

## Photographic and Acoustic Monitoring of Killer Whales in Prince William Sound and Kenai Fjords

Project Number: 01012-BAA  
Restoration Category: Monitoring  
Proposer: C. Matkin/North Gulf Oceanic Society  
Lead Trustee Agency: NOAA  
Cooperating Agencies: None  
Alaska SeaLife Center: No  
New or Continued: Cont'd  
Duration: 9th yr.  
  
Cost FY 01: \$74.5  
Cost FY 02:  
Geographic Area: Prince William Sound, Kenai Fjords  
Injured Resource/Service: Killer whale

### ABSTRACT

This project will continue the monitoring of the damaged AB resident pod and the potentially endangered AT1 transient population as well other Prince William Sound/Kenai Fjords killer whales. Monitoring has occurred on a yearly basis since 1984. Methods include the photo-identification of individual whales and acoustic monitoring with remote and vessel-based hydrophone systems. The project continues interpretation of current and previous data as well as data collected with other funds. [NOTE: This project also requested funds for FY 01 (\$72,000), FY 03 (\$75,000), and FY 04 (\$80,000).]

## INTRODUCTION

This project is a continuation of the reduced annual killer whale monitoring program. Killer whales were monitored under EVOS Trustee Council funding in 1989, 1990, and 1991 (damage assessment) and in 1993 and 1995 (restoration monitoring). A reduced annual monitoring program was initiated in 1996. Analysis in this project will build on results of the comprehensive killer whale investigation initiated in FY95 and continued in FY96, FY97, and FY98. In FY99 and FY00 the monitoring program was augmented with matching funding to continue aspects of genetic and contaminant analysis and we expect this to be the case in 2001.

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. There has been a net increase of only two individuals since 1995. Due to two additional mortalities in 1999 and one recruited calf, the pod currently contains 24 individuals. The rate of mortality observed in this pod after the oil spill far exceeds that recorded for other resident pods observed in Prince William Sound over the past 13 years or for 19 pods in British Columbia over the past 20 years. Continued mortalities have prevented recovery.

Nine whales from the transient AT1 group have not been observed since 1989. Two additional AT1 whales have not been sighted for seven years. From genetic and photographic data from beached whales, two of these eleven whales are known to be dead. Although transient killer whale social structure is not fully understood, we are increasingly certain that the missing AT1 whales are dead. Statistical analysis also strongly suggests that they have either died or permanently emigrated from the area. Since there is no record of them in adjacent regions and they appear to have a limited range, it is most likely they are dead.

This project will continue the monitoring program necessary to map the changes (recovery or non-recovery) of Prince William Sound killer whales on a reduced annual basis. Behavioral observations and spatial and temporal data will be collected opportunistically in the course of photographic and acoustic monitoring, but there will be no new analysis of this data.

Fourteen years of systematic data collected under public and private funding have been placed in a specially designed GIS database currently housed at the U.S. Fish and Wildlife Service, Marine Mammals Management Division, Anchorage, Alaska. The database contains 763 records of encounters with killer whales in and near Prince William Sound and Kenai Fjords, Alaska. Among these are 557 encounters with resident whales and 206 encounters with transient-type whales. Analyses have found large-scale differences in spatial distribution patterns between resident and transient whales over time (Sheel et al in press). Changes in transient whale distributions have been examined in relation to changes harbor seal populations.

There is worldwide concern that specific PCB and dioxin congeners may have negative effects on reproduction in mammals. The recovery of killer whales in Prince William Sound and the long-term health of the population is dependent on unimpeded reproductive processes. Recently there is concern over contaminant levels and their relationship to the recent decline of southern resident killer whales in Puget Sound. During this study we have determined contaminant levels in both resident and transient killer whales, and found much higher levels in the transient population. Contaminants seem to be passed from mother to offspring via lactation and levels follow consistent patterns within genealogies. Samples were obtained from individually identified living whales that can be

resampled to assess future changes in levels. The ability to sample and potentially resample specific known individuals and their known kin is a unique aspect of this project. Soon to be published results (Ylitalo et al, in prep.) raise concern that contaminants in transient whales could negatively impact reproduction. There has been no successful reproduction in the AT1 group since 1984. All chemical analysis of tissue and assistance in the interpretation of results has been provided without cost by the NMFS/NOAA Environmental Contaminant Laboratory, Seattle, Washington.

