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POST-BREEDING MOVEMENTS AND PREY SELECTION OF ROSEATE TERNS AT STRATTON ISLAND, MAINE

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Abstract.—Roseate Terns (*Sterna dougallii*) from at least eight breeding colonies in the northeastern United States disperse to southern Maine each August before migrating to their wintering quarters. Peak numbers of terns are recorded in mid-August, and during this time daily counts may exceed 200 adults and 100 juveniles on Stratton Island. Roseate Terns use the island as a loafing and roosting site and feed in the surrounding waters of Saco Bay during the day. From 1989 to 1992, 193 individual adults and 31 fledglings were identified by observing color-band combinations and reading numbers on leg bands. Length of stay varied among individual terns and years and ranged from 1 to 26 d. Using appropriate Jolly-Seber sighting-resighting models it was estimated that 5–10% of all breeding adult Roseate Terns in the northeastern U.S. disperse to Stratton Island each August. During this post-breeding period, juvenile terns practice fishing for themselves but are still dependent on their parents for food. In 2 yr of study, adults fed fledglings sand lance (*Ammodytes* sp.) exclusively. It is suggested that Roseate Terns disperse to Stratton Island each August because of the availability of sand lance in Saco Bay.

MOVIMIENTOS POSTREPRODUCTIVOS Y SELECCIÓN DE PRESAS POR *STERNA DOUGALLII* EN LA ISLA STRATTON, MAINE

Sinopsis.—Individuos de *Sterna dougallii* pertenecientes a por lo menos ocho colonias reproductivas se dispersan al sur de Maine cada agosto antes de migrar a sus áreas invernales. Números extremos de estas aves se registran a mediados de agosto, donde los conteos diarios pueden exceder los 200 adultos y 100 juveniles en la Isla Stratton. *Sterna dougallii* usa la isla como área de haraganear y de dormir y se alimentan en las aguas de la Bahía Saco durante el día. Entre el 1989 y el 1992 se identificaron 191 adultos y 31 volantones mediante la observación e identificación de anillas numeradas y de colores. El largo de la estadía varió de 1 a 26 días entre gaviotas y entre años. Utilizando los modelos Jolly-Seber de detección visual y redetección apropiados se estimó que de 5–10% de todas las *Sterna dougallii* en el noreste de los Estados Unidos de América se dispersan a la Isla Stratton cada agosto. Durante este período post reproductivo los juveniles practican la pezca por ellos mismos, pero todavía dependen de sus padres para alimentarse. En dos años de estudio, los adultos alimentaron a los pichones exclusivamente con *Ammodytes* sp. Se sugiere que *Sterna dougallii* se dispersa a la Isla Stratton cada agosto debido a la accesibilidad de presas (*Ammodytes*) en la Bahía Saco.

Migratory birds generally disperse from the breeding grounds after chicks have fledged but before migration ensues (Moore 1976, Rappole and Ballard 1987). Postbreeding dispersal may reduce the threat of predation or overcrowding (Pinowski 1965), alleviate competition for food (Waser 1985), or promote inbreeding avoidance (Dhondt 1979, Greenwood et al. 1978). Birds may disperse a few hundred meters to several

hundred kilometers during the postbreeding period (Dhondt 1979, Staav 1979).

Patterns of dispersal, based on band recovery data and tagging studies, are common topics in the literature, particularly for the Ciconiiformes (see Byrd 1978, and references therein) and Charadriiformes (e.g., Burger 1981, Coulter 1975, Haymes and Blokpoel 1978). Few studies, however, have documented the behavior and ecology of a species during the postbreeding period. Seabirds are particularly problematic for studies of this kind because they travel great distances over water.

From 1989 to 1992 we studied the postbreeding dispersal patterns and behavior of Roseate Terns (*Sterna dougallii*) at Stratton Island in southern Maine. Our observations were facilitated by a color-banding program begun in 1988 at several Roseate Tern colonies in Massachusetts, Connecticut and New York. Color bands used in this program reveal an individual's identity (adults) or natal colony (young). Specific objectives of this study were to identify all banded terns and determine their origins, determine length of stay for individual terns and estimate the number of terns that disperse to Stratton Island each year. Additionally we sought to document the activities and behavior of Roseate Terns, as well as determine prey selection during the postbreeding period.

In North America, Roseate Terns typically breed from May to July but do not begin migrating to their winter quarters in South America until late August or early September (Hamilton 1981, Nisbet 1984). Prior to migration, terns may congregate in large groups around favorable roosting and feeding areas (U.S. Fish and Wildlife Service 1989), but little is known about their habits at this time. Northeastern Roseate Terns were listed as endangered in 1987. One objective of the recovery plan for this population is to identify staging areas and to determine factors that influence use of these areas (U.S. Fish and Wildlife Service 1989).

