

RESEARCH ARTICLE OPEN ACCESS

A New Species of Tokoriro in the Genus *Insulanoplectron* Richards (Orthoptera: Rhabdophoridae) from Rakiura/Stewart Island

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ABSTRACT

Five monotypic genera of Rhabdophoridae have been described from remote islands located south and east of New Zealand's South Island and surrounded by ocean for at least 100 km in all directions. These genera are *Novoplectron* Richards, 1958 from Chatham Islands; *Ischyroplectron* Hutton, 1896 from Bounty Islands; *Notoplectron* Richards, 1964 from Campbell Island; *Dendroplectron* Richards, 1964 from Auckland Islands; and *Insulanoplectron* Richards, 1970 from Snares Islands. It is only recently that one of these genera, *Notoplectron*, was shown to include a species previously described from mainland New Zealand, *Notoplectron brewsterense* (Richards, 1972). Here, we discuss the discovery of a new species of cave wētā on Rakiura/Stewart Island. Morphology and mitochondrial DNA show that the species is related to *Insulanoplectron spinosum* Richards, 1970. We thus describe the new species *Insulanoplectron stanneum* sp. nov. and redescribe the genus *Insulanoplectron* based on traits that are common to both species.

1 | Introduction

To the south and east of New Zealand's South Island are a number of remote islands and archipelagos, separated from the nearest land by at least 100 km of open ocean, in most cases several hundreds of kilometres. These include Rēkohu/Chatham Islands, located 850 km east of Christchurch, and five archipelagos in the Southern Ocean (Tini Heke/Snares Is., Motu Maha/Auckland Is., Motu Ihupuku/Campbell I., Moutere Mahue/Antipodes Is., and Moutere Hauriri/Bounty Is.) that are collectively referred to as Subantarctic Islands (Figure 1) and recognised as a world heritage site (UNESCO 2025). In spite of their remoteness and isolation, all of these offshore islands have been colonised by cave wētā (tokoriro in Te Reo Māori; family Rhabdophoridae) (Dowle et al. 2024), a family of flightless Orthoptera. The Chatham Islands are home to three species of tokoriro: *Talitropsis crassicuris* Hutton, 1896; *Talitropsis megatibia* Trewick, 1999; and *Novoplectron*

serratum (Hutton, 1903) (Hutton 1896; Hutton 1903; Trewick 1999). The Subantarctic Islands host one species in each archipelago: *Ischyroplectron isolatum* (Hutton, 1895) on the Bounty Islands; *Notoplectron campbellense* Richards, 1964, on Campbell Island; *Dendroplectron aucklandense* Richards, 1964, on Auckland Islands; and *Insulanoplectron spinosum* Richards, 1970, on Snares Islands (Figure 1) (Hutton 1895; Richards 1964; Richards 1970). An unidentified orthopteran, probably a rhabdophorid, has been seen on the Antipodes Islands, but no specimens have been collected (Marris 2000).

Except for *Talitropsis*, which is represented on all of mainland New Zealand by the ubiquitous *Talitropsis sedilloti* Bolívar, 1882, the remaining five genera listed above were established as monotypic genera restricted to remote islands. Modern genetic analyses support the validity of all five genera (Hegg et al. 2019; Dowle et al. 2024), but revealed that the genus *Notoplectron* is also present

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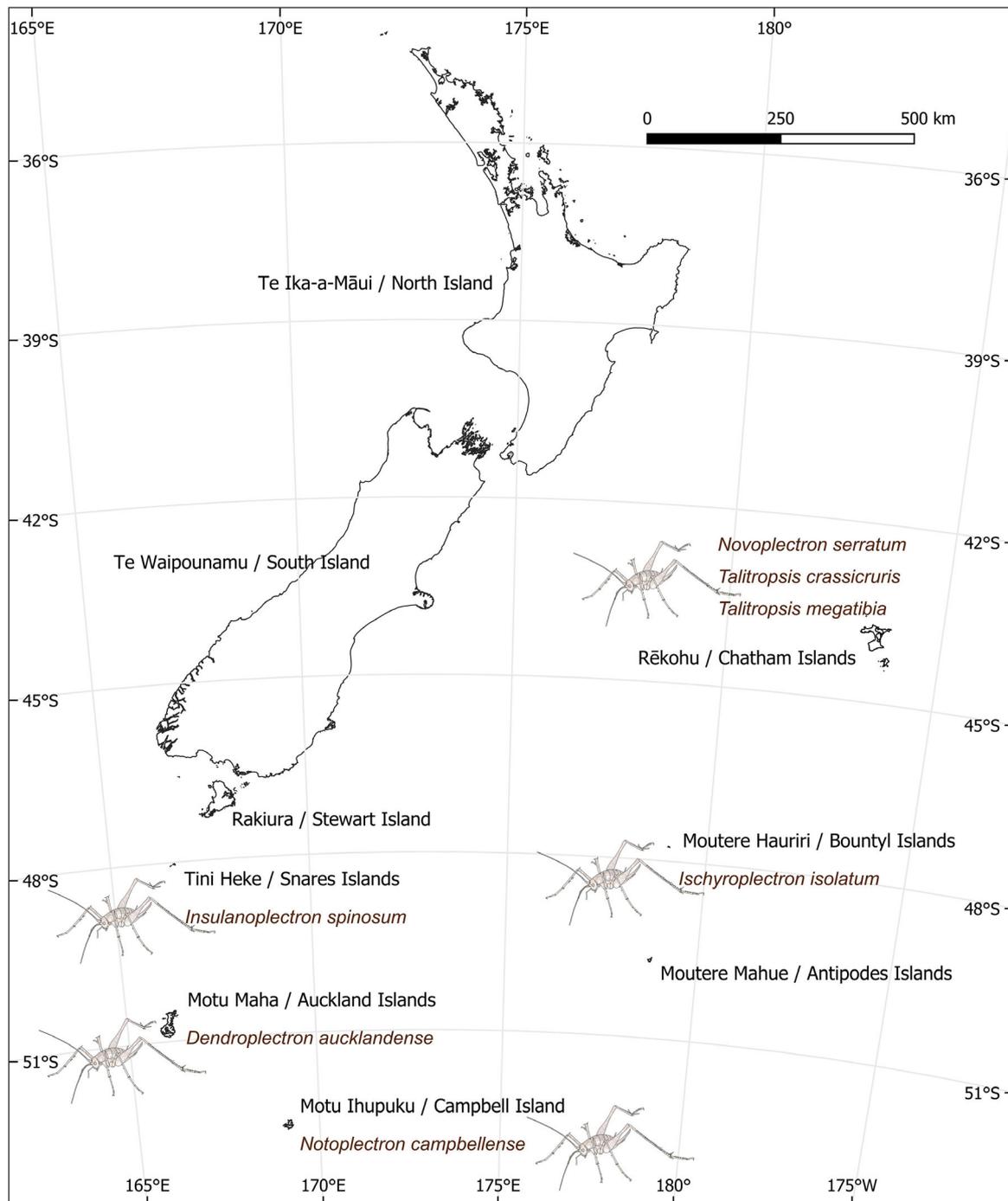


FIGURE 1 | Map of New Zealand and offshore islands, with endemic species of Rhaphidophoridae known from the Chatham and Subantarctic Islands.

on New Zealand's South Island with the species *Notoplectron brewsterense* (Richards, 1972), formerly placed in *Pharmacus* (Hegg et al. 2022). The remaining subantarctic genera *Dendroplectron*, *Insulanoplectron*, *Ischyroplectron*, and *Novoplectron* have remained as monotypic genera on their respective archipelagos.

