

# Nesting Success of Least Terns on two South Carolina Barrier Islands in Relation to Human Disturbance

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## ABSTRACT

I studied the nesting of Least Terns on Kiawah and Seabrook Islands in 1986, and the main objective was to determine the effect of increased disturbance by humans on nesting success. The disturbances may have driven one colony to a more isolated region on the island. However, comparison of these data with earlier observations dating back to 1975 indicate that the major cause of unsuccessful nesting has been harsh weather. By comparison, the effect of disturbance by humans has been relatively minor.

## INTRODUCTION

The Least Tern (*Sterna antillarum*) breeds in colonies on exposed beaches along the coast from Florida to Massachusetts. Increasingly, this habitat has been affected by human use of the beaches, and this disturbance has been considered a principal cause for the marked decline in the tern population (Fisk, 1975). For example, the species presently is designated "threatened" in South Carolina (Chamberlain, 1981). Fisk (1975) reported that Least Terns were first observed in 1957 to be using alternative nesting sites on flat roofs of buildings in Florida, and this adaptation had spread to Charleston County, S. C., by 1975 (Chamberlain, 1981). Least Terns also have adopted dredge spoil islands as nesting sites (Jernigan et al., 1978).

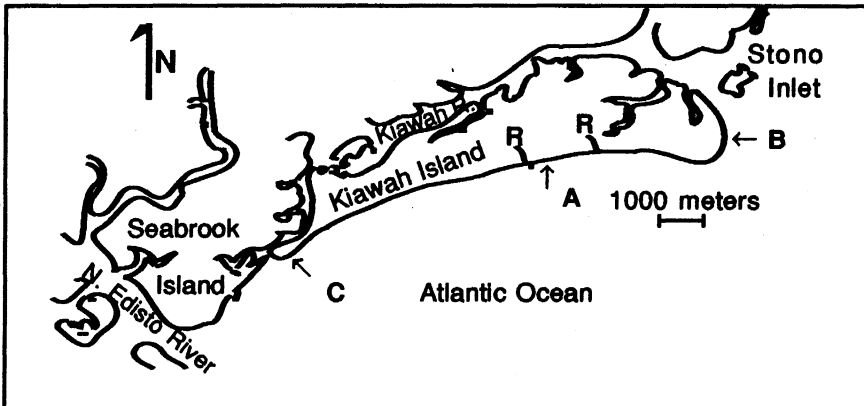


Figure 1. Diagrammatic map of the Kiawah-Seabrook area.

One aim of this study was to assess the effect of human disturbance on two Least Tern colonies on Kiawah Island, a barrier island 27 km south of Charleston, South Carolina. The colonies at sites A and C (Figure 1) were first

described by Chamberlain and Chamberlain (1975) and later studied by Roch (1977) and Chamberlain (1981). I was interested in continuing the study of these two colonies because the extent of human disturbance has increased in recent years. The colony at site A was subjected to greater disturbance by both foot and vehicle traffic along the beach as the human population of the island increased. Site C was profoundly changed because the channel of the Kiawah River between Kiawah and Seabrook Islands was altered in February 1983. A new channel was dug, and the old channel was blocked by a dike of sand (Figure 2). By April 1983, site C had become a part of Seabrook Island. I hoped to investigate the effect of these topographic changes on the tern's choice of the site.

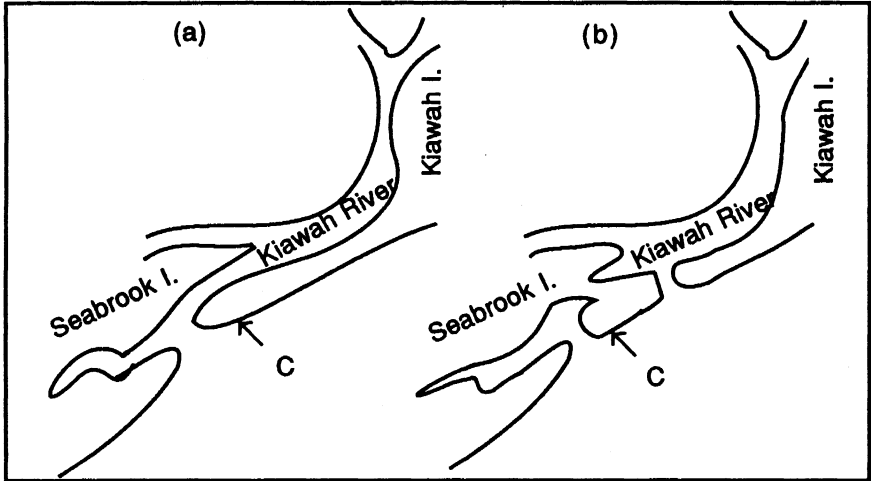


Figure 2. Diagram of the Kiawah-Seabrook area before (a) and after (b) rechannelization of the Kiawah River.

