WEIGHTS OF SOME SMALL BIRDS IN CENTRAL NEW YORK

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The wide range of birds, and their long migratory travels, as well as their rapid rate of metabolism, great diversity of food and their close contact with mankind make them an extremely important ecological factor. An understanding of these relationships and their importance depends in part upon a knowledge of their weights.

Considerable information already has been published on some species, and extensive studies have been carried on in some localities. The birds in the area around Syracuse, New York, however, have not been so studied. This study records information on weights of 68 species collected in the immediate vicinity of Syracuse. Over 1650 weights were recorded from living birds taken at a bird-banding station on the Syracuse University campus, and 800 additional weights were taken from fresh specimens shot in adjacent areas for various purposes. More than ten individuals for each of 16 species furnish most of the information on variability in this study.

METHODS

Live birds were removed from the traps three to five times daily. They were taken to the laboratory, which was within 100 feet, where they were banded immediately, wrapped in a small piece of cotton cloth, and their weights taken on a Chatillon spring balance which had a capacity of 500 grams and a sensitivity to ½ gram. The balance was equipped with a movable dial, and this was always set in the zero position with the cloth on the scales so that the weights of the birds could be read directly. Birds handled in this way were quiet during the weighing, and as the cloth was unrolled they were allowed to fly free. No known injuries resulted from this method of handling, and the fact that they returned readily indicates that they were not unduly frightened.

It is realized that the birds have varying amounts of food when weighed, but this is always true of wild-caught birds, and no attempt was made to account for it. Stevenson (1933) found that food averaged about 1.5 percent of the weight in similar species of birds. Care was exercised to exclude weights from specimens showing signs of abnormality such as sickness, injury, and excessive wetting. Baldwin and Kendeigh (1938), in their study of variation in bird weights, showed that the effect of the trap habit was negligible on weight. This agrees with the weights taken during this study. Therefore, all weights are included and repeated weights of the same individual treated the same as a single weight for each specimen.

There was more divergence in handling the killed specimens because of varied field conditions and lapse of time before weights could be taken. Cotton wads were placed in natural openings and shot wounds as soon as the specimens were taken, to prevent bleeding and contamination of the plumage. Birds were then placed separately in paper cones and carried in a field bag. Generally no more than six individuals were

taken on each trip. Weights were not taken from badly damaged specimens.

In this study all weights are recorded to the nearest gram and all averages are recorded to the nearest one-tenth of a gram.

WEIGHT DIFFERENCES BETWEEN DEAD AND LIVING SPECIMENS

Sufficient observations were made on ten species to compare the weights of dead and living specimens. Table 1 summarizes this information. The great amount of variation is due in part to the small numbers involved. In some cases the dead specimens actually weighed more than the living specimens of the same species. This is in keeping with what Baldwin and Kendeigh (1938) have shown, that "random weights may be obtained that are higher or lower than the average of any individual bird." The variations shown in Table 1 do not exceed the variations exhibited by individuals of the same species, as will be explained later.

TABLE 1

Differences in weight between dead and living specimens

Species	Living		Dead		Difference	% of Dead Weight
	No. of Records	Average Weight	No. of Records	Average Weight	Grams	
Northern Blue Jay	3	90.0	4	84.9	—5.1	6.0
Eastern Cowbird	18	48.6	7	44.9	—3.7	8.2
White-crowned Sparrow	39	31.5	2	32.2	+ .7	2.2
White-throated Sparrow	570	27.5	9	26.8	— .7	2.6
Slate-colored Junco	404	19.7	5	19.1	— .6	3.1
Eastern Song Sparrow	278	20.7	15	22.3	+1.6	7.2
Eastern Fox Sparrow	8	38.5	8	39.0	+ .5	1.3
English Sparrow	272	28.7	22	28.6	— .1	.3
White-breasted Nuthatch	3	21.7	9	20.6	—1.1	5.3
Black-capped Chickadee	3	11.0	11	11.4	+ .4	3.5

When all differences shown in Table 1 are combined on the basis of the minimum number compared in each species the average loss of weight per individual is 4.3 percent of the weight of the dead specimen. A much greater loss would be shown by specimens badly damaged during collection. On the basis of these findings the live weights of carefully and freshly collected specimens could be approximated by adding 4 percent to the dead weight. Four percent was added to the weights of dead specimens to make them comparable with the weights of living specimens in determining seasonal variation.

