

Workshop Announcement:
"Climate Impacts on the Gulf of Alaska Large Marine Ecosystem"
Juneau, February 27-28, 2007

Steering Committee: Carl Schoch, Phil Mundy, Molly McCammon, Clarence Pautzke, Bill Smoker

Sponsored by: North Pacific Research Board, Alaska Ocean Observing System, Auke Bay Laboratories (NMFS) University of Alaska Fairbanks, University of Alaska Southeast.

Purpose: to address research and monitoring needs in the Gulf of Alaska Large Marine Ecosystem in the context of the following:

- (1) describing the physical state of the Alaska Current and Alaska Coastal Current System and predicting inter-annual to decadal changes;
- (2) testing predictions of climate impacts on selected trophic levels to see whether they are reliable enough to inform management decisions;
- (3) improving knowledge and models of other trophic levels so that climate impacts on them can also be predicted;
- (4) optimizing small (100's km) and large (1000's km) scale ocean observing systems, including observation platforms and data assimilation models, to benefit the fishery management community (including marine mammals and seabirds).

The "Climate Impacts on the Gulf of Alaska Large Marine Ecosystem" workshop is intended to build on the results of a similar meeting held for the California Current Ecosystem in November 2006. We aim to address (1) efforts at the NPRB to address fishery management issues through integrated ecosystem research, (2) the need for coordination of climate and ecosystem monitoring and data dissemination between Alaska, Canada and the west coast Regional Associations of the Integrated Ocean Observing System, and (3) the emerging consensus that single-species management must expand to include awareness of all elements of an ecosystem including climate forcing.

It is important to understand climate impacts on ecosystems in the Gulf of Alaska, because these ecosystems are subject to climate variations in various forms and frequencies including the ENSO and PDO patterns, more regional fluctuations in the timing of the Spring Transition, and longer-term changes of unknown origin. There are long physical and biological records that show correlations between physical forcing by these signals and ecosystem components ranging from plankton to upper trophic level predators. There are good reasons to believe these correlations because the climate variability should modulate nutrient supply to the lowest trophic levels while ocean temperature and other physical characteristics are known to affect animal behavior in both shallow and deep-water regimes.

Although the case for strong climate impacts on oceanic ecosystems and its nearshore waters is strong, it has been difficult to clarify the mechanisms and predictability of these impacts and, consequently, climate variability is explicitly included in the management of only two managed species: sardines and squid off the coast of California. In order to use developing predictions of physical climate variability to improve management of marine resources and ecosystems it is necessary that: (1) methods for describing the present physical state of the ocean and predicting future states be developed and implemented; (2) predictions of climate impacts on selected trophic levels must be tested so that we can determine if they are reliable enough for management decisions; and (3) methods of extending predictability of climate impacts on higher trophic levels must also be developed.

The NPRB, AOOS, and NOAA are calling this workshop to develop specific plans for carrying forward a coordinated research program on assessing and predicting climate impacts on marine resources and ecosystems along the west coast including the Gulf of Alaska and inshore waters. To guide the development of this Integrated Ecosystem Research Program (IERP), the following overarching question for the Gulf of Alaska is proposed: *How do environmental processes affect the various trophic levels and dynamical linkages among trophic levels, with particular emphasis on fish and fisheries, marine mammals, seabirds, and humans within the Gulf of Alaska, and how do they in turn, help determine ecosystem state and resilience in response to natural and anthropogenic perturbations?*

The NPRB planning team for the Gulf of Alaska has identified 8 key management issues that may be tractable through the \$7M Integrated Ecosystem Research Program:

- *Periodic regime shifts*: What are the physical and/or biological processes (tipping points) that result in large-scale ecological shifts?
- *Marine mammals*: Are there significant ecological implications of recovering populations of the great whales for fisheries and for conservation of listed marine mammals such as Steller sea lion and harbor seal?
- *Herring (Forage Species)*: What are the contributions of disease mortality, predation mortality, and fishing mortality to Pacific herring and forage species population dynamics, and how do shifts in subpopulations contribute to ecosystem dynamics?
- *Endangered species*: What are the contributions of disease mortality, predation mortality, and subsistence harvest and how do these sources of mortality differ among subpopulations in different areas of the Gulf of Alaska?
- *Carrying capacity*: Large numbers of hatchery salmon from North America and Asia inhabit the Gulf of Alaska and are major predators on forage species. What are the ecological implications of these predators and how are they manifested in the GOA food web?
- *Crabs*: How do ecosystem processes interact to enhance or inhibit recovery of many previously important invertebrate species such as red king, Dungeness, and Tanner crabs in the Gulf of Alaska?
- *Climate change*: What are the fishery implications of climate forcing on primary productivity and its transfer up the food chain to fished populations in the Gulf of Alaska? For example, what are the direct and indirect effects of the timing and magnitude of fresh water inputs and wind forcings on water column stability and how will these influence primary and secondary production (type, timing, magnitude) in the Gulf of Alaska?
- *Species response to management strategies*: On the basis of new and developing knowledge of physical circulation patterns, population status, life histories including larval duration and

habitat utilization, and relevant adult behaviors, how are different subpopulations responding to fishery conservation strategies such as bycatch restrictions, time-area closures, etc., and why are some strategies effective for some subpopulations and not for others?

