

# BIRD-BANDING

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## MOVEMENTS OF COLOR MARKED BROWN PELICANS

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Reports of sightings of color marked birds provide a valuable adjunct to band encounters (Southern, 1971; Burger, 1972; Weeks, 1972; and references therein). Presented here are the results obtained from color marking Brown Pelicans (*Pelecanus occidentalis*) on the Atlantic Coast and Florida Gulf Coast of the United States in 1969–1973. This report is one aspect of a long term, ongoing study on the biology of this endangered species. Other aspects of my study will be and have been published elsewhere (Schreiber and Risebrough, 1972; Schreiber and Schreiber, 1973; Lawrence and Schreiber, 1974; Schreiber, 1974; Schreiber et al., 1975).

### METHODS

Nestling Brown Pelicans were leg banded and color marked between 6 and 11 weeks of age on Tarpon Key and Hall Island in Florida and on the Cape Romain National Wildlife Refuge in South Carolina (Table 1). On Tarpon Key in 1969 purple wing streamers were used (Sprunt, 1968), but this color was difficult to see. In 1970–1973 the more conspicuous "Aurora Pink" SaFlag was used as leg streamers on Tarpon Key, and green SaFlag leg streamers were used on Hall Island in 1970. The streamers measured  $7 \times 1.5$  inches with 2.75 inches surrounding the leg of the birds. The "Arc Yellow" and "Blaze Orange" SaFlag wing streamers used in South Carolina were similar to those described previously (Williams and Martin, 1969). Many of the Tarpon Key streamers had large numbers painted on with RamCote vinyl upholstery finish ("Panther Black") that bonded to the SaFlag material and remained visible for as long as the tags remained on the birds.

The "Blaze Orange" or "Arc Yellow" colors are not easily distinguished from "Aurora Pink" in the field but the location of the streamer on the bird permitted identification of the banding location of all color sighting reports. When the color did not conform to the banding scheme, I determined the location of banding by the position of the streamer on the bird, i.e., leg or wing streamer.

The first reports of marked birds were received from the public through the National Audubon Society Research Department. Reports were directly solicited through news releases from the Florida Game and Fresh Water Fish Commission in Florida newspapers in mid-July and December 1970, and in early August and January 1972, and posters publicizing this study.

I received more than 1,500 reports of color marked pelicans during this study. However, many were repeat sightings of the

TABLE 1.

Location, date, color code, and number of nestling Brown Pelicans banded and color marked.

Location	Year	Number banded	Color code
Tarpon Key, Pinellas Co. Florida West Coast: Tampa Bay.	1969	253	Purple wing streamer
	1970	280	Pink leg streamer and red leg band, left leg
	1971	395	Pink leg streamer and red leg band, right leg
	1972	176	Pink leg streamer, left leg
	1973	75	Pink leg streamer, right leg
Hall Island, Brevard Co. Florida East Coast.	1970	100	Green leg streamer
Cape Romain National Wildlife Refuge, Charleston Co., South Carolina.	1969	300	Arc Yellow wing streamer
	1970	300	Blaze Orange wing streamer
	1971	300	Blaze Orange wing streamer
	1972	90	Blaze Orange wing streamer

same bird at the same locality over a long period of time. Including all these reports in this analysis would bias the results; thus all repeat sightings were combined as one report at one location in each month. The following paper is an analysis of 1,050 reports of nestlings banded on Cape Romain and Tarpon Key, along with 34 reports of nestlings banded on Hall Island.

Results from banding studies are dependent on the willingness of people to report encounters. The probability of such reports is obviously greater in centers of human population and this bias must be accounted for in an analysis of color marking sightings. These results indicate the interaction of several factors, not all of which are related to the biology of pelicans: (1) Reports from people with addresses outside of Florida indicate that winter residents and tourists are more willing to report color marked birds than permanent residents. I know of sightings by commercial fishermen and other non-tourists who did not make a report. (2) The type and frequency of publicity and news releases strongly affected the report rates of color mark sightings. Reports increased sharply closely after a news release and tended to taper off rapidly thereafter. Recurrent releases evoked good response, especially during the winter when they reach newcomers to the state who were not previously aware of the study. (3) The SaFlag material used for the leg streamers became worn and frayed and streamers did not remain on the birds for more than 6 to 9 months.

