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COWBIRD PARASITISM ON LARK BUNTINGS: FREQUENCY, ACCEPTANCE, AND FLEDGING

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Abstract.—Twelve of 22 (54.5%) Lark Bunting (*Calamospiza melanocorys*) nests examined near Val Marie, Saskatchewan, were parasitized by Brown-headed Cowbirds (*Molothrus ater*). Of five naturally parasitized nests found during the egg stage, two nests contained one, two contained two, and one contained three cowbird eggs, in addition to the host eggs. Real cowbird eggs were accepted at least five days at four experimentally parasitized nests, whereas the cowbird egg disappeared within 24 h of its introduction at a fifth nest, while the host eggs remained intact. A cowbird egg laid naturally in the same nest, three days after ejection, was accepted. Cowbird eggs also were accepted at 12 naturally parasitized nests and six cowbirds fledged from the five nests that were monitored.

PARASITISMO DE *CALAMOSPIZA MELANOCORYS* POR *MOLOTHRUS ATER*: FRECUENCIA, ACEPTACIÓN, Y PRODUCCIÓN DE VOLANTONES

Sinopsis.—Doce de 22 nidos (54.5%) de *Calamospiza melanocorys* examinados cerca de Val Marie, Saskatchewan, fueron parasitados por *Molothrus ater*. De cinco nidos naturalmente parasitados hallados en la etapa de huevo, dos contenían uno, dos contenían dos, y uno contenía tres huevos de *Molothrus ater* en adición a los huevos de la pareja. Huevos verdaderos del parásito fueron aceptados al menos cinco días en cuatro nidos parasitados experimentalmente. Sin embargo, el huevo del parásito desapareció dentro de las 24 h después de su introducción en un quinto nido, mientras que los huevos del hospedero quedaron intactos. Un huevo de *M. ater* puesto de forma natural en el mismo nido tres días después del rechazo del huevo plantado, fué aceptado. Los huevos del parásito también fueron aceptados en 12 nidos parasitados naturalmente y seis pichones de *M. ater* volaron de los cinco nidos que se monitorearon.

The Lark Bunting (*Calamospiza melanocorys*) has been confirmed recently as a frequent host of the Brown-headed Cowbird (Hill 1976, Wilson 1976, Friedmann and Kiff 1985, Davis 1994), and Rohwer and Spaw (1988) listed it as an accepter of cowbird parasitism. This host species is especially interesting because its range is within the cowbird's ancestral center of abundance. Late in the last century, Allen (1874) reported 28% of 18 nests parasitized in the Dakotas and Montana, but for the next 100 years or so, parasitism on this species was recorded infrequently, and only locally (Friedmann 1963, Friedmann et al. 1977). Commenting on the scarcity of records of parasitism on Lark Buntings since Allen's report, Friedmann (1963:153) noted that "The phenomenon cannot be blamed on the dropping off of interest in egg collecting, but, at the same time, there is no reason for thinking that the Lark Bunting has become immune to cowbird parasitism."

Parasitism frequencies of 15% to 20% on Lark Buntings have been recorded and observations in one study suggest that Lark Buntings may reject cowbird eggs (Hill 1976, Wilson 1976). Hill (1976) found cowbird eggs on the ground near five Lark Bunting nests, and recorded more

desertions of parasitized than unparasitized nests. Hill suspected that Lark Buntings had removed the cowbird eggs and that the desertions were in response to cowbird parasitism. Ejection of cowbird eggs between nest inspections would explain the infrequent records of parasitism for Lark Buntings (see Friedmann et al. 1977), compared to many other host species of the grasslands. Without experimentation, however, Hill (1976) could not have been sure that the cowbird eggs were removed by Lark Buntings, and not by predators or cowbirds. Host species such as the Lark Bunting that occur within the cowbird's ancestral range should be expected to reject parasitism if, when parasitized, their reproductive output is compromised.

The present study was stimulated by Hill's (1976) observations of apparent ejection of cowbird eggs by Lark Buntings and because cowbirds have not been reported fledging from Lark Bunting nests (Hill 1976, Wilson 1976, Friedmann and Kiff 1985, Davis 1994). I parasitized clutches experimentally to determine whether Lark Buntings reject or accept cowbird eggs. The extreme difference in appearance of eggs of Brown-headed Cowbirds and Lark Buntings suggests that Lark Buntings should be able to distinguish between the two egg types, if Lark Buntings show true egg recognition (cf. Rothstein 1982). Cowbird eggs are white with numerous small brown and gray spots, whereas Lark Bunting eggs are generally immaculate, light blue. To increase the sample size of responses, I inspected naturally parasitized nests to determine the fate of the cowbird eggs, and to confirm fledging of cowbird chicks.

METHODS

I located Lark Bunting nests in fields, pastures, and roadside ditches around Val Marie, southwestern Saskatchewan (49°03′N, 107°13′W), from 21 Jun.–4 Jul. 1997. Nests were flagged at least 3 m away. For the experiments, I used real Brown-headed Cowbird eggs salvaged from nests of other species on the study site. The eggs were refrigerated when not in use. I placed one cowbird egg into nests during the laying stage, whenever possible, because this is when most natural parasitism occurs. Cowbird eggs were added at some nests after laying was complete. Ejection occurs in most rejecter species regardless of the stage of the nesting cycle (e.g., Rothstein 1975a, 1977; Sealy and Bazin 1995). I did not remove any host eggs from the nest. I determined the day of the laying cycle or of incubation when the cowbird egg was added by backdating from the hatching date, based on an incubation period of 12 d for the Lark Bunting (Wilson 1976, pers. obs.). Contents of four nests were experimentally parasitized between 0700 and 1030 h CST, the fifth nest at 1330 h. I checked each nest the day after experimental or natural parasitism and then every other day through hatching. Nests containing cowbird eggs when discovered or laid before I could add a cowbird egg to the nest were inspected as above. I considered a cowbird egg accepted when laying or incubation was not interrupted and the cowbird egg and intact host clutch were tended for at least five days. A cowbird egg was ejected if it disappeared from the

nest but the original clutch of host eggs was still tended by the buntings (Rothstein 1975a). Actually, accepted cowbird eggs were left in the experimental nests until the Lark Bunting eggs hatched, and in the naturally parasitized nests until the cowbird eggs also hatched.

