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Scoter Life History and Ecology: Linking Satellite Technology with Traditional Knowledge to Conserve the Resource

Project Number:	00273
Restoration Category:	Research
Proposer:	D. Rosenberg/ADFG
Lead Trustee Agency:	ADFG
Cooperating Agencies:	None
Alaska SeaLife Center:	No
New or Continued:	Cont'd
Duration:	3rd yr. 3 yr. project
Cost FY 00:	$205.4
Cost FY 01:	$0.0
Cost FY 02:	$0.0
Geographic Area:	Prince William Sound, lower Cook Inlet
Injured Resource/Service:	Subsistence, intertidal community

ABSTRACT

This project will study the life history and ecology of surf scoters that over-winter in or migrate through Prince William Sound. This information will be integrated with traditional ecological knowledge. Scoter populations in Alaska are declining. Communities in Prince William Sound and lower Cook Inlet harvest scoters for subsistence purposes. Scoters are among the least studied of North American waterfowl and little is known of their life history, ecology, and distribution. Scoters will be marked with surgically implanted satellite transmitters to define the breeding areas, molting areas, and wintering areas. To reduce mortality rates, scoters will be transported to the Alaska SeaLife Center for surgery and recuperation. Dialogue with community members will continue in order to collect traditional ecological knowledge and convey project information. Participation of local students will be encouraged through the Youth Area Watch project (/210).

INTRODUCTION

This project will study the life history and ecology of surf scoters (*Melanitta perspicillata*) that winter or migrate through Prince William Sound (PWS) and integrate this information with traditional ecological knowledge collected from community members within the study area. In the first year (FY98) we initiated a pilot project to test the feasibility of catching scoters in PWS. In late-April and early-May, 1998 we marked ten birds with surgically implanted satellite transmitters (Rosenberg and Petrula, in prep.). Satellite telemetry is providing information that allows us to define breeding, molting, and wintering areas of this subsistence resource. In FY99 (April/May) we marked an additional fifteen surf scoters and ten white-winged scoters with satellite transmitters. In both years mortality rates were high. We believe predation within two weeks of surgery was the ultimate cause of mortality. In FY00 we propose changing methods to allow birds to recuperate from surgery in a predator-free environment at the Alaska SeaLife Center (ASLC).

Since 1977, scoters in Alaska have been estimated to decline by as much as 40% (Hodges et al. 1996). Between 1972-1973 and 1989 estimated winter populations of scoters in PWS declined from 56,600 to 14,800 birds. Summer populations (July) declined from 13,000 to 5,400 birds (Klosiewski and Laing, 1994). An estimated 1,000 scoters died as a direct result of the *Exxon Valdez* oil spill (John Piatt, pers. comm.). Since the spill, the number of wintering scoters in PWS may be increasing (Agler and Kendall 1977), but are still below historical levels. Initially, the spill had a negative effect on summer populations of scoters in PWS (Klosiewski and Laing 1994). However, by 1998, Irons et al. (in prep.) no longer detected an oil spill effect in summer.

Scoters are an important subsistence resource to the people living in the communities of PWS and LCI (James Fall, ADF&G, pers. comm., Gary Kompkoff, Tatitlek IRA, pers. comm.) These species of seaducks comprise the large majority of the sea duck harvest in the communities of Tatitlek, Chenega Bay, Port Graham, and Nanwalek (Scott et al. 1996). Residents of the communities affected by the *Exxon Valdez* Oil Spill remain concerned about the abundance of their traditional food resources and maintaining their cultural ties to their traditional use of fish and wildlife (*Exxon Valdez* Oil Spill Trustee Council, 1999). In 1993, 55% of the households in Tatitlek reported using scoters harvested for subsistence purposes, as did 40% of the households in Nanwalek and almost 12% of Port Graham households (Scott et al. 1996).

Scoters are among the least studied of North American waterfowl (Godfrey 1989, Savard and Lamothe 1991, Henny et al. 1995, Savard et al. 1998). Little is known about the ecology, breeding areas, molting areas, and migration routes of these species anywhere in North America (Bellrose 1976; Herter et al. 1989; Goudie et al. 1994, Savard et al. 1998). Surf scoters, black scoters (*M. nigra*), and white-winged scoters (*M. fusca*) all occur in PWS and lower Cook Inlet. Among these, the surf scoter is the most abundant (Isleib and Kessel 1973). It occurs as both a year-round resident and migrant. Surf scoters are most numerous in spring due to the influx of migrants probably in response to spawning Pacific herring (*Clupea pallasi*) (Isleib and Kessel, 1973; Bishop et al. 1995). Nonbreeders remain in PWS in summer, although these birds may not be part of the PWS winter population. Basic ecological information is lacking for scoter populations that use PWS.

