

A CONTRIBUTION TO OUR KNOWLEDGE OF SOME MAMMALS FROM INLAND AUSTRALIA

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SUMMARY

We record the positive results of 24 weeks of field work on the mammals of northern South Australia and adjoining areas. Localities, notes on the natural history and some discussion of the taxonomy of the species located are given.

We found the rare rabbit bandicoot, *Macrotis lagotis* Reid, in two areas. The marsupial mouse, *Sminthopsis crassicaudata* (Gould), was moderately common near Birdsville and Oodnadatta. There is evidence that it is more active in the early part of nights without moonlight. Two other rarer species of *Sminthopsis* and *Antechinomys spenceri* Thomas were taken as solitary specimens. We located the two rock wallabies *Petrogale lateralis* Gould and *P. xanthopus* Gray.

Near Oodnadatta, we found a native rodent, either *Pseudomys* (*Pseudomys*) *minnie* Troughton or *Ps.* (*Ps.*) *rawlinnae* Troughton. Two groups of specimens of *Pseudomys* (sub-genus *Leggadina*) were obtained, but not specifically identified. *Ps.* (*Leggadina*) *hermannsburgensis* Waite and the northern hopping mouse, *Notomys alexis* Thomas, were moderately plentiful in and near north-western South Australia. *N. cervinus* (Gould) and a solitary specimen of *N. fuscus* (Wood-Jones) from in and near south-west Queensland, were recorded.

INTRODUCTION

As early as 1925, Wood-Jones documented the alarming decline of populations of many South Australian mammals (Wood-Jones, 1923-5). Finlayson (1961) surveyed the Central Australian mammal fauna, and his conclusions showed that this decline was continuing. Calaby (1963) suggested that six marsupials and several native rodents from Australia were already extinct, and that as many as fifty species were either close to extinction, or so little known that no definite statement could be made.

It is generally agreed that if many of Australia's mammals are to be kept from extinction, urgent measures to conserve them must be undertaken. It is also agreed that knowledge of their distribution and natural history is a prerequisite to their conservation.

With the aim of contributing to this knowledge, we surveyed the mammal fauna of parts of arid Australia. In particular, we sought information on the following seven rare marsupials: *Myrmecobius fasciatus rufus* Wood-Jones, *Macrotis lagotis* Reid, *M. leucura* (Thomas), *Chaeropus ecaudatus* (Ogilby), *Bettongia pencillata* Gray, *Caloprymnus campestris* (Gould), and *Onychogalea lunata* (Gould). We also obtained information about other mammals during the search for these seven rare species.

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METHODS

The areas involved in this survey are vast, and our time was limited. This forced us to rely particularly on information from local people. The aboriginal people, and in particular the older men from the large reserves in the north-west of South Australia and Central Western Australia, gave us valuable information.

Several rodents, and the fat-tailed marsupial mouse, *Sminthopsis crassicaudata* (Gould), were readily found and caught at night. The procedure we adopted was to drive along roads or over other accessible country at about 25 miles per hour, with the lights of our truck on low beam. Small mammals within about 30 yards (27 metres) of the truck could often be seen. They usually ran away from the lights, but when followed with a spotlight trained on them, they often sought refuge in depressions or behind grass tussocks. Here they would crouch motionless, and could readily be approached on foot. They were then caught with a net or by hand. This method was particularly effective for *S. crassicaudata*, which cannot run quickly.

Observation of sign in the form of burrows, tracks and droppings is an obvious method of locating some species. The form of a burrow is often a clue to the species which made it. "Runs" of the northern hopping mouse, *Notomys alexis* Thomas, and the sandy inland mouse, *Pseudomys* (*Leggadina*) *hermannsburgensis* Waite, often led to burrows. Aborigines are particularly adept at digging these out. This is a practical method for obtaining alive such burrowing species as the rabbit bandicoot, *Macrotis lagotis* Reid. Several species of *Notomys*, *Pseudomys*, and *Sminthopsis* were taken in this way. We did not use traps. However, it is possible that the setting of a large number of traps on many nights may have revealed the presence of rarer, more cryptic species.

The older aborigines of the Pitjantjatjara tribe (from the Blackstone Range to the Musgrave and Everard Ranges), and the Nga:nyatjara tribe (from the vicinity of the Warburton Ranges), have specific names for the mammals of their country. We found that the use of these names amongst them created immediate interest, and helped us obtain information on localities and the natural history of many species. The aboriginal names of some of the species considered below are recorded. They are spelt phonetically following Douglas (1964). Measurements of lengths of head and body, tail, hind-foot (pes), and ear of all specimens were taken using the methods described in Wood-Jones (1923). All dead specimens secured on this survey are preserved in the South Australian Museum under the registered numbers used below.

RESULTS

Between April and December, 1966, we spent 24 weeks in the field. Fig. 1 shows the route we followed. Special attention was given to the following areas: near Birdsville (3 weeks), south of the Blackstone, Mann and Musgrave Ranges (5 weeks), and near the Warburton Range (3 weeks).

We obtained information on the distribution and natural history of the following species of mammals. Where no mention is made of a species previously recorded from inland Australia, it may be assumed that no positive records of it were obtained.

Order ORNITHODELPHIA

Tachyglossus aculeatus (Shaw and Nodder), Echidna

Aboriginal Names: tjirilya—Pitjantjatjara; tjilkamata—Nga:nyatjara.

Field Notes. We made no serious effort to locate the moderately plentiful echidna. Aboriginals at four settlements (Fregon, Ernabella, Musgrave Park and Warburton), reported that it was common in nearby rocky hills. Residents of two stations east and west of Lake Eyre reported seeing indisputable signs of *Tachyglossus* recently. We observed tracks and faeces at Mt. Lindsay, 129°54'E, 27°02'S.

