

# Walrus Islands State Game Sanctuary Annual Report 2008



Diane Calamar Okonek, Brian Okonek, and Marian Snively  
Alaska Department of Fish and Game  
Division of Wildlife Conservation  
333 Raspberry Road  
Anchorage, Alaska 99518

# TABLE OF CONTENTS

Executive Summary .....	2
Introduction.....	3
Methods and Materials.....	3
Staffing .....	3
Visitor Program .....	3
Access Violations .....	4
Walrus Disturbance .....	4
Wildlife Surveys and Monitoring .....	4
Walrus Surveys .....	4
Steller Sea Lion Surveys .....	5
Seabird Monitoring .....	5
Other Observation/Projects/Activities .....	5
Internship Project .....	5
Archeology Project.....	5
Subsistence Hunt .....	5
Ivory Collection.....	6
Daily Observations .....	6
Facilities Management .....	6
Invertebrates .....	6
Results and Discussion .....	7
Staffing .....	7
Visitor Program .....	7
Access Violations .....	8
Walrus Disturbance .....	8
Wildlife Surveys and Monitoring .....	9
Walrus Surveys .....	9
Steller Sea Lion Surveys .....	10
Seabird Monitoring .....	10
Other observations/Projects/Activities .....	11
Internship Project .....	11
Archeology Project.....	11
Subsistence Hunt .....	12
Ivory Collection.....	12
Daily Observations .....	13
Facilities Management .....	13
Invertebrates .....	13
Recommendations.....	14
Acknowledgements.....	15
Literature Cited .....	16
Figures .....	17
Tables.....	21
Appendices.....	27

## **EXECUTIVE SUMMARY**

The Walrus Islands State Game Sanctuary protects one of the largest terrestrial haulout sites in North America for Pacific walrus (*Odobenus rosmarus divergens*). The sanctuary also protects important habitats for several species of seabirds, Steller sea lions (*Eumetopias jubatus*) and other marine and terrestrial birds and mammals. The Alaska Department of Fish and Game (ADF&G) manages the sanctuary primarily to protect these important habitats and wildlife species, and secondarily to provide these resources for public use.

The ADF&G staffs Round Island through the summer months to protect and monitor walruses and other wildlife, and to operate a visitor use program. Walrus counts for the 2008 field season were conducted from May 9 to August 14. The maximum east and west side combined count of 4,081 occurred on June 3. The daily mean count from the east side beaches was 586 which represents a 60% decrease from the 2007 mean count of 1,463.

Sanctuary staff monitored populations and productivity of several nesting seabird species and provided these data to the U.S. Fish and Wildlife Service and U.S. Geological Survey for use in their statewide seabird monitoring programs. Steller sea lions were also monitored at their Round Island haulout site. These data along with brand sightings were provided to the ADF&G Marine Mammal Program for use in their statewide monitoring program.

Sixty-one visitors and two guides came to Round Island in 2008. Of these, 18 were day-visitors and 43 were campers. There was a 26% increase in camper numbers from the 2007 summer season and a 55% decrease in day-visitors. The total number of visitors declined by 15% but there was a 24% increase in visitor use days due to the increase in the numbers of multi-day campers. The average length of stay for overnight campers on Round Island was 4.35 days.

One vessel violated the three mile restricted zone around the island (Alaska State Regulation – 5AAC 92.066). The vessel complied immediately when Round Island instructed them to change course. Round Island staff photographed a plane that circled the island at approximately 1500 ft. over the beaches. The identification numbers were reported and the incident is under investigation. During the fishing season staff used the VHF radio to broadcast the Sanctuary regulations regarding boating restrictions, access procedures and aircraft advisories.

Special projects in 2008 included a two week joint National Park Service, Bureau of Indian Affairs and Department of Natural Resources archeological survey. In cooperation with the Bristol Bay Native Association, two interns were hired to take part in all daily activities and duties in monitoring Round Island for two weeks. To improve the facilities and after obtaining a permit, two new tent platforms were built and an outhouse was moved.

## **INTRODUCTION**

The Walrus Islands State Game Sanctuary was created in 1960 by the Alaska State Legislature. The sanctuary protects a group of seven small islands and their adjacent waters in northern Bristol Bay, approximately 65 miles southwest of Dillingham (Fig 1). The primary purpose of the sanctuary at the time of its creation was to protect the last remaining terrestrial haulout for Pacific walruses (*Odobenus rosmarus divergens*) in North America (Alaska Statute 16.20.090). All other haulouts had been abandoned due to anthropogenic disturbances, mostly related to commercial hunting.

Today, the sanctuary continues to provide important habitat for walruses and comprises one of four primary active haulout sites in Bristol Bay. The sanctuary also protects important habitats for many species of seabirds, Steller sea lions (*Eumetopias jubatus*), and other marine mammals and terrestrial birds.

The Alaska Department of Fish and Game (ADF&G) manages the sanctuary primarily to protect these habitats and wildlife species, and secondarily to provide for public use and enjoyment of these resources including the opportunity for scientific and educational study, viewing, and photography. Since 1985, all access to Round Island and its surrounding waters requires an access permit and restrictions have been placed on visitor numbers and their activities (Alaska Administrative Code 5 AAC 92.066).

ADF&G provided two technicians to monitor Round Island through the summer months. Staff duties consisted primarily of the protection of sanctuary resources; enforcement of sanctuary laws, regulations and policies; monitoring the sanctuary wildlife including walruses, seabirds, Steller sea lions and other species; managing the visitor use and access permit program; and maintaining trails and facilities.

## **METHODS AND MATERIALS**

### **STAFFING**

ADF&G will provide the monitoring staff on Round Island which will include a Sanctuary manager and a field technician. Other projects will call for more employees to work on the island.

### **VISITOR PROGRAM**

Campers arrive on Round Island after obtaining a permit from the ADF&G Dillingham office. Day visitors are issued permits upon arrival on the island after obtaining access authorization from staff through morning VHF radio contact.

One of the primary goals of the sanctuary staff is to manage a visitor use program and to balance the quality of the experience for the visitors while protecting wildlife and other resources. When visitors arrive on Round Island, they are briefed on the rules and regulations of the island, given a brief history of the sanctuary, and shown how to approach walrus beach viewpoints

without disturbing the animals. All visitors are required to remain on established trails with the exception of going to the summit from the East Cape. To avoid disturbance, visitors are not permitted on the beaches except for during island arrival and departure at Boat Cove or the Campground Beach alternative beach access site. Other duties involved with the visitor program include monitoring the marine radio, authorizing access to sanctuary waters, issuing permits, collecting user fees, reviewing sanctuary rules and safety procedures, answering visitor questions, and improving and maintaining island facilities. For the safety of the visitors, the precipitous and slippery nature of the trails is described and recommendations for their use explained. All visitors provide emergency contacts and sign an Assumption of Risk form.

Commercial transporters operating at Round Island are required to obtain a permit due to the Alaska Board of Game regulations that were implemented in 2006.

### **ACCESS VIOLATIONS**

To protect sanctuary wildlife and other resources, access to Round Island and the waters within three nautical miles of the island is restricted to those possessing permits from ADF&G. Boats are allowed to access the island by utilizing a designated corridor on the northeast side of the island. Since low-flying aircraft can cause major disturbances at walrus haulouts (Fay 1982), aircraft access to the island is discouraged and ADF&G requests that all pilots avoid flights below 5,000 ft Above Ground Level (AGL) within three miles of the island. Boats or planes that are observed within the restricted areas are hailed through VHF marine radio and told of the restrictions or advisories. Although ADF&G does not have the authority to regulate airspace, pilots who harass walrus can be prosecuted by the FWS under the Marine Mammals Protection Act (MMPA).

