

Report from the Field

Assessing the Conservation Value of Shade-Grown Coffee: a Biological Perspective using Neotropical Birds

Thomas V. Dietsch

School of Natural Resources and Environment, University of Michigan, 430 E. University Ave., Ann Arbor, MI 48109; wilderth@umich.edu

Abstract

Shade-grown coffee has been marketed as a less intensive management practice that may help improve biodiversity conservation (Perfecto et al. 1996). Studies have shown higher species richness in shade-grown coffee than sun, however, effects on bird species of conservation concern are not clear. This study uses two international conservation lists produced by the World Conservation Union (IUCN) and the Convention on International Trade in Endangered Species (CITES) to evaluate potential benefits for Neotropical birds. Sixty-six species of birds observed in coffee grown with a shade component were found on either the IUCN or CITES lists. An alternative approach may be to use range-restricted endemic birds as indicators of conservation success (ICBP 1992). Countries with high numbers of these endemics are among the highest-ranked producers of coffee. Biodiversity-friendly agriculture is only in its infancy, with coffee as an important test case. Improved assessment and monitoring of species at risk, Neotropical birds in this case, can provide an important guide for future research while improving consumer confidence in this complicated effort.

A number of studies have shown that coffee farms using less intensive management practices (shade-grown) contain a higher diversity of resident and migratory birds (Wunderle & Latta 1996, Greenburg, et al. 1997b). The initial promise of these studies has spurred a movement to market certified "shade-grown" coffees. These coffees currently focus on producing high quality taste to compete with other gourmet coffees, but are sold at higher prices (by including a price premium) to provide incentives for farmers to use less intensive growing practices. While these marketing efforts have emphasized the general benefits to tropical biodiversity and migratory birds, the direct benefits of shade-grown coffee for species identified as meriting conservation attention has received little attention. Higher numbers of species does not necessarily translate into better conservation since common species often move into human-managed landscapes artificially inflating species richness. Consequently,

a better measure is needed to assess the conservation value of alternative land-use management practices like shade-grown coffee. This paper uses two well-known international lists that identify species which merit conservation attention produced by the World Conservation Union (IUCN) and the Convention on International Trade in Endangered Species (CITES) to assess how many birds species of conservation concern might benefit from shade-grown coffee in the Neotropics.

This study compared IUCN and CITES bird lists with those found in eight research publications on birds found in coffee plantations that contained some level of shade canopy as defined by the authors, excluding those found in areas defined as sun coffee. Sixty-six species of Neotropical birds listed by IUCN or CITES have been observed in shade coffee plantations (Table 1) suggesting there may be some conservation value that may enhance traditional conservation pro-

grams (i.e., park conservation). While CITES gives us a good snapshot of species that could benefit from changes in habitat management, the list is somewhat selective since species are placed on the list to impede the international wildlife trade. Several groups including birds of prey, parrots, and hummingbirds receive blanket coverage to improve enforcement efforts. However, even with these groups removed from Table 1, ten species remain based on other criteria including the Golden-cheeked Warbler (*Dendroica chrysoparia*; U.S. Endangered Species and long distance migrant), rare endemics like the Azure-rumped Tanager (*Tangara cabanisi*) and national symbols like the Resplendent Quetzal (*Pharomachrus mocinno*).

This review focused on the Neotropics where the majority of the work on birds and coffee has been conducted and does not include endangered species lists from individual countries. Another approach evaluating conservation poten-

Table 1. Neotropical bird species of international concern observed in shade coffee plantations as listed by the World Conservation Union (IUCN, where END= endangered and NT=threatened) (Collar, et al. 1992, Collar, et al. 1994) and the Convention on International Trade in Endangered Species (CITES appendix listing, see Figure 1), grouped by order and family. Data compiled by author.

