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 SeriesVol. 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 examinat ion 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 (Table1.) 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 (Table1) 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 75.4km (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 matrilines which appear more consistent in blubber chemical composition. Matrilines 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 matrilines 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. Natoa 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 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..

Table 1. Summary of Tags Deployed 2006-2007

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.

YEAR	*AT1*	**AT2**	**AT3**	**AT4**	*AT5*	**AT6**	*AT7*	*AT8*	**AT9**	**AT10**	*AT11*	*AT12*	**AT13**	**AT14**	*AT15*	*AT16*	**AT17**	**AT18**	*AT19*	*AT20*	*AT21*	*AT22*
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

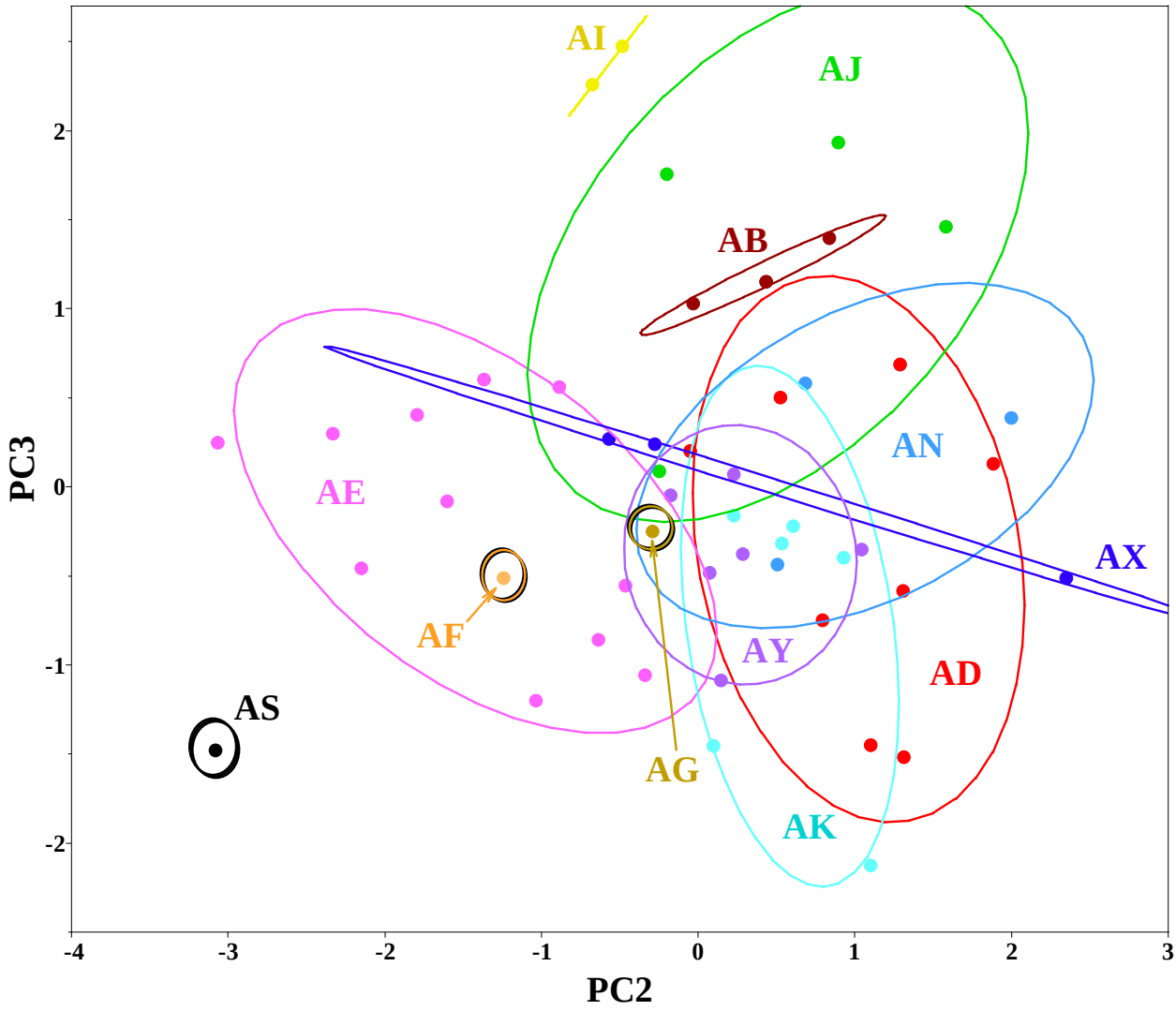


Figure 1. Principal component analysis plot of "dietary" fatty acids present in the outer-blubber biopsy tissues of twelve different pods of Gulf of Alaska resident killer whales. Samples were collected between spring 1998 and summer 2007. Each individual data point represents the dietary fatty acid profile of one whale. Ovals represent the 80% probability density functions of each of the twelve pods depicted. Dietary fatty acids are expressed in units of weight percent composition relative to the sum of all fatty acids present in each blubber sample. With the exception of pod "AS", none of the remaining pod groups were statistically significantly different from one another on the first principal component axis, PC1. Interestingly, relative to other months, the June & July samples tend to be high/low on the PC2/PC3 axes, respectively in line with stable isotope results.

