

SIZE OF RED BLOOD CORPUSCLES AND THEIR NUCLEUS  
IN FIFTY NORTH AMERICAN BIRDS

BY PAUL BARTSCH, W. H. BALL, W. ROSENZWEIG AND S. SALMAN

NO ONE in America seems to have made a systematic comparative study of the measurements of the red blood corpuscles and their nucleus, and little research in this field has been done abroad. In order to make up for the deficiency, as far as American birds are concerned, the senior author assigned to three of his advanced students at The George Washington University, the problem of measuring the red blood corpuscles and their nucleus in fifty eastern North American birds.

In the preparation of the material for examination blood smears were made in the usual way by placing a drop from a freshly killed bird on one end of a slide and quickly drawing another slide at an oblique angle across this, effecting in this way a fairly even attenuated distribution of blood over the slide. The blood was next stained with Wright's stain, then twenty corpuscles and the nucleus of each were measured. It was deemed wise to have three students do this work, in order to check up on the question of personal error. For this reason the same microscope and equipment were used by all three in measuring. The measurements here given are in microns and they show for each species the general average only of the three students.

The range of measurements discovered in the length of the red blood corpuscles in the fifty birds examined, varies from 16.5, to the least, 6.0 microns; while the short diameter ranges from 10.0 to 4.0 microns. The long diameter of the nucleus varies from 7.87 to 3.1 microns, while its short diameter was found to range from 5.7 to 1.1 microns.

The largest cell was found in the Osprey, which yielded the length 16.5 microns, while the smallest length was observed in the Carolina Chickadee, which gave a length of 6.0 microns. The greatest diameter of the cell was found in the Osprey and the Red-headed Woodpecker, both of which gave a reading of 10.0 microns, while the Eastern Tree Sparrow yielded the least diameter, namely, 4.0 microns.

In the measurements of the nucleus the largest diameter fell to the Red-headed Woodpecker, which yielded 7.87 microns, while the shortest length of the nucleus fell to the White-breasted Nuthatch and the Yellow-throated Warbler, both registering 3.10 microns. The greatest diameter of the nucleus was registered by the Red-headed Woodpecker which gave 5.7 microns, while the least diameter of the nucleus fell to the White-breasted Nuthatch and the Eastern Hermit Thrush, both of which yielded 1.10 microns.

In taking these measurements, it should be stated that one has to be careful not to select for that purpose a partly tilted corpuscle, for the oval shape of these elements would be materially foreshortened by that procedure.

It is to be hoped that this initial enterprise, which embraced 12,000 measurements, may stimulate other observers to extend these observations.

The main literature on the subject is covered by the five citations listed at the end of this paper.

## MEASUREMENTS OF AVIAN RED BLOOD CORPUSCLES

	Blood cell, average length	Blood cell, average width	Nucleus, average length	Nucleus, average width
Eastern Red-tailed Hawk, <i>Buteo b. borealis</i> .....	13.49	6.58	5.85	2.48
Osprey, <i>Pandion haliaëtus carolinensis</i>	13.49	7.36	6.64	2.76
American Coot, <i>Fulica a. americana</i> ..	12.04	7.29	5.03	3.05
Barn Owl, <i>Tyto alba pratincola</i> .....	14.05	7.79	6.27	2.53
Red-bellied Woodpecker, <i>Centurus carolinus</i> .....	13.6	6.76	6.41	2.31
Red-headed Woodpecker, <i>Melanerpes erythrocephalus</i> .....	14.09	7.28	6.5	2.77
Eastern Hairy Woodpecker, <i>Dryobates v. villosus</i> .....	12.4	6.27	6.21	2.15
Northern Downy Woodpecker, <i>Dryobates pubescens medianus</i> .....	12.74	5.80	5.95	2.32
Northern Crested Flycatcher, <i>Myiarchus crinitus boreus</i> .....	11.31	6.72	5.21	2.34
Eastern Phoebe, <i>Sayornis phoebe</i> .....	10.78	5.82	4.99	2.18
Carolina Chickadee, <i>Penthestes c. carolinensis</i> .....	10.44	5.55	4.93	1.93
Tufted Titmouse, <i>Baeolophus bicolor</i> ..	10.74	5.89	5.32	1.95
White-breasted Nuthatch, <i>Sitta c. carolinensis</i> .....	11.30	5.76	5.24	2.09
Carolina Wren, <i>Thryothorus l. ludovicianus</i> .....	11.20	5.57	5.23	1.76
Eastern Mockingbird, <i>Mimus p. polyglottos</i> .....	10.98	6.15	4.88	2.12
Eastern Robin, <i>Turdus m. migratorius</i>	11.14	6.09	5.56	2.20
Eastern Hermit Thrush, <i>Hylocichla guttata faxoni</i> .....	11.88	5.55	5.68	2.08
Blue-gray Gnatcatcher, <i>Polioptila c. caerulea</i> .....	9.99	6.30	4.50	2.07
Eastern Golden-crowned Kinglet, <i>Regulus s. satrapa</i> .....	9.75	5.04	4.65	1.96
Eastern Ruby-crowned Kinglet, <i>Corithylio c. calendula</i> .....	10.23	5.31	4.80	2.30
Starling, <i>Sturnus v. vulgaris</i> .....	10.37	6.25	5.34	2.38

