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# Population Studies of Migratory Birds in Virgin Islands National Park

By Robert A. Askins and David N. Ewert

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 frequent 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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## Water Quality Monitoring

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### Future Plans

We hope to continue the monitoring program to establish a sufficient database to assess long-term trends in water quality in the park. We also hope to start analyzing bacterial contaminants, in particular, fecal coliforms, for sites adjacent to coastal developments developments or heavily visited bays.

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# Seagrass Disturbances in Great Lameshur Bay, St. John

By Lisa Muehlstein

Seagrass habitats are extremely important components of coastal ecosystems; they stabilize bottom sediments and improve water clarity, exhibit high rates of productivity, and provide shelter and nursery grounds for many commercially important species. Seagrasses also serve as a direct food source for a number of different animals, most notably the green sea turtle (Dawes 1981, Zieman 1982). The seagrass communities in the Virgin Islands are subjected to many stresses, including pollution, development, recreational boating, disease and storms.

Great Lameshur Bay, St. John, has been the site of a multi-faceted seagrass study over the past three years, including the documentation of disturbances and the establishment of a long-term ecological study. This bay is within Virgin Islands National Park and Biosphere Reserve and receives less pressure from recreational use and development than other areas of the park. However, the seagrass community has been stressed significantly over the last three years.

### Bluegreen Algal Overgrowth

In 1989, an unusual bluegreen algal overgrowth appeared in the bay following a tropical storm. In May, the overgrowth covered approximately one-third of the seagrass community and extended over the fringing reef along the western edge of the bay. In some areas, this bluegreen mat was 20-30 cm deep. A decrease in the vigor of the seagrass plants was apparent in these areas. Leaves were pale and senescing, apparently from lack of light and a decrease in available oxygen. The alga was tentatively identified as a species of *Schizothrix*. The cause of the overgrowth remains unknown. The tropical storm may have caused a flushing of the fringing mangrove system, releasing high levels of nutrients into the bay and stimulating the algal bloom. Hurricane Hugo wiped out the bluegreen algae, along with the overgrown seagrasses.

### Hurricane Damage

During Hurricane Hugo, dislodged coral heads, tree trunks and other debris were carried into the seagrass bed by storm waves, leaving behind severely damaged plants. In many areas, seagrass plants were almost completely buried. In Great Lameshur, the seagrass bed was extensively damaged, with large blowouts reaching a maximum of 20 m by 20 m and up to 1 m deep. Several blowouts were marked after the storm to document recovery and succession within the seagrass bed. Measurements were taken on a quarterly basis to record areal change of the blowouts. Recovery of seagrasses could take several years partly because of extensive damage to the terminal meristems of the rhizomes (Fuss and Kelly 1969, Tomlinson 1974). Similar blowouts took 5 to 15 years to recover (Patriquin 1975). It took up to six months following the storm for sediments to begin to fill in the extensive pits. Fifteen months following the storm calcareous green algae including *Penicillus* spp. and *Halimeda* spp. began to colonize the bottom of the blowouts. This colonization may be the initial successional stage within a seagrass bed (Zieman 1982). However, the size of the blowouts actually increased as damaged seagrass plants continued to die back. Eighteen months after the storm, some new growth and colonization by manatee grass, (*Syringodium filiforme*) and turtlegrass, (*Thalassia testudinum*) was apparent. The size of the blowouts appeared to be stable, and no increase in area was observed. Twenty months after the storm, the blowouts appeared to be diminishing in size, reflecting more colonization by turtlegrass. Full recovery of the blowouts is likely to take several more years.

### Disease

Disease is another stress affecting turtlegrass in Great Lameshur Bay. A pathogenic species of *Labyrinthula* has been isolated from turtlegrass in this bay as well as other bays around St. John, St. Thomas, and St. Croix. In laboratory tests conducted according to Muehlstein et al. (1988), the isolates of *Labyrinthula* have been conclusively demonstrated to be a pathogen of turtlegrass. Although no major disease-related declines have been documented in Great Lameshur or other local bays, the stress of disease is present and represents a threat to the habitat. Both temperate and tropical seagrass habitats have suffered major declines from disease over the last 10 years (Short et al. 1987, Muehlstein et al. 1988, Robblee et al. 1991).

### Long-term Monitoring

In an effort to document the current status of the seagrass habitat and the effects of disturbance, a long-term monitoring project has been established in Great Lameshur Bay. Three 250 m permanent transects have been installed for the collection of basic ecological data. Measurements of seagrass density, community structure, and seagrass productivity have been taken at quarterly intervals for the last two years. Preliminary analysis indicates an unstable community structure with fluctuating populations of macroalgae, dominated by *Penicillus* spp. and varying densities of manatee grass and turtlegrass. Productivity is low in comparison to other areas. The instability of the community may reflect the level of disturbance over the last several years. It is extremely important to maintain a monitoring program, not only to document changes within the system but also to provide a solid data base for future resource management decisions.

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## Migratory Birds in Virgin Islands NP

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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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