classed with the Mudhen and not even bagged in the 'old days'; also they never came in flocks but in small bunches of two and four".

Teal were listed without separating the Green-winged from the Cinnamon. The great majority, of course, were Green-winged, the Cinnamon, besides never being especially abundant in these marshes, having migrated south prior to the height of the hunting season. McAllister states that during one of the above years (about 1890) "Green-winged Teal were present in countless thousands — like clouds in the sky".

Under the column for "Remarks" are entered data concerning the weather, tides, abundance or scarcity of ducks, and observations such as follows: "Poachers shooting on Ibis and Cordelia by moonlight" (October 25, 1893). "Johnson says Cordelia Club, by moonlight shooting, have scared away the 'cans' from the marsh" (January 17, 1892). "Heavy fall of snow" (January 4, 1887). "Hot as Hades" (February 3, 1891). "Members should kill all the mudhens they can as they are great destroyers of feed. They eat three or four times as much as the ducks" (December 6, 1895).

Shore-birds were recorded, but these were not analysed inasmuch as the records show only indefinite identification, such as snipe, plover and curlew. Geese recorded during the period are 394 Snow Geese, 16 Canada, and 31 White-fronted; 8 swans were reported as killed, this species being legally taken as a game bird at that time.

Benicia, California, December 23, 1933.

WINTER WEIGHTS OF GOLDEN-CROWNED AND FOX SPARROWS

By JEAN M. LINSDALE and E. L. SUMNER, Sr.

During the 1932-1933 winter season, we gathered facts to supplement those already reported (Univ. Calif. Publ. Zool., 40, 1934, pp. 309-320) concerning variability in weight in the Golden-crowned Sparrow (*Zonotrichia coronata*). From September to May, inclusive, 1422 records of weight were obtained for this species. These involved 286 different birds, trapped and banded on the University of California Campus at Berkeley.

Weights of Fox Sparrows (*Passerella iliaca*) trapped along with the Golden-crowned Sparrows were studied also. In all, 711 records were obtained from 91 birds at Berkeley, during the 1932-1933 winter season. These birds were not identified as to sex or subspecies; they belonged, however, to the assemblage of races which nests along the coast of British Columbia and Alaska. Some study of variation in weight in Fox Sparrows has been made already (Univ. Calif. Publ. Zool., 30, 1928, pp. 309-315).

Table 1. Summary of weight records (in grams) of wild Golden-crowned Sparrows trapped at Berkeley, California, in the 1932-1933 winter.

	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May
Number weight records	2	19	201	50	55	310	542	228	15
Average weight in morning	29.35	27.89	28.53	28.27	30.50	28.34	28.41	30.44	33.33
Number birds	1	4	48	17	6	55	90	57	6
Average weight at noon		27.03	29.69	29.95	30.81	30.04	29.50	31.23	38.03
Number birds		4	39	9	20	46	79	26	5
Average weight in afternoon	29.30	29.55	29.77	30.06	31.82	30.32	30.85	31.70	.....
Number birds	1	9	38	19	21	53	77	28	.....
Average all weights	29.33	28.57	29.27	29.36	31.22	29.53	29.52	30.94	35.47
Minimum weight	29.30	22.65	23.00	24.40	27.10	11.95	21.15	22.10	29.10
Maximum weight	29.35	33.20	35.60	35.25	35.30	37.05	36.50	42.15	41.30

Table 1 was arranged primarily to determine if these records reveal any change in weight that can be correlated with advance in season. To counter-balance as much as possible the uneven representation of individuals and time of day, the average weight of every individual bird was computed for each month, and morning, noon,

and evening. These individual averages then were used to determine the values shown in the table. Each of the six series of weights shown may be examined for indications of seasonal trend in weight. Without considering September, which has only two records, there are two evident peaks, one in January and one in May. The latter is the most clearly marked, and it seems to represent beyond any doubt a distinct weight increase which comes just before the spring migration.

Another way to test the records for seasonal change in weight, is to trace the trend of a single bird. The twenty-two readings for one individual (no. C161330) from March 18, to May 9, indicate (table 2) a pronounced gain in the last part of April and in early May. Other examples show weight changes similar to those of this bird, but usually in lesser amounts.

