NRPP Science Support Project 9353AOC
Task 1.19 Sea otters

Sea otter movements and life history in Glacier Bay National Park and Preserve

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In fiscal year 2004 we received the first years funding in a three year project to measure the magnitude of the potential treatment effect of recolonizing sea otters in Glacier Bay, Alaska. Work in 2003 included development, review and approval of a study plan. The approved study plan incorporates monthly aerial surveys of sea otter abundance and distribution that will provide an estimate of the presence, abundance, and proximity of sea otters to our benthic study sites. Also included in the plan are repeated sampling of a subset of the intertidal clam sampling transects that were initially sampled between 1999 and 2000, but were not likely affected by foraging sea otters. The revised study plan was implemented early in 2004 and will be continued through 2006. Annual reports of research results will be submitted in 2004 and 2005 with a final report in 2006.

This annual report provides the results of monthly aerial surveys of sea otter abundance and distribution in Glacier Bay from 1 January - 31 December, 2004. We also report on the results of repeated sampling of intertidal clam populations in Glacier Bay that occurred during spring and summer low tides in 2004.

Sea otters are well established throughout the year in most areas of lower Glacier Bay (Table 1). The average count over 10 surveys in 2004 was 666 individuals (range 2631083), and mean group size was 8 , (range 3.8-19.4). Although monthly counts vary by about a factor of 4 , the relative contribution of movements into and out of the study area, and differences in detection among surveys is unknown. Examination of the distribution of sea otters remains fairly consistent within the Lower Bay among surveys, suggesting that the surveys should provide a reasonable approximation of the potential for sea otter induced effects among our benthic and intertidal study sites. Examination of the monthly counts over time reveals no temporal patterns that might be expected if monthly, or longer period immigration/emigration was responsible for the monthly differences in counts.

The other component of this project that was completed in 2004 consisted of resampling 17 intertidal clam sites that were initially sampled in 1999/2000. The objective of the initial sampling was to estimate the species composition, abundance, size distributions of intertidal clam populations prior to sea otter recolonization. The objective of the 2004
resampling was to obtain an estimate of the temporal variation in those same variables prior to sea otter recolonization, by sampling quadrats along the same transects initially sampled in 1999/2000.

Table 1. Summary of monthly surveys of sea otter abundance in Glacier Bay, 2004.

| Date | \# Groups | Sum of Counts | Mean Group <br> size |
| :---: | :---: | :---: | :---: |
| $1 / 19 / 2004$ | 66 | 459 | 7.0 |
| $2 / 26 / 2004$ | 96 | 847 | 8.8 |
| $3 / 23 / 2004$ | 71 | 875 | 12.3 |
| $4 / 10 / 2004$ | 70 | 711 | 10.2 |
| 5/10/2004 | 158 | 1083 | 6.9 |
| $6 / 4 / 2004$ | 69 | 425 | 6.2 |
| $7 / 8 / 2004$ | 35 | 679 | 19.4 |
| $9 / 1 / 2004$ | 157 | 647 | 4.1 |
| $11 / 12 / 2004$ | 69 | 263 | 3.8 |
| $12 / 7 / 2004$ | 117 | 669 | 5.7 |
| Means | $\mathbf{9 1}$ | $\mathbf{6 6 6}$ | $\mathbf{8}$ |

Table 2. Summary of the density ( $\# / 0.25 \mathrm{~m}^{2}$ ) of intertidal clams at random and preferred clam habitat (PCH) sites sample in 1999/2000 and in 2004. Because the initial sampling was destructive (all clams were removed from the quadrat), the 2004 was not a repeated measure of the quadrat. Species codes MAS=Macoma, PRS= Protothaca, SAG=Saxidomus, Mys=Mya, His=Hiatella, Cla=Clam.

|  |  | MAS | PRS | SAG | MYS | HIS | CLA | SUM |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Random | 1999 | 223.43 | 93.82 | 20.96 | 25 | 56.46 | 8.8 | $\mathbf{4 2 9 . 6 7}$ |
| PCH | 1999 | 336.98 | 69.1 | 29.16 | 38.28 | 138.6 | 4.64 | $\mathbf{6 1 6 . 9 6}$ |
| Totals | $\mathbf{1 9 9 9}$ | $\mathbf{5 6 0 . 4 1}$ | $\mathbf{1 6 2 . 9 2}$ | $\mathbf{5 0 . 1 2}$ | $\mathbf{6 3 . 2 8}$ | $\mathbf{1 9 5 . 0 6}$ | $\mathbf{1 3 . 4 4}$ | $\mathbf{1 0 4 6}$ |
|  |  |  |  |  |  |  |  |  |
| Random | 2004 | 302.6 | 71.4 | 17.3 | 24.3 | 78.2 | 4.6 | $\mathbf{4 9 8 . 4}$ |
| PCH | 2004 | 263.37 | 69.45 | 27.21 | 74.45 | 172.19 | 6.9 | $\mathbf{6 1 3 . 5 7}$ |
| Totals | $\mathbf{2 0 0 4}$ | $\mathbf{5 6 5 . 9 7}$ | $\mathbf{1 4 0 . 8 5}$ | $\mathbf{4 4 . 5 1}$ | $\mathbf{9 8 . 7 5}$ | $\mathbf{2 5 0 . 3 9}$ | $\mathbf{1 1 . 5}$ | $\mathbf{1 1 1 2}$ |

The sum of clam densities ( $>10 \mathrm{~mm} \mathrm{tl}$ ) at the 17 sites sampled in 1999/2000 was 1,046 clams ( $61 /$ site). The sum of the clam densities at those same 17 sites in 2004 was 1,112 clams (65/site). This pattern of similar overall densities between periods for all clam species was also evident within species (Table 2). While the sum of the densities was nearly equal between sampling periods, there were differences at the level of the site, between periods. There was a trend toward more clams at random sites, and fewer clams at PCH sites in 2004 (Table 2). The mean proportional difference between the two sampling periods at random sites was $202 \%$ (range $15-1000 \%$ ) and at the PCH sites the mean was $88 \%$ (range 10-250\%).

