ASPECTS OF COWBIRD PARASITISM IN SOUTHERN OKLAHOMA

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ASPECTS of the parasitic breeding habits of the Brown-headed Cowbird (*Molothrus ater*) have been documented extensively by Friedmann (1929), Laskey (1950), Berger (1951), Norris (1947), and others. It was the purpose of this study to investigate some of the major aspects of such parasitism in the breeding avifauna of southern Oklahoma. Particular emphasis was placed on observation of the incidence of nest parasitism by the cowbird on host species in this population, the nesting success of the cowbird in relation to its hosts, and the nature of the laying period of the cowbird.

SURVEY AREA

The study was conducted between 15 June and 6 August 1960, and 8 June and 4 August 1961, at the University of Oklahoma Biological Station, Marshall County, Oklahoma. The biological station is located along the north shore of Lake Texoma, a large impoundment of the Red and Washita Rivers, 18 miles south of Madill, Oklahoma. The area is characterized by tall grass prairies and blackjack-post oak forests, but the major portion of the study was carried out in the bottomland-floodplain area bordering the lake. This habitat was rather open, clumps and thickets of black willow (*Salix nigra*), persimmon (*Diospyros virginiana*), American elm (*Ulmus americana*), cottonwood (*Populus deltoides*), buttonbush (*Cephalanthus occidentalis*), and other shrubs being scattered through open mixed grasslands which were sporadically grazed.

Nests in this area were tagged and observed three or four times per week until young fledged or the nest was deserted or destroyed.

INCIDENCE OF PARASITISM

Cowbird parasitism was noted at 31 nests of eight species during the study. Table 1 indicates the degree of parasitism for each species observed. Similar data from the study of Ely (1957), conducted in the same area in 1956, are included in the table for comparison. Parasitism of each species is discussed in more detail below. Nests of species which were not parasitized were not considered in this study. Nest heights are from ground level to the nest rim.

Vireo bellii.—The Bell's Vireo was one of the commonest breeding species in the study area, and one of the most heavily parasitized. Of 31 active nests found during 1956, 1960, and 1961, 22 (71.0%) were parasitized. Overmire (1962*a*) found 61 nests in northern Oklahoma, 18 (30%) of them parasitized. Three of five nests (60%) observed in Illinois by Pitelka and Koestner (1942) were parasitized, while Mumford (1952) noted parasitism

TABLE 1
INCIDENCE OF COWBIRD PARASITISM, 1956,[1] 1960, 1961

Species	Total nests	Parasitized nests
Bell's Vireo	17	12 (70.6%)
	14	10 (71.4%)
Dickcissel	15	5 (33.3%)
	14	1 (8.5%)
Cardinal	4	4 (100%)
	12	1 (9.1%)
Lark Sparrow	4	3 (75.0%)
	17	1 (5.9%)
Orchard Oriole	3	3 (100%)
	13	6 (46.2%)
Blue Grosbeak	5	2 (40.0%)
	8	6 (75.0%)
Painted Bunting	2	1 (50.0%)
	5	4 (80.0%)
Field Sparrow	1	1 (100%)
	4	3 (75.0%)
Red-winged Blackbird	33	0 ——
	73	2 (3.0%)
TOTAL	84	31 (36.9%)
	160	34 (21.2%)
TOTAL (excluding Red-winged Blackbird)	51	31 (60.8%)
	87	32 (36.8%)

[1] Second line of data is from Ely's 1956 study.

at seven of 13 nests (53.8%) in Indiana. Barlow (1962) observed 35 nests in Kansas, 24 (68.6%) of them parasitized. Of the 17 nests found during the present study, eight were in persimmon, six in willow, and three in buttonbush; all were on the edges of low clumps of these plants. These nests were from 2.2 to 4.2 feet (average, 2.9 feet) from the ground. Ely (1957) found 13 nests in persimmon, one in osage orange (*Maclura pomifera*), and none in willow or buttonbush; these nests were from 1 to 8 feet (average, 6 feet) above the ground. Barlow (1962) recorded an average nest height of 2.25 feet for 36 nests found in Kansas.

Spiza americana.—Twenty-nine Dickcissel nests were found during 1956, 1960, and 1961. Table 1 shows that a difference exists in the incidence of parasitism found in 1956 by Ely (8.5%) and in 1960–61 by me (33.3%). Nineteen of 61 nests (31%) found by Overmire (1962*b*) in northern Oklahoma were parasitized, while Hergenrader (1962) reported an incidence of 52.9 per cent in 17 nests found in Nebraska. During 1960–61, 11 nests were found in willow saplings, three in greenbriar (*Smilax* sp.) clumps, and one in bunch grass (*Andropogon* sp.). These nests were usually near the center of the sapling or clump, but were exposed and well lighted. The nests were from 1 to 6 (average, 3.3) feet from the ground.

