OVERLAND FEEDING FLIGHTS BY THE COMMON TERN ON LONG ISLAND

GILBERT S. RAYNOR

Although colonial sea birds are known to fly long distances in search of food, such feeding flights are generally over water. However, Common Terns (*Sterna hirundo*) nesting on small islands on the south shore of central Long Island, New York commonly travel about fifteen miles across the Island to feed in Long Island Sound.

Common Tern nesting sites in the south shore bays of Long Island are normally small islands created by tidal currents or, more frequently, by dredging operations and are most often located near an inlet between a bay and the ocean. Colonies are seldom permanent in a given location but tend to increase in size for some time after formation of an island. Islands usually begin as bare sand but vegetation normally becomes established within two or three years and after several more years becomes dense enough to diminish suitable nesting area. The colony then declines in size or the island is taken over by gulls unless additional sand is added.

During the period and in the area covered by this study, terns have nested on four islands (one no longer in existence) near Moriches Inlet and on one island in Bellport Bay (Fig. 1). The fifth column of Table 1 lists the status of the Moriches Inlet colonies, as far as known, during each year of the study. These colonies are composed largely of Common Terns but, in some years, as many as 5 to 10% of the individuals are Roseate Terns (*S. dougallii*).

Estimates of colony size were aided by information from two sources in addition to the writer's own observations. Leroy Wilcox supplied figures on Common Terns banded by him from 1936 through 1970 and a tabulation was furnished by the Bird Banding Laboratory of Common Terns banded by all banders in the block containing the colonies involved in this study for the years 1956 through 1969. The figures in the last column of Table 1 are Wilcox's totals through 1950 and those of all banders from 1956 to 1970. Wilcox did not band in this area from 1951 through 1955 and data from years prior to 1956 are not available from the Banding Laboratory so colony size is largely unknown for this period.

OBSERVATIONS

Ornithological observations have been taken by the writer at Manorville, near the center of Long Island, since 1936. Through 1958, Common Terns were observed over this area no more than a few times each year (Table 1) and most of these observations seemed to represent random wandering or sporadic cross-island flights. In 1959, however, well-or-

ganized, purposeful and frequent feeding flights from Moriches Bay to Long Island Sound began. These have been noted each year since except during seasons when no colony was present.

Except for a few omissions, every observation of terns over inland areas of Long Island has been recorded. After large flights began in 1959, the time of day, the direction of flight and the number of birds were usually recorded although, in some instances, non-quantitative terms such as "a few," "a flock," or "a small group" were employed. Additional observations were contributed by family members and other observers. Observations were possible nearly every day except for a few brief absences from the area but observations were not continuous throughout the day and the number of flights recorded can only be regarded as a minimum or a sampling of those that occurred.

However, significant patterns are evident from the data. In most years, flights commenced soon after the terns returned in spring and continued until they left in late summer. The number of birds increased after young hatched and again after they fledged. Flights were generally northward in the morning and southward in the evening although, in some years, considerable travel in both directions occurred during the intervening hours. The main flight path extended from East and Center Moriches through Manorville to Wading River (Fig. 1). A few birds were seen as far east as Calverton and as far west as Brookhaven National Laboratory. The writer's home, marked by an X on Fig. 1 is near the center of this flight path. A second flight path from the colony in Bellport Bay passed from Southaven and Brookhaven over Yaphank and Middle Island to the sound at Shoreham and Miller Place.

RELATIONSHIP TO BREEDING COLONIES

Reference to Table 1 reveals that organized flights did not occur prior to 1959 although a sizable nesting population existed at Moriches Inlet from 1939 to 1941, in 1947 and 1948 and possibly in other years as well. From 1959 on, the number of flight days is well correlated with the size of the breeding colony. They reached a peak in the 1960–1962 period and a smaller peak in 1967–1970 when the colony became reestablished. In 1968, many flights were not specifically recorded but notes such as "terns flying over daily" were made periodically.

SEASONAL OCCURRENCE

Dates of first and last observations and the number of days on which terns were observed inland are listed in Table 1. During non-flight years, inland occurrences tended to be in mid to late summer. In 1959, flights did not start until June 27, about the time young birds were hatching. In all later flight years, sightings began in May, about the time of colony

