SENNETT, G. B. 1879. *Further notes on the ornithology of the lower Rio Grande of Texas, from observations made during the spring of* 1878. *Bull. U. S. Geol. and Geogr. Surv.*, **5**: 371-440.

SNYDER, T. E. 1948. *Our enemy the termite.* Comstock Pub. Co. Ithaca, N. Y., 257 pp.

STEIRLY, C. C. 1957. *Nesting ecology of the red-cockaded woodpecker in Virginia. Atlantic Naturalist* **12**(6): 280-292.

TURCEK, F. J. 1960. *On the damage by birds to power and communication lines. Bird Study*, **7**(4): 231-236.

John V. Dennis, Box 389, Leesburg, Virginia

Received January, 1964

WEIGHTS OF AUTUMN MIGRANTS FROM COASTAL NEW JERSEY

By BERTRAM G. MURRAY, JR., AND JOSEPH R. JEHL, JR.

Weights of birds are being analyzed with increasing frequency in migration studies. Such analyses, made in different areas in different conditions, can lead to a better understanding of migration. In this paper we report and discuss the weights of migrants captured in autumn at the Island Beach Operation Recovery Station in 1959, 1960, and 1961.

METHODS

The Operation Recovery Station is located at Island Beach State Park, Ocean County, New Jersey, on the southern end of a barrier beach peninsula that parallels the mainland. On the east is the Atlantic Ocean, and on the west is Barnegat Bay.

Birds were captured in mist-nets and taken to a central station where they were banded and weighed. The time elapsing between

[1]Scientific names of species mentioned are in Appendix 1.

TABLE 1. WEIGHTS (IN GRAMS) OF AUTUMN MIGRANTS FROM ISLAND BEACH, OCEAN COUNTY, NEW JERSEY

Species	Range	1959			1960			1961		
		No.	Mean	S. D.	No.	Mean	S. D.	No.	Mean	S. D.
Pigeon Hawk					1	179	—			
Sora					1	61.4	—			
Semipalmated Plover	32.2-69.1	2	62.6-64.5	—	4	45.3	—	5	54.5	—
Ruddy Turnstone								1	107	—
Spotted Sandpiper					1	28.0	—			
Solitary Sandpiper					1	37.8	—			
Lesser Yellowlegs								1	81.7	
Least Sandpiper	18.4-32.3	5	24.4	—	1	21.6	—			
Short-billed Dowitcher					1	70.1	—			
Semipalmated Sandpiper	19.8-41.3	43	27.4	4.2	44	28.0	4.3	15	30.3	2.3
Western Sandpiper	19.4-33.1	10	25.5	3.1	5	26.1	—			
Least Tern					1	31.1	—			
Yellow-billed Cuckoo	43.2-57.4				3	50.3	—			
Black-billed Cuckoo	34.7-40.0	5	37.1	—	19	39.7	5.9	1	37.4	—
Saw-whet Owl								1	89.6	
Common Nighthawk								1	81.0	
Ruby-throated Hummingbird	2.6-4.0	1	3.5	—	1	4.0	—	1	2.6	—
Belted Kingfisher	127-175	6	150	—	6	160	—	2	149-153	—
Yellow-shafted Flicker	112-153	2	114-122	—	23	130	12.4	1	123	—
Red-headed Woodpecker		1	66.4	—						
Yellow-bellied Sapsucker	40.5-50.1				7	45.8	—			
Downy Woodpecker	21.4-36.6	16	26.1	1.3	75	26.4	2.7	10	26.5	2.2
Eastern Kingbird	34.5-53.5	2	39.4-48.9	—	18	42.3	4.9	6	40.6	—
Great Crested Flycatcher	28.0-42.5	4	35.8	—	12	33.0	3.0	4	34.4	—
Eastern Phoebe	15.9-20.8				9	18.8	—			
Yellow-bellied Flycatcher	7.9-12.8	13	10.2	1.2				6	10.4	—
Eastern Wood Pewee	11.4-15.4	3	12.8	—	5	12.9	—	2	11.9-15.0	—
Olive-sided Flycatcher	32.0-34.4	2	32.0-34.4	—						
Tree Swallow	16.4-22.2	5	19.2	—	23	19.9	1.4			
Barn Swallow	17.0-19.8	6	18.7	—				1	19.6	—
Blue Jay	76.1-89.1				4	84.6	—			

