Project: Ecosystems & Fisheries-Oceanography Coordinated Investigations (EcoFOCI).

PI(s):
UW - N. Bond; NOAA - P. Stabeno

Other Personnel:
UW - A. Hermann, Y.-W. Lee, C. Mordy, F. Mueter, C. Parada, S. Rodionov, D. Righi, M. Sullivan, E. Dobbins, M. Wang, N. Kachel
NOAA - J. Napp, S.A. Macklin, B. Megrey, J. Overland

NOAA Primary Contacts:
PMEL and AFSC

NOAA Goals:
1) Protect, Restore and Manage the Use of Coastal and Ocean Resources Through Ecosystem-based Management.

2) Understand Climate Variability and Change to Enhance Society's Ability to Plan and Respond.

Task: II & III

Objectives:

1. Improve and expand observational network necessary to monitor the ecosystem, verify models and develop indices.

2. Improve understanding of the effects of climate variability on the North Pacific marine ecosystem.

3. Describe and quantify temporal variability in the spatial distribution of individual ground fish species and ground fish assemblages.

4. Improve modeling capabilities in pursuit of ecosystem-wide forecast models for commercially valuable fish and shellfish, endangered species and related interdependent species.

Accomplishments:

1. EcoFOCI was successful in adapting acoustic data relay technology to the M2 biophysical mooring in the eastern Bering Sea. This development enabled real-time transmission of measurements of temperature and salinity (at two depths), fluorescence and zooplankton abundance. Following download at PMEL, the information is processed, assembled and distributed using World-Wide Web protocols. Thus, information is available to scientists and managers for real-time decision making.

2. EcoFOCI personnel partnered with the National Marine Mammal Laboratory and the AFSC Midwater Assessment and Conservation Engineering Program to conduct a multi-disciplinary cruise to the ice edge in the eastern Bering Sea during May 2006. The characteristics and location of the marginal sea ice zone in the eastern Bering Sea are changing in response to the changing climate. Many living marine resource species (e.g. snow crab, ribbon seals, ringed seals) depend on the ice or some property associated with the presence of ice in the ecosystem. Other living marine resources (e.g. pollock) may use the physical fronts created at the ice edge to find prey at elevated concentrations. Information obtained from this first look at ice edge patterns and processes, from ocean physics to seals, will greatly increase our understanding of ecosystem processes, and the role of climate in ecosystem dynamics. This will form a foundation for future efforts under the EcoFOCI, IPY (FY07) and Loss of Sea Ice (LOSI; FY08) programs.

3. During Quarter 1 of FY 2006, EcoFOCI researchers completed a multi-year study to improve understanding of the influence of climate and weather on the transport of larval northern rock sole (*Lepidopsetta polyxystra*), a commercially fished species, in the eastern

Bering Sea. Successful rock sole recruitment is thought to be determined by the transport of larvae into the Bristol Bay region of the eastern Bering Sea. Previous research at the Alaska Fisheries Science Center correlated transport with periods of successful recruitment, but only considered transport by wind-driven surface currents and assumed that all larvae were near the ocean's surface. EcoFOCI improved on this understanding by collecting and analyzing larval samples to determine their vertical distribution in the water column, and by developing a new ROMS-based circulation model to simulate currents throughout the water column. The new model can be used to predict the annual transport paths of larvae of any species, and as a tool to investigate the effects of changing climate on transport in this region. These results were presented at the recent International Flatfish Symposium, and are being prepared for submission to a peer-reviewed journal.

4. Advances in understanding and modeling ecosystem processes were achieved with development of a sea-ice-inclusive hydrodynamic model for the Bering Sea. This model advances our ability to predict consequences of climate change on ecosystems. Seasonal sea ice is a significant component of the Bering Sea ecosystem. All existing and to-be-developed ecological predictive models will benefit from linkages to this more advanced, ice-inclusive circulation model. EcoFOCI's new model, based on the Regional Ocean Modeling System (ROMS), resolves to 10 km and spans the entire Bering Sea. This version has been expanded to include ice dynamics. Hindcasts, driven by winds and heat fluxes, span the period 1955-present, and capture the observed inter-annual variability of ice cover in the Bering Sea. The model has been used to study ocean currents over the southeastern shelf; Alaska Fisheries Science Center scientists will use the model in the assessment of southeastern Bering Sea flatfish populations. Initial work has begun on the implementation of a simple lower trophic level model (NPZD) that will be run in conjunction with the ice-inclusive hydrodynamic model.