

EVOSTC ANNUAL PROJECT REPORT

Recipients of funds from the *Exxon Valdez* Oil Spill Trustee Council must submit an annual project report in the following format by **Sept. 1** of each fiscal year for which project funding is received (with the exception of the final funding year in which a final report must be submitted). **Please help ensure that continued support for your project will not be delayed by submitting your report by Sept. 1.** Timely receipt of your report allows more time for court notice and transfer, report review and timely release of the following year's funds.

Satisfactory review of the annual report is necessary for continuation of multi-year projects. Failure to submit an annual report by **Sept. 1** of each year, or unsatisfactory review of an annual report, will result in withholding of additional project funds and may result in cancellation of the project or denial of funding for future projects. **PLEASE NOTE:** Significant changes in a project's objectives, methods, schedule, or budget require submittal of a new proposal that will be subject to the standard process of proposal submittal, technical review, and Trustee Council approval.

Project Number: 040699

Project Title:..... *Biophysical Observations Aboard Alaska Marine Highway System Ferries*

PI Name: *Edward D. Cokelet, Calvin W. Mordy and W. Scott Pegau*

Time period covered: 1 October 2006-31 December 2006

Date of Report: 31 August 2007

Report prepared by:..... *Edward D. Cokelet*

Project website (if applicable): : www.pmel.noaa.gov/foci/GEM/alaska_ferry

Work Performed: Summarize work performed during the reporting period, including any results available to date and their relationship to the original project objectives. Explain deviations from the original project objectives, procedural or statistical methods, study area or schedule. Also describe any known problems or unusual developments, and whether and how they have been or can be overcome. Include any other significant information pertinent to the project.

The Alaska Coastal Current (ACC) is important because it flows along the continental shelf of the Gulf of Alaska carrying the river runoff, nutrients and plankton that fuel this rich ecosystem. In addition, it transported the *Exxon Valdez* oil spill onto Kenai Peninsula, Cook Inlet and Kodiak archipelago beaches. The goal of this project has been to design, build, install, operate and maintain an oceanographic observation system aboard the Alaska state ferry *Tustumena* to measure the near-surface water properties of the ACC. The primary advantage of using the ferry to make the measurements is that the ship time is free; whereas large oceanographic research vessels cost approximately \$1,000/hour to operate. System design, construction and installation were accomplished in FY04. Oceanographic monitoring began on 15 September 2004, and nearly three years of monitoring have been completed by the date of this report.

It is important to compare separate measurement systems to make certain that they agree whenever possible. Fortunately for the first year of operation, the ferry sailed very near to the GAK1 oceanographic monitoring site on the Seward Line in the Gulf of Alaska. That site is

sampled periodically with CTD (conductivity, temperature, depth) casts from oceanographic ships. We extracted the ocean temperature at 4 m from the ferry's thermosalinograph time series whenever it passed within a 3x3 km box centered on the GAK1 site and compared it with the CTD observations at the sea surface. The time series in Figure 1 shows the two sets of measurements. They agree very well, generally differing by the short-term variability as measured by the closely spaced ferry transits in the summer of 2005. This gives confidence in both sets of measurements.