TABLE 1. (Continued)

Species	Range	1959			1960			1961		
		No.	Mean	S. D.	No.	Mean	S. D.	No.	Mean	S. D.
Carolina Chickadee	9.6-10.4	3	10.2	—				1	9.6	—
White-breasted Nuthatch		1	18.0	—						
Red-breasted Nuthatch	8.0-12.7	2	9.5-10.5	—				310	9.8	0.7
Brown Creeper	6.5-9.8	5	7.3	—	170	7.7	0.6	2	7.7-8.0	—
House Wren	9.9-12.0	1	9.9	—	3	11.3	—	1	11.5	—
Carolina Wren	14.2-19.7				3	17.7	—			
Long-billed Marsh Wren					1	15.0				
Mockingbird	45.1-60.9	1	49.8	—	4	51.6	—			
Catbird	23.2-45.3	51	35.7	2.8	443	35.2	2.8	97	34.7	3.1
Brown Thrasher	51.9-75.4	11	63.9	6.6	60	66.0	2.9	7	61.7	—
Robin	64.8-84.2	1	74.2	—	32	69.8	5.4	16	76.8	3.3
Wood Thrush	42.7-52.0	1	42.7	—	7	48.9	—			
Swainson's Thrush	22.9-37.3	28	27.2	2.2	93	29.0	2.5	17	28.1	2.6
Gray-cheeked Thrush	23.9-35.3	3	26.9	—	25	29.3	2.9	4	25.6	—
Veery	24.1-38.9	9	31.2	—	35	30.0	2.9	13	30.3	2.4
Blue-gray Gnatcatcher	5.7-7.2				3	6.3	—			
Golden-crowned Kinglet	5.3-5.8				2	5.3-5.8	—			
Ruby-crowned Kinglet	4.5-7.5	2	5.6-7.5	—	66	5.8	0.6	1	5.8	—
Cedar Waxwing	22.9-37.2	13	30.1	1.1	38	28.9	3.3	6	32.1	—
Loggerhead Shrike					1	47.4	—			
White-eyed Vireo	10.7-12.4	7	11.9	—	5	11.6	—			
Bell's Vireo		1	10.2	—						
Yellow-throated Vireo		1	17.3	—						
Solitary Vireo	12.3-16.1	2	14.7-15.1	—	15	15.2	2.8			
Red-eyed Vireo	12.3-25.7	48	17.2	2.1	314	16.9	2.0	305	16.8	1.8
Philadelphia Vireo	8.9-15.2	12	11.1	1.0	20	11.2	1.4	21	11.2	1.3
Warbling Vireo	13.4-16.3	1	16.3	—	3	14.0	—			
Black-and-white Warbler	7.9-14.9	58	10.3	1.4	56	10.0	1.5	133	10.3	1.2
Prothonotary Warbler								1	17.8	—

TABLE 1. (Continued)

