EXXON VALDEZ OIL SPILL DETAILED PROJECT DESCRIPTION

Project Title: Harlequin duck population dynamics

Project Number:	01407
Restoration Category:	Monitoring
Proposer:	Alaska Department of Fish and Game
Lead Trustee Agency:	Alaska Department of Fish and Game
Cooperating Agencies:	USFWS, USGS-BRD
Alaska SeaLife Center:	No
Duration:	2nd year of 3 year project
Cost FY01:	$67,600
Cost FY02:	$70,000
Cost FY03:	$43,000 (Report Writing, Close-Out)
Geographic Area:	Prince William Sound
Injured Resource:	Harlequin ducks

ABSTRACT

Harlequin duck (*Histrionicus histrionicus*) populations in Prince William Sound (PWS) have not recovered from the effects of the *Exxon Valdez* Oil Spill. Populations are declining in oiled areas while increasing in unoiled areas. Proposed late-winter boat surveys have been designed to assess the recovery of ducks inhabiting oiled areas. Population structure, abundance, and recruitment will be compared between oiled and unoiled areas in PWS to assess trends, population dynamics, and the progress of recovery. As part of the Gulf Ecosystem Monitoring program this survey will help identify changes to the Gulf of Alaska ecosystem and improve our ability to differentiate between natural and man-caused population changes. This will be the second year of this project.

INTRODUCTION

Harlequin duck (*Histrionicus histrionicus*) populations in Prince William Sound (PWS) have not recovered from the effects of the *Exxon Valdez* Oil Spill. Populations are declining in oiled areas while increasing in unoiled areas (Rosenberg and Petrula 1998). This lack of recovery may be a result of continued oil exposure. Ducks in oiled areas exhibit elevated levels of cytochrome P450 induction, indicating continued oil exposure and adult female winter survival was lower on oiled than unoiled areas (Holland -Bartels et al. 1999). These two studies provide strong evidence that harlequin ducks have not recovered from the effects of the *Exxon Valdez* oil spill (*Exxon Valdez* Oil Spill Trustee Council 1999).

Harlequin ducks occur year-round in intertidal zones of PWS (Isleib and Kessel 1973). At least 1,298 harlequin ducks were estimated to have died as a direct result of oil exposure following the Exxon Valdez oil spill (J. Piatt pers. comm.). Oil spill studies of harlequin ducks in western Prince William Sound (PWS) from 1990-93 found consistently low numbers of birds during the breeding season, little breeding, low productivity, and an apparent decline in post-breeding molting birds (Patten et al. 1998a, Patten et al. 1998b). In 1995, six years after the Exxon Valdez oil spill there was no sign of recovery (Exxon Valdez Oil Spill Trustee Council 1996).

As a result of the 1990-1993 findings and the lack of recovery, ADF&G initiated population monitoring in 1994 (Rosenberg and Petrula 1998). These studies, conducted from 1994 through 1997, found no difference in population structure between oiled and unoiled areas; no brood production in the spill area; and a decline in molting populations. Similar population structures, a positive finding, indicated that the population was in a position to recover. However, the declining trend in numbers during autumn surveys for the oiled areas of western PWS remained a concern, especially since populations in unoiled eastern PWS increased. This indicated that recovery has not occurred.

Other studies have collaborated our findings. Winter survival of adult female harlequin ducks was lower on oiled areas than unoiled areas in PWS (Holland-Bartels et al. 1999). Modeling efforts based on this data predicted a declining population in the oiled area and a stable population in the unoiled area. Lower survival rates may be related to continued oil exposure (Holland-Bartels et al. 1999). Results of USFWS marine bird surveys were more ambiguous. These surveys show no evidence of population recovery based on summer surveys. However their March surveys show an increase in densities in both oiled and unoiled areas, although the comparative increase between the oiled and unoiled area does not meet their criteria for recovery (Lance et al. 1999).

Sea duck populations, in general, are composed of relatively long-lived birds with delayed sexual maturity. Productivity may be limited to a few favorable years and population levels may change slowly. Long-term population stability depends on high adult survival coupled with a few years of successful reproduction. Initial high losses of adults, especially females, may result in a long and slow recovery period, especially if initial causes of mortality are still influential.