In this paper, we examine the taxonomic placement of Rhaphidophoridae specimens we collected on the Tin Range on Rakiura/Stewart Island. Through a combination of morphology and mtDNA analysis, we show that the material examined belongs to a new species in the genus *Insulanoplectron* Richards, 1970. We describe the new species *Insulanoplectron stanneum* sp. nov., and we give an updated description for the genus, based on

morphological traits that are common to both species it now includes. We explore three possible scenarios for this enigmatic new species' ecology and distribution.

2 | Material and Methods

2.1 | Collection and Morphological Methods

All tokoriro examined as part of this study were collected using an insect net while spotlighting at night. They add to more than 5,800 specimens from all over New Zealand, which are held in the Phoenix Lab collection at Massey University (MPN). More than 1,000 specimens have been measured, examined in detail,

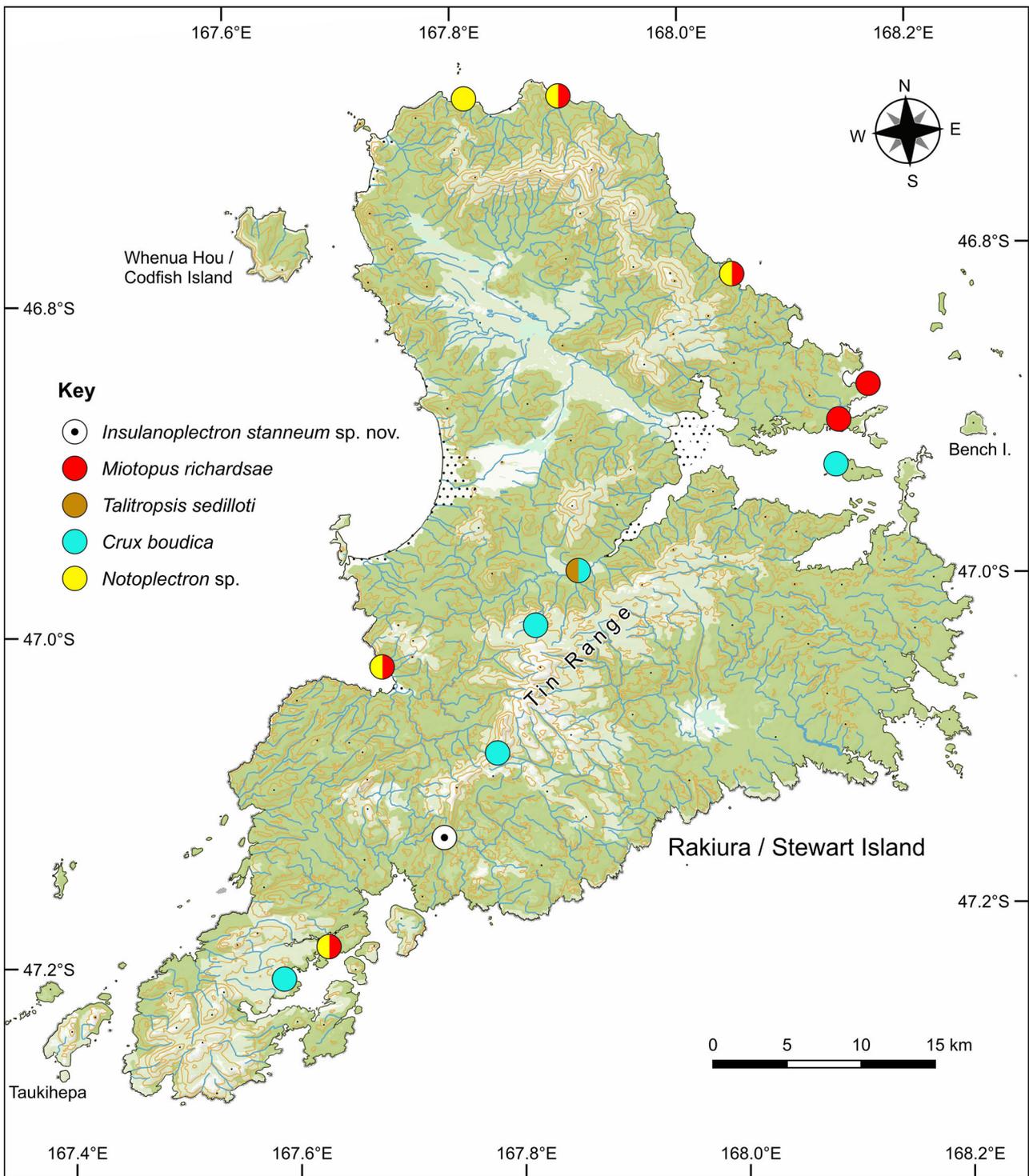


FIGURE 2 | Map of Rakiura/Stewart Island, showing locations searched during trips in 2017–2018. Species of Rhaphidophoridae at each site are identified by circles of different colours. Split circles indicate locations where two species were found.

and/or genotyped. In 2017 and 2018, Rhaphidophoridae were collected at 13 discrete localities on Rakiura/Stewart Island during the course of four separate visits (Figure 2). *Insulanoplectron spinosum* specimens were collected at the type locality, Station Point on North East Island (Tini Heke/Snares Islands), and were matched against the original description by Aola Richards (1970). Type material is deposited at the Museum of New Zealand Te Papa Tongarewa (NMNZ).

Specimens were examined and photographed using a DSLR camera (Nikon D800 or Nikon Z7 II) attached to a Mitutoyo M Plan Apo 5×/0.14 microscope objective and Nikon PB-6 bellows, mounted on a Cognisys Stackshot 3× automated rail. Focus stacks were generated using the software Helicon Focus 8.2.2 Pro (RRID: SCR_014462). Adults were distinguished from immature individuals by darker, sclerotised bodies and fully formed external genital structures. In particular, the pigmentation, shape and sharpness of ovipositors, subgenital plates, and cerci were informative about the

developmental stage. We looked for the presence/absence of articulated spines at the apex of all femora and tibiae (max. 22, see [Fitness et al. 2018](#); Figure 1), as well as the configuration and numbers of linear spines on all leg segments, the shape of the subgenital and suranal plates in both sexes, and the apex of the ovipositor. The nomenclature used in this paper is shown in Figure 3.

Measurements of key body parts (Table 1) were obtained using digital callipers with 0.01 mm resolution and rounded to the nearest 0.1 mm. For each species, median, minimum, and maximum values for all linear measurements and count data were calculated in JASP ver. 0.19.3 (RRID:SCR_015823; [JASP Team 2025](#)). We did not statistically test for sexually dimorphic measurements due to the small sample size. Where measurements are suspected to be sexually dimorphic, they are reported separately for males and females; otherwise, the measurements for both sexes are pooled. Some traits included in Table 1 are invariable among the species examined in this paper—they are included nonetheless, since they are useful for comparison with other genera of NZ Raphidophoridae (see tables in [Fitness et al. 2018](#); [Hegg et al. 2019](#); [Hegg et al. 2022](#); [Hegg et al. 2024](#)).

2.2 | Acronyms for Collections and Entomological Regions

iNaturalist = Available from iNaturalist.nz [accessed 6 July 2025]

MPN = Phoenix Lab, Massey University, Palmerston North, New Zealand

NMNZ = Museum of New Zealand Te Papa Tongarewa, Wellington, New Zealand

Two-letter codes in the 'Material examined' sections refer to the New Zealand entomological regions ([Crosby et al. 1998](#)). Codes used in this paper are as follows (Figure 4): SI = Stewart Island; SN = Snares Islands.

