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Revision of the Rhaphidophoridae (Orthoptera) of New Zealand

Part X—Three New Species of the Genus *Gymnoplectron* Hutton 1897, from Rotorua

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Abstract

THREE new species of Rhaphidophoridae belonging to the genus *Gymnoplectron* Hutton, *Gymnoplectron spinosa* n. sp., *G. tuarti* n. sp., and *G. ngongotahaensis* n. sp. are described. A fresh key is given to the genus *Gymnoplectron* Hutton.

INTRODUCTION

THE genus *Gymnoplectron* Hutton consists of both bush-dwelling and cave-dwelling forms. Up till this paper, six cave species and three bush species had been recorded; now two further bush-dwelling species and a tunnel inhabiting species are described. The bush-dwelling species were removed from inside rotten logs in rimu-tawa forest and were not nearly as common as the tunnel species. These three species are all closely related to cave-dwelling species in the northern part of the North Island, and lack the sturdy hind legs of other bush-dwelling members of the genus. They are the first species of *Gymnoplectron* to be recorded from the Rotorua district.

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As twelve species have now been placed in the genus *Gymnoplectron* Hutton, a fresh key to the genus is given below.

KEY TO THE SPECIES OF *Gymnoplectron*

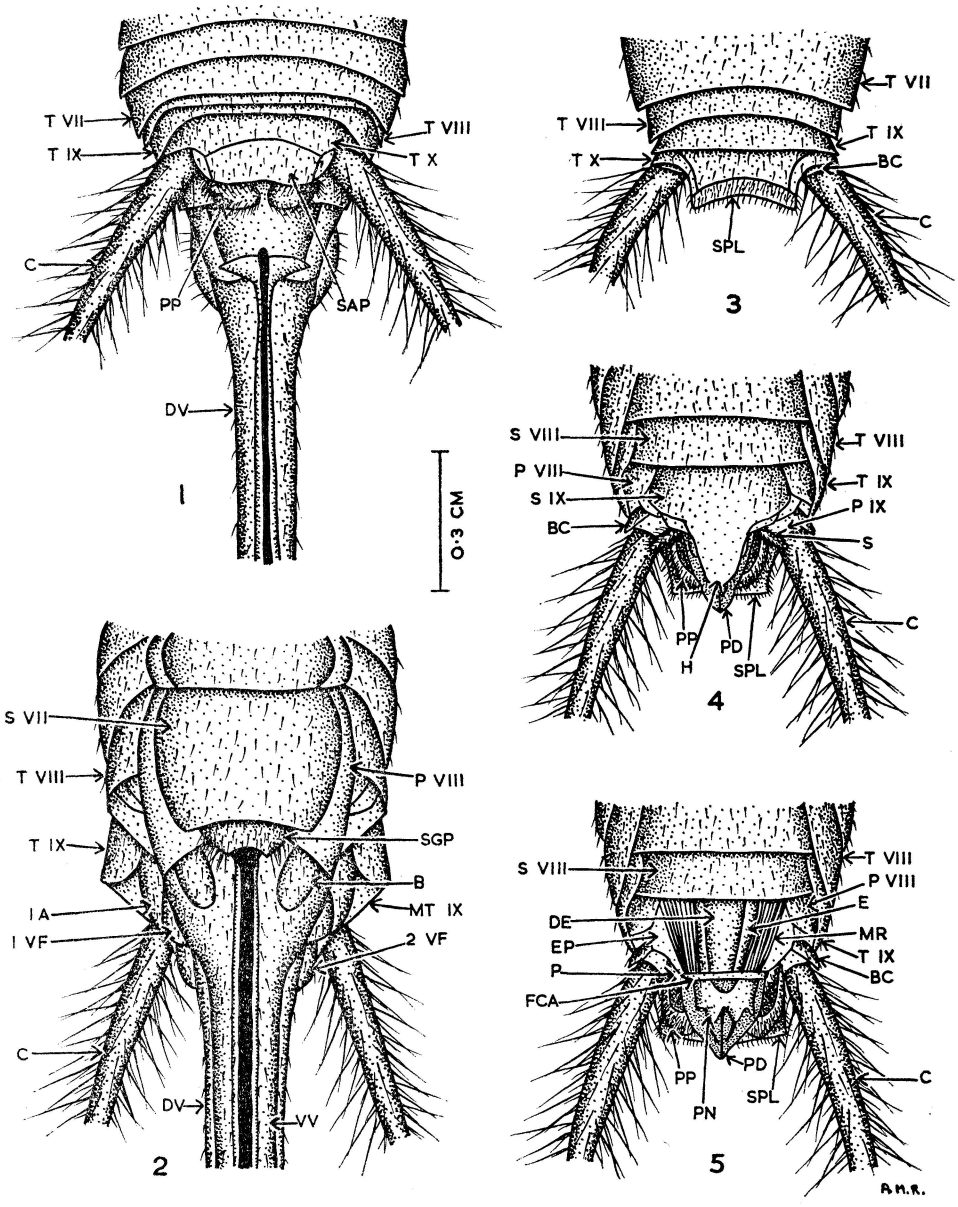
1.	Hind tarsus of male with small round dorsal callosity between apical spines of second proximal tarsal segment	*G. waipuensis* Richards	
	Hind tarsus without callosity		2
2.	Antennae in male armed with spines		3
	Antennae in male without spines		6
3.	Antennae in male with both blunt and sharply pointed spines	*G. spinosa* n. sp.	
	Antennae with sharp spines		4
4.	Antennae in male with numerous small sharp spines	*G. fascifer* (Walker)	
	Antennae in male with large or small blunt spines		5
5.	Antennae in male with 5 or 6 large blunt spines; posterior femora (male and female) bearing approximately 21 retrolateral and 12 prolateral linear spines beneath	*G. acanthocera* Milligan	
