Spring Migration at Hawk Mountain Sanctuary, 1969-1998

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Introduction

Hawk Mountain Sanctuary, the world's first refuge for birds of prey, has been monitoring the autumn migrations of northeastern U. S. and eastern Canadian populations of raptors since its founding in 1934. The Sanctuary currently maintains the longest and most complete record of raptor migration in the world (Broun 1949; Brett 1991; Bildstein 1998). Hawk Mountain's autumn counts have helped document the harmful effects of DDT and other organochlorine pesticides on populations of birds of prey (Carson 1962), as well as to assess long-term population trends of raptors (Bednarz et al. 1990). The autumn database also has been used to examine relationships between (1) passing cold fronts and the magnitude of raptor migration at the site (Allen et al. 1996), (2) gender and American Kestrel (*Falco sparverius*) migration (Stotz and Goodrich 1989), and (3) recent shifts in the distribution of wintering Sharp-shinned Hawks (*Accipiter striatus*) and declines in their numbers at eastern migration watchsites (Viverette et al. 1996).

Between 1934 and 1995, an average 17,787 raptors has been observed at Hawk Mountain Sanctuary each autumn, with an average passage rate of 23.3 birds per hour (Bildstein 1998). In contrast to autumn, spring migration at the site is much less pronounced, with an average passage rate of 6.0 birds per hour in 1969-1998. Not surprisingly, count efforts and analyses of raptor migration at the site have focused on autumn movements. Here, we summarize data collected during spring migration at the site and compare these data to data collected in autumn.

Methods

Count efforts at Hawk Mountain Sanctuary in spring have been sporadic. Spring raptor migration was monitored in 1969-1970, 1976-1977, 1980, 1982-1988, 1992, and 1994-1998, with a range of 2 to 56 days and an average 69 hours of observation each year (Figure 1). Spring counts have been made as early as 1 February and as late as 21 May. Twenty-seven % of the count effort has been in March; 60% has been in April (Figure 2). Spring coverage typically extends from 09:00 to 15:00, with 1 or 2 observers conducting each day's count. Counters use binoculars to spot, identify, and count north- and northeast-bound raptors at the site. Counts have been conducted at 9 lookouts on or within 8 km of the Sanctuary. Eighty-nine % (1116 of 1249 hours) of the spring watchsite effort has occurred at the Cobble and the North Lookout (Table 1, Figure 3). For the purposes of the analyses that follow, autumn data from the site include only those years in which spring observations also were made (1969-1997).

Results and discussion

7433 raptors were observed during 1249 hours of spring counts at Hawk Mountain Sanctuary in 1969-1998. Six species of raptors (Osprey [scientific binomials appear in Table 2], Sharp-shinned Hawk, Broad-winged Hawk, Red-tailed Hawk, Northern Harrier, and American Kestrel) account for 92% of the spring flight. Spring totals and averages for each species, and a comparison of the spring and autumn flights are shown in Table 2.

Broad-winged Hawks were the most common spring and autumn migrants (48% of the flight in spring, 41% of the flight in autumn). The next most common migrant, Sharp-shinned Hawk, comprised 28% of the autumn flight and 15% of the spring flight. Relative percentages of Red-tailed Hawks and American Kestrels varied slightly between seasons (Table 2). Two generally broad-frontal migrants, Ospreys (Poole 1989) and Northern Harriers (MacWhirter and Bildstein 1996), were decidedly more common in spring than in autumn (9.5 versus 2.4%, and 3.1 versus 1.4%, respectively), most likely because other more corridor-oriented autumn migrant species were relatively less common in spring than in autumn at the site.

Passage rates averaged <3 birds per hour in 1 March to 10 April; 6.4 birds per hour in 11-15 April, 10 birds per hour in 16-20 April, 8.5 birds per hour in 21-25 April, and 15 birds per hour in 26-30 April (Figure 4A). In May, passage rates dropped to ≤3.0 raptors per hour.

Passage rates of Ospreys, Sharp-shinned Hawks, and Broad-winged Hawks all peaked between 11 and 30 April (Figure 4A), while Red-tailed Hawks, Northern Harriers, and American Kestrels showed gradual and protracted migration in spring (Figure 4B). The 11-15 April peak passage rate for American Kestrels is due to an extraordinary flight on 14 April 1983, when 70 kestrels were counted in 7 hr between 0900 and 1600.

