FY10 INVITATION
PROPOSAL SUMMARY PAGE

Project Title: Historical Humpback Whale Abundance in Prince William Sound in Relation to Pacific Herring Dynamics

Project Period: October 1, 2009 – September 30, 2011

Primary Investigator(s): (List each investigator and their affiliation)
PI: Terrance J. Quinn II, Juneau Center, School of Fisheries and Ocean Sciences, University of Alaska Fairbanks, 17101 Point Lena Loop Rd., Juneau, Alaska 99801, (907) 796-5457, Terry.Quinn@uaf.edu
Co-PI: Janice M. Straley, University of Alaska Southeast, Sitka Campus, PO Box 273, Sitka, Alaska 99835, (907)747-7779, jmstraley@uas.alaska.edu.
Collaborator: Olga von Ziegesar, Eye of the Whale Research, PO Box 15191, Homer, AK 99603, 907-235-2133, olgasadventures@gmail.com
Co-PI: John Moran, TSMI/Auke Bay Labs, 17109 Point Lena Loop Road, Juneau, AK 99801, john.moran@noaa.gov

Study Location: Prince William Sound, in aggregate
Keywords: data salvage, humpback whales, Pacific herring, age-structured model, predation.

Abstract:
The principal objective of this study is to analyze historical data on humpback whales to develop time series of abundance for humpback whales in Prince William Sound. This historical data is currently inaccessible, and has never been analyzed. Annual high-quality surveys used photoidentification, so that numbers were counted accurately. In this proposal, a relative index will be calculated from sightings and sampling effort. Mark-recapture models will be developed from sighting histories. These data will be used in an age-structured assessment model of Pacific herring to estimate the historical effect of whale predation on herring, leading to Suzie Teerlink's Master's thesis and three journal articles. This project is an offshoot from Project 090804 and will give a 30 year perspective to the findings of that project. This study develops a historical perspective to provide a better framework for understanding herring recovery. No field work is required for this data salvage project.

Estimated Budget:
EVOS Funding Requested *(must include 9% GA)*

FY10	FY11	FY12	FY13	Total
$94.2	$69.5			$163.8

Non-EVOS Funds to be used:

FY10	FY11	FY12	FY13	Total

PROJECT PLAN

I. NEED FOR THE PROJECT

A. Statement of Problem

Pacific herring are undoubtedly a main staple to the upper trophic levels, as well as a human commodity in the form of a lucrative fishery. Despite their ecologic and economic importance, herring populations in Prince William Sound (PWS) crashed in 1993 due to several compounding factors. Some of the known contributing factors include; disruption to recruitment caused by the 1989 Exxon Valdez oil spill (Brown et al. 1996), possible overexploitation by the commercial fishery in some years (Hulson et al. 2007), and elevated occurrence of disease (Marty et al. 2003). At present, ten years after the closure of the herring fishery, Exxon Valdez Oil Spill Trustee Council (EVOS TC) continues to classify PWS herring as "not-recovered" (Rice and Carls 2006). Most importantly, a recent study (Rice et al. close-out in 2010), has identified humpback whale predation as a major predator that impacts the standing stock of adult herring, approximately to the extent of a commercial fishery.

In FY 2005, a synthesis of Prince William Sound herring factors that limit recovery of herring (EVOS TC funded project 050794) was initiated by a group of scientific investigators (including ABL/TSMRI and University of Alaska researchers). One essential component of the synthesis was the continued development of an age-structured assessment model. The group concluded that lingering oil exposure does not play a role in limiting recovery, but disease probably does. In addition, they noted that there were insufficient data to assess the role of predators in limiting recovery, but admitted they could be a significant factor. Therefore, future management and enhancement strategies need evaluations on the significance of predation (Rice and Carls 2006).

Current study on humpback whale predation: Humpback whales in Alaska are seasonal migrants, spending summers feeding on schooling fish and zooplankton. Intensive foraging on aggregated winter herring populations may represent a significant source of mortality to herring, particularly if herring stocks are depressed and humpback whale numbers increase. A team of ABL/TSMRI and University of Alaska researchers have been undertaking an EVOS TC funded 3-year study to this end (Project 070804 – 090804 / Significance of Whale Predation on Natural Mortality Rate of Pacific Herring in PWS; 090804 will be used subsequently in this proposal to denote the 3-year study).

The team has been evaluating this potential by estimating the number and residency of whales foraging in winter, working to determine when and if there is a prey switch to herring, and assessing how long the whales focus on herring as prey. These data are being combined in a bioenergetics model to determine numbers of herring consumed and the energy content consumed. The estimated numbers of herring consumed has been compared to biomass of herring in the population from an age-structured model and may represent 15% or more of the population's biomass, roughly equivalent to the harvest formerly taken in past fisheries. (Results are preliminary.) So this focused foraging event on herring recovery may be very significant. However, the past exploitation by whales was never considered in this project; this proposal will salvage the data that has never been published, and analyze the data in the context of herring

foraging, and fill in the gaps of the probable population ramp-up that has occurred in the last 30 years.

More than 30 years of data are available from the non-profit research group Eye of the Whale (since 1977), working out of Homer. Analysis of this data, salvaged from the files and photo repository will greatly aid in the understanding of the historical relationship between humpback whales and herring in Prince William Sound. These data have never been analyzed to estimate whale abundance, the whale population trends, and their relevance to herring populations

We began efforts in year 3 of the whale Project 090804 to begin data acquisition and analysis. We found that the magnitude of available data was much larger than we anticipated, that the quality of these data were excellent because of the extensive collection of whale identification photographs, and that to do a proper job of database construction and analysis, an additional year of data acquisition and analysis is necessary. As stipulated in the FY2010 Request for Proposals we also include a second year for report writing and preparation of publications.

B. Relevance to 1994 Restoration Plan Goals and Scientific Priorities

The Exxon Valdez Oil Spill Trustee Council classifies Pacific herring as "not recovered" in Prince William Sound. This project specifically addresses two concerns identified by the EVOSTC: "predation on juvenile herring in Prince William Sound" and "modeling marine mammal predation on herring". Previous work in PWS (Norcross and Brown 2001) has shown that winter is a particularly sensitive period for herring because prey resources are scarce. Herring store energy prior to winter to forestall starvation and form tight aggregates, presumably to avoid predation. We hypothesize that these aggregations of energy rich prey form an appealing prey field to humpback whales.

In 1965 the International Whaling Commission (IWC) initiated protection for depleted humpback whales in the North Pacific (Straley et al. 2009). Since, humpback whale populations have been recovering. Though they are still considered endangered under the Endangered Species Act (ESA), their populations have been increasing with an estimated recovery rate of 6-7% annually in the North Pacific (Calambokidis et al. 2008). This rate of increase probably extends to the population foraging within PWS, but this study would estimate the real rate of increase in PWS. We hypothesize that increasing humpback whale populations have been increasing the intensity of foraging pressure on herring stocks, and that this is an important component working to suppress the natural recovery of herring in PWS.