	Antennae in male with approximately 9 small blunt spines; posterior femora (male and female) bearing approximately 3 retrolateral and 8 prolateral linear spines beneath	*G. fusca* Richards	
6.	Fore femur without linear spines		7
	Fore femur with linear spines		8
7.	Suranal and subgenital plates of female with rounded apex distally	*G. tuarti* n. sp.	
	Suranal and subgenital plates of female emarginate distally	*G. waitomoensis Richards*	
8.	Posterior tibia with approximately more than 27 prolateral or retrolateral linear spines above		9
	Posterior tibiae with approximately less than 27 prolateral or retrolateral linear spines above		10
9.	Subgenital plate of female truncate	*G. ngongotahaensis* n. sp.	
	Subgenital plate of female with V-shaped notch distally	*G. uncata* Richards	
10.	Hind tarsus without linear spines	*G. longipes* (Colenso)	
	Hind tarsus with linear spines		11
11.	Suranal plate in male and female without median spine	*G. longicauda* Richards	
	Suranal plate with a small blunt median spine in female; and a large blunt median spine in male	*G. delli* (Richards)	

Genus GYMNOPLECTRON Hutton, 1897. *Trans. N.Z. Inst., 29*: 229.

1897. *Pachyrhamma* (Brunner) Hutton, *Trans. N.Z. Inst., 29*: 230–231.
1954. *Macropathus* Walker. Richards, *Trans. Roy. Soc. N.Z., 82*: 741.
1958. *Pachyrhamma* Brunner. Richards, *Trans. Roy. Soc. N.Z., 85*: 466.

Gymnoplectron spinosa n. sp. Text-fig. 1, Figs. 1–5.

COLOUR. Basic colour mid-brown with pronotum, mesonotum, metanotum and abdominal terga irregularly mottled with dark brown, light brown and ochreous; lateral and posterior borders of pronotum, mesonotum, metanotum and posterior borders of abdominal terga ochreous; femora of all legs light brown with transverse ochreous bands towards proximal ends; fore and middle tibiae light brown, changing to ochreous distally; hind tibiae deep ochreous; tarsi ochreous; antennae light brown; ovipositor reddish brown.



