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Aerial Surveys for Roseate and Common Terns South of Tuckernuck and Muskeget Islands July-September 2013

US Department of the Interior
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Aerial Surveys for Roseate and Common Terns South of Tuckernuck and Muskeget Islands July-September 2013

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ABOUT THE COVER

Front cover: Roseate tern photo courtesy of David Pereksta.

ABSTRACT

We conducted four transect surveys using a fixed wing aircraft to search for aggregations of foraging Roseate and Common Terns over the waters immediately south of Tuckernuck and Muskeget Islands, Nantucket, Massachusetts during July – September 2013. Roseate Tern is the only federally endangered seabird to occur regularly off the east coast of the United States, and we wanted to carefully document those areas likely to be important to this species. Previous work has shown that Roseate Terns congregate with larger numbers of Common Terns during the post breeding season (July – September) in the vicinity of Tuckernuck and Muskeget. Our surveys showed that most Roseate Terns in the area foraged within 10 NM of the beach, and that peak abundance occurred in late August and early September.

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INTRODUCTION

In North America, Roseate Terns are federally endangered; 90% of the population of about 3,000 pairs nests between eastern Long Island and Cape Cod (Gochfeld et al., 1998; Nisbet et al., 2013). In Massachusetts, Roseate Terns nest among Common Terns on islands in Buzzards Bay during early May to mid-July, after which they leave the colonies and move to sites such as the shoals off Muskeget (Veit and Petersen, 1993), where they forage and feed their young. They remain in these post-breeding aggregations until about mid-September, when they depart for their southbound migration. Thus, Roseate Terns spend almost as much of their annual cycle in post-breeding aggregations (8 weeks) as they do on the nesting colonies (about 10 weeks) (Gochfeld et al., 1998). This important part of the annual cycle during which chicks presumably learn how to forage and build up fat reserves for the southward migration has been little studied, and there are no data on where the birds roosting on the Muskeget Shoals actually feed. We have observed up to 2,000 Roseate Terns at one time on the Muskeget Shoals (about one third of the current northeastern population) and it is likely that a substantially higher proportion of the northeastern population stops here at some point during July – September. We have also observed terns roosting in the Muskeget post-breeding aggregations flying south out to sea and returning with fish, mainly sand lance, to eat and to feed their chicks. We have not been able to see where the terns have caught these fish, but they often fly southward outside of telescope range. It is of interest to determine exactly where these birds feed, so the objective of this study was to use aircraft transects to map the distribution and abundance of Roseate Terns south of Muskeget, with particular focus on determining the presence of any foraging "Hotspots". Roseate Terns invariably associate with the more numerous Common Terns in this area, and in some instances we have included both Common and Roseate Terns within the mapped data.

METHODS

We collected data from a high-winged, O2 version of a Cessna 337 "Skymaster" aircraft, along 8 parallel transects spaced at 5 km intervals. The average flight speed during all surveys was 100 kts and the altitude was 90 meters (~300 ft). We conducted surveys only on days with light to moderate winds (≤20 kt) and on days with good atmospheric clarity; most were conducted between 0900 EST and 1500 EST when the sun was highest in the sky to minimize glare on either side of the plane. Two observers, positioned opposite one another at the rear windows, recorded all birds seen within two 200 m strips, one on either side of the plane. Thus we collected two simultaneous strip

transects. We each entered data into laptop computers using the program Dlog3 (R.G. Ford Consulting, Portland, Oregon). The weather conditions were essentially the same on all surveys – clear, visibility > 5 km, wind speed < 20 km/hr. We surveyed the transects from west to east, with minor modifications to dodge rain squalls and on instructions from Nantucket airport.

