

The Tule Goose mystery —a problem in taxonomy

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MORE THAN FIFTY YEARS AGO, two scientists working at the University of California at Berkeley, were alerted by a Fish and Game official that an unusually large form of White-fronted Goose (or "Speckle-belly") had been noted in California by hunters during the winter months. This big bird hunters called the "Timber Goose" or "Tule Goose" because of its preference for the more remote marsh areas where ponds and sloughs were surrounded by tules and willows.

The Berkeley scientists, Harry S. Swarth and Harold C. Bryant, initiated an investigation, for it seemed incredible that such a goose could have remained unknown to science until the "late date" of 1917. With the help of a California Supreme Court judge and the aid of a professional hunter, Swarth and Bryant had 14 specimens collected of this impressive bird. Upon examination, they became convinced that the specimens were unique, and that what they were seeing was a subspecies of White-fronted Goose that had not been described. Swarth and Bryant published an account of their findings so that the scientific community would be alerted to the existence of the Tule Goose. They bestowed upon the bird the formal Latin name *Anser albifrons gumbelli*, designating it a subspecies of the common White-fronted Goose.

As much as in any other discipline, the power of science relies on the process of verification. For every scientist that describes some new object or phenomenon, there are others who will test and ultimately confirm or reject his results and conclusions.

After Swarth and Bryant published their findings other researchers began looking for the rare Tule Goose, described as having (1) a proportionately longer neck in addition to overall larger body size; (2) a plumage which was browner in overall coloration than the common form; (3) yellow instead of the usual

gray eye-ring; and (4) males as having 18 tail feathers, a unique characteristic since both sexes of White-fronted Geese usually have only 16 tail feathers.

IN 1918, ONLY ONE YEAR after Swarth and Bryant published their account an exception was noted. Alfred M. Bailey examined several specimens of White-fronted Geese taken at a hunting camp in Louisiana and found several birds of the smaller race with yellow eye-rings as well as gray—a finding which contradicted Swarth and Bryant's statement that the yellow was unique to the Tule Goose. Again in 1921 another contradiction arose when Bailey, this time working on the Arctic coast of Alaska near Wainwright, examined several breeding specimens of the smaller race which had seventeen and probably at one time eighteen tail feathers. Thus, another unique characteristic attributed to Tule Goose proved to be false.

Could it be that Swarth and Bryant were wrong? On the basis of Bailey's findings, some researchers conjectured that Tule Geese were not really members of a distinct subspecies after all, but instead merely represented a few large, old birds mistakenly identified as belonging to some new race. Surely this would explain why Tule Geese were so rare. Only a few individuals of the small race live long enough to grow large and fat! It was pointed out, too, that the breeding grounds of the Tule Goose had never been found. If Tule Geese were just large White-fronteds, the reason the breeding grounds had never been discovered became obvious. The breeding grounds, like the goose, didn't exist! The question remained conjectural for over half a century.

In light of this confusion over what Tule Geese look like and whether they even exist, I initiated a research project to investigate the question of whether there really is a Tule Goose. As a graduate student at the Univer-



White-fronted Geese including possible Tules.
 Photo/ John B. Cowan.

sity of California, Berkeley, the opportunity was made available to me by a local duck and goose hunt club which funded the study in the interests of conservation.

UNDER THE GUIDANCE OF my major professor, A. Starker Leopold, a "plan of attack" was discussed in which it was decided that a literature search first should be conducted to weed out fact from fiction regarding the supposed Tule Goose.

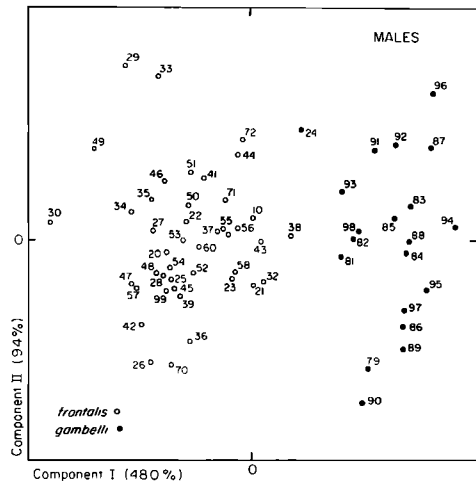
My next order of business was to visit the museum collections where I could make a direct examination of alleged Tule Goose specimens in relation to specimens of the common White-fronted. I took many measurements from each study skin in an effort to see whether the Tules were really distinct. But, if I didn't know whether Tule Geese really existed, how could I determine whether individual specimens belonged to one race or to the other? Fortunately, I didn't have to.

