

## Description of a New Species of *Pseudomys* (Rodentia : Muridae) from Northern Territory

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### Abstract

*Pseudomys johnsoni* sp. nov. is described from twelve specimens from central Northern Territory. It is compared with *P. chapmani*, *P. hermannsburgensis*, *P. bolami* and *P. delicatulus* using external and cranial morphology.

### Introduction

In Western Australia there are mounds of small pebbles, characteristic of those constructed by rodents occurring in the Pilbara, Murchison and Gascoyne districts (Dunlop and Pound 1981). For many years these mounds were thought to have been constructed by *Pseudomys hermannsburgensis* (Waite, 1896). However, Dunlop and Pound (1981) attributed their construction to *Pseudomys chapmani* Kitchener, 1980, which is a sibling species also living among these mounds.

A result of this lithophilous habit of *P. chapmani* is that the species' modern, and perhaps original, distribution is indicated by these largely indestructible mounds of pebbles.

Until recently the nearest mounds of pebbles attributed to a lithophilous rodent were recorded by Thomas (1906) from Alexandria Station in central eastern Northern Territory. Thomas (op. cit.) quotes Stalker's observations that at this locality *P. hermannsburgensis* "make large burrows in the hard stony ridges, piling up the excavated stones on the surface." It was of considerable interest, then, when Dr M. Fleming, Conservation Commission of the Northern Territory, recently located *P. hermannsburgensis* and another form, superficially similar to *P. chapmani*, near Old Station Waterhole, Murchison Range, central Northern Territory (20°29'S, 134°27'E). The habitat was gently sloping country with quartzitic stones, with mounds of pebbles similar to the smaller of the mounds made by *P. chapmani*.

The absence of known pebble mounds between the Pilbara and central Northern Territory localities suggests that it is unlikely that geographically intermediate populations will be discovered to allow ready appraisal of *P. chapmani* with this Northern Territory form.

A series of specimens representative of the Murchison Range form was compared with *P. chapmani*, *P. hermannsburgensis* and *P. bolami* Troughton, 1932. The latter species had been included within *P. hermannsburgensis* (Ride 1970) until its recent recognition as a distinct species (Kitchener *et al.* 1984). Additionally, comparison was made with *P. delicatulus* (Gould, 1842); a small (<20 gm) species occurring in the region, with which it could be confused. These comparisons revealed that the Murchison Range form was sufficiently distinct morphologically to warrant its description as a new species.

## Systematics

### *Pseudomys johnsoni* sp. nov.

Figs 1-8, Table 1

#### Holotype

Central Australian Wildlife Collection Registration No. CAWC854, adult male, in alcohol with skull separate.

Type locality: Kurinelli Mine, Kurundi Station, central Northern Territory, 20°37'S, 134°51'E and altitude c. 150m. Collected on 27 September 1983 by M. Hewett in a rocky outcrop with large boulders on a stony rise vegetated with *Triodia longiceps*.

#### Paratypes (all adults in alcohol with skull separate)

Kurinelli Mine, Northern Territory (20°37'S, 134°51'E), 3♂, 1♀, CAWC (845, 847, 849, 853); and Old Station Waterhole, N.T. (20°29'S, 134°30'E), 4♂, 3♀, CAWC 797, CAW 1034-40.

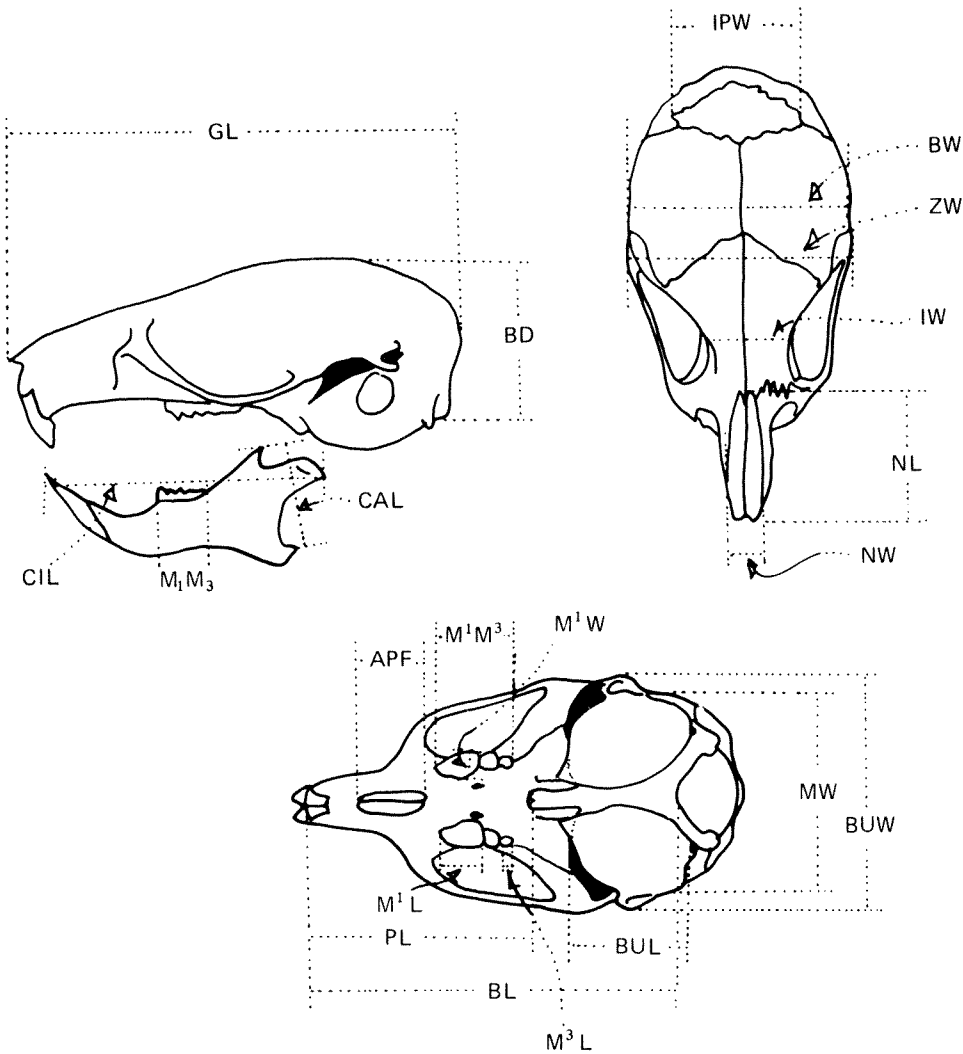
#### Diagnosis (mean measurements in mm)