In the FY2010 RFP, the relevant scientific focus for our project is "restoration of PWS Pacific herring." Our project could lead to important information about understanding when and if the Pacific herring population will be restored. Our project will develop quantitative understanding of the importance of whales in the magnitude of herring mortality. From these quantitative measures, it can be estimated at what point there may be surplus production in the herring population for rebuilding beyond what the ecosystem is demanding for forage. Understanding whale predation, by life stage, and the population trends, are likely to influence supplementation strategies when they are developed.

Our project is relevant to the Integrated Herring Program, in that our study advances understanding of the factors limiting the recovery of herring. By synthesizing results into a single age-structured model (Quinn et al. 2000, Marty et al. 2003, Hulson et al. 2008, Marty et al., in review), we can determine the relative importance of factors affecting the population. This responds to the RFP's desire for population modeling (section a, page 9). In our study, we will develop new time series of humpback whale abundance dating back to the 1970s that have heretofore not existed. Thus new insight will be gained into the historical roles of these factors as well as their current effects. This is specifically mandated in the RFP as topic 5, Historical Data Compilation. Parenthetically, our work will be directly relevant to topic 3, disease monitoring, because the model uses disease information dating back to 1994 as one of the relevant factors.

II. PROJECT DESIGN

A. Objectives

The principal objectives of this study are to analyze historical data on humpback whales (late 1970s to present) collected by Eye of the Whale to develop time series of abundance for humpback whales in Prince William Sound. A relative index will be calculated from sightings and sampling effort. Mark-recapture models will be developed from sighting histories. These data will be used in an age-structured assessment model of Pacific herring, currently funded by EVOS Trustee Council, to estimate the historical effect of whale predation on herring. These data will be used as the basis for a graduate student Suzie Teerlink's master's thesis under the advisement of Dr. Terrance Quinn II, Professor of Fish Population Dynamics, University of Alaska Fairbanks, Juneau Center School of Fisheries and Ocean Sciences. The main hypothesis being tested is whether humpback whales constitute an important component of predation on Prince William Sound herring. If so, then the recovery of the Pacific herring population may be limited by this predation.

B. Procedural and Scientific Methods

In order to better understand the historical population-level interactions between humpback whales and herring in PWS, we intend to develop the first time series of humpback whale abundance for this region. Humpback whales are individually identifiable by the unique pigmentation pattern on the ventral side of their flukes. By periodically identifying individuals in the study area using fluke photographs (i.e. "sampling"), it is possible to estimate the relative abundance using mark-recapture theory (Straley et al. 2009).

In order to make this retrospective analysis we have identified and recruited an additional collaborator, Olga von Ziegesar (Eye of the Whale (EOW) Research), who is providing humpback whale sighting data she has collected in PWS from 1980 to the present. Woods Hole Oceanographic Institute collected data from 1977 to 1980 and are available through the EOW catalog. Some funding from current EVOS project 090804 is making this possible. This data is in the form of whale counts and sighting histories which consist of individual whale photographs across years. Tracklines were first recorded in 1984, a necessary source of information for calculating sampling effort. In detail, EOW Research will provide: (1) an Excel spreadsheet of sighting histories of humpback whales seen each year during summer field surveys from 1977 to 2009, (2) copies of field data sheets for determining days of effort and survey tracklines, (3) a digital catalog of photographs of individual humpback whale flukes (von Ziegesar et al. 2001), and (4) loan of the negatives (1980 to 2003) or a digital image (2004-2009) of the best photo of

each whale seen each year to assess for photo quality. Graduate student Suzie Teerlink will organize the data in an Access database (AK_Humpback_Database, currently used for EVOS project 090804) under the guidance of Straley.

Specific steps needed for getting these data organized into a usable format for this analysis are: (1) sighting histories will need to be error checked, compiled and entered into the Photo and Group tables in AK_Humpback_Database, (2) trackline data will need to be assessed for format compatibility and some field data will need to be digitized or converted before it can be entered into the effort table in the AK_Humpback_Database, and (3) photo quality will need to be assessed and entered into the database Photo table for each sighting of each whale each year. Quality of photos will be taken into account in this analysis. Poor photo quality can significantly affect the estimates generated (Stevick et al, 2001, Calambokidis et al., 2008). Therefore, photo quality will be assessed using the protocol adopted by Calambokidis et al., 2008, and photos ranked "poor" will be excluded from the analysis.

We will use the recent data from the EVOS project 090804 to compliment this historic sighting data. Together, these data will be used to develop two time series of relative humpback whale abundance; one will employ count per unit effort, and the other will utilize the Jolly-Seber method and mark-recapture theory (Seber 1982, see next section for specifics). The time series start year will need to be determined once all available data are gathered and assessed for consistency because the early years may have insufficient detail to be included in a complex mark recapture analyses. However, these early years may be suitable for the analysis using counts.

C. Data Analysis and Statistical Methods

Abundance estimation from the previous field study

The final report for Project 090804 (due April 2010) will contain mark-recapture analysis of both years of field data (2007-2008 and 2008-2009). Most of this modeling work has already been completed using Program Mark. Data from the second year of field work led to more precise abundance estimates. Secondly, it was possible to characterize variability in seasonal distribution with a second year of data. It appears that the seasonable distribution in the second year was more uniform with an earlier peak than the first year, although this requires additional analysis. This peak in late season whales is very similar to other areas of SE Alaska.

Whale time series

The modeling of the herring population in this current proposal is necessary to separate the effects of predation by humpback whales from disease and other factors. To get a historical view of the impact of whale predation, the age-structured assessment model can be extended to include whale predation. This requires the development of a whale time series back to 1980, which has not previously been done. Specifically, we will develop two series. The first is based on whale counts per unit effort. The second utilizes the Jolly-Seber method to obtain estimates of abundance and mortality using mark-recapture theory (Seber 1982). Whale abundance will be estimated from photographic data as described in Straley et al (2008).

For the mark-recapture analysis, we will be using the state-of-the-art platform for assessment of mark-recapture data, program MARK. This was developed by Gary White, Ken Burnham, David

Anderson, and their colleagues at Colorado State University; it contains most of the newly developed models in a fairly intuitive Windows-based environment (White and Burnham 1999). The structure allows several hierarchical and non-hierarchical models to be estimated and compared. Both likelihood ratio tests and AIC statistics are provided, as well as detailed estimation output. In addition to mark-recapture data, covariates can be used to improve estimation and parameters can be added, fixed, and set equal across time periods, groups, and strata. The models within program MARK that will be utilized for this analysis include: basic closed population models, which will generate estimates of annual abundance, and Pradel models, which estimate the population trend over years. The closed population models will be structured to assume that the population is closed within a given study season and then allowed to be open between those periods; an important factor for a migratory species such as humpbacks.

