© Journal of The Royal Society of New Zealand,
Volume 29, Number 2, June 1999, pp 165–173

A new weta from the Chatham Islands (Orthoptera: Raphidophoridae)

Steven A. Trewick*

Cave weta from the Chatham archipelago, previously attributed to a single highly variable species *Talitropsis crassicruris*, actually comprise two different morphotypes. Specimens from Chatham Island were found to be taxonomically distinct from those collected on Rangatira, Pitt, Mangere and Little Mangere islands. A new species, *Talitropsis megatibia*, is described from these latter islands, and a neotype is provided for *T. crassicruris* Hutton from Chatham Island itself. Aspects of the ecology and evolution of these weta are discussed.

Keywords New Zealand, Orthoptera, weta, Raphidophoridae, island, *Talitropsis megatibia* new species, *crassicruris*, morphology

INTRODUCTION

The Chathams archipelago is situated some 650 km east of the New Zealand mainland. It is comprised of two relatively large, inhabited islands, Pitt and Chatham, plus several smaller uninhabited islands. These include Mangere, Little Mangere and Rangatira offshore from Pitt, and The Sisters north of Chatham (Fig. 1).

Two species of Chatham Raphidophorids were described by Hutton, *Talitropsis crassicruris* (1897) and *Pleioplectron serratum* (1904). *Talitropsis* was established by Bolivar (1882) with his description of *T. sedilloti* (which is widespread in New Zealand), and Hutton (1897) added two further species to the genus, *T. irregularis* and *T. crassicruris*. Alfken (1901) created on rather tenuous grounds a new genus for "*T. crassicruris*" called *Gammaroparnops*, but Richards (1958) found that the description of this genus was inconsistent with the specimens she examined. Whilst Richards (1958) considered that there were also inconsistencies between Hutton's original species description and the types, she synonomised *Gammaroparnops* Alfken with *Talitropsis*. Richards (1958) found five points on which "*P. serratum*" was inconsistent with Hutton's generic description and raised a new monotypic genus, *Novoplectron*, for the Chatham species.

Hutton's holotype of *T. crassicruris* apparently originated from Banks Peninsula, and he described the species as otherwise found only on the Chatham Islands. This would have been an intriguing distribution, but the species has never since been found on Banks Peninsula nor elsewhere in New Zealand. As it was, Hutton's type was of little assistance in resolving the taxonomy of the Chatham weta, as Richards (1958) found "the hind legs and one middle leg ...[to be]... absent from each specimen". As key features of *T. crassicruris* relate to thickening and spination of the hind tibiae, the absence of these limbs presents difficulties.

Specimens examined during the course of this study demonstrate that *Novoplectron serratum* and *T. crassicruris* are sympatric on The Sisters, Mangere, Pitt and Rangatira

---

*Department of Zoology, University of Otago, P.O. Box 56, Dunedin, New Zealand
steve.trewick@stonebow.otago.ac.nz

