OLD COWBIRD BREEDING RECORDS FROM THE GREAT PLAINS REGION

By Peter E. Lowther

Prior to settlement of North America, the Brown-headed Cowbird (*Molothrus ater*) was restricted mostly to the Great Plains (Friedmann, 1929; Mayfield, 1965b). Vegetational conditions have since changed to favor the spread of the cowbird into regions formerly forested. The cowbird's parasitic habits have received much attention, but until recently most observations have not been made in the area of the cowbird's original (and present) region of abundance. In the Great Plains, cowbird parasitism is perhaps more specialized and adapted to long-time hosts with which cowbirds have coevolved. Ely (1956), Hergenrader (1962), Wiens (1963), Klaas (1975), Elliott (1976), and Hill (1976) have investigated cowbird breeding biology in Kansas, Oklahoma, or Nebraska—the present center of cowbird abundance (Van Velzen, 1972).

Oological collections made early in this century provide a source of information on old breeding records of cowbirds. Such reports are closer in time to original habitat conditions and thus may be useful in understanding the Brown-headed Cowbird's specialization to its hosts. Such data were examined to compare the pattern of cowbird parasitism with more recent studies and to test for evidence of adaptation to particular hosts. Since these parasitized egg sets come from varied sources (see Appendix) and most certainly from a wide variety of bird communities, additional sources of variation supply confounding effects that can obscure real relationships. However, significant relationships that are discovered would be expected to be even more evident if extraneous sources of variation were eliminated.

METHODS

The egg collection in the Division of Ornithology, Museum of Natural History, University of Kansas at Lawrence, was obtained primarily from individuals living in Kansas City, Missouri, and the collection is most representative of that region. For this analysis I examined only parasitized egg sets from Kansas, Missouri, and Nebraska. There are 78 egg sets cataloged with one or more cowbird eggs. Among these sets are 81 intact cowbird eggs from 59 of the sets. From these sets I recorded the following information: date of collection, locality, number of eggs (host's and cowbird's), and length (L) and maximum breadth (B) for whole shells. An index of egg size or "volume" was calculated expediently as equal to $LB^2/4$. This measure is the volume of a circumscribed cylinder if multiplied by the constant π. If a constant within-species egg shape is assumed, this value is proportional to actual egg volume (see Tatum, 1975). This measure is similar also to the Schönwetter weights (Nice, 1937:113, citing Schönwetter, 1924) which accurately predict actual egg weight.

I used Pearson product-moment correlations to measure associations between cowbird egg size and host size or time of season.

These associations were also described by linear regressions. Additionally, analysis of variance was used to search for differences in cowbird egg sizes between host species.

Distribution of cowbird eggs with respect to nests, host species, and time of season were tabulated and compared to results of other workers.

RESULTS

Figure 1 shows the composite seasonal occurrence of cowbird eggs for the Kansas-Missouri-Nebraska data. The 78 egg sets were

