially segmented; inner ramus the longer, small spine on surface near base, about 4 pairs of plumose setae, a single spine proximally on inner margin, outer ramus has about 3 pairs of plumose setae, 3 to 5 spines proximally on outer margin; peduncle outer margin concave, has long single spines; a few spines on surface proximally, 1st pleopod has about 6 spines proximally on inner margin; 3rd has row of about 5 down inner surface.

**UROPODS.** *First*: Peduncle dorsal margin strongly spined, a few spines on proximal surface, 4 on proximal  $\frac{1}{2}$  of ventral margin. Inner ramus has 2 dorsal rows of long spines, outer has single row of about 7 long dorsal spines, about 4 end spines. *Second*: Rami longer than peduncle, peduncle strongly spined dorsally and on surface. Inner ramus has 2 dorsal rows of numerous spines, ventral margin has 3 strong spines proximally; outer ramus has about 8 long and 1 short spine marginally and at end. *Third*: Peduncle slightly wider than ramus, about 7 long spines distally on margin, numerous fine spines medially on surface; about 18 spines on ramus dorsal margin and in strong terminal cluster. *Telson*: Ovate, distally emarginate, surface strongly spined

## DESCRIPTION OF FEMALE

In spirit yellow. Length, about 14 mm, width, 3 mm; depth,  $3\frac{3}{4}$  mm.

**ANTENNAE** *First*: Length,  $1\frac{1}{2}$  mm; flagellum of 6 segments, reaching slightly past 4th peduncle segment of antenna 2. *Second*: Length,  $3\frac{1}{4}$  mm; flagellum of 21 segments



TEXT-FIG. 12 —*Talorchestia dentata* (Filhol). 149—Antenna 1, male 150—Antenna 1, female. 151—Antenna 2, male 152—Antenna 2, female 153—Upper lip 154—Lower lip 155—Maxilla 1 156—Maxilla 2. 157—Maxilliped. 158—Gnathopod 1, male 159—Gnathopod 1, female. 160—Gnathopod 2, male 161—Gnathopod 2, female 162—Telson

PERAEOPODS. All less spinous and without sign of lily-shaped spines as in male. *Fifth*: Like Pr. 5 in *T. chathamensis*, female.

LOCALITIES. Kaiapoi Beach, near mouth of Waimakariri, coll. C. Chilton, 13/4/1903; Ross Beach, Westland (Tray 36, Chilton Collection).

TYPES. Slides C.13 (male); C.15 (female), Chilton Collection.

REMARKS. This species is based on specimens from Ross Beach in Westland and from Kaiapoi Beach, near Christchurch, which Chilton considered intermediate in character between the two forms of *T. telluris* which he described and which I consider separate species. Here again, the apparent similarity of facies proves to be deceptive when the specimens are examined in detail. The carpus of the male first gnathopod characteristically lacks the pellucid process found in *T. telluris* and *T. chathamensis*. This does not appear to change markedly with age, the most mature specimens I have being without the lobe, whilst immature *T. chathamensis* show a well-developed lobe. The male second gnathopod and 5th peraeopod carpus, as figured, appear to be mature forms. The epimeral plates are not spined anteriorly or ventrally, and the pleopods are quite characteristic and constant from both South Island localities. The uropods are distinctive. And on the 3rd to 5th male peraeopods there are peculiar spines of a type which I have not elsewhere encountered in the amphipods. These lily-shaped spines do not appear to be present in the female but are, I believe, of specific value.

*Talorchestia dentata* (Filhol), 1885. (Figs 149–170).

*Orchestia dentata* Filhol, 1885: 462, Pl. 53, Fig. 1

*Orchestia tucurauna*, Chilton 1919: 376–386, Text-figs 1–14 non Muller.

#### DESCRIPTION OF MALE

Differing from *T. cookii* in the following details

ANTENNAE. *First*: Flagellum of 6 segments, 1st 2 or 3 fused. Peduncle segments successively longer and narrower, a few setae marginally and superiorly on flagellum segments. *Second*: Flagellum stout, of about 18 segments, 1st 4 or 5 fused. Peduncle 5th segment slightly longer than 4th, segments successively narrower, small spines on margins.