2.3 | Molecular Phylogenetic Analysis

From four specimens collected on Rakiura/Stewart Island and one from Snares Island, we extracted DNA, amplified, and sequenced a fragment of mitochondrial *COI* as previously described ([Fitness et al. 2018](#)). These DNA sequences were aligned with *COI* sequences from 21 specimens representing 16 New Zealand genera (GenBank accessions: OR551709; OR551710; OR551712 to OR551714; OR551717; OR551718; OR551720 to OR551730; OR551735; OR551736; PV935177; PP786548; PP786549; PV959966). Sequences were aligned and analysed using DNADynamo (Blue Tractor Software Ltd). Phylogenetic relationships were inferred with Maximum Likelihood analysis in IQ-TREE-2 ([Trifinopoulos et al. 2016](#); [Minh et al. 2020](#)) using ModelFinder for model selection ([Kalyaanamoorthy et al. 2017](#)) and 1000 ultrafast bootstrap replicates ([Hoang et al. 2018](#)).

3 | Results

Eleven specimens of *Insulanoplectron* (five males and six females) were collected at a single locality on Rakiura/Stewart Island during two separate visits. No specimens were found at 12 other locations searched on the island (Figure 2). Six specimens of *Insulanoplectron spinosum* (three males and three females) were collected at the species' type locality, Station Point on Tini Heke/Snares Islands (Figure 4).

Tokoriro collected on Rakiura and on the Snares Islands present a number of morphological similarities. These include dorsal linear spines on the hind tibiae that are visibly articulated at the base (Figure 5C), two rows of conspicuous spinules on either side of the pulvilli on the first and second tarsal segments (Figure 5D), and a lack of sexual dimorphism in the scapes of the antennae.

Specimens collected at the two localities also display a number of significant differences, including the shape of the external

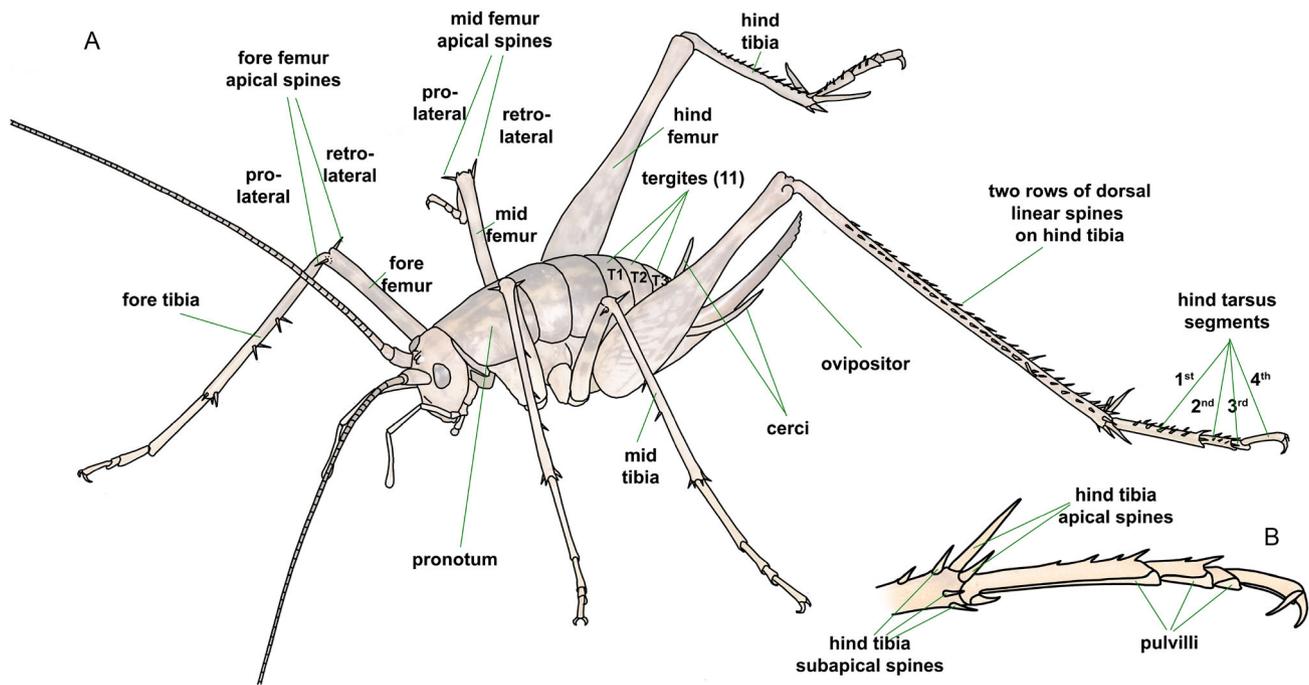


FIGURE 3 | Rhaphidophorid body plan (adult female), labelled with nomenclature used throughout this paper. (A) Whole insect. (B) Detail of hind tarsus, ventral view.

TABLE 1 | Dimensions and spine count of two tokoriro (Rhaphidophoridae) species in the genus *Insulanoplectron* Richards, 1970.

		<i>Insulanoplectron spinosum</i> Richards, 1970	<i>Insulanoplectron stanneum</i> sp. nov.
Sample size		6 (3♀, 3♂)	11 (6♀, 5♂)
Apical spines fore, mid, and hind femora ^a		1 0, 1 1, 0 0	1 0, 1 1, 0 0
Apical spines fore, mid, and hind tibiae		4-4-8	4-4-8
Body length, mm ^b		♀ 15.5 (13.8–16.4) ♂ 14.6 (12.4–15.3)	♀ 13.3 (12.0–14.0) ♂ 12.7 (12.2–14.1)
Pronotum length, mm		4.9 (4.5–5.2)	4.3 (3.6–4.8)
Eye colour		Dark brown	Dark brown
Ovipositor length, mm		13.2 (12.9–13.7)	10.1 (8.7–10.9)
Ratio ovipositor to body length		0.84 (0.83–0.96)	0.78 (0.64–0.84)
Teeth: ventral valve of ovipositor		17 (15–17)	0
Dorsal valve of ovipositor		Smooth	Smooth
Length of hind tibia, mm		♀ 14.2 (14.0–14.6) ♂ 17.0 (15.6–18.3)	♀ 16.95 (14.9–17.6) ♂ 16.8 (15.9–18.4)
Ratio hind tibia to body length		♀ 0.94 (0.85–1.03) ♂ 1.25 (1.11–1.26)	♀ 1.28 (1.10–1.41) ♂ 1.29 (1.23–1.45)
Superior spines on hind tibia	Prolateral	22 (18–23)	21 (18–23)
	Retrolateral	19 (18–22)	19 (17–21)
Spine density on hind tibia (count/mm)	Prolateral	♀ 1.57 (1.27–1.58)	♀ 1.19 (1.03–1.34)
	Retrolateral	♂ 1.29 (1.20–1.41)	♂ 1.26 (1.14–1.36)
		♀ 1.29 (1.03–1.34)	♀ 1.10 (0.97–1.21)
		♂ 1.20 (1.18–1.22)	♂ 1.14 (1.09–1.26)
Pairs of longer spines on hind tibia		0	0
Superior spines on 1 st tarsus segment		0 (0–2)	4 (3–7)
Superior spines on 2 nd tarsus segment		0	2 (1–3)
Fore tibia, inferior spines	Prolateral	3 (3–3)	3 (2–4)
	Retrolateral	3 (3–3)	3 (3–4)
Fore tibia, superior spines		0	0
Mid tibia, inferior spines	Prolateral	3 (2–3)	3 (3–3)
	Retrolateral	3 (3 – 3)	2 (1–3)
Mid tibia, superior spines	Prolateral	0	0
	Retrolateral	0	0 (0–1)
Fore femur, inferior spines	Prolateral	0 (0–1)	0
	Retrolateral	0	0
Mid femur, inferior spines	Prolateral	3 (0–6)	0
	Retrolateral	0 (0–1)	0
Hind femur, inferior spines	Prolateral	2 (2–29)	0
	Retrolateral	7 (7–10)	1 (0–2)

^aThe six numbers are, in order from left to right, as follows: fore femur prolateral and retrolateral, mid femur prolateral and retrolateral, hind femur prolateral and retrolateral. '1' means that an apical spine is present; '0' means that an apical spine is absent.