SEX DIFFERENCES IN WEIGHT

The species are grouped in Table 2 according to sex differences in weight. This table reveals that a considerable variation exists between species in this regard. Thus in one pair of eastern solitary sandpipers the female exceeded the weight of the male by 58 percent. The other extreme is shown in the weights of 16 eastern redwings in which the females average 37.3 percent less in weight than the males.

TABLE 2

Sex differences in weight

Group A. Sexes weigh approximately the same

Species	Males		Females		% Diff.
	No.	Average Weight	No.	Average Weight	
Northern Downy Woodpecker	7	26.6	2	26.3	1.1
Eastern Phoebe	1	21.4	1	21.1	1.4
Eastern Yellow Warbler	1	11.5	1	11.3	1.7

Group B. Males heavier than females

Killdeer	1	121.8	1	95.7	21.4
Eastern Hairy Woodpecker	2	74.7	3	70.5	5.6
Eastern Kingbird	2	40.3	1	36.7	8.9
Prairie Horned Lark	3	35.7	2	34.3	3.9
Northern Blue Jay	1	93.3	1	64.2	31.2
Eastern Crow	1	652.6	1	449.0	31.2
Starling	253	81.9	216	76.2	7.0
Eastern Cowbird	15	49.3	10	40.6	17.6
Eastern Redwing	16	65.9	5	41.3	37.3
Eastern Goldfinch	13	13.0	4	12.6	3.1
Eastern Tree Sparrow	6	20.6	1	19.2	6.8
Lincoln's Sparrow	1	17.8	1	16.5	7.3
Scarlet Tanager	1	30.0	1	20.0	33.3
English Sparrow	147	29.1	146	28.3	2.8
Catbird	5	45.3	3	40.8	9.9

Group C. Females heavier than males

Eastern Solitary Sandpiper	1	38.3	1	60.7	58.5
Spotted Sandpiper	1	46.3	3	48.6	5.0
Northern Flicker	2	121.8	1	131.1	7.6
White-breasted Nuthatch	2	19.6	2	20.6	5.1
Eastern Robin	11	84.6	7	86.9	2.7
Eastern Bluebird	8	31.6	4	33.5	6.0

Sex cannot be determined with certainty in species like the sparrows and thrushes without dissection; therefore banding operations do not furnish such information unless the sexes are noticeably different.

The grouping in Table 2 agrees fairly well with the findings of Baldwin and Kendeigh (1938). Observations on all the species are included, although the number of records for several species is too small to be more than an indication. It is probable that with larger numbers of observations the grouping of some of these species would change.

SEASONAL VARIATION IN WEIGHT

Banding operations were carried on during April, May, June, September, October and November. The majority of weights therefore were taken during the spring and fall migrations. With few exceptions the species whose principal diet was insects were heavier in the fall, and those whose principal food was seeds were heavier in the spring. There were some exceptions to this rule, but most of them were easily explained on the basis of few numbers of records. The English sparrow was an exception and also exceptional in its feeding habits. Its relative domestication may well explain why its weight does not conform to the pattern set by our native sparrows.

The eastern robin, eastern bluebird and eastern redwing were unexpectedly heavier in the spring although normally considered principally insect-eaters. These three species are the early arrivals in the spring and depart late in the fall. Robins sometimes stay all winter in protected areas. Perhaps this is good evidence that they depend considerably upon fruits and seeds and are able to increase their weight during the late fall and winter similar to the seed-eaters. This may also be one of the reasons they are among the first arrivals in the spring.

