

Project #: B59

Title: Surface trawl survey acoustics

Principal Investigator(s), Co-Principal Investigators and Recipient Organization(s):

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Contract Period and Amount of Funding:

1 February 2008 to 31 December 2012; \$425,731

Report Period:

1 October 2008 through 31 March 2009

Report Date:

March 31, 2009

Lead Author of Report:

John Horne

Proposed timeline and milestones within report period:

Milestones for project B59 during 2008- 2009

What	Who	Start (2009)	Other key dates
Plan 2009 Fall BASIS survey	Farley, Sigler, Clary, Horne, Parker-Stetter, Heintz, Aydin	January 2009	Complete plan during May
Analysis of 2008 data	Parker-Stetter, Horne	January 2009	
Delivery of 2008 data to modelers	Parker-Stetter, Horne	July 2009	
2009 Survey - Oscar Dyson	Farley, Eisner, Horne, Parker-Stetter	Tentative dates: Sept 1 to 30, 2009	
Begin analysis BASIS acoustic and midwater trawl data	Parker-Stetter, Horne	October 2009	

Project Summary:

This project will quantify forage fish (e.g. juvenile pollock, capelin, herring) distributions on portions of the eastern Bering Sea shelf, and examine how oceanography and environment may influence forage fish distribution, abundance, and ultimately effect apex predator distribution and abundance. Acoustics and midwater trawling will be added to the BASIS survey (project B90) to document density distributions of forage species. We will map forage species distribution and compare distributions and abundances among survey years and supply IBM and energetic models with forage fish data as requested. Milestones for the reporting period are listed above.

Progress Summary:

Data pre-processing of the 2008 survey data is complete. Additional analytic tools are being developed in conjunction with another NPRB-funded project to enhance and speed up processing and discrimination of forage fish in BASIS acoustic data. An additional project component examining diel jellyfish vertical distribution has been added to the project based on preliminary analyses of 2008 data (see Preliminary Results and Lessons Learned for details).

Quality assurance and quality control of acoustic data collected during the BASIS cruise in September 2008 are complete. Summary echograms for all transects have been produced to illustrate vertical and horizontal nekton distributions. BASIS trawl catch data has been received from Ed Farley. Preliminary examination and planning of backscatter distribution data analysis has been completed. A plan for the BASIS 2009 cruise has been negotiated and agreed on by participants.

Preliminary Results:

Vertical distribution of acoustic backscatter (reflected energy, a relative biomass index) differed between day and night. A layer found deeper than 20 m during day rises to the surface during night and becomes mixed with jellyfish that ascend from dispersed aggregations deeper in the water column (Fig. 1).

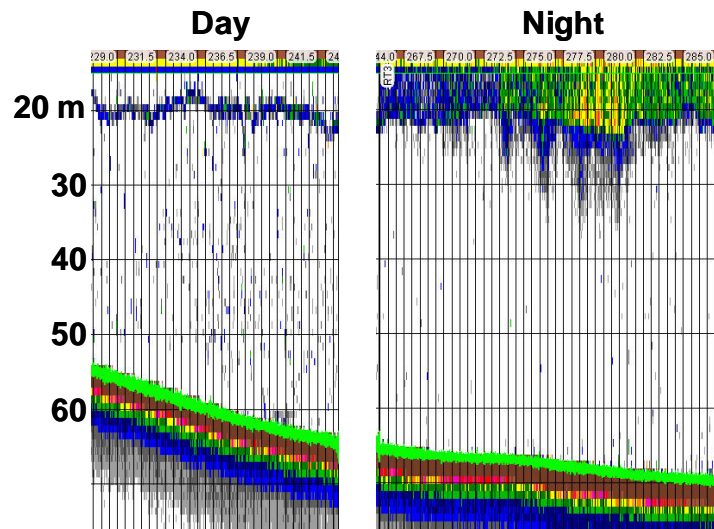


Figure 1. Echogram (38 kHz) illustrating vertical distribution of acoustic backscatter during day (left) and night (right).

Acoustic backscatter from fish and jellyfish generally increased from east to west and was highest in the middle domain (60-80 m bottom depth). High backscatter values at the northern ends of transects were due to forage fish aggregations. Note that red (-56 dB) denotes high backscatter and yellow (-89 dB) denotes low backscatter.

