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NEST VISITATION BY HUMANS DOES NOT INCREASE PREDATION ON CHESTNUT-COLLARED LONGSPUR EGGS AND YOUNG

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Abstract.—The influence of nest visitation by humans on predation on Chestnut-collared Longspur (*Calcarius ornatus*) eggs and nestlings was examined. In contrast to previous correlational studies of this nature, an experiment was designed in which the level of observer nest disturbance was randomly determined (*a priori*). Only nests surviving at least seven days of incubation were used in the analysis to control for bias introduced when nests are found at different times during the nesting cycle. Visitation did not significantly increase predation ($P = 0.50$) and there was a trend toward decreased predation with increased visitation.

VISITACIÓN DE NIDOS DE *CALCARIUS ORNATUS* POR HUMANOS NO AUMENTA LA DEPREDACIÓN DE SUS HUEVOS Y PICHONES

Sinopsis.—Se examinó la influencia de la visitación de nidos de *Caicarius ornatus* por humanos en la depredación de huevos y pichones. En contraste a estudios previos correlativos de esta naturaleza, se diseñó un experimento en el cual el grado de disturbio por el examinador se determinaba al azar (a priori). Solo se utilizaron nidos que sobrevivieron al menos siete días en el análisis para controlar los vicios introducidos cuando los nidos se encuentran a diferentes tiempos dentro del ciclo de anidamiento. La visitación no aumentó significativamente la depredación ($P = 0.50$), y existe una tendencia hacia menos depredación al aumentar las visitas.

Most bird species experience predation pressure during the egg and nestling stages (e.g., Groom 1993, Lack 1954, MacIvor et al. 1990, Morton et al. 1993, Ricklefs 1969, Sedgwick 1993). In fact, predation is often the major cause of nest failure in passerines (Lack 1954, Ricklefs 1969) and has a larger impact on nestling survival than does nest desertion, starvation of the young, or nestling death due to inclement weather (Ricklefs 1969). Predation on eggs and nestlings affects the population dynamics of rare or endangered species by decreasing recruitment and therefore limiting population growth (Vickery et al. 1992). Martin (1993a) has suggested that predation may also influence the community structure of nesting birds, such that more complex habitats attract more species because such habitats provide better protection from predators. Nestling predation has even been postulated to be at least as significant as wintering-ground deforestation in the recent decline of some passerine species (Böhning-Gaese et al. 1993).

Avian field research necessarily results in the disturbance of the individuals being studied (Lenington 1979). Depending on the species involved and the precautions taken by field workers, disturbance may increase, decrease, or not affect the survival of young in the nest (reviewed by Götmark 1992). Increased nestling and egg predation can result from vegetation packing around nests (Morton et al. 1993) or the use of experimental apparatus that attracts predators (Nol and Brooks 1982). Disturbance may also cause birds to discontinue nest defense long enough for predators to steal eggs (Götmark 1992). Sometimes, investigator disturbance can increase nest success by deterring those predators that avoid contact with humans (MacIvor et al. 1990, Morton et al. 1993). In other cases researchers do not significantly affect the nest success of their study species (Gailbraith 1987, Gotfried and Thompson 1978, Vickery et al. 1992). Given the importance of nestling and egg predation in the life histories of most bird species, and the potential for investigator disturbance to affect that predation, it is important for researchers to assess their influences on the nest success of their study species.

Chestnut-collared Longspurs (*Calcarius ornatus*) are small ground-nesting passerines native to short-grass and mixed-grass prairie. Birds nesting in grassland habitats experience high nest mortality: often 50% of nests are lost to predation (Martin 1993b). The effects of observer disturbance on the breeding biology of passerines, however, have received less attention than the effects on larger and potentially more sensitive birds such as raptors (Götmark 1992). Overlooking the effects of observer disturbance may be a result of the difficulty in measuring nest success in passerines, or an inherent belief that certain taxa are less vulnerable than others to disturbance (Götmark 1992).

In this study we examined the effects of human nest visitation on the nest success of Chestnut-collared Longspurs. Other studies have examined investigator influences by monitoring nests from different distances (MacIvor et al. 1990), visiting nests only once as opposed to daily visits (Major 1990), comparing the success of nests visited during incubation to those never visited (Hannon et al. 1993), and *a posteriori* tests of the effect of total nest visits on predation rates (Hannon et al. 1993; see Götmark 1992). We tested directly the influence of nest visitation on predation rates by randomly assigning nests to different visitation schedules and thus to different levels of disturbance. To our knowledge, this is the first experimental test of the hypothesis that human nest visitation influences nestling and egg predation rates (see Götmark 1992).

METHODS

This study was conducted from the end of April to mid-August 1993. Chestnut-collared Longspur nests were located and monitored within a 600 × 700 m grid located in the Remount Community Pasture near Bindloss, Alberta, Canada (50°40′N, 110°10′W). This pasture is a native, mixed-grass prairie community dominated by blue gramma grass (*Bouteloua gracilis*) and needle-and-thread grass (*Stipa comata*).

We found nests by dragging an unweighted 30-m rope to flush female longspurs off nests during incubation and by observing female behavior. Once discovered, we marked nests by placing small pieces of blue flagging tape 1.5 m on either side of them. It was necessary to mark nests for relocation because longspur nests are cryptic and the habitat is homogeneous. We randomly assigned each nest to a visitation schedule of one

TABLE 1. Human nest visitation frequency and survival rates of Chestnut-collared Longspur nests during the incubation period, nestling stage, and overall (incubation and nestling combined).

