Yaquina Head Seabird Colony Monitoring
2009 Season Summary

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Project Overview

Yaquina Head Outstanding Natural Area (YHONA) is home to some of Oregons's largest and most publically visible seabird colonies, including over 50,000 Common Murres (*Uria aalge*). The seabird colonies surrounding Yaquina Head present a unique opportunity for research and monitoring given their close proximity to viewing platforms and intensive oceanographic studies of surrounding waters. Additionally, this appears to be of the most rapidly growing and successful murre colonies on the Oregon coast. YHONA seabird studies are a joint project among Oregon State University, U.S. Fish and Wildlife Service, and the Bureau of Land Management. 2009 was the 3rd consecutive year of study by these collaborators and combined with similar studies conducted by Julia Parrish (University of Washington) at YHONA from 1998 to 2001,

we are now developing a much needed time series investigation for the Oregon Coast (currently at 7 years). Unfortunately, no data were collected at YHONA from 2002-2006, a timeframe containing highly anomalous ocean conditions. With El Niño conditions potentially affecting breeding in 2010, it will be a critical year to continue studies at this site.

We are interested in seabird reproductive success and how the diet and foraging activities of birds are affected by changing ocean conditions. Furthermore, we wish to quantify the effects of bald eagles and other sources of predation or disturbance during the breeding season. Building on a previous study conducted during 1998-2001, we mapped 12 plots on Colony Rock and Flattop Rock (Figure 1). We closely monitored breeding birds (Figure 2), watching and recording when eggs were laid and then following these pairs through the incubation and chick rearing period. Simultaneously, we watched for disturbances and recorded the frequency and duration of these events. For prey identification, we used a digital camera and spotting scope (digiscoping) to photograph fish in the bills of birds returning to the colony. This information allows us to analyze the birds' diet and provide information about foraging conditions and link to oceanographic investigations adjacent to these seabird colonies.

Results

In 2009 we logged 140 hours during 53 days of observations between 10 May (some eggs were already present) and 2 August (Table 1). Common Murre chicks were first observed on 17 June and median hatch date was 24 June, overall. Hatching dates, however, were significantly earlier on Flattop Rock compared to Colony Rock. Asynchrony in hatching dates may be caused by greater predation pressure on Colony Rock during the pre-laying season, preventing birds from settling on colony and initiating egg laying (see disturbance results below). Among plots, 86% ($\pm$ 0.03 SE, 0.67-1.0 range) of the eggs hatched a chick (hatching success) and 77% ($\pm$ 0.04 SE, 0.56-0.90 range) of the eggs laid produced chicks that fledged (reproductive success; chicks $\geq$ 15 days were considered fledged; Table 1). Reproductive success in 2009 was similar to 2008 and both were greater than 2007 (Table 1). Another notable occurrence among the years was the number of murre chick carcasses found on beaches during fledging (July). Fledgling carcass deposition rates in July were greatest in 2007, almost nonexistent in 2008, and moderate in 2009. Many variables, of course, can effect deposition rates (e.g., wind, waves, etc.), but the patterns were quite striking for a beach immediately adjacent to seabird colonies at YHONA (Cobble Beach), and warrant further investigations.

During the past three years, murre diets varied annually. Overall dominant prey items included smelt (Osmeridae), Pacific herring or sardine (Clupeidae), northern anchovy (*Engraulis mordax*), and Pacific sand lance (*Ammodytes hexapterus*; Fig. 3). Other prey species included flatfish (Bothidae or Pleuronectidae), surfperch (Embiotocidae), and rockfishes (*Sebastes* spp.). The most striking difference among the past three years was the occurrence of sand lance, which were not observed in 2007, the dominant prey in 2008, and intermediate in 2009. Additionally, sand lance were primarily young-of-year fish in 2008, and seemingly 1-year-old in 2009 (preliminary results). Rock fish were most abundant in diets in 2008.

We have collected and analyzed feathers of beach-cast murre chick carcasses for stable isotope analyses of diet composition and nutrient sources. Preliminary results

show marked interannual variation and we are currently evaluating whether this might correlate to ocean production/upwelling regimes and overall murre reproductive success.