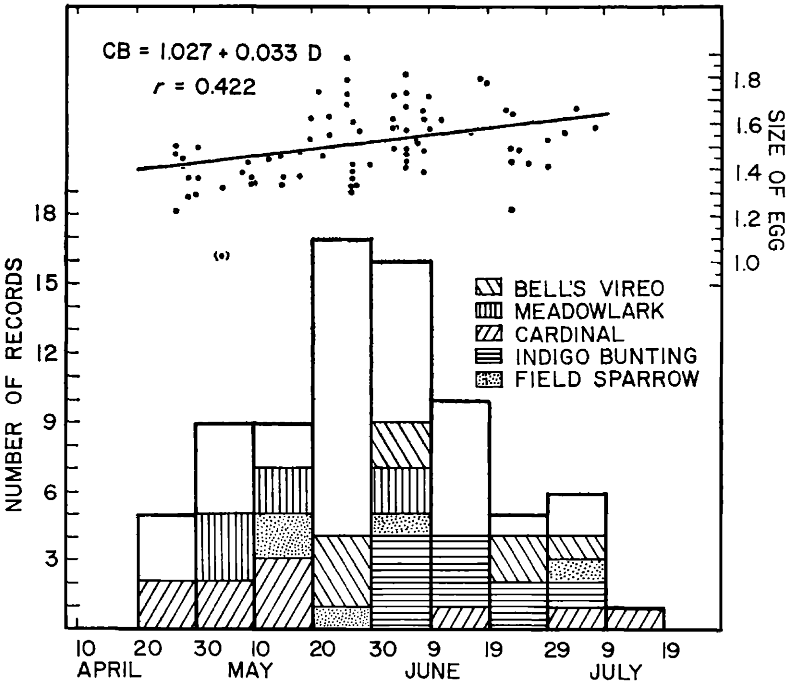

FIGURE 1. Seasonal occurrence of cowbird breeding records (n = 78) and seasonal variation in cowbird egg size. The dates of parasitism of the five more commonly recorded hosts are indicated. The regression of season on egg size is based on 80 cowbird eggs. (Excluded is a small cowbird egg shown in parentheses.) Units of egg size are cm^3 and give the volume of a circumscribed cylinder if multiplied by π.

collected between 1899 and 1968, 72 of them between 1909 and 1939. (The Appendix gives more details.) Nest contents are presented in Table 1.

Table 2 lists host species and the frequency of cowbird parasitism as suggested by data in the egg collection. Parasitism frequencies would be minimum values since some species are rejectors (i.e. species that remove cowbird eggs from their nests; Rothstein, 1975). Host size (weight) and host egg size are given as well as

TABLE 1.
Tabulation of nest contents of parasitized sets.

Number of Cowbird eggs	Number of host eggs 0	1	2	3	4	5	6	Totals
1	3	4[1]	17	16	10[2]	4		54
2	4[3]	4[3]	6	1	1		1	17
3	2[3,4]	2			1			5
4	1			1				2
Totals	10	10	23	18	12	4	1	78

[1]One set is from an Orchard Oriole nest for which the catalog was not specific on the number of oriole eggs (but at least 1).
[2]One set is from an Eastern Meadowlark nest that the catalog indicated as containing "5 eggs", interpreted as 4 meadowlark eggs and 1 cowbird egg as present in the collection.
[3]One set is from the nest of an unknown species.
[4]One set is from an Eastern Meadowlark nest listed in the catalog as 2 cowbird eggs but in the collection there are 3.

mean size of cowbird eggs laid in nests of that host. Regressions to describe the relationship between host size and cowbird egg size for that host and between time of season (by 10-day periods) and cowbird egg size (see also Figure 1) are listed below:

$$CB = 1.507 + 0.000128\ H \qquad (r = 0.031,\ n = 74,\ ns)$$

$$CB = 1.027 + 0.033\ D \qquad (r = 0.422,\ n = 80,\ P < 0.01)$$

where CB is cowbird egg size, D is time of season, and H is host weight. In both regressions a near runt cowbird egg is excluded; also excluded from the first regression are cowbird eggs associated with unknown hosts. Inclusion of the runt egg in the second regression only strengthens the relationship ($r = 0.440$, n = 81). Host weight (H) is taken as a middle value from the range of weights available either from my banding data or from specimens in the Museum of Natural History, University of Kansas. Time of season (D) is day of year divided by 10 and truncating the decimal fraction (e.g., for 20-29 April, days 110-119, D = 11). Host weight provides an index for both nest and egg size of host, both possible cues used by parasitizing cowbirds. Inside nest dimensions indicate the size of the host; egg size is highly significantly correlated to adult weight for the host species listed in Table 2 ($r = 0.941$, n = 24).

Analysis of variance showed no differences in egg size and dimensions of cowbird eggs laid in nests of five species represented by five or more cowbird eggs (Bell's Vireo, meadowlarks, Cardinal, Indigo Bunting, and Field Sparrow; Table 4).

