AUSTRALIAN MAMMAL SOCIETY

Program and Abstracts

Perth, Western Australia
6 - 8 July 1998

CALM

PERTH ZOO
WESTERN AUSTRALIA

AUSTRALIAN MAMMAL SOCIETY MEETING

PERTH, WESTERN AUSTRALIA

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Opening Address – Australia Mammal Society Meeting, Perth July 6 1998

WESTERN SHIELD – VALUE ADDED FAUNA RECOVERY

Dr Syd Shea
Executive Director
WA Department of Conservation and Land Management

Western Shield is CALM's feral predator control and native fauna recovery program, which has been highly successful in addressing the problem of mammal conservation in WA. Through a coordinated program of broadscale fox control, recovery of remnant populations and translocations, to date three species (Woylie, Quenda and Tammar Wallaby) have been removed from the State's threatened fauna list and several other species, such as Numbat and Chuditch, have had their status improved. Fox control now extends over 3.5 million hectares of CALM estate in the south west of WA and captive breeding programs for ten threatened species have been established to support translocation programs. Once effective methods for feral cat control have been developed, Western Shield will move into the more arid parts of WA. Apart from the enormous conservation benefit that Western Shield will bring to WA, there is significant potential to add value to this program through nature based tourism ventures and education. Many of the components of Western Shield such as Project Eden in Shark Bay and Return to Dryandra near Narrogin, will be implementing captive breeding and translocation programs in areas that already attract significant numbers of visitors. By spending extra time at these locations to view or participate in Western Shield activities, tourists will inject significant extra dollars into both the program and local communities. Western Shield is also serving as a focus for educational activities at primary, secondary and tertiary levels.

Session 1

Evolutionary History of Mammals

Evolution of Australia's Inhuman Mammals: Synopsis of Current Research

Prof. Michael Archer, School of Biological Science, University of New South Wales, Sydney NSW 2052

Because of vast gaps in knowledge, four phases of Australian mammal evolution define themselves: 1, e. Cretaceous pre-tribosphenid phase; 2, e. Eocene Gondwanan/Pangaeic phase; 3, Oligo-Miocene endemic phase; 4, Miocene-Holocene modern phase. Australia's Triassic synapsids are too early to include annectant reptile/mammal transitional groups but presence of these in the late Triassic of other Gondwanan regions means mammals could as well have originated in Australia. Early Cret. (110 Ma) mammals from NSW are all monotremes which indicate a much earlier origin for the group. Interordinal relationships of monotremes are highly controversial. The e. Cret. (115 Ma) *Ausktribosphenos* from Victoria is not, as originally argued, a placental, but may be an archaic monotreme or peramurid, the latter being known from the e. Cret. of several continents including S. America. The e. Eoc. (55 Ma) Tingamarra assemblage from Queensland contains, in addition to archaeonycterid bats and extinct groups previously only known from S. America, marsupial groups that reflect (suspiciously too perfectly) DNA hybridisation studies of marsupial relationships. Interfamilial relationships of 'bandicoots', based on magnificent new fossil materials, are becoming clear but interordinal relationships are increasingly controversial. Interpretations about dasyuromorphian interfamilial relationships, based on palaeontological and molecular datasets, are congruent but again interordinal relationships are controversial. Undescribed Miocene notoryctemorphians from Riversleigh reveal much about the origins of this order but 'thingodontans' and 'weirdodontans' remain controversial in terms of interordinal relationships. Diprotodontian intraordinal relationships are becoming less controversial but hotspots remain such as the subordinal relationships of marsupial lions. Congruent independent hypotheses about the relationships of kangaroos are now (amazingly) emerging. Miocene wombat evolution has become delightfully complex. Old concepts of Australian as well as global bat evolution have been thoroughly shaken by recent discoveries at Riversleigh. Australian rodent evolution is similarly much more complex than previously thought and, like the bats, now subject to international cooperative research. Overall, congruent diversification patterns are emerging for most of Australia's mammal groups; these appear to correlate with Cainozoic cycles of greenhouse/icehouse environmental change.

A revision of *Pseudantechinus* with the discovery of a new species in the Pilbara

Norah K. Cooper & Kenneth P. Aplin
Western Australian Museum of Natural Sciences, Perth

There are currently four or five recognised species of *Pseudantechinus* in Australia (*P. macdonnellensis, P. mimulus, P. ningbing, P woolleyae, P.bilarni*?) and three of these occur in Western Australia, two being endemic. Recent field surveys in the Pilbara region have provided more material for a better resolution of the morphometrics and genetics of *Pseudantechinus*, resulting in the description of a new species endemic to this region. This new species was previously misidentified as *P. macdonnellensis* which is restricted to the central Australian highlands A reassessment of some morphological characters within the Tribe Dasyurini indicates the need for further genetic revision within this morphologically diverse but relatively recently evolved branch of the Dasyuridae.

Variation Within the *Antechinus stuartii* Complex

Mathew Crowther

B.Sc. (Hons) UNSW, Ph.D. student

School of Biological Sciences & Institute of Wildlife Research, University of Sydney, NSW 2006 Australia.

The Brown Antechinus (*Antechinus stuartii*) was originally thought to be one species with a distribution extending from north-eastern Queensland through to south-western Victoria. Evidence is presented showing that it actually consists of at least four morphologically and electrophoretically distinct species. *Antechinus agilis* (Dickman, Parnaby, Crowther & King 1998) has just been described from south-eastern New South Wales and Victoria and it differs from *A. stuartii* in its smaller size; greyish pelage; shorter, narrower rostrum; rounded premolars and smaller palatal vacuities. It is electrophoretically distinct from *A. stuartii* and differs in sympatry by time of breeding. *Antechinus subtropicus* from the subtropical rainforests of north-eastern NSW and south-eastern Queensland is currently being described and it differs from the others in its very large size (up to 72g), long, narrow rostrum; huge palatal vacuities and well-developed entoconids. Its molecular distinctiveness is being worked on but its species status seems certain with *A. stuartii* overlapping with it in distribution. *Antechinus adustus* from the tropical rainforests of north-eastern Queensland is currently being raised from subspecies to full species level. It is geographically isolated from other *A. stuartii* complex species and electrophoretically distinct (Baverstock *et al.* 1982). It differs from other members of the *A. stuartii* complex by its dark pelage, small alisphenoid bullae, small size and broad rostrum. There is enormous variation within species plus confusion in the *A. stuartii* and *A. flavipes* species complexes in northern New South Wales and so morphological and genetic work is continuing.

Climatic Modelling of the Distribution of the Mahogany Glider *Petaurus gracilis* and Implications for its Evolutionary History.

Stephen M. Jackson

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Abstract

The known distributions of the mahogany glider *Petaurus gracilis* and the squirrel glider *Petaurus norfolcensis* (in Queensland) were used to predict the distributional limits of both these species in Queensland, using the computer program BIOCLIM. The mahogany glider was confined to areas with a higher mean annual temperature, smaller temperature range, higher annual precipitation, higher precipitation seasonality, higher moisture index seasonality and higher precipitation in the wettest and warmest quarters compared to the squirrel glider. The predicted distribution of the mahogany glider did not extend outside the known area on the mainland, or above 500m elevation. It did however predict them to occur on Hinchinbrook Island and the Palm Islands. The squirrel glider was predicted to occur significantly outside its known distribution, and to almost completely overlap the known distribution of the mahogany glider. Despite this predicted overlap, the closest these two species are known to occur is 25km. The large body size of the mahogany glider appears to agree with Boyce's hypothesis which suggests the large size is a result of high productivity and a high seasonal climate. The limited distribution of the mahogany glider and the large distribution of the squirrel glider also agree with Rapoport's rule, which suggests that species (such as the mahogany glider) that live in low latitudes experience a narrow range in yearly climate (and develop a narrow climatic tolerance) and therefore have only a small distribution, compared to species such as squirrel gliders which occur at higher latitudes.

THE POPULATION GENETICS AND TAXONOMY OF ONE OF AUSTRALIA'S MOST THREATENED MAMMAL TAXA - THE RUFOUS HARE-WALLABY

Peter Spencer & Mark Eldridge[1]

CRC for Marsupial Conservation and Management / Perth Zoo, PO Box 489, South Perth, WA, 6151 and [1]Biological Sciences, Macquarie University, Sydney, NSW, 2109

The Rufous hare-wallaby has an extremely limited distribution on the mainland with the population limited to captive colonies in the deserts of the Northern Territory (where it is commonly known as the Mala) and on two island populations. It is one of the most threatened mammal taxa in Australia and is now classified as "Extinct in the wild". Since European colonisation it has declined from at least 90% of its former range and the mainland subspecies now consists of about 200 individuals. Genetic studies using mitochondrial DNA (mtDNA) and microsatellites have revealed a number of important findings. We have now (i) clarified the taxonomic status of mainland and island groups of *Lagorchestes hirsutus*, as being a single Evolutionary Significant Unit (ESU) and (ii) investigated the genetic relatedness and compared levels of genetic variation and genetic similarity between populations of the Rufous hare-wallaby (*L. hirsutus*) and the Mala. The island populations show about 30% less genetic variation than the mainland populations. These findings will directly assist in the translocation program being undertaken presently by conservation agencies in both Western Australia and the Northern Territory.

Session 2

Ecophysiology and its role in Mammal Conservation

Ecophysiological studies on desert mammals: Insights from stress physiology

Professor Don Bradshaw
Zoology Department, University of WA

Ecophysiology is the study of the physiological responses of animals living in their natural environment and can provide information substantially different from that obtained in laboratory situations where animals are constrained by artificial surroundings. Rates of metabolism are a good example. Marsupials have substantially lower basal rates of metabolism than eutherian mammals when measured under standard laboratory conditions, but their field metabolic rates (FMR), measured with doubly-labelled water, are not uniformly lower and, especially in the case of the small insectivorous species, are greater than those of similar-sized eutherians. Recent work with arid-living mammals in WA has focused on the measurement of seasonal responses of free-ranging individuals to drought and has involved measurements of rates of turnover of water, along with changes in kidney function and circulating levels of antidiuretic hormone (ADH), the pituitary hormone essential for conservation of water. Central to these studies has been an attempt to identify periods when animals in the field may be exposed to physiological stress due to a lack of adequate supplies of water, and to document their responses to this. Stress is defined as ..."the physiological resultant of demands that exceed an organism's regulatory capacities" (Bradshaw, 1986) and is detected through the combination of a significant perturbation of the *milieu intérieur* of the animal, despite the maximum deployment of normal homeostatic responses (eg. substantial dehydration despite maximal circulating levels of ADH see Bradshaw, 1992). This approach also raises the possibility of determining the vulnerability of threatened and endangered species to extinction by comparing their actual rates of water turnover in the dry part of the year with allometric predictions. We would predict that species which display a profligate pattern of water usage would be much more susceptible to any environmental changes that might reduce the availability of water

Hibernation Of Echidnas On The New England Tablelands

Frank Falkenstein., Gerhard Körtner., & Fritz Geiser

Zoology, School of Biological Sciences, University of New England, Armidale NSW 2351

Short-beaked echidnas (*Tachyglossus aculeatus*) living on southern islands and in alpine areas are known to hibernate. Detailed measurements on hibernation in the species are available for populations from Kosciuszko National Park, Central Tasmania, and Kangaroo Island. There is also indirect evidence on hibernation from seasonal digging activity on the cool-temperate New England Tablelands, northern New South Wales, but direct measurements have not been conducted. We therefore investigated whether free-ranging New England echidnas hibernate, what pattern of hibernation they exhibit, and how it compares to that of other populations. We studied thermal biology of echidnas in their natural environment during the period of Winter 1997 at Oxley Wild Rivers National Park, near Armidale. Body temperatures were measured telemetrically, using implanted temperature-sensitive radio transmitters. Echidnas hibernated from April/May to August/September. The lowest body temperatures of four echidnas recorded during hibernation ranged from 6.9 to 8.8°C and occurred during the last two hibernation bouts. Torpor bout length ranged from 2 to 18 days and increased with progression of the hibernation season, while the body temperatures declined. Times of entry into and arousals from hibernation were randomly distributed throughout the day and therefore do not appear to be controlled by an endogenous rhythm, nor by photoperiod. While qualitatively hibernation of echidnas in New England is similar to that observed in other populations, physiological variables differed in accordance with environmental temperatures of their particular habitat.

