

Progress Report for Interim Funding 2009

Project Number: 080742

Project Title: Monitoring, Tagging, Feeding Studies, and Restoration of Killer Whales in Prince William Sound/Kenai Fjords in 2008

PI Name: Craig O. Matkin

Time Period Covered by Report: September 2007-August 2008

Date of Report: 1 Sept 2008

Summary of Progress in Completion of Objectives

1. To provide photographic population monitoring of resident killer whale pods, including the non-recovered AB pod in order to determine status. Also monitor the depleted AT1 transient group which has lost over half its members since the spill. **Thus far in 2008 AB pod (except AB25 subpod) has been photographed, all members accounted for, but no new calves. We expect to photograph the AB25 subpod this fall. All 7 members of the AT1 group have been accounted for in 2008.**

2. To use remotely attached satellite tags to aid in detailing habitat use and to allow relocations of pods for food sampling studies. Suggest restoration alternatives from feeding habit and habitat use data. **A total of 14 tags were deployed in 2006-2007 and 4 have been deployed in 2008. We expect to deploy another 5 tags in the fall of this year. Results from 2006-2007 were presented at the Alaska Science Symposium in January 2008**

3. Examine seasonal feeding habits, particularly of AB pod and other resident type pods to determine specifics and timing and predation using observational methods based on collection of fish scales from kill sites and using stable isotope and lipid/fatty acid analysis to corroborate and/or extend field observations. To examine possible restoration through enhancement of particular salmon prey species. **We collected scale samples from 12 kills in 2007 and from 12 kills thus far in 2008. We hope to expand our collection in the late season (September/October) in Prince William Sound. Contaminant/stable isotope/lipid fatty acid analysis has recently been completed for the 2006 and 2007 seasons and will be examined this fall/winter. We have collected 7 biopsy samples this season, but our focus will be on collection during the September/October period 2008**

4. To complete journal papers on the assessment of long-term effects of the *Exxon Valdez* oil spill on AB pod and AT1 population (submitted, spring 2007) on resident killer whale population dynamics (analysis completed summer 2007 submission spring 2008). Journal papers on tagging studies are also planned. **Published "Ongoing population-level impacts on killer whales *Orcinus orca* following the 'Exxon Valdez' oil spill in Prince William Sound, Alaska"**

C. O. Matkin, E. L. Saulitis, G. M. Ellis, P. Olesiuk, and S. D. Rice (Marine Ecological Progress Series Vol. 356: 269–281, 2008). It has been widely requested. Population dynamics paper has been delayed due to reanalysis of data using newly developed techniques. Will be submitted this winter (2008-2009)

5. To provide data for assessment of the role of transient and resident killer whales in the near-shore ecosystem; to monitor any changes in feeding habits in this area based on previously published dietary information (Saulitis et al 2000). **This has been the most difficult of our objectives to complete. Due to the small population size and limited number of encounters with the AT1 killer whales, it has been possible to monitor numbers, but examination of food habits has been problematic. These whales have become extremely difficult to approach and follow.**

6. To continue to work with local groups (Youth Area Watch, tour boat operators/industry) in providing community involvement with our work and promote restoration through education and reduction in harassment. **Youth Area watch was discontinued this year, however we made presentations in local schools and continued our education program with local schools. We have involved residents of Chenega Village in monitoring tagged whales via the ARGOS website. We have continued our work of education and monitoring of tourboat and vessel operators. Our database is available via the Alaska Sealife Center for other researchers and collaboration.**

Work Performed:

The current project was initiated in 2007. It addresses the lingering effects of the *Exxon Valdez* oil spill in Prince William Sound. It includes a continuation of the monitoring of AB pod, other major resident pods, and the AT1 population of transient killer whales. It includes an innovative satellite tagging program that is being used to examine habitat preference and to aid in a more extensive examination of feeding habits using observational and chemical techniques. Results will allow us to more closely examine the potential for restoration for the non-recovered AB pod and the depleted AT1 population.