STUDY AREA AND METHODS

Stratton Island (43°31′N; 70°19′W) is located 2.5 km southeast of Prouts Neck off the mouth of the Scarborough River, Saco Bay, Maine (Fig. 1). The island (11 ha) is part of the Phineas W. Sprague Memorial Sanctuary of the National Audubon Society and supports a diverse array of nesting birds, including several species of heron and gull, Common Eiders (*Somateria mollissima*), and a recently-established tern colony (mostly Common Terns, *Sterna hirundo*).

Nesting by terns was reestablished at the island in 1987 using techniques described by Kress (1983) at Eastern Egg Rock, Maine. Although the tern colony suffers annually from Black-crowned Night-Heron (*Nycticorax nycticorax*) predation (Shealer and Kress 1991, and unpubl. data), it has increased from five pairs in 1987 to 242 pairs in 1992. Of these, two pairs of Roseate Terns nested in 1989, 18 in 1990, 14 in 1991, and eight in 1992. During the first week of August 1989, we noticed a large influx of Roseate Terns to Stratton Island, which included many adults that had been color-banded at other breeding colonies. We identified

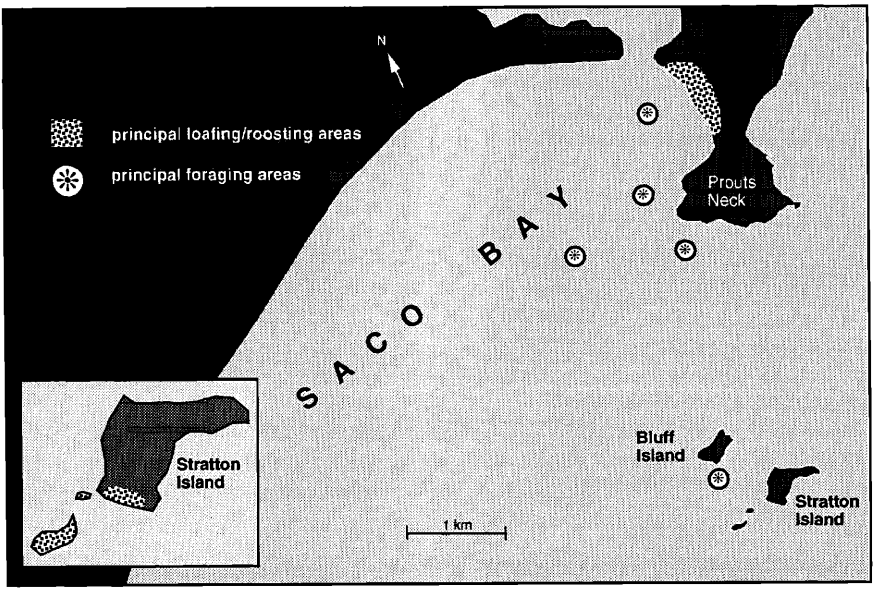

FIGURE 1. Map of Stratton Island, Saco Bay and vicinity, showing principal foraging and roosting areas used by Roseate Terns during the postbreeding dispersal period, August 1989–1992.

several color-banded terns in 1989 but lacked the proper equipment to do so consistently. Therefore, except for individual identification of terns, we excluded the 1989 data in our analysis.

From 1990 to 1992 we established observation blinds near areas where terns congregated in 1989. Entrance paths were chosen so that we were undetected by the resting terns as we entered and left the blinds. Observation dates were 8–23 Aug. 1990, 5–22 Aug. 1991 and 1–31 Aug. 1992. Daily observations were generally made in the early morning, at the diurnal high tide, and at dusk when terns were grouped close together at a single location. Observations usually lasted at least 2 h. We used binoculars and a 15-40 × Kowa TSN-4 spotting scope to read color-band combinations and band numbers on metal U.S. Fish and Wildlife Service bands.

During each observation we first counted the total number of adult and juvenile Roseate Terns visible from the blind. We then counted a sample of banded and unbanded birds whose legs were exposed to derive a ratio that estimated the total number of banded birds among the group (1991 only). We spent the remainder of the time reading color-band combinations and band numbers to identify individuals. To identify individuals, year and colony of banding, we compared color-band combinations with records maintained by J. A. Spendelow, who is coordinating the Roseate Tern color-banding program. Some color-band combinations we

identified could not be matched with a particular individual; we therefore classified these as misreads or band loss and excluded them from our analysis.