Table 2. Weights of one Golden-crowned Sparrow (no. C161330) in the spring of 1933.

	9:00 a. m.	1:00 p. m.	5:30 p. m.		9:00 a. m.	1:00 p. m.	5:30 p. m.
Mar. 18	.....	29.95	.....	Apr. 1	.....	.....	28.10
Mar. 19	.....	27.95	28.50	Apr. 2	24.90	.....	.....
Mar. 20	25.50	.....	.....	Apr. 3	26.35	.....	27.95
Mar. 21	25.15	.....	27.90	Apr. 4	25.90	.....	.....
Mar. 22	.....	26.50	27.70	Apr. 23	.....	.....	32.20
Mar. 23	.....	26.30	26.20	May 3	29.59	.....	.....
Mar. 24	24.60	25.60	26.80	May 9	.....	36.85	.....
Mar. 31	.....	.....	28.50				

Table 3. Weights of a Golden-crowned Sparrow (no. C161233) recorded near 9:00 a. m. through the spring of 1933.

February		March		April		May	
day	grams	day	grams	day	grams	day	grams
8	29.25	1	26.95	3	28.80	3	30.80
15	29.10	4	27.15	19	30.60	4	30.80
16	28.55	5	27.25	21	28.90	10	31.55
19	27.20	6	27.65	22	29.70	12	32.20
20	27.05	8	28.15	23	29.00	15	34.05
22	28.20	14	27.95	24	29.00	....	.....
23	27.75	18	29.00	26	29.10	....	.....
25	28.20	20	28.30	28	29.75	....	.....
26	26.95	21	28.55	....	.....	....	.....
27	27.90	....	.....	....	.....	....	.....
28	28.65	....	.....	....	.....	....	.....
Av.	28.07	Av.	27.88	Av.	29.35	Av.	31.54

The long series of weights of a single bird, taken at the same hour each day, and shown in table 3, indicates relative uniformity of the day to day fluctuation, as compared with the seasonal change. Again, a sharp increase in weight just before the time for migration is evident.

From the weight records made by E. Lowell Sumner, Jr., in 1928, at Claremont, California, and supplied to us, nine Golden-crowned Sparrows in January averaged 30.56 grams (25.3 to 33.5), and eighteen in February averaged 29.78 grams (23.0 to 34.9). Out of twenty-four weights of Golden-crowned Sparrows, from his records for April 13 to 29, 1932, in San Mateo County, California, six were above 40 grams. The dates with the readings above 40 grams are as follows: April 13, 42.1; April 18, 40.5, 41.0, 41.3; April 25, 46.4; April 29, 41.0. The average for the twenty-four weights is 37.0 grams; extremes, 31.0 and 46.4.

Weights of Golden-crowned Sparrows close to, or on the breeding grounds in British Columbia have been given to us by Mr. and Mrs. T. T. McCabe. Five males taken in 1932, weighed as follows: May 15, 35.4 grams; May 29, 29.92 grams; June 17, 29.50, 33.07 and 36.18 grams. Average for the five is 32.81 grams. Records from the same source in 1933, were as follows: Three females from Bella Coola, April 29 and May 5, weighed 33.71, 34.88, and 36.50 grams; three from Calvert Island, May 16 to 19, weighed 28.73, 32.09, and 32.86 grams; average of all six, 33.13 grams. Seventeen males from Bella Coola, April 22 to May 3, averaged 34.95 grams, extremes 29.70 and 39.29. Three immature birds from Chezacut, September 16 to 28, weighed 29.10, 32.02, and 32.32 grams, average 31.14.

Table 4. Summary of weights (in grams) of Fox Sparrows trapped during winter of 1932-1933, at Berkeley.