Most scoters depart PWS in spring to unknown nesting areas, perhaps in interior Alaska and the Yukon (Gabrielson and Lincoln 1959), as far north as the Mackenzie Delta and the Brooks Range (Johnson and Richardson 1982), and as far east as the Horton River, Yukon Territory

(Rosenberg and Petrula 1999, Rosenberg and Petrula, in prep.). Male seaducks abandon incubating females in early summer and congregate at communal molting sites (Salomonsen 1968). Often these areas are distinct from nesting or wintering areas. Three male surf scoters marked in PWS, bypassed breeding areas and migrated by a coastal route to molting areas at the mouth of the Kuskokwim River (Rosenberg and Petrula 1999, Rosenberg and Petrula, in prep.). As with other waterfowl, wing feathers are lost simultaneously, rendering birds flightless for about one month until new feathers emerge.

In winter, scoters feed in intertidal and subtidal zones, areas susceptible to contaminants (Vermeer and Peakall 1979). Among the three scoter species, surf scoters are most associated with intertidal areas in PWS (Patten et al. 1998). They feed primarily on bivalves, especially mussels (Crow 1978, Vermeer 1981), but in spring they may switch to a diet composed primarily of herring roe (Vermeer 1981, Goudie et al. 1994, Bishop et al. 1995).

Sea ducks are among the species most vulnerable to mortality from oil spills (Piatt et al. 1990). Further compounding any direct mortality from the spill, is contamination or reduction of their principal food resources. Mussels and intertidal sediments in PWS showed increases in petroleum hydrocarbon concentrations directly attributable to *Exxon Valdez* oil (Short and Babcock 1996), and oil in mussel beds in PWS and the Kenai Peninsula persisted for several years after the spill (Babcock et al. 1996). Further, the PWS herring stocks suffered a dramatic decline in 1993 and stocks have remained depressed (Morstad et al. 1997). The large increase in sea otter populations since the mid-1900's may have led to increased competition for food between scoters and otters (Nanwalek residents, pers. comm.). Quite likely, any decline results from a combination of factors such as food and habitat changes, contaminants, or climate change.

The large decline in PWS between 1972-1973 and 1989 may be a result of long-term oscillations in ocean temperatures in the Gulf of Alaska (Piatt and Anderson 1996) or effects from exposure to contaminants. Several studies have shown scoters and other sea ducks to bioaccumulate trace metals and organochlorines from their environment (Vermeer and Peakall 1979, Henny et al. 1991, Olendorf et al. 1991, Henny et al. 1995). White-winged scoter die-offs occurred in the Cape Yakataga area in southeast Alaska during 1990-1992 (Henny et al. 1995). Although no definitive cause could be identified, elevated levels of cadmium were detected in the birds, but no source of contamination could be identified. The difficulty of detecting a source of contamination was confounded by lack of specific information on breeding, molting, or wintering areas.

Human activities, such as hydroelectric development (Savard and Lamothe 1991), estuarine pollution (Ohlendorf et al. 1991), or introductions of exotic species (Bordage and Savard 1995) on the breeding, wintering, or molting areas potentially have profound affects on abundance or distribution of a population. The lack of information on distribution and migration patterns can prevent the identification of potential harmful environmental exposures or alterations and make it extremely difficult to determine possible causes of population declines. Location of and links between breeding grounds, migration routes, and timing of migration are important factors used to evaluate contaminant uptake or loss in a migratory species as well as changes to food resources and other environmental changes (Henny et al. 1991). Nesting is considered one of the weakest links in the life cycle, especially with regard to contaminant effects (Henny et al. 1995).

In the first two years of this project mortality rates of surgically implanted birds were high. Within the first two weeks following surgery, mortality was about 50% for both surf and white-winged scoters. This compares with a mortality rate of 3.4% in the same 14-day post-release period for harlequin ducks with similar surgeries to implant lighter VHF transmitters (Mulcahy and Esler, in press). In 1998, poor weather was thought to be a contributing factor. However, weather did not appear to be a factor in 1999 and mortality rates were equally high. Ninety percent of the mortality we observed occurred within the first seven days after surgery. In 1999, we detected no significant difference in internal body temperature in the first two week period after surgery between the birds that survived and those that died (p=.197). Among those that survived, body temperatures were not significantly different, during the first two week period after surgery than later periods (p=.361).

PWS has a large population of bald eagles (*Haliaeetus leucocephalus*) and glaucous-winged gulls (*Larus glaucescens*). These species, which are waterfowl predators, concentrate in areas of herring spawn. Other potential predators also exist in the nearshore environment. Unlike harlequin ducks, our surgeries were conducted in spring when important food sources, such as pacific salmon, are less available to these predators. Nineteen ninety-eight and 1999 were also poor years for herring spawning activity (ADF&G 1999), perhaps further concentrating predators or increasing the necessity to find additional food sources.

