

Intertidal community structure & function across a glacial gradient

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Background

Impact of glacial melt on downstream estuaries

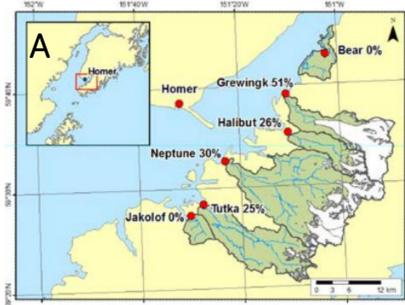
- Alaskan glacier discharge rates have doubled in the past decade and modulate downstream temperature, salinity, nutrient, and sediment stratification profiles.
- Predicted to influence the biological response and ecological function of coastal marine communities.
- Intertidal communities are composed of organisms that reflect the local conditions.

Alaskan Rocky Intertidal – ‘The Players’

Mytilus trossulus

Fucus distichus

Balanus glandula &
Semibalanus balanoides



Estuary Site	Percent Glaciated
A. Kachemak Bay	
Jakolof	0
Tutka	8
Halibut	16
Wos	27
Grewwingk	60
B. Lynn Canal	
Sheep	0
Cowee	16
Lemon	25
Eagle	48
Mendenhall	63

Figure 1. Map (A,B) highlight the five watersheds and estuarine ecosystems sampled in Kachemak Bay and Lynn Canal. Intertidal sits are marked with a red circle.

Objectives & Hypotheses

Overarching goal: Characterize intertidal community structure, biological response and their underlying environmental determinants across a glacial gradient (Fig. 1).

H1: Primary producer, *Fucus distichus* will dominate in less glaciated estuaries and biological parameters will correlate to glacial silt and sedimentation.

H2: Filter-feeders, *Mytilus*, *Balanus* and *Semibalanus* will dominate in more glaciated estuaries and biological parameters will correlate to glacial melt subsidies.

H3: Intertidal communities will display greater variability across watershed glaciation and local site conditions, rather than across regions.

Methods



Intertidal sampling design



Figure 2. Diagram of the sampling protocol. Five quadrats were randomly sampled above and below the 50 m transect. The larger (0.25 m²) quadrats were sampled at the transect, while biomass samples were taken approx. a meter from the transect.

Sampling Protocol

- (April – September 2019) At each site, percent coverage and mobile counts were estimated at ten random quadrats (0.25 m²) along a 50 m transect (Fig. 2).
- Ten separate quadrats (0.0625 m²) were sampled for biomass which included scrapes of all organisms inside the quadrat that were then brought to the lab for identification and processing.

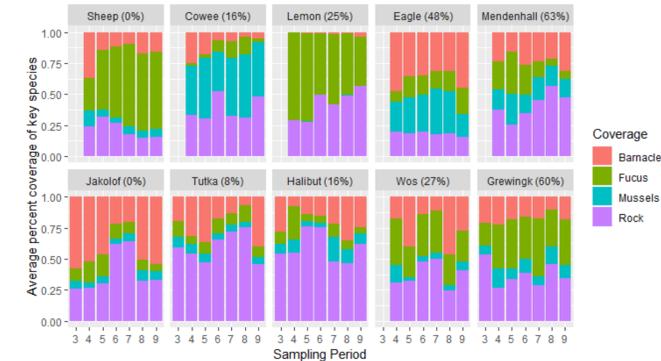
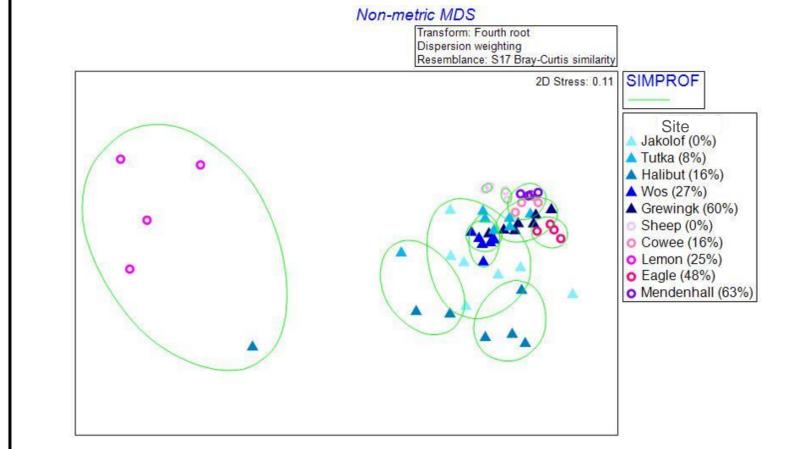


