VARIATION IN NORTH AMERICAN RAVENS

BY GEORGE WILLETT

DURING several years past the writer has given considerable time to the study of the Raven (*Corvus corax*) as it occurs in North America. This work was undertaken in an effort to ascertain the number of geographical races and the limits of their ranges. Summation of the facts brought to light has been delayed in the hope that additional material from pertinent localities might be secured, but, as it seems unlikely that this hope will be realized in the very near future, it may be advisable to publish a short account of what has been learned, so that it may be available to other students in this field.

There are at least three factors that make the recognition of different races in *C. corax* difficult. First, because of sameness in color, only variability in size and proportion is useful in separating races. Second, individual variation in size in birds of the same region is so great that even a fairly large series of specimens obtained at random may be misleading. Third, we have little knowledge regarding migratory movements in the species, so that it is unsafe to assume that birds taken outside the breeding season are members of the breeding population where they are secured.

It has apparently been the custom of some authors to combine measurements secured from specimens of both adult and immature ravens, a method that is sure to result in erroneous conclusions. A bird may have assumed most of its adult plumage and still not have attained full size. All the birds used in this study are believed to be adult, having been separated from immatures by the shape of the tail-feathers. This selection resulted in decreasing greatly the number of specimens available for use, as it was found that most collections contain a large proportion of immature birds. A total of 120 specimens of adult birds has been used, admittedly far too few for satisfactory solution of some of the more complex problems involved. Gratitude is expressed to the following institutions and collectors for use of their specimens: Colorado Museum of Natural History, Donald R. Dickey Collection, Hancock Foundation, Los Angeles Museum, Museum of Vertebrate Zoology, Museum of Zoology (Ann Arbor), San Diego Natural History Museum, Louis B. Bishop, Ed. N. Harrison, Stanley G. Jewett, Robert T. Moore, J. R. Pemberton, Kenneth E. Stager and John G. Tyler.

Measurements used throughout this study, and believed to be the most important ones, are wing, culmen (from frontal feathers to tip), and depth of bill at nostril. Also, a character that appears good in differentiating between northern and southern birds is depth of tarsus (front to back) at its middle.

Results of computation of average measurements of various series of birds used here appear to indicate a large race (*principalis*), with heavy bill and tarsus, in Alaska and British Columbia; another large race (*sinuatus*), with slender bill and tarsus, in the Rocky Mountains and Great Basin region; and a small race (*clarionensis*) ranging from interior valleys of California to Clarion Island, Mexico. There seem to be intergradational areas between the two large races in northwestern United States, and in northeastern United States and Canada, and between large and small races in southeastern California and to a lesser extent on the islands off southern and Lower California and on the peninsula of Lower California itself. An examination of birds from these three last localities shows an extreme individual variation not found in specimens from any other region. No specimens of eastern birds from the southern part of the range of *C. corax* have been available, consequently nothing regarding their racial identity can be said here.

Following are *average* measurements in millimeters of series of specimens to be discussed (cul. = culmen from frontal feathers; d. b. = depth of bill at nostril; d. t. = tarsus from front to back at middle).

ALASKA AND BRITISH COLUMBIA (*C. c. principalis*)

8 males: wing, 438; cul., 77.45; d. b., 28; d. t., 11.5
4 females: wing, 433; cul., 73.7; d. b., 27.4; d. t., 11.2

ROCKY MOUNTAINS AND GREAT BASIN (*C. c. sinuatus*)

14 males: wing, 439; cul., 74.2; d. b., 24.3; d. t., 10.2
10 females: wing, 425; cul., 69.7; d. b., 23.4; d. t., 9.8

SAN JOAQUIN VALLEY, CALIFORNIA (1 male from Sacramento Valley)

7 males: wing, 403; cul., 66.5; d. b., 22.5
5 females: wing, 407; cul., 66.6; d. b., 21.7

SOUTHWESTERN CALIFORNIA

1 male: wing, 410; cul., 69; d. b., 22.6
2 females: wing, 399; cul., 66.6; d. b., 21.4

