

COWBIRD PARASITISM OF THE NORTHERN YELLOW-THROAT

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DURING the summers of 1948 through 1951 I made an intensive study of the life history of the Yellow-throat (*Geothlypis trichas*). The summers of 1948 and 1949 were spent in studying a population near Ann Arbor, Michigan, and the study was continued in 1950 and 1951 at Duluth, Minnesota. An important part of the study was the relationship between the Yellow-throat and the Cowbird (*Molothrus ater*).

Amount and Type of Injury to the Host.—Twenty nests, or about 38 per cent of the Yellow-throat nests found in the four-year study, were parasitized by the Cowbird, and only three of these nests produced any Yellow-throat young. Almost 58 per cent of the total egg loss of the Yellow-throats studied could be attributed to the Cowbird. Thirty-three per cent of this egg loss was due to the removal of host eggs, 20 per cent to punctured eggs, 13 per cent to nest desertions caused by Cowbird activity, and 33 per cent to the loss of heat to the larger Cowbird eggs. This information is summarized for each year in Table 1.

TABLE 1
INJURY TO THE YELLOW-THROAT BY COWBIRD PARASITISM

	1948	1949	1950	1951
Total number of Yellow-throat nests found	18	20	8	6
Number of Yellow-throat nests parasitized	7	11	1	1
Yellow-throat eggs known laid	59	50	30	13
Egg loss	18	18	10	6
Egg removal attributed to Cowbird	2	8	0	0
Punctured eggs attributed to Cowbird	3	1	2	0
Eggs lost through nest desertion caused by Cowbird activity	3	1	0	0
Eggs abortive, loss attributed to loss of heat to Cowbird eggs	3	6	0	1
Total egg loss attributed to Cowbird	11	16	2	1
Percentage of egg loss attributed to Cowbird	61.1	88.8	20.0	16.6

I was never fortunate enough to see the removal of an egg by a Cowbird. I have assumed, therefore, on the basis of the laying of Cowbird eggs after or before the host eggs disappeared and the well-authenticated proof that Cowbirds do remove host eggs established by Hann (1937: 204, 1941: 211–221), that the ten host eggs and three

Cowbird eggs that disappeared from nine nests were removed by the parasite. There were other instances where, undoubtedly, host eggs were removed which do not enter into these figures. For instance, one nest, when found, contained two Cowbird eggs and two Cowbird young, but no host eggs or young. Undoubtedly, Yellow-throat eggs were removed, but just how many is questionable. Considering both host and parasite eggs, the number of eggs removed from the nest was equal to 81 per cent of the total Cowbird eggs laid. This compares to Hann's (1937: 204) findings of 85 per cent in his Oven-bird study.

Some of the host eggs left in the nest showed tiny punctures in the shell of a type and shape apparently caused by the claws of the Cowbird. There has been some disagreement as to whether punctures of this type are accidental or deliberate, and whether they are caused by the nails or the mandibles (Norris, 1947: 88). The size and the shape of the punctures I found in Yellow-throat eggs fitted the claws better than they did the mandibles, and I feel, as did Friedmann (1929: 186), that such punctures are caused by the claws of the Cowbird when the clumsy female tries to place herself on a nest too small for her. I found seven of these punctured eggs during the investigation, and none of them hatched.

Four nest desertions were attributed to Cowbird activity at the nest. Two nests were undoubtedly deserted because the contents of an egg leaked out on the other eggs through the punctures caused by the Cowbird. At another nest the Cowbird laid eggs before the Yellow-throat eggs were laid, and at a fourth nest it seemed likely that the removal of several eggs may have caused desertion.

There was a direct relationship between the hatching success and the number of Cowbird eggs laid in the nest. No more than two Cowbird eggs, or one Cowbird egg and two Yellow-throat eggs hatched in any nest; and if more than one Cowbird egg was present, no Yellow-throat eggs hatched. This relationship held true for all parasitized Yellow-throat nests under observation, and apparently, as indicated by the number and kinds of young, it was true also in broods out of the nest for which nests were never found. Roughly, the heat of incubation each Cowbird egg received was enough to prevent the hatching of two Yellow-throat eggs.

