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**Fauna of New Zealand
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Terrestrial Talitridae
(Crustacea: Amphipoda)

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EDITORIAL ACKNOWLEDGMENT

On 28 June 1994 John Longworth retired as General Manager of the (then) Native Plants and Animals Division of Manaaki Whenua - Landcare Research. At his farewell function, guests were treated to a résumé of John's career that left no doubt in one's mind: here is a man who makes things happen. One of those many things was the inception in 1982 and the ongoing support of the *Fauna of New Zealand* series, which John leaves to his successor in robust health. As Chairman of the Fauna Advisory Group, John has shepherded the series through a period of intense change in the structures of New Zealand science. The existence today of more than thirty volumes, with perhaps as many again in preparation, and the regard in which 'The Fauna' is widely held, are fitting tributes to John's clear-sighted leadership. In these few words we express our indebtedness to John.

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Front cover The landhopper depicted is *Kanikania rubroannulata*.

Aro mua Ko te pekepeke-whenua nei a *Kanikania rubroannulata*.

Class / Karaaihe **Crustacea**

Order / Oota **Amphipoda**

Family / Whaamere

Talitridae (terrestrial)

Landhoppers

Amphipods are a very successful group that tend to specialise in eating low-quality food such as algal fronds and plant wastes. Their ability to thrive on such unattractive but vastly abundant material is one reason for their great success.

Most amphipod species are marine. Others are found between the tides, even in those most difficult habitats of all, on rocky and sandy beaches, buffeted by the violent forces of tide and wind in a loose and highly abrasive habitat. A number live in freshwater streams and lakes. Finally, there are a considerable number of semi-terrestrial and terrestrial forms. All the terrestrial amphipods belong to the family Talitridae, which also includes marine and semi-terrestrial species.

The terrestrial talitrids, called landhoppers, are especially interesting in being one of relative few groups of animals that have managed to occupy the land exclusively. They cannot survive in dry habitats, but are restricted to the relatively moist environments of forest and grassland litter, long pasture, and gardens. Though not as terrestrial as insects, they are abundant in the forest leaf litter of those southern lands that once made up the primeval supercontinent known as Gondwana.

Landhoppers occur naturally in New Zealand, Australia, the Pacific Islands, the Subantarctic Islands, Africa, India, Southeast Asia, Indonesia, Japan, and Central America. They are invading many areas where they are not found naturally, including South and North America, western Eurasia, and the United Kingdom.

In appearance they are much like any other amphipod, the sideways-flattened body looking as though it should topple over whenever they walk. They are very similar to

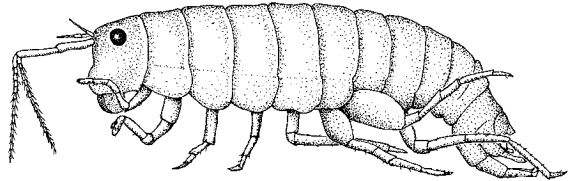


Illustration / Whakaahua: *Makawe hurleyi*.
Illustrator / Kai-whakaahua: Kelvin Duncan.

Kua tupu te ora o nga wae-ahua-rua ('amphipods'). Ko aa raatou kai he rau rimurimu, he rau raakau pirau raanei. Na te kaha ki te kai i nga kai peenei ka tupu te ora.

I roto moana te kaainga o te nuinga o nga wae-ahua-rua. E kitea ana eetahi i roto i te onepuu, kei runga raanei i nga toka i tahatai, ahakoa te akinga mai e te tai me te puua-whenga mai e te hau. E noho ana eetahi i roto i nga wai, i nga roto. E noho ana eetahi i runga i te whenua. Ko te whaamere 'Talitridae' nga mea e noho ana i runga i te whenua. Kei roto hoki i taua whaamere eetahi e noho ana i roto i te moana.

Ko nga mea e noho ana i runga i te whenua anake e kiia ana ko pekepeke-whenua. E kore raatou e taeca te noho ki nga waahi maroke, engari nga waahi maakuukuu o te ngahere, o te maania, o nga taiapa, o nga kaari. He maha raatou i roto i nga raapihi rau raakau i roto i te ngahere o nga whenua ki te tonga, araa, nga whenua moorehu o te tuawhenua nui o mua e kiia ana ko 'Gondwana.'

He tangata whenua nga pekepeke-whenua ki Niu-Tiireni, ki Aahitereiria, ki nga moutere o te moana nui a Kiwa, ki nga moutere o te tai-tonga, ki Awherika, ki Inia, ki Aatia whaka-te-tonga-raawhiti, ki Tiapani, ki Amerika-ki-wanganui. Kua noho manuhiri mai i Amerika ki te Raki, i Amerika ki te tonga, i Ooratia ki te Hauaauru, i Ingarangi hoki.

He rite te aahua o nga pekepeke-whenua ki eetahi wae-ahua-rua. Na te parehe o te tinana ka aahua tatutatu kau te

(continued overleaf)

(ara haere tonu)

their close relatives the sandhoppers and beach fleas, differing in having much less strongly developed bodies and in being smoother, usually smaller, and less spiny.

They eat dead plant material, shredding and chewing it with their specially adapted mouthparts. They may climb up grass stems or even trees in order to reach dead leaves above the ground, and are active at night. The males are usually smaller and more active than the females. Like all arthropods, they grow by a series of moults. The different species are distinguished by their colour pattern.

A sexually mature female breeds once per moult, and carries a brood of 15 or fewer large eggs throughout the intermoult period. She may have seven or more broods in her lifetime, each comprising successively larger number of eggs. The eggs are held by special brood plates under the thorax, where they are regularly tended by the mother. The hatching young look like miniature adults, and may pass through eight or so moults before becoming sexually mature. In New Zealand landhoppers live for about a year.

Twenty-six species in seven genera are recognised from New Zealand. Certain areas, such as Northland, have a more diverse fauna than elsewhere. Often several genera occur together at a single locality, while species within genera do not. Some species are very widespread on both main islands, but others are highly localised and sometimes are restricted to specialised habitats.

Certain distribution patterns may be detected, especially in relation to distance from the sea or from marine influence. Some species are restricted to a narrow zone close to the upper limit of the tide. Others inhabit a zone further away from the sea, while yet others are completely independent of the sea and may be found far inland, and at altitudes from sea level to well above the treeline. One or two species may be restricted to soils of high salinity.

Neither Cook Strait nor Foveaux Strait appear to have been barriers to the dispersal of the species. Barriers, such as they are, appear to be related to temperature and soil salinity, and to more ancient geological structures, rather than to much more recent geomorphological features.

Contributor Kelvin W. Duncan was born in Dunedin and attended Otago University, where he obtained a BSc (Hons). He later gained a PhD from Canterbury University, where he is currently Dean of Science. His research interests centre on the ecological physiology and systematics of invertebrates, but he has published on micro-organisms, fishes, and birds. His current work centres on the utilisation of lignocellulose materials by micro-organisms and invertebrates in order to produce products of value to mankind.

haere. He aahua rite ki te moowhitiwhiti me te ngengeti, engari he toohihi te tinana, he maeneene hoki, kaaore oona taratara.

He raapihi raakau te kai, ka haehaea, ka ngaua ki o raatou waha. Ka piki i nga otaota, i nga raakau hoki kia taaea ai nga rau maroke. E haere ana raatou i nga poo. Ko nga toa e iti iho i nga uwaha, engari, he kaha ki te haere. Ma te whakamaunu kiri ka tupu ai, peenei i nga aitanga ppeepeke katoa. Ka whaitohutia ia whaamere iti ki nga taura kara.

I muri i ia whakamaunutanga kiri, ia whakamaunutanga kiri, ka aitia te uwaha e te toa. Tekau maa rima oona heeki, iti iho raanei. E whitu pea oona hapuutanga, aa, i ia hapuutanga ka nui ake oona heeki. E haria ana, e tiakina ana nga heeki i roto i nga pereti i raro i te uma o te uwaha. Ka pao nga heeki ka kite nga tamariki e peenei an me nga pakeke. E waru pea nga whakamaunutanga o te tamariki, ka pakeke. I Niu Tiireni nei, kotahi tau te pakeke ka mate.

Erua te kau ma ono nga tuumomo ('species') wae-ahuarua. E whitu nga hapuu ('genera') i teenei whenua. He maha nga tuumomo i Te Tai Tokerau me eetahi atu rohe. I eetahi takiwaa e torutoru nga hapuu, aa, kotahi tonu te tuumomo i roto i ia hapuu. Kua horahora eetahi tuumomo ki runga ki Aotearoa me Te Waipounamu. Ko eetahi tuumomo kua whakatiikina te nohoki te waahi kotahi.

Kua kitea eetahi taura nohonoho: ko te tawhiti atu i te moana teetahi. Kua whakatiikina eetahi tuumomo ki nga waahi taipuu. Ko eetahi e noho ana i tahatai. Ko eetahi e noho ana i uta, i te tuawhenua, mai i nga raorao ki nga maunga tiketike i runga ake i nga ngaaherehere. He takitahi nga tuumomo kua whakatiikina ki nga oneone maataitai.

Kaaore i aaraitia nga wae-ahua-rua e te Moana o Raukawa, e te Moana o Rakiura. Heoi anoo nga aarai ko te makariri, ko te maataitai. Ko nga mea hoki i puutake mai i nga okeokenga o te ika i hiia ake ai e Maau i nehe ra teetahi aarai, haaunga nga mahi a Rauimoko i nga waa o muri.

I whaanau a Kelvin W. Duncan i Otepoti. I haere ia ki te whare waananga o Ootaakou, aa, ka whiwhi ki te tohu maatauranga BSc (Hons). I muri mai ka whiwhi ia ki te tohu PhD i te whare waananga o Otautahi. Inaiaianei, ko ia te tumuaki o te waahanga puu-taiao o taua whare waananga. Ka ahu oona whakaaro ki te aahua o nga tinana me nga ara whakapapa o nga kararehe kor-iwi-tuaroa, engari, kua tuhi ia i eetahi pukapuka mo nga manu, me nga ika, me nga ngaarara iti rawa e kore e kitea e te whatu tangata. Kei te rapu maatauranga ia inaiaianei mo nga mahi a eenei ngaarara iti ki nga raakau me nga rau kaakau, aa, mehemea ka puta mai i aua tikanga he ora mo te tangata.

ABSTRACT

Twenty-six species of terrestrial Talitridae (landhoppers) are described and figured from the New Zealand region; all but one are endemic. The species are grouped into seven genera, of which five are new – *Kanikania*, *Makawe*, *Puhuruhuru*, *Tara*, and *Waematau*. There are 12 new species – *Kanikania motuensis*, *Makawe waihekensis*, *M. otamatuakeke*, *Tarataranaki*, *T. hauturu*, *Waematau manawatahi*, *W. reinga*, *W. kaitaia*, *W. unuwahao*, *W. muriwhenua*, *Parorchestia ihurawao*, and *Puhuruhuru aotearoa*. *Parorchestia stewarti longicornis* is raised to specific status as *P. longicornis*. Proposed new combinations are *Kanikania improvisa*, *K. rubroannulata*, *Makawe hurleyi*, *M. insularis*, *M. maynei*, *M. parva*, *Tara simularis*, *T. sinbadensis*, and *Puhuruhuru patersoni*. The previously synonymised species *Orchestia (Parorchestia) sylvicola* (Dana) is resurrected in a new combination as *Tara sylvicola*. One introduced species, *Arcitalitrus sylvaticus*, is described. Notes are given on ecology, biogeography, and collecting techniques.

CHECKLIST OF TAXA

<p>Genus <i>Arcitalitrus</i> Hurley, 1975 11 <i>sylvaticus</i> (Haswell, 1879) 11</p> <p><i>Kanikania</i> new genus 13 <i>improvisa</i> (Chilton, 1909) new combination 13 <i>motuensis</i> new species 17 <i>rubroannulata</i> (Hurley, 1957) new combination 20</p> <p><i>Makawe</i> new genus 22 <i>hurleyi</i> (Duncan, 1968) new combination 22 <i>insularis</i> (Chilton, 1909) new combination 24 <i>maynei</i> (Chilton, 1909) new combination 26 <i>otamatuakeke</i> new species 28 <i>parva</i> (Chilton, 1909) new combination 31 <i>waihekensis</i> new species 33</p> <p>Genus <i>Parorchestia</i> Stebbing, 1899 35 <i>ihurawao</i> new species 36 <i>lesiensis</i> (Hurley, 1957) new combination 39 <i>longicornis</i> (Stephensen, 1938) new status 41 <i>tenuis</i> (Dana, 1852) 43</p> <p><i>Puhuruhuru</i> new genus 45 <i>aotearoa</i> new species 45 <i>patersoni</i> Stephensen, 1938 49</p> <p><i>Tara</i> new genus 51 <i>hauturu</i> new species 52 <i>simularis</i> (Hurley, 1957) new combination 54 <i>sinbadensis</i> (Hurley, 1957) new combination 56 <i>sylvicola</i> (Dana, 1852) resurrected species, new combination 58 <i>taranaki</i> new species 63</p>	<p><i>Waematau</i> new genus 66 <i>kaitaia</i> new species 66 <i>manawatahi</i> new species 69 <i>muriwhenua</i> new species 72 <i>reinga</i> new species 75 <i>unuwahao</i> new species 77</p>
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Transactions of the Royal Society of New Zealand 85(1). Any systematist is deeply indebted to the numerous collectors who methodically preserve and label their collections of what most of them regarded as 'entomological weeds'.

INTRODUCTION

The terrestrial Talitridae ('talitrids' or 'landhoppers') are members of the cryptozoa (nocturnally active, terrestrial invertebrates) of grasslands, scrubland, and forests in New Zealand and other remnants of Gondwana with the exception of South America. However, they are invading other places, including South America, Europe, and North America, and there is one introduced species in New Zealand.

Within New Zealand their distribution is interesting in that genera are usually sympatric whereas species within genera are allopatric. Furthermore, most species show a very limited latitudinal range spanning only a few degrees.

Amplexis, the carrying of the female by the male during copulation, which is such a notable feature of talitrids, is not seen in most New Zealand species. Instead the female lies prone during copulation, and the male mounts her (or males, since multiple copulation has been observed). The eggs are relatively large, and there are only a small number per brood. The mother broods the clutch under her thorax; the eggs are held in this marsupium by broodplates. In this position the eggs are immersed in the fluid that surrounds the external gills. While brooding, the mother exhibits maternal care: she turns the eggs in the brood, and rejects any that are unfertilised or addled.

Hatchlings closely resemble the adults except for their lack of secondary sexual characteristics and their simpler spination. Development is direct. During juvenile and adult life individuals undergo a number of ecdyses, increasing their body size and the complexity of their spination with each moult. Breeding in New Zealand conditions seems to cease in winter, and occurs continuously throughout the rest of the year. In some species, however, there are breeding peaks in early spring and late summer.

Landhoppers live in litter, under logs and rocks, in unlined burrows in the soil that they construct themselves, or in the burrows of other species. They feed on dead plant material at night, especially when conditions are warm and humid, and they may climb tree trunks or grass stems to reach the canopy in order to browse. They are so abundant in forests that they are probably one of the major agents for the comminution of dead plant material. Other than this, they have no economic importance. They seem to thrive in cooler climates, though most species have a relatively

narrow latitudinal range. Their lifespan seems to be annual. They live in all kinds of native terrestrial plant communities, but some species are restricted to soils of high conductivity, such as occur under coastal pohutukawa (*Metrosideros excelsa*) forest. Some species occur in rough pasture and waste grassland, while others have successfully invaded exotic pine plantations, although in much lower numbers than in native forests.

METHODS AND CONVENTIONS

Talitrids can be collected using coarse-meshed sieves, pitfall traps, flotation, flooding, entomological aspirators, or Tulgren funnels. Irritants such as weak alcohol, carbon dioxide, or commercial fly sprays can be used to extract them from the soil or litter. Storage is best in 70% ethanol to which a small quantity of chalk has been added to prevent fatty acid destruction of their calcium-impregnated exoskeleton (many collections have been destroyed by the breakdown of the animals' fat to free fatty acids that, in turn, attacks the calcium in the exoskeleton). Periodic replacement of the alcohol in which the specimens are stored also helps prevent this destruction. Dissection is best under alcohol with the body held in a bed of black sand or pinned on black wax.

Talitrids pose difficulties for the systematist since, unlike insects, there is no single, stable adult stage that can be described relatively easily. Furthermore, small-bodied species can closely resemble the young of large-bodied species, so the differences between species may be relatively slight. Because talitrids have many more appendages than insects, their external morphology is much more complex (Fig. 1), and so taxonomic descriptions are long and very detailed.

For all the descriptions of new taxa in this work the position of a spine or spine group on a segment of an appendage is indicated as a proportion (from the proximal end) of the total length of that segment (Fig. 2). If this proportion refers to a spine group then the number of spines is given in parentheses, the first number referring to large spines and the second to small spines. For example, 0.56 (2+1) indicates that a spine group 56% of the way down the segment comprises two large spines and one small.

The terminology employed generally follows that currently employed in talitrid systematics, with the exception of the term 'scionate' which is used to describe a peculiar bifurcation of certain larger spines (Fig. 3), particularly on the uropods, where at the distal tip a small fork branches off the main stem of the spine. I have not seen this feature on any other than the few New Zealand species that exhibit it.

The contours of segmental structures are sometimes 'stepped' or 'scalloped', or both together (Fig. 4).

The descriptions are traditional in giving details of the shape and spination of all body parts, but the needs of the non-systematist have been borne in mind in that characteristics that enable the species to be identified relatively easily without dissection have been given in a separate section for each species. In particular, body colours and pigmentation patterns allow species to be easily identified. Unfortunately these patterns disappear in storage, so are of little value for traditional systematics, but they enable talitrids to be readily identified while they are alive or freshly dead. Absolute body dimensions are of little use for identification because talitrids grow throughout life.

Caution must be exercised in the use of certain relative characters such as the number of antennal flagellar segments compared with the length of the body, since the ratio in question may differ between individuals and populations. Both in culture and in nature, well fed individuals have a greater growth increment at each moult than poorly fed ones. Because a fixed number of flagellar segments are added at each moult to the antennal flagellum, well fed individuals have a large body with few flagellar segments, whereas poorly fed individuals have a small body with a large number of flagellar segments. Unfortunately, this caution also holds for the easiest characters to assess: the size and shape of the male second gnathopod propod. These characters vary with the age and nutritional history of the individual, so general development trends must be borne in mind when using them as diagnostic clues.

The last major review of the New Zealand Talitridae was that of Hurley (1957), who recognised two terrestrial genera, *Orchestia* and *Talitrus*, in the New Zealand fauna. Hurley considered *Talorchestia* to be a closely related but supralittoral genus. In his classification *Orchestia* had both terrestrial and supralittoral species. This arrangement proved unsatisfactory, as it became evident that Hurley's *Orchestia* was a complex containing a number of separate groups that should all have generic status. In 1982 Bousfield placed the supralittoral members of the *Orchestia* complex into *Transorchestia*. The remainder were left to be sorted out in regional reviews.

The present work attempts to systematise New Zealand's terrestrial members of the *Orchestia* complex as well as review the previously established terrestrial genera. All the described terrestrial species are reviewed, with the exception of *Parorchestia campbelliana*, which Bousfield (1964) thought was a rare terrestrial species occurring on Campbell Island. This species is abundant in the supralittoral of Campbell Island, and belongs in genus *Transorchestia*. Since it is not terrestrial it is not considered here.

KEY TO TERRESTRIAL TALITRIDAE RECORDED FROM NEW ZEALAND

- 01 Gnathopod 1 simple in both sexes; body pigmentation striped. North I. and northern South I.
... (p. 11) .. *Arcitalitrus sylvaticus*
—Gnathopod 1 chelate in one sex or both; body pigmentation striped or reticulate ... 02
- 02(01) Gnathopod 1 simple in female, subchelate in male; body heavily spined ... *Puhuruhuru* .. 07
—Gnathopod 1 chelate in both sexes, body less heavily spined ... 03
- 03(02) Palm on gnathopod 1 oblique and strongly developed; body pigmentation strongly hooped or striped, not reticulate; pleopods short and broad; pleopod 3 may be reduced. Strand species found in high-conductivity soils ... *Kanikania* .. 08
—Palm on male gnathopod 1 transverse; body pattern hooped, striped, or reticulate .. 04
- 04(03) Pleopod peduncles setose; pleopods all present, biramous, although pleopod 3 may be reduced; body pattern not reticulate. Mainly coastal species
... *Makawe* .. 10
—Pleopod peduncles naked or only very finely setose; pleopods delicate, all biramous or pleopod 3 reduced or pleopods 2 and 3 reduced. Mainly inland species ... 05
- 05(04) Uropod 1 outer ramus spined dorsally; inter-ramal spine on uropod 1 absent; pleopods delicate, all present and biramous; broodplates spined only on distal tips ... *Tara* .. 15
—Uropod 1 outer ramus naked dorsally, although terminal spines present; inter-ramal spine present or absent; pleopods broad or delicate; pleopod 3 or pleopods 2 and 3 may be reduced ... 06
- 06(05) Uropod 2 outer ramus spined dorsally. Northland ... *Waematau* .. 19
—Uropod 2 outer ramus naked dorsally, although terminal spines present ... *Parorchestia* .. 23
- 07(02) Antenna 2 short and stumpy, with 16 or fewer flagellar segments in adult; pleopods reduced to small stumps and not biramous; male gnathopod 1 propod enlarged. Subantarctic Is, Stewart I., and coastal forests of south-eastern South I. as far north as Oamaru
... (p. 49) .. *Puhuruhuru patersoni*
—Antenna 2 long and delicate, with more than 16 flagellar segments in adult; pleopods all present and biramous; male gnathopod 1 propod not enlarged, similar to that of female. North I., western and southern regions of South I., and Stewart Island
... (p. 45) .. *Puhuruhuru aotearoa*

- 08(03) Uropod 1 outer ramus naked. Stewart I. and its offshore islands ... (p. 17) .. *Kanikania motuensis*
—Uropod 1 outer ramus spined ... 09
- 09(08) Large-bodied species; all pleopods present. The Snares Is ... (p. 13) .. *Kanikania improvisa*
—Small-bodied species; pleopods 2 and 3 reduced to vestigial stumps. Strand species, northern North I. coast and offshore islands
... (p. 20) .. *Kanikania rubroannulata*
- 10(04) Uropod 1 outer ramus with dorsal spines; gnathopod 2 mitten-shaped in both sexes ... 11
—Uropod 1 outer ramus naked dorsally although terminal spines present; male gnathopod 2 not mitten-shaped ... 12
- 11(10) Uropod 1 outer ramus with more than 3 spines on dorsal margin; pleopod 3 outer ramus margin with some or many spines; gnathopod 1 propod expanded in male. East coast of South I. and Chatham Is
... (p. 22) .. *Makawe hurleyi*
—Uropod 1 outer ramus with 3 or fewer spines on dorsal margin; pleopod 3 very reduced; gnathopod 1 relatively slender in both sexes; antenna 1 not reaching peduncle segment 4 of antenna 2; epimeral plate posterior margin emarginate. Waiheke I.
... (p. 33) .. *Makawe waihekensis*
- 12(10) Uropod 2 outer ramus strongly spined, with more than 2 spines. Auckland I. ... (p. 31) .. *Makawe parva*
—Uropod 2 outer ramus naked or only weakly spined on very old specimens ... 13
- 13(12) Uropod 2 inner ramus with a single row of dorsal spines. Auckland I. and Campbell I.
... (p. 24) .. *Makawe insularis*
—Uropod 2 inner ramus with 2 rows of dorsal spines ... 14
- 14(13) Male gnathopod 2 propod mitten-shaped; telson with terminal spines only. Oamaru district
... (p. 28) .. *Makawe otamatuakeke*
—Male gnathopod 2 propod greatly expanded; telson with marginal spines laterally as well as terminally. Auckland, Adams, and Disappointment islands
... (p. 26) .. *Makawe maynei*
- 15(05) Male gnathopod 2 propod produced, not mitten-shaped ... 16
—Male gnathopod 2 propod mitten-shaped, as in female ... 18
- 16(15) Uropod 1 lightly spined; body smaller. Northland ... (p. 58) .. *Tara sylvicola*
—Uropod 1 heavily spined; body large ... 17
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DESCRIPTIONS

Genus *Arcitalitrus* Hurley

Arcitalitrus Hurley, 1975: 161 (as subgenus of *Talitrus*).
Friend, 1987: 35 (as genus). Type species *Talitrus sylvaticus* Haswell, designated by Hurley (1975).

Moderate to large, weakly sexually dimorphic landhoppers with male and female gnathopods similar. Colour in life slate grey. Very active. Antenna 1 reaching at least halfway along last peduncle segment of antenna 2. Antenna 2 only moderately long. Maxilliped outer plate arcuate, with an acute apex bearing a single group of spines. Gnathopod 1 simple in both sexes; segment 6 long, narrowing distally. Gnathopod 2 propod mitten-shaped; apical lobe sharp. Epimeral plate 2 the longest, rounded below; hind corner sharp; hind margin straight. Epimeral plate 3 subsquare, rounded in front, convex below; hind corner sharp. Oostegites short, slender, with a few simple setae distally placed. Anterior and posterior gills much the largest; peraeopod 6 gill anseriform. Pleopods 1 and 2 biramous; pleopod 3 smaller though still biramous, reduced (uniramous), or vestigial. Uropod 1 and 2 outer ramus dorsal margin naked. Uropod 3 small; ramus very short, with apical spines only. Telson entire or only slightly emarginate.

Remarks. Three species are known in this Australian genus: *A. sylvaticus* (Haswell), also introduced into California, Europe, and New Zealand; *A. dorrieni* (Hunt), found also on Norfolk Island and introduced into Great Britain; and *A. bassianus* Friend, restricted to Victoria and Tasmania. The adventive populations were possibly distributed with eucalypts or other Australian plants. The practice of using Wardian cases (nowadays called terraria) last century for the transport of live plants facilitated landhopper dispersion.

Arcitalitrus sylvaticus (Haswell)

Plate 1, Map 1

sylvaticus Haswell, 1879: 246 (*Talitrus*). Stebbing, 1906: 524. Sayce, 1909: 30–32. Chilton, 1916: 83–86. Hale, 1929: 218–219. Stephensen, 1943: 296 (*Talitroides*). Ruffo, 1948: 206–207 (*Talitrus*). Hurley, 1955: 147–155; — 1975: 161 (*Talitrus* subgenus *Arcitalitrus*).

Description. Sexes very similar. Colour in life dark slate to brown, occasionally yellowish fawn. Eyes round, black.

Antenna 1 1.25 mm long, reaching to about halfway

along last peduncle segment of antenna 2. Flagellum as long as peduncle or almost so, with 7 segments each bearing a group of small setae mediolaterally and 2 short spines inferolaterally. Peduncle segments successively narrower and longer, with margins sparsely spined.

Antenna 2 5 mm long. Peduncle segment 3 half length of segment 4, which is half segment 5; segments finely spined and successively narrower. Flagellum longer than peduncle, with up to 33 segments each bearing 4 equidistant spines around end; last segment tufted.

Upper lip finely setose distally. *Lower lip* inner lobes vestigial; inner and end margins of principal lobes strongly setose.

Maxilla 1 inner plate the shorter; palp minute, with only the barest suggestion of a second segment.

Maxilla 2 plates subequal; distal margins setose.

Mandibles. *Left:* cutting edge with 3 plates, the upper with 3 teeth, the lower with 4, the median with 2; spine row comprising 4 setose spines; molar process with a large setulose spine on inner proximal margin. *Right:* incisor 4-cusped; lacinia mobilis distally bifurcate; upper lobe fimbriate, lower lobe with 4 or 5 teeth.

Maxilliped dactyl rudimentary; inner and outer plates well developed, the inner with 3 stout teeth distally, a spine in between teeth, and inner margin bearing 2 pairs of plumose setae; outer plate arcuate, reaching halfway along carpus, distally sickle-shaped and prolonged into a fine tip tufted with setae; outer margin convex, naked; inner margin with 4 sets of 1 or 2 spines; outer surface with a pair of spines at merus level. Carpus as long as propod, merus shorter and wider, with 2 or 3 long spines on outer distal angle of each; groups of fine setae on inner distal angles; inner surface shallowly concave. Dactyl small, dome-like, setose-tipped, ringed by 5 or 6 spines on end of propod.

Gnathopod 1. Sideplate ovate-rectangular, ventrally and posteriorly spined. Basos width one-quarter of length; a few spines anteriorly, and 2 or 3 large, stout spines posteriorly and at distal angle. Ischium subsquare; posterior margin spined. Merus subtriangular, a little longer than ischium, produced into a small, scabrous and pellucid lobe; posterodistal surface with an oblique row of about 6 spines. Propod slightly shorter and narrower than carpus, narrowing further to long, curved dactyl; anterior margin with 3 sets of 2 or 3 spines; posterior and end margins strongly spined. Dactyl half length of propod, with 1 spine on inner margin.

Gnathopod 2. Sideplate subsquare, spined on ventral and excavate posterior surfaces. Basos width one-quarter of length; anterior margin and posterior angle spined. Ischium subrectangular, width half of length, posterodistally spined. Merus subrectangular, as long and wide as

ischium, posterodistally produced into a scabrous pellucid lobe, with 1 or 2 spines on either side. Carpus wider, about twice as long, anteriorly convex, with 1 or 2 spines on distal angle; posterior margin expanded into a scabrous pellucid lobe, with about 5 long spines along base of lobe. Propod longer and narrower; scabrous pellucid posterior margin produced into a distal lobe beyond end of dactyl; 1 or 2 spines on anterior margin, 2 or 3 on anterodistal angle; a double row of spines medially along surface. Dactyl small; palm slightly oblique; a pair of spines at inner base of dactyl and dactyl tip.

Peraeopod 1. Sideplate subrectangular, posteriorly excavate; ventral and posterior margins spined. Basos width about one-third of length; margins spined. Ischium sub-square, posterodistally spined. Merus as wide as ischium, about 3x as long, with a few spines anteriorly and quite strongly spined posteriorly. Carpus about two-thirds of merus length, narrower, similarly spined. Propod longer, narrower, similarly spined. Dactyl short, curved, with a spine on inner margin.

Peraeopod 2. Segments shorter and narrower than in peraeopod 1, otherwise similar.

Peraeopod 3. Anterior lobe of sideplate larger than posterior lobe; ventral and posterior margins with small spines. Basos ovate, narrowing distally; margins spined, with spines on anterior margin the stronger. Other segments stouter than in peraeopod 1. Propod and dactyl longer, with spines stouter.

Peraeopod 4 longer than peraeopod 3. Basos further expanded, and segments relatively longer than in peraeopod 3, otherwise similar.

Peraeopod 5 much the longest. Basos nearly as broad as long; posterior margin finely serrate and minutely spined.

Gills. Gnathopod 1 gill S-shaped. Peraeopod 1 and 2 gills simple, as long as basos. Peraeopod 3 gill S-shaped. Peraeopod 4 gill large, goose-necked, with a cleft tip.

Epimeral plates with small setae on posterior margin. Plate 1 with ventral margin obtuse, hind margin slightly convex. Plates 2 and 3 with posterior margin straight, posterodistal angle right-angled.

Pleopods. Pleopods 1 and 2 biramous; peduncle and rami subequal; outer ramus with 8 distinct segments, inner ramus with 9, each with a pair of long plumose setae; peduncle outer margin with plumose setae, and 2 coupling spines distally. Pleopod 3 uniramous, a vestigial triangular stump.

Uropod 1. Peduncle longer than rami, with 2 or 3 spines dorsally; inter-ramal spine long. Inner ramus with 4 spines dorsally and 1 long, 2 medium, and 2 short terminal spines. Outer ramus with dorsal surface naked, terminating with 2 long and 2 short spines.

Uropod 2. Rami as long as peduncle, with 3 dorsal spines. Inner ramus with 2 dorsal spines and 2 long and 3 short end spines. Outer ramus with dorsal surface naked, terminating with 1 short and 2 long spines.

Uropod 3. Ramus much smaller than 1-spined peduncle, with 1 long and 1 short spine at tip.

Telson longer than broad; posterior and lateral margins spined, slightly emarginate.

Type data. *Hypotypes* (designated by Hurley 1955): Slides 21 (male) and 32 (female), TK, Hurleyville, 28 January 1949, D.E. Hurley, from sawdust under woodheap near hedge of *Aeliagnus japonica*.

Material examined. *Hypotypes*, plus collections bearing the following data.

North Cape area, forest remnant 3 miles SE of Unuwhao, 183 m, 24 Nov 1967, K.A.J. Wise, leaf litter. Omaha State Forest, 10 Oct 1974, J.C. Watt, regeneration after clear-felling near kauri reserve. Kaingaroa area, Pekerau, 1 Jul 1967, K.A.J. Wise, forest remnant, puriri leaf litter, and leaf litter and moss, 91 m. Hikurangi, Waro Reserve, 10 Aug 1966, K.A.J. Wise, beaten from *Freycinetia*. Tangihua, Mt Horokaka, 518 m, 16 Aug 1977, J.S. Dugdale, litter. Ruakaka, Feb 1976, C. Butcher, ex pitfall trap under kikuyu. N of Waiwera, forest remnant, 2 Nov 1966, K.A.J. Wise, lichen and bark on a rotten log. Orewa, 20 Jan 1972, G.W. Ramsay, litter. Wainui, Aropohue Rd, Jan 1968, leaf mould in a small patch of open bush. Whangaparaoa Peninsula, 22 Dec 1981, K.W. Duncan: abundant in burrows and cracks in mudstone, under exotic grass, and under planted manuka, *Coprosma*, and *Pittosporum*; Shakespeare Regional Park, in litter under kanuka shrubs; Arkles Bay, Bruce Scott Reserve, litter under pohutukawa. Auckland, Northcote, Kauri Glen Reserve, 2 Nov 1966, K.A.J. Wise. Auckland, Remuera, 19 Feb 1971. Auckland, Lynfield, Tropicana Drive, 14 Sep 1975, G. Kushel. Waitakere Range, Cascades Kauri Park, 14-17 Oct 1976, J.C. Watt, pit traps. Huia, 24 Jan 1979, A.K. Walker. NW of Taupiri, 5 May 1949, AJH, leaf mould. Hamilton, 22 Rhonda Ave, 27 Dec 1981, K.W. Duncan, under ponga in litter. Mahoenui, 26 Jun 1977: G.W. Ramsay, litter; Gibbons Road, J.C. Murcer, sifted litter. Hutt Valley, Bartons Bush Reserve, 28 Nov 1981, K.W. Duncan, podocarp/hardwood overgrown with *Tradescantia*. Hutt Valley, George Hayward Park, 29 Nov 1981, K.W. Duncan, mature totara / matai bush with severely damaged undergrowth and little regeneration. Petone, park on W side of Hutt Motorway, 29 Nov 1981, K.W. Duncan, cut-over bush of poor quality, ground storey with blackberry and irises. Horokiwi, 13 Nov, RGO & JHMcM, leaf

mould. Wellington: Karori Gardens, 31 May 1948, BMB; 59 Montreal Grove, 29 Nov 1981, K.W. Duncan, long grass.

Nelson City, Monaco, 16 Jan 1986, K.W. Duncan, suburban garden within metres of sea. Greymouth Camping Ground, 17 Feb 1984, K.W. Duncan, seaside forest litter. Christchurch, University of Canterbury, Ilam Campus, 1 Aug 1982, D. Greenwood, grass litter under willows near stream.

ND, AK, WO, WN / NN, WD, MC.

Remarks. In New Zealand *Arcitalitrus sylvaticus* is easily distinguished from other landhopper species by its large size, colour, and frantic hopping when disturbed. It is found mainly in northern urban and disturbed habitats. It is the commonest landhopper in Auckland and Wellington gardens, and has twice invaded the Christchurch urban area in the past 20 years. In one instance the means of dispersal is known – transportation with potted plants. However, the populations died out each time. In Northland it is displacing native landhoppers from disturbed habitats, and in the vicinity of the Hutt Valley and Wellington it is steadily displacing native landhoppers. Thus it is still actively dispersing.

The yellowish-fawn variant is probably a result of a bacterial disease of landhoppers. The species was, possibly, the means by which this disease was introduced into New Zealand, where it has ravaged indigenous species and continues to do so (Duncan 1981).

Kanikania new genus

Type species *Parorchestia improvisa* (Chilton, 1909).

Small, robust, weakly sexually dimorphic landhoppers. Antennae 2 with fine setae. Mature adults of both sexes with strongly developed chelate gnathopod 1, and mitten-shaped gnathopod 2. Pleopods short, broad, sometimes reduced or vestigial. Uropod 1 outer ramus weakly spined or without spines.

Remarks. *Kanikania* is clearly distinguished by the pronounced development of the gnathopod 1 propod and dactyl. The males of some weakly sexually dimorphic species in other genera, such as *Makawe hurleyi*, may resemble it superficially because their male secondary sexual characters resemble female *Kanikania*, but most of these species can be distinguished readily using non-sexual characters.

The members of this genus live in coastal forests, the soils of which may be quite saline. *Kanikania* species have enlarged first gnathopods that seem to be used for digging in the loose, friable, well drained soil typical of their habitat. Unlike most bush hoppers they are able to escape drought by digging downwards to moist soil found well below the surface. They live in unlined burrows or under stones or logs, or they use the burrows of other invertebrates.

The name *Kanikania* is derived from the Maori word 'kanikani', meaning 'to dance'; gender feminine.

Kanikania improvisa (Chilton) new combination

Plates 2 and 3, Map 12

improvisa Chilton, 1909: 641, fig. 10 (*Parorchestia*).
Shoemaker, 1935: 13. Hurley, 1957: 183–185 (*Orchestia*).

Diagnosis. A small to medium-sized, weakly sexually dimorphic *Kanikania* with large eyes, long, slender antennae 2, normal body shape, and striped body pigmentation pattern (in alcohol). Gnathopod 1 well developed, strongly subchelate. Gnathopod 2 feebly developed, weakly chelate and mitten-shaped in both sexes. Peraeopods stout. Pleopods somewhat reduced, but all present, with 4 coupling spines. Uropod 1 and 2 outer and inner rami spined.

Chilton's holotype slide material (Chilton labelled two specimens as holotype – one as a series of slides labelled A1 to A6, and the other a whole specimen. It seems best to treat the dissected specimen as the holotype, since it most closely resembles the published description. Both specimens are in the Canterbury Museum.)

Body dimensions not given. Antenna 1 3 mm long; flagellum shorter than peduncle, of 7 segments. Antenna 2 10 mm long; flagellum long, of 41 segments, spined as in male; peduncle segment 4 0.6x as long as segment 5; segment 3 half as long as segment 4. Uropod 1 outer ramus with 2 spines. Otherwise as for paratype male described below.

Allotype female (The undissected specimen also labelled as holotype by Chilton, but treated as allotype here.) Length 11.7 mm, width 1.5 mm, depth 2.4 mm. Head deeper than long. Eye round, its diameter about one-third of head length. Antenna 1 1.7 mm long, extending to about half length of segment 5 of antenna 2 peduncle; flagellum 6-segmented, with spination as in male; peduncle as in male. Antenna 2 5 mm long; flagellum with 28 segments.

Gnathopod 1 proportionately smaller than in male; side-plate with smaller spines; basos, ischium, merus, and carpus as in male but less heavily spined. Propod narrower than in male; palm less angled (117°), sinuous, with a prominent setae, scarcely produced lobe fringed by prominent setae. Dactyl as long as palm or longer. Gnathopod 2 and pereopods as in male. Uropods as in male, but outer ramus of uropod 1 with 2 spines.

Description of new material. (Chilton's two type specimens are unusually large in comparison with the other adult specimens I have examined. Extensive searching in any talitrid population will usually reveal one or two unusually large specimens, but these have such exaggerated characters owing to their extreme size that their use as types can be confusing. Therefore, I have selected specimens for an extended description that are far more typical of the species while still resembling the holotype as closely as possible.)

Male. Length 13.2 mm, width 1.8 mm, depth 2.0 mm. Body not very deep. Pigmentation pattern (in alcohol) consisting of weak, red-brown stripes on a yellow-white background. Head deeper than long; anterior margin of cheek with a prominent seta. Eye round, deeply pigmented, its diameter about one-third of head length.

Antenna 1 1.5 mm long, reaching to about half length of segment 5 of antenna 2 peduncle. Peduncle segment 1 shortest, stouter than other peduncle segments, with a long seta on outer dorsodistal margin, a short seta on inner margin, and 2 setae near midpoint on ventral margin; peduncle segment 2 longer and narrower than segment 1, with a long seta on outer anterodistal margin, and 3 setae equally spaced on ventral margin; peduncle segment 3 longer than segment 2, with 2 longer setae anterodistally, 1 shorter seta ventrodistally, dorsal surface bearing a longer seta midway, and ventral surface bearing 2 setae equally spaced along long axis. Flagellum shorter than peduncle, with 5 segments, each bearing 2 long setae on outer dorsodistal margin, and 5 shorter setae forming a partial rosette distally on outer dorsolateral margin; terminal segment with a brush of 5 setae.

Antenna 2 5.2 mm long. Peduncle segment 3 with a prominent seta ventrodistally; peduncle segment 4 with a rosette of setae distally and 2 rows of paired setae running axially; peduncle segment 5 as long as segments 4 + 3, with a distal rosette of setae and 4 rows of 7 setae running axially. Flagellum of 32 segments, each having a long seta at each of the 4 distal angles.

Upper lip of normal semicircular shape, with a setose margin ventrally.

Mandible with a 5-cusped incisor; lacinia mobilis 4-toothed, with 5 pilose setae in area between teeth; molar twice as long as width, heavily setose, 18-striate, with medial seta prominent.

Lower lip scroll-shaped, deeply cleft, with fine setae almost on ventral and lateral margins; a fine setose comb on ventral margin; medial surfaces of lip with a stronger setal row proximal to the setose comb.

Maxilla 1. Inner plate slender, narrowing distally, with the 2 terminal setae heavily pilose. Outer plate broad, with palp and outer margin finely setose; distal margin with 9 strong teeth having 1, 1, 0, 5, 5, 5, 5, 4, and 4 lateral protuberances (= lateral teeth) respectively; very fine setae clothing base of innermost (medial) teeth.

Maxilla 2. Plates broadening distally, with distal spines curved inwards; inner margins of both plates bearing very fine setae; inner plate spine row terminating proximally with a stout pilose sensory seta.

Maxilliped. Inner plates subrectangular, with distal margin bearing 3 spine teeth, the inner tooth smallest, the outer 2 subequal; teeth masked by a row of 7 or 8 pilose spines; other pilose spines present down cleft almost to ischium. Outer plate distally rounded, with a row of plumose setae set back from margin and projecting beyond it to form a comb, and terminating in a patch of 2 or 3 longer spines medially. Palp short, broad; lateral lobes of segments 1, 2, and 3 projected inwards, bearing prominent setal combs set slightly submarginally; segment 4 distinct, not masked by segment 3; outer margins of segments 2, 3, and 4 bearing pairs of long setae.

Gnathopod 1. Coxal plate with ventral margin rounded, bearing a row of long setae. Basos broad, with 4 or so smaller spines anteriorly, larger ones posteriorly. Ischium slightly narrower than basos, spined posterodistally. Merus with posterior lobes (that sheathe margin of reflexed propod) bearing 1 lateral spine and 1 terminal spine. Carpus with prominent, pellucid, propod-sheathing posterior lobes bearing pairs of spines on each lobe and at base of lobes; anterior margin with small spines midway and larger ones distally. Propod broad, its margins subparallel; anterior margin nearly twice as long as posterior margin, with 3 groups of equidistant spines and a prominent group distally at hinge of dactyl; posterior margin slightly curved, with prominent marginal spines and a strong spine row diagonally across surface below palm; angle of palm (to anterior margin) 143°; palm nearly straight, but indented posteriorly to receive dactyl tip; palmar surface heavily sclerotised with article-tooth grooves, especially anteriorly; inner palmar spine row single, with 5 spines, the most posterior largest; outer spine row with 3 large, scionate spines. Dactyl as long as palm, without prominent cuticular

sculpturing but with 1 or 2 spines laterodistally at beginning of heavy sclerotisation, and 1 or 2 on palmar surface.

Gnathopod 2. Coxal plate ventral margin rounded and spined. Gill a large, simple, trilobate sac. Basos about one-third as wide as long, with 4 single spines on anterior margin, 1 on posterior margin. Ischium subparallel, with anterior margin slightly produced into a lobe; a single spine posterodistally. Merus posterior margin produced into a prominent, distally expanding lobe, its surface microsculptured and setose, with 2 spines at base of lobe; anterior margin slightly convex. Carpus with prominent posterior lobes that are microsculptured and spined at base; distal margin spined laterally and anteriorly. Propod with margins subparallel, slightly broader distally, as long as wide; surface microsculptured; anterior margin produced into a lobe in which dactyl engages; posterior margin less sculptured, spined at distal angle; a row of single spines running axially over lateral face of propod; palm short, strongly convex, half as wide as propod, flanked by a row of 3 or 4 small spines, terminating with a spine anteriorly. Dactyl short, curved towards propod lobe, its tip inserting into a palmar depression distally.

Peraeopod 1. Coxal plate subsquare; posterior and ventral margins slightly convex, and ventral margin spined. Gill a simple sac, about half to 0.8x as wide as sideplate. Basos anterior margin concave, with 2 large spines marginally and 2 close together distally; posterior margin with 3 large spines marginally and 1 distally. Ischium slightly lobed anteriorly, with a spine posterodistally. Merus broader distally; anterior margin convex, with a few stout spines; posterior margin slightly sinuous, with 5 groups of stout spines. Carpus about half as wide as merus, with 2 spines midlaterally; posterior margin convex, with 5 or 6 pairs of long spines, and distal margin spined anteriorly. Propod longer than carpus, tapering distally; anterior margin with 3 spines; posterior margin with 6 pairs of long spines forming a comb-like structure used for grooming; distal margins with 3 long spines anteriorly. Dactyl long, with a strong posterior spine and a weak anterior spine.

Peraeopod 2. Coxal plate ventral margin convex, with about 11 spines; anterior and posterior angles more rounded than in peraeopod 1. Gill larger than in peraeopod 1, a simple flattened sac. Basos subparallel; anterior margin slightly concave, with 3 long spines marginally; posterior margin slightly convex, with 3 equidistant, strong, marginal spines; distal margin with a pair of strong spines anteriorly and a spine posteriorly. Ischium short, broadening distally, slightly lobed anteriorly, spined posterodistally. Merus about 0.8x as long as basos; margins subparallel; anterior margin convex, with 4 equidistant stout

spines; posterior margin nearly straight, with 5 stout spines; posterodistal angle produced, with 3 stout spines; anterodistal angle with 1 spine. Carpus subrectangular, with margins subparallel; anterior margin with 2 spines; posterior margin with 4 pairs of stout spines. Propod slightly narrower distally; anterior margin with 3 spines; posterior margin with 7 pairs of spines. Dactyl not as long as in peraeopod 1.

Peraeopod 3. Coxal plate half-rounded; ventral margin spined. Gill larger than peraeopod 2 gill, with a distal lobe. Basos pyriform, narrowing distally; anterior margin with 6 pairs of spines; posterior margin with about 8 long spines; distal marginal angles spined. Ischium smaller and broader than in peraeopods 1 and 2, subrectangular, with a pair of spines anterodistally. Merus broadening anterodistally, with 3 pairs of spines anterolaterally and 1 spine on posterior margin; distal margin with 2 spines, 1 long and 1 shorter, anteriorly and a pair of long spines posterodistally. Carpus narrowing slightly distally; anterior margin with 5 sets of 3 long spines; posterior margin with 4 long spines; distal angle spined. Propod long and tapering; anterior margin with 7 spines paired with stout, peg-like lateral spines; posterior margin with 4 long spines. Dactyl long, conical.

Peraeopod 4 1.5x as long as peraeopod 3. Gill simple, plate-like. Sideplate small, rounded ventrally. Basos ovoid; anterior margin with 10 strong spines; posterior margin with about 9 smaller spines; distal margin spined anteriorly, rounded posteriorly. Ischium small, spined anterodistally. Merus slightly broadening distally; anterior margin with 5 pairs of triplets of spines; posterior margin with 4 stout spines; anterodistal angle with 4 or 5 prominent spines. Carpus long; margins subparallel; anterior margin with 5 triplets of stout spines; posterior margin with 5 long spines paired with very small spines; posterodistal margin with 3 very long spines. Propod very long, tapering, slightly curved posteriorly; anterior margin convex, with 11 pairs or triplets of spines; posterior margin with 8 pairs or triplets of spines. Dactyl long, conical.

Peraeopod 5. Gill trilobate, not plicate. Basos teardrop-shaped; anterior margin with 7 strong spines; posterior margin with 5 very small spines; posterodistal angle recurved. Ischium rhomboidal; anterodistal angle spined; posterior margin slightly produced into a conical process. Merus long, broader distally; anterior margin with 4 triplets of spines; posterior margin with 4 spines; anterodistal and posterodistal angles produced into a sclerotised lobe. Carpus as long as merus but narrower, slightly reflexed posteriorly; anterior margin with 5 groups of spines, posterior margin with 2; posterodistal margin with a group of prominent spines. Propod long, slightly narrowing dist-

ally; anterior margin with 6 pairs of spines, posterior margin with 4. Dactyl long, scarcely curved, with 3 small, rounded spines in an axial line.

Epimeral plates. Plate 1 with anterior and ventral margins rounded; posterodistal angle produced slightly. Plates 2 and 3 with posterior margin straight and bearing 1 or 2 minute spines; posterodistal angle only slightly produced posteriorly.

Pleopods all present, short, broad. Pleopod 1 longest, pleopod 3 very short. Peduncles longer than rami, with 4 coupling spines on inner distal margin; inner ramus 0.7x as long as outer ramus; all rami with sparsely plumose setae, segmentation poorly developed, and very fine setae present on margins, more particularly on pleopod 3.

Uropod 1 peduncle as long as rami, with 4 or 5 spines on each dorsal margin. Inner ramus with 2 spines or spine sockets on margin, terminating with 2 long spines and 2 short ones. Outer ramus with 3 marginal spines, terminating with 2 long spines and 2 short spines; a large inter-ramal spine present, about one-quarter of ramus length.

Uropod 2 peduncle with dorsal surface spined. Inner ramus with 1 spine on dorsal margin and terminating in 1 long spine and 1 short one. Outer ramus with 2 spines on outer dorsal margin and 2 pairs of spines on inner dorsal margin, one member of each pair long and one short; ramus terminating with 3 long spines; a strong inter-ramal spine present.

Uropod 3 much the shortest, with dorsal margin spined and with a single ramus terminating in 2 larger setae and 1 smaller one.

Telson moderately cleft, nearly twice as long as wide, with a long spine on each lobe.

Type data and comment. Holotype: male, The Snares Islands, G.R. Mariner (CMNZ, Chilton Collection, slides A1–A6).

Allotype: undissected female in tube, same data as holotype.

Paratypes: The Snares Islands, opposite Mollymawk Islet, beating *Poa astonii*, 24 January 1967, P.M. Johns (CMNZ slide and tube numbered 3514, 3515; author's catalogue number KD 816).

Chilton (1909) thought that all his material of this species was female. He figured and described the species from a series of slides labelled A1 to A6 deposited in the Canterbury Museum, all presumably made from the dissection of a single specimen that was, I have assumed, the true holotype. He also deposited an intact specimen that he also nominated "holotype." The slides could not have been made from this specimen, nor could his description have been based on it, in spite of its label as holotype, since it

differs from his figures and text in a number of important points, especially in the details of the palmar spination. Obviously the slide material is the holotype, since the description is in agreement with it; the intact specimen can be considered a syntype. I have prepared slides of the first and second gnathopods from this allotype, and deposited them with the holotype.

Unfortunately the remains of the body of the holotype specimen used to prepare Chilton's slides A1–A6 are no longer in existence, and so the sex of this specimen cannot be decided by reference to penis organs or other more certain evidence of sex. However, the fact that in the slide-mounted specimen the dactyl of gnathopod 1 nestles in a bilobed extension of the propod posterodistal margin and the finger is shorter than the palm (both strongly male features) makes Chilton's designation of the holotype slide material as female open to considerable doubt. Furthermore, morphometric analysis of the relative dimensions of gnathopod 1 shows that it is typically male, being relatively more massive than that of the female, with a palm angled more acutely. Nor do the pereopods have brood plates, as could be expected if the specimen were female, although this is weaker evidence since it is possible that the brood plates were lost during dissection. The view taken here is that this specimen is a male and is the holotype for the species.

Chilton's very large whole specimen (designated allotype here) is typically female, as evidenced by its functional brood plates, although it is somewhat masculinised by its extreme age.

In view of the confusion surrounding the type specimens of this species, I have considered it advisable to supplement the descriptions based on the type material with descriptions of a paratype male. Unfortunately Chilton did not designate any paratypes, and in any event his other material is now in too poor condition to be used for taxonomic purposes. The supplementary descriptions are based on specimens from Mr P. M. Johns's collections, selected so as to be as similar to the types as possible.

Material examined. Type specimens, plus 76 non-type adult examples (25 males, 51 females) from The Snares, as follows: Dec 1947, R.A. Falla, ex leaf-mould (taken with *Puhuruhuru patersoni*); 7 Jan 1967, G.A. Knox, from Buller's mollymawk nest material; opposite Mollymawk Islet, 24 Jan 1967, P.M. Johns, beating *Poa astonii*; Penguin Creek, 26 Nov 1972, D.S. Horning, in wet *Olearia lyallii*; Sink Hole Flat, _ Mar 1971, D.S. Horning, litter.

Remarks. In all females examined the brood plates are of the typical nonbreeding (winter) form. In this condition

they are spineless, and are much thicker than during the breeding season, probably because they are filled with haemolymph and functioning as accessory gills. The broodplates of *Makawe hurleyi* have the same haemolymph-filled appearance in winter, and have been shown to assist in the acclimation of metabolic rate to temperature in winter (Duncan 1993). All the collections I have studied were taken in early summer and, since no breeding adults are present in the collections, this species must have a single, brief breeding season in late summer to early autumn, unlike the species on New Zealand's main islands that have a prolonged breeding season extending over spring, summer, and autumn (Duncan 1969).

Chilton remarked that this species was present on Stewart Island as well as The Snares. This distribution was also given by Stephensen (1935), although he stated that his specimens did not have spines on the outer ramus of uropod 1. Hurley (1957) described a small "female" as a hypotype and gave the localities as The Snares and Stewart Island. I have not been able to examine this specimen as it was not deposited in the National Museum of New Zealand and cannot be located. However, all the specimens nominally of this species that I have examined from Stewart Island show a number of distinctive differences from the Snares form, including lack of spines on the outer ramus of uropod 1, less well developed male gnathopod 1 propod and dactyl, palm without the terminal lobes, and generally weaker spination. Morphometric analysis of allometric growth relationships shows that the Stewart Island specimens are profoundly different from the Snares specimens. Because of these differences, I consider that the two populations are two different but closely related species. The Stewart Island species is described below as *Kanikania motuensis*. It shows some interesting adaptations to the terrestrial environment beyond those of the more primitive *K. improvisa*, in that its antennae 2 are more slender, its gnathopods are less well developed, and its uropod 1 outer ramus is naked. It is also smaller than *K. improvisa*.

Kanikania motuensis new species

Plate 4, Map 2

Diagnosis. A small, weakly sexually dimorphic landhopper with large eyes, long and slender antennae 2, gnathopod 1 well developed and strongly subchelate, gnathopod 2 feebly developed, weakly chelate, and mitten-shaped in both sexes, peraeopods stout, pleopods somewhat reduced but all still present, with only 2 coupling spines, and uropod 1 outer ramus naked.

Description. Holotype male. Length 8 mm, width 1.2 mm, depth 1.9 mm. Body not very deep. Pigmentation pattern comprising red-brown stripes on a yellow-white background. Head deeper than long. Eye round, about one-third of head length, deeply pigmented.

Antenna 1 0.7 mm long, reaching to about one-third the length of segment 5 of antenna 2 peduncle. Peduncle segment 1 with 2 large spines on dorsodistal margin, otherwise naked. Peduncle segment 2 longer than segment 1, spined on ventrodistal and dorsodistal margins, otherwise naked. Peduncle segment 3 longer than segment 2, spined ventrodistally; dorsal surface with 1 spine midway. Flagellum shorter than peduncle, 5-segmented, spined dorsodistally.

Antenna 2 4.1 mm long. Peduncle segment 3 with 3 rows of about 4 spines each running axially. Peduncle segment 4 twice length of segment 3, with a rosette of setae distally and 3 rows of paired setae running axially. Peduncle segment 5 as long again as segment 4, with 4 rows each of 4-7 spines running axially. Flagellum of 24 segments, each with 3 pairs of long spines at distal angles, but inner dorsodistal margin with 3 spines in a group, and last segment terminating with a tuft of about 5 tightly bound setae.

Upper lip. Ventral margin semicircular and setose.

Mandibles with incisor 5-cusped, lacinia mobilis 4- or 5-toothed, molar 20-striate, molar medial seta prominent.

Lower lip scroll-shaped, deeply cleft, with outer margins finely setose and inner margins heavily setose, with 2 main brush-like rows of setae.

Maxilla 1. Inner plate slender, narrowing distally, with 2 heavily pilose terminal setae. Outer plate broad, with a palp on finely setose outer margin; distal margin with 9 or 10 strong teeth bearing, in order from outer to inner, 1, 1, 0, 4, 4, 4, 4, 4 lateral protuberances; base of inner teeth clothed with a few fine setae.

Maxilliped. Inner plates with 3 distal teeth not masked by pilose setae set between them. Outer plates with distal margin rounded, and with a double row of 9 or 10 setae set back from margin and projecting beyond it to form a comb; face of plate with a group of 4 large spines. Palp broad; terminal segment not masked by terminal tuft of setae; segments 3 and 2 with inner margin produced, bearing a row of 6-8 setae set back from margin but projecting beyond to form a comb, and distal margin with a pair of strong spines frontally and a single strong spine on outer margin.

Gnathopod 1. Coxal plate rounded ventrally, with 4 strong spines. Basos long, broadening distally; anterior margin concave, with 3 spines; posterior margin convex, with 2 stronger spines; posterodistal angle with 1 spine.

Ischium slightly narrower than basos, subrectangular; anterior margin slightly excavate, with 2 spines at posterodistal margin. Merus posterior margin produced into a sculptured pellucid lobe, with single spines proximal, distal, and lateral to it; lateral face of merus with a short spine row. Carpus posterior margin produced into a prominent, sculptured, pellucid lobe sheathing the reflexed propod and with 2 large spines on either side; posterodistal angle spined; anterior margin angled convexly, with 2 marginal spines midway and 2 large spines at anterodistal angle. Propod margins parallel; anterior margin with 4 spines set back from margin on each face and equally spaced, the shorter posterior margin with 2 strong spine pairs; lateral face of propod with 2 irregular rows of about 6 spines angled below palm posteriorly; medial face with 2 rows of stronger spines; palm sinuous, excavate proximally, produced mesodistally, strongly convex distally, sclerotised and ridged, flanked by a single row of 5 spines, terminating in a pair of strong spines. Dactyl as long as palm or longer, with a strong inner spine basally.

Gnathopod 2. Coxal plate convex, strongly spined. Gill trilobate, scarcely plicate. Basos widening medially, narrower proximally and distally, with 3 small spines on anterior margin, 1 on posterior margin. Ischium posterodistal angle spined; anterior margin slightly produced. Merus posterior margin produced into a sculptured pellucid lobe, with 1 spine near posterodistal angle. Carpus anterior margin naked, weakly convex to nearly straight; posterior margin produced into a lobe, with a group of 3 spines at posterodistal angle and a pair at anterodistal angle. Propod mitten-shaped, long, with margins subparallel and naked; an irregular row of 7-9 spines running axially over both inner and outer faces to base of palm; posterior margin produced into a long, scabrous, pellucid lobe; palm short, strongly convex, so dactyl appears to 'bite' into propod lobe; a pair of long spines at anterior end of palm, a row of short spines flanking it, and a group of longer terminal spines. Dactyl short, about half propod width.

Peraeopod 1. Coxal plate ventral margin only slightly convexly curved, with 8 or so marginal spines, the largest anterior. Gill simple. Basos long, wider distally; anterior margin somewhat concave, with 2 spines distally; posterior margin convex, with 5 larger, equally spaced spines; distal angles spined. Ischium subsquare; anterior margin slightly produced; posterior angle with a pair of spines. Merus widening distally; anterior margin with 2 large spines; posterior margin with 5 spines (the most proximal a pair); distal angles each with a pair of strong spines. Carpus subrectangular; anterior margin with a single short spine; posterior margin with 5 or so pairs of strong spines.

Propod slightly recurved posteriorly; anterior margin with 2 pairs of strong spines, and posterior margin with 4 pairs. Dactyl long, strongly spined posteriorly.

Peraeopod 2. Coxal plate subsquare, with ventral margin spined. Gill simple. Basos anterior margin very concave, with 2 marginal spines; posterior margin convex, with 3 marginal spines. Ischium subsquare, with anterior margin slightly produced, spined at posterodistal angle. Merus broadening distally; anterior margin with 2 spines, posterior margin with 5; anterodistal angle with a pair of spines, posterodistal angle with 3. Carpus shorter than propod; anterior margin straight, with a single spine; posterior margin with 4 pairs of strong spines. Propod anterior margin with 2 groups of spines, posterior margin with 3 groups. Dactyl long.

Peraeopod 3. Coxal plate margins spined. Gill lobed, about half basos length. Basos teardrop-shaped, narrowing distally; anterior margin with 6 spines, posterior margin with 5, some of them bifid; distal angles spined. Ischium small, subrectangular, spined anterodistally. Merus broadening posterodistally; anterior margin with 3 groups of strong spines; posterior margin with a single spine; distal margins spined. Carpus lateral margins subparallel; anterior margin with 3 groups of strong spines; posterior margin with a single spine; distal angles spined. Propod long, tapering distally; anterior margin with 4 pairs of strong spines; posterior margin with 2 pairs of spines.

Peraeopod 4. Coxal plate rounded, nearly naked. Gill trilobate. Basos ovate, with about 7 spines on anterior margin, 7 on posterior margin; posterodistal angle rounded, somewhat produced. Ischium with posterior margin angular; anterodistal angle spined. Merus broadening distally; anterior margin with 4 pairs of strong spines; posterior margin with 2 pairs of spines; distal margins spined. Carpus subparallel, slightly recurved posteriorly; anterior margin with 4 triplets of strong spines; posterior margin with 2 pairs of spines. Propod long, subparallel; anterior margin with 5 spines; posterior margin with 4 triplets of strong spines. Dactyl long, tapering.

Peraeopod 5. Coxal plate small, semicircular, almost naked. Basos pyriform; anterior margin with 6 spines; posterior margin produced, with 5 very small spines. Ischium rhomboidal; anterodistal angle spined. Merus anterior margin with 4 groups of strong spines; posterior margin with 4 spines; distal angles spined. Carpus anterior margin with 4 groups of strong spines; posterior margin with 2 pairs of small spines. Propod long, only slightly tapering; anterior margin with 6 groups of spines, posterior margin with 5 groups. Dactyl long, scarcely curved.

Epimeral plates. Plate 1 with anterior and ventral margins rounded, posterodistal angle only slightly produced.

Plates 2 and 3 subsquare, with posterodistal angle slightly produced and posterior margin with 2 very small spines.

Pleopods all present, short and broad, the 1st longest, the 3rd shortest. Segmentation rudimentary. Inner rami shorter than outer rami. A pair of coupling spines (retinaculae) present on all peduncles outer margins with fine pilose setae, inner margins with very fine setae.

Uropod 1. Peduncle with a row of 6 spines on outer (lateral) dorsal margin and 7 spines on inner (medial) dorsal margin; a large inter-ramal spine present. Outer ramus without marginal spines, terminally with 2 large spines (1 of these scionate) and 2 smaller spines. Inner ramus with 2 marginal spines, 2 large and 2 small terminal spines (2 of these scionate).

Uropod 2. Peduncle with axial rows of 2 and 4 spines dorsally; an inter-ramal spine present; outer ramus naked, inner ramus with 2 spines.

Uropod 3. Peduncle with 2 spines.

Telson with a single long spine on each lobe.

Allotype female. Length 12.7 mm, width 2.2 mm, depth 2.5 mm.

Antenna 1 1.8 mm long. Peduncle segment 3 with 1 spine dorsally, 2 small spines ventrally. Flagellum with 7 segments.

Antenna 2 6.6 mm long. Flagellum with 30 segments.

Gnathopod 1. Basos anterior margin nearly straight, with 6 spines; posterior margin convex, with 2 spines; posterodistal angle with 1 long spine and 4 very small spines. Ischium with 4 spines at posterodistal angle. Merus with posterior margin produced. Carpus posterior margin produced into prominent lobes, with 3 strong spines at base of lobe and 2 on margin; anterior margin convex, with a solitary spine and a group of 3 spines; anterodistal angle with 4 spines. Propod margins subparallel; anterior margin with 5 groups of spines; posterior margin with 4 spines; 2 rows of strong spines running more or less axially on medial face, with 4 spines per row; palmar angle 123°; palm sinuous, flanked by a single row of 5 small spines; posterodistal angle with 4 stronger spines. Dactyl longer than palm.

Gnathopod 2. Basos anterior margin with 8 spines. Ischium longer than wide. Merus posterior margin with a pellucid lobe bearing 2 strong spines at its base. Propod long, slightly broadening distally, mitten-shaped; palm about one-third of propod width.

Peraeopod 1. Basos anterior margin with 6 spines; posterior margin with 3 spines. Merus anterior margin naked. Propod anterior margin with 3 pairs of spines, posterior margin with 5 pairs.

Peraeopod 2. Oostegite as long as basos. Basos with 3 spines on each margin. Propod anterior margin with 3 groups of spines, posterior margin with 5 groups.

Peraeopod 3. Basos anterior margin with 7 groups of spines, all scionate; posterior margin with 7 or 8 longer spines. Carpus anterior margin with 5 groups of strong spines; posterior margin with 2 spines. Propod anterior margin with 5 groups of spines, posterior margin with 3 groups.

Peraeopod 4. Basos ovate, with 8 spines on anterior margin and 9 on posterior margin. Merus anterior margin with 4 groups of spines, posterior margin with 3 spines. Carpus posterior margin with 2 spines. Propod anterior margin with 7 groups of spines, posterior margin with 5 spines.

Peraeopod 5. Basos anterior margin with 7 spines; posterior margin rounded, somewhat scalloped, with about 9 minute spines. Carpus posterior margin with 3 groups of spines. Propod margins each with about 7 groups of spines. Oostegites about as long as basos of peraeopod 3, with about 7–11 setae, a few them weakly curl-tipped.

Uropod 1 peduncle with 2 spine rows comprising 6 and 5 scionate spines; inner ramus with 3 marginal spines. *Uropod 2* inner ramus with 3 marginal spine pairs.

Type data. Holotype: male, SI, Big South Cape Island, Murderers Cove, 24 January 1955, R.K. Dell and B.A. Holloway (CMNZ slide no. 3516 and 3517, plus tubes containing remains of dissected specimens; author's catalogue number KD 780).

Allotype: same data as holotype.

Material examined. Type specimens, plus 22 collections from Stewart I. and vicinity, as follows (AMNZ, BMNH, CMNZ, BPBM, NMNZ, NZAC).

Big Stage I. (Mutton Bird I.), 27 Feb 1972, R. Nilssen. NE Big South Cape I., 22 Feb 1969, J. McBurney, litter. Big South Cape I., 20 Feb 1969, J. McBurney, mats. Big South Cape I., Murderers Cove, 24 Jan 1955, R.K. Dell & B.A. Holloway, leafmould. SE Stewart I., 23 Jan 1955, R.K. Dell & B.A. Holloway, leafmould. Hidden I., 28 Jan 1955, R.K. Dell & B.A. Holloway, leaf mould. Nelly I., 47°12'S, 167°42'E, 22 Jan 1955, R.K. Dell & B.A. Holloway, *Senecio* & tussock leafmould. Lords R., 47°07'S, 168°08'E, 29 Jan 1955, R.K. Dell & B.A. Holloway, leafmould, and N entrance, *Senecio* leafmould. Small Craft Retreat, 23 Jan 1955, R.K. Dell & B.A. Holloway, and R.K. Dell. Port Pegasus, 22 Jan 1955, R.K. Dell, leafmould. Kundy I., 21 May 1956, R.K. Dell. Solomons I., 25 Jan 1955, R.K. Dell & B.A. Holloway, leafmould. Paterson Inlet, Thule, 31 Oct 1948, R.K. Dell.

Mokinui I., 28 Jan 1955, R.K. Dell & B.A. Holloway, leafmould. Port Pegasus, near wharf, 25 May 1956, R.K. Dell. Tommy I. (Bravo group), 30 Nov 1981, L.C. Cadenhead & N.A. Deans, under log in *Senecio* verge. Mephistopheles, 11 Jan 1982, L.C. Cadenhead & N.A. Deans, tree fern pit traps. Codfish I., East hut, L.C. Cadenhead & N.A. Deans, pit trap 100 in pakihi scrub. Codfish I., Mirkwood petrel colony (no other details).

— / SI / —.

Taken in *Senecio* and other plant leaf-mould, often with other talitrid species such as *Puhuruhuru patersoni* and *Parorchestia tenuis*.

Remarks. *Kanikania motuensis* is typical of its genus in living only in high-conductivity soils. Friend (1980) has described *Tasmanorchestia annulata* that occurs in the same kind of habitat in Tasmania. Of some possible significance is the fact that this Australian species, too, is strongly striped.

The greater degree of spination shown by the female allotype is because it is older and larger than the holotype male.

The name *motuensis* is derived from the Maori 'motu,' meaning 'island'.

***Kanikania rubroannulata* (Hurley) new combination**

Plates 5 and 6, Map 3

rubroannulata Hurley, 1957: 179–183, fig. 11, 12 (*Orchestia*).