High rates of spring passage in 1969, 1970, 1984, and 1992 correspond to low hours of observation (<90) (Figure 1).

The Sanctuary plans to maintain its recently reinitiated season-long (1 April-15 May) spring watchsite effort as part of its accruing long-term raptor migration database.

Acknowledgments

Our analysis would not have been possible without the watchsite efforts of Sanctuary curators Maurice Broun, Alex Nagy, and Jim Brett who, together with numerous Sanctuary staff, volunteers, and interns, collected the autumn and spring-count data. Most of the 1998 spring-count data were collected by the Sanctuary's 1998 spring interns. Mark Monroe prepared Figure 3. We thank them all for their contributions to the Sanctuary's mission. This is Hawk Mountain Sanctuary contribution number 71.

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Table 1. Spring watchsites at or near Hawk Mountain Sanctuary, including hours of observation and years active.

Watchsite	Hours of observation	Years of observation
The Cobble	882	1969, 1976, 1977, 1980, 1982-1988
North Lookout	234	1969, 1970, 1977, 1980, 1983, 1988,1994-1998
Port Clinton Fire Tower*	52	1969, 1976, 1977, 1983
Owl's Head	41	1977, 1980, 1983
Top of the World*	12	1992
The Pinnacle*	9	1969
East Rocks	6	1992
Hemlock Heights	6	1969
Combined**	6	1976
Eckville*	0.75	1992

*Near but not on the Sanctuary
**North Lookout and Cobble

Table 2. Comparison of spring and autumn raptor migration at Hawk Mountain Sanctuary.

	Spring Total	Spring Average	Autumn Average	%spring flight	%autumn flight	Spring: Autumn
Osprey	705	39	492	9.5	2.4	4.0
Bald Eagle	21	1.2	58	0.3	0.3	1.0
Golden Eagle	12	0.7	59	0.16	0.3	0.5
Sharp-shinned Hawk	1085	60	5688	15	28	0.5
Cooper's Hawk	96	5.3	400	1.3	2	0.7
Northern Goshawk	27	1.4	80	0.35	0.4	0.9
Red-shouldered Hawk	138	7.7	277	2	1.4	1.4
Broad-winged Hawk	3532	196	8253	48	41	1.2
Red-tailed Hawk	901	50	3748	12	19	0.6
Rough-legged Hawk	10	0.6	12	0.13	0.06	2.2
Northern Harrier	228	13	283	3.1	1.4	2.2
American Kestrel	315	18	514	4.2	2.6	1.6
Merlin	10	0.6	57	0.13	0.3	0.5
Peregrine Falcon	5	0.3	21	0.07	0.1	0.7
Unidentified	348	8.6	180	4.7	0.9	5.2

Note: Turkey Vultures (*Cathartes aura*) and Black Vultures (*Coragyps atratus*) are not included in this analysis due to inconsistencies in counting methods and the relatively recent appearance of the Black Vulture at Hawk Mountain in the 1950s. Autumn data include only those years (1969-1997) in which spring counts occurred.

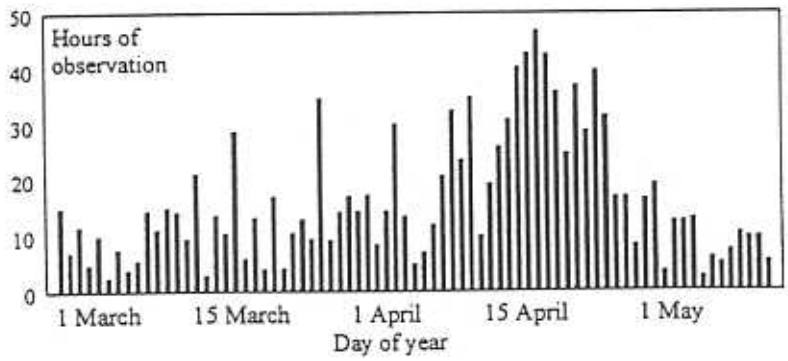

Figure 2. Total hours of observation by day of year for spring migration at Hawk Mountain Sanctuary, 1969-1998.

