

that, and what look like through migrations, sometimes may be only drifts, as of ducks or gulls along the beach. Perhaps there is every gradation between drifting and distance migrating individuals, or the same individual may even shift from one to the other of these classes, this last an unjustifiable hypothesis, however, lacking evidence to support it.

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## PELICAN TRAVELS

BY C. RUSSELL MASON

Of all the birds found along the south coastal areas of the United States, the Brown Pelican is probably best known to the layman. The bird's size and grotesque appearance, his skimming of the waves along the shore where he is conspicuous to strollers and bathers, his tameness around fishing boats and piers, serve to make him well known.

In the Western Hemisphere the Brown Pelican is characteristically a bird of the semitropical and tropical seacoasts of North, Central and South America, and the West Indies, though stray individuals infrequently penetrate inland to fresh-water lakes.

The Eastern Brown Pelican (*Pelecanus occidentalis carolinensis*) breeds on the South Atlantic and Gulf coasts of the United States from South Carolina to Texas, and along the coasts of Central and South America to northern Brazil. The Western Brown Pelican (*P. o. californicus*), a larger subspecies, breeds from Santa Barbara, California, to the Galapagos and, from banding and sight records, apparently wanders from British Columbia to Mexico. The West Indian form (*occidentalis*) is reported by Barbour to have its principal breeding ground in Cuba, near Cardenas.

On the east coast of North America there are but three breeding colonies of the Brown Pelican, one at Cape Romain, South Carolina, with 559 nests counted in 1944; a smaller one at Egg Bank, St. Helena, Beaufort County, South Carolina; and an extensive one, usually numbering 2,000 or more pairs, on one or more small islands in Mosquito Lagoon, Merritt Island, east of Titusville, Florida.

On the Gulf Coast of Florida there are several small breeding colonies from Cedar Keys and Tarpon Springs to the Florida Keys, usually containing from one hundred to five hundred pairs of birds. Colonies of similar size or larger are found along the Gulf coast from Mississippi to Texas. In Louisiana in June, 1933, a colony on the North Islands in the Chandeleur Island group contained 2,300 nests, while

another on Belle Pass Island, east of Timbalier Island, had 1,000 nests.

The Florida East Coast colony was originally located on Pelican Island, off Sebastian. Records of the Pelicans nesting there date back at least to 1858, when Bryant wrote of this colony. Pelican Island was set aside by President Theodore Roosevelt in 1903 as the first Federal Bird Reservation in the United States and became a part of the chain of refuges under the administration of the Biological Survey (now the Fish and Wildlife Service).

In 1923 the pelican colony moved to a twelve-acre island in the south end of Mosquito Lagoon, about fifty miles to the north of Pelican Island, where the birds have nested ever since. At times they have occupied also a smaller island, about two acres in extent, just to the east of the main island; and during some seasons part of the colony has moved to islands toward the north end of the lagoon, within fifteen miles distance. The twelve-acre island mentioned above was set aside as Brevard Reservation by President Calvin Coolidge, and, though under the supervision of the Fish and Wildlife Service, warden protection was for several years provided by the Florida Audubon Society at the expense of the Society. According to old residents of the section, pelicans visited these islands in Mosquito Lagoon in Civil War days, but there seems to be no written evidence of their using them for nesting prior to 1923.

The number of Brown Pelicans nesting at Brevard Refuge and on the islands toward the north end of the lagoon has been estimated by wardens and other observers between the years 1930 and 1942 as given below:

NESTING PAIRS			
Year	Brevard Reservation	N.-NE. of Haulover	E. of Oak Hill (Hong Kong Is.)
1930	3000		
1932	1200 plus		
1933	1200	300	
1936	750	1500	
1937	2000	some	
1938	2000		
1939	2500		
1940	2000	500	800
1941	1700	0	
1942	2500		

It is difficult to ascribe a reason for the movement of these pelicans from one breeding spot to another unless it might be that the bushes are killed out to a certain extent and the region fouled by accumulation of guano.

The Gulf Coast colonies apparently have a "normal" time for breed-

ing, eggs being found in the nests in spring from late March until June; the time of breeding varies somewhat from island to island.