RESULTS

Response to experimental parasitism.—I placed single cowbird eggs into two Lark Bunting nests during the laying period and into three nests 3–7 d into incubation. Cowbird eggs were accepted at four experimental nests but the egg disappeared from one nest. The latter cowbird egg had been added to the nest on the day the third of five bunting eggs was laid. The introduced cowbird egg disappeared within 24 h, and was not found near the nest. Three days later (one day after clutch completion), this nest was parasitized by a cowbird. This cowbird egg was accepted and eventually hatched several hours after the buntings. Neither the naturally laid cowbird egg nor any Lark Bunting eggs in this or any other experimental nest was damaged. However, in one nest one of four bunting eggs disappeared 3–4 d after the cowbird egg had been accepted.

Natural parasitism and cowbird fledging.—I found 22 Lark Bunting nests, of which 12 (54.5%) were parasitized by Brown-headed Cowbirds. The observed frequency likely represents the actual frequency of parasitism on this population. None of the parasitized or unparasitized nests was deserted. Of the five parasitized nests found during the egg stage, two nests contained one, two contained two, and one contained three cowbird eggs in addition to host eggs. Except for two cowbird eggs embedded in the lining of one nest, all cowbird eggs at these nests were accepted. In the nest with three cowbird eggs, two cowbird eggs were laid before the first of five bunting eggs. The cowbird eggs were partially embedded in nest material and did not hatch. The third cowbird egg was laid the same day as the second bunting egg. The cowbird and four buntings hatched, but I left the study site before any young fledged.

Two other nests were depredated during the incubation stage, but cowbirds and buntings fledged from the remaining two nests. A 6-day-old cowbird disappeared from one nest on the same day one bunting died and two days before the other two buntings fledged. I saw only young Lark Buntings being fed outside the nest by adult buntings. From the other nest, which originally contained two cowbird eggs and four bunting eggs, two cowbirds and two buntings fledged.

Seven other nests contained nestling Lark Buntings and cowbirds when discovered, but fledging was confirmed at only three of them. One nest contained one cowbird nestling that apparently departed prematurely, and one bunting (plus single unhatched cowbird and bunting eggs). One bunting plus two cowbirds fledged from the second nest, and two buntings and one cowbird fledged from the third nest. In all, six cowbirds fledged from five Lark Bunting nests, but the immediate fate of one fledgling was not determined.

DISCUSSION

The frequency of parasitism (55%) recorded in southwestern Saskatchewan is the highest reported for Lark Buntings. Since Allen's (1874) report of parasitism frequency of 28%, Hill (1976) and Wilson (1976) recorded frequencies, in Kansas, of 15.5% (22 of 142 nests) and 20.8% (16 of 77 nests), respectively. In these and other studies (Smith and Smith 1966, Davis 1994), and the present one, up to three cowbird eggs were observed in some nests. Previous workers recorded cowbirds tended by Lark Buntings only for six days or less, before the nests failed (Smith and Smith 1964, Hill 1976, Wilson 1976, Davis 1994). Fledging was confirmed in the present study, but the survival of cowbird and host young after leaving the nest remains to be determined.

The high frequency of parasitism recorded in this study, acceptance of naturally laid cowbird eggs and 80% of the experimental eggs, and fledging of cowbird chicks are strong evidence that Lark Buntings accept cowbird parasitism. Friedmann et al. (1977) argued that in the absence of experimental data, a species can be assumed to be an accepter if 20% or more of its nests are parasitized and whether the cowbird egg is always, or nearly always, accepted, as observed by the investigator. This limit is justified because in most rejecter species, 80% to 100% of all individuals in the population eject cowbird eggs (Rothstein 1975b). In fact, the percentage of ejections usually approaches 100% (Rothstein 1975b, 1977; Sealy and Bazin 1995; Sealy 1996; but see Burhans and Freeman 1997, Peer and Bollinger 1997).

The disappearance of the experimental cowbird egg from one nest probably represents a true case of ejection, as the cowbird egg disappeared quickly from the nest and its vicinity, while the clutch remained intact and was tended by the buntings. Cowbird eggs are usually ejected within 24 h (Rothstein 1977, Sealy and Bazin 1995) and are carried several meters from the nests (Sealy and Neudorf 1995, but see Burhans and Freeman 1997). Acceptance of the cowbird egg that was laid later in this nest, however, complicates the picture. In the only nest at which ejection was recorded in an experimental study of Western Wood-Pewees (*Contopus sordidulus*), cowbird eggs added to the nest four days apart were ejected (Curson et al. 1998). However, I cannot rule out the possibility that the egg was removed by a predator (see Sealy 1994) or by the cowbird that later parasitized the nest (Sealy 1992). In light of these results, how should Hill's (1976) observations be interpreted?

Hill (1976) suggested that removal of cowbird eggs from Lark Bunting nests represented ejection by the buntings, rather than a pattern of normal egg loss (see Regosin 1994). The apparently undamaged cowbird eggs may have been grasped by the buntings, but fell from their bills near the edge of the nests. Again, cowbirds or predators may have been responsible. More experiments are needed on nests of the Lark Bunting.

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