Science, Service, Stewardship

Broadening stakeholder involvement in fisheries research through the development of cooperative research initiatives in Korean (and Alaskan) fisheries

Dr. Steven Barbeaux

Alaska Fisheries Science Center, NOAA

Dr. Jae Bong Lee

Dokdo Fisheries Research Station, NFRDI

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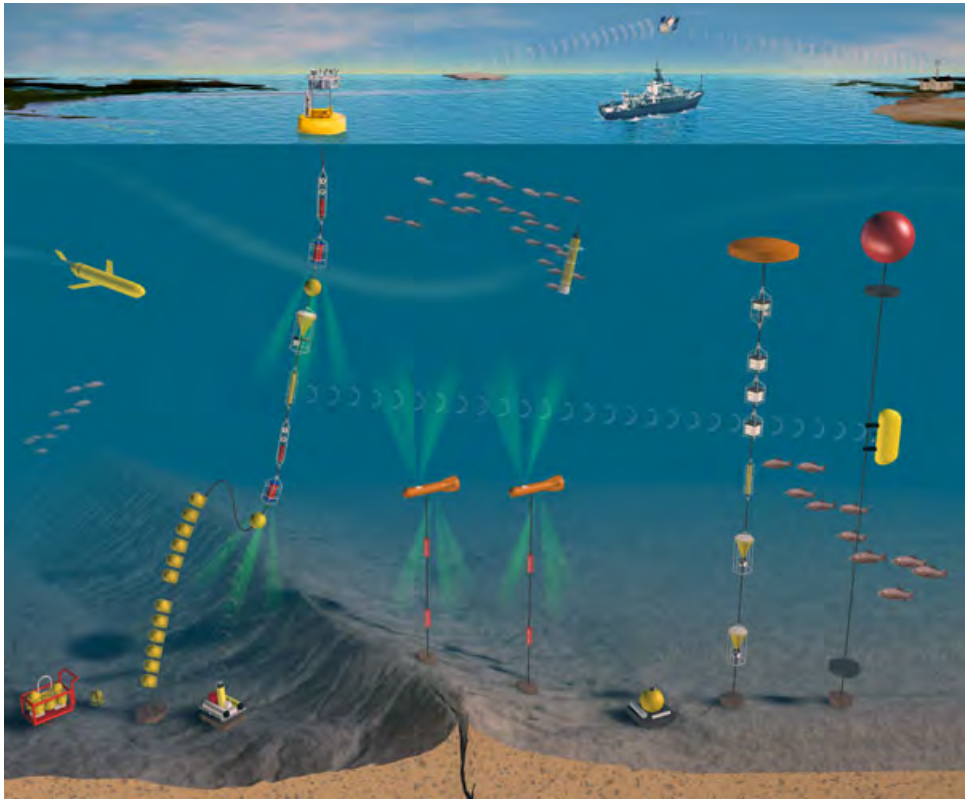
Global ocean monitoring system



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Filling in the data gaps








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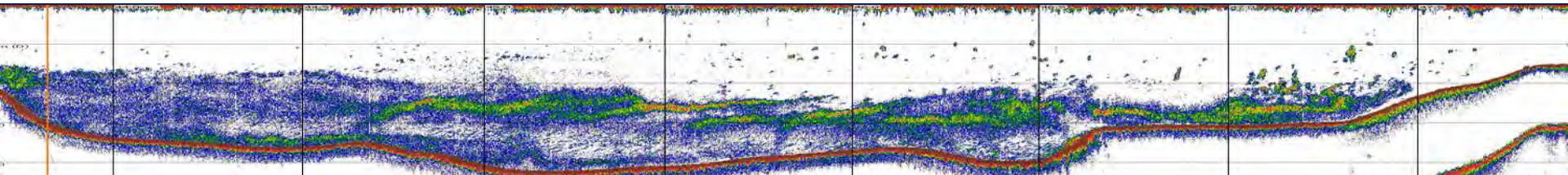
Towards the Development of a Low-cost Cooperative Ocean Monitoring Network

- Share expertise on cooperative research technology and techniques among US and ROK researchers
- Explore possible extensions of US cooperative projects to Korea and Korean cooperative projects to US
- Examine the feasibility of a joint US/ROK workshop on cooperative monitoring
- Consult between US and ROK researchers on the development of a joint US/ROK long-term ocean monitoring network based on cooperative monitoring programs



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Towards the Development of a Low-cost Cooperative Ocean Monitoring Network

- Dr. Steven Barbeaux
  - Eastern Coast , Korea
    - 7-20 July 2013
- Dr. Keith Bosley
  - Pusan and Pohang, Korea
    - 11-17 May 2014

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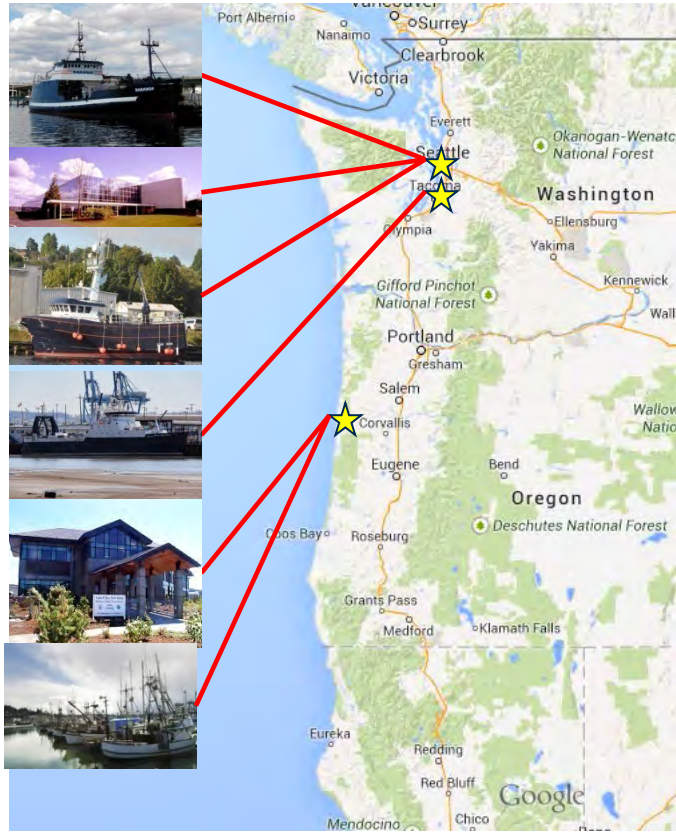
Towards the development of a low-cost cooperative ocean monitoring network

- Dr. Jae-Bong Lee, Dr. Young-Min Choi, and Dr. Young-Yull Chun
  - Seattle, Washington
    - 21-27 July 2013
- Dr. Jae-Bong Lee, Dr. Young-Min Choi
  - Seattle and Tacoma, Washington
    - 18-20 August 2014
  - Newport ,Oregon
    - 20-23 August 2014



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Applications of cooperative monitoring

- **Fishing effort standardization**
  - Fixed gear – Set number and soak duration
  - Active gear – Haul number and fishing duration
- **Physical oceanographic data**
  - Surface and at depth temperature and salinity
  - Bathymetry and bottom type from acoustics
- **Animal density and seasonal distribution**
  - Acoustic density over time and space

