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Avian Ecology and Conservation in Tropical Agricultural Landscapes with Emphasis on Vermivora Chrysoptera

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Abstract
The world's biodiversity is concentrated in tropical ecosystems, yet tropical forests are being converted for agriculture at a rapid rate. I evaluated the potential of an alternative coffee production system known as Integrated Open Canopy (IOC) to contribute to avian conservation. This study was conducted from 2005-2010 in the Cordillera de Tilarán, Costa Rica. My results indicate that species richness of forest-dependent birds was higher in IOC farms than in shade coffee farms, and was comparable to secondary forest sites. There was no difference in species richness of Neotropical-Nearctic migrants between IOC and shade coffee farms. Overall similarity was higher between IOC farms and primary forest than between shade coffee farms and primary forest. The golden-winged warbler *Vermivora chrysoptera* is a declining Neotropical-Nearctic migrant bird, yet little is known about its non-breeding season ecology and demographics. I found that golden-winged warbler abundance was highest at

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intermediate precipitation levels found at middle elevations (1000-1200 m) of the Pacific slope, but they were absent from the dry forests at lower elevations on the Pacific slope. Abundance peaked in forests with canopy heights of 22 m, and was positively related to the quantity of hanging dead leaves. Radio-telemetry data indicated that golden-winged warblers used microhabitat features characteristic of disturbance more frequently than expected by chance. Selection of these microhabitat features was related to their highly specialized dead-leaf foraging behavior, which may also have contributed to their high degrees of site fidelity, mixed-species flock attendance, and territoriality. These behaviors have important conservation implications because they constrain density, and thus could affect carrying capacity. Population dynamics were characterized by estimating plot-level and individual-level apparent survival and recruitment rates within and among non-breeding seasons. Both levels of analysis suggested that recruitment was too low to offset mortalities within this study area. This study indicates that increasing forest cover in tropical agricultural landscapes may be the most effective way of providing habitat for bird species of high conservation concern, including the golden-winged warbler. Integrated open canopy coffee production is one option for achieving this goal because it provides a financial incentive to protect or restore forest.

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