Sanctuary staffs also document all access violations and initiate an immediate response when appropriate. The assistance of the Alaska State Troopers, US Fish & Wildlife Service (USFWS) Law Enforcement, and the Federal Aviation Administration (FAA) are requested as needed.

### **WALRUS DISTURBANCE**

Staff monitor and document the response of walrus to both authorized and unauthorized access and other activities. When walrus are in sight of observers, the number of affected animals and the degree of their response is recorded using three distinct behaviors (head raising, reorienting, and dispersing) as measures of quantifying the level of disturbance (Salter 1979). At such times when a vessel is in close proximity to the island while clients and/or their guides arrive on island for periods exceeding 60 minutes the response is quantified as two potential disturbance occurrence; one for arrival and one for departure.

### **WILDLIFE SURVEYS AND MONITORING**

#### **WALRUS SURVEYS**

Established Round Island protocols are followed when collecting daily weather and other data.

Before the start of the walrus counts, wind speed and direction, percent cloud cover, type of precipitation and tide are recorded at the cabin. Maximum and minimum daily temperature are recorded at 2000 hrs and the barometric pressures are recorded daily at 0800 and 2000 hrs. At the start of each beach count the Beaufort Sea state, start and end time, method, visibility, beach condition and count quality are recorded. For more detailed information on the Round Island protocols see the Round Island Annual Report 2005 (Okonek and Snively 2005).

Established Round Island protocols are followed when collecting daily walrus counts. On the East side of the island, nine beaches are counted beginning with Second Prime (SP), Second Beach (S), First Prime (FP), First Beach (FB), Campground (CG), Boat Cove (BC), Flat Rock (FR), North Boat Cove (NBC), and ending with Main Beach (MB; Fig 2). The west side of the island includes West Main beach (WM) and West Main Beach South (SWMB; Fig. 2).

#### STELLER SEA LION SURVEYS

Steller sea lion counts are conducted following protocols established by the ADF&G marine mammals department. Brands from the sea lions are recorded, photographed and injuries, entanglements, suckling behavior, or any unusual conditions are noted.

#### SEABIRD MONITORING

Three species of colonial nesting seabirds are monitored throughout the summer at several sites on Round Island. Nesting chronology and nest productivity data are collected for the following species of seabirds; pelagic cormorants (*Phalacrocorax pelagic*; PECO), black-legged kittiwakes (*Rissa tridactyla*; BLKI), and common murrelets (*Uria aalge*; COMU). Population counts are conducted from Observation Point (OP) for PECO's, BLKIs, and COMUs.

#### OTHER OBSERVATION/PROJECTS/ACTIVITIES

##### INTERNSHIP PROJECT

The Bristol Bay Native Association (BBNA) and ADF&G sponsored two interns on Round Island from June 23-July 7, 2008. BBNA and ADF&G continue to provide an opportunity for students to gain field experience in monitoring different species of wildlife, working with archeologists, and managing a state refuge while working directly with the Round Island manager and technician.

##### ARCHEOLOGY PROJECT

An archeological survey involving the National Park Service, Bureau of Indian Affairs and the Department of Natural Resources occurred on Round Island from June 18-29, 2008. The primary goal is to identify appropriate staff and visitor outhouse sites while avoiding or minimizing impacts to cultural resources. Secondary goals include the documentation of any cultural resources encountered.

##### SUBSISTENCE HUNT

Subsistence hunting of walrus on Round Island is open to members of the Quayassiq Walrus

Commission (QWC) from September 10 through October 20 and is managed via Subsistence Walrus Hunting on Round Island, Bristol Bay, Alaska Cooperative Agreement between the ADF&G, EWC, QWC, and USF&WS. Subsistence hunt take is limited to 20 walrus. In the past (2003-2006), managing agencies have had hunt monitors on Round Island during the fall subsistence hunt. Although the annual Round Island subsistence hunt continues, currently the island is not staffed and the hunt is not monitored by state or federal agencies.

#### IVORY COLLECTION

When conditions allow, ivory from beach cast walrus carcasses is collected by Round Island staff to discourage unauthorized off season access to the island. All ivory collected from Round Island is donated to the Eskimo Walrus Commission (EWC). The ivory is auctioned to Alaska native carvers and the proceeds are deposited in the Pacific Walrus Conservation Fund, which supports Pacific Walrus educational, research and management projects.

#### DAILY OBSERVATIONS

General and unusual observations are also recorded and include general biological information such as first wildlife and blooming plant sightings, the presence of beach cast-marine mammals, and general environmental conditions.

#### FACILITIES MANAGEMENT

Round Island staffs also conduct a number of facilities maintenance and construction duties during the season. Typical projects include structure maintenance, power and water system maintenance, campground and trail maintenance and improvements. Trail improvements to reduce erosion and improve visitor safety, and the replacement of tent platforms in the campground are to be implemented in 2008.

#### INVERTEBRATES

Samples of Round Island worms from different locations are to be collected and sent to Dr. Dan Shain, associate professor at Rutgers University for analysis. He will amplify a fragment of the cytochrome C oxidase subunit 1 (CO1) gene, and compared to the worldwide GenBank database.

Other invertebrates are collected opportunistically and sent to Derek S. Sikes, Curator of Insects, Assistant Professor of Entomology, University of Alaska Museum. The carrion beetle species will be collected from fox-killed common murre and pelagic cormorant carcasses. Beetles are stored on a pin board or in an envelope (to keep the carrion beetle mites intact).

Other insects are also collected opportunistically using a net, stored on a pin board and sent to Kenelm W. Philip, Senior Research Associate, Institute of Arctic Biology, University of Alaska, Fairbanks for identification and cataloguing.

## **RESULTS AND DISCUSSION**

### **STAFFING**

Diane Calamar Okonek, sanctuary manager, and Brian Okonek, field technician, arrived on Round Island by Pollux Aviation helicopter on May 7. The optimal arrival date of May 1 was delayed because of the presence of sea ice in Togiak Bay. The F/V Kustatan, operated by Charlie Rehter, transported lumber, food and camp supplies from Homer to Round Island. On May 9, the Kustatan anchored northeast of the cabin and coordinated with the helicopter pilot to sling 3000 lbs of gear from the boat deck to the cabin in nine minutes.

Between July 28 and August 16 ADF&G employees; Lauri Jemison, Grant Hilderbrand and Ed Weiss, each spent approximately one week monitoring the island with the sanctuary manager. A volunteer spent six days working on Island trails and five archeologists from the National Park Service, Bureau of Indian Affairs and Department of Natural Resources spent two weeks excavating sites behind the cabin and at the campground.

### **VISITOR PROGRAM**

Sixty-three visitors (guides, volunteers, interns and archeologists not included) came to Round Island during the summer of 2008. Of these, 18 were day-visitors and 43 were campers (Fig.3). This represents a 26% increase in overnight campers from the 2007 field season (N = 32) and a 55% decrease in day-visitors from the 2007 field season (N = 40). Twenty-five percent of the campers and 66 percent of the day visitors were guided. There was a total of 211 visitor use days and the average length of stay for overnight visitors was 4.35 days.

Fifty-three percent (N=23) of the campers and sixteen percent (N = 3) of the day visitors were Alaskans. Out of state visitors were from the following states in the U.S.: California, Colorado, Florida, Maine, Missouri, New Jersey, New York, Pennsylvania, and Washington; and countries: Denmark and Germany (Table 1). Guides from two companies were on the island for a total of 15 days, Terry Johnson of Walrus Island Expeditions for 11 days, and Scott Hauser, of the Nature Conservancy for four days.

Historically, visitation to Round Island has been variable (Fig 3). Fluctuations in visitation may be attributed to a number of social and economic factors including the availability of transportation to the island, national and international economic conditions, funding availability for staffing the island (Koenen and Rice 1996). Periods of opportunistic day visitation have also influence variability.