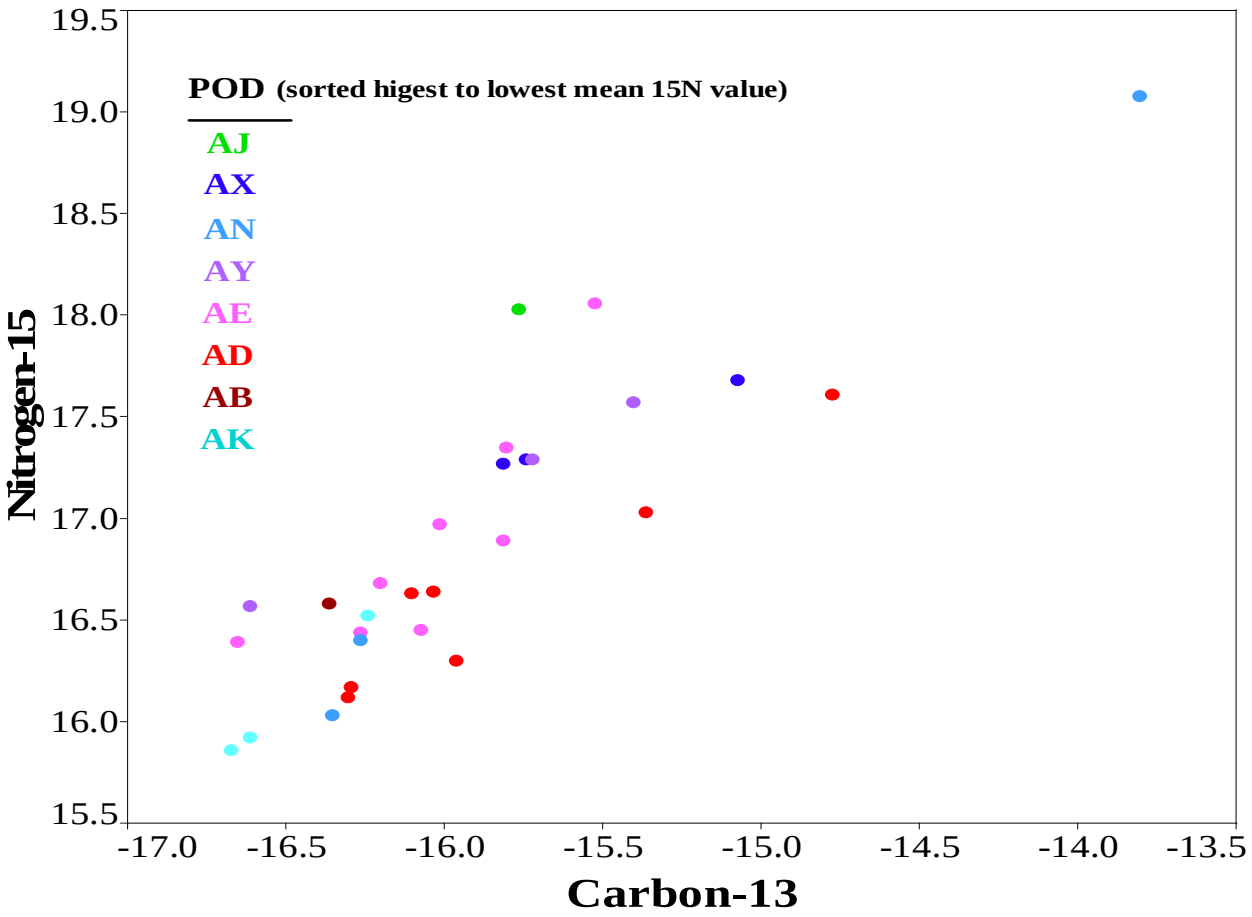


Figure 2. Plot of δ15N versus δ13C for Gulf of Alaska resident killer whales with individual whales color-coded by pod association. Among all pods, only pod "AK" is statistically significantly different from pods "AJ" and "AX" in their δ15N values.

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

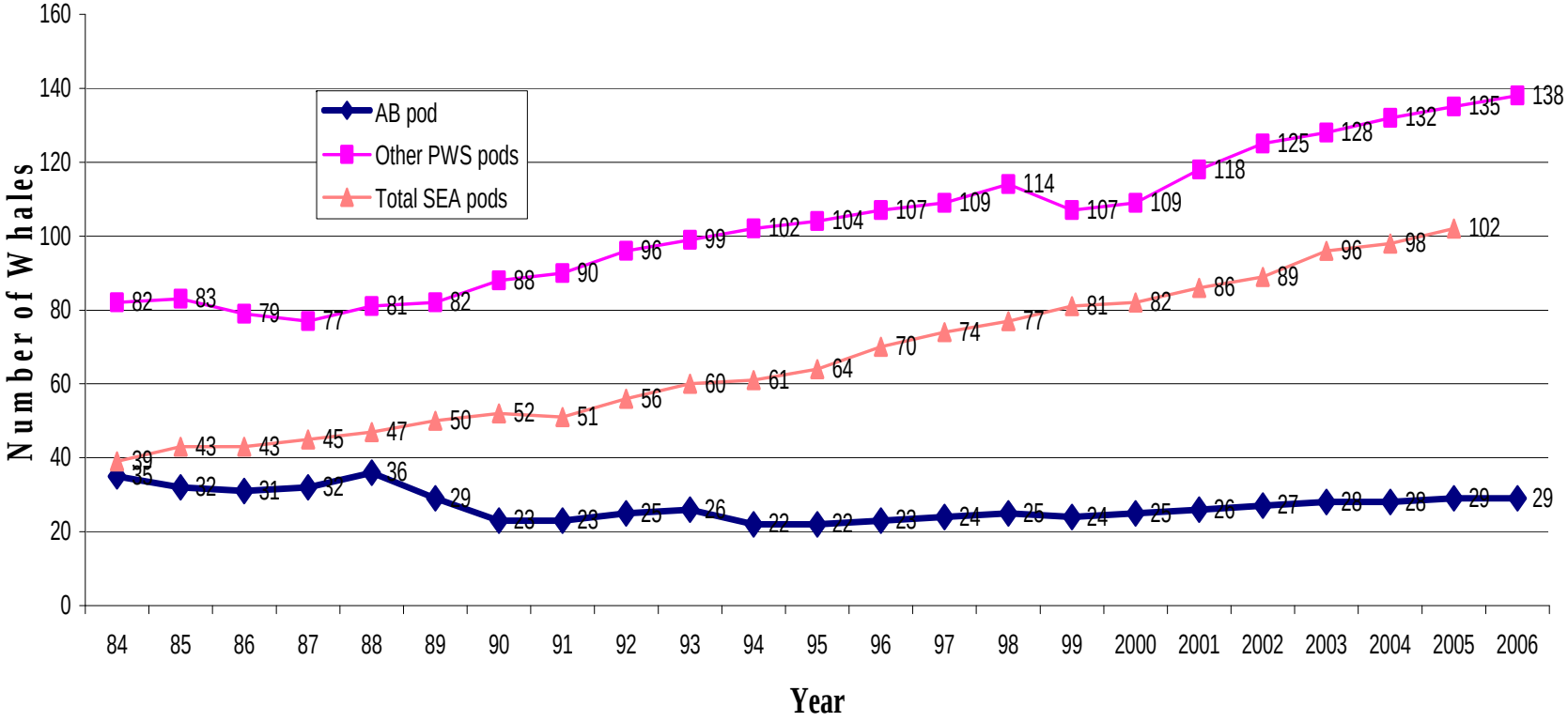
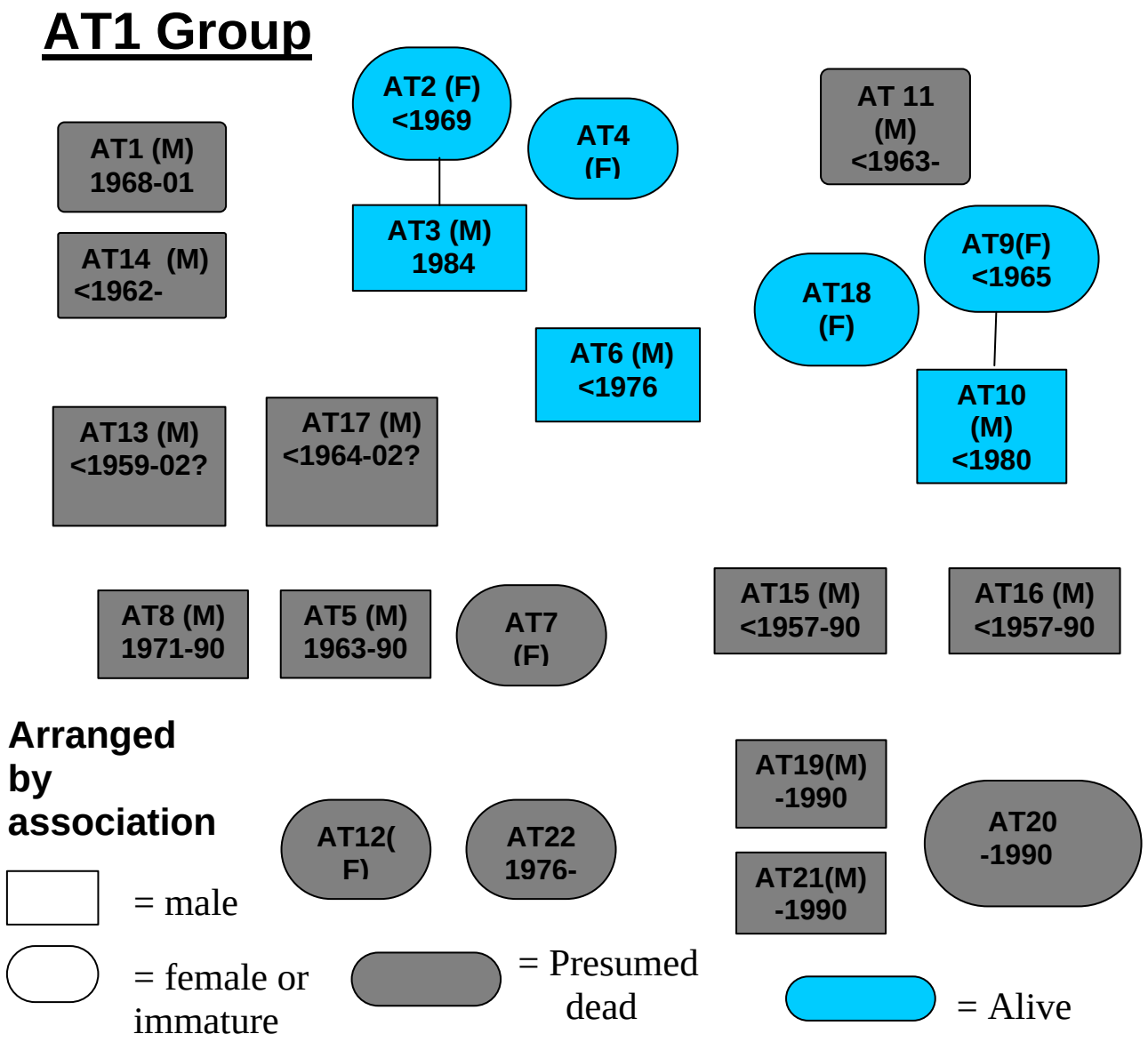


