Revision of the Rhaphidophoridae (Orthoptera) of New Zealand

Part I.—The Rhaphidophoridae of the Chatham Islands 1954 Expedition

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Abstract

Two species, comprising the total known rhaphidophorid fauna from the Chatham Islands, are redescribed, their synonymy discussed, and one of them placed in a new genus. Attention is drawn to the wide range of variation within each species. The paucity of Orthoptera in the Chatham Islands is noted, five species only having been recorded, and the ecology of the two rhaphidophorids is discussed

Introduction

The Order Orthoptera appears to be very poorly represented at the Chatham Islands, five species only having been recorded. These consist of two rhaphidophorids, one henicid, one blattid and one phasmid; and of these the two rhaphidophorids are by far the most abundant, a single specimen only of both the henicid and the phasmid having been collected Till 1897, when J. J. Fougère visited the Chathams and collected *Periplaneta undulivitta* (Walker), the only orthopterous insect known from there was *Talitropsis crassicruris* Hutton In 1896-97, Dr. Schauinsland also visited the Chatham Islands and obtained specimens of *Platyzosteria brunni* (Alfken), probably synonymous with *Periplaneta undulivitta, Talitropsis crassicruris* Hutton, which was placed in a new genus *Gammaroparnops* Alfken, *Onosandrus focalis* (Hutton) now *Zealandosandrus maculifrons* (Walker), and *Argosarchus horridus* (White). In 1903 Fougère made another trip to the Chathams, where he collected two males and two females of *Novoplectron serratum* (Hutton) from Pitt Island. In the summer of 1924, the Otago Institute sent a party to the Chatham Islands and several specimens of *T. crassicruris* and one of *N. serratum* were collected by Archey, Lindsay and Cannon from Kaingaroa and Ouwenga on Chatham Island, and also from Mangere Island. In 1937, further specimens of both species were collected by Mr. E. G. Turbott of the Auckland Museum, from South East Island. In the Chatham Islands 1954 Expedition, as in the 1924 trip, the only Orthoptera collected were *T. crassicruris* and *N. serratum*. Nineteen specimens of *T. crassicruris* from South East Island, The Sisters, Pitt Island, Kaingaroa and Waitangi, and 31 specimens of *N. serratum* from South East Island and The Sisters were collected by Forster and Dell. *N. serratum* is endemic to the Chathams, and although Hutton records *T. crassicruris* as occurring also on Banks Peninsula, and his type material was collected from there, no more have been seen since, while they appear to be well distributed throughout the Chatham Islands. The lack of speciation among the Rhaphidophoridae is strange when one compares it with the large number of species present on the North and South Islands of New Zealand, and could perhaps be attributed to lack of suitable ecological niches.

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Order ORTHOPTERA
Super-Family GRYLLACRIDOIDEA
Family RHAPHIDOPHORIDAE
Sub-Family MACROPATHINAE
Genus TALITROPSIS Bolivar, 1882

Talitropsis crassicruris Hutton, 1896.

1897. *Talitropsis crassicruris* Hutton, *Trans N Z Inst*, 29, p. 226, Pl XII, Figs 8, 8a
1901. *Gammaroparnops crassicruris* (Hutton) Alfken, *Abhand Naturwiss Ver. Bremen* XVII, Band 1 Heft. pp. 146–150.
1925. *Gammaroparnops crassicruris* (Hutton), *Rec. Cant. Mus.* Vol. II, No. 5, pp. 302–306, Figs 1–5.

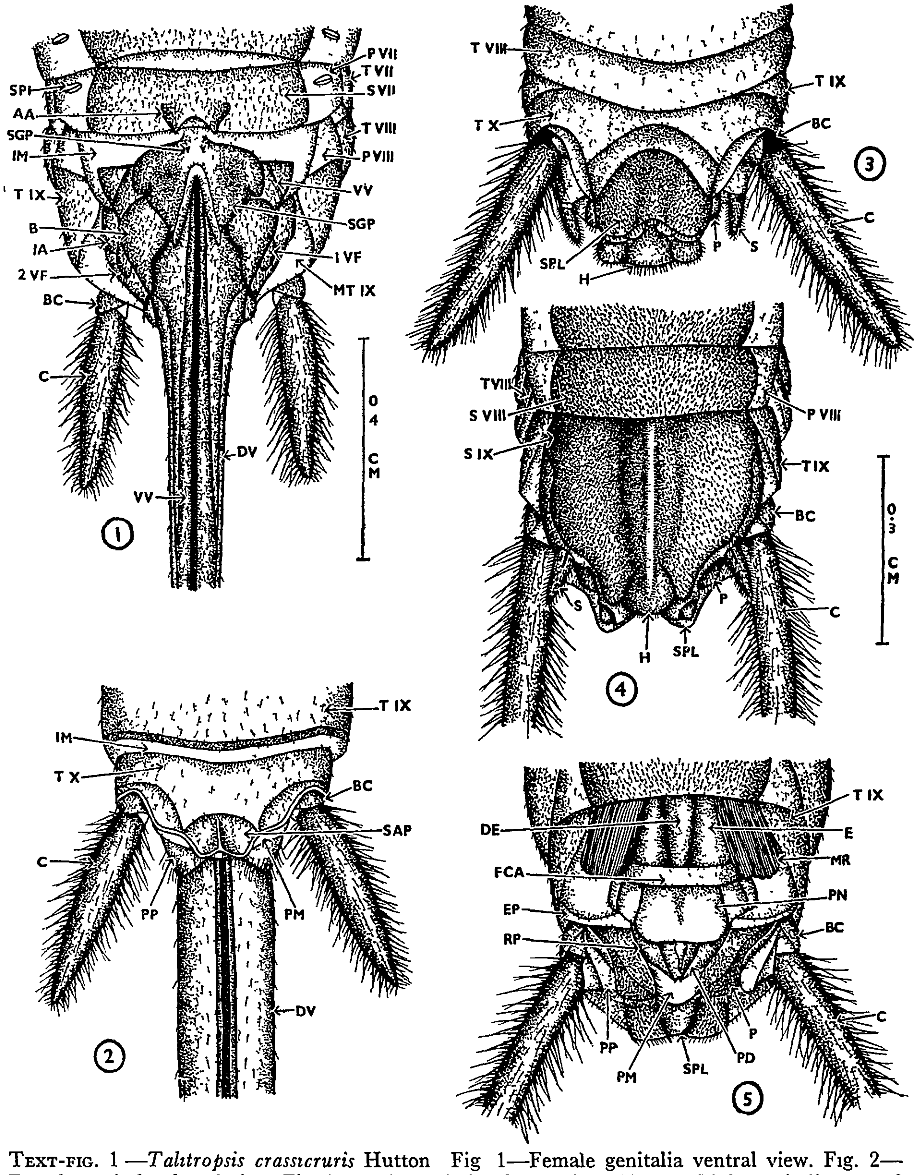
Plate 24. Figs. 1, 2. Text-fig. 1, Figs. 1–5