Species	Range	1959			1960			1961		
		No.	Mean	S. D.	No.	Mean	S. D.	No.	Mean	S. D.
Worm-eating Warbler					1	12.7	—			
Blue-winged Warbler	8.3-11.0	2	8.3-8.4	—	1	8.8	—	1	11.0	—
Tennessee Warbler	7.5-9.8	5	9.2	—	9	8.6	—	1	9.5	—
Nashville Warbler	6.1-9.3	9	7.6	—	26	7.6	0.7			
Parula Warbler	6.3-11.8	3	7.6	—	25	7.7	1.1			
Yellow Warbler	6.9-13.7	16	10.0	1.5	24	9.6	0.8	14	10.5	1.2
Magnolia Warbler	5.8-9.3	17	7.7	0.4	32	7.2	0.9	14	7.9	0.6
Cape May Warbler	7.8-15.2	23	9.6	0.7	77	9.7	1.5	57	9.4	1.4
Black-throated Blue Warbler	7.5-13.0	13	8.9	1.1	73	9.2	1.1	2	8.9-10.3	—
Myrtle Warbler	10.0-18.8	1	10.5	—	27	11.6	1.6			
Black-throated Green Warbler	6.5-11.5	4	7.9	—	17	8.6	1.1			
Blackburnian Warbler	7.3-10.3	3	8.2	—	3	8.9	—			
Chestnut-sided Warbler	8.0-11.5	2	9.2-9.3	—	7	9.0	—	5	9.5	—
Bay-breasted Warbler	9.3-13.4	2	10.5-13.4	—	12	10.8	0.8			
Blackpoll Warbler	8.5-22.1	15	11.6	1.9	120	13.1	3.1	8	12.0	—
Prairie Warbler	6.0-10.7	8	8.2	—	16	8.0	1.0	21	8.1	1.0
Palm Warbler	7.9-13.4	6	9.7	—	58	9.8	0.7	2	8.7-10.5	—
Ovenbird	14.8-26.3	11	18.1	2.2	40	19.1	2.4	10	18.3	2.4
Northern Waterthrush	13.1-24.6	44	17.3	2.0	70	16.5	2.2	20	17.9	2.4
Louisiana Waterthrush	22.0-23.3				1	22.0	—	1	23.3	—
Kentucky Warbler								1	12.1	—
Connecticut Warbler	10.9-20.3	10	13.1	1.5	17	14.0	2.4	2	11.8-14.0	—
Mourning Warbler	9.7-13.2	4	11.8	—	5	11.9	—	5	10.5	—
Yellowthroat	7.3-13.6	76	9.6	1.5	159	9.2	0.8	113	10.1	1.2
Yellow-breasted Chat	19.4-33.4	33	27.3	1.8	62	25.8	2.7	8	26.5	—
Hooded Warbler	8.0-10.1	2	8.0-9.7	—	1	10.1	—			
Wilson's Warbler	6.1-8.3	5	7.3	—	10	7.2	0.7	5	6.8	—
Canada Warbler	7.3-13.0	5	9.5	—	11	9.5	1.5	32	9.6	1.2
American Redstart	5.5-11.3	61	7.7	0.8	202	8.0	0.9	95	8.0	1.1
Bobolink	20.4-34.5	2	23.8-33.1	—	3	26.4	—	5	29.7	—
Redwinged Blackbird	39.5-65.7							5	49.6	—

TABLE 1. (Continued)

Species	Range	1959			1960			1961		
		No.	Mean	S. D.	No.	Mean	S. D.	No.	Mean	S. D.
Orchard Oriole								1	20.9	
Baltimore Oriole	25.6-47.2	35	34.2	3.7	165	34.0	4.3	35	34.5	3.2
Brown-headed Cowbird	38.1-44.3				4	40.9	—			
Scarlet Tanager	24.5-42.5	3	27.2	—	18	29.5	4.0			
Summer Tanager	27.0-29.1				1	27.0	—	1	29.1	—
Cardinal		1	41.1	—						
Rose-breasted Grosbeak	38.4-53.9	2	40.8-42.8	—	10	46.4	4.5	1	38.4	
Blue Grosbeak		1	27.5	—						
Indigo Bunting	12.2-17.3				5	15.1	—			
Dickcissel	25.0-29.5	1	27.2	—	2	25.0-29.5	—	1	29.2	—
Purple Finch	20.6-24.5	3	22.4	—						
American Goldfinch	11.8-13.3	4	12.3	—	1	12.8	—	1	13.3	—
Rufous-sided Towhee	31.4-47.5	30	39.0	3.6	86	39.1	2.6	5	38.8	—
Savannah Sparrow	14.8-19.9	4	17.2	—	11	17.6	1.4	1	16.7	—
Sharp-tailed Sparrow	17.6-19.3							2	17.6-19.3	—
Seaside Sparrow	17.7-23.3	1	17.7	—	3	20.8	—	2	23.1-23.3	
Lark Sparrow		1	27.1	—						
Slate-colored Junco	15.0-20.4	1	16.8	—	74	17.5	1.3			
Chipping Sparrow	9.7-14.0	1	11.7	—	6	11.6	—	4	11.8	—
Clay-colored Sparrow					1	10.9	—			
White-crowned Sparrow					1	26.9	—			
White-throated Sparrow	19.0-33.7				341	23.7	2.1			
Lincoln's Sparrow	15.0-19.7	1	19.7	—	4	15.5	—			
Swamp Sparrow	14.8-17.8	1	15.7	—	9	16.6	—			
Song Sparrow	16.4-24.9	44	20.7	3.2	54	20.3	1.4	17	19.6	1.3

