PROTOCOL: Common Murre Reproductive Plot Monitoring at Yaquina Head, OR

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Introduction

Reproductive plot monitoring is a method used in the assessment of reproductive success for a selected species. Plots are designated at reproductive sites of a species in order to provide locations that are easily relocated, may be monitored consistently and allow for multiple measures of reproductive success. Plots are usually kept in the same place to allow for annual observation and the production of a long-term database.

Reproductive success is the number of young produced per female per year. Estimates of reproductive success are important in understanding the health of the ecosystem and of the observed species. Seabirds are important indicators of ecosystem health. In the case of the common murre colony at Yaquina Head, Oregon, reproductive success estimates are essential in the assessment of future conservation strategies and ecosystem vitality.

The Yaquina Head Outstanding Natural Area, just north of Newport, Oregon, is an ideal place for monitoring the reproductive success of the common murre. The Yaquina headland is home to one of the largest murre colonies in the northwest. Birds nesting on rocks off of Yaquina Head are easily visible from both decks of the Yaquina Lighthouse, and conveniently provide reproduction and population data. The murre colony at Yaquina Head is known to exhibit moderate-to-good reproductive success.

Target Population and Purpose

The target population of murres being monitored at Yaquina Head is the colony portion that is easily viewed from the Yaquina Lighthouse upper deck or the lower observation deck. This allows for different viewing angles in order to see nest contents.

The purpose of reproductive plot monitoring of the common murres at this site is to evaluate annual reproductive success at Yaquina Head. In previous years, this colony was one of the fastest growing murre colonies on the west coast. However, murre populations are currently declining, and it is important to monitor this decline by evaluating reproductive success. The

reproductive data collected are valuable because murres at this colony could potentially become ecosystem indicators.

Survey Design

Plot selection: Monitoring plots are sections of rock that 1) may be viewed from the lighthouse decks so that the nest contents can be seen, 2) have easily identifiable boundaries, 3) should contain approximately 25 nesting murres. The same plot locations are used for monitoring each year. Plots were determined by Julia Parrish from the Zoology Department of University of Washington in 2001. In recent years, murres did not nest in all of the regular plots, and thus new plots were added in areas where murres were nesting. This allows us to cover the entire range of breeding possibilities surrounding the headland.

Parameters: All of the following should be estimated when applicable:

Hatching Success (% of eggs laid that hatch)
Fledging Success (% of chicks hatching that fledge)
Reproductive Success (% eggs laid that fledge chicks)
Median Laying, Hatching, and Fledging Dates

Sample Size: The Yaquina Head reproductive monitoring system includes 12 plots, each with approximately 25 nesting birds. Sample size is the **number of plots**, with each **nest** as a **subsample.** In certain years, monitoring 25 nesting pairs may not be possible due to pairs being situated in locations that are hard to re-sight or there are not enough pairs with eggs. If so, a subsample of 12 nests is sufficient for analytical purposes.

Data Collection

Study Site: Previously established by Julia Parrish (2001), twelve plots were set up on two, easily viewed ocean rocks off of the Yaquina headland; plots were divided evenly between the two rocks (6 on each). The two rocks, referred to as Colony Rock and Flat Top, are situated north and south of one another respectively, and can be found just off the western side of the headland (Appendix A).

Pre-Season Preparation: Before the start of each field season, photos of all 12 plots (with birds on rocks), must be taken, printed, and properly labeled. These photos will serve as maps upon which observes can mark the locations of birds included in that year's survey. Thus photos must be taken once each plot becomes filled-in with nesting birds but before egg-laying has begun;

this enhances referencing and relocation of birds included in the monitoring effort. Each photo should be placed in a 3-ring plastic sheet protector and sealed with tape to ensure its continued use through any inclement weather.

Photos can appear quite different from each other depending on, among other things, the angle and time of day the photo was taken. For this reason, it is helpful for observers to also take time to study plot photos from previous years. This will help observers anticipate what each plot may look like when the breeding season is fully underway. Studying photos from previous years, especially the most recent year, will also provide new observes with marked locations where easily observable birds may be located. These photos can be found in the Seabird Oceanography Lab, next to the equipment cabinet in the clear field-season resource box. An example photo marked for training purposes can be found in Appendix B.

