second year or older—the evidence indicates that the hybrids obtained, and one observed, were not of a family group even though killed in areas about two miles apart during a 6-day period.

It is also important to consider the fact that the hybrids obtained were associated with approximately 10,000 Snow and Blue geese and 35,000 Canada Geese (mostly *B. c. hutchinsi*).

The frequency of such crosses in the wild is difficult to determine without more knowledge of the breeding habits of the two species and the extent to which breeding ranges overlap, as well as more detailed examinations of a larger number of geese.

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BIRDS ON THE GULF OF MEXICO

BY GEORGE G. WILLIAMS

It was long assumed that birds seen over the Gulf of Mexico in spring were making a trans-Gulf migration. I tried to show (Williams, 1945, 1947, 1950b) that evidence indicates that the spring migrations normally pass around the Gulf of Mexico, not across it, and that large numbers of birds seen over the Gulf in spring have been driven there by adverse weather.

Bullis and Lincoln (1952) described a heavy concentration of land birds observed from the U. S. Fish and Wildlife Service's *M/V OREGON* 60 miles off the Louisiana coast, from 9 o'clock till dawn on the night of April 6–7, 1951. They stated (p. 37) "In the opinion of the authors the observations recorded here provide definite evidence of a heavy trans-Gulf migration between the Yucatán Peninsula and the coast of Louisiana."

These authors have omitted so many pertinent data that their observation deserves re-examination and re-interpretation.

1. Among other birds captured on the *OREGON* was a Vermilion Flycatcher, *Pyrocephalus rubinus*. This species breeds in the United States far to the west of where it was captured, and it would have no reason for making a trans-Gulf flight to Louisiana. A few scattered individuals, however, winter along the coasts of Texas and Louisiana. It would seem likely, therefore, that the individual captured on the *OREGON* came from north or west of its point of capture, and that it was not migrating across the Gulf.

2. Purple Martins (*Progne subis*), Tree Swallows (*Iridoprocne bicolor*), and another species of swallow were observed on or about the

boat that night. But all our swallows are normally *daytime* migrants (Lincoln, 1950: 16). Thus it seems doubtful whether any of these swallows seen late at night over the sea were migrating normally.

3. They also state (pp. 35–36) "Owing to . . . the criss-cross movement of the birds, it was difficult to obtain a true bearing on the direction of flight, but the whole movement was in north-northwesterly direction." Moreover, "The flight was so dense that it is difficult to see how an application of the technique described by Lowery in his lunar studies of bird migration could have been applied" (p. 37). Finally, there is a notation on page 35 about ". . . the din caused by the continuous peeps of the smaller birds" and the quacking of ducks. All this suggests a multitude of birds lost or confused. It does not suggest a normal, orderly migration.

4. Bullis and Lincoln stated that they had studied the weather data for the April 3–7 period, and concluded (p. 38) that ". . . the general climatic conditions were not unusual." It is difficult to conceive how they arrived at this conclusion.

The facts, easily verifiable from the records of the United States Weather Bureau, are these:

From Galveston to New Orleans throughout the afternoon of April 6, a low, heavy overcast obscured the sky. The humidity ranged from 94 per cent to intermittent drizzle and rain everywhere along the coast. The barometer was falling steadily. In the evening, thick fog gathered from Galveston eastward along the Louisiana coast. Early in the evening a squall line formed in western Louisiana and moved eastward across the entire Louisiana coast. It was accompanied by lightning, thunder, rain, and gusts of high wind. According to the weather map, this squall line extended about 50 miles out into the Gulf, and thus fell just short of the place where the *OREGON* lay. The rain on the Louisiana coast directly opposite the *OREGON'S* position was almost continuous during the evening, and fairly heavy (more than an inch). The night was absolutely moonless.

Meanwhile, a cold front from the northwest was moving toward the coast, and struck it shortly before midnight. Though this front was not severe, temperatures along the coast dropped more than 10° in the next 24 hours, and it brought north winds up to 24 miles per hour.

Of all these facts, Bullis and Lincoln barely mention two: that there was little or no sunshine along the coast on April 6, and that precipitation along the coast ". . . was very small, being only a trace at some stations" (p. 38).

Though Lincoln (1950: 80) has held that migrations are little affected by weather, most other ornithologists think that weather has a

vital influence on migration (see, for example, Bagg *et al.*, 1950; Gunn and Crocker, 1951; Lowery, 1945; Robbins, 1949; Williams, 1950a). To me it seems beyond question that the rather remarkable accumulation of bad flying conditions along the Louisiana coast on the evening of April 6 could have affected coastwise migration.

