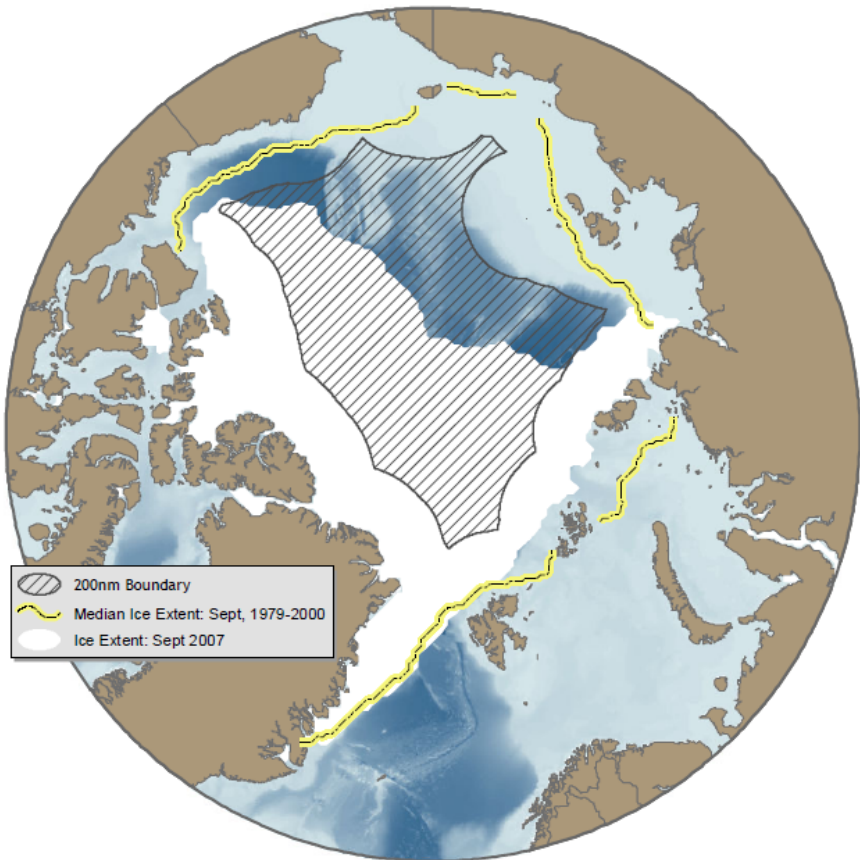
A photograph of an Arctic landscape. In the foreground, several large, white icebergs float in the dark blue water. A small white boat with a red stripe is visible in the middle ground. The background shows a rugged, snow-covered mountain range under a clear sky. The text is overlaid on the top half of the image.