*P. johnsoni* differs from *P. chapmani* in having a shorter tail length relative to snout to vent length (1.21 v. 1.33); longer pes length (17.4 v. 16.0); wider interparietal (7.6 v. 6.2); shorter bulla (5.4 v. 5.8); longer both upper and lower molar crown lengths (4.1 v. 3.8 and 3.7 v. 3.4, respectively); much slighter intrusion of occipital into post-squamosal sinus. It differs from *P. hermannsburgensis* in having greater pes length relative to ear length (1.43 v. 1.25); interparietal width narrower relative to greatest skull length (0.32 v. 0.35); anterior palatine foramen shorter (3.7 v. 4.3); longer upper and lower molar row crown lengths (v. 3.6 and 3.3 respectively); much slighter intrusion of occipital into post-squamosal sinus; first loph of M<sup>1</sup> more elongate. It differs from *P. bolami* in having shorter ears (12.2 v. 16.9); shorter pes (17.4 v. 19.3); shorter tail length relative to snout to vent length (v. 1.30); tail less heavily furred (37 v. 80 hairs/scale row); shorter interparietal width relative to skull length (v. 0.35); shorter anterior palatine foramen (v. 4.4); longer both upper and lower molar row crown lengths (v. 3.5 and 3.4, respectively). It differs from *P. delicatulus* in being larger for all characters except anterior palatine foramen length. For example, snout to vent length (69.5 v. 54.6), pes length (v. 16.4) total body weight (11.7 v. 7.6) greatest skull length (24.0 v. 20.4), upper molar row crown lengths (v. 3.5), M<sup>1</sup> crown width (1.3 v. 1.1). Bulla longer relative to greatest skull length (0.23 v. 0.19); interparietal width narrower relative to greatest skull length (v. 0.34); anterior palatine foramen shorter relative to palate length (0.30 v. 0.37) and interorbital width narrower relative to greatest skull length (0.14 v. 0.16).

#### Description

Measurements recorded are indicated on Figure 1. Terminology for vibrissae and other external characters follows Wood Jones (1923). Counts of hairs on tail were numbers of hairs round circumference of tail at a point 1 cm from vent. Measurements of type specimens examined are presented in Appendix I.

Analysis of characters listed in table 1, using T-tests, shows that *P. johnsoni*, *P. chapmani*, *P. hermannsburgensis*, *P. bolami* and *P. delicatulus* are not sexually dimorphic. For this reason measurements of males and females of these species are pooled in this paper.



**Figure 1.**

Skull measurements used in this study:

GL, greatest skull length; NL, nasal length; NW, nasal width; IW, interorbital width; ZW, zygomatic width; MW, mastoid width; BW, braincase width; BD, braincase depth, lower arm of calipers placed level with pre- and basisphenoid, upper arm in contact with apex of skull; IPW, interparietal width; PL, palatal length; APF, anterior palatine foramen length; BL, basicranial length; BUL, bulla length, excluding eustachian projection; BUW, distance outside bullae, caliper points in contact with anterodorsal edge of tympanic ring; M<sup>1</sup>-M<sup>3</sup>, upper molar row crown length; M<sup>1</sup>L, first upper molar crown width; M<sup>3</sup>L, third upper molar crown length; CAL, tip of coronoid process to posterior edge of angular process; CIL, dentary condyle to anterior edge of first lower incisor.