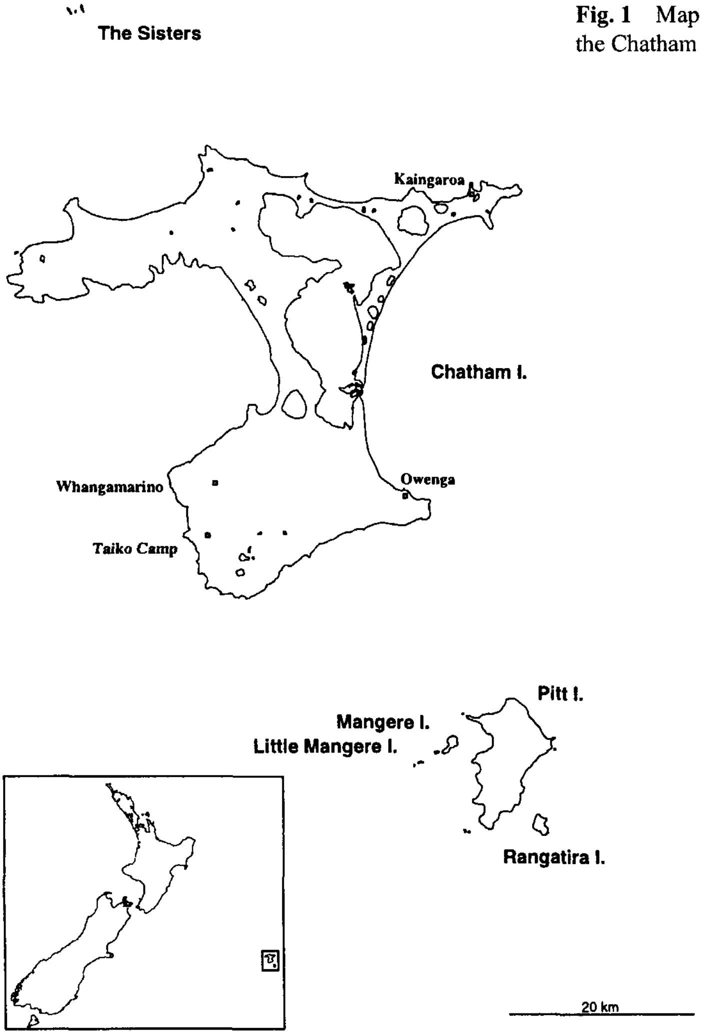

Fig. 1 Map showing relative positions of the Chatham Islands and New Zealand.

islands. There are no records of *N. serratum* on Chatham Island, which appears to be the domain of *T. crassicruris* alone.

Lysaght (1925) observed that hind tibiae of *T. crassicruris* were variable in breadth, and Richards (1958) concurred with this. Lysaght (1925) described this limb as "being distinctly narrower" on specimens from Owenga and Kaingaroa (both on Chatham Island) than on individuals from neighbouring islands. Both also noted variation in spine number on this limb. The fact that neither Lysaght (1925) nor Richards (1958), who had examined 26 specimens from various locations, noticed the geographic consistency of this variability is curious. In this paper I examine the nature of the morphological variation and systematic status of "*T. crassicruris*".

METHODS

Specimens assignable to *T. crassicruris* that had been collected on islands of the Chatham archipelago were examined. None of the specimens examined by Lysaght (1925) were available. Similarly, only six of the specimens which I located in museums had previously been examined by A. M. Richards in 1955 and 1957 (however, it was not possible to confirm that data from these were included in her 1958 paper). I collected a total of 41 specimens from Chatham, The Sisters, Rangatira, Pitt, Mangere and Little Mangere for this analysis.

Each individual was examined for those external characters cited by Hutton (1897) and/or Richards (1958) to be of systematic importance. Counts of spines on each limb pair (if present) were made. Measurements of pronotum, hind femora and tibiae were taken using Mitutoyo electronic callipers. The pronotum length was measured along the dorsal midline. Femoral and tibial lengths were taken on the right leg (unless absent) with the joints flexed. Tibial breadth and depth were measured at the widest point in each orientation. ANOVA analysis was performed using SYSTAT 5 (Wilkinson 1990).

Specimens were sourced from the following institutions: Auckland Institute and Museum (AMNZ), Canterbury Museum (CMNZ), Lincoln University Entomology Museum (LUNZ), Museum of New Zealand (MONZ), New Zealand Arthropod Collection (NZAC), Otago Museum (OMNZ), University of Canterbury (UNCZ), Victoria University of Wellington (VUNZ).

RESULTS

None of the specimens examined had spines on fore or mid femora, whereas all had one and sometimes two prolateral and retrolateral distal spines on the underside of the hind femora. Where two spines were present, the most anterior one was smaller than the posterior one.

On the fore tibiae, spine numbers varied among individuals to some extent. On the majority of individuals the arrangement consisted of two each on the prolateral and retrolateral underside, plus a pair of apical spines in line with these. In most instances the non-apical spines were not paired. Mid tibiae had a similar arrangement of spines, but with rare exceptions there was only one spine on the retrolateral side, not two. Two thirds of the individuals examined also possessed one additional apical spine on the posterior side (i.e., a total of three). First and second joints of the hind tarsi had a pair of superior apical spines which were not present on the fore or mid tarsi.