The following species were heavier in the fall:

Eastern hairy woodpecker	Swamp sparrow
Northern downy woodpecker	Eastern cardinal
Northern blue jay	Maryland yellowthroat
Starling	English sparrow
Eastern cowbird	Catbird
Bronzed grackle	White-breasted nuthatch
Eastern chipping sparrow	Black-capped chickadee

Those heavier in the spring were:

Eastern redwing	Eastern song sparrow
Eastern goldfinch	Scarlet tanager
White-crowned sparrow	Cedar waxwing
White-throated sparrow	Eastern robin
Eastern tree sparrow	Eastern bluebird
Slate-colored junco	

DAILY VARIATION IN WEIGHT BY SPECIES

Table 3 is a record of weights by the hour of day for seven species based upon 1600 records. The percentages are computed on the mean weight for the species, based on all records for that species and not

on just the individuals whose weight is recorded in the table. Too few weights were taken earlier than 8:00 A.M. or later than 8:00 P.M. to be included in the table. Birds start feeding much earlier than 8:00 A.M. in this area and continue to feed later than 8:00 P.M. Therefore more information is greatly to be desired for these periods.

The same changes in weight are shown that were found by Baldwin and Kendeigh (1938), Stewart (1937) and others. There is an increase during the morning hours until noon or a little after, then a leveling off or even a slight loss in weight, followed by another gain toward five to seven in the afternoon. The figures show a loss of weight during the night of 7 percent or more in some cases. It is believed that weights taken before feeding starts in the morning would show a greater loss of weight during the night, making the overnight loss at least 10 percent for the smaller birds. This would agree with the findings of Stewart *(l. c.)*.

DAILY VARIATION IN WEIGHT OF INDIVIDUAL BIRDS

The weights of two individuals from each of three species are presented in Table 4.

White-throated sparrow

Band Number 20-184703 was banded September 30 and recaptured 43 times to November 7.

Band Number 20-184742 was banded October 15 and recaptured 21 times to November 7.

Slate-colored junco

Band Number 48-55415 was banded September 26 and recaptured 34 times to November 7.

Band Number 21-21518 was banded April 28 and recaptured 37 times to May 20.

Eastern song sparrow

Band Number 50-80403 was banded April 4 and recaptured 21 times to April 30.

Band Number 50-80443 was banded April 21 and recaptured 25 times to May 14.

No change in average daily weight is shown by any of the six birds.

The maximum weight change within a 24-hour period for these three species is as follows:

White-throated sparrow	30.0%
Slate-colored junco	16.7%
Eastern song sparrow	20.0%

In each of the above cases the weights of the birds were normal thereafter. The greatest difference occurred between the 5:00 P.M. weighing and the 8:00 A.M. weighing. This difference probably would be greater if the morning weights were taken before any feeding had occurred. In each instance the bird concerned had been banded and had been recaptured from one to several times before the greatest change in weight occurred. Therefore the relatively light morning weight was not immediately following a night migratory flight.

Weight changes from 8:00 A.M. to 5:00 P.M. frequently varied from 5 to 20 percent, which makes the above maximums seem less spectacular. On this basis a 150-pound man would frequently vary from 7.5 to 30 pounds in body weight within nine hours or might even change in weight as much as 45 pounds in extreme cases. This certainly indicates that the physiological processes of birds differ widely from those of mankind.