Pradel models utilize the basic concepts of a Cormack-Jolly-Seber (CJS) approach though, by reversing the sighting histories, estimate the probability of individuals entering (not leaving) the population. So, in essence, the Pradel model removes the estimation of Phi (probability of persisting in the population from t_i to t_{i+1}) and instead estimates Gamma, the probability that individuals seen at t_i were in fact present at t_{i-1}. This parameter is referred to as seniority. With the use of seniority as a parameter, we will be able to maximize the amount of information extracted from the data while modeling the population trend. (See Pradel (1996) for a full explanation of this method.)

In these analyses, we will employ the features of MARK to assist us in comparing models built to address various considerations. Among these considerations are: varying capture probabilities with time (difference in sightability conditions, etc), survey effort, heterogeneity and misidentification. Effort will be introduced as a covariate in both model types. Magnitude of effort is undoubtedly an important factor in the frequency of marks and recaptures acquired in a given sampling session. For this analysis, we will introduce effort as both nautical miles traveled and hours spent “on effort” for each sampling session. We will then evaluate which form of effort best explains variability in the model. For the closed capture population models we will also introduce parameters to estimate heterogeneity and misidentification. Heterogeneity, an inequality in capture probabilities due to individual behavioral response to boat presence, has been cited as a potential source of error for humpback mark-recapture analysis (Hammond 1990, Stevick et al, 2001). To correct for this we will generate models that include an estimate of heterogeneity. This is done by allowing the model to divide the population into groups of individuals that have higher and lower capture probabilities within each survey occasion. Misidentification, the situation where individuals are falsely categorized as new individuals when they are actually recaptures, can also be estimated and accounted for. While this is likely an infrequent occurrence, it can significantly alter results and therefore should be considered (Stevick et al, 2001).

We would then calibrate the relative abundance series to absolute estimates obtained from the ABL fall-winter mark-recapture studies of 2007 and 2008. This would require making the assumption that if whale abundance in the summer increases, then so would whale abundance in the fall-winter.

Herring Modeling

Quinn et al. (2001) and Marty et al. (2003) developed an age-structured assessment model (Quinn and Deriso 1999) for Prince William Sound that included disease information. Thus the model can be used to evaluate the impact of disease on population abundance, recruitment, and survival. ADF&G uses this model in its annual assessments of herring (S. Moffitt, ADF&G, pers. comm.).

The model contains information about the fisheries on PWS herring, which include purse-seine, gillnet, pound fisheries in the spring (mainly for roe), and a food and bait fishery in the summer and fall. The model provides an estimation framework to integrate the various sources of information about Pacific herring in Prince William Sound from 1980 – 2006, including age compositions from the purse-seine fishery and spawning surveys, egg production estimates, mile-days of milt from aerial surveys, and hydroacoustic biomass estimates (Quinn et al. 2001, Marty et al. 2003, Hulson et al. 2006, Marty et al. 2006). These observations are contrasted to comparable model quantities in a least squares setting to obtain parameter estimates of recruitment, natural mortality, abundance, and biomass.

We propose to use this model as the basis of comparing the relative magnitudes of the various factors affecting PWS herring dynamics. Recruitment estimates at age 3 will be related to auxiliary variables related to disease, the environment, spawning stock, and predation. It is a simple matter to use the model as a simulation framework, in which alternative harvest and recruitment scenarios are developed. An example of a question to be addressed would be: If whales did not eat herring, would the population have rebounded more so than what really occurred?

Specifically the model will be used: (1) to determine if predation on adult PWS herring is significantly contributing to its failure to recover, (2) to compare the magnitude of this effect to other known factors such as disease and low recruitment, (3) to investigate whether low recruitment is a function of predation. This will help EVOS TC better understand what factors are preventing the recovery of herring.

D. Description of Study Area

The study area is the whole marine area of Prince William Sound (in aggregate).

E. Coordination and Collaboration with Other Efforts

This study is an outgrowth of EVOS Project 090804 on Whale Predation and Pacific Herring that ends in October 2009, a collaborative effort between researchers at TSMRI (Jeep Rice, Ron Heintz, John Moran, and others), the University of Alaska, and others. John Moran has volunteered up to a month of his time each year to assist us on this project. We plan to continue our collaborative efforts through new projects responding to the EVOS FY2010 RFP along with ongoing efforts using existing resources outside of EVOS. In particular, we will follow with great interest the new research project “Impact of Humpback Whale Predation on Young of the Year Pacific Herring in Prince William Sound” (John Moran, Jan Straley, PIs). Since those two PIs appear on this proposal as well, we will share relevant results from our study seamlessly. We will continue to collaborate with Steve Moffitt, ADF&G, Cordova, who provides us updated

herring data for the herring model. We will present our results at scientific conferences and EVOS herring PI meetings.

Products and Outreach to Communities

von Ziegesar, O., Straley, J., Teerlink, S, and others. Humpback whale long-term associations. Mar. Mam. Sci. [A paper presenting a description of this decades-long field project and key findings.]

Teerlink, S., von Ziegesar, O., Straley, J. Quinn, T., Matkin, C., and Saulitis, E. Time series of relative and absolute abundance for humpback whales in Prince William Sound. Mar. Mam. Sci. [A paper focusing on the statistical analysis of sightings and mark-recapture data, leading to a relative and absolute index of historical humpback whale abundance]

Teerlink, S., and Quinn, T. Effect of humpback whale abundance on historical Pacific herring dynamics. Can. J. Fish. Aquat. Sci. [A paper incorporating the humpback whale indices into the age-structured assessment model for Prince William Sound herring.]

The last two manuscripts will form the core of Suzie Teeerlink's Master's Thesis to be completed by Summer, 2011.

Quarterly, annual, and final reports to EVOS TC

Outreach: Alaska Marine Science Symposium, EVOSTC sponsored workshops, public presentations.

III. SCHEDULE

A. Project Milestones

Objective 1. Acquire and process all whale sightings and effort data.
To be met December 2009

Objective 2. Develop an annual relative index of historical whale abundance using numbers of sightings and sampling effort.
To be met March 2010

Objective 3. Perform mark-recapture analysis to develop annual historical estimates of whale abundance.
To be met June 2010

Objective 4. Construct herring age-structured models using the two abundance time series.
To be met December 2010

Objective 5. Prepare draft of final report, which summarizes work done on previous objectives and addresses the main hypothesis of whether humpback whales constitute an important component of predation on Prince William Sound herring.
To be met April 2011

Objective 6. Finalize report addressing peer review comments; draft manuscripts for publication.
To be met September 2011

B. Measurable Project Tasks

FY 10, 1st quarter (October 1, 2009- December 31, 2009)

October 1: *Project funding approved by Trustee Council*

October 31: *Coordinate specific data needs and project logistics with Eye of the Whale Research*

Coordinate transfer of hard-copy data from Eye of the Whale Research to UAF (Juneau Center)

November 30: *Digitize effort data from hard-copy datasheets of historic surveys*