Data Books:

Before monitoring can begin, *Reproductive Plot Journals* need to be created for each rock. We use No.311 Rite in the Rain all weather notebooks. Each journal should be labeled with the appropriate rock name on its cover, and the year. The first page is set aside as a key for the symbols used in the journal, and acts as an in-the-field reference for observers (Table 1). Each journal contains 48 pages, including the first key page. Each plot should be given 8 full pages for data entry, with plot number 6 only receiving 7. The first 6 pages of each plot should be left for observation data entry, with the last 2 pages kept for notes observers may make regarding the plot in question (Appendix C).

Using the same type of Rite in the Rain notebook, the creation of a *Disturbance Log Journal* needs to be completed before monitoring can begin. Only one journal is needed for the whole colony. This journal allows observers to log, track, and comment on colony disturbances that occur during monitoring efforts. See Appendix C for an example of the Disturbance Log journal setup.

Bird Selection: When selecting birds to include in the monitoring effort, consider those located along cliff edges and atop outcrops or prominent features. As the season progresses, these plots will often fill to capacity with breeders, and selecting nests on cliff or feature edges ensures they will be visible even after the colony fills in with other murres. Choosing to monitor birds found in the middle of flat areas, regardless of how visible they may be at the onset, is not advisable. Nests selected for monitoring are dropped from the study when egg/chick presence data are unobtainable or unconfirmed for extended periods of time.

In certain years, monitoring 25 nesting pairs may not be possible due to pairs being situated in locations that are hard to re-sight or there are not enough pairs with eggs. If so, a minimum subsample of 12 nests in each plot is sufficient for analytical purposes. This may be difficult at the onset, as work will begin before the entire colony has settled on the rocks. Fill in the requisite amount of monitored nests as the situation allows, you may draw in any extra highly visible potential breeders within the first two weeks of monitoring. Keep in mind that aiming for

25 active nests for each plot, if conditions allow, allows a suitable buffer in reaching our minimum goal of 12 nests.

The reproductive journal has 25 rows per page, allowing for a total of 25 birds to be monitored per plot. Monitored nests are each given a number, which corresponds to the labeled row chosen for them in the journal for each rock/plot. Each monitored nest location and general orientation is drawn onto the photo for the given plot, including its number. Birds dropped from the study, should have an "X" drawn on the plot photo, a line drawn across the row in the field notebook, and are subtracted from the 12 required pairs per plot. **Important:** Failed nests are not subtracted from the required number of subsamples, they provide good data and are used in the final analysis.

Field Equipment: The following list of equipment is necessary for successful monitoring.

- Tripods (one for each person surveying)
- Spotting scopes (one for each person surveying)
- Binoculars(a pair for each person surveying)
- Field Notebooks (Disturbance and Reproductive Plot Journals)
- Paper clips to hold notebook pages
- Field Binders (With plot photos inside)
- Large Binder Clips
- Pencils, Pens and Sharpies
- Keys to front gate and lighthouse
- Watch
- Rain gear
- Warm clothes
- Hat
- Gloves
- Water bottle and snack

Monitoring: Monitoring efforts will begin around mid-May, and often continue into mid-August. Monitoring is conducted Monday-Friday, with a start time between sunrise - 9am and lasts ~3 hours. This early morning time frame allows for the use of the upper lighthouse deck (permitted by the Bureau of Land Management), providing a better angle for viewing the birds. The early hours of this time window are best for monitoring, as they correlate with peak activity and predation events of the colony. Additionally, since the morning light is behind you, eye fatigue is less of an issue, with regard to sun glare. The wind at our research sites can make observations difficult when using high powered optics. However, conducting observations during the early morning hours typically guarantees that you will experience the least intense wind speeds (the wind tends to pick up around 10AM). Moreover, tours of the lighthouse begin from

10am -12pm in June/July, and as such, all non BLM personnel need to be clear of the area before then. Therefore, check with staff as their hours change every year and plan accordingly.

Using a tripod mounted Nikon Prostaff 60x82 Waterproof Straight Spotting Scope, selected nests in each plot are monitored daily and their statuses checked. Nest status is recorded in the reproductive plot journals in the correct section and row/column using the following codes:

Table 1. Codes used to record nest status

Code	Description
X	No egg, chick, or adult bird present.
ø	No egg or chick present
E	Egg present
C	Chick present
EBL or CBL	Egg or chick blocked, but known to have been present before. Do your best to confirm egg or chick the following day.
E? or C?	Egg/chick has not been visible before, but bird is suspected to have one based on adult posture.
E] or C]	First day adult bird is seen with an egg or chick

Note on failed nests- When a bird receives an "X" for three consecutive days, we confirm that such nest is no longer existing and we stop monitoring it. Draw a line across its corresponding row in the field notebook and draw an "X" over its silhouette in the plot photo.