Many of the birds seen about the *OREGON* belonged to species well known to be largely, or perhaps exclusively, coastwise or overland migrants. These were Purple Martins, two species of swallows, Common Nighthawk (*Chordeiles minor*), Roseate Spoonbill (*Ajaia ajaja*), and the Vermilion Flycatcher (a coastal winter resident that has never previously been mentioned as a trans-Gulf migrant). The fact that so many migrants of this type were present in such numbers indicates that they were not casual strays. All this evidence suggests that the birds seen were coastwise migrants that had been forced out to sea by the fog, rain, and squalls along the Louisiana coast. They accumulated in a dense aggregation ahead of and out beyond the end of the squall line, just where the *OREGON* lay.

Even though the relatively local weather conditions on the Louisiana coast were sufficient to account for the presence of the birds about the ship, we must not discount the effects of the cold front approaching the coast. Elsewhere (Williams, 1950a: 57–59) I have mentioned examples of spring migrants retreating southward several hours ahead of cold fronts.

From April 4 to the night of April 6, 1951, an unseasonable warm spell, with temperatures up to 90°, light southerly winds, and clear skies prevailed in southern Texas and eastern Mexico. Undoubtedly, multitudes of migrants followed the warm wave northward into Texas and Louisiana. When they encountered, or became aware of, the cold front that lay about 50 to 75 miles from the coast on the afternoon of April 6, they probably retreated toward the coast according to a regular pattern of migratory behavior (Williams, 1950b). In the coastal region on this particular afternoon and evening they found unusual weather conditions: the low overcast, rainy weather, fog in the early evening, squalls, and complete darkness by sunset. Caught between the approaching cold front and the bad weather of the coast, they became lost and confused. At any rate, the aimless criss-crossings of their flight, their cries, their low-altitude flying, their attraction to the lights of the *OREGON*, the displacement of swallows from their normal migration hours, the displacement of several species from their normal coastwise migration route, and the presence of the Vermilion Flycatcher, a western species, strongly suggest lost birds.

Similar invasions of the Gulf by birds retreating before cold fronts

have been described fairly often. Joseph C. Howell described one (Lowery, 1946; Williams, 1947). Dufresne (1947) described a small invasion accompanying a remarkable double front (Williams, 1950a: 62–63). Packard (1947) described several invasions in the spring of 1943. Packard did not record the dates of his observations, though he saw a large number of birds "one morning in May." Through the U. S. Maritime Board, I found that Packard's vessel crossed the Gulf on these dates in 1943: March 17–22, April 5–11, April 15–19, May 7–11, May 14–19. The first date is too early for major migrations; and I find no unusual weather conditions for the second crossing, or for the last. But it happens that the very worst weather of both April and May fell in the remaining two periods. These were periods when cold fronts, strong northerly winds, low temperatures, and rains occurred all along the Texas and Louisiana coasts, and large concentrations of migrant land birds appeared on the Texas coast. Presumably, some of the birds retreating southeastward before the cold fronts overshot the coast and were observed at sea the next morning—like those seen by Bullis at night.

For several years during the 1940's Mr. E. P. Romain, Chief Officer of a Standard Oil tanker plying regularly between Gulf ports and ports on our north Atlantic coast kept records of land birds observed aboard his ship. He sent these records to Mr. Richard Pough, of the National Audubon Society, who kindly lent them to me. Birds came aboard Mr. Romain's vessel in both spring and autumn, when his ship was in the Atlantic all the way from the latitude of Florida to that of New York, and from 40 to 200 miles at sea, where there was no possibility of a trans-oceanic migration. They appeared also on the Gulf of Mexico, but no more commonly than on the Atlantic. Mr. Romain correlated each of his observations with weather phenomena, and came independently to the following conclusion: "I am inclined to believe that the birds try to follow courses over land, and that those we see on ships have been blown off their routes by contrary winds."

This most recent record, by Bullis and Lincoln, of large numbers of birds over the Gulf of Mexico is interesting, but adds little to what was already known about this class of phenomena. Interpreted in relation to *all* the available facts, it merely contributes additional evidence that spring migrants may be forced southward over the Gulf of Mexico by bad weather coming from the continental United States.

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