

USCGC Healy Cruise Plan

HLY0902

April 3 – May 12 2009

Carin Ashjian, Chief Scientist
Evelyn Lessard, Co-Chief Scientist

PROJECTS (in Random Order)

1) BEST: Sea Ice Algae, a Major Food Source for Herbivorous Plankton and Benthos in the Eastern Bering Sea (NSF ARC-0732767)

PIs: Rolf Gradinger, Bodil Bluhm, Katrin Iken (UAF)

Cruise Participants: Katrin Iken, Jared Weems, Heloise Chenelot

Abundance, biomass, community composition and productivity of sea ice algae and phytoplankton. Salinity, temperature, and nutrient concentrations in ice cores and under-ice water, ice thickness, snow cover and light regime. Sedimenting material, stable isotope ratios ($d^{13}C$, $d^{15}N$) and algal community composition.

On-ice sampling with ice augers and ice-tethered sub-ice sediment traps. Ship based plankton nets, benthic grabs. Occasional small boat and helicopter. Stable isotopes.

2) BEST: Mesozooplankton-microbial food web interactions in a climatically changing sea ice environment (NSF ARC-0732301, -0732362, -0732382)

PIs: Evelyn Sherr and Barry Sherr, Robert Campbell, Carin Ashjian

Cruise Participants: Carin Ashjian, Celia Gelfman, Celia Ross, Julie Arrington, Donna van Keuren

Mesozooplankton/microzooplankton grazing rates and grazing impacts; high resolution vertical and horizontal distribution of plankton.

Plankton nets, CTD, Video Plankton Recorder, On-deck incubators (2).

3) BEST - A Service Proposal to Examine Impacts of Sea-ice on The Hydrographic Structure and Nutrients Over the Eastern Bering Sea Shelf (NSF ARC-0732430, -0732640)

PIs: Whitledge (UAF), Sonnerup (U. Washington), (Stabeno (NOAA))

Cruise Participants: Calvin Mordy, Jessica Cross, Daniel Naber, Nancy Kachel, David Kachel, Ned Cokelet

Hydrography, nutrients, and chlorophyll.

CTD sampling. On ice sampling.

4) Collaborative Research: BEST - A service proposal to examine impacts of sea-ice on the distribution of chlorophyll-a over the eastern Bering Sea shelf. (NSF ARC-0813985)

PIs: Rolf Sonnerup (UW), T. Whitledge (UAF)

Cruise Participants: See Service Proposal (#4)

Chlorophyll-a data.

CTD sampling.

5) BEST: The Trophic Role of Euphausiids in the eastern Bering Sea: Ecosystem Responses to Changing Sea-ice Conditions (NSF ARC-0732389, -0732667)

PIs: Evelyn Lessard (UW), Rodger Harvey (U Maryland)

Cruise Participants: Evelyn Lessard, Rodger Harvey, Tracy Shaw, Rachel Pleuthner, Megan Bernhardt, Gigi Endel

Age structure and diet history of important euphausiids; euphausiid grazing rates and growth and trophic lipid markers.

CTD, plankton nets, on ice sampling. On-deck incubators (2).

6) BEST: Nitrogen supply for new production and its relation to climatic conditions on the eastern Bering Sea Shelf. NSF ARC-0612427, -0612198

PIs: Raymond Sambrotto (LDEO-Columbia), Daniel Sigman (Princeton)

Cruise Participants: Didier Burdloff, Kris Swenson

New (nitrate) and regenerated nitrogen production; nitrogen isotope ratios.

CTD, on-ice sampling. Stable isotopes. On-deck incubator.

7) BEST: Denitrification and global change in Bering Sea shelf sediments (NSF ARC-0612436, -0612380)

PIs: Allan Devol (U. Washington), David Shull (Western Washington U.)

Cruise Participants: David Shull, Heather Whitney, Maggie Esch

Profiles and fluxes of oxygen, nitrate, ammonium, phosphate and silicate in the sediment; measurement of ^{222}Rn and ^{210}Pb ; water column radon.

Benthic coring with Multicore; AUV work under ice, CTD. Radioisotopes.

8) BEST: The Impact of Changes in Sea Ice Extent on Primary Production, Phytoplankton Community Structure, and Export in the eastern Bering Sea (NSF ARC-0732680, -0732359)

PIs: Brad Moran (URI), Mike Lomas (BBIOS)

Cruise Participants: Mike Lomas, Pat Kelly, Doug Bell

Gross and net primary production using traditional ^{14}C , ^{13}C methods, and triple oxygen isotope technique and dissolved oxygen concentrations. Water column fluxes of particulates along the slope. Sinking rates of particulates.

