WEIGHT, WING LENGTH, AND FAT CLASS MEASUREMENTS OF LIVING TREE SPARROWS (SPIZELLA ARBOREA)

By Kenneth W. Prescott

During the winter season, November - April, over a seven year period (1966-1973), measurements of the weights, wing lengths, and visual fat of 600 living Tree Sparrows (Spizella arborea) were recorded at my Pennington, New Jersey station. From time to time, assistance was rendered by my sub-permittee Trudy Prescott, but approximately 99% of the measurements were made by me. Within 5-20 minutes after capture, weights of banded Tree Sparrows were taken on a Ohaus Harvard Trip Balance Scale (capacity two kg.) and recorded to the nearest one-tenth of a gram; wing chord lengths to the nearest half mm. were measured on a steel ruler with the wing loosely held against the right-angled base. Age of the fall birds were assigned based on the degree of ossification as determined "by eye" and, when questionable, examining the skull with a table lens (25X). These measurements are summarized in Tables Three, Five, Six and Seven.

The weights, means, and standard deviations for Tree Sparrows as recorded in the literature (Tables One, Two and Four) give a wide range of weights from the lightest individual(s) weighing 12.90 gms. to the heaviest at 25.1 gms. and of the mean weights which vary from 16.6 gms. to 22.00 gms.

TABLE ONE

Weights (gms.) of Tree Sparrows from the Literature

Source	Locality	Season	N	Range	Mean and S.D.
Amadon (1943)	Ohio	Winter	472	-	19.53
Baumgartner (1938)	New York	Winter	43	19.0 - 24.4	22.00
Baumgartner (1938)	Manitoba	Summer & Winter	455	15.0 - 22.7	19.05
Becker & Stack (1944)	Michigan	Summer & Winter	3	15.4 - 18.5	16.6
Broun (1933)	Mass.	Fall	2	17.0 - 17.8	17.4
Helms (1959)	Mass.	Spring	7 (pre-flight)	19.0 - 22.5	20.13 ± 1.20
Helms (1959)	Mass.	Spring	4 (post-flight)	17.9 - 20.0	18.98
Helms & Drury (1960)	Mass.	Winter	1,645	15.2 - 25.1	20.22 ± 1.56
Helms & Smythe (1969)	Penna.	Fall, Winter, Spring	60	-	18.88 ± 0.23
Heydweiller (1935)	Manitoba	Summer	5 (males)	-	17.30
Heydweiller (1935)	Manitoba	Summer	4 (female)	-	16.50
Nice (1938)	Ohio	Spring	5	17.3 - 20.8	18.4
Nice (1938)	Ohio	Winter	7	16.5 - 20.2	18.4
Stewart (1937)	Ohio	Winter	134	12.90-20.50	18.53
Weatherbee (1934)	Mass.	Winter	48	17.40-22.38	19.59
West & Peyton (1972)	So. Yukon Terr.	Spring	38 (male)	-	19.48 ± 1.37
West & Peyton (1972)	So. Yukon Terr.	Spring	3 (female)	-	17.20
Whittle (1926)	Mass.	Winter	12	18.00-24.50	21.04

Helms and Drury (1960:12) pointed out that the mean weights of their 1,645 Tree Sparrows (20.22 ± 1.56 gms.) were higher than other means which they reported from the literature because their sample included many mid-winter individuals at their "peak". Other mid-winter samples with high means are the Whittles' 12 Tree Sparrows which they recorded as having a mean weight of 21.04 gms. and Baumgartner's 43 birds with an even higher mean of 22.00 gms. (Table One). The mean weights for my January, 20.65 ± 1.609 gms., and February, 20.22 ± 1.505 gms. birds not only represent the heaviest monthly samples in my six month over-wintering period, but also contain the heaviest individuals (Table Three). The weights and visual fat recorded by Helms and Smythe (Table Four) similarly show mid-and late-winter high points. The several samples discussed here are not easily comparable, but the general trend described by Helms and Drury, and Helms and Smythe that weight and visual fat are highest in mid-winter and lowest in the fall and early spring seem to be substantiated by my measurements (Tables Three and Five).

TABLE TWO

Weights (gms.) of 642 Tree Sparrows and Visual Fat (West and Peyton, 1972)

N	Visual Fat	Mean and SD
196	little fat	17.55 ± 0.99
239	little to moderate fat	18.33 ± 1.04
167	moderate fat	19.02 ± 1.08
31	moderate to heavy fat	19.46 ± 1.06
9	heavy fat	20.16 ± 0.79

Over several years during late April and May, West and Peyton (Table Two) obtained weights and recorded "visible fat" according to five fat classes (1-little to 5-heavy) of 642 living Tree Sparrows. Although they found that body weights were chiefly influenced by size of bird and the amounts of material in the digestive tract, it was the amount of stored fat which represented by far the greatest determinent in body weights. Helms and Drury (1960:34-36) speculated that weight and fat increases in Tree Sparrows may occur several days prior, or even on the day preceding actual migration. Birds taken by them just prior to migration were significantly heavier than the mean half-month weight of Tree Sparrow weights for the same period and they hypothesized that both the Song (Melospiza melodia) and the Tree Sparrow show a pre-flight "preparation" by increases in weight and stored fat.

