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

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Global ocean monitoring system
Filling in the data gaps
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
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
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
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
Fishing effort standardization (2013)

Gill net soak time

Seine tow number

Tinytag Gemini Data Loggers
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
Oceanographic data from the commercial deep-sea crab fishery

Korean red snow crab movement?

@1800m deep
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*  
*Reinhardtius hippoglossoides*  
*Hippoglossus stenolepis*  
*Anoplopoma fimbria*
Temperature and depth recorders on commercial trawlers

• Seabird SBE 39 and cases (US$1900 each)
• Deployed on 18 vessels
• Attached to trawl headrope
• High sampling rate (up to 3 sec.)
• High accuracy (±0.002°C and ±0.1% pressure)

High maintenance!
Spatial distribution of temperature depth recorder data

- 1930 temperature and depth profiles

Winter 2008 – A Season

Summer 2008 – B Season
Chinook salmon bycatch in the pollock fishery GAM analysis

Effects on pollock catch abundance

Effects on probability of Chinook salmon in pollock trawl
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
Acoustic data from commercial longliners in the far Western Aleutian Islands

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

![Diagram of Alaska with 800-1200 M range and a map of the FV Baranof in Seattle.](image)
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
Visualizations of pollock aggregations from opportunistic acoustic data

Day

Night
Visualizations of pollock aggregations and fishery interaction

- Integrates diverse data sources
  - Acoustic
  - On-board observer
  - VMS
Leslie Model: Local Biomass and Fishing Exploitation Rates
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
Large purse-seine fisheries opportunistic acoustic data
Squid jig fisheries opportunistic acoustic data

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


[http://www.nmfs.noaa.gov/podcasts/2013/05/eye_on_pollock.html](http://www.nmfs.noaa.gov/podcasts/2013/05/eye_on_pollock.html#.UbimzvnuAg)
Oceanographic data recording from ferries

Ferry Temp. & Salinity

Satellite SST

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