MOUTHPARTS. *First Maxillae*: Palp minute, of one segment with sharply narrowed tip, a few bristles on margin. *Maxilliped*: Outer plate reaches  $\frac{1}{2}$  along carpus, outer margin has about 6 setulose spines distally, row of plain spines set along and in from inner margin. Basos to merus segments has a few short stout spines on outer margins. Carpus as long as merus, outer distal angle has about 3 spines, inner margin forms slight flange with row of short spines along  $\frac{3}{4}$ . Propod almost globular, row of short strong spines on inner margin; about 6 strong spines on one side  $\frac{3}{4}$  along outer margin, marking off very rudimentary dactylos.

GNATHOPODS. *First*: Sideplate subtriangular. Basos posterior margin convex, short spines on margins and surface. Ischium subsquare, about  $\frac{1}{2}$  basos length. Merus subtriangular, more than  $\frac{1}{2}$  basos length, shorter than carpus. Carpus subtriangular, posterior margin produced distally to small pellucid scabrous process with spines each side of base. Propod subrectangular, widening slightly distally, greatest width about  $\frac{1}{2}$  length anterior margin, as long as merus; margins and surface strongly spined; posterodistal angle produced in scabrous pellucid lobe to transverse palm which has row of 3 or 4 strong spines medially. Long tapering dactylos overlaps palm, inner margin has a short stout spine medially. *Second*: Sideplate shallow, rounding to excavate posterior margin. Basos narrowing sharply proximally, width  $\frac{1}{2}$  length, posterior margin convex. Ischium subsquare, a few small spines distally. Merus slightly smaller, posterior margin spined, anterior margin contiguous with posterior margin of smaller triangular non-spined carpus. Propod greatly expanded, as long as basos plus ischium, width about  $\frac{3}{4}$  length, margins more or less parallel, oblique spinulose palm has large median tooth, large concavity between this tooth and small sharp defining tooth; defining tooth has a few small spines at base and on outer margin. Stout curved dactylos does not narrow greatly, has stout tooth  $\frac{1}{2}$  along inner margin, which fits into small depression between hinge and median tooth of palm; dactylos slightly overlaps palm.

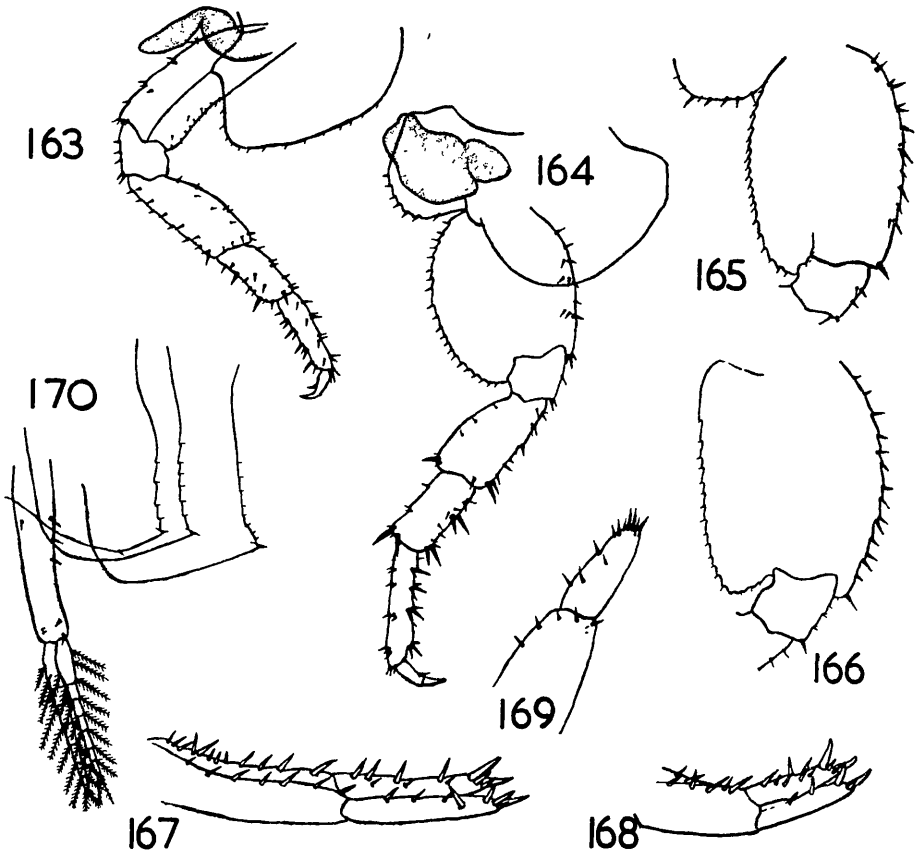
PERAEOPODS. *First*: Sideplate shallow, much wider than deep; anterior margin rounds to spined ventral margin. Basos width  $\frac{1}{2}$  length. Ischium subrectangular,  $\frac{3}{4}$  basos length. Merus proximally narrowing, about  $\frac{3}{4}$  basos length, width not  $\frac{1}{2}$  length, carpus more than  $\frac{1}{2}$  merus length; strong spines on margins especially posterior. Propod longer, narrowing slightly to strong curved tapering dactylos which has strong short spine on inner margin. *Second*: Sideplate less wide, posterodistal angle less sharp, otherwise like Pr. 1. *Third*: Sideplate posterior lobe ventrally spined. Basos almost as wide as long, anterior margin has short, stout spines;

