Revision of the Rhaphidophoridae (Orthoptera) of New Zealand

Part VII. The Rhaphidophoridae of the Waipu Caves

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Abstract

Two new species of Rhaphidophoridae, *Pachyrhamma waipuensis* n.sp. and *Pallidoplectron peniculosum* n.sp., are described.

Introduction

The Waipu caves are situated in limestone country about 100 miles north of Auckland. Waipu Cave, the best known of the caves, is renowned throughout the district for its large number of glow-worms, and some years ago was used as a tourist attraction. However, the cave quickly floods during periods of heavy rain, so that it has come to be regarded as rather unsafe.

In September, 1959, several of these caves, including Waipu Cave, were visited by the author. A number of insects were collected, most of them being trogloxenes from the outside world. Two new species of Rhaphidophoridae are described here. A male and female *Pallidoplectron peniculosum* n.sp were collected from about 200 yards inside Waipu Cave. No other specimens of this species have so far been found in other caves in the area. The other species, *Pachyrhamma waipuensis* n.sp., however, was much more common and occurred in several of the caves, always quite close to the entrance of each. Fourteen specimens of this species were examined. At Waipu the same ecological niches are filled by these two genera as at Waitomo (Richards, 1956), *Pallidoplectron* always occurring close to water, with *Pachyrhamma* usually in the drier parts of the cave or in caves without water.

Genus Pachyrhamma Brunner, 1888. *Monog. Steno. Gryll. Verh. z–b* Wien, XXXVIII, p. 302.

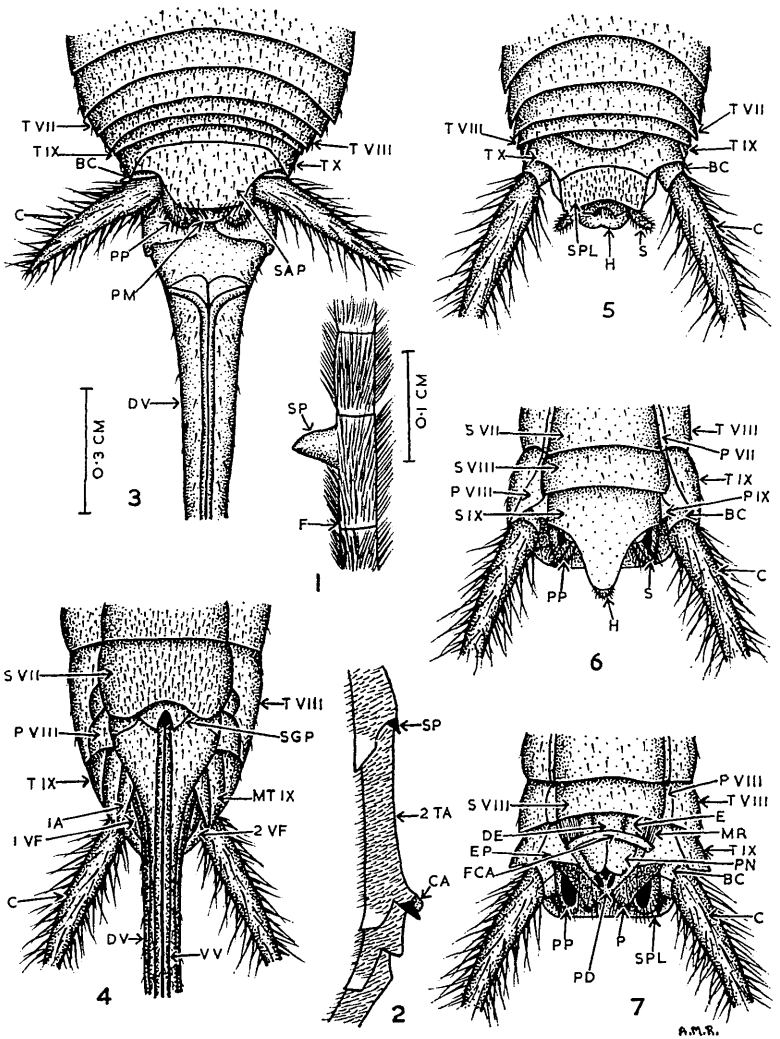
1954. *Macropathus* Walker. Richards, *Trans. Roy. Soc. N.Z., 82,* p. 741.
1958. *Pachyrhamma* Brunner. Richards, *Trans. Roy. Soc. N.Z., 85,* p. 466.

