

Bering Sea Integrated Ecosystem Research Project: Semiannual Progress Report

Project #: B.61

Title: Functional Foraging Response

Principal Investigator(s) and Recipient Organization(s):

Kerim Aydin kerim.aydin@noaa.gov
Ed Farley ed.farley@noaa.gov
Troy W. Buckley troy.buckley@noaa.gov

Contract Period and Amount of Funding:

Contract Period: April 1, 2007 – September 30, 2010

Amount of Funding: \$341,631

Report Period: October 1, 2008 – March 31, 2009

Report Date: April 1, 2009

Lead Author of Report: Kerim Aydin, Ed Farley, Troy W. Buckley

Proposed timeline and milestones within report period:

<i>Milestone</i>	<i>Who</i>	<i>Due</i>	<i>Status</i>
Food habits data from field work through September 2008 made available (submitted to data manager).	Buckley, Aydin, Farley	March 31, 2009	For most species, data has been provided or will be provided by April 30, 2009. One species (Pacific cod) will not be complete until Sept. 2009.
Identify additional stomach sampling platforms that potentially can provide physical (e.g. temperature), prey-field (e.g. zooplankton) and predator-field (e.g. arrowtooth flounder, pollock, P. cod) information.			This milestone has been met and sampling plans have been established for these platforms.

Project Summary: This project is aimed at distinguishing between temperature related and prey density related responses of juvenile and adult pollock, a nodal species in the eastern Bering Sea food web. Understanding these biological responses will help predict ecosystem responses to projected reduced production, increased overlap between piscivores and forage fishes, and increased abundance of piscivores due to predicted warming of the climate. The specific functional forms and relationships measured between predator and prey will become a critical component of the FEAST model (Project B.70).

Progress Summary:

Bering Sea Integrated Ecosystem Research Project: Semiannual Progress Report

During this reporting period, we have made progress on laboratory analysis of predator stomach samples, we have improved the coordination of this project with B62 - Fish Forage Distribution and Ocean Conditions, and B.70 - FEAST Modeling, and we have identified survey platforms that will allow more synoptic collection of physical, prey-field and predator-field information.

Stomach samples from arrowtooth and Kamchatka flounders collected during the 2008 Bottom Trawl Survey (n = 1,238) have been analyzed. This data is being error checked and is due to be submitted to the data manager very soon. We anticipate completion by early April of the laboratory analysis of the walleye pollock stomach samples (n = 1,867) collected during the 2008 Bottom Trawl Survey. Summer survey commitments will delay the completion of the 2008 Pacific cod stomach samples (n = 1,358) until September. We anticipate that all of the 2008 predator stomach contents data will be submitted to the data manager by the end of September 2009. All of this data is undergoing exploratory statistical analyses and is being shared with the FEAST model PIs (Project B.70) as it becomes available. We have fostered communication with other BSIERP projects and this has resulted in the modification of our field sampling approach and modification of the desired detail in our identification of consumed zooplankton. Stomach samples from walleye pollock will be collected during the 2009 Hydroacoustic Survey in addition to the 2009 Bottom Trawl Survey. These samples will provide more information about localized interactions between vertical thermal structure, zooplankton abundance and feeding of walleye pollock. In addition, these samples will allow comparisons between the zooplankton selected by nets and by walleye pollock. Opportunities to sample pollock predators in late fall are being explored. More detailed identification of zooplankton in the diets of walleye pollock and other forage fishes will enhance modeling efforts and communication between the NPZ and FEAST models. Additional collection and processing of additional field samples and more detailed identification of prey will be supported by a re-allocation of funds (\$83,371) from Project B.58.

Lessons learned and project adjustments:

We have learned that communication between the NPZ and the FEAST models could be improved by providing more detailed information about the zooplankton consumed by walleye pollock and other forage fishes. The procedures for analyzing stomach samples in the laboratory have been adjusted to meet this need, but this requires more time spent on each sample. Discussions at BSIERP meetings have highlighted the need to put an extra collection and analytical focus on euphausiids and their influence on the distribution of walleye pollock over the eastern Bering Sea continental shelf. We are adding field sampling of walleye pollock stomachs during the Hydroacoustic Survey to investigate this relationship. The extension of our work back into retrospective studies was an addition for the purposes of modeling as identified by the Ecosystem Modeling Committee; those costs were submitted separately as part of the modeling package but the data analysis shall be included here (with no adjustments to this project).

