BREEDING SUCCESS OF THE COWBIRD

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THE Brown-headed Cowbird (*Molothrus ater*) has always been of special interest as our only obligate nest parasite. Since Friedmann's (1929) monograph, there have been many published notes on new species victimized, and papers on the breeding activities of other species frequently comment on the effect of cowbird parasitism. However, the success of the parasite itself has usually received only incidental attention in these reports.

Studying the reproductive activity of such a species, which builds no nest, obviously presents special problems. Under unusual circumstances it may be possible to trace the activities of an individual female, if the egg markings are distinctive, as was done by Walkinshaw (1949). But ordinarily this cannot be done with any degree of accuracy.

To investigate breeding success in the cowbird, the only feasible approach is to record all eggs laid, then carefully keep track of them, and note the number of eggs which produce fledglings.

Considerable data of this sort are imbedded in various papers, so that an attempt to estimate the cowbird breeding success seems reasonable at this time. The material that follows contains data gleaned from these different papers, plus information I gathered during field studies in Wisconsin. The field studies during 1959 and 1960 were supported by NSF Grant G–7446.

It is evident that the cowbird breeding success varies widely with the species parasitized. The Robin, for example, almost never accepts the cowbird egg, and the same applies to the Catbird. In these cases the striking contrast of the mottled cowbird eggs against the blue of the hosts' eggs is probably the cause of the rejection. The Cedar Waxwing also appears to be unsatisfactory as a foster parent. I have found single nestling cowbirds in three different waxwing nests. In each case the parasite died in the nest, while the waxwing young fledged. The color of the mouth of the young waxwing is distinctive, and it may be that the gaping of the young cowbirds was not a proper stimulus, so that they were not adequately fed. I find no records of cowbirds fledging successfully from waxwing nests.

Because none of these three species is parasitized to any significant extent, this low success has no great effect on cowbird breeding. This suggests the possibility that the cowbird is adapted to parasitize most frequently those birds which are most likely to rear cowbird young successfully—a point which will be considered in more detail later.

In general, however, the breeding efficiency of the cowbird appears to be quite low. Norris (1947) presented information on 74 parasitized nests of

15 different species. One hundred and eight cowbird eggs laid in these nests resulted in only 29 cowbird fledglings. In other words the breeding success was 27 per cent.

Berger (1951) reported on 112 parasitized nests of 20 different species. In these cases, 204 cowbird eggs produced 43 fledglings, a breeding success of only 22 per cent.

When data are gathered for a number of different specific hosts (Table 1), a range of success in cowbird breeding is found. For most of these hosts the data are inadequate, but for three different hosts there are data on 75 or more cowbird eggs. Of these, the Red-eyed Vireo (23 per cent of 121 cowbird eggs produced fledglings) and the Song Sparrow (30 per cent of 223 cowbird eggs produced fledglings) show results comparable to those cited immediately above. The Yellow Warbler (only 8 per cent of 75 cowbird eggs produced fledglings) seems not to be a particularly desirable host, even though it is frequently parasitized (40 per cent of 126 nests).

For certain of the other species, some information can be gained by grouping data. Among the warblers, 23 per cent of 251 cowbird eggs, and among the fringillids, 27 per cent of 361 cowbird eggs produced fledglings.

It will be noted that fledging success is considerably in excess of hatching success, and this pattern is repeated in the majority of the host species. The reason is apparent; there are certain hazards faced by both eggs and nestlings: predation, weather, death of the female, etc. But in addition there are dangers particularly faced by the cowbird egg, but not by the young. Many birds will desert when a strange egg appears, some will remove it, some will bury it. In addition, a significant number of cowbird eggs are laid in nonactive nests, where desertion has occurred, or even in nests where the young have already fledged.

Considering the 36 host species listed in Table 1, the over-all success of the cowbird was 25 per cent (218 fledglings from 879 eggs). However, to get a precise figure, one would have to know what proportion of cowbird eggs are laid in the nests of each parasitized species, which have varying suitability as hosts.

Such exact figures are unavailable. However, the success of cowbird breeding efforts will be determined mainly by those eggs laid in the nests of abundant species which are commonly parasitized. These will constitute the bulk of its reproductive attempts.

Table 1 shows five common species with at least 40 per cent parasitism, for which information is available on at least 50 cowbird eggs. These are: Red-eyed Vireo, Ovenbird, Yellow Warbler, Yellowthroat, and Song Sparrow. Totalled, the data on these species again give a cowbird success of 25 per cent (134 young fledged from 543 eggs).