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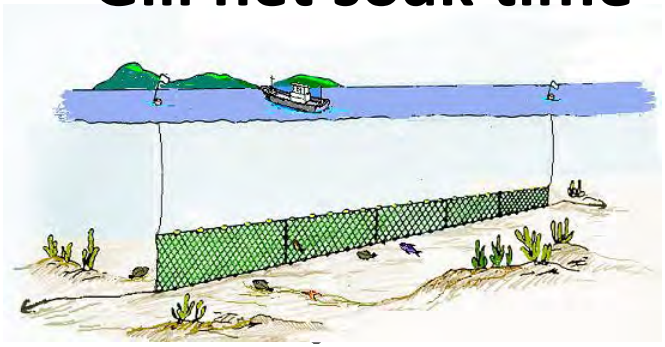
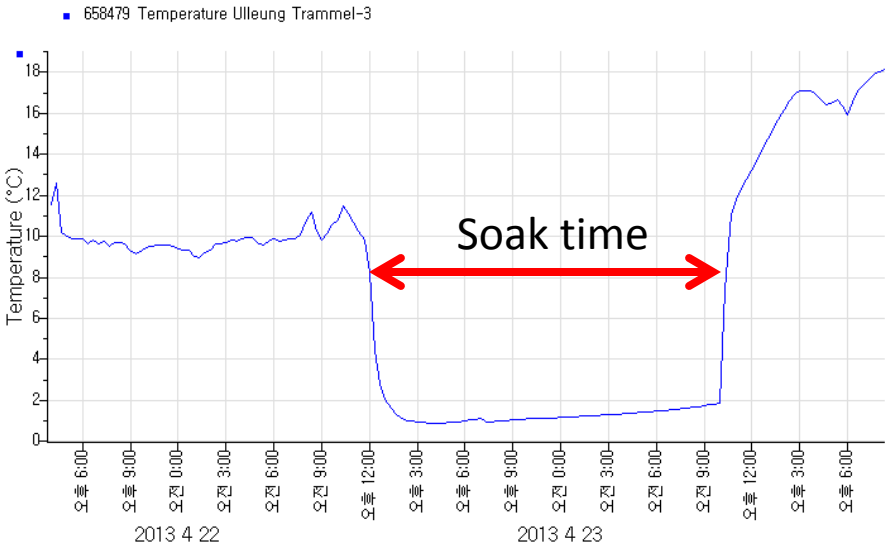
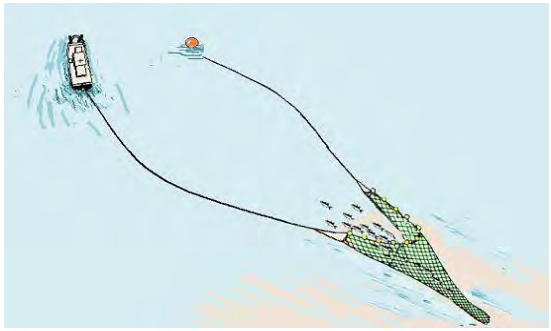
Fishing effort standardization (2013)

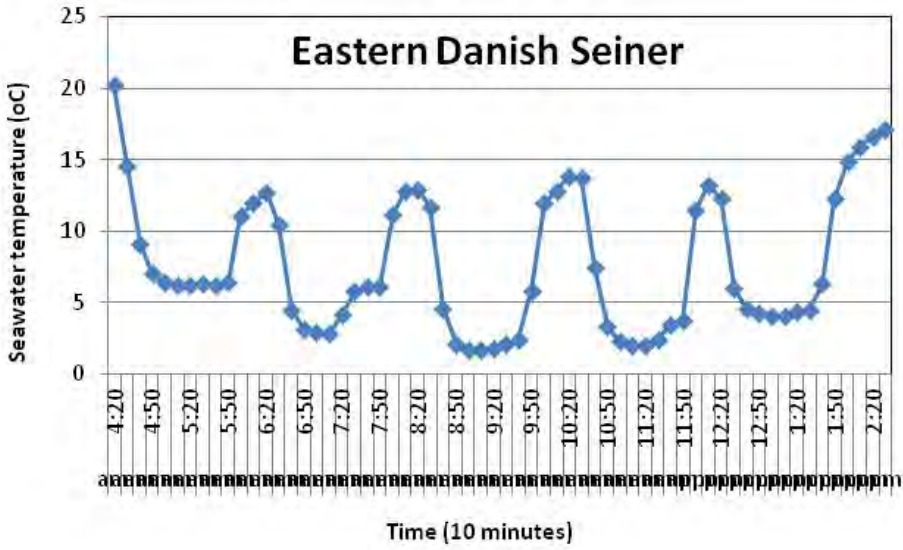
Gill net soak time





Seine tow number





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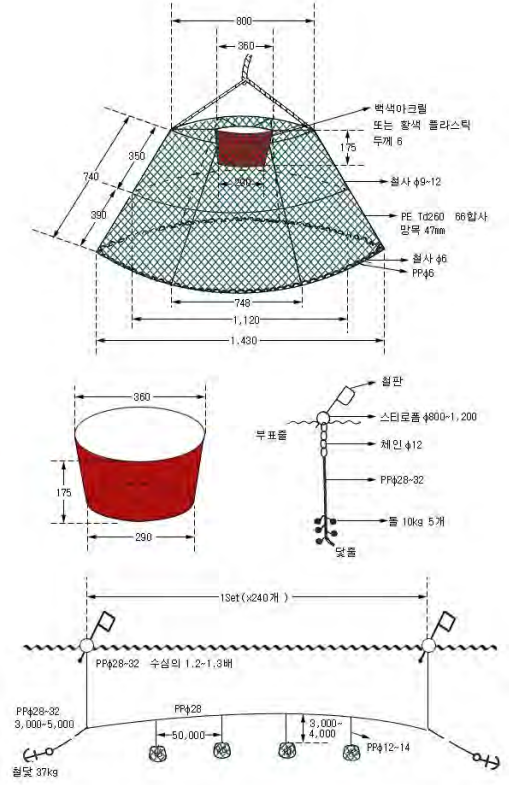
Physical oceanographic data (Korea)

- **Oceanographic data from the commercial deep sea crab (2010- present)**
  - Investigate oceanographic triggers for crab migration
  - Red snow crab (*Chinoecetes japonicus*) fishery



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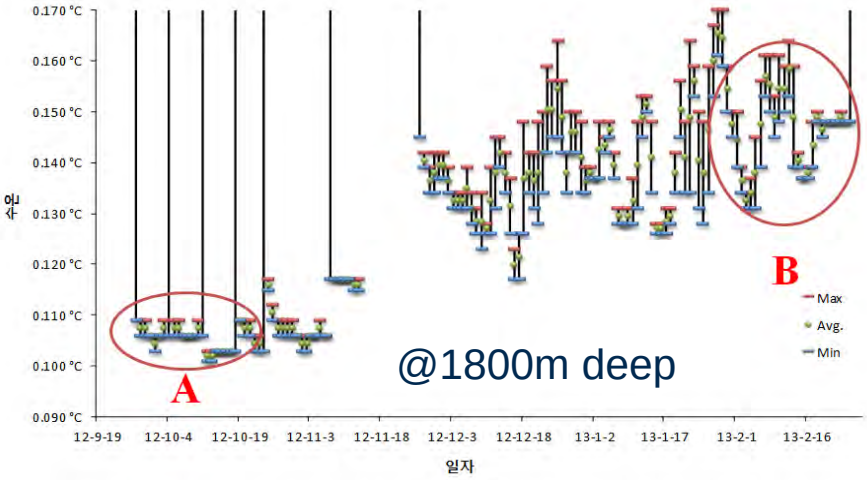
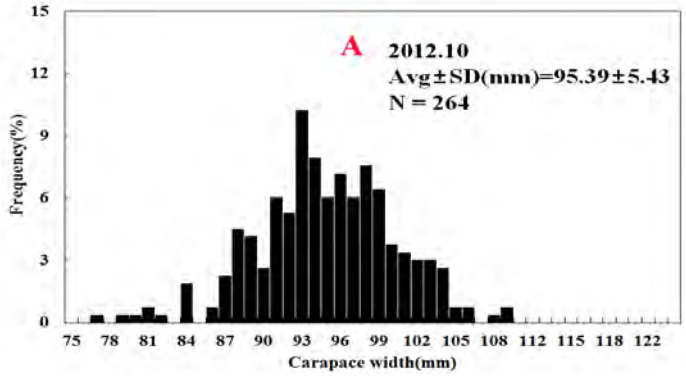
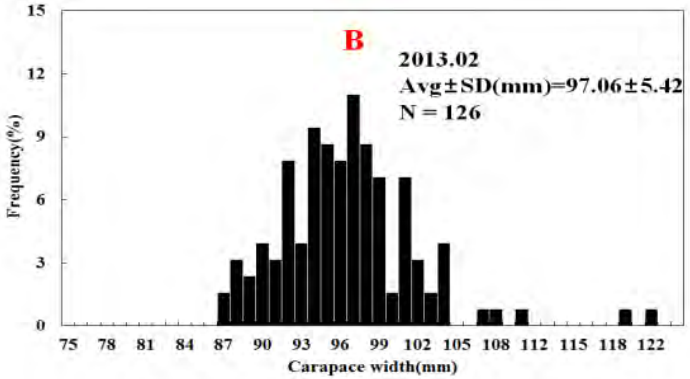
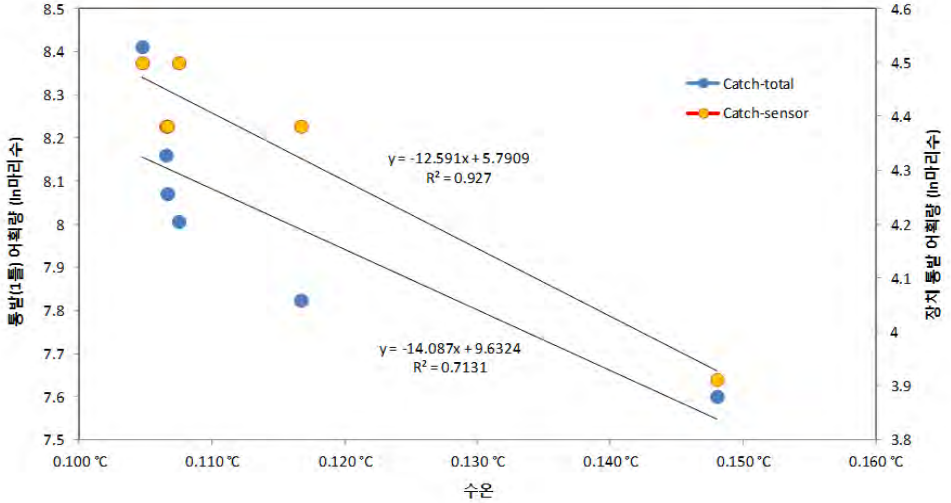
Oceanographic data from the commercial deep-sea crab fishery