^bBody length is measured from the apex of the fastigium to the posterior margin of the suranal plate.

genitalia in males, the shape of the female subgenital plate, and the serrations at the apex of the lower valve of the ovipositor (Figures 6 and 7). These differences are consistent with two macroscopically distinct species.

MtDNA (*COI*) sequences from one Snares Islands and four Rakiura specimens were uploaded to GenBank (accession numbers PV959966, PV935178 to PV935181). The phylogeny

inferred from 26 Rhaphidophoridae DNA sequences resolved sister relationships between taxa from the same genera (Figure 4). For example, in the phylogenetic tree, *Talitropsis megatibia* is sister to *Talitropsis sedilloti*, and *Isoplectron armatum* is sister to *Isoplectron serratum*. Within our sampling, the species from Rakiura is sister to the Snares Island species *Insulanoplectron spinosum*, a relationship supported by bootstrap resampling (96%).

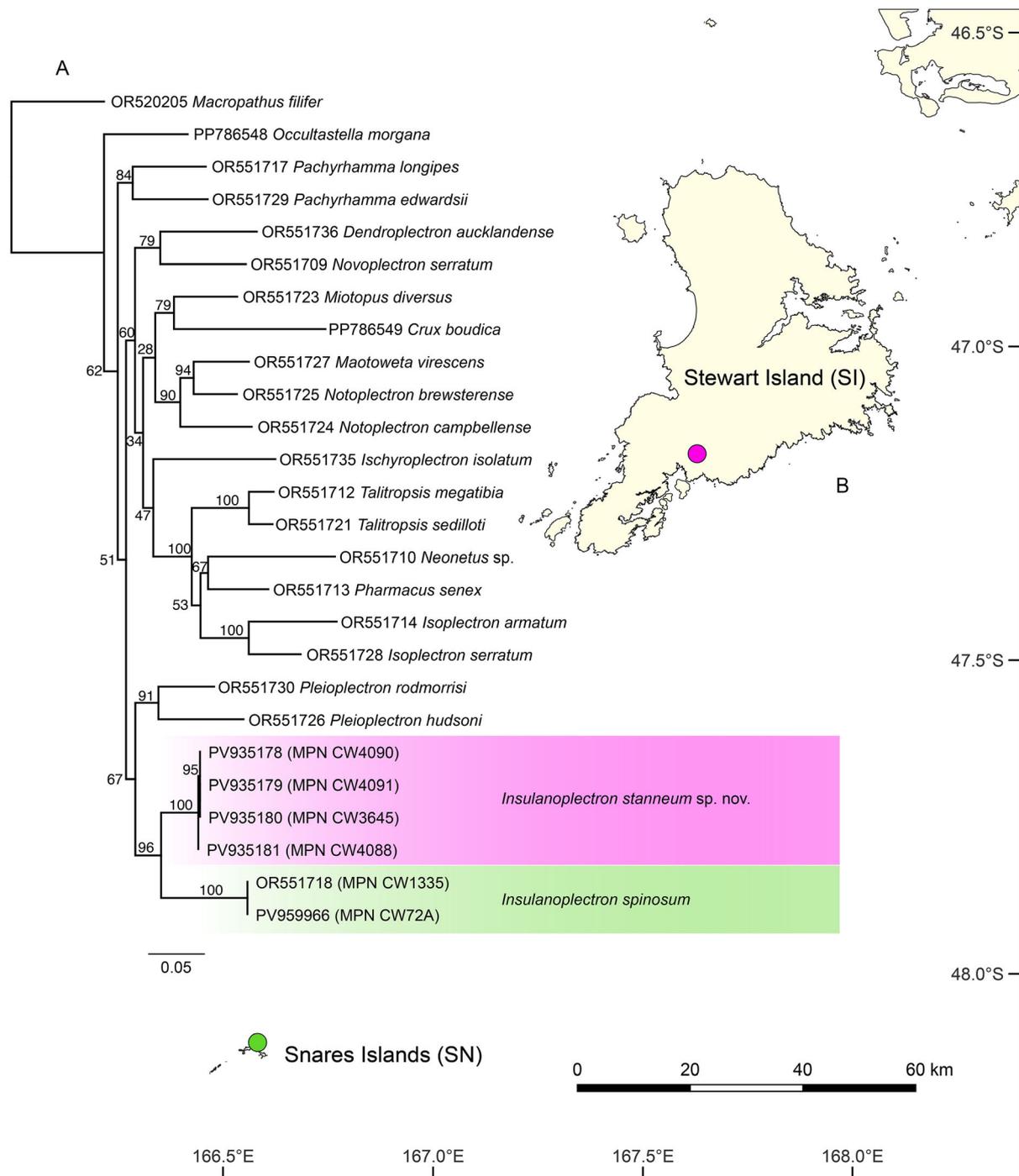


FIGURE 4 | (A) Maximum likelihood phylogeny of partial mitochondrial DNA cytochrome oxidase I sequences representing New Zealand tokoroiro genus-level diversity. Values at nodes are bootstrap percentages, and tip names include GenBank accession numbers. (B) Map of Rakiura/Stewart Island and Tini Heke/Snares Islands, showing locations of *Insulanoplectron* Richards, 1970. Green circle = *Insulanoplectron spinosum* Richards, 1970. Magenta circle = *Insulanoplectron stanneum* sp. nov. Acronyms in brackets are the area codes for the entomological regions (Crosby et al. 1998).

4 | Taxonomy

Class Insecta Linnaeus, 1758
 Order Orthoptera Latreille, 1793
 Superfamily Rhaphidophoroidea Walker, 1869
 Family Rhaphidophoridae Walker, 1869
 Subfamily Macropathinae Karny, 1930

Tribe Macropathini Karny, 1930

Genus *Insulanoplectron* Richards, 1970

Insulanoplectron Richards, 1970: 866–868, Figs. 1 to 6, Table I.

Insulanoplectron — Richards, 1974: 496, 498. — Dowle et al., 2024: 1–14, Figs. 1, 3, 4, Tables I, II.

Type species. *Insulanoplectron spinosum* Richards, 1970.