Richards (1958) found the ratio of hind tibia breadth to length ranged between 0.16 : 1 and 0.3 : 1. In the present study a similar range of 0.11 : 1 to 0.27 : 1 was found (all data pooled). The standard deviation (SD) for tibial breadth and depth measurements was higher in the pooled data than within each island population treated independently (Table 1). This suggests an erroneous merging of distinct size distributions. However, variance in the lengths of the

Table 1 Summary statistics of *Talitropsis* weta from Chatham Islands (All), Chatham Island alone (Chatham), and islands excluding Chatham (Excl. Chatham). ANOVA test results for comparison of Chatham with other islands are given.

	All (37)		Chatham (10)		Excl. Chatham (27)		
Location	Mean	SD	Mean	SD	Mean	SD	*P*
Hind femora length	12.54	1.65	12.51	1.68	12.55	1.65	NS
Hind tibia length	11.38	1.77	11.92	1.63	22.28	1.77	NS
Hind tibia width	2.44	0.60	1.62	0.15	2.74	0.37	<0.001
Hind tibia deptrh	2.05	0.57	1.30	0.16	2.33	0.37	<0.001
Pronotum length	5.30	0.71	4.99	0.56	5.41	0.74	<0.05

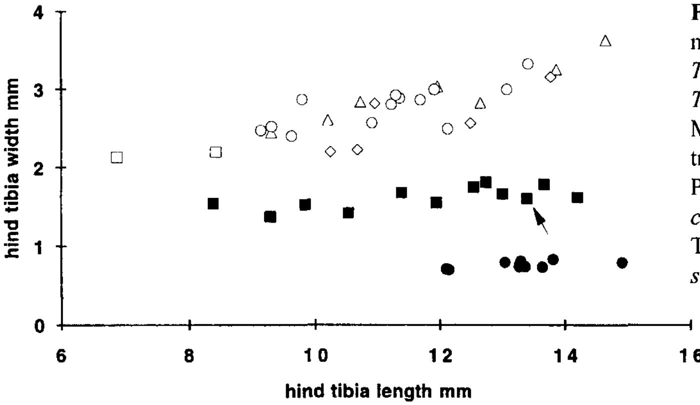

Fig. 2 Length and breadth in millimetres of hind tibiae of *Talitropsis* weta. Open shapes *T. megatibia* (squares Little Mangere, circles Rangatira, triangles Mangere, diamonds Pitt). Filled squares *T. crassicruris* (arrow indicates The Sisters). Filled circles *T. sedilloti*.

hind femur, hind tibia and pronotum remained similar regardless of how the data were grouped. On the basis of hind tibial depth and breadth, individuals from Mangere, Little Mangere, Pitt and Rangatira were morphometrically indistinguishable from one another, but the populations from these islands were significantly different from the one on Chatham Island and The Sisters (Table 1, Fig. 2). All of the *Talitropsis* from the Chatham archipelago (Fig. 3A-D) had thicker hind tibiae than *T. sedilloti* from New Zealand (Fig. 3F).

In conjunction with hind-tibial metric dimensions, the number and arrangement of spines on this limb also differed among populations. Lysaght (1925) and Richards (1958) gave examples of spine-count variation. Lysaght (1925) indicated that it was the number on the prolateral superior margin of the hind tibia that varied most in her sample. This is consistent with the present study, in which individuals from Chatham Island had spines along the full extent of the prolateral superior margin, with a maximum of between 7 and 9 on each limb. Individuals from Mangere, Little Mangere, Pitt and Rangatira islands had 3–5. These latter animals also sometimes had what Richards (1958) called spinelets, which consist of the spine tip itself but no raised base, on the proximal, prolateral portion of the hind tibiae. The retrolateral superior margin of all individuals bore 6–8 spines. All individuals had four articulated apical spines, two superior and two inferior. Specimens of *T. sedilloti* had 8 or 9 and 7 or 8 well-formed but comparatively small superior prolateral and retrolateral spines respectively. A secondary set of even smaller spines was also present on each side in this species.