Along with reproductive monitoring, observers are responsible for logging any disturbance to the colony while on duty. These disturbances are recorded in the *Disturbance Log Journal* previously mentioned. For each disturbance on any observable rock colony, the following fields need to be filled out:

- Date
- Event #
- Time Start/End
- Location -Rock name and zones of colony affected (CR and FT only, refer to Appendix D for rock zone determination)
    - Rock Names & Abbreviations:
        - Colony Rock – CR
        - Flat Top – FT

    - Satellite Rock –SR
    - Lion's Head- LH
    - Lower Colony Rock- LCR
- Primary Predator species and number –Identify between adult (A) or sub-adult (SA) in eagles
- Number of eggs/chicks/adults killed by Primary Predator
- Secondary Predator species and number
- Number of eggs/chicks/adults killed Secondary Predator (s)
- Approximate % of total rock area evacuated

Disturbances are instigated by what is termed a Primary Predator, which are often accompanied by Secondary Predators. An example of a disturbance event might be the presence of bald eagle(s) (Primary) on the colony, and the subsequent arrival of gulls (Secondary) to prey on eggs and chicks left uncovered in the panic. When recording the location of the evacuated colony, refer to the zones by which each rock is segregated (Appendix D), but record the % cleared of Colony Rock or Flat Top (versus each zone). In other words, the zones exist only to help identify and refer to parts of the respective rock, but we are interested in overall rock clearance—not by section.

We define a disturbance as the period of time when 50 or more adult Common Murres evacuate together from the breeding site, until at least 80% of the vacated area of the colony is covered with returning birds. It is not uncommon for disturbance events to start before or even last throughout the entire monitoring period of the day they begin. In these cases, simply mark the start or end time of the disturbance as less/greater than the time you start/stop monitoring for the day; e.g. >10:45am if monitoring ends at 10:45am that day. In addition, if you did not observe the start of a disturbance, refer to what the rock looks like at peak attendance to determine its end time.

We often observe a subsequent disturbance before the initial one has officially 'ended' (before 80% of vacated area is filled). In this case, we enter a new disturbance in the log, and the % of area cleared is the cumulative clearance on the rock, versus the % of clearance from the remaining birds after event #1.

> **Example**: Event #1 occurs when a SABAEA (sub-adult bald eagle) lands on Colony Rock at 0700 and results in 50% clearance. There are 15 gulls that arrive after the SABAEA. At 0730, the birds that evacuated during event #1 have not returned, but another SABAEA lands on Colony Rock and clears 30% of the remaining birds (80% of total rock now cleared). 5 Additional gulls arrive after this disturbance. At 0830, Colony Rock is mostly filled back in. The corresponding data should appear somewhat like the following:

Event	Start	End	Disturbed area	Primary predator	Second. Predator	Primary Takes	Second. Takes	% cleared
1	0700	0830	CR A, B	1 SA BAEA	15 WEGU	1 adult	20 eggs	50%
2	0730	0830	CR C, D, E	2 SA BAEA	20 WEGU	1 adult	10 eggs	80%
3	0900	1000	CR A,B	1 A BAEA	11 WEGU	1 adult	5 eggs	50%
3	0900	0930	FT A	1 A BAEA	5 WEGU	0	9 eggs	20%

If a disturbance occurs on both Colony Rock and Flat Top within the minute (often the case when eagles fly-by), give each entry the SAME event number and the same start time, however the end period may be different for each. We are interested in the number of disturbance events that occur at the site and not how many occur at each rock, therefore each event gets a consecutive number unless they start at the same time.