DISCUSSION

I. Patterns in Cowbird Parasitism

Collection dates of parasitized nests range from 26 April to 12 July (both extremes in Cardinal nests, Jackson County, Missouri, 1921; Fig. 1). Johnston (1964:644-645) reported Kansas egg records for cowbirds as from 21 April to 20 July. Johnston's reported modal date is earlier than in this sample but the general pattern of seasonal occurrence is quite similar to that presented here. Hill (1976) gives similar dates for cowbird egg laying in central Kansas —21 April to 16 July.

Comparison of cowbird egg distribution among nests with other studies showed no difference ($\chi^2 = 10.96$, df = 8, $0.50 > P > 0.10$; Table 3). Mayfield (1965a) showed cowbird eggs to be distributed randomly among host nests. I compared egg distribution of my data with that of the compiled nine studies from northeastern United States that Mayfield (1965a) considered and with the combined results of five Great Plains' studies (Ely, 1956; Newman, 1970; Klaas, 1975; Elliott, 1976; Hill, 1976). Apparently there is one pattern of cowbird egg distribution among parasitized nests. The various studies mentioned above were conducted in different host communities but within the sample of parasitized nests, the relationships of singly and multiply parasitized nests is very similar. The data of this paper, although not as restrictive temporally or spatially as the comparison studies, show representative cowbird egg distribution.

Most nests had four or fewer eggs (both cowbird and host; Table 1); 4 eggs per nest was most numerous. Two nests had 7 eggs and one had 8: a meadowlark with 4 cowbird eggs and 3 of its own; a Red-eyed Vireo with 3 cowbird eggs and 4 of its own; and a Carolina Wren with 2 cowbird eggs and 6 of its own.

Hosts that were parasitized are typical for the central Great Plains (see Table 2). Only five species are not listed by Johnston (1964) for Kansas (Red-eyed Vireo, Summer Tanager, Scarlet Tanager, Rose-breasted Grosbeak, and Prothonotary Warbler), but these species have been recorded as hosts elsewhere (Friedmann, 1963). All species, except the Prothonotary Warbler, are known to have reared cowbird young (Friedmann, 1963, 1971; Elliott, 1976). The five species most commonly parasitized (five or more instances) are Bell's Vireo, meadowlarks (mostly Eastern Meadowlark), Cardinal, Indigo Bunting, and Field Sparrow—all species of grassland, edge, or second-growth habitats. Among all hosts neither intensity of parasitism nor occurrence of parasitism is unexpected for this region of North America, especially when it is not known how systematic egg collecting may have been.

The data I have are representative of cowbird parasitism in terms of host selection, breeding season, and distribution of eggs. This suggests that the egg collectors of this sample were not overly selective or discriminatory and may have provided a sample of nesting data typical for bird populations in the central Great Plains (but see Friedmann et al., 1977:2-3,6).

The regression of cowbird egg size with season is statistically significant and shows an increase in size with season. The same relationship has been found for other species, so this may be normal variation in egg sizes of birds. For House Sparrows (*Passer domesticus*) I also found a significant linear regression in which date of laying was used to predict egg size. I examined data gathered from

TABLE 2.

Summary of Brown-headed Cowbird breeding records obtained from the egg collection in the Museum of Natural History, University of Kansas