This is considerably less than Southern (1971) reported for wing streamers on gulls. Most wear occurs around the place of attachment to the leg in pelicans. I cannot explain this severe wear, but it is probably related to corrosion caused by salt water immersion. (4) An analysis of pelican band encounters (Henny, 1972; Schreiber, unpubl. data) indicates that postfledging mortality during the first year of life is 70-75 percent. Thus, the number of streamered birds decreases rapidly during the first year and only a small sample of marked birds would be alive a year after banding. Acknowledging the interaction of these factors, the following data and analysis are presented.

#### RESULTS

The number of reports of sightings varies between years (data available on request). This variation is accountable through differences in the number of birds banded each year and differences in publicity about the project. A similar general pattern in reports exists for all years, and for further analysis all reports for all years are grouped by month.

I received 485 reports from the east coast of Florida and 34 reports from the Florida Keys of pelicans that had been banded in South Carolina (Table 2); 439 reports from the west coast of Florida and an additional 92 reports from the Florida Keys of pelicans that had been banded on Tarpon Key (Table 2); and 34 reports of pelicans from the east coast of Florida that had been banded on Hall Island.

On the Florida East Coast no sightings were reported in July and few in August and September, numbers increased through October-November and December-January to a maximum in February, then dropped off drastically through March, April, May, and June. Sightings of South Carolina banded birds did not occur in the Florida Keys until December and most were reported in February. Of a total of 519 reports of South Carolina banded birds, only 34 (7%) were reported from the Keys.

On the Florida West Coast the first reports of color marked birds were made in July, increased in August, remained remarkably constant from September through March and then declined through April, May, and June. No reports of Tarpon Key birds occurred in the Florida Keys in August, a few were reported in September and October, more in November and December and most in January-February, decreasing in March through July. Probably the July sightings were of one-year-old birds and are not of a bird-of-the-year that moved rapidly to the Keys.

All the data in Table 2 indicate: few sightings occurred in July (the month of banding and first fledging), numbers increased gradually through August, September, and October, increased again and remained similar in November and December-January, peaked in February, and then decreased in March-April. Few reports occurred in May and June, during the 11th and 12th month of tag life.

Tables 3 and 4 summarize the reports of color marked pelicans by month and distance from banding location. Figure 1 illustrates

TABLE 2.  
Reports of color marked Brown Pelicans in Florida.

	Sighted on East Coast		Sighted in Keys, banded in S.C.		Sighted in Keys, banded in Tampa Bay		Sighted on West Coast		Total sighted in Fla., banded in S.C.		Total sighted in Fla., banded in Tampa Bay		Total Sighted	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
July	0	—	0	—	2	2	4	1	0	—	6	1	6	1
August	3	0.6	0	—	0	—	25	6	3	0.6	25	5	28	3
September	4	1	0	—	2	2	53	12	4	1	55	10	59	6
October	23	5	0	—	1	1	51	12	23	4	52	10	75	7
November	59	12	0	—	8	9	60	14	59	11	68	13	127	12
December	87	18	5	15	8	9	58	13	92	18	66	12	158	15
January	87	18	4	12	16	17	47	11	91	18	63	12	154	16
February	147	30	19	56	22	24	44	10	166	32	66	12	232	22
March	26	5	3	9	12	13	51	12	29	6	63	12	92	9
April	39	8	2	6	11	12	25	6	41	8	36	7	77	7
May	8	2	1	3	8	9	14	3	9	2	22	4	31	2
June	2	0.4	0	—	2	2	7	2	2	0.4	9	2	11	1
Total	485		34		92		439		519		531		1,050	

TABLE 3.

Reports of color marked Brown Pelicans in Florida, recorded by month and distance from site of banding. Nestlings banded and color marked on the Cape Romain National Wildlife Refuge, South Carolina. All years combined. See Fig. 1 for locations of mileage.