Table 1: See facing page

Character	<i>P. johnsoni</i>				<i>P. chapmani</i>				<i>P. hermannsburgensis</i>				<i>P. bolami</i>				<i>P. delicatulus</i>			
	$\bar{x}$	SD	Range	N	$\bar{x}$	SD	Range	N	$\bar{x}$	SD	Range	N	$\bar{x}$	SD	Range	N	$\bar{x}$	SD	Range	N
GL	24.01	0.57	23.0-25.9	12	22.92	1.31	21.1-25.0	12	22.32	0.85	20.8-24.0	13	22.75	0.82	21.0-24.2	15	20.43	0.40	20.0-21.0	9
NL	8.39	0.41	7.7- 9.0	12	7.60	0.67	6.4- 8.4	10	7.68	0.40	7.1- 8.3	13	7.58	0.40	6.8- 8.3	16	7.20	0.34	6.9- 7.7	11
NW	2.15	0.16	1.8- 2.3	12	2.06	0.12	1.9- 2.2	11	2.16	0.11	2.0- 2.4	13	2.11	0.12	1.9- 2.3	17	1.92	0.41	1.8- 2.2	11
IW	3.43	0.19	3.2- 3.8	12	3.38	0.09	3.2- 3.5	11	3.41	0.13	3.1- 3.6	13	3.61	0.17	3.3- 3.9	17	3.30	0.12	3.0- 3.5	11
ZW	11.91	0.19	11.6-12.3	12	11.36	0.39	10.8-11.6	11	11.53	0.32	11.0-12.0	13	11.43	0.41	10.7-12.1	16	10.25	0.28	9.8-10.7	11
MW	9.25	0.23	8.8- 9.6	12	9.06	0.24	8.8- 9.4	11	9.32	0.35	8.9-10.1	13	9.69	0.23	9.1-10.0	17	8.23	0.48	7.0- 8.6	10
BW	10.98	0.25	10.6-11.3	12	10.87	0.29	10.5-11.4	11	10.78	0.27	10.5-11.3	13	10.99	0.27	10.4-11.3	17	9.89	0.26	9.3-10.2	10
BD	7.38	0.25	7.0- 7.8	12	7.09	0.15	6.9- 7.4	11	7.14	0.21	6.7- 7.4	13	7.33	0.22	7.0- 7.9	16	6.61	0.25	6.2- 7.0	10
IPW	7.57	0.33	7.0- 8.1	11	6.21	0.43	5.6- 6.8	13	7.87	0.38	7.1- 8.5	12	8.00	0.23	7.6- 8.3	11	6.99	0.41	6.5-7.7	10
PL	12.42	0.31	12.0-13.0	12	11.64	0.66	10.7-12.7	11	11.42	0.43	10.6-12.1	13	11.38	0.51	10.6-12.3	17	10.11	0.18	9.8-10.3	10
APF	3.70	0.17	3.5- 4.0	12	3.48	0.17	3.2- 3.7	11	4.26	0.23	3.9- 4.7	13	4.39	0.29	3.9- 5.0	17	3.74	0.17	3.5- 4.1	10
BL	19.96	0.50	19.2-20.9	12	18.73	1.13	17.3-20.6	11	18.56	0.74	17.4-19.9	13	18.74	0.87	17.2-20.2	15	16.45	0.39	15.8-16.9	9
BUL	5.41	0.17	5.1- 5.7	12	5.82	0.27	5.5- 6.0	11	4.98	0.19	4.5- 5.2	13	4.67	0.19	4.4- 5.0	17	3.81	0.09	3.6- 3.9	10
BUW	11.10	0.31	10.6-11.7	12	11.05	0.32	10.6-11.7	11	10.72	0.25	10.3-11.3	13	10.75	0.32	10.3-11.4	14	9.34	0.51	8.1- 9.9	10
M <sup>1</sup> -M <sup>3</sup>	4.11	0.16	3.8- 4.4	12	3.76	0.18	3.5- 4.1	11	3.55	0.12	3.4- 3.7	13	3.54	0.09	3.4- 3.7	17	3.45	0.16	3.2- 3.7	11
M <sup>1</sup> L	2.23	0.11	2.1- 2.4	12	2.09	0.11	2.0- 2.3	11	1.88	0.07	1.8- 2.0	13	1.86	0.07	1.8- 2.0	17	1.89	0.09	1.8- 2.0	11
M <sup>1</sup> W	1.26	0.05	1.2- 1.3	12	1.15	0.05	1.1- 1.2	11	1.14	0.05	1.1- 1.2	13	1.14	0.05	1.1- 1.2	17	1.06	0.05	1.0- 1.1	11
M <sup>3</sup> L	0.93	0.06	0.8- 1.0	12	0.75	0.07	0.6- 0.8	11	0.77	0.06	0.7- 0.9	13	0.80	0.06	0.7- 0.9	12	0.75	0.07	0.6- 0.8	11
M <sub>1</sub> -M <sub>3</sub>	3.74	0.13	3.6- 4.0	12	3.41	0.14	3.2- 3.6	11	3.32	0.13	3.1- 3.5	13	3.42	0.07	3.3-3.6	17	3.05	0.08	3.0- 3.2	11
CAL	5.61	0.29	5.2- 6.0	12	5.09	0.48	4.5- 6.0	11	5.39	0.32	4.8- 5.7	13	5.07	0.23	4.8- 5.5	11	4.74	0.39	4.4- 5.4	5
CIL	14.68	0.47	14.0-15.5	12	13.71	0.85	12.5-15.4	11	13.57	0.43	12.8-14.4	13	13.68	0.48	12.9-14.7	16	12.30	0.25	11.9-12.5	10
SVL	69.51	4.81	60.8-74.1	12	60.54	5.01	52.2-67.7	8	68.67	5.18	62.1-77.0	13	67.00	5.77	57.0-77.1	16	54.58	3.42	50.2-61.7	12
TL	84.03	5.21	75.8-94.5	10	80.24	9.54	63.6-94.4	8	79.59	5.87	73.1-91.5	11	87.36	5.90	78.6-96.2	13	69.81	6.94	61.1-84.1	12
PL	17.44	0.52	16.8-18.5	12	16.00	0.86	15.1-17.2	8	16.84	0.66	15.7-18.0	13	19.34	0.56	18.4-20.1	16	16.35	0.59	15.2-17.2	12
EL	12.17	0.34	11.7-13.0	12	10.39	0.85	9.2-11.6	8	13.42	0.78	12.5-14.5	12	16.89	0.90	15.2-18.6	16	11.67	0.69	10.6-12.8	12
HS	36.8	4.3	30 -44	11	38.9	2.6	36 -43	8	40.7	2.3	38 -45	13	80.0	7.0	71 -95	19	34.75	2.83	30 -38	12
WT	11.67	2.60	9 -17	9	11.24	3.07	7.5-16.7	7	13.36	2.40	10.5-17.2	8	13.86	3.59	10.5-21.0	7	7.64	1.19	6.0-10.0	11

◀ **Table 1:** Mean, standard deviation, range, and sample size of the skull, dental and external measurements (mm) for adult: *Pseudomys johnsoni* (7♂, 5♀); *P. chapmani* (7♂, 3♀); *P. hermannsburgensis* – Northern Territory only (3♂, 10♀); *P. bolani* (7♂, 12♀) and *P. delicatulus* (7♂, 9♀). Code for skull measurements are in caption of Fig. 1; those for external measurements are as follows: SVL, tip of rhinarium to vent length; TL, tip of tail to vent length; PL, pes length, excluding claw; EL, ear length; HS, number of tail hairs/scale row and WT, total body weight (gms).

### Skull (Figure 2)

Nasals exceed premaxillae anteriorly; anterior edge of zygomatic plate straight or slightly concave near base; outline of parieto-squamosal suture sigmoidal; occipital barely intrudes into post-squamosal sinus and then only as a sliver on the dorsal edge; anterior palatine foramen short, generally extending posterior to a point just anterior to M<sup>1</sup> alveoli; anterior half of median palatine septum inflated, premaxillary and maxillary septal suture near middle; presphenoid broad and flat, narrowing anteriorly, with slight upward expansion encircling optic foramen, generally with a small wing intruding moderately into region of frontal; mesopterygoid fossa not noticeably widened posteriorly and sides frequently parallel; parapterygoid fossae shallow; bulla length moderate relative to greatest skull length (see Figure 3 for comparison with the other *Pseudomys* considered); interparietal width relative to skull length moderate (see Figure 4 for comparison with the other *Pseudomys* considered).

### Dentition

Upper incisors opisthodont, molar cusp laminae gently tilted upwards; labial cusps reduced; upper molar row long, M<sup>1</sup> buccal surface oval, elongate first loph with a small to moderate accessory anterior cusp (Figure 2); first loph of M<sub>1</sub> slightly bicuspid, less so than in the other species.

### Externals

Tail length averages 55% of total body length; ear length 12.2; pes length 17.4. The relationship between pes and ear lengths of *P. johnsoni* and the other species considered is shown in Figure 5. Total body weight 11.7 gm. Plantar pads large, particularly interdigital and hallucal pads; second interdigital pad reaches anteriorly approximately three-quarters the length of third interdigital pad; distance between posterior pads variable, but generally metatarsal pad, hallucal pad and post hallucal pad approximately equidistant from each other (Figure 6).

### Pelage and Skin Colour

Described following Ridgway's (1912) colour standard after careful drying of recently collected specimens fixed in 10% formalin and preserved in 70% ethyl alcohol.

