

## II. MAMMALS OF BENDERING AND WEST BENDERING NATURE RESERVES

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### INTRODUCTION AND METHODS

The mammal surveys of Bending Reserve (BR) and West Bending Reserve (WBR) are part of an integrated survey of the vertebrates of the Western Australian wheatbelt involving some 25 reserves throughout the area (Kitchener 1976).

Apart from their value to the overall survey, the results reported herein are of immediate interest in that they allow comparison between the mammal fauna of two adjacent reserves which were separated, some time prior to 1962, by *ca* 7 km of intervening wheat fields. These reserves are now connected by only a narrow strip of vegetation on the road verges between them. Although WBR is considerably smaller than BR it is thought to provide an equal range of habitats for mammals. Muir, this publication, reports that both reserves have the same vegetation formations present with approximately equal numbers of associations within each formation (except for mallee associations which are approximately three times more abundant on BR).

Prior to this study both BR and WBR have been examined briefly by other Government Departments. On 1 April 1970 D. Mell and K. Morrison, Fisheries and Wildlife Department, recorded Grey Kangaroos and Echidna on BR. WBR was examined by P. Hewitt of the Forests Department in February 1970. He recorded Western Brush Wallaby (common), Brush-tailed Possum (common), Pygmy Possum, and Fox (Forests Department records).

During the surveys discussed herein mammals of BR were recorded between 7-14 November 1972 and 19-29 March 1973; and at WBR between 20-26 September 1975 and 23-28 March 1976. The annotated list below includes mammals sighted, and those collected and lodged in the Western Australian Museum. Registration numbers of those collected at BR in November are M9550-69, M10707-8, and in March are M10071-73, M10077-87, M10090-106, and those collected at WBR in September are M13907-18, and in March M14469-85. The *Sminthopsis murina* from WBR in November 1972 has the number M9565, and five *Chalinolobus gouldii* shot there on 22 March 1973 are numbered M10074-76 and M10088-9.

The types of traps, the manner of positioning traps and the bait used are described in Kitchener and Chapman (1976). Sites where traplines were deployed are shown in Muir (1977a, Maps 1 & 2) for BR, and Muir (1977b, Map 1) for WBR. The trapping effort is detailed in **Appendix I**. Weight was recorded from all specimens, and the body measurements recorded for those specimens made into study skins. All females were dissected and their reproductive organs examined *in situ*. Only weights are presented herein, and then only for females carrying young or recently pregnant. If more than one animal was captured in a trapline, the numbers caught are indicated in brackets.

Detailed descriptions of the vegetation, litter, and soil at each trapline are presented for BR in Muir (1977a) and at WBR in Muir (1977b). These data are summarised in **Appendix II**.

#### ANNOTATED LIST

##### Western Grey Kangaroo (*Macropus fuliginosus*)

Common on BR and adjacent farmland during both surveys. In November groups of up to 4 seen; although just as numerous in March, sightings usually of solitary animals. Common on WBR in September; several sightings of individuals or pairs in Open Tree Mallee, Open Shrub Mallee, Low Forest A (*Acacia acuminata*) and in paddocks on the western side of the Reserve. A group of 13 was seen in this last formation, which is near trapline 10. This is the largest group sighted by us in the wheatbelt. In March a pair was seen near trapline 5 and on the southwest boundary.

##### Western Brush Wallaby (*Macropus irma*)

More common on BR than *M. fuliginosus* but not seen in adjacent farmland. Most sightings confined to a large area of heath (locs 4.15, 4.16) burnt during the summer of 1971-1972. This area was separated from a block of unburnt heath and shrubland (locs 4.7, 4.8, 4.6, 3.13, 3.4 and 1.7) by a gravel road. Frequently seen crossing this road into the burn at dusk and out of it during early morning. Observed feeding on regenerating vegetation within the burnt area. Not common on WBR; several individuals at locs 4.6, 4.5, 4.4 in September; in March an individual near W4 and one on the southwest boundary.

