

Bering Sea Integrated Ecosystem Research Project B52: Semiannual Progress Report

Project #: B52

Title: Biophysical Moorings

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

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Contract Period and Amount of Funding:

2008-2010 \$732,259

Report Period:

1 November 2007 – 30 September 2008

Report Date:

1 October 2008

Lead Author of Report:

Dr. Phyllis J. Stabeno

Proposed timeline and milestones within report period:

2008 Tasks, Assignments, Timeline

| <i>What</i> | <i>Who/Ship</i> | <i>Dates</i> | <i>Other information</i> |
|--|--|---------------------------|--|
| Prep equipment, design and build moorings, develop cruise plans. | Stabeno, Napp, Whitledge, Mordy (SNWM) | Now | |
| Recover/deploy moorings M2 and M4 (ice permitting) | SNWM, NOAA Ship <i>Miller Freeman</i> | May 1 – May 10, 2008 | Will also conduct CTD/bongos along southern hydrography line through M2 |
| Process and disseminate data, | SNWM | May 15-Aug 15 | |
| Send plankton samples to Poland to be counted | Napp | Jun 1, 2008 – Jun 1, 2009 | The actual time for processing varies |
| Deploy moorings at M5 and M8 | Stabeno, Whitledge, USCG <i>Healy</i> | July 2008 | |
| Recover/Deploy moorings M2, M4, M5 and M8 | SNWM, <i>Miller Freeman</i> and/or <i>Melville</i> | Sep 2008 | CTD/bongos along the 5 primary hydro. lines (70m isobath, & 4 cross shelf transects: Fig. 1) |

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Project Summary: This project is a continuation of a long-term partnership between NOAA and NPRB. Moorings have been maintained on the southeastern Bering Sea shelf at four sites: M2 (56.9°N, 164.1°W) since 1995, M4 (57.9°N, 168.9°W) since 1996, M5 (59.9°N, 171.7°W) and M8 (62.2°N 174.7°W) since 2004. This project together with research by the NOAA program North Pacific Climate Research and Ecosystem Productivity (NPCREP) will continue these measurements for the next three years (2008-2010). These moorings, together with observations along the 70-m isobath, are core to the long-term observations on the Bering Sea shelf. All four moorings are deployed on the 70-m isobath. Key findings (the Oscillating Control Hypothesis (OCH), timing of spring bloom, the magnitude of increased temperature (>2°C) and stability in the nutrient supply) have all been a result of the data collected on these moorings. Data from M2 has quantified the warming that occurred over the southern shelf during 2001-2005. This project continues the time series of temperature, salinity, fluorescence, currents, zooplankton abundance (TAPS-8 at M2 and possibly M4), nitrate, and oxygen (at M2 and possibly M5) at four mooring sites on the Bering Sea shelf. In addition during the late spring and summer, a surface mooring (two if ice permits) will be deployed that will measure meteorological variables (air temperature, humidity, barometric pressure, wind velocity and solar radiation – PAR). The surface moorings permit real time reporting of selected data. Data from these moorings are also critical to model verification. Products include mixed layer depth, heat content, temperature, position of the transition between southern pelagic-dominated shelf and northern benthic-dominated shelf, advection, nutrient supply and timing of the spring phytoplankton bloom.

This project supports all five BSIERP hypotheses (see <http://bsierp.nprb.org/focal/index.html>).

Progress Summary: All milestones were met. Equipment was procured, moorings were designed and built, and cruise plans were developed to address project goals for the coming seasons. In May, BSIERP personnel aboard the NOAA Ship *Oscar Dyson* recovered and deployed moorings at M2 and M4. The subsurface mooring at M4 had been displaced, likely by a fishing boat, some 40 km from its origin, and that part of M4 was recovered in September by the *Melville*. At M2, we completed 2 CTD casts, a bongo tow and a series of 3 CalVet tows, plus two additional calibration CTD casts. Around the station's periphery, four corner sampling stations were visited with a CTD and bongo tow at each corner. At M4, pre- and post-recovery calibration CTDs were completed, as well as a single bongo tow and a series of three Calvet tows. Due to ice coverage, we could not access the standard corner stations around the mooring site, but we were able to complete bongo and CTD sampling at the center of M4 and at two revised "corner stations". On our steam south from M4, we completed five CTD/Bongo stations along the Cape Newenham line.

