

A PRELIMINARY LIST OF BIRD WEIGHTS

BY PAUL A. STEWART

THE striking dearth in American ornithological literature of data on the body weights of even our most common song birds induced me, in 1929, to take up the weighing of birds handled at my banding station. Up to the present time 1807 weighings have been made of 1353 individual birds, representing 66 species.

The initial problem in this investigation was the selection of a suitable weighing equipment. Two very delicate scales of the balance type were procured, but the manipulation of weights proved so time-consuming as to make their use prohibitive. Everett C. Myers (1928), who had experimented with the Chatillon dietetic spring balance, found it very satisfactory for use in taking bird weights. This apparatus is fitted with a revolving dial with which the tare can be eliminated, and the net weight read directly from the face. The dial is graduated to grams and the fractions are only approximate, but with due care can be read with a reasonable degree of accuracy. The readings were frequently checked against a very sensitive scale of the balance type, and almost identical figures were shown. Of course, an equipment giving a higher degree of accuracy would be desirable in certain lines of special investigation, for instance, those involving metabolism. The Chatillon dietetic spring balance was used for taking all of the weights here presented, except those of the Crow. The birds are collected from the traps and taken to my study to be weighed and banded. There the conditions affecting variable weight readings can be controlled to a minimum.

Following banding routine, the birds are placed in a cloth sack, with their head in a corner, and snugly wrapped with the length of the sack. Thus confined the birds struggle very little, and I have inflicted no injuries through the weighing process though, as the above figures show, many birds have been involved. A sack six by twelve inches, when flattened out, is suitable for birds up to the size of Bob-white. The card system is employed for the preservation of the records, and each bird is given its individual card. The date and hour of the weighing, the age and sex (when known) of the bird, together with remarks on the approximate amount of ingested food, as influenced by availability prior to weighing, are parts of each entry. If a bird is taken in such a manner that it has had opportunity to feed right up to the time of weighing, the note under the last-named heading is simply "Plus." If a bird is confined in a trap out of reach of food, or is not weighed immediately on capture, this is indicated by the

symbol "TM," or "Trap Minus." Record is likewise made of various other conditions with pertinent symbols.

Bird weights vary considerably according to the hour of day at which they are taken. The minimum readings for diurnal birds are taken in the early morning, while the peak is gained in the late afternoon. Generally speaking, there is a steady morn to eve rise, with a slight mid-day smoothing or even slumping of the curve (see Table 2). If this variation were to be counteracted by arriving at some arbitrary basis as to what should be considered the "true" weight of a bird, there would undoubtedly be much difference of personal opinion. Some might favor the evening bird with a well-filled stomach; others the morning bird with the minimum of extraneous matter in the form of ingested food; while still others would strike a mean between the two extremes. Theoretically, this last is the principle by which most of the published averages are reached. When a hundred or more birds are weighed at various times of the day the mean, or mid-day weight should be represented in a fair way by the resulting average.

It is obvious, too, that an average struck with indifference to the time of weighing of individual birds may be influenced by better representation of records for some special time of day. If birds trapped more readily in the morning the average would be kept down; if their response at the traps were greater in the evening, the average would be raised. Several hundred samples studied for the purpose show the mid-day mean to be represented almost perfectly in the average of my weighings made throughout the day.

The traps are attended at frequent intervals so that no bird is confined for an unduly long period. Even thus, birds found in the second chamber of the Government sparrow trap are not directly comparable with those taken from the drop trap, for instance. Fifty-three "trap minus" Song Sparrows compared with 143 birds of this species, which definitely had not been artificially deprived of food, give a difference of 0.89 grams in favor of the food "plus" series. In the final analysis only the significance of the time of weighing is destroyed. The weight of a 10.00 a. m. bird taken in the Government sparrow trap is about equal to the 8.00 a. m. bird taken in the drop trap. Birds which enter the trap in the early morning seem to consume enough food before proceeding into the trap's second chamber, to keep the later-taken weight up to the early-morning average. Unless there is due reason for rejection, all such weighings enter into the average.

Some birds, notably the House Wren, that enter the traps solely out of curiosity, fail to find food to their liking, and so might be considered as deprived of it; while others might be of such a nervous temperament that even if their natural food be available in abundance during confinement in the trap, they would fail to partake of it. No allowances are made for such exceptions, since they cannot be detected with suitable accuracy.

