# THE PEBBLE-MOUND MOUSE
# PSEUDOMYS CHAPMANI

## A BRIEF TRIAL OF
## SAMPLING METHODOLOGY

**Prepared for: Conservation and Land Management**

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# SURVEY METHODS

## Trapping Site Configuration

The original intention was to sample each pebble-mound as illustrated in Attachment 1. However, because of the licensing requirements that non-injurious techniques were to be used and the possibility that a 50cm pit trap could have encroached upon a burrow system, a series of five medium Elliott box traps was set within each drift-fence enclosure instead, as illustrated in Attachment 2. Traps were baited and apple was placed in each to supply moisture to trapped animals. Bait was checked every day and tissue paper supplied for warmth. In addition, all traps were covered by a dense layer of spinifex and soil to discourage predators and to reduce stress on captured animals.

## Sampling Site Selection

Two aspects influenced the final choice of sampling sites: the strict conditions of the license which dictated the proportion of available mounds that could be sampled in a particular area and, ease of access such that the site could be included as an integral element of an already intensive survey programme. It was therefore decided to sample an area within the Marandoo mining tenement where a sampling location had been previously established and where pebble-mounds were common. A trapline design as shown in Attachment 3 had been operating for nine nights prior to establishment of the trial sampling area during which time, surprisingly, no Pebble-mound Mice had been captured despite the presence of three mounds in close proximity to it.

## Site Location and Description

The area chosen for sampling was located 10 kilometres ESE of the Marandoo mining camp (622 750mE 7 491 750mN) and was situated on a series of low rises at the base of a range of hills. Vegetation consisted of a Mallee community of *Eucalyptus gamophylla* and mixed, open Acacia shrubland over sparse *Triodia basedowii*. Soils were a hard-packed pebbly clay matrix derived from a scree slope.

## Individual Mound selection

Prior to the selection of individual mounds, a transect of the area was carried out to estimate the number of mounds within its vicinity. A strip of country about one kilometre long by 200 metres wide (20 hectares) was searched and it was established that at least 15 mounds of varying size and condition were present. Obviously disused mounds where pebbles were in the process of merging into the surrounding matrix were ignored.

Five presumably active sites were chosen along a transect some 600 metres long and about 100 metres wide. All but two of these were widely spaced with one of these latter sites being chosen because it appeared to be in the initial stages of construction. Site choice was effectively determined by an attempt to sample a range of mound types. A brief description of each site is given below.

**Mound 1:** about 1.5 metres in diameter, well-established, two entrance cones and one ground-level entrance present, some spinifex growth.

**Mound 2:** as above but with substantial spinifex cover.

**Mound 3:** about 30 centimetres in diameter, barely established and consisting of one small entrance cone with a minor pebble scatter, no spinifex growth.

**Mound 4:** extremely large mound nearly 3.0 metres in diameter, six entrance cones in various stages of development, substantial spinifex cover.

**Mound 5:** about 1.6 metres in diameter, well-established with three entrance cones and two ground-level entrances, no spinifex cover.

### Sampling Duration

All sites were monitored for four nights from June 25 to June 28, 1991 and checked early each morning. On the fifth day, sampling was terminated because of increasing disturbance to traps by Torresian Crows. The nearby pit trapping site shown in Attachment 3 was left operational during the mound sampling project out of interest and to gain some insight into the movements of animals.

### Marking of individuals

On first capture, each animal was measured (head-vent, ear, hind foot). Its sex, age, weight and breeding condition was recorded and any distinguishing feature such as a truncated tail was noted. A marking pen was used to draw a band round the base of the tail and an additional band was drawn for each night it was captured. Using a combination of these features, individual animals from each mound could be recognised.

