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THE RHAPHIDOPHORIDAE (Orthoptera) OF AUSTRALIA. Part 8. Two new species of *Parvotettix* Richards

By Aola M. Richards[1]

Abstract: Two new species, *Parvotettix rangaensis* n. sp. and *P. domesticus* n. sp. are described. *P. rangaensis* occurs in a limestone cave on Flinders Island. *P. domesticus* occurs in the backyard of a Hobart residential property, Tasmania. A key is given for the species of *Parvotettix* Richards, and the distribution of *Parvotettix* is discussed.

Late in 1966, the first specimens of the genus *Parvotettix* Richards were found in Little Trimmer Cave, Mole Creek, in northern Tasmania, and described as *P. goedei* Richards (Richards 1968). Since then, two more species belonging to this genus have been discovered, and the distribution of *P. goedei* has been extended across the NE part of the island. *P. rangaensis* n. sp. occurs in a limestone cave near Ranga on Flinders I., and *P. domesticus* n. sp. has been collected from a suburban residential property at Battery Point, Hobart. Unlike the more gregarious rhaphidophorid genus *Micropathus* Richards, *Parvotettix* species normally occur as solitary individuals. In caves they may be found in the twilight zone or in total darkness, and they may share this habitat with other rhaphidophorid species. *P. goedei* has been observed in association with *Micropathus cavernicola* Richards, and *P. rangaensis* in association with *Cavernotettix flindersensis* (Chopard).

P. goedei is the first rhaphidophorid to be recorded from limestone caves at Eugenana, near Devonport, and at Gray Mountain, near St. Marys. Most Tasmanian caves have developed in the Gordon Limestone of the middle and upper Ordovician, or in Precambrian dolomites and limestones (Goede 1967). Sherrill's Cave at Eugenana is in Ordovician limestone. Permian limestones occur in the eastern part of the island, but there has been little cave development. A few small caves have developed in Gray Mountain, and the Bottomless Pit is the largest. It consists of a shaft about 23 m deep, which widens at the bottom into a small dark chamber with a large pile of vegetable debris on the floor. *P. goedei* was found there in association with the Tasmanian cave spider, *Hickmania troglodytes* (Higgins & Petterd). *P. goedei* has also been taken from the Pyramid Mine, approximately 1.6 km north of Upper Scamander, and the Beulah Mine near Scamander. The two mines are about 6.4 km apart, close to the coast and about

1. School of Zoology, University of New South Wales, Sydney.

19 km north of the Bottomless Pit.

The cave on Flinders I. is in dune limestone, and has already been described (Richards 1967). It is quite small, and there is no zone of total darkness. The two rhaphidophorid species were observed in different parts of the cave, *Parvotettix rangaensis* being further from the entrance.

P. domesticus is the first epigean rhaphidophorid species to be described from Tasmania. Nymphs of this species were first discovered under old wooden boards and between blocks of sandstone in the backyard of a house. At night some of the insects were observed moving about in the garden near an old sandstone wall which contained numerous hollows and cavities. Others were feeding on vegetable matter, lawn seed and a dead spider. A single specimen was found inside the house, in the bathroom. Rhaphidophorids have also been recorded from human habitations in other parts of the world. In New Zealand, they will become established in the basements of houses if they are sufficiently damp and dark, usually occurring on wooden rafters or hidden behind loose folds of building paper (Richards 1954). They have also occasionally been found in bathrooms. In North America, both Banta (1907) and Hubbell (1936) have recorded them from cellars or inside houses.

Genus **Parvotettix** Richards

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

The genus *Parvotettix* contains a single species, *P. goedei* Richards, from a cave at Mole Creek in northern Tasmania. Now two more species are described here—one from a cave on Flinders Island and one from a suburban backyard in Hobart. The three species may be distinguished by the following key.

Key to species of Parvotettix

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

Parvotettix goedei Richards

Parvotettix goedei Richards, 1968, *Pacif. Ins.* **10**: 168-70, fig. 1, table 1.

