

FORM OF EGG AND EXTENT OF MIGRATION

By CHARLES K. AVERILL

THE BLACKPOLL Warbler breeds far north in the Canadian and Hudsonian zones, and spends the winter in South America. The breeding range of the Yellow Warbler reaches north to the tree limit and extends across the continent; it winters from Yucatan to Peru. The Bay-breasted and Blackburnian warblers do not breed south of the Canadian Zone, and in winter reach South America. Other warblers of the same genus, *Dendroica*, winter within the limits of the United States, to some extent, as the Pine, Myrtle, Yellow Palm; or, as the Prairie and Black-throated Blue, do not go farther south than the West Indies. We can hardly doubt that there is a correlation between vigor and extent of migration. It would be of interest if some indication of relative vigor could be found. Fortunately, Coues' Key to North American Birds indicates that the vigor of a bird is expressed in the form of the egg. We read in the edition of 1884 (p. 224):

The short diameter corresponding to the calibre of the oviduct is less variable than the long axis; for when the quantity of food—yolk and white, upon which the difference in bulk depends, varies with the vigor of the individual, the scantiness or redundancy is expressed by shortening or lengthening of the whole mass.

From this it follows that the ratio of the long axis to the short axis is an indication of relative vigor of the female at the time of laying, which vigor we may with reason assume would be transmitted to the chick. I have extended this, tentatively, to the species, and placed the ratio of long diameter to short diameter opposite each species in tables of the warblers above-mentioned. Thus, the egg of the Blackpoll Warbler according to Ridgway measures $.72 \times .53$, which gives a ratio of 1.36; the egg of the Yellow Warbler, on the same authority, is $.66 \times .48$, ratio 1.36; Bay-breasted Warbler $.71 \times .51$, ratio 1.39; Blackburnian Warbler $.66 \times .49$, ratio 1.35. Average ratio of these long-distance travelers, 1.37.

In the same way and on the same authority the ratio for the Pine Warbler is 1.30, Myrtle Warbler 1.32, Prairie Warbler 1.34, Yellow Palm Warbler 1.29, Black-throated Blue Warbler 1.37. Average for these short-distance migrants 1.32.

If we use Chapman's figures for the same two groups of warblers, we have for the first group the average ratio of 1.36, for the second 1.31, a closely similar result.

From a similar table¹ of five western species of the same genus, *Dendroica*, whose migrations are short, none reaching South America in winter, I find the ratios given by Ridgway to be as follows: Audubon Warbler 1.30, Black-throated Gray 1.22, Townsend 1.22, Hermit 1.20, Golden-cheeked 1.36; average 1.26. The average given by Chapman for the same warblers is 1.32; either figure is below the average for the long-distance group (1.36).

It is useless to compare the eggs of species whose migrations do not differ greatly. In the following genera I have compared only the most northerly with the most southerly breeding bird, the northerly one in each case being the long-distance traveler. *Oporornis*: Connecticut Warbler 1.37, Kentucky

¹Extensive tables accompanied this article; but in the interests of economy in cost of publication, and with the author's permission, they are omitted.—EDITOR.

Warbler 1.28. *Seiurus*: Water-thrush 1.30, Louisiana Water-thrush 1.24. *Vireosylva*: Red-eyed Vireo 1.49, Warbling Vireo 1.37. *Lanivireo*: Solitary Vireo 1.44, Yellow-throated 1.35, Black-whiskered 1.34. In these tables I have combined the ratios from both Chapman's and Ridgway's figures.

According to Ridgway, the ratios for the following members of the genus *Icterus* arranged in order of their northerly distribution are as follows: Baltimore Oriole 1.48, Bullock Oriole 1.49 (these two are closely related species), Orchard 1.38, Scott 1.45, Audubon 1.37, Arizona Hooded 1.43.

In the genus *Vermivora*, the law cannot be made out from the figures available, either because exceptions are to be expected or because the eggs of the rarer species had not been taken often enough to obtain a fair average.

The Northern Shrike compared with the Loggerhead of the southern states shows about the same difference in form of egg as do the birds in the preceding tables.

