

# FIRST ASSESSMENT OF MIGRATORY TERN NUMBERS IN PARAÍBA STATE, BRAZIL

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Four species of terns have been recorded in the state of Paraíba, Brazil: Yellow-billed Tern *Sternula superciliaris*, Common Tern *Sterna hirundo*, Roseate Tern *Sterna dougallii* and Cabot's Tern *Thalasseus acutiflavus* (Efe *et al.* 2009, Schulz-Neto 1995); however, little information is available on their numbers and on the sites used for foraging and roosting. This is the first article to report data on the population size and on the sites used by terns for roosting in Paraíba.

## METHODS

The coast of Paraíba (6°29'S–34°59'W to 7°32'S–34°49'W) covers 147 km of flat beaches, sand dunes, cliffs as well as several estuaries; it has a semidiurnal tidal regime with amplitudes ranging from 0.0 m to 2.8 m.

From May through October 2010, we conducted surveys of the terns' roost sites along the coast of Paraíba. We walked along 24 stretches of beaches, northward and southward, starting from peninsulas and from the mouths of rivers (Fig. 1a); each stretch comprised 2.5 km,

totalling 60 km of transects. Also, using a boat, we searched for roosts on an estuarine island and on fences of fish corrals.

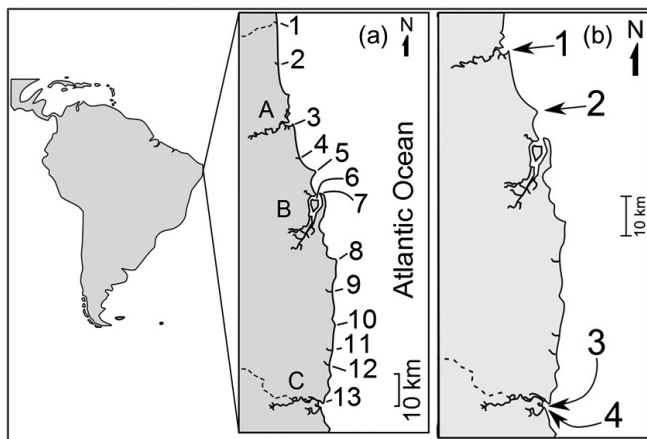
After a roost was found, it was monitored by point counts, which were conducted monthly until April 2011. Along sandy beaches, one observer would count all terns from various vantage points, and the same principle was used to count terns by boat at the fish corrals. Each census, composed of several counts that were then averaged, lasted one hour and took place within  $\pm 2$  h of high tide. Binoculars (10 × 50 mm) and a spotting scope (20–60 × 60 mm) were used.

We used Kruskal-Wallis rank sum tests to examine whether species abundance varied significantly among months and among roosts. Statistical analyses were performed using R 2.12.2 (R Development Core Team 2005).

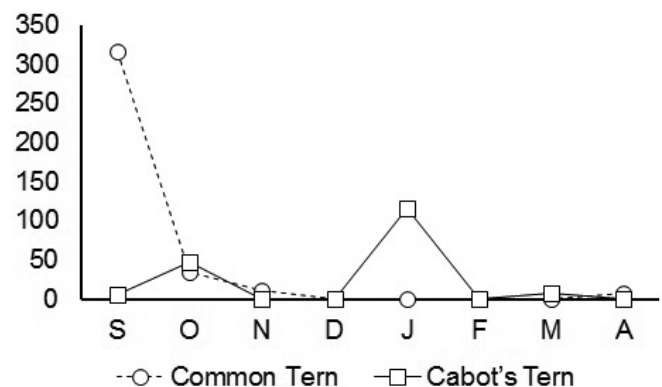
## RESULTS AND DISCUSSION

We found four tern roosts on the coast of Paraíba (Fig. 1b): Barra de Mamanguape Beach (6°45'S and 34°55'W), located at the Mamanguape Estuary; Lucena Beach (6°59'S and 34°51'W), located in the Paraíba do Norte Estuary; and on the fences of two fish corrals on the Goiana estuary (7°33'S and 34°49'W).

During 32 surveys, we recorded 548 birds: 371 Common Terns and 177 Cabot's Terns. Numbers varied among months ( $\chi^2 = 20.9554$ ,  $df = 7$ ,  $P = 0.003837$ ). Maximum counts occurred from September to November for Common Tern and from October to January



**Fig. 1.** (a) Coast of Paraíba state, northeastern Brazil, showing the locations where the surveys were conducted: (1) Guajú, (2) Camaratuba, (3) Mamanguape, (4) Miriri, (5) Lucena, (6) Restinga Island, (7) Cabedelo, (8) Cabo Branco, (9) Gramame, (10) Bucatú, (11) Mucatú, (12) Abiaí, (13) Acaú; (b) Coast of Paraíba, Brazil, showing the roosting sites where terns were found: (1) Barra de Mamanguape Beach (located in Mamanguape Estuary), (2) Lucena Beach (located in Paraíba do Norte Estuary), (3) Acaú fish corral and (4) Carne de Vaca fish corral (located in the Goiana estuary).



**Fig. 2.** Total number of terns recorded on the coast of Paraíba state from September 2010 to April 2011.

for Cabot's Tern (Fig. 2). All roosting sites were used by both species (Fig. 3), and there were no significant differences in bird abundance among roosts ( $\chi^2 = 0.996$ ,  $df = 3$ ,  $P = 0.8022$ ).