Korean red snow crab movement?







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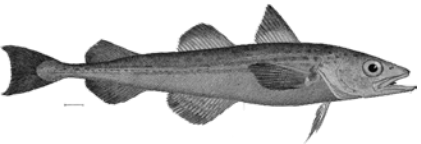
Physical oceanographic data (USA)

- **Temperature and depth recorders on commercial trawlers (2007-2008)**
  - Walleye pollock (*Gadus chalcogrammus*) fishery
  - Temperature and fishing depth effects on salmon bycatch
- **Acoustic data from commercial longliners in the Aleutian Islands (2014)**
  - Aleutian Islands sablefish (*Anoplopoma fimbria*) and halibut (*Hippoglossus stenolepis*) fishery
  - Bathymetry , bottom typing,
- **Temperature and depth recorders on commercial longliners (Proposed)**
  - Greenland turbot (*Reinhardtius hippoglossoides*) fishery
  - Oceanographic data collection at the shelf-edge



Gadus chalcogrammus

Reihardtius hippoglossoides

Hippoglossus stenolepis

Anoplopoma fimbria

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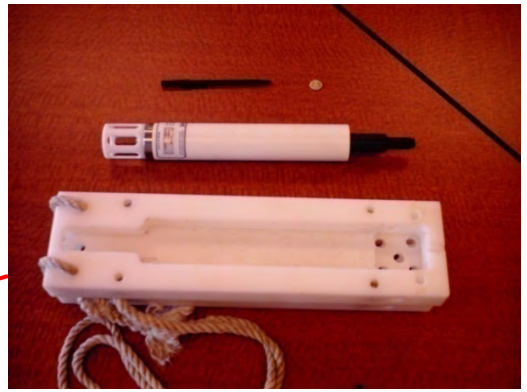
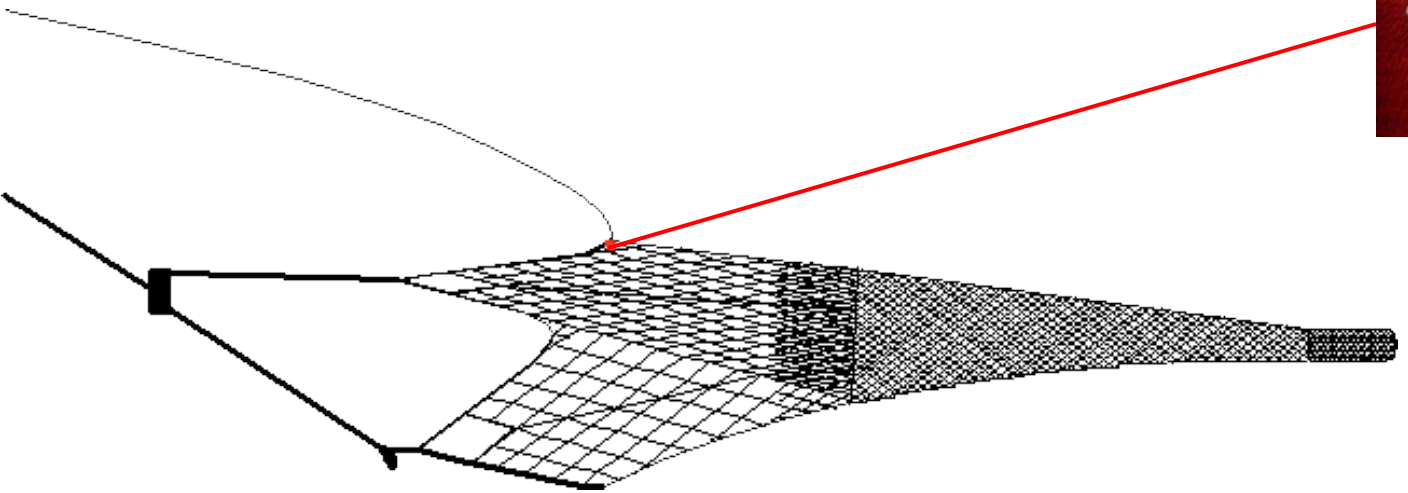
Temperature and depth recorders on commercial trawlers

High maintenance!





