# Revision of the Rhaphidophoridae (Orthoptera) of New Zealand

## Part IV—The Rhaphidophoridae of the Thames Gold Mines

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***Abstract***

The synonymy of *Pachyrhamma edwardsii* (Scudder) with *Macropathus filifer* Walker is confirmed. Two new species belonging to the genus *Pachyrhamma* Brunner, *P. uncata* n.sp., and *P. fusca* n.sp., are described. Material lodged as *Pleioplectron cavernae* Hutton (det. Karny) in the Brunner von Wattenwyl Collection in the Naturhistorisches Museum, Vienna has been found to be *P. fusca*.

### Introduction

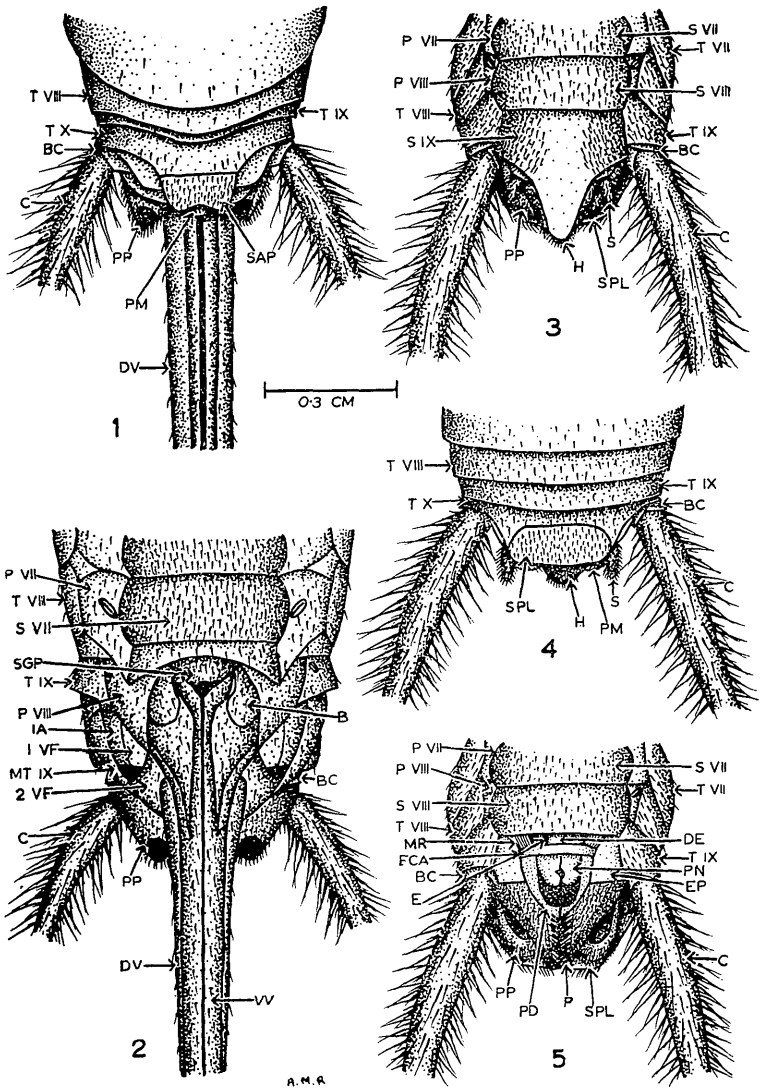
The genus *Pachyrhamma* Brunner, which contains the largest New Zealand members of the subfamily Macropathinae, is well represented in caves and tunnels throughout the country. Two new species belonging to this genus have recently been discovered in gold-mine tunnels near Thames. Only one of these species has previously been collected. These two species show a very close relationship with other members of the same genus in the northern part of the North Island, particularly in their strongly marked sexual dimorphism.

In 1880, and again in 1891, Reischek collected several specimens of a species of Rhaphidophorid occurring in tunnels at Coromandel. This material, consisting of six males, two females and six nymphs, was sent to Europe and housed in the Naturhistorisches Museum, Vienna, as part of Brunner von Wattenwyl's Collection. In 1930, Karny revised Brunner's Collection and placed Reischek's specimens in Hutton's species *Pleioplectron cavernae*. He illustrated his remarks on *P. cavernae* with a line drawing of an adult male collected by Reischek.

