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ROAD-KILLED ROYAL TERNS (*STERNA MAXIMA*) RECOVERED
AT SEBASTIAN INLET STATE PARK, FLORIDA, USA:
A 23-YEAR ANALYSIS OF BANDING DATA

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Abstract: Large numbers of Royal Terns (*Sterna maxima*) from breeding colonies in North Carolina and Virginia migrate to Sebastian Inlet, Florida for a winter residence. A road and two-lane bridge at the site result in many road-kills from collisions with motor vehicles. At least 148 Royal Terns have been killed in this manner since formal surveys were initiated in 1989; while opportunistic collection of dead, banded birds has been sporadically conducted since 1979. Recoveries of 82 bands during the 23-year period 1979 to 2001 have supplied considerable demographic data. Eleven Royal Tern breeding colonies were differentially represented among the band recoveries. Most banded mortalities were 0.5 yr age class juveniles, with an overall range of 5 months to 12 yr 7 months. Most mortalities occurred December through February. These trends and additional data are discussed.

Introduction

Royal Terns (*Sterna maxima*) winter along the Atlantic Coast of the United States from North Carolina south through Florida (Clapp et al. 1983). In addition, Royal Terns breed in the estuarine habitats along both the Atlantic and Gulf coasts of Florida (Egensteiner et al. 1996). Although the species is fairly common along both coasts of Florida throughout the year, local populations are greatly augmented in winter by terns migrating from breeding colonies farther north (Van Velzen 1968; Van Velzen 1971; Clapp et al. 1983; Robertson and Woolfenden 1992; Smith et al. 1994). Nonbreeding and wintering Royal Terns can also be found at inland freshwater lakes and rivers in central and southern Florida (Barbour and Schreiber 1978; Lohrer 1984; Egensteiner et al. 1996). Many Royal Tern nesting colonies are found on islands of dredged materials (Egensteiner et al. 1996). Florida recoveries of banded migrants from Virginia (Van Velzen 1968; Smith et al. 1994) and the Carolinas (Van Velzen 1971; Smith et al. 1994) have been previously reported. This paper reports the data obtained from 82 Royal Tern bands recovered by Florida Park Service staff from Sebastian Inlet State Park (SISP) during the period 1979-January 2001.

SISP is an approximately 324.5 ha park located in Melbourne Beach, Florida, USA, about 22.6 km north of Vero Beach, at the juncture of Brevard and Indian River counties. The Sebastian Inlet essentially bisects SISP from east to west. The area is managed by the Florida Department of Environmental Protection (FDEP), Florida Park Service.

SISP is further subdivided north to south by approximately 5.0 km of State Road A-1-A. In response to high numbers of road-killed birds, predominantly Royal Terns, bird mortality reduction structures were installed on the two-lane bridge on State Road A-1-A over the Sebastian Inlet in late 1994 (Egensteiner et al. 1998). These were 3-meter high poles attached vertically 3.7 meters apart on both sides of the bridge (Egensteiner et al. 1998). The purpose of the poles was to direct birds up and away from bridge traffic.

Methods

Opportunistic collection of dead, banded birds at SISP has been sporadically conducted since 1979. A formal, daily road-kill survey procedure was initiated in 1989 consisting of slowly driving the road and bridge surfaces while scanning for dead wildlife. Road-kills are identified to species when possible and bands are recovered from birds if present. Bands were recovered at the bridge site as well as at the adjacent Atlantic coast beach.

Results and Discussion

Road-kills have been monitored regularly since 1989; although these data are variable between years, a general reduction in the number of road-killed birds within the park has been noted. Whereas Smith et al. (1994) reported 84 Royal Terns road-killed in the period 1989-1992, only 64 birds were killed during 1993-2001. Royal Tern bands were recovered mostly in winter.

Eighty-two bands were recovered from terns banded at eleven locations (Table 1). A subset of the data reported by Smith et al. (1994) reflecting the period of 1979-1992 included recoveries (n=41) from eight sites (Table 1). Differences in banding localities and relative distribution are noted in the data set recoveries (n=41) encompassing 1993-2001 (Table 1).