Diagnosis. A very small, weakly sexually dimorphic *Kanikania* with large eyes and with a strongly striped body when alive. Antenna 1 flagellum shorter than peduncle. Antenna 2 relatively short. Gnathopod 1 propod strongly developed, especially in male; palmar angle about 70°. Gnathopod 2 mitten-shaped in both sexes. Pleopods 2 and 3 vestigial. Uropod 1 inter-ramal spine short.

Description. Male. Body in life strongly marked with transverse rufous stripes; in alcohol stripes fading to orange-red and persisting for many decades, unlike markings in other species. Length 6.5 mm, depth 1.25 mm, width 1.5 mm.

Antenna 1 1 mm long. Peduncle segment 1 as long as segment 2, wider; segment 3 1.5x length of segment 2, narrower; inferior and distal margins with a few spines. Flagellum shorter than peduncle, of 5 segments, the last one tufted; other segments with a pair of small spines distally on dorsal surface, longer ones distally on ventral

surface.

Antenna 2 2.75 mm long. Peduncle segments with long, slender spines on margins and surfaces; segment 4 about two-thirds length of segment 5. Flagellum longer than peduncle, with 15 or 16 segments.

Mandibles. Left: spine row comprising 5 setose spines; upper article of cutting edge with 3 teeth, lower article with 4 poorly defined teeth. Right: upper article with 4 teeth, lower article bulbous-headed with a fimbriated margin; molar process proximally bristled.

Maxilliped. Inner plate with about 9 setulose spines on one side between distal teeth and halfway down cleft, about 4 setulose spines on end margin outside teeth, and setulose spines across inner distal angle. Outer plate almost reaching end of carpus, with a row of submarginal spines across inner surface, about 3 similar spines on inner margin to mid-merus level, 2 or 3 on surface below merus inner proximal angle, and 1 or 2 on outer distal angles of basos, ischium, and merus; 2 long, stout spines on carpus outer distal angle. Propod end margin with 5 stout spines. Merus inner distal angle and carpus mediodistal margin with groups of 2 or so small spines. Carpus and propod inner distal angles with short spines, in propod masking the tip. Delineation between propod and dactyl indistinct, although propod produced terminally like a rudimentary dactyl.

Gnathopod 1. Coxal plate ventrally rounded and spined. Basos width one-third of length. Ischium subrectangular, posteriorly spined. Merus as long as ischium, spined posteriorly, with a small, apical non-scabrous lobe. Carpus anterior margin as long as merus posterior margin, spined mainly on anterodistal angle, posterodistally produced into a scabrous lobe with a few long spines. Propod relatively produced, longer than carpus, subrectangular; anterior margin with about 5 groups of long, slender spines; outer dactyl base with several fine spines; posterior margin and most of surface with stouter, stronger spines; palm a little oblique (70°), half propod width, with about 6 slender spines on either side, defined posteriorly by a long, stout spine on either side of dactyl plus a shorter stout spine on one side. Dactyl overlapping end of palm a little, distally slender, with spines on outer margin and surface.

Gnathopod 2 feebly chelate. Coxal plate ovate, spined ventrally and posteriorly. Basos width one-third of length; margins sinuous; a small spine near anterodistal angle. Ischium anterior margin one-third length of posterior margin; a feeble spine on posterodistal angle. Merus as large as ischium, subtriangular; anterior margin contiguous with proximal third of carpus posterior margin; posterior margin with a spined, scabrous pellucid lobe. Carpus anterodistal angle with feeble spines; posterior margin

produced into a scabrous, pellucid lobe; anterior margin 1.3x length of merus posterior margin. Propod as long as carpus with a posterior scabrous lobe produced past oblique palm and finger; short, stout spines present from posterior proximal angle to dactyl inner base; palm with 4 or so short spines. Dactyl stubby, spined, as long as poorly defined palm, with further small spines at outer base. Gills long, narrow, tapering at apex, reaching ischium.

Peraeopod 1. Basos width one-quarter of length, with margins spined. Ischium subsquare, one-third of merus length, posterodistally spined. Merus narrowing a little distally. Carpus with spined margins. Propod longer than carpus, narrower, with strongly spined margins. Dactyl long.

Peraeopod 2. Coxal plate wider and shallower than that of peraeopod 1. Basos anterior margin widening sharply distad, almost lobed. Segments proportionately shorter and wider than in peraeopod 1, and spines longer, but otherwise similar.

Peraeopod 3. Coxal plate anterior lobe spined ventrally. Basos width about two-thirds of length; posterior margin with small single spines; anterior margin with 3 or 4 groups of 1-3 larger, stouter spines. Ischium spined strongly anterodistally. Merus subtriangular; margins and distal angles with long, stout spines; distal width half length. Carpus subrectangular, slightly shorter than merus, about half merus width, strongly spined anteriorly and distally, with a pair of spines on posterior margin. Propod a little longer than merus, linear, narrower than carpus, distally only as wide as the short, spined dactyl.

Peraeopod 4. Gills long, lanceolate. Basos width half length; anterior margin with a single stout spine and a group distally; posterior margin with a single, less robust spine. Merus and carpus posterior margins with a few spine groups distally; remaining segmental margins (except anterior ischium) with groups of 2 or more stout spines.

Peraeopod 5. Basos subovate, as wide as long; anterior margin with a spine group including a single stout spine, and with 2 or 3 small spines on distal angle; posterior margin serrate, minutely spined.

Epimeral plates. Plate 1 subtriangular, with posterior margin sigmoid, and with a minute spine medially. Plates 2 and 3 with posterior margin more or less straight, with 2-5 minute spines, serrate; posterodistal angle of all plates produced a little.

Pleopods. First pleopod biramous, spined proximally; outer margin sometimes with a few minute setae; rami not segmented; margins with long, plumose setae. Pleopods 2 and 3 as vestigial triangular stumps, sometimes with 1 or 2 small terminal spines.

Uropod 1. Peduncle with both dorsal margins spined;

inner ramus dorsally spined, with 4 short and 2 long, stout terminal spines; outer ramus dorsally naked, with 1 long and 3 short terminal spines.

Uropod 2. Peduncle as long as rami, with both dorsal margins spined; inner ramus with several short stout spines dorsally, and 2 long and 2 short terminal spines; outer ramus with 1 or 2 dorsal spines, and 2 long and 1 short terminal spines.

Uropod 3. Peduncle much larger than ramus, with a stout spine dorsally and a few very small spines on ventral surface; ramus with 4 or 5 terminal spines.

Telson slightly longer than wide; apical lobes narrow, subtriangular, with about 6 spines on each margin.

Female. As for male, except as follows.

Antenna 1 flagellum with 4 segments.

Antenna 2 flagellum with 12 segments.

Gnathopod 1 less well developed. Carpus a little longer proportionately, with free hind margin larger and less 'pinched off'. Propod not as broad; anterior margin with about 3 groups of 2 or 3 spines; dactyl outer and inner bases with 2 or 3 long setae. Propod inner surface with stout, seta-tipped spines in a triangular field from dactyl inner base to propod posterior proximal angle; palm almost transverse, half propod width; 2 stout spines on propod outer margin, 2 short, narrow spines on palm. Dactyl long, overlapping palm inner margin, with a short, stout, forward-projecting spine medially; 2 setae medially on surface.

Type data. Holotype: male, BP, Karewa Island, 29 February 1949, R.R. Forster, leafmould (NMNZ; prepared slide 71, lost).

Allotype: female, SD, Stephens Island, 14 May 1950, R.R. Forster, leafmould (NMNZ; prepared slide 86, lost).

Material examined. Collections from which type specimens were drawn, plus 56 other collections (AMNZ, BMNH, CMNZ, BPBM, NMNZ, NZAC, OMNZ).

Offshore island populations: Tawhiti Rahi I. (Poor Knights), Little Barrier I., The Noises Is, Cuvier I., Green I., Shoe I., Mayor I., Karewa I., Kapiti I., Stephens I.

Mainland populations: Whangaparaoa Peninsula, Auckland; Cape Colville and Colville, Coromandel Peninsula.

ND, AK, CL, BP, WN / SD [GB, WD: Hurley 1956].

Taken in leaf litter, especially of coastal plants such as nikau palm (*Rhopalostylis sapida*) and pohutukawa (*Metrosideros excelsa*), and in nikau leaf bases.

Remarks. *Kanikania rubroannulata* is a member of the community of salt-tolerant coastal organisms dominated

by coastal trees such as the pohutukawa. The deposition of salt in sea mist, spray, and splash causes these coastal fringe soils to have a high salt load that may result in high osmotic pressures through concentration of the soil water by evaporation. The ability of *K. rubroannulata* to tolerate such conditions enables it to live in guano-rich soils, since these are also of high conductivity. It is not, however, dependent on the presence of guano.

This small-bodied species is usually very abundant where it occurs on offshore islands and exposed peninsulas of the northern part of the North Island. It is not dependent on leaf litter, since it can burrow in friable soil. Hurley (1957) considered it to be relict, but it is too abundant and widely distributed for that. It is probably dispersed very readily because of its salt-tolerance. It is very obvious when disturbed, owing to its concentrated numbers and frantic activity. It does not penetrate very far inland, but is usually found within metres of the beach.

Makawe new genus

Type species *Orchestia hurleyi* Duncan, 1968.

Plesiomorphic talitrids resembling *Transorchestia* but not as robust, with pleopod peduncles setose, all pleopods present, biramous, although pleopod 3 may be much smaller than others. Peraeon deep, peraeopods relatively long, body pigmentation pattern hooped. Brood plates long, delicate, and narrow, setose only distally. Female gnathopod 1 without brood plates.

Remarks. The members of this genus generally occupy coastal or strand situations, and are intermediate between the supralittoral *Transorchestia*-like talitrids and the more terrestrial inland species.

The name *Makawe* is a Maori word for 'hair', an allusion to the hairy appearance of the pleopods; gender feminine.

Makawe hurleyi (Duncan) new combination

Plates 7 and 8, Map 4

hurleyi Duncan, 1968: 205–210 (*Orchestia*).

Diagnosis. A large landhopper of the genus *Makawe*. Sexes strongly dimorphic in size but otherwise only weakly dimorphic. Body pigmentation pattern of dark bands or 'hoops' running parallel with segment boundaries. Eyes black, round. Antenna 1 short but reaching to end

of penultimate segment of antenna 2 peduncle; flagellum of 8 segments. Antenna 2 short, with a flagellum of about 20 segments. Gnathopod 1 more strongly chelate in male, chelate in female. Gnathopod 2 mitten-shaped in both sexes, although that of male broader. Gills as simple sacs. Pleopods all present, biramous, with pilose setae on peduncle outer margins; pleopod 3 somewhat reduced. Uropod 1 with an inter-ramal spine, both rami spined on dorsal margin. Uropod 2 with both rami spined dorsally. Telson with a single long spine on each lobe.

Description. Holotype male. Length 10 mm, width 2.5 mm, depth 2 mm. Colour in life a brownish-red background with darker brown annulations; males with a patch of brown (red in alcohol) on segments 5 and 6 of gnathopod 1. Colour in alcohol a background of yellowish-white with transverse red annulations. Eye black, round, diameter (0.035 mm) one-third of head length. Cheek anterior margin with 2 prominent spines.

Antenna 1 1.4 mm long, extending to end of penultimate segment of antenna 2 peduncle. Peduncle segments much the same length but narrowing successively. Segment 1 with small spines at midway on each margin. All segments with spines at dorsodistal angle, the outer spines largest. Flagellum of 8 segments, all (except the first) with a group of 3 or 4 spines superiorly and with spines at outer dorso-distal angles. Last segment with a tuft of 4 or more setae.

Antenna 2 5.5 mm long. Peduncle 2.5 mm, the segments successively narrower. Segment 3 half length of 4th segment; ventrodistal margin fringed with 4 spines, outer margin with 3. Segment 4 half length of segment 5, with 4–6 spines along outer margin and 2–4 on inner margin. Segment 5 with 5 groups of 2 spines on each margin. Flagellum varying from 6 to 23 segments (20 in holotype); segments subsquare in cross-section, with spines at each of the 4 distal corners of all but the 1st segment; last segment tufted, with 8–12 setae.

Upper lip ventral margin rounded, fringed with numerous fine setae.

Mandible upper article with 4 teeth, lower article with 3; basal spine row with 4 plumose spines; molar area with a rosette of 4 or more plumose spines distally and 1 longer plumose spine proximally.

Lower lip ventral margins and surface clothed in setae.

Maxilla 1 anterior face and margins clothed with patches of very fine setae; outer ramus with minute, 2-segmented palp lightly clothed with setae; 9 serrated spines distally.

Maxilla 2 with margins of plates fringed with fine setae; terminal spine row double, with 16–18 spines on outer lobe and 24 on inner lobe, the inner row terminating in 2 plumose spines (cf. 1 in female).

Maxilliped inner plate with plumose spines in 2 rows set back from margin and arranged outside and between teeth, and a single row continuing down midline cleft to basos. Outer plate a little narrower, with a row of spines terminating proximally one-third down inner margin, distal margin bearing plumose spines, and a group of 2 or 3 spines halfway down plate. Basos distal margin spined; outer distal angles of segments from basos to propod spined. Ischium with 3 spines at angle of outer lobe. Carpus to propod with 1 spine on inner margin distally. Merus to propod with a group of spines near mid-distal margin. Propod distal margin with a few strong spines. Dactyl small, not masked by propod spines.

Gnathopod 1 subchelate. Coxal plate ellipsoid, its ventral and posterior margins bearing a few very small spines. Basos width one-third of length; spines stronger on posterior margin than on anterior. Ischium small, subrectangular; anterior margin three-quarters length of posterior; spines only on posterodistal angle. Merus posterior margin 1.5x length of segment 3; posterior and distal margin spined. Carpus twice length of merus, with width half length; posterior margin with spine rows protecting a short row of spines at distal margin. Propod subrectangular; posterior margin about half length of carpus, produced to a transparent scabrous area protected by a row of 3-5 spines; anterior margin with 3 groups of 1 or 2 spines; distal angle with a group of spines; palm half width of propod, transverse, partially obscured by a row of stout spines, with numerous short scabrous spines. Dactyl finger projecting beyond palm, with 2 short spines at base of finger.

Gnathopod 2 feebly chelate; coxal plate depth equal to length, with angles and ventral margin rounded, posterior margin excavated. Gill large, lobed. Basos width one-third of length, with a few small spines on margins. Ischium width one-third of length, with spines on posterodistal angle. Merus length three-quarters of ischium; posterodistal margin and angle spined. Carpus widest distally; posterior margin produced into a scabrous lobe that widens distally, protected by a row of stout spines. Propod as long as carpus; posterior margin and angle produced into a scabrous lobe, protected by 2 rows of prominent spines set back from margin; palm oblique, one-third width of propod, with several small strong spines obscured by a fringing row of stouter spines; anterodistal angle spined. Dactyl short, its tip fitting into socket in propod lobe.

Peraeopod 1 as long as peraeopod 2. Gill simple, sac-like. Coxal plate ventral margin rounded and spined, posterior margin excavated and bearing spines. Basos widening distally, spined marginally and at angles; length 5x width. Merus subrectangular, as long as wide; distal angles spined; anterior and posterior margins spined, with post-

erior spines the largest. Carpus width one-third of length, half of merus width; posterior margin with prominent spines; anterior margin with a group of small spines at midway and at distal angle. Propod width 0.15x length, length half of carpus width; posterior margin with 5 groups of spines, anterior margin with 3 groups; distal angles spined. Dactyl with notching not pronounced, bearing 1 spine on each margin.

Peraeopod 2 lost.

Peraeopod 3 slightly longer than 1st and 2nd peraeopods. Sideplate longer than deep, otherwise as for peraeopod 1. Gill simple larger than in peraeopod 2. Basos posterior margin with pairs of short and long spines, anterior margin with long spines only. Merus expanded distally. Ischium and merus shorter than in peraeopods 1 and 2, other segments longer.

Peraeopod 4. Sideplate ventral margin spined, slightly crenulate. Gill large, with 2 lobes. Basos width three-quarters of length, with strong single spines on margins; other segments longer than in peraeopod 3.

Peraeopod 5. Sideplate longer than deep (deeper in female); margins spined, and posterior margin slightly excavated; posterior angle acute. Basos nearly as wide as long. Merus to propod successively narrower and longer. Dactyl long and narrow, with only 1 spine in axilla.

Epimeral plates subtriangular. Plate 1 with posterior angle acute but rounded, with a small spine at midway on posterior margin. Plate 2 subsquare; anterior angle and ventral margin rounded; posterior margin slightly excavated, with a small spine at 0.75. Plate 3 squarer than plate 2; ventral margin less rounded, and anterior margin slightly sinuous; small spines at posterior angle and at midway on posterior margin.

Pleopods. Segmentation of rami only superficial. Pleopod 1 inner ramus slightly smaller than outer ramus; setulose spines down outer margin of base and all margins of rami; rami longer than peduncle, with all margins fringed with very fine setae; 2 coupling spines at peduncle inner distal angle. Pleopod 2 longer than 1st pleopod, with spination similar; inner ramus only slightly smaller than outer ramus. Pleopod 3 half length of 2nd pleopod, reduced but still biramous; peduncle outer margin with 2 spines and setulose setae on distal half, inner margin with 2 coupling spines; inner ramus two-thirds length of outer ramus, with 1 spine; outer ramus with 3 spines, outer margin with only 7 or so setulose spines, inner margin with even fewer.

Uropod 1. Peduncle as long as rami; dorsal margins each with 4 spines. A large inter-ramal spine present, its length one-third that of rami. Outer ramus with 3 spines dorsally, 1 long (hooked) and 2 short terminally. Inner ramus with 4 spines dorsally, 2 long (hooked) and 2 short terminally.

Uropod 2. Peduncle with 4 spines on outer dorsal margin, 2 smaller spines on inner dorsal margin. Outer ramus with 2 spines dorsally, 2 long and 2 short terminally. Inner ramus with 3 spines dorsally, 2 long and 2 shorter terminally.

Uropod 3. Peduncle small, as long as ramus, with 2 spines. Ramus with 1 terminal spine.

Telson moderately cleft, subtriangular, with 1 spine on end of each lobe.

Female. As for male except as follows. Length 12 mm, width 3 mm, depth 2 mm.

Antenna 1 1.27 mm long. Peduncle segment 3 with 2 spines at each dorsodistal angle. Flagellum with 6 segments.

Antenna 2 4.8 mm long. Flagellum length 2.7 mm; number of segments varying from 6 to 22 (18 in allotype).

Maxilla 2: see male, above.

Gnathopod 2. Sideplate deeper than long, with spines more numerous than in male. Broodplate length 5x width, with 9 spines distally. Basos with only anterior margin spined. Merus posterior margin produced into a scabrous lobe, spined; distal angle spined. Carpus posterior and distal margins spined, produced into a scabrous lobe. Palm of propod more oblique. Dactyl relatively shorter. Coxal plates deeper.

Peraeopods. Sideplates deeper.

Pleopod 3. Spination not as reduced.

Uropod 1. Peduncle dorsal margin with 5 spines.

Type data. **Holotype:** male, MC, Christchurch, Riccarton Bush (CMNZ).

Paratypes: males and females, same data as holotype (CMNZ, NMNZ).

Material examined. Type specimens, plus 2389 other collections (AMNZ, BMNH, BPBM, CMNZ, NMNZ, NZAC, OMNZ).

— / NC, MC, SC, CO, DN, SL / Chatham Is.

Widespread in suburban gardens and urban long grass habitats in Christchurch, Timaru, Oamaru, and Dunedin. Present in farmland wherever conditions are moist enough. In tussock grassland from sea level to 2000 m. Present in leaf litter of modified native mixed podocarp/hardwood forest, under gorse and bracken, in forest ecotones, and in adventive pine and hardwood plantations.

Remarks. *Makawe hurleyi* is easily recognised by its uropod spination and pigmentation pattern. It is common in the eastern to southern South Island and the Chatham Islands, where it inhabits temperate and alpine grasslands,

damaged native forest, and ecotones of less damaged forests. Wildish (1979) has incorrectly recorded it as occurring in tropical grasslands. It also occurs in adventive communities such as exotic pine forests, in the leaf litter under exotic angiosperm trees and shrubs, and in suburban gardens and waste grassland. In fact, it is present wherever it is damp enough in grasslands or man-induced habitats, and is usually abundant. No other landhopper seems to have invaded grassland so thoroughly. In coastal Otago and Southland *Puhuruhuru patersoni* does to a certain extent, but does not penetrate inland very far. Much of the original vegetation in Canterbury and Otago consisted of wide expanses of tussock grassland of a type that produces a comparatively thick litter and a well buffered micro-environment beneath a tall canopy. These conditions were possibly conducive to the evolution of a grassland form.

Makawe insularis (Chilton) new combination

Plate 9, Map 12

insularis Chilton, 1909: 639–640, fig. 8a–c (*Parorchestia*). Stephensen, 1927: 349–350, fig. 23. Shoemaker, 1935: 66. Stephensen, 1935: 13. Hurley, 1957: 187–188, fig. 274–296 (*Orchestia*).

Diagnosis. A medium-sized, strongly sexually dimorphic *Makawe* with normal body shape and slender antennae 2 of moderate length. Gnathopod 2 with a transverse palm half the width of the propod, with dactyl short and stout. Gnathopod 2 propod greatly expanded in male, with a strongly emarginate palm; dactyl long, engaging in a fork at end of palm. Pleopods all present and biramous, although the 3rd is short. Uropod 1 outer ramus naked on dorsal margin; a large inter-ramal spine present. Uropod 2 with both rami spined on dorsal margin.

Description. Male. Length 10.5 mm, width 3 mm, depth 2.25 mm.

Antenna 1 1.5 mm long, almost reaching end of antenna 2 peduncle segment 4. Peduncle segments successively narrower; segment 2 slightly longer than the 1st and half length of segment 3; margins and surface spined. Flagellum slightly shorter than peduncle, of 5 segments; terminal segment very small, terminally setose; other 4 segments each with 2 pairs of setae distally.

Antenna 2 7 mm long, reaching peraeon segment 3. Peduncle segment 3 about one-third length of segment 4; segment 4 two-thirds length of segment 5 and wider; peduncle segments with fine spines inferiorly and distally, segment 5 spined superiorly. Flagellum of 25 segments, the

ultimate segment long and tapering.

Maxilliped. Inner plate with about 10 setulose spines on one side across inner distal angle, 5 outside distal teeth, and about 6 on other side down cleft almost to basos. Outer plate with a row of spines on inner surface set back from margin, and 4 or 5 on end of outer margin; spine groups on outer margin at ischium level and a little more distally on inner margin. Basos spined below outer plate insertion; basos, ischium, merus, and propod all with long, paired spines on posterodistal angle. Merus as long as carpus and propod; carpus widest. Inner distal margin of carpus and propod densely spined; a group of 4 spines on carpus margin mediolaterally. Propod spines masking small, terminally spined dactyl. Dactyl with a row of 5 or 6 spines.

Gnathopod 1. Sideplate ventral and posterior margins spined. Basos width one-quarter of length, with short spines anteriorly and distally. Ischium subsquare, as wide as basos, posterodistally spined. Merus as long as ischium, posteriorly produced into a small, scabrous pellucid lobe; margin and lobe base spined. Carpus scabrous lobe with a few long spines, surface spined, anterior margin convex, and anterodistal angle spined. Propod slightly shorter than carpus; anterior margin with 3 groups of long spines; posterior margin expanded slightly into a scabrous pellucid lobe, with a row of long spines on surface set back from margin; palm half of propod width. Dactyl short, stout, not reaching end of palm.

Gnathopod 2. Sideplate subsquare, spined ventrally and posteriorly. Basos posterior margin sparsely spined, widening sharply to about one-third of length. Basos and ischium subtriangular in cross-section; anterior surface grooved to take bent-back propod. Ischium subsquare, with anterior margins both lobed. Merus as long as ischium, half its width; posterodistal angles of both spined. Carpus very small. Propod greatest width about one-third of length, almost as long as basos plus ischium; anterior margin convex; posterior margin with a projecting tooth defining end of palm, the tooth bifurcated to take dactyl between its forks; palm with a sharp tooth one-third along from dactyl hinge that impinges on outer surface of dactyl, dividing palm into 2 concave depressions. Dactyl stout, with minutely spined medial surface and inner margin.

Peraeopod 1. Sideplate subrectangular. Basos width one-quarter of length; margins with short single spines. Ischium subrectangular; anterior margin slightly lobed; posterodistal angle spined. Merus as wide as ischium, about two-thirds of basos length, with groups of 2 or 3 spines on margins. Carpus narrower, one-third of merus length. Propod slightly narrower, about three-quarters of merus length. Spines seta-tipped.

Peraeopod 2. missing.

Peraeopod 3 longer than peraeopod 1. Sideplate with anterior lobe spined ventrally, posterior lobe spined posteriorly. Basos width half of length; margins with several short single spines, those on posterior margin the stronger. Merus shorter and wider, and carpus and propod longer than in peraeopods 1 and 2.

Peraeopod 4. Basos width slightly more than half of length, not narrowing noticeably throughout length, but posterodistally rounding. Merus, carpus, and propod stouter and longer than in peraeopod 3.

Peraeopod 5. Sideplate ventrally convex, with 2 minute marginal spines. Basos almost as wide as long; anterior margin with about 6 single stout spines; posterior margin serrate, with about 12 minute spines; otherwise like peraeopod 4.

Epimeral plates. Plates 1 and 2 with anterior margin rounded convexly to ventral margin; posterior margins serrate, minutely spined. Plate 2 with posterior margin slightly sigmoid. Plates 1 and 3 with posterior margins straight.

Pleopods. Outer ramus shorter than inner ramus; none of rami completely segmented, all with plumose setae; inner ramus of each pleopod longer than peduncle. Pleopod 3 much the shortest; peduncle with plumose setae.

Uropod 1. Peduncle with both dorsal margins spined. Inter-ramal seta long. Inner ramus with 3 dorsal spines and 2 short and 2 long end spines; outer ramus dorsally naked, with 1 long and 3 short end spines.

Uropod 2. Peduncle with both dorsal margins spined. Both rami spined dorsally; outer ramus with 2 short, 1 medium, and 1 long end spines; inner ramus with 2 short and 2 long end spines.

Uropod 3. Peduncle much larger than ramus, with 1 short and 1 long spine dorsally. Ramus with 1 short and 1 long end spine.

Telson subtriangular, with about 3 seta-tipped spines on each apex and 2 on each side.

Female. As for male except as follows. Length 12 mm, width 2.25 mm, depth 2.5 mm.

Antenna 1 1.25 mm long.

Antenna 2 5.5 mm long.

Gnathopod 2. Basos anterior margin and posterodistal angle spined. Ischium slightly longer than wide, spined posterodistally. Merus posterior margin with a scabrous pellucid lobe bearing a few spines on each side and at base. Carpus larger; posterior scabrous lobe spined as in merus; anterodistal angle spined. Propod slightly shorter and narrower than carpus, widening distally; posterior margin scabrous, produced beyond vertical palm. Dactyl outer base with 4 or 5 slender spines; palm with several short

spines continuous with a row across propod to postero-proximal angle.

Broodplates with short setae on ventral and posterior margins; width about 3x length.

Type data. Syntypes (designated by Hurley 1957): Campbell Island, under stones and wood, C. Chilton (CMNZ, Chilton Collection, slides CM1 and CM2).

Topotypes (designated by Hurley 1957): same data as syntypes (CMNZ, slides 47 and 48).

Material examined (AMNZ, CMNZ, NMNZ, NZAC). Type series, plus other collections with the following data.

Campbell I. — "Mt Stream Collection", moss and lichens, T.H. Sorensen, 24 Feb 1947; Mount Station, 24 Feb 1947, C. Chilton, in moss and lichen; Mt Beaman, 17 Aug 1947, J.H. Sorensen, ex B Fleafmould; Mt Beaman, 10 Jan 1969, P.M. Johns, under tussock; Mt Lyall, 21 Jan 1969, beating tussocks near *Diomedea* colony; Beeman (*sic*) Camp, 21 Feb 1981, G.W. Ramsay, beating and under stones; Northwest Bay, 24 Feb 1981, G.W. Ramsay & T.K. Crosby, *Dracophyllum* forest litter; Beeman (*sic*) Camp, 26 Feb 1981, G.W. Ramsay, supralittoral zone on *Poa*; also Chilton, Stephensen, "under wood or stones".

Auckland I. — Magnetic Station Cove, 18 Jan 1966, P.M. Johns, *Metrosideros* forest; also Auckland I., Adams I., Stephensen.

Remarks. *Makawe insularis* was first described by Chilton (1909) from specimens taken on Campbell Island "up to the top of the highest hills." Chilton described only the male gnathopods.

Stephensen (1927) described a variety based on a male with a different second gnathopod from material collected on Auckland and Adams Islands.

Hurley (1957) remarked on the differences between the specimens from the different islands, but "after examining varietal specimens and comparing them with the type material, I can find no essential differences apart from those already described, further confirming the suspicion that these are only older males than the type specimens and those that Stephensen attributes to Chilton's original species." He considered that both forms are found on both Campbell Island and Auckland Island, and noted the following differences between the Auckland Island specimens and the types.

The male pleopods are somewhat longer, and the first two pairs show a greater discrepancy in length between outer and inner rami than in the female, but generally there is little difference, particularly in regard to the comparatively short and squat pleopod 3 peduncle.

The female first gnathopod is not as angular as in Stephensen's figure, and the dactyl appears longer and less stubby.

In the absence of good specimens in sufficient number to resolve whether or not the Auckland Island population are the same species, I must leave the situation as Hurley did: a single species inhabiting Campbell, Auckland, and Adams Islands.

This species can be easily identified by the distinctive telson, pleopods, uropods, and epimeral plates, and the basos and sideplates of peraeopods 3–5.

Makawe maynei (Chilton) new combination

Plate 10, Map 12

maynei Chilton, 1909: 637–638, fig. 7a–g (*Parorchestia*).
Stephensen, 1927: 349; —1935: 13–14; —1938: 259–260. Shoemaker, 1935: 66. Hurley, 1957: 191–196, fig. 316–335 (*Orchestia*).

Diagnosis. A moderate-sized, strongly sexually dimorphic *Makawe* with moderately long antennae, pleopods all present and strongly setose, maxilliped palp developed, a marked carina on the basos median surface of peraeopod 3, diamond-shaped telson with 3 large spines on apex, uropod 1 outer ramus dorsal surface without spines, and interramal spine only moderate in size.

Description. Male. Length 12 mm, width 3.5 mm, depth 3.5 mm (based on Hurley's supplementary specimen).

Antenna 1 reaching beyond peduncle segment 4 of antenna 2. Peduncle segment 1 as long as 2nd segment, half length of 3rd. Peduncle segments 1 and 2 spined distally, segment 3 with a few single spines on margins and end. Flagellum shorter than peduncle, with 5 segments; segments longer than wide, with setae on end margins.

Antenna 2. Peduncle segment 3 about one-third length of segment 4, spined distally; other segments with small marginal and surface spines. Flagellum as long as peduncle, with 31 segments; segments longer than wide.

Maxilliped (not entire in holotype). Inner plate end margin slightly oblique and slanting inwards, with about 5 setulose spines outside end teeth, a few setose spines between inside teeth, and a strong field of setose spines down cleft almost to basos. Outer plate distally rounded; outer margin with 3 or 4 setose spines distally; inner margin with a strong field of spines just past end of inner plate, and a transverse row of about 4 spines set apart a little lower. Basos to carpus segments with 1–3 medium to long spines on outer distal angle, 2 on ischium below merus inner

angle. Merus and carpus inner distal angles with 3 spines; carpus much wider than deep, its inner margin expanded into a wide, strongly spined flange. Propod with a similar, less pronounced flange, distally spined; outer distal angle with 1 long and 2 short strong spines, 4 short strong spines singly across dactyl articulation on one side, and on other a row of 4 long close spines. Dactyl distinct, conical, with 4 or 5 distal spines.

Gnathopod 1. Sideplate ovate, distally rounded; margin with strong spines. Basos width one-quarter of length; margins with a few single spines. Ischium small, subsquare, posterodistally spined. Merus subrectangular, not half of basos length; posterior margin with several spines, produced distally into a scabrous lobe. Carpus three-quarters of basos length; anterior margin slightly convex, with a few single spines; distal angle with a spine group; surface strongly spined; posterior scabrous lobe marked off by long spines. Propod subrectangular, half of basos length; distal width half of length; anterior margin with 4 groups of spines; posterior scabrous lobe with about 6 long spines along base; palm small, slightly oblique, with short spines. Dactyl overlapping palm, with 2 small stout spines near inner base.

Gnathopod 2. Sideplate almost rectangular, but ventral margin rounded to posterior excavation. Basos width one-third of length, with a few small spines on margins. Ischium small, subsquare, with distal angle spined. Merus similar, smaller. Carpus very small and indistinct. Propod ovate, as long as basos plus ischium, slightly longer than wide; margins convex, with posterior margin half length of anterior margin; palm somewhat oblique, fairly broad, with a strong acute tooth near dactyl hinge, strongly excavate beyond tooth; remaining two-thirds of palm almost right-angled; palm margins forming small ridges, the inner one spined. Dactyl stout, its end spatulate, fitting into shallow depression between palmar ridges, with fine setae on inner margin and a projecting boss on dactyl near hinge, the boss impinging against anterior margin of palmar tooth.

Peraeopod 1. Sideplate wider than deep. Gills small, simple. Basos slightly concave, width one-quarter of length. Ischium small, subrectangular, distally spined. Carpus length nearly 3x width. Propod narrower, three-quarters of merus length; anterior margin with 4 groups of small spines; posterior margin with 6 pairs of larger spines. Dactyl one-third of propod length, with inner margin setose.

Peraeopod 3. Sideplate anterior lobe ovate, much wider and slightly deeper than posterior lobe; ventral margin spined; posterior lobe subtriangular; posterior margin barely concave, with 2 small spines. Basos width two-thirds of length; anterior margin with groups of short stout

spines; posterior margin with smaller single spines, slightly angular, not serrate; a thin raised and spined ridge or carina extending longitudinally, so basos Y-shaped in cross-section.

Peraeopod 4. Basos width two-thirds of length; margins convex, with about 12 single spines on each, stronger on anterior margin. Other segments as in peraeopod 5.

Peraeopod 5. Basos as wide as long, with margins convex; anterior margin bearing short single spines; posterior margin serrate, minutely spined. Ischium small, subsquare, with anterodistal angle spined. Merus width half of length, one-third of basos length; lateral margins more or less parallel, spined; anterior margin with more numerous spines. Carpus narrower, slightly longer, otherwise like merus. Propod narrower, as long as basos; anterior margin bearing about 9 groups of 2 or 3 stout spines and posterior margin about 7. Dactyl long, slender, one-quarter of propod length.

Epimeral plates. Plate 1 subtriangular; ventral margin rounded to posterior margin, the latter convex between spines, not serrate, with about 4 minute spines. Plate 2 with anteroventral margin convex; posterior margin more-or-less straight, with 9 minute spines and small marginal convexities between spines. Plate 3 subsquare; anterodistal angle bluntly rounded; posterodistal angle right-angled; ventral margin straight; posterior margin serrate, with about 8 minute spines.

Pleopods all present and biramous. Pleopod 1 peduncle with a single plumose seta on outer distal angle; rami subequal, slightly shorter than peduncle, with about 7 superficial segments, their margins finely bristled; outer ramus segment 1 with about 3 plumose setae on outer margin; other segments with a pair of plumose setae each. Pleopod 2 peduncle shorter and thicker than in pleopod 1, its outer distal margin with 3 plumose setae; rami with about 6 superficial segments. Pleopod 3 peduncle width two-thirds of length, its outer margin with about 10 plumose setae; inner ramus as long as peduncle, with about 6 superficial segments; outer ramus slightly longer.

Uropod 1. Peduncle dorsal margins spined; a strong inter-ramal spine present; outer ramus dorsal margin naked, terminating with about 4 spines; inner margin with about 4 dorsal and 4 end spines.

Uropod 2. Peduncle dorsal margins spined; rami with about 4 dorsal and 4 terminal spines.

Uropod 3. Peduncle twice length of small conical ramus, with 2 large spines dorsally; ramus with 2 large and 1 small end spines.

Telson almost diamond-shaped, with 3 large spines on each apex and 2 large spines proximally on surface near margin.

Female. As for male except as follows. Length 13 mm, width 2.75 mm, depth 3.75 mm (supplementary specimen).

Antenna 2 flagellum with 26 segments.

Gnathopod 1. Sideplate subovate, deeper than wide, ventrally and posteriorly spined, ventrally convex. Merus posterior margin with 5 or 6 long spines, produced slightly to a lobe but not scabrous. Carpus two-thirds of basos length, its distal width half of length; anterior margin with 4 pairs of spines; scabrous lobe with 4 or 5 long spines near margin, 6 or more at base of scabrous area. Propod posterior margin very straight, scabrous, with long spines; palm transverse, not clearly defined, with numerous spines particularly posteriorly, some stout. Dactyl in type specimens not as long as palm, in others slightly longer, with 2 spines on inner margin near hinge.

Gnathopod 2. Sideplate large, with ventral angles rounded, ventrally spined. Gills very long and sinuous. Ischium subrectangular, nearly half of basos length. Merus posterior margin expanded into a scabrous pellucid lobe bearing about 6 long spines. Carpus subtriangular, two-thirds of basos length; anterior margin convex, spined distally; posterior scabrous lobe spined distally. Propod half of basos length; anterodistal angle spined; posterior scabrous area expanded past small oblique spine-guarded palm, with short spines along base of scabrous area to palm. Dactyl as long as palm.

Peraeopod 4. Sideplate extending halfway down basos, with a single serration and a minute spine ventrally.

Epimeral plate 2 with fewer minute spines, and posterior margin straighter.

Pleopods. Pleopod 1 peduncle with 9 segments. Pleopod 2 peduncle with 10 segments. Pleopod 3 peduncle with 8 segments.

Type data. **Holotype:** Auckland Island, Norman (*sic*) Inlet, 27 November 1907, J.B. Mayne (CMNZ, Chilton Collection).

Syntypes (designated by Hurley 1957): Disappointment Island, — Nov 1907, W.R.B. Oliver (CMNZ).

Material examined. Type series, plus collections in CMNZ bearing the following data: Adams I., R. Speight, 2000'. Disappointment I., W.B. Benham.

Remarks. *M. maynei* may be easily recognised by the distinctive male gnathopod 2 with its spined and emarginate palm, the pronounced and spined carina (longitudinal ridge) on the peraeopod 3 basos median surface, and the distinctive spination of the telson.

***Makawe otamatuakeke* new species**

Plate 11, Map 12

Diagnosis. A moderate-sized landhopper of the genus *Makawe*. Body pigmentation pattern in alcohol consisting of transverse reddish hoops superolaterally and dots laterally. Eyes round, black. Antenna 1 short, extending to or just beyond junction of antenna 2 peduncle segments 4 and 5. Antenna 2 short, not very tapering, delicately spined. Gnathopod 1 chelate in both sexes. Gnathopod 2 mitten-shaped in both sexes. Peraeopods not very long and not particularly stout. Pleopods all present and biramous; outer margin of peduncles setose. Uropod 1 outer ramus naked, with a smaller inter-ramal spine. Uropod 2 outer ramus naked; inner ramus with 2 rows of marginal spines dorsally. Telson moderately cleft.

Description. **Holotype male.** Length 10.9 mm, width 1.50 mm, depth 1.57 mm. Pigmentation pattern (in alcohol) with 1 red transverse stripe on each segment superolaterally widening into a longitudinal stripe or dot laterally; sideplates with a large, diffuse red spot; appendages transversely banded. Eyes black, round, about one-third of head capsule length. Cheek with 3 prominent setae.

Antenna 1 1.20 mm long, extending just beyond junction of antenna 2 peduncle segments 4 and 5. Peduncle longer than 7-segmented flagellum. Peduncle segment 1 longer and broader than segments 2 and 3, with spines at dorsodistal angle. Peduncle segment 2 spined on inferior margin at midway; superodistal and ventrodistal angles with 2 spines each. Peduncle segment 3 as long as segment 2 but narrower, broadening distally. Flagellum segments successively narrower and longer; ultimate segment short, triangular, bearing a short, sparse terminal tuft.

Antenna 2 3.85 mm long, heavily spined with long, delicate spines. Peduncle segment 3 with spines at distal margin and on inferior margin. Peduncle segment 4 1.5x length of segment 3, with margins convex, spined. Peduncle segment 5 1.8x length segment 4, narrowing distally, with margins heavily spined and scalloped. Flagellum tapering, of 19 segments.

Upper lip. Ventral margin semicircular, pilose; inner shelf present.

Mandible with 6 interdentate pilose setae; abmolar setal tuft prominent; molar 20-striate, with medial seta long and pilose.

Maxilla 1. Outer plate broadening distally; distal margin with 9 inwardly curved teeth, the inner 5 bearing 4 lateral teeth. Inner plate narrow, narrowing distally, with both margins sparsely pilose, terminating with 2 pilose setae.

Maxilla 2. Outer plate narrowing slightly distally; inner plate foliaceous, with inner margin pilose.

Maxilliped broad, with relatively few, although large, spines. Inner plate distal margin rounded, with 2 large and 1 small spine teeth; pilose setae set submarginally, continuing down midline. Outer plate distal margin rounded; submarginal setal comb short, not continued down inner margin. Peduncle segment 1 with a short row of stout spines on medial distal margin. Peduncle outer distal angles spined. Palp broad; segment 4 relatively large, not obscured by segment 3.

Gnathopod 1. Coxal plate ventral margin rounded, with 2 large and 7 smaller marginal spines; plinthic ridge present, with 2 spines. Basos margins subparallel, curved anteriorly; anterior margin slightly concave, with spines at 0.44, 0.58, and 0.71; anterodistal angle with 3 spines; posterior margin convex, with larger spines at 0.43 and 0.76; posterodistal angle with 1 spine. Ischium anterior margin sinuous; posterodistal angle with 3 spines. Merus posterior margin with spines at 0.42, 0.62, 0.70, 0.71 (submarginal), 0.76, 0.81, and 0.86; carpus anterior margin with 2 spines at 0.35; anterodistal angle with 3 spines; posterior margin with about 8 large spines in a row between posteroproximal angle and mediiodistal margin; posterodistal angle with 1 large spine. Propod moderately broad, with both margins convex; anterior margin stepped and with spines at 0.72 (3) and 0.84 (3); anterodistal angle with 3 long spines; posterior margin with submarginal spines at 0.17, 0.35, and 0.52; palm convex, half of propod width, flanked by 2 large spines anteriorly, 5 smaller spines mesially, and 3 larger spines posteriorly; palmar angle 101°. Dactyl projecting slightly beyond propod margin.

Gnathopod 2. Coxal plate ventral margin rounded, with about 13 spines. Gill large, not convoluted; subcephalic lobe long, with distal margin rounded. Basos narrowing distally; anterior margin convex, with spines at 0.79; posterior margin sinuous, naked; posterodistal angle with 1 minute spine. Ischium long; posterodistal angle with 1 spine. Merus produced distally into a pellucid lobe guarded by 1 large spine at proximal edge and 4 spines at distal edge. Carpus anterior margin naked; anterodistal angle with 4 spines; posterior margin produced into a pellucid lobe that is broadest distally and guarded at base by 1 spine proximally and 3 spines distally. Propod mitten-shaped, long; anterior margin sinuous, naked; anterodistal angle with 4 spines; posterior margin produced distally into a pellucid lobe extending well beyond palmar area; palm small, oblique, flanked by 6 spines at posterior end; palmar angle 37°. Dactyl short, occluding propod pellucid lobe.

Peraeopod 1. Coxal plate ventral margin nearly straight. Gill a simple ellipsoidal sac. Basos broadening distally,

with both margins convex and stepped; anterior margin scalloped, with spines at 0.58, 0.69, 0.85, and 0.91; posterior margin with spines at 0.31, 0.50, 0.67, and 0.79; posterodistal angle with 2 spines. Ischium posterodistal angle with 2 large and 1 small spines. Merus broadening distally, with both margins scalloped; anterior margin with spines at 0.26, 0.47, and 0.72; posterior margin with spines at 0.08, 0.19 (2), 0.41 (2), 0.68 (2), and 0.88; posterodistal angle with 2 spines. Carpus with margins subparallel, curved posteriorly; anterior margin convex, stepped, with spines at 0.33 and 0.59; anterodistal angle with 3 small spines; posterior margin with larger spines at 0.11, 0.28 (2), 0.56, 0.63, 0.70, and 0.74; posterodistal angle with 3 larger spines. Propod broadest medially, with both margins stepped and scalloped; anterior margin with spines at 0.26 (2), 0.51 (2), and 0.82 (2); anterodistal angle with 3 spines; posterior margin with spines at 0.18 (2), 0.28 (2), 0.40 (2), 0.54 (2), 0.70 (2), and 0.87 (2); posterodistal angle with 1 spine. Dactyl short, conical, with margins not emarginate.

Peraeopod 2. Coxal plate ventral margin straight, with 10 spines. Basos curved anteriorly; anterior margin with spines at 0.67 and 0.78; posterior margin with spines at 0.38, 0.50, 0.64, and 0.88; posterodistal angle with 2 spines. Ischium posterodistal angle with 2 spines. Merus broadening distally; anterior margin with spines at 0.50; anterodistal angle with 3 spines; posterior margin slightly scalloped, with larger spines at 0.24 (2), 0.51 (2), and 0.76 (2); posterodistal angle with 3 spines. Carpus broadening distally; anterior margin stepped, with spines at 0.47; anterodistal angle with 2 spines; posterior margin scalloped and stepped, with larger spines at 0.29 (2) and 0.56 (2); posterodistal angle with 4 spines. Propod curved posteriorly; anterior margin convex, stepped, with spines at 0.34 (2), 0.62 (2), and 0.84 (2); anterodistal angle with 2 spines; posterior margin deeply scalloped, with spines at 0.21 (2), 0.35 (2), 0.53 (2), 0.69 (1), and 0.82 (2). Dactyl short, conical, curved posteriorly; posterior (inner) margin slightly emarginate.

Peraeopod 3. Coxal plate lobes broadly rounded, the anterior lobe with 10 spines, the posterior lobe with 6 spines. Gill a simple, flattened discoid. Basos an inverted pear-shape; both margins with 8 large spines. Ischium anterodistal angle with 2 spines. Merus broadening distally, with both margins stepped; anterior margin with spines at 0.45; anterodistal angle with 4 spines; posterior margin with spines at 0.13 (1), 0.29 (2), and 0.60 (2); posterodistal angle with 3 spines. Carpus anterior margin stepped, with spines at 0.60; anterodistal angle with 2 spines; posterior margin scalloped, with spines at 0.12, 0.28, 0.52, and 0.79; posterodistal angle with 2 spines. Propod narrowing distally, with both margins stepped;

anterior margin with spines at 0.31 (2), 0.51 (2), and 0.83 (2); anterodistal angle with 3 spines; posterior margin with spines at 0.16 (1), 0.27 (2), 0.41 (2), 0.61 (2), 0.77 (2), and 0.83 (1).

Peraeopod 4. Coxal plate ventral margin rounded, with 6 small spines. Gill a simple ellipsoid. Basos nearly ovate, broadest proximally, with both margins spined, although spines on anterior margin slightly larger. Ischium anterodistal angle with 2 spines. Merus broadening distally; anterior margin stepped, with spines at 0.12 (1), 0.21 (2), 0.35 (1), 0.44 (3), 0.64 (1), and 0.71 (2); anterodistal angle with 3 spines; posterior margin scalloped, with spines at 0.14, 0.30, and 0.62. Carpus damaged in holotype. Propod narrowing distally, with both margins stepped; anterior margin with spines at 0.12 (2), 0.22 (3), 0.35 (3), 0.70 (3), 0.78 (3), and 0.89 (3); posterior margin with spines at 0.19 (3), 0.36 (4), 0.62 (4), 0.82 (4), and 0.93 (4); posterodistal angle with 2 spines.

Peraeopod 5. Basos broadest distally, width 0.93 of length; anterior margin with large spines; posterior margin slightly scalloped, with small spines. Ischium posterior margin nearly straight; posterodistal angle with 2 spines. Merus broadening distally; anterior margin scalloped, stepped, with spines at 0.16 (1), 0.29 (2), 0.50 (3), and 0.75 (2); anterodistal angle with 4 spines; posterior margin stepped, with spines at 0.22, 0.40, and 0.57; posterodistal angle with 2 spines. Carpus with both margins stepped and scalloped; anterior margin with spines at 0.17 (2), 0.34 (3), 0.59 (2), and 0.85 (2); anterodistal angle with 3 spines; posterior margin stepped, with spines at 0.35 (2), and 0.64 (2); posterodistal angle with 4 spines. Propod narrowing distally, with both margins slightly scalloped; anterior margin with spines at 0.12 (2), 0.22 (2), 0.35 (2), 0.49 (2), 0.58 (2), 0.77 (2), and 0.88 (2); anterodistal angle with 1 spine; posterior margin with spines at 0.23 (2), 0.42 (2), 0.58 (2), 0.68 (3), 0.85 (2), and 0.93 (3); posterodistal angle with 3 spines.

Pleopods all present and biramous. Pleopod 1 0.95 mm long, pleopod 2 0.87 mm long, pleopod 3 0.85 mm long. All peduncles narrow, with setose outer margins; inner margins with 2 coupling spines distally; rami with obscure segmentation and heavily setose margins; inner ramus on each pleopod slightly longer than outer ramus.

Uropod 1. Peduncle with 6 dorsal spines; a large interramal spine present, extending to 0.41 along rami. Outer ramus long, thin, somewhat wasp-waisted, naked dorsally, longer than inner ramus, with 1 long and 2 smaller terminal spines. Inner ramus delicate, with 4 spines on dorsal margin and 2 long and 2 short terminal spines.

Uropod 2. Peduncle with 4 large dorsal spines; an interramal spine present, reaching to 0.25 along rami. Outer

ramus naked, terminating with 1 long and 1 shorter spine. Inner ramus heavily spined dorsally, with 2 rows of 3 spines on both inner and outer margins, terminating with 2 long and 2 short spines.

Uropod 3 small, uniramous; peduncle with 2 dorsal spines; ramus terminating with 1 larger and 1 smaller spine.

Telson moderately cleft, each lobe with 2 marginal spines.

Female. As for male except as follows. Length 11.2 mm, width 2.18 mm, depth 2.05 mm.

Antenna 1 1.13 mm long. Flagellum of 6 segments.

Antenna 2 4.10 mm long. Flagellum of 17 segments.

Gnathopod 1. Basos anterior margin naked; posterior margin with spines at 0.33, 0.53, and 0.75. Propod slightly longer and narrower.

Gnathopod 2. Merus posterior margin with 2 more spines proximally; palm larger; palmar angle 56°. Propod distal pellucid lobe slightly less produced.

Broodplates present in winter stage, without spines in allotype, long and narrow, with spine bases only at rounded distal ends. Last pair with posterolateral margin rolled and thickened and with a few spine bases distally.

Type data. **Holotype:** male, DN, Oamaru, Warren Street Reserve, 6 May 1983, K.W. Duncan (CMNZ; slides and tube containing dissected remains).

Paratypes: same data as holotype. Collected from leaf litter under flax along with *Puhuruhuru patersoni*, *Makawe hurleyi*, and *Parorchestia ihurawao*.

Material examined. Type series only.

— / DN.

Remarks. *Makawe otamatuakeke* was abundant in the area in which it was found. It was taken with the coastal species *M. hurleyi*, whose centre of distribution is to the north of Oamaru, and *Puhuruhuru patersoni*, centred to the south. One specimen of the inland species *Parorchestia ihurawao* was also found at the same locality. *M. otamatuakeke* is distinguished by the combination of setose outer margins of the pleopods, naked outer rami of uropods 1 and 2, double spine row on the dorsal margin of uropod 2, and short antenna 1 that extends to or just beyond the junction of antenna 2 peduncle segments 4 and 5. Like most New Zealand landhoppers it possesses an odd mix of advanced and primitive characters.

The species name is a Maori expression meaning 'from my uncle's place.' The type material was collected from the garden of the late Mr Arthur Lawson (my wife's uncle), bordering a reserve in which the species is abundant.

Makawe parva (Chilton) new combination

Plate 12, Map 12

parva Chilton, 1909: 640–641, fig. 9 (*Parorchestia*).

Stephensen, 1927: 350;—1935: 14. Shoemaker, 1935:

66. Stephensen, 1938: 259–260. Hurley, 1957: 188–

191, fig. 297–315 (*Orchestia*).

Diagnosis. A small, pleisiomorphic landhopper of the genus *Makawe*. Strongly sexually dimorphic. Antenna 2 short, reaching peraeon segment 2. Male gnathopod 1 propod subrectangular, with a transverse palm; dactyl longer than propod width. Male gnathopod 2 propod strongly expanded into an ovoid; palm convex, heavily spined; dactyl strong, curved, with an expanded tip fitting into a socket of the propod. Male peraeopod 5 merus and carpus expanded. Pleopods all present, biramous, superficially segmented, relatively broad. Uropod 1 outer ramus naked on dorsal margin. Telson with stout marginal spines.

Description. Male. Length 8.5 mm, width 2 mm, depth 2.25 mm.

Antenna 1 1 mm long. Peduncle longer than flagellum; segments successively longer and narrower, with single spines on superodistal angles and smaller spines inferodistally. Flagellum with 5 segments, each bearing small spines inferodistally and longer setae superodistally; ultimate segment tapering, tufted.

Antenna 2 3 mm long, reaching 2nd peraeon segment. Flagellum longer than peduncle, of 13 segments.

Maxilla 1. Palp bristled.

Mandibles. Left cutting edge: upper article with 4 teeth, lower article coarsely fimbriate; spine row with 5 setose spines. Right cutting edge: upper article with 4 teeth.

Maxilliped. Outer plate with a few setulose spines on outer distal margin, continuous with row of non-setulose spines down inner margin; lobe distally produced a little into a terminal knob. Inner plate with about 10 setulose spines on one side across inner distal angle, 5 similar spines outside end teeth, 8 or 9 setulose spines on other side in a row from inner teeth down cleft almost to basos, and a field of bristles as far as basos parallel to and outside these. Merus inner distal angle and carpus mediiodistal margin with similar groups of spines; carpus and propod inner margins with spines on distal half. Outer distal angles of all segments with 1 or 2 long spines, and 3 further spines on propod across end margin. Propod barely longer than carpus and merus, half their width; carpus and merus wider than long. Dactyl rudimentary, not well defined.

Gnathopod 1. Sideplate subovate. Basos width one-third to one-quarter of length; margins with a few long

single slender spines. Ischium subsquare, posterodistally spined. Merus posterior margin with a few long spines at base of scabrous lobe. Carpus anterior margin with a long spine medially and a group on distal angle; posterior margin more than twice merus length; scabrous lobe with long spines at base. Propod widening distally, as large as merus; anterior margin with 3 groups of long spines; posterior margin produced into a scabrous lobe distally, with a few long slender spines on surface, mainly posteriorly; palm transverse, scabrous, half of propod width, with about 6 short spines. Dactyl long, impinging into a socket on end lobe of propod palm, with a group of spines on inner base and a spine on outer margin.

Gnathopod 2. Sideplate subovate. Basos triangular in cross-section, with a small spine on anterior and posterior margins, also on basos, merus, and ischium posterodistal angles. Ischium subsquare, with both anterior margins distally lobed, as large as merus. Carpus about half size of merus. Propod subovate, as wide as long, unspined except for palm, which has 9 or more short stout spines on each side; palm oblique, minutely corrugate; dactyl longer than palm, impinging on palmar groove, with tip spatulate and inner margin corrugate and minutely spined.

Peraeopod 1. Basos width one-quarter of length. Ischium narrower, a little longer than wide, with posterodistal angle spined. Merus width half of length, widening a little distally; a few strong spines on anterior margin, more strongly spined posteriorly, the spines stout and long; anterodistal angle produced downwards a little. Carpus width half of length; anterodistal angle spined; long stout spines on posterior margin. Propod narrower still, width one-third of length, with margins spined.

Peraeopod 2. Segments shorter and wider than in peraeopod 1, and spines stronger and longer; otherwise similar.

Peraeopod 3. Sideplate anterior lobe spined ventrally, posterior lobe spined posteriorly. Basos width proximally two-thirds of length, narrowing to one-third distally; anterior margin with a few short stout spines, posterior margin with a very few small single spines, serrate. Other segments stouter than in peraeopod 1, with merus proportionately much shorter, pyriform.

Peraeopod 4. Basos narrowing slightly distally, width about two-thirds of length; anterior margin with strong single spines; posterior margin with about 6 small spines, serrate. Other segments much stouter than in peraeopod 3, with spines very long and strong. Dactyl long, narrow, barely curved.

Peraeopod 5 longer than peraeopod 4. Basos anterior margin with strong spines; posterior margin with very small spines, strongly serrate; posterodistal angle only

slightly produced. Merus subtriangular, with very long strong spines on margins. Carpus as long as merus, subglobular, width two-thirds of length, strongly spined anteriorly; posterior margin sometimes with a single spine medially; posterodistal angle spined.

Epimeral plates. Plates 1 and 2 with anterior margin rounded sharply to ventral margin, and ventral to posterior. Posterior margin of all 3 plates with a few minute spines set well apart; margin between spines not serrate. Plate 3 with posterior margin slightly concave.

Pleopods. Segmentation only superficial; inner ramus the shorter. Pleopod 1 longest, with peduncle much longer than rami. Pleopod 2 longer than pleopod 3, with rami as long as peduncle.

Uropod 1. Peduncle with both dorsal margins spined; a large inter-ramal spine present; only inner ramus spined dorsally, with 3 short and 1 long end spines; outer ramus with 1 long and 3 short end spines.

Uropod 2. Peduncle dorsal margin spined; inner ramus with 2 dorsal spines and 3 terminal ones; outer ramus with terminal spines only, 2 long and 2 short.

Uropod 3. Peduncle much larger than ramus, with 1 dorsal spine. Ramus with 1 short and 1 long end spine.

Telson. Both margins with 3 equidistant large stout spines.

Female. Length 4.5 mm, width 1 mm, depth 1.5 mm.

Antenna 2 2 mm long. Peduncle segments with long slender spines inferiorly. Peduncle segment 4 half length of segment 5. Segment 5 with long spines superiorly. Flagellum with 10 segments.

Gnathopod 1. Sideplate ventrally rounded, with a few strong spines. Basos width one-quarter of length, with 1 or 2 spines on distal angles. Ischium slightly wider, sub-square, with 1 or 2 spines on distal angle. Merus half of basos length; posterior margin convex, with 1 spine. Carpus subtriangular, two-thirds of basos length, with a few spines on anterior margin and angle; scabrous lobe with about 4 long spines. Propod as long as merus; margins with 2 or 3 spines each medially; distal angles with 2 or 3 spines; palm transverse, irregular, and scabrous, half of propod width. Dactyl slightly overlapping palm.

Gnathopod 2. Sideplate ovate, posteriorly excavate, as wide as deep, with 2 or 3 spines ventrally; distal angles broadly rounded. Basos, ischium, and merus with a spine on distal angle. Basos width one-third of length. Ischium subrectangular, nearly half of basos length. Merus half of basos length; posterior margin with a large scabrous pellucid lobe. Carpus subtriangular, three-quarters of basos

length; anterior margin convex, posterior margin a scabrous lobe. Propod nearly as long as carpus; posterior scabrous lobe expanded past small oblique spine-guarded palm; a pair of spines below palm and at outer dactyl hinge. Dactyl as long as palm.

Peraeopod 3. Sideplate posterior lobe a little more triangular than in male.

Peraeopod 5. Carpus about three-quarters of basos length, slightly longer than merus, width one-third of length; margins more or less parallel.

Epimeral plates. Posterior margins straighter than in male, with only 1 or 2 minute spines. Plate 3 more rectangular than in male.

Pleopods. Pleopods 1 and 2 longer; peduncle much longer, as long as subequal rami; rami with about 5 superficial segments bearing plumose setae, not as lanceolate as in male; peduncle outer distal angles with 1 (1st) and 2 (2nd) plumose setae. Pleopod 3 peduncle greatest width three-quarters of length; outer margin with about 6 plumose setae and several plumose bristles; inner ramus the shorter, with about 4 superficial segments.

Type data. Topotypes (designated by Hurley 1957): 1 male, Auckland Island, [Normans Inlet], slide 69; 1 female, slide CM 6, C. Chilton (CMNZ).

Material examined. Topotypes and original collection from which these were designated, plus further collections with the following data: Auckland I. and Adams I., K. Stephensen, from trunks of rata trees; Musgrove Peninsula, 13 and 19 Apr 1947, J.H. Sorensen, some from trunks of *Nerta* [= *Meryta*?] trees (determined as female by DEH, actually male); Fleming Plateau, 16 Feb 1973, J.S. Dugdale, exposed fellfield at 487 m (1 female, 2 male, all very large) (all CMNZ).

— / Auckland Is.

Remarks. Chilton (1909) established this species by describing only the antennae, gnathopods, and peraeopods. It is distinguished by its short antennae, the ovoid and largely naked propod of the second gnathopod, the short, broad pleopods, and the dilated merus and carpus of the adult male peraeopod 5. In these characters it is similar to the supralittoral species of *Transorchestia*, in most of which one or more of the segments of peraeopods 4 and 5 are enlarged, and the antennae are short and stout — all adaptations for life in a supralittoral habitat. The collection data suggest that it is truly terrestrial, but the expanded merus and carpus on peraeopods 4 and 5 indicate that it burrows.

Makawe waihekensis new species

Plate 13, Map 12

Diagnosis. A small, weakly sexually dimorphic landhopper of the genus *Makawe*. Eyes large, deeply pigmented. Antenna short, not reaching to beginning of last segment of antenna 2 peduncle. Antenna 2 moderately long. Both antennae with very short spines. Gnathopod 1 without a plinthic ridge; propod chelate in both sexes. Gnathopod 2 propod mitten-shaped in both sexes. Gills moderately large, of a simple discoidal shape, half spiralled except for first and last, which are lobed. Pleopods all present, biramous, the last reduced in size; peduncle outer margins setose; rami heavily setose. Uropod 1 with a long interramal spine; both rami weakly spined dorsally. Uropod 2 rami both spined. Epimeral plates subsquare; anterodistal angles rounded.

Description. Holotype male. Length 11.2 mm, width 2.17 mm, depth 2.35 mm. Eye dark, its diameter about one-third of head capsule length.

Antenna 1 1.36 mm long, not reaching beginning of antenna 2 peduncle last segment. Peduncle segment 1 lost. Peduncle segment 2 with a minute spine at anterodistal angle. Peduncle segment 3 narrow, with a minute spine at ventrodistal angle. Flagellum of 7 segments, all about the same length and each with a group of minute spines dorsodistally. Terminal segment short, with a rudimentary terminal tuft.

Antenna 2 6.55 mm long. Peduncle length 2.90 mm. Peduncle segment 3 with a group of 3 longer spines at ventrodistal angle. Peduncle segment 4 superior margin with spines at 0.40, inferior margin with spines at 0.17 and 0.54 (2); ventrodistal angle with 1 spine. Peduncle segment 5 narrowing slightly distally, long; superior margin with spines at 0.20, 0.33, 0.53, 0.67, and 0.79; inferior margin with spines at 0.15, 0.27, and 0.48. Flagellum moderately long and slender, tapering, of 20 segments, each with short spines at the 4 distal angles. Terminal tuft very short and tight.

Upper lip distal margin slightly more pointed than usual, densely pilose; inner shelf present.

Mandible with incisor 5-toothed; lacinia mobilis with 4 teeth arranged in a plane, and 4 interdentate pilose setae; abmolar setal tuft dense; molar as wide as long, 15-striate, with a densely pilose seta medially.

Maxilla 1. Outer plate broadening slightly distally; distal margin with 8 spine teeth each bearing 0, 0, 1, 3, 4, 4, 4, 0 lateral teeth respectively. Inner plate narrowing distally, terminating in 2 pilose setae; inner margin finely pilose.

Maxilla 2. Outer plate ellipsoid; distal margin rounded,

with numerous inwardly curved spines; outer margin pilose. Inner plate distally pointed; distal margin flanked by a spine row terminating proximally with a long, pilose seta; inner margin pilose.

Lower lip scroll-shaped; inner and distal margins heavily pilose.

Maxilliped moderately broad. Inner plate rounded distally, with 2 large and 1 small spine teeth and below and beyond these a row of pilose setae extending distad. Outer plate inner margin nearly straight, with a setal comb set back from distal and inner margins. Palp segments 1, 2, and 3 with 1 long spine at outer distal angle and a spine tuft at inner distal angle. Palp segments 2 and 3 with distal margins spined. Palp segment 4 present, spined, not obscured by segment 3.

Gnathopod 1. Coxal plate anterodistal and posterodistal angles rounded; distal margin slightly emarginate, with 9 spines; plinthic ridge absent. Basos broadening distally; anterior margin straight, with spines at 0.62, 0.75, 0.85, 0.95, and 0.97; posterior margin convex, scalloped, with large spines at 0.26, 0.39, 0.59, and 0.79; posterodistal angle with 1 spine. Ischium anterior margin sinuous, slightly produced distally; posterodistal angle with 2 spines. Merus posterior margin convex, with spines at 0.34, 0.44, 0.53, 0.61 (2), 0.76, 0.81, 0.84, 0.87, and 0.89. Carpus broadening distally; anterior margin stepped, with spines at 0.20, 0.33, 0.58, 0.64, and 0.92 (1+2); posterior margin with spines at 0.24, 0.41, and 0.59; posterodistal angle with 1 spine. Propod narrower than carpus; anterior margin stepped and scalloped, with spines at 0.32, 0.55 (3), and 0.80 (2); anterodistal angle with 2 spines; posterior margin sinuous and emarginate distally, with spines at 0.40, 0.55, and 0.73; palm convex, half of propod width, flanked by a row of 6 spines; palmar angle about 97°. Dactyl projecting beyond propod margin, with 1 spine on outer (anterior) margin at base of terminal spine.

Gnathopod 2 distorted in holotype. Basos narrowing slightly distally; anterior margin with a small spine at 0.71; posterior margin slightly sinuous, naked. Ischium broadening distally; anterior margin slightly produced into a very discrete pellucid lobe distally. Propod long, mitten-shaped, with many spines running in longitudinal rows on both faces; palm oblique, small. Dactyl small.

Peraeopod 1. Gill moderately large, simple, narrowing distally. Basos curved slightly anteriorly; anterior margin with spines at 0.64, 0.75, and 0.91; posterior margin with spines at 0.40, 0.52, and 0.80; posterodistal angle with 2 spines. Ischium with 1 large and 1 minute spine at posterodistal angle. Merus broadening slightly distally; posterior margin with spines at 0.21, 0.44, and 0.72; posterodistal angle with 2 spines. Carpus anterior margin stepped, with

spines at 0.56; anterodistal angle with 1 spine; posterior margin scalloped, with spines at 0.18 (2), 0.39 (2), 0.63 (2), and 0.75 (3); posterodistal angle with 1 spine. Propod narrowing slightly distally; anterior margin stepped and slightly scalloped, with spines at 0.23 (2), 0.52 (2), and 0.79 (2); posterodistal angle with 2 spines; posterior margin scalloped, with spines at 0.11 (1), 0.19 (2+1), 0.36 (2+1), 0.52 (2+1), 0.70 (2+1), and 0.87 (2+1). Dactyl curved inwardly, somewhat wasp-waisted owing to margins being slightly emarginate distally.

Peraeopod 2. Gill simple, but distal half rotated about 90°. Coxal plate ventral margin almost straight, slightly emarginate, with 6 small spines. Basos margins subparallel; anterodistal angle with 1 spine; posterior margin with spines at 0.50 and 0.69. Ischium anterior margin not produced; posterodistal angle with 1 spine. Merus broadening distally; posterior margin with spines at 0.18 and 0.44; posterodistal angle with 2 spines. Carpus anterior margin slightly stepped, with spines at 0.51 and 0.77; anterodistal angle with 1 spine; posterior margin scalloped, with spines at 0.15, 0.41 (2), and 0.77 (4). Propod broadest medially; anterior margin stepped, with spines at 0.26, 0.45, and 0.77; anterodistal angle with 2 spines; posterior margin scalloped, with spines at 0.19 (2+1), 0.33 (2+1), 0.52 (2+1), 0.68 (2+1), and 0.86 (2+1).

Peraeopod 3. Coxal plate ventral margin rounded, with 2 minute spines. Basos an inverted pyriform shape; anterior margin nearly straight distally, but scalloped and with spines at 0.18, 0.28, 0.37, 0.49, 0.61, 0.76, and 0.88; anterodistal angle with 1 spine; posterior margin stepped and with spines at 0.16, 0.31, 0.41, 0.53, 0.72, 0.90, and 0.96. Ischium anterodistal angle with 1 spine. Merus broadening distally; anterior margin scalloped and with spines at 0.22 (2), 0.49 (2), and 0.82 (1); anterodistal angle with 2 spines; posterior margin stepped and with spines at 0.45; posterodistal angle with 1 larger and 1 smaller spine. Carpus margins subparallel; anterior margin scalloped and with spines at 0.21 (1), 0.34 (3), 0.58 (3), and 0.89 (3); posterior margin stepped, slightly scalloped, and with spines at 0.42 (1), and 0.67 (1+1); posterodistal angle with 1 larger and 1 smaller spine. Propod narrowing slightly distally; anterior margin scalloped and with spines at 0.12 (1), 0.22 (2), 0.40 (3), 0.63 (3), and 0.85 (3); posterior margin stepped and with spines at 0.33 (2), 0.58 (2), and 0.78 (2); posterodistal angle with 2 spines. Dactyl waisted; inner margin with 1 large spine at base of terminal spine.