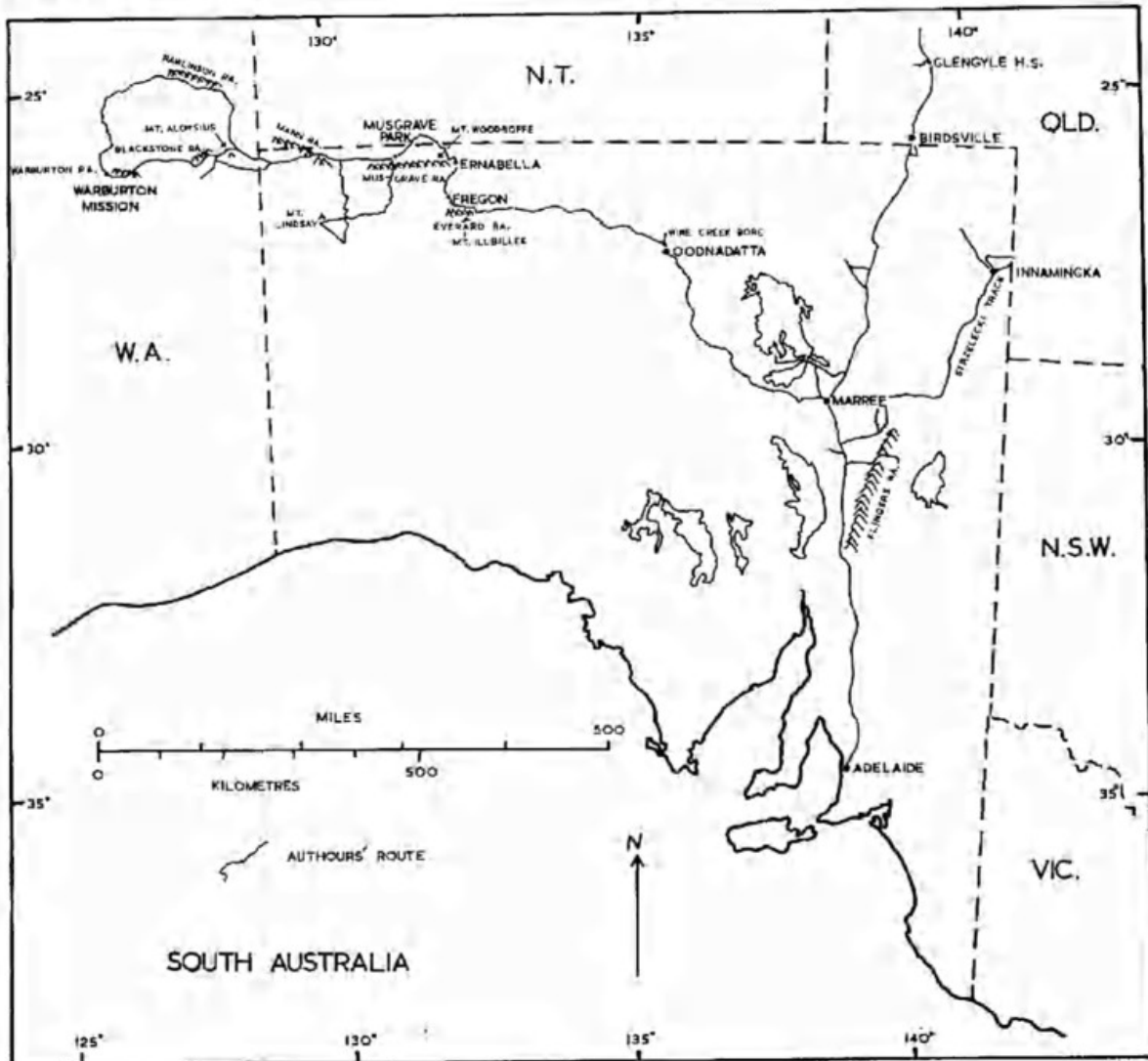


Fig. 1. Map of South Australia and adjoining areas, showing the survey route followed by the authors, and the principal place names mentioned in the text.

Order DIDELPHIA
Family DASYURIDAE

Sminthopsis crassicaudata (Gould), fat-tailed marsupial mouse
(Plate 1, Figure 1)

Aboriginal Name: Papalakuntalkuntalpa—Pitjantjatjara (probably a compound name).

Localities. (i) Within 15 miles (24 km) of Birdsville, SW. Queensland; 139°21'E, 25°54'S; June 6-23, 1966; 7 females (♀) and 12 males (♂); 1 ♀ now South Australian Museum registered number M 6398. (ii) Within 5 miles (8

km) of Glengyle Homestead, SW. Queensland; $139^{\circ}36'E$, $24^{\circ}47'S$; June 11-19, 1966; 3 ♀ and 4 ♂. (iii) Wire Creek Bore, 20 miles (32 km) N. of Oodnadatta, N. South Australia; $135^{\circ}28'E$, $27^{\circ}16'S$; July 9-August 16; 8 ♀ and 4 ♂; 1 ♂ now M 6399.

Field Notes. Most of the marsupial mice were caught at night using a spotlight. At Birdsville and Glengyle, they were found on open gibber plains and on sand-ridges and the flats between these ridges. A sand ridge where many individuals were caught is shown in Plate 1, Fig. 2. At Oodnadatta, we caught them on a gibber-strewn and deeply cracked flat shown in Plate 3, Fig. 2. Occasionally a marsupial mouse, seen in the spotlight, would seek refuge in a well-used burrow less than 12 inches (30 cm) long and 4 inches (10 cm) deep.

We obtained some indication of the most active period of *S. crassicaudata*. Fig. 2 is a histogram showing the number of marsupial mice caught per hour of searching, against the number of hours elapsed since sunset. To draw this graph, we considered only those nights when one or more mice were caught. The accurate time of sunset in astronomical tables for all these dates was determined, and all times were converted to local time. We did not search earlier than one hour after sunset or later than nine hours.

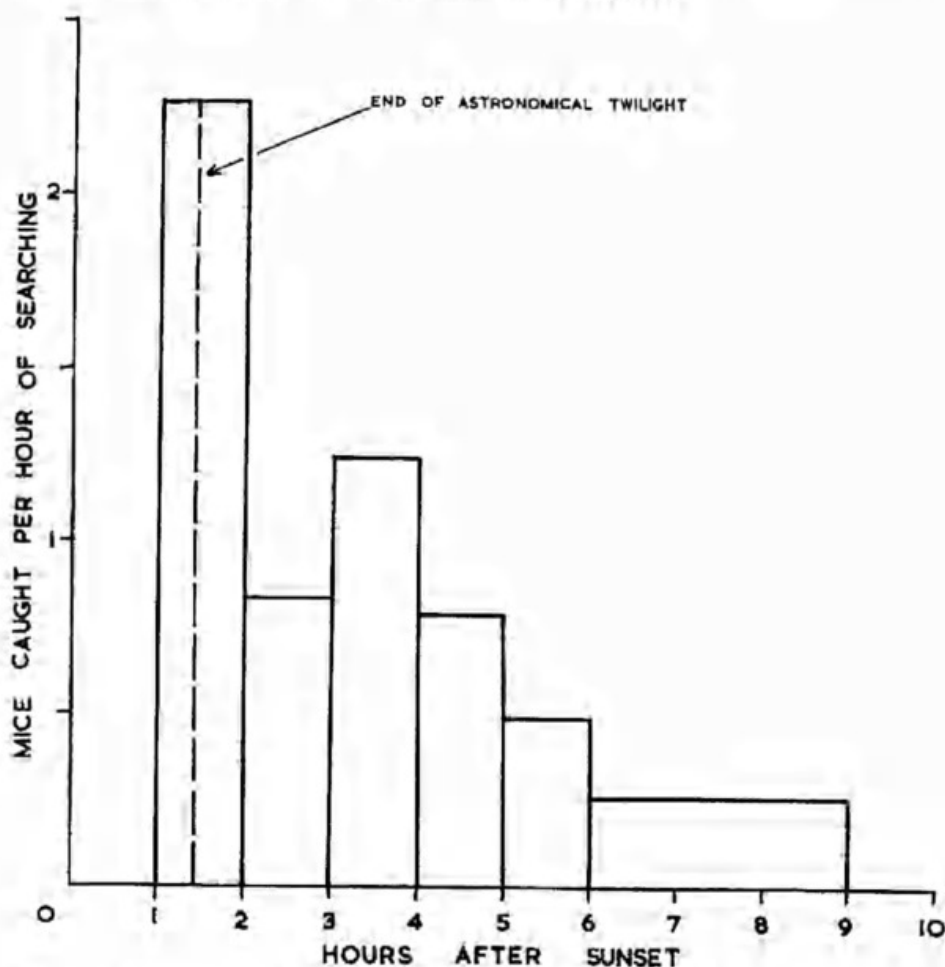


Fig. 2. Histogram of the number of fat-tailed marsupial mice (*Sminthopsis crassicaudata*) caught per hour of searching with a spotlight, against the number of hours elapsed since sunset. No searches were made earlier than one hour after sunset and later than nine hours. Each interval includes at least three and a half hours of searching.

