

All the observed encounters between California Gulls and Herring Gulls or Ring-bills were purely hostile. The nesting Ring-bills, and all other Ring-bills on their own territories, reacted to the approach of a California Gull in much the same way that they reacted to the approach of other "dangerous" animals or potential predators, such as Herring Gulls or White Pelicans. (The California Gulls were the most inveterate egg-thieves on the island.) The mere approach of a California Gull was apparently enough to activate both the attack and escape drives of a territorial Ring-bill, usually stimulating both drives very strongly and the escape drive slightly more than the attack drive. The approached Ring-bill would usually show high-intensity hostile displays, most frequently the high-intensity display containing the relatively strongest escape element (see Moynihan, Behaviour, In Press, for a description of these displays). Only very rarely would a territorial Ring-bill make a brief and hesitant attack on an intruding California Gull. Ring-bills away from their territories usually avoided California Gulls by simple retreat. A few Ring-bills, apparently drawn by the sight of food, would sometimes approach a California Gull when the latter was eating stolen eggs; but the California Gull always attacked them immediately, and they were always forced to flee. The California Gulls usually ignored the Ring-bills in other circumstances. Similarly, the California Gulls and the Herring Gulls usually ignored one another. I did not observe any contacts between the incubating California Gulls and Herring Gulls in 1954. In 1955, however, I saw several disputes when a California Gull and a Herring Gull tried to steal the same egg. These disputes were quite as brief as the similar squabbles between California Gulls and Ring-bills; but in these circumstances it was the Herring Gull that attacked and the California Gull that fled.

It should be noted, incidentally, that some of the hostile displays of the California Gulls, relatively common during certain intra-specific disputes, were rather distinctive in physical form, differing from the homologous displays of both the Herring Gulls and the Ring-bills.

California Gulls have been observed in Manitoba on several previous occasions (I am grateful to Mr. A. G. Lawrence, of Winnipeg, for looking up these earlier reports); but I believe that this is the first authentic breeding record for the Province. In any case, the apparent absence of sexual or "friendly" social reactions between the California Gulls and Herring Gulls on Pelican Island would strongly suggest that the two forms are now separate species.—M. MOYNIHAN, *Museum of Comparative Zoology, Harvard University, Cambridge 38, Massachusetts.*

A Preliminary Study of Subspecies of Savannah Sparrows at the Savannah River Plant, South Carolina.—During January and February, 1955, an intensive study of population density and habitat selection of wintering fringillids in abandoned fields of the Atomic Energy Commission's Savannah River Plant, Aiken and Barnwell counties, S. C., was made as part of the University of Georgia's AEC-supported program of ecological studies directed by Dr. Eugene P. Odum. Winter fringillids are very important in the ecology of old fields since these birds together with certain rodents are the chief "harvesters" of seed crops which have been produced throughout the growing season. In these studies large numbers of birds were caught with Japanese mist nets, banded, and released. The Savannah Sparrow (*Passerculus sandwichensis*) was by far the most abundant species in fields now three years abandoned to cultivation.

On January 15 and 16 I obtained a sample of birds from three diverse types of Savannah Sparrow habitat to determine qualitatively the subspecific composition of the populations. Net operations were under the direction of Gordon Hight, Jr.

assisted by Chandler Robbins, Alfred Smalley, Henry Robert, J. B. Gentry, E. P. Odum, and the author. Several of the specimens obtained were birds accidentally killed, but most were selected from the banding cages so that the extremes of color and size would be represented in the sample. During the two-day period, 295 Savannah Sparrows were caught, 274 banded and released, and 21 prepared as study skins. Subspecific determinations of the latter have been made by Dr. John W. Aldrich, Fish and Wildlife Service, U. S. Department of the Interior, Washington, D. C.

Savannah Sparrows were taken and identified from three ecologically different areas as follows (all in Aiken county):

Area 3-412.—A large, level upland area of 150 acres consisting of a series of fields separated by roads and low dirt terraces located just north of the former town of Ellenton on the Sunderland Terrace of the upper Coastal Plain. The soil is Cahaba Loamy Sand, which has a dark grayish-brown topsoil and a reddish-yellow subsoil; it is considered one of the better agricultural soils of the region. Birds were sampled from 10 acres in the center of the area, which had been planted in cotton and corn in 1951 and since abandoned to cultivation for three growing seasons. In the fall and winter of 1954-1955 the standing crop of vegetation by weight consisted of 95 per cent forbs ($2\frac{1}{2}$ to 6 feet tall), chiefly *Haplopappus divaricatus*, *Heterotheca subaxillaris* and *Leptilon canadensis*, and 5 per cent grasses, largely *Sorghum halepense* and *Digitaria sanguinalis*. A total of 151 Savannah Sparrows were caught in this field, five specimens of which represented the following subspecies: *nevadensis* 1 ♂, 1 ♀; *oblitus* 1 ♀; *savanna* 2 ♂ ♂.

