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# GENERAL NOTES

**Nest selection by Brown-headed Cowbirds.**—Brown-headed Cowbirds (*Molothrus ater*) are brood parasites: their eggs are laid in the nests of other species. Norman and Robertson (Auk 92:610–611, 1975) describe behavior by which cowbirds have been observed to find nests. Activity of potential hosts about nests—when building, laying eggs, and incubating—can serve to attract some attention to the nest and to identify nesting stages to cowbirds. Additionally, female cowbirds may be successful in searching for nests without seeing host activity, though such potential has not been well documented.

Thompson and Gottfried (Wilson Bull. 88:673–675, 1976) experimentally tested the prerequisite of host activity at the nest for cowbird parasitism by setting out nests with 2 Japanese Quail (*Coturnix coturnix*) eggs followed by daily examination of nests for changes in contents. They made a total of 240 of these nestings over 12 weeks, and observed no cowbird activity. I similarly tested for the requirement of host activity and also examined variation in habitat, nests, and eggs in terms of possible cowbird preferences.

*Methods and materials.*—Egg shells were filled with agar and the hole sealed with paraffin. Length and width of these eggs were measured as well as spot size and density. Fig. 1 shows variation in appearance of eggs used in 1977. During 1978 egg shells of Barn Swallows (*Hirundo rustica*) were used for the most part. "Clutches" were composed of eggs similar in size and appearance. In some cases intact House Sparrow (*Passer domesticus*) eggs were used to compose clutches. These eggs were placed in nests, 1 per day, to produce clutches of 2, 3, or 4 eggs. Nests were checked daily thereafter for a total of 10 days. Damage to or disappearance of eggs was noted. This procedure similated the egg-laying and initial incubation period of birds.

Experimental nests were nests that had been used the previous year or earlier in the season, and were no longer active. The nests, showing varying degrees of weathering, were of open cup construction and included nests of the following species: American Robin (*Turdus migratorius*, 2 nests), Bell's Vireo (*Vireo bellii*, 1), Northern Oriole (*Icterus galbula*, 1), Red-winged Blackbird (*Agelaius phoenicus*, 4), Cardinal (*Cardinalis cardinalis*, 3), American Goldfinch (*Carduelis tristis*, 3), Field Sparrow (*Spizella pusilla*, 6), and 5 unidentified nests. Some were retained in the position where they were built; others were inserted into woody vegetation. Heights of these nests ranged from 0.4 to 2.6 m above ground.

Three series of experimental "egg-laying" were conducted. The 2 series in 1977 included 10 nests each: 1 began on 10 May 1977 and the other on 2 June 1977. The last series started 16 May 1978 and involved 13 nests. All nests were within a 9 ha area of second growth on the West Campus of the University of Kansas, in Douglas Co., Kansas.

Based on the mean values for each clutch, eggs could be described by 2 dimensions of variability determined by egg size and marking pattern. Egg size is approximate egg volume given by $V = 0.512\ LB^2$, where $L$ is egg length and $B$ is egg width (Stonehouse, Emu 65:227–228, 1966). Egg marking pattern was measured on a subjective scale, determined in part by spot size and density, that ordered eggs from light to dark in appearance. In addition to locating the experimental clutches on these axes, I did the same for 50 Kansas open-nesting passerine species. The species were selected from Zimmerman's (Kansas Ornithol. Soc. Bull. 20:13–16, 1969) report on the 1968 Breeding Bird Survey for Kansas. The suitability of these species as cowbird hosts was determined from information in several sources (Friedmann, U.S. Natl. Mus. Bull. 233, 1963; Auk

