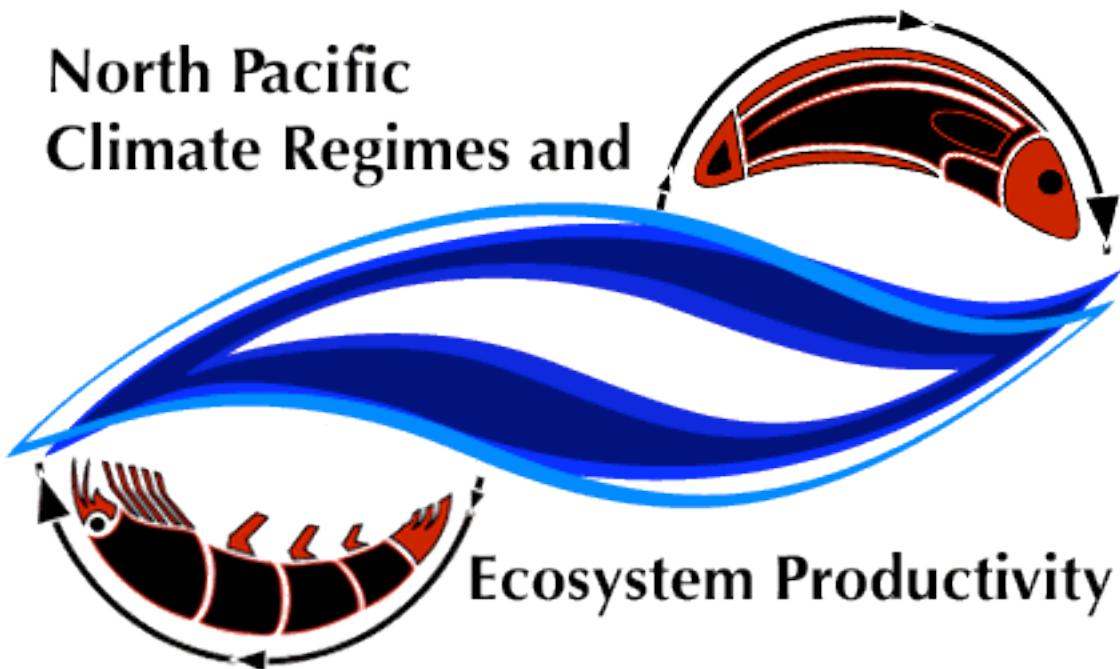


# North Pacific Climate Regimes and



## Ecosystem Productivity

# FY 2007 Accomplishments and FY 2008 Plans

**September 2007**

Alaska Fisheries Science Center  
7600 Sand Point Way NE  
Seattle, WA 98115-6349



Pacific Marine Environmental Laboratory  
7600 Sand Point Way NE  
Seattle, WA 98115-6349



## FY 2007 Accomplishments and FY 2008 Plans

### FY 2007 Accomplishments

As in previous years, North Pacific Climate Regimes and Ecosystem Productivity (NPCREP) in FY 2007 helped the United States understand how varying climate conditions affect marine ecosystems of the North Pacific Ocean. NPCREP's mission is to conduct research on climate variability and ecosystem response in the North Pacific, focusing initially on the productive waters of the eastern Bering Sea and western Gulf of Alaska. The intent of this research is to improve scientific understanding and guidance for resource managers. NPCREP has two long-term goals that address its mission. The first goal is to observe, understand and predict relationships between climate and ecosystems. The second goal is to aid protection and management of marine resources.

NPCREP works with other NOAA marine research programs such as Fisheries-Oceanography Coordinated Investigations under the banner of EcoFOCI (Ecosystems & Fisheries Oceanography Coordinated Investigations). Many NPCREP accomplishments are leveraged by activities within other EcoFOCI sectors.

### PRIORITIES

For FY 2007, NPCREP had the following priorities:

- Continue development of the EcoFOCI observation network.
- Develop a mechanistic understanding of ice-edge ecosystem processes.
- Plan a “Bering Sea Ecosystem Forecast” workshop to produce an ecosystem forecast.

### ACCOMPLISHMENTS

Specifically during 2007, NPCREP worked to accomplish the following tasks, generally classified into broad categories of *observe, understand and predict*.

#### *Observe*

- NPCREP preserved and expanded the NPCREP portion of EcoFOCI's existing biophysical observing system to detect climate impacts.

**FY 2007 MILESTONE: Continue NPCREP's climate and ecosystem observing network.**

In FY 2007, NPCREP led 10 of EcoFOCI's 14 cruises in support of the climate and ecosystem observing network. Cruise activities included recovery and deployment of bio-physical moorings; surveys of physical, chemical and biological features; and process studies in the Bering Sea, North Pacific Ocean and Gulf of Alaska. An additional fall NPCREP cruise to observe the location and evolution of the cold pool was conducted from 9/24-10/11. Biophysical moorings were maintained along the 70-m isobath of the eastern Bering Sea (4 moorings), across Amukta Pass in the Aleutian Islands (4), in Bris-

tol Bay (2), in Chiniak Bay (1) and Pavlof Bay (1), and in Southeast Alaska (2). Three moorings across Shelikof Strait were discontinued this year because of fishing pressure. The biophysical mooring at M2 was expanded to include an additional zooplankton sensor and near-bottom temperature and salinity sensors. Data from the latter sensors were transmitted in real time. NPCREP worked with the Aleut Community of St. Paul Island and the St. George Traditional Council to establish satellite-telemetered temperature and salinity networks on the major piers at St. Paul and St. George Islands.