During studies in 1991 and 1992 we observed adult terns returning to the island with fish and identified prey carried in the terns' bills. Common Terns also disperse to Stratton Island each August, but except for comparisons of prey deliveries by adults to fledglings, we do not report any data on this phenomenon. In 1992 we also distinguished between adults that fed fledglings and those that fed adults (presumably their mates) or used the fish in ritualized displays. We also observed terns foraging in Saco Bay, from a 4-m inflatable Avon equipped with a 15-hp motor.

The total number of individual adult Roseate Terns that visited Stratton Island during the postbreeding period in 1991 and 1992 was estimated from sighting-resighting data with the Jolly-Seber (Jolly 1965, Seber 1965) Model A for open populations. We chose Model A (survival and capture probabilities day-specific) based on goodness-of-fit tests and tests between models (Brownie et al. 1986, Pollock et al. 1990). The program JOLLY (Brownie et al. 1986) was used to compute population estimates from sighting-resighting data. The general formula used to estimate yearly population size is given as:

$$N_{ind} = N_1 + \sum_{i=1}^{k} (N_{i+1} - N_i\phi_i),$$

where N_{ind} = the estimated number of individual Roseate Terns that visited Stratton Island during the postbreeding period, N_1 = the initial number of Roseate Terns present on Stratton Island during the first day of observation, and ϕ = the probability of an individual remaining on the island between sampling periods. Only the subset of color-banded terns was used in the model as color combinations could easily be identified with a spotting scope from distances up to 70 m; we found we could only read band numbers on terns less than 20 m from the blind.

Not all individual terns that remained at Stratton Island for more than 2 d were seen by observers on consecutive days. Length of stay was defined as the number of days between the first and last sighting, inclusive (Lavee et al. 1991). To avoid biasing the data, we excluded any new arrivals on or after 20 Aug. 1991 and 30 Aug. 1992 from our calculations of length of stay. We did not exclude individuals that were still present when we left the island at the end of the season; therefore, our results represent the minimum length of stay for many terns. We report data only from years in which we obtained a sufficient sample size. Statistical tests are identified as they appear in the results.

RESULTS

Attendance patterns and origins of individuals.—The first color-banded Roseate Terns were seen at Stratton Island on 8 Aug. 1990, 5 Aug. 1991

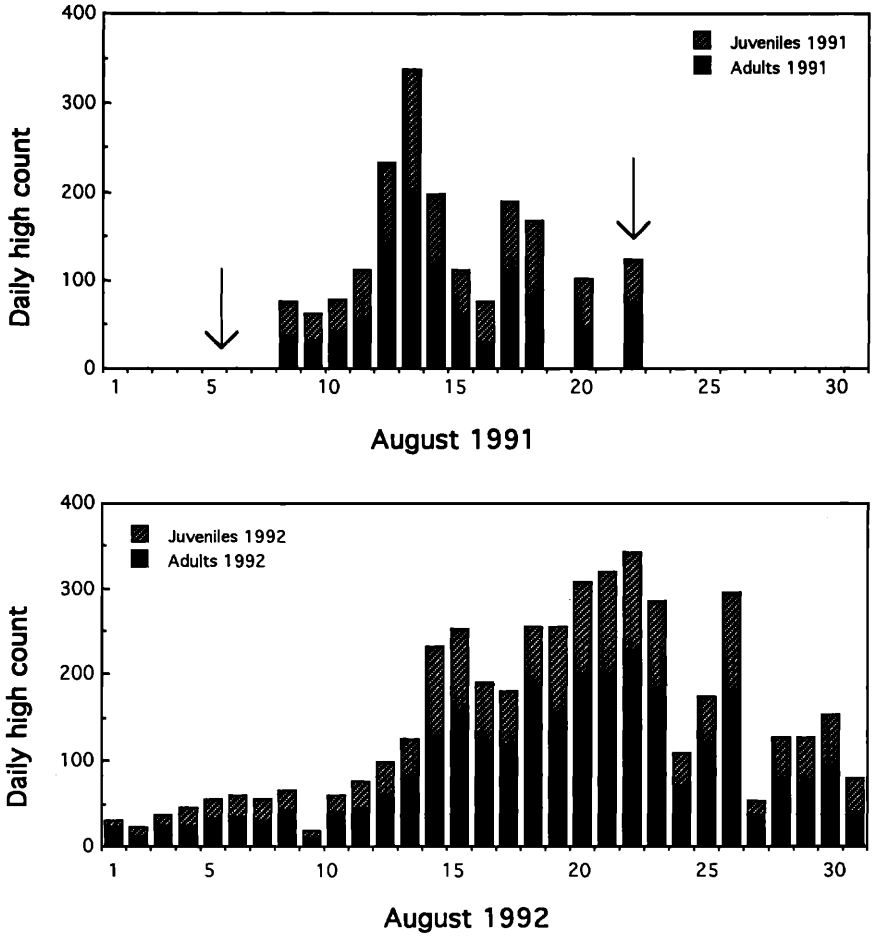

FIGURE 2. Daily high counts of adult and juvenile Roseate Terns resting on Stratton Island in August 1991 and 1992. Arrows indicate beginning and end of observation periods.