Initial analysis of tagging data was completed in Fall-Winter 2007. We deployed 14 tags in this region in 2006 and 2007 (Table 1.) Resights following loss of tags indicated no significant problems with scarring. Excluding two apparent electronic failures, the range in attachment/operating time was 10-54 days (Table 1) with an average of 31 days (sd 7.8). Most killer whales tagged were males due to the larger fin (target) size, although attachments to females were also effective. There was no obvious relationship between the position of the tag and the length of attachment, although tags about 1/3 of the way up the fin and posterior of the mid-fin were thought to have the best chance for extended attachment. Tags very low on the fin returned poorer location data. The range of distance traveled per day was 28.3 km to 111.1 km for resident killer whales with an average of 75.4 km (sd 24.5). The Oceanic Home Range area varied from 5,050 to 142,840 km², although if the wide-ranging AG pod was excluded, the largest home range was 26,594 km². For the one Gulf of Alaska transient tagged, (AT109) the rate of travel was 89.9 km/day with an Oceanic Home Range of 18,415 km². Fixed Kernel Density Estimation was used to examine the most complete set of tag location data (total 96 days) from three tags placed on whales from AK pod. In 2008 we have deployed 4 tags and plan to deploy an additional 5 tags. Tags placed on AB pod whales during July and August this year indicated the importance of Hinchinbrook Entrance and the adjacent Gulf of Alaska waters to AB pod during that period. At times AB pod whales moved over 30 km offshore and little time was actually spent inside Prince William Sound.

Biopsy samples were analyzed for stable isotope and lipid/fatty acid, and contaminant content to examine temporal and pod specific differences in feeding habits. A total of 22 samples were taken in 2007. Some initial analytical results of the lipid/fatty acid and stable isotope analysis is presented in Figure 1 and Figure 2. Although there is great overlap between pods in analytical results, there are noticeable differences, with the nearshore AK pod demonstrating the lowest stable isotope levels. There is variation in fatty acid signatures within pods and we are examining the differences between matriline which appear more consistent in blubber chemical composition. Matriline within a number of pods (including AD, AK, AE, AB, and AJ) have traveled more independently in recent years and may pursue combinations of prey specific to the matriline, and this will be examined in future analysis. Examining blubber chemistry in relation to specific prey also is part of our future work.

The following are the most recent census summaries for the primary resident pods of Prince William Sound/Kenai Fjords and two Southeast Alaska pods that regularly visit our area (AF22 and AG). These whales are used to track population trajectories:

AB Incomplete coverage in 2007, however, thus far in 2008 we have completely photographed the AB10 and AB17 subpods. There are no new mortalities nor new calves since 2006. The remaining AB25 subpod that travels with AJ pod has not been photographed yet in 2008.

AD 5 In 2007 a new calf, AB43, accompanied AD8 and AD24 was missing and presumed dead. All whales were present and accounted for in recent encounters in 2008.

AD16 AD16 was missing in 2006 and confirmed dead in 2007. All others accounted for in 2007 and 2008.

AE In 2007 AE1 who was missing in 2006 confirmed dead and AE10 missing and presumed dead. All other animals accounted for and no new calves in 2007. Pod not yet completely photographed in 2008

AF22 AF 85 is a 2006 calf for AF28 and AF 64 was confirmed dead in 2007 and AF 22 was missing and presumed dead in 2007, all others were accounted for in 2007 and not yet completely photographed in 2008.

AG Incomplete coverage in 2008, although all matriline except AG11's were accounted for in 2007. Well photographed in superpod encounter in August 2008, but photos not yet analyzed.

AI All present and accounted for in 2008. AI 10 was a 2006 calf to AI4

AJ Pod not completely covered in 2007 and partially covered thus far in 2008.

AK All animals accounted for and no new calves in 2007 and 2008.

Figure 3 diagrams the number of whales documented annually in AB pod since the beginning of the study as well as the number of whales documented in the other major resident pods of the Southern Alaska Resident population that have been monitored during the same period.

Through our own encounters and submitted photos, the remaining 7 AT1 whales have been accounted for in 2008, and none of the missing/dead AT1 whales have re-appeared (Table

2). These whales have become very difficult to approach, and although we have attempted to tag members of the group, we have not yet been successful. It is noteworthy that the two youngest males, AT 10 (born about 1980) and AT3 (born in 1984) still have not developed the larger dorsal fins associated with males, although both are certainly physically mature by this time (Figure 4). We suspect this inhibited development results from high contaminant load or nutritional stress or both. Although harbor seals numbers have apparently increased in recent years in the Sound, these two males developed during a period of historically very low harbour seal numbers and this is indicated as a major food for the AT1 transients.