Integrating ecophysiology with wildlife conservation - an example in rodent research

Dorian Moro[1], Don Bradshaw[1], & Keith Morris[2]

[1] Department of Zoology, The University of Western Australia, Nedlands WA 6009

[2] Department of Conservation and Land Management, P.O. Box 51, Wanneroo WA 6065

Ecophysiological parameters were applied as part of recovery actions to protect the only island population of short-tailed mouse (*Leggadina lakedownensis*) in Australia from invading house mice (*Mus domesticus*). Research pivoted around the hypothesis that selective control was possible if ecophysiological differences could be identified between the target and non-target species, and exploited in the interests of control of the target species. Both species of mouse inhabit an environment that experiences extremes in water availability and salinity. A radio-isotope study found that free-ranging house mice required significantly more water than the native mice to remain in physiological balance, and their sodium intake was twice that of the native mice. Microhabitat differences between species could not explain the higher requirement of water by house mice, because the difference persisted under laboratory conditions. In contrast, differences in their sodium turnovers did not persist in the laboratory, suggesting that the diet in the field must have been extremely salty. Estimates of feeding rates suggest that *M. domesticus* obtained their water and sodium from sources additional to their diet. *L. lakedownensis*, however, obtained all their water and sodium from their food. It was concluded that, on a mass-specific basis, differences in the water and sodium fluxes of mice in the field were due to a greater quantity of food eaten by *M. domesticus*. This intake was required to meet their physiological needs for water. Therefore, in unison with a specially-constructed bait-delivery station, the nature of the poison baits will need to consider the water and sodium additives.

DIGESTA PASSAGE IN NORTHERN BROWN BANDICOOTS (ISOODON MACROURUS)

Kylie McClelland, Ian D. Hume

School of Biological Sciences, University of Sydney

Bandicoots are primarily insectivorous in summer but in winter they eat more plant and fungal material. We were interested to know how their relatively simple gut might accommodate and process such different foods as invertebrates and plant material. Digesta passage was measured on two diets, both based on a commercial small carnivore mix, with either 50% mealworm larvae or 24% ground lucerne hay included. Two inert markers given as a pulse dose per os were used to describe the rate of passage of digesta through the gut. The mean retention time, MRT (average time for a marker to be eliminated) of the fluid marker was similar on the two diets (27.4 and 30.4 h), but that of the particle marker was much shorter in animals on the lucerne diet (10.0 vs. 24.7 h; $P < 0.01$. Thus, on the lucerne diet the MRT of the particle marker was less than half that of the fluid marker ($P < 0.001$), indicative of selective retention of fluid and small particles. Selective retention of fluid and small particles (including bacteria) concentrates fermentative effort on potentially more digestible components of the digesta while facilitating the elimination of large refractory particles. This is especially important for small mammals feeding on plant-based diets given their high ratio of mass-specific metabolic rate to gut capacity. Thus it seems that, despite a relatively simple gut structure, selective digesta retention provides the bandicoot digestive system with the flexibility needed to enable these small omnivores to utilize nutritionally unpredictable environments such as fire-prone heathlands.

Measurement of Nectar and Pollen Intake in Free-Ranging Honey Possums (*Tarsipes rostratus)* in Southwestern WA

Don Bradshaw & Felicity Bradshaw
Zoology Department, University of WA E-mail: Don.Bradshaw@uwa.edu.au

Turnover rates of a combination of stable and radioactive isotopes (tritium, oxygen-18 and sodium-22) have been used to estimate daily intake of pollen and nectar in free-ranging Honey possums in Scott National Park in the extreme southwest of WA. The Field Metabolic Rate (FMR) is measured using doubly-labelled water and nectar intake is estimated independently from the turnover of both water and sodium. These two estimates of nectar intake are then averaged if comparable. Nectar energy intake is then estimated from the sugar concentration of fresh nectar collected from the inflorescences on which the Honey possums have been feeding. Pollen intake is finally estimated as the difference between the energy derived from nectar and the FMR. The method assumes that Honey possums normally do not drink free-water in the field, that all the sodium in their diet is derived from nectar, and that individuals are in energetic balance over the measurement period. These assumptions have been tested and found to be reasonably robust, except during periods of heavy rain when some free-water intake may occur. Data from some 30 individuals show that nectar intake is reasonably constant at 6-7ml.day^{-1} for individuals with an average mass of 9g. Daily pollen intake varies considerably between individuals, however, averaging 510mg.day^{-1} but ranging from 0 to as much as 2g.day^{-1}. Laboratory studies with a captive colony of Honey possums predict that the minimum nitrogen requirement for the maintenance of balance in this species is approximately 95mg.kg$^{-0.75}$.day^{-1}, well below that recorded for macropodid marsupials but very similar to that of the Sugar glider, *Petaurus breviceps* that also feeds on a high carbohydrate diet (see Smith & Green, Physiol. Zool., **60**:82-92, 1987). This study will enable us to test whether the characteristically low reproductive rates of nectar, sap and gum-feeding possums is a consequence of a limited protein intake.

Session 3

Reproduction & Captive Breeding as a tool for Mammal Conservation

Reproduction and Captive Breeding as a Tool for Mammal Conservation: What can zoos do besides sweeping up poo?

Mark P. Bradley
Research Program, Perth Zoological Gardens, 20 Labouchere Road, South Perth, WA 6151, Australia

There is a growing awareness in the scientific research community of the role that zoological institutions can play in the conservation of threatened or endangered species. Zoos themselves have changed and become more focussed on the contributions they can make to regional conservation objectives, driven in part by the "World Zoo Conservation Strategy" published in 1993. Perth Zoo has committed to this strategy and established a collaborative scientific research program with CALM, WA, to develop captive breeding techniques for a number of Western Australian native species. To achieve this, the zoo has established a sub-program known as the Native Species Breeding Program. This consists of 6 specialist keepers who are charged with developing specialised skills in captive husbandry of selected species, and the implementation of research projects. All of the species under study are part of recovery plans, and many of the species are being produced for release under the objectives of those plans and as part of CALM's "Western Shield Project". Mammal species under study are the Numbat, Chuditch, Dibbler, Shark Bay Mouse and the Greater Stick nest rat. Currently, Chuditch, Numbats and Shark Bay Mice bred in captivity have been the subject of re-introduction programs. The results of these breeding programs and the subsequent releases of selected species into different habitats in Western Australia will be presented, along with a discussion of the issues which relate to the limitations of captive breeding as a conservation tool.

Cross Fostering & Conservation: Efforts to Accelerate the Reproductive Rate of the Endangered Brush-tailed Rock Wallaby, *Petrogale penicillata*.

***D.A. Taggart[1], G. Underwood[2], K. Phillips[3] and D. Schultz[4].**
[1]Dept of Anatomy, Monash University, Clayton, Victoria, 3168 (PhD). [2,3]Tidbinbilla Nature Reserve, Tharwa, ACT, 2620 (Dip Anim.Tech) [4]Adelaide Zoological Gardens, Adelaide, 5001.

The Brush-tailed Rock Wallaby (BTRW) is critically endangered within Victoria. Despite ongoing baiting programs population numbers remain low. Recently, a 'Captive Breeding and Management Strategy' was devised (Taggart & Halley, 1997. Unpublished Report, D.N.R.E, Vic) to rapidly increase the number of captive animals for reintroduction. The latter program is based on a technique termed cross fostering which uses surrogate females from related species to rear BTRW pouch young (PY). The surrogate species used in this preliminary study were the Tammar Wallaby and Yellow footed Rock Wallaby (YFRW). A total of 20 PY were pulled from non target female BTRW's to determine whether, the species was polyoestrous and breeding was seasonal. Eleven of these PY removed between April-October 1997 and weighing between 1g - 106g (ages ~ 7-120 days), were attached to the teats of surrogate females (9 to tammar and 2 to YFRW surrogates) to determine if this technique was a viable means of accelerating the production of BTRW PY. The effects of age of PY at transfer on PY survival and the growth rate of cross fostered young on surrogate mothers was also examined. Preliminary results indicate that females are not seasonal and that between 6-8 young can be produced annually by each female using this method. Time from removal and transfer of BTRW PY to birth of the next young varied from 26-32 days. Cross fostering proved successful across the range of transfer weights examined. Growth rates of PY on surrogate females appeared normal. Application of this technique to the conservation of this and other endangered marsupials will be discussed.

Management of a Long-term Laboratory Colony of *Sminthopsis macroura*, The Stripe-faced Dunnart.

Dr. Lynne Selwood
School of Zoology, La Trobe University, Bundoora, VIC 3083 Australia.

I have maintained a colony of *Sminthopsis macroura* at La Trobe University since 1985. The founders of the colony were 10 females and 10 males of which 13 were obtained from Meredith Smith at The Evolutionary Biology Unit in the South Australian Museum and 7 from Darwin Evans at The Department of Conservation and Natural Resources, Victoria. Long-term (>10 years) continuous maintenance of marsupials as laboratory colonies, without input of wild caught stock, is rare.

The colony is fully pedigreed and a policy of outbreeding by avoiding matings between close relatives (brother/sister; parent/offspring) has been followed. The colony has been maintained at 18-21°C and on the normal light regime of Melbourne. The diet consists of dried cat or dog food, a mince mixture supplemented with calcium and iodine, mealworms and water, supplemented with vitamins, provided *ad lib*.

The animals have maintained a breeding season of July-February, similar to that of field animals and the length of the oestrous cycle, gestation period and lactation has not varied with colony age. The proportion of females breeding per annum has not varied widely, but the proportion of males has. It is recommended that to ensure survival of similar colonies; 1. female and male reproductive performance and the oestrous cycle of females are monitored during the breeding season, and 2. that rather than continuous pairing of males and females, males are placed with females at the peak of oestrous.

Monitoring The Reproductive Cycle Of The Southern Dibbler, *Parantechinus apicalis*, In Captivity

Harriet R. Mills[1], Cathy Lambert[2], and Mark P. Bradley[2]
[1]Department of Animal Science, The University of Western Australia
[2]Research Program, Perth Zoological Gardens, South Perth, Western Australia

As part of a study aimed at maximising the success of future captive breeding programs, a study has been conducted to more clearly define the reproductive cycle of captive Southern Dibblers, *Parantechinus apicalis*. Oestrus was monitored in 17 females by recording both changes in behaviour, and changes in epithelial cell composition and morphology of urogenital tract secretions. In males, the ratio of testis volume to body weight were measured weekly in 8 males, and urine was checked for the presence of sperm. Males became spermatorrhoeic in February and early March, and had a peak ratio of testis volume to body weight just prior to observed matings. Animals were paired when males were spermatorrhoeic and when cornified epithelial cells first appeared in the urine of females. Of 11 paired females, matings were observed in 8 animals. Increased numbers of cornified epithelial cells were present in the urine of females for a mean period of 15 days (range 10-22 days), coinciding with onset of oestrus (n=13), but behavioural oestrus lasted for a maximum of 5 days (as determined by mating), with the longest single copulation observed for 7 hours. Both females and males mated with multiple partners, and future genetic studies will reveal whether this results in multiple paternity within a litter. This research fulfils part of the objectives of the draft recovery plan for this endangered species.

Rearing of foster young by the Julia Creek Dunnart, *Sminthopsis douglasi*

Patricia A. Woolley., Juliey L. Beckman., & Megan E. Coleman

Department of Zoology, La Trobe University

Rearing of foster young by the Julia Creek Dunnart, *Sminthopsis douglasi*

Patricia A. Woolley., Juliey L. Beckman., & Megan E. Coleman

Captive Julia Creek Dunnarts with dependent young will accept the young of other females and rear them together with their own. Mothers with young 50 days and older reared foster young that were from 12 days younger to 2 days older than their own young. Growth of the young was monitored and with one exception the growth rates of the nine young fostered were roughly comparable to those of the natural young.

The fostering of young from an age at which they may be left in the nest while the mother is out foraging raises the possibility of females rearing young other than their own in the wild.

EVOLUTION OF THE CONTROL OF BIRTH BEHAVIOUR IN MARSUPIALS

Randy Rose & Barbara Fadem

School of Zoology, University of Tasmania, Australia &
Dept of Psychiatry, New Jersey Medical School, Newark NJ, USA

The Tammar wallaby responds within minutes to injections (IM) of prostaglandin $F_{2\alpha}$ by initiating typical birth behaviour. We have repeated this experiments and have shown that all major groups of Australian marsupials (including males and developing pouch young) respond with a "birth response". Subsequently, we have shown that a similar response occurs after injection of the hormone oxytocin (although with a longer latency period). Oxytocin appears to operate via the stimulation of $PGF_{2\alpha}$ synthesis as there was no response after injection of oxytocin and inhibitors of $PGF_{2\alpha}$ synthesis. Given that there is a 75 million year separation between Australian and American marsupials it is of considerable interest to know whether the above behavior is also found in American marsupials and hence may have been present in their common ancestor. Equal numbers of both sexes of adult South American opossums (*Monodelphis domestica)*, were assigned to one of three groups 1) Saline control, 2) $PGF_{2\alpha}$ 0.05 mg kg^{-1} and 3) Oxytocin 0.1 iu kg^{-1}; subsequently group 3) was injected with the $PGF_{2\alpha}$ inhibitor, Finadyne®, before oxytocin re-injection. The results showed that both male and female gray opossums respond to $PGF_{2\alpha}$ with birth behavior but only females responded to oxytocin. Also, since there was little difference in the latency of response to oxytocin by females after the $PGF_{2\alpha}$ inhibitor was given, oxytocin may act directly in this species and not via the synthesis of $PGF_{2\alpha}$ as in Australian Marsupials. These results suggest that there are similarities and differences between American and Australian marsupials in the hormonal control of birth behaviour. In both gray opossums and Australian species, prostaglandins initiate birth behavior in males as well as females. In contrast to Australian species, in gray opossums oxytocin initiates birth behavior only in females and does not operate via stimulation of prostaglandin secretion.

