The Condor 103:192–194

ACCIPITER PREDATION OF AMERICAN REDSTART NESTLINGS[1]

CYNTHIA A. MCCALLUM[2] AND SUSAN J. HANNON
Department of Biological Sciences, University of Alberta, Edmonton, AB, Canada, T6G 2E9

Abstract. We used small video cameras to film predators at nests of American Redstarts (*Setophaga ruticilla*). We filmed three predation events, all by accipitrine hawks, in which no signs of predation were left at nests. Hence, as suggested by other workers, predator identification based on signs left at nests is unreliable. In addition, predation rates may be underestimated if accipiters or other predators take nestlings just prior to fledging without leaving signs. These incidents may be interpreted by field workers as nests where young fledged successfully.

Key words: Accipiters, American Redstarts, nest predation, predator identification, Setophaga ruticilla, *video systems.*

Nest predation can be one of the major causes of reproductive loss for birds (Ricklefs 1969). Numerous field workers have attempted to identify nest predators by the signs that they leave at natural or artificial nests (Best and Stauffer 1980, Westmoreland and Best 1985, Haskell 1994). However, some predators may not leave signs at the nest (other than removing the nest contents), and hence description of potential predator communities may be biased towards species that leave signs (reviewed in Pietz and Granfors 2000). More recently, camera systems have been used to capture the act of predation on film (Brown et al. 1998, Thompson et al. 1999, Pietz and Granfors 2000), alleviating this potential bias. These and other studies caution that previous assignments of predator identity based on signs left at the nest may be erroneous (Larivière 1999). In this paper we describe the use of a video camera system that we employed to document predation events at American Redstart (*Setophaga ruticilla*) nests. Our tapes revealed a predator of nestlings that we had not previously expected and led to a re-evaluation of estimates of predation rates for our population.

METHODS

We conducted this study in the summers of 1998 and 1999 in aspen (*Populus tremuloides*) woodlots in an agricultural area around the Meanook Biological Research Station (54°37′N, 113°20′W) near Athabasca, Alberta, Canada. The study area has approximately 29% forest cover, with woodlots surrounded by cropland and pasture (Hannon and Cotterill 1998). Nests were monitored as part of a long-term study of reproductive success in American Redstarts. We started searching for nests when the first females arrived and monitored those found until most nestlings had either fledged successfully or nests had been depredated or abandoned. Nests were marked by placing flagging tape approximately 5–15 m from the nest, and all nests were checked for activity every 2 to 4 days either visually or with a mirror fixed to a telescoping pole. The majority of the nests (72.2%) were found prior to the initiation of incubation.

A video system was employed to determine the identity of nest predators. In 1998 we used one video camera to film two nests consecutively from 2 July to 10 July, for a total of eight camera days, in 1999 we used four cameras to film five nests from 2 June to 18 July, for 87 camera days. The video systems, developed by Sandpiper Technologies of Manteca, California, consisted of a 3.8 × 3.8 × 3.2 cm camera connected to a video cassette recorder (VCR). Cameras had an 11-mm focal length and six 940-nm infrared lights imbedded around the lens for night viewing. We painted the casings with a camouflage design. Cameras were set within 1.5 m of the nest. Nests chosen for videotaping ranged from 1.6 m to 5.2 m high and were all in willow (*Salix*), except for one nest in 1998 that was 0.5 m high in red osier dogwood (*Cornus stolonifera*). Single cameras were connected directly to the VCR, and multiple cameras were connected to a splitter that allowed up to four cameras to run on one VCR. The VCR and splitter were both housed in waterproof Pelican® cases that had been specifically wired for this use and were powered from a single 12-V deep-cycle marine battery. The VCR was set to allow 24 hr of footage on one 120-min tape by recording frames at 0.216-sec intervals. The VCR, splitter, and battery were placed 20 to 70 m from the nest to avoid disturbance when the videotape was changed each day, and were covered with camouflage fabric. A small video monitor was connected to the VCR case to check camera angle and image daily when the videotape was changed.

RESULTS

In 1998 we had cameras set up at two nests during the nestling period; one of these nests was depredated. In 1999 we had cameras on five nests during the nestling period, and two nests were depredated. All three predators were accipitrine hawks, and all three nests were depredated late in the nestling period, when nestlings were 5–8 days old (Table 1). During nest checks after the predation events, no disturbance to the nest bowl

[1] Received 23 March 2000. Accepted 9 September 2000.
[2] E-mail: cindy.mccallum@ualberta.ca

TABLE 1. Details of accipiter predation of American Redstart nestlings.

