

Ph.D. Thesis Abstracts

Comparative Ecology, and Conservation, of the *Melithreptus* Genus in the Southern Mount Lofty Ranges, South Australia

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The work presented in this thesis aimed to do the following:

- investigate the cause of decline of the three *Melithreptus* species of the Mt Lofty Ranges, with a particular emphasis on *M. gularis* due to its critical status in the ranges;
- investigate the ecology and behaviour of sympatric *M. brevirostris* and *M. lunatus* populations in the Mt Lofty Ranges; and
- suggest management options for the three species.

Further, it became clear through the course of the project that an understanding of the decline in *Melithreptus* required:

- comparisons with other honeyeater species, particularly widespread and abundant honeyeater species.

Three species of *Melithreptus* occur in the Mt Lofty Ranges: Brown-headed Honeyeater, *Melithreptus brevirostris*; White-naped Honeyeater, *Melithreptus lunatus*; and Black-chinned Honeyeater, *Melithreptus gularis*. Since at least the 1970s all three species have been in decline within the ranges. One species has been reduced in both abundance and distribution within the region (*M. gularis*), while the other two are now recognised as having reduced in abundance.

Melithreptus species in the Mt Lofty Ranges are sympatric with strikingly similar ecology. *Melithreptus gularis* is the largest of the three, while *M. brevirostris* and *M. lunatus* are almost identical in weight, feeding behaviour and morphology. Despite their similarities no studies have closely examined their ecology in sympatry and no studies have examined possible causes of their decline.

Interspecific competition is thought to be important in the organisation of honeyeater communities. Studies of nectarivore communities suggest a number of ways in which competition causes the component species to partition resources: size; beak length; habitat; and behaviour, which includes a mix of social and feeding strategies. Due to its role in honeyeater community organisation, changed level of interspecific competition has been highlighted as a possible cause of decline in some honeyeater species in the woodlands of southern Australia.

Both interference competition and exploitative competition have been highlighted in various situations (Ford *et al.* 2001). Given the hypothesised role of interspecific competition in the decline of honeyeater species and the declining status of all the *Melithreptus* in the Mt Lofty Ranges the genus appeared to provide a good basis for examining the hypothesis that interspecific competition is contributing to the decline of some honeyeater species through exclusion from resources and/or reduction in resources available.

Ford *et al.* (2001) give the following as potential tests for their interspecific competition hypothesis:

- examine community structure for 'forbidden

combinations' (pairs of species that rarely occur together);

- compare time spent in interspecific competition (interference) and foraging in fragmented and continuous habitat;
- measure seasonal and spatial patterns of resource abundance and depletion; and
- remove competitors and observe response in abundance and behaviour of other species.

These suggestions form the basis for much of the work presented in this thesis. An initial survey examined not only community structure for forbidden combinations, but also investigated other possible causes of decline, based on literature for both declining woodland birds and *Melithreptus*. Besides interspecific competition, other possible causes included insufficient preferred habitat, insufficient food resources and landscape fragmentation.

Repeated counts of honeyeaters at 90 sites of one hectare in the Mt Lofty Ranges were undertaken over a one year period. *Melithreptus lunatus* was found to be more abundant where certain eucalypt species occurred (particularly *E. viminalis*), although this was postulated to be a reflection of productive soils. *Melithreptus brevirostris* was found to be more abundant where *Phylidonyris novaehollandiae* (New Holland Honeyeater) was most abundant, despite *P. novaehollandiae* also being the most widespread and abundant honeyeater in the Mt Lofty Ranges. Thus, the survey work did not find forbidden combinations of honeyeaters. However, the scale at which the survey work was undertaken (sites of 1 ha) may have masked any competition between species due to spatial heterogeneity.

At the scale of one hectare there are likely to be areas of resource not used by other honeyeaters, allowing *Melithreptus* to avoid feeding territories of aggressive honeyeaters. Therefore, in order to more thoroughly investigate competition between *P. novaehollandiae* and *Melithreptus*, a removal experiment with finer resolution than 1 ha was carried out. This demonstrated that *P.*

novaehollandiae do prevent *M. lunatus* from using certain areas of the landscape.

A final examination of interactions between *Melithreptus* and widespread and abundant honeyeaters was carried out in the form of a survey in which individual trees were watched and visits by honeyeater species timed. Based on observations of *Melithreptus*, it appeared that generally *M. brevirostris* groups used a swamping strategy to access defended resources, whereas *M. lunatus* moved quietly, often as individuals or pairs. Thus the two species were hypothesised to use two different behavioural strategies to access defended resources, termed stealth (the use of secretive behaviour to access resources that are being protected) and swamping (the use of a combined direct approach by a number of individuals to access resources that are being protected).