	MILES:												Total n	%	
	under 200	199- 250	251- 300	301- 350	351- 400	401- 450	451- 500	501- 550	551- 600	601- 651	651- 700	700			
July	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
August	1	2	0	0	0	0	0	0	0	0	0	0	0	3	>1
September	0	2	1	0	0	1	0	0	0	0	0	0	0	4	1
October	5	3	0	2	10	2	0	1	0	0	0	0	0	23	4
November	1	9	13	10	14	3	3	4	2	0	0	0	0	59	11
December	0	17	10	14	21	8	6	7	4	4	1	1	4	92	18
January	1	9	15	3	28	4	12	5	7	3	4	3	4	91	17
February	0	19	7	8	31	31	32	15	2	10	11	11	11	166	32
March	0	2	2	1	8	7	6	0	0	0	0	0	3	29	6
April	0	3	2	2	15	8	3	6	0	2	0	0	0	41	8
May	2	1	0	0	5	0	0	0	0	0	1	1	1	9	2
June	2	0	0	0	0	0	0	0	0	0	0	0	0	2	>1
Total n	12	67	50	40	132	64	62	38	15	19	20	20	4	519	
%	2	13	10	8	25	12	11	7	3	4	4	4	4		

TABLE 4.

Reports of color marked Brown Pelicans in Florida, recorded by month and distance from site of banding. Nestlings banded and color marked on Tarpon Key, Pinellas County, Florida. All years combined. See Fig. 1 for locations of mileage.

	MILES:										Total n	%
	51+	21-50	within 20	21-50	51-100	101-150	151-200	Flamingo and Keys	Total			
	north	north		south	south	south	south	south	n			
July	0	0	4	0	0	0	0	0	2	6	1	
August	0	0	22	2	1	0	0	0	0	25	5	
September	2	0	48	0	1	2	0	0	2	55	10	
October	0	0	45	0	2	4	0	0	1	52	10	
November	1	0	42	2	4	9	0	0	10	68	13	
December	2	0	39	0	8	9	0	0	8	66	12	
January	2	0	14	3	15	13	0	0	16	63	12	
February	4	0	21	0	9	12	0	0	20	66	12	
March	1	0	19	7	13	11	0	0	12	63	12	
April	0	1	17	3	2	2	0	0	11	36	7	
May	2	1	7	1	2	1	0	0	8	22	4	
June	0	1	4	1	1	0	1	1	1	9	2	
Total n	14	3	282	19	58	63	1	1	91	531		
%	3	1	53	4	10	12	1	1	17			

the straight line mile distances from Tarpon Key on the west coast of Florida and from Cape Romain on the east coast of Florida as well as the major geographical points in these regions.

*Pelicans Banded in South Carolina* (Table 3). There are no reports in Florida in July, only 3 in August and 4 in September. The August reports are from the most northern section of the east coast, and in September one bird was reported as far south as Vero Beach. The number of reports increases in October with birds reaching into the Fort Lauderdale region. Numbers continue to increase in November and December. January has the same number of reports as December. The first sightings reported from the Florida Keys occur in December, with numbers present there in January and February. The number of sightings reported in December through February shows a relatively even distribution throughout the east coast and the Keys with a gradual trend of movement toward the south through January and February. The number of

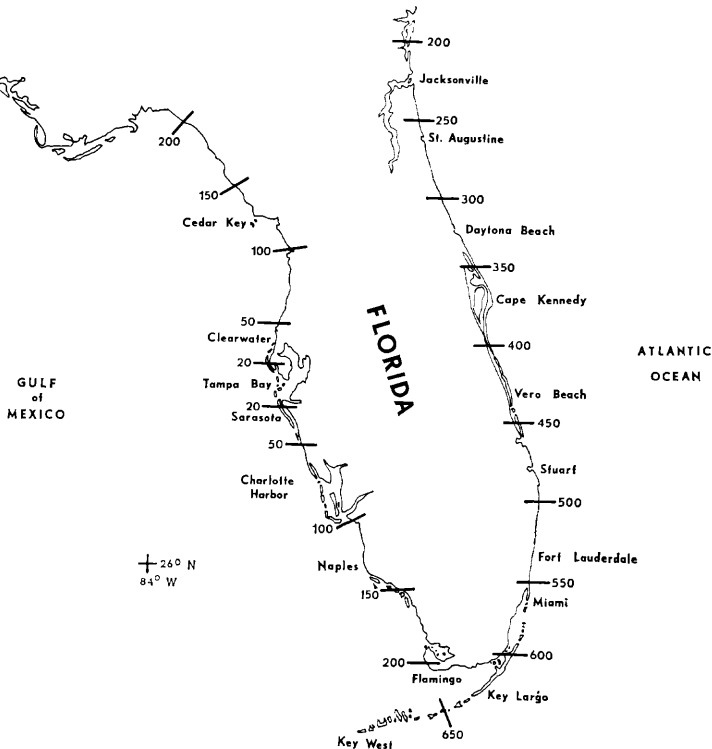


FIGURE 1. Map of Florida illustrating straight line mile distances along the west coast of Florida from Tarpon Key (at the mouth of Tampa Bay); and along the east coast of Florida from the Cape Romain National Wildlife Refuge in Charleston Co., S. C. Major geographical points are marked for ease in discussion and orientation.

