ADDITIONAL DATA CONCERNING THE SUBSPECIFIC STATUS OF THE CORMORANTS OF GREAT SALT LAKE

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On a previous occasion (1936) the writer presented the data then available to him bearing on the subspecific status of the cormorants that breed on Egg Island, Great Salt Lake, Utah. Since then, Mendall (1936:114), in connection with an economic study of the eastern Double-crested Cormorant (*Phalacrocorax auritus auritus*), has reviewed the systematic problem of the Great Salt Lake birds, pointing out the need for still further data before the racial affinities of the birds could be unquestionably established. Mendall's comments pertaining to this are as follows: "Regarding the Utah birds, the stomach records, taken in 1915 and 1916, were published by Lewis [1929:70] under *P. a. auritus*, since the A.O.U. *Check-List* (third edition) recognized this subspecies as the breeding Cormorant of the state. The fourth edition of the *Check-List* (1931), however, substituted *P. a. albociliatus* for *P. a. auritus*. Dr. Alexander Wetmore, who took the Utah specimens, has informed me, in a letter of February 28, 1936, that these birds were at first tentatively identified as *P. a. auritus*, and the stomach contents were recorded under this name. The skins were later examined by Dr. Harry Oberholser who determined that they belonged to the subspecies *P. a. albociliatus*. Recently, the work of Behle (1936) indicates that *P. a. auritus* may be the form now found in this state, at least in one of the colonies. Six specimens, examined by him, were taken during the early part of the breeding season in 1935 at Egg Island, Great Salt Lake. Five of these birds showed traces of crests and in four of the crests black plumes predominated. It is, of course, difficult to distinguish between *P. a. auritus* and *P. a. albociliatus*, although the former is usually slightly larger and shows a predominance of black plumes in the crest—the plumes of *P. a. albociliatus* being mostly white. No measurements were given by Behle concerning his specimens."

In Mendall's further discussion the point was brought out that the Utah birds may constitute a group of intermediates between the eastern and western subspecies. It appears, however, that Mendall considered the Utah birds as being *albociliatus*, for he states (*op. cit.*, p. 14) that "Utah has long been included in the breeding range of *P. a. auritus*, and was so treated by Lewis. It now appears that *P. a. albociliatus* may have been the subspecies found in this region at that time, although some uncertainty exists regarding the present status of the Cormorants of this state as well as those of New Mexico." Again on page 115 he says that "data on the Utah birds, collected by Dr. Wetmore, are not given, as the specimens are no longer regarded as pertaining to *P. a. auritus*."

In Mendall's statements there is an implication that there may have been a change through the years in the subspecies of cormorants nesting in the region, that the Farallon Cormorant may once have been the breeding bird of the Great Salt Lake region but that now the Double-crested Cormorant is to be found nesting. I do not think that such is the case. Whatever the racial make-up of the Utah cormorants may be, the birds have probably been the same throughout the years. The difficulty lies simply in differences of opinion among systematists as to the birds' identity. That such is the case is understandable where there is a paucity of material upon which to base judgments.

Cormorants in times past have nested on Dolphin Island in Great Salt Lake and at Bear Lake in northeastern Utah and southeastern Idaho. There are records of nesting sites in recent years in Cache Valley in the northeastern part of the state. Also of late

a colony has become established on some artificial islands at the Bear River Migratory Bird Refuge. When Mendall makes the statement that *P. a. auritus* may be the form now found in the state, at least in one of the colonies, he implies that perhaps the Farallon Cormorant may also be a summer resident of the state. Peters (1931:86), shares that opinion for he includes Utah in the range of both the Farallon Cormorant and the Double-crested Cormorant. I can not conceive of there being more than one race breeding in Utah. The distribution of cormorants throughout the West is extremely discontinuous owing to the nature of the terrain and the birds' habitat requirements. The distributional area of the Utah population is more or less restricted and isolated from those elsewhere. It seems to me that the cormorants in all the Utah colonies both present and past would show the same combination of characters and have the same racial affinities.

In order to contribute further to the determination of the subspecific status of the cormorants of the Great Salt Lake region, I have for the last four years, as opportunity arose, visited the Egg Island colony, collecting a few breeding cormorants each year. Seventeen additional adult specimens have thus accumulated. With the specimens previously at hand, there are now available for study 26 cormorants that have been taken in the last decade from Egg Island. Of these, 16 are males and 10 are females. These specimens afford data both as to coloration of nuptial plumes and size. All 26 are considered in the ensuing discussion, thus including those previously reported on.

Concerning the 16 males, 6 lack nuptial plumes entirely. Of those with plumes, one individual has one black plume on each side. Another has 3 white plumes on one side and one black one on the other. Another specimen has 4 black plumes on each side. Yet another has about 10 plumes on the left side, all of which are black except one which has the basal half white. This same specimen has 5 plumes on the right side of which 4 are black. The fifth has its basal half white. The remaining 6 cormorants have conspicuous "crests" on both sides of the head. The plumes in these clusters number for the most part in excess of 20 and in every case all the feathers are black.