	Blood cell, average length	Blood cell, average width	Nucleus, average length	Nucleus, average width
Yellow-throated Vireo, <i>Vireo flavifrons</i>	11.20	6.32	5.30	2.23
Blue-headed Vireo, <i>Vireo s. solitarius</i>	11.20	6.07	5.18	2.34
Red-eyed Vireo, <i>Vireo olivaceus</i> .....	11.00	6.56	5.85	2.55
Black and White Warbler, <i>Mniotilta varia</i> .....	10.84	5.97	5.06	2.18
Worm-eating Warbler, <i>Helmitheros vermivorus</i> .....	11.25	6.08	5.42	2.33
Magnolia Warbler, <i>Dendroica magnolia</i>	10.93	6.26	5.21	2.39
Black-throated Blue Warbler, <i>Den- droica c. caerulescens</i> .....	11.26	6.26	5.36	2.62
Myrtle Warbler, <i>Dendroica coronata</i> ..	11.02	5.96	5.26	2.38
Black-throated Green Warbler, <i>Den- droica v. virens</i> .....	10.88	6.30	4.97	2.43
Blackburnian Warbler, <i>Dendroica fusca</i>	11.37	5.61	5.07	2.36
Yellow-throated Warbler, <i>Dendroica d. dominica</i> .....	11.14	6.11	5.28	2.43
Northern Pine Warbler, <i>Dendroica p. pinus</i> .....	9.7	5.86	4.81	2.45
Northern Prairie Warbler, <i>Dendroica d. discolor</i> .....	10.76	6.25	4.93	2.13
Oven-bird, <i>Seiurus aurocapillus</i> .....	11.68	5.48	5.26	2.45
Louisiana Water-thrush, <i>Seiurus mota- cilla</i> .....	11.70	6.04	5.55	2.36
Hooded Warbler, <i>Wilsonia citrina</i> ....	11.76	6.69	5.86	2.56
English Sparrow, <i>Passer d. domesticus</i>	11.29	5.56	5.43	2.30
Purple Grackle, <i>Quiscalus q. quiscula</i> ..	10.65	6.18	4.73	2.33
Scarlet Tanager, <i>Piranga erythromelas</i>	11.90	6.19	5.12	2.38
Eastern Cardinal, <i>Richmondena c. car- dinalis</i> .....	11.91	5.99	5.60	2.12
Red-eyed Towhee, <i>Pipilo e. erythroph- thalmus</i> .....	11.41	6.08	5.23	2.38
Slate-colored Junco, <i>Junco h. hyemalis</i>	11.65	5.89	5.51	2.33
Eastern Tree Sparrow, <i>Spizella a. arborea</i> .....	10.22	5.26	5.08	1.98
Eastern Chipping Sparrow, <i>Spizella p. passerina</i> .....	10.05	5.98	5.03	2.32
Eastern Field Sparrow, <i>Spizella p. pusilla</i> .....	11.33	5.89	5.33	2.20
White-throated Sparrow, <i>Zonotrichia albicollis</i> .....	11.68	5.11	5.54	2.09
Eastern Fox Sparrow, <i>Passerella i. iliaca</i> .....	11.25	6.19	5.69	2.22
Swamp Sparrow, <i>Melospiza georgiana</i>	10.88	5.90	5.11	2.43
Eastern Song Sparrow, <i>Melospiza m. melodia</i> .....	11.06	6.12	5.32	2.33

LITERATURE

BURTON, C. J.

1915. A comparison of the sizes of the red cells of some vertebrates. 84th Meeting, British Assoc. Adv. Sci., pp. 404-405.

CLELAND, J. B., AND JOHNSTON, T. H.

1911. Relative dimensions of the red blood cells of vertebrates, especially of birds. *Emu*, **11**: 188-197.

GROEBBELS, F.

1932. Die Blutelemente im postembryonalen Leben. *Der Vogel*, **1**: 111-117.

GULLIVER, G.

1875. Observations on the sizes and shapes of the red corpuscles of the blood of vertebrates. *Proc. Zool. Soc. London*, 1875, pp. 474-495.

MAGNAN, A.

1911. Recherches sur les dimensions des globules sanguins chez les oiseaux. *Comptes Rend. Soc. Biol., Paris*, **71**: pt. 2, 495-496.

*The George Washington University Zoological Laboratory  
Washington, D. C.*