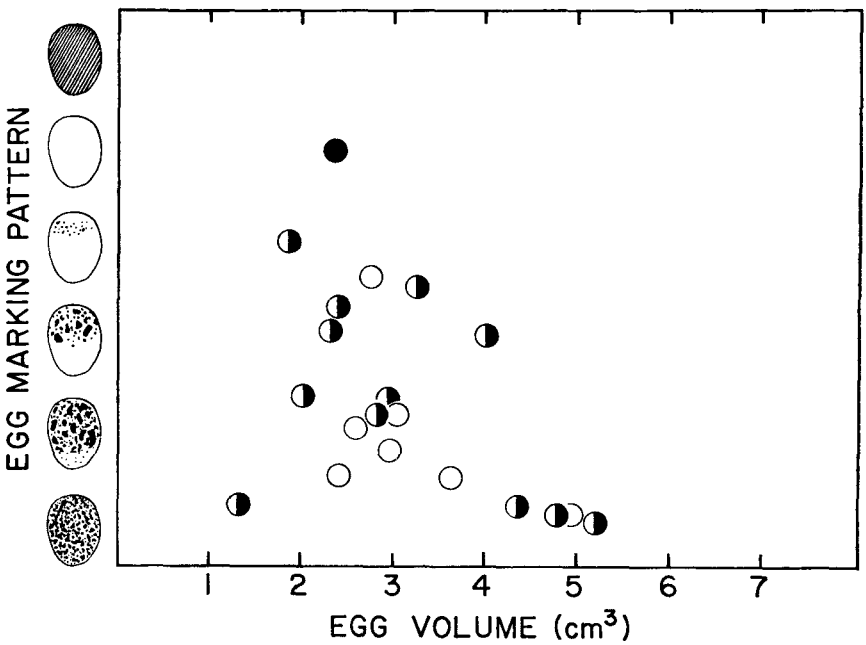


FIG. 1. The experimental clutches of 1977 located on axes of marking pattern (darkness) and size (volume). Solid circle—parasitized clutch; half-solid circle—clutches from which single eggs disappeared; open circles—others. Egg pattern examples are (from top): Gray Catbird (*Dumetella carolinensis*) (a blue egg); Eastern Phoebe (*Sayornis phoebe*); vireos; Yellow-breasted Chat (*Icteria virens*), or Orchard Oriole (*Icterus spurius*); Cardinal or House Sparrow; Brown Thrasher (*Toxostoma rufum*). The parasitized clutch in 1978 was lightly spotted and 1.9 $cm^3$.

88:239–255, 1971; Friedmann et al., Smithson. Contrib. Zool. 235, 1977; Elliott, Auk 95:161–167, 1978; Hill, Wilson Bull. 88:555–565, 1976; Rothstein, Condor 77:250–271, 1975). I used illustrations in Reed (North American Birds Eggs, Doubleday, Page & Co., New York, 1904) for egg marking patterns and Bent's Life History series (U.S. Natl. Mus. Bull. 179, 191, 195, 196, 197, 203, 211, 1942–1968) for egg sizes. The variation in egg appearance of Kansas passerine birds is illustrated in Fig. 2, as is the relative abundance of each species and their suitability for cowbirds, and shows the egg universe to which Kansas cowbirds are exposed.

Nest size and construction is not dealt with here except for incidental comments. In general I placed larger eggs into nests with larger inside diameters. I tried to measure nest exposure but found no easy way to do this. Nests were not completely concealed from view when I was within a few meters of them.

*Results.*—Two instances of cowbird parasitism were noted—1 each year. One occurred in an American Goldfinch nest (built the previous year and still in its original site) situated at the edge of a thicket of sapling elms (*Ulmus rubra*) and placed 226 cm above

