

BIRD-BANDING

A JOURNAL OF ORNITHOLOGICAL INVESTIGATION

VOL. IX

JULY, 1938

No. 3

TERN MORTALITY ALONG THE MAINE COAST

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THE writer was on Little Green Island, in Penobscot Bay, from July 13th to 28th, inclusive, 1937. Because the nesting season for the terns there, as well as at Matinicus Rock, was a complete failure, the writer's curiosity was aroused as to how successful the hatch had been at other colonies along the coast and what factors had affected the breeding season. Data were solicited from other observers and a summary of reports is presented.

A. H. Norton and R. P. Allen made a journey of inspection of Maine sea-bird colonies from June 23d to July 14th, 1931. This trip was mentioned by Allen (1931) and Norton and Allen (1931 and 1932). Norton and Allen (1931) reported Common Terns (*Sterna h. hirundo*) breeding at 20 colonies, Arctic Terns (*Sterna paradisæa*) at 6, and Roseates (*Sterna d. dougalli*) at 3 colonies. No mention of the total population was made here, but elsewhere Allen (1931) stated that the terns were "holding their own, there being more than 7,400 Arctic Terns, more than 7,300 Common Terns, and about 550 Roseates, scattered along the coast." All the important breeding colonies were included in this count. It is interesting to note also that 77 nesting colonies of Herring Gulls (*Larus argentatus smithsonianus*) were found and an "extremely conservative estimate of adult birds was placed at 52,000."

Figures for the population of each of the tern colonies mentioned below, for 1931 were kindly sent me by R. P. Allen.

Machias Seal Island.—O. S. Pettingill, Jr. writes that 2,000 pairs of Arctic Terns and 50 pairs of Common Terns nested here in 1937. The season ran its course in the normal way. Dr. Pettingill writes: "I was greatly surprised with the high death rate of the chicks. It was due, however, to a number of factors and not to any particular one. Weather conditions, particularly the northeastern storm of July 13th, accounted for the lives of nearly a dozen chicks from the hundred nests. But desertion by parents, the feet of the resident cattle, falls over ledges or ledge-shelves, and imprisonment in deep crevices accounted for many more lives. After my study

of a hundred nests I would hazard a guess that only a third of the young terns hatched on Machias Seal Island in 1937 ever lived to fly from it. I believe that this is not unusual and occurs from year to year; certainly these death-dealing factors have been present during previous breeding seasons. But the truth of the matter can be determined only after the colony has been studied over a period of years. I have no evidence that a gull caused the loss of a single egg or chick. Not one hawk, owl, crow or raven was observed during my stay."

The tern population on Machias Seal Island was approximately the same in 1937 as in 1931.

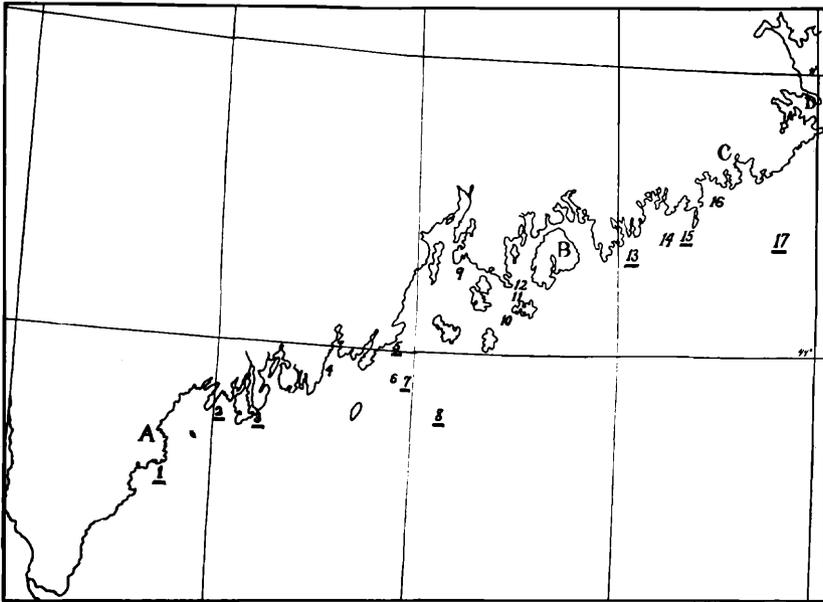
Egg Rock (Jonesport).—James Urquart of the Great Wass Island Coast-guard Station writes that very few terns (approximately 50) were present during the 1937 season. He is of the opinion that the Herring Gulls have encroached upon the terns to the extent of driving the latter from the region. In 1931 there were 100 Arctic and 500 Common Terns nesting on Egg Rock.

Green Island (Petit Manan).—W. L. Lockhart, keeper of Petit Manan Light, reports that 5,000 terns (Arctic and Common, with the latter predominating) were present in 1937. Approximately half of the normal crop survived. Some eggs were apparently chilled by cold weather, some were destroyed by gulls, and some rolled off the cliffs into the sea. Many very young chicks were found dead, their deaths seemingly caused by cold and damp weather. In 1931 there were 200 Arctic and 600 Common Terns on Green Island. This colony must have grown rapidly after that year.