During June-September 2007 we completed 50 survey days on the R.V. Notoa with a total of 43 encounters with killer whales. A total of 35 encounters were with fish-eating resident whales and 8 with mammal-eating transient whales. During May to August 2008 we completed 33 days of field work in Kenai Fjords and Prince William Sound of a proposed total of 53 days through the fall. Spring surveys were severely limited by weather due in part to the “La Nina” conditions that have persisted in the North Pacific the past two seasons. Two additional 10 day trips are planned in September and October to provide additional late season data. In 2009 we plan to focus on early season work. Complete photographic coverage of the AB17 sub pod has been completed in 2008 and we hope to finish the monitoring of the AB25 sub pod this fall..

Whale ID	Pod	Total in pod	Date Deployed	Date Expired	Total Days
AK1	AK	15	8/10/2006	9/23/2006	44
AJ7	AJ	49	9/3/2006	9/4/2006	2
AJ21	AJ	49	9/2/2006	9/27/2006	25
AB11	AB	29	9/13/2006	11/7/2006	54
AD28	AD16	7	9/15/2007	10/22/2007	37
AD6	AD5	15	6/11/2007	7/25/2007	44
AE18	AE	18	9/16/2007	10/23/2007	37
AE6	AE	18	8/2/2007	9/6/2007	35
AG3	AG	37	8/14/2007	9/3/2007	21
AJ25	AJ	49	7/7/2007	7/10/2007	4
AK1	AK	15	6/12/2007	7/7/2007	25
AK9	AK	15	9/16/2007	10/13/2007	27
AT109	AT	3	7/4/2007	7/20/2007	17

Table 2. Sighting histories for all AT1 transient whales for years with effort greater than 40 days.

<u>YEAR</u>	<u>AT1</u>	<u>AT2</u>	<u>AT3</u>	<u>AT4</u>	<u>AT5</u>	<u>AT6</u>	<u>AT7</u>	<u>AT8</u>	<u>AT9</u>	<u>AT10</u>	<u>AT11</u>	<u>AT12</u>	<u>AT13</u>	<u>AT14</u>	<u>AT15</u>	<u>AT16</u>	<u>AT17</u>	<u>AT18</u>	<u>AT19</u>	<u>AT20</u>	<u>AT21</u>	<u>AT22</u>
84	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
85	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
86	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
88	X	X	X	X				X	X	X	X	X	X	X	X		X	X		X	X	X
89	X				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
90	X	X	X	X	-	X	-	-	X	X	X	X	X	X	-	-	X	X	O	-	-	-
91	X	X	X	X	-	X	-	-	X	X	-	X		X	-	-		X		-	-	-
92	X	X	X	X	-	X	-	-	X	X	-	-	X	X	-	-	X	X		-	-	-
93		X	X	X	-	X	-	-	X	X	-	-			-	-	X	X		-	-	-
94	X				-		-	-	X	X	-	-		X	-	-		X		-	-	-
95	X	X	X	X	-	X	-	-	X	X	-	-	X	X	-	-	X	X		-	-	-
96	X	X	X	X	-	X	-	-	X	X	-	-		X	-	-		X		-	-	-
97	X	X	X	X	-		-	-			-	-	X		-	-	X		-	-	-	-
98	X				-	X	-	-	X	X	-	-	X	X	-	-	X	X		-	-	-
99		X	X	X	-	X	-	-	X	X	-	-			-	-		X		-	-	-
2000	O				-		-	-			-	-	X	X	-	-	X		-	-	-	-
2001		X	X	X	-	X	-	-	X		-	-	X		-	-	X	X		-	-	-
2002		X	X	X	-		-	-	-		-	-	-	X	-	-	-		-	-	-	-
2003		X	X	X	-	X	-	-	X	X	-	-	-	-	-	-	-	X		-	-	-
2004		X	X	X	-	X	-	-	X	X	-	-	-	-	-	-	-	X		-	-	-
2005		X	X	X	-	X	-	-	X	X	-	-	-	-	-	-	-	X		-	-	-
2006		X	X	X	-	X	-	-	X	X	-	-	-	-	-	-	-	X		-	-	-
2007		X	X	X	-	X	-	-	X	X	-	-	-	-	-	-	-	X		-	-	-
2008		X	X	X	-	X	-	-	X	X	-	-	-	-	-	-	-	X		-	-	-