## METHODS

I patrolled the colony areas from 26 April through 20 July with as much care as possible to minimize disturbance. Whenever possible the colonies were inspected in early morning or late afternoon to reduce exposure of chicks and eggs to mid-day heat. I recorded observations on tape to minimize time in the colony. I marked each nest with a 15 cm plastic stake placed 1 m to landward. Each stake was marked with nest number and date of discovery. Observations for each nest included number of eggs, amount of vegetation, and nest elevation. Observations on subsequent days included number of eggs, chicks, predation and other possible causes of loss. Predation was judged by tracks left by the predator.

## RESULTS

### Habitats of the colonies:

The location of the Kiawah colony (site A, Figure 1) changed in 1986. On 26 April there were 28 Least Terns loafing on the beach at site A, but no eggs were found in the fore-dunes as in previous years. On 2 May that area was flooded by a combination of spring tides, and a strong off-shore wind. By 14 May site A was abandoned and I found ten nests with eggs at site B (Figure 1). The colony area was about 75 x 350 m and was located between the Stono Inlet and vegetated dunes, beyond which was a shallow slough. The terrain was similar to that of the Seabrook colony as described below, except for slightly more vegetation and more low dunes of fine, unstable sand. These dunes acquired a crescent shape and were sand-driven so that they moved over the colony and frequently covered nests. This entire east end of the island from the slough to the inlet was created only in the past two to three years by accretion of sand brought down the Stono River and from the northeast by ocean currents.

The habitat of the Seabrook colony (site C of Figure 2b) changed significantly after the 1983 rechannelization. Changes in ocean and river-outlet currents, redeposition of sand, and changes in vegetation occurred after rechanneling. In 1986, the colony occupied an area of about 150 x 750 m that ran parallel to the ocean and was at least 15 m beyond the high tide mark. On the landward side it was bordered by vegetated dunes and a tidal slough (Figure 2b). The substrate consisted of fine sand with small amounts of shell (largely *Donax variabilis*). The terrain was flat except for some dunes that rarely exceeded 0.5 m in height. Vegetation covered less than 1% of the ground and was mainly bitter panicum (*Panicum amarum*) and seashore elder (*Iva imbricata*). Additional cover was provided by dead *Spartina alterniflora* and other debris brought in by the wind and waves. The colony was bordered on the east by vegetated dunes and on the west by a tidally connected slough that was the remnant of the old Kiawah River channel.

### Extent of disturbance by humans:

The Kiawah colony at site A was about 3 km from the residential area and was not significantly disturbed by people on foot, but it was exposed to bicycle traffic. Also, colony A was situated between two beach access roads (marked R in Figure 1). Often at high tide the entire flock of terns would take flight when a vehicle passed. This traffic has increased yearly because of an increase in the number of residents with suitable vehicles and during a typical daytime period in June 1986, an average of seven disturbances per hour occurred. Even at night there was some disturbance from the Loggerhead Turtle nesting patrol that drove up and down the beach several times each night. Site B was much more sheltered from human disturbances. It was about 9 km from the residential area and was not accessible by vehicles except at low tide.

The amount of disturbance of the Seabrook colony caused by the rechanneling of the river was difficult to assess. The colony was only 2 km from the residential section of Seabrook Island. It had been marked with warning signs by the Seabrook Property Owners Association, but nonetheless, the colony was frequently crossed by people on their way to the beach, by their free-running dogs, and by saddle horses and security vehicles. No malicious damage was noted, but the terns harassed them all as potential predators.