Imaging

The main components of the imaging system consisted of a Sony Alpha NEX-7 camera and a Sony E 50mm f/1.8 OSS lens. The camera was secured in a fixed mount in the belly of the aircraft and was operated wirelessly (infrared) with a customized control box and associated software from a dedicated laptop. In the program settings, the system operator manually entered the flight speed, altitude, and the desired overlap (if any) between the areas of sea surface captured within successive images, and the software automatically selected the corresponding time interval between which the camera recorded the images. Due to problems associated with adjusting the camera focal distance to the birds, we were unable to obtain more than a very few usable images. On the other hand, it proved easier than expected to distinguish between Common and Roseate Terns using binoculars from the plane, and we are confident of our specific identifications of these birds, even during September, when plumage and soft part differences between species become obscure.

RESULTS

The maps represent the densities of bird per km^2. Table 1 includes Roseate Tern densities by survey. The data were "binned" every 3 linear kilometers of survey strip. The total width of the two survey strips was 400 meters (two 200m strips), so the area of each bin was 1.2 km^2 (3 km x 0.4 km). The densities were calculated by dividing the total number of birds seen within a bin by the area of one bin. The choice of bin size was largely arbitrary but the scale was small enough to allow us to correlate the locations of birds with oceanographic features such as hydrographic fronts (*e.g.* White, 2013). The maps represent tern abundance per survey. The size of dots in the legend represent the density scale, and the red dots represent the highest densities on each survey. The density breaks are mapped based on quintiles of bird abundance. As previously mentioned, we have included some data on Common Terns and terns unidentified to species (but either Common or Roseate) as appropriate.

We found both Common and Roseate Terns to be clustered closer to shore than expected, throughout the survey period. Most terns were < 10 NM from shore and virtually all < 15 NM from shore. The only foraging flocks that we saw were within < 5

NM from land, mainly near Tuckernuck and Muskeget Islands and surrounding shoals. Although we have no other surveys of the area with which to draw comparison, the fact that the terns we have observed in the past flying out to feed from the shoals at Muskeget flew well out of telescope range. Despite the aggregation of most birds in inshore waters, there was a tendency of single Roseates to forage over the turbulent and shoal-ridden waters of the Muskeget Channel, and there was a suggestion they followed the 10m depth contour (Figure 5).

Previous observations in the area (Veit and Petersen, 1993; Veit and Perkins, pers. obs.) suggest that both Common and Roseate Terns arrive in the area we surveyed by mid-July, and Veit counted 800 terns, 400 of these Roseates on the shoals off Muskeget on 22 July 2013, the day after we flew our first aircraft survey. It is puzzling why we saw no Roseates on that survey, and we offer no explanation (Figure 1).

By late August, more terns had moved in to the area surrounding Tuckernuck and Muskeget, and we identified at least 127 Roseate Terns among the Commons (Table 1, Figures 2 and 3). Five of six single Roseate Terns that we identified at sea were over the waters of the Muskeget Channel.

We found peak numbers of terns, including 191 Roseates in early September. This timing is consistent with previous counts of terns made in post-breeding aggregations in the area (Veit and Petersen, 1993). As in August, single foraging Roseate Terns were broadly distributed over the waters of the Muskeget Channel and west to the channel between Muskeget and Tuckernuck (Figure 5). Terns were all inshore from fishing trawlers near the outer ends of our transects. The trawlers were attended by hundreds of Great and Cory's Shearwaters and large gulls, and there is perhaps some avoidance of those areas by terns for this reason. We saw no terns attending the trawlers.

On our last survey 19 September, most terns had left the area and the ones remaining were almost all directly over the roosting shoals off Muskeget (Figure 6). We did however identify 12 Roseate Terns, and this is rather unusually late for Roseates which ordinarily depart earlier in fall than do Commons, often in early to mid-September. There has been a tendency in recent years for Roseates to depart later in fall than they have in the past (J. Spendelow, I Nisbet, pers comm.).

Other Species Seen

Most conspicuous of other birds we recorded were hundreds of Cory's Shearwaters and smaller numbers of Great Shearwaters, with a peak of 900+ birds on the 4 September survey. The number dropped dramatically by 19 September, but this was undoubtedly due to the departure of the fishing trawlers at that time. The trawlers were persistently

farther offshore from the area where we saw terns feeding. However, we did see flocks of shearwaters separate from the trawlers, close to the shore of Tuckernuck. There was one unidentified skua (probably a Great Skua) attending the trawlers in late August, and we saw a few individual phalaropes (probably Red-necked Phalaropes).