Assess photo quality for all applicable historic sighting data

December 30: *Compile data into appropriate formats for analysis*

FY 10, 2nd quarter (January 1, 2010-March 30, 2010)

March 31: *Analysis of sightings data: Generate time series of relative humpback whale abundance*

FY 10, 3rd quarter (April 1, 2010-June 30, 2010)

June 30: *Analysis of mark-recapture data: Generate time series of absolute humpback whale abundance*

FY 10, 4th quarter (July 1, 2010-September 30, 2010)

September 30: *Incorporate first humpback whale index into ASA model of herring*

FY 11, 1st quarter (October 1, 2010- December 31, 2010)

December 31: *Incorporate second humpback whale index into ASA model of herring*

FY 11, 2nd quarter (January 1, 2011- March 31, 2011)

January 1: *Begin work on manuscripts for publication.*

(Date unknown): *Annual Marine Science Symposium*

FY 11, 3rd quarter (April 1, 2011-June 30, 2011)

April 15: *Submit final report to Trustee Council office*

May 1: *Teerlink completes first draft of M.S. thesis.*

FY 11, 4th quarter (July 1, 2011-September 30, 2011)

June 30: *Respond to peer review comments*

June 30: *Teerlink defends M.S. thesis and revises thesis*

July 30: *Secure final approval, acceptance of final report*

September 30: *Publication of final report complete*

September 30: *First drafts of manuscripts complete*

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Stevick, P.T., Palsboll, P.J., Smith, T.D., Bravington, M.V., and Hammond, P.S. 2001. Errors in identification using natural markings: rates, sources, and effects on capture-recapture estimates of abundance. Canadian Journal of Fisheries and Aquatic Science. 58: 1861-1870.

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CURRICULUM VITAE

Terrance J. Quinn II
Professor of Fish Population Dynamics
Juneau Center, School of Fisheries and Ocean Sciences
University of Alaska Fairbanks
Juneau AK 99801-8677
Ph. 907-796-5457
FAX 907-796-5446
E-mail: Terry.Quinn@uaf.edu
Birthdate: October 27, 1952

EDUCATION

Ph.D., Biomathematics, 1980, University of Washington, Seattle WA
M.S., Fisheries, 1977, University of Washington, Seattle WA
B.A., Mathematics, 1973, University of Colorado, Boulder CO

EXPERIENCE

1998-	Professor of Fish Population Dynamics, Juneau Center, School of Fisheries and Ocean Sciences, University of Alaska Fairbanks
1985-1997	Associate Professor of Fish Population Dynamics, Juneau Center, School of Fisheries and Ocean Sciences, University of Alaska Fairbanks
1978-1985	Biometrician, International Pacific Halibut Commission

PUBLIC SERVICE

Member since 1986 and former chair of the Statistical and Scientific Committee of the North Pacific Fishery Management Council.
Member of Ocean Studies Board of the National Research Council from 1995 to 1998; served on 5 NRC committees and chaired two of those, all leading to NRC publications.
Associate Editor, Canadian Journal of Fisheries and Aquatic Sciences
Reviewer, several journals in fisheries and statistics, for agencies, for individuals
Editor, three conference proceedings

AWARDS

National Associate of the National Academies of Science, Engineering, and Medicine, December 2001

CONSULTING

National Marine Fisheries Service (stock assessment and fishery management)
Alaska Dept. of Fish and Game (various shortcourses)
Ohio Dept. of Fish and Wildlife (catch-age analysis)
South Atlantic Fishery Management Council (swordfish)
New South Wales Fisheries Research Institute (catch-age analysis)
CSIRO, Australia (catch-age analysis)
Makah Indian Tribe (halibut, groundfish fisheries)
Ministry of Fisheries, New Zealand (hoki stock assessment)
MRAG Americas (North Pacific observer program)
Minnesota Department of Natural Resources (Mille Lacs Lake walleye assessment)
Natural Resources Consultants (independent peer reviewer for assessment of large coastal sharks)

Collaborators

Tony Booth, Steve Cadrin, John Calambokidis, Jeremy Collie, Richard Deriso, Martin Dorn, Fritz Funk, Chris Gabriele, Anne Hollowed, Jim Ianelli, Pat Livingston, Gary Marty, Sally Mizroch, Steve Moffitt, Jeep Rice and his program staff, Paul Spencer, Jan Straley, Vidar Wespestad (colleagues at UAF not included here)

Students

Bonita Nelson, Jack Turnock, Scott Johnson, Bob Lafferty, Scott MacPherson, Nicole Szarzi, Robert Marshall, Lowell Fair, Daniel Bosch, Edgar Jones, Jon Heifetz, Peter Hagen, Randy Ericksen, Lewis Coggins, Erik Williams,

Caihong Fu, Matthew Foster, Dana Hanselman, James Savereide, Brian Battaile, Colin Schmitz, Ben Williams, Briana Witteveen, Sara Miller, Kray Van Kirk, Haixue Shen, Peter Hulson, Joe Liddle, Suzie Teerlink. (Not chaired but significant involvement: Jie Zheng, Mike Sigler,Peggy Merritt, Ed Farley, Chris Rooper, Michio Fukushima, William Templin)

Books

Funk, F., T.J. Quinn II, J. Heifetz, J.N. Ianelli, J.E. Powers, J.F. Schweigert, P.J. Sullivan, and C.-I. Zhang (editors). 1998. Fishery Stock Assessment Models. Proc. Symp. Fishery Stock Assess. Models 21st Cent. Alaska Sea Grant College Program, Fairbanks AK, AK-SG-98-01. 1054 p.

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National Research Council. 1998b. Review of Northeast Fishery Stock Assessments. National Academy Press, Washington DC. 128 p. (chair and co-author)

