

DO BIRDS CROSS THE GULF OF MEXICO IN SPRING?

BY GEORGE G. WILLIAMS

THE THEORY

It is almost universally believed that, in spring, many birds migrate northward directly across the full width of the Gulf of Mexico. They are said to take off from Yucatan and the Campeche Bay region in the evening, with favorable weather, and reach the Gulf Coast of the United States the next morning.

Though this theory of trans-Gulf migration is so generally accepted, I can find no modern writer giving actual evidence in support of it. Apparently all evidence that exists was assembled one or two generations ago; and the theory itself was publicized by the late Wells W. Cooke early in the present century. Since Cooke's time every writer that I can find discussing bird migration in North America accepts the theory at face value, and inquires no further.

One of the reasons, perhaps, why ornithologists have ignored the problem is that peculiarity of logic which makes absolute disproof of most theories almost impossible. Thus, nobody yet has actually disproved the theory that mother snakes swallow their young to protect them from enemies; or that small birds hitch-hike on the backs of larger birds during migration; or that the interior of the moon is made of green cheese. We cannot disprove these theories; all that we can do is to show how evidence for them is lacking, or how the preponderance of evidence supports another theory.

The evidence that Cooke marshalled to support the trans-Gulf theory was of three kinds: (1) that migrating birds have actually been seen crossing the Gulf; (2) that species unknown or uncommon in spring on the coasts of Texas and of Florida may appear in great numbers in the lower Mississippi Valley, or along the Louisiana coast; and (3) that simultaneous arrival dates of many species all along the Gulf Coast indicate an overnight, trans-Gulf flight.

Let us examine this evidence in the order mentioned.

BIRDS ON THE GULF OF MEXICO

One of the pillars upon which Cooke (1904: 25) leaned heavily for his theory of trans-Gulf migration was M. A. Frazer's paper (1881) recording the appearance of several species of migratory birds "seen at noon April 22, 1881, 30 miles off the coast of Louisiana, striving to reach the shore against a severe norther." As a matter of fact, Frazer's date is April 2, 1881; and he saw the birds about an hour after noon.

Frazar's paper is worth studying carefully. He writes: "At about noon of that day the wind suddenly changed from east to north, and within an hour it was blowing a gale; we were now about thirty miles south of the mouths of the Mississippi River . . . within an hour after the storm broke [birds] began to appear, and in a very short time birds of various species were to be seen in all directions, singly and in small flocks, and all flying towards the Mississippi River."

Frazar gives a list of 23 species which he recognized in the storm. Among these birds were "a few" Towhees. This species, however, does not winter south of the United States. We must conclude, therefore, that it was blown *southward* from the mainland; it was not migrating across the Gulf. Furthermore, several other species seen (Myrtle Warbler, Maryland Yellow-throat, Phoebe, Pigeon Hawk, Mourning Dove, Turnstone) are common winter residents of the Gulf Coast region. Two species (Cliff Swallow and Pigeon Hawk) are known to migrate by land rather than by water; and all the other species Frazar mentions are common spring migrants through Florida. On the whole, therefore, it would seem quite logical to believe that the birds, instead of being met by the norther on a trans-Gulf flight, had been migrating along the Gulf Coast (perhaps with the east wind that had been blowing), and had been blown *southward* into the Gulf.

This interpretation is consistent with the observations recorded by W. T. Helmuth (1920) on making a trip by water from Sabine Pass, Texas, to Tampa, Florida. On March 29, 1918, Helmuth, then aboard ship, writes: "A 'norther' with terrific wind and rain . . . 125 miles from land." On this day three Great Blue Herons, a Belted Kingfisher, several Tree Swallows, Robins, Redstarts, and Myrtle, Parula, and Black-throated Blue Warblers came aboard the ship.

This record, too, deserves careful scrutiny. The first point of interest is the fact that the ship must have sailed straight from Sabine Pass to Tampa, for it was "Anchored off Sabine Pass" March 28, presumably left there late on the 28th, or on the 29th, and reached the coast of Florida in the early afternoon of March 31. It could not have made the trip so quickly if it had not gone directly. Accordingly, at some time on March 29 the ship may have been 125 miles from Sabine Pass, but it must have been relatively near the Louisiana coast. Secondly, five of the eight species mentioned are abundant winter residents of Louisiana; and the Robins could not possibly have come from south of the Gulf. Lastly, a "terrific" north wind was blowing. The only logical explanation of these facts is that the birds were blown *southward* from the coast. They were not making a trans-Gulf migration.

