Pacific Arctic Group 2019 Spring Meeting
May 23rd, 2019 (9:00 – 15:30)
Northern (Arctic) Federal University
Arkhangelsk, Russia

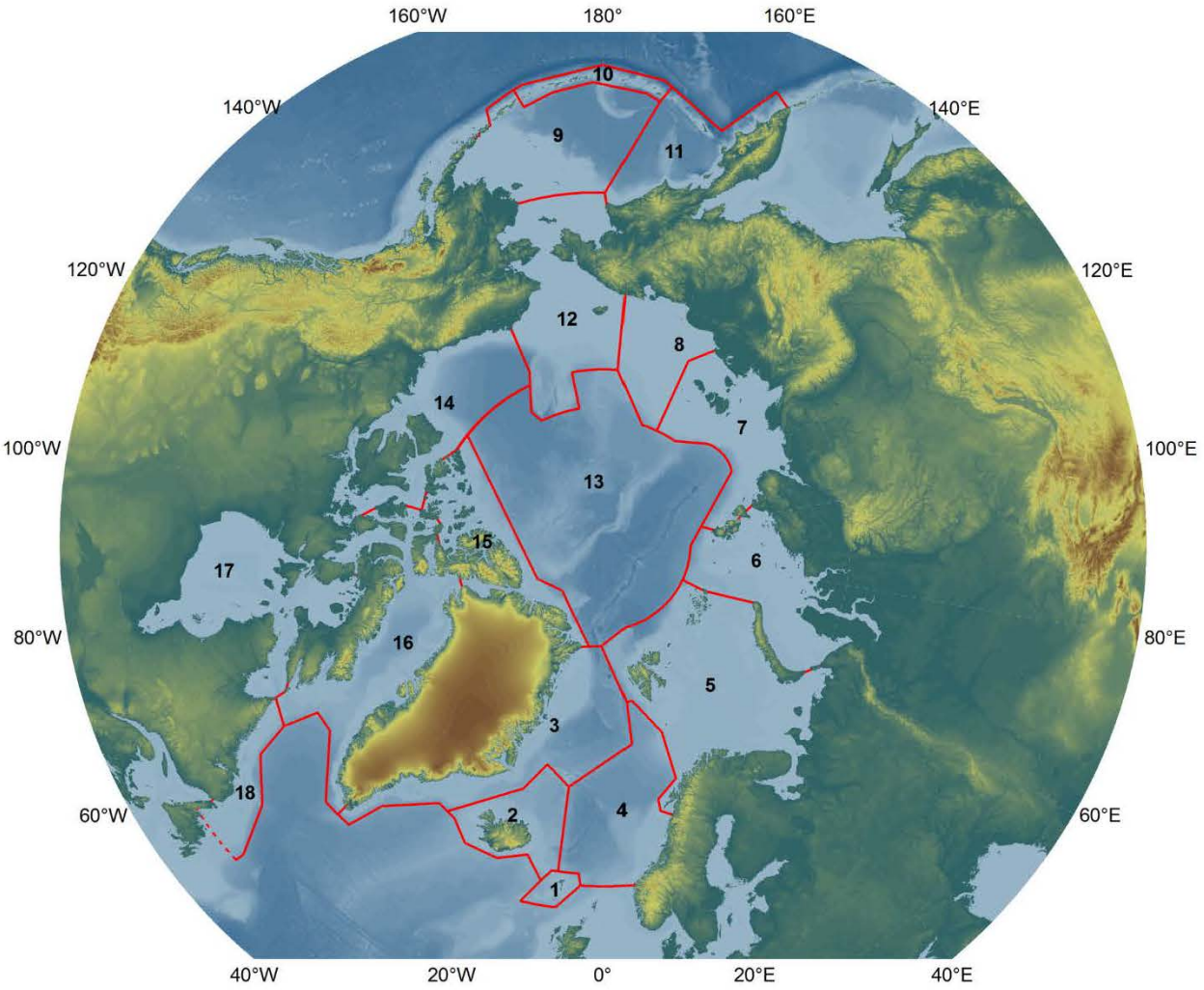
# 4th Meeting of the ICES/PICES/PAME Working Group on Integrated Ecosystem Assessment for the Central Arctic Ocean (WGICA)