It follows that the eggs of birds breeding in high latitudes will differ in shape from those of similar birds of southerly districts. Let us compare such "sparrows" of eastern North America as breed far north with some of the southerly ones. Savannah, White-crowned, White-throated, Lincoln, and Fox sparrows show a general average, according to Ridgway and Chapman, of 1.38. The southerly sparrows are the Grasshopper, Henslow, Sharp-tailed, Seaside, Pine Woods, and Bachman; general average 1.27. All these winter within the limits of the United States. For such fringilline birds as are southerly and pass into the tropics in winter, as the Blue Grosbeak, Indigo Bunting, Painted Bunting, Dickeissel, the average ratio is greater than that of the southerly sparrows, being about halfway between the northern and southern groups.

Passing from passerine birds we find a good opportunity in the herons, since the Great Blue Heron which is migratory has a closely related species, the Ward Heron, which is resident in the Gulf region. The ratio for the migrant bird is 1.66, for the southern bird 1.43. This ratio for the Great Blue Heron is much larger than that for any of our North American herons, thus corresponding with its much longer migration.

If we compare the eggs of the Dowitcher, Wilson Snipe, and Woodcock, three snipe whose migrations differ greatly in length, we find the ratios in the order named to be 1.46, 1.42, 1.32, using Ridgway's figures. From this comparison and from the tables of sparrows, we see that the law is general and that it is not necessary that the eggs compared should be of birds of the same genus. In the same way we find the eggs of the Golden, Black-bellied, and Semipalmated plovers to be more elongated than those of the Wilson, Piping, and Killdeer plovers.

It is not advisable to compare eggs of birds greatly different in size, as there is a law, also unnoted so far as I know, that the larger bird in the same genus or family, lays a more elongated egg than does the smaller. This becomes very evident when the birds differ greatly in size. Thus in the auks the ratio for the Great Auk is 1.60, Razor-billed Auk 1.63, while at the other end in point of size are the Black Guillemot (1.45) and the Dovekie (1.47). Among the grebes the Western Grebe and Holboell Grebe average 1.55 and 1.62, while the little Eared Grebe and the Pied-billed Grebe each average 1.44. Among Anatidae the ratio for the Trumpeter Swan is 1.54, Canada Goose 1.57,

Blue-winged Teal 1.37, Green-winged Teal 1.36, and so on through the herons, rails, tubinarines, vultures, grouse, owls, goatsuckers, ravens and crows, and thrushes, with equally well marked differences. The figures for these tables are taken from Ridgway.

I can do no more than record this law, no explanation of it occurring at the present time. To state that the caliber of the oviduct does not increase in proportion as the size of the bird increases, would only be putting it in another way. This law prevents us from comparing the eggs of some birds whose migrations differ in length, for it is the smaller bird generally, in the very longest journeys, that makes the longer migration (see Forest and Stream, October, 1922, p. 445); hence confusion in the results.

Returning to our first principle, the correlation of form of egg with extent of migration. It is obvious that it cannot be made out in such birds as swifts, swallows, terns, gulls, and others whose habits have fully developed their powers of flight independently of migration. That the ratio of length to short diameter indicates vigor in action appears to explain why, among passerine birds, the swallows' eggs are more elongated than others, why the swifts' and hummingbirds' eggs are notably elongated, for these are birds of unsurpassed volatile ability. The eggs of the diurnal birds of prey are more elongated than those of the softly flying owls, for the same reason. Among water-fowl, the expert divers that pursue fish under water, auks, loons, grebes and others, are distinguished from the ducks, geese, and swans by the elongate form of egg.

The eggs of owls are noted for their approach to the spherical form. It is in accordance with the two principles I have brought out that the closest approach to the sphere is found in the eggs of owls of smallest size and southerly distribution, namely, Elf Owl and Pigmy Owl.

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SOME GEOGRAPHICAL NOTES ON THE CACTUS WREN

By GRIFFING BANCROFT

THE STATUS of the Cactus Wren of the San Diegan district, as indicated in the literature, has long been unsatisfactory. Authorities disagree so widely that they offer us no less than four distinct definitions. Bailey (Handbook of Birds of the Western United States, 1921 ed., p. 548) refers the Cactus Wren of this district to the form *Heleodytes brunneicapillus bryanti*. The most generally accepted name is *H. b. couesi*; to quote authorities here would be to name the majority of those who have written on the subject.

Two expedients have been adopted to account for the manifest difference between some coast birds and the apparently homogeneous form that spreads over six American and four Mexican states. From specimens collected it is argued that *bryanti* and *couesi* nest in the same localities near San Diego, and that *bryanti* ranges sparingly through the district. On the other hand, there has been a growing sentiment, led by Dr. J. Grinnell, to disavow as *bryanti*