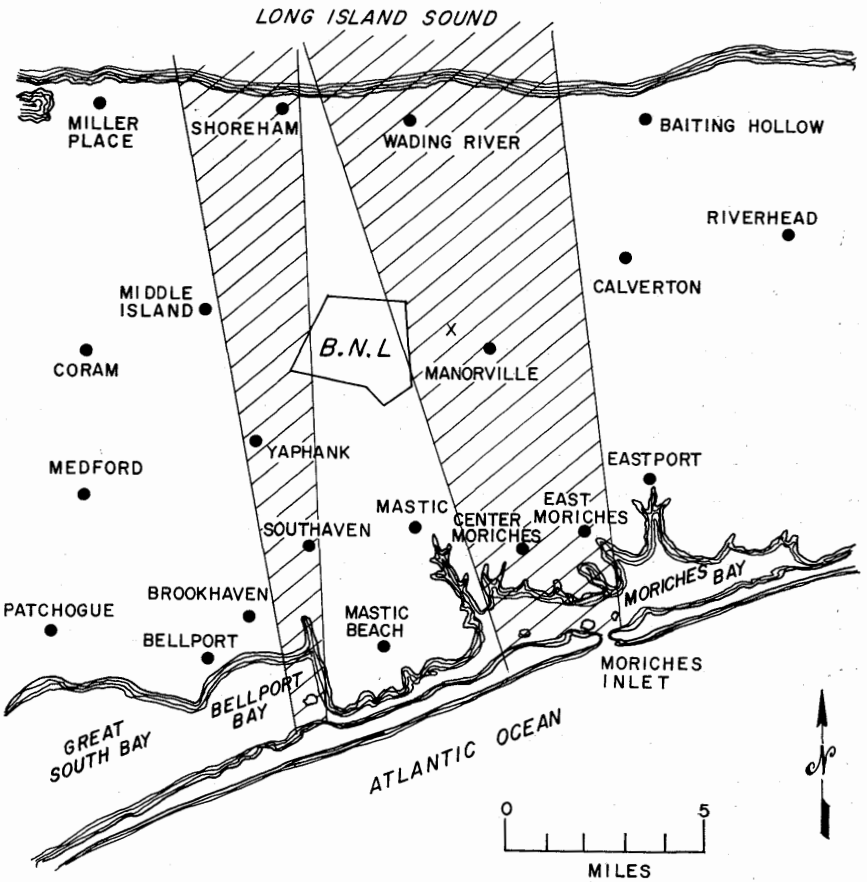

FIGURE 1

Map of a portion of central Long Island showing the location of tern breeding colonies in Moriches and Bellport Bays and the flight paths to Long Island Sound. The principal observation point is marked by X. B.N.L. indicates Brookhaven National Laboratory.

occupation, and continued to late August or September, well after essentially all young birds were flying and about the time many terns were leaving on their southward migration.

DIURNAL PATTERNS

As mentioned above, nearly all early morning flights were northward and evening flights southward. In 1960, for instance, 5 of 6 flights prior to 0900 were headed north. After 1600, 102 of 104 groups or individuals were headed south. In 1967, no morning flights were observed but 37 of 38 evening flights were southbound. The exception was a single bird. During mid-day hours, a relatively small number of flights were seen, partly due to absence at work, but more were headed south than north. During May and June, the basic pattern seemed to be a mass northward movement early in the morning with a few individuals and groups returning at any hour but the bulk of the birds remaining until late in the day. After young hatched, flights in both directions were frequent throughout the day but still predominantly north in the morning and south in the evening.

Relatively few early morning flights were documented since the terns normally arose earlier than the observer but northbound flights were noted as early as 0350 EST on June 21 and 0355 EST on June 29, 32 and 30 minutes before sunrise respectively. Evening flights usually terminated within 30 to 40 minutes after sunset but one flight took place 63 minutes after sunset and another group was heard flying south at 2130 on July 18, two hours and 13 minutes after sunset. However, the bulk of the birds passed in the two hour period prior to sunset.

NUMBER OF BIRDS

In non-flight years, flock sizes observed inland tended to be small, from one to ten individuals, although 55 were seen flying south in the evening of August 23, 1964. In flight years, flocks travelling northward in the morning sometimes totaled 50 to several hundred birds. Returning flocks were usually small in the early part of the season but often included from 50 to 100 birds after young had joined the adults. However, flocks often followed one another in rapid succession and an evening movement might include several hundred birds observed from one location with rather restricted lateral vision. The largest flight observed took place on August 25, 1960 when 1177 birds were counted in 40 minutes, an average of 29.4 birds per minute with an average flock size of 59 birds. Estimating a similar rate for a brief period when observations could not be made, nearly 1400 terns flew south in less than an hour. Probably many more traveled beyond the range of vision both east and west. However, it seems likely that more than ten percent of the population seldom took part in cross island flights on any one day.

