

Nine interesting species are taken up in detail and their migration routes described and plotted. The extremes of direct and circuitous routes are exemplified by the Black-poll Warbler and the Cliff Swallow respectively. The two races of the Palm Warbler travel by wholly different routes to and from their winter homes. (The author, however, omits to state for the benefit of the general reader, that the Palm Warblers belong to two quite distinct subspecies). The migration line of the Eastern form is from northeast to southwest, while that of the Western race runs from northwest to southeast, the two lines crossing at right angles in Georgia.

The Connecticut Warbler on its southward flight in the fall follows a wholly different path from that by which it reached its breeding grounds in the spring. An elliptical route such as this is rare among land birds but is followed on a far larger scale by a number of water birds of which the Golden Plover is here taken as an example.

The greatest traveler of all is the Arctic Tern, which breeds in the Arctic regions and winters in the Antarctic, and in its annual wanderings between these two points must cover over 22,000 miles. The northward migration of the Robin is of interest as it keeps pace with the advance of spring, and the Robins of the Pacific side of the continent travel at a much more rapid rate than those of the Atlantic slope and the interior. A very narrow path from the United States to South America is followed by the Scarlet Tanager; while the Bobolink deserves special mention as it is extending its range towards the Pacific coast, thereby lengthening its route of migration.

Prof. Cooke also endeavors to trace the evolution of the present remarkable migration lines of the Golden Plover and maps the hypothetical routes of earlier times.— W. DeW. M.

Beal on the Food of Woodpeckers.¹— This paper gives the results of the stomach examination of 3500 woodpeckers, representing 22 species. The number of individuals of each kind examined ranges from one of the Gila Woodpecker and two of the Ivory-bill to 684 of the Flicker and 723 of the Downy Woodpecker.

The Red-headed, Hairy and Red-bellied Woodpeckers and the Yellow-bellied Sapsucker are each represented by more than 270 specimens. As the individuals of these six species were taken throughout the United States range of each, representing many subspecies, and in every month of the year, the material is ample on which to base conclusions as to their economic value. With most of the remaining species, while the results are less conclusive, at least the general character of their food is well shown.

In the genera of the *Melanerpes* group the percentage of vegetable food exceeds that of animal, in *Picoides* and *Dryobates* the animal food greatly

¹ Food of Woodpeckers of the United States. By F. E. L. Beal, Assistant, Biological Survey. Biological Survey Bull. No. 37. 8vo, pp. 64, with 6 colored plates and 3 text cuts. May 24, 1911.

exceeds the vegetable part of the diet. The Pileated Woodpecker, the Flickers and the Sapsuckers, with the possible exception of *S. thyroideus*, are more or less intermediate in this respect.

Ants constitute the largest item of animal food, taking all the species collectively, and are actually the largest item in eight species. The smallest numbers are consumed by the Three-toed Woodpeckers and the members of the *Melanerpes* group. Beetles rank next in importance, and these two items combined constitute nearly one-half of the total food.

The vegetable food consists almost wholly of fruit, cambium and mast. Cambium is eaten chiefly by the Sapsuckers, while beech nuts are an important article of diet with the Red-head, and acorns form more than half the food of the California Woodpecker.

Prof. Beal concludes that the Sapsuckers are the only injurious species of the family in the United States, their damage to timber due to their fondness for cambium and sap being extensive and serious. The two species of Three-toed Woodpeckers are of particular value in our northern forests for their destruction of wood-boring coleopterous larvæ. The Downy Woodpecker is also one of the most useful species, its only fault, shared by several other Woodpeckers, being the dissemination of the seeds of poison ivy and poison sumach.

Each of the two stomachs of the Ivory-billed Woodpecker examined contained many destructive wood-boring larvæ. As the author says: "These powerful birds are able to reach wood-boring grubs in places where smaller species fail, and their large bodies require a great quantity of such food"; and further: "When we see how much good this woodpecker is capable of doing as a guardian of the forest, it seems deplorable that it should be allowed to be exterminated. Wise legislation, backed by intelligent public opinion, may retard, if not absolutely prevent, the present destruction and allow the bird to regain something of its former abundance. There is plenty of room for this splendid species and much need of its services in the great southern forests."

Colored plates by Fuertes, illustrating seven species, add to the usefulness of this valuable report.—W. DeW. M.

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