

MONITORING COMMON TERN PRODUCTIVITY FOR SOUTH MONOMOY ISLAND

PURPOSE: Large, productive common tern colonies provide safety and attract nesting roseate terns, which are a federally listed species. To attract roseate terns we must have a productive colony, and to have an understanding of our productivity, we must monitor the nesting terns by productivity plot so that we can extrapolate our observations to the entire colony. Good productivity is important and takes precedence to number of nesting pairs. A high productivity with a lower number of nesting pairs is better than having a large colony with poor productivity. Good productivity for Monomoy NWR is greater than or equal to 1.0 chick fledged per pair.

Part 1: Monitoring Tern Phenology and High Counts

The following information, with the exception of firsts, should be recorded opportunistically as time allows. Record all of these observations in your field notebook, on the high counts data sheet, and on the firsts data sheet, as appropriate.

- Record when birds first arrive on the islands—South Monomoy, Minimoy, North Monomoy.
- Record maximum number of birds seen at one time flying around the colony as settling is occurring. Often, dawn and dusk will produce the highest counts, but the time may vary each day.
- Record when birds start landing in the nesting area and where they are landing (wash, outer colony, etc...).
- Once birds have started landing in the colony, conduct a quick walk through the colony every few days to check for scrapes. Once scrapes have been documented, do a quick walk through the colony every day to look for the first eggs. Each check should be no more than 30 minutes and should focus on areas where birds are seen landing.
- Keep track of how the colony area fills in with birds – which areas fill in first and last. Use the Grid Map to aid in this.
- Record this information in your field notebook.
- Record first egg, chick and fledgling on **“firsts” data sheet**.

Productivity Plot Placement - See Protocol, “Establishing Productivity Plots” for placement and installation.

Part 2: Monitoring Tern Productivity

Productivity is performed as a crew; one person will record, while observers check nests and chicks. The recorder is responsible for ensuring that all data is recorded accurately and that all nests and chicks are accounted for before leaving the plot. Observers are responsible for marking nests, examining eggs, banding chicks and locating banded chicks.

The colony is very loud, making communication difficult. **It is everyone's responsibility to be sure that your message was heard.** Staff are not permitted to wear ear plugs during productivity.

Each of the following time frames should be determined by Refuge biologists. Do not change the rate of productivity checks unless directed to do so.

In late May and early June, *during peak laying*, check all of the plots every other day. In some cases it may be every third day due to weather or other higher priority activities (for example, plover exclosures take priority). Continue this method until the chicks begin hatching in mid-June.

During egg laying:

- All observers enter the plot. Mark all nests in each plot with a numbered tongue depressor. The tongue depressor should be labeled on one side only (the side facing the nest) with the nest number in black permanent marker. The tongue depressor should be placed several inches to the **north** of the nest with only an inch or so exposed above the sand. If one of the adult birds from this nest is banded, also mark the tongue depressor with a "B" on the side that is facing the nest. *Note: Nests of banded adults outside the plots should be marked as well, see protocol, "Trapping and Banding Terns".*
- As nests are being labeled the observer will yell the nest number and number of eggs to the recorder "Nest 1 has 3 eggs". The recorder will acknowledge the record by responding to the observer for each nest reported.
- Check the plot thoroughly for any remaining nests before moving to the next plot.
- When returning each day, enter the plot, find all the nests, and record the number of eggs (plus any abandonment, predation etc, see "Recording Tern Productivity" below).

TRY TO VISIT EVERY PLOT ON JUNE 20th. Nests laid on or before June 20th are considered A census period nests. Any nests laid after June 20th are considered B census period nests.

During hatching, the plots should be divided into two separate groups, A and B. Groups should be selected so that when checking either group, A or B, the whole colony will be traversed. During hatching, group A should be checked on one day and group B the next. If a day of productivity is lost due to weather or other priorities, resume the plot checks with the group that was supposed to be

covered on the lost day the next time productivity is done. By dividing the groups in this way, the whole colony will be covered each day throughout hatching. Pipping and hatching chicks attract more predators to the colony and the colony will be monitored more intensely to increase the quality of information regarding predator activity.

During hatching:

- All observers enter the plot. Locate marked nests and examine eggs for signs of hatching (approximately three weeks after first eggs are laid). Observers continue to look for any new nests and mark appropriately.
- Observers yell nest number and nest contents to the recorder. Nest contents are expressed in order of progression (i.e. Nest 1 has 1 pipping, 1 star, and 1 egg). Wait for acknowledgment from the recorder before yelling another nest.
- Recorder will check to make sure all nests were documented. If not, they will yell “I need nest numbers X, Y, Z” until all are accounted for.
- When chicks begin to hatch they will be banded during the first visit they are found, unless they are recently hatched and are still too wet to be banded by inexperienced banders. In this case, they will be recorded as a wet chick and will be banded at the next visit to this plot.
Refuge personnel or volunteers MAY NOT BAND under any circumstances until they have received training and permission from the refuge/complex biologist.
- As each chick is banded, the recorder will add each chick to the Chick Productivity sheet, this chick will no longer be tracked on the COTE nest productivity sheet.
- When banding chicks, report the band in use to the recorder as soon as it is removed from the string. Do not remove the band from the string unless you have the chick in hand, this will decrease chances of dropping/losing bands. Chick banding should be reported as follows: “I am banding a new chick from nest 1 with band number 1234-56789, chick is 0 days old.” The recorder will acknowledge the bander. Both recorder and bander should look for any discrepancies in band numbers. Missing or lost bands need to be recorded as a dated note on the Chick Productivity data sheet.
- When returning to a plot after chicks have been banded, continue with nests as before. Pick up chicks and read band number to recorder, the last three digits is sufficient. As chicks grow larger and become more mobile you will need to place them in a chick corral after reading the band number. This makes it easier to keep track of ones that have already been read and avoids the chicks pecking their bills through the chicken fencing. Do not place small chicks in the corral with large chicks. During some points of the season, it may be necessary to place chicks in the corral prior to reading their bands. This change in protocol is up to the discretion of the staff at the time of productivity checks.

- Recorder double checks that all nest and chicks are accounted for before leaving plot.

Part 3: Recording Tern Productivity

Record nest contents for each nest on the **COTE Productivity data sheet**. See the sample data sheet.

- For each nest, note the number of eggs during egg laying (i.e. 1E, 2E, etc). Always use capital “E” because lowercase “e” can look like a “c.”
- Abandoned eggs are denoted as “A” on the data sheet. If you think an egg may have been abandoned, stand the egg on it’s wide end. On the productivity data sheet, please record “A” with an up-arrow after it. If the egg(s) are still flipped up on the next visit, bury them and record “A(buried)” on the datasheet to indicate that the nest has been buried. Draw a line through the nest row so that it will not be looked for in future checks. Be sure to continue this line across new data sheets as well.
- Depredated eggs or nests are denoted as “Dep by predator” in the data sheet box for that nest; be sure to note the number of depredated eggs as well (i.e. 2E Dep by gull). On occasion eggs and nests will disappear with no visible explanation. Missing eggs, when the nest bowl can be located, are denoted as “OE”. Missing eggs when the popsicle stick for the nest bowl cannot be found should be noted as “NF” for not found.
- Please mark changes in productivity such as a decrease in eggs of a single nest with a check mark to show that the recorder noticed the change and verified that it was in fact the case.

During the late hatching period, look for starred or pipped eggs (this should be about 3 weeks after first eggs are laid), and indicate these by writing in the appropriate row for that nest. Denote the number of starred eggs with an “S” and the number of pipped eggs with a “P”, record the eggs on a single line from left starting with the most progressed egg or chick (i.e. 1C 2P, 1P 1S 1E, 2P 1S, etc). If the nest has hatched and the chicks have been banded, draw a line through the nest row so that it will not be looked for in future checks. Be sure to continue this line across new data sheets as well. The first time that chicks are found they are marked on both the nest sheet and the chick sheet. Chicks are no longer tracked on the nest sheet beginning at their second check.

Record chicks for each nest on the **Chick Productivity data sheet**. See the sample data sheet.

- When chicks begin to hatch, start a chick productivity data sheet for each plot.
- For each new chick, record the band number and age on the day banded on the chick productivity data sheet. (Hatch day =0)

- If bands are destroyed or lost during productivity, record them on the bottom of the chick data sheet with a dated note.
- For each chick also include the nest number that the chick hatched from. If it is determined that the chick was dropped into the plot and does not belong to a nest in the plot, use “drop-in” to indicate that the chick should not be used in productivity calculations. Please make every effort to identify the chick before labeling as drop-in. It is possible that the chick was found earlier but was not banded that day (i.e. too wet).
- If there is the appropriate number of unbanded chicks in a plot (the expected number of newly hatched chicks based on previous checks) but the chicks have wandered out of their nest bowl and the original nest is uncertain, use the process of elimination to assign a nest number to each chick based on age. Assigning a chick to a nest number should also be based on the previous check's nest content. Any uncertainty with chick-nest assignment should be marked with an asterisk in the "orig. nest #" column.
- On each visit indicate presence of this chick with an “X” in the appropriate box.
- Use “NF” (not found) for a chick that you ACTIVELY searched for and couldn’t find.
- Use “NC” (not checked) for a chick that you did not have time to search for and did not find.
- Anything unusual with the chick should be noted on the chick productivity sheet in the margins (i.e. mauled, leg injury, distended abdomen, etc).
- If a chick from a productivity plot is found dead and the cause of death is known, mark the box with the name of the predator or cause of death (E for exposure, Dead maul, Dep by gull).
- If the cause of death is unknown, simply write “Dead unk.” in the appropriate box.
- If a chick has died, draw a line through the chick row so that it will not be looked for in future checks. Be sure to continue this line across new data sheets as well.
- If a chick banded during productivity is found dead outside of productivity checks, make sure that this information is recorded appropriately on the chick productivity data sheet when you return to camp.