TABLE 1
Weight in Grams of 66 Species and Races of Ohio Birds

Name	Number Weighed	Maximum	Minimum	Mean	Adults Weighed	Maximum	Minimum	Mean
<i>Falco sparverius sparverius</i>	1	123.00	123.00	123.00	1	123.00	123.00	123.00
<i>Colinus virginianus virginianus</i>	108	227.50	128.00	186.77	108	227.50	128.00	186.77
<i>Ereunetes pusillus</i>	1	36.00	36.00	36.00	1	36.00	36.00	36.00
<i>Otus asio naevius</i>	2	227.75	206.00	216.87	2	227.75	206.00	216.87
<i>Chaetura pelagica</i>	47	27.00	21.00	23.33	47	27.00	21.00	23.33
<i>Centurus carolinus</i>	5	96.75	67.00	67.50	5	96.75	67.00	67.50
<i>Melanerpes erythrocephalus</i>	4	69.50	66.50	68.50	4	69.50	66.50	68.50
<i>Dryobates villosus villosus</i>	2	73.00	71.00	72.00	2	73.00	71.00	72.00
<i>Dryobates pubescens medianus</i>	16	29.50	23.75	26.75	16	29.50	23.75	26.75
<i>Sayornis phoebe</i>	7	21.50	17.00	20.00	7	21.50	17.00	20.00
<i>Empidonax minimus</i>	2	13.00	10.50	11.75	2	13.00	10.50	11.75
<i>Otocoris alpestris alpestris</i>	9	48.00	30.25	43.09	9	48.00	30.25	43.09
<i>Otocoris alpestris praticola</i>	8	47.00	28.50	37.70	8	47.00	28.50	37.70
<i>Otocoris alpestris (race?)</i>	10	51.25	40.50	43.30	10	51.25	40.50	43.30
<i>Hirundo erythrogaster</i>	4	18.00	17.00	17.75	4	18.00	17.00	17.75
<i>Corvus brachyrhynchos brachyrhynchos</i>	1	482.75	482.75	482.75	1	482.75	482.75	482.75
<i>Penthestes atricapillus atricapillus</i>	3	11.00	9.25	10.41	3	11.00	9.25	10.41
<i>Baeolophus bicolor</i>	52	24.00	17.00	18.96	52	24.00	17.00	18.96
<i>Sitta carolinensis carolinensis</i>	35	23.25	17.25	20.36	35	23.25	17.25	20.36
<i>Sitta canadensis</i>	1	10.25	10.25	10.25	1	10.25	10.25	10.25
<i>Troglodytes domesticus baldvini</i>	67	13.00	9.00	11.36	67	13.00	9.00	11.36
<i>Nannus hiemalis hiemalis</i>	2	9.50	8.50	9.00	2	9.50	8.50	9.00
<i>Thryomanes bewicki bewicki</i>	1	10.75	10.75	10.75	1	10.75	10.75	10.75
<i>Dumetella carolinensis</i>	5	39.75	34.00	35.55	5	39.75	34.00	35.55
<i>Toxostoma rufum</i>	1	66.00	66.00	66.00	1	66.00	66.00	66.00
<i>Turdus migratorius migratorius</i>	15	81.00	62.25	73.34	15	81.00	65.00	74.87
<i>Sialia sialis sialis</i>	6	32.00	27.00	29.12	6	32.00	27.00	29.12
<i>Corthylio calendula calendula</i>	1	6.50	6.50	6.50	1	6.50	6.50	6.50
<i>Anthus spinolaeta rubescens</i>	5	24.00	19.00	23.16	5	24.00	19.00	23.16
<i>Bombicilla cedrorum</i>	19	40.25	32.00	36.84	19	40.25	32.00	36.84
<i>Lanius ludovicianus migrans</i>	1	43.75	43.75	43.75	1	43.75	43.75	43.75
<i>Sturnus vulgaris vulgaris</i>	82	96.00	59.00	74.66	29	95.00	63.50	77.22
<i>Protonotaria citrea</i>	1	11.90	11.90	11.90	1	11.90	11.90	11.90