TABLE 2. COMPARATIVE DATA

Species	This paper (1960 data only) No.	Mean	Tordoff and Mengel, 1956 No.	Mean	Graber and Graber, 1962 No.	Mean	Johnston and Haines (1957) No.	Mean	Woodford and Lovesy, 1958 No.	Mean	Connell, Odum and Kale, 1960 No.	Mean
Catbird	443	35.3	43	37.7	29	38.7	28	37.5	—	—	—	—
Swainson's Thrush	93	29.0	15	30.8	125	31.6	36	38.6	—	—	10 ♀	26.22
Gray-cheeked Thrush	25	29.3	—	—	57	32.4	34	40.2	—	—	—	—
Red-eyer Vireo	314	16.9	64	20.0	30	19.2	26	21.3	—	—	87 ♂	15.05
											91 ♀	14.55
Philadelphia Vireo	20	11.2	11	13.6	9	13.3	—	—	—	—	—	—
Black-and-white Warbler	56	10.0	3	10.8	8	10.8	24	11.4	4	11.4	—	—
Tennessee Warbler	9	8.6	4	10.8	15	10.1	28	11.3	6	11.4	11	7.94
Nashville Warbler	26	7.6	174	9.2	—	—	—	—	6	11.0	—	—
Magnolia Warbler	32	7.2	3	9.0	21	8.8	29	9.5	82	9.5	8	6.70
Bay-breasted Warbler	12	10.8	3	14.0	9	12.4	—	—	—	—	10	9.88
Black-throated Blue Warbler	73	9.2	3	13.1	—	—	—	—	3	11.1	16	7.64
Ovenbird	40	19.1	30	21.1	58	20.4	—	—	—	—	—	—
Mourning Warbler	5	11.9	93	12.9	—	—	—	—	18	13.6	—	—
Yellowthroat	159	9.2	167	11.1	15	11.8	27	10.4	16	11.0	—	—
Wilson's Warbler	10	7.2	3	7.9	—	—	—	—	21	8.1	—	—
American Redstart	202	8.0	1	9.1	19	8.4	31	8.4	14	8.3	—	—
Scarlet Tanager	18	29.5	—	—	4	32.2	—	—	—	—	28	23.52
Boblink	3	26.4	4	40.8	17	46.2	—	—	—	—	10 ♂	25.04
											16 ♀	22.92
Indigo Bunting	5	15.1	6	16.2	—	—	33	16.2	—	—	37 ♂	13.14
											18 ♀	12.46
White-throated Sparrow	341	23.7	—	—	—	—	—	—	—	—	9 ♂	22.75
											35 ♀	21.24
Lincoln's Sparrow	4	15.5	76	17.4	—	—	—	—	—	—	—	—

capture and weighing normally did not exceed one hour. Birds were weighed on Ohaus triple-beam balances that can be read to 0.1 gram. Several balances were often in use at the same time. When they were checked against each other for consistency, the maximum difference was 0.2 gram. While the number of balances in operation and the techniques of different banders varied, errors in weighing were probably few. This is indicated by the close agreement of average weights from year to year, in spite of changes in personnel and equipment.

The station was in operation from 29 August to 27 September 1959, from 25 August to 2 October 1960, and from 25 August to 29 October 1961.

RESULTS

Weight data are presented in Table 1. For each species number weighed, mean weight, and standard deviation (when number is ten or more) are given for each year. Range refers to the maximum and minimum weights recorded during the three year period.