The Genus *Talitropsis* was erected by Bolivar in 1882 to describe a new species of cave-weta endemic to New Zealand, which he called *Talitropsis sedilloti.* In 1897, Hutton added two new species to this genus, *T. crassicruris* and *T. irregularis* Comparison of specimens of *T. crassicruris,* collected on the Chatham Islands 1954 Expedition, with the generic description show that they differ from it in two points Hutton says, " Subgenital plate in the female with three angular notches on the posterior margin." I have found this to be the case in only one specimen which was deeply notched medianly and had two small lateral notches. All other specimens examined are deeply emarginate medianly, but have no other notches. Hutton's type material has the lateral margins concave, while in all other specimens they are convex. He also says, " Femora without apical spines, or with a short stout one on the inner side," but they sometimes have a pair of apical spines on the hind femora, although the retrolateral one is small and may only be recognisable as a tubercle. Sometimes either prolateral or retrolateral apical spines or both are present on the fore and middle femora (see Table II).

Comparison of the specimens with Hutton's specific description for *T. crassicruris* gives the same result. Hutton says, " Femora without any apical spines," whereas they may occur on fore, middle and hind femora Examination of Hutton's type material—a mature female and an immature male from Banks Peninsula—is not of great assistance as the hind legs and one middle leg are absent from each specimen. Describing the spination of the legs Hutton says, " Hind femora, below, with two spines on the outer and one on the inner edge. Fore tibiae, below, with two pairs of spines; middle tibiae, below, with two on the anterior and one on the posterior side. Hind tibiae . . . the spines are nine on the outside and eight on the inside, equal in size and at equal distances; no spines below ". Examination of 26 specimens has shown that, though the numbers of spines Hutton gives are correct, there is a certain amount of variation occurring within the species so that those numbers are by no means constant (see Table I). Hutton's statement that the spines on the hind tibiae are " equal in size and at equal distances " cannot be substantiated as the proximal spines are half the size or less of the more distal ones, and the spacing between the individual spines is irregular.

Alfken, in 1901, examined orthopteran material collected on the Schauinsland Expedition 1896-97 to New Zealand and decided, in spite of several differences, that one species he was examining from the Chatham Islands was the same species as

Hutton had called *Talitropsis crassicruris* in 1896. On examination of the hind femur he found a small spine on the inner side in contrast to Hutton's statement, " Femora without any apical spines ". Hutton also described the fore tibia as having " two pairs of spines " beneath, while Alfken found his specimens had four alternating spines. The hind femur has, according to Hutton, " two spines on the outer edge "; but Alfken found two spines on one leg and one on the other. Alfken then says, " If in spite of this I identify our specimens with *Talitropsis crassicruris,* I do this because I presume that in Hutton mistakes of observation are present in these



TEXT-FIG. 1 —*Talitropsis crassicruris* Hutton Fig 1—Female genitalia ventral view. Fig. 2—Female genitalia dorsal view Fig. 3—Male genitalia dorsal view. Fig. 4—Male genitalia ventral view, hypandrium in place Fig. 5—Male genitalia ventral view, hypandrium removed to expose structures beneath.

Scale 0 4 cm applies to Fig 1 Scale 0.3 cm applies to Figs. 2, 3, 4, 5.

For list of abbreviations, see index at end of paper.

points ". However, Alfken considers these three differences are sufficient to warrant erecting a new genus *Gammaroparnops* for the species.

Comparison of the generic description of *Gammaroparnops* with my specimens shows several differences Alfken says, " Femora antica et intermedia inermia ", whereas apical spines may occur on both femora. Also the hind femora each usually bear two apical spines, one prolateral and the other retrolateral, while Alfken observed only the inner one. Spine counts of the legs of 26 specimens have shown that the number of spines mentioned by Hutton and Alfken are both correct, and that variation is common throughout the species, so that it cannot be used as a taxonomic character. Whether the spines on the fore tibiae are paired or irregular is not of sufficient importance taxonomically to warrant consideration here.

In 1925, Miss Lysaght expanded Alfken's description when she examined material collected on the 1924 Otago Institute trip to the Chatham Islands The description agrees with the specimens except that her statement, " Front and mid femur unspined ", is not always correct, although Hutton's type material does lack spines. Also she records only the prolateral apical spine on the hind femur, and failed to observe the retrolateral one. She realised that variability occurred in the number of spines present on the hind tibia, but did not expand this to cover the other segments in all the legs. She also noted the variability in width of the hind tibiae.

The differences which Alfken raises to support his decision to remove this species from the genus *Talitropsis* Bolivar and describe for it a new genus *Gammaroparnops,* do not seem to me to be sufficiently strong to warrant such a step. The spination of the hind femora and fore tibiae are variable throughout the species and cannot be used as taxonomic characters The other point of the hind femur possessing a small apical spine which Hutton failed to observe does not seem to me sufficient evidence on its own for changing the generic name, especially as the generic description of *Talitropsis* says, " Femora without apical spines, or with a short stout one on the inner side." In actual fact, I have found there are sometimes two apical spines on the hind femur, but because of the close agreement of the species *crassicruris* to the generic description of *Talitropsis* in all other points, I think it can be regarded as an oversight on Hutton's part, and of specific rank only. Thus I propose to place this weta back in its original genus *Talitropsis* Bolivar and synonymise *Gammaroparnops* Alfken with *Talitropsis.*

From examination of 26 specimens of *T. crassicruris* the main specific features by which it can be easily recognised appear to be:

(1) Hind tibae dilated and flattened above in both male and female.