All female *Talitropsis* from the Chathams which I examined possessed a bi-lobed medial appendage on the distal margin of sternite VII. Richards (1958) drew special attention to this feature, and concluded that it "may be an accessory to the external genitalia". When everted, as during mating, the subgenital plate clearly fits neatly between the two lobes (Fig. 3E). However, Hutton (1898) had previously noted that this character was sometimes present in *T. sedilloti*, and it was well developed in one of the seven females of this species I examined. Therefore this appendage is variable within the genus: it is not restricted to, but is most common in, the Chatham species. The subgenital plate and other genital structures of males and females did not differ consistently among populations (good figures are given in Richards 1958).

On the basis of differences in morphology of the hind tibiae that are consistent among populations with distinct island distributions, I propose that a second species of *Talitropsis* be recognised for the Chatham fauna.

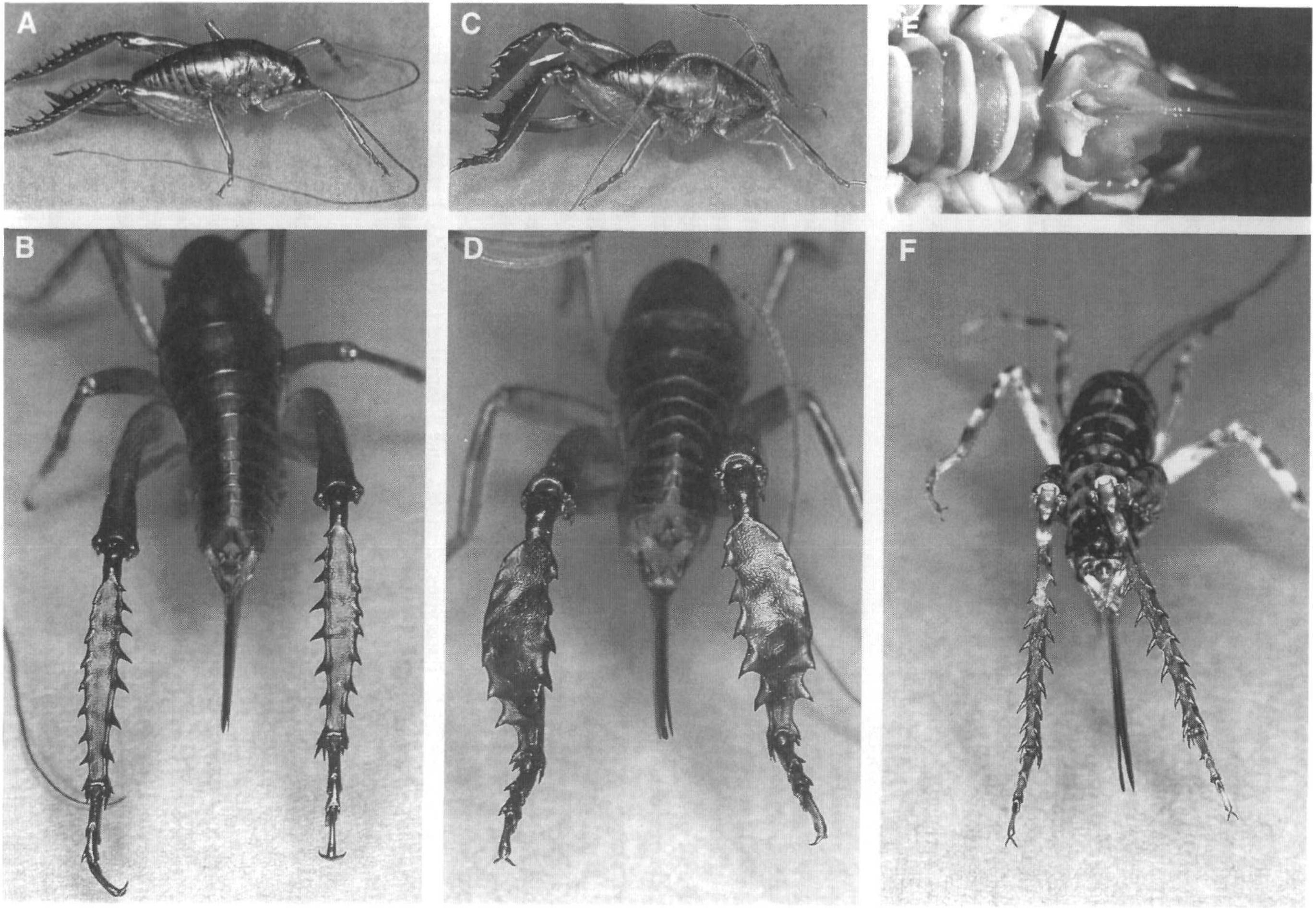

Fig. 3 *Talitropsis crassicruris* (A, B), *T. megatibia* sp. n. (C, D) and *T. sedilloti* (F), showing the difference in shape and spination of hind tibiae. White arrow in C indicates distal, inferior, retrolateral spine on hind tibia. Black arrow in E indicates bi-lobed appendage on sternite VII.

SPECIES DESCRIPTION

Talitropsis megatibia Trewick, new species

Etymology: Referring to the exceptionally dilated hind tibiae.

Diagnosis: Hind tibiae bearing stout, only slightly backward-pointing spines on the retrolateral and prolateral margins, but these are absent from the proximal half of the prolateral margin. Hind tibiae slightly laterally convex above, upper surface strongly longitudinally convex, or bulging. Average length/maximum width ratio of tibiae 4.1:1.

Genitalia: Female. Subgenital plate slightly wider than long, distal notch to between half and three quarters length of the plate. Lateral margin generally s-shaped. Cleft appendage arising medianly on sternite VII and extending distally, everted subgenital plate engages between the two lobes of this appendage.