TABLE 1

COWBIRD BREEDING SUCCESS

Host species	Total nests	Parasitized		Total cowbird eggs	Avg. per parasitized nest	Eggs hatched		Young fledged		% eggs producing fledglings	References
		No.	%			No.	%	No.	%		
Eastern Phoebe (*Sayornis phoebe*)	15	5	33	8	1.6	5	63	5	100	63	Berger (1951)
Acadian Flycatcher (*Empidonax virescens*)	68	17	25	19	1.1	7	37	7	100	37	Brandt (1947); Walkinshaw (1961)
Traill's Flycatcher (*E. traillii*)	115	12	10	16	1.3	8	50	5	63	31	Batts (1958); Berger (1951); Walkinshaw (1961); Young
Least Flycatcher (*E. minimus*)	37	3	8	3	1.0	2	67	2	100	67	Terrill (1961); Walkinshaw (1961)
Catbird (*Dumetella carolinensis*)	3,349	11	0.3	13	1.2	1	8	1	100	8	Berger (1951); Nickell (1958); Norris (1947); Terrill (1961); Young
Brown Thrasher (*Toxostoma rufum*)	19	1	5	2	2.0	0	0	0	0	0	Norris (1947); Young
Robin (*Turdus migratorius*)	200	2	1	2	1.0	0	0	0	0	0	Batts (1958); Young
Wood Thrush (*Hylocichla mustelina*)	18	3	17	4	1.3	1	25	1	100	25	Berger (1951); Norris (1947)
Veery (*Hylocichla fuscescens*)	11	7	64	8	1.1	8	100	4	50	50	Norris (1947)
Cedar Waxwing (*Bombycilla cedrorum*)	93	7	8	7	1.0	3	43	0	0	0	Lea (1942); Putnam (1949); Young
Bell's Vireo (*Vireo bellii*)	6	5	83	9	1.8	0	0	0	0	0	Mumford (1952)
Red-eyed Vireo (*Vireo olivaceus*)	131	67	51	121	1.8	43	36	28	65	23	Batts (1958); Lawrence (1953); Norris (1947); Southern (1958)
Yellow Warbler (*Dendroica petechia*)	126	51	40	75	1.5	8	11	6	75	8	Batts (1958); Berger (1951); Schrantz (1943); Young

TABLE 1. CONTINUED

Host species	Total nests	Parasitized		Total cowbird eggs	Avg. per parasitized nest	Eggs hatched		Young fledged		% eggs producing fledglings	References
		No.	%			No.	%	No.	%		
Black-throated Blue Warbler (*D. caerulescens*)	7	3	43	3	1.5*	1	33	0	0	0	Terrill (1961)
Black-throated Green Warbler (*D. virens*)	1	1	100	1	1.0	0	0	0	0	0	Pitelka (1940)
Chestnut-sided Warbler (*D. pensylvanica*)	2	1	50	3	3.0	0	0	0	0	0	Norris (1947)
Prairie Warbler (*D. discolor*)	17	4	24	4	1.0	1	25	1	100	25	Walkinshaw (1959)
Ovenbird (*Seiurus aurocapillus*)	51	30	59	57	1.9	29	51	13	45	23	Berger (1951); Hann (1937); Norris (1947)
Louisiana Water-thrush (*S. motacilla*)	15	8	53	17	2.1*	?	?	12	?	71	Eaton (1958)
Yellowthroat (*Geothlypis trichas*)	88	37	43	67	1.8	?	?	19	?	28	Batts (1958); Berger (1951); Hofslund (1957); Norris (1947); Stewart (1953); Young
Yellow-breasted Chat (*Icteria virens*)	14	11	79	22	2.0	7	32	6	86	27	Berger (1951); Nickell (1955)
American Redstart (*Setophaga ruticilla*)	18	1	6	2	2.0	0	0	0	0	0	Sturm (1945)
Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*)	120	1	0.8	1	1.0	1	100	1	100	100	Young
Red-winged Blackbird (*Agelaius phoeniceus*)	2,021	45	2	48	1.1	12	25	5	42	10	Batts (1958); Berger (1951); Nickell (1955); Wood (1938); Young
Common Grackle (*Quiscalus quiscula versicolor*)	82	1	1	1	1.0	0	0	0	0	0	Petersen and Young (1950); Young
Scarlet Tanager (*Piranga olivacea*)	4	4	100	5	1.3	2	40	2	100	40	Norris (1947)
Cardinal (*Richmondena cardinalis*)	38	15	39	25	1.7	6	24	6	100	24	Berger (1951); Laskey (1950); Norris (1947); Young