Hutton's species *Pleioplectron cavernae* was described from four males and two females collected from a small cave near Karapiti fumarole, Taupo. Unfortunately, most of this material has been lost, an immature and badly damaged male and female in the British Museum (Nat. Hist.) Collection being all that remain. When he described *Pleioplectron cavernae,* Hutton (1900) synonymised *Pachyrhamma edwardsii* (Scudder) with it. As *P. edwardsii* had been the type species for the genus *Pachyrhamma,* Hutton designated *P. fascifer* (= *novae-zealandiae*) as the new type species for the genus.

The author has been able to study the type material of *Pachyrhamma edwardsii* (Scudder) from the Geneva Museum. An examination of this material confirms the conclusion reached by the author from a comparison of written descriptions with type material of *Macropathus filifer* Walker (Richards, 1954, 1958) that *P. edwardsii* (Scudder) is a synonym of *M. filifer*. *P. fascifer* remains the type species for the genus *Pachyrhamma.*

Through the courtesy of Dr. D. R. Ragge, of the British Museum (Nat. Hist.) the remaining two specimens of Hutton's original series of *Pleioplectron cavernae* have been examined by the author. *M. filifer* Walker is generally very different from *P. cavernae* Hutton.




TEXT-FIG. 1. *Pachyrhamma fusca* n.sp. Fig. 1—Female genitalia, dorsal view. Fig. 2—Female genitalia, ventral view. Fig. 3—Male genitalia, ventral view, subgenital plate in place. Fig. 4—Male genitalia, dorsal view. Fig. 5—Male genitalia, ventral view, subgenital plate removed to expose structures beneath.

The author has also been able to examine a pair of the insects collected by Reischek from Coromandel in 1891, and labelled by Karny as *Pleioplectron cavernae* Hutton. These specimens are much larger than both *M. filifer* Walker and *P. cavernae* Hutton, and are markedly different.

In 1958, the author was fortunate to collect twenty-one specimens of the same species as Reischek from gold-mine tunnels near Thames. This is considered to be a new species and in no way related to *Pleioplectron cavernae*. Thus Karny's determination is incorrect.

The species is described as follows:

## Genus PACHYRHAMMA Brunner, 1888

**Pachyrhamma fusca** n.sp. Plate 5, Figs. 3, 4, 5. Text-fig. 1, Figs. 1–5.

1930. *Pleioplectron cavernae* Hutton, Karny, *Ann. Nat.-Hist. Mus. Wien, 44*: 182–185, Fig. 143.

COLOUR. Basic colour medium brown, with anterior and posterior borders of pronotum and posterior borders of mesonotum, metanotum and abdominal terga dark brown; femora of all legs medium brown with transverse ochreous bands at proximal ends; tibiae mid brown proximally, changing to ochreous distally; tarsi ochreous; antennae medium brown; ovipositor reddish-brown.

BODY. Length up to 30 mm in male and 26 mm in female, average length 26 mm in male and 23 mm in female. Body sparsely clothed with setae. Ovipositor subequal with length of body. Antennae approximately seven times as long as body. Fastigium as high as long, rising abruptly, with base touching scape of antennae. Maxillary palps with third and fourth segments subequal in length.

ANTENNAE. Scape about four times as large as pedicel, which is narrower than scape, but broader than other segments; third segment on dorsal aspect narrower than pedicel and twice as long, and on ventral aspect half as long again; from fourth segment onwards segments unequal in length, although steadily decreasing in size; all segments thickly clothed with short setae. Sexual dimorphism present in antennae, male possessing longer, stouter antennae than female; middle portion of flagellum in male armed with a number of short, blunt dorsal spines (Plate 18, Fig. 5), each spine borne on a swelling on the upper part of its segment; variability in number of spines present is common, but is most frequently nine; female never possesses spines.