reports in March, April, and especially May-June is small but there appears to be a gradual withdrawal of the South Carolina banded pelicans from the Keys and more southern portions of Florida.

There is a distinct clustering of reports in the region around Jacksonville, and a few reports from the St. Augustine through Daytona Beach regions. An increase in reports occurs in the Cape Kennedy region, and numbers remain high through Vero Beach, Fort Pierce, and Stuart. Few sightings occur in the Miami region.

These results clearly indicate the southward movement into Florida of Brown Pelicans banded as nestlings in South Carolina. It appears to take approximately one month for the first birds to arrive in Florida after fledging. Not until late October, November, and December do large numbers appear and by then they have dispersed along the entire east coast and into the Keys. Large numbers of pelicans banded as nestlings in South Carolina obviously spend the winter in Florida and this fact must be considered when discussing the population fluctuations of the colonies in South Carolina.

*Pelicans Banded in Tampa Bay* (Table 4). There are reports of these birds within 20 miles of the banding location in July, the month in which first fledging occurred. Reports increase in numbers through November and remain remarkably constant through March, then decrease in April through June. The distance from the banding location also increases with time after fledging and reports are scattered quite evenly along the southwest coast to Naples. An excellent example of the factor that sightings only occur where people are present is the almost complete lack of reports in the 151-200 mile-south distance. This is the region of the 10,000 Islands with its very sparse human population. Numbers of reports at Flamingo and in the Keys are high and several reports are from the Dry Tortugas, 70 miles west of Key West, and 40 miles from the nearest other key. The lack of reports in the 21-50 mile-north area is somewhat surprising since this is an area of high human habitation and pelicans are common in the region. Several reports came from north of Clearwater, two more than 200 miles-north in the Panama City region, at the same locality within two weeks of each other. These reports are undoubtedly of the same bird.

*Pelicans Banded on Hall Island*. None of these birds were reported until November. In December and January, reports (20) were received. The peak of reports occurred in February (38). Six reports were received in April and May. Most were sighted within 50 miles of the natal colony (59%); a few occurred to the north (9%) but more were seen south of the banding location (33%) but only as far south as Marathon in the Keys.

These data clearly indicate that fledgling Brown Pelicans disperse from their nesting colony in primarily a southward direction. However, a few stragglers do move long distances to the north.



*Reports From Outside Florida.* In addition to the reports summarized above, several sightings were received of color marked pelicans outside of Florida. The following were of single birds banded on the Cape Romain National Wildlife Refuge:

August	Ocracoke Ferry, between Cedar Point and Hatteras, N. C.	1971
September	St. Simons Island, Ga.	1971
October	Oregon Inlet, N. C.	1969
	Hatteras Inlet, N.C.	1969, 1970
November	Cove Banks, Drum Inlet, S.C.	1971
	Ossabaw Island, Ga.	1970
January	Drum Island, Charleston, S.C.	1971
May	Shutes Folly Island, Charleston, S.C.	1971
June	Hilton Head, S.C.	1971
	Ocracoke Inlet, N.C.	1971

It is interesting to note that most of these northern reports occurred in 1971, a year of unseasonably warm fall and winter temperatures in Florida.

Another unusual report came from Andy Patterson at Fox Town, Abaco, Bahamas, on 23 August 1971. He reported a faded plastic band on the right leg "which may once have been red but was then a very light pink." This is undoubtedly a bird banded in Tampa Bay in 1970.

*Individually Marked Pelicans.* I received 20 reports of individual pelicans with numbered streamers that were sighted once at one location. In addition, 31 individually numbered pelicans were reported from one or more location more than once (data available on request).