CTD and floating sediment traps. On-ice sampling. Radioisotopes (^{14}C). On-deck incubator.

9) BSIERP: North Pacific Pelagic Seabird Observer Program (NPRB Project 637)

PIs: Kathy Kuletz, David Irons (USFWS)

Cruise Participants: Liz Labunski, Marty Reedy

Seabird abundance and composition relative to oceanography.

Visual observations from bridge. GPS feed for laptop; table on bridge.

10) Bering Ecosystem Study Data Management Support (NSF ARC-0808853)

PIs: Jim Moore, Greg Stossmeister, Steve Williams (NCAR/EOL)

Cruise Participants: Janet Scannell

Develop an on-line field catalog including project documentation and data browsing capabilities during the cruise. EOL will also provide archival services for all data collected during this cruise.

11) Assessment of Mesozooplankton Population and Biomass in the Eastern Bering Sea for Spring and Summer of 2008, 2009 and 2010. (NSF ARC-0816805)

PIs: Ken Coyle and Alexei Pinchuk (UAF).

Cruise Participants: Alexei Pinchuk

Mesozooplankton species composition, abundance, and biomass.

MOCNESS (in open water only) and CalVET plankton nets. White free-standing incubators.

12) IPY: Collaborative Research: Live from the Poles; A Multimedia Educational Experience. (NSF DRL-0632219)

PIs: Chris Linder

Cruise Participants: Chris Linder and Helen Fields

This project brings together polar researchers, science centers and broadcast media reporters to tell the story of polar research expeditions to the general public, teachers and students. A photographer (Linder) and a science writer (TBD) will participate in the cruise. Information will be disseminated via the web and via several scheduled real-time phone patches to audiences at a range of museums including the Smithsonian Natural History Museum and at other media outlets.

Photography, writing, teleconferences.

General Cruise Plan

The cruise will sample along three major transects across the Bering Sea and a transect running along the 70 m isobath. Generally, there will be a long (20 hours?), process station every other day, with multiple short stations in between. Ice conditions permitting, there will be an ice station once daily as well. Short ice stations will last 2-4 hours and long ice stations will last ~6-7 hours. Ice stations will occur during hours of daylight.

See Detailed Itinerary.

See Operations Plan.

Mooring locations are in the Operations plan.

APPENDIX

Project Summaries (in Random Order):

1) BEST: Sea Ice Algae, a Major Food Source for Herbivorous Plankton and Benthos in the Eastern Bering Sea (NSF ARC-0732767)

PIs: Rolf Gradinger, Bodil Bluhm, Katrin Iken (UAF)

Funds are provided to study the role of sea ice algae in the food web of the eastern Bering Sea shelf ecosystem. The scarce observations available from the Bering Sea indicate that ice algal production may be as high as 30% of the phytoplankton production; during times of ice cover, ice algal biomass can be nearly as high as integrated pelagic algal biomass. The overarching hypothesis of this proposal is that sea ice algae are the major food source for pelagic and benthic herbivores in spring, specifically during periods of ice melt. In addressing this hypothesis, this proposal aims at providing information on the spatial and temporal patterns of abundance, biomass, community composition and productivity of sea ice algae and phytoplankton just below the ice in relation to the physical and chemical environment. Environmental measurements will include salinity, temperature, and nutrient concentrations in ice cores and under-ice water, as well as ice thickness, snow cover and light regime. Sedimenting material, stable isotope ratios ($\delta^{13}\text{C}$, $\delta^{15}\text{N}$) and algal community composition will be used as three lines of evidence to follow the fate of ice algal production through the pelagic and into the benthic food web of the Bering Sea. Field work conducted during different ice cover regimes will be augmented with experimental work on pelagic and benthic herbivores, producing the first-ever stable isotope turnover rate measurements for any Bering Sea invertebrates. The combined data set will allow for a refined interpretation of the relevance of the sea ice produced organic matter for the food web structure in the Bering Sea.

This project is part of a larger program designed to develop understanding of the integrated ecosystem of the eastern Bering Sea shelf, a highly productive region of US coastal waters. This ecosystem is home to a major portion of the commercial fisheries of

the US and also provides significant resources to subsistence hunters and fisherman of Alaska. Understanding role of sea ice algae in this system is essential to being able to predict how and why the system may respond to changes in sea ice conditions, such as have been observed in recent years.