and 3 Aug. 1992. Terns were still present at the island on 23 Aug. 1990, 22 Aug. 1991 and 31 Aug. 1992 when researchers left the island, but numbers were declining (Fig. 2). A few Roseate Terns were seen around the yacht club at Prouts Neck during the first week of September in all years (S. Lee, pers. comm.). Daily attendance of Roseate Terns at Stratton Island in 1991 and 1992 showed a unimodal distribution (Fig. 2), with peak numbers in 1992 occurring 1 wk later than in 1991.

Daily counts of juveniles were directly proportional to counts of adults in both 1991 ($r = 0.951$, df = 12, $P < 0.01$) and 1992 ($r = 0.955$, df = 30, $P < 0.001$, Fig. 3). Daily counts were not conducted consistently in either 1989 or 1990. In 1991 daily counts of juveniles comprised 46.0 ±

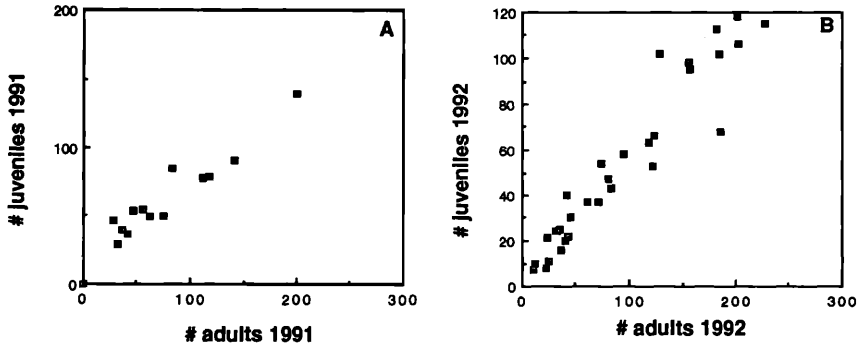

FIGURE 3. Relationship between the number of adults and juveniles counted each day on Stratton Island in 1991 and 1992. Each point represents a combination of the highest count of adults and the highest count of juveniles observed on the same day. r^2(A) = 0.904, (B) = 0.912.

6.3% ($\bar{x}$ ± 1 SD) of Roseate Terns at Stratton Island; in 1992 the mean daily percentage of juveniles was 37.2 ± 5.6% (*t*-test, $t = 4.61$, df = 42, $P < 0.001$), suggesting that 1991 was a more successful breeding year than 1992.

Banded Roseate Terns came to Stratton Island from at least eight breeding colonies: Eastern Egg Rock (EEME) and Petit Manan Island (PMME), both in Maine; Plymouth Beach (PBMA), New Island (NIMA) and Bird Island (BIMA), all in Massachusetts; Falkner Island (FICT), Connecticut; Great Gull Island (GGNY) and Cedar Beach (CBNY), both in New York (Fig. 4). We identified 193 individual adults and 31 fledglings between 1989 and 1992. Most terns we identified came from Bird Island, Massachusetts, and Great Gull Island, New York (Fig. 5), the two largest breeding colonies of this species in the northeastern United States. Counts from the two Maine colonies and two Massachusetts colonies (PBMA, NIMA) are probably underrepresented because only chicks were color-banded there in recent years.

Twenty-eight of 176 (15.9%) color-banded adults identified between 1989 and 1991 were seen at Stratton Island in 2 yr; seven of 44 (15.9%) identified between 1989 and 1990 were seen in 3 yr. Minimum length of stay ($\bar{x}$ ± 1 SD) for individual terns in 1990 was 3 ± 2 (range 1–8) d, in 1991 was 4 ± 4 (range 1–16) d, and in 1992 was 10 ± 9 (range 1–26) d. In 1991, the mean daily percent of adult Roseate Terns that had at least a metal USFWS band was 32 ± 11%. The mean daily percent of adult Roseate Terns banded with a USFWS band and three color bands was 26 ± 15%.

