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## **FIRST RECORD OF ROSEATE TERNS NESTING IN THE KEY WEST NATIONAL WILDLIFE REFUGE: A BY-PRODUCT OF HURRICANE WILMA**

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In the Western Hemisphere, the Roseate Tern (*Sterna dougallii*) exists as two distinct breeding groups: the endangered northeastern population (New York to Nova Scotia) and the threatened Caribbean population (see Smith 1996). In the U.S., birds of the latter group nest only in the Florida Keys, an arcuate string of islands stretching ca 355 km from Key Largo to the Dry Tortugas.

Despite the Florida Keys' considerable length, from 1974-1998 a peak of only four nesting colonies was active in a single year (1976), with only 34 known colonies (mean = 1.3 colonies per year) during the 25-year period (computed from Zambrano et al. 2000). That 11 (32%) of the colonies were on rooftops (computed from Zambrano et al. 2000) coupled with most other nesting occurring on islands cleared or created by man suggests that a lack of natural sites is a limiting factor.

On 24 October 2005, Hurricane Wilma obliterated Pelican Shoal, a low-lying offshore island 13 km southeast of Key West—the sole natural Roseate Tern nesting site and one of only two active colonies that year in the Florida Keys. Aerial reconnaissance on 7 November 2005 revealed that the hurricane had created a sand island (ca 400 m long, width 5-100 m) and a narrow, attached finger spit, located 0.1 km west of Boca Grande Key (19 km west of Key West and ca 38 km from Pelican Shoal). Hereafter this entire area will be referred to as Sand Island. Although within the administrative boundaries of the Key West National Wildlife Refuge, Sand Island and surrounding waters are under State of Florida jurisdiction.

TW boated past or stopped at Sand Island at least twice monthly from December 2005 through May 2006. Despite the remote location,

visitors were often present, with as many as 23 people and three unleashed dogs observed at one time. Flocks of shorebirds and Least Terns (*S. antillarum*), a state-listed threatened species, were observed being flushed en masse by the latter.

On 5 June 2006, we observed a Roseate Tern incubating one egg ca 20 m from the west terminus of the island (hereafter nest one). The egg was deposited on bare sand but nearly touched a small, branched coral fragment. On that same day, permission was requested from the State of Florida to close part of the island as an emergency measure until State personnel could arrive later in the month. On the following morning, we erected area-closed signs around the nesting area, providing a minimum buffer of ca 33 m. The bird remained in the incubating position.

By 12 June, nest one had been washed away. A new nest with an incubating Roseate Tern (hereafter nest two) was observed ca 10 m from the former site of nest one. The bird's scrape nearly touched a piece of carpet (ca  $0.5 \times 1$  m) nailed to and protruding from a plywood panel (ca  $1 \times 1.5$  m) that had washed ashore. The scrape was otherwise surrounded by short (ca 4-10 cm) fragments of branched coral and rope. On June 14, State personnel posted new area-closed signs, each connected by a rope to delineate the closed nesting area. They also placed a sign ca 75 m beyond the cordoned area to provide an additional buffer.

Observations on 19 June and 26 June revealed that the bird at nest two was still incubating, and on the latter date three additional Roseate Terns, all within the closed area, were nearby (Table 1).

On 3 July, two additional Roseate Terns, each in an incubating position, were observed within the closed area. The scrape of one nest (nest three), 1 m from nest two and on the opposite side of the carpet, nearly touched the plywood panel. Nest four was ca 12 m east of nest three.

On 5 July, we observed 16 Roseate Terns, including the three incubating birds, in the closed area. Two pairs engaged in courtship flights (see Gochfeld et al. 1998) shortly after our arrival. Both pairs were later observed copulating, one within the closed area, the other ca 80 m beyond it and alongside a water-filled depression on the island. Pre-copulatory behavior for the latter pair was observed: one of the birds made begging calls and the terns moved in short circles around each other for about 45 seconds. The female then held her body parallel to the sand whereupon the male mounted her. The copulation occurred amidst more than 50 Least Terns.

Copulation was a protracted affair for both pairs of Roseate Terns. We timed the length of copulation for the pair observed outside the closed area: 1 minute, 35 seconds or 35 seconds longer than reported for this species (see Gochfeld et al. 1998). In both instances, the female was standing when copulation began, but eventually sank to the sand

**Table 1. Summary of Roseate Tern observations on Sand Island, June 5-August 21, 2006.**

Date	No. Roseate Terns <sup>1</sup>	No. active nests <sup>2</sup>	No. young
5 June	1	1	0
12 June	1	1	0
19 June	4	1	0
26 June	4	1	0
3 July	3	3	0
5 July	16	3	0
12 July	23	3	0
15 July	26	3	1
22 July	5	2	0 <sup>3</sup>
7 Aug	10	0	0 <sup>3</sup>
12 Aug	15	0	3
21 Aug	8	0	0
4 Sep	0	0	0
6 Sep	0	0	0
11 Sep	0	0	0
18 Sep	0	0	0

<sup>1</sup>Exclusive of nestlings.

