# Comparing Sea Otter Prey Consumption to Epibenthic Prey Availability around Mariculture in Various Weather Conditions

Samantha Allen and Emily Reynolds

URSA UNDERGRADUATE RESEARCH & SCHOLARLY ACTIVITY · Sea Grant Alaska · UAF UNIVERSITY OF ALASKA FAIRBANKS

## Introduction

Kachemak Bay has a high density of oyster farms, as well as a healthy population of sea otters, an important keystone species. Sea otters are crucial to the ecosystem, and primarily eat macro-invertebrates such as bivalves. As the mariculture industry grows, it is important to understand the impact that oyster farms could have on sea otter foraging preferences and behavior. **The goal of this project is to determine if and how active oyster farms influence sea otter foraging.**

## Hypotheses:

1. I predict a correlation between consumed prey and environmental parameters within oyster farms.
2. Increased foraging will be seen in farms during poor weather conditions.
3. Sea otters will consume more fouling organisms in farms than non-farm areas.

## Methods

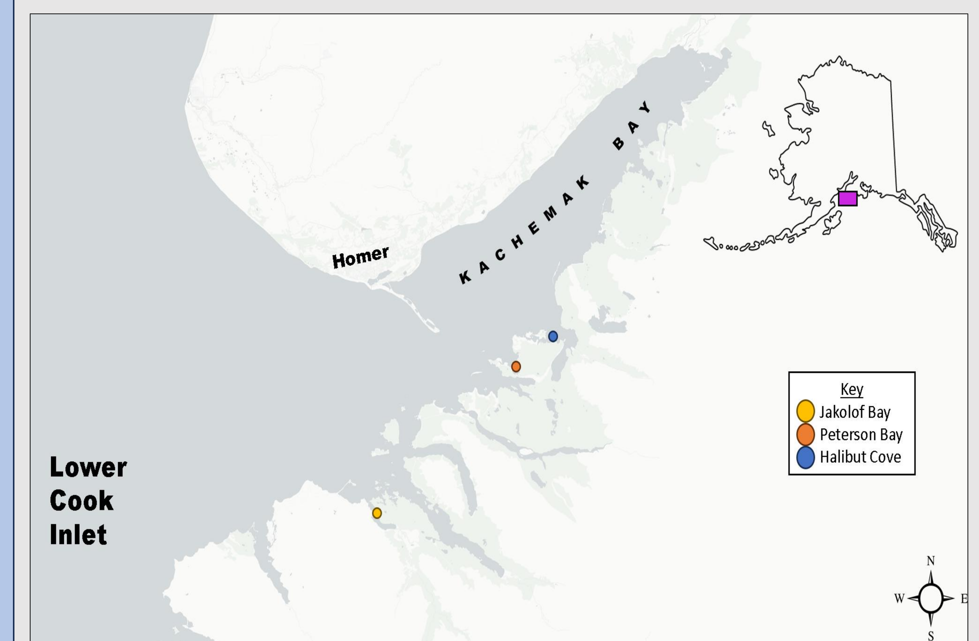


Figure 1. Study area in Kachemak Bay, Alaska.

Consumed prey was determined through targeted foraging observations.

- A Questar scope was used to observe otters and identify prey after successful dives

To characterize the epibenthic habitat, a drop camera was used:

- The camera was dropped at 10 random intervals along a 50m transect in each farm.
- Environmental parameters (i.e., percent cover of biota and substrate, organisms present, and depth) were recorded at each drop to compare to foraging observations.

Weather was quantified with wind speeds taken from NOAA station HMSA2.

Drop camera was used to determine presence of natural potential structures for fouling organisms.

- Only sites and foraging locations with no fouling structures were included.
- Fouling organisms were identified by specific taxa that are commonly observed within fouling communities (e.g., barnacles, mussels, tubeworms).

Image 1. Deploying the drop camera.

