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Body composition and organ weights of the Verdin (*Auriparus flaviceps*)

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BODY COMPOSITION AND ORGAN WEIGHTS OF THE VERDIN (*AURIPARUS FLAVICEPS*)

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Studies of ecosystem energetics require a knowledge of inorganic and organic composition of the organisms present. At this time, too few data are available to generalize on the proportion of organic material in birds (but see Turcek, 1960). Lipid composition has been examined extensively, especially in connection with migration studies, but is generally unknown for birds on their breeding grounds (King et al., 1965; Zimmerman, 1965; Yarbrough, 1970). Water content is also known for several species, but few studies have dealt with protein, carbohydrate, or ash fractions (Turcek, 1960; Zimmerman, 1965).

Also of interest are organ weights. Heart and kidney weights have been examined in numerous species, but few weights are available for liver and lungs (Quiring and Bade, 1943; Oakeson, 1953; Quiring, 1962; Dunson, 1965).

While conducting research on the Verdin (*Auriparus flaviceps*), I had the opportunity to examine these factors in a number of birds collected by myself and others in Clark County, Nevada, where the species is a common permanent resident in areas dominated by woody legumes (*Prosopis juliflora*, *P. pubescens*, *Acacia greggii*).

Methods.—Spring birds were collected between 1 March and 5 April 1969 and summer birds on 10-11 August 1969. On collection, the birds were sealed individually in plastic bags and kept on ice until return from the field. Weight (to 0.01 g) was taken within five hours of collection. Spring birds were frozen two to four days, reweighed (weight loss less than one per cent), and the heart, liver, lungs, kidneys, and gonads were excised, trimmed, and blotted of excess tissues and moisture, and weighed to 0.1 mg. Weights of shot damaged organs were discarded.

After weighing, excised organs and trimmed tissues were replaced with the carcass. Stomach contents were removed and their weight subtracted from the original body weight. Carcasses were then subjected to one of two treatments: (1) dried to a constant weight in a vacuum oven (80 C) or (2) completely homogenized in a blender and divided into two or three aliquots which were weighed and dried to a constant weight. Weight change represents body water composition. Differences between the two treatments were insignificant ($P>0.9$ by t test). Those subjected to the latter treatment were analyzed for protein, lipid, and ash content. One aliquot was subjected to ethyl ether lipid extraction in a Soxhlet apparatus, one was analyzed for organic nitrogen by the Kjeldahl method, and one was burned in a furnace (500 C) to determine ash content. The

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difference between dry weight and the weights of protein, lipid, and ash was taken to be carbohydrate weight.

Summer birds were opened, sexed; stomach contents were removed and weighed; and the carcass was dried to a constant weight.

Results and Discussion.—Body composition and organ weight data are presented in Tables 1 and 2, respectively. Body composition data are within the ranges given by Zimmerman (1965) for nonmigrating Dickcissels (*Spiza americana*). Water composition is within the range given for several species (Turcek, 1960; Odum et al., 1964; Helms et al., 1967; Yarbrough, 1970). Lipid levels are also similar to those for birds on their breeding grounds (Zimmerman, 1965; Yarbrough, 1970). Ash content (12.8% of dry weight) approximates the 12% given by Turcek (1960). Total organic biomass was 30% of wet body weight and is within the range given by Turcek (1960). No sexual or seasonal differences were noted.

Body and organ weights were similar among the sexes. The greater weight of females was due to two birds with oviductal eggs (body weight = 8.7 g, 8.1 g). It is of interest that the livers of these two females were larger than any of the thirteen other livers (0.3157 g, 0.2927 g). Organ weights are comparable (as per cent body weight) to those given for small birds (Quiring and Bade, 1943; Hartman, 1955; Norris and Williamson, 1955; Quiring, 1962; Dunson, 1965; Johnson, 1968). Fresh kidney weights were less (by 27% than those given previously for a preserved sample of four Verdins (Johnson, 1968).

Table 1. Body composition of the Verdin.

Component	Spring Per Cent Wet Weight	Per Cent Dry Weight	N	Summer Per Cent Wet Weight	N
Water	66.9	—	16	68.0	13
Solids	33.1	—	16	32.0	13
Protein	24.5	72.3	11	—	—
Lipid	3.7	10.9	7	—	—
Ash	4.4	12.8	5	—	—
Carbohydrate	1.3	4.0	5	—	—

Table 2. Organ weights of the Verdin.

Organ	♂♂ Mean Weight	S.D.	% Body Weight	N	♀♀ Mean Weight	S.D.	% Body Weight	N
Kidney	0.0786	0.0224	1.19	10	0.0772	0.0292	1.05	5
Heart	0.1068	0.0088	1.64	11	0.0959	0.0094	1.31	5
Lungs	0.0895	0.0087	1.37	11	0.0832	0.0127	1.13	5
Liver	0.2106	0.0394	3.24	11	0.2707	0.0423	3.61	4
Left Testis	0.0238	0.0074	0.36	10	—	—	—	–
Right Testis	0.0155	0.0072	0.24	9	—	—	—	–
Ovary	—	—	—	–	0.0291	0.0236	0.39	4
Body Weight	6.51	0.32	—	11	7.34	0.99	—	5

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LITERATURE CITED

DUNSON, W. A. 1965. Adaptation of heart and lung weight to high altitude in the robin. Condor 67:215-219.

HARTMAN, F. A. 1955. Heart weight in birds. Condor 57:221-238.

HELMS, C. W., W. H. AUSSIKER, E. B. BOWER, AND S. D. FRETWELL. 1967. A biometric study of major body components of the slate-colored junco, *Junco hyemalis*. Condor 69:560-578.

JOHNSON, O. W. 1968. Some morphological features of avian kidneys. Auk 85:216-228.

KING, J. R., D. S. FARNER, AND M. L. MORTON. 1965. The lipid reserves of white-crowned sparrows on the breeding ground in central Alaska. Auk 82:236-252.

NORRIS, R. A., AND F. S. L. WILLIAMSON. 1955. Variation in relative heart size of certain passerines with increase in altitude. Wilson Bull. 67:78-83.

OAKESON, B. B. 1953. Cyclic changes in liver and spleen weights in migratory white-crowned sparrows. Condor 55:3-16.

ODUM, E. P., D. T. ROGERS, AND D. L. HICKS. 1964. Homeostasis of the nonfat components of migrating birds. Science 143:1037-1039.

QUIRING, D. P. 1962. Organ weights: birds, p. 422-425. *In* P. L. Altman and D. S. Dittmer [ed.], Growth. Washington, D.C., Fed. Amer. Soc. Exp. Biol.

QUIRING, D. P., AND P. H. BADE. 1943. Organ and gland weights of the English sparrow. Growth 7:299-307.

TURCEK, F. J. 1960. The proportions of plumage, organic matter, and water content in the bodies of some birds. Proc. XII Int. Ornithol. Congr.:724-729.

YARBROUGH, C. G. 1970. Summer lipid levels of some subarctic birds. Auk 87:100-110.

ZIMMERMAN, J. L. 1965. Carcass analysis of wild and thermal-stressed Dickcissels. Wilson Bull. 77:55-70.