A record number of visitors (303) to Round Island occurred in 1977. However, the inflated visitation that year was due to the approximately 250 day visitors that were ferried to the island from a small cruise ship. In the 1980's and early 90's, many members of the herring fishing fleet would visit Round Island opportunistically during breaks in the fishery. Also during this time, there was national and international publicity of the sanctuary through television programs and



magazine articles (Rice 2002). In 1987 a record number of 131 campers visited the island and the number of campers to the island remained high during the late 1980's and early 1990's. After the decline of the fishery in Bristol Bay, a drop in visitation was noted.

Visitation generally declined between 1990 (110 Campers, 58 day use) and 2004 (19 Campers, 55 day use). Since 2005 visitation to Round Island has risen slightly. In 2008, 61 people (43 Campers, 18 day use) visited the island.

During 2008, Paul Markoff, owner of Togiak Outfitters and captain of the Lindsey Mary, made 17 trips from Togiak to Round Island transporting staff and 18 visitors between June 18 and August 16. Terry Johnson owner of Walrus Islands Expeditions and captain of the M/V Inconnu made 23 trips to Round Island transporting 46 visitors from Eagle Lake to Round Island between June 22 and July 19.

### **ACCESS VIOLATIONS**

Prior to the commercial fishing season written notice of the Walrus Islands State Game Sanctuary regulations was mailed to all vessel owners with State of Alaska permits for Bristol Bay fishing. During the fishing season the Round Island VHF marine radio was used to broadcast the Sanctuary regulations regarding boating restrictions, access procedures and aircraft advisories. This contact with the public may have attributed to fewer violations in 2008 with a total of two, compared to four in 2006 and six in 2007.

Commercial transporters, guides, and visitors followed regulations and staff suggestions to keep anthropogenic disturbances to a minimum. Boat operators followed staff requests to approach the island slowly and anchor in locations that would cause the least disturbance to walrus.

On July 27, 2008 staff observed a vessel within the three mile restricted zone that surrounds the island (Alaska State Regulation – 5AAC 92.066) and contacted the vessel crew by radio. The boat operator immediately left the sanctuary waters as requested.

On August 12, 2008 an airplane was observed and photographed flying over the island, well below 5000 ft. Above Ground Level (AGL). No disturbance to walrus was observed. The incident was investigated by ADF&G personnel and a verbal warning issued to the persons involved.

### **WALRUS DISTURBANCE**

Sixty-two anthropogenic activities occurred during the 2008 field season (App. A). The boat activities that had an arrival time and departure time greater than an hour apart were counted as two potential disturbance activities.

No reaction occurred during thirty activities. Fifteen activities had no walrus present on associated beaches. Sixteen disturbances occurred while boats approached or departed the island. Walrus reaction was not observed during one activity (Table 2). Dispersals from Main Beach

caused by engine noise in the entry corridor were observed more frequently in 2008 than in recent years. Dispersals of 1 - 10 walrus were observed on four occasions and of 10 to 50 walrus on four occasions during boat arrivals or departures.

On August 5, 2008 forty-eight walrus dispersed while a high flying jet flew past. The jet altitude was estimated at 30,000 feet but was clearly heard by island staff.

## **WILDLIFE SURVEYS AND MONITORING**

### **WALRUS SURVEYS**

Walrus counts for the 2008 field season were conducted from May 9 to August 14. All beaches along the east side of Round Island were counted 90 out of the total 101 days (Table 3: App. B). West Main Beach was counted on 18 of the survey days. The maximum count for 2008, a combined east and west side total, was 4,081 and occurred on June 3 (Fig. 4; Table 3). The maximum east side count was 3,136; also on June 3. This represents a 40% decrease from the maximum east side count in 2007. There were no walrus on the east side beaches on eight days between May 7 and Aug 16. On West Main Beach (WMB) the maximum count of 945 occurred on June 3. Only two boat based counts of walrus at Round Island were completed during the 2008 field season.

The 2008 daily mean count for east and west side beaches was 629 walrus (Fig. 5). The mean count for east side beaches only was 586 (Fig. 6), which represents a 60% decrease from the east side mean count of 1,463 walrus during 2007 (Okonek and Snively 2007). However,

The annual peak count of walrus at Round Island varies significantly between years with the highest estimated count documented being 15,000 during a 1978 aerial survey (Fig. 5). The lowest annual peak count was 1,746 in 1998 (Raymond 1998). The maximum count varies considerable between years and is attributed to the movement of walrus between several Bristol Bay haulouts and not necessarily to population fluctuations. During the mid-1900's, with the exception of Round Island, all terrestrial haulouts were abandoned. This abandonment was presumably caused by commercial hunting pressure as well as other disturbances (Fay 1982). It is possible that as walrus reestablished use of their traditional haulouts fewer animals used Round Island at any one time. This may be evidenced by the general decline in peak walrus numbers at Round Island over the past three decades.

It is not known if the 2008 drop in numbers after June 3 is due to changes in food distribution or walrus using other haulouts in Bristol Bay. Consistent counts of walrus numbers are only gathered at two (Round Island and Cape Pierce) of the four Bristol Bay area walrus haulouts. In recent years walrus have also begun hauling out on Hagemeister Island, located approximately 36 miles west of Round Island and east of Cape Peirce. The USFWS, Togiak National Wildlife Refuge conducted four aerial surveys of the haulouts on Hagemeister Island during the summer of 2008. Photographs were taken of the herd and the walrus were digitally counted from the images. The first two of these aerial surveys were completed on July 28, an hour apart. The first

found 1,816 walruses and the second found 2,158 animals on the beach. By comparison the same day the Round Island count was 340 walruses. Counts of Hagemeister Island also occurred on August 18 and on August 25. The counts were 2,941 and 685, respectively for those dates. The Round Island camp had closed for the season prior to these August counts of Hagemeister Island, however, the last Round Island count taken on August 14 totaled only 65 walruses.

#### STELLER SEA LION SURVEYS

Round Island Steller sea lions typically haul out at East Cape, located on the eastern tip of the island. Throughout the summer, 58 land counts were conducted from three vantage points. (App. C). The maximum count of 266 animals occurred on August 8 and the minimum count of 29 occurred on June 25, the daily mean count for 2008 was 134 (Fig. 7). There were 32 different brands photographed in 2008. of the branded Stellar sea lions observed on Round Island during 2008; twenty-eight were branded on Ugamak Island in the Aleutians, one in Southeast Alaska, two from Kodiak, and one from Russia.

Lauri Jemison from the Marine Mammal Division of ADF&G was on Round Island from July 28 through August 5 to compare sea lion observation sites from past to present. She eliminated viewpoint 3B and added a new view point to increase the visibility of the haulout. The new viewpoint will be called V4 for future Steller sea lion monitoring activities.

Adding a new count station to the haulout increased the visibility of the haulout and may have contributed to the high August numbers.

All sea lion data were given to ADF&G Marine Mammal Division for their annual sea lion monitoring program.

#### SEABIRD MONITORING

##### *Pelagic cormorant productivity monitoring*

Pelagic cormorant (PECO) productivity monitoring for the 2008 field season was conducted from May 15 through August 15. A 29 nest plot was established at First Beach (FB) and a 30 nest plot was established at First Prime beach (FP). The first PECO egg was observed on May 15 and the last on June 11. The first chick was observed on June 17. The maximum chick count, including both plots, equaled 105 on July 20 (Table 4; App. D). On August 15, the last day of observations, 96 chicks were 40 days or older. Productivity for PECO was 1.63 chicks/nest (Table 5) based on chicks forty days or older on August 15 compared to 2.5 chicks/nest in 2007.