<sup>2</sup>Adult bird on scrape.

<sup>3</sup>No spotting scope on these dates; nestlings may have been overlooked.

with the male still on her back, with copulation continuing for 30 additional seconds in the second pair.

On 12 July (1044 hours) we visited Sand Island at the crest of the highest spring tide of the month. About half the island was inundated, including a small portion of the closed area, but all the tern nests were above water and the birds were incubating. Including the three nesting birds, 23 Roseate Terns were observed, 14 within the closed area, nine others near a flock of 35 Royal Terns (*S. maxima*).

On 15 July, 26 Roseate Terns were observed on the island. Birds were present at nests two, three and four. However, the bird at nest two was sitting higher in its nest than the other nesters, suggesting a hatchling was being brooded. Because incubation normally is completed in 24 days (Gochfeld et al. 1998) and nest two had one egg on 12 June, incubation may have been protracted at this nest. Incubation in Roseate Terns may last as long as 31 days (Nisbet 1981). Further, it is possible that a second egg was laid at nest two. Individual eggs may be laid as much as four days apart (Gochfeld et al. 1998). It may be that the first egg at nest two did not hatch (or if it did, we did not observe a nestling), and, perhaps, the bird was still sitting on the second egg (or a small hatchling) on 15 July.

On 22 July, no bird was present at nest two, but incubation was still underway at nests three and four. We had binoculars only (no spot-

ting scope) and did not observe any nestlings. Five Roseate Terns, including the incubating birds, were observed in the closed area.

On 7 August, no incubating Roseate Terns were observed, but 10 roosting birds were present in the closed area. Two men were on Sand Island, cast-netting from the shoreline at a point barely within the closed area. The men were oblivious to the signs; their activity did not cause the terns to flush. We did not have our spotting scope and may have overlooked nestlings if they had been immobile and cryptic due to the presence of the fishermen.

On 12 August, 15 adult Roseate Terns and three fledglings were observed. Age differences were readily apparent. One fledgling was nearly full grown (primaries well developed); the others were smaller, one considerably so. Given its advanced development, we believe that the largest fledgling was from nest two.

On 21 August, no birds were present in the closed area. Eight roosting birds (all adults) were observed elsewhere on the island. No Roseate Terns were observed on 4, 6, 11, and 18 September.

#### DISCUSSION

Prior to our observations, Roseate Terns had not nested within the administrative boundaries of the Key West National Wildlife Refuge (KWNWR). Since 1986, a few tropical storms and other hurricanes (e.g., Georges in 1998) have created tiny sand islands in KWNWR, but these were ephemeral and unsuitable for tern nesting (Wilmers pers. obs.). Thus, Hurricane Wilma's creation of Sand Island was noteworthy. The island had characteristics similar to that reported by Robertson (1978) for a Roseate Tern nesting site in the Dry Tortugas: a barren substrate of sand, shell, and broken coral.

Whether nesting occurred before our first observation on June 5 was unknown. Prior observations of public use (and the presence of free-roaming dogs) on Sand Island falsely led us to assume there would be no nesting by any bird species. Thus, we may have overlooked any earlier nest(s).

Egg-laying rangewide for the Caribbean population usually begins in May with hatching in mid-June (Gochfeld et al. 1998). However, two of the four Sand Island nests were laid after 26 June, which is more typical for Florida (Kushlan and White 1985, Smith 1996, Zambrano 2001). Roseate Terns nesting at Sand Island could also have been young adults, which in the northeastern population lay eggs later than their older counterparts (Burger et al. 1996).

Beaches and sand islands are rare in the FL Keys and attract boaters, some with dogs. Nesting Roseate Terns left unprotected in remote areas like Sand Island inevitably will be subjected to human-caused

disturbance. The deleterious impact of the latter (see Nisbet and Drury 1972) is unrecognized by some, if not most, visitors. Further, the birds of the Caribbean population are more prone to human disturbance impacts than their northern counterparts (Gochfeld et al. 1998).

Because nesting birds are particularly sensitive to disturbance during the courtship and incubation periods (Fyfe and Olendorff 1976), it was important that we quickly provided a buffer zone (see Rodgers and Smith 1995, 1997). Closing the entire island, while preferable, was not possible for a number of reasons, including a lack of officers to enforce the closure. We believe the small size of the buffer zone enhanced compliance because of its reasonableness: most of the island remained open to public use. Signs on Sand Island were not damaged and, with the noted exception, we did not see human trespassers in the closed area.

Although less than 10% of Sand Island was closed to public use, two letters of complaint appeared in a local newspaper denouncing the closure, including one entreaty to leave the entire island open so that dogs could run at will. Although the posted signs stated the area was closed for nesting birds, no news releases had been provided to avoid drawing undue attention to the nesting terns. Whether the latter was the more prudent action is a conjectural matter.

Lastly, Sand Island's importance was not limited to Roseate Terns. We observed four other tern species (as many as 290 Least Terns), 11 shorebird species (as many as eight Piping Plovers (*Charadrius melodus*), and three wading bird species (as many as four Reddish Egrets (*Egretta rufescens*).

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