

THE STATUS OF CAPE COD TERNS IN 1933¹

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WHILE the 1933 tern season, viewed from the angle of chicks matured, left much to be desired, it was in many other ways most interesting and profitable. Tern Island produced a large number of young, which offset in part an aggregate of small calamities on the other rookeries. Heavy easterly storms early in July ruined most of the smaller exposed nesting sites just as the eggs were hatching, and created much havoc on the larger ones, but the frustrated birds soon laid second clutches of eggs. As most of our time was given over to trapping adults on the nests, the general distribution and dissemination of the parent birds for their unsuccessful second nesting was observed in considerable detail. The capture and banding of adults garnered much data of great value in our studies of the distribution and general ecology of the species. This, however, is being reserved for a second paper to be published during the coming winter. This article is simply a narration of the season's activities.

THE RECLAMATION OF TERN ISLAND

It is certain that the past four years have witnessed a steady decline in the number of breeding birds occupying what long had been the Cape's best tern rookery—Tern Island at Chatham.² Tern rookeries are not stable entities. They fluctuate in population cyclically, as has been noted by several observers. Tern Island reached the peak of its cycle in 1929, when ecological conditions there were at their optimum. Since then a progressively increasing rank growth of beach grass, encouraged by the constant fertilization the island has received for a decade, has encroached on the available territory, rendering the terrain unsuitable for nest-building, and allowing cover for a large number of rats. This Station has endeavored to circumvent the normal workings of nature by restoring the Tern Island colony to the peak of its cycle. Previous investigations had determined that two procedures were of essential importance—first to thin out the densely matted beach grass,

¹ Contribution No. 14 from the Austin Ornithological Research Station.

² See Austin, O. L., Jr.: "Further Contributions to the Knowledge of the Cape Cod *Sterninae*", *Bird-Banding*, Vol. III, No. 4, October, 1932, pp. 123-139.

second to eliminate the rats, which had found excellent cover beneath the ten-year accumulation of interwoven dead foliage. Accordingly, the island was burned over on December 9, 1932, and left clean to the sand. The moment the old grass had gone, an almost incredible number of rat burrows, now deserted were seen.

As the grass did not start to sprout again until late April, the returning birds found a relatively clean island, with a greater area of suitable nesting territory. Rather than "coming to land" suddenly in a body as is their usual custom, the terns arrived this year in small groups. On May 2d a vanguard of fifty birds hovered high over the island. This nucleus was augmented from day to day until by May 15th there were on the island, going through courtship antics and hollowing out nests in the sand, approximately three thousand pairs of birds, an increase of 30 per cent over the preceding season's population.

The first eggs were laid on May 16th, and the general laying continued until May 23d, whereas the corresponding period in 1932 extended from May 23d to May 31st. The northern half of the island, which in 1932 had been relatively unoccupied owing to the density of the matted grasses, now was dotted plentifully with nests and eggs. The increased number of nests in areas formerly heavily grassed is shown by the count in quadrat 4 (see *ibid* p. 125). This quadrat, marked out in 1932 in the densest beach grass had then supported 25 nests containing a total of 47 eggs, averaging 1.9 eggs per nest. In 1933, after having been burned over, this same area held 31 nests containing a total of 70 eggs, an average of 2.3 eggs per nest. This year 62 eggs, or 89 per cent, hatched, as against a successful incubation of 32 per cent the previous season.

The partly grassed observation quadrat (Q3) was slightly more heavily grassed than the previous year, owing to the sprouting of new clumps from stolons. It contained 35 nests with 90 eggs, an average of 2.6 eggs per nest, as against 30 nests with 75 eggs, an average of 2.5 for the previous year. This quadrat had 57 eggs, or 76 per cent, of the first laying hatch in 1932. In 1933, 81, or 90 per cent, of the eggs completed incubation, an improvement of 14 per cent.

The other partly grassed quadrat of last year (Q1) became enormously overgrown this year. It contained only 34 nests with a total of 89 eggs, an average of 2.6 per nest, as against 38 nests with 106 eggs, an average of 2.7 in 1932. The decrease is a direct result of the excess grass. It was in the immediate

vicinity of Q1 that most of the egg-destruction by rats occurred this year, so that only 56 of the eggs, or 63 per cent, hatched. Rat-control, however, made this an 11 per cent gain over the 52 per cent survival in 1932.