TABLE 3

Average hourly weights by species

Species		Hour of Day												
		Forenoon					Afternoon							
		8	9	10	11	12	1	2	3	4	5	6	7	8
Eastern Cowbird	% of Av. Wt.	93.2	91.9				94.0			91.8				106.6
	Av. Wt.	45.3	44.3				45.7			44.6				51.8
White-crowned Sparrow	% of Av. Wt.	99.7	103.0	104.8		104.8	105.0	115.9		98.4		106.3		93.1
	Av. Wt.	31.4	32.5	33.0		33.0	33.2	36.5		31.0		33.5		29.3
White-throated Sparrow	% of Av. Wt.	96.7	93.5	109.5	100.7	104.7	102.9	102.2	103.6	102.2	100.4	110.2	111.6	104.4
	Av. Wt.	26.6	25.7	30.1	27.7	28.8	28.3	28.1	28.5	28.1	27.6	30.3	30.7	28.7
Eastern Chipping Sparrow	% of Av. Wt.	94.3		106.6			106.6				114.8			
	Av. Wt.	11.5		13.0			13.0				14.0			
Slate-colored Junco	% of Av. Wt.	101.0	100.5	103.0	103.0	106.0	104.1	102.0	98.5	101.0	92.4	105.6	105.6	95.4
	Av. Wt.	19.9	19.8	20.3	20.3	20.9	20.5	20.1	19.4	19.9	18.2	20.8	20.8	18.8
Eastern Song Sparrow	% of Av. Wt.	97.6	96.1	101.9	106.3	101.4	102.8	103.9	94.7	106.3	101.0	101.4	104.8	87.0
	Av. Wt.	20.2	19.9	21.1	22.0	21.0	21.3	21.5	19.6	22.0	20.9	21.0	21.7	18.0
English Sparrow	% of Av. Wt.	99.3	97.2	101.0	98.3	103.1	101.0	101.7	97.6	101.7	99.3	100.3		
	Av. Wt.	28.5	27.9	29.0	28.2	29.6	29.0	29.2	28.0	29.2	28.5	28.8		
Av. percentage (all species)		97.4	97.0	104.5	102.1	104.0	102.3	105.1	98.6	100.2	101.6	104.8	107.7	97.3*

*Some of these weights were taken after dark and loss in weight had begun.

TABLE 4

Daily weight variation in individuals

Specimen	Time of Day														
	Forenoon						Afternoon								
	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9
White-throated Sparrow															
Band #20-184703		20.4	20.8		21.0	22.0	22.0	21.5			22.0				
Band #20-184742		21.5	22.0		24.0	24.0		24.0			23.6				
Slate-colored Junco															
Band #48-55415		17.0	17.7			18.0	18.3	18.0	18.0		19.0		19.0		
Band #21-21518		18.9	20.0			21.7	18.5	19.0	20.0		20.8	20.5		18.0	
Eastern Song Sparrow															
Band #50-80403	18.0	18.0	18.5	20.5		19.0	19.3	19.5			19.0	19.0			
Band #50-80434	16.5	18.4	17.3	18.0		18.5	19.0		18.0		18.0	18.0		18.0	17.0

The greatest percentile change in weight is in the smaller birds. As the birds increase in size the percent of change diminishes.

Could this be in part a reflection of the ratio of surface exposed to body volume? Nice (1938) states "The smaller bird has a relatively larger surface than a larger bird and hence loses more heat than the other." Baldwin and Kendeigh (1938) mention that temperature and relative humidity must enter into this rapid change in weight. They found a direct correlation between relative humidity and weight and an inverse correlation between temperature and weight.

When one considers the respiratory system of birds and its direct relationship to all three of the above factors and realizes that all three of the factors operate independently and that they may all operate to supplement or to counteract each other as far as weight is concerned, the possibility of great change is evident. Taber (1938) concluded that the average daily food consumption was 15 or 16 percent of a bird's weight. This being the case, something in addition is needed to produce the greater changes in weight shown by these records.

We know that the metabolic rate is very high in birds and that the relative amounts of food consumed (15 or 16 percent of a bird's weight, according to Taber [1938]) also contribute to the weight change. Certainly the physiologist has a fertile field for further investigation.