Pachyrhamma waipuensis n.sp. Text-fig. 1, Figs. 1–7.

Colour. Basic colour light brown; with anterior border of pronotum deep ochreous, posterior borders of pronotum, mesonotum, metanotum and abdominal terga light brown; lateral borders of pronotum and mesonotum deep ochreous; nota irregularly mottled with mid-brown and ochreous; abdominal terga mottled with mid-brown; femora and tibiae transversely banded with light brown and ochreous, mid-brown at their junctions; tarsi pale ochreous; antennae light brown; ovipositor deep reddish-brown.

Body. Length up to 30 mm in male and 28 mm in female; average length 27 mm in male and 25 mm in female. Body sparsely clothed with setae. Ovipositor subequal in length with body. Antennae approximately six times as long as body in female and nine times as long as body in male. Fastigium rising abruptly, convex posteriorly, concave anteriorly. Maxillary palps with third joint 0.8 as long as fourth.

Antennae. As in generic description (Richards, 1954). Sexual dimorphism well developed, male possessing longer, stouter antennae than female; middle portion of flagellum in male armed with a number of short, blunt dorsal spines, Fig. 1 (SP), each spine being



TEXT-FIG. 1.—*Pachyrhamma waipuensis* n.sp. Fig. 1—Portion of flagellum of antenna of adult male showing spine. Fig. 2—Portion of hind tarsus of adult male showing callosity at distal end of second tarsal segment. Fig. 3—Female genitalia, dorsal view. Fig. 4—Female genitalia, ventral view. Fig. 5—Male genitalia, dorsal view. Fig. 6—Male genitalia, ventral view. Fig. 7—Male genitalia, ventral view, subgenital plate removed to expose structure beneath.

borne on the anterior part of its segment; variability in number and size of spines present is common; number ranges between 7 and 9, the mean of 10 antennae being 8.2; female never possesses spines.