Richmondena cardinalis.—Sixteen Cardinal nests were found during my survey and that of Ely. Only one of the 12 nests found by Ely (9.1%) was parasitized, while all four of the nests I found held cowbird eggs. Berger (1951) found 10 of 22 nests (45.4%)

parasitized in Michigan. Three of eight nests (37.5%) observed by Norris (1947) in Pennsylvania were parasitized. The four nests found during the present study were in juniper (*Juniperus virginiana*), persimmon, winged elm (*Ulmus alata*), and a greenbriar tangle about a sapling willow. They were from 3.5 to 4 feet (average, 3.7 feet) above the ground.

Chondestes grammacus.—During 1956, 1960, and 1961, 21 Lark Sparrow nests were found, four (19.0%) of them parasitized. Table 1 indicates the difference in incidence which existed between Ely's study and my own. During the present study nests were found in persimmon, post oak (*Quercus stellata*), juniper, and winged elm, from 4 to 10 feet (average, 5.5 feet) above the ground.

Icterus spurius.—Of the 16 Orchard Oriole nests found during 1956, 1960, and 1961, nine (56.3%) were parasitized. As before, Table 1 indicates that a difference existed in incidence of parasitism between Ely's study and my own. The population of orioles was apparently larger in 1956 than in 1960 and 1961, this factor perhaps influencing parasitism incidence. Two of the nests found during my study were in willow saplings, one in a cottonwood tree; all were in exposed situations. These nests were from 8 to 11 (average, 9.0) feet up.

Guiraca caerulea.—During Ely's study and in 1960 and 1961, 13 Blue Grosbeak nests were found in the area, eight (61.5%) of them parasitized. In the present study four nests were found in willow saplings, one in a persimmon. They were from 6 to 10 feet (average, 7.6 feet) from the ground.

Passerina ciris.—Five of seven Painted Bunting nests (71.4%) found during 1956, 1960, and 1961 were parasitized. Parmelee (1959) found 13 of 45 nests (28.9%) parasitized in the same area during the summer of 1957, despite the fact that he attempted to remove cowbirds from the area by collecting. Both of the nests found during the present study were in winged elm saplings, 4 and 5.5 feet (average, 4.7 feet) from the ground.

Spizella pusilla.—Four of five Field Sparrow nests (80.0%) found during Ely's survey and my own were parasitized. Berger (1951) reported six of 33 nests found (18.1%) to be parasitized in Michigan, while Norris (1947) noted parasitism at nine of 57 nests (15.8%) in Pennsylvania. The one nest found during the present study was 4 feet up in a winged elm sapling in a clearing in a post oak woods a short distance from the main study area.

Agelaius phoeniceus.—Friedmann (1929) regards the Red-winged Blackbird as "a fairly common but rather local victim" of the cowbird. The species appears to be only rarely parasitized in southern Oklahoma. Two of 106 nests found during the present survey and that of Ely contained cowbird eggs. Berger (1951) examined 99 nests in Michigan, five of which (5.0%) were parasitized, and Terrill (1961) found only two of "many hundreds" of nests examined in southern Quebec to hold cowbird eggs. Hergenrader (1962), on the other hand, noted a high incidence of parasitism (54.2%) among 59 nests found in Nebraska. Nests found during the present study were invariably in willow saplings over water.

Sayornis phoebe.—No Eastern Phoebe nests were found during the present study, but Ely found one of two nests (50%) parasitized in 1956. Friedmann (1929) lists the phoebe as one of the "very commonest" victims of the cowbird.

The data in Table 1 show that the degree of parasitism for several host species found by Ely in 1956 is different from that of the present study. These differences may be due to changes in population size of cowbirds and host species between 1956 and 1960–61. These changes in turn apparently are due

to a shift in the comparative abundance of habitat types during this period. For some years prior to 1956 the entire area was dry, with tall persimmons or willows widely scattered through the grasslands bordering the lake, and little low brushy edge growth. In 1957, the drought was broken by heavy rains. The increase in moisture during the following summers initiated the growth of a number of sapling willows and persimmons, and, in some areas, clumps of buttonbush, thus increasing considerably the amount of low exposed brushy vegetation.