On March 30, on this same trip, Helmuth reports: "Very heavy weather with violent squalls, wind varying in direction." At this time the ship was probably not far off the mouth of the Mississippi. A Henslow's Sparrow came aboard, and five Louisiana Herons were seen. The sparrow does not occur south of the United States, and therefore was certainly blown out from the mainland; and the Louisiana Herons doubtless came from the same place, since the species is not known to migrate from regions south of us to Louisiana.

The morning of March 31, when the ship was about 90 miles off the entrance of Tampa Bay, Myrtle, Parula, Black and White, and Prothonotary Warblers came aboard and spent the morning. All these are birds regularly and abundantly present in Florida at that time, and could easily have been blown from the peninsula, or off their normal coastwise migration route, by the "violent squalls" of the preceding day. The fact that they stayed aboard the ship so long indicates that they were tired or lost.

Birds appear frequently on ships plying about northwestern Cuba, the Bahamas, the Florida Keys, and the west coast of Florida. It seems, therefore, that if birds really did migrate across the Gulf itself, they would have appeared at some time on ships plying across the middle of the Gulf. But I can find no record of such appearances. All seeming records (like Helmuth's) when broken down and analyzed critically, reveal only the well-known fact that adverse winds may blow migrating birds to sea.

In the spring of 1939, a Bureau of Fisheries boat engaged in shrimp research spent several weeks at the height of the spring migration period at different positions 20 to 100 miles off the Louisiana and Texas coasts. My friend, Mr. Albert W. Collier, who was on the boat, reports to me that, when the boat was fairly close to land, a Sparrow Hawk and one or two other small birds came aboard while northers were blowing; furthermore, when the boat was 20 to 30 miles east of Corpus Christi, Texas, a northward migration of Barn Swallows passed during several days of fine weather. Otherwise, however, no land birds were seen during the entire spring.

A final bit of negative evidence is this: about 50 miles southeast of Galveston lies the celebrated Heald Bank to which, in peacetime, fishing boats go by the dozen every spring and remain for several days at a time. But I have yet to find anyone who has seen any land bird on these expeditions.

In short, I have been unable to find any direct evidence of any trans-Gulf migration.

BIRDS ON THE TEXAS COAST

The second piece of evidence supporting the trans-Gulf migration theory was Cooke's belief that certain species common as migrants in Louisiana and northwestern Florida are rare or absent in Texas, as well as on the east coast of Mexico and the northwest coast of Cuba. Their absence could best be explained by the hypothesis of a direct trans-Gulf flight north from Yucatan.

As a matter of fact, however, until this very day we know practically nothing about bird migration in the immediate coastal region of eastern Mexico or northwestern Cuba. And not until 1936 was any extensive and consistent work done on bird migration along the Texas coast. In that year a group of highly competent observers began correlating their data, and in the intervening years have learned more about birds on the Texas coast than was ever known before. Special tribute must be paid to three people who have done an enormous amount of careful, thorough work in the immediate neighborhood of the Gulf and its bays: Mrs. Conger Hagar of Rockport, Mr. A. K. McKay of Cove, and Mr. J. M. Heiser of Houston and Kemah. Without them the present paper would have been impossible, and to them the author holds himself in grateful indebtedness. In the light of what they have learned, Cooke's several works on the distribution and migration of various groups, as well as his and Oberholser's articles on the migrations of North American birds appearing many years since in 'Bird-Lore,' would require drastic revision. Moreover, the 'Season' reports from Harlingen, Texas, published in the 'Audubon Magazine' a few years ago by Mr. Irby L. Davis, have added immeasurably to our knowledge. If the information that these observers have collected had been available to Cooke, he might not have been so strong a proponent of the trans-Gulf migration theory.

