An aerial photograph showing a vast expanse of the Arctic Ocean covered with numerous ice floes of various sizes and shapes. The ice floes are white and light blue, floating on a dark blue sea. The perspective is from a high angle, looking down on the ice field.

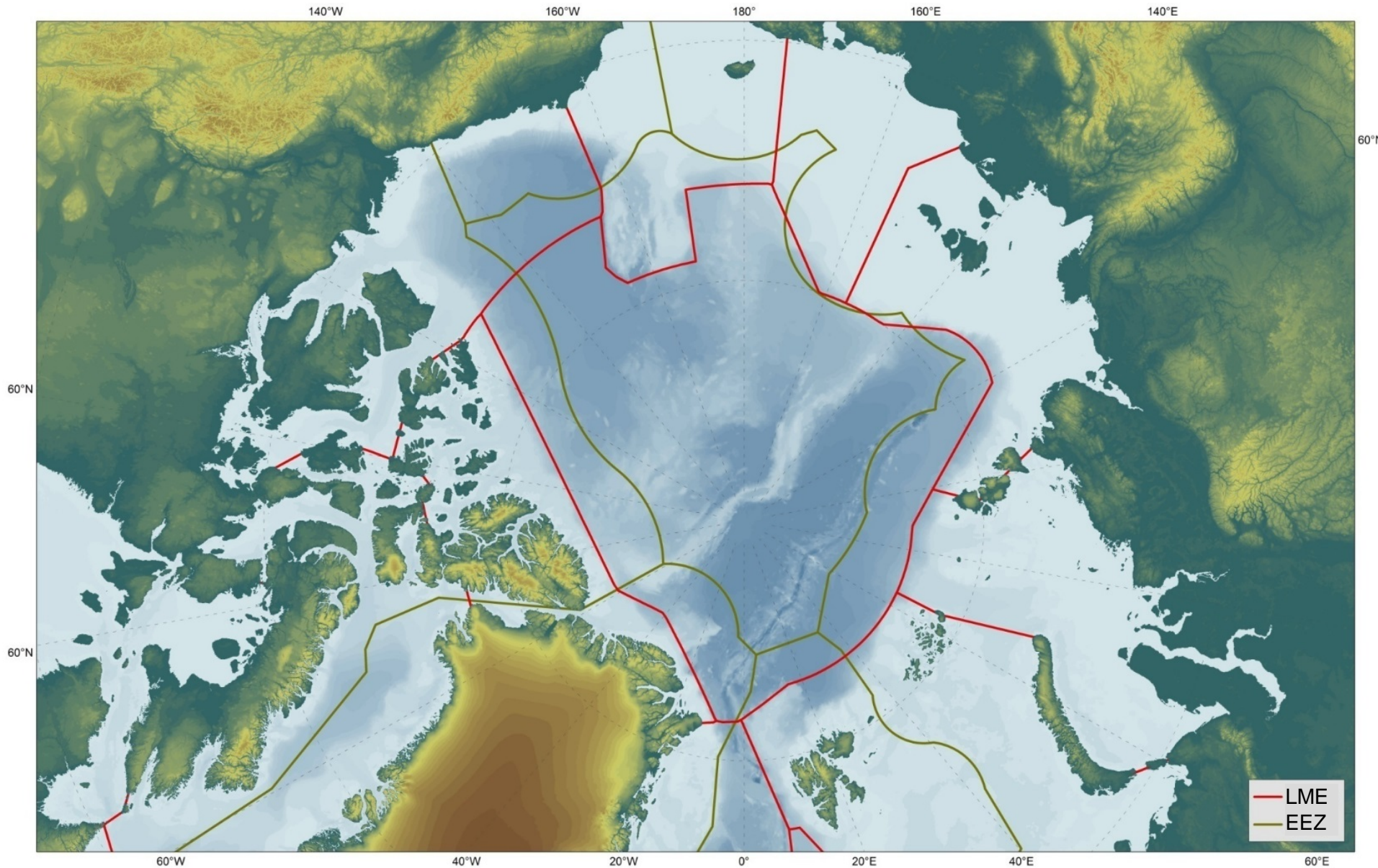
# **ICES/PICES/PAME Working Group on Integrated Ecosystem Assessment for the Central Arctic Ocean (WGICA)**

