

## ANTI-PREDATOR RESPONSES OF SHARP-SHINNED HAWKS

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### Abstract

Migrating Sharp-shinned Hawks (*Accipiter striatus*) aggressively approached a Great Horned Owl (*Bubo virginianus*) model. Components of the approach included a silent flight devoid of wing motion, vocalizations, use of tarsi, multiple approaches and avoidance of the front of the model. These components were manifested in different combinations and frequencies. It is suggested that the function of attacking by this species is to drive off a larger predator and that predation upon this species by other raptors is probably more common than reported in the literature.

### Introduction

In birds, anti-predator behavior such as mobbing has been studied mostly among passerine species (Curio 1975; Hartley 1950; Hinde 1954; Nice & ter Pelkwyk 1941; Smith & Graves 1978). Mobbing has been defined as a demonstration made by a bird against a potential or supposed enemy of a more powerful and dangerous species (Hartley 1950). It is manifested by aggressive approaches toward the stimulus object and also alert calls while the mobbers perch near the predator. The term "mobbing" is generally used to describe anti-predator behavior by groups and controversy arises when applying it to action by an individual. Many passerines are either members of family groups in the nesting season, or mixed species or intraspecific flocks during the remainder of the year. Many non-passerines, including raptors, are relatively asocial during the non-breeding season and yet, they engage in behavior similar to the mobbing of passerines when a predator is recognized. Anti-predator behaviors in these species have not been systematically investigated. In the present study we describe anti-predator behavior of immature and adult Sharp-shinned Hawks (*Accipiter striatus*) directed toward a Great Horned Owl (*Bubo virginianus*) model.

### Materials and Methods

Because of the differential migration routes of adult and immature Sharp-shinned Hawks, two locations were used for observations. We watched immatures along an isolated section of dunes covered by shrubby vegetation (<2 m height) near Cape May Point, New Jersey (38°40' N, 74°58' W). Adult birds were viewed at Raccoon Ridge, Blairstown, New Jersey (39°40' N, 75°02' W). Adults were rare at Cape May as were immatures at Raccoon Ridge and were not included in the analysis. Observations were made between 27 September and 16 October 1980 during the peak migration.

A life-sized plastic Great Horned Owl model was mounted on a pole 2-3 m high and oriented to face oncoming migration. The model was situated in the center of a 60 m wide arena which was perpendicular to migration and marked by altering prominent vegetation. The location of the arenas at both sites were chosen to maximize both observation and the number of migrants exposed to the model. Hawks passing through the arena at an altitude less than 10 m were considered to be potential candidates for exhibiting anti-predator behavior. Birds flying higher than 10 m rarely responded to the model. Hawks approaching from outside the

arena were also noted. To minimize disturbance to the approaching hawks the observer quietly sat approximately 10 m behind and to one side of the model facing oncoming migration. Notes were taken only after a behavioral bout was complete. Sharp-shinned Hawks did not seem to be disturbed by observer presence, and many approached the model while it was being positioned by the observer. These latter responses were not included in the data set.

### Results and Discussion

For convenience of description and analysis, anti-predator responses were conceptualized as having 4 sequential phases: recognition, reorientation, approach and resumption of migration. Because it was impossible to determine whether or not hawks actually recognized the model as an owl, we operationally defined recognition as having occurred if the model was attacked and recognition distance as the point at which a reorientation by the migrant was observed. Nearly 70% (90 of 131) of the hawks passing through the arena approached the owl (Table 1). Recognition occurred at distances well beyond the borders of the arena as 30.1% (28 of 70) of immatures responded to the model from outside the arena (distances greater than 30 m).

Table 1. Anti-predator behavior of Sharp-shinned Hawks to a model Great Horned Owl. The percentages for birds vocalizing, making tarsal threats and multiple approaches are given as proportions of those birds eliciting these behaviors out of the total number that approached the model.