##### *Black-legged kittiwake productivity monitoring*

Black-legged kittiwake (BLKI) productivity monitoring for the 2008 field season was conducted from June 5 through August 15. Two plots were included at Observation Point (OP): OP2 which contained 23 nests and OP3 which contained 25 nests. On the first observation day staff observed 2 eggs at OP2 and 9 eggs at OP3. Nests were added to the plots as eggs were laid. The first chicks were observed at OP2 on June 27 which was eight days earlier than in 2007. The first chick was observed on July 1 at OP3, which was three days earlier than in 2007. The maximum

chick counts were 15/plot at OP2 and OP3 (Table 4; App. D). Eight chicks fledged from OP 2 and 12 chicks fledged from OP 3. Productivity for black-legged kittiwakes was 0.42 chicks/nest (Table 5) compared to 0.38 chicks/nest in 2007.

#### Common murre productivity monitoring

Common murre (COMU) productivity monitoring for the 2008 field season was conducted from June 16 through August 15. Three plots containing a total of 52 nests were established at Observation Point (OP): OP1 had 17 nest sites, OP2 had 17 nest sites and OP4 had 18 nest sites. On June 17, seven eggs were observed on OP1. On June 16 eleven eggs were observed on OP2 and eleven eggs on OP4 (Table 4; App. D).

Brooding posture of the murre suggested that the first COMU chicks hatched on July 18 as compared to July 14 in 2007. The maximum chick count was sixteen chicks out of 17 nests at OP1 on August 1. The maximum chick count for OP2 was twelve on August 1 out of 17 nests. The maximum chick count for OP4 was eleven out of 18 nests on August 1 (Table 4).

The first COMU chicks fledged on August 8 and were still fledging on the last observation day, August 15. Of the total 52 COMU nests monitored 28 chicks fledged (chicks older than 15 days were assumed to have fledged) giving a productivity rate of 0.54 chicks/nest (Table 5) compared to 0.45 chicks/nest in 2007.

#### Population counts

Ten total population counts of the five Observation Point plots were conducted for three seabird species between June 12 and July 9 as weather permitted (Appendix E). The focal species included; PECO, BLKI, and COMU. The population counts began after the observation of the first egg.

The seabird population and productivity monitoring data were given to USFWS migratory bird management and USGS for inclusion in their statewide seabird-monitoring program.

### **OTHER OBSERVATIONS/PROJECTS/ACTIVITIES**

#### INTERNSHIP PROJECT

Two interns, Chasity Anelon and Paul Askoak participated in an intership program on Round Island from June 23 – July 7. The internship program allows BBNA and ADF&G to provide opportunities for students to learn wildlife monitoring, archeology and refuge management based on one-on-one mentoring from the staff.

#### ARCHEOLOGY PROJECT

In order to identify new outhouse sites, six one-meter square test units were excavated by NPS, BIA and ADNRR archeology staff between June 18<sup>th</sup> and June 29<sup>th</sup>. Over 9000 artifacts were recovered and a new oldest date for the Quayassiq site (6,300 years before present) was established. Two new outhouse options for ADF&G staff were provided. Time did not allow

complete excavation of the garden outhouse site below the base of the cultural deposits into sterile sediments. NPS, BIA and ADNR staff stated that complete excavation of sterile sediments to deepen the pit must be done before use so that waste deposition occurs below the cultural material exposed in the side walls. This excavation of the sterile sediments does not need to be done by an archaeologist if the sidewalls are not disturbed. They recommend that a visqueen lining be placed in the pit to protect the sidewalls. The new one meter square campground outhouse pit yielded 4,000 artifacts. Artifacts were recovered from the surface to 2.0 meters below the surface. This is a very important area of the site as it contains a dense cultural deposit spanning over 6,000 years. Any disturbance in this area should be avoided (App F).

#### SUBSISTENCE HUNT

Historically, the Pacific walrus has thrived in the Bering and Chukchi seas (Fay1982). In the 17<sup>th</sup> century there was an increased demand for walrus ivory, oil, and hides, which corresponded to the arrival of the Europeans. Walrus were hunted extensively until the end of the 19<sup>th</sup> century when only a fraction of the population remained (Fay 1957).

Round (Quayassiq) Island was a traditional walrus hunting ground for Alaskan Natives. In the early 1990's native hunters, mainly from the village of Togiak, petitioned the Alaska Board of Game (BOG) for access to the island for subsistence hunting purposes. This resulted in the formation of the Quayassiq Walrus Commission (QWC) in 1995, which helped to reestablish the Round Island subsistence hunt. The BOG agreed to allow island access between October 1 and 31 for the hunt. A Cooperative Agreement between the DF&G, EWC, QWC, and USF&WS was established to provide guidance and administer the hunt. The initial harvest limit was set by the cooperative agreement at ten walrus (including struck and lost animals). Since 1995 the dates and harvest numbers have changed. As established by the 2003 cooperative agreement, the current hunt period is September 10 through October 20 and the harvest limit is 20 walrus (including struck and lost animals) (Subsistence Walrus Hunting on Round Island, Bristol Bay, Alaska Cooperative Agreement).

Due to the increased duration of the hunt the managing agencies agreed to provide two monitors on Round Island during the earlier hunt period starting in the fall of 2003 and ending after the fall of 2006. For hunt information the authors contacted Jim Woolington from the ADF&G Dillingham office.

On September 26, 2008, the Togiak hunt captain and crew went to Round Island for the annual hunt but no walrus were present. The Togiak hunt occurred on Hagemeister Island instead.

#### IVORY COLLECTION

Three dead walrus were washed up on the beaches of Round Island in 2008. No ivory was collected from the carcasses because the tusks were broken and were too small to harvest.

## DAILY OBSERVATIONS

Humpback whales were observed off shore for a three week period between June 26 and July 16. They were seen bubble feeding a mile off shore from the cabin and were frequently vocalizing and breaching (App. G).

## FACILITIES MANAGEMENT

One hundred feet of geoblock™ were added where the existing dirt trail was most heavily traveled. Wire mesh was stapled to wooden walkways where needed to add traction as a safety precaution. Two tent platforms were added to the campground making a total of eight tent platforms. A new outhouse pit was excavated at the campground by Molly Casperson, archeologist of the National Park Service. This site was dug approximately three feet northwest from the old site.

## INVERTEBRATES

Six samples of Round Island worms from six different locations on the island were collected and sent to Rutgers University for genetic analysis. No matches from the CO1 gene were found within the Worldwide GenBank for the Round Island worms. The closest sequence was from an Asian worm, *Rhynchelmis brachycephala*. Dr. Shain explains that this raises some interesting questions. For example, the ancestral population may have spread from Asia during a time when the Bering land bridge was exposed. The genetic distance is quite far, suggesting that this event occurred some 10-15 million years ago. He goes on to say that from the available data, it is reasonable to assume that the Round Island worm is an undescribed species. He asks the Round Island staff to describe any behavioral data that has been observed during the next field season. Dr. Shain is interested in the evolution and adaptation of worms to different environments. Worms found on Round Island are potentially interesting because they are geographically isolated and may have evolved specialized behaviors and/or survival mechanisms. All specimens are stored at Rutgers University.

Thirteen specimens of *Nicrophorus investigator* (Coleoptera: Silphidae) a holarctic carrion & burying beetle were collected from Round Island. These beetles have phoretic mites on them (not parasitic) in the genus *Poecilochirus* (Acari: Parasitidae). Two species of the genus *Carabus* (Coleoptera: Carabidae) and another Carabid prob. genus *Pterostichus* (this last one is smaller and probably of interest and will be loaned out to a Carabid specialist for species ID). The non-beetle insects included two specimens of *Bombus* sp. (Hymenoptera: Apidae) - bumble bees and one fly in the family Calliphoridae. All specimens are awaiting curation at the University of Fairbanks Alaska Museum. Once the insects have been curated and sent to specialists more precise identification information will be available.

