

SHELFZ project: pelagic fish and macrozooplankton in the eastern Chukchi Sea

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Introduction

The Shelf Ecology and Habitat of Fish and Zooplankton (SHELFZ) project examined distributions of Arctic aquatic organism in the transition from nearshore to offshore waters over Barrow Canyon in the eastern Chukchi Sea. Pelagic fish and macrozooplankton densities were quantified in two concurrent surveys during daylight hours using active acoustics (38 and 120 kHz) and midwater trawls.

Site Location

The Chukchi Sea study site included coastal and offshore waters between Wainwright and Barrow, AK. Water depths ranged from 5 to 160 meters.



The Chukchi Sea is important to marine birds and mammals, numerous fish and invertebrate species, as well as subsistence hunters of northern Alaska. Comprehensive studies of the Chukchi's marine ecosystem are lacking due to its remote location and seasonal ice coverage.

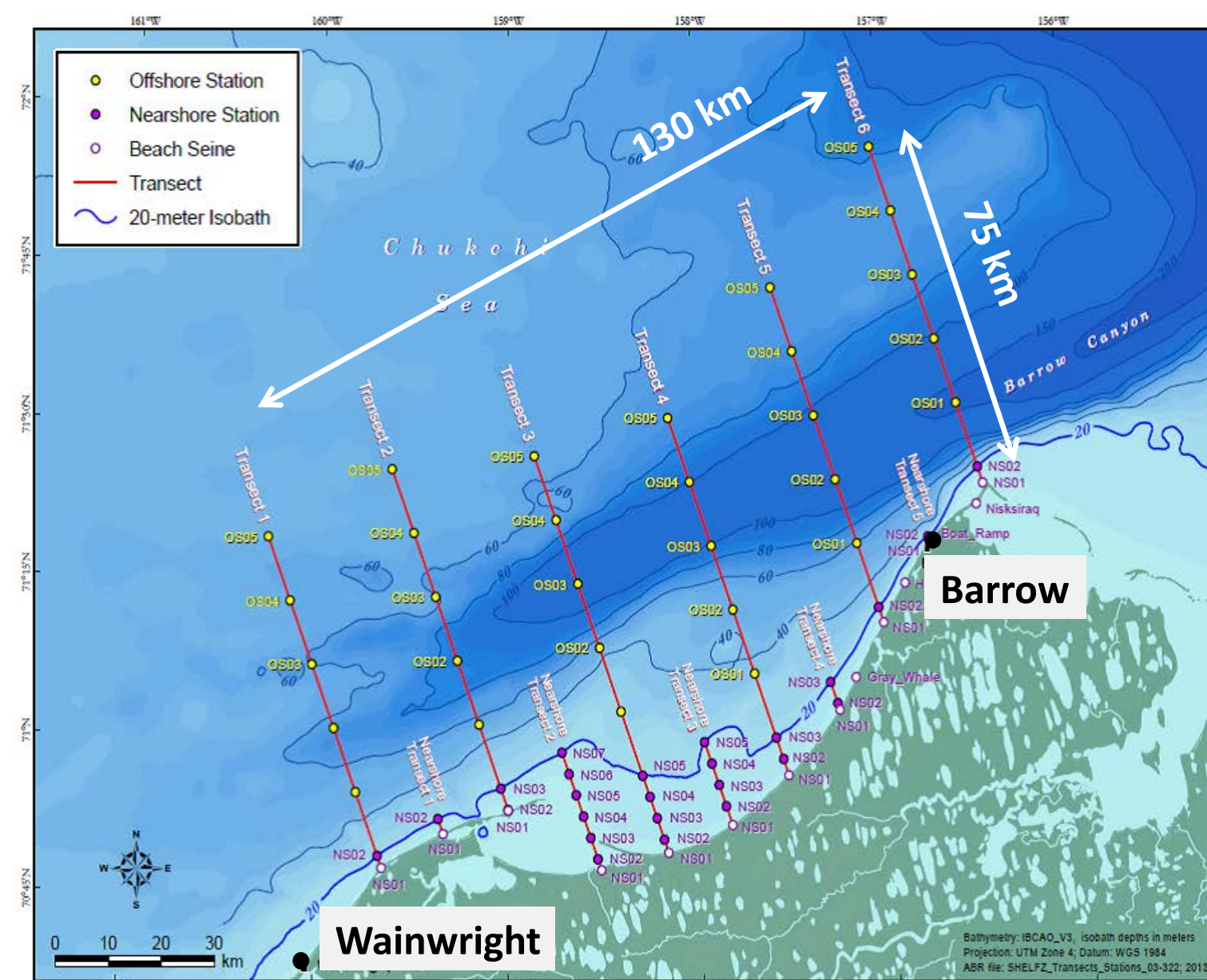
Project Objectives

- Survey the pelagic community across a submarine canyon, encompassing nearshore and offshore habitats
- Collect baseline data on macrozooplankton using acoustics
- Collect baseline data on fish using acoustics and net samples
- Map and compare distributions and abundances of fish and macrozooplankton across nearshore and offshore habitats
- Use metrics to characterize vertical distributions of fish and macrozooplankton along sampled transects



Sampling Shipboard Surveys

Two concurrent surveys were conducted in the Chukchi Sea during August-September of 2013. Survey transects were 26 km apart and extended 75 km offshore. Nearshore stations were placed every 6 km along transects, sampled by the R/V Ukpik. Offshore stations were spaced at 12 km intervals and sampled by the F/V Alaska Knight.



