REPORT OF THE NORTH DISTRICT TERN WARDEN: SEASON OF 1980

by Dennis Minsky, Long Beach, California

This report is an account of tern nesting and the tern protection program in the North District of Cape Cod National Seashore, for the season of 1980. The North District encompasses what is known as the Outer Cape; it begins at the Truro-Wellfleet town line and continues West/Northwest to the tip of Cape Cod.

There were 7 tern colonies in the North District during the 1980 season, representing 3 tern species: Least (Sterna albifrons), Arctic (Sterna paradisaea), and Common (Sterna hirundo). The only tern nesting on the Outer Cape outside Seashore boundaries was one Least Tern nest in Truro, just north of the mouth of the Pamet River (1 egg on 5/30/80; outcome unknown).

The single Arctic Tern nest at the Race Point Light colony represents the first attempted Arctic nesting in the district since 1976, and the first productive one (although 2 of the 3 fledged young were run over by vehicles) since records began.

The number of nesting Common Terns this season (15 June estimate: 30 pairs; season total: 48 nests) is nearly double last season's estimate for both nesting sites, and their production of fledged young (estimate: 22) increased in a like manner.

Least Tern nesting figures also show increases over last season, which was a record year. The number of pairs of Least Terns nesting on 15 June - 193 - is 18% higher than the 1979 count on that date. The total number of Least Tern nests for the 1980 season - 380 - represents a 36% increase over last season. Average clutch size (2.03), too, is up, due to an increase in 3-egg and decrease in 1-egg clutches this season. Least Terns in the North District produced a record 262 fledged young in 1980. Perhaps most important is the fact that the number of Least Tern colonies rose (50%) to 6.

There were no major storms this season; predation was low, moderate, or nonexistent; losses related to human activity were low due to beach closures; and food supply appeared very good.

The tern protection program was staffed by a tern warden, Dennis Minsky (18 May through 30 August), 2 Student Conservation Association assistants, Chuck Hoopes (8 June through 30 August) and George Madison (8 June through 20 August), and a volunteer from the Association for the Preservation of Cape Cod, Jeffrey Bryant (15 June through 15 August).

METHODS AND MATERIALS

In regard to methods, I quote from the 1979 Report of the North District Tern Warden a list compiled from the official position description. Further details will then be provided for some

activities.

1) Surveying and patrolling, establishing locations of all tern colonies and nesting terns.
2) Posting all tern colonies, as well as extra-colony posting.
3) Monitoring of posted areas to prevent intrusion.
4) Censusing of nesting terns.
5) Contact with the public and various media sources reinterpretive and educational aspects of tern nesting.
6) Evaluation of production, including all relevant factors.

For additional background material, see Report of the North District Tern Warden: 1979 (Minsky); and Bird Observer, Vol. 8, No. 3, 1980, p. 102.

POSTING

Posting a colony is done as quickly and expeditiously as possible. Disturbance of nesting terns can be counterproductive, and in extreme cases may cause desertion. If there are no other factors - such as access-ways, ORV (off-road vehicle) passage, and high tide routes - posting does not proceed if it is disturbing the terns. It must be remembered that recreational activity will go on right up to a KEEP OUT sign. If the posting itself causes no disturbance, a buffer zone will have been created between nesting terns and beach users. Colonies may sometimes expand, however, and outer boundaries may need to be moved - three or four times in a season, sometimes.

Signs are evenly spaced, as a visual aid in censusing and nest watches. The actual distance between signs is a product of the need for them and their availability. Reflective signs are used where night ORVs are a factor. Nylon twine has proved most effective and durable over time. Reflective tape is affixed to this twine at regular intervals.

Large interpretive signs (with picture and text) are posted at either approach to each colony. As chicks begin to appear, CAUTION: YOUNG BIRDS IN TRACKS signs are also posted at either approach, on the lower beach. They are helpful in reminding beach-walkers and horsebackriders of the presence of the young birds.

Vehicles are another matter. Once again this season, areas in the vicinity of tern colonies were closed to all vehicular traffic - with the exception of the Wood End colonies, beyond the Cut. Three separate areas, encompassing approximately 2.7 miles and 5 of the 7 colonies, were posted with cedar posts and wire cable from the rear dune to the low water line. This posting began on 3 July and remained as long as pre-fledged young birds were in evidence. In future years posting should begin with the first hatching chick, and should be applied at all colonies. Prior notification of this situation should be achieved through press releases and public contacts via the Oversand Booth and all sand patrol rangers. It should

be emphasized that vehicles only are excluded; all foot use of these beaches is permitted.

