Pacific Insects 13 (3-4): 575-587 5 December 1971

THE RHAPHIDOPHORIDAE (Orthoptera) OF AUSTRALIA

Part 9. The distribution and possible origins of Tasmanian Rhaphidophoridae, with descriptions of two new species

By Aola M. Richards[1]

Abstract: A new species of *Parvotettix* Richards, *P. maydenaensis* n. sp., is described from caves and rain forest in the Florentine/Junee region of southern Tasmania. A new species of *Micropathus* Richards, *M. montanus* n. sp., is also described from a cave and surface areas on Mt Ronald Cross in the central-west of the island. A key and new locality records are given for all species of *Parvotettix* and *Micropathus*. The current distribution, effects of Pleistocene glaciation, and possible origins of the 9 species of Tasmanian Rhaphidophoridae are discussed.

Since the rhaphidophorid genera *Micropathus* Richards and *Parvotettix* Richards were first described from limestone caves (Richards 1964, 1968), their range has been extended throughout Tasmania and they have been found in a number of different habitats. Two new species have recently been discovered, one belonging to each genus. Both species have been collected from caves and the epigean region. *M. montanus* n. sp. occurs at Mt Ronald Cross in the central-west, and *P. maydenaensis* n. sp. in the Florentine/Junee area in southern Tasmania.

Micropathus is most common in the moister western 1/2 of the island, where it is established in large colonies in caves and mine adits. Isolated occurrences have been recorded from the forest and a mountain highway, but no species has been found near human habitations. It is primarily a subterranean genus.

Parvotettix is mainly confined to the drier, eastern 1/2 of Tasmania. It has a much wider range of habitat than *Micropathus*, occurring in limestone caves and mine adits, in rain forest and in the vicinity of houses. The genus is equally distributed in epigean and subterranean habitats, its main requirements being cool, moist, dark conditions.

Mesa et al. (1969) record *P. goedei* Richards from rain forest 59.6 km SSW of Burnie, 40.3 km NNW of St. Helens, 11.3 km W of Maydena and at Mt Field National Park. None of this material is available for examination, as no Australian rhaphidophorid material studied by these authors has been deposited in the Australian National Insect Collection, Canberra, although this institution is named by them. It is quite possible that the Mt Field National Park and Maydena specimens could be *P. maydenaensis*, as these areas are very close to those from which I have specimens of this species. However, an isolated record of *P. goedei* has recently been verified to the SW of this region. The material from near St. Helens may prove to be *P. goedei*, as this species appears to be established in NE Tasmania. The area SSW of Burnie is an isolated locality record for *Parvotettix* in NW Tasmania, and it is by no means certain the insects are *P. goedei*. Because of the impossibility of verifying Mesa's identifications,

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his locality records have been disregarded when discussing the distribution of the genus later in this paper.

The distribution of the 9 species of Tasmanian Rhaphidophoridae is now sufficiently distinct to be able to postulate their possible origins, and the effects of the last Pleistocene glaciation on their current distribution.

Genus **Parvotettix** Richards

Parvotettix Richards, 1968, *Pacif. Ins.* **10**(1) : 168.

The genus *Parvotettix* contains 3 species, *P. goedei* Richards from caves and mines in northern Tasmania ; *P. rangaensis* Richards from a cave on Flinders Island ; and *P. domesticus* Richards from a Hobart house and backyard. A fourth species, from caves and rain forest in southern Tasmania, is described here. The 4 species may be distinguished by the following key.

Key to species of Parvotettix

1. Prominent dark setae on abdominal segments 2
   Prominent light brown setae on abdominal segments ..... **maydenaensis** n. sp.
2. Prominent dark setae on first 9 abdominal segments. Subgenital plate in ♀ with distal margin not truncate. ♂ styli less than 0.7 length of sternite IX 3
   Prominent dark setae on 1st 8 abdominal segments. Subgenital plate in ♀ with distal margin truncate. ♂ styli 0.7 length of sternite IX..... **rangaensis** Richards
3. Ovipositor armed with 8 teeth. Subgenital plate in ♀ with rounded apex. Subgenital plate in ♂ with distal margin truncate ..... **goedei** Richards
   Ovipositor armed with 7 teeth. Subgenital plate in ♀ with acute apex. Subgenital plate in ♂ with distal margin emarginate ..... **domesticus** Richards

Parvotettix goedei Richards

Parvotettix goedei Richards, 1968, *Pacif. Ins.* **10** : 168-70, fig. 1, table 1 ; 1970, *Pacif. Ins.* **12** : 2-3.

Fresh material has recently been collected from several new localities in the NW, NE and S of Tasmania. The species has now been found in rain forest and inside a house.

New records. TASMANIA : Mine adit, Anchor Lease, Lottah, 24.X.1970, coll. A. Goede ; laundry of old farm house, Grey, near St. Marys, 28.XI.1970, coll. T. Goede ; under wood, rain forest 438 m along Scotts Peak Road, 644 m E of Mt Wedge, altitude 500 m, 9.I.1971, coll. T. Goede ; unnamed cave, 966 m SW of Montagu, altitude 30 to 60 m, 29.I.1971, coll. A. Goede and T. Goede.

Parvotettix rangaensis Richards

Parvotettix rangaensis Richards, 1970, *Pacif. Ins.* **12** : 3-5, fig. 1, table 1.

Since this species was described from Flinders Island, it has been collected from a limestone cave on another of the Furneaux Islands.

NEW RECORD. CAPE BARREN ISLAND: In Modder River Cave at western end of island, 23.V.1970, coll. J. Whinray.