We saw 5 Leatherback Turtles in July and August and a single shark, probably a Sand Tiger, on 19 September.

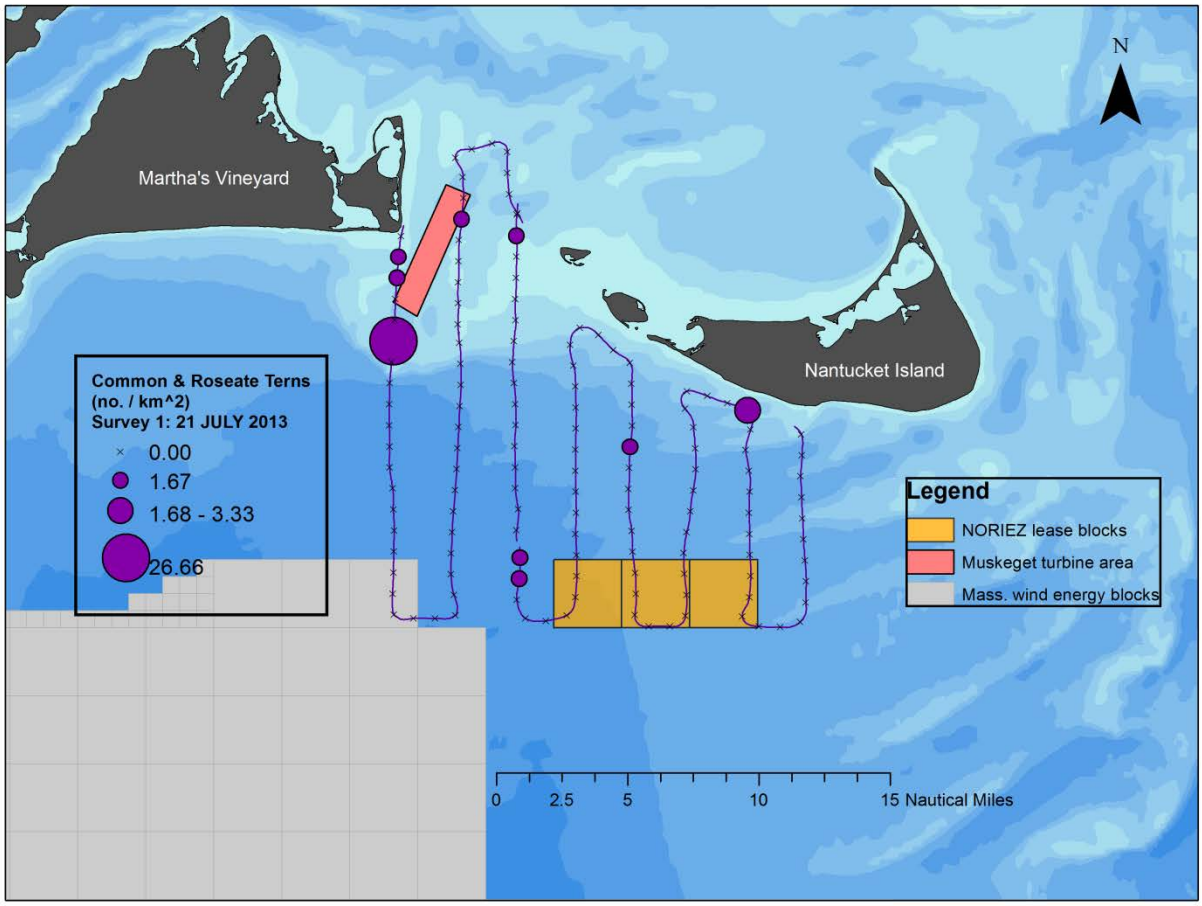

Figure 1.) Few terns were present in July, and most of those that were recorded were observed feeding in small flocks south of Martha's Vineyard . We identified no Roseate Tern on this survey, but Veit saw about 50 the day after at Muskeget. In this and all subsequent figures, the yellow rectangle represents the NORIEZ lease blocks, the pink rectangle represents the proposed Muskeget Channel turbine area, and the grey area represents the northeast portion of Massachusetts Wind Energy Area.