The open quadrat (Q2) remained as it had been last year aside from a closer approach to its boundaries by bordering grass. It supported 25 nests with 59 eggs, an average of 2.4 eggs per nest, as against 32 nests, 83 eggs, a 2.6 average in 1932. This falling off was expected, since terns usually elect lightly vegetated areas in preference to open sand stretches, and the winter burning had provided extensive areas of more desirable terrain, into which the returning breeding birds scattered. 56, or 95 per cent, of the eggs survived, whereas in 1932 the hatch was 90 per cent.

It could not be expected that after the feast the rats had in 1932 they would fail to return to the rookery this year. The burning of the nearby garbage-dump and the curtailment of food at the fish-houses on the adjacent mainland increased the probability of another rodent invasion. In early May it was certain that not one rat lived on the island. The grass was sparse, the only possible cover being a small pile of dry thatch and seaweed deposited on the center of the island close to Q1 by an unusually high March tide. On May 29th two eggs were missing from Q1, and a search revealed two newly-made rat burrows under the thatch. Each day fresh holes were discovered in various places elsewhere on the island. Red squill in fish and meat baits had proved fruitless in 1932, and the burrows then could not be located well enough to make trapping efficient. Now that the burrows were in plain sight, steel traps were set in all the holes. But the rats were evidently trap-wise. Five days of trapping produced but two of them and the foot of a third, and the damage increased, paralleling the experience of 1932. The situation was serious. The rodents were rapidly getting out of hand, and another wholesale tragedy seemed imminent. As a last resort strychnine carried in a rolled-oats bait was tried. Eight quarts of poisoned oatmeal (prepared according to the Biological Survey formula) were scattered over the island, with heavy doses in the burrows and in the neighborhoods where most of the rat damage was noticed. Though the island was searched carefully daily, not a single dead rat was found; but the damage stopped miraculously, and no further signs of rat work were noticed.

The island was similarly re-poisoned at weekly intervals until July 15th, when the last chicks of the first nesting had flown

away and second nestings had begun. By that time the grass had become too long for efficient work. A late visit on July 31st showed the rats again in full possession of the island, living on the eggs of renesting birds. But the rookery had succeeded so well in its yearly duty of replenishing the breeding stock that a failure of the second nesting was of no great moment.

The chicks commenced to hatch on June 7th, five days earlier than the preceding year, and continued hatching until June 20th, with the peak between the 12th and 16th. Food fish had been relatively scarce all spring, and the slender lance for which the terns show a decided preference was not observed at all. The usual schools of "bait" had not appeared in the run between the island and the mainland, and the incubating adults were forced to seek sustenance in the harbor, and even in the open ocean beyond the bars, three miles away. The old birds found enough for themselves, but when the hatching of the chicks demanded a heavy increase of food, the absence of the usual schools of minnows which supported them in former years caused a mortality by starvation of well over 50 per cent of the chicks which hatched previous to June 17. We saw on the island minnows four and five inches long, which were much too large for the young terns to swallow, and a herring six inches in length was found in the center of the colony! Fortunately, on June 17th the "bait struck in" and ended the starvation period. On that day a census of the island showed 634 live chicks and 644 dead ones (two hundred of the dead chicks had been banded on previous visits). The dead chicks were all buried, so that an accurate check might be made on total mortality. With the rats under control, and an adequate food-supply available, the hatch then prospered. In our later work on the island, during the banding of 2137 more chicks, we encountered but 305 dead ones, showing a subsequent mortality of about 12 per cent.

Thus we banded on Tern Island this year 2,458 young Common Terns and 513 young Roseate Terns, a total of 2,971, of which probably 80 per cent matured sufficiently to fly away. Although this is less than half the number of young the colony produced in any one of its good years between 1925 and 1929, it may well be considered as successful in comparison with the total failure of the rookery in 1932.

EGG ISLAND

Egg Island, in Lewis Bay, was the most productive rookery on the Cape in 1932. There were banded on it that year 5,425

chicks. Since the island afforded the best ecological conditions of any of the Cape's nesting sites, such as insular isolation, freedom from predators, and ideal vegetation, its prosperity was expected to continue for several years. Its geographical location, which provided shelter from the most destructive storms, promised to preserve its physical characteristics indefinitely. But allowance had not been made for human interference. During the summer and fall of 1932 dredging operations were carried on for the widening and deepening of Hyannisport Harbor and the channel leading to it through Lewis Bay. This resulted in the establishment of new currents which during the winter eroded away fully one quarter of the northern end of the island, and narrowed the remaining portion markedly. The returning birds found available in 1933 not more than 60 per cent of the space they had used the previous year, when the rookery had been fully occupied. Consequently this year the population was 40 per cent lower than in 1932.

