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# Ecological and Economic Services Provided by Birds on Jamaican Blue Mountain Coffee Farms

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coffee berry borer; coffee farms; ecosystem services; *Hypothenemus hampei*; Jamaican coffee; pest c

barrenador del café; café Jamaíquino; control de plagas; fincas cafetaleras; *Hypothenemus hampei*; s

**Abstract:** *Coffee farms can support significant biodiversity, yet intensification of farming practices is degrading agricultural habitats and compromising ecosystem services such as biological pest control. The coffee berry borer (*Hypothenemus hampei*) is the world's primary coffee pest. Researchers have demonstrated that birds reduce insect abundance on coffee farms but have not documented avian control of the berry borer or quantified avian benefits to crop yield or farm income. We conducted a bird-exclosure experiment on coffee farms in the Blue Mountains, Jamaica, to measure avian pest control of berry borers, identify potential predator species, associate predator abundance and borer reductions with vegetation complexity, and quantify resulting increases in coffee yield. Coffee plants excluded from foraging birds had significantly higher borer infestation, more borer broods, and greater berry damage than control plants. We identified 17 potential predator species (73% were wintering Neotropical migrants), and 3 primary species composed 67% of migrant detections. Average relative bird abundance and diversity and relative resident predator abundance increased with greater shade-tree cover. Although migrant predators overall did not respond to vegetation complexity variables, the 3 primary species increased with proximity to noncoffee habitat patches. Lower infestation on control plants was correlated with higher total bird abundance, but not with predator abundance or vegetation complexity. Infestation of fruit was 1–14% lower on control plants, resulting in a greater quantity of saleable fruits that had a market value of US\$44–\$105/ha in 2005/2006. Landscape heterogeneity in this region may allow mobile predators to provide pest control broadly, despite localized farming intensities. These results provide the first evidence that birds control coffee berry borers and thus increase coffee yield and farm income, a*

*potentially important conservation incentive for producers.*

**Resumen:** *Las fincas cafetaleras pueden soportar biodiversidad significativa. Sin embargo, la intensificación de las prácticas agrícolas está degradando los hábitats naturales y comprometiendo los servicios del ecosistema tal como el control biológico de plagas. El barrenador del café (Hypothenemus hampei) es la principal plaga del café a nivel mundial. Los investigadores han demostrado que las aves reducen la abundancia de insectos en las fincas cafetaleras pero no han documentado el control de aves sobre el barrenador del café ni cuantificado los beneficios de las aves a la producción o al ingreso de la finca. Realizamos un experimento de exclusión de aves en fincas cafetaleras en las Blue Mountains, Jamaica, para medir el control de barrenadores del café, identificar especies potencialmente depredadoras, asociar la abundancia de depredadores y la reducción de barrenadores con la complejidad vegetal y cuantificar los incrementos en la producción de café. Las plantas de café excluidas del forrajeo de aves tuvieron significativamente mayor infestación y reproducción de barrenadores, mayor daño de frutos que las plantas control. Identificamos 17 especies potencialmente depredadoras (73% fueron especies migratorias neotropicales), y 3 especies primarias comprendieron 67% de las detecciones de migratorias. La abundancia relativa promedio y la diversidad de aves en relación con la abundancia de depredadores residentes incrementaron con la cobertura de árboles de sombra. Aunque los depredadores migratorios no respondieron en general a las variables de complejidad de la vegetación, las 3 especies primarias incrementaron con la proximidad a los fragmentos de hábitat no cafetalero. La menor infestación en plantas control se correlacionó con la mayor abundancia total de aves, pero no con la abundancia de depredadores o la complejidad de la vegetación. La infestación de frutos fue 1–14% menor en las plantas control, lo que resulta en una mayor cantidad de frutos que tuvieron un valor de mercado de US\$44–105/ha en 2005/2006. La heterogeneidad del paisaje en esta región puede permitir que los depredadores controlen plagas, no obstante intensidades agrícolas localizadas. Estos resultados aportan la primera evidencia del control de barrenadores por aves y el consiguiente incremento en la producción y el ingreso económico, un incentivo de conservación potencialmente importante para los productores.*

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