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Maotoweta virescens new genus and new species; hidden in a moss forest (Orthoptera: Rhaphidophoridae)

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ABSTRACT

A mottled green weta, *Maotoweta virescens* new genus and species. (Rhaphidophoridae: Macropathinae) (cave cricket) is described.

KEY WORDS

Maotoweta; Rhaphidophoridae; Macropathinae; weta; cave cricket; camel cricket.

INTRODUCTION

The New Zealand cave weta (Rhaphidophoridae) are receiving considerable attention due to the large number of species (ca100, with 59 available names presently assigned to 54 recognised species) (Richards 1972 and her previous papers; Johns 1991; Eades et al, 2013) and their biogeography. Some are widely distributed in forest habitats, others restricted to cave systems or alpine screes. Species radiation within karst areas is now the subject of mtDNA analysis (Cook and Trewick, 2007, Cook et al, 2010).

However, nomenclatural and taxonomic problems abound owing to the misidentification of known species and the abundance of undescribed species for which the features of some defy the present understanding of the generic and species limits. This is the outcome of

the variation in the number of femoral apical spines which was considered to be fixed within a genus (Richards, 1958; Ward, 1998) and the complexity of the male subgenital plates and associated structures. The transversely divided subgenital plate of the male seems characteristic of the New Zealand genera *Neonetus* Brunner von Wattenwyl, 1888, *Talitropsis* Bolivar, 1882, *Pharmacus* Pictet and Saussure, 1891, *Isoplectron* Hutton 1897, *Setascutum* Richards, 1972, *Petrotettix* Richards, 1972 and *Maotoweta* new genus, yet *Setascutum* is almost certainly a synonym of *Isoplectron*. The limits of *Talitropsis*, and the alpine *Petrotettix* and *Pharmacus* are also unclear with respect to about 15 species. The variations between the species assigned to all these genera do not approach the form shown by this new species, thus the combination of characters of *Maotoweta virescens* new species, one of New Zealand's smallest and rarest species, are considered sufficient to separate it at the generic level. The major problems lie in the many species yet to be assigned to other genera whose diagnoses may yet need to be expanded. This is particularly the case with *Talitropsis*, presently the only member of the Macropathini: Talitropsini.

This description distinguishes between the terms 'spines' and 'spurs'. The former are those articulated, semi-articulated or fixed, sharp processes that lie along



Figure 1. Male subgenital plate and spines of hind tibia

the shank of a leg unit, especially the tibia. The latter are confined to the apex of a unit and are usually articulated. 'Spinules' are short, fine, cylindrical spines. 'Setae' are fine, generally sensory hairs having their own insertions.

SYSTEMATIC SECTION

Order ORTHOPTERA Burmeister, 1839

Suborder Ensifera Chopard, 1920

Family Rhaphidophoridae Walker, 1869

Subfamily Macropathinae Karny, 1930

Maotoweta new genus species

Type species (by designation): *Maotoweta virescens*
new species

Diagnosis (see Table 1).

Colour: mottled green in life (mottled brown when preserved), all other New Zealand species are basically brownish-black, brown to yellow-brown, mottled, banded or striped. Eyes almost hemispherical, flatter on the anterior median surface. Fastigium sub-conical in lateral view, medially deeply incised almost to base. Palps relatively short, 3rd and 4th entirely setose. Antennae: setose for entire length. Femoral apical spurs (prolateral/retrolateral): fore 1,0; middle 1,1; hind 0,0; fore and middle femora lacking spines below; hind femur with two prominent, subapical, flat, articulated spines on inner (posterolateral) ventral ridge; fore and middle tibiae each with 2 pairs of ventral articulated spines, set slightly asymmetrically; fore tibia with ventro-apical spurs; middle tibiae with both ventro-apical and latero-apical spurs; hind tibial shank with 3-4 almost paired,

articulated spines each flattened and with a sharp, curved apex (figs 1, 2) and setose margins, with 1-2 simple or slightly flattened spines between; hind tibia with pair of subequal dorsal spurs approx 0.75x length of metatarsus, and two shorter lateral spurs, no ventral spurs; tarsi setose, hind metatarsus lacking dorsal intermediate spines, the apical pair small; all metatarsi with broad, flat plantulae that lack linear rows of spinules alongside.