posterior serrate with minute spines, carpus proportionately shorter and wider than in Pr 1; otherwise segments similar but reverted. *Fourth*: Basos oval, width  $\frac{2}{3}$  length, posterior margin serrate with minute spines; posterodistal angle produced  $\frac{1}{2}$  length of ischium as rounded projection. Other segments proportionately longer and narrower than in Pr. 3, otherwise similar. *Fifth*: Basos anterior margin slightly convex, with stout spines, posterior straight, serrate, minutely spined; width about  $\frac{2}{3}$  length, posterodistal angle produced downwards in rounded flange almost to merus. Segments longer than in Pr. 4, otherwise similar.

**EPIMERAL PLATES** *First*: Ventral margin convexly rounded; posterior margin sinuous with about 5 spines, posterodistal angle a little produced. *Second*: Subrectangular, anteroventral angle broadly rounded, posterior margin sinuous, about 7 spines. *Third*: Posterior margin nearly straight; posterodistal angle a little produced, about 9 spines.

**PLEOPODS**. Rami slightly shorter than peduncle. Peduncle outer margin has 2 spines on distal angle (1st pleopod) or several spines marginally and a few on surface (2nd and 3rd pleopods). Rami have 7 or 8 segments, pair of long plumose setae on each segment; inner ramus slightly the longer.

**UROPODS**. *First*: Peduncle slightly longer than rami, both dorsal margins strongly spined, rami have about 4 stout end spines each, inner has 7 dorsally, outer has 4. *Second*: Peduncle longer than rami, both dorsal margins spined; rami each have 2 long and 2 short end spines, outer ramus has 2 dorsal spines, inner has about 5. *Third*: Peduncle longer and wider than ramus, has 5 short single spines dorsally and at end; ramus a little dilated medially, has about 3 spines dorsally, cluster of about 9 on end. *Telson*: Distally emarginate, has 9 or 10 spines on each side.



TEXT-FIG 13—*Talorchestia dentata* (Filhol) Male 163—Peraeopod 1 164—Peraeopod 3  
165—Peraeopod 4 166—Peraeopod 5 167—Uropod 1 168—Uropod 2 169—Uropod 3  
170—Epimeral plates and pleopod

## DESCRIPTION OF FEMALE

ANTENNAE *First*: Flagellum of 6 segments, first 2 fused, slightly longer than peduncle  
*Second*: Flagellum of 17 segments, first 3 or 4 fused; slightly longer than peduncle

