Chukchi Sea Environmental Studies Program

DBO-4 line, 2013:
Lower Trophics and related disciplines

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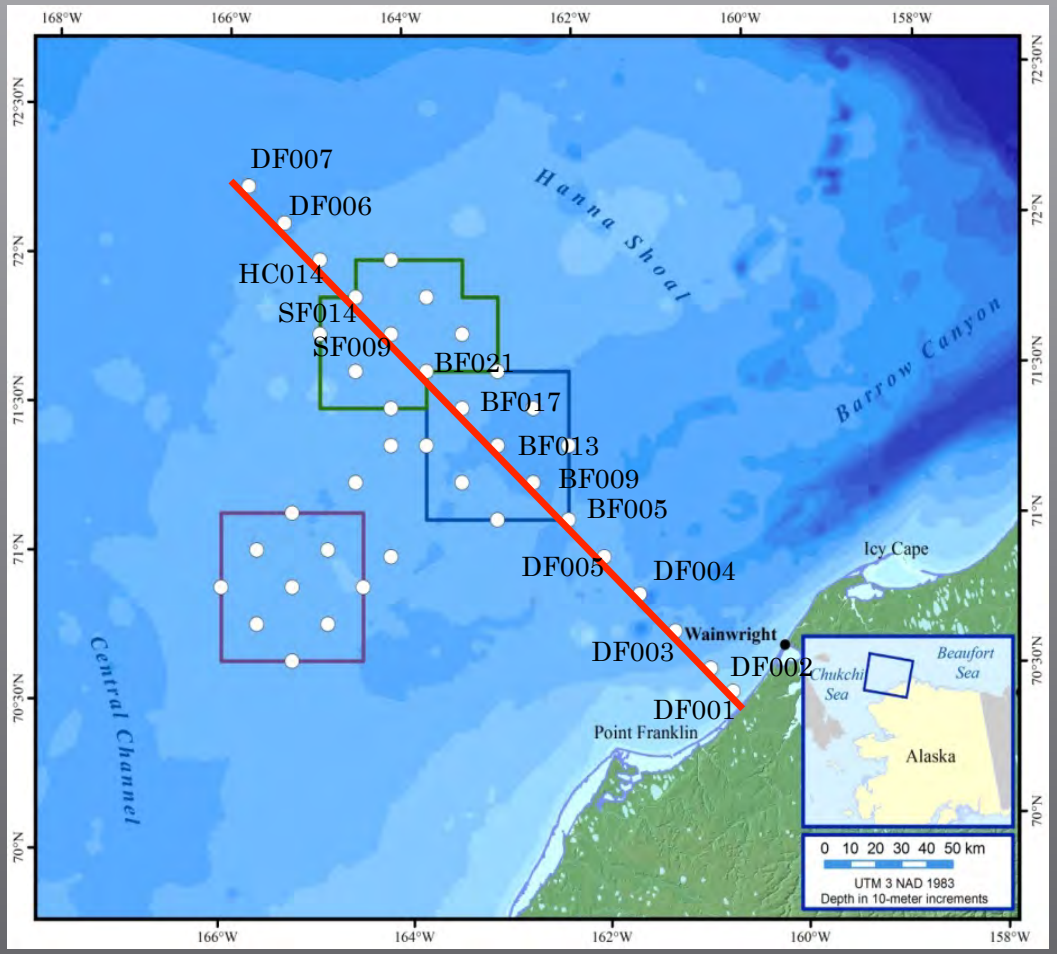
Distributed Biological Observatory Workshop
Seattle WA October 29-31, 2014

DISCIPLINES

- Physical oceanography
- Nutrients
- Chemical oceanography/Acidification (Added 2010)
- Zooplankton (microplankton in 2012)
- Benthic macrofauna
- Marine mammal observations
- Seabird observations
- MM acoustics (moorings nearby)