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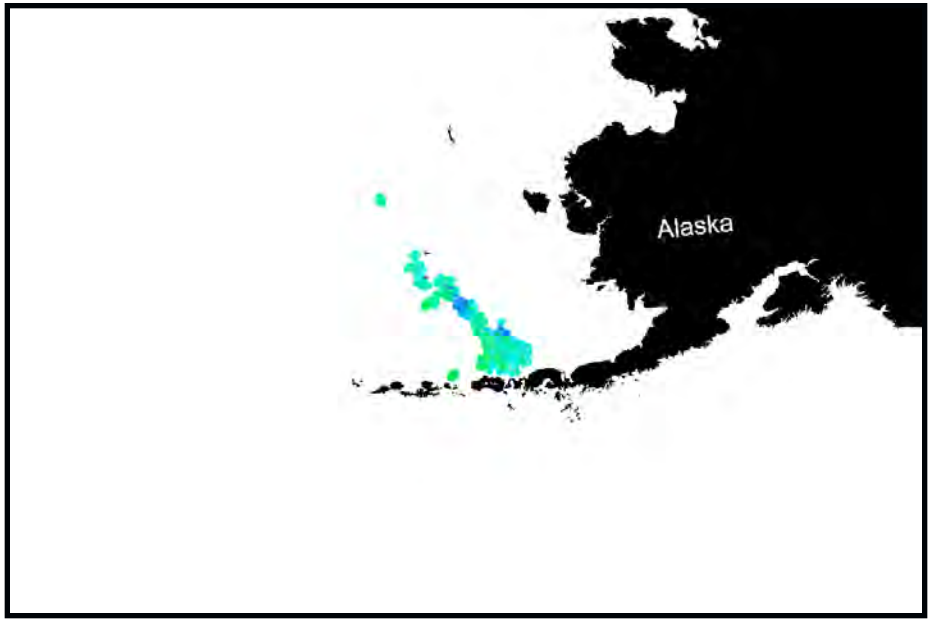
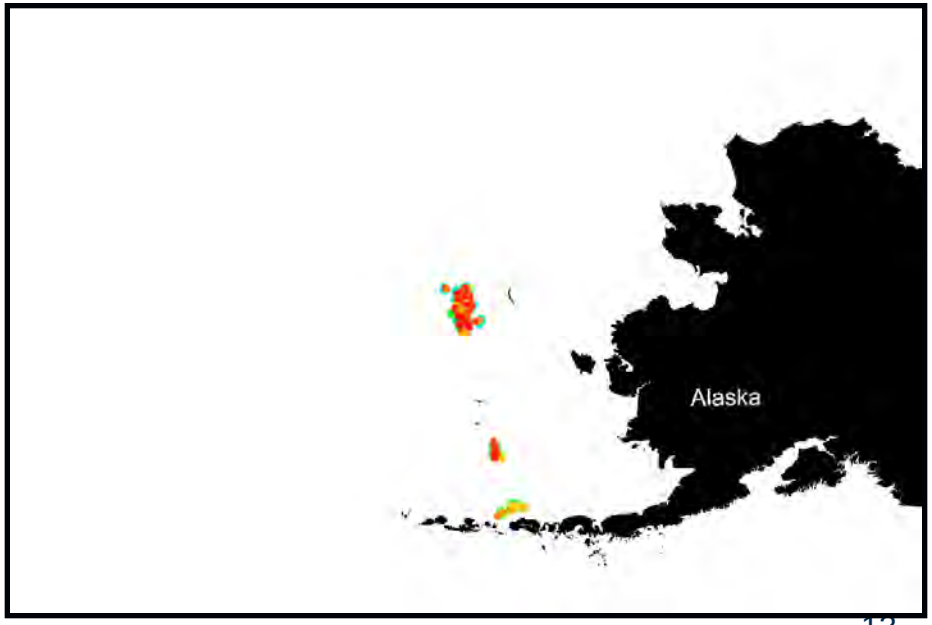
Spatial distribution of temperature depth recorder data

- 1930 temperature and depth profiles

Winter 2008 – A Season



Summer 2008 – B Season



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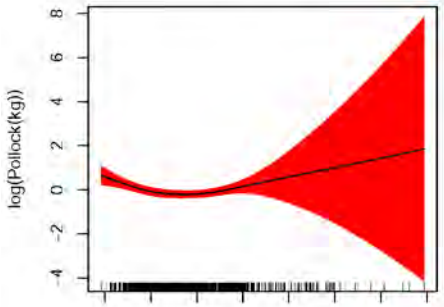
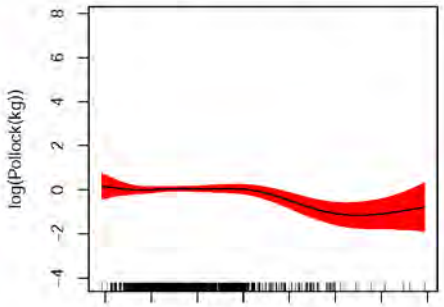
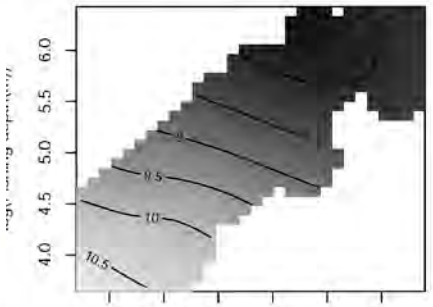
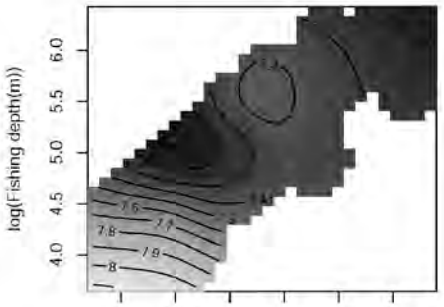
Chinook salmon bycatch in the pollock fishery GAM analysis

Effects on pollock catch abundance

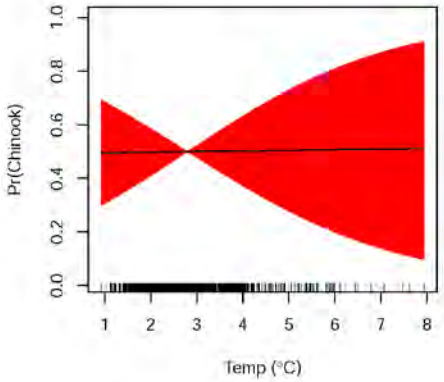


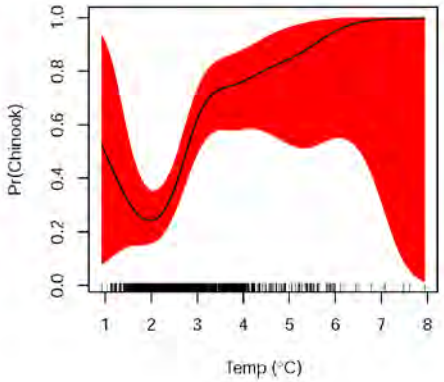


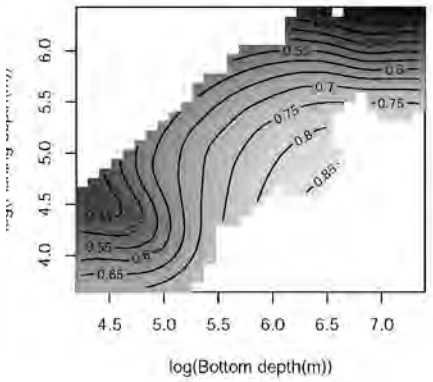


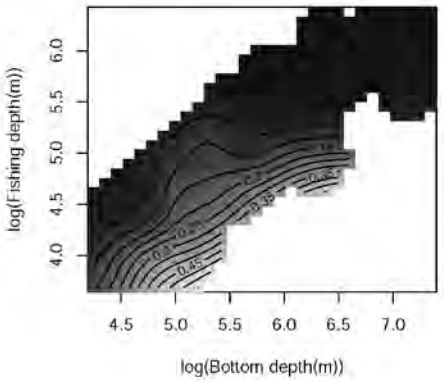


Effects on probability of Chinook salmon in pollock trawl









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The next step?

- TDR archival tags and cases (~US$230-$990 each)
  - Lower accuracy (± 0.1°C and ± 1% pressure)
  - High sampling rate (up to 1 sec)
  - Low maintenance!