Peraeopod 4. Gill broad, with a relatively short, triangular pendulous lobe. Basos ovoid, width 0.56 of length; anterior margin with larger spines at 0.06, 0.17, 0.27, 0.32, 0.44, 0.54, 0.69, and 0.83; anterodistal angle with 1 spine; posterior margin slightly stepped, with small spines at

0.45, 0.61, 0.74, and 0.87. Ischium anterodistal angle with 2 spines. Merus broadening slightly distally; anterior margin scalloped and with spines at 0.13 (1), 0.25 (1), 0.45 (3), 0.67 (3), and 0.90 (2); anterodistal angle with 1 long spine; posterior margin stepped and with spines at 0.26 and 0.53; posterodistal angle with 2 spines. Carpus long, with margins subparallel; anterior margin scalloped, with spines at 0.17 (1), 0.29 (2), 0.53 (2), 0.73 (1), and 0.89 (2); posterior margin nearly straight, with spines at 0.32, 0.48, and 0.70; posterodistal angle with 4 spines. Propod long; anterior margin with spines at 0.16 (1), 0.29 (2), 0.52 (2), 0.65 (3), 0.74 (2), and 0.90 (2); posterior margin with spines at 0.21 (2), 0.38 (3), 0.62 (3), 0.77 (2), and 0.90 (2). Dactyl slightly wasp-waisted.

Peraeopod 5. Basos width 0.77 of length; anterior margin slightly stepped and with large spines at 0.15, 0.23, 0.35, 0.50, 0.63, 0.74, and 0.89; posterior margin scalloped and with minute spines at 0.20, 0.29, 0.35, 0.45, 0.53, 0.64, 0.73, 0.80, and 0.91; posterodistal angle with 2 spines. Ischium anterodistal angle with 2 spines. Merus anterior margin with spines at 0.12 (1), 0.25 (2), 0.44 (3), and 0.69 (2) and scalloped; anterodistal angle with 2 spines; posterior margin with small steps and with spines at 0.26 and 0.54; posterodistal angle with 2 spines. Carpus margins subparallel; anterior margin deeply scalloped, with spines at 0.15 (2), 0.28 (1), 0.45 (3), 0.64 (3), 0.79 (1), and 0.85 (1); posterior margin scalloped, with spines at 0.26, 0.43, and 0.67. Propod with both margins stepped; anterior margin with spines at 0.10 (2), 0.21 (2), 0.35 (3), 0.45 (2), 0.56 (3), 0.69 (2), 0.75 (2), 0.84 (2), and 0.91 (2); posterior margin with spines at 0.18 (1), 0.29 (3), 0.46 (2), 0.67 (3), 0.84 (1), and 0.92 (2); posterodistal angle with 2 spines. Dactyl only slightly wasp-waisted, with both margins sinuous.

Pleopods relatively broad and stout. Pleopod 1 1.20 mm long; peduncle outer margin heavily setose with pilose setae, inner margin naked except for 2 coupling spines distally; inner ramus slightly shorter than outer ramus; both rami with long pilose setae on inner and outer margins. Pleopod 2 1.02 mm long. Pleopod 3 reduced but still biramous, 0.60 mm long, with 2 coupling spines on peduncle inner margin; rami equal in length, with a few short pilose setae.

Epimeral plates. Plate 1 subtriangular; posterodistal angle notched; posterior margin with 2 small, backward-pointing spines proximally. Plate 2 with anterodistal angle rounded; ventral margin convex; posterodistal angle acute, with a minute spine; distal margin convex, with 2 small spines proximally, emarginate distally. Plate 3 with ventral margin more rounded than plate 2; posterodistal angle acute and rounded apically; posterior margin emarginate, with 1 spine proximally.

Uropod 1. Peduncle with a row of 3 spines and another of 2 spines dorsally; inter-ramal spine reaching about one-third length of rami. Outer ramus with 2 spines dorsally, inner ramus with 4; both rami terminating with 2 larger and 2 smaller spines.

Uropod 2. Peduncle with 1 spine dorsally; a large inter-ramal spine reaching to about one-quarter length of rami; both rami with 3 spines dorsally and 1 long, 2 slightly smaller, and 2 small spines terminally.

Uropod 3 uniramous. Peduncle with 2 dorsal spines. Ramus with no marginal spines, terminating with 1 larger and 1 smaller spine.

Telson not cleft, with 1 marginal spine directed posteriorly on each lobe.

Female. As for male except as follows. Length 10.75 mm, width 2.59 mm, depth 2.94 mm.

Antenna 1. Peduncle segment 1 short, with 1 minute spine at ventrodorsal angle. Flagellum of 6 segments, the 1st segment longest.

Antenna 2. Segment 4 dorsal margin naked.

Maxilla 1 outer plate with a small palp on outer margin.

Gnathopod 1. Ischium posterior margin with 1 spine at midway. Carpus anterior margin with only 3 spine groups. Propod slightly narrower.

Gnathopod 2. Gill broad, trilobate, with a large sub-cephalic lobe. Basos anterior margin with spines at 0.34, 0.47, 0.59, and 0.73; posterior margin naked. Ischium posterior margin with 1 small spine at midway; posterodorsal angle with 4 spines. Merus posterior margin produced distally into a discrete pellucid lobe; margin with about 8 longer spines. Carpus anterior margin convex, naked; anterodorsal angle with 3 spines; posterior margin produced into a pellucid lobe, widest distally, with a few spines along its base. Propod shorter than carpus; posterior margin produced into a pellucid lobe extending beyond palm, with a row of spines running longitudinally along face; palm short, oblique, flanked by a few spines; palmar angle about 50°.

Broodplates. All except last pair with rounded distal end bearing about 11 setae; last pair with a rolled margin bearing 2 vestigial setae distally.

Uropod 1 peduncle with 3 spines in each dorsal row; outer ramus with 3 spines dorsally.

Uropod 2 peduncle with 4 spines dorsally; outer ramus with 2 dorsal spines.

Type data. Holotype: male, AK, Auckland, Waiheke Island, 12 February 1949, G. Chamberlain (CMNZ) (slide and tube containing dissected remains; author's catalogue no. KD 630).

Allotype: same data as holotype.

Paratypes: 1 male, 3 females, same data as holotype. This collection also contained *Parorchestia tenuis*. All the females collected were in breeding condition, and one was ovigerous.

Remarks. I describe this species with some reluctance, since the specimens available have deteriorated a little from their long storage in alcohol. However, they represent a good species, and as no other material is available I feel justified in describing it using the specimens at hand. It is very similar to *M. hurleyi* from the South Island; so similar, in fact, that it can be regarded as a sibling species differing only in its smaller size, more reduced pleopod 3, reduced spination on the dorsal margin of uropod 1, shorter first antenna, and emarginate epimeral plate posterior margin. It is easily separated from most other Northland and Auckland landhoppers by having both rami of uropod 1 spined dorsally, a character otherwise seen here only in genus *Tara*. The gills, however, are larger than in *M. hurleyi*, presumably because in the warmer environmental temperatures it experiences larger gills are required to maintain an adequate rate of oxygen uptake.

M. hurleyi is an abundant catastrophe-community and grassland species penetrating damaged and arid environments, achieving very high densities, and thriving in man-made habitats, yet *M. waihekensis*, so similar morphologically, appears to be a relict occurring only on Waiheke Island. It may be more widespread than this, but it cannot be a dominant species since I would have detected it in some of the thousands of collections I have examined from Northland and Auckland.

M. waihekensis is named after the type locality. 'Waiheke' means 'ebbing water' in Maori (Reed & Brougham 1978).

Genus *Parorchestia* Stebbing

Parorchestia Stebbing, 1906: 557. Type species *Orchestia tenuis* Dana, 1852, by original designation.

Like *Waematau*, with naked peduncle outer margins on pleopods, body fine, antenna 2 delicately spined and tapering, and uropod 1 outer ramus naked, but with uropod 2 outer ramus also naked. A truly inland species found far from the shore, with some species feminised and some with reduced pleopods.

Remarks. Stebbing erected this genus to receive *tenuis*, *hawaiensis*, and *sylvicola*. Both *sylvicola* and *hawaiensis*

are excluded by the definition above. They are more plesiomorphic species that are best placed in other genera.

Stephensen (1935) included in *Parorchestia* a number of species that are excluded by this definition. The New Zealand species in his grouping have been dealt with earlier in this work, but those beyond New Zealand need formal regrouping. *Parorchestia* as defined herein is endemic to New Zealand.

Parorchestia ihurawao new species

Figure 18, Map 12

Diagnosis. A weakly sexually dimorphic *Parorchestia* with a semi-reticulate body pattern (in ethanol) that defines prominent yellow superolateral dots. Eyes large, black. Antenna 1 extending to between one-third and one-half length of antenna 2 peduncle segment 5. Antenna 2 short, not very tapering, delicately spined. Gnathopod 1 chelate in both sexes. Gnathopod 2 mitten-shaped in both sexes. Peraeopods relatively short and stout. Pleopods all present, biramous, broad, marginally pilose or setose, with 2 coupling spines. Uropod 1 with a long inter-ramal spine reaching halfway along rami; outer ramus naked. Uropod 2 outer ramus naked.

Description. Male. Length 6.47 mm, width 1.18 mm, depth 1.50 mm. Pigmentation in ethanol a semi-reticulate red-brown pattern, with mid-dorsal longitudinal stripe ill defined on thorax, more definite on abdomen; segments each with 2 radial hoops merging superolaterally and a complex series of spots on thorax midlaterally. Colour in life rufous with a glistening, iridescent surface. Eye round, black, nearly half of head capsule length. Cheek with 2 prominent spines.

Antenna 1 1.27 mm long. Peduncle segment 2 slightly longer and narrower than segment 1; superodistal angle with 2 small spines; inferodistal angle with 2 large spines. Segment 3 with 2 spines on superior margin; superodistal angle with 2 spines; inferodistal angle with 1 large spine. Flagellum 5-segmented, extending to halfway along antenna 2 peduncle segment 5. Segments 1–4 equal in length, each progressively narrower, with 3 spines superiorly and 3 longer spines inferiorly on distal margins; ultimate segment short, triangular, with a sparsely setose terminal tuft as long as the segment itself.

Antenna 2 3.44 mm long, relatively short, not very tapering. Peduncle segment 3 distal margin spined laterally and inferiorly. Segment 4 superior margin with 2 minute spines; superodistal angle with 1 spine; inferior margin

with spines at 0.28 and 0.55; inferodistal angle with 1 spine. Segment 5 1.33x length of segment 4, narrowing distally, with 3 groups of spines on superior and inferior margins; distal surface with 1 spine superiorly, 2 spines superolaterally, 2 spines inferolaterally, and 1 spine inferiorly. Flagellum with 16 segments, each except the ultimate bearing 4 groups of 3 or 4 fine setae on distal margins; ultimate segment relatively long and conical, with a closely bound, sparse terminal tuft.

Upper lip. Distal margin slightly more acutely rounded than usual, finely pilose.

Mandible 5-toothed; lacinia mobilis 5-toothed, with 4 interdentate pilose setae; abmolar setal tuft absent; molar about 13-striate, with medial seta pilose, about as long as molar width.

Lower lip sparsely pilose distally.

Maxilla 1. Outer plate with a minute palp, otherwise naked; distal margin with 9 inwardly curved teeth bearing 0, 1, 1, 3, 3, 3, 3, 3, 3 lateral protuberances respectively (from outer to inner).

Maxilla 2. Outer plate margins subparallel; outer margin finely pilose; distal margin bearing 15 or so inwardly-curved teeth; inner margin concave distally, pilose. Inner plate more rectangular and less foliaceous than usual, with distal margin more defined and bearing 18 or so inwardly curved teeth; spine row terminating at inner margin in a densely pilose long seta; inner margin nearly straight, densely pilose, with pili nearly as long as distal teeth.

Maxilliped (lost in holotype; description based on a male paratype). Inner plate distal margin with 2 large and 1 small spine teeth, and with pilose setae submarginally and partly down midline. Outer plate rounded distally, with a fringing comb of setae set submarginally from inner and distal margins. Palp not very broad, with segment 4 not obscured by segment 3.

Gnathopod 1. Basos broadening distally; anterior margin slightly concave, with spines at 0.71, 0.82, and 0.89; posterior margin slightly convex, with spines at 0.72 and 0.80; posterodistal angle with 2 spines. Ischium posterodistal angle with 2 spines. Merus posterior margin convex, with spines at 0.45, 0.60, 0.79, 0.83, 0.87, and 0.89. Carpus broadening distally; posterior margin produced distally into a pellucid lobe; anterior margin with spines at 0.41; anterodistal angle with 4 spines; posteroproximal angle with 2 large spines; posterodistal angle with 2 large spines submarginally. Propod broadening distally; anterior margin stepped, with spines at 0.73 (2); posterodistal angle with 3 long spines; posterior margin convex, but not greatly produced, with 2 longitudinal submarginal rows of 2 and 3 long spines; palm convex, half of propod width, flanked by a row of 5 spines terminated anteriorly by 2 long spines;

palmar angle 92°. Dactyl slightly longer than palm, with 2 short spines at base of terminal spine.

Gnathopod 2. Basos broadest medially. Ischium long, with posterodistal angle bearing 1 small spine. Merus and carpus produced posterodistally into pellucid lobes. Propod broadest medially, mitten-haped; anterior margin slightly concave; anterodistal angle with 6 spines; posterior margin convex, produced into a pellucid lobe projecting distally beyond palmar region; palm flanked by about 5 spines; palmar angle 45°. Dactyl short.

Peraeopod 1. Basos broadening distally; anterior margin with spines at 0.67 and 0.90 (2); posterior margin with spines at 0.36, 0.49, and 0.79; posterodistal angle with 1 spine. Ischium posterodistal angle with 1 spine. Merus broadening distally; anterior margin stepped and spined at 0.45; posterior margin nearly straight, with spines at 0.24, 0.41, 0.52, 0.69, and 0.90. Carpus margins subparallel; anterior margin naked; anterodistal angle with 2 spines; posterior margin scalloped, with spines at 0.11, 0.26, 0.36, 0.63, 0.84, and 0.89. Propod narrowing distally; anterior margin stepped, with spines at 0.42; anterodistal angle with 3 spines; posterior margin scalloped and stepped, with spines at 0.26 (1), 0.40 (2), and 0.64 (2).

Peraeopod 2. Basos strongly curved anteriorly; anterior margin concave, naked; anterodistal angle with 1 spine; posterior margin convex, with spines at 0.48 and 0.71; posterodistal angle with 2 spines. Ischium rhomboidal, with posterodistal angle bearing 2 spines. Merus broadening distally; anterior margin with spines at 0.32; anterodistal angle with 2 spines; posterior margin with spines at 0.40, 0.81, and 0.89. Carpus with anterior margin naked; anterodistal angle with 3 spines; posterior margin scalloped, with spines at 0.33 (2), 0.70 (2), and 0.82 (1). Propod narrowing distally; anterior margin slightly scalloped, with spines at 0.35 (2) and 0.74 (2); anterodistal angle with 4 spines; posterior margin scalloped and stepped, with spines at 0.32 (2), 0.49 (2), and 0.74 (2); posterodistal angle with 1 spine.

Peraeopod 3 relatively short. Coxal plate lobes spined. Basos an inverted pyriform shape; anterior margin with spines at 0.22, 0.37, 0.52, and 0.73; anterodistal angle with 2 spines; posterior margin with large spines at 0.51 and 0.79 and small spines at 0.09, 0.22, and 0.44; posterodistal angle with 1 large spine. Ischium anterodistal angle with 2 spines; posterior margin slightly produced. Merus short, broadening distally; anterior margin with spines at 0.40, 0.77, and 0.89; posterior margin with spines at 0.35; posterodistal angle with 2 spines. Carpus as long as merus, with margins subparallel; anterior margin with spines at 0.28 (1), 0.47 (2), and 0.79 (3); posterior margin naked; posterodistal angle with 1 large and 2 smaller spines.

Propod tapering distally, with both margins stepped; anterior margin with spines at 0.18 (1), 0.32 (2), 0.50 (2), and 0.73 (3); posterior margin with spines at 0.47 (2) and 0.75 (2); posterodistal angle with 4 spines.

Peraeopod 4 relatively short. Gill not very large, with pendulous lobe short, triangular. Coxal plate ventral margin rounded, naked. Basos an inverted pyriform shape; anterior margin with spines at 0.07, 0.11, 0.23, 0.34, 0.49, 0.64, and 0.82; anterodistal angle with 1 spine; posterior margin with spines at 0.56 and 0.82. Ischium anterodistal angle with 2 spines. Merus broadening slightly distally, with both margins stepped; anterior margin with spines at 0.27 (2), 0.52 (3), and 0.90 (1); anterodistal angle with 2 spines; posterior margin with spines at 0.31 and 0.56; posterodistal angle with 1 long spine. Carpus anterior margin scalloped, with spines at 0.25 (2), 0.51 (3), 0.79 (1), and 0.87 (3); posterior margin with spines at 0.59; posterodistal angle with 3 spines. Propod broadest medially, with both margins stepped; anterior margin with spines at 0.15 (1), 0.30 (3), 0.51 (3), 0.78 (3), and 0.92 (3); anterodistal angle with 1 spine; posterior margin with spines at 0.35 (3), 0.58 (3), and 0.87 (3); posterodistal angle with 3 spines.

Peraeopod 5. Basos as broad as long; anterior margin with spines at 0.23, 0.36, 0.44, 0.71, and 0.86; anterodistal angle with 1 spine; posterior margin scalloped, with minute spines at 0.12, 0.50, 0.60, 0.72, 0.84, 0.91, and 0.98; posterodistal angle with 1 spine. Ischium anterodistal angle with 1 large and 1 smaller spine. Merus narrowing distally; anterior margin with spines at 0.38 (2) and 0.68 (2); posterior margin with spines at 0.39 and 0.66; distal angles with 1 long and 1 smaller spine. Propod anterior margin with spines at 0.22 (2), 0.40 (3), 0.57 (2), and 0.79 (2); anterodistal angle with 1 spine; posterior margin with spines at 0.22 (2), 0.40 (2), 0.64 (2), and 0.88 (2); posterodistal angle with 3 spines.

Peraeopod gills relatively small simple sacs without plicate folding.

Pleopods all present and biramous though short and broad, with pleopod 3 the smallest. Pleopod 1 length 0.67 mm; peduncle broad, with margins pilose and with 2 coupling spines on inner margin; rami of equal length, broad; inner ramus inner margin pilose proximally. Pleopod 2 narrower and slightly shorter than pleopod 1; peduncle outer margin pilose, inner margin with 2 coupling spines; inner ramus slightly shorter than outer ramus. Pleopod 3 length 0.52 mm; peduncle outer margin pilose, inner margin with 2 coupling spines; rami of equal length, their segmentation not very obvious.

Uropod 1 moderately long and fine; peduncle with 3 spines dorsally; inter-ramal spine large, extending halfway along rami; outer ramus naked dorsally, slightly longer

than inner ramus, with 1 long and 2 shorter terminal spines; inner ramus with 3 spines dorsally and 2 long and 1 short spines terminally.

Uropod 2 (lost in holotype; description based on male paratypes). Peduncle with 3 dorsal spines; outer ramus naked dorsally, with 2 longer and 2 shorter terminal spines; inner ramus with 3 spines dorsally and 1 long, 2 shorter, and 2 very short terminal spines.

Uropod 3 uniramous; peduncle with 1 dorsal spine; ramus with 2 terminal spines.

Female. As for male except as follows. Length 9.12 mm, width 1.94 mm, depth 2.24 mm.

Antenna 1 1.52 mm long; flagellum with 6 segments.

Antenna 2 4.44 mm long; flagellum with 19 segments.

Gnathopod 1. Coxal plate ventral margin less rounded than usual, with about 4 large spines; plinthic ridge not well developed, with few spines. Basos broadening distally; anterior margin slightly concave, with spines at 0.63 and 0.80; anterodistal angle with 2 spines; posterior margin slightly convex, with spines at 0.73, 0.81, and 0.89; posterodistal angle with 2 spines. Ischium curved anteriorly; posterior margin convex, with 3 spines at posterodistal angle. Merus posterior margin smoothly convex, with spines at 0.28, 0.48, 0.64, 0.70, 0.79, 0.82, and 0.85. Carpus broadening distally; anterior margin with spines at 0.44 (2) and 0.66; anterodistal angle with 3 spines; posterior margin produced distally into a small pellucid lobe, with 4 large marginal spines, 2 smaller spines medially on outer surface, and 2 large spines at posteroproximal angle. Propod broadening distally; anterior margin convex, stepped, with spines at 0.53 (2) and 0.77 (2); anterodistal angle with 3 large spines; posterior margin convex, with 2 submarginal spines and a row of 3 mesial spines; palm convex, half of propod width, with 2 long spines at anterior end, flanked by a row of about 8 spines; palmar angle 108°. Dactyl longer than palm, with 2 small spines at base of terminal spine.

Gnathopod 2. Coxal plate ventral margin rounded, with about 8 large spines. Gill trilobate, with anterior lobe large and ellipsoid. Broodplates long, narrow, setose only distally. Basos broadest medially; anterior margin with spines at 0.43, 0.55, and 0.68; posterodistal angle with 2 spines. Merus long, with posterodistal angle bearing 2 spines. Ischium produced posterodistally into a pellucid lobe. Carpus anterior margin convex, naked; posterior margin produced into a pellucid lobe. Propod long, broadening somewhat distally, with both margins naked; anterior margin concave; posterior margin convex, produced distally into a lobe protruding beyond palmar area; palm very short, angled very acutely; palmar angle 20°. Dactyl short, about one-quarter of propod width.

Uropod 1. Peduncle with 4 dorsal spines; inner ramus with 4 dorsal spines.

Uropod 2. One of the dorsal spines appearing like a small inter-ramal spine.

Type data. Holotype: male, SC, Peel Forest (43°54'S, 171°15'E) (CMNZ).

Allotype: same data as holotype.

Material examined. Type specimens, plus non-type examples with the following data: Kaikoura, upper Puhupuhi R., 6 Jul 1968, P.M. Johns, in scree by stream (2 f) (KD 83); Kaikoura, Hapuku Scenic Reserve, 3 Sep 1977, K.W. Duncan, J. Craig, & M. Summerfield, in leaf mould (KD 28), 14 Apr 1980, K.W. Duncan, litter (KD 579), 31 Aug 1981, K.W. Duncan (KD 614–616); Kaikoura, Kowhai Bush Reserve, 2 Sep 1977, K.W. Duncan, roadside edge of bush in grass litter (1 imm.) (KD 33); Kaikoura district, Omihi Reserve, 3 Sep 1983, K.W. Duncan (5 f all breeding, 3 m much smaller than f) (KD 1003); Hundalee, Limestone Creek, 15 Feb 1960, P.M. Johns, in leafmould and mosses (1 f) (KD 27); Banks Peninsula, Kaituna Vly, 14 Apr 1967, R. Forster & C.L. Wilton (2 f) (KD 480); McLennan Bush, Awa Awa Reserve, Hutt Mt Rd, 31 Dec 1980, K.W. Duncan, *Nothofagus*-podocarp litter (13 f) (KD 592), 24 Apr 1983, K.W.D., litter of burnt black beech (KD 917); SE Mt Somers, Bowyers Stn, Sharplin Falls, 610 m, 2 Feb 1976, G.W. Ramsay; Mt Peel, Horsefall Rd, 2 Feb 1980, K.W. Duncan, podocarp-hardwood trampled undergrowth (KD 594); Peel Forest, 10 Feb 1946, R. Forster, leaf mould (KD 207), 3 May 1969, K.W. Duncan, in ecotone at forest margin (2 f) (KD 80), 2 Jan 1981, K.W. Duncan, ex podocarp-hardwood litter (5 f) (KD 593), 6 May 1983, leaf litter (taken with *Makawe hurleyi*) (KD 918, 919); Waimate, Kelseys Bush, 30 Mar and 30 Apr 1948, W.J. Paul, leaf mould (KD 150, 786); N bank of Waitaki River at Glentaki, 20 Aug 1977, S. Duncan, in grass (3 immature) (KD 19); Oamaru, Warren St Reserve, 6 May 1983, K.W. Duncan, in flax litter (taken with *Puhuruhuru patersoni*, *Makawe hurleyi*, and *M. otamatuakeke*) (KD 920); N. Otago, Goodwood Scenic Reserve, 27 Aug 1977, K.W. Duncan, in grazed bush litter (1 f, taken with numerous *Makawe hurleyi*) (KD 11); Dunedin, Sullivans Dam, — Oct 1965, R. Forster, in second-growth regenerating bush litter (1 imm. m) (KD 1); Dunedin, Woodhall Gardens, 21 Aug 1977, S. Duncan, in leaf litter (8 f, 4 m, taken with 6 specimens of *Makawe hurleyi*) (KD 2); Dunedin, Sullivans Dam, 20 Feb 1966, R. Forster, in second-growth regenerating native bush leaf litter (4 f, 3 m) (KD 3); Dunedin, Leith Vly, 21 Aug 1977, S. Duncan, in leaf litter (taken with *Makawe hurleyi*) (KD 10); Dunedin, Upper (Botanical)

Gardens, 6 Sep 1974, K.W. Duncan, in kanuka litter, (KD 24); Dunedin district, Leith Saddle, 6 May 1983, K.W. Duncan, leaf litter mixed podocarp-hardwood forest (taken with *Makawe hurleyi*) (KD 921); Barrier Vly, Red Stm, Barrier Camp, 2 Feb 1975, J.S. Dugdale, at night along bush margin (1f) (KD 951).

— / KA, NC, MC, SC, CO, DN, FD.

Remarks. *Parorchestia ihurawao* is a small but abundant species with a very distinctive pigmentation pattern consisting of a semi-reticulate bright rufous colour outlining prominent yellow dots. Other distinguishing characteristics are the short, blunt, pilose pleopods, the extremely long inter-ramal spine on uropod 1, and the weak development of the gnathopods in both sexes. It may be readily distinguished from *P. tenuis* by its short antenna 1, which reaches only up to half the length of the last peduncle segment of antenna 2.

The sex ratio is heavily biased, there being on average seven females to every male, although the ratio varies from place to place, and is less biased in wetter habitats. The females are small relative to other landhoppers, but the males are smaller still. The species inhabits forested regions, particularly podocarp-hardwood forests, on the foothills of the Southern Alps and in the coastal forests of Otago.

The early stage of development of eggs in the broods of ovigerous females collected in the Hapuku Reserve on 30 August 1981 indicates that breeding commences in the spring. These broods were very small, consisting of only 2-4 eggs depending on the size of the female. Other collections indicate that this species does not breed in winter, but the gills do not seem to change in form or size as do those of *Makawe hurleyi* in winter.

There is considerable variation in morphological features and pigmentation pattern from place to place in *P. ihurawao*. For example, specimens from the Dunedin district are much larger and have the first antenna extending just beyond the joint of peduncle segments 4 and 5 of antenna 2.

I regard this variation as indicating no more than sub-specific variation in a species with a gene pool that has undergone frequent and prolonged disruption by being isolated into virtual islands on hills and mountains separated by arid valleys, river action, and the like. But it may be that there is a species swarm consisting of a number of very similar sibling species derived from the same parental stock, each isolated region having given rise to its own specific form.

The specific epithet means 'from peel (or uncover) forest' in Maori.

Parorchestia lesliensis (Hurley) new combination

Plate 15, Map 5

lesliensis Hurley, 1957: 172-174 (*Orchestia*).

Diagnosis. A small, weakly sexually dimorphic *Parorchestia* with a reticulate body pigmentation pattern. Antennae fine and tapering, though not very long. Antenna 1 reaching slightly further than half-way along antenna 2 peduncle segment 5. Gnathopod 1 similar in both sexes, with dactyl almost reaching end of transverse palm. Male gnathopod 2 propod weakly developed, subrectangular, with a weakly developed scabrous lobe into which dactyl occludes. Pleopods 1 and 2 biramous and of similar size, finely pilose. Pleopod 3 reduced to a vestigial stump. Uropod 1 with a large inter-ramal spine. Telson partly cleft.

Description. Holotype: male. Length 11 mm, width 2 mm, depth 2.25 mm. Pigmentation pattern reticulate. Colour in life shining rufous brown, the pigmentation pattern becoming more obvious in ethanol, when the reticulation shows as a reddish network on a yellow-white background.

Antenna 1 2 mm long. Peduncle segment 2 slightly longer and narrower than segment 1, with a few minute spines on each. Segment 3 slightly longer than segment 2, narrower, with a few small spines superiorly and distally. Flagellum slightly longer than peduncle, with 7 segments, each bearing 2 pairs of setae superodistally, ultimate segment very small, with 2 terminal setae.

Antenna 2 4.75 mm long. Peduncle segment 4 twice length segment 3, half length of segment 5, which is narrower than both; lateral margins with long, fine, single and paired spines. Flagellum longer than peduncle, with 19 segments; ultimate segment a thin, narrow-spined finger.

Lower lip. Inner distal angle of each lobe with a small stout spine.

Left mandible with upper spine of cutting edge bifurcate, bearing 3 teeth on upper fork and 4 on lower, and with a row of 4 spines, one of them bifurcate.

Maxilliped. Inner plate with about 11 setulose spines on one side across inner distal angle and halfway down inner margin; outer margin with 4 setulose spines. Outer plate with a row of spines on inner surface set back from margin, a few spines on margin of outer distal angle, and a group of 3 or 4 on inner margin at ischium level. Palp segments successively shorter and narrower, with single or paired long spines on outer distal angles; several short spines present on inner distal angles, those on propod masking the minute rudimentary dactyl. Propod inner margin setose.

Gnathopod 1. Coxal plate subovate. Basos width one-

quarter of length, with a few short spines on posterior margin and both distal angles. Ischium subsquare, with posterodistal angle spined. Merus subrectangular; posterior margin medially scabrous, with a few spines at base and on each side of lobe. Carpus twice length of merus; anterodistal angle with few spines; posterodistal margin expanded into a scabrous pellucid lobe with long slender spines at base and on either side. Propod narrower, widening slightly distally; anterior margin with 3 groups of 3 or 4 long fine spines; scabrous posterior margin with 6–8 long slender spines set back from margin on each side; palm half of propod width, with about 6 long spines on each side and 3 at dactyl base. Dactyl almost reaching palm edge, with a short spine at 0.5 on inner and outer margins.

Gnathopod 2. Basos width one-third of length, with a few single spines posteriorly. Ischium about one-third of basos length, with posterodistal angle spined. Merus subrectangular; anterior margin contiguous with proximal two-thirds of carpus posterior margin; posterior margin distally produced into a scabrous pellucid lobe, spined on both sides. Carpus slightly longer than merus; anterior margin convex; posterior margin expanded into a scabrous lobe with spined base. Propod anterior margin convex; anterodistal angle spined; posterior margin scabrous, produced distally past palm into a pellucid lobe, thus defining corrugated palm; palm transverse, half of propod width, with about 6 short spines on each side, a parallel stouter row on propod immediately below, and longer finer spines from palm diagonally to posteroproximal angle; palmar angle 100°. Dactyl short, thick, with tip strongly hooked; inner margin with 5 or 6 small spines set back a little, creating a ridged appearance.

Peraeopod 1. Basos width one-quarter of length; anterior margin concave, with several single bifurcate spines. Ischium small, with posterodistal angle spined, Merus almost as long as basos, narrower, with margins strongly spined. Carpus anterior margin with 2 groups of short spines; posterior margin with 4 or 5 groups of paired longer spines. Propod longer, narrower; anterior margin with 4 pairs of short spines; posterior margin with 4 or 5 groups of 3 long spines. Dactyl long, with both margins spined.

Peraeopod 2. Basos expanded a little anterodistally. Carpus anterior margin spined only on distal angle.

Peraeopod 3 shorter than *peraeopod 2*. Coxal plate lobes spined ventrally. Basos greatly expanded proximally, strongly spined; spines on anterior margin paired; posterior margin narrowing very irregularly distally.

Peraeopod 4. Basos ovate, with margins spined.

Peraeopod 5 longer than *peraeopod 4*. Carpus, propod, and dactyl especially elongate. Basos ovate; anterior margin strongly spined; posterior margin spined, serrate.

Pleopods. First and 2nd biramous; peduncle with a group of small coupling spines; rami segmented, with plumose setae. Third: a vestigial triangular lobe representing peduncle, with no apparent spines.

Epimeral plates. Plate 1 with anterior margin convexly rounded; posterior margin slightly convex, minutely spined. Plates 2 and 3 with posterior margins straight, minutely spined and serrated.

Uropod 1. Peduncle inner dorsal margin with 2 or 3 spines distally, outer margin with about 6 stout spines; a large, curved inter-ramal spine reaching to half length of rami. Both rami with 1 long and 2 short end spines; inner ramus with 4 dorsal spines.

Uropod 2. Peduncle as long as rami; dorsal margins each with about 4 stout spines; inner ramus with 3 short spines dorsally and 2 long and 3 short end spines; outer ramus with dorsal margin minutely serrate, and with a few short spines on lower surface.

Uropod 3. Peduncle with 3 stout seta-tipped spines. Ramus much smaller than peduncle, with 1 long and 1 short end spine.

Telson with 2 spines on either side of apical notch.

Female. As for male except as follows. Length 14.5 mm, width 2.75 mm, depth 2.5 mm. Colour in ethanol mottled orange.

Antenna 1. Length 2 mm, reaching to halfway along 5th segment of antenna 2 peduncle; peduncle rather broader than in male; flagellum of 8 segments.

Antenna 2. Length 5 mm.

Gnathopod 1. Merus and carpus slightly longer than in male, with scabrous lobes not as well developed (merus lobe almost absent). Propod about two-thirds length of carpus; anterior margin with 3 groups of 2–4 spines and 3 smaller single spines set in from margin; posterior margin with 2 marginal groups of 2 or 3 longer stouter spines. Palm transverse, half of propod width, scabrous; 2 stout spines on each side of dactyl base, and 4 stout short spines defining end of palm.

Gnathopod 2. Broodplates lanceolate, with long, fine marginal setae. Basos margins spined. Ischium narrower, width about one-third of length; posterodistal angle with about 6 spines. Merus posterior margin produced into a scabrous pellucid lobe, with slender spines on each side and at base. Carpus subtriangular, about twice length of merus; anterior margin convex; anterodistal angle spined; long, flexible spines at distal base of scabrous pellucid lobe. Propod not as large as carpus; palm oblique, scabrous, with slender spines from posteroproximal angle to palm and 4 or 5 spines on palm. Dactyl short, curved, with a spine on outer margin.

Type data. **Holotype** not located, given by Hurley (1957) as "Slides 26, male; 28, female (Leslie Valley), Dom. Mus. Collection".

Paratypes: adult male and female, MC, Banks Peninsula, Coopers Knob, K.W. Duncan, 25 April 1992 (CMNZ, slides and tubes containing dissected remains).

Material examined. Paratypes, plus 15 non-type collections comprising 125 females and 35 males (AMNZ, CMNZ, NMNZ, NZAC, OMNZ).

WN? / NN, MC, SC, CO, SL.

Recorded on hills and mountains to 1516 m. Commonly taken in beech litter, although also found in relict totara forest litter and upland mixed podocarp/hardwood or podocarp/beechn forest.

Remarks. This upland species occurs discontinuously on hills and mountains throughout eastern districts of the South Island and, apparently, the south of the North Island. I have not been able to confirm its occurrence on the North Island in spite of extensive searching. It is easily identified by its reticulate body pattern, the vestigial third pleopod, and the characteristic gnathopods. It is moderately abundant, and often found in association with other landhopper species.

Parorchestia longicornis Stephensen

Plates 16 and 17, Map 12

stewarti Stephensen, 1938: 257–258 (in part as forma *longicornis*).

tenuis Hurley, 1957: 166–172 (*Orchestia*; *P. stewarti* synonymised).

Description. Male. Length 12.4 mm, width 1.3 mm, depth 1.37 mm.

Antenna 1 compressed dorsoventrally, extending to two-thirds along last segment of antenna 2 peduncle; length 1.1 mm. Peduncle segment 1 inner margin with 3 spines; inner distal angle with 1 spine; outer distal angle with 1 large spine. Segment 2 length 0.83x segment 1, width three-quarters of segment 1, broadening distally; inner margin with 2 spines; inner distal angle with 1 spine; superodistal margin with 1 long spine; outer margin naked. Segment 3 length 1.24x segment 2. Flagellum with 7 segments, each successively longer and narrower except the last; terminal segment short, triangular, with a short, closely bound apical tuft of 3 spines.

Antenna 2. Length 4.81 mm. Peduncle segment 3 inferior margin with 3 large spines. Peduncle segment 4 super-

ior margin naked; inferior margin with 2 large spines; inferodistal angle with 3 spines. Segment 5 superior and inferior surfaces with 5 spine groups; inferodistal angle with 1 long spine. Flagellum with 44 segments.

Upper lip wider than deep; ventral margin less curved than usual, sparsely pilose; inner shelf present.

Mandible. Molar 14-striate; medial seta present.

Maxilla 1. Outer plate with a minute palp on outer margin.

Maxilla 2. Outer plate distal margin rounded, with a row of inwardly curved spines; outer margin naked. Inner plate foliaceous; distal margin with a row of inwardly curved spines terminating on inner margin with a stout pilose seta.

Maxilliped not broad; spine teeth on inner plate longer than usual. Palp segment 4 not large, but not obscured by segment 3.

Gnathopod 1. Coxal plate ventral margin rounded, with long spines. Basos broadening distally, curved anteriorly; anterior margin concave, with minute spines at 0.49, 0.61, and 0.87; posterior margin slightly scalloped, with long spines at 0.17, 0.29, and 0.47; posterodistal angle with 2 spines. Carpus anterior margin with spines at 0.57, 0.76, and 0.89; anterodistal angle with 2 spines; superior face with 3 large spines; posterior margin produced medially into a pellucid lobe with 2 large spines at base. Propod broadening at 0.3 then narrowing distally, length 1.4x width; palm oblique, well defined by a sclerotic area, flanked by long spines, length 0.41x propod width; palmar angle 120°. Dactyl stout, projecting slightly beyond propod margin when occluded.

Gnathopod 2. Basos anterior margin with minute spines at 0.47, 0.52, 0.60, and 0.68. Ischium and carpus posterior margins produced into large pellucid lobes. Propod mitten-shaped; anterior margin sinuous, naked but for 2 spines at anterodistal angle; posterior margin produced into a large pellucid lobe; lateral faces each with a longitudinal row of spines; palm small, oblique; palmar angle 48°.

Peraeopod 1. All distal margins with relatively large spines. Basos curved anteriorly; anterior margin slightly stepped, with spines at 0.37, 0.52, 0.73, and 0.87; posterior margin with spines at 0.17, 0.42, and 0.65. Merus broadening distally but less than usual; anterior margin with spines at 0.28 and 0.48; anterodistal angle with 1 spine; posterior margin with spines at 0.25, 0.49, and 0.56; posterodistal angle with 2 spines. Carpus anterior margin naked; anterodistal angle with 2 spines; posterior margin scalloped, with spines at 0.23, 0.40, and 0.68; posterodistal angle with 1 spine. Propod curved slightly posteriorly, narrowing slightly distally, 1.1x length of carpus; anterior margin stepped, with spines at 0.35 and 0.77 (2); posterior margin with spines at 0.24 (1), 0.36 (2), 0.60 (2), and 0.80 (2).

Peraeopod 2. Basos curved anteriorly, broadening distally; anterior margin with large spines at 0.76 and 0.87; posterior margin with spines at 0.24, 0.36, 0.60, and 0.80; posterodistal angle with 1 spine. Ischium posterodistal angle with 1 spine. Merus anterior margin with spines at 0.51; anterodistal angle with 1 spine; posterior margin with spines at 0.27 and 0.53; posterodistal angle with 1 spine. Carpus shorter and narrower than merus; anterior margin naked; anterodistal angle with 1 spine; posterior margin with spines at 0.41, 0.74, and 0.88; posterodistal angle with 2 spines. Carpus narrowing distally; anterior margin with spines at 0.38 and 0.73; anterodistal angle with 1 spine; posterior margin with spines at 0.32, 0.55, and 0.77.

Peraeopod 3. Coxal plate lobes with only 1 or 2 spines. Gill simple. Basos an inverted pyriform shape; anterior margin slightly scalloped, nearly straight, with spines at 0.25, 0.48, and 0.77; anterodistal angle with 2 spines; posterior margin stepped, with spines at 0.32, 0.57, 0.78, and 0.92. Ischium anterior margin nearly straight; anterodistal angle with 2 spines. Merus broadening distally; anterior margin scalloped and stepped, with spines at 0.24 (1), 0.46 (2), and 0.88 (1); anterodistal angle with 1 long spine; posterior margin stepped, with spines at 0.44; posterodistal angle with 2 long spines. Carpus 1.15x length of merus; anterior margin deeply scalloped, with spines at 0.34 (2), 0.57 (2), 0.78 (1), and 0.92 (1); posterior margin naked; posterodistal angle with 2 spines. Propod narrowing slightly distally, with both margins stepped; anterior margin with spines at 0.24 (1), 0.35 (2), 0.56 (2), and 0.77 (2); posterior margin with spines at 0.40 (2) and 0.73 (2); posterodistal angle with 2 spines.

Peraeopod 4. Basos ovoid, with both margins slightly scalloped; anterior margin with spines at 0.38, 0.57, 0.76, and 0.98; anterodistal angle with 1 spine; posterior margin with spines at 0.05, 0.20, 0.37, 0.60, and 0.77. Ischium anterodistal angle with 2 small spines. Merus broadening distally, with both margins scalloped; anterior margin with spines at 0.28 (2), 0.53 (2), and 0.80 (1); anterodistal angle with 3 spines; posterior margin with spines at 0.27 and 0.49; posterodistal angle with 2 spines. Carpus with both margins stepped; anterior margin with spines at 0.19 (1), 0.32 (2), 0.56 (3), and 0.91 (2); anterodistal angle with 1 spine; posterior margin with spines at 0.46 (1) and 0.68 (2); posterodistal angle with 3 spines. Propod damaged.

Peraeopod 5. Basos subtriangular with convexly rounded margins; anterior margin with large spines; posterior margin with minute spines. Ischium anterodistal angle with 1 long and 1 small spine. Merus margins subparallel, long; anterior margin scalloped, with spines at 0.13 (1), 0.28 (2), 0.58 (2), and 0.89 (2); anterodistal angle with 3 spines; posterior margin with spines at 0.33 and

0.57; posterodistal angle with 3 spines. Carpus narrower than merus and only slightly longer, with margins subparallel, stepped; anterior margin with spines at 0.32 (2), 0.54 (1), 0.75 (1), and 0.88 (3); posterior margin with spines at 0.43 and 0.68; posterodistal angle with 3 spines. Propod 1.38x length of carpus, narrowing distally, with margins stepped; anterior margin with spines at 0.15 (1), 0.25 (2), 0.45 (2), 0.71 (2), and 0.85 (2); posterior margin with spines at 0.29 (2), 0.52 (2), 0.72 (1), and 0.89 (2); posterodistal angle with 1 spine.

Pleopods 0.76 mm, 0.61 mm, and 0.52 mm long respectively, very broad, with short stout peduncles each bearing a pair of coupling spines on inner distal angle. Pleopod 3 peduncle outer margin spined. Outer rami nearly twice length of inner rami. Segmentation obscure on all rami; marginal setae dense and of even length throughout.

Uropod 1. Peduncle longer than rami, heavily spined dorsally. A large inter-ramal spine present, reaching over one-third along rami. Outer ramus naked dorsally, with 3 long and 2 short terminal spines. Inner ramus as long as outer ramus, with 7 dorsal spines and 2 long and 2 short terminal spines.

Uropod 2. Peduncle with 4 spines dorsally. Outer ramus naked dorsally. Inner ramus with 2 rows of 4 dorsal spines, one on outer margin, the other on inner margin. Both rami terminating with 2 large and 2 small spines.

Uropod 3. Peduncle with 2 dorsal spines. Rami half length of peduncle, with 1 dorsal spine and 1 long and 1 short terminal spine.

Telson bilobed, each lobe bearing 1 terminal spine.

Female. As for male, except as follows.

Gnathopod 1. Distal segments not produced into pellucid lobes. Propod subrectangular, longer than broad; palm half of propod width, almost transverse. Dactyl longer than palm.

Gnathopod 2. Broodplates long and narrow, with terminal setae only. Gill relatively large and multi-lobed. Merus and ischium margins produced into pellucid lobes. Propod broadening distally, mitten-shaped, with margin produced well beyond small dactyl; palm short, flanked by heavy spination.

Peraeopods. Gills relatively large simple sacs. Broodplates long and slender, with terminal setae; lateral margins naked.

Uropod 2. Peduncle with a single row of setae.

Type data. Holotype: male, Stewart Island, under logs and stones in forest at great altitudes, 2 November 1914, Th. Mortensen (ZMKD).

Allotype: same data as holotype.

Material examined. Type specimens, plus 1 male and many females taken in leaf mould with 2 females and 6 other individuals of *P. tenuis* from Stewart I., Halfmoon Bay, 21 Nov 1946, R.R. Forster (OMNZ). Stewart I., Mt Rakeahua, 24 Nov 1981, L.C. Cadenhead & N.A. Deans, under podocarp bark (KD 797). Bluff Hills, 21 Jan 1955, B.A. Holloway & R.K. Dell (1 male, taken with 1 male *tenuis*). Also other females from Stewart I. (CMNZ, NZAC).

— / SL / SI.

Remarks. Stephensen (1938) described *Parorchestia stewarti* as having two forms, *brevicornis* with a short antenna 2 and *longicornis* with a long antenna 2. Unfortunately he was able to describe only the female of both forms.

In a subsequent review, Hurley (1957) merged this species into *Orchestia tenuis*. I agree with this decision with respect to forma *brevicornis*, given the present state of knowledge, but forma *longicornis* is a good species, since the relative length of the second antenna is highly species-specific. *P. longicornis* is clearly differentiated by its long antenna 2, broad, short, hairy pleopods, and the double row of spines on the dorsal margin of the inner ramus ofuropod 2, present on all the specimens (male and female) I have examined but not figured by Stephensen.

P. longicornis appears to be an upland and inland species restricted to Stewart Island and Southland. It is of delicate build, with long, slender appendages that are frequently damaged in specimens in collections.

Parorchestia tenuis (Dana)

Plates 18 and 19, Map 6

tenuis Dana, 1852: 202 (*Orchestia*); —1853, 1855: 872–873. Bate, 1862: 29. Stebbing, 1899: 402 (*Orchestia*); —1906: 557–558. Chilton, 1909: 642 (*Parorchestia*); —1911: 565. Stephensen, 1935: 14. Shoemaker, 1935: 6. Hurley, 1957: 166–172 (*Orchestia*). Bousfield, 1964: 45 (*Parorchestia*).

Description. Male. Length 10.5 mm, width 2.25 mm, depth 2.5 mm. Pigmentation pattern reticulate, with yellow dots on a pale red background in ethanol, the pigments becoming lost on extended storage in ethanol.

Antenna 1 1.75 mm long, almost reaching end of antenna 2 peduncle. Peduncle segments successively narrower; segment 1 as long as segment 2, and segment 3 slightly

longer; distal angles with a few long setae; a single seta halfway along each margin of segment 3. Flagellum as long as peduncle, with 7 or 8 segments each bearing short setae superiorly and longer ones inferiorly.

Antenna 2. Peduncle segments 3 and 4 slightly less than half length of segment 5; all segments with long marginal setae; surface of segments 4 and 5 setose, the setae usually single. Flagellum longer than peduncle, with 22 long, narrow segments; terminal segment tufted.

Mandible. Left mandible with a row of 5 or 6 scabrous spines; maxilla 5-toothed, lacinia mobilis 4-toothed. Right maxilla with a row of 5 spines.

Maxilliped. Inner plate with setulose spines between and outside end teeth. Outer plate with distal portion of inner margin bearing a row of spines set back a little from edge and reaching end of inner plate; outer margin with a distal row of 4 setose spines; spines present on basos below inner plate. Basos, merus, and ischium with 1–4 short and long spines on outer distal angles, also on inner distal angle of merus. Carpus and propod wider than long; inner margin produced into a flange, with a row of spines set back a little from margin. Propod smaller, with a similarly spined flange, more obviously produced; outer distal angle with about 5 very stout spines. Carpus and propod each with a row of 4 or 5 short spines medially on end margin. Dactyl longer than wide, cone-shaped, with distinct stout end spines.

Gnathopod 1. Basos width one-quarter of length; anterior margin with about 9 single spines; posterior margin with about 4 single spines medially and 2 or 3 small spines on distal angle. Ischium about one-third of basos length; anterior margin much shorter; posterodistal angle alone spined, with 3 or 4 spines. Merus subrectangular, with 2 pairs of spines on each side of scabrous lobe and a 3rd pair medially. Carpus with about 5 short stout spines on anterodistal angle; posterior free margin produced into a scabrous pellucid lobe, its greatest width distally half of carpus length, with 2 spines at distal base of lobe and about 5 on proximal margin below merus. Propod as long as merus but much narrower proximally, its width distally half of length; anterior margin with 4 groups of 2–5 stout spines; posterior margin with spines along base of scabrous area. Palm not half of propod width, with about 5 short stout spines on one side and several long setae on the other. Dactyl half of propod width, with small spines at 0.5 on outer margin.

Gnathopod 2. Coxal plate subsquare, wider than deep, spined; ventral margin rounded to posterior margin. Gills anchor-shaped. Basos strong, triangular in cross-section, width one-third of length, anteriorly recessed to receive propod; posterior margin with small single spines. Ischium small, wider than long; anterior margin recessed for pro-

pod; a minute spine on posterodistal angle. Merus slightly longer, with a few minute spines on posterior and end margins; posterodistal angle acutely pointed. Carpus very small, wedge-shaped. Propod greatly expanded, ovate, its width three-quarters of length; posterior free margin not half of propod length; palm oblique, more than half of propod length, produced a little into a small tooth near dactyl hinge; palmar area with short, seta-tipped end notched to receive dactyl; palmar angle 41° . Dactyl curved, considerably longer than palm, greatly narrowed at tip into a slender process; inner margin with short setae.

Peraeopod 1. Coxal plate not much wider than deep. Basos width one-quarter of length; anterior margin with a few single spines; posterior margin with about 5 spines. Ischium ovate, longer than wide, with posterodistal angle spined. Merus almost as long as basos, narrower, with long spines posteriorly and anterodistally. Carpus shorter, with a pair of stout spines on posterior margin at 0.5 and at anterodistal angle. Propod narrower, slightly longer than carpus; margins with about 4 groups of spines, the posterior groups stronger and with more spines. Dactyl relatively long, with a strong spine at 0.5 along inner margin and shorter spines on outer margin.

Peraeopod 2. Coxal plate much wider than deep. Segments narrower and shorter than in peraeopod 1.

Peraeopod 3. Gills lobed, liver-shaped. Coxal plate anterior lobe ovate, with 2 or 3 spines ventrally, twice as wide as smaller posterior lobe but slightly less deep; posterior lobe strongly rounded ventrally, with 5 spines ventrally and posteriorly. Basos narrowing evenly to ischium, narrower than long; anterior margin with about 6 groups of 1–4 short stout spines; posterior margin serrate, with about 12 irregular-sized minute and strong spines and a particularly long, strong spine at 0.5; distal angle not obvious. Ischium small, with strong spines anterodistally. Merus pyriform, two-thirds length of basos, with 3 groups of strong spines on anterior margin and 2 single spines on posterior margin; posterodistal angle a little produced, strongly spined. Carpus linear, slightly longer than merus, similarly spined, with anterior spines much the stronger, as in merus and propod. Propod similar but narrower and slightly longer, with 5 groups of spines anteriorly and 4 posteriorly.

Peraeopod 4 much the longest. Sideplate deeper than wide, ventrally rounded, with about 3 small spines. Basos ovate, width two-thirds of length; margins with strong single spines; posterior margin with fewer long spines interspersed with minute spines; posterodistal angle rounded, almost obsolete. Merus longer, proportionately narrower than in peraeopod 3. Dactyl longer and narrower, with segments in general more strongly spined and longer,

otherwise similar.

Peraeopod 5. Basos as wide as long, ovate; anterior margin with about 10 spines, and distal angle with about 4; posterior margin with about 12 serrations bearing minute spines; posterodistal angle rounded, not very prominent.

Epimeral plates. Plate 1 subtriangular; distal angle sharp, with a small tooth; posterior margin slightly convex, with about 5 minute spines and serrations. Plate 2 with anterior margin rounded; posterodistal angle almost right-angled, with a small tooth; posterior margin straight, with about 9 minute spines and serrations. Plate 3 with anterior margin less broadly rounded, otherwise similar to plate 2.

Pleopods. First: peduncle shorter than rami, long and narrow, with fine bristles on end of outer margin, a few small spines proximally, and 4 or 5 coupling spines. Rami with 9–16 superficial segments, and long plumose setae marginally. Second: peduncle with 3 coupling spines; outer margin more heavily spined than in pleopod 1; peduncle and rami subequal, otherwise like pleopod 1. Third: peduncle shorter and broader, longer than rami, with about 2 coupling spines and fewer segments.

Uropod 1. Peduncle with a single dorsal row of about 8 spines; a large single spine distally between rami for almost half their length. Inner ramus with 4 short spines dorsally and 2 short and 2 long end spines; outer ramus lacking dorsal spines, with 1 long and 3 short end spines.

Uropod 2. Rami and peduncle subequal. Peduncle with a dorsal row of about 7 spines. Inner ramus with 4 dorsal spines and 3 short and 2 long end spines. Outer ramus dorsal margin naked, with 2 long and 2 short end spines.

Uropod 3. Peduncle with 3 long dorsal spines; inner margin finely fringed with small setae. Ramus subtriangular, about half of peduncle length, terminating with 1 long and 2 short spines.

Telson almost subtriangular, cleft, with 2 long spines on end of each lobe.

Female. As for male except as follows. Antenna 2 with 30 flagellar segments.

Gnathopod 1. Propod about two-thirds of carpus length, much narrower, width about one-third of length; margins parallel, each with 3 groups of spines, and with spines on posterior surface; palm short, slightly oblique, defined by stout end spine; about 5 similar stout spines between end spine and dactyl hinge on one side of palm, and much longer, finer spines on other side; posterior margin scabrous. Dactyl slender, reaching end of palm, with 2 setae medially on surface.

Gnathopod 2. Broodplate long, narrow, sparsely setose, the setae not curl-tipped. Basos margins sinuous, a little expanded medially, with a few spines. Ischium half of

Puhuruhuru new genus

Type species *Puhuruhuru aotearoa* new species.

basos length, with posterodistal angle spined. Merus slightly shorter, half of carpus length; posterior margin expanded into a scabrous pellucid lobe, with about 4 spines. Carpus scabrous lobe with about 2 spines distally, 1 proximally. Propod as long as ischium, width one-third of length, expanded past palm and dactyl into a mitten shape; spine rows running from propod posterodistal angle to palm; anterior margin with about 3 single spines distally; outer distal angle with a spine group; palm small, oblique, spined. Dactyl short, curved, as long as palm, fitting into a small pocket.

Uropod 3 with 2 dorsal spines.

Type data. Holotype: female, collected according to Dana "Apud oras sinus 'Bay of Islands', Novi-Zelandiae." There is no doubt that the species does occur that far north, so the type locality may be taken as the Bay of Islands, forest margin, even though the type material is now lost.

Material examined. Non-type examples from 1820 collections (NZAC, BMNH, BPBM, AMNZ, NMNZ, CMNZ, OMNZ).

North I. / NN, BR, WD, FD / SI / ?Campbell I.

Collected throughout the year from mixed podocarp-hardwood forest litter, beech litter, manuka scrub, and gorse litter.

Distribution. Throughout New Zealand (North, South, and Stewart islands), with the exception of the east coast of the South Island north of Dunedin and south of Seddon. There is a dubious record (Chilton 1909) from the mouth of a freshwater stream on Campbell Island. *P. tenuis* is not usually coastal and is not found in fresh water, and since Chilton's specimens were small and therefore difficult to identify, the record from the subantarctic islands is suspect. It has been found from sea level to over 2000 m, and occurs in all kinds of native forests, although it is less common in beech forests and manuka/kanuka scrubland. It is also less common in grassland and suburban gardens. A notable feature is that it has recolonised the areas of the North Island devastated by volcanic ash showers. Obviously, it disperses rapidly and is an opportunistic coloniser.

Remarks. *Parorchestia tenuis* is one of the most common New Zealand landhoppers, and is readily identified by its bright red colour and strongly reticulate pigmentation pattern when recently killed in ethanol. It commonly occurs with other species, notably *Puhuruhuru aotearoa*, but is being displaced from agricultural areas and urban gardens by the very aggressive introduced landhopper *Arcitaitrus sylvaticus*.

Very like other terrestrial talitrids, but with a relatively spiny body and a simple first gnathopod in the mature female. Maxilliped outer plate arcuate. Male gnathopod 1 palm formed by posterior margin of propod becoming produced, especially distally. Palmar sclerotic area not as heavily developed as in other terrestrial genera. Dactyl on male gnathopod 2 guided and protected distally by a lobe at posterodistal end of palm.

This genus is related to the *Talitrus* assemblage, found beyond New Zealand, by the general form of the body, the simple gnathopod in the mature female, the size and form of the male first gnathopod, and the arcuate outer margin of the maxilliped outer plate. It is possibly a sister group to the Australian genus *Arcitaitrus*.

The name *Puhuruhuru* is a Maori word meaning 'hairy'.

Puhuruhuru aotearoa new species

Plates 20 and 21, Map 7

Diagnosis. A large, weakly sexually dimorphic *Puhuruhuru* with large eyes (one-third length of head). Antennae 1 relatively long, reaching almost to end of antenna 2 peduncle. Antenna 2 long (two-thirds length of body), slender. Gnathopod 1 weakly subchelate in male, simple in female; propod very spiny in both sexes. Gnathopod 2 propod mitten-shaped in both sexes. Gills moderately large, multilobed. Pleopods slender, all present and biramous, the third pair smaller than the other two. Uropod 1 outer ramus naked in females and younger males, spined in older males. Pigmentation consisting of deeply pigmented hoops running around body.

Description. Male. Length 13.9 mm, width 3.4 mm, depth 3.8 mm. Body moderately deep. Pigmentation in life rufous with a glistening, iridescent surface and with deeper pigmented hoops running around body; in ethanol, each segment with a diffusely edged hoop of rose pink on a whitish cream background, antennae suffused with pink, and coxal plates with diffuse pink patches. Eye round, very black, about one-third of head length.

Antenna 1 3.4 mm long, almost as long as antenna 2 peduncle. Peduncle segment 1 with very small spines at superior and inferior distal margin. Peduncle segment 2 narrower and slightly shorter than segment 1, with a pair of long spines near inferodistal angle; superodistal angle with a small spine. Peduncle segment 3 nearly twice as long as segment 2 but narrower; superior margin spined at 0.38 and

0.55; inferior margin spined at 0.35 and 0.57; superior and inferior distal angles with 2 spines. Flagellum with 10 segments, each except the last 2 with double spines at superior and inferior distal angles. Penultimate segment with a strong tuft of 3 or 4 spines on inferodistal angle. Terminal segment with an apical tuft of very few spines.

Antenna 2 9.0 mm long, slender, moderately long. Peduncle segment 3 with both margins convex; superodistal angle with 1 large and 1 small spine; inferior margin with 2 stronger spines; inferodistal angle with a group of 2 or 3 stout spines. Segment 4 longer than segment 3, with margins slightly sinuous; dorsal margin naked; lateral margin with an axial row of 3 spines; ventral margin with spines at 0.38 (1), 0.55 (1), 0.77 (2), and 0.85 (1); superodistal angle with 1 spine; laterodistal margin with 2 strong spines; inferodistal angle with 2 spines. Segment 5 longer than segments 3 and 4 combined, narrowing slightly distally; superior margin with 3 spines; lateral margin with 4 spines; inferior margin with spines at 0.25, 0.35 (2), 0.53, 0.66 (2), 0.81, 0.87, and 0.95 (2); superodistal angle with 1 spine; inferodistal angle with 2 spines. Flagellum moderately long and slender, with 32 segments, each bearing groups of 2 long, slender spines at the 4 distal angles; terminal segment long, with a short tuft of 8–10 spines apically.

Upper lip. Lateral margins a little expanded and pilose; ventral margins heavily pilose.

Left mandible with a 6-cusped incisor; lacinia mobilis with 4 teeth, and with 4 pilose interdental setae; molar 19-striate, with setal tuft not obvious and medial seta absent.

Right mandible with a 5-cusped incisor; molar setal tuft prominent; medial seta prominent, heavily pilose, length about half of mandible width.

Lower lip of normal bifid scroll shape; ventral and inner margins sclerotised, pilose, with 2 rows of fine setae.

Maxilla 1. Inner plate slender, narrowing distally, the 2 terminal setae heavily pilose. Outer plate broader; inner margin nearly straight, sparsely pilose; outer margin convex, with a small palp; distal margin with 9 teeth bearing 0, 1, 1, 4, 4, 4, 4, 4 lateral protuberances respectively (from outer to inner).

Maxilla 2 with plates not broadening distally. Inner plate setose on inner margin; a row of very fine setae running parallel with inner margin and distal margin; a stout pilose seta terminating a row of spines that are less inwardly curved than in most talitrid species. Outer plate outer margin convex, sparsely pilose; distal margin with a row of inwardly curved spines.

Maxilliped. Inner plate subovate, narrowing somewhat distally; inner margin with a row of long setae, these becoming larger and pilose distally; pilose setal row con-

tinuing parallel to distal margin but a little proximally to it until it contacts margin at outer distal angle of plate; distal margin with 2 spine teeth and 1 smaller spine tooth medially. Outer plate with setal comb rows along distal margin and parallel to inner margin for about one-fifth of its length; inner lateral surface with group of 4 stouter spines at midway. Peduncle segment 1 with 1 spine at outer distal angle; distal margin with a group of 3 spines. Peduncle segment 2 with 1 spine at outer distal margin and 2 spines at inner distal angle. Palp outer margin arcuate; segments each with a spine at outer distal angle and a patch of spines at inner distal angle; inner margins of segments 2 and 3 lobular, with a setal comb. Segment 4 distinct, not masked by segment 3.

Gnathopod 1. Basos broadening slightly distally; anterior margin with spines at 0.43, 0.50, 0.63, 0.74, and 0.86; posterior margin with spines at 0.17, 0.50, and 0.73; posterodistal angle with 1 large and 1 small spine. Ischium posterior margin convex, with a spine at 0.70 and one at distal angle. Merus posterior margin convex, with 6 spines. Carpus anterior margin convex, with 2 spines; anterodistal angle with 4 stout spines; posterior margin produced distally into a scabrous pellucid lobe, protected by about 6 large spines arising at its base; lateral surface with 1 spine. Propod broadening distally; posterior margin with stout spines at 0.63 (2) and 0.85 (3), and at posterodistal angle (4); posterior margin produced, especially distally, into a scabrous pellucid lobe protected by stout spines basally and by a row of about 9 spines running axially; palm indistinct, but palmar area convex, flanked by few (about 6) stout spines; palmar angle 123°. Dactyl stout, longer than palm, curved towards palm, with 1 spine on inner margin and 2 at base of terminal spine.

Gnathopod 2. Coxal plate ventral margin convex, with about 6 spines. Gill large, multilobed. Basos broadening at 0.3, narrowing to a shallow waist at 0.8 then broadening distally; anterior margin with spines at 0.35, 0.57, and 0.71; posterior margin naked except for 1 small spine at posterodistal angle. Ischium long, recurved anteriorly, spined only at posterodistal angle. Merus posterior margin produced distally into a bifid pellucid lobe (partially collapsed in holotype), with 3 spines distal of this. Carpus anterior margin convex, naked except for 2 small spines at distal angle; posterior margin produced into a large bifid pellucid lobe; posteroproximal angle with 1 small spine; posterodistal angle with 3 spines on both inner and outer face. Propod anterior margin straight, naked except for about 4 or 5 spines at distal angle; posterior margin produced into a pellucid lobe; a row of stout spines running axially along lateral face; palm short, less than one-third of propod width, distinct, flanked by a row of about 8 spines; palmar

angle 55°. Dactyl short, curved towards palm; terminal spine occluded into a recess at end of palm.

Peraeopod 1. Coxal plate ventral margin and anterior angle rounded, spined. Gill large with 2 elongate lobes. Basos slightly expanded distally, slightly curved anteriorly; anterior margin with spines at 0.47, 0.57, 0.65, and 0.73; anterodistal angle with 2 spines; posterior margin with spines at 0.42 and 0.66; posterodistal angle with 2 spines. Ischium with 2 spines at posterodistal angle. Merus broadening distally; anterior margin slightly convex, with spines only at 0.19 and 0.47; anterodistal angle with 2 spines; posterior margin sinuous, with spines at 0.17 (2), 0.32 (1), 0.40 (1), 0.56 (2), 0.67 (2), and 0.88 (1); posterodistal angle with 2 large spines. Carpus subrectangular; anterior margin naked; anterodistal angle with 2 spines; posterior margin with spines at 0.15 (3), 0.37 (1), 0.50 (2), and 0.77 (3); posterodistal angle with 2 stout spines. Propod slightly curved posteriorly; anterior margin with spines at 0.31 (2), 0.60 (2), and 0.88 (2); anterodistal angle with 3 spines; posterior margin with spines at 0.10 (1), 0.22 (2+1), 0.43 (2+1), 0.62 (2+1), and 0.83 (2+1). Dactyl conical, nearly straight, with 1 inner spine.

Peraeopod 2. Coxal plate ventral margin slightly sinuous, with 3 spines. Gill large, with a long distal lobe. Basos broadening slightly distally, curved a little anteriorly; anterior margin mainly concave, with spines at 0.59 (1), 0.71 (2), and 0.88 (2); posterior margin with a spine at 0.60 and 1 large and 1 small spine at distal angle. Ischium rhomboidal, with 2 spines at posterodistal angle. Merus broadening distally; anterior margin with spines at 0.15 and 0.36; anterodistal angle with 3 spines; posterior margin with spines at 0.11, 0.16, 0.35, 0.42, 0.64, and 0.76; posterodistal angle with 2 large spines. Carpus subrectangular; anterior margin unspined, nearly straight; anterodistal angle with 2 spines; posterior margin with spines at 0.11 (2), 0.27 (2), 0.58 (2), and 0.82 (2); posterodistal angle with 2 large spines. Propod slightly longer than carpus, broadest medially; anterior margin with spines at 0.25 (2), 0.52 (2), and 0.83 (2); anterodistal angle with 4 spines; posterior margin with larger spines at 0.09 (1), 0.19 (2+1), 0.38 (2+1), 0.62 (2+2), and 0.85 (3+1). Dactyl slightly curved posteriorly, with 1 spine on inner margin and 1 small spine on outer margin at base of terminal spine.

Peraeopod 3. Coxal plate bilobed, with anterior margin thickened and spined; ventral angle of anterior lobe sharply curved and spined; ventral margin of posterior lobe more gradually curved and spined. Gill smaller than anterior gills, folded but not plicate. Basos an inverted pyriform shape, narrowing distally; anterior margin with spines at 0.09, 0.20, 0.35, 0.52, 0.62, and 0.73; anterodistal angle with 2 spines; posterior margin with spines at 0.18, 0.32,

0.41, 0.53, 0.58, 0.79, and 0.95. Ischium with 3 spines at anterodistal angle. Merus broadening posterodistally to a spinous lobe; anterior margin nearly straight, with spines at 0.15 (2), 0.38 (2), 0.75 (1), and 0.82 (1); anterodistal angle spined; posterior margin with spines at 0.38 (1); posterodistal lobe with 1 small and 2 large spines. Carpus with sides subparallel; anterior margin with spines at 0.19 (1), 0.33 (3), 0.57 (4), 0.79 (1), and 0.86 (2); anterodistal angle spined (1+1); posterior margin with spines at 0.67 (1) and at distal angle (1+1). Propod slightly longer than carpus; anterior margin with spines at 0.09 (1), 0.17 (2), 0.32 (3), 0.49 (2), 0.68 (3), and 0.87 (3); posterior margin with spines at 0.37 (2), 0.61 (2), and 0.88 (2); posterodistal angle with 3 spines. Dactyl as for peraeopod 2.

Peraeopod 4. Coxal plate small, rounded except for proximal margin, with ventral margin bearing 3 spines. Gill large, multilobed. Basos elongate, subovate; anterior margin with spines at 0.23, 0.36, 0.50, 0.58, 0.69, and 0.83; anterodistal angle with 1+1 spines; posterior angle with small spines at 0.24, 0.35, 0.43, 0.67, 0.82, 0.87, and 0.96. Ischium anterodistal angle with 2 spines. Merus broadening distally; anterior margin with spines at 0.08 (1), 0.20 (1+1), 0.41 (1+2), and 0.63 (1+2); anterodistal angle with 2 spines; posterior margin with smaller spines at 0.19, 0.37, and 0.62; posterodistal angle with 2+1 spines. Carpus anterior margin with spines at 0.10 (2+1), 0.26 (3), 0.43 (3), 0.64 (4), and 0.81 (1); anterodistal angle with 3 large spines; posterior margin with spines at 0.37, 0.54, and 0.74; posterodistal angle with 3 large spines. Propod 1.15x carpus length; anterior margin with spines at 0.08 (1), 0.16 (2), 0.27 (2+1), 0.39 (2+1), 0.54 (2+1), 0.69 (2+1), 0.81 (2), and 0.89 (2+1); posterior margin with spines at 0.16 (2), 0.30 (3), 0.51 (3), 0.71 (3), and 0.92 (3); posterodistal angle with about 5 spines. Dactyl with only 1 small spine on inner margin.

