

**FY07 INVITATION
PROPOSAL SUMMARY PAGE**

Project Title: Seabird Predation on Juvenile Herring in Prince William Sound

Project Period: FY 2007 – FY 2010

Proposer(s):

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Study Location: Prince William Sound, and intensive study area Northeast Prince William Sound (Sheep Bay, Simpson Bay, Port Gravina)

Abstract: Based on population trends, the Prince William Sound (PWS) Pacific herring population does not show signs of recovering. Predation pressure on juvenile herring may be an important factor in preventing recovery. Here we propose a large-scale, three-year study to investigate seabird predation on juvenile herring during winter months (October-March), a season about which relatively little is known. Juvenile herring are heavily predated by multiple species of seabirds including five species injured by the *Exxon Valdez* Oil Spill, one recovering species, and one recovered species. We will examine the spatial and temporal abundance of seabird predators in and around juvenile herring schools, as well as the physical and biological characteristics of the schools they feed on. Our project relies on seabird surveys being performed onboard vessels associated with three other projects (2 proposed EVOS studies, 1 PWSSC study) conducting hydroacoustic surveys for juvenile herring schools. Our estimates of juvenile herring consumption will aid in planning future restoration efforts as well as in assessing the role of seabird predation on herring recruitment by providing data to both herring and ecosystem modeling efforts.

FUNDING: *The first year only (FY 07) was approved by the Trustee Council on 11/14/06. The other years are pending.*

EVOS Total Funding Requested: \$ 609.2K

FY07 \$ 197.0K

FY08 \$ 204.3K

FY09 \$ 196.0K

FY10 \$ 11.9K

Total Non-EVOS Funds to be used: \$276.0K

FY07 \$ 108.0K

FY08 \$ 78.0K

FY09 \$ 78.0K

FY10 \$ 12.0K

Date: 1 August 2006

I. NEED FOR THE PROJECT

A. Statement of Problem

Pacific herring (*Clupea pallasii*) has been identified as a resource injured by the 1989 Exxon Valdez Oil Spill (EVOS). Based on population trends, the Prince William Sound (PWS) herring population does not show signs of recovering. The collapse of the PWS herring population including its commercial fishery has impacted not only the economy and well-being of PWS communities, but also a variety of seabirds and marine mammals that depend on herring. Pacific herring is a critical component of the diet of many marine mammals and seabirds in PWS (Aglar et al. 1999; Matkin et al. 1999; Irons et al. 2000a). Holleman (2000) describes herring as a principal prey of at least 40 species in PWS. The PWS herring crash has been implicated in the decline of the endangered western stock of Steller sea lion (*Eumetopias jubatus*) (Thomas and Thorne 2003). Kuletz (2005) concluded that juvenile herring were critical to marbled murrelets (*Brachyramphus marmoratus*) and suggested that the decline in murrelets in PWS was linked to the concurrent decline in herring. Similarly, Irons and others (2000a) determined that the effects of EVOS on several marine seabirds lasted longer than expected and may be the result of reduced forage fish abundance. In addition, they found that the most persistent declines are associated with seabirds that over-winter in PWS, while birds that migrated south for the winter recovered more quickly.

Herring populations tend to be dominated by the occasional strong year class. Most recently, the PWS 1999 herring year class showed a strong recruitment at age three (R. Thorne, PWSSC, pers. comm.), however, this recruitment event has been insufficient to restore herring populations to the levels of the 1980's. A critical bottleneck for herring recruitment is juvenile abundance and condition for young-of-the-year (hereafter referred to as 0-age class) going into and coming out of the October to March winter period, a period when zero or negative growth rates occur (Paul and Paul 1999). The 0-age class juvenile herring are heavily predated by multiple species of seabirds (Irons 1992; Duffy 2000). Brown (2003) suggested that by 1-year, juvenile abundance should be directly correlated with year class strength 2 or 3 years later unless the local population is in a "predator pit". She suggested that predation pressure resulting from a stable or increasing predator population in PWS could maintain or reduce the herring recruitment when the juvenile herring population is composed of smaller school sizes and fewer aggregations over a reduced geographic range.

Juvenile herring (0, 1, 2 year olds) over-winter at depths <30m in several bays and inlets primarily in east-northeast and west-southwest areas of PWS that are distinct from adult over-wintering areas (Stokesbury et al. 2000; Norcross et al. 2001). During October 1995, and March and July 1996, Stokesbury and others (2000) used hydroacoustics to survey four bays in PWS as part of the EVOS sponsored Sound Ecosystem Assessment (SEA) project. More recently, in March 2006, Richard Thorne from PWS Science Center conducted hydroacoustic surveys in Sawmill Bay and northeast PWS for juvenile herring schools as part of a study on the relationship between Steller sea lions and Pacific herring. Thorne is submitting a proposal to EVOS Trustee Council to fund additional hydroacoustic surveys for juvenile herring throughout the PWS during November and March (see EVOS proposal, "Trends in adult and juvenile herring distribution and abundance in PWS"). Concurrently, Richard Crawford from PWS Science Center is submitting to EVOS a proposal to fund an intensive study of juvenile herring habitat in northeast PWS (Simpson Bay, Sheep Bay, and Port Gravina). Crawford's study would

include four winter hydroacoustic surveys (October, November, January, and March; see EVOS proposal, “Characterization of herring nursery habitat in PWS”).

The two studies will use 1) hydroacoustic surveys to determine juvenile herring biomass and abundance; and, 2) trawl surveys for species composition and size class. Together these two studies provide an unprecedented opportunity to study the relationship between seabirds and juvenile herring during winter. In Alaska, most studies on seabirds and prey fish have been conducted in the summer, and have focused on the effect of fish abundance and quality on seabird productivity or foraging behavior (Golet et al. 2000, Litzow et al 2002, Piatt et al. 1997, Suryan et al. 2000, 2002).

Our proposed study will investigate the effects of seabird predation on juvenile herring recruitment. Our study is designed to complement and expand on the current and proposed studies that comprise the PWS Science Center’s Herring Research Program. From a fisheries management standpoint, this study will provide data on bird consumption that can be used by managers to more realistically model herring recruitment. Stock assessment models can then determine how much (what biomass) needs to be available to birds, so that both bird and commercial fishery requirements do not create a “predator pit”.

Outside of summer, herring consumption by birds in PWS has focused on consumption of adult herring and herring spawn. As part of the SEA project, Co-Principal Investigator for this proposal, Dr. Mary Anne Bishop, studied avian predation on herring spawn during April and May at Montague Island (Bishop and Green 1999, 2001). She collected additional spring data on of adult herring consumption by birds at Montague Island during a study on avian mussel consumption (a component of the EVOS Nearshore Vertebrate Predator Project; Bishop et al. 1998). More recently, as part of the PWS Science Center study on the relationship between Steller sea lions and Pacific herring, bird observers are being placed on vessels conducting adult herring hydroacoustic surveys in over-wintering areas. Common murre (*Uria aalge*), a deep-diving species, has been the most common seabird observed, followed by glaucous-winged gull (*Larus glaucescens*) and loons (*Gavia* spp.) (M.A. Bishop, unpubl. data).