Star Oddi or Lotek

Tinytag- Gemini Data Loggers

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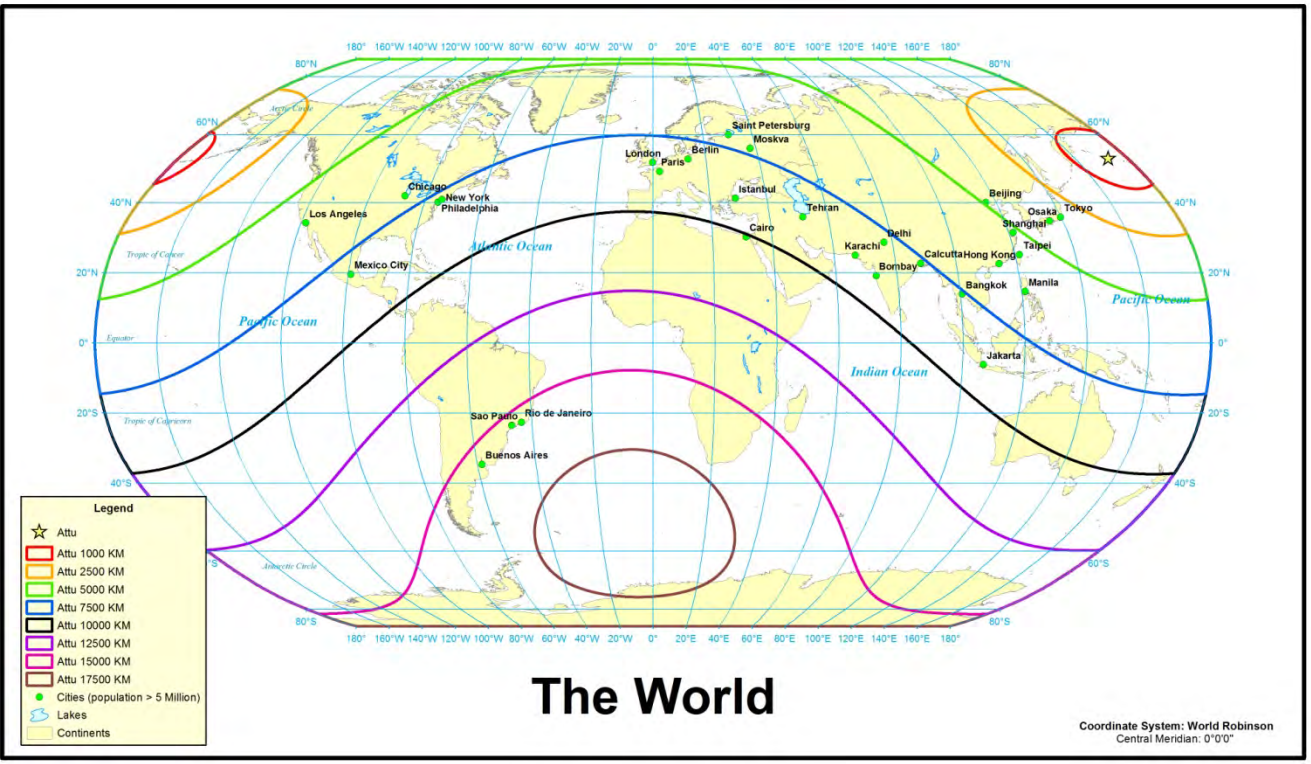
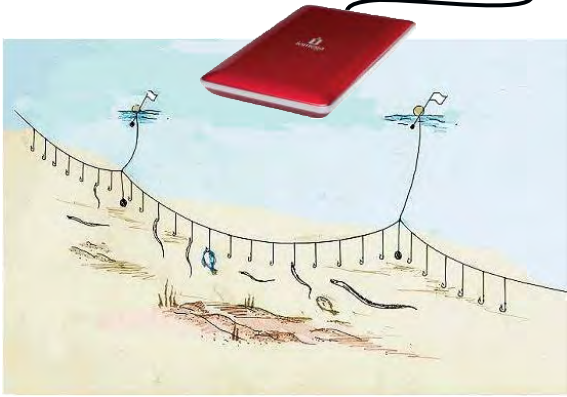
Acoustic data from commercial longliners in the far Western Aleutian Islands

- **Bathymetry, bottom typing, and seasonal ecological partitioning in the far western Aleutian Islands**





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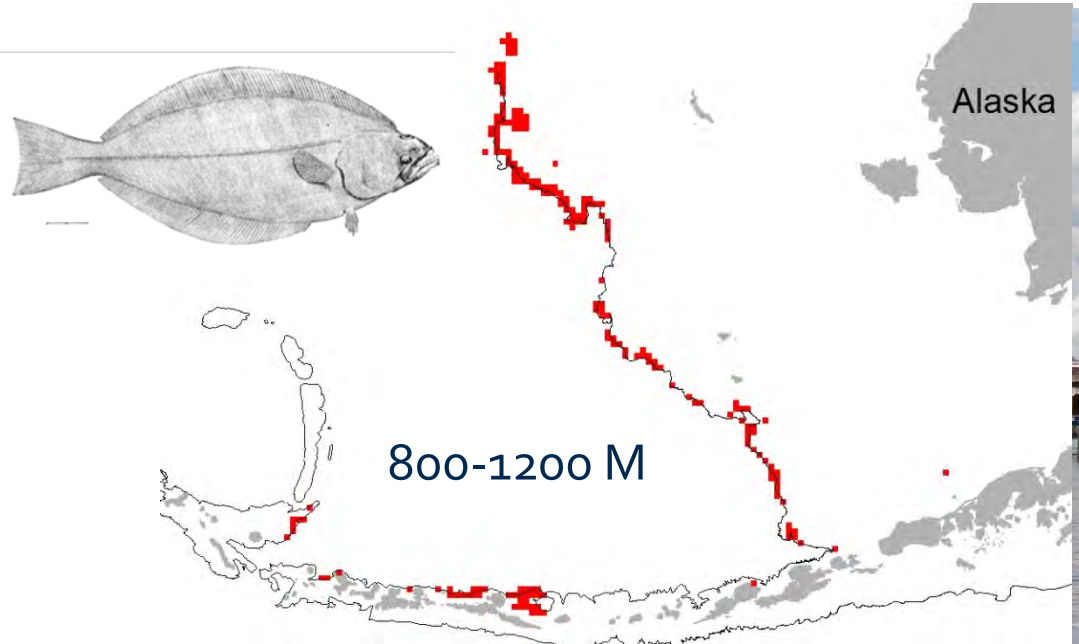
Temperature and depth recorders on commercial longliners

- **Oceanographic data collection at the shelf-edge**
  - Vessel visit in Seattle on board the FV Baranof with Korean researchers
  - Sensors to be deployed in Winter 2014



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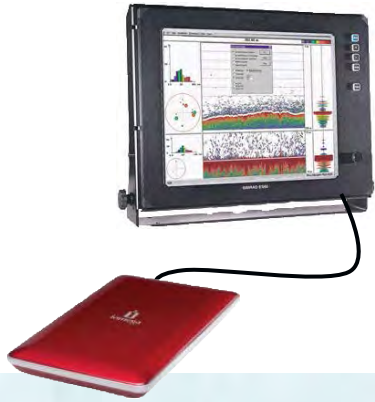
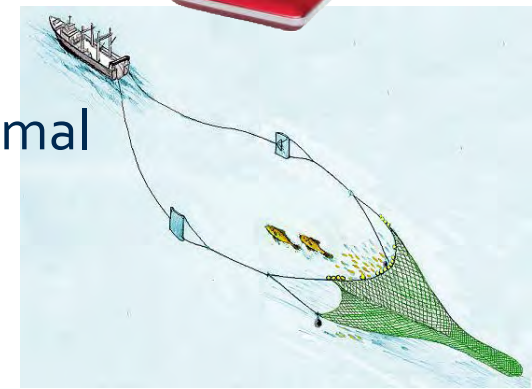
Animal density and seasonal distribution



- **Opportunistic acoustic data collection (2002-Present)**
  - Collect acoustic data from trawlers during normal operations
    - Simrad ES-60 Echosounders
    - 250GB hard drives (US$69)
    - ~35,000km per year on 2 to 12 vessels