LEGS. Fore and middle legs subequal in length, with hind leg approximately twice length of fore and middle legs. Sexual dimorphism is shown by fore and middle legs of female being 0.75 as long as male, and hind legs of female 0.64 as long as male. Femora, tibiae and proximal two segments of hind tarsi armed with variable numbers of spines (Table 1). No spines occur on fore or middle femora and tarsi. Length of proximal segment of hind tarsus greater than other three together in male, subequal with other three in female. Ratios of length of legs to length of body: Fore leg, male, 2.1:1; female, 1.8:1. Middle leg, male, 2.1:1; female, 1.8:1. Hind leg, male, 4.5:1; female, 3.3:1.

GENITALIA. *Female*: Suranal plate, Fig. 1 (SAP), concave laterally, rounded and notched medianly distally; distal margin clothed with short setae. Subgenital plate, Fig. 2 (SGP), deeply notched distally and sparsely clothed with short setae. *Male*: Suranal plate, Fig. 4 (SPL), slightly convex laterally, straight distally, bearing two groups of setae. Subgenital plate, Fig. 3 (H), triangulate, as wide as long, sides spreading slightly proximally, tapering to concave distally with a rounded apex, glabrous on dorsal side, but with apical protuberance on ventral surface thickly clothed with short setae. Two styli, Figs. 3, 4 (S), thickly clothed with short setae, length of styli being 0.2 length of sternite IX (S IX). Subgenital plate covers genitalia. Parameres, Fig. 5 (P), attenuated, broad at base and tapering to a point, 2.5 longer than broad, prolateral margin thickly clothed with long setae, rest of paramere clothed with short setae. Pseudosternite, Fig. 5 (PD), 1.1 wider than long, tapering to a point distally. Penis, Fig. 5 (PN), two-lobed, each lobe 1.5 longer than broad. Paraprocts, Figs. 3, 5 (PP), elongate, 1.6 longer than broad.

LOCALITY. Gold-mining tunnels, Thames (type locality), coll. A. M. Richards, 1958; tunnels Coromandel, coll. Reischek, 1891.

TYPES. Holotype male, Allotype female and Paratype male and female in Auckland Institute and Museum Collection. Paratype male and female in British Museum (Nat. Hist.) Collection. Paratype male and female in Vienna Museum Collection.

TABLE I.—VARIABILITY IN NUMBER OF LINEAR SPINES ON THE LEGS OF 21 SPECIMENS OF *PACHYRHAMMA FUSCA* n.sp.

| | | Arith. Mean | | Std. Dev. | | Range | |
|---|---|---|---|---|---|---|---|
| | | L. | R. | L. | R. | L. | R. |
| Fore Femur Inf. | Pro. | 0 | 0 | — | — | — | — |
| | Retro. | 0 | 0 | — | — | — | — |
| Fore Tibia Inf. | Pro. | 3 | 3 | — | — | — | — |
| | Retro. | 3 | 3 | — | — | — | — |
| Fore Tarsus | Pro. | 0 | 0 | — | — | — | — |
| | Retro. | 0 | 0 | — | — | — | — |
| Mid. Femur Inf. | Pro. | 0 | 0 | — | — | — | — |
| | Retro. | 0 | 0 | — | — | — | — |
| Mid. Tibia Sup. | Pro. | 2.9 | 3.1 | 0.8 | 0.9 | 1–4 | 1–5 |
| | Retro. | 1.3 | 1.3 | 0.7 | 0.6 | 0–3 | 0–3 |
| Mid. Tibia Inf. | Pro. | 3 | 3 | — | — | — | — |
| | Retro. | 3 | 3 | — | — | — | — |
| Mid. Tarsus | Pro. | 0 | 0 | — | — | — | — |
| | Retro. | 0 | 0 | — | — | — | — |
| Hind Femur Inf. | Pro. | 8.4 | 8.4 | 1.3 | 0.8 | 7–12 | 7–10 |
| | Retro. | 2.7 | 2.7 | 0.7 | 0.8 | 2–4 | 2–4 |
| Hind Tibia Sup. | Pro. | 31.8 | 31.9 | 3.3 | 3.7 | 26–38 | 25–37 |
| | Retro. | 34.6 | 34.4 | 2.4 | 2.9 | 30–38 | 30–39 |
| Hind Tarsus 1 Sup. | Pro. | 1.9 | 1.8 | 0.6 | 0.4 | 1(4), 2(16), 4 | 1(5), 2(15) |
| | Pro. | 1.7 | 1.8 | 0.9 | 0.7 | 0–4 | 0–3 |
| Hind Tarsus 2 Sup. | Retro. | 0.1 | 0 | — | — | 0(20), 1 | 0(19), 1 |
| | Retro. | 0.1 | 0 | — | — | 0(20), 1 | 0(20) |

Figures in brackets are number of specimens.