(2) Constancy in shape of the subgenital plate in the male.

(3) Fore and middle femora usually without spines, but sometimes possessing apical spines.

(4) Second segment of hind tarsi less than half the length of first segment.

(5) Maxillary palps with third and fourth segments subequal.

The species *Talitropsis crassicrusis* is now redefined as follows:

Colour: Basic colour mid-brown, marbled with deep ochrous, pronotum, mesonotum and metanotum not margined; abdominal segments with a deeper brown band at distal margin; anal segment dark brown; fore and middle femora, tibiae and tarsi pale ochrous, interspersed with transverse bands of deeper ochrous; hind femora ochrous with narrow bands of brown, apex of hind femora, hind tibiae and hind tarsi deep reddish-brown, ovipositor deep reddish-brown.

Body: Length up to 24 mm, average length 23 mm Body sparsely clothed with short golden setae. Ovipositor 0.625 as long as body. Antennae 3 5 times as long as body Compound eyes nearly as wide as long Fastigium almost as high as long, rising abruptly, slightly convex, with base touching scapes of antennae. Maxillary palps with third and fourth segments subequal. Pronotum, mesonotum and metanotum margined; sternum transversely narrowed, metasternum with a low rounded medial elevation. Cerci, Figs. 1, 2 (C), long, tapering, unsegmented, clothed with long and short setae; 0.25 length of ovipositor. Bodies of male and female subequal.

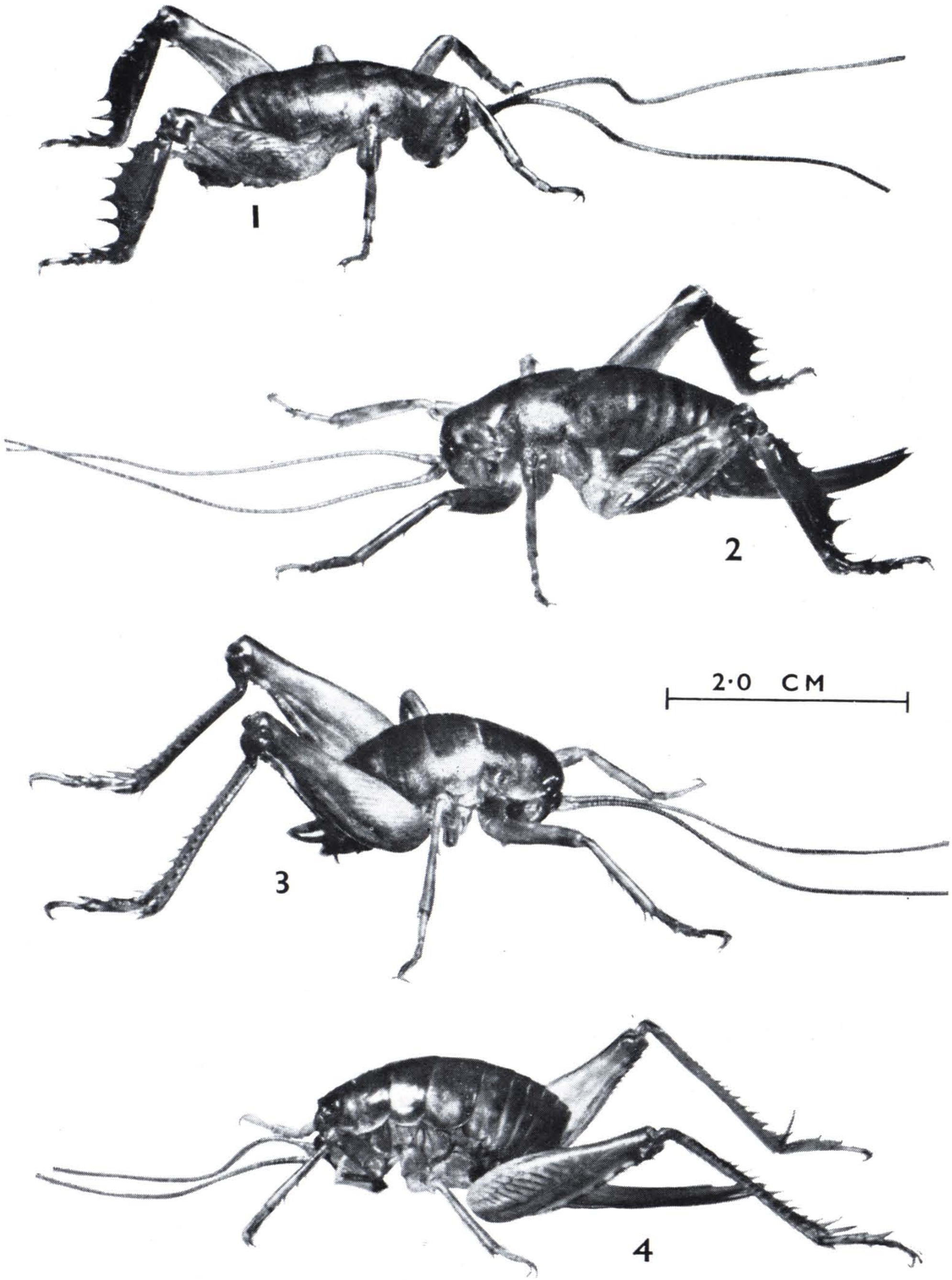


Fig. 1.—*Talitropsis crassicruris* male. Fig. 2.—*T. crassicruris* female. Fig. 3.—*Novoplectron serratum* male. Fig. 4.—*N. serratum* female.

Photos: M. D. King, A.R.P.S.

TABLE I.—VARIABILITY IN SPINES ON THE LEGS.
Talitropsis crassicruris. Chatham Islands, 1954.