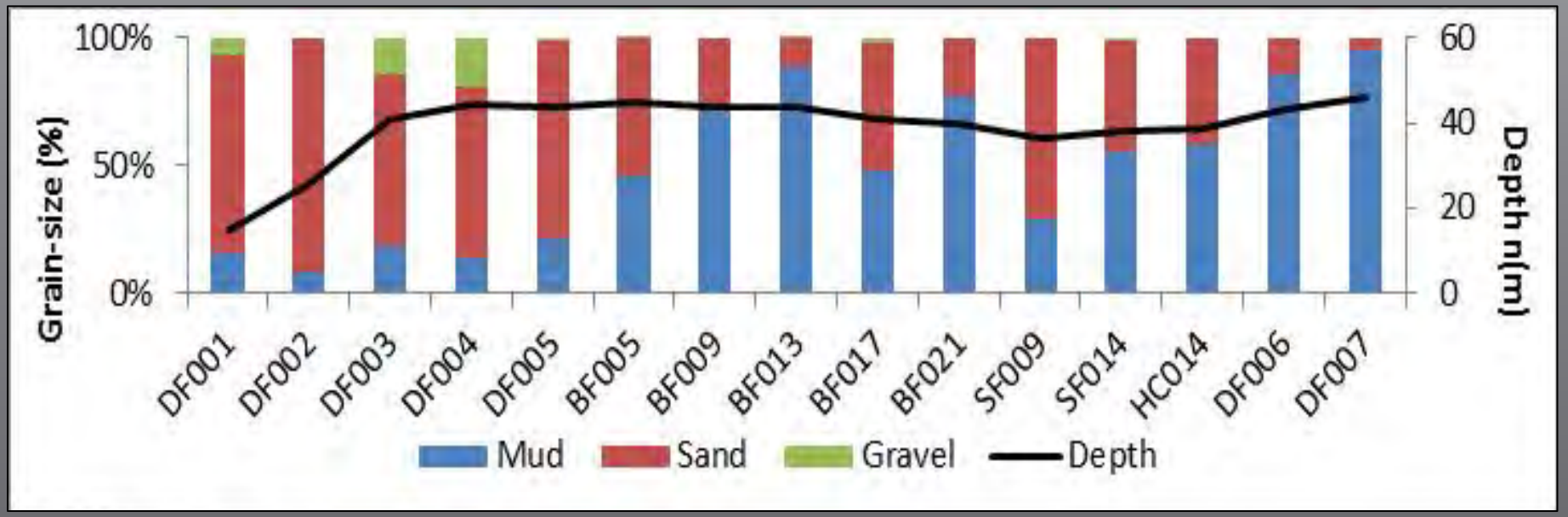
CSESP STUDY AREA 2013

- DBO-4 line crosses strong depth and physical gradients.
- Sampled 2012 and 2013.



DBO-4 Line Physical Conditions

- Coarser sediments in more dynamic, shallower water.

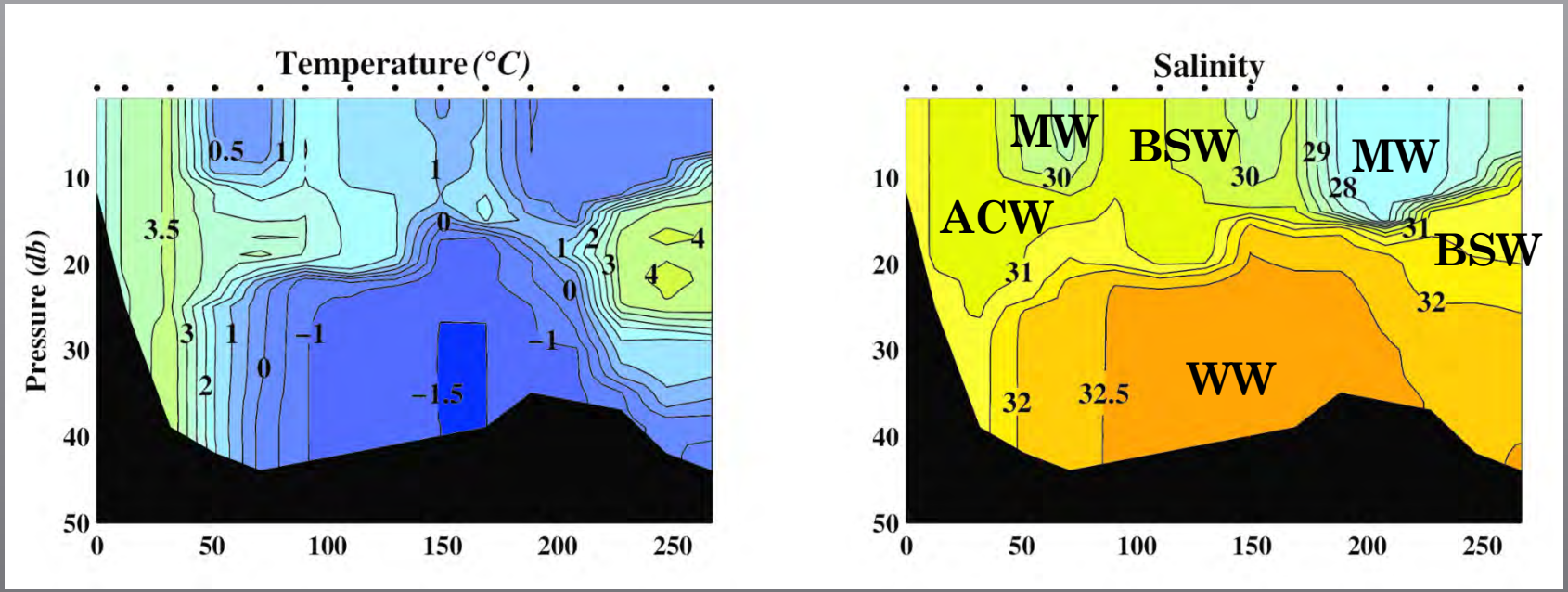


Nearshore

Offshore

DBO-4 Line Physical Conditions

(9/25/2013-10/6/2013)