Figure 4. Structure of the depleted AT1 population of transient killer whales September 2006.



PROPOSAL SIGNATURE FORM

THIS FORM MUST BE SIGNED BY THE PROPOSED PRINCIPAL INVESTIGATOR AND SUBMITTED ALONG WITH THE PROPOSAL. If the proposal has more than one investigator, this form must be signed by at least one of the investigators, and that investigator will ensure that Trustee Council requirements are followed. Proposals will not be reviewed until this signed form is received by the Trustee Council Office.

By submission of this proposal, I agree to abide by the Trustee Council's data policy (*Trustee Council Data Policy**, adopted July 9, 2002) and reporting requirements *(Procedures for the Preparation and Distribution of Reports***, adopted June 27, 2007).

PROJECT TITLE: ___ Monitoring, Tagging, Feeding Studies, and Restoration of Killer Whales in Prince William Sound/Kenai Fjords in 2009

Printed Name of PI: ____Craig O. Matkin_____

Signature of PI: ____Craig O. Matkin_____ Date _Aug 27,2008

Printed Name of co-PI: _____

Signature of co-PI: _____ Date _____

Printed Name of co-PI: _____

Signature of co-PI: _____ Date _____

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PROPOSAL SUMMARY PAGE
(To be filled in by proposer)

Project Title: Monitoring, Tagging, Feeding Studies, and Restoration of Killer Whales in Prince William Sound/Kenai Fjords in 2009

Project Period: October 1, 2008 – September 30, 2009

Proposer(s): Craig O. Matkin cmatkin@acsalaska.net
North Gulf Oceanic Society 3430 Main St Suite B1 Homer, Alaska 99603

Study Location: Prince William Sound, Kenai Fjords

Abstract:
: The proposed project is a continuation of the monitoring of AB pod and the AT1 population killer whale populations in Prince William Sound. These groups of whales suffered serious losses at the time of the spill and have not recovered at projected rates. The project also extends the scope of the basic monitoring to include an innovative satellite tagging program 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. The project will more clearly delineate the role of killer whales in the nearshore ecosystem and possible effects on the restoration recovery of harbor seals and sea otters. Community based initiatives such as Youth Area Watch and educational programs for tour boat operators educational programs will continue to be integrated into the work to help foster restoration improving public understanding and reducing harassment of the whales

Funding: EVOS Funding Requested: FY 09 $ 126.7
(must include 9%GA)

TOTAL:

Non-EVOS Funds to be Used: FY 09 $ 25.0

TOTAL:

Date: 30 Aug 2008

Monitoring, Tagging, Feeding Studies, and Restoration of Killer Whales in Prince William Sound/Kenai Fjords in 2009

I. NEED FOR THE PROJECT

A. Statement of Problem

The proposed project is a continuation of a project funded under the 2008 RFP. They address 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 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.

On March 31, 1989 AB pod was observed in oil sheens and six of the 36 pod members were missing. A total of 14 whales were lost from resident AB pod in the two years following the *Exxon Valdez* oil spill and there was no recruitment into the pod during those years. Since that time the social structure within AB pod has shown signs of deterioration. Maternal groups have traveled independently or with other pods, and pod members have not consistently traveled with closest relatives. Although 4 calves were recruited during the period 1992-1994, there were 5 additional mortalities in 1994. If we include the AB25 subpod which contained 11 individuals in 2006, AB pod now contains 29 individuals versus 36 the year prior to the spill. The AB25 subpod has been traveling with with AJ pod following the spill which is unprecedented in our work or in other work on resident killer whales in the North Pacific. The rate of mortality observed in AB pod after the oil spill far exceeds that recorded for 10 other resident pods observed in southern Alaska over the past 19 years or for 19 pods in British Columbia over the past 26 years (Matkin et al 1999, Matkin et al 2003). Although it appears the AB17 and AB10 and AB 25 sub-pods are slowly recovering, population modeling indicates recovery of these sub-pods will not be complete until 2015 due to the loss of females and juveniles at the time of the spill and the reduced reproductive potential of these groups.