		Arith. Mean	Std. Dev.	No.
Prolat.	Fore Femur	0 – 0	0 – 0	19 – 19
Retrolat.		0 – 0	0 – 0	19 – 19
Prolat.	Fore Tibia Inf.	2.05 – 2	0 22 – 0	19 – 19
Retrolat.		1.94 – 2	0.23 – 0	19 – 19
Prolat.	Fore Tarsus	0 – 0	0 – 0	19 – 19
Retrolat.		0 – 0	0 – 0	19 – 19
Prolat.	Mid Femur	0 – 0	0 – 0	19 – 19
Retrolat		0 – 0	0 – 0	19 – 19
Prolat.	Mid Tibia Sup	0 – 0	0 – 0	19 – 19
Retrolat.		0 – 0	0 – 0	19 – 19
Prolat.	Mid Tibia Inf	1 – 1	0 – 0	19 – 19
Retrolat.		2 – 1.84	0 – 0.37	19 – 19
Prolat.	Mid Tarsus	0 – 0	0 – 0	19 – 19
Retrolat.		0 – 0	0 – 0	19 – 19
Prolat.	Post Femur Inf	1.15 – 1.25	0 37 – 0.52	19 – 16
Retrolat.		1.84 – 1.81	0.68 – 0.83	19 – 16
Prolat.	Post Tibia Sup	7 84 – 7 93	0.37 – 0.25	19 – 16
Retrolat.		9 – 9.1	0 47 – 0.38	19 – 16
Prolat.	Post. Tarsus 1	0 – 0	0 – 0	19 – 16
Retrolat.		0 – 0	0 – 0	19 – 16
Prolat.	Post. Tarsus 2	0 – 0	0 – 0	19 – 16
Retrolat.		0 – 0	0 – 0	19 – 16

For list of abbreviations, see index at end of paper.

TABLE II.—VARIABILITY IN APICAL SPINES ON THE LEGS.
Talitropsis crassicruris. Chatham Islands, 1954.

		Arith. Mean.	Std. Dev.	No.
Prolat.	Fore Femur Inf	0.52 – 0.47	0.35 – 0.37	19 – 19
Retrolat.		0.58 – 0.26	0.32 – 0.39	19 – 19
Prolat.	Fore Tibia Inf.	1 – 1	0 – 0	19 – 19
Retrolat.		1 – 1	0 – 0	19 – 19
Prolat.	Fore Tarsus	0 – 0	0 – 0	19 – 19
Retrolat.		0 – 0	0 – 0	19 – 19
Prolat.	Mid Femur Inf.	0.73 – 0.47	0.23 – 0.37	19 – 19
Retrolat		0 47 – 0 42	0.37 – 0.70	19 – 19
Prolat.	Mid. Tibia Sup.	1 – 1	0 – 0	19 – 19
Retrolat.		0 – 0	0 – 0	19 – 19
Prolat.	Mid. Tibia Inf.	1 – 1	0 – 0	19 – 19
Retrolat.		1 – 1	0 – 0	19 – 19
Prolat	Mid Tarsus	0 – 0	0 – 0	19 – 19
Retrolat.		0 – 0	0 – 0	19 – 19
Prolat.	Post. Femur Inf.	0 9 – 1	0.31 – 0	19 – 16
Retrolat.		0.7 – 0 75	0.47 – 0.44	19 – 16
Prolat.	Post Tibia Sup.	1 – 1	0 – 0	19 – 16
Retrolat.		1 – 1	0 – 0	19 – 16
Prolat.	Post. Tibia Inf.	1 – 1	0 – 0	19 – 16
Retrolat.		1 – 1	0 – 0	19 – 16
Prolat.	Post. Tarsus 1 Sup.	1 – 1	0 – 0	19 – 16
Retrolat.		1 – 1	0 – 0	19 – 16
Prolat.	Post Tarsus 2 Sup	1 – 1	0 – 0	19 – 16
Retrolat.		1 – 1	0 – 0	19 – 16

For list of abbreviations, see index at end of paper.

ANTENNAE: Scape longer than broad, between four and five times as large as pedicel, which is narrower than scape, but broader than other segments; pedicel 1 66 as broad as long on dorsal aspect, 1.25 as long as broad on ventral aspect; from fourth segment onwards segments become unequal in length although steadily decreasing in size. All segments thickly clothed with short golden setae Sexual dimorphism is very poorly developed, but the antennae of the male are slightly longer and more robust than those of the female. No spines are present on the male flagellum.

LEGS: Fore and middle legs long and slender, hind leg long and sturdy. Fore and middle legs subequal in length, with hind leg 0 33 as long again. All femora sulcate below. Hind tibiae much dilated and flattened above, below strongly arched Hind femora, fore, middle and hind tibiae armed with variable numbers of spines; fore and middle femora and all tarsi without spines (see Table I). Inside retrolateral margin of hind tibiae is a row of small irregular spinelets. Femora, tibiae and two proximal segments of hind tarsi armed with apical spines (see Table II). Position of prolateral apical spine on hind femur variable Second segment of hind tarsi less than half the length of first. Ratio width of hind tibia to length varying between 0.16 : 1 to 0.3 : 1. Ratios of length of legs to length of body are: fore leg 0.91 : 1; middle leg 0.87 : 1; hind leg 1.41 : 1.