8-10 May 2019
Hokkaido University
Sapporo, Japan

over 20 participants

# WGICA Co-chairs

The Working Group on Integrated Ecosystem Assessment for the Central Arctic Ocean provides integrated ecosystem assessments (IEAs), including ecosystem overviews, for the Central Arctic Ocean.



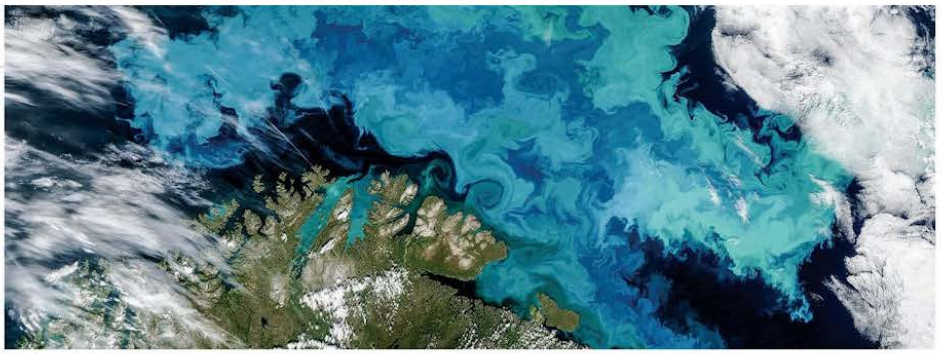
# Agreement to prevent unregulated high seas fisheries in the central Arctic Ocean

Hoag, *Science*, 2017

28-30 November 2017
@ Washington, D.C.

Agreement between USA, Canada, Russia, Norway, Denmark, China, Japan, Korea, Iceland and EU

No commercial fishing in the High Sea in the coming 16 years



In a boon for fish stocks, the Barents Sea last year saw a steep rise in photosynthesis by phytoplankton (blue-green bloom above) and other organisms.

PHOTO: JEFF SCHMALTZ/WIKIMEDIA COMMONS

CLIMATE CHANGE

## *Nations put science before fishing in the Arctic*

Historic fishing ban gives scientists time to probe ecology as northern waters warm

*By* **Hannah Hoag**

Nine nations and the European Union have reached a deal to place the central Arctic Ocean (CAO) off-limits to commercial fishers for at least the next 16 years. The pact, announced last week, will give scientists time to better understand the region's marine ecology—and the effects of climate change—before receding sea ice opens the way to widespread fishing.

"There is no other high seas area where we've decided to do the science first," says Scott Highleyman, vice president of conservation policy and programs at the Ocean Conservancy in Washington, D.C., who was part of the U.S. delegation involved in the negotiations. "It's a great example of putting the precautionary principle into action."

The deal to protect 2.8 million square kilometers of international waters in the Arctic was reached after six meetings over 2 years. The parties include the five nations with Arctic coastlines—Canada, Denmark (representing Greenland), Norway, Russia, and the United States—and others that have fishing fleets interested in operating in the region.

Thus far, thick ice and uncertain fish stocks have kept commercial fishing vessels out of the CAO, but the region is becoming increasingly accessible. In recent summers, as much as 40% of the CAO has been open water, mostly north of Alaska and Russia, over the Chukchi Plateau.

As the summer sea ice becomes thinner and its edge retreats northward, more sunlight is penetrating the water, increasing production of plankton, the base of the Arctic food web. These sun-fed plankton are gobbled up by Arctic cod, which in turn are hunted by animals higher up the food chain, including seals, polar bears, and humans. Some parts of the Arctic Ocean's adjacent seas, such as the Barents Sea (off the northern coasts of Russia and Norway), saw steep increases in primary production—photosynthesis by plankton and other organisms—in 2016, approaching 35% above the 2003 to 2015 average, according to the U.S. National Oceanic and Atmospheric Administration.