## RESULTS AND DISCUSSION

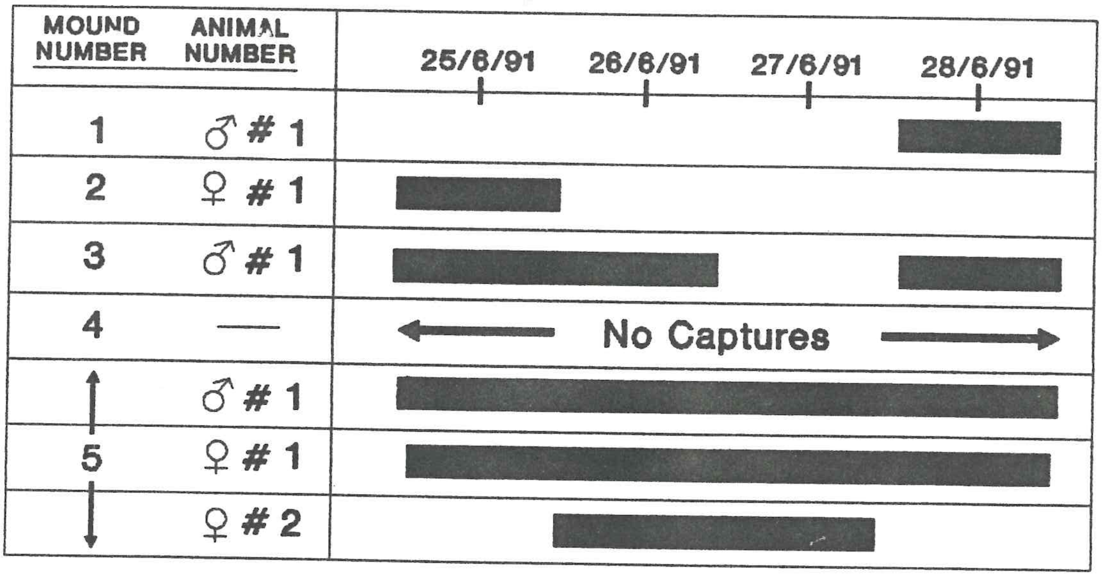
### Capture Rate

A total of 15 captures were made with only six individual animals (3 females, 3 males) being involved. All were adults. Figure 1 shows the results for each mound over the four-day sampling period. There appeared to be no correlation between the size and condition of the mound and the number of animals trapped, although this may be a feature of sample size and/or the after-effects of an extensive period of drought. The maximum number of animals from any one mound was three (Mound 5) with one animal per mound being the norm. All sites apart from Mound 4 were active, a surprising result from this latter site since it superficially appeared to have the most potential because of its large size and number of active cones (see earlier description of selected mounds).

## Recapture Rate

The number of recaptures of individual animals was high (Figure 1), suggesting that populations in the mounds were low or, alternatively, that some dominance factor was in operation. All animals apart from the male from Mound 3 appeared to be in prime condition with no indication of population stress from drought or other external factors. This latter animal was in a weakened condition after being trapped on two consecutive nights and while some animals coped well with being trapped on four consecutive nights (Figure 1), it may be pertinent to this individual that its mound was evidently in the initial stages of construction, an activity which in itself may be stressful in the short-term.

Figure 1 Diagram showing number of individuals, sex and frequency of capture of *Pseudomys* from individual pebble-mounds sampled at Marandoo in June 1991.




## Movements

No evidence of movement between mounds was recorded. By inference there also appeared to be little, if any, movement beyond the immediate vicinity of the mounds. Attachment 2 shows a trapline which was operational for nine nights before the commencement of mound sampling and which ran concurrently with them for a further four nights. Despite being relatively close to Mounds 2, 3 and 4 and several other unsampled sites, no Pebble-mound Mice were captured. While it could be argued that the flywire fences around the sampled mounds represented barriers to movement, no animals were trapped in the main grid before establishment of the mound sites and it is also extremely unlikely that flywire presents an insurmountable barrier to an animal determined to cross it.

### Species Recognised

Since pebble-mounds were first attributed to a native rodent, there has been some discussion as to whether their residents are either *Pseudomys chapmani* or *Pseudomys hermannsbergensis*. Both apparently have been recorded from mounds. The brief Marandoo trial has done little to elucidate this question; it has in fact complicated matters considerably. Kitchener *et al.* (1984) present a diagram showing the relationship between ear and hind foot length for three species of *Pseudomys*, including *P. chapmani* and *P. hermannsbergensis*. During the sampling trial these measurements were utilised, given that the license issued did not allow collection of specimens. The following conclusions were reached for all *Pseudomys* captured during the Marandoo survey including those from traplines not part of the mound survey:

- four of the six individuals captured from the sample mounds fell within the *p. chapmani* group described by Kitchener *et al.* (1984).

