ever, these ants do secrete anal fluids that are potentially insecticidal.—WILLIAM POST, *Box 582, Aiken, South Carolina 29801* AND MICOU M. BROWNE, *Dept. Entomology, North Carolina State Univ., Raleigh, North Carolina 27607.* *Accepted 5 Mar. 1981.*

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Competition between Red-winged Blackbirds and Common Grackles.—Interspecific competition is often difficult to document in natural situations because species pairs or groups are commonly studied after they have long been in contact (see for example, Cody, Competition and the Structure of Bird Communities, Princeton Univ. Press, Princeton, New Jersey, 1974). It is therefore difficult to know what effect each species had on the reproductive success of the other at the time of initial contact when competition was presumably most intense. Although Red-winged Blackbirds (*Agelaius phoeniceus*) and Common Grackles (*Quiscalus quiscula*) have long been sympatric, they frequently do not nest in the same habitat. Despite the fact that cattail marshes may have been an original nesting habitat for grackles (Stepney, Ph.D. thesis, Univ. Toronto, Toronto, Ontario, 1979), they are generally considered now to be prime nesting habitat for red-wings and, in many areas, rather unusual nesting substrate for grackles (Wiens, Auk 82:356–374, 1965). Occasionally, however, grackles do nest in such areas. The present study documents a possible effect of the arrival of grackles on red-wing reproductive success in a cattail marsh. For a comparison of red-wing and grackle nesting behavior, as well as for a description of the interaction between the two species, see Wiens (1965).

In 1974 the senior author studied red-wings on four marshes (Redwing Slough, Crawdad Slough, 87th Street Slough and Long John Slough) located in Palos Park Forest Preserve about 45 km outside Chicago, Illinois. In 1978 both authors worked on two of the four marshes (Redwing Slough and the south end of 87th St. Slough). In 1974 no grackles nested on any of the four marshes. In 1978 grackles nested on Redwing Slough although none nested on the other three marshes. The present study compares reproductive success of red-wings nesting on Redwing Slough before and after the arrival of grackles. In addition, reproductive success of red-wings on this marsh in 1978 is compared with that on 87th St. Slough where no grackles nested.

The two marshes emphasized in this study were located 1.5 km apart. Both Redwing Slough and the southern end of 87th St. Slough contained six red-wing territories each year. The principal emergent vegetation on the marshes was cattails (*Typha* spp.). Redwing Slough also contained substantial amounts of buttonbush (*Cephalanthus occidentalis*). A detailed description of the marshes and the methods used in making various measurements is presented in Lenington (Anim. Behav. 28:347–361, 1980). Harem sizes were estimated by determining the minimum number of females required to account for the number of nests on a territory (Holm, Ecology 54:356–365, 1973). Because females renest readily if a nest is destroyed, there were usually more nests on a territory than there were females.

In both marshes in 1974 and 1978 I measured the size of each male's territory, the density of cattails on the territory and the number of females nesting on the territory. In addition, in 1978 I noted the date on which females settled on territories. Nests were checked every 2–5 days to determine fledging success.

In 1978, four pairs of grackles nested on Redwing Slough. The grackles occupied small nest-centered territories within the area of the larger red-wing territories. Grackles nested exclusively within the cattail portion of the marsh; none nested in buttonbush. It is possible that grackles selected Redwing Slough for nesting while not nesting on the other three marshes because Redwing Slough appeared to be the highest quality marsh (when studied

TABLE 1
COMPARISON OF REDWING AND 87TH ST. SLOUGHS IN 1974 AND 1978

	Redwing 1974	Redwing 1978	87th St. 1974	87th St. 1978
Mean cattail density of territories (stems/m^2)	5.45 (0.78)[a]	10.49 (0.96)	6.51 (1.17)	11.73 (0.94)
Mean territory size (m^2)	660 (123.67)	578.3 (105.09)	1139 (58.9)	1676 (73.26)
Date of arrival of first female	2 April	11 April	7 April	4 April
Date when all territories had at least one female	—	27 April	—	11 April
Mean harem size	7.17 (1.17)	3.50 (0.43)	2.00 (0.32)	2.33 (0.33)
Date of first nest	2 May	7 May	4 May	7 May
Mean clutch-size	3.56 (0.07) [52][b]	3.70 (0.15) [23]	3.41 (0.11) [22]	3.42 (0.15) [17]
Proportion of successful nests	0.685 [54]	0.483 [29]	0.115 [26]	0.222 [18]
Mean no. of young fledged from successful nests	2.00 (0.18) [37]	3.00 (0.28) [14]	1.67 (0.33) [3]	2.25 (0.25) [4]

[a] Value in parentheses is standard error of the mean.
[b] Value in brackets is sample size where not given in text.

in 1974 it had the largest harems, highest proportion of nests fledging young and largest number of young fledged from successful nests of any of the four marshes).

Grackles tended to nest earlier than red-wings. Three grackle nests were started in the week of 25 April–1 May and one was started the following week. In contrast, only one red-wing nest had been started by 8 May and the peak of red-wing breeding did not occur until the week of 23–29 May.

A comparison of the characteristics of red-wing territories and the components of red-wing reproductive success in 1974 and 1978 is presented in Table 1. The major change in red-wing reproductive success potentially attributable to grackles is a reduction in harem size. Mean harem size on Redwing Slough was significantly smaller in 1978 than in 1974 ($t = 2.96$, df = 10, $P < 0.02$), whereas mean harem size on the 87th St. Slough was unchanged between the two years ($t = 0.69$, df = 10, $P > 0.05$). In addition, as can be seen by the data on the date all territories had at least one female, females settled considerably later on Redwing Slough than they did on 87th St. Slough. A cursory examination of other nearby marshes that did not contain grackles showed that they also had large numbers of females at a time when few females were found nesting on Redwing Slough. In contrast, the first female seen on any of the four marshes studied in 1974 was on Redwing Slough.