Fig. 2 shows a trend of decreasing numbers of mice being caught per hour of searching with increasing hours after sunset. This suggests that marsupial mice were most active in the early evening. The end of astronomical twilight, and the beginning of complete darkness was about 1 hour 25 minutes after sunset. Although we searched on several occasions before this time, we saw no active marsupial mice.

We caught *S. crassicaudata* on calm and on windy nights, and on clear and on cloudy nights. Some association of success in locating mice and the presence of moonlight is suggested by the following figures. Only twenty-two per cent of our successful searching time was carried out under moonlight (7 out of 32½ hours). Also, during these moonlight searches, we only caught eleven per cent of the total mice secured by this method (4 out of 37).

All mice were weighed alive within 24 hours of capture. There were no significant weight differences between localities. The mean weight of 19 males was 13.2 ± 0.18 gm, with a range of 10½ to 17 gm. For 18 females, the mean was 13.9 ± 0.34 gm, and the range from 10½ to 19 gm. There was no significant difference between the weights of the sexes ($t_{35} = 1.02$, $30\% < P < 40\%$). None of the females had pouch-young.

A photograph of the tracks left by a live captive is given on Plate 1, Fig. 3. The mouse was running quickly for cover. The prints left by the two front feet are the last two in each series in the photograph. The left and right front feet do not regularly alternate as the leading foot, although this does occur in Fig. 3.

Sminthopsis larapinta Spencer, stripe head marsupial mouse

Locality. Wire Creek Bore, 20 miles (32 km) N. of Oodnadatta, N. South Australia; $135^{\circ}28'E$, $27^{\circ}16'S$; July 7, 1966; 1 ♀.

Field Notes. This marsupial mouse was caught under similar circumstances to the *S. crassicaudata* individuals from locality (iii) shown on Plate 3, Fig. 2, and considered above. It lived sympatrically with them, and a male and female *S. crassicaudata* were caught close by within 35 minutes of the time of capture of this specimen. Its weight on capture was 21 gm.

Sminthopsis species, unidentified

Locality. Fregon, NW. South Australia; $132^{\circ}02'E$, $26^{\circ}47'S$; July 16, 1966; 1 ♂; M 6366.

Field Notes. We dug this animal from a shallow burrow on a sand-ridge. The burrow resembled those of *Pseudomys* (*Leggadina*) *hermannsburgensis* Waite, a small rodent which was common in the area. Aborigines from the settlement at Fregon did not have a specific name for this species. They gave us only the word "mingkiri", a word used generally for all small mice. This suggested that the animal was rare or particularly cryptic.

Taxonomy. This marsupial mouse was smaller and more delicately built than *S. crassicaudata* and *S. larapinta*. The flesh dimensions (given in mm) were: Head and body 70, tail 85, hind-foot 13, and ear 16. Its weight on capture was 10½ gm. The skull dimensions (given in mm) were: greatest length 20.9, basal length 20.4, zygomatic breadth 11.5, interorbital 4.2, braincase breadth 8.9, palate 11.0, nasals 7.4 x 2.0, bulla 5.7, anterior palatal foramina 1.5, P4 approx. 2 x P1 and P3.

Careful examination of the pes and manus showed that the sole-pads had an obvious longitudinal row of enlarged granules at their apex. Troughton (1964) claimed that this was a diagnostic feature of the *murina* "complex". He

stated, however, "The fact remains that because of the acknowledged lack of differential cranial characters it is impossible to provide objective diagnoses of the typical and allied forms of *murina* at present." Positive identification of this interesting specimen will have to await further collections and comparisons.

Antechinomys spenceri Thomas, western hopping marsupial mouse

Locality. 16 miles (26 km) W. of Glengyle Homestead, SW. Queensland; 139°22'E, 24°48'S; June 14, 1966; 1 ♀; M 6387.

Field Notes. We caught this marsupial mouse while spotlighting at night on an undulating gibber plain. It did not have pouch-young, and weighed 19.5 gm on capture. The native rodent *Notomys cervinus* (Gould) was caught close by using the same method and it is probable that these two superficially similar species are sympatric.

Family NOTORYCTIDAE

Notoryctes typhlops Stirling, marsupial mole

Aboriginal Names: itjaritjari—Pitjantjatjara; yitarutju—Nga:nyatjara.

Field Notes. We were told that specimens of this distinctive species have been obtained within the last five years in sand-ridge areas on Everard Park Station, Musgrave Park Station (No. 16 bore), Curtain Springs Station (where it may be more common) and west of Warburton Mission. Aborigines from Fregon and Warburton said that it is not seen in winter. However, others disputed this claim. Most suggested that this burrowing species comes to the surface after rain. It is not eaten by aborigines. It seems likely that the marsupial mole, by reason of its small size and cryptic behaviour, is more common than is indicated by a general survey.

Family PERAMELIDAE

Macrotis lagotis Reid, rabbit bandicoot

(Plate 2, Figure 1)

Aboriginal Names: talku, nīnu—Pitjantjatjara; nīnu, matura—Nga:nyatjara.

Localities. (i) 12 miles (19 km) SW. of Mt. Aloysius, Blackstone Range, Central Western Australia; 128°27'E, 26°06'S; November 9 and 14, 1966; 2 ♀; 1 ♀ now M 6340. (ii) 7 miles (11 km) N. of Warburton Mission, Warburton Range, Central Western Australia; 126°34'E, 26°02'S; December 7 and 8, 1966; 2 ♀; 1 ♀ now M 6397.

Field Notes. The results of a field study of a population from locality (ii) will be reported elsewhere.

This species was collected near Birdsville during 1957-59 (Mack, 1961). We were told that it had not been seen there for about five years. However, we obtained reports of sightings of a mammal which was probably *M. lagotis* within the last two years from localities west of Glengyle Homestead. The only area we visited where it seemed to be moderately plentiful was near Warburton Mission. None of the females had pouch-young.

Taxonomy. The measurements made on live specimens as soon as practicable after capture are given in Table 1. General appearance and the above measurements suggest that these specimens belong to the type subspecies *M. lagotis lagotis* Reid.

TABLE 1
Flesh measurements of four female rabbit bandicoots, *Macrotis lagotis*,
from Central Western Australia

	Juvenile ♀, Blackstone Ra.	Adult ♀*, Blackstone Ra.	Adult ♀, Warburton Ra.	Adult ♀† Warburton Ra.
Date of capture	9.XI.66	14.XI.66	7.XII.66	8.XII.66
Wt. on capture (gm)	400	700	960	850
Head and body (mm)	310	320	330	320
Tail (mm)	180	190	230	220
Ear (mm)	70	85	90	85
Hind-foot (mm)	78	88	96	92

* M 6340

† M 6397

Family MACROPODIDAE

Petrogale lateralis Gould, black-flanked rock wallaby

(Plate 2, Figure 2)

Aboriginal Name: waru—Pitjantjatjara, Nga:nyatjara.