## Mosaic of drop camera

## Results and Discussion

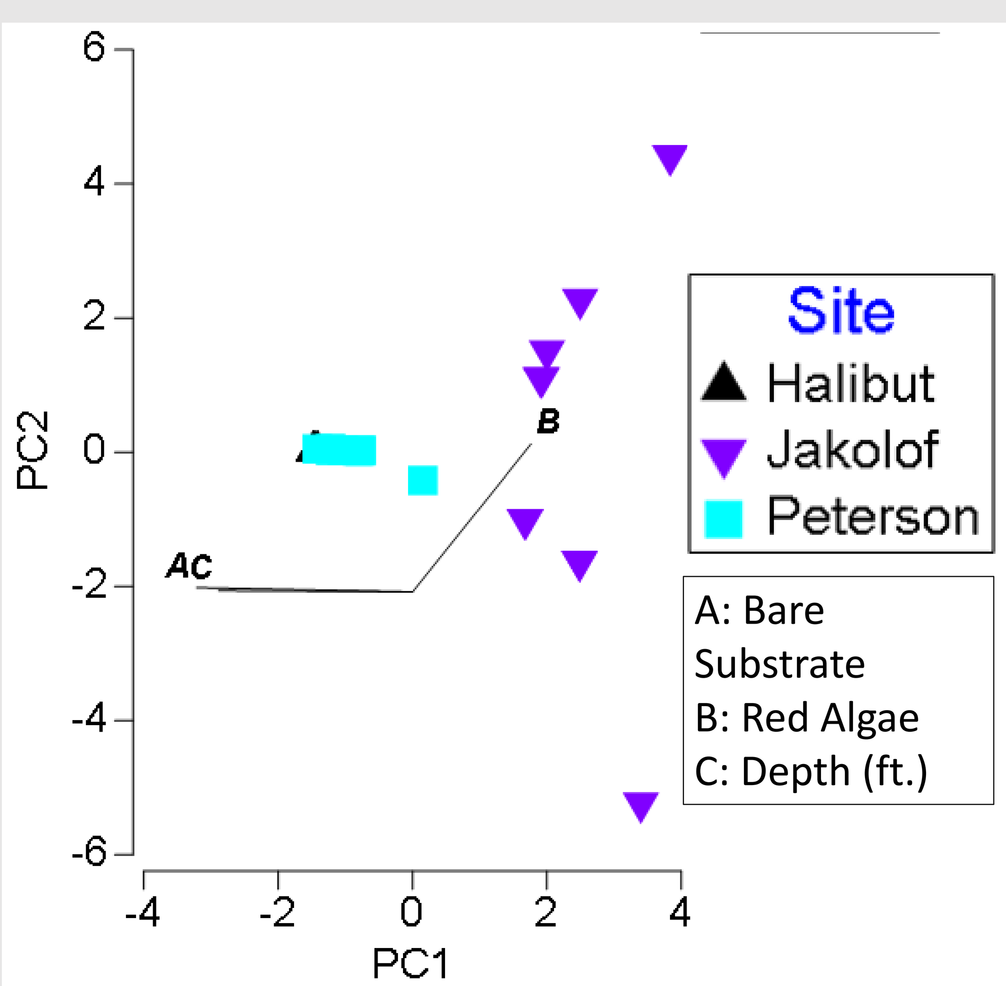


Figure 2. PCA of drop camera transects at the three study sites with significant environmental vectors (Pearson correlation > 0.8).