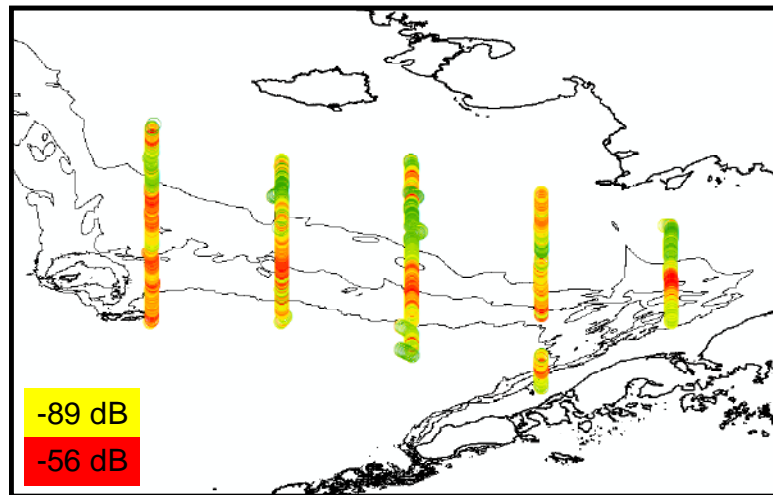


Figure 2. Distribution of acoustic backscatter (S_v) at 38 kHz during BASIS 2009.

Lessons learned and project adjustments:

The reduction in BASIS survey days during 2008 reduced the geographic range and resolution of acoustic transects compared to those collected during previous surveys and planned in the proposal. The BASIS revised transect layout eliminated northern sampling stations and will prevent mapping distributions of target species north of 60°N. The increased spacing between transects (i.e. lower resolution) prevents using a geostatistical approach to estimate abundance of target species. This reduced data product may impact any project looking to use forage fish abundance estimates from this area.

Preliminary analyses of the 2008 backscatter data indicate that the near-surface juvenile fish layer depth varies spatially (see Figure 1, left panel). This spatiotemporal distribution pattern potentially creates two problems when interpreting BASIS acoustic and net data: position during the day and migration of the upper backscatter layer may preclude fish from being sampled with the surface trawl; mixing of the upper backscatter layer with jelly fish during dark hours will hamper acoustic density and abundance estimates of forage fish in near surface waters during dark hours.

Using the acoustic data, we will examine consistency of the near-surface backscatter layer in the corresponding depth range sampled by the BASIS net (top 15m), and compare relative abundance estimates of net catches to acoustic measurements. The 2008 acoustic data suggests that the near-surface juvenile fish layer depth varies spatially (see Figure 1, left panel). This additional activity will delay the availability of abundance estimates to other project groups.

We will also evaluate whether the diel migration of large jellyfish into surface waters at night (Figure 2, right panel) will require novel analytic techniques to meet our objective of quantifying juvenile fish. Additional nighttime surface tows are planned for the 2009 BASIS survey to address this question.

Integration activity

Ongoing communications with fish component PI's has been used to communicate status and interpretations of BASIS-collected acoustic data. A meeting with Ivonne Ortiz was used to discuss how acoustic data would be incorporated into the FEAST model. Sandra Parker-Stetter met with Patrick Ressler and Neal Williamson at the Alaska Fisheries Science Center to discuss 2008 acoustic data analysis and to examine common patterns observed on echograms. Additional discussions were held during the Girdwood PI meeting and at the Alaska Marine Science Symposium.

Education and Outreach:

None so far

Next year's Work plan (not part of the 5 page target length): At the end of your progress report, please update your work plan for the coming year. In particular, add detail for 2009. Contact Mike Sigler if you have any questions in regards to your work plan. Follow this template:

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2009-2010 Tasks, Assignments, Timeline

<i>What</i>	<i>Who</i>	<i>Start (2009)</i>	<i>Other key dates</i>
Analyze acoustic and catch data from BASIS cruise	Parker-Stetter, Horne	Oct, 2008 to Mar 2009	
Plan 2009 Fall survey, including liaison with BSIERP data group	Farley, Sigler, Clary, Hollowed, Horne, Heintz,	January 2009	Complete plan during May
2009 survey	Farley, Eisner, Horne, Parker-Stetter	Tentative dates Sept 1 to 30, 2009	
Analyze acoustic and catch data from BASIS cruise	Parker-Stetter, Horne	Oct. 2009 to Mar 2010	
Station data delivery (lat, lon, number of fish caught, biological data for age 0 pollock, cod, etc)	Farley	December 2009	
Plan 2010 Fall survey, including liaison with BSIERP data group	Farley, Sigler, Clary, Hollowed, Horne, Heintz, Aydin, Ortiz	January 2010	