Locality. Alkara, 90 miles (145 km) SW. of Mt. Woodroffe, Musgrave Ranges, NW. South Australia; 130°30'E, 27°04'S; July 27, 1966; 1 ♂ M 6388 (skull only).

Field Notes. We observed two or more rock wallabies on a rocky hill of tumbled, granite-like boulders shown on Plate 2, Fig. 3. They emerged from their lairs at about mid-afternoon. The testimony of aboriginals that this wallaby does not drink regularly was borne out by the absence of permanent water nearby. Herbs and shrubs growing on the slopes, and which were possible food species, included buckbush (*Salsola kali*), wild geranium (*Erodium cypnorum*), several perennial grasses, and the shrubs *Sida virgata* and *Ptilotus obovatus*.

Occasionally, aboriginals living on settlements from Fregon to Warburton Mission catch and eat rock wallabies, and suggest that it is one of the more plentiful mammals of the area.

The wallaby weighed 4.590 kg on capture, and its body dimensions (in mm) were: head and body 525, tail 540, hind-foot 142 and ear 66.

Petrogale xanthopus Gray, yellow-footed rock wallaby

Field Notes. We observed these wallabies on April 10 to 16, 1966, at three localities in the Northern Flinders Ranges between 138°40' and 139°20'E longitude, and 30°20'S and 30°40'S latitude. In two areas, we watched them feeding on the green herbs in creek beds at dusk and at dawn. One female had a large joey.

Order MONDELPHIA

Family MURIDAE

Pseudomys (*Pseudomys*) species, unidentified native rodent

(Plate 3, Figure 1)

Locality. Wire Creek Bore, 20 miles (32 km) N. of Oodnadatta, N. South Australia; 135°28'E, 27°16'S; July 9 and August 16, 1966; 4 ♀, 3 ♂ and 3 juveniles (J); 1 ♀ now M 6341.

Field Notes. These native rodents were living on an open gibber flat, with silver saltbush (*Atriplex rhagodioides*) being the only perennial plant. The habitat is shown on Plate 3, Fig. 2. We dug eight of them from burrows built under or near the saltbushes. These burrows were less than 2 feet (60 cm) long, and one is shown on Plate 3, Fig. 3. A male, a female and three juveniles were dug from one burrow; another contained a male and a female, whilst a third contained a solitary female. A male and a female were caught with a spotlight about 4½ hours after sunset on different nights. One of the females captured on July 9 produced a litter of 3 on about July 12. She was paired on October 21, and produced another litter of 3 on December 2. On January 3, 1967, she again produced young; this time there were 4 offspring.

Taxonomy. Tables 2 and 3 present flesh and skull dimensions of three of these native rodents, and of types of *Ps. minnie* Troughton and *Ps. rawlinnae* Troughton taken from Troughton (1932).

TABLE 2

Flesh dimensions of three adult females of an unidentified *Pseudomys* (*Pseudomys*) species from near Oodnadatta, N. South Australia, and of type specimens of *Ps. minnie* and *Ps. rawlinnae*.

	♀, M6341	♀, M6342*	♀, M6343*	♀, allotype <i>Ps. minnie</i>	♂, holotype <i>Ps. rawlinnae</i>
Wt. on capture (gm)	33	—	35	—	—
Head and body (mm)	99	98	101	117	113
Tail (mm)	94	85	93	111	99
Ear (mm)	23	21	22	23	21½
Hind-foot (mm)	26	24	27	27	27½

* Born in captivity, and measured when 6 months old.

TABLE 3

Skull dimensions (in mm × 10) of three adult females of an unidentified *Pseudomys* (*Pseudomys*) species from near Oodnadatta, N. South Australia, and of type specimens of *Ps. minnie* and *Ps. rawlinnae*.

	♀, M6341	♀, M6342*	♀, M6343*	♀ allotype <i>Ps. minnie</i>	♂ holotype <i>Ps. rawlinnae</i>
Greatest length	29.5	28.4	29.4	30.7	30.8
Basal length	26.6	25.1	25.8	25.0	—
Zygomatic breadth	15.4	14.6	14.5	16.3	16.1
Braincase breadth	14.1	12.9	13.7	14.3	13.7
Interorbital breadth	4.6	3.8	4.3	4.0	3.8
Nasals length	11.9	10.8	11.2	11.1	12.0
Nasals breadth	3.3	3.0	3.5	3.0	2.9
Palatal length	16.6	15.4	15.8	15.0	14.5
Anterior palatal foramina	6.8	6.7	6.7	7.3	7.0
Bulla	5.2	4.3	5.0	—	—
Upper molar series	5.3	5.3	5.3	5.8	5.3
Breadth M1	1.8	1.9	1.8	—	1.8

* Born in captivity, and measured when 6 months old.

We have used Tate (1951) to assist in the following deductions.

The absence of accessory cusps anterior to the first loph of m1, and the large size of the species indicate that it may be assigned to the sub-genus *Pseudomys* Gray.

The above tables show that the dimensions of our series are similar to those given by Troughton (1932) for *Ps. minnie* and *Ps. rawlinnae*. The coat also appears to be similar. Finlayson (1939b) noted that these species were similar in some features, but that the upper molar row, anterior palatal foramina, and palatal length were shorter in *Ps. rawlinnae*. These differences are slight in Table 3, but they may indicate that our series are closer to *Ps. rawlinnae*. Troughton (1932), in his description of *Ps. rawlinnae*, made no mention of a black calcaneal patch which is well marked on our specimens. However, Finlayson (1939b) reported that the patch was present in the specimens he called *Ps. rawlinnae*.

J. A. Mahoney of Sydney has examined these specimens, and has indicated that he considered the sum total of characters to be closer to descriptions of *Ps. minnie*. However, he also noted that recorded descriptions of the two species are little different, and that they may perhaps be shown after further study to be conspecific.

Pseudomys (*Leggadina*) species (group 1), unidentified native rodent
(Plate 4, Figure 1)

Localities. (i) 30 miles (48 km) N. of Birdsville, SW. Queensland; 139°28'E, 25°23'S; June 12, 1966, 2♂; M 6350-1. (ii) Wire Creek Bore, 20 miles (32 km) N. of Oodnadatta, N. South Australia; 135°28'E, 27°16'S; July 9, 1966, 1♂; M 6352.

Field Notes. The two specimens from locality (i) were obtained by spotlighting about 7 hours after sunset. The single specimen from locality (ii) was taken from a shallow burrow, which was without a nest, and which had been freshly dug after rain. The habitat at locality (ii) is shown on Plate 3, Fig. 2. A series of tracks of a live captive from Birdsville are shown on Plate 4, Fig. 2. The mouse was running for cover.

Taxonomy. Tables 4 and 5 contain skull dimensions of these three native rodents, and also of types of *Ps. forresti* Thomas, *Ps. waitei* Troughton and *Ps. messoria* Thomas taken from the original descriptions.

