

SOME INITIAL EFFECTS OF HURRICANE HUGO ON ENDANGERED AND ENDEMIC SPECIES OF WEST INDIAN BIRDS

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HURRICANE HUGO, A CATEGORY 4 hurricane with sustained winds of 140–150 miles per hour and gusts over 180 miles per hour, was perhaps the most violent storm ever to hit islands of the eastern Caribbean. The hurricane passed directly over or near Puerto Rico, Montserrat, Guadeloupe, and Dominica. Each of these islands harbor endangered, threatened, or otherwise vulnerable species of endemic forest birds. We report on Hurricane Hugo's initial impacts to and consequences for some West Indian birds following the storm's landfalls during mid-September 1989 in the eastern Caribbean. We summarize damage to each island, contrast Hugo's impacts on birds with other historical hurricanes, and briefly evaluate these catastrophic events with respect to future conservation strategies for island birds.

We noted the following general forms of initial damage to forest

habitats on all four islands: uprooting of trees in windfalls ("throw"), usually localized and confined to narrow swaths and exposed hillsides, trees shorn of crowns and major limbs by high winds but remaining upright, and defoliation of all leaves, flowers, and fruits. Less catastrophic forms of hurricane-induced damage may result in suspension of fruiting and flowering for three or more years in highland forests (Johnson 1988). However, due to increased sunlight now reaching understories, delayed flowering and fruiting occurred at higher than normal levels in Puerto Rican mid-level and lowland forests six to eight months after Hugo's passage (J.M. Wunderle, unpubl.).

On Puerto Rico, Hurricane Hugo affected the populations or habitat of three endangered birds. Of 47 Puerto Rican Parrots (*Amazona vitata*) known to exist in the wild prior to hurricane passage,

only 20 to 26 parrots could be located during censuses conducted by the U.S. Fish and Wildlife Service, U.S. Forest Service, and Puerto Rican Department of Natural Resources (M. Wilson, pers. comm. Anon. 1989). Whether this 50% decline represents a real and obviously catastrophic loss, or merely dispersal into uncensused areas, is still unknown. Biologists knew of five wild breeding pairs prior to Hugo, and at least three pairs have been subsequently located. One nest had eggs and a second nest had reproductive activity. By the beginning of this century, the localized, traditional nesting areas of the Puerto Rican Parrot had already enhanced susceptibility of the species to the ravages of hurricanes (Snyder *et al.* 1987).

A small, remnant population of Yellow-shouldered Blackbirds (*Agelaius xanthomus*) formerly inhabited the Roosevelt Roads Naval Station and Ceiba region in eastern Puerto Rico. Only two individuals have been observed in this area since Hugo. The Roosevelt Roads population was already declining, probably from Shiny Cowbird (*Molothrus bonariensis*) parasitism, prior to the hurricane (Anon. 1989). Habitats of the larger populations of Yellow-shouldered Blackbirds in western Puerto Rico and on Mona Island were unaffected by the storm. Assisted by defoliated trees, censusers counted 203 Puerto Rican Plain Pigeons (*Columba inornata wetmorei*) after Hurricane Hugo (Anon. 1989). Although this number is similar to 176 birds counted in January 1989, some of the pigeon's most important breeding habitat at Cidra was destroyed. An epizootic disease, possibly related to flooding from the hurricane, subsequently broke out and affected 90 of the 124 captive-reared pigeons (Anon. 1989).

The small island of Montserrat, home to the endemic Montserrat

Oriole (*Icterus oleri*), was especially hard-hit by Hurricane Hugo. Exposed ridges and hillsides lost as much as 63% of their forest cover, and even sheltered ravines were still 30-40% defoliated three months after hurricane impact. Refoliation on upper slopes had not commenced even after seven months (Arendt 1990). Haney observed a single oriole in a ravine near woodlands in late December 1989, and residents reported a few additional sightings of the species immediately after the hurricane. On December 31, 1989, no orioles or any other birds could be located in the dwarf forest of the South Soufriere Hills. Many forest-dwelling birds seemed scarce during Haney's two-day visit to Montserrat: the Purple-throated Carib (*Eulampis jugularis*), Trembler (*Cincloerthia ruficauda*), Forest Thrush (*Cichlherminia lherminieri*), Antillean Euphonia (*Euphonia musica*), and Lesser Antillean Bullfinch (*Loxigilla noctis*) were not observed at all. Failure of flowering plants to recover immediately after the hurricane may have influenced low counts of Green-throated Caribs (*Sericotes holosericeus*) and Antillean Crested Hummingbirds (*Orthorhynchus cristatus*) in lowland areas.

Arendt (1990) observed more than 100 Montserrat Orioles during an intensive two-week survey conducted six months after hurricane impact. By March 1990, orioles had emigrated from dwarf forest on upper slopes, and large concentrations were found in regenerating forest tracts between 400-800 meters elevation as well as within steep-sided arroyos (locally called "ghauts") of interior foothills. Most orioles were paired, and post-hurricane reproduction was confirmed. A habitat generalist, the Montserrat Oriole occurs from coastal, mangrove, and dry forest through montane forest with highest densities in dwarf forest above 500 meters

(Faaborg and Arendt 1985). Arendt (1990) noted similar movements and displacements by other species on Montserrat, but few bird populations appeared to have declined.

