Nearshore Fish Community Composition Along a Gradient of Glacial Influence in Southeast and Southcentral Alaska

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Alaska is on the front lines of climate-driven ecological change. Climate models predict increased temperature and precipitation for the Southeast and Southcentral regions of Alaska (Kunkel et al. 2017), which may impact important ecosystems like estuaries downstream of glaciers. By examining the nearshore fish community composition of estuaries that fall along a gradient of glacial watersheds, from 0% glaciated to 60% glaciated, we may be able to draw conclusions about the future impacts of climate change on Alaska’s fisheries and ecosystems. The objectives of this study were to:

1) Describe and compare nearshore fish community composition across a gradient of glacial influence in two regions of the Gulf of Alaska (Southeast and Southcentral), and
2) Evaluate seasonal trends in fish diversity and abundance in Lynn Canal and Kachemak Bay.

Methods

• Community data were collected during the negative low tide April-September 2019 at ten sites: five estuaries in Lynn Canal and five estuaries in Kachemak Bay (Figure 1).
• Fish were captured using a 50ft x 8ft beach seine (mesh size 0.5 in).
• Fish were identified, measured, and released. Juvenile coho salmon were retained for gut content analysis.
• Water sensors were deployed and collected each month to continuously measure temperature, salinity, dissolved oxygen, light, and depth.
• Community composition was analyzed using non-metric multidimensional scaling with the R package vegan (Oksanen et al. 2019).

Results

• Fish community composition showed the greatest variation between regions
• Sites within Kachemak Bay had greater differences in community composition than sites within Lynn Canal.
• Catch-per-unit-effort (CPUE) was largest in both regions in the middle of the summer and tapered at the beginning and end of the sampling season.

Conclusion and Next Steps

The primary sources of variation in community composition from Year 1 are regional differences in fish species and differences in habitat type. With analysis of the water quality data we will be able to detect seasonal and site-based trends in water chemistry that may be drivers of fish community composition within regions. Year 2 sampling will begin in April 2020.

This study is part of the Alaska EPSCoR Fire and Ice project that is investigating climate-driven ecological change in Alaska’s boreal forest and nearshore coastal ecosystems. A central goal of the coastal research efforts is to quantify how physical and chemical properties of glaciated watersheds influence ecological community structure in the nearshore marine environment.

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References