Climate Change and Changing Fisher Behavior in the Bering Sea Pollock Fishery

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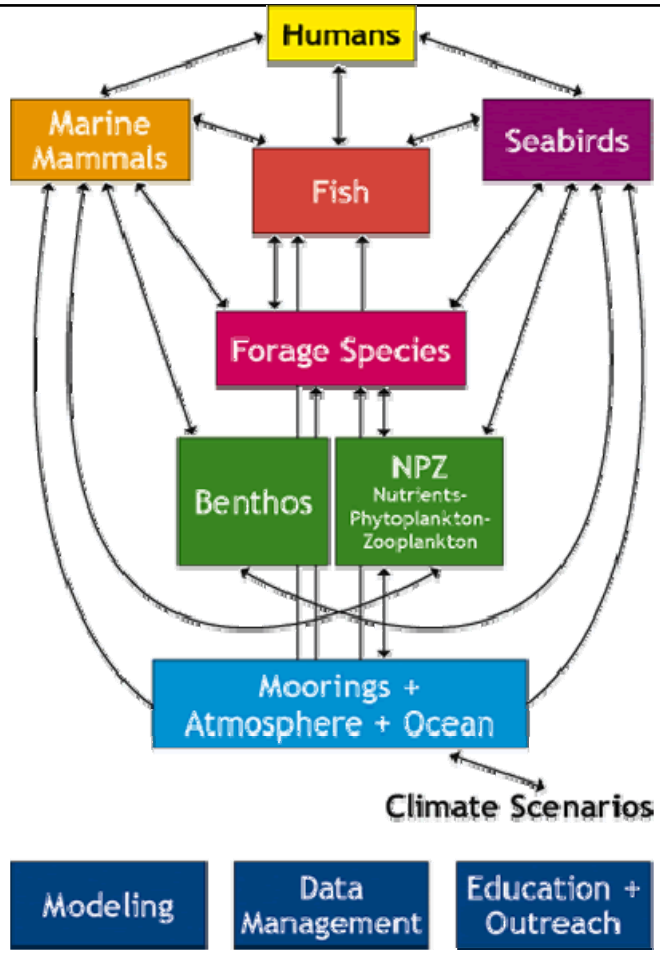
Overview

- Introduction to the Bering Sea pollock fishery
- Economics and climate modeling
- How does climate affect fishing?
- How do we predict the impact of climate change on fisher behavior?
- Future work

Bering Sea pollock fishery

- 1.5 million metric tons caught in recent years – TAC adjusted downward last 2 years to 1.0 million tons in 2008
- Three sectors– inshore, catcher processor, and mothership
- American Fisheries Act passed in October 1998 “rationalized” the fishery and ended the race for fish.

BSIERP Project Overview



- Bering Sea Integrated Ecosystem Research Program (BSIERP)
- Early stages of project
- Human component includes both economic modeling and work with local traditional knowledge (LTK)

Why is it important to include economics in an integrated climate / ecosystem model?

- Redistribution of fleet effort with changing ecosystem will have a significant impact on the ecosystem
- Spatial and market regulations will be much more effective if they consider the relationship between fishermen and the environment
- Fisheries management should be forward-looking.