The milestone to make available (submit to data manager) the food habits data from field work through September 2008 was not wholly met. The procedures for analyzing stomach samples in the laboratory have been adjusted to meet the modeling need of more detailed zooplankton identification, and these new methods are more time consuming. The milestone to identify additional stomach sampling platforms that potentially can provide physical, prey-field and predator-field information has been met through successful identification of, and funding acquired for, sampling during additional surveys.

Integration activity: The Functional Foraging Response project component has the same lead PI (Kerim Aydin) as in the Modeling project and in the Science Advisory Board, thus facilitating communication with both groups. Previously established collaborative communication between Resource Ecology and Ecosystem Modeling (REEM) and Fisheries Oceanography Coordinated Investigations (bongo tows for zooplankton prey), REEM and Midwater Assessment and Conservation Engineering (euphausiid prey abundance), REEM and Groundfish Assessment (pollock distribution), and REEM and Pacific Marine Environmental Laboratory (water temperature profiles and fronts) has continued to develop. Collaborative communication between REEM and Auke Bay Laboratory (seasonal gadoid liver energy) continues, and we are attempting to coordinate this work with the Ichthyoplankton Seasonal Bioenergetics

Bering Sea Integrated Ecosystem Research Project: Semiannual Progress Report

project component (Project B.54, PI Ron Heintz). New collaborative communication has resulted in a funded effort to more closely examine the relationship between ocean conditions, zooplankton composition and abundance with the food habits of walleye pollock (Project B.62).

Education and Outreach: None to date.

Next year's Work plan:

BSIERP Project B.61, Functional Foraging Response

Contacts:

Troy W. Buckley	troy.buckley@noaa.gov	206-526-4349
Kerim Aydin	kerim.aydin@noaa.gov	206-526-4225
Ed Farley	ed.farley@noaa.gov	907-789-6085

2009-2012 Tasks, Assignments, Timeline:

<i>Milestone</i>	<i>Who</i>	<i>Due</i>	<i>Status</i>
<p>Food habits data from field work through September 2008 made available (submitted to data manager).</p> <p>Identify additional stomach sampling platforms that potentially can provide physical (e.g. temperature), prey-field (e.g. zooplankton) and predator-field (e.g. arrowtooth flounder, pollock, P. cod) information.</p>	Buckley, Aydin, Farley	March 31, 2009	<p>For most species, data has been provided or will be provided by April 30, 2009. One species (Pacific cod) will not be complete until Sept. 2009.</p> <p>This milestone has been met and sampling plans have been established for these platforms.</p>
Food habits data from field work through March 2009 made available (submitted to data manager)	Buckley, Aydin, Farley	September 30, 2009	Currently on schedule to meet this milestone.
Food habits data from field work through September 2009 made available (submitted to data manager)	Buckley, Aydin, Farley	March 31, 2010	
Analyzed maps of food habits and functional responses for field work to date prepared for input into FEAST model	Aydin, Buckley, Farley	April 30, 2010	
Food habits data from field work through March 2010 made available (submitted to data manager)	Buckley, Aydin, Farley	September 30, 2010	

Bering Sea Integrated Ecosystem Research Project: Semiannual Progress Report

manager)			
Manuscript submitted: Functional response between pollock and prey (specifically zooplankton), local environmental factors affecting functional response, and global extrapolation of geographic conditions (e.g. cold pool) in relation to functional response.	Buckley, Aydin, Farley, other fish group members	September 30, 2010	
Food habits data from field work through September 2010 made available (submitted to data manager)	Buckley, Aydin, Farley	March 30, 2011	
Manuscript: Functional responses and foraging from the BASIS survey.	Farley, other Fish group members	March 30, 2011	
Manuscript: Statistics of diet and functional response analysis: implications for multispecies models.	Aydin, Buckley, other Fish group members	March 30, 2011	
Manuscript: Bioenergetic growth potential (dynamic habitat) of pollock given prey and oceanographic conditions.	Aydin, Buckley, Hollowed, Heinz, other Fish group members	Sept 30, 2011	

Additional publications leveraging BSIERP PIs and other NPRB work:

1. Buckley, Hurst, Aydin: Cod and prey, specifically focusing on Benthic/pelagic split: ~September 2010.
2. Aydin, Buckley, Zador, Cianelli: the relationship between ATF density and pollock consumption: extend focus on local factors (water column, etc.): ~December 2009.