In FY97 we initiated a remote hydrophone and acoustic analysis monitoring element. Initial analysis and separation of pods has been completed and initial publication readied for submission. Currently we are operating a single hydrophone in Resurrection Bay powered by solar and wind power and using microwave transmission technology. It is currently operational and is effectively documenting presence and absence of killer whales during the winter months

We are still compiling our catalogue of acoustic dialects for resident pods. In 1999 we obtained much needed recordings of AJ, AD05 and AD16 pods. We are hopeful of obtaining additional recordings of AG, and AF pods to fill out pod specific repertoire data. (NGOS is using a 16 year database of killer whale recordings to establish killer whale dialects). The dialect of the AT1 transient group have been established and also related to behavior. (Saulitis et al, in prep) The dialect catalogue is used to document the presence of specific killer whale pods and groups recorded from the remote hydrophone. The long-term goal of this aspect of the project is to determine the extent of winter use by killer whales of these inshore waters and provide an additional, innovative, cost effective tool for monitoring killer whales year round. A hydrophone in Resurrection Bay has the added benefit of providing a continuous live feed to the Alaska Sea Life Center and Seward for the education of visitors and residents. In winter 1998/1999, using in kind donations for opportunistic surveys, we were able to determine that AB pod used inner Resurrection Bay on a routine basis in all months from October to April. Other pods including AI, AN10, and AJ were also present at times. In winter 1999-2000 acoustic monitoring indicated whales were absent for most of the late fall/midwinter, however, AJ pod and AD05 pods returned in late winter.

## NEED FOR THE PROJECT

### A. Statement of Problem

The AB pod of killer whales was injured by the EVOS. Although it had shown signs of recovery from 1991 to 1993, mortalities in 1994/95 reduced the number of surviving AB pod whales to 22. Since 1995 there has been a net gain of only two individuals, and recovery has not occurred. At least 11 of the AT1 group of transient killer whales have apparently died since 1989 and there has been no recruitment within the group. This project will continue to monitor the status of AB pod and the AT1 group.

Sightability of killer whales in Prince William Sound has changed since the spill; particularly resident whales are now more frequently encountered in the Kenai Fjords region. Transient whales are seen less frequently in all areas.

Initial mortalities within AB pod following the spill have apparently led to additional mortalities due to loss of key individuals. Deterioration of AB pod social structure has led to a situation where one subpod now travels separately most of the time (the AB25 subpod travels with AJ pod). The project will provide long-term insight into effects of changes in killer whale social structure due to unnatural mortalities.

Despite considerable effort, re-sightings of the AT1 group have declined and fewer individuals are seen when members of this transient group are located. We are confident that half of the original 22 members of this group are dead, or have emigrated to other

regions; although the later possibility is very unlikely. None of these whales have been identified in southeastern Alaska despite healthy pinniped populations in that region.

Although the rate of encounter with members of the AT1 transient group has declined, there has been no detectable increase in the sightings of other transient groups, suggesting that other transients are not increasing their use of the Sound as use of the region as AT1 group declines. Whether this overall decline in the encounters with transient (marine mammal eating) killer whales is related to oil spill effects or ecosystem changes is not clear, but we suspect a combination of the two factors. It is likely that the severe decline in harbor seals and Steller sea lions are important factors in the decline of transients in the region.

MtDNA and nuclear DNA analysis has demonstrated the genetic uniqueness of the AT1 group from residents as well as from other transients. Our nuclear DNA analysis is confirming those differences. The loss of the AT1 group could represent a serious overall loss of genetic diversity.

Some environmental contaminants such as PCBs and DDTs have been linked to reproductive dysfunction in mammals. We have discovered high levels of these contaminants in the transient (marine mammal eating) killer whales, including the non-reproducing AT1 group. When compared to other cetacean populations, these levels appear to be in a range that could result in reproductive dysfunction or other effects that might impede recovery of this group.