Within the field of systematics, there have recently been developed a series of classification aids, based on the capacity of a computer to simultaneously consider a large number of biological characters — a feat quite beyond the capacity of the human mind. This technique is called cluster analysis, in which groups of morphologically similar objects are clustered and separated if they are dissimilar. Cluster analysis makes it easier for the researcher who must decide how to categorize and classify his subjects. So, with the aid of a computer and a few mathematical clustering methods, all of the specimens of White-fronted Geese were sub-

jected to a classification scheme. If Tule Geese were not unique, they would group with the common White-fronteds; whereas if they were distinct, they would split from the main group. With all the measurements taken (16 from each specimen: 52 males and 49 females examined) the data were transcribed to punched cards, and computer-analyzed. The results: two groups! Based on all measurements analyzed simultaneously, the specimens labelled Tule Geese fell into one group, and the common White-fronteds fell into another (see figure 1).

THESE RESULTS, HOWEVER, could not serve as final proof of the existence of Tule Geese, for it might still be argued that members of the group were really just large White-fronteds. Closer examination of the museum specimens provided evidence against this argument. Of the 16 characters (body parts) examined, statistically significant differences were shown to exist between 15 of them. Yes, Swarth and Bryant had incorrectly identified eye-ring color and tail feather number as unique, but their conclusions regarding size and plumage coloration differences were correct.

Not wishing to base the total analysis on museum specimens alone, I designed a field study to verify that Tule Geese could still be found wintering in the Central Valley of Cali-



On the basis of 16 measurements treated simultaneously, adult male Tule Geese (*gambelli*) are unique from White-fronteds (*frontalis*). Females are similarly distinct.

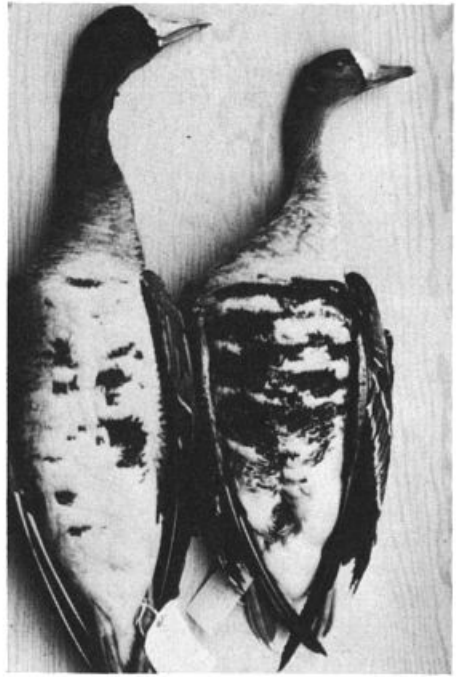
fornia. We chose the Sacramento National Wildlife Refuge for the study, since most recently reported sightings of Tule Geese came from that area.

Each Friday night I arrived at the Sacramento Refuge hunter check station where Fish and Game officials monitored the weekend waterfowl harvest by sportsmen.

With a cup of hot coffee, clipboard, and calipers for taking measurements, I ambled over to the check stand and waited. Depending on the success of the morning shoot, the first geese were brought in by hunters, anywhere from one to five hours after daylight.

As each hunter passed I checked his bag for White-fronted Geese. Each bird was carefully examined and its characters recorded. Several hours passed and several White-fronteds were checked through the station when a bird appeared which unmistakably resembled the specimens of Tule Geese that I had examined in the museums. In fact, as the weekends passed, my sample grew, of not only adult specimens, but also of immature males and females with characters clearly attributable to the Tule Goose. Certainly, the argument that Tule Geese were simply large, old birds was invalid.

THERE ARE OTHER PIECES of evidence also, that the Tule Goose is unique. Through field study it was determined that Tule Geese on the Sacramento Refuge flock together but apart from the common White-fronteds. Thus, they behave as a distinct population unit on their California wintering grounds. Also, it has become apparent that Tule Geese are unique to the Pacific Flyway. Measurements taken from geese in the Central Flyway are comparable only with the smaller western form of White-fronted. One of the most curious finds is that Tule Geese display on their forehead an orange feather stain which is probably acquired while they feed on aquatic vegetation somewhere in the muskgs of the northern breeding grounds. The usual absence of stain on the common White-fronted suggests that differences in feeding patterns exist. Field observations have already indicated that Tule Geese prefer to bottom-feed on aquatic vegetation, whereas the smaller form grazes primarily on



*Size comparison of Tule and White-fronted Geese.
Photo/ U.S.F. & W.S.*

grasses and sedges in wet meadows, or in grain stubbles.

No one knows yet where Tule Geese breed, but obviously they spend their summers somewhere in the vast expanses of the north. Therein lies the mystery of the Tule Goose. Thanks to the sponsorship by an interested hunt club, we now know that the Tule Goose *does exist*.

Some day soon, other biologists will study the Tule Goose and probably locate its breeding grounds. Once found, an estimate of its total population can be made. Perhaps an even more complete knowledge of their life history will be gained so that wildlife biologists can properly manage and insure the survival of these rare and beautiful birds.

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