The importance of juvenile herring as a winter food resource for birds has not been investigated. Juvenile herring occur at more shallow depths than adult herring (<30m), making them potentially more available to shallow-diving seabirds. There has been no information on numbers and distribution of avian predators on juvenile herring, how predictable or variable their consumption of juvenile herring is during winter, nor what physical features the birds may be responding to. Based on previous U.S. Fish and Wildlife Service (FWS) seabird population surveys conducted during March, we have identified 19 seabird species wintering in PWS, that are known (14 species) or suspected (5 species) to consume juvenile herring (Table 1).

Foraging behavior by seabirds can be influenced by many factors including prey abundance, prey location (depth), prey size, and the presence of other herring predators. For example, marbled murrelets are the most numerous alcid in PWS. During summer, Ostrand et al. (2004) found that marbled murrelets in PWS preferentially selected for schools of juvenile herring. Murrelet’s selection of other fish species for consumption depended on herring availability, rather than fish school characteristics such as fish school depth or habitat.

Foraging in multi-species flocks is common among seabirds (Maniscalco and Ostrand 1997), and there appears to be mutual benefit gained by pursuit divers (e.g. loons, cormorants, alcids) and surface/plunge feeders (e.g. kittiwakes, gulls) by their joint participation (Porter and

Sealy 1981). Co-Principal Investigator for this project, Dr. Kathy Kuletz (2005) found that murrelets in PWS foraged in larger groups when prey were less abundant, but foraged as pairs or individuals when prey was abundant, possibly because murrelets suffer kleptoparasitism by larger birds (Maniscalco and Ostrand 1997). The size of prey may also influence foraging behavior. In PWS, black-legged kittiwakes (*Rissa tridactyla*) foraged in larger flocks if prey were 0-age class herring, than they did when foraging on larger 1-age class herring (Irons et al. 2000b). In addition to fish abundance and size, hydrographic features may also play a role in attracting seabirds to a site. For example, marbled murrelets forage on small schools of fish in nearshore, shallow waters, or areas of upwelling (Kuletz et al. 1995, Kuletz 2005, Ostrand et al. 1998), presumably because prey are consistently available there. All these results suggest that group dynamics among birds is tied to fish type, abundance, and availability (as mediated by habitat).

Table 1. Piscivorous birds wintering in PWS known or suspected to consume Pacific herring. Population estimates from McKnight et al. 2006.

Species	Herring documented *	EVOS Restoration Status	PWS winter Population 2005
Red-throated Loon	Yes		0 **
Pacific Loon	Yes		323 ± 266
Common Loon	Yes	Not Recovered	1233 ± 662
Yellow-billed Loon	No info		27 ± 24
Horned Grebe	No info		2203 ± 782
Red-necked Grebe	Yes		1054 ± 813
Pelagic Cormorant	Yes	Not Recovered	10649 ± 2575
Double-crested Cormorant	Yes	Not Recovered	154 ± 138 ***
Red-faced Cormorant	No info	Not Recovered	458 ± 449
Common Merganser	No info		3008 ± 1558
Red-breasted Merganser	Yes		962 ± 467
Black-legged Kittiwake	Yes		15903 ± 5416
Mew Gull	Yes		8925 ± 3497
Herring Gull	No info		2030 ± 813
Glaucous-winged Gull	Yes		35363 ± 8851
Common Murre	Yes	Recovered	90902 ± 23191
Marbled Murrelet	Yes	Recovering	9431 ± 3291
Pigeon Guillemot	Yes	Not Recovered	1485 ± 896
Horned Puffin	Yes		

*Based on a review of *Birds of North America* species accounts.

**loons difficult to identify in winter; total loons = 2347 ± 1023.

*** total cormorants, including unidentified = 14654 ± 3089.

B. Relevance to 1994 Restoration Plan Goals and Scientific Priorities

Pacific herring has been identified as a resource injured by the 1989 Exxon Valdez Oil Spill. Currently, the PWS herring population does not show signs of recovering. The Trustee Council recognized that conservation and improved management of injured resources and services will require substantial ongoing investment to improve understanding of the marine and coastal ecosystems that support the resources, as well as the people, of the spill region. In the

case of herring, this knowledge can only be provided through a long-term monitoring and research program that will span decades.

The collapse of the PWS herring fishery has impacted not only the economy and well-being of PWS communities, but also several species of seabirds that depend on herring. Herring are likely an important winter-period food supply for at least three of the five remaining (as of 2002) non-recovered bird species and/or bird groups including common loon (*Gavia immer*), pigeon guillemot (*Cepphus columba*), and cormorants (pelagic, red-faced, and double-crested). Juvenile herring has also been documented as an important food source for marbled murrelet, a recovering species and for common murre, a recovered species. Thus actions that identify and protect important overwinter areas for herring will benefit multiple injured species.

The effort proposed here is relevant to most of the 8 categories for herring proposals outlined in the Invitation. Our information will be critical to understanding seabird predators and their impact on herring. Our study will also provide information important for planning, modeling, mapping and intervention. Until now, predation has not been included in herring population models. Brown (2003) noted in her modeling work that including information on predation in a herring recruitment model may become increasingly important if recruitment failure continues in PWS. Information from our study on areas with high seabird predation will also be important for planning any future intervention.

II. PROJECT DESIGN

A. Hypotheses & Objectives

The overall hypothesis of the seabird predation project is that Pacific herring adult recruitment depends partly on the density and distribution of juvenile herring predators, including seabird predators. We will test this hypothesis by comparing juvenile herring abundance (0, 1, and 2 year olds) spatially and temporally, relative to the distribution and abundance of wintering piscivorous birds in PWS. The specific objectives are:

1. Characterize the spatial and temporal abundance of seabird predators in and around juvenile herring schools in PWS.
2. Characterize key habitats and characteristics of fish schools where seabird predation on juvenile herring is significant.
3. Model juvenile herring consumption by the most important seabird predators.

In meeting these objectives, we will be able to assist in the assessment of the role of seabird predation on adult herring recruitment by providing data to both herring and ecosystem modeling efforts.

B. Procedural and Scientific Methods

The impact of seabird predation on juvenile herring will be documented by observing the distribution, relative abundance and behavior of birds foraging on juvenile herring. Hydroacoustic surveys will provide detailed information on the vertical and horizontal distribution of schools (including total depth of water, depth to each fish school, depth below each school) as well as density and biomass of juvenile herring populations in PWS during winter (October through March). Fish

schools observed with the acoustic equipment will also be sampled with mid-water trawls to determine species composition and size structure. Based on their observations of marbled murrelets, Ostrand et al. (2004) suggested that multiple years of study were necessary to define prey selection. To determine predation impact on herring from seabirds we will conduct surveys over two consecutive winter seasons.

All study sites overlap with the juvenile herring hydroacoustic survey areas. Seabird surveys will be performed in conjunction with daytime and early-evening hydroacoustic transects for juvenile herring. For the hydroacoustic transects a commercial purse seiner runs a zigzag track, approximately 200m or greater from shore at a speed of approximately 6 knots (see R. Thorne’s EVOS proposal, “Trends in adult and juvenile herring distribution and abundance in PWS, and R. Crawford’s EVOS proposal, “Characterization of herring nursery habitat in PWS” for hydroacoustic methods). Seabird observations will be conducted from the same vessel along these transects, using established U.S. Fish and Wildlife Service protocols (Klosiewski and Laing 1994). One observer will record birds using a strip transect width of 200 m (100m both sides and ahead of the boat). Observations will be recorded into a GPS-integrated computer, which will provide location data for every record as well as sea conditions and weather. When possible we will conduct bird surveys concurrent with the herring surveys. However, if light is insufficient to identify species, we will repeat the same transects at the next available daylight, using the GPS-generated track lines recorded during the nocturnal herring surveys.