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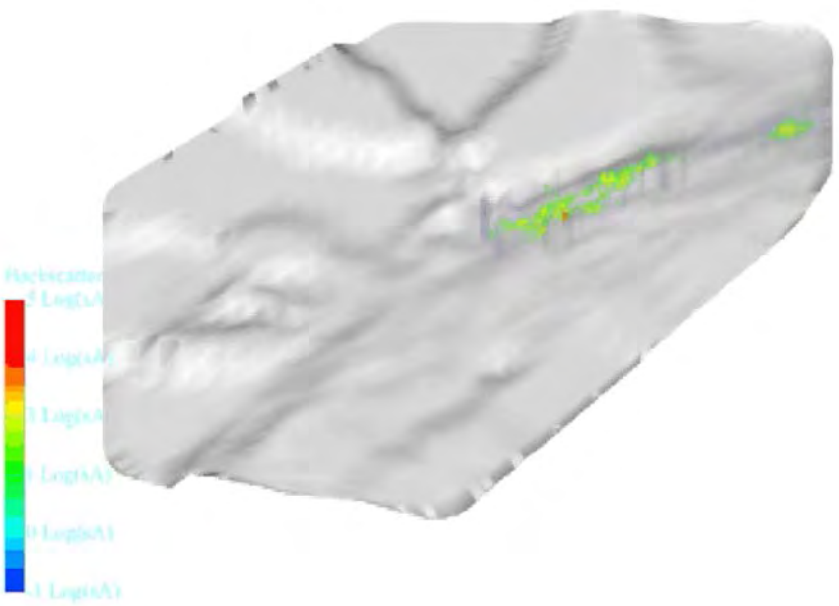
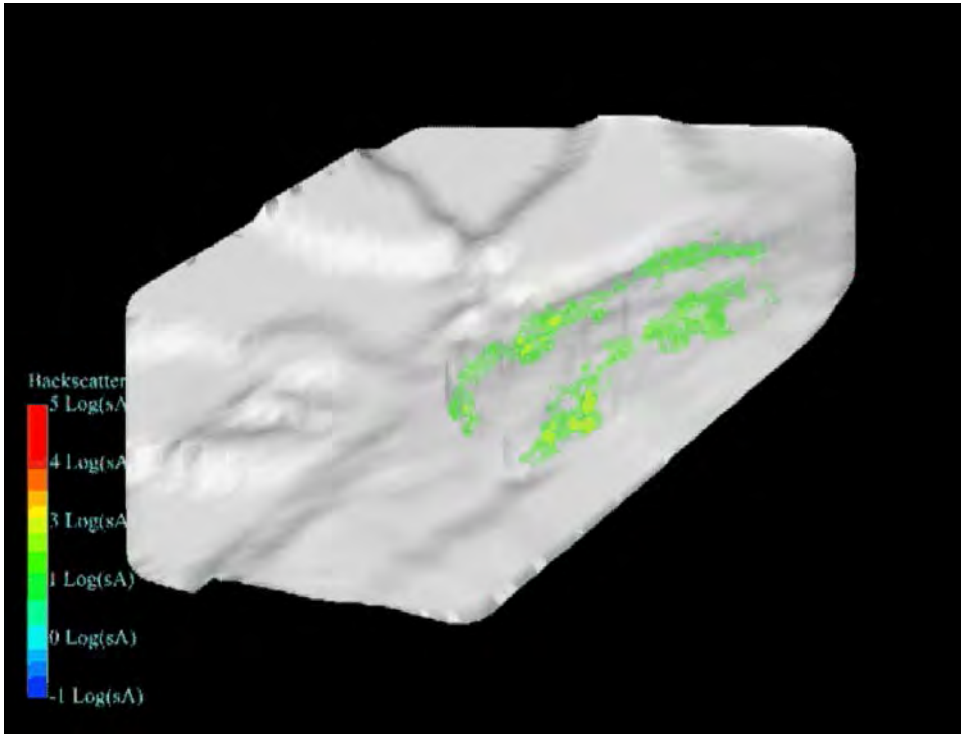
Visualizations of pollock aggregations from opportunistic acoustic data



Day



Night

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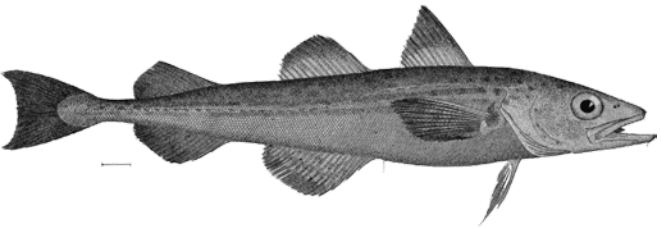
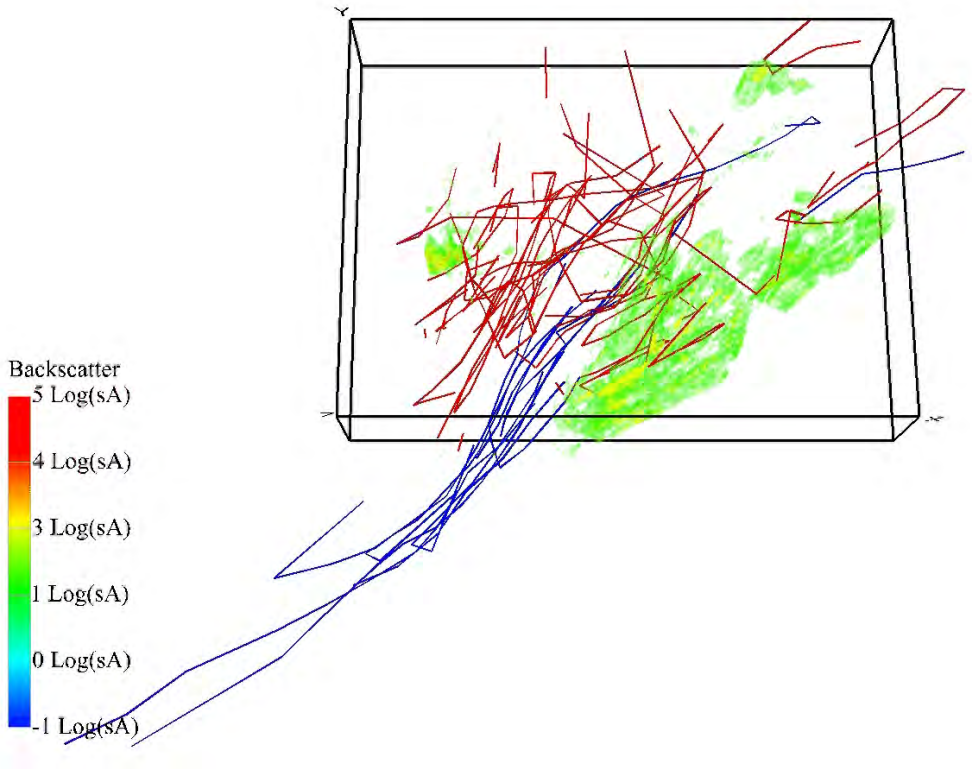
Visualizations of pollock aggregations and fishery interaction