If this theory were really true, it does seem, as Cooke inferred, that species wintering entirely south of the United States and breeding between our Gulf Coast and the Arctic Ocean would appear as abundant spring migrants in Louisiana, northwestern Florida, and perhaps extreme eastern Texas, but would not appear in other parts of Florida or of Texas. But, as a matter of fact, *no species appears in Louisiana and northwestern Florida that does not appear in at least equal numbers along the whole Texas coast, or on the keys and peninsula of Florida.*

The following table shows the presence or absence, and the abundance, of migrants in the regions indicated. In the table, *** means *regularly and frequently seen each spring*; ** means *regularly but not*

frequently seen each spring; and * means *seldom seen* in spring. "Lower Texas Coast" means from Rockport southward to the Rio Grande. Species occurring with equal frequency in all regions are ignored; they prove nothing either way. Rare or casual occurrences are likewise ignored.

If birds really migrated regularly and in numbers across the Gulf, the greatest number of stars in the table would fall in columns 3 and 4. But such is not the case; the greatest numbers fall in columns 1, 2, and 5. Furthermore, if any one species regularly migrated across the Gulf, the stars for that species would fall away in numbers to the left and right of columns 3 and 4. Actually, however, the number of stars for every species tapers off either from the right or from the left, so that in no case do more stars fall in columns 3 and 4 than in the column to the left or to the right. The only logical interpretation of these findings is that the species mentioned in the table migrate *around* the Gulf, via Florida or Texas, and not *across* it.

Another significant fact connected with the above table is this: a large number of species breed north and east of Florida and extend in winter well into Central or South America (Yellow-bellied, Alder, Least, and Olive-sided Flycatchers, Philadelphia and Warbling Vireos, Golden-winged, Tennessee, Nashville, Magnolia, Canada, and Chestnut-sided Warblers, Yellow-breasted Chat, and Dickcissel). If these birds really did cross the Gulf in spring, they would certainly appear as common migrants in Florida. Their rarity or absence in that state, together with their abundance all along the Texas coast, would indicate that these species were migrating *around* the western Gulf Coast—not directly across the Gulf.

MIGRATION DATES

The third and last pillar supporting the trans-Gulf theory is the fact that spring arrival dates on the Texas, Louisiana, and Florida coasts vary little from region to region. These practically simultaneous dates seemed to Cooke to prove that the new arrivals had come from directly across the Gulf in a single day or night; if they had come *around* the coast, there would be considerable differences in their arrival dates at different points on the coast.

Cooke put great faith in arrival dates because his famous work on migration up the Mississippi Valley had shown him that most species move forward in spring at the rate of something like 25 to 70 miles per day, and with considerable regularity. Consequently, the sudden arrival of birds all along a 1400-mile expanse of coast within a period or two or three days seemed to imply that the birds had crossed the Gulf in a single flight.

	1	2	3	4	5
	<i>Lower Texas coast</i>	<i>Galveston Bay region</i>	<i>Southern Louisiana</i>	<i>North- western Florida</i>	<i>Florida keys or peninsula</i>
Golden Plover	***	***	***		
Hudsonian Curlew	***	***	**	*	***
Upland Plover	***	***	***	*	*
Knot		*	*	*	***
Pectoral Sandpiper	***	***	***	**	**
White-rumped Sandpiper	**	**	**	*	*
Baird's Sandpiper	***	*			
Stilt Sandpiper	***	**	*		**
Buff-breasted Sandpiper	***	***	*		
Black Tern	***	***	***	**	**
Black-billed Cuckoo	**	**	**	*	*
Gray Kingbird				*	***
Arkansas Kingbird	***	**	*		
Scissor-tailed Flycatcher	***	***	*		
Yellow-bellied Flycatcher	**	**	*		
Acadian Flycatcher	**	**	**	**	
Alder Flycatcher	**	**	*		
Least Flycatcher	**	**	*		
Olive-sided Flycatcher	*	*			
Bank Swallow	***	***	**	*	***
Rough-winged Swallow	***	***	***	**	
Cliff Swallow	?	***	**	**	*
Wood Thrush	**	**	**	*	**
Olive-backed Thrush	***	***	***	*	*
Gray-cheeked Thrush	***	**	**	*	***
Veery	***	**	*		*
Philadelphia Vireo	***	*			
Warbling Vireo	**	**	*		*
Swainson's Warbler		*	*	*	**
Worm-eating Warbler	?	***	**	*	**
Golden-winged Warbler	***	***	*		
Blue-winged Warbler	***	**	*	*	*
Bachman's Warbler		*	*	*	**
Tennessee Warbler	***	***	**		*
Nashville Warbler	**	**			*
Magnolia Warbler	***	***	**		*
Cape May Warbler					***
Black-throated Blue Warbler					***
Black-throated Green Warbler	***	***	***	*	*
Cerulean Warbler	**	**	**	*	*
Blackburnian Warbler	***	***	**	*	*
Chestnut-sided Warbler	***	***	**	*	
Bay-breasted Warbler	***	***	**	*	*
Black-poll Warbler			*	*	***
Louisiana Water-thrush	***	***	**		**
Kentucky Warbler	?	***	***	**	*
Yellow-breasted Chat	***	***	***	*	
Wilson's Warbler	*	*			
Canada Warbler	**	**	**		
Redstart	***	***	***	*	***
Bobolink			*	*	***
Baltimore Oriole	***	***	***	*	**
Rose-breasted Grosbeak	***	***	***	*	*
Blue Grosbeak	***	***	***	*	**
Painted Bunting	***	***	***	*	***
Dickcissel	***	***	***		