We propose to continue our winter survey that is comparing population trends and structure in the same oiled and unoiled areas surveyed in project \427 (Rosenberg and Petrula 1998) and expanded in this project. By expanding geographic coverage we will improve our ability to compare regional differences in population trends within oiled and unoiled areas, increase statistical power, and detect long-term changes in the marine ecosystem.

Harlequin ducks occur year-round in the nearshore environment, feed on benthic invertebrates, exhibit site-fidelity, are relatively long-lived, and are widely dispersed in the Gulf of Alaska. These characteristics make them unique among nearshore avian predators and ideal candidates for monitoring ecosystem change.

With modifications, this is a continuation of Project /427 Harlequin Duck Recovery Monitoring conducted from 1995-1997. A March survey was conducted in 1997. No fieldwork was conducted on project /427 in FY98 or FY99. This project will continue to monitor harlequin duck populations in oiled and unoiled areas of PWS. Surveys will be conducted in March. March is a period when pair bonds are well formed, and there is relative stability in both numbers and movements of harlequin ducks.

NEED FOR THE PROJECT

A. Statement of Problem

Harlequin ducks have not recovered from the effects of the *Exxon Valdez* oil spill. Populations in oiled areas are continuing to decline (Rosenberg and Petrula 1998). Declining molting populations, coupled with low female survival, and exposure to hydrocarbons in oiled areas are all indicative of a lack of recovery and continued oil spill effects. Residual oil is still present in the nearshore environment (Pat Harris, NMFS, pers. comm.) and it has the potential to interfere with physiological processes (Holland -Bartels et al. 1999). Two main hypotheses have been presented to explain population declines: (1) ingested oil is continuing to cause either mortality and/or sublethal impairment of reproduction; and/or (2) initial mortality caused significant losses to the western PWS population which may result in a protracted recovery period.

The greatest biological problem in identifying the effects of the EVOS was our lack of basic knowledge on harlequin duck life history, ecology, distribution, and abundance. Poor knowledge of harlequin duck life history at the time of the spill made it difficult to design effective damage assessment and monitoring programs. Scant baseline data on population size made assigning injury and recovery based on pre-and post-spill comparisons tenuous because of a low sample size, high variability, and data that was collected many years before the spill. Poor understanding of regional differences within PWS confounded interpretations of differences between oiled and unoiled areas. This clearly pointed out the need to have good baseline information and time-series data on numbers, distribution, population structure, and a variety of life history events.

Identifying and establishing the cause of population declines depends on knowledge of the status of the resource immediately prior to environmental perturbations and an understanding of the inter-annual variability or the normal variation between years in periods of little perturbations in the larger physical system. Thus, our ability to detect departures from natural variation is necessary if

we are to accurately evaluate the effects of major environmental perturbations whether natural or man-caused. This requires numerous samples, distributed through time, preferably focusing on long-lived species that tend to show less natural variability. Without time-series data on harlequin duck abundance and abiotic and biotic ecosystem changes we lack the ability to interpret the affects of natural or man-induced processes.

B. Rationale/Link to Restoration

This proposed work represents a relatively simple, workable approach to the long-term monitoring of harlequin duck populations that will allow us to assess recovery from the spill, detect long-term ecosystem changes, gather basic life history information, and improve management.

We propose a survey that will have the power to detect trends in populations in oiled and unoiled areas, provide information on population demographics, and give insight into geographic differences within PWS. This study is directly linked to the recovery objectives for harlequin ducks in the EVOS Restoration Plan (Exxon Valdez Oil Spill Trustee Council 1999). This project will provide winter population trends; compare population structure, and provide an index of recruitment between oiled and unoiled areas.

Harlequin ducks are highly philopatric to breeding, molting, and wintering sites. This is an adaptive strategy in natural situations and predictable environments. It is not favorable in the face of dramatic environmental perturbations or rapidly changing land-use practices. It does not favor rapid recovery and colonization of new undisturbed sites. This strong philopatry may result in continued exposure to residual oil or delays in pioneering new nest sites once populations stabilize. Monitoring provides a direct approach to assess recovery.