Coordinated sightings of 18 color-banded birds between breeding colonies and Stratton Island indicate that Roseate Terns require 26 ± 9 (SD) d to reach southern Maine (Table 1). The shortest interval was 3 d, but this record is based on the assumption that the bird fledged its chick, not

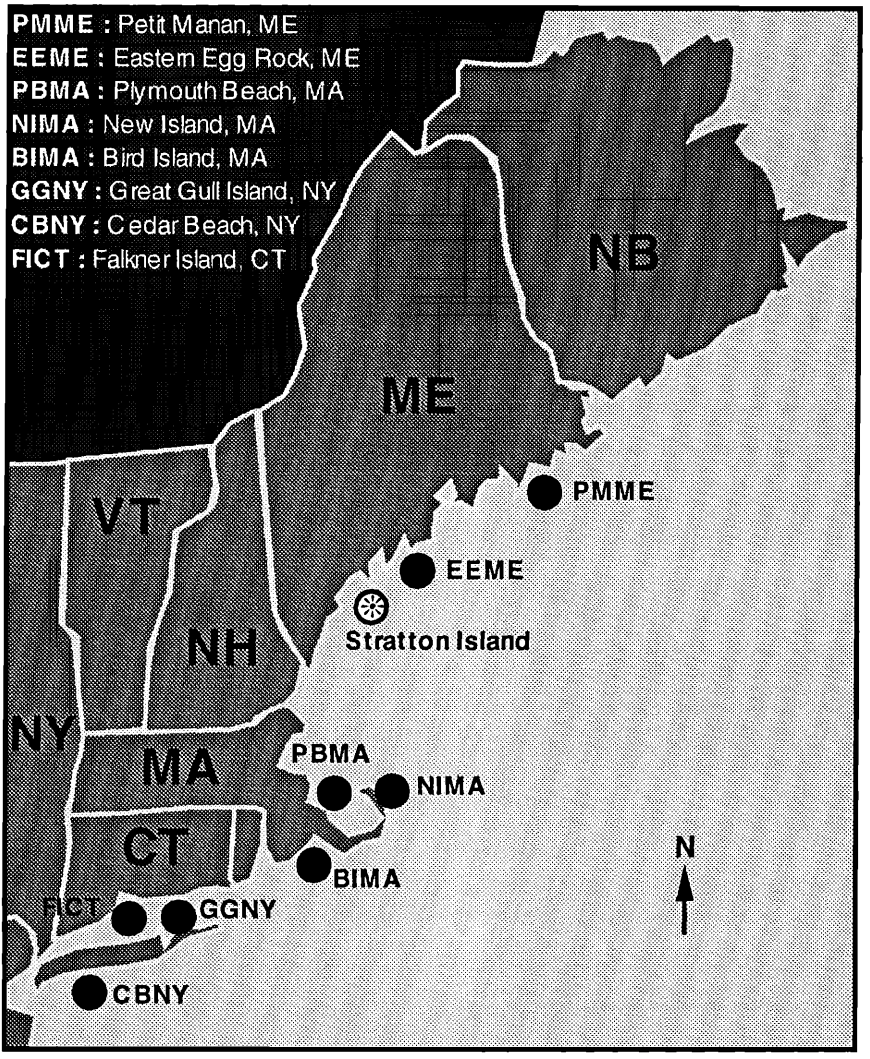

FIGURE 4. Map of northeastern United States showing location of Stratton Island in relation to other Roseate Tern breeding colonies, from which banded terns were identified between 1989 and 1992.

on an actual sight record at the breeding colony (J. A. Spendelow, pers. comm.). One bird that nested at Bird Island was seen with a fledgling on 20 July at Chatham, Massachusetts (I. C. T. Nisbet, pers. comm.), and then first seen at Stratton Island on 8 August. We have no solid evidence that Roseate Terns disperse directly to Stratton Island from their respective breeding colonies, but rather it appears that dispersal occurs gradu-