Nine whales from the transient AT1 group have not been observed since 1989. Two additional AT1 whales have not been sighted for seven years. Another member of this group stranded and died on a beach near Cordova, Alaska in July 2000 and another stranded and died in 2001 on Hinchinbrook Island. Another AT1 whale stranded and died on Latouche Island in spring 2003. From genetic and photographic data from beached whales, five of these fourteen missing AT1 group whales are known to be dead. Although transient killer whale social structure is not fully understood, we are confident that the other missing AT1 whales also are dead as no AT1 whale has been resighted after missing from our observations for more than 4 years. Statistical analysis backs up this supposition and indicates that they have either died or permanently emigrated from the

area. Since there is no record of these whales in adjacent regions and they appear to have a limited range, it is almost certain that the missing AT1 whales are dead.

Twenty two years of systematic data collected under public and private funding have been placed in a specially designed database currently housed at the NGOS offices in Homer and at Alaska Sea Life Center, Seward, Alaska. The database contains nearly 1000 records of encounters with killer whales in and near Prince William Sound and Kenai Fjords, Alaska. Analyses have determined large-scale differences in spatial distribution patterns between resident and transient whales over time (Scheel et al. 2001).

Without more accurate information on killer whale range, habitat preferences, feeding locations and prey species on a pod by pod basis we cannot judge possible restoration strategies. In this project we will use satellite tagging technology recently developed by the ASLC and NGOS to look at movements of specific groups primarily the AT1 transients and AB pod. Tags will allow relocation of these pods or groups and possibly permit additional encounter time for obtaining feeding data from observation and biopsy. In addition we will monitor longer term movements remotely using locations downloaded daily from the Argos satellite system and to determine use of habitat by these whales.

Feeding habits data will be collected during our long-term follows of killer whales. Resident killer whales are primarily salmon feeders (at least during the spring, summer and fall) and transient killer whales eat solely marine mammals including harbor seals, Dall's porpoise, harbor porpoise, and Steller sea lions (Saulitis et al 2000). Although we have observed only harassment of sea otters and sea otters do not appear to be declining in the region, transient killer whales could potentially switch to this prey as has been postulated as the reason for the sea otter decline in the Central Aleutians (Estes et al 1998). Observations of feeding behavior will be coupled with contaminant/ stable isotopes/lipid fatty-acid analysis as an aid in determination of killer whale feeding habits. Preliminary chemical analysis indicates different feeding preferences for different pods and lineages in the region. The DDT/PCB ratios and ppDDT/Total DDT ratios from biopsy samples indicate whales are not leaving the northern Gulf of Alaska to feed and are dependent on a prey concentrations in the northern Gulf of Alaska.

The AT1 group is now recognized as depleted under the Marine Mammal Protection Act. The results of the Integral Consulting review suggest it should be considered as damaged by the spill and not recovering It appears that 14 of the original 22 members of AT1 group of transient killer whales have apparently died since 1989 (Saulitis et al 2005) and there has been no recruitment within the group. Recovery for this group seems doubtful at this time. This project will continue to monitor the status of AB pod and the AT1 group and use innovative tagging and analytical techniques to examine restoration and recovery possibilities for these whales.

B. Relevance to 1994 Restoration Plan Goals and Scientific Priorities

The status of AB pod is considered "not recovered" at this time. AB pod now contains approximately 29 whales (2008 census is not yet complete), but numbered 36 whales before the spill and was a unified pod. The AB25 subpod generally does not travel with the rest of AB pod, but has attached itself to AJ pod. The AT1 transient group has also failed to recover from the 9 mortalities suffered following the spill and now numbers

7 individuals. This project continues monitoring the lingering oil spill effects and assesses recovery of AB pod and AT1 group killer whales following the *Exxon Valdez* oil spill and provides funding for analysis and publications and will examine restoration possibilities for killer whales.

Satellite tagging studies will help determine locations of important killer whale feeding habitat and examine restoration possibilities via protection of important habitat or enhancement/protection of fish and marine mammal populations. We will continue the slow process of examining feeding habits of killer whales using observational and chemical techniques and provide data to aid in examination of effects of predation on the the nearshore ecosystem and on relevant prey species. Data from this project will be suitable for use in future modeling projects. Harbor seals are currently known to be a major prey item for the AT1 transient killer whales, and we are concerned that sea otters could also become an important prey. Recent evidence from stomach contents indicates AT1 whales are preying on sea otters to some extent. Also, resident killer whales, including AB pod, are important near-shore predators on salmon. Previous work (Saulitis et al 2000) has indicated specific species may be important: detailed food habits studies will more clearly delineate species of salmon involved and determine if other species are also important and examine the restoration potential of producing/protecting particular salmon species.

An important part of the restoration plan is the long term monitoring of non-recovering and not-recovered resources. An annual killer whale database of spanning 23 years now exists with an associated spatial database in GIS format. Details of all encounters as well as behavioral data in a spatial context are readily available. This is linked to our photographic identification database that includes identifications of all individuals from each frame of film for every encounter.

Restoration also has a strong community involvement aspect to foster understanding and reduce harassment of these whales. We have been part of the Youth Area Watch program which provides the opportunity for young students to accompany us during our research. We make annual presentations in local schools. In addition, we provide research results and educational briefings to tour boat operators in both Seward and Whittier on a regular basis. We maintain a monitoring program that examines tour boat interactions with killer whales and seeks to reduce harassment of specific groups including the AT1 transients. We collaborate with the environmental monitoring program at Chenega village and exchange information on a regular basis as well as involve residents in the ARGOS based tracking of whales. Our observer network is given verbal and web-based feedback on status of the whales creating support for conservation of these animals.

PROJECT DESIGN

A. 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.

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.

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

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.

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).

6. To continue to work with local groups (Youth Area Watch, tour boat operators/industry, volunteer sighting network) in providing community involvement with our work and promote restoration through education and reduction in harassment.

B. Procedural and Scientific Methods

Our work depends on accurate photo-identification of each individual in each pod/group that regularly uses the Sound, particularly AB pod and the AT1 population. It is important that researchers maximize the time actually spent with resident killer whales (particularly AB pod and other resident whales) to insure thorough identification of all individuals and meet other objectives of this proposal which now amended to include satellite tracking and detailed food habits evaluation.