Host species	Number of sets	Number of parasitized sets[1]	Host adult weight (g)	Host egg size[2]	Cowbird egg size $\bar{x}$	Cowbird egg size s^2	Cowbird egg size n
Eastern Phoebe, *Sayornis phoebe*	31	2 (2)	18	1.026	—	—	0
Horned Lark, *Eremophila alpestris*	16	3 (2)	33	1.331	1.798	0.0065	3
Carolina Wren, *Thryothorus ludovicianus*	5	1	20	1.060	1.405	0.00002	2
Brown Thrasher, *Toxostoma rufum*	38	2 (2)	75	2.493	1.335	—	1
Wood Thrush, *Hylocichla mustelina*	18	2 (1)	50	2.197	1.568	—	1
Bell's Vireo, *Vireo bellii*	29	8 (6)	10	0.691	1.539	0.0180	8
Red-eyed Vireo, *V. olivaceus*	4	3 (2)	18	1.067	1.546	0.0071	2
Prothonotary Warbler, *Protonotaria citrea*	15	1 (1)	16	0.978	1.561	—	1
Yellow Warbler, *Dendroica petechia*	27	2 (2)	10	0.659	1.501	0.0173	2
Common Yellowthroat, *Geothlypis trichas*	12	2 (2)	10	0.774	1.315	—	1
Yellow-breasted Chat, *Icteria virens*	14	3 (2)	27	1.564	1.437	0.0057	3
Eastern Meadowlark, *Sturnella magna*[3]	69	7 (4)	110	2.873	1.521	0.0282	13
Red-winged Blackbird, *Agelaius phoeniceus*	51	3 (3)	60	1.910	1.655	0.0334	3
Orchard Oriole, *Icterus spurius*	15	1 (1)	21	1.082	1.790	—	1
Scarlet Tanager, *Piranga olivacea*	1	1	29	1.586	1.452	0.0295	4
Summer Tanager, *P. rubra*	2	2 (1)	29	1.689	1.557	0.0021	3
Cardinal, *Cardinalis cardinalis*	39	10 (8)	48	2.095	1.359	0.0358	7
					1.417	0.0150	6[4]

Rose-breasted Grosbeak, *Pheucticus ludovicianus*	2	1 (1)	45	1.927	1.358	—	1
Indigo Bunting, *Passerina cyanea*	14	10 (7)	16	0.887	1.520	0.0065	9
Dickcissel, *Spiza americana*	24	2 (2)	28	1.282	1.474	—	1
Rufous-sided Towhee, *Pipilo erythrophthalmus*	11	2 (1)	37	1.669	1.419	—	1
Lark Sparrow, *Chondestes gramineus*	5	1 (1)	29	1.270	1.705	—	1
Chipping Sparrow, *Spizella passerina*	7	1	14	0.732	1.314	0.0034	2
Field Sparrow, *Spizella pusilla*	14	5 (3)	14	0.816	1.479	0.0127	5
unknown host		3[5]			1.399	0.0110	6
Mean cowbird egg size					1.497	0.0244	81
					1.503	0.0217	80[4]

[1]Number in parentheses is the number of sets with only one cowbird egg.
[2]Host egg size is calculated as $LB^2/4$ from mean egg dimensions as given in Bent (1942-1968); units are cm^3.
[3]Most meadowlark nests were identified as Eastern Meadowlarks, 5 as Western Meadowlarks *S. neglecta*, and 3 unknown to species.
[4]One of the cowbird eggs was very small and was excluded in the second line.
[5]One set with 2 cowbird eggs is described as "probably Lark Sparrow"; host egg is smaller (14.9 x 19.2 mm = 1.066 size) than Lark Sparrow egg size and in its markings resembles a chat's or yellowthroat's.

TABLE 3.
Distribution of cowbird eggs.

	Number of cowbird eggs per parasitized nest				
Study	1	2	3	4	5+
This paper	54	17	5	2	—
5 Great Plains' studies[1]	187	66	29	7	7
9 northeastern US studies[2]	433	198	49	12	6

[1]Elliott (1976), Ely (1956), Hill (1976), Klaas (1975), Newman (1970).
[2]Compiled from Mayfield (1965a).

a single breeding season at one farm near Lawrence, Kansas. The linear dimensions of second and third eggs laid in 26 clutches of five or more eggs were used and egg size calculated. The actual date of laying was known within two days. (The dates for the cowbird eggs are dates of collection—any time from laying through all stages of incubation, and perhaps later if the nest had been deserted when found.) The regression ($HS = 1.101 + 0.01685\ D$, $r = 0.410$, $P < 0.01$) shows a smaller rate of increase per 10-day interval; House Sparrow eggs are 10% smaller than Brown-headed Cowbird eggs and adult birds are almost 10 g lighter. Nice (1937:115) found the same seasonal relationship for egg dimensions of the Song Sparrow (*Melospiza melodia*) and cites four other papers with similar findings. Kendeigh et al. (1956) similarly discovered a seasonal increase in egg size of House Wrens (*Troglodytes aedon*), and they discuss the probable physiological bases for this observation. Perrins (1970) believed that Great Tit (*Parus major*) females laid smaller eggs early in the season because they are unable to find food sufficient to produce larger eggs. Apparently, later in the season food is more available and, more importantly, metabolic pathways for egg production and hormone balance are already established and allow more efficient egg production and thus eggs can be slightly larger later in a season.