Information from this project will aid in the development of a population model. A population model is central to monitoring harlequin duck recovery. The model must include demographic parameters and identification of critical periods of the annual cycle that may limit recovery from the *Exxon Valdez* oil spill. This will allow researchers to predict population trends and rate of recovery. While some of this information has been collected for PWS populations (Rosenberg and Petrula 1998, Holland-Bartels et al.1999) and harlequin ducks in North America (Goudie et al. 1994, Robertson and Goudie 1999), many specifics are still lacking, including data on productivity, recruitment, dispersal, and subadult survival.

Detecting trends in abundance and productivity from natural year-to-year variation will be met sooner with increased sampling. Results of this work will have a direct bearing on assessing the status and outlook for this resource and help guide agency programs and policies related to public uses, especially subsistence and recreational hunting, land-use practices, and wildlife viewing.

C. Location

The proposed project will be conducted in the oil spill area of western Prince William Sound and unoiled eastern PWS between Valdez and Cordova and northern Montague Island. March surveys will repeat areas surveyed in /427 Harlequin Duck Recovery Monitoring (Rosenberg and Petrula 1998). Additional survey sites in PWS will be located on Montague Island, following the sampling scheme of project \025 Nearshore Vertebrate Predator Project (Holland-Bartels et al. 1999), and southwestern PWS.

Surveys in the spill area will focus on Knight Island, Applegate Island, Foul Bay, Main Bay, Eshamy Bay, Crafton Island, Chenega Island, Green Island, Naked Island, and Bainbridge, Evans, and LaTouche islands in southwestern PWS. Surveys in non-oiled areas will include portions of Hinchinbrook Island, Simpson Bay, Sheep Bay, Port Gravina, Landlocked Bay, Bligh and Busby islands, Galena Bay and Valdez Arm, and Montague Island.

Communities affected by the project include Chenega Bay, Tatitlek, Whittier, Valdez, and Cordova.

COMMUNITY INVOLVEMENT AND TRADITIONAL ECOLOGICAL KNOWLEDGE

The project will continue to inform and coordinate our community involvement activities. This effort began with project /427 (Harlequin duck recovery monitoring) and a TEK report is included in Rosenberg and Petrula (1998). This effort was continued with project /273 (Scoter life history and ecology: linking satellite telemetry with traditional ecological knowledge).

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. Information gathered from this project will be shared with local communities. Study plans and results of project /427 and project /273 have been presented in the oil spill communities of Tatitlek, Chenega Bay, Cordova, Port Graham, Nanwalek, and Seldovia and at meetings of community facilitators. We will continue to present information to local communities and prepare articles or photographs for Trustee Council publications.

Boat and air charter contracts, and other services will continue to be contracted from local sources when possible.

PROJECT DESIGN

1. Surveys

A. Objectives

1. Compare population structure (number of breeding pairs, subadult males, adult males, and females) between oiled and unoiled areas during March.

2. Estimate density for oiled and unoiled survey sites in March.

3. Compare annual changes in density and population structure for oiled and unoiled survey sites.

4. Compare annual changes in density and population structure *within* oiled and unoiled survey sites during March.

5. Compare results with EVOS project /427 Harlequin Duck Recovery Monitoring.

6. Add to our knowledge of harlequin duck life history

7. Integrate data with other long-term monitoring surveys to detect long-term changes in marine ecosystems

B. Methods

This study will test the following hypotheses:

1. Objective 1.
   H_o: The ratio of males to females; total ducks to subadult males; and breeding pairs to total ducks is the same for oiled and unoiled populations during March.

   $H_{1:}$ The ratio of males to females; total ducks to subadult males; and breeding pairs to total ducks is different for oiled and unoiled populations during March.

A generalized logit model (Agresti, 1990) will be used to test differences in population structure for oiled versus unoiled survey sites for winter and late-summer for objectives 1 and 2. Male:female ratios for individual survey periods will be compared by estimating proportions using cluster sampling (flocks) (Cochran, 1977).

2. Objective 2. No hypothesis is being tested.

3. Objective 3.
   Ho: The rate and direction of population change between years is the same for oiled and unoiled survey sites.

