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Author(s): I. C. T. Nisbet

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Behavior of Common and Roseate Terns After Trapping

I. C. T. NISBET

Massachusetts Audubon Society, Lincoln, Massachusetts 01773, USA¹

This paper reports a study of the behavior of Roseate Terns (*Sterna dougallii*) after trapping, conducted at Bird Island, Massachusetts (41°40'N, 70°43'W) in 1980. Roseate Terns have been decreasing in numbers and should be proposed for designation as Threatened or Endangered Species (Nisbet 1980, Buckley 1981). Accordingly, I sought to document the circumstances in which they could be disturbed and handled without causing damage. To augment this study, I have summarized notes on the behavior of 20 Roseate Terns and 320 Common Terns (*S. hirundo*), which I trapped between 1970 and 1979. Most of these birds were trapped either at Bird Island or at Monomoy National Wildlife Refuge (41°36'N, 69°59'W). Both of these colonies have been subjected to intensive biological study (Nisbet 1978), so that the birds have become habituated to regular visits, and are relatively tame. For this reason, it is possible that they may be more tolerant of trapping than birds at less disturbed colonies.

The terns were caught on the nest in wire drop-traps about 70 cm square. The traps were operated by stick and string from a nearby blind; all birds were removed from the traps within about 15 seconds of seeing the trapper approaching them. The birds were taken to the blind and were banded, measured, and weighed. Nineteen of the 28 Roseate Terns trapped in 1980 were marked on one wing with a patagial tag of flexible plastic that was wrapped around the wing and fastened to itself (i.e., not secured to the wing with a pin). The trapping procedure is fairly traumatic, but all of the birds were released within about three minutes of trapping. Birds trapped in previous years were handled similarly, except that only 36 of the Common Terns were marked with patagial tags, most of which were pinned to the patagium. Only

one bird from each pair was trapped on any one day.

After release, the Roseate Terns were watched for several minutes, usually until they returned to the island and settled. Most of the birds were trapped at the beginning of periods of continuous study of the incubation behavior of neighboring birds, so that I and my assistants maintained surveillance of the nesting area, usually continuously for 24 hours after trapping and intermittently during the succeeding 24 hours. We recorded the time at which each trapped bird returned to the vicinity of the nest, the time when it first went onto the nest and resumed incubation, and the approximate time at which it resumed "normal" incubation behavior. The last determination is somewhat subjective, because incubation behavior is variable. In general, behavior was regarded as "normal" as soon as the birds assumed a regular pattern of alternating bouts of incubation, and as "abnormal" if the marked bird moved off the nest within a few minutes of settling, or stayed away for more than three hours. Approximately one-third of the Common Terns were watched similarly, although detailed notes were kept on only 82 of them.

The most serious adverse effect that was observed was desertion of the nest. Table 1 shows that Roseate Terns trapped in the first 15 days of incubation sometimes deserted their nests. These results were obtained in a pilot study in 1970, and I did not trap any birds in this early period in 1980. None of the 28 Roseate Terns trapped in 1980 between days 17 and 22 of incubation deserted their nests. I have not observed any desertions by Common Terns trapped after the completion of their clutches. However, two male Common Terns trapped in 1975 immediately after their mates laid their first eggs deserted. No females trapped during the egg-laying period deserted (see Nisbet 1977).

These results might lead to the con-

¹Present address: Codman Road, Lincoln, Massachusetts 01773.

TABLE 1. Frequency of nest desertion by Common Terns and Roseate Terns after trapping. The figures given are the number of birds that deserted/number of birds trapped in each period.

Time when trapped	Common Tern	Roseate Tern
During egg-laying	2/66	—
Days 0-15 after laying of first egg	0/124	3/7
Days 16-26 after laying of first egg ^a	0/130	0/41

^aThe first egg usually hatches on day 22 or 23, and the last egg between day 24 and day 27 (Nisbet and Cohen 1975).

clusion that trapping of terns after day 17 of incubation has no adverse effects. However, I have observed that Roseate Terns are often slow to return to the nest after trapping.

After release, terns of either species display a characteristic sequence of behavior. They fly directly out to sea as far as 300 m, then settle on the water and bathe vigorously for several minutes. They return to the colony, sometimes stopping to bathe again on the way, settle on the shore, and preen thoroughly for 10-20 minutes. After resting for a variable period, they fly to the vicinity of the nest. Common Terns usually land close to the nest and soon approach it to take over incubation, but Roseate Terns sometimes land away from the nest, even in another pair's territory. After first landing near the nest, Roseate Terns frequently remain there for only a few minutes before flying back to the shore, and they sometimes do not approach the nest until after several flights to and from the shore. At this time, they do not show signs of alarm, but stand for long periods doing nothing or preening. Even when they have gone onto the nest, they sometimes incubate for spells of only 1-5 minutes, walking off the nest to preen, changing places with their mates if the latter are present, or leaving the eggs uncovered for up to 10 minutes if their mates are away.

