*Rec. West. Aust. Mus.* 1982, **10** (1): 47-52

# The Habitat and Life History of the Pilbara Ningaui *Ningaui timealeyi*

J.N. Dunlop and Maryanne Sawle*

**Abstract**

The preferred habitat of the Pilbara ningaui is dense to mid-dense hummock grassland especially with an upper stratum of open mallee or scrub. Males are larger than females. Litters of 4-6 pouch young or females with distended mammae were observed from September to March. The species is short-lived, with few individuals surviving into a second breeding season.

## Introduction

The ecology of the recently described marsupial genus *Ningaui* is as yet little known. Two species have been described, *Ningaui ridei* from central Western Australia and *N. timealeyi* from the Pilbara (Archer 1975). More species almost certainly exist as specimens of undescribed forms have recently been collected in other arid parts of the continent (D.J. Kitchener, pers. comm.).

This paper presents information on the habitat preferences and life history of *N. timealeyi* based on data collected on a number of biological surveys conducted in the eastern Pilbara between March 1979 and March 1981. Six distinct localities were trapped; three during biological/environmental surveys accompanying mineral exploration and three during a privately organized survey of the Hamersley Range National Park. These localities are shown on Figure 1.

## Methods

Ningauis were captured using pitfall and drift fence traplines. These consisted of 10-12 lined pits (0.18 m diameter × 0.43 m deep) placed at 4 m intervals along, and on alternate sides of a 35-50 m long flywire fence, 0.15 m high. Each pit had a minimal catching area of about 12 m of fence and, during the study period, trapping efforts totalled 6333 pit trap days. The vegetation structure of each trapping locality was described using the life-form/density classes of Muir (1977).

Although most ningauis captured were released alive after being toe-clipped for subsequent recognition, some voucher specimens were collected from each locality and lodged at the Western Australian Museum. Animals were weighed to 0.1 g using a Pesola spring balance and the maximal scrotum width of males was measured to 0.1 mm using vernier calipers. Females were examined for pouch and mammae development and for the presence of pouch young.

* School of Environmental and Life Sciences, Murdoch University, Western Australia 6150.

## Results and Discussion

### Habitat Preferences

During the study period, 156 ningauis were trapped (excluding recaptures), making them the most common mammal in the study area. They were trapped in all six localities surveyed. The data from all three years have been combined in the analysis of habitat preferences. The habitat (vegetation structure) preferences of *N. timealeyi* were evaluated in terms of relative abundance from trapping data. Capture rates from each of the six localities sampled were based on different trapping efforts and population sizes and are therefore not directly comparable. However, using an abundance index (AI) similar to that devised by Kitchener (1981), results from different localities can be standardised for effort and population size giving importance values for each habitat type:

$$(AI) = 10^2 \sum_{i=1}^{n} \frac{Pi}{Ti}$$

where Pi = proportion of captures in each locality in the ith habitat type
Ti = number of trap-days in each habitat of the ith type
n = number of ith habitat types sampled.