H_1: The rate and direction of population change between years is different for oiled and unoiled survey sites.

Density changes will be tested by regression and population structure will be tested with logistic regression (Agresti, 1990).

4. Objective 4.
H_o: The rate and direction of population change between years is the same within oiled and unoiled survey sites.

H_1: The rate and direction of population change between years is different within oiled and unoiled survey sites.

Density changes will be tested by regression and population structure will be tested with logistic regression (Agresti, 1990).

5. Objective 5. No hypothesis is being tested.

6. Objective 6. No hypothesis is being tested.

7. Objective 7. No hypothesis is being tested.

March surveys. Surveys will be conducted in representative portions of oiled areas in western PWS and unoiled areas in eastern PWS. FY 95-97 transects will be repeated (Rosenberg and Petrula 1998) and new transects will be established in areas of northern Montague Island and southwestern PWS. Surveys will be conducted from approximately March 20 through 30. Repeat surveys will not be conducted and surveys in oiled and unoiled areas will not be conducted simultaneously because population flux is expected to be minimal at this time of year.

All harlequin ducks will be recorded along each survey route. Observations will be recorded as pairs or by sex, and males will be divided into two age groups using predetermined criteria (Rosenberg and Petrula 1998). Surveys will be conducted from open skiffs up to 20 feet long. Each skiff will have two observers. Surveys will be conducted from within 30 meters of shore along predetermined routes. A pace and course will be chosen that will assure complete coverage of the survey area and maximize the opportunity to see ducks. All transects will be mapped and all observations will be recorded by date and location and mapped by flock. Exxon Valdez oil spill beach segment modifiers (oiled areas), habitat associations, time, and weather will be noted.

Population composition and annual changes in density will be compared to test whether harlequin duck populations are exhibiting similar growth trends or the oiled (injured) population is exhibiting a different direction or rate of change. We will continue to test whether low reproductive success in oiled areas has resulted in changes in population age and sex structure. The proportion of first-year males to total males will be used as a measure of past reproductive success. Proportions of paired birds and male:female ratios will be compared for oiled and unoiled sites to indicate breeding propensity. Surveys will be used to detect changes in abundance and compare the

direction and rate of change between years for the two survey areas. Surveys within oiled and unoiled areas will be compared to determine if geographic differences are detectable. Data from FY95-FY97 surveys will be incorporated into the analysis when applicable.

Power Analysis. We compared similar surveys conducted in March 1997 and March 2000. In EPWS (unoiled), 24 transects from 5 geographically similar regions were surveyed covering 244 km of shoreline. In WPWS (oiled), 18 transects from 7 geographically similar regions were surveyed covering 310 km of shoreline. For each transect we fit a simple linear regression model (y = density, x = year) to obtain an estimate of the rate of change in duck densities (birds/km). A hierarchical ANOVA was used to test for differences in the rate of change between locations. The model used was:

Rate of Change = overall mean + location + region (location) + transect (region location)

The power of the test was then calculated for several differences in slope between EPWS and WPWS and is presented below.

Difference in slope	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2	1.3
power (α= 0.10)	0.52	0.67	0.81	0.90	0.95	0.98	0.99	1.00	1.00
power (α= 0.05)	0.30	0.46	0.62	0.76	0.87	0.94	0.97	0.99	1.00

We observed a significant difference in the rate of change in density between EPWS and WPWS (difference in mean slopes = 0.76, p-value = 0.016). We would correctly reject the null hypothesis that there is no difference in the rate of change between EPWS and WPWS 81% of the time when the slopes differed by at least 0.7 (α=0.10). Because the slope is based upon density (birds/km), we can convert this change in slope to the change in the number of ducks we observe on our surveys.

By adding transects in oiled portions of southwest PWS (SWPWS) and unoiled Montague Island (Montague) we should be able to increase the power of our test, thus improving our ability to assess recovery. However, at present we cannot calculate a variance or slope for SWPWS or Montague because we only have one year of survey data. Thus, we cannot determine the power to detect a change in slopes between SWPWS and WPWS (i.e. within oiled areas) or between Montague and EPWS (within unoiled areas) until we have at least one more year of surveys. Regardless, the difference in slopes and how they compare to WPWS and EPWS will give us an estimate of geographic differences and of the contribution of these additional areas to any changes we observe.