Bald eagles (*Haliaeetus leucocephalus*) are known to cause significant disturbance to murre colonies in Oregon and they were the dominant disturbance source at YHONA (Fig. 4). In all years, however, disturbance by eagles declined in June and July, during late incubation and chick-rearing. Furthermore the vast majority of disturbances (92% in 2009) occurred on a small section of Colony Rock which was outside of our study plots and seemed to have little effect on overall reproductive success. However, disturbance during early season does appear to affect lay dates noted above and no chicks were reared on the headland itself this year, likely due to eagle disturbance in 2009 and prior years. Murre adults were most frequently killed by eagles and most eggs were removed by secondary predators (e.g., Western Gulls, *Larus occidentalis*). In 2009, Common Ravens (*Corvus corax*) became a new disturbance source, generally being very persistence in stealing eggs from adults and disturbing other breeders in the process, but certainly not to the extent that eagles do. During 140 hrs of observation, we witnessed 27 disturbance events where 6 adult murres, 0 chicks, and 50 eggs were taken (Table 1, Fig. 4).

Data Considerations

The majority of our observations occur in the morning, before 12 noon. We did not attempt to estimate the number of murre pairs that laid an egg (a valuable metric for estimating the total number of chicks produced at the colony). We also did not estimate feeding frequency (foraging trip duration) or the proportion of "loafing time" (both parents present at colony), which are good indicators of foraging conditions. We hope to include these observations, however, in future years. Prey identification was of any item brought to the colony regardless of whether or not it was fed to a chick. Determining the fate of each prey item would require considerably more observer effort.

Future Directions – Project Integration

We hope to continue this project in 2010 with the ultimate goal of establishing long-term monitoring at this site. The colony site is particularly valuable for research and monitoring given the abundant and diverse group of seabirds, it's proximity to the Newport Hydrographic Line (sampled twice monthly at stations 1-25 nm offshore) and a wide array of other oceanographic research and monitoring conducted by NOAA Fisheries and OSU's College of Oceanic and Atmospheric Sciences. Eventually we would like to add video monitoring of the colony as a research and public education/outreach tool.

Acknowledgements

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Table 1. Summary metrics from studies of Common Murres at the Yaquina Head colony, 2007-2009.

	Observation			Hatch Date					Predation Rate # per hour[c] (total #)		
Year	Hours	Days	# plots	1st	Med	Hatching success[a]	Reproductive success[b]	# disturbances	Egg	Chick	Adult
2007	149	30	11[d]	6/20	6/27	0.70 (± 0.05 SE)	0.54 (± 0.07 SE)	23	0.21 (32)	0.00 (0)	0.06 (9)
2008	117	35	11[d]	6/10	6/23	0.86 (± 0.04 SE)	0.77 (± 0.05 SE)	20	0.21 (25)	0.00 (0)	0.04 (5)
2009	140	53[f]	10[e]	6/17	6/24	0.86 (± 0.03 SE)	0.77 (± 0.04 SE)	27	0.36 (50)	0.00 (0)	0.04 (6)

[a]Chicks hatched per eggs laid (mean among plots)

[b]Chicks fledged (≥15 days old) per eggs laid (mean among plots)

[c]Total # observed taken/total # observation hours

[d]Two adjacent plots (CR5 & CR6) were combined because of a low number of visible eggs to follow

[e]Two sets of adjacent plots (CR2 & CR3, CR5 & CR6) were combined because of a low number of visible eggs to follow

[f]Thick fog limited observations to very short time periods or prevented observations altogether during some days in July – much more so than in previous years.