The colonies on the Florida East Coast are irregular in breeding time. In the early 1900s the pelicans started to nest in November or December but gradually advanced the nesting dates until, in 1935, the first egg-laying was in May and June, the height of the season in September and October, with nesting finishing in December. In some seasons nesting has been almost continuous over twelve months of the year. Since there is considerable doubt that the same pelicans are raising a second or third brood, which they do not do in other colonies so far as records show, it is probable that the Brevard Refuge is simply overcrowded and the pelicans take turns laying eggs and raising young, to use the best spaces to good advantage.

As a further indication of the irregularity of breeding time, the following records will be of interest:

In 1925 there were plenty of eggs and nestlings in February, while ten years later the height of the season was September.

In 1932 and 1933 the birds started nesting in June and July, with the season extending from May to December.

In mid-July of 1936, perhaps retarded by high water, only one hundred nests had been started at Brevard Refuge, while in the colony a few miles north, to which a large percentage of the birds had moved, young had left the nests by late August, hence the birds certainly got an earlier start there.

In 1937 the pelicans were breeding at Brevard from July to December, with eggs found over many months time.

In 1942 nesting was well advanced on the first of June.

Data kept by one of the Brevard wardens, W. E. Shannon, furnished the following information:

Incubation period averaged 30 days.

Young hatched naked and reddish in color, turning black.

A few pin feathers present at one week of age.

White down present at two weeks of age.

Brown feathers appear at three weeks of age.

Young still in nest but able to clamber about bushes at five weeks of age.

Young can climb readily but not clear the ground in flight when seven weeks old.

Young able to fly at nine weeks of age.

Full grown young are brown above, grayish-white below.

Adults probably acquire yellow crown at three years of age.

At Brevard Reservation the earliest nests were built at the west end of the island, later nestings toward the east end. Most of the nests were placed in mangroves at heights of from two to fifteen feet above the ground; a few were built on the ground. The nests on the ground were of coarse grasses and salicornia lined with grasses, while those in bushes had a foundation of sticks. In colonies where bushes are lacking, Brown Pelicans regularly build on the ground.

Protection of the Brevard Refuge pelican colony was necessary for many years because of the prejudice of fishermen who blamed the birds for loss of food fish. It is true that pelicans sometimes become a nuisance to fishermen because of getting entangled in the nets and occasionally taking some fish from the nets. However, research carried on by the University of Louisiana in cooperation with the U. S. Biological Survey at the time of the food drive for World War I — when a



FIG. 1

The Brown Pelicans in this colony, lacking suitable bushes, have placed their nests on the ground.

Photo by A. M. Bailey and R. J. Niedrach

movement was started to exterminate the pelican in the interests of food conservation—showed that 90 percent of the food of Brown Pelicans is manhaden and most of the rest of it fish of little value for human food. Before the pelican colonies were given warden service, they were invaded and the young clubbed to death by the hundreds. A warden has not been necessary during the past three or four years because of the

long campaign of protection and education carried on by the Florida Audubon Society and other agencies.

At the time the life history of the Brown Pelican was written by Arthur Cleveland Bent, little was known of pelican migration, since we were dependent on sight records of the birds. Consequently, this species was considered to travel little, and that little was a wandering for comparatively short distances north and south of their breeding territory. Through banding recoveries in recent years, we have secured a more complete picture, though there are still many blanks in our information to be filled in through more extensive banding.

The first banding of the Brown Pelican in this country was done in 1925 by R. J. Longstreet of Daytona Beach, Florida, for several years President of the Florida Audubon Society and to the present date editor of *The Florida Naturalist*. In the first year he banded fifty birds of the Brevard Reserve colony. Subsequently, other members of the Florida Audubon Society, including the writer, joined in the pelican banding and study of the species on this area. Other banders were the late E. M. Davis and W. M. Davis of Winter Park, Florida, and Shirley, Mass.; Joseph C. Howell and M. J. Westfall, students at Rollins College and Cornell University, the latter a warden at the Reserve for two seasons; C. Mills Boyd, Jr., a University of Georgia student and former marine, who also served as sanctuary warden, C. Brooke Worth and Edward Kimball.