Several species listed have breeding populations at Island Beach. Of these, Catbirds[1], Brown Thrashers, Yellowthroats, Rufous-sided Towhees, and Song Sparrows nest commonly; Downy Woodpeckers, Mockingbirds, Carolina Wrens, White-eyed Vireos, Cardinals, Goldfinches, Sharp-tailed, Seaside, and Swamp Sparrows breed in small numbers. A few other species that breed on the nearby mainland may breed on Island Beach, but in small numbers. Because it is usually impossible to distinguish resident individuals from migrants, all weights are included in the averages. However, most of the birds netted were migrants, and the inclusion of weights of residents probably does not affect the averages greatly. Very low weights among resident species could be of juveniles from late broods.

In Table 2 we have compared some of our data with those of (1) Tordoff and Mengel (1956), who reported weights of birds killed in autumn at a Kansas television tower, (2), Graber and Graber (1962), who reported weights of autumn migrants at an Illinois television tower, (3) Johnston and Haines (1957), who reported weights of autumn migrants killed at a ceilometer in Georgia; (4) Woodford and Lovesy (1958), who reported weights of mist-netted warblers in Canada in spring, and (5) Connell, Odum, and Kale (1960), who reported on fat-free weights of autumn migrants killed at a Florida television tower. The species compared are those for which most data are available; data from other species do not alter the general picture, and are not included, because samples were small.

For most species we do not have weights of birds of known age and sex; therefore, we limit our discussion to comparisons of average weights. To make these comparisons we have had to convert the data of Tordoff and Mengel (1956), Graber and Graber (1962, Johnston and Haines (1957), and Woodford and Lovesy (1958) to overall averages.

The samples were collected at different times of day. According to Carson (1954), the majority of Tordoff and Mengel's birds were killed between 0300 and 0400 hours. Graber and Graber's three major kills occurred at different times in different years. "In 1958, the kill of migrants occurred throughout the night, while in 1959 the peak kill probably occurred at about 0100, and in 1960, at 0500" (Graber and Graber, 1962, p. 78). The Georgia birds were killed during the night. The Canadian spring migrants were captured during the day at Pelee Island. Most of the Island Beach birds were captured in the morning.

Interpretation of Table 2 is made difficult by the timing problem, but three generalizations can be made: (1) *in all species* the lowest average weight occurs at Island Beach, (2) average weights from inland areas differ less among themselves than they do from average weights from Island Beach, in spite of differences in time of kill or capture, or differences in age and sex ratios, and (3) Island Beach birds average slightly above the fat-free weight.

We have observed that most birds at Island Beach have very little subcutaneous fat. This is in marked contrast to the findings of Tordoff and Mengel (1956), Johnston and Haines (1957), and Graber and Graber (1962, whose birds had considerable amounts of fat. Some of the Island Beach birds are lighter than the fat-free weight (Tables 1 and 2); only one species (Scarlet Tanager) did not have some individuals below fat-free weight.

Drury and Keith (1962) reported the ranges in weights of thirteen species of autumn migrants, captured in New England. These are compared with ranges of weights of Island Beach birds in Table 3. In general, Drury and Keith's maxima and minima are higher, but their ranges are wider in seven of thirteen species.

TABLE 3. COMPARISON OF WEIGHT RANGES OF ISLAND BEACH BIRDS WITH THOSE PRESENTED BY DRURY AND KEITH (1962)

Species	This paper	Drury and Keith (1962)
Catbird	23.2-45.3	30.4-48.8
Swainson's Thrush	22.9-37.3	23.4-41.0
Gray-cheeked Thrush	23.9-35.3	25.5-50.3
Red-eyed Vireo	12.3-25.7	15.1-24.8
Black-and-white Warbler	7.9-14.9	8.5-14.5
Myrtle Warbler	10.0-18.8	10.0-19.6
Blackpoll Warbler	8.5-22.1	10.0-23.4
Northern Waterthrush	13.1-24.6	14.2-24.7
American Redstart	5.5-11.3	7.1-11.9
Savannah Sparrow	14.8-19.9	14.6-27.0
Slate-colored Junco	15.0-20.4	14.6-26.7
White-throated Sparrow	19.0-33.7	17.3-37.3
Song Sparrow	16.4-24.9	14.5-28.0

DISCUSSION

The average weights of species captured at Island Beach in autumn are considerably lower than those of autumn television tower kills in Kansas, Illinois and Georgia, as well as those of mist-netted spring migrants in Ontario. Because weight differences between age and sex classes are small (Tordoff and Mengel, 1956, Johnston and Haines (1957), and Graber and Graber, 1962), differences in age and sex ratios at the several sampling areas cannot account for the differences in average weights. Even when 0.5 gram is added to the average weights of warbler-sized birds, and 1.0 gram to the average weights of thrush-sized birds (in order to allow, generously, for weight loss between capture and weighing), the average weights of Island Beach birds are lowest.

