Monitoring woodland birds in the Mount Lofty Ranges

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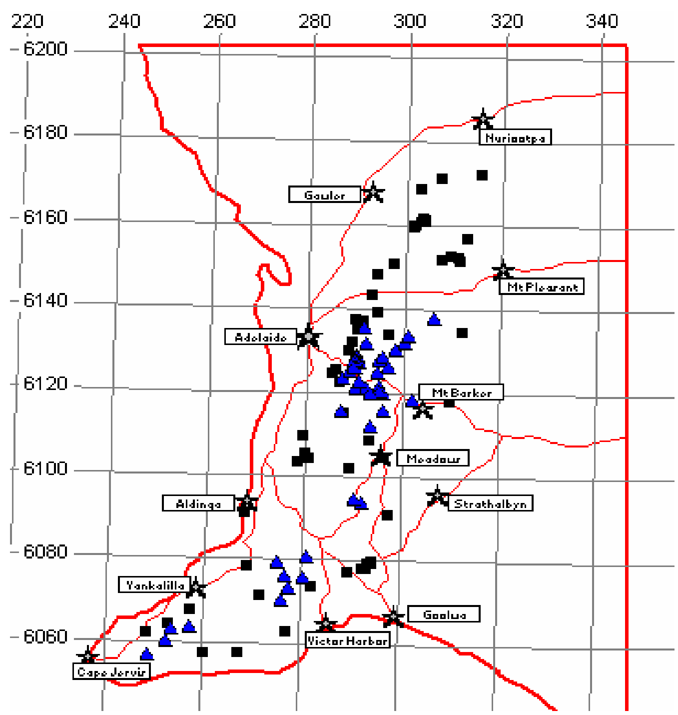
Introduction

Australian woodland birds are widely considered to be under serious threat (Olsen *et al*. 2005). The Mount Lofty Ranges is an outlying island of woodland that has lost, and is expected to lose, a significant fraction of its avifauna (Ford and Howe 1980, Possingham and Field 2000, Black 2005). While the Mount Lofty Ranges contains no endemic species, it contains some endemic subspecies and many isolated populations of species typical of wetter woodlands and forests (Schodde and Mason 1999). Less than 20% of the original vegetation remains so the fate of its avifauna can be thought of as a litmus test of the fate of the woodland birds of all of eastern Australia.

In 1999, funded by an Australian Research Council (ARC) Discovery grant, we began to monitor woodland birds in the Mount Lofty Ranges (MLR). Since then the project has been funded further by the ARC, the Department of Environment and Heritage (SA), The Nature Foundation (SA), The University of Queensland, the Mount Lofty region Natural Resources Management Board and the Birds for Biodiversity project (through the Conservation Council of SA). The project has a wide variety of purposes, some of which have been reported in the peer-reviewed literature (see references and further reading below). Here we briefly discuss the abundance of different species of common woodland bird and the potential to detect changes in abundance in the future.



Monitoring methods

Building from 38 sites in 1999 and 106 sites in 2000, over 150 survey sites have now been established in the Mount Lofty Ranges on private and public land (Figure 1). These cover a range of relatively intact gum and stringybark eucalypt woodland habitats. Sites are chosen to represent the range of major habitat types and habitat patch sizes. Three repeat 2ha-20minute surveys are conducted at each site every year in spring and early summer. Occupancy levels for each year are estimated using the zero-inflated binomial (ZIB) model[1], which corrects occupancy estimates for imperfect delectability.

Results

Table 1 shows the probability that a species occurs in a site, averaged across all sites for each year from 2000 to 2003. Most of the high occupancy species (19 in total) appear to have populations that are quite secure, as the fluctuations experienced over the survey period were rather minor and rarely negative in sign (Table 1). While these high occupancy species show little change in occupancy over the entire period they differ in how much they fluctuate from year to year.

Table 1. Estimated occupancy levels and net change in occupancy over the period 2000-2003 for the forty-one most widespread woodland species.

[1] This is a statistical model that corrects presence-absence data for imperfect detectability of species, increasing the statistical power to detect changes over time (Tyre, A.J., et al., 2003).