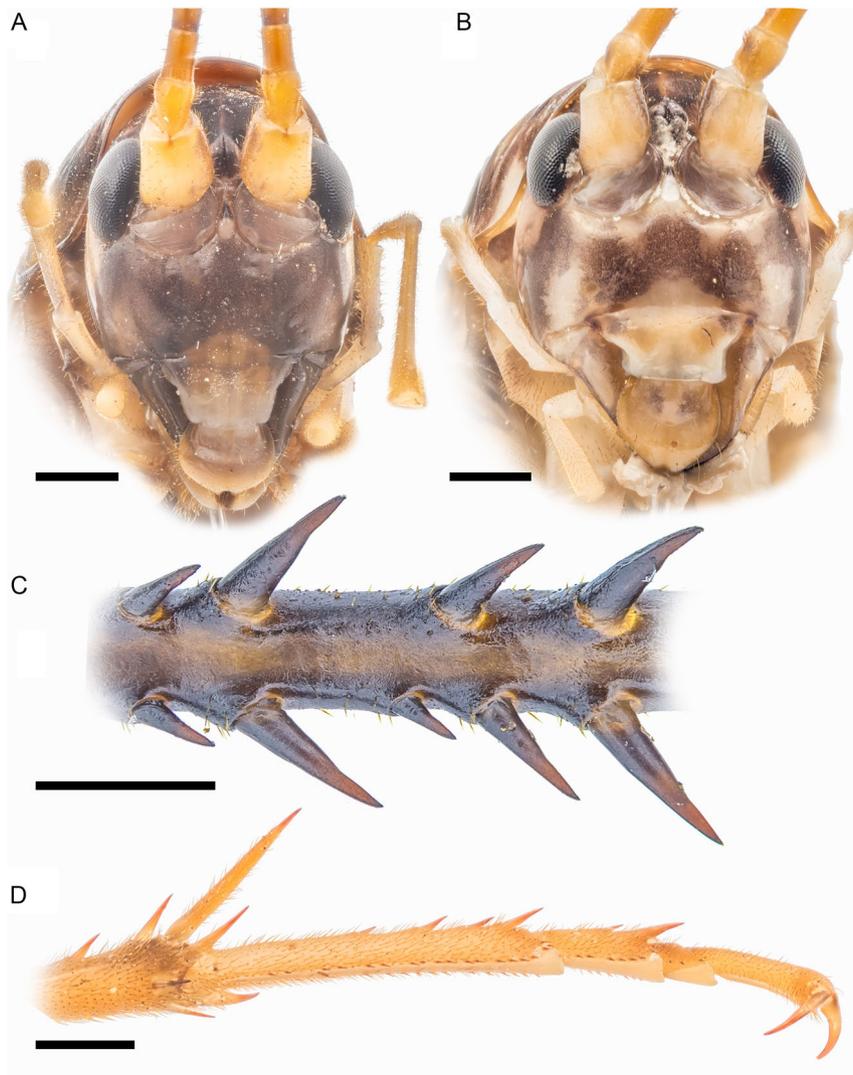


FIGURE 5 | Morphological traits that characterise the Rhabdiphoridae genus *Insulanoplectron* Richards, 1970. (A,B) Frontal view of head in adult male (A) *Insulanoplectron spinosum* Richards, 1970. Station Point, Snares Islands. (MPN CW5840). (B) *I. stanneum* sp. nov. Tin Range, Stewart Island (MPN CW3915). (C) Detail of dorsal spines on left hind tibia in *I. spinosum*. Station Point, Snares Islands. (MPN CW5833). (D) Hind left tarsus in *I. stanneum* sp. nov. Tin Range, Stewart Island. (MPN CW3915). Scale bars = 1 mm.

Etymology. *Insulanoplectron* means ‘island tokoriro.’ When [Hutton \(1896\)](#) designated the genera *Isoplectron* and *Pleioplectron*, he most likely used the Greek word *plectron* to refer to the dorsal spines on the hind tibiae ([Hegg et al. 2019](#); [Hegg et al. 2024](#)). [Richards \(1964; 1970\)](#) extended the word’s meaning to include the whole insect. The name *Insulanoplectron* is neuter gender.

Diagnosis. A genus of small- to medium-sized Rhabdiphoridae (adult body length typically 12–16 mm), dark reddish-brown to brown in colour, with a conspicuous pale patch on the inferior margin of the lateral lobes of pronotum, mesonotum, and metanotum (Figure 8). Fore femora always armed with one prolateral spine at the apex, whereas a retrolateral apical spine is always absent. Mid femora armed with both a prolateral and a retrolateral apical spine. Dorsal linear spines on the hind tibiae relatively strong and visibly socketed at the base (Figure 5C). Pulvilli on the first and second tarsal segment always delimited at the base by a row of small spinules on each side (Figure 5D).

Description.

The description below applies to both species in the genus

Insulanoplectron. Individual species descriptions only include details that are specific to each species.

MEASUREMENTS. See Table 1.

HEAD. (Figure 5A, B). Glabrous, broadly oval in shape, gradually tapering towards the labrum in the bottom third. Eyes rounded, taller than wide. Eye colour uniform dark brown to black. Fastigium divided by a deep median groove; dark with pale ocellum on either side. Median ocellum distinctly visible near the lower margin of the sockets of the antennae. No visible sexual dimorphism in scapes of antennae or any other head part. Labial and maxillary palps pale, with moderately dense tomentum.

THORAX. Pronotum, mesonotum, and metanotum dark brown or reddish brown, except for a conspicuous pale patch on the lower edge of all lateral lobes. Margin of lateral lobes of pronotum and mesonotum thickened with a weak rim, slightly up-turned. In dorsal view, the pronotum is approximately as wide as it is long.

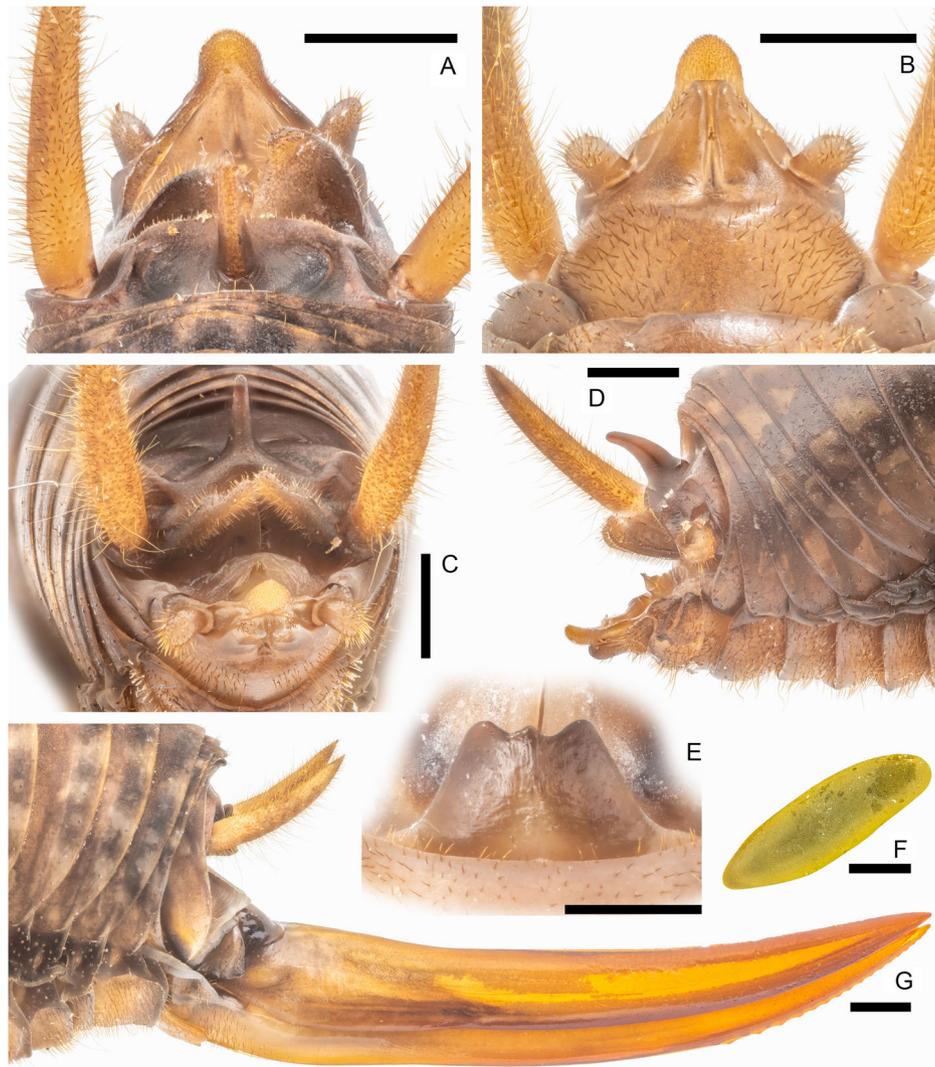


FIGURE 6 | Male and female terminalia in *Insulanopteron spinosum* Richards, 1970. Station Point, Snares Islands. (A–D) Male terminalia; (A) dorsal, (B) ventral, (C) posterior, and (D) lateral views. (A) MPN CW5832. (B–D) MPN CW5833. (E) Female subgenital plate. (F) Egg, extracted from the female's abdomen. (E,F) MPN CW5841. (G) Ovipositor. MPN CW5842. Scale bars = 1 mm.