Farther north, the state of fish stocks in the CAO is unknown, but existing international law does not prohibit fishing there. Some researchers, environmental groups, and policymakers fear unregulated commercial fishing in the CAO could harm the fragile and rapidly changing marine ecosystem. In the late 1980s, fishing trawlers from Japan, China, and elsewhere crowded the international waters in the Bering Sea between Russia and the United States and removed millions of tons of pollock. By the early 1990s, the pollock population had crashed. It has still not recovered, says David Benton, a member of the U.S. Arctic Research Commission on Admiralty Island in Alaska.

In 2012, some 2000 scientists called for a fishing moratorium in the CAO to prevent a similar catastrophe. Their efforts were a success: By 2015, five Arctic nations vowed to bar their own fishing vessels from the area. But the moratorium left the area open to other large global fishing fleets. Later that year, delegations from other fishing nations—Japan, China, South Korea, and Iceland—as well as the European Union joined the discussions to negotiate a broader new agreement. "The delegations saw the wisdom in waiting [to start commercial fishing] until there was enough science and management in place," says David Balton, deputy assistant secretary for oceans and fisheries at the U.S. Department of State in Washington, D.C., who has chaired the negotiations since 2015. The deal will stand for 16 years, and will renew automatically every 5 years after that unless a country objects or until science-based fisheries quota and rules are put in place.

In addition to closing the area to fishing, the delegations have agreed to a research and monitoring program to identify species, their abundance, predator-prey relationships, and the pressures they face, including climate change. It hasn't been worked out yet how the program would be funded and managed, Balton says.

For now, reaching the CAO to study its marine ecology requires significant icebreaking capacity, says Peter Harrison, an Arctic policy and fisheries expert at Queen's University in Kingston, Canada, and former deputy minister of Canada's Department of Fisheries and Oceans. Although the United States and Canada have struggled to maintain and expand their icebreaking fleets, other signatories, including China, have that capacity.