GENITALIA. *Female*: Suranal plate, Fig. 2 (SAP), lateral margin convex proximally, changing to concave distally, terminal margin emarginate, rising to a ridge medianly which extends back along the plate; distal margin clothed with short setae. Subgenital plate, Fig. 1 (SGP), 1 2 times as broad as long; proximally it has a short neck, the distal portion of which bears two posteriorly directed small spines; medianly the plate is bluntly keeled; it is deeply notched distally, and laterally is S-shaped in most specimens, but a few have the lateral margin notched medianly On sternite VII a two-lobed appendage, Fig 1 (AA), arises medianly and extends to the distal margin of the sternite on most wetas examined. *Male*: Suranal plate, Fig 3 (SPL), rounded laterally and emarginate terminally with a median depression; ventrally, on either side of the depression, the plate bears two large lobes thickly clothed with setae, as is the dorsal surface also. Subgenital plate (hypandrium), Fig. 4 (H), inflated, 0.9 times as long as wide, lateral margin convex proximally, changing to concave distally, medianly the plate is bluntly keeled along its whole length; distally it is divided into three lobes, the median one being spatulate and shorter than the two lateral lobes, which taper apically. On the ventral surface these two lobes are swollen and thickly clothed with setae The dorsal surface of the whole plate is thickly clothed with setae. Disto-laterally the plate bears two small tapering styli, Fig. 4 (S), thickly clothed with short setae; length of styli being 0 26 the length of sternite IX. Parameres, Figs. 3, 4, 5 (P), small, elongate, twice as long as broad, thickly clothed with setae. Pseudosternite, Fig. 5 (PD), 1 47 as wide as long, lateral margin convex, but deeply notched 0.33 from proximal border; distal margin rounded, tapering to a point with a small median V-shaped notch. From proximal end to 0 57 length of pseudosternite, a chitinous flap overlies pseudosternite and is fused to it laterally, 0.33 of distance from proximal border. Penis not visible, is supported on this chitinous flap Paraprocts, Figs 2, 4 (PP), large in the female and thickly clothed with long setae; small, elongate in the male, 3.5 as long as wide and less than half the size of parameres

LOCALITIES. Banks Peninsula, Canterbury (type locality); Chatham Islands-South East Island, coll. E G. Turbott, R R Forster, R. K. Dell: The Sisters, coll. R. K. Dell, R. R Forster; Waitangi, coll. R. R. Forster; Pitt Island, near Glory Bay, coll. R. R. Forster; Kaingaroa, coll. R. R. Forster; Ouwenga, Mangare Island, coll. C. Lindsay.

TYPES. Holotype in Canterbury Museum Collection.

Genus NOVOPLECTRON nov.

1897. *Pleioplectron* Hutton (in part), *Trans N Z Inst.* 29, pp 232–233

Hutton erected the genus *Pleioplectron* in 1897 and placed in it four new species—*P. simplex* from N Canterbury and Banks Peninsula, *P. hudsoni* from Wellington, *P. pectinatum* from Banks Peninsula, and *P. diversum* from Upper Wanganui. In 1904 he added to the genus a new species, *P. serratum* from Pitt Island, Chatham Islands. Comparison of specimens collected on the Chatham Islands 1954 Expedition with Hutton's generic description, has revealed five distinct points in which they differ. Hutton says, "Hind femora without apical spines", but all the specimens I have examined have a sharp, well-defined prolateral apical spine. His description of the hind tibiae as having three pairs of apical spines "of which the superior are acicular, hairy; more than half the length of the first joint of the tarsi; the middle pair about half the length of the superior pair, the inferior pair quite small", is not correct as they possess a fourth pair above, equal in length to his "middle pair", which Hutton failed to observe. Describing the hind tarsi, Hutton says, "The first joint longer than the other three together", while the first segment is actually not quite as long as the other three together. According to Hutton the subgenital plate of the male is longer than broad, but it is really broader than long. In the female he says the subgenital plate is short and has "the apex with three points". This does not agree with my specimens as the plate is short and widely emarginate; but in Hutton's type material for the species the plate is not visible.

From the foregoing it can be seen that the differences between *P. serratum* and Hutton's generic description of *Pleioplectron* when considered together are major ones. Thus it appears that *P. serratum* was not placed in the correct genus. Any one of these characters might be disregarded generically, but together they have a definite significance and so, because of this, I propose to make *P. serratum* the type species of a new genus *Novoplectron.*

The genus *Novoplectron* is now defined as follows:

Body rather stout, sparsely clothed with short setae. Antennae very long and tapering, three times as long as body, almost touching at their bases; scape about four times as large as pedicel, which is narrower than scape, but broader than other segments; pedicel as broad as long; third segment narrower than pedicel, on dorsal aspect one third as long again, and on ventral aspect half as long again as pedicel; from fourth segment onwards to about 0.33 length of flagellum, segments broader than long, more distally segments become unequal in length and steadily decrease in size Scape thickly clothed with setae; segments from pedicel to fourteenth segment sparsely clothed with setae; from fourteenth segment onwards all segments thickly clothed with short golden setae. Head vertical; compound eyes laterad, nearly elliptical; a single anterior, white, median ocellus only. Fastigium almost as high as long, rising abruptly, slightly sulcate, with base touching scape of antennae. Mandibles small. Maxillary palpi with third segment 0.625 length of fourth. Pronotum rounded anteriorly and produced in front over occiput, truncated posteriorly; pronotum, mesonotum and metanotum not margined. Sternum transversely narrowed, metasternum bearing a median tubercle. Fore coxae close together, but not quite touching, each armed laterally with a spine. All femora sulcate ventrally. Femora, tibiae and two proximal segments of hind tarsi armed with variable numbers of spines above and below. No spines occur on fore femora, or fore and middle tarsi. Apical spines on femora, tibiae and two proximal segments of hind tarsi constant in number—fore femur bears one spine beneath prolaterally; fore tibia bears four spines, one above and one beneath, both prolaterally and retrolaterally; fore tarsus is unarmed; middle femur bears two spines beneath, one prolateral, the other retrolateral; middle tibia bears four spines, one above and one beneath, both prolaterally and retrolaterally; middle tarsus unarmed; posterior femur bears one spine above prolaterally; posterior tibia has a pair of apical spurs above clothed with setae, two pairs of apical spines—one pair above and one beneath, and a pair of smaller subapical spines beneath, one from each pair being prolateral and the other retrolateral; posterior tarsus two proximal segments each has two spines above, one prolateral and one retrolateral; other two segments unarmed. Proximal segment of hind tarsus nearly as long as the other three segments together. Cerci long, slender, tapering, unsegmented, clothed with long and short setae. Subgenital plate of female much broader than long, with distal margin widely emarginate. Ovipositor sabre-shaped, 0.66 to 0.75 as long as body Subgenital plate of male triangular, broader than long, sides spreading slightly proximally, tapering abruptly to concave distally, with a rounded apex; lanceolate distal portion thickly clothed with short setae on both dorsal and ventral surfaces Laterally the plate bears two styli thickly clothed with short setae; the lanceolate distal portion of the plate and the two styli are joined laterally by a connective membrane.