TABLE 4.
Analysis of variance of egg dimensions for differences among cowbird eggs distributed among five host species (8 from Bell's Vireo nests, 13 from Eastern Meadowlark nests, 7 from Cardinal nests, 9 from Indigo Bunting nests, and 5 from Field Sparrow nests).

Measurement	Source of variation	df	MS	F	
Length	Among hosts	4	1.626	1.459	$P > 0.25$
	Within hosts	37	1.114		
Width	Among hosts	4	0.479	1.319	$P > 0.25$
	Within hosts	37	0.363		
Size = $LB^2/4$	Among hosts	4	0.04003	1.158	$P > 0.25$
	Within hosts	37	0.03457		

II. Adaptation of Cowbird Egg Characteristics to Particular Hosts

Do female cowbirds show specialization in egg characters for particular hosts? Elliott (1976) found that fresh cowbird egg weights were heavier in the nests of heavier hosts (a statistically significant relationship). However, egg volume (comparable to the egg size measurement I used) showed no significant correlation with host size. I examined this question using the data I had available.

The eggs laid by an individual female are generally more similar than the eggs of different females within a species (Sternberg and Winkel, 1970; Pikula, 1971; Väisänen et al., 1972). Similarity of eggs within females is also known for Brown-headed Cowbirds (Jones, 1941; Walkinshaw, 1949; McGeen and McGeen, 1968), but identity of the females was determined, in part, by measurement and appearance of the eggs themselves. This premise provides a means to test for host specialization by cowbirds. Are cowbirds specialized to particular hosts? Three answers are possible: (1) females parasitize particular species and are adapted to these hosts in regard to egg characters; (2) females may parasitize particular species but are not adapted to them with regard to egg characters; and (3) females do not parasitize particular species.

If answer (1) were true, the variance in egg measurements within a host species (s^2_{host}) would be expected to be less than the variance of the measurement for all cowbird eggs (s^2). If answers (2) or (3) were true, the relationship would be $s^2_{host} \backsimeq s^2$. The comparison between s^2_{host} and s^2 is easily made by analysis of variance. This is a test of adaptedness of cowbird eggs to specific host species rather than of the extent individual females may specialize in host selection. No adaptation of cowbird eggs to host species was found (Table 4) in terms of egg length, breadth, or size. (A linear regression of cowbird egg size on host size—a test for a regular pattern in specialization in host types—was not significant also. As can be seen in Figure 1, the smaller cowbird eggs are laid early in the season mostly in nests of the larger hosts.)

Cowbirds may not perceive host categories as species, but rather may cue on some combination of habitat, nest structure, egg characters (size or coloration), or adult hosts (appearance or activity). Cowbirds find nests by "(1) cryptic, silent watching of nest building hosts . . .; (2) secretive searching . . .; and (3) active, intentionally noisy searching . . . [to flush hosts from nests]" (Norman and Robertson, 1975:611). King's (1973) experiments suggest host egg size influences parasitism of nests. Cowbirds usually remove a host's egg(s) from nests parasitized, often the day prior to laying its own (Friedmann, 1963). Cowbirds were found to parasitize Gray Catbirds (*Dumetella carolinensis*) proportionally less than Cardinals (Scott, 1977); this was explained as probably due to the greater attentiveness given to the nest by catbirds than by Cardinals rather than due to cowbirds discriminating between these two hosts. Thus, laying females are exposed to a variety of stimuli in the course of finding a nest, laying in it, and when removing host's eggs. Cowbirds are generalists in terms of host selection, as 216 species are known to have been parasitized