Since this species was described, fresh material has been collected from several new localities in the N and NE parts of Tasmania. The species occurs in both caves and mines. In Scotts Cave it occurred in association with *Micropathus cavernicola* Richards, but in all other caves and in the mines it was the only species of Rhaphidophoridae present.

New records. TASMANIA: Scotts Cave, Mole Creek, 6.IV.1968, coll. A. Goede;

Mersey Hill Cave, Mole Creek, 7.VII.1968, coll. A. Goede; Bottomless Pit, Gray Mountain near St. Marys, 1.VI.1968, coll. R. J. Cockerill; Sherrill's Cave, Eugenana, 6.4 km SW of Devonport, 22.II.1969, coll. A. Goede; Adits, Pyramid Mine, Upper Scamander, 4.IV. 1969, coll. A. Goede; Adits, Beulah Mine, Scamander, 5.IV.1969, coll. A. Goede; Rex Hill Mine, NNW of Avoca, 28.IX.1969, T. & A. Goede.

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

Color: Head, pronotum, mesonotum and metanotum dark brown, sparsely mottled with light brown; abdominal terga mottled with dark brown, light brown and ochreous; 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 varying from 8 mm to 10 mm in both sexes, but usually 9 mm. Antennae broken. First 8 abdominal terga with prominent proximally directed dark brown setae. Ovipositor 0.5 length of body; ventral valves armed distally 0.4 of total length to apex with 8 well developed teeth (fig. 1).

Antennae: As in generic description. Third segment on dorsal aspect 2.6× as long as pedicel and on ventral aspect 2.5× as long. Sexual dimorphism absent. No spines present on flagella of ♂ or ♀.

Legs: Fore and middle legs subequal in length, with hind leg 1.6 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 1.3: 1; middle leg 1.2 : 1; hind leg 2.1 : 1.

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

		Mean		Number Specimens		Standard Deviation		Range	
		L	R	L	R	L	R	L	R
Hind Tibia	Pro.	11.8	12.3	10	9	1.6	1.3	8-14	11-15
Sup.	Retro.	10.6	10.3	10	9	1.2	1.2	9-13	9-12
Hind Tarsus	Pro.	0.8	0.8	10	9	0.4	0.4	0-1	0-1
1 Sup.	Retro.	0.1	0.1	10	9	0.3	0.3	0-1	0-1

Genitalia: ♀. Suranal plate, fig. 2 (SAP), triangulate, slightly convex laterally, tapering to a rounded apex, whole plate sparsely clothed with setae. Subgenital plate, fig. 3 (SGP), triangulate with truncate apex; whole plate 0.3× as long as wide, sparsely clothed with setae. ♂. Suranal plate, fig. 4 (SPL), triangulate, concave laterally, tapering to a rounded apex, whole plate sparsely clothed with setae. Subgenital plate, fig. 5 (H), rectangulate, approximately 1.8× as wide as long, convex laterally, distal margin slightly emarginate. Proximomedianly plate is raised, then slopes towards margins; whole plate sparsely clothed with setae, distal margin and laterodistal margins clothed with numerous long setae. On ventral surface plate curved over anteriorly; pseudosternite and penis located beneath this. Two styli, fig. 5 (S), short, conical, thickly clothed with short setae, length of styli being 0.7 length of sternite IX (S IX). Parameres, fig. 5, 6 (P), elongate, rounded at apex, 2.3× longer than wide, distal portion thick-

