GENERAL NOTES

Responses of nesting Red-winged Blackbirds and Yellow Warblers to Brown-headed Cowbirds.—Brood parasitism by the Brown-headed Cowbird (*Molothrus ater*) lowers the nesting success of the host (Mayfield 1965, Payne 1977). Usually one host egg is lost since cowbirds often remove an egg (Friedmann 1963). Also, nesting success frequently is reduced by nestling competition, especially in smaller hosts (Payne 1977). Aggressive nest defense can prevent nest predation (Blancher and Robertson 1982) and brood parasitism (Slack 1976) and would be an optimum strategy for cowbird hosts to prevent nest losses (Robertson and Norman 1976).

We studied the aggressive responses of Red-winged Blackbirds (*Agelaius phoeniceus*) and Yellow Warblers (*Dendroica petechia*) to a model female cowbird. These hosts have a high parasitism rate in northwest Iowa (Lowther 1983) and have responded aggressively to cowbird mounts (Folkers 1982). Since cowbird parasitism would be most successful when their eggs are synchronized with the host's egg laying or very early incubation, it is the aggressive nest guarding by hosts at these times that would most reduce parasitism losses. We examined this hypothesis.

Methods.—Three sites in Dickinson County, Iowa, were searched for Red-winged Blackbird and Yellow Warbler nests. These sites—the Freda Haffner Kettlehole Preserve, Cayler Prairie, and Iowa Lakeside Laboratory—are all prairie areas within 5 km of each other. Field testing was done between 14 June and 3 July 1983.

Study skins of a female Brown-headed Cowbird and a Song Sparrow (*Melospiza melodia*) were mounted on poles approximately 1 m in height. A model was placed within 1 m of an active nest and left in position for 5 min. During this time the reactions of the nesting pair were recorded from at least 10 m (for warblers in shrubby habitat) or 40 m (in open areas; all red-wings). Observations were made from outside the normal response distance of these birds to humans. This procedure was then repeated with the second model. The order of presentation of each model at a nest was alternated. Although the models' postures were somewhat unnatural, both specimens possessed reasonably lifelike plumages.

Aggressiveness of nesting pairs toward both models was scored using the scheme of Robertson and Norman (1976) as follows: (1) distant (>5 m), silent observation; (2) close (<5 m), silent observation; (3) distant alarm calling; (4) close alarm calling; (5) fly-by investigation; (6) nest attentiveness; (7) hovering above model; (8) distraction; and (9) attacking the model. Duration of response was scored as follows: (1) response given briefly; (2) response given several times or up to 1 min; (3) response given for 1–3 min; and (4) response given for 3–5 min. The total response score (R) for each sex of the host pair was then computed by taking the intensity score times the duration score summed for all behaviors observed during the 5-min test period. KLF made all observations and scoring judgments. There was no problem identifying sexes of red-wing pairs; some Yellow Warblers, a less obviously dimorphic species, were color-marked to aid individual identification. Stage in the nesting cycle (N) was scored either from the date the first egg was laid (=day 1) or from date of hatching (=day 15). This determination was accurate to within 2 days for nests visited more than once and within 4 days of actual stage for nests visited once. Tests for statistical significance followed methods outlined in Sokal and Rohlf (1981).

Results.—Yellow Warblers and Red-winged Blackbirds both reacted with significantly more aggression to the female cowbird model than to the sparrow model (paired comparison t-test: $t = 5.45$, $P < .001$ for red-wing; $t = 2.24$, $P < .05$ for warbler; Table 1). In male Red-winged Blackbirds, individuals responding with a high score to one model tended to have high scores against the other model also ($r = .50$, $P < .01$). For female blackbirds and warblers this was not true.

Yellow Warblers reacted more aggressively to cowbirds during the early stages of the nesting cycle than during later stages. This relationship is seen in the linear regression relating response score (R) to nesting stage (N), but limited sample size and great variance in individual behavior prevents a statistically significant regression slope ($R = 22.7 - .272$ N, $t = .70$). This same pattern of decreasing aggressive response to cowbirds over the

TABLE 1. Mean responses of host species to models.

Host species	Presentations (No. of nests)	Response to models (mean ± SE)	
		Female cowbird	Song Sparrow
Yellow Warbler pairs	17 (8)	19.8 (2.6)	11.9 (2.9)
Red-winged Blackbird pairs	53 (29)	47.9 (3.5)	29.0 (2.7)
Parasitized pairs			
Males	29 (13)	25.4 (2.9)	13.3 (2.5)
Females	29 (13)	20.4 (2.8)	11.1 (1.9)
Non-parasitized pairs			
Males	24 (16)	24.9 (3.4)	17.9 (2.9)
Females	24 (16)	25.5 (3.3)	16.6 (2.4)

nesting cycle was shown by all male Red-winged Blackbirds (at non-parasitized nests, R = 30.8 − .466 N, t = .96; at parasitized nests, R = 32.8 − .511 N, t = 1.10) and females at non-parasitized nests (R = 34.6 − .715 N, t = 1.57). Collectively these data have a significant regression coefficient (=−.625, t = 2.44). Female Red-winged Blackbirds at parasitized nests showed the opposite tendency (R = 16.4 + .277 N, t = .60).