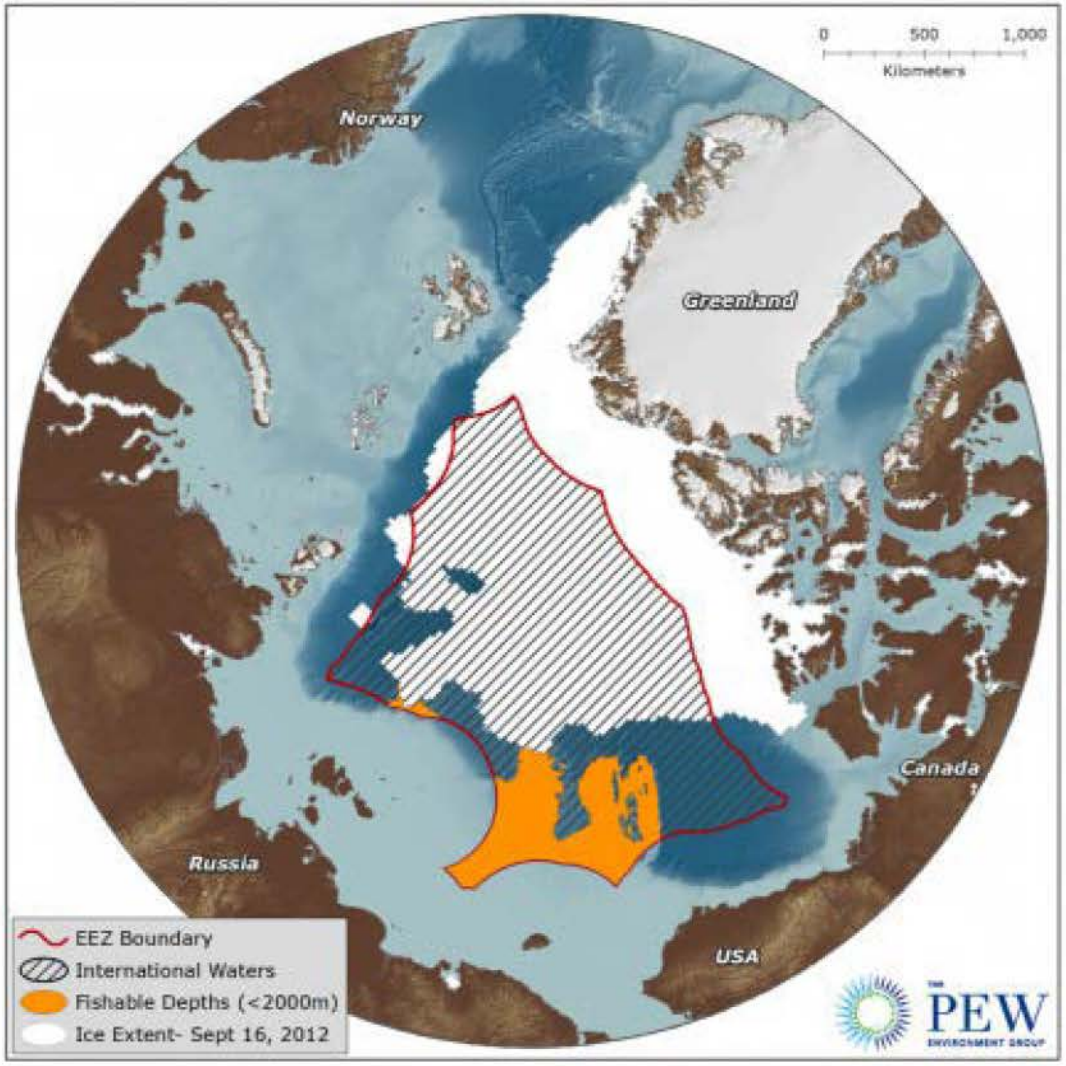
Harrison argues that the signatories should create a new multinational science organization focused on the CAO. It could set science priorities, share and analyze the data collected, and provide advice on the state of the CAO's fish stocks. "If you say commercial fishing will not take place until there is sufficient science, going forward, the science will play a very significant role," he says. ■

*Hannah Hoag is a science journalist in Toronto, Canada.*



Published by AAAS

# Fishable area in the Arctic international waters



# Review of new Terms of References (ToRs) for 2019-2021

a: Review and consider approaches and methodologies for conducting an IEA of the CAO ecosystem.

b: Review and report on ongoing and recent changes and events in the CAO ecosystem associated with changes such as in sea ice, oceanographic circulation, and hydrographic properties.

# Review of new Terms of References (ToRs) for 2019-2021

c: Continue to examine effects of climate change on the CAO ecosystem by compiling and reviewing information on changes in response to the ongoing 'Great melt', and assess likely consequences to the CAO ecosystem of projected future changes associated with further loss of sea ice and other climate-related changes (i.e. a climate impact assessment).

# Review of new Terms of References (ToRs) for 2019-2021

d: Assess the consequences of recent and ongoing climatic and oceanographic changes on transport pathways (physical and biological) and potential effects of contaminants in the CAO ecosystem.

e: Review and report on new studies on fish as well as other biological components of the CAO ecosystem.

# Review of new Terms of References (ToRs) for 2019-2021

e: Continue to identify priority research needs and monitor how identified knowledge gaps (needed to improve IEA and management effectiveness) are being addressed and filled.

f: Prepare an Ecosystem Overview for the CAO ecosystem.

a task requested from ICES

Provides a description of the ecosystems, identify the main human pressures, and explain how these affect key ecosystem components.