TABLE 4

Flesh dimensions of three adult males of an unidentified *Pseudomys* (*Leggadina*) species (group 1), and of type specimens of *Ps. forresti*, *Ps. waitei* and *Ps. messoria*.

	♂, M6350*	♂, M6351*	♂, M6352†	♀, type <i>Ps. forresti</i>	♂, holotype <i>Ps. waitei</i>	♂, type <i>Ps. messoria</i>
Head and body (mm)	80	75	80	104	83	67
Tail (mm)	56	60	61	72	59	53
Ear (mm)	12	11	14	15	12	13
Hind-foot (mm)	18	17	18	19	16½	17

* From 30 miles N. Birdsville, S.W. Queensland.

† From near Oodnadatta, N. South Australia; weighed 18.5 gm on capture.

The general characteristics of the skulls of these specimens fit Thomas' (1910) definition of the subgenus *Leggadina*. The specimens readily fit into the *forresti-waitei-messoria* group of Tate (1951), who provides a key to the groups of *Leggadina*. The measurements above indicate that our specimens are considerably smaller than *Ps. forresti*, but larger than *Ps. messoria*. Flesh dimensions match those of *Ps. waitei*, but there are a number of differences, notably the palatal and nasal lengths of the skulls. Coat colours of all three species in

TABLE 5

Skull dimensions of three adult males of an unidentified *Pseudomys* (*Leggadina*) species (group 1), and of type specimens of *Ps. forresti*, *Ps. waitiei*, and *Ps. messoria*.

	♂, M6350*	♂, M6351*	♂, M6352†	♀, type <i>Ps. forresti</i>	♂, holotype <i>Ps. waitiei</i>	♂, type <i>Ps. messoria</i>
Greatest length	23.1	24.3	25.1	25.0	22.6	23.5
Basal length	20.6	21.7	21.5	—	—	—
Zygomatic breadth	—	13.3	13.1	13.5	12.0	13.0
Braincase breadth	11.3	11.7	11.6	—	11.1	11.2
Interorbital breadth	3.6	3.6	3.7	3.6	3.5	3.6
Nasals length	8.3	8.2	8.4	8.5	7.6	8.0
Nasals breadth	2.5	2.8	2.6	—	2.3	—
Palatal length	12.9	13.4	13.1	13.0	11.2	11.5
Anterior palatal foramina	5.1	5.3	4.9	5.5	5.3	6.0
Bulla	—	4.2	4.2	—	—	4.1
Upper molar series	4.5	4.5	4.4	4.4	4.1	4.5
Breadth M1	1.5	1.5	1.4	—	—	—

* From 30 miles N. Birdsville, S.W. Queensland.

† From near Oodnadatta, N. South Australia.

the group, and of our specimens are apparently similar. However, Thomas (1910) said that the hairs on the belly of *Ps. messoria* were slaty grey, whereas those of the above series are pure white to the base.

Pseudomys (*Leggadina*) species (group 2), unidentified native rodent.

Aboriginal Name: ilpalya—Pitjantjatjara.

Localities.—(i) 20 miles (32 km) SSE. of Mt. Aloysius, Blackstone Range, Central Western Australia; 128°44'E, 26°17'S; November 15, 1966; 1 ♀ and 3J; M 6344. (ii) 26 miles (42 km) SE. of Mt. Aloysius, Blackstone Range, Central Western Australia; 128°52'E, 26°18'S; November 15, 1966; 4 ♀, 1 ♂ and 11J; M 6345-9.

Field Notes. We dug these mice from burrows in two loamy plains near rocky hills shown on Plate 5, Figs. 3 and 4. There were many small saltbushes, grasses and ephemeral herbs on both plains, but no other perennial plants. The burrows were about 6 inches (15 cm) deep and 15 inches (37 cm) long. A nest of grass and flowers of an everlasting daisy was found in the deepest part. One or more blind tunnels led from the nest. Unlike the unidentified *Pseudomys* (*Pseudomys*) species, adult males and females were not found in the same burrow. Two burrows contained solitary mice; one a male, the other a pregnant female. Four burrows each contained a lactating female and her young. There were two litters of three and two of four mice.

Living sympatrically with these rodents was the house mouse, *Mus musculus* Linne. We dug out two pregnant house mice from burrows near to and closely resembling those of the native mouse.

Pitjantjatjara elders from Musgrave Park unhesitatingly called the native mice "ilpalya". Finlayson (1961) reported that this was a Pitjantjatjara name for a *Notomys* species "close to *alexis* but not specifically identified".

Taxonomy. Tables 6 and 7 give measurements of individuals in the flesh and of skulls of this series.

We have considered this group of specimens separately from the preceding group of *Pseudomys*. Closer study may show them to be conspecific. As with *Pseudomys* (*Leggadina*) species (group 1), they fall readily into Thomas' (1910) subgenus *Leggadina*, and Tate's (1951) *forresti-waitiei-messoria* group.

TABLE 6

Flesh dimensions of six adult specimens of an unidentified *Pseudomys* (*Leggadina*) species (group 2), from SE. of the Blackstone Range, Central Western Australia. All females were lactating.

	♀, M6344	♀, M6345	♂, M6346	♀, M6347	♀, M6348*	♀, M6349
Wt. on capture (gm)	25	29	18	24	29	21½
Head and body (mm)	88	100	80	85	90	81
Tail (mm)	59	69	58	59	69	56
Ear (mm)	15	14	14	14	14	12
Hind-foot (mm)	17	17	16	16	18	16

* Pregnant.

TABLE 7

Skull dimensions of five adult female specimens of an unidentified *Pseudomys* (*Leggadina*) species (group 2) from SE. of the Blackstone Ranges, Central Western Australia.

	♀, M6344	♀, M6345	♀, M6347	♀, M6348	♀, M6349
Greatest length	23.3	24.3	23.1	23.8	22.4
Basal length	10.9	21.2	21.1	20.3	19.2
Zygomatic breadth	12.0	13.4	12.2	12.5	11.9
Braincase breadth	11.1	11.7	11.0	11.0	10.8
Interorbital Breadth	3.6	3.3	3.9	3.5	3.2
Nasals length	7.9	8.3	7.9	8.0	7.9
Nasals breadth	2.2	2.4	2.2	2.4	2.3
Palatal length	12.0	12.8	12.0	12.5	11.5
Anterior palatal foramina	5.1	5.4	5.1	5.1	4.7
Bulla	4.2	4.1	4.1	3.9	4.0
Upper molar series	4.7	4.8	4.5	4.6	4.4
Breadth of M1	1.6	1.6	1.6	1.5	1.5

J. A. Mahoney has examined a sample of the two preceding unidentified groups. He placed both of them in the *forresti-waiteti-messoria* group, and, believing that its members are conspecific, tentatively called all our specimens *Pseudomys* (*Leggadina*) *forresti* Thomas.

The relationships of what we have called *Pseudomys* (*Leggadina*) species (group 1) and (group 2), and other native rodents will have to await further collections, and study of new specimens and the types before any definite statement can be made.

