

## EVOS ANNUAL PROJECT REPORT

Project Number: <sup>3</sup>02574

**Project Title: Assessment of Bivalve Recovery on Treated Mixed-Soft Beaches in Prince William Sound**

**PI Name: Dennis C. Lees**

**Time Period Covered by Report: 9/10/2002 to 9/2/2003**

**Date of Report: 2 September 2003**

### 1. Work Performed:

The purposes of this program are to determine if the impoverished condition of intertidal bivalve assemblages observed in oiled and treated areas during the NOAA 1990-97 studies is general to treated sites throughout the western sound and to examine the sediment characteristics that may be causing it. The program will address two major objectives. The first is to evaluate whether the depressed condition of bivalve assemblages at treated sites observed in our earlier work is general to treated sites throughout western Prince William Sound. The second objective is to evaluate the role that three sediment characteristics may play in the apparent depression of bivalve assemblages in treated sediments.

In preparation for the field sampling program, we conducted extensive research in the EVOS SCAT and NOAA HAZMAT records to identify suitable sampling locations. We then conducted an aerial reconnaissance survey to make a final selection of sampling locations.

Based on this research, we sampled a total of 40 sites versus the 34 sites proposed initially. These sites included 36 randomly selected sites and 4 historic sites from a previous NOAA study. The 36 randomly selected sites included 17 oiled but unwashed (reference) sites and 19 oiled and washed (treated) sites. Three historic NOAA sites had been treated and one was a reference site.

As proposed, we collected 5 replicate infaunal samples and 1 composited sediment sample for analysis of particle grain size distribution, TOC, and TKN at each site. In addition, prior to commencing field work, we decided to augment the originally proposed field effort by adding an additional sampling component. Consequently, we collected three samples of larger bivalves from 0.25 sq. m. X 15 cm deep excavations at each site. These samples were sieved on 6.35 mm mesh screen.

Analysis of the 0.25 sq. m. excavation samples is complete and a preliminary analysis of these data was presented in January 2003 at the EVOS Annual Meetings in Anchorage. The results of this analysis are summarized below.

## Species Composition

- Twelve species of large bivalve were observed in the excavation samples.
- Four species of large clams dominated intertidal bivalve assemblages in mixed-soft habitats throughout the area surveyed (Table 1). In order of abundance, these were:
  - Littleneck clams (*Protothaca staminea*)
  - Arctic nestling Hiatellas (*Hiatella arctica*)
  - Pointed Macomas (*Macoma inquinata*).
  - Butter clams (*Saxidomus gigantea*)
- Species composition was significantly different between Reference and Treated sites, probably primarily due to differences in abundance.

## Abundance and Species Richness

- Total numbers of clams per site ranged from 0 to 263 (Table 1).
- Bivalve assemblages were still depressed at the NOAA sites resampled during this study (Table 1).
- Numbers of individuals averaged significantly higher at Oiled but Unwashed Reference sites than at Treated sites (including old NOAA sites).
- Numbers of species per site did not differ significantly between Treated and Reference sites.
- Distance into Prince William Sound from the Gulf of Alaska did not appear to exert any effect on bivalve abundance at the sites examined.

## Size Structure and Likely Growth Rates

- Size structure of the four dominant species did not differ appreciably between Treated and Reference sites.
- Based on relationships between shell length and annuli, likely growth rates for all of the dominant species also did not differ appreciably between treatment categories.

## Validity of Proposed Hypotheses

In preliminary comparisons of large bivalves between Treated and Reference sites:

- Large clams were significantly (nearly 3 times, on average) more abundant at Reference sites than at Treated sites.
- Species richness was not significantly different.
- Species composition differed significantly but probably due to abundance differences.
- Bivalve assemblages typically were dominated by burrowing suspension feeders at most sites but deposit feeders were common; functional characteristics of the bivalve assemblages did not appear to differ.

## Preliminary Conclusions Based on Large Bivalves

Except at old NOAA sampling sites, several characteristics of bivalve assemblages did not appear to differ significantly between Reference sites and Treated sites. This appeared true for:

Table 1

Numbers of More Abundant Large Bivalves in 1/4 sq. m. Excavations

Abundance of  
Dominant Bivalve Species\*

Site Type	Abundance and Frequency of Occurrence	<i>Diplodonta impolita</i>	<i>Hiatella arctica</i>	<i>Macoma balthica</i>	<i>Macoma golikovi</i>	<i>Macoma inquinata</i>	<i>Protothaca staminea</i>	<i>Saxidomus gigantea</i>	Total Number of Individuals per Category**	Total Number of Species per Category
Old NOAA sites (4 sampled)	Number of Individuals	0	9	1	0	0	11	0	21	3
	% of Sites Occupied	0	75	25	0	0	50	0		
	Site Averages								5.25	1.5
Oiled but Unwashed Reference Sites (17 sampled)	Number of Individuals	14	327	7	4	68	645	84	1157	10
	% of Sites Occupied	12	59	29	12	53	88	59		
	Site Averages								68.06	3.2
Treated (Oiled and Washed) Sites (19 sampled)	Number of Individuals	8	64	11	5	106	235	49	485	11
	% of Sites Occupied	5	42	21	11	32	89	53		
	Site Averages								25.53	2.7
Overall	Number of Individuals	22	391	18	9	174	880	133	1642	12
	% of Sites Occupied	7.5	45	22.5	10	37.5	80	50	41.05	2.8

\* Details for less common species included only in totals

\*\* Highly significant differences among categories

- Species richness
- Size structure
- Apparent growth rates

Density of larger bivalves was significantly higher at Reference sites than at Treated sites.

Species composition differs significantly between Reference and Treated sites, probably due mainly to the abundance differences.

Depth into Prince William Sound, as measured by latitude, did not appear to exert an influence on the structure of bivalve assemblages.