It is interesting to note that for a particular host species there appear to exist regional differences in the incidence of cowbird parasitism, or in the importance of that species as a host. This is especially apparent in the Red-winged Blackbird and Dickcissel. The cowbird's range includes a number of avian communities, each with a particular species composition. It would seem that such regional differences in incidence of parasitism of a species might to some extent depend upon the position of the species in a particular regional community with respect to the abundance of other possible host species in the community.

Another factor possibly correlated with the incidence of parasitism is the breeding ecology of the cowbird. The cowbird appears to have originally been a bird of open short-grass plains (as indicated by its present centers of abundance), and Friedmann (1929) attributes its spread during the past century to deforestation and colonization of areas which before were virgin forests. Berger (1951) has noted that parasitized nests of field-nesting species in Michigan were in open areas bordered by a woodlot or thicket, while non-parasitized nests were not near such vegetation. Parasitized nests found during the present study were usually on the edges of low brushy thickets bordered by fairly open expanses of mixed grasslands, while nests found in such open grasslands were, as a rule, not parasitized.

Parasitized nests did not differ appreciably from nonparasitized nests with respect to substrate or nest height. Parasitized nests were found in willow saplings (12), persimmons (6), greenbriar clumps (3), winged elm saplings (3), buttonbush clumps (3), junipers (2), cottonwood saplings (1), and post oak (1). Nonparasitized nests were found in willow saplings (11), persimmons (5), tangles of pepper-vine (*Ampelopsis arborea*) (2), greenbriar clumps (1), and winged elm saplings (1). Parasitized nests were from 2 to 11 feet (average, 4.4 feet) above the ground; nonparasitized nests were found from 1 to 10 feet (average, 4.0 feet) up.

Friedmann (1929) has concluded that it is characteristic for a cowbird to lay one egg in a nest, and Mayfield (1960) has suggested that after the first cowbird egg is deposited in a nest the distribution of additional eggs in these nests is completely random. In six of the 31 parasitized nests found during

TABLE 2

SUCCESS OF PARASITIZED AND NONPARASITIZED NESTS, 1956,[1] 1960, 1961

Species	Parasitized nests				Nonparasitized nests	
	Cowbird eggs	Cowbirds fledged	Host eggs	Host fledged	Host eggs	Host fledged
Bell's Vireo	15	3 (20.0%)	28	2 (7.1%)	18	4 (22.2%)
	15	1 (6.7%)	25	3 (12.0%)	8	0 ——
Dickcissel	5	0 ——	10	0 ——	34	17 (50.0%)
	1	0 ——	3	0 ——	43	24 (55.8%)
Cardinal	4	1 (25.0%)	14	4 (28.6%)	—	— ——
	2	0 ——	2	1 (50.0%)	23	12 (52.2%)
Lark Sparrow	4	0 ——	4	0 ——	3	2 (66.6%)
	1	1 (100%)	2	0 ——	60	19 (31.7%)
Orchard Oriole	4	4 (100%)	11	7 (63.6%)	—	— ——
	9	4 (44.4%)	20	11 (55.0%)	13	9 (69.2%)
Blue Grosbeak	2	0 ——	2	0 ——	11	0 ——
	13	4 (30.8%)	13	4 (30.8%)	4	4 (100%)
Painted Bunting	1	1 (100%)	2	1 (50.0%)	3	2 (66.6%)
	5	0 ——	3	1 (33.3%)	4	0 ——
Field Sparrow	2	0 ——	2	0 ——	—	— ——
	4	1 (25.0%)	3	0 ——	3	1 (33.3%)
TOTAL	37	9 (24.3%)	73	14 (19.2%)	69	25 (36.2%)
	50	11 (22.0%)	71	20 (28.3%)	158	69 (43.6%)

[1] Second line of data is from Ely (1957).

the study, two cowbird eggs were laid; the other 25 nests held one cowbird egg each. Four of these six nests were deserted during incubation. Norris (1947) noted that nests in which more than one cowbird egg were laid were usually deserted, but Berger (1951) listed several nests which contained as many as four cowbird eggs and were not deserted.

NESTING SUCCESS

Another important aspect of cowbird parasitism is its effects upon the reproductive success of the host species. While parasitism may reduce the success of a host species in an area, the nesting success of the cowbird itself may be wholly dependent upon that of the host. Barlow (1962) attributed the failure of 12 of 35 Bell's Vireo nests he found to cowbird parasitism, and further noted that the percentage of cowbird eggs hatched in relation to the number laid in these nests was relatively low. Table 2 analyzes the success of parasitized and nonparasitized nests of eight host species. Again the data of Ely (1957) are included.