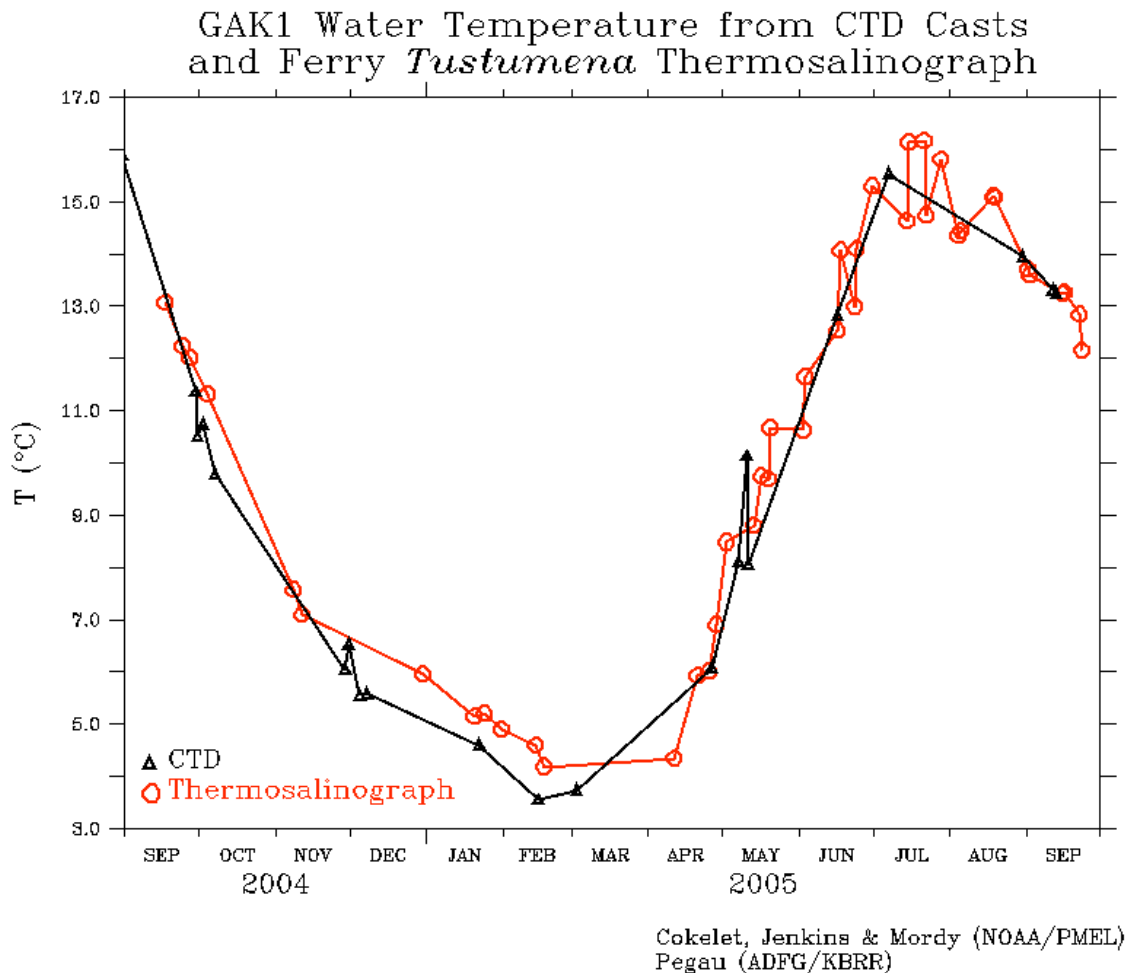


Figure 1. A comparison between the temperature measured by the ferry's thermosalinograph and that measured by CTD casts from oceanographic ships at the GAK1 site on the Seward Line in the Gulf of Alaska.

The work of Tom Royer and colleagues at the GAK1 oceanographic monitoring site has shown that a minimum of three years of measurements are necessary to begin to define the annual cycle of an oceanic variable. The ferry observational period is approaching that time span. Figure 2 shows the time series of temperature in Kennedy Entrance. This site was chosen as an indicial site through which most of the ACC flows into Shelikof Strait. The measurements show that