Hairs on shoulder, back and flanks up to 6.5 mm long, base of hairs Fuscous Gray to Dark Mouse Gray, distal 2 mm Clay, lightly tipped with Fuscous. Hairs on forehead, rostrum and sides of face shorter (4.5 mm) with distal one-third Clay, occasionally tipped with Fuscous. Ears lightly furred with 2 mm long hairs which are Hair Brown on the outer and White on the inner ear surfaces. Guard hairs on dorsum numerous, up to 11 mm long and Black; on flanks

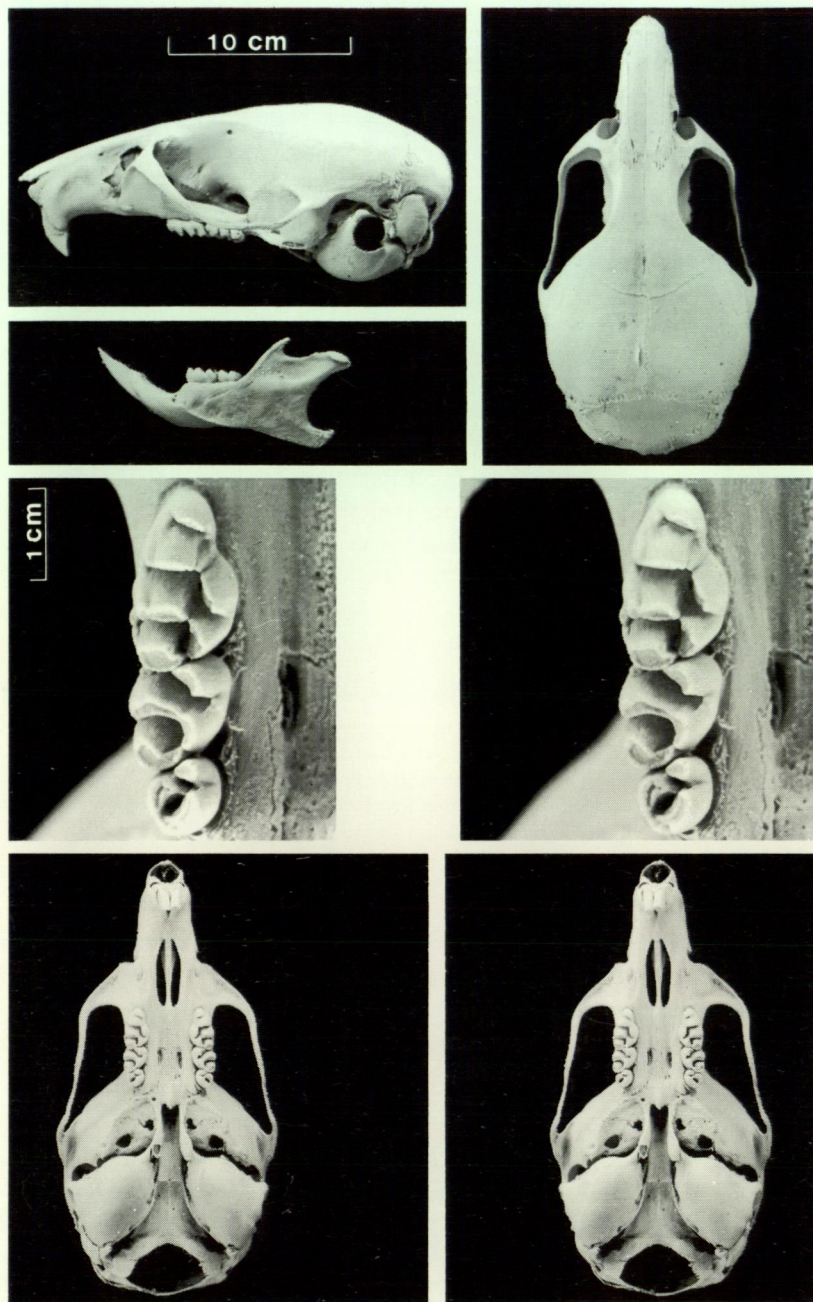


Figure 2. Skull, upper molar row and dentary of *Pseudomys johnsoni* holotype. Ventral aspect of skull and upper molar row as stereopairs.