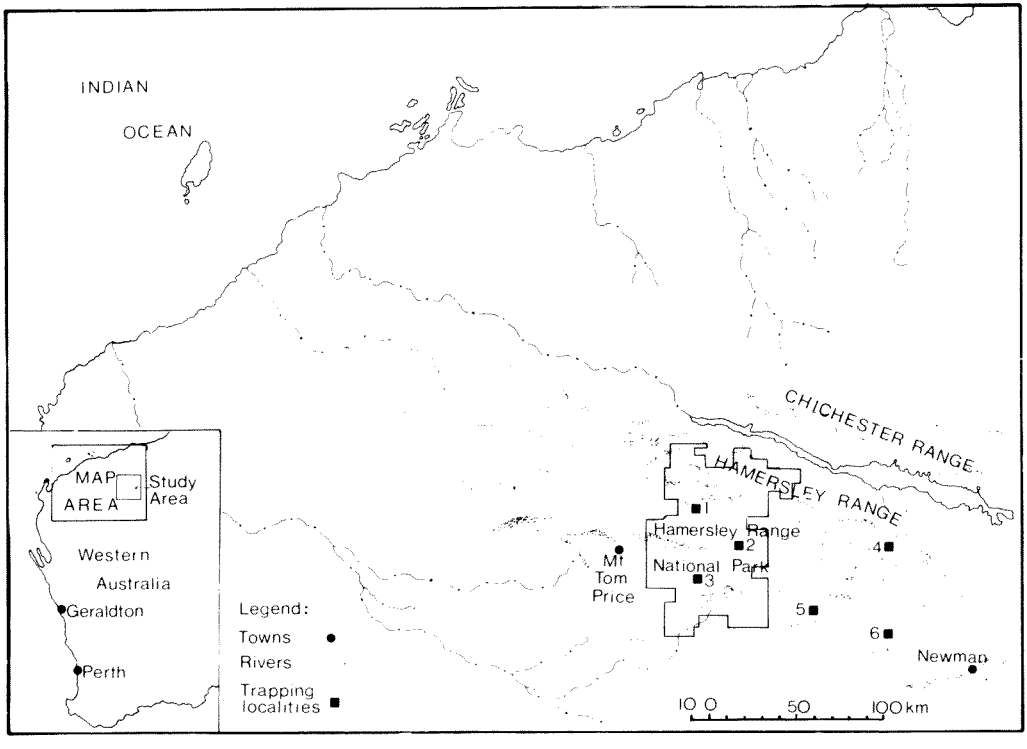


**Figure 1** Map showing the location of the study area and of the six trapping locations.

Although trapping success varied seasonally, with the lowest numbers of captures in winter (June/July), ningauis were captured in reasonable numbers throughout the year. Data from all sampling periods have been used in this analysis.

Abundance indices were calculated for each vegetation stratum sampled using the life-form/height and canopy cover density (LFD) classes of Muir (1977). These values are presented in Muir's LFD matrix (Table 1) along with the total trapping effort for each stratum (in parenthesis).

The total AI values in the LFD matrix indicate a preference in *N. timealeyi* for open tree or very open shrub mallee or scrub over dense or mid-dense hummock grass. The open tree and shrub mallee strata almost always comprised the same stands and the AI values for these classes could be lumped together.

The scrub stratum in the area usually consisted of Mulga *Acacia aneura* and associated *Acacia* spp. Both mallee and scrub strata were usually over mid-dense hummock grass.

In Mulga low woodland (sparse trees 5-15 m) the hummock grass stratum was absent. No ningauis were trapped in this LFD. The species was also scarce in sparse or very sparse stands of hummock grass including areas which were regenerating after fire. It would appear that a dense or mid-dense hummock grass stratum is an essential component of the habitat of ningauis. Optimal conditions exist where the hummock grassland has an upper stratum of open mallee or scrub. This may be because the animal is to some degree scansorial. One ningaui was observed at night climbing the stem of a low branching shrub.

## Life History

Scrotal size may be used as an indicator of spermatogenesis in dasyurid marsupials (Woolley 1966). The measurements of maximal scrotum width for males trapped in each of five sampling periods (Table 2) suggest that males reached peak sexual development in spring (September/October). Thereafter, those animals continuing in the population showed a decline in gonadal size. Young were produced over the spring