### Brush-tailed Possum (*Trichosurus vulpecula*)

At BR in March an adult male was caught at trapline 6 in Low Forest A. Very common on WBR; 5 adult males and 3 adult females trapped and released from traplines 2 and 4(7) in September; in March, 3 adult males and 1 adult female trapped and released from traplines 1, 2, 4 and 13. In March the adult males had a prominent brown-stained throat patch. In September, 3 (thought to be two adults and a juvenile) were sighted in the crown of a York gum, *E. loxophleba*, near trapline 13. It appears that *T. vulpecula* is not wide ranging in these Reserves but is confined to areas with eucalypt trees or tree mallees and the adjoining open shrub mallees and shrub mallees. Its favoured habitat is probably Low Forest A.

### Western Native Cat (*Dasyurus geoffroii*)

At BR in November a juvenile male was caught at trapline 4 (Open Shrub Mallee over Heath A over Low Heath C on sandy loam); in March, 1 male was caught at trapline 7 (Dense Shrub Mallee over Open Scrub on brown sandy loam) and another at a breakaway just east of the western boundary of the Reserve. The lower jaw of a *D. geoffroii* collected by a cat in February 1976, presumably from BR, was presented to the Museum by Mrs A.W. Ashley who lives just off the southern boundary of BR.

### Red-tailed Wambenger (*Phascogale calura*)

None collected at BR in November; in March 1 was trapped from each of traplines 2, 3, 4, 6, 7 and 9 (two were released at their site of capture). Five were adult males; the other was a juvenile female. In September at WBR an adult female was caught at each of traplines 4 and 8. In March, 3 adult females, 1 adult male and 2 sub-adult females were collected at traplines 1, 8(3), 9 and 13. One adult female was released from trapline 8; it had small teats and it was similar in size to the other adult female collected at this trapline.

Observation of *P. calura* following release at their site of capture indicates the species to be a very skilful climber. In particular it was seen to move easily between *Casuarina acutivalvis* and *C. campestris* shrubs, and *Eucalyptus loxophleba* shrub mallees by leaping distances of up to 1 m between foliage clumps. This ability as an aerialist may well explain its preference for vegetation that has trees, mallees or tall shrubs that allow it easy passage through the foliage; 3 of the traplines in which it was caught were in Low Forest A; 5 were in associations dominated by shrub or tree mallees; 2 were in Thickets (*Casuarina campestris/C. acutivalvis* and *Acacia signata*); 1 in a lithic complex with *C. campestris* prominent, and the remaining trapline

was in scrub with *C. acutivalvis* dominant. Apart from the presence of either tall shrubs or trees, there appears to be little in common between the associations in which *P. calura* was trapped. The canopy cover of the dominant strata ranges from sparse to dense; the number of lower strata varies in range in canopy cover from very sparse to mid-dense; and leaf litter, while generally moderately abundant, is sparse or absent in several associations.

*P. calura* apparently gives birth to young in early spring. In September the 2 females at WBR were both probably still suckling young because they had enlarged teats, ca 4 mm long, swollen mammary glands, and uteri which although approximately the same size as those of the adult females caught in March, appeared to have recently involuted. Further, 3 sub-adult *P. calura* collected on the March surveys of BR and WBR had smooth uteri with no pronounced vascularisation, tiny teats, and no mammary gland swelling.

*P. calura* masticates its food thoroughly, making identification of its stomach contents difficult. It does appear, however, to be predominantly insectivorous. An examination of the stomach contents of 6 *P. calura* collected at WBR (1 in September and 5 in March) shows that it ingests a wide range of insects, including: Mantodea, Hymenoptera (Formicidae), Coleoptera (adult Scarabaeidae), Orthoptera (Tettingoniidae), Isoptera (termite workers), Hemiptera, Diptera, Blattodea (*Polyzosteria mitchellii*) and Lepidoptera (larvae) and Acarina mites. Lepidoptera larvae were recorded only in the September specimen. Separately, termites and cockroaches formed a large proportion of the stomach contents of two specimens. The stomachs of *P. calura* collected at BR in March also contained insects. In addition 1 had bird feathers which, following comparison with Museum specimen skins, were probably those of a Redthroat, *Pyrrholaemus brunneus* (J. Dell, pers. comm.). Redthroats were recorded from the site of capture of this particular Wambenger.