Male: Subgenital plate slightly wider than long, bearing blunt median keel along its length. Lateral margin s-shaped, concave distally and three lobed at apex with abundant short setae. Median lobe bulbous.

Legs: Fore and mid-femora without spines. Hind femora with single distal inferior spine on retrolateral and prolateral margin, sometimes with one smaller additional spine anterior of this. Fore tibiae with 2 retrolateral and 2 prolateral unpaired, inferior spines and 2 apical spines. Mid tibiae with 1 retrolateral and 2 prolateral spines, 2 sometimes 3 apical spines. Hind tibiae with 3–5 and 6–8 superior prolateral and retrolateral spines respectively, the most distal pair of these are close to apical spines. Two pairs of articulated apical spines. First and second segments of the hind tarsi each with one pair of superior apical spines.

Localities: Type locality, Rangatira Island, coll. G. Taylor. Woolshed Bush, Rangatira, coll. E. G. Turbott, J. W. Early. R. M. Emberson. Near hut and in Robin Bush, Mangere Island, coll. J. W. Early, C. Lindsay. Little Mangere, coll. M. Bell, D. Bell, I. A. Atkinson. Waipaua Scenic Reserve, North Head, Glory Scenic Reserve, Cannister Cove Scenic Reserve, Pitt Island, coll. C. A. Muir, J. W. M. Marris, R. M. Emberson, J. W. Early.

TYPE MATERIAL: Holotype Male: Rangatira Island, Chatham Islands. Coll. G. Taylor, February 1995 (MONZ). Paratypes: 2 males and 3 females (MONZ), 1 male and 1 female with the author, 2 males and 6 females (AMNZ), 2 males and 7 females (LUNZ), 1 female (LMNZ).

Distribution: Mangere, Little Mangere, Pitt and Rangatira Islands.

Habitat: Collected on trees (e.g., olearia) and shrubs (e.g., hebe) at night, and extracted from within dry wood, rotten logs and petrel burrows.

Talitropsis crassicruris Hutton, 1897

Diagnosis: Hind tibiae bearing stout, only slightly backward-pointing spines along the entire length of inner and outer margins, spines on proximal third of outer margin blunt, but present. Hind tibiae flattened or slightly concave above, upper and lower surfaces near parallel. Average length/maximum width ratio of tibiae 7.2:1.