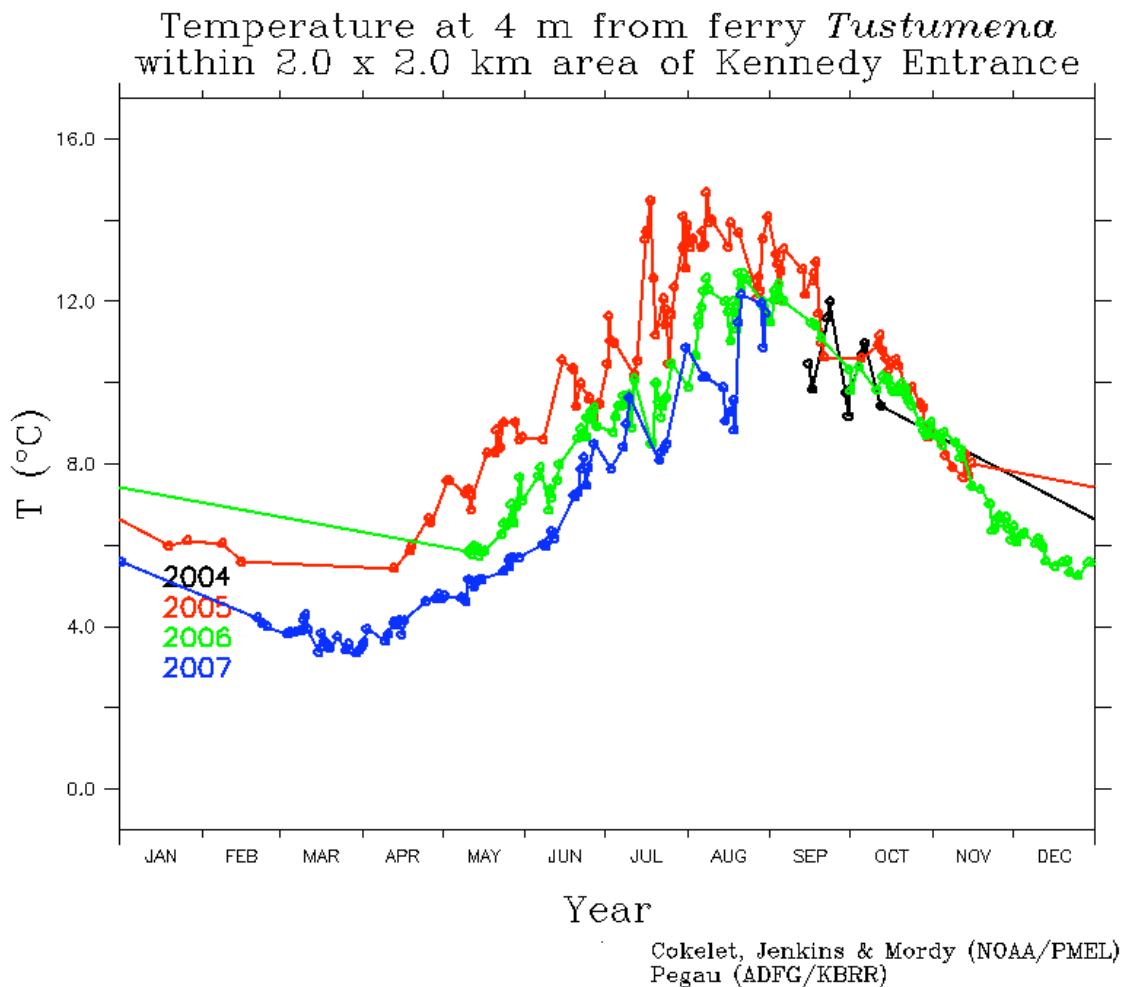
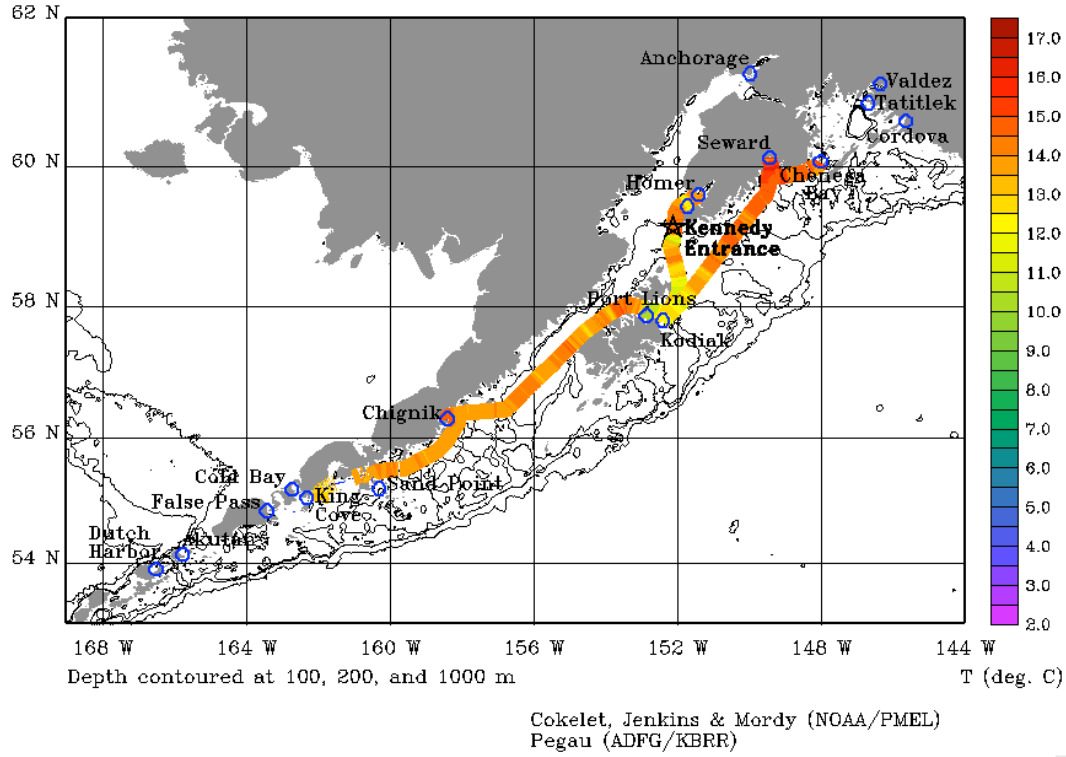