We suspect that behavior of implanted scoters is altered as a result of surgical trauma, increasing their vulnerability to predators. Once birds survive two weeks post-surgery, mortality rates decline significantly. In 1998, of the four birds that survived beyond two weeks, only one died. This bird, a female surf scoter died nine weeks after surgery and five weeks after travelling to the nesting grounds in the Northwest Territories. In 1999, 3 of 15 implanted birds, alive after 14 days, died as of June 28, 1999. Two of these birds died within 16 and 20 days of surgery and one died in the interior, during migration, in very close proximity to a subsistence hunting camp. No post-release mortality occurred in five surgically implanted white-winged scoters in the interior of Alaska (Deborah Rudis, USFWS, pers.comm.). As surgical methods were similar, we attribute their success to few predators. We propose to test this hypothesis by holding birds in a predator-free environment at the ASLC for two weeks following surgery. Birds will then be released in PWS.

External backpack-mounted transmitters attached with harnesses have the potential to eliminate the need for surgery. However, internal transmitters have the advantage of eliminating hydro- and aerodynamic drag. Hydrodynamic drag is an important consideration in diving birds. Further, an external satellite transmitter reinforced for dive pressure will increase the transmitter weight from a minimum of 20 grams to 28 grams (Paul Howey, Microwave Telemetry, pers. comm.). In addition to increased drag (Gessaman and Nagy 1988, Holliday et al. 1988), harness arrangements have caused increased feather wear, lower survival rates, and lower reproductive success in wild mallards (Chabaylo 1990, Pietz et al. 1993, Dzus and Clark 1996, Paquette et al. 1997). With future advancements in transmitter and receiver design, harness and other alternative attachment methods will warrant experimentation in sea ducks. Currently though, we believe implants have the best potential to document scoter distribution without interfering with survival and reproduction.

In summary, little is known about the ecology, breeding areas, molting areas, and migration routes of scoters anywhere in North America. Population trends in scoters are uncertain, but appear to be declining in most regions. Affiliations between breeding and wintering areas are unknown, compounding meaningful integration of survey data. The susceptibility of seaducks to contaminants is a concern to resource managers and subsistence consumers. Determining distribution is the first step in assessing breeding, wintering, and molting ecology. Potential breeding and molting sites range throughout Alaska and western Canada. We propose a program that will integrate traditional knowledge, scientific methods, and modern technology to perpetuate the subsistence patterns of these communities. This will be accomplished through greater understanding of scoter life history and ecology, sharing knowledge with local community members, involving the youth of the communities in the restoration process, and improving conservation strategies for this species.

White-winged scoters, black scoters, and Barrow's goldeneyes (*Bucephala islandica*) are also an important subsistence resource to communities in PWS and LCI (Scott et al. 1996). Using EVOS funds as a financial match, we received a grant to purchase and monitor 10 satellite transmitters. These were placed in White-winged scoters in PWS in 1999. This year we will pursue grants to fund the purchase of additional satellite transmitters.

This project is integrated with project \052B Traditional Ecological Knowledge, project \210 Youth Area Watch, project \025 Nearshore Vertebrate Predator Project, \320 Predation on Herring Spawn, project \407 proposed Harlequin Duck Recovery Monitoring, and project \159 Prince William Sound Marine Bird Surveys.

We have created an Internet site that provides information on this project and tracks the movements of satellite transmitted birds (Rosenberg and Petrula 1999). Movements of marked birds will be regularly updated.

NEED FOR THE PROJECT

A. Statement of Problem

Scoters are an important component of the traditional culture of the communities affected by the oil spill and scoter populations in Alaska and PWS have been declining. Native inhabitants of PWS have used scoters (locally known as black ducks) as a subsistence resource for centuries. Surf scoters, black scoters, and white-winged scoters, are the most abundant avian species found at archeological sites in PWS (Linda Yarborough, USFS, pers. comm). However, little is known about the distribution or movements of these birds within or outside of PWS. Although scoters are known to breed throughout much of Alaska and Canada (Gabrielson and Lincoln 1959; Godfrey 1986), until this project (Rosenberg and Petrula in prep.) nothing was known about specific populations and the affiliations between winter, breeding, and molting areas. The few studies that have identified molting sites have not made the link between these and winter and breeding areas (Johnson and Richardson 1982, Dau 1987).

In marine environments, scoters feed on bivalves, especially blue mussels (*Mytilius edulis*), species known to concentrate contaminants. Herring roe, another important food source has become less abundant, as herring stocks have recently declined in PWS. As mentioned, scoters are known to bioaccumulate contaminants and die-offs have occurred, including several among white-winged scoters at Cape Yakataga, in southeast Alaska (Henny et al. 1995). The cause of this die-off was undetermined. Individual scoters range over a broad geographic area. They are susceptible to environmental changes and habitat alterations over their entire range.

Exposure of migratory waterfowl to contaminants or other mortality factors may occur during migration, nesting, molting, or at wintering areas. To begin to understand factors such as contaminants that may limit or reduce populations we first need to make the affiliations between winter, breeding, and molting areas. This would allow us to direct sampling and monitoring efforts at specific population segments. Traditional marking of birds with metal leg bands has little success with sea ducks because so few birds are killed in the harvest. The vast geographic range of the birds (Rosenberg and Petrula 1999, Rosenberg and Petrula in prep.) makes conventional telemetry impractical and costly. Satellite telemetry studies offer the best method for identifying migration routes, staging areas, and breeding, molting, and wintering sites.