Parvotettix domesticus Richards

Parvotettix domesticus Richards, 1970, *Pacif. Ins.* **12**: 5-7, fig. 2, table 2.

Further records of this species have been obtained from Hobart, but its known distribution is still very limited.

NEW RECORDS. TASMANIA: Under small pile of rocks, 10 Meath Avenue, Taroona, Hobart, 29.VIII.1970, coll. K. Kiernan; on damp earth under board beneath house, 10 Meath Avenue, Taroona, Hobart, 12.XII.1970, coll. K. Kiernan.

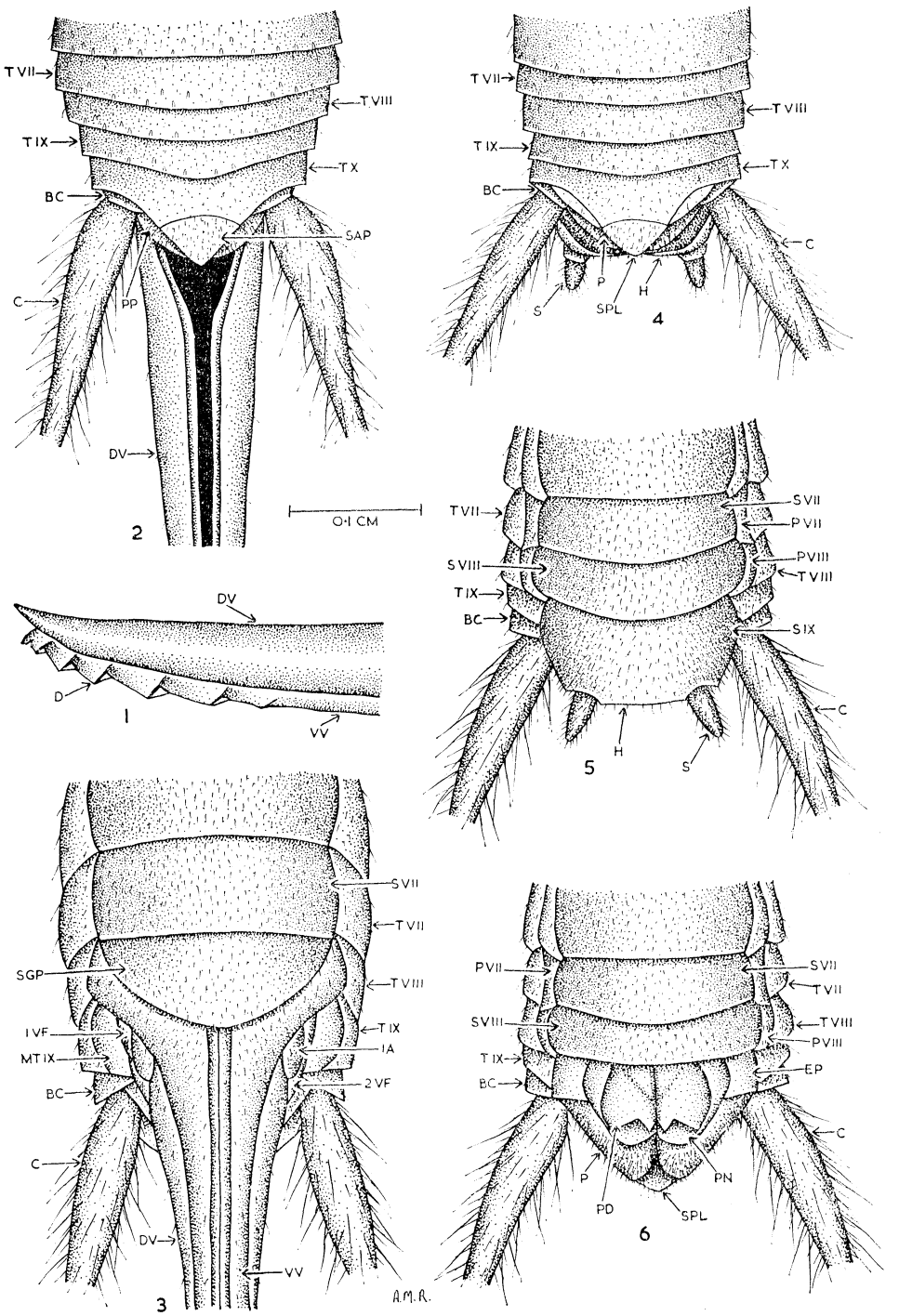
Parvotettix maydenaensis Richards, new species Fig. I (1-6).