## *Understand*

For FY 2007, NPCREP completed a third year of study to achieve a mechanistic understanding of climate-ecosystem interactions. The primary work element was to synthesize information from ice-edge ecology cruises.

- Combine observations and analyses to develop understanding of climate-ecosystem dynamics.

### **FY 2007 MILESTONE: Develop mechanistic understanding of ice-edge ecosystem processes.**

NPCREP has synthesized results from spring and fall 2005 cruises to the eastern Bering Sea. The synthesis is in the form of a draft manuscript entitled, "The influence of seasonal sea ice on the eastern Bering Sea shelf ecosystem: 2005" by P. Stabeno, C. Mordy, and J. Napp. The manuscript will first undergo internal review and then be submitted for peer review during FY 2008. The manuscript synthesizes a large amount of data including historical trends in ice coverage; along-shelf transects of temperature, salinity, nutrients, oxygen, chlorophyll fluorescence, zooplankton biomass and species composition; cross-shelf distributions of physical and chemical attributes; and time series of winds and biophysical properties at four mooring sites. The manuscript is rich with information, containing one table and nine figures, many requiring color to convey the large amounts and types of data displayed. The results demonstrate the strong role of sea ice (and thus climate) in structuring the environment and north-south gradients over the shelf. Previously, most attention in the eastern Bering Sea was on climate and cross shelf gradients. This work expands our paradigm for climate forcing to both cross-shelf and along-shelf variability in habitat suitability for lower and upper trophic levels.

## *Predict*

NPCREP continued steps to develop an ecosystem approach to management that includes climate variability. For FY 2007, NPCREP cooperated with other NOAA projects working in the Bering Sea to plan an integrative workshop.

- Develop biophysical indicators and models that meet the needs of marine resource managers to adapt to predicted climate-induced changes in coastal and living marine resources.

**FY 2007 MILESTONE: Plan a “Bering Sea Ecosystem Forecast” workshop to produce an ecosystem forecast.**

We held discussions during the year with Drs. Jennifer Boldt and Anne Hollowed regarding an annual ecosystem integration workshop. We are proposing to hold a workshop in late September or early October of next year to have a roundtable discussion and synthesis of ecosystem information valuable to the preparation of the Ecosystems Considerations Chapter of the NPFMC SAFE document. The time is set to occur after the first draft is prepared, but before it is edited to produce the second draft. The meeting would involve about 30 people and last for 1.5 to 2 days at an offsite location in Seattle. The goal is to continue to strengthen the use and application of chapter by providing the lead author with more synthesis and opinions about potential effects. We discussed what disciplines might be represented and who might be asked to participate. Strengthening of the Gulf of Alaska summary is a goal of the lead author (Jennifer Boldt) as is strengthening of some individual sections such as salmon. Note that last year the NPFMC took a more cautionary approach to setting the pollock ABC in the Bering Sea due to information contained in the chapter regarding the trends in predators and prey of the pollock as well as trends in the environment and the recruitment time series. Successful execution of such a workshop will depend, in part, on timely arrival of appropriated funds.

NPCREP would contract a local facility to host the meeting and would also supply travel funds to bring some of the topical experts to Seattle. We would need to know our funding situation early in the calendar year to reserve the facility and get people to reserve their time.

## *CHALLENGES*

During FY 2007, NPCREP was challenged to meet its declared milestones. Mentionable among these challenges are the following

- Secure funding support and ship time.

Laboratory policy prevents us from expending funds before they are in-house. Because our funding is arriving so late in the fiscal year, it is difficult to act on milestones, especially for early-in-the-year planning. This challenge accompanies the lack of increased funding as planned originally in NPCREP's creation.

- Integrate climate-ecosystem data from a variety of sources into a single, easy-to-use data tool.

Developing and refining Ecosystem Approach to Management and Recruitment Prediction require scientists to have easy access to geographically registered environmental and biological data through cross-LO data retrieval systems with common front ends that search separate databases in real time and return data to users in standard format. Presently, separate IT security requirements of the two line offices have prevented development of such a system in Seattle between AFSC and PMEL. Recognition of the need and problem at the highest levels of respective LOs would encourage IT Administrators to work with program scientists to develop common access to relevant data without com-

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promising NOAA IT systems. Benefits include faster development of new recruitment forecast methods, stock assessments that include ecosystem information and faster delivery of data to stakeholders, including IOOS. This issue was a topic at an FY 2007 workshop to better coordinate OAR and NMFS research endeavors.