## **B. Rationale/Link to Restoration**

Annual killer whale population monitoring will determine recovery status of AB pod and the AT1 transient group. The actual status of AB pod is considered non-recovering at this time. Long term patterns will only be clarified by continued monitoring. A low level annual monitoring program was initiated in FY96 and is proposed to continue in FY01. Since all pods and whales are not observed in every year, annual monitoring will prevent extensive data gaps and allow determination of recruitment and mortalities in a much shorter time frame. An annual killer whale behavioral database of spanning 16 years now exists in a GIS format. It is accompanied by a photographic database that includes identifications of all individuals from each frame of film for every encounter logged in the GIS system. This data system will be used to log all encounters and summarize effort. Because killer whales are a long-lived species with low reproductive and mortality rates, this monitoring must be consistent and long-term to be meaningful. Without the pre-spill monitoring of these whales damage assessment would have been impossible. This species is a key ecosystem element (a sentinel species) reflecting long-term environmental trends and is worthy of inclusion in a long-term monitoring program.

Continued development of acoustic monitoring and dialect is providing a cost-effective year-round extension of the monitoring program. We will continue to work cooperatively with the Alaska Sea Life Center, Kenai Fjords National Park, and See More Wildlife Systems in this endeavor. In addition we will be providing a two day workshop in May 2000 for tour and charter boat operators in the region to draft guidelines for behavior of their vessels in the presence of whales. Over 100,000 visitors used these operators to view wildlife in 1999. Our program will directly involve residents and visitors in the process of monitoring and restoration through connection with Alaska Sea Life Center and Kenai Fjords charter boat industry.

## **C. Location**

This project is part of an ongoing killer whale research in Prince William Sound and the Kenai Fjords region, Alaska. The project involves the village of Chenega, Port San Juan Hatchery, the Alaska Sea Life Center, Kenai Fjords National Park, and other

residents and visitors to the region. It operates cooperatively with the Kenai Fjords and Prince William Sound tourboat industry.

## **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 rapidly expanding **tourboat** industry depends on a healthy killer whale **population** to attract and satisfy 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 a **catalogue** of individual whales to enhance enjoyment of whale observation. We have provided and continue to provide workshops detailing whale biology. We will conduct an intensive **2 day** whale watching guideline workshop with **tourboat** operators and conduct **onboard** training for operations around marine mammals. We are involved in the Youth Area Watch program, **taking** young students out to participate in our research. Recent 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 recent publication: "Killer Whales of Southern Alaska".

## **PROJECT DESIGN**

### **A. Objectives**

1. Continue photographic monitoring program and **determine** status of resident killer whale pods, particularly AB pod. Examine the demographics of this pod in relation to other resident killer whale pods.
2. Monitor the AT1 group of transient **killer** whales to **determine** mortality or recruitment and indications of recovery to pre-spill distribution and abundance.
3. Monitor year round movements of resident and transient killer whales using remote hydrophone in Resurrection Bay.
4. Continued analysis of calls and separation of pod dialects necessary for interpretation of remote hydrophone data.

### **B. Methods**

#### **Killer Whale Photographic Monitoring**

The goal of this aspect of the study is the photoidentification of each individual in each pod/group, that regularly uses the Sound, particularly AB pod and the AT1 group. Knowledge of the demographics of all regularly sighted **pods** and groups may be necessary to meet recovery definitions.

Thus, it is important that researchers maximize the time **actually** spent with killer whales (**particularly** AB pod and the AT1 group) to insure thorough identification of all individuals. 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 sixteen consecutive 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 **tourboat** 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.

A vessel log and chart of the vessel track will kept for each day the research vessels operate. 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.

Specifics of each encounter with killer whales will be recorded. The killer whale encounter data sheet developed in 1995 and specifically tailored to GIS data entry requirements **will** be used. 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' **trackline** during the encounter will be completed **and** the distance traveled by the vessel with the whales will be calculated at the time of GIS input. General behavior of the whales (**i.e.** feeding, resting, traveling, socializing, milling) will be recorded by time and location.