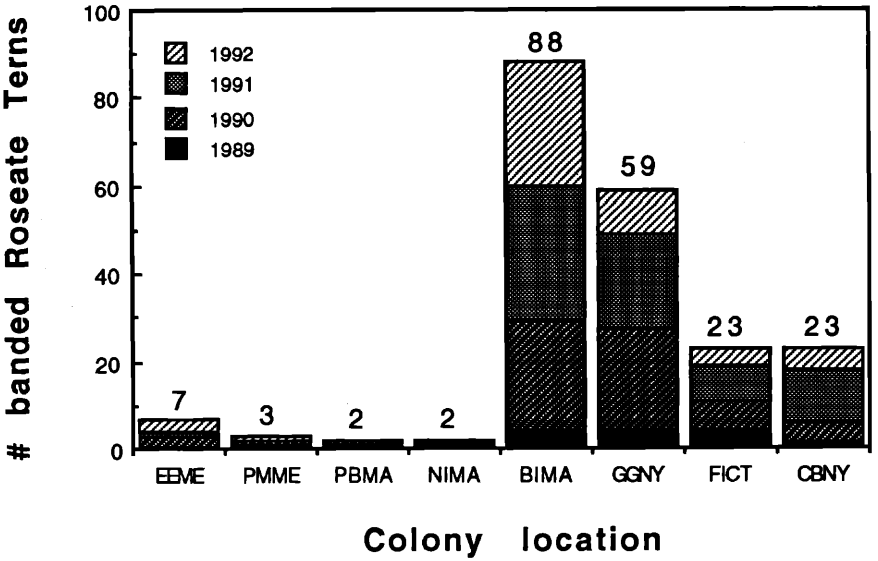

FIGURE 5. Number of Roseate Terns (adults and juveniles) from other colonies in the United States seen at Stratton Island between 1989 and 1992. Values include both color-banded individuals and those banded with a metal USFWS band only. See Figure 4 for colony identification.

ally over several weeks, with many birds ultimately reaching Stratton Island in August.

Jolly-Seber models estimated that at least 352 individual adults visited Stratton Island between 8 and 20 Aug. 1991 and that between 3 and 25 Aug. 1992, 600 adults visited the island. Thus, based on the estimates of 7218 (1991) and 5796 (1992) breeding adults in the northeastern United States (R. Andrews, pers. comm.), at least 4.9% of all adult Roseate Terns breeding in the United States visited Stratton Island in 1991 and at least 10.4% visited the island in 1992. Lack of consistent observations prevented us from performing this analysis for 1989 and 1990.

The distribution of color-banded Roseate Terns coming to Stratton Island from the four major breeding colonies differed from expected in 1991 ($\chi^2 = 18.2$, df = 3, $P < 0.001$), based on survival estimates of colorbanded adults (Table 2). Fewer birds than expected came from Great Gull Island (GGNY), whereas proportionally more came from the smallest colony (CBNY). Both the nearest (BIMA) and farthest (CBNY) colonies had higher numbers than expected at Stratton Island, whereas the two intermediate colonies (GGNY, FICT) had lower numbers. This analysis was not repeated in 1992 because the color-banding program was discontinued and we lacked a sufficient sample size.

Behavior of terns.—Juvenile and adult terns rested on Stratton Island throughout the day, with the highest numbers generally recorded in the

TABLE 1. Last dates (based on sight records or estimated chick fledging dates) of color-banded adult Roseate Terns at U.S. breeding colonies and dates of first sightings at Stratton Island.

Year	Band number	Colony	Date last recorded at breeding colony[a]	Date first seen at Stratton Island	Elapsed time (d)	Status
1990	892-01005	FICT	22 July	21 August	30	CPF[b]
1990	892-01067	FICT	22 July	19 August	28	CPF
1990	892-02655	FICT	22 July	17 August	26	CPF
1990	892-02657	FICT	14 August	17 August	3	CPF
1991	802-82869	BIMA	14 July	11 August	28	Sight record
1991	802-87611	BIMA	24 July	11 August	18	Sight record
1991	802-87629	BIMA	24 July	17 August	24	Sight record
1991	882-93944	BIMA	13 July	11 August	29	Nest failed
1991	892-01083	FICT	15 July	15 August	31	CPF
1991	892-01190	FICT	22 July	9 August	18	CPF
1991	892-01944	FICT	27 July	17 August	21	CPF
1991	892-31064	FICT	26 July	12 August	17	Sight record
1991	892-59381	BIMA	12 July	12 August	31	Sight record
1992	802-83579	BIMA	14 July	20 August	37	Sight record
1992	802-87646	BIMA	16 July	6 August	21	Sight record
1992	802-87656	BIMA	19 July	29 August	41	Sight record
1992	802-91354	BIMA	12 July	14 August	33	Sight record
1992	882-91835	BIMA	19 July	13 August	25	Sight record

[a] Falkner Island (FICT) records courtesy of J. A. Spendelow; Bird Island (BIMA) records courtesy of I. C. T. Nisbet.

[b] CPF = chick presumed fledged on date last recorded at breeding colony.

early morning and late afternoon. Casual observations indicated that the three main activities of terns during this time were sleeping, preening and bathing. We observed juvenile terns making swift, erratic flights around the island, and also hovering over the water and "practice-diving" by dropping strands of rockweed into the water and seizing them in their

TABLE 2. Estimated number of breeding Roseate Terns at the four major colonies in the northeastern United States in 1991, the number of color-banded adults since 1988, and the number of individuals seen at Stratton Island in 1991. Percents of column totals are given in parentheses.