## FY 2008 Plans

### STATEMENT OF WORK

North Pacific Climate Regimes and Ecosystem Productivity (NPCREP) will help the United States understand how varying climate conditions affect marine ecosystems of the North Pacific Ocean. It is NPCREP's mission to conduct research on climate variability and ecosystem response in the North Pacific, focusing initially on the productive waters of the eastern Bering Sea and western Gulf of Alaska. Research will improve scientific understanding and guidance for resource managers. NPCREP has two long-term goals that address its mission. The first goal is to observe, understand and predict relationships between climate and ecosystems. The second goal is to aid protection and management of marine resources.

### PRIORITIES

For FY 2008, NPCREP has priorities similar to the previous four years:

- Continue development of observation network.
- Develop and refine tools to synthesize/integrate large numbers of indices or metrics.
- Increase understanding of mechanisms linking climate and ecosystem productivity.
- Incorporate environmental data into forecast/stock assessment models.

Specifically during 2008, NPCREP will work to accomplish the following tasks, generally classified into broad categories of *observe* and *predict*.

#### *Observe*

NPCREP monitors changes in coastal and marine ecosystems through a network of *in-situ* and remote observing systems. For FY 2008, NPCREP will continue the NPCREP portion of EcoFOCI's existing biophysical observing system to detect climate impacts. Tasks are

- Monitor changes in coastal and marine ecosystems through a network of in-situ and remote observing systems.

#### **FY 2008 MILESTONE: Continue NPCREP Climate and Ecosystem Observing Network.**

NPCREP will maintain the number and functionality of biophysical moorings, drifters, ship surveys, remote sensing activities and observations of upper ocean physics and biology. If budget increases are realized [\$2M], NPCREP will add an additional research cruise to the eastern Bering Sea in the fall of 2008 to observe the evolution of the cold pool and its front with respect to distribution of young-of-the-year walleye pollock, and will design and implement real-time bottom temperature data collection through December 2008 for the pollock fishing industry. Full funding [\$2M] will also permit NPCREP to expand real-time data delivery from Bering Sea shelf site M2 to include summer near-bottom temperature and salinity and to deliver real-time zooplankton acoustic observations from site M4. The purpose is to deliver high-quality data products to our

stakeholders and to increase our understanding of how changes in climate affect the productivity, structure, and function of the eastern Bering Sea ecosystem. The work will be accomplished by scientists at the Pacific Marine Environmental Laboratory and the Alaska Fisheries Science Center and will be led by Drs. Phyllis Stabeno and Jeffrey Napp

### *Predict*

NPCREP develops biophysical indicators and models that meet the needs of marine resource managers to adapt to predicted climate-induced changes in coastal and living marine resources. In FY 2008, NPCREP will continue steps to develop an ecosystem approach to management that includes climate variability.

- Develop biophysical indicators and models that meet the needs of marine resource managers to adapt to predicted climate-induced changes in coastal and living marine resources.

**FY 2008 MILESTONE: Initiate focused studies on climate-mediated larval transport in the southeastern Bering Sea.**

NPCREP will partner with the Bering Sea Integrated Ecosystem Research Program to begin a focused study of the mechanisms responsible for climate-mediated transport of larval walleye pollock, Pacific cod and arrowtooth flounder in the southeastern Bering Sea. Data from three field years (2008, 2009, 2010) will be gathered and synthesized to understand how climate-mediated transport affects the distribution and condition of fishes from this region. The above project is one component of a much larger study that partners with university, Federal and other NOAA scientists to integrate knowledge vertically from each trophic level into a comprehensive understanding of how climate affects both bottom-up and top-down processes that ultimately influence people and their use of Alaska's living marine resources. The purpose is to increase our understanding of mechanisms responsible for climate-mediated variability in the recruitment of major commercial fish species in the eastern Bering Sea. The work will be accomplished by the EcoFOCI group at the Pacific Marine Environmental Laboratory and the Alaska Fisheries Science Center. The principal lead at PMEL is Dr. Phyllis Stabeno; the leads at the AFSC are Drs. Duffy-Anderson, Matarese, and Napp.

**FY 2008 MILESTONE: Develop physical and biological metrics for the Gulf of Alaska.**

NPCREP supports development of ecological indicators for two of the four LMEs assigned to the Alaska Fisheries Science Center. We have been supporting a retrospective study that examines time trends in larval fish abundance in the Gulf of Alaska (1981 – 2003) using the Fisheries Oceanography Coordinated Investigations (FOCI) database. Links between larval fish abundance and basin and local-scale measures of the state of the atmosphere and upper ocean have begun to emerge from the study. The degree of

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synchrony in larval abundance trends, links with physical variables, and early life history strategies imply that a common response to physical forcing takes place among certain groups of fishes during their early life history. The goal is develop and apply physical and biological metrics that represent the health, status, and trajectory of our large marine ecosystems. The work is being led by Dr. Doyle of the University of Washington, Joint Institute for the Study of Atmosphere and Oceans (JISAO), and is dependent on sufficient funding from the NPCREP appropriation.

### *CHALLENGES*

During FY 2008, NPCREP expects the same challenges to accomplishing these tasks as it has experienced in past years. Mentionable among these are the following

- Adequate and stable funding
- Adequate ship time.