Methods proposed to obtain photographic data necessary to meet monitoring objectives will be similar to those used by the NGOS in Prince William Sound/Kenai Fjords for the past 22 years. Searches for whales will not be made on random transects, but based on current and historical sighting information. In addition whales will be located by listening for killer whale calls with a directional hydrophone (calls can be heard up to 10 miles away), or by responding to VHF radio calls from other vessels reporting sightings of whales. We have developed network of cooperating vessel owners and tour boat operators that regularly report whale sightings. In addition, requests for recent killer whale sightings will be made routinely on hailing Channel 16 VHF and working channel 77. Finally, we will use satellite tracking positions, when possible, to direct searches for individuals and groups.

A vessel log and chart of the vessel track will kept for each day the research vessels operate. Nobletech software and a laptop computer configured with GPS will

automatically record the research vessel track in real time. The elapsed time and distance traveled will be recorded and vessel track plotted. Record will be made of the time and location of all whale sightings and the weather and sea state noted at regular intervals.

Data from each encounter will be stored in an access database and trackline and all vessel and whale tracklines stored in a GIS database. This data system will be used in 2008 to log all encounters and summarize effort. Data recorded will include date, time, duration, and location of the encounter. Rolls of film exposed and the estimated number of whales photographed will also be recorded. A chart of the whales' track line during the encounter will be completed and the distance traveled by the vessel with the whales will be calculated by GIS on a daily basis. We will link general behavior of the whales (i.e. feeding, resting, traveling, socializing, milling) to location and time.

Photographs for individual identification will be taken of the port side of each whale showing details of the dorsal fin and gray saddle patch. Photographs will be taken at no less than 1/1000 sec using Fuji Neopan 1600, a high speed black and white film. A Nikon F-100 auto focus camera with internal motor drive and a 300 mm f4.5 auto focus lens will be used. Digital photographs are taken as a backup using a Nikon D200 SLR camera, but film is still our primary recording medium. When whales are encountered, researchers will systematically move from one subgroup (or individual) to the next keeping track of the whales photographed. If possible, individual whales will be photographed several times during each encounter to insure an adequate identification photograph. Whales will be followed until all whales are photographed or until weather and/or darkness make photography impractical.

All photographic negatives will be examined under a Wild M5 stereomicroscope at 9.6 powers. Identifiable individuals in each frame will be recorded. When identifications are not certain, they will not be included in the analysis. Unusual wounds or other injuries will be noted. Photographic negatives will be analyzed using a photographic database that spans 22 years.

Recently we have accomplished the first successful remote attachments of satellite transmitters to killer whales using a crossbow arrangement and small barbed tag that attaches to the dorsal fin of the whale. Re-sighting data indicates minimal scarring after the tag drops off. The prototype position-only satellite transmitter that we are proposing to deploy is approximately 3.8 cm in diameter in a half dome shape, with a maximum height of 2.2 cm. The transmitting antenna is approximately 1.5 mm in diameter and 17 cm long sticking out of the center of the half dome. On the flat side, opposite the point of the antenna protrusion will be one or two barbed attachment post that will be 5 cm long and 0.6 cm in diameter. Attachments will be made from distances of approximately 6-8 meters using either a crossbow (e.g. Barnett Wildcat 170 pound bow or similar). Uplink schedules are set prior to tagging and data received through the Argos satellite system. We have had attachment times of up to 2 months in our tagging in Prince William Sound in 2007. Reaction to application of the tags is slight and scarring after the tag drops off is minimal based on re-sight data from animals tagged in 2006. As part of this project we will attempt to place 9 additional tags on different whales in 2008, looking at variations in habitat use by the different pods. We will access positions from the field on a daily basis to find individuals, in addition to compiling a long term record of movements.

Field observations of feeding will be made and prey parts collected when possible. Scales are retrieved from fish predations events and read for species and age at the Pacific Biological Station in Nanaimo, British Columbia, where a scale laboratory has been established and certified for over 20 years. If mammal prey species cannot be identified visually, then genetic analysis will be conducted if bits of prey remains are collected. The University of British Columbia, Department of Zoology genetics laboratory maintains a reference collection of genetic markers for each marine mammal species and will conduct species identification analysis.

Contaminant, lipid/fatty acid analysis and stable isotope analysis will be conducted from biopsies obtained from individual whales using collection procedures described in Matkin et al (2003). Genetic analysis conducted at the University of British Columbia using mtDNA haplotypes and nuclear DNA micro satellites will be used as necessary to identify the population of new groups or individuals (see Data Management and Quality Assurance attached to this proposal). Lipid/fatty acid analysis and OC contaminants analysis will be conducted on the blubber samples using the procedures detailed in Herman et al (2005) and in the Data Management and Quality Assurance statement. Stable isotopes will be determined from epidermis tissue from biopsy samples using standard procedures (Herman et al 2005). All analysis will be conducted by the Environmental Contaminant Laboratory, Northwest Fisheries Science Center (NWFSC), Seattle,WA. Although the NWFSC maintains a large reference library of values for contaminants/fatty acids and stable isotopes for potential prey species of killer whales, it will be necessary to augment their collection with samples from our regions, as values may change appreciably between areas. Collection of potential prey for analysis (including all species of salmon and marine mammals as available) will be a part of this project.

The primary research platform will be a 34' diesel inboard powered vessel capable of 18 knots that can sleep 3-4 individuals (R.V. *Natoa).* With sleeping accommodations and large fuel capacity, the R.V. *Natoa* can remain in the field for periods up to two weeks. This vessel will operate a total of 32 days under funding from this project (and an additional 25 days from the Alaska Sea Life Center funding), with days selected to maximize encounters with resident whales (AB pod) and the AT1 group during the early season (April/May) the late season (Aug/Sept) in order to compare food habits during the different periods.

C. Data Analysis and Statistical Methods

Because photographic and observational data are being made in the same format as during the past 22 field seasons and using the techniques now standardized for studying killer whales, the data will be comparable with other data collected around the North Pacific. Since we identify every individual in each pod of resident killer whales, and pod membership only changes through death or calf production, we can accurately assess changes in pods/population.

The report for the monitoring segment will include a summary of all field effort including that funded outside of this DPD, and will include a summary of the pods and individuals encountered and a status report on AB pod and the AT1 group. Changes

within AB pod will be examined with consideration for the age and sex structure of the pod and maternal groups within the pod and related to the population model now under development. Trends in transient killer whale sighting rates and demographics will also be presented.

Feeding data will be summarized and field observations and data from scales (species and age) will be summarized and compared by area and by pod. In conjunction with the NWFSC we have used contaminant/fatty acid/stable isotope analysis to describe aspects of killer whale predation in other areas (Herman et al 2005, Krahn et al 2006, see Data Management and Quality Assurance). Analysis and publication for this project will follow the model presented in these papers. We will also compare chemical markers indicative of diet between pods and from different times of year (late winter/spring and late summer/fall). We will take into account that chemical markers usually indicate prey from approximately two months prior to the sample in temporal comparisons. Genetic analysis, when appropriate, will be conducted using the methods detailed in Matkin et al (2003) and will include mtDNA and nuclear DNA analysis. Track lines from whales tagged with satellite tracking devices will be presented and analyzed in GIS format. Tracks will be examined for patterns in movements, and in relation to topography, to known migratory pathways of prey and to areas of potential prey abundance.

