The Auk 117(3):795–799, 2000

Long-distance Commuting by Brown-headed Cowbirds in New Mexico

DAVID R. CURSON,[1] CHRISTOPHER B. GOGUEN, AND NANCY E. MATHEWS
Department of Wildlife Ecology, University of Wisconsin, Madison, Wisconsin 53706, USA

The Brown-headed Cowbird (*Molothrus ater*) is a widespread brood parasite that has attracted considerable recent attention as a possible threat to forest-dwelling songbirds (e.g. Finch 1991, Robinson et al. 1995). Cowbirds are unusual among passerines in that their parasitic nature allows some populations to have spatially and temporally separate breeding and feeding activities (Rothstein et al. 1984). Cowbirds are ground foragers that feed in open habitats such as grazed grasslands, agricultural fields, livestock corrals, and mowed lawns (Friedmann 1929, Mayfield 1965, Ortega 1998). For breeding, however, cowbirds occupy a wider variety of habitats where their passerine hosts occur in higher densities (Robinson et al. 1995). This reliance on distinct habitat types for essential activities gives rise to daily commuting patterns in landscapes where breeding and feeding habitats are spatially separated (Rothstein et al. 1984, Thompson 1994, Gates and Evans 1998).

Cowbirds are restricted to parasitizing nests that are within commuting distances of their feeding habitats. In recent years, recognition of the relationship between feeding and breeding habitats of cowbirds has led to management strategies involving the manipulation of feeding habitats to alter cowbird breeding distributions for the benefit of potential hosts. For example, in the Coconino National Forest, Arizona, managers rotate livestock (which enhance feeding opportunities for cowbirds) away from nesting sites of endangered Southwestern Willow Flycatchers (*Empidonax traillii extimus*; Goguen and Mathews 1999). For such strategies to effectively protect hosts, the scale at which they are implemented must be sufficient to discourage cowbirds from commuting. The maximum commuting distance between breeding and feeding sites of cowbirds is one of several factors needed to determine the correct scale of management efforts for cowbirds.

In previous radio-telemetry studies, the longest observed commute between breeding and feeding areas of female cowbirds has been around 7 km (Rothstein et al. 1984, Thompson 1994, Gates and Evans 1998). This distance has been used as an estimate of the maximum commuting distance for female cowbirds (e.g. Gustafson and Crow 1994, Coker and Capen 1995) and is the distance used for livestock removal in some cowbird management efforts (e.g. Goguen and Mathews 1999). Given the conservation implications, it is necessary to know whether 7 km truly approximates the upper limit of commuting distance for cowbirds. We studied Brown-headed Cowbirds and their hosts along a forest-prairie interface in New Mexico where cowbirds were abundant and the forest contained little if any feeding habitat. Observations of parasitized nests in forests more than 10 km from known cowbird feeding habitats suggested that cowbirds were commuting considerably farther than previously recorded (Goguen and Mathews 2000). In this paper, we report results from a radio-telemetry study that document regular long-distance commuting by Brown-headed Cowbirds.

Methods.—We conducted our study in Coal Canyon on the 13,350-ha NRA Whittington Center and on adjacent ranch lands in Colfax County, northeastern New Mexico (Goguen and Mathews 1998). The study site encompassed a major boundary between shortgrass prairie and coniferous forest. Shortgrass prairie occupied the lower elevations (1,950 to 2,000 m) in the eastern portion of the site. The remainder of the site consisted of mountainous topography that supported mostly mixed-conifer forests of ponderosa pine (*Pinus ponderosa*) and Douglas fir (*Pseudotsuga menziesii*) and dense oak (*Quercus* spp.) scrub.

Seasonal cattle grazing was the dominant land use on the prairies, with cattle present in most prairie habitats. Forests were free of livestock grazing throughout most of the songbird breeding season, although cattle were present in Coal Canyon after 3 July. Ungrazed mixed-conifer forest extended for at least 20 km to the west of the study site. Thus, mixed-conifer habitats in the western portion of the study site remained isolated from livestock grazing and other potential cowbird feeding habitats throughout most of the songbird breeding season.

From 26 May to 16 June 1998, we captured cowbirds during the morning in mixed-conifer habitats along the western edge of the Whittington Center. All capture sites were located more than 8 km from grazed prairie. We used box traps baited with birdseed and live male and female cowbirds as lures. Upon capture, all cowbirds were banded with U.S. Fish and Wildlife Service aluminum leg bands and plastic color bands. We subsequently released males but fitted females with 1.3-g backpack-style radio transmitters (Advanced Telemetry Systems) that we attached in a manner similar to that used by Raim (1978). First, we glued a piece of denim cloth to the underside of the transmitter and then glued this directly to the skin of the dorsum immediately posterior to the neck after clipping the feathers. Transmitters had a battery life of at least 30 days and a reception

[1] E-mail: curson@calshp.cals.wisc.edu

range of about 2 km under good conditions. When possible, we recaptured females who dropped their transmitters so that we could replace the transmitters.

