NMFS Climate Science Strategy

Southeastern Bering Sea

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Climate and Fisheries

EXPLAIN THIS:
Walleye pollock abundance dramatically fell in the early 2000’s, leading to a 40% drop in the quota for the largest single fishery in the US, and then rebounded.

EXPLANATION: Due to bloom timing, large crustacean zooplankton benefit from icy winters, providing prey for age-0 pollock to enter their first winter fat (and happy?)

Identify mechanisms
Modeling
Ecosystem monitoring
Identify mechanisms
Climate informed management
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Assessment

Action Plan
Monitor ecosystems
Seasonal surveys

April-May & Sept-Oct physics

May, larval

August-September, age-0

June-July, age-1

June-July, age-3+
Alaska Marine Ecosystem Considerations
Identify mechanisms
(process studies)
Ocean acidification research


Fur seal research

- Pup production on the Pribilof Islands decreased by approximately 45% since 1998. Cause unknown, but may include direct and indirect effects of fishery competition as well as climate.
- Satellite telemetry in 2015 and 2016 is being used to understand effects during the winter migration and summer foraging.
- This project will link fine-scale changes in fur seal foraging behavior with measures of pollock distribution and abundance in real time.

Modeling:
Forecast models and management strategy evaluations (MSE)
Ocean model projections


Identify human community dependence on LMRs and effects of climate change.

NPFMC Fisheries Ecosystem Plan. Approved by the Council in December 2015, the FEP includes a climate module that would:
1) synthesize current climate change project outcomes;
2) prioritize species for MSE evaluation; and
3) run MSEs on specific species and scenarios identified by the Council.
Challenge 1

Our ability to project future impacts is limited by our understanding of ecological processes. Understanding is sufficient for only 3 of 21 comprehensively assessed stocks in the southeastern Bering Sea.

- Walleye pollock (through loss of sea ice)
- Red king crab (through increased CO2)
- Northern rock sole


A climate vulnerability assessment for the southeastern Bering Sea, which will qualitatively assess species vulnerabilities to climate change and provide guidance on research prioritization, currently is underway. The vulnerability assessment uses expert elicitation methods to quantify a species’ exposure and sensitivity to expected climate change.

Spencer, Hollowed, Nelson, Sigler, In prep.. *Climate Vulnerability Assessment for the southeastern Bering Sea.*
Recruitment Processes Alliance

- Research is conducted to understand processes affecting recruitment strength, including effects of climate.
- To date, understanding of these ecological mechanisms sufficient only to quantify effects on 3 fisheries (pollock, red king crab, northern rock sole).
- A significant fraction of AFSC resources are invested in this effort (e.g., ~15% of labor).
The NPFMC currently has a process that adapts harvest actions to changing measurements from fishery independent surveys. What is not well worked out is how and when the North Pacific Fishery Management Council should react to climate-induced reference point changes.
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Regional Action Plan for Southeastern Bering Sea Climate Science

- Northeast US
- Southeast US
- Pacific Islands
- California Current
- Gulf of Mexico
Most important steps to improve efforts to identify and adapt to climate change impacts on fisheries:

- Identify winners and losers and adjust management programs (i.e., catch share programs) as necessary
- Identify and monitor thresholds in ecosystem parameters that signal the need to adjust management strategies