Field Studies from a Rooftop: Monitoring Autumn Hawk Migration

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IN FIELD BIOLOGY COURSES there is always a need for new and more interesting ways to get students into the field. Many students are not free to participate in day-long and weekend trips; there is a need for more field activities that can be undertaken within allotted class periods. A hawk-monitoring project done by biology students in Towson, Maryland, in 1973 met this requirement. By walking up to a rooftop observation station, the class was almost instantly "in the field."

In this project, three different elective biology classes at Towson High School monitored the autumn flights of diurnal birds of prey over the school. The study was used as a focal point for learning about migration, aerodynamics of avian flight, predator-prey relationships, endangered species problems, and the effects of weather on migration patterns. Field identification techniques and the statistical interpretation of biological data were also emphasized. Most students gained an aesthetic appreciation of hawks in flight, and the information and field methods acquired provided a springboard for several independent projects. Some of the data gathered and analyzed during the study were published in a local ornithological journal.

Lucky Start

The project actually started almost by chance. While discussing energy pyramids one day in early fall, I mentioned the osprey as an example of a top-order consumer. Many of the students had never heard of an osprey, and I decided, on the spur of the moment, to take the class to the roof. I had previously seen a few migrating hawks flying over the area, and hoped we might be lucky enough to see an osprey or some other species of hawk in the time remaining in the period. We were lucky. Not only did we see an osprey, but seventeen broad-winged hawks and an American kestrel passed over our heads in twenty minutes. It was one of those magic times when a little knowledge and a lot of luck bring about an unusually impressive event, one that grabs the students' attention and interest better than some of the best planned activities. Our "hawk watch" was off the ground.

The project had obvious potential, not only for purely education purposes but scientific ones as well. Little work had been done on hawk movements in our area; therefore one of the goals of the study would be to gather valid new information. This aspect of the project, of course, further increased student enthusiasm.

Methods

After a brief general discussion of hawk migration, several class periods were devoted to learning to identify the birds in flight. Peterson's *A Field Guide to the Birds* and Robbins' *Birds of North America* were used, along with slides, some purchased from Hawk Mountain Sanctuary, Kempton, Pennsylvania, and some I had myself. Mounted birds and study skins were borrowed from a local museum. Students provided their own binoculars. Other references we used are listed at the end of the article.

Class study was followed by rooftop practice in which students learn to scan the sky systematically, aim and focus the glasses, and identify the small specks that passed by. A hawk in flight, especially when not directly overhead, is not easy to identify. Nevertheless, a number of students became quite proficient and formed the mainstay of the "hawk watch."

After the practice period, the students organized a monitoring schedule arranged so that every period of the

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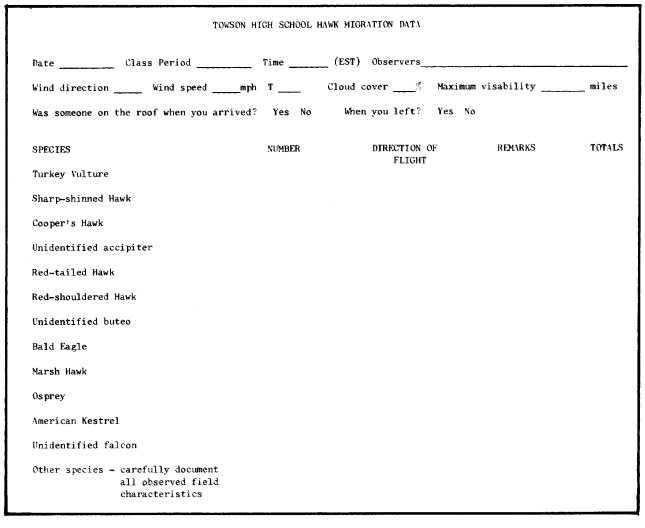
school day would be covered by a minimum of two students, at least one of whom was proficient at hawk identification. I spent as much time as possible on the roof, chiefly to help with identifications.

Participants were provided with forms (fig. 1) for recording data uniformly. Information on observed field marks, flight pattern, elevation, time, compass heading, and weather conditions was logged on this data chart for each sighting, although occasionally so many birds appeared simultaneously that it was not practical to record all the data. All records were kept in Eastern Standard Time which conformed with time records kept by other eastern hawk observation stations.



TOWSON HIGH SCHOOL HAWK MIGRATION DATA

Date _____ Class Period _____ Time _____ (EST) Observers_____

Wind direction ____ Wind speed ____mph T ____ Cloud cover ___% Maximum visability _____ miles

Was someone on the roof when you arrived? Yes No When you left? Yes No

SPECIES	NUMBER	DIRECTION OF FLIGHT	REMARKS	TOTALS
Turkey Vulture				
Sharp-shinned Hawk				
Cooper's Hawk				
Unidentified accipiter				
Red-tailed Hawk				
Red-shouldered Hawk				
Unidentified buteo				
Bald Eagle				
Marsh Hawk				
Osprey				
American Kestrel				
Unidentified falcon				
Other species - carefully document all observed field characteristics				

FIGURE 1: Sample Field data chart.