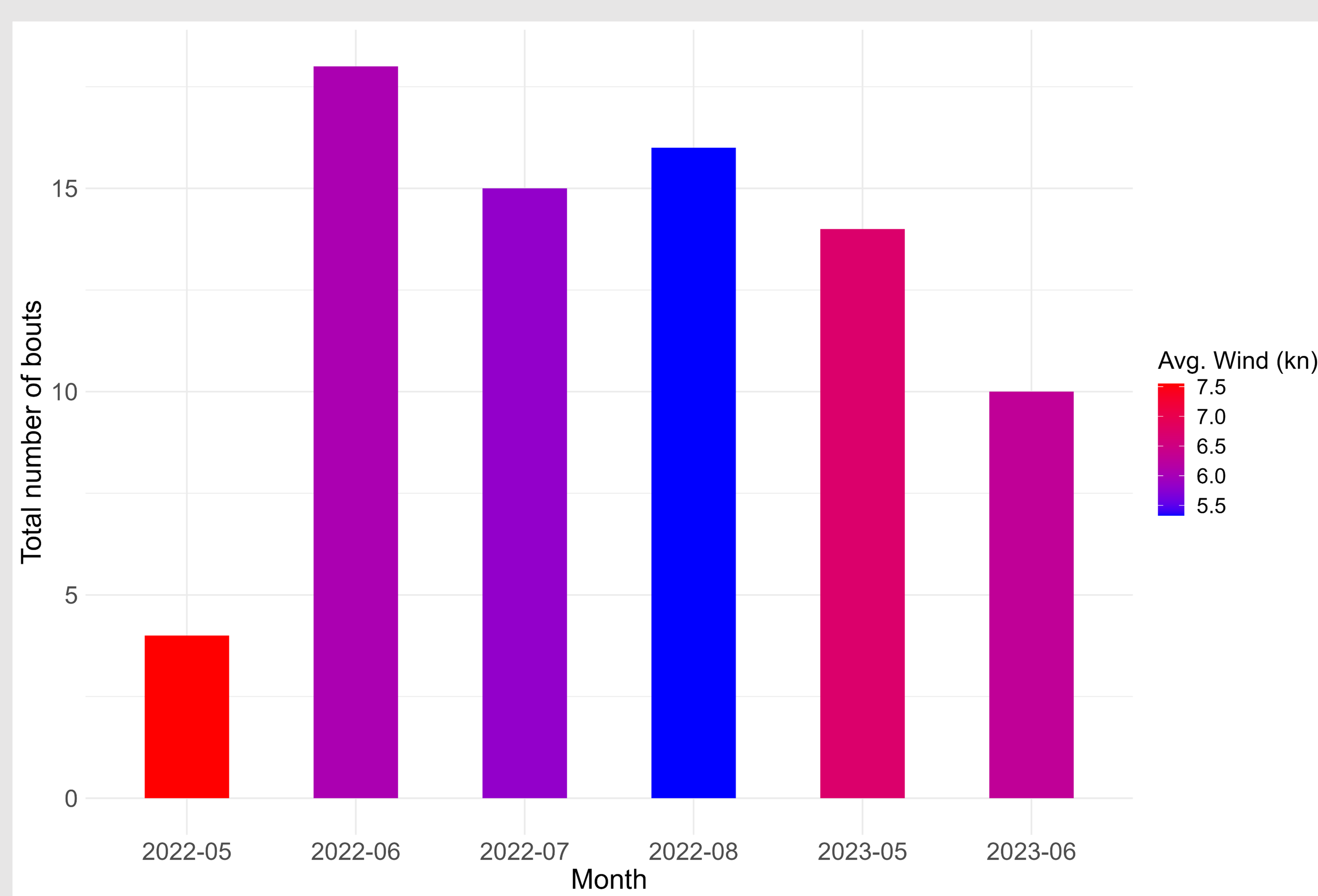


Figure 3. Total foraging bouts for each month, color coded by average wind speed in knots.

| Non-farm areas | |
|---|---|
| Avg. similarity: 38.69 | |
| **Species** | **% Contribution** |
| Unidentified prey | 44.61 |
| Unidentified clam | 44.12 |
| Butter clam | 6.70 |
| **Farm** | |
| Avg. similarity: 50.52 | |
| **Species** | **% Contribution** |
| Unidentified prey | 43.01 |
| Mussel | 33.12 |
| Unidentified clam | 19.15 |

Table 1. SIMPER results at all sites within the farm and non-farm areas for top contributing prey species.

- A Bio-Env analysis resulted in a Pearson rank correlation of 0.174, indicating that there was no significant correlation between the environmental parameters and consumed prey. Nonetheless, the Halibut and Peterson sites were characterized by the parameters depth and bare substrate (Fig. 2).
- Averaged wind speeds were significantly correlated to foraging activity with $p = 0.05$ in a one-way ANOVA. The relationship was opposite to my hypothesis as fewer foraging otters occurred at higher wind speeds (Fig. 3). However, differences in wind speeds were marginal, as they only varied by two knots.
- A SIMPER analysis revealed that the primary contributing prey species in non-farm areas were unidentified prey and clams, whereas in the farm areas, mussels were the second top contributor (Table 1).

## Conclusions

### Hypothesis 1:

- No correlation between consumed prey and chosen environmental parameters.

### Hypothesis 2:

- Significant relationship between wind speed and foraging activity; however, there were minimal differences in wind speed.
  - Higher wind speed correlated to fewer foraging otters.

### Hypothesis 3:

- Fouling organisms (i.e., mussels) were identified as prey in farm areas.
- In the non-farm areas, top contributors were non-fouling organisms.

## Acknowledgements:

Funding was provided for by Undergraduate Research and Scholarly Activity at the University of Alaska Fairbanks. Thank you to Emily Reynolds and Brenda Konar for their mentorship throughout the project, the staff at Kasitsna Bay Laboratory, and Mack Hughes and Brian Ulaski for driving the boat.