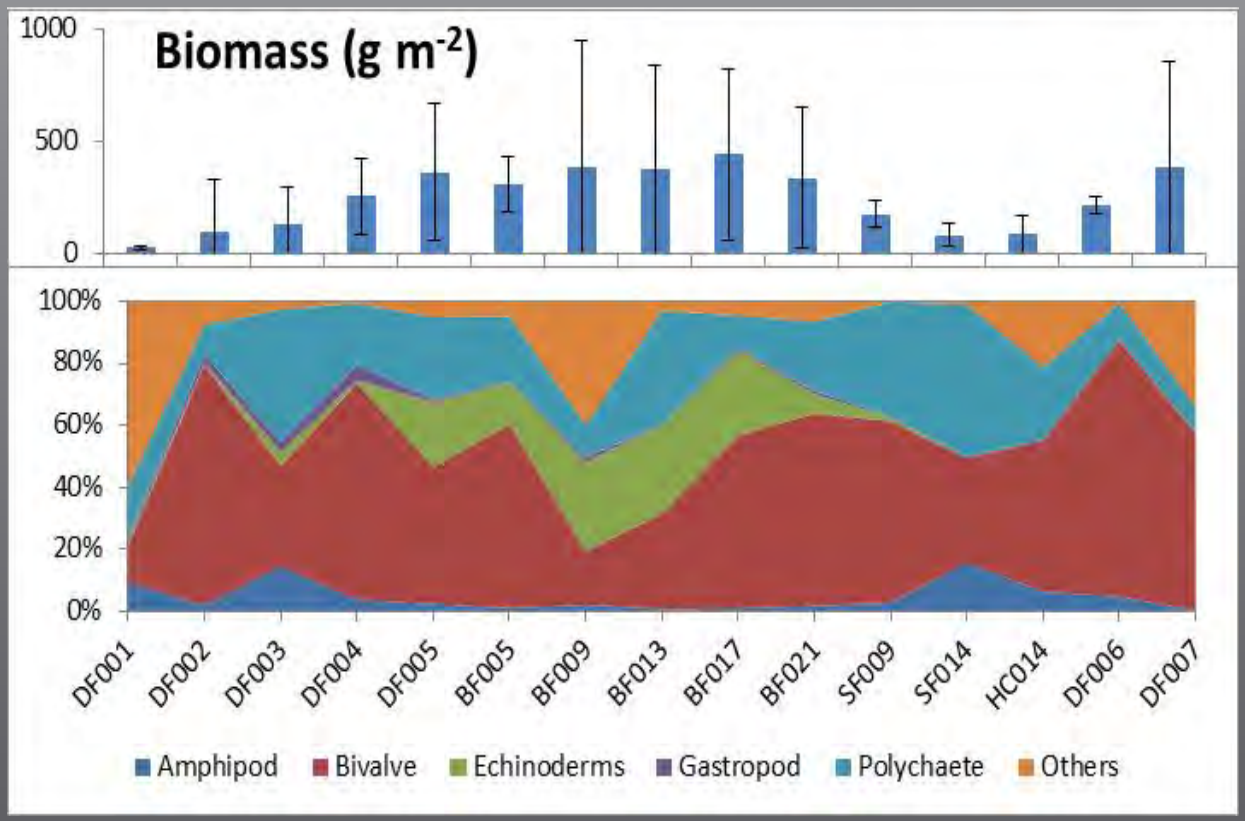
ACW = Alaska Coastal Water, BSW = Bering Sea Water, MW = melt water, WW = winter water

At seafloor:

- Colder & more saline waters offshore
- Warmer, fresher waters nearshore

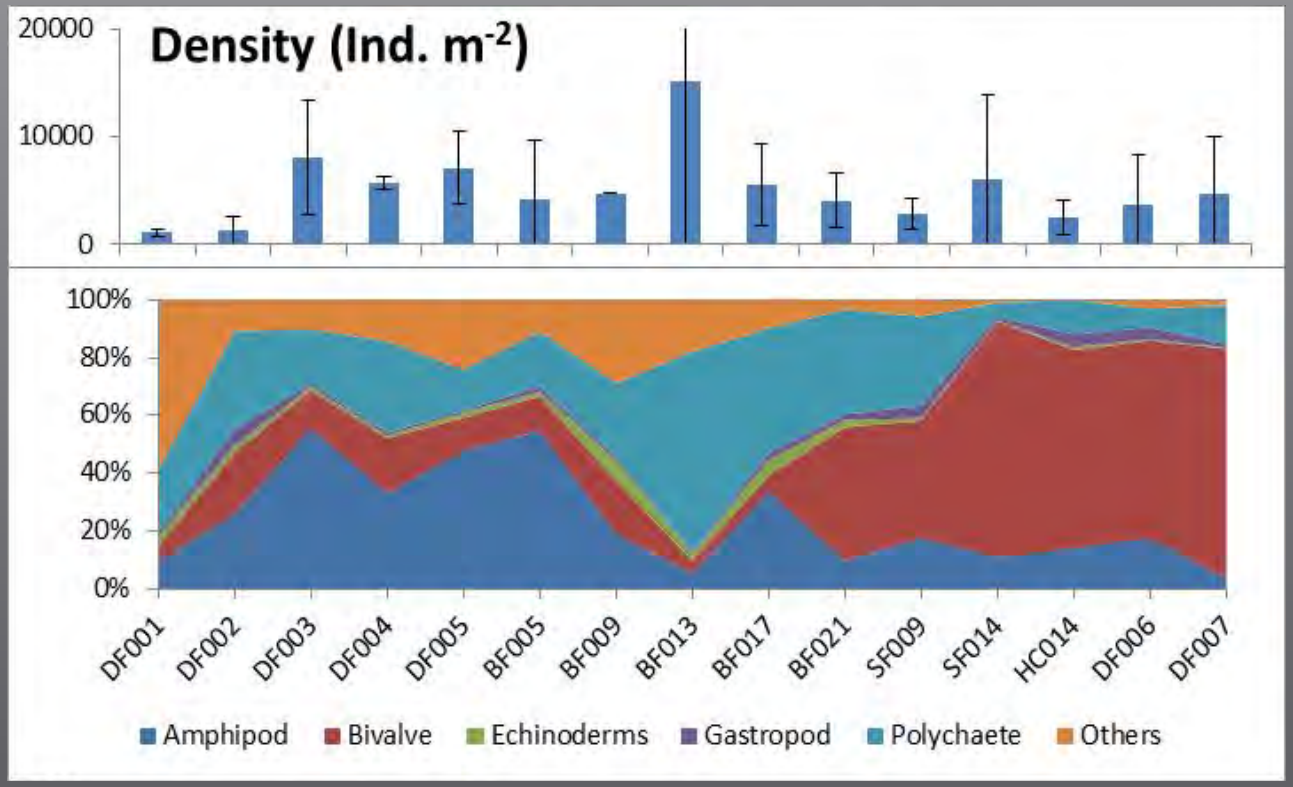
DBO-4 Line Benthic Biomass

- Strong spatial gradient:
  - Low nearshore (DF001) and high offshore.
  - Bivalves with high biomass throughout.



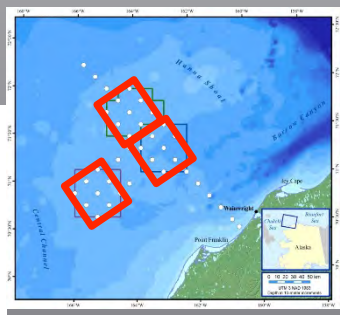
DBO-4 Line Benthic Density

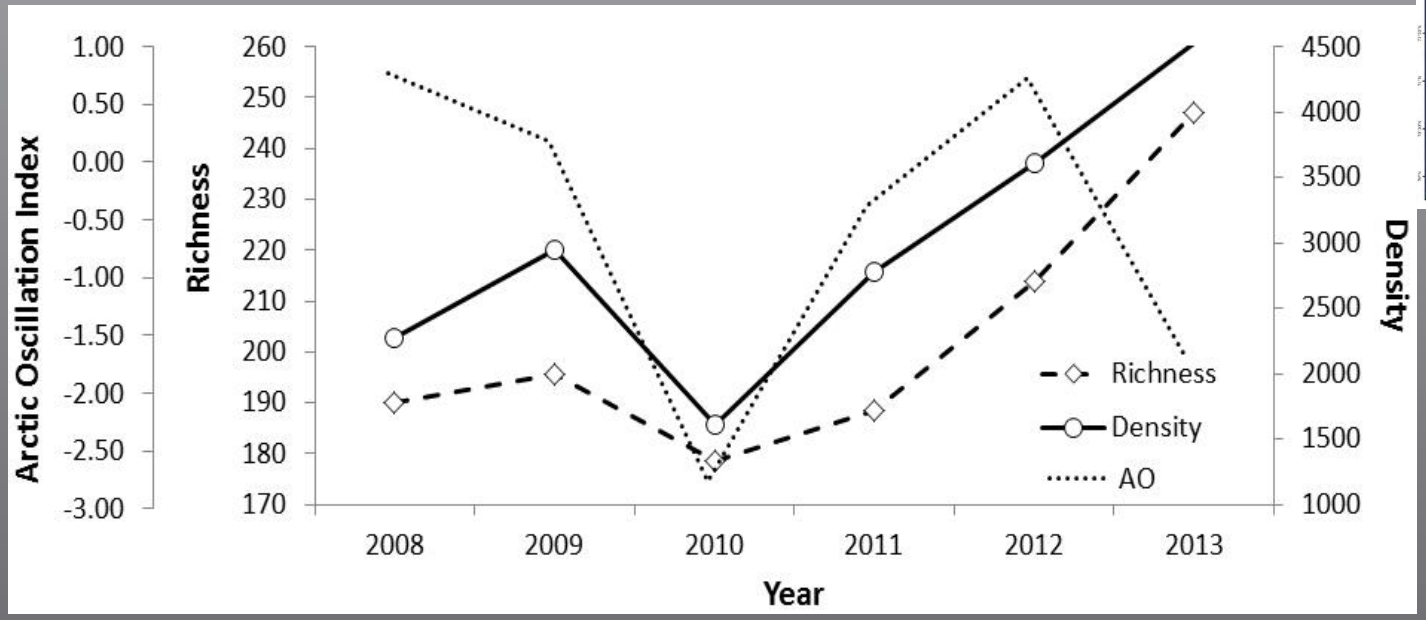
- Strong spatial gradient:
  - Low density nearshore (DF001) and high offshore.
  - High amphipod density inshore and bivalve density offshore.