Pseudomys (*Leggadina*) *hermannsburgensis* Waite, sandy inland mouse.
(Plate 4, Figure 4)

Aboriginal Name: mingkiri — Pitjantjatjara, Nga:nyatjara (now used for all small mice).

Localities. (i) 15 miles (24 km) E. of Mt. Illbillee, Everard Ranges, NW. South Australia; 132°43'E, 27°01'S; July 13, 1966; 3 ♀ and 3 ♂. (ii) Fregon, NW. South Australia; 132°02'E, 26°47'S; July 16, 1966; 7 ♀ and 7 ♂. (iii) Bowden Hill, 80 miles (129 km) SW. of Mt. Woodroffe, Musgrave Ranges, NW. South Australia; 130°41'E, 26°58'S; July 23, 1966; 1 ♀ and 1 ♂; 1 ♀ now M 6354. (iv) Alkara, 90 miles (145 km) SW. of Mt. Woodroffe, Musgrave Ranges, NW. South Australia; 130°30'E, 27°04'S; July 27, 1966; 3 ♀ and 3 ♂; 1 ♀ now M 6353. (v) 42 miles (68 km) SW. of Mt. Aloysius, Blackstone Ranges, Central Western Australia; 128°06'E, 26°28'S; November 12, 1966; 2 ♀; 1 ♀ now M 6355.

Field Notes. This species was one of the commonest mammals between 128° and 132°E longitude and 26° to 27°S latitude. All specimens were taken from burrows in sandy-loam soil, often in mulga (*Acacia aneura*) scrub. The burrows were characterised by the absence of a large mound of soil near the mouth, as illustrated by Plate 4, Fig. 3. From one to four mice, with sex ratios amongst them variable, were taken from single burrows. One female from Fregon and two from locality (v) were pregnant, and a litter of four juveniles was seen at Fregon.

The mean weight of 17 adult males which were weighed less than 24 hours after capture was 11.1 ± 0.4 gm with a range of 8 to 13 gm. For 9 adult, non-pregnant females, the mean weight was 10.3 ± 1.4 gm, with a range of 9 to $13\frac{1}{2}$ gm.

Taxonomy. Flesh and skull dimensions of the three specimens in the South Australian Museum (M 6353-5) all fall within the limits given by Finlayson (1941) for a large series of *Ps. hermannsburgensis*. Habits and coat colour which he described for this species are closely similar to those of our series.

Notomys cervinus (Gould), fawn hopping mouse.

(Plate 5, Figure 1)

Localities. (i) From 18 miles (29 km) S. to 70 miles (113 km) N. of Birdsville, SW. Queensland; 139°21'E, 25°54'S; June 11-23, 1966; 3 ♀ and 7 ♂. (ii) 5 miles (8 km) S. of Glengyle Homestead, SW. Queensland; 139°36'E, 24°48'S; 9 ♀ and 9 ♂; 10 specimens from both localities now M 6357-65 and M 6400.

Field Notes. This species was moderately plentiful, and all specimens were taken while spotlighting at night on bare claypans and flats illustrated on Plate 1, Fig. 2. It was seen on the same nights and in the same areas as *Sminthopsis crassicaudata* and *Antechinomys spenceri*. All specimens were taken between 3 and 8 hours after sunset.

Taxonomy. There was no gular pouch in any of the specimens but a marked groove was present on the anterior surface of the upper incisors of 9 skulls examined from individuals from both localities (M 6357-65). Finlayson (1959) stated that these are characteristics of *N. cervinus*, and that they distinguish it from *N. fuscus* (Wood-Jones).

Notomys fuscus (Wood-Jones), Wood-Jones' hopping mouse.

Locality. Pandie Pandie Homestead, Diamantina R., NE. South Australia; 139°23'E, 26°07'S; summer of 1964-65; 1 ♀; M 6356.

Field Notes. This specimen was obtained by Mrs. L. Morton, who reported that similar hopping mice were often seen during the summer of 1964-65; we found no live specimens while in the area.

Notomys alexis Thomas, northern hopping mouse.

(Plate 5, Figure 2)

Aboriginal Name: tarkawara—Pitjantjatjara, Nga:nyatjara.

Localities. (i) Turner's Well, 22 miles (35 km) NE. of Mt. Woodroffe, Musgrave Range, NW. South Australia; 132°00'E, 26°07'S; July 19, 29, 1966; 3 ♀, 4 ♂ and 6J; 1 ♀ and 4J now M 6367. (ii) 14 miles (23 km) WSW. of Mt. Aloysius, Blackstone Range, Central Western Australia; 128°21'E, 26°10'S; November 1, 1966; 2 ♀ and 15J (including 8 ♀ and 7 ♂); M 6369-85.

Field Notes. This species was common over much of the area where we found that *Pseudomys* (*Leggadina*) *hermannsburgensis* was plentiful. However, we obtained most *N. alexis* from more sandy areas, with less mulga scrub. All specimens were dug from burrows. From two to five juveniles were taken from six single burrows; in four of these burrows lactating females were also taken. The burrows had a vertical entrance shaft, about 6 to 18 inches (15 to 45 cm) deep, and with no soil at the mouth. Horizontal "drives", with occasional branches extended from the base of the shaft to a maximum of about 6 feet (1.8 m). At the end of the "drive", a vertical escape shaft was often dug stopping about an inch (2.5 cm) below the surface.

At locality (ii), empty shells of the quandong, *Santalum acuminatum*, were found near the entrance and along the "drive" of one *N. alexis* burrow. The shells had been opened by removal of a small circular segment of the hard outer coat.

DISCUSSION

Of the seven rare marsupials searched for specifically, we located only *Macrotis lagotis*. Because of the large fluctuations in numbers which occur in many desert-living species, and because we searched only a small proportion of suitable habitats, it is by no means certain that any of the others are extinct. However, only elderly aboriginal men had any knowledge of some of the species, and this knowledge was obtained when they were young men. For example, *Myrmecobius fasciatus* is spoken of as having gone for many years from the Everard and Bedford Ranges. However, we should note that aboriginal people everywhere are much less mobile and dependent on native mammals for food now than they were in the past.

None of the 18 female *Sminthopsis crassicaudata* caught during June, July and August had pouch-young though some of them were too young for breeding. Conditions during this period were excellent, with recent rains having increased plant and insect life. Martin (1965) recorded breeding of this species from July to April under optimal conditions in the laboratory. It is therefore possible that breeding in the wild is to some extent regular and seasonal, unlike the fairly regular breeding noted under laboratory conditions.

Nearly all of the females of the unidentified *Pseudomys* (*Pseudomys*) species, *Pseudomys* (*Leggadina*) species (group 1), and of *Notomys alexis* were lactating, or were pregnant. Recent rains had resulted in good growth of herbs, which had matured and shed their seed.

This large-scale, synchronous breeding of native rodents and consequent population increase, can perhaps explain to some extent the taxonomic difficulty of this group. That there are large fluctuations in numbers of many native rodents has often been noted, especially in arid regions such as the Lake Eyre Basin (e.g. Finlayson, 1939a). A large increase in variability has been observed when a large increase in the numbers of several animals has occurred. Ford and Ford (1930), working with the butterfly *Melitaea aurinia*, were one of the first to draw attention to this large increase in variability. The presence of much variation in rapidly increasing populations of rodents would tend to decrease the number of differential characters which could be used to separate closely related species. Also, variability of the one species from different areas would probably be large. This is because populations from different localities would perhaps be derived from isolated small numbers of individuals present before the large increase.