Color: Head, pronotum, mesonotum and metanotum dark brown mottled with light brown; abdominal terga ochreous mottled with dark brown and light brown; femora and tibiae mottled or banded with dark brown, light brown and ochreous, all tarsi light brown; antennae mid brown; ovipositor light reddish brown. *Body:* Length 10 mm in ♂; and 10 to 11 mm in ♀. Antennae broken. First 9 abdominal terga with a few proximally directed light brown setae. Ovipositor 0.5 length of body; ventral valves armed distally 0.4 of total length to apex with 7 well developed teeth (fig. 1). *Antennae:* As in generic description. Third segment on both dorsal and ventral aspects 2.3 × as long as pedicel. Sexual dimorphism absent. No spines present on flagella of ♂ or ♀. *Legs:* Fore and middle legs subequal in length, with hind leg 1.8 length of fore and middle legs. Sexual dimorphism absent. All legs thickly clothed with short setae. Hind tibia and proximal segment of hind tarsus armed with variable number of linear spines (Table 1). No linear spines on fore, middle and hind femora, or fore and middle tibiae and tarsi. Apical spines constant in number, as in generic description. Length of proximal segment of hind tarsus subequal with other 3 segments together. Ratio of length of legs to length of body: fore leg 1.2 : 1; middle leg 1.2 : 1; hind leg 2.1 : 1. *Genitalia:* ♀. Suranal plate, fig. 2 (SAP), triangulate tapering to an acute apex, distal portion of plate clothed with setae, rest of plate sparsely clothed with setae. Subgenital plate, fig. 3 (SGP), triangulate with distal margin rounded; whole plate 0.4 as long as wide and clothed with setae. ♂. Suranal plate, fig. 4 (SPL), triangulate, convex laterally, tapering to a pointed apex; proximal portion of plate sparsely clothed with setae, distal portion more thickly clothed with setae. Subgenital plate, fig. 5 (H), rectangulate, approximately 2.3 as wide as long, convex laterally, distal margin truncate. Proximomedianly plate is raised, then slopes towards margins; whole plate clothed with setae, lateral portions more thickly clothed with setae. On ventral surface

Table 1. Variability in number of linear spines on the legs of *Parvotettix maydenaensis* n. sp.

		Mean		Number Specimens		Standard Deviation		Range	
		L	R	L	R	L	R	L	R
Hind Tibia Sup.	Pro.	12.9	13.2	12	11	1.2	1.1	10-14	11-15
	Retro.	13.3	13.3	12	11	0.9	0.9	12-15	12-14
Hind Tarsus 1 Sup.	Pro.	1.1	1.2	12	11	0.6	0.6	0-2	0-2
	Retro.	0	0	12	11	0	0	0	0

Fig. I


T VII
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6

plate curved over anteriorly, fig. 4 (H); pseudosternite and penis located beneath this. Two styli, fig. 4, 5 (S), short, conical, thickly clothed with short setae, length of styli being 0.6 length of sternite IX (S IX). Parameres, fig. 4, 6 (P), elongate, rounded at apex, 2 × as long as wide, lateral and distal portions thickly clothed with setae. Pseudosternite fig. 6 (PD), 1.7 wider than long, covers greater portion of penis; distal margin divided into 2 large lateral lobes and 2 smaller median lobes. Penis, fig. 6 (PN), 2-lobed, each lobe 1.1 longer than wide. Paraprocts absent.

LOCALITY: TASMANIA: Rain forest, Nichols Spur, Maydena (type locality), 6.VII. 1969, T. Goede; 31.VIII.1969, coll. T. Goede; under logs, Junee Quarry Road, Maydena, 31.VIII.1969, coll. T. Goede; under log, Junee area, 3 miles west of Maydena, 26.IX. 1970, coll. T. Goede; Welcome Stranger Cave, Florentine Valley, 3.X.1970, coll. A. Goede; Cashion Creek Cave, Florentine Valley, 8.XI.1970, coll. A. Goede.

Holotype ♂, allotype ♀ and 2 paratypes ♂ and ♀ in Australian National Insect Collection, C.S.I.R.O., Canberra. One ♂ paratype in Australian Museum Collection, Sydney.

Remarks. Very closely related to *P. goedei* and *P. domesticus.* Separated from them by several characters.

1. Shape of subgenital plate of ♀.
2. Proximally directed setae on first 9 abdominal tergites a light brown color.
3. Shape of ♂ pseudosternite.
4. Greater number of setae on suranal and subgenital plates of both ♂ and ♀.

Genus **Micropathus** Richards

Micropathus Richards, 1964, *Pacif. Ins.* 6 (1): 217-18.

The genus *Micropathus* contains 3 species, *M. tasmaniensis* from caves and forest in southern Tasmania, *M. cavernicola* from caves in the central-west and northern Tasmania, and *M. fuscus* from caves in the N and NW of the island. A fourth species from caves and surface in central-western Tasmania is described here. The 4 species may be distinguished by the following key.

KEY TO SPECIES OF MICROPATHUS

1. Hind femora armed with linear spines 2
   Hind femora without linear spines ..... **tasmaniensis** Richards
2. Basic color pale brown; suranal plate of ♂ bearing spines on distal margin; subgenital plate of ♀ with lobes less than 0.4 total length of plate 3
   Basic color dark brown; suranal plate of ♂ without spines on distal margin; subgenital plate of ♀ at least 0.4 total length of plate ..... **fuscus** Richards
3. Suranal plate of ♂ with 4 spines on distal margin; suranal plate of ♀ with distal margin rounded ..... **cavernicola** Richards
   Suranal plate of ♂ with 8 spines on distal margin; suranal plate of ♀ with distal margin

Fig. I. *Parvotettix maydenaensis* n. sp.: 1, distal portion of ovipositor showing teeth on ventral valve; 2, ♀ genitalia, dorsal view; 3, ♀ genitalia, ventral view; 4, ♂ genitalia, dorsal view; 5, ♂ genitalia, ventral view; 6, ♂ genitalia, ventral view, subgenital plate removed to expose structures beneath.

notched medianly and produced into 2 rounded lobes ..... **montanus** n. sp.

Micropathus tasmaniensis Richards

Micropathus tasmaniensis Richards, 1964, *Pacif. Ins.* **6** (1): 218-20, fig. 1, table 1 ; 1968, *Pacif. Ins.* **10** (1): 171.

Recently this species has been collected from a number of new cave localities throughout the southern part of Tasmania, and its range has been extended. It has now been found in mine adits. Old material in the Insect Collection of the Department of Agriculture, Hobart, has also been examined.