LEGS. Fore and mid legs tomentose, alternating pale and dark bands. Fore femora armed with a prolateral apical spine; retrolateral apical spine always absent. Mid femora always armed with prolateral and retrolateral apical spines. Fore and mid tibiae each fitted with three pairs of needle-shaped ventral linear spines, and with two pairs of apical spines, one above and one below; the spines in the bottom pair are longer than the ones above. Hind femora relatively stout, three times as long as their maximum width. Hind tibiae armed with c. 20 pairs of fairly strong dorsal linear spines, visibly socketed at the base (Figure 5C). Hind tibiae armed with two pairs of apical and two pairs of sub-apical spines at the apex (8 spines total; see Figure 3B). Fore, mid and hind tarsi bearing two rows of small spinules ventrally on each side of the pulvilli on the first and second tarsal segments (Figure 5D).

ABDOMEN. Colour and tomentum vary by species.

FEMALE TERMINALIA. Subgenital plate trapezoidal, tricuspidate on posterior margin (Figures 6E and 7E). Upper valve of ovipositor always smooth, not serrated.

Distribution. New Zealand, Tini Heke/Snares Islands, and Rakiura/Stewart Island.

Insulanopteron spinosum Richards, 1970

Figures 1, 4, 5A,C, 6, and 8A,B

Insulanopteron spinosum Richards, 1970: 866–868, Figs. 1–6, Table 1.

Insulanopteron spinosum — Richards 1974: 496, 498. — Dowle et al. 2024: 1–14, Figs. 1, 3, 4, Tables I, II.

Etymology. The Latin adjective *spīnōsus* means ‘spiny’. While not explicitly stated in the original description, the species name almost certainly refers to the ‘small, blunt spine [located] medially on the suranal plate’ (Richards 1970) (see Figure 6D).

Diagnosis. A small- to medium-sized raphidophorid, dark brown to black mottled with mid brown/red. Sexual dimorphism is noticeable in the insect's measurements, with females having a larger body, but males sporting longer legs. While similar to its sister species from Rakiura, *Insulanopteron spinosum* is unique in the following morphological traits: frons and vertex uniformly brown

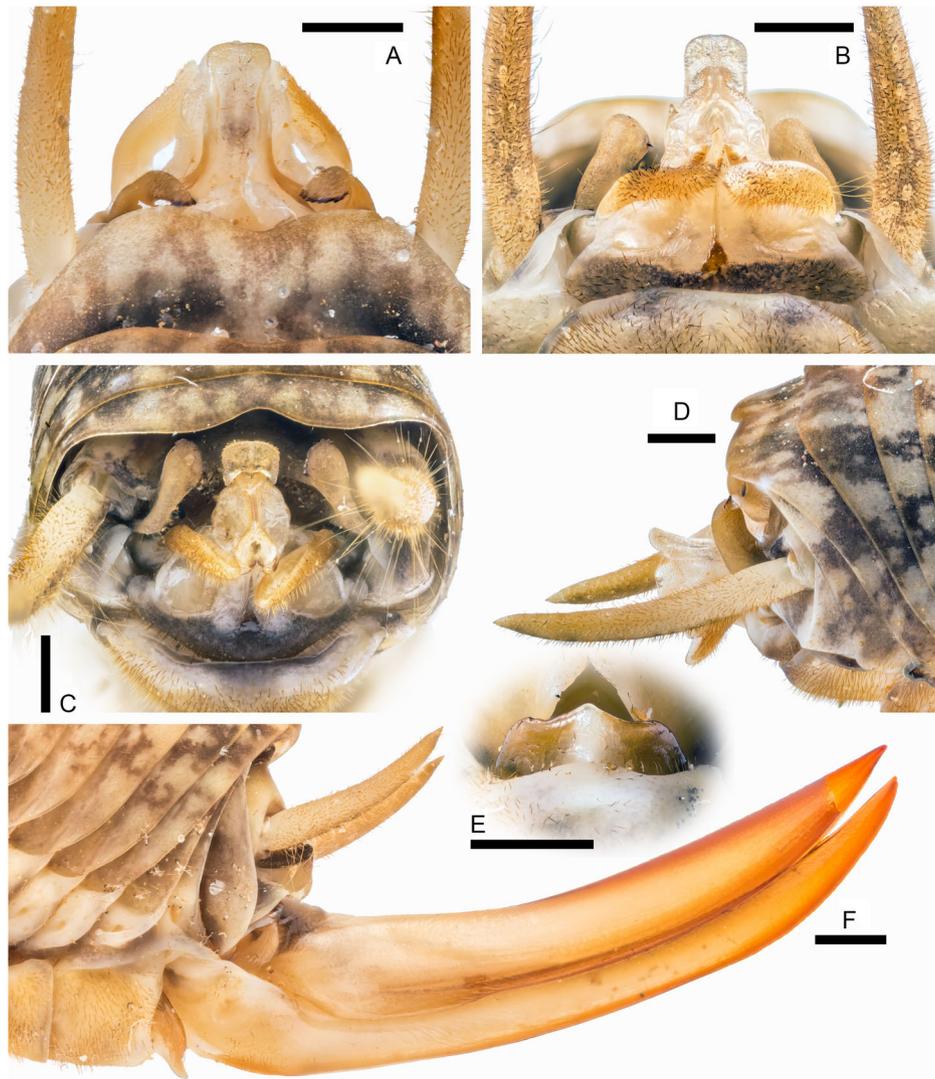


FIGURE 7 | Male and female terminalia in *Insulanopteron stanneum* sp. nov. Tin Range, Stewart Island. (A–D) Male terminalia; (A) dorsal, (B) ventral, (C) posterior, and (D) lateral views. (A,B) MPN CW4088. (C,D) MPN CW4087. (E) Female subgenital plate. (F) Ovipositor. (E,F) MPN CW4090. Scale bars = 1 mm.

(Figure 5A); body only sparsely tomentose or entirely glabrous. All femora armed ventrally with a variable number of linear spines. The fore femur may have none; the hind femur may have any number between 2 and 30 on the outer edge (Table 1). First segment of hind tarsus only occasionally bearing one or two dorsal linear spines; most frequently it is unarmed. Male terminalia as shown in Figure 6A–D, with a conspicuous blunt tooth jutting backwards from the suranal plate. Female subgenital plate tricuspidate and depressed at centre (Figure 6E). Lower valve of ovipositor finely serrated near apex (Figure 6G).

Holotype (Not Sighted)

NEW ZEALAND • ♂, adult; Snares Islands (SN), Station Point; 48.023° S, 166.610° E; 10 m a.s.l.; 6 Dec. 1947; Sir C. Fleming leg.; on *Macrolechia lyallii* on forest floor; NMNZ AI.000642.