Table 2. Proposed winter surveys for seabird predators on juvenile herring in PWS. Surveys would be performed on boats conducting hydroacoustic surveys for juvenile herring (see proposals by R. Thorne and R. Crawford). Northeast (NE) PWS study area includes Sheep Bay, Simpson Bay, and Port Gravina.

Month	Calendar 2007	Calendar 2008	Calendar 2009
Jan		NE PWS	NE PWS
Mar	PWS NE PWS	PWS NE PWS	PWS NE PWS
Oct	NE PWS	NE PWS	
Nov	PWS NE PWS	PWS NE PWS	

We will attempt to visually identify any fish brought to the surface by birds, using 10x42 binoculars with built-in stabilizers, and a digital camera with stabilizer. Fish will be visually identified to the lowest possible taxon, using study guides developed by USGS and USFWS. The computer program (DLOG; Ford Consulting, Inc., Portland OR), will be arranged to simultaneously record foraging observations during the surveys. Foraging data will include observations of foraging activity of birds, including numbers and species of predators, behavior, and associated fish observations (visual, acoustic, or trawl-caught).

C. Data Analysis and Statistical Methods

To describe the relationship between seabird densities and juvenile herring biomass in PWS we will run linear regressions, using juvenile herring survey data provided from the hydroacoustic surveys. For each bird species, a best model for explaining variability in bird densities will be determined using a general linear model. A natural log or square root transformation of the dependent variable will be used when appropriate to improve the fit of the model to the data. The relationship between date, densities of each seabird species observed and herring biomass will be evaluated at two spatial scales: a) five broad geographic areas in PWS (see Fig. 1 below); b) all juvenile herring areas detected during PWS hydroacoustic surveys. Similar analyses will be used for data from the intensive northeast PWS study site of Sheep Bay, Simpson Bay and Port Gravina.

The main hypothesis, that seabird predation on juvenile herring impacts adult herring recruitment, will be examined by modeling juvenile biomass among sites relative to local seabird abundance and consumption. We will use multivariate logistic regressions to compare by year the characteristics of juvenile herring fish schools associated with seabirds to all other juvenile herring schools detected by hydroacoustics (Manly et al. 1993). Our analysis will focus on variables that appear to be important to seabird predation. These include school density, species composition and size structure, total water depth, depth to school, depth below each school, and distance from shore (Day and Nigro 2000; Ostrand et al. 1998, 2004, Kuletz 2005). If information on school area is available, we will include that too. Models will be developed that are composed of all possible combinations of variables, excluding interactions. Logistic regressions will be fitted to all equations within the model set and ranked based on Akaike's information criterion (Akaike 1973, Burnham and Anderson 1998). For each year we will determine importance values for each independent variable using the model sets (Burnham and Anderson 1998).

We will estimate daily juvenile herring consumption for the most numerous seabird predators. The biomass of juvenile herring consumed by each species of bird will be determined by: 1) the allometric daily energy needs of individuals of each species (from Visser 2002 and Hunt et al. 2000); 2) the abundance of each bird species at sites with juvenile herring (from our data); and, 3) the contribution of herring to the diet of each species (from literature and on-site observations). Information on the condition and caloric content of juvenile herring before and after winter will be provided by the proposed EVOS study, "PWS herring forage contingency" (PI Tom Kline). Our bioenergetics model, developed by Bishop and Green (2001) to estimate herring spawn consumption, is similar to that used by Madenjian and Gabrey (1995). We will use the following equation to calculate C , the daily juvenile herring consumption (total kg) per individual bird predator: $C = (FMR/MEC) \times P \times H$. For this equation, FMR = field metabolic rate ($\text{kJ}\cdot\text{d}^{-1}$), MEC = metabolizable energy coefficient of juvenile herring, P = estimated proportion of total energy acquired from juvenile herring and, H = biomass of juvenile herring (kg) needed to produce 1 kJ.

D. Description of Study Area

For Thorne's juvenile herring hydroacoustic and trawl surveys, coverage is comprehensive for PWS. Effort is allocated by several factors, including historical information, reports from fishermen, hunters and others transiting PWS, aerial surveys of seabirds and marine

mammals, and community observations. Thorne’s study will also adopt a sampling plan developed by Dr. Brenda Norcross (University of Alaska at Fairbanks) that includes 10 bays, based on historic observations of juvenile herring in spring and fall (Fig. 1). These include the four bays, Eaglek, Simpson, Whale and Zaikof Bays, that were sampled repeatedly during the SEA program (Norcross et al. 2001). Crawford’s study to characterize herring nursery areas will take place in Northeast PWS, and will include Sheep Bay, Simpson Bay, and Port Gravina.

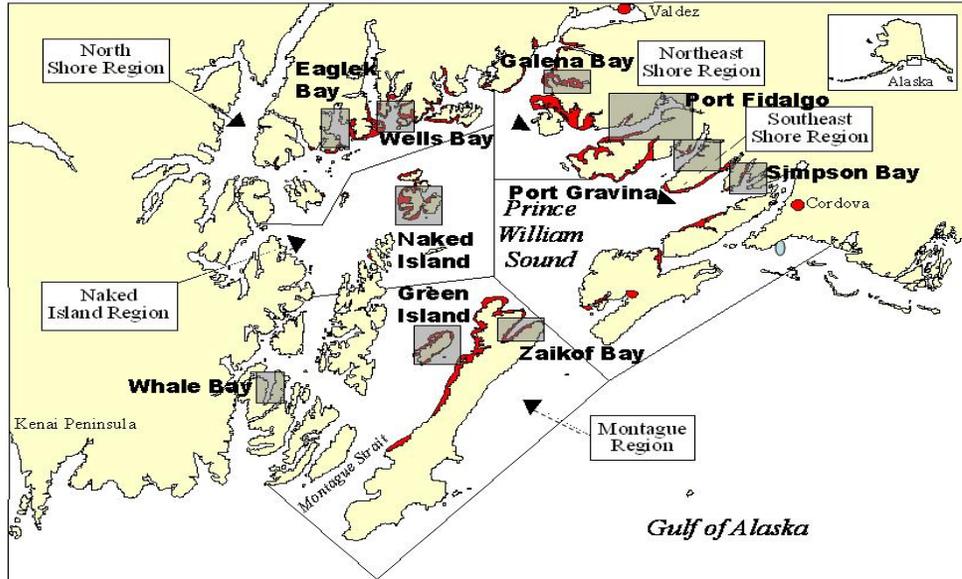


Figure 1. Map of PWS study area, including 10 bays identified as historically important for juvenile herring.

E. Coordination and Collaboration with Other Efforts

The proposed study will complement the North Pacific Seabird Observer Program funded by North Pacific Research Board in 2006, by contributing data on seabird abundance and distribution to the North Pacific Pelagic Seabird Database. This study is part of the PWS Science Center’s Herring Research Program, and is designed to complement the Science Center’s ongoing herring research, including the long-term study on Steller sea lion food limitation research. In addition, this study relies on conducting boat observations during hydroacoustic surveys that are part of 2 studies proposed to EVOS: Trends in adult and juvenile herring distribution and abundance in PWS” (PI Richard Thorne), and “Characterization of herring nursery habitat in PWS” (PI Richard Crawford). These two projects will also provide our project with data from the juvenile herring hydroacoustic and trawl surveys. The proposed study, “PWS herring forage contingency” (PI Tom Kline) will provide our study with information on the condition and caloric content of juvenile herring before and after winter, data that will be used in modeling seabird consumption. Finally, in addition to these three studies, our information on seabird predators will provide data to the proposed EVOS modeling study: “Life-stage specific ecosystem model of PWS Pacific Herring (PI D. Kiefer).