As discussed in Lenington (1980), red-wing harem size within (although not between) marshes near Chicago is positively correlated with cattail density and territory size. However,

TABLE 2

COMPARISON OF MEAN AND VARIANCE OF RED-WING HAREM SIZES FROM 14 LOCALITIES

Location	No. of years studied	Mean (unweighted)	Between-year variance	Reference
Mann and Beaver lakes	2	2.91	0.058	Orians (1980)
30 Acre and Little McDowell lakes	2	2.84	0.031	Orians (1980)
TNWS	2	2.85	0.045	Orians (1980)
CNWS	4	5.93	1.480	Orians (1980)
Westham Island	2	4.80	0.020	Picman, Can. J. Zool. 58:337–350, 1980
Chesapeake Bay: Colony 1	4	1.47	0.063	Meanley and Webb (1963)
Chesapeake Bay: Colony 2	3	1.63	0.063	Meanley and Webb (1963)
Airport Marsh	2	2.15	0.168	Case and Hewitt (1963)
Inlet Valley Marsh	2	2.17	0.000	Case and Hewitt (1963)
Millbrook Marsh	5	1.48	0.578	Brenner, Am. Midl. Nat. 76:201–210, 1966
Lake Opinicon, Ontario	2	2.80	0.051	Weatherhead and Robertson, Can. J. Zool. 55:1201–1267, 1977
87th St. Slough	2	2.17	0.054	Lenington and Scola, this study
Redwing Slough	2	5.61	8.860	Lenington and Scola, this study

neither of these factors can account for the decrease in harem size on Redwing Slough between 1974 and 1978 because territories did not differ in size between the two years and mean cattail density was substantially greater in 1978 than in 1974. No other components of reproductive success (clutch-size, nesting success, or number of young fledged from successful nests) differed significantly between 1974 and 1978.

It is possible that the change in harem size on Redwing Slough between 1974 and 1978 simply represents normal between-year variability. To test this hypothesis we examined published data from all marsh localities (Table 2) where red-wing harem sizes have been recorded for two or more years in order to estimate the between-year variance in harem size. The variance in 13 localities ranged from 0 (Case and Hewett, Living Bird 2:7–20, 1963) to 1.48 (Orians, Some Adaptations of Marsh-nesting Blackbirds, Princeton Univ. Press, Princeton, New Jersey, 1980). The variance in harem size on Redwing Slough was 8.86. The

probability of obtaining one value more extreme than the 13 others if they all come from the same population is $1/2^{12}$ or 0.00025. Thus, it is highly unlikely that the decrease in harem size in Redwing Slough is due to nothing more than normal between-year variation.

In a study of interactions between red-wings and grackles nesting on a cattail marsh Wiens (1965) concluded that red-wing female reproductive success was not adversely affected by the presence of grackles on the marsh. This conclusion was supported by Snelling (Auk 85:560–585, 1968), whose data suggested that red-wings and grackles do not compete for food. Although Wiens did not have data on harem size before and after the arrival of grackles on the marsh, far fewer nests were found on his marsh during the years of his study than had been found 15 years earlier when no grackles nested on the marsh (Beer and Tibbits, Flicker 22:61–77, 1950). Data from this study support the contention of the above two studies that female reproductive success may not be decreased by the presence of grackles. If, however, female red-wings consider marshes containing grackles undesirable places to nest, reproductive success of male red-wings would be considerably reduced due to the decrease in harem size. On Redwing Slough the mean number of young fledged per male was 9.8 in 1974 and 5.1 in 1978. As one might expect, male red-wings in this study, as well as on the marsh studied by Wiens (1965), were aggressive toward grackles.

It is not, however, evident why female red-wings should avoid nesting on marshes containing grackles. One possible reason for this avoidance may be the predatory behavior of grackles noted by several authors (Davis, Auk 61:139–140, 1944; Poor, Proc. Linn. Soc. N.Y. 54-57:54–55, 1946; Bent, U.S. Natl. Mus. Bull. 211:1–549, 1958; Meanley and Webb, Chesapeake Sci. 4:90–100, 1963). Although there was no evidence in either this study or that by Wiens (1965) that grackles preyed on red-wing nests, Meanley and Webb (1963) considered grackles to be the principal predators on red-wing nests in the Chesapeake Bay region. This behavior on the part of grackles may result in aggression on the part of red-wing males toward grackles attempting to nest on a marsh and female avoidance of nesting in marshes containing grackles. Because it would probably be impossible for red-wings to know in advance whether or not in any given instance grackles would or would not prey on nests, the agonistic behavior of red-wings toward grackles may be manifested even in situations in which grackles represented little or no threat to red-wing nesting success. The aggressive behavior of the male might further contribute to the decrease in harem size since males would have less time to court females.

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Incidence of Brown-headed Cowbird parasitism on Red-winged Blackbirds.—A high incidence of Brown-headed Cowbird (*Molothrus ater*) parasitism on the Red-winged Blackbird (*Agelaius phoeniceus*) appears to be a localized phenomenon (Friedmann, The Cowbirds, Charles C. Thomas Co., Springfield, Illinois, 1929). Friedmann et al. (Smithson. Contrib. Zool. 235, 1977) report that the incidence of parasitism on red-wings is greatest in the central United States and Canada. Within this geographic region the literature shows a wide range in rates of parasitism. Berger (Wilson Bull. 63:26–35, 1951) reported that only 5% (N = 99) of the red-wing nests he examined in Michigan contained cowbird eggs, and Wiens (Wilson Bull. 75:130–138, 1963) observed no parasitism in 33 nests in southern Okla-