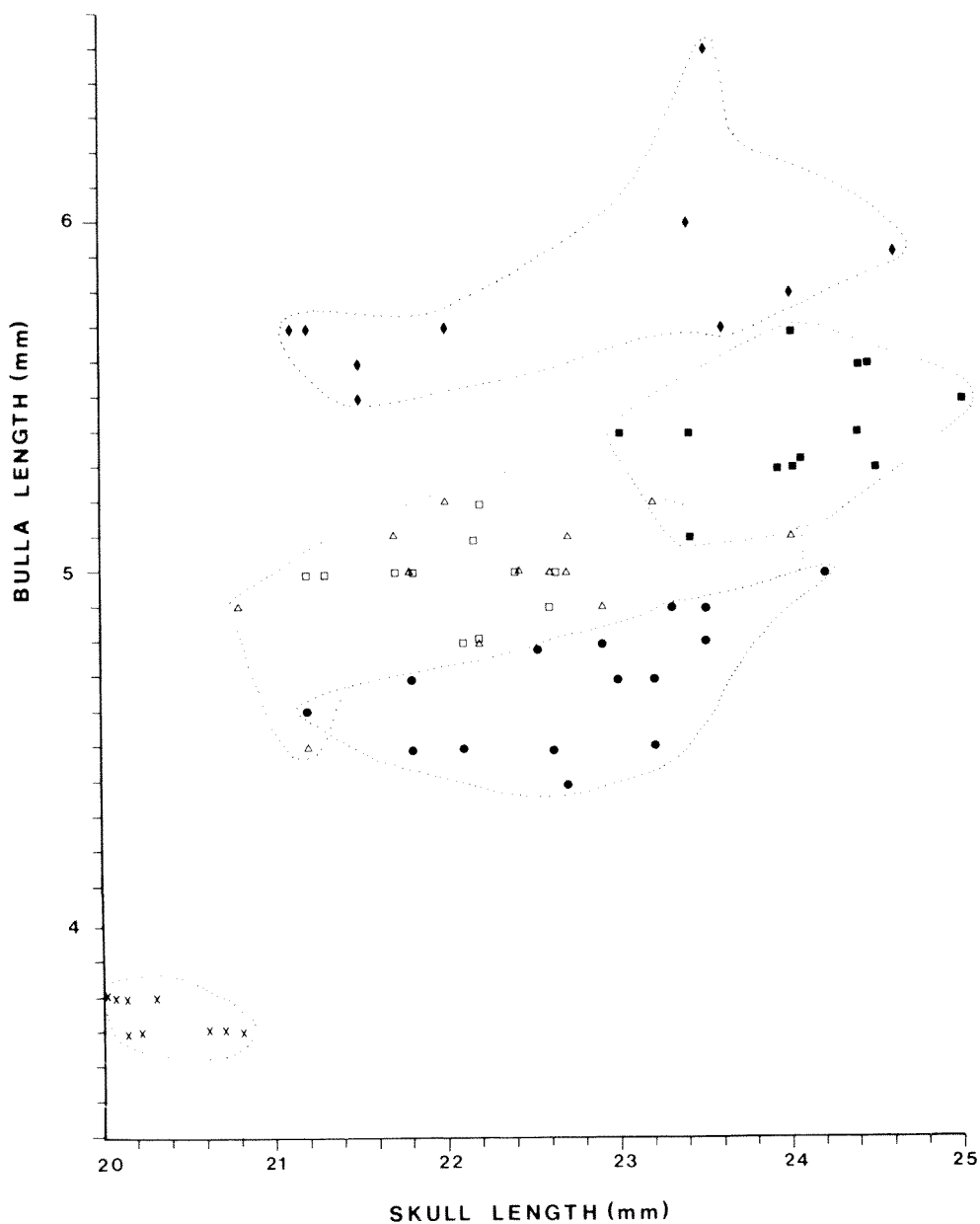
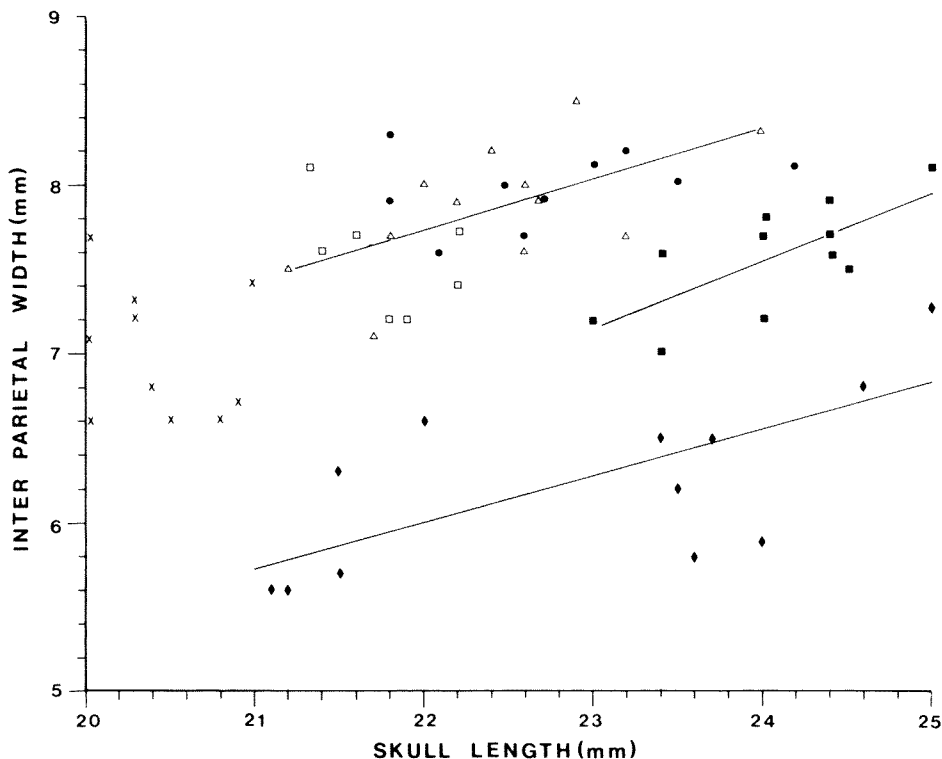


Figure 3. Length of bulla versus maximum skull length for adult *Pseudomys johnsoni* (■), *P. chapmani* (◆), *P. hermannsburgensis* - Northern Territory (△), Pilbara (□), *P. bolami* (●) and *P. delicatulus* (x).



**Figure 4.** Regression of interparietal width versus greatest skull length for adult *Pseudomys johnsoni* (■),  $y = 0.404x - 2.135$ ,  $r = 0.72$ ,  $p < .05$ ; *P. chapmani* (◆),  $y = 0.276 - 0.067x$ ,  $r = 0.67$ ,  $p < .05$ ; *P. hermannsburgensis* N.T. (△),  $y = 0.302x + 1.091$ ,  $r = 0.59$ ,  $p < .05$ , *P. bolami* (●),  $y = 0.072x + 6.341$ ,  $r = 0.26$ , N.S. and *P. delicatulus* (×),  $y = 11.600 - 0.228x$ ,  $r = 0.217$ , N.S. The regressions between *P. johnsoni* and *P. chapmani* and *P. johnsoni* and *P. hermannsburgensis* have the same slope but intercepts of *P. johnsoni* differs significantly from both *P. chapmani* ( $F_{1,29} = 34.25$ ,  $p < .001$ ), and *P. hermannsburgensis* (NT only) ( $F_{1,29} = 20.04$ ,  $p < .001$ ). Values for *P. hermannsburgensis* from Pilbara (□), W.A., are also plotted. Regression lines are shown for *P. johnsoni*, *P. chapmani* and *P. hermannsburgensis*.

less numerous, shorter (9 mm). Hairs on ventral surface of body, and on throat, chin, sides of mouth, manus and pes White – which contrasts sharply with Clay of lateral parts; basal one-third of ventral hair 4.5 mm long and Pale Smoke Gray. Guard hairs on venter and abdomen less numerous, up to 7.5 mm long and White.

Hairs on tail 1.5 mm long, averaging 37 hairs/scale row; on dorsal surface hairs Brownish Olive; on ventral surface White. No terminal tuft of hair on tail. Up to 35 mystacial vibrissae, posteriorly these are very long (26 mm) and Black, on edge of lips shorter (11 mm) and White. Usually a single moderately long (14 mm) Black genal vibrissae. Two supraorbital vibrissae, the longer one (16 mm) twice the length of the other. Two ulnar vibrissae both short (4.5 mm) and white. Occasionally a short (4 mm) white medial antibrachial vibrissa.



Skin of pes and manus Warm Buff. Skin of ear Dusky Drab. Ventral skin of tail Deep Olive Buff; dorsal skin Buffy Brown.