Little Green Island (Penobscot Bay).—Allan Cruickshank writes that 20 pairs of terns were present on June 16, 1937. Some nests with eggs were found. On July 6th a large flock of terns was at the island, but the birds showed no signs of nesting.

When the writer arrived on Little Green Island on July 13th, there were 200 Arctic and 400 Common Terns present. No eggs nor young terns were found at any time during the succeeding two weeks. One might, at first, have thought that the terns had produced young, for frequently the adults were seen carrying fish. Among both species of terns present pairs of adults frequently indulged in the performance of rubbing their breasts on the ground, then passing a fish back and forth between the two birds. This behavior is related to courtship and has been discussed by Austin (1932a : 130).

The weather was certainly the chief factor in causing the birds to nest successfully here, and not the fact that the island had an unusually rank growth of grass on it. The Common Terns that normally nest on the grassy portion and the Arctic Terns on the rubble stones were equally unsuccessful in bringing off any young. Austin (*loc. cit.* : 126) has shown that a rank growth of grass is unsuited to nesting terns.



Map of Maine coast showing location of most of the important tern colonies. Letters indicate weather bureau stations. Numbers underlined refer to colonies mentioned in accompanying text.

1. Stratton Id. 2. Pond Id. 3. The Sugarloaves 4. Ross Id.
5. Garden Id. 6. Metinic Id. 7. Little Green Id. 8. Matinicus Rock 9. Two Bush Id. 10. Brimstone Id. 11. Ship Id.
12. Trumpet Id. 13. Green Id. (Petit Manan) 14. Flat Id.
15. Egg Rock 16. Foster's Id. 17. Machias Seal Id.

Coastal weather stations: A. Portland B. Bar Harbor
C. Machias D. Eastport.

(Note. Portage Lake, mentioned in the text, is too far inland to appear on this map.)

Only a few pairs of Arctic and Common Terns were found at this locality by Norton and Allen in 1931; the writer estimated that a total of 700 breeding birds were there in July, 1935.

The Laughing Gulls (*Larus atricilla*) on Little Green Island succeeded in bringing forth about 120 young birds, according to Cruickshank, who saw them on his last visit to the island on August 16th—more than two weeks after the writer's departure. As about 300 adults were present, the number of chicks raised seems below normal.

Black Guillemots (*Cepphus g. grylle*) have increased in the last two years from 5 or 6 pairs to about 25 pairs in 1937. The weather did not affect their nesting season. Herring Gulls are discouraged here because their presence is detrimental to the interests of the "medricks" and "black-polls," as the terns and Laughing Gulls are locally called. Not over 20 Leach's Petrels (*Oceanodroma pelagicus*) nested on the island in 1937. One pair of Northern Ravens (*Corvus corax principalis*) attempted to nest in 1935, but none have tried since.

Muscongus Bay.—Allan Cruickshank reports that the terns had a very poor breeding season in this region, which is only a short distance west of Little Green Island. The terns were present in normal numbers in early June and began nesting, but a protracted period of stormy and foggy weather apparently was the factor that caused the destruction of eggs and young, and the adults did not attempt to nest a second time.

Mr. Cruickshank writes, in part: "During the second week in July we were flooded with Arctic Terns in Muscongus Bay and at first could not understand why such great numbers of adults were present on all the islands. For a week or two it seemed as though they were getting ready to nest, as many birds were going through the courtship displays and flights. But we soon correlated it with the widespread failure of the birds on the breeding grounds to raise young. These birds stayed around for several weeks and then left. There is no question that gulls do bother nesting terns, but this year's catastrophe was due to bad weather."

Matineus Rock.—According to Robert P. Allen, 6,000 Arctic Terns were present during 1936. The present writer visited the rock on July 24, 1937, and was told by W. E. Thompson, assistant lighthouse keeper there, that 2,000 terns had started to nest this year. The cold wet fog of June caused the death of all the young that had hatched, and the adults deserted their unhatched eggs. The terns disappeared, only two being seen on July 24th by the writer.

Matineus Rock is the most southwesterly breeding station of Atlantic Puffins (*Fratercula a. arctica*) on the Atlantic Coast. These interesting birds seem to have increased steadily in numbers in recent years. Norton (1904:154) states: "Four puffins are here this year, an increase of one pair since last year." About 85

of these birds were said to have appeared at Matinicus Rock in the early spring of 1937, and about 20 pairs remained to nest. The writer counted 26 adults in sight at one time on July 24, 1937. Some of them were carrying fish. No young were seen. The keepers of the light declared that, since the puffins nest deep down in crevices among the rocks, no young are ever seen until they are old enough to leave the nests.

Over 140 Black Guillemots were successfully nesting at the Rock, while Spotted Sandpipers (*Actitis macularia*), which nest in much more exposed places than do the puffins and guillemots, raised their young successfully in spite of the weather that proved so disastrous to the terns.