With these management issues identified, the workshop intends to identify the key science priorities for the following:

(1) modeling ocean physics and the selected trophic levels of the region with the intent to (a) eventually develop forecasts for selected fish species under the varying climate of the Gulf of Alaska, (b) describe the physical manifestations of the varying climate and relate these to biological observations of key forage species and commercially important fish, and (c) develop and test a capability to predict elements of the ecosystem from nutrients to plankton to fish populations and humans.

(2) augmenting the present sustained ocean and meteorological observations needed to initialize and constrain models and initialize prediction schemes; and

(3) expanding sustained biological and chemical observations needed to (a) test model descriptions of nutrients and plankton populations and (b) provide impetus to the development of stock assessment and ecosystem models with the objective of predicting climate impacts on the entire ecosystem.

To do this, we seek participation by scientists active in the Gulf of Alaska Regional Association observing system, west coast and basin scale climate variability, who are concerned with climate impacts and are involved in modeling or observing the climate variability or biota of the Gulf of Alaska currents and its neighboring inshore waters.

The meeting agenda follows.

DRAFT
Workshop on “Climate Impacts on the Gulf of Alaska LME”
27-28 February 2007

National Marine Fisheries Service
Regional Office
Fourth Floor Conference Room
Federal Building*
709 W. Ninth Street
Juneau, AK 99801

*Participants will need government issued photo i.d. to enter building

27 February (Tuesday)

0600 – 0715 Breakfast on your own

0715 Bus service from Frontier Suites to Federal Building, arrive at Fed Bldg approx. 7:45am

Session 1: Program overviews

0800 Workshop Introduction	Phil Mundy
0810 NPRB Integrated Ecosystem Research Program	Clarence Pautzke
0830 Alaska Ocean Observing System	Molly McCammon
0850 GLOBEC	Beth Turner
0910 Pacific Coast Ocean Observing System (PaCOOS)	Liz Clarke
0930 Overview of the GOA IERP	Carl Schoch

0950 BREAK

Session 2: Physical observations

1010 Climate Scales: review of physical observations	Tom Royer
1030 Terrestrial forcing of the coastal environment	Tom Weingartner
1050 Air Sea forcing of the Gulf of Alaska	Bill Crawford
1110 Observing: Physical processes governing lower trophic levels	Sonia Batten
1130 Observing: Physical processes governing upper trophic levels	Phyllis Stabeno
1150 Discussion: Improvements in physical observations	Steve Okkonen

1210 Lunch provided

Session 3: Biological observations

1310 Climate Scales: review of biological observations	Ricardo Letelier
1330 Observing lower trophic levels: NPZ	Suzanne Strom

1350 Observing upper trophic levels: Forage species	Alex Wertheimer
1410 Observing upper trophic levels: Fish species	Anne Hollowed
1430 Observing upper trophic levels: Endangered species	Kate Stafford
1450 Discussion: Improvements in biological observations	Mike Dagg

1510 BREAK

Session 4: Modeling physical processes

1530 Modeling: Hydrodynamics	Yi Chao
1540 Unresolved processes in physical models	Antonio Baptista
1610 Modeling: Physical processes governing NPZ	Ken Coyle
1630 Discussion: Improvements in models	Hal Batchelder

1650 Bus service to University of Alaska Southeast Library

1715 Reception at UAS hosted by UAF

1830 Bus service to Ted Stevens Marine Research Institute

1845 Guided Tour of TSMRI

1945 Bus service to Frontier Suites from TSMRI

2000 Dinner on your own

28 February (Wednesday)

0600 Breakfast on your own

0715 Bus or drive to meeting facility in downtown Juneau

Session 5: Modeling biological processes

0800 Workshop Introduction to Day 2	Bill Smoker
0810 Modeling upper trophic levels: Forage species	Brenda Norcross
0830 Modeling upper trophic levels: Fish species	Terry Quinn
0850 Modeling human socio-economics	Sarah Kruse
0910 Unresolved mechanisms in population and ecosystem models	Kerim Aydin
0930 Discussion: Improving data input to fisheries management	Franz Mueter

1000 BREAK

1030 Break-out sessions

Group 1: Observations: Physical and biological measurements (Lead: Frank Whitney)

Group 2: Modeling: Hydrodynamic and biological models (Lead: Yi Chao)

Breakout session questions:

1. What are the unresolved observational and modeling issues or research questions?
2. How will solving this issue affect the management of fisheries?
3. What do we need to know to resolve the issue?
4. What measurements are required and where?
5. What predictions or forecasts are required?
6. What kind of model needs to be developed? (ecosystem, food web, population, numerical, statistical, etc.)
7. How can models be used to design field experiments?
8. How good do the models need to be? (what space and time scales need to be resolved?)

1200 Lunch provided

1300 Working group reports (30 minutes each)

1400 Discussion of working group reports

1430 Regular meeting adjourns. Bus to hotel, airport, or tour Juneau on your own.

1500 Steering Committee meets to discuss the workshop results

1530 Adjourn