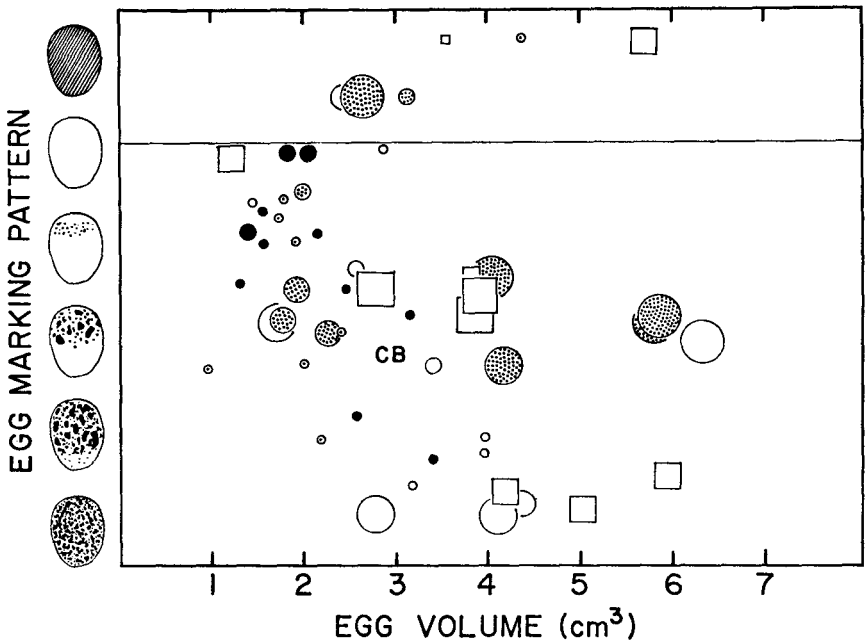


FIG. 2. Egg variation of Kansas open-nesting passerines ordered on the same scale as Fig. 1. Symbol size shows relative abundance of each species (see Zimmerman, 1969): smallest to largest symbols—less than 1 bird per census route, 1.0 to 4.9, 5.0 to 9.9, 10.0 to 29.9, 30.0 to 75.0. Solid circles—abundantly parasitized, good host species; stippled circles—moderately parasitized, good hosts; open circles—incidental hosts; squares—rejector species and poor hosts. CB shows position of cowbird eggs.

the ground. The clutch assigned to this nest was of phoebe-like eggs. The first of 4 eggs was placed in the nest on 10 May 1977. This egg was missing the following day when the second was added. The third egg (making 2 in the nest) was inserted the next day. When I added the last egg on day 4, the second egg was missing. On 14 May, nest contents were the fourth egg and a cowbird egg. On 15 May only the cowbird egg, with a hole in the side, remained in the nest. This egg was then removed by me. The other instance occurred in an old Northern Oriole's nest inserted 190 cm above ground in an elm sapling. Barn Swallow eggs were "laid" in this nest on 17 and 18 May 1978. On 22 May the contents were 1 "host" egg and 1 cowbird egg. The nest was empty the next day.

Several instances were observed when only 1 egg from the clutch disappeared, suggestive of cowbird activity, i.e. removal of a host egg prior to cowbird laying (Friedmann, op. cit.). During 159 nest-days of observation at the 20 experimental nests in 1977, the disappearance of 1 egg, as sole nest contents, happened 11 times and, as part of a clutch, 11 times. There were 15 other instances of loss or damage to contents of experimental nests; only 2 of the 20 nests were completely free from losses. I once saw

a black rat snake (*Elaphe obsoleta*) at an experimental nest with eggs missing. Damaged eggs appeared frequently to have been pecked; once a missing egg was found about 20 m away from its nest with a puncture in the side. Thus, snakes and birds were likely predators of some eggs.

During the experiments there were 3 times that I prepared a mixed clutch: 2 eggs of similar size but different in pattern—1 (a House Sparrow's) cowbird-like and the other much less spotted. Twice, 1 egg disappeared leaving the more cowbird-like egg.

Cowbird activity was shown twice by the appearance of a cowbird egg; host activity about the nest is not an absolute requirement for cowbird parasitism. Additional cowbird activity was suggested by predation of single eggs, especially by the disappearance of an egg not cowbird-like from mixed egg clutches.

*Discussion.*—Brown-headed Cowbirds can find nests by searching and need not observe activity of host birds at the nest. The cowbird eggs elicited by these experiments were laid at an "appropriate" time—at the start of or early in incubation. These observations and others at nests from which single eggs disappeared hint of exploratory visits to nests. Perhaps further parasitism was stopped as other nests were discovered not to have real eggs. The overall parasitism rate in my experiment, 6% of the nestings presented, however, is lower than parasitism rates of Kansas bird populations studied by Hill (1976). Of 1218 passerine nests observed by Hill (including 712 of host species), 166, or 14%, were parasitized. The mere presence of nests and eggs does not result in a "normal" parasitism rate. Thus the importance of host activity as aids for cowbirds to find nests cannot be discounted.

