AVIFAUNAL RESPONSES TO LANDSCAPE-SCALE HABITAT FRAGMENTATION IN THE LITTORAL FORESTS OF SOUTH-EASTERN MADAGASCAR

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Abstract: Madagascar’s lowland littoral forests are rich in endemic taxa and considered to be seriously threatened by deforestation and habitat fragmentation. In this study I examined how littoral forest bird communities have been affected by fragmentation at the landscape scale. Bird species composition within 30 littoral forest remnants of differing size and isolation was determined using point counts conducted in October – December in 2001 and 2002. Each remnant was characterised by measures of remnant area, remnant shape, and isolation. Step-wise regression, nestedness analysis, and binomial logistic regression modelling was used to test the relationship between bird species and landscape variables. Bird species richness in remnants was significantly (p<0.01) explained by remnant area but not by any measure of isolation or landscape complexity. The bird communities in the littoral forests were significantly (p<0.01) nested. The majority of forest-dependent species had significant (p<0.01) relationships with remnant area. As deforestation and fragmentation are still significant issues in Madagascar, I recommend that large (>200 ha) blocks of littoral forest are awarded protected status to preserve what remains of their unique bird community.

Key words: Littoral forest; fragmentation; isolation; species-area relationship; birds; island biogeography; Madagascar; nestedness
1. INTRODUCTION

The Fort Dauphin (Tolagnaro) region of southeastern Madagascar is arguably one of the most diverse on the island. The region’s size (approximately 10000 km², or about 1.7% of the total land area of island) is small, but it contains a large variety of habitats, including different forest types, coastal zones, high mountains, and areas of inland freshwater habitat (Goodman et al., 1997). As a result of this habitat variety, the region has one of the highest numbers of bird species of any area on the island; Goodman et al. (1997) found 189 bird species within the area, representing 68% of the birds known in Madagascar. This is impressive when one considers the region’s size. However, much of the forested landscape in southeastern Madagascar is fragmented and little is known on how this process affects the region’s bird communities.

At the landscape scale, it is believed that dynamics of bird populations are influenced by five interrelated processes associated with habitat loss and subsequent fragmentation: habitat loss, subdivision of habitat, patch isolation, edge effects, and compositional changes to the landscape matrix (Forman, 1995; Lindenmayer and Franklin, 2002). The last four factors are defined as habitat fragmentation – the subdivision of habitat patches – and needs to be distinguished from habitat loss, which is the overall depletion of habitat (Andrén, 1994). In this study I examine the effects of two aspects associated with landscape-scale habitat fragmentation; that is, the effects of sub-division of habitat and patch isolation. The original data for this study can be found in Watson (2004).

2. METHODS

2.1 Study area

The study was conducted in fragmented littoral forest remnants located to the west and north of Fort Dauphin (Fig. 1). The mosaic surrounding these forests include small patches of Melaleuca swamp forest and plantations of Eucalyptus citriodora Hook and E. robusta Blakely, and a dominant heath-type matrix consisting of Erica spp. (Ramanamanjato and Ganzhorn, 2001). This region has a subtropical climate with a regional mean annual minimum temperature of 15 °C, mean maximum temperature of 28 °C, and mean annual rainfall ranging from 500 - 3000 mm (Goodman et al., 1997).