<i>Dendroica magnaolia</i>	1	8.00	8.00	8.00	1	8.00	8.00	8.00
<i>Dendroica caerulescens caerulescens</i>	2	12.00	11.00	11.50	2	12.00	11.00	11.50
<i>Dendroica coronata</i>	1	11.50	11.50	11.50	1	11.50	11.50	11.50
<i>Dendroica virens virens</i>	3	13.00	8.00	9.83	1	8.00	8.00	8.00
<i>Dendroica cerulea</i>	1	8.50	8.50	8.50	1	8.50	8.50	8.50
<i>Dendroica fusca</i>	1	9.90	9.90	9.90	1	9.90	9.90	9.90
<i>Dendroica pinus pinus</i>	1	11.90	11.90	11.90	1	11.90	11.90	11.90
<i>Geothlypis trichas brachidactyla</i>	3	9.75	9.00	9.50	3	9.75	9.00	9.50
<i>Icteria virens virens</i>	4	26.00	19.75	23.37	4	26.00	19.75	23.37
<i>Passer domesticus</i>	6	29.00	25.00	27.68	3	29.00	26.25	27.75
<i>Dolichonyx oryzivorus</i>	1	36.00	36.00	36.00	1	36.00	36.00	36.00
<i>Agelaius phoeniceus phoeniceus</i>	19	74.50	35.00	64.61	19	74.50	35.00	64.61
<i>Euphagus carolinus</i> ¹	1	57.00	57.00	57.00	1	57.00	57.00	57.00
<i>Molothrus ater ater</i>	2	38.55	38.55	38.55	2	38.55	38.55	38.55
<i>Richmondia cardinalis cardinalis</i>	6	45.00	39.50	42.37	6	45.00	39.50	42.37
<i>Passerina cyanea</i>	2	12.50	11.90	12.20	.....	.....	.....	.....
<i>Spinus tristis tristis</i>	172	14.50	10.25	13.41	172	14.50	10.25	13.41
<i>Pipilo erythrophthalmus erythrophthalmus</i>	1	41.75	41.75	41.75	1	41.75	41.75	41.75
<i>Passerculus sandwichensis savanna</i>	2	16.50	16.00	16.25	2	16.50	16.00	16.25
<i>Ammodramus savannarum australis</i>	2	16.25	12.00	14.12	2	16.25	12.00	14.12
<i>Passerherbulus henslowi henslowi</i>	1	13.50	13.50	13.50	1	13.50	13.50	13.50
<i>Poocetes gramineus gramineus</i>	19	27.00	18.25	21.86	15	27.00	18.25	23.66
<i>Junco hyemalis hyemalis</i>	171	25.10	14.75	20.88	171	25.10	14.75	20.88
<i>Spizella arborea arborea</i>	134	20.50	12.90	18.53	134	20.50	12.90	18.53
<i>Spizella passerina passerina</i>	93	14.00	9.50	11.12	44	14.00	10.00	11.37
<i>Spizella pusilla pusilla</i>	255	15.00	9.75	11.21	201	15.00	9.75	11.00
<i>Zonotrichia leucophrys leucophrys</i>	52	37.10	19.90	28.62	21	37.10	19.90	31.22
<i>Zonotrichia leucophrys gambeli</i>	1	33.25	33.25	33.25	1	33.25	33.25	33.25
<i>Zonotrichia albicollis</i>	26	29.50	20.75	24.79	21	29.50	20.75	24.79
<i>Melospiza lincolni</i>	23	19.00	13.00	16.29	23	19.00	13.00	16.29
<i>Melospiza georgiana</i>	10	17.00	13.25	15.88	7	17.00	13.25	15.88
<i>Melospiza melodia beata</i>	263	25.25	16.00	19.64	169	25.25	16.00	20.22
<i>Calcarius lapponicus lapponicus</i>	3	30.00	27.00	29.00	3	30.00	27.00	29.00
<i>Plectrophenax nivalis nivalis</i>	2	34.50	33.00	33.75	2	34.50	33.00	33.75