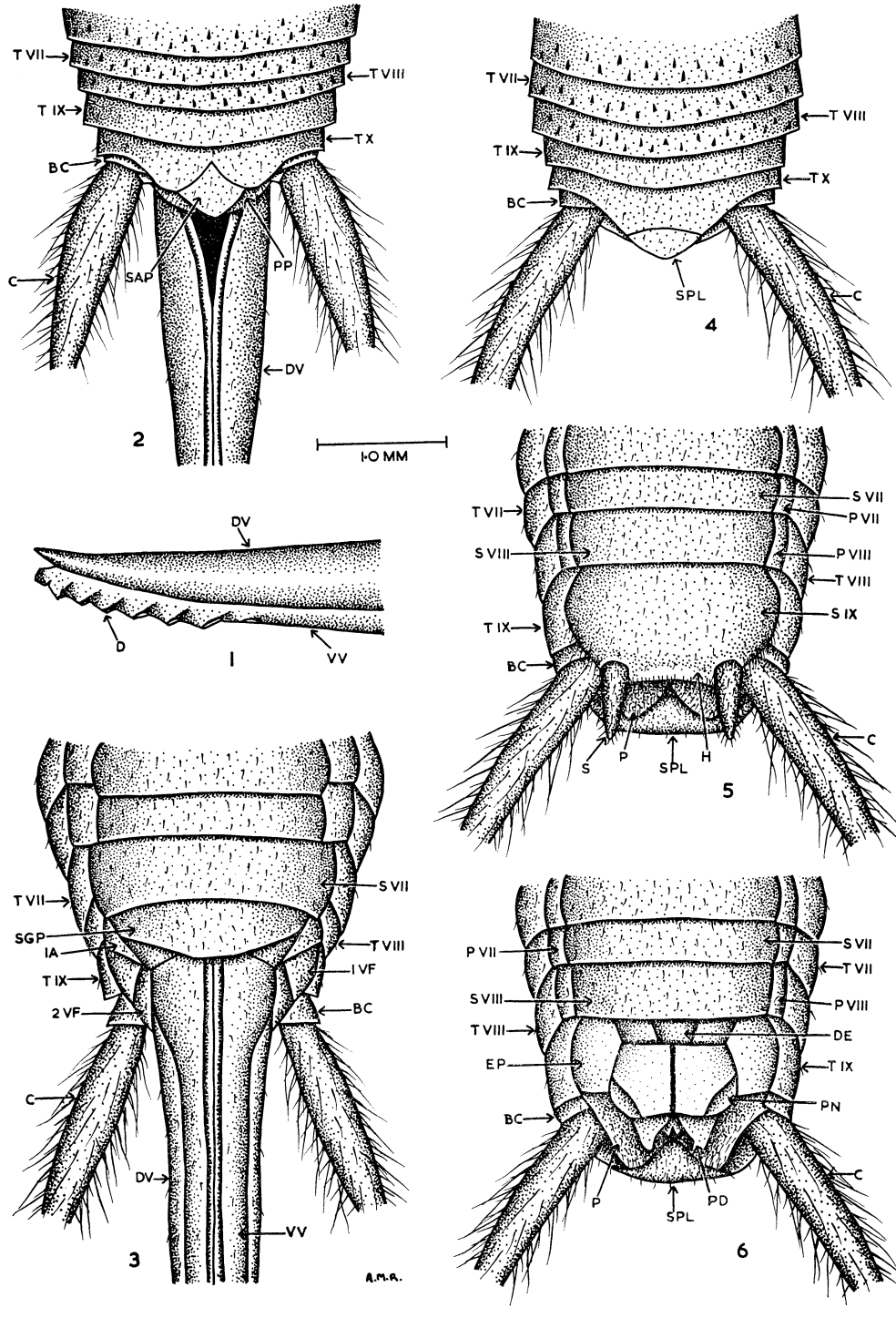

Fig. I (1-6). *Parvotettix rangaensis* n. sp.: 1, distal portion of ovipositor showing teeth on ventral valve; 2, ♀ genitalia, dorsal view; 3, ♀ genitalia, ventral view; 4, ♂ genitalia, dorsal view; 5, ♂ genitalia, ventral view; 6, ♂ genitalia, ventral view, subgenital plate removed to expose structures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

ly clothed with setae. Pseudosternite, fig. 6 (PD), subequal in width to length, produced distally into 3 lobes; median lobe tapering to an acute apex, strongly chitinised; 2 lateral lobes longer than median lobe, each tapering to a rounded apex; greater portion of dorsal lobe covers penis. Penis, fig. 6 (PN), 2-lobed, each lobe 1.3 longer than wide. Paraprocts absent.