The endemic Guadeloupe Woodpecker (*Melanerpes herminieri*), is the only species of the family Picidae in the Lesser Antilles. Although comparatively little is known about its biology, the Guadeloupe Woodpecker was not thought to be threatened before Hurricane Hugo struck the island (Johnson 1988). Guadeloupe actually consists of two narrowly-separated islands: The western island (Basse Terre) is more mountainous and its wet forests are the principal habitat of the woodpecker (Short 1974). Basse Terre's 14,600 hectares of rainforest and lower montane rainforest were heavily damaged by the storm, especially the wetter forests on east-facing slopes.

Guadeloupe Woodpeckers were censused on January 21, 1990, approximately four months after hurricane impact, and eight months after a similar census conducted before the hurricane during May 1989. Haney and five other observers allotted equivalent time and followed the exact route of the May census (Prise d'Eau to the Station de Reserches de Zoologie, and along Highway D23 from Vernou to Pointe Noire). Only four Guadeloupe Woodpeckers were counted along the route in January compared to 13 seen in these areas the previous May. Part of the woodpecker's diet is comprised of fruit, and compared to other woodpeckers it feeds more by gleaning and probing than by tapping (Short 1974). Fruit availability was certainly reduced after the storm since the hurricane caused extensive and very widespread damage to forest habitats on Basse Terre. We noted no fruiting trees during January 1990, and indeed trees were only beginning to refoliate four months after

hurricane impact.

Hurricane Hugo had considerably less effect on Dominica, where damage consisted mainly of destruction to banana crops and some coastal erosion on the island's Atlantic coastline. That Dominica was spared Hugo's more violent destruction of neighboring islands is especially fortunate because the 1979 hurricanes (David and Frederick) caused the most severe damage ever reported for island forests (Johnson 1988). Morne Trois Pitons National Park lost nearly all of its trees (Guarnaccia 1989). Both of the island's endemic parrots suffered dramatic declines because of the hurricanes. The Imperial Parrot (*Amazona imperialis*), Dominica's national bird, became extirpated from southern Dominica, its stronghold, and its population dropped from about 200 to an estimated 60 individuals. Both the Imperial and Red-necked parrots (*A. arausiaca*) are now recovering in the more sheltered Dyer/Syndicate Estate and Northern Forest Reserve regions of Dominica, areas that escaped the full force of the 1979 hurricanes.

Hurricanes have acted as agents for other changes in the avian biogeography of the West Indies. Raffaele (1989) speculated that the St. Kitts race of the Puerto Rican Bullfinch (*Loxigilla portoricensis*) was extirpated, and that the Puerto Rican Flycatcher (*Myiarchus antillarum*) declined on Puerto Rico following the hurricanes of 1928 and 1932. On the other hand, the Caribbean Elaenia (*Elaenia martinica*) on Montserrat was recorded as more common and widespread following habitat disturbances by hurricanes (Arendt 1990). Studies of bird populations following the passages of Hurricanes Gilbert on Jamaica and Hugo on Puerto Rico will continue. Preliminary results suggest that numbers of forest birds can actually

exhibit local, if only apparent increases when canopy-dwelling species move closer to the forest floor and upper-elevation species move to lowland areas in order to take advantage of denser, less damaged vegetation (Wunderle *et al.* 1989, Wunderle 1990).

Two separate lines of evidence suggest hurricanes might be more frequent, intense, or widespread in the West Indies in coming decades. Concern over global climatic change has prompted modeling its consequences for the Caribbean region. With an increase of 1.5° C in sea surface temperature, the number of Caribbean hurricanes may increase by 40%, and maximum sustained wind speeds could increase by 8% (UNEP 1989). Although not analyzed by these models, changes in the locations of hurricane formation and subsequent storm tracks could be as important as changes in storm frequency and strength. Other climatologists, noting a 20-year cycle linked to West African rainfall, have also predicted more intense Atlantic hurricanes in the next decade (Kerr 1990). In any case, the period between 1969-1985 has been remarkably quiescent for North Atlantic hurricanes, so some increase in the incidence of devastating storms seems likely.

Hurricanes are usually infrequent catastrophic events, typically confined to coastal or marine areas. However, terrestrial ecosystems are clearly not exempt from such coastal processes in much of the Caribbean. The destructive or disruptive influence of hurricanes on interior and montane forest habitats may be cause for special concern on smaller islands, especially the Lesser Antilles which harbor several endemic birds. Unlike continental areas and larger islands (*e.g.*, Cuba and Hispaniola), small islands provide little protection and fewer refugia for bird populations during intense storms. Island forests may require more

than 50 years to regenerate and regain the "climax" conditions existing prior to hurricane destruction (Lugo *et al.* 1983).

Hurricanes could be particularly devastating to populations of highly-localized species of West Indian birds already under cumulative pressure from other factors. Habitat preservation alone could prove to be an insufficient response for preserving of avian biodiversity in the West Indies. Because chance events such as hurricanes are already known to directly influence dynamics of small populations of Caribbean birds, we believe hurricane effects should be considered during evaluation of future conservation strategies. ■

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