Male and female Red-winged Blackbirds differed in the quality of their response. Males' reactions generally were more intense but of shorter duration than females'; females were less aggressive but more vigilant, often doing close silent observation throughout the entire presentation. Males averaged 9.2 strikes to the model while females averaged only 2.5 strikes. Quantitatively, the average male response score (24.7) was slightly higher than the average female score (22.3). There was a significant correlation between response scores to the cowbird model by males and females of non-parasitized blackbird pairs (r = .49, $P < .05$) but no similar relationship within parasitized pairs (r = .08, $P > .05$).

Discussion.—Both Yellow Warblers and Red-winged Blackbirds showed greater aggression to the female Brown-headed Cowbird mount than to the Song Sparrow. We expected such a result based on Folkers' earlier findings (Folkers 1982) and the general findings of Robertson and Norman (1976). These birds recognize female Brown-headed Cowbirds as a particular threat to their nesting success and respond in an appropriate manner. There is much selective pressure for host species to react this way to cowbirds.

Our hypothesis, that hosts should be more aggressive during the egg-laying stage was not clearly supported. Although hosts recognize cowbirds as a threat, they do not show the optimum strategy of defending their nests only—or primarily—during early nesting stages. Only in a general sense is this predicted pattern seen in Yellow Warblers and certain categories of Red-winged Blackbirds.

The comparison of response patterns of female Red-winged Blackbirds at parasitized nests with females at non-parasitized nests suggests a reason for the nest's parasitism. Intense nest guarding by females during egg laying (=high response scores) can prevent cowbirds from laying eggs; less intense nest guarding (=low response scores) would not prevent cowbirds from visiting a nest.

Most cowbird hosts may need to learn appropriate responses to cowbirds, as Song Sparrows seem to do (Nice 1943). Thus birds with previous nesting experience (possibly with exposure to cowbirds), or birds nesting in colonies or near other pairs, may learn to identify cowbirds sooner than do isolated or first-time nesting individuals. The different pattern of responses of parasitized and non-parasitized red-wings is compatible with this interpretation.

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Use of a Mirror Trap to Capture Territorial Waterfowl.—As part of a study on the breeding ecology of Barrow's Goldeneye (*Bucephala islandica*) in central British Columbia, I wanted to capture and mark adult drakes to facilitate the study of territorial behavior (Savard, J.-P.L., Can. J. Zool. 60:3439–3446, 1982). I could not obtain hand-reared birds to use as decoys and decided to try mirrors. Instead of a clover-leaf trap with open entrances as used by Donaghey (Spacing behaviour of breeding Bufflehead (*Bucephala albeola*) on ponds in the southern boreal forest. M.Sc. thesis, Univ. Alberta, Edmonton, Alberta, Canada, 1975), I used a spring-door decoy trap made from a folding wire dog cage (0.5 × 1 m) which I fitted with a tripping mechanism similar to that described by Anderson et al. (J. Wildl. Manage. 44:217–219, 1980).

A glass mirror (.4 × .8 m) was fixed with wires at the closed end of the trap. To reach the mirror, the bird had to swim over the treadle that closed the trap door. Each trap was positioned within a Barrow's Goldeneye territory in 1 m of open water. Four aluminum poles held the cage fixed so that the treadle and the mirror base were underwater. It took less than 10 min to install a trap. Results reported here are from 519 trap hours (daylight only): 12 h/trap in 1982 (2 traps), 35 h/trap in 1983 (5 traps), and 80 h/trap in 1984 (4 traps). Each trap was checked at least in early morning and at sunset. All trapping was done during egg laying and early incubation when territorial behavior was the strongest.

Results.—We captured 41 Barrow's Goldeneyes, 27 males and 16 females with mirror traps (Table 1). In territories where a goldeneye drake was captured, effort per trap averaged 10.7 h and ranged from 4 to 28 h (n = 25). In those where a female was captured, trapping effort averaged 17.5 h and ranged between 17 and 33 h (n = 16). Female Barrow's Goldeneyes usually do not take part in territorial defense, but have been observed to attack other females (Savard 1982).

Whenever a female goldeneye was captured, her mate swam around the trap and stayed close to it. If two traps had been located side by side, it is likely that the male would have been captured also. When a male was captured, his mate never came close to the trap.