# INTRODUCTION

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Distributions of prey are inherently patchy. The perceived patchiness of prey, however, depends on a predator's rate of movement. To optimize net energy gain, predators should therefore move through the environment at speeds that reduce perceived prey patchiness, minimizing energy expenditure while maximizing the homogeneity of prey encounter rates.

### **Hypotheses**

- Whelks forage at speeds that maximize the homogeneity of prey encounter rates while minimizing energy expenditure. Movement rates should therefore depend on focal prey, not non-prey.
- 2. Individuals vary in diets, and thus perceive different prey communities.
- 3. The strength of selection varies over time.

### **COMMUNITY PATCHINESS**

**Objective:** Characterize variation in intertidal communities across spatial scales

Methods:

- 18 experimental patches scraped to bare rock, June 2013
- Invertebrate densities monitored monthly for four years



- Non-metric multidimensional scaling (NMDS) used to characterize community structure
- Patchiness was quantified as dispersion (βdiversity) between units at five spatial scales each month

#### **PREDATOR MOVEMENT**

**Objective:** Quantify magnitude and variation of whelk daily displacement rates

#### **Methods:**

- 100 individually marked whelks
- Position measured daily for 3 months (June-August 2017)

# Matching spatial scales of predator movement and community variation **Shannon M Hennessey and Mark Novak** Department of Integrative Biology, Oregon State University, Corvallis OR 97331

*Bench*: 400 m<sup>2</sup> *Sub-bench*: 100 m<sup>2</sup> *Patch*: 2.25 m<sup>2</sup> *Quadrat*: 0.0875 m<sup>2</sup> *Sub-quadrat*: 0.0025 m<sup>2</sup>



## SIGNIFICANCE

Scale-dependent patterns of predator movement and community variation enhance our understanding of how predators respond to their environment. This links the behavior of individuals to the broader community patterns they affect. Whelks provide a tractable model to study these processes, as they are more easily manipulated than larger predators that may be vulnerable to environmental change.

# RESULTS



- whelks are responding only to their prey.





**Community patchiness** varies through time, as well as across spatial scale (Fig. 3).

Perceived patchiness in the focal prey community increases as succession progresses (Fig. 3a).

The non-prey community exhibits a decrease in perceived patchiness through time, especially at larger spatial scales (Fig. 3b).

The strength of selection for individual whelks foraging varies with time.

This may explain differences in individual movement patterns.



- Whelk individuals exhibit patterns of daily displacement that, on average, match the spatial scale at which the patchiness of the community increases.
- Community patchiness varies across time and spatial scale, with differing patterns for prey and non-prey.
- The strength of selection for foraging whelks is variable through time.



