

# SSC Feb 2023 Workshop Day 1 Readout

Session 1: What do we know about the current state and near-term future environmental / ecological states of the northern Bering Sea and southern Chukchi Sea?

# Key indicators of change

## Physical Oceanography & Lower Trophic Levels

- Increased flow, heat flux, positive temperature anomalies northward.
- Salinity shifts and subsequent cold pool variability
- Sea Ice timing, extent, persistence
- Shifting bloom timing → phytoplankton spp (smaller) leading to shift in food chain length (less efficiency and lower benthic flux.
- Spatial variability in aerial spring bloom magnitude
- Functional diversity of epibenthic inverts shift from sessile → crawler → swimmer
- Infaunal biomass reduction south and northerly increase

# Key indicators of change

## Upper Trophic Levels

- Seabird movement based on spp specific prey needs (fish vs plankton; copepods vs euphausiids)
- Mass mortality events
- Seal body condition decline/low pup survival
- Bowhead overwintering distribution
- Cold water fish species distribution/density
- Groundfish total consumption increased in warm years (K!)

# Data/information/knowledge gaps

- Incorporation of TEK/Indigenous Knowledge
- OA impacts on ecosystem productions and specific species
- Presence of or changes in hypoxic conditions
- NBS/Chukchi phytoplankton/zooplankton species comp (size) ~ temperature during Spring-Fall. How will total production be affected.
- Euphausiid abundance (prey resource)
- Functional diversity of epibenthic invertebrates prior to 2009 to understand relative magnitude of current change

# Data/information/knowledge gaps

- Seabird starvation events cause unknown
- Disconnect between feeding success and seal pup haulout requirements.
- Carrying capacity (K) in NBS for commercial fish
- Predation pressure and recovery of NBS ecosystem
- Temp thresholds and tolerance for juv, adult fish, lower trophic levels
- Movement (distributional shifts – rates - connectivity GOA/EBS/NBS/Chukchi)
- Role of Chukchi Sea as summer habitat for juvenile & adult fish (Pasture or sink?)
- Potential of northern Bering Sea to provide suitable spawning habitat and juvenile nursery habitat for commercial species?

# Unmet Monitoring Needs

- Nutrient fed spring bloom (currently persisting but...)
- Sea-ice characteristics (thickness) effects on cold pool
- CytoBot imaging for seasonal/spatial variability
- Sediment traps to track interannual pelagic-benthic coupling
- Ships of opportunity to collect seabird/marine mammal data
- Community data collection (seabird/marine mammal mortality events, seabird production, hunter conditions and samples)
- Nearshore sampling for juvenile fishes

# Tools to develop

- Assessment of community sustainability
- Communication with northern Indigenous communities and Co Management entities (Ice Seal Committee)
- Euphausiid collection methods
- eDNA (phyto, zoop, infauna/epifauna)
- Mooring imaging
- Temperature tolerance of infauna/epifauna species
- DNA bar coding...seabird diets in non-breeding season

# Questions

- What scale of information is needed to track non-stationary production, shifting boundaries, and changing species interactions?
- Can/should we track indices of K?
- How would we have monitored the NBS and Chukchi ecosystem(s) to catch the 2019 heat wave effects?
- How should we be monitoring the current “recovery” of stocks and ecosystems?
- How do we more effectively identify bottlenecks?