

Feeding at Night by Wintering Pine Siskins.—With the exception of the House Sparrow (*Passer domesticus*) in urban environments (Brooke, *Auk* 90:206, 1973; Broun, *Auk* 88:924, 1971), there are few documented examples of wild passerine birds feeding during hours of darkness. However, at 0230 on 24 December 1984, with ambient temperature of -30°C , I observed 3 Pine Siskins (*Carduelis pinus*) feeding at a baited area on a country road at Malartic Lake, Quebec ($48^{\circ}15'\text{N}$, $78^{\circ}10'\text{W}$).

During the preceding day, a flock of 10–12 Pine Siskins and Common Redpolls (*Carduelis flammea*) had been observed feeding at a patch of grit exposed by a passing snowplow. The area was subsequently baited with commercial bird seed for photographic purposes. During the night, the patch was partially illuminated by a floodlight from an adjacent cottage. I was alerted to the presence of the birds by a call note, and investigated, finding 3 Pine Siskins feeding at the bait within the illuminated area. The birds were observed for approximately 5 s, when one other bird (siskin?) entered the beam from the dark side of the patch. The four birds immediately flushed and were not seen during the next 10 min.

Since foraging bouts of birds are necessarily frequent during cold weather, it is likely that these Pine Siskins used the familiar food source to satisfy the elevated energetic requirements associated with thermoregulation during this cold night. As such, this observation of nocturnal feeding represents an extreme example of foraging opportunism by winter birds.

I thank A. L. A. Middleton, L. Beattie, and two anonymous reviewers for comments on an earlier draft of this paper.—DAVID R. C. PRESCOTT, *Department of Zoology, University of Guelph, Guelph, Ontario N1G 2W1, Canada*. Received 28 Jan. 1985; accepted 18 July 1985.

Food Habits and Hunting Success of Cooper's Hawks in Missouri.—Although the Cooper's Hawk (*Accipiter cooperii*) is currently included on the Missouri State Endangered Species List, there have been no studies published on these hawks in Missouri and few from the Midwest. Here I present food habits of Cooper's Hawks at two nests observed from 18 April through 10 July 1983, and at 12 nests studied from 1 May through 20 July 1985. Hunting success rates were obtained by observing Cooper's Hawks from September 1978 through July 1985 throughout the southern half of Missouri.

Observations totaling 176 h were made during the two nesting seasons. I watched nests from blinds placed in trees or on the ground, as well as from inside a vehicle. In 1983 nests were located in a shagbark hickory (*Carya ovata*) and white oak (*Quercus alba*) at heights of 11.0 m and 12.5 m. In 1985 nests were in 2 white oaks, a red pine (*Pinus resinosa*), 3 scotch pines (*P. sylvestris*), and 6 shortleaf pines (*P. echinata*) at an average height of 11.6 m (range = 6.0–16.5 m). An average of 3 nestlings (range = 2–4) were present at these nests. Most nestlings were ca. 1 week of age when studies were initiated and 4–6 weeks of age when observations were terminated.

At 8 nests I used a 40 \times spotting scope and 9 \times binoculars to identify prey captured in hunting bouts, delivered to nests, and deplored at plucking perches. Prey remains and regurgitated pellets were collected from beneath the other 6 nests and associated perches. Analysis revealed no differences in relative percentages of prey types among observed prey deliveries, pellet contents, and prey remains, so they were combined. I calculated percent frequency of each prey item from the total number of items delivered to nests and collected from prey remains and pellets. Percent biomass was estimated by multiplying frequency of occurrence by average species' weights given in Schwartz and Schwartz (1959), Steenhof (1983), and Terres (1980).

There were 259 prey items delivered to Cooper's Hawk nests (Table 1). Birds comprised 86.8% of the diet by frequency and 64.8% in biomass. Mammals comprised 12% and reptiles around 1% of the diet by frequency. In order of their occurrence as prey, the 5 species delivered most often were: Blue Jay (*Cyanocitta cristata*), European Starling (*Sturnus vulgaris*), Common Grackle (*Quiscalus quiscula*), American Robin (*Turdus migratorius*), and Red-bellied Woodpecker (*Melanerpes carolinus*).

TABLE 1. Prey of Cooper's Hawks at nests in Missouri, 1983 and 1985.