2) BEST: Mesozooplankton-microbial food web interactions in a climatically changing sea ice environment (NSF ARC-0732301, -0732362, -0732382)

PIs: Evelyn Sherr and Barry Sherr (OSU), Robert Campbell (URI), Carin Ashjian (WHOI)

Funds are provided for an analysis of the impact of changing sea ice conditions on planktonic food web structure, focusing on microzooplankton and mesozooplankton trophic linkages and the fate of phytoplankton blooms in the Bering Sea during spring sea ice conditions. To this end, the principal investigators plan to conduct experiments over a range of ice, ice edge, and open water conditions, and, particularly, will consider the importance of detached ice algae, when present, as a food source for the secondary consumers. As part of this effort, they will determine standing stock biomass, composition, and size structures of phytoplankton, microzooplankton and mesozooplankton assemblages, measure microzooplankton growth and mesozooplankton reproduction rates, and measure grazing rates and prey preferences of heterotrophic protists and dominant species of mesozooplankton. They will also determine the fine scale vertical distribution of plankton, especially of fragile forms such as colonial phytoplankton, to identify thin layers of plankton/ particles in association with hydrographic features. Their collaborative study will explicitly address trophic linkages previously unexplored in this region of the subarctic. They hypothesize that changing ecosystem structure due to global warming, e.g. decrease in seasonal sea ice, will alter these trophic interactions, and thus the ultimate fates of algal production in this region. They plan to participate in each of the three annual cruises proposed for spring sea-ice conditions during the BEST field program. They will carry out a full set of analyses (standing stock determinations and rate measurements) at designated stations along transects within the BEST study area. Abundances and rate measures will be combined to determine relative microzooplankton and mesozooplankton grazing impacts.

While the direct measurements and observations to be derived from this program will allow the principal investigators to describe the microzooplankton and mesozooplankton of the eastern Bering Sea shelf and their grazing impacts with a detail heretofore unavailable, the numbers they derive will also provide strong constraints on the ecosystem models to be developed as part of BEST. These models will serve as an important tool during the synthesis of the collective understanding derived by the BEST investigators.

3) BEST - A Service Proposal to Examine Impacts of Sea-ice on The Hydrographic Structure and Nutrients Over the Eastern Bering Sea Shelf (NSF ARC-0732430, -0732640)

PIs: Whitley (UAF), Sonnerup (U. Washington)

Funds are provided to collect, quality control, analyze and distribute to all Bering Sea Ecosystem Study (BEST) investigators the core physical and chemical observations during the spring cruises projected for BEST. This proposed study will also examine how sea-ice affects along- and across-shelf gradients of temperature, salinity, fluorescence, oxygen, nutrients and currents by integrating data from multiple hydrographic surveys in late winter and spring with trajectories from satellite-tracked drifters and data from long-term moorings (funded elsewhere).

4) BEST: The Trophic Role of Euphausiids in the eastern Bering Sea: Ecosystem Responses to Changing Sea-ice Conditions (NSF ARC-0732389, -0732667)
PIs: Evelyn Lessard (UW), Rodger Harvey (U Maryland)

The principal investigators' primary hypothesis is that seasonal and interannual variation in the timing and coverage of sea-ice and associated food resources will lead to differences in age structure, diet history and nutritional condition for euphausiids, which ultimately translate into differences in production rates and availability as prey to higher trophic levels. Funds are provided to quantify the age structure and diet history of important euphausiids together with detailed information on their consumption and growth and to link field collections and analysis with laboratory rearing for age calibrations and shipboard feeding experiments to test the validation and retention of trophic lipid markers as well as the quality and quantity of food resources.

The investigators' objectives include:

1. To determine the potential impact of climate driven changes in sea-ice conditions on lipid content and lipid classes in major euphausiid species and thus nutritional condition and reproductive potential over seasonal and interannual time scales.
2. To understand the feeding history, feeding rates and grazing strategies of euphausiids under changing spatial (i.e. ice-covered, ice-edge, and open water zones) and temporal (i.e. seasonal and interannual) prey fields. Multiple approaches (i.e. feeding experiments, gut content analysis) will be used for validation and determination of retention of specific lipid dietary markers.
3. To apply recent advances in biochemical approaches to determine the age structure in field populations of euphausiids and the potential effects of climate change on maintenance or disruption of cohort populations seasonally and interannually. Laboratory rearing conducted in parallel by Alaskan colleagues will allow calibrating precise ages in cohorts.