LOCALITY: FLINDERS I.: In cave near Ranga (type locality), 2.I.1969, 5.I.1969, 9.I. 1969, coll. A. Goede, T. Goede.

Holotype ♂, allotype ♀ and 2 paratypes (♂, ♀) in Australian National Insect Collection, CSIRO, Canberra. Two paratypes (♂, ♀) in Australian Museum Collection, Sydney.

Remarks: Very closely related to *P. goedei* and *P. domesticus*. Separated from them by several characters. 1, Dark setae on 1st 8 abdominal segments in both ♂ and ♀. 2, Shape of suranal plate of ♂ and ♀. 3, Shape of subgenital plate of ♀. 4, Greater length of styli. 5, Teeth on ventral valve of ovipositor not so well developed as in other 2 species.

Parvotettix domesticus Richards, new species Fig. II(1-6).

Color: Head, pronotum, mesonotum, metanotum and abdominal terga dark brown sparsely mottled with light brown; femora and tibiae mottled or banded with dark brown and light brown; all tarsi light brown; antennae mid brown; ovipositor light reddish brown.

Body: Length 9 mm to 10 mm in both sexes. Antennae broken. First 9 abdominal terga with a few prominent proximally directed dark brown setae. Ovipositor 0.5 length of body; ventral valves armed distally 0.4 of total length to apex with 7 strongly developed teeth (fig. 1).

Antennae: As in generic description. Third segment on dorsal aspect 2.5 × as long as pedicel, and on ventral aspect 2.5× as long. 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 2). 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 a rounded apex, distal

Table 2. Variability in number of linear spines on the legs of *Parvotettix domesticus* n. sp.

		Mean		Number Specimens		Standard Deviation		Range	
		L	R	L	R	L	R	L	R
Hind Tibia	Pro.	15.8	15.6	20	20	1.5	1.7	14-19	14-19
Sup.	Retro.	14.5	14.5	20	20	1.4	1.0	12-17	13-16
Hind Tarsus	Pro.	1.0	1.1	20	20	0	0.4	1	0-2
1 Sup.	Retro.	0.1	0	20	20	0.3	0	0-1	0