# *Wednesday, 8 May – Day 1*

## Ongoing and recent changes and events in the CAO ecosystem (ToR b)

- Climate, oceanography and sea ice
- Pacific gateway, SAS
- Primary production
- Zooplankton and ice biota
- Fish
- Birds
- Marine mammals

*Thursday 9 May – day 2*

**Climate change and effects on the CAO ecosystem (ToR c)**

**Approaches and methodologies for IEA (ToR a)**

**Initial consideration of how to address contaminants and pollution in the CAO (ToR d)**

# *Day 2 Summary*

- 3 items
  - ToR c – climate
  - Tor a – approach and methodology
  - Tor d – pollution
- 2nd IEA CAO Report – 2021
  - Climate
  - Pollution
  - Shipping
  - Fisheries

# Climate impact assessment

- Large changes in sea ice conditions last 3 decades – 'big melt'
- What have the biological and ecological consequences been?
- Plankton, ice biota, fish, birds, mammals
- What is documented in published literature?
- What can be inferred?
- Cooperation – AMAP climate experts, CAFF CBMP

# Approach and methodology

- Time series data – sea ice oceanography
- Remote sensing – optical properties, production characteristics
- Modelling – 3D circulation, 1D production
- Literature review and summaries

# Contaminants and pollution

- Expertice in the group
- Cooperation – AMAP pollution experts, ICES WGBEC (Working Group on Biological Effects of Contaminants)
- Pathways
- Concentrations
- Effects
- Plastic
- Ocean sound
- EIA (Environmental Impact Assessment) /EIS (Environmental Impact Statement), PAME

## *Friday 10 May – day 3*

**New studies on fish and other components of the CAO ecosystem (ToR e)**

**Ecosystem overview for the CAO - initial planning (ToR f)**

**IEA CAO final report**

- Contents
- Time line

# *Integrated Ecosystem Assessment of the Central Arctic Ocean: Ecosystem description and vulnerability characterization*

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## *1. Ecosystem description*

Geography and topography
Climate, oceanography and sea ice
Algae – phytoplankton and ice algae (including limiting factors for growth, and primary production)
Microorganisms
Zooplankton and sea ice (invertebrate) fauna
Benthos
Fish
Birds
Mammals

## *2. Vulnerability characterization*

# *Integrated Ecosystem Assessment of the Central Arctic Ocean: Ecosystem description and vulnerability characterization*