Finding a solution to the high rate of mortality experienced by implanting satellite transmitters in sea ducks in winter and spring in marine environments will allow for the continued use of this valuable technology.

B. Rationale/Link to Restoration

The location of breeding grounds, migration routes, winter areas, and the timing of migration are all critical factors used to evaluate contaminant uptake or loss in a migratory species as well as evaluating the consequences of other environmental disturbances or changes (Henny et al. 1991). Scoter populations are susceptible to natural and man-made disturbances over a wide and inaccessible geographic area.

To conserve these subsistence resources and restore the traditional activities associated with these two species, we have proposed to identify their movements, distribution, and ecological relationships using satellite telemetry. This information is necessary to identify problems and develop and implement management strategies to promote the species long-term conservation. We hope this information and the activities associated with collecting this data will 1) allow resource managers to reverse population declines; 2) renew local confidence in the health of this food supply; 3) help maintain traditional lifestyles; 4) provide opportunities to the youth of local communities to promote their historical connection with this subsistence resource; 5) merge traditional knowledge with modern science to develop a more complete understanding of scoter and goldeneye life history and ecology; and 6) help students develop skills to promote the long-tern conservation of this species and others important to their economy and lifestyle.

Restoration requires assessment of population health and definition of impediments to recovery. The tasks presented in this proposal will begin the process of understanding the factors that affect population dynamics in surf scoters and develop management strategies to ensure the long-term health and welfare of the population. Without an understanding of the underlying events that influence population change, we can not prescribe specific activities to conserve or enhance the population.

C. Location

In FY 00 capture work will be conducted in Prince William Sound. Capture sites will occur in northern PWS between Valdez and Cordova and on northern Montague Island. The abundance and distribution of birds will ultimately determine sites. Surgery and recuperative care will be conducted at the ASLC in Seward.

In FY00, community involvement (Chugach School District, Youth Area Watch, and traditional knowledge) will be focused in the villages of Tatitlek, Chenega Bay, Nanwalek, and Port Graham. Nanwalek and Port Graham are not within the Chugach School District and are not part of the Youth Area Watch Program.

COMMUNITY INVOLVEMENT AND TRADITIONAL ECOLOGICAL KNOWLEDGE

This program will continue to exchange information with residents of the communities of Prince William Sound and lower Cook Inlet. In FY98 and FY99 the principal investigator exchanged information and attended workshops in Tatitlek, Chenega Bay, Nanawalek, Seldovia, and Port Graham. The principal investigator was a member of the planning team for the youth-elders subsistence conference in Cordova and presented findings of this study at the conference and at the EVOS annual workshop. The principle investigator has also made presentations and exchanged information and ideas at community facilitator meetings in Anchorage.

Efforts have and will continue to be made throughout the restoration process to participate in and provide public involvement in the design and implementation of this project. The project will continue to inform and coordinate our community involvement activities, including the collection of indigenous knowledge with Dr. Henry Huntington, TEK specialist Chugach Regional Resources Commission; Hugh Short, Community Coordinator, EVOS Restoration Office; Roger Sampson and Rick DeLorenzo, Chugach School District; and the Subsistence Division of the Alaska Department of Fish and Game.

Information gathered from this project will continue to be shared with local communities. We will continue to gather information on TEK through synthesis workshops, local community facilitators, and residents. The Chugach School District, through Youth Area Watch, will provide interested students and teachers to participate in capture and monitoring. We have initiated a sea duck monitoring program in the Tatitlek Narrows through the YAW program and Tatitlek School. The school district will provide classroom aides (computer and software, maps etc.) to be used in local schools for monitoring bird movements throughout the year. ADF&G will relay satellite-monitoring information to local communities. Students will assist in collecting information from local residents on TEK, and report band returns from local hunters.

Project personnel will adhere to the protocols for including indigenous knowledge in the restoration process presented in Appendix C of the Invitation to Submit Restoration Proposals for Federal FY 2000. Boat and air charter contracts, and other services will be contracted from local sources when possible.

PROJECT DESIGN

A. Objectives

<u>FY 00:</u>

1) Capture 15 surf scoters and 10 white-winged scoters in spring on saltwater in PWS,

2) Mark 8 adult female and 7 adult male surf scoters and 6 female and 4 male white-winged

scoters with surgically implanted satellite telemetry transmitters*;

3) Capture and band as many additional seaducks as time and budget allows;

4) Collect and archive blood and feather samples for contaminant and genetic studies;

5) Determine migration routes, breeding areas, and molting and wintering sites;

6) Compare mortality rates of surgically implanted scoters with 1998 and 1999 results;

7) Compare behavior and health of surgically implanted scoters and untreated scoters during the captive phase;

8) Compare survival of surgically implanted scoters with VHF (externally attached) transmitted scoters for a 2-4 week period following release,

9) Document traditional ecological knowledge about seaducks from residents of PWS and LCI communities (and perhaps communities in the breeding and molting areas, and migration paths); and

10) Incorporate local residents through the Chugach School District and Youth Area Watch program in the collection and monitoring of data, including traditional knowledge.