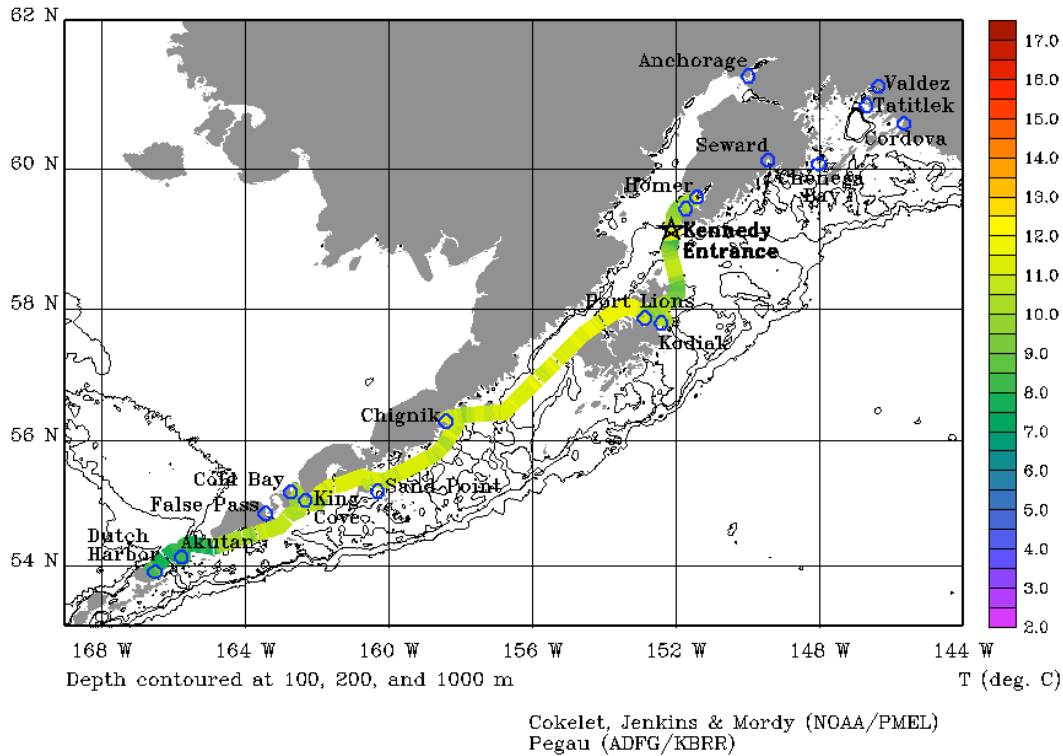
Figure 2. Three years of observations of the near-surface water temperature in Kennedy Entrance at the head of Shelikof Strait in the Gulf of Alaska.