### Nesting success

Data for the numbers of eggs observed are given in Figure 3. The large loss of eggs at the Kiawah colony (site B) in the period between 3 June and 10 June resulted from a series of storms. Winds from the northeast leveled the low dunes and covered many nests. Then, exceptional spring tides produced water levels 0.67 m above the normal high tides of 1.69 m. This occurred in the period of 20-22 June, and both colonies were completely flooded.

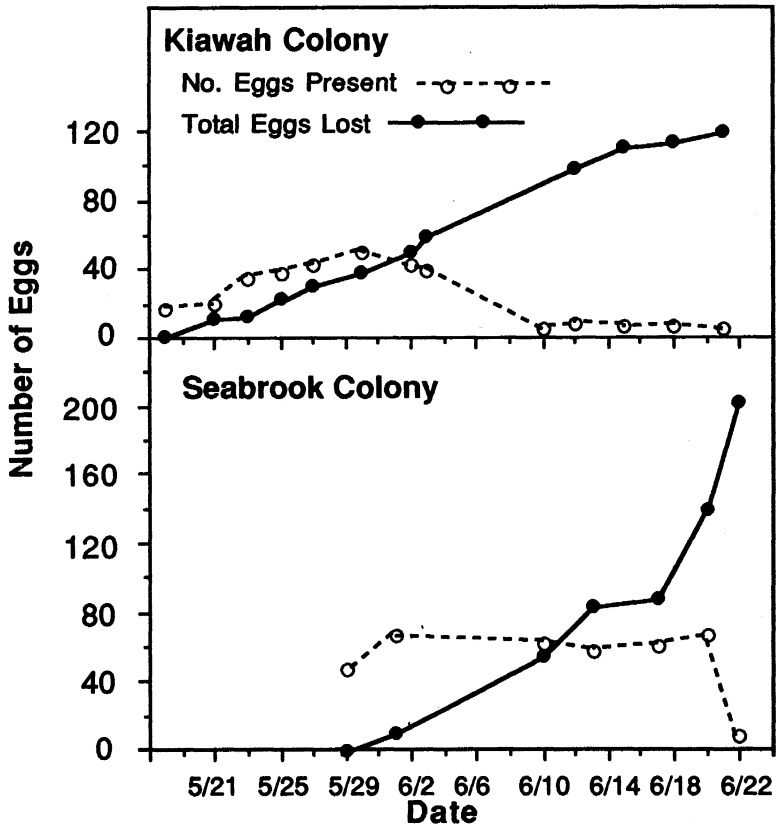


Figure 3. Record of eggs in the two colonies on various dates of observation.

The average number of eggs per nest at the two sites was 1.8 at Kiawah and 1.5 in the Seabrook colony. The hatching success was low for both colonies (Table 1), but some chicks did survive. Nine juveniles were seen in a flock of 42 Least Terns at site A on 16 July and six juveniles were in a flock of 30

Table 1. The Fates of Nests with Eggs

|                              | Kiawah Colony |         | Seabrook Colony |         |
|------------------------------|---------------|---------|-----------------|---------|
|                              | No.           | Percent | No.             | Percent |
| Total Nests                  | 66            |         | 135             |         |
| No. Nests Hatching           | 2             | 3%      | 12              | 9%      |
| Probable Causes of Nest Loss |               |         |                 |         |
| Tidal overwash               | 25            | 38%     | 81              | 60%     |
| Sand covered                 | 25            | 38%     | 24              | 18%     |
| Ghost Crab                   | 5             | 8%      | 7               | 5%      |
| Raccoon                      | 2             | 3%      | 1               | 1%      |
| Laughing Gull                | 2             | 3%      | 0               | 0%      |

terns at site C on 19 July. A comparison of my 1986 results with data from earlier studies is given in Table 2 and will be discussed below.

### DISCUSSION

The Least Tern nesting colony at site A has been exposed to increased beach traffic in the past few years, but I observed nesting terns in 1984 and 1985 and I believe Least Terns have used this site annually since at least 1974. However, human disturbance may have been the principal cause for the movement of the colony to site B in 1986 although as noted above, site A was flooded by high tides on 2 May. Least Terns have strong colony site attachment and this site tenacity may mean that the birds will attempt to use an area even after the habitat becomes unsuitable (Austin, 1941).