Peraeopod 5. Coxal plate small; ventral margin rounded, with few small spines. Penis organs square. Basos an inverted pyriform shape, with both anterior and posterior margins expanded; anterior margin convexly rounded, with 6 stout spines; anterodistal angle with 1 stout spine; posterior margin convexly rounded and scalloped, with 10 small spines. Ischium anterodistal angle with 3 spines. Merus broadening distally; anterior margin with spines at 0.16 (2), 0.34 (3), 0.47 (1), 0.61 (3), and 0.78 (2); anterodistal angle with 3 spines; posterior margin with spines at 0.24 and 0.55; posterodistal angle with 3 spines. Carpus broadening a little distally; anterior margin with spines at 0.14 (2+1), 0.26 (3), 0.40 (3), 0.52 (1), 0.65 (4), 0.78 (2), and 0.89 (1); anterodistal angle with 2 spines; posterior margin with spines at 0.32 (1), 0.48 (1), and 0.68 (2); posterodistal angle with 2 spines. Propod 1.35x carpus

length; anterior margin with spines at 0.12 (2), 0.22 (2), 0.34 (2), 0.46 (2), 0.55 (3), 0.66 (2), 0.77 (2), and 0.93 (3); posterior margin with spines at 0.19 (2), 0.30 (2), 0.43 (2), 0.63 (2), 0.80 (2), and 0.93 (2); posterodistal angle with 3 double spines.

Pleopods all present and biramous although narrow and slender, all with 2 coupling spines, and with outer margins bearing pilose setae. Pleopods 1 and 2 equal in length; outer margins with pilose setae. Pleopod 3 0.8x length of pleopod 1. Rami with poorly developed segmentation, and margins with pilose setae; outer ramus the shorter.

Epimeral plates. Plate 1 subtriangular, acutely angled distally; posterior margin with 2 small spines. Plate 2 subsquare; anterodistal angle rounded; posterodistal angle acute and slightly produced; posterior margin slightly sinuous, with 3 small spines. Plate 3 subsquare; anterodistal angle rounded; posterodistal angle acute; posterior margin slightly scalloped, with 4 spines.

Uropod 1 slender. Peduncle with a row of 4 spines on both dorsal margins. Inner ramus with spines at 0.11, 0.25, 0.48, and 0.67. Outer ramus with spines at 0.60 and 0.74. A large inter-ramal spine present. Both rami terminating with 2 larger and 2 smaller terminal spines, the second largest scionate.

Uropod 2. Dorsal margin of peduncle with 2 spines. A small inter-ramal spine present. Both rami with scionate spines, and terminating with 1 larger and 2 smaller spines, of which one is scionate.

Uropod 3 a simple uniramous tubercle, with 2 spines on peduncle and 2 large and 2 small terminal spines on ramus.

Telson scarcely bilobed, not cleft, the 3 spines on each lobe so arranged that the 6 together form a coronal circlet posteriorly.

Female. As for male except as follows. Width 3.4 mm, depth 3.4 mm.

Antenna 1 3.2 mm long. Peduncle segment 1 inferior margin with 1 small spine proximally and 3 larger spines distally. Peduncle segment 2 with 2 large spines at inferodistal angle; superodistal angle spined. Peduncle segment 3 superior margin with spines at 0.23, 0.36, and 0.55; inferior margin with spines at 0.21 and 0.43; superodistal angle with 3 spines. Flagellum with 9 segments.

Antenna 2 9.7 mm long. Peduncle segment 3 with 3 spines on inferior margin. Peduncle segment 5 superior margin with 4 spines; lateral margin with 5 spines; ventral margin with spines at 0.22, 0.30 (2), 0.42, 0.55 (2), 0.67 (2), 0.76, 0.83, and 0.90. Flagellum with 29 segments.

Left mandible with 6 pilose interdentate setae. Molar 21-striate; admolar tuft of pilose setae present.

Gnathopod 1. Basos broadening distally; anterior mar-

gin with spines at 0.49, 0.60, 0.69, 0.82, and 0.90; posterior margin with spines at 0.34, 0.45, 0.73, and 0.80. Ischium posterior margin convex but naked, with distal angle bearing 4 spines. Merus posterior margin convex, with spines at 0.27, 0.43, 0.48, 0.64, 0.68, 0.78, and 0.86. Carpus broadening posterodistally into a pellucid lobe; posterior margin with 6 stout spines; frontal surface with 2 groups of 3 spines and 2 single spines; anterior margin with spines at 0.39 (2) and 0.67 (2). Propod heavily spined, narrowing distally; anterior margin with spines at 0.35 (2), 0.65 (3), and 0.85 (3); posterior margin with scionate spines at 0.11 (5), 0.35 (5), 0.57 (5), 0.84 (5), and 0.89 (1); a short row of 4 spines running at an oblique angle to posteroproximal margin across lateral face of segment; palm absent, but dactyl and propod at least partially chelate. Dactyl longer than distal width of propod, with 1 inner spine and 2 small spines at base of terminal spine.

Gnathopod 2. Broodplate much longer than broad, rounded distally, with 10 setae. Basos anterior margin with spines at 0.21, 0.40, 0.57, and 0.79; posterodistal angle with 3 spines. Ischium posterodistal angle with 4 spines. Merus posterior margin produced into a pellucid lobe, with about 5 spines surrounding base. Carpus anterodistal angle with 4 spines; posterior margin produced into a pellucid lobe, with 3 spines proximally and 4 larger spines distally. Propod long, with naked margins; outer surface with a row of stout spines running axially; inner surface with a more sparse row running axially to palmar area; posterior margin produced into a long pellucid lobe projecting well beyond palm; palm small, oblique, recessed into pellucid lobe and masked by a marginal row of about 8 spines. Dactyl short.

Peraeopod 1. Broodplate shorter than in gnathopod 1, rounded distally, with 13 setae. Basos less curved than in male; anterior margin with spines at 0.56, 0.67, and 0.76; posterior margin with spines at 0.35, 0.51, and 0.75. Merus anterodistal angle with 3 spines; posterior margin much less setose than in male, with spines at 0.26 (2), 0.50 (2), and 0.71 (2); posterodistal angle with 3 spines. Carpus anterior margin with 1 spine at 0.54.

Peraeopod 2. Broodplate longer than in peraeopod 1; distal end rounded, with 12 spines.

Peraeopod 3. Broodplate as long as in peraeopod 2; distal end rounded, with 9 setae. Basos proportionately wider than in male. Merus posterior margin with spines at 0.27 and 0.53; lobe at posterodistal angle a little more produced. Carpus posterior margin and propod anterior margin naked.

Peraeopod 4. Broodplate smaller than the others, somewhat triangular, narrowing distally, with only 2 much reduced setae. Basos more massive than in male, broader distally. Propod anterior margin with spines at 0.13 (2),

0.24 (2), 0.38 (3), 0.56 (3), 0.72 (3), and 0.89 (3).

Peraeopod 5. Basos longer than in male. Merus anterior margin with spines at 0.23 (4), 0.46 (4), and 0.66 (4); posterior margin with spines at 0.29, 0.43, and 0.65; posterodistal angle produced distally into a lobe bearing 4 spines.

Uropod 1 outer ramus naked.

Uropod 2 with both rami bearing 3 spines on dorsal margin.

Uropod 3 with 1 large and 1 small terminal spine on ramus.

Telson with 4 spines on each lobe.

Type data. **Holotype:** male, WA, Castle Hill (E of Alfredton), 40°0'S, 175°55'E, from leaf litter, 1 December 1981, K. W. Duncan (CMNZ).

Allotype: same data as holotype (CMNZ).

Paratypes: same data as holotype (AMNZ, NMNZ, NZAC).

Material examined. Type series, plus 1534 individuals in 180 collections with the following summarised data (full data on file 'TAL/Puh/aot.dat', NZAC).

Three Kings Is / North I. excl. TO / SD, MB, KA, NN, BR, MC, WD, OL, FD, SL / SI.

Distribution. *Puhuruhuru aotearoa* occurs throughout the North Island and in the north and west of the South Island, straggling to Fiordland, the southern coast of Southland and Otago (south of Taieri Mouth), and Stewart Island. It is abundant on islands around Cook Strait. It ranges from sea level to at least 1000 m. It occurs in both podocarp / hardwood and beech forests, living in moss and leaf litter. It is also abundant in bush remnants – even where the soil has been heavily churned by stock – and in regenerating forests. It is common under bracken fern, but uncommon under grass, and it occurs in *Pinus radiata* plantations. It breeds in spring, summer, and autumn.

Remarks. *Puhuruhuru aotearoa* is very abundant and widespread through much of the country. Indeed, it may qualify as one of New Zealand's most numerous native terrestrial animals. Like the allopatric species *P. patersoni*, it reaches peak density in coastal regions. It has been extensively collected, and good examples occur in every collection I have examined. *P. aotearoa* is a feminised species (males resemble females), which are among the most successful and abundant terrestrial talitrids.

Little is known of the ecology of *P. aotearoa* other than that it occurs in very high densities in lowland forest, but not in the pohutukawa strand forest occupied by *Kanikania*

rubroannulata. Above 300 m it occurs with *Parorchestia tenuis*, which partially replaces it at even higher altitudes and in low-conductivity soils. In the Wellington District it is being replaced by the aggressive introduced species *Arcitalitrus sylvaticus*.

The Maori word 'aotearoa' has many possible meanings, but is usually taken as 'Land of the long white cloud', according to Reed & Brougham (1978).

Puhuruhuru patersoni (Stephensen)

Plate 22, Map 8

patersoni Stephensen, 1938: 247–251 (*Talorchestia*).
Hurley, 1957: 196–198 (*Orchestia*).

Diagnosis. A medium-sized, strongly sexually dimorphic *Puhuruhuru* with a strongly reticulate pigmentation pattern, small black eyes, and a relatively small head. Body not deep, more heavily spined than in other New Zealand talitrid genera; legs relatively short. Gnathopod 1 simple in both sexes. Gnathopod 2 propod strongly developed in adult males. Maxilliped arcuate. Gills relatively small and simple. Pleopods all reduced to simple, small vestiges.

Description. **Male.** Length 8 mm, width 2 mm, depth 2.5 mm. Pigmentation pattern very distinctly reticulate, with rufous markings on a cream background. Body moderately slim. Head somewhat shorter than the 2 mesosomal segments together. Eyes medium-sized, diameter about one-third of head length, round, black.

Antenna 1 reaching to two-thirds of last peduncle segment of antenna 2. First 2 peduncle segments about equal in length, about half length of 3rd segment. Flagellum as long as peduncle, with 8 segments.

Antenna 2 as long as head and first 4 mesosomal segments. Fourth peduncle segment somewhat shorter than the 5th. Flagellum as long as last 3 peduncle segments, with 18 segments.

Lower lip. Inner lobes rudimentary.

Left mandible. Spine row with 3 setose spines; 2 smaller spines on molar process below.

Maxilliped. Inner plate with 2 spine teeth distally and a 3rd, smaller tooth just below inner distal angle; about 4 setulose spines outside teeth, and about 6 diagonally across angle below inner teeth; other side with a larger triangular area of setulose spines down cleft almost to ischium; surface with 3 groups of 2–4 spines, one group on outer margin and 2 on inner margin. Outer plate narrow, reaching just past merus, narrowing to inwardly projecting blunt tip, with fine setae fringing base and defining lip. Merus,

carpus, and propod subequal in length, successively narrower. Merus outer distal angle with at least 1 short and 1 long spine; inner distal angle with 1 group of spines. Carpus with 1 short and 2 long spines, and with 2 groups of fine setae on inner distal angle. Propod with a number of long stout end spines and 2 groups of fine setae, mainly on inner distal margin. Ischium outer distal angle with 2 spines. Dactyl absent.

Gnathopod 1. Sideplate subovate, with about 10 spines equidistant on ventral margin. Basos broadening distally to one-third of its length; anterior margin with single spines at 0.4, 0.53, 0.61, 0.76, and 0.90; posterior margin with a strongly bifurcate spine at 0.5 (damaged in some specimens); posterodistal angles spined. Ischium subsquare, with posterodistal angle spined. Merus almost as long as carpus, with posterior margin heavily spined. Carpus anterior margin with a few smaller spines; posterior margin and distal angle heavily spined; anterodistal angle with a few small spines; surface with a few short to long spines. Propod 0.6x length of carpus, subovate but narrowing considerably distally; anterior margin with 4 groups of 3 or 4 smaller spines; posterior margin and posterior surface with large spines, many of them bifid; palm not evident. Dactyl finger-like, short, one-third of propod length; posterior margin with 1 or 2 small spines at 0.5.

Gnathopod 2. Sideplate ventral margin convex, with single small equidistant spines. Basos broadening distally; anterior margin with single spines at 0.33, 0.46, 0.60, 0.69, 0.79, and 0.92; posterior margin with a small spine at 0.7. Ischium longer and narrower than in gnathopod 1, with spines at distal angles. Merus as wide as ischium but shorter; posterior margin with a long scabrous lobe medially, and spines proximal to lobe (lobe may be missing in northern specimens). Carpus slightly longer than merus; anterior margin somewhat convex and lacking in spines; posterior margin markedly produced into a long scabrous lobe. Propod subtriangular, 0.65x length of basos, widening distally until width equals length; anterior margin convex, naked; posterior margin slightly sinuous; posterodistal angle produced into a lobe overlapped by dactyl tip; palm sinuous, half of propod width, fringed by a row of spines becoming larger posteriorly; palmar angle varying with age and location (The Snares oblique, Stewart I. and South I. transverse). Dactyl originating 0.7 from propod proximal margin, not from distal margin as in most other landhoppers, with a prominent curved finger nearly reaching propod distal margin and overlapping lobe.

Peraeopod 1. Basos slightly wider than in gnathopod 1; anterior margin with a few spines distally; anterodistal angle with 3 spines; posterior margin with 3 or 4 large single spines. Ischium as for gnathopod 1. Merus almost as

long as basos; anterior margin with a few spines, especially on angle; posterior margin and surface spined. Carpus anterior margin with 2 spines; posterior margin and surface with several stout spines. Propod narrower and slightly longer; anterior margin with about 3 pairs of short spines; anterodistal angle with 3 spines; posterior margin with 4 groups of 3 spines. Dactyl posterior margin with a spine.

Peraeopod 2 shorter than peraeopod 1.

Peraeopod 3 about as long as peraeopod 2. Sideplate anterior lobe wider and deeper than sparsely spined posterior lobe. Basos expanded, with anterior margin bearing a few single and paired stout spines. Merus shorter and wider than in peraeopod 1. Other segments longer and narrower.

Peraeopod 4. Segments longer than in peraeopod 1, otherwise similar.

Peraeopod 5 longer than peraeopod 4. Basos posterior margin not as strongly spined, distally more serrate; segments longer, otherwise similar to peraeopod 4.

Epimeral plates. Plate 1 with ventral and posterior margins convex; posterior margin with 1 or 2 small spines. Plates 2 and 3 with anterior and posterior margins parallel, spined.

Pleopods all minute, vestigial, 1-segmented stumps. Pleopod 1 with 4 small surface spines in holotype, fewer in paratypes. Pleopod 2 with 4 spines, and slightly smaller than pleopod 1. Pleopod 3 even smaller, with 3 spines.

Uropod 1. Peduncle inner dorsal margin with a few spines; posterodistal angle with 1 spine; outer dorsal margin with a few minute spines anteriorly and 3 medium spines posteriorly; posterodistal angle with a large stout spine. Rami with surface minutely spined. Inner ramus with 4 spines dorsally and 2 large and 3 smaller terminal spines; surface between spines minutely serrate, in places setose. Outer ramus with dorsal margin minutely setose anteriorly, and with 3 small and 1 large terminal spines.

Uropod 2. Peduncle slightly shorter than rami; inner dorsal margin with 1 posterodistal spine, outer margin with 4. Rami minutely spined on surface. Inner ramus with 1 or 2 dorsal spines and 2 long and 3 short terminal spines. Outer ramus with dorsal margin minutely setose and serrulate, and with 2 long and 2 short terminal spines.

Uropod 3 uniramous. Peduncle much larger and longer than ramus, with 2 medium bifurcate-tipped spines, and several very small spines on ventral surface. Ramus with 1 medium and 1 small bifurcate-tipped terminal spine and a few minute surface spines.

Telson subovate, with 3 bifurcate-tipped spines on each side of end notch and a few minute spines on surface.

Female Length 9 mm, width 1.75 mm, depth 2 mm.

Antenna 1 1.25 mm long, reaching to halfway along 5th

peduncle segment of antenna 2. Flagellum of 7 segments. *Antenna 2* 2.5 mm long, reaching 3rd peraeon segment; flagellum of 14 segments. *Gnathopod 1* propod simple. *Gnathopod 2* propod mitten-shaped; palm oblique, reaching half width of propod; dactyl weak. Broodplates weakly spined. *Pleopods* vestigial as in male.

Type data. Type specimens not located. The species was established on **topotypes** (designated D.E. Hurley) Slide 44 (no other data) and **hypotypes** (designated D.E. Hurley) Slides 30, male and 28, female, Bench Island, and Slides 42 (no other data).

Material examined. Non-type collections with the following data: Oamaru, Warren St Reserve, K.W. Duncan, 6 May 1983, in *Phormium* litter; Dunedin, Town Belt, K.W. Duncan, 26 May 1967, in regenerating bush litter; Dunedin, Opoho, C.L. Wilton, 10 Dec 1970, regenerating bush litter; Owaka, Cannibal Bay, G. Kuschel, 14 Jan 1978, sifted kelp, debris, and plants (DSIR 78/31); 38 km SW of Owaka, G. Kuschel, 15 Jan 1978, litter and rotten wood (DSIR 78/33); Catlins District, Purakaunui Falls, G. Kuschel, 15 Jan 1975, sifted litter and rotten wood (DSIR 78/34); Tutuku (*sic*) [presumably Tautuku, near Chaslans Mistake], G. Kuschel, 19 Jan 1978, sifted litter (DSIR 78/44); 38 km S of Owaka, Waipati Beach, G. Kuschel, 19 Jan 1978, sifted litter; Solander I., R.A.F., 9 Dec 1947, leafmould, C. Lindsay, 20 Jul 1948, leafmould, R.K. Dell, 20 May 1956, leafmould; Codfish I., Sealers Bay, 46°46'S, 167°38'E, R.K. Dell, 8 Nov 1948, under *Phormium*, Mirkwood petrel colony (no other details), Rodrigues Track, L.C. Cadenhead & N.A. Deans, 6 Jan 1982, *Myrsine* leaf litter; Bench I., C.J.L., leafmould, J. Lindsay, 9 Jul 1948, leafmould. Stewart I., Paterson Inlet, Ulva I., L.C. Cadenhead & N.A. Deans, 16 Nov 1981, podocarp leaf litter; Port Pegasus, Crooked Reach, R.K. Dell & B.A. Holloway, 22 Jan 1955, from foliage; SW Stewart I., R.K. Dell, 28 Jan 1955, in leaf mould; Lords River, 47°07'S, 168°08', K. Dell & B.A. Holloway, 29 Jan 1952, in litter and leaf mould under *Senecio* scrub; Nelly I., 47°12'S, 167°42'E, K. Dell & B.A. Holloway, 22 Jan 1955, ex *Senecio* and tussock leaf mould; Owens I., R.K. Dell & B.A. Holloway, 29 Jan 1955, in leaf mould; Hidden I., R.K. Dell & B.A. Holloway, 28 Jan 1955, in leaf mould; Kundy I., K. Dell, 21 May 1956; Solomans I., K. Dell & B.A. Holloway, 25 Jan 1955; Kinui I., R.K. Dell & B.A. Holloway, 28 Jan 1955; Big South Cape I., Murderers Cove, R.K. Dell & B.A. Holloway, 24 Jan 1955. Snares I., R.A. Falla, Dec 1947, leafmould (3 collections with same data).

— / DN, SL / SI / The Snares Is.

Found within a few kilometres of the sea, in leaf litter of coastal forests, urban gardens, and waste grassland southward from Oamaru.

Remarks. *Puhuruhuru patersoni* is easily identified by its vestigial pleopods, a feature seen in no other terrestrial talitrid, and the very characteristic male second gnathopods. The Snares specimens differ in having a relatively simple gnathopod 1 in the adult male, a smaller body, and a different male gnathopod 2. Fully mature Snares males (Fig. 354, 355) resemble young adult South Island/Stewart Island forms (Fig. 356–359). Evidently, the Snares population is neotenous in comparison with the others. These differences may be fairly profound, but I believe that they are of only subspecific significance since there is evidence of clinal variation involving neoteny from north to south. Therefore, I designate the northern subspecies as *P. patersoni patersoni* and the Snares population as *P. patersoni snaresensis*. Stephensen's description is of the larger-bodied population on Stewart Island, which serves as a description of the South Island specimens as well, while Hurley's is mainly of the small-bodied *snaresensis*.

This is a fairly inactive species. It does not hop, nor does it climb. Escape depends more on its ability to 'play possum' and its cryptic coloration. It will scurry if greatly disturbed. It has smaller broods and larger eggs than the sympatric species *Makawe hurleyi*. It does not breed in winter. It has relatively small gills. Mature males are less common than mature females. It tolerates more saline soils than do more terrestrial species. It is allopatric to the congeneric species *P. aotearoa*.

Tara new genus

Type species *Orchestia sylvicola* Dana, 1852.

Reticulate, semi-reticulate, or spotted landhoppers with a moderately robust body, although much finer than supralittoral talitrids such as *Transorchestia*; pleopod peduncles naked; broodplates setose only on distal margins; rami of uropods 1 and 2 spined on dorsal margins.

Remarks. I have followed Bousfield's (1964) suggestion that new generic names be created for the 'sylvicola' group, thus reserving *Parorchestia* for those species resembling *Parorchestia tenuis*. *Tara* contains some coastal species, but most are true inland species found far from the sea; none seems to be widely distributed.

The name *Tara* derives from the Maori word for 'spine', and is an allusion to the spiny uropods in this genus; gender feminine.

Tara hauturu new species

Plate 23, Map 12

Diagnosis. A moderate-sized, weakly sexually dimorphic landhopper. Eyes oval, black. Antenna 1 extending just beyond end of antenna 2 peduncle segment 5, with 8 flagellar segments. Antenna 2 moderately long, with 21 flagellar segments. Mandible with 4 interdentate pilose setae and a prominent abmolar setal tuft. Maxilla 2 plates foliaceous. Gnathopod 1 chelate in both sexes. Gnathopod 2 mitten-shaped in both sexes. Gills moderately large, the first and last trilobate, the last with a relatively short pendulous lobe. Pleopods all present and biramous; segmentation on rami not obvious; 2 coupling spines present; peduncle inner margins naked. Uropod 1 long; rami heavily spined dorsally; inner ramus with a 2nd row of dorsal spines; inter-ramal spine absent. Uropod 2 rami heavily spined dorsally; inter-ramal spine present. Telson moderately cleft, with 1 long submarginal spine and 4 marginal spines on each lobe.

Description. Male. Length 10.88 mm, width 1.90 mm, depth 1.95 mm. Eye black, ovoid, with major axis at 46° to longitudinal axis of body; major axis 1.33x length of minor axis. Cheek rounded, with 3 long marginal spines.

Antenna 1 1.65 mm long, extending just beyond end of antenna 2 peduncle penultimate segment. Peduncle segment 1 superior margin naked; superodistal angle with 1 spine; inferior margin with 1 spine at midway; inferodistal angle with 2 spines. Segment 2 narrower than segment 1, narrowing distally; superodistal angle with 1 spine; inferodistal angle with 2 spines. Segment 3 narrower and slightly longer than segment 2, with both margins slightly scalloped; superior margin with spines at 0.50; superodistal angle with 1 spine; inferior margin with spines at 0.45; inferodistal angle with 2 spines. Flagellum tapering, with 8 segments, these becoming progressively longer and narrower distally; each segment except 1, 7, and 8 with 1 spine at superodistal angle and 2 oblique spines at inferodistal angle; segment 1 naked, penultimate segment relatively long and tapering, and last segment a short stump bearing a closely bound terminal tuft.

Antenna 2 6.13 mm long, moderately long and tapering. Peduncle segment 3 short; distal margin with 4 or 5 spines inferiorly. Segment 4 broadening slightly distally; superodistal angle with 1 spine; lateral face with 3 spines; inferior surface with 2 rows of 3 spines each; distal margin with 5 spines inferiorly. Segment 5 long, broadening distally; superior margin with spines at 0.14, 0.29, 0.39, 0.59, 0.73, and 0.88; lateral face with spines at 0.21 (2), 0.39 (2), 0.64 (2), and 0.82 (2); inferior margin with spines at 0.21, 0.38,

0.63, and 0.79; outer distal margin with 5 large spines. Flagellum moderately long and tapering, with 21 segments, each broadening only slightly distally, and with a pair of spines at the 4 distal angles; last segment long, with a short, sparse terminal tuft of setae.

Upper lip ventral margin rounded, setose; inner shelf present, setose.

Mandible 5-toothed; lacinia mobilis 4-toothed, with 4 interdentate pilose setae; abmolar setal tuft dense, prominent; molar 18-striate, with medial setae pilose and longer than molar width.

Lower lip ventral margins subsquare, setose only on inner region of distal margin and on inner margin.

Maxilla 1 outer plate subrectangular; outer margin slightly sinuous; distal margin rounded, with 9 inwardly curved spine teeth, each bearing 0, 0, 0, 1, 1, 2, 2, 2, 2 lateral protuberances respectively (from outer to inner); inner plate narrow, narrowing distally; inner margin pilose; distal margin with 2 long pilose setae.

Maxilla 2 plates foliaceous. Outer plate outer margin convex, sparsely pilose; distal margin rounded, with a row of 13 inwardly curved setae, the 3 outer ones larger than the rest; inner margin nearly straight. Inner plate outer margin convex; distal apex rounded; inner margin with 17 setae from distal to medial, where spine row terminates with a densely pilose long seta; proximal outer margin sparsely pilose.

Gnathopod 1. Plinthic ridge present, with 5 marginal spines. Basos broadening distally; anterior margin with small spines at 0.55, 0.65, 0.74, 0.86, and 0.92; posterior margin slightly scalloped between spines at 0.46 and 0.61; posterodistal angle with 1 spine. Ischium anterior margin not produced; posterior margin with 1 spine at midway; posterodistal angle with 2 spines. Merus posterior margin rounded but not produced, with 7 spines. Carpus anterior margin convex, slightly scalloped and with spines at 0.31, 0.42, 0.53, and 0.69; anterodistal angle with 4 spines; posterior margin produced into a pellucid lobe distally, protected by 6 large submarginal spines and 3 medial spines. Propod broadening distally, length twice width; anterior margin stepped, with spines at 0.52 and 0.76; anterodistal angle with 2 long spines; posterior margin with long spines at 0.45, 0.65, and 0.79; a row of 3 or 4 spines running longitudinally on inner face; palm convex, half of propod width, flanked by 2 large spines at anterior end, 5 smaller spines medially, and 5 larger spines posteriorly; palmar angle about 105°. Dactyl slightly shorter than propod width, with outer margin naked.

Gnathopod 2. Coxal plate ventral margin rounded, with about 15 spines. Gill large; subcephalic lobe long, narrow. Basos length twice width, narrowing slightly distally;

anterior margin sinuous, with spines at 0.32 and 0.85; posterior margin slightly convex, with spines at 0.30, 0.56, and 0.82. Ischium posterodistal angle with 2 spines. Merus posterior margin convex, produced into a discrete pellucid lobe distally, with spines at 0.30, 0.50, 0.65, 0.86, and 0.92. Carpus broadening distally; anterior margin naked; anterodistal angle with 2 spines; posterior margin produced into a pellucid lobe broadening distally; posterodistal angle with 2 spines. Propod long, narrow, 0.19 x 0.57 mm, with margins naked; anterodistal margin with 4 spines; posterior margin produced into a lobe extending beyond palmar area; palm short, oblique, flanked by 9 spines; palmar angle 33°. Dactyl curved, length about half of propod width, with distal tip occluding propod distal lobe.

Peraeopod 1. Coxal plate subsquare; anterodistal angle rounded; ventral margin convex, with 14 spines. Gill large, though smaller than on gnathopod 2, discoidal, half spiralled. Basos narrowing slightly distally, curved slightly anteriorly; anterior margin concave, with small spines at 0.59, 0.69, and 0.77; posterior margin with larger spines at 0.49 and 0.70; posterodistal angle with 2 spines. Ischium anterior margin slightly produced anteriorly; posterodistal angle with 2 spines. Merus broadening distally; anterior margin convex, slightly stepped, with spines at 0.28 and 0.51; anterodistal angle with 2 spines; posterior margin slightly scalloped, with spines at 0.36, 0.62, and 0.76; posterodistal angle with 2 spines. Carpus curved slightly posteriorly, with both margins stepped; anterior margin with spines at 0.36 and 0.56; anterodistal angle with 1 spine; posterior margin with spines at 0.19 (1), 0.40 (3), 0.61 (3), 0.85 (2), and 0.92 (1); posterodistal angle with 2 spines. Carpus narrowing slightly distally, curved posteriorly, with both margins stepped; anterior margin with spines at 0.25 (2), 0.49 (2), and 0.75 (3); anterodistal angle with 3 spines; posterior margin with spines at 0.18 (3), 0.30 (3), 0.48 (3), 0.65 (3), and 0.85 (3). Dactyl conical, curved posteriorly, with 1 long spine on posterior margin at base of terminal spine.

Peraeopod 2. Coxal plate ventral margin nearly straight, with about 11 spines. Gill large, discoidal, folded in holotype. Basos curved anteriorly; anterior margin concave, naked; anterodistal angle with 1 spine; posterior margin with spines at 0.23, 0.38, and 0.63 (2); posterodistal angle with 1 spine. Ischium posterodistal angle with 1 spine. Merus broadening distally; anterior margin convex, with spines at 0.28 and 0.50; anterodistal angle with 2 spines; posterior margin slightly sinuous, with spines at 0.15, 0.35 (2), and 0.57; posterodistal angle with 2 spines. Carpus 0.67x length of merus; anterior margin stepped, with spines at 0.52; anterodistal angle with 1 spine; posterior margin scalloped, with spines at 0.14 (1), 0.29 (3),

0.57 (1), and 0.72 (3); posterodistal angle with 2 spines. Propod narrowing slightly distally, curved posteriorly; anterior margin stepped and scalloped, with spines at 0.22 (1), 0.43 (2), and 0.70 (3); anterodistal angle with 3 spines; posterior margin stepped, with spines at 0.25 (3), 0.40 (3), 0.59 (3), and 0.78 (3); posterodistal angle with 2 spines. Dactyl curved posteriorly; inner margin with a spine distally, emarginate proximally, bearing a short protuberance between marginal spine and terminal spine; outer margin smoothly convex, with a minute spine at base of terminal spine.

Peraeopod 3. Coxal plate with both lobes bearing 5 spines. Gill small, discoidal. Basos an inverted pyriform; anterior margin with 7 large spines; posterior margin with 7 slightly smaller spines. Ischium anterodistal angle with 1 spine. Merus broadening distally, with both margins scalloped; anterior margin with spines at 0.26 (2), 0.47 (2), and 0.70 (1); anterodistal angle with 3 spines; posterior margin with spines at 0.27 (2), 0.34 (1), and 0.52 (2); posterodistal angle with 3 spines. Carpus as long as merus; anterior margin scalloped, with spines at 0.33 (3), 0.58 (3), and 0.87 (3); posterior margin stepped, with spines at 0.44 (2) and 0.71 (2); posterodistal angle with 3 spines. Propod narrowing distally, with both margins stepped; anterior margin with spines at 0.22 (2), 0.35 (2), 0.53 (3), 0.67 (3), and 0.84 (3); posterior margin with spines at 0.32 (1), 0.52 (1), and 0.76 (2); posterodistal angle with 2 spines. Dactyl curved inwardly; inner margin smoothly concave, with a marginal spine distally and a protuberance between marginal spine and base of terminal spine.

Peraeopod 4. Gill large, trilobate; pendulous lobe not very long, triangular. Basos ovoid, width 0.65x length; anterior margin with 8 spines; anterodistal angle with 2 spines; posterior margin with 11 spines. Ischium anterodistal angle with 1 spine; posterior margin sinuous. Merus broadening slightly distally; anterior margin stepped and scalloped distally, with spines at 0.11 (1), 0.22 (2), 0.34 (2), 0.46 (3), 0.61 (2), and 0.70 (3); anterodistal angle with 4 spines; posterior margin stepped, with spines at 0.24 (1), 0.39 (1), and 0.74 (2); posterodistal angle with 2 spines. Carpus margins subparallel; anterior margin scalloped and stepped, with spines at 0.19 (3), 0.36 (3), 0.59 (3), and 0.78 (2); anterodistal angle with 3 spines; posterior margin stepped and scalloped distally, with spines at 0.23 (1), 0.35 (2), 0.53 (3), and 0.76 (3); posterodistal angle with 3 spines. Propod narrowing slightly distally; anterior margin stepped, with spines at 0.15 (2), 0.26 (2), 0.39 (3), 0.50 (2), 0.59 (3), 0.71 (2), 0.80 (2), and 0.91 (3); posterior margin stepped and scalloped, with spines at 0.17 (1), 0.29 (2), 0.46 (2), 0.57 (1), 0.66 (2), 0.74 (1), and 0.94 (2); posterodistal angle with 3 spines. Dactyl conical.

Peraeopod 5. Basos nearly circular, width 0.95x length; anterior margin with 10 spine groups; anterodistal angle with 2 spines; posterior margin scalloped, stepped, with 9 minute spines. Ischium anterodistal angle with 3 spines. Merus margins subparallel; anterior margin scalloped and stepped, with spines at 0.10 (2), 0.23 (2), 0.37 (3), 0.52 (4), and 0.73 (2); anterodistal angle with 4 spines; posterior margin with spines at 0.19 and 0.44 (1+1); posterodistal angle with 2 spines. Carpus lateral margins subparallel; anterior margin scalloped, with spines at 0.21 (2), 0.35 (2), 0.49 (1), 0.59 (4), and 0.81 (2); anterodistal angle with 5 spines; posterior margin stepped, with spines at 0.22 (1), 0.33 (1), 0.48 (2), and 0.71 (2); posterodistal angle with 2 spines. Propod narrowing distally, curved anteriorly; anterior margin stepped, with 2 spines at each of 0.16, 0.25, 0.38, 0.49, 0.58, 0.70, 0.77, 0.86, and 0.94; anterodistal angle with 1 spine; posterior margin stepped, with spines at 0.09 (2), 0.15 (3), 0.27 (2), 0.43 (3), 0.53 (2), 0.56 (2), 0.73 (3), 0.83 (3), and 0.93 (3). Dactyl long, conical.

Pleopods. First and 2nd pleopods 1.88 mm long, narrow, delicate; peduncle margins naked except for 2 coupling spines on inner distal margin; outer ramus shorter than inner ramus, which is slightly longer than peduncle; both margins on both rami with long setae; ramal segmentation not obvious. Third pleopod slightly more reduced, 1.35 mm long; peduncle margins naked except for 2 coupling spines on inner distal margin; outer ramus shorter than inner ramus; both rami with long marginal setae, and with segmentation even less obvious than in pleopods 1 and 2.

Sideplates. First subtriangular; posterior margin emarginate distally to form a notch at acute posterodistal angle, with 2 backward-pointing spines proximally. Second and 3rd subsquare; ventral margins only slightly convex; posterior margin notched near acute posterodistal angle, with 2 backward-pointing spines proximally.

Uropod 1 relatively long and delicate, heavily spinose, with long spines. Peduncle with 2 rows of 4 spines each dorsally; no inter-ramal spine evident. Outer ramus with 6 marginal spines dorsally and 2 long and 2 short spines terminally. Inner ramus dorsal margin with a row of 8 spines; dorsal outer margin with 2 spines, 1 very long and 1 long, and 2 shorter terminal spines.

Uropod 2. Peduncle with 5 dorsal spines; inter-ramal spine present. Outer ramus with 3 marginal dorsal spines and 1 short and 2 long terminal spines. Inner ramus heavily spined; inner dorsal margin with 8 spines; outer dorsal margin with 2 spines and 2 larger and 2 smaller terminal spines.

Uropod 3 uniramous. Peduncle with 4 dorsal spines. Ramus with 1 long and 1 short terminal spine.

Telson bilobed, not deeply cleft, with 1 long spine

towards outer margin and 3 shorter spines medially.

Female. As for male except as follows. Length 12.3 mm, width 17.8 mm, depth 2.14 mm.

Antenna 1 peduncle segment 2 with 1 spine on superior margin at 0.5; flagellum with 6 segments.

Antenna 2 flagellum with 18 segments.

Gnathopod 1 sideplate ventral margin rounded, with 6 large spines. Propod anterodistal angle with 3 large spines. Dactyl terminating slightly short of propod ventral margin.

Gnathopod 2 basos narrower.

Uropod 1 outer ramus with 4 dorsal marginal spines; inner ramus with a row of 7 spines on inner dorsal margin and 1 spine on outer dorsal margin.

Uropod 2 outer ramus with 2 spines on dorsal margin; inner ramus with 7 spines.

Telson bilobed, not deeply cleft; each lobe with 1 large spine submarginally and 4 smaller marginal spines.

Type data. Holotype: male, CL, Little Barrier Island, 23–28 November 1954, G.W. Ramsay, taken with one large specimen of *Arcitalitrus sylvaticus* (CMNZ; KD 647).

Allotype: same data as holotype.

Material examined. Type specimens, plus non-type examples as follows: 1 large male, 4 smaller females, same data as holotype (NZAC); Little Barrier I., 1 Mar 1948, R.A. Falla, in leaf mould, small specimens taken with *Puhuruhuru aotearoa* and *Parorchestia tenuis* (OMNZ).

Remarks. *Tara hauturu* is readily identified by the very distinctive heavy spination on the uropods. In most other species of this genus the outer ramus of the uropods tends to be naked or only weakly spined. It probably has a wider distribution than that recorded, but it may be confused with females of *T. sylvicola*, a species that was itself overlooked for 130 years even though it is very common.

The specific epithet is from the Maori name for Little Barrier Island, 'Hauturu', which means 'wind's resting post' (Reed & Brougham 1978).

Tara simularis (Hurley) new combination

Plate 24

simularis Hurley, 1957: 177–179, fig. 188–221, 375–379 (*Orchestia*).

Diagnosis. A small, weakly sexually dimorphic *Tara*. Antenna 1 ultimate segment rudimentary and masked by spines. Antenna 2 short and fine. Gnathopod 1 weakly

chelate in female; dactyl long, overlapping weakly defined palm. Male gnathopod 1 palm transverse. Male gnathopod 2 propod expanded, with a weak transverse dactyl extending to only half propod width. Female gnathopod 2 mitten-shaped. Broodplates large, lanceolate. Epimeral plates with a row of 2 or 3 spines set back from posterior margin.

Description. Male. Length 7.75 mm, width 1.75 mm, depth 2 mm.

Antenna 1 1 mm long, reaching to end of antenna 2 peduncle segment 4. Peduncle segment 1 longer and wider than other peduncle segments, with small spines on distal angles and single spines on margins. Flagellum shorter than peduncle, with 5 segments, each bearing 2 small spines inferodistally and 4 smaller spines superodistally; segment 4 somewhat produced superodistally; rudimentary 5th segment masked by segment 4 and bearing small spines.

Antenna 2 2.5 mm long, reaching 3rd peraeon segment. Peduncle segment 3 half length of segment 4, which is slightly shorter than segment 5; each segment bearing small spines inferiorly and on surface; segment 5 with spines superiorly. Flagellum with 11 segments.

Lower lip. Inner lobes small.

Left mandible with a row of 5 setose spines; upper article of cutting edge with 3 teeth; lower article with very coarsely corrugated upper edge.

Maxilliped. Inner plate with about 7 setulose spines on one side between end teeth and across inner distal angle; end margin with 6 setulose spines outside teeth and about 3 below inner teeth; inner margin with a row of setulose spines from distal angle almost to basos. Outer plate with a row of spines set slightly back from end and inner margins; inner margin with 5 or 6 spines just above merus level. Basos with a stout spine below inner plate; margins and surface with strong spines. Ischium, merus, and carpus with 1 or 2 strong spines on outer distal angles. Ischium with 3 or 4 spines below merus inner proximal angle; similar groups on merus distal margin and carpus medio-distal margin. Merus as large as carpus. Propod slightly smaller, globular. Carpus and propod with stout spines halfway down inner margin from distal angle. Propod with about 5 stout spines distally on outer side; distal marginal spines masking the very rudimentary dactyl. Dactyl not clearly differentiated from propod, spine-tipped.

Gnathopod 1. Basos width not half of length; margins spined; posterodistal angle with 2 spines. Ischium as wide as basos, subsquare; posterior margin spined. Merus longer than ischium; posterior margin as long as propod, about three-quarters length of carpus anterior margin, with several single spines; surface with a few spines. Carpus

anterior margin sparsely spined; posterior margin with a median scabrous lobe bearing long spines; surface with a few spines. Propod anterior margin with a few single spines; distal margin with groups of spines; posterior margin and surface scabrous, with short stout spines; palm half of propod width, scabrous, with a few short spines. Dactyl stout; inner proximal margin scabrous.

Gnathopod 2. Sideplate subsquare, almost ovate, spined posteriorly and ventrally. Basos width one-quarter of length; posterior margin and distal angles with a few minute spines. Ischium with minute spines on posterodistal angle. Merus a little smaller than ischium; posterior margin convex, with a few small spines. Carpus slightly larger, subovate, not spined. Propod more than twice length of carpus, width about three-quarters of length; posterior margin sinuous; posterodistal angle scabrous; palm with small spines, not defined posteriorly. Dactyl short, stubby, three-quarters of propod width, with margins somewhat sinuous; inner margin with a few minute spines; distal tip with a slightly larger spine.

Peraeopod 1. Basos anterior margin with numerous short stout spines; posterior margin with a few single longer spines; posterodistal angle with 2 spines. Ischium slightly narrower, subsquare. Merus two-thirds of basos length, narrower, pyriform; posterior margin more strongly spined than anterior margin. Carpus subovate, width not half of length; posterior margin more strongly spined than anterior margin. Propod a little longer than carpus, slightly more than half of carpus width; anterior margin with pairs of short stout spines; posterior margin with groups of 3 spines each.

Peraeopod 2. Sideplate wider and shallower than in 1st peraeopod; segments shorter and wider, with spines on posterior margin much stouter; otherwise similar.

Peraeopod 3 longer than 2nd peraeopod. Sideplate anterior lobe spined ventrally; posterior lobe spined ventrally and posteriorly. Basos expanded, width more than two-thirds of length; anterior margin with about 5 groups of 1-4 short stout spines; posterior margin with many small spines. Carpus subrectangular, almost linear. Other segments wider than on peraeopod 2 except for longer propod.

Peraeopod 4. Basos width about three-quarters of length.

Peraeopod 5 longer than 4th peraeopod, with segments longer. Basos greatly expanded, nearly as wide as long; anterior margin as in peraeopod 3; posterior margin serrate, with minute spines; posterodistal angle produced halfway along ischium.

Epimeral plates. Posterior margins of all plates sinuous, serrate, with 5-8 stout short spines; posterodistal angle produced backwards a little, with a row of 2 or 3 spines set

back from margin. Plate 1 with 3 stout spines anteriorly.

Pleopods. Each ramus appearing to have 3–5 segments, but segmentation may be only superficial; outer ramus slightly the longer.

Uropod 1. Peduncle dorsal margins each with about 5 spines; inner ramus with 4 dorsal spines; outer ramus with 2 dorsal spines; both rami with 2 long and 2 short end spines.

Uropod 2. Peduncle with about 3 spines on outer dorsal margin; inner dorsal margin with 1 spine distally; outer ramus with 1 spine dorsally and 1 short and 2 long end spines; inner ramus with 2 spines dorsally and 2 long and 2 short end spines.

Uropod 3. Peduncle with 2 stout dorsal spines distally; lower surface with several short fine spines; ramus shorter than peduncle, narrower, cylindrical, with a stout spine dorsally and 6 short and long end spines.

Telson. Both lobes with 3 marginal spines and 2 end spines, all stout.

Female. As for male except as follows. Length 8 mm, width 21 mm, depth 2 mm.

Antenna 2 reaching peraeon segment 3; flagellum with 13 segments.

Gnathopod 1. Carpus subtriangular, with margins and surface spined; anterior margin 1.5x length of merus; scabrous lobes lacking. Propod shorter than carpus, narrower; anterior margin with 3 groups of 3 or more short stout spines; distal margin with several fine slender spines anteriorly; surface and posterior margin with stout single spines; palm transverse, very short, defined by a spine, with a group of fine slender spines inside it. Dactyl much longer than palm.

Gnathopod 2. Broodplates large, lanceolate, about three-quarters length of basos, width nearly half of length, fringed with setae lacking curl-tips. Sideplate strongly spined ventrally. Basos with a few fine marginal spines distally. Ischium width about half of length, with posterodistal angle spined. Merus as wide as ischium, a little shorter; posterior margin convex, with few marginal spines. Propod subovate, two-thirds of carpus length, with few fine spines at outer distal margin; palm poorly defined, with a few short spines and with longer fine spines from dactyl inner base to posteroproximal angle. Dactyl short, curved.

Type data. **Holotype:** male, The Snares Islands, R.A. Falla, in leafmould (slide 68, NMNZ).

Allotype: female, same data as male (slide 70, NMNZ).

Remarks. *Tara simularis* may be recognised by the fol-

lowing characters: antenna 1 end segment reduced, almost masked by penultimate segment, which bears an expanded lobe distally; male gnathopod 2 very distinctive, with sinuous palm and dactyl margins; and rows of spines set back from posterior margin of epimeral plates.

Tara sinbadensis (Hurley) new combination

Plate 25, Map 9

sinbadensis Hurley, 1957: 174–177, fig. 166–187, 365–369 (*Orchestia*).

Diagnosis. A small, strongly sexually dimorphic *Tara* with relatively short and slender antennae 2. Gnathopod 1 propod long, with a transverse palm in both sexes and a strong dactyl. Gnathopod 2 propod mitten-shaped in female, strongly developed in male into a triangular shape, with a sinuous palm and a strong dactyl extending beyond end of palm. Pleopods not reduced. Uropod 1 spined on both dorsal margins, with a strong inter-ramal spine.

Description. Male. Pigmentation in ethanol yellow, with orange-red blotches on dorsum. Body length 9 mm, width 2 mm, depth 11 mm.

Antenna 1 1.75 mm long, reaching to two-thirds along antenna 2 peduncle segment 5. Peduncle segment 1 as long as segment 2 but wider, two-thirds length of segment 3, which is narrower; all segments with a few long setae distally. Flagellum as long as peduncle, with 5 segments, each bearing pairs of long setae on distal margins; ultimate segment with 3 long terminal setae.

Antenna 2 3 mm long, reaching 3rd peraeon segment. Peduncle segments with a few long slender setae, mainly on inferior margins and surface. Flagellum with 11 segments, slightly longer than peduncle; ultimate segment long, tapering.

Mandibles. Left: upper article of cutting edge with 3 teeth; median article bifurcate; lower article with 4 teeth. Right: upper article with 3 teeth; median article bifurcate; lower article U-shaped.

Maxilliped. Inner plate distal margins with 4 setulose spines outside end teeth; distal angle with several spines across and halfway down inner margin, and remainder of inner margin to basos finely bristled. Outer plate reaching end of carpus; inner surface with a row of spines set back from margin. Basos to propod segments all with 1 or 2 spines on outer distal angle. Propod, carpus, and merus of equal length, with fine bristles on inner surface; carpus as wide as merus, propod narrower. Merus with 2 short spines on inner distal angle. Carpus with 2 spines mediodistally,

and fairly dense, short, stout spines on inner distal angle. Propod with 3 long stout spines on one side of small dactyl, and strong spines on other side, masking dactyl. Dactyl with 3 end spines.

Gnathopod 1. Basos width one-quarter of length, sparsely spined anterodistally and posteriorly. Ischium subsquare, as wide as basos, lobed slightly anteriorly, posterodistally spined. Merus subrectangular; posterior scabrous lobe with 2 long slender spines. Carpus longer than merus; anterodistal angle spined; posterior margin distally expanded into a scabrous pellucid lobe, with a few long slender spines. Propod subrectangular, shorter and narrower than carpus; anterior margin with 4 groups of stout spines, the last at base of short curved dactyl; posterior margin scabrous; palm scabrous, half of propod width, with 4-6 short and medium slender spines on each side; a row of long slender spines on posterior surface. Dactyl with a spine on outer margin.

Gnathopod 2. Sideplate spined ventrally and posteriorly. Basos width one-quarter to one-third of length; margins with very few small spines; basos and ischium triangular in cross-section, with a depression between anterior margins for reflexed propod. Ischium slightly narrower, subsquare, with minute spines on posterodistal angle. Merus posterodistal angle produced downwards a little. Carpus very small. Propod subtriangular; anterior margin as long as basos plus ischium, as wide as long, narrowing greatly proximally. Palm slightly oblique, longer than posterior margin, with a strong tooth near base of dactyl; remainder of palm sinuous, grooved to receive dactyl, with both sides bearing stout bifurcate-tipped spines. Dactyl with a slight bulge outside palm tooth, impinging on palmar groove, and with a spatulate finger extending beyond palm; inner margin corrugate, spined; medial surface with a row of spines.

Peraeopod 1. Basos width one-quarter of length. Ischium subrectangular, spined posteriorly. Merus slightly narrower, half of basos length; anterior margin with 2 spines proximally, 2 distally; posterior margin with 3 or 4 pairs of spines. Carpus about three-quarters of merus length; anterior margin with a single spine at midway and 2 spines distally; posterior margin with 3 groups of long strong spines. Propod slightly longer than carpus; margin with 2 or 3 stout spines, and a single spine posterodistally. Dactyl long, with margins spined.

Peraeopod 2 with fewer, shorter spines on anterior margins than *peraeopod 1*.

Peraeopod 3 slightly shorter than *peraeopod 2*. Sideplate anterior lobe spined ventrally; posterior margin spined distally. Basos greatly expanded, sharply constricted distally; anterior margin with several groups of

short stout spines; posterior margin with a few minute spines and 2 very long spines. Merus wider than in *peraeopod 2*, and carpus and propod longer; spines seta-tipped, much stouter and longer, particularly those on merus and carpus anterodistal angles.

Peraeopod 4. Basos expanded, width more than half of length, not narrowing as sharply distally as in *peraeopod 3*; margins with strong single spines.

Peraeopod 5. Basos ovate, as wide as long; anterior margin with strong single spines; posterior margin serrate, with minute spines. Other segments missing.

Pleopods. Peduncle outer margins finely bristled. Rami longer than peduncle, with segmentation visible only at distal ends; inner ramus longer than outer ramus. Pleopod 1 peduncle with 3 coupling spines distally; pleopod 2 and 3 peduncles each with 2 coupling spines. Pleopod 3 smaller than others, biramous, not greatly reduced.

Epimeral plates. Anterior margins convexly rounded to ventral margins; posterior margins serrate, minutely spined, sigmoid in plate 1, straight in plates 2 and 3; posterodistal angles produced slightly backwards.

Uropod 1. Peduncle with both dorsal margins spined; inter-ramal spine long, extending to half length of rami. Inner ramus with 3 or 4 dorsal spines and 2 long and 2 short end spines; outer ramus similar. Both rami minutely spined and serrate, the spines seta-tipped.

Uropod 2. Peduncle as long as rami, with both dorsal margins spined. Inner ramus with 1 long, 1 medium, and 3 short terminal spines; outer ramus with 1 long and 3 short terminal spines. Both rami dorsally spined.

Uropod 3. Peduncle much larger than ramus, with 1 dorsal spine; ramus with 1 long and 1 short end spine.

Telson subtriangular, with 1 short and 1 long seta-tipped spine on end of each lobe.

Female. As for male except as follows. Length 13 mm, width 2.5 mm, depth 2.5 mm.

Antenna 1 reaching halfway along *antenna 2* peduncle segment 5; flagellar setae slightly longer than in male.

Antenna 2 with 26 segments.

Gnathopod 1 propod not as wide, with dactyl longer, and palm extending to posterior edge of segment; spines on posterior margin stronger and paired.

Gnathopod 2. Sideplate a little more ovate. Basos width one-quarter to one-third of length; margins with very few and small spines. Ischium width more than half of length, with posterodistal angle spined. Merus with posterior pellucid lobe bearing a few spines. Carpus subtriangular, with scabrous lobe very sparsely spined. Propod as long and wide as carpus, subovate, with a row of spines from inner base of short curved dactyl to well down segment; palm

with 8 or so short spines on each side. Dactyl with a spine on inner margin.

Type data. Holotype: male, FD, Milford Sound, Sinbad Gully, R.R. Forster, 29 August 1946 (slide 56, NMNZ).

Allotype: same data as holotype (slide 55, NMNZ) (type status designated by D.E. Hurley).

Material examined. Type specimens, plus collections bearing the following data: Franz Josef, 23 Jan 1973, leafmould (KD 52); Mt Luxmore, 3 Jan 1973, P.M. Johns, bushline (KD 609); Manapouri, Wilmot Pass, 2100', G.W. Ramsay, beaten *Weymouthia* moss on *Hoheria* (KD 935); Wilmot Pass, Mt Barber, 8 Jan 1970, J.S. Dugdale & J.M. Hay, in mats, DSIR 70/13 (KD 936).

— / WD, FD.

Remarks. *Tara sinbadensis* is easily identified by the triangular shape of the male gnathopod 2 propod. In one collection some of the males did not have the typical spination pattern on their uropods, possibly because they were too young to have developed mature spination.

The species is apparently restricted to Fiordland and South Westland, and is found in moss on trees as well as in leaf litter, hence its occurrence in samples taken by beating or sweeping aerial vegetation. In much of Fiordland and Westland the soil and litter are saturated for a good part of the year, and are too wet for landhoppers.

Tara sylvicola (Dana) new combination

Plates 26 and 27, Map 10

sylvicola Dana, 1852: 202 (*Orchestia*); —1853 & 1855: 873–875. Bate, 1862: 21. Miers, 1876: 122. Thomson, 1881: 212. Thomson & Chilton, 1886: 145. Della Valle, 1893: 510. Thomson, 1899: 203–204. Stebbing, 1899: 402 (in part) (*Parorchestia*); —1906: 558. Chilton, 1909: 642–643; —1911: 566; —1927: 176. Stephensen, 1935: 14. Shoemaker, 1935: 66. Bousfield, 1964: 52.

tenuis Hurley, 1957: 166 (*Orchestia*) (*sylvicola* designated nomen dubium).

Diagnosis. A large, sexually dimorphic *Tara* with a reticulate body pattern. Eyes large. Antenna 1 reaching just beyond beginning of last segment of antenna 2 peduncle. Antenna 2 moderately long, slender. Gnathopod 1 strongly subchelate in both sexes. Gnathopod 2 strongly chelate in male, mitten-shaped in female. Peraeopods stout. Pleopods all present and biramous, slender, with 2 coupling spines.

Uropod 1 and 2 rami dorsal margins heavily spined on both branches. Telson with 1 large spine and a few small spines on each lobe.

Description. Male. Length 15.9 mm, width 2.71 mm, depth 2.94 mm. Body not very deep. Pigmentation pattern reticulate. Head deeper than long. Eye round, black, about one-third of head width.

Antenna 1 2.10 mm long, extending just beyond junction of segments 4 and 5 of antenna 2 peduncle. Length of peduncle 0.8x length of flagellum. Peduncle segment 1 with a small spine on dorsal margin, 1 at distal angle, and 2 on inferior margin. Peduncle segment 2 as long as segment 1, with 2 spines mid-dorsally, 1 at dorsodistal angle and laterally, and 3 longer spines at ventrodiscal angle. Peduncle segment 3 1.3x length of segment 2 and 0.63x its width, with 1 spine on superior margin, 1 at dorsodistal angle, 2 spines laterally, and 2 at ventrodiscal angle. Flagellum of 8 segments, each except the first and last bearing a group of 2 or 3 spines at both dorsodistal and ventrodiscal angles; terminal tuft comprising about 6 short spines.

Antenna 2 7.55 mm long. Peduncle 0.7x length of flagellum. Peduncle segment 3 spined on inferior margin, at ventrodiscal angle, and around laterodistal margin, with 1 spine on outer face. Peduncle segment 4 2.1x length segment 3, with 4 spines on outer face; distal margin with 4 spines on outer face, 2 at ventrodiscal angle, and 2 on inner face; inferior margin with 5 spines. Peduncle segment 5 0.83x width of segment 4; superior margin with groups of 3 spines at 0.25, 0.43, 0.64, and 0.83; inferior margin bearing spines at 0.14, 0.25, 0.42, 0.52, 0.63, and 0.80; inner face bearing spines close to inferior margin at 0.25, 0.42, 0.63, and 0.82; distal margin with 2 spines at superior, lateral, and inferior angles. Flagellum of 23 segments, tapering distally; each segment except the first and last with 3 spines at the 4 angles on distal margin; terminal tuft comprising short setae.

Upper lip. Distal margin rounded, densely setulose; inner shelf naked.

Left mandible with a 6-cusped incisor; lacinia mobilis with 4 teeth and with 8 pilose setae in pairs between teeth; molar about 27-striate, with medial seta prominent. *Right mandible* as for left, but molar medial seta not present.

Lower lip of normal scroll shape; distal margin rounded, pilose. Inner margin pilose, with a setal row running diagonally from mid-distal margin then turning parallel to inner margin.

Maxilla 1. Inner plate slender, narrowing distally; inner margin finely pilose, terminating with 2 long pilose setae. Outer plate broadening distally; distal margin with 9 teeth

bearing respectively 1, 1, 4, 4, 4, 4, 4, 4 lateral protuberances (from outermost to innermost).

Maxilla 2. Outer plate margins subparallel; distal margin rounded, with about 20 inwardly curved setae; inner margin sparsely pilose. Inner plate narrowing distally; inner and distal margins fringed with a row of setae terminating proximally with a stout pilose seta. Inner plate inner margin sparsely pilose proximally.

Maxilliped. Inner plate distal margin rounded, with 3 stout marginal spine teeth and with pilose setae set below teeth and down inner margins. Outer plate with a spine comb row along distal margin and down inner margins; inner margin with a patch of about 4 spines at midway; basal segments with spines at outer distal angles and a patch of 3 on mid-distal margin. Palps broad; segment 1 with 3 spines on outer distal angle and a patch of 4 on inner distal angle; segment 2 outer distal angle with 3 spines, inner distal angle with 4, and inner margin produced inwardly, with a fringing comb of 10 or more setae; segment 3 heavily spined on inner margin and distally; segment 4 present, not obscured by segment 3 spines.

Gnathopod 1. Coxal plate ventral margin rounded, with 4 spines. Basos broadening immediately proximally then subparallel for distal two-thirds of its length; anterior margin straight, with spines at 0.44, 0.55, 0.66, 0.77, 0.86, and 0.95; posterior margin angled initially, with stouter spines at 0.37, 0.49, and 0.62 and at distal angle. Ischium a rhomboid, with 2 spines at posterodistal angle. Merus not much longer than ischium; posterior margin with about 6 spines, and produced distally into a pellucid lobe. Carpus anterior margin somewhat convex, with spines at 0.24, 0.42, and 0.66; anterodistal angle with 2 large spines; posterior margin produced into a large pellucid lobe, guarded at base by a row of 4 stout spines on both inner and outer faces; posterodistal angle with 5 stout spines. Propod broadening distally, produced a little posterodistally into a pellucid lobe projecting apically beyond dactyl tip; anterior margin with spines at 0.38 (1), 0.63 (2), and 0.83 (3); anterodistal angle with 4 spines; inner face with a longitudinal row of 11 stout spines from near posteroproximal margin to anterior of palm; outer face with 2 longitudinal spine rows, one of 4 stout spines, the other of 5; palm transverse, convex, about half of propod width, fringed with a row of about 12 spines on each side. Dactyl about three-quarters of propod width.

Gnathopod 2. Coxal plate rounded ventrally, with 15 spines. Gill trilobate, but distal lobe short and narrow. Basos broadening distally; anterior margin very slightly sinuous, naked; posterior margin convexly rounded, with small spines at 0.35, 0.49, 0.58, and 0.67; posterodistal angle with 2 small spines. Ischium produced anteriorly into

a prominent pellucid lobe; posterodistal angle with 2 small spines. Merus shorter than ischium; posterior margin with 2 spines; posterodistal angle with 2 spines. Carpus short, with 1 spine on anterior margin. Propod greatly expanded, broadening distally, triangular; anterior margin convexly curved; posterior margin short, straight; palm slightly convex, fringed on both sides by spine rows of about 30 short setae, terminating in a transverse lobe that guides and protects dactyl tip; setae increasing in size posteriorly, and those on outer face shortest; palmar angle 143°. Dactyl long, curved; inner margin with a few needle setae; distal end with a rounded inflexible tip overlapping propod.

Peraeopod 1. Coxal plate ventral margin slightly convexly rounded, spined. Gill discoidal, smaller than on gnathopod 2 but almost reaching midline. Basos long, subparallel, curved somewhat anteriorly; anterior margin concave, with small spines at 0.43, 0.57, 0.68, 0.72, and 0.81; posterior margin with larger spines at 0.25, 0.32, 0.45 (2), and 0.66; posterodistal angle with 2 spines. Ischium anterior margin slightly produced into a pellucid lobe; posterodistal angle with 3 spines. Merus broadening distally; anterior margin with spines at 0.17 (1), 0.33 (1+1), and 0.55 (1+1); anterodistal angle with 2 spines; posterior margin sinuous, with spines at 0.24 (3), 0.40 (3), 0.54 (1), 0.60 (1), 0.66 (1), 0.79 (1), and 0.96 (1); posterodistal angle with 1 spine. Carpus anterior margin with spines at 0.31 (1) and 0.59 (2); anterodistal angle with 3 spines; posterior margin with spines at 0.19 (1+1), 0.39 (1+1), 0.63 (1+1), 0.81 (2), and 0.86 (1); posterodistal angle with 1 spine. Propod curved slightly posteriorly; anterior margin with spines at 0.27 (2), 0.50 (2), and 0.79 (2); anterodistal angle with 1 spine; posterior margin curved slightly convexly, with spines at 0.14 (1), 0.23 (2), 0.35 (3), 0.53 (3), 0.69 (3), and 0.88 (5). Dactyl relatively long, with 1 spine on inner margin.

Peraeopod 2. Coxal plate subsquare; ventral margin nearly straight, with 9 spines; posterodistal angle rounded. Gill ovately discoidal. Basos anterior margin concave, with small spines at 0.72, 0.80, and 0.86; anterodistal angle with 2 spines; posterior margin with spines at 0.28 (1), 0.38 (2), and 0.63 (1); posterodistal angle with 3 spines. Ischium anterior margin slightly produced into a lobe; posterodistal angle with 2 spines. Merus broadening distally; anterior margin with spines at 0.22 and 0.44; anterodistal angle with 3 spines; posterior margin with larger spines at 0.25 (1+1), 0.46 (3), and 0.70 (3); posterodistal angle with 3 stout spines. Carpus anterior margin with small spines at 0.31 (1) and 0.58 (2); anterodistal margin with 3 spines; posterior margin with larger spines at 0.19 (1+1), 0.38 (1+1), 0.64 (1+2), 0.74 (1), 0.81 (2), and 0.90 (1). Propod margins subparallel, only slightly curved posteriorly; anterior

margin with spines at 0.25 (2), 0.46 (2), and 0.73 (3); anterodistal angle with 4 spines; posterior margin with spines at 0.19 (1), 0.30 (3), 0.46 (3), 0.63 (3), 0.68 (1), 0.82 (3), and 0.87 (1).

Peraeopod 3. Coxal plate with both ventral lobes rounded and spined. Gill relatively large, with 2 slightly developed lobes. Basos an inverted pear-shape, width three-quarters of length; anterior margin with spines at 0.25 (2), 0.41 (1), 0.55 (1), 0.66 (1), and 0.76 (2); anterodistal angle with 3 spines; posterior margin with spines at 0.06, 0.19, 0.35, 0.68, 0.81, and 0.94. Ischium short, with spines at anterodistal angle; posterior margin slightly produced. Merus broadening distally; anterior margin with spines at 0.24 (3), 0.51 (3), and 0.76 (3); anterodistal angle with 5 spines; posterior margin with spines at 0.32 and 0.56; posterodistal angle with 4 spines. Propod narrowing slightly distally, 7x longer than broad; anterior margin with spines at 0.20 (2), 0.32 (2), 0.46 (3), 0.65 (4), and 0.85 (3); posterior margin with spines at 0.37 (1), 0.59 (4), and 0.85 (3); posterodistal angle with 5 spines.

Peraeopod 4. Coxal plate ventral margin rounded, with few small spines. Gill large, multilobed; pendulous lobe large, somewhat triangular. Basos ovate, width 0.8x length; anterior margin with spines at 0.07, 0.18, 0.26, 0.40 (2), 0.54 (2), 0.70 (1), 0.81 (2), and 0.89 (1); anterodistal angle with 2 spines; posterior margin with spines at 0.31, 0.40, 0.46, 0.51, 0.58, 0.69, 0.78, 0.86, and 0.92. Ischium anterodistal angle with 2 spines. Merus slightly broadening distally; anterior margin with spines at 0.12 (1), 0.24 (2), 0.33 (1), 0.46 (3), 0.58 (1), 0.70 (3), and 0.81 (1); anterodistal angle with 4 spines; posterior margin with spines at 0.14 (1), 0.24 (1), 0.39 (1), and 0.63 (1+1); posterodistal angle with 3 spines. Carpus subparallel; anterior margin with spines at 0.15 (2), 0.30 (2), 0.44 (1), 0.57 (4), 0.77 (2), and 0.91 (3); posterior margin with smaller spines at 0.36 (2), 0.53 (2), and 0.77 (1); posterodistal angle with 2 large spines. Propod width 0.1x length; anterior margin with spines at 0.14 (2), 0.24 (3), 0.36 (2+2), 0.49 (2+2), 0.56 (2+2), 0.71 (2), 0.82 (3), and 0.94 (2+2); posterior margin with spines at 0.23 (2), 0.34 (3), 0.51 (3), 0.61 (1), 0.68 (3), 0.85 (3), and 0.95 (3); posterodistal angle with 4 spines. Dactyl coniform, slightly curved anteriorly.

Peraeopod 5. Coxal plate ventral margin rounded, spined. Penis organ subsquare. Basos ovate, as wide as long. Ischium with 3 spines at anterodistal angle; posterior margin only slightly produced. Merus broadening only slightly distally; anterior margin with spines at 0.12 (2), 0.25 (3), 0.36 (2), 0.49 (2+2), and 0.74 (2+1); anterodistal angle with 4 spines; posterior margin with spines at 0.11 (1), 0.21 (1), 0.41 (1+1), and 0.67 (1+1); posterodistal angle with 1+2 spines. Carpus margins subparallel, width

0.18x length; anterior margin with spines at 0.15 (2), 0.29 (2), 0.43 (0+2), 0.55 (2+2), 0.75 (2), and 0.89 (3); posterior margin with smaller spines at 0.25 (2), 0.35 (2), 0.52 (2), and 0.74 (2); posterodistal angle with 4 spines. Propod narrowing slightly distally, curved slightly anteriorly, width 0.09x length; anterior margin with spines at 0.16 (1), 0.25 (2), 0.37 (3), 0.49 (3), 0.59 (3), 0.70 (2), 0.79 (3), 0.86 (1+1), and 0.91 (2+1); posterior margin with spines at 0.15 (2), 0.22 (3), 0.35 (3), 0.48 (3), 0.59 (3), 0.69 (3), 0.83 (3), and 0.96 (3); posterodistal angle with 2 spines.

Pleopods all present, slender, biramous, with 2 coupling spines. Peduncle margins naked. Rami clearly segmented; outer rami smaller than corresponding inner rami. First pleopod 2.85 mm long, 2nd 2.69 mm, 3rd 2.15 mm.

Epimeral plates. Plate 1 subtriangular; posterodistal angle produced slightly into a hook shape; posterior margin with 2 small spines. Plates 2 and 3 subsquare, with rounded anterodistal angles; posterodistal angles moderately produced into hook shapes; posterior margins with 5 small spines.

Uropod 1 moderately long; peduncle with 2 rows of about 8 spines each dorsally; inter-ramal spine minute; rami heavily spined dorsally, terminating with 2 large and 2 smaller spines.

Uropod 2. Peduncle spined dorsally; a short, stout inter-ramal spine present; both rami spined dorsally; outer ramus with 3 very large spines, inner ramus with 7 smaller spines.

Telson only slightly cleft, with a cluster of 1 large and about 5 small spines around apex of each lobe.

Female. As for male except as follows. Length 18.8 mm, width 3.41 mm, depth 3.65 mm.

Antenna 1 2.42 mm long, extending to about 0.2 along antenna 2 peduncle segment 5. Segment 2 with 3 spines mid-dorsally. Segment 3 with 2 spines on superior margin and 1 spine on inferior margin. Flagellum with 8 segments.

Antenna 2 9.43 mm long. Peduncle 0.65x length of flagellum. Flagellum with 24 segments.

Mandibles. Molar medial setae not discernible.

Gnathopod 1. Sideplate anterodistal angle sharper than in male; posterior margin with an additional spine at 0.81. Ischium posterior margin with a prominent spine. Merus not produced into a pellucid lobe. Propod narrower, width 0.45x length; palm extending to edge of propod, fringed by larger spines. Dactyl almost as wide as propod.

Gnathopod 2. Brood plate narrowing distally, rounded terminally, with about 21 spines. Basos broader proximally than in male, narrower distally, width 0.34x length; posterior margin with spines at 0.35, 0.49, 0.59, 0.69, 0.76, 0.86, and 0.94. Merus with 3 marginal spines, 4 on lateral face, and 2 at posterodistal angle. Carpus long, broadening

distally, with a pellucid lobe posterodistally; 3 spines at anterodistal angle, 2 at posterodistal angle, and about 7 on lateral face. Propod mitten-shaped, long, broadening distally into a pellucid lobe that projects posterodistally beyond palm, weakly subchelate; palm only about one-third of propod width; palmar angle 18°. Dactyl short, its tip occluding into propod lobe.

Peraeopod 1. Broodplate margins subparallel, rounded distally, with about 20 spines. Basos broader, with anterior margin straighter. Merus anterior margin with spines at 0.17, 0.33, 0.55, and 0.70.