From these reports of individually numbered birds it appears that individual pelicans wander extensively. However, when conditions apparently are acceptable, they remain in one location for some period of time. It also appears that individuals may return to an acceptable location after having left it. The limited data suggest that the most important factor affecting these movements is food availability. These interesting patterns of individual movement warrant further studies, probably with radio transmitters.

#### DISCUSSION

The results of this color marking study are not directly comparable to those of Longstreet and Davis (1936) or Mason (1945) since they did not separate encounters into age-class groupings, because their samples were banded in different colonies, and because they analyzed band encounters, primarily of dead birds and not sightings of color marked live birds. However, my data do confirm many of their conclusions as well as expanding on their results.

Presently I am analyzing the more than 1,800 bird-band encounters of Brown Pelicans banded in South Carolina and Florida

since 1925. We continue to band large numbers of nestlings each year and thus the results become more valuable as time passes after banding. To date the information on postfledging dispersal amassed from over 1,500 sightings of only 2,269 banded and color streamered Brown Pelicans indicates the great usefulness of color marking as a means of studying postfledging dispersal.

Three major conclusions result from this study: (1) The majority of the Brown Pelican fledglings move south away from the natal colony during the first months out of the nest. (2) Individual birds-of-the-year wander extensively, often remaining in one location for some period of time, frequently up to a month, and often visit a specific location on a rather regular basis, perhaps as a result of moving up and down the coast. (3) At least during their first year, it appears that the Florida population of Brown Pelicans is segregated into two sub-groups: one on the East and one on the West Coast. These data indicate that pelicans hatched on the East Coast of Florida and in South Carolina move primarily to the south in the fall but remain along the East Coast and in the upper Florida Keys. They do not move around the tip of the peninsula and north along the Florida West Coast. No birds banded as nestlings in South Carolina have been reported from Flamingo, in upper Florida Bay, from west of Marathon, or anywhere along the West Coast. Pelicans hatched in Tampa Bay move primarily south in the fall and they are common at Flamingo, in upper Florida Bay and in the lower keys west of Marathon to the Dry Tortugas. With the exception of one individual that stayed at the University of Miami Marine Station on Key Biscayne for a few weeks, no pelican banded as a nestling in the Tampa Bay region has been reported from the Florida East Coast. Since the vast majority of our records of first-year birds are to the south of the natal colony, or within a few miles of the colony, this tendency to move south may impede an extensive northward movement around the south tip of Florida.

Additionally, these results show that large numbers of the young pelicans raised in South Carolina spend their first winter in Florida. This information must be considered when discussing population trends of the Brown Pelican on the East Coast of the United States (Schreiber and Schreiber, 1973).

#### SUMMARY

Reports of sightings in Florida of Brown Pelicans banded and color marked in South Carolina and Florida indicate a primary southward postfledging dispersal. The pelicans wintering in Florida during their first year of life are segregated into two groups: birds hatched in South Carolina remain on the East Coast of Florida and those hatched in the Tampa Bay region remain on the West Coast. Color marking this species is extremely useful as a means of studying postfledging dispersal.

#### ACKNOWLEDGMENTS

I owe a special word of thanks to the hundreds of individuals who reported color marked pelicans, making this report possible.

Lovett E. Williams, Jr., Wildlife Biologist with the Florida Game and Fresh Water Fish Commission, was instrumental in generating the publicity that resulted in the sightings reported here and he kindly forwarded these sightings to me for analysis. His assistance has been invaluable in my studies of Brown Pelicans in Florida. Personnel of the U.S. Fish and Wildlife Service banded the pelicans in South Carolina and B. S. Neely kindly supplied the information on those activities contained in Table 1. T. Below, W. Causey, E. Schreiber, J. Seagle, H. Werner, C. Winegarner, G. Woolfenden, and R. Zimmerman braved the mud, heat, guano, and biting-scratching pelicans on more than one banding trip to Tarpon Key. The Frank M. Chapman Memorial Fund, the International Council for Bird Preservation, the National Audubon Society, The National Geographic Society, the St. Petersburg Audubon Society, the Pelican Island Audubon Society, the Fisher Pierce Company, the Outboard Marine Corporation, A. P. W. Connelly, and the Florida Game and Fresh Water Fish Commission generously supported my study. Peggy Ferguson and Debbie Drager helped compile the reports of sightings. I express my sincere appreciation to all these individuals and organizations.

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