Material Examined

NEW ZEALAND – Snares Islands (SN) • 2 ♀♀; same data as for holotype; 21 Apr. 1998; T. de Cruz leg.; MPN CW72B, CW166 • 1 ♀; same data as for preceding; GenBank: PV959966; MPN CW72A • 1 ♂; same data as for holotype; 16 Apr. 1998; T. de

Cruz leg.; MPN CW165 • 5 specimens; same data as for holotype; 11 Apr. 2010; NIWA leg.; MPN CW1334, CW1336 to CW1339 • 1 nymph; same data as for preceding; GenBank: OR551718; MPN CW1335 • 3 ♂♂; same data as for holotype; 12 Apr. 2025; K. Rexter-Huber & K. Simister leg.; MPN CW5832, CW5833, CW5840 • 3 ♀♀; same data as for preceding; MPN CW5841 to CW5843.

Description. The original description by Richards (1970) is adequate. Here, we only report on any discrepancies or omissions we observed in the material we examined. See also Figures 5A and 6.

The upper part of the insect's body is mostly glabrous. Richards (1970) stated that 'No linear spines occur on fore and middle femora or all tarsi'. We found that while the hind tarsi are mostly unarmed, the first segment does occasionally bear one or two dorsal linear spines. The mid femora on the other hand are mostly armed with up to six ventral linear spines on the anterior edge, one ventral linear spine on the posterior edge. A ventral linear spine is occasionally present on the anterior edge of the fore femur also.

EGG (Figure 6F). Dimensions 1.2 mm wide and 3.8 mm long, rounded at one end, pointed at the opposite end. Exterior surface pattern typical of all Orthoptera eggs.

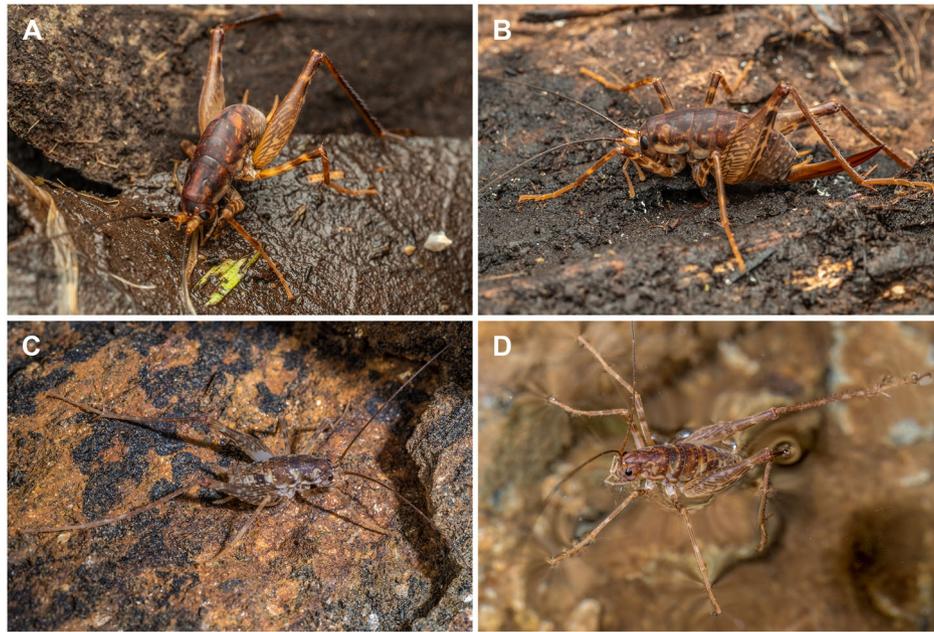


FIGURE 8 | Live *Insulanoplectron* Richards, 1970, in their natural habitat. (A,B) *Insulanoplectron spinosum* Richards, 1970. Station Point, Snares Islands, (A) male, (B) female. (C,D). *I. stanneum* sp. nov. Tin Range, Stewart Island, (C) male, (D) female.

MEASUREMENTS. See Table 1.

Distribution. New Zealand, Tini Heke/Snares Islands. Currently only known from North East Island.

***Insulanoplectron stanneum* sp. nov.**

Figures 2, 4, 5B,D, 7, and 8C,D

Etymology. The Latin adjective *stanneus* means ‘made out of tin’. The insect was discovered in an abandoned tin mineshaft on the Tin Range, Rakiura/Stewart Island.

Diagnosis. A small- to medium-sized rhabdiphorid, brown to reddish/brown. No noticeable sexual dimorphism in the insect’s body or leg length. While similar to its sister species from Snares Islands, *Insulanoplectron stanneum* is unique in the following morphological traits: frons and vertex mottled white/brown (Figure 5B); body covered in fine tomentum. Fore and mid femora unarmed; hind femora only occasionally armed with up to two ventral linear spines on the inner edge. First and second segments of the hind tarsus always bearing up to seven and three dorsal linear spines respectively. Male terminalia as shown in Figure 7A–D. Female subgenital plate tricuspidate and depressed laterally (Figure 7E). Lower valve of ovipositor smooth, not serrated (Figure 7F).

Material Examined

Holotype

NEW ZEALAND • ♂, adult; Stewart Island (SI), Tin Range; 47.13880° S, 167.74733° E; 460 m a.s.l.; 8 Mar. 2018; D. Hegg leg.; in disused mineshaft; NMNZ AI.083908 (MPN CW4087).

Paratype

NEW ZEALAND • ♀, adult; same data as for holotype; GenBank: PV935178; NMNZ AI.083909 (MPN CW4090).

Other Material

NEW ZEALAND – **Stewart Island (SI)** • 3 ♀♀; same data as for holotype; 19 Jan. 2018; MPN CW4093 to CW4095 • 1 ♂; same data as for preceding; GenBank: PV935179; MPN CW4091 • 2 ♂♂;

same data as for preceding; MPN CW3915, CW4092 • 1 nymph; same data as for preceding; GenBank: PV935180; MPN CW3645 • 2 nymphs; same data as for preceding; MPN CW3646, CW3647 • 2 ♀♀; same data as for holotype; MPN CW3919, CW4089 • 1 ♂; same data as for holotype; GenBank: PV935181; MPN CW4088.

Description

HEAD. (Figure 5B). Broad in frontal view, almost round above the clypeus; mostly glabrous, except for palps and scapes of antennae. Vertex brown. Frons brown at centre and under the eyes, with large pale patches above the mandibles and beneath the scapes of the antennae. Clypeus and palps pale; labrum tawny.

THORAX. As per genus description. Pronotum, mesonotum, and metanotum covered with fine tomentum.

LEGS. Apical spines on all femora and tibiae, ventral linear spines on fore and mid tibiae, and dorsal linear spines on hind tibiae, as per genus description. Fore and mid femora always unarmed below. Mid tibiae occasionally with a dorsal linear spine on the posterior edge. Hind femora with up to two ventral linear spines on interior edge only. Hind tarsi always armed with dorsal linear spines, up to seven on the first tarsal segment, up to three on the second segment. Two rows of small but conspicuous spinules border the pulvilli on the first two tarsal segments on each side (see Figure 5D).

ABDOMEN. All tergites covered in dense, fine tomentum. Colour mottled brown, variable in tone between individuals (see Figure 8C, D).

MALE TERMINALIA (Figure 7A–D). Suranal plate absent and subgenital plate heavily reduced, fully exposing the genitalia. Paraprocts long and recurved upwards, ending with a sharp, heavily sclerotised, serrated margin, presumably to hold the female in place during copulation.