#### White-tailed Dunnart (*Sminthopsis granulipes*)

None collected at BR in November, 3 adult males collected in March from traplines 5 and 11(2). An adult female was collected at WBR in September at trapline 5.

We suggest that *S. granulipes* prefers vegetation dominated by low to medium height shrubs. Although trapline 11 has an upper stratum of very sparse (less than 10%) shrub mallee, it is thought that its second stratum of Dense Low Heath is more likely to influence the distribution of *S. granulipes*.

The female collected in September appeared to be still suckling young; its mammary glands were enlarged, its teats were distended and *ca* 3.8 mm long, and its uteri were slightly enlarged.

The stomach contents of the 3 *S. granulipes* examined (1 from BR and 1 from WBR in September, and 1 from BR in March) contained mostly insects. The specimen collected on WBR in September had seeds and flower parts of *Calytrix*, *Micromyrtis*, and *Grevillea*, but these were possibly ingested incidentally while it was feeding on insects. The invertebrates ingested included: Lepidoptera (adults), Hemiptera (Gelastocoridae), Hymenoptera (Formicidae), Coleoptera (Scarabaeidae and Curculionidae), Orthoptera (Acrididae eggs, affin; *Austracris*), Isoptera (termite workers) and Araneida. The stomach of the specimen collected in BR in March contained numerous termites.

#### Common Dunnart (*Sminthopsis murina*)

A sub-adult female was collected by hand in WBR in November 1972 (M9565) near trapline 13 in Open Tree Mallee over very Open Low Sedges on clayey sand.

#### Honey Possum (*Tarsipes spencerae*)

A single animal was sighted at 2100 hr in WBR in September near trapline 6 in Open Low Scrub A.

#### Mitchell's Hopping Mouse (*Notomys mitchellii*)

At BR in November, 2 males and 2 females were collected from traplines 3(3) and 13; and in March, 2 males and 1 female from traplines 8 and 9(2). At WBR in September, 1 adult male and 2 adult females were collected at traplines 7(2) and 9. In March, 1 adult male and 2 adult females were collected at traplines 3(2) and 9 — a further 1 was released from trapline 9.

The stomach contents of 3 specimens from WBR in March were similar to those reported here for *Pseudomys occidentalis*. Insect fragments again included Coleoptera (Curculionidae).

*N. mitchellii* on these Reserves were collected from vegetation with an upper stratum ranging from low shrubs to low forest, mostly with sparse or very sparse foliage cover, and generally on lighter soils, although trapline 13 in BR was silty clay loam.

At BR, 2 females collected on 10 November (weighing 43.0 and 44.4 gm) were pregnant and both had 4 fetuses with mean crown to rump length of

6.1 and 6.9 mm respectively; the March female showed no sign of reproductive activity. At WBR in September, the 2 females (with 2 and 4 fetuses) were at about the same stage of pregnancy as those collected at BR in November. The female collected in March at WBR showed no signs of reproductive activity.

#### Western Mouse (*Pseudomys occidentalis*)

At BR in November, 5 males, 8 females, and 2 unsexed (partial specimens) were collected from traplines 2, 3, 4, 5(10); in March, 6 males, 8 females, and 1 partial specimen were collected from traplines 1(2), 7(2), 9(6), 10(2), 14(2) and 15. At WBR in September, 3 adult males and 1 adult female were collected from traplines 8(2) and 9(2); in March an adult male was collected at trapline 2 and another escaped.

*P. occidentalis* on these Reserves was trapped in vegetation which had an upper stratum ranging from low heaths to low woodlands, mostly with sparse or mid-dense foliage cover. About 60% of these traplines were on the heavier clay loams.

Stomach contents of 2 *Pseudomys occidentalis* collected in WBR in September, and 1 collected in March were examined. They were apparently captured early in the night because they appear to have not fed immediately prior to capture. Their stomachs contained small boluses of hair (probably from grooming), fibrous vegetable material and thoroughly masticated insects including Coleoptera (?Chrysomelidae). The proportion of insects suggests that they were not ingested accidentally.