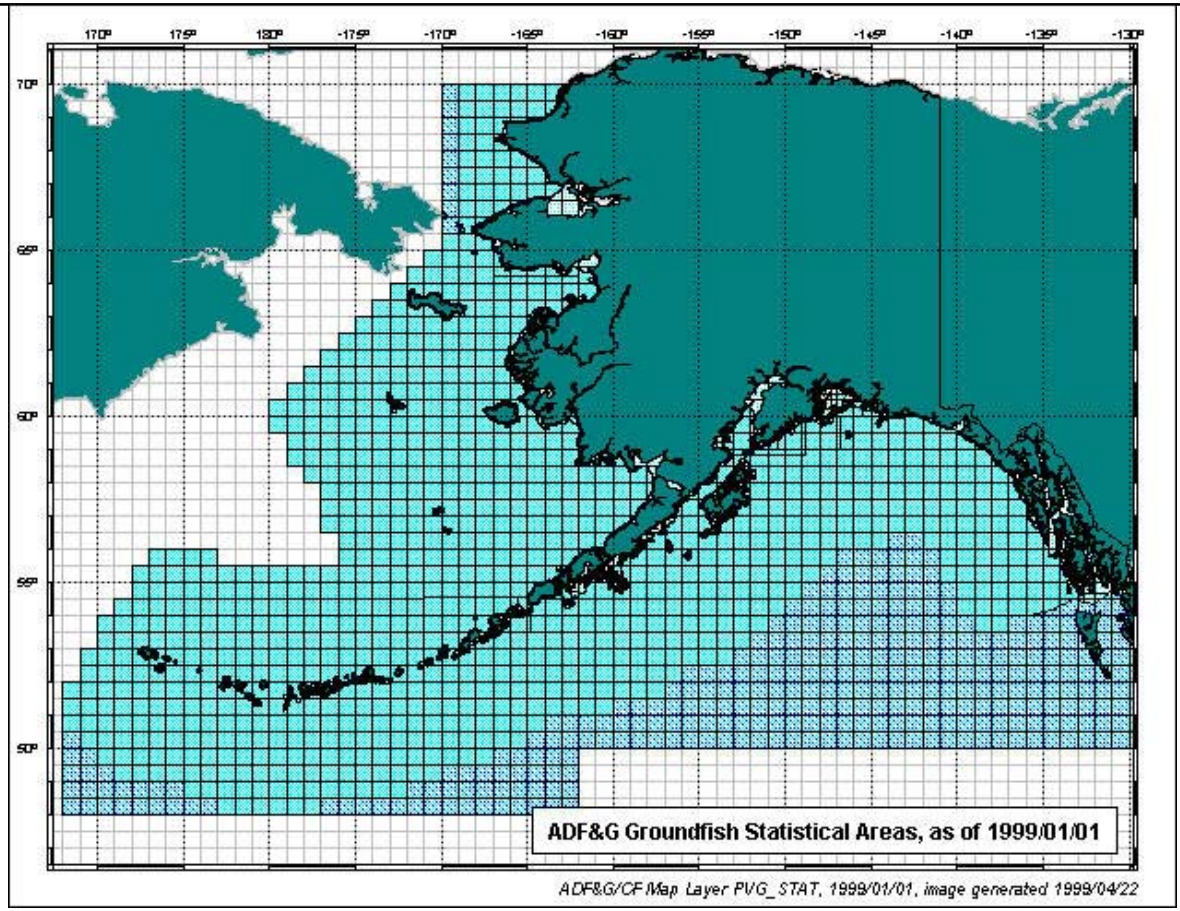
Economics in BSIERP

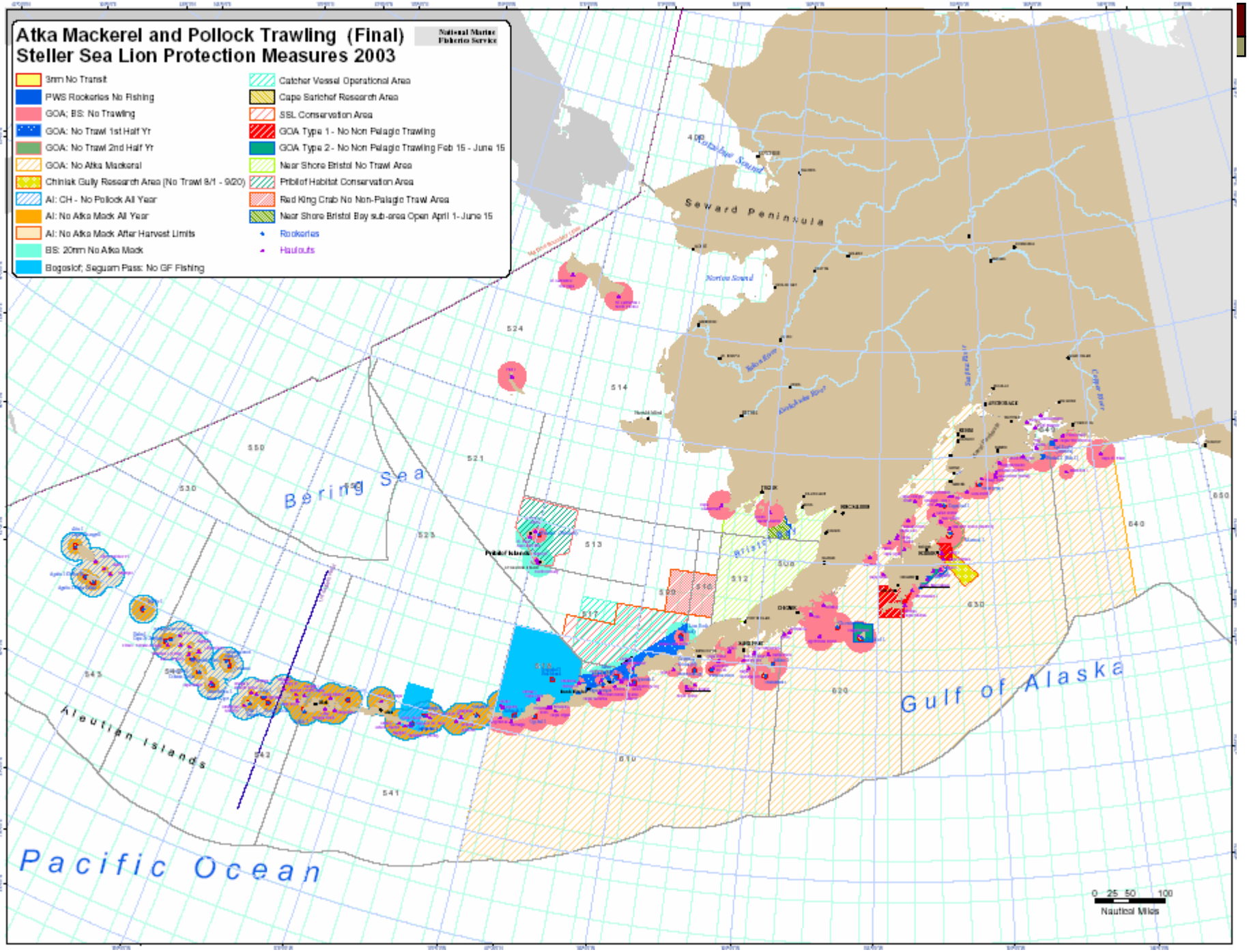
- Spatial Economic Models of Pollock and Cod
  - Methods discussed here
  - Work will begin with pollock, then extend to cod, then return to both species as ecosystem work advances
- Separate economic component of BSIERP will integrate fleet impacts directly into the ecosystem model.