FEMALE TERMINALIA. Female subgenital plate trapezoidal, tricuspidate, longer medianly than laterally (Figure 7E).

Ovipositor about three quarters of body length, smooth and without any serrations on both dorsal and ventral valves.

MEASUREMENTS. See Table 1.

Distribution. New Zealand, Rakiura/Stewart Island. Currently only known from one location at the southern end of the Tin Range (Figure 2).

5 | Discussion

A phylogenetic study of subantarctic Rhabdiphoridae has found that the most recent common ancestors of five island species with their nearest mainland relatives were all much older than the islands they live on (Dowle et al. 2024). This observation of old lineages on young islands means that more closely related taxa were not available for analysis. This might reflect true absence (extinction) or failure of discovery. In the case of *Insulanoplectron spinosum* from the Snares Islands, we have found the latter to be true.

5.1 | Rhabdiphorid Fauna on Rakiura/Stewart Island

The discovery of *Insulanoplectron stanneum* sp. nov. adds to six other Rhabdiphoridae known from Rakiura/Stewart Island. The presence on the island of *Crux boudica* Trewick, 2024; *Miotopus richardsae* Fitness et al., 2018; and *Praecantrix silvatica lutea* Hegg et al. 2024, has been documented in the respective species descriptions. The Phoenix Lab collection at Massey University (MPN) also holds specimens of *Talitropsis sedilloti* and of an undescribed *Notoplectron* species originating from Rakiura. In addition, *Pleioplectron simplex* Hutton, 1896, has been recorded in Oban (e.g. iNaturalist 200481242).

Crux boudica, *Miotopus richardsae*, *Praecantrix silvatica*, and *Talitropsis sedilloti* are all forest species that are sympatric over much of Rakiura. *Crux boudica* is also found in shrubland on the island's wind-swept tops, whereas *Miotopus richardsae* also ventures onto rocky coastlines, which it shares with *Notoplectron* sp. *Pleioplectron simplex* has only been recorded from inhabited areas in Oban and may be a recent, accidental introduction from the South Island.

5.2 | Habitat and Distribution of *Insulanoplectron*

Each species of *Insulanoplectron* is only known from one locality (Figure 4). In contrast, the vast majority of New Zealand rhabdiphorid species are widespread over large geographical regions and have been sampled at multiple locations.

Every single specimen of *Insulanoplectron spinosum* collected so far, starting with the holotype discovered by Sir Charles Fleming in 1947, originates from Station Point on North East Island, the main island in the Snares. No tokoriro have ever been recorded elsewhere on North East Island nor on other islands of the archipelago: Broughton Island, Alert Stack, or the Western Chain. To a large extent, this reflects the nature reserve status of the Snares Islands, to which access is highly controlled. Station Point is where the researchers' hut is and is the only place on the Snares Islands where scientists are allowed to remain overnight.

As finding nocturnal insects is best achieved by searching at night when they are active (Reid and Hutton 2024), it is likely that *I. spinosum* is more widespread on North East Island, Broughton Island and Alert Stack, and that it has not been found there because of a lack of searching opportunities.

Some details of the life history of *I. spinosum* are reasonably well known. Male and female *I. spinosum* go through eight and nine nymphal instars, respectively. Contrary to the inference by Richards (1970), *I. spinosum* hides in seabird burrows during the day and probably lays its eggs in the burrow's walls (Butts 1983). During the night, it emerges and climbs onto the trunks and into the foliage of *Macroleaia lyallii* trees. The diet is typical of Rhabdiphoridae, comprising a mixture of plant and animal matter. Crop contents examined by Butts (1983) contained mainly vegetal matter in nymphs, with the animal component of the diet progressively increasing to approach 50% in adults. The crop of first instar nymphs however contained over 90% animal matter. It is likely that an important proportion of nutrients is scavenged from dead seabirds (Butts 1983).

Insulanoplectron stanneum sp. nov. is also only known from one locality, a disused mineshaft at the southern end of the Tin Range on Rakiura/Stewart Island (Figures 2 and 4). In this instance, we cannot put the blame on limited searching opportunities. We have collected tokoriro at 13 distinct localities on the island (Figure 2). More significantly perhaps, of 130 Rhabdiphoridae observations from Rakiura entered in iNaturalist as of 12 July 2025, none are of *I. stanneum* sp. nov.

Furthermore, we have observed the species only in a human-made cavity, never in the natural environment. The mineshaft that is the type and only locality is permanently flooded and requires wading to enter. The entrance is surrounded by dense shrubs that are typical of wind-swept mountain tops on Rakiura at 500 m a.s.l. We have searched in similar vegetation at two other locations on the Tin Range; the only tokoriro we have found there was *Crux boudica* (Figure 2). More work is required to understand the habitat requirements of *I. stanneum* sp. nov. In an effort to direct future searches, we discuss three alternative scenarios.

It is possible that *I. stanneum* sp. nov. lives in subalpine shrubland at mid elevations on Rakiura, at relatively low densities perhaps, and that it has therefore been missed while searching in vegetation on the Tin Range. To confirm whether this is the case, more time should be spent searching at night in similar habitat on Rakiura, on the Tin Range, on Mt Rakeahua, on Hananui/Mt Anglem, or on the Deceit Peaks.

We have observed in countless searches throughout the country that cave wētā found in wet caves and mineshafts are often insects that predominantly inhabit canyons, river gorges, or overhung stream banks. These insects are rarely observed, not because they are rare or cryptic, but because nobody likes wading in canyons or crawling in mud, especially at night. If this scenario is true, then searches for *I. stanneum* sp. nov. should focus on overhung riverbanks and canyons at the toe of waterfalls anywhere on Rakiura—a rather unappealing proposition on an island where most streams flow slowly and deep.

Considering what is known about the association of *I. spinosum* from Snares Islands with seabird burrows (Butts 1983), it is also possible that *I. stanneum* sp. nov. prefers similar habitat. If so, it might have become scarce due to the disappearance of burrowing

seabirds on Rakiura following the introduction of mammalian predators by humans. Feral cats *Felis catus*, brushtail possums *Trichosurus vulpecula*, and three species of rats *Rattus* spp. are known threats to native wildlife on Rakiura (Harper 2009; Towns et al. 2011). Butts (1983) also noted that ‘*Insulanopteron responded to human interference most often by remaining absolutely still*’. This is the same defence strategy used by giant wētā (*Deinacrida* spp.), and while it might work against visual predators, it is ineffective against mammals that track prey by scent (Field and Glasgow 2001). While many species of cave wētā on mainland New Zealand are coping with the presence of introduced mammalian predators, there are some that do not. *Novopteron serratum* for instance is associated with the burrows of petrels that became extinct on main Chatham Island early on, and while it was discovered on Pitt Island in 1903 (Hutton 1903), it was last sighted there in 1924 and is now believed to only survive on predator-free Rangitira and Mangere Islands (Lysaght 1925; Richards 1958; Hegg 2024). If *I. stanneum* sp. nov. typically roosts at ground level in bird burrows, it would be especially susceptible to predation by introduced mammals. If this is the case, searches for this tokoriro should be conducted on islands where burrowing seabirds are still present, i.e. the Tītī Islands (Dicey 2025).

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Disclosure

The authors report there are no competing interests to declare.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

All DNA sequences used in this study are available at <https://www.ncbi.nlm.nih.gov/nuccore> [accession numbers: OR551709; OR551710; OR551712 to OR551714; OR551717; OR551718; OR551720 to OR551730; OR551735; OR551736; PV935177; PP786548; PP786549; PV959966; PV935178 to PV935181].

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