All other insects were identified as *Pieris marginalis* (butterflies), *Phragmatobia fuliginosa* (moths), two undetermined specimens of Geometridea, and two undetermined specimens of Noctuidae. The specimens are currently residing in the Alaska Lepidoptera Survey collection in Fairbanks.

## **RECOMMENDATIONS**

- Update the visitor permit to include the Hazardous Conditions Disclaimer.
- Update the visitor permit to include an emergency notification contact name and phone number.
- Update the web site.
- Update the bird list.
- Evaluate commercial use permits.
- Replace the west third of the boat hoist cable across Boat Cove.
- Purchase a new chain hoist for the 2009 season.
- Send written notification of the Round Island access regulations to all registered fishing boats and processors in the area.

## **ACKNOWLEDGEMENTS**

Thanks are extended to Eunice Dyasuk and Jim Woolington in the Dillingham ADF&G office for their continued support during the Round Island field season. Pete Abraham of the USFWS is acknowledged for his kindness in making our volunteers and staff feel welcome at the bunkhouse in Togiak. We would like to thank Judy Alderson, the program manager for the National Park Service's National Natural Landmark Program, for her continued support, generous funding and hard work at Round Island. ADF&G would like to thank the archeologist, Jeanne Schaff and Molly Casperson from the NPS, Matt O'Leary of Bureau of Indian Affairs and Richard VanderHoek of the Department of Natural Resources for their enthusiasm and long hours of hard work dedicated to learning more about the cultural history of Round Island.



## LITERATURE CITED

- Fay, F.H., 1957. History and present status of the Pacific walrus population. Transactions of the North American Wildlife Conference 22, 431-443.
- Fay, Francis. 1982. Ecology and biology of the Pacific Walrus. North American Fauna no. 75. Washington, D.C. US Dept. Of the Interior, FWS 279 pp.
- Koenen, K. and S. Rice. 1996. Walrus Islands State Game Sanctuary Annual Report. ADF&G rept. Anchorage, AK.
- Okonek, Diane and Marian Snively. 2005. Walrus Islands State Game Sanctuary Annual Report. Unpubl. Rept. Division of Wildlife Conservation, ADF&G. Anchorage, AK 46. pp.
- Okonek, Diane, Brian Okonek and Marian Snively. 2007. Walrus Islands State Game Sanctuary Annual Report 2007. Unpubl. Rept. Division of Wildlife Conservation, ADF&G. Anchorage, AK 63. pp.
- Raymond, R. 1998. Walrus Islands State Game Sanctuary Annual Report. ADF&G rept. Anchorage, AK.
- Rice, Steven. 2002. Walrus Islands State Game Sanctuary Annual report. ADF&G rept. Anchorage, AK.
- Salter, R. E. 1979. Site utilization, activity budgets and disturbance responses of Atlantic walruses during terrestrial haul-out. Can. J. Zoology. 57:1169-1180.

# FIGURES

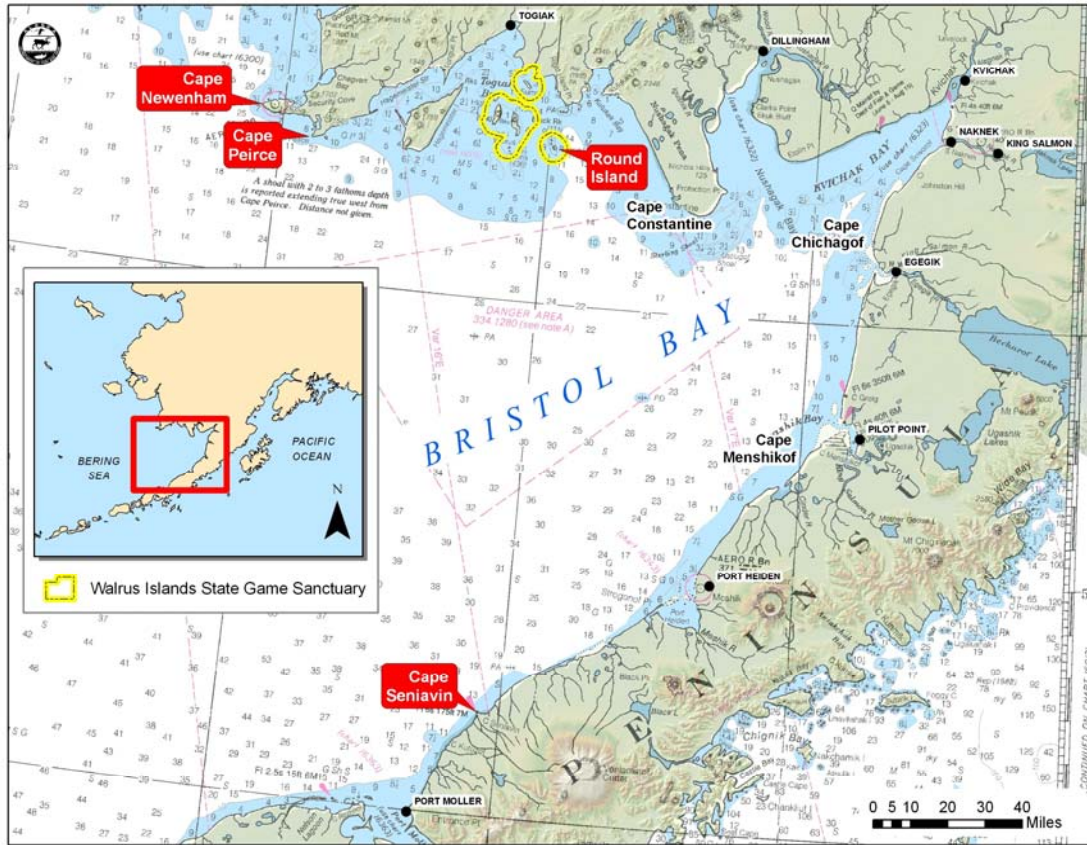


Figure 1. Map of Bristol Bay showing the locations of Round Island, the Walrus Islands State Game Sanctuary, and the four major terrestrial Pacific walrus haulout sites in the United States.