Date	No. chicks depre-dated	Chick age (days)	Nest height (m)	Time of predation	Predator
10 July 1998	2	8	1.6	07:38	Adult male Northern Goshawk (*Accipiter gentilis*)
1 July 1999	4	5	1.9	20:05	Subadult male Cooper's Hawk (*A. cooperii*)
7 July 1999	2	5	5.2	12:51	Subadult male Sharp-shinned Hawk (*A. striatus*)

was detected and no other signs were left by the predators.

In 1998 and 1999 combined, we found a total of 119 nests. For nests without video cameras, we concluded a nest was depredated if eggs disappeared or were punctured, or if nestlings disappeared before they were old enough to have fledged. We considered the nesting attempt successful if we saw the parents feeding one or more fledglings or if the nest was empty and undisturbed at the time when fledging was expected. By these criteria, 78 (65.5%) nests were successful in fledging at least one redstart chick. However, in 10 of these cases (12.8% of successful nests), nestlings disappeared within two days of the expected fledge date, leaving an undisturbed nest bowl. If these had been depredated, then our success rate would have been 57.1%. At 15 of the 29 nests that we recorded as depredated, and at 8 of the 14 that were depredated during the nestling stage, the nest was intact but the contents were gone.

DISCUSSION

Many studies of predation on both natural and artificial nests make no mention of raptors when considering possible predators (Wilcove 1985, Rudnicky and Hunter 1993, Howlett and Stutchbury 1996). Our earlier attempts to document nest predators in the boreal mixedwood forest used plasticine and quail eggs in artificial nests (Hannon and Cotterill 1998, Cotterill and Hannon 1999). These studies documented egg predation by red squirrels (*Tamiasciurus hudsonicus*), chipmunks (*Tamias minimus*), corvids (Blue Jays *Cyanocitta cristata*, American Crows *C. brachyrhynchos*, Black-billed Magpies *Pica hudsonica*), mice and House Wrens (*Troglodytes aedon*). These studies, and the fact that accipiters were rarely seen in our area (no doubt due to their secretive nature), led us to disregard accipiters as nest predators. However, a growing number of studies, many using cameras, have documented raptor predation at nests.

Thompson et al. (1999), using a video camera system on real passerine nests in old fields, documented predation of nestlings by Broad-winged Hawks (*Buteo platypterus*) and Barn Owls (*Tyto alba*). Pietz and Granfors (2000) videotaped Northern Harrier (*Circus cyaneus*) and *Buteo* spp. predation at grassland passerine nests. Picman and Schriml (1994) photographed 1 Cooper's Hawk (*Accipiter cooperi*), 3 Northern Harriers, and 14 Broad-winged Hawks destroying artificial eggs at experimental nests in forest, meadow, and marsh habitats. In addition, Sharp-shinned Hawks (*Accipiter striatus*) are suspected predators of nestling Magnolia Warblers (*Dendroica magnolia*) (Hall 1994), and Cooper's Hawks and Broad-winged Hawks prey on fledgling Wood Thrushes (*Hylocichla mustelina*) (Anders et al. 1997). Sherry and Holmes (1997) observed American Redstarts mobbing Cooper's Hawks.

Early conclusions that avian predators leave the nest intact (Best and Stauffer 1980, Westmoreland and Best 1985, Haskell 1994) have been questioned by more recent work using video cameras (Thompson et al. 1999, Pietz and Granfors 2000). In addition, many mammalian predators were thought to always damage the nest structure (Best 1978, Best and Stauffer 1978, Westmoreland and Best 1985), but Thompson et al. (1999) and Pietz and Granfors (2000) have found evidence to the contrary. Finally, parent birds or scavengers also can alter the appearance of a nest after predation (Brown et al. 1998, Pietz and Granfors 2000). These studies stress the danger of using nest condition and known or suspected predator community to determine predator species.

A commonly used protocol is to consider as successful any nests that have nestlings disappear within two days of their expected fledge date and that show no signs of predation (Johnson and Temple 1990, Martin et al. 1997). Given that many predators leave no signs of disturbance at the nest and that nestling predation rates increase with nestling age (Pietz and Granfors 2000), total predation may easily be underestimated if based only on clues left at the nest. In our study, 10 of the nests that were considered successful (12.8% of successful nests) based on this protocol could have been depredated late in the nestling period, which would increase our overall predation rate to 33% from 24%. Searching around empty nests for signs of parental activity (feeding, chipping) could help to determine actual nest fate, but even this could produce errors because parents may visit the nest area and bring food several hours after nests have been depredated (Pietz and Granfors 2000). Collectively, studies using video cameras at nests have demonstrated the difficulties of assessing predation rate using indirect signs, but unfortunately the high costs of video monitoring systems and the increased labor to run them may preclude common use of this technique in avian field biology.