Frame by frame input of identification data from exposed film into VAX and IBM PC computer systems will occur and identifications tabulated by pod and by individual. Copies of killer whale encounter data and vessel logs will be stored at the Alaska Sea Life Center and this data will be archived in the GIS database for potential future analysis. Frame by frame identification data will also be made available on disk. Copies of the GIS program and data base will be available by request to NGOS.

PC (Windows) compatible computers owned by NGOS will be used to analyze field data. The various long-term databases will be housed at NGOS offices and the Alaska Sea Life Center, although copies will be made available to other management agencies on request.

D. Description of Study Area

This project is part of an ongoing killer whale research in Prince William Sound and the Kenai Fjords region, Alaska (Matkin et al 2005). The overall study area stretches from the Nuka Bay, outer Kenai Peninsula region to Cordova on the eastern edge of Prince William Sound. However, the funding specifically requested in this proposal will be used primarily in western Prince William Sound and Kenai Fjords where likelihood of encountering the focal whales is most likely. We cannot predict the specific locations where encounters will occur.

E. Coordination and Collaboration with Other Efforts

The monitoring of killer whales and analysis of current data is part of a long-term program to investigate killer whale recovery, monitor populations and examine the interactions of killer whales with other species. Although Craig Matkin is the sole P.I. on this project, he will work closely with collaborators Russ Andrews at the Alaska Sea Life

Center, who has designed the satellite tags and with Dave Herman and Peggy Krahn at the Northwest Fisheries Science Center, who conduct diet and contaminant analysis, to complete the project and Lance Barrett-Lennard who conducts the genetic analysis. As possible it will be integrated with near shore studies that focus on sea otters and with the oceanographic studies of the Alaska Coastal Current. We will work as collaborators/consultants for work on humpback whale impact on herring studies (Jeep Rice, P.I.) should they be funded.

We have a record of community involvement and plan to continue work with the Youth Area Watch Program. In FY2009 this project will rely on approximately $10,000 in project funds (primarily salaries) from the ASLC up to $15,000 in additional analytical time provided by the NMFS, NWFSC, Environmental Contaminant Laboratory. Support from various foundations completes the overall program. In addition we are supported and work cooperatively with the NMFS regional office (Aleria Jensen) to provide observation and education of the tour boat fleet in the Prince William Sound/Kenai Fjords region. As a non-profit research institution familiar with private funding sources and cooperative programs, NGOS can work with the Trustee Council to maximize return for current and future funding.

III. SCHEDULE

A. Project Milestones

Objective 1. Write paper on oil spill effects on killer whales in Prince William Sound in April 2007 (completed and published in Marine Ecological Progress Series)

Objective 2. To prepare and launch field collection of data, including identification photos, prey samples and observations, biopsy samples and satellite tag attachments. Field work will begin in April 2009 and end by October 2010.

Objective 3. Conduct analysis on prey samples, biopsy samples, and plot results of tagging efforts. Completion date February 2010

Objective 4. Submit paper on population dynamics of resident killer whales by April 2009

Objective 5. Write Final report to be submitted April 2010

B. Measurable Project Tasks

FY09, 1st quarter (October 1, 2008-December 31, 2007)

. Workup satellite tag data in GIS format and update databases. Lipid/fatty acid, contaminant, stable isotope and genetic analysis.

FY08, 2nd quarter (January 1, 2009-March 31, 2009)
January 23-27 Annual Marine Science Symposium Finish analysis of photographs from fieldwork and workup satellite tag data in GIS format and update databases. Lipid/fatty acid, contaminant, stable isotope and genetic analysis completion. preparation of population dynamics paper and submission
FY08, 3rd quarter (April 1, 2009-June 30, 2009)
Submit and answer reviews of population dynamics paper. Prepare for April field work Conduct fieldwork in April (2 weeks) May (1 week) and June (1 week)
FY08, 4th quarter (July 1, 2009- September 30, 2009)
Conduct fieldwork in July (2 weeks) and August (10 days) and September (10 days) Initiate analysis of 2008 data. Money is provided for attendance at the Marine Science Symposium (Jan 2009) for presentation of results. After winter analysis the final report will be completed for this 2 year project in April 2010

C. Completion Date

Annual report will be submitted by September 1 2009. Final report to be submitted by late April 2010.

IV. RESPONSIVENESS TO KEY TRUSTEE COUNCIL STRATEGIES

A. Community Involvement and Traditional Ecological Knowledge

There is great public concern and interest for killer whales in Prince William Sound and in Kenai Fjords. The expanding tourboat industry depends on a healthy killer whale population to attract and satisfy visitors and residents and the research and its results enrich the experience of visitors and residents. We have been closely involved with tourboat and recreational operators and residents by exchanging sighting information on a daily basis and providing updated catalogues of individual whales to enhance enjoyment of whale observation (Contact Dan McDonald, Kenai Fjords Tours, Seward Alaska and Tom Tougas, Renown Tours, Seward, Alaska). We have provided and continue to provide annual spring workshops in Seward detailing the biology of Alaskan killer whales. We are involved in the Youth Area Watch program, taking young students out to participate in our research (Contact Shu Salasky, Glacier School District). Publication of an updated identification catalogue that includes details of our research results and viewing guidelines has further sparked interest in these whales. Killer whales now draw thousands of visitors to the region each year.

We continue to collect observations and stories from native residents and others that will provide background for interpretation of our findings and place the work in a historical and cultural perspective. Some of these legends and stories are used to place

our research in a broader context in our publication: “Killer Whales of Southern Alaska” (Matkin et al 1999).

B. Resource Management Applications:

This study builds on a long-term database that gives us the ability to track the changes in killer whale populations in this region. Currently, resident killer whales are increasing in number except for the oil spill damaged AB pod, while the AT1 transients are in serious decline. This study will continue to examine these changes and hopefully help better explain and interpret them. The AT1 transients are listed as depleted under the Marine Mammal Protection Act. Killer whales are an important resource for the tour industry as well as a cultural resource for native and non-native cultures and tourboat and other human interaction should be managed effectively. We are currently working with the National Marine Fisheries Service National Marine Mammal Laboratory (Dr John Durban and Dr Paul Wade), Regional Management Office, Juneau, Alaska (Kaja Brix and Aleria Jensen) in providing data on vessel and whale interactions and assisting in formulation of management guidelines. Contaminant data from killer whales aids in monitoring of toxic chemicals that are moving into Alaskan waters from other regions (primarily southeast Asia) and can be an aide in promoting management of those chemicals on a worldwide basis. Data we collect on killer whale habitat use and important prey species could provide possibilities for management strategies that will encourage the recovery of the oil spill damaged killer whale groups.