Terns occur in far lower numbers on the coast of Paraíba than at other coastal sites in Brazil, such as the National Park of Lagoa do Peixe and vicinities in southern Brazil (Harrington *et al.* 1986, Vooren & Chiardia 1990, Bugoni & Vooren 2005), Mangue Seco Beach in the state of Bahia (Hays *et al.* 1999, Nascimento 2001), islands off the state of Espírito Santo (Efe *et al.* 2000) and the estuarine complex of Cananeia, Iguape and Ilha Comprida, in the state of São Paulo (Barbieri & Pinna 2007).

The two species of terns observed in our study have different breeding areas and undertake different migratory routes. The Common Tern is a cosmopolitan species, which breeds in the Northern Hemisphere from April to July and winters in the Southern Hemisphere (Harrison 1983, Gochfeld & Burger 1996). Since we observed Common Terns during the early non-breeding season, we hypothesize that the coast of Paraíba is a migration stopover site. It appears that far fewer Common Terns use this area during the northward migration.

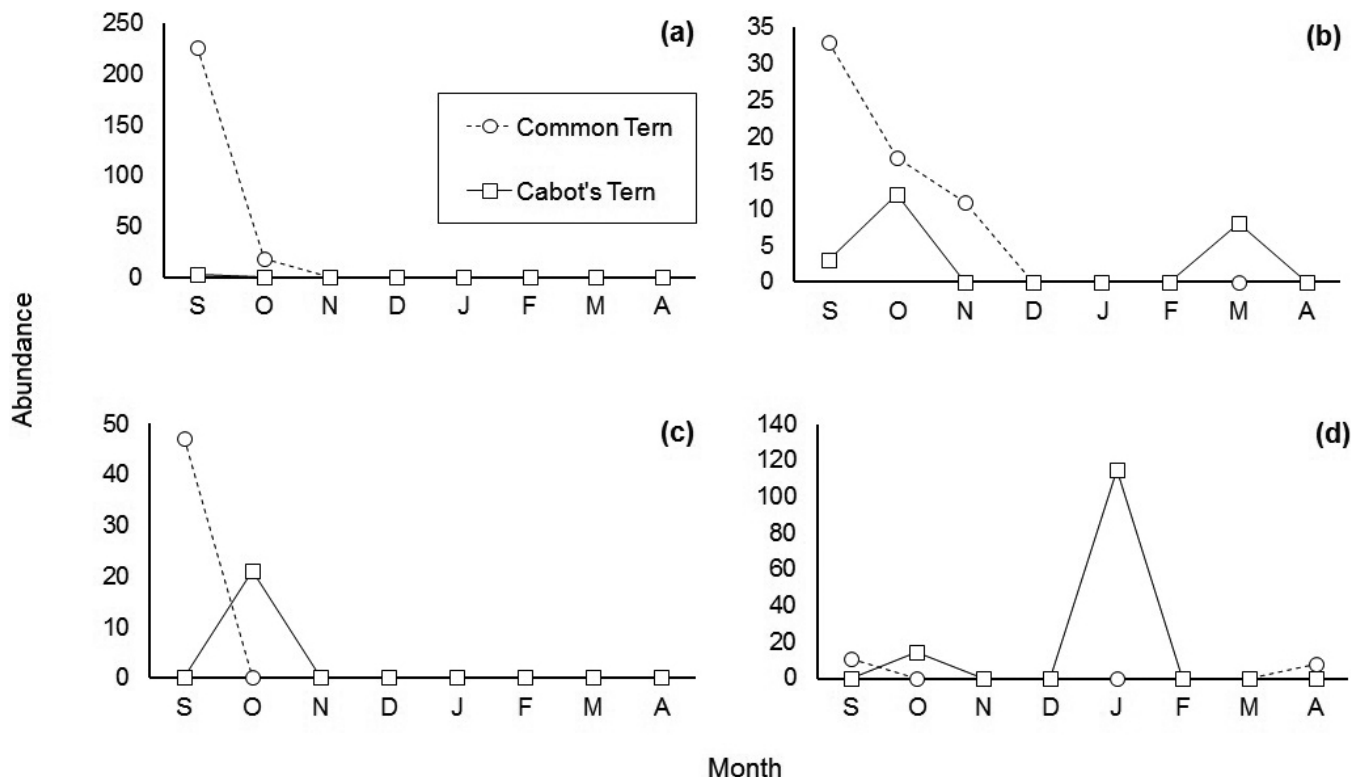
Cabot's Tern breeds on the Caribbean and Atlantic coasts of North and South America, and timing of breeding depends on the region (Efe & Bonatto 2011). The species shows an excellent capacity for long-distance post-breeding dispersal, moving northward and southward from their breeding colonies and mixing different populations during migrations (Efe *et al.* 2000, Bugoni & Vooren 2005). There are no breeding colonies of Cabot's Terns in Paraíba or in nearby states; therefore, we concluded that the observed birds were migrants from an unknown breeding location.

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**Fig. 3.** Number of terns recorded in four roosts on the coast of Paraíba from September 2010 to April 2011: (a) Barra de Mamanguape Beach, (b) Lucena Beach, (c) Acaú fish corral, (d) Carne de Vaca fish corral.

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