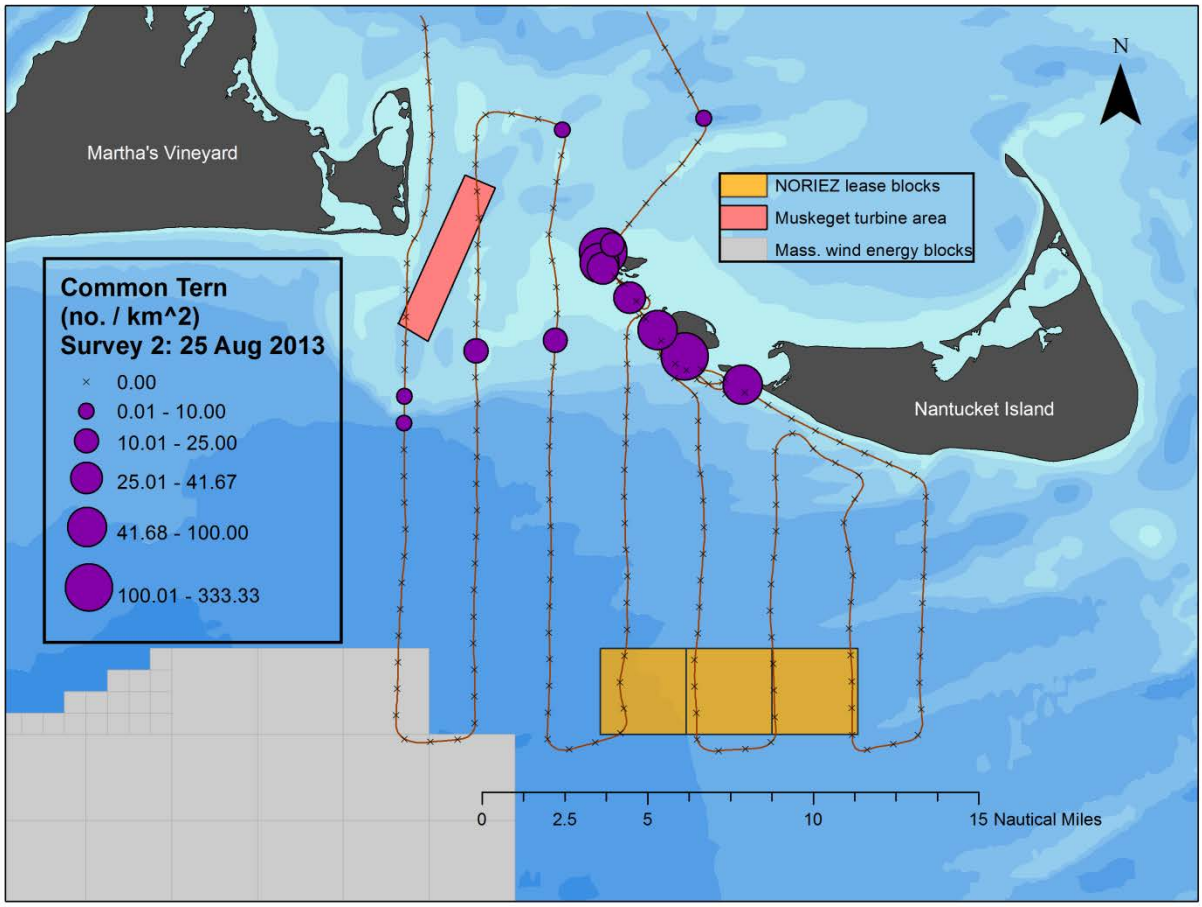

Figure 2.) On our second survey 25 August, Common Terns were feeding over tidal rips along the south side of Tuckernuck and Muskeget Islands.

