THE SUNBIRD

Volume 27 No. 3  September 1997

HOW USEFUL ARE SMALL BUT LIGHTLY TREED SUBURBAN PARKS FOR FOREST BIRDS IN BRISBANE?

KIRSTI HUDSON, CARLA P. CATTERALL, SKYE MCNAMARA and MARK B. KINGSTON

ABSTRACT

Bird densities were assessed in eight sites within each of the following four habitat types within the southern suburbs of Brisbane: forest interior, forest edge, suburbs and suburban parks containing some eucalypts. Grey Fantail, Yellow-faced Honeyeater and White-throated Honeyeater (grouped together as "honeyeaters"), Magpie-lark and Noisy Miner were selected for study. Grey Fantails and honeyeaters were common in the forest interior but rare elsewhere; Magpie-larks were commonest in suburban areas, and Noisy Miners had higher densities in parks and forest edges than elsewhere. Differences in bird numbers counted in the morning versus late afternoon were not statistically significant. These results indicate that lightly treed parkland sites, lacking in understorey, support birds typical of suburbs or forest edges rather than forest interior or forest-dependent species.

INTRODUCTION

Previous research has demonstrated that many bird species are significantly affected by clearing and fragmentation of forest habitat and by urbanisation of the cleared areas. Some species increase their numbers in urban areas or at the forest edge, whilst others decline or disappear either as a direct consequence of the habitat loss, or as an indirect result of their interactions with species which have successfully adapted to edges and open spaces created by clearing (see for example Catterall et al. 1991, Recher & Serventy 1991).

Suburban landowners are often urged to plant native trees and shrubs in order to provide habitat for native birds, although research in some suburbs of Brisbane has clearly shown that, within an urbanised landscape, even well planted gardens close to remnant forest areas are not frequently visited by most
forest birds (Catterall et al. 1989, 1991; Sewell & Catterall MS). It is also useful to know the extent to which urban parkland with retained native trees provides habitat for forest-dependent birds.

This study was designed to determine whether the densities of several species of bird differ significantly between the following four habitat types within the southern suburbs of Brisbane: forest interior, forest edge, suburbs and suburban parks. It was hypothesised, in particular, that parks characteristic of the suburbs surrounding the forest would not support the numbers and types of birds typically found in forest areas, but would be more similar to suburban areas and/or forest edges.

STUDY AREA AND METHODS

Study Sites
Data for the study were collected in the southern suburbs of Brisbane city, in and around Toohey Forest. Eight sites were chosen within each of four habitats, according to the following criteria.

i) Forest interior sites were located within the boundaries of Toohey Forest at least 0.25 km from the forest edge. Vegetation, aspect and other physical factors were kept similar at all of the sites. Toohey Forest is a relatively undisturbed, large forest remnant (approximately 600 ha) containing a mosaic of eucalypt woodland and open forest with a well-developed understorey and shrub layer present.

ii) Forest edge sites were located along the boundary between Toohey Forest and residential suburbs, and were away from major roads. Minor roads and tracks within Toohey Forest were not considered to create edges.

iii) Park sites were chosen on the basis that they contained at least 25 medium to large trees including some eucalypts, had a cleared understorey, did not contain any houses or buildings, and were situated at least 0.25 km from remnant forest. Most selected parks were only a few hectares in area. The overall tree cover in the parks was substantially less than that in the forest or edge sites.

iv) Suburban sites were of medium housing density, on standard sized allotments in suburbs of a similar age. All had a moderate cover of trees and shrubs, and were at least 0.25 km from remnant forest.

Additionally, all were situated at least 0.5 km apart and at least 0.5 km from the nearest large water body. The two site types away from the forest were interspersed with one another to ensure that any differences were due to the site type rather than other confounding factors.

Bird Data
Each site was visited once in the morning between 6.30 and 9.30 am and once in the afternoon between 4.30 and 6.30 pm, on different days. Data were collected
over five weeks between 20 March and 23 April 1995. An index of relative bird density was obtained within a transect of 200 m by 20 m at each site by two observers (K. H. and S. M.) who spent 20 minutes, beginning in the centre and walking away from each other until reaching opposite ends of the transect, while recording all birds seen. Birds that flew over or straight through the transect were excluded from the data analysis. The following species were selected for statistical analysis: Yellow-faced Honeyeater *Lichenostomus chrysops* and White-throated Honeyeater *Melithreptus albogularis*, grouped together as “honeyeaters”; Grey Fantail *Rhipidura fuliginosa*; Magpie-lark *Grallina cyanoleuca*, and Noisy Miner *Manorina melanocephala*.