All of the Royal Terns recovered near the inlet were banded as immature (too young to fly) birds in their northern colonies. Ages of birds recovered during 1979-1992 ranged from approximately 5 months to 3 yr 10 months (Smith et al. 1994). Ages of birds recovered (n=23) during a subset period of more intensive surveys (1989-1992) ranged from approximately 5 months to 1 yr 6 months, with a preponderance of approximately 0.5 yr (n=11) and 1.5 yr (n=7) age class birds (Smith et al. 1994). In the more recent data (1993-2001), ages ranged from 5 months to approximately 12 yr 7 months. Thirty-four (82.9%) of the animals were aged approximately 5 months to 8 months (0.5 yr). Smith et al. (1994) reported that most of the band recoveries between 1989-1992 occurred in December (30.4%) and January (47.8%). The majority of the band recoveries for the 1993-2001 data occurred in January (48.8%) and February (29.3%).

The trend toward band recovery from juvenile Royal Terns in winter also has been noted in previous studies. Van Velzen (1968) reported that recoveries in Florida occurred from November through June, with 35% of these obtained in January; all birds were younger than one year old. In another study, Van Velzen (1971) reported that most Royal Terns were recovered in the initial fall and winter after banding. The band recoveries noted thus far from Sebastian Inlet show similar patterns of seasonal use and age class structure.

The data we present indicate that Sebastian Inlet is a well-frequented wintering area for some Royal Terns migrating southward from more northern banding locations. There also appears to be a temporal abundance of first and second year birds from these locations during winter, particularly December through February. Because much older birds also have been noted, the recoveries may be more of an indication of high juvenile mortality than local age class wintering. Additionally, more intensive banding efforts at some breeding grounds during various years and increased survey frequency during some months may affect band recovery patterns. Additional research is needed to determine why the area is frequented by these migratory birds. Buckley and Buckley (1972) reported that Royal Tern breeding colonies in Virginia and North Carolina were consistently located "at or very near an inlet between bay and ocean." A similar attraction for inlets may influence some Royal Terns to winter at Sebastian Inlet (Smith et al. 1994).

At some sites in Florida, buffer zones have been implemented to protect breeding (Rodgers and Smith 1995) as well as foraging and loafing (Rodgers and Smith 1997) marine birds from anthropogenic disturbances. Similar buffer zone strategies may need to be developed for marine birds interacting with the road and bridge structure at Sebastian Inlet.

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Table 1

Band locations of Royal Terns recovered at SISP, Melbourne Beach, Florida, from 1979-2001.

Approximate Location*	Number of bands recovered (a)	Percent**	Number of bands recovered (b)	Percent**	Total Number of bands recovered	Percent
Kure Beach, North Carolina	12	29.3	19	46.3	31	37.8
Beaufort, North Carolina	11	26.8	3	7.3	14	17.1
18 km S of Wanchese, North Carolina	5	12.2	3	7.3	8	9.8
Kiptopeke, Virginia	4	9.8	2	4.9	6	7.3
Lola, North Carolina	3	7.3	5	12.2	8	9.8
Hatteras, North Carolina	2	4.9	1	2.4	3	3.6
Cape Lookout, North Carolina	2	4.9	0	0.0	2	2.4
14.5 km E of Birdnest, Virginia	2	4.9	0	0.0	2	2.4
Portsmouth Island, North Carolina	0	0.0	6	14.6	6	7.3
Accomac, Virginia	0	0.0	1	2.4	1	1.2
Ocean City, Maryland	0	0.0	1	2.4	1	1.2
Total	41	100.1	41	99.8	82	99.9

* All locations obtained from individual USFWS recovery certificates.

** All percentages are rounded up.

(a) Smith et al. (1994): Data covers 1979-1992.

(b) Data covers 1993-2001.