* Funds for white-winged scoter transmitters and Argos data processing will be sought through additional grants.

B. Methods

Capture and Marking

ADF&G will capture, mark, and monitor scoters with professional staff, veterinarians, and local assistance. We will capture adult birds between late March and late April during the herring spawn, when large flocks of sea ducks aggregate to feed on herring roe. The commercial herring gillnet fishery, which precedes major spawning events by a few days, ranges from April 9-28 for the period from 1972-1993 (Donaldson et al. 1995). Capture sites will be determined by monitoring known areas of herring spawn deposition (Morstad et al. 1996), scoter concentrations, ADF&G Commercial Fisheries Division aerial spawn and survey maps, and local knowledge. Scoters will be captured at one or two locations in northern PWS. Results in FY99 may dictate FY00 capture sites.

Scoters will be captured with floating mist nets suspended among decoys. Trap locations will be mapped using Global Positioning Systems and nautical charts (NOAA).

Once transported to the work vessel all captured seaducks, in addition to those marked with telemetry, will be banded with USFWS aluminum leg bands. Sex and age will be identified based on plumage characteristics and age may further be determined by bursal probing. Adults do not have a bursa and if possible, second-year birds will be distinguished from third year subadults by bursa depth. Scoters will be weighed, measured (culmen, tarsus, and wing length) and blood and feather samples will be collected and archived for future contaminant, genetics, and stable isotope studies.

To facilitate the release of captive birds back to their original flock, five scoters, not slated for surgery or controls, will be marked with external VHF transmitters. These birds will be marked at the capture site and immediately released. If no large flocks remain at the original capture location, these birds will be located, and birds held at the ASLC will be released in the vicinity of these VHF marked birds.

Scoters will be housed in pet kennels with absorbent materials and kennels will be placed in cool, dry areas. Birds will be gavaged, via temporary esophageal intubation, with an electrolyte solution to prevent dehydration. A temporary holding pen will be constructed, if necessary, to allow birds to be removed from the kennels in order to swim and preen while in field captivity. Birds will be transported daily by small aircraft to holding facilities at the ASLC. The capture, marking, and handling of birds will follow procedures of the Ornithological Council (1997).

Experimental treatment, observation, and care of captive birds will occur at the ASLC by prior arrangements with the staff. Once at the ASLC birds will be allowed to acclimate to the facility. A certified veterinarian, trained in avian implant surgeries, will place transmitters in the peritoneal cavity with the antenna exiting caudally, following procedures described by Korschgen et al. (1996). Two variations of satellite transmitters will be used (Microwave Telemetry, Columbia, Maryland). The first, which will be deployed in female surf scoters, measures 10 mm deep, 55 mm long, 35 mm wide and weighs approximately 36g. Battery life can be expected to last about 10 months depending on advances in technology at time of purchase. Efforts will be made to maximize battery life by adjusting the programmable duty cycle. A larger transmitter, designed to have a longer battery life (up to 18 months) will be used in male surf scoters and all white-winged scoters. These weigh approximately 52 grams and are similar in size and shape to the smaller transmitters but with an extra 25mm x 31mm x 8mm "box" protruding from one side. Each transmitter will be hermetically sealed with a Teflon-coated multi-strand stainless-steel antenna. Transmitters will be programmed and calibrated to record and transmit body temperature to confirm that signals are being emitted from live birds.

Following surgery birds will remain in captivity for 14 days. Protocol for post-surgical care and health assessment and monitoring will be developed in consultation with ASLC staff and veterinarians. At a minimum, blood samples will be collected prior to and 48 hours after surgery in both the treated birds and the control group. Complete blood panels will be analyzed. Final protocols for blood sampling, and measuring morphological and physiological parameters during captivity will be determined prior to capture.

A control group of 15 surf scoters and 10 white-winged scoters will also be transported to the ASLC and kept under identical conditions. Birds will be subject to the same experimental protocols for health assessment and monitoring. Non-implanted birds will be marked with short-term (up to 60 day) 4 gram external VHF transmitters (Advanced Telemetry Systems). To assure high retention rates transmitters will be attached mid-dorsally using a subcutaneous anchor attachment, subcutaneous suture, and epoxy (Pietz et al. 1995, Newman et al. 1999). Birds will be sedated with a gas anaesthetic (Isoflurane) during the procedure. Transmitters will be equipped with a mortality signal.