Modeling a fisherman's choice

- A fisherman chooses to fish in a certain location to maximize expected net revenue from fishing
- A fisherman makes a discrete choice of a zone
- The zone is chosen as a function of
  - Expected catch/revenue in the zone
  - Travel costs (fuel, time, wages, the opportunity cost of not using the boat elsewhere)
  - Boat characteristics

STAT6 Areas in the Bering Sea




Atka Mackerel and Pollock Trawling (Final)
Steller Sea Lion Protection Measures 2003
National Marine Fisheries Service
3nm No Transit
PWS Rookeries No Fishing
GOA; BS: No Trawling
GOA: No Trawl 1st Half Yr
GOA: No Trawl 2nd Half Yr
GOA: No Atka Mackerel
Chiniak Gully Research Area (No Trawl 8/1 - 9/20)
AI: CH - No Pollock All Year
AI: No Atka Mack All Year
AI: No Atka Mack After Harvest Limits
BS: 20nm No Atka Mack
Bogoslof; Seguam Pass: No GF Fishing
Catcher Vessel Operational Area
Cape Sarichef Research Area
SSL Conservation Area
GOA Type 1 - No Non Pelagic Trawling
GOA Type 2 - No Non Pelagic Trawling Feb 15 - June 15
Near Shore Bristol No Trawl Area
Pribilof Habitat Conservation Area
Red King Crab No Non-Pelagic Trawl Area
Near Shore Bristol Bay sub-area Open April 1- June 15
Rookeries
Haulouts
Bering Sea
Aleutian Islands
Pacific Ocean
Gulf of Alaska
Seward Peninsula
Bristol Bay
Norton Sound
Kotzebue Sound
0 25 50 100
Nautical Miles

What determines expected catch/revenue?