Table 2

Historical record of the colonies at Site A (B in 1986) and Site C. The measure of success is qualitative. "Successful" denotes that the colony was not affected by major storms or high predation. "Unsuccessful" denotes that the colony was tidally flooded and/or covered by windblown sand.

| Year              | Site A                  |                   | Site C                  |                   |
|-------------------|-------------------------|-------------------|-------------------------|-------------------|
|                   | Number of Nests Present | Degree of Success | Number of Nests Present | Degree of Success |
| 1975 <sup>1</sup> | 43                      | Unsuccessful      | 43                      | Unsuccessful      |
| 1977 <sup>2</sup> |                         | ?                 | 26                      | Successful        |
| 1979 <sup>3</sup> | 41                      | Unsuccessful      |                         | ?                 |
| 1981              |                         | ?                 |                         | Unsuccessful      |
| 1982              |                         | ?                 |                         | Successful        |
| 1984              |                         | Successful        |                         | ?                 |
| 1985              |                         | Unsuccessful      |                         | ?                 |
| 1986              | 31                      | Unsuccessful      | 43                      | Unsuccessful      |

Source of data:

<sup>1</sup> Chamberlain and Chamberlain, 1975

<sup>2</sup> Roche, 1977

<sup>3</sup> Chamberlain, 1981

All other years' data based on personal observation.

The colony at site C, which is now on Seabrook Island, has been subjected to more profound changes. Colony C had been observed in 1981 and 1982, when it was attached to Kiawah Island and the amount of human disturbance was low. The rechanneling of the Kiawah River in 1983 may be expected to have long-term effects on the nesting habitat. Certainly, the attachment of the colony to Seabrook Island has produced an increase in disturbance by humans, dogs, horses and vehicles. No information was available for 1983 or 1984, except that the terns did not nest on the residual spit of Kiawah Island shown in Fig. 2b. However, colony C was active in 1985 (pers. observation).

A comparison over a period of years is helpful when trying to assess the effects of human disturbance on nesting success (Table 2). In 1975 Chamberlain and Chamberlain reported both colonies were on low, exposed fore-dunes, and were destroyed by winds and tides. Roche (1977) compared reproductive success of Least Terns at Kiawah Island site C with a rooftop colony and a third on a spoil deposit in Charleston. From her data on numbers of nests, eggs and hatchlings, it appeared that all three colonies in 1977 were successful in the qualitative sense defined in Table 2. The 1979 study of Table 2 compared differences in Least Tern colonies on disturbed (Kiawah Island) and undisturbed (Caper's and Cape Islands) barrier islands, with emphasis on the effects of human disturbance and predation on reproductive success. However, because the Caper's Island colony was totally destroyed by raccoons (*Procyon lotor*) and the other two colonies were partially destroyed by tidal flooding, it appears that human disturbance was relatively inconsequential. More recent observations during 1981-1986 document continued poor nesting success. This record suggests that increased human disturbance in the period 1975-1986 had not discouraged nesting. The numbers of nests in the colonies at any given time were not significantly different over this period (Table 2). Predation by other animals was minor for both colonies (Table 1). Historically, the main cause of unsuccessful nesting has been severe weather. The Least Tern has always had to contend with these conditions because of its tendency to nest on exposed beaches. Kotliar and Burger (1986) studied 26 Least Tern colonies in New Jersey on beaches and dredge sites and reported that this species frequently abandons nest sites, and generally has low reproductive success on beaches. The results of this study, in which I found terns to be successful in only three of ten colony years (Table 2), agree with their findings. The relatively recent use of alternate nest sites on rooftops and dredge islands is a significant change in behavior which may favor the survival of the species.

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#### ADDENDUM

I monitored the Least Tern nesting on Kiawah and Seabrook Islands during the three nesting seasons of 1987-89.

At Site A on Kiawah Island, nesting continued to a minor degree (6 nests in 1987; 11 nests in 1988 and 16 nests in 1989). Motor vehicle traffic that would have passed this site was greatly restricted during the three years.

At Site B on Kiawah Island, no nests were found during the three years, although Least Terns were seen in the area each year.

At Site C on Seabrook Island, a maximum of 69 nests were observed on 15 May 1987 but the colony was completely destroyed by a severe storm on 4 June. One nest was found in 1988 and none in 1989.

No nesting on flat roof-tops was seen on Kiawah Island during the three years.

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