	Sample Sizes	Aggressive Approaches	Approach Distance (m) $\pm$ SD	Vocalizing	Tarsal Threats	Multiple Approaches
Adults	28	71.4% (20)	.78 $\pm$ .39	10.0% (2)	10.0% (2)	0.0% (0)
Immatures	103	68.0% (70)	1.42 $\pm$ .62	17.1% (12)	18.6% (13)	20.0% (14)
Total	131	68.7% (90)	1.24 $\pm$ .55	15.6% (14)	16.7% (15)	15.6% (14)

The hawks reoriented in several ways. Where the direction of approach was noted 29 of 37 (76.3%) hawks continued past the model to the border or beyond the arena only to approach from the side or back of the model. Although these birds were confronted with the owl's front (face and eyes) they approached from another side even though it took them out of their migratory pathway. To determine whether or not hawks were preferentially avoiding the front of the model (side with eyes) or were approaching along a line of vegetation used as cover for the approach, the model was rotated 90° away from the direction of oncoming migration. Seventeen of 23 (75.1%) hawks approached from the sides or back. There were no significant differences ( $X^2 = .12$ ,  $df = 1$ ) between these distributions and the results can be attributed to an avoidance of the model's face.

Approaches were characterized by low glides 1–3 m above the surrounding vegetation. No wing movement occurred during the last 10–15 m and approaches were ordinarily to within 2 m of the model. The birds' tarsi were sometimes lowered during the final 5 m. This behavior may have an aerodynamic function, be an aggressive threat, or an aborted act of physical aggression. It was obvious that in some cases the legs were used as airbrakes while in others they were aggressively thrust down at the owl model.

The end of the approach was marked by an abrupt turn away from the owl model and commencement of flapping flight in the original direction. As the hawk flew away a quiet "kiiif" or "seeet" vocalization (Bent 1937) was sometimes audible. In some cases the hawk proceeded a few meters, turned and made a second or even third pass at the

owl. In 4 cases Sharp-shinned Hawks perched in trees 20 m away before or after the approach and appeared to stare at the owl. One of these individuals gave the “kek kek kek kek . . .” vocalization reported by Bent (1937).

In Table 2 a comparison is made of the anti-predator responses of passerines and Sharp-shinned Hawks. The overall anti-predator responses of these hawks are somewhat different from those of passerines but are consistent with Hartley's (1950) definition of mobbing. The responses by this raptor, which seldom last more than a few seconds, are of shorter duration than those of passerines, which can persist over several minutes. The attacks by Sharp-shinned Hawks are more aggressive and potentially more damaging than those of most passerines. The greatest differences are between the stealthy and solitary nature of the hawk attacks and loud demonstrations by groups of passerines. Thus, mobbing of owl models by Sharp-shinned Hawks is performed within the same context and range of responses as mobbing by passerines, although the actual behaviors are dissimilar.

Table 2. Comparison of attack behavior of Sharp-shinned Hawks and mobbing behavior of passerines. Compiled from previously cited literature for passerines including Curio (1978), Harvey & Greenwood (1978) and Tinbergen (1953).

Characteristics of Behavior	Sharp-shinned Hawks	Passerines
Mobbing by groups	Infrequent	Often—Always
Vocalizations	Infrequent (soft)	Frequent—Always (loud)
Perching near predator	Infrequent—Rare	Frequent
Use of tarsi	Uncommon—Threats potentially damaging to predator	Tarsi not often used. Pecking with bill infrequent
Approaches	Single approach most often No flapping	Multiple approaches (approach-withdraw), Flapping and wing flipping
Duration	Short (seconds)	Usually long (minutes)

The significance of Sharp-shinned Hawks attacking the models is not readily evident as no accounts of predation on this species by owls were found in the literature. Studies by Mikkola (1976) and Newton (1979) report heavy predation from some localities upon the slightly larger European Sparrowhawk (*A. nisus*) by Eagle Owls (*B. bubo*) and Tawny Owls (*Strix aluco*). The frequent and aggressive responses of Sharp-shinned Hawks to a model owl suggests that predation on this species is probably more prevalent than reported in the literature.

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## COMPOSITION AND SEASONAL VARIATION OF THE BARN OWL (*TYTO ALBA*) DIET IN ARIZONA

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### *Abstract*

We analyzed Barn Owl (*Tyto alba*) castings collected during August 1974 to May 1977 from birds inhabiting an urbanized Sonoran desert community. Prey species composition and age (adult versus juvenile) varied seasonally. The cotton rat (*Sigmodon arizonae*) was the most frequent prey, comprising 38.8% of the overall diet.

### *Introduction*

Numerous studies have detailed owl diets through analysis of pellets (Maser and Brodie 1966, Maser and Hammer 1972, Marti 1969, 1974, Ohmart and Anderson 1976, and others). These studies have indicated the reasons for the usefulness of pellets in food studies. Although diet composition has been determined for various owl species, little in-

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