Climate Change and Arctic Fisheries

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Outline: Climate Change and Arctic Fisheries

• Ecological and economic importance
• Ecosystem changes
• NOAA policies on Arctic fishing
Ecological and Economic Importance
Scale Matters: California is Small
U.S. Arctic and Subarctic

Subarctic-Arctic ecosystem boundary
Arctic Ecosystem (benthic dominant)

June 29, 2009

Gray whales

Walrus

Bivalves and amphipods
Subarctic Ecosystem (pelagic dominant)

- Humpback and fin whales
- Kittiwakes, murres, fur seals
- Forage species: Juvenile pollock, capelin, myctophids
- Pollock, cod, arrowtooth flounder
- Euphausiids and copepods
Bering Sea Fisheries

• 2 million metric tons annually

June 29, 2009
Alaska Feeds the Nation

Largest private sector employer in Alaska

US Domestic Commercial Fisheries

- Weight of catch (million metric tons)
- Categories: Rest of US, Alaska
U.S. Arctic Fisheries

- **Commercial**
  - None in EEZ waters
  - Possibly some personal use fishery sales in nearshore waters: red king crab, chum salmon, whitefishes

- **Subsistence**
  - Dolly Varden
  - Whitefishes
  - Arctic cod
  - Saffron cod
  - Sculpins

Several hundred tons annually (Arctic Ocean totals 12,800 t)
Subsistence Harvests Critical for Many Coastal Communities

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07B17, 856 cm, male; 9 October 2007
Barrow, Captain: Jonathan Aiken

Inuit whaling boat
Protected, Endangered & Threatened Species

- Bowhead Whales
- Right Whale
- Bearded seal
- Ringed seal
- Spotted seal
- Steller Sea Lion
- Ribbon seal
- Humpback Whale
Ecosystem Changes
Ice-Free Arctic Summers Likely Sooner Than Expected

April 2, 2009

Summers in the Arctic may be ice-free in as few as 30 years, not at the end of the century as previously expected. The updated forecast is the result of a new analysis of computer models coupled with the most recent summer ice measurements.

"The Arctic is changing faster than anticipated," said James Overland, an oceanographer at NOAA's Pacific Marine Environmental Laboratory and co-author of the study, which will appear April 3 in Geophysical Research Letters. "It's a combination of natural variability, along with warmer air and sea conditions caused by increased greenhouse gases."

Overland and his co-author, Mu辛 Wang, a University of Washington research scientist with the Joint Institute for the Study of the Atmosphere and Ocean in Seattle, analyzed projections from six computer models, including three with sophisticated sea ice physics capabilities. That data was then combined with observations of summer sea ice loss in 2007 and 2008.

The area covered by summer sea ice is expected to decline from its current 4.5 million square kilometers (about 1.8 million square miles) to about 1 million square kilometers (about 390,000 square miles) – a loss approximately two-fifths the size of the continental U.S. Much of the sea ice would remain in the area north of Canada and Greenland and decrease between Alaska and Russia in the Pacific Arctic.

"The Arctic is often called the 'Earth's refrigerator' because the sea ice helps cool the planet by reflecting the sun's radiation back into space," said Wang. "With less ice, the sun's warmth is instead absorbed by the open water, contributing to warmer temperatures in the water and the air."

NOAA understands and predicts changes in the Earth's environment, from the depths of the ocean to the surface of the sun, and conserves and manages our coastal and marine resources.
Significant Northward Displacement in the Bering Sea


Greenland halibut 98 km

Arrowtooth flounder 46 km

Snow crab 89 km

Flathead sole 57 km

Eulachon 34 km

Pacific halibut 55 km

Bering flounder 76 km

Plus 8 other species
Snow Crab Population Has Diminished and Contracted North

Reduction of Benthic Prey Populations


June 29, 2009
Insufficient information to make adequate assessments
Northward migration into the Arctic was observed for all five species of salmon during 2007.

Growth rate potential models indicated that the Chukchi Sea provided excellent rearing habitats for juvenile salmon.

http://www.afsc.noaa.gov/ABL/MESA/mesa_basis.php
Nearshore Arctic Fish Surveys

- Capelin and Arctic cod accounted for 80% of beach seine and bottom trawl catches.

http://www.afsc.noaa.gov/ABL/Habitat/ablhab_nearshore_atlas.htm
Six Species Have Extended Range from the Bering or Chukchi Seas to the Beaufort Sea

Marbled eelpout
Bering flounder
Pacific cod
Walleye pollock
Bigeye sculpin
Salmon snailfish

NOAA Policies on Arctic Fishing
Arctic Fishery Management Plan

- Closes Arctic Management Area to commercial fishing
- Public comment period and Secretarial review

Per NPFMC final action in February 2009
Northern Bering Sea Research Area

Closed to bottom trawling until research conducted and a plan developed to manage fishing in the area, including appropriate protection measures.

Endangered Species Act Listing Determinations for Ice Seals

- Ribbon seal: Listing not warranted (12/08) because annual ice (critical for reproduction, molting and resting) will continue to form each winter in the Bering Sea and Sea of Okhotsk, where most ribbon seals are located.

- Ringed, spotted, and bearded seals: Status reviews underway.

http://www.fakr.noaa.gov/protectedresources/seals/ice.htm
Summary

• Arctic ecosystem benthic dominant; Subarctic ecosystem pelagic dominant
• Species shifting northward
• Arctic ecosystem closed to commercial fishing
International Arctic Fisheries Symposium

Purpose: To initiate international discussions for conserving and managing future fisheries in the Arctic Ocean including managing migratory, transboundary and straddling fish stocks.