

Observations of birds at *Cecropia* trees in Puerto Rico.—The fruits of *Cecropia* trees are a favored food of many tropical birds (Eisenmann, Auk, 78:636–637, 1961), and in fact the seeds of these fruits show an enhanced viability after passing through the alimentary canal of birds (Olson and Blum, Ecology, 49:565–566, 1968). Observations on the avian exploitation of *Cecropia* have been conducted throughout second-growth areas of Central and South America, but there have been no studies from the West Indies. In this note I summarize sightings at *Cecropia* trees in Puerto Rico to compare with my work at mainland trees and to add another perspective of the impact of North American migrants in the Caribbean.

Observations were made in January (17–27) 1970, and January (15–26) 1971, in eastern Puerto Rico at Luquillo National Forest. The ecology of this wet montane area, with almost 200 inches of rain annually, has been extensively reviewed by Odum (A tropical rain forest, 1970). I worked between 2,300 feet elevation near the base of El Yunque to 1,500 feet elevation at the La Mina Visitor's Center. Large *Cecropia peltata* trees were common along cleared areas in the forest, and many individuals were fruiting in both years. A 1971 census in the study area showed 45 in flower, 27 fruiting, and six non-reproducing.

Species account of birds at *Cecropia* trees.—An asterisk is used to identify species actually seen feeding on *Cecropia* fruits.

* Canary-winged Parakeet (*Brotogeris versicolorus*).—This parakeet is an escaped species that is becoming established in the lowlands of Puerto Rico, and recently (1971) expanding in Luquillo Forest. It was relatively tame while feeding on fruits.

Puerto Rican Parrot (*Amazona vittata*).—This endangered endemic regularly perched in *Cecropia* trees, but was never actually observed feeding.

Puerto Rican Lizard Cuckoo (*Saurothera vieilloti*).—A few individuals fed on large insects on the branches. They probably take the common tree lizards (*Anolis* sp.) as well.

Puerto Rican Emerald (*Chlorostilbon maugaeus*).—Several took insects from the underside of leaves.

* Puerto Rican Woodpecker (*Melanerpes portoricensis*).—Woodpeckers fed on fruits, and would sunbathe on the exposed limbs (this is the first report of sunbathing in a tropical woodpecker—Kennedy, Brit. Birds, 62:249–258, 1969).

* Pearly-eyed Thrasher (*Margarops fuscatus*).—Thrashers regularly took fruits and sang from *Cecropia*.

* Red-legged Thrushes (*Mimocichla plumbea*).—The crepuscular thrushes were infrequently observed feeding at the fruits.

* Bananaquit (*Coereba flaveola*).—Bananaquits were abundant at *Cecropia* and frequently fed on fruit and insects.

Black-and-white Warbler (*Mniotilta varia*).—This species was an infrequent insect feeder at the trees.

* Parula Warbler (*Parula americana*).—The Parula was common at *Cecropia* where it fed on fruit and insects.

* Cape May Warbler (*Dendroica tigrina*).—This species was also common and fed on both fruit and insects at the trees. One individual was permanently territorial at a *Cecropia* where it would supplant and chase Bananaquits and Black-throated Blue Warblers (away from this tree the Cape May Warbler was subordinate to the Bananaquit and of equal dominance with the other warbler).

* Black-throated Blue Warbler (*Dendroica caerulescens*).—This species was an uncommon fruit feeder at *Cecropia*, and scarce throughout the forest.

* Chestnut-sided Warbler (*Dendroica pensylvanica*).—This rare migrant regularly fed at the catkin fruits. The species has not been previously reported from the Luquillo Forest (Bond, Fifteenth supplement to the check-list of birds of the West Indies, 1956).

* American Redstart (*Setophaga ruticilla*).—The redstart was generally an uncommon fruit feeder at *Cecropia*.

Blue-hooded Euphonia (*Euphonia musica*).—Euphonias were regular about *Cecropia* but I have no definite feeding records. However it is quite probable that they take the fruits like other euphonias in Central America (e.g. *E. fulvicrissa*).

* Stripe-headed Tanager (*Spindalis zena*).—This tanager uses *Cecropia* for exposed song perches and eats quantities of fruit.

* Puerto Rican Tanager (*Neospingus speculiferus*).—This endemic arrives at the trees in small flocks to feed on fruits.

* Puerto Rican Bullfinch (*Loxigilla portoricensis*).—The bullfinch only feed infrequently at the fruits.

* Black-faced Grassquit (*Tiaris bicolor*).—Grassquits rarely fed on fruits, at short trees near clearings.