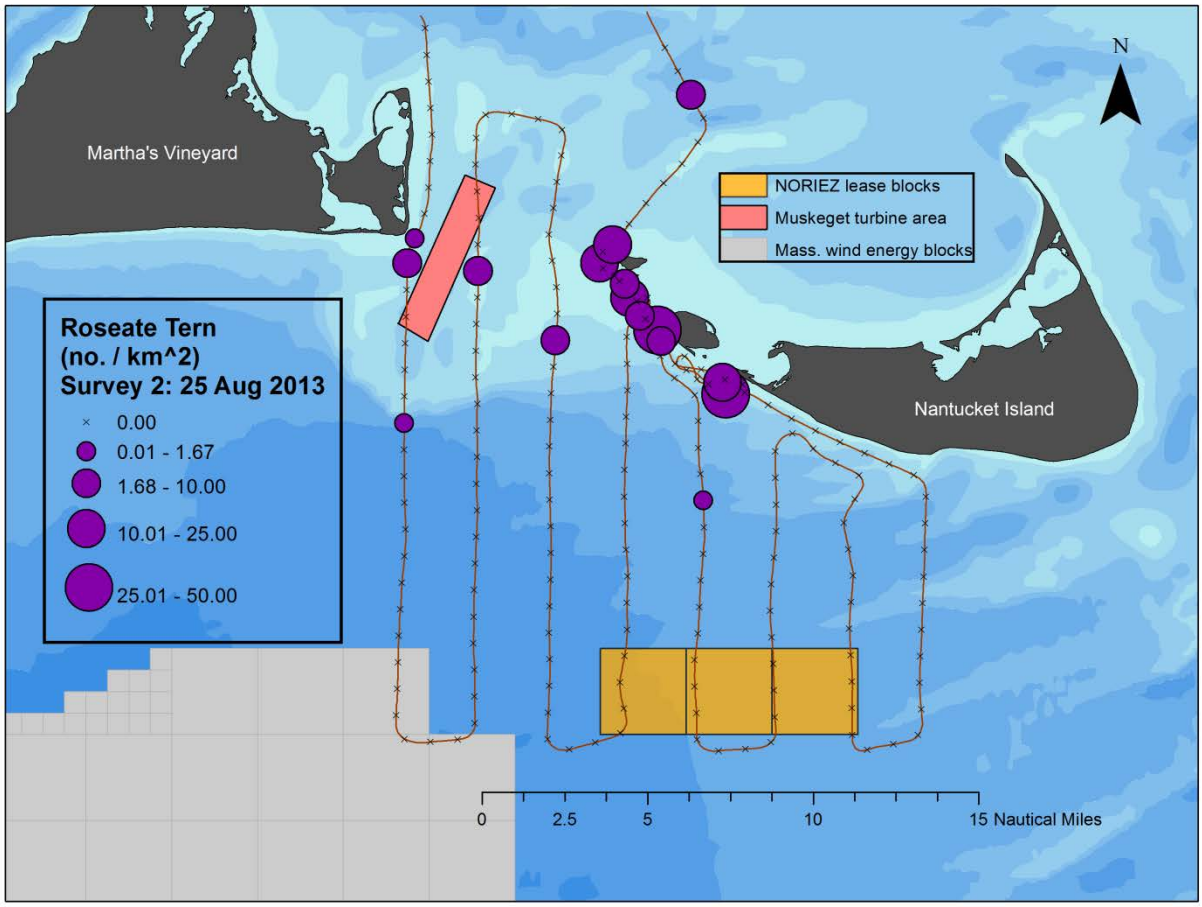

Figure 3.) Most Roseate Terns on 25 August were feeding along the south shores of Tuckernuck and Muskeget, but we also saw single birds feeding over the Muskeget Channel.