Spermiogenesis And Spermatid Nuclear Shaping In The Wombat (*Lasiorhinus latifrons*).

Mario Ricci & Bill Breed.

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The differentiation of the head of the mammalian spermatozoon during spermiogenesis is a very precise process that results in spermatozoa having a highly reproducible, species-specific, shape. The overall shape of the sperm head appears to reflect that of the nucleus, but how the precise shape of the sperm nucleus, and therefore sperm head, is produced is not known in detail.

In marsupials there have been relatively few studies on factors that determine sperm nuclear shape. In most species, it is a flat, elongated plate whose long axis lies perpendicular to that of the flagellum when the sperm leaves the testis, but in koalas and wombats a totally different structural organisation occurs, with the sperm nucleus being 'hook-shaped', with the extent of curvature varying between individual spermatozoa. The aim of the present TEM study was to determine, in the Southern Hairy-Nosed Wombat (*Lasiorhinus latifrons*), the shape changes that occur to the sperm head nucleus during the time of its formation, with consideration of the factors that determine the final form that results.

Ultrastructural observations have shown that, though the main events are generally similar to those of other marsupial species, the process of the spermiogenesis differs, and is relatively more complex, than that of other species studied to date with the exception of the koala. The unique features include: (1) the formation of a granule within the proacrosomal, and then acrosomal, vacuole early in spermiogenesis, (2) a near basal, rather than central, point of attachment of the flagellum to the convex surface of the sperm head, (3) an uneven condensation of the spermatid chromatin, and (4) the development of curvature of the spermatid nucleus. The factors that bring about these changes during spermiogenesis will be considered and it will be concluded that the arrangement of the manchette, the initial shape of the acrosome, and the Sertoli cell ectoplasmic specialisations, probably determine the final form of the sperm nucleus, and therefore sperm head, that develops in this species.

Pouch microflora of the koala and their implications for the welfare of the young

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The pouch of macropods such as the quokka and the tammar have been shown to harbour a number of micro-organisms whose diversity and numbers are significantly influenced by the stage of oestrus and the presence or absence of pouch young. On the other hand it has been reported that the koala pouch is normally free of micro-organisms and the presence of bacteria leads to death of the pouch young. In the light of these observations we have studied the bacterial flora of a group of six female koalas over a period of 18 months, including 2 reproductive periods. Pouch washes were also collected to explore the possibility that the koala pouch epithelium secreted antimicrobial substances.

A number of bacteria were isolated over the study period in both the presence and absence of young. There did not appear correlation between the identity of the isolates or their relative abundance and the reproductive stage of the animal. However, as a general obsesrvation growth was lighter in swabs collected from animals with very young PY.

During the study period one animal lost her back young - it was found dead in the enclosure and one animal had a back young removed as it failed to thrive. In both these animals *Klebsiella pneumonia* was the sole isolate from the pouch. This observation suggests this organism may play a role in pouch young loss.

A case for embryonic diapause or extended gestation in the koala, *Phascolarctos cinereus*?

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Embryonic diapause is defined as a natural delay in the implantation of the developing embryo or blastocyst. This delay in implantation and maturation is well documented in macropods but has never been reported in the koala, *Phascolarctos cinereus*. However, recent observations on a captive breeding population maintained at Taronga Zoo have suggested that this may be possible.

Bundeena is a mature female maintained with 3 other females and a mature male Fatso in the Koala Exhibit. On 16.9.97 she had a 10 months old backyoung removed and on the 1.10.97 Fatso was removed from the yard. No replacement male was introduced. A pouch check was performed on the 19.11.97 and no pouch young was detected (t=50 days after removal of the male). On the 5 February, 1998 the pouch was once again checked and a young, estimated to be 51 days, by head measurement, was detected. This provides an estimated date of birth of 18.11.97 - a total of 79 days from the removal of the male.

Three possible explanations are

(a) a wild male had entered the enclosure, mated and left

(b) the pouch young is due to a blastocyst that was reactivated

(c) an extended gestation of 79 days

To eliminate option (a) paternity testing using microsalellite markers was conducted.

Confirmation of Fatso as the father supports 2 possibilities, (b) & (c), both have implications for management of captive koala populations.

The Marsupial Zona Pellucida: A "Trivial" Structure?

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Eggs of higher vertebrates are surrounded by a glycoprotein coat, the zona pellucida (ZP) to which sperm must bind if penetration and fertilization are going to occur. Marsupial ZPs have been reported to be much thinner, and 'trivial', structures compared to those of eutherians and it has also been suggested that the marsupial ZP changes in consistency around the time of ovulation. The aim of this study is to investigate the formation, and structural organization, of the ZP from several marsupials including those of the koala, wombat, dunnart, tammar wallaby and possum. In particular, emphasis is placed on interspecific variation of its oligosaccharide components which may relate to species-specificity of sperm-egg binding, and the pre- and post-ovulatory changes that occur.

Preliminary observations have shown that: (1) the ZP is formed at a similar stage of follicular development to that in eutherians, (2) the ZP varies markedly in thickness between species, with that of the koala and wombat being as thick as, or even thicker, than that of some eutherians; (3) interspecific variation in FITC-conjugated lectin-binding patterns of ZPs occurs; and (4) the ZP changes from broad and diffuse prior to ovulation to thin and compact after ovulation in the possum but this does not appear to occur in dunnarts.

The results of this preliminary investigation show that, despite claims to the contrary, the marsupial ZP appears to be similar in its timing of development, oligosaccharide composition and, in some cases, thickness to that of eutherians. These findings suggest a re-evaluation of the term "trivial" to describe marsupial ZP.

PRECOPULATORY AND MATING BEHAVIOUR IN THE TASMANIAN BETTONG

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Observations on the interactions of captive male and female Tasmanian bettongs (*Bettongia gaimardi*), tested in dyadic combinations have disclosed the existence of distinctive elements of behaviour; several of these are also associated with agonistic confrontations and occur in predictable response sequences. There was no evidence of a consort period between males and pre-oestrous females. Overt sexual interactions were observed to occur only on the night of oestrus, coincidentally with the maintenance of close spatial proximity. During copulation multiple intromissions were regularly achieved but the intervals between successive bouts of these acts generally increased. Males were also observed to engage in regular attempts at social (urogenital) investigation and were apparently able to determine the reproductive state of all resident females, presumably utilising olfactory cues. The brevity of sexual interactions occurring between individuals of the species contrasts with the more complex repertoire of the gregarious large macropodoid marsupials

The effects of competition on mating behaviour and ejaculation in *Antechinus stuartii* .

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Antechinus stuartii is a small, insectivorous dasyurid marsupial with a simple, synchronous life history cycle. Recent studies on mating behaviour in the laboratory have indicated that when no direct competition is present females control much of the mating behaviour for a copulating pair. In this study we investigate mating behaviour of both males and females and subsequent sperm transport patterns in females. When two males were introduced to a single oestrous female, males spent much of their initial time determining dominance through fighting prior to the dominant male mating with the female. Females did not permit the subdominant male to mate and following dismount the dominant male made no attempt to guard his mate. The time spent mounted by the dominant male did not vary between two matings on consecutive days nor was it different to the time spent mounted when no direct mate competition was present. The time frame for ejaculation was similar to previous studies where no mate competition was evident. When a single male was given access to two oestrous females he appeared to divide his time between the two females. At least three hours of uninterrupted copulation was required before sperm deposition was completed. Lengthy copulation ensures efficient transport of the sperm to the storage sites in the lower isthmus and also deters females from seeking additional mates in the immediate future. We suggest that the extended mount times that have been observed in the laboratory may also be occurring in the wild.

Biparental Obligate Monogamy in a Marsupial.

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Monogamy is rare among mammals. I studied the social organization of the little-known Rock Haunting possum *Petropseudes dahli* in Kakadu National Park in Northern Australia. Preliminary field observations revealed that most possums were found in groups consisting of a male-female pair and young, which suggests that this species may have a monogamous mating system. The aims of this study were to determine whether *P. dahli* displays obligatory monogamy. To do this I measured the degree of symmetry between sexes in maintaining the pair bond and initiating group activity changes. I also measured the extent of maternal and paternal care, nest and mate defense. Observations of three groups of possums (21 observational periods, > 30 hours) showed that males contribute equally with females in terms of parental care, maintaining the pair bond and nest and mate defense in the form of scent marking. Males participate to a substantial degree in maintaining relationships with one mate and their offspring. Collectively, these results suggest that the mating system of this population of Rock Haunting possums is biparental obligate monogamy.

Session 4

Insular Mammal Conservation

Conservation values and management of Australian islands for mammal conservation

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More than 16 species of Australian mammals have become extinct over the past 200 years. Without islands, however, this figure would be even worse as nine species that were formerly widespread on mainland Australia are now restricted to landbridge islands. In addition, six species of endangered and vulnerable mainland mammals that still occur on the mainland have island populations, reducing their chance of extinction. In all, 43 islands protect 29 taxa of Australian threatened mammals. Since European settlement some island mammal populations have become extinct, while many new populations, of both Australian and exotic mammals, have been established. The extinction of island native mammal populations is significantly correlated with the introduction of exotic mammals. Prevention of introduction and establishment of further exotics to important islands through hygiene procedures is vital, especially for islands with permanent or temporary human habitation. Eradication or control of existing exotics is required for many islands and eradication of further introductions, as soon after detection as possible, should be a high priority action for nature conservation land management agencies. Past exotic mammal eradications and needs for the future are discussed. Islands with exotics can be of value for re-introduction of locally extinct mammals or introductions (marooning) of threatened species that are at risk from feral predators on the mainland once the exotics have been eliminated.

Biodiversity, biogeography and systematics of mammals in eastern Indonesia

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Knowledge of the species and distributions of mammals in Nusa Tenggara and Maluku Tenggara has been totally reconstructed following 12 field surveys over 8 years to these regions. Some 28 new mammal taxa have been described and many islands have been surveyed for the first time. The major interface between the Oriental and Australian biogeographic regions for mammals is now placed close to Weber's line, 1000 km to the east of Wallace's 1876 line.

Nusa Tenggara represents a unique biogeographic region. The pattern of intraspecific morphological variation in most observed cases reflects both the current and Pleistocene associations of islands.

The Taxonomic Status of the Boullanger Island Dunnart

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There has been much confusion over the identities of members *Sminthopsis murina* species complex in Western Australia that were separated by Kitchener *et al.* (1984) into *S. griseoventer*, *S. dolichura* and *S. gilberti*. A population of *Sminthopsis* was found on Boullanger Island, north of Perth, by Fuller & Burbidge (1987). These were initially identified by Dr D. J. Kitchener as *S. dolichura* (Fuller & Burbidge (1987) and then as *S. griseoventer* (Lynam 1987). Electrophoretic work of blood proteins indicated that there are three fixed differences between mainland *S. griseoventer* and Boullanger Island *Sminthopsis*. This evidence was not supported by the allozyme and DNA work undertaken by the Evolutionary Biology Unit at the South Australian Museum. Many *Sminthopsis* skulls and bodies were examined as well as owl pellet and subfossil material to find morphological differences between populations. Boullanger Island *Sminthopsis* are morphologically distinct in having no entoconids on the lower third molar (*S. griseoventer* has medium to large entoconids), a longer tail as well as differences in the size and shape of the skull. These characters were important in separating *S. griseoventer* from the other species . This indicates that the island animals could be a distinct taxon. It is now also easier to tell mainland species apart through bivariate plots. This taxonomic work is extremely important because the Boullanger Island population is critically endangered and it appears to be suffering from competition from a extremely high-density population of introduced House Mice (Dickman unpublished).

House Mice Versus The Boullanger Dunnart: Interspecific Competition In An Island Ecosystem.

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The Boullanger dunnart, *Sminthopsis* sp., is a distinctive dasyurid marsupial that appears to be confined to Boullanger Island, near Jurien, in Western Australia. Although the dunnart occurs broadly throughout the island, population size does not exceed 300 individuals and numbers appear limited by competition from the introduced house mouse, *Mus domesticus*. Experimental removal of *Mus* from three plots over a 2½ year period allowed dunnart numbers to increase by up to four-fold compared to numbers in three unmanipulated control plots. Unusually among small mammals, competition appears to occur via exploitation. Dietary analysis, measurement of invertebrate biomass in control and *Mus*-removal plots and direct observations of interactions between dunnarts and mice suggest that competition occurs for food. *Mus* remove invertebrates directly by eating them, but further reduce the availability of prey to dunnarts by disturbance of foraging opportunities. Control of mice on Boullanger Island is a potentially important goal for future management of the Boullanger dunnart. However, control will be difficult due to the seasonally high densities of mice that occur on the island, and to interactions with sympatric dibblers, *Parantechinus apicalis,* seabirds and lizards. Suggestions for management will be discussed.