Progress on the other two elements of the sampling program is summarized below.

Sediment analyses have been completed but these data will not be analyzed until infaunal sample processing has been completed.

The level of effort for processing infaunal core samples was based on sample volumes and processing effort observed during the 1990-1996 NOAA studies. Unfortunately, infaunal sample volumes during the current study have proven to be about 4 times greater on average than those previously observed because of differences in grain size and content of detrital material in sediments on the beaches sampled. Consequently, the schedule for analyzing the infaunal core samples is lagging. Moreover, the cost of this analysis is considerably higher than originally proposed. These schedule and budget issues are compounded by the fact that we sampled 17 percent more sites than originally proposed and added a third sample type (0.25 sq. m. excavations) in an effort to improve the statistical power of the program.

To resolve these issues, I have requested a no-cost extension for the contract until September 2004 from Dr. Peter Hagen, Contract Officer's Technical Representative. I wish to defer the final report until that date, by which time I will have also completed preparation and submittal of a peer-reviewed paper describing the results of this program to a journal. I will also be prepared to present the results at the annual EVOS workshop and other national conferences. Furthermore, referral of the completion date will allow me to complete the program with no cost implications.

2. **Future Work:** Tasks remaining to be completed include:

- Laboratory analysis of infaunal samples
- Statistical analysis of infaunal and sediment data
- Preparation of a paper for a peer-reviewed journal

3. **Coordination/Collaboration:** Not applicable

4. **Community Involvement/TEK & Resource Management Applications:** An attempt was made to hire two individuals from the Village of Tatitlek prior to the summer 2002 field

survey. The response from the village was initially enthusiastic but I was not able to achieve further communications over a period of about two months and had to make other arrangements for field assistance.

5. **Information Transfer:** No publications were produced during the reporting period. The poster, "Preliminary Assessment of Bivalve Recovery on Treated Mixed-Soft Beaches in Prince William Sound" was presented by Dennis C. Lees and William B. Driskell at the EVOS Annual Workshop from 13-17 January 2003. No data or information products were produced during the reporting period

6. **Budget:** Expenditures to date and for the program are within the allocated budget.

**Report Prepared By: Dennis C. Lees**

**Project Web Site Address:** \_\_\_\_\_

Location	Lat - degree	Lat - seconds	Long - degree	Long - seconds	Lat - degree in decimals	Long - degree in decimals
<b>KN007 - NOAA Bay of Isles</b>	60	23.061	147	44.983	60.3844	147.75
<b>CH001</b>	60	19.636	148	0.558	60.3273	148.009
<b>CH008A</b>	60	21.9303	147	59.3388	60.3655	147.989
<b>CH008B</b>	60	21.989	147	59.357	60.365	147.989
<b>CH009</b>	60	22.7273	147	59.682	60.3788	147.995
<b>DI066</b>	60	29.7791	147	40.0506	60.4963	147.668
<b>DI067</b>	60	29.9177	147	39.8308	60.4986	147.664
<b>DI067B</b>	60	29.9381	147	39.5867	60.499	147.66
<b>EV008</b>	60	6.09439	148	0.72383	60.1016	148.012
<b>EV016</b>	60	7.64269	147	55.0897	60.1274	147.918
<b>EV070</b>	60	5.974	148	2.842	60.0996	148.047
<b>FL003A</b>	60	9.071	148	2.709	60.1512	148.045
<b>FL003B</b>	60	9.072	148	2.718	60.1512	148.045
<b>FL003C</b>	60	9.54365	148	2.75391	60.1591	148.046
<b>FL004A</b>	60	10.0587	148	2.56407	60.1676	148.043
<b>FL004B</b>	60	10.444	148	1.87527	60.1741	148.031
<b>IN031</b>	60	30.055	147	38.333	60.5009	147.639
<b>IN032</b>	60	29.7447	147	37.6016	60.4957	147.627
<b>KN004</b>	60	22.9729	147	42.789	60.3829	147.713
<b>KN0103A</b>	60	29.655	147	41.845	60.4943	147.697
<b>KN0103B</b>	60	29.6876	147	41.8408	60.4948	147.697
<b>KN0104</b>	60	29.695	147	41.231	60.4949	147.687
<b>KN0106A</b>	60	28.236	147	41.138	60.4706	147.686
<b>KN0106B</b>	60	28.424	147	40.979	60.4737	147.683
<b>KN0118</b>	60	28.324	147	42.7119	60.4721	147.712
<b>KN0130</b>	60	25.5042	147	47.2891	60.4251	147.788
<b>KN0131A</b>	60	25.906	147	47.02	60.4318	147.784
<b>KN0131B</b>	60	25.901	147	46.999	60.4317	147.783
<b>KN0133</b>	60	26.0342	147	46.4811	60.4339	147.775
<b>KN0502</b>	60	27.24	147	47.956	60.454	147.799
<b>KN0507</b>	60	25.741	147	49.032	60.429	147.817
<b>KN0553</b>	60	21.87	147	51.943	60.3645	147.866
<b>KN0554A</b>	60	21.211	147	50.8116	60.3535	147.847
<b>KN0554B</b>	60	20.0444	147	49.3506	60.3341	147.823
<b>KN0575</b>	60	17.0634	147	51.334	60.2844	147.856
<b>LA016</b>	60	4.014	147	50.01	60.0669	147.834
<b>NW Bay West Arm - NOAA</b>	60	32.609	147	36.24	60.5435	147.604
<b>Shelter Bay - NOAA</b>	60	7.07813	147	57.3963	60.118	147.957
<b>SL001</b>	60	19.898	147	53.75	60.3316	147.896
<b>Sleepy Bay - NOAA</b>	60	3.91824	147	50.2765	60.0653	147.838