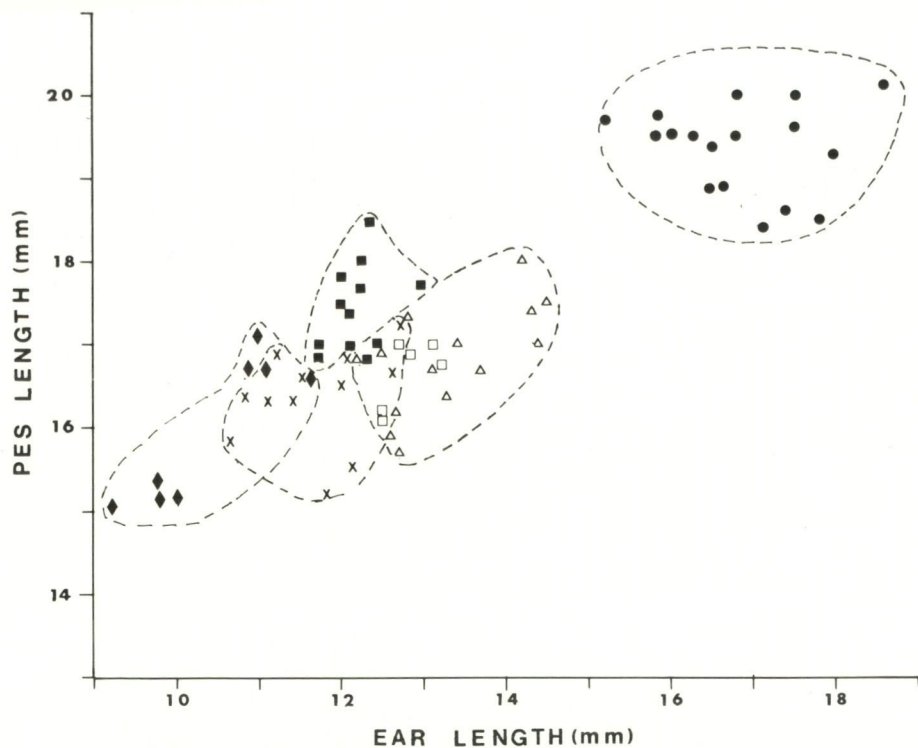


Figure 5.

Length of pes versus length of ear for adult: *P. johnsoni* (■), *P. chapmani* (◆), *P. bolami* (●), *P. hermannsburgensis* from Northern Territory (△) and Pilbara, W.A. (□) and *P. delicatulus* (×).

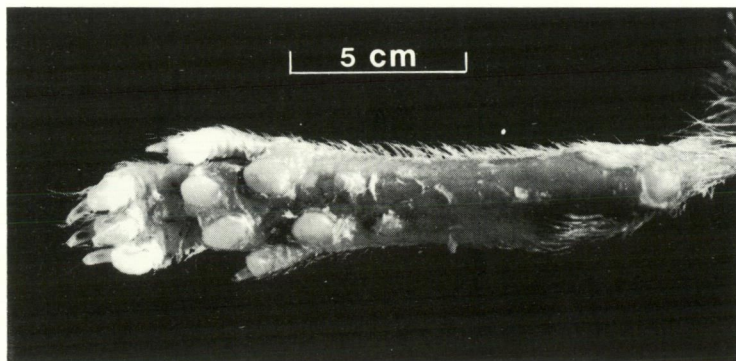
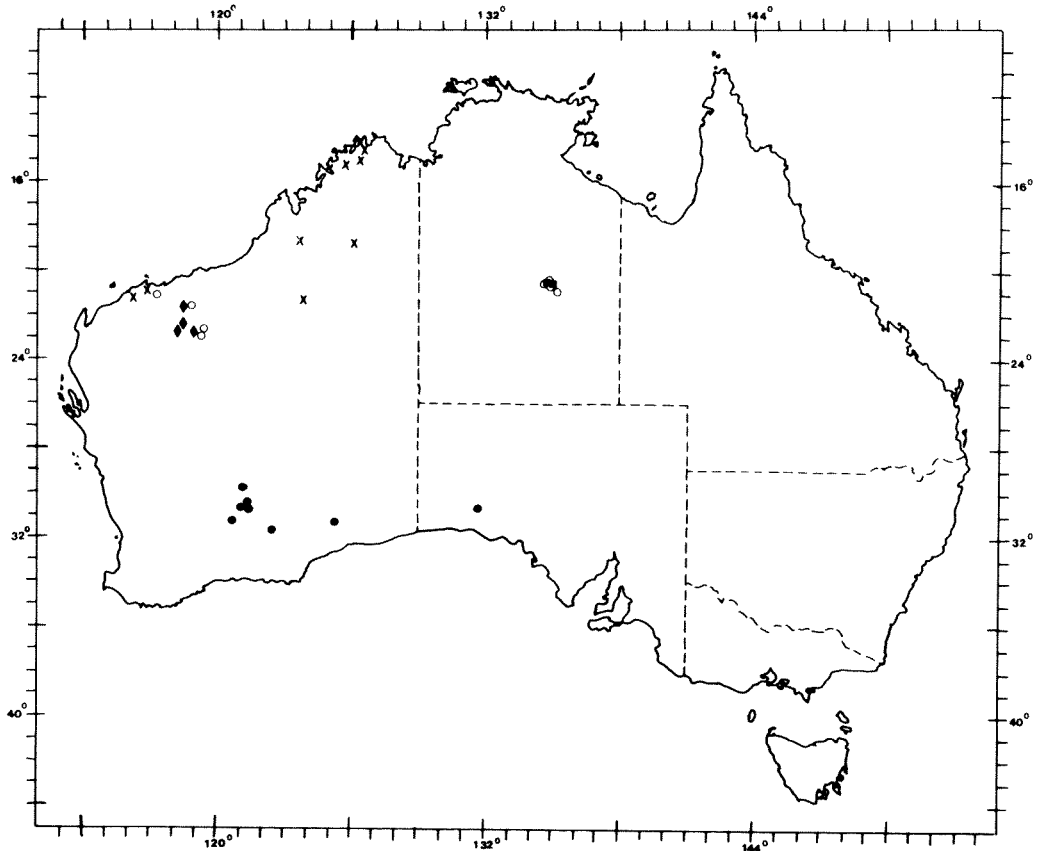


Figure 6.