Session 5

Disturbance Ecology of Mammals

Disturbance Ecology of Mammals

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The Australian native mammal fauna has evolved in an environment where 'natural' or endogenous disturbance is ongoing and widespread, be it fire, flood, grazing, drought or cyclones. Since European settlement, however, the type, scale, frequency and intensity of disturbance has changed and added a new suite of exogenous impacts with which the mammalian fauna must cope if it is to survive. These new disturbances include introduced predators and herbivores, vegetation clearance, habitat fragmentation, altered fire regimes, grazing, timber harvesting and mining. This has presented novel and very significant adaptive challenges to native mammals over a compressed time-scale, resulting in major extinctions, population declines and disruption to community structure. In this paper we examine the ecology of Australian mammals in the context of these new disturbances, and compare the response patterns observed for different types of exogenous disturbance in an attempt to determine whether there are common processes and principles operating. These comparisons highlight the importance of the degree of disruption or change in stand structure (particularly age-class composition), density and spatial pattern of the vegetation in determining mammalian succession following disturbance. While mammalian successional patterns are broadly similar for different types of disturbance within a particular habitat type, they are non-linear and closely tied to vegetation regeneration. This means that mammalian successional states at any point in time may vary greatly between different disturbance types within any ecosystem, depending on the disturbance conditions affecting the critical elements of vegetation structure and composition. Regional factors and broad-scale differences in the abundance of species also need to be considered.

Climate Change Impacts on the Distribution of Selected Western Australian Mammals

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Conservation strategies focusing on counteracting landscape fragmentation and feral vertebrate predators have had some great success in Western Australia. However, the native fauna of this state faces a uncertain future in the long term. Climate change has the potential to considerably disrupt the natural and managed environment, including protected areas and those remote areas now used for re-introduction programmes. Climate change will add further stress to species survival and endangered native species are particularly at risk.

This study focuses on the distribution of mammal species endemic to Western Australia and on the National and State lists of endangered vertebrates. The climatic envelope of each species was determined from its current (all species) and historical (some species only) geographical records which were obtained from the WA Museum and validated when necessary. The shift of the species distribution under the CSIRO 1996 climate change scenario was examined by applying three global temperature increases: +0.5°C, +1°C and +2°C. Changes in rainfall were given by the scenario. Soil type data were included when relevant.

The results indicate that most species will see their distribution constrict under even small temperature increases. There is a trend for species with small current distribution to be more sensitive to temperature increases than those species for which the current or historical distributions were much larger. Even species currently inhabiting harsh environments such as the arid zone were not immune to the impacts of climate change.

The results have implications for long-term conservation strategies including landscape management, reserve location and management, and re-introduction programmes.

Long-Term Studies of Small-Mammal Communities in Disturbed Habitats.

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Long-term monitoring of small mammals has provided a large amount of information not available from shorter-term surveys. A forest fire study identified repeating mammalian successions within the 26 year interval since the last fire. Monitoring individual sites through extended time periods support published chronosequence analyses. Repeated mammalian successions in this interval appear driven by changes in the structure of the vegetation. An extended study of fire in heathland demonstrates that post-fire mammalian succession becomes a species replacement sequence provided there is sufficient time, rather than a change in the relative dominance of species, previously suggested. Regeneration of sand-mined forest has proved to be another valuable system for study and validation of chronosequence analysis techniques, compared with individual sites followed through time. In heathland regeneration, data collected 18 years after sand-mining confirms predictions made two decades earlier about the rate of growth in New Holland mouse populations. Few of these results would have been apparent from short-term data sets, or even from chronosequences covering longer time spans; long-term monitoring of the same sites has delivered more interpretable information than either alternative approach. In particular, a second wave of mammalian succession in response to late seral vegetation senescence could not have been predicted from 'short-cut' methods. A strong case can be made for the value of long-term studies: these offer superior returns in time and effort relative to investment in short projects.

A unique population of an endangered species in a ski resort: The Mountain Pygmy-possum at Mount Buller

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There are four distinct populations of the endangered Mountain Pygmy-possum *Burramys parvus* found in Victoria (Mount Bogong, the Bogong High Plains, Mount Hotham and Mount Buller). Over 80% of the Victorian population occurs at Mount Hotham and Mount Buller where ski resort developments have had adverse affects on the continuity and quality of the boulderfield habitats. In 1996 the Mountain Pygmy-possum was discovered at Mount Buller. The estimated breeding population is now 300, fluctuating to an unknown degree. Animals from Mount Buller are morphologically and genetically distinct from those found elsewhere. Results from trapping and radio telemetry suggest that some adult females have small home ranges (less than a hectare) while others, including the adult males, have ranged over a kilometre and used multiple nest sites. Individuals were recorded moving across roads (up to seven metres wide), although none were recorded moving between habitat patches which were divided by developed ski runs (above 20 metres wide). Habitat on Mount Buller is fragmented, therefore these observations have implications for future management.

Do European rabbits impact on the population dynamics of the burrowing bettong?

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The European rabbit has long been thought of as playing a key role in the decline and extinction of a number of medium-sized arid and semi-arid Australian mammals. The burrowing bettong is an example of one such species. The two are morphologically and ecologically similar with the bettong now extinct on mainland Australia, other than as a reintroduced population, and the rabbit thriving throughout the bettongs' former range.

The objective of this study is to describe the impact of rabbits on the population dynamics of a reintroduced population of burrowing bettongs on Heirisson Prong at Shark Bay, WA. In the absence of predators and sustained control measures rabbit densities have increased steadily on the 1200 ha study site over the past 3 years. They reached a peak of 38 per hectare in December 1997 compared to bettong densities of 0.1 per hectare.

We have examined bettong body condition, quality of diet, pouch young per female, recruitment, and survival of bettongs at a time of high rabbit abundance and compared results to previous years when rabbit numbers were much lower to determine the level and mode of impact.

The effects of fire on the foraging patterns and habitat use of a mycophagous marsupial.

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A study of movement paths of the northern bettong (*Bettongia tropica*) was undertaken to examine the foraging patterns and habitat use of a mycophagous marsupial within burnt and unburnt habitats in Australian fire-prone forest. Observed mean-squared displacements were compared with those expected from a simple model of correlated random walk based upon observed step lengths and turning angles of movement paths. Twenty-two percent of the observed displacement distances fell beyond the 95% confidence interval of the models predictions, indicating that this model was insufficient to fully describe bettong movement. Further analysis revealed that bettongs exhibited area-restricted search behaviour by taking significantly shorter steps and more acute turns following successful foraging. Prior to a foraging event where truffles were recovered, bettongs took shorter steps and more acute turns indicating that truffles were detected one step prior to being recovered. After the experimentally induced fire, bettongs had equal access to burnt and unburnt habitat, but significantly more bettongs chose to forage in the burnt habitat during this time. In burnt habitat bettongs experienced higher probabilities of truffle recovery and were less likely to investigate previously existing diggings. The greater foraging success experienced on recently burnt habitat combined with a tendency to exhibit area restricted search probably explains the significantly higher turning angles observed on burnt versus unburnt habitat. We conclude that a tendency by bettongs to exhibit area restricted search behaviour combined with low order serial correlation of movement parameters within movement paths results in non-conformity with the model predictions.

Soil disturbance events by the mycophageous Woylie

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The mycophageous Woylie (*Bettongia penicillata*), was once common and abundant in the southern portion of Australia. The total population of this species declined dramatically after European settlement leaving the Woylie vulnerable to extinction. However conservation strategies adopted in the late 1980's have resulted in increasing local populations in the Wheatbelt and Woolbelt of Western Australia.

This study examines one such isolated population in Dryandra Woodland, 200 km south-east of Perth in Western Australia. Dryandra Woodland is itself disjointed, resulting in a healthy population of *B. penicillata* in the central block of the woodland, whilst adjoining blocks of reserve contain no Woylies at all. This provided an opportunity to examine the impact that this species, once common and abundant but now conservation dependent, has on the soils it disturbs whilst foraging for hypogeous fungi.

Data presented here forms part of a series of long-term field experiments, and quantifies the extent to which these animals forage and the distribution of the disturbance regime due to their digging activity. It has been found that individual Woylies can make up to 113 diggings per night (July to October 1995). At this rate of digging, for an average sized hole, individual Woylies can disturb in excess of 9 tonnes of soil annually. This degree of disturbance may have important implications for soil processes and ecosystem function at a landscape level.

The role of behaviour in the decline and extinction of native mammals

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The introduced Red Fox has been identified by naturalists as a primary cause of decline and extinction in Australian mammals since at least 1923. Much current management of remnant and reintroduced populations of mammals hinges critically on effective fox control. One such example is the reintroduced population of burrowing bettongs *Bettongia lesueur* on Heirisson Prong at Shark Bay. This population was reintroduced from Dorre Island in 1992 and is now well-established and abundant. However, despite ongoing predator control, foxes have been responsible for most deaths within the free-range population over the past 5 years.

This study looks at the behaviour of both exotic predator and native prey species and tries to identify the attributes of both that might contribute to extinction of the prey species by the predator. Data comes from an experiment at Shark Bay examining the behaviour of burrowing bettongs in the presence of a predator and from observations of kills of burrowing bettongs at Shark Bay by predators.

A Small Mammal Community Living in a Powerline Easement at Bunyip State Park, Victoria

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Small mammals living in a powerline easement that had been cleared of trees were surveyed in Bunyip State Park in Gippsland, Victoria. Five species of native small mammals were detected either by trapping or via hair tubes. These were *Rattus lutreolus* (394 captures from 2180 traps, hair in 260 tubes from 2090 set), *R fuscipes* (186 trapped, 167 in hair tubes), *Mastacomys fuscus* (93, 160), *Antechinus stuartii* (93, 122) and *A. swainsonii* (18, 17). The different species showed some habitat selectively, with *R. lutreolus, M. fuscus* and *A. swainsonii* being detected more frequently in the wetter, densely covered sites than in drier sites. Others elsewhere have reported that slashed powerline easements are invaded by typically grassland species, by other non-forest species or by exotic species. That no introduced rodents were detected in such an obviously modified is unusual.

Predator control and rock-wallaby population dynamics, twenty years on: an overview of the impact of introduced predators — the fox and feral cat

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Abstract: Five remnant populations of rock-wallabies (*Petrogale lateralis*) persisting in the WA wheatbelt have been periodically censused since 1979. From 1982-90, foxes were controlled by baiting at two sites and all sites were censused at 2-4 year intervals. From 1990 to 1998, all five sites have been baited, but in 1995, the frequency of baiting was doubled for all sites and additionally, at 3 sites, efforts to control feral cats were also made. A summary of some results is as follows: Absolute control of predators was not possible because the sites were rapidly re-invaded between baitings. Nevertheless, all populations have increased significantly in response to fox control, and one population has reached carrying capacity. Another population (during the period of no predator control) went to extinction, but translocated rock-wallabies to this site have thrived under fox control.

In some populations, regardless of the frequency of baiting, a disparity in the sex ratio is evident suggesting that there is a background level of predation affecting female rock-wallabies more so than males. The cause of the sex ratio bias, which strongly favours males at some sites, remains unresolved. New baiting procedures that selectively remove, either the feral cat, or the fox, would help to resolve this issue.

Clearly, predation is the major threatening process affecting the abundance and distribution of *P. lateralis*. Predator control is therefore mandatory if the long term viability of this species can be guaranteed, but the optimum baiting protocol still needs more research.

Session 6

Mammal Recovery Programs

Recovery and Discovery: Where We Have Been and Where We Might Go with Species Recovery.

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Re-introduction biology gathered momentum during the 1980s leading to the IUCN publishing a position statement on "Introductions, Reintroductions and Re-stocking" in 1987 and in 1995 releasing "Guidelines for Re-introductions".

Australia had been practising "Introductions" since 1788 and needed little guidance in that discipline. It had also been testing re-introductions, with varying success, in the decades prior to the 1980s. These re-introductions were most successful either within island areas such as Tasmania, or within the wetter more stable environments of southern Australia. Re-introductions in arid or semi-arid areas have been disappointingly unsuccessful.

Failed re-introduction programs have nonetheless focussed attention on a range of threatening processes including habitat degradation, competitors and predators. The overwhelming impact of the Fox and Feral Cat has emerged as a key conservation problem. Assuming cats will be eventually controlled along with foxes, the longer term concern will be for the evolutionary direction of mammal fauna in an environment free of cursorial predators. With Dingoes also gone, will we be left with a zoo?

Many arid zone species collapsed from abundance to extinction in less than 20 years. There are danger signs for species of the wet-dry tropics, and some remaining arid zone mammals. The need for action is urgent. Besides predator control we must further explore threatening processes through yet untested trophic groups such as small insectivores (*Phascogale calura*), rock dwellers (*Zyzomys pedunculatus*), arboreal herbivores (*Trichosurus vulpecula*), and smaller rodents (*Pseudomys fieldii*).