III. SCHEDULE

A. Project Milestones

1. Characterize the spatial and temporal abundance of seabird predators in and around juvenile herring schools in PWS. Completed September 2009.
2. Characterize key habitats and characteristics of sites where seabird predation on juvenile herring is significant. Completed September 2009.
3. Model the juvenile herring consumption by the most important seabird predators. Completed September 2009.
4. Assist in assessing the role of seabird predation on adult herring recruitment by providing data to herring recruitment model. Completed September 2009.

B. Measurable Project Tasks

- FY 07, 1st quarter (October 1, 2006-December 31, 2006)
Oct Project funding approved by Trustee Council
- FY 07, 2nd quarter (January 1, 2007-March 31, 2007)
Jan Annual Alaska Marine Workshop
Mar Field work (seabird/acoustic surveys) all PWS, & NE PWS intensive study site
- FY 07, 3rd quarter (April 1, 2007-June 30, 2007)
Apr 1-Jun 30 Analyze data
- FY 07, 4th quarter (July 1, 2007-September 30, 2007)
Jul 1-Sep 30 Analyze data
Sep 1 Submit annual report to EVOS
- FY 08, 1st quarter (October 1, 2007-December 31, 2007)
Oct Field work (seabird/acoustic surveys) NE PWS intensive study site
Nov Field work (seabird/acoustic surveys) all PWS, & NE PWS intensive study site
- FY 08, 2nd quarter (January 1, 2008-March 31, 2008)
Jan Field Work (seabird/acoustic surveys) NE PWS intensive study site
Annual Alaska Marine Workshop
Mar Field work (seabird/acoustic surveys) all PWS, & NE PWS intensive study site
- FY 08, 3rd quarter (April 1, 2008-June 30, 2008)
Apr 1-Jun 30 Analyze data
- FY 08, 4th quarter (July 1, 2008-September 30, 2008)
Sep 1 Submit annual report to EVOS and submit manuscript
- FY 09, 1st quarter (October 1, 2008-December 31, 2008)
Oct Field work
Nov Field work (seabird/acoustic surveys) all PWS, & NE PWS intensive study site
- FY 09, 2nd quarter (January 1, 2009-March 31, 2009)
Jan Annual Alaska Marine Workshop
Mar Field work (seabird/acoustic surveys) all PWS, & NE PWS intensive study site
- FY 09, 3rd quarter (April 1, 2000-June 30, 2009)
Apr 15 Prepare 2 manuscripts
- FY 09, 4th quarter (July 1, 2009-September 30, 2009)
Jul 1-Sep 30 Submit final report to EVOS (2 draft manuscripts for publication)

IV. RESPONSIVENESS TO KEY TRUSTEE COUNCIL STRATEGIES

A. Community Involvement and Traditional Ecological Knowledge (TEK)

Because of the extensive knowledge of local fishers, local guides, and the historic knowledge of native Alaskans, an interactive exchange will be of great benefit to the project. Direct input to the project will be solicited by the PI from the local native villages (Eyak, Tatitlek, and Chenega) and the local fishing and guide community to provide observations of large foraging seabird flocks. We will also use the EVOS-sponsored PWS Fisheries Research Application and Planning group (PWSFRAP) as an additional means to reach local fishers and guides about the project. Results of the project will also be fully available to the local community through presentations at PWSFRAP workshops and public seminars given through the PWS Science Center. Articles will also be written for the local newspaper, *The Cordova Times*, and for *The Breakwater*, the newsletter of the PWS Science Center informing the public of the study. The *Cordova Times* is publicly available. The Prince William Science Center also maintains a regional science education and outreach program. Our project will also use the education/outreach program to communicate the need and benefits of conservation of marine resources to the public and visiting student groups. As part of its outreach program, the PWS Science Center maintains an extensive web site. This project would be featured on the web, and would have links to the EVOS web site as well as links to any other collaborating projects.

B. Resource Management Applications

From a fisheries management standpoint information on seabird predation is important because if the seabird predator population remains relatively constant or increases, then the lower herring stock levels that PWS is currently experiencing could experience higher rates of predation. Until now, predation has not been included in herring population models. Brown (2003) noted in her modeling work of PWS herring that including information on predation in a herring recruitment model may become increasingly important if recruitment failure continues in PWS. Our study will provide information on the seabird component of herring predation. In addition, our study will provide data on habitat features that can be used to assist in identification of sites appropriate for restoration activities that will benefit herring and marine birds.

V. PUBLICATIONS AND REPORTS

In addition to annual reports, we foresee at least 3 peer-reviewed publications produced from this study. Their proposed titles, journals, and submission dates are:

- The relationship between seabirds and juvenile herring in Prince William Sound during winter. *Marine Ecology Progress Series*. September 2008.
- Food habits of seabirds in Prince William Sound during winter. *Journal Field Ornithology*. September 2009.
- Modeling biomass consumption of juvenile herring by avian predators in a sub-arctic estuary. *Fisheries Oceanography*. September 2009.

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Education

- Ph.D. Wildlife Ecology, Department of Wildlife & Range Sciences, University of Florida, Gainesville, 1988.
M.S. Wildlife & Fisheries Sciences, Department of Wildlife and Fisheries Sciences, Texas A & M University, College Station, 1984.
B.B.A. School of Business, University of Wisconsin-Madison, 1974.

Professional Experience

- 6/99-present Research Ecologist, Prince William Sound Science Center, Cordova, Alaska.
11/88-present Research Associate & Principal Investigator for Tibet Black-necked Crane Study, Intl. Crane Foundation, Baraboo, Wisconsin (location: Tibet, PR China).
3/97-5/99& Research Wildlife Biologist, Pacific Northwest Research Station, U.S. Forest
4/90-4/94 Service, Cordova, Alaska
4/94-3/97 Research Wildlife Biologist, Dept. Fisheries and Center Streamside Studies, Univ. Washington assigned to Copper River Delta Institute, US Forest Service
5/92-4/93 Acting Manager, Copper River Delta Institute, Pacific Northwest Research Station, U.S. Forest Service, Cordova, Alaska.
7/89-4/90 Wildlife Biologist, Forestry and Range Sciences Laboratory, Pacific Northwest Research Station, U.S. Forest Service, LaGrande, Oregon.
9/88-6/89 Biological Technician, Malacology Lab, Florida Museum of Natural History, Gainesville, Florida.
8/83-8/88 Project Biologist, Department of Wildlife and Range Sciences, University of Florida, Gainesville.