At BR on 11 November, a pregnant female (53.2 gm) had 5 fetuses with crown to rump lengths between 9.2 and 12.0 mm. Three of the other females collected in November at BR (34.6-37.4 gm) had thickened uteri and distended mammae and are thought to have recently given birth and to be suckling young. Two juveniles (13.2 and 14.2 gm) collected at this time confirmed that some females had bred earlier in spring. The other 4 females collected in November (31.3 and 34.5 gm) showed no signs of recent pregnancy. In March none of the 8 females collected (26.3 to 35.9 gm) appeared to be pregnant or to have recently given birth. Further, no juveniles were caught in that month.

At WBR in September, the single female collected (46.5 gm) appeared to have recently given birth; its slightly enlarged uterine horns were shrivelled and darkened and had four swellings marking the previous position of the fetuses, the lumina of the horns were full of cellular detritus. Further, the mammary glands were very swollen and the teats elongated to ca 2.5 mm.

**Little Bat (*Eptesicus regulus*)**

One adult male shot at WBR in March at 0700 hr while flying at a height of 15 m amongst the foliage of York Gums.

**Gould's Wattled Bat (*Chalinolobus gouldii*)**

Frequently seen flying at dusk among salmon gums at BR and WBR during both surveys. In March, 3 females and 2 males shot at WBR and 1 female and 1 male at BR.

**Echidna (*Tachyglossus aculeatus*)**

One seen at 1700 hr in March crossing the road which bisects BR. One seen at WBR in September near trapline 2.

**House Mouse (*Mus musculus*)**

Not collected at BR during the surveys. Three were, however, collected 2 km east of the Reserve from a road verge 18 m wide of Open Scrub with mallee emergents (trapped to establish the capacity of verges to support mammals). Paddocks with wheat stubble were on either side of this verge and the Reserve is the closest block of natural vegetation.

During autumn 1975 there was a major irruption of House Mice in the wheatbelt and other areas of Western Australia. In May 1975 mice were so abundant on BR that 150-200 were seen simultaneously crawling over domestic rubbish (B.G. Muir, pers. comm.).

At WBR in September 10 males and 3 females were collected from traplines 2(1), 5(6), 6(3) and 12(3); in March 14 were collected from traplines 2(3), 5(7), 6(1), 8(1), 11(1) and 12(1). None of the female mice collected appeared pregnant.

**European Rabbit (*Oryctolagus cuniculus*)**

Several seen on BR but particularly abundant in road verges just outside the Reserve. Common throughout WBR particularly in the vicinity of the granite outcrops.

**Domestic Cat (*Felis catus*)**

One seen entering BR from west boundary in March. One caught at WBR in March at trapline 9.

## DISCUSSION

Bendering and West Bendering Reserves have a combined total of 13 species of native mammals (excluding Hewitt's 1970 record of Pygmy Possum, *Cercartetus concinnus*, which is unconfirmed) and together constitute one of the more important mammal sanctuaries in the wheatbelt — comparable to the Tuttanning Reserve, which has 12 species of native mammals (Sampson 1971), and Dragon Rocks Reserve which has 13 species of native mammals (McKenzie *et al.* 1973). BR and WBR are particularly important because three of the mammals present, *Phascogale calura*, *Sminthopsis granulipes* and *Pseudomys occidentalis* have been declared under the Wildlife Conservation Act (1950-1976) as 'rare and likely to become extinct'. Further, the latter two are endemic to the southwest of Western Australia and have been collected from relatively few localities (see Ride 1970 for collection dates and localities for these species prior to 1970). Since 1970 *S. granulipes* has been collected near the following localities: Three Springs, Narrogin, Lake Grace, Wubin and Jurien Bay. *P. occidentalis* has been collected at Dragon Rocks near Hyden, Lake Chinocup Reserve, Tarin Rock Reserve, and a reserve near Tambellup. *Trichosurus vulpecula* and *Dasyurus geoffroii*, although not as limited in range as the above species, are infrequently recorded from the wheatbelt. The remaining species on these reserves have all been collected from numerous localities within the wheatbelt in recent times.

