The effects of roads and their edges on the movement patterns and community composition of understorey rainforest birds in central Amazonia, Brazil

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"The last word in ignorance is the man who says of an animal or plant: "What good is it ?" If the land as a whole is good, then every part is good, whether we understand it or not. If the biota in the course of aeons, has built something we like but do not understand, then who are we to discard seemingly useless parts ? To keep every cog in the wheel is the first precaution of intelligent tinkering" (Leopold 1953)

DEDICATION

To my parents who encouraged my love of nature and discovery.

Candidate's Certification

I certify that the substance of this thesis has not already been submitted for any degree and is not currently being submitted for any degree or qualification.

I certify that any help received in preparing this thesis, and all sources used have been acknowledged in this thesis.

S. G. W. Laurance

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Abstract

Understorey rainforest birds appear to be exceptionally sensitive to habitat fragmentation and disturbance. This study aims to examine the responses of understorey birds to roads and their edges in the lowland rainforests of central Amazonia. A two-year mist-net study captured 3681 birds at six study sites, along a small (30 - 40m wide) unpaved road. Bird movement across the road and bird composition within the forest was compared among three road-verge treatments: cleared, moderate regrowth and tall regrowth.

Understorey birds varied considerably in their ability to cross a small road. Of the seven understorey guilds studied, the frugivorous and the edge/gap guilds appeared unaffected by the road at all sites. The five insectivorous guilds, however, demonstrated significantly fewer movements across a cleared road. While forest regrowth along road verges facilitated the movements of some insectivorous bird guilds, the solitary understorey birds still showed significant inhibition.

Radio-tracking experiments of translocated birds were undertaken across a highway (45 - 65 m), a large farm clearing (250 m wide), and in continuous forest. Translocated birds returned to their home ranges across the highway and in continuous forest, but not across the large farm clearing.

Edge effects, caused by the road clearing, were found to significantly alter the distribution of

many understorey birds. Total bird captures declined significantly near forest edges irrespective of the type of habitat bordering the edge. Of all the bird guilds, the understorey insectivores showed the strongest pattern of edge avoidance. Captures of army-ant followers, solitary species, mixed-species flocks and terrestrial species declined dramatically near borders whereas edge/gap specialists increased. Frugivores, nectivores, and canopy and mid-storey insectivores did not vary as a function of edge distance.

These thesis data were integrated with two other bird datasets from the BDFFP, to examine six species-traits which could predispose understorey birds to decline and possible extinction in forest fragments. Three significant traits were identified as predictors of post-fragmentation abundance: edge response, natural abundance, and foraging guild. The relative fragmentation response was also examined, and edge response was found to be a highly significant predictor explaining almost 50% of the variability in the data. The implications of this study for reserve design and bird conservation are discussed.

Resumo

Examinei a resposta de pássaros de sub-bosque à estradas e suas bordas, em uma área de floresta tropical da Amazônia central. Em um estudo de dois anos, usando redes de neblina, capturei 3681 pássaros em 6 sítios de estudo, de uma pequena estrada (30 – 40m de largura) não pavimentada. O movimento de pássaros cruzando a estrada e a composição dentro da floresta foi comparado entre três tratamentos em beira de estrada: com vegetação cortada, com vegetação secundária de tamanho moderado e com vegetação secundária alta.

Pássaros de sub-bosque variaram consideravelmente em sua habilidade em atravessar uma pequena estrada. Das sete guildas de sub-bosque estudadas, frugívoros e especialistas de borda/clareira pareceram não ser afetados pela estrada, em nenhum dos sítios estudados. No entanto, as cinco guildas insetívoras demonstraram, significativamente, pouca movimentação através de uma estrada em que a vegetação estava cortada nas bordas. Enquanto, áreas de vegetação secundária ao longo das estradas facilitaram a movimentação de algumas guildas insetívoras, pássaros solitários de sub-bosque ainda mostraram uma significante inibição.

Em experimentos de translocação de pássaros, usando rádio telemetria, pássaros foram levados de um lado a outro de uma rodovia (45 – 65m), de um lado a outro de uma grande área aberta (250m de extensão), e também translocados em área floresta contínua. Os pássaros translocados retornaram a sua área de vida atravessando a rodovia, e em floresta contínua, mas não atravessaram grandes áreas abertas.

O efeito de borda causado pela estrada alterou significativamente a distribuição de muitos pássaros de sub-bosque. O número total de capturas declinou perto da borda independente do tipo de ambiente adjacente à estrada. De todas as guildas de pássaros estudadas, o efeito de borda foi mais forte para insetívoros de sub-bosque, que evitaram as áreas de borda. Capturas de pássaros seguidores de correição, espécies solitárias, espécies de bando misto e espécies de chão declinaram dramaticamente próximo às bordas, ao passo que especialistas de borda/clareira aumentaram. Frugívoros, nectívoros, e insetívoros de dossel e sub-dossel não variaram em função da distância da borda.

Os dados desta tese foram integrados a outros dois bancos de dados do PDBFF, afim de examinar características de seis espécies, as quais poderiam predispor o declínio ou extinção dessas espécies em fragmentos florestais. Três características significantes foram identificadas como um indicativo de abundância pós-fragmentação: resposta à borda, abundância natural e guilda de forrageamento. Dessas, a resposta à borda mostrou ser um indicativo altamente significante, explicando aproximadamente 50% da variabilidade dos dados. As implicações desse estudo para o desenho de reservas e a conservação de pássaros são discutidos.

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