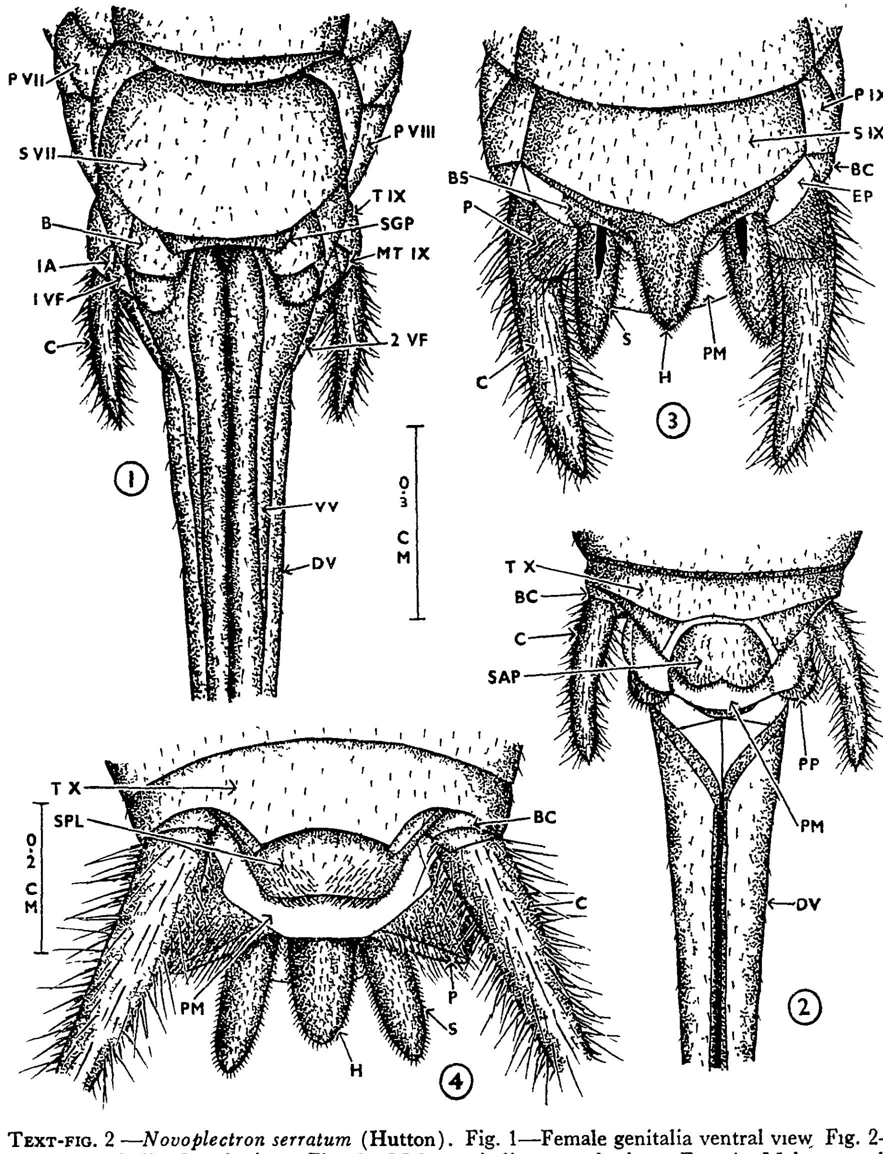
Type species for the genus: *Novoplectron serratum* (Hutton).

Novoplectron serratum (Hutton), 1904.

1904. *Pleioplectron serratum* Hutton, *Trans. N.Z. Inst* 36, p. 154
1925 *Pleioplectron serratum* Hutton, *Rec. Cant. Mus.* Vol. II, No. 5, pp 306–307, Figs. 6–8.

Plate 24, Figs. 3, 4. Text-fig. 2, Figs. 1–4.

There are several small points in which my material differs from Hutton's description of the species *Pleioplectron serratum,* but none of them are as important as the generic differences. Hutton says, "Fore and middle femora unarmed below", but in some specimens the middle femora do bear spines, although the fore femora never have them. However, in the type material neither fore nor middle femora possess spines. The hind femora, according to Hutton, are armed "with fifteen teeth below in each row, those of the outer row smaller than those of the inner". In 1924 Miss Lysaght found the number of spines on the hind femora very variable, and counts of the type material gave for the two females 15, 16; and 10, 13; and the two males 22, 14; and 14, 14. In 1954 I re-examined this type material and found the spines for the two females were really 17–17, 18–17; and 10–18, 12–16; and the two males 19–21, 15–24; and 13–18, 14–17. Although Miss Lysaght's figures and mine do not agree, they both differ from Hutton's and show the wide range of



TEXT-FIG. 2.—*Novoplectron serratum* (Hutton). Fig. 1—Female genitalia ventral view. Fig. 2—Female genitalia dorsal view. Fig. 3—Male genitalia ventral view. Fig. 4—Male genitalia dorsal view.
Scale 0.3 cm applies to Figs. 1, 2. Scale 0.2 cm applies to Figs. 3, 4.
For list of abbreviations, see index at end of paper.

variability which occurs. Hutton describes the fore and middle tibiae as having three pairs of spines below and none above. This, however, is not always the case and the middle tibiae usually bear two or three prolateral spines above as well as an occasional-retrolateral one. These spines are present in the type material, but were missed by Hutton. Hutton says the spines on the hind tibiae range from 16–20, but in actual fact the amount of variation is considerably greater. In the three female types the subgenital plate is hidden and so is undescribed; however, it is visible in some of the females collected on the 1954 Expedition and is short and widely emarginate Hutton's measurements of the type material agrees with my measurements except that the length of the pronotum in the male is 8 mm., not 15 mm.; the width of the mesonotum is 12 mm., not 9 mm. in the male, and 12 mm., not 8 mm. in the female; and the total length is 27 mm., not 32 mm. in the male, and 22 mm., not 27 mm in the female. The measurements tend to vary among different members of the species.