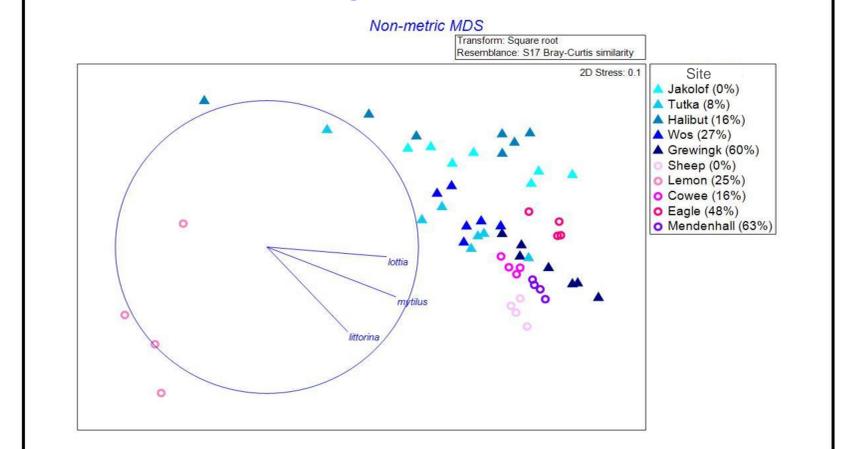
Figure 3. Average percent coverage of key species by month and site.

Results & Discussion

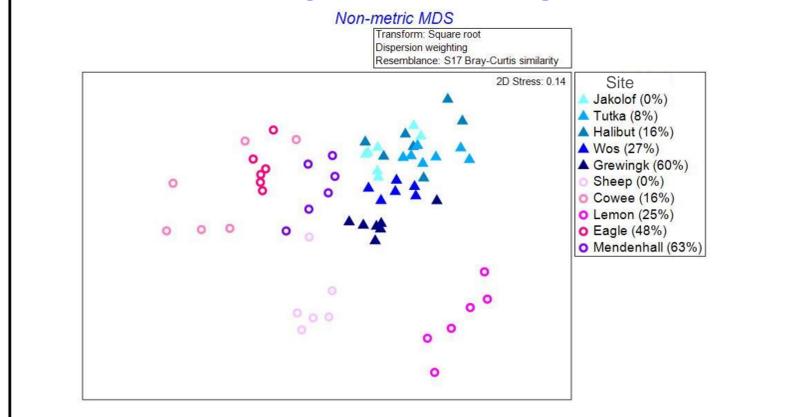
[Fig. 4] Biomass



[Fig. 5] Abundance



[Fig. 6] Percent Coverage



Results: Community variability across a glacial gradient

- In contrast to H1, *Fucus* coverage in Kachemak Bay increased with increasing glaciation. *Fucus* coverage in Juneau is more variable and does not seem to follow the same pattern as Kachemak Bay (Fig. 3).
- Intertidal community biomass data averaged by month and site in Juneau are highly clustered and less variable than Kachemak Bay communities, with the exception of Lemon (Fig. 4). Groups are clustered by green SIMPROF circles. Communities were tested and found to vary significantly across both sites and months (ANOSIM, $p = 0.001^*$).
- Abundance differences in the mobile invertebrate communities are primarily driven by the mussel, *Mytilus* and the limpets, *Lottia* and *Littorina* (Fig. 5).
- Percent coverage of sessile organisms shows greater variability in Juneau communities than in Kachemak Bay communities (Fig. 6).

Future Work: Assessing the influence of environmental drivers

- Correlate local environmental profiles to the biological communities.