Peraeopod 2. Broodplate narrowing somewhat distally. Merus slightly broader.

Peraeopod 3. Broodplate somewhat cup-shaped, with posterior margin upturned and folded forwards; distal margin tapering into a lobe with about 9 spines; peraeopods 3–5 more massive than in male, but shape and spination basically the same.

Uropod 1. Peduncle dorsal margin with 2 rows of spines, terminating distally with a large spine; inter-ramal spine absent. Both rami with a dorsal row of 9 scionate spines becoming progressively larger distally, terminating with 2 large scionate spines and 2 smaller spines.

Uropod 2. Peduncle with dorsal spines small except for 4 in 2 groups on distal margin; inter-ramal spine short, stout. Outer ramus with 4 stout spines on dorsal margin; inner ramus with 2 longitudinal rows of 11 and 3 dorsal spines; both rami terminating with 2 large and 2 small spines.

Uropod 3 uniramous. Peduncle with 5 stout spines dorsally. Ramus with 2 spines mid-dorsally and 1 spine on mid-ventral margin. Terminal spine cluster comprising 1 large and 3 smaller spines.

Type data. Holotype: female, ND, "from moist soil in the bottom of the extinct volcano of Taiamai" (now called Ohaeawai), J.D. Dana. No details on deposition, so presumed lost (D.E. Hurley, pers. comm.).

Neotypes: ND, Kaitaia, Tangihua, Mt Horokaka, 518 m, J.S. Dugdale, ex litter (taken with *Parorchestia tenuis* and *Puhuruhuru aotearoa*) (CMNZ).

Syntypes: ND, summit Mangamuka Hills, 382 m, K.A.J. Wise, beaten from *Freyinetia* (taken with *P. tenuis*) (NMNZ, NZAC).

Material examined. Type series, plus other collections bearing the following data. Mangamuka Summit, 386 m, B.M. May, 13 Dec 1976, ex litter, taken with an unidentifiable landhopper. N side Mangamuka Hills, 300 m, K.A.J. Wise, 19 Nov 1966. Mangamuka Hills, forest summit, 382

m, K.A.J. Wise, 19 Nov 1966. Mangamuka Gorge, K.A.J. Wise, 19 Nov 1966, beaten. Mt Mangamuka, R.R. Forster, 7 Jan 1967. 3 miles S of Paihia, by swamp forest, K.A.J. Wise, 18 Dec 1966, ex leaf litter, taken with *Puhuruhuru aotearoa*. Waipu Gorge, K.A.J. Wise, 20 Nov 1966, ex leaf litter in forest. Tangihua Range, Tangihua Strm, J.S. Dugdale, 17 Jul 1977, tributary in forest. Omahuta, near Kauri Reserve, in regeneration after clear-felling, J.C. Watt, 10 Oct 1974, ex litter, taken with 2 other undescribed landhopper species.

ND / —.

Remarks. In 1852 Dana described the female of *Orchestia sylvicola* from moist soil in the bottom of the extinct volcano Taiamai – now called Ohaeawai – in the Bay of Islands district. He amplified his description in 1853 and 1855. Unfortunately he was not able to associate a male with the female with certainty. He did describe a male that had been collected from either the Bay of Islands or the volcano Taiamai as *Orchestia sylvicola*, but mentioned that the difference in uropod spination (the male had a naked outer ramus) suggested that the male and female did not belong to the same species. It was his opinion that if they did not belong together then the male was in fact *O. tenuis*, a species that he had described from the same general area.

Parorchestia tenuis is very similar in gross morphology, but besides the difference in uropod spination mentioned by Dana there were other differences given in his drawings and text that clearly differentiated the two species. These include the length of antenna 1 in relation to the peduncle of antenna 2 (that of *P. tenuis* is much longer), the general shape of the body, especially depth (*P. tenuis* is shallower), the length and conformation of the peraeopods (longer in *T. sylvicola*), the robustness of the uropods, and the shape of the gnathopods.

Unfortunately Dana's type specimens have been lost, and confusion has reigned over the two species for a very long period. Bate (1862) repeated Dana's descriptions of the female and reproduced his figures. He also described a male of *T. sylvicola* collected by the Erebus and Terror Expedition from New Zealand that appears from the figures to have a spined outer ramus, but his description was not sufficient to clarify the matter.

Thomson (1881) suggested a radical solution: to unite *T. sylvicola*, *P. tenuis*, and the supralittoral *O. novaezealandiae* in *Orchestia sylvicola*. He postulated that this species is polymorphic, having more than one adult form. This conclusion was based on 163 terrestrial talitrids he collected from ferns, etc. on the Otago Peninsula, from cocksfoot and other grasses in the Town Belt, Dunedin,

from bush on Flagstaff, Dunedin district, from Preservation Inlet, from bush at Port Pegasus, Stewart Island, from Copper Island (SI), and from bush in the neighbourhood of Dunedin. He stated (p. 212): "The antennae vary greatly in length; thus the superior pair in some extend only as far as the extremity of the penultimate joint of the lower, while in others they extend as far as the extremity of the ultimate. In some cases the inferior pair are not one-third as long as the animal; in others they are more than half as long. Some exhibit a regular gradation in length of the 3rd, 4th, and 5th peraeopoda; others have the 3rd and 4th subequal and short, and the 5th very long ..."

It is obvious that he was examining a mixed collection, probably consisting of *Makawe hurleyi*, *Puhuruhuru patersoni* (the few males with large second gnathopods in his collection), and *Parorchestia ihurawao*, all of which are common in the Dunedin district. From his Stewart Island sites he would have taken *P. patersoni*, *Kanikania motuensis*, plus some other species such as *Parorchestia tenuis*. None of his material would have included *sylvicola* as Dana described it. It is surprising that he did not detect that he had a multiplicity of species, since he collected the material himself, and the pigmentation patterns of these species around Dunedin and Stewart Island are species-specific and very distinctive. He did note the multiplicity of colours in his sample, but seemed unaware of its implications, and he makes no mention of the far more important pattern characteristics by which species can be readily identified. It is a great pity that he did not examine material from the type locality designated by Dana. Systematic conventions require this, if at all possible, before taking such a radical step as merging three species that were, by the standards of the day, well described.

The confusion reigning in both the ecological and the taxonomic literature since Thomson's time has been considerable. Stebbing (1906) redescribed both species, giving more detail apparently from new material. What material it was we have no knowledge, and unfortunately his description of *T. sylvicola* is neither internally consistent nor consistent with Dana's description. For instance, he states: "Antenna 1 reaching end of penultimate joint of peduncle of antenna 2, but sometimes much farther." This seems a simple case of species confusion; the sympatric species *Puhuruhuru aotearoa* has longer antennae, and looks like the female of *T. sylvicola*. It is commonly collected together with *Tara sylvicola* and *P. tenuis* in Northland. Later Stebbing states: "Uropods 1 and 2, outer ramus with spines only at apex, in both sexes (Dana: only in male)."

Chilton (1925) recorded *Parorchestia sylvicola* (Dana) from Wharekauri in the Chatham Islands and stated that

this is the common terrestrial amphipod of New Zealand. He gave as its distribution New Zealand, Chatham Islands, Kermadec Islands, and Lord Howe Island. The species he collected from the Chatham Islands was probably *Makawe hurleyi*, which is the commonest landhopper there, occurring also on the east coast of the South Island. I have never seen any collections containing *Tara sylvicola* from the Chatham Islands, and I have been unable to locate Chilton's original Chatham Island material.

Stephensen (1938) lists *sylvicola* as having no spines on the outer ramus, but mentions that some specimens from New Zealand, as determined by Stebbing, in the Zoological Museum of Copenhagen have about four marginal spines.

In his 1957 review of genus *Orchestia* Hurley discussed the question of the validity of *T. sylvicola* at length. He considered that it was not practical to separate *tenuis* and *sylvicola* on the basis of written descriptions, so he proposed to merge them under *tenuis*, in genus *Orchestia*, along with *Orchestia gammarellus* Della Vale, *Allorchestia recens* Thomson, and two forms of *P. stewarti* Stephensen. He was correct in saying that the written descriptions are confusing, but since the two species can be distinguished using Dana's descriptions, it is invalid to merge them.

There is no evidence of anyone – with the possible exception of Bate – examining new material from Northland since Dana's time. If they had, the confusion would have been resolved easily. The material I have examined shows that *P. tenuis* and *T. sylvicola* co-exist in Northland. *P. tenuis* extends beyond Northland to the rest of the North Island, especially in upland areas of low soil conductivity, and to Nelson and Westland in the South Island, to Stewart Island, and perhaps The Snares. *T. sylvicola*, on the other hand, is restricted to Northland. Dana's attribution of the male to *T. sylvicola* was, as he suspected, incorrect; it belongs with *P. tenuis*. Both sexes of *T. sylvicola* have spined outer rami on uropod 1.

T. sylvicola is easily identified by its reticulate body pattern, the shortness of antenna 1 relative to the antenna 2 peduncle, and the very distinctive male second gnathopod propod and dactyl. It seems to persist in spite of environmental disturbance, since it occurs in cut-over forest areas that are now regenerating. But, unlike some other native landhoppers such as *P. tenuis* and *M. hurleyi*, it has not penetrated non-native plant communities. This is probably because the aggressive and ubiquitous *Arcitalitrus sylvaticus*, an adventive landhopper from Australia, is widespread throughout the Auckland urban area and Northland, where it generally occupies both the long grass and the disturbed scrubland habitats, displacing the native species from such areas.

Tara taranaki new species

Plates 28 and 29, Map 12

Diagnosis. A large, strongly sexually dimorphic *Tara* with large eyes. Antenna 1 extending just beyond beginning of last segment of antenna 2 peduncle. Antenna 2 moderately long and slender. Gnathopod 1 strongly subchelate in both sexes. Gnathopod 2 strongly chelate in male, mitten-shaped in female, with basos broadened in both sexes. Peraeopods stout. Pleopods slender, all present and biramous, with 2 coupling spines. Uropod 1 and 2 ramus dorsal margins heavily spined on both branches.

Description. Holotype male. Length 14.9 mm, width 2.8 mm, depth 2.5 mm. Body not very deep. Pigmentation pattern unknown. Head deeper than long. Eye round, black, about one-third of head length.

Antenna 1 1.7 mm long, extending to just beyond junction of segments 4 and 5 of antenna 2 peduncle. Peduncle segment 1 with spines at 0.66 on both margins and at distal angles. Peduncle segment 2 with spines at 0.5 on upper margin and at distal angles. Peduncle segment 3 longer than segments 1 and 2, with spines at 0.5 on both margins and at distal angles. Flagellum about as long as peduncle with 6 segments, each bearing spines at distal angles; terminal tuft short, closely bound.

Antenna 2 6.4 mm long. Peduncle about three-quarters length of flagellum. Peduncle segment 1 with a spine at ventrodistal margin. Peduncle segment 2 with a row of single spines inferiorly and a single spine a little above the spine at midway on inferior margin; a larger spine on ventrodistal margin. Peduncle segment 3 longest, with spines in axial rows of up to 4. Flagellum slender, with 20 segments, these not greatly expanded distally; spines in 4 groups on distal margins of each segment, comprising 1, 2, or 3 spines (lower numbers resulting perhaps from wear or breakage). Ultimate flagellar segment longer than the penultimate, with a terminal tuft of very short spines (less than one-fifth of segment length).

Upper lip normal, with ventral margin setose.

Mandible with an 8-cusped incisor; lacinia mobilis 4-toothed, with interdental pilose setae evenly spaced; molar 32-striate, with setal tuft present but short.

Lower lip scroll-shaped, deeply cleft; inner margins heavily sclerotised, with proximal setae more robust than distal setae.

Maxilla 1. Inner plate slender, narrowing distally, with 2 terminal setae heavily pilose. Outer plate broad; distal margin with 9 teeth bearing respectively 2, 1, 3, 3, 3, 3, 3, 1 lateral protuberances (from outer to inner).

Maxilla 2. Plates broadening distally. Inner plate inner

margin setose proximally; distal margin with a row of inwardly curved spines terminating in a stout pilose seta. Outer plate with a row of inwardly curved spines distally.

Maxilliped narrower than normal, with inner plates broadening distally; distal margin with 3 teeth, the inner one smallest and the other 2 subequal, and pilose setae arising between the teeth; outer distal margin lateral to tooth row fringed by a double-rowed spine comb. Outer plate distally rounded, with a row of pilose setae set back from distal margin and projecting beyond it. Palp segment 1 with a single spine at outer distal margin; segment 2 with a double spine on outer margin, and inner margin scarcely produced inwards, with a relatively sparse fringing spine comb; segment 3 only sparsely spined; segment 4 indistinct, but not masked by segment 3 spines.

Gnathopod 1. Coxal plate ventral margin rounded, with 6 spines. Basos anterior margin nearly straight, with 3 small spines at 0.5, 0.65, and 0.8; distal angle spined; posterior margin parallel and spined distally, with stouter spines at 0.35, 0.5, and 0.7. Ischium narrower than basos, spined on posterodistal angle. Merus posterior margin produced into a projecting pellucid lobe at about 0.75, with proximal to lobe 3 equally spaced stout spines, around its base 3 spines, and distally a patch of short setae. Carpus anterior margin convex, with 2 small single spines marginally and a patch of 3 stouter spines at distal angle; inner face with 4 long spines; posterior margins each with 2 long spines. Propod chelate, subrectangular; anterior margin with 3 spine groups; anterodistal angle with 4 long spines; posterior margin with 4 longer spines, and slightly produced distally into a small scabrous lobe; palm length 0.6x propod width; palmar area fringed with 2 rows of 6 spines each. Dactyl shorter than palm.

Gnathopod 2. Coxal plate rounded ventrally, with 20 spines equidistant along margin. Gill large, trilobate. Basos narrowest proximally, broadest medially; anterior margin sinuous proximally but straight for most of its length, naked; posterior margin broadening medially but narrowing distally, with 3 equally spaced spines. Ischium anterior margin naked, with an axial groove to receive the reflexed merus and carpus; posterior margin naked; posterodistal angle spined. Merus posterior margin with 3 spines. Carpus short, naked. Propod greatly produced, subtriangular, broadening distally, with margins naked; anterodistal angle with 2 small spines; palm only slightly convex, fringed by rows of many short but stout spines, terminating in a raised sclerotic area onto which dactyl tip occludes; palmar angle 145°. Dactyl strongly recurved, longer than propod is broad, with about 12 small cylindrical spines set a little retrogradely.

Peraeopod 1. Coxal plate ventral margin slightly con-

vex, spined. Gill simple, moderately large. Basos broadening a little distally; anterior margin slightly concavely recurved, with 3 small spines; anterodistal margin spined; posterior margin with stouter spines at 0.20 (1), 0.25 (2), 0.44 (2), and 0.69 (2); posterodistal angle spined. Ischium subrectangular, with spines at posterodistal angle. Merus broadening distally; anterior margin slightly convexly recurved, with spines at 0.20 (1), 0.36 (1), and 0.57 (1); anterodistal angle with 3 spines; posterior margin slightly sinuous, with spines at 0.15 (2), 0.27 (3), 0.44 (2), 0.64 (3), 0.80 (2), and 0.93 (3); posterodistal angle spined. Carpus shorter and narrower than merus, broadening only slightly distally; anterior margin with spines at 0.38 (2) and 0.65 (2); anterodistal angle with 2 smaller spines; posterior margin with stout spines at 0.20 (1+2), 0.40 (2+1), 0.63 (1+1), 0.82 (2), 0.86 (0+1), and 0.92 (1). Propod narrower but longer than carpus; anterior margin with spines at 0.16 (0+1), 0.30 (1), 0.55 (1), and 0.80 (1); anterodistal angle with 1 spine; posterior margin with spines at 0.22 (1), 0.35 (1+1), 0.52 (1+1), 0.71 (1+2), 0.85 (1+1), and 0.92 (1).

Peraeopod 2. Coxal plate ventral margin straight, spined, rounded posteriorly; posterior margin spined. Basos subrectangular; anterior margin only slightly concave, with 2 spines at 0.70, 0.80, and 0.90; anterodistal angle with 2 spines; posterior margin almost straight, with stout spines at 0.25 (1), 0.43 (1+2), and 0.66 (1+2); 1 spine at posterodistal angle. Ischium with 2 spines at posterodistal angle. Merus broadening distally; anterior margin with 3 stout spines; anterodistal angle with 4 spines; posterior margin with 3 groups of 2 or 3 stout spines; posterodistal angle with 3 large spines. Carpus slightly shorter than that of peraeopod 1, broadening a little posterodistally; anterior margin with a group of 2 small spines at 0.60; anterodistal angle with 3 spines; posterior margin with stout spines. Propod anterior margin with 3 groups of stout spines; anterodistal angle spined; posterior margin with 5 spine groups each comprising 1 large and 2 smaller spines.

Peraeopod 3. Coxal plate rounded ventrally, with ventral margin bearing 5 spines. Gill somewhat discoidal. Basos produced into an elongate ellipsoid; anterior margin less convex than posterior margin, with stout spines at 0.16 (1), 0.29 (1), 0.43 (2), 0.63 (2), and 0.82 (2); anterodistal angle with 3 spines; posterior margin with single smaller spines at 0.06, 0.12, 0.22, 0.35, 0.42, 0.54, 0.72, 0.83, and 0.96. Ischium with a single spine at anterodistal angle. Merus broadening distally; anterior margin with 4 groups of strong spines; posterior margin with 2 smaller spines; posterodistal angle with 3 spines. Carpus narrower than merus, subrectangular; anterior margin with spines at 0.17 (1), 0.29 (2+1), 0.52 (1+1), 0.60 (1), 0.78 (0+1), and 0.85

(2+1); posterior margin with 2 smaller spines; posterodistal angle with 1 large and 1 small spine. Propod longer and narrower than carpus, narrowing slightly distally; anterior margin with spines at 0.15 (0+1), 0.23 (2), 0.37 (2), 0.51 (2), 0.68 (2+1), and 0.83 (2+1); posterior margin with spines at 0.25 (0+1), 0.40 (1), 0.58 (1), and 0.85 (1+1); posterodistal angle spined.

Peraeopod 4. Basos ovoid; anterior margin with 10 groups of large spines; posterior margin with 10 groups of smaller spines. Ischium rhomboidal, with spines at anterodistal angle. Merus broadening distally; anterior margin with spines at 0.12 (0+1), 0.23 (2), 0.33 (0+2), 0.45 (1), 0.49 (1), 0.61 (0+2), and 0.7 (2); anterodistal margin with 1 large and 2 smaller spines; posterior margin with 3 spine groups; posterodistal angle with 1 small and 2 large spines. Carpus narrower than merus, broadening distally; anterior margin with spines at 0.19 (0+2), 0.36 (2), 0.51 (0+2), 0.61 (1), 0.64 (3+1), 0.82 (1), and 0.92 (1); anterodistal angle with 3 spines; posterior margin with spines at 0.37 (0+1), 0.53 (1), and 0.75 (2); posterodistal margin with 4 larger spines. Propod long, narrowing distally; anterior margin with 8 groups of 1 and 3 spines each; posterior margin with 7 groups of 3 spines each; posterodistal angle with 3 smaller spines.

Peraeopod 5. Basos greatly produced especially posteriorly, narrowing a little distally; anterior margin with 10 groups of smaller spines; posterior margin with about 12 very small spines. Ischium rhomboidal, with spines at anterodistal angle. Merus slightly broader distally; anterior margin with spines at 0.12 (2), 0.27 (2+1), 0.37 (0+3), 0.50 (2+2), and 0.75 (1+1); anterodistal angle with 3 spines; posterior margin with spines at 0.15 (0+2), 0.30 (1+1), and 0.60 (1+1); posterodistal angle with 3 spines. Carpus broadening a little distally; anterior margin with spines at 0.15 (2), 0.30 (2), 0.44 (1), 0.55 (3), 0.75 (1), 0.88 (1), and 0.92 (1); anterodistal angle with 1 small and 2 large spines; posterior margin with spines at 0.37 (1), 0.52 (1+1), and 0.73 (1+1); posterodistal angle with 3 spines. Propod slightly curved; anterior angle with spines at 0.13 (2), 0.23 (3), 0.38 (3), 0.54 (3), 0.65 (3), 0.77 (2), and 0.85 (3); posterior margin with spines at 0.14 (1), 0.22 (3), 0.35 (3), 0.52 (3), 0.66 (3), 0.78 (3), and 0.93 (3); posterodistal angle with a tuft of 3 spines. Dactyl relatively long, curved, with a small spine on posterior margin and a longer one on anterior margin at base of terminal spine.

Pleopods all present and biramous, narrow and slender, sparsely setose, each with a pair of coupling spines (retinaculae); inner rami the longer. Ramal segmentation somewhat indistinct. Pleopods 1 and 2 almost equal in length; pleopod 3 shortest.

Epimeral plates. Plate 1 subtriangular; anteroventral

margin convexly curved and thickened; posterior margin with 2 small spines directed posteriorly. Plates 2 and 3 subrectangular, with anterior and ventral margins thickened; anterodistal angle rounded; posterodistal angle acute; posterior margin with 2 small spines.

Uropod 1 long, relatively slender; peduncle with a row of spines on each dorsal margin, the inner row terminating distally with a single long spine; inter-ramal spine very short. Rami spined dorsally; outer ramus with 8 marginal dorsal spines and 1 large scionate, 2 medium, and 1 smaller terminal spines; inner ramus with 11 dorsal marginal spines and 2 large and 2 smaller scionate terminal spines.

Uropod 2. Peduncle dorsal margin with 4 spine groups. Rami spined dorsally; inner ramus terminating with 3 large spines, the 2 smaller ones scionate; outer ramus terminating with 1 large and 1 small spine.

Uropod 3. Peduncle with 3 spines, uniramous, the ramus with 1 marginal spine dorsally and 3 terminal spines.

Telson moderately cleft, with 4 marginal spines.

Female. Length 20.6 mm, width 3.8 mm, depth 2.9 mm. Pigmentation pattern very faint in allotype; last 2 thoracic segments and all abdominal segments with a reddish stripe running around posterior margin of dorsal aspect to about one-third down lateral aspect; from mid-dorsal posterior margin a red stripe running forward, and a yellowish-white spot defined on either side of dorsal midline in posterior third of segment. Last 2 abdominal segments with ill defined spots anteriorly.

Antenna 1. Length 1.25 mm. Peduncle segment 1 with 2 spine groups on dorsal margin, spined on ventrodistal angle. Segment 2 with 3 spines at 0.66 on dorsal margin; ventral margin with 1 spine at 0.33; ventrodistal angle spined. Segment 3 longest and narrowest; dorsal margin with 1 spine at 0.5; ventral margin with 4 spines; anterodistal angle with 2 longer spines; ventrodistal angle with a short row of 4 spines. Flagellum with 8 segments.

Antenna 2. Length 8.5 mm. Segment 3 with spines on distal margin. Segment 4 ventral margin with 3 spines; lateral surface with 3 spines in an axial row; dorsal margin with 1 spine; ventrodistal angle with 4 spines; dorsodistal angle with 1 spine. Segment 5 ventral margin with 5 spines; dorsal surface with 10 spines; lateral surface with 7 spines. Flagellum with 22 segments.

Gnathopod 1. Basos anterior margin with 5 sets of single spines; posterior margin with 3 spines at posterodistal angle. Ischium with 1 spine on posterior margin, 4 spines at posterodistal angle. Merus posterior margin convex, with about 10 spines. Carpus anterior margin slightly concave, with 3 spines; posterior margin produced into a scabrous lobe surrounded by numerous large spines. Pro-

pod widening distally; anterior margin with 3 spine groups; anterodistal angle with about 4 large spines; posterior margin produced into a slight scabrous pellucid lobe protected by 2 parallel axial rows of large spines; palm convex, fringed with spines. Dactyl shorter than propod width, curved to conform with palm; inner surface with 2 spines; base of terminal spine with 2 small lateral spines.

Gnathopod 2. Brood plate narrower proximally and distally than medially, with 23 long spines. Basos produced to form a wide flat plate. Ischium relatively long. Merus posterior margin produced distally to form a small pellucid lobe. Carpus posterior margin forming a pellucid lobe, with a basal fringing row of large spines. Propod mitten-shaped, with posterior margin produced into a large pellucid lobe extending distally beyond palmar area; frontal and abfrontal surfaces with 2 rows of spines running mid-axially; palm short, oblique, fringed by a spine row. Dactyl short.

Peraeopod 1. Brood plate long, squared distally, with setae long, not curl-tipped. Limb as in male, with posterior surface more heavily spined than other surfaces, especially on merus, carpus, and propod.

Peraeopod 2. Brood plate square-tipped distally, with 21 long spines lacking curl tips. Basos anterior margin with spines at 0.58 (1), 0.62 (1), 0.71 (1), and 0.92 (2); posterior margin with spines at 0.34 (1), 0.48 (1), and 0.65 (1); posterodistal angle with 1 small and 2 large spines. Merus posterior margin with 3 groups of stout spines at 0.16 (2), 0.36 (2+1), and 0.62 (1+1); posterodistal angle with 3 spines. Propod posterior margin with spines at 0.16 (1), 0.28 (1+1), 0.38 (1+1), 0.48 (2), and 0.66 (1+2); posterodistal angle with 4 spines.

Peraeopod 3. Ischium anterodistal angle with 1 large and 1 small spine. Merus posterior margin with 2 larger and 2 smaller spines; posterodistal angle with 4 spines. Carpus anterior margin with 3 groups of spines at 0.08 (1), 0.22 (3+2), 0.45 (1), 0.51 (3), 0.76 (1+1), 0.85 (2+1), and 0.92 (1); posterodistal angle with 1 large and 2 small spines.

Peraeopod 4. Sideplate rounded, with no anterodistal or posterodistal angles; ventral margin with 4 minute spines. Basos expanded, but more square than in male, with posterior margin straighter and bearing 12 groups of smaller spines. Merus anterior margin with spines at 0.15 (2), 0.25 (2), 0.38 (2), 0.48 (2), 0.54 (1), 0.65 (2), 0.70 (1), 0.76 (1), and 0.81 (1); anterodistal angle with 3 larger spines; posterodistal angle with 2 larger and 2 smaller spines. Carpus anterior margin with spines at 0.10 (2), 0.23 (4), 0.39 (2), 0.48 (3), 0.67 (3), and 0.84 (3+1); posterior margin with spines at 0.24 (1), 0.38 (1+1), 0.56 (1+2), and 0.75 (3). Propod slightly curved anteriorly; anterior margin with 10 spine groups; posterior margin with 8 spine groups.

Peraeopod 5. Gill large, trilobate. Basos posterior mar-

gin with about 16 small spines. Merus anterior margin with spines at 0.09 (1), 0.18 (2), 0.27 (2+1), 0.45 (3+1), 0.59 (0+1), and 0.65 (3); anterodistal angle with 5 large spines; posterior margin with spines at 0.18 (1), 0.27 (0+2), 0.52 (1+1), 0.61 (1+1), and 0.75 (1); posterodistal angle with 4 spines. Carpus anterior margin with spines at 0.16 (2), 0.32 (2+2), 0.46 (2), 0.58 (2+2), 0.75 (2), and 0.89 (2); posterior margin with spines at 0.31 (1), 0.44 (1), 0.58 (2), and 0.77 (2). Propod anterior margin with spines at 0.14 (2), 0.20 (2), 0.30 (2+1), 0.42 (2+1), 0.54 (2+1), 0.63 (2+1), 0.72 (2+1), 0.82 (2+1), and 0.93 (2+1); posterior margin with spines at 0.11 (1), 0.20 (1), 0.24 (2), 0.39 (2), 0.52 (2), 0.59 (1), 0.78 (2), 0.80 (1), and 0.89 (2).

Uropod 1. As for male, but inter-ramal spine very short and stout. Inner ramus with 2 marginal spine rows; inner row with 3 spine groups at 0.57 (1), 0.67 (1), and 0.74 (2); outer row with 10 spines extending from 0.32 to 0.90. Outer ramus with 8 spines in a row along dorsal margin from 0.15 to 0.77.

Uropod 2. Outer ramus with a dorsal marginal row of 8 spines. Inner ramus dorsal margins with 4 spines.

Type data. **Holotype:** male, TK, Mt Taranaki, Dawson Falls, 945 m, 14 October 1955, G.W. Ramsay (CMNZ).

Allotype: large female with a brood of 12 eggs, TK, Holly Hut, 950 m, November 1975, K.J. Fox, beating *Cordyline indivisa* (CMNZ). Author's catalogue no. KD 686 and KD 854.

Paratypes: 2 males, 3 females, same data as holotype (NMNZ).

Material examined. Type series, plus: 1 female collected at night, Holly Hut, 950 m, A.K. Walker, 26 Nov 1975; 1 mature female, same data as holotype; 50 females, 25 males, various locations in vicinity of Dawson Falls, 950 m, K.W. Duncan, Jun 1991.

TK / —.

Remarks. This large and distinctive landhopper is very abundant in the mid-altitude native forest on Mt Taranaki, in spite of its having been collected so infrequently. Other talitrid species occur at higher and lower altitudes on Mt Taranaki, but *T. taranaki* has not been collected with them. It can climb trees, since it was collected by beating cabbage trees (*Cordyline indivisa*) by K.J. Fox.

The marked differences in spination between the holotype and allotype should be interpreted with caution. Some of the difference is due to sexual dimorphism, but much is due to the different age of the two specimens.

The specific epithet is the name of the type locality, Taranaki.

Waematau new genus

Type-species *Waematau manawatahi* new species.

Like *Tara* with margins of pleopod peduncles lacking stout setae, and broodplates long, delicate, and spined only distally. Uropod 2 lateral margins spined on both rami, but differing from *Tara* in having uropod 1 outer ramus lateral margin naked. Many species with reduced pleopods, especially the 3rd pair, or 2nd and 3rd pairs.

Remarks. Genus *Waematau* is erected for five species, some very apomorphic and including some feminised ones, all confined to Northland. Some of the species described here may have become extinct already, since I have been unable to collect them in their type localities.

The name *Waematau* stems from the Maori for 'foot' and 'hook', an allusion to the large inter-ramal spine present in most of this genus; gender feminine.

Waematau kaitaia new species

Plate 30, Map 12

Diagnosis. A large *Waematau* with a long, slender antenna 2. Antenna 1 extending to one-quarter along antenna 2 peduncle segment 5. Male gnathopod 1 chelate. Male gnathopod 2 propod expanded into an ellipsoid, with a long convex palm; dactyl curved, longer than palm, with a soft tip. Gills large, spirally rolled. Uropod 1 outer ramus naked. Uropod 2 rami both spined, equal in length. Uropod 3 and telson as flattened plates acting as faecal guides. Pleopods all present but reduced, particularly the 3rd.

Description. **Holotype male.** Length 13.5 mm, width 2.39 mm, depth 2.40 mm. Body shallow. Pigmentation in ethanol banded, with 2 pinkish-red hoops per abdominal segment, merging dorsally to form a diffuse longitudinal stripe running mid-dorsally.

Antenna 1 1.68 mm long. Peduncle segments equal in length. Segment 1 narrowing distally, with spines at superodistal angle. Segment 2 narrower; superior and inferior margins convex, with spines at superodistal and inferodistal angles. Segment 3 margins nearly straight, broadening distally; superodistal and inferodistal angles each with 2 or 3 spines. Flagellum with 5 segments tapering distally, each except the last with 3 spines at distal angles; 1st segment recurved superiorly so that flagellum is inclined upwards at an angle from antenna 2.

Antenna 2 6.74 mm long, relatively long, fine, and tapering. Peduncle segment 3 inferodistal angle with a

patch of spines. Segment 4 2.2x length of segment 3, broadening distally until nearly as wide as segment 3; superior margin straight, with 3 spines; superodistal angle with 1 spine; inferior margin with larger spines at 0.17 (1) and 0.36 (2); inferodistal angle with 3 spines. Segment 5 1.8x length of segment 4 but narrower; superior margin with spines at 0.22, 0.39, 0.50, 0.61, 0.73, and 0.85; superodistal angle with 4 spines; inferior margin with pairs of spines at 0.14, 0.28, 0.46, 0.64, 0.82, and 0.98; inferodistal angle with 2 spines. Flagellum 4.08 mm long, with 22 segments; each segment with 3 spines at the 4 distal angles; ultimate segment with terminal tuft sparse, short.

Upper lip more ovate than usual; distal margin strongly setose; inner shelf present.

Mandible. Incisor large, 5-cusped, with a characteristic saw-toothed linear shape; lacinia mobilis 4-toothed, with 4 interdentate pilose setae on inner margin; setal tuft proximal to these on distal margin of molar prominence; molar about 24-striate, with medial seta prominent, pilose.

Lower lip setose distally on inner margins only; frontal setal row short, sparse.

Maxilla 1. Inner plate narrowing distally, terminating with 2 long pilose setae. Outer plate lateral margins subparallel, oblique; distal margin with 9 teeth; outer lateral margin bearing a minute palp.

Maxilla 2. Inner plate curved somewhat inwardly; distal margin with inwardly curved setae; outer margin sparsely pilose. Outer plate distal margin oblique, with a row of inwardly curved setae terminating with a strong pilose seta; inner margin pilose.

Maxilliped broad. Inner plate distal margin rounded, with 1 small and 2 large spine teeth; a pilose setal row below these and down inner margins. Outer plate with a setal row on rounded distal margins. Basal segment 1 with 2 or 3 spines at outer distal angles and 2 spines in 2 groups medially on distal margin. Segment 2 broader, with 1 spine at distal angles and 3 spines medially. Palp broad, heavily setose on inner margins; segment 4 but nearly completely obscured by distal spines on segment 3.

Gnathopod 1. Coxal plate ventral margin rounded, with 5 or 6 large spines; plinthic ridge present as a thickened shelf, with 7 large spines. Basos broadening distally; anterior margin straight, with small spines at 0.59, 0.70, and 0.79; posterior margin convex, with larger spines at 0.33 and 0.53; posterodistal angle with 3 smaller spines. Ischium anterior margin slightly sinuous; posterior margin naked except for 2 larger spines at posterodistal angle. Merus posterior margin broadening distally into a discrete pellucid lobe guarded by 3 larger spines at base. Carpus anterior margin convexly rounded, with spines at 0.38 and 0.60 and at anterodistal angle (3); posterior margin pro-

duced into a pellucid lobe guarded by a proximal row of 5 large spines running almost transversely and another transverse row of 4 large spines distally. Propod broadening distally; anterior margin convex, with spines at 0.38 (1), 0.62 (2), and 0.83 (3); posterodistal angle with a tight group of 6 spines; posterior margin produced into a pellucid lobe, especially distally, projecting slightly beyond palm and protected by about 5 large spines on each face; palm short, slightly convex, flanked by a row of 5 spines on each side, these becoming larger posteriorly; palmar angle 90°. Dactyl short, about two-thirds of propod width; inner margin with 2 spines; distal margin at base of terminal spine with 3 spines; distal tip curved inwards, occluding pellucid lobe.

Gnathopod 2. Coxal plate ventral margin rounded, with 6 relatively large spines. Basos broadest medially; anterior margin naked, very slightly sinuous; posterior margin convex, with spines at 0.41, 0.55, and 0.66; posterodistal angle with 1 spine. Ischium relatively long, broadest distally; posterodistal angle with 1 spine. Merus and carpus short, triangular. Propod greatly produced, strongly subchelate, ovate; frontal surface with a more-or-less longitudinal ridge running down to anterior of dactyl base; anterior margin very slightly emarginate; palm long, convex, flanked by many short, stout spines; palmar angle 138°. Dactyl much longer than palm, curved inwards, with margins naked, terminating distally with a slightly recurved, 'soft' tip sitting on a shelf-like extension of palm.

Peraeopod 1. Coxal plate distal angle rounded; ventral margin convex, spined. Gill relatively large; margins rolled, the whole forming a spiral. Basos expanded slightly distally, curved only slightly anteriorly; anterior margin concave, with spines at 0.56, 0.69, 0.86, and 0.94; posterior margin convex, stepped at spine bases, with spines at 0.25, 0.39, 0.53, and 0.67; posterodistal angle with 1 spine. Ischium with 2 spines at posterodistal angle. Merus broadening distally; anterior margin convex, stepped at spine bases, with spines at 0.24 and 0.48; anterodistal angle with 2 spines; posterior margins scalloped between spine bases, with spines at 0.18 (2), 0.37 (2), 0.59 (2), 0.71 (1), and 0.91 (2+1); posterodistal angle with 2 spines. Carpus anterior margin nearly straight, with spines at 0.24 and 0.37; anterodistal angle with 1 spine; posterior margin scalloped between spine bases, with spines at 0.23 (2), 0.52 (3), 0.77 (3), and 0.89 (2). Propod narrowing distally, with margins stepped at spine bases; anterior margin with spines at 0.24, 0.50, and 0.83; anterodistal angle with 3 spines; posterior margin with spines at 0.25 (3), 0.43 (3), 0.64 (3), and 0.82 (4). Dactyl inner margin slightly emarginate.

Peraeopod 2. Coxal plate subsquare; distal angles rounded; ventral margin straight, with 6 spines. Gill a

discoid twisted into a spiral. Basos broadening slightly distally, curved only slightly anteriorly; anterior margin concave, with spines at 0.61 and 0.86 (2); posterior margin with spines at 0.31 and 0.67; posterodistal angle with 1 spine. Ischium posterodistal angle with 1 spine. Merus broadening distally; anterior margin spined and stepped at 0.37; anterodistal angle with 2 spines; posterior margin nearly straight, only slightly stepped, with spines at 0.23 (2), 0.45 (2), and 0.67 (1); posterodistal angle with 3 spines. Carpus short, narrow; anterior margin with spines at 0.30; anterodistal angle with 1 spine; posterior margin scalloped between spines at 0.32 (2) and 0.68 (2+2). Propod narrowing slightly distally; anterior margin convex, stepped, with spines at 0.18, 0.46, and 0.79; anterodistal angle with 3 spines; posterior margin stepped, with spines at 0.28 (1+1), 0.45 (3), 0.66 (3), and 0.84 (4). Dactyl inner margin scarcely emarginate.

Peraeopod 3. Coxal plate bilobed; anterior lobe with 3 marginal spines, posterior lobe with 4. Gill discoidal, twisted into a spiral. Basos broadest proximally, an inverted pyriform shape; anterior margin with 6 larger spines; anterodistal angle with 3 spines; posterior margin with 9 spines. Ischium anterodistal angle with 4 spines. Merus broadening distally; anterior margin scalloped, with spines at 0.25 (3), 0.49 (3), and 0.89 (3); anterodistal angle with 1 spine; posterior margin convex, with a minute spine at 0.24 and a larger one at 0.53; posterodistal angle with 3 spines. Carpus margins subparallel; anterior margin scalloped, with spines at 0.21 (2), 0.42 (2), 0.51 (1), 0.78 (2), and 0.90 (1); posterior margin straight, with spines at 0.60; posterodistal angle with 3 spines. Propod tapering slightly distally, with both margins stepped; anterior margin with spines at 0.27 (2), 0.44 (3), 0.64 (3), and 0.84 (3); posterior margin with spines at 0.38, 0.57, and 0.83; posterodistal angle with 3 spines. Dactyl long, slightly curved.

Peraeopod 4. Coxal plate rounded. Basos ellipsoidal; anterior margin with 10 large spines; anterodistal angle with 2 spines; posterior margin with 8 smaller spines. Ischium anterodistal angle with 2 spines. Merus broadening distally, with both margins stepped; anterior margin with spines at 0.09 (1), 0.21 (2), 0.41 (2), 0.68 (3), and 0.90 (2); anterodistal angle with 2 spines; posterior margin with spines at 0.19 (1), 0.38 (1), and 0.63 (1+1); posterodistal angle with 3 spines. Carpus narrow, broadening distally; anterior margin scalloped, with spines at 0.20 (2), 0.38 (3), 0.61 (3), and 0.88 (2); posterior margin stepped, with spines at 0.36, 0.55, and 0.77; posterodistal angle with 4 large spines. Propod long, narrow (damaged in mounted holotype); anterior margin slightly scalloped, with spines at 0.11 (1), 0.23 (2), 0.37 (2), 0.54 (2), 0.72 (2), and 0.93 (2); anterodistal angle with 2 spines; posterior margin with

spines at 0.27 (2), 0.36 (2), 0.50 (2), 0.79 (1), and 0.90 (2). Dactyl long, conical; base curved slightly anteriorly.

Peraeopod 5. Gill not very large, pendulous lobe triangular. Basos broad, anterior margin smoothly convex, with 9 large spines, anterodistal angle with 3 spines, posterior margin scalloped with about 7 minute spines. Ischium anterior margin straight, anterodistal angle with 2 large spines. Merus broadening distally, anterior margin scalloped, with spines at 0.09 (2), 0.21 (3), 0.42 (3), 0.66 (3), and 0.94 (5), posterior margin only slightly stepped, with spines at 0.17, 0.34, and 0.60, posterodistal angle with 2 spines. Carpus margins subparallel, anterior margin scalloped, with spines at 0.10 (2), 0.19 (3), 0.38 (3), 0.63 (2), and 0.90 (3), posterior margin only slightly stepped and concave, with spines at 0.30, 0.48, and 0.71, posterodistal angle with 3 spines. Propod long, tapering distally, curved posteriorly, anterior margin stepped, with spines at 0.16 (3), 0.31 (3), 0.46 (3), 0.61 (3), 0.77 (2), and 0.94 (2), anterodistal angle with 4 spines, posterior margin slightly stepped, with spines at 0.11 (1), 0.18 (1), 0.31 (1), 0.44 (1), 0.59 (2), 0.76 (2), and 0.93 (2). Dactyl long, conical, with margins naked, anterodistal angle with 1 minute spine, posterodistal angle with 1 larger spine. Penis organ rectangular, extending nearly to midline.

Pleopods all present and biramous, but reduced; 2nd shorter than the 1st, and 3rd very short. First with a pair of coupling spines; peduncle margins naked; rami short, sparsely setose, with segmentation not obvious; inner ramus the longer. Second and 3rd with only 1 coupling spine on inner margin; rami very short, equal in length, sparsely setose, about 3-segmented, although segmentation difficult to determine.

Epimeral plates. Plate 1 triangular; posterodistal angle acute but not notched; posterior margin naked. Plate 2 subsquare; ventral margin somewhat rounded; posterior margin emarginate slightly above acute posterodistal angle, with only 1 minute spine. Plate 3 with anterodistal angle rounded; posterodistal angle acute; ventral margin rounded; posterior margin emarginate or notched distally, with 1 minute spine proximally.

Uropod 1. Peduncle with 3 spines dorsally; inter-ramal spine about one-third of ramus length; outer ramus naked dorsally, terminating with 1 long and 2 short spines; inner ramus with 4 spines dorsally, terminating with 1 long and 1 short spine; terminal spines on each ramus with a slight distal hook.

Uropod 2. Peduncle with 3 dorsal spines; inter-ramal spine present; both rami spined dorsally.

Uropod 3 uniramous; peduncle forming a flat faecal guide, with 2 stout marginal spines; ramus naked except for 2 short terminal spines.

Telson only slightly cleft, with 2 marginal spines on each lobe.

Type data. **Holotype:** male, ND, Kaitaia, Tangihua, Mt Horokaka, 518 m, 16 August 1977, J.S. Dugdale, ex litter (CMNZ; KD 904).

Paratype: 1 male, same data as holotype (NMNZ). Both specimens were taken with *Tara sylvicola*.

Material examined. Type specimens only.
ND / —.

Remarks. The male of *Waematau kaitaia* is distinguished from *Parorchestia tenuis*, and from other similar species that live in the same area, by its double-hooped pigmentation pattern, long antenna 2, characteristic gnathopods, reduced but biramous pleopods, naked outer ramus of uropod 1, and spined rami on uropod 2. It can be distinguished from *W. unuwhao*, which it closely resembles, by its longer, more tapering antenna 2 and by its pleopods being all present and biramous (though these are fine, with the third quite small). The naked outer ramus of uropod 1 distinguishes it from *Tara sylvicola*.

The female has not been identified with certainty, because this species occurs with others in the limited collections available.

The specific epithet alludes to the type locality.

Waematau manawatahi new species

Plate 31, Map 11

Diagnosis. A large, strongly sexually dimorphic *Waematau* with large eyes. Antenna 1 extending to one-third along antenna 2 peduncle segment 5. Antenna 2 medium-sized, slender. Gnathopod 1 chelate in both sexes. Male gnathopod 2 strongly subchelate; propod an elongate ovoid, with a heavily spined convex palm; dactyl long, overlapping, with a soft tip. Female gnathopod 2 mitten-shaped. Broodplates reduced, with only a few spines, these lacking curl tips; 4th broodplate rolled, with very few spines. Gills moderate-sized, discoidal. Uropod 1 long, with outer ramus naked. Uropod 2 rami equal in length, spined on dorsal margins. Pleopods all present and biramous; 3rd pair smaller than anterior 2 pairs. Telson with only a few marginal spines.

Description. **Holotype male.** Length 13.8 mm, width 2.82 mm, depth 2.65 mm. Body not very deep. Pigmentation in ethanol partly reticulate. Head deeper than long. Eye round, black, about one-third of head length.

Antenna 1 1.5 mm long, reaching to one-third along antenna 2 peduncle segment 5. Peduncle segment 1 narrowing distally, with 1 large spine at 0.66 on inferior margin. Segment 2 longer and narrower than 1st segment; superior margin straight; superodistal angle spined; inferior margin convex, spined at 0.75. Segment 3 slightly shorter and narrower than 2nd segment; margins parallel, with spines at distal angles. Flagellum short, with 4 segments, each bearing 3 large spines at superior and inferior distal margins; segment 2 shorter than segment 3; terminal cluster of spines as long as ultimate segment, not closely bound.

Antenna 2 5.42 mm long. Peduncle segment 3 narrower than segment 4, with a pair of spines at inferodistal angle. Segment 4 broadening distally, 1.5x length of segment 3; mid-dorsal margin with 1 small spine; outer superodistal angle with 1 spine; inferior margin with 3 spines; outer inferodistal angle with 4 or 5 spines. Flagellum relatively short, not very tapering, with 21 segments, each bearing moderately long spines; terminal tuft short, sparse.

Upper lip distal margin rounded, densely pilose; inner shelf not well developed.

Mandible. Incisor 7-cusped; lacinia mobilis 4-toothed, with 6 interdentate pilose setae in pairs along margin; molar 22-striate, with medial seta pilose.

Lower lip. Distal and inner margins pilose.

Maxilla 1. Inner plate slender, terminating with 2 long, pilose setae. Outer plate broader, with margins subparallel but curved inwards; distal margin with 9 stout teeth bearing 0, 0, 4, 4, 4, 4, 4, 4, 4 lateral protuberances respectively (from outer to inner).

Maxilla 2. Outer plate outer margin convexly curved; distal margin rounded, spined. Inner plate subtriangular; distal margin spined; inner margin convexly rounded and pilose proximally, with a large pilose seta at beginning of a spine row running distally.

Maxilliped not very broad at base; palps broad, somewhat arcuate, with ultimate segment small but not obscured by penultimate segment.

Gnathopod 1. Coxal plate ventral margin rounded, bearing 4 spines. Basos broadening immediately proximally then narrowing slightly distally; anterior margin straight, with 1 small spine at 0.69; anterodistal angle with 1 spine; posterior margin convex, with larger spines at 0.20, 0.31, and 0.49 and at distal angle. Ischium with 3 spines at posterodistal angle. Merus longer than ischium; posterior margin produced distally into a pellucid lobe protected by 6 stout spines around base. Carpus anterior margin convex, naked except for a spine at anterodistal angle; posterior margin produced into a prominent pellucid lobe protected by 6 stout spines at base. Propod shorter than

carpus, broadening distally; anterior margin with spines at 0.38, 0.64, and 0.87; anterodistal angle with 4 stout spines; posterior margin somewhat produced into a pellucid lobe; inner surface with a row of 6 stout spines running longitudinally; outer face with 2 longitudinal rows of spines; palm transverse, flanked by a short row of spines terminating in longer spines at either end. Dactyl about three-quarters of propod width.

Gnathopod 2. Coxal plate ventral margin rounded, with about 11 spines. Gill moderately large, trilobate, not plicate. Basos widest medially, narrowing a little distally; anterior margin straight, with 1 minute spine at 0.72; posterior margin convex, with spines at 0.39, 0.46, 0.53, 0.61, and 0.72; posterodistal angle spined. Ischium posterodistal angle spined. Merus short, with 1 small spine near posterodistal angle. Carpus short, broadening distally. Propod massively produced into an ellipsoid, with margins naked; palm long, smoothly convexly rounded, flanked by a row of about 24 spines on each side, with a large spine guide on each side near posterior termination; palmar angle 150°. Dactyl longer than palm, curved to conform with palm; inner surface naked, terminating in a slightly curved flexible tip.

Peraeopod 1. Coxal plate subsquare, with rounded anterodistal and posterodistal angles; ventral margin only slightly convex, with 10 spines. Gill relatively small, simple, discoidal. Basos 3.4x longer than broad, curved anteriorly, broadening a little distally; anterior margin somewhat sinuous, with spines at 0.54, 0.60, 0.71, 0.81, and 0.89 (2); posterior margin convex, with spines at 0.23, 0.37, 0.52, and 0.76; posterodistal angle with 2 spines. Ischium short; anterior margin angularly produced; posterior margin straight, with 2 spines at distal angle. Merus broadening distally; anterior margin convex, with stout spines at 0.33 and 0.55; anterodistal angle spined; posterior margin straight, with spines at 0.16 (3), 0.39 (2), 0.48 (1), 0.68 (2), and 0.89 (1); posterodistal angle with 2 spines. Carpus shorter and narrower than merus, subrectangular; anterior margin with spines at 0.25 and 0.49; anterodistal angle spined; posterior margin slightly scalloped between spine groups at 0.24 (1), 0.41 (1), 0.49 (3), 0.67 (1), 0.80 (1), and 0.84 (1); posterodistal angle with 1 spine. Propod slightly longer and narrower than merus, narrowing slightly distally; anterior margin somewhat convex, with spines at 0.23 (1), 0.47 (1), and 0.79 (2), and at distal angle (3+1); posterior margin straight, with spines at 0.16 (1), 0.27 (2), 0.48 (3), 0.69 (3), and 0.87 (3), and at distal angle (1). Dactyl with a long inner spine at base of terminal spine.

Peraeopod 2. Coxal plate ventral margin straight, with 7 spines; anterodistal and posterodistal angles rounded. Gill simple, relatively small, discoidal. Basos curved ant-

eriorly, broadening distally; anterior margin concave, spined at 0.71, 0.81, and 0.86; posterior margin convex, with spines at 0.27, 0.38, 0.55, and 0.71. Ischium posterodistal angle with 3 spines. Merus broadening into a slight posterodistal bulge; anterior margin curved, with spines at 0.45 and 0.64; posterior margin straight, with spines at 0.24 (1), 0.45 (1), 0.69 (2), and 0.94 (2). Carpus shorter and narrower than merus; anterior margin convex, with spines at 0.42 and at distal angle; posterior margin straight, somewhat scalloped between spine groups, with spines at 0.34 (2), 0.52 (3), and 0.85 (3); posterodistal angle with 1 spine. Propod narrowing distally, slightly curved posteriorly; anterior margin with spines at 0.21 (1), 0.46 (2), and 0.77 (2); anterodistal angle with (2+1) spines; posterior margin with spines at 0.21 (2), 0.37 (3), 0.57 (4), 0.78 (4), and 0.88 (1); posterodistal angle with 1 spine. Dactyl posterior margin concave, somewhat indented or notched; anterior margin with 2 small spines.

Peraeopod 3. Coxal plate posterior lobe larger than anterior lobe, with 6 larger spines on ventral margin; anterior lobe with 4 spines on ventral margin. Gill simple, discoidal. Basos broad proximally, narrowing distally; anterior margin with stouter spines than posterior margin. Ischium short, with spines at anterodistal angle. Merus broadening distally; anterior margin scalloped between spine groups, with spines at 0.20 (1), 0.45 (3), 0.75 (1), 0.85 (1), and 0.96 (1); posterior margin somewhat convex, with spines at 0.32 and 0.60; posterodistal angle spined. Carpus narrower than merus; lateral margins subparallel; anterior margin with spines at 0.16 (2), 0.31 (3), 0.53 (3), and 0.83 (3); posterior margin with spines at 0.57; posterodistal angle with 3 spines. Propod narrowing distally; anterior margin somewhat scalloped between spine groups at 0.16 (1), 0.25 (3), 0.42 (3), 0.59 (3), and 0.81 (3); posterior margin with spines at 0.19 (1), 0.34 (2), 0.56 (2), and 0.81 (2); posterodistal angle with 4 spines. Dactyl narrowing distally, with inner margin straight.

Peraeopod 4. Coxal plate small, rounded distally. Gill trilobate; pendulous lobe long, narrow. Basos ovate, longer than broad; anterior margin with large spines; posterior margin with smaller spines. Ischium with 2 spines at anterodistal angle. Merus broadening distally; anterior margin nearly straight, scalloped between spine groups at 0.08 (1), 0.19 (2), 0.39 (2), 0.59 (2), and 0.86 (2); posterior margin with spines at 0.19, 0.32, 0.51, and 0.70; posterodistal angle with 2 spines. Carpus margins subparallel; anterior margin scalloped between spine groups at 0.11 (1), 0.23 (3), 0.41 (3), 0.64 (3), 0.89 (3), and 0.99 (3); posterior margin with small spines at 0.20 (1), 0.34 (1), 0.47 (1), 0.61 (1), and 0.74 (2); posterodistal angle with 3 long spines. Propod 1.5x length of carpus and 0.67x width; lateral mar-

gins slightly scalloped and stepped at spine groups; anterior margin with spines at 0.08 (1), 0.15 (2), 0.25 (2), 0.41 (3), 0.58 (3), 0.74 (3), and 0.89 (3); posterior margin with spines at 0.20 (1), 0.33 (2), 0.55 (2), 0.74 (3), 0.86 (3), and 0.95 (2); posterodistal angle with 3 double spines. Dactyl conical, with margins straight.

Peraeopod 5. Basos as broad as long; anterior margin with spines stronger than on posterior margin. Ischium anterodistal angle with 3 spines. Merus broadening distally; lateral margins somewhat scalloped and stepped; anterior more so, with spines at 0.16 (2), 0.28 (3), 0.45 (4), 0.70 (4), and 0.95 (5); posterior margin with spines at 0.10, 0.24, 0.45, and 0.65; posterodistal angle with 2 spines. Carpus broadening a little distally, 1.1x length of merus but only 0.7x width; anterior margin scalloped, with spines at 0.13 (1), 0.19 (1), 0.25 (2), 0.40 (3), 0.60 (4), 0.79 (2), 0.90 (2), and 0.96 (2); posterior margin nearly straight, with small spines at 0.22, 0.32, 0.48, and 0.72; posterodistal angle with 2 stout spines. Propod narrowing slightly distally, 1.35x length of carpus; lateral margins stepped at spine groups; anterior margin with spines at 0.12 (2), 0.23 (3), 0.35 (3), 0.52 (3), 0.66 (3), 0.82 (3), and 0.94 (3); anterodistal angle with 1 small spine; posterior margin with spines at 0.19 (2), 0.30 (2), 0.47 (3), 0.63 (3), 0.80 (3), and 0.97 (3); posterodistal angle with 4 spines.

Pleopods all present, slender, biramous. Peduncle margins naked except for 2 coupling spines distally. Rami all segmented, with setae sparse, not pilose; inner rami the longer. Pleopod 1 length 1.13x pleopod 2 and 1.80x pleopod 3.

Epimeral plates. Plate 1 with anteroventral margin somewhat rounded; posterodistal angle acute, not rounded; posterior margin with 2 spines. Plate 2 subsquare; anterodistal angle rounded; ventral margin somewhat convex; posterodistal angle acute, posterior margin concave, scalloped between the 6 backward-pointing spines. Plate 3 anterodistal angle rounded; ventral margin convex; posterodistal angle acute; posterior margin sinuous, slightly scalloped between the 4 backward-pointing, minute spines.

Uropod 1. Peduncle with 2 rows of 3 or 4 spines dorsally; a large inter-ramal spine present, 0.43x length of ramus; inner ramus with 5 spines, outer ramus naked; rami equal in length, longer than peduncle, terminating with 1 large and 2 smaller scionate spines.

Uropod 2. Peduncle with 4 or 5 dorsal spines; rami equal in length, very slightly longer than peduncle, both spined dorsally.

Uropod 3 uniramous, naked except for 2 terminal spines.

Telson bilobed, with 6 marginal spines; median cleft not deep.

Female. As for male except as follows. Length 13.5 mm, width 2.71 mm, depth 2.82 mm.

Antenna 2 5.74 mm long; segment 4 superior margin naked; flagellum with 21 segments.

Gnathopod 1 basos anterior margin with small spines at 0.43, 0.51, 0.61, 0.74, 0.83, and 0.91; posterior margin with larger spines at 0.25 and 0.52; posterodistal angle with 2 spines. Carpus anterior margin with spines at 0.29, 0.40, 0.51, and 0.63; anterodistal angle with 3 spines. Propod not quite as broad distally as in male. Dactyl extending to propod margin.

Gnathopod 2. Broodplate narrowing a little distally, with setae reduced in number. Basos slightly curved posteriorly; anterior margin with spines at 0.21, 0.25, 0.33, 0.43, and 0.58; posterior margin naked except for 3 spines at distal angle. Ischium long, broadening distally, with 2 spines at posterodistal angle. Merus produced posteriorly into a pellucid lobe protected by 2 spines on each surface. Carpus long; anterior margin naked except for 2 spines at distal angle; posterior margin produced into a pellucid lobe protected by a row of 3 or 4 spines medially on outer face; posterodistal angle with 2 spines. Propod long, narrow, mitten-shaped, with about 20 large spines running longitudinally and submedially on outer and inner faces; posterior margin extending well beyond termination of palm to a soft pellucid lobe into which the short dactyl occludes; palm short, flanked by a row of short setae; palmar angle 38°.

Peraeopod 1. Broodplate short, narrowing distally, sparsely setose; distal margin rounded. Basos and merus broader distally, with anterior margin more rounded and produced.

Peraeopod 2 more peg-shaped. Broodplate larger than in peraeopod 1, tapering distally, sparsely setose. Basos broader distally; anterior margin convex distally; posterior margin with 2 spines at 0.71. Merus broader distally. Dactyl indentation not as marked.

Peraeopod 3. Broodplate margin thickened and rolled; distal margin rounded, narrow, with about 5 terminal setae.

Peraeopod 4. Carpus posterior margin with spines at 0.29, 0.46, 0.69, and 0.79. Propod posterior margin without a spine group at 0.74.

Peraeopod 5. Propod posterior margin with spines at 0.15 (2), 0.28 (4), 0.46 (4), 0.61 (3), 0.78 (3), and 0.93 (3).

Uropod 3. Peduncle with a single long spine dorsally.

Telson with 1 short and 3 long spines on each lobe.

Type data. **Holotype:** male, Three Kings Islands, summit, 200 m, 28 November 1970, G. Kuschel (CMNZ; KD 916).

Allotype: 1 female, same data as holotype.

Material examined. Type specimens, plus collections bearing the following data (AMNZ, CMNZ, NMNZ, NZAC). Three Kings Is, summit, 200 m, 28 Nov 1970, G. Kuschel, litter. Three Kings group, South West I., summit ridge, 13 Jan 1951, E.G. Turbott (Au P/S 4; KD 833). Omaha State Forest, 10 Oct 1974, J.C. Watt, regeneration after clear-felling near kauri reserve (taken with *Arcitalitrus sylvaticus*, *Tara sylvicola*, and *Parorchestia tenuis*) (ED 74/79; KD 863). Omaha Kauri Reserve, 10 Oct 1974, J.C. Watt, litter (taken with *Puhuruhuru aotea-roa*) (ED 74/81, KD 865). Mangamuka Summit, 386 m, 13 Dec 1976, B.M. May, litter (taken with *Tara sylvicola*) (KD 903). Whangaroa County, Tauranga Bay, Butterfly Vly, 28 Nov 1966, K.A.J. Wise (Au P/S 43; KD 834). Waipoua Forest, 6 Jan 1967, R.R. Forster; Waipoua Forest, Headquarters Rd, beside river, 15 Dec 1976, B.M. & V.A. May, litter 76/105 (KD 867, 868). Kaingaroa area, Peka-rau, 91 m, forest remnant, 8 Jul 1967, K.A.J. Wise, in puriri leaf litter (found with *A. sylvaticus* and *P. tenuis*) (KD 874). Waitakere Range, Cascades Kauri Park, 14–17 Oct 1976, J.C. Watt, pit traps (taken with *A. sylvaticus*) (KD 895).

Three Kings Is / ND, AK / —.

Remarks. *Waematau manawatahi* can be easily recognised by its very distinctive male second gnathopod. Except for the secondary sexual characters there is little dimorphism between males and females. Many of the differences that do occur between the type specimens, in spination for example, can be accounted for by differential wear, since the range of variation seen in other specimens is quite wide. The broadening of certain peraeopod segments in the female does seem to be a true dimorphism.

Nothing is known of the ecology of this species. In particular it would be interesting to know if it does occur in kauri (*Agathis australis*) litter. It has been recorded as occurring in kauri reserves, but these are usually composite mosaics of two very distinctive communities, one dominated by kauri and the other by taraire (*Beilschmiedia tarairi*) (Cockayne 1908). In work to be published elsewhere I have shown that kauri litter contains substances that are toxic to *Makawe hurleyi*. *W. manawatahi* may have specific protective mechanisms that permit survival in kauri litter, but I have never collected it in any kauri community, so it is more probable that, although it lives near kauri, it is actually in the taraire litter community. In

extensive trials I extracted very few animals of any kind from kauri litter: only a few nematodes and ciliates, and no meso- or macrofauna. Certainly, no amphipods were present.

The specific epithet is derived from the Maori place name for the islands on which *Waematau manawatahi* is found. Manawatahi means 'out of breath' in Maori.

Waematau muriwhenua new species

Plate 32, Map 12

Diagnosis. A small to moderate-sized *Waematau*. Antenna 2 moderately long, relatively slender. Eyes round. Gnathopod 1 chelate and gnathopod 2 mitten-shaped in both sexes. Peraeopods relatively short. Gills large, the last pair each having a long, finger-like pendulous lobe. Pleopods reduced. Pleopods 1 and 2 biramous, slender, sparsely setose. Pleopod 3 vestigial, reduced to a cylindrical stump. Uropod 1 with a large inter-ramal spine, extending to half length of rami; outer ramus naked; inner ramus feebly spined dorsally; both rami with very long terminal spines. Uropod 2 rami both strongly spined dorsally and terminally.

Description. **Holotype male.** Length 11.0 mm, width 1.66 mm, depth 1.54 mm.

Antenna 1. Peduncle segment 1 broadening distally, with spines at superodistal and inferodistal angles. Segment 2 as long as segment 1, broadening distally; superodistal angle with 1 minute spine; inferodistal angle with 1 spine. Segment 3 short, curved inferiorly; superodistal angle with 1 minute spine; inferodistal angle with 1 spine. Flagellum with 5 segments; segments 1–3 each with 3 spines superodistally and 1 or 2 spines inferodistally; terminal segment obscured by spines of penultimate segment.

Antenna 2. Peduncle segment 3 short; superior margin convex, with 1 minute spine at superodistal angle; inferodistal angle with a patch of 5 spines. Segment 4 broadening distally, longer than segment 3; superior margin with spines at 0.41 (1) and 0.81 (3); inferodistal angle with 1 spine. Segment 5 long, broadening distally; superior margin scalloped, with spines at 0.12 (1), 0.29 (1), 0.45 (2), 0.65 (3), 0.75 (3), and 0.93 (1); superodistal angle with 2 spines; inferior margin with spines at 0.18 (2), 0.35 (2), 0.49 (2), 0.58 (2), 0.74 (2), and 0.86 (2); inferodistal angle with 2 spines. Flagellum with 17 segments, not very tapering; each segment except the last with 3 spines at the 4 distal angles; terminal tuft on last segment short, sparse.

Upper lip. Ventral margin circular, pilose.

Mandible. Incisor linear, saw-shaped, 5-toothed; lacinia mobilis with 4 teeth and with 4 interdentate pilose setae; setal tuft present; molar 19-striate, with medial seta pilose, shorter than usual.

Lower lip with normal scroll shape; setae limited to distal inner margin.

Maxilla 1. Inner plate narrow, tapering distally, terminating in 2 long pilose setae. Outer plate broader, with margins subparallel, curved inwards distally, terminating with a row of 8 spine teeth bearing 2, 2, 4, 4, 4, 4, 4, 4 lateral protuberances respectively (from outer to inner); a small palp present towards outer margin.

Maxilla 2. Inner plate distal margin acutely angled, hence plate almost triangular; distal margin with a row of setae terminating proximally with a long pilose seta. Outer plate curved somewhat inwardly; distal margin convex, with a row of setae.

Maxilliped lost.

Gnathopod 1. Coxal plate ventral margin rounded, with 5 spines; plinthic ridge with 5 large spines. Basos broadening distally; anterior margin straight, with spines at 0.48, 0.65, and 0.76; posterior margin convex, slightly scalloped between spine groups at 0.43 and 0.63; posterodistal angle with 2 spines. Basos subsquare; anterior margin scarcely produced; posterior margin slightly convex; posterodistal angle with 2 spines. Merus posterior margin produced mesodistally into a discrete, rounded pellucid lobe guarded at base by 3 large spines. Carpus anterior margin long, with spines at 0.51; anterodistal angle with 5 long spines; posterior margin produced into a large pellucid lobe, guarded proximally by 1 spine on one face and 2 on the other; posterodistal angle with 3 large spines. Propod broadening distally; anterior margin slightly stepped, with spines at 0.60 (3) and 0.86 (3); anterodistal angle with 5 long spines; posterior margin produced into a pellucid lobe guarded at base by a row of 7 spines on each face; pellucid lobe produced a little distally beyond palmar area posteriorly; palm transverse, terminating short of propod posterior margin, flanked on each side by a row of spines that are biggest at beginning and end of palm. Dactyl shorter than propod width, its tip appearing to occlude a short extension of propod pellucid lobe.

Gnathopod 2. Coxal plate ventral margin rounded, with about 6 strong spines. Gill relatively large, trilobate; anterior lobe hooked; anterior margin crenulate. Basos broad; anterior margin convex, naked; posterior margin slightly sinuous; posterodistal angle with 1 small spine. Ischium relatively long, broadening slightly distally; posterodistal angle with 2 small spines. Merus posterior margin produced into a pellucid lobe guarded by a few small spines at base. Carpus anterior margin long, naked; posterior margin

produced into a pellucid lobe; posterodistal angle with 1 small spine. Propod mitten-shaped; lateral margins subparallel, straight, naked; anterodistal angle with 2 spines; outside surface with a longitudinal row of about 8 spines; posterior margin produced distally into a lobe extending well beyond palmar area; palm short, flanked by a row of spines, palmar angle 43°. Dactyl short, appears to occlude pellucid lobe of propod.

Peraeopod 1. Coxal plate ventral margin convex, with 7 spines. Gill discoidal. Basos curved anteriorly; anterior margin concave, with spines at 0.58, 0.70, 0.77, and 0.90 (2); posterior margin convex, slightly scalloped, with larger spines at 0.29, 0.53, and 0.71; posterodistal angle with 1 larger spine. Ischium anterior margin produced slightly; posterior margin nearly straight; posterodistal angle with 1 spine. Merus broadening distally; anterior margin with spines at 0.13 and 0.39; anterodistal angle with 2 large spines; posterior margin with spines at 0.32 (2), 0.52 (2), and 0.79 (2); posterodistal angle with 2 spines. Carpus curved slightly posteriorly; anterior margin with spines at 0.29 (1) and 0.47 (2); anterodistal angle with 1 spine; posterior margin scalloped, with larger spines at 0.11, 0.31, 0.57, and 0.80; posterodistal angle with 2 large spines. Propod curved posteriorly, with both margins stepped; anterior margin with spines at 0.21, 0.51, and 0.77; anterodistal angle with 2 spines; posterior margin with larger spines at 0.23 (3), 0.38 (3), 0.57 (3), and 0.85 (3); posterodistal angle with 1 small spine. Dactyl relatively long, with inner margin slightly emarginate.

Peraeopod 2. Coxal plate ventral margin nearly straight, with about 6 spines; anterodistal angle rounded. Basos margins subparallel, curved a little anteriorly; anterior margin naked; posterior margin with 2 large spines at 0.22 and 0.37. Ischium anterior margin slightly produced; posterior margin straight, with 1 spine at distal angle. Merus anterior margin with spines at 0.50; anterodistal angle with 1 spine; posterior margin with spines at 0.24, 0.45, and 0.90 (2); distal margin flanked by 3 large spines. Carpus anterior margin naked; anterodistal angle with 1 small spine; posterior margin scalloped, with large spines at 0.38 (2); posterodistal angle with 3 large spines. Propod with both margins stepped; anterior margin with spines at 0.37 (2) and 0.75 (2); anterodistal angle with 4 large spines; posterior margin scalloped, with spines at 0.21 (1), 0.34 (2), 0.55 (3), and 0.81 (3); posterodistal angle with 1 spine. Dactyl inner margin slightly emarginate.

Peraeopod 3. Coxal plate ventral margin bilobed, the lobes rounded and bearing 3 spines each. Gill discoidal. Basos an inverted pyriform shape; anterior margin with large spines at 0.40 (1), 0.51 (1), 0.63 (2), and 0.82 (2); anterodistal angle with 2 spines; posterior margin with

small spines at 0.19, 0.37, 0.49, 0.60, and 0.84; posterodistal angle with 1 spine. Ischium anterodistal angle with 1 spine; posterior margin slightly produced. Merus anterior margin scalloped, with spines at 0.26 (2), 0.49 (3), and 0.79 (3); posterior margin with spines at 0.60; posterodistal angle with 1 large spine. Propod with both margins stepped, particularly the anterior; anterior margin with spines at 0.16 (2), 0.36 (2), 0.59 (2), and 0.84 (4); posterior margin with spines at 0.50 and 0.81; posterodistal angle with 1 spine. Dactyl inner margin slightly emarginate.