One or two observers tracked radio-tagged cowbirds daily until all of the radio signals were lost in early July. We located birds visually or by triangulation at close range (<100 m) when in dense foliage. We estimated bird locations to an accuracy of 100 m and recorded them on USGS topographic maps (1: 24,000). We tracked cowbirds on their breeding grounds in the morning until signals were no longer detected (i.e. until all had commuted), and then tracked them on their prairie feeding areas in the afternoon. In instances where we detected a signal but did not determine a bird's specific location, we recorded the bird as present on the breeding grounds or feeding grounds, as appropriate. We also recorded locations of females that had dropped their transmitter but were identifiable by color bands, and we attempted to locate birds at roosting sites. On 5 July, we used a fixed-wing aircraft to search the entire study region.

We classified all nonfeeding observations before 1200 MST as occurring on breeding areas and observations of feeding as occurring on feeding areas (Thompson 1994, Gates and Evans 1998). We calculated the number of tracking days for each cowbird (days that the bird could potentially be located by telemetry) as the number of days from the time its transmitter was attached to the last time it was detected on the bird, discounting two days in late May when telemetry was not conducted. We calculated commuting distances between breeding and feeding areas as the straight-line distance between consecutive breeding and feeding locations on the same day. We calculated commuting distances between roosting and breeding areas as the straight-line distance between an evening roost location and the first breeding location the following morning, or between roosting and breeding locations on the same day.

Results.—We trapped 11 females and 19 males between 25 May and 17 June 1998. All females were fitted with transmitters and released. One female was not detected after her release, but the other 10 were recorded on subsequent days, each near the point of capture (breeding grounds) and on prairies more than 10 km east of the original capture site. Individual transmitters attached before 25 June remained on birds for a mean of 21.4 days (n = 10). The mean number of days that the 10 females were tracked by telemetry, including replacement transmitters, was 22.3 days (range 4 to 42 days).

In the morning, most females occupied a breeding range in the vicinity of their capture location. Breeding behavior, including nest searching, courtship, and copulation, was noted during tracking, and tactile examination of the abdomen upon capture revealed that several females had an oviducal egg. Four females were recorded on their breeding grounds over a period of more than 30 days, four for a period of more than 20 days, and two others for 14 and 15 days, respectively. One of these females, tracked by telemetry for only 4 days, was observed on the breeding grounds without a transmitter on five occasions over the subsequent 16 days. We found 9 of the 10 females present on their breeding grounds for 60% or more of the tracking days ($\bar{x}$ = 70%, range 27 to 91%; Table 1). Breeding and feeding locations of four females are shown in Figure 1.

Feeding was rarely noted during the morning. On four occasions, we detected females feeding with cattle at dawn (0450 to 0500) in areas where they usually foraged in the afternoon. Three of these females were present on their breeding grounds later the same morning. On one occasion, a female foraged among oak flowers on her breeding grounds.

In the afternoon, females foraged with cattle in shortgrass prairie, usually more than 10 km from breeding territories. Afternoon feeding areas did not overlap with breeding areas (Fig. 1). Although all 10 females were detected on the prairies during some afternoons, the mean detection rate at feeding areas was only 38% of tracking days (range 13 to 75%; Table 1). The larger amount of potential feeding area to be searched, and limited access to some prairie sites, probably were responsible for the lower detection rates at feeding areas.

We found few roosting locations during the peak of the breeding season. Once (19 June) we found a female roosting on her breeding ground, and twice (11 and 18 June) another female roosted in riparian habitat near her feeding area but 9.9 km from her breeding ground. On 22 June, a third female roosted in a forested valley halfway (6 km) between her breeding and feeding grounds. On 1 July, we discovered a communal roost that contained 600 to 1,000 cowbirds and smaller numbers of Red-winged Blackbirds (*Agelaius phoeniceus*), Yellow-headed Blackbirds (*Xanthocephalus xanthocephalus*), and Common Grackles (*Quiscalus quiscula*). This roost was in a small cattail (*Typha* sp.) marsh in open prairie 4 km east of the main study site (Fig. 1). Four of five cowbirds that still carried transmitters at this time used the roost during the next 13 days (Table 1). We also detected a transmitter, presumably dropped, of another female (no. 251) at the communal roost.