Species	n	% frequency	Avg. weight (g)	% estimated biomass
Birds				
Northern Bobwhite (<i>Colinus virginianus</i>)	14	5.4	172	8.3
Rock Dove (<i>Columba livia</i>)	2	0.8	400	2.8
Mourning Dove (<i>Zenaida macroura</i>)	9	3.5	134	4.2
Pileated Woodpecker (<i>Dryocopus pileatus</i>)	1	0.4	370	1.3
Northern Flicker (<i>Colaptes auratus</i>)	10	3.9	132	4.5
Red-headed Woodpecker (<i>Melanerpes erythrocephalus</i>)	2	0.8	80	0.6
Red-bellied Woodpecker (<i>M. carolinus</i>)	15	5.8	75	3.9
Hairy Woodpecker (<i>Picoides villosus</i>)	2	0.8	60	0.4
Downy Woodpecker (<i>P. pubescens</i>)	2	0.8	27	0.2
American Crow (<i>Corvus brachyrhynchos</i>)	2	0.8	525	3.6
Blue Jay (<i>Cyanocitta cristata</i>)	33	12.7	89	10.1
American Robin (<i>Turdus migratorius</i>)	16	6.2	79	4.1
Gray Catbird (<i>Dumetella carolinensis</i>)	3	1.2	40	0.4
Brown Thrasher (<i>Toxostoma rufum</i>)	2	0.8	70	0.5
European Starling (<i>Sturnus vulgaris</i>)	25	9.7	79	6.8
Common Grackle (<i>Quiscalus quiscula</i>)	20	7.7	112	7.7
Red-winged Blackbird (<i>Agelaius phoeniceus</i>)	4	1.5	50	0.7
Brown-headed Cowbird (<i>Molothrus ater</i>)	2	0.8	41	0.3
Northern Oriole (<i>Icterus galbula</i>)	1	0.4	36	0.1
Eastern Meadowlark (<i>Sturnella magna</i>)	3	1.2	95	1.0
Scarlet Tanager (<i>Piranga olivacea</i>)	1	0.4	30	0.1
Northern Cardinal (<i>Cardinalis cardinalis</i>)	5	1.9	44	0.8
Rufous-sided Towhee (<i>Pipilo erythrophthalmus</i>)	4	1.5	41	0.6
Indigo Bunting (<i>Passerina cyanea</i>)	1	0.4	15	0.05
American Goldfinch (<i>Carduelis tristis</i>)	2	0.8	15	0.1
Tufted Titmouse (<i>Parus bicolor</i>)	1	0.4	22	0.08
House Sparrow (<i>Passer domesticus</i>)	4	1.5	27	0.4
Yellow-billed Cuckoo (<i>Coccyzus americanus</i>)	10	3.9	50	1.7
Chuck-Will's-Widow (<i>Caprimulgus carolinensis</i>)	1	0.4	90	0.3
Whip-Poor-Will (<i>C. vociferus</i>)	2	0.8	57	0.4
Unidentified adult and nestling small birds	26	10.0	40	3.6
Subtotals	225	86.8	—	64.8
Mammals				
Eastern Cottontail (immature) (<i>Sylvilagus floridanus</i>)	7	2.7	600	14.5
Eastern Fox Squirrel (immature) (<i>Sciurus niger</i>)	3	1.2	450	4.7
Eastern Gray Squirrel (<i>Sciurus carolinensis</i>)	7	2.7	450	10.9
Eastern Chipmunk (<i>Tamias striatus</i>)	6	2.3	100	2.1
Eastern Woodrat (<i>Neotoma floridana</i>)	1	0.4	255	0.9
Cotton Rat (<i>Sigmodon hispidus</i>)	1	0.4	120	0.4
Unidentified small rodents	4	1.5	30	0.4
Unidentified bats	2	0.8	9.5	tr
Subtotals	31	12.0	—	33.8

TABLE 1. Continued.

Species	<i>n</i>	% frequency	Avg. weight (g)	% estimated biomass
Reptiles				
Black Rat Snake (<i>Elaphe obsoleta</i>)	1	0.4	200	0.7
Unidentified snakes	1	0.4	190	0.67
Five-lined Skink (<i>Eumeces fasciatus</i>)	1	0.4	20	0.07
Subtotals	3	1.2	—	1.4
Totals	259	100.0	—	100.0

Food habits studies from other regions of the eastern United States showed similar percentages of birds and mammals in the diets of Cooper's Hawks (Brown and Amadon 1968, Craighead and Craighead 1956, Fisher 1893, Hamerstrom and Hamerstrom 1951, Meng 1959, Sherrod 1978, Snyder and Wylie 1976). McDowell (1941), however, reported a preponderance of mammals (71.4%) in the diet of Cooper's Hawks in Pennsylvania.