Physical/Biological interactions

- Average benthic density of 9 repeatedly sampled stations in the CSESP study area vs. the Arctic Oscillation index (Nov-March).
- Average richness vs. winter AO.



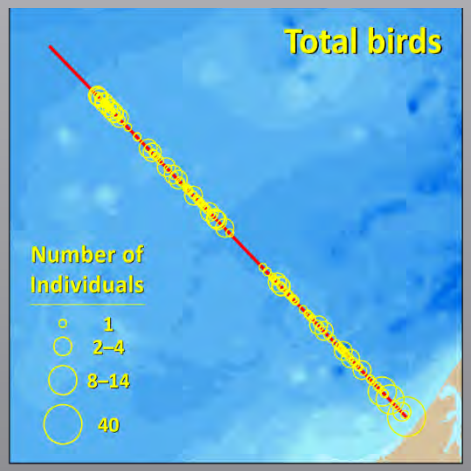


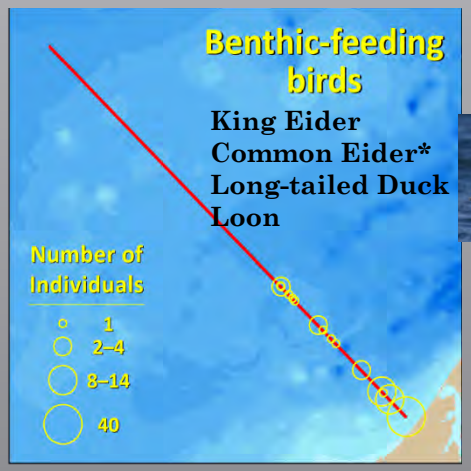
From 2008 to 2012: r = 0.85 for density and r = 0.78 for richness

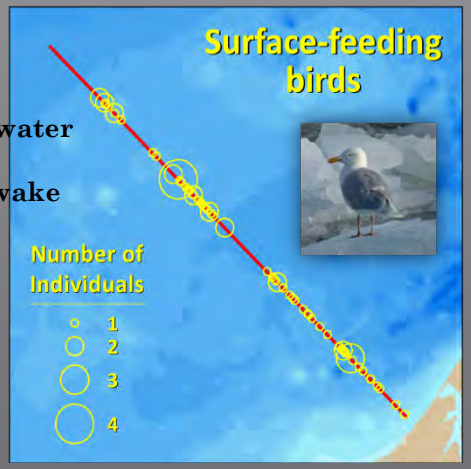
From 2008 to2013: r = 0.15 and r = -0.05.

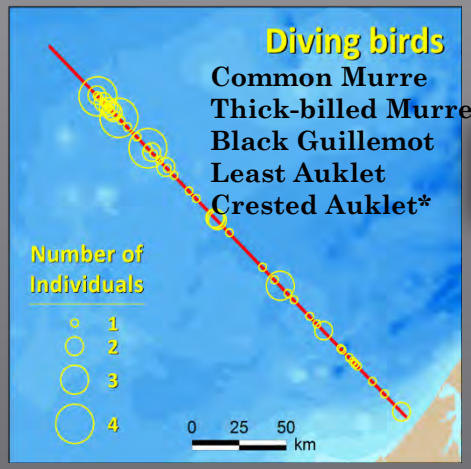
Association between benthic structure and water circulation evident elsewhere in NP.