Because the Island Beach birds are lightest, we suggest that they have been flying longest. Most migrants arriving at Island Beach come in from over the ocean. While migrants over land are able to alight at dawn, migrants over the sea continue their flight after dawn. This results in additional weight loss. The overwater flight, following nocturnal flight, could account for (1) the generally low average weights of migrants at Island Beach, and (2) the occurrence of birds weighing less than fat-free weight. If the birds were landing at Island Beach at or before dawn, the average weights would be closer to those of birds killed at night.

Often, we have seen migrants arriving from over the ocean, but never have we seen any come in from the bay. We suspect that the two to four miles of water (Barnegat Bay) between the mainland and Island Beach diverts migrants that are over the mainland from flying toward Island Beach. We have observed that migrants are diverted from crossing Barnegat Bay from Island Beach to the mainland. This diversion-line accounts, in part, for the large concentrations of migrants at Island Beach.

Drury (1960) and Drury and Keith (1962) have stated that nocturnal migrants along the New England coast have large amounts of fat. Migrants along the New Jersey coast do not. Mean weights of migrants along the New England coast are unpublished. Because the ranges of weights along the New England coast differ slightly from ours (Table 3), we suspect that the average weights also differ slightly from ours, and that most migrants captured along the New England coast are light. In fact, the average weight of Blackpoll Warblers captured at Block Island, Rhode Island, is lower than average weights of Blackpolls captured at two inland stations in Massachusetts (Nisbet, Drury, and Baird, 1963).

SUMMARY

The weights of birds at the Island Beach Operation Recovery station are reported and compared with weight data from several other areas. The average weights of Island Beach migrants are lowest, and we suggest that the Island Beach migrants have been flying longer. Most migrants arriving at Island Beach come in from over the ocean. Thus, migrants at Island Beach are captured after a nocturnal and overwater flight.

ACKNOWLEDGEMENTS

We are indebted to Mrs. Stanley S. Dickerson, Mrs. Ben Warburton, and Mr. Albert Schnitzer, who directed the banding program at Island Beach, and who made the original information available to us. We are also indebted to the late F. I. Dewald, Chief, Forests and Parks Section, New Jersey State Department of Conservation and Economic Development, and John B. Verdier, Superintendent of Island Beach State Park, for their cooperation and assistance during the course of the program. We thank the many persons who assisted in gathering data: B. Adams, Mr. and Mrs. W. Bigger, J. Centa, Mr. and Mrs. T. Crebbs, P. Davis, Mr. and Mrs. S. S. Dickerson, J. Dickerson, E. Donelson, C. Ellenson, Mr. and Mrs. J. Frankenfield, F. Frazier, Sr., F. Frazier, Jr., R. French, R. Grant, G. Goldbeck, P. Hamer, S. Harty, F. Hornick, J. D. Jehl, J. R. Jehl, M.D., Mr. and Mrs. H. Kuch, Mr. and Mrs. J. Logan, M. Logue, T. Logue, G. Leubner, C. Lincoln, Mr. and Mrs. F. McCamey, the late B. Matlack and Mrs. B. Matlack, R. Margerum, M. Sears, J. Miller, Mr. and Mrs. C. Neel, A. North, Mr. and Mrs. W. Pepper, M. Pepper, C. Price, Jr., J. Richardson, R. Riesz, Mr. and Mrs. J. Schmid, Mr. and Mrs. B. Schaughency, Mr. and Mrs. A. Schnitzer, R. Sell, H. Straus, Mr. and Mrs. M. Townsend, the late B. Warburton and Mrs. B. Warburton, and C. Warburton.