Thompson and Gottfried's (1976) experiment was not successful in inducing cowbird parasitism—possibly due to 2 features of their procedure. One—perhaps the more important criticism—is their use of *Coturnix* eggs. These eggs are large, generally much larger than usual host species ($V = 9.74$ cm$^3$; 1.6 times larger than meadowlark eggs and about 9 times larger than the smallest hosts' eggs). King (Am. Zool. 13:1259, 1973; pers. comm.) found egg size to be a very influential variable for inducing cowbird parasitism in captive birds—nests with larger egg sizes were avoided. The other feature of criticism is the use of 2 eggs placed in a nest together rather than simulating egg-laying. This criticism presupposes that cowbirds select nests preferentially during the egg-laying stage by responding to changes in nest contents. King (pers. comm.) found no evidence for such a preference in his experiments.

Most of the experimental nests were within the range of habitat preference of cowbirds determined by Lowther and Johnston (Kansas Ornithol. Soc. Bull. 28:36–40, 1977) for northeastern Kansas. Among 7 natural nests found in 1977, the only cowbird activity in the study area was at a Red-winged Blackbird nest. Three cowbird eggs were found in the nest on 26 April. (This nest was empty on 24 April after a visit by a black rat snake: the nest was again empty on 29 April. This nest was later used in the experiments.) In 1978, 3 parasitized nests were found during the course of the experiment. Two Red-winged Blackbird nests and 1 Cardinal nest were found with 7 cowbird eggs among them.

I saw, at most, 5 or 6 cowbirds on the study area. This number is indicative of cowbird density similar to that determined for a successional area censused by Cink and Paul (Am. Birds 29:1122–1123, 1975) only 3 km away. Experimentation was done during peak cowbird activity in Kansas (Lowther, Bird-Banding 48:358–369, 1977).

Egg variation for Kansas host species is shown in Fig. 2. Commonly used host species have eggs generally smaller and less marked than cowbird eggs. The eggs of the

parasitized experimental clutches are decidedly within the size range of common hosts. Rejector species (Rothstein, 1975) and poor hosts have eggs differing from the size-marking range most often victimized by cowbirds. Brown-headed Cowbird eggs are themselves partly outside this range which may aid in preventing egg ejection by other female cowbirds (but see Elliott, Auk 94:590–594, 1977). Similarities of eggs of good and poor hosts are not always as close as suggested in Fig. 2. For example, Eastern Kingbird (*Tyrannus tyrannus*, a rejector) and Red-winged Blackbird (a fairly good host) eggs are similar in spotting density (my subjective opinion) and size, but are obviously different in background color and shape of markings. (This shows a real deficiency of my 2-dimensional representation of egg variation.)

Little attention was given to variation in nest structure. This deficiency, however, may not be critical. King (pers. comm.) found that nest variation is of minor importance in comparison to egg appearance, especially egg size. In my experiments, nest dimensions covaried with egg size across species: smaller eggs were in nests of smaller nest dimensions, larger eggs in larger nests. Any search image that cowbirds may use in selecting host nests could still include aspects of nest construction independent of egg appearance.

My interpretation can be questioned on several grounds. Most noteworthy is that neither were cowbirds observed nest searching nor were experimental nests watched for cowbird visits. Cowbirds are known to lay eggs in deserted nests, but events at these parasitized nests argue against non-deliberate egg-laying. Accurate knowledge of which nests were actually exposed to cowbirds would greatly aid in proper interpretation of my experiment.

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**Cowbird parasitism on Common Bushtit nest.**—While studying nest helping in Common Bushtits (*Psaltriparus minimus*) we observed an instance of Brown-headed Cowbird (*Molothrus ater*) parasitism on a bushtit nest. Previously, Bent (U.S. Natl. Mus. Bull. 191, 1946), Friedmann (U.S. Natl. Mus. Bull. 233, 1963; U.S. Natl. Mus. Bull. 149, 1966), and Friedmann et al. (Smithson. Contrib. Zool. 233, 1977) have reported a total of 8 cases of parasitism of this species in California and British Columbia. Among the reports from California were 1 cowbird egg in a nest with 8 eggs and 2 parasitized clutches that were partially buried under new nest linings. We believe clutch burying to be a sign of abandonment and not a part of normal incubation behavior.

The nest we observed was discovered on 30 April 1977, in a woodland portion of the University of Washington campus in Seattle. The nest was attached to a solitary arch of a blackberry vine (*Rubus* sp.) 1.5 m from the ground. On 1 May the female bushtit was captured in a mist net as she left the nest, and another bird, presumably her mate, was noted in the vicinity. The female was banded and weighed and no brood patch was evi-