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The relationship between ocean-climate indices and diet of Rhinoceros Auklets (Cerorhinca monocerata)

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INTRODUCTION

Marine system productivity varies as a result of changing ocean-climate conditions and cascades through trophic levels, impacting marine mammals and birds. These ocean-climate conditions can be measured through indices, such as Sea Surface Temperature (SST), Multivariate El Niño Index (MEI), Pacific Decadal Oscillation (PDO), and Coastal Upwelling Index (UI). Variation in these indices may result in "bottom-up physical forcing," in which abiotic effects impact biotic effects. Upper-trophic level predators, such as seabirds, can be used as indicators of marine environmental conditions, specifically through analysis of diet composition, foraging ecology, and reproductive success. In this study, we investigated how Rhinoceros Auklets (*Cerorhinca monocerta*), a migratory seabird that breeds in coastal colonies in the North Pacific, respond to oceanographic variability.

OBJECTIVES & HYPOTHESES

- Measure Rhinoceros Auklet diet composition and diversity on two islands within different ocean systems: Destruction Island, off the coast of Washington and in the California Current System, and Protection Island, in the Salish Sea (see Figure 1).
- Compare these values to ocean-climate indices, such as SST, MEI, PDO and UI
- Assess what physical forcing mechanisms affect diet, and ultimately reproductive performance, of Rhinoceros Auklets.

We hypothesized that –

1. The diet collected on Destruction Island will differ from that collected on Protection Island, and will have a greater diversity of fish
2. These differences will correlate with bottom-up physical forcing factors, as a result of different oceanographic indices.

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Photo by Eli Spiegel

METHODS

- Study sites:
  - Destruction and Protection islands (Fig. 1)
- Diet samples collected at two different stages of the chick-rearing period
- Spot-lighting method used to collect bill loads from adults returning to the colonies
- Diet analyses
  - Total mass of bill load
  - All individual fish were identified to species and measured (mass and length)
- Oceanographic index data obtained from online archives

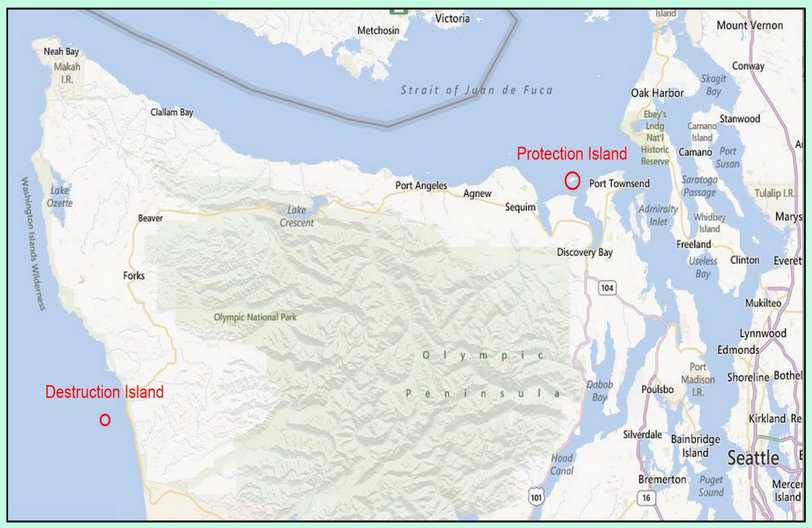
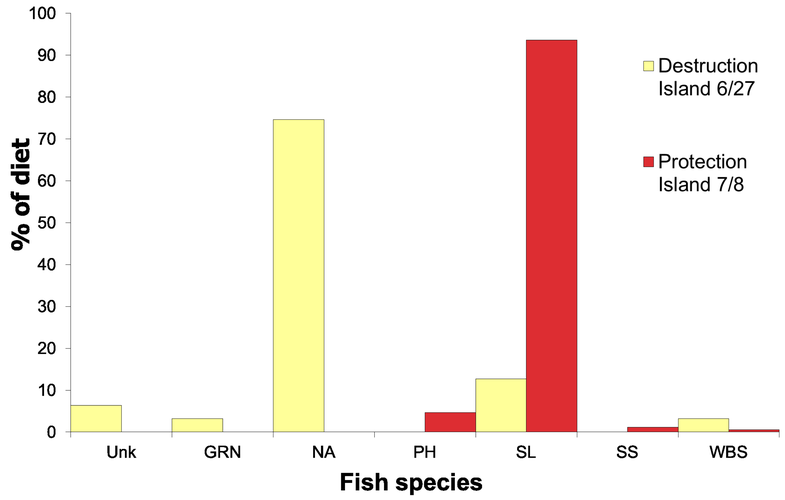


Figure 1. Map of Destruction and Protection islands, Washington. Destruction Island, along the Washington coast, is within the California Current System, whereas Protection Island is located in the Salish Sea and is influenced by a tidal-flow system. Map obtained from Bing.

PRELIMINARY RESULTS & DISCUSSION



was dominated by Sand Lance. Legend: Unk = unknown; GRN = greenling spp.; NA = Northern anchovy; PH = Pacific herring; SL = sand lance; SS = surf smelt; and WBS = whitebait smelt.

- Mean mass of bill load is greater on Protection Island. (Protection = 32.2 ± 0.4 SE g; Destruction = 27.4 ± 0.6 SE g)
- Mean number of fish per bill load is greater on Protection Island. (Protection = 5.5 ± 0.5 SE fish; Destruction = 2.1 ± 0.2 SE fish).
- Prey species diversity is greater on Destruction Island.
- These results suggest that Rhinoceros Auklets have flexible foraging strategies.

NEXT STEPS

- Complete diet sample analyses from our second trips
- Compare current diet data to previous years of diet data from Destruction and Protection islands (2008-2010)
- Analyze relationship between current and previous diet data and ocean-climate indices, including sea surface temperature (SST), Multivariate El Nino Index (MEI), Upwelling Index (UI), and Pacific Decadal Oscillation (PDO), to determine any spatial and/or temporal correlations
- Use these analyses to better understand Rhinoceros Auklet preferences in diet, and their response to changing ocean and climate conditions