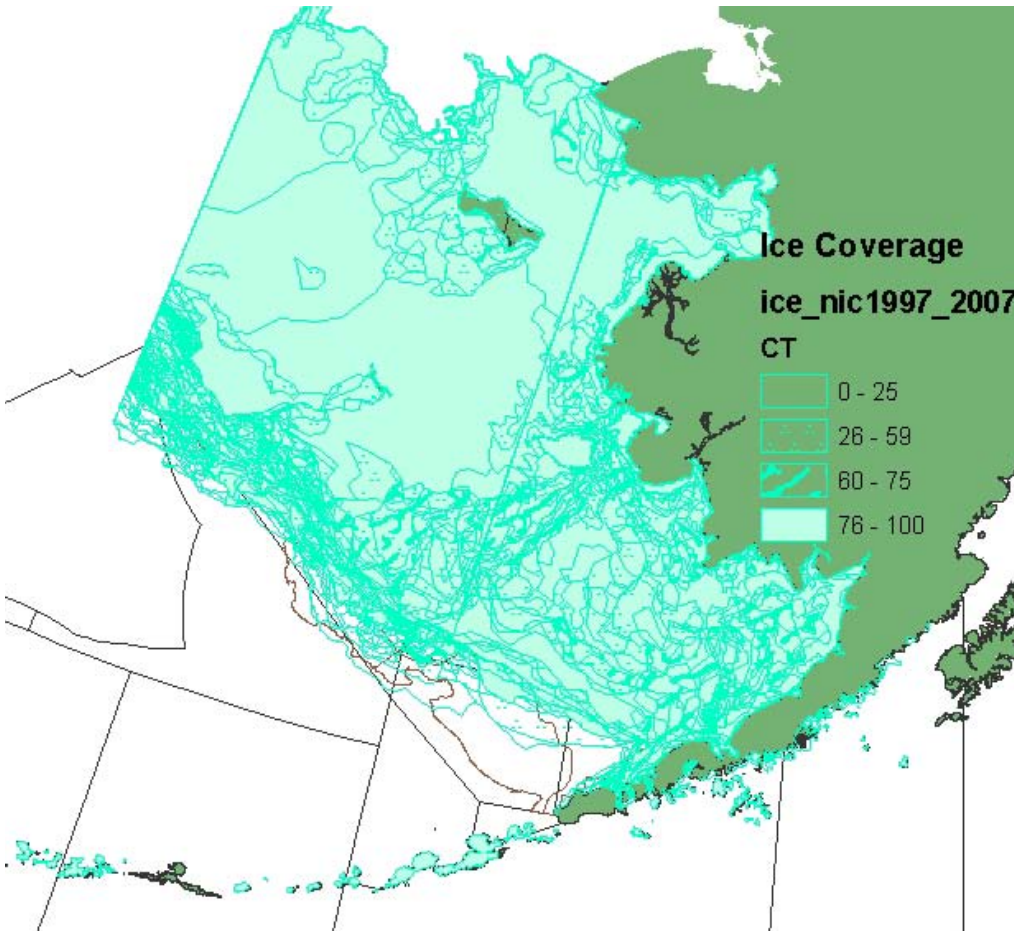
- Probability of encountering fish at acceptable abundance/ CPUE
- Product type/quality
- Price for products
- Fishing technology.

We would expect all of these factors to evolve with climate change.

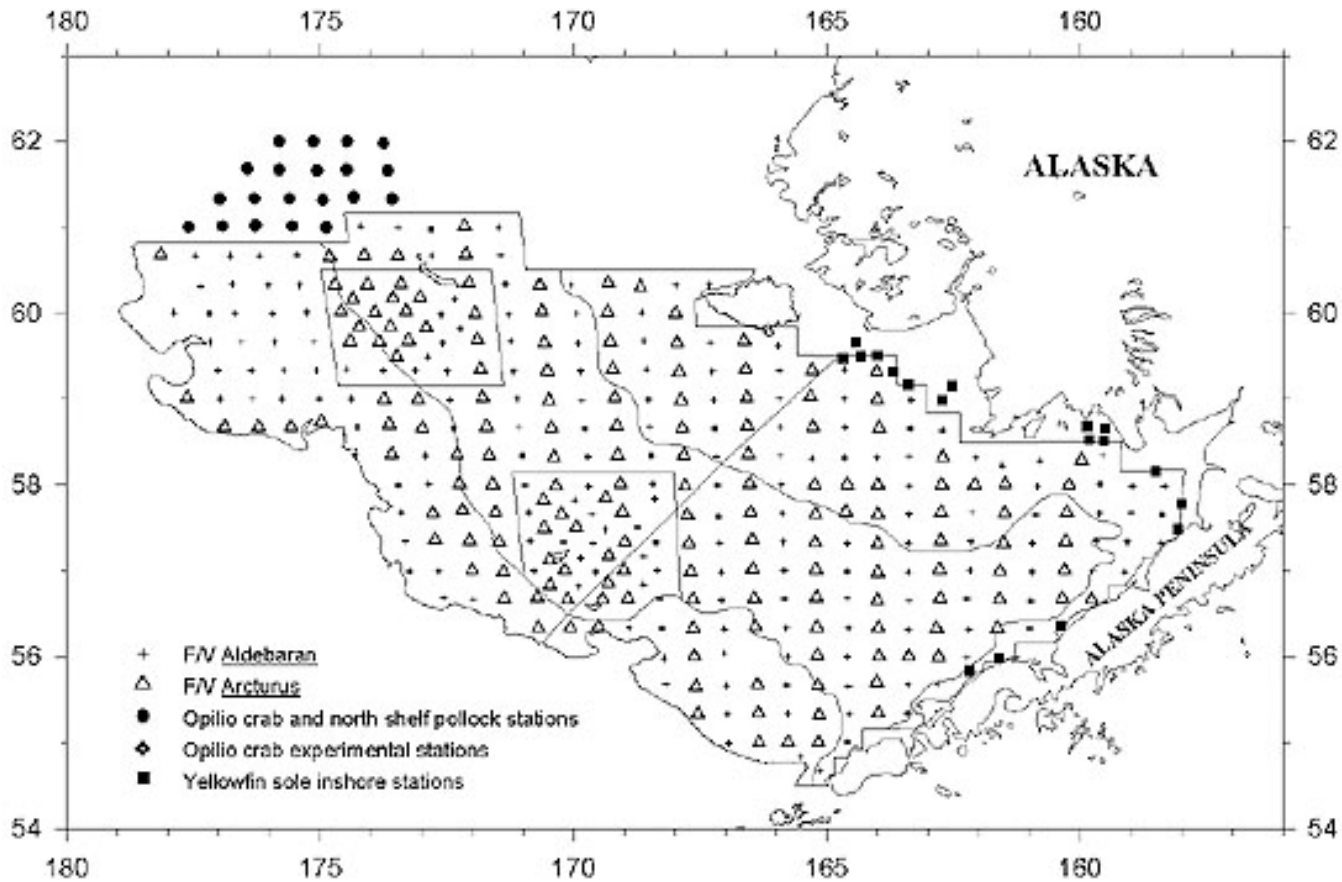
Predicting climate change's impact on the pollock fishery