¹ A wintering cripple.

TABLE 1—Continued
Weight in Grams of 66 Species and Races of Ohio Birds

Weighted	Maximum	Minimum	Mean	Males Weighed	Maximum	Minimum	Mean	Females Weighed	Maximum	Minimum	Mean
.....	63	227.50	152.00	188.30	1	123.00	123.00	123.00
.....	1	36.00	36.00	36.00	45	226.50	128.00	185.24
.....
.....	3	96.75	68.00	82.27	2	78.00	67.00	72.00
.....	1	73.00	73.00	73.00	1	71.00	71.00	71.00
.....	7	29.00	25.00	27.10	9	29.50	23.75	26.30
.....
.....	8	48.00	30.25	42.68	1	10.50	10.50	10.50
.....	6	47.00	28.50	37.70	1	43.50	43.50	43.50
.....	7	51.25	40.50	43.30	2	42.50	35.50	39.00
.....	2	19.00	18.00	18.50	2	42.25	40.50	41.37
.....	2	18.00	17.00	17.50
.....
.....	25	23.00	17.50	20.62	1	17.50	17.50	17.50
.....	1	10.25	10.25	10.25	10	23.25	17.25	20.10
.....
.....	1	11.50	11.50	11.50
.....
4	77.50	62.25	71.81	.....	.....	.....	.....	.....	.....	.....	.....
.....	3	29.00	27.00	27.75	3	32.00	28.00	30.50
.....	2	23.00	19.00	21.00	1	6.50	6.50	6.50
.....
53	81.75	69.00	72.05	9	86.00	67.00	74.66	1	43.75	43.75	43.75
.....	5	96.00	63.50	82.35
.....	1	11.90	11.90	11.90
.....	2	12.00	11.00	11.50	1	8.00	8.00	8.00
.....	1	11.50	11.50	11.50	.....	.....	.....	.....
2	13.00	8.50	10.75	2	8.50	8.00	8.25	.....	.....	.....	.....
.....	1	8.50	8.50	8.50	.....	.....	.....	.....
.....	1	9.90	9.90	9.90	.....	.....	.....	.....
.....	1	11.90	11.90	11.90
.....	3	9.75	9.00	9.50
.....
3	27.00	25.00	25.83	3	29.00	26.25	27.75	.....	.....	.....	.....
.....	1	36.00	36.00	36.00	.....	.....	.....	.....
.....	18	74.50	61.90	66.25	1	35.00	35.00	35.00
.....
.....	1	51.00	51.00	51.00	2	38.55	38.55	38.55
2	12.50	11.90	12.20	.....	.....	.....	.....	5	45.00	39.50	42.75
.....	1	14.00	14.00	14.00	.....	.....	.....	.....
.....
.....
.....	1	13.50	13.50	13.50	.....	.....	.....	.....
.....
.....	2	19.50	18.00	18.75	.....	.....	.....	.....
49	12.50	9.50	11.00	1	10.75	10.75	10.75	.....	.....	.....	.....
54	14.00	9.75	11.54	.....	.....	.....	.....	.....	.....	.....	.....
31	32.00	23.50	27.56	.....	.....	.....	.....	.....	.....	.....	.....
.....	1	33.25	33.25	33.25	.....	.....	.....	.....
5	27.00	23.00	24.80	.....	.....	.....	.....	.....	.....	.....	.....
.....
3	17.00	14.75	15.91	.....	.....	.....	.....	.....	.....	.....	.....
94	22.75	16.00	19.07	.....	.....	.....	.....	.....	.....	.....	.....
.....	2	30.00	27.00	28.50	.....	.....	.....	.....
.....	1	33.00	33.00	33.00	1	34.50	34.50	34.50

While the great majority of weights presented in the list on pages 326 and 327 are of birds trapped for banding, data obtained from those collected for museum specimens are also incorporated. The loss of blood through the shot wound must be negligible, and weights of birds thus taken seem readily comparable with those of trapped birds. The advantage of being able to sex the bird is thus accorded. Weights of birds collected contribute seventeen species and seventy-eight individuals to the list.

Repeated weighings of the same individuals enter into the average, and when a bird is trapped late in the evening it is retained and its weight on the following morning is also used. All weights are given in grams, and fractions are carried only to the nearest hundredths. All weights are of birds captured in the general vicinity of Leetonia, Ohio.

These data are so meager that it seems almost useless to attempt deductions; and the writer is aware that quite opposite conclusions might be forthcoming from a less limited series of notes. However, it seems proper to mention some of the problems raised, and to apply the data thereto, as a suggestion for the collection of further notes. It was hoped that it might be possible to separate the sexes, at least of certain species, on the basis of their weights. This of course, could be done in the case of the Red-winged Blackbird and some others, but the majority of small song birds which are not separable by plumage differences are no more separable by size differences. Three female Horned Larks give a higher average than fourteen males, but both extremes are represented among males. There are numerous cases also, where the male holds the higher average, but the range of the sexes is so great that their weights merge in most instances. The situation with adult and immature birds is quite similar. Adult Starlings and Vesper and White-crowned Sparrows give a higher average than do their immatures; while in Chipping and Field Sparrows the reverse is true. It is well known that young altricial birds acquire a weight in excess of their parents (Edson, 1930). Evidently this has all been lost before the birds enter the traps readily.