TABLE THREE

Mean Weights (gms.) of Over-Wintering Tree Sparrows

	Mean ± S.D.	Range	N
November	17.8 ± 1.741	15.1 - 21.9	23
December	19.4 ± 1.637	16.1 - 23.5	43
January	20.65 ± 1.609	16.1 - 26.7	170
February	20.22 ± 1.505	15.1 - 24.5	130
March	19.06 ± 1.439	15.3 - 22.9	171
April	19.38 ± 1.596	15.4 - 24.1	63

TABLE FOUR

Weights (gms.) and Visual Fat (0-5 scale) of 60 Tree Sparrows (Helms and Smythe, 1969)

Period	Visible Fat	Weight
Fall Migration	2.9	17.44 ± 0.26
Early Winter	2.7	17.94 ± 0.48
Mid-Winter	2.9	20.40 ± 0.43
Late Winter	3.2	19.55 ± 0.48
Spring Migration	2.8	19.15 ± 0.46

Based on the amount of visible fat in the furculum, my Tree Sparrows were graded into four fat categories: 0 - no fat, 1 - little fat, 2 - moderate fat, and 3 - heavy fat. Visual inspection of fat is relative classification highly subject to individual interpretation and one can expect an overlap of individuals within the arbitrarily assigned fat classes. For my 600 Tree Sparrows, Table Five gives the percentage of individuals by fat class (0-3) for each month of the over-wintering season. That 82.61% of recently arrived November Tree Sparrows were classified as not fat (0) would seem to fit the general concept that stored fat is used during migration; moreover, the November weights (Table Three) are significantly less than those of the other winter months. That approximately 60% of my April birds were rather evenly distributed in the lower (0-2) fat classes suggests that these individuals had not yet increased fat deposition in preparation for their northward migration. It is possible, although by no means demonstrable from these data, that the fat class 3 birds of April and those of late March were physiologically ready for migration while those of fat classes 0-2 were not.

TABLE FIVE

Visual Fat of Over-Wintering Tree Sparrows (HY and AHY)
Percentage of Individuals by Fat Class* for Each Month

	Fat Class*				
Month	0	1	2	3	N
November	82.61%	4.35%	13.04%	0	23
December	37.21	13.97	37.21	11.63	43
January	8.24	21.76	38.24	31.76	170
February	7.69	16.15	41.54	34.62	130
March	23.98	22.22	42.10	11.70	171
April	19.05	20.63	20.63	39.69	63
N	112	116	223	149	600

* 0 = no visible fat in furculum
1 = little " " " "
2 = moderate " " " "
3 = very much" " " "

TABLE SIX

Visual Fat of Tree Sparrows

Percentage of Individuals by Fat Class* for November and December

Month and Age Group	Fat Class* 0	1	2	3	N
November					
HY	100.00%	0	0	0	12
AHY	63.64	9.09%	27.27%	0	11
December					
HY	66.67	0	16.67	16.67	12
AHY	25.81	19.35	45.16	9.68	31

* 0 = no visible fat in furculum
1 = little " " " "
2 = moderate " " " "
3 = very much" " " "

My sample of November and December Tree Sparrows is regretably small, but it is noteworthy that all of the HY birds captured in November (Table Six) and approximately 67% of those measured in December were classified as having "0" fat. Although approximately 64% of the older, AHY, Tree Sparrows similarly had "0" fat, shortly after arrival in November, over 50% of those newly banded in December were of class "2" and "3" fat categories. The comparison of HY and AHY birds in November and December suggests that the younger Tree Sparrows arrive to the over-wintering grounds with less fat than adult Tree Sparrows and, perhaps, that the adult birds more readily build up depleted fat reserves after arrival. Moreover, HY Tree Sparrows trapped at Pennington were not as heavy as the adults (Table Seven).

TABLE SEVEN

Weights (gms.) of HY and AHY Over-Wintering Tree Sparrows

	HY	AHY	HY + AHY
Range	16.0 - 23.5	15.1 - 26.7	15.1 - 26.7
Median	17.5	19.8	19.8
Mean	17.97 $\pm$ 1.780	19.8 $\pm$ 1.658	19.7 $\pm$ 1.723
N	24	576	600

Although wing measurements are subject to wide variation, perhaps dependent more upon the measurer than the measured, my measurements of Tree Sparrow wings (chord) appear to be in agreement with those made by Weatherbee (1934:60-61), and Helms and Smythe (1969:285): Weatherbee, 70.75-81.25 mm, mean 75.69, N48; Prescott, 68.5-80.5 mm, mean 74.0 $\pm$ 2.722, N585; Helms, et al, ---, mean 76.0 $\pm$ 0.3, N60.

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