Common Name	Scientific Name	IUCN	CITES	REFS	Common Name	Scientific Name	IUCN	CITES	REFS
FALCONIFORMES					APODIFORMES (Trochilidae)				
Sharp-shinned Hawk	<i>Accipiter striatus</i>	II		d, f	Little Hermit	<i>Phaethornis longuemareus</i>	II		d, e
Black Hawk-Eagle	<i>Spizaetus tyrannus</i>	II		f	Great-billed Hermit	<i>Phaethornis majoris</i>	II		b
Roadside Hawk	<i>Buteo magnirostris</i>	II	b, d, f, i		Reddish Hermit	<i>Phaethornis ruber</i>	II		b
Red-crowned Parakeet	<i>Dacrydium amethystinum</i>	II	b, d, f, i		Long-billed Hermit	<i>Phaethornis superciliosus</i>	II		d, e
GALLIFORMES (Cracidae)					Emerald-chinned Hummingbird	<i>Abelilla abelillei</i>	II		c
Great Curassow	<i>Crax rubra</i>	III		f	Jamaican Mango	<i>Anthracothorax mango</i>	II		g
Highland Guan	<i>Penelope nigra</i>	NT			Berylline Hummingbird	<i>Amazilia beryllina</i>	II		f
Plain Chachalaca	<i>Ortalis vetula</i>	III		a, f	White-bellied Emerald	<i>Amazilia candida</i>	II		f
PSITTACIFORMES					Azure-crowned Hummingbird	<i>Amazilia cyanocephala</i>	II		d, e
Blue and yellow Macaw	<i>Ara ararauna</i>	II		b	Blue-tailed Hummingbird	<i>Amazilia cyanura</i>	II		c
Red-bellied Macaw	<i>Ara manilata</i>	II		b	Snowy-bellied Hummingbird	<i>Amazilia edward</i>	II		i
Chestnut-fronted Macaw	<i>Ara caninus</i>	II		b	Cyanation Hummingbird	<i>Amazilia rufus</i>	II		a, f
White-fronted Parrot	<i>Amazona albifrons</i>	II		a	Rufous-tailed Hummingbird	<i>Amazilia tzacatl</i>	II		d, e, i
Red-tailed Parrot	<i>Amazona autumnalis</i>	II		b	Green-fronted Hummingbird	<i>Amazilia viridifrons</i>	II		f
Yellow-crowned Parrot	<i>Amazona ochrocephala</i>	II		b	Antillean Mango	<i>Anthracothorax virdis</i>	II		j
Hispaniolan Parrot	<i>Amazona ventralis</i>	NT			Ruby-throated Hummingbird	<i>Archilochus colubris</i>	II		d, e, f
White-crowned Parrot	<i>Pionus senilis</i>	II		d	Wine-throated Hummingbird	<i>Atthis ellioti</i>	II		f
Black-headed Parrot	<i>Pionus melanocephalus</i>	II		b	Violet Sabrewing	<i>Campylopterus hemileucurus</i>	II		d, f, i
Blue-headed Parrot	<i>Pionus menstus</i>	II		b	Gray-breasted Sabrewing	<i>Campylopterus largipennis</i>	II		b
Orange-fronted Parakeet	<i>Aratinga canicularis</i>	II		f	Rufous Sabrewing	<i>Campylopterus rufus</i>	II		f
Green Parakeet	<i>Aratinga holochlora</i>	II		a	Fork-tailed Emerald	<i>Chlorostilbon canivetii</i>	II		d
Cobalt-winged Parakeet	<i>Brotopogon cyanopectus</i>	II		b	Hispaniolan Emerald	<i>Chlorostilbon hispaniolae</i>	II		j
STRIGIFORMES					Magnificent Hummingbird	<i>Eugenes fulgens</i>	II		d, f
Mottled Owl	<i>Strix virgata</i>	II		f	Plain-capped Starthroat	<i>Heliconaster constantii</i>	II		f
Tropical Screech-Owl	<i>Otus choliba</i>	II		b	Long-billed Starthroat	<i>Heliconaster longirostris</i>	II		d, f
Ferruginous Pygmy-Owl	<i>Glaucidium brasilianum</i>	II		b, f	Blue-throated Goldenthal	<i>Hylocharis elices</i>	II		f
PICIFORMES					White-eared Hummingbird	<i>Hylocharis leucotis</i>	II		d
(Rhamphastidae)					Amethyst-throated Hummingbird	<i>Lampornis amethystinus</i>	II		d
Red-billed Toucan	<i>Rhamphastos tucanus</i>	II		b	Blue-throated Hummingbird	<i>Lampornis clemenciae</i>	II		f
TROGONIFORMES					Green-throated Mountain-gem	<i>Lampornis viridiflans</i>	II		d, f
Resplendent Quetzal	<i>Pharomachrus mocinno</i>	NT		i, h	Vervain Hummingbird	<i>Mellisuga minima</i>	II		g, j
CORACIIFORMES (Todidae)					Sparkling-tailed Hummingbird	<i>Tilmatura dupondii</i>	II		f
Narrow-billed Tody	<i>Todus angustirostris</i>	NT			Streamertail	<i>Trochilus polytmus</i>	II		g
References					PASSERIFORMES				
a Calvo and Blake 1998	c Dietsch, pers. obs				e Greenberg et al. 1997b				
b Canaday 1997	d Greenberg et al. 1997a				f Fuerrero 1999				
					g Johnson 2000				
					h Puebla et al. 1999				
					i Roberts et al. 2000				
					j Wunderle and Latta 1996				