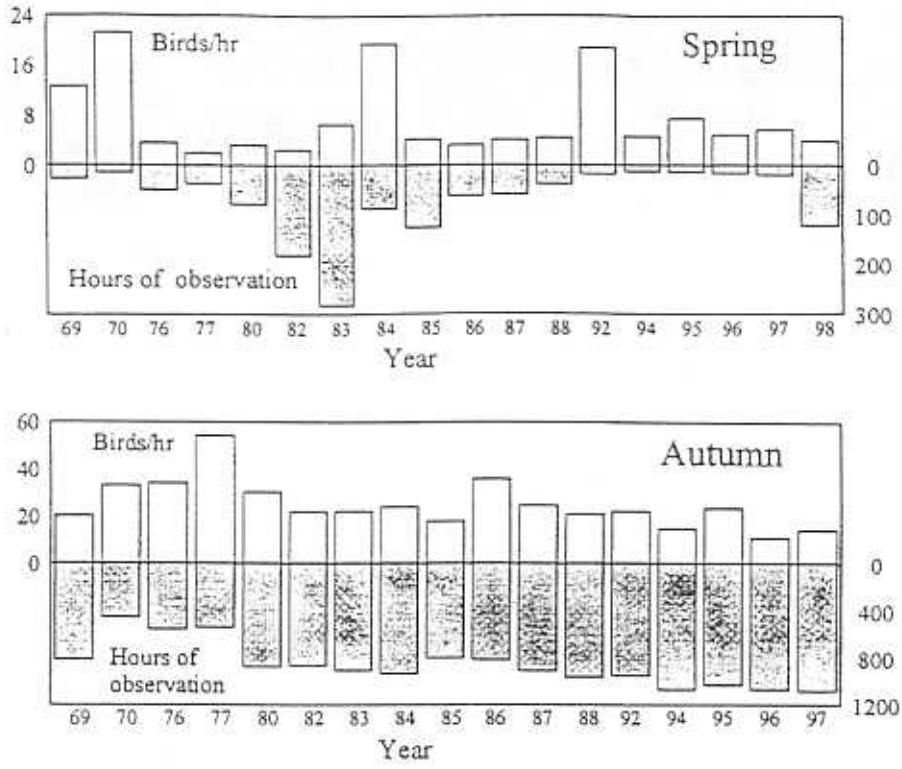

Figure 1. Hours of observation and rate of passage during spring and autumn raptor migration counts at Hawk Mountain Sanctuary, 1969-1998. Note that vertical scales differ between spring and autumn.

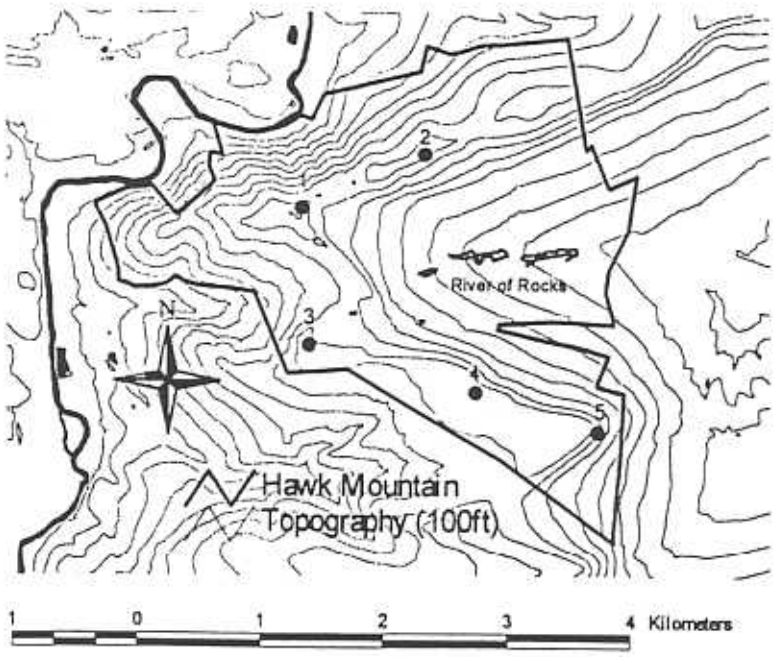

Figure 3. Map of Hawk Mountain Sanctuary, indicating on-site five lookouts: (1) North Lookout, (2) East Rocks, (3) The Cobble, (4) Hemlock Heights, and (5) Owl's Head. The Port Clinton Fire Tower, Top of the World, The Pinnacle, and Eckville are not depicted on the map.