This project is part of a larger program designed to develop understanding of the integrated ecosystem of the eastern Bering Sea shelf, a highly productive region of US coastal waters. This ecosystem is home to a major portion of the commercial fisheries of the US and also provides significant resources to subsistence hunters and fisherman of Alaska. Euphausiids are believed to be a critical link in the food web connecting plankton to fish resources in the region. Understanding the ecology of these organisms is critical to understanding how the commercial and subsistence fisheries may respond to a changing environment.

5) BEST: Nitrogen supply for new production and its relation to climatic conditions on the eastern Bering Sea Shelf. NSF ARC-0612427, -0612198

PIs: Raymond Sambrotto (LDEO-Columbia), Daniel Sigman (Princeton)

This project will measure new (nitrate) and regenerated nitrogen production directly with tracer incubation measurements in ice-impacted and ice-free regions of the eastern Bering Sea shelf. New production is indicative of the total amount of organic material available for higher levels of the food chain and the ratio of new to total nitrogen production (the co-ratio) indicates the degree to which production is linked to grazing within the water column. This ecological information will be used to characterize the partitioning of primary production between water column and bottom-dwelling consumers and how this changes with conditions on the shelf. The PIs hypothesize that the seasonal development of regenerated production will be closely associated with that of the zooplankton populations and thus the nitrogen productivity data will test a key component of the oscillating control hypothesis that links climate variability to the flow of nutrition through the food web. Community composition will be evaluated in parallel with nitrogen productivity because significant successional as well as year-to-year changes in phytoplankton have been observed on the eastern Bering shelf.

This project also will measure the natural isotopic ratios of both the nitrate supply (both $^{15}\text{N}/^{14}\text{N}$ and $^{18}\text{O}/^{16}\text{O}$) and the forms of nitrogen produced (the $^{15}\text{N}/^{14}\text{N}$ of suspended and sinking particles, dissolved organic N and ammonium). These measurements provide a passive isotope approach that will reflect the intensity of nitrate assimilation and provide a new constraint on shelf new production. The project will calibrate this new approach against tracer incubation measurements. The passive isotope approach should be particularly useful in quantifying new production in hydrodynamically complex, but ecologically important regions, such as the shelf break, that are difficult to characterize with standard budgets and incubation-based measurements. Finally, the PIs will examine the processes for year-to-year variations of combined nitrogen on the shelf. This analysis will be used to test the hypothesis that variations in physical and biological processes may influence productivity of larger organisms by controlling the amount of combined nitrogen available on the shelf for growth.

6) BEST: Denitrification and global change in Bering Sea shelf sediments (NSF ARC-0612436, -0612380)

PIs: Allan Devol (U. Washington), David Shull (Western Washington U.)

Observed patterns of seasonal and inter-annual variation of ice cover in the Bering Sea appear to be linked to global climate change. These patterns suggest that long-term warming of the Bering Sea would cause a shift in timing of the spring bloom and, concomitantly, in energy flow from benthic to pelagic communities. The PIs will test the hypothesis that variation in the timing of the spring bloom changes the rate of denitrification in Bering Sea sediments, which will have substantial consequences for productivity in this region.

Denitrification in shelf sediments of the southeastern Bering Sea is estimated to remove about one third of the total nitrate supply to the Bering Shelf. The specific hypotheses that the PIs propose to test are:

- (1) Denitrification covaries with organic matter input to the sediment and infaunal burrow densities, peaking at intermediate infaunal densities,
- (2) Macrofaunal burrow ventilation rates covary with organic matter input,
- (3) Return of nitrogen to the overlying water will be a non-linear increasing function of organic-matter input, and
- (4) The fraction of export production reaching the sediment will change with the timing of sea ice melt.

To test these hypotheses, they will participate in oceanographic cruises in 2007-2009, conduct onboard experiments, and collect core samples for the measurement of profiles and fluxes of oxygen, nitrate, ammonium, phosphate and silicate. They will also collect samples for measurement of ^{222}Rn and ^{210}Pb profiles, from which they will calculate sediment bioirrigation rates and bulk sedimentation rates, respectively. This combination of measurements will allow them to estimate sedimentary denitrification rates, overall benthic carbon oxidation rates, macrobenthic irrigation rates and organic-matter burial rates, and to test their hypotheses. Additionally, they will use the data to construct a mathematical model of sedimentary nitrogen cycling that can be used as a boundary condition for larger Bering Sea Ecosystem models.

