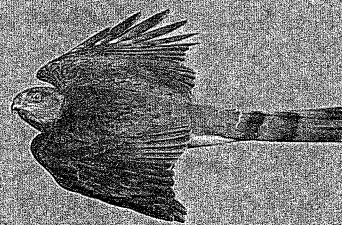


Was the Rise and Fall of Eastern Sharp-shinned Hawk Migration Counts Linked to the 1970s Spruce Budworm Infestation?



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A mystery of raptor monitoring in eastern North America was the cause of the large declines, starting in the 1980s, in fall hawk-watch counts of Sharp-shinned Hawks (*Accipiter striatus*) (Kerlinger 1992; Kellog 1993; Viverette et al. 1996). During the same time, Sharp-shinned Hawk counts increased at Christmas Bird Count sites in southern New England and in the mid-Atlantic states. This seeming paradox might be explained by an increasing tendency of Sharp-shinned Hawks to migrate shorter distances, termed short-stopping, than did their ancestors, causing fewer to be counted at fall hawk-watches (Duncan 1996; Viverette et al. 1996).

This article examines an alternative hypothesis: that much of the dynamics in eastern Sharp-shinned Hawk populations during the 1970s and 1980s was caused by changes in boreal songbird populations that accompanied a large infestation of eastern spruce budworm (*Choristoneura fumiferana*) (Clem.), a role previously suggested by Bildstein and Meyer (2000).

Trends in Fall Migration Counts

I examined fall hawkwatch data from four eastern sites, two coastal: Cape May, NJ, and Kiptopeke, VA; and two on Pennsylvania's Kittatinny Ridge: Hawk Mountain, PA, and Waggoner's Gap, PA (Table 1, Figure 1). Data were obtained from *Hawk Migration Studies* and from site compilers. Years before 1960 and those with fewer than 200 count hours were omitted. Migration data were expressed as yearly counts/hour.

Count patterns at the two coastal sites showed very similar trends (correlation = 0.81, P-value < 0.0005). Cape May counts reached a peak in 1977. Counts at both sites appeared to decline in the mid-1980s, bottoming out during 1989-93, increased again during 1994-99, then subsequently falling back to low levels (Figure 1).

Count patterns at the two Kittatinny Ridge sites also exhibited very similar trends to each other (correlation = 0.94, P-value < 0.0005). At Hawk Mountain, counts/hour reached low levels during the DDT era of the 1950s and 1960s (Bednarz et al. 1990), showed rapid increases during 1970-1977, also reaching a peak in 1977. A dip occurred during 1982-1985, followed by higher counts during 1986-90. Counts have remained low since 1991, with a slight downward trend during

this time partially attributable to increasing count hours during August and December. Data from Waggoner's Gap showed a similar trend (Figure 1).

Identification of Sharp-shinned Hawks by age has revealed that juvenile birds dominate the coastal flights, while flights at the ridge sites are of mixed ages. Of 16,472 Sharp-shinned Hawks captured for banding at Cape May during 1971-79, 96% were juveniles (Clark 1985). Of migrant sharp-shins aged at Hawk Mountain, 49% in 1987 and 72% in 1988 were classified as adults (Goodrich 1989).

Table 1. Fall hawk-watch sites from which data were examined.

Site	Started	Yearly hours
Cape May, NJ	1976	558–1002
Kiptopeke, VA	1977	277 or higher since 1983, 692 or higher since 1994
Hawk Mountain, PA	1934	769 or higher since 1985
Waggoner's Gap, PA	1976	Fewer than 200 hours in 1980, 1982, 785 or higher since 1990

The 1970s Spruce Budworm Infestation

Large-scale spruce budworm infestations of the eastern boreal forest periodically occur with the right combinations of environmental and forest conditions. What is commonly called the 1970s infestation started during the late 1960s in small areas of eastern Ontario, western Quebec, and New Brunswick. In 1974, a spectacular advance resulted in 55 million hectares of boreal forest between Lake Superior and the Atlantic Ocean being defoliated by the 1975 peak. By the mid-1980s, the outbreak had collapsed and half or more of the affected forest was dead (Hudak and Raske 1981; Blais 1983; Sanders et al. 1985; Armstrong and Ives 1995) (Figure 2, data from Armstrong and Ives 1995; Natural Resources Canada 2002). To put 55 million hectares into perspective, the combined area of New York, Pennsylvania, Maryland, West Virginia, Virginia and North Carolina is about 57 million hectares.