We thank Terra Birkigt, Michael Enright, Scott Jamieson, April Mitchell, Erin Stephens, Lorene Stoby, and Conrad Thiessen for assistance in the field, and the staff of the Meanook Biological Research Station for logistical support. Gordon Court and Kevin Hannah assisted with predator identification. Our thanks to the landowners who kindly allowed us access to their woodlots. Funding was provided by a Natural Sciences and Engineering Research Council (NSERC) operating grant to SJH. Thanks to Pam Pietz for comments on the paper.

LITERATURE CITED

ANDERS, A. D., D. C. DEARBORN, J. FAABORG, AND F. R. THOMPSON III. 1997. Juvenile survival in a population of Neotropical migrant birds. Conserv. Biol. 11:698–707.

BEST, L. B. 1978. Field Sparrow reproductive success and nest ecology. Auk 95:9–22.

BEST, L. B., AND D. F. STAUFFER. 1980. Factors affecting nesting success in riparian bird communities. Condor 82:149–158.

BROWN, K. P., H. MOLLER, J. INNES, AND P. JANSEN. 1998. Identifying predators at nests of small birds in a New Zealand forest. Ibis 140:274–279.

COTTERILL, S. E., AND S. J. HANNON. 1999. No evidence of short-term effects of clearcutting on artificial nest predation in boreal mixedwood forests. Can. J. For. Res. 29:1900–1910.

HALL, G. A. 1994. Magnolia Warbler (*Dendroica magnolia*). *In* A. Poole and F. Gill [EDS.], The birds of North America, No 136. The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, DC.

HANNON, S. J., AND S. E. COTTERILL. 1998. Nest predation in aspen woodlots in an agricultural area in Alberta: the enemy from within. Auk 115:16–25.

HASKELL, D. 1994. Experimental evidence that nestling begging behaviour incurs a cost due to nest predation. Proc. R. Soc. Lond. B 257:161–164.

HOWLETT, J. S., AND B. J. STUTCHBURY. 1996. Nest concealment and predation on Hooded Warblers: experimental removal of nest cover. Auk 113:1–9.

JOHNSON, R. G., AND S. A. TEMPLE. 1990. Nest predation and brood parasitism of tallgrass prairie birds. J. Wildl. Manage. 54:106–111.

LARIVIÈRE, S. 1999. Reasons why predators cannot be inferred from nest remains. Condor 101:718–721.

MARTIN, T. E., C. R. PAINE, C. J. CONWAY, W. M. HOCHACHKA, P. ALLEN, AND W. JENKINS. 1997. BBIRD Field Protocol. Montana Coop. Wildl. Res. Unit, Univ. Montana, Missoula, MT.

PICMAN, J., AND L. M. SCHRIML. 1994. A camera study of temporal patterns of nest predation in different habitats. Wilson Bull. 106:456–465.

PIETZ, P. J., AND D. A. GRANFORS. 2000. Identifying predators and fates of grassland passerine nests using miniature video cameras. J. Wildl. Manage. 64:71–87.

RICKLEFS, R. E. 1969. An analysis of nesting mortality in birds. Smithson. Contrib. Zool. 9:1–48.

RUDNICKY, T. C., AND M. L. HUNTER JR. 1993. Avian nest predation in clearcuts, forests, and edges in a forest-dominated landscape. J. Wildl. Manage. 57: 358–364.

SHERRY, T. W., AND R. T. HOLMES. 1997. American Redstart (*Setophaga ruticilla*). *In* A. Poole and F. Gill [EDS.], The birds of North America, No. 277. The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, DC.

THOMPSON, F. R., III, W. DIJAK, AND D. E. BURHANS. 1999. Video identification of predators at songbird nests in old fields. Auk 116:259–264.

WESTMORELAND, D., AND L. B. BEST. 1985. The effect of disturbance on Mourning Dove nesting success. Auk 102:774–780.

WILCOVE, D. S. 1985. Nest predation in forest tracts and the decline of migratory songbirds. Ecology 66:1211–1214.