From the *Healy* in July, we deployed ocean temperature sensors at 5 and 8 m on moorings at M5 and M8. The mooring at M5 also

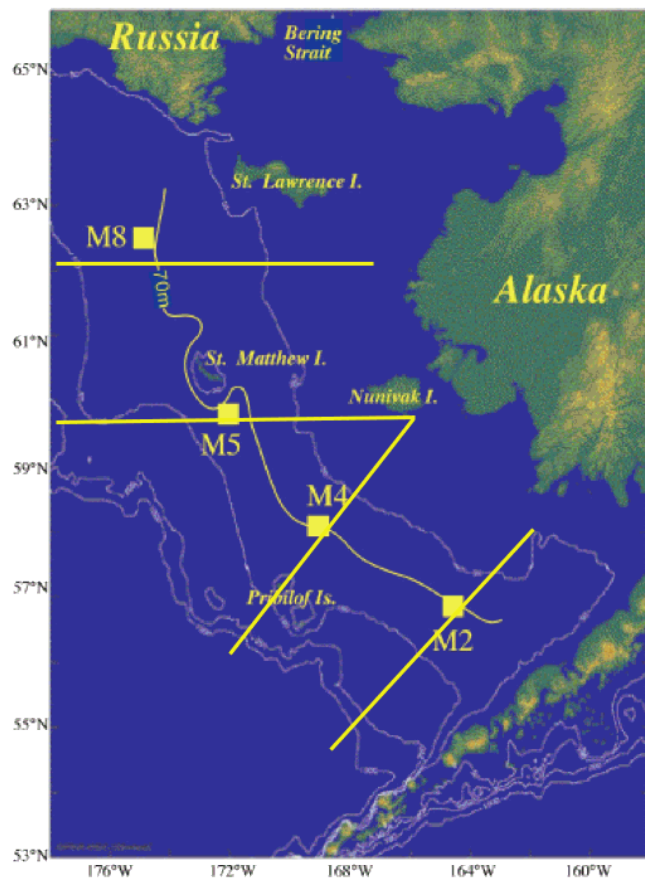


Figure 1. Bathymetry of the eastern Bering Sea. The location of the four biophysical moorings (M2, M4, M5 and M8), the 70-m isobath and the four cross shelf lines that have been adopted as standard lines.

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included a nitrate meter.

Aboard the *Melville* in August and September, we occupied stations of our primary hydrographic grid on the Bering Sea shelf: four cross-shelf transects and one along-shelf (70-m isobath) hydrographic line. All stations had a CTD cast with water sampling. Approximately every second station had a MARMAP bongo tow and chlorophyll sampling. Additionally, chlorophyll samples were taken on the stations shallower than 50 m and all the 70-m stations. The stations near Unimak Pass had bongo tows at each station. Around each of the four mooring sites on the 70-m isobath, we samples the four corner stations with CTD and bongos, plus three replicate CalVET tows at the mooring sites in the centers. We then visited the M8 mooring site, where we recovered three moorings and deployed two others for the winter. During the cruise, we recovered the displaced M4 mooring with its data.

The final mooring operations of the season were conducted aboard the *Miller Freeman*. At M2, the nitrate meter was missing from the mooring upon recovery. In addition, the ADCP mooring at M2 was missing. Two moorings were deployed at M2 for the winter season. At M4, the ADCP mooring was recovered, but, again, the M4 subsurface mooring was missing. A search was made without success. The two winter moorings were deployed at M4. The three moorings at M5 were recovered successfully and two moorings were deployed for the winter.