Species	2000	2001	2002	2003	Net change
High Occupancy					
Superb Fairy-wren	0.96	0.97	0.91	0.96	0.00
Adelaide Rosella	0.88	0.89	0.96	0.86	-0.02
Striated Thornbill	0.86	0.91	0.88	0.90	0.04
Grey Fantail	0.84	0.90	0.89	0.84	0.01
Grey Shrike-thrush	0.84	0.91	0.86	0.84	-0.01
Striated Pardalote	0.84	0.88	0.81	0.84	0.01
Yellow-faced Honeyeater	0.76	0.82	0.88	0.82	0.05
Golden Whistler	0.81	0.74	0.89	0.84	0.03
Brown Thornbill	0.73	0.83	0.80	0.85	0.12
Grey Currawong	0.81	0.98	0.66	0.75	-0.06
Crescent Honeyeater	0.73	0.76	0.81	0.81	0.09
Eastern Spinebill	0.66	0.74	0.82	0.79	0.13
Silvereye	0.66	0.72	0.81	0.78	0.12
Little Raven	0.68	0.76	0.86	0.58	-0.10
White-browed Scrubwren	0.61	0.70	0.77	0.71	0.10
Red Wattlebird	0.75	0.59	0.71	0.60	-0.15
White-throated Treecreeper	0.61	0.68	0.69	0.67	0.06
Black-faced Cuckoo-shrike	0.58	0.62	0.62	0.82	0.24
Common Blackbird	0.59	0.71	0.61	0.59	0.00
Moderate Occupancy					
Spotted Pardalote	0.50	0.90	0.67	0.24	-0.26
Common Bronzewing	0.25	0.58	0.48	0.90	0.65
White-backed Magpie	0.58	0.39	0.55	0.52	-0.05
Scarlet Robin	0.60	0.47	0.46	0.46	**-0.14**
New Holland Honeyeater	0.45	0.52	0.44	0.45	0.00
Brown-headed Honeyeater	0.39	0.39	0.46	0.62	0.23
Buff-rumped Thornbill	0.45	0.58	0.40	0.39	-0.07
Mistletoebird	0.41	0.36	0.48	0.52	0.11
Galah	0.35	0.37	0.48	0.46	0.11
White-naped Honeyeater	0.29	0.33	0.56	0.46	0.17
Red-browed Finch	0.40	0.61	0.38	0.19	-0.21
Horsfield's Bronze-Cuckoo	0.29	0.66	0.25	0.33	0.03
Rufous Whistler	0.37	0.32	0.49	0.30	-0.08
Rainbow Lorikeet	0.28	0.40	0.32	0.26	-0.01
Musk Lorikeet	0.29	0.33	0.27	0.22	-0.06
Sacred Kingfisher	0.25	0.64	0.10	0.10	-0.15
Yellow-tailed Black-Cockatoo	0.24	0.28	0.29	0.25	0.01
Weebill	0.11	0.17	0.15	0.48	0.38
Sulphur-crested Cockatoo	0.19	0.33	0.14	0.10	-0.10
Common Starling	0.17	0.19	0.13	0.05	-0.11
White-browed Babbler	0.19	0.16	0.08	0.10	**-0.10**
White-plumed Honeyeater	0.05	0.06	0.05	0.13	0.08

The first eight species in the table appear to be remarkably stable over time. Of the remaining species, the occupancy levels of the grey currawong, eastern spinebill, silvereye, little raven, red wattlebird and black-faced cuckoo shrike tend to fluctuate more from year to year. However none of the fluctuations would seem to be cause for immediate conservation concern.

The situation is different for the moderate occupancy species (22 in total), many of which experienced substantial annual fluctuations (Table 1). These changes were particularly large for the spotted pardalote, common bronzewing, red-browed finch, Horsfield's bronze cuckoo, sacred kingfisher, brown-headed honeyeater and weebill. The sometimes dramatic swings in occupancy for these species highlight the danger of using just two surveys separated widely in time when assessing their conservation status, as has been done in the past (for example when we compare data from the two Australia-wide Bird Atlases). Thus, although the spotted pardalote and red browed finch underwent the two largest negative net changes over the survey period, these changes are not necessarily cause for alarm, as they may be within the bounds of natural fluctuations. On the other hand, even though common bronzewings were extremely abundant in 2003, it would be unwise to assume they are of no conservation concern, as their numbers have fluctuated extraordinarily in other years. Of the more stable species, two native species (the scarlet robin and white-browed babbler) showed evidence of declines that may be cause for concern, in part because they are considered by experts to be in trouble over a longer period.

The absence of clear population trends is unsurprising, given the degree of natural variability exhibited by most species and the likelihood that declines, if they are occurring, are unfolding on timescales longer than the five years of data gathered here. Recognising this, we calculated the amount of time and survey effort necessary to detect longer-term changes if they are in fact occurring. Results show that for many species, changes would begin to become clearly noticeable within ten years of sampling, i.e. in the next five years. For species of high occupancy and detectability like the striated thornbill, crescent honeyeater and white-throated treecreeper, and even sparser, less detectable species like the scarlet robin, we will be able to determine if significant declines are occurring with another five years of data. For less ubiquitous species of lower detectability, like the white-naped honeyeater and the white-browed babbler, further effort will be required and trends may not become visible until a further ten years or more of data are collected.

Discussion and summary

While occasional "snapshot" surveys may be sufficient to keep track of the more secure, stable populations, those that fluctuate widely must be monitored annually. Data collection for a further 10 years would yield a compelling, statistically robust set of population trajectories for a majority of species in the region. This could provide an invaluable tool for forming management decisions and increasing public awareness of, and support for, this and other biodiversity conservation issues in the MLR. The Department of Environment and Heritage in South Australia have a responsibility and mandate to report on regional changes in biodiversity and this study represents one of few long-term regional scale studies of a group of species in Australia.

While this note focuses on the detecting trends in bird abundance, the data is, and will, be used for other practical purposes:

- The data collected are being used to improve our understanding of **habitat preferences** in MLR bird species. This includes not just site-level preferences, like habitat type and structure, but also landscape-level preferences like patch size and shape (Westphal *et al.* 2003). This information can be used to guide habitat restoration by regional bodies, non-government organisations and governments.
- Regional bodies funded by Natural Heritage Trust funds have a responsibility to **monitor and evaluate** the performance of their activities intended to maintain or restore biodiversity. The data can be used as a benchmark for the success of habitat restoration

and rehabilitation. Furthermore it can be used as "before" data in before-after control-impact experiments on the success of actions like fox baiting or weed removal.

Many people have contributed to this project so far – too many to list. Maintaining the survey effort costs about $35,000 per annum (organised this year by the Nature Conservation Society of South Australia); cursory analysis of the data requires about $20,000 per annum; while innovation in research and synthesis requires considerably more resources (see references). We thank our numerous supporters, financial and other, and hope we can continue the project through this critical phase when significant changes in abundance might be detected.

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