As a matter of fact, however, actual banding records show that birds may move faster than 25–70 miles per day. Individual Mallards are known to have traveled 200, 287, and 322 miles per day; a Blue-winged Teal averaged 100 miles per day on the long trip between Quebec and British Guiana; and a Lesser Yellow-legs averaged 385 miles per day between Cape Cod, Massachusetts, and Martinique, West Indies (Lincoln, 1939: 28–29).

At noon on July 12, 1932, I observed a flock of about 200 Common Canada or Lesser Canada Geese migrating north over Houston, Texas. So large a flock at that time of year is unknown in south Texas. At my request, a local radio station broadcast a message asking anyone who had seen the geese to communicate with me. Many people saw them as much as 20 miles north of where I saw them; one observer wrote that he had seen a flock of over 100 geese near Corpus Christi, Texas, at about 5 P. M., July 11, 1932, flying northeast around a bay. If this flock and the one seen in Houston were the same, the birds had traveled about 180 miles (in a straight line) overnight, although, since the birds were heading due north over Houston, they had probably followed the coastline to a point south of Houston—perhaps the mouth of the Brazos River—and then started north, covering a distance of about 210 miles overnight.

Rapid traveling such as this may help to explain why arrival dates along the Gulf Coast have no regular pattern but may appear almost simultaneous for a long stretch of coast.

Suppose we consider some arrival dates of birds that Cooke and others admit travel overland without crossing the Gulf.

In 1938, Bank Swallows arrived (or were first observed) in the Rio Grande Valley region on April 9; at Rockport, 120 miles to the north, April 7; and at Kemah, 170 miles northeast of Rockport, April 2. In 1940 they arrived at Rockport on April 18, and at Cove, 190 miles northeast of Rockport, on April 19. In 1941 they arrived at Rockport on April 19, and at Cove, April 14. In 1943 they arrived at Rockport on April 18, and at Cove, April 18.

In 1936, Barn Swallows arrived in the Rio Grande Valley on April 12; Cove, April 12; Pensacola, Florida, April 11. In 1937 they arrived in the Rio Grande Valley on April 11; at Rockport, April 8; at Cove, April 12; at Pensacola, April 2. In 1938 they arrived at Rockport on March 31; at Cove, March 29; at Kemah, April 2; at Pensacola, April 10. In 1942 they arrived at Rockport on April 8, and at Cove on April 8.

In 1936, Cliff Swallows arrived in the Rio Grande Valley on April 4,

and at Beaumont, Texas (near the Louisiana border), April 5. In 1943 they arrived at Rockport on April 17, and at Cove on April 19.

In 1940, Chimney Swifts arrived at Rockport on March 29; at Kemah, March 30; at Cove, March 24; and at Pensacola, March 27

In 1937, Nighthawks arrived in the Rio Grande Valley on April 29; at Rockport, April 23; at Kemah, April 21; at Houston, April 21; at Cove, April 13. In 1938 they arrived in the Rio Grande Valley on April 15; Rockport, April 17; Kemah, April 15; Houston, April 16; Cove, April 11; Pensacola, April 7. In 1940 they arrived in the Rio Grande Valley on April 14; Cove, April 17; Pensacola, April 14. In 1941 they arrived at Rockport on April 20; Kemah, April 19; Cove, April 19; Pensacola, April 10. In 1942 they arrived at Rockport on April 8; Houston, April 8.