(Friedmann et al., 1977). Perhaps cowbirds show no discrimination in selecting hosts, especially since some species that are victimized are unsuited for successful parasitism (e.g. rejector species, precocial species, doves) and the reproductive effort is wasted in such instances. However, Rothstein (1976) points out, cowbirds still may have host preferences but are not able to lay all eggs in nests of preferred hosts. Successful cowbird eggs are synchronized with host species' egg laying. As cowbirds lay in clutches (Payne, 1965), preferred host nests may not be available for all eggs of a series. Thus certain eggs may be selectively placed whereas others are "dumped" in any available nest. Good host species may be learned by visits back to parasitized nests or by a preference for the species that raised the cowbird (Rothstein, 1976). More likely, certain general features shared by most good hosts are used as cues in cowbird host selection but some poor hosts also have these same characteristics and as a result cowbird reproductive strategies are not optimum (Rothstein, 1976). Cowbirds may still be adapted to "host-types" rather than to hosts identified as species, but this cannot be tested until it is known how cowbirds view potential hosts.

Cowbirds are migratory but show Ortstreue (indicated in Frankhauser, 1971) and will return to the same or very similar host-community (in terms of species composition and abundances). Thus, cowbird host preferences may vary geographically in response to adaptation to different host-communities. Perhaps within different regions there are only a few important cowbird hosts and cowbirds have, or are, adapting to these species. Selection could then adapt cowbird eggs so that they are more acceptable to the important hosts and permit better survivorship with that host. This could be in terms of egg weight or density (discussed by Elliott, 1976), egg coloration and markings, or egg dimensions. Such adaptation would be easier in communities of few species (P. F. Elliott, pers. comm.), as in the Great Plains, which support bird communities of comparatively low diversity (Wiens, 1972:241).

CONCLUSIONS AND SUMMARY

Further information on cowbird parasitism within different bird communities is needed to resolve better the question of host specialization by cowbirds. Data gathered from a single location within a single season will eliminate sources of variation present in this study.

Egg collections form one useful repository of information on breeding biology, especially if accompanied with accurate field data. Measurements of egg sizes can be taken and variation in coloration and markings can be studied. However, important aspects of breeding biology—e.g., hatching success and survivorship—are not known and cannot be related to the nesting attempt itself or to the parent birds. Active field workers can get much of the same data available in egg collections without taking the eggs and also get more interesting information by following the nesting attempt and knowing the adult birds.

The available information on cowbirds in the egg collection of the Museum of Natural History, University of Kansas, shows the occurrence and intensity of cowbird parasitism to be not different from other observations more restricted in time and space. Cowbird egg size was found to increase with season which is probably a common occurrence among birds. No indication of host specialization was discovered with regard to the egg dimensions of cowbirds.

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APPENDIX

A. Collection information for parasitized egg sets.—A total of 78 egg sets with one or more Brown-headed Cowbird eggs in the Museum of Natural History, The University of Kansas, provided data for this paper. Additional information regarding their collection is given here.

Collectors: Harry Harris of Kansas City, Missouri (25 sets), Dix Teachenor of Kansas City, Missouri (25), Herbert A. Smith of Webster Groves, Missouri (15), Ben[jamin] F. Bolt (5), Sievert A. Rohwer (3), Cha[rle]s W. Tindall (1), Jerome A. Jackson (1), Ray Wolfe (1), M. J. Brumwell (1), and collector unknown (1). Harris, Teachenor, Smith, and Bolt were often listed as joint collectors among themselves; egg sets in these cases are listed as from an individual's collection.

Location of collection, by county: Missouri—Jackson (39), Johnson (4), Cass (2), Buchanan (1), Franklin (1), Platte (1), St. Louis (1), Saline (1); Kansas—Douglas (9), Johnson (5), Wyandotte (2), Barton (1), Decatur (1), Edward (1), Geary (1), Jewell (1), Leavenworth (1), Sedgwick (1); Nebraska—Cherry (5).