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Recent Articles

1. Straley, J.M., Quinn, T.J., II, and Gabriele, C.M. 2009. Assessment of mark-recapture models to estimate the abundance of a humpback whale feeding aggregation in Southeast Alaska. Journal of Biogeography 36: 427-438.
2. Calambokidis, J., Falcone, E.A., Quinn, T.J., II, and 19 others. 2008. SPLASH: Structure of populations, levels of abundance and status of humpback whales in the North Pacific. Final Report to US Dept. Commerce, Western Administrative Center, Seattle WA. 57 pp.
3. Hulson, P.-J.F., Miller, S.E., Quinn, T.J., II, Marty, G.D., Moffitt, S.D., and Funk, F. 2008. Data conflicts in fishery models: incorporating hydroacoustic data into the Prince William Sound Pacific herring assessment model. ICES J. Marine Science 65: 25-43.
4. Marty, G.D., Quinn, T.J., II, Carpenter, G., Meyers, T.R., and Willits, N.H. 2003. Role of disease in abundance of a Pacific herring population. Can. J. Fish. Aquat. Sci. 60: 1258-1265.
5. Quinn, T.J., II, Marty, G.D., Wilcock, J., Willette, M. 2001. Disease and population assessment of Prince William Sound Pacific herring. Pages 363-379 In Herring: Expectations for a New Millennium. Alaska Sea Grant College Program, Fairbanks AK.
6. Miller, S.E., Quinn, T.J., II, and Ianelli, J.N. 2008. Estimation of age-specific migration in an age-structured model. Pages 161 – 178 In Resiliency of Gadid Stocks to Fishing and Climate Change, Alaska Sea Grant College Program, AK-SG-08-01, Fairbanks AK.
7. Shen, H., Quinn, T.J., II, Wespestad, V., Dorn, M.W., and Kookesh, M. 2008. Using acoustics to evaluate the effect of fishing on school characteristics of walleye pollock. Pages 125 – 140 In Resiliency of Gadid Stocks to Fishing and Climate Change, Alaska Sea Grant College Program, AK-SG-08-01, Fairbanks AK.
8. Marasco, R.J., Goodman, D., Grimes, C.B., Lawson, P.W., Punt, A.E., and Quinn, T.J., II. 2007. Ecosystem-based fisheries management: some practical suggestions. Can. J. Fish. Aquat. Sci. 64: 928-939.
9. Booth, A.J., and Quinn, T.J., II. 2006. Maximum likelihood and Bayesian approaches to stock assessment when data are questionable. Fisheries Research 80:169-181.
10. Quinn, T.J., II, and Collie, J.S. 2005. Sustainability in single-species population models. Philosophical Transactions of the Royal Society B 360: 147-162.

JANICE M. STRALEY
PO Box 273, Sitka, Alaska 99835
Jan.Straley@uas.alaska.edu
907-747-7779 (work) 907-747-5431 (home)

EDUCATION:

1994 Master of Science, Biological Oceanography, School of Fisheries and Ocean Sciences, University of Alaska Fairbanks, Fairbanks, AK (Dr. F. Fay, Advisor)
1975 Bachelor of Science, College of Fisheries, University of Washington, Seattle, WA
1974/76 Friday Harbor Marine Lab, U. W.: Invertebrate biology, embryology and botany field courses

PROFESSIONAL BACKGROUND:

1999-present **ASSISTANT PROFESSOR OF BIOLOGY** University of Alaska Southeast-Sitka
1994-1999 **ASSISTANT PROFESSOR** University of Alaska Southeast-Sitka and University of Alaska Fairbanks, College of Rural Alaska, Rural Alaska Science and Math Network.
1979-1999 **INDEPENDENT MARINE BIOLOGIST**
1988-1992 **MARINE BIOLOGIST** Glacier Bay National Park, Alaska
1987-1988 **INSTRUCTOR** University of Alaska Southeast-Sitka
1980-1984 **FISHERIES BIOLOGIST** NSRAA Sitka, AK
1979 **WILDLIFE BIOLOGIST** U.S. Forest Service, Sitka, AK
1977-78 **BIOLOGICAL TECHNICIAN** U.S. Fish and Wildlife Service, Sitka, AK
1974-1977 **WILDERNESS RANGER**, U.S. Forest Service, Winthrop, WA

SELECTED PUBLICATIONS AND REPORTS:

Straley, J.M., Quinn, T.J., II, and Gabriele, C.M. 2009. Assessment of mark-recapture models to estimate the abundance of a humpback whale feeding aggregation in Southeast Alaska. Journal of Biogeography 36: 427-438.

Neilson, J.A., Straley, J.M., Gabriele, C.M., Robbins, J. & Hills, S. 2007 Humpback whale (*Megaptera novaeangliae*) entanglement in fishing gear in northern Southeast Alaska. Journal of Biogeography, doi: 10.111/j.1365-2699.2007.01820.x

Gabriele, C.M, J. M. Straley, S.A. Mizroch, C.S. Baker, A.S. Craig, L.M. Herman, D.Glockner-Ferraari, S.Cerchio, P. von Ziegesar, J. Darling, D. McSweeney, T.J. Quinn II and J. J. Jacobsen. 2000. Estimating the mortality rate of humpback whale calves in the central North Pacific Ocean. Can. J. Zool. 79:589-600.

Mizroch, S.A., L.M. Herman, J.M. Straley, D. Glockner-Ferrari, C. Jurasz, J.D. Darling, S. Cerchio, C.M. Gabriele, D.R. Salden and O. von Ziegesar. 2004. Estimating the adult survival rate of Central North Pacific humpback whales. Journal of Mammology.

Gabriele, C.M, J. M. Straley, S.A. Mizroch, C.S. Baker, A.S. Craig, L.M. Herman, D.Glockner-Ferraari, S.Cerchio, P. von Ziegesar, J. Darling, D. McSweeney, T.J. Quinn II and J. J. Jacobsen. 2000. Estimating the mortality rate of humpback whale calves in the central North Pacific Ocean. Can. J. Zool. 79:589-600

Gabriele, C.M., J.M. Straley, L.M. Herman and R.J. Coleman. 1996. Fastest documented migration of a North Pacific humpback whale. Marine Mammal Science 12:457-464.

Straley, J. M. and C. M. Gabriele. 1997. Humpback whales of southeastern Alaska: a catalog of photographs. National Park Service, Gustavus, Alaska 99826. 107 pp.

Straley, J.M. 1994. Seasonal characteristics of humpback whales (*Megaptera novaeangliae*) in southeastern Alaska. Master's thesis, University of Alaska Fairbanks, Fairbanks, AK. 121pp.

Straley, J.M., C.M. Gabriele, C.S. Baker. 1994. Annual reproduction by individually identified humpback whales (*Megaptera novaeangliae*) in Alaskan waters. Marine Mammal Science 10(1):87-92.

Straley, J.M. 1990. Fall and winter occurrence of humpback whales *(Megaptera novaeangliae)* in southeastern Alaska. Reports of the International Whaling Commission (Special Issue 12):319-24.