PUBLICATIONS AND REPORTS:

Annual/Final reports will be filed as scheduled. Published papers will include (1) a paper detailing the immediate and long-term effects of the *Exxon Valdez* oil spill on AB pod and the AT1 population.(2) a paper modeling the population dynamics of the southern Alaska resident killer whale population and

PROFESSIONAL CONFERENCES:

Papers developed using data collected under this contract will be presented at various meetings and conferences, including the annual Alaska Marine Science Symposium in Anchorage in January 2009. Support to attend this conference is requested in this proposal.

LITERATURE CITED

Estes, J.A., M.T. Tinker, T.M. Williams, D.F. Doak 1998. Killer Whale Predation on Sea Otters Links Oceanic and Nearshore Ecosystems. Science 282: 473-476

Herman, D.P., D.G. Burrows, P.R. Wade, J.W. Durban, C.O. Matkin, R.G. LeDuc, L.G.

Barrett-Lennard, and M.M. Krahn. 2005. Feeding ecology of eastern North Pacific killer whales Orcinus orca from fatty acid, stable isotope, and organochlorine analyses of blubber biopsies. Mar Ecol. Prog. Ser.302:275-291

Krahn, Margaret M., David P. Herman, Craig O. Matkin, John W. Durban, Lance Barrett-Lennard, Douglas G. Burrows, Marilyn E. Dahlheim, Nancy Black, Richard G. LeDuc and Paul R. Wade In Press.
Use of chemical tracers in assessing the diet and foraging regions of eastern North Pacific killer whales. Marine Environmental Research

Matkin, C. O., G. M. Ellis, L. G. Barrett-Lennard, H. Yurk, E. L. Saulitis, D. Scheel, P. Olesiuk and G. Ylitalo. 2003. Photographic and acoustic monitoring of killer whales in Prince William Sound and Kenai Fjords, *Exxon Valdez* Oil Spil Restoration Project Final Report (Restoration Project 03012 Final Report), North Gulf Oceanic Society, Homer, Alaska.

Matkin, C. O., E. Saulitis, D. Maldini, J. Maniscalco and L. Mazzuca. 2005. Steller sea lion predation by killer whales in Kenai Fjords/Prince William Sound, Alaska. Pages 212-226 *in* T. R. Loughlin, S. K. Atkinson and D. G. Calkins, eds. Synopsis of research on Steller sea lions: 2001-2005. Alaska SeaLife Center's Steller Sea Lion Research Program, Seward, Alaska. 344 pp.

Matkin, C.O., Ellis, G.M., Saulitis, E.L., Barrett-Lennard, L.G., & Matkin, D. 1999. *Killer Whales of Southern Alaska*. North Gulf Oceanic Society, Homer, Alaska.

Saulitis, E.L., C.O. Matkin, K. Heise, L. Barrett Lennard, and G.M. Ellis. 2000. Foraging strategies of sympatric killer whale (*Orcinus orca*) populations in Prince William Sound, Alaska. Marine Mammal Science16(1):94-109.

Saulitis, E., C. O. Matkin and F.H. Fay. 2005. Vocal repertoire and acoustic behavior of the isolated AT1 killer whale subpopulation in Southern Alaskaa. Canadian Journal of Zoology **83**: 1015-1029.

Scheel, D., C. Matkin, E. Saulitis. 2001. Distribution of killer whale pods in Prince William Sound, Alaska over a thirteen-year period, 1984-1996. Marine Mammal Science 17(3).

Ylitalo, G.M., C.O. Matkin, J. Buzitis, M. M. Krahn, L. L. Jones, T. Rowles, and J. Stein. 2001. Influence of Life-History Parameters on Organochlorine Concentrations in Free-Ranging Killer Whales (*Orcinus orca*) from Prince William Sound, Alaska.. The Science of the Total Environment 281: 183-203.

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Education

B.A. in Biology, University of California, Santa Cruz 1974.
MA. in Zoology, University of Alaska Fairbanks. 1980.

Experience

Currently: Director, North Gulf Oceanic Society, a non-profit research and education organization
Adjunct faculty, University of Alaska, Anchorage, Lower Penninsula Campus

Mr. Matkin has conducted research on marine mammals in southern Alaska since 1977. He completed work on harbor seals and Steller sea lions and their interactions with fisheries in 1978-79. He initiated photo-identification work of killer whales and humpback whales in Prince William Sound in 1977. Since 1982 he has been employed by the North Gulf Oceanic Society and has worked under numerous contracts from the National Marine Mammal Laboratory, NMFS; the U.S. Fish and Wildlife Service; the Sea Grant Marine Advisory Program; Alaska Council on Science and Technology, U.S. Marine Mammal Commission Hubbs Sea World Research Institute, the *Exxon Valdez* Trustee Council and the Alaska Sea Life Center. He has directed the NGOS long-term photo-identification project examining killer whale population dynamics in southern Alaska since 1984. He has conducted population/distribution/genetics research on humpback whales in Prince William Sound and western Alaska. He has specialized in biopsy sampling of various cetaceans including killer whales, humpback whales, and sperm whales. He directed work contracted by the Exxon Valdez Oil Spill Trustee Council and National Marine Fisheries Service assessing the impacts of the *Exxon Valdez* Oil Spill on killer whales for the past 12 years (1989-2001) and currently supervises a killer whale research program that extends from southeastern Alaska to the Eastern Aleutians. He has examined environmental contaminant levels in killer whales and humpback whales in Alaskan waters using biopsy sampling techniques. Currently he is a member of the Alaska Scientific Review Group, advising the National Marine Fisheries Service on the status of marine mammal stocks in Alaska.

Mr. Matkin has extensive experience in the operation and maintenance of commercial fishing and research vessels and has operated commercial vessels in southern Alaska since 1978. He has owned and operated a salmon and herring purse seine vessel since 1984. His commercial fishing experience includes Dungeness crab and Tanner crab pot fishing, salmon seining and gillnetting, herring seining, and roe-on-kelp impoundment.

Selected Publications

Matkin, CO. and E. Saulitis. 1994. Killer whale (*Orcinus orca)*: Biology and Management in Alaska. U.S. Marine Mammal Commission, Washington D.C. 80pp. Contract T75135023.

Matkin, C.O., G.M. Ellis, M.E. Dahlheim, and J. Zeb. 1994. Status of killer whale pods in Prince William Sound 1985-1992. *In*: T. Loughlin, *ed*. Marine Mammals and the *Exxon Valdez*. Academic Press, San Diego.