The Reintroduction of the Western Barred Bandicoot to Heirisson Prong, Western Australia

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The Western Barred Bandicoot was last recorded on mainland Australia in 1929, but survived on two islands in Shark Bay, Western Australia. It was reintroduced from Dorre Island to a captive breeding enclosure at Heirisson Prong, Shark Bay in November 1995. Heirisson Prong is a mainland site where foxes and feral cats have been eradicated, but has a dense population of rabbits. In May 1997, four male and four female bandicoots were radio collared and released to free-range on Heirisson Prong. Most animals remained in the release area. Females moved < 400 metres from their release point and males moved up to 4.8 kilometres over a ten day period after release. However, all but one male remained in contact with females. The free-range bandicoot population had gradually increased with production of young and has dispersed over time to occupy 4 km^2. Hence, dispersal of released animals was not a major problem.

Body condition and reproduction of the reintroduced animals are similar to those of animals on Dorre and Bernier Island despite substantial browsing by rabbits causing major defoliation of shrubs chosen as nest sites by bandicoots. Current research is aimed at quantifying the impact of rabbits on canopy structure and litter accumulation on shrubs preferred for nesting sites and assessing whether this impact affects nest choice.

Nest Use by Reintroduced Western Barred Bandicoots at Heirisson Prong, Western Australia

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The Western Barred Bandicoot was reintroduced from Dorre Island to Heirisson Prong at Shark Bay in November 1995. Heirisson Prong is a mainland site where foxes and feral cats have been eradicated, but has dense populations of rabbits.

Nest construction and choice of shrubs for nesting sites by bandicoots were examined at two sites on Heirisson Prong. Bandicoots nest amongst leaf litter under the canopy of a shrub, creating a small depression in the sand, lining the base with litter and then covering themselves with another layer of litter. Females typically use 3-5 nests and males 4-6 nests over a 10 day period. Bandicoots nest under shrubs with an average ground litter cover surrounding the nest of 76% but ranging from as little as 5% to 100%. Litter depth averages 2.4 cm (ranging from 0.5 to 6.8 cm). The two most common shrub species used for nest sites were *Acacia tetragonophylla* (37%) and *Melaleuca cardiophylla* (24%). The availability of these species at the release sites were 9.5% and 28% respectively, while the most common shrub *Thryptomene baeckeacea* (45%) was not used as a nest site by the bandicoots, probably due to a lack of leaf litter. Hence, the bandicoots appear to actively choose particular shrub species as nest sites.

Browsing by rabbits causes substantial defoliation of shrub species chosen as nest sites by bandicoots. Current research is aimed at quantifying this impact on canopy structure and litter accumulation and assessing whether this affects the microclimate of nests or the vulnerability of bandicoots to predation.

Translocation Of The Western Pebble-mound Mouse In The Pilbara Of Western Australia.

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The Western Pebble-mound Mouse (*Pseudomys chapmani*) is distributed throughout the Pilbara region of Western Australia. Prior to 1997 *P. chapmani* was listed under Schedule 1 of the Wildlife Conservation Act (1950) as a species that is rare and endangered and likely to become extinct. The presence of *P. chapmani* on iron ore deposits in the Pilbara represented a major conservation issue for mining companies operating in the region. In order to minimise the level of disturbance to *P. chapmani* during the development of new mining projects a translocation program was developed and undertaken at Hamersley Iron's Yandi iron ore project. The primary aim of the translocation was to remove *P. chapmani* from high disturbance mining areas and relocate them to areas that will not be disturbed. In addition to the primary aim the translocation methodology tested the effects of individual familiarity within translocation groups on translocation success. Translocation success was measured by comparing the long term survivorship and fecundity of translocated mice with that of non translocated (control) mice. Of the 101 *P. chapmani* translocated at Yandi, 65% were recaptured at least once post release. Eight mice were recaptured at, or close to, their point of release 6 months post translocation. Reproductive activity was recorded in 13 of the 29 (44%) females recaptured post translocation. Familiarity within translocation groups did not affect translocation success. The results indicate that both long term survivorship and fecundity have been achieved in the translocation group. It can be concluded that the translocation at Yandi has been successful in relocating *P. chapmani* away from mine site disturbance.

Assessment of habitat utilization by *Pseudomys novaehollandiae* for recovery planning.

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The New Holland Mouse (*Pseudomys novaehollandiae*) is currently known to be present at only four locations within Victoria: Wilsons Promontory, Loch Sport, Providence Ponds and Anglesea. The only known extant population at Anglesea inhabit a small area of heathy woodland located in the Forest Road Flora Reserve. As part of the recovery plan the aims of this study were to determine the habitat utilization of the New Holland Mouse and other small mammal species present within the study area.

Floristic and structural vegetation data was assessed at each trap site. The vegetation data was analysed using multidimensional scaling, cluster analysis and logistic regression. Based on trapping data, population dynamics were assessed. Habitat overlap between small mammal species within the study site was analysed using the Levins Index for overlap. The location and use of burrows by the New Holland Mouse was also investigated.

Over the three year study period the population of species present have declined. The New Holland mouse inhabited diverse heathy woodland communities in preference to rehabilitating pine plantations and bracken dominated woodlands. Females within the New Holland Mouse population inhabited select burrows while males did not exhibit such preferences. The implications of the analysis for recovery of the species are discussed

The distribution and roost habitat of the Orange Leaf-nosed bat, *Rhinonycteris aurantius* (Microchiroptera: Hipposideridae) in the Pilbara region of Western Australia.

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Prior to the present study, *Rhinonycteris aurantius* had been collected from seven locations throughout the Pilbara region of Western Australia since 1925. Furthermore, roost sites were only known from two of these records, which occur in disused underground mines near Marble Bar. Six field surveys have provided further knowledge of the distribution and roosting requirements of the taxon in the region. *R. aurantius* has been observed in at least three additional mines, which are used for at least part of the year, near Marble Bar. Additionally, *R. aurantius* was recorded in four new locations in the East Pilbara. In two of these, *R. aurantius* occupies mines at Bamboo Creek and Nullagine. In the other two locations, it is predicted that natural roosts remain to be discovered. The newly discovered roost at Bamboo Creek supports the largest known colony in the Pilbara. Three natural roost sites were also located in Barlee Range Nature Reserve. The formation of these unique erosional features is dependant on the type of geology and the action of water. Only certain types of terrain in the Pilbara have the potential to provide the unique features suitable for roost sites and roost availability is predicted to be low. A model of the interconnectedness of predicted suitable habitat of *R. aurantius* in the Pilbara is being developed based on landform features. It can be tentatively concluded that the typical roosting requirements of *R. aurantius* in the Pilbara may be different to those reported from the Northern Territory. In addition, although there are records from throughout the Pilbara, the number of *R. aurantius* usually observed has generally been less than ten.

Intersite differences in population demography (1987-1997) of Mountain Pygmy-possums *Burramys parvus* Broom: Implications for metapopulation conservation in Koskiuszko National Park.

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Four populations of the endangered Mountain Pygmy-possum *Burramys parvus* have been under study in Koskiuszko National Park, since 1987. Analysis of the 11 year data sets indicate some generalised trends in population numbers and weights which were related to gross differences in depth and duration of snow cover and extreme minimum temperatures across the region. However, there were strong intersite differences in yearly population trends, annual and overwinter recapture rates and recruitment. Initiation of breeding varied annually and between sites, due to annual and localised differences in the timing of snow melt. Site differences were also expressed in operational sex ratios and longevity. Strong density dependance was shown on all sites in annual recruitment and to a lesser extent survival. These results are discussed in relation to differences in the microhabitat characteristics of each site and the social system of *B. parvus*. Implications for metapopulation conservation are inferred.

Behaviour of Gilbert's Potoroo (*Potorous gilbertii* Gould) in Captivity

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In late 1994, Gilbert's Potoroo was rediscovered at Two People's Bay Nature Reserve near Albany, almost 120 years after it was believed to have become extinct. Since then, detailed studies of the potoroo's behaviour and ecology have been considered vital to an understanding of the needs of this critically endangered species, and to provide the basis for management decisions in relation to breeding, habitat management and captive care.

A study was conducted on nine animals housed in a captive colony at Two People's Bay Nature Reserve in order to determine the behavioural repertoire of the species with particular attention to breeding behaviour, interactions between males and females, and the behaviour of males housed in differing conditions. One purpose of the last was to determine whether there was a behavioural cause for an observed excessive encrustation of male genitalia. Activity patterns were also studied.

It was found that the behavioural repertoire of Gilbert's Potoroo is similar to that of other *Potorous* spp. and other closely related potoroid marsupials. No obvious behavioural differences between a male housed alone and males housed with one or two females were observed that might explain penile encrustation. Some differences in the behaviours of sexually compatible and incompatible pairs were observed.

It was also found that although *Potorous gilbertii* is most active at night, activity before sunset and after sunrise commonly occurs. Activity during the middle of the day was, however, observed on only a few occasions.

Conservation of the western ringtail possum, *Pseudocheirus occidentalis*: Review of distribution; and Translocation of rehabilitated possums.

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Although considered patchy, the former distribution of the western ringtail possum, *Pseudocheirus occidentalis*, encompassed most of the southwest corner of Western Australia, the Perth metropolitan area and some wheatbelt sites. This distribution has contracted and is now restricted to coastal and near-coastal peppermint (*Agonis flexuosa*) woodland and eucalypt forest. The only known inland populations where peppermint is absent were thought to be at Perup forest and nearby forest blocks northeast of Manjimup. Recent survey has extended the northern limit of species' known distribution and it has also been confirmed at jarrah/blackbutt sites near Collie and karri/marri forest in Porongurup National Park. The known distribution now extends from the Harvey River, east of Harvey, south along coastal and near coastal areas to east of Albany with inland sites at Collie, Perup/Manjimup and Porongurup National Park. Population size is considered critically low at the Harvey River site and unknown at the Collie and Porongurup sites. However, the western ringtail possum is locally common in the Busselton and Albany areas in the southwest. Within Busselton and Albany townsites, western ringtail possums are often reported injured and/or orphaned. These possums are usually rescued, passed on to wildlife carers and rehabilitated to a condition where they are suitable for release into the wild. A release program, in the presence of fox control, commenced in 1991 at Leschenault Peninsula Conservation Park, north of Bunbury. The program has led to the establishment of a self sustaining population in secure conservation estate. The results contrast sharply with findings from a similar study of the closely related common ringtail possum, *Pseudocheirus peregrinus*, from eastern Australia.

Management considerations of two species of rock-dwelling possum.

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Rock-dwelling mammals are especially vulnerable to extinction, because many populations are restricted to small isolated patches where the effects of anthropogenic disturbance or introduced predators can be severe. Most research has focused on southern species (rock wallabies), yet the distribution and ecology of northern saxicolous mammals remains virtually unstudied. I studied the behaviour and habitat requirements of two species of rock-dwelling possums, the Rock Haunting Possum (*Petropseudes dahli*) and the Scaly-tailed Possum (*Wyulda squamicaudata*) in Northern Australia. Radio-tracking and field observations provided information on food and nest-site requirements, home ranges, and social organisation. Both species require fractured rocks for nest sites and specific food plants in close proximity to rock outcrops. Potential threats include the invasion of a predator (such as foxes) which are capable of penetrating rock nest sites, and late dry season firing of bush around rocks which threatens the short and long term food supply of rock dwelling possums. Clearing of bush and grazing are also potential threats to these possums. However, effective management of both species will involve detailed survey work to determine the current distribution and abundance of rock-dwelling possums.

1080 and Rufous Hare Wallaby Conservation

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Captive breeding of the Tanami Desert population of Rufous Hare Wallabies (*Lagorchestes hirsutus*) began in 1980. It was the only known mainland population of the species and has now become extinct. A captive population from that project and wild populations on Bernier and Dorre Islands are the only ones currently known to exist. There are re-establishment plans for the species which now occurs on less than 1% of its former range. Reintroductions of Australian mammals have been most effective in areas where exotic predators were controlled, generally by using poison baits.

High levels of tolerance to 1080 of some species of native fauna was shown in southwest Western Australia in the 1970s. It occurs because of coevolution with plants in the genus *Gastrolobium*, which contain 1080 and are abundant in Western Australia. High tolerance to 1080 was found later in some species in central Australia.

The tolerance of Hare Wallabies is approximately 200 times that of foxes and 1080 is a highly selective toxin for foxes, which readily take meat baits. It is currently not used near the captive compound in the Tanami because of landholder concerns. Shooting and trapping are used for control of foxes, which are more labour intensive and costly.

Baiting programs in Western Australia have been highly successful in reducing fox numbers. Many species of mammals are showing recoveries in baited areas. There are plans for reintroductions of Hare Wallabies into reserves in Western Australia after a successful breeding program.