A two-factor Analysis of Variance (ANOVA, Zar 1984) was used to test whether the density of each taxon varied according to either the habitat type or the time of day. When there was a significant ($P<0.05$) habitat effect, extended $t$-tests were used to test the significance of differences between each pair of habitat means. Pooling of the two honeyeater species was necessary to facilitate valid statistical analyses, and was considered justified for species with broadly similar habits that frequently occur together in mixed-species flocks within Toohey Forest (Catterall et al. 1991).

**RESULTS**

The effect of habitat was significant ($P<0.05$) for all types of bird tested (Fig. 1 and Table 1). Grey Fantails were common in the forest interior sites but rare elsewhere, and this difference was highly significant. The combined density of Yellow-faced and White-throated Honeyeaters (perhaps including a small proportion of White-naped Honeyeaters *M. lunatus*) showed a similar pattern, which was also statistically significant. Magpie-larks showed a contrasting pattern, being more common in suburban areas than in any other habitat type.

**TABLE 1. Effect of habitat and time of day on bird density: ANOVA results.** The morning and afternoon densities are across all habitats (S.E. is the standard error). See Fig. 1 for habitat means.

<table>
<thead>
<tr>
<th>Bird species</th>
<th>Morning density mean</th>
<th>Morning density S.E.</th>
<th>Afternoon density mean</th>
<th>Afternoon density S.E.</th>
<th>ANOVA: probability ($P$) values</th>
<th>Habitat (H)</th>
<th>Time (T)</th>
<th>H X T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grey Fantail</td>
<td>0.7</td>
<td>0.30</td>
<td>0.7</td>
<td>0.32</td>
<td>0.0003</td>
<td>0.87</td>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td>Honeyeaters</td>
<td>0.6</td>
<td>0.31</td>
<td>1.0</td>
<td>0.43</td>
<td>0.027</td>
<td>0.39</td>
<td>0.56</td>
<td></td>
</tr>
<tr>
<td>Magpie-lark</td>
<td>1.3</td>
<td>0.45</td>
<td>0.7</td>
<td>0.25</td>
<td>0.001</td>
<td>0.19</td>
<td>0.89</td>
<td></td>
</tr>
<tr>
<td>Noisy Miner</td>
<td>6.4</td>
<td>1.27</td>
<td>3.8</td>
<td>0.86</td>
<td>0.004</td>
<td>0.06</td>
<td>0.84</td>
<td></td>
</tr>
</tbody>
</table>
and typically seen foraging on the ground within these areas. The Noisy Miner, in groups of various sizes, was the most common of these species over all habitat types, and had significantly higher densities in parks and forest edges than in suburbs and forest interior sites.

The effect of habitat on bird density was consistent across both times of day, and there were no statistically significant differences ($P>0.05$) in density between the morning and afternoon sampling periods (Table 1). However, for both Noisy Miner and Magpie-lark, about twice as many birds were seen in the morning as in the afternoon (this was not statistically significant, although nearly so for the Noisy Miner, $P=0.06$).

---

**Fig. 1.** Bird density (means of morning and afternoon, and standard error bars) in the four habitats. Points on each graph with the same letter (A or B) were not significantly different ($P>0.05$) from one another (extended t-tests).
DISCUSSION

Time of Day
Much research on the effect of time of day has focused on the detection of differences between hours within the morning, ignoring other times of day (Skirvin 1981), and has also frequently focused on the detection of singing individuals, in keeping with traditional northern hemisphere bird census methods (Robbins 1981). Individual species may show a variety of activity patterns, including little diurnal change (Robbins 1981, Arnold 1989, Leach & Watson 1994).

In the present study both the Noisy Miner and Magpie-lark showed a strong trend for more sightings in the morning hours than late in the afternoon, whereas no such trend was recorded for the Grey Fantail or the honeyeaters. Arnold (1989) similarly found little diurnal variation in frequency of sighting during winter transect counts for Grey Fantail and White-naped Honeyeater in Western Australia, and Evans et al. (1997) working in the same region as the present study, found no difference between morning and afternoon counts of Grey Fantails. In the present study, differences in local activity patterns resulting from variation in habitat type were considerably greater than those due to time of day. Counts along narrow transects which are based largely on sightings may be less affected by diurnal activity patterns than methods of assessing bird abundance which rely mainly on detecting vocalisations.