TEXT-FIG. 1.—*Gymnoplectron spinosa* 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.

BODY. Length up to 29 mm, average length 27 mm. 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, grooved medianly and longitudinally, 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 narrower than pedicel, on dorsal aspect 2.5 times as long as pedicel in male and three times as long in female, on ventral aspect 1.2 as long in both male and female; 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 three or four short, blunt, dorsal spines; approximately 40th and 50th segments from proximal end of flagellum armed with a short, sharply pointed prolateral spine; each spine borne on a swelling on the upper part of its segment; 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 0.83 as long as male, and hind legs of female 0.76 as long as male. Femora, tibiae and proximal two segments of hind tarsi armed with variable numbers of spines (Table I). No spines occur on fore or middle tarsi. Length of proximal segment of hind tarsus subequal with other three together. Ratio of length of legs to length of body: Fore leg, male 2.2:1; female 1.8:1. Middle leg, male 2.1:1; female 1.7:1. Hind leg, male 4.4:1; female 3.2:1.

TABLE I.—VARIABILITY IN NUMBER OF LINEAR SPINES ON THE LEGS OF 9 SPECIMENS OF *GYMNOPLECTRON SPINOSA* n. sp.

		Arith. Mean		Std. Dev.		Range (or actual distribution)	
		L	R	L	R	L	R
Fore Femur	Pro.	6.2	7.1	2.3	3.9	2–11	0–13
Inf.	Retro.	0	0	0	0	0	0
Fore Tibia	Pro.	3	3	0	0	0	0
Inf.	Retro.	3.1	3	—	0	3(8), 4	0
Fore Tarsus	Pro.	0	0	0	0	0	0
	Retro.	0	0	0	0	0	0
Mid Femur	Pro.	5.4	5.4	2.4	2.3	3–10	3–10
Inf.	Retro.	13.1	12.1	3.4	3.1	8–19	8–17
Mid Tibia	Pro.	3.9	4.0	1.1	0.5	2–5	3–5
Sup	Retro.	1.2	1.6	1.0	0.9	0–3	0–3
Mid Tibia	Pro.	3	3	0	0	0	0
Inf.	Retro.	3	3	0	0	0	0
Mid Tarsus	Pro.	0	0	0	0	0	0
	Retro.	0	0	0	0	0	0
Hind Femur	Pro.	13.4	13.1	1.4	1.5	12–16	11–15
Inf.	Retro.	23.7	26.0	6.8	6.8	17–35	18–34
Hind Tibia	Pro.	34.3	34.7	2.1	3.0	31–37	31–40
Sup.	Retro.	39.0	38.2	1.7	2.4	36–41	36–43
Hind Tarsus	Pro.	0	0	0	0	0	0
1 Sup.	Retro.	1.8	2	—	0	1(2), 2(7)	0
Hind Tarsus	Pro.	0	0	0	0	0	0
2 Sup.	Retro.	0	0	0	0	0	0

(Figures in parentheses represent number of specimens.)

GENITALIA. *Female*: Suranal plate, Fig. 1 (SAP), concave laterally, rounded and notched medianly at distal margin; distal margin clothed with two groups of setae. Subgenital plate, Fig. 2 (SGP), deeply notched distally; lateral margins of plate clothed with long setae, rest of plate sparsely clothed with short setae. *Male*: Suranal plate, Fig. 3 (SPL), concave laterally and distally; distal portion of plate thickly clothed with short setae, rest of plate sparsely clothed with short setae. Subgenital plate, Fig. 4 (H), triangulate, subequal in width to length, 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, Fig. 4 (S), thickly clothed with short setae, length of styli being 0.25 length of sternite 1X (S 1X). Parameres, Fig. 5 (P), attenuated, broad at base, and tapering to a point, 1.4 longer than wide, prolateral margin thickly clothed with long setae, rest of paramere clothed with short setae; parameres covered by pseudosternite. Pseudosternite, Fig. 5 (PD), subequal in width to length, tapering to a point distally. Penis, Fig. 5 (PN), two-lobed, each lobe bearing a smaller lateral lobe, each lobe 1.4 longer than wide. Paraprocts, Figs. 4, 5 (PP), elongate, 2.4 longer than broad, thickly clothed with setae.