Localities: Whangamarino, Taiko Camp, Henga Scenic Reserve Chatham Island and The Sisters. Coll. S. A. Trewick, A. Tennyson, C. Tisdall, C. A. Muir, R. K. Dell.

TYPE MATERIAL: The holotype (LMNZ) designated by Hutton (1897) was found to be severely damaged and lacking in parts of systematic importance (i.e., hind tibiae).

Neotype male: The Sisters. Coll. R. K. Dell, 2 February 1954 (CMNZ). This neotype was apparently designated by A. Richards (4 February 1955) but this was not reported in Richards (1958). The morphology of this individual is consistent with specimens of *Talitropsis* *crassicruris* collected on Chatham Island and therefore stands. This neotype is especially significant as it is the only known specimen of *Talitropsis* from The Sisters. A second neotype (female), also designated by A. Richards came from Mangere Island (Coll. C. Lindsay, 14 January 1924) and is consistent, in morphology and location, with *T. megatibia*. Paratypes: 1 male and 2 females (MONZ), 2 males and 3 females with the author.

Distribution: Restricted to Chatham Island.

Habitat: Collected on trees and shrubs at night, or extracted from narrow holes in living and dead wood by day.

DISCUSSION

Richards' (1958) review of the Chatham *Talitropsis* weta cited several points on which her observations conflicted with Hutton's (1897) description of the species. Hutton stated that no spines were present on the fore and mid femora. Although Richards found a few individuals with spines on these limbs (how many is not apparent), I agree with Hutton's observation. I also agree with Hutton (1897) in finding no apical spines on the hind femora. Alfken (1901) and Richards (1958) however, both reported apical spines on individuals they examined, but this appears to be because they enigmatically designated the distal, inferior femoral spines (which are indeed positioned close to the apex of this limb) as apical (Fig. 3C).

More important differences of opinion relate to the hind tibiae, which are the most characteristic feature of the Chathams *Talitropsis*. Hutton's (1897) description includes the statement, "Hind tibiae much dilated and *flattened above*: the spines are *nine on the outside* and eight on the inside, equal in size, and equal in distances" (my emphasis). Richards (1958) observed only that the number of spines on the hind tibiae was variable among individuals, but Table 1 shows that this lability is primarily due to the erroneous grouping of distinct morphotypes. On the basis of Hutton's spine counts, and his description of the hind tibiae as "flattened" above, it seems that he had examined specimen(s) of cave weta from Chatham Island, and that his description was based upon these (Fig. 3A, B). His locality simply says "Chatham Islands" so there is no indication that he had specimens from other islands in the group.

The weta from Chatham Island examined in the present study fit Hutton's (1897) description in having near equal numbers of spines (around nine) on the retrolateral and prolateral superior edges of the hind tibiae. The hind tibiae were dilated and flattened on the superior surface (by comparison with other New Zealand cave weta such as *T. sedilloti*). On the other hand, Richards (1958) seems to have based her redescription primarily on animals collected from Rangatira and Pitt Islands, and this is why discrepancies in the two descriptions have arisen. Hence the need for the new description above, which reaffirms Huttons' species *T. crassicruris* from Chatham Island, and raises a new species (*T. megatibia* sp. n.) for Rangatira, Pitt, Little Mangere and Mangere Islands.

The range of *T. megatibia* sp. n. on Rangatira, Mangere and Pitt overlaps entirely with that of *N. serratum*, but *T. crassicruris* is the only weta found on Chatham main island. Richards (1958) suggested that the apparent absence of *N. serratum* on Chatham Island may have been due to the difficulty of reaching petrel burrows there. However, this species has, judging from existing specimens, been most frequently taken on vegetation and logs when collected on Rangatira and Mangere. On Chatham main island *T. crassicruris* has also frequently been collected on vegetation at night around the Taiko Camp, and neither this species nor *N. serratum* has been recorded from petrel burrows there. This implies a real absence of *N. serratum* on Chatham Island, as the examination of burrows is the primary occupation of many would-be insect collectors in that area.