At noon on April 8, 1942, thousands of Broad-winged Hawks began passing over Rockport, going northeastward parallel to the coast; the next day similar huge flights were seen at Cove and elsewhere at the north end of Galveston Bay. Presumably the migration had covered the 180-190 miles overnight.

Many other data could be given to show that birds which admittedly travel *around* the Gulf may inundate our entire Gulf Coast within two or three days. We must conclude, therefore, that *the fact that spring arrival dates for any species may be very close together for the entire Gulf Coast does not prove that the species in question has migrated across the Gulf of Mexico.*

Indeed, trying to prove anything from spring arrival dates along our Gulf Coast is an almost hopeless task. Observers living inland, or in the North where orderly migrations are the rule, do not realize the extreme complexity and seeming irregularity of migrations on the Gulf Coast. Here dates close to salt water and dates only two or three miles back from salt water may vary by weeks; the elevation (from sea level to 50 feet above) and the conformity of the land may determine the abundance or the complete absence of a species within a radius of two or three miles; places without cover along the generally bare and sandy Texas coast may be ornithological deserts, whereas an accidental thicket a hundred yards down the beach may be teeming with birds; many days of good weather may pass without the appearance of a single migrant, but the instant a northerly wind or a local shower comes, migrants may appear by the thousands. These facts, together with the circumstance that the number of consistent observers, who keep records, along 1,400 miles of coast may be numbered on the fingers of one's hands, deprive arrival dates of any wide significance.

EVIDENCE FOR COASTWISE MIGRATION

It was pointed out, early in this paper, that when we try to improve any theory, we must confine ourselves to two logical processes: (1) showing that evidence for the theory is lacking, and (2) showing that a great deal of evidence supports a contrary theory. Up to this point, I have been trying to show that the evidence upon which Cooke and others based their trans-Gulf theory is entirely lacking or highly questionable. Next, I wish to show that there is excellent evidence that birds migrate *around* the Gulf in spring.

1. Royal Terns banded as young birds in the Galveston and Matagorda Bay regions of Texas are regularly recovered in late winter in Florida, many hundred miles due east of the banding place. If, as normally happens with most birds, these terns return to the general region of their birth, they must migrate along the coast in spring.

2. I have mentioned the flock of geese in summer and the migrating hawks that had probably followed the shoreline up from southern Texas.

3. Little Blue Herons do not breed in the immediate coastal area of Texas. But on several occasions in spring I have seen flock after flock of the birds (five to fifteen birds to the flock) beating rapidly up the outside shoreline of Galveston Island, a few hundred yards offshore. They would appear as mere specks far to the southwest of the place where I was standing, come abreast rapidly, and then disappear to the northeast, never pausing, and always maintaining their distance from the shore. They were obviously using the coast line as a migration route.

4. I have seen flocks of Eastern Kingbirds, flocks of Indigo Buntings, and many individual Yellow Warblers flying along the length of the island in spring, about half a mile back from the surf. For several miles a road parallels a thin line of cedar shrubs running in a southwest-northeast direction on the island, and I have driven slowly along this road and watched the birds mentioned flitting ceaselessly northeastward through the shrubs alongside the road.

5. Rough-winged, Bank, Barn, and Cliff Swallows have an invariable migration route along the coast in spring. A few hundred yards back from the beach, along every part of the Texas coast that I have visited in spring, they stream by the thousands all day long, and (except for an occasional straggler) are generally not seen more than a few hundred yards from the beach. These, too, are obviously using the coast line as a migration route.