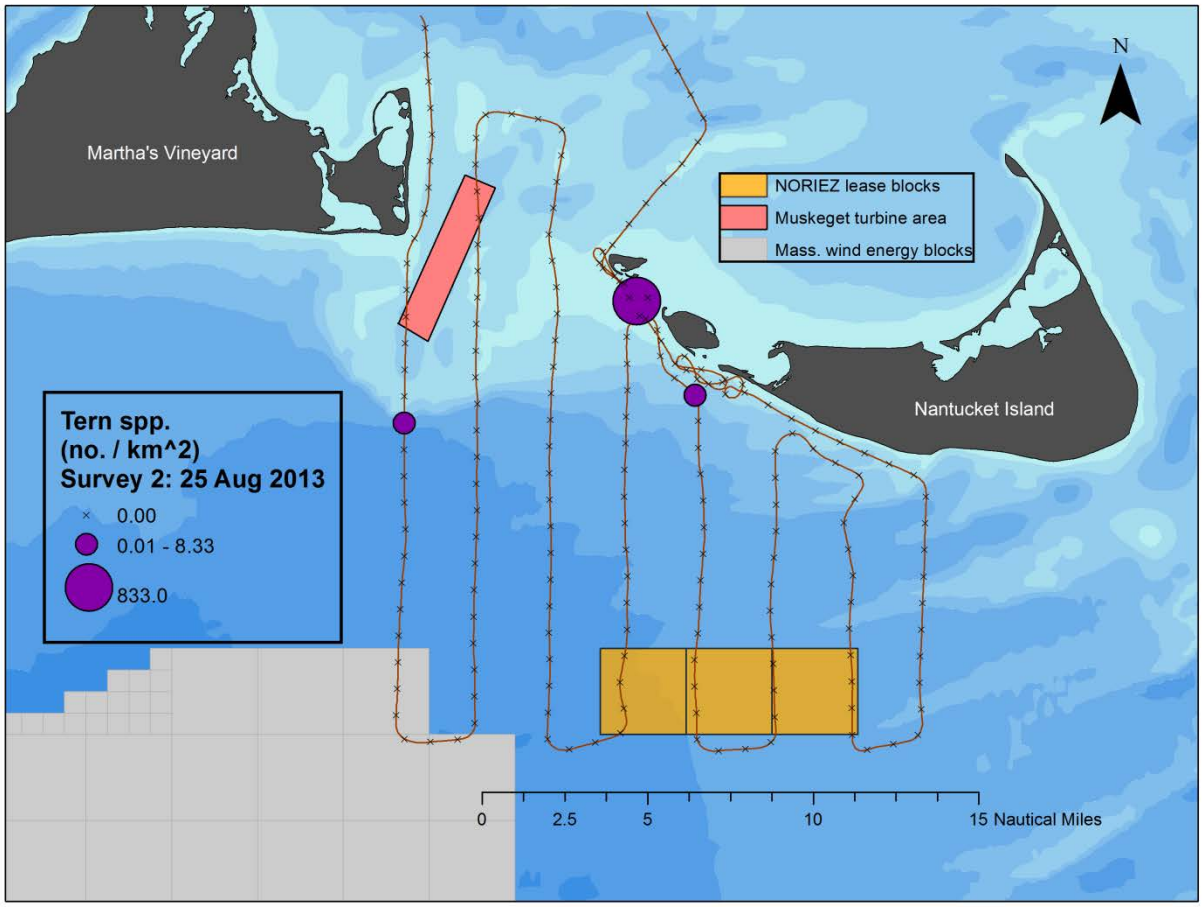

Figure 4.) A mixed flock of Common and Roseate Terns was roosting on a sandbar west of Muskeget Island 25 August.

