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Effects of Parasitism by Brown-headed Cowbirds May Persist into Post-fledging

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ABSTRACT.—Brood parasitism by Brown-headed Cowbirds (*Molothrus ater*) typically decreases the number of host juveniles that fledge: however, little information

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exists regarding the effect of cowbird parasitism during the post-fledging period. We monitored 115 Ovenbird (*Seiurus aurocapilla*) nests in 2006–2008 in northcentral Minnesota, six of which were parasitized. We used radiotelemetry to monitor movements of 36 Ovenbird fledglings (9 additional fledglings depredated <24 hrs after fledging were excluded from the movement analysis) from non-parasitized nests and one fledgling from a parasitized nest. Clutch sizes and productivity were lower in parasitized Ovenbird nests than non-parasitized nests, similar to populations at other locations. The fledgling we tracked from a parasitized nest (in 2008) died after 26 days. It was the only fledgling in our study that died ($n = 20$) with no sign of predation and an empty stomach. That fledgling took 12 days to travel >50 m from its nest and 25 days to travel >100 m from its nest. Fledglings from non-parasitized broods tracked for ≥25 days during 2008 ($n = 16$) took 4.1 ± 0.71 and 9.5 ± 1.14 days to travel the same distances. Our observations suggest that negative effects of brood parasitism may persist into the post-fledging period, possibly confirming observations of cowbird-only survival compiled from the literature. *Received 6 March 2011. Accepted 22 July 2011.*

Brood parasitism by Brown-headed Cowbirds (*Molothrus ater*; hereafter cowbirds) has numerous negative effects on productivity of nesting migrant passerines (Rothstein 1990, Robinson et al. 1995, Ortega 1998, Lorenzana and Sealy 1999). Egg replacement by female cowbirds significantly decreases number of Ovenbirds (*Seiurus aurocapilla*) fledged in parasitized nests (Hann 1937, Donovan et al. 1995, Hersek et al. 2002). Cowbird parasitism significantly increased nest abandonment by California Gnatcatchers (*Polioptila californica*) (Braden et al. 1997) and delayed nesting of Yellow Warblers (*Setophaga petechia*) that bury parasitized clutches (Guigueno and Sealy 2010). Nest predation of parasitized songbirds is also influenced by the presence of cowbird nestlings. Predation of American Redstart (*S. ruticilla*) nests was 16–19% higher in parasitized nests than in nests not parasitized by cowbirds (Hannon et al. 2009). Begging behavior in nestling songbirds is a significant factor contributing to nest predation (Haskell 1994) and cowbirds beg significantly more than nestlings of host species (Payne 1991). Experimental nests at which cowbird begging calls were broadcast were significantly more likely to be depredated than nests at which Indigo Bunting (*Passerina cyanea*) calls were broadcast (Dearborn 1999).

Substantial attention has been given to effects of cowbirds on nesting success, but less is known about how cowbird nest parasitism impacts host broods during the post-fledging period. Smith (1981) monitored marked Song Sparrows (*Melospiza melodia*) and found that fledglings experienced no significant reduction in survival due to brood parasitism. However, juvenile Indigo Buntings from parasitized nests were 82% less likely to return to natal areas in their second year than juveniles from non-parasitized nests (Payne and Payne 1997). Rasmussen and Sealy (2006) reported that adult hosts of parasitized broods, in 97 of 102 observations involving 45 species of hosts, were observed feeding cowbird fledglings, but not their own young. Airola (1986) found that parasitized family groups in the Sierra Nevada contained 76% fewer host fledglings than non-parasitized groups. These authors suggested the discrepancy in parental care may cause increased mortality of host fledglings in the early post-fledging period. The post-fledging period is a time of high mortality for many songbirds without additional stresses from cowbird parasitism (Ricklefs 1968, King et al. 2006, Berkeley et al. 2007).

Cowbird fledgling activity occurs in four main phases: inactive, active, superactive, and independent (Woodward 1983). The inactive and active phases cover the first 11 days after leaving the nest when the cowbird develops the ability to fly, but generally does not actively beg or follow the host parents. The superactive phase occurs 13 to 23 days after fledglings leave the nest and is characterized by fledglings following host adults and near-constant begging. The superactive period is followed by independence, 25 to 30 days after leaving the nest. Thus, cowbird-induced parental neglect of offspring may affect host fledgling survival up to 30 days into the post-fledging period.