NEW RECORDS. TASMANIA : Mt Wellington, Hobart, no date, coll. A. M. Lea ; Ida Bay Caves, XII.1909, coll. A. M. Lea ; Loons Cave, Ida Bay, 15.IV.1968, coll. A. Goede and T. Goede ; King George V Cave, Hastings, 21.IV.1968, coll. A. Goede and T. Goede ; unnamed Cave, Damper Inn, Weld River, 28.IV.1968, coll. A. Goede ; fissure caves on McKays Peak, opposite Davis Creek at foot of Mt Arrowsmith, Mt Ronald Cross area, altitude 540 m, 20.VII.1968, coll. R. J. Cockerill ; Bradley-Chesterman Cave, Ida Bay, 15.XII.1968, coll. T. Goede ; disused adit, Sandfly Colliery, Kaoota, 31.X.1968, coll. A. Goede ; coal mine adit, Mt Cygnet, 9.II.1969, coll. A. Goede ; mine adit E of Gardners Bay, Mt Cygnet area, 9.II.1969, coll. A. Goede ; unnamed cave, Mt Anne, altitude 500 m, 4.X.1969, coll. A. Goede ; "Glory Hole" 80 m below surface in Tassy Pot, Florentine Valley, 14.XI.1970, coll. K. Kiernan.

Micropathus cavernicola Richards

Micropathus cavernicola Richards, 1964, *Pacif. Ins.* **6**: 220-23, fig. 2, table 2 ; 1968, *Pacif. Ins.* **10**: 171.

Further records of this species have been obtained from caves in the central-west and north of Tasmania. It has also been found in a mine adit in the central-west of the island.

NEW RECORDS. TASMANIA : Scotts Cave, Mole Creek, no date, coll. R. A. Black ; Baldocks Cave, Mole Creek, 6.III.1967, 29.IX.1968, coll. R. J. Cockerill ; 7.IV.1968, coll. A. Goede and T. Goede ; Hamoik II Cave, south Mt Darwin Peak, Kelly Basin, 14.VI. 1970, coll. K. Kiernan ; mine adit, Mt Jukes, altitude 651 m, 12.IX.1970, coll. A. Goede and T. Goede.

Micropathus montanus Richards, new species Fig. II (1-6).

Color: Basic color light brown with pronotum, mesonotum, metanotum and abdominal terga irregularly mottled with mid brown and ochreous; fore, middle and hind femora and tibiae light brown banded or mottled with ochreous, all tarsi ochreous; antennae light brown; ovipositor light reddish brown. *Body:* Length up to 20 mm ; average length 18 mm. Dorsal surface of body sparsely clothed with setae ; ventral surface thickly clothed with setae. Antennae broken. Fastigium as high as long. Ovipositor 0.6 length of body ; ventral valves very weakly armed distally 0.2 of total length to apex with 6 small teeth gradually decreasing in size towards apex (fig. 1). *Antennae:* As in generic description. Third segment on dorsal aspect 1.8 × as long as pedicel, and on ventral aspect 1.6 × as long. Sexual dimorphism absent. No spines present on flagella of ♂ or ♀. *Legs:* Fore and middle legs subequal in length, with

hind leg 1.7 length of fore and middle legs. Sexual dimorphism absent. Hind femora, all tibiae and proximal 2 segments of hind tarsi armed with variable numbers of linear spines (Table 2). No linear spines occur on fore and middle femora or tarsi. Apical spines constant in number; as in generic description except that hind femur bears a very small prolateral apical spine. Length of proximal segment of hind tarsus subequal with other 3 segments together. Ratio of length of legs to length of body: fore leg 1.7 : 1; middle leg 1.7 : 1; hind leg 2.8 : 1. *Genitalia* : ♀. Suranal plate, fig. 2 (SAP), convex laterally, distal margin notched medianly and produced into 2 rounded lobes; distal margin thickly clothed with setae, rest of plate sparsely clothed with setae. Subgenital plate, fig. 3 (SGP), convex laterally, distal margin widely emarginate medianly; disto-medianly plate bears 2 small lobes each with a strongly chitinized apex, whole plate 0.3 as long as wide, sparsely clothed with setae but more numerous laterally. Pleural membrane covers lateral portions of plate.

Table 2. Variability in number of linear spines on the legs of *Micropathus montanus* n. sp.

		Mean		Number Specimens		Standard Deviation		Range	
		L	R	L	R	L	R	L	R
Fore Tibia Inf.	Pro.	4.1	4.0	9	9	0.6	0.5	3-5	3-5
	Retro.	4.0	3.9	9	9	0.5	0.3	3-5	3-4
Mid Tibia Inf.	Pro.	4	4	9	9	0	0	4	4
	Retro.	4.1	4.1	9	9	0.3	0.3	4-5	4-5
Hind Femur Inf.	Pro.	0.8	0.9	9	7	0.4	0.4	0-1	0-1
	Retro.	0	0	9	7	0	0	0	0
Hind Tibia Sup.	Pro.	33.9	32.3	9	7	3.8	4.0	27-40	28-39
	Retro.	36.1	35.7	9	7	3.9	3.7	30-41	29-41
Hind Tarsus 1 Sup.	Pro.	2.1	2.4	9	7	0.3	0.5	2-3	2-3
	Retro.	2.4	2.9	9	7	1.1	0.6	1-5	2-4
Hind Tarsus 2 Sup.	Pro.	1.8	1.9	9	7	0.6	0.4	1-3	1-2
	Retro.	1.6	2	9	7	0.5	0.8	1-2	1-3