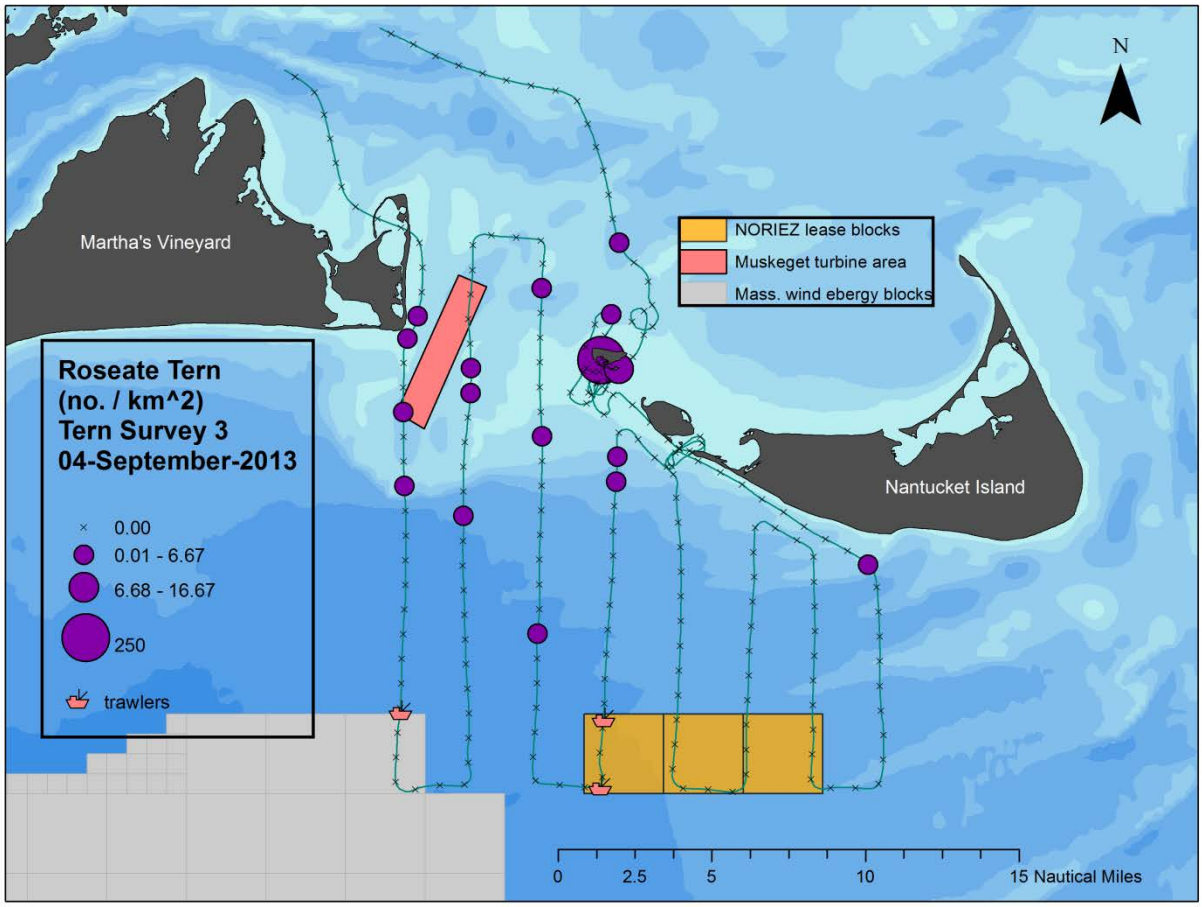

Figure 5.) By early September, Roseate Terns increased and were widely distributed over the waters of the Muskeget Channel.