X whale present

O whale dead (stranded)

- whale missing presumed dead

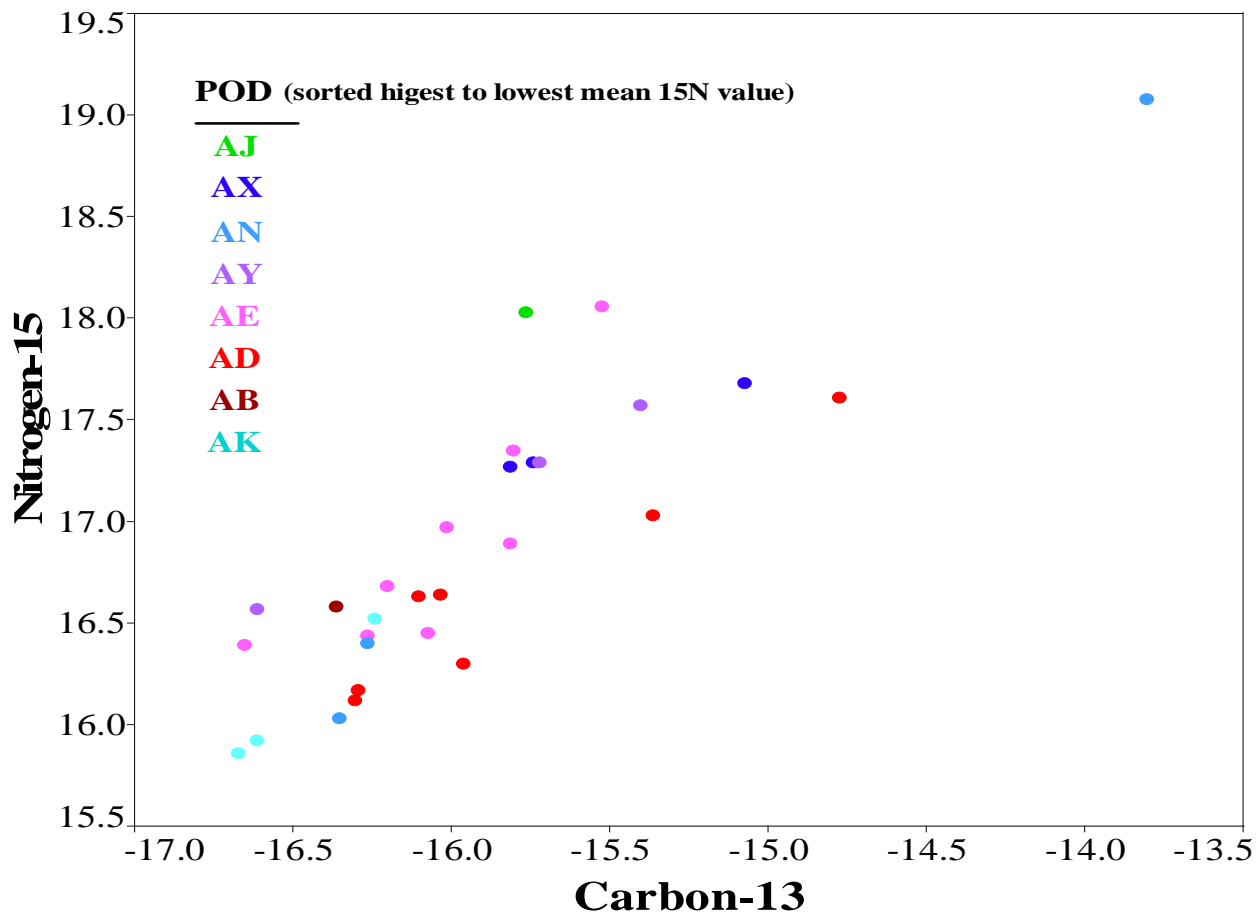


Figure 2. Plot of $\delta^{15}\text{N}$ versus $\delta^{13}\text{C}$ for Gulf of Alaska resident killer whales with individual whales color-coded by pod association. Among all pods, only pod “AK” is statistically significantly different from pods “AJ” and “AX” in their $\delta^{15}\text{N}$ values.