Finlayson (1961) considered that pastoral exploitation, and the introduced rabbit, fox and domestic cat were important factors influencing the abundance and range of Central Australian species. In order to conserve at least some of these species, they must first be located. Then, the influence of the above factors should be analysed. Finally, suitable areas should be proclaimed as reserves, and some control of the environment attempted in order to minimise these deleterious factors. We hope our study has contributed to the first step in such a programme of urgent conservation.

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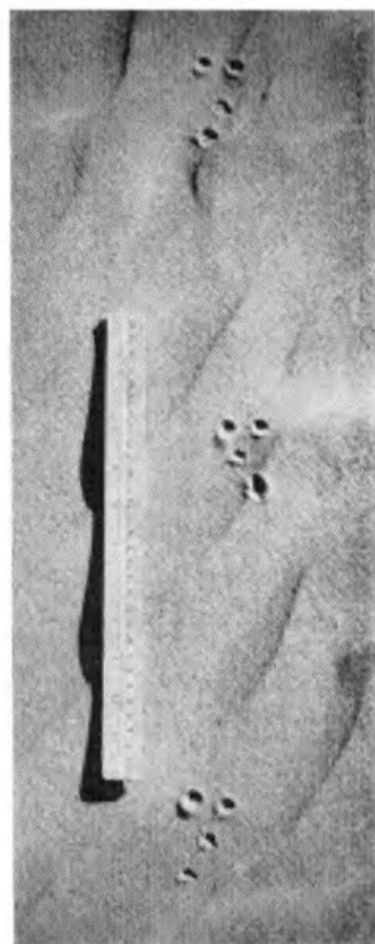
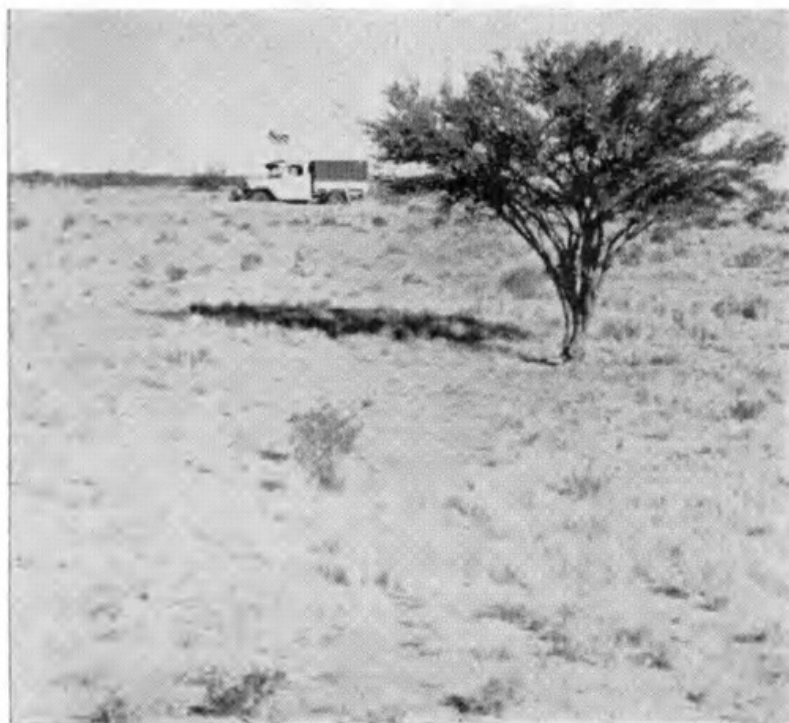


Fig. 1. Male *Sminthopsis crassicaudata* from near Birdsville, approx. life-size.

Fig. 2. Looking along a stabilized sand-ridge 3 miles east of Birdsville where we caught 6 *S. crassicaudata*. *Notomys cervinus* was also living nearby.

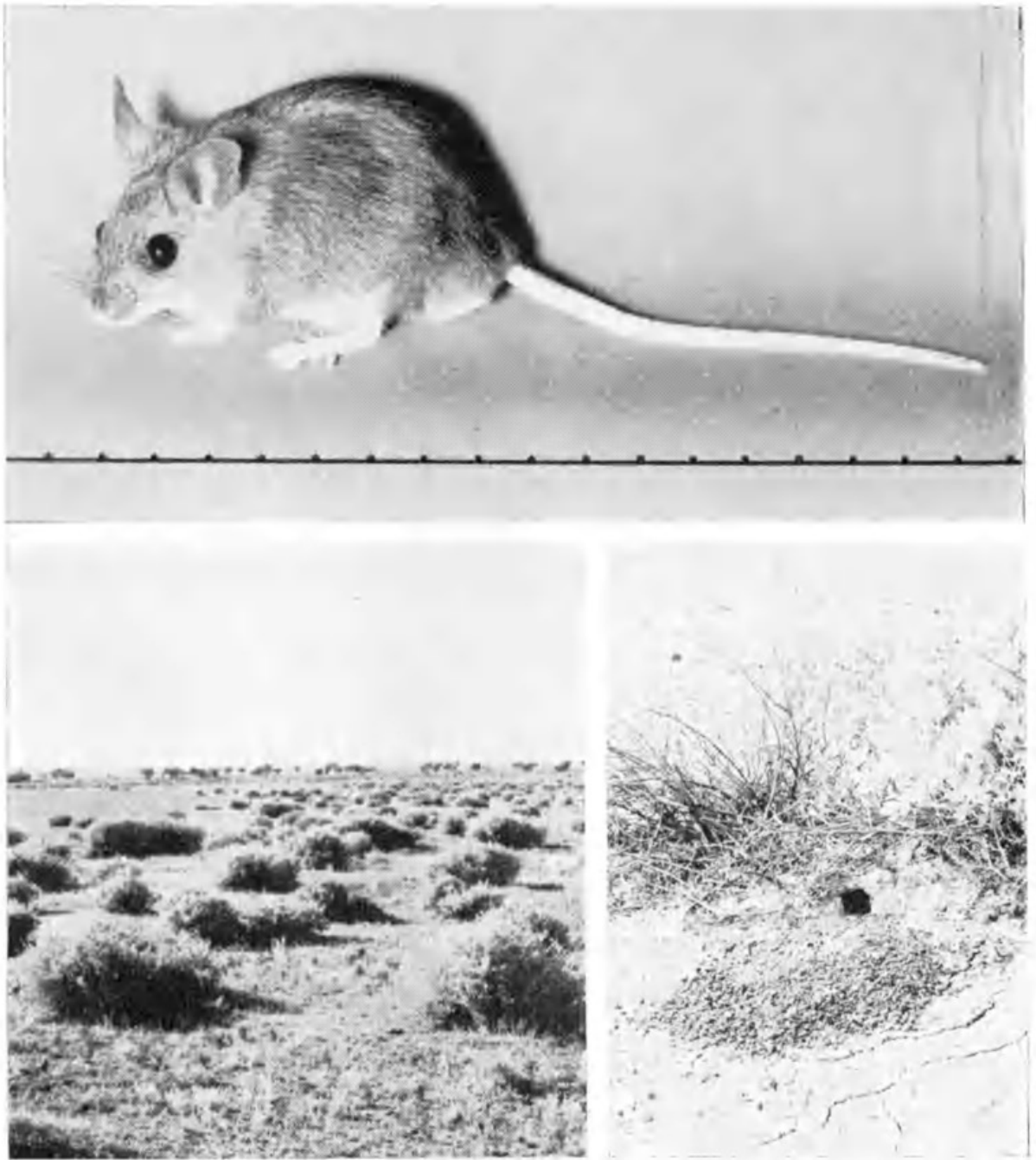
Fig. 3. Tracks of a captive male *S. crassicaudata* from Glengyle. Direction of travel is from bottom to top, and the scale is in inches and centimetres (see text).