LOCALITY. In rimu-tawa forest, Te Pu, Rotorua (type locality), coll. D. Tuart, 1958.

TYPES. Holotype male, Allotype female and Paratype male and female in Entomology Division Collection, Nelson.

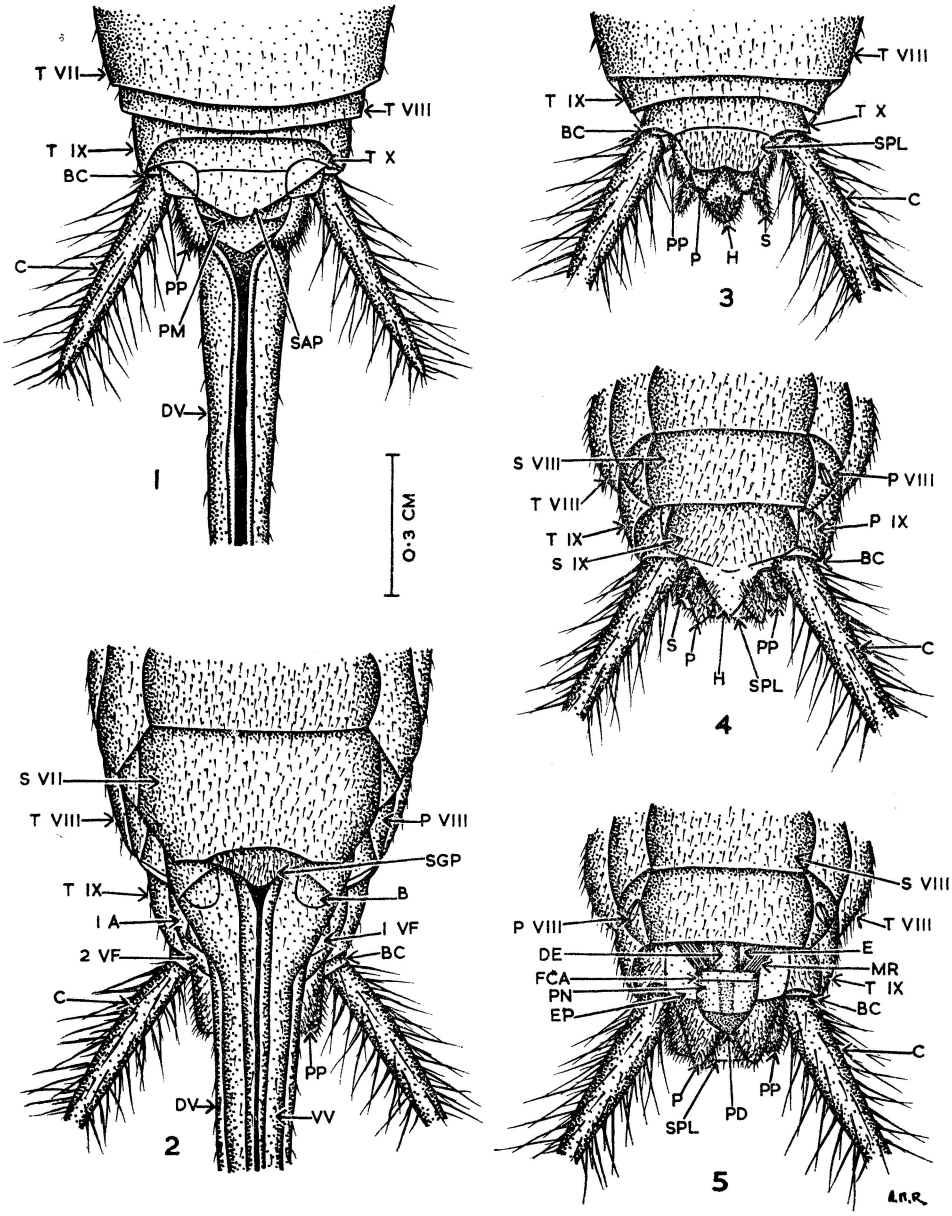
MATERIAL EXAMINED. Holotype male, Allotype female, Paratype male and female, and 3 males and 2 females.