In 1925 Miss Lysaght added further points to Hutton's description of *P. serratum.* Of the antennae she says, " The first two joints of the antennae are longer than broad, those following are broader than long till about one-third of the length from the tip, where they become longer in proportion ", but although the scape is longer than broad, the pedicel is as broad as long and the third segment is longer than broad; from the fourth segment onwards to about a third of the length of the flagellum the segments are broader than long Miss Lysaght recognised the range of variation which occurs in the spination of the legs. Describing the apical spines of the fore tibia she says, " There is one pair of apical spines below, and a single apical spine at the side ", but in all the specimens I have examined there are four apical spines, two above and two beneath. Unfortunately most of her remarks on the apical spines are so confusing that they cannot be followed, and therefore must be disregarded. With regard to the spination of the hind tibiae she says, " The number of spines on the hind tibia, which Hutton gives as 16 to 20, ranges from 18 to 28 on either margin in the females examined, and in the males from 19 to 25 ". From examination of 30 specimens I can see no reason for this division of the sexes. Also she says of the apical spines, " In the female there are three pairs of apical spines, the hind tibia and one very large unpaired spine on the inside; the male has four pairs of apical spines on the hind tibia " This statement is completely without foundation, both the male and female possessing four pairs of apical spines on the hind tibia in the type material and in the specimens collected on the 1954 Expedition. Miss Lysaght was trying to draw attention to a sexual dimorphism which does not exist in the spination of the legs.

The differences observed between my specimens and the specific descriptions given by Hutton and Miss Lysaght all point to variation within the species and, although they should be recorded because of this, they are of no real taxonomic value.

From examination of 30 specimens of *N. serratum,* the main specific features by which it can be easily recognised appear to be.

(1) Constancy in shape of the subgenital plate in both male and female.
(2) Hind femora inflated in mature male only.
(3) Constancy in number of apical spines of the legs.
(4) Fore femora, and fore and middle tarsi without spines.
(5) Proximal segment of hind tarsus nearly as long as other three segments together.
(6) Maxillary palps with third segment 0.625 length of fourth.
(7) Metasternum bearing a median tubercle.

The species *Novoplectron serratum* is now redefined as follows:

COLOUR· Basic colour of body medium to dark fuscous with lateral portions of terga paler fuscous, pronotum, mesonotum and metanotum not margined, no pale line on the pro-

TABLE III.—VARIABILITY IN SPINES ON THE LEGS.
Novoplectron serratum. Chatham Islands, 1954

		Arith. Mean.	Std. Dev	No.
Prolat.	Fore Femur	0 – 0	0 – 0	25 – 25
Retrolat.		0 – 0	0 – 0	25 – 25
Prolat.	Fore Tibia Inf.	2.3 – 2.3	0.55 – 0.55	25 – 25
Retrolat.		2.9 – 2.8	0.34 – 0 33	25 – 25
Prolat.	Fore Tarsus	0 – 0	0 – 0	25 – 25
Retrolat.		0 – 0	0 – 0	25 – 25
Prolat.	Mid. Femur Inf.	0.2 – 0.1	0.42 – 0.42	25 – 25
Retrolat.		0.2 – 0.1	0.46 – 0.38	25 – 25
Prolat.	Mid. Tibia Sup.	1.7 – 1.9	0.64 – 0.81	25 – 25
Retrolat.		0 2 – 0.2	0.46 – 0.56	25 – 25
Prolat.	Mid Tibia Inf.	2 4 – 2.5	0.57 – 0.5	25 – 25
Retrolat.		2.9 – 2.7	0.35 – 0 54	25 – 25
Prolat.	Mid. Tarsus	0 – 0	0 – 0	25 – 25
Retrolat.		0 – 0	0 – 0	25 – 25
Prolat.	Post. Femur Inf.	12 9 –12.5	2.33 – 2.06	24 – 20
Retrolat.		16.6 –15.9	2.58 – 2.42	24 – 20
Prolat.	Post. Tibia Sup.	19.8 –19.3	2.17 – 1.42	24 – 19
Retrolat.		22.1 –22.7	1.46 – 2 05	24 – 19
Prolat.	Post Tarsus 1 Sup.	1 8 – 1.8	0.54 – 0.37	24 – 19
Retrolat.		2.3 – 2 4	0.56 – 0.51	24 – 19
Prolat.	Post. Tarsus 2 Sup.	0.9 – 1	0.03 – 0	24 – 19
Retrolat.		1 – 1	0 – 0	24 – 19

For list of abbreviations, see index at end of paper.

notum; head medium to pale fuscous, antennae pale fuscous, femora and tibiae of all legs transversely banded with broad bands of deep ochrous, interspersed with narrow bands of light brown and pale ochrous, tarsi pale ochrous, ovipositor reddish-brown

BODY: Length up to 26 mm., average 24 mm. Ovipositor 0 66 to 0.75 as long as body Antennae three times as long as body Compound eyes 1 25 as long as broad. Cerci, Fig 2 (C), 0.16 length of ovipositor. Bodies of male and female subequal

ANTENNAE: Flagella very long, slender, tapering, thick and almost touching at their bases; scape longer than broad. Sexual dimorphism very poorly developed, the antennae in the male being a little longer and stouter than those of the female The flagellum in the male never bears spines.

LEGS: Long and slender. Fore and middle legs subequal in length, with hind leg twice as long. Sexual dimorphism present in hind leg. In mature male femur is inflated and wide and deeply sulcate; in female only slightly rounded and not so deeply sulcate. Hind tibiae spindly, but more robust in male than female. Femora, tibiae and two proximal segments of hind tarsi armed with variable numbers of spines (see Table III) Spines on hind femora increase in size from proximal to distal end and are larger on prolateral than retrolateral margin No spines occur on fore femora or fore and middle tarsi. Ratios of length of legs to length of body are: fore leg 1.07 : 1, middle leg 1 1 : 1; hind leg 2.12 : 1

