



North Pacific Research Board *Project Synopsis*

**PROJECT
520
603**

CONTINUED AS
708, 804

FUNDING SUMMARY

Principal Investigators
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Years funded
2005, 2006

Research period
April 2005–
September 2007

Budget
\$1,085,921
(total)

Gulf of Alaska long-term observations: the Seward Line

TAKING THE LONG VIEW IN THE GULF

The North Pacific has varied significantly over the past decade, due partly to variations in climate, as reflected in indices such as El Niño and the Pacific Decadal Oscillation (PDO). There are even suggestions of a recent “regime shift”—a fundamental change in ecosystem structure and function—similar to the large change that occurred in 1976 when the shrimp-dominated fishery in the Gulf of Alaska became dominated by pollock, salmon and halibut.

WHY WE DID IT

This project provided observations of the state of the Northern Gulf of Alaska from 2005–2007. It builds on the time-series data collection at the Gulf of Alaska’s Seward Line, which was conducted by the GLOBEC program from 1998–2004.

Apart from the Canadian Line-P sampling program to the south, no other program in the Alaska Gyre allows observation of long-term changes in the oceanography of a region that is so critical to Alaska’s fisheries, subsistence and tourist economies. We need long-term data such as these to distinguish patterns and causes from simple year-to-year variability.

HOW WE DID IT

Cruises in May and September captured spring phytoplankton blooms and summer conditions along a 150-mile transect across the Gulf of Alaska shelf to the south of Seward, Alaska. We determined the physical-chemical structure, primary (algal) production and the distribution and abundance of zooplankton, along with their seasonal and inter-annual variations.

We compared observations with historical data sets, and tried to understand how different climatic conditions influence the biological condition in each of these years.

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Neocalanus cristatus. (Russ Hopcroft / UAF)

The Big Picture

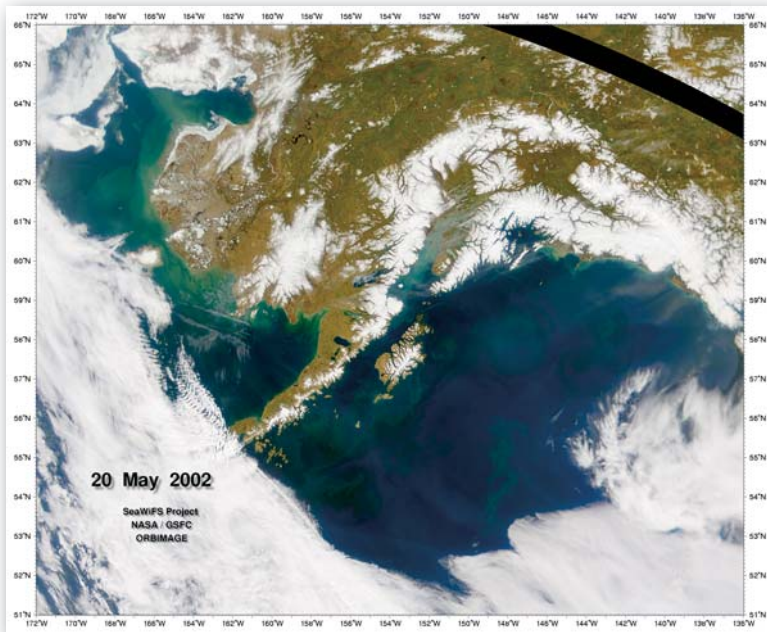
Seasonal cruises across the Gulf of Alaska since 1998 have shown that the relationship between climate indices and conditions in the Gulf of Alaska are much more complicated than previously thought. Zooplankton biomass and community composition appear to be correlated with pink salmon survival in this region.

NPRB Research Interest

The relatively recent “regime shift”—a fundamental change in ecosystem structure and function—in the North Pacific has brought major changes to its fisheries, which have until now been dominated by pollock, salmon, and halibut. This shift and its implications comprise a variety of pressing fishery management issues, which NPRB is mandated to address.



RESEARCH THEME
Ecosystems



A large phytoplankton bloom colored the surface waters of the Gulf of Alaska various shades of green on May 20, 2002. This image was captured by the Sea-viewing Wide Field-of-view Sensor (SeaWiFS), flying aboard the OrbView-2 satellite. (Image courtesy the SeaWiFS Project [<http://oceancolor.gsfc.nasa.gov/SeaWiFS/>], NASA GSFC, and ORBIMAGE)

MISSION OF THE NPRB

Building a clear understanding of the North Pacific, Bering Sea and Arctic Ocean ecosystems that enables effective management and sustainable use of marine resources

WHAT WE DISCOVERED

To date, we have observed extremely warm years where spring zooplankton biomass was often low, and extremely cold years where spring biomass was often high. We have also observed seasonal invasion of more southern species during warm years. Spring and summer zooplankton biomass, as well as community composition, appear to be correlated with pink salmon survival in this region.

The relationship between climate indices and conditions in the Gulf of Alaska are much more complicated than previously thought. Results from the May 2007 cruise show significantly cooler waters than typical for spring, with Alaska Coastal Current surface water significantly saltier than normal due to the late spring melt in 2007. The cool observations for May 2007 are also at odds with the existence of a moderate El Niño early in 2007 similar to the one in the 2002–2003 winter that resulted in the high temperatures during 2003.

In addition, zooplankton communities developed slower in 2007 than they had done in previous years. This delayed development is consistent with lower than normal temperatures, and more similar to what was observed for the April period during the GLOBEC sampling years. It is unclear what consequences this will have for higher trophic levels, but we speculate that the peak of zooplankton biovolume as measured by the Prince William Sound hatcheries has occurred much later than normal in 2007.

WHAT'S NEXT

We continued to provide observations of the current state of the northern Gulf of Alaska during 2007 as we entered into a moderate El Niño event.

OUTREACH

- © An overview of 2005–2006 results was presented as a poster at the 2007 Alaska Marine Science Symposium. A similar poster was presented at the 4th International Zooplankton Symposium, held June 2007 in Hiroshima, Japan.
- © Results for 2005–2007 are available online at www.ims.uaf.edu/GLOBEC/.
- © Seward Line cruises have provided valuable at-sea experiences for more than a dozen UAF graduate students.

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