A simpler posting operation is the placing of shelter boxes throughout tern colonies. These boxes were wooden pint-sized strawberry boxes, upturned, with openings cut out, staked in the sand with shards of shingles. They provide shade and shelter from the elements and must enhance chick survival and fledging.

CENSUSING

Censusing method is by direct count. Each nest is marked with a shingle, placed approximately four feet away - always forward of the nest and to the left. On the shingle is marked (using a waterproof marker) a number, date of discovery of the nest and its contents; any changes in the nest - hatching, abandonment, etc. - are also recorded as they occur. These data can be read from outside the colony with 7X binoculars.

Daily censusing is attempted, but heat waves, inclement weather, posting priorities, and vehicle breakdowns interfere. Colonies are never entered during the heat of mid-day or during showers or heavy fog.

Direct nest counts are complemented by nest watches from a vehicle or blind. These watches determine whether nests are active (i.e., being tended); chicks and fledged young can be accurately counted or observed only from a blind or vehicle; behavioral observations, too, are possible.

Table 1: Number of Censuses (Data Sheets Completed), Season of 1980

Colony	
High Head (S)	39
Charlies	36
Exit #9	57
Exit #8	29
Race Point Light	36
Wood End Outside	37
Wood End Inside	25
Total	259

Table 2: Number of Recorded Visitor Contacts, Season of 1980

Positive:	64
Negative:	113
Breakdown of Negative Contacts Re Cause:	
Dog:	8
People:	6
Vehicle:	99

While the program cannot afford the hundreds of hours of observation-time necessary for behavioral research, still, periodic nest watches are valuable for the information they provide, and - more importantly - for the bonds they create between tern-watcher and tern.

All data collected are entered on a standardized data sheet (see Table 1) - one for each census - and then transferred to a master sheet for future compilation.

PREFACE TO RESULTS AND DISCUSSION, COLONY PROFILES, AND EVALUATION

Unless otherwise noted, all numbers refer to active nests. It is our assumption that each nest represents a pair of terns.

Nests - or eggs in nests - referred to as abandoned are those that have been observed on two consecutive days to be unattended. The first day of such observation is recorded as the day of abandonment.

The numbers of hatched nests include only those that have been directly observed to hatch, i.e., chicks in the scrape - not just in the vicinity.

Likewise, the numbers for predation, tide/wind, and human-related mortality factors are all based on direct observation, i.e., tidelines, fox tracks, etc.

For a variety of reasons, our direct nest counts could not be total; consequently the outcome of some nests must be recorded "unknown". This is actually a measure of the effectiveness of our census efforts, rather than any intrinsic quality of the nests or terns. Known-outcome values range from 60% to 85%, with a mean of 74%. We fully believe - based on past seasons' observations - that the great majority of the outcome-unknown nests hatched.

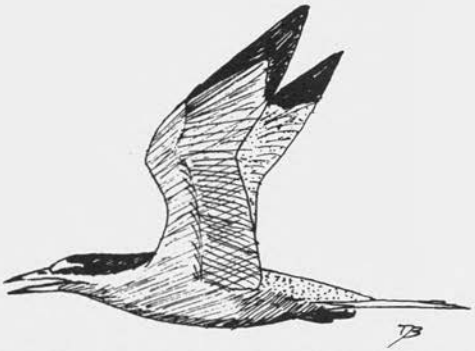
The peak hatch is defined as the date on which more nests contain chicks than eggs.

Production figures refer to number of fledged (=flying) young. Obviously, each one was not flushed into the air: with some experience, an accurate appraisal can be made according to plumage and development of primaries.

Production rate per se is defined as the number of fledged young per number of nests. Another parameter is survival rate - the number of fledged young per number of eggs hatched. This is meant to eliminate those mortality factors that ordinarily apply more to the egg-stage (tide/wind, and, presumably, most predation). These rates reflect phenomena about which we know very little. This season, of 457 eggs hatched, 23 chicks were found dead, and 262 were estimated fledged, leaving 172 with a fate unknown.

One approach to Least Tern census data employed in past seasons has been discontinued this year: the analysis of nest/renest data. It had been assumed that any nest discovered before 15 June was a first nesting attempt, and any nest found thereafter was a renest - a second or even third attempt after initial failure.

We have become increasingly uncomfortable with this analysis, as it is based largely on conjecture and not observation.