*Pachyrhamma fusca* is most closely related to *P. waitomoensis,* but differs from it in:

1. The presence of spines on antennae of mature male.
2. A greater number of linear spines on hind femora.

From the same tunnels from which *P. fusca* was collected, twenty-five specimens of another species, also belonging to the genus *Pachyrhamma,* were collected. They are considered to be new and are described as follows:

**Pachyrhamma uncata** n.sp. Plate 5, Figs. 1, 2. Text-fig. 2, Figs. 1–5.

COLOUR. Basic colour deep ochreous, with pronotum, mesonotum, metanotum and abdominal terga irregularly mottled with dark brown and medium brown. Anterior margin of pronotum and lateral margins of pronotum, mesonotum and metanotum ochreous; femora and tibiae of all legs transversely banded with broad bands of light brown interspersed with narrow bands of ochreous; tarsi pale ochreous; antennae light brown; ovipositor deep reddish-brown.

BODY. Length up to 28 mm in male and 25 mm in female; average length 24 mm in male and 23 mm in female. Body sparsely clothed with setae. Ovipositor subequal in length with body. Antennae approximately 5.7 times as long as body. Fastigium rising abruptly, as high as long. Maxillary palps with third and fourth joints subequal in length.

ANTENNAE. Scape about four times as large as pedicel, which is narrower than scape, but broader than other segments; third segment on dorsal and ventral aspects narrower than pedicel and twice as long. From fourth segment onwards segments unequal in length, although steadily decreasing in size, all segments thickly clothed with short setae. Sexual dimorphism poorly developed, antennae of male slightly stouter and longer than those of female; no spines present on flagellum of male or female.

LEGS. Fore and middle legs subequal in length, with hind leg approximately twice length of fore and middle legs. Sexual dimorphism is shown by fore and middle legs of female