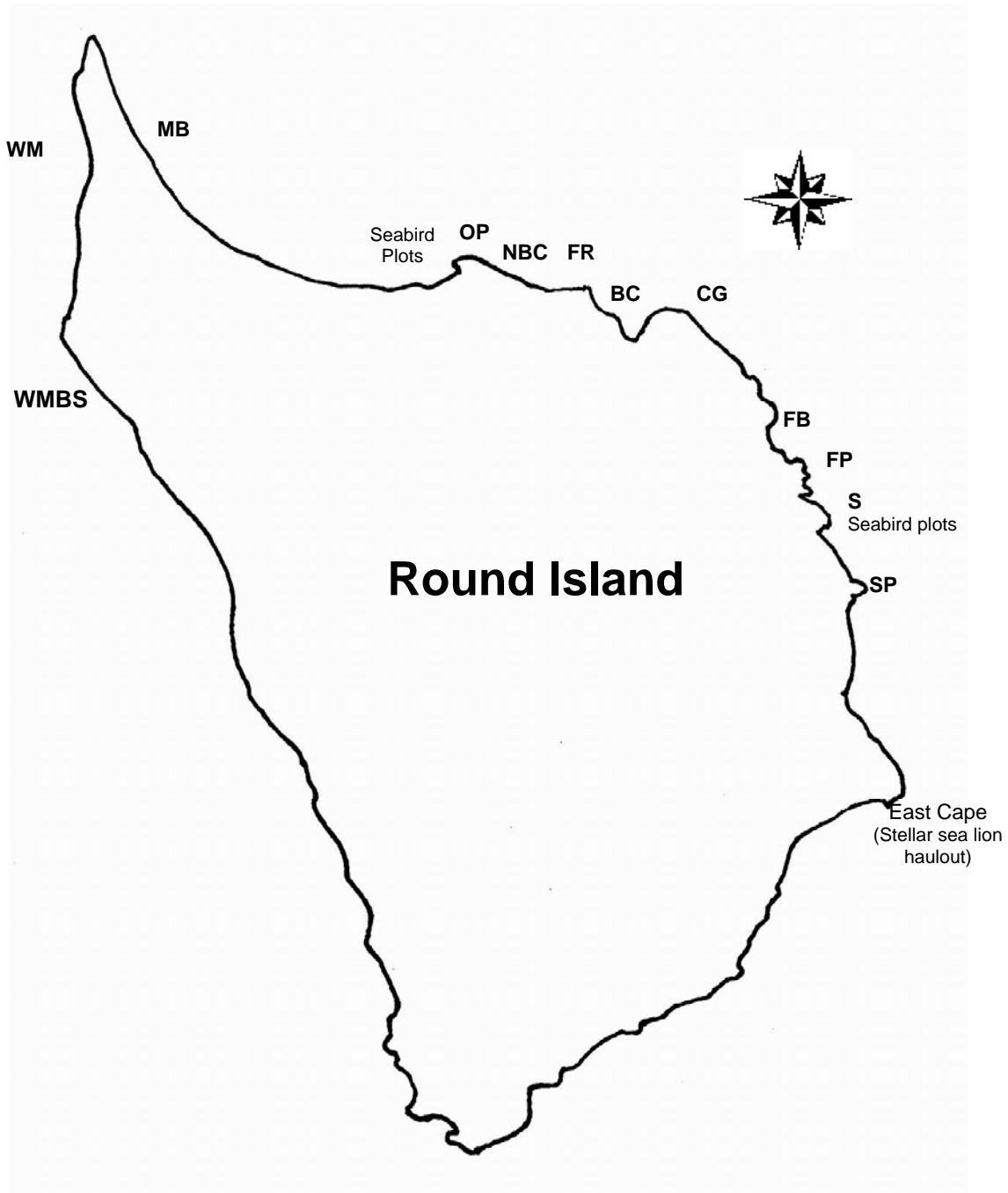


Figure 2. Map of Round Island with locations of walrus haulout beaches, bird plots and sea lion haulout site; East Cape (sea lion haulout), SP (Second Prime), S(Second Beach), FP (First Prime), FB (First Beach), CG (Camp Ground), BC (Boat Cove), NBC (North Boat Cove), OP (Observation Point), MB (Main Beach), WM (West Main Beach, SWM (South West Main Beach).

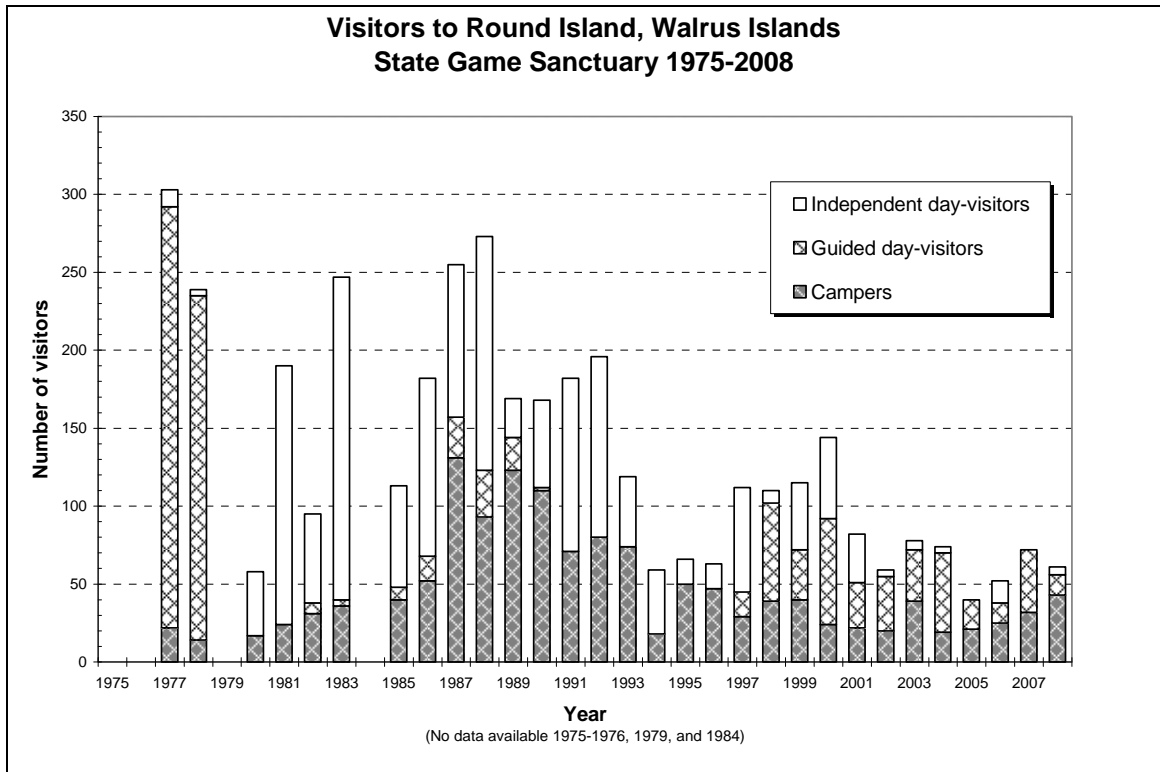


Figure 3. Number of Visitor to Round Island between 1977-2008.

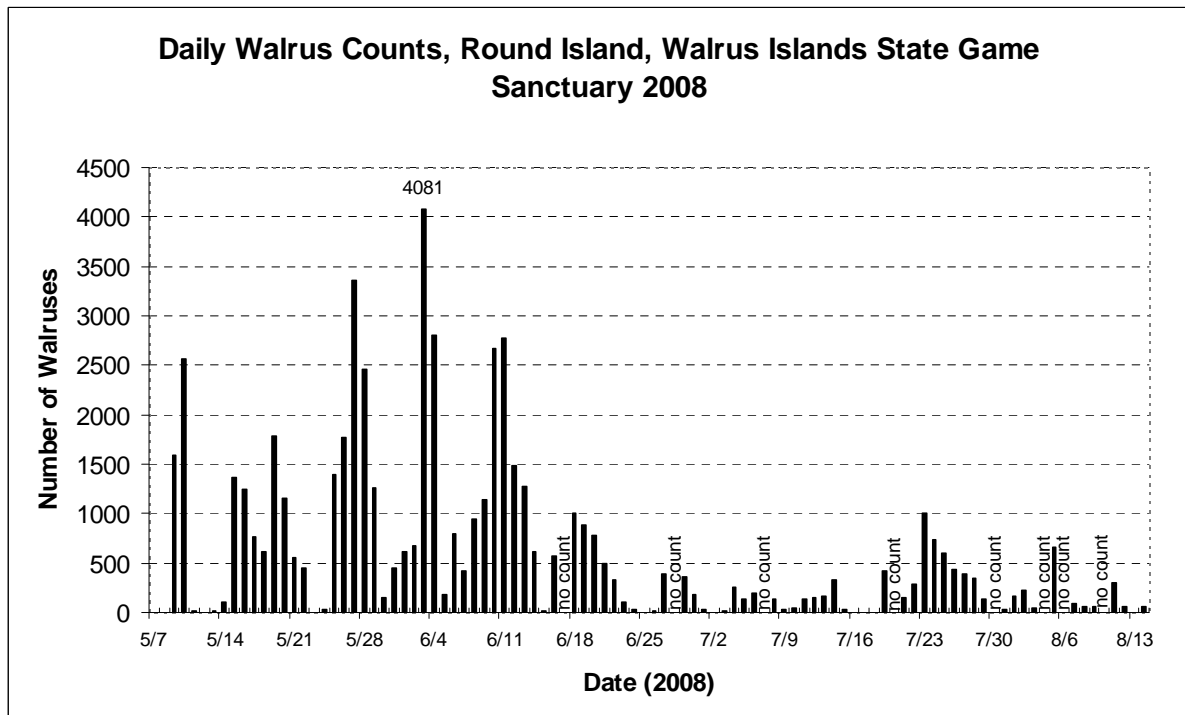


Figure 4. Walrus daily counts, Round Island 2008.