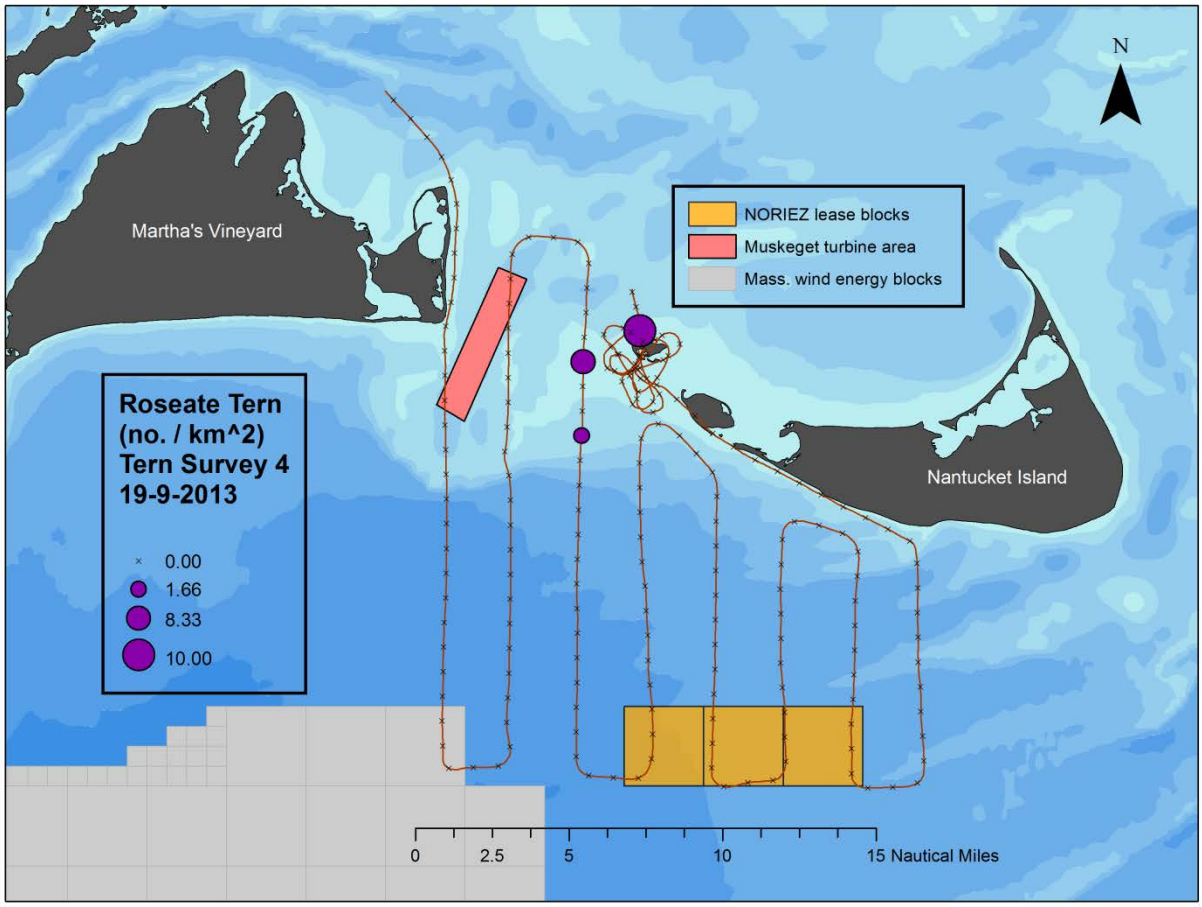

Figure 6.) In late September, all terns were clustered around their roosting site on the shoals southwest of Muskeget.

Table 1.) Number and calculated density (number per km^2) of Roseate Terns on four aircraft surveys in July-September 2013.

	Number Seen	Density (+/- 1 s.d.)
22 July	0	0
25 August	127	1.1 (5.7)
4 September	191	1.46 (17.0)
19 September	12	0.1 (0.9)

DISCUSSION

Substantial numbers of endangered Roseate Terns forage over the waters surrounding Tuckernuck and Muskeget Islands during the post-breeding period from mid-July to mid-September. The foraging we observed was focussed within 5 NM (~9 km) of shore. Because of this inshore distribution, these foraging birds were not encountered during the Mass Clean Energy Center surveys of the Massachusetts Wind Energy Area (Veit et al., 2013). However, the densities and distribution of Roseate Terns we encountered are in broad agreement with modeled densities predicted by Kinlan et al. (2013).

We found much larger single concentrations of birds than did Veit et al. (2013), because we surveyed the waters surrounding Muskeget and Tuckernuck Islands, which are known to be focal areas for post-breeding terns since at least the 1960s (Veit and Petersen, 1996). A slim portion of the area we surveyd in 2013, over the center of the Muskeget Channel, was also surveyd by Veit et al. (2013), who found densities of ~ 20 Common and Roseate terns /km^2 there in summer and fall.

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