Location	# breeding individuals	Color-banded adults		
		Number	Estimated # alive in 1991[a]	# seen in 1991
Bird Island, MA	3456 (51.8)	779	528 (32.8)	32 (45.7)
Great Gull Island, NY	2600 (39.0)	800	658 (40.9)	18 (25.7)
Falkner Island, CT	376 (5.6)	472	302 (18.8)	8 (11.4)
Cedar Beach, NY	240 (3.6)	223	121 (7.5)	12 (17.1)
Total	6672	2274	1609	70

[a] Based on 75% yearly survival in adults (Spendelow and Nichols 1989).

bills. Presumably these behaviors served to strengthen flight muscles, improve agility and facilitate the development of prey-capture techniques.

On at least 50 occasions in each year, we observed adult terns take wing and circle around the loafing area several times, all the while giving a loud "che-vick" call. This behavior was usually (over 80% of the time) followed by a response call from a juvenile which then flew off in pursuit of the adult, toward the feeding grounds. Upon returning alone to the island with a fish, adult terns repeated the departure behavior until a juvenile initiated an aerial chase, which eventually led to a feeding. Occasionally (<20%) Roseate Terns returning with fish were harassed by conspecifics or adult Common Terns. These attempts at kleptoparasitism were rarely successful. In 1992, however, two Parasitic Jaegers (*Stercorarius parasiticus*) appeared regularly for 4 d, and for periods up to 1 h at a time, robbed most (>70%) terns returning to the island with fish. During these encounters, terns surrendered the fish after initiating only a few evasive maneuvers.

During our 4 yr of observations of Roseate Terns at Stratton Island, we witnessed no mortality to either adults or juveniles. In 1991, a single juvenile was found with its foot caught in the shell of a blue mussel (*Mytelus edulis*) but flew away when freed by a researcher.

Observations on foraging and prey selection.—Roseate Terns foraging in Saco Bay formed loose flocks with Common Terns, and although juveniles attempted to catch fish on their own, they were usually unsuccessful (Roseate Tern success: 7/21 [33%]; Common Tern: 1/9 [11%]). Generally, adults caught fish and then fed them to chicks that had alighted on the water. We identified five principal foraging areas for Roseate Terns in Saco Bay (Fig. 1). All were shallow water areas (<10 m depth) and over sandy substrates. We also discovered one sandy beach area on mainland Prouts Neck that terns used during the day (Fig. 1), presumably as a resting site between foraging bouts.

During August 1991 and 1992, Roseate Terns fed fledglings sand lance (*Ammodytes* sp.) exclusively (Table 3). During the same period Common Terns at Stratton Island fed chicks mostly sand lance but delivered some herring (*Clupea harengus*) and other fish types. We classified most (79%) of the fish fed to chicks as "large" (i.e., fish length > 1.5 × adult bill length). Most terns fed chicks single fish, but 5.1% of all (62) Roseate Tern fish deliveries in 1992 included two fish. On one occasion we also witnessed an adult Common Tern return with three large sand lance in its bill and feed them to a single chick in rapid succession. In 1992 Roseate Terns used sand lance in all but one case in mate feeding and display (Table 4); Common Terns used a wider variety of fish in mate feeding and display than did Roseate Terns, but the difference between the two species was not significant (Fisher's exact test on two classes: sand lance and all other types, $P = 0.11$). Although we did not quantify prey availability throughout the season, we visually noted large schools of sand lance in Saco Bay in August of each year.

TABLE 3. Prey fish delivered (percent of total) by adult Roseate and Common Terns to fledglings at Stratton Island 8–22 Aug. 1991 and 1–31 Aug. 1992.

Species		Prey delivered			
		Roseate Tern		Common Tern	
		1991	1992	1991	1992
Sand lance	*Ammodytes* sp.	34 (100)	62 (100)	13 (59.1)	84 (88.4)
Herring	*Clupea harengus*	0 (0)	0 (0)	6 (27.3)	6 (6.3)
Hake	*Urophycis* sp.	0 (0)	0 (0)	1 (4.5)	3 (3.2)
Pollock	*Pollachius virens*	0 (0)	0 (0)	0 (0)	2 (2.1)
Mackerel	*Scomber scombrus*	0 (0)	0 (0)	1 (4.5)	0 (0)
Mummichog	*Fundulus heteroclitus*	0 (0)	0 (0)	1 (4.5)	0 (0)
Total		34	62	22	95

DISCUSSION

Prior to this study, most observations of staging in Roseate Terns after the breeding season were between Long Island, New York and Cape Cod, Massachusetts, with the highest numbers reported at Monomoy National Wildlife Refuge, Massachusetts (Nisbet, cited in U.S. Fish and Wildlife Service 1989). Our observations have determined that not only do Roseate Terns also disperse to southern Maine, but that this dispersal occurs annually and includes terns from all of the major breeding colonies in the northeastern United States. In addition, roughly 30% of the adults we identified appeared at Stratton Island in at least two different years.