Although the range and habitats used or preferred by wheatbelt mammals may not be clearly revealed until the completion of the wheatbelt project, it appears that many of the mammals in BR and WBR have restricted habitats. Examination of the trapline descriptions suggests that *Pseudomys occidentalis* prefer habitat in which denser strata of shrub mallees and shrubs (1.5 m and higher) occur. *N. mitchellii* on the other hand was not captured in vegetation dominated by mallees. It prefers more sandy soils than *Pseudomys occidentalis* and was caught in traplines irrespective of the density of the vegetation strata there. *Phascogale calura* showed a tendency to be captured in traplines which had dense thicket or shrub mallee strata present and, as suggested earlier, probably prefers habitat which has trees or shrubs suitable for its arboreal activities.

The mammal assemblages recorded in BR and WBR are similar. *Dasyurus geoffroii* was not recorded from WBR and it is thought to be the only mammal not on both Reserves, despite the apparent absence of *Sminthopsis murina* and *Tarsipes spenceriae* from BR. It is believed that both these species probably occur there, but were missed by the trapping. This argument has



support in that neither species was trapped at WBR (a single *Sminthopsis murina* was collected there by hand, and *Tarsipes spencerae* was recorded there from a single night time observation). Further, *Sminthopsis murina* is one of the most ubiquitous mammals in wheatbelt reserves and so is expected to also occur on BR; and the habitat in which *Tarsipes spencerae* was sighted is also present in some extent on BR.

It would appear then that with the probable exception of *Dasyurus geoffroii*, no mammal species have yet been lost from WBR as a result of its separation from the larger BR. Certainly *D. geoffroii* is now very rare in the wheatbelt and its presence on conservation reserves in the wheatbelt is only confirmed from the large BR. Evidence to support the belief that *D. geoffroii* may be lost from WBR is suggested from the Tuttanning Reserve. This reserve, at ca 2,000 ha, is about the same size as WBR and contains an equally diverse mammal fauna. *D. geoffroii* is not, however, now found on Tuttanning Reserve (Sampson 1971) although it was almost certainly there at the beginning of this century. Shortridge (1910) recorded it only 6 km to the east of Tuttanning Reserve at 'Woyaline Wells'.

Little can be said concerning the relative numbers of native mammals in BR and WBR because the surveys were not conducted simultaneously. It is probable, however, that *Trichosurus vulpecula* are in fact more abundant on WBR where there are more extensive formations with eucalypt trees and tree mallees. It is also suspected that there are relatively fewer *Macropus irma* on WBR than BR.

At BR and WBR, spring appears to be an important season for the emergence of young from the pouch in marsupials, and for the birth of young in eutherians. Young of the two dasyurids, *Phascogale calura* and *Sminthopsis granulipes*, appear to leave the pouch from late winter to spring; the two rodents, *Pseudomys occidentalis* and *Notomys mitchellii* probably give birth throughout spring.

The bats *Chalinolobus gouldii* and *Eptesicus regulus* are known to give birth from late spring to early summer in the South West (Kitchener 1975, Kitchener & Halse, in press.). At Tuttanning Reserve, western wheatbelt, *Trichosurus vulpecula* has its peak breeding season in autumn, although it also gives birth in spring (Sampson 1971). Because pouch life in this species is about 5 months (Tyndale-Biscoe 1973), most young at BR and WBR would probably also be emerging from the pouch in spring. *Macropus fuliginosus* young probably also emerge from the pouch in late spring to early summer because Poole (1975) records them as giving birth to young in summer and that the pouch life of these young is about 320 days. *Tarsipes*

*spencerae* gives birth from at least mid-autumn to mid-spring (Kitchener & Chapman 1975) and small pouch young have been recorded in the wheatbelt in both April and September (Kitchener & Chapman 1976 and 1977).

### APPENDIX I

Number of trapnights for each trapline at (a) Bending Reserve, during November 1972 and March 1973, and (b) West Bending Reserve, during September 1975, and March 1976. (BB = breakback, E = Elliott, C = cage, and P = pit trap.) A trapnight is one trap set for 24 hours.