Gymnoplectron spinosa is most closely related to *G. fusca* Richards (Richards 1959), but differs from it in:

1. The presence of linear spines on fore and middle femora.
2. The greater number of linear spines on hind femora.
3. The absence of spines on second segment of hind tarsus.
4. Antennae of male with fewer blunt dorsal spines, and presence of two sharply pointed prolateral spines.

Gymnoplectron tuarti n.sp. Text-fig. 2, figs. 1–5.

COLOUR. Basic colour light brown with pronotum, mesonotum, metanotum and abdominal terga irregularly mottled with mid-brown and ochreous. Lateral and posterior borders of pronotum, mesonotum and metanotum ochreous; femora and tibiae of all legs light brown with transverse bands of ochreous; tarsi ochreous; antennae light brown; ovipositor reddish brown.



TEXT-FIG. 2.—*Gymnoplectron tuarti* 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.

BODY. Length, 28 mm. Body sparsely clothed with setae. Ovipositor 0.8 as long as body. Antennae broken. Fastigium longer than high, rising abruptly, grooved medianly and longitudinally, 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 and ventral aspects narrower than pedicel and approximately 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 being 0.93 as long as male, and hind legs of female 0.86 as long as male. Femora, tibiae and proximal two segments of hind tarsi armed with variable numbers of spines (Table II). No spines occur on fore or middle femora and tarsi. Length of proximal segment of hind tarsus subequal with other three. Ratio of length of legs to length of body: Fore leg: male, 1.6:1; female, 1.5:1. Middle leg: male, 1.6:1; female, 1.5:1. Hind leg: male, 3.1:1; female, 2.7:1.

TABLE II.—VARIABILITY IN NUMBER OF LINEAR SPINES ON THE LEGS OF 5 SPECIMENS OF *GYMNOPLECTRON TUARTI* n. sp.

		Arith. Mean		Std. Dev.		Range (or actual distribution)	
		L	R	L	R	L	R
Fore Femur Inf.	Pro.	0	0	0	0	0	0
	Retro.	0	0	0	0	0	0
Fore Tibia Inf.	Pro.	3	3	0	0	0	0
	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 Inf.	Pro.	0	0	0	0	0	0
	Retro.	0	0	0	0	0	0
Mid Tibia Sup.	Pro.	2.2	2.2	1.5	1.5	0–4	0–4
	Retro.	1.2	1.4	0.8	0.9	0–2	0–2
Mid Tibia Inf.	Pro.	3	3	0	0	0	0
	Retro.	3	3	0	0	0	0
Mid Tarsus	Pro.	0	0	0	0	0	0
	Retro.	0	0	0	0	0	0
Hind Femur Inf.	Pro.	7.2	7.4	1.6	0.9	6–9	6–8
	Retro.	8.0	6.6	4.2	4.5	2–11	2–12
Hind Tibia Sup.	Pro.	31.2	31.8	1.9	3.6	29–34	28–35
	Retro.	36.2	37.2	4.1	4.0	30–39	32–41
Hind Tarsus 1 Sup.	Pro.	1.4	1.4	1.3	1.3	0–3	0–3
	Retro.	2.4	2.6	0.9	0.5	2–4	2–3
Hind Tarsus 2 Sup.	Pro.	0.2	0.2	—	—	0(4), 1	0(4), 1
	Retro.	0.2	0.2	—	—	0(4), 1	0(4), 1

(Figures in parentheses represent number of specimens.)

