Planktonic communities of the northeastern Chukchi

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The Chukchi Sea Environmental Studies Program (CSESP) is a multi-disciplinary effort to describe the baseline ecosystem of the North-eastern Chukchi Sea.
3 northward pathways
- CTD casts
- Macronutrients
- 150 µm Vertical net haul
- 505 µm Bongo net tow
~70 of 350 species
• 5 years of observations: 2 cold, 2 warm
• Community changes/evolves over the season
• Planktonic communities of each year different
Multidimensional analysis
2011 – Perspective

- Expansion of CSESP to encompass Hanna Shoal
- AKMAP program sampled outside of lease area
Most common shelf species & meroplankton are more prominent in warmer waters

Some species prefer Alaska Coastal Water
• “Oceanic” species imported from Bering/Pacific “track” the warmer Bering Sea Water
• Bering/Pacific oceanic species rare in Alaska Coastal Water
Cluster analysis

- Oceanic Arctic water
- Cooling Bering Sea water
- Something different
- Warm Coastal water
- Warm Bering Sea water
Oceanic Arctic Copepods on the shelf

- *Calanus hyperboreus* is a basin species – unusual to find it this far from shelf break in the Chukchi

- Although *C. glacialis* is common on the shelf seasonally, it “peaks” in some of the same locations as *hyperboreus* (& it does not like Hanna Shoal)
Upwelling events in Barrow Canyon moves plankton far onto the shelf and westward below Hanna Shoal.
Interannual differences are high:

*Pseudocalanus* spp.

![Image of Pseudocalanus spp. distribution over years and months](image_url)
Limacina helicina

2008 2009 2010 2011

Aug

Sept

Oct
Differences between WARM & COLD seasons

Abundant sea ice

- Ice algae
- Phytoplankton
- Benthos
- Diving ducks
- Walrus
- Gray whale
- Bearded seal
- Demersal fish

Limited sea ice

- Phytoplankton
- Ice algae
- Benthos
- Sea birds
- Pelagic fish
- Minke Bowhead

Iken: after Carroll & Carroll 2003

[Modified after Carroll and Carroll 2003]
Driving forces:

- Community composition is related to environmental factors
- 3 water types occupy the study area seasonally:
  - Cold winter water (high nutrients)
  - Warm Bering Sea Water (low nutrients)
  - Cold Melt water (low nutrients)
- As ice melts, Winter water becomes overlaid with melt water, and Bering Sea water eventually displaces one or both during September
Mechanisms

- Timing of ice removal, and nearby polynyas, jumpstart spring production in Winter Water and may favor zooplankton survival/development
- Aged Bering Sea Water is devoid of nutrients and may carry a burden of Pacific large-bodied species
- Storms may be important in mixing some Winter Water toward the surface, stimulating Primary production
- Next steps are understanding advection & residence time of different water masses, and the communities trapped within them.
Questions?

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