Small fixed-wing aircraft will transport all birds from the ASLC to release site(s) in PWS. Captive birds will all be released at either the capture location, if scoter flocks are still present, or if not, with other large scoter flocks in PWS (see above). Small fixed wing aerial flights will be conducted weekly to locate VHF transmitted birds. Flights will be terminated when the majority of satellite transmitted birds leave PWS or by June 1. In the event of post-release mortality of satellite transmitted birds in PWS, a Cospas-Sarsat Ground Receiver (UHF pulse direction finder) will be employed to retrieve transmitters.

This study will test the following hypotheses

1. Objective 6.

   Ho: The survival rate of scoters implanted with satellite transmitters and held in captivity is greater than or equal to the survival rate of scoters implanted with satellite transmitters (from prior years) that were not held in captivity.

   H_1: The survival rate of scoters implanted with satellite transmitters and held in captivity is less than the survival rate of scoters with implanted satellite transmitters (from prior years) that were not held in captivity.

A two-sampled proportion test will be used to test for differences in the survival rate between the two groups (Fleiss1981, Zar 1984).

2. Objective 7.

   Additional hypothesis will be developed to test for differences in blood parameters and health indicators between surgically implanted birds and the control group.

3. Objective 8.

   H_0: The survival rate of scoters implanted with satellite transmitters and held in captivity is greater than or equal to the survival rate of scoters held in captivity but not implanted with satellite transmitters.

   H_1: The survival rate of scoters implanted with satellite transmitters and held in captivity is less than the survival rate of scoters held in captivity but not implanted with satellite transmitters.

A two-sampled proportion test will be used to test for differences in the survival rate between the two groups (Fleiss1981, Zar 1984). Using a sample size of 25 surgically implanted birds (15 surf scoters and 10 white-winged scoters) and 25 controls of the same species composition we will have the power to detect a mortality difference of 25% between the two populations, 75% of the time at @=.10 (Fleiss 1981). Funding for satellite transmitters to be used in the additional 10 white-winged scoters will be obtained through grants.

Satellite signals will be analyzed using Service Argos Data Collection and Location System (Landover, Maryland). Argos Standard and Animal-Tracking data processing services will provide near real-time information on the precision of each location through on-line interrogation. Movements will be monitored throughout the life of the transmitter. Locations will be mapped using a Geographic Information System (GIS) and posted on the Internet. Movements and locations of scoters will be forwarded to the Chugach School District and affected communities so students can monitor the progress and movements of birds between breeding, molting, and wintering areas.

C. Cooperating Agencies, Contracts, and Other Agency Assistance

Dan Mulcahy, a licensed veterinarian with USGS-BRD, will assist in satellite telemetry implants. All data collection and analysis will be supervised by ADF&G. Private sector contracts for fuel purchase, equipment, vessel support and air charter will be solicited, usually from the local Prince William Sound or lower Cook Inlet region. Contracts for satellite transmitters and data downloading will be solicited from the private sector.

The project will be pursued in cooperation with the ASLC. Funding for ASLC ("bench fees") has been included in this proposal.

Cooperation for community involvement will be sought through the EVOS Restoration Office, Chugach School District, the villages of Tatitlek, Port Graham, and Nanwalek, and the Alaska Department of Fish and Game Subsistence Division (see above).

SCHEDULE

A. Measurable Project Tasks for FY 00

October-December: 1999	Coordinate and plan community involvement, Youth Area Watch and TEK. Attend Synthesis Workshops in local communities. Meet with local subsistence harvesters. Order satellite and VHF transmitters and field gear. Contract for vessel support, veterinary services. Apply for grants for additional transmitters
January-March: 2000	Attend Restoration Workshop. Hire field technicians. Organize field gear, test equipment. Plan field logistics and organize equipment and personnel. Coordinate community involvement, Youth Area Watch, and TEK. Reconnaissance surveys for scoter concentrations. Capture birds for radio implants.
April-June:	Continue with capture activities. Monitor birds at ASLC. Conduct surgical implants and attach VHF transmitters. Release birds in PWS. Conduct VHF tracking flights to measure mortality. Monitor satellite transmitters. Maintain and store field equipment.
July-September	Monitor movement of satellite transmitted birds Maintain Web site. Organize and analyze data

B. Project Milestones and Endpoints

FY00

October-March:	Monitor FY99 satellite transmitter birds. Post results on the Internet. Coordinate and plan community involvement.
March-April:	Capture birds for transmitter implants and VHF marking.
April:	Submit annual report for FY99 Monitor birds at ASLC. Release captive birds
May-September:	Monitor birds for defining migration routes, breeding areas, and molting areas. Monitor for mortality. Coordinate with local communities. Maintain Web site.

FY01

October-March:	Monitor satellite transmitter birds. Post results on the Internet. Coordinate and plan community involvement, Youth Area Watch, and TEK.
April:	Submit final report.
May-September:	Continue to monitor any active transmitters.

C. Completion Date

All project objectives, except continued monitoring of active transmitters, updating the web page, and completion of final reports and publications, will be met following FY00.