Awards

- U.S. Forest Service National *Taking Wing* Awards:
2001 Capacity Building Category
1999 Public Awareness & Community Involvement Category
1993 & 1997 Research Investigations Category
Tibet Autonomous Region, PR China:
1994 *Development of Science and Technology in Tibet* Award (2nd Place)
Wildlife Conservation Society: 1993 Research Fellow
The Wildlife Society
1992 Monograph Publication Award for "A conservation strategy for the Northern Spotted Owl," Interagency Scientific Committee (Team Member).
1991 Group Achievement Award for Participation as Team Member in Interagency Scientific Committee to Address the Conservation of the Northern Spotted Owl

Most Recent Publications

- Williams, T.D., N. Warnock, J. Y. Takekawa, and **M.A. Bishop**. *in press*. Flyway Scale Variation In Plasma Triglyceride Levels In Spring Migrating Western Sandpipers. *Auk*.
- Bishop, M.A.**, N. Warnock, J.Y. Takekawa. 2006. Spring migration patterns in Western Sandpipers. *Waterbirds around the world: in press*.
- Powers, S.P., **M. A. Bishop**, S. Moffit, and G. H. Reeves. 2006. Variability in freshwater, estuarine and marine residence of sockeye salmon (*Oncorhynchus nerka*) within the Copper and Bering River Deltas, Alaska. Pages XX–XX. In: C. A. Woody, editor. *Sockeye salmon ecology, evolution, and management*. American Fisheries Society, Symposium XX, Bethesda, Maryland. *In press*.
- Powers, S.P., **M.A. Bishop**, J. Grabowski and C.H. Peterson. 2006. Distribution of the invasive bivalve *Mya arenaria* L. on intertidal flats of southcentral Alaska. *Journal Sea Research*, 55: 207-216.
- Bishop, M.A.**, N. Warnock, and J. Takekawa. 2004. Differential spring migration of male and female Western Sandpipers at interior and coastal stopover sites. *Ardea* 92:185-186.

Other Relevant Publications

- Powers, S.P., **M.A. Bishop**, J.H. Grabowski, and C.H. Peterson. 2002. Intertidal benthic resources of the Copper River Delta, Alaska, USA. *Journal Sea Research* 47:13-23.
- Bishop, M.A.** and S.P. Green. 2001. Predation on Pacific herring (*Clupea pallasii*) spawn by birds in Prince William Sound, Alaska. *Fisheries Oceanography* 10 (Suppl.1): 149-158.
- Cooney, R.T., J.R. Allen, **M.A. Bishop**, D.L. Eslinger, T. Kline, B.L. Norcross, C.P. McRoy, J. Milton, J. Olsen, V. Patrick, A.J. Paul, D. Salmon, D. Scheel, G.L. Thomas, S.L. Vaughn, and T.M. Willette. 2001. Ecosystem control of pink salmon (*Oncorhynchus gorbuscha*) and Pacific herring (*Clupea pallasii*) populations in Prince William Sound. *Fisheries Oceanography* 10(1):1-13.
- Bishop, M.A.**, P. Meyers, and P.F. McNeley. 2000. A method to estimate shorebird numbers on the Copper River Delta, Alaska. *Journal Field Ornithology* 71(4):627-637.
- Bishop, M.A.**, and S.P. Green. 1999. *Sound Ecosystem Assessment (SEA): Avian predation on herring spawn in Prince William Sound*. Exxon Valdez Oil Spill Restoration Project final report (Restoration Project 96320-Q). Copper River Delta Institute, Cordova, Alaska and Center for Streamside Studies, University of Washington. 78pp.

Professional Collaborations

E. Clesceri (UNC-Chapel Hill), D. Crowley (Alaska Dept. Fish & Game), K. George (Alaska Dept. Environmental Conservation), J. Grabowski (U. Maine), O. Johnson (Montana State Univ.), T. Kline (PWSSC), E. Knudsen (USGS-BRD Anchorage), A. Lang (Intl. Crane Foundation), B. Lance (NOAA), A. LeSueur, F. Li (Intl. Crane Foundation), S. Moffit (Alaska Dept. Fish & Game), C. “Pete” Peterson, (Inst. Marine Sci., UNC-Chapel Hill), S. Powers (Univ. S. Alabama & Dauphin Island Sea Lab), G. Reeves (USFS Pac. NW. Res. Station & OSU), J. Takekawa (USGS-BRD-San Francisco), A. Taylor (Univ. Alaska-Fairbanks), R. Thorne (PWSSC), D. Tsamchu (Tibet Plateau Institute of Biology, PR China), N. Warnock (PRBO Conservation Sciences), T. Williams (Simon Fraser Univ.), C. Woody (USGS-BRD Anchorage)

Curriculum Vitae

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Anchorage, Alaska 99503

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Education

Ph.D. Biology, 2005	University of Victoria, British Columbia
B. S. Ecology & Evolutionary Biology, 1983	University of California, Irvine
M. S. Wildlife Ecology 1974	California State Polytechnic, San Luis Obispo, with Honors

Recent Professional Experience

1998-present	Alaska Seabird Specialist / At-Sea Program Coordinator, Migratory Bird Management, U.S. Fish and Wildlife Service
1989-1997	Principal Investigator, <i>Exxon Valdez</i> studies on marine birds, U.S. Fish and Wildlife Service
2000-present	Member, NOAA/NPFMC Groundfish Fisheries Plan Team

Related Professional Experience

Principal Investigator for North Pacific Pelagic Seabird Observer Program
Developed protocols and at-sea survey protocols in cooperative workshops
Consultant on listing petitions for marbled & Kittlitz's murrelets under Endangered Species Act
Consultant in selection of lands by EVOS Trustees, to mitigate injury to seabirds
Scientific advisor to Alaska Audubon Society.
Assist NOAA & NPFMC with Programmatic Environmental Impact Statements
International Fishers Forum (working groups to reduce bycatch of seabird and sea turtles)
Cooperate with NOAA on studies of seabird bycatch in fisheries
Coordinator of Seabird Observer Notes database; observations by NOAA fishery observers.

Committees

North Pacific Pelagic Seabird Database Management Team (USFWS & USGS)
Short-tailed Albatross Recovery Team (Endangered Species/ USFWS)
North Pacific Albatross Working Group
Alaska Seabird Working Group
Marbled Murrelet Technical Committee

Professional Societies

Pacific Seabird Group (Secretary, 1998-1999)
American Ornithologists' Union
Society of Conservation Biologists

Honors, Awards, and Fellowships

King Platt Memorial Award, University of Victoria, 1998 & 1999
Exceptional Service Award, *Exxon Valdez* Oil Spill, U.S. Fish and Wildlife Service, 1989
Regents Fellowship, University of California, Irvine, 1980, 1981

Seabird Predation on Juvenile Herring in PWS

Bishop (PWSSC) & Kuletz (USFWS)

Related Publications

- Carter, H.R. and K.J. Kuletz. 1995. Mortality of marbled murrelets due to oil pollution in North America. Pages 261-269. In: C.J. Ralph, G.L. Hunt, Jr., M.G. Raphael, and J.F. Piatt (eds). Ecology and Conservation of the Marbled Murrelet. USDA For. Serv. Gen. Tech. Rep. PSW-152.
- Kuletz, K.J. 2005. Foraging behaviour and productivity of a non-colonial seabird, the Marbled Murrelet (*Brachyramphus marmoratus*) relative to prey and habitat. Ph.D. Dissertation. University of Victoria, Victoria, British Columbia.
- Kuletz, K.J., D. Irons, J.F. Piatt, B. Agler, and D.C. Duffy. 1997. Long-term changes in diets and populations of piscivorous birds and mammals in Prince William Sound, Alaska. Pages 703-706 In: B.R. Baxter (ed.), Proceedings of the Symposium on the Role of Forage Fish in the Marine Ecosystem. Alaska Sea Grant College Program AK-SG-97-01.
- Kuletz, K. J., and S. J. Kendall. 1998. A productivity index for marbled murrelets in Alaska based on surveys at sea. *Journal of Wildlife Management* 62(2):446-460.
- Kuletz, K. J., S.W. Stephensen, D.B. Irons, E.A. Labunski, & K.M. Brenneman. 2003. Changes in distribution and abundance of Kittlitz's murrelets *Brachyramphus brevirostris* relative to glacial recession in Prince William Sound, Alaska. *Marine Ornithology* 31:133-140.