Fig. 1. Immature female rabbit bandicoot (*Macrotis lagotis*) from south of the Blackstone Ranges, approx. $\frac{1}{4}$ life-size,

Fig. 2. A male black-flanked rock wallaby (*Petrogale lateralis*) taken in the wild at Alkara, south of the Musgrave Ranges,

Fig. 3. Alkara, 90 miles south-west of Mt. Woodroffe. We observed *P. lateralis* on the darker rock on the left of the hill. We caught *Pseudomys hermannsburgensis* on the sand ridge in the foreground,



- Fig. 1. An adult female *Pseudomys* (*Ps.*) *minnie* or *rawlinnae*, obtained as a juvenile from Wire Creek Bore, approx. 0.65 x life-size. Each division of the scale is 1 centimetre.
- Fig. 2. Habitat at Wire Creek Bore 20 miles north of Oodnadatta. The shrub in the foreground is the silver saltbush, *Atriplex rhagodioides*. On this plain we caught *Sminthopsis crassicaudata*, *S. larapinta*, *Ps. minnie* or *rawlinnae*, and an unidentified species of *Ps.* (sub-genus *Leggadina*).
- Fig. 3. A burrow of *Ps. minnie* or *rawlinnae* under a silver saltbush at Wire Creek Bore. The mound at the entrance is approx. 9 inches wide.



Fig. 1. An unidentified male *Pseudomys* (*Leggadina*) species from 30 miles north of Birdsville, approx. 0.6 x life-size.

Fig. 2. Tracks of the *Ps.* (*Leggadina*) species shown in Fig. 1. Direction of travel is from bottom to top, and the scale is in inches and centimetres (see text).

Fig. 3. Entrance to a *Pseudomys hermannsburgensis* burrow near Fregon.

Fig. 4. A male *Pseudomys* (*Leggadina*) *hermannsburgensis* from Alkara, south of the Musgrave Ranges.

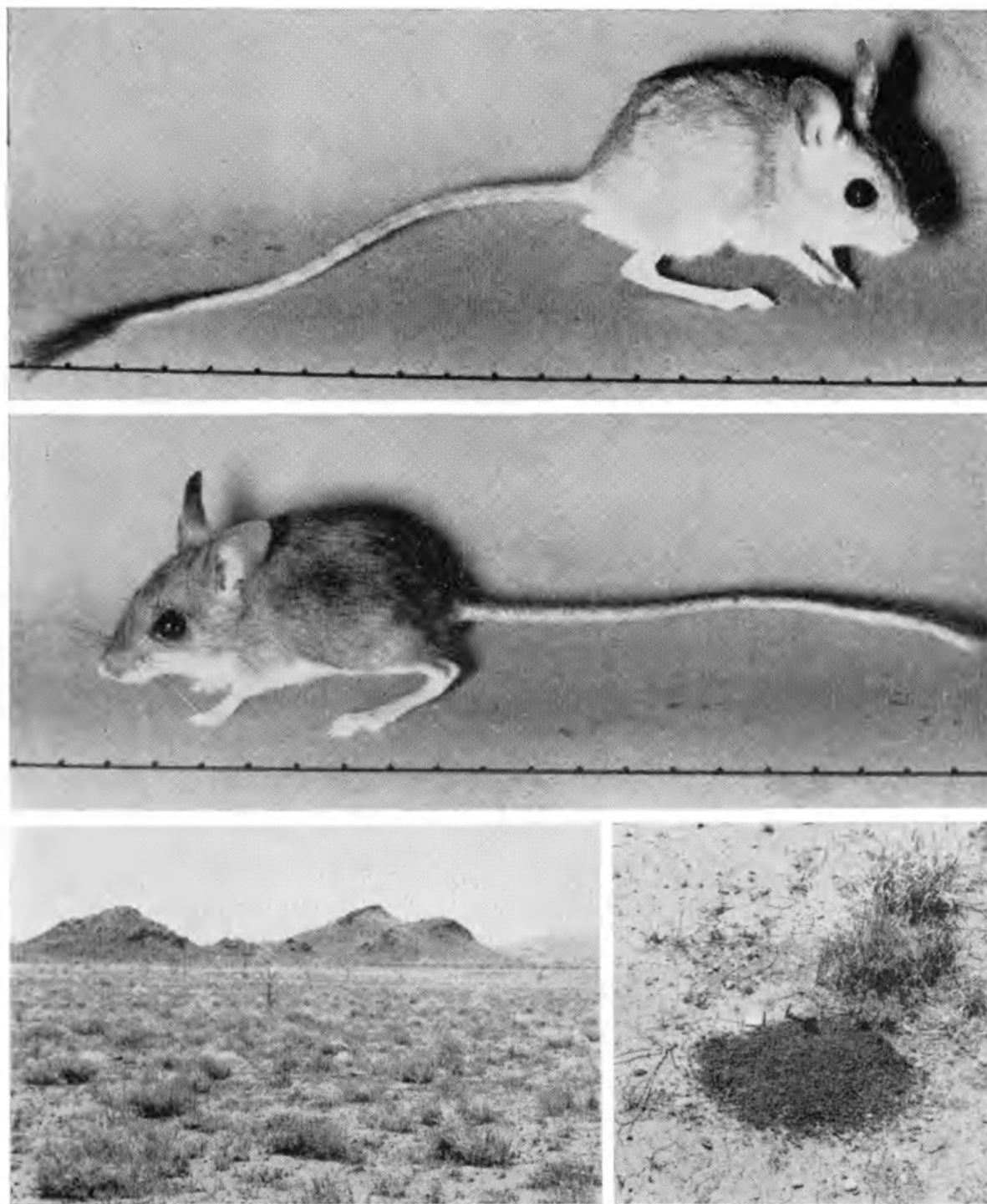


Fig. 1. A male *Notomys cervinus* from near Birdsville, approx. 0.6 x life-size.

Fig. 2. A male *Notomys alexis* from Turners Well, near Ernabella, approx. 0.6 x life-size.

Fig. 3. Habitat of an unidentified *Ps. (Leggadina)* species (group 2), 20 miles south-south-east of Mt. Aloysius.

Fig. 4. Entrance to a burrow of *Ps. (Leggadina)* species (group 2), at the locality shown in Fig. 6. The burrow contained an adult male.



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