The Egg Island birds, as usual, returned and commenced nesting a little later than did the Tern Island occupants. The chicks began hatching June 11th, but the majority did not emerge from their shells until June 20th. During this period the island was swept by electrical storms, one of which, on June 12th, was accompanied by great numbers of large hailstones. Each of the storms took considerable toll of the newly hatched fledgings, so that of the first hatch, which should have numbered at least 3,000 chicks, there survived for banding only 1,354. Many of the adults that had lost their eggs or chicks during the storms promptly laid again, mid-July showing a second incubation under way extensively all over the island. A few of the frustrated birds had gone to other sites for another attempt at nesting, as our adult trapping showed, but the greater part elected to relay on Egg Island. The eggs of the second nesting commenced hatching on July 31st, but continued rains attended by easterly winds during the following ten days killed almost all the young that emerged. On August 17th we combed the rookery and found but ten half-grown chicks, eight of them Roseates, and two Commons. This proportionately greater survival of Roseate than Common chicks during bad weather, especially hard, cold rains, results from the Roseates' tendency to hide, except when being fed, under protecting clumps of grass.

PAMET RIVER ROOKERY

This rookery has been so markedly unsuccessful during the past several years, owing to its poor insularity, that it was determined to waste on it this season no more time than necessary. On June 13th we estimated an adult population of 350 pairs—a noticeable increase over 1932. Tidal action had extended the northward end of the island about a hundred yards, and there were eighteen nests on the new land. Predator conditions, however, were still as unfavorable as ever. There is abundant cover for rats in the tangle of flotsam and grass, and as the bars between the island and the mainland dry at high tide, four-footed prowlers find a ready means of egress to the colony. The bathing-beach on the mainland at the north end of the island has become increasingly popular, and the birds have very little chance of rearing their young successfully unless they nest so early that the juvenal birds are able to fly by July 1st. Owing to the high percentage of mortality consequent to such conditions, it is not considered worthwhile to band the chicks until they are at least three-quarters grown, when chances of band-wastage are lower. On June 30th we banded 40 such chicks, and on July 12th, when the rookery was almost deserted, two more.

This rookery is noteworthy in that it supports one of the two best colonies of Arctic Terns on the Cape. On June 14th there were eighteen pairs of this species nesting in the sand just above the high-tide line on the westward side of the island. It is extremely doubtful if any of them reared young, for two weeks later the nests were gone, and no chicks could be found.

BILLINGSGATE AND JEREMY'S POINT

Billingsgate is now a high sand-bar, entirely devoid of vegetation. A strip a quarter-mile long and from ten to two hundred yards wide is dry during normal tides, but covers over when the moon is full. It was washed completely over on May 13th, and again on June 10th. Shortly after this, however, the terns started breeding there again. On June 27th the we found 250 nests along the crest of the island, all of them of Common Terns.

We trapped 159 of the adults, of which 20 were already banded. Fifteen of the banded birds had been handled first in previous years (ten at Billingsgate, six in 1932 and four in 1929, and five at Tern Island between 1927 and 1932) but five had been captured earlier in the same season incubating eggs

on other rookeries. Of these two were banded on Egg Island, June 2d and June 7th, respectively, and two at Tern Island, May 24th and June 9th, respectively. The last bird was banded June 10, 1932, at Pamet River Rookery and retaken at Tern Island, Chatham, June 12, 1933, and now appeared for its second nesting in 1933 at Billingsgate.

This nesting was unsuccessful, for the island was again inundated on July 6th, and all the eggs washed away. The next inundation was on August 5th, but throughout July and August constant sailing and picnic parties kept the birds away from the sand-spit.

Jeremy's point has shown possibilities of eventually becoming a rookery. Terns have attempted to nest on it many times in the past decade, but have always been routed by scavenging cats, skunks and foxes from Great Island, to which it was attached. A storm two winters ago broke the base of the point through, making an island of it at high tide, and subsequent gales this past winter deepened the cut-through, so that the point is connected to Great Island only at dead low water. But this spring, for the first time in at least four seasons, the terns made no attempt whatsoever to nest on the Point. Why they did not defies explanation, for ecological conditions seem quite suitable.

HOPKINS AND ROCKY ISLANDS, AND NAUSET POINT AND MARSH

Hopkins Island is rapidly approaching the low part of its cycle. The rookery is becoming so heavily overgrown with wild rose vines and beach plum bushes that the terns are in danger of being crowded off. The tangle makes it almost impossible to find the young, once they have left the nest, and, of course, affords excellent shelter for the omnipresent rat. Negotiations, as yet unsuccessful, have been attempted to secure title to the island in order to restore it by removing the vegetation.