Peraeopod 4 coxal plate ventral margin rounded, naked. Gill relatively small; pendulous lobe short, blunt. Basos ovoid. Ischium anterodistal angle with 2 spines; posterior margin short. Merus broadening distally; anterior margin stepped, with spines at 0.23 (2), 0.43 (2), 0.57 (1), and 0.71 (2); anterodistal angle with 4 spines; posterior margin stepped, with spines at 0.18, 0.35, and 0.69; posterodistal angle with 3 spines. Carpus broadening distally; anterior margin stepped, with spines at 0.22 (2), 0.40 (3), and 0.63 (3); anterodistal angle with 3 spines; posterior margin slightly scalloped, with spines at 0.28 (2), 0.48 (1), and 0.73 (1); posterodistal angle with 4 spines. Propod long, not tapering, with both margins stepped; anterior margin with spines at 0.15 (1), 0.25 (2), 0.42 (3), 0.64 (2), and 0.91 (3); posterior margin with spines at 0.18 (1), 0.28 (3), 0.49 (2), 0.72 (1), and 0.91 (1). Dactyl long, conical.

Peraeopod 5. Coxal plate anterodistal angle very rounded, with margins naked. Basos broader than long. Ischium anterodistal angle with 2 spines. Merus broadening slightly distally, with both margins stepped; anterior margin with spines at 0.13 (1), 0.21 (2), 0.43 (3), 0.59 (1), and 0.70 (3); anterodistal angle with 4 spines; posterior margin with spines at 0.14, 0.32, and 0.58; posterodistal angle with 3 spines. Carpus anterior margin stepped, with spines at 0.12 (1), 0.21 (2), 0.38 (3), 0.59 (3), and 0.78 (1); anterodistal angle with 3 spines; posterior margin nearly straight, with spines at 0.31, 0.49, and 0.73; posterodistal angle with 3 spines. Propod long, curved slightly anteriorly, tapering slightly, with both margins stepped; anterior margin with spines at 0.07 (1), 0.21 (2), 0.35 (3), 0.51 (3), 0.70 (3), and 0.90 (3); posterior margin with spines at 0.07 (2), 0.23 (3), 0.38 (3), 0.56 (3), 0.75 (3), and 0.94 (1). Dactyl long, narrow, conical.

Pleopod 1 (excluding terminal spines) 1.13 mm long; peduncle margins naked, with 1 coupling spine on inner margin; rami reduced to fewer than about 5 segments, although segmentation difficult to determine; inner ramus the longer.

Pleopod 2 0.86 mm long; peduncle margins naked, with 2 coupling spines; rami reduced to short stumps of about 3 segments, inner ramus slightly the larger.

Pleopod 3 very reduced, 0.41 mm long; peduncle narrowing distally, with 2 small coupling spines; rami reduced to 1-segmented triangles, sparsely setose.

Uropod 1. Peduncle with 7 large spines in a row dorsally; a large inter-ramal spine present; outer ramus naked, terminating with 1 very large scionate spine and 1 small spine; inner ramus with 3 weak dorsal spines, terminating in 1 very long scionate spine and 2 smaller spines.

Uropod 2. Peduncle with 3 spines dorsally; inter-ramal spine present; rami spined dorsally, terminating with 1 shorter and 2 longer spines.

Uropod 3 uniramous, forming a faecal guide; peduncle with 2 marginal spines; ramus very characteristically spined, with 2 dorsal and 3 terminal spines all directed upwards, and 3 longer spines directed backwards.

Telson only slightly cleft, with 1 large and 1 small spine on each lobe.

Allotype female (non-ovigerous, possibly immature) as for male except as follows. Length 9.41 mm, width 1.24 mm, depth 1.53 mm.

Antenna 1 extending to one-quarter of antenna 2 peduncle segment 5; flagellum with 5 segments; segment 1 slightly curved superiorly; segment 3 longest.

Antenna 2 flagellum with 14 segments.

Maxilliped palps relatively narrow, with segment 4 partly obscured by segment 3.

Gnathopod 1 propod narrower, and palm shorter.

Gnathopod 2 propod distal lobe not as produced, and palmar angle slightly more obtuse.

Type data. Holotype: male, ND, North Cape area, 5 km southeast of Unuwahao, 183 m, in litter in a forest remnant, 24 November 1967, K.A.J. Wise (CMNZ; KD 904).

Allotype: same data as holotype.

Material examined. Type specimens, plus 1 ovigerous female and 1 male from E Spirits Bay, Unuwahao, 29 Nov 1960, B.A. Holloway (taken with 2 small *Arcialurus sylvaticus*).

ND / —.

Remarks. I designate the female specimen as allotype with reluctance since it is non-breeding and rather small. Such specimens do not show the breeding oostegites, which are important systematically, nor do they show the full development of the sexually dimorphic characters. The small size of the females probably explains the marked similarity between the sexes, the only reliable sexual character being the presence or absence of penis organs. However, because no larger or better specimens are present in the collections

available, and because the species may well now be extinct, I feel justified in nominating both a holotype and an allotype, even though the two are very similar and small.

The specific epithet is the Maori name for the type locality; *muriwhenua* means 'land's end' in Maori.

***Waematau reinga* new species**

Plate 33, Map 12

Diagnosis. A moderate-sized, weakly sexually dimorphic *Waematau*. Antenna 1 short, extending to one-fifth along antenna 2 peduncle segment 5. Antenna 2 with about 22 segments, each bearing a few long spines. Eye ellipsoid, not very dark. Mandible with lacinia mobilis small. Gnathopod 1 chelate in both sexes; basos lacking a plinthic ridge; dactyl long, extending beyond propod margin. Gnathopod 2 propod mitten-shaped in both sexes. Peraeopods somewhat short and peg-like; coxal plate margins with many small spines. Gills large, the last pair with a long, pointed pendulous lobe. Broodplates sparsely setose. Pleopods 1 and 2 long, biramous, sparsely setose, with 2 coupling spines. Pleopod 3 reduced to a vestigial stump. Uropod 1 peduncle weakly spined; inter-ramal spine very long, extending halfway along rami; outer ramus with margins naked. Uropod 2 rami both with dorsal margins spined. Telson slightly cleft, with about 7 marginal spines.

Description. **Holotype male.** Length 12.2 mm. Eye not very dark, ellipsoidal.

Antenna 1 1.28 mm long. Peduncle segment 1 with margins convex; superodistal angle with 2 spines. Segment 2 with margins subparallel; superodistal angle with 2 spines; posterodistal angle with 1 spine. Segment 3 narrower than segment 2; distal angles with 2 spines each. Flagellum with 5 segments, the first longest; segments 1 and 2 with long spines at superodistal angle and 2 small spines at inferodistal angles; segment 3 with long spines at superodistal and inferodistal angles; segment 4 with 1 dorsal spine; segment 5 short, triangular, with a short, close-bound terminal tuft.

Antenna 2 4.51 mm long. Peduncle segment 3 broadening distally, with a prominent patch of 3 long spines at inferodistal angle. Segment 4 superior margin naked; superodistal angle with 1 small spine; inferior margin with 4 spines; inferodistal angle with 4 longer spines. Segment 5 long, narrow, with spines long and delicate. Flagellum long, tapering, with 21 segments; each segment longer than broad, with concave margins and 2 long spines at the 4 distal angles; ultimate segment long, conical, with a tight tuft of terminal setae.

Upper lip. Ventral margin rounded, setose. Maxilla with a flat, plate-like, saw-shaped mandible bearing 4 teeth; lacinia mobilis small, 4-toothed, with 2 interdentate pilose setae; setal tuft prominent; molar 17-striate, with medial seta length about twice molar width. **Lower lip** ventral margin rounded, sparsely setose.

Maxilliped. Palps relatively broad, with segment 4 not obscured; inner plate teeth very large.

Gnathopod 1. Coxal plate short; ventral margin straight, with about 6 spines; no plinthic ridge present. Basos broadening distally; anterior margin slightly concave, with spines at 0.70, 0.92, and 0.96; posterior margin convex and stepped, with spines at 0.57; posterodistal angle with 2 large spines. Ischium relatively large; anterior margin not produced; posterior margin convex, with spines at 0.50; posterodistal angle with 1 large and 1 small spine. Merus posterior margin scarcely produced, convex, with large spines at 0.22, 0.42, 0.55, 0.62, and 0.67. Carpus anterior margin nearly straight, with spines at 0.27, 0.57, and 0.69; anterodistal angle with 3 spines; posterior margin convex, stepped, not produced into a pellucid lobe, with spines at 0.20, 0.31, 0.51, 0.62, and 0.76. Propod broadening distally; anterior margin stepped, with spines at 0.35, 0.58, and 0.85; anterodistal angle with 2 long spines; posterior margin with spines at 0.52 and 0.72; palm convex, extending to edge of propod, flanked by long spines, especially posteriorly; palmar angle 108°. Dactyl longer than palm, projecting beyond propod posterior margin.

Gnathopod 2. Coxal plate ventral margin rounded, with many spines, some paired. Basos anterior margin emarginate anteriorly, with spines at 0.28 and 0.39; posterior margin slightly sinuous, naked; posterodistal angle with 1 small spine. Ischium long; posterodistal angle with 1 spine. Merus posterior margin produced into a pellucid lobe guarded by 3 or more spines at base. Carpus anterior margin long; anterodistal angle with 3 spines; posterior margin produced into a pellucid lobe. Propod mitten-shaped; anterior margin naked; anterodistal angle with 2 spines; posterior margin produced into a pellucid lobe projecting well beyond palmar area; palm short, oblique, flanked by a longitudinal row of spines; palmar angle about 68°. Dactyl short, occluding propod lobe.

Peraeopod 1. Coxal plate ventral margin nearly straight, with 12 spines. Basos broadening distally; anterior margin convex; posterior margin slightly stepped, with spines at 0.30, 0.49, and 0.72. Ischium posterodistal angle with 2 spines. Merus anterior margin with spines at 0.29 and 0.58; anterodistal angle with 2 spines; posterior margin with spines at 0.16, 0.26, and 0.53; posterodistal angle with 3 spines. Carpus narrowing distally; anterior margin convex, naked; posterior margin slightly emarginate proximally,

with spines at 0.23, 0.51, and 0.74. Propod scalloped, curved posteriorly; anterior margin with spines at 0.18 (1), 0.41 (2), 0.61 (2), and 0.80 (2); anterodistal angle with 1 spine; posterior margin with spines at 0.29 (3), 0.51 (3), and 0.74 (3); posterodistal angle with 3 spines. Dactyl long, conical, with 1 small spine on anterior margin and a larger one on posterior margin at base of large terminal spine.

Peraeopod 2. Coxal plate ventral margin nearly straight, with 11 small spines; anterior angle rounded. Gill discoidal, with partly rolled edges. Basos to merus not clear in holotype. Carpus anterior margin with 1 small spine at 0.47; posterior margin with spines at 0.18 (3) and 0.68 (3). Propod margins stepped, narrowing slightly distally; anterior margin with spines at 0.35 (2) and 0.75 (2); posterior margin with spines at 0.26 (2), 0.49 (2), and 0.75 (3). Dactyl long, conical.

Peraeopod 3. Coxal plate lobes less produced than usual, each with about 4 spines. Gill small, discoidal. Basos broader proximally, narrowing distally; anterior margin with large spines at 0.12, 0.28, 0.59, and 0.77; posterior margin with spines at 0.28, 0.42, 0.72, 0.81, 0.87, and 0.97. Ischium anterodistal angle with 1 very large spine. Merus very broad distally; anterior margin slightly scalloped, with large spines at 0.21, 0.33, 0.48, and 0.73; anterodistal angle with 4 large spines; posterior margin with 1 small spine at 0.48; posterodistal angle with 1 very long and 1 minute spine. Carpus as long as merus but narrower; anterior margin with long spines at 0.11 (1), 0.36 (3), 0.71 (1), and 0.79 (1); posterior margin naked; posterodistal angle with 3 large spines. Propod narrowing distally; anterior margin scalloped and stepped, with spines at 0.18 (1), 0.30 (2), 0.54 (2), and 0.82 (3); posterior margin stepped, with spines at 0.46 (1+1) and 0.83 (1+1); posterodistal angle with 3 spines. Dactyl not curved, conical, with terminal spine curved anteriorly.

Peraeopod 4. Coxal plate small; ventral margin rounded, bearing a few minute spines. Gill large, trilobate; pendulous lobe narrow, tapering to an acute angle distally. Basos longer than broad; anterior margin rounded, with 9 larger spines; posterior margin with 8 smaller spines. Ischium anterodistal angle with 1 spine. Merus broadening distally; anterior margin scalloped, with spines at 0.15 (1), 0.31 (2), 0.59 (2), and 0.84 (1); anterodistal angle with 2 spines; posterior margin stepped, with smaller spines at 0.37 and 0.60; posterodistal angle with 2 large spines. Carpus margins subparallel; anterior margin scalloped, with spines at 0.08 (1), 0.21 (3), 0.48 (3), 0.82 (1), and 0.87 (4); posterior margin straight, with minute spines at 0.39 and 0.67; posterodistal angle with 3 large spines. Propod margins stepped and somewhat scalloped; anterior margin with spines at 0.17 (2), 0.36 (3), 0.55 (3), and 0.84 (3);

posterior margin with spines at 0.19 (1), 0.42 (2), 0.70 (3), and 0.95 (3); posterodistal angle with 1 spine. Dactyl long, narrow, tapering; terminal spine only slightly curved anteriorly.

Peraeopod 5. Coxal plate margins rounded, naked. Basos as broad as long, an inverted pear-shape; anterior margin smoothly convex, with large spines; posterior margin minutely scalloped, with minute spines. Ischium anterodistal angle with 3 spines. Merus broadening slightly distally; anterior margin stepped, with spines at 0.15 (1), 0.25 (2), 0.44 (3), 0.60 (1), and 0.73 (4); anterodistal angle with 4 large spines; posterior margin with small spines at 0.29, 0.42, 0.55, and 0.68; posterodistal angle with 1 spine. Carpus margins subparallel; anterior margin scalloped, with spines at 0.17 (1), 0.37 (2), and 0.63 (2); anterodistal angle with 3 spines; posterior margin with minute spines at 0.37 and 0.63; posterodistal angle with 2 large spines. Propod long, narrowing distally; anterior margin strongly stepped, with spines at 0.12 (0+1), 0.25 (2), 0.41 (3), 0.64 (3), and 0.87 (3); anterodistal angle with 2 long spines; posterior margin weakly stepped, with spines at 0.24 (2), 0.41 (2), 0.67 (2), and 0.92 (2); posterodistal angle with 1 spine. Dactyl long, conical.

Pleopods. First 1.20 mm long, narrow, delicate, biramous; peduncle slender, with margins naked and with 2 coupling spines; rami weakly setose; outer ramus much the shorter. Second 1.13 mm long; peduncle with margins naked and with 2 coupling spines; rami sparsely setose; inner ramus twice length of outer ramus. Third reduced to a short, triangular stump, with 1 minute spine distally.

Uropod 1. Peduncle with 3 dorsal spines at 0.56, 0.84, and 0.90; inter-ramal spine large, half length of rami. Outer ramus naked, terminating with 1 very long and 2 short spines; inner ramus with 3 dorsal spines at 0.18, 0.40, and 0.60, terminating with 1 very long and 1 shorter spine; rami long, bearing a few terminal spines with long, very fine scions extending well beyond spine tip.

Uropod 2. Peduncle with 2 dorsal spines and 1 long inter-ramal spine; both rami spined dorsally, terminating with 2 long and 2 shorter spines.

Telson slightly cleft; lateral margins bearing 3 pairs of spines.

Female. As for male except as follows.

Antenna 1 broader. Peduncle segment 1 with 2 spines at superodistal angle and 1 spine at mid inferior margin. Segment 2 with 1 small spine at mid inferior margin.

Antenna 2 5.06 mm long.

Maxilla 1. Outer plate with a small palp; distal margin with 9 spine teeth bearing 0, 0, 1, 4, 4, 4, 2, 4, 1 lateral protuberances respectively (from outer to inner). Inner

plate terminal setae not very long. Maxilliped inner plate distal margin with 2 large spine teeth; pilose setae arranged in a short diagonal row below this, not extending down midline.

Gnathopod 1. Basos anterior margin with spines at 0.43, 0.56, 0.70, and 0.96; posterior margin with spines at 0.40 and 0.58; posterodistal angle with 1 very long and 1 long spine.

Gnathopod 2. Broodplate elongate; distal margin rounded, with 8 spines. Basos anterior margin with spines at 0.12, 0.27, 0.37, and 0.57.

Peraeopod 1. Broodplate distal margin terminating in a rounded point, with about 8 setae. Basos anterior margin with spines at 0.48, 0.54, 0.69, 0.74, and 0.88; posterior margin with spines at 0.49 and 0.52; posterodistal angle with 1 large spine. Dactyl inner margin slightly emarginate.

Peraeopod 2. Broodplate distal margin rounded, with 8 setae. Basos slightly curved anteriorly; anterior margin with spines at 0.57, 0.69, 0.79, and 0.90; posterior margin with spines at 0.29, 0.47, and 0.68. Ischium with 2 spines at posterodistal angle. Merus broadening distally; anterior margin with 1 small spine at 0.40; anterodistal angle with 2 spines; posterior margin with spines at 0.36 and 0.50; posterodistal angle with 3 large spines. Dactyl inner margin markedly emarginate.

Peraeopod 3. Basos with 2 longer spines at posterodistal angle.

Peraeopod 4. Basos posterior margin more rounded, with 12 minute spines. Ischium anterodistal angle with 2 spines. Carpus anterior margin with spines at 0.12 (1), 0.31 (3), 0.57 (3), 0.82 (3), 0.88 (2), and 0.92 (1); posterior margin with spines at 0.42 and 0.79; posterodistal angle with 1 spine. Propod anterior margin with spines at 0.14 (1), 0.23 (2), 0.40 (3), 0.62 (3), and 0.86 (3); posterior margin with spines at 0.23 (2), 0.46 (3), and 0.75 (3); posterodistal angle with 4 spines.

Peraeopod 5. Merus anterior margin with spines at 0.13 (2), 0.35 (3), and 0.64 (3); anterodistal angle with 3 spines; posterior margin with spines at 0.25, 0.40, and 0.62; posterodistal angle with 1 spine. Propod anterior margin with spines at 0.20 (2), 0.34 (2), 0.51 (3), 0.70 (3), and 0.90 (2); posterior margin with spines at 0.20 (2), 0.34 (3), 0.53 (3), and 0.76 (3); posterodistal angle with 3 spines.

Uropod 1. Inter-ramal spine extending beyond mid ramus; outer ramus naked; inner ramus with 2 dorsal spines, terminating with 1 long scionate spine and 2 shorter spines.

Uropod 3. Peduncle with 1 spine; ramus with 1 longer and 2 shorter terminal spines.

Type data. **Holotype:** male, ND, east Spirits Bay, Unuwhao, 29 November 1960, B. Holloway (CMNZ; KD 633).
Allotype: same data as holotype (CMNZ).

Material examined. Type specimens only.

Remarks. *Waematau reinga* is readily distinguished from any other known species by its delicate pleopods 1 and 2, vestigial pleopod 3, and extremely long inter-ramal spine on uropod 1 that reaches to halfway or more along the rami.

The specific epithet alludes to the proximity of the type locality to Cape Reinga, at the northern tip of the North Island.

Waematau unuwhao new species

Plate 34, Map 12

Diagnosis. A small, sexually dimorphic *Waematau*. Body not very deep. Eyes dark, round. Antenna 1 extending to between one-third and halfway along antenna 2 peduncle segment 5. Antenna 2 short. Gnathopod 1 chelate in both sexes. Male gnathopod 2 propod ovate, with a long, oblique, convexly curved palm and a long overlapping dactyl with a soft tip. Female gnathopod 2 mitten-shaped. Peraeopods relatively short and stout. Pleopod 1 small, biramous. Pleopod 2 reduced to a cylindrical vestige, and pleopod 3 reduced to a triangular stump. Uropod 1 with no inter-ramal spine; outer ramus naked; inner ramus weakly spined. Uropod 2 rami both spined. Uropod 3 forming broad plates or faecal guides. All uropods with very long, relatively straight terminal spines. Telson forming a dorsal flat faecal guide, with long spines.

Description. **Holotype male.** Length 8.59 mm, width 1.65 mm, depth 1.68 mm. Eyes round, not very black, diameter one-third of head length.

Antenna 1 1.26 mm long, extending to between one-third and halfway along antenna 2 peduncle segment 5. Peduncle segment 1 narrowing distally, with 1 spine at inferodistal angle. Segment 2 slightly longer than segment 1, narrower; superodistal angle with 1 small spine; inferodistal angle with a larger spine. Segment 3 1.5x length of segment 2; superodistal angle with 1 spine; inferior margin with 1 spine at midway and 2 spines at distal angle. Flagellum not very tapering, with 5 segments; 1st and 4th segments longest; each segment with spines at superodistal and inferodistal angles; ultimate segment short, conical, with a loosely bound, sparse terminal setal tuft.

Antenna 2 3.23 mm long. Peduncle segment 3 widening a little distally, with spines at midway on inferior margin

and at inferodistal angle (2). Segment 4 superior margin naked except for 2 spines at distal angle and 2 midlaterally; inferior margin slightly scalloped, with 3 spines; inferodistal angle with 2 spines. Segment 5 1.6x length of segment 4, three-quarters of its width; superior margin with 4 spines; superodistal angle with 1 spine; lateral face with 5 spines; distal margin with 2 spines midlaterally; inferior margin with 4 spines; inferodistal angle with 2 spines. Flagellum with 13 segments, each except the last finely setose at the 4 distal angles; last segment finely tapering, with a short, close-bound terminal tuft.

Upper lip. Ventral margin rounded, only finely setose; no inner shelf.

Mandible. Incisor 5-cusped; lacinia mobilis 4-cusped, with 2 pairs of interdentate pilose setae and, between these and molar, a dense setal tuft; molar 18-striate, with setose medial setae.

Lower lip. Setae confined to inner margin and inner region of distal margin.

Maxilla 1. Inner plate slender, terminating in 2 long pilose setae. Outer plate broader, with margins subparallel; distal margin with 10 stout teeth; a small palp present.

Maxilla 2. Outer plate outer margin convex; distal margin spined. Inner plate subtriangular; distal margin spined, the spine row terminating at inner margin with a long pilose seta.

Maxilliped not very broad, but palps broad. Palp segment 4 small, almost masked by spines and produced inner distal margin of segment 3.

Gnathopod 1. Coxal plate ventral margin somewhat stepped at spine groups, with 5 spines. Basos slightly curved anteriorly; anterior margin slightly sinuous, with spines at 0.46, 0.59, 0.69, 0.79, and 0.96; posterior margin convex, with spines at 0.43 and 0.68; posterodistal angle with 1 spine. Ischium posterior margin with 1 spine at 0.5; posterodistal angle with 2 spines. Merus posterior margin produced into a pellucid lobe, with 4 spines. Carpus broadening distally; anterior margin with spines at 0.26, 0.35, and 0.63; posterior margin produced into a pellucid lobe distally protected by 5 large spines around base. Propod shorter than carpus; anterior margin slightly stepped at spine groups, with spines at 0.42 (2), 0.67 (1), and 0.89 (2); anterodistal angle with 4 spines; posterior margin slightly produced; palm short, flanked by a short row of about 6 spines; palmar angle 90°. Dactyl shorter than propod width.

Gnathopod 2. Coxal plate ventral margin rounded, with 9 spines. Gill relatively small, bilobed. Basos broadening distally; anterior margin sinuous, spined only at 0.53; posterior margin convex, with spines at 0.24, 0.36, 0.54, and 0.68. Ischium anterior margin produced; posterior

margin slightly sinuous; posterodistal angle with 1 spine. Merus short; posterior margin with 1 spine. Carpus short, triangular, with margin convex. Propod greatly produced, ellipsoidal; palm long, oblique, convex, flanked by a row of short, stout spines on each side, the posterior end recessed to receive dactyl tip; palmar angle 26°. Dactyl longer than palm, with curved 'soft' tip bearing a small accessory sensory spine.

Peraeopod 1. Coxal plate ventral margin rounded, with 11 spines. Gill small, discoidal. Basos broadening distally, curved anteriorly; anterior margin concave, with spines at 0.57, 0.64, 0.70, 0.80, 0.88, and 0.96; posterior margin convex, with spines at 0.45 (1), 0.59 (1), and 0.74 (2); posterodistal angle with 1 spine. Ischium anterior margin sinuous; posterior margin straight; posterodistal angle with 1 spine. Merus broadening distally; anterior margin convex, somewhat stepped at spine groups, with spines at 0.41 and 0.65; anterodistal angle with 3 spines; posterior margin sinuous, with spines at 0.06 (1), 0.20 (2), 0.41 (1), 0.45 (2), 0.67 (1), 0.71 (2), and 0.89 (2); posterodistal angle with 2 spines. Carpus short, narrowing distally; anterior margin with spines at 0.25 (1) and 0.55 (2); anterodistal angle with 1 spine; posterior margin with spines at 0.03, 0.28, 0.56, 0.72, and 0.87; posterodistal angle with 3 spines. Propod curved a little posteriorly, with margins somewhat stepped at spine groups; anterior margin with spines at 0.23 (2), 0.54 (2), and 0.81 (2); anterodistal angle with 3 spines; posterior margin with spines at 0.21 (2), 0.30 (3), 0.47 (3), 0.66 (3), 0.84 (3), and 0.91 (1).

Peraeopod 2. Coxal plate rounded anteriorly; ventral margin with 11 spines, emarginated posteriorly; posterior margin rounded. Gill discoidal. Basos curved anteriorly, with margins a little stepped at spine groups; anterior margin with spines at 0.65, 0.72, 0.82, and 0.91; posterior margin with spines at 0.46 (2) and 0.69 (2); posterodistal angle with 1 spine. Ischium anterior margin slightly produced and sinuous; posterodistal angle with 2 spines. Merus broadening distally; anterior margin convex, with spines at 0.35, 0.58, 0.93, and 0.95; posterior margin straight, with spines at 0.10, 0.25, 0.47, 0.63, 0.86, and 0.90; posterodistal angle with 2 spines. Carpus short, with margins subparallel, slightly scalloped at spine groups; anterior margin with spines at 0.47; anterodistal angle with 2 spines; posterior margin with spines at 0.19 (2), 0.39 (2), and 0.83 (2); posterodistal angle with 1 spine. Propod narrowing slightly distally, curved a little posteriorly, with margins stepped at spine groups; anterior margin with spines at 0.19 (3), 0.54 (3), and 0.82 (3); anterodistal angle with 3 spines; posterior margin with spines at 0.21 (3), 0.40 (3), 0.60 (3), and 0.81 (3); posterodistal angle with 1 spine. Dactyl inner (posterior) margin emarginate proximal to

base of terminal spine.

Peraeopod 3. Coxal plate lobes both spined. Gill small, discoidal. Basos an inverted pear shape, narrowing distally; anterior margin with larger spines than posterior margin. Ischium anterior margin straight; anterodistal angle spined; posterior margin a little produced. Merus broadening distally; anterior margin somewhat scalloped, with spines at 0.19, 0.43, 0.47, 0.77, and 0.90 (2); posterior margin with spines at 0.42 and 0.60; posterodistal angle with 2 spines. Carpus narrowing only slightly distally; anterior margin stepped at spine groups, with spines at 0.19 (2), 0.50 (3), and 0.83 (2); anterodistal angle with 2 spines; posterior margin with small spines at 0.42 and 0.68; posterodistal angle with 2+2 spines. Propod narrowing only slightly distally, broadest medially; anterior margin stepped, with spines at 0.20 (2), 0.33 (3), 0.54 (3), and 0.77 (3); posterior margin also stepped, with spines at 0.15 (1), 0.35 (3), 0.62 (3), and 0.86 (3); posterodistal angle with 4 spines. Dactyl only slightly curved inwardly.

Peraeopod 4. Coxal plate rounded, with a few very small spines ventrally. Gill bilobed; pendulous lobe narrow, long. Basos ellipsoidal; anterior margin convex, with a number of spines; posterior margin slightly sinuous owing to shallow excavation proximally, with numerous small spines. Ischium anterodistal angle with 2 spines; posterior margin slightly produced. Merus broadening distally; anterior margin slightly stepped and with spines at 0.10 (2), 0.23 (3), 0.45 (3), 0.71 (3), and 0.82 (1); anterodistal angle with 3 spines; posterior margin with spines at 0.25 (1), 0.42 (1+1), and 0.66 (1+1); posterodistal angle with 1+1 spines. Carpus margins subparallel; anterior margin scalloped, with spines at 0.14 (3), 0.36 (3), 0.60 (3), and 0.81 (4); posterior margin straight, with spines at 0.36 (2), 0.54 (2), and 0.72 (2); posterodistal angle with 3 spines. Propod long, narrowing only slightly distally, with both margins scalloped; anterior margin with spines at 0.14 (2), 0.29 (2), 0.47 (2), 0.65 (3), 0.79 (1), and 0.89 (2); posterior margin with spines at 0.20 (2), 0.33 (2), 0.51 (2), 0.72 (2), and 0.94 (2); posterodistal angle with 3 spines. Dactyl long, conical, with terminal spine curved inwards.

Peraeopod 5. Basos with both margins convex, stepped at spine groups; anterior margin with the larger spines. Ischium anterior margin straight; anterodistal angle with 1 spine; posterior margin angularly produced. Merus broadening distally, with both margins slightly stepped at spine bases; anterior margin with spines at 0.16 (1+1), 0.28 (2), 0.49 (3), 0.75 (3), and 0.95 (3); posterior margin with spines at 0.16, 0.26, 0.46, and 0.70; posterodistal angle with 1+1 spines. Carpus margins subparallel; anterior margin scalloped, with spines at 0.11 (2), 0.30 (3), 0.62 (3), and 0.92 (3); posterior margin straight, with small spines at

0.27 and 0.73. Propod narrowing slightly distally, with both margins stepped; anterior margin with spines at 0.19 (2), 0.33 (2), 0.49 (2), 0.67 (1), and 0.89 (2); posterior margin with spines at 0.24 (3), 0.39 (3), 0.55 (3), 0.75 (3), and 0.93 (2); posterodistal angle with 3 spines. Penis organs subsquare, not abutting at midline.

Epimeral plates. Plate 1 triangular; posterior margin with a small emargination distally and 2 minute spines proximally. Plate 2 subsquare but with anterodistal angle rounded; posterior margin similarly emarginate, with 3 minute spines. Plate 3 squarer than the others, smaller than plate 2; posterior margin with a more pronounced emargination or notch distally and 6 or 7 minute spines posteriorly.

Pleopods. First biramous but relatively short, delicate; peduncle tapering distally, with margins naked and with 1 coupling spine; rami about equal in length, with segmentation not obvious and setae sparse. Second reduced to a vestigial cylindrical stump bearing a single spine. Third even more reduced, to a short triangular vestigial stump.

Uropod 1 biramous, relatively short and dumpy; peduncle with 2 rows of spines dorsally; no inter-ramal spine present; rami equal in length; outer ramus naked; inner ramus with 4 weak spines dorsally.

Uropod 2 biramous; peduncle with a distinctive spine group dorsodistally; rami both short, spined.

Uropod 3 uniramous; peduncle with 1 spine dorsally.

Telson bilobed, not very cleft, with 3 marginal spines on each lobe.

Female. As for male except as follows. Length 11.1 mm, width 1.65 mm, depth 2.00 mm.

Antenna 1 1.30 mm long.

Antenna 2 3.87 mm long. Peduncle segment 3 with a spine at superodistal angle; inferodistal angle with 3 spines. Segment 4 superior margin with spines at 0.5; superodistal angle with 2 or 3 spines; inferior margin with spines at 0.30 (1) and 0.60 (2); inferodistal angle with 1 small spine. Segment 5 superior margin with spines at 0.27 (1), 0.44 (1), 0.64 (2), and 0.84 (2); superodistal angle with 2 spines; inferior margin with spines at 0.18 (2), 0.35 (2), 0.56 (2) and 0.74 (2); inferodistal angle with 1 spine. Flagellum with 17 segments.

Mandible. Incisor 7-cusped; lacinia mobilis 5-cusped, with 3 pairs of interdentate pilose setae.

Gnathopod 1. Basos broader proximally, with spines on anterior margin becoming larger distally. Merus posterior margin not produced. Propod narrower. Dactyl extending beyond propod margin.

Gnathopod 2. Broodplate narrowing distally, with distal end rounded and bearing 8 spines, these not curl-tipped.

Basos anterior margin slightly sinuous, with spines at 0.12, 0.23, 0.33, 0.55, and 0.94; posterior margin straight; posterodistal angle with 1 spine. Ischium long, curved anteriorly; posterodistal angle with 2 spines. Merus posterior margin produced into a pellucid lobe with 4 large spines around base. Carpus posterior margin produced into a pellucid lobe; anterodistal angle with 2 spines. Propod long, narrow, mitten-shaped; anterior margin sinuous, naked; posterior margin produced into a pellucid lobe (folded back in paratype slide); outer surface with about 12 large spines in a longitudinal row; inner surface with 2 longitudinal rows of about 10 spines each; palm short, flanked by a group of spines. Dactyl short, occluding into propod pellucid lobe, which extends beyond it distally.

Peraeopod 1. Broodplate rounded distally, with 9 setae. Basos broader distally; anterior margin rounded, naked. Propod anterior margin with spines at 0.13 (1), 0.32 (2), 0.61 (2), and 0.88 (2); posterior margin with spines at 0.16 (1), 0.24 (3), 0.47 (3), 0.64 (3), 0.72 (3), 0.84 (3), and 0.91 (1).

Peraeopod 2. Broodplate with 8 setae distally. Propod anterior margin produced distally into a slight pellucid lobe. Dactyl inner surface emarginate.

Peraeopod 3. Broodplate with 5 setae; rolled margin extending only to about one-third along. Basos longer and broader.

Peraeopod 4. Basos long, ovate; posterior margin smoothly convex.

Peraeopod 5. Basos posterior margin with larger spines.

Type data. Holotype: male, ND, North Cape area, 5 km southeast of Unuwhao, 183 m, in forest remnant, 24 November 1967, K.A.J. Wise, collected with 4 other specimens (nominated as paratypes) of this species and with specimens of *Waematau muriwhenua* and *Parorchestia tenuis* (CMNZ; KD 894).

Material examined. Type series only.

ND / —.

Remarks. *Waematau unuwhao* is very rare. In spite of extensive searching through all the very large collections held by museums and government departments, both here and overseas, I have encountered only the five specimens in the type collection. In view of the extensive land modification that has taken place in the past – and still taking place today – in the general vicinity of the type locality I would not be surprised if this species were now extinct. I was unable to find it when I collected in the area in 1972.

W. unuwhao is easily recognised by its short antennae 2, massive and distinctive male second gnathopod, vestigial

nature of pleopods 2 and 3, naked outer ramus of uropod 1 and sparse spination on the inner ramus, spination on both rami of uropod 2, and marginal (not coronal) spines on the telson.

As in many species, the mature female has broader basos segments on the gnathopods and anterior peraeopods than the male, perhaps allowing the eggs to be manipulated and held during brooding. Egg size and average brood size are unknown, but the brood probably consists of a few large eggs, since other species in which the broodplates (oostegites) are as reduced as in *W. unuwhao* have broods of this kind. Larger eggs may not be held as well by oostegites as are small eggs, and so these additional mechanisms for holding them are required.

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ILLUSTRATIONS

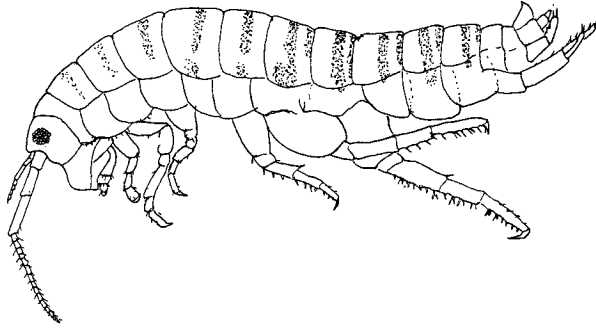


Fig. 1 Habitus, lateral, *Kanikania rubroannulata*, showing pigmentation pattern.

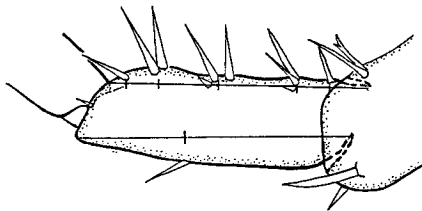


Fig. 2 Derivation of spination indices.

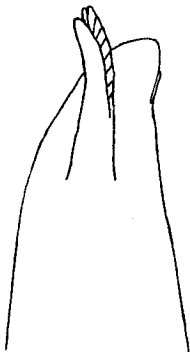


Fig. 3 Scionate spine, showing bifurcate tip.

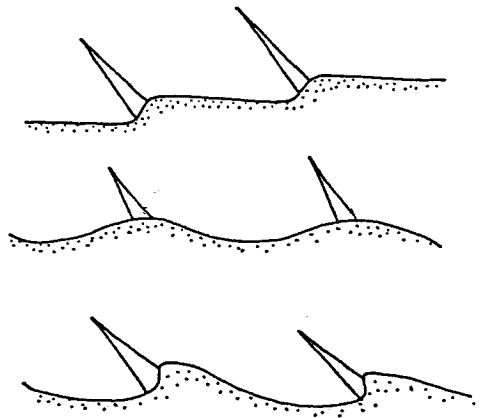


Fig. 4 Stepped, scalloped, and composite outlines.

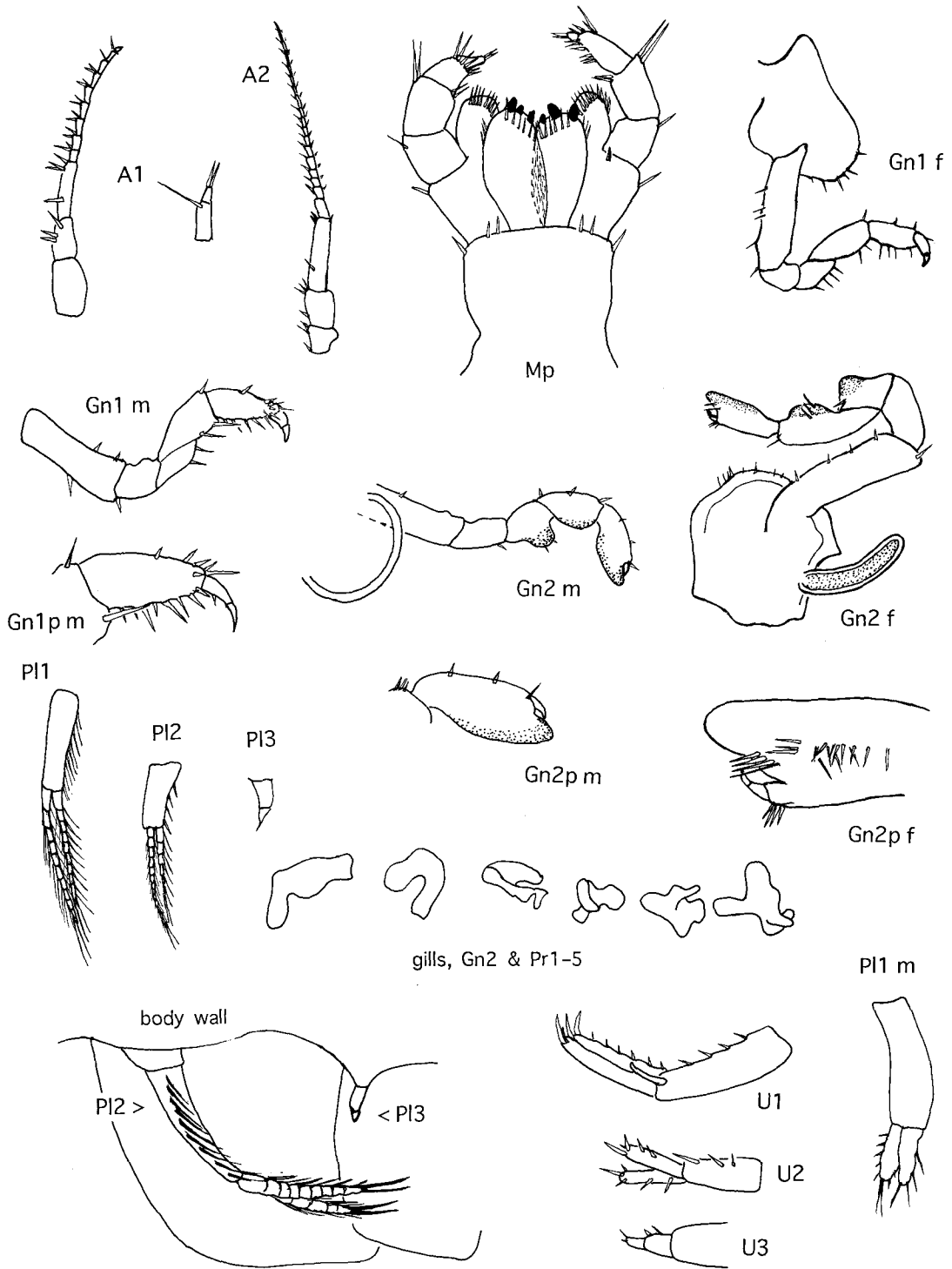


Plate 1 *Arcitalitrus sylvaticus* (abbreviations keyed on p. 104)

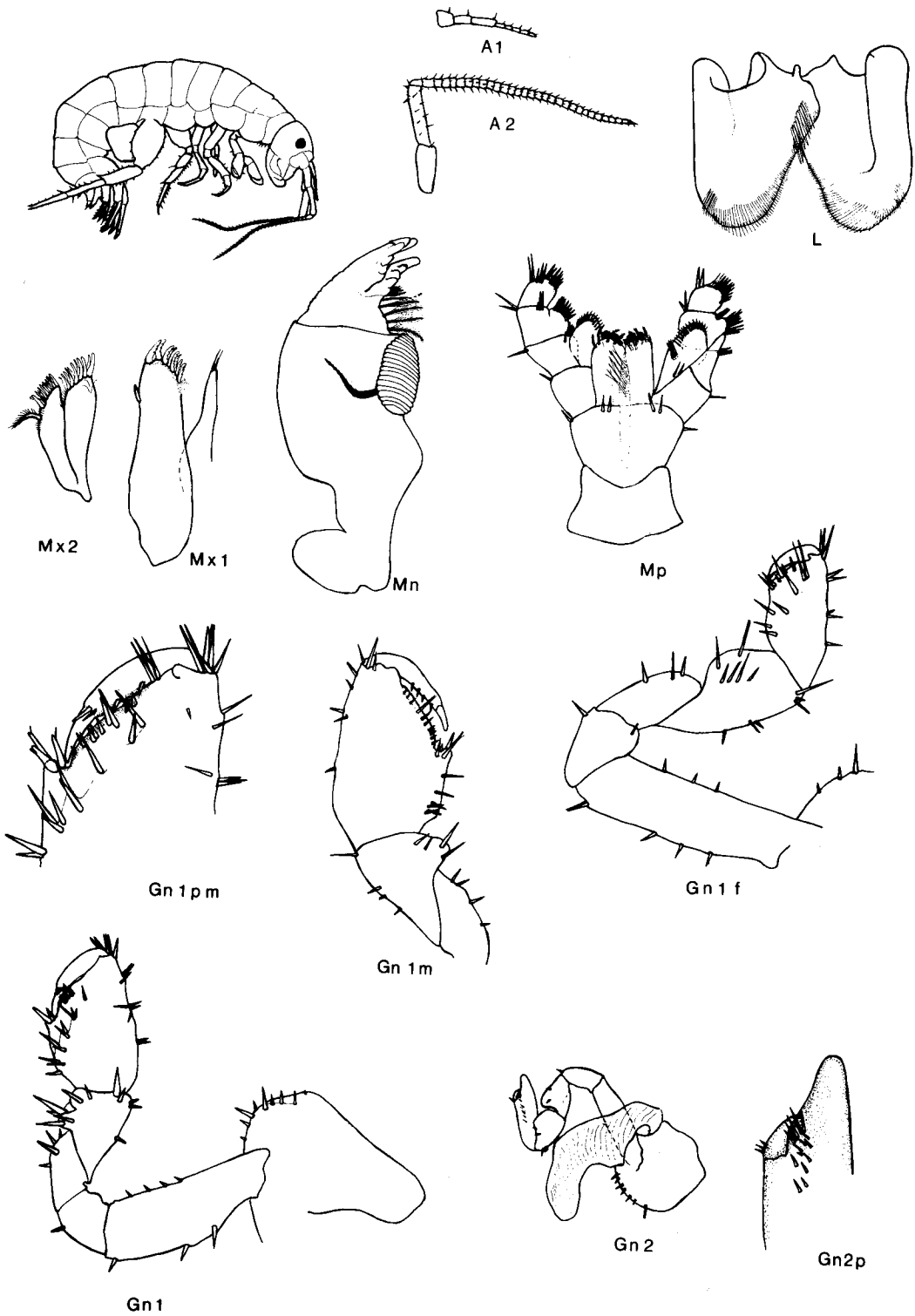


Plate 2 *Kanikania improvisa* (abbreviations keyed on p. 104)

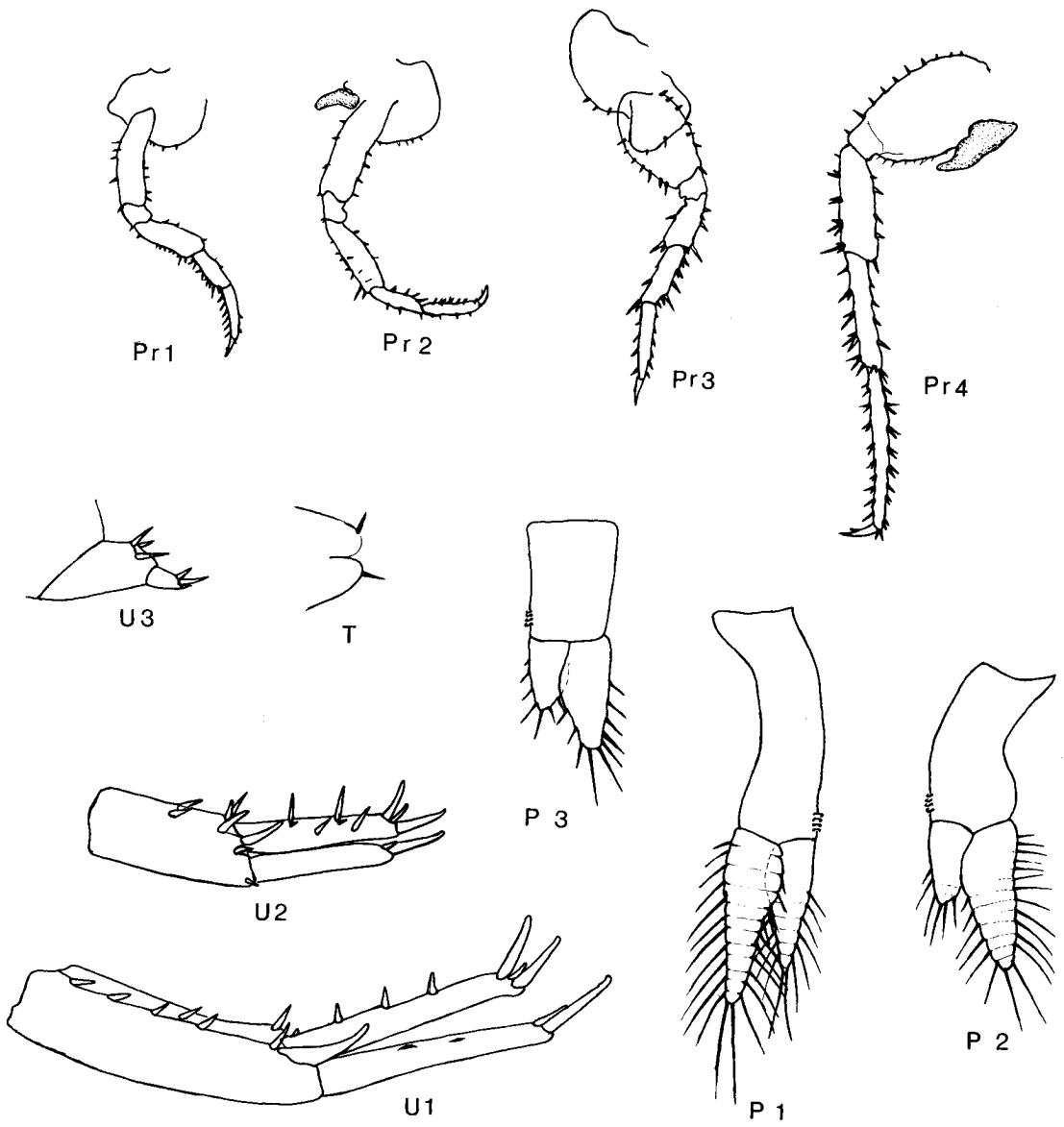


Plate 3 *Kanikania improvisa* (abbreviations keyed on p. 104)

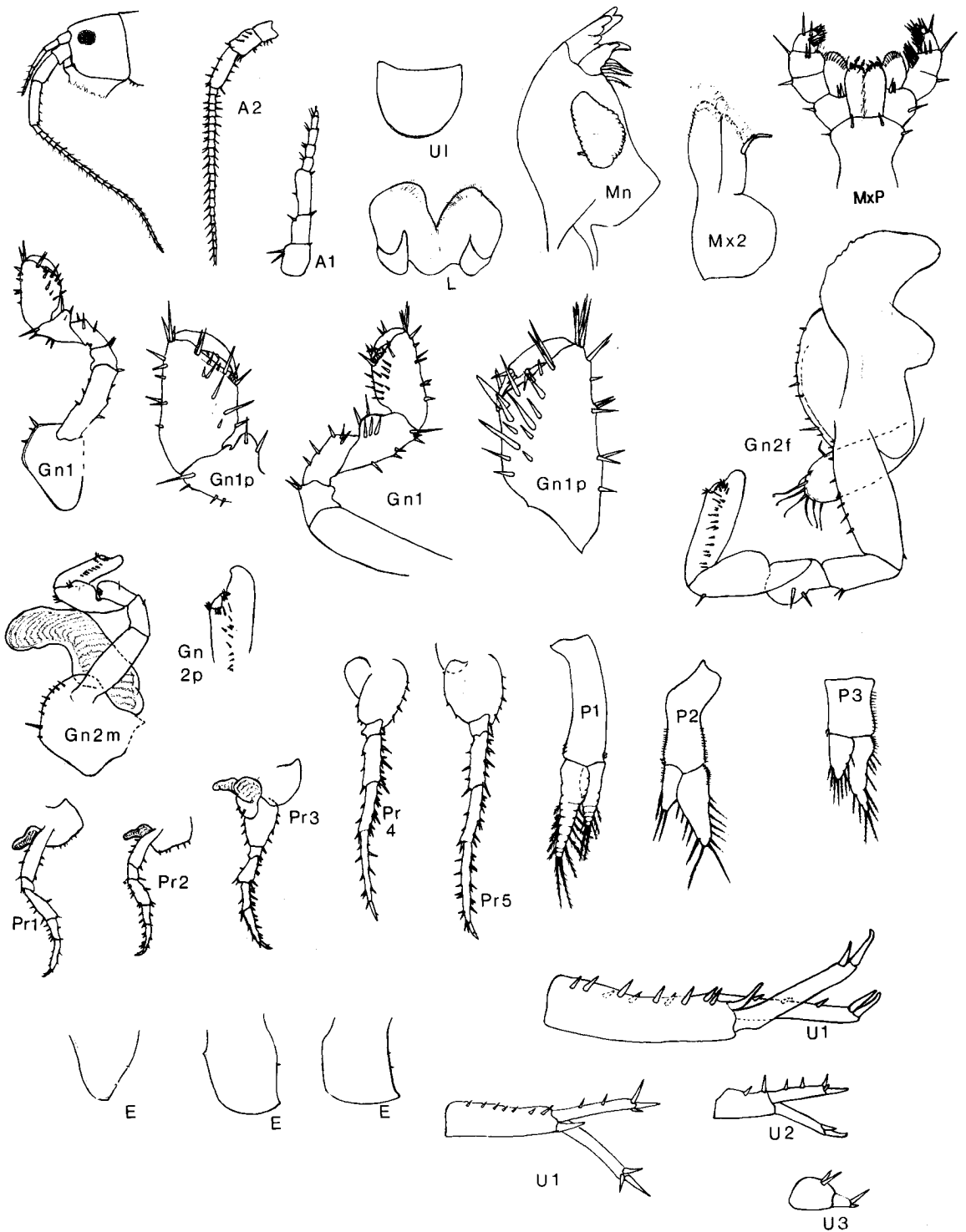


Plate 4 *Kanikania motuensis* (abbreviations keyed on p. 104)

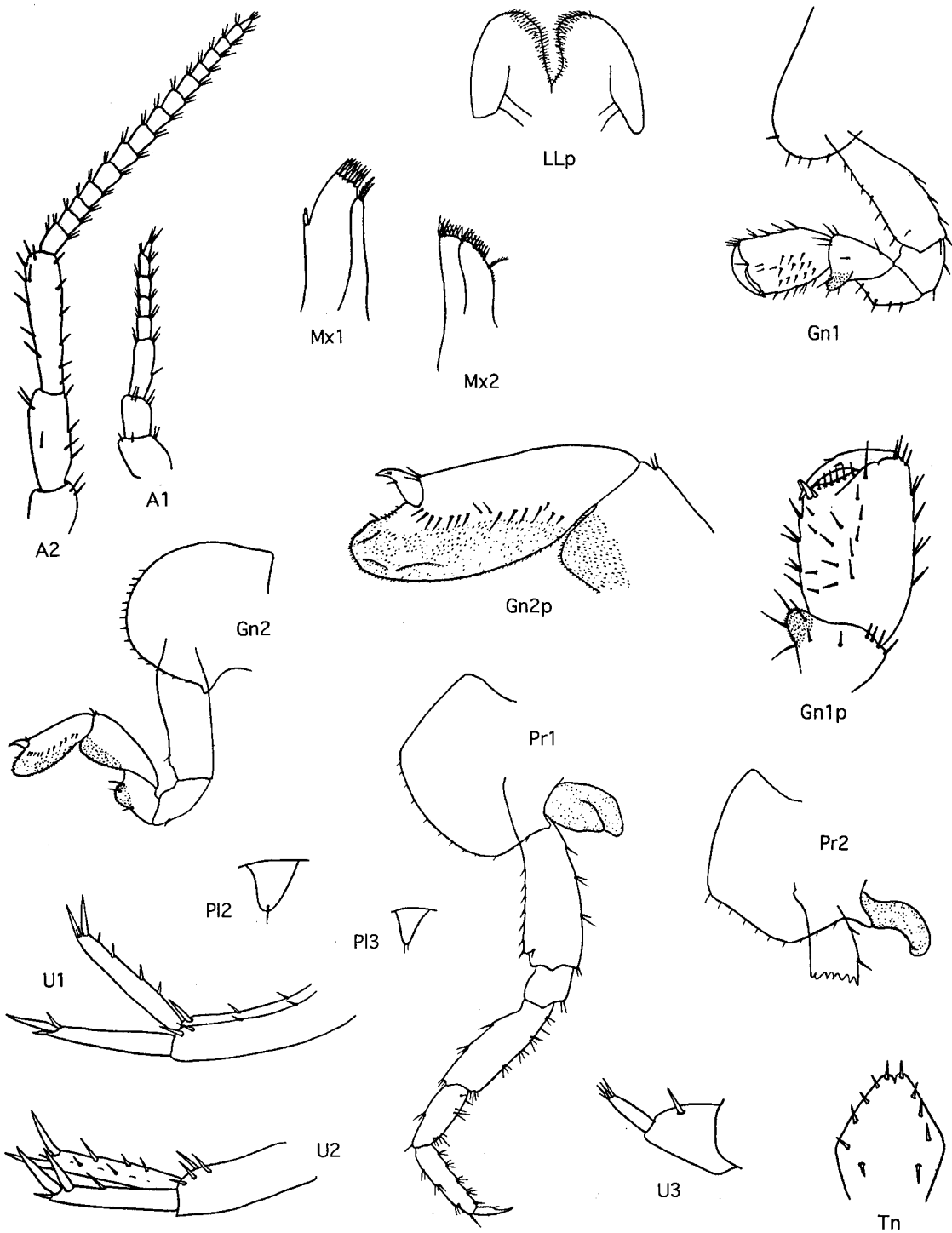


Plate 5 *Kanikania rubroannulata*, male (after Hurley 1957; abbreviations keyed on p. 104)

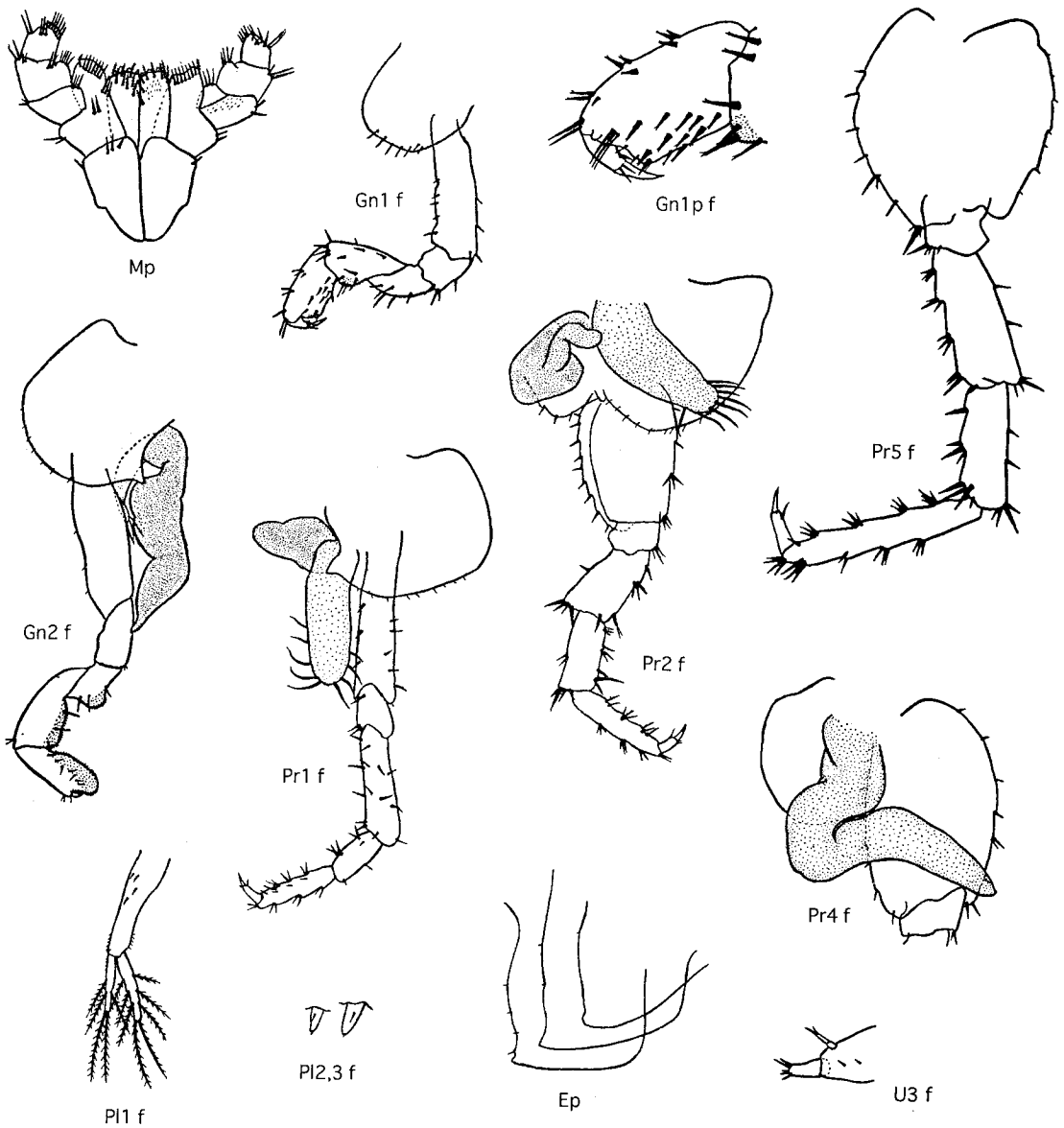


Plate 6 *Kanikania rubroannulata* (after Hurley 1957; abbreviations keyed on p. 104)

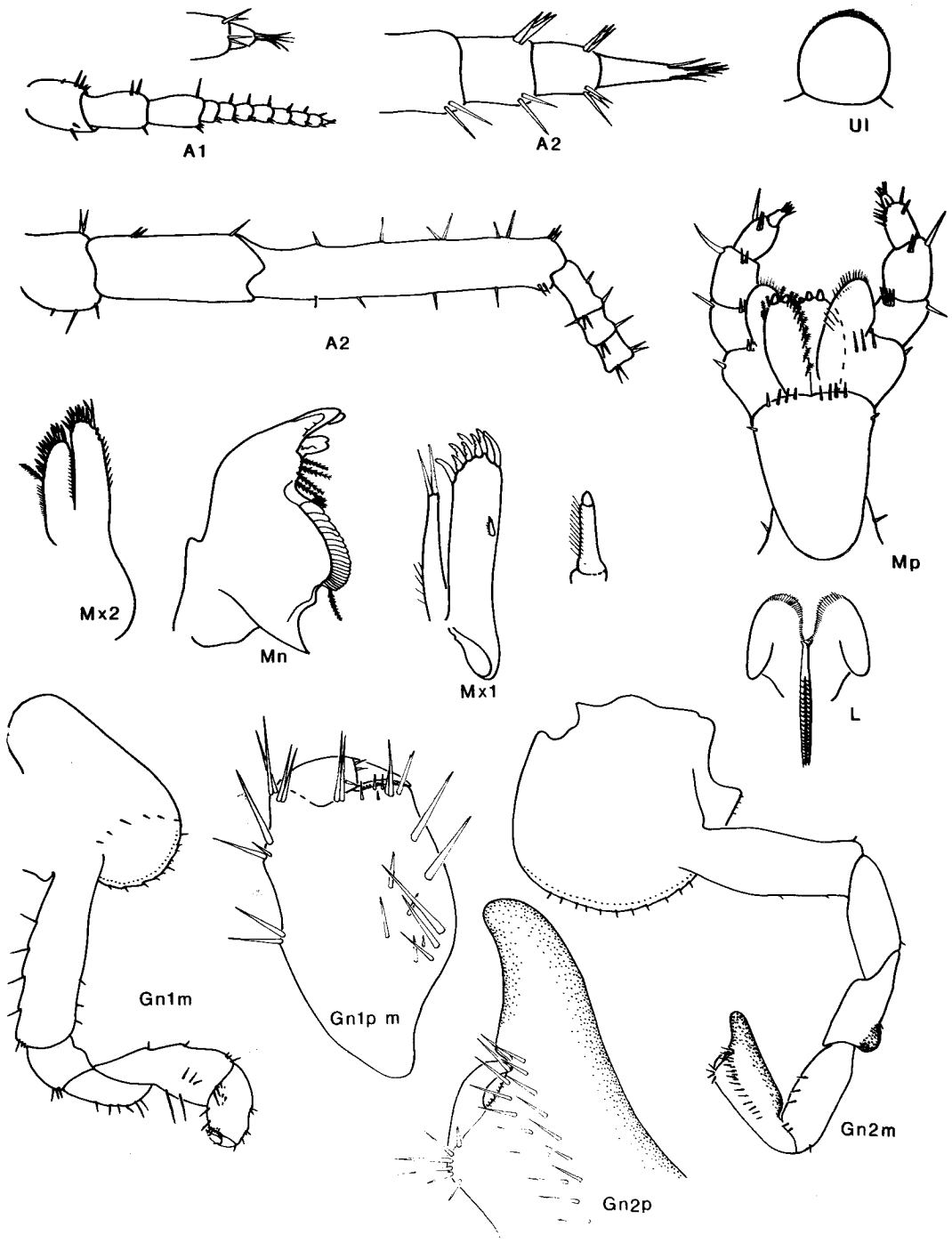


Plate 7 *Makawe hurleyi* (abbreviations keyed on p. 104)

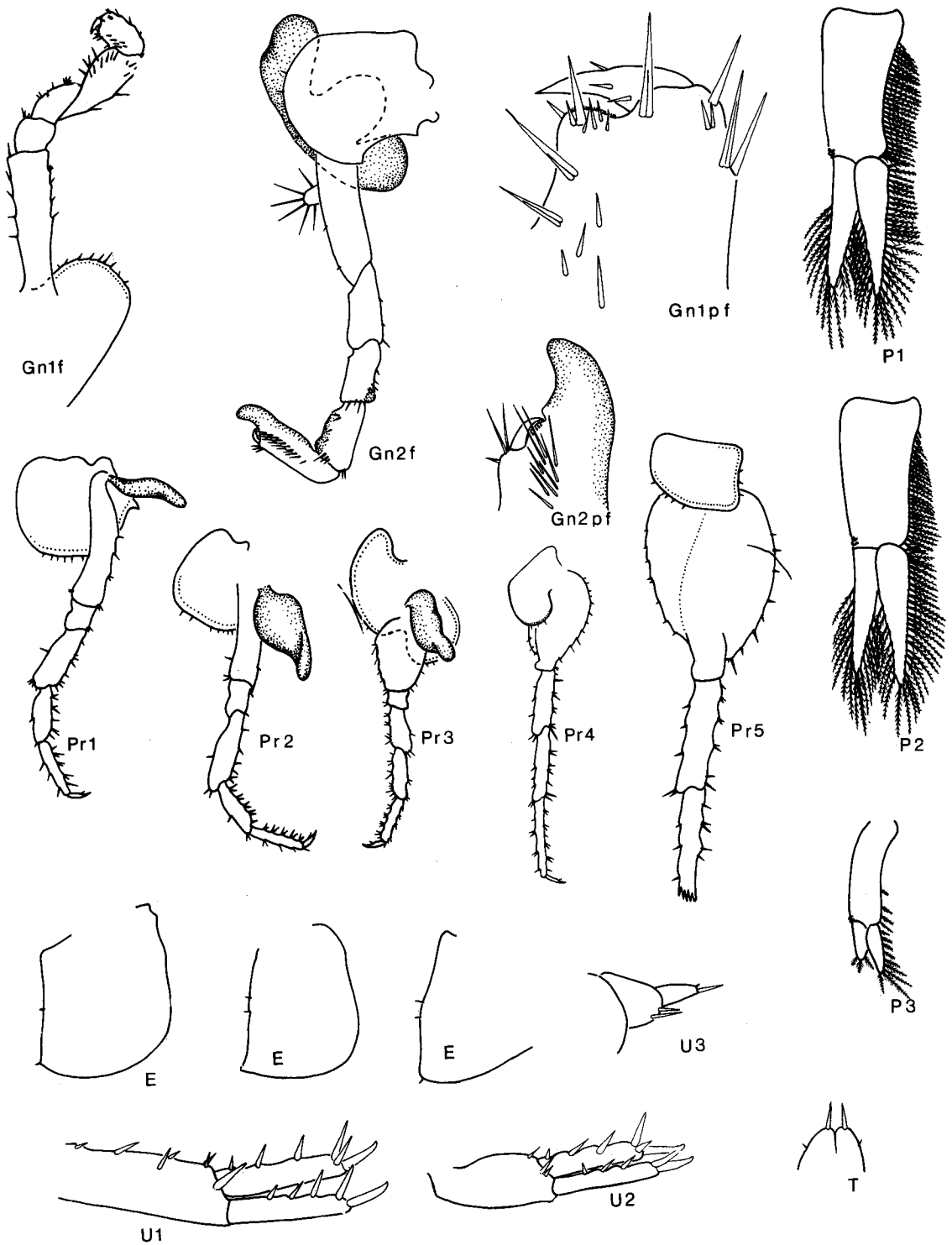


Plate 8 *Makawe hurleyi* (abbreviations keyed on p. 104)