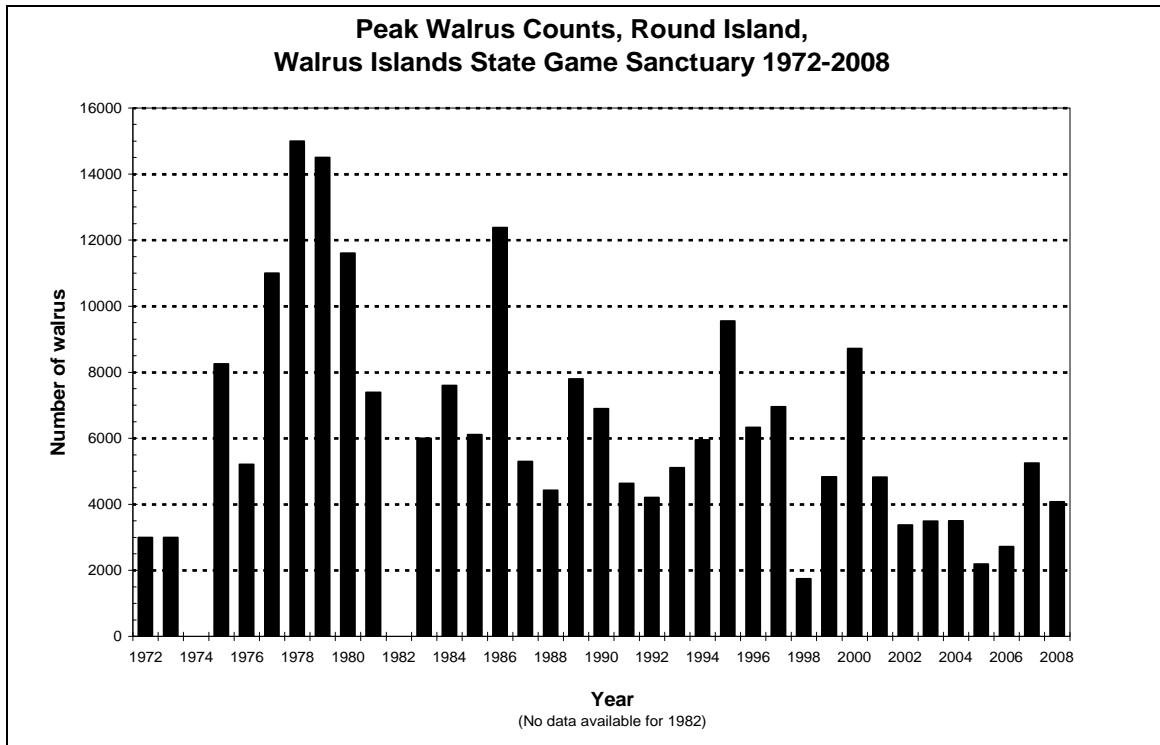


Figure 5. Walrus peak numbers, Round Island 1972-2008.

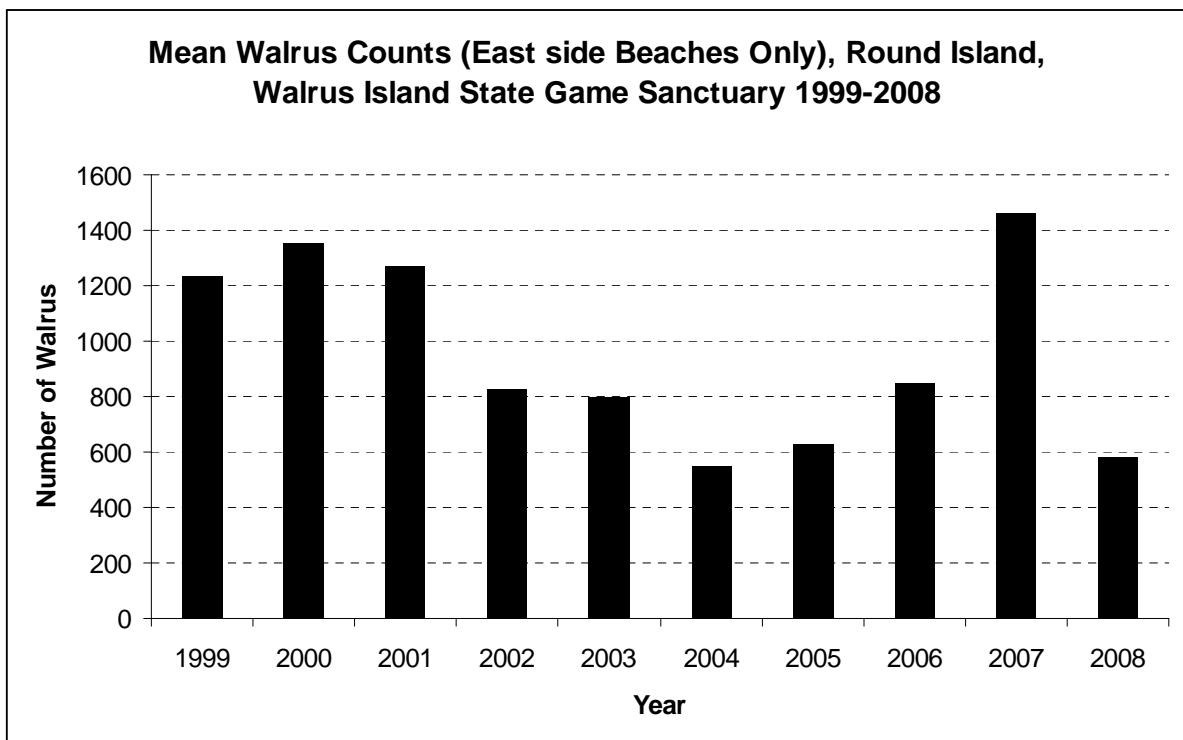
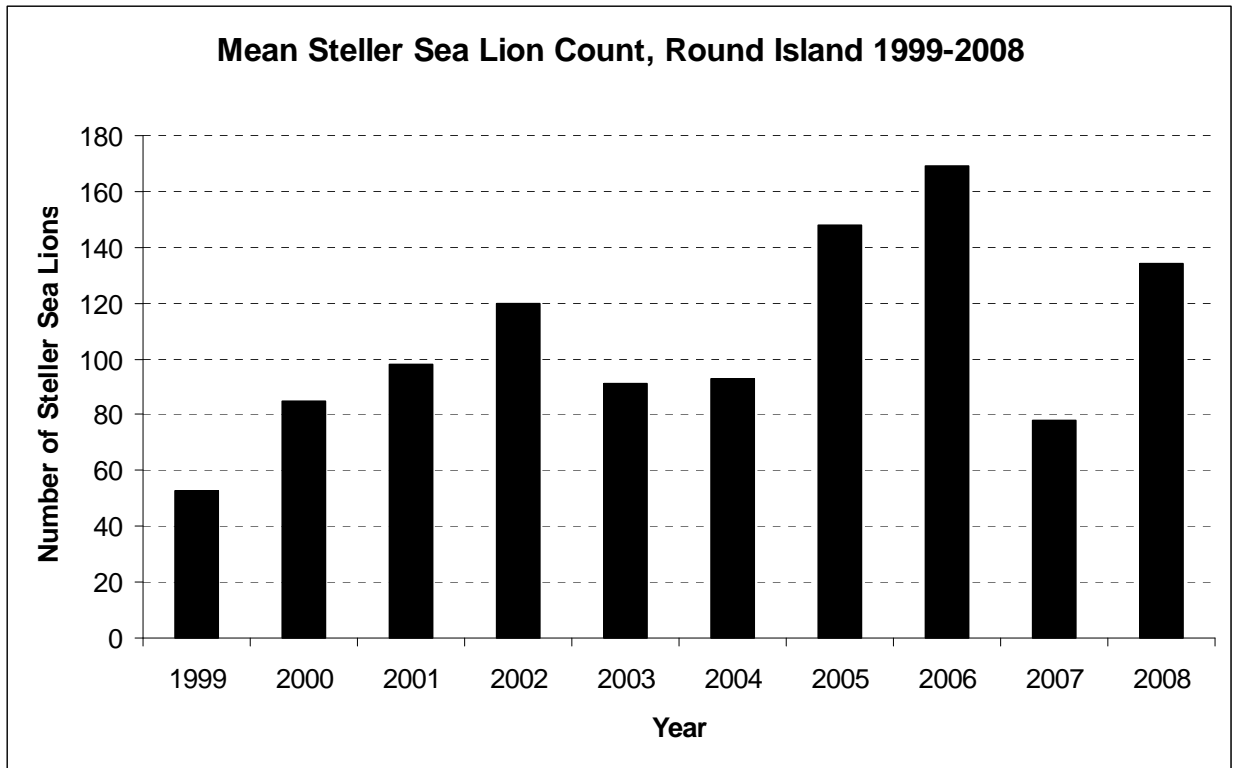