Figure 3. The number of resident killer whales in AB pod, in seven other Prince William Sound pods, and in three Southeastern Alaska pods (all pods of the Southern Alaska Resident population).
1984-2007

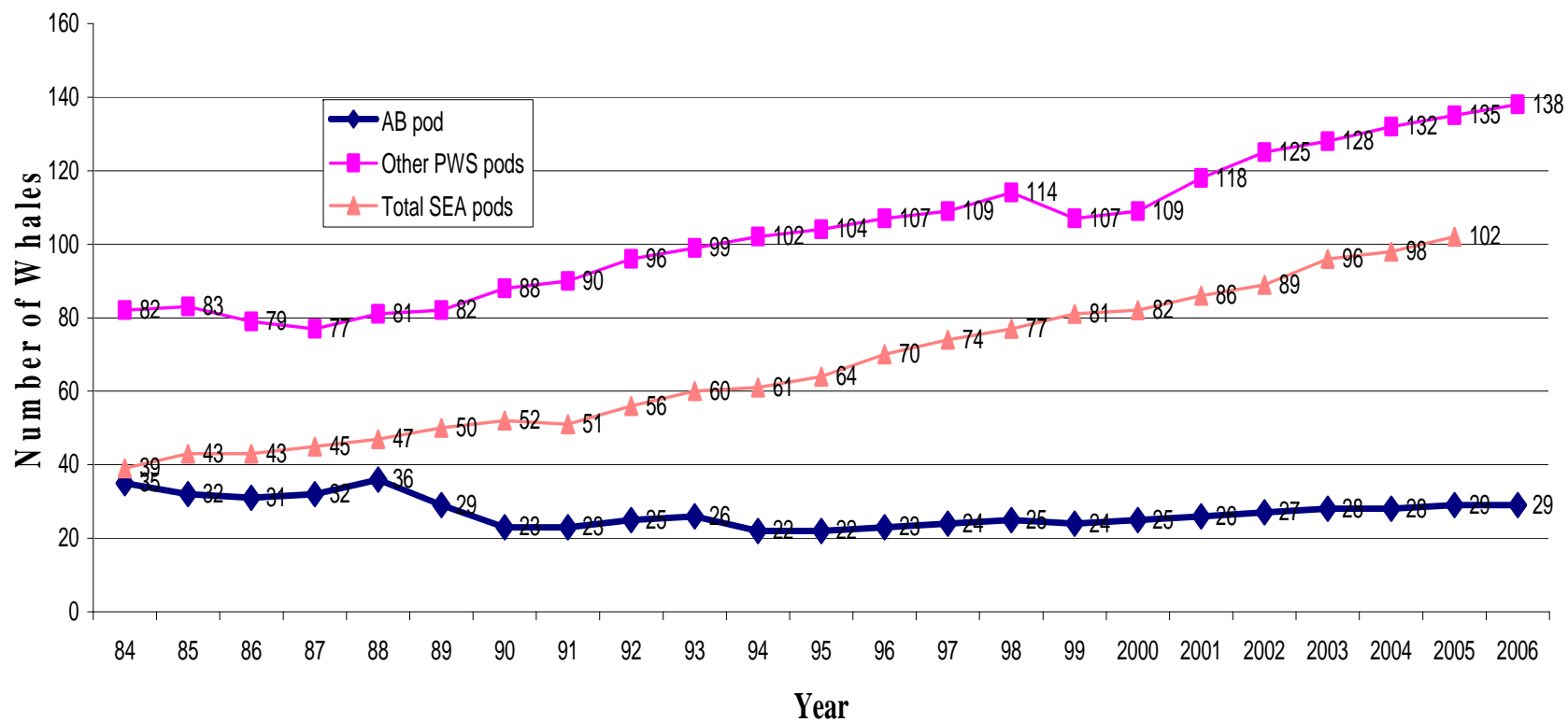


Figure 4. Structure of the depleted AT1 population of transient killer whales September 2006.