♂. Suranal plate, fig. 4 (SPL), concave laterally, distal margin produced into 2 small lateral lobes and a larger median lobe; distal margin curved over ventrally and bearing 8 small spines, 4 on each side, lateral 1 largest, 2 median spines smaller and of equal size, inner spine smallest; whole plate thickly clothed with setae. Subgenital plate, fig. 5 (H), triangulate, 1.8 wider than long, convex laterally tapering distally to a rounded apex; whole plate thickly clothed with setae. On ventral surface plate curves over anteriorly; pseudosternite and penis located beneath this. Two styli, fig. 5 (S), short, broad, conical, thickly clothed with setae, length of styli being 0.3 length of sternite IX (S IX). Parameres, fig. 5, 6 (P), elongate, rounded at apex, 2.7 longer than wide, distal portion thickly clothed with setae. Pseudosternite, fig. 6 (PD), 1.7 wider than long, lateral margin convex and tapering to an acute apex medianly, distal portion curved back anteriorly over rest of pseudosternite and slightly keeled medianly, distal margin emarginate but produced medianly into a small acute apex. Penis, fig. 6 (PN), 2-lobed, each lobe 1.8 longer than wide. Paraprocts absent.

LOCALITY: TASMANIA: Virgo Cave, Mt Ronald Cross in area of sub-alpine scrub, altitude 961 m, co-ordinates 146°05′15″ / 42°14′30″, grid reference 079E / 995N St. Clair Sheet (type locality), 26.I.1969, coll. R. J. Cockerill, 14.III.1971, coll. R. J. Cockerill; on Lyell Highway on side of Mt Arrowsmith, Mt Ronald Cross area, altitude 574 m, 22.

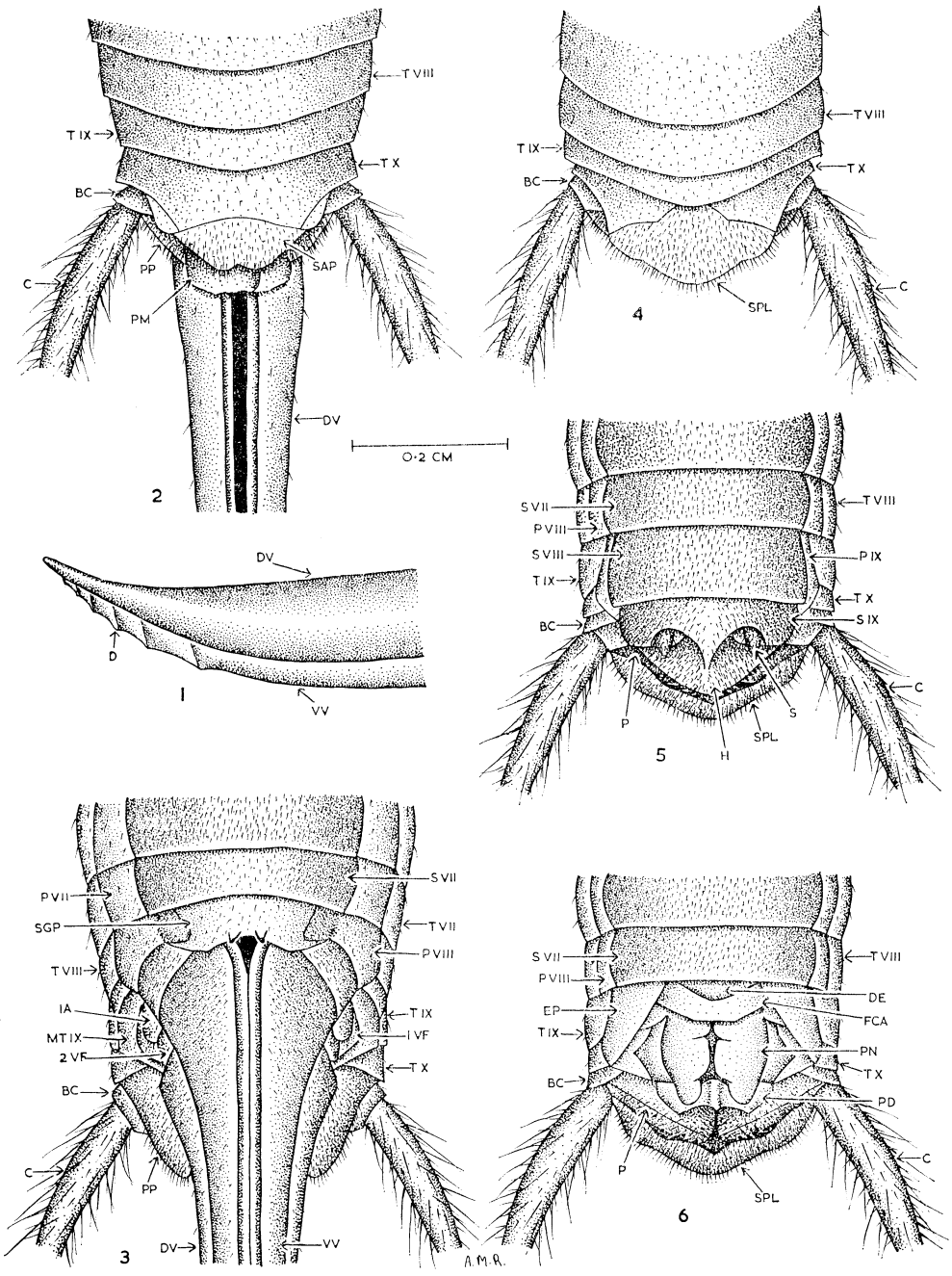


Fig. II. *Micropathus montanus* n. sp.: 1, distal portion of ovipositor showing teeth on ventral valve; 2, ♀ genitalia, dorsal view; 3, ♀ genitalia, ventral view; 4, ♂ genitalia, dorsal view; 5, ♂ genitalia, ventral view; 6, ♂ genitalia, ventral view, subgenital plate removed to expose structures beneath.