FLIGHT ALTITUDE

No measurements of flight altitude were possible but estimates were frequently made. Early morning flocks often swept north just over the treetops at altitudes of less than 100 feet. Later northbound flocks tended to fly at heights of several hundred feet. Evening flights varied with weather conditions. On days with strong headwinds, flights were often low while on days with light winds and good weather, the usual altitude was several hundred feet. On a few occasions, birds were estimated as high as 800 to 1000 feet. Flight altitude often varied with terrain. Terns would fly close to the surface while crossing ponds or open fields and rise higher when traversing forested areas. Flocks leaving Long Island Sound, rose to a height of several hundred feet before crossing the shoreline since a range of hills, some as high as 200 feet, comprises the northern rim of the island. Upon reaching the southern coastline, flocks usually dipped low and skimmed a few feet above the bay the nesting island.

BEHAVIOR

Although silent flocks were sometimes seen and others were undoubtedly missed, most flocks called fairly frequently. At times, only an occasional call was given but, at others, the entire flock seemed to call almost continuously. No correlation was noted between calling and weather conditions, direction of flight, altitude or season. The presence of young birds could be detected by their distinctive calls and during August, 1960, Roseate Terns may have constituted from 5 to 10 percent of the evening flights as judged by their calls.

Southbound birds were often observed carrying fish, even early in the season before young had hatched, but more frequently later. All appeared to be Silversides (*Menidia* sp.) or Sand Lances (*Ammodytes americanus*) both frequent prey of the Common Tern. Often nearly every bird in a sizable flock was seen carrying a dangling fish but fish were never observed on northbound flights.

Flocks often showed interest in small, inland ponds by flying low or lingering over the water. Terns occasionally stopped to rest on ponds in the Manorville area particularly during the mid-day period and, several times, brief fishing forays by a few individuals were noted. No interactions between terns and other species of birds were observed except that one southbound flight included a domestic pigeon.

Flight direction was sometimes direct but flocks often engaged in a great deal of zig-zagging while progressing in the right general direction. During periods of fog, flocks often seemed rather disoriented, sometimes circled and usually zig-zagged excessively but always maintained progress in the desired direction. On one occasion, a straight flying flock paralleling a highway was timed for some distance with the car speed-

ometer at 30 mph. A light headwind was estimated at 5 mph at flight altitude indicating an airspeed of about 35 mph. At this rate, cross-island flights would average somewhat less than one half hour in duration.

DISCUSSION

Although the overland flights must be advantageous to the birds involved or to the colony as a whole, the advantages are not completely obvious in the absence of detailed information on food availability and intraspecific competition. Presumably, the flights function as a mechanism for reducing local competition for food, particularly during years of peak colony size but no data are available to indicate whether or not the local area could furnish adequate and readily available food during those years. Moriches Bay with its associated coves covers about 15.9 square miles. A flight 14 miles eastward from Moriches Inlet (the minimum distance traversed overland) would bring 7.3 square miles of Quantuck and Shinnecock Bays within reach while flight to the west for a similar distance would reach 20.8 square miles of Bellport Bay. Shinnecock Bay was utilized to some extent for food by Moriches Bay terns. Leroy Wilcox has frequently observed terns in numbers comparable to those making overland flights carrying fish westward from the vicinity of Shinnecock Inlet, a distance of 15 miles, during years when no colony existed in the Shinnecock area. No observations are available on flights westward into Bellport Bay but it seems to contain an abundance of small fish similar to the situation in Moriches Bay. In addition to the bays, a fourteen mile radius from Moriches Inlet includes about 308 square miles of ocean. Terns are frequently seen fishing off shore but not as regularly during the breeding season as later in the summer when, perhaps, the availability of small fish is greater. Thus, the food gleaned from the ocean may be small compared to that taken in the shallow water bays and, perhaps, not as readily available as in the Sound.

The birds which reach the Sound do not, of course, confine their foraging to the areas first reached but range widely both east and west and well off shore. No tern breeding colonies exist near this section of Long Island Sound although small colonies have been present for many years further west at Port Jefferson and Stony Brook Harbors. Thus, these birds utilize a nearly untouched food resource.

Certain observations suggest that the overland flights may be learned behavior. In 1959, the first year of their occurrence, flights did not begin until the hatching season, a period of increasing need for food. The number of birds involved was small at first but increased as the season progressed. In later years, flights started at much earlier dates, presumably by birds familiar with the procedure from the previous year. In 1964, the Moriches Inlet colony disappeared but at least some of the Moriches birds, as shown by banding recoveries, moved to the island in

Bellport Bay and promptly began cross-island flights from that location. These flights were similar in timing and other respects to those from Moriches Bay.