Follow chicks until **at least 15 days of age** (hatch day = 0), when they are considered “fledged.” Chicks don’t truly fledge until they are about 23 days old, so try to follow chicks to 23 days old, or until capable of flight. To assist with fledging status in the field, mark the boxes that each chick becomes 15 days old in red and 23 days old in blue. Different colors may be used as long as you are consistent within a single season.

NOTE: refer to “Handling Dead Birds” protocol for tips on reducing the spread of disease by removing dead chicks from the colony. Also use the chick death tally data sheet when the average number of dead chicks found during productivity is more than 25.

On both productivity data sheets (nests and chicks) be sure to leave a column for **each day** on the data sheet and draw lines through the days that the plot is not checked. This is very important and helps with determining the age of a chick quickly. If plots aren’t checked on a specific day due to weather or any other reason, make sure to note this on the sheets. When starting a new data sheet, make sure to include the last day of data recorded for that plot (and any days in between the last data day and the current date) on the new sheet to aid in finding nests and chicks. Only include exactly what happened that day. Transfer all lines indicating that a nest has hatched or a chick died to new data sheets. If you are transferring “NF” it is helpful to include the last day it was seen. You may want to spend more time looking for a chick that was seen two visits ago than one that was seen five visits ago.

Begin taking down fencing when all chicks in a plot are fledged, **UNLESS** you find high numbers of mauled chicks inside a plot. In this case, take it down immediately (Refuge Biologist must approve this action). At this time, also consider taking down fencing in nearby areas. If you remove an active plot, **continue to search for chicks in the plots that had not yet reached fledging, concentrating on those that did not reach 15 days yet.**

If there is a lot of predation and/or abandonment in the colony, re-laying may be occurring within the A census period. In this situation it is important to note re-nests of a particular pair and to notify Refuge biologists immediately. A nest may be considered a re-nest if it is **laid in the same nest bowl within 4 to 10 days of being lost.** The minimum length of time to relay is 4 to 7 days from lost nest. In the case of renesting, create a new line for the re-nest and number it with the original nest number and a “B.” Renesting will only be monitored in situations where there are very high levels of predation in the colony; otherwise productivity is calculated using chicks fledged per nest.

NOTE: If a roseate tern or laughing gull nests within a productivity plot at any time within the nesting season, the plot must be moved to exclude that nest.

Calculating Productivity

- Use only nests that were found with eggs on or before June 20 for the A count window productivity. This is what gets reported to the State. Calculate the B count window with the remaining late nesters. If you did not visit all of the plots on June 20th, you **must backdate all nests from hatching** to see if there are additional nests that were laid on or before June 20th.
- Any chick not seen **on day 15 or older** is considered dead in the productivity estimate.

- Any chick that is found dead after 15 days of age but before day 23 is counted as dead in the productivity estimate. Be sure to go through the **productivity data sheets** carefully to make sure all dead banded chicks from plots have been transcribed to the **banding data submission**.
- Any chick that is found alive after 15 days and does not die before day 23 is considered fledged even *if it was only seen on day 15*.
- Determine each of the following summary statistics for A and B period nests separately:
 - **Average clutch size** is calculated by dividing the number of total eggs laid by the number of nests.
 - **Hatch success** is the number of eggs hatched divided by the total number of eggs laid (given as a percentage)
 - **Eggs hatched per pair** is the total number of eggs hatched divided by the total number pairs/nests.
 - **Fledging success** is the number of chicks that survived to 15 days (fledged) (subtracting the ones found dead before 23 days) divided by the number of chicks that hatched (given as a percentage).
 - **Reproductive success (Productivity)** is the number of chicks that survived fledged divided by the number of pairs.

NOTE: IN CALCULATING THESE PARAMETERS, THERE IS A BIG ASSUMPTION THAT THE TOTAL NUMBER OF NESTS = THE TOTAL NUMBER OF PAIRS. THIS IS NOT ALWAYS THE CASE. IN YEARS OF HEAVY DEPREDAATION WHEN MANY BIRDS ARE RELAYING (ESPECIALLY DURING THE A-COUNT WINDOW), CALCULATING PRODUCTIVITY CAN BE DIFFICULT. WHEN YOU FIRST NOTICE THIS IN THE FIELD, TAKE GOOD NOTES ON THE DATA SHEET, PARTICULARLY IF NEW NESTS ARE WITHIN OLD NEST BOWLS OR EXTREMELY CLOSE TO THE OLD NEST BOWL. MAKE NOTATIONS ON THE DATA SHEET REGARDING THE PROXIMITY OF A NEW NEST TO THE NEAREST “LOST” NEST.

IF YOU NOTICE HEAVY NEST LOSS IN PLOTS, FOLLOWED BY RELAYING, LET THE BIOLOGIST KNOW IMMEDIATELY SO DATA RECORDING CAN BE MODIFIED.