

# Secrets of Southern Hairy-nosed Wombats Revealed by DNA Forensics on Remotely-collected Hairs

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## INTRODUCTION

Southern hairy-nosed wombats (*Lasiorhinus latifrons*) are of eminent size (they commonly attain 25 kg), celebrity (they are South Australia's faunal emblem), and style (they have a gorgeous waddle), yet they keep secrets. These nocturnal, pussle-gutted burrowers are shy and nearly impossible to spy on. But luckily, they're hairy. Between 1999 and 2004, I literally and figuratively knelt at the doorstep of wombats, suspending double-sided sticky tape across burrow entrances, and they were kind enough to make hair donations as they trundled about during the night. DNA harboured in these hairs enabled me to identify individuals, and to determine their relatedness to one another and their patterns of burrow use in various habitats. From this I teased out a few things about wombat life.



## Warren and space-use

- Warrens at BCP were used by between 1 and 10 wombats
- Individuals used between 1 and 7 warrens (usually less than 3), and warren-use was consistent over time
- Wombats preferentially used warrens with more burrow entrances
- Area used by wombats ranged from between 0 and 7.8 ha. Interestingly, this is on par with results of a radiotracking study, though maximum figures determined by remote sampling were greater
- There were no sex, sampling period, or seasonal differences in burrow, warren, or space-use
- However, there was some evidence of more activity in spring than autumn, which may be tied to above average rainfall, and may be indicative of rainfall sanctioning a mating season

## Parents and offspring

At the BCP site, 43 parent-offspring pairs were identified by genetic analysis, as were five mother-father-offspring triads. Parents and offspring tended to share warrens, or to be in neighboring ones. Perhaps the most interesting outcome of the parentage analysis was the apparent longevity of the father-son relationship. For instance, by the end of the study it was clear that all fathers and sons who significantly associated were adults; based on sampling times, sons were at least 2-3 years old.



## CONCLUSIONS

Unlike the overwhelming majority of mammals, male southern hairy-nosed wombats are homebodies, residing near their birthplaces their entire lives (about 20-30 years). Groups of related males live together in warrens, and close male relatives are even quite chummy. It may be that male relatives cooperate in defending burrows or warrens from other males, since these are likely important to females. Or, it may be that male wombats simply tolerate related males over unrelated ones.

Females, on the other hand, venture forth to new subterranean villas and aren't particularly fond of one another, relative or not. Some seem to disperse after raising young: bequeathing burrows to their tubby bubs may be a form of maternal care, since it would be problematic for a young wombat to establish a burrow of its own. This form of dispersal has been found (though rarely) in other species, where survival is tied to a resource that is difficult for young to secure, such as a burrow, tree hollow, or food cache. Burrows may be such a resource in southern hairy-nosed wombats, although this needs to be examined further.



## RESULTS

Wombats at BCP had 7,000 opportunities to donate hair for this study, 1,000 of which were taken. A total of 102 wombats were detected in the study area, and individuals were sampled between 1 and 44 times. Models suggest that all or nearly all wombats in the sampling area were detected. The sex ratio was female-biased (39 males, 63 females); this was also found for another study population in continuous habitat on the Nullarbor Plain.

## Female-biased dispersal

Dispersal in southern hairy-nosed wombats is female-biased (indicated by several genetic tests for both BCP and Nullarbor Plain). Though opposite of what usually occurs in mammals, this is also the case for northern hairy-nosed and common wombats. Why wombats are different from most other mammals is unknown. Additionally, there was evidence at BCP of breeding dispersal, which is dispersal by adult females following weaning of offspring. It may be that females bequeath their burrows to offspring as a form of maternal investment, since it would be difficult for a young wombat to establish a burrow of its own. This has also been suggested for the other wombat species.

Unlike females, male southern hairy-nosed wombats tend to live close to where they were born (i.e. are philopatric). Thus, male relatives live in close proximity to one another, which was also found in the other two wombat species. Within warrens, male wombats tend to be highly related.



## Association and burrow-sharing

Male BCP wombats chose to associate with their close male relatives. Female wombats, on the other hand, chose to associate with unrelated females. These results were mirrored by tests of the relatedness of wombat pairs that shared burrows. (This was determined by an analysis of association, which assessed whether pairs of wombats were detected together more than expected by chance).



## METHODS

At Brookfield Conservation Park (BCP), a 2.0 x 0.5 km area was sampled biannually (spring and autumn). Every burrow of all warrens was taped for 7 days, and tapes were checked daily for hair and replaced if present. DNA extractions were performed on single hair follicles, and were carried out at the BCP science camp on the same day that wombats left their hairy donations.

Back in the lab at Monash University, samples were scored for 15 highly variable microsatellite loci, as well as a sexing marker (to determine the gender of wombats). Because these genetic markers were so variable, it was possible to assign hairs to individuals, determine the relatedness of pairs of wombats, identify parent-offspring pairs, and assess whether there was a sex-bias in dispersal. Further, when combined with burrow-use information, it was feasible to examine space use, and significant association between pairs of individuals.



## Effects of soil type

The hard, sheet-like calcareous layer at BCP appears to have influenced warren structure. Warrens at BCP are larger (composed of significantly more burrows) than those on the Nullarbor Plain (and other areas) and are distributed over the landscape less randomly. Further, depth to calcrete was greater at BCP, and the calcrete appeared to be more solid than at the Nullarbor site. These warren structure and soil differences between BCP and the Nullarbor are consistent with the hypothesis that calcrete is an ecological constraint; this may be the reason warren and group size at BCP are inflated, and may have implications for social behaviour.

## Comparison to a small, isolated population

A southern hairy-nosed wombat population on the Yorke Peninsula is isolated by habitat fragmentation. It exists at high wombat density (about twice that at BCP) and female-biased dispersal is inhibited. As a result, female relationships were altered: females preferred to coexist with their female relatives, the opposite result to BCP. It would be expected that high population density and inhibited dispersal would cause females to coexist with female relatives over non-relatives, as a way to decrease the costs of sociality or increase indirect fitness benefits.

In fragmented habitat, this changes. Females are unable to disperse, population density increases, and females opt to dwell with female relatives. Thus it appears that this waddling wonder provides one of only a few examples of habitat fragmentation altering behaviour, which is likely a harbinger of extinction in many species.

The non-invasive genetic approach used in this study was effective for unraveling some of the secrets of the southern hairy-nosed wombat. Undoubtedly, they have many more.

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