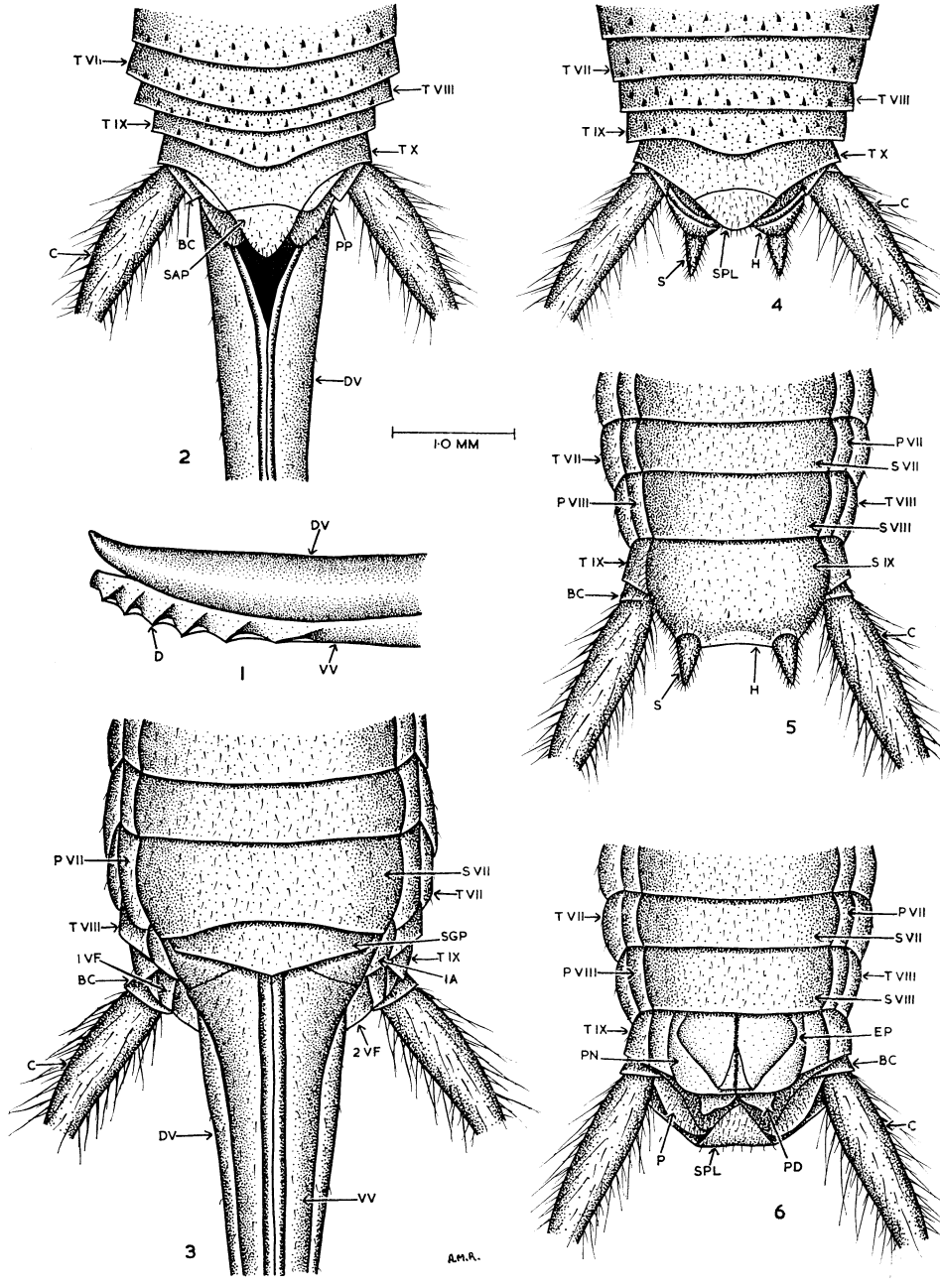

Fig. II (1-6). *Parvotettix domesticus* n. sp.: 1, distal portion of ovipositor showing teeth on ventral valve; 2, ♀ genitalia dorsal view; 3, ♀, genitalia, ventral view; 4, ♂ genitalia, dorsal view; 5, ♂ genitalia, ventral view; 6, ♂, genitalia, ventral view, subgenital plate removed to expose structures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

margin of plate clothed with setae, rest of plate sparsely clothed with setae. Subgenital plate, fig. 3 (SGP), triangulate with an acute apex; whole plate 0.3 × as long as wide, sparsely clothed with setae. ♂. Suranal plate, fig. 4 (SPL), triangulate concave laterally, tapering to a rounded apex; distal margin clothed with setae, rest of plate sparsely clothed with setae. Subgenital plate, fig. 5 (H), rectangulate, approximately 1.8× as wide as long, convex laterally, distal margin slightly emarginate. Proximomedianly plate is raised, then slopes towards margins; whole plate sparsely clothed with setae, laterodistal portion of plate clothed with numerous setae. On ventral surface 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 0.5 length of sternite IX (S IX). Parameres, fig. 6 (P), elongate, rounded at apex, 2× as long as wide, distal portion thickly clothed with setae. Pseudosternite, fig. 6 (PD), 1.3× wider than long, produced into 2 distolateral lobes, each lobe tapering to a rounded apex; greater portion of dorsal lobe covers penis. Penis, fig. 6 (PN), 2-lobed, each lobe 1.2× longer than wide. Paraprocts absent.

LOCALITY: TASMANIA: Under old boards and between blocks of sandstone in backyard 52 St. George's Terrace, Battery Point, Hobart (type locality), 20.I.1969, 21.I.1969, 23.I.1969, 25.I.1969, coll. A. Goede, T. Goede; in bathroom of house 52 St. George's Terrace, Battery Point, Hobart, 9.X.1968, coll. T. Goede.