Etymology

Maoto: (adj) Maori, fresh green, particularly of new growth; *weta* (n) Maori name for animals in this group. The feminine gender is applied to this name.

***Maotoweta virescens* new species**

Species description

Length: male (holotype) 9 mm, antennae 32 mm, hind femur 7.4 mm, hind tibia 8.6 mm, hind metatarsus 1.4 mm, cercus 1.2 mm; female length 12 mm, ovipositor 5.5 mm.

Colour: bright mottled-green in life (mottled brown when preserved), the males being slightly duller than the one known female (figs 2, 3).

T 9 of both sexes expanded in centre, this subtriangular lobe slightly projecting upwards; male cerci cylindrical but slightly swollen in middle (fig 1), the apex blunt; female cerci relatively short, also swollen, the apices relatively sharp. Male suranal plate sharply reflexed ventrad, the surface apparently weakly sclerotised, ventral margin with broad, simple, almost rectangular median emargination, the lateral edges with a thin, heavily sclerotised, slightly convex, 'knife-edge' rim below; paranal plates broadly ovate and weakly sclerotised; 8th sternites enlarged; subgenital plate very short, transverse, slightly convex, transversely divided at styler bases, each style on its own separate plate, this with a short spine close to the style; region between styles weakly sclerotised, forming two lobes above and many fine, short spinules in the groove between.

Female: suranal plate with a median, almost unsclerotised rectangular lobe; subgenital plate reduced to two short, parallel, finger-like lobes; ovipositor curved, the dorsal valves smooth edged; ventral valves with 5-6 very weak teeth and ridges at apex.



Figure 2. *Maotoweta virescens* holotype male



Figure 3. Paratype female



Figure 4. General habitat

Material examined

Holotype ♂, paratypes 1 ♂, 1 ♀ Princhester Creek - Bog Creek forest, Takitimu Mountains, Southland, New Zealand. (167° 57.197', 45° 35.735') P M Johns and L D Cook. 5 Dec. 2006. Paratype ♂ same locality, P M Johns 1 Dec. 2006. All taken at night (approx 2100-2400 hrs) on mossy *Nothofagus menziesii* and *N. fusca* tree-trunks (figs 3, 4) (all in Canterbury Museum, Christchurch - CMNZ). Paratype ♂, same locality, L D Cook. 1-4 Dec. 2006 (unsuccessfully used for mtDNA purposes).

Non-type material, possibly not conspecific.

1 ♂ Lake Te Au, Fiordland National Park. R R Forster 12-24.i.53 (CMNZ)

1 ♀ Salisbury's Clearing, Mt Arthur. R R Forster 23.i.48 (CMNZ)

Etymology

virescens: Latin, growing green or verdant.

Remarks

The non-type material (CMNZ) mentioned above were not diagnosed as they are fragile. Further, fresh material is needed to confirm that they are *Maotoweta virescens*. A specimen in Gibbs and Morris (1998: Plate 13) is possibly conspecific, but the photograph shows a paler, browner animal and would need a voucher specimen associated with a male. Females of other species tend to be conservative in their structural details and singletons are thus difficult to identify.

The species is compared with the type species of those genera that have obvious *plantulae*, small bodies



Figure 5. Paratype male on moss (right hind leg missing)

and relatively short legs (Table 1). *Miotopus diversus* (Hutton, 1896) is not included as only the female holotype is known and no further specimens have been collected at or near its type locality. There are males from distant localities that have yet to be confirmed as this species that are presently placed in *Pleiopectron*.