GENITALIA: *Female*: Supra-anal plate, Fig. 2 (SAP), lateral margin rounded, terminal margin slightly or more deeply emarginate, clothed with short golden setae. Subgenital plate, Fig. 1 (SGP), 9.5 times as broad as long, sparsely clothed with setae, distal margin widely emarginate *Male*: Supra-anal plate, Fig. 4 (SPL), slightly concave laterally, slightly emarginate terminally, thickly clothed with setae. Subgenital plate (hypandrium), Fig. 3 (H), triangular, 0.75 as long as wide, sides spreading slightly proximally, concave laterally, tapering abruptly distally with a rounded apex, lanceolate distal portion thickly clothed with short setae on dorsal and ventral surfaces. Laterally the plate bears two styli, Figs 3, 4 (S), thickly clothed with short setae, length of styli being 0.6 the length of sternite IX. The lanceolate distal portion of the hypandrium and the two styli are joined laterally by connective membrane Parameres, Figs 3, 4 (P), broad at base, as long as broad with prolateral edge thickly clothed with long setae. Pseudosternite 0.73 as long as broad, tapering to a point distally Penis two-lobed, each lobe being nearly twice as long as broad. Paraprocts, Fig. 2 (PP), small, thickly clothed with long setae on distal margin; present in female, but absent in all male specimens examined

LOCALITIES Chatham group—Pitt Island, coll J. J. Fougère, Mangere Island, South East Island, coll. E. G Turbott, R R. Forster and R. K. Dell; The Sisters, coll R. R. Forster and R. K. Dell In petrel burrows and under stones.

TYPES. Lectotype and Paratypes in Canterbury Museum Collection

ECOLOGY

N. serratum and *T. crassicruris* are widely distributed throughout the Chatham Islands, and during the 1954 Expedition specimens were collected from South East Island, The Sisters, the south-east coast of Pitt Island near Glory Bay, and from Waitangi and Kaingaroa on Chatham Island. In 1924, specimens were also collected from Ouwenga and Mangere Island. Most of the wetas on the 1954 Expedition were collected from South East Island and The Sisters, largely because of the untouched conditions of the surroundings. *T. crassicruris* occurs in rotten logs and dead trees, is nocturnal in its habits, and is more generally distributed than *N. serratum,* which appears to be restricted to those areas inhabited by petrels.

South East Island is covered with coastal scrub, with little undergrowth, and is sheep infested *T. crassicruris* was found in and under logs and fallen branches, while *N. seratum* occurred under stones and in the burrows of storm petrels, broad-billed prions and mutton birds.

On The Sisters the soil is soft and peaty and riddled with burrows, there being little surrounding vegetation except hard fern and *Cotula renwicki. T. crassicruris* was found to inhabit rotten logs, while *N. serratum* was found under large stones half embedded in the soil, in association with large skinks, beetles and earwigs. The dark, humid burrows of mutton birds and prions also yielded specimens of *N. serratum.* A number of immature specimens of *N. serratum* were collected and found to be far more abundant than adults on the island.

The fact that *N. serratum* has not been recorded from Chatham Island is probably due to the inaccessibility of the petrels' nesting places, which has prevented the burrows from being visited by members of the various expeditions. At Waitangi and Kaingaroa in 1954, collecting was only carried out around the landing area.

DISCUSSION

(1) The Rhaphidophoridae exhibit a wide range of variation in the number of spines on the legs, and it is unfortunate that Hutton, partly through lack of specimens, should have used this character so extensively to form new species within the group.

(2) In general, apical spines are a more reliable character for the establishment of genera and species within the family; but in *Talitropsis crassicruris* apical spines may or may not be present on the fore, middle and hind femora.

(3) Sexual dimorphism is often exhibited by members of the family; but it is poorly developed in the two species discussed in this paper.

(4) The shape of the external genitalia is remarkably constant in both species.

(5) Neither *N. serratum* nor *T. crassicruris* have been adequately illustrated. Hutton's type description of *N. serratum* in 1904 is without any figures, while his description of *T. crassicruris* is illustrated with very small drawings of the male subgenital plate and the apex of the hind tibia Miss Lysaght has drawn the "supra-genital plate" of the male and the supra-anal plate and hind tarsus of the female of *N. serratum,* but these drawings are not typical of the species. *T. crassicruris* is illustrated much more fully by her than by Hutton, but not very accurately

(6) Attention is drawn to two small tubercles situated medianly on sternite VII, just proximal to the subgenital plate. The function of this appendage is unknown, but it may be an accessory to the external genitalia during the mating of the wetas. It is present only in females, and not always then, so that it is not a specific character, but variable.

(7) The habitats chosen by these two species of cave-weta may be correlated with the size, structure and spination of the hind legs. *N. serratum* with its short, thin, weak hind tibiae armed with numerous very small spines, inhabits petrel burrows or hollows under stones, where its home, with the conditions it requires, is already

made for n. *T. crassicruris,* on the other hand, has large, dilated hind tibiae flattened dorsally and armed with a few large, sharp spines which can be used for digging holes in order to penetrate into the dark interior of rotten logs. A number of specimens examined possessed spines either broken off or worn down by constant use.

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INDEX TO TEXT-FIGURES.

AA, abdominal appendage.
B, basivalvula.
BC, basal segment of cercus.
BS, basal segment of stylus.
C, cercus.
DE, ductus ejaculatorius.
DV, dorsal valve.
E, endapophysis.
EP, endoparamere.
FCA, feebly chitinised arch connecting rami.
H, hypandrium (subgenital plate male).
IA, intersegmental apodeme.
IM, intersegmental membrane.
MR, muscle attached to ramus.
MT IX, membrane of tergite IX.
P, paramere (ectoparamere)
P VII, P VIII, P IX, pleurite VII, VIII, IX
PD, pseudosternite.
PM, perianal membrane.
PN, penis
PP, paraproct
RP, rami of pseudosternite
S, stylus.
S VII, S VIII, S IX, sternite VII, VIII, IX.
SAP, supra-anal plate female
SGP. subgenital plate female
SPI, spiracle.
SPL, supra-anal plate male
T VII, T VIII, T IX, T X, tergite VII, VIII, IX, X
1 VF. first valvifer
2 VF. second valvifer.
VV, ventral valve.

INDEX TO TABLES

Arith. mean, Arithmetic Mean. Inf., Inferior. No., Number of Specimens Prolat., Prolateral Retrolat., Retrolateral. Std. Dev., Standard Deviation Sup., Superior

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