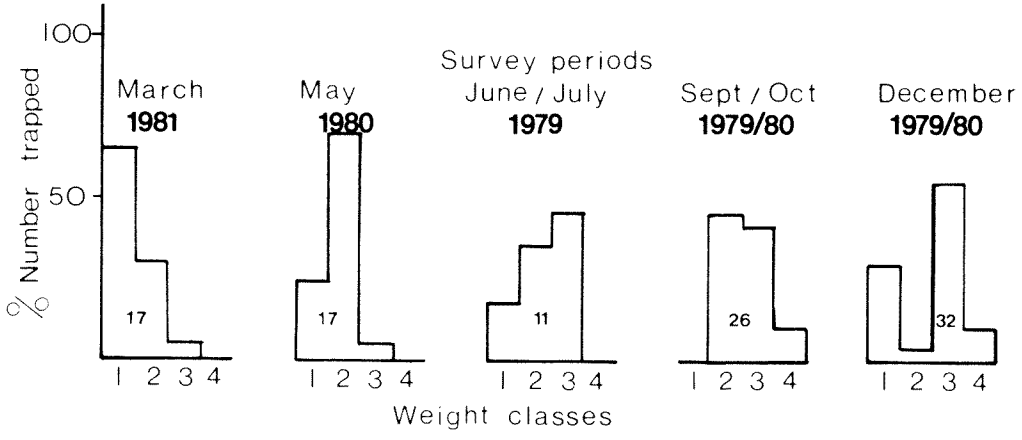


**Figure 2** The weight distributions of *Ningaui timealeyi* captured at four times of year.

**Table 1** Abundance Index values for *Ningaui timealeyi* for all habitats (strata) trapped. The life-form/height and canopy cover matrix is that of Muir (1977). Values in parenthesis indicate trapping effort, i.e. total trap-days for each habitat.

| Life-form/ Height Class | Canopy Cover | | | |
|---|---|---|---|---|
| | **Dense 70-100%d** | **Mid-Dense 30-70%c** | **Sparse 10-30%i** | **Very Sparse 2-10%r** |
| T Trees >30 m | *– | – | – | – |
| M Trees 15-30 m | Not sampled | Not sampled | – | – |
| LA Trees 5-15 m | – | – | 0 (100) | Not sampled |
| LB Trees <5 m | – | – | 2.0 (346) | 6.4 (633) |
| KT Mallee tree form | – | – | 12.9 (174) | |
| KS Mallee shrub form | – | – | 3.6 (629) | 26.4 (3168) |
| S Shrubs >2 m | – | 0 (297) | 28.4 (1845) | 9.8 (1835) |
| SA Shrubs 1.5-2.0 m | – | – | 5.4 (308) | Not sampled |
| SB Shrubs 1.0-1.5 m | – | – | 4.2 (2558) | 0 (179) |
| SC Shrubs 0.5-10. m | – | – | 8.3 (12) | – |
| SD Shrubs 0.0-0.5 m | – | – | 3.6 (140) | – |
| P Mat plants | – | – | – | – |
| H Hummock grass | 17.9 (659) | 24.9 (4520) | 10.3 (537) | 0.5 (316) |
| GT Bunch grass >0.5 m | – | Not sampled | – | – |
| GL Bunch grass <0.5 m | 0 (40) | – | – | – |
| J Herbaceous spp. | – | – | 0 (100) | – |
| VT Sedges >0.5 m | – | – | – | – |
| VL Sedges <0.5 m | – | – | – | – |
| X Ferns | – | – | – | – |
| Mosses, liverworts | – | – | – | – |

* Indicates that LFD is not present in the study area.

and summer months (Table 2) with pouch young as early as September in 1979 and females still lactating in late March 1980. During 1978, however, pouch young were recorded only in December, suggesting a shorter breeding period in poorer seasons. Litters consisted of four to six pouch young.

Data for March were collected in 1981, for May in 1980 and for June/July during 1979. Animals trapped during September/October and December were of similar sizes in both 1979 and 1980 (Table 3), and data from both years have therefore been combined. Figure 2 presents the weight distributions of all ningauis at five different times of year. It is assumed that seasonal weight distributions reflect the age structures of the population at these times. During the breeding period the mean weight of males trapped (7.0 g ± s.e. 0.2) was significantly greater than the mean weight of females (5.8 g ± s.e. 0.3) ($t_{48} = +3.67$; $P < 0.001$). Females as small as 5.5 g were recorded with pouch young