GENITALIA. *Female*: Suranal plate, Fig. 1 (SAP), convex laterally, convex distally forming an apex medianly; distal margin clothed with short setae. Subgenital plate, Fig. 2 (SGP), concave laterally tapering to a rounded apex distally; whole plate clothed with short setae. *Male*: Suranal plate, Fig. 3 (SPL), straight laterally, distal margin emarginate; whole plate clothed with short setae. Subgenital plate, Fig 4 (H), triangulate, subequal in width to length, sides spreading slightly proximally tapering to a pointed apex distally; on dorsal surface proximal portion thickly clothed with setae, disto-laterally bearing two groups of setae; 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 1X (S 1X). Parameres, Fig. 5 (P), attenuated, broad at base and tapering to a point distally, 1.6 longer than wide, prolateral margin thickly clothed with long setae, rest of paramere clothed with short setae. Pseudosternite, Fig. 5 (PD), subequal in width to length, tapering to a point distally. Penis, Fig. 5 (PN), two-lobed, each lobe 1.5 longer than wide. Paraprocts, Figs. 3–5 (PP), elongate, 2.5 longer than broad, thickly clothed with setae.

LOCALITY. Otahuia Canyon, Rotorua (type locality), coll. D. Tuart, 1956; in rimutawa forest, Te Pu, Rotorua, coll. D. Tuart, 1958.

TYPES. Holotype male, Allotype female and Paratype female in Entomology Division Collection, Nelson.

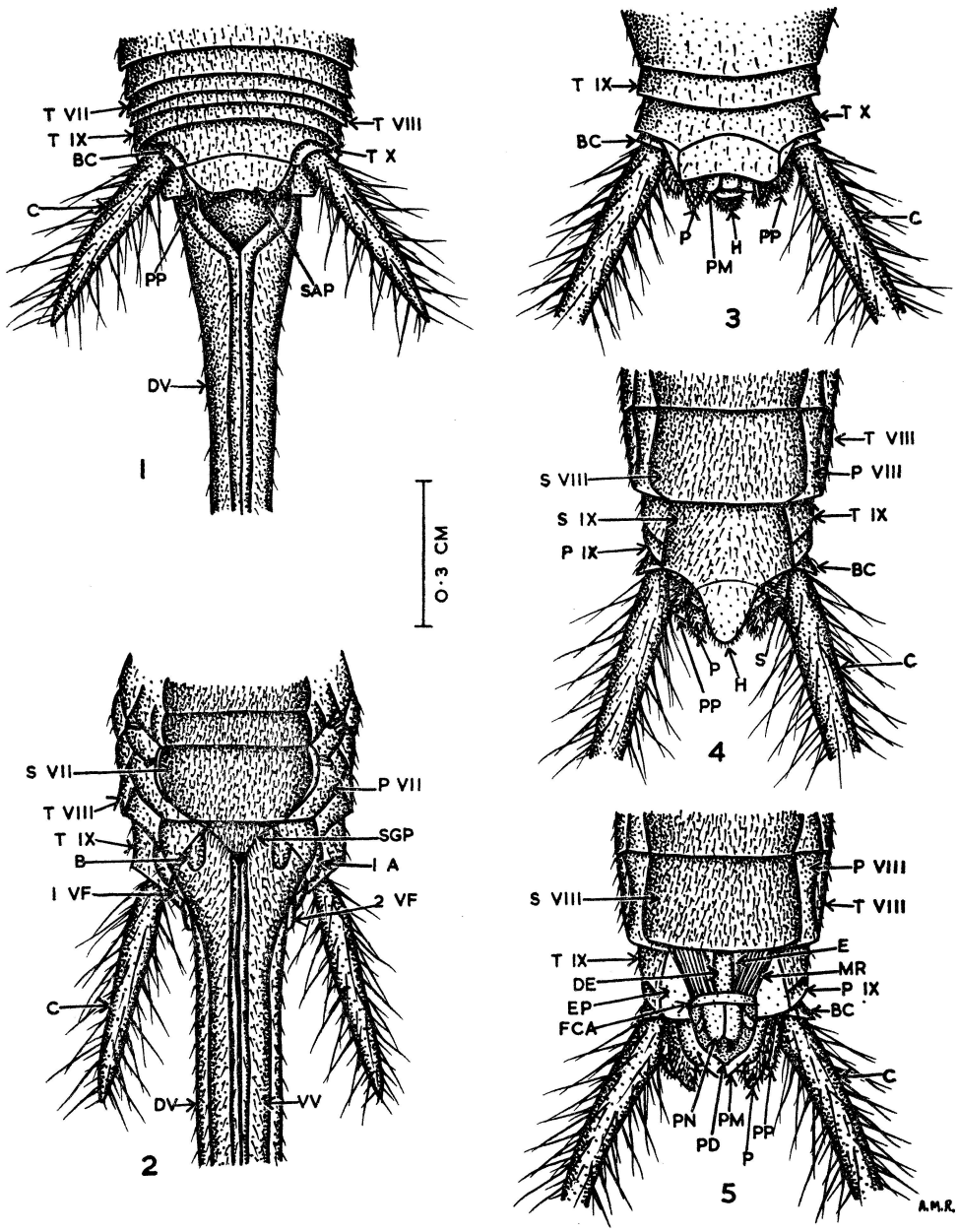
MATERIAL EXAMINED. Holotype male, Allotype female, Paratype female and 2 males.