Bird Density Differences among the Four Habitats
The Grey Fantail, Yellow-faced Honeyeater and White-throated Honeyeater have been identified in previous studies as being dependent on native forest habitat and hence vulnerable to habitat loss and fragmentation, both in the Brisbane region and elsewhere (Catterall et al. 1989, 1991; Catterall & Kingston 1993). Previous work in the Brisbane area concluded that Magpie-larks were suburban or suburb edge species (Catterall et al. 1989, 1991), consistent with the findings of this study. There is a growing body of evidence that Noisy Miners increase in density where there is naturally sparse or artificially thinned woodland with grassy ground cover (Ford 1993), in small heavily grazed woodland remnants (Loy 1987), in low density residential developments with an overstorey of remnant forest trees (Sewell & Catterall MS), and along forest edges (Catterall et al. 1991). In the present study, Noisy Miners were more abundant in the edges and wooded park sites than in forest interior and suburban sites.

The Conservation Value of Lightly Treed Suburban Parks
The results of this study supported our hypothesis that the areas of treed parkland would contain birds typical of suburbs or forest edges rather than forest interior species. There were, however, some patterns that would not be
expected on the basis of typical feeding and movement habits. For example, Magpie-lark did not frequent park and edge sites where open and grassy ground cover existed and should have provided a suitable feeding substrate. It is also difficult to explain on the basis of species' resource requirements the low densities of Grey Fantail and honeyeaters at edge sites, for these sites had a well developed understory and forest canopy. These low densities could be a consequence of the interspecific aggressiveness of Noisy Miners (Loy 1987, Catterall et al. 1991, Ford 1993), and it has been suggested that high Noisy Miner densities in Brisbane's western suburbs were the cause of low densities of many other species (Woodall 1995).

There are several possible explanations for the low abundance of the forest interior birds in these parks. (1) The sparse canopy and lack of understory mean that there is a lack of suitable structure and substrates for foraging or insufficient cover from predators. However, Catterall & Sewell (MS), in studies in the same region, found that Grey Fantail densities were not reduced in habitats where the understory had been removed, but Noisy Miner densities were not high. (2) Total habitat area is too small, even though the habitat structure is adequate. Area sensitivity is a well documented phenomenon in forest birds, although why it occurs remains poorly understood for many species, and many forest birds will use forest patches at least as small as 10 ha (Loy 1987, Catterall et al. 1991, Sewell & Catterall MS). The habitat area associated with the parks in this study varied in size; most were only a few hectares, but some were also adjacent to other areas of natural or semi-natural habitat. (3) Forest birds might be excluded from (or avoid) the parks as a result of the high density and interspecific aggression of Noisy Miners. Evans et al. (1997) found that Noisy Miners had high densities in small (1-2 ha) remnants with understory, and that Grey Fantails were very rare in these remnants. Some forest interior species might visit parks more often, in spite of the alterations to the habitat structure, if Noisy Miners were absent.

Both habitat area and adequate understory are likely to be important determinants of the habitat value of parks. Many treed parks within urban Brisbane are only a few hectares in area, but whether they are too small for use by forest birds is at present unknown. The relative importance of habitat area and habitat structure within smaller remnants could be tested by comparing bird densities within treed but open parks and forest remnants of similar size. It is possible that tree species composition within the parks may also influence Noisy Miner density, and a future investigation could assess the extent to which a eucalypt overstorey may encourage Noisy Miners more than a rainforest or mixed tree species composition.

This study has shown that suburban parks, even if they contain mature eucalypts and other trees, are unlikely to provide useful habitat for
forest-dependent birds. Further research is needed and there is considerable scope for urban planners to contribute to the development of this knowledge by experimentally altering the habitat structure in some of the open or lightly treed parks. This could include: increasing the variety of native tree genera and families; planting native shrubs to promote the development of an understorey; and repeating this within differently sized areas. Once such plantings have been established it would be a comparatively simple matter for bird observers to conduct systematic bird counts to evaluate the outcomes, provided that several examples of each situation are available. While not providing a substitute for conservation networks of larger forest remnants, Queensland’s urban parks, if appropriately planted and managed, should be able to provide better wildlife habitat than they do at present.

ACKNOWLEDGEMENTS

This project was initially carried out as part of the third year subject Advanced Population Biology within the Australian School of Environmental Studies at Griffith University. KH and SM were students; CC and MK the project supervisors. Jane Hughes provided comments on the project design. We thank other staff and students for useful discussions, and Gayle Johnson and the Editor for helpful comments on the manuscript.

REFERENCES


KIRSTI HUDSON, CARLA P. CATTERALL, SKYE MCNAMARA & MARK B. KINGSTON, Faculty of Environmental Sciences, Griffith University, Nathan, Q 4111.