Winter transects will give us greater power to detect a change than did our fall surveys (Rosenberg and Petrula 1998). Once we have 3 years of survey data we will be able to calculate the true slope and variance. Beyond that, frequency of sampling will depend upon biological and economic factors, and recovery objectives. Comparing the annual variation and rate and direction of slopes relative to each other will help determine sampling frequency.

C. Cooperating Agencies, Contracts, and Other Agency Assistance

ADF&G personnel will conduct all data collection and analysis. Winter surveys and contracts for vessel support for winter surveys will be coordinated with related EVOS projects. Private sector contracts for winter vessel support will be solicited.

SCHEDULE

A. Measurable Project Tasks for FY 2001

October 2000	Project start-up. Interagency coordination. Plan logistics and personnel for winter surveys. Contract for vessel support.
Jan. –Feb. 2001	Hire seasonal technicians for March survey. Prepare field equipment. Finalize field logistics.
March 2001	Conduct winter surveys in PWS.
April – May 2001	Create databases, GIS. Analyze field data and begin report preparation. Maintain equipment.
June - July 2001	Analyze data
July-Aug-Sept 2001	Analyze data and begin report preparation
April 2002	Annual Report submitted

B. Project Milestones and Endpoints

FY01

October-February:	Coordinate and plan surveys, prepare equipment, contract for vessel support, hire personnel.
March:	Conduct population surveys.
April-September:	Data analysis and report preparation, maintain equipment.
April 15:	Submit annual report.

FY02

October-February:	Coordinate and plan surveys, prepare equipment, contract for vessel support, hire personnel.
March:	Conduct population surveys.
April-September:	Data analysis and report preparation, maintain equipment.
April 15:	Submit annual report.

FY03

October-February:	Coordinate and plan surveys, order transmitters, prepare equipment, contract for vessel support, hire personnel.

March:	Conduct population surveys.
April-September:	Data analysis and report preparation, maintain equipment.
April 15:	Submit annual report.

This is a minimum three-year monitoring program designed to assess the recovery of an injured species. Each project objective will be assessed annually for oiled and unoiled areas then compared with each other and with data collected in subsequent years. Year to year trends will first be compared in 2000 and then each year after. At the end of each year results will be compared with the restoration goals to assess whether recovery has occurred.

C. Completion Date

Under present guidelines, harlequin ducks will have recovered when breeding- and nonbreeding-season densities return to prespill levels. An increasing population and decreasing exposure to hydrocarbons in oiled parts of PWS will indicate that recovery is underway (Exxon Valdez Oil Spill Trustee Council, 1999).

This project will compare harlequin duck population structure and abundance between oiled and unoiled areas and within geographic areas**.** Until further information is gathered it will not be possible to predict when densities will return to prespill levels and oiled populations exhibit a positive trend, indicative of a population increase comparable to unoiled areas. This project may also discover new information that will suggest changes to the Recovery Objectives and it meets the objectives of the Gulf Ecosystem Monitoring program. If continued for the long-term, this survey will help identify changes to the Gulf of Alaska ecosystem and improve our ability to differentiate between natural population changes and those induced by human intervention.

PUBLICATIONS AND REPORTS

Annual reports will be presented to the Chief Scientist by April 15. Reports will include survey areas, population structure and abundance and movements and timing of marked birds. A final report will be prepared at the end of the proposed monitoring schedule unless continued monitoring is warranted or when recovery objectives are met. Special reports (publications) will be prepared during the course of the monitoring effort if warranted. Publications will be prepared for peer-review journals when sufficient data has been collected to warrant manuscript preparation.

PROFESSIONAL CONFERENCES

None

NORMAL AGENCY MANAGEMENT

There are no other agency or non-agency contributions to this project. ADF&G is not required to conduct these surveys by statute or regulation. Limited staffing and funding precludes ADF&G

from undertaking these surveys as part of normal operations and in the past ADF&G has not conducted marine bird surveys in PWS as part of its normal waterfowl management functions.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

This research relies on incorporation of methods and information from other EVOS Trustee sponsored research, including projects /427, and /025. Equipment purchased by /427 and /273 will be used to conduct this research. Location of research sites, and data collection and analysis will follow previously established protocols. All efforts will be made to coordinate surveys and share vessel support and equipment with other EVOS projects. Personnel with ADF&G and USGS-BRD will assist each other when possible.