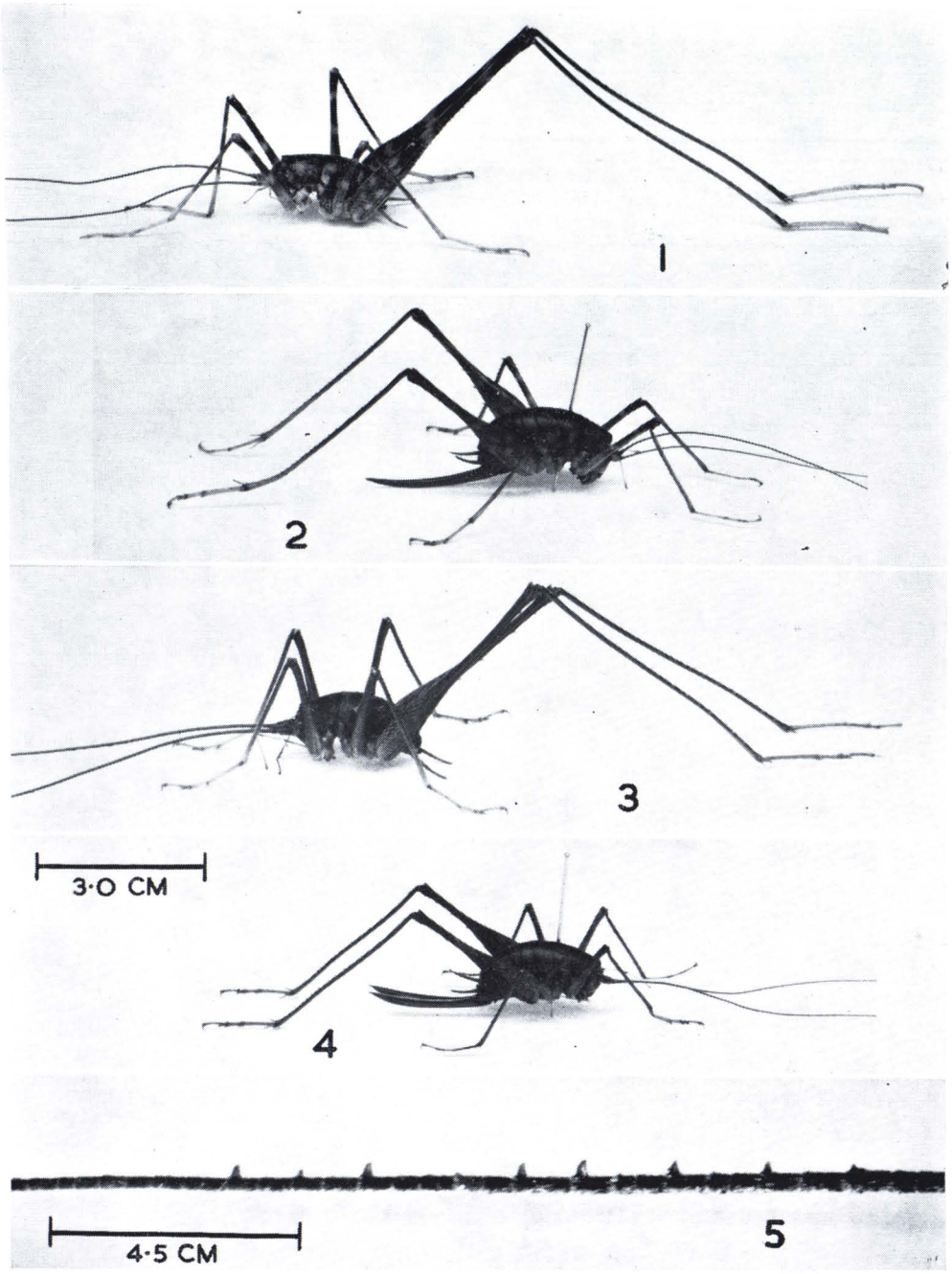
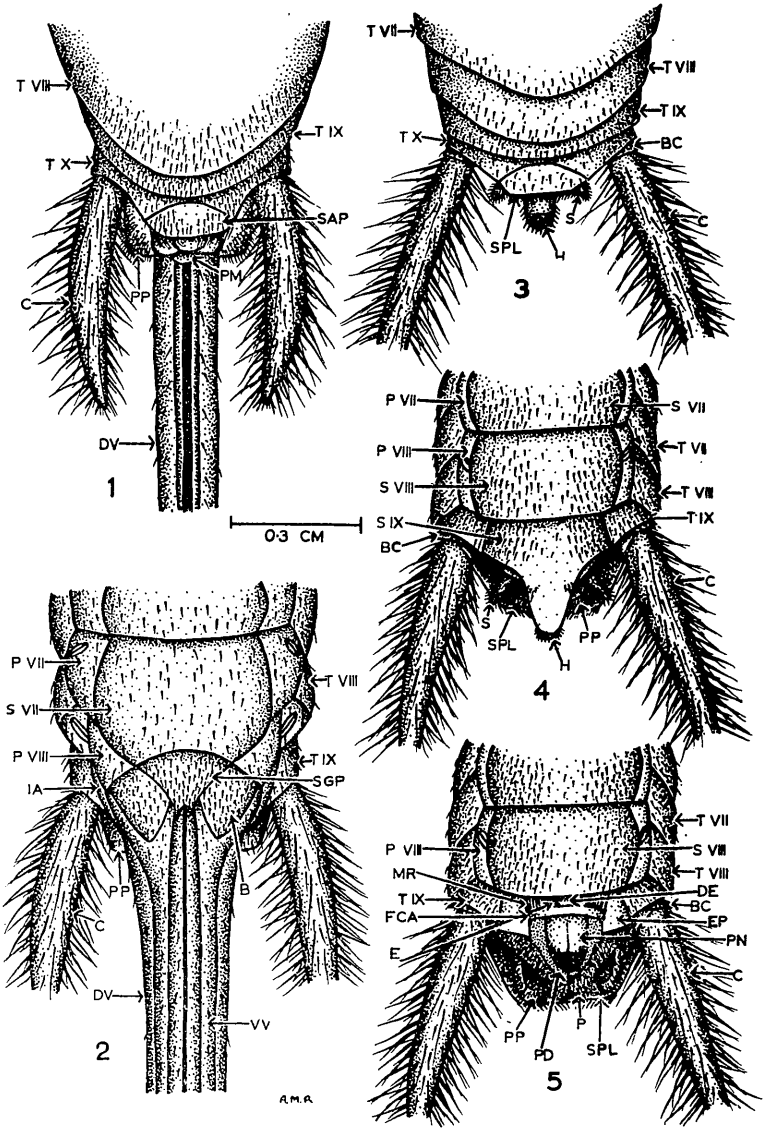