INVITATIONAL WORKSHOPS, APPOINTMENTS, COMMITTES, GRANTS:

2009 Invitational workshop Ice Retreat and Potential Shipping and Fishing Effects on Western Arctic Marine Wildlife
2006 Steering committee to develop a research strategy for a study of North Pacific killer whales with a focus on predation upon marine mammal populations
2005 Steering committee to organize a workshop: Fisheries Depredation by Killer and Sperm Whales: Behavioural Insights, Behavioural Solutions. Vancouver Aquarium, October 2006
2005 Invitational workshop to develop a research plan for assessing populations of sperm whales
2004 Invitational workshop to assess fishing gear modifications to reduce large whale entanglement
2004-05 Regional coordinator and received grant for North Pacific humpback whale study (SPLASH)
2002 Steering committee to develop a basin wide study of N Pacific humpback whales (SPLASH)
2002 Invitation to technical workshop on Cetacean Interactions with Commercial Longline Fisheries in the South Pacific Region: Approaches to Mitigation, Apia, Samoa, 11-15 November 02
1997 President Sitka WhaleFest, a non profit dedicated to celebrating marine wildlife in the North Pacific through community and educational events
1996 Appointment by NMFS to the Alaska Regional Scientific Review group for marine mammals
1988 Alaska Marine Mammal Health and Stranding Network member includes large whale disentanglement

Research Support

Ongoing Research Support

2007-P Exxon Valdez Oil Spill Trustees Council, Significance of Whale Predation on Herring, $123,600
2008-P USDA CSREES Strengthening Alaska and Hawai'i student and faculty partnerships through experiential learning, $99,511
2008-P Subaward from UCSD, International Association of Oil and Gas Producers, Testing of potential alerting signals on sperm and humpback whales, $109,329

<u>Completed research support</u>

2001 NOAA, North Pacific Universities Marine Mammal Research Consortium and Cooperative Institute for Arctic Research, Predation of Steller Sea Lions by Killer Whales in Southeastern Alaska, $131,000
2003-06 North Pacific Research Board, Sperm Whale Fisheries Interactions in the Gulf of Alaska, $284,000.
2004-06 Cascadia Research, Structure of Populations, Levels of Abundance and Status of Humpbacks (SPLASH) Southeastern Alaska, $80,000.
2005 Marine Mammal Commission, Understanding Killer Whale Diet Preference, $41,273.
2006-07 USDA CSREES ANNH, Animal Migration and Demographics, $125,000.

RECENT COLLABORATORS:

John Calambokidis, Cascadia Research, Olympia, WA
Christine Gabriele, Glacier Bay National Park and Preserve, Gustavus, AK
Craig Matkin, North Gulf Oceanic Society
Sarah Mesnick, Southwest Fisheries Science Center, La Jolla, CA
Janet Neilson, Glacier Bay National Park and Preserve, Gustavus, AK
Tory O'Connell, Commercial Fisheries, Alaska Department of Fish and Game, Sitka, Alaska
Terry Quinn, School of Fisheries and Ocean Sciences, University of Alaska Fairbanks, Juneau, AK
Aaron Thode, Scripps Institution of Oceanography, La Jolla, CA

Olga von Ziegesar

Eye of the Whale
P.O.Box 15191
Fritz Creek, Alaska 99603

Research Experience

1980-2008 Principal Investigator/Project coordinator /photographer and boat operator/ for the Humpback Whale Survey in Prince William Sound, Alaska collected data and identification photos of killer whales for the North Gulf Oceanic Society (NGOS) at the same time, opportunistically

1979-1982 Photographer and boat operator for the Kona coast humpback whale survey (Principal Investigator: Dan McSweeney)

1981-1982 Research assistant for humpback whale survey in south- east Alaska (Principal Investigator: Dan McSweeney)

1984 Field biologist for the Alaska killer whale survey sponsored by Hubb's Sea World Research Institute

1989-1991 Co-Investigator for assessment of damages to humpback and killer whales from the Exxon Valdez Oil Spill in Prince William Sound

Education

1979-1984 B.A. Biology and Natural History, double major.
University of California at Santa Cruz. Graduated with honors. Senior thesis project: Prince William Sound humpback whale survey sponsored by Kennith S. Norris.

1975-1977 Degree in Cabinet and Millwork at the Utah Technical College, Provo, Utah

1971 Student of the National Outdoor Leadership School in Prince William Sound five week Kayaking Course

Related work experience

1984-1985 Biology Outdoor education teacher for the Santa Clara County School District.

1986-1993 Commercial fisherperson in Prince William Sound herring and salmon.
Through the years-guide/instructor for horse rides and pack trips in Kachemak Bay and in the Wrangle mountains for Wrangle Mountain Outfitters
Kayak guide-Kachemak Bay and Prince William Sound

Other skills

Scuba diver
Trained in First Aid and CPR
Proficient in Spanish and French

Publications

Calambokidis,A, John, Gretchen H. Steiger, Janice M. Straley, Louis M. Herman, Salvatore Cerchio, Dan R. Salden, Jorge Urbán R., Jeff K. Jacobsen, Olga Von Ziegesar, Kenneth C. Balcomb, Christine M. Gabriele, Marilyn E. Dahlheim,K Senzo Uchida,L Graeme Ellis,M Yukifumi Miyamura,N Paloma Ladrón De Guevara P, Manami Yamaguchi,,Fumihiko Sato,, Sally A. Mizroch, Lisa Schlender, Kristin Rasmussen, Jay Barlow, And Terrance J. Quinn Ii. 2001. MOVEMENTS AND POPULATION STRUCTURE OF HUMPBACK WHALES IN THE NORTH PACIFIC BASIN. Marine Mammal Science17:769-794

Gabriele, Christine M., Janice M. Straley, Sally A. Mizroch, C.Scott Baker, Alison S. Craig, Louis M. Herman, Debbie Glockner-Ferrari, Salvatore Cerchio, Olga Von Ziegesar, Jim Darling, Dan

Mcsweeney, Terrance J. Quinn Ii, And Jeff K. Jacobsen. Estimating The Mortality Rate Of Humpback Whale Calves In The Central North Pacific Ocean Canadian Journal Of Zoology. 79:589-600 (2001)

Von Ziegesar, O., Goodwin, B. And Rene Devito. 2001. A Catalog Of Humpback Whales In Prince William Sound, Alaska 1977-2001. Printed And Distributed By Eye Of The Whale Research, P.O. Box 15191, Homer, Alaska 99603.

Von Ziegesar, Olga, Elizabeth Miller, And Marilyn Dalheim. Impacts On Humpback Whales In Prince William Sound. Chapter Ten, Marine Mammals And The Exxon Vadez, Edited By Tom Laughlin, Academic Press Inc. 1994

Von Ziegesar And Craig Matkin, Humpback Whales In Prince William Sound In 1985, For The National Marine Fisheries Service National Marine Mammal Laboratory, Contract No. 41 Usc 252 January 1986

Von Ziegesar, O. Survey Of Humpback Whales (Megaptera Novaengliae) In Southwestern Prince William Sound, Alaska 1980-1981-1983. Report To The Alaska Council On Science And Technology. 1984.Juneau Alaska 37pp. (Unpubl).

Von Ziegesar, O., And B. Goodwin. 1980. Humpback Whale Survey Of Prince William Sound, Alaska-Summer 1980. Environmental Field Program, University Of California Santa Cruz. 39 Pp. (Unpubl.)

Von Ziegesar, O. G. Ellis, C.O. Matkin And B. Goodwin. 1986. Repeated Sightings Of Identifiable Killer Whales (Orcinus Orca) In Prince William Sound, Alaska. 1977-1983. Cetus 6(2):9-13.