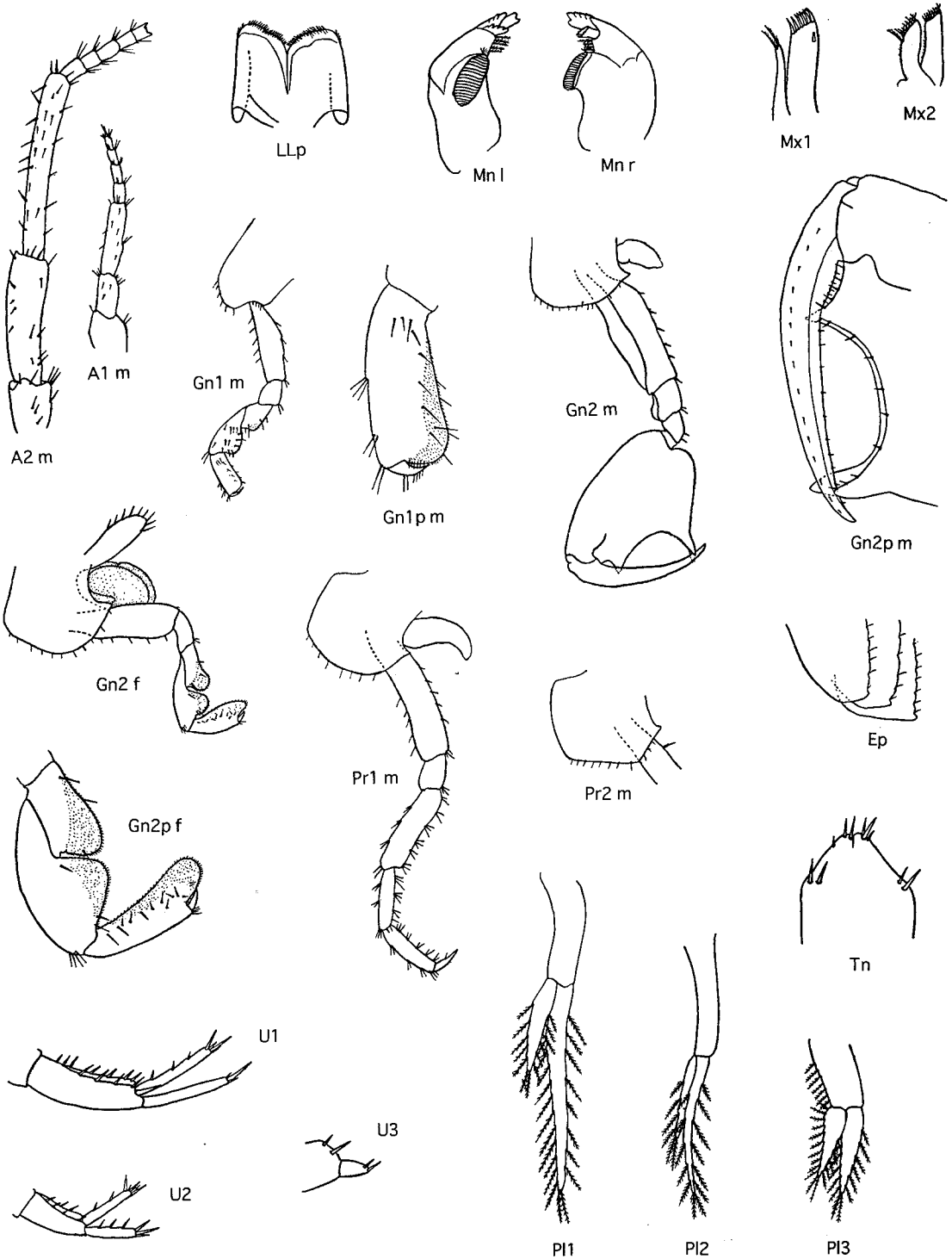


Plate 9 *Makawe insularis* (after Hurley 1957; abbreviations keyed on p. 104)

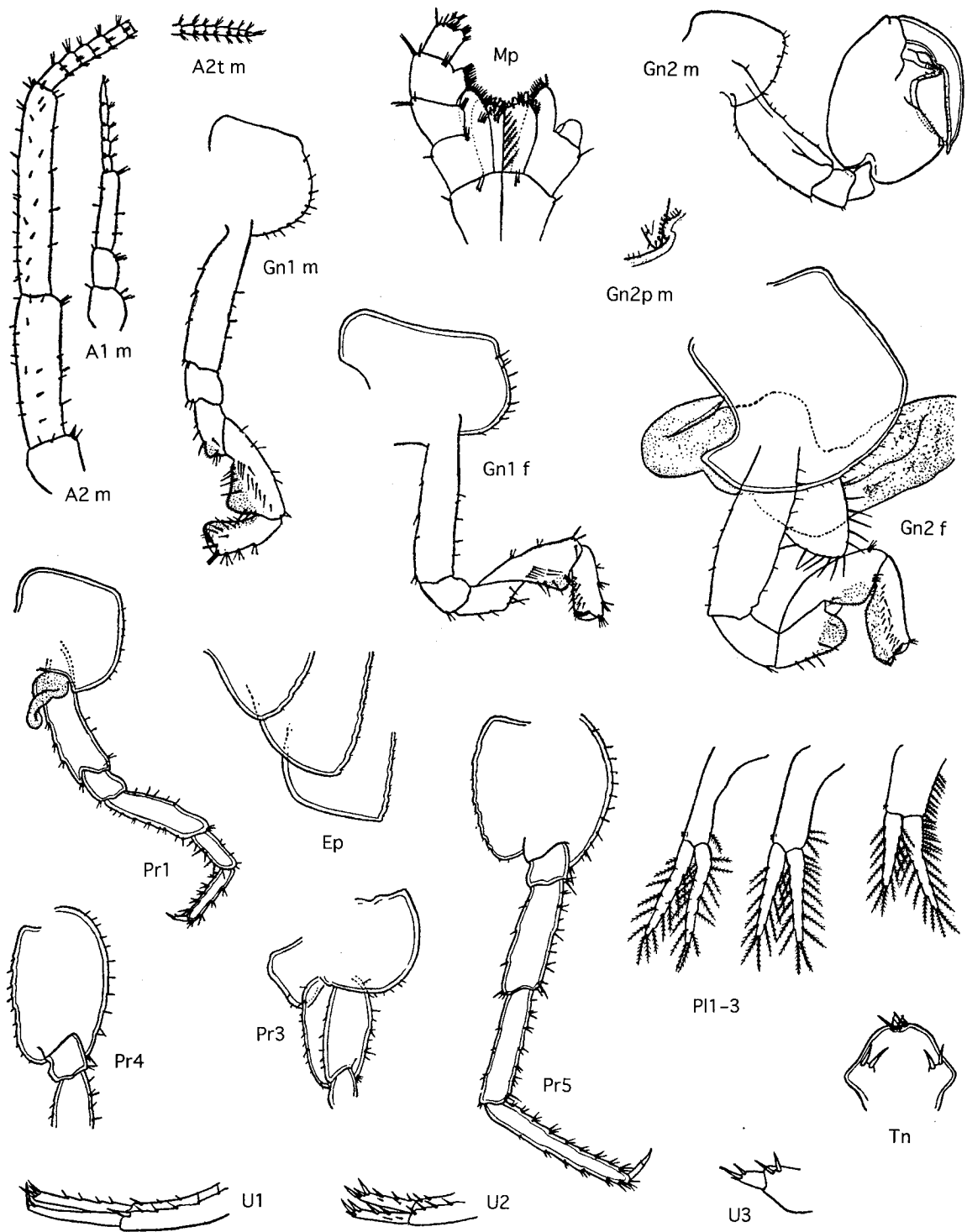


Plate 10 *Makawe maynei* (after Hurley 1957; abbreviations keyed on p. 104)

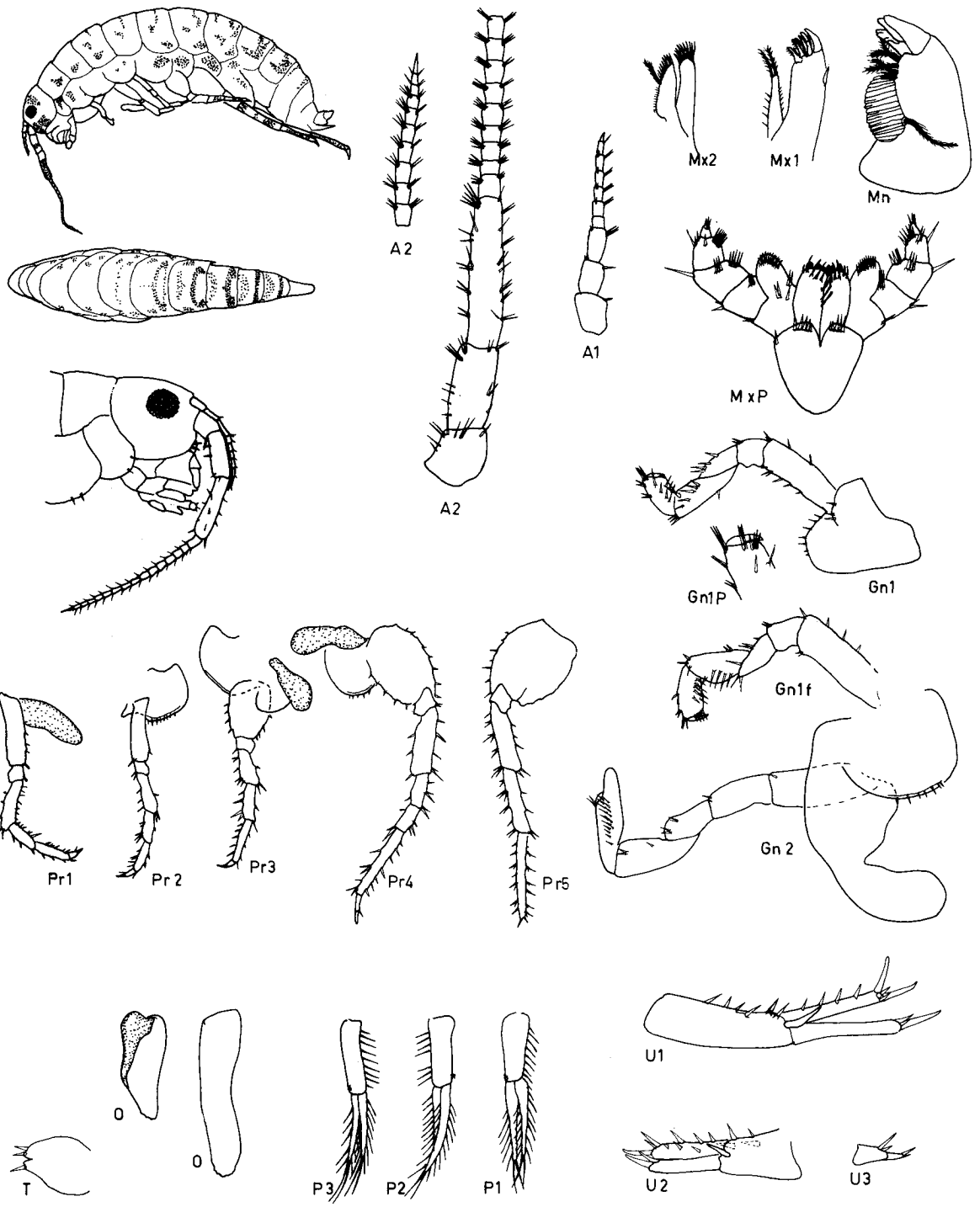


Plate 11 *Makawe otamatuakeke* (abbreviations keyed on p. 104)

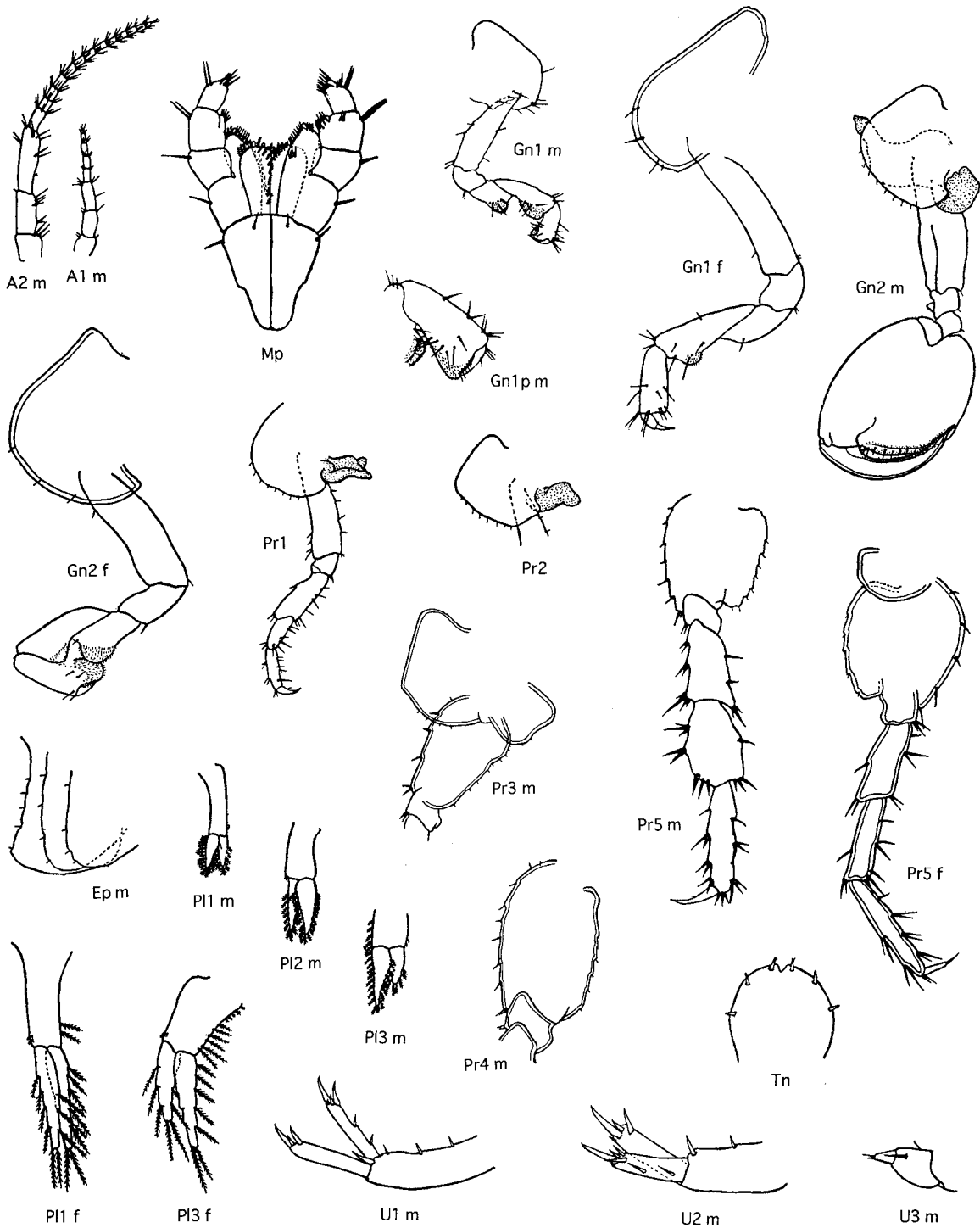


Plate 12 *Makawe parva* (after Hurley 1957; abbreviations keyed on p. 104)

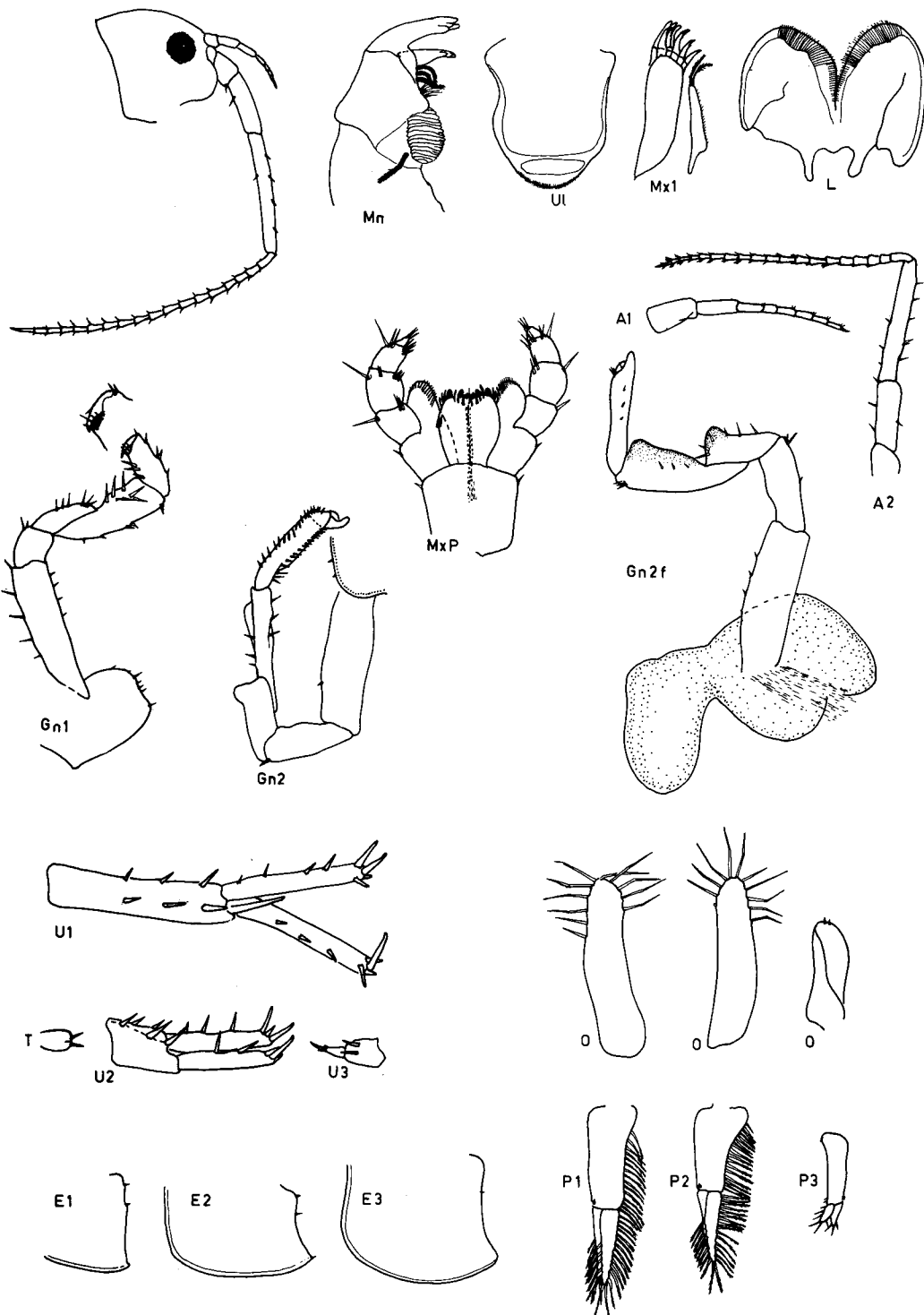


Plate 13 *Makawe waihekensis* (abbreviations keyed on p. 104)

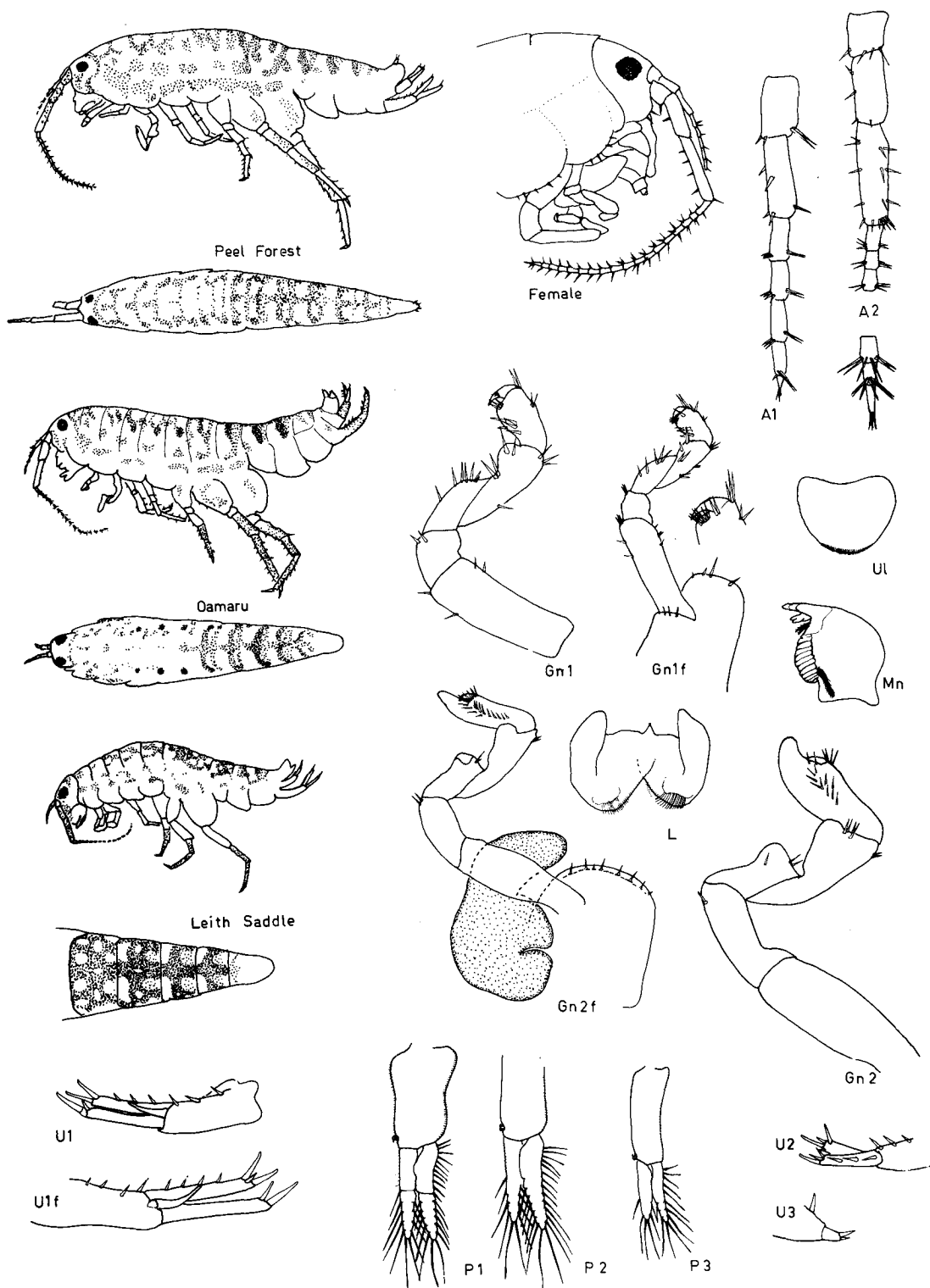


Plate 14 *Parorchestia ihurawao* (abbreviations keyed on p. 104)

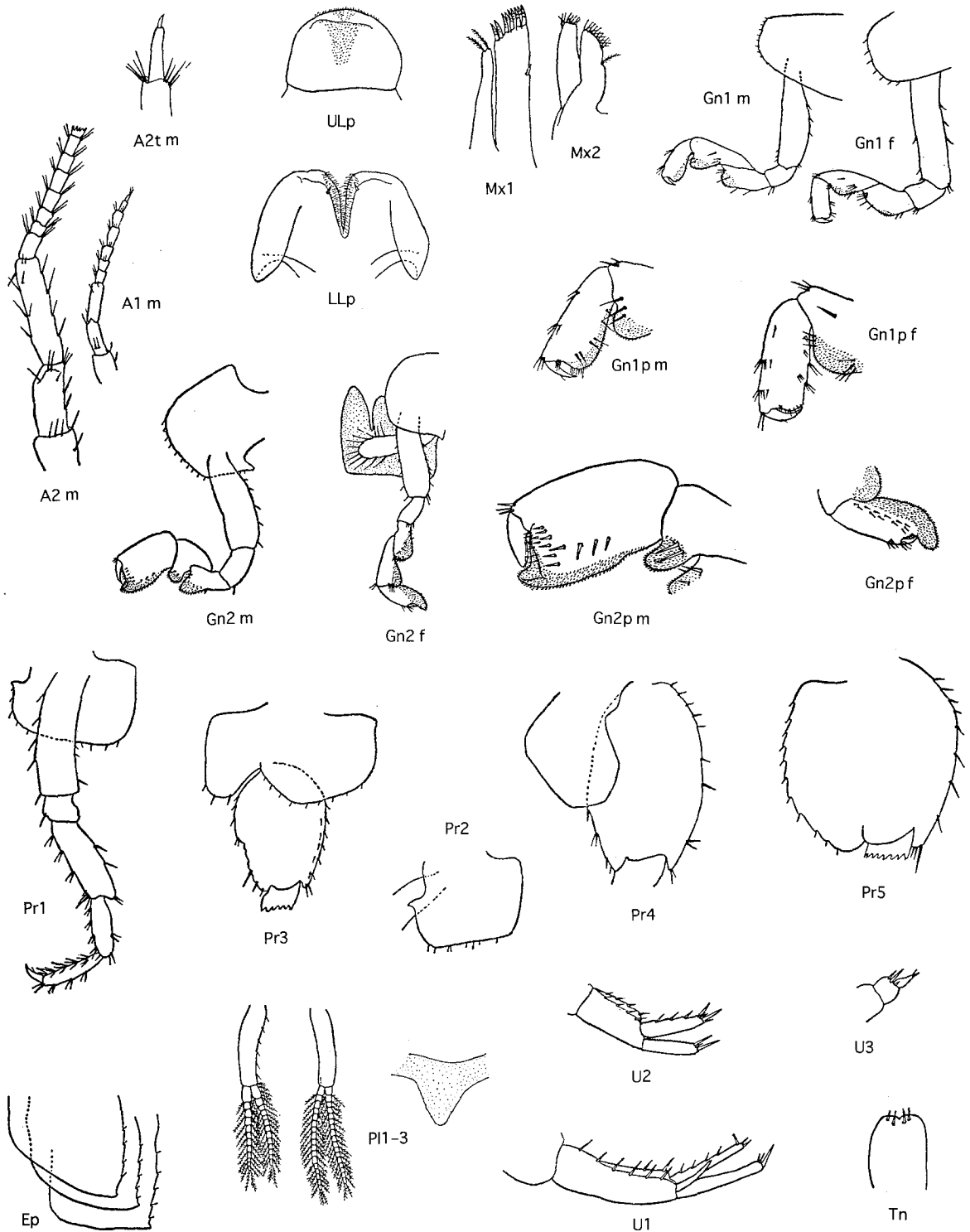


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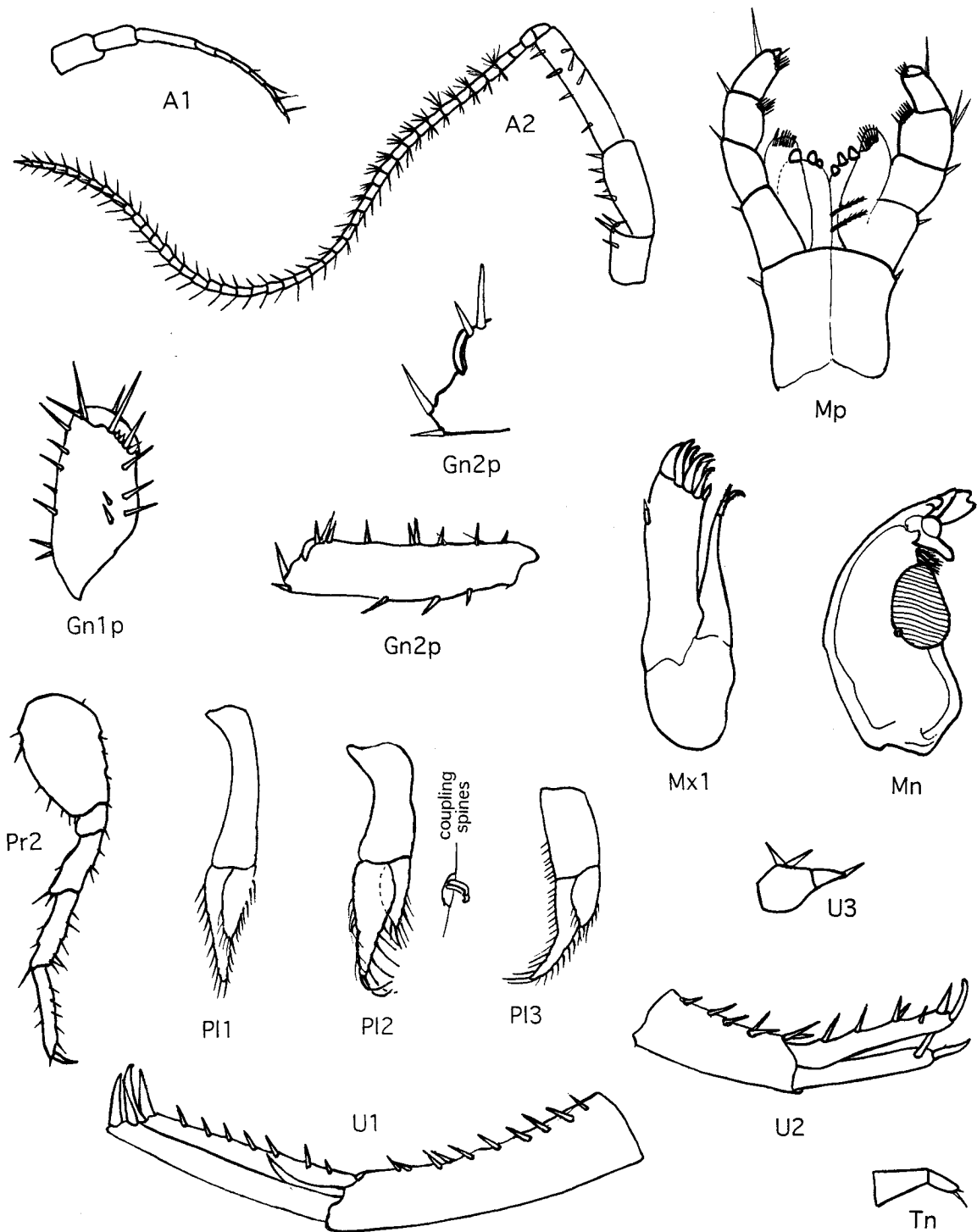


Plate 16 *Parorchestia longicornis*, male (abbreviations keyed on p. 104)

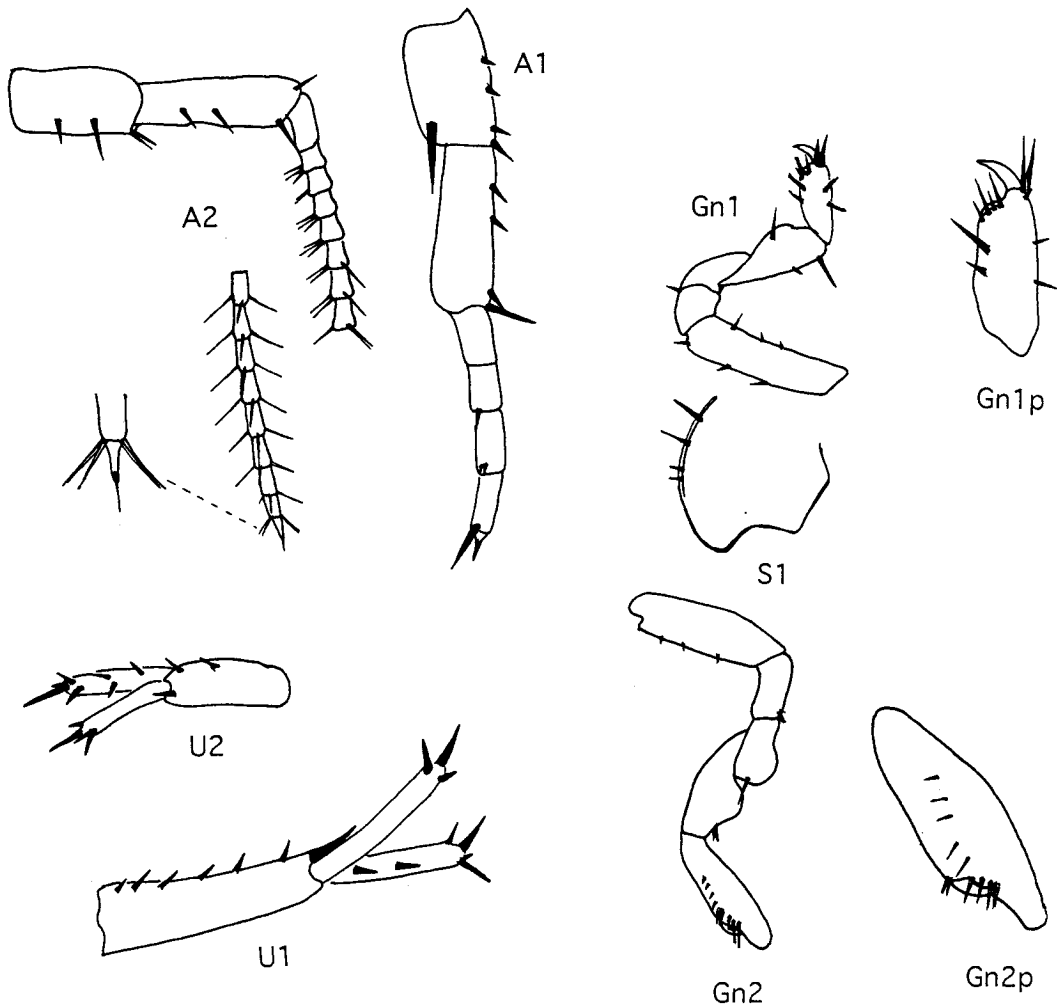


Plate 17 *Parorchestia longicornis*, female (abbreviations keyed on p. 104)

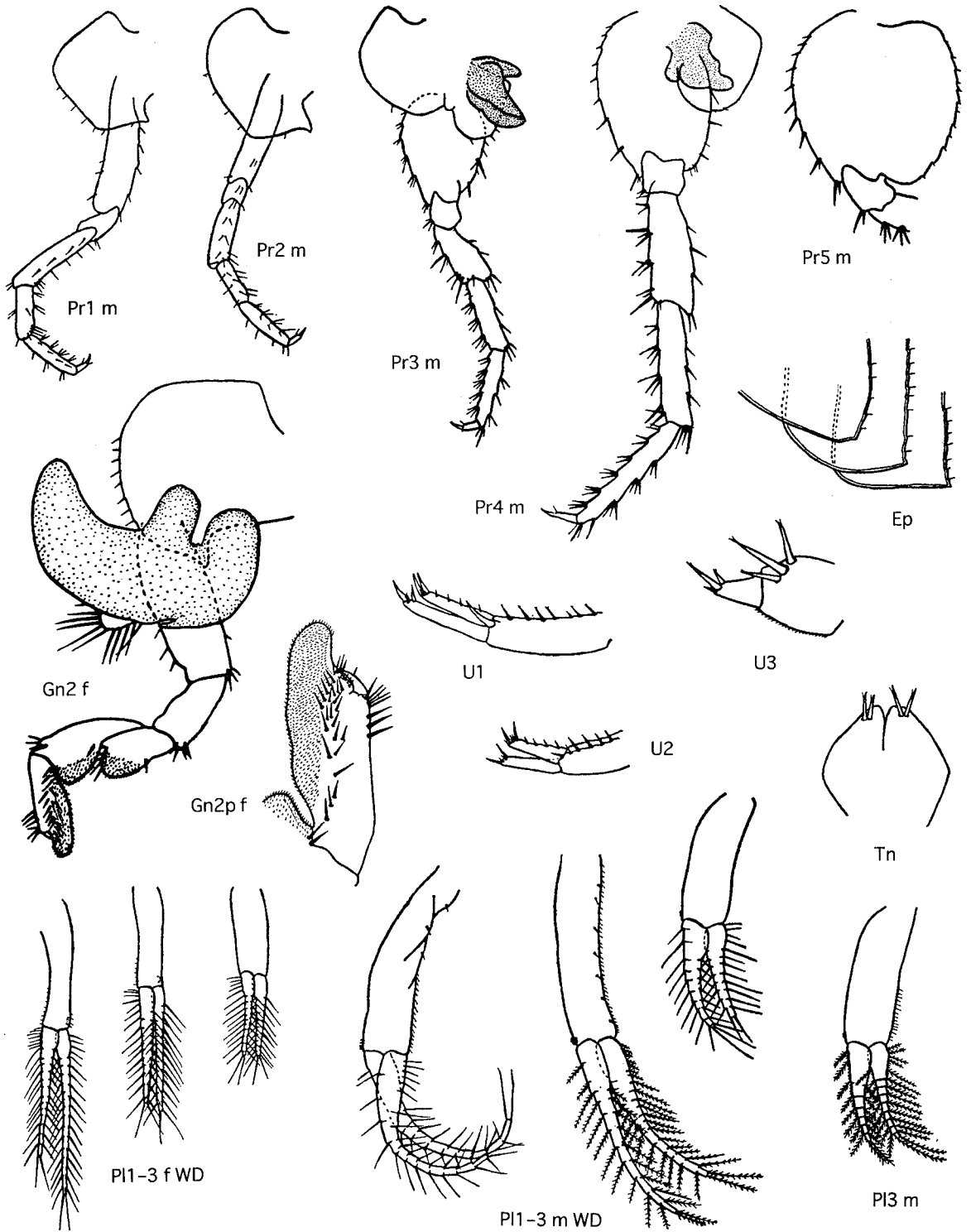


Plate 18 *Parorchestia tenuis* (after Hurley 1957; abbreviations keyed on p. 104)

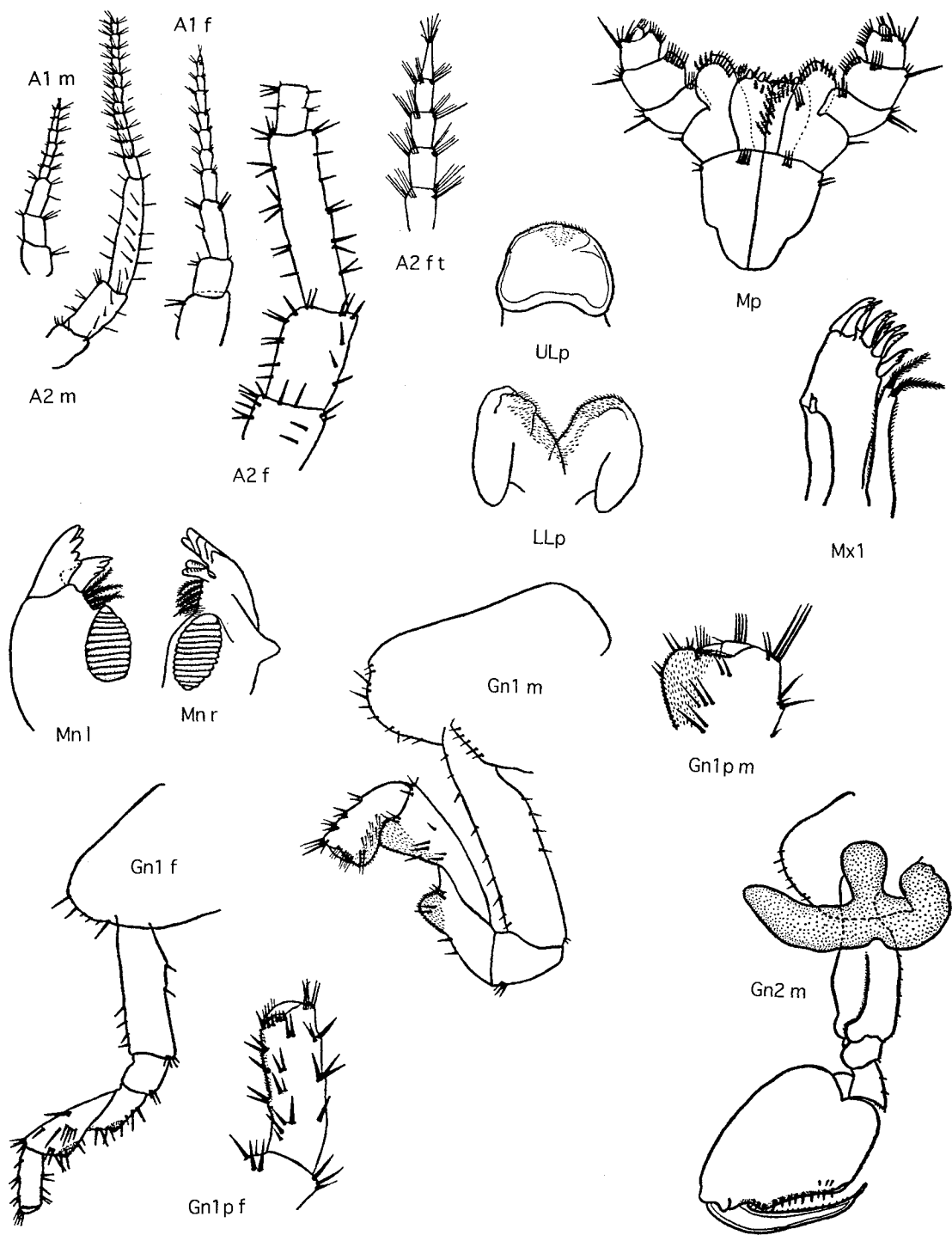
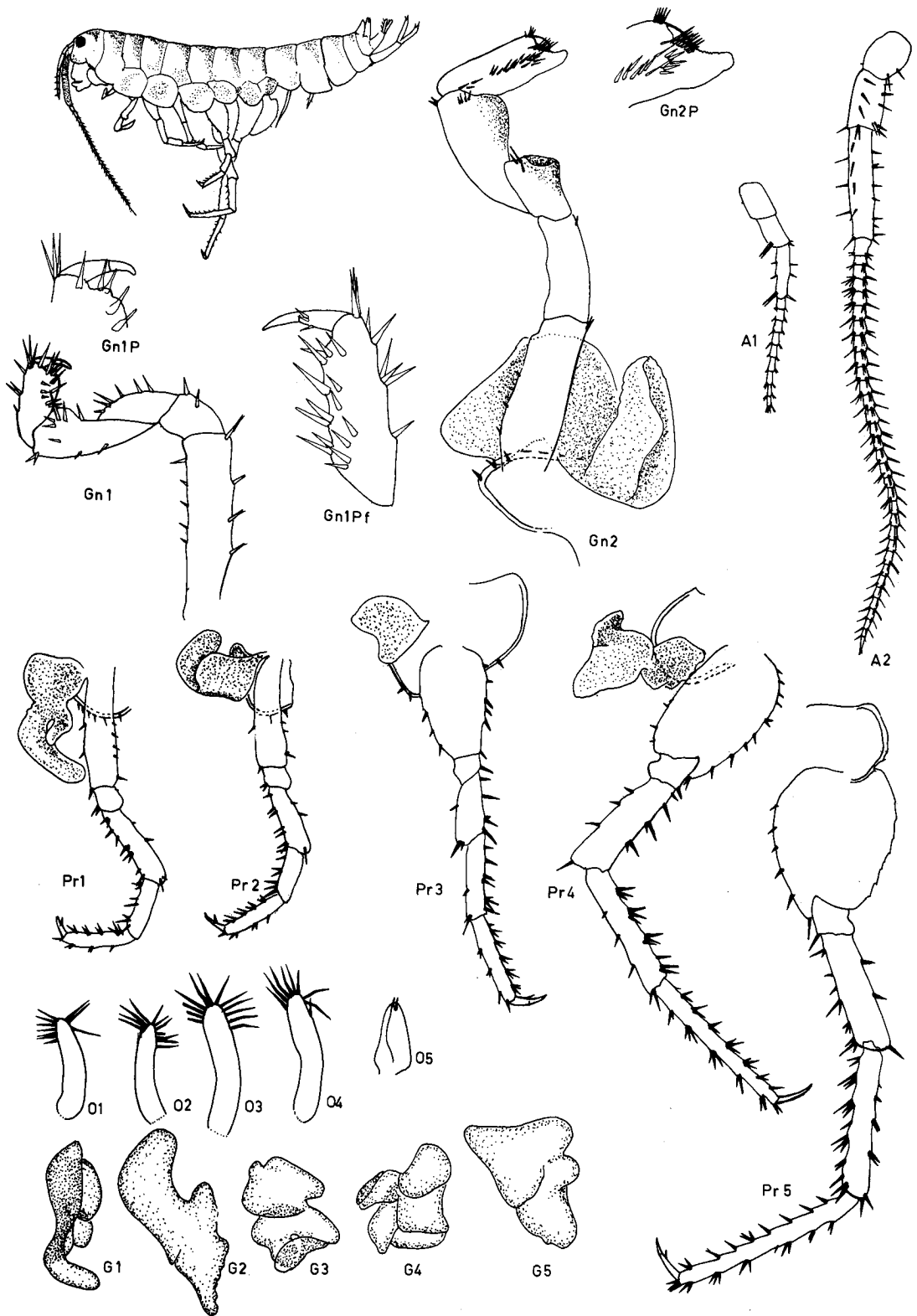
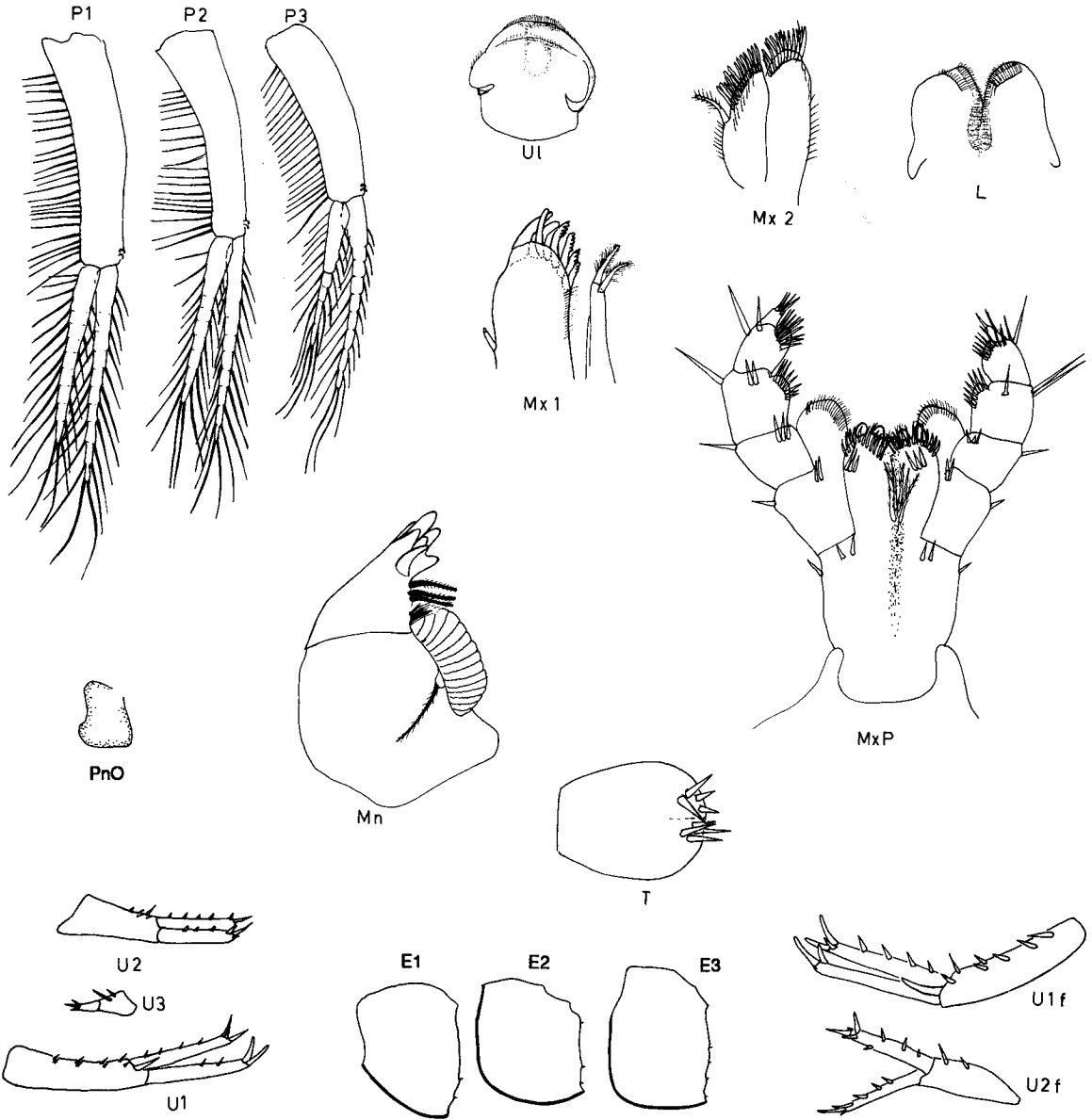


Plate 19 *Parorchestia tenuis* (after Hurley 1957; abbreviations keyed on p. 104)

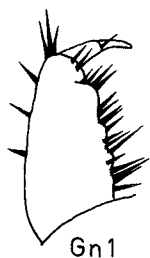




Plates 20 (opposite page) and 21 *Puhuruhuru aotearoa* (abbreviations keyed on p. 104)

ABBREVIATIONS USED IN ILLUSTRATIONS

A1, 2	antennae 1, 2	S	side plates
E, Ep	epimeral plate	T, Tn	telson
G1-5	gills	U1-3	uropods 1-3
Gn1, 2	gnathopods 1, 2	UI	upper lip
L, LLp	lower lip		
Mn	mandible	Suffixes	
Mp, MxP	maxilliped	f	female
Mx1, 2	maxillae 1, 2	l	left side
O	oostegite (brood plate)	m	male
P, Pl1-3	pleopods 1-3	p	propod
PnO	penis organ	r	right side
Pr1-5	peraeopods 1-5	t	tip



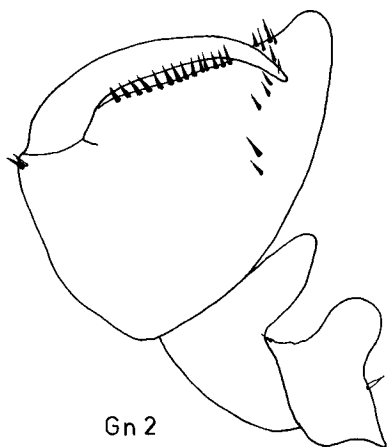
Gn1



Gn1

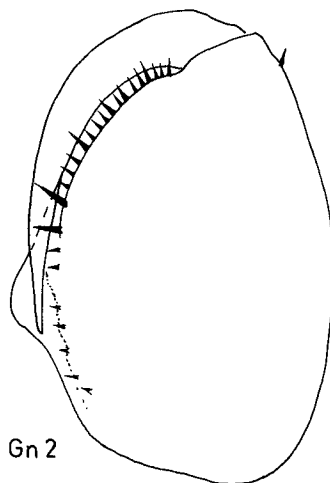


Gn1



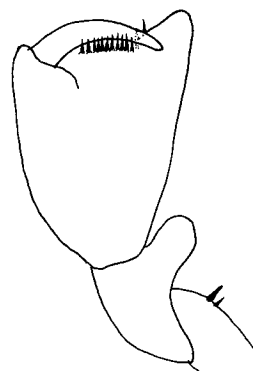
Gn 2

Snares



Gn 2

Catlines



Gn 2

Dunedin

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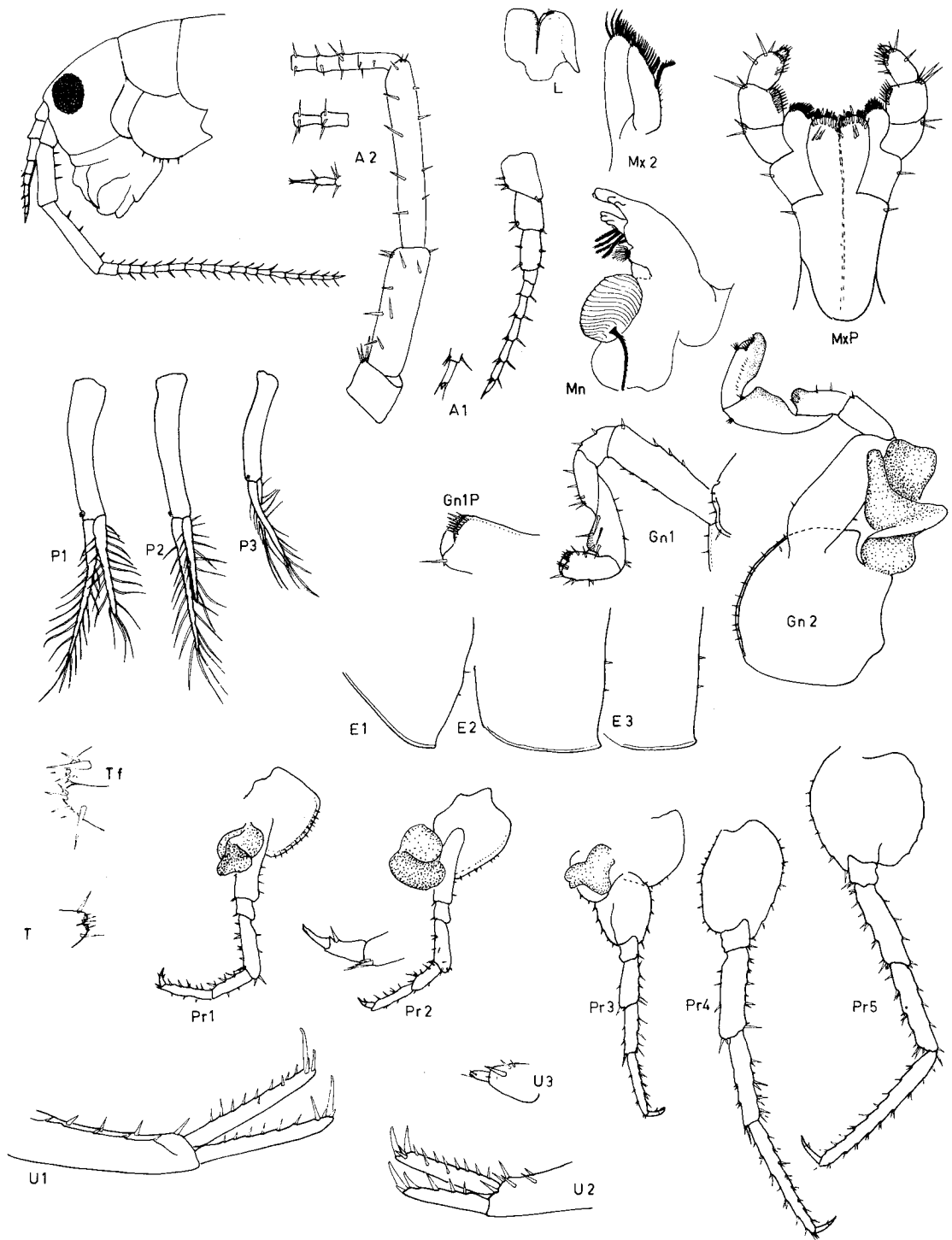


Plate 23 *Tara hauturu* (abbreviations keyed on p. 104)

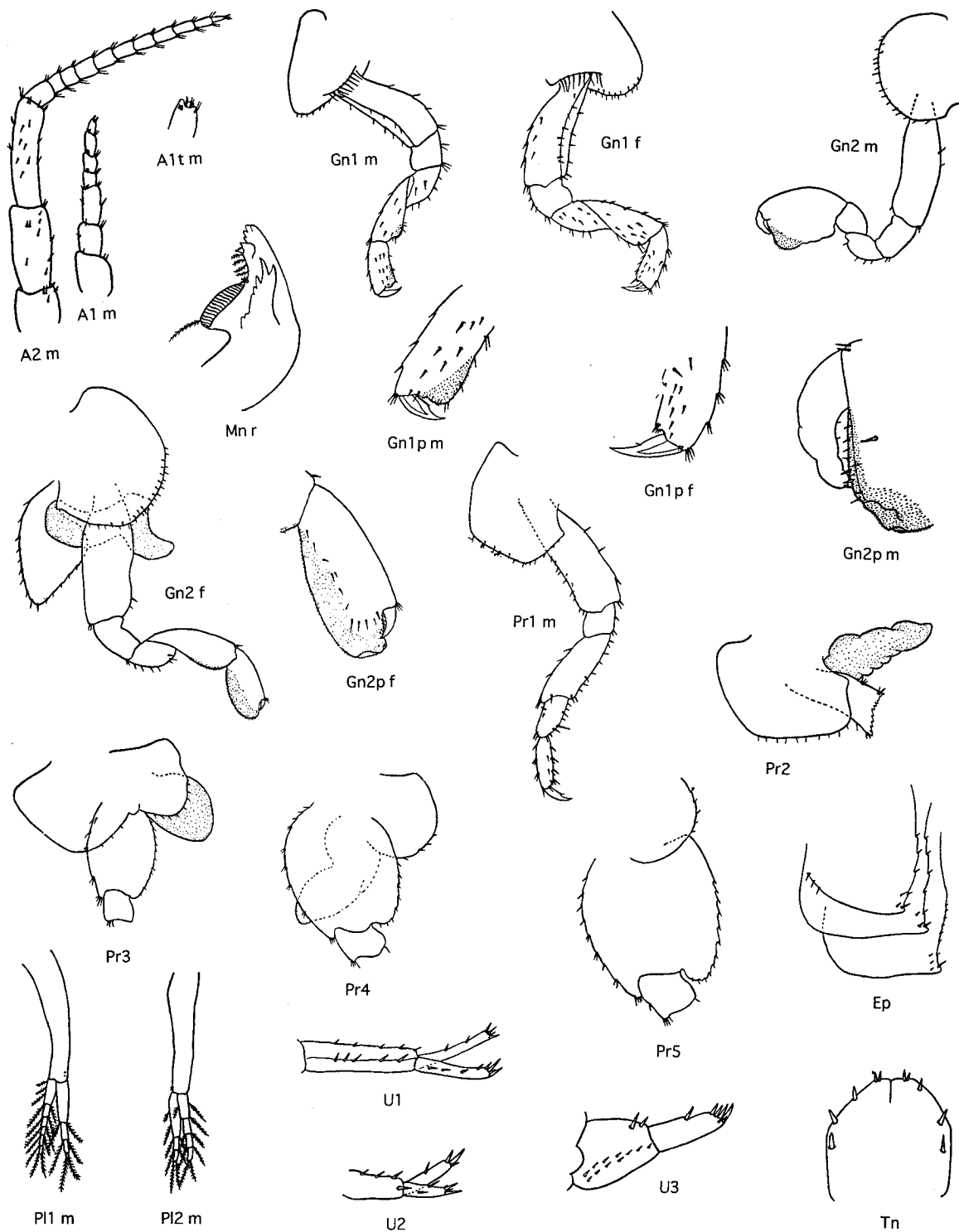


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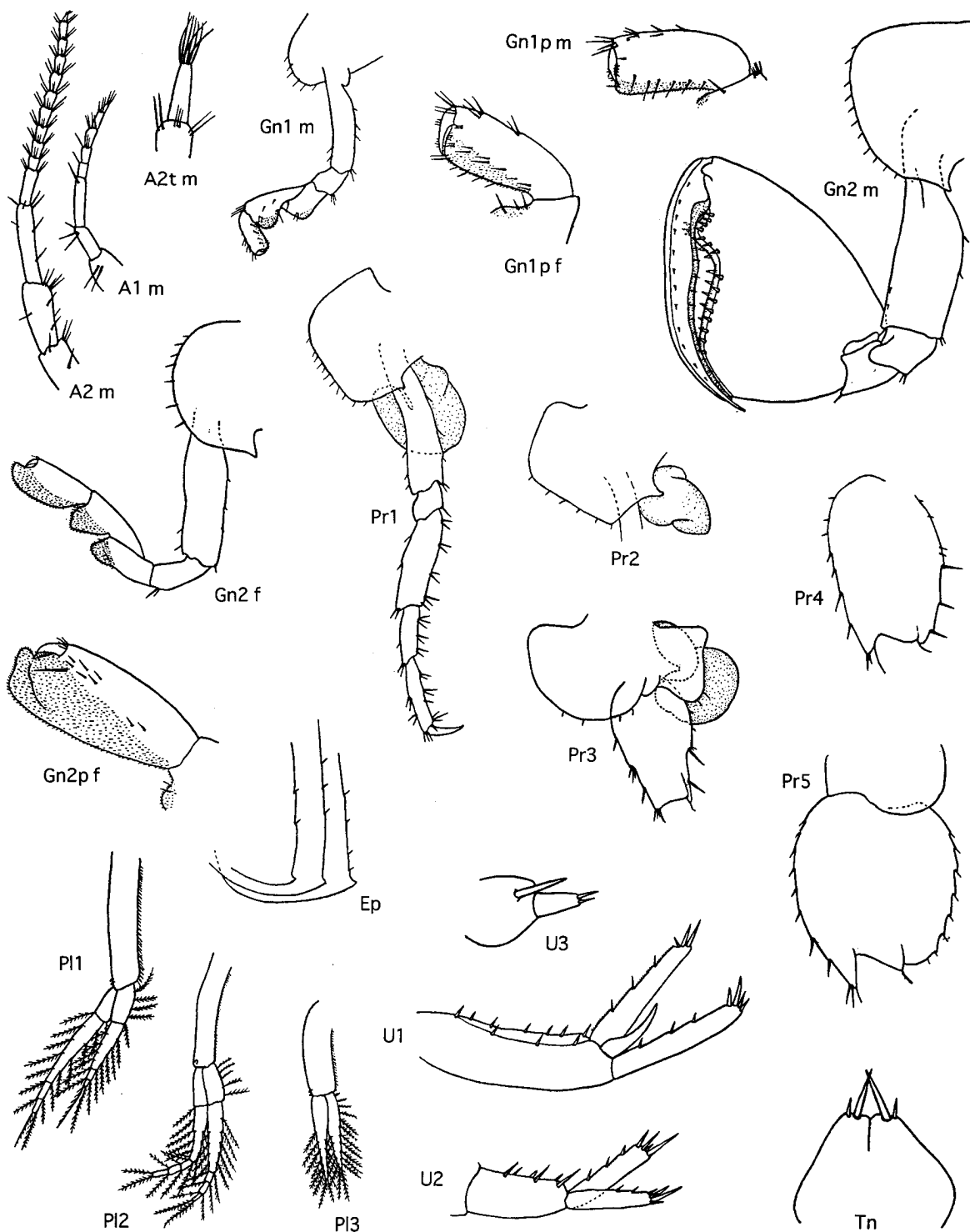


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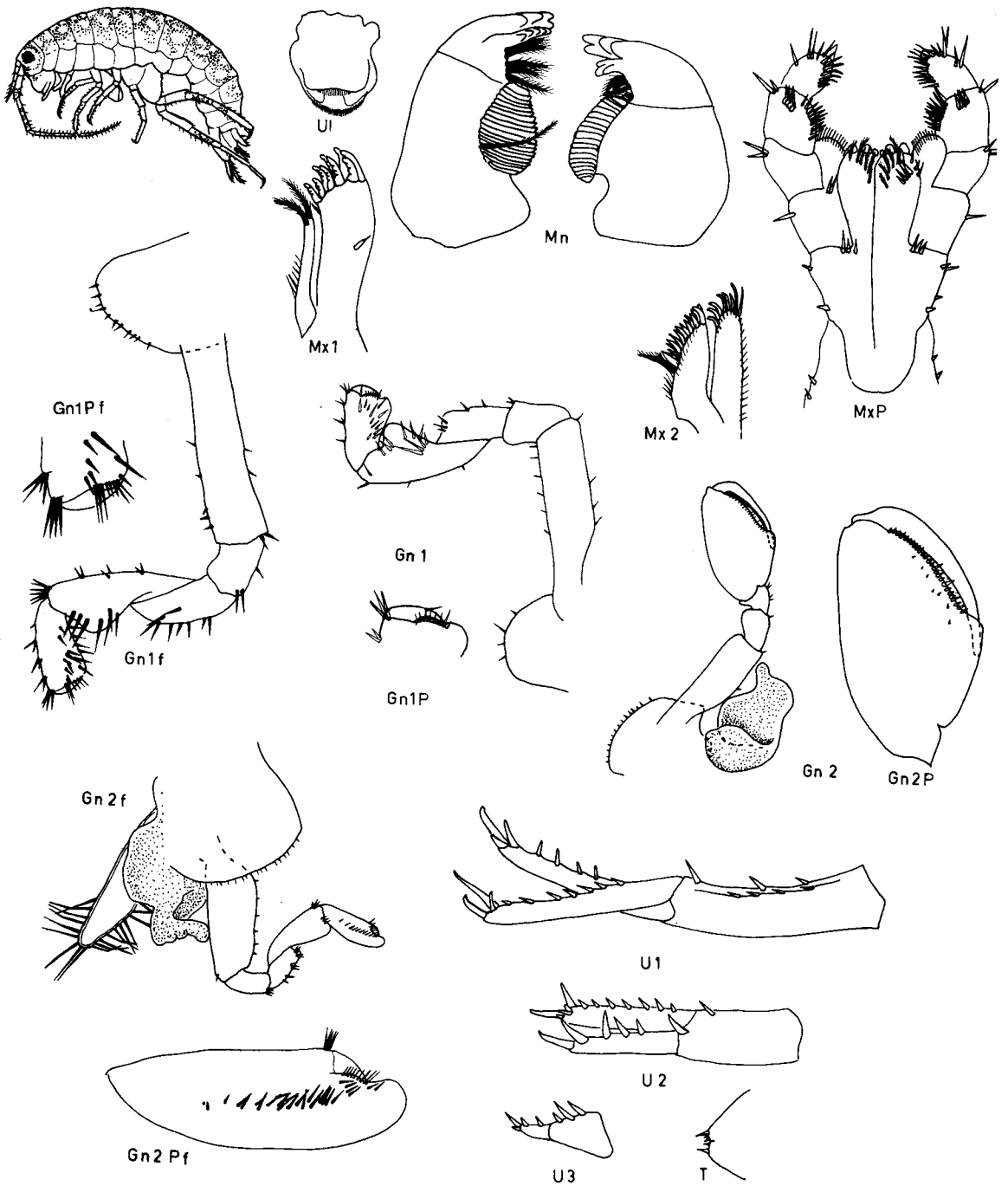


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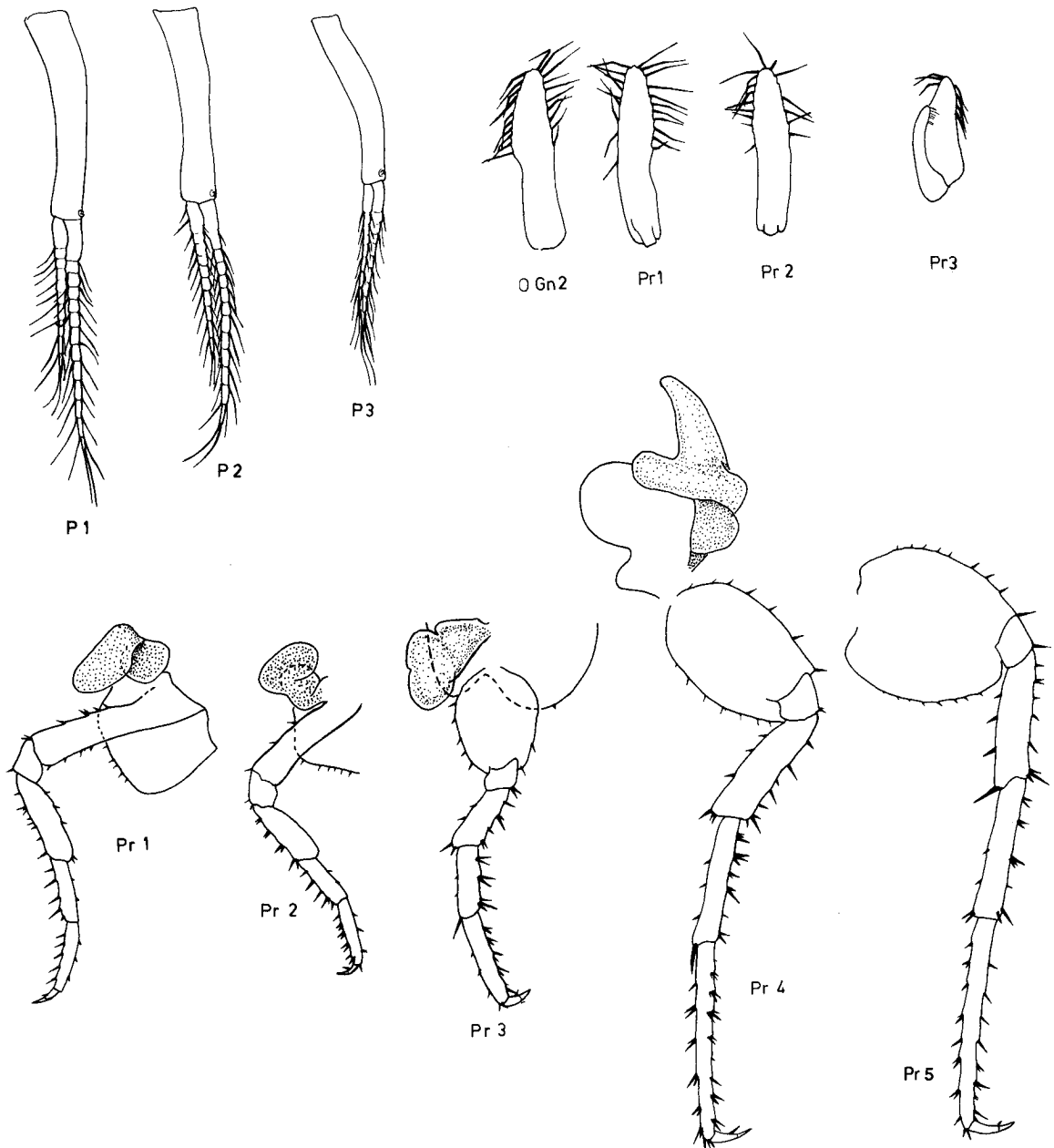


Plate 27 *Tara sylvicola* (abbreviations keyed on p. 104)