Upper and Lower Sugarloaf Islands.—The population here in the summer of 1937 consisted of a total of about 1,000 birds, 85 per cent being Common Terns, with the remainder probably Arctics with a few Roseates. Although a fairly numerous hatch was reported, with over half the hatch surviving, the writer questions the value of the report obtained. Few people ever land on these rocks, for they are in the midst of swirling currents. The birds can be observed at a distance from the mainland and the sight of many adults about the rocks would indicate, to most observers, that all was going well.

The number of birds nesting here has remained nearly constant since 1931. The writer has visited the islands on several different years.

Pond Island.—Mr. Joseph Wallace, in writing of Pond Island, also refers to near-by Pumpkin Nub and Mark Island. In 1937 these places were occupied respectively by 400, 200 and 300 Common Terns. The birds nested earlier than usual, then weather conditions became unsuitable for them and only about 10 per cent of the eggs hatched. About 75 per cent of this hatch survived. No gulls were seen eating young terns. The same writer states that in former years Green Island, Brown Cows, Stepping Stones and Ram Island were used as nesting sites by the terns, but the gulls and cormorants have now taken possession, and have forced the terns to go elsewhere.

It was estimated that 200 Common Terns nested on Pond Island in 1931.

Stratton Island.—A. H. Norton writes as follows: "On July 11, 1937, with Mr. J. F. Fanning of Portland, I visited a colony of between 1,000 and 1,500 terns off Scarborough expecting to find the young in all stages of growth, but really found almost no young terns alive and remains of many which had died and rotted, leaving only tufts of down. Nests were few and looked as though the eggs in them were addled and bleached. The adults still resorted to the shore and even sat on the sorrowful looking eggs; they were bringing no fish ashore, as is usual when the young are numerous and growing. I associated this almost complete mortality with

the wet period, as a theory to explain this condition; now your report strengthens this belief. There are now but few tern colonies along the coast, compared with those of 25 years ago."

Portage Lake (Aroostook County).—From this far inland locality Howard Mendall reported that 3 adults and 1 young Common Tern, the latter barely able to fly, were present on August 18, 1937. On August 23d, 4 adults and 2 young well able to fly were seen. It is said that a few terns have nested at this station for many years.

After scanning the above reports it is obvious that the weather played an important part in the destruction of the eggs and young of terns on the Maine coast in 1937. Weather Bureau reports show that, from east to west along the coast, there was a considerable difference in the total precipitation for the month of June. By consulting "Climatological Data" the amounts, in inches, are found to be as follows: Eastport, 2.20; Machias, 3.16; Bar Harbor, 3.86; and Portland, 5.38. It is also noted that the rainfall was more evenly distributed and not concentrated on particular days on the eastern part of the coast, as it was to the westward. Thus the easterly-situated Machias Seal Island was not subjected to severe storms, except for the late one of July 13th, when the precipitation was only 0.59 inches. On the central and western part of the coast during the first, third and last weeks in June there were periods of several days in succession when a dense fog prevailed. The latter two of these periods, which were accompanied by much rainfall and abnormally low temperatures, proved most destructive to the terns.

Austin (1932b : 151) stated that a large number of young terns in a Massachusetts colony were destroyed by a storm in 1931.

No evidence is available to show that any of the terns attempted to nest again after once losing eggs or young.

It has been suggested that a cold spring and summer might keep the sea water at a subnormal temperature and thus cause the small herring, mackerel and shrimp to be scarce in the storm area. Although these items were reported by Mendall (1934) to form the bulk of the food of terns on a part of the Maine coast during 1933 and 1934, other writers have indicated that terns are "opportunists" and are not confined to a specialized diet. The other food items mentioned by Mendall might form the bulk of the diet at other times and places. Furthermore the writer saw many terns carrying sand-lances at Little Green Island where no young were being raised by these birds. Obviously there was no failure of the food supply.

Floyd (1932 : 174) presented inconclusive evidence which indicated that possible food shortage might have caused terns to desert a Massachusetts colony after part of the eggs had hatched.

Terns are efficient providers of food for their young, but somewhat negligent in caring for their eggs or offspring during pro-

tracted periods of unfavorable weather. This is *one* of the factors making for a high mortality of young and a loss of eggs.

Tern colonies on the Maine coast (and elsewhere) are subjected to a number of quite easily discernible factors which tend directly to keep down the population or to prevent the birds from nesting in certain localities. Among these factors are gulls, cormorants, rats, dogs, weather, domestic animals and man. The terns are frequently driven from inshore islands by rats and the visitations of man, only to be driven off the outside islands to which they have moved by the expanding population of gulls and cormorants. Thus colonies shift from place to place. It has also been suggested that terns are cyclic in numbers, with the cycles independent of the factors listed above. The latter would be a difficult theory to prove, with the birds continually changing their breeding grounds.

CONCLUSIONS

Judging by the total percentage of the Maine tern population nesting on the islands within the storm area and the known damage done to the colonies which have been listed, it is conservative to estimate that between a third and a half of the young terns which normally would have been raised in 1937 were not raised during that year. Abnormal weather conditions caused this high mortality.

It is shown that the present number of nesting puffins at Matineus Rock indicates that this colony is thriving.

One little known inland nesting site of the Common Tern is mentioned.

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