- two formed a group of their own in association with two animals distinct from the mound survey which were trapped on the highest levels of the landscape supporting Snappy Gum *Eucalyptus leucophloia* and mixed shrubs over Spinifex *Triodia wiseana* and *T. brizoides* (see Section 1.0).

- all other *Pseudomys*, distinct from the mound survey and trapped in the lower, loamy levels of the landscape where no mounds occur, fell within the *Pseudomys hermannsbergensis* group defined by Kitchener *et al.* (1984).

## CONCLUSIONS

### Methodology

As a means of sampling individual mounds to investigate their contents and to confirm whether they are active or not, the methodology utilised in this survey works reasonably well. However, it does have several drawbacks. The number of animals captured in any single night is limited by the number of Elliott traps laid out. In addition, these traps have the disadvantage of stressing animals by being either too hot or too cold depending on the weather. Elliott traps are also susceptible to disturbance by predators such as the Torresian Crow as observed during this survey and unless checked and set late in the evening, results could be strongly influenced by traps being triggered during daylight hours. The use of pit traps with shaded tops and an insulated refuge box at the bottom of the pit may be a better option for long-term studies.

Prior to any long-term study of the species, however, the specific goals and the sampling design to be used needs careful thought. Concentrating on a series of individual mounds by encircling them with fences may mask any potential connection between them by creating a partial barrier to free movement; pit trapping may also mask movement in the short-term. A combination of circled mounds, un-circled mounds and unfenced pit grids may be a better option.

A non-injurious system of permanently marking each capture, as opposed to the traditional methods of toe-clipping and ear-notching, needs to be established. With some modification, it may be possible to use the fluorescent pigment marking techniques described by Soderquist and Dickman (1988).

### Taxonomy

The survey has shown that there may be problems with the taxonomy of the Pebble-mound Mouse. From the Marandoo survey results, acknowledging that the sample size is small, it appears on face value that: (a) according to the criteria of Kitchener *et al.* (1984), two different species, *Pseudomys chapmani* and *Pseudomys sp.* can exist in the same mound; (b) one of these (*Pseudomys sp.*) has close affinities with animals trapped on the higher levels of the landscape; and, (c) all *Pseudomys* from lower, loamy levels of the landscape where mounds do not occur are *Pseudomys hermannsbergensis*. However, it is much more likely that a single species of *Pseudomys*, accounts for pebble-mounds and any confusion over the species involved has more to do with the *ad hoc* nature of sampling to date and the difficulty of carrying out consistently accurate field measurements of the ear and hind foot on live animals, when the external differences between species are a matter of two or three millimetres.

## REFERENCES

Dunlop, J. N. and Pound I. R. 1981. Observations on the Pebble-mound Mouse *Pseudomys chapmani* Kitchener, 1980. Records of the Western Australian Museum 9 (1): 1-5.

Kitchener, D. J., Adams, M. and Baverstock, P. 1984. Redescription of *Pseudomys bolami* Troughton, 1932 (Rodentia: Muridae). *Australian Journal of Mammology.* 7: 149-59.