PUBLICATIONS AND REPORTS

An annual report of FY00 activities will be submitted to the Restoration Office before 15 April 2000. Journal publications will be prepared upon completion of all fieldwork.

PROFESSIONAL CONFERENCES

To be determined.

NORMAL AGENCY MANAGEMENT

The work proposed here is not part of normal agency management and is related specifically to research addressing oil spill restoration concerns. No similar work has been conducted, is currently being conducted, or is planned using agency funds.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

As described in the Introduction, this research relies on incorporation of methods and data from other EVOS Trustee sponsored research, including projects /427 and /025. Equipment purchased by those projects will be used to conduct this research. Location of research sites, and data collection and analysis will follow previously established standards. All efforts will be made to share vessel support, telemetry monitoring, study sites, and equipment with other EVOS projects.

This project is integrated with project \052B Traditional Ecological Knowledge; project \210 Youth Area Watch; project \025 Nearshore Vertebrate Predator Project; project \320 Predation on Herring Spawn; project \427 Harlequin Duck Recovery Monitoring; and project \159 Prince William Sound Marine Bird Surveys.

See Community Involvement and Traditional Ecological section above for more details on coordination of TEK and Youth Area Watch activities.

EXPLANATION OF CHANGES IN CONTINUING PROJECTS

Due to the results of the FY99 field season, major changes from the FY99 and original FY00 proposal include the following: 1) Surgery will be conducted and scoters will temporarily be held in captivity at the ASLC in Seward, 2) Components of the FY99 and FY00 proposals that included nesting and molting surveys will be eliminated and the FY99 component will be used to reduce FY00 expenses, and FY00 funds will be reallocated to cover some costs attributed to use of the ASLC, 3) Due to increased costs attributed to use of the ASLC, no capture will be attempted in lower Cook Inlet, 4) A control group of 25 birds will also be held in captivity and marked with VHF transmitters to compare the effects of surgery.

PROPOSED PRINCIPAL INVESTIGATORS

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PERSONNEL QUALIFICATIONS

Dan Rosenberg has been a waterfowl biologist for The Alaska Department of Fish and Game (ADF&G) since 1985. From 1980-1983 Mr. Rosenberg conducted field research in Alaska as a waterfowl biologist for the U.S. Fish and Wildlife Service and from 1983-1984 as a Habitat Biologist for ADF&G. Mr. Rosenberg received a Bachelor of Science degree in Wildlife Management from Humboldt State University, Arcata, CA in 1979.

Mr. Rosenberg has conducted harlequin duck population (age and sex structure) and production surveys in Prince William Sound since 1994 as the Principle Investigator of a Trustee sponsored restoration project. He has conducted extensive waterfowl population monitoring and habitat assessment surveys on the Copper River delta, Stikine River delta, Kenai wetlands, upper Cook

Inlet, Aleutian Islands, and Kodiak Island. As project leader, Mr. Rosenberg has assessed impacts to waterfowl and wildlife populations from hydroelectric development, urban expansion, habitat alterations, chemical pollutants, timber harvest, and surface mining.

OTHER KEY PERSONNEL

Mike Petrula, Wildlife Biologist, ADFG. Field logistics, capture, data analysis, telemetry monitoring, report preparation.

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Revision 7-27-99
Approved TC 8-9-99

2000 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 1999 - September 30, 2000

Budget Category:	Authorized FY 1999	Proposed FY 2000						
Personnel	$90.2	$84.2						
Travel	$11.7	$8.4						
Contractual	$38.3	$67.7						
Commodities	$49.8	$27.1						
Equipment	$0.0	$0.6	LONG RANGE FUNDING REQUIREMENTS					
Subtotal	$190.0	$188.0			Estimated FY 2001	Estimated FY 2002		
General Administration	$12.9	$17.4						
Project Total	$202.9	$205.4			$160.0	$160.0		
Full-time Equivalents (FTE)		1.4						
	Dollar amounts are shown in thousands of dollars.							
Other Resources								

Comments:

The cost of satellite transmitters and related data downloading expenses from Service Argos Inc., a satellite based location and data collection system are sole source.

Major changes from the April 15, 1999 DPD have been explained in the accompanying cover letter. Increases are from Alaska SeaLife Center bench fees.

No money is allocated for NEPA compliance. Only salary money is allocated for attendance at Anchorage workshops. Travel to villages for TEK "Synthesis Workshops" is included. Travel for students to participate in field work as part of Youth Area Watch and school district programs is not included in this budget.

The ten days allocated for vessel charter assumes a minimum of 8 days of good operating weather.

Estiamted FY2001 expenses include continued Argos data downloading and processing costs, web page updating, report writing and satellite transmitter marking in lower Cook Inlet.