Other Publications

- Day, R.H., K. J. Kuletz, and D.A. Nigro. 1999. Kittlitz's murrelet (*Brachyramphus brevirostris*). In A. Poole and F. Gill, eds. *The Birds of North America*. Academy of Natural Sciences, Philadelphia, PA, and American Ornithologists' Union, Washington, DC.
- Golet, G. H., K. J. Kuletz, D. D. Roby, and D. B. Irons. 2000. Adult prey choice affects chick growth and reproductive success in pigeon guillemots. *Auk* 117(1):82-91.
- Golet, G. H., P. E. Seiser, A. D. McGuire, D. D. Roby, J. B. Fischer, K. J. Kuletz, D. B. Irons, T. A. Dean, S. C. Jewett, and S. H. Newman. 2002. Long-term direct and indirect effects of the 'Exxon Valdez' oil spill on pigeon guillemots in Prince William Sound, Alaska. *Marine Ecology Progress Series*. Vol 241: 287-304.
- Hayes, D.L. and K.J. Kuletz. 1997. Decline of Pigeon Guillemot populations in Prince William Sound, Alaska, and apparent changes in distribution and abundance of their prey. *Proc., Forage Fishes in Marine Ecosystems*. AK Sea Grant College Program, Univ. Alaska, AK-SG-97-01: 699-702.
- Kuletz, K. J. 1996. Marbled murrelet abundance and breeding activity at Naked Island, Prince William Sound, and Kachemak Bay, Alaska, before and after the *Exxon Valdez* oil spill. Pages 770-784 in S. D. Rice, R. B. Spies, D. A. Wolfe, and B. A. Wright, editors. *Proceedings of the Exxon Valdez oil spill symposium*. American Fisheries Society Symposium 18.
- Kuletz, K. and K. Rivera. 2002. Seabirds. pp. 144-200. In: Livingston, P.A. (ed). *Ecosystem Considerations for 2003*. Appendix C. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the EBS/AI and GOA. North Pacific Fishery Management Council, 605 W. 4th Ave, Suite 306, Anchorage, AK 99501. 230p.

Collaborators: Boldt, Jennifer, NOAA, E. Brown (UAF), V. Byrd (USFWS), G.Drew (USGS), D. Dragoo (USFWS), S. Fitzgerald (NOAA), G. Ford (R.G. Ford Consulting), G. Golet (TNC), S. Howlin (West Inc.), D. Irons (USFWS), S. Kendall (USFWS), L. McDonald (West Inc.), J. Piatt (USGS), K. Rivera (NOAA), S. Stephensen (USFWS)

DATA MANAGEMENT AND QUALITY CONTROL STATEMENT

EVOS Project: Seabird Predation on Juvenile Herring

Prince William Sound Science Center & US Fish & Wildlife Service

All the marine bird data collected in this study will be archived in the North Pacific Pelagic Seabird Database. We have abided by the Federal Government Data Committee standards for metadata and we have created our metadata form (see below).

Study Design and Statistical Analyses:

Survey methodology will follow protocols used by the U. S. Fish and Wildlife Service (Klosiweski and Laing 1994, Gould et al. 1982, Gould and Forsel 1989). Our survey track lines will depend on the concurrent juvenile herring surveys. For the juvenile herring surveys a purse seiner follows a zig-zag survey track, 200m from shore or greater. One observer will record birds using a strip transect width of 200 m (100m both sides and ahead of the boat). Observations will be recorded into a GPS-integrated computer, which will provide location data for every record as well as sea conditions and weather. Observers will sample continuously and use binoculars to aid in species identification. Observers will practice estimating distances with a duck decoy, and laser rangefinders will be used regularly to calibrate observers. We will survey most transects when wave height is <30 cm, and we will not survey when wave height is >60 cm. These surveys are not designed to provide population estimates; rather they will be used to calculate densities (birds / km²) of birds associated with juvenile herring (as determined by concurrent herring surveys).

We will visually identify any fish brought to the surface by birds, using 10x42 binoculars with built-in stabilizers, and a digital camera with stabilizer. Fish will be visually identified to the lowest possible taxon, using study guides developed by USGS and USFWS. The computer program (DLOG; Ford Consulting, Inc., Portland OR), will be prepared to simultaneously record foraging observations during the surveys. Foraging data will include observations of foraging activity of birds, including numbers and species of predators, behavior, and associated fish observations (visual, acoustic, or trawl-caught).

Metadata Form:

On the following page is a copy of the North Pacific Pelagic Seabird Database metadata form which conforms to the FGDC standards. Our data fit into your Taxonomic Sampling category. The fields associated with our data can be found in the list below:

Lat., Long, hour, minute, second, year, month, day, record number, type, distance, depth, species, number, behavior, transect, observer condition, weather, direction, wind, vessel, seas, observer name, glare conditions, comments (fish ID, etc) salinity, air temp, water temp.

All data will be used as it was collected, that is not reduced, although species numbers will be averaged for the individual transects and will analyzed as discussed earlier in this section.

Paradox or Access will be used with SAS to do analyses.

*This project was approved for FY 07, as submittd, by the Trustee Council on 11/14/06
The other years are pending, as submitted*

Budget Narrative

Total Project Estimate = \$609.2K for FY 2007 – FY 2010

Avian Predation on Juvenile Herring in Prince William Sound
US FISH & WILDLIFE SERVICE &
PRINCE WILLIAM SOUND SCIENCE CENTER
CORDOVA, ALASKA

Personnel Salaries & Fringe Benefits : \$383.8K

PWSSC: \$274.2K

FY07 = \$89.4, FY08 = \$95.3, FY09 = \$89.5, FY10 = \$0

Co-Principal (Lead) Investigator Bishop: Yrs 1, 2 & 3: 6.0 mo/yr (includes .5 mo/yr vessel time). For this project Bishop will assist with project design, execute a portion of avian surveys. Along with Kuletz, she will be responsible for statistical analysis and data interpretation and preparation of manuscripts. Bishop will also coordinate with the EVOS herring studies and the PWSSC- NOAA Congressional earmark study Stellar Sea Lion Winter Food Limitation study (the juvenile herring surveys component).

Research Biological technician Fritsch: Yr 1: 6.0 mo, Yr 2: 6.5 mo, Yr 3: 5.0 mo (includes 2 mo/yr vessel time)

For this project technician will assist with all field, laboratory work, and data entry.

USFWS: \$109.6K

FY07 = \$32.0, FY08 = \$32.9, FY09= \$33.8. FY10 =\$ 10.9

Co-Principal Investigator Kuletz: Yrs1, 2, & 3: 2.0 mo + 1 mo in-kind/yr (includes 0.5 mo/yr vessel time); YR 4: 1.0 mo. For this project Kuletz will assist with project design and will execute a portion of the avian surveys. Along with Bishop, she will be responsible for statistical analysis and data interpretation and preparation of manuscripts. While the USFWS is the trust agency for seabirds, this project is outside of normal USFWS monitoring operations. The USFWS bird surveys are conducted under different protocols and different times of the year, therefore the surveys conducted within this study require separate funding.