Among prey items, Blue Jays were most frequent (12.7%), but eastern cottontails (*Sylvilagus floridanus*) contributed the most biomass (14.5%), although none was full grown. Birds typically associated with woodlands or forest edge during nesting comprised 19 of 30 (63%) of the avian species identified as prey. These species represented 69% (137 of 199) of the total identified avian prey items.

Overall, the average size of Cooper's Hawk prey was 112.0 g (range = 15–600 g). Avian prey averaged 83.5 g, while mammalian prey averaged 316.5 g. Male Cooper's Hawks captured and/or delivered prey which averaged 65.9 g in weight ($n = 45$). All of the prey items which I observed males handling were birds. Females captured and/or delivered prey which averaged 227.7 g in weight ($n = 25$). All larger mammals, including young eastern cottontails, young eastern fox squirrels (*Sciurus niger*), and eastern gray squirrels (*S. carolinensis*) were handled by females. Storer (1966) also reported that pronounced sexual dimorphism in Cooper's Hawks resulted in larger prey taken by females, though both sexes took smaller prey than in my study (37.6 and 50.7 g mean prey weights of males and females, respectively).

During 7 years I observed 45 capture attempts by adult Cooper's Hawks of which 33% were successful. Adults were successful in capturing small mammals on 8 of 15 (53.0%) attempts, including 3 eastern gray squirrels, 2 eastern cottontails, 2 eastern fox squirrels, and one cotton rat (*Sigmodon hispidus*). The eastern cottontails captured, as well as those delivered to nests, were small and probably subadults. Adult fox squirrels which weigh as much as 1350 g (Schwartz and Schwartz 1959) are probably too formidable for Cooper's Hawks, and those seen captured or delivered to nests were about half grown. The hunting success rate for capturing birds was 20.6% (6 of 29).

I witnessed one successful capture of a black rat snake (*Elaphe obsoleta*) by a female hawk. She was incubating 3 eggs while the rat snake was lying quietly in a small clearing only 10 m from the nest tree. The hawk dove from the nest and made two raking passes which severely injured the snake. On her third approach she landed and grabbed the snake's head, killed it, and then carried it in her talons to a perch ca 30 m away. She ate for only 1.5 min before carrying the snake out of sight into the pines. She returned 30 s later without her prey and immediately resumed incubation. This behavior may have been an example of either opportunistic foraging or nest defense, resulting in elimination of a potential nest predator.

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Identification of Second-year and After-second-year Eastern Bluebirds.—Comparisons of 10th primary coverts from known-age Eastern Bluebirds (*Sialia sialis*) suggest these feathers may be used to distinguish second-year (SY) from after-second-year (ASY) individuals. Tenth primary coverts from fully-developed nestlings and SY birds are virtually identical. Apparently 10th primary coverts are not molted with the remainder of the juvenal plumage. The 10th primary of Eastern Bluebirds is much shorter than the other primaries, averaging 15.3 mm (13.0-18.0, SD = 1.35, $n = 20$). It has only 1 covert which is 7.5-11.0 mm long ($\bar{x} = 9.0$, SD = 0.8, $n = 20$) and is completely covered by the 9th primary greater covert which is 17.0-21.0 mm long ($\bar{x} = 19.0$, SD = 1.02, $n = 20$).

A 10th primary covert was collected from 27 known-age males (18 SY and 9 ASY) and 29 known-age females (16 SY and 13 ASY) in Obion Co., Tennessee, during the 1981-1984 nesting seasons. Five of the birds (2 females, 3 males) were banded as nestlings and then recaptured in both their second and third years.

While several characteristics of the 10th primary covert were examined, the 2 features of most value for age determination were the shape of the tip and the color of the pigmented part of the feather. Each 10th primary covert has a dark central area surrounded by a white border. The border varies in width; wide white borders are more frequently seen in SY birds, but border width is not a reliable indicator of age in either sex.

In males, the most consistent difference between age classes was the shape of the covert tip (Fig. 1). All SY coverts (18 of 18) had tips without distinct, or pointed, tips, while all ASY (9 of 9) coverts were sharply pointed. Seventeen of 18 SY coverts were dark grayish brown (20) or fuscous (21), while 1 SY covert was cerulean blue (67). (Color names and numbers are from Smithe, *Naturalist's Color Guide, Part I, Color Guide, Am. Mus. Nat.*