Parasitized nests were equally successful in fledging cowbird and host young (24.3% and 19.2%, respectively, in the present study), while fledging success was notably higher (36.2%) in nonparasitized nests of the same

species. Berger (1951) listed a fledging success of 21.9 per cent for 204 cowbird eggs laid in nests of 19 species in Michigan. In Pennsylvania, Norris (1947) found a fledging success of 26.8 per cent for 108 cowbird eggs laid in nests of 14 species.

Sample sizes are generally too small to make statements concerning specific host efficiency, but it can be noted that the Bell's Vireo, one of the major hosts in the study area, was not a particularly efficient or successful host, and that Dickcissels were totally unsuccessful in fledging either their own or cowbird young from parasitized nests. Overmire (1962*b*) noted that none of the cowbird eggs laid in 19 Dickcissel nests he found in northern Oklahoma hatched.

Thirty-one parasitized nests were observed during the study. Of these, seven were successful in fledging young, nine were deserted during incubation, nine were destroyed by predators, two were failures due to poor nest construction, and three were unsuccessful for unknown causes. Of the 20 nonparasitized nests observed, six were successful, four were deserted, seven were destroyed by predators, one was a failure due to poor construction, and two were unsuccessful for unknown causes.

LAYING PERIOD

The reproductive success of a host species is to a considerable extent dependent upon the laying period of the cowbird. Obviously, a species which begins nesting only after cowbird egg-laying has ceased will be relatively free of parasitism. Such is the case of the American Goldfinch (*Spinus tristis*) in Michigan, which normally begins nesting in mid-July, after the majority of cowbird activity has ceased (Sutton, 1959). Only when the cowbird lays late or the goldfinch nests early is the species victimized.

The laying period of the cowbird usually extends from about mid-April to early or mid-July. Norris (1947) gave 12 July as the latest egg-laying date over a two-year period in Pennsylvania, while Berger (1951) listed 26 July as the latest date of egg-laying over a four-year period in southern Michigan. Hann (1937) gave 6 July as the latest date for egg-laying in nests of the Ovenbird (*Seiurus aurocapillus*) during a three-year period in Michigan, and Sutton (1959) listed 21 July as the latest date for egg-laying in goldfinch nests in Michigan. The latest date for egg-laying I recorded was 29 or 30 July, in a Bell's Vireo nest.

I knew to the exact one- or two-day period the laying dates of 13 cowbird eggs, and, using the incubation period of 11.6 days obtained by Norris (1947) for the cowbird in Pennsylvania, I was able to estimate the date of laying of 15 additional eggs. Data for these 28 eggs are presented in Fig. 1.

The distribution of these egg-laying dates indicates that two peaks in egg production existed during June and July. Between these peaks there appeared

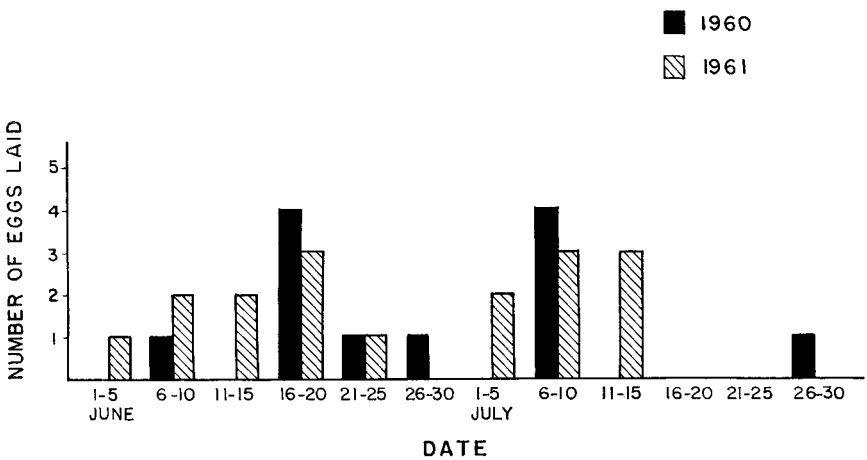

FIG. 1. Chronology of cowbird egg-laying, 1960, 1961.

to be a marked slump in egg production. The data show a similar distribution for 1960 and for 1961.

The laying dates for 97 eggs of the eight host species listed in Table 2 were determined, and are shown with the laying dates for the 28 cowbird eggs in Fig. 2. Observations for 1960 and 1961 are totaled.

