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BLACKPOLL WARBLER MORTALITY DURING FALL MIGRATION AT A TOWER IN SOUTHEASTERN FLORIDA

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Whether Blackpoll Warblers (*Dendroica striata*) reach their wintering grounds in South America by a transoceanic path over the Atlantic Ocean from the northeastern United States (Nisbet et al. 1963) or follow a route over land through the southeast (Murray 1989), they are uncommonly observed in Florida during autumn migration (Kale and Maehr 1990). The more southern departure would place the western edge of the migratory route closer to peninsular Florida and more closely parallel to the coast than the route over the western Atlantic Ocean. Their spring migration is primarily through the Caribbean and peninsular Florida (Avisé and Crawford 1981).

This difference in migration routes is evident from Blackpoll Warbler mortality at tall buildings and towers in Florida. More Blackpoll Warblers are killed at fixed structures during the spring migration than in the fall. The objective of our paper is to document a significant mortality event which appears to be the largest number of Blackpoll Warblers killed by striking a structure. This event contributes some information to the possible autumn migratory route of the Blackpoll Warblers.

This incident occurred at the U.S. Coast Guard LORAN Station located on the northeast boundary of Jonathan Dickinson State Park, 4 km south of Hobe Sound in Martin County (Lat. 27°01'58.5" N, Long. 80°06'53.5" W), Florida. The LORAN antenna tower is approximately 191 meters tall with 54 supporting guy wires extending 262 meters from the base. The tower has the mandatory red and white lights to denote hazards to air traffic.

At approximately 0345 EST on 8 October 1991, Michael S. Feener of the U.S. Coast Guard arrived at the U.S. Coast Guard LORAN Station and noticed what seemed to be thousands of birds flying around the antenna tower and several dead birds beneath the structure. The phenomenon was still going on when he left the facility at 0415. Upon arrival at 0545 he noticed very few birds flying around and many dead birds at the base of the antenna. The weather between 0300 and 0400 EST on 8 October 1991 was overcast with north winds to 27 km/hr, as recorded in West Palm Beach, Florida, 34 km south of the location.

We collected a total of 617 dead birds representing nine species (Table 1). Most of the birds were retrieved at the base of and south/southwest of the tower. Dead birds were frozen immediately following collection, which took place between 0700 and 1100 EST on 8 October 1991. Frozen weights of the Blackpoll Warblers were measured using a Pesola scale on 5 and 13 November 1991. Twenty-six birds were not weighed due to body decomposition by fire ants (*Solenopsis* sp.). The mean body mass was 16.5 grams ($n = 560$, range = 12.0 to 19.4, $SD = 1.46$). All specimens were donated to the Archbold Biological Station, Lake Placid, Florida.

Avian mortality during a long migration is high even without meteorological events that produce adverse weather conditions. In the past thirty years, there have been numerous publications that document fatalities of nocturnal migrant birds at towers and structures in Florida (Stoddard and Norris 1967; Taylor and Anderson 1974; Williams et al. 1977; Crawford 1978, 1980; Taylor and Kershner 1986). Several of these studies document Blackpoll Warbler mortality at fixed structures in Florida. From 1955 to 1980 casualties of Blackpoll Warblers at the Tall Timbers television tower (Leon County) totaled 5 in the fall

and 158 in the spring (Stoddard and Norris 1967, Avise and Crawford 1981). Another study of a television tower in central Florida (Orange County), recorded 10 Blackpoll Warblers killed in the fall months between 1969 and 1971, and 25 in the spring of 1971 alone (Taylor 1981; Taylor and Anderson 1973, 1974). A third study from 1970 through 1981 at the Vehicle Assembly Building, John F. Kennedy Space Center (Brevard County), reported 5 fatalities of Blackpoll Warblers in the fall and 652 in the spring (Taylor and Kershner 1986).

One documented event, which occurred in Brevard County, provides data that are atypical of the pattern of Blackpoll mortality in Florida. In October 1964, severe weather conditions caused by Hurricane Hilda and a cold front that produced continuous drizzle, haze, and 53 km/hr winds, resulted in the death of 322 Blackpoll Warblers (Case et al. 1965). Outside of this event and the event reported herein, fatalities of Blackpoll Warblers due to collision with structures during the fall migration are not well represented by any of the long-term studies. Both of the large fall mortality events appear to be attributed to high winds and adverse weather conditions causing individuals to deviate from their normal offshore migratory route.

The incident at the U.S. Coast Guard LORAN Station provides supporting evidence for Murray's conclusion that the Blackpoll Warblers are migrating closer to the southeastern United States than the farther eastward transoceanic path (Murray 1989). The mean body mass (frozen weight) of 16.5 grams is heavier than the mean weight of 14.0 grams that was measured in Bermuda (Murray 1989). These data are consistent with Murray's (1989) hypothesis that Blackpoll Warblers store fat in the southeastern United States before departing on their transoceanic migration. Adverse weather conditions encountered during migration would cause the birds to utilize more body reserves to reach Bermuda rather than the closer Florida peninsula. As stated by Murray (1989), the details of distribution and movement in the southeastern United States remain to be studied.

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Table 1. Number of dead birds collected at the U.S. Coast Guard LORAN Tower, Martin County, Florida, 8 October 1991.

Species	Number of individuals
Blackpoll Warbler, <i>Dendroica striata</i>	586
Yellow-billed Cuckoo, <i>Coccyzus americanus</i>	7
Ovenbird, <i>Seiurus aurocapillus</i>	7
Connecticut Warbler, <i>Oporornis agilis</i>	5
Cape May Warbler, <i>Dendroica tigrina</i>	8
Red-eyed Vireo, <i>Vireo olivaceus</i>	1
Common Yellowthroat, <i>Geothlypis trichas</i>	1
Indigo Bunting, <i>Passerina cyanea</i>	1
Scarlet Tanager, <i>Piranga olivacea</i>	1
Total	617

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