X.1967, coll. R. J. Cockerill; unnamed cave, Mt Ronald Cross, 500 m E of Virgo Cave, altitude 915 m, 14.III.1971, coll. R. J. Cockerill.

Holotype ♂, allotype ♀ and 2 paratypes ♂ and ♀ in Australian National Insect Collection, C.S.I.R.O., Canberra. Two ♀♀ and 1 ♂ paratypes in Australian Museum Collection, Sydney.

Remarks. Most closely related to *M. cavernicola.* Separated from it by several characters.

1. Greater number of linear spines on proximal segment of hind tarsus.
2. Shape of suranal plate of ♂ and ♀.
3. Greater number of spines on distal margin of suranal plate of ♂.
4. Shape of subgenital plate of ♀.

Genus **Cavernotettix** Richards

Cavernotettix Richards, 1966, *Pacif. Ins.* **8**: 619.

Cavernotettix flindersensis (Chopard)

Cavernotettix flindersensis : Richards, 1967, *Proc. Linn. Soc. N. S. W.* **92** (2): 152-56, fig. 1, table 1, 2.

Since this species was redescribed from a cave on Flinders Island, fresh material has been collected from inside a hut at North Pat's River and from a limestone cave on another of the Furneaux Islands, thus bringing the species closer to Tasmania.

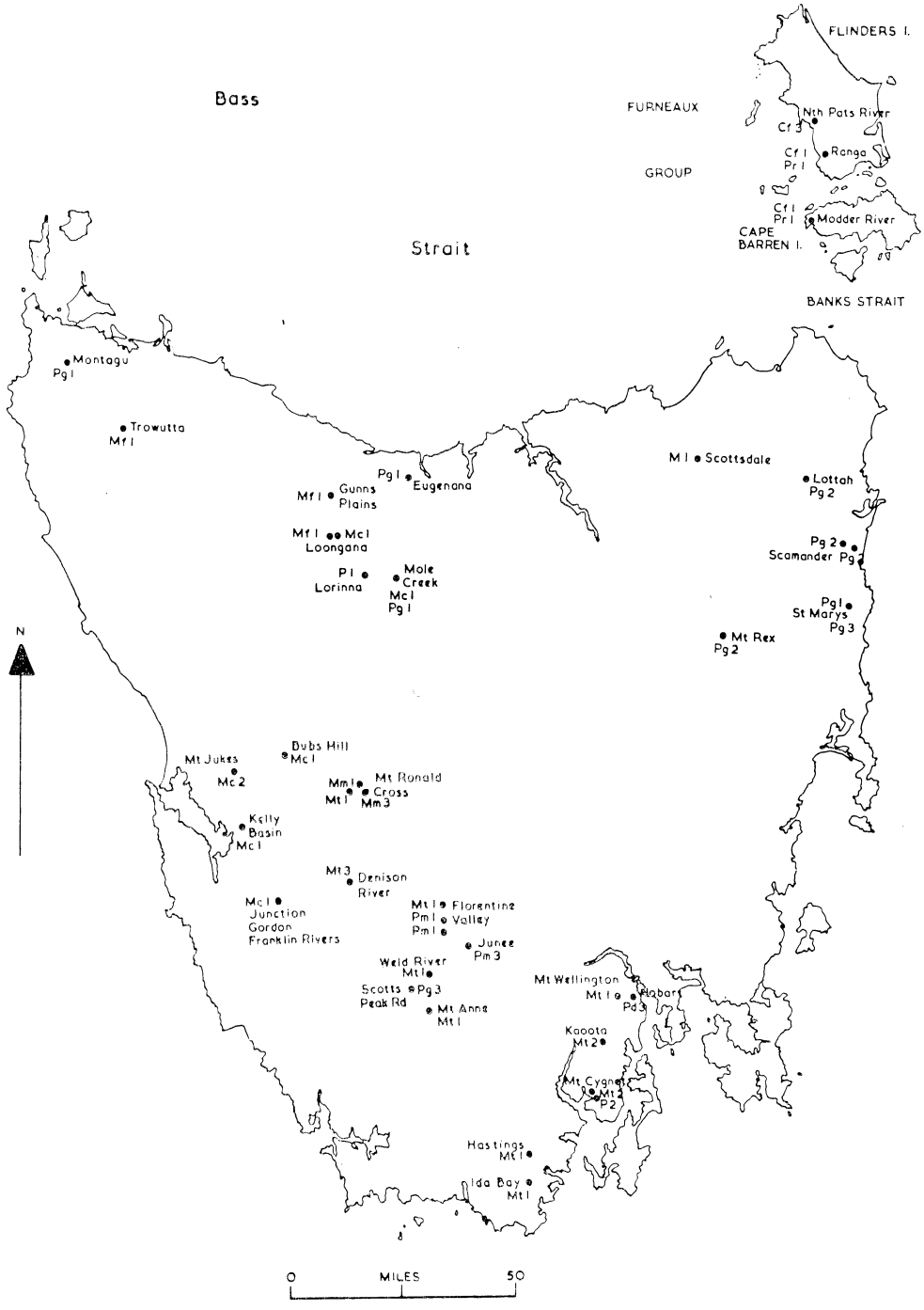
NEW RECORDS. FLINDERS ISLAND: On wall of hut, North Pat's River, 15.III.1971, 29.III.1971, 30.III.1971, coll. J. Whinray; in water drum by same hut, 30.III.1971, coll. M. H. Christie. CAPE BARREN ISLAND: In Modder River Cave at western end of island, 23.V.1970, coll. J. Whinray.