John Bengtson, NMFS, NOAA, Seattle, USA

Hein Rune Skjoldal, IMR, Bergen, Norway

Sei-ichi Saitoh, Hokkaido University, Japan

# Large Marine Ecosystems (red) and Territorial Boundaries (green) of the Central Arctic Ocean



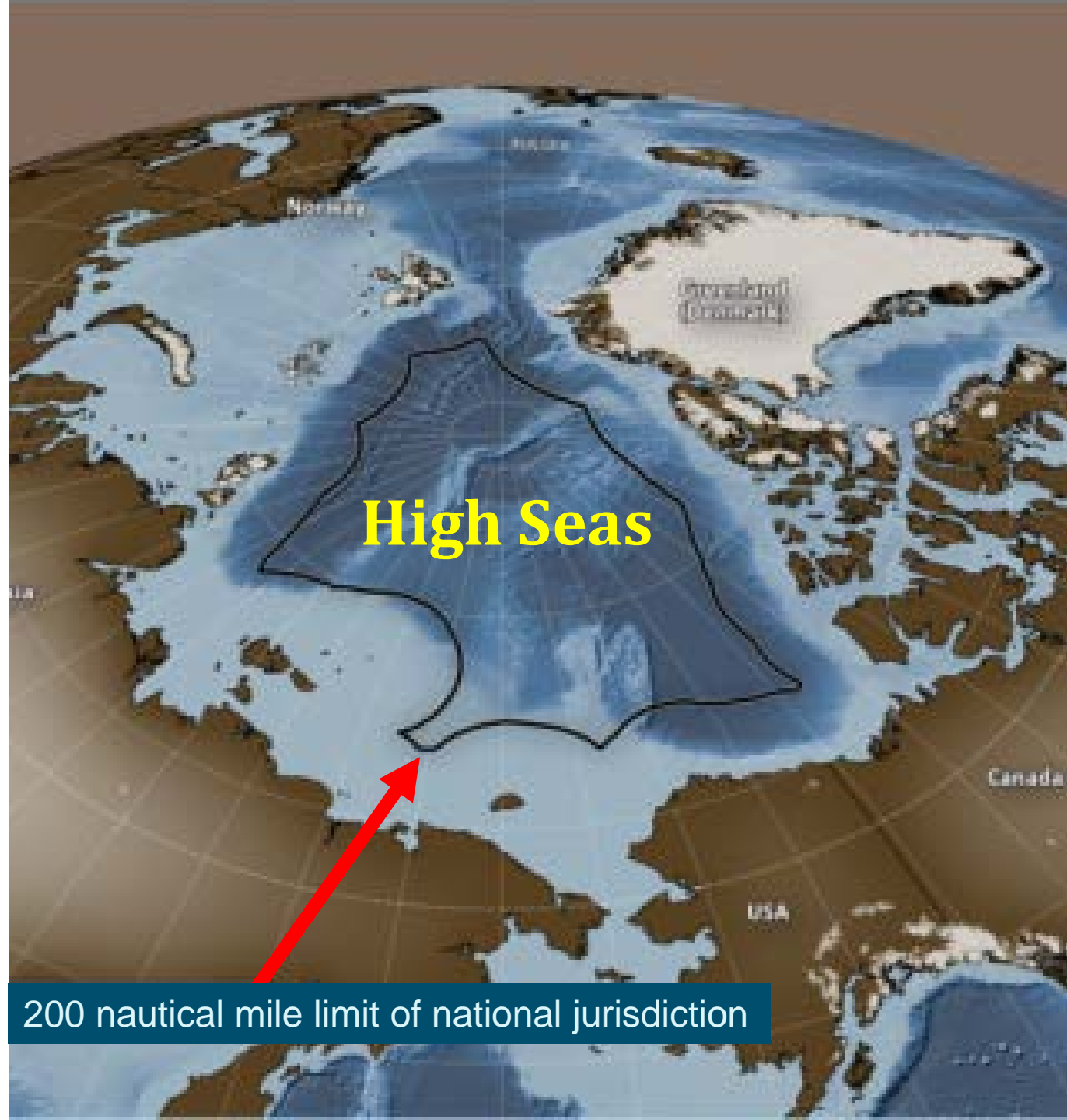
“Agreement to prevent  
unregulated high seas  
fisheries in the Central  
Arctic Ocean”  
(November 2017)