Offshore (> 20 m water depth)



F/V Alaska Knight (143 feet)

- CTD
- Tucker Trawl and CalVET
- Midwater trawl (Marinovich 6 x 4 m)
- Bottom trawl (83–112 Eastern Otter Trawl, 34 m footrope)
- Acoustics (38 & 120 kHz split-beam echosounders)

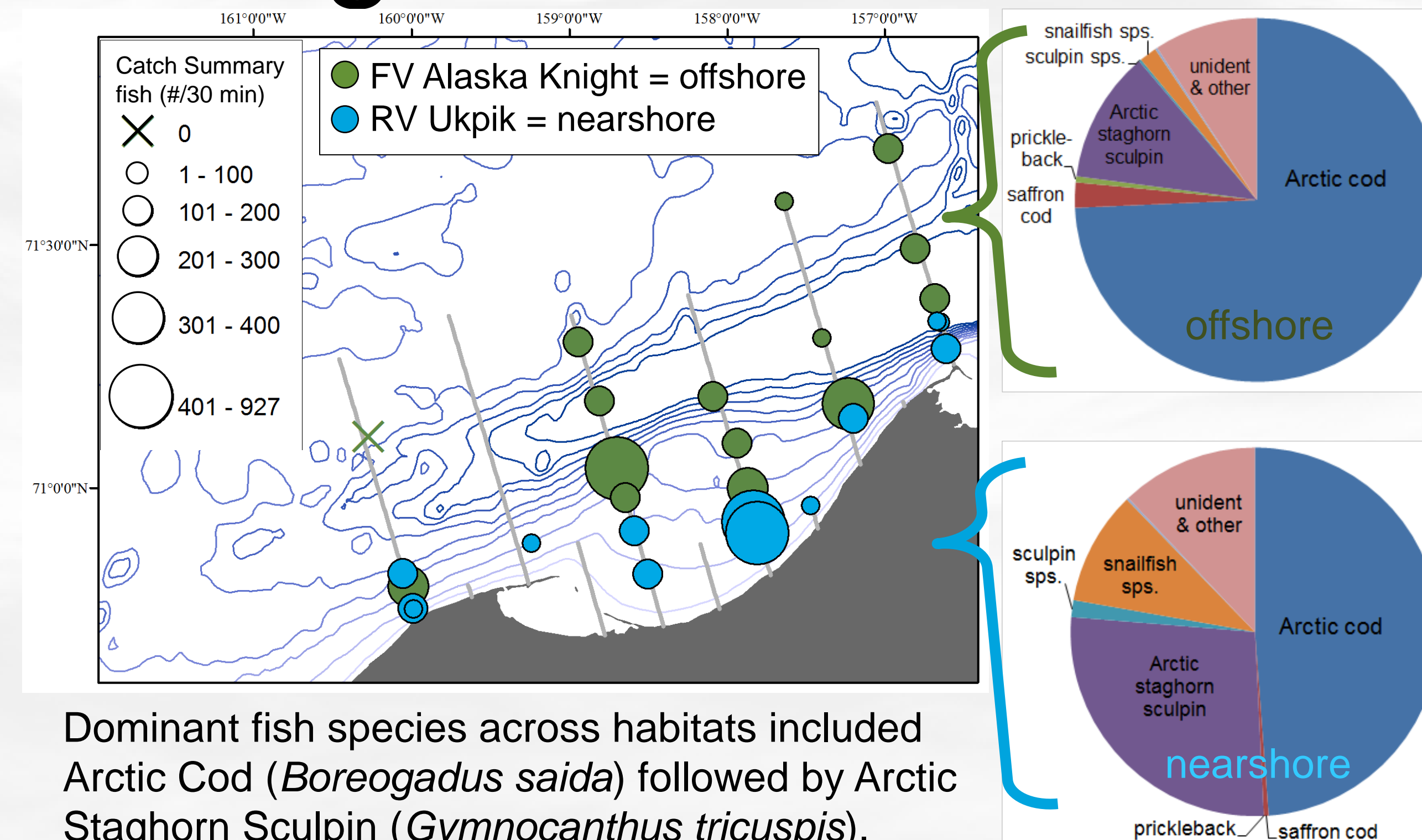
Nearshore (< 20 m water depth)



R/V Ukpik (50 feet)