Year of collection: 1899 (1), 1900 (1), 1909 (1), 1911 (7), 1912 (5), 1915 (4), 1920 (1), 1921 (17), 1922 (10), 1923 (5), 1924 (3), 1925 (1), 1926 (6), 1927 (1), 1928 (1), 1929 (2), 1932 (3), 1934 (1), 1939 (4), 1968 (3), unknown year (1).

B. Number of egg sets of unparasitized species.—Egg sets from 38 unparasitized species of passerines are also present in the collection from the same region (Kansas, Missouri, and Nebraska). These are listed below with the number of sets represented in the collection.

Eastern Kingbird (*Tyrannus tyrannus*), 13; Western Kingbird (*T. verticalis*), 3; Great Crested Flycatcher (*Myiarchus crinitus*), 4; Acadian Flycatcher (*Empidonax virescens*), 5; "Traill's" [= Willow] Flycatcher (*E. traillii*), 24; Eastern Wood Pewee (*Contopus virens*), 2; Tree Swallow (*Iridoprocne bicolor*), 6; Bank Swallow (*Riparia riparia*), 17; Rough-winged Swallow (*Stelgidopteryx ruficollis*), 4; Barn Swallow (*Hirundo rustica*), 18; Cliff Swallow (*Petrochelidon pyrrhonota*), 2; Purple Martin (*Progne subis*), 1; Blue Jay (*Cyanocitta cristata*), 12; Black-billed Magpie (*Pica pica*), 10; Common Crow (*Corvus brachyrhynchos*), 17; Black-capped Chickadee (*Parus atricapillus*), 21; Tufted Titmouse (*P. bicolor*), 5; White-breasted Nuthatch (*Sitta carolinensis*), 1; House Wren (*Troglodytes aedon*), 38; Long-billed Marsh Wren (*Cistotherus palustris*), 7; Rock Wren (*Salpinctes obsoletus*), 1; Mockingbird (*Mimus polyglottos*), 8; Gray Catbird (*Dumetella carolinensis*), 19; American Robin (*Turdus migratorius*), 17; Eastern Bluebird (*Sialia sialis*), 9; Blue-gray Gnatcatcher (*Polioptila caerulea*), 4; Loggerhead Shrike (*Lanius ludovicianus*), 20; White-eyed Vireo (*Vireo griseus*), 3; Warbling Vireo (*V. gilvus*), 4; Chestnut-sided Warbler (*Dendroica pensylvanica*), 1; Ovenbird (*Seiurus aurocapillus*), 1; Kentucky Warbler (*Oporornis formosus*), 2; House Sparrow (*Passer domesticus*), 7; Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*), 11; Northern Oriole (*Icterus galbula*), 5; Common Grackle (*Quiscalus quiscula*), 18; American Goldfinch (*Carduelis tristis*), 8; and Lark Bunting (*Calamospiza melanocorys*), 3.

C. The size of host eggs in the parasitized egg sets used in this study.—Mean host egg size based on host eggs from parasitized sets examined in this study are as follows: Eastern Phoebe (2 nests/4 eggs) 1.082, Horned Lark (2/3) 1.290, Carolina Wren (1/4) 1.046, Brown Thrasher (1/3) 2.767, Wood Thrush (2/4) 2.389, Bell's Vireo (4/10) 0.709, Red-eyed Vireo (3/8) 1.135, Yellow Warbler (1/4) 0.619, Common Yellowthroat (1/4) 0.854, Eastern Meadowlark (6/18) 3.028, Red-winged Blackbird (3/10) 1.810, Summer Tanager (2/4) 1.406, Cardinal (10/19) 2.137, Rose-breasted Grosbeak (1/4) 2.036, Indigo Bunting (8/15) 0.945, Dickcissel (2/5) 1.458, Rufous-sided Towhee (2/5) 1.869, Lark Sparrow (1/2) 1.265), and Field Sparrow (4/11) 0.741.