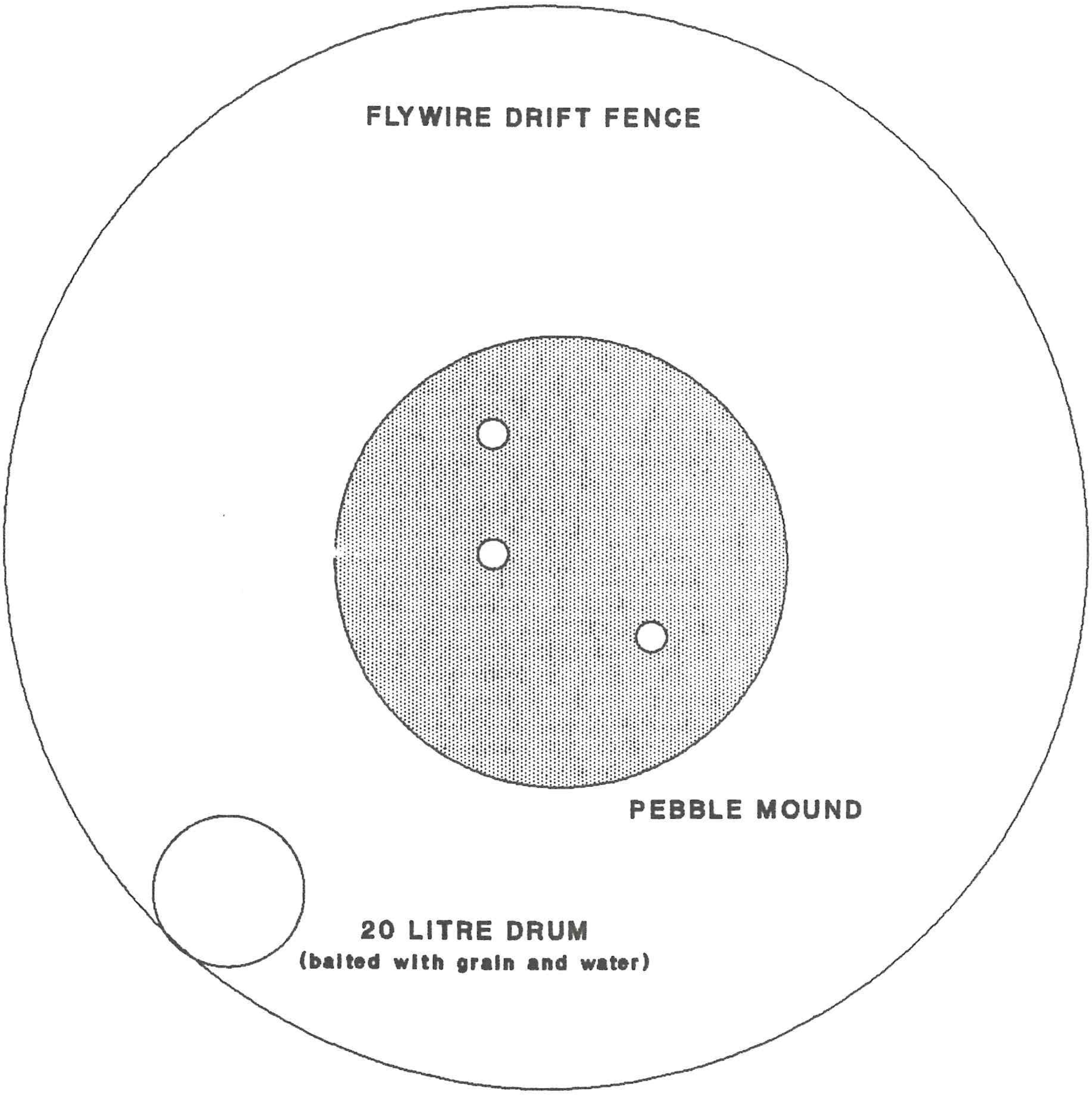
Soderquist, T. R., and Dickman, C. R. 1988. A technique for marking marsupial pouch young with fluorescent pigment tattoos. *Australian Wildlife Research.* 15: 561-3.

Wildlife Conservation Act 1950. (Amendment 1990). *Government Gazette*, November 16, 1990.