Period	Visitation frequency			χ^2	P
	1 day	2 day	4 day		
Incubation	16/18 (88.9%)	21/23 (91.3%)	16/17 (94.1%)	0.30	0.86
Nestling	11/16 (68.8%)	12/21 (57.1%)	7/16 (43.8%)	2.04	0.36
Overall	11/18 (61.1%)	12/23 (52.2%)	7/17 (41.2%)	1.39	0.50

visit every 1, 2, or 4 days. Nests were monitored according to their assigned visitation schedule until nest failure or the young left the nest successfully. Nest monitoring involved flushing the female (if present) and quickly counting the number of eggs or young in the nest. Nestlings were measured and banded 6 d after hatch, but this activity was conducted well away from the nest to avoid trampling vegetation. To reduce the effects of finding nests at different points during the nesting cycle, only nests that survived at least 1 wk of incubation were used in our visitation analysis (see Mayfield 1961). All nests were used, however, when calculating overall predation rates. Consequently 18 nests were visited every day, 23 nests were visited every 2 d, and 17 nests were visited every 4 d. Individual nests were approached from different directions on subsequent visits to avoid forming paths in the vegetation, which springs back readily if not walked on repeatedly.

A Chi-squared test of independence was used to detect differences between treatment groups, and power analyses (Cohen 1977) were performed to determine our ability to detect a significant difference. Statistical tests had a rejection level of 0.05 and were two-tailed.

RESULTS

In this study, 50% (38 of 76) of all nests failed completely. Nest failure resulted from several factors, including nest predation (89.5%, n = 34), predation of incubating females (5.3%, n = 2), nest desertion (2.6%, n = 1), and trampling by cattle (2.6%, n = 1). Predation of incubating females was inferred by the discovery of adult longspur feathers within 2 m of the nest. In the one case of nest desertion, the banded female longspur remained on the same territory and renested. Predation on eggs or nestlings was the single greatest cause of nest failure.

Overall, we found no statistical difference in the survival rate of eggs and nestlings combined in nests visited on different schedules ($\chi^2 = 1.39$, df = 2, $P = 0.50$; Table 1). Only those nests that failed because of nestling or egg predation were included in this analysis. Eighty-two percent (23 of 28) of nest predation in the experiment occurred during the nestling stage. There was no statistically significant effect of nest visitation frequency when we considered the incubation ($\chi^2 = 0.30$, df = 2, $P = 0.86$) and nestling periods ($\chi^2 = 2.13$, df = 2, $P = 0.36$) separately (Table 1).

There was a trend, however, that nests visited more frequently were more likely to survive than those visited less frequently (Table 1). As the power of our tests is low (overall, $1 - \beta = 0.10$), it is not possible to rule out the significance of this trend.

DISCUSSION

It is clear from this experiment that nest visitation by humans did not increase predation on Chestnut-collared Longspur eggs and young in nests. It is unclear, however, the degree to which human nest visitation may decrease predation because the power of our test was low. Nest visitation tends to decrease predation rates when the predominant predators are mammals (Götmark 1992). MacIvor et al. (1990) suggested that this may occur particularly in areas where mammals are hunted or "persecuted" by humans and, consequently avoid the scent-trails or paths left by researchers. On our prairie study site, Richardson's ground squirrels (*Spermophilus richardsoni*), thirteen-lined ground squirrels (*Spermophilus tridecemlineatus*), and striped skunks (*Mephitis mephitis*) are prevalent and were suspected nest predators. American Crows (*Corvus brachyrhynchos*) were the only corvid observed and they were rarely seen, possibly because there were very few perches on the study site. The most commonly observed avian predators, Northern Harriers (*Circus cyaneus*), were suspected to prey on fledglings, rather than nestlings, because they concentrated their hunting efforts on those territories where young had recently left the nest (pers. obs.). Nonetheless, the harriers were wary of us and flew away from those areas where we were working.

Our motivation for conducting this study was to determine whether our routine nest monitoring had a negative impact on longspur nest survival and, if so, to find ways in which we could reduce that impact (e.g., by altering nest visitation frequency). It is possible that visitation frequency had no influence on predation rates because we minimized our disturbances at the nest. For example, we were careful not to trample vegetation around nests and used inconspicuous nest markers, as suggested by Martin and Geupel (1993). In other studies, only large, conspicuous markers increased predation rates (Götmark 1992). Also, as we conducted other experiments in the study area, scent-trails left by us may have been of little use to predators as most trails lead to nothing (also see Stoddard 1931, as cited in Gotfried and Thompson 1978).

To our knowledge, this is the first experiment designed to test directly whether frequency of nest visitation influences the survival rate of young in nests (see Götmark 1992). Many studies that have compared the effects of differential disturbance on nest predation have examined nests visited irregularly for reasons unrelated to the analyses (e.g., as a result of inclement weather or distance to particular nests; Hannon et al. 1993). Other studies have examined extremes in human nest visitation schedules (e.g., visits every day vs. only once; Major 1990) which, although of interest for their own sake, do not readily suggest employable procedures to field workers interested in reducing their impact. In contrast, in this experiment we randomly assigned nests *a priori* to a disturbance regime and we chose visitation frequencies that could be used in intensive studies without forfeiting vital information. We believe that this approach reduces the chance of introducing bias into the treatment groups and we hope that other field workers will adopt similar methodology to assess their research impact on their study species.

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