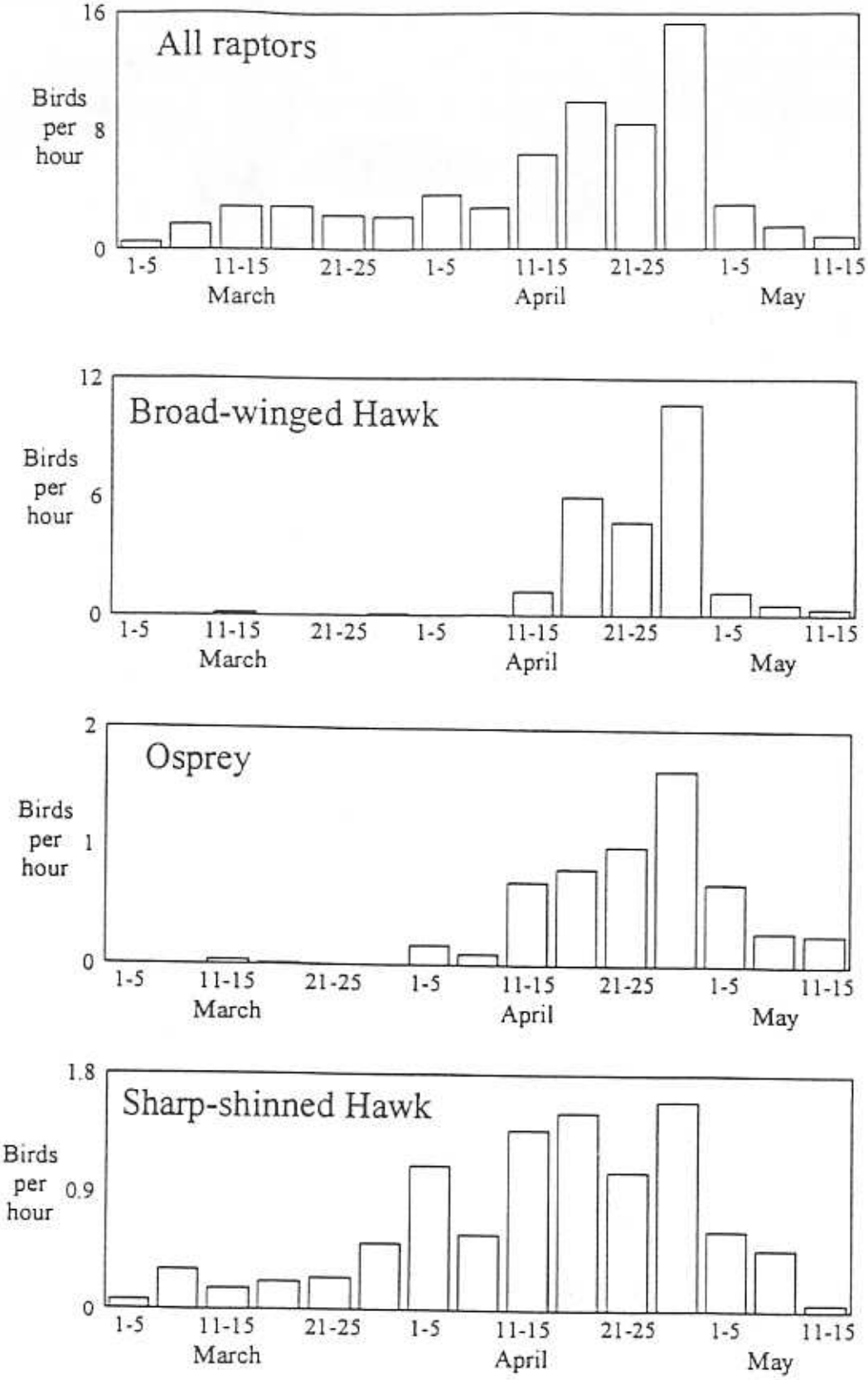

Figure 4A. Rates of passage of all raptors, Broad-winged Hawks, Ospreys, and Sharp-shinned Hawks in spring at Hawk Mountain Sanctuary, 1969-1998.