**Table 2** Breeding data for Pilbara Ningaui, *Ningaui timealeyi.*

| Trapping period | Males | | | Females | | | |
|---|---|---|---|---|---|---|---|
| | Number measured | Scrotum width (mm) Mean | Range | Number recorded | Number with unfurred pouch | Number with pouch young (N: CRL)* | Number with distended mammae in pouch |
| March | 10 | 4.6 | 2.0-6.3 | 7 | – | – | 1 |
| May | 4 | 6.3 | 5.0-7.0 | 13 | – | – | – |
| June/July | 5 | 7.0 | 5.0-8.8 | 7 | – | – | – |
| September/October | 17 | 9.0 | 7.1-10.3 | 6 | 1 | 1 (6: 7mm) | – |
| December | 18 | 7.7 | 6.7-9.2 | 5 | – | 2 (5: 11 mm) (6: 6 mm) | 4 |

* (Number of pouch young: Crown-rump length [mm] of pouch young.)

indicating maturity at around 5 grams. Males weighing 7.0 g or over were considered to be adults since scrotal width did not increase after this weight.

Animals caught in March consisted predominantly of immatures and there were few surviving adults from the previous year. This annual cohort of young moved progressively into the larger weight classes in May and June/July (Figure 2). Only four adults were trapped in May and none in June/July. This suggests that adults from the previous year probably disappeared from the population by mid-winter and would not have reproduced a second time. In September/October all animals trapped were adults; males had reached peak breeding condition and some females had developed pouches or were carrying pouch young. The histogram for December was markedly bi-modal with a new cohort of young evident as class 1 and the large breeding and post-breeding adults making up classes 3 and 4. Animals as small as 2.1 g were trapped in December and March.

**Table 3** The live weights (g) of male and female *Ningaui timealeyi* captured during September, October and December during both 1979 and 1980.

| Trapping period | 1979 | | 1980 | |
|---|---|---|---|---|
| | Males | Females | Males | Females |
| September/October | 4.6,6.7,7.0, 7.4,7.9,9.4 | 4.3,6.0,6.5 | 5.0,5.0,5.5,6.0, 6.0,6.5,6.5,7.0, 7.0,7.5,7.9,8.0, 8.4,8.5,8.5 | 4.5,5.5* |
| December | 5.9,7.5,8.4,8.5 | 6.5* | 3.0,3.9,6.6,6.7, 6.7,6.7,7.0,7.0, 7.2,7.3,7.5,7.6, 7.9,7.9,8.8 | 2.1,2.5,2.5, 3.0,3.1,3.3, 3.5,5.9,6.0, 6.5,6.5,7.5* |

* Indicates a female with pouch young.

## Conclusion

These results suggest that *N. timealeyi* is a short-lived seasonally breeding species. Probably few, if any, individuals survive into a second breeding season. Populations are therefore dependent on the progress of a single, annual cohort of young. This characteristic could make the species vulnerable to local extinctions if populations were isolated in small pockets of habitat by burning patterns or development. However, the habitat of this ningaui is so widespread in the region that the species is unlikely to be endangered in the foreseeable future.

## Acknowledgements

We gratefully acknowledge the assistance of Cliffs International, Inc., Texasgulf (Australia) Ltd, CRA Ltd, CSR Ltd, Hamersley Iron Pty Ltd, and the Western Australian National Parks Authority. Dr R.D. Wooller kindly commented on the manuscript.

## References

Archer, M. (1975). *Ningaui,* a new genus of tiny dasyurids (Marsupialia) and two new species, *N. timealeyi* and *N. ridei* from arid Western Australia. *Mem. Qld. Mus.* **17:** 237-249.

Kitchener, D.J. (1981). Breeding, diet and habitat preference of *Phascogale calura* (Gould, 1844) (Marsupialia: Dasyuridae) in the southern wheat belt, Western Australia. *Rec. West. Aust. Mus.* **9:** 173-186.

Muir, B.G. (1977). Vegetation and habitat of Bendering Reserve. In *Biological Survey of the Western Australian Wheatbelt,* Part 1. *Rec. West. Aust. Mus.* Suppl. No. 3: 7142.

Woolley, P. (1966). Reproduction in *Antechinus* spp. and other dasyurid marsupials. In *Comparative Biology of Reproduction in Mammals* (Ed. I.W. Rowlands): 281-294. (Academic Press: Aberdeen.)

Received 3 September 1981 Accepted 7 January 1982 Published 30 June 1982