GNATHOPODS. *First*: Sideplate has long slender spines below basos insertion. Basos width  $\frac{1}{2}$  length. Merus larger than ischium, posterior surface spined. Carpus anterior margin nearly as long as basos and twice merus length, margins and surface strongly spined. Propod narrower, narrowing distally to stout curved dactylos which has stout short spine on inner margin. Propod  $\frac{1}{2}$  carpus length, margins and surface strongly spined. *Second*: Sideplate subsquare. Gills anchor-shaped, broodplate as long as basos, width more than  $\frac{1}{2}$  length. Basos posterior spine row set a little back from margin. Ischium subrectangular, width  $\frac{1}{2}$  length, as long as basos is wide. Merus subtriangular, convex, posterior and surface spined, posterior margin slightly longer than ischium; anterior margin contiguous, with proximal  $\frac{1}{2}$  of carpus posterior margin, the rest of which is free and convex. Carpus  $\frac{2}{3}$  basos length. Propod ovate, almost as long as carpus, widening a little distally, row of spines on propod surface to dactylos base. Dactylos has small row of spines on outer hinge, palm small, parallel to main propod axis, scabrous.

LOCALITIES "On the shores of Kapiti Island" (Filhol); "Banks of Waitohi Stream, Picton, at some distance from mouth", coll. Chilton, 11/7/1910; "on rocks at base of waterfall", Kapiti Island, coll. Dr. Cockayne, 1906, Waitohi Stream Estuary, coll. Dr. Redman.

HYPOTYPES Slides A<sub>1</sub>–A<sub>4</sub> (male), Tray 45, Chilton Collection; C.5 (female). Also: C.2, C.3, male, B<sub>1</sub>–B<sub>5</sub>, Tray 54, Chilton Collection (male); C.4, female.

REMARKS. I have identified these specimens with Filhol's *Orchestia dentata*. The hypotypes are those which Chilton (1919) described and figured from Picton and Kapiti as *Orchestia tucurauna* Müller. Additional details are taken from other specimens from the Picton locality.

The original description of *O. tucurauna* (Fritz Müller, 1864) is extremely scant and could equally well include Stebbing's *O. sulensoni* (1899). The latter Chilton considered synonymous with *O. tucurauna* and his own specimens.

Stebbing's *O. sulensoni* differs from Chilton's *O. tucurauna*, here described as *Talorchestia dentata*, in these respects.

1. The number of segments in the first antennae
2. The palm shape in the male 2nd gnathopod and the length-width proportions of the propod.
3. The lack of dorsal spines on the outer ramus of the 1st uropod
4. The fewer spines on the end of the 3rd uropod ramus
5. The number of spines on the end margin of the 3rd uropod peduncle

Chilton disregards the first two of these as being merely growth differences. If they were all, he would probably have been justified. However, taken in conjunction with the last three which are not normally subject to much change with growth and seem very consistent, even specific, characteristics in this group of littoral amphipods, I believe they give good grounds for separation. A complete comparison of the two lots of specimens with particular attention to the maxillipeds, epimeral plates and pleopods would probably clarify the problem.

Müller's description of the male second gnathopod agrees reasonably with Stebbing's. The basos of Müller's female second gnathopod seems a little too dilated to belong to the same species as Chilton's specimens. Shoemaker (1932) suggests that Stebbing's *Talorchestia fritzi* may possibly be identical with Müller's species.

The distinctive features of Chilton's specimens, apart from the male second gnathopods, are the third uropod with its terminal brush of spines, and the shape of the epimeral plates in which the posterodistal angle is produced slightly backwards and armed with strong spine. In most species, the extremity of this angle is free from spines.

In his specific diagnosis, Chilton says "palm nearly transverse in old males, more oblique in younger individuals". In his discussion he states, "in the second (gnatho-

pod of *O. sulensoni*) the palm is more transverse (than in my specimens); both these differences are probably due to the fact that the type-specimen of *O. sulensoni* was hardly as mature as the Picton specimens". The second statement appears the more correct as regards the palm. The first is an accidental transposition.

Stephensen (1935) and Schellenberg (1938) have noted that Chilton's species belongs to *Talorchestia*, a fact which follows from the simple gnathopod of the female.

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