	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May
Number weight records	7	33	108	26	46	270	163	48	10
Average weight in morning	32.73	31.46	32.58	33.82	31.97	31.49	30.55	33.12	35.73
Number birds	3	5	17	7	10	33	21	7	2
Average weight at noon	29.40	31.40	32.62	33.32	32.64	32.13	32.32	33.32	35.48
Number birds	1	8	20	5	15	34	16	4	2
Average weight in afternoon	32.95	32.72	32.93	34.45	34.47	32.41	32.97	34.04	35.78
Number birds	2	7	13	8	12	39	19	4	1
Average all weights	32.25	31.88	32.69	33.95	33.05	32.03	31.82	33.42	35.64
Minimum weight	29.40	27.80	26.15	28.80	26.85	25.25	21.70	27.65	31.25
Maximum weight	34.70	39.80	40.30	39.35	40.35	42.10	38.55	36.85	39.35

Turning to the Fox Sparrows, seasonal change in weight is again the main object in our study of the records. Table 4, was made up in the same way as table 1, and it shows that Fox Sparrows also fluctuated through the winter in weight averages. The first peak came earlier than in the Golden-crowned Sparrows, being in December rather than January. The highest monthly average was for May, but a distinct weight increase came in April just before the departure of the birds for their northern breeding grounds. These tables doubtless reflect the weight trends through the winter, for the two kinds of sparrows at Berkeley, but so many factors influence weight, that many individuals fail to conform to the normal program for their species.

We have selected two Fox Sparrows, whose individual records are numerous, and which, we *think,* but cannot demonstrate conclusively, represent fairly the normal weight changes for the species during the winter. Table 5 shows the mid-winter peak, and table 6 illustrates the late-spring increases which the averages for all the birds indicate.

Table 5. Weights of one Fox Sparrow (no. C102064) in the winter of 1932-1933.

	9:00 a. m.	1:00 p. m.	5:30 p. m.		9:00 a. m.	1:00 p. m.	5:30 p. m.
Nov. 6	.....	32.55	.....	Feb. 17	.....	29.40	.....
Nov. 7	.....	32.15	.....	Feb. 18	30.00	.....	30.95
Nov. 9	.....	.....	34.95	Feb. 19	.....	30.40	.....
Nov. 15	31.90	.....	.....	Feb. 20	29.45	29.70	29.75
Nov. 16	.....	33.20	.....	Feb. 21	.....	29.90	31.00
Nov. 21	30.30	.....	.....	Feb. 22	29.75	29.35	30.65
Nov. 22	.....	31.65	32.25	Feb. 23	.....	32.30	30.15
Nov. 23	31.15	.....	.....	Feb. 24	.....	29.30	29.65
Dec. 1	.....	.....	36.40	Feb. 25	.....	29.75	30.60
Dec. 2	32.05	.....	38.35	Feb. 26	28.45	30.45	29.10
Dec. 3	35.95	.....	.....	Feb. 27	.....	28.05	.....
Dec. 8	.....	.....	32.90	Feb. 28	28.20	28.60	28.60
Jan. 12	.....	38.00	.....	Mar. 1	28.10	28.15	.....
Jan. 14	.....	.....	37.55	Mar. 5	.....	.....	32.80
Feb. 6	.....	30.85	.....	Mar. 6	30.90	32.10	.....
Feb. 8	30.70	31.75	.....	Mar. 7	.....	31.00	31.50
Feb. 9	30.10	30.55	.....	Mar. 8	31.50	31.45	32.05
Feb. 10	29.00	.....	30.40	Mar. 9	.....	29.95	.....
Feb. 14	.....	29.95	30.75	Mar. 14	33.10	31.65	32.75
Feb. 16	30.35	.....	.....				

Table 6. Weights of one Fox Sparrow (no. C161318) in the spring of 1933.