## ATTACHMENT 1

### PEBBLE-MOUND MOUSE

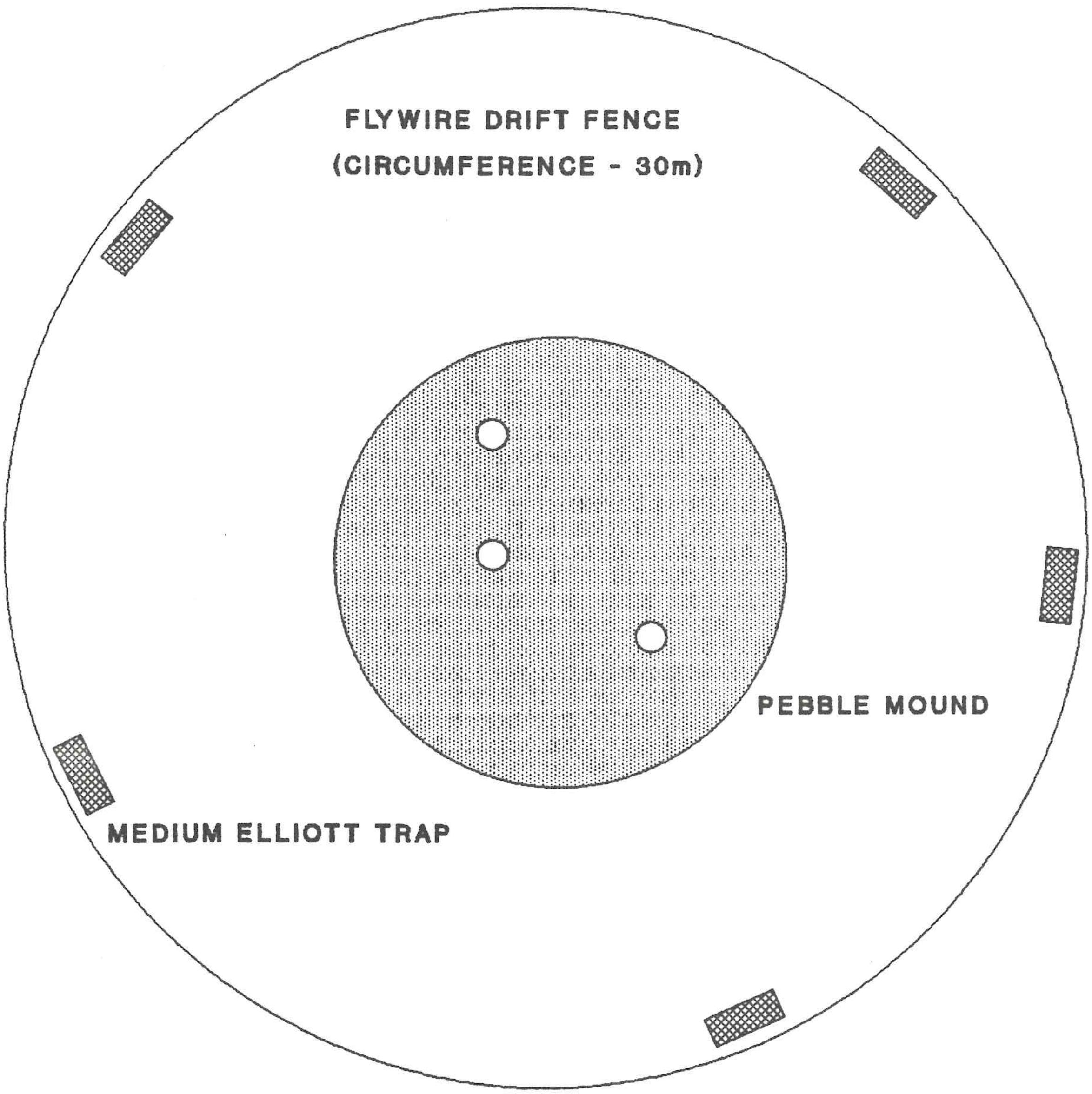
### PILOT STUDY



# ATTACHMENT 2

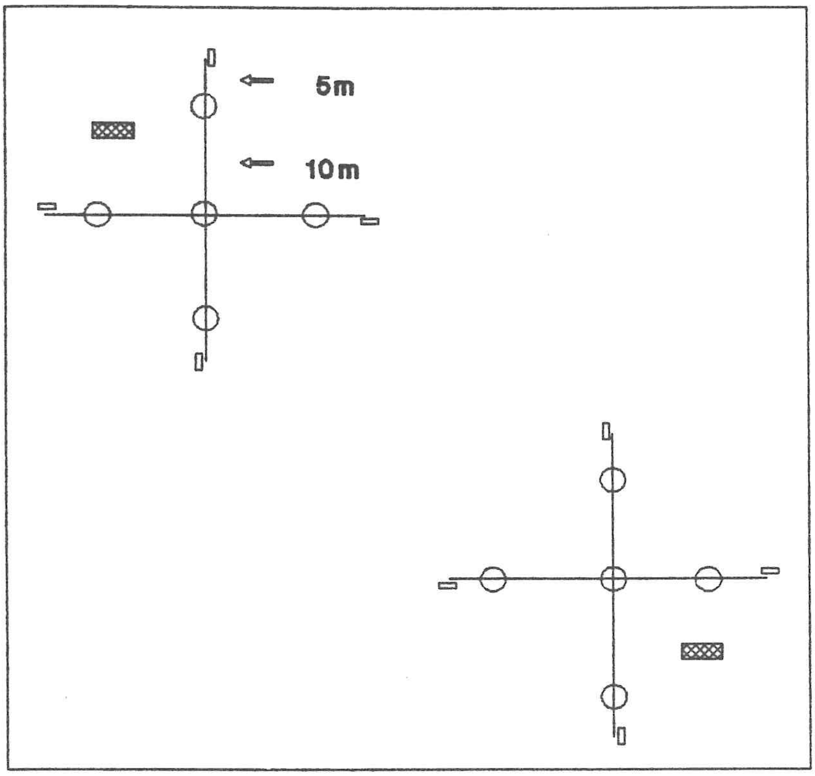
## PEBBLE-MOUND MOUSE

## PILOT STUDY



# ATTACHMENT 3

## VERTEBRATE TRAPPING GRID
## (100X100 Metres)




**KEY** **NOT TO SCALE**

- 20 Litre drum 280 x 410mm
- Large Elliott box/cage trap
- Standard Elliott box trap

ATTACHMENT 4

## NOTES ON THE FUNCTION OF PEBBLE-MOUNDS

It has been proposed that the function of pebble-mounds is to increase condensation so that adequate water is available for their inhabitants as an evolutionary response to the normally harsh conditions of the arid zone. This may be an overly-complicated theory with little evidence to support it. Mounds are undeniably soaked with dew on cold mornings but because of their high visibility, may appear to be more obviously so. From recent and past experience of the country, spinifex and shrubs immediately adjacent to mounds and well within the reach of animals are equally, if not more capable of maintaining large amounts of dew. It is much more likely that mounds are constructed to firstly divert sheet-wash from heavy rain around the mound and, perhaps more importantly, as a defense against predators.

**Sheet-water diversion:** the upland country and consolidated scree slopes where the mounds are generally situated has little capacity to absorb water since the ground is hard-packed or extremely rocky. Raised mounds would tend to divert flow away from burrow systems during heavy rain and a parallel may be found in the many species of ant which construct the entrances to their nests well above ground level.

**Predator defense:** during the release of captured animals it was noticed that most, if not all, available entrances to burrow systems were blocked with pebbles, particularly those with well-formed entrance cones. To facilitate the release of animals, attempts were made to carefully clear pebbles away, a frustrating exercise which generally resulted in more pebbles falling deeper into the burrow from the sides of the entrance cone.

On being left to their own devices mice generally headed directly into the cone, disturbing pebbles in the process and further blocking the entrance. However, if left undisturbed, animals picked up pebbles in their jaws, transferred them to their forepaws and balanced them on the slopes of the cone until a space barely large enough to squeeze through was available. Kicking of the hind legs as the animal disappeared generally dislodged more pebbles and entrance burrows were normally blocked by loose debris from the cone by the end of this process.

It was concluded that movements of the animals themselves in and out of the cones probably dislodges pebbles and that predators such as snakes and monitors which do not have the evident manipulative skills and site familiarity of the Pebble-mound mouse would have great difficulty in gaining access to the burrow system.