6. According to the trans-Gulf theory, birds take off from southern

Mexico in the evening, and complete the flight across the Gulf by the next morning. But the facts are these. If one is along the Texas beaches during April and early May in good weather, one will see few migrants during most of the day. Near sunset, however, the occasional low thickets that one finds near the shore will begin to come alive with warblers, grosbeaks, Dickcissels, flycatchers, and other small birds. The inference is that the birds are seeking shelter for the night; and certainly they have not just arrived from a flight begun the preceding evening in southern Mexico. In this same connection, I should mention the fact that, at three o'clock in the morning of May 1, 1943, Mr. Ludlow Griscom and I, having started on a bird trip from Houston, heard above us the chirpings of thousands of birds moving northward. Mr. Griscom identified the birds as Veerys. It would have been physically impossible for these birds to have arrived over Houston at that time after leaving southern Mexico the preceding evening; and it seems incredible that the birds could have been on the wing since the second previous evening. We must believe, therefore, that the birds had not just migrated across the Gulf. More probably they were birds which had been migrating along the coast and which at some place on the coast (perhaps the mouth of the Brazos River) had diverged from the coast and struck off northward.

7. If birds migrated on a broad front straight across the Gulf and then went on inland, as they are generally supposed to do, one would expect them to be fairly evenly distributed over the entire hinterland back from the coast. But one of the most pronounced phenomena of the spring migrations in the region is the almost fabulous concentration of species and individuals just back of the beaches every spring, literally within a stone's throw of salt water, and the dearth of migrants a few miles inland. Grand Isle, off the southern Louisiana coast, is celebrated as a concentration point and resting place for birds that have supposedly just crossed the Gulf. Edward Stiles Hopkins (1929) reports having noted 102 species of birds there during the months of March, April, and May, 1927; and Mr. Hooker Oliver Lindsey (1931) records 103 species from the same place. But along the Texas coast, anywhere from Galveston Bay to the mouth of the Rio Grande, any single good 'bird day' will yield 125 species without trouble. In other words, there is a concentration of spring migrants, almost inconceivable to one who has not seen it, along the *entire* Gulf Coast, not merely opposite Yucatan. This fact, together with the virtual absence of spring migrants a mile or two back from the water, can be explained only by our assuming that the birds are migrating *along* the coast, not *across* it.

The concentration of birds along the coast and the dearth of them inland is most apparent during the first few weeks of April. Toward the end of April, and in May, migrants begin appearing inland as well as on the coast. Seemingly, the spring flight starts as a small rivulet of birds trickling up the coast; but as the season progresses, the rivulet grows into a river that overflows into the interior. See also Section 9, below.

8. Northern observers who are accustomed to seeing 'waves' of migrants on fine spring days may be surprised to know that most spring migrants are seen on the Gulf Coast during or just after bad weather. Indeed, any number of fine bright days may pass during spring with few or no migrants to be seen. But if a sudden shower, squall, or norther comes, the birds will drop to earth immediately. Here they may be counted by the scores and hundreds where, thirty minutes previously, not a bird was in sight. This sudden appearance of the migrants will occur (and occur invariably) *at any hour of the day when bad weather comes* in spring. Writing of his experiences on Grande Isle, Louisiana, Ambrose Daigre (1936) comments on this phenomenon: "I have noticed that very few migrants stop of their own accord when weather conditions are favorable for migration, but as soon as a dark cloud appears on the horizon accompanied by northwest wind, thousands of migrants drop from the sky like so many leaves."

The fact that the birds appear at a moment's notice is evidence that they are passing overhead continuously (during the migrating season) even though they are invisible. But a sudden shower, squall, or norther inland a little distance from salt water will result in no such deluge of migrants. Putting two and two together, therefore, we cannot help concluding that the birds must be migrating *along* the coast, not *across* it.

If they were really migrating across it after a trans-Gulf flight, the birds would become visible only when the arrival of bad weather coincided exactly with the hour and the minute when the birds were reaching the coast; furthermore, the bad weather would drive the birds to earth and make them visible in the interior as well as along the margins of sea and bay. The fact that neither of these conditions is realized casts doubt on the theory of trans-Gulf migration, and indicates instead that the birds migrate along the coast.

9. Presumably, as the migrants proceed along the Gulf Coast, they are continually funneled off northward by rivers and bays leading into the interior. In southern Louisiana an extensive system of bays, bayous, lakes, and rivers, including the great Mississippi, undoubtedly

serves as a most, probably *the* most, important funnel. A glance at the map will show other bay and river systems in Texas, Florida, Alabama, and Mississippi that probably serve as lesser funnels. My own experience with such diversionary systems, however, has been confined mostly to Galveston Bay.