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- ***Time line***

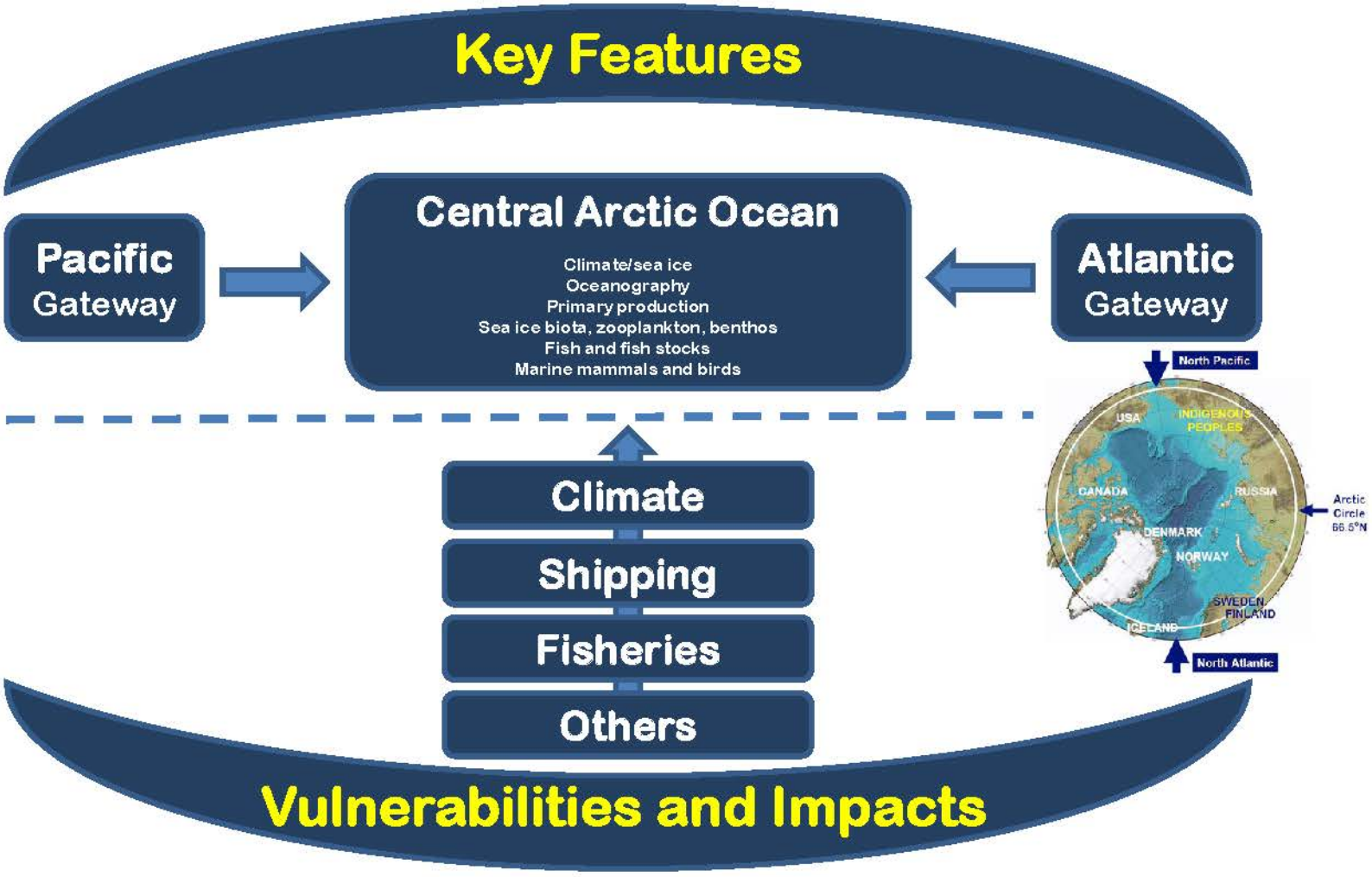
End of June – Draft of the report will be completed

Mid-August – Internal reviews

1 September – Final draft of the report ready for submission to ICES for final technical editing with external reviews

November – The report will be published

# Integrated Ecosystem Assessment of the Central Arctic Ocean



# Vulnerability Characterization – linkages between activities/pressures and ecosystem components

Focal Ecosystem Components in the Central Arctic Ocean

Elements of Assessment

| | Ringed seal | Spits Bowhead | Polar bear | Ivory gull | Ross' gull | Polar cod | Greenland halibut | Plankton phy zoo | Sea ice biota | Benthos |
|---|---|---|---|---|---|---|---|---|---|---|
| Fishing | | | | | | | | | | 2,2,2,2 |
| Shipping | 2,2,2 | | | 2, 3 | | | | | | |
| POPs/Hg | | | | 3, 3 | | | | | | |
| Temp | | | | | | | | | | 2,2,2,2 |
| Ice | 3,3,3 | | | 3,3,3 | | | | | | 2,2,2,2 |
| Snow | 3,3,3 | | | | | | | | | |
| Currents/ fronts | | | | | | | | | | |
| Salinity | | | | | | | | | | |
| O2 | | | | | | | | | | 2,2,2,2 |
| pH | | | | | | | | | | 3,3,3,3 |
| Invasives | | | | | | | | | | |

**Assessing the cumulative effects of different stressors affecting focal ecosystem components of the Central Arctic Ocean.**