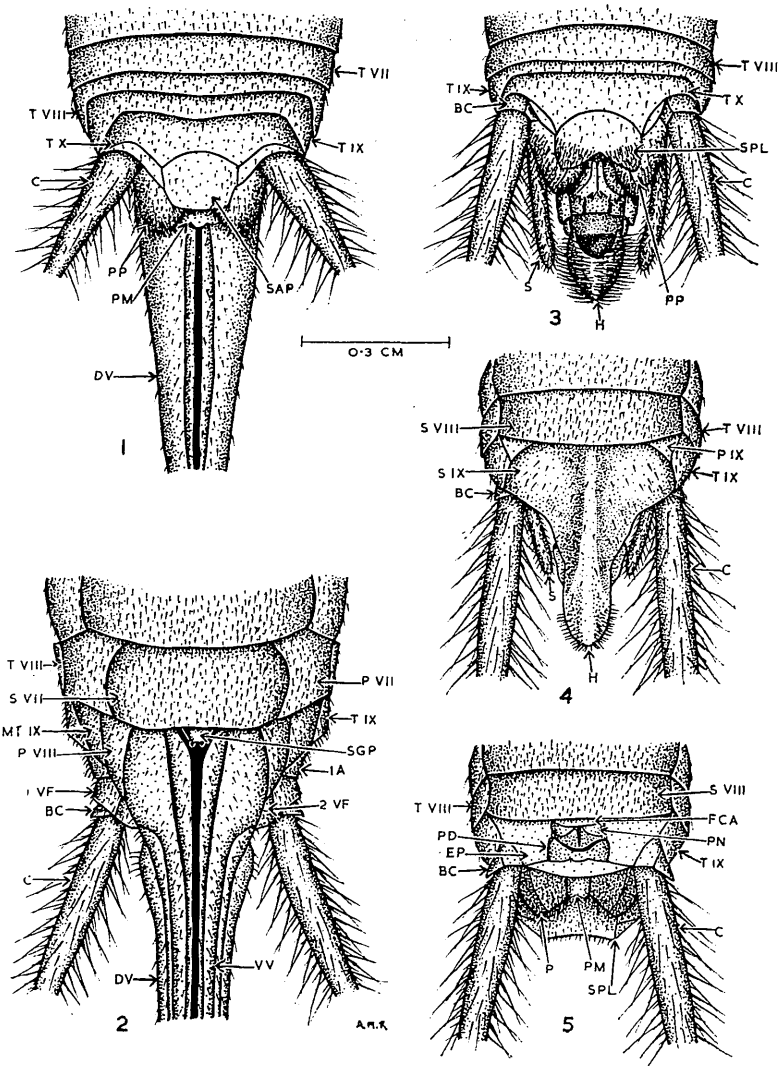
LEGS. Fore and middle legs subequal in length, with hind leg slightly less than twice length of fore or middle legs in female, and slightly more than twice length of fore or middle legs in male. Sexual dimorphism is shown by fore and middle legs of female being 0.6 as long as in the male and hind legs of female 0.5 as long as in the male. Fore and hind femora, fore, middle and hind tibiae and proximal segment of hind tarsi armed with variable number of linear spines (Table I). No spines occur on middle femora and fore or middle tarsi. Apical spines constant in number, as in generic description. On hind tibiae prolateral apical dorsal spur longer than retrolateral one. Sexual dimorphism is shown in hind tarsi: those of adult male possessing a small, round, dorsal callosity between apical spines of second proximal tarsal segment, Fig. 2 (CA); this callosity is not present in tarsi of female. Length of proximal segment of hind tarsus subequal with other three together. Ratio of length of legs to length of body: Fore leg, male 2.9:1; female 2:1. Middle leg, male 2.8:1; female 1.9:1. Hind leg, male 5.9:1; female 3.6:1.

TABLE 1.—Variability in Number of Linear Spines on the Legs of 13 Specimens of *Pachyrhamma waipuensis* n.sp.

		Arith Mean		Std. Dev.		Range	
		L	R	L	R	L	R
Fore Femur	Pro.	0.08	0.08	—	—	0(12), 1(1)	0(12), 1(1)
Inf.	Retro.	0	0	0	0	0	0
Fore Tibia	Pro.	2.69	2.77	—	—	2(4), 3(9)	2(3), 3(10)
Inf.	Retro.	3	3	0	0	0	0
Fore Tarsus	Pro.	0	0	0	0	0	0
	Retro.	0	0	0	0	0	0
Mid Femur	Pro.	0	0	0	0	0	0
Inf.	Retro.	0	0	0	0	0	0
Mid Tibia	Pro.	0.31	0.23	—	—	0 (9), 1(4)	0(10), 1(3)
Sup.	Retro.	0.08	0	—	0	0(12), 1(1)	0
Mid Tibia	Pro.	3	3	0	0	0	0
Inf.	Retro.	2.92	3	—	0	3(12), 2(1)	0
Mid Tarsus	Pro.	0	0	0	0	0	0
	Retro.	0	0	0	0	0	0
Hind Femur	Pro.	7.92	8.00	1.04	1.48	6–10	5–10
Inf.	Retro.	1.85	1.73	0.56	0.79	1–3	0–3
Hind Tibia	Pro.	24.00	24.00	4.49	5.27	18–31	17–33
Sup.	Retro.	28.46	28.64	4.79	4.78	21–37	21–35
Hind Tarsus	Pro.	1.69	1.55	—	—	1(4), 2(9)	1(5), 2(6)
1 Sup.	Retro.	1.69	1.82	—	—	1(4), 2(9)	1(2), 2(9)
Hind Tarsus	Pro.	0.08	0	—	0	0(12), 1(1)	0
2 Sup.	Retro.	0.15	0.18	—	—	0(11), 1(2)	0(9), 1(2)

(Figures in parentheses represent number of specimens.)