During preparation of this paper we have had the assistance of Jeanne D. Jehl. We have also benefited from the criticism of H. B. Tordoff, who also generously allowed us the use of his original data.

LITERATURE CITED

CARSON, L. B. 1954. New records for fall migrants in eastern Kansas. *Kansas Orn. Soc. Bull.* **5**: 27-29.

CONNELL, C. E., E. P. ODUM, and H. KALE 1960. Fat-free weights of birds. *Auk,* **77**: 1-9.

DRURY, W. H., JR. 1960. Radar and bird migration—a second glance. *Mass. Aud.,* **44**: 173-178.

DRURY, W. H., JR., and J. A. KEITH. 1962. Radar studies of songbird migration in coastal New England. *Ibis,* **104**: 449-489.

GRABER, R. R., and J. W. GRABER. 1962. Weight characteristics of birds killed in nocturnal migration. *Wilson Bull.* **74**: 74-88.

JOHNSTON, D. W. and T. P. HAINES. 1957. Analysis of mass bird mortality in October, 1954. *Auk,* **74**: 447-458.

NISBET, I. C. T., W. H. DRURY, JR., and J. BAIRD. 1963. Weight-loss during migration. Part I: Deposition and consumption of fat by the Blackpoll Warbler *Dendroica striata. Bird-Banding,* **34**: 107-138.

TORDOFF, H. B., and R. M. MENGEL. 1956. Studies of birds killed in nocturnal migration. *Univ. Kansas Publ., Mus. Nat. Hist.,* **10**(1): 1-44.

WOODFORD, J., and F. T. LOVESY. 1958. Weights and measurements of wood warblers at Pelee Island. *Bird-Banding,* **29**: 109-110.

Appendix I. Scientific names of species mentioned in text. Pigeon Hawk (*Falco columbarius*), Sora (*Porzana carolina*), Semipalmated Plover (*Charadrius semipalmatus*), Ruddy Turnstone (*Arenaria interpres*), Spotted Sandpiper (*Actitis macularia*), Solitary Sandpiper (*Tringa solitaria*), Lesser Yellowlegs (*Totanus flavipes*), Least Sandpiper (*Erolia minutilla*), Short-billed Dowitcher (*Limnodromus griseus*), Semipalmated Sandpiper (*Ereunetes pusillus*), Western Sandpiper (*Ereunetes mauri*), Least Tern (*Sterna albifrons*), Yellow-billed Cuckoo (*Coccyzus*