	9:00 a. m.	1:00 p. m.	5:30 p. m.		9:00 a. m.	1:00 p. m.	5:30 p. m.
Mar. 19	.....	.....	35.90	Apr. 23	30.85	.....	.....
Mar. 23	31.45	.....	33.45	Apr. 24	31.50	.....	.....
Mar. 24	.....	31.55	31.45	Apr. 25	31.70	.....	.....
Mar. 29	.....	.....	32.05	Apr. 26	31.50	.....	.....
Mar. 30	29.40	29.25	.....	Apr. 27	32.65	.....	.....
Mar. 31	30.60	29.35	31.00	Apr. 28	32.10	.....	.....
Apr. 1	29.65	31.30	30.80	Apr. 30	31.10	.....	.....
Apr. 2	27.65	30.00	.....	May 1	31.30	.....	.....
Apr. 3	29.20	30.10	30.40	May 3	31.75	.....	.....
Apr. 4	29.45	30.40	31.40	May 4	31.25	.....	.....
Apr. 18	.....	32.50	33.50	May 9	.....	.....	36.30
Apr. 19	29.55	.....	.....	May 10	.....	36.00	.....
Apr. 20	31.85	.....	.....	May 11	.....	.....	35.25
Apr. 21	30.80	.....	.....	May 14	34.15	.....	.....
Apr. 22	30.95	.....	.....	May 15	.....	33.80	.....

Weights of Fox Sparrows obtained near the coast in British Columbia, by Mr. and Mrs. T. T. McCabe, have special interest, when compared with records made during early stages of the spring migration. Eleven males from Bella Coola, April

22 to May 2, 1933, ranged in weight from 33.05 to 42.35, average 36.82 grams. Weights of eight females from the same place, April 22 to May 9, ranged from 28.94 to 45.33, average 35.83 grams.

These figures, as well as the comparable ones for Golden-crowned Sparrows, bring the suggestion that the weight increase which comes just before the spring migration is maintained, in both species, throughout the actual migration. This tends to contradict the notion that the migration is an activity of more than ordinary exertion. However, we still believe that the migrating birds are subject to extraordinary strains and that if a high weight is actually kept, it results from an altered metabolism, and is made possible in spite of, or even to meet, the emergencies which surely accompany a long flight.

Table 1 also shows some evidence which helps to clarify our understanding of the change in weight which takes place in each bird during the day. Times of weighing the birds were principally clustered about the hours of 9 a. m., 1 p. m., and 5 p. m. In the winter months these hours fairly represented morning, noon, and evening, but, of course, some foraging was done by the birds before the morning weights were recorded. However, we think that the records serve satisfactorily to gauge the amount of correction of weights necessary to allow for differing time of day of capture, by field collectors, of birds of this type.

Fifty or more records were made for each month beginning with November and running through April. In each of these months, the average noon weight was greater than the average morning weight, and the average evening weight was greatest of the three. These values confirm those already determined for captive birds.

One golden-crown (no. C161122) weighed 34.65 grams at 5 p. m. on March 21. The next morning at 9 a. m. it was in the trap and weighed only 27.60 grams. It had lost 7.05 grams or 20 per cent of its weight the evening before. Its weight on four later mornings at the same hour was as follows: March 23, 28.40 grams; March 24, 27.50 grams; March 31, 29.45 grams; April 2, 29.60 grams. We interpret this record as meaning that the bird reëntered the trap on the evening of March 21, and that it had little or no food before its weight was taken the next morning. Also it apparently did not immediately regain its former weight.

The greatest loss of weight for a single individual as well as the minimum for any Golden-crowned Sparrow was recorded for no. A181228. This bird was first trapped on November 4, 1932, when it weighed 27.20 grams at 5:15 p. m. Its maximum weight, 32.05 grams, was recorded at 5:30 p. m. on January 18, 1933. On February 24, at the same hour it weighed 26.65 grams. At 9:30 a. m. on February 26, it weighed only 11.95 grams (reading checked three times) and was so emaciated that it obviously was dying. It was never recaptured. In forty hours this bird lost 55 per cent of its weight.

Table 7. Extremes and ranges of weights (in grams) of all Golden-crowned Sparrows trapped ten or more times.