tial may be to use endemic range-restricted (less than 50,000 km²) species as a subset of birds more likely to face conservation problems (ICBP 1992). There seems to be a strong correlation between countries with high coffee production and high numbers of range-restricted endemic birds (Table 2). In the highlands of southern Mexico, 26 of these rare bird species are found and depending on habitat requirements could benefit from the expanded use of sustainable "biodiversity-friendly" coffee growing practices (ICBP 1992). Ten of these endemic species appear on species lists from coffee plantations in southern Mexico and Guatemala (Greenberg et al. 1997a & b, Peters pers.

comm., Dietsch pers. obs.). In Jamaica, Johnson (2000) found 17 of 35 endemics in shade coffee plantations.

These results suggest that conservation benefits for endemic and resident birds in the Neotropics merit more attention, especially since these birds are further constrained by breeding requirements. Of the 66 species listed here, only three are long distance migrants, a major focus of the current birds and coffee literature and marketing material. However, much more work is needed, the birds reported in Table 1 are from just a handful of studies in a fraction of the countries currently producing coffee. A number of studies are currently underway that should

provide a more complete assessment for the Neotropics including Mexico, El Salvador, Nicaragua, Columbia, and Peru but more work is needed in other major coffee producing areas (i.e., Brazil and Costa Rica). While some work has been done in India, other parts of the world are conspicuously absent from the coffee-and-bird literature, most notably Africa and Southeast Asia, both major coffee producing regions (FAO 1999). Evaluating particular groups that may be at risk from management practices should improve assessments of conservation value as research continues.

Numerous challenges still remain before this approach to a conservation

CITES Appendix definitions

1. Appendix I shall include all species threatened with extinction which are or may be affected by trade. Trade in specimens of these species must be subject to particularly strict regulation in order not to endanger further their survival and must only be authorized in exceptional circumstances.

2. Appendix II shall include:

- a) all species which although not necessarily now threatened with extinction may become so unless trade in specimens of such species is subject to strict regulation in order to avoid utilization incompatible with their survival; and
- b) other species which must be subject to regulation in order that trade in specimens of certain species referred to in subparagraph (a) of this paragraph may be brought under effective control.

3. Appendix III shall include all species which any Party identifies as being subject to regulation within its jurisdiction for the purposes of preventing or restricting exploitation, and as needing the cooperation of other parties in the control of trade.

Figure 1. CITES Appendix definitions.

problem can be judged a success. Just as higher diversity does not necessarily mean better conservation, neither does the presence of an endangered species. Many of the species listed in Table 1 may have been adversely affected by the removal of original forest and native overstory trees at mid-altitudes (300 to 1,500 meters) as coffee has expanded and intensified in the Neotropics. Consequently, incentives to farmers through certification programs may help reverse this trend by encouraging the retention of native trees in the overstory, but only if gains are not offset by encouraging additional clearing of remaining forests for coffee production. Proposed certification criteria also have

yet to be tested for their effectiveness in separating management practices that provide suitable habitat for birds and other taxa. While using these lists highlights the potential connections between the conservation of endangered or threatened Neotropical birds and shade-grown coffee, ultimately, the success of this effort will depend on how readily consumers respond to the idea of paying higher prices and thus contributing directly to the costs of conservation.