TABLE 1. CONTINUED

Host species	Total nests	Parasitized		Total cowbird eggs	Avg. per parasitized nest	Eggs hatched		Young fledged		% eggs producing fledglings	References
		No.	%			No.	%	No.	%		
Rose-breasted Grosbeak (*Pheucticus ludovicianus*)	3	2	60	2	1.0	0	0	0	0	0	Berger (1951); Young
Indigo Bunting (*Passerina cyanea*)	26	12	46	17	1.4	6	35	6	100	24	Berger (1951); Phillips (1951); Norris (1947); Young
American Goldfinch (*Spinus tristis*)	326	3	0.9	4	2.0*	0	0	0	0	0	Berger (1951); Stokes (1950); Young
Rufous-sided Towhee (*Pipilo erythrophthalmus*)	42	21	50	36	1.7	16	48	12	75	36	Batts (1958); Berger (1951); Nice (1937); Norris (1947); Walkinshaw (1938)
Vesper Sparrow (*Pooecetes gramineus*)	13	3	23	3	1.0	3	100	1	33	33	Batts (1958); Berger (1951)
Chipping Sparrow (*Spizella passerina*)	91	10	11	12	1.2	2	17	2	100	17	Batts (1958); Berger (1951); Norris (1947); Walkinshaw (1944)
Clay-colored Sparrow (*S. pallida*)	19	8	42	14	1.8	0	0	0	0	0	Fox (1961); Walkinshaw (1939)
Field Sparrow (*S. pusilla*)	126	19	15	25	1.3	7	28	5	71	25	Batts (1958); Berger (1951); Norris (1947)
Song Sparrow (*Melospiza melodia*)	329	149	45	223	1.5	124	56	68	55	30	Batts (1958); Berger (1951); Nice (1937); Norris (1947); Young

* Information not available on all nests.

It was suggested earlier that the cowbird seldom parasitized those species which were not good hosts. This idea also can be examined by using data from Table 1. Here we find five species, Traill's Flycatcher, Catbird, Red-winged Blackbird, Field Sparrow, and Chipping Sparrow, where the incidence of parasitism does not exceed 15 per cent, and where at least 10 cowbird eggs are recorded. The number of eggs in this sample is small, but it is clear that data on cowbird eggs from lightly parasitized nests will accumulate very slowly, so it is appropriate to use the information at hand. In this group we find a cowbird success of 16 per cent (18 fledglings from 114 eggs). This shows a significant difference from the heavily parasitized hosts ($\chi^2 = 4.185$, $P < 0.05$), but more information would be desirable. As previously noted, the Yellow Warbler also appears to be a poor host, but is heavily parasitized.

The poorer success of the cowbird with the lightly parasitized group seems to be due almost entirely to differences in egg acceptance. Forty-three per cent (204/476) of the cowbird eggs hatched in the nests of heavily parasitized species, while only 26 per cent (30/114) hatched in the nests of the lightly parasitized hosts. The difference is highly significant ($\chi^2 = 10.516$, $P < 0.01$). The fledging success was similar in each group: 56 per cent (115 fledglings from 204 nestlings) in the nests of heavily parasitized species, and 60 per cent (18 fledglings from 30 nestlings) in the nests of those lightly parasitized. The difference here is of no statistical significance ($\chi^2 = 0.015$, $P > 0.90$).

While no general rule for cowbird reproductive success is advanced here, the information indicates that figures in the range of 20 to 30 per cent will often approach the over-all actual success. As with other species, of course, this will vary with the season, locality, and other factors.

Studies of other passerine species usually indicate a considerably better fledgling/egg ratio. For example, a sample of 548 Robin eggs (Young, 1955) showed 45 per cent of them producing fledglings. Nice (1937) found 36 per cent of Song Sparrow eggs producing fledglings, and a study of six species (Young, 1949) showed an over-all average of 40 per cent.

The unimpressive breeding efficiency of the cowbird is perhaps compensated for by increased egg production. This is typical of parasitic forms—witness the myriads of eggs produced by helminth endoparasites, scarcely any of which result in a new adult. Conceivably the cowbird is adapted in a similar fashion, but of course on a much milder scale.

Information on this point is scanty, but such as there is does not invalidate the idea. According to Friedmann (op. cit.), a caged cowbird laid 13 eggs in 14 days. And Walkinshaw (1949) estimated 25 eggs produced during one season by a single female. If this latter case is at all typical, and if 25 per cent approaches the actual fledging rate, we would have an average of about

six young produced per adult female per season. Data on the Robin (Young, 1955) indicate that the average female produces about 11.5 eggs per season, which result in about 5.6 fledglings. The figures on cowbird production, of course, are purely hypothetical, and show that much still needs to be learned about the life history of this species.

Although there is ample evidence to show that cowbird parasitism reduces the success of the host species (Nice, op. cit.; Norris, op. cit.; Hann, 1937; etc.), it must be remembered that these species have evolved with the problem, and over centuries they have demonstrated their ability to survive with the cowbird. While it is not a popular species, the cowbird is a natural part of our American avifauna, with a reproductive pattern distinctive among native species. Fewer cowbird eggs should be removed by well-meaning people, and more information should be gathered on their fate, so that eventually we may get a more detailed and accurate picture of its breeding biology.

SUMMARY

Data were gathered on the hatching and fledging success of 879 cowbird eggs from 580 nests of 36 host species. Fledging success was distinctly better than hatching success, reflecting the special perils faced by the cowbird eggs, and over-all reproductive success was 25 per cent (218 fledglings from 879 eggs). The fledging rate for eggs laid in the nests of heavily parasitized species was 25 per cent; for those laid in the nests of lightly parasitized nests it was 16 per cent. The difference appears to be due to varying degrees of egg acceptance. It is hypothesized that there are approximately six young produced per adult female cowbird per season.

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