Waite, Janice M., Marilyn E. Dahlheim, Roderick C. Hobbs, Sally A. Mizroch, Olga Von Ziegesar-Matkin, Janice M. Straley, Louis M. Herman, Jeff Jacobsen,
Evidence Of A Feeding Aggregation Of Humpback Whales (*Megaptera Novaeangliae*) Around Kodiak Island, Alaska, Marine Mammal Science, 15(1):210 (January 1999)

Witteveen, Briana H,, Janice M. Straley, Olga Von Ziegesar, D. Steel, And C. Scott Baker
Abundance And Mtdna Differentiation Of Humpback Whales (*Megaptera Novaeangliae*) In The Shumagin Islands, Alaska Canadian Journal Of Zoology Pages 1352-1359 Volume 82, Number 8, August 2004

Collaborators

Scott Baker
John Calambokidis
Christine Gabriele
Janice Straley
Eva Saultis
Janice Waite
Briana Witteveen

John R. Moran
Tel: (907) 789-6014
Email: John.Moran@noaa.gov

EDUCATION
University of Alaska Fairbanks, M.S. in Fisheries, August 2003.
University of New Hampshire, B.A. in Zoology, minor in Marine Biology, May 1989.

PROFESSIONAL EXPERIENCE
Research Fisheries Biologist, *U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Auke Bay Laboratory, Juneau AK. August 2006- present*
Research Associate, *University of Alaska Southeast, Juneau, AK.* September 2003- August 2006
Research Assistant, *University of Alaska Fairbanks, Juneau, AK*. January 2002-May 2003
Weir Crew Leader, *SWCA, Salt Lake City, UT.* September 2001-November 2001
Graduate Intern, *Alaska Department of Fish and Game, Juneau, AK.* April 2000-April 2001
Teaching Assistant, *University of Alaska Fairbanks, Juneau, AK.* September 1999-December 2000
Biological Technician (Fisheries), *U.S. Fish and Wildlife Service, Togiak NWR, Dillingham, AK***.** April 1998-August 1999
Biological Science Technician (Wildlife), *U.S. Fish and Wildlife Service, Togiak NWR, Dillingham, AK*
Fisheries Technician/Tagger/Diver, *Prince William Sound Aquaculture, Cordova, AK.* February 1992-April 1993

PAPERS (primary author)

Moran, J.R., B.P. Kelly, O.Badajos, and M. Kunnasranta. The influence of environmental variables on counts of visible ringed seals. In prep.

Moran, J.R., M.D. Adkison, and B.P. Kelly. Counting seals: Estimating the unseen fraction using a photographic capture-recapture and covariate model. In prep. for the Canadian Journal of Zoology.

Moran, J.R. 2003. Counting seals: Estimating the unseen fraction using a covariate and capture-recapture model. M.S. Thesis, University of Alaska Fairbanks.

Moran, J.R., and C. A. Wilson. 1996. Abundance and distribution of marine mammals in northern Bristol Bay and southern Kuskokwim Bay - a status report of the marine mammal monitoring effort at Togiak NWR. Annual report 1995. USFWS report, 19 pp. Dillingham, AK.

Moran, J.R. 1994. Landbird monitoring at Cape Peirce, Alaska, 1994. USFWS report, 4 pp. Dillingham, AK.

PAPERS (co-author)

Kelly, B.P., S. Nghiem, M. Kunnasranta, O.Badajos, J. Moran, and D. Douglas. The Ringed Seal's Sense of Snow. In prep.

Swanson, B.J., B.P. Kelly, C. Maddox, and J.R. Moran. Shed seal skin as a source of DNA molecular. In press. for Molecular Ecology Notes.

Wilson C.A., J.R. Moran, and R. Mac Donald. Pacific walruses (*Odobenus rosmarus divergens*) falling from cliffs in southwestern Alaska. In review for Marine Mammal Science.

Kelly, B., O. Badajos, M. Kunnasranta and J. Moran. 2005. Timing and re-interpretation of ringed seal surveys. Final report to Coastal Marine Institute, University of Alaska Fairbanks.

Lisac, M.J. and J.R. Moran 1999. Migratory and seasonal distribution of Dolly Varden *Salvelinus malma* in the Togiak River watershed, Togiak National Wildlife Refuge. Progress report 1999. USFWS report, 28 pp. Dillingham, AK.

RECENT COLLABORATORS:

Mary Anne Bishop, Prince William Sound Science Center, Cordova, AK
Peter Boveng, Polar Ecosystem Program, NMML, NMFS, Seattle, WA
Lois Harwood, Department of Fisheries and Oceans Canada, Yellowknife, NT, Canada
Brendan Kelly, University of Alaska Southeast, Juneau, AK
Mervi Kunnasranta, University of Joensuu, Joensuu, Finland
Tom Smith, EMC EcoMarine Corporation,Quebec, Canada
Rex Snyder, Nanuuq Commission, Anchorage, AK
Janice Straley, University of Alaska Southeast, Sitka AK.

Budget Justification

Personnel Salaries ($90.0K) – One month of salary is requested for PI Quinn in year 1 and three weeks in year 2. His responsibilities include overall project supervision, modeling of whale and herring populations, and supervision of a graduate student. One month of salary is requested for co-PI Straley in year 1 and three weeks in year 2. Her responsibilities will be to guide the graduate student in database construction and serving as a coordinator for data transfer and analysis.

Funds are requested each year to support a graduate student (S. Teerlink) stipend during the academic year and in the summer to support graduate student from October 1, 2009 to July 1, 2011.

Senior personnel salaries are incremented by 4.5% and other personnel are incremented by 3% to allow for increases beginning in year 2. Students work full time in summer and part time during the academic year and are not incremented for increases.

Benefits:
Staff benefits are applied according to UAF's fixed benefit rates for FY09 with the Office of Naval Research (ONR). A copy of the negotiated rate proposal is available at: http://www.alaska.edu/controller/cost-analysis/negotiated_agreements.html. Funds are requested for graduate student health care costs.

Travel ($7.6K) - *Domestic*: Funds are requested to cover airfare, lodging and meals at the Marine Science Symposium in Anchorage in each of the two years for Quinn, Straley, and Teerlink. Funds are also requested for a trip to a national fisheries meeting in year 2 to present results of this study. 10% has been added to airfare, car rental and taxi travel beginning in year 2 to accommodate anticipated price increases. Per Diem (food, lodging and mileage) has not been increased.

Contractual Services ($11.4K)
About $2300 is included for meeting fees, computer services, and shipping. $5000 in year 1 and $4000 in year 2 is requested as a subcontract to Eye of the Whale, a non profit research group based in Homer, Alaska, whose biologists have collected humpback whale data since 1977, for its work in locating, processing, and mailing data to the PIs. Members of this group (von Ziegesar, in particular) will also be participating in manuscript preparation.

Commodities ($2.0K) - $1000 is requested each year to cover project supplies.

Student Services ($9.3K)
Funds are requested to cover graduate student tuition for 2 years. Tuition is incremented by 10% per year to allow for increases.