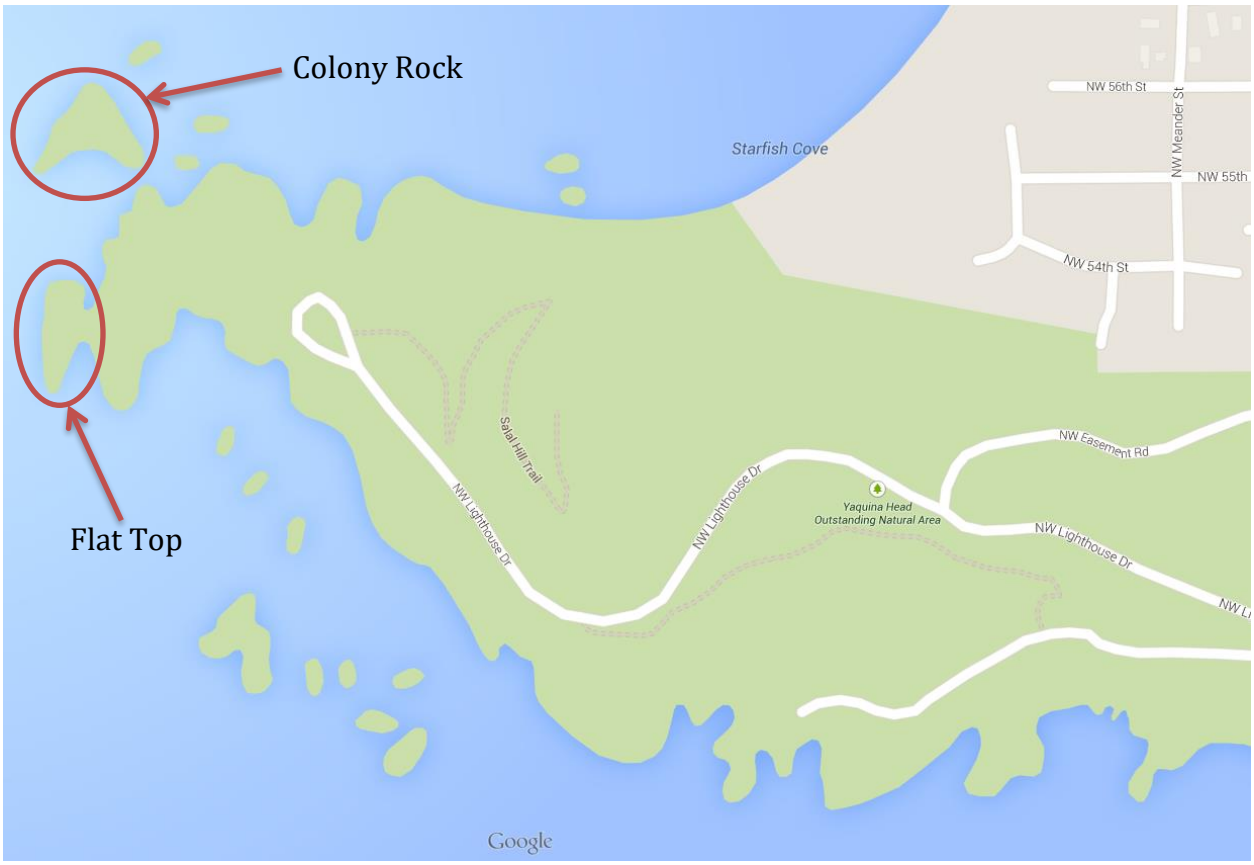
Contrary to the number of disturbance events, we collect predation data for each rock. Therefore make a separate entry for each rock colony that was affected in a disturbance. You should keep a tally for how many gulls are present and how many eggs are taken for each colony. A good way to do this, is to assign one person to each rock and have the same person periodically check if additional eggs are being eaten or destroyed by gulls. Fresh runny yolk is a good indicator of a recently broken egg and can be used at the start of the day to assess the number of eggs broken prior to arrival. But, do not assume broken shells are a sign of a recently destroyed eggs, as the same shells could remain intact from a previous night/day.