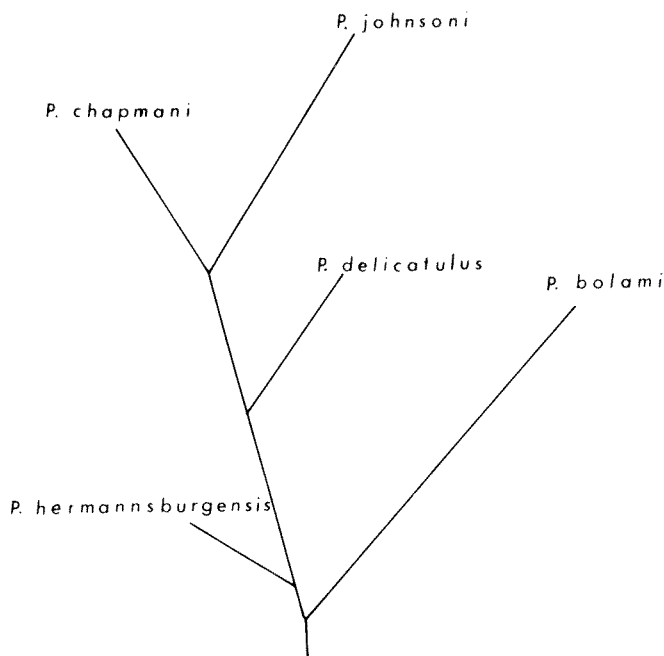
Plantar surface of left pes of holotype of *Pseudomys johnsoni*.

**Distribution and Habitat**

*Pseudomys johnsoni* has a very restricted distribution in arid central Northern Territory (Figure 7). This species has probably had a restricted distribution for a very long time because officers of the Bureau of Mineral Resources involved in the extensive geological mapping of the Northern Territory saw only four pebble mound sites. These were in the Murchison Ra. (20°35'30"S, 134°44'20"E, 20°33'20"S, 134°39'25"E and 20°34'30"S, 134°38'40"E) and the Davenport Ra. (20°45'20", 134°31'30"E) (A. Stewart pers. comm.). Most of the captures were on stony ridges, rises and gravelly plains vegetated with *Plectrachne pungens* or *Triodia longiceps* with varying degrees of shrubby overstorey including *Acacia spondylophylla*, *A. hilliana* and *Grevillea wickhamii*; pebble mounds are commonly associated with these habitats (M. Hewett pers. comm.).



**Figure 7.** Localities of specimens of *Pseudomys johnsoni* (■), *P. champani* (◆), *P. hermannsburgensis* (△, □), *P. bolami* (●) and *P. delicatulus* (×) used in this study.



**Figure 8.** Wagner tree showing relationships between *Pseudomys johnsoni*, *P. chapmani*, *P. hermannsburgensis*, *P. bolami* and *P. delicatulus*. Branch lengths are shown in proportion to their estimated values.

### Phylogenetic Relationship

These relationships are derived from synapomorphies involving the following eight characters: 1, elongated first loph  $M^1$ ; 2, slight occipital intrusion into post-squamosal sinus; 3, long pes; 4, long ears; 5, narrow interparietal; 6, long bulla; 7, short anterior palatine foramen; 8, heavily furred tail. Synapomorphies determined by out-group comparison with *Leggadina forresti*. In the character matrix presented below for each species, plesiomorphic characters are scored as 0 and apomorphic characters as 1. The intermediate continuous measurements (all characters except 2) are scored as fractional values scaled between 0-1 and based on their mean values in Table 1. The elongated first loph of  $M^1$  is represented by the mean value for the crown length of  $M^1$ .

Species	Character Matrix							
	1	2	3	4	5	6	7	8
<i>P. johnsoni</i>	1	1	.43	.27	.22	.80	.75	.05
<i>P. chapmani</i>	.62	0	0	0	1	1	1	.09
<i>P. hermannsburgensis</i>	.05	0	.25	.47	.07	.58	.14	.13
<i>P. bolami</i>	0	0	1	1	0	.43	0	1
<i>P. delicatulus</i>	.08	1	.10	.20	.52	0	.71	0

The Wagner tree derived from this character matrix was produced manually utilising the Wagner algorithm as illustrated in Wiley (1981). It is rooted by assuming an ancestral species with all characters plesiomorphic (zero values) (Figure 8).

The Wagner tree indicates that *P. johnsoni* and *P. chapmani* are sister species and that *P. bolami* is the most distantly related to *P. johnsoni*.

### Etymology

Named after Dr Ken Johnson, Conservation Commission of the Northern Territory, in recognition of his contributions to the study of mammals in the Northern Territory.

### Remarks

*Pseudomys johnsoni* is typical of other species in the genus *Pseudomys* Gray, 1832, diagnosed by Thomas (1910) as containing species that have a mammary formula of 0-2 = 4 (none having pectoral mammae). Their skull is lightly built, without supraorbital ridges; the interorbital region is narrow, parallel-sided with round, or in a few species, square edges.

Although lacking the computer facilities required to carry out a detailed morphometric study of the relationships of *P. johnsoni*, it appears to be closer both phenetically and phylogenetically to *P. chapmani* than to the other species considered.

The taxon *Pseudomys patrius* (Thomas and Dollman, 1909) was also examined because of its larger size and the possibility that Mahoney (as reported in Ride 1970) was incorrect in synonymising *P. patrius* within *P. delicatulus*. I am in support of Mahoney's judgement of the placement of this taxon.

### Specimens Examined

Museum catalogue numbers are prefixed with WAM (Western Australian Museum), AM (Australian Museum); CAWC (Central Australian Wildlife Collection) and BMNH (British Museum of Natural History). All are adults.

#### *Pseudomys bolami* Troughton, 1932

South Australia. Ooldea, 30°27'S, 131°50'E, AM M4938, female, skin and skull (holotype); 1 ♀, AM M2991, skin and skull; 2 ♀, AM M4931-32, entire alcohol specimens.

Western Australia (all alcohol specimens with skulls separate). Black Flag Hs. area, Goldfields 30°35'30"S, 121°16'E, 3 ♂, 1 ♀: WAM M20531, WAM M20544-46; 30°37'00"S, 121°18'00"E, 2 ♀, WAM M20535-6; 30°37'S, 121°18'E, 2 ♂, 1 ♀, WAM (M20538-9, M20547); 30°30'S, 122°21'E, 1 ♂, WAM M20542; 30°35'30"S, 121°16'E, 2 ♀, WAM M20532-3; near Woolgangie Road Station, 31°18'00"S, 120°32'30"E, 1 ♂, 1 ♀, WAM M20587-8; 31°18'30"S, 120°32'30"E, 1 ♂, WAM M20589; 31°17'00"S, 120°33'30"E, 1 ♂, WAM M20585; 31°20'30"S, 120°32'30"E, 1 ♂ WAM M20586; Goongarrie area, Goldfields, 29°53'15"S, 121°11'45"E, 1 ♂, WAM M17561; Woodline area, 31°53'S, 122°27'E, 1 ♂, WAM M17971; Rawlinna 31°01'S, 125°20'E, 1 ♀, AM M4644, skin and skull.

#### *Pseudomys hermannsburgensis* (Waite, 1896)

Hermannsburg, central Australia 23°57'S, 132°46'E, ? sex, AM M1070A, skin and skull (lectotype).