FIG. 1—*Pachyrhamma uncata* male, lateral view.
FIG. 2—*Pachyrhamma uncata* female, lateral view.
FIG. 3—*Pachyrhamma fusca* male, lateral view.
FIG. 4—*Pachyrhamma fusca* female, lateral view.
FIG. 5—Portion of antenna of adult male *Pachyrhamma fusca* showing blunt dorsal spines.

*Photos: J. W. Endt.*




TEXT-FIG. 2. *Pachyrhamma uncata* n.sp. Fig. 1—Female genitalia, dorsal view. Fig. 2—Female genitalia, ventral view. Fig. 3—Male genitalia, dorsal view. Fig. 4—Male genitalia, ventral view, subgenital plate in place. Fig. 5—Male genitalia, ventral view, subgenital plate removed to expose structures beneath.

being 0.7 as long as male, and hind legs of female 0.6 as long as male. Femora, tibiae and two proximal segments of hind tarsi armed with variable numbers of spines (Table II). No spines occur on fore or middle tarsi. Length of proximal segment of hind tarsus subequal, with length of other three segments together. Sexual dimorphism is shown in the spination of the hind femora, the more proximal portion of the prolateral margin of the male bearing three laterally directed, enlarged hooked spines, while in the female they are smaller and posteriorly directed. Ratios of length of legs to length of body: Fore leg, male 2.3:1; female 2:1. Middle leg, male 2.3:1; female 1.9:1. Hind leg, male 5:1; female 3.6:1.

GENITALIA. *Female*: Suranal plate, Fig. 1 (SAP), convex laterally, straight distally; distal margin clothed with two groups of setae. Subgenital plate, Fig. 2 (SGP), concave laterally with V-shaped notch distally; sparsely clothed with short setae. *Male*: Suranal plate, Fig. 3 (SPL), with straight margins, the lateral ones tapering distally; distal margin with a fringe of short setae. Subgenital plate, Fig. 4 (H), triangular, 1.1 wider than long, sides spreading slightly proximally, tapering to concave distally with a rounded apex, glabrous on dorsal side, but with apical protuberance on ventral surface thickly clothed with short setae. Two styli, Figs. 3, 4 (S), thickly clothed with short setae, length of styli being 0.3 length of sternite IX (S IX). Subgenital plate covers genitalia. Parameres, Fig. 5 (P), attenuated,

TABLE II.—VARIABILITY IN NUMBER OF LINEAR SPINES ON THE LEGS OF 25 SPECIMENS OF *PACHYRHAMMA UNCATA* n.sp.