Data Entry

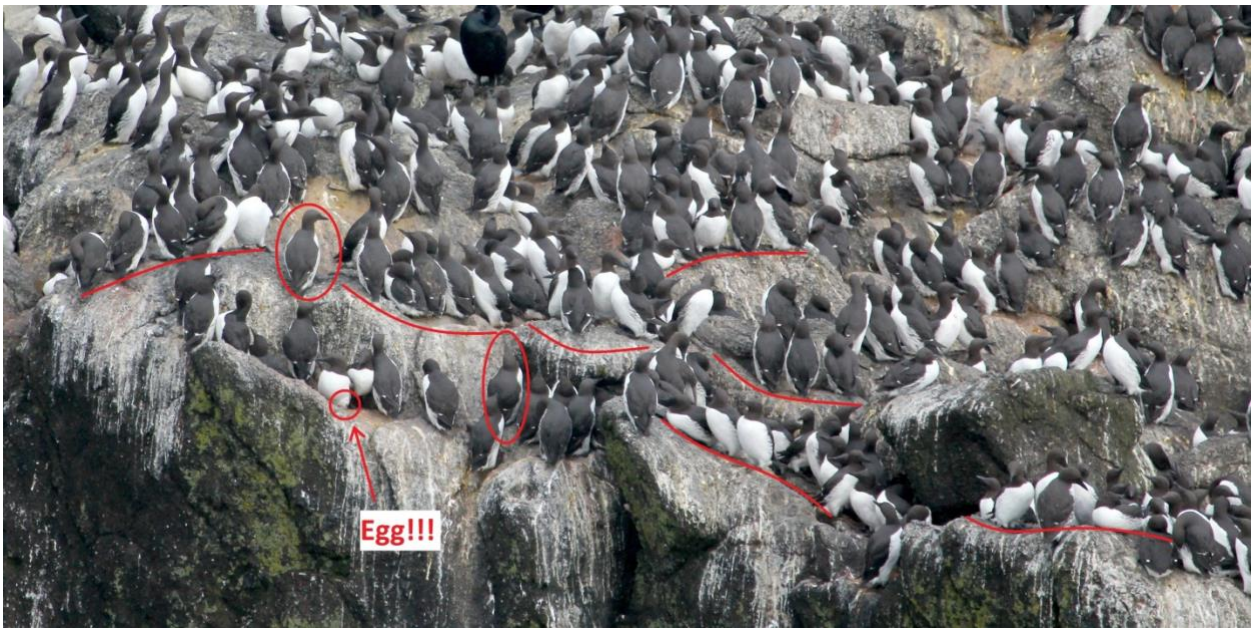
Reproductive plot data should be entered into the appropriate Excel file after each day of monitoring; files will be labeled COMU_Repro_Plot_Journal – YOHNA (Year).xlx. If this is not possible, take a picture of the field notebook and enter data on the next available day. This ensures the recoverability of data should any one of the journals become damaged or missing while out in the field. Along with the sightings, any notes recorded for that day may also be entered into the data file, but are not necessary. Once the field season has ended, all of the relevant data for that year will be copied into the YHONA master file, which contains data from all previous years.

APPENDIX A

Map of YHONA showing the two rocks included in your survey efforts circled in red



Appendix B
Sample plot photo highlighting easily viewable birds and features in red

