Short Term Variation in Nearshore Fish Communities in Barrow, Alaska

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Background

Why study fish in the Arctic nearshore?
- Nearshore habitats at lower latitudes provide nursery habitat for fish. Does the Arctic behave the same?
- Significant changes are occurring in the Arctic: retreating ice, increased commerce, energy development.
- Nearshore areas are important for human subsistence & predator foraging activities, and may be especially sensitive to oil spills.
- Evidence of interannual variation in nearshore fish communities (Thedinga et al., 2013).
- Fish serve as an important link between plankton and higher trophic levels.
- Fish must utilize a brief open water season to forage, grow, and prepare for winter.

How do nearshore fish communities in Barrow, Alaska, vary during the brief open water season?

Methods

- Weekly beach seining at 12 sites targeting 3 water masses: Beaufort Sea, Chukchi Sea, and Elson Lagoon.
- Sampling period: 14 July– 25 August 2013
- Oceanographic measurements: salinity, temperature, dissolved oxygen.
- Zooplankton collection weekly at each water mass.

Results

Weekly shifts in total abundance, relative abundance, and species composition:

Beaufort Sea

Chukchi Sea

Elson Lagoon

Week 1: July 14-20
Week 2: July 21-27
Week 3: July 28- Aug 3
Week 4: Aug 4-10
Week 5: Aug 11-17
Week 6: Aug 18-24
Week 7: Aug 25

Wind drives weekly changes in temperature:

Beaufort Sea

Chukchi Sea

Elson Lagoon

Week 1:
Week 2:
Week 3:
Week 4:
Week 5:
Week 6:
Week 7:

Short term changes in energetic condition (species dependent):

Seasonal Energy Density of Fourhorn Sculpin in Elson Lagoon

Seasonal Energy Density of Capelin at Beaufort Sites

Age-0 Pacific sand lance (top) and capelin (bottom).

Conclusions

- Nearshore fish communities around Barrow are highly variable during the short summer season. Changes in total abundance, relative abundance, and species composition occur over intervals as short as one week.
- Nearshore habitats near Barrow are heavily utilized by age-0 fish during the open water season. 98% of specimens collected were age-0 fish. Growth was not observed among all fish species in the nearshore.
- Shifts in temperature and salinity occur in all three water masses. Elson Lagoon undergoes an early-summer shift from estuarine conditions to marine conditions. Changes in temperature and salinity in the Chukchi and Beaufort Seas appear to be driven by prevailing wind direction.

Future Work

- Future work in 2014 will incorporate nearshore trawling and acoustic surveys in addition to beach seining and oceanographic measurements.
- Isotopic analysis of fish and zooplankton samples will quantify trophic relationships between organisms in varying nearshore habitats.

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