It is assumed that, at present, the nitrogen needed to fuel the primary production on the Bering Sea shelf is derived from cross-shelf transport of oceanic waters and denitrification in shelf sediments. How the relative importance of these two sources of nitrogen would change under an altered ice regime and the consequences for the ecosystem remain important unanswered questions. This research effort should provide a considerable improvement in our knowledge of existing conditions and our projections of future conditions.

7) BEST: The Impact of Changes in Sea Ice Extent on Primary Production, Phytoplankton Community Structure, and Export in the eastern Bering Sea (NSF ARC-0732680, -0732359)

PIs: Brad Moran (URI), Mike Lomas (BBIOS)

Funds are provided to test the following core hypothesis: climate-driven interannual variability in sea-ice extent and duration shifts the eastern Bering Sea autotrophic community between one of two states; marginal ice-zone (MIZ) blooms vs. open-water blooms. The MIZ bloom state is characterized by high biomass, diatom-dominated blooms, high pelagic export and tight pelagic-benthic coupling, whereas the open-water bloom state is characterized by lower biomass, flagellate blooms, low pelagic export, and reduced pelagic-benthic coupling. This project will generate measurements of primary production using traditional ^{14}C , ^{13}C methods, and use the innovative triple oxygen isotope technique and dissolved oxygen concentrations to estimate gross and net primary production, respectively. This combination of productivity measurements will be used to test the hypothesis that while gross primary production does not change with sea-ice extent, net production does, and is inversely related to sea-ice extent.

Phytoplankton community structure measurements will allow the PIs to test their hypothesis that the autotrophic community switches from a diatom-dominated, high

export system in the MIZ, to a flagellate-dominated, lower export, system in open water blooms.

This project is part of a larger program designed to develop understanding of the integrated ecosystem of the eastern Bering Sea shelf, a highly productive region of US coastal waters. This ecosystem is home to a major portion of the commercial fisheries of the US and also provides significant resources to subsistence hunters and fisherman of Alaska. Characterization of rates of primary production by phytoplankton and the varying structure of the phytoplankton community in response to changing sea ice conditions will provide information about changes at the base of the food chain that will constrain models of the ecosystem. This information will be essential to a successful integrated ecosystem modeling protocol for the region.

8) North Pacific Pelagic Seabird Observer Program (NPRB Project 637)

PIs: Kathy Kuletz, David Irons (USFWS)

The U. S. Fish and Wildlife Service (USFWS) is undertaking an at-sea program utilizing ships of opportunity, with the goal to update our seabird database and improve efforts to use them as indicators of change in the North Pacific/Arctic oceans. A seabird observer will be onboard HLY0802 to take advantage of oceanographic and biological data in relation to seabird distribution and abundance. The USFWS seabird observer will be equipped with all necessary field gear, including a laptop computer with integrated GPS for data recording. Following established protocols, the observer will conduct surveys during daylight hours, recording all marine birds and mammals within a set transect width.

9) Bering Ecosystem Study Data Management Support (NSF ARC-0808853)

PIs: Jim Moore, Greg Stossmeister, Steve Williams (NCAR/EOL)

Funds are provided for continuing data management services for the next 4 years of the BEST project. These services will include field catalog support aboard each cruise and data archival of all project data including that from BEST 2007 activities. This proposal, together with work that was begun in support of 2007 activities will help tie together all data management tools and services throughout the BEST campaign. Together with BSIERP data managers, EOL will work toward an integrated archive that provides full access to the wealth of data collected from BEST and BSIERP to current and future investigators.

Specific tasks that are funded as part of this project include:

1) EOL will provide an on-line field catalog on-board the USCGC Healy during each BEST cruise to allow scientists to access, peruse and contribute preliminary data and analyses as well as documentation of project activities. It will serve as the primary long-term documentation of each BEST cruise. The catalog will have similar functionality to the one deployed during the BEST cruise in 2007. After each cruise is completed, the field catalog will be re-installed at EOL's BEST archive website for general access to the scientific community.