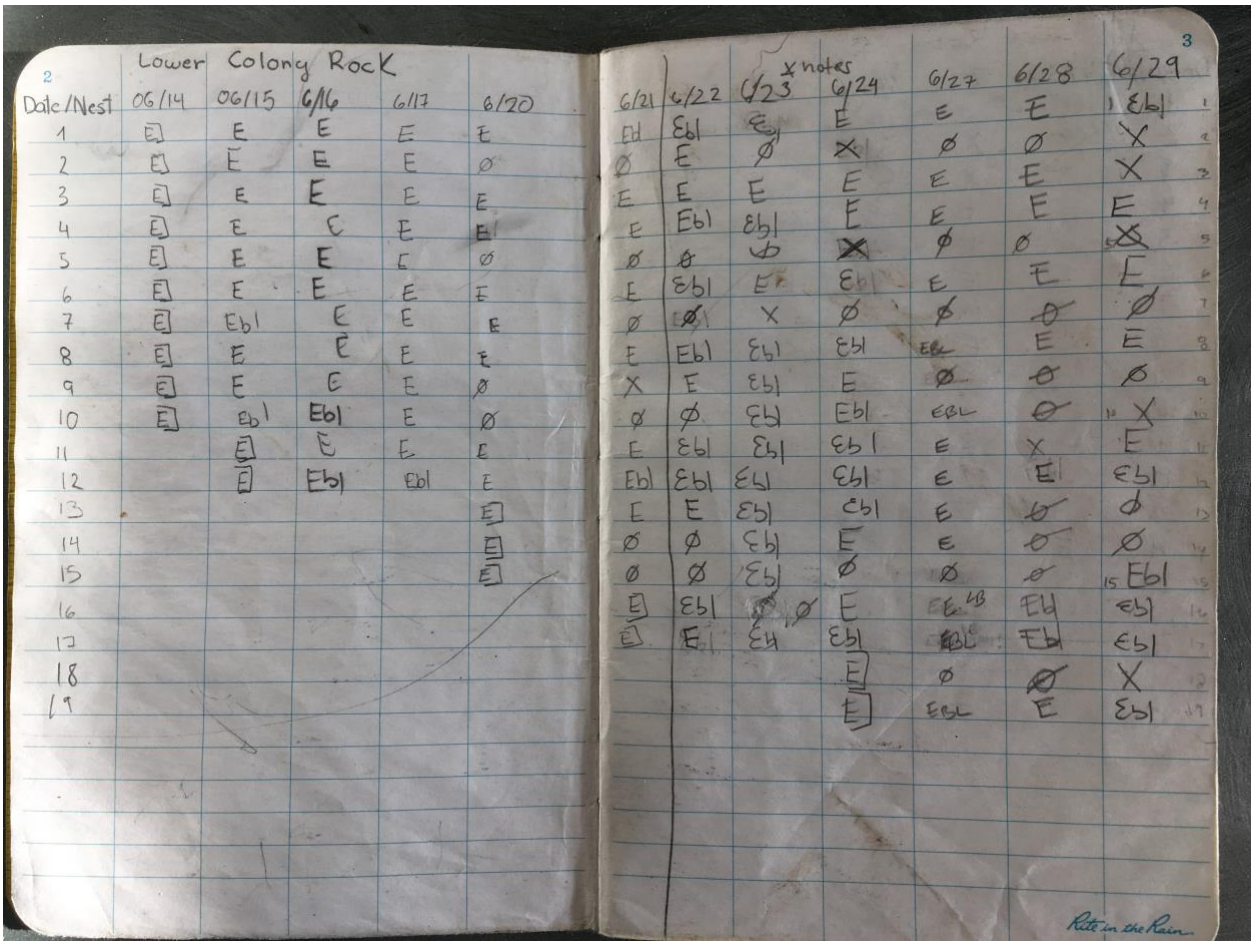


Birds along ledges and atop rock features are easiest to track throughout the season