Species identification from the rooftop vantage point was difficult compared with typical mountaintop hawk watching. Poor light, the wide angle of approach, and the altitude of the birds all limited efforts to detect field marks. Because of this, students were encouraged to make liberal use of the "unidentified" category whenever the identity of a bird was questionable. We found that the best method for spotting hawks was systematic scanning of the northern horizon and the clouds in the northern half of the sky. Very few birds were able to get over or behind us without being seen well in advance.

Although the time students spent on the roof outside class time was voluntary, I devised a point system to reward extra participation. During and after the monitoring period, many class discussions centered on refining identification techniques and interpreting the data. Some students developed independent projects based on specific aspects of the study. One student with a particular aptitude for statistics developed analyses of the data and helped prepare the material for publication.

Scientific Results

The results of this study appeared in an article in *Maryland Birdlife* (Lee and Sykes 1975), which discussed species composition, calendar period of migration for each species, daily rhythm of migration, correlation of weather with flight activity, and speculations about the reason for so many birds passing over Towson, which is not directly in the path of any known major flyway. During the eight-week study, students logged 1,526 individuals and calculated that over 4,000 moved through our observation area during the fall of 1973.

Each species was most abundant during a definite calendar period. Early migrants included broad-winged hawks, ospreys, and probably immature bald eagles. Large falcons were confined to mid-October, and red-tailed hawks and turkey vultures appeared in large numbers toward the latter part of our study. Even species seen throughout the study period, American kestrels and sharp-shinned hawks, for example, had peak periods of flight activity. These observations are nearly identical to those of many authors who have recorded hawk movements along the major flyways.

Mueller and Berger (1973) have shown specific daily

TABLE 1. Time of observed migration of vultures and hawks, Towson, Maryland 1973.

	7:00-8:00	8:00-9:00	9:00-10:00	10:00-11:00	11:00-12:00	12:00-1:00	1:00-2:00	2:00-3:00	3:00-4:00
Turkey vultures	0.0	2.7	7.6	9.1	18.0	27.1	20.1	12.5	2.2
Accipiters	3.2	8.8	14.7	19.7	12.2	21.4	12.0	5.9	1.0
Buteos (excluding Broad-wing Hawks)	2.2	1.6	5.0	21.0	31.3	13.6	17.2	6.3	1.4
Broad-wing Hawks	0.0	85.7	4.7	0.0	0.0	9.5	0.0	0.0	0.0
Osprey	2.1	10.5	19.1	6.3	23.4	25.5	8.4	4.2	0.0
Falcons	2.0	6.0	22.7	22.4	16.1	14.3	8.2	12.0	0.0

Note—Time is Eastern Standard Time. Numbers are percents.

rhythms of migration activity in hawks at Cedar Grove, Wisconsin. Their data suggest that accipiter activity peaks in the morning, followed by that of buteos; falcons are most common in the early afternoon. Our accipiters and buteos appeared in the same sequence but perhaps in slightly later time slots (see table 1). Falcons, however, were most common in the morning. As Mueller and Berger observed, the movement of broad-winged hawks seems aberrant compared with that of the other buteos. In our study, at least, this can be attributed to our small sample. Activity was low before 9:30 A.M. and after 3:00 P.M. for all species except broad wings.

FIGURE 2: Students observe and record a sharp-shinned hawk passing overhead.

FIGURE 3: A student gives classmates a review of field identification techniques.

Where and When

It is not possible to state categorically in what regions of the country successful hawk monitoring studies could be conducted. Good flights are known to occur along portions of the Atlantic Coast, the Appalachian ridges, and places near large bodies of water (the Great Lakes, Chesapeake Bay), where migrants are funneled past certain points. Other factors can also influence local migration patterns and produce noteworthy flights. Even in areas removed from known flight paths it is often possible to see a small number of birds each day. However, attempts to arrange long-range periods of observation should only be made in places where sightings are frequent enough to sustain student interest—at least an average of several every hour during the peak of migration. The best approach would probably be to check a potential observation station periodically during the fall of the year preceding the project.

Because of weather variables, several successive days of minimal activity may occur when few, if any, birds are observed, particularly early in the season when broad-winged hawks are the dominant migrants. At these times, even at the best hawk observation post, hours or days may pass without a single sighting. Conversely, it is not uncommon to see 500-1,000 broad-wings in a span of a few minutes. Students should be made aware of the sporadic nature of autumn hawk flights and anticipate that their particular watch periods may not record any activity for several days.