FY00

Prepared:4/9/99,Rev7/7,7/27

Project Number: 00273
Project Title: Scoter Life History and Ecology: Linking Satellite Technology with Traditional Knowledge to Conserve the Resource.
Agency: ADFG

FORM 3A
TRUSTEE
AGENCY
SUMMARY

2000 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1999 - September 30, 2000

Personnel Costs:		GS/Range/	Months	Monthly		Proposed
Name	Position Description	Step	Budgeted	Costs	Overtime	FY 2000
D. Rosenberg	WBIII, Principal Investigator	18J	6.5	5.9	1.0	39.4
Mike Petrula	WBII, Data analysis, report prep., graphic	16B	6.5	4.5	1.0	30.3
1 F&G Tech.	F&G Tech. III, Field Tech/graphics	11F	2.5	3.7	1.0	10.3
1 F&G Tech.	F&G Tech. III, Field Tech	11F	1.0	3.7	0.5	4.2
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
	Subtotal		16.5	17.8	3.5	
					Personnel Total	$84.2

Travel Costs:	Ticket	Round	Total	Daily	Proposed
Description	Price	Trips	Days	Per Diem	FY 2000
Portage-Whittier Alaska Railroad vehicle,boat, and 1 psng.	0.4	2			0.8
Portage-Whittier Alaska Railroad vehicle and psng.	0.2	4			0.8
Portage-Whittier Alaska Railroad Psg. fare	0.1	1			0.1
Anchorage-Tatitlek by air	0.4	3	3	0.1	1.5
Anchorage -Valdez by air	0.2	2	4	0.1	0.8
Anchorage-Chenega by air	0.3	2	2	0.1	0.8
Anchorage -Port Graham/Nanwalek by air	0.3	3	4	0.1	1.3
Anchorage-Cordova by air	0.2	2	2	0.1	0.6
Airport parking, taxi fare, excess baggage					0.2
Per diem, Seward, Whittier			15	0.1	1.5
					0.0
				Travel Total	$8.4

FY00

Prepared:4/9/99,Rev7/7,7/27

Project Number: 00273
Project Title: Scoter Life History and Ecology: Linking Satellite Technology with Traditional Knowledge to Conserve the Resource.
Agency: ADFG

FORM 3B
Personnel
& Travel
DETAIL

2000 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 1999 - September 30, 2000

Contractual Costs: Description	Proposed FY 2000
Air charter for field support 36 hrs @ $275/hr (incl. recon, bird transport to Seward & back, post-release monitoring	10.0
Boat and outboard motor repair	0.8
Trailer and boat moorage Whittier	0.2
Photo processing, presentation productions	0.3
Vessel support for bird capture and marking 10 days @1300/day	13.0
Satellite telemetry data downloading 15 birds at $900/bird	13.5
Air freight - equipment shipment	0.5
SeaLife Center Bench Fees (fee schedule attached)	22.4
Blood analysis, $45/sample x 100 samples	4.5
Cospass-Sarsat ground receiver rental $38.50/day x 30 days,insurance, shipping	1.5
Refurbish 5 satellite transmitters	1.0
When a non-trustee organization is used, the form 4A is required. **Contractual Total**	$67.7

Commodities Costs: Description	Proposed FY 2000
Boat fuel 175 galllons @ $1.50/gal	0.3
Boat supplies- parts, props, fuel lines, fuel filters, water filters, battery, absorbent rags, oil, emergency provisions	0.5
Field survey supplies- rite-in-rain notebooks/paper, nautical charts, batteries,	0.6
Computer software for analysis, graphing, mapping, web page development	0.6
VHF Transmitters 30 @ 190.00 each	5.7
Mist nets and trapping equipment	1.8
Satellite radio transmitters - 6 @ $2,700 each	16.2
Veterinarian surgical supplies	1.0
Blood sampling supplies	0.4
Commodities Total	$27.1

FY00

Prepared:4/9/99,Rev7/7,7/27

Project Number: 00273
Project Title: Scoter Life History and Ecology: Linking Satellite Technology with Traditional Knowledge to Conserve the Resource.
Agency: ADFG

FORM 3B
Contractual & Commodities
DETAIL

2000 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1999 - September 30, 2000

New Equipment Purchases: Description	Number of Units	Unit Price	Proposed FY 2000
EPIRBS	2	0.3	0.6
			0.0
			0.0
			0.0
			0.0
			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.		**New Equipment Total**	$0.6

Existing Equipment Usage: Description	Number of Units	Inventory Agency
20 ft. Caribe rigid hull inflatable	1	ADFG
17 ft. Boston Whaler	1	ADFG
10x40 binoculars	4	ADFG
Spotting Scopes	2	ADFG
Achilles 8 ft inflatable dinghy	2	ADFG
Remington Shotguns	2	ADFG
Honda generators	3	ADFG
Survival Suits	2	ADFG
Outboard Motors/various hp	6	ADFG
Magellan GPS	3	ADFG
Marine VHF radios	4	ADFG

FY00

Prepared:4/9/99,Rev7/7,7/27

Project Number: 00273
Project Title: Scoter Life History and Ecology: Linking Satellite Technology with Traditional Knowledge to Conserve the Resource.
Agency: ADFG

FORM 3B
Equipment
DETAIL