- Include direct affects of weather
  - Ice
  - Winds
  - Cold pool.
- Stock effects –link observed fishing distributions to the following information
  - Driving strong year classes
  - Systematic movements of pollock densities
  - Size of stock.
- Integrate as a loop with the ecosystem model.

Sample ice coverage data



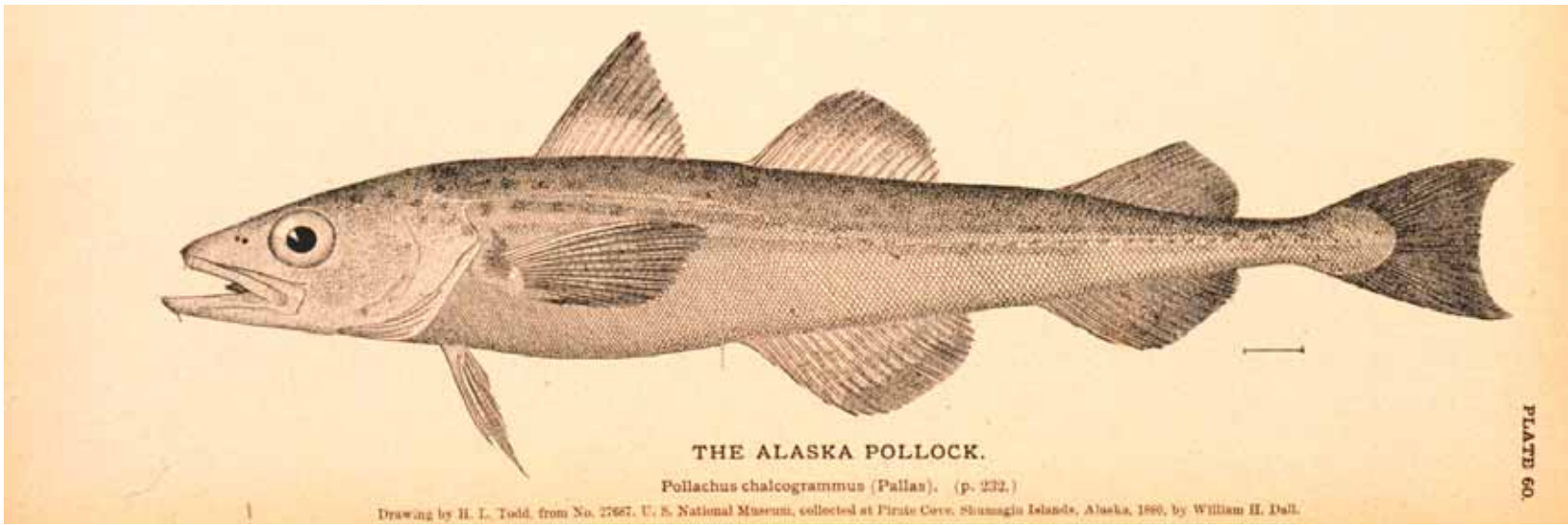
July-August Crab and Groundfish Sampling Survey Stations



Next Steps

- Run current models with complete suite of available climate information
- Investigate spatial and temporal scale of environmental data and choice model
- Compare results to other economic models
- Adapt and apply models to cod fishery.

The End



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