As to the females, 6 likewise lack nuptial plumes. The 4 with plumes all show conspicuous "crests." One possesses plumes that are black for the most part, but a few feathers show white at their bases and a few scattered white feathers appear on the neck. In a second female about one-fourth of the plumes on each side are white; the rest are black. This is the only bird of either sex with any appreciable amount of white in the crests. Even in this individual the black plumes predominate. The other two specimens have entirely black plumes.

In addition to these specimens, a partly decomposed bird was found at Egg Island on April 21, 1940. The head, which shows conspicuous black crests, was saved. Furthermore, while collecting specimens, we were continually watching for individuals bearing crests. At no time did we see any white on the head region of the birds.

Considering the Great Salt Lake birds as a whole, they constitute a more uniform lot as to plume color than series of Pacific Coast examples of the race *albociliatus* that I have examined. Many west-coast birds show distinctly bicolored crests, and I have gained the impression that Pacific Coast birds are less uniformly white than the Great Salt Lake birds are uniformly black in plume coloration. The data afforded as to plume coloration by this series of cormorants from Great Salt Lake indicates that they have closest affinities with the eastern race of Double-crested Cormorant, *P. a. auritus*. The presence of a small amount of white in the plumes of some individuals should not detract from this statement when one keeps in mind the seemingly greater variability in this respect of birds taken much closer to the metropolises of the eastern and western races.

In taking wing measurements I was surprised to find how nearly alike were cord length and length of flattened wing, especially in specimens whose wings had been sewed through so that they were held tightly to the body. Owing to different "makes" of skins encountered, I think the flattened wing measurement is a better indication of size than the cord and so have used this in the accompanying table. The Great Salt Lake birds that were measured are for the most part in the Museum of Zoology of the University of Utah. Specimens measured from other localities are either in the collections of the Museum of Vertebrate Zoology or the California Academy of Sciences. Although only two specimens of the eastern race were available for comparison, the measurements of these are similar to those given by others for eastern birds. Indications from the data in the accompanying table are that the Great Salt Lake birds are intermediate in size between eastern and western birds, being larger than *albociliatus* and smaller than *auritus*. No comparable series of females was available for comparison. The ten females from Great Salt Lake have an average flattened wing length of 312 mm., thus indicating considerable difference between sexes in this character. The tails of most specimens are badly frayed. Measurements of culmen and tarsal length do not seem to show significant differences.

Location	Number and sex	Average flattened wing length
Kodiak Island, Alaska	3 ♂ ♂	353 mm.
Vancouver Island, B.C.	2 ♂ ♂	346
San Francisco Bay Area	5 ♂ ♂	322
San Diego Bay Area	7 ♂ ♂	319
San Martín Island, L.C.	6 ♂ ♂	321
Salton Sea, California	5 ♂ ♂	332
Great Salt Lake, Utah	16 ♂ ♂	327
Minnesota	2 ♂ ♂	345

On the basis of size it would seem that the Great Salt Lake birds are intermediate between the eastern and western races. However, taking into consideration the data on plume color also, I feel that as far as nomenclature is concerned they should be referred to *Phalacrocorax auritus auritus*, the Double-crested Cormorant.

To summarize the variational trends within the species as to the geographically variable characters, it seems that on the west coast of North America the cormorants have nuptial plumes that are white or predominantly white. Birds from the northern part of the west coast are large, representing the culmination of this character. This combination of white plumes and large size has led to their being designated as the race *cincinatus*. A progressive trend to the southward involving decreasing size sets in, resulting in a smaller race along the California coast known as *albociliatus*. Birds as far south as Vancouver Island and off the Washington coast, although intermediate in size, have been placed with *cincinatus*. Apparently a hiatus exists southward for some distance along the coast where no cormorant colonies occur. Where they are again found they are closest to *albociliatus*. From the west coast to the east coast the trend is toward increase in size and black plume coloration. Birds from interior California, as at Buena Vista Lake, Kern County (see van Rossem, 1936:217) and Salton Sea, are intermediates. Both populations show considerable mixture of plume color but white predominates thus indicating closest affinities with the Farallon Cormorant. The Great Salt Lake birds are intermediate as to size but on the basis of plume color they show closest affinities to the Double-crested Cormorant of the east. The break comes between Great Salt Lake and the Salton Sea; it would be exceedingly interesting to know the situation existing at the Pyramid Lake colony in Nevada. The birds of the east coast, as men-

tioned, are characterized by black plumes, but again a north-south size trend is encountered. In the northeastern section of the country is the large race, *auritus*, whereas in the southeastern coastal area the small Florida race, *floridanus*, exists.

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