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Frequency of Egg and Nestling Destruction by Female Brown-headed Cowbirds at Grassland Nests

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ABSTRACT.—Researchers have suggested that Brown-headed Cowbirds (*Molothrus ater*) destroy nest contents of potential hosts to induce renesting and thus enhance future opportunities for parasitism. Although cowbird destruction of passerine nests has been witnessed and surmised, few data are available on frequency of those events. We used miniature video-cameras at nests of grassland passerines and documented partial or complete destruction of eggs or nestlings by cowbirds at 7 of 132 nests monitored with cameras. At least three of the seven cases appeared to be attempts to totally destroy the nest contents; those cowbirds did not appear to be motivated by food or an intent to parasitize the nest. Three cases probably were associated with parasitism, but two involved egg removal late in incubation and the third was unusually destructive. Cowbirds were responsible for 24% of egg losses and 5% of nestling losses caused by predators. The importance of cowbirds as an agent of egg and nestling loss undoubtedly varies among sites and years, but it should not be overlooked.

Brood parasites lay eggs in nests of other birds and potentially depress host productivity in several ways. The most frequently reported effects of brood parasitism by Brown-headed Cowbirds (*Molothrus ater*) are removal of host eggs in conjunction with laying their own eggs and competition of cowbird nestlings with host nestlings for food (Robinson et al. 1995). In addition, adult cowbirds may function as predators (Arcese et al. 1996, De Groot et al. 1999); female cowbirds have been observed removing eggs from unparasitized nests of potential hosts without subsequent parasitism (Blincoe 1935, Potter 1985), and have been seen killing nestlings of host species (Du Bois 1956, Tate 1967, Beane and Alford 1990, Scott and McKinney 1994, Sheppard 1996, Elliott 1999). Arcese et al. (1992) found that nest success for an insular population of Song Sparrows (*Melospiza melodius*) was lower when Brown-headed Cowbirds were present, but that predation rates were higher on unparasitized than on parasitized nests. Early research on brood parasitism asserted that Old World cuckoos destroy host nestlings to induce renesting, thus increasing opportunities for brood parasitism (Jourdain 1925). Arcese et al. (1996) hypothesized that cowbirds destroy nests of potential hosts for the same reason.

Although cowbird destruction of passerine nests has been witnessed and surmised, few data are available on frequency of those events. Thompson et al. (1999) reported a cowbird attack on nestlings at one of 52 nests monitored with video cameras, although no nestlings died. We previously reported videotaped evidence of cowbirds destroying contents of two grassland passerine nests (Pietz and Granfors 2000). Here we provide additional evidence of cowbirds destroying eggs and nestlings, quantify parasitism frequency and the frequency of egg and nest-

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ling loss due to cowbirds, and discuss motives of cowbird destruction of eggs and nestlings in different circumstances.

Methods.—We used miniature black-and-white cameras (4 × 4 × 4 cm) to videotape predation and other activities at grassland passerine nests (Pietz and Granfors 2000) in Stutsman, Barnes, McHenry, and Bottineau counties in southeastern and north-central North Dakota, 1996–1999. Study areas were widely separated each year; study fields were native and nonnative grasslands, some of which were managed by haying, grazing, or burning, but were idle during this study. We found nests by rope dragging, pole sweeping, and observation of adult behavior. We candled eggs to estimate incubation stage (Lokemoen and Koford 1996). We placed cameras at nests of 12 passerine species, all of which were potential cowbird hosts. We attempted to deploy cameras during early incubation, but due to limited availability of nests and cameras, stage of camera deployment ranged from late laying to near hatching. Distance between nest and camera averaged 21 cm, and the field of view included the nest and a small surrounding area. Infrared LEDs provided cryptic illumination at night. We placed a DC-powered videocassette recorder ≤50 m from the nest site and recorded events continuously in 24 h time-lapse mode on standard VHS tapes (4–5 images/s).

Results and discussion.—We documented partial or complete destruction of nest contents at 57 of 132 nests monitored with cameras. Cowbird destruction of some or all host eggs or nestlings present in a nest occurred at 7 (12%) of the 57 nests: one case in each of the first three years and four in 1999 (Table 1). Of 13 predator species identified, only thirteen-lined ground squirrels (*Spermophilus tridecemlineatus*) depredated more nests (19) than did cowbirds. The 11 other identified species removed contents from one to five nests each. Cowbirds destroyed or removed the entire contents at one of the seven nests at which they acted as predators, compared to 12 of 19 nests for thirteen-lined ground squirrels and 20 of 33 nests for other predators (note: two nests were visited by more than one predator species). Cowbirds were responsible for 9% of all egg losses (16 of 169) and 24% of egg losses due to predators (16 of 66) in nests monitored by cameras. Cowbirds caused 4% of all nestling losses (6 of 147) and 5% of nestling losses due to predators (6 of 110) in nests monitored by cameras. In 1999, the only year with cowbird attacks on nestlings, cowbirds caused 16% of 38 nestling mortalities. All cowbirds viewed on videotape to date were females.