Hann (1947: 174) estimated that the probable limit of egg volume that an Oven-bird can hatch successfully was between 1.3 and 1.8 times the volume of the normal five-egg clutch, and that it was probably nearer 1.3 than 1.8. The normal Yellow-throat clutch is four (Hofslund, 1953: 69), and although five-egg clutches are not un-

common, frequently only four of the five eggs will hatch. Using Schönwetter's formula (Nice, 1937: 113) and average measurements for the Yellow-throat and Cowbird eggs examined during the study, I calculated the average volume of a Yellow-throat egg to be near 1.7 cc. and that of a Cowbird egg to be near 3.1 cc. The volume of a normal four-egg clutch would thus be approximately 6.8 cc.; of two Cowbird eggs 6.2 cc., or almost the same volume as the four-egg Yellow-throat clutch. The replacing of two Yellow-throat eggs by two Cowbird eggs would bring the total volume to 9.6 cc., or 1.4 times the normal egg volume. While these figures are calculated and have not been tested in the field, the number of Yellow-throat-Cowbird broods I have observed which had the relationship previously mentioned seems to indicate that 1.3 times the normal clutch volumes closely represents the limit of egg-volume that a Yellow-throat will normally hatch, and ordinarily one can say that a nest with more than one Cowbird egg in it is doomed to failure as far as the Yellow-throat eggs are concerned.

Shaver (1918: 10) blamed the failure of a Yellow-throat egg to hatch on a Cowbird egg-shell that had slipped over it and adhered there. Hann (1937: 204) found that this type of accident had no effect on the hatching of the Oven-bird egg. My findings bear out Hann's conclusion. I observed three instances of the half-shell of a hatched Cowbird egg slipping over the smaller Yellow-throat egg. In one case the shell was removed by the adult Yellow-throat and the egg hatched. In the second instance I removed the shell, but despite what I considered as help, the egg failed to hatch. In the third instance the shell remained and the egg failed to hatch. The evidence seemed to indicate that the Cowbird egg-shell did prevent the hatching of the latter two eggs, but when the contents of these two eggs were examined they were found to contain embryos that had not progressed beyond the 4 to 5 mm. stage, indicating death of the embryo long before the adherence of the Cowbird half-shell. Shaver made no mention of the Yellow-throat egg being pipped, and as the contents of the egg were not examined, the embryo may have been dead before the shell adhered to it.

In the Ann Arbor region, Yellow-throats normally raised two broods a season. If an attempt was unsuccessful they tried again. These attempts continued until at least one was successful, or presumably, physiological changes prevented further effort. One pair of Yellow-throats in the study made at least three and perhaps four attempts before they were finally successful in raising a brood, which in this case consisted of two Cowbirds. Theoretically, a pair of

Yellow-throats should raise from seven to ten young a season. The raising of Cowbirds only, however, satisfies the physiological urge to raise young. Thus if the first attempt at raising a brood produces nothing but Cowbirds, one Yellow-throat brood is lost, and only one more attempt will be made. If this also should produce only Cowbirds, it is still a successful attempt as far as the parents are concerned, and no further effort will be made. Therefore, Cowbird interference under these conditions has caused the loss of from seven to ten Yellow-throats. In areas such as Duluth where only one brood is normally raised, it is conceivable that a heavy Cowbird year could cause serious inroads on the population.

The above instances are all concerned with egg loss. I found no loss of nestlings that could be attributed to the Cowbird with the possible exception that Cowbird nestlings seem to be more noisy than Yellow-throat nestlings, and there is the possibility that predators might be attracted more to nests containing Cowbirds than to those that have Yellow-throat nestlings alone.

The Cowbird may hatch from one-half to one day earlier than the Yellow-throat, and usually they remain in the nest from one-half to one day after the Yellow-throats leave, thus exposing the parent birds over a longer period to the attendant dangers of the nesting cycle.

There were no losses of young Yellow-throats during the four years of study from suffocation or starvation, and Yellow-throats in parasitized nests developed at about the same rate as did those in unparasitized nests.

The Cowbird is an important check on the Yellow-throat population, but it does not seem to be a critical factor, as witness the fact that although the incidence of parasitism was relatively high, the reproductive success of the Yellow-throats during the four-year study was slightly better than 51.9 per cent. One important factor here was that only rarely were cases of parasitism found that occurred after the first part of July. Second and third attempts were generally free of Cowbird parasitism. In Duluth, where only one brood was raised, the breeding season of the Yellow-throat normally is enough later than the Cowbird's that the relative frequency of parasitism usually is quite low.