Data collected from spring and summer operations have been processed and disseminated through web sites and data archives. Spring plankton samples were sent to Poland for further processing.

Lessons learned and project adjustments: We assume that changes to the Bering Sea's ecosystem have brought increased fishing pressure to those areas of the shelf where we have moorings. We are working with the fishing industry to increase awareness of scientific mooring sites, and to increase cooperation between science and industry.

Integration activity: Significant collaborations were accomplished on the cruises, especially on the two Healy cruises. Insight has been shared via the SAB (which the lead PI is a member) and at the BSIERP PI meetings. Three posters have been prepared for the fall BSIERP/BEST meeting in Girdwood, AK.

Education and Outreach:

EcoFOCI maintains suite of NPRB-related web sites that can found at <http://www.pmel.noaa.gov/foci/>.

Bering Sea Ice Expedition 2008. Ladd, C. Outreach presentation to four 5th grade classrooms at Sunset Elementary, Issaquah School District, May 22, 2008.

Presentations and News letters

Stabeno, P., J. Napp, C. Mordy and T. Whitledge, Southeast Bering Sea shelf: a contrast between a warm year and a cool year. Alaska Marine Science Symposium, Anchorage Alaska. January 2008.

Ladd, C. North Pacific meets the Bering Sea: transport through Amukta Pass. Alaska Marine Science Symposium, Anchorage Alaska. January 2008.

Stabeno, P. and J. Napp. EcoFOCI: The Bering Sea ecosystem. PMEL Site Review. Seattle, Washington. August 2008.

Stabeno, P.J., J.M.Napp, T.E.Whitledge, and C. Mordy. The influence of seasonal sea ice on the eastern Bering Sea shelf ecosystem. AGU / ASLO Ocean Sciences Meeting, Orlando, Florida, February 2008.

Napp, J. and P. Stabeno. Bottom-up control of eastern Bering Sea ecosystem: implications for integrated ecosystem assessment during a period of climate change. Library Lunch Seminar. Washington DC.

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Napp, J. The Bering Sea: Current Status and Recent Events. *PICES Press, 16 (1)*, January 2008. p. 31-33.

Napp, J. The Bering Sea: Current Status and Recent Events. *PICES Press, 16 (2)*, July 2008. p. 30-31.

Next year's Work plan (not part of the 5 page target length):

BSIERP B52, Biophysical Moorings, Dr. Phyllis J. Stabeno, phyllis.stabeno@noaa.gov, 206-526-6453

2009 Tasks, Assignments, Timeline

| <i>What</i> | <i>Who</i> | <i>Start (2009)</i> | <i>Other key dates</i> |
|---|--|--|--|
| Data delivery to data manager | Stabeno, Napp, Whitledge, Mordy (SNWM) | Nov. 2008: phys/chem Sep 2009: zoop | |
| Send plankton samples to Poland to be counted | Napp | Jun 1, 2008 – Jun 1, 2009 | The actual time for processing varies. |
| Process and disseminate data Data delivery to data manager | SNWM | Oct – Dec, 2008 Mar 2009: phys/chem | |
| Send plankton samples to Poland to be counted | Napp | Oct 1, 2008 – Oct 1, 2009 | The actual time for processing varies. |
| Recover/deploy moorings M2 and M4 (ice permitting) Data delivery to data manager | SNWM, <i>Oscar Dyson</i> or <i>Miller Freeman</i> | May 2009 Oct 2009: phys/chem | Will also conduct some hydrographic stations |
| Deploy moorings at M5 and M8 | Stabeno, Whitledge, USCG <i>Healy</i> | Jun/Jul 2009 | |
| Recover/deploy moorings M2, M4, M5 and M8 | SNWM, <i>Oscar Dyson</i> or <i>Miller Freeman</i> and/or <i>Thompson</i> | Sep 2009 | Will also conduct some hydrographic/bongo stations |