The Steps Towards Conserving Koala Habitat On Private Lands In NSW: Ecology, Policy, Economics, Planning And Management

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The conservation of koala habitat on private lands has proved to be a complex issue requiring the integration of ecology, policy, economics, planning and management. In Coffs Harbour, on the north coast of NSW, the development of a plan of management for koalas involved rigorous survey and mapping of koala habitat, compliance with new state planning policy to protect this habitat, an economic evaluation of the koala plan of management and working with council planners to incorporate koala habitat into the revision of their local environmental plan, which is a formal planning instrument. The koala plan of management provides a consistent approach to koala protection on private lands in the shire, including planning constraints for various levels of koala habitat, specific objectives for the management of this habitat and actions for the management of road risk, dogs, health and welfare, fire and ongoing management and review. A comparison of the costs and benefits of a shire-wide plan, shows that the benefits are more than double those of the costs of piecemeal decision making, *i.e.* a decision after a development application has been lodged. Thus a strategic approach is cost-efficient, and the success of this work should provide the impetus for other councils currently considering whether to adopt this program for conserving remnant koala habitat on private lands within their jurisdiction.

Session 7

General Papers

Translocation behaviour and natural dispersal in brushtail possums

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The behaviour, movements and fate of radio-tagged brushtail possums (*Trichosurus vulpecula*) were studied after they were translocated between sites on farmland in two areas in the southern North Island, New Zealand. At both sites some possums remained near the release site while others moved up to 12.5 km before settling. At one site, four possums returned distances of about 3.9 km from the release site to their sites of capture (homing), with two of these homing successfully twice. Translocated possums displayed some of the characteristics of naturally dispersing possums but unlike them, their long distance movements were not male-biased nor made particularly by juveniles. The location and availability of suitable nest sites appeared to influence the movements of translocated possums, but no other major influences of landscape features on their patterns of movement were detected. Survival after translocation was not influenced by sex, age, weight, distance moved or time since release. Translocated possums on New Zealand farmland, where the main predators are people and vehicles, suffered much lower mortality than possums in a similar study in Australia, where canids, particularly foxes, were a major cause of death.

The Survival Rate of Brushtail Possums Relocated into Captivity in Brisbane from the Environs of Brisbane, Adelaide and Armidale

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The transfer of possums from the wild into captivity is thought to cause stress and presumably additional stress is observed following their relocation to an area distant from their site of capture. In the present study, brushtail possums from the environs of Brisbane, Adelaide and Armidale were monitored following their placement into captivity in Brisbane. The survival rate of possums trapped in the environs of Brisbane was considerably higher than that for possums relocated from Adelaide and Armidale. Over the first 20 weeks of captivity, the survival rate of the Brisbane, Adelaide and Armidale possums was 80.4% (N=20), 53% (N=17) and 60% (N=24) respectively. The most common cause of death during the first 20 weeks of captivity was bacterial infection whereas many possums that survived longer than 20 weeks died of renal disease. During the first 20 weeks of captivity, possums may have become susceptible to bacterial infections as a result of the stress associated with their capture and relocation into captivity. These possums displayed a rapid decrease in body weight, a high plasma concentration of cortisol, a low concentration of thyroxine and changes in the number and proportion of white blood cells, all indicators of stress. Stress may also have contributed to the low birth rate of the Adelaide and Armidale possums compared to the Brisbane possums. The results of this study confirm the hypothesis that possums relocated from a distant location experience greater stress compared to possums from the local environment when placed in captivity.

Platypus activity patterns and foraging behaviour in a sub-alpine Tasmanian lake system.

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The seasonal differences in activity patterns and foraging behaviour of adult platypus was examined by hand-held radio-tracking techniques. Eight platypus (five males and three females) were tracked over a 24 hour period in August/October and five (two males and 3 females) in February.

A high proportion (5 of 13) of the platypus confined their activity to daylight hours. This occurred more in winter than summer, with 4 of 8 platypus being diurnal in winter and only 1 of 5 diurnal in summer. Diurnality occurred more often with females rather than males, with only 1 of the males diurnal compared to 4 of 6 females.

The duration of foraging activity ranged between 8.5 and 14 hours with significantly longer foraging periods in winter. Foraging ranges (lake area used during one foraging period) were between 3 and 58 hectares (lake size 142 ha), with no significant differences between the seasons or sexes.

Burrow usage was also investigated with some platypus using vegetated burrows, being in grass tussocks and sphagnum mires, rather than the more typical consolidated burrows.

Thymus, Thyroid, Parathyroids, and Ultimobranchial Bodies in the Echidna, *Tachyglossus aculeatus.*

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A study of the anatomy and microstructure of the thymus, thyroid, parathyroid gland and ultimobranchial body in the echidna (*Tachyglossus aculeatus*) showed that these organs have unique morphology for mammals with many features showing reptilian affinities. Monotremes are the only mammals that have thyroid and parathyroid glands entirely located in the thorax and ultimobranchial bodies which form separate endocrine organs ventrolateral to the commencement of the trachea. The location of the thymus is also unique for a mammal in that its caudal region associates with the ventral surface of the pericardium.

Echidnas have one pair of parathyroid glands located near the origins of the major branches arising from the aortic arch. The parathyroids are often associated with thymic tissue but never with the thyroid. Histologically principal cells and non-secretory cells were identified in the parathyroid glands. Principal cells showed polarity and had microlamellar projections that formed intercellular canaliculi. Non-secretory cells had ultrastructural features similar to those of some thymic epithelial reticular cells. Immunostaining of parathyroid hormone showed diffuse distribution in parathyroid principal cells and none in ultimobranchial bodies. The thyroid is on the ventral surface of the end of the trachea and ventral to it is fibrofatty tissue containing thymic lobules. Calcitonin and calcitonin gene-related peptide were not detected in the thyroid by immunostaining, indicating a lack of parafollicular cells in this gland. However similar techniques revealed the presence of these hormones in the ultimobranchial bodies thus confirming the identification of these organs.

Species Composition and Abundance of Bats in a Semi-arid Region of Central Western Queensland, Australia

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Basic information on the species composition, relative abundance, distribution and habitat preferences of bats in the arid and semi-arid areas of Australia is poorly known even though many reviews and fauna surveys have been undertaken in these areas. During most of these surveys bats are only sampled opportunistically and there are very few published long-term studies of bat communities in these areas.

In 1995 a survey was conducted at Idalia National Park, about 85 kilometers west south-west of the town of Blackall, in the semi-arid zone of central western Queensland. During the survey 14 species, representing nine genera and four families were recorded using a variety of direct and indirect methods of detection. A sampling effort of 27 bat trap-nights and four tripline-hours over 15 days resulted in 859 captures of nine species. The mean number of bats captured per trap-night was 31.4 with highest capture success being 273 bats caught in one trap set for one night.

The bat species recorded were: *Pteropus scapulatus,* two unidentified *Mormompterus* species, *Mormopterus beccari*, *Nyctinomus australis*, *Taphozous georgianus*, *Saccolaimus flaviventris*, *Nyctophilus gouldi*, *N. geoffroyi*, *Chalinolobus picatus*, *C. gouldii*, *Scotorepens greyii, Vespadelus vulturnus,* and *V. finlaysoni* (?). The occurrence of the Little Forest Bat *Vespadelus vulturnus* at Idalia represented a northward range extension of about 500 kilometers for this species in eastern Australia. On the basis of body mass and forearm length, *V. vulturnus* from Idalia is Australia's smallest mammal and is within the size range of Kitti's Hog-nosed Bat *Craseonycteris thonglongyai*, which is reported to be the world's smallest mammal.

Further observations on the biological and chemical characteristics of the chin gland secretion of the rabbit

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Both field and laboratory studies have been conducted on social structure and dominance behaviour in the European rabbit (*Oryctolagus cuniculus* L.). Behavioural and other studies around the world suggest that the secretion from the submandibullar cutaneous (chin) gland play a vital role in this behaviour.

While it is not feasible to conduct a complete chemical characterisation of the chin gland secretion, which contains more than one hundred volatile components, some steps have been taken and are reported here. The volatile components of the chin gland secretion have been examined by headspace gas chromatography, and coupled gas chromatography-mass spectrometry. Solid-phase microextraction and solvent-based chromatographic methods have also been used. Results of all of these techniques will br discussed.

The protein content of the chin gland secretion has also examined, and the amino acid sequence of several of the important protein bands were determined. These sequences were then compared to published sequences of rabbit proteins using the computer-based ANGIS system.

Comparisons were made between captive wild rabbits and field rabbits with respect to behavioural observations and chemical composition of the chin gland secretion The social status of captive wild rabbits held in groups of three was determined from observation. This social system was then perturbed by removal of the dominant male. This removal resulted in a decrease in the complexity of the chemical signal of both the remaining male and female. The implications of this will be discussed.

Behaviour and Ecology of the Bottlenose Dolphins, *Tursiops truncatus*, in Port Phillip Bay, Victoria: Seasonal Patterns.

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The behaviour, ecology and sound production of bottlenose dolphins, *Tursiops truncatus*, in Port Phillip Bay, Victoria was studied from January 1997-March 1998. The study was conducted in the southern end of Port Phillip Bay, which has been proposed as a marine sanctuary zone. Behaviour was documented using a five minute group focal sampling technique.
Data collected included variables such as behaviour, pod geometry, pod orientation, pod size, number of subpods, specific behaviour, surface behaviour, distance offshore, tidal current, boat traffic and tour operators approach. It is believed that these are the first documented observations of the dolphins in Port Phillip Bay throughout an annual cycle.
The overall proportion of time spent by the dolphins in the area was; Summer 1997 (9.2%), Autumn (6.4%), Winter (2.1%), Spring (11.8%), Summer 1998 (51.6%) and March (18.9%). The total number of sightings were greatest during the summer period accounting for 77.4% of the sightings and least in winter (1.2%).

Underwater sound recordings of dolphin vocalizations were analyzed. 100 whistles (from 450 whistles recorded) were selected based on clarity. Whistles were analyzed using a spectroanalysis software program (Avisoft) suggesting the presence of 5 distinctive contours produced by this population of *T. truncatus*. It is possible therefore to identify five individual bottlenose dolphins from these results based on the signature whistle hypothesis.

Southern Right Whale Remains from 19th Century Whaling at Fowlers Bay, SA

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Fowlers Bay was the site of whaling operations during the mid 1800s. Ship logs of one American barque, *Amazon*, are available which show that 33 southern right whales and 8 humpbacks were taken there during winter 1840. In 1994, 105 well-preserved whale bones were unearthed from sands deposited along the shore since last century. All identifiable bones were from southern right whales, *Eubalaena australis*. Six skulls were excavated and a further four were visible at the surface, making 10 the minimum total individuals at the site. Postcranial bones were mostly ribs and large vertebrae from both physically mature and immature animals. Comparison of measurements with known-length skeletons showed the Fowlers Bay animals to be >12 m. No bones of calves were recorded but these may have been too fragile to have been preserved. One of the aims of the study was to determine if flensing and trying-out were done on shore or on ship while at anchor. Bones were generally found in groups which contained the remains of more than one individual. This suggests that if the whales had been flensed on shore and the relatively intact carcass left there to rot, the bones had since become mixed up by wave action during north easterly storms. Had the carcasses been left to sink after flensing beside the ship, it would be difficult to imagine how so many dense bones could have been washed up on shore. The existence of an extensive rock platform below the bones on the old shoreline would have made an ideal surface for flensing and trying-out blubber. An archaeological team studied the site during the bone dig but no structures or whaling implements were found.

Spatial Patterns In Honey Possums

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The honey possum *Tarsipes rostratus* is a small (7-12g) diprotodont marsupial that feeds exclusively on pollen and nectar. It occurs only in south-western Australia and is most abundant in sandplain heathlands. We have studied honey possums in one such heathland, the Fitzgerald River National Park, since 1984 using mark-recapture in grids of pitfall traps. Most were very sedentary all year, moving no more than 30 m over 1-3 months. Male home ranges, estimated by the minimum area method for individuals caught six times or more, were significantly larger (1277m^2) than those of females (701m^2) but neither sex appeared markedly territorial. However, the larger females, which have pouch-young throughout the year, may secure priority access to the best floral food resources, forcing males farther afield. More extensive male movements may also be linked to a promiscuous mating system.

Spool-and-line tracking of 23 male and 18 female honey possums resulted in 9 males and 9 females followed for at least 10m. On average, 75% of each trail was on the ground. Eleven individuals were traced to feeding sites on banksia and dryandra flowers where some were later observed. It is suggested that honey possums are trap-line foragers that use known foraging routes during sequential nights.

On The Rearing Of Honey Possums

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Previous attempts at breeding the marsupial Honey possum (*Tarsipes rostratus*) in captivity have met with some success although females have not successfully weaned their young. A small colony with founder animals from the Scott National Park and the Fitzgerald River National Park has been established in outdoor yards measuring 4m x 4m x 2m, planted with species of *Banksia, Adenanthos, Isopogon, Grevillea, Dryandra* and *Callistemon*. The animals were fed a supplementary daily diet in which the amount of nitrogen was increased from 5.6mg in a published diet (Russell and Renfree, 1989) to 20mg for each animal, with a concomitant increase from 15% to 54% of the nitrogen presented as pollen. The higher concentration of nitrogen was based on estimates of dietary components in the field and represents an average daily consumption of 500mg pollen. The first young were born approximately 3 months after a mating season in the field or after the females were transferred from indoor conditions to outdoor yards. Four mothers have successfully reared six joeys to adult weight and are now producing their second litter. One mother, from the Fitzgerald River National Park gave birth barely three months after the birth of her previous litter, while the three mothers from Scott National Park all gave birth some five months after the birth of their first litter. These second births in animals from both origins have been synchronised to occur in the middle two weeks of February.