We studied a population of Ovenbirds in northcentral Minnesota to assess the effects of forest management practices on reproductive success. Ovenbirds generally do not remove cowbird eggs or abandon nests at high frequencies in response to parasitism, but are capable of successfully raising cowbirds and their own young through the nesting period (Hann 1937, Hersek et al. 2002). However, little is known about the effects of brood parasitism on Ovenbird fledgling survival. We report an observation of one parasitized nest that supports the hypothesis that cowbird parasitism reduces host fledgling survival while the young are dependent on adult care.

METHODS

We searched for and monitored Ovenbird nests during the 2006–2008 breeding seasons in mature

TABLE 1. Clutch, brood, and fledgling parameters (mean ± SE, *n*) for parasitized (by Brown-headed Cowbirds) and non-parasitized Ovenbird nests in the Chippewa National Forest, Minnesota.

Variable	Parasitized	Non-parasitized	*U*	*P*
Clutch size	3.0 ± 0.60 (6)	4.8 ± 0.05 (99)	−3.81	<0.001
Brood size	2.8 ± 0.73 (5)	4.5 ± 0.10 (71)	−2.92	0.003
No. fledged	2.5 ± 0.87 (4)	4.4 ± 0.12 (55)	−2.65	0.008
Days to >50 m [a]	12.0 (1)	4.1 ± 0.71 (16)		
Days to >100 m [b]	25.0 (1)	9.5 ± 1.14 (16)		
Adult care[c]	3/9 (0.33)	105/155 (0.68)		

[a] Days to travel >50 m from nest.
[b] Days to travel >100 m from nest.
[c] Proportion of days adults were present during observations of fledglings during the cowbird superactive phase (Days 13–23).

mixed northern hardwood-coniferous forests in the Chippewa National Forest, Itasca County, Minnesota, USA (47° 26′ N, 93° 40′ W). We visited nests every 4 days to monitor condition and contents, and visited nests more frequently as the estimated fledge date approached. We observed nests remotely with binoculars when possible and took different paths to and from nests to avoid developing trails leading to nests. We recorded clutch or brood size and presence of cowbird eggs and nestlings during each observation. We weighed and banded Ovenbird nestlings with standard aluminum U.S. Geological Survey leg bands 1 or 2 days before we expected nestlings to fledge. We attached radio transmitters to one (rarely 2–3) Ovenbird nestling in each nest using a figure-eight harness (Rappole and Tipton 1991). Radio transmitters lasted ~60 days, had a 0.5–1.0-km signal range during ground-based telemetry, and were 4.3–4.9% of nestling mass at time of attachment, decreasing to 3.0–3.5% as birds reached maturity. We monitored fledglings daily and recorded location, activity, adult presence, and fledgling status (alive or dead). We recorded locations of nests and fledglings using handheld Global Positioning System units (100 points averaged per location) and derived distances from fledglings to the nest from which they fledged using Geographic Information System software. We recorded parental activity as present or absent and noted if parents were feeding fledglings during each 15–20-min observation of the fledgling. Proportions of observations when parents were present were based on 95% confidence intervals. We visually inspected remains of dead fledglings for signs of predation and identified stomach contents when stomachs were recoverable. We compared clutch size, brood size, and number of fledged young between parasitized and non-parasitized nests using Mann-Whitney *U*-tests. We report the number of days required for fledglings to travel >50 and >100 m from nests as means ± SE.

RESULTS

We monitored 115 Ovenbird nests during 2006–2008, six (5%) of which were parasitized by cowbirds (each with 1 cowbird egg). One parasitized nest was abandoned during the laying stage, one was depredated during the nestling stage, one fledged one Ovenbird with the cowbird egg unhatched, and three fledged at least one Ovenbird and one cowbird. Parasitized nests contained smaller Ovenbird clutches ($U = -3.81$, $P < 0.001$) and broods ($U = -2.92$, $P < 0.003$), and fledged fewer Ovenbird young ($U = -2.65$, $P < 0.008$) than non-parasitized nests (Table 1).