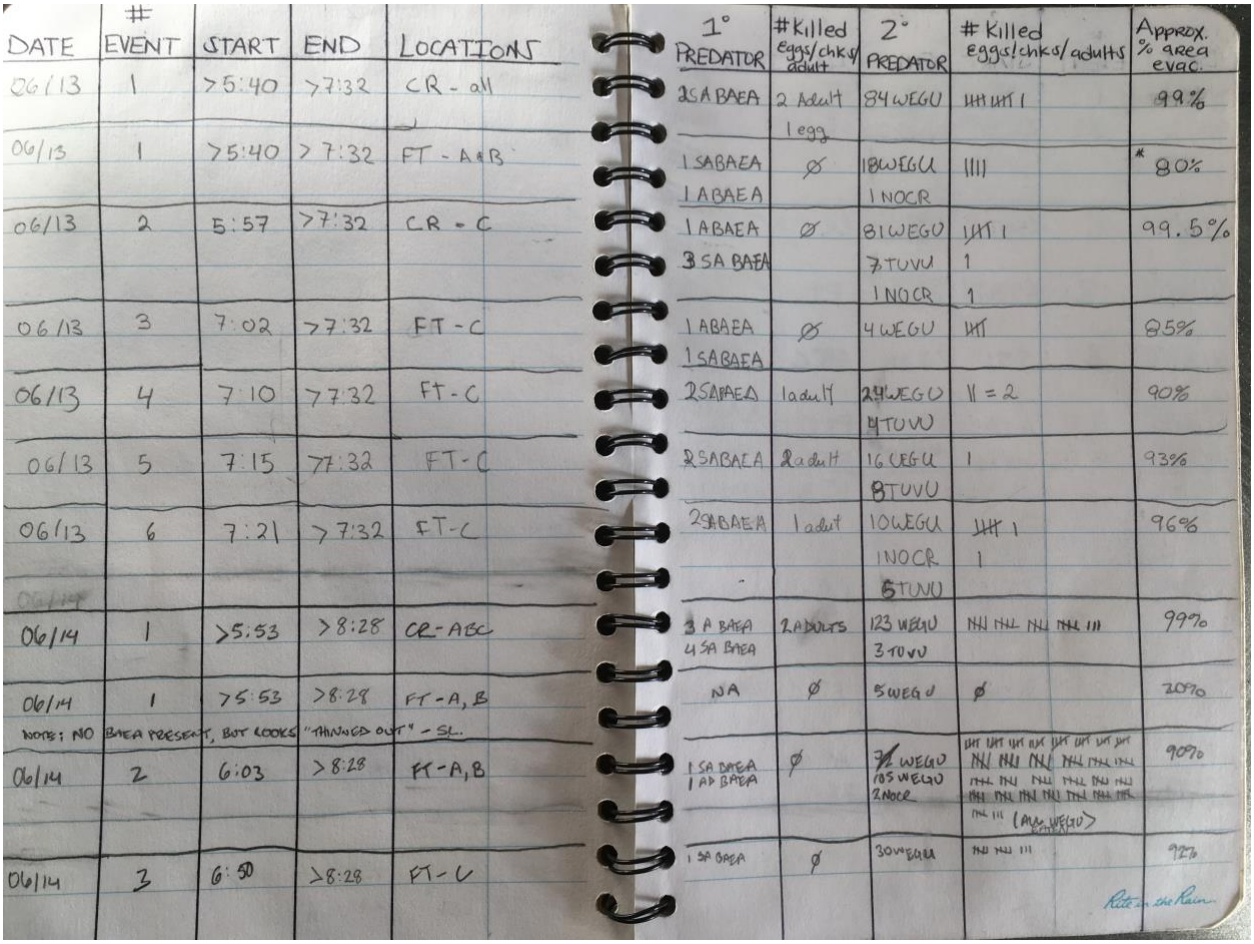
Birds showing egg posturing; wings often down at side, belly puffed up, not fully resting on the ground