CLARION ISLAND (*C. c. clarionensis*)

6 males: wing, 410; cul., 71.8; d. b., 23.4
11 females: wing, 391; cul., 68.1; d. b., 22.3

ISLANDS OFF SOUTHERN AND LOWER CALIFORNIA

8 males: wing, 421; cul., 70.5; d. b., 23.9
12 females: wing, 404; cul., 67.3; d. b., 22.8

PENINSULA OF LOWER CALIFORNIA

12 males: wing, 421; cul., 69.7; d. b., 23.6
7 females: wing, 417; cul., 66.9; d. b., 22.5

From the first two lots of measurements it will be noted that the only substantial size differences between *principalis* and *sinuatus* are in depth of bill and depth of tarsus. Although the culmen in our northern birds averages longer, there is much overlapping in this character. A male and two females (D. R. Dickey Coll.) from Salvador have longer wings than the average Alaskan specimens, but the bills are more slender, averaging 25 millimeters in depth. Three males from New Brunswick (L. B. Bishop Coll.) average: wing, 431; cul., 74.9; d. b., 26.1. These birds (*europhilus* Oberholser) appear to be intergrades between *principalis* and *sinuatus,* somewhat nearer the former.

As preceding lists of measurements show, birds from the interior valleys of California and the Pacific slope of the southern part of that State are of about the same size as specimens from Clarion Island, Mexico (*clarionensis*), although bills of the Californian birds appear slightly smaller. Examples from territory intervening between southwestern California and Clarion Island average nearer to *clarionensis* than to *sinuatus,* though measurements of wing and depth of bill may indicate an approach toward the latter. Among twelve males from Lower California there is not a single specimen as large as average *sinuatus,* and in seven females, just one bird (El Rosario, San Diego Soc. Nat. Hist.), with measurements of 430, 70.4, 23.6, reaches that average. None of the twenty birds from islands off southern and Lower California is as large as average *sinuatus.* In the last two lots, however, seven birds out of 39 examined reach the minimum of *sinuatus,* and, if taken in the Rocky Mountain region, would undoubtedly be referred to that form without question. In this connection, it may be worthy of record that the two largest of the above seven birds are from the more northern islands of Santa Cruz and San Nicolas, and that both were taken during the winter months.

From the limited material at hand it is obviously impossible to tell how far down the coast the influence of *principalis* may extend. Two males, one from Marin County and the other from Mendocino County, California, average 422, 69 and 24.7 millimeters, a shorter wing than is found in any of our Rocky Mountain specimens and

with proportionately thicker bill, just about what might be expected in intergrades between *principalis* and *clarionensis*. Specimens of ravens from the coastal region of central California are apparently rare or absent in collections, consequently it has not been possible to determine how far north along our coast the smaller bird extends. One male example (Mus. Vert. Zool.) from Red Bluff, Sacramento Valley, measures 405, 66, 21.5 millimeters, which would appear to place it definitely with the small, southwestern bird.

Among seven birds from the California deserts, a region where intergradation between the small coastal birds and larger montane ones would be expected, are two males (Mojave and Riverside Mt.) that are typical *sinuatus*, one female (Mecca) close to typical *clarionensis*, and four variously intermediate between the two.

These facts appear to indicate that the ravens of the southwestern coastal district of the United States and the west coast of Mexico are smaller than *Corvus corax sinuatus* of the Rocky Mountain and Great Basin regions, and that they are not satisfactorily distinguishable from the bird of Clarion Island, Mexico, which has been called *C. c. clarionensis*. However, the series of specimens examined is admittedly small, perhaps inadequate, for study of a species that exhibits so much individual variation. The decision as to whether sufficient evidence has been presented here to call for inclusion of *Corvus corax clarionensis* in the A. O. U. 'Check-list' is left entirely to the Committee preparing that list. One recommendation is ventured, however, that if *clarionensis* is included, its vernacular name be 'Southwestern Raven,' rather than 'Clarion Island Raven,' so avoiding another addition to the present list of misnomers such as Farallon Rail, California Creeper and White-cheeked Goose.

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