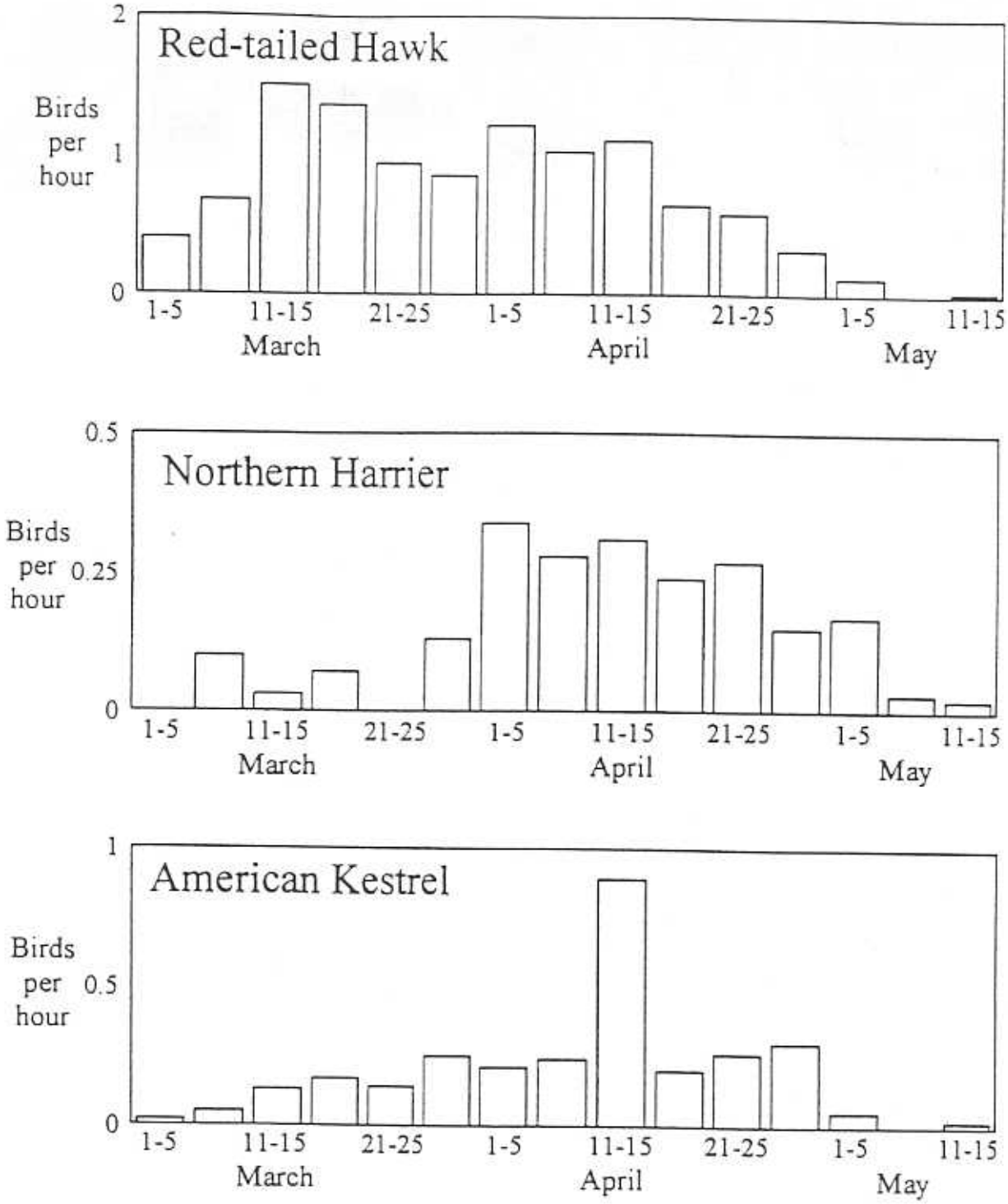

Figure 4B. Rates of passage of Red-tailed Hawks, Northern Harriers, and American Kestrels in spring at Hawk Mountain Sanctuary, 1969-1998.