Table 2 summarizes my observations on the return of birds after release. Common Terns usually return to the nest within 20-30 minutes and take over incubation

TABLE 2. Intervals between release and return to the nest and resumption of normal behavior. Intervals are given in hours (median in parentheses). N = number of birds observed.

	Common Tern	Roseate Tern ^a
First return to nest area	0-4.8 (0.4) N = 82	0.3-18 ^b (3.0) N = 22
First settling on eggs	0-4.8 (1.1) N = 49	0.4-18 ^b (5.2) N = 19
Resumption of "normal" incubation behavior	0.3-20 ^b (1.2) N = 38	5-40 ^b (18 ^b) N = 15

^aAll differences between Roseate and Common Terns were statistically significant ($P < 0.001$, Mann-Whitney test).

^bIn these cases the event had not taken place at nightfall, but had taken place early the next morning and the precise time could not be determined.

soon afterwards, unless their mates are sitting firmly. Their behavior usually returns to normal within an hour or two, although one exceptional bird did not return to the nest for nearly six hours after release, and did not take up its share of incubation until the next day.

Roseate Terns, in contrast, usually do not return to the nest for several hours after release, so that their eggs may remain uncovered for 1-2 hours if their mates are away fishing when they are trapped. After they return, they sometimes do not go onto the eggs for several more hours, and their behavior usually does not return to normal until the day after trapping. Two birds did not return to the nest on the day of trapping and spent only a few short periods on the nest on the next day, so that their mates spent nearly 15 hours incubating. The behavior of the trapped birds returned to normal on the second day.

Statistical differences between groups were investigated using the Mann-Whitney U-test. All differences between Roseate and Common Terns tabulated in Table 2 were highly significant ($P < 0.001$). These differences all remained highly significant ($P < 0.001$) when comparisons were limited to birds that had received patagial tags. Among the Roseate Terns trapped in 1980, there were no significant differences in recorded behavior between tagged and untagged birds ($P > 0.05$ for each com-

TABLE 3. Comparison of reproductive success of Roseate Terns at Bird Island in 1980, according to the extent of handling and disturbance.

Reproductive success	Birds subjected to detailed study ^a			Total	Low Disturbance Controls ^b
	Trapped, with patagial tags	Trapped, banded only	Not trapped		
Fledged ^c 1 chick	9	3	50	62	—
Fledged 2 chicks	10	6	43	59	—
Mean productivity	1.53	1.67	1.46	1.48	1.43

^aIn addition to trapping of adults, the study area was disturbed several times each day for periods of up to 20 minutes during checks of nests and chicks.

^bA group of 85 pairs nesting in an isolated patch of vegetation: the area was not visited between the date when the last clutch was complete and the date when the first chick was due to fledge.

^cChicks known to be alive on or after day 14 were deemed to have fledged: none was found dead after this age, despite thorough searches. All pairs raised either one or two young.

parison). Among Common Terns, however, the birds that were given patagial tags returned and resumed incubation significantly more slowly than untagged birds. Median intervals after release were as follows: first return to nest area, 0.6 vs. 0.3 hours ($N = 46, 36, P < 0.01$); first settling on eggs, 1.3 vs. 0.9 hours ($N = 29, 20, P < 0.05$); resumption of normal incubation behavior, 1.4 vs. 1.0 hours ($N = 23, 15, P < 0.1$). The tagged birds were generally retained and handled for much longer than the untagged birds, and it is uncertain whether their slower return was due to this difference in handling or to the tags themselves.

After the second day, the behavior of the Roseate Terns appeared normal in all respects. We banded the chicks and checked as many as we could find each day until they fledged. All the trapped birds raised at least one chick to fledging, as did all the untrapped birds whose chicks we were able to follow. The average productivity of trapped and untrapped birds was almost identical (Table 3).

CONCLUSIONS AND RECOMMENDATIONS

I conclude that Roseate Terns can be trapped and tagged safely after day 17 of incubation. However, I recommend that they should not be trapped on pipping eggs or newly hatched chicks, because the delay of up to 1½ days before resumption of normal behavior might then lead to neglect of the chicks at the critical time when

they need to be brooded by one parent and fed by the other. The best time to trap a Roseate Tern is on day 19 or 20, when its first egg is "starred" (i.e., about three days before hatching). Once the egg is pipped, it is too late to trap the parents without risk of harm to the chick.

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