GENITALIA. *Female*: Suranal plate, Fig. 3 (SAP), concave laterally, truncated distally; distal margin clothed with short setae. Subgenital plate, Fig. 4 (SGP), convex laterally, very deeply notched distally; sparsely clothed with setae. *Male*: Suranal plate, Fig. 5 (SPL), convex laterally, emarginate distally; plate thickly clothed with short setae. Subgenital plate, Fig. 6 (H), triangulate, subequal in width to length, sides spreading slightly proximally, tapering to concave distally with a rounded apex, glabrous on dorsal side, but apical protuberance on ventral surface thickly clothed with short setae. Two styli, Figs. 5, 6 (S), thickly clothed with short setae, length of styli being 0.25 length of sternite IX (S IX). Subgenital



TEXT-FIG 2.—*Pallidoplectron peniculosum* 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. Fig. 5—Male genitalia, ventral view, subgenital plate removed to expose structures beneath.

plate covers genitalia. Parameres, Figs. 6, 7 (P), attenuated, broad at base and tapering to a point, subequal in length to width, prolateral margin thickly clothed with long setae, rest of paramere clothed with short setae. Pseudosternite, Fig. 7 (PD), 1.3 wider than long, tapering to a point distally. Penis, Fig. 7 (PN), two-lobed, each lobe subequal in width to length. Paraprocts, Figs. 6, 7 (PP), elongate, 1.7 longer than broad.

LOCALITY. Limestone caves, Waipu (type locality), coll. A. M. Richards, B. M. May.

TYPES. Holotype male, allotype female, and paratype male and female so designated in Plant Diseases Division collection.

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

1. Absence or marked reduction in number of dorsal linear spines on middle tibiae.
2. Presence on hind tarsi of adult male of a round dorsal callosity between the apical spines of the second proximal tarsal segment.
3. Shape of subgenital plate of female.

Genus PALLIDOPLECTRON Richards, 1958. *Trans. Roy. Soc. N.Z., 85,* p. 703.

Pallidoplectron peniculosum n.sp. Text-fig. 2, Figs. 1–5.

COLOUR. Basic colour light brown, anterior and posterior borders of pronotum and posterior borders of mesonotum, metanotum and abdominal terga light brown; lateral borders of pronotum and mesonotum light brown; nota and abdominal terga irregularly mottled with light brown and ochreous; femora and tibiae banded with light brown and ochreous; tarsi ochreous; antennae light brown; ovipositor deep ochreous, pale reddish-brown at tip and along edges of dorsal and ventral valves.

BODY. Length, 15 mm in male, 16 mm in female. Ovipositor 0.7 times as long as body. Antennae in male 7 times as long as body, and in female 6 times as long as body. Fastigium twice as long as high, with base touching scape of antennae. Maxillary palps with third and fourth joints subequal in length. Pronotum and mesonotum distinctly margined laterally and posteriorly.

ANTENNAE. As in generic description (Richards, 1958). Third segment narrower than pedicel, but subequal in length with it. All segments thickly clothed with short golden setae. Sexual dimorphism very poorly developed, antennae of male slightly longer than those of female; no spines present on flagellum of male or female.