Literature cited

Calvo, L. and J. Blake. 1998. Bird diversity and abundance on two different shade coffee plantations in Guatemala. *Bird Conservation Inter-*

national 8: 297-308.

Canaday, C. Loss of insectivorous birds along a gradient of human impact in Amazonia. *Biological Conservation* 77: 63-77.

Collar, N.J., M.J. Crosby and A.J. Stattersfield. 1994. *Birds to Watch 2. The World List of Threatened Birds.* Birdlife conservation series no. 4. Bird life International. Smithsonian Institution Press, Washington DC, 407 p.

Collar, N.J., L.P. Gonzaga, N. Krabbe, A. Madroño Nieto, L.G. Naranjo, T.A. Parker III, and D.C. Wege. 1992. *Threatened Birds of the Americas. The ICBP/IUCN Red Data Book.* Smithsonian Institution Press, Washington DC, 1150 p.

Greenberg, R., P. Bichier, and J. Sterling. 1997a. Bird populations in rustic and planted shade coffee plantations of eastern Chiapas, Mexico. *Biotropica* 29(4): 501-514.

Greenberg, R., P. Bichier, A. C. Angon, and R. Reitsma. 1997b. Bird Populations in shade and sun coffee in central Guatemala. *Conservation Biology* 11(2): 448-459.

Guerrero, R. M. 1999. Efecto de la tecnificación cafetalera sobre la diversidad de aves, en la reserva de la biosfera El Triunfo, Chiapas. Tesis profesional para Licenciado en Biología. UNICACH, Tuxtla Gutierrez, Chiapas, Mexico. 112 p.

FAO 1999. *FAO Production Yearbook 1998.* Food and Agriculture Organization of the United Nations, Rome.

ICBP 1992. *Putting biodiversity on the map: Priority areas for global conservation.* International Council for Bird Preservation, Cambridge, U.K, 90 p.

Johnson, M. D. 2000. Effects of shade-tree species and crop structure on the winter arthropod and bird communities in a Jamaican shade coffee plantation. *Biotropica* 32(1): 133-145.

Perfecto, I., R. A. Rice, R. Greenberg, and M. E. Van der Voort. 1996. Shade coffee: A disappearing refuge for biodiversity. *BioScience* 46: 598-608.

Puebla, L.F., J. Guzman Hdz. & R. Villegas-Patracá. 1999. Personal communication. Sixth Neotropical Ornithology Congress, Monterrey, MX.

Roberts, D. L., R. J. Cooper, L. J. Petit. 2000. Flock characteristics of ant-following birds in premontane moist forest and coffee agroecosystems. *Ecological Applications* 10: 1414-1425.

Peters, W. 1999. Personal communication. Finca Irlanda, Tapachula, Chis., MX.

Wunderle, Jr., J. M., and S. C. Latta. 1996. Avian abundance in sun and shade coffee plantations and remnant pine forest in the Cordillera Central, Dominican Republic. *Ornithologia Neotropical* 7: 19-34.

Wunderle, J.M. 1999. Avian distribution in Dominican shade coffee plantations: Area and habitat relationships. *Journal of Field Ornithology* 70(1): 58-70.

Table 2. Countries with high numbers of range-restricted (R-R) birds also rank highly in coffee production (ICP 1992, FAO 1999). Endemic birds are those found only in the country listed. R-R birds are those whose geographic range is less than 50,000 km² (ICBP 1992).

Country	# of R-R Birds Occurring	# of R-R Endemic Birds	Hectares (in 1000's) of Coffee Production	Total Coffee Production (MT)	
				1998	Rank (of 59)
Indonesia	411	339	844	455	3
Peru	216	106	189	120	140
Brazil	201	122	2,095	1,690	1
Colombia	189	81	1,080	732	2
Papua New Guinea	172	82	87	66	22
Ecuador	159	32	279	120	140
Venezuela	120	40	150	51	28
Philippines	111	106	137	121	13
Mexico	102	59	625	288	6
Costa Rica	78	6	95	138	12
India	76	47	246	228	7