Support for the CAO  
agreement from a  
precautionary,  
**ecosystem approach**



Integrated  
Ecosystem Assessment  
&  
Joint Program of  
Scientific Research and  
Monitoring

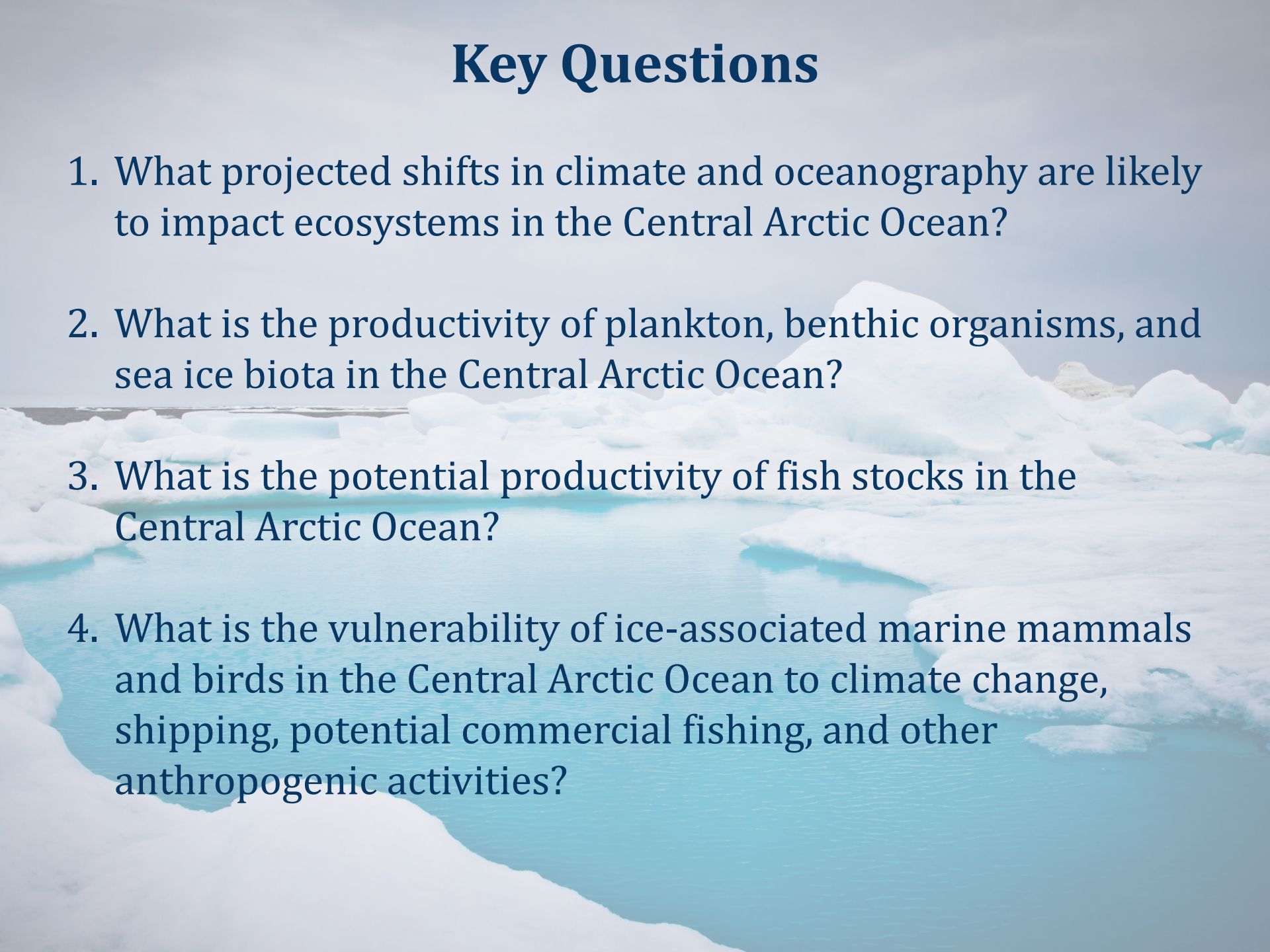


200 nautical mile limit of national jurisdiction

# WGICA Terms of Reference

- Approach and methodology for doing an IEA
- Assemble data and information, carry out appropriate analyses
- Prepare an IEA for the current status of the CAO ecosystem
  - Productivity – phyto- and zooplankton
  - Fish stocks – potential production, abundance
  - Vulnerability – to anthropogenic and natural impacts  
(Sea ice biota, plankton, benthos, fish, marine mammals, birds)
- Requirements and design of future research and monitoring
- Identify priority research issues

# Key Questions

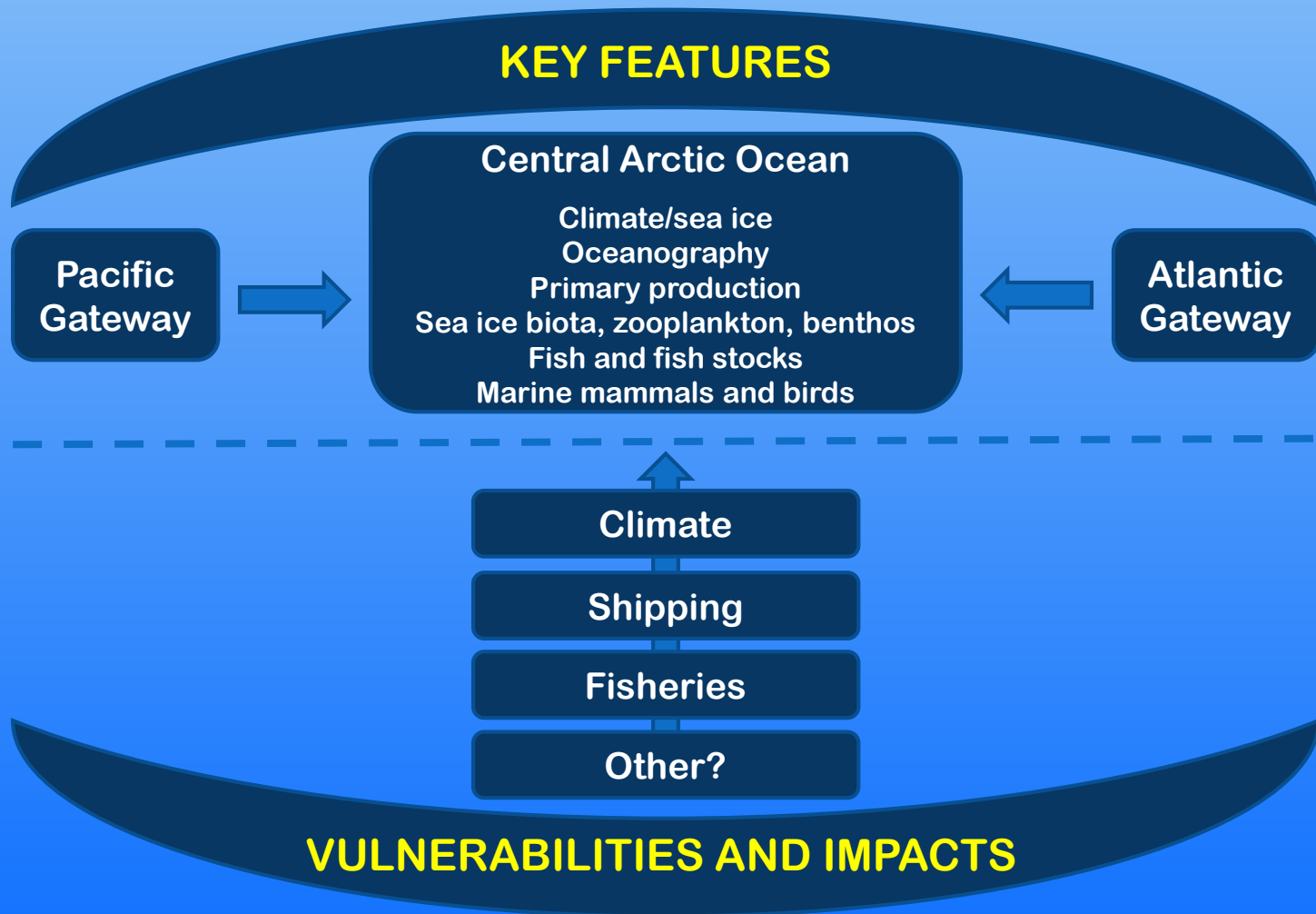
1. What projected shifts in climate and oceanography are likely to impact ecosystems in the Central Arctic Ocean?
  2. What is the productivity of plankton, benthic organisms, and sea ice biota in the Central Arctic Ocean?
  3. What is the potential productivity of fish stocks in the Central Arctic Ocean?
  4. What is the vulnerability of ice-associated marine mammals and birds in the Central Arctic Ocean to climate change, shipping, potential commercial fishing, and other anthropogenic activities?
- 
- A photograph of a vast, icy Arctic landscape. The foreground and middle ground are filled with numerous ice floes of various sizes, some appearing as large, rounded blocks and others as smaller, more irregular pieces. The ice is a bright, clean white, contrasting sharply with the deep, clear blue of the water between the floes. The background shows a flat horizon line under a pale, overcast sky, suggesting a wide, open expanse of the ocean. The overall scene is serene and cold, capturing the essence of the Arctic environment.