As expected, most terns came to Maine from the two largest breeding colonies, one of which (BIMA) is only about 250 km from Stratton Island. In 1991, however, a higher proportion of terns than expected came to Stratton Island from Cedar Beach, New York, which is the smallest of the four principal colonies and also the most distant (approx. 500 km). We suggest that dispersal routes and prey availability may provide an explanation for this phenomenon. Safina and Burger (1989) found inter-annual variability in prey availability for terns on the south shore of Long Island (near the Cedar Beach ternery), and suggested that this variability may promote rapid dispersal as soon as chicks fledge. Roseate Terns breeding at Bird Island routinely travel 30 km round-trip in some years

TABLE 4. Display fish and fish fed to adults (presumably mates) by Roseate and Common Terns at Stratton Island 1–31 Aug. 1992. Percents are given in parentheses.

Species[a]	Roseate Tern	Common Tern
Sand lance	11 (91.7)	37 (72.5)
Herring	0 (0)	9 (17.6)
Hake	1 (8.3)	2 (3.9)
Pollock	0 (0)	4 (7.8)

[a] See Table 3 for scientific names.

to feed their chicks (Heinemann 1992), suggesting that food around the colony is scarce (I. C. T. Nisbet, pers. comm.). Thus, if Roseate Terns disperse along coastal areas, as is believed, then Cedar Beach birds would travel around the eastern tip of Long Island and north to Massachusetts, where food appears to be limited (see Fig. 4). As a result, both Bird Island and Cedar Beach Roseate Terns may appear in southern Maine in higher proportions than terns breeding in Long Island Sound. Although our data support this explanation, we recognize that because these data come from only 1 yr, any interpretation must be cautious. Seasonal variation in prey abundance or availability for Roseate Terns in Long Island Sound has not been assessed. The fact that large groups of terns are observed in this area during the postbreeding period, however, suggests that sufficient prey is available to them at this time.

We suggest that Roseate Terns disperse from their breeding colonies to southern Maine each August to take advantage of the abundant schools of sand lance in Saco Bay during this time. In New York and Connecticut colonies, Roseate Terns feed primarily on sand lance (Richards and Schew 1989, Safina et al. 1990). Terns breeding in Europe also rely heavily on sand lance in their diets; declines in sand lance availability may result in large-scale breeding failure (Monaghan et al. 1989). Fish abundance shows a seasonal decline, at least near the Cedar Beach ternery, so that by the time chicks fledge, prey fish are relatively scarce (Safina and Burger 1988, Safina et al. 1988). By contrast, sand lance populations in Saco Bay appear to increase in availability in late July and early August, as large schools are visible at the surface. The origins of these fish are unknown, but it is possible that terns gradually track fish schools northward after the breeding season. Our findings that Roseate Terns require 3–4 wk to reach Stratton Island from their breeding colonies (Table 1) support this suggestion.

Safina et al. (1990) suggested that temporal changes in prey selection by Roseate Terns reflect either changes in preference or prey availability. We suspect that prey availability plays a more important role, particularly in chick rearing. Sand lance are similar to herring in caloric content and fat per gram of body weight but have less protein (Massias and Becker 1990). Thus if available, herring should be fed to young chicks that require a high-protein diet. The available data are equivocal. Sand lance comprised the majority of prey items fed to Roseate Tern chicks throughout the season at Falkner Island (Richards and Schew 1989) and Cedar Beach (Safina et al. 1990); at Cedar Beach herring and other fish replaced anchovies (*Anchoa* sp.) as the most important prey to Common Terns later in the season, whereas sand lance deliveries remained relatively low but consistent (Safina et al. 1990: table 3). At Stratton Island in 1991, breeding Common Terns delivered more herring and hake early in the chick-rearing stage, but shifted to sand lance in late July (S. W. Kress, unpubl. data), just before the first Roseate Terns arrived at the island. The fact that Common Terns at Cedar Beach did not shift to sand lance later in the season may reflect ecological differences between the

two populations, but the most parsimonious interpretation is that prey selection directly relates to prey availability.

The postfledging period is an important time in a young tern's life, as it must develop its flight capability for migration as well as learn to fish for itself (Nisbet 1976). Not surprisingly, this period is also characterized by high juvenile mortality (Burger 1972, Nisbet and Drury 1972), although our 4 yr of study revealed no mortality in fledglings on the staging grounds at Stratton Island. Our observations at Stratton Island indicate that, although young terns may catch some fish on their own, they are almost totally dependent on their parents to locate and catch fish for them. The sanctuary at Stratton Island provides a safe roosting site, and Saco Bay provides an abundant source of sand lance for Roseate Terns to increase their energy intake before migrating to their winter quarters in South America.

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