This project will be integrated with ongoing studies or findings of past studies including project \052B Traditional Ecological Knowledge; project \025 Nearshore Vertebrate Predator Project; project \427 Harlequin Duck Recovery Monitoring; and project \159 Prince William Sound Marine Bird and Mammal Surveys.

EXPLANATION OF CHANGES IN CONTINUING PROJECTS

No major changes from FY2000. This is the second-year of this proposed 3-year project.

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. Mr. Rosenberg is currently the principal investigator on EVOS Trustee sponsored project \273 Surf Scoter Life History and Ecology: Linking Satellite Telemetry with TEK to Conserve the Resource. 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, surveys, data analysis, and report preparation. Mr. Petrula has an MS degree in wildlife Biology from the Univ. of Alaska, Fairbanks. He has been working on EVOS projects \427 Harlequin Duck Recovery Monitoring and \273 Surf Scoter Life History and Ecology: Linking Satellite Telemetry with TEK to Conserve the Resource.

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2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Budget Category:	Authorized FY 2000	Proposed FY 2001
Personnel	$34.8	$38.5
Travel	$2.8	$0.2
Contractual	$18.1	$19.8
Commodities	$1.6	$1.9
Equipment	$0.0	$0.0
Subtotal	$57.3	$60.4
General Administration	$6.5	$7.2
Project Total	$63.8	$67.6
Full-time Equivalents (FTE)	0.6	0.6

LONG RANGE FUNDING REQUIREMENTS				
			Estimated FY 2002	Estimated FY 2003
			$70.0	$43.0

Dollar amounts are shown in thousands of dollars.

Other Resources

Comments:

FY01

Prepared:10/30/00

Project Number: 01407
Project Title: Harlequin Duck Population Dynamics
Agency: Alaska Department of Fish and Game

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Personnel Costs:		GS/Range/	Months	Monthly		
Name	Position Description	Step	Budgeted	Costs	Overtime	
D. Rosenberg	WBIII, Principal Investigator	18J	3.0	6.5		
Mike Petrula	WBII, survey and data analysis	16B	2.5	4.5		
2 F&G Tech.	F&G Tech. III, Field Technician	11F	1.8	3.7	1.0	
	Subtotal		7.3	14.7	1.0	
					Personnel Total	

Travel Costs:	Ticket	Round	Total	Daily	
Description	Price	Trips	Days	Per Diem	
Whittier parking, 2 vehicles- 12 days					
				Travel Total	

FY01

Prepared:10/30/00

Project Number: 01407
Project Title: Harlequin Duck Population Dynamics
Agency: Alaska Department of Fish and Game

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

Contractual Costs:	
Description	
Boat and outboard motor repair and maintenance Photo processing, presentation productions Air charter for field support 4 hrs @ $270/hr Trailer and boat moorage Whittier Vessel support for March surveys 12 days @1300/day Truck Leasing Costs	
When a non-trustee organization is used, the form 4A is required. **Contractual Total**	
Commodities Costs:	
Description	
Boat fuel 350 gallons @ $2.00/gal Boat supplies- replacement parts, props, fuel lines, fuel filters, water filters, battery, absorbent rags, oil, emergency provisions Field survey supplies- rite-in-rain notebooks/paper, nautical charts, batteries,	
Commodities Total	

FY01

Prepared:10/30/00

Project Number: 01407
Project Title: Harlequin Duck Population Dynamics
Agency: Alaska Department of Fish and Game

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

New Equipment Purchases:	Number of Units	Unit Price	
Description			
NONE			
Those purchases associated with replacement equipment should be indicated by placement of an R.		**New Equipment Total**	

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

FY01

Prepared:10/30/00

Project Number: 01407
Project Title: Harlequin Duck Population Dynamics
Agency: Alaska Department of Fish and Game