Gymnoplectron tuarti is most closely related to *G. ngongotahaensis* n. sp., but differs from it in:

1. Absence of spines on fore femora.
2. Shape of suranal plate of female.
3. Pointed apex of subgenital plate of male.

Gymnoplectron ngongotahaensis n. sp. Text-fig. 3, figs. 1–5.

COLOUR. Basic colour light brown with pronotum, mesonotum, metanotum and abdominal terga irregularly mottled with dark brown and ochreous; lateral and posterior borders of pronotum, mesonotum, metanotum and posterior borders of abdominal terga ochreous; femora and tibiae light brown with ochreous spots and transverse ochreous bands towards proximal ends; tarsi ochreous; antennae light brown; ovipositor reddish brown.



TEXT-FIG. 3.—*Gymnoplectron ngongotahaensis* 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.

BODY. Length up to 24 mm in female and 30 mm in male. Body thickly clothed with setae. Ovipositor 0.8 length of body. Antennae broken. Fastigium longer than high, rising abruptly, grooved medianly and longitudinally, with base touching scape of antennae. Maxillary palps with third and fourth segments subequal in length.

ANTENNAE. Scape about three times as large as pedicel, which is narrower than scape, but broader than other segments; third segment narrower than pedicel, on dorsal aspect in both male and female approximately two times as long as pedicel, on ventral aspect 1.3 times as long in male, and 1.6 times as long in female; 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 being 0.73 as long as male, and hind legs of female 0.67 as long as male. Femora, tibiae and proximal two segments of hind tarsi armed with variable numbers of spines (Table III). No spines occur on middle femora and fore and middle tarsi. Length of proximal segment of hind tarsus subequal with other three. Ratio of length of legs to length of body: Fore leg: male, 1.5:1; female, 1.4:1. Middle leg: male, 1.5:1; female, 1.4:1. Hind leg: male 3.1:1; female, 2.6:1.

TABLE III.—VARIABILITY IN NUMBER OF LINEAR SPINES ON THE LEGS OF 18 SPECIMENS OF *GYMNOPLECTRON NGONGOTAHAENSIS* n. sp.