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 8008 or N70 autofocus camera with internal motor drive and a 300 mm f4.5 autofocus lens will be used. 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 makes photography impractical.

**A21** photographic negatives will be examined under a Wild M5 stereomicroscope at 9.6 power. 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 sixteen years. Identities of each whale that appears in every frame of usable film will be recorded and stored in VAX computer system. Final **analysis** and assessment will follow Matkin et al. (1994).

The primary vessel used to secure identification photographs will be a 34' diesel inboard powered vessel capable of 20 knots, that can sleep 3-4 individuals (R.V. *Windwalker*). With sleeping accommodations and large fuel capacity, the R.V. *Windwalker* can remain in the field for extended periods photographing whales.. This vessel will operate a total of 50 days under funding from this project, with periods of operation in May as well as during the late July through early September period. From historical data these dates are judged to be to be the most likely time to encounter AB pod as well as many of the other resident pods that use the Prince William Sound and Kenai Fjords.

The report for the monitoring segment will include a summary of field effort, and 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. 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 made available to the EVOS Trustee Council **and/or** lead agency 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 disc. Copies of the GIS program and data base will also be made available by request to NGOS.

### Acoustic Monitoring

Pod specific dialects for resident killer whales have been determined from **tape** recordings made by several researchers in the Prince William Sound area and in Southeast Alaska during the spring and summer months of the years 1984 to 1997. Construction of a catalogue of pod specific dialects is ongoing and dependent on recordings that will be made during the FY99 field season. Specific calls from *Prince William Sound* transient (AT1 group) killer whales **also** have been catalogued (Saulitis 1993, Saulitis in prep.). A total of 8456 calls have been screened and digitized using a Kay **Elemetrics Real Time Sound Spectrum Analyzer**, Model 5500. Samples from this screening process were digitized using the Canary acoustic spectrum analysis software (The **Cornell Bioacoustics Workstation**). Calls from different killer whale pods and transient groups are being categorized using the **same** method used by John Ford in British Columbia, Canada. This process involves arbitrary acoustical **identification** paired with a visual and statistical comparison of sound spectra. The results of this initial analysis were presented at the 12th Biennial Conference of Marine **Mammalogy** in Monaco (Yurk , H., Barrett-Lennard, L., Ford, J.K.B., **Matkin**, C.M., Saulitis, E., and K. Heise. 1998. Clans among resident killer whales (*Orcinus orca*) in Prince William Sound.)

Continued assessment of repertoires of Prince William Sound killer whales will occur in 2000. A publication detailing the linkage of **dialect and** genetic data Hopefully this will include the repertoires of the less frequently encountered pods from which we will attempt to obtain recordings from in FY99. In addition, **recordings** from the remote hydrophone obtained will be **analyzed**. The acoustic relationships between resident pods will be clarified and further compared with genetic results. While similarities of **mitochondrial DNA** sequences or **overall** genetic similarity describes relatedness of pods within the past 10,000 to 20,000 years, dialects reflect the more recent history of community divergence.

Because of movements of killer whales into the Kenai Fjords region during the early and late winter months in recent years, our remote hydrophone has operated in the Thumb Point area of Resurrection Bay . An anchored and encased cable runs **from** the transmitter on shore to the hydrophone at a depth of about **30** meters. A microwave transmission system will relays acoustic signals to Seward. The system is operated by a combination of wind and solar power coupled with storage batteries.

During summer months the hydrophone will be monitored from the R.V *Windwalker* as an aid in locating whales. During the summer and winter months in Kenai Fjords it will be monitored in Seward on a regular basis. Receivers are equipped with recording systems. The receiver will be monitored on a regular scheduled basis and a log of operation maintained. Whale calls will be recorded by M. Brittain in Seward and analyzed by Harald Yurk at the University of British Columbia.

Most equipment needed to complete the contracted field research will be provided by the North Gulf Oceanic Society, including binoculars, nets, directional hydrophones, photographic equipment and biopsy equipment. Remote hydrophone equipment and maintenance of that equipment will be provided by contract to See More Wildlife Systems. Apple Macintosh and IBM compatible computers owned by NGOS as well and the GIS system at U.F.W.S, Marine Mammal Management Division in Anchorage and VAX data

system at the Pacific Biological Station, Nanaimo will be used for data storage and analysis.