Of 78 recorded commutes between breeding and feeding grounds, 48 were measured to an accuracy of 100 m (Table 1, Fig. 2). Mean commuting distance between breeding and feeding grounds for nine females ranged from 9.3 to 13.2 km ($\bar{x}$ = 11.8 km). Some individual commutes exceeded 15 km. Of eight commutes between the communal roost and breeding grounds, seven were measured to within 100 m (Table 1). Mean commuting distance between the roost and breeding grounds for three females ranged from 17.8 to 20.6 km ($\bar{x}$ = 19.0 km).

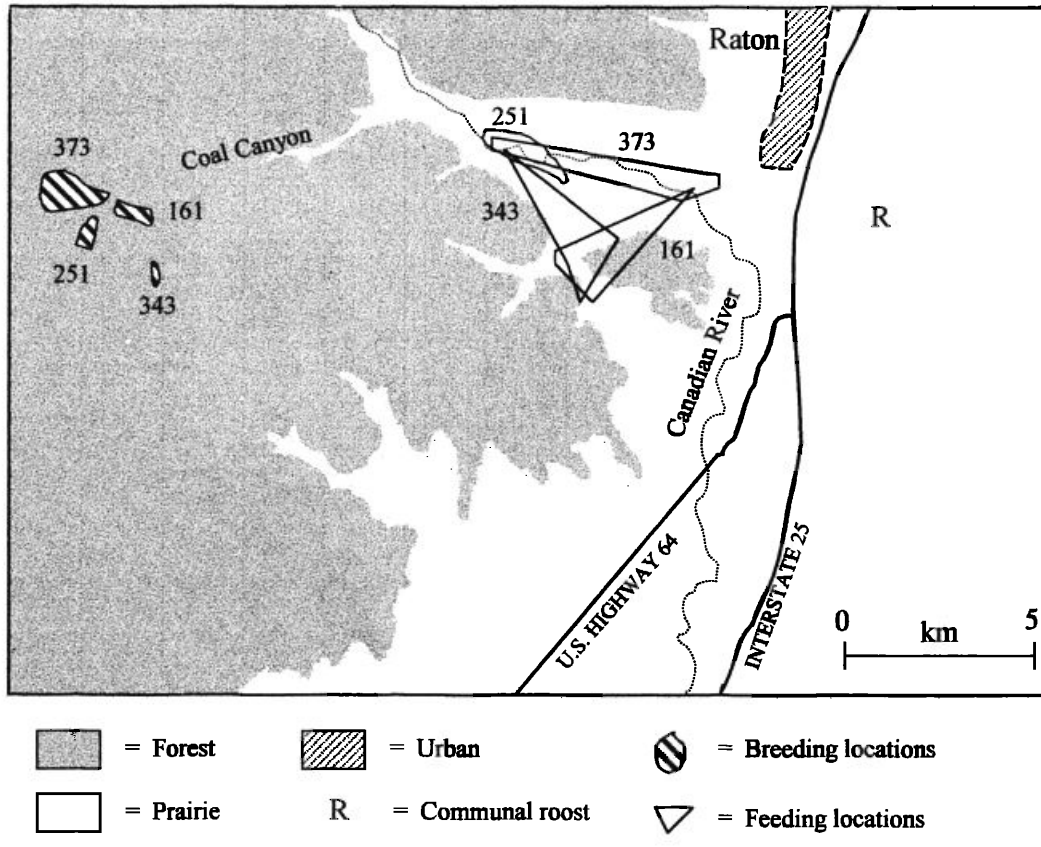

FIG. 1. Map of the study site in northeastern New Mexico showing minimum convex polygons of breeding and feeding locations of four representative radio-tagged female Brown-headed Cowbirds (nos. 161, 251, 343, and 373).

Discussion.—Prior to our research, the longest average commuting distance between breeding and feeding areas published for a female cowbird was 6.7 km (Rothstein et al. 1984), although studies had suggested that some commuting cowbirds exceeded this distance (Verner and Ritter 1983, Rothstein et al. 1984). Our data demonstrate that Brown-headed Cowbirds regularly maintain breeding ranges that are more than 11 km from feeding habitats. Furthermore, our observation that some females commute in excess of 18 km from roost sites to morning breeding areas suggests that longer commutes are possible. These results clearly demonstrate that cowbirds can penetrate forest tracts to breed considerably farther from feeding areas than previously realized.