		Arith. Mean		Std. Dev.		Range (or actual distribution)	
		L	R	L	R	L	R
Fore Femur	Pro.	0.1	0.1	—	—	0(16), 1(2)	0(15), 1(2)
Inf.	Retro.	0	0	0	0	0	0
Fore Tibia	Pro.	3	3	0	0	0	0
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.	2.8	2.8	0.9	0.9	1–5	1–5
Sup.	Retro.	2.0	2.2	0.8	0.8	1–3	1–3
Mid Tibia	Pro.	2.9	3	—	0	2(2), 3(16)	0
Inf.	Retro.	2.9	3	—	0	2(1), 3(17)	0
Mid Tarsus	Pro.	0	0	0	0	0	0
	Retro.	0	0	0	0	0	0
Hind Femur	Pro	6.6	6.3	1.2	0.7	5–10	5–8
Inf.	Retro.	7.8	7.2	2.5	3.2	3–12	2–15
Hind Tibia	Pro.	30.8	31.6	3.8	2.8	24–38	25–37
Sup.	Retro.	35.1	34.5	2.4	3.7	29–38	26–39
Hind Tarsus	Pro.	2.3	2.3	1.2	0.6	1–6	2–3
1 Sup.	Retro.	2.5	2.4	0.9	0.7	1–4	1–4
Hind Tarsus	Pro.	0.1	0.2	—	—	0(16), 1	0(13), 1(3)
2 Sup.	Retro.	0.1	0.1	—	—	0(15), 1(2)	0(15), 1

(Figures in parentheses represent number of specimens.)

GENITALIA. *Female*: Suranal plate, Fig. 1 (SAP), distal margin rounded and notched medianly; distal margin clothed with two groups of setae. Subgenital plate, Fig. 2 (SGP), concave laterally, tapering distally; distal margin truncate; whole plate thickly clothed with setae. *Male*: Suranal plate, Fig. 3 (SPL), straight laterally, distal margin emarginate; distal margin clothed with short setae. Subgenital plate, Fig. 4 (H), triangulate, subequal in width to length, sides spreading slightly proximally, tapering to concave distally with a rounded apex, proximal portion thickly clothed with setae, distal portion sparsely clothed with setae; apical protuberance on ventral surface thickly clothed with short setae. Two styli, Fig. 4 (S), thickly clothed with short setae, length of styli being 0.2 length of sternite 1X (S 1X). Parameres, Fig. 5 (P), attenuated, broad at base and tapering to a point distally, 2.5 longer than broad, thickly clothed with setae. Pseudosternite, Fig. 5(PD), subequal in width to length, tapering to a point distally. Penis, Fig. 5 (PN), two-lobed, each lobe 1.8 longer than wide. Paraprocts, Figs. 3–5 (PP), elongate 2.6 longer than wide, clothed with setae.

LOCALITY. Government Game Farm, Ngongotaha, Rotorua (type locality), coll. E. R. Rye, 1954, R. Zondag, 1959.

TYPES. Holotype male, Allotype female and Paratype male and female in Plant Diseases Division Collection, Auckland.

MATERIAL EXAMINED. Holotype male, Allotype female, Paratype male and female, 15 males and 10 females.

Gymnoplectron ngongotahaensis is most closely related to *G. waitomoensis* Richards (Richards, 1958), but differs from it in:

1. Occurrence of spines on fore femora.
2. The greater number of linear spines on hind femora.
3. Length of body and ratio of length of legs to length of body smaller in both male and female.
4. Shape of subgenital plate of female.
5. Parameres, penis and paraprocts more elongated. Sub-genital plate with rounded apex.

ACKNOWLEDGMENTS

I am indebted to Dr. G. W. Ramsay, Entomology Division, for the loan of material collected from Otahuia Canyon and Te Pu, Rotorua. I should also like to thank Dr. H. R. Thompson, of the Applied Mathematics Laboratory, for assistance in preparing the tables.

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INDEX TO TABLES

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

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 apodeme.
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.

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ERRATA

Paper 23, Zoology Series.

In Key to the Species of Gymnoplectron, p. 312:—

4. Antennae in male with numerous small, sharp spines . . . .
read *G. edwardsii* (Scudder)
in place of *G. fascifer* (Walker)