2) EOL will continue support for the BEST archive by expanding it beyond the 2007 datasets to include new datasets from the recently funded NSF PIs. This would be a total of 4 years of support. This will involve collecting preliminary and final datasets as they become available from all BEST PIs and providing access to interested users through the EOL data and metadata archival and distribution system (EMDAC). EOL will password protect datasets by request of the PIs to limit distribution to BEST and BSIERP funded PIs for a temporary period consistent with NSF and to be developed BEST-BSIERP data policies. EOL will also provide GIS mapserver support for appropriate PI cruise datasets (see Section 2.5). This support will consist of assisting PIs in converting their datasets to a GIS format and loading their data as a layer in the central BEST mapserver located at EOL. We will also provide the ability for PIs to download these layers for work off-line. EOL will stage all final datasets and accompanying metadata to the appropriate long-term archive. EOL will work toward implementing a BEST archive process using the developing CADIS approach to better handle data and metadata as well as archival and access to the NSF data in a consistent and comprehensive manner.

3) Due to the synergistic nature of both BEST and BSIERP it will be important for the two data archive centers to work together to allow researchers to easily find and access complementary datasets. EOL will work with BSIERP data managers to develop linkages between the archives to meet these needs. We will also offer NPRB suggestions and advice on a data management structure that resonates with both projects. EOL can provide a consolidated data table that could include datasets from both projects. The BEST datasets would be housed at EOL while the table would transparently link to the BSIERP data archive for those datasets (see section 2.8 for more details).

4) We will also continue to work with Mark John and Ann Fineup-Riordan to improve access and display of their unique Local and Traditional Knowledge (LTK) datasets through a GIS mapserver tool. There is still a significant amount of exploration required in this area to develop products that are truly useful to the PIs and the communities they are working with. Additional funding for this task will be required if there are developments that require substantial work with new PIs or in new geographic areas.

10) BEST: Assessment of mesozooplankton population and biomass in the eastern Bering Sea for spring and summer of 2008, 2009 and 2010. (NSF ARC-0816805)
PIs: Ken Coyle and Alexei Pinchuk (UAF).

The goal of BEST (Bering Sea Ecosystem Study), a large NSF-supported research effort, is to identify and quantify mechanistic links between climate and the ecosystem response. An ecosystem responds to changes in climate forcing by altering the abundance, biomass and species composition of its constituent populations. Without information on lower trophic level populations forming the base of the food web, it is impossible to determine the state of the system, estimate the direction or magnitude of change, if any, to validate or refute hypotheses or to adequately validate or parameterize lower trophic level models. In order to contribute to the assessment of the state and variability of the species composition, abundance and biomass of the populations forming the ecosystem of the Eastern Bering Sea Shelf during BEST and to estimate population trends, funds are provided to collect and process approximately 260 zooplankton samples from the eastern Bering Sea during each of two cruises per year and to analyze the resultant data.

11) IPY: Collaborative Research: Live from the Poles; A Multimedia Educational Experience. (NSF DRL-0632219)
PI: Chris Linder (WHOI)

This project brings together polar researchers, science centers and broadcast media reporters to tell the story of four polar research expeditions to the general public, teachers and students. The four expeditions to the Arctic and Antarctic were chosen based on their relevance to the three primary IPY research emphasis areas defined by NSF. A science writer and a professional photographer/oceanographer reporting on each expedition will do daily webcasts on the "Polar Discovery web site (<http://polardiscovery.who.edu>)" as well as several scheduled real-time phone patches to audiences at the Museum of Science, Boston, the Smithsonian Natural History Museum, The Field Museum (Chicago), the Houston Museum of Natural Science, the Pacific Science Center (Seattle), the Birch Aquarium (San Diego), National Public Radio stations, CBS News and to student "reporters" writing for Scholastic Online. Programs will also be broadcast on University of California TV. A museum exhibit at the WHOI Exhibit Center will highlight polar research. Components of it will either travel to partner museums or be replicated in the partnering museums. Photo archives of the expeditionary material will also be created and made available to interested users.

12) Collaborative Research: BEST - A service proposal to examine impacts of sea-ice on the distribution of chlorophyll-a over the eastern Bering Sea shelf . (NSF ARC-0813985)

PIs: Rolf Sonnerup (UW), Terry Whitledge (UAF)

Funds are provided for a service project to collect, quality control, analyze and distribute to all BEST investigators the core chlorophyll-a data. This project will support one person on each spring cruise. Data will be freely available on databases at PMEL, NODC, and the Alaska Ocean Observation System (AOOS). In addition to the service portion of this proposal, the PIs will use the biological data from this proposal combined with a) physical and chemical data collected on spring and summer BEST cruises b) data from a September NPCREP cruise c) data from moorings and from satellite-tracked drifters to address one hypothesis: The marked difference between the more pelagic southern shelf and the more benthic northern shelf is a result of the position of the sea-ice edge during the transition from strong winter winds to milder summer conditions.