Overall frequency of parasitism was low in this study: 11% of nests with cameras and 14% of all nests found (Table 2). Parasitism frequency reported elsewhere in the Great Plains generally has been higher: 43% in Nebraska (Hergenrader 1962), 24% in west-central Kansas (Hill 1976), 70% in northeast Kansas

TABLE 1. Host egg and nestling destruction by Brown-headed Cowbirds at grassland passerine nests monitored with miniature videocameras.

Case	Date	Host species	Stage	Days incubated or nestling age	Host eggs/nestlings: When camera setup	Host eggs/nestlings: Destroyed or removed	Number of cowbird visits	Cowbird parasitism[a]	Nest fate
1	28 June 1996	Western Meadowlark	Incubation	6	5	5	1	None	Abandon[b]
2	7 June 1997	Clay-colored Sparrow	Incubation	6	4	3	4	None	Abandon[b]
3	28 June 1998	Bobolink	Incubation	10	4	1	4	Before[c]	Fledge
4	27 May 1999	Savannah Sparrow	Incubation	1	4	2	3	After	Abandon
5	7 June 1999	Bobolink	Incubation	6	6	1	1	None	
	13 June 1999		Nestling	0	5	3	1	None	Fledge
6	21 June 1999	Red-winged Blackbird	Incubation	6	3	2	2	Before, after	Predation
7	13 July 1999	Savannah Sparrow	Nestling	4	4	3	1	None	Fledge

[a] Before = prior to camera deployment; After = after camera deployment; None = no cowbird eggs laid before or after camera deployment.
[b] Nest was not attended by parents after camera deployment; cowbird visits occurred on the day of camera deployment.
[c] Cowbird egg found outside the nest on the day of camera deployment.

TABLE 2. Frequency of cowbird parasitism at grassland songbird nests in North Dakota, 1996–1999.

Host species	Nests found		Nests with cameras	
	Total	Parasitized (%)	Total	Parasitized (%)
Sedge Wren (*Cistothorus platensis*)	4	0(0)	0	0(0)
Sprague's Pipit (*Anthus spragueii*)	7	0(0)	0	0(0)
Common Yellowthroat (*Geothlypis trichas*)	2	0(0)	1	0(0)
Clay-colored Sparrow (*Spizella pallida*)	492	68(14)	64	6(9)
Vesper Sparrow (*Pooecetes gramineus*)	53	0(0)	6	0(0)
Savannah Sparrow (*Passerculus sandwichensis*)	150	31(21)	29	2(7)
Grasshopper Sparrow (*Ammodramus savannarum*)	21	2(10)	4	1(25)
Baird's Sparrow (*Ammodramus bairdii*)	11	3(27)	3	1(33)
Le Conte's Sparrow (*Ammodramus leconteii*)	6	0(0)	2	0(0)
Nelson's Sharp-tailed Sparrow (*Ammodramus nelsoni*)	1	0(0)	0	0(0)
Song Sparrow (*Melospiza melodia*)	11	5(45)	2	1(50)
Unknown sparrow	9	3(33)	0	0(0)
Chestnut-collared Longspur (*Calcarius ornatus*)	71	3(4)	9	0(0)
Bobolink (*Dolichonyx oryzivorus*)	36	11(31)	8	2(25)
Red-winged Blackbird (*Agelaius phoeniceus*)	4	2(50)	1	1(100)
Western Meadowlark (*Sturnella neglecta*)	7	0(0)	3	0(0)
Total	885	128(14)	132	14(11)

(Elliott 1978), 32% in southwest Manitoba (Davis and Sealy 2000), and 25–39% in southeast North Dakota (Koford et al. 2000).

At least three, and possibly four, of the seven cowbird attacks on nests appeared to be attempts at total nest destruction with no previous or subsequent parasitism (Table 1). In case 1, a cowbird punctured all five Western Meadowlark (*Sturnella neglecta*) eggs within 1.2 min, leaving two eggs in the nest and three 10–15 cm from the nest. In case 5, the cowbird removing an egg was chased and pecked by the female Bobolink (*Dolichonyx oryzivorus*), which may have prevented further destruction. Six days later on the day of hatch, that nest was attacked again and was vigorously defended by the female Bobolink. The cowbird killed three nestlings and left one live nestling and one unhatched egg. In case 7, at a nest >6 km away from case 5, a cowbird repeatedly stabbed and tossed all four Savannah Sparrow (*Passerculus sandwichensis*) nestlings in the air during 1.3 min; one nestling rolled back into the nest and survived, but the three outside the nest died and were removed by the adults. Case 2 is more ambiguous than the preceding three cases. At 0950 (CST), a cowbird removed two of four Clay-colored Sparrow (*Spizella pallida*) eggs within 2 min and a cowbird removed a third egg at 1709 the same day. The nest was then inspected by a cowbird four times: twice within 2.3 min of the third egg removal, once the next morning, and once the following evening.