2005 was a warm year, and since then the water has cooled. This is probably the effect of short-term climate change related to the Pacific Decadal Oscillation (PDO), not a long-term climate signal. The temperature differences are largest in spring and summer and approach zero in autumn. There are few winter and early-spring measurements because the ship was in the shipyard during those seasons. Figures 3a-c show a snapshot of the water temperature along the ferry's route between Homer and Dutch Harbor, Alaska, in August of 2005, 2006 and 2007.

Temperature at 4 m, M/V *Tustumena*
13-AUG-2005 16:30 to 18-AUG-2005 23:56 GMT



Temperature at 4 m, M/V *Tustumena*
12-AUG-2006 15:46 to 15-AUG-2006 18:17 GMT



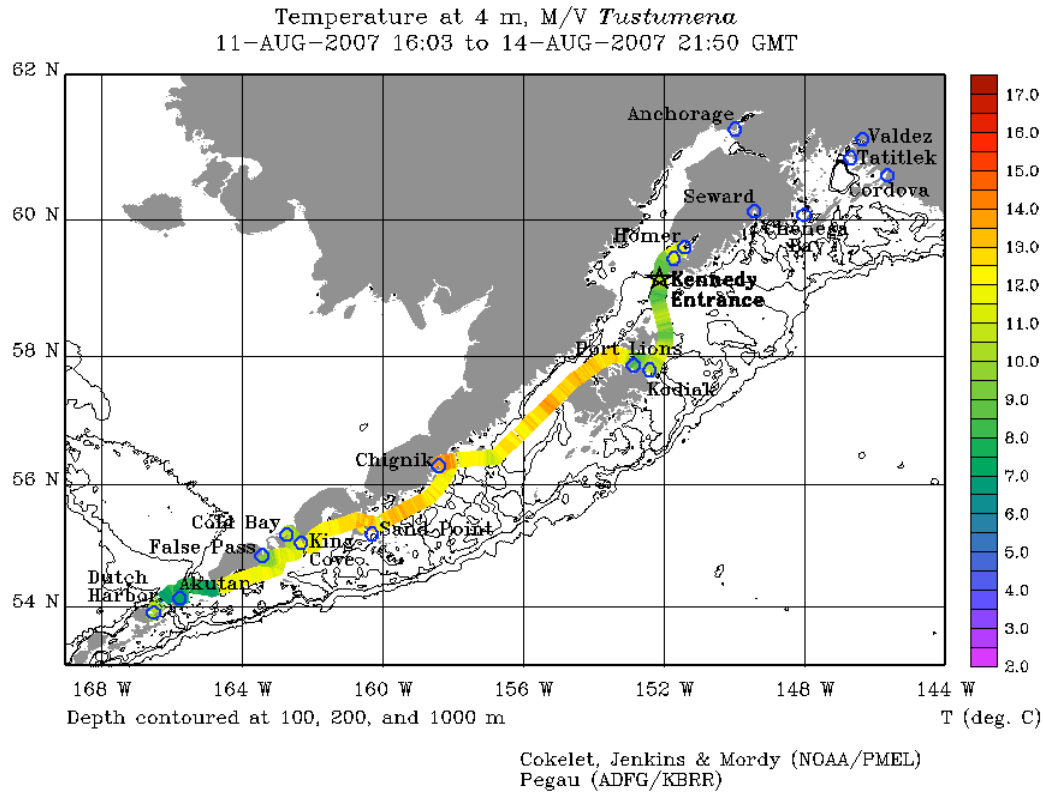


Figure 3. The water temperature along the ferry route from Homer to Dutch Harbor in August (a) 2005, (b) 2006 and (c) 2007. The Kennedy Entrance site is also shown.

August 2005 was noticeably warmer than the other years along the entire route. Although the August time series at Kennedy Entrance was warmer in 2006 than 2007 (Figure 2), the opposite is true along the route in these snapshots. This could be due to short-term variability, or the results at Kennedy Entrance might reflect deeper water mixed up by stronger turbulence there.