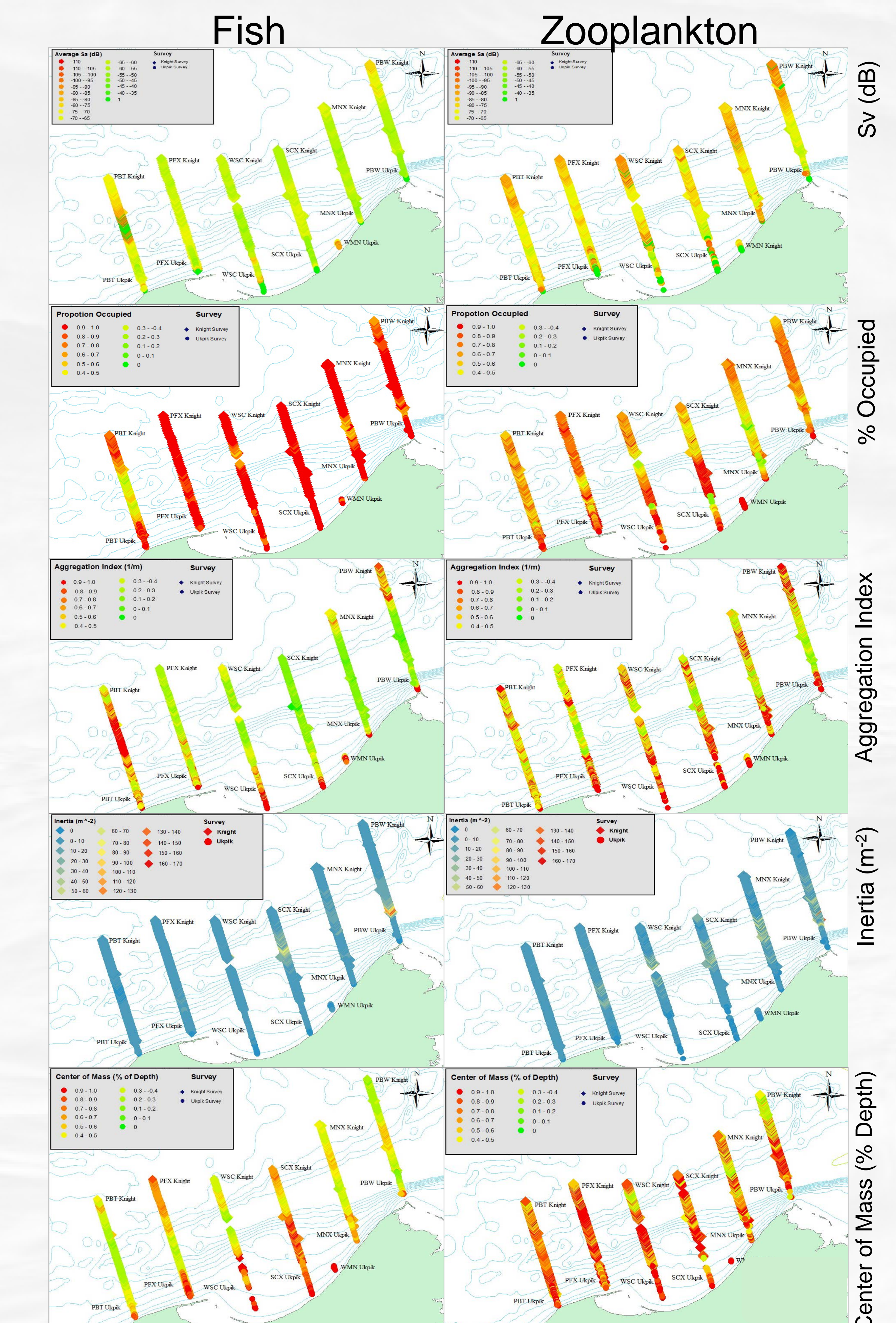
- CTD
- Tucker Trawl and CalVET
- Midwater trawl (Aluette 6 x 4 m)
- Bottom trawl (Plumb Staff Beam Trawl, 5 m vertical opening)
- Acoustics (38 & 120 kHz split-beam echosounders)
- Beach seine

Pelagic Fish Catches



Acoustic Distributions Echometrics

A suite of five metrics was used to characterize vertical distributions of fish and zooplankton along transects: relative density (S_a , dB re $1 \text{ m}^2 \text{ m}^{-2}$), proportion of water column occupied (O_c , %), aggregation index (AI , m^{-1}), dispersion (I , m^2), and center of mass (CM , m) (cf. Urmey et al. 2012).



Interpretation

High acoustic densities were observed very near shore and along the north side of Barrow Canyon. Fish occupied more of the water column compared to zooplankton, with zooplankton being more aggregated and closer to the bottom except in the shallowest depths. Density and distribution transitions from nearshore to offshore waters were not as strong as predicted for fish or macrozooplankton, even within or near Barrow Canyon.