APPENDIX C

Reproductive plot and Disturbance log journal examples

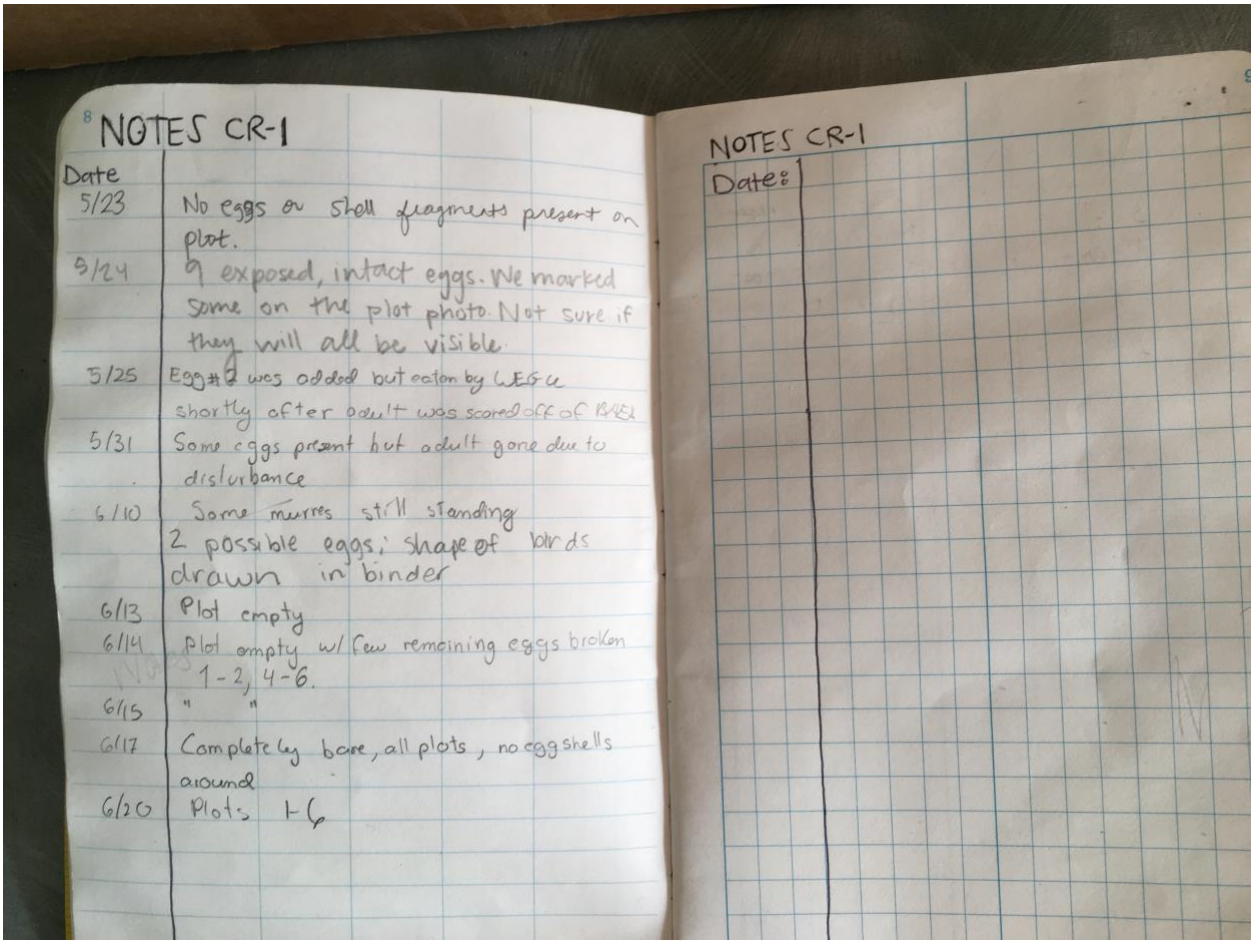


Reproductive plot journal



DATE	# EVENT	START	END	LOCATIONS	1° PREDATOR	# Killed eggs/chks/adult	2° PREDATOR	# Killed eggs/chks/adults	Approx. % area evac.
06/13	1	>5:40	>7:32	CR - all	2SA BAEA	2 Adult 1 egg	84 WEGU	卌 卌 |	99%
06/13	1	>5:40	>7:32	FT - A&B	1 SABAEA 1 ABAEA	Ø	18WEGU 1 NOCR	||||	*80%
06/13	2	5:57	>7:32	CR - C	1 ABAEA 3 SA BAEA	Ø	81WEGU 7 TUVU 1 NOCR	卌 | 1 1	99.5%
06/13	3	7:02	>7:32	FT - C	1 ABAEA 1 SABAEA	Ø	4 WEGU	卌	85%
06/13	4	7:10	>7:32	FT - C	2SABAEA	1adult	24WEGU 4TUVU	|| = 2	90%
06/13	5	7:15	>7:32	FT - C	2SABAEA	2adult	16 WEGU 8TUVU	|	93%
06/13	6	7:21	>7:32	FT - C	2SABAEA	1adult	10WEGU 1NOCR 5TUVU	卌 | 1	96%
~~06/14~~									
06/14	1	>5:53	>8:28	CR - ABC	3 A BAEA 4 SA BAEA	2ADULTS	123 WEGU 3 TUVU	卌 卌 卌 卌 |||	99%
06/14	1	>5:53	>8:28	FT - A, B	NA	Ø	5 WEGU	Ø	20%
NOTE: NO BAEA PRESENT, BUT LOOKS "THINNED OUT" - SL.									
06/14	2	6:03	>8:28	FT - A, B	1 SA BAEA 1 AD BAEA	Ø	~~72~~ WEGU 105 WEGU 2 NOCR	卌 ||| (ALL WEGU EATEN)	90%
06/14	3	6:50	>8:28	FT - C	1 SA BAEA	Ø	30 WEGU	卌 卌 |||	92%

Disturbance Log



NOTES CR-1

Date	
5/23	No eggs or shell fragments present on plot.
5/24	9 exposed, intact eggs. We marked some on the plot photo. Not sure if they will all be visible.
5/25	Egg #2 was added but eaten by WEGU shortly after adult was scared off of BAEL
5/31	Some eggs present but adult gone due to disturbance
6/10	Some murres still standing 2 possible eggs; shape of birds drawn in binder
6/13	Plot empty
6/14	Plot empty w/ few remaining eggs broken 1-2, 4-6.
6/15	" "
6/17	Completely bare, all plots, no eggshells around
6/20	Plots 1-6

NOTES CR-1

Date:

Reproductive plot journal- notes section

Appendix D
Map of colony rocks with designated reproductive plots (yellow) and regions (red)