Terns were observed flying about Hopkins Island on May 11th, and by June 1st there were 197 nests being incubated—an increase of two over 1932. On June 28th a careful search revealed only three fairly well grown chicks, and 37 nests, in two of which were newly hatched young. The island was honeycombed with burrows of field mice (*Microtus*), which have never been known to damage the tern nests. Under a large boulder on the north side of the island was a burrow in

which a number of broken eggs were found, which points to probable rat invasion.

Rocky Island remained unchanged from 1932. Thirty-five nests were built there in June, the same number as in 1932, and but few, if any, chicks were reared to maturity. The island is too small to allow them any cover, and every storm-driven tide covers it. It was inundated during the easterly gale of July 3rd and 4th.

The Nauset Marsh colony continued to expand. On May 18th we observed two hundred birds playing over it. On the next visit, June 20th, the birds had increased, and while trapping 97 adults we estimated 250 nests. The rookery was bothered late in June by summer visitors from Nauset Heights, and the early July gales finished it.

At the base of the outermost dunes on the tip of Nauset Point a splendid colony of Arctic and Common Terns established itself late in May. There were slightly over one hundred nests, of which thirty were of Arctics. On June 21st we trapped 48 of the Common Terns and 18 Arctic Terns, of which one was a bird banded as an adult on near-by Hopkins Island in June, 1929. Three of the Common Terns were returns, one banded as an adult in the Nauset Marsh colony in 1932, the other two both banded on Tern Island in 1929, one as an adult, the other as a juvenal. The Point Colony was wiped out entirely by the easterly gale of July 4th, which deposited almost two feet of sand on the rookery site. The birds attempted nesting again in the dunes a quarter of a mile to the northward, where they were soon broken up by marauding animals.

NORTH BEACH AND MONOMOY POINT, CHATHAM

It will be remembered that in 1932 many of the terns which had been driven from Tern Island by rats attempted their second nesting at the tip of North Beach, across the mouth of Chatham Harbor. The sands of this point shift continually from the action of wind and tide. This year an additional hook made out at the southern tip of the point. A handful of terns made forty nests in the neighborhood of their old site, but were disrupted by the usual agencies in June. Twenty more pairs attempted to nest in July on the new hook, but these were likewise a failure.

Experience shows that very seldom are any of the beach colonies successful in raising broods to maturity. We were able this year to investigate the reputed Monomoy colonies,

which proved not only to be unsuccessful, but likewise never to have been so large and prosperous as reported. Small isolated colonies established themselves on the outer beach between the old lighthouse and the tip, but they were all broken up, almost before they began. Monomoy abounds in skunks, and there are many dogs and cats kept by the Coast Guard.

SUMMARY

As an index to the status of the terns on the various rookeries, the following summary of the numbers banded in each of the colonies is appended:

TERNs BANDED IN 1931, 1932 and 1933

	ADULTS									CHICKS								
	hirundo			dougalli			para-disæa			hirundo			dougalli			para-disæa		
	'31	'32	'33	31	32	33	31	32	33	'31	'32	'33	'31	'32	'33	31	32	33
Tern Island....	77	704	892	2	1	5	..	2	5	5085	1716	2458	1045	38	513	..	..	..
Egg Island....	..	53	1458	..	1	8	..	..	..	1721	4220	1134	55	1205	218	..	..	..
Billingsgate....	..	52	159	..	..	..	..	..	..	418	118	..	..	..	..	..	..	..
Pamnet River....	31	9	108	..	..	..	4	3	11	125	5	42	..	..	..	..	..	..
Hopkins Island..	9	1	..	..	..	..	..	..	..	122	161	3	..	..	..	..	..	2
Rocky Island....	..	..	..	..	..	..	..	..	..	40	4	..	..	..	..	..	..	..
Nauset Marsh (Inlet).....	..	126	109	..	..	..	..	..	..	41	108	..	..	..	..	..	..	..
Nauset Point....	..	..	51	..	..	..	1	19	..	..	..	..	..	..	..	..	..	5
North Beach....	..	286	..	..	..	..	..	..	..	..	225	..	..	..	..	..	..	1
Totals	117	1231	2777	2	2	13	4	6	35	7552	6557	3637	1100	1243	731	..	3	5

	Adults	Chicks	Total	Returns
1931.....	123	8652	8725	1931..... 18
1932.....	1239	7803	9042	1932..... 62
1933.....	2825	4373	7198	1933..... 234
	4187	20,828	24,965	314

North Eastham, Cape Cod, Mass.