DISTRIBUTION AND POSSIBLE ORIGINS

Over the last 3 years the distribution of *Micropathus*, *Parvotettix* and *Cavernotettix* has been extended (fig. III). *Micropathus* occurs through the western and southern parts of Tasmania and is the dominant genus on the island. A single nymph taken from a granite cave near Scottsdale in the northeast suggests its range may be far more extensive than currently known. *Parvotettix* has been recorded from northern, southern and eastern regions. The 2 genera overlap in caves at Mole Creek in the north and the Florentine Valley in the south. They converge at Mt Cygnet in the southeast where they occur in different mine adits, and at Hobart where *Micropathus* occurs on Mt Arthur at an altitude of 1040 m, while *Parvotettix* occurs almost at sea level (Richards 1970). *Cavernotettix* is a mainland Australian genus (Richards 1966), extending from the Southern Highlands of New South Wales to the Furneaux Islands in Bass Strait. It is associated with *Parvotettix* on Flinders Island and Cape Barren Island, but has not so far been recorded from Tasmania.

There is little overlap in the distribution of the 4 species of *Micropathus.* *M. fuscus* occurs in caves at Trowutta, Gunns Plains and Loongana in northwestern Tas-

Fig. III


Bass
Strait
FLINDERS I.
FURNEAUX
GROUP
Nth Pats River
Cf 3
Cf 1
Pr 1
Ranga
Cf 1
Pr 1
Modder River
CAPE
BARREN I.
BANKS STRAIT
Montagu
Pg 1
Trowutta
Mf 1
Pg 1
Eugenana
Mf 1
Gunns
Plains
Mf 1
Mc 1
Loongana
Pl
Lorinna
Mole
Creek
Mc 1
Pg 1
M 1
Scottsdale
Lottah
Pg 2
Pg 2
Scamander Pg
Pg 1
St Marys
Pg 3
Mt Rex
Pg 2
N
Dubs Hill
Mc 1
Mt Jukes
Mc 2
Mm 1
Mt 1
Mt Ronald
Cross
Mm 3
Kelly
Basin
Mc 1
Mt 3
Denison
River
Mc 1
Junction
Gordon
Franklin Rivers
Mt 1
Florentine
Pm 1
Valley
Pm 1
Junee
Pm 3
Weld River
Mt 1
Scotts
Peak Rd
Pg 3
Mt Anne
Mt 1
Mt Wellington
Mt 1
Hobart
Pg 3
Kaoota
Mt 2
Mt Cygnet
Mt 2
P2
Hastings
Mt 1
Ida Bay
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mania. *M. cavernicola* is established in caves at Mole Creek and Loongana in the north, and in caves or mine adits at Mt Jukes, Bubs Hill, Kelly Basin and the junction of the Gordon and Franklin Rivers in the central-west. *M. montanus* occurs in a cave and on the surface at Mt Ronald Cross, also in the central-west. *M. tasmaniensis* is confined to the southern part of the island, and has been recorded from caves, mines or on the surface at Ida Bay, Hastings, Mt Cygnet, Kaoota, Mt Wellington, Mt Anne, Weld River, Florentine Valley, Denison River and Mt Ronald Cross. *M. fuscus* and *M. cavernicola* converge at Loongana, but do not occur in the same caves. *M. tasmaniensis* and *M. montanus* converge at Mt Ronald Cross, but are separated by altitude, *M. tasmaniensis* occurring in caves at 540 m and *M. montanus* at 930 m in the subalpine zone. The species from Scottsdale has yet to be identified.

This distribution suggests that in the past the genus was influenced by Pleistocene glaciation. It is probable that before this period an ancestral species was widespread throughout the island. During the last Pleistocene glaciation small ice caps occurred on the Central Plateau and an area to the west, while extensive valley and cirque glaciation occurred further south (Goede 1967). Ice moved down the valleys of the Princess and Nelson Rivers only a few miles west of Bubs Hill, while cirque glaciation occurred on the Raglan Range a short distance to the southeast. The Mt Ronald Cross area may have been isolated by valley glaciers (Goede, pers. commun.). The cave crickets were probably forced out of much of the central-west by the extensive glaciation, and due to geographic isolation caused by the unfavorable conditions, speciation eventually occurred. *M. tasmaniensis* became established in the southeast, *M. cavernicola* in the coastal central-west, and *M. fuscus* in the northwest. The close relationships between the species (Richards 1964, 1968) suggests that speciation has been comparatively recent. *M. fuscus* is closely related to both *M. cavernicola* and *M. tasmaniensis*, and could not have arisen from *M. cavernicola* alone, thus giving further support to a common origin. The present day distribution of the species indicates that 3 of them have re-colonized the central-west after the retreat of the ice and the return of a milder climate. *M. tasmaniensis* appears to be migrating west and becoming established in western caves. *M. cavernicola* is migrating north and encroaching on the region occupied by *M. fuscus*. It is unlikely that glacial activity isolated the northern and central-west populations of *M. cavernicola*, as they exhibit identical morphological characters inconsistent with a long period of isolation. When the western part of Tasmania becomes better known, it is possible that more locality records of both *M. cavernicola* and *M. fuscus* will be added between the central-west and the north. *M. montanus* is paler than the other species in the genus. Its range is very limited.