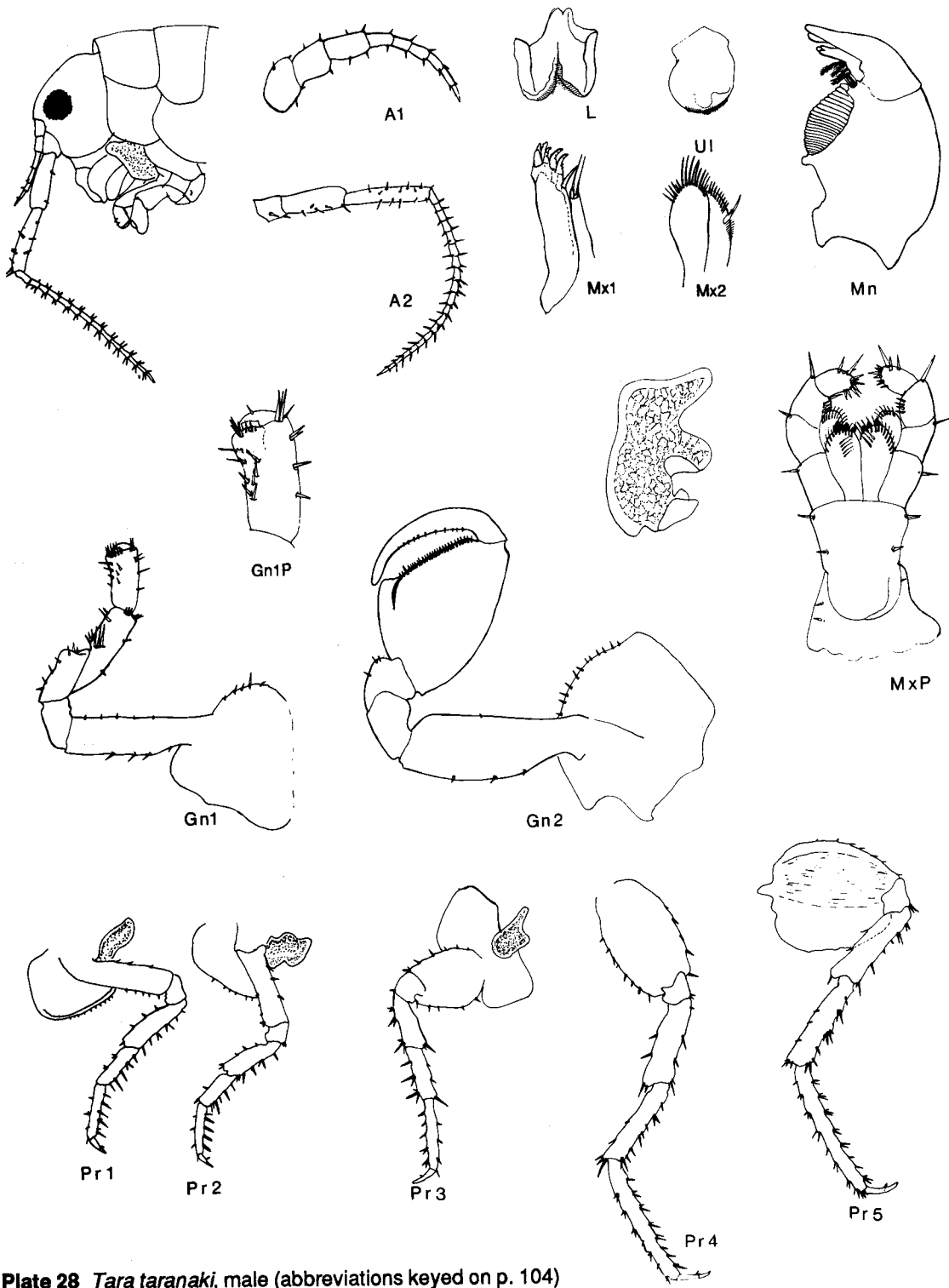


Plate 28 *Tara taranaki*, male (abbreviations keyed on p. 104)

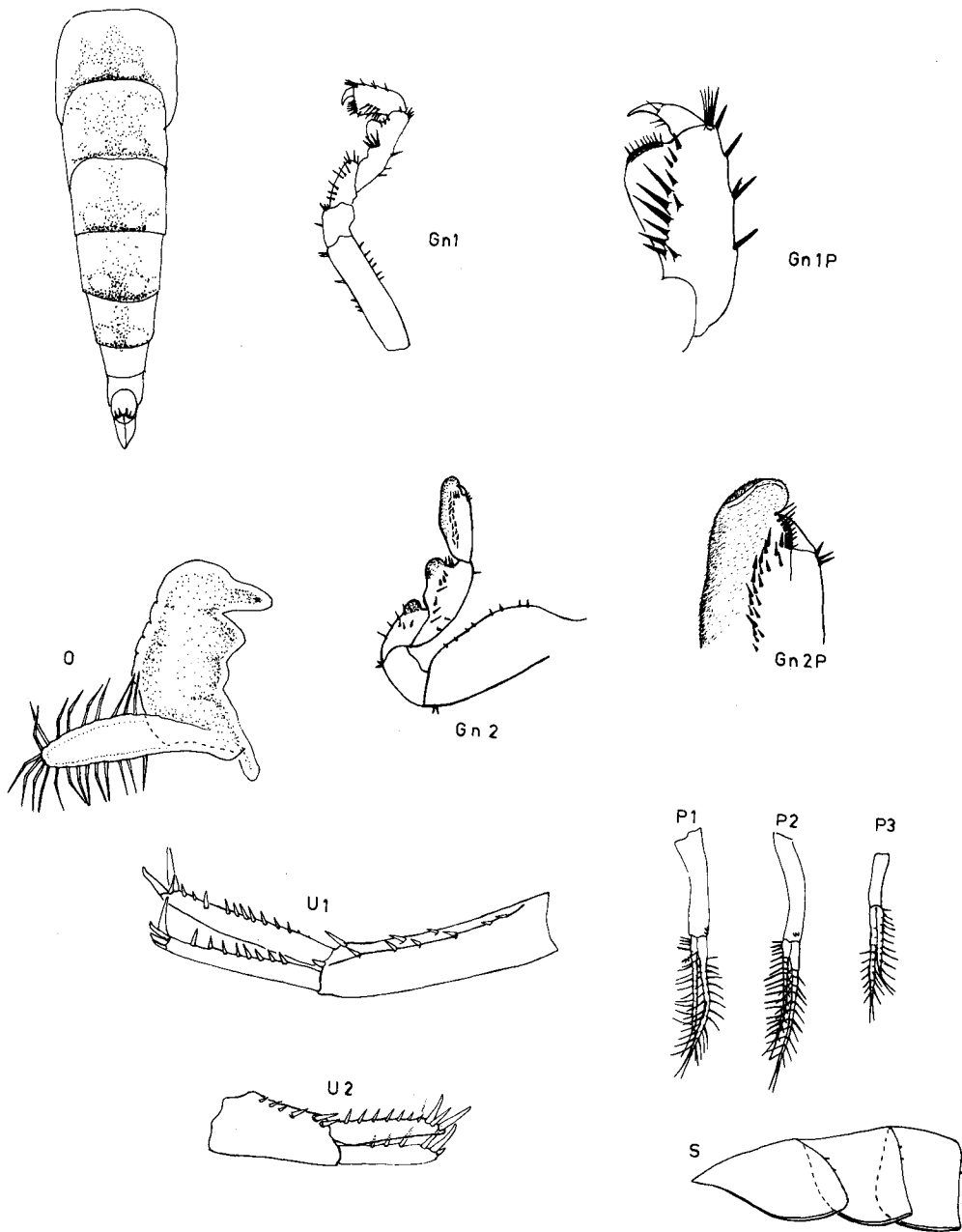


Plate 29 *Tara taranaki*, female (abbreviations keyed on p. 104)

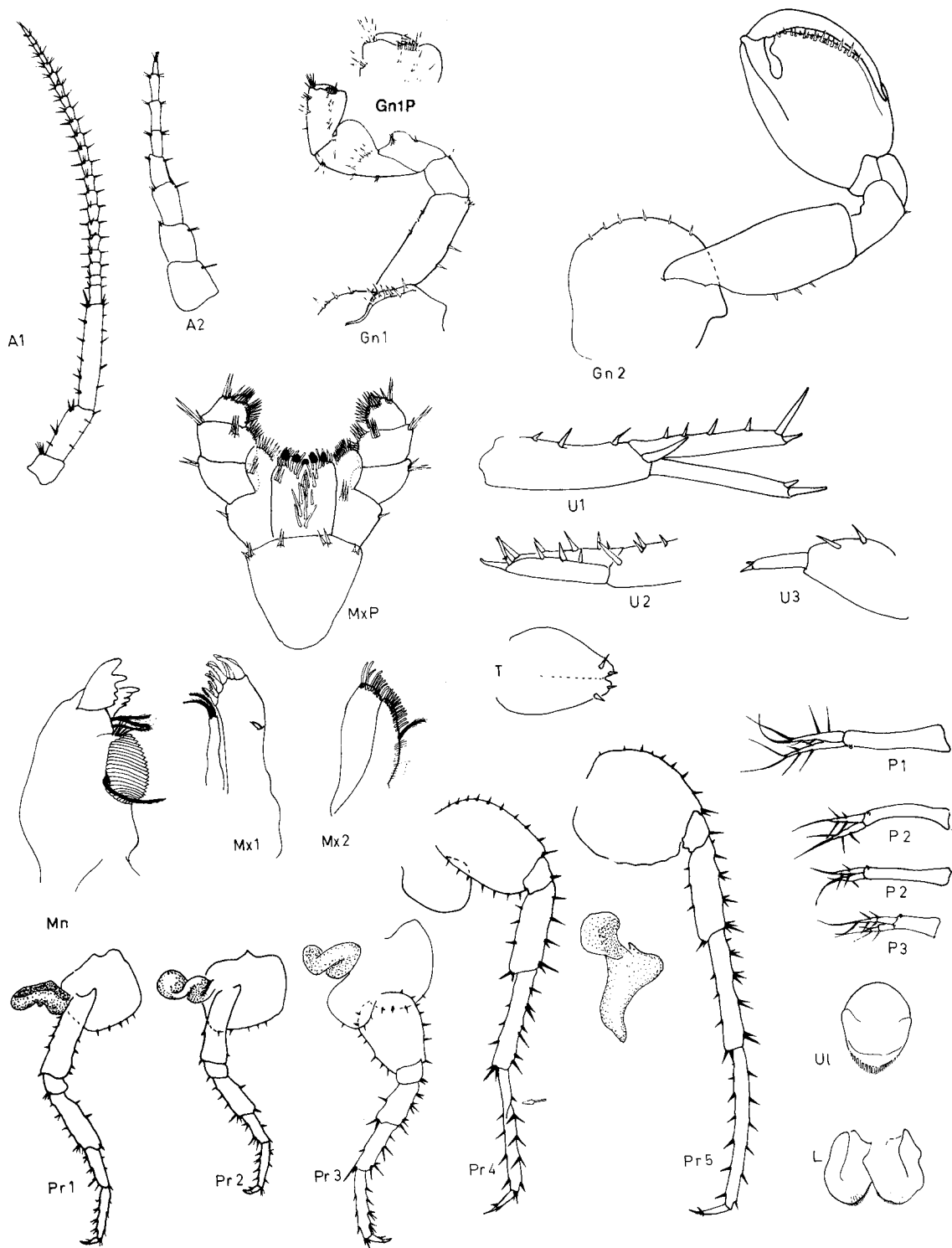


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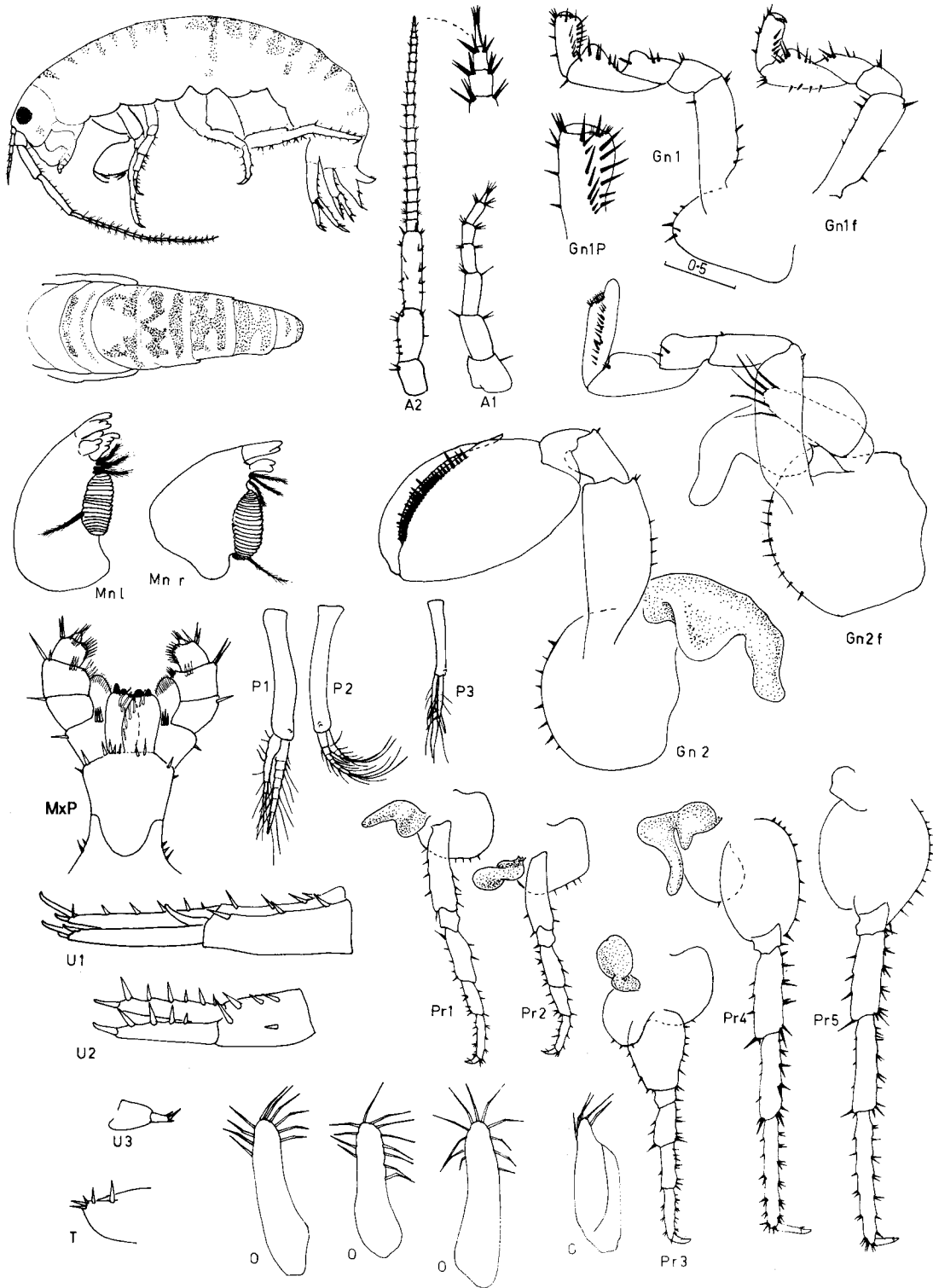


Plate 31 *Waematau manawatahi* (abbreviations keyed on p. 104)

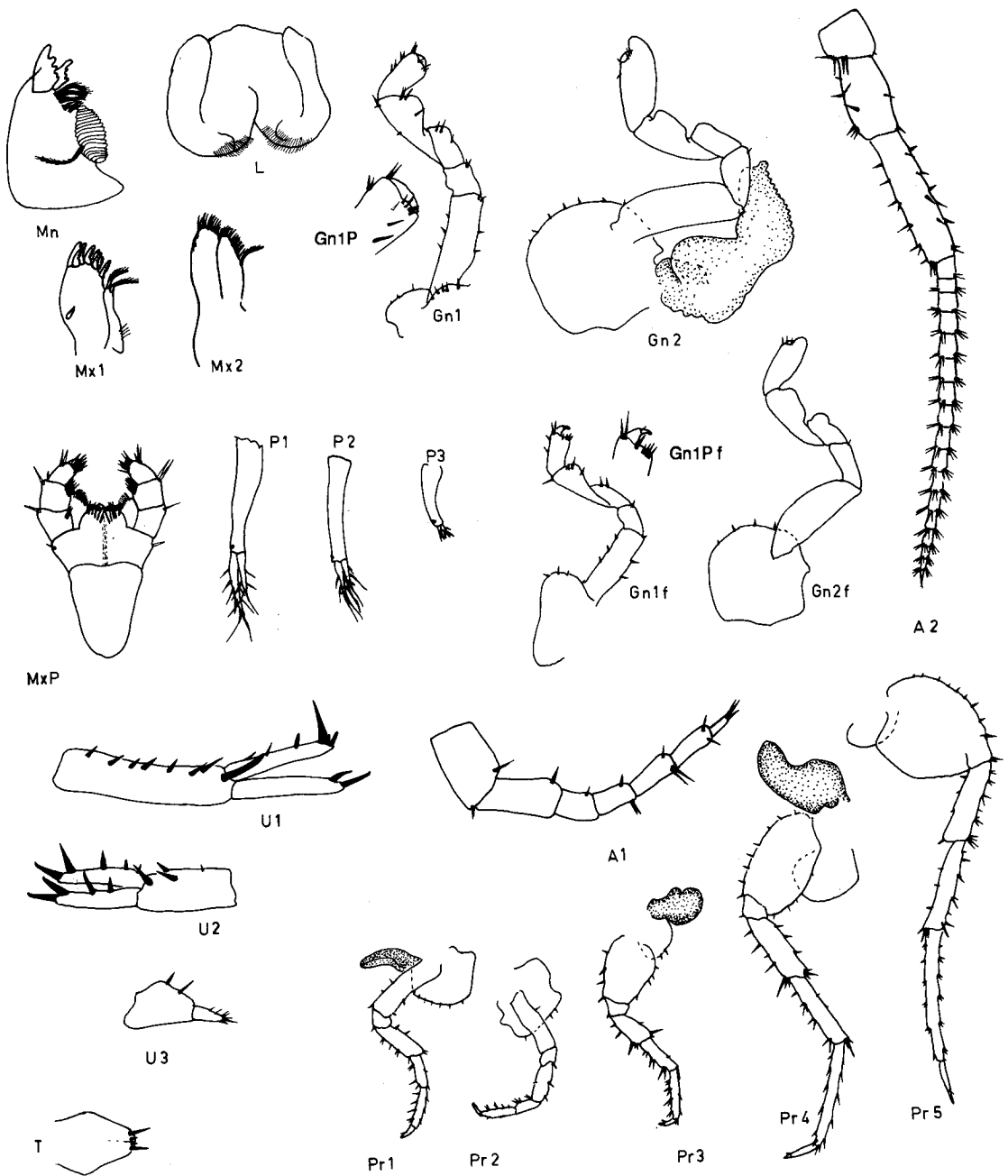


Plate 32 *Waematau muriwhenua* (abbreviations keyed on p. 104)

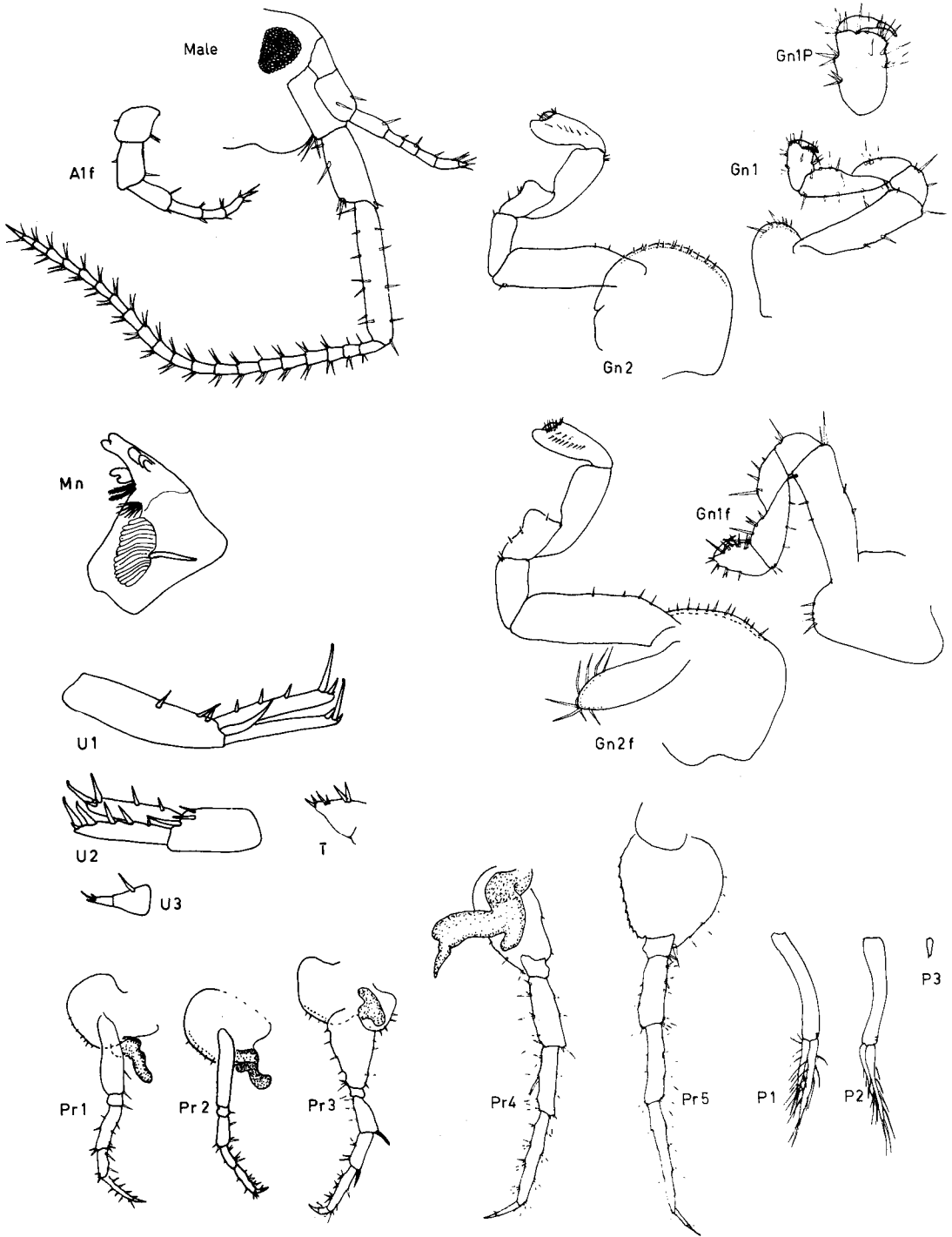


Plate 33 *Waematau reinga* (abbreviations keyed on p. 104)

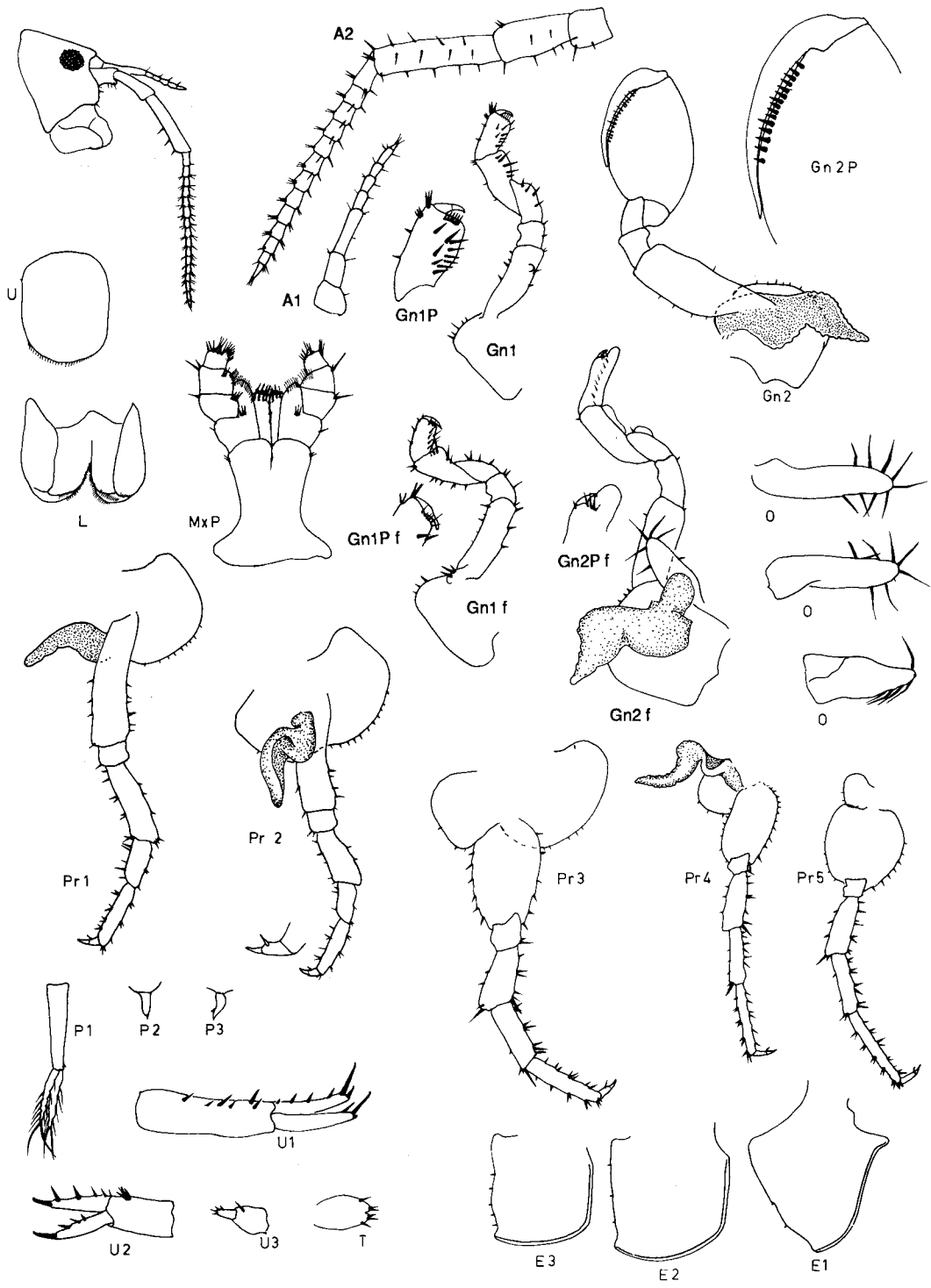
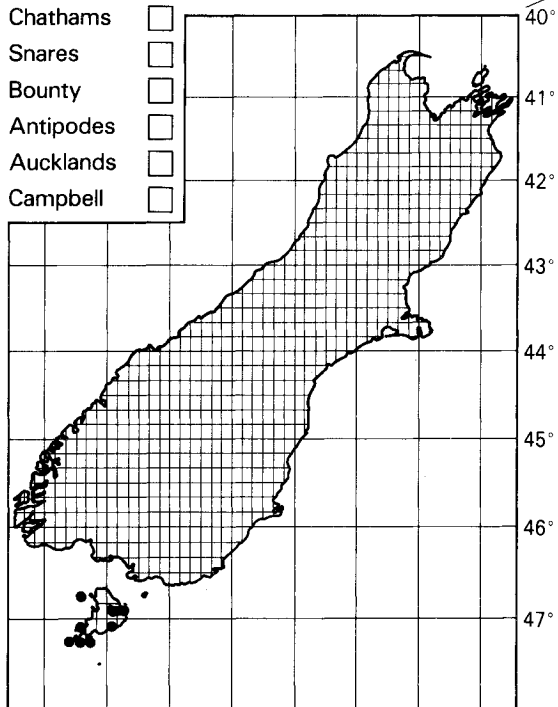
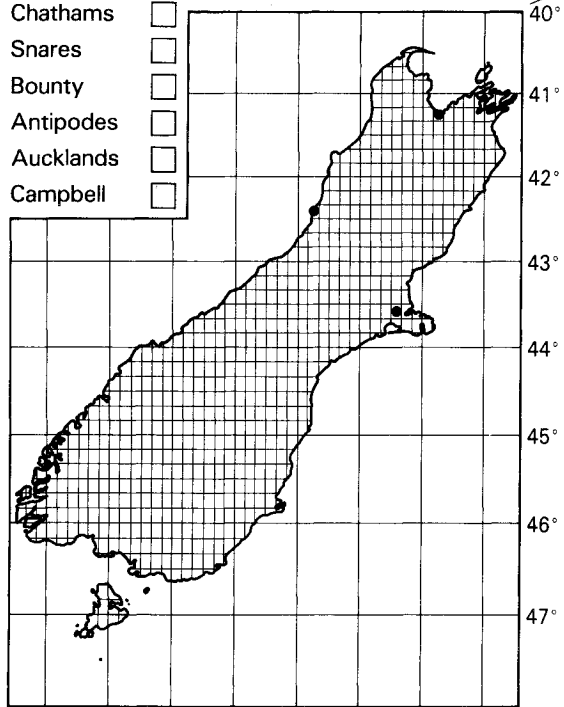
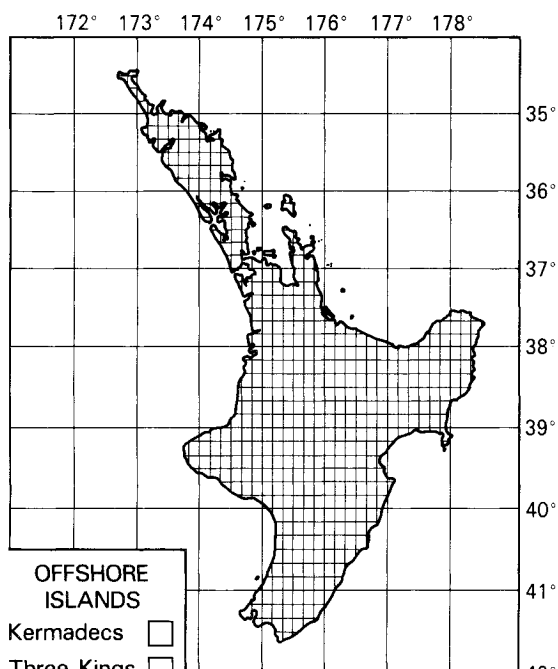
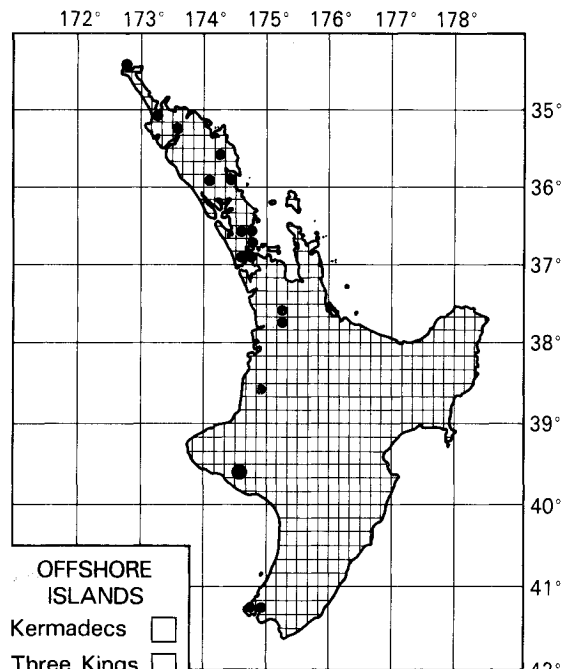


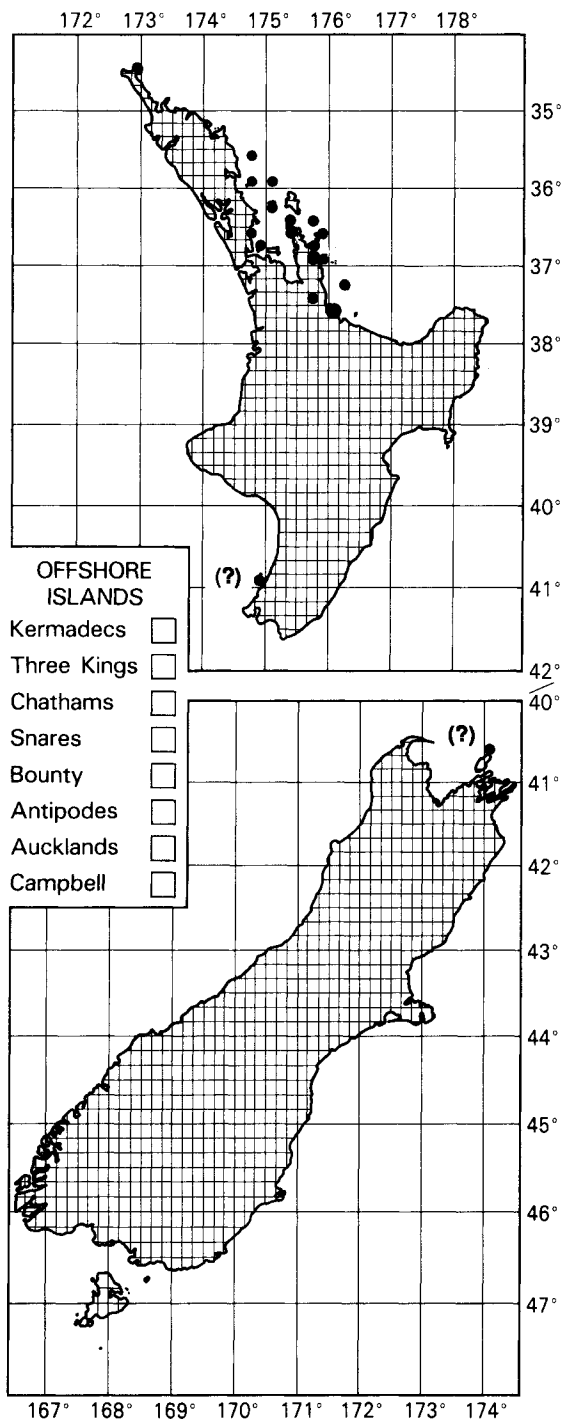
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DISTRIBUTION MAPS

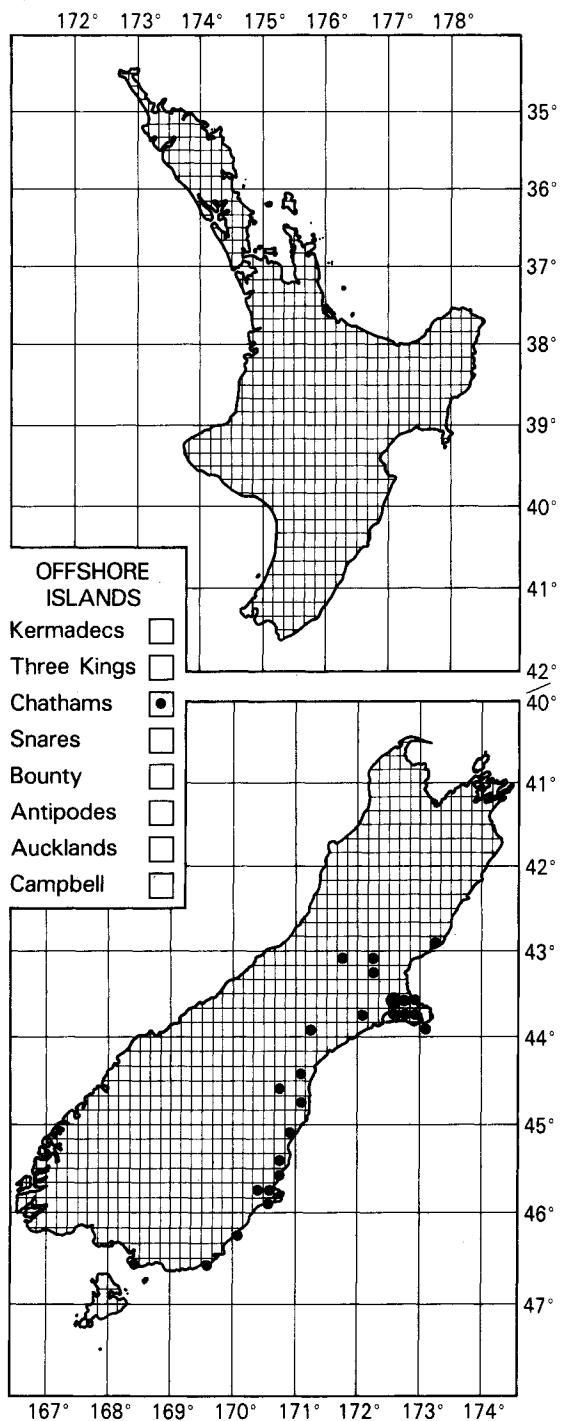


• **Map 1** Collection localities, *Arcitalitrus sylvaticus* •

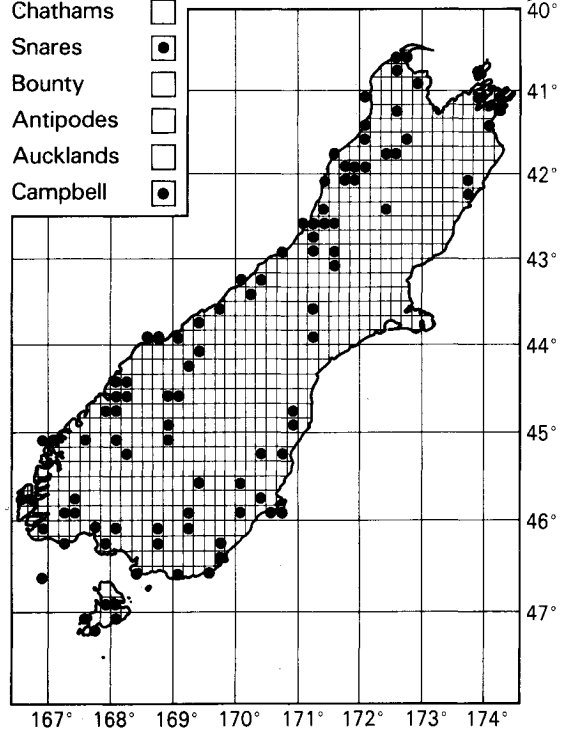
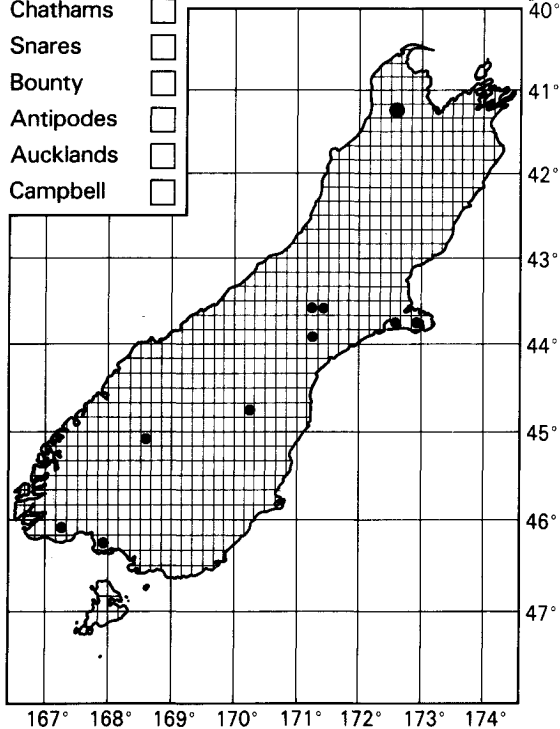
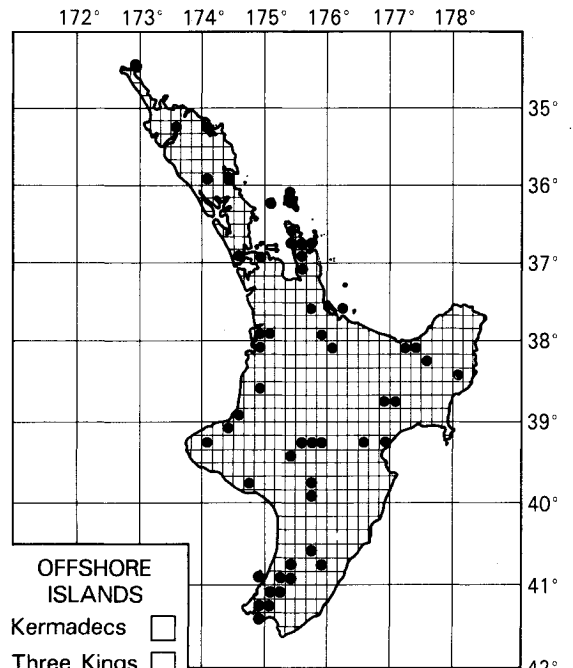
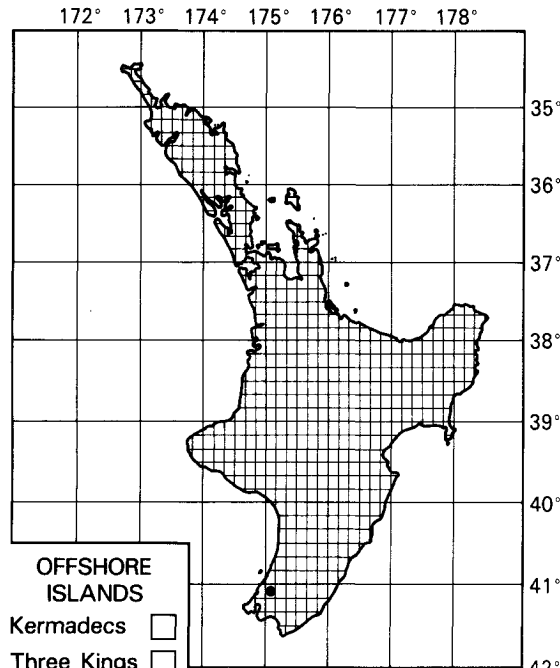
• **Map 2** Collection localities, *Kanikania motuensis* •



• Map 3 Collection localities, *Kanikania rubroannulata* •

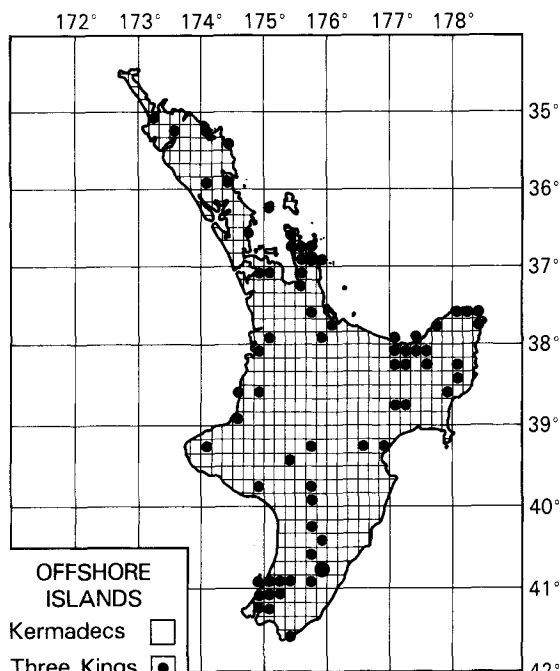


• Map 4 Collection localities, *Makawe hurleyi* •



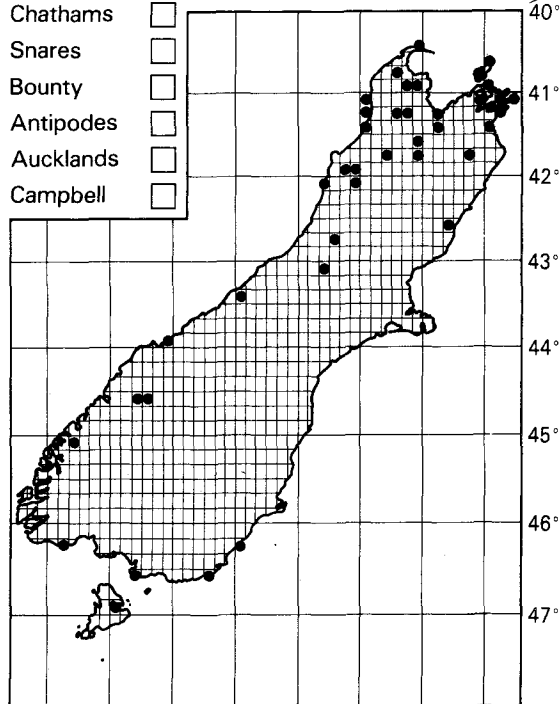
• Map 5 Collection localities, *Parorchestia lesliensis* •

• Map 6 Collection localities, *Parorchestia tenuis* •



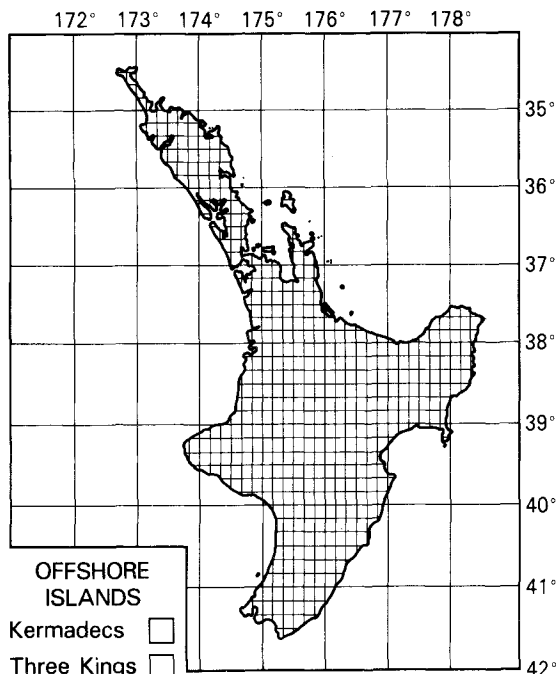
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- Kermadecs
- Three Kings
- Chathams
- Snares
- Bounty
- Antipodes
- Aucklands
- Campbell



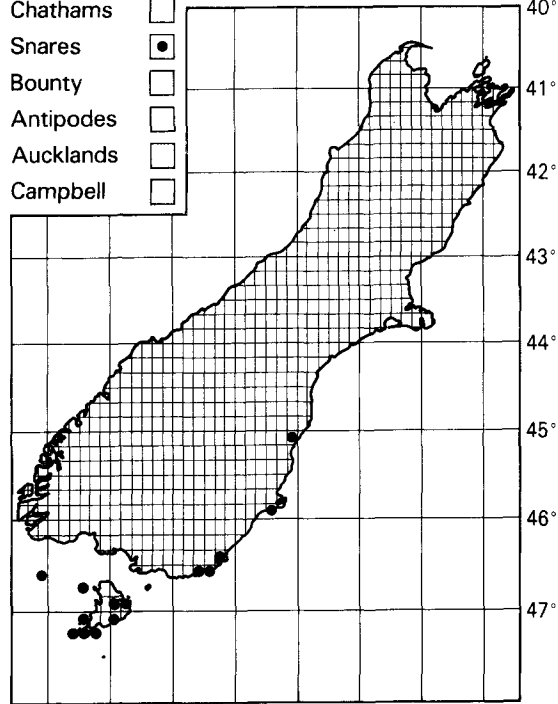
167° 168° 169° 170° 171° 172° 173° 174°

• Map 7 Collection localities, *Puhuruhuru aotearoa* •



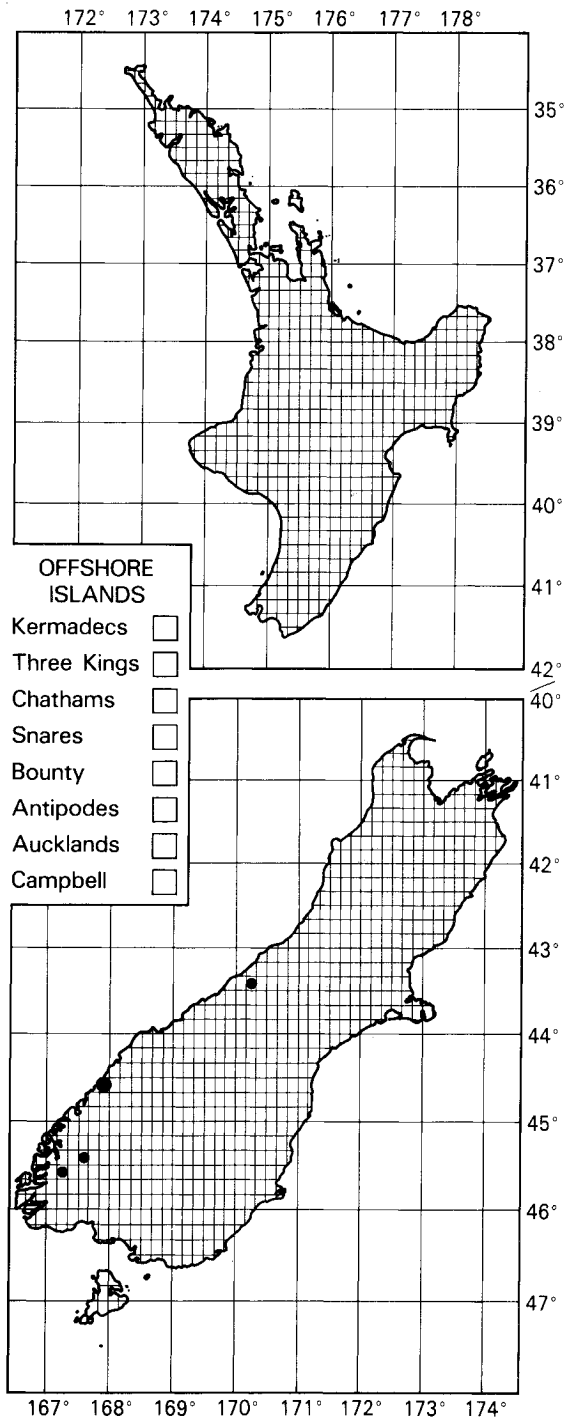
OFFSHORE ISLANDS

- Kermadecs
- Three Kings
- Chathams
- Snares
- Bounty
- Antipodes
- Aucklands
- Campbell

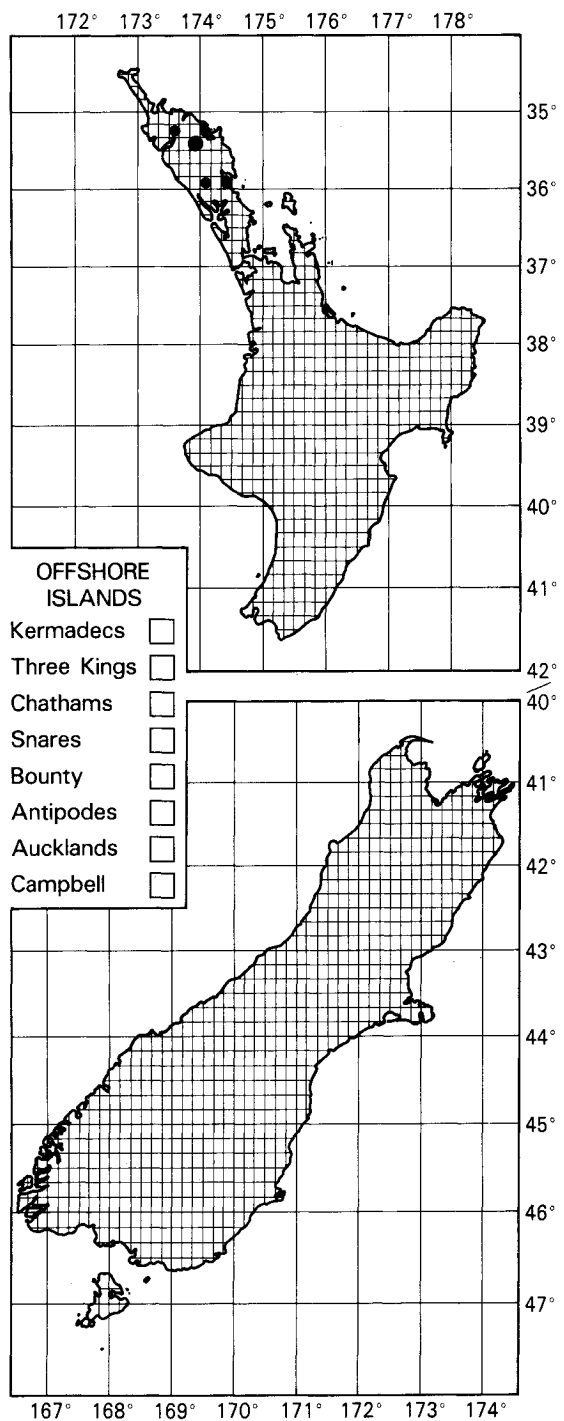


167° 168° 169° 170° 171° 172° 173° 174°

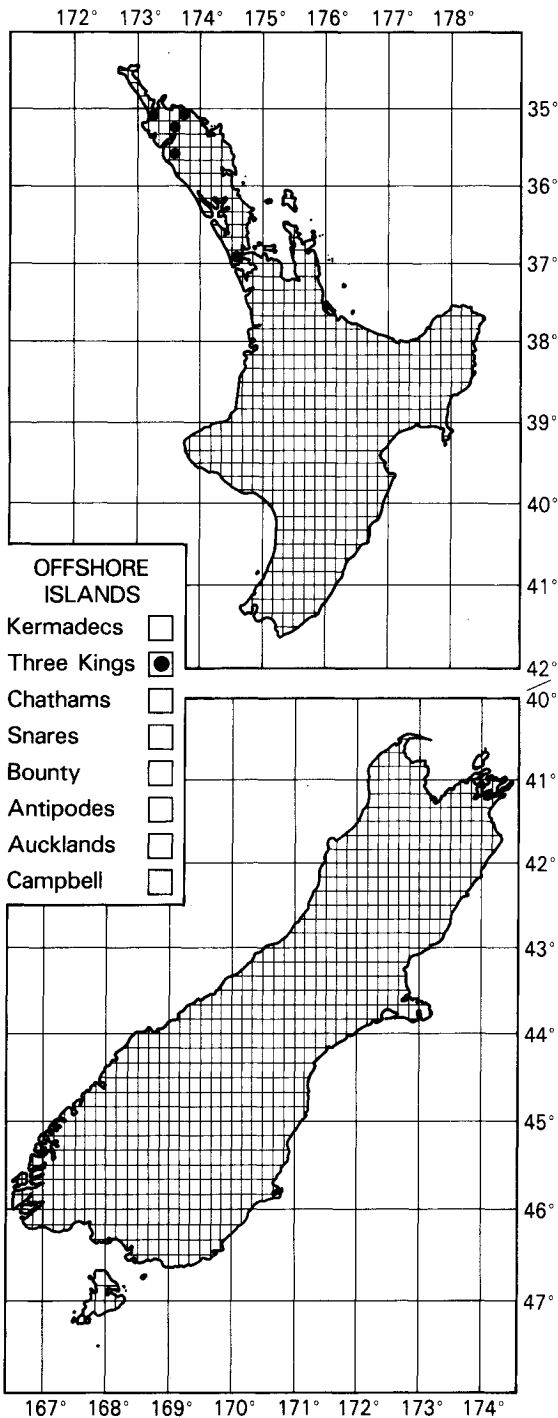
• Map 8 Collection localities, *Puhuruhuru patersoni* •



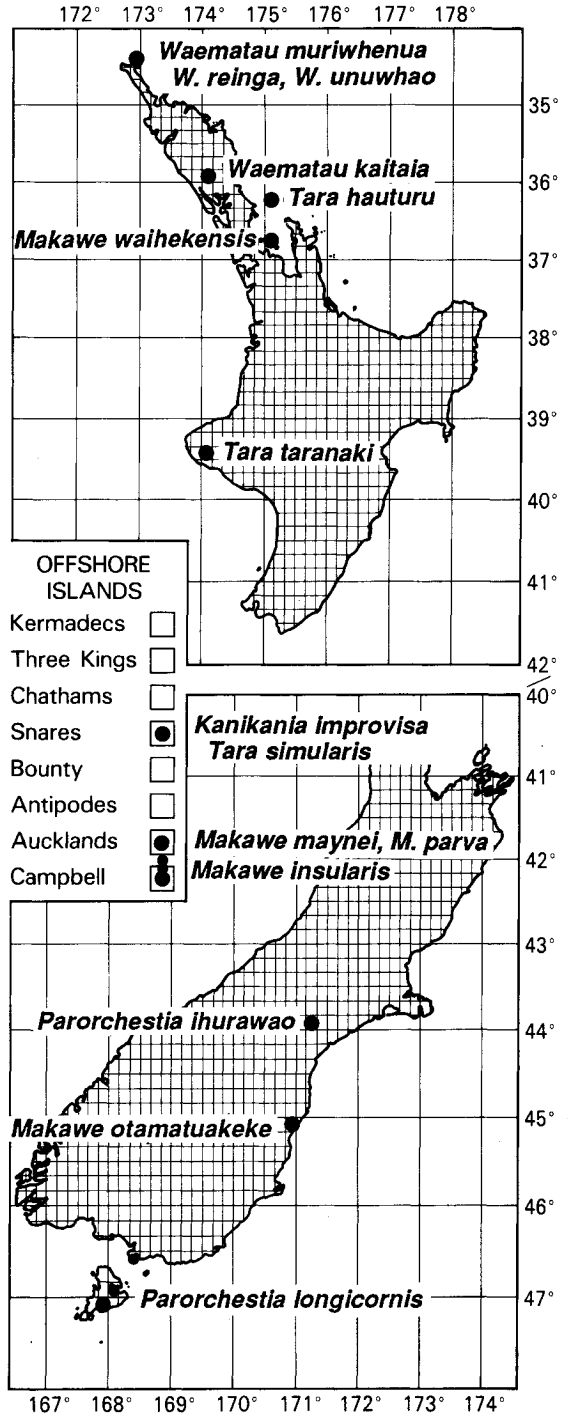
• Map 9 Collection localities, *Tara sinbadensis* •



• Map 10 Collection localities, *Tara sylvicola* •



• Map 11 Collection localities, *Waematau manawatahi* •

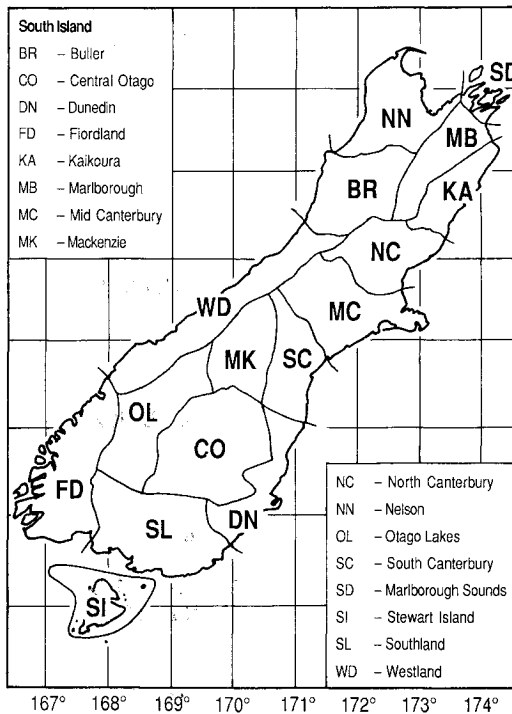
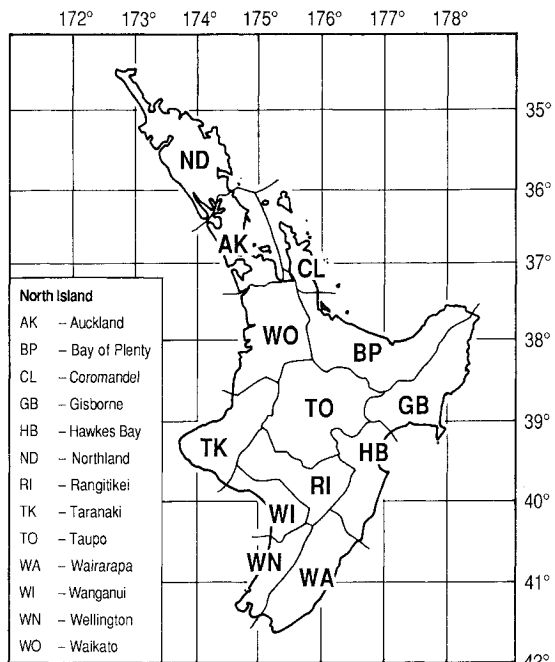


• Map 12 Collection localities, as labelled •

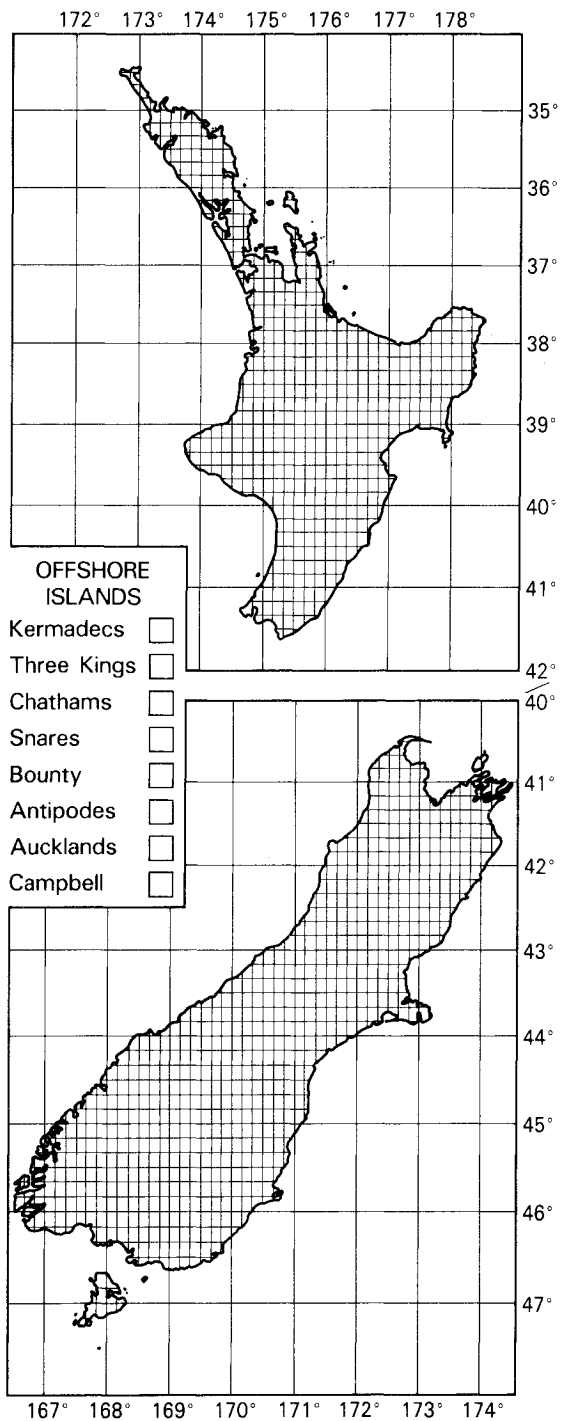
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This index covers the nominal taxa mentioned in the text, regardless of their current status in taxonomy. Page numbers in bold type indicate descriptions of taxa, and in italic type illustrations. Suffixed letters are used to indicate keys (k) and distribution maps (m).

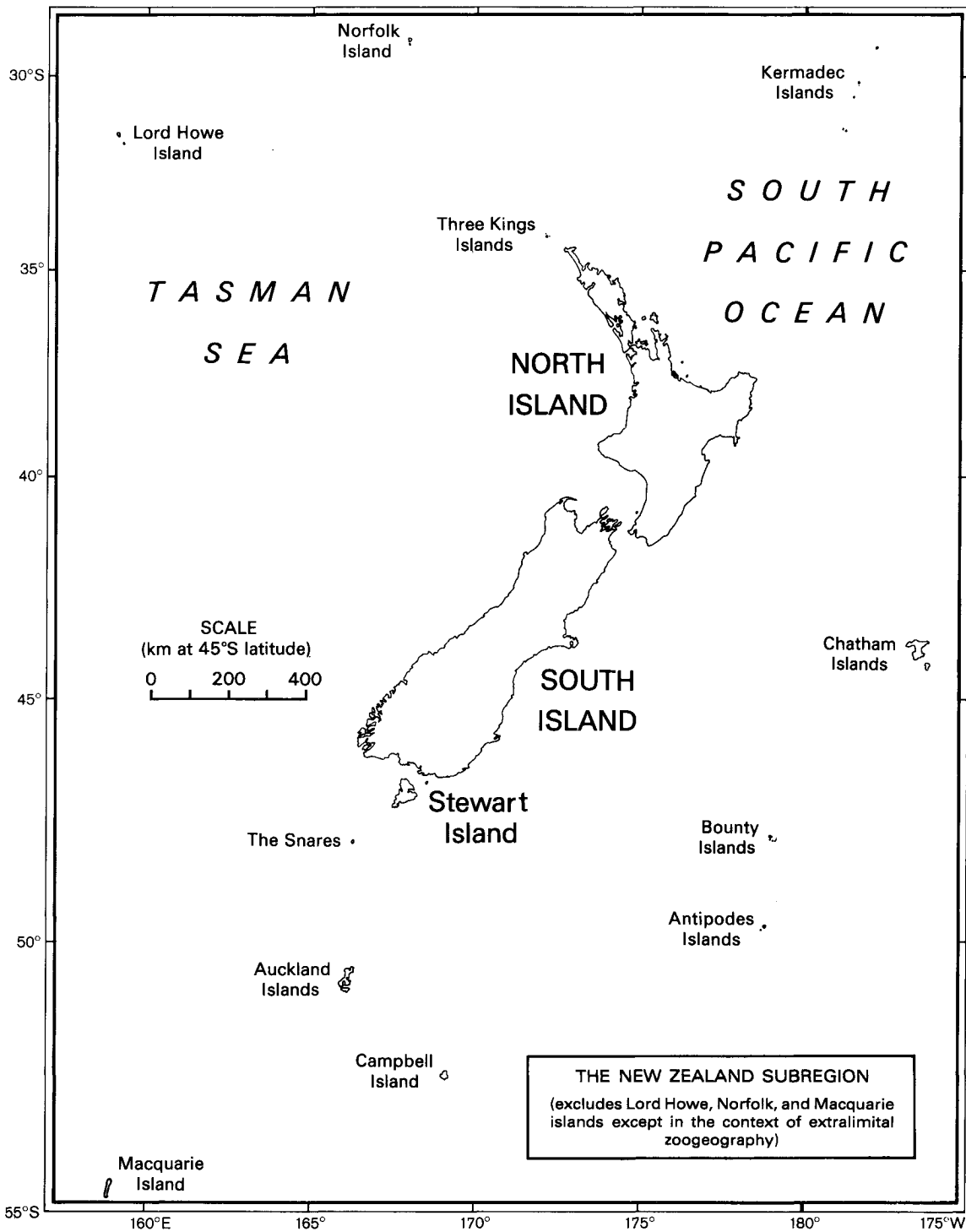
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Area codes and boundaries used to categorise specimen locality data (after Crosby *et al.* 1976)



Base-map for plotting collection localities; this may be photocopied without copyright release



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This series of refereed occasional publications has been established to encourage those with expert knowledge to publish concise yet comprehensive accounts of elements in the New Zealand fauna. The series is professional in its conception and presentation, yet every effort is made to provide resources for identification and information that are accessible to the non-specialist.

'Fauna of N.Z.' deals with non-marine invertebrates only, since the vertebrates are well documented, and marine forms are covered by the series 'Marine Fauna of N.Z.'.

Contributions are invited from any person with the requisite specialist skills and resources. Material from the N.Z. Arthropod Collection is available for study.

Contributors should discuss their intentions with an appropriate member of the 'Fauna' Advisory Group or with the Series Editor before commencing work; all necessary guidance will be given.

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Kua whakatuuria teenei raarangi pukapuka hei whakahau ki nga tohunga whai maatauranga kia whakaatu i nga mea e paa ana ki nga kararehe o Niu Tiireni. He aahua tohunga teenei raarangi pukapuka, engari, ko te hiahia kia maarama ai te tuhituhi, kia moohio ai te maria ki nga tohu o ia ngaarara, o ia ngaarara, aa, kia whakaari i te maatauranga e paa ana ki a ratou.

Ko eenei pukapuka 'Fauna of New Zealand' kaaore e paa ana ki nga kararehe, ki nga ika, ki nga maataitai raanei. E tino moohiotia ana nga kararehe. Kei roto i nga pukapuka e kiia ana 'Marine Fauna of New Zealand' nga tuhituhi e paa ana ki nga ika me nga maataitai.

Tuhituhinga. Ko te tono ki nga tohunga kia tukua mai aa koutou pukapuka. E waatea ana te kohikohinga kararehe e kiia ana ko te New Zealand Arthropod Collection hei maatakitaki maau.

Me whaakii oo koutou whakaaro ki te mema o te kaahui tohutohu o 'Fauna' e tika ana, ki te Etitia raanei, i mua i te tiimatanga tuhituhi.

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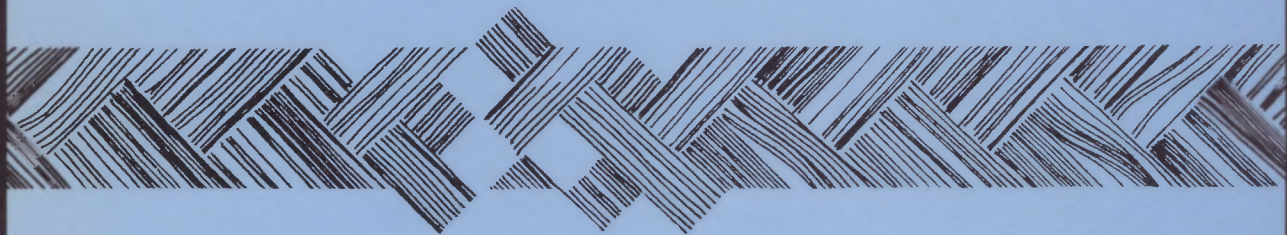
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Te utu (tirohia te whaarangi 126): Ko te koopakitanga me te pane kuini kei roto i te utu. Me utu koutou e noho ana Niu Tiireni me Aahitereiria ki nga taara o Niu Tiireni. Ko eetahi atu me utu te whakaritenga i nga taara Marikena.

E toa ana nga pukapuka o mua. Mehemea e hiahia ana koe ki te katoa o nga pukapuka, tonoa mai kia heke iho te utu. E rua pai heneti te heke iho o te utu ki nga toa hoko pukapuka.

Fauna of New Zealand

Ko te Aitanga Pepeke o Aotearoa



Number 31

Terrestrial Talitridae

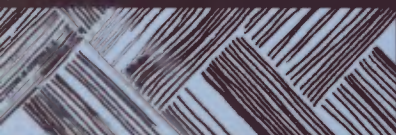
(Crustacea :
Amphipoda)



K. W. Duncan



POPULAR SUMMARY



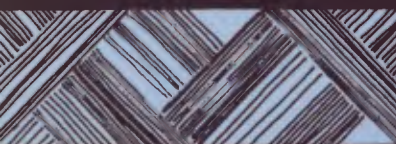
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