Two of the three Ovenbird fledglings tracked from parasitized broods lost their transmitters within 2 days of leaving the nest and their fates were unknown. The third fledgling was in a brood with two other Ovenbirds and one cowbird. The mean mass of the three Ovenbirds when banded was 14.7 g, 1.2 g more than the mean mass of all Ovenbird nestlings weighed. The fledgling with the transmitter weighed 15.5 g, 1.0 g more than the mean mass of all Ovenbird nestlings to which we attached transmitters. We monitored that Ovenbird fledgling for 26 days, and 36 Ovenbird fledglings from 31 non-parasitized broods for 1 to 49 days each. Twenty-six days after fledging, the fledgling from the parasitized brood was dead, but there was no evidence of predation. Its stomach was empty. All stomachs recovered from fledglings of non-parasitized broods ($n = 4$) contained multiple intact and partial insects (Coleoptera and Lepidoptera), and one also contained a snail (Pulmonata) and a seed. All fledglings recovered from non-parasitized nests had signs of predation.

We did not observe the fledgling from the parasitized brood >50 m from the nest until 12 days after fledging and it did not move >100 m from the nest until 25 days after fledging. Fledglings from non-parasitized broods tracked for at least 25 days ($n = 16$) were observed >50 m from nests 2–10 days ($\bar{x} = 4.1 \pm 0.71$) after fledging, and >100 m from nests 3–16 days ($\bar{x} = 9.5 \pm 1.14$) after fledging. We observed host adults with the fledgling from the parasitized brood during three (33%) of nine observations during the cowbird fledgling superactive phase (days 13–23). We observed adults present with fledglings from non-parasitized broods during 105 (68%) of 155 observations during that period (difference = 0.35; 95% confidence interval = 0.034–0.666).

DISCUSSION

Cowbird parasitism reduced Ovenbird clutch size, brood size, and number of young fledged in northcentral Minnesota. These findings are similar to results of studies of Ovenbird populations in other regions (Hann 1937, Hersek et al. 2002). Our observations of apparent parental neglect and starvation of a fledgling from a parasitized brood is consistent with claims by Rasmussen and Sealy (2006) that effects of cowbird parasitism likely extend beyond the nesting period. Rasmussen and Sealy (2006) suggested that host adults spend most of their time provisioning cowbird fledglings, thereby neglecting their own offspring. The host fledgling we monitored was accompanied by adults less often than any fledgling from a non-parasitized brood during the cowbird superactive phase (days 13 to 23), and was the only fledgling to apparently starve (i.e., empty stomach and no sign of predation). This fledgling also remained closer to its nest than any other fledgling we monitored, suggesting the cowbird fledgling may have reduced brood movement. We acknowledge that inference from our post-fledging observations is speculative because of the small sample size. It is possible the fledgling's mortality may have been caused by adult mortality or by disease. However, adult Ovenbird survival is high during the post-fledging period (Bayne and Hobson 2001), and we observed no signs of additional stressors (e.g., blowfly infection or heavy tick load). Brood parasitism could significantly impact reproductive success in populations with high incidence of nest parasitism if our observations are representative of fledglings in broods with cowbirds.

Ovenbirds renest up to five times (more commonly once or twice) after nest failure (Hann 1937, Podolsky et al. 2007). However, pairs rarely double brood (Hann 1937, Zach and Falls 1976, Podolsky et al. 2007). The presence of cowbirds in successfully-fledged broods may reduce seasonal reproductive success more than cowbird-induced nest failure. On average, an adult Ovenbird has two nesting seasons (Hann 1937). Thus, if cowbirds reduce the survival of host fledglings, a single cowbird fledgling could substantially reduce the lifetime reproductive success of an average Ovenbird. Models of songbird reproductive success typically rely on estimates of nest success and assumptions about fledgling survival. Our observations suggest brood parasitism may decrease reproductive success by decreasing nest productivity and by reducing survival of young fledged from parasitized nests. Each of these influences could result in overestimates of reproductive success if all successful nests are treated equally. We recommend further investigation of the relationship between cowbird brood parasitism and host fledgling survival, especially in areas where brood parasitism is relatively common.

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