

**2007 ANNUAL REPORT FOR PJ 070829, BIOAVAILABILITY AND EFFECTS OF LINGERING OIL TO LITTLENECK CLAMS (*PROTOTHACA STAMINEA*) AND POPULATION RECOVERY STATUS IN PWS**

**1. Project Number**

070829

**2. Project Title**

Bioavailability and Effects of Lingering Oil to Littleneck Clams (*Protothaca staminea*) and Population Recovery Status in PWS

**3. Principal Investigator's Name(s)**

Shigenaka, Coats, Fukuyama

**4. Time Period Covered by the Report**

November 20, 2006 – August 31, 2007

**5. Date of Report**

August 24, 2007

**6. Summary of Work Performed**

Beyond the challenges of navigating through the new and improved NOAA contracting procedures, the significant accomplishment for the time period covered by this report was the successful planning, initiation, and completion of project field work for PJ 070829.

In July, 2007, a six-person scientific complement spent ten days sampling and processing aboard the M/V *Babkin* in Prince William Sound, visiting clam study locations originally sampled between 1990 and 2000 in the NOAA Long-Term Monitoring Program. All objectives proposed in our original project description were met, and all sites were successfully sampled. However, an unanticipated result will complicate the interpretation of the data: littleneck clams (*Protothaca staminea*), the target species for this study, were found in considerably lower abundances than expected.

Table 1 shows summary results from clam excavations, and in all cases, the 2007 abundances were the lowest encountered for a given site or site oiling and treatment category. There appeared to be no correlation to prior oiling or treatment history.

Table 1. Densities per m<sup>2</sup> of *Protothaca staminea* clams encountered in excavations in Prince William Sound for sampled years, 1991-2007.

	1991	1992	1994	1999	2007
<b>UNOILED</b>	271	355	440	231	14
<b>OILED/UNWASHED</b>	283	656	685	145	31
<b>OILED/WASHED</b>	10	22	41	89	2
<b>UNOILED</b>					
Bainbridge	N/A	N/A	N/A	N/A	0.67
Crab Bay	N/A	62	69	55	N/A

Outside Bay	94	58	33	74	0
Sheep Bay	177	235	338	102	13.3
<b>OILED/UNWASHED</b>					
Block Island	112	420	337	N/A	18.7
Snug Harbor	46	45	58	30	2
Mussel Beach	95	176	263	31	10
Herring Bay	30	15	27	97	0.3
<b>OILED/WASHED</b>					
Sleepy Bay	0	2	N/A	N/A	0.7
Shelter Bay	10	10	N/A	43	0
NW Bay W. Arm	0	10	41	48	1.3

Although infaunal core samples collected at each site have not been sorted and analyzed, we qualitatively noted the absence of newly recruited or smaller littleneck clams. In contrast, butter clams (*Saxidomus gigantea*) were found as both adults and recent recruits.

Lingering oil, in the form of oil sheen on the surface of interstitial water, was observed during collection and field sample processing at only one site, Block Island.

Clam tissue samples and sediment samples for hydrocarbon analysis were collected at each site. However, the scarcity of littleneck clams will complicate the analysis and interpretation of results. Our original intent was to collect discrete tissue and sediment (surface and subsurface) samples from each of four excavation quadrats at each site. This would have resulted in a total of 40 tissue chemistry samples and 80 sediment chemistry samples. Because we were able to find clams in only 36% (24 of 66 total) of the quadrats excavated, our ability to most directly link tissue hydrocarbon levels with sediments in the immediate vicinity will be substantially compromised. Moreover, because the numbers of clams sampled were so small (i.e., of the 24 excavations where *Protothaca* were found, 8 of these yielded only one individual clam), our ability to composite clams to provide sufficient tissue mass for a representative *site* sample is in doubt. We will consult with our chemistry support laboratory at Louisiana State University, and with our contracted expert (Dr. Jim Payne) to determine the best analytical course of action, given these circumstances.

In terms of the analysis of littleneck clam abundance that is the basis for our 2007 project work, the recent field results are expected to provide an interesting basis for assessing the state of recovery of the clams. In previous iterations of the NOAA Long-Term Monitoring Program, we have employed an analytical framework we termed “parallelism,” in which trends in abundance at impacted sites were compared to those at reference sites. The underlying concept was that larger-scale (e.g., oceanic or climatic) influences would affect both reference and impacted sites in similar ways, so comparison of trends over time would “filter out” site-specific conditions unrelated to oil spill impacts.

Because the depression in littleneck clam abundance appears to extend across categories of oiling and treatment, the parallelism approach would not reflect the kind of global decline we observed this year. However, other methods based on changes in absolute abundances would.

The trend information we used for assessment of littleneck clam status was, in fact, based on absolute abundances at treated sites and at reference sites. The numbers of clams at treated sites were less than those at reference sites immediately after the *Exxon Valdez* spill, but over subsequent years, there was steady convergence. In the year 2000, that convergence was essentially complete.

Our 2007 project was designed to ascertain current status, and the preliminary results we summarized above suggest that recovery is incomplete—but perhaps for reasons besides the oil spill.

### **7. Summary of Future Work to be Performed**

Laboratory analysis of samples collected in July is underway in Edmonds, WA; Ventura, CA; and Baton Rouge, LA. This analysis will continue through the first quarter of FY2008, although we expect to be interpreting results as they are generated in preparation for the Alaska Marine Science Meeting in January 2008. As was laid out in our 2007 project plan, data interpretation and reporting will continue through the remainder of FY2008, with final report delivery on schedule for September, 2008.

In accordance with provisions of an email notification received from the EVOSTC on July 3, 2007, we have also submitted for consideration a proposal for supplemental FY2008 work to determine the underlying cause or causes for the population decline in littleneck clams. This work would have a more forensic orientation than the population assessment work we performed in 2007.

### **8. Coordination/Collaboration**

Field sampling protocols for both clam metrics and chemistry were modified to provide greater comparability with other Trustee and oil spill research projects. Specifically, clam excavation replicates were increased in number from 4 to 6 to match the sampling protocols of PJ 070750, Database Development for Long Term Monitoring of Nearshore Resources (James Bodkin); and chemistry protocols were modified according to guidelines prepared for this project by Dr. James Payne, chemistry consultant to the Prince William Sound Regional Citizens Advisory Council.

In addition, we consulted with previous EVOSTC clam researcher Dennis Lees (PJ 040574, Assessment of Bivalve Recovery on Treated Mixed-Soft Beaches in PWS), to determine whether we could incorporate measurements or field collections into our field sampling plan to augment or illuminate their previous work. Based on conversations with Lees prior to our July sampling cruise, we designed and incorporated a series of field measurements to estimate beach armoring status.

In August of 2007, NOAA invited Lees to present his current project status at a Seattle seminar. Two of the PIs for our project attended and discussed both the previous results as well as the preliminary results from the current project.

**9. Community Involvement/TEK and Resource Management**

N/A

**10. Information Transfer**

N/A

**11. Budget**

The Project is within budget with no major deviations from the originally submitted financial plan. Slightly higher than projected expenditures for equipment and supplies were more than offset by lower than anticipated contract and salary costs.