### **C. Contracts and Other Agency Assistance**

The entire project will be completed under the auspices of the North Gulf Oceanic Society (NGOS) under permits held by NGOs. NGOs will provide a technician to enter data collected in 2001 into the GIS database housed at U.S.F.W.S. in Anchorage using the a preexisting menu interface. Final photographic analysis will be completed by Graeme Ellis at the Pacific Biological Station in Nanaimo, B.C. Acoustic analysis will be conducted by Harold ~~Yurk~~ at the University of British Columbia. Monitoring the remote hydrophone system will be a cooperative project with Mike Brittan and the Alaska Sea Life Center. Contracts for vessel leases will be issued by the North Gulf Oceanic Society or the Society will use its own vessel for the project.

## **SCHEDULE**

### **A. Measurable Project Tasks for FY2001**

Oct 1-30 2000: Summarize monitoring fieldwork for FY2000. Input data into GIS system.

Oct. 1 - Dec. 31, 2000: Analysis of photographs from 2000 fieldwork.

Oct. 1-Dec. 31, 2000: Acoustic analysis of killer whale calls from previous year.

Oct. 1,2000- May 1 2001: Publication of paper on population dynamics of killer whale pods since EVOS.

Oct. 1 2000- March 30 2001: Continue winter recordings in Seward from remote hydrophone.

May -Sept. 2001: Killer whale monitoring emphasis field work. Monitor hydrophone from research vessel as possible.

The R.V. *Windwalker* will operate for 50+ selected days in May, July, August and September. The primary function of this vessel will be killer whale photoidentification monitoring. Time periods is selected are based on historical periods of high encounter rate with AB pod, other resident pods and the AT1 transient group and sighting reports from tourboat operators. Operational expense for additional field days will be funded by other monies.

### **B. Project Milestones and Endpoints**

The FY2001 killer whale project will continue the reduced annual photoidentification monitoring program and the acoustic monitoring program initiated in FY1997. Future fieldwork will involve population monitoring and acoustic monitoring and regular publications of results.



## C. Completion Date

Killer whale monitoring and remote hydrophone projects are completed on an annual basis, however they are envisioned as ongoing elements of the GEM program.

## PUBLICATIONS AND REPORTS

**Matkin**, C.O., G.E. Ellis, and E. Saulitis. Populations of killer whales in Prince William Sound eleven years after the *Exxon Valdez* oil spill. To be submitted to Marine Mammal Science.

Saulitis, E.S., F. Fay, and C.O. **Matkin**. The acoustic behavior of the AT1 transient group in Prince William Sound, Alaska. To be submitted to **Animal Behavior**.

## PROFESSIONAL CONFERENCES

Biennial Conference of the Biology of Marine Mammals, Vancouver, B.C. Canada November 2001

## COORDINATION AND INTEGRATION OF RESTORATION EFFORT

The monitoring of killer whales and analysis of historic and current data on killer whale behavior is part of an program to investigate killer whale recovery and the interactions of killer whales and harbor seals. It will be integrated with the harbor seal trophic studies (Kathy Frost, project leader). In FY2001 this project will rely on approximately \$9,000 in matching funds from other sources. As a non-profit research institution familiar with private funding sources and cooperative programs, NGOs can work with the Trustee Council cooperation to maximize potential for other funding in the future.

## PROPOSED PRINCIPAL INVESTIGATOR:

Craig O. **Matkin**  
North Gulf Oceanic Society  
P.O. Box 15244, Homer, Alaska 99603  
Phone/Fax (907) 235-6590  
COMATKIN@xyz.net

## KEY PERSONNEL

**Craig Matkin** (M.S. University of Alaska), is the project leader. **Matkin** will be responsible for supervising the completion of all fieldwork and insuring successful operation of boats and equipment. He will be the operator of the R.V. *Windwalker* and supervise directly all work completed from that platform. He will direct data analysis and assemble all material for annual and comprehensive reports and be responsible for completion and submission of these reports. He will represent this project and present the work to the EVOS Trustee Council.