The greatest amount of banding of pelicans in the country was carried on by this group at Brevard Reserve, though there were a limited number of birds banded on the Gulf coast of Florida, and others on the South Carolina coast, in Louisiana, and in Texas, as well as in California. Still more recently there have been a number of recoveries reported of Brown Pelicans banded on the coast of Perú by William Vogt, Conservation Director for the Pan American Union.

The Brown Pelicans are banded on the nest or in the bushes before they are able to fly, the banding age being from about three to eight weeks. Of the birds banded on the east coast of Florida, there have been 563 recoveries to date (August 1, 1945). On the basis of recoveries from close to 1,500 birds banded by the writer, recoveries average over 10 percent, which is quite satisfying to the bander and at the same time furnishes sufficient data to be of real interest. These 563 recoveries were reported from the following states and countries:

Florida	370	New York	1
Cuba	167	Mississippi	1
Georgia	13	Mexico	1
Bahama Islands	5	Nicaragua	1
South Carolina	4		

Of the recoveries made in Florida, we find the following distribution of recovery locations:

At or near banding station	30
Florida east coast north of banding station	39
Florida east coast south of banding station	250
Florida Keys	22
Florida west coast (all but two south of Tampa)	19
Interior Points	9
Undetermined	1



FIG. 2

The figures placed on above outline map showing southeastern United States and contiguous territory indicate the general locations of returns from Brown Pelicans banded at Brevard Reservation, Florida.

Of the 167 Cuban recoveries, we find the birds scattered along both north and south coasts with a few at interior points, none of which are very far removed from the sea:

North coast	94
South coast	51
Isle of Pines (south)	1
Interior points	9
Points not located	6

Of the five pelicans recovered in the Bahamas, it will be noted from the map that all were at points comparatively near the Florida coast.

These recovery data indicate quite clearly that the main movement of Brown Pelicans from the Brevard Reserve colony is from the nesting area southward along the east coast of Florida and across to the coasts of Cuba, with few straying either east to the Bahamas or westward to the Florida west coast or farther west along the Gulf. Only a small number of the birds reach points more than 500 air miles from their point of origin, as indicated by recaptures of only single birds in New York, Mississippi, Mexico and Nicaragua.

The great number of recaptures of birds less than one year old, as compared with birds of greater age, indicates that the Brown Pelican is comparatively short-lived. Of 709 recoveries from birds banded along the east and south coasts of the United States from South Carolina to Texas, we find the following ages (all birds banded at from three to eight weeks of age):

Over twelve years	1
6 to 7 years	3
5 to 6 years	5
4 to 5 years	19
3 to 4 years	16
2 to 3 years	32
1 to 2 years	90
Under one year	543

Of the birds recaptured at three years of age or older, recoveries are about equally divided between points on the Florida east coast comparatively near the banding station and more distant points such as the west coast of Florida and Cuba. The birds captured in New York and Nicaragua were each older than  $1\frac{1}{2}$  years, while the Mississippi recovery was more than two years old. These data might seem to refute statements made by some observers that the older birds do not travel the distances that younger birds do. However, there is no evidence to prove that these older birds traveling the greater distances did not reach there as young birds and simply remain in those localities instead of

returning to their ancestral home. Only eighteen pelicans have been recovered a second time after being released following their first capture, and in every case the second recovery was near the place of first recovery. With the exception of two second recoveries a little more than a year after the first, and two three years after the first recovery, all were within a few weeks or months after the first finding of the banded birds.

Of fifty-one recoveries of pelicans banded by Daisie M. Morrison, Major G. D. Robinson, and F. M. Stott at St. Petersburg, on the west coast of Florida, all but eight were found in the St. Petersburg area. The other eight wandered only short distances north or south of the banding station, the longest distances being traveled by three birds, one recovered at Cedar Keys, 85 miles to the north, and two at Sarasota, 35 miles to the south.