Based on estimations of the standardised protection of resources for individual trees, *M. lunatus* were able to access defended resources for longer, while *M. brevirostris* were able to access better defended resources but for a shorter time. These results were consistent with the hypothesis of two different behavioural strategies for accessing defended resources. Both species may employ both strategies, but *M. brevirostris* more often use swamping, and *M. lunatus* more often use stealth.

Investigating the morphology of the small honeyeaters of the Mt Lofty Ranges confirmed that size and beak length were important in discriminating between most species. However, these did not provide any basis for separating the *Melithreptus*. Closer examination of morphology between *M. brevirostris* and the *M. lunatus* sexes revealed further similarities to those previously documented. The average values for many morphological attributes of *M. brevirostris* fell between the average value for the *M. lunatus* sexes, suggesting that ecologically the three species/sexes formed a continuum. The *M. lunatus* sexes and *M. brevirostris* were then referred to as

the small *Melithreptus* guild (it was not possible to sex *M. brevirostris* based on the range of attributes measured). The greatest differences between the small *Melithreptus* guild were found in wing length and leg morphology. The direction of the differences suggested that *M. brevirostris* would be more similar to female *M. lunatus* in movements and more similar to male *M. lunatus* in foraging behaviour. These two aspects of *Melithreptus* ecology were the subject of the last and most extensive phase of the project.

Movements were investigated for *Melithreptus* at four sites in the Mt Lofty Ranges using radio-telemetry techniques. *Melithreptus* were found to use large areas of the landscape and to have large core areas of activity within their home range. Using the same methods confirmed that *Melithreptus* had larger home ranges (mean 100% minimum convex polygon (MCP) 23 hectares) than *P. novaehollandiae* (mean 100% MCP 5 hectares), and larger home ranges than those reported in the literature for other honeyeater species. Data on a single *M. gularis* (100% MCP 140 hectares) suggest that this species has even larger home range requirements. Information from colour-banded birds suggests that most *M. brevirostris* and male *M. lunatus* had stable core areas of activity over the period of this study, while female *M. lunatus* were less likely to have stable core areas of activity, particularly during the non-breeding season. A trend in home range and movement data was consistent with the hypothesis that *M. brevirostris* was more similar to female *M. lunatus* than to male *M. lunatus*.

Behaviour of *Melithreptus* and *P. novaehollandiae* were investigated using time budget techniques. *Melithreptus* were found to spend most of their day foraging (up to 84%), very little time resting (as little as 1.8%) and very little time in aggression (as little as 0.6%). These values are each within the outer range of results published on other honeyeaters. *Melithreptus gularis* behaviour was very similar to both *M.*

brevirostris and *M. lunatus*. *Melithreptus* appear to forage predominantly from poor quality resources, requiring a large proportion of their time allocated to foraging. The small proportion of time spent resting is probably a result of the time spent foraging. The small proportion of time spent in aggression is partly the result of a lack of aggression by *Melithreptus*, but is also potentially due to their knowledge of aggression levels within their home range and their use of stealth and swamping. *Melithreptus* are likely to avoid the most highly protected (and therefore the most productive) areas within their home ranges. A trend in behavioural data was consistent with the hypothesis that *M. brevirostris* was more similar to male *M. lunatus* than to female *M. lunatus*.

Based on the data collected in this study, *Melithreptus* in the Mt Lofty Ranges are characterised by: relatively large home range size with core areas that are used over extended periods of time; similar foraging behaviour and morphology; lack of aggression; and (probably) complex social behaviour. Their decline in the Mt Lofty Ranges can be attributed to the preferential clearance of their preferred habitat, their requirement for a large home range and their predominant use of poor quality resources, particularly in comparison to other, locally successful honeyeaters.

The final aim of this work on *Melithreptus* honeyeaters in the Mt Lofty Ranges was to provide options for managing remaining *Melithreptus* populations, in particular *M. gularis* which, according to informed observers, is now critically endangered in the region. Due to the extent of habitat clearance in the Mt Lofty Ranges, the decline of *Melithreptus* will only be addressed in the long term through large scale revegetation projects. *Melithreptus* requirements in any large scale revegetation are most likely to be met by providing a range of eucalypt species.

In the short to medium term, management actions may be needed to prevent the loss of *M.*

gularis from the region. Given the findings of this study, there are few such options available. The management of woody weeds in known *Melithreptus* home ranges is suggested as one possible management strategy. *Melithreptus* rarely use a shrub layer for foraging, shelter or nesting, whereas *P. novaehollandiae* use a shrub layer for each of these activities. Thus, where grassy woodlands have been invaded by woody weeds, *P. novaehollandiae* potentially have an increased year round presence.

REFERENCES

- Ford, H. A., Barrett, G. W., Saunders, D. A. and Recher, H. F. 2001. Why have birds in the woodlands of southern Australia declined? *Biological Conservation* 97: 71-88.
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