| | | Arith. Mean | | Std. Dev. | | Range | |
|---|---|---|---|---|---|---|---|
| | | L. | R. | L. | R. | L. | R. |
| Fore Femur Inf. | Pro. | 2.7 | 3 | 1.7 | 1.9 | 0–6 | 0–7 |
| | Retro. | 0.04 | 0.04 | — | — | 0(24), 1 | 0(24), 1 |
| Fore Tibia Inf. | Pro. | 3 | 3 | — | — | — | — |
| | Retro. | 3 | 3 | — | — | — | — |
| Fore Tarsus ♂ | Pro. | 0 | 0 | — | — | — | — |
| | Retro. | 0 | 0 | — | — | — | — |
| Mid. Femur Inf. | Pro. | 0.5 | 0.4 | 0.9 | 0.9 | 0–3 | 0–3 |
| | Retro. | 1.5 | 1.8 | 1.4 | 1.8 | 0–5 | 0–5 |
| Mid. Tibia Sup. | Pro. | 3.8 | 3.9 | 1.3 | 1.4 | 2–7 | 2–7 |
| | Retro. | 2.8 | 2.6 | 1.2 | 1.2 | 1–6 | 1–5 |
| Mid. Tibia Inf. | Pro. | 3 | 3 | — | — | — | — |
| | Retro. | 3 | 3 | — | — | — | — |
| Mid. Tarsus | Pro. | 0 | 0 | — | — | — | — |
| | Retro. | 0 | 0 | — | — | — | — |
| Hind Femur Inf. | Pro. | 6.4 | 6.2 | 1.0 | 0.7 | 4–8 | 5–8 |
| | Retro. | 18.6 | 17.4 | 6.2 | 4.9 | 7–32 | 9–29 |
| Hind Tibia Sup. | Pro. | 35.3 | 34.7 | 3.1 | 3.7 | 27–40 | 26–42 |
| | Retro. | 37.6 | 38.3 | 3.7 | 3.2 | 30–43 | 32–45 |
| Hind Tarsus 1 Sup. | Pro. | 3 | 3.2 | 0.8 | 0.8 | 2–4 | 2–4 |
| | Retro. | 3 | 3 | 0.7 | 1.0 | 2–4 | 1–6 |
| Hind Tarsus 2 Sup. | Pro. | 0.4 | 0.6 | — | — | 0(15), 1(10) | 0(11), 1(14) |
| | Retro. | 0.6 | 0.5 | — | — | 0(10), 1(15) | 0(12), 1(13) |

Figures in brackets are number of specimens.

broad at base and tapering to a point, 1.2 broader than long, prolateral margin thickly clothed with long setae, rest of paramere clothed with short setae. Pseudosternite, Fig. 5 (PD), 1.1 wider than long, tapering to a point distally. Penis, Fig. 5 (PN), two-lobed, each lobe 1.8 longer than broad. Paraprocts, Figs. 4, 5 (PP), elongate, 1.8 longer than broad.

LOCALITY. Gold-mining tunnels, Thames (type locality), coll. A.M. Richards.

TYPES. Holotype male, Allotype female and Paratype male and female in Auckland Institute and Museum Collection. Paratype male and female in British Museum (Nat. Hist.) Collection. Paratype male and female in Dominion Museum Collection.

*Pachyrhamma uncata* is most closely related to *P. acanthocera,* but differs from it in:

1. The absence of spines on antennae of mature male.
2. Smaller number of linear spines on middle and hind femora.
3. Presence of enlarged hooked spines on prolateral margin of hind femora of adult male.

## ACKNOWLEDGMENTS

I am indebted to Dr. M. Beier, Naturhistorisches Museum, Vienna, for the loan of material from Brunner von Wattenwyl's Collection, and Dr. D. R. Ragge, curator of Orthoptera at the British Museum (Nat. Hist.) for permission to examine Hutton's specimens of *Pleioplectron cavernae.* I should also like to thank Mr. K. Frazerhurst for allowing me to collect specimens from gold-mining tunnels on his property at Thames, and Dr. H. R. Thompson, of the Applied Mathematics Laboratory, in preparing the tables.

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## INDEX TO TEXT-FIGURES.

B, basivalvula; BC, basal segment of cercus; C, cercus; DE, ductus ejaculatorius; DV, dorsal valve; E, endapophysis; EP, endoparamere; FCA, feebly chitinised arch connecting rami; H, subgenital plate, male; IA, intersegmental apodome; 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; S, stylus; S VII, S VIII, S IX, sternite VII, VIII, IX; SAP, supra-anal plate, female; SGP, subgenital plate, female; 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; Prol., Prolateral; Retro., Retrolateral; Std. Dev., Standard Deviation; Sup., Superior; Mid., Middle; L., Left leg; R., Right leg.