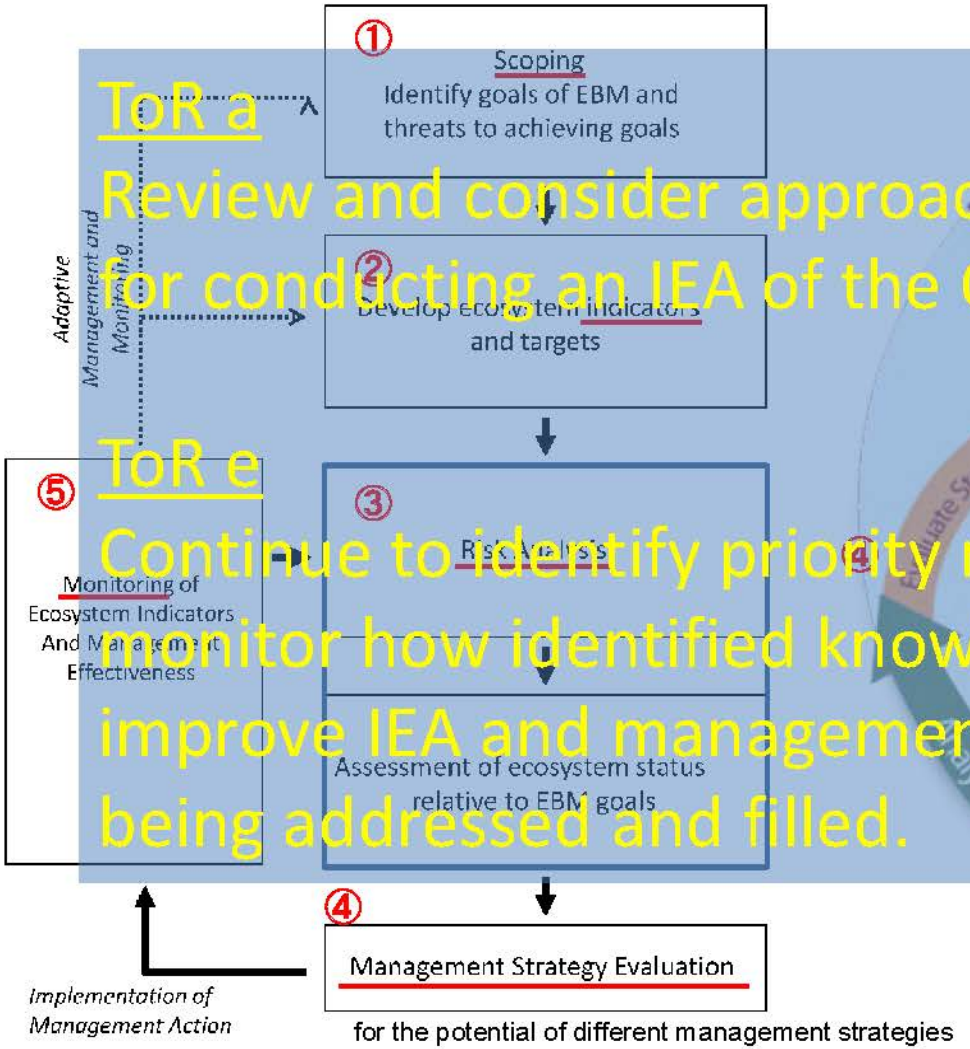
Colors indicate changes in abundance, distribution, biomass, phenology, species composition

1=low impact 2=moderate effect 3=major effect

From Lisa Speer [3rd WGICA Meeting]

# Various approaches of IEAs

Five-Step Process of IEA




Levin *et al.* [2009; PLoS Biol]

NOAA IEA Approach


[NOAA IEA webpage]

