

Demography, mating system and reproductive success of the Brown-headed Cowbird (*Molothrus ater*) at Delta Marsh, Manitoba

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Introduction

The Brown-headed Cowbird (*Molothrus ater*) is a native North American icterid and the most common obligate interspecific brood parasite in North America. Brood parasites lay their eggs in the nests of other bird species and all parental care, including incubation and feeding is provided by the host species. The mating system of the cowbird is one of the most widely studied aspects of its biology (Friedman 1929; Darley 1982, 1981; Payne 1973, Elliot 1980; Ankney and Scott 1982; Dufty 1982a, 1982b; Yokel 1986; Teather and Robertson 1986). However, all of this research is based on observational data and experimental manipulations. These approaches are limited by their ability to quantify directly several key aspects of an individual's reproductive biology such as: 1) the genetic mating system and 2) individual reproductive success, which are essential to understanding ecological, behavioural and evolutionary processes.

We are using recently developed microsatellite markers (Alderson *et al.*, in review), combined with behavioural observations, to determine the demographic characteristics, mating system and factors affecting individual reproductive success of cowbirds in a single population. Specifically, using the cowbird population at Delta Marsh, we intend to determine: 1) survival and social behaviour of marked individual male and female cowbirds; 2) the genetic mating system of the cowbird population over multiple years; 3) an estimate of annual reproductive success of individual male and female cowbirds.

This information will be analyzed to: 1) describe the demography of the Delta Marsh cowbird population; 2) test predictions of the current hypotheses for the evolution of cowbird mating system; 3) determine important factors influencing the reproductive success of individual male and female cowbirds. These data will allow the determination of the genetic mating system and realized reproductive success of individual cowbirds. It will be the basis for my investigation of the ecological and social factors involved in the evolution of the mating system and the correlates of individual reproductive success.

Methods

Study site

Data for this study were collected at the University of Manitoba Field Station (Delta Marsh). Details of the habitat are provided by MacKenzie *et al.* (1982), and Weatherhead (1989). The study site consisted of a 2 km strip of habitat running parallel to the shore of the lake. This area (approx. 60 ha) is composed of a strip of forested dune-ridge (ranging from 50-300m in width) and the adjacent cattail marsh (approx. 200m wide).

Data collection

We collected data during the cowbird breeding season (mid May through early July) by trapping, behavioural observations and point censuses. Adult cowbirds were trapped daily between 0600h and 2200h (CST), using tunnel traps baited with cracked corn at trap sites established throughout the study area near cowbird perch sites to maximize trapping success. At first capture, cowbirds were fitted with a unique combination of three plastic colour bands and a uniquely numbered aluminum band issued by the U.S. Fish and Wildlife Service. At first and each subsequent capture, band numbers were noted, birds were sexed and several standard morphological measurements were recorded. In addition, blood samples (for genetic analysis) were taken from the brachial vein of all birds at first capture.

We also collected information that will be analyzed to determine social mates, level of sociality, and spatial exclusion of other individuals. We recorded observations of colour banded birds while systematically walking through the study site or remaining stationary at locations known to be frequented by cowbirds and additional observations were recorded opportunistically while other research activities, such as nest searching and trapping, were ongoing. Emphasis was placed on recording the identity of individuals based on colour band combinations, location, vocalizations, and behaviours (feeding, courtship, copulations, agonistic interactions) as well as the time and date of the observation. We also did point counts of cowbirds seen

and heard at 0600h (C.S.T.) every five days, weather permitting. Counts were done at stations established 300m apart throughout the study site and we monitored each station for 10 minutes.

A subset of our study site (approx. 40 ha) was intensively searched for potential host nests. Once a nest was located, it was marked with flagging tape, its location, stage and the host species were recorded and the nest was monitored daily until clutch completion. Any cowbird eggs laid in host nests were removed and incubated in the lab for up to 10 days to ensure sufficient tissue development for genetic analysis. After incubation, the eggs were frozen and stored until genetic analysis could be performed.

Lab Work

Determination of the genetic mating system is done using microsatellite analysis parentage exclusion for all cowbird eggs found on the study site. Briefly, DNA is isolated from blood and tissue samples by organic solvent purification (Sambrook *et al.* 1989). For each of 7 microsatellite loci (Alderson *et al.*, in review), DNA undergoes PCR amplification. PCR products are resolved on acrylamide gels. Gels are exposed to x-ray film and the form of the alleles present at each locus is determined. Exclusion analysis based on the 7 loci is used to determine paternity and maternity of each chick. The genetic mating systems is determined by the successful matings between individual males and females.

Results

Field work

Cowbirds were first observed on the study site on 12 May and were trapped beginning on 14 May. As in other years, the peak in trap activity occurred in late May and early June. During the field season, we trapped a total of 193 cowbirds (121 males and 72 females). Fifty-three percent (n=64) of the males were new birds and 47% (n=40) were returning birds banded in previous years, while 67% of females were new captures and 31% were birds trapped in previous years.

The population density and sex ratio of cowbirds on the study site were calculated by pooling observation and trapping data. Our resident population consisted of 39 males and 30 females and the population sex ratio was 1.30 males : 1 female which is not significantly different from unity (Chi-square test). Annual survival was calculated by determining the number of birds resident in 1995 that were trapped or observed during the 1996 season; the probability of survival was 0.41 for females and 0.59 for males.

The first cowbird egg was located on the study site on 31 May, in a Red-winged Blackbird nest. A total of 42 cowbird eggs was collected on our study site during the breeding season.

Lab Work

Genotypic analysis of the blood and tissue samples collected in 1996 is still ongoing and consequently, no results were available.

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