Matkin C.O., Matkin D.R., Ellis G.M., Saulitis E, and D. McSweeney. 1997. Movements of Resident Killer-Whales between Southeastern and Prince-William-Sound, Alaska

Marine Mammal Science: 13(3) Pp. 469-475 .
Matkin, C.O., G. Ellis, , E Saulitis, L. Barrett-Lennard and D. Matkin. 1999. *Killer Whales of Southern Alaska.* North Gulf Oceanic Society, Homer, Alaska
Matkin, C.O., G. Ellis, P. Olesiuk and E. Saulitis. 1999. Association patterns and inferred genealogies of resident killer whales, Orcinus orca, in Prince William Sound, Alaska. Fisheries Bulletin
Saulitis, E.L., C.O. Matkin, L. Barrett-Lennard, K. Heise and G. Ellis. 2000. Foraging strategies of sympatric killer whale (*Orcinus orca*) populations in Prince William Sound, Alaska Marine Mammal Science, 16(1)94-109**.**
Scheel, D. C. O. Matkin, and E. Saulitis 2001. Distribution of killer whale pods in Prince William Sound, Alaska over a 13 year period 1984-1996. Marine Mammal Science. 17(3).
Ylitalo**,** G.M., C.O. Matkin, J. Buzitis, M. M. Krahn, L. L. Jones, T. Rowles, and J. Stein. 2001. Influence of Life-History Parameters on Organochlorine Concentrations in Free-Ranging Killer Whales (*Orcinus orca*) from Prince William Sound, Alaska.. The Science of the Total Environment 281:183-203.
Saulitis, E., C. O. Matkin and F.H. Fay. 2005. Vocal repertoire and acoustic behavior of the isolated AT1 killer whale subpopulation in Southern Alaskaa. Can J Zool **83**: 1015-1029.
Matkin, C. O., E. Saulitis, D. Maldini, J. Maniscalco and L. Mazzuca. 2005. Steller sea lion predation by killer whales in Kenai Fjords/Prince William Sound, Alaska. Pages 212-226 *in* T. R. Loughlin, S. K. Atkinson and D. G. Calkins, eds. Synopsis of research on Steller sea lions: 2001-2005. Alaska SeaLife Center's Steller Sea Lion Research Program, Seward, Alaska. 344 pp.
Herman, D.P., D.G. Burrows, P.R. Wade, J.W. Durban, C.O. Matkin, R.G. LeDuc, L.G. Barrett-Lennard, and M.M. Krahn. 2005. Feeding ecology of eastern North Pacific killer whales Orcinus orca from fatty acid, stable isotope, and organochlorine analyses of blubber biopsies. Mar Ecol. Prog. Ser.302:275-291
Krahn, Margaret M., David P. Herman, Craig O. Matkin, John W. Durban, Lance Barrett-Lennard, Douglas G. Burrows, Marilyn E. Dahlheim, Nancy Black, Richard G. LeDuc and Paul R. Wade In Press.
Use of chemical tracers in assessing the diet and foraging regions of eastern North Pacific killer whales. Marine Environmental Research

Collaborators:

Lance Barrett-Lennard Vancouver Public Aquarium, Vancouver, B.C. Canada
Russ Andrews, Alaska Sea Life Center
John Durban, National Marine Mammal Laboratory
Dave Herman, Northwest Fisheries Science Center
Peggy Krahn, Northwest Fisheries Science Center
Graeme Ellis Pacific Biological Station, Nanaimo, B.C. Canada
Peter Olesiuk Pacific Biological Station, Nanaimo, B.C. Canada
Eva Saulitis, North Gulf Oceanic Society, Homer, Alaska
David Sheel Alaska Pacific University, Anchorage, Alaska
Jan Straley, University of Alaska Southeast, Sitka, Alaska
Paul Wade National Marine Mammal Laboratory, Seattle, WA
Harald Yurk University of British Columbia, Vancouver, B.C. Canada

2008 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2007 - September 30, 2008

Budget Category:	Authorized FY 2008	Proposed FY 2009
Personnel	$31.7	$31.7
Travel	$1.3	$1.4
Contractual	$38.5	$39.3
Commodities	$34.1	$33.2
Equipment	$0.0	$0.0
Subtotal	$105.6	$105.6
Indirect NGOS	$10.6	$10.6
NMFS Administration 9%	$10.5	$10.5
Project Total	$126.7	$126.7
Full-time Equivalents (FTE)		0.6
Other Resources		$30,000.0

LONG RANGE FUNDING REQUIREMENTS

Dollar amounts are shown in thousands of dollars.

Comments:
The Northwest Fisheries Science Center, Environmental Contaminant Lab will provide up to 15,000 in additional analytical services.

All permanant equipment will be provided by NGOS through grants from foundations and maintenance provided through
NGOS indirect monies

Comments:

FY09

Project Number: 08742
Project Title: Monitoring, Tagging, Feeding Studies, and Restoration of Killer Whales
Name: North Gulf Oceanic Society

Prepared:

2008 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2007 - September 30, 2008

Personnel Costs:			Months	Monthly		
	Name	Position Description	Budgeted	Costs	Overtime	
	Craig Matkin	P.I., Field Biologist	4.5	5100.0		
	Eva Saulitis	Field Biologist, Data analysis -	2.5	3500.0		
		Subtotal	7.0	8600.0	0.0	
					Personnel Total	

Travel Costs:			Ticket	Round	Total	Daily	
	Description		Price	Trips	Days	Per Diem	
	Annual Anchorage Science Meeting	2009	950.0	1	3	150.0	
						Travel Total	

FY09

Project Number: 08742
Project Title: Monitoring, Tagging, Feeding Studies, and Restoration of Killer Whales
Name: North Gulf Oceanic Society

Prepared:
Matkin Budget FY2009

2008 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2007 - September 30, 2008

Contractual Costs:	
Description	
Vessel Contract (34' R.V. Natoa, deiisel inboard) 40days @ ·500/day) Contaminant/Lipid-fatty acid/stable isotope analysis (12 units @ 1000 apiece) GIS analysis PhotoID/Catalogue	
Contractual Total	

Commodities Costs:	
Description	
Misc tagging equipment 7 satellite tags @3000 apiece Field Food ($40/day for 40 days) Fuel ($150/day for 40 days) Film, Photo processing Communication, Tracking, Shipping, and Misc Equip	
Commodities Total	

FY09

Project Number: 08742
Project Title: Monitoring, Tagging, Feeding Studies, and Restoration of Killer Whales
Name: North Gulf Oceanic Society

Prepared:

2008 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2007 - September 30, 2008

New Equipment Purchases:	Number of Units	Unit Price	
Description			
Those purchases associated with replacement equipment should be indicated by placement of an R.		**New Equipment Total**	

Existing Equipment Usage:	Number of Units	
Description		

FY09

Project Number: 08742
Project Title: Monitoring, Tagging, Feeding Studies, and Restoration of Killer Whales
Name: North Gulf Oceanic Society

Prepared:
Matkin Budget FY2009