

Population Studies of Migratory Birds in Virgin Islands National Park

The majority of the individual songbirds nesting in the deciduous forests of eastern North America migrate to the West Indies, Central America and South America during the winter. They typically spend more than six months in tropical winter habitats. Until recently relatively little was known about their habitat requirements during the winter, but increasing concern about declining populations of many migratory songbirds combined with widespread alarm about the rapid destruction of tropical forests has led to a flurry of research on this subject (Terborgh, 1989; Askins et al. 1990). In 1987 we initiated a study of the ecology and behavior of migrants in the Virgin Islands, particularly in Virgin Islands NP on St. John. This study has not only yielded information about the winter ecology of migratory birds, but also about the distribution of resident species and (unexpectedly) the impact of a major hurricane on bird populations.

Habitat Requirements of Migratory Songbirds in Winter

Unlike other islands in the Virgin Islands group, St. John has large continuous tracts of moist tropical forest and dry woodland. Establishment of Virgin Islands NP in 1956 insured protection of much of the forest that was growing back on land that had been covered with sugar cane or pasture in the 19th century (Tyson, 1987). After completing an intensive survey of birds on St. John in February and March of 1957, Robertson (1962) concluded that some species of winter-resident migrants that were considered rare on nearby islands were widely distributed in the moist forests of St. John. Moreover, records from Christmas Bird Counts indicate that St. John has a higher diversity of winter-resident warblers than the other major islands in the U.S. Virgin Islands, St. Croix and St. Thomas (Pashley and Martin, 1988). These results suggested that Virgin Islands NP might include important habitat for migratory songbirds.

To assess the importance of different habitats for wintering migrants, we surveyed birds in the dominant habitats on St. John and St. Thomas. Land-use patterns on the two islands are dramatically different; St. John is 86 percent forested while 62 percent of St. Thomas is covered with commercial and residential

areas, and only 38 percent is forested (Askins et al., in press). The remaining forest and woodland on St. Thomas is in the form of relatively small, disjunct patches. Our primary goal was to compare similar natural areas on the two islands to determine if forest fragmentation on St. Thomas had resulted in relatively low densities of migratory birds.

We surveyed birds at 218 points scattered across the two islands (Askins et al., in press). We counted all birds detected within 25 m of the point during a 10-minute observation period. Survey points were located in moist forest, dry woodland, and artificial habitats (e.g., hotel grounds and residential areas). Vegetation surveys were completed on a plot centered at each survey point.

We recorded an impressive diversity of winter residents during these surveys: 13 species of warblers and one species of vireo (Askins et al., in press). Like Robertson (1962), we found that the density of winter residents is more than three times higher in moist forests than in dry woodlands, and that some species were largely restricted to moist forests. Artificial habitats had relatively low densities of winter migrants and many species were never recorded in this habitat. Consequently, moist forest is a critical habitat for winter residents.

On St. Thomas, most moist forests are in steep-sided ravines (guts) surrounded by residential areas or on mountain tops that are being subdivided for housing. In contrast, the moist forests of St. John are embedded in extensive tracts of dry woodland. The remaining moist forests on St. Thomas have a vegetation structure similar to those on St. John, but the density of winter residents is significantly lower; we detected an average of 1.9 winter-resident birds per survey point on St. John compared to only 0.6 per point on St. Thomas (Askins et al., in press). Moreover, even the artificial habitats on St. John have a higher density of winter residents than similar habitats on St. Thomas. Degradation and fragmentation of natural habitats on St. Thomas have apparently resulted in a relatively low density of wintering migratory songbirds.

Maintenance of an abundance and diversity of wintering songbirds in the U. S. Virgin Islands will depend upon protection of the remaining tracts of moist forest, especially the relatively large tracts in Virgin Islands National Park. Some of these tracts, such as the upland forest on Bordeaux Mountain, are threatened by development on private land. A long-term threat is the pressure for road construction and recreational development along the south shore of St. John, where there are forested coastal basins.

Social Behavior of Wintering Songbirds

Our surveys revealed that wintering songbirds often occurred in mixed species flocks or aggregations. If participation in mixed flocks is important for wintering migrants, then forest fragmentation might have a negative effect on them if individuals become isolated and are unable to form flocks. To assess the distribution and frequency of mixed flocks, we surveyed transects in remnant patches of moist forest on St. Thomas and in larger moist forests on St. John (Ewert and Askins, 1991).

Most of the individuals detected in flocks (91%) were migrants. The two most abundant winter residents, Northern Parula (*Parula americana*) and Black-and-white Warbler (*Mniotilta varia*), were especially fre-

quent in flocks. In contrast, only 17 percent of the flocks included permanent residents. Many of the groups of migratory birds moved together in a cohesive flock for more than 20 minutes, indicating that these groups were not merely chance aggregations at a favorable feeding site.

When we compared the frequency of flock participation and the size of flocks on the two islands, we found no significant difference. The average number of birds per flock (4.0 individuals of 3.1 species) was similar on St. John and St. Thomas despite the lower density of migrants on the latter island. Thus, there is no obvious relationship between habitat fragmentation and flocking behavior. However, survivorship of birds in flocks of similar size and composition may differ on the two islands. This requires further study.

Distribution of Resident Species

Unlike migratory birds, resident birds are more abundant in dry woodland than in moist forest (Robertson, 1962; Askins et al., in press). Although areas of dry forest are larger and more continuous on St. John than on St. Thomas, the number of species and individuals detected per survey point are similar on the two islands, indicating that habitat fragmentation does not have a major effect on either the density or diversity of resident birds. Hence, in this case the main concern may be the direct effect of habitat loss rather than to indirect effects caused by fragmentation of the remaining habitat.

Impact of Hurricane Hugo on Bird Populations

Hurricane Hugo hit the Virgin Islands in September, 1989. We visited St. John in January, 1990 to study the effect of the storm on bird populations. We completed surveys at 62 points in moist forest and dry woodland, compared to 90 points in these two habitats in 1987 (Askins and Ewert, 1991). The average number of individual permanent residents per survey point was significantly lower after the hurricane. Most of the species that showed substantial declines were species that feed primarily on fruit or nectar, a pattern that has been documented in several other studies of the impact of hurricanes on birds (Wunderle et al., in press). For example, Scaly-naped Pigeon (*Columba squamosa*), Antillean Crested Hummingbird (*Orthorhynchus cristatus*) and Bananaquit (*Coereba flaveola*) all showed significant declines. Most wintering migrants had similar densities before and after the hurricane, but the most abundant species (Northern Parula) showed a significant decline (Askins and Ewert, 1991).

Substantial declines of some resident bird populations after hurricanes indicate that island populations may be vulnerable to extinction, especially if their populations are already greatly reduced as a result of habitat destruction. The possibility of severe population declines due to hurricanes must be considered in any management plan for threatened or endangered species in the Virgin Islands. As much favorable habitat as possible should be protected for these species, with special attention to protection of sites with different exposures, elevations and slopes to allow for differences in susceptibility to hurricane damage.

Future Research

Permanent survey points have been established in Virgin Island NP to facilitate long-term monitoring. We plan to determine population trends in migratory song-

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birds in relatively undisturbed habitats in the park. Consistent declines of migrants in these habitats would be evidence for an overall population decline, perhaps due to habitat changes in the breeding areas or on the migratory routes. At the same time, we can assess population changes of permanent residents, particularly rare or localized species. We also plan to expand our research on the ecology and behavior of particular species of wintering migrants.

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