DBO-4 Line Seabirds 2013





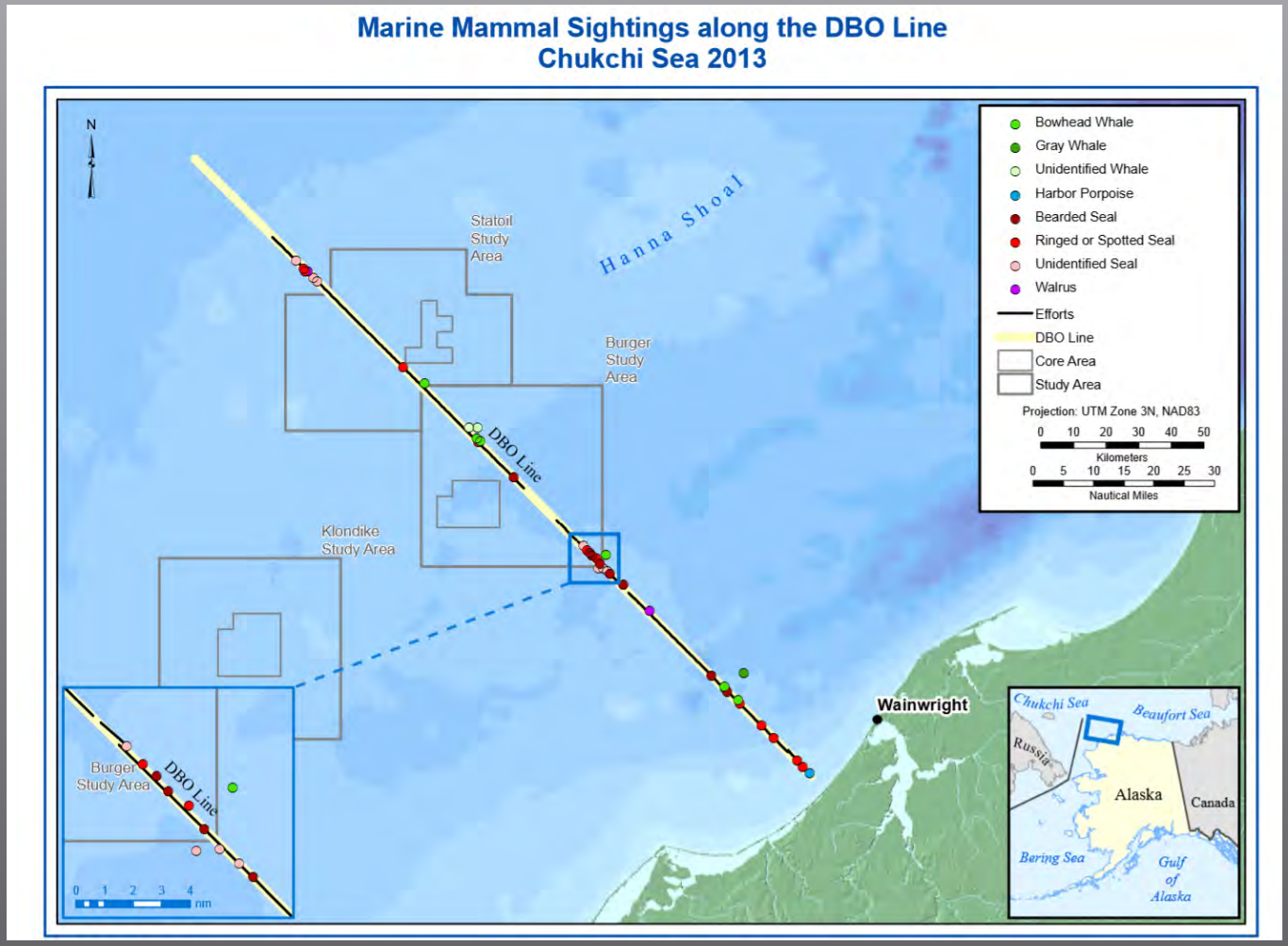




* = most abundant.

- Benthic-feeding birds most abundant nearshore and absent >100 km offshore.
- Surface-feeding birds occurred along most of the line.
- Diving birds more abundant offshore than nearshore.