Fig. III. Distribution of *Micropathus* Richards, *Parvotettix* Richards and *Cavernotettix* Richards throughout Tasmania.

Key to Figure III

Species.	M — *Micropathus* sp.	P — *Parvotettix* sp.
	Mc — *M. cavernicola*	Pd — *P. domesticus*
	Mf — *M. fuscus*	Pg — *P. goedei*
	Mm — *M. montanus*	Pm — *P. maydenaensis*
	Mt — *M. tasmaniensis*	Pr — *P. rangaensis*
	Cf — *Cavernotettix flindersensis*	
Localities.	1 — cave ; 2 — mine ; 3 — surface.	

It occurs at a relatively high altitude in the center of the glacial region, which suggests that it may have been established there for a considerable time. While it is most closely associated with *M. tasmaniensis*, it is most closely related to *M. cavernicola* although it has several characters in common with *M. fuscus*.

Of the 4 species of *Parvotettix* (Richards 1968, 1970), *P. goedei* is the most widely distributed, its range extending from near Montagu, through Eugenana and Mole Creek to Lottah, Scamander, Mt Rex and St. Marys, and south to the Mt Wedge area, thus establishing itself in caves, mines and on the surface across the northern part of Tasmania with an isolated record in the south. A damaged nymph of *Parvotettix* sp. from a cave at Lorrina probably also belongs to this species. *P. rangaensis* occurs in caves on Flinders Island and Cape Barren Island. *P. domesticus* is an epigean species centered on Hobart. *P. maydenaensis* occurs on the surface at Junee, and in caves in the Florentine Valley. Nymphs of *Parvotettix* sp. have been taken from a mine adit at Mt Cygnet. All 4 species are closely related.

While Pleistocene glaciation may have influenced the distribution of *Micropathus*, there is no evidence that it had any effect on the distribution of *Parvotettix*. Apart from the Florentine/Junee, Mt Wedge and Mt Rex areas, this genus is established in coastal and lowland regions.

The presence of *P. rangaensis* in association with *C. flindersensis* (Richards 1967) in caves on Flinders Island and Cape Barren Island is of particular interest when considering possible origins of the Tasmanian rhaphidophorid fauna. Rhaphidophorids are apterous insects, extremely sensitive to temperature changes and requiring a very high relative humidity. Their normal habitat is in caves, tunnels or mines, or in the bush hidden under stones or bark, or in rotten logs. These requirements would form a barrier to their being carried passively across Bass Strait by strong winds. *Cavernotettix* probably reached the Furneaux Islands via the land bridge which extended from Wilson's Promontory to Flinders Island during the Pleistocene and until as recently as about 10,000 to 15,000 years ago (Jennings 1971). *Micropathus* and *Parvotettix* may also have used this land bridge to reach Tasmania. However, neither of these genera show close affinities with southeastern Mainland Australian genera, and it is suggested that they either migrated to Tasmania before the Pleistocene, or that they have evolved independently in Tasmania. The 2 genera are in no way related to each other.

The Furneaux Islands were also connected to northeastern Tasmania during the Pleistocene and up till about 8,500 to 10,000 years ago (Jennings 1971), thus permitting *Parvotettix* to migrate there from Tasmania. As the last land bridge between northern Tasmania and Flinders Island was about 1,500 years later than that between Wilson's Promontory and Flinders Island, this could explain why *Parvotettix* is not known from Victoria or southern New South Wales, and it supports a Tasmanian origin for this genus. It is strange that migration between Tasmania and the Furneaux Islands should have been in one direction only, and that *Cavernotettix* has been unable to cross Banks Strait and establish itself in northeastern Tasmania.

Acknowledgments: I should like to thank A. Goede, University of Tasmania, Hobart, and his wife for their invaluable assistance in collecting material from all over Tasmania, including the new species of *Parvotettix;* R. J. Cockerill, Department of Agriculture, Hobart, for collecting the very interesting material from the Mt Ronald

Cross area including the new species of *Micropathus*, and for organizing the loan of material from the Department of Agriculture Insect Collection; K. Kiernan, Southern Caving Group, Hobart, for additional locality records of a number of species; and J. Whinray, Whitemark, Flinders Island, for his very valuable contribution in collecting specimens from the Furneaux Islands in Bass Strait.

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Index to Tables

L. — left leg.
R. — right leg.
Sup. — superior.
Pro. — prolateral.
Retro. — retrolateral.

Index to Figures I, II

BC. — basal segment of cercus.
C. — cercus.
D. — teeth.
DE. — ductus ejaculatorius.
DV. — dorsal valve.
EP. — endoparamere.
FCA. — feebly chitinized arch.
H. — subgenital plate, ♂.
IA. — intersegmental apodeme.
MT IX. — membrane of tergite IX.
P. — paramere (ectoparamere).
P VII, P VIII, P IX. — pleurite VII, VIII, IX.
PD. — pseudosternite.
PM. — peritrophic membrane.
PN. — penis.
PP. — paraproct.
S. — stylus.
S VII, S VIII, S IX. — sternite VII, VIII, IX.
SAP. — suranal plate, ♀.
SGP. — subgenital plate, ♀.
SPL. — suranal plate, ♂.
T VII, T VIII, T IX, T X. — tergite VII, VIII, IX, X.
1 VF. — first valvifer.
2 VF. — second valvifer.
VV. — ventral valve.