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Characteristics of urbanization that influence bird communities in suburban remnant vegetation

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From

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I, Patricia Ruth Hodgson, declare that this thesis, submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the Department of Biological Sciences, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for qualifications at any other academic institution.

Patricia Ruth Hodgson

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Abstract

In many landscapes subject to fragmentation, particularly through the process of urbanization, small remnants of original native vegetation surrounded by a highly modified matrix are often the only suitable habitat for most native species. Management of these small remnants may be the most feasible option for the conservation of regional avian biodiversity and urban-sensitive species. Remnant native vegetation may improve the complexity of urban vegetation, or provide regular habitat or stepping-stones for dispersal in an inhospitable matrix. External factors in the surrounding matrix, or internal constraints related to the size of the remnant may influence bird communities within remnant vegetation. Determining the relative influence between these factors should assist management of conditions that will help to retain urban-sensitive species.

On the Central Coast of New South Wales, Australia, bird communities in remnant vegetation were surveyed to investigate the influence of internal and external factors on composition. The effect of housing density and vegetation type was investigated in relation to remnant size. The foraging behaviour of five insectivorous species (present in low numbers) in remnants surrounded by high-density housing was examined in relation to the vegetation structure. Bird movements across habitat edges were investigated at the interface between remnant vegetation and suburban housing. The proportion of crossings by guilds and individual species were compared between edges of high- and low-density housing.

Bird communities of remnant vegetation were significantly influenced by the surrounding housing density. There was no interaction between remnant size and

surrounding housing density, suggesting external factors were having a greater influence than internal factors. Community composition changed in response to surrounding housing density. Introduced species, granivores and medium nectarivores occurred more often in remnants surrounded by high-density housing. These communities resembled those commonly described for the urban matrix itself. Small insectivores and nectarivores occurred more often in remnants surrounded by low-density housing, giving these communities a closer resemblance to those often described in undisturbed vegetation. It appears that remnants surrounded by low-density housing can support several bird species dependent on native habitat.

The composition of bird communities in remnant vegetation was significantly influenced by vegetation type when remnants were larger than 80 ha. In remnants smaller than 35 ha bird communities were not influenced by vegetation type, suggesting they are influenced more by external factors. Bird density and species richness were influenced by vegetation structure and were positively associated with high-shrub cover. Increasing the cover of high shrubs may be one way to improve bird diversity within remnants smaller than 35 ha. Retaining larger remnants (> 80 ha) that provide resistance to characteristics of the surrounding suburban matrix is likely to be an important way of maintaining urban-sensitive species and bird assemblages specific to particular vegetation types, over the majority of the suburban landscape.

The foraging behavior of small insectivorous birds in remnants surrounded by high-density housing was not adversely affected by urbanization. Canopy- and shrub-foragers showed minimal behavioural changes. Species classified as feeding on or near the ground tended to forage at lower heights in remnants compared with those in

continuous vegetation. These changes were partially explained by structural differences between vegetation in remnants and continuous sites. The rate at which birds attacked prey items was significantly higher in continuous habitat for only two species. Overall, it appears that remnants have potential value as habitat and foraging sources in a suburban landscape. Despite this, small insectivores are still sensitive to urbanization, suggesting that other factors, probably associated with the matrix, are important.

Behavioural responses to edges adjoining the two densities of housing matrix differed significantly among feeding guilds. Guilds of omnivores and nectarivores were significantly more likely than insectivores to penetrate edges adjoining high-density housing. Analysis of individual species revealed several consistent trends. Nectarivorous species appeared more likely to cross at edges of high-density housing, while insectivores were more likely to cross at edges of low-density housing. Regression models suggest these trends were influenced by characteristics within the matrix, principally the proportion of housing and shrub and canopy vegetation. Importantly, by crossing at these habitat edges many species demonstrated, that with appropriate management of the housing matrix, they have the potential for dispersal necessary for the maintenance of meta-populations.

Overall this thesis suggests that characteristics of the surrounding matrix influence both the internal remnant quality and the ability of birds to disperse among remnant vegetation. Therefore management of the matrix is likely to play a pivotal role if small remnants are to function as a habitat network and promote the avian diversity of suburban landscapes.

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