Two factors probably explain why the cowbirds we studied commuted farther than those examined in other studies. One relates to landscape configuration, particularly differences in the juxtaposition of breeding and feeding habitats. Thompson (1994) and Gates and Evans (1998) studied cowbirds in human-modified landscapes in which forest breeding habitat was regularly interspersed with feeding habitat. Thus, most cowbirds probably could establish breeding ranges relatively close to feeding habitats, and core forest areas that were far from feeding habitat probably were rare. In the relatively undeveloped forests of the Sierra Nevada, horse corrals, campgrounds, and other small human-created feeding sites were also widespread (Rothstein et al. 1984). In contrast, our study site contained large areas of continuous forest that were distant from cowbird feeding habitat.

The second factor responsible for our detection of long-distance commuters was our study design. The cowbirds we studied did not represent a random sample of the population. Instead, they were selected specifically to evaluate the ability of cowbirds to penetrate the forest interior, and they probably represented the upper end of the distribution of commuting distances in our region. In fact, point-count surveys in coniferous forests on our study site indicated that cowbird abundance declined with increasing distance from grazed prairie (i.e. feeding habitat; Goguen and Mathews 2000). Cowbirds that occupied breeding ranges close to the forest/prairie ecotone at our site generally commuted less than 3.5 km be-

TABLE 1. Radio-tracking success and commuting distance ($\bar{x} \pm$ SE, with n and range in parentheses) of 10 female Brown-headed Cowbirds in Colfax County, New Mexico.

Bird no.	n[a]	Tracking days found on breeding ground (%)	Tracking days found on feeding ground (%)	Commuting distance from breeding to feeding ground (km)	Commuting distance from breeding to roosting ground (km)
12	14	71	21	12.7 (1)	—
221	4	75	40	9.3 (1)	—
131	30	67	53	11.1 ± 0.6 (7, 9.6 to 14.2)	—
161	28	68	25	12.9 ± 0.2 (3, 12.6 to 13.2)	—
191	42	83	55	10.9 ± 0.3 (18, 9.8 to 13.8)	18.7 ± 0.2 (4, 18.5 to 19.2)
251	24	67	75	12.1 ± 0.2 (8, 11.3 to 13.1)	—
281	22	91	27	12.4 ± 1.5 (4, 9.4 to 15.4)	17.8 (1)
343	20	60	25	11.4 ± 0.2 (2, 11.2 to 11.6)	—
373	25	88	32	13.2 ± 0.7 (4, 12.5 to 15.3)	20.6 ± 0.0 (2)
403	15	27	13	—	—

[a] Number of radio-tracking days.

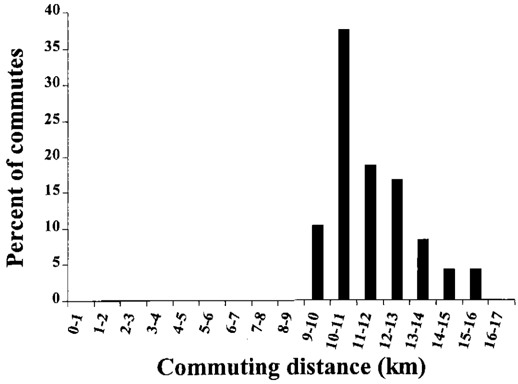

FIG. 2. Commuting patterns between breeding and feeding areas of radio-tagged female Brown-headed Cowbirds. Bars represent the percentage of all commutes from breeding to feeding areas by 1-km distance classes (n = 48 commutes by 9 females).

tween breeding and feeding areas (Goguen 1999). Thus, we suspect that only a small proportion of the cowbirds at our site were long-distance commuters, some of which would have been missed in a random sample of birds.

Cowbirds in our study area used two different types of roosting sites, cattail marsh in open prairie where they roosted communally in large numbers, and sites with trees (conifer forest or riparian woodland) where they roosted individually or in small groups. Thompson (1994) considered a communal roost of cowbirds in a flooded stand of maple (*Acer saccharinum*) saplings in Illinois to serve a predator-avoidance function. The communal roost at our site also may have served to reduce predation because it was one of the only sites in the area that contained dense emergent vegetation.

Recent studies have identified the need to account for cowbird commuting distances in management guidelines for songbirds (Gates and Evans 1998, Goguen and Mathews 1999). Our results suggest that under certain circumstances, effective guidelines must consider a larger scale than previously realized. However, the use of maximum known commuting distance as a radius for removal of cowbird feeding sites may be excessive in many situations. Further research is required to understand mechanisms that influence selection of breeding sites by female cowbirds and to determine factors that limit commuting distances during the breeding season.