Field 3-409.—A 35-acre field bordered by pine woods and hedgerows, located about three miles northeast of area 3-412 on the rolling upland of the Aiken Plateau or Sandhill section (Barnwell Sand Formation) of the Upper Coastal Plain. The topography is gently rolling and the soil is Lakeland Sand, which has a light gray topsoil and a pale yellow sandy subsoil; it is a relatively sterile, very light-colored, sandy soil. Birds were sampled from five acres at one end of the field which was an abandoned watermelon field now three years fallow. The standing crop of vegetation by weight was approximately 50 per cent forbs ($2\frac{1}{2}$ feet or less in height), chiefly *Haplopappus*, *Heterotheca* and *Diodia teres*, and 50 per cent grasses, chiefly species of *Aristida* and *Leptoloma*. Small scattered bare patches of sand give the area a dune-like appearance. One hundred and twenty-four Savannah Sparrows were caught, and five subspecies were represented: *labradorius* 3 ♂ ♂, 1 ♀; *mediogriseus* 1 ♂, 2 ♀ ♀; *nevadensis* 1 ♂; *oblitus* 2 ♂ ♂; *savanna* 1 ♂.

Bay 3-3.—This was a small "Carolina Bay" with water in the center and concentric zones of vegetation and was located adjacent to area 3-412. We sampled birds from about five of the 25 acres along the moist periphery where grasses (*Panicum* and *Andropogon*) comprised a dense stand mixed with some blackberry bushes (*Rubus*). The soil is poorly drained with a dark upper layer and a blue clay subsoil as is characteristic of the "Bays." Only 20 Savannah Sparrows were caught here of which five specimens represented the following: *mediogriseus* 1 ♀; *nevadensis*, 1 ♂; *oblitus* 1 ♂, 2 ♀ ♀.

The sample of 21 specimens indicates that subspecies are not sharply segregated into different types of fields. One might expect *a priori* that the darker subspecies might select darker soil types with thicker vegetation and vice versa, but the data presented above indicate that both dark (*oblitus*) and light (*nevadensis*) subspecies are found on both dark and light soil types. Thus, while different species of fringillids

show marked differences in habitat selection in winter, as well as during the breeding season, this is apparently not true at the subspecific level in Savannah Sparrows. However, a larger sample might show that there was a quantitative segregation.

The fact that five distinct subspecies were found within a small area indicates that Savannah Sparrows wintering on the Savannah River Plant area may come from breeding areas which are geographically widely separated both north-south and east-west.

Finally, it is of interest to point out that the specimens of three of these subspecies, —*mediogriseus*, *nevadensis*, and *oblitus*,—constitute additions to the list of South Carolina birds because these forms are not listed by Sprunt and Chamberlain in *South Carolina Bird Life* (Univ. S. C. Press, 1949).—DAVID W. JOHNSTON, *Department of Biology, Mercer University, Macon, Georgia*.

Waterfowl Reaction to an Earthquake.—To have a group of wild creatures under observation at the moment of an earthquake is a rare opportunity. At 9:45 A.M., February 14, 1956, an earthquake with an intensity of 4 struck the Tokyo area. Its center was in Saitama Prefecture only about 15 miles north of the city. My two assistants and I were watching birds in the Shin Hama Imperial Duck Netting Grounds on the shore of Tokyo Bay at the eastern edge of the city. We were situated in small house blinds at the edge of a pond surrounded by a dense bamboo thicket. Before us and about us were several thousand birds including Teal (*Anas crecca*), Pochard (*Aythya ferina*), Tufted Duck (*Aythya fuligula*), Mallard (*Anas platyrhynchos*), Shoveller (*Spatula clypeata*), Wigeon (*Mareca penelope*), Spectacled Teal (*Anas formosa*), Common Cormorant (*Phalacrocorax carbo*), Black-crowned Night Heron (*Nycticorax nycticorax*), Snowy Egret (*Egretta garzetta*), Plumed Egret (*Egretta intermedia*), Gray Heron (*Ardea cinerea*), Turtle Dove (*Streptopelia orientalis*), Bull-headed Shrike (*Lanius bucephalus*), Tree Sparrows (*Passer montanus*), and Ashy Starling (*Sturnus cineraceus*).

The waterfowl were resting quietly on the water, either asleep or slowly paddling around. The herons and egrets were roosting in the bamboo. The other species were in the bamboo and about trees of nearby lawns. As it was mid-morning the amount of activity was reduced to a minimum.

I had been watching the ducks through peep-holes in the blind, had just stepped out, and was walking on a lawn behind the bamboo border of the pond. My assistant was still watching through a peep-hole.

Suddenly all of the ducks squawked loudly. I quickly scanned the sky for a Peregrine Falcon, and my assistant looked over the pond to see where the strike was to be made. Then the earth began to shake violently from side to side accompanied by a concussion-like change in air pressure. Trees before me swayed as if to be uprooted and I could hardly stand. The swaying lasted several seconds. The ducks had obviously heard or sensed the first shock before I did. Their initial squawk was similar to that given when a falcon swoops to attack. Immediately after this shock and as the earth began to rock, they rose from the water. About ten per cent remained on the water and all were swimming in one direction after the rocking started. It seemed to me that the waves of movement came from Tokyo Bay, and all of the ducks were headed in the opposite direction. The reverse may have been true, and they were orienting themselves to face the direction of shock, for the epicenter was northwest of us and the Bay south and east. Herons and egrets left the bamboo and the doves and passerines flew excitedly out of the refuge. The waterfowl and ardeids circled in the air above the refuge for a few minutes and then returned to the water and foliage.