Running almost at a right angle to the Gulf shore, extending many miles inland and ending at the north in the mouths of two large



TEXT-FIGURE 1.—Map showing probable migration routes around the Gulf of Mexico.

ivers, this bay forms an ideal arrangement both for bird migration and for the study of bird migration.

In spring, White Pelicans, cormorants, Water-Turkeys, ducks, geese, hawks, and swallows may be seen in enormous flights moving northward along the beach line of Galveston Bay. Moreover, small perching birds by the thousands concentrate, in bad weather, in the cover bordering the water. But back inland from the sides of the bay, few birds will be seen on even the most favorable days; a few hundred yards will spell the difference between an ornithological paradise and an ornithological desert. The abundance of birds at the bay's edge, the almost complete absence of migrants away from the water, and the actual sight of the migrating flocks—all these confirm the

theory that the birds are following the coast line during the spring migration. If they were not following the coast line, but were moving forward on a broad front from across the Gulf, they would be no more abundant along the edge of Galveston Bay than anywhere else. Moreover, since Yucatan lies considerably *east* of the longitude of Galveston Bay, one would expect any possible concentration of trans-Gulf migrants to be along the *eastern* shore of the bay. But, in my experience, the reverse has been true; the concentrations are along the western shore.

It would be foolish for any man to say that no birds ever fly northward across the Gulf of Mexico in spring, or to deny that some individual birds may fly across the Gulf every spring. Birds, like the weather of which they are so often the playthings, are always breaking rules and doing the unexpected.

Furthermore, birds undoubtedly cut chords across indentations in the coast, as suggested in the accompanying map. Finally, when the coastwise rivulet of migration expands into an overflowing river, as explained earlier in this paper, it is not impossible that the expansion may extend seaward as well as inland. Accordingly, toward the end of the season, a few birds may be found well out to sea. This last, however, is mere hypothesis.

CONCLUSION

There is no direct evidence to show that birds migrating from regions south of us in spring actually cross the Gulf of Mexico in any appreciable numbers; but there is abundant evidence to show that vast numbers of these birds, both individuals and species, take the coastwise routes *around* the eastern and western edges of the Gulf.

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The Rice Institute

Houston, Texas

NOTES ON PANAMANIAN BIRDS

BY JOHN W. ALDRICH

WHEN E. A. Goldman visited eastern Panama to collect birds and mammals for the U. S. Biological Survey in 1911 and 1912, that part of Central America was still virtually unexplored ornithologically. The explorations of the Italian naturalist, Festa, in the Rio Tuyra Valley, in 1895, seem to have been the only previous work. After Goldman brought back his fine collection from Porto Bello, Cerro Azul, Chepo, Rio Tuyra Valley, Mt. Pirri, and Cana, the late E. W. Nelson began its study and described many interesting new forms from it. Unfortunately, he was never able to complete his study and no comprehensive report was ever written on the birds, although some information about them was included incidentally in the report on the mammals of Panama by Goldman (1920: 25-42). Since that time several other collectors have worked in eastern Panama, and the region has become much better known. Nevertheless, there seem to be a few things left in the Goldman collection that have escaped more recent investigators.

In his lists of species characteristic of the Arid Lower Tropical Life Zone of Panama, Goldman (1920: 35) included '*Ammodramus savannarum obscurus*,' which was then the name used for the grasshopper sparrows breeding in southern Mexico. This publication, as well as the specimens on which it was based, have apparently been overlooked by subsequent investigators of the Panamanian avifauna, since there is no mention of the species as occurring in that country by either Hellmayr (1938: 495-501), or Griscom (1935). The three specimens of grasshopper sparrow, on which Goldman's (1920: 35) citation was based, were taken by him near Chepo, at the eastern end of the Pacific coastal savannas in eastern Panama. These include an immature male and a non-sexed adult specimen collected on the Rio Pacora, ten miles west of Chepo, altitude 100 feet, March 28, 1911; also an adult female taken ten miles northwest of Chepo, March 20, 1911. The immature male is interesting in that it is in process of molt from the juvenal plumage to the adult dress. Much of the head and back