The Influence of Flowering Resources on the Behaviour of *Cercartetus concinnus*

Briony Cadzow

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A number of studies have shown that *Cercartetus* species uses nectar and pollen as a food resource (Carthew 1994, Horner 1994, Turner 1984, Ward 1992a, Ward 1992b). The aim of the present study is to look more closely at the relationship between flowering and the behaviour of *Cercartetus concinnus*. To determine whether the distribution and abundance of flowers influences the movements of *C. concinnus*, 12 trapping grids have been established in three vegetation communities at Newland Head Conservation Park, near Victor Harbor in South Australia. Trapping has been conducted monthly, and the timing and density of flowering at each trapping grid have also been monitored, allowing comparisons between capture rates and flowering. Animals have also been tracked using chemi-luminescent tags. This has allowed more detailed observations of animal movement, and of foraging behaviour at individual plants.

Carthew, S. (1994). *Oikos*. 69: 133-139

Horner, B. (1994). Honours Thesis. Adelaide University.

Turner, V. (1984). *Oikos*. 43: 53-61.

Ward, S.J. (1992)a. *Aust. J. Zool.* 38: 287-304.

Ward, S.J. (1992)b. *Aust. J. Zool.* 40: 43-55.

The Social Behaviour and Captive Management of the Bennett's Wallaby

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Macropod species are commonly exhibited, despite little being known of how captive conditions may affect their behaviour. Behavioural changes can indicate more profound changes in physiological status, particularly stress and reproductive parameters. Bennett's wallabies are frequently maintained in zoos in Australia and other countries, often in groups of reasonable numbers. This is the first detailed comparison of the behaviour of Bennett's wallabies in the wild and captivity under various regimes. Questionnaires on the captive conditions of macropods were distributed to Australian zoos and animal parks. This allowed a detailed analysis of specific factors including the size and shape of enclosures, stocking rates, feed amount and type and composition of groups. An inventory of behaviours performed in the wild and captivity has been compiled to form the basis of a comprehensive ethogram. Activity and sociospatial patterns are also being quantified. Manipulations of the captive conditions of a group of Bennett's wallabies are being undertaken. Their social behaviour, spatial patterns and stress and reproductive hormone levels are being used to quantify the effects of: stocking rates; group structure; dominance relationships and their effects on breeding; visitor disturbance on activity patterns; and the number and positioning of feeders. Recommendations will be made about ways to optimise the captive conditions of Bennett's and, by extrapolation, other macropods in captivity in zoos and farming operations.

Who needs sex chromosomes anyway? Sex chromosome elimination in the bandicoot *Isoodon macrourus*.

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Cytogenetic studies have shown that the Y chromosome is eliminated from many somatic cell types of *Isoodon macrourus*, the Northern brown bandicoot. Molecular techniques allow examination of a greater range of tissue types than was possible using cytogenetic techniques. Presence or absence of the Y chromosome was established using partial DNA sequences of *I. macrourus* Y-linked *SRY* (Sex determining Region on the Y) and *UBE1Y* (Ubiquitin activating Enzyme 1Y) genes and X-linked *G6PD* (Glucose-6-phosphate dehydrogenase) as a control. We show that a very small proportion of cells comprising haematopoietic tissues, and even fewer in peripheral blood, retain the Y chromosome. The Y chromosome is retained in most brain, liver, kidney and lung cells and in cardiac and skeletal muscle. We have shown that the Y chromosome is retained in some cell types within tissues of adult bandicoots previously believed to completely eliminate the Y chromosome.

Diet And Foraging Of Brush-tailed Phascogales In Jarrah Forest

Fiona Scarff; Susan Rhind & Stuart Bradley

The diet and foraging behaviour of an arboreal marsupial, the Brush-tailed Phascogale (*Phascogale tapoatafa tapoatafa*), was examined in the jarrah forest of southwestern Australia. Radio-tracking was used to confirm the species' nocturnal foraging habit and to make direct observations of foraging behaviour. Eleven stomachs, and a collection of 45 scats obtained during summer and autumn, were microscopically examined for content. The availability of major prey items (invertebrates found on or under the bark of tree trunks) was quantified. Phascogales proved to be foraging generalists, and their diet predominantly consisted of invertebrates. Some invertebrate taxa appeared to be preferred but few taxa were avoided. Active pursuit of vertebrates was negligible. However, the species appears opportunistic, and scavenging of vertebrates may contribute to the diet. Nectar was also taken, appearing to be a particularly prized but rare and patchy food source. The foraging niche occupied by the phascogale is discussed in the light of these results.

Brushtail possum, *Trichosurus vulpecula*, populations in south-western Australia: demography, diet and conservation status

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The Common Brushtail Possum, *T. vulpecula*, has suffered a marked reduction in its geographic range from the arid areas of Western Australia and now is abundant only in the more mesic forests and woodlands of the southwest. A mark-recapture and dietary study of a population in the Tuart/Peppermint forests near Busselton revealed that the population occurred at a density of between 2-3 individuals per hectare, fed principally on Peppermint, *Agonis flexuosa*, but occupied all treed habitats in the area, including *Pinus radiata* plantations. Females matured after three years, producing a single young annually between April and September which was weaned around seven months later. Comparisons between the demographic parameters of this populations and that of a study from semiarid southwestern Australia showed marked differences which were comparable to variation shown by population studies of *T. vulpecula* in eastern Australia and New Zealand. Predation has probably had a marked effect on determining the present distribution and abundance of the species in southwestern Australia.

Foraging behaviour of a small dasyurid, *Ningaui yvonneae.*

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Ningaui yvonneae is a small dasyurid found in the semi-arid regions of southern Australia. We are examining the foraging behaviour of this species, with the aim of identifying the preferred foraging micro-habitats, the frequency of prey captures within micro-habitats, the size and type of prey captured and the type of activity performed within each micro-habitat. Data is collected by directly observing animals at night with the aid of chemi-luminescent tags. To date, *Triodia irritans* has been the most commonly visited micro-habitat (48% of observations) along with leaf litter (24%) and low shrubs (13%). However, *Triodia* is also one of the more commonly available habitats at the site (15%), and preference indices (which take into account availability) indicate that other micro-habitats are also important. *N. yvonneae* spends a significant amount of its 'active' time foraging for food (49%). It has a broad invertebrate diet, varying in size from termites to large centipedes. Most prey captures occur in leaf litter (40% of observations) and *Triodia* (31%). Future work will focus on the relationship between foraging place and the risk of predation.

Spatial Organisation of the Tiger Quoll, *Dasyurus maculatus*, in South-east Australia

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The spatial organisation of the tiger quoll was investigated by means of a trapping and radiotelemetry study at three sites in south-east Australia. Male tiger quolls were found to occupy very large home ranges (1500 - 4500 ha), which overlapped extensively with other males and females. Home range size appears to remain constant throughout the year, however movement within the home range increases during the breeding season (May-August).

Female tiger quolls occupy significantly smaller home ranges (600 - 1000 ha) than males, and they display intrasexual territoriality, responding to the presence of other females on or near their territorial boundaries. Female offspring appear to be tolerated within the adult females territory, until they approach reproductive maturity. It is unclear whether the adult female partitions her territory, tolerates overlap, or expands her territory to accommodate her female offspring.

Male offspring appear to disperse from the natal territory soon after weaning.

Poster Presentation

The importance of disused mines for threatened bats in the east Pilbara, Western Australia.

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Several disused mines in the East Pilbara support the largest known aggregations of two monotypic endemic bat species, *Macroderma gigas* and *Rhinonycteris aurantius*, in the Pilbara region of Western Australia. Both species are regarded as "Vulnerable" by the IUCN (1996), the latter being specially protected under Schedule 1 of W.A. state legislation. *M. gigas* and *R. aurantius* have been recorded throughout the Pilbara but less abundantly in areas other than the mines of the East Pilbara, possibly due to the availability and nature of roost sites. Individuals in the East Pilbara rely on the mines for the provision of a suitable microclimate for breeding and survival. The purpose of this presentation is to highlight that, despite their conservation status, the roosts in which these two bat species form the largest aggregations due to the provision of suitable habitat, are not protected. The colonies have been subjected to several disturbances in the past and there is some evidence that this has been to their detriment. The colonies also face several future threats. Short and longer term solutions are proposed to protect the roosts of *M. gigas* and *R. aurantius*. Further study is also recommended.

A Close Shave: development of a photographic of reference of Dasyuridae hair

Maria Belvedere, Rob Wallis, & Hans Brunner

Ms Maria Belvedere (post graduate student, working towards Masters of Applied Science) Professor Rob Wallis,

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Mammalian hair analysis has applications in a wide variety of scientific disciplines. In wildlife management studies in can be used to detect species which may not be found using conventional survey techniques. Hair samples are typically collected in the field from scats and pellets, hair funnels / tubes or from tufts of hair found in places such as sprung traps or on fences. To date mammalian hair studies in Australia have occurred in southern Australia and have been regional studies. Given the last published reference was in 1985, it is believed that continuing research of hair structure of Australian mammals is long overdue. This research is examining the hair structure of species within the family Dasyuridae. The intent is that by studying closely related species it will be possible to determine the specificity of a variety of hair characters. This research will add to previous Australian studies by incorporation of colour photomicrography, use of the Scanning Electron Microscope (SEM) to examine cuticular scale patterns and examination of hairs for fluorescence under UV light. Preliminary observations of Dasyuridae hair structure are present. Results from this study will have practical applications for field researchers. In the long term, this research will contribute to an Australian wide reference of the hair characteristics of all our mammal species. The authors are also calling on fellow researchers studying Dasyurid species for hair samples.

A Preliminary Population Model for the New Holland Mouse *Pseudomys novaehollandiae*

Arnis Dzedins and Barbara Wilson

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Population models have typically been developed for long-lived species inhabiting environments which are relatively stable over time scales comparable to the species' longevity. Such models frequently track populations on an annual basis. Generic models are thus not well adapted to the biology of small rodent species whose population processes take place in significantly shorter timeframes. The New Holland Mouse *Pseudomys novaehollandiae* is a short-lived species with a life expectancy of approximately 12 months. Its optimum habitat is vegetation actively regenerating after major disturbance such as fire and the lifetime of this optimum habitat is of the order of 2 to 5 years. Its reproductive potential is variable, with the number of litters produced dependent on the length of the breeding season, which in turn depends on rainfall. In suitable conditions females may breed in the season of their birth. The long-term survival of New Holland Mouse populations is dependent on the availability of patches of suitable habitat and on its ability to colonise and exploit these patches while optimum conditions persist. A preliminary stochastic, age-based simulation model is described which is based on monthly time steps and takes explicit account of the species' biology and ecology. Preliminary results of simulations are presented with respect to patch size, habitat persistence, dispersal rate and environmental variability and their management implications are discussed.

The effect of season and the presence of female brushtail possums *(Trichosurus vulpecula)* on serum testosterone concentrations of male brushtail possums.

Dr Terry Fletcher, Denise Jones & Susie Scobie
Landcare Research & Cooperative Research Centre for Conservation and Management of Marsupials, PO Box 69, Lincoln, New Zealand

Male brushtail possums produce sperm all year and have seasonal changes in prostate activity and testosterone levels. The effects of season and presence or absence of female possums on testosterone concentration, body weight, scrotal volume and urine sperm numbers were measured in mature male brushtail possums. From June 1995 to November 1996 male possums (n=16) were kept in grassy outdoor pens (4x4x2m) in groups of one male and two females. The possums were maintained on a diet of cereal pellets with fresh fruit. Male possums were weighed, scrotal width and length measured, and urine and blood samples taken at 2-3 week intervals. The sperm numbers in urine samples were scored from 0-4. Serum testosterone was measured by radioimmunoassay. In January 1997six male possums were caged with an ovariectomized female and six male possums were caged with a female sterilized by tubal ligation. A third group of six male possums were caged alone approximately 30 m from the nearest female. All male possums were measured and sampled as above and, in addition, the width of their prostate gland was estimated by palpation. In 1995/96 mean body weight was maximal at the onset of breeding and minimal at the close of breeding. Testis volume and sperm score showed no seasonal pattern of change. A marked peak in testosterone secretion was correlated with the onset of breeding. The presence or absence of female possums did not affect seasonal changes in body weight, prostate width and testosterone concentration in male possums. An increase in prostate width was correlated with a rise in serum testosterone in each group of male possums.

Epididymal Structure and Function in the Koala

Rachel J. Gibson and William G. Breed,
Department of Anatomical Science University of Adelaide

Fertilisation is an unique event in biology when two genetically dissimilar cells, the sperm and the egg, come together to form a new individual. In order for this to take place the two gametes have to be functionally mature and, in eutherian mammals, the spermatozoon matures after it leaves the testis while migrating along the epididymis which involves a variety of molecular changes to its surface.