No evidence is available to indicate whether birds taking part in overland flights during the incubation period were breeding individuals or unmated birds attached to the colony. Since many birds evidently spent the whole day away from the nesting site, it seems likely that these were not breeding birds since both sexes incubate and change places rather frequently and both take part in feeding young (Bent, 1921). The increased number of birds and the greater frequency of mid-day flights in mid-summer indicate that breeding birds also participate after young hatched. When the young became able to fly, breeding adults undoubtedly took part in the flights for young birds follow and are fed by the parents for some time after achieving flight and many young were included in the late summer flights.

Leroy Wilcox has kindly furnished substantiating recoveries of banded birds. One young banded at Moriches Inlet was picked up dead in Manorville and six on the Sound shore between Stony Brook and Baiting Hollow. Two other birds were taken on the Connecticut shore of the Sound, one at Yonkers, New York and two in Peconic Bay. However, some of these may represent post-breeding season wanderers rather than birds engaged in cross-island flights. Two birds banded at Brookhaven were taken the same season at Smithtown, Long Island, which is further west on Long Island Sound, while three were taken in the Peconic Bay area.

In addition to these recoveries, six birds banded at Moriches Inlet were recovered on the north shore of Long Island between Stony Brook and Baiting Hollow in later years. Many of these probably were birds engaged in cross-island flights. However, only about half of all the recoveries on the north shore of Long Island occurred during years when large or frequent overland flights were observed.

Data from birds banded by Wilcox at Fire Island Inlet suggest that overland flights may also occur further west on Long Island. One bird was recovered at Brentwood, in the center of the Island and two on the Sound shore. Two other recoveries in New England were in mid-September and October and must represent post-breeding season dispersal.

Further investigation of this phenomenon might be fruitful as a study in population pressure and adaptive behavior but would entail considerable research effort including systematic sampling of prey items throughout the season in the waters involved, measurement of the area of the Sound actually utilized by the feeding terns, sampling of fish brought from the Sound to the colony, estimation of fishing success in each area and evaluation of the relationships between the terns and prey species.

TABLE 1

First and Last Date and Number of Days on Which Cross-island Flights from Moriches Bay Were Observed and Size of the Breeding Colony

Year	*Date*			*Size of Breeding Colony at*	*No. of Com.*
	First	*Last*	*No. of Days*	*Moriches Inlet*	*Terns Banded*
1936	—	—	0	Small	363
1937	—	—	0	Small	184
1938	July 29	—	1	Small	462
1939	July 25	Aug. 10	2	Moderate	2300
1940	Aug. 8	—	1	Moderate	1354
1941	July 20	—	1	Moderate	1344
1946	July 3	Aug. 15	4+	Small	223
1947	May 24	July 28	3	Moderate	1277
1948	—	—	0	Large	744
1949	July 6	July 25	6	Small	42
1950	June 12	June 27	3	Small	83
1951	July 16	Aug. 10	4	Unknown	0
1952	Aug. 4	Aug. 13	3	Unknown	0
1953	—	—	0	Unknown	0
1954	—	—	0	Unknown	0
1955	Aug. 13	Sept. 14	6	Small	0
1956	Aug. 8	—	1	Moderate	48
1957	July 27	Aug. 7	7	Moderate	384
1958	Aug. 30	—	1	Small	93
1959	June 27	Sept. 6	19	Moderate	1102
1960	May 23	Sept. 4	44	Large	6756
1961	May 14	Sept. 6	54	Large	6892
1962	May 15	Aug. 26	39	Large	6611
1963	May 9	Sept. 9	24	Small	681
1964	May 12	Aug. 23	6	None	0
1965	July 5	Aug. 12	4	None	0
1966	May 16	May 23	2	Small	14
1967	May 18	Aug. 27	26	Moderate	1790
1968	May 4	Aug. 29	13+	Moderate	858
1969	May 3	Sept. 1	1	Moderate	854
1970	May 3	Aug. 22	18	Abandoned during season	0

ACKNOWLEDGEMENTS

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Schultz Road, Manorville, Long Island, New York 11949.

Plan now to attend the

Twenty-fifth Annual Meeting

of the

New York Federation of Bird Clubs

at the

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SHOREBIRD RECAPTURE OPERATION

The University of Montreal is again conducting a research program to study the migration routes of North American shorebirds.

Several species of shorebirds mist-netted on the Magdalen Islands in the Gulf of St. Lawrence will be marked with yellow feather dye on the underparts and yellow streamers on their legs. Sanderlings will be marked only with the leg streamers.

The collaboration of bird watchers is again requested in reporting marked birds. Records should include the locality, date and species; the name and address of the observer; and the band number if the bird is taken alive. Also, if possible, the weight of the bird should be reported.

All information should be sent to Dr. Raymond McNeil, Centre de Recherches Ecologiques de Montreal, 4101 est, rue Sherbrooke, Montreal 406, Quebec, Canada.