Diet Summary.—Of the 20 species of birds utilizing *Cecropia* at Luquillo Forest, 14 definitely came for fruit feeding. Three of these frugivores and three additional species were recorded taking insects from the trees. Similar avian exploitation is noted in Central America. At Barro Colorado Island in the Canal Zone I recorded 41 species at *Cecropia* (13 taking fruits, four insectivores, and 24 incidental visitors), over several months (Leck, The seasonal ecology of fruit and nectar eating birds in lower Middle America, Unpubl. Ph.D. thesis, Cornell, 1970). At *Cecropia* trees in Costa Rica, H. Hespeneheide (in litt.) and others recorded 21 species of frugivores, one insectivore, and four visitor species.

Birds exploiting the Puerto Rican *Cecropia* included almost all of the common species in Luquillo Forest, while the trees in Central America were visited by only a small part of the total local avifauna. This difference reflects the large number of rare species on the mainland and the more specialized feeding niches of mainland birds, with many species strictly limited to non-fruit diets (e.g. antbirds).

North American Migrants.—Six of the 20 species recorded at Luquillo trees were North American migrants. This is a considerably higher migrant percentage (30 per cent) than noted at the trees in Panama (22 per cent) or in Costa Rica (15 per cent). Such a shift in the proportion of migrants is predictable from a comparison of selected avifaunal lists from the neotropics—the percentage of an area's avifauna that is non-resident dramatically increases in insular situations and with decreasing island size. Percentages of non-residents from sample areas will demonstrate this gradient: Mexico 22 per cent, Canal Zone 26 per cent, Hispaniola 41 per cent, Puerto Rico 44 per cent, Jamaica 48 per cent, St. Croix 48 per cent and San Andres 80 per cent. This change in the percentage of migrants is of course produced by a rapid decline in the number of resident species in insular situations, while there are relatively similar numbers of migrant species throughout. Of considerable interest then is an evaluation of the impact of the migrants at food resources in the West Indies—are they a more important competitive element on islands than on the mainland? I made a comparison of migrant vs. resident exploitation by recording all feeding visits to *Cecropia* in six hours (Table 1). The migrants were responsible for more than 60 per cent of both the insect and the fruit-feeding visits. At fruit trees in Panama migrants accounted for only about 10 per cent of the feeding visits in the lowland and up to 46 per cent in the highlands (Leck, Auk, 89:842-850, 1972). Thus, in Puerto Rico the migrants, again associated with higher eleva-

TABLE I
COMPARISON OF RESIDENT AND MIGRANT EXPLOITATION OF *CECROPIA* TREES IN LUQUILLO
NATIONAL FOREST
(Six hours—January 1971).

	Insect-feeding Visits	Fruit-feeding Visits
<i>Residents</i>		
Canary-winged Parakeet		2 (9%)
Puerto Rican Emerald	1 (6%)	
Puerto Rican Woodpecker		1 (5%)
Bananaquit	5 (30%)	3 (13%)
Puerto Rican Tanager		1 (5%)
Puerto Rican Bullfinch		1 (5%)
Resident Subtotals	6 (36%)	8 (37%)
<i>Migrants</i>		
Parula Warbler	4 (23%)	4 (18%)
Cape May Warbler	7 (41%)	7 (31%)
Black-throated Blue Warbler		1 (5%)
Chestnut-sided Warbler		2 (9%)
Migrant Subtotals	11 (64%)	14 (63%)

tions, are obviously of greater impact than on the mainland. Over 10 years ago Bond (*In: The warblers of America, 1957*) suspected the competitive importance of migrant warblers in the Greater Antilles, but almost no field data were available.

Cecropia resources.—In both Central America and the West Indies human activities have greatly increased *Cecropia* populations through the disruption of forested areas. *Cecropia* rapidly invades such disturbed areas and has thus become ubiquitous in most of the neotropics. As an "insect-resource" *Cecropia* are fair on islands, but poor on the mainland where symbiotic ants constantly remove other insects and epiphytes (Janzen, *Ecology*, 50:147-153, 1969). As a fruit-resource *Cecropia* are important to at least several hundred bird species in the New World, and they are a significant resource for many opportunistic migrants.

During both recent visits to Luquillo Forest I enjoyed the kind hospitality of Drs. Cameron and Kay Kepler, U.S. Forest Service. Their suggestions and added sightings at *Cecropias* were most helpful.—CHARLES F. LECK, *Department of Zoology, Rutgers University, New Brunswick, New Jersey 08903, 7 February 1972.*