# Ecosystem Approach Framework

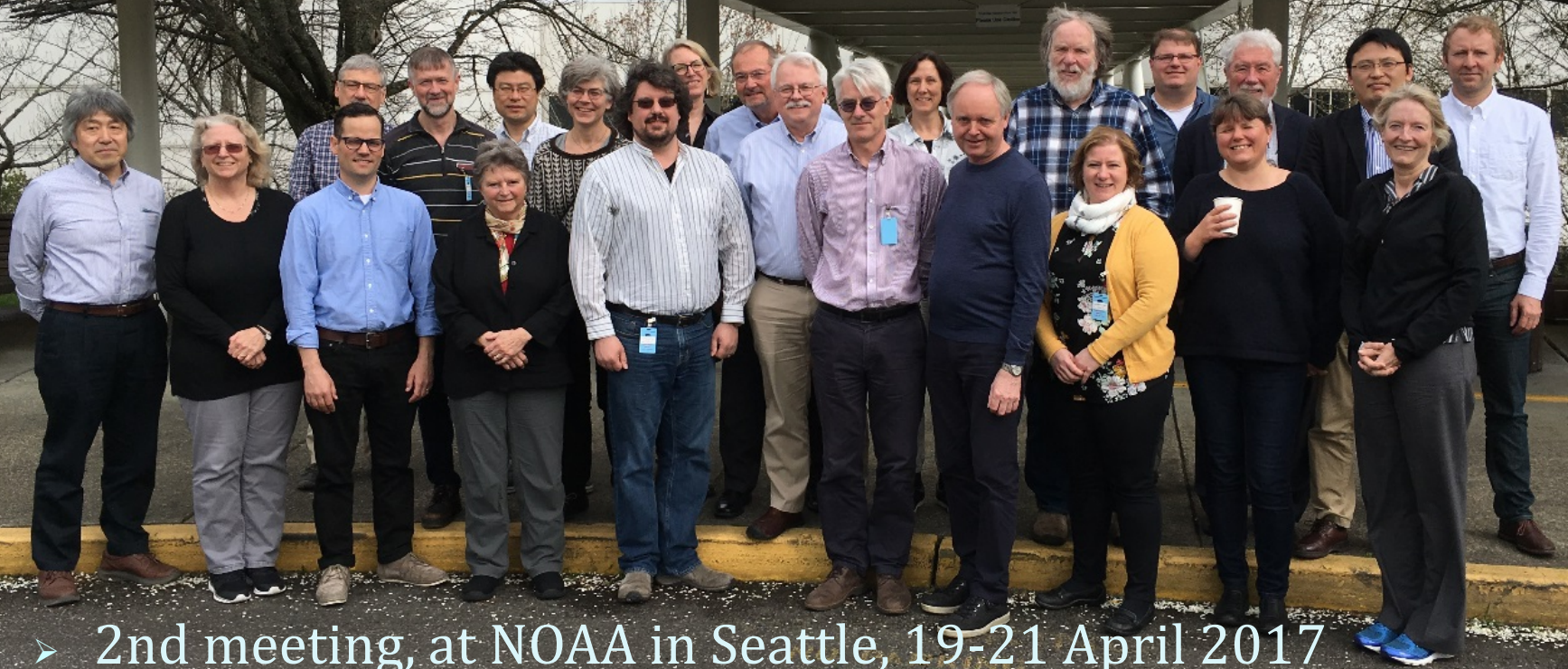
- **Define** the ecosystem
- **Describe** the ecosystem
- **Set** ecological objectives
- **Assess** the ecosystem (IEA)
- **Value** the ecosystem
- **Manage** human activities