#### (a) Bending Reserve

Trapline No.	Number of Trapnights							
	November				March			
	BB	E	C	P	BB	E	C	P
1	70	70	14	0	50	50	10	0
2	70	70	14	0	50	50	10	0
3	70	70	14	0	50	50	10	0
4	70	70	14	0	50	50	8	0
5	70	70	14	0	50	50	10	0
6	35	35	7	0	25	25	5	0
7	35	35	7	0	35	35	6	0
8	0	0	0	0	50	50	10	0
9	0	0	0	0	50	50	10	0
10	0	0	0	0	30	30	0	0
11	0	0	0	0	30	30	0	0
12	0	0	0	0	0	0	0	20
13	0	0	0	0	24	0	0	15
14	0	0	0	24	0	0	0	20
15	0	0	0	21	0	0	0	0
16	0	0	0	12	0	0	0	0
Miscellaneous	36	36	0	6	48	40	32	0

(b) West Bending

Trapline No.	Number of Trapnights							
	November				March			
	BB	E	C	P	BB	E	C	P
1	70	70	14	0	60	60	12	0
2	70	70	14	0	60	60	12	0
3	70	70	14	0	60	60	12	25
4	70	70	14	0	50	50	10	0
5	70	70	14	63	60	60	12	0
6	70	70	14	35	50	50	10	0
7	60	60	12	48	60	60	12	0
8	70	70	14	35	50	50	10	0
9	70	70	14	0	50	50	10	0
10	70	70	14	0	50	50	10	0
11	70	70	14	0	60	60	12	0
12	60	60	12	0	0	0	0	50
13	0	0	0	0	40	40	8	0

## APPENDIX II

Codified vegetation and soil descriptions and leaf litter density, from Muir (1977a and 1977b) for each trapline at Bendering and West Bendering Reserves.

### (a) Bendering Reserve

Trapline No.	Vegetation Location No.	Vegetation and Soil Code	Leaf Litter
1	4.7	xSBI / KSCL	sparse, clumped
2	1.5	eLAc. xSAi. xSCr / FSL	abundant, large debris
3	3.1	cSi. xSAi. xSDc. n <sub>1</sub> Pr / SCL	moderately abundant, clumped
4	2.86	eKSi. mSAc. xSDi / FSL	very sparse, clumped
5	2.164	eKSi. xSCc / SCL	abundant, clumped
6	W4	eLAc. xSAr / SiCL	absent
7	M2	eKSd. xSr / SL	absent
8	1.8	eMr. eKSi. xSAr. nPr / FSL	sparse, clumped
9	5.4	aLBr. cnSc. xSDi / SL	moderately abundant, clumped
10	4.24	mSCc / SCL	sparse
11	2.137	eKSr. xSDd / FSL	sparse, clumped
12	4.16	xSDr / KSCL	sparse, clumped
13	W4	eLAc. xSAr / SiCL	absent
14	2.164	eKSi. xSCc / SCL	abundant, clumped
15	2.164	eKSi. xSCc / SCL	abundant clumped
16	2.95	eKSi. xSr. xSBI / SCL	sparse, clumped

(b) West Bending Reserve

Trapline No.	Vegetation Location No.	Vegetation and Soil Code	Leaf Litter
1	2.9	eKSi. cSi. n <sub>1</sub> GLi / LS	sparse, clumped
2	2.6	eKSc. mSAr. xSDr / FSL	moderate to abundant, clumped
3	4.2	xSAi. xSCc / LSCL	sparse, clumped
4	1.14	eLAc. xSBr. n <sub>1</sub> Pr / HC	abundant
5	4.6	n <sub>1</sub> SCr. xSDc / SL	very sparse, clumped
6	4.5	cSAr. xSCi. xJi / FSL	sparse, clumped
7	1.3	eLAI. xSr. n <sub>1</sub> SDr / CLS	abundant, clumped
8	3.10	cSd. n <sub>1</sub> GLi / SCL	moderately abundant, clumped
9	3.5	aSd. mSDi / SCL	abundant, clumped
10	5.8	aLAc / SL	very abundant
11	5.6	aeLAI. cSc / SL	sparse to abundant
12	4.4	xSCc / SL	very sparse, clumped
13	1.9	eKTI. n <sub>1</sub> VLr / CLS	abundant