**Matkin** has studied killer whales in Prince William Sound since 1977. He initiated systematic killer whale photoidentification in Prince William Sound, and is a founding

member of NGOS. In 1994 he completed the "The Biology and Management of Killer Whales in Alaska" for the U.S. Marine Mammal Commission. Other pertinent publications include EVOS killer damage assessment results ("The Status of Killer Whales in Prince William Sound 1984-1992", Craig O. Matkin, G. M. Ellis, M.E. Dahlheim, and J. Zeh in T.R. Loughlin, ed. Marine Mammals and the *Exxon Valdez* and Matkin and C.O., Matkin, D.R., Ellis, G.M., Saulitis, E. and McSweeney, D. 1997. Movements of resident killer whales in Southeastern Alaska and Prince William Sound, Alaska. Marine Mammal Science, 13(3):469-475. Mr. Matkin also teaches at the University of Alaska, Lower Kenai Peninsula Campus.

**Eva L. Saulitis** (M.S. University of Alaska), a director of NGOS, has conducted fieldwork on killer whales in Prince William Sound each season since 1987. She is a principal field biologist for the monitoring segment of this project (photoidentification) and will co-operate the research vessel Whale 2 aid in maintenance of the remote hydrophone. She will make ready and maintain all necessary equipment, complete photoidentification work and all logs and data sheets as required. She will provide entry of field data into the GIS system.

Saulitis completed her MS thesis "The Behavior and Vocalizations of the AT Group of Killer Whales in Prince William Sound, Alaska." in 1993. She coauthored the "Biology and Management of Killer Whales in Alaska" for the U.S. Marine Mammal Commission and "Killer Whales" for the EVOS Restoration notebook series and authored 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 Science 16(1):94-109. She has done extensive analysis of killer whale calls and has operated research vessels in Prince William Sound since 1988.

**Graeme Ellis** has participated in killer whale photoidentification studies in Canada and Alaska for 24 years. Ellis will do all final identifications of individual killer whales. He will examine all negatives on a repetitive frame by frame basis and supervise the input of the final identification data into the VAX computer system. With Matkin he will update all life history information on individual whales and provide positive identifications from photographs of each whale biopsied.

Currently Ellis directs whale identification work at the Pacific Biological Station in Nanaimo, British Columbia and has done final identifications on Prince William Sound killer whale photographic negatives since 1983. He has more experience than any other individual identifying Prince William Sound killer whales from photographic negatives and his accuracy has been certified by repeated testing.

**Harold Jurk** Harald is a Phd. candidate at the University of British Columbia and specializing in cetacean acoustics. He is conducting analysis and interpretation of killer whale acoustic data collected over the past 13 years in Prince William Sound/Kenai Fjords from vessels and from remote hydrophones.

## LITERATURE CITED

Matkin, C.O., G. Ellis, M. Dahlheim, and J. Zeh. 1994. Status of killer whales in Prince William Sound, 1984-1992. in T. Loughlin, ed. Marine Mammals and the *Exxon Valdez*. Academic Press, San Diego, CA.

Saulitis, E. 1993. The behavior and vocalizations of the AT1 group of transient killer whales in Prince William Sound, Alaska. MSC. Thesis, Institute of Marine Science, University of Alaska. Fairbanks.

Ford, J.K.B. 1991. "Vocal traditions among resident killer whales (*Orcinus orca*) in coastal waters of British Columbia." *Can. J. Zool.* 69:1454-1483

Jurk , H., Barrett-Lennard, L., Ford, J.K.B., Matkin, C.M., Saulitis, E., and K. Heise 1998. Clans among resident killer whales (*Orcinus orca*) in Prince William Sound. Oral presentation at the World Marine Mammal Conference, Monaco.