		Minimum		Maximum		
Band No.	No. Records	Date	Weight	Date	Weight	Range
A181354	31	Apr. 4	27.50	May 3	33.45	5.95
A181228	18	Feb. 26	11.95	Jan. 18	32.05	20.10
A181224	29	Feb. 19	24.95	Mar. 6	33.15	8.20
C102031	18	Mar. 9	23.03	Nov. 5	28.90	5.60
C102043	16	Nov. 14	27.35	Jan. 9	32.55	5.25
C102019	13	Nov. 23	22.90	Nov. 6	25.80	2.90
C102048	11	Nov. 14	27.30	Mar. 29	34.05	6.75
C161001	22	Nov. 25	24.75	Dec. 2	28.80	4.05
C161182	21	Apr. 1	26.90	Feb. 21	31.90	5.00
C161152	20	Feb. 23	23.55	Feb. 8	32.85	9.30
A180823	18	Mar. 4	25.20	Mar. 30	31.10	5.90
A181217	26	Feb. 28	27.60	Feb. 20	33.30	5.70

C161037	18	Feb. 6	29.20	Apr. 18	39.60	10.40
C161060	25	Feb. 22	21.50	Feb. 2	30.10	8.60
C161080	62	Apr. 1	24.90	Mar. 18	30.25	5.35
C161095	34	Mar. 9	25.45	Feb. 16	30.55	5.10
C161120	52	Apr. 28	26.90	Feb. 15	34.35	7.45
C161122	21	Mar. 24	27.50	Mar. 14	34.65	7.15
C161129	20	Feb. 11	27.05	Feb. 14	35.20	8.15
C161124	22	Mar. 22	27.05	Mar. 18	33.95	6.90
C161117	12	Mar. 19	28.40	Nov. 29	34.05	5.65
C161203	11	Mar. 1	29.65	Apr. 18	36.05	6.40
C161205	13	Feb. 22	29.65	Mar. 19	35.25	5.60
C161207	10	Feb. 6	25.80	Jan. 14	31.25	5.45
C161226	33	Mar. 20	23.50	Mar. 17	28.50	5.00
C161227	12	Feb. 11	25.50	Mar. 22	29.15	3.65
C161232	18	Feb. 22	28.20	Mar. 29	35.75	7.55
C161233	43	Feb. 26	26.95	Mar. 8	38.15	11.20
C161242	27	Mar. 21	23.25	Mar. 30	36.20	12.95
C161298	11	Mar. 31	28.05	Mar. 29	32.20	4.15
C161306	18	Apr. 25	28.15	May 1	34.60	6.45
C161111	18	Mar. 19	22.20	Mar. 24	29.20	7.00
C161326	12	Apr. 4	26.15	Mar. 30	30.60	4.45
C161330	22	Mar. 24	24.60	May 9	36.85	12.25
C161333	24	Apr. 4	24.95	Mar. 18	30.30	5.35

Obviously, it is impossible to measure the complete seasonal change in weight for every individual trapped in the wild. Table 7 shows the minimum and maximum weights, the dates for those records and the range for each Golden-crowned Sparrow trapped ten or more times. These incomplete records for thirty-five birds show seasonal ranges in weight from 2.9 to 20.1 grams, averaging 7.05 grams. These amounts seem large in comparison with the small average range for one day. However, they help to emphasize that body weight is a widely variable character in these birds.

Table 8. Extremes and ranges of weights (in grams) of all Fox Sparrows trapped ten or more times.

		Minimum		Maximum		
Band No.	No. Records	Date	Weight	Date	Weight	Range
C102096	23	Mar. 24	30.00	May 1	39.35	9.35
A181364	19	Oct. 4	29.00	Mar. 1	35.40	6.40
A181359	20	Oct. 2	32.30	Feb. 17	36.90	4.60
A181358	17	Oct. 9	31.20	Nov. 22	37.35	6.15
C101970	53	Feb. 19	28.10	Nov. 6	36.10	8.00
C102064	66	Feb. 27	28.05	Dec. 2	38.35	10.30
C102097	38	Nov. 17	30.25	Mar. 30	38.00	7.75
C161005	10	Nov. 21	26.80	Nov. 9	35.10	8.30
C161048	21	Feb. 9	29.60	Feb. 4	36.80	7.20
C161186	13	Jan. 13	27.50	Jan. 17	32.85	5.35
C161049	11	Nov. 28	30.30	Dec. 8	33.75	3.45
C161044	17	Nov. 17	29.75	Mar. 7	38.45	8.70
C161191	17	Feb. 24	27.90	Feb. 10	35.60	7.70
C161192	16	Mar. 14	28.20	Mar. 7	36.15	7.95
C161213	21	Feb. 18	26.95	Mar. 14	34.40	7.45
C161221	10	Feb. 25	25.25	Feb. 3	31.70	6.45
C161206	11	Feb. 20	26.95	Feb. 14	34.60	7.65
C161235	39	Feb. 28	29.95	Mar. 29	37.20	7.25
C161064	16	Feb. 21	26.95	Feb. 15	40.80	13.85
C161259	10	Feb. 22	25.45	Feb. 17	30.65	5.20
C161262	24	Mar. 24	21.70	Mar. 17	27.85	6.15
C161318	43	Apr. 2	27.65	May 9	36.30	8.65