Obviously any nest discovered on 1 June represents an original effort, but are later nests the result of renesting or the first attempts of late-nesting pairs? The propensity of Least Terns to renest after initial nest failure is often cited in the literature (e.g., J. A. Hagar, Least Tern Studies-1935 and 1936, Bull. Mass. Aud. Soc. 21(4), 1937; or B. W. Massey, Breeding Biology of the California Least Tern, Proc. Linn. Soc. of N.Y., #72, 1974). Too, for the larger species of terns, a relationship has been established between late nests and first-time, young, less experienced breeders (e.g., I. C. T. Nisbet, Population Models for Common Terns in Massachusetts, Bird-Banding, 49(1), Winter 1978).

To further complicate the situation, the arrival patterns of Least Terns in May is by no means uniform. Colony formation in the South District of the Seashore (S. Wellfleet, Eastham, Orleans) has always preceded the North by a week or more. For instance, this season, on 27 May, there were 194 Least Tern nests on Nauset Spit, Eastham (Kathy Keane, personal communication) and only 3 in the entire North District (see tern reports of 1976, 1977, and 1978 for similar data). In light of this, the choice of 15 June as a cutoff date seems arbitrary.

For the purpose of continuity, we record 193 definite pairs of Least Terns on 15 June (see Table 3). We record also that there were a total of 380 Least Tern nests throughout the season, 60 of which were lost or abandoned; any nest/renest analysis of these data is conjectural.

Table 3: Comparison of North District Least Tern Data, Seasons 1976 through 1980

	1976	1977	1978	1979	1980
No. of nests (= pairs)	107	124	90	163	193
Initiated nesting	5/20	5/21 (storm)	6/4	5/26	5/26
First hatch	6/23	7/1	7/1	6/22	6/16
Peak hatch	7/14	7/15	7/21	7/2	6/24
Production	84	55	74	195	262
Production rate	--	--	--	0.70	0.69
Survival rate	--	--	--	0.63	0.57
Ave. clutch size	--	--	--	1.88	2.03

CENSUS DATA

The preceding data present a very positive picture of the 1980 nesting season. For Least, Common, and Arctic Terns, numbers of nesting pairs, total number of nests for the season, and total fledged yound produced have increased over the 1979 season (itself a record year).

The 18% increase in the number of pairs of North District Least Terns is slightly higher than the estimated overall statewide increase of 15% (Brad Blodget, Mass. Div. of Fish and Wildlife, 1980 Tern Census and Inventory Data). Pairs of Common Terns almost doubled last season's estimate for the North District, and this far exceeds the 15% statewide increase projected for this species. And the single pair of Arctic Terns at Race Point Light - the first since 1976 - is noteworthy in light of their 13% decline (to just 39 pairs) this season in Massachusetts.

We can record these increases, but we cannot explain them. Certainly the tern population of Cape Cod is one of the best protected in the world. Over the years we must have added breeding individuals to this population and enhanced this area's attractiveness to nesting terns. At the same time, food supply (small baitfish) appeared abundant again this season, and this factor must also be involved.

COLONY FORMATION

The increase (50%, from 4 to 6) in the number of Least Tern colonies is especially heartening, but likewise inexplicable. We know very little about arrival patterns, colony formation, and intra-seasonal movements of Least Terns.

We do know - as mentioned earlier - that the large colonies of the South District (Eastham, Orleans) form at least a week in advance of the North District's colonies. The fact that High Head (S) - the southeasternmost Least Tern colony on the North District's Backshore - did not form earlier than others to the northwest and west indicates that colony site selection involves more than just a progressive movement along the Backshore.

Certainly one criterion for colony site selection must be beach width and height. The High Head (S) colony site had broadened considerably over the winter, while 0.7 miles to the northwest the High Head (N) colony site - which had continuous nesting since 1976 - eroded dramatically. Least Terns were first observed at that site this season, but never nested.

Beach dimensions cannot be the only factor, however. Wood End Outside - along with Exit #9 the only 5-year continuously-used nesting site - is no more than a sliver of upper beach; the terns nest right in the drift line and up the sharply sloping foredune.