Research Biological technician Yrs 1, 2, & 3: 3.0 mo/yr + 1 mo in-kind (includes 1 mo vessel time).

For this project technician will assist with November and March field cruises, laboratory work, and data entry. This person will be hired specifically for this project, which is not part of normal USFWS operations.

Travel : \$30.6K

PWSSC: \$15.3K

FY07 = \$5.1, FY08 = \$5.1, FY09 = 5.1, FY10 = 0

Co-Principal Investigator Bishop, Cordova-Anchorage: Ticket price \$325, 4 trips, 10d; to meet with Co-Principal Investigator Kuletz & attend Jan 2008 Alaska Marine Symposium

Co-Principal Investigator Bishop attend National Meeting

USFWS: \$13.5K

FY07 = \$4.5, FY08 = \$4.5, FY09 = \$4.5, FY10 = 0

Co-PI and biological technicians are based in Anchorage, and will require travel expenses to PWS, which are not part of normal operating expenses: Anchorage-Cordova-: Ticket price \$325, 6 trips/yr, (2 people, 3 trips ea) to meet hydroacoustic charter vessel; Per diem while in Cordova 12 d/yr food & incidentals @ \$72/d. Lodging in Cordova (6 nights, 2 rooms @ \$85/d). Some travel may involve travel by car to Whittier to meet the boat, thus includes 4 RT truck and boat tunnel fee (Portage – Whittier). USFWS requires field per diem of \$3/d when working in the field; 2 people, 60 days winter @ \$3/d.

Contractual/Consultants : \$58.4K (\$387.7 of USFWS's contractual costs for PWSSC is spread across all cost codes within this justification)

PWSSC: \$13.4K

FY07 = \$4.8, FY08 = \$4.8, FY09 = \$3.8, FY10 = 0

Aircraft Charter: transport personnel to and from Cordova to charter vessels 6 @ 500/ea

Computer Network Costs (based on \$100/mo x 12 staff mo) = \$1200/yr (direct cost)

Phone/Fax/copy/mail/freight Charges (\$50/mo @ 12 mo) = \$600/yr (direct cost based on use only)

USFWS: \$45.K

FY07 = \$15.0, FY08 = \$15.0, FY09 = \$15.0, FY10 = 0 (this does not include the subcontract to the PWS Science Center, details of which are included in this narrative)

A statistician (contract) will be hired to assist in research design and data analysis.

Basic fees for use of USFWS skiff outside of normal duties, or to other agencies, is \$250/d. At an estimated 60 days = \$15K. Additional costs are anticipated for boat repairs and parts for skiff, if needed.

Commodities: \$3.0K

PWSSC: \$4.5K

FY07 = \$1.5, FY08 = \$1.5, FY09 = \$1.5, FY10 = 0

Supplies est. \$1,500 Includes scales, log books, scientific collecting jars, plastic bags, plastic buckets, field notebooks, office supplies, personnel gear, gps, recording equipment, fuel for Prince William Sound Science Center truck.

USFWS: \$3.K

FY07 = \$1.0, FY08 = \$1.0, FY09 = \$1.0, FY10 = 0

Includes IT supplies (backup disks, batteries, electronics, etc) for use during in-field data collection and in-office data management and analysis. Vehicle travel to Whittier and preparations in Anchorage will rely on in-kind GSA vehicle (user fee = \$3k).

Equipment: \$1.3K

PWSSC: \$1.3K

FY07 = \$1.3, FY08 = \$0, FY09 = 0, FY10 = 0

1 laptop @ \$1300 for use during seabird surveys . PWSSC will be providing a Seabird 19-B Profiler that includes a Wetlab fluoremeter/turbidity sensor.

USFWS: \$.0K

FY07 = \$0, FY08 = \$0, FY09 = 0, FY10 = 0

In-kind equipment user fee (computers, survival suits, electronics, binoculars, rangefinders, etc.) estimated at \$10k. These are needed to conduct bird surveys on board research vessels, and the equipment deteriorates from use in winter conditions.

Indirect Costs: \$129.4K

PWSSC: \$79.K

FY07 MTID is 25.57%, and has been negotiated and approved by NOAA.
FY08 & FY09 are estimated at the same amount

USFWS: \$50.4K

As a Trustee Agency, the GA is 9%

2007 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2006 - September 30, 2007

Budget Category:	Authorized FY 2006	Approved FY 2007	Pending FY 2008	Pending FY 2009	Pending FY 2010	Total Project
Personnel		\$32.0	\$32.9	\$33.8	\$10.9	\$109.6
Travel		\$4.5	\$4.5	\$4.5	\$0.0	\$13.5
Contractual		\$143.2	\$149.0	\$140.5	\$0.0	\$432.7
Commodities		\$1.0	\$1.0	\$1.0	\$0.0	\$3.0
Equipment		\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Subtotal	\$0.0	\$180.7	\$187.4	\$179.8	\$10.9	\$558.8
General Administration		\$16.3	\$16.9	\$16.2	\$1.0	\$50.4
Project Total	\$0.0	\$197.0	\$204.3	\$196.0	\$11.9	\$609.2
Full-time Equivalents (FTE)		0.4	0.4	0.4	0.1	
Dollar amounts are shown in thousands of dollars.						
Other Resources		\$108.0	\$78.0	\$78.0	\$12.0	

Only FY 07 as submitted was approved by the Trustee Council on 11/14/06; The other years are pending.

Comments:
 Cost-share Funds FY 2007:
 In this box, identify non-EVOS funds or in-kind contributions used as cost-share for the work in this proposal. List the amount of funds, the source of funds, and the purpose for which the funds will be used. Do not include funds that are not directly and specifically related to the work being proposed in this proposal.

In-kind contributions:
 Kathy Kuletz salary (GS12 for 1 months) = \$10K
 Boat user fee (60 days @ 250/day) = \$15k
 Equipment user fee (computers, survival suits, electronics, binoculars, rangefinders, etc.) = \$10k
 GSA vehicle user fee = \$3k

FY 2007 - FY 2010

Project Number: 070814
 Project Title: Seabird Predation on Juvenile Herring in PWS
 Agency: DOI - US Fish and Wildlife Service

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Prepared: July 26, 2006
 format revisions: August 12, 2006

2007 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2006 - September 30, 2007

Personnel Costs:		GS/Range/Step	Months Budgeted	Monthly Costs	Overtime	Proposed FY 2007
Name	Position Description					
Kuletz	Co-project Leader	GS/12/5	2.0	10.0		20.0
Unknown	Biological Technician	GS/7/1	3.0	4.0		12.0
						0.0
						0.0
						0.0
						0.0
						0.0
Subtotal			5.0	14.0	0.0	
Personnel Total						\$32.0
Travel Costs:		Ticket Price	Round Trips	Total Days	Daily Per Diem	Proposed FY 2007
Description						
Truck and boat tunnel fee (Portage - Whittier)		0.1	4			0.4
Per diem (camp rate), 2 people, 60 days winter @ \$3/d				60		0.2
Per diem (Cordova), 1 person per trip (\$72/d)			6	12	0.1	0.9
Lodging, 6 nights, 2 rooms @ \$85/night/room (Cordova)				6	0.2	1.2
6 RT flights, Anchorage-Cordova		0.3	6			1.8
						0.0
						0.0
						0.0
						0.0
Travel Total						\$4.5