It is exceedingly difficult to find the very cryptic specimens on the mossy tree-trunks (2 persons, 3 nights, total person-hours about 16 for 5 specimens). The holotype and paratype female were taken in copula on moss. It shares the habitat, at least at night, with the larger *Talitropsis sedilloti* Bolivar, 1882 and *Talitropsis chopardi* (Karny, 1937) (new combination), and on the ground is *Hemiandrus maculifrons* (Walker, 1869) (*Anostomatidae*). Up to 19 sub-adult and adult *Talitropsis* spp. were seen on one tree while searching for this species. Dozens of very small (?1st or 2nd instar) *Talitropsis* spp. were also seen.

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TABLE 1: Characters, based on the type species of each genus (excluding the large, long-legged *Pachyrhamma* Brunner von Wattenwyl, 1888 (see Cook et al 2007), *Macropathus* Walker, 1869, *Miotopus* Hutton, 1898, montane and monospecific insular genera)

Character	<i>Maotoweta viridescens</i> new species	<i>Pleiopectron simplex</i> Hutton, 1897	<i>Neonetus variegatus</i> Brunner von Wattenwyl, 1888	
body length	9-12 mm	12-18 mm	11-16 mm	
femoral spine formula	1,0: 1,1: 0,0	1,0: 1,1: 0,0	1,1: 1,1: 0,0	
hind femoral ventral ridge armature	several, usually 2, modified, flattened, moveable spines	0-few small fixed spines	10-15 small fixed points	
hind tibial shank spination	3-4 pairs flat, moveable spines; smaller slightly flattened socketted spines between	2-3 pairs immoveable socketted spines, 5-10 pairs fixed spines	23-28 pairs small immoveable socketted spines	
hind tibial apical spurs	long dorsal spurs shorter laterals no ventral pair	dorsal and lateral pairs, very small ventral pair	long dorsal spurs shorter laterals no ventral pair	
hind tarsal plantulae	broad, no spinules	very narrow, bordered with spinules	moderately broad, no spinules	
male subgenital plate	8th sternite enlarged, sgp very short, transverse, two short apical lobes between terminal styles	simple, quadrate, weakly lobed; styles close to corners	sgp very highly modified, partly fused with 8th sternite; massive central ridged portion separated from margins and elongate styles near base	
male suranal plate	subquadrate, weakly bilobed, each lobe with sclerotised transverse ridge below	weakly trilobed, no tubercles	weakly bilobed, no tubercles	
female subgenital plate	quadrate, partly unsclerotised & deeply bilobed,	truncated triangle	subtriangular, with 2 small apical lobes	

	Weta thomsoni Chopard, 1923	Isoplectron armatum Hutton, 1896	Talitropsis sedilloti Bolívar, 1882
	12-18 mm	11-17 mm	14-20 mm
	1,1; 1,1; 0,0-1	0,0: 0,1: 0,0	0,0: 0,1: 0,0
	0-2 very small points	single large spine	several fixed points & spines
	10-15 immoveable pairs, 10-30 smaller, irregularly spaced spines and points	11-14 pairs fixed spines, numerous small points	5-7 pairs of fixed long spines, 10-20 shorter points
	long dorsal spurs, shorter laterals, no ventral pair	short dorsal and laterals, very small ventral pair	short dorsal and laterals, no ventral pair
	narrow and shortened, bordered with numerous spinules	broad, no spinules	broad, no spinules
	very highly modified incorporating elements of preceding three sternites and intersegmental membranes; styles reduced (not absent as in Ward (1997))	very large, subtriangular with median ridge, styles long, midway	median ridge slightly extended, margins separate and styles midway
	subquadrate, no tubercles	subquadrate, weakly bilobed, each with single, short, broad tooth below	weakly bilobed, each with small arch of tubercles below
	greatly reduced to weak flap	short, broad, bilobed	very large, fully sclerotised, 4 sharp triangular lobes