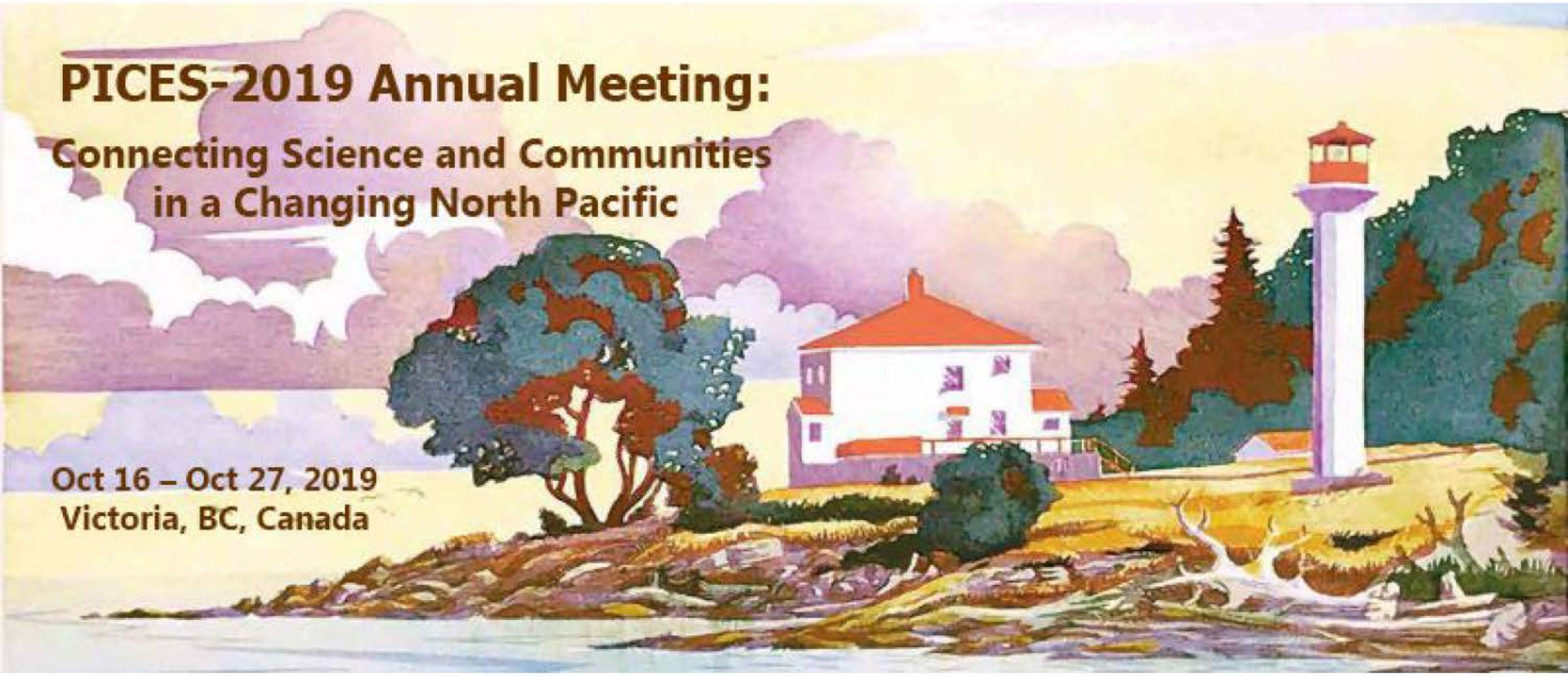
ToR a

Review and consider approaches and methodologies for conducting an IEA of the CAO ecosystem.

ToR e

Continue to identify priority research needs and monitor how identified knowledge gaps (needed to improve IEA and management effectiveness) are being addressed and filled.

# IEA session (S8) and workshop (W17) @ PICES-2019




**W17: BIO Workshop, Convened by Libby Logerwell (NOAA)**

Scoping an IEA of the Northern Bering-Chukchi Seas LME

October 16, 09:00-12:30 and 14:00-18:00

**S8: FIS/BIO/POC Topic Session, Convened by Alan Haynie (NOAA)**

Creating more effective Integrated Ecosystem Assessments (IEAs) in PICES Countries

October 24, 10:50-12:50, 14:00-16:00, and 16:20-18:00