To date there have been 45 recoveries of pelicans banded on the coast of South Carolina between 1931 and 1941 by E. Milby Burton, A. H. DuPre, J. M. Lofton, Jr., and William P. Baldwin. Of these, 33 were found along the east coast of Florida, ten in Cuba, one in North Carolina and one in the Bahamas. The North Carolina recovery reached the greatest age of the South Carolina banded pelicans, being taken 4 years and 4 months after banding; one Florida recovery passed the three-year mark and one the two-year, while only five others were over one year old.

Of the limited bandings in Louisiana in 1929 by S. C. Arthur and in 1939 by F. M. Carroll, of which nine recoveries have been made, only one was found on the Louisiana coast, the others scattering widely to Alabama (2), west coast of Florida (2), Texas (2), Cuba (1), and Campeche, México (1). All were found less than a year after banding.

One pelican banded in Kleburg Co., Texas, in 1923 by R. D. Camp was found  $2\frac{1}{2}$  years later in Alvarado, Vera Cruz, Mexico, 700 air miles away. Fourteen other recoveries of birds banded in Texas in 1934 by Alston Clapp, Sr., Robert H. Eames, and J. W. Stiles, were all made on the Texas coast and were birds less than a year old, with the exception of one two years old.

Two recoveries, both within a year of banding at Pelican Key, Florida, by E. J. Reimann, were reported from the coasts of Cuba.

Banding done in Ventura County, California, by Richard M. Bond in 1939 and 1940 has brought in sixty-four recoveries. Of the fifty-three for which recovery locations have been accurately checked, 20 ranged northward from 25 to 600 miles, one-fourth of these found over 500 miles from the banding station. Of the 33 birds that were found to the south, only three were recovered more than 250 miles from the banding station, but one of these had traveled 1,400 air miles to reach Colima, México.



Banding of Brown Pelicans on the Lobos de Tierra, the Lobos de Afuera, and the North Chincha Islands off the coast of Peru was carried on in 1939 and 1940 by William Vogt, at that time ornithological consultant for the company administering the harvest of Peruvian guano and now Conservation Director for the Pan American Union. Of the 72 recoveries reported to date whose location could be readily established by the writer, 31 had moved north of the banding stations for from 50 to 700 miles, the majority recovered within 300 miles of the place of banding, a few reaching the coast of Ecuador, none farther north. Of the 41 recoveries to the south of the banding stations 50 per cent had gone beyond five hundred miles, seven had reached Chilean coastal points 1,000 to 2,000 miles to the south, and one, the long-distance traveler of them all, was captured on the Foltén River in Chile, 2,400 miles from "home."

The wanderings of the pelicans, wherever made, can no doubt be correlated with their food supply, those on the west coast of South America progressing only as far along the coast as their food fish may be influenced by the Humboldt Current.

One phase of bird-banding interesting to the bander is to have some of his birds recovered by friends in other sections. Such has been my experience in the case of a few pelicans. Several were found along the Florida coast by wardens of Pelican Island with whom I am well acquainted. Bob Allen of the National Audubon Society staff captured one of "my" birds on the Florida Keys while engaged in his Sponbill research. Still another was found at Santiago, Cuba, by an old friend, Dr. S. C. Bruner, the well-known entomologist and ornithologist of the Experiment Station at Santiago de las Vegas.

#### CONCLUSIONS

The main movement of pelicans from Brevard Reserve is southward along the east coast of Florida and across to the Cuban coasts.

Few of the Brevard pelicans reach the Gulf coast or move eastward into the Bahamas.

Only a small percentage of the Brevard pelicans move northward, as indicated by the small number of returns from the Florida coast north of the banding station or from the coasts of Georgia and South Carolina, as compared with the number of recaptures on the east coast of Florida south of the banding station.

Most of the pelicans travel rather short distances, only a few traveling more than 500 air miles from the banding station.

A few pelicans stray a little farther, as indicated by recoveries in New York, Mississippi, México and Nicaragua—none of these, however, as much as 1,000 air miles from the banding station.

The great percentage of recaptures of birds less than one year old

indicates that pelicans usually live but a few years. At the same time, recognition should be given to the possibility of pelicans attaining a considerable age, as indicated by the 12-year-old bird banded by R. J. Longstreet in January, 1927, and shot at Daytona Beach, Florida, in June, 1939.

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