DBO-4 Line Marine Mammals 2013



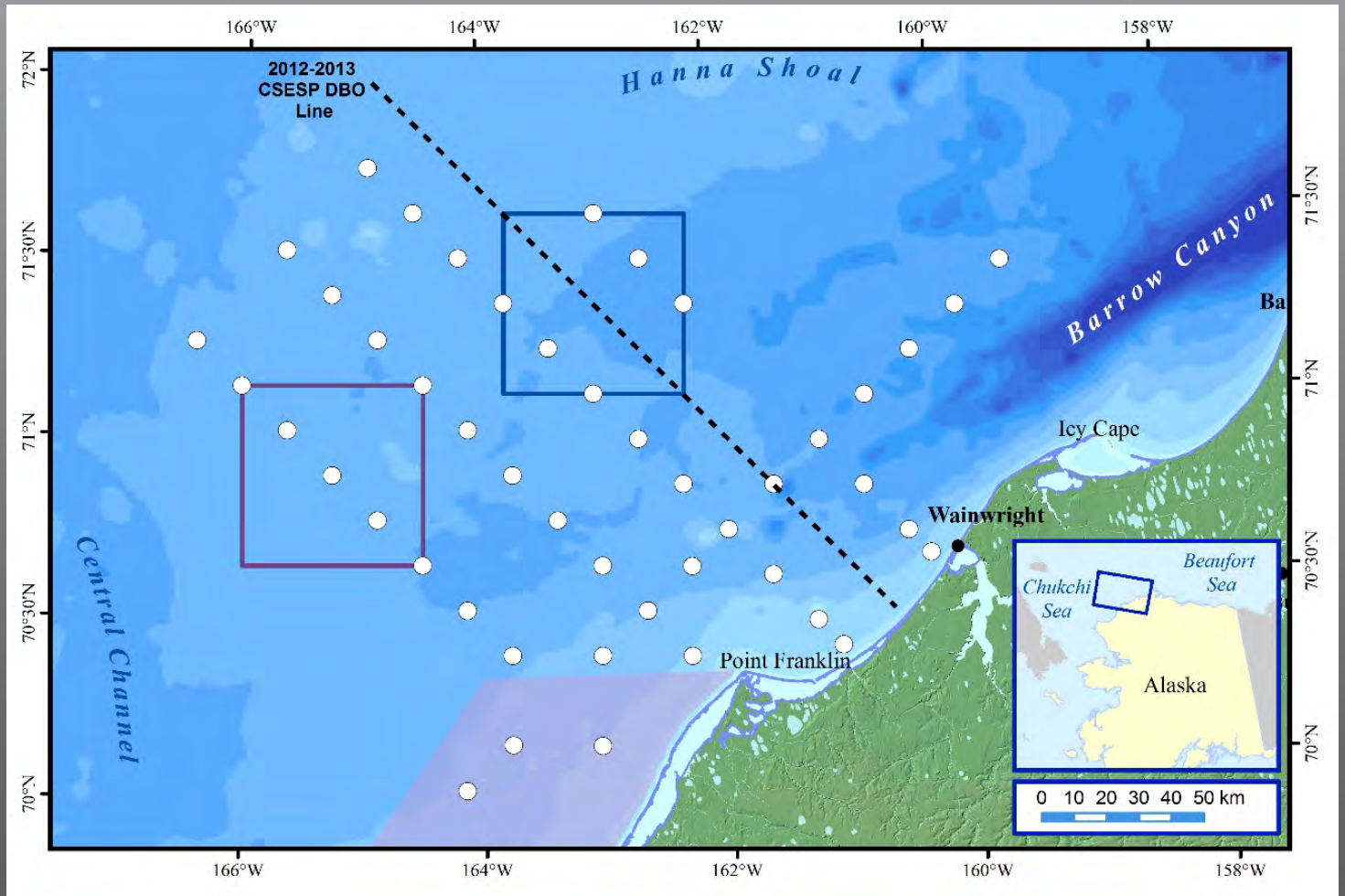
Summary

- As expected, distributions of benthic fauna, seabirds, and marine mammals reflect physical conditions (conclusions from CSESP & DBO).

- Benthic fauna reflect physical conditions.
  - Disturbance-tolerant isopods and nematodes predominate in shallow waters.
    - Effect of expected increased wave energy, disturbance, etc. in shallow water (15m) created strongest environmental/spatial gradient.
      - Major range extensions!
    - Bivalves and polychaetes offshore.
    - Same patterns for benthic in 2012, but less visible due to fewer sampling locations.