Figure 6. Mean Pacific walrus counts on Round Island 1999-2008.



*Figure 7. Mean Steller sea lion counts on East Cape haul-out, Round Island 1999-2008.*

## TABLES

Table 1. Country/state of origin of visitors, Round Island 2008.

Origin	Non-guided campers	Guided campers	Non-guided day visitors	Guided day visitors	Guides
<b>United States</b>					
Alaska					
Anchorage	7	3			2
Dillingham	7	1		1	
Fairbanks	2				
Girdwood				1	
Juneau					
Ruby			1		
Soldotna	2				
California	4			5	
Colorado	1				
Florida	1				
Maine	3				
Missouri		2		2	
New Jersey		2			
New York		1			
Pennsylvania		2			
Washington	3		4		
<b>Denmark</b>				4	
<b>Germany</b>	2				
<b>Totals per group</b>	32	11	5	13	2
<b>Total visitors</b>	63				

Table 2. Walrus response to anthropogenic activities, Round Island 2008

Walrus Response	Anthropogenic Stimulus
Head Raises	1 - helicopter, 1 - jet, 2 boats
Reorienting	3 - boats
Dispersal	11 - boats, 1 jet
<b>Total Response to stimulus</b>	19
No reaction	28 boats, 1 helicopter
Walrus not observed	1 aircraft
No walrus present	13 boats, 1 - helicopter, 1 - boat and helicopter
Unknown cause	1
<b>Total of activities</b>	62

Table 3. Walrus count summary, Round Island 2008.

Date	East Side Total	West Side Total	Total # walrus
5/9	1597	no count	1597
5/10	2568	no count	2568
5/11	14	no count	14
5/12	0	no count	0
5/13	10	no count	10
5/14	111	no count	111
5/15	1368	no count	1368
5/16	1246	no count	1246
5/17	770	no count	770
5/18	614	no count	614
5/19	1782	no count	1782
5/20	1155	no count	1155
5/21	562	no count	562
5/22	452	no count	452
5/23	0	no count	0
5/24	24	no count	24
5/25	1393	no count	1393
5/26	1770	no count	1770
5/27	3357	no count	3357
5/28	2073	383	2456
5/29	1097	164	1261
5/30	157	no count	157
5/31	128	315	443
6/1	45	565	610
6/2	113	560	673
6/3	3136	945	4081
6/4	2378	430	2808
6/5	180	no count	180
6/6	798	no count	798
6/7	416	no count	416
6/8	944	0	944
6/9	1139	5	1144
6/10	2436	232	2668
6/11	2770	no count	2770
6/12	1485	no count	1485
6/13	1280	no count	1280
6/14	620	no count	620
6/15	18	no count	18
6/16	570	0	570
6/17	no count	no count	
6/18	1010	no count	1010



Table 3. continued.

<b>Date</b>	<b>East Side Total</b>	<b>West Side Total</b>	<b>Total # walrus</b>
6/19	889	no count	889
6/20	787	no count	787
6/21	494	no count	494
6/22	337	0	337
6/23	99	0	99
6/24	28	no count	28
6/25	0	0	0
6/26	7	4	11
6/27	387	3	390
6/28	no count	no count	no count
6/29	355	0	355
6/30	178	no count	178
7/1	28	0	28
7/2	0	no count	0
7/3	1	8	9
7/4	152	106	258
7/5	0	132	132
7/6	196	0	196
7/7	no count	no count	no count
7/8	136	0	136
7/9	29	0	29
7/10	40	no count	40
7/11	129	0	129
7/12	150	no count	150
7/13	164	0	164
7/14	335	no count	335
7/15	29	0	29
7/16	0	no count	0
7/17	1	no count	1
7/18	3	no count	3
7/19	416	0	416
7/20	no count	no count	no count
7/21	145	no count	145
7/22	284	no count	284
7/23	1010	no count	1010
7/24	683	48	731
7/25	600	no count	600
7/26	433	no count	433
7/27	395	no count	395
7/28	340	0	340
7/29	130	no count	130
7/30	no count	no count	no count
7/31	25	0	25

Table 3. continued

<b>Date</b>	<b>East Side Total</b>	<b>West Side Total</b>	<b>Total # walrus</b>
8/1	170	no count	170
8/2	223	0	223
8/3	44	no count	44
8/4	no count	no count	no count
8/5	653	no count	653
8/6	no count	no count	no count
8/7	85	0	85
8/8	65	no count	65
8/9	63	0	63
8/10	no count	no count	no count
8/11	300	no count	300
8/12	65	no count	65
8/13	6	0	6
8/14	65	no count	65
<b>Total</b>	<b>52,740</b>	<b>3900</b>	<b>56,523</b>

Table 4. Seabird productivity summary, Round Island, 2008.

Species	Plot	# of nests	Date of 1st egg	Date of 1st chick	Max chick count	Date of max chick count
PECO	FP	30	5/15	6/17	48	7/20
PECO	FB	29	5/21	6/21	57	7/20
BLKI	OP2	23	6/5	6/27	15	7/18
BLKI	OP3	25	6/5	7/1	15	7/13
COMU	OP1	17	6/17	7/22	16	8/1
COMU	OP2	17	6/16	7/18	12	8/1
COMU	OP4	18	6/16	7/18	11	8/1

Table 5. Productivity of three indicator seabird species; pelagic cormorant, black-legged kittiwakes, and common murre, Round Island 2008.

	PECO	BLKI	COMU
	#	#	#
Nests or pairs	59	48	52
Eggs laid	174	71	52
Chicks hatched	129	35	42
Chicks fledged	96	20	28
Productivity (chicks/nests)	1.63	0.42	0.54
	%	%	%
Hatching success	74	50	81
Reproductive success	55	28	54
Nesting success	78	40	54

## APPENDICES

### Appendix A. Anthropogenic activities and natural occurrences, Round Island 2008

Date	Start time	End time	Dist. Type A/V	Closest approach to walrus	# Walruses and beach ID	# Walruses react and beach ID	Boat name Comments
5/7	18:40	19:00	helicopter/A		0		no walrus on island
5/9	8:55	9:50	boat/heli/A		0		
6/18	8:45	9:14	boat,A/V	150'	2-BC	1-DS	Linsey Mary
				250'