Success of the Cowbird in Yellow-throat Nests.—At least 75 per cent of the parasitized nests contained more than one Cowbird egg (Table 2), the most common number in a single nest being two, and with an average of 2.0 per parasitized nest, a figure comparable to the 1.8 average found by Stewart (1953: 113) in his Yellow-throat study.

This is apparently a high percentage when compared to other passerine victims. Friedmann (1929: 178) found that only 33 per cent of over 9000 passerine nests had more than one Cowbird egg; Nice (1937: 156), 30 per cent of 98 Song Sparrow nests; Norris (1947: 89), 38 per cent of 73 passerine nests; Hann (1937: 202), 55 per cent of 22 parasitized Oven-bird nests; and Berger (1951: 33), 52 per cent of 112 passerine nests.

TABLE 2
DISTRIBUTION OF COWBIRD AND YELLOW-THROAT EGGS IN
PARASITIZED YELLOW-THROAT NESTS

Number of eggs	<i>First nesting</i>					<i>Subsequent nestings</i>				
	<i>Number of nests</i>					<i>Number of nests</i>				
<i>Yellow- throat bird</i>	1948	1949	1950	1951	Total	1948	1949	1950	1951	Total
5	3						1			1
4	2	1			1					
3	2	1	1		2		1			1
3	1	1			1					
2	3		1		1					
2	2	2		1	3		2			2
2	1		2		2	1				1
1	2				1	1	1			2
0	2		1		1					
0	4						1			1
Average number of Cowbird eggs per nest:										
	1.8	1.8	2.0	2.0	1.8	1.5	2.5			2.2
Average number of Cowbird eggs laid in the 20 parasitized nests:										2.0

The Cowbird received as good care and solicitude as the Yellow-throat nestlings. The Cowbird hatched after an average of 11.6 days of incubation, a figure similar to that found by Hann (1937: 204) and Norris (1947: 95), and the young did not leave the nest normally until the ninth day after hatching. They required roughly a week less care before reaching independence than did the Yellow-throats. Their enemies must be considered the same as the host, and that must include the adult Cowbird, too. Parasite eggs as well as host eggs were removed, and sometimes the physiological urge to lay eggs produced rather strange and, for the Cowbird, unfortunate results. One Cowbird female laid an egg in a depression left after I removed a deserted Yellow-throat nest. Another laid in a nest that already had eggs incubated for 11 days, and still another laid in a nest that had been deserted for two weeks.

TABLE 3
SUCCESS AND MORTALITY OF COWBIRDS PARASITIZING YELLOW-THROAT NESTS

	1948	1949	1950	1951
Yellow-throat nests parasitized	7	11	1	1
Per cent of total nests parasitized	38.8	55.0	12.5	25.0
Cowbirds eggs laid in all nests	12	24	2	2
Cowbird eggs hatched	4	12	0	1
Per cent of Cowbird eggs laid that hatched	36.3	50.0	0.0	50.0
Cowbirds fledged	3	8	0	1
Per cent of eggs hatched producing fledglings	75.0	66.6	0.0	50.0
Loss of Cowbird eggs				
Number of eggs lost	7	12	2	1
Removed by Cowbirds	1	2	0	0
Predation	0	2	0	0
Infertile or abortive	1	5	0	1
Desertion	5	4	2	0
Loss of Cowbird nestlings				
Number of nestlings lost	1	4	0	0
Predation	1	4	0	0
Average number of Cowbird eggs per parasitized nest	1.07	2.18	2.0	2.0
Average number of fledglings per parasitized nest	0.42	0.72	0.0	1.0

When we compare the success of the Cowbird eggs with that of the host's, we find that the per cent of Cowbird eggs hatched was less than that of the Yellow-throat, 42.5 per cent as compared to 65.8 per cent. Nice (1937: 163) had a ratio of 63.7 per cent Cowbird eggs hatching to 60.7 per cent Song Sparrow eggs. Only nine of the 20 parasitized nests produced Cowbird fledglings (Table 3) an average of 1.3 Cowbirds per successful nest, but only 0.6 per cent Cowbirds per parasitized nest. The Yellow-throat, therefore, can be considered as only a fairly favorable host.

SUMMARY

The Cowbird, a frequent parasite of the Yellow-throat, is moderately successful with this host. It acts as an important check on the Yellow-throat population, with most of the damage it does to the host coming during the egg stage of the nesting cycle, when it may cause loss of host eggs through deliberate removal, accidental punctures, causing of nest desertion, and loss of the heat of incubation, that normally would go to the host egg, to the parasite eggs.

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