Indirect Costs (UAF- $27.8K) Facilities and Administrative (F&A) Costs for research is calculated at 25% of the Modified Total Direct Costs (MTDC) per EVOS instructions. MTDC includes Total Direct Costs minus tuition, stipends, scholarships, subaward amounts over $25,000, and equipment. A copy of the agreement is available at: http://www.alaska.edu/controller/cost-analysis/negotiated_agreements.html.

DATA MANAGEMENT AND QUALITY ASSURANCE/ QUALITY CONTROL STATEMENT

This project involves processing data and modeling. Data management and quality control will be the responsibility of Dr. Terrance J. Quinn, using established scientific protocols. If this proposal is funded, then we will work with EVOSTC to set up a data management plan, so that essential data on humpback whales and herring will be archived. Computer models will be provided in electronic form along with detailed explanations of how they work. We will use MetaLite, freeware created by USGS for collecting and validating Federal Geographic Data Committee (FGDC)-compliant metadata, as needed.

1. Study design and statistical analyses are given elsewhere in this proposal.
2. Standard scientific protocols will be used for hypothesis testing.
3. Data characteristics
    a. Metadata will be provided if the proposal is funded.
    b. Quantitative datasets will be obtained for humpback whales and herring.
4. Our cited literature describes the methods to be used for converting signals to observations.
5. Standard software will be used (Microsoft Office, R, Mark).

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 10- FY 12

Budget Category:	Proposed FY 10	Proposed FY 11	Proposed FY 12	Proposed FY 13	TOTAL PROPOSED
Personnel	$53.0	$37.0	$0.0	$0.0	$90.0
Travel	$2.7	$4.9	$0.0	$0.0	$7.6
Contractual	$12.5	$8.2	$0.0	$0.0	$20.7
Commodities	$1.0	$1.0	$0.0	$0.0	$2.0
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0
Indirect *(will vary by proposer)*	$ 17.3	$12.7			$30.0
SUBTOTAL	$86.5	$63.8	$0.0	$0.0	$150.3
General Administration (9% of subtotal)	$7.8	$5.7	$0.0	$0.0	$13.5
PROJECT TOTAL	$94.2	$69.5	$0.0	$0.0	$163.8
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0

COMMENTS:

FY10 - 13

Project Title: Historical Humpback Whale Abundance in Prince William Sound in Relation to Pacific Herring Dynamics Lead PI: Quinn, T.

FORM 4A NON-TRUSTEE AGENCY SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 10- FY 12

Personnel Costs:		GS/Range/	Months	Monthly		Personnel
Name	Project Title	Step	Budgeted	Costs	Overtime	Sum
Quinn, T.	Principal Investigator	Faculty	1.0	15.1		15.1
Straley, J.	co-Investigator	Faculty	1.0	8.2		8.2
MS graduate student (TBA)	student	student	12.0	2.5		29.7
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
	Subtotal		14.0	25.8	0.0	
					Personnel Total	$53.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Juneau to Anchorage, Alaska Marine Science Symposium	400.0	2	8	139.0	1.7
Sitka to Anchorage, Alaska Marine Science Symposium	500.0	1	4	139.0	1.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$2.7

FY10

Project Title: Historical Humpback Whale Abundance in Prince William Sound in Relation to Pacific Herring Dynamics Lead PI: Quinn, T.

FORM 4B PERSONNEL & TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 10- FY 12

Contractual Costs:	Contract
Description	Sum
computer services	0.5
shipping	1.0
tuition	6.0
subcontract: Eye of the Whale	5.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$12.5

Commodities Costs:	Commodities
Description	Sum
project supplies	1.0
Commodities Total	$1.0

FY10

Project Title: Historical Humpback Whale Abundance in Prince William Sound in Relation to Pacific Herring Dynamics Lead PI: Quinn, T.

FORM 4B CONTRACTUAL & COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 10- FY 12

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency

FY10

Project Title: Historical Humpback Whale Abundance in Prince William Sound in Relation to Pacific Herring Dynamics Lead PI: Quinn, T.

FORM 4B EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 10- FY 12

Personnel Costs:		GS/Range/	Months	Monthly		Personnel
Name	Project Title	Step	Budgeted	Costs	Overtime	Sum
Quinn, T.	Principal Investigator	Faculty	0.7	10.9		10.9
Straley, J.	co-Investigator	Faculty	0.7	5.9		5.9
MS graduate student (TBA)	student	student	12.0			20.2
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
	Subtotal		13.4	16.8	0.0	
					Personnel Total	$37.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Juneau to Anchorage, Alaska Marine Science Symposium	400.0	2	8	139.0	1.8
Juneau toPittsburgh, American Fisheries Society Mtg	1200.0	1	5	168.0	2.0
Juneau to Sitka, Alaska Marine Science Symposium	500.0	1	4	139.0	1.1
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$4.9

FY11

Project Title: Historical Humpback Whale Abundance in Prince William Sound in Relation to Pacific Herring Dynamics Lead PI: Quinn, T.

FORM 4B PERSONNEL & TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 10- FY 12

Contractual Costs:		Contract
Description		Sum
computer services		0.5
meeting registration		0.4
tuition		3.3
subcontract: Eye of the Whale		4.0
If a component of the project will be performed under contract, the 4A and 4B forms are required.	**Contractual Total**	$8.2

Commodities Costs:	Commodities
Description	Sum
project supplies	1.0
Commodities Total	$1.0

FY11	**Project Title:** **Lead PI:**	**FORM 4B** **CONTRACTUAL & COMMODITIES DETAIL**

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 10- FY 12

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency

FY11

Project Title:
Lead PI:

FORM 4B
EQUIPMENT
DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 10- FY 12

Personnel Costs:		GS/Range/	Months	Monthly		Personnel
Name	Project Title	Step	Budgeted	Costs	Overtime	Sum
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
	Subtotal		0.0	0.0	0.0	
					Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY12

Project Title:
Lead PI:

FORM 4B
PERSONNEL &
TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 10- FY 12

Contractual Costs: Description		Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required.	**Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY12

Project Title:
Lead PI:

FORM 4B
CONTRACTUAL & COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 10- FY 12

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency

FY12

Project Title:
Lead PI:

FORM 4B
EQUIPMENT
DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 10- FY 12

Personnel Costs:		GS/Range/	Months	Monthly		Personnel
Name	Project Title	Step	Budgeted	Costs	Overtime	Sum
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
	Subtotal		0.0	0.0	0.0	
					Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY13

Project Title:
Lead PI:

FORM 4B
PERSONNEL &
TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 10- FY 12

Contractual Costs: Description		Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required.	**Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY13

Project Title:
Lead PI:

FORM 4B
CONTRACTUAL & COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 10- FY 12

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency

FY13

Project Title:
Lead PI:

FORM 4B
EQUIPMENT
DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 10- FY 12

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 10- FY 12

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 10- FY 12

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 10- FY 12

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DETAILED BUDGET FORM FY 10- FY 12