americanus), Black-billed Cuckoo (*Coccyzus erythropthalmus*), Saw-whet Owl (*Aegolius acadicus*), Common Nighthawk (*Chordeiles minor*), Ruby-throated Humming bird (*Archilochus colubris*), Belted Kingfisher (*Megaceryle alcyon*), Yellow-shafted Flicker (*Colaptes auratus*), Red-headed Woodpecker (*Melanerpes erythrocephalus*), Yellow-bellied Sapsucker (*Sphyrapicus varius*), Downy Woodpecker (*Dendrocopos pubescens*), Eastern Kingbird (*Tyrannus tyrannus*), Great Crested Flycatcher (*Myiarchus crinitus*), Eastern Phoebe (*Sayornis phoebe*), Yellow-bellied Flycatcher (*Empidonax flaviventris*), Eastern Wood Pewee (*Contopus virens*), Olive-sided Flycatcher (*Nuttallornis borealis*), Tree Swallow (*Iridoprocne bicolor*), Barn Swallow (*Hirundo rustica*), Blue Jay (*Cyanocitta cristata*), Carolina Chickadee (*Parus carolinensis*), White-breasted Nuthatch (*Sitta carolinensis*), Red-breasted Nuthatch (*Sitta canadensis*), Brown Creeper (*Certhia familiaris*), House Wren (*Troglodytes aedon*), Carolina Wren (*Thryothorus ludovicianus*), Long-billed Marsh Wren (*Telmatodytes palustris*), Mockingbird (*Minus polyglottos*), Catbird (*Dumatella carolinensis*), Brown Thrasher (*Toxostoma rufum*), Robin (*Turdus migratorius*), Wood Thrush (*Hylocichla mustelina*), Swainson's Thrush (*Hylocichla ustulata*), Gray-cheeked Thrush (*Hylocichla minima*), Veery (*Hylocichla fuscescens*), Blue-gray Gnatcatcher (*Polioptila caerulea*), Golden-crowned Kinglet (*Regulus satrapa*), Ruby-crowned Kinglet (*Regulus calendula*), Cedar Waxwing (*Bombycilla cedrorum*), Loggerhead Shrike (*Lanius ludovicianus*), White-eyed Vireo (*Vireo griseus*), Bell's Vireo (*Vireo bellii*), Yellow-throated Vireo (*Vireo flavifrons*), Solitary Vireo (*Vireo solitarius*), Red-eyed Vireo (*Vireo olivaceus*), Philadelphia Vireo (*Vireo philadelphicus*), Warbling Vireo (*Vireo gilvus*), Black-and-white Warbler (*Mniotilta varia*), Prothonotary Warbler (*Protonotaria citrea*), Worm-eating Warbler (*Helmitheros vermivorus*), Blue-winged Warbler (*Vermivora pinus*), Tennessee Warbler (*Vermivora peregrina*), Nashville Warbler (*Vermivora ruficapilla*), Parula Warbler (*Parula americana*), Yellow Warbler (*Dendroica petechia*), Magnolia Warbler (*Dendroica magnolia*), Cape May Warbler (*Dendroica tigrina*), Black-throated Blue Warbler (*Dendroica caerulescens*), Myrtle Warbler (*Dendroica coronata*), Black-throated Green Warbler (*Dendroica virens*), Blackburnian Warbler (*Dendroica fusca*), Chestnut-sided Warbler (*Dendroica pensylvanica*), Bay-breasted Warbler (*Dendroica castanea*), Blackpoll Warbler (*Dendroica striata*), Prairie Warbler (*Dendroica discolor*), Palm Warbler ((*Dendroica palmarum*), Ovenbird (*Seiurus aurocapillus*), Northern Waterthrush (*Seiurus noveboracensis*), Louisiana Waterthrush (*Seiurus motacilla*), Kentucky Warbler (*Oporornis formosus*), Connecticut Warbler (*Oporonis agilis*), Mourning Warbler (*Oporornis philadelphia*), Yellowthroat (*Geothlypis trichas*), Yellow-breasted Chat (*Icteria virens*), Hooded Warbler (*Wilsonia citrina*), Wilson's Warbler (*Wilsonia pusilla*), Canada Warbler (*Wilsonia canadensis*), American Redstart (*Setophaga ruticilla*), Bobolink (*Dolichonyx oryzivorus*), Redwinged Blackbird (*Agelaius phoeniceus*), Orchard Oriole (*Icterus spurius*), Baltimore Oriole (*Icterus galbula*), Brown-headed Cowbird (*Molothrus ater*), Scarlet Tanager (*Piranga olivacea*), Summer Tanager (*Piranga rubra*), Cardinal (*Richmondena cardinalis*), Rose-breasted Grosbeak (*Pheucticus ludovicianus*), Blue Grosbeak (*Guiraca caerulea*), Indigo Bunting (*Passerina cyanea*), Dickcissel (*Spiza americana*), Purple Finch (*Carpodacus purpureus*), American Goldfinch (*Spinus tristis*), Rufous-sided Towhee (*Pipilo erythophthalmus*), Savannah Sparrow (*Passerculus sandwichensis*), Sharp-tailed Sparrow (*Ammospiza caudacuta*), Seaside Sparrow (*Ammospiza maritima*), Lark Sparrow (*Chondestes grammacus*), Slate-colored Junco (*Junco hyemalis*), Chipping Sparrow (*Spizella passerina*), Clay-colored Sparrow (*Spizella pallida*), White-crowned Sparrow (*Zonatrichia leucophrys*), White-throated Sparrow (*Zonotrichia albicollis*), Lincoln's Sparrow (*Melospiza lincolnii*), Swamp Sparrow (*Melospiza georgiana*), Song Sparrow (*Melopsiza melodia*).

The University of Michigan Museum of Zoology,
Ann Arbor, Michigan.

Received January, 1964