---

Proposed Project Manager  
Bruce Wright  
NOAA/Oil Spill Office  
P.O. Box **210029** 11305 Glacier Hwy. Auke Bay AK **99821**  
Phone: **(907)789-6600**  
FAX: **(907)789-6608**  
**BWRIGHT@ABL.AFSC.NOAA.GOV**

FY 01 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET  
 October 1, 2000 - September 30, 2001

*Approved TC 8-3-00*

| Budget Category:                                  | Authorized<br>FFY 2000 | Proposed<br>FFY 2001 |  |  |  |  |  |  |
|---|------------------------|----------------------|--|--|--|--|--|--|
| Personnel   |                        | \$0.0                |  |  |  |  |  |  |
| Travel  |                        | \$0.0                |  |  |  |  |  |  |
| Contractual                                       |                        | \$69.6               |  |  |  |  |  |  |
| Commodities                                       |                        | \$0.0                |  |  |  |  |  |  |
| Equipment   |                        | \$0.0                |  |  |  |  |  |  |
| Subtotal  |                        | \$69.6               |  |  |  |  |  |  |
| General Administration                            |                        | \$4.9                |  |  |  |  |  |  |
| Project Total                                     |                        | \$74.5               |  |  |  |  |  |  |
| Full-time Equivalents (FTE)                       |                        |                      |  |  |  |  |  |  |
| Other Resources                                   |                        |                      |  |  |  |  |  |  |
| Dollar amounts are shown in thousands of dollars. |                        |                      |  |  |  |  |  |  |

Comments:

**2001**

Project Number: 01012  
 Project Title: Killer Whale Monitoring  
 Agency: NOAA

FORM 3A  
 SUMMARY

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

*4-15-01  
Approved TC 8-3-00*

| Budget Category:            | Authorized FY2000 | Proposed FY2001 | LONG RANGE FUNDING REQUIREMENTS |                  |                  |           |
|-----------------------------|-------------------|-----------------|---------------------------------|------------------|------------------|-----------|
| Personnel                   |                   | \$28,990.0      |                                 |                  |                  |           |
| Travel                      |                   | \$1,700.0       |                                 |                  |                  |           |
| Contractual                 |                   | \$25,000.0      |                                 |                  |                  |           |
| Commodities                 |                   | \$7,590.0       |                                 |                  |                  |           |
| Equipment                   |                   | \$0.0           |                                 |                  |                  |           |
| Subtotal                    |                   | \$63,280.0      | Estimated FY2002                | Estimated FY2003 | Estimated FY2004 | Estimated |
| Indirect                    |                   | \$6,328.0       | \$72,000.0                      | \$75,000.0       | \$80,000.0       |           |
| Project Total               | \$77,479.0        | \$69,608.0      |                                 |                  |                  |           |
| Full-time Equivalents (FTE) |                   | 8.5             |                                 |                  |                  |           |
| Other Resources             |                   | \$9,500.0       |                                 |                  |                  |           |

Dollar amounts are shown in thousands of dollars.

Comments:

*+ \$4,900 GA (NOAAA)  
TOTAL: \$74,500*

**2001**

Prepared: April 2000

Project Number: ~~0012~~ 01012A  
 Project Title: Killer Whale Monitoring  
 Name: North Gulf Oceanic Society