Western Australia (all alcohol specimens with skull separate). Pilbara, Woodstock Hs., 21°37'S, 118°57'E, 5 ♂, 2 ♀, WAM (M3418, M5587, M5583 A & B, M5735-6, M7734); Marillana Hs., 22°47'10"S, 119°15'47"E, 1 ♂, WAM M18815; Yandicoogina Ck, 22°45'50"S, 119°13'08"E, 1 ♂, 2 ♀, WAM M18991-3; 30 km S Roebourne, 21°03'S, 117°07'E, 1 ♂, WAM M101822.

Northern Territory. Kurundi Hs., (alcohol specimens with skull separate). 20°36'S, 134°50'E, 2 ♀, CAWC (844, 852); 20°12'S, 134°31'E, 1 ♂, CAWC 855; 20°37'S, 134°50'E, 2 ♀, CAWC (841, 843); 20°42'S, 135°12'E, 1 ♀, CAWC 848; 20°41'S, 135°13'E, 1 ♂, CAWC 859; 20°42'S, 135°15'E, 1 ♂, 1 ♀, CAWC (850, 856); 20°12'S, 134°24'E, 1 ♀, CAWC 846; 20°28'S, 134°29'E, 1 ♀, CAWC 842; Meerie Wh., Phillip Ck. Hs., 19°14'S, 134°15'E, 2 ♀, CAWC 955-6.

*Pseudomys chapmani* Kitchener, 1980

Pilbara (all alcohol specimens with skulls separate). Woodstock Hs., 21°37'S, 18°57'E, 1♂, WAM M3419; Mt Edgar Hs., 21°18'S, 120°04'E, 1♂, WAM M5767; White Springs Hs., 21°47'S, 118°48'E, 1♂, WAM M5865; West Angelas 21°47'S, 118°48'E, 2♂, 1♀, WAM M18249-51 (including holotype WAM M18251); Mt Meharry, 23°12'S, 118°49'E, 2♂, WAM (M16825, M18345); Mt Bruce, 22°37'30"S, 118°03'30"E, 1♂, 2♀, WAM (M18751-2, M24936); Wittenoom, 22°21'30"S, 118°17'20"E, 1♂, WAM M19839; Nr Marillana Hs., 22°45'50"S, 119°13'08"E, 1♂, WAM M 18977.

*Pseudomys delicatulus* (Gould, 1842)

Western Australia (alcohol specimens with skull separate unless otherwise stated). Bohemia Downs Hs., 18°54'S, 126°15'E, 1♀, WAM M12162; Prince Regent R. Nature Reserve 15°26'12"S, 125°36'42"E, 1♂, 1♀, WAM M12316, M12318; - 15°07'32"S, 125°32'47"E, 1♀, WAM M12318; Edgar Ra. 18°52'50"S, 123°43'00"E, 1♀, WAM M15065; - 18°54'00"S, 123°02'20"E, 1♂, WAM M16710; Burrup Peninsula 20°37'40"S, 116°47'40"E, 1♀, WAM M19103; 17 km 112° from Mardie Hs., 21°15'00"S, 116°07'40"E, 1♂, WAM M19686; 27.5 km 138° from Mardie Hs., 21°23'00"S, 116°09'30"E, 2♂, WAM (M19692, M19695); Kalumburu 14°16'12"S, 126°37'54"E, 1♀, WAM M 19927.

Northern Territory. Port Essington 11°16'S, 132°09'E, ? sex, BMNH 42.5.26.17-18, skin and skull, (syntypes *Pseudomys delicatulus* (Gould, 1842).

Queensland. Mt Inkerman 19°45'S, 147°30'E, 1♀, BMNH 7.8.9.44, skin and skull [holotype *Pseudomys patrius* (Thomas and Dollman, 1909)].

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## Appendix I

Measurements, counts and weights for the following type specimens: *P. johnsoni* (CAWC 854, A♂, S, A1, holotype); *P. chapmani* (WAM M18251, A♂, S, A1, holotype); *P. hermannsburgensis* (AM M1070A, ?sex, S, sk, lectotype); *P. bolami* (AM M4938, A♀, S, sk, holotype), *P. delicatulus* (BMNH 42.5.26.18, ?sex, S, sk, syntype); *P. patrius* (BMNH 7.8.9.44, A, S, sk, holotype). A, adult; S, skull, A1, carcase in alcohol, sk, skin; NA, measurements not available, \* from Troughton (1932). Code for characters are in captions of Figure 1 and Table 1.

Character	<i>P. johnsoni</i>	<i>P. chapmani</i>	<i>P. hermannsburgensis</i>	<i>P. bolami</i>	<i>P. delicatulus</i>	<i>P. patrius</i>
GL	23.4	21.2	NA	23.3	NA	22.5
NL	8.2	6.9	7.7	7.9	7.4	8.2
NW	1.9	2.0	2.2	2.2	2.2	2.0
IW	3.3	3.4	3.3	3.7	3.5	3.1
ZW	11.8	10.8	NA	12.1	NA	11.0
MW	9.5	8.8	NA	9.5	NA	8.8
BW	11.0	10.5	10.7	11.5	NA	10.4
BD	7.5	6.9	NA	7.2	NA	6.8
IPW	7.0	5.6	NA	NA	NA	NA
PL	12.0	10.7	NA	11.8	NA	12.1
APF	3.5	3.4	4.3	4.8	NA	4.2
BL	19.2	17.6	NA	NA	NA	18.3
BUL	5.1	5.7	4.8	4.9	NA	4.0
BUW	10.9	10.6	NA	11.4	NA	9.8
M <sup>1</sup> -M <sup>3</sup>	4.2	3.7	3.6	3.4	3.7	4.2
M <sup>1</sup> L	2.2	2.0	1.8	1.8	1.9	2.3
M <sup>1</sup> W	1.3	1.1	1.1	1.1	1.1	1.2
M <sup>2</sup> L	0.9	0.7	NA	NA	0.8	0.8
M <sub>7</sub> -M <sub>5</sub>	3.8	3.3	3.1	3.4	3.0	3.9
CAL	5.5	4.8	5.3	5.1	NA	4.7
CIL	14.0	13.0	13.9	13.9	NA	13.6
CVL	71.7	56.0	NA	87.0*	NA	60.2
TL	75.8	75.9	NA	88.0*	NA	80.4
PL	17.0	15.2	NA	19.5*	NA	18.6
EL	11.7	10.0	NA	16.0*	NA	11.1
HS	39	36	40	84	NA	30
WT	10.4	9.0	NA	NA	NA	NA

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