CSESP 2014

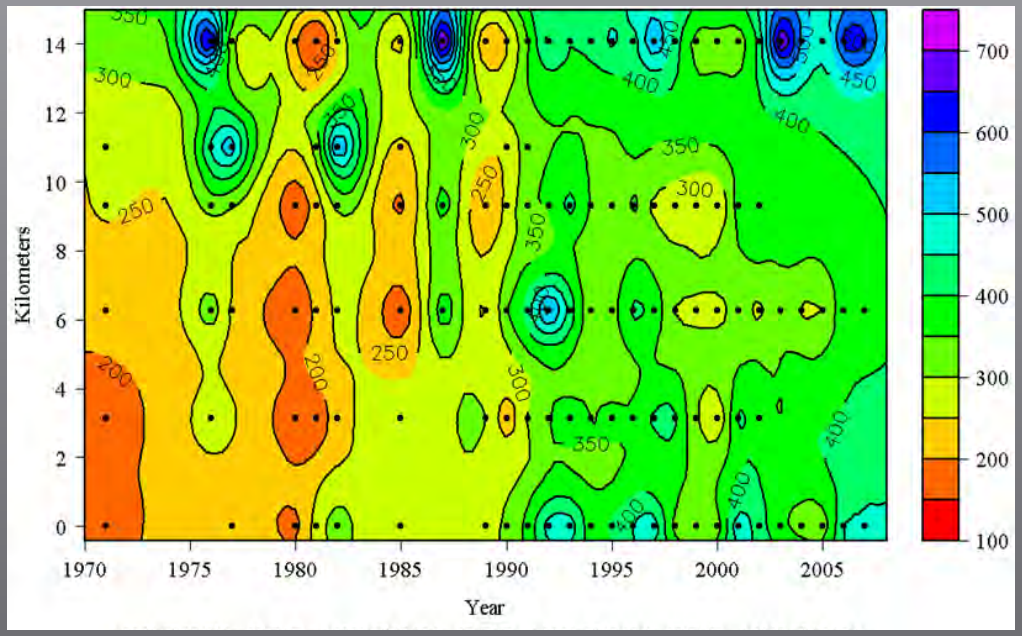
- Sampling extensively nearshore.



Seeds for thought: Focusing on the long-term

Design for long-term analyses

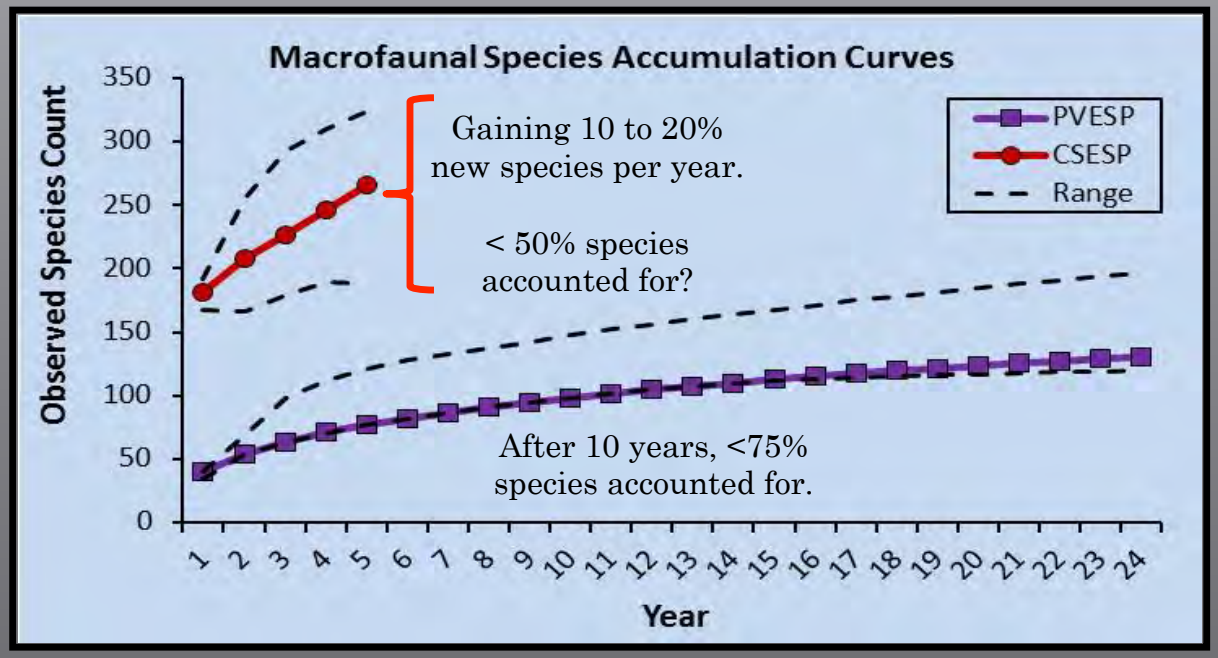
Port Valdez benthic density 1971-2007.



Now a 40+ year database!

Inferences from this data for any 5-year "window" will be misleading.

Seeds for thought:
Focusing on the long-term
Making conclusions with limited data



Don't be in a hurry to publish.
Account for uncertainties.

Seeds for thought: Focusing on the long-term
Standardize methods

- Expecting multiple investigators to sample same locations within a year, many players.
- Incompatible data can result from:
  - Changing equipment.
  - Changing labs.
  - Etc.
- Develop standardized methods, taxon lists, etc. to increase data usability.

  e.g., Blanchard lab working on reconciliation of macrofaunal taxonomy across whole of Alaska's coastal waters.

Find out more about the Chukchi Sea Environmental Studies Program (CSESP) at:

www.chukchiscience.com