Those videotaped events provide further evidence that Brown-headed Cowbirds destroy eggs and nestlings of host species, and support the inference that cowbirds can function as predators (Arcese et al. 1996, De Groot et al. 1999). Cowbird access to the meadowlark nest may have been facilitated by the lack of attending adults (i.e. camera effect), but that does not negate the fact that, given the opportunity, a cowbird quickly dispatched the entire clutch. At that nest and the two where nestlings were destroyed, the cowbirds probably had no intention of laying eggs. The cowbird behavior at the Clay-colored Sparrow nest also seems inconsistent with intent to parasitize because removal of more than one egg often results in nest abandonment (Rothstein 1975, Sealy 1992, Hill and Sealy 1994).

Although cowbirds acted as predators in those cases, they did not appear to be motivated by food. In cases 1 and 7, where all nest contents were left at the nest, it was clear that the cowbirds did not eat the eggs or nestlings. Scott et al. (1992) concluded that, although cowbirds may sometimes consume eggs taken from passerine nests, nutrition was not the primary motivating factor. Likewise, Sealy (1992) reasoned that more eggs would be taken if feeding was the main objective. All four cases (1, 2, 5, and 7) are generally consistent with Arcese et al.'s (1996) hypothesis that cowbirds destroy nests to induce renesting, yet none of those nests were known to have failed as a result of cowbird activity; the two nests with eggs may already have been abandoned and the other two nests produced fledglings. Thus, comparing nest success (fledging ≥1 young) rates of parasitized versus unparasitized nests to infer cowbird nest destruction (Arcese et al. 1996, Rothstein and Robinson 1998) may be misleading.

Another possible motive for egg and nestling destruction by cowbirds is to reduce food competition for their own offspring in nearby nests. Several researchers have suggested that interspecific and intraspecific nest destruction is an interference mechanism to reduce competition (e.g. Western Meadowlarks

[Creighton and Porter 1974, Schaeff and Picman 1988], Marsh Wrens [*Cistothorus palustris*; Picman 1977], House Wrens [*Troglodytes aedon*; Belles-Isles and Picman 1986]). Such a hypothesis would require that cowbirds in grasslands have stable breeding areas, as demonstrated in other ecosystems (Dufty 1982, Rothstein et al. 1984, Thompson 1994, Hahn et al. 1999).

Egg destruction in cases 3, 4, and 6 (Table 1) may have been associated with parasitic egg-laying. In case 3, the cowbird might have removed the host egg late in incubation in conjunction with an earlier parasitism attempt. Alternatively, the cowbird removed the egg to assess suitability of the nest for subsequent parasitism. In case 4, a cowbird spent 4 min 16 s at the nest poking and inspecting the eggs, leaving all eggs in the nest with one visibly punctured. The host returned and removed a different egg, suggesting it also was damaged, but abandoned the nest later that day. Although we could not determine if the cowbird that damaged eggs was the same cowbird that laid and removed an egg the next morning, the egg damage suggests deliberate destruction rather than behavior associated with parasitism. Brown-headed Cowbirds have been suspected of puncturing eggs without removal (Hofslund 1957, Kondla and Pinel 1971, Carey 1986) but it is considered rare and more typical of Bronzed Cowbirds (*Molothrus aeneus*) (Carter 1986, Peer and Sealy 1999). Massoni and Reboreda (1999) suspected that Shiny Cowbirds (*Molothrus bonariensis*) punctured eggs to assess incubation stage. However, potential hosts of Brown-headed Cowbirds desert nests containing punctured eggs, so puncturing eggs may serve to induce renesting (Peer and Sealy 1999). If egg removal was used to assess incubation stage in case 6, the assessment was incorrect or ignored because an egg was laid two days later. The egg also was laid despite nest defense by the host female, who pecked the cowbird while the cowbird was laying the egg.

Cowbird visits usually occurred after the host left the nest, suggesting that cowbirds monitored nests closely. When the cowbird appeared <10 s after the host left the nest, the nest was defended: both times at a Bobolink nest (case 5) where first an egg and several days later the nestlings were attacked, and at the Red-winged Blackbird nest (case 6) when an egg was laid. Excluding abandoned nests, the other four cowbird visits occurred 2.0–7.3 min after the host left, possibly to avoid confrontation.

The use of cameras allowed us to document rarely observed behaviors of cowbirds and their hosts. Although cameras may have influenced events at two of the seven nests discussed here, the videotapes still provided valuable evidence of the cowbird's role as nest predator as well as parasite. Cowbirds probably would not have been suspected as predators at the four nests with no evidence of parasitism. The importance of cowbirds as an agent of egg and nestling loss undoubtedly varies among sites and years, but it should not be overlooked.

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