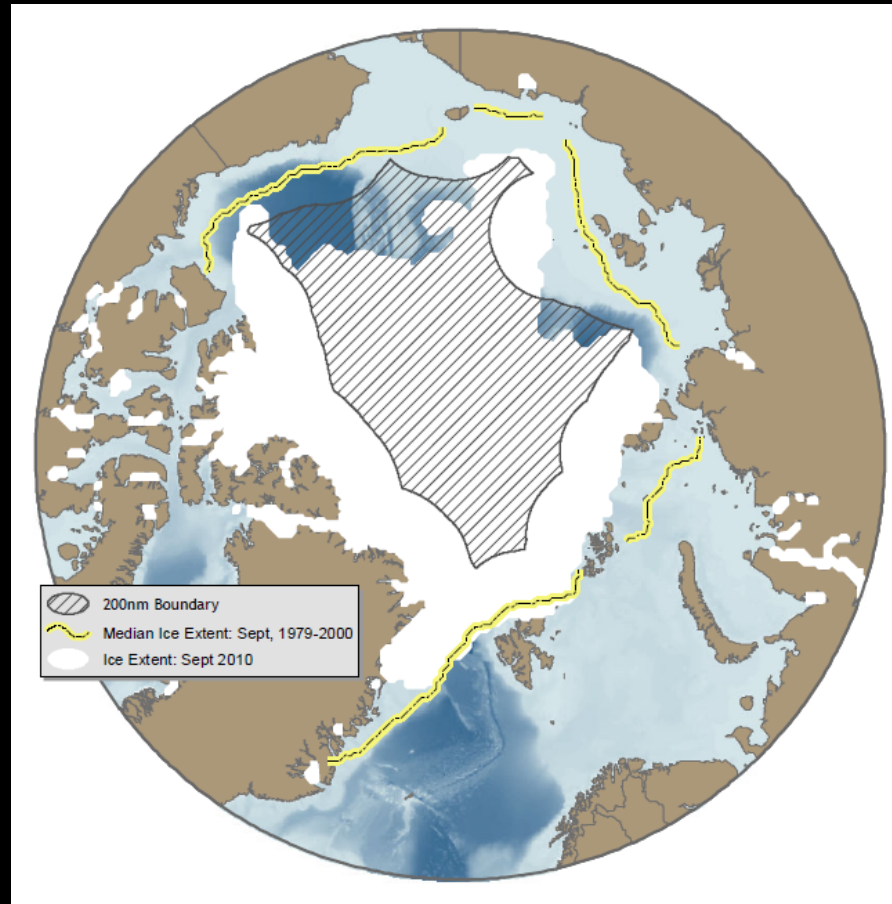
# Science, Management, and Fisheries in the Arctic Ocean Donut Hole: the case for an international agreement

*Henry P. Huntington, Raychelle G. Daniel, & Scott D. Highleyman  
Oceans North/Pew Environment Group*