- Integrates diverse data sources
  - Acoustic
  - On-board observer
  - VMS





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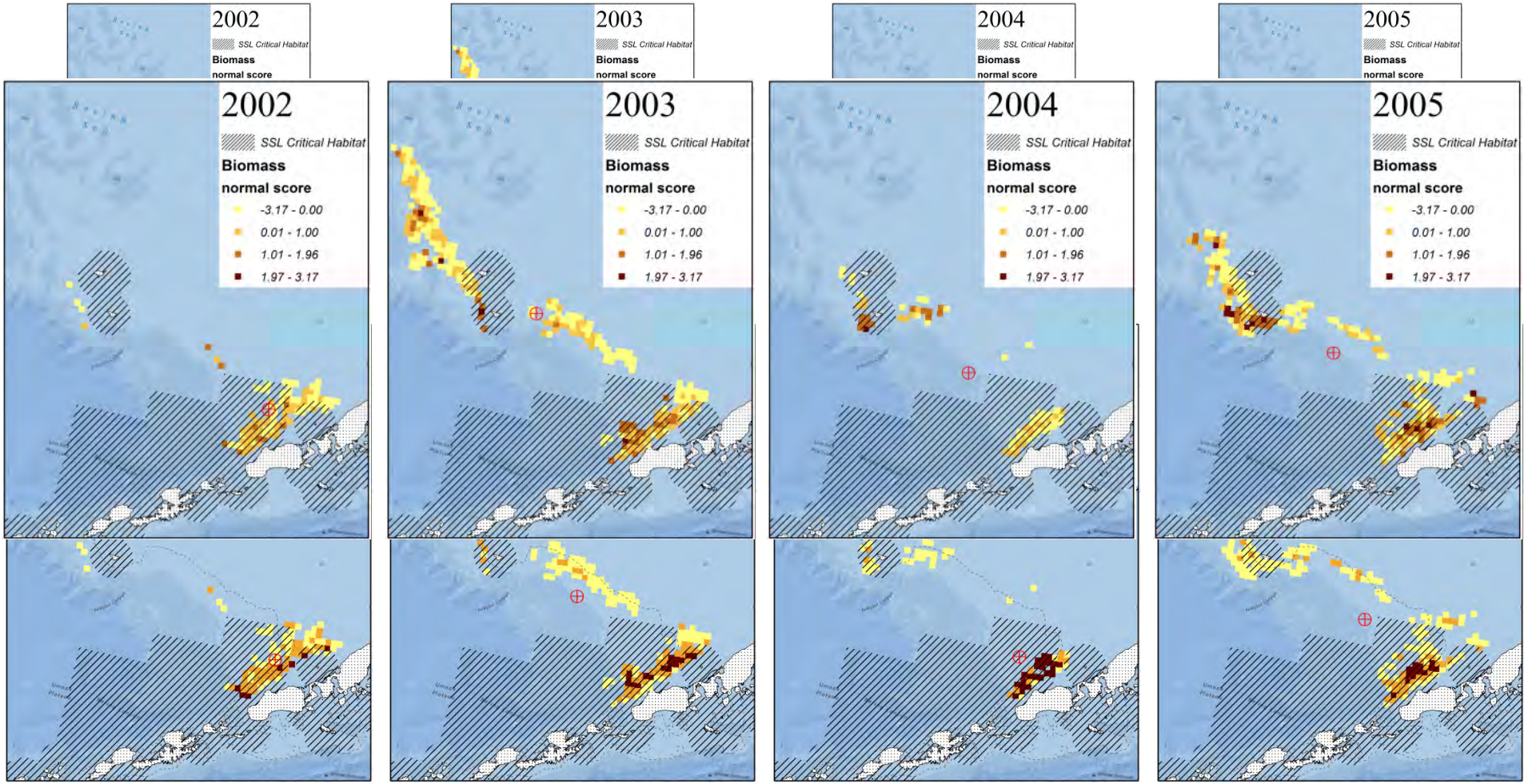
Leslie Model: Local Biomass and Fishing Exploitation Rates



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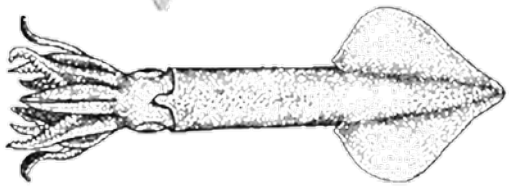
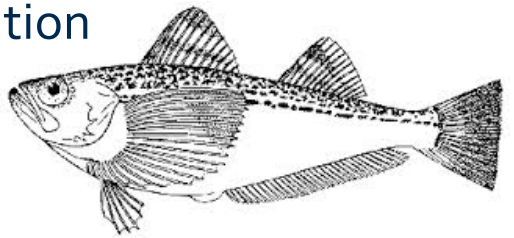
Proposed Korean cooperative projects

- **Acoustic data collection commercial fishing vessels (Korea)**
  - Chub mackerel (*Scomber japonicus*) large purse-seine
    - Chub mackerel migration and population dynamics
    - Mackerel vs. tuna identification
  - Squid (*Loligo sp.*) Jig
    - Squid seasonal distribution
  - Eastern Danish Seine
    - Sandfish (*Arctoscopus japonicus*) seasonal migration and population dynamics





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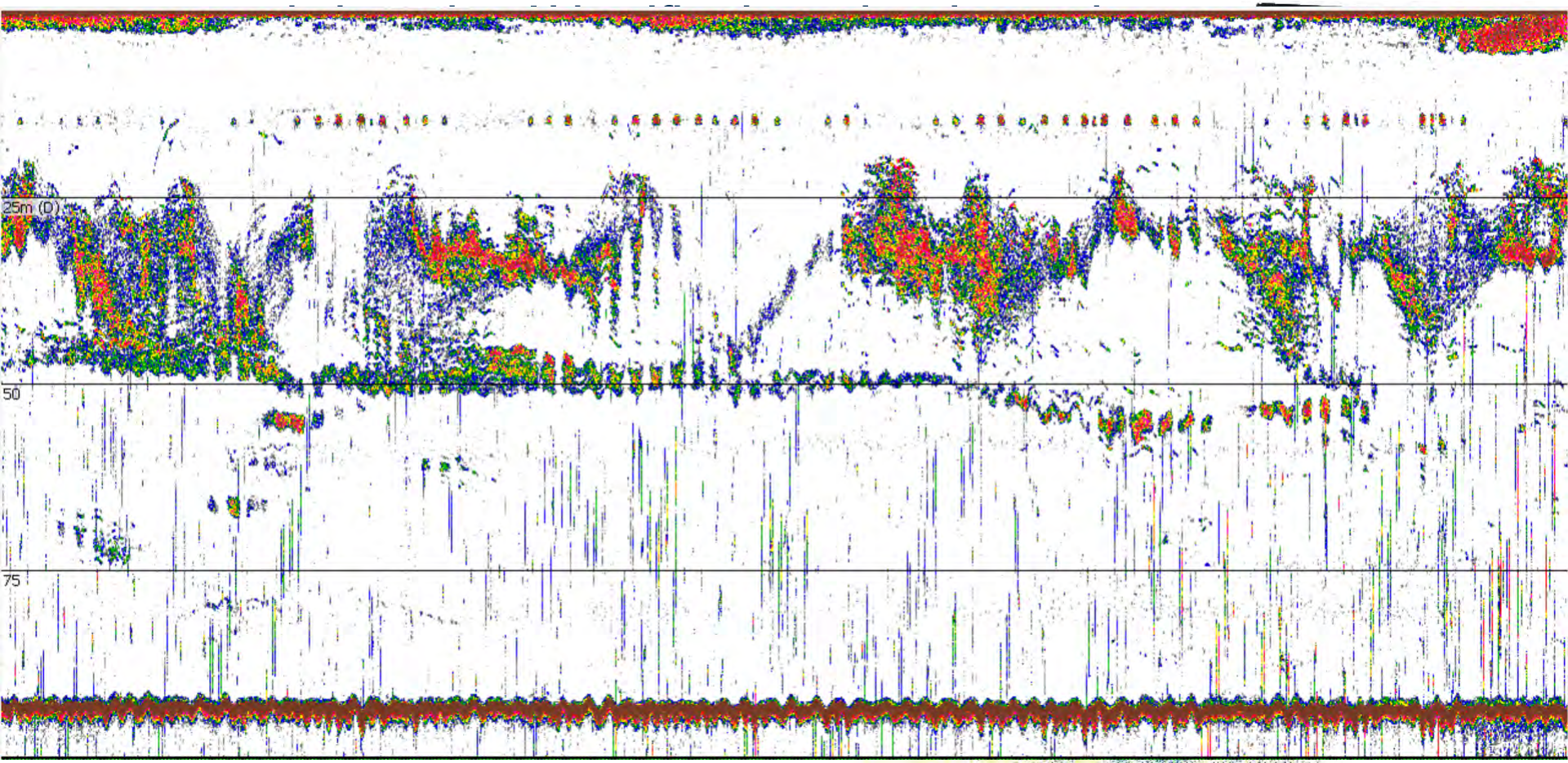
Large purse-seine fisheries opportunistic acoustic data