FY07

Project Number: 070814
 Project Title: Seabird Predation on Juvenile Herring in PWS
 Agency: DOI - US Fish and Wildlife Service

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Prepared: July 26, 2006

2007 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2006 - September 30, 2007

Contractual Costs:		Proposed
Description		FY 2007
Statistician (contract)		10.0
Boat repairs and parts		5.0
Insert 4A/B Link		128.2
When a non-trustee organization is used, the form 4A is required.		
Contractual Total		\$143.2
Commodities Costs:		Proposed
Description		FY 2007
IT supplies (backup disks, batteries, electronic support, etc)		1.0
Commodities Total		\$1.0

FY07

Project Number: 070814
 Project Title: Seabird Predation on Juvenile Herring in PWS
 Agency: DOI - US Fish and Wildlife Service

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Prepared: July 26, 2006

2007 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2006 - September 30, 2007

Contractual Costs:		Proposed
Description		FY 2008
Insert 4A/B Link		134.0
Statistician (contract)		10.0
Boat repairs and parts		5.0
When a non-trustee organization is used, the form 4A is required.		
Contractual Total		\$149.0
Commodities Costs:		Proposed
Description		FY 2008
IT supplies (backup disks, batteries, electronic support, etc)		1.0
Commodities Total		\$1.0

FY08

Project Number: 070814
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2007 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2006 - September 30, 2007

Prepared: July 26, 2006

New Equipment Purchases:		Number of Units	Unit Price	Proposed FY 2008
Description				
Those purchases associated with replacement equipment should be indicated by placement of an R.				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
New Equipment Total				\$0.0
Existing Equipment Usage:		Number of Units	Inventory Agency	
Description				
	usfws skiff w motor	1	fws	

FY08

Project Number: 070814
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Prepared: July 26, 2006

2007 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2006 - September 30, 2007

Contractual Costs:		Proposed
Description		FY 2009
Insert 4A/B Link		125.5
Statistician (contract)		10.0
Boat repairs and parts		5.0
When a non-trustee organization is used, the form 4A is required.		
Contractual Total		\$140.5
Commodities Costs:		Proposed
Description		FY 2009
IT supplies (backup disks, batteries, electronic support, etc)		1.0
Commodities Total		\$1.0

FY09

Project Number: 070814
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 Agency: DOI - US Fish and Wildlife Service

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Prepared: July 26, 2006

2007 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2006 - September 30, 2007

Contractual Costs:		Proposed
Description		FY 2010
Insert 4A/B Link		0.0
When a non-trustee organization is used, the form 4A is required.		
Contractual Total		\$0.0
Commodities Costs:		Proposed
Description		FY 2010
Commodities Total		\$0.0

FY10

Project Number: 070814
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Prepared: July 26, 2006

2007 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2006 - September 30, 2007

New Equipment Purchases:		Number of Units	Unit Price	Proposed FY 2010
Description				
Those purchases associated with replacement equipment should be indicated by placement of an R.				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
New Equipment Total				\$0.0
Existing Equipment Usage:		Number of Units	Inventory Agency	
Description				

FY10

Project Number: 070814
 Project Title: Seabird Predation on Juvenile Herring in PWS
 Agency: DOI - US Fish and Wildlife Service

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Prepared: July 26, 2006

2007 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2006 - September 30, 2007

Budget Category:	Authorized FY 2006	Proposed FY 2007	Proposed FY 2008	Proposed FY 2009	Proposed FY 2010	Project Total
Personnel		\$89.4	\$95.3	\$89.5	\$0.0	\$274.2
Travel		\$5.1	\$5.1	\$5.1	\$0.0	\$15.3
Contractual		\$4.8	\$4.8	\$3.8	\$0.0	\$13.4
Commodities		\$1.5	\$1.5	\$1.5	\$0.0	\$4.5
Equipment		\$1.3	\$0.0	\$0.0	\$0.0	\$1.3
Subtotal	\$0.0	\$102.1	\$106.7	\$99.9	\$0.0	\$308.7
Indirect		\$26.1	\$27.3	\$25.6	\$0.0	\$79.0
Project Total	\$0.0	\$128.2	\$134.0	\$125.5	\$0.0	\$387.7
Full-time Equivalents (FTE)		1.0	1.0	0.9	0.0	
Dollar amounts are shown in thousands of dollars.						
Other Resources		\$70.0	\$40.0	\$40.0		

Comments: Bird Surveys would be conducted on vessel charters provided by 3 collaborative projects:

- 1) "Trends in adult and juvenile herring distribution and abundance in Prince William Sound" (Principal Investigator Richard Thorne, Prince William Sound Science Center) proposed for EVOS 07 funds
- 2) "Characterization of herring nursery habitat in Prince William Sound" (Principal Investigator Richard Crawford, Prince William Sound Science Center) proposed for EVOS 07 funds.
- 3) Stellar Sea Lion Winter Food Limitation study (Nov 07 juvenile herring survey; Principal Investigator Richard Thorne, Prince William Sound Science Center), funded by NOAA.

FY 2007 - FY 2010

Project Number: 070814
 Project Title: Seabird Predation on Juvenile Herring in PWS
 Agency: PWS Science Center, Dr. Mary Anne Bishop

Prepared: August 1, 2006
 Format revisions: August 12, 2006

2007 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2006 - September 30, 2007

Contractual Costs:		Proposed
Description		FY 2007
Vessel Charter - provided by Thorne collaborative EVOS proposal		
Vessel Charter - Northeast PWS, provided by Crawford collaborative EVOS proposal		
Vessel Charter - provided by Thorne collaborative NOAA Stellar Sea Lion (Nov 07 survey)		
Aircraft Charter Cordova to PWS charter vessel 6@\$500 ea		3.0
network costs (based on \$100/mo x staff mo)		1.2
phone/fax/copying charges/mail/freight		0.6
	Contractual Total	\$4.8
Commodities Costs:		Proposed
Description		FY 2007
field, office & lab supplies		1.5
	Commodities Total	\$1.5

FY07

Project Number: 070814
 Project Title: Seabird Predation on Juvenile Herring in PWS
 Agency: PWS Science Center, Dr. Mary Anne Bishop

Prepared: August 1, 2006

2007 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2006 - September 30, 2007

Those purchases associated with replacement equipment should be indicated by placement of an R.

New Equipment Purchases:		Number	Unit	Proposed
Description		of Units	Price	FY 2007
	Laptop computer	1	1.3	1.3
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
Those purchases associated with replacement equipment should be indicated by placement of an R.				0.0
New Equipment Total				\$1.3
Existing Equipment Usage:		Number		
Description		of Units		
	Laboratory - Prince William Sound Science Center		1	
	Safety equipment - Prince William Sound Science Center		1	
	Desktop Computers and software (PWSSC)		2	
	CTD w fluorescence & turbidity		1	

FY07

Project Number: 070814
 Project Title: Seabird Predation on Juvenile Herring in PWS
 Agency: PWS Science Center, Dr. Mary Anne Bishop

Prepared: August 1, 2006

2007 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2006 - September 30, 2007

Contractual Costs:		Proposed
Description		FY 2010
Contractual Total		\$0.0
Commodities Costs:		Proposed
Description		FY 2010
Commodities Total		\$0.0

FY10

Project Number: 070814
 Project Title: Seabird Predation on Juvenile Herring in PWS
 Agency: PWS Science Center, Dr. Mary Anne Bishop

Prepared: August 1, 2006