# Open water, open fishing?



2007



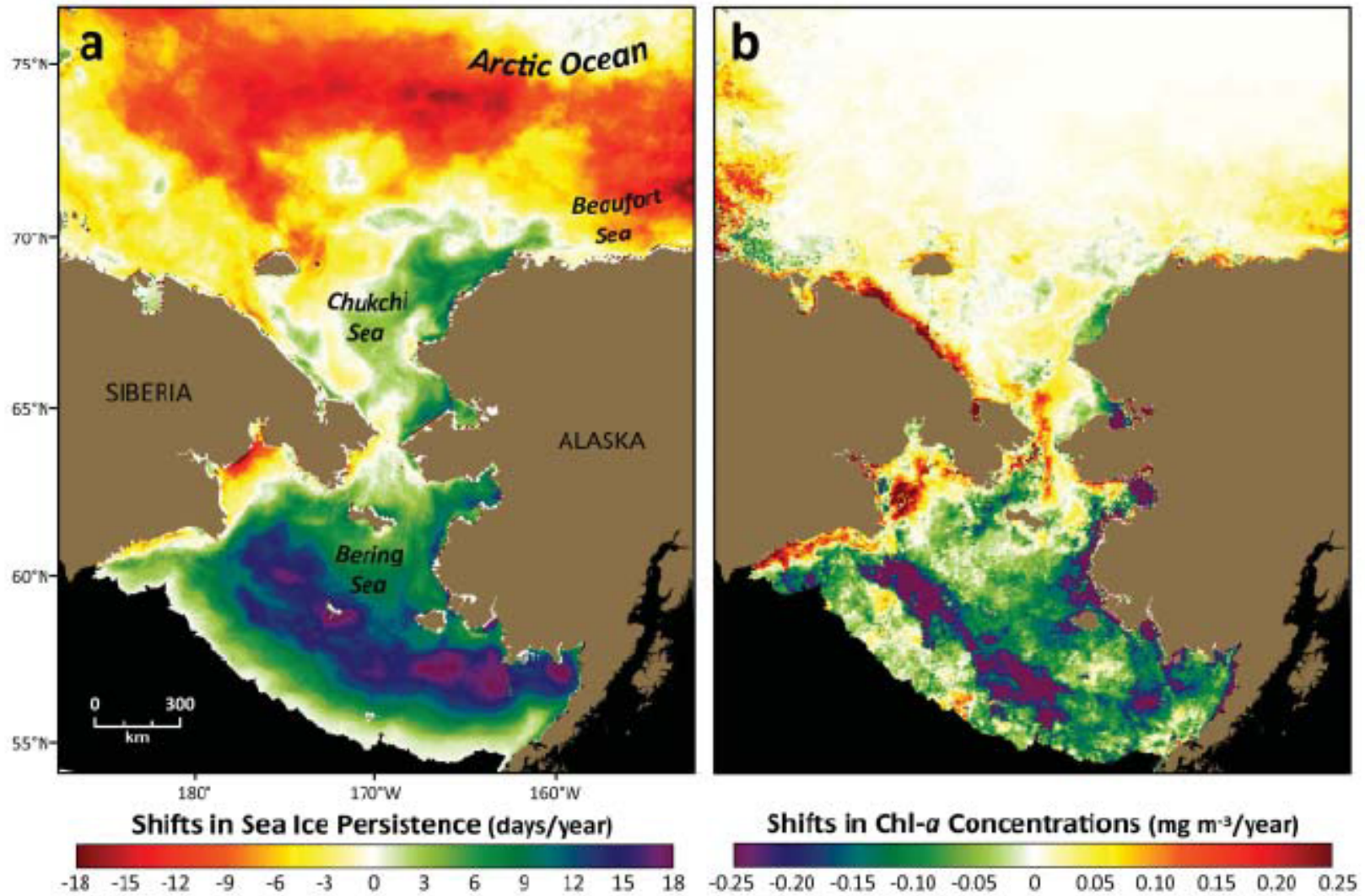
2010

International waters vs. summer sea ice minimum

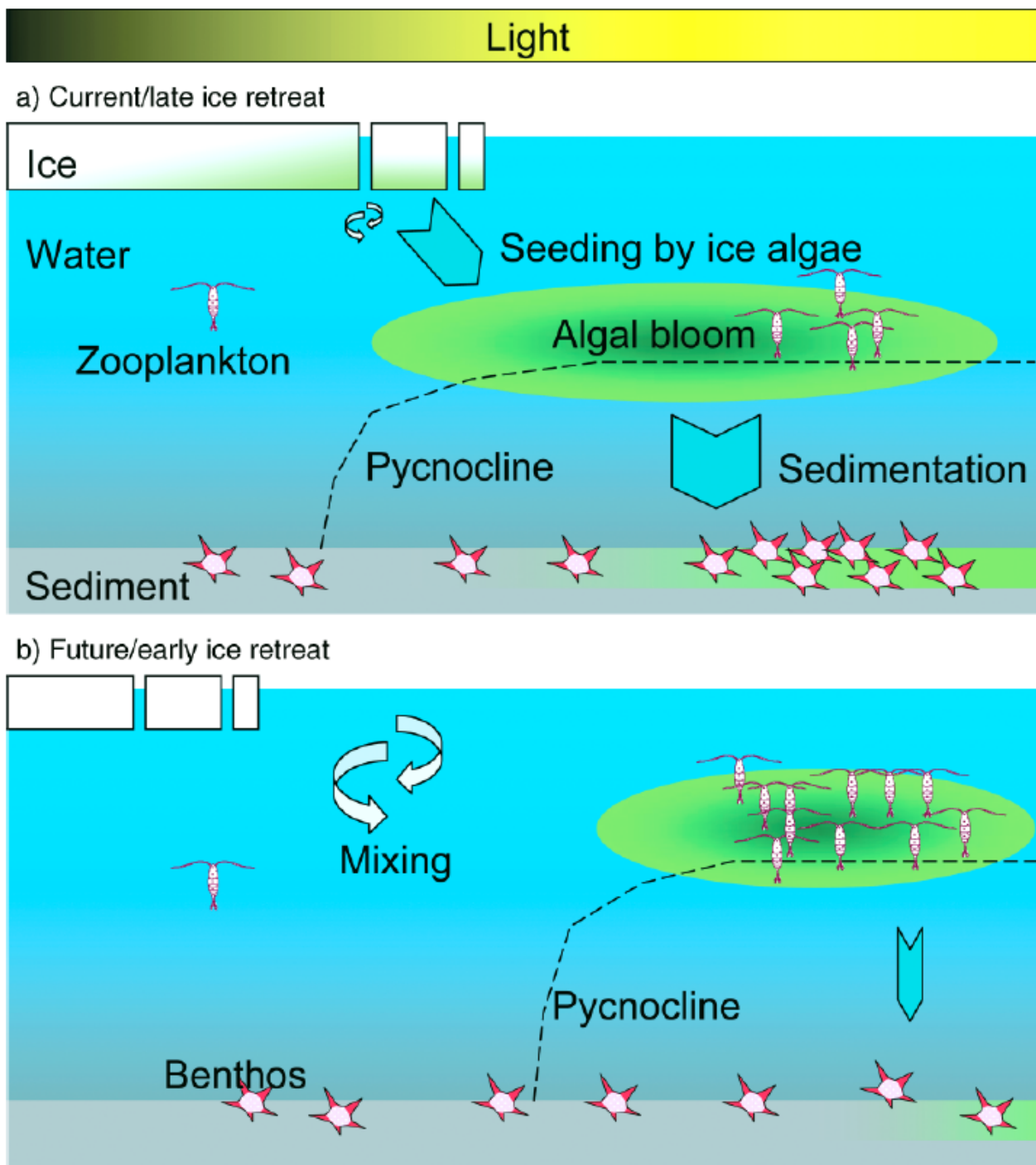
# Towards ecosystem management

Management Type	Description
Single-species management	Maintaining productivity of target species by managing fishery, with no consideration of other factors or ecosystem components
Implicit fishery ecosystem planning	Management of target species with some consideration of other factors
Explicit fishery ecosystem planning	Management of target species and a range of ecosystem services
Ecosystem-based fisheries management	Management of full range of fisheries impacts on an ecosystem
Marine ecosystem management	Management of full range of human impacts on an ecosystem