Sperm maturation in marsupials has been little studied and, in this project, male koalas have been used, making use of material obtained from the Kangaroo Island Vasectomy Programme. From this material the morphology and secretory activity of the epithelial lining of the koala epididymis has been determined.

Preliminary light and electron microscopical studies have shown the epididymal epithelium to contain four cell types. These appear similar to principal cells, basal cells, "clear" cells, and "narrow" cells described for other species. Principal cells are the most abundant and have a large Golgi apparatus with many vesicles suggesting synthesis and secretion of proteins. The basal cells increase in frequency along the duct and make contact with the basal lamina but not the lumen and thus may not be involved in producing secretions. The so-called "clear" cells have a very pale stained cytoplasm, but are PAS positive, indicating the presence of carbohydrates and mucosubstances. They do not have stereocilia on their apical surface, and may exhibit endocytosis. The cells described as "narrow" cells have cytoplasm filled with many vesicles and mitochondria suggesting secretion. 1D-SDS PAGE of epididymal fluids and sperm membrane extracts indicates that proteins of epididymal origin occur and that these become adsorbed onto the sperm surface. This study has shown that, in the koala, four cell types line the epididymis which appear to be similar in abundance and morphology to those in other marsupials. Their details will be described. The PAGE results suggest that there are proteins secreted by these cells, the details of which, have yet to be determined.

Nature and Intensity of Mortality Acting on an Adult Radio-Tagged Rabbit Population in Temperate NSW

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Mortality of radio collared adult rabbits was estimated using radio telemetry at Bathurst NSW. The objectives of the study were to determine the cause of death of the rabbits and compare mortality rates between specific groups with in the rabbit population.

Previous estimates of rabbit mortality have shown predation to be the most significant agent of mortality. These estimates failed to distinguish between rabbits dead from predation and scavenging by predators on rabbits dead from other causes. This over estimate of predation and the emergence of the rabbit calicivirus disease as a significant agent of mortality suggests mortality due to predation is markedly lower than is normally assumed. Rabbits were radio tracked every twelve days to determine their status as dead or alive. "Dead" signals were investigated and cause of death determined via observation, autopsy and liver analysis. Results of a study designed to estimate scavenging rates, conducted to rectify overestimation of mortality due to predation will also be reported.

Several groups within rabbit populations have been defined with reference to habitat usage and dispersal. One group described as "drifters" do not belong to social groups and utilise above ground structures as cover. The other group are "social group rabbits" which belong to warren systems and the normal social hierarchies. Lack of effective cover leading to an increased risk of predation and a greater risk of disease transmission for "drifting rabbits" suggests that their mortality rate should be higher than those with in social groups. Radio telemetry is being used to determine mortality rates and causes for rabbits belonging to the two groups. Preliminary results are described in this poster.

A Pilot Study to Determine the Validity of the Optical Disector Method for Cell Quantitation in Testes of Australian Rodents

Eleanor Peirce and Bill Breed

Department of Anatomical Sciences, University of Adelaide

Within the Australian hydromyine rodents, huge interspecific differences in absolute and relative testes sizes exist (Breed, 1997 Australian Journal of Zoology 45:651-669), with the testes of plains rats *Pseudomys australis* contributing about 3%, and those of spinifex hopping mice, *Notomys alexis*, only about 0.2% of body mass. We hypothesize that these differences in testis size relate, in part, to numbers of Sertoli and germ cells present. The aim of this study was to assess the validity of the optical disector method (Wreford 1995 Microscopy Research and Techniques 32:423-436) for quantifying cell numbers in the testes of sexually mature male plains rats and hopping mice.

Adult, laboratory bred, animals were perfused with Bouin's fixative, testes removed, weighed and sent to the Department of Anatomy, Monash University, where they were embedded in methacrylate, sectioned at 20µm, and stained with haematoxylin and periodic acid-Schiff reagent. Sertoli cells and germ cells at various maturational stages were counted in frames of known area that were optically sectioned through a 10µm depth. Numerical densities, and absolute numbers, of each cell type were calculated from the raw counts.

Preliminary results indicate that both estimates of numerical density and absolute numbers of spermatids are greater in plains rat than hopping mouse testes, although numerical densities of other germ cell types and Sertoli cells are similar. We conclude that the optical disector method is valid for estimating germ and Sertoli cell numbers in these species and, that the larger testes of plains rats relate, not only to higher absolute cell numbers, but also to a greater density of spermatids. Possible reasons for this will be discussed.

Seasonal Variation in Endoparasites of *Oryctolagus cuniculus* and their Effect on Host Mortality

Sheryn Phillips and Barry Richardson

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Parasites are thought to have a regulating effect on the size of populations of the European rabbit, *Oryctolagus cuniculus*, especially those in higher rainfall areas. However, very little research has been carried out on this effect. Generally it is assumed that as the parasite burdens of a population increases, the mortality rate increases as well. Parasite burdens also fluctuate throughout the year depending on the climate, season and sex of the host rabbit. The endoparasite burdens of a rabbit population in a high rainfall area were investigated for the differences between parasite loadings between seasons and sex of adult rabbits. The effect of the parasites on the mortality of the population was also investigated. Results from these investigations will be presented.

The rabbit population used for the study was located on the Richmond campus of the University of Western Sydney, Hawkesbury. The population was sampled through the use of live trapping. Faecal counts were used as an indication of the endoparasite burdens of the rabbits. This method of estimating endoparasite burdens was chosen because it can be carried out without requiring the death of the rabbits involved in sampling. This was important as the technique of capture-mark- recapture was used to estimate the size and mortality of the population.

ASSESSMENT OF SUITABLE HABITAT FOR RECOVERY AND REINTODUCTION OF THE NEW HOLLAND MOUSE, *PSEUDOMYS NOVAEHOLLANDIAE.*

Kylie J. Slattery B.Sc. & Barbara A. Wilson B.Sc.(Hons.), Dip.Ed., M.Sc., Ph.D.

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The New Holland Mouse is endangered in Victoria. At Anglesea the species is presently known at one locality and is subject to extinction. As part of a recovery plan the aims of this study were to locate futher populations in the region and identify areas that would be suitable for the reintroduction of the species from captive-bred populations. A predictive model of suitable habitat in the region using a Geographic Information System (GIS) was tested.

Twenty sites were selected and a hierachial stratified sampling regime was employed. At each site variables assessed included post-fire age, geology, soils, vegetation, topography and size of the patch. Live trapping for small mammals was undertaken and the density and diversity of populations calculated. The overall trapping results were low. *Rattus lutreolus, Cercartetus nanus* and the New Holland Mouse were located at only one site each. *Rattus fuscipes* and *Antechinus stuartii* were both found at two sites. *Smithopsis leucopus* occurred at seven of the twenty four sites.

The suitability of the model for identifying further populations and suitable habitat was then assessed.

Density, Distribution and Impacts of Eastern Grey Kangaroos in the Warby Range, North-East Victoria

Kate Stuart & Dr Catherine Meathrel

Honours project, Department of Environmental Management and Ecology, La Trobe University, P.O. Box 821, Wodonga, Victoria 3689

It has been alleged that eastern grey kangaroos *Macropus giganteus* from within the Warby Range State Park are causing financial losses to horticulturalists and viticulturalists on adjacent properties by grazing on small trees and vines. This alleged problem has been particularly apparent during the drought of 1997/98, so much so that landholders are lobbying the Department of Natural Resources and Environment to initiate an extensive culling program. This study aims to: i) assess the population size and density of eastern grey kangaroos in the Warby Range using line transects inside and outside the park, ii) determine the movements of kangaroos across the park's boundaries in relation to water and food availability, and iii) compare landholders' perceptions (audiotaped, unstructured interviews and mail surveys) of kangaroo impacts with an independent, scientific assessment based on spot sampling. Initial observations suggest that: i) there is a large population of kangaroos in the Warby Range (up to 5000 kangaroos in an area of 8000 ha), ii) they are grazing in the park during the day and moving out of the park at night in search of a more abundant food and water supply, and iii) damage perceived to have been caused by kangaroos may have, in fact, been caused by rabbits *Oryctolagus cuniculus.*

Fungi as a Key Dietary Component of Australia's Most Critically Endangered Mammal - Gilbert's Potoroo (*Potorous gilbertii*)

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Gilbert's Potoroo (*Potorous gilbertii*) is Australia's most critically endangered mammal. It was considered extinct from the early 1900's. Its rediscovery in 1994 at Two Peoples Bay, WA, led to a captive breeding colony being established to reduce the risk of only one small wild population. Possible management options include translocation of animals to new areas, requiring a fundamental understanding of the species' biology, including dietary requirements. Fungi are an important food source for other potoroo species in Australia. To assess mycophagy in Gilbert's Potoroo, faecal scats from wild individuals were examined for fungal material. The scats were found to consist of over 90% fungal spores or pieces of undigested fungal fruiting bodies, the remaining material being unidentifiable detritus. No plant or insect material was identified. A wide diversity of fungal spores were found, including those of genera such as *Hysterangium* and *Zelleromyces*. Many of the fungi eaten were truffle like mycorrhizal species associating particularly with N-fixing *Gastrolobium bilobum* in main potoroo habitats, although some epigeal species were also present. Further studies aim to match spores from scats to fruit bodies of fungi occurring in the area so that the nutritional contribution of fruit bodies to the diet of Gilbert's Potoroo can be assessed and fungal spores may be more accurately identified.

WESTERN SHIELD FAUNA RECOVERY PROGRAM

by

Mitzi Vance and Keith Morris
Department of Conservation and Land Management

Since 1996, Western Australia has made significant advances in native fauna recovery under the *Western Shield* program. When the program began, the aim was to capitalise on two great natural advantages WA has to reconstruct the native fauna of the State. The first of these advantages is the ability to control feral predators with 1080 baits without harming non target species. The second is the presence of populations of threatened mammals on island nature reserves and in the south west forests which provide the founder animals for captive breeding programs and translocations. These advantages enable CALM to reverse the decline of many of our native animals by controlling introduced predators, the European fox and feral cat. Two years into the program, this aim is being realised with three native species brought back from the brink of extinction and removed from threatened fauna lists. Several other species are also increasing in abundance and by the end of the century CALM hopes to recover at least 13 species.

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CHEMICAL EXPLANATIONS FOR INTRASPECIFIC VARIATION IN KOALA FEEDING PREFERENCES IN SEVERAL EUCALYPT SPECIES

Formyl phloroglucinol compounds (FPCs) are plant secondary compounds known to influence feeding decisions by vertebrate and some invertebrate herbivores of *Eucalyptus*. We investigated how foliar chemistry affected the preferences of koalas for individual trees of *Eucalyptus melliodora*, *E. camaldulensis*, *E. globulus*, *E. ovata* and *E. viminalis*. Although the palatability of individual trees varied considerably for all species, the amount that koalas ate depended on foliar chemistry in several different ways. In the simplest case *E. melliodoraE. ?*, a single compound determined koala preference, but in *E. globulus* and *E. viminalis* we identified independent roles for multiple groups of compounds. For two species, palatability of individual trees did not vary continuously, but was bimodal. In *E. ovata*, the different amounts eaten from each class was attributable to a qualitative, rather than a quantitative difference in FPC content. In contrast, the difference observed for *E. camaldulensis* was not explained by FPCs at all, indicating the importance of other factors. As well as determining the preferences of herbivores for particular plant species and individuals, secondary compounds also affect preferences for different plant parts and foliage age classes. We offered koalas a series of choices between young leaf tips from *E. globulus* and paired mature foliage from the same individual trees. Contrary to many anecdotal reports, koalas usually preferred older foliage a preference attributable to its lower FPC concentrations. Differing patterns of variation in secondary chemistry amongst *Eucalyptus* species mean that feeding decisions by herbivores in the field involve more than simple correlations with concentrations of a single compound.

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FIRST MAINLAND REINTRODUCTION OF THE DIBBLER (*Parantechinus apicalis*) - PRELIMINARY RESULTS

In recent years, dibblers have been found only in the Fitzgerald River National Park on the south coast of Western Australia, and on Boullanger and Whitlock Islands off Jurien Bay on the west coast. A population has been established on Escape Island, near Whitlock Island, using dibblers bred in captivity at Perth Zoo from island stock. The zoo colony has been restocked with mainland animals and progeny bred for reintroduction to a suitable area on the mainland.

Peniup reserve (6530 ha), a fox-baited area of long-unburnt remnant bushland 40 km from Fitzgerald River NP, was chosen for the first mainland reintroduction. Forty-one dibblers, 23 fitted with radio-collars, were released near the centre of the reserve in October 2001 and monitored by radio-tracking and trapping.

There was significant mortality amongst the radio-collared dibblers. Ten of the 13 known dead were taken by birds, at least four of these by grey currawongs, which hung the dibblers in the fork of a tree for dismemberment. It is possible that the radio-collars disadvantaged the dibblers, but trapping showed that few of the uncollared dibblers survived near the release area either. The collared animals did not disperse far from the release site, the greatest movement being 1.5 km. Despite the early mortality, surviving dibblers have bred and their young have been captured during monitoring sessions.