Besides water temperature, we have also measured salinity, optical transmittance, chlorophyll and colored-dissolved-organic-matter fluorescence and dissolved nitrate. The EVOS Trustee Council did not fund us to measure dissolved oxygen – an indicator of primary production – as we had requested.

Future Work: Summarize work to be performed during the upcoming year, if different from the original proposal. Describe any proposed changes in objectives, procedural or statistical methods, study area or schedule. **NOTE:** Significant changes in a project's objectives, methods, schedule or budget require submittal of a new proposal subject to the standard process of proposal submittal, technical review and Trustee Council approval.

EVOS funding terminated after 31 December 2006. No future EVOS work is planned. The monitoring system will continue under NPRB funding at least through July 2008.

Coordination/Collaboration: Describe efforts undertaken during the reporting period to achieve the coordination and collaboration provisions of the proposal, if applicable.

No specific coordination/collaboration provisions were mentioned in the proposal other than that amongst the Principal Investigators at NOAA/PMEL, Kachemak Bay Research Reserve and the University of Washington/JISAO. In FY08 work will concentrate on serving the data to the public and the research community via the Worldwide Web. Also data will be exported to the AOOS web site.

Community Involvement/TEK & Resource Management Applications: Describe efforts undertaken during the reporting period to achieve the community involvement/TEK and resource management application provisions of the proposal, if applicable.

The Alaska Marine Highway System (AMHS) has cooperated with the project by granting permission to install instruments on the ferry *Tustumena*. AMHS Port Engineering staff and the ship's captains and crew assisted in various ways and have hosted us during system maintenance. A computer display in *Tustumena*'s passenger lounge gives project background, acknowledges EVOS/GEM and shows maps of the ship's position and oceanographic variables measured underway. A US Forest Service naturalist utilizes our computer display in interpretive lectures.

Information Transfer: List (a) publications produced during the reporting period, (b) conference and workshop presentations and attendance during the reporting period, and (c) data and/or information products developed during the reporting period. **NOTE:** *Lack of compliance with the Trustee Council's data policy and/or the project's data management plan will result in withholding of additional project funds, cancellation of the project, or denial of funding for future projects.*

(a) Publications – none to date

(b) Conference and workshop presentations:

E.D. Cokelet, A.J. Jenkins, W.S. Pegau, C.W. Mordy and M. Sullivan , “Climate Shift and Ecosystem Differences Observed in Alaskan Ferry Oceanographic Measurements” poster presented at the Alaska Marine Science Symposium, 21-24 January 2007, Anchorage, AK.

E.D. Cokelet gave a presentation on ferrybox systems in the Gulf of Alaska at the Prince William Sound Experiment planning meeting sponsored by AOOS and NPRB, 11 Oct 2006, Seattle, WA.

(c) Data and/or information products – see web site:

http://www.pmel.noaa.gov/foci/GEM/alaska_ferry

Budget: Explain any differences and/or problems between actual and budgeted expenditures, including any substantial changes in the allocation of funds among line items on the budget form. Also provide any new information regarding matching funds or funds from non-EVOS sources for the project. **NOTE:** *Any request for an increased or supplemental budget must be submitted as a new proposal that will be subject to the standard process of proposal submittal, technical review, and Trustee Council approval.*

Expenditures were in line with the projected budget. NOAA provides matching funds for one Principal Investigator's salary as mentioned in the original proposal. The EVOS Trustee Council decided to fund this research for just 3 months (October, November and December 2006) in FY07 and advised the investigators to seek other sources of funding. The system has been maintained with limited NOAA/PMEL funds until August 2007 when the North Pacific Research Board began one year of funding.

We can accept your annual report as a digital file (Microsoft Word or WordPerfect), with all figures and tables embedded. Acrobat Portable Document Format (PDF) files (version 4.x or later) are also acceptable; please do not lock PDF files or include digital signatures.

Please submit reports electronically in [ProjectView](#) or by email to mandy.migura@alaska.gov. Also, please be sure to post your annual report on your own website, if you have one.



*We appreciate your prompt submission of your annual report
and thank you for your participation.*

Submit this report via e-mail to mandy.migura@alaska.gov . Thank you!