# Whither productivity?



*Grebmeier et al. 2010. EOS 91(18):161-168.*



# Whither Biota?

*Bluhm & Gradinger. 2008. Ecological Applications, 18(2): S77-S96.*

# Options for international action

- Arctic Peace Park

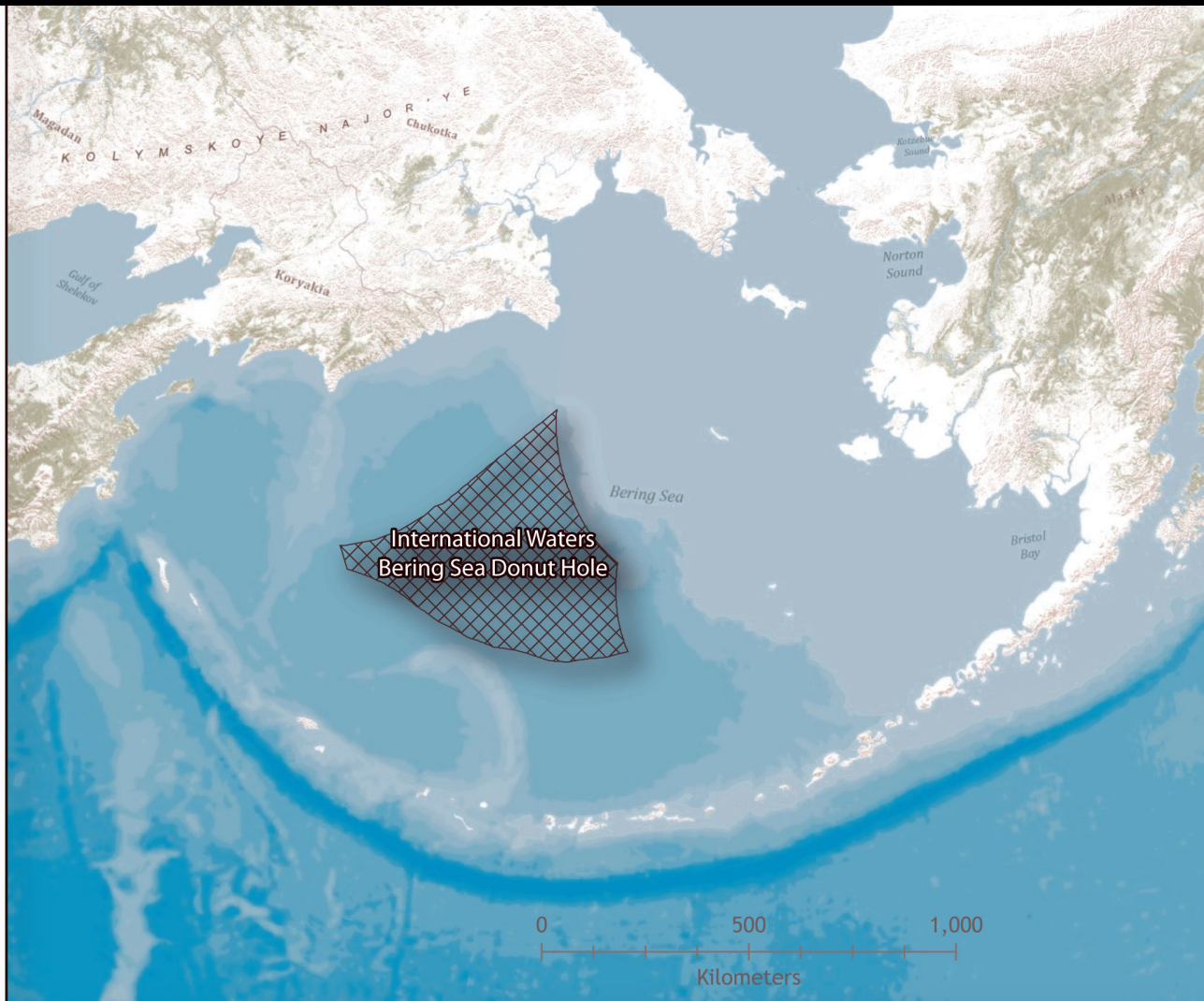


- Comprehensive International Agreement

- Expand existing RFMO
- New RFMO

- Long-term or permanent moratorium/ban on commercial fishing

# The Bering Sea Donut Hole: Precedent?



- Surrounded by EEZs
- International fleet
- Fishing already occurring
- Pollock stock declining
- Closure tied to pollock count in US waters

# Evaluation of options

	Park	Treaty	RFMO	Ban
<i>Protection vs. management?</i>	+	-	-	+
<i>Big or small?</i>	-	+	+	+
<i>Temporary or permanent?</i>	+	+	-	+
<i>Entanglement with o&amp;g/ext. cont. shelves?</i>	-	-	+	+
<i>Depth of likely support/opposition?</i>	-	-	-	+
<i>Enforcement prospects?</i>	+	+	+	+



# Next steps: Science

A large, white iceberg with a jagged peak floats in the middle of a vast, blue ocean. The sky is a clear, deep blue. The foreground shows the surface of the water with some ripples and a small amount of ice.

- Identify species present
- Conduct stock assessment for target species
- Assess interactions across EEZ boundaries
- Determine functional ecological relationships
- Evaluate impacts of climate change
- Collect time-series data to assess variability

# Conclusions

- The Arctic Ocean Donut Hole is opening up
- Ecosystem approaches require information
- The Arctic marine ecosystem is changing, with little fisheries data available
- International action is required to manage the Donut Hole
- An international ban on fisheries is focused and feasible, and should include a research program