LEGS. Thickly clothed with short setae. Fore and middle legs subequal in length, with hind leg 1.7 length of fore or middle legs. Sexual dimorphism absent. All femore sulcate ventrally. Fore and middle femora unarmed; hind femora bearing 6 prolateral and 2 retrolateral linear spines beneath in male, and 6 prolateral and either 1 or 2 retrolateral linear spines beneath in female. Fore and middle tibiae bearing 2 prolateral and 2 retrolateral linear spines beneath; hind tibiae with 19 or 21 prolateral and 21 or 24 retrolateral linear spines above in male, and 23 or 24 prolateral and 23 or 27 retrolateral linear spines above in female. Fore, middle and hind tarsi without linear spines. Apical spines constant in number, as for generic description. Length of proximal segment of hind tarsus subequal with other three together. Ratio of length of legs to length of body: fore leg, 1.6:1; middle leg, 1.6:1; hind leg 2.8:1.

GENITALIA. *Female*: Suranal plate, Fig. 1 (SAP), slightly convex laterally, with distal margin truncated and bearing two groups of setae. Subgenital plate, Fig. 2 (SGP), straight laterally, distal margin bearing two tubercles; plate glabrous. *Male*: Suranal plate, Fig. 3 (SPL), concave laterally, deeply notched distally; latero-distal parts of plate thickly clothed with setae, rest of plate sparsely clothed with setae. Subgenital plate, Figs. 3, 4 (H), concave laterally, attenuated and rounded distally; the well-developed median keel thickly clothed with setae at distal end, rest of dorsal surface of plate sparsely clothed with setae; ventral surface with distal lobe thickly clothed with long setae; proximal to the median depression are two lobes fused together medianly and each bearing five small processes distally. Two styli, Figs. 3, 4 (S), thickly clothed with short setae, length of styli being 0.4 length of sternite IX (S IX). Subgenital plate covers genitalia. Parameres, Fig. 5 (P), small, broad at base, tapering to a point 1.2 broader than long, thickly clothed with setae. Pseudosternite, Fig. 5 (PD), compressed dorsoventrally, 1.5 broader than long; lateral margin straight, but notched medianly, distal margin trilobed, the two lateral lobes larger and extending beyond the median one. Penis, Fig. 5 (PN), two-lobed, each lobe nearly twice as broad as long. Paraprocts absent.

LOCALITY. Waipu Cave (type locality), coll. A. M. Richards.

TYPES. Holotype male and allotype female in Plant Diseases Division collection.

Pallidoplectron peniculosum resembles *P. turneri* Richards, the only other species in the genus, but differs from it in:

1. Greater number of linear spines on hind femora.
2. Shape of suranal plate of male.
3. Shape of subgenital plate of male.

ACKNOWLEDGMENTS

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LITERATURE CITED

RICHARDS, A. M., 1956. *The Systematics, Ecology and Life History of Two Species of Rhaphidophoridae (Orthoptera) at Waitomo Caves.* Unpublished thesis in Library of Victoria University of Wellington.

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INDEX TO TABLE.

Inf.—Inferior.
L.—Left leg
Mid.—Middle.
Pro.—Prolateral.
Retro.—Retrolateral.
R.—Right leg.
Std. Dev.—Standard deviation.
Sup.—Superior.

INDEX TO TEXT-FIGURES.

B—Basivalvula.
C—Cercus.
DV—Dorsal valve.
EP—Endoparamere.
F—Flagellum.
H—Subgenital plate, male.
MR—Muscle attached to ramus.
P—Paramere (ectoparamere).
PD—Pseudosternite.
PN—Penis.
S—Stylus.
BC—Basal segment of cercus.
CA—Callosity.
DE—Ductus ejaculatorius.
E—Endopophysis.
FCA—Feebly chitinised arch connecting rami.
IA—Intersegmental apodeme.
MT IX—Membrane of tergite IX.
P—Pleurite.
PM—Perianal membrane.
PP—Paraproct.
SAP—Supra-anal plate, female.
SGP—Subgenital plate, female.
SPL—Suranal plate, male.
2 TA—Second hind tarsal segment.
2 VF—Second valvifer.
S—Sternite.
SP—Spine.
T—Tergite.
1 VF—First valvifer.
VV—Ventral valve.