One hundred sixty-five Goldfinches (*Spinus tristis tristis*) which were weighed at various hours of the day give a fair idea of weight rhythm of a bird throughout the day (see Table 2).

A similar rhythm is shown by other species studied. As already noted the low and the high are attained in the morning and the late afternoon, respectively. A steady morning increase is maintained until about 11.00 a. m.; then comes a slight lull through the noon hour until the climb is resumed shortly after 1.00 p. m. The peak is reached by 3.00 p. m., followed by a decline running through the night. This slumping is broken off at the end of the rest period. An overnight weight-loss of about ten per cent is sustained in the smaller birds. The ratio diminishes as the size of

TABLE 2
Hourly Weight Rhythm shown by 165 Goldfinches

Hour	Number weighed	Average weight
7.00 a. m.....	6	12.04 grams
8.00 a. m.....	13	12.33 "
9.00 a. m.....	8	12.42 "
10.00 a. m.....	11	12.68 "
11.00 a. m.....	1	12.75 "
12.00 m.....	23	12.73 "
1.00 p. m.....	58	12.67 "
2.00 p. m.....	11	13.10 "
3.00 p. m.....	15	13.33 "
4.00 p. m.....	7	13.25 "
5.00 p. m.....	9	13.11 "

the bird increases. In the Bob-white the loss is about five per cent. No figures are available to show the percentage egested as feces, and the part taken up in metabolic processes.

Perhaps no other factor is so influential in imposing variation on bird weights as is disease and parasitism. The Bob-white offers a striking example. A range of 100.50 grams is shown among fully adult specimens (see Table 1). The possibility of the light bird being an immature is precluded, since this weight was taken in February. Although necropsy was not undertaken in view of findings of the Ohio Department of Conservation, parasitism seems a tenable diagnosis. M. B. Trautman (1933) reports that of sixty-five Ohio Bob-white weighed during the winter of 1931-32, 77.62 per cent were later found to be parasitised. Perhaps the degree of lightness is an index to the extent of parasitism. If all weights of parasitised birds could be definitely segregated they might properly be omitted from the average. Since no fair line can be drawn without killing the birds, no such attempt was made. A sufficient run of light Bob-white was taken during 1934 to lower the average from 194.79 to 186.77 grams. The earlier average was drawn from fifty-five weighings, which seemed a satisfactory series.

In view of the supposition that birds stop on their migratory journey to rest and regain the energy which they have spent, the following case of White-throated Sparrow (*Zonotrichia albicollis*), C93093, seems paradoxical (see Table 3).

TABLE 3
Loss of Weight in White-throated Sparrow C93093 during a Three-day Stop-over

Date	Hour	Weight
April 28, 1931.....	2.00 p. m.	29.00 grams
April 29, 1931.....	1.00 p. m.	25.50 "
April 30, 1931.....	8.00 a. m.	23.50 "
April 30, 1931.....	12.00 m.	24.25 "
April 30, 1931.....	8.30 p. m.	23.00 "

As the table shows, this bird steadily declined in weight during a three-day stop-over, until a total of six grams was lost. While this bird seemed in good health, little confidence can be attached to the record until corroborative or disqualifying data are available. It is not definitely known whether this bird's visits to the trap were terminated through death or migration.

The increasing food scarcity as the winter wears on, may affect the weight of birds taken at that season, especially in those that require a comparatively large amount of food, or those that forage in flocks or have a limited feeding range. Thus forty-eight Bob-white weighed in December give an average of 196.71 grams; while fifty-nine February birds give an average of 171.59 grams. Most of the small song birds, however, seem able to maintain a nearly constant average throughout the winter months as indicated in the case of sixty-six Tree Sparrows (*Spizella arborea arborea*) weighed from December to March (see Table 4).

TABLE 4

Average Monthly Weights of Sixty-six Tree Sparrows in Winter

Month	Number of Birds	Weight
December.....	8	17.42 grams
January.....	16	16.71 "
February.....	15	17.18 "
March.....	17	17.17 "

Song Sparrows (*Melospiza melodia beata*) actually showed an increase through the winter months (see Table 5).