Apparently, host egg production gradually decreased at an even rate from early June on, showing no peaks or marked slumps. Thus the pattern in cow-

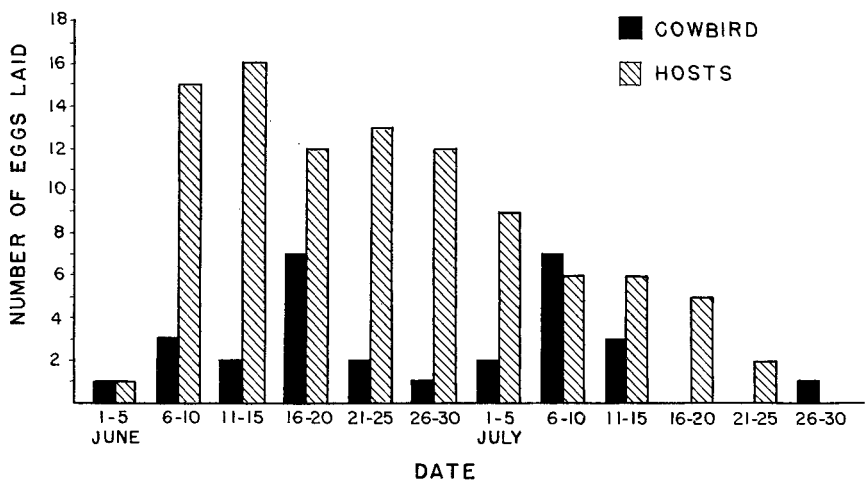

FIG. 2. Cowbird egg-laying in relation to egg-laying of eight host species, 1960–61.

bird egg-laying does not appear to be dependent upon host availability, and shows no correlation with host activity. Sample sizes are too small to permit speculation regarding the causes of such peaks in cowbird egg-laying, but apparently they are not due to random fluctuations in the data.

Cowbird eggs are usually laid during the laying period of the host. Hann (1937), in studying the relationship between the cowbird and Ovenbird, noted that "extreme cases of laying . . . were three days before the first Oven-bird's egg was laid, and three days after incubation began." Berger (1951), Norris (1947), and Mayfield (1960) have observed instances of cowbird activity well after host incubation had begun. I found cowbird-host laying periods to be coincident in most cases, but in one instance a cowbird egg was apparently laid in a Bell's Vireo nest which had been partially destroyed by a predator, and in another an egg was deposited (on 29–30 July) in a Bell's Vireo nest containing a well-developed cowbird chick. Mayfield (1960) has noted that it is "a rare event" for a cowbird egg to be deposited in a nest containing young. Such instances have been recorded in nests of the Red-eyed Vireo (*Vireo olivaceus*) (Mumford, 1959), the Kirtland's Warbler (*Dendroica kirtlandii*) (Leopold, 1924), Indigo Bunting (*Passerina cyanea*) (Friedmann, 1929), Chipping Sparrow (*Spizella passerina*), and Field Sparrow (Berger, 1951).

SUMMARY

From 15 June to 6 August 1960, and from 8 June to 4 August 1961, Brown-headed Cowbird parasitism in the breeding bird population about the University of Oklahoma Biological Station, Marshall County, Oklahoma, was studied with respect to incidence, success of cowbirds and hosts, and the laying period of the cowbird.

Parasitism was noted at 31 of 84 nests (including 33 Red-winged Blackbird nests which were not parasitized). Six of these 31 nests contained two cowbird eggs; in each of the remaining 25 a single cowbird egg was laid. Nests of the Bell's Vireo, Dickcissel, Cardinal, Lark Sparrow, Orchard Oriole, Blue Grosbeak, Painted Bunting, and Field Sparrow were parasitized. Parasitized nests of these species were usually in somewhat exposed situations on the edges of bottomland thickets, bordering open mixed grasslands. Nests found in more open areas without edge growth were generally not parasitized. Parasitized nests did not differ appreciably from nonparasitized nests with respect to height from ground or substrate.

Seven of the 31 parasitized nests (22.6%) and six of the 20 nonparasitized nests of the same species (30.0%) were successful. Thirty-seven cowbird eggs and 73 host eggs laid in parasitized nests produced nine (24.3%) and 14 (19.2%) young, respectively. Twenty-five young (36.2%) fledged from 69 eggs laid in nonparasitized nests of the same species.

The laying dates of 28 cowbird eggs and 97 host eggs were determined. The distribution of these dates indicates that two peaks existed in egg production in the cowbird, one in mid-June, the other in early July, while host egg production gradually decreased from early June on. The pattern of cowbird egg production was thus independent of host availability. Cowbird egg-laying declined after mid-July, the last egg being laid on 29 or 30 July. Cowbird-host laying periods were generally coincident, but one cowbird egg was

apparently laid in a partially destroyed nest, and another was laid in a nest containing a well-developed cowbird chick.

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NEW LIFE MEMBER

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