# Integrated Ecosystem Assessment



# WGICA 2017



- 2nd meeting, at NOAA in Seattle, 19-21 April 2017
- 23 persons from four countries (Canada, Japan, Norway, U.S.A.)
- Report available



# Summary of 2017 Meeting

## Progress since 2016 meeting

- Focal areas for IEA:
  - Amerasian Basin/Pacific Gateway
  - Eurasian Basin/Atlantic Gateway
  - Central Arctic Ocean
  - High seas basins plus relevant slopes and shelves
- Arctic fisheries: new fisheries agreement, links to FiSCAO
- CAFF/CBMP – State of Arctic Marine Biodiversity Report (SAMBR)

## Ecosystem description (emphasis on key characteristics)

- Descriptions of key features, seasonal aspects, climate linkages, and conceptual models for:
  - Climate and sea ice
  - Oceanography
  - Primary production
  - Sea ice biota/zooplankton, benthos
  - Fish and fish stocks
  - Marine mammals and birds

# Summary of 2017 Meeting

## Climate, oceanography and sea ice

- Changing Arctic climate and sea ice
- “Great Melt” – including a climate assessment in the CAO IEA
  - Loss of 75% of summer ice in recent decades
  - Loss of 50% area coverage, 50% thickness
  - Effects on plankton, sea ice biota, fish, mammals & birds

## Primary production (literature review)

- Limiting factors for primary production
- Light conditions
- Nutrients



# Summary of 2017 Meeting

## **Fish and fish stocks**

- Arctic fishes and fish in the CAO – overview
- Occurrence/distribution of fish in the Arctic Ocean
- Polar and Arctic cod
- Acoustic data from Swedish icebreaker ‘Oden’

## **Ecosystem vulnerability (strategic impact assessment)**

- Sources of potential impacts to ecosystem
  - Climate
  - Shipping
  - Commercial fisheries
  - Other impacts
- Sea ice biota, plankton, benthos
- Marine mammals & seabirds – overview
  - Polar bear – several subpopulations
  - Ringed seal, bowhead whale, beluga, narwhal
  - Ivory and Ross’ gulls



# Next Steps

An aerial photograph of a river with several salmon swimming in the water. The river is surrounded by large, light-colored rocks or ice floes. The water is dark, and the salmon are visible as bright spots in the water.

Prepare initial draft text  
on vulnerabilities (April 2018)

Assemble first version  
of IEA (April 2018)

# Next Steps

3<sup>rd</sup> WGICA meeting:  
24-26 April 2018  
St. John's, Newfoundland  
Canada





Thank you