Holotype ♂, allotype ♀ and 2 paratypes (♂, ♀) in Australian National Insect Collection, CSIRO, Canberra. Two paratypes (♂, ♀) in Australian Museum Collection, Sydney.

Remarks: Very closely related to *P. goedei* and *P. rangaensis*. Separated from them by several characters. 1, Dark setae on 1st 9 abdominal segments in both sexes. 2, 7 teeth on ventral valve of ovipositor. 3. Shape of suranal plate of ♂ and ♀. 4, Shape of subgenital plate of ♀. 5, Greater number of linear spines on hind tibia.

DISTRIBUTION OF PARVOTETTIX

So far only two genera of Rhaphidophoridae are known from Tasmania. *Micropathus* Richards extends through the western and southern parts of the island (Richards 1968), while *Parvotettix* has been observed in northern and eastern regions. The two genera overlap in caves at Mole Creek. At Hobart, *Micropathus* occurs on Mt. Arthur at an altitude of 1040 metres, while *Parvotettix* occurs almost at sea level. While Pleistocene glaciation may have influenced the distribution of *Micropathus*, it is doubtful if it had any effect on the distribution of *Parvotettix*.

On Flinders Island the presence of *Parvotettix rangaensis* in a cave in association with *Cavernotettix flindersensis* is of particular interest. *Cavernotettix* Richards is a Mainland Australian genus extending from the Southern Highlands of New South Wales to Flinders I., but not so far recorded from Tasmania. While *Parvotettix* may have migrated to Tasmania via the land bridge which extended from Wilson's Promontory to Flinders I. during the Pleistocene and until as recently as about 10,000–15,000 years ago (Jennings, pers. comm.), today this genus has no close affinities with SE Australian genera. Because of this it has been suggested (Richards 1968) that *Parvotettix* either migrated to Tasmania before the Pleistocene, or evolved independently on the island. Flinders I. was also connected to NE Tasmania during the Pleistocene and up till about 8,500–10,000 years ago (Jennings, pers. comm.) thus permitting *Parvotettix* to migrate to or from Tasmania. As the last land bridge between northern Tasmania and Flinders

I. was about 1,500 years later than that between Wilson's Promontory and Flinders I., this could explain why *Parvotettix* is not known from Victoria or southern New South Wales, and it suggests a Tasmanian origin for the genus. It is strange that migration should have been in one direction only, and that *Cavernotettix* was unable to reach and establish itself in northern Tasmania.

Of the three species of *Parvotettix*, *P. goedei* is the most widely distributed, its range extending from Eugenana, through Mole Creek to Scamander and Gray Mountain near St. Marys, thus establishing itself in caves and mines across the north-eastern part of Tasmania. *P. rangaensis* is an isolated record from the only known cave on Flinders I. *P. domesticus* is an epigean species so far known only from a single property in Hobart. However, its habitat and behaviour suggest that it is probably far more widely distributed than currently known.

Acknowledgements: I should like to thank Albert Goede, University of Tasmania, Hobart, and his wife Therese for collecting and sending me the material on which the two new descriptions are based, and for making observations on the behaviour of these insects. I am also grateful to the Goedes and R. J. Cockerill, Department of Agriculture, Hobart, for the new locality records of *Parvotettix goedei*. Finally I should like to thank J. N. Jennings, Australian National University, Canberra, for information on the age of the land bridges connecting Flinders I. with Tasmania and Mainland Australia.

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INDEX TO TABLES

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

INDEX TO FIGURES

BC.—basal segment of cercus.
C.—cercus.
D.—teeth.
DE.—ductus ejaculatorius.
DV.—dorsal valve.
EP.—endoparamere.
H.—subgenital plate, ♂.
IA.—intersegmental apodeme.
P.—paramere (ectoparamere).
P. VII, P. VIII—pleurite VII, VIII.
PD.—pseudosternite.
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.
1VF.—1st valvifer.
2VF.—2nd valvifer.
VV.—ventral valve.