The coincidence of geographic range of these species is intriguing and may point towards an ecological explanation for the morphological differences between the two fat-legged weta. *T. crassicruris* and *T. megatibia* sp. n. are similar in the fine details of spine number (on fore and mid limbs) and genital construction, as well as most metric dimensions of the limbs measured. This suggests close systematic affinity, and yet they differ significantly and consistently in the proportions and spination of the hind tibia. *N. serratum* is a more typical thin-legged cave weta, and it is easy to imagine, though not to prove, a process of character divergence operating between *T. megatibia* sp. n. and *N. serratum* where their ranges overlap. However, both Chatham *Talitropsis* species differ significantly from *T. sedilloti*, the common New Zealand sister species, with respect to shape and spination of the hind tibiae. This suggests that even in the absence of *N. serratum*, *T. crassicruris* has changed from the ancestral state, if *T. sedilloti* is representative of that condition. On the other hand, the presence of *T. crassicruris* (currently evinced by a single specimen) on The Sisters where *N. serratum* has also been found suggests a more complex ecological interaction and/or biogeographical history.

Richards (1958) proposed that the wide tibiae of "*T. crassicruris*" could be used for digging burrows in rotten logs. However, if selection for digging capability were the cause of enlarged tibiae it would suggest *T. crassicruris* is less well adapted for this activity than *T. megatibia* sp. n., and yet it is found in similar habitat. It is also far from clear how a weta could use its hind legs to dig, and there is no clear evidence that either species digs burrows.

The *T. crassicruris* that I collected on Chatham main island were extracted from narrow cavities in living or dead trees. These cavities had evidently been entered head first, and the entrance blocked with the stout, spiny hind tibiae in a manner characteristic of most tree weta (*Hemideina*) on mainland New Zealand. *Hemideina* is absent from the Chatham Islands. Most New Zealand cave weta tend to occupy open cavities, often in groups, and with no particular orientation or opportunity to use their legs for defence, intraspecific or otherwise. These observations suggest a move to *Hemideina*-type hole occupancy by both Chatham *Talitropsis*, with separate character divergence operating where *T. megatibia* sp. n. meets *N. serratum.*

ACKNOWLEDGMENTS

Many thanks to Rowan Emberson and John Marris (LUNZ), Phil Sirvid and Ricardo Palma (MONZ), Simon Pollard (CMNZ), Trevor Crosby (NZAC), John Early (AMNZ), Tony Harris (OMNZ) for their assistance with specimens. Thanks also to Ralph Powlesland who gave me the opportunity to visit Chatham Island, and Dave Rentz and an anonymous reviewer for their comments on the manuscript. Ken Miller (University of Otago) provided considerable photographic and graphics assistance. This work was part of a programme supported by a Foundation for Research, Science and Technology Postdoctoral fellowship.

REFERENCES

Alfken, J. D. 1901: Neue Orthopteren von Neu-Seeland und den Hawaiischen Inseln. *Abhandlungen Herausgegeben vom Naturwissenschaftlichen Verein zu Bremen* XVII, Band 1 Heft: 146–150.

Bollivar, M. I. 1882: Description d'Orthoptères synonymiques diverses. *Annales de la Societe Entomologique de France 6*: 461–462.

Hutton, F. W. 1897: The Stenopelmatidae of New Zealand. *Transactions of the New Zealand Institute 29*: 223–240.

Hutton, F. W. 1898. Supplement to the Stenopelmatidae of New Zealand. *Transactions of the New Zealand Institute 31*: 40–43.

Hutton, F. W. 1904: On a new weta from the Chatham Islands. *Transactions of the New Zealand Institute 36*: 154.

Lysaght, A M 1925 Orthoptera and Dermaptera from the Chatham Islands *Records of the Canterbury Museum 2* 300–310

Richards, A M 1958 Revision of the Rhaphidophoridae (Orthoptera) of New Zealand Part I- The Rhaphidophoridae of the Chatham Islands 1954 Expedition *Transactions of the Royal Society of New Zealand 85* 263–274

Wilkinson, L 1990 Systat The system for statistics Evanston, IL, SYSTAT Inc

R98026 Received 22 October 1998, accepted 23 January 1998