FORM 4A  
Non-Trustee  
SUMMARY

**2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET**  
 October 1, 2000 - September 30, 2001

| Personnel Costs:                |                       |                 |               |                |                  |              |             |            |                |                   |
|---------------------------------|-----------------------|-----------------|---------------|----------------|------------------|--------------|-------------|------------|----------------|-------------------|
| Name                            | Position Description  | Months Budgeted | Monthly Costs | Overtime       | Proposed FY 1998 | Ticket Price | Round Trips | Total Days | Daily Per Diem | Proposed FY 1998  |
| Craig O. Matkin                 | P.I. Field Biologist  | 3.0             | 4400.0        |                | 13,200.0         |              |             |            |                |                   |
| Graeme Ellis                    | Photo Analyst         | 1.0             | 3500.0        |                | 3,500.0          |              |             |            |                |                   |
| Eva Saulitis                    | Field Biologist       | 2.5             | 2800.0        |                | 7,000.0          |              |             |            |                |                   |
|                                 | Field Assistant       | 0.7             | 1500.0        |                | 1,050.0          |              |             |            |                |                   |
|                                 | Data entry technician | 0.3             | 2800.0        |                | 840.0            |              |             |            |                |                   |
|                                 | Acoustic Analyst      | 1.0             | 3400.0        |                | 3,400.0          |              |             |            |                |                   |
| Subtotal                        |                       | 8.5             | 18400.0       |                |                  |              |             |            |                |                   |
| <b>Personnel Total</b>          |                       |                 |               |                |                  |              |             |            |                | <b>\$28,990.0</b> |
| <b>Travel Costs:</b>            |                       |                 |               |                |                  |              |             |            |                |                   |
| Description                     | Ticket Price          | Round Trips     | Total Days    | Daily Per Diem | Proposed FY 1998 |              |             |            |                |                   |
| Homer/Vancouver (RT) CONFERENCE | 650.0                 | 1               | 5             | 90.0           | 1,100.0          |              |             |            |                |                   |
| Homer/AnchorageRt               | 150.0                 | 2               | 3             | 100.0          | 600.0            |              |             |            |                |                   |
|                                 |                       |                 |               |                | 0.0              |              |             |            |                |                   |
|                                 |                       |                 |               |                | 0.0              |              |             |            |                |                   |
|                                 |                       |                 |               |                | 0.0              |              |             |            |                |                   |
|                                 |                       |                 |               |                | 0.0              |              |             |            |                |                   |
|                                 |                       |                 |               |                | 0.0              |              |             |            |                |                   |
|                                 |                       |                 |               |                | 0.0              |              |             |            |                |                   |
|                                 |                       |                 |               |                | 0.0              |              |             |            |                |                   |
|                                 |                       |                 |               |                | 0.0              |              |             |            |                |                   |
| <b>Travel Total</b>             |                       |                 |               |                |                  |              |             |            |                | <b>\$1,700.0</b>  |

**2001**

Project Number: 00112  
 Project Title: Killer Whale Monitoring  
 Name: North Gulf Oceanic Society

FORM 4B  
 Personnel  
 & Travel  
 DETAIL

Prepared:

**2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET**  
 October 1, 2000 - September 30, 2001

| <b>Contractual Costs:</b>                         |  | <b>Proposed</b>    |
|---|--|--------------------|
| <b>Description</b>                                |  | <b>FY 1998</b>     |
| Sea More Wildlife                                 |  |                    |
| Hydrophone/ equipment lease/ maintenance          |  | 4,000.00           |
| 34' research vessel (Windwalker) 50 days@ 420/day |  | 21,000.00          |
| <b>Contractual Total</b>                          |  | <b>\$25,000.00</b> |
| <b>Commodities Costs:</b>                         |  |                    |
| <b>Description</b>                                |  | <b>Proposed</b>    |
| Phone   |  | FY 1998            |
| Field Food (\$16/person/day)                      |  | 280.00             |
| E-mail/Computer                                   |  | 1,800.00           |
| Fuel  |  | 120.00             |
| Film/Processing/Printing                          |  | 3,000.00           |
| Field Supplies                                    |  | 1,600.00           |
| Shipping  |  | 320.00             |
|   |  | 470.00             |
| <b>Commodities Total</b>                          |  | <b>\$7,590.00</b>  |

**2001**

Prepared:

Project Number: 00112  
 Project Title: Killer Whale Monitoring  
 Name: North Gulf Oceanic Society

FORM 4B  
 Contractual &  
 Commodities  
 DETAIL

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET  
 October 1, 2000 - September 30, 2001

| New Equipment Purchases:<br>Description   | Number<br>of Units  | Unit<br>Price      | Proposed<br>FY 1998 |
|---|---------------------|--------------------|---------------------|
| Those purchases associated with replacement equipment should be indicated by placement of an R. |                     |                    |                     |
| Existing Equipment Usage:   |                     |                    |                     |
| Description   | New Equipment Total | Number<br>of Units | \$0.0               |
|   |                     | 1                  | 0.0                 |

**2000**

Prepared: 7/8/99

Project Number: 00012  
 Project Title: Killer Whale Monitoring  
 Name: North Gulf Oceanic Society

FORM 4B  
 Equipment  
 DETAIL