Table 4: North District Least Tern Clutch Size Data, Survival Rate Data, and Production Data: Season of 1980

COLONY	CLUTCH SIZE			SURVIVAL RATE	PRODUCTION RATE
	1 egg	2 egg	3 egg	# chicks fledged / # eggs hatched	# chicks fledged / # total nests
Race Point Light	1	32	0	0.86	0.91
Charlies	7	51	7	0.24	0.23
Wood End Outside	6	86	10	0.56	0.73
Exit #9	8	99	12	0.76	1.14
High Head (S)	3	40	6	0.17	0.16
Exit #8	0	12	0	0	0
Total	25	320	35		
Average for total North District		2.03		0.57	0.69

1 egg clutches: 6.57% of total
2 egg clutches: 84.21% of total
3 egg clutches: 9.21% of total

PRODUCTION

The increase in production of fledged young is, of course, encouraging. The single fledged Arctic Tern (last seen 27 July, 40 days old) is this season's brightest note.

While the total number of fledged young Least Terns increased this season (262 vs 195 last season), the production rate remained about the same (1979: 0.70; 1980: 0.69, see Table 4). This is also true for Common Terns, although census data are less detailed. This apparent constancy in production rate between seasons is interesting, since mortality factors were not the same.

TIDE/WIND

For the second consecutive season this area was spared a major storm. Only 2 nests were lost to high tides - both were initiated late in the season, outside the posted colonies, low on the beach. Other low nests survived and hatched. Storm/tide damage is often a major mortality factor, as all the colonies are extremely vulnerable.

On 6 July winds gusted to 40 mph on the Backshore. At High Head (S) we observed from a vehicle that 6 nests were covered by sand and were not attended. We recorded these nests as lost. The following day, all but one egg had been uncovered and were again being incubated.

The only other potentially adverse weather factor was the intense heat in July. There were numerous indications that the terns were stressed: panting individuals, adults standing over their eggs, adults brooding very large chicks, large numbers of adults and young on the lower beach by the water line. This heat may have contributed to egg and chick mortality.

PREDATION AND ABANDONMENT

Predation losses this season are the lowest ever recorded: less than 7% of Least Tern nests were taken by predators, compared with 28% last season. We have no explanation for this.

Known predators, in order of relative impact, were Red Fox (Vulpes fulva), gulls - either Herring Full (Larus argentatus) or Great Black-backed Gull (Larus marinus) - and Common Crow (Corvus brachyrhynchos). Also operating in the vicinity of tern colonies were Marsh Hawks (Circus cyaneus), and American Kestrels (Falco sparverius); snake tracks were noted in Charlies colony.

Only 2 colonies were affected by fox predation this season: High Head (S) and Charlies; both have histories of heavy fox predation, and are close enough to each other (1.3 miles) that the same fox(es) could have been operating in both. Their rates of predation (14%) are twice the district average.

The puzzling aspect of the fox predation is its low intensity. In past seasons foxes would wipe out colonies in a single night. This season, only 11 nests were taken, and these gradually, although fox tracks were continually seen. Tracks often went right by nests and left them unharmed. Of course, we have no idea of the amount of predation on chicks. Both High Head (S) and Charlies have similarly low survival and production rates (see Table 4).

A probable consequence of the fox was the night desertion observed by Hoopes on 7 July at High Head (S), but its duration is unknown and incubation intervals there were not significantly longer than the district mean - although peak hatch was later there and at Charlies.

There was no sign at all of fox until 5 July, long after peak hatch. In past seasons fox predation usually occurred around 20 June. Because of the late timing and low intensity, we decided that an electric fence was not necessary.

A dead fox was found on the Point in early June; no other sign of fox was found there all season.

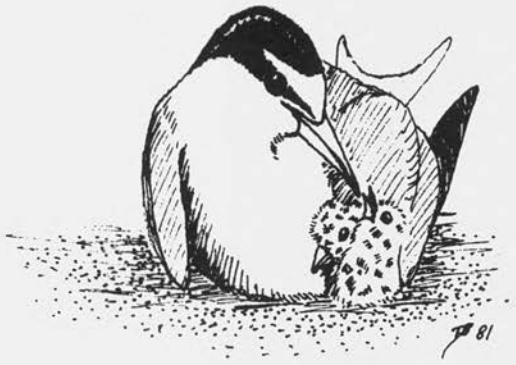
1980 is the first season that both gull and crow predation have been documented in the North District. It is unlikely that these are new phenomena, but they were not observed in past seasons, with an equal number of observers in the field. Such predation was always being looked for, too.

Perhaps the level of gull and/or crow predation has increased - due to increases in predator and/or prey populations, decrease in alternative food sources, and/or decrease in competing (fox, owl) predator populations - and is therefore more noticeable.