SUMMARY

1. The relative weights of males and females differed in different species of birds. This study revealed that in some species the males averaged as much as 37.3 percent heavier than the females. In other species the females averaged as much as 36 percent heavier than the males and in still other species the sexes were nearly equal in weight.

2. Specimens killed (or shot) in the field averaged 4.3 percent lighter than living specimens of the same species.

3. With few exceptions the insectivorous species were heavier in the fall, while the seed-eating species were heaviest in the spring.

4. Birds increased in weight most rapidly during the morning hours. They then remained about the same weight or even lost some weight in the early afternoon, and this period was followed by another period of increase in the afternoon.

5. The greatest loss in weight occurred during the night. This loss probably averaged 10 percent or more for each species.

6. Individuals showed considerable daily variation in weight. The maximum weight change within 24 hours was 30 percent for the white-throated sparrow.

7. The greatest percentile change in weight was in the smaller birds. As the size of the bird increased the percentage of change decreased.

8. No noticeable effect on weight was shown by the development of the trap habit.

LITERATURE CITED

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GENERAL NOTES

A Criterion for Young-of-the-Year in the Blue Jay.—It is advantageous to distinguish young-of-the-year from adult birds in late summer and fall, but in species with no definite plumage differences between young and old, it soon becomes difficult, and although one may have a pretty good idea which are which, it is not good enough for the record.

At Mastic, Long Island, I trapped and banded 25 Blue Jays from July 4 to September 7, 1953. There were an adult and young together on July 4, two young on July 5. Though of the opinion that the 21 banded later were all young, I was not sure of the age of any of them.

A Blue Jay's bill is black or blackish, from the outside. They frequently open their mouths when being banded, and I was interested to note that the inside of the bill of one of the young, July 5, was white. Of two on August 8, one had the inside of the bill entirely white, the other white except for a large black blotch on the inside of the upper mandible; one on August 9 (No. 543-70811), white with considerable black. The last one in which it was noted as all white was on August 23; and a bird on September 6 had it white with black blotches.

The thought that white inside of bill, being replaced blotchingly by black, was characteristic of young Blue Jays of-the-year, had been formulated, when it was confirmed by the next Jay trapped, on October 28, at Garden City, Long Island. This had the inside of bill black with a couple of white marks. But it remained to check the hypothesis.

Four individuals taken at Garden City, respectively on February 19, May 8, 21, and June 19, 1954; as well as No. 543-70811 of August 9, 1953 (see above), trapped as a return at Mastic May 16, 1954, had the whole inside of the bill black.

Furthermore, five young birds trapped at Garden City July 2 to 20, had the whole inside of the bill white (bluish white in 4, greyish white in one). Incidentally, the entire mouth farther back was pink, in noticeable contrast with that of the four adults, February 19 to June 19, in which it had been mostly black. Finally, I trapped a young bird in Garden City on July 29 which had the inside of the bill bluish white except for a small lengthwise black spot on that of the upper mandible. But for this bill character I could only have guessed at its age.

My conclusion is that white (or black and white) on the inside of the bill of a Blue Jay is a criterion of a bird-of-the-year which lasts into the fall. It is tangible, not relative, and very easy to see.—J. T. Nichols, The American Museum of Natural History, Central Park West at 79th St., New York 24, N. Y.

Bluebirds Attracted by Peanut Hearts.—These are further observations along the line of the note "Bluebirds Lured to Ground Traps" in *Bird-Banding*, **25**: 112, 1954. The Bluebird *(Sialia sialis)* is listed as a permanent resident in this area. No Bluebird has been taken in ground traps by us, but on our home acre 3 have been trapped (and banded) in a 4-cell Potter type trap on feeding trays placed on posts 4 or 5 feet above the ground as follows:

Band No.	*Date Banded*	*Date Retrapped*
21-116596 F	Jan. 18, 1953	Feb. 1, 1953 June 27, 1953
21-116872 M	March 23, 1953	—
21-171196 I or F	Oct. 25, 1953	—