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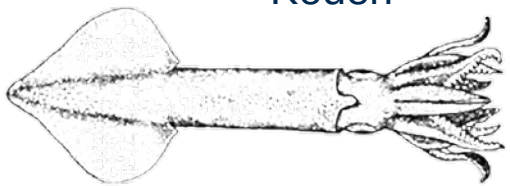
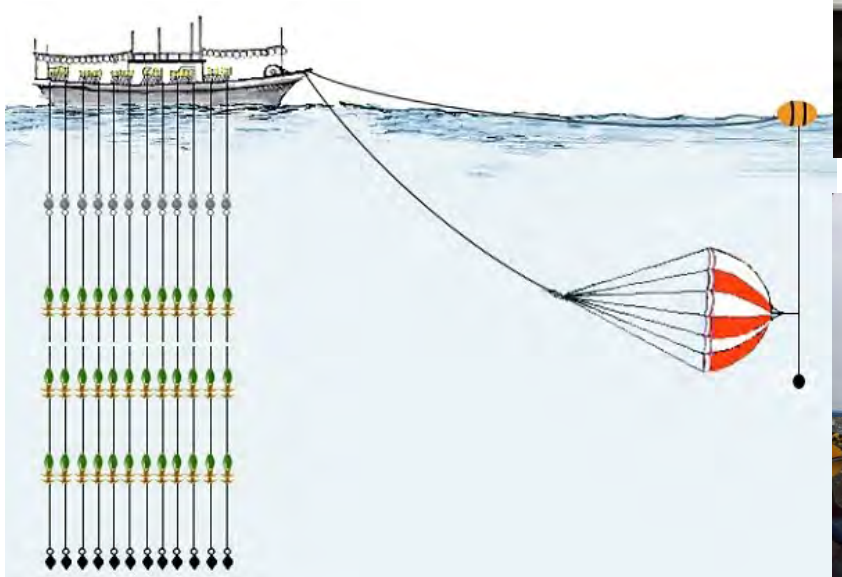
Squid jig fisheries opportunistic acoustic data

- **Squid seasonal distribution**
  - Vessel visit in Gangneung to evaluate technical feasibility

Furuno

Koden





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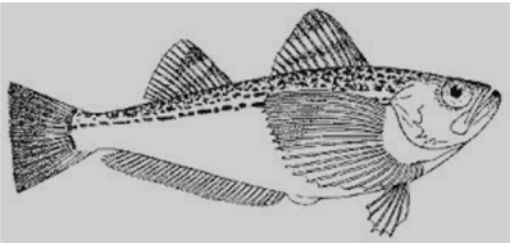
Eastern Danish seine fisheries opportunistic acoustic data

- **Sandfish (*Arctoscopus japonicus*) seasonal migration and population dynamics**
  - Eastern Danish Seine Association Chairman
  - Vessel visit in Kampo to evaluate technical feasibility

Furuno



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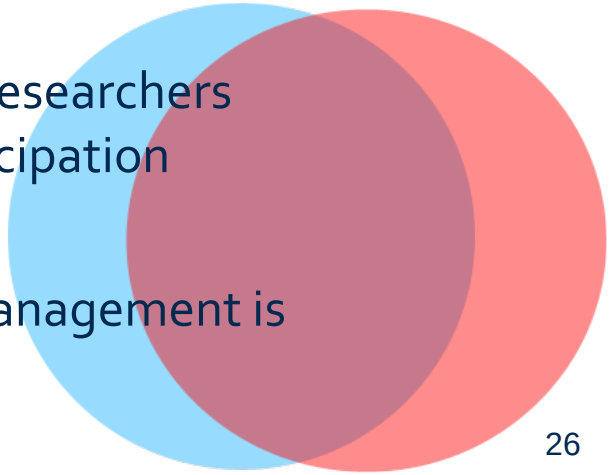
Commonalities

- Fishermen and other stakeholders in both countries are eager to participate in cooperative monitoring and research
- Engaging stakeholders in data collection improves communication across all channels and increases trust in the science
- Clear-cut and reasonable objectives for both the researchers and the data collecting stakeholder improves participation
- Managing expectations of the fishers and upper management is essential



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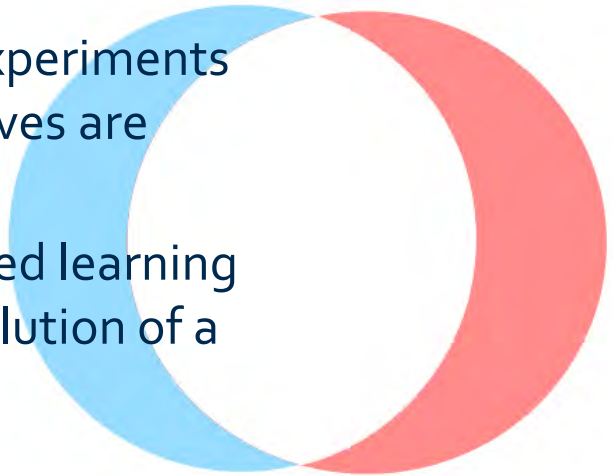
Key cultural differences

- **Korean Management**
  - Essential to have a very clear and rigid plan of action prior to involving stakeholders or upper management
  - Small missteps or mistakes are failures that can kill projects and potentially damage careers
- **USA Management**
  - Projects are often designed as adaptive experiments sometimes without knowing if the objectives are attainable
  - Small missteps and mistakes are considered learning opportunities that are essential to the evolution of a project and a scientist



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Publications

Barbeaux, S.J., Horne, J. and Ianelli, J. 2014. Novel approach for estimating location and scale specific fishing exploitation rates of eastern Bering Sea walleye pollock (*Theragra chalcogramma*) . Fish. Res. 153:69-82

Barbeaux, S. J. , Horne, J. and M. Dorn. 2013. Characterizing walleye pollock (*Theragra chalcogramma*) winter distribution from opportunistic acoustic data. ICES J. Mar. Sci. 70:1162-1173

Press, Rich. 2013. Keeping an eye on pollock (podcast with Dr. Steve Barbeaux). Available: http://www.nmfs.noaa.gov/podcasts/2013/05/eye_on_pollock.html#.UbimzvnvuAg

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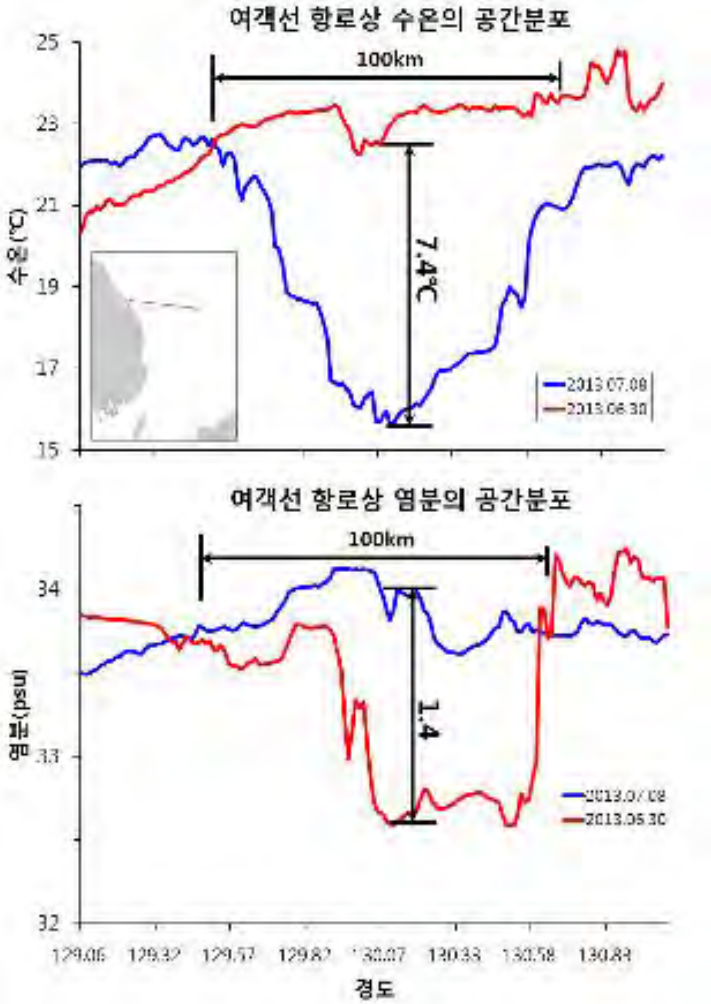
Oceanographic data recording from ferries

- Global Ocean Observing System (GOOS) Project
- Dr. Jong-Hwa Park

Ferry Temp. & Salinity



Satellite SST