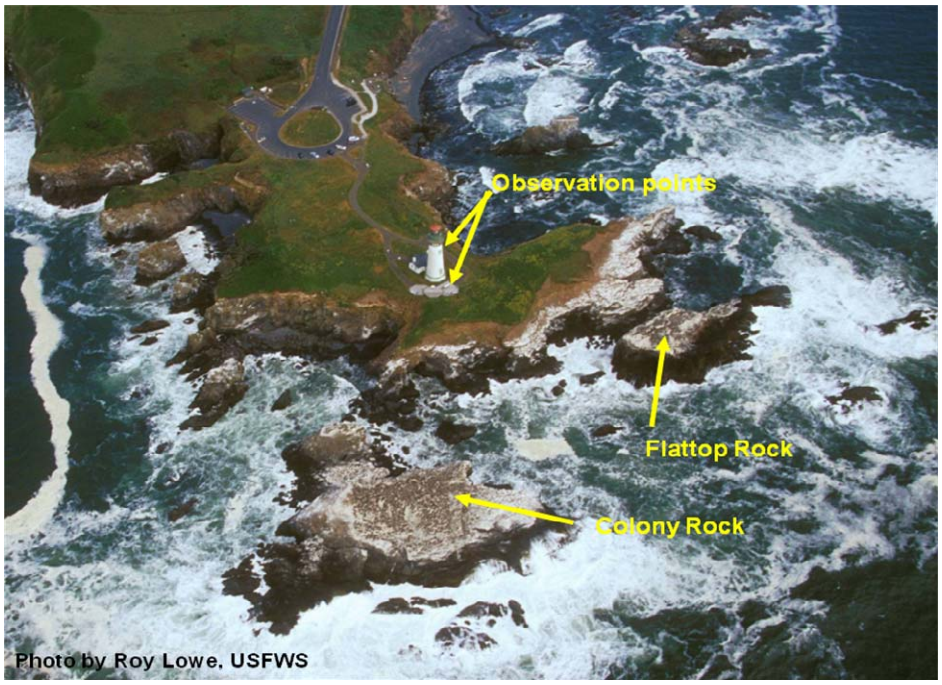

Figure 1. Study plots on Colony and Flattop Rocks.