Still, the number of nests taken - 5 by crows and 9 by gulls - is small. Of course, once again the large unknown is the number of chicks and fledged young taken by these avian predators.

Almost every nest lost to gull or crow was on the extreme perimeter of the colony. Five of the nests lost to gulls were in the same area (northernmost perimeter of Exit #9), and lost on the same day (6 August) late in the season, leading us to believe that they may not have been vigorously defended.

The fact that the percentage of 1-egg clutches lost to predators is so much higher than the mean percentage of all clutches lost also leads us to the hypothesis that they were not as well placed (in relation to predator-avoidance) as 2 and 3-egg clutches. And the fact that the 1-egg clutches evidence such a high level of abandonment, compared with the all-size-clutch mean percentage, seems to indicate that perhaps the



above 1-egg clutches taken were already abandoned - or at least not vigorously defended. It has often been suggested that 1-egg clutches are the result of younger, inexperienced, first-year breeders, with very low nesting success.

Other than the preponderance of 1-egg clutches, there is little else we are able to say about abandonment. What causes terns to abandon their eggs? Two abandoned eggs were found with chicks that had died during pipping. Why do abandonment levels vary between colonies? Abandoned eggs at Charlies and High Head (S) may have been taken by predators before we recorded them. One reason for the relatively high level at Wood End Outside is the sharply sloping foredune there. Several nests were irretrievably disrupted when the eggs rolled down this slope and were abandoned. (An interesting note: one such egg was "adopted" by a neighboring pair of birds that already had 2 chicks; the egg was rolled approximately one foot into their previously-used scrape and was incubated from 22 June until 25 July, outcome unknown.)

LOSSES RELATED TO HUMAN ACTIVITY

Losses related to human activities were very low, in fact the lowest since recording began. The one glaring exception is the loss of 2 of the 3 fledged Arctic Terns (and 1 Least chick) to an ORV on 13 July. The fact that these birds were already fledged and were "protected" by the regular colony posting and a cedar post and wire cable barrier around that, that they were found run down in the colony just a few feet from where they hatched, makes it all the harder to accept. There can be no protection against acts like that, other than 24-hour watches on each colony.

Total known lost to vehicles: 1 Least Tern nest, 5 Least Tern chicks, and 2 Arctic Tern fledglings. The probability of finding a crushed chick in the sand is low, so our figures are the very minimum. With the exception of the above incident, all these losses occurred before the posting of barriers to vehicles. These losses could have been avoided if the barriers were erected from the day of first hatching.

The single nest lost to a pedestrian was on the very edge of Exit #9, just outside the posted area. The 5 nests lost to horseback riders represent a special case, and can be remedied next season by closer contact with the riding stable involved.

Beyond these direct losses, we believe the indirect effect of human disturbance on tern nesting was also very low. There were fewer instances of people in or near colonies, and fewer cases of dogs (see Table 2). This may have contributed to the pronounced synchrony of nesting this season.

CONCLUSION

This has been an extremely productive season for tern nesting and for the tern program. But one season in itself is not important. Tern nesting on Cape Cod is an ongoing process - with fluctuations, good years and bad, with new factors affecting breeding success, or perhaps new combinations of the old factors. Any program on behalf of tern nesting must retain at its core this ongoing quality, an ability to perceive the process and not overconcentrate on one season, one beach, one nest.

It is in this spirit that we present this account of the 1980 season. It is our hope that workers in future seasons will find herein things of value: perhaps the cumulative data, perhaps our methodology, or some of the questions and hypotheses we raise.

Questions and hypotheses abound. We have tried here to underline how much is not known, how much remains to be learned. Certainly, protection is our first priority. But informed action is effective action. Research must continue and expand. Important contributions this season were Mrs. Erma J. (Jonnie) Fisk's banding program and Chuck Hoopes' colony mapping-both should continue. And once again this season we earnestly request criticism and comments from the scientific community, so that the research aspect of the program may grow and improve.

The season closes; the work is done; the birds are gathering or gone; the beaches quiet. Now is the time to acknowledge the effective support of North District Ranger Irving Tubbs. Now, too, we mention Jonnie Fisk's energy and work; she is a constant inspiration.

The SCAs, Chuck Hoopes and George Madison, and the APCC volunteer, Jeffrey Bryant, all devoted time, energy, and ideas beyond what was expected. Their work was good, and they may take pride in its results. They take their reward - as I do, as Jonnie does - in the brief association that we are privileged to have with these intense and beautiful birds.

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