Acknowledgments.—We thank Leslie McInenly, Kim Score, Lauren Golten, Amanda Favis, Brady Mattsson, and Kim Suedkamp for help with radio telemetry. The NRA Whittington Center, V-7 Ranch, Vermejo Park Ranch, Jerry and Misty Stolarczyk, and Tim Harkness kindly provided access to their lands. The manuscript was greatly improved by the comments of W. H. Karasov, S. I. Rothstein, F. R. Thomp-

son III, and two anonymous reviewers. Funding was provided by the Global Climate Change program of the U.S. Fish and Wildlife Service, the BBIRD program of the U.S. Geological Survey, the National Fish and Wildlife Foundation, and the University of Wisconsin at Madison.

LITERATURE CITED

COKER, D. R., AND D. E. CAPEN. 1995. Landscape-level habitat use by Brown-headed Cowbirds in Vermont. Journal of Wildlife Management 59: 631–637.

FINCH, D. M. 1991. Population ecology, habitat requirements, and conservation of Neotropical migratory birds. United States Forest Service General Technical Report RM-205.

FRIEDMANN, H. 1929. The cowbirds: A study in the biology of social parasitism. C. Thomas, Springfield, Illinois.

GATES, J. E., AND D. R. EVANS. 1998. Cowbirds breeding in the central Appalachians: Spatial and temporal patterns and habitat selection. Ecological Applications 8:27–40.

GOGUEN, C. B. 1999. Brown-headed Cowbird movements, habitat use, and impacts on hosts in a grazed and ungrazed landscape. Ph.D. dissertation, University of Wisconsin, Madison.

GOGUEN, C. B., AND N. E. MATHEWS. 1998. Songbird community composition and nesting success in grazed and ungrazed pinyon-juniper woodlands. Journal of Wildlife Management. 62:474–484.

GOGUEN, C. B., AND N. E. MATHEWS. 1999. Review of the causes and implications of the association between cowbirds and livestock. Pages 10–17 *in* Research and management of the Brown-headed Cowbird in western landscapes (M. L. Morrison, L. S. Hall, S. K. Robinson, S. I. Rothstein, D. C Hahn, and T. D. Rich, Eds.). Studies in Avian Biology No. 18.

GOGUEN, C. B., AND N. E. MATHEWS. 2000. Local gradients of cowbird abundance and parasitism relative to livestock grazing in a western landscape. Conservation Biology 14: in press.

GUSTAFSON, E. J., AND T. R. CROW. 1994. Modeling the effects of forest harvesting on landscape structure and the spatial distribution of cowbird parasitism. Landscape Ecology 9:237–248.

MAYFIELD, H. F. 1965. The Brown-headed Cowbird with old and new hosts. Living Bird 4:13–28.

ORTEGA, C. P. 1998. Cowbirds and other brood parasites. University of Arizona Press, Tucson.

RAIM, A. 1987. A radio transmitter attachment for small passerine birds. Bird-Banding 49:326–332.

ROBINSON, S. K., S. I. ROTHSTEIN, M. C. BRITTINGHAM, L. J. PETIT, AND J. A. GRZYBOWSKI. 1995. Ecology and behavior of cowbirds and their impact on host populations. Pages 428–460 *in* Ecology and management of Neotropical migratory birds: A synthesis and review of critical issues (T. E. Martin and D. M. Finch, Eds.). Oxford University Press, New York.

ROTHSTEIN, S. I., J. VERNER, AND E. STEVENS. 1984. Radio-tracking confirms a unique diurnal pattern of spatial occurrence in the parasitic Brown-headed Cowbird. Ecology 65:77–88.

THOMPSON, F. R. III. 1994. Temporal and spatial patterns of breeding Brown-headed Cowbirds in the midwestern United States. Auk 111:979–990.

VERNER, J., AND L. V. RITTER. 1983. Current status of the Brown-headed Cowbird in the Sierra National Forest. Auk 100:355–368.

Received 26 February 1999, accepted 24 November 1999. Associate Editor: S. I. Rothstein

---

The Auk 117(3):799–802, 2000

Female Dominance and Aggressive Behaviors in House Sparrow Flocks

JODIE M. JAWOR[1]
Biology Department, Ball State University, Muncie, Indiana 47306, USA

Some bird species display intersexual dominance at food resources (e.g. Bekoff and Scott 1989, Piper and Wiley 1989, Tarvin and Woolfenden 1997). Such interactions fall into three patterns: year-round female dominance, year-round male dominance, and alternating dominance wherein females dominate in the breeding season and males in the nonbreeding season (Smith 1980). Although Smith found alternating dominance to be the most common pattern in birds, she suggested that year-round female dominance should occur in socially monogamous, nonterritorial species. In such species, no advantage would accrue to males who exhibit dominance in the

[1] Present address: Department of Biology, University of Dayton, 300 College Park, Dayton, Ohio 45469, USA. E-mail: jawor@neelix.udayton.edu