The study should be started as early as possible in the fall, since broad-winged hawks begin their flight south in mid-August. Hawks should continue to pass over in sufficient numbers until Thanksgiving. The school schedule may limit available time for student participation, but usually the school day coincides with the birds' major activity period. In some places (like the Outer Banks of North Carolina), accipiters begin flying at dawn. In such cases students would have to volunteer additional time to get meaningful counts.

Projects of this sort are most valuable when conducted consistently. Observations can be scheduled in two ways: constant monitoring and random monitoring. We used constant monitoring throughout the day (7:00 A.M. to 4:00 P.M.) This schedule provides maximum data but requires a tremendous number of person-hours. Random monitoring, or abbreviated periods of coverage during peak activity periods, would yield data that could be used to estimate the number of hawks per hour. Hackman and Henny (1971) used this technique and pooled six years of random observations in an attempt to analyze population stability for ten species of hawks. While this method is easier, it would probably be several years before the students had enough information for meaningful interpretation or comparison.

Educational Results

The educational results of the project are difficult to assess, since they were different for each student. A few students were minimally involved; others were so deeply

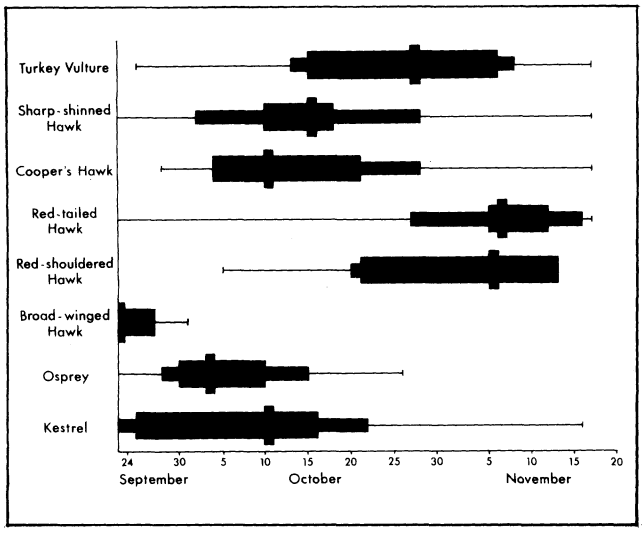


FIGURE 4: Statistical interpretation of seasonal distribution for selected species of Falconiformes migrating over Towson. Maryland (1973), expressed in inter-quartile and inter-octile ranges. Thin lines represent observed range of activity. Heavy lines, progressing from left to right, represent 1/8, 1/4, 1/2, 3/4, and 7/8 of total recorded species activity (i.e., 1/8, 1/4, 1/2, 3/4, 7/8). For example, by October 10th, 1/8 of our total number of Sharp-shinned hawks had been observed. (From Lee and Sykes, 1975).

involved that the project took up most of their free time during the entire full semester. Several students conducted independent monitoring projects in the years that followed.

In addition to learning about the various species of hawks, certain specific skills were acquired by almost everyone, to varying degrees. Many found the identification of hawks challenging and some developed unique methods of their own. Several students learned to identify the birds at great distances. The gathering, recording, compiling, interpreting, and graphic presentation of the data were carried out by most of the class.

For several students this project was the beginning of a new and sustained interest in birds. Some joined the local ornithological society and attended lectures and field trips. Some visited other hawk observation points, such as Hawk Mountain Sanctuary in Pennsylvania.

Other outgrowths of the study were more subjective, but included an increased awareness of hawks, their beauty, and their place in ecological communities. Because of this awareness, hawks became a convenient point of reference for many other topics in the course during the year.

Value and Potential of Project

The use of hawk flights as a teaching and research tool is valuable on many levels. Using student time in properly organized and supervised monitoring programs could provide valuable scientific information. With schools and colleges in key locations cooperating and providing the data for central usage, it would be possible to trace pathways and learn about daily flight distances. Comparative counts could illustrate possible changes in flight paths as weather systems shift. Data gathered from stations distributed across a broad front should give statistically reliable counts that would not be biased by annual variations in weather patterns.

Accurate hawk counts could have further uses. Hawks are top-order predators; their numbers are good ecological indicators of the health of biological communities. Because of their relatively low densities and large territories, good counts are practical only during migration. At present, however, we do not usually know the specific origin or destination of migratory birds. Student observations could assist in these evaluations.

Persons interested in conducting this type of project should contact any regional hawk watching station (see Heintzelman 1975) or the author so their efforts can be coordinated with those of others.

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Talent alone cannot make a writer. There must be a man behind the book. *Ralph Waldo Emerson*