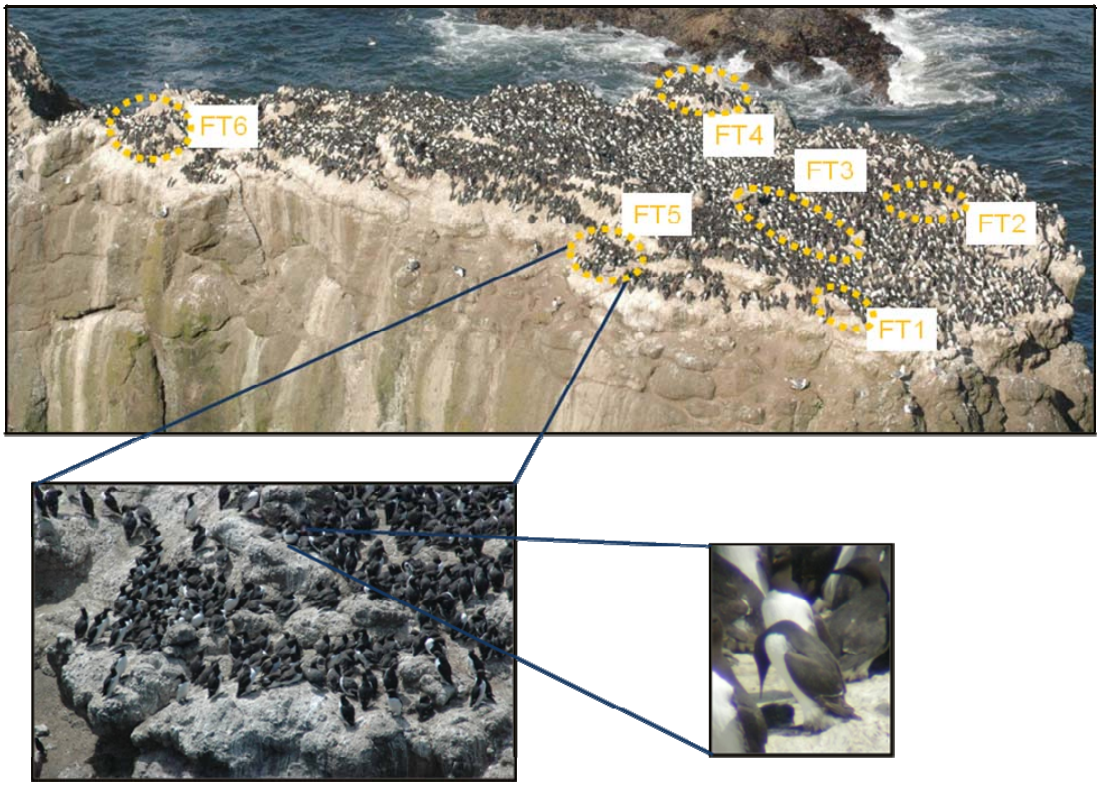

Figure 2. Close-up of Flattop Rock, plot #5, and an adult with a young chick

Figure 3. Example digiscope photos of, from left to right, (a) smelt, (b) herring or sardine, (c) northern anchovy, (d) flatfish, (e) surfperch, and (f) sand lance in murre bills at YHONA taken from the observation deck at the base of the lighthouse.

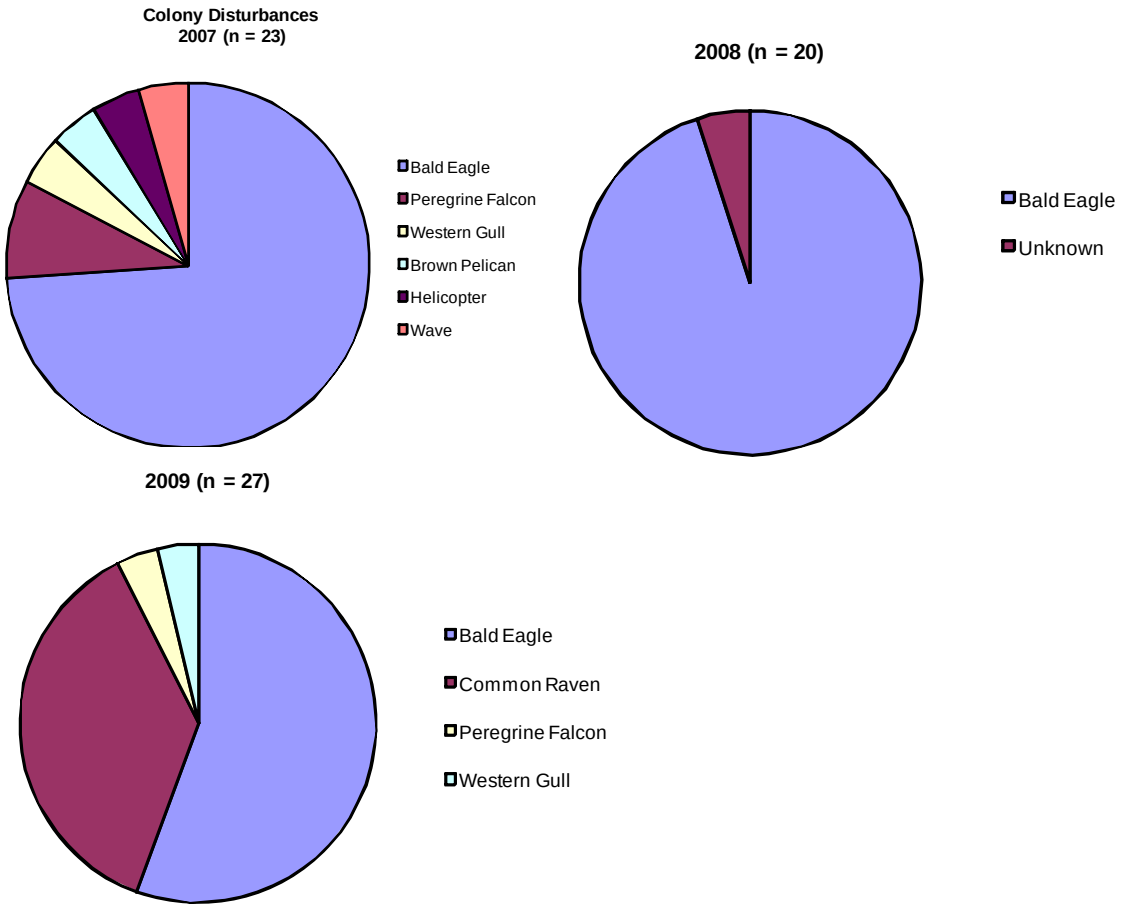

Figure 4. Sources of disturbance (≥ 1 bird leaving colony) to Common Murres, 2007-2009.