TABLE 5

Monthly Weights, August to April, of 215 Song Sparrows

Month	Number of birds	Average weight
August.....	66	19.84 grams
September.....	29	19.90 "
October.....	71	20.32 "
November.....	No weights taken	
December.....	2	20.87 "
January.....	3	22.91 "
February.....	2	21.25 "
March.....	22	21.97 "
April.....	20	19.13 "

Perhaps an increase of weight in winter would not have been anticipated among birds subjected to more or less rigorous winter weather conditions, such as occur in northern Ohio. Linsdale and Sumner (1934), studying Golden-crowned and Fox Sparrows during the winter of 1932-33, at Berkeley, California, found that "both species [*Zonotrichia coronata* and *Passerel-*

la iliaca] reached one peak in weight in mid-winter and another, considerably higher one just before the spring migration." My Song Sparrows failed to show a comparable increase before migration, but the rise in weight through the winter months, and the mid-winter peak are quite evident. Perhaps the Song Sparrow's habits are such that its food requirements can always be met to the extent that it is able to build up a reserve in spite of the long nights and cold winters of northern Ohio. Certainly, as has already been shown, the Bob-white reacts very differently to Ohio winters.

Whittle (1929) was led to suspect the existence of a more northern, undescribed form of the Song Sparrow, from the presence of heavier birds during the migration season, at his banding station at Cohasset, Massachusetts. Four of these heavier birds gave an average of 26 grams, which is 3.48 grams above an average he had drawn from twenty-nine ordinary Song Sparrow weighings. During March 1930, Hoffman (1930) also trapped an abnormally large Song Sparrow at Lakewood, Ohio, weighing 28.19 grams. Other banders also have noted these heavier Song Sparrows. It is noteworthy, that of the 215 birds of this species which I have weighed during the past six years, none with a comparably high weight was taken, my largest bird weighing only 25.25 grams. While this weight nearly approaches Whittle's figures, other information prevents my bird being comparable with his. At least, there is evidence against my birds' being representatives of a more northern race of Song Sparrow. My second heaviest bird, weighing 25.15 grams, was taken at a late summer date, too early for migration. Furthermore, its weight increased from the small Song Sparrow range, to the range of the larger birds, thus corresponding with the seasonal rhythm shown by 215 weighings (see Table 5). This record is sufficiently interesting to be worth giving in detail (see Table 6).

TABLE 6
Seasonal Weight Rhythm of Song Sparrow C93062

Month	Hour	Weight
August 24, 1931.....	6.00 p. m.	23.50 grams
March 11, 1932.....	8.00 a. m.	25.10 "

It will be noted that the lighter weight was taken in the evening, and thus represents approximately the maximum for this individual during the season represented. The March weight was taken rather early in the morning, and if this were to be corrected for comparison with the August weight, it would easily be possible to raise the March figure to 26.50 grams, without any undue assumption. This, too, would bring my heaviest Song Sparrow well within the range of the heavy birds found by other students of the problem. Since some of Whittle's heavy birds were taken in the autumn,

my observations do not invalidate his suggestion of a more northern Song Sparrow race. However, I have yet to take an inexplicably heavy bird here during the autumn.

Many more weights from other seasons and localities are desired. Since the bulk of my birds were weighed during the migration seasons, it is impossible to follow even one species through its seasonal cycles. What reaction does the body weight of birds show as they undergo the moult? To what extent do birds store up energy in the form of fat in preparation for migration? Do nesting duties sufficiently tax a bird to affect its body weight? These and many other problems await the attention of the bird weigher. Every bird bander is a potential weigher, and with the thousands of birds which are being handled annually for banding, the field of weighing need not continue unexplored.

LITERATURE CITED

- EDSON, J. M.
1930. Recession in weight of nesting birds. *Condor*, **32**: 137-141.
- HOFFMAN, E. C.
1930. Weighings of the northern form of the Eastern Song Sparrow (*Melospiza m. melodia*). *Bird-banding*, **1**: 80-81.
- LINSDALE, JEAN M., AND SUMNER, E. L., SR.
1934. Winter weights of Golden-crowned and Fox Sparrows. *Condor*, **36**: 107-112.
- MYERS, EVERETT C.
1928. Taking body weights of birds. *Auk*, **45**: 334-338.
- TRAUTMAN, M. B.
1933. Ohio Bobwhite studies. In Wickliff, E. L., *Game Research in Ohio*. Trans. 19th Amer. Game Conference, 1932, pp. 355-358.
- WHITTLE, C. L.
1929. Recent Song Sparrow weighings. *Bull. Northeastern Birdbanding Assn.*, **5**: 152-154.

Leetonia, Ohio