Table 8 shows for the twenty-two Fox Sparrows trapped more than ten times each, the extremes and dates of their recording. The individual seasonal ranges for these birds ran from 4.6 to 13.85 grams, average 7.49 grams.

The fact that maximum weights of individuals are not always in the seasons indicated in the earlier discussion as ones of high body-weight cannot be taken as

denial of the first implication. The individual birds are not represented by complete seasonal records. Certain individuals, also, failed to gain when the averages showed a high peak for the whole population.

The records we have studied affect our evaluation of single weight readings. We now believe that each reading should have with it locality, date, time of day, and, if possible, sex. Records without this accompanying information appear to us to have less value than we thought at first; records with it we consider of more value than we did formerly. That is, it has been impressed upon us again that weight of a bird is not a static quality but is one of continuous and ordered change.

The amount of fluctuation exhibited by individuals is great. The daily change seems to be much smaller than the normal seasonal change. The daily change is, obviously, mainly the result of the normal intake and outgo of food. The seasonal changes are, we think, mainly the result of the internal changes in the birds' metabolic activities which accompany the rhythm of the breeding cycle, including migration. But there is also weight change which is sometimes great and which comes from external influences. Possibly the early winter peaks in weights of the two species we have considered resulted from external factors favorable to the foraging or the nutrition of these kinds of birds.

The material contained in this report along with that in the two papers already cited appears to show the nature of the variations which occur in body-weight in the Golden-crowned and Fox sparrows. How generally the trends pointed out apply also to other kinds of birds we cannot say. However, analyses of weight in the House Finch (*Carpodacus mexicanus*) by Partin (Condor, 35, 1933, pp. 60-63) and of the Chaffinch (*Fringilla coelebs*) by Groebbels (Der Vogel, 1, 1932, pp. 636-637), where they are comparable, exhibit remarkably close parallels with the records of the birds we have studied. Other species in a different family studied by Groebbels (*loc. cit.*) show an entirely different type of seasonal rhythm in weight change. Thus it appears that records must be obtained for many more species before general conclusions may be drawn concerning variations in bird weights.

Summary.—Winter weight records (numbering 1422) for 286 Golden-crowned Sparrows and half as many (711) for 91 Fox Sparrows trapped at Berkeley in 1932-1933 show that both species reached one peak in weight in mid-winter and another, considerably higher one just before the spring migration. Supplementary records from other sources show the validity of the spring increase and indicate that high weight is maintained until arrival on the breeding grounds. The records confirm previous determinations that, on the average, weight increases during the day. Seasonal deviations in weight seem to be greater than other kinds which affect a single bird.

Museum of Vertebrate Zoology, Berkeley, California, January 19, 1934.

FROM FIELD AND STUDY

The Jay as a Benefactor of Man.—While on an afternoon hike on August 26, 1933, I flushed several groups of California Jays (*Aphelocoma californica*) at different points along my route from where they had been feeding on the ground in an extensive field near Benicia, Solano County, California. There were probably not less than forty birds feeding in this manner, and I suspect, judging from the size of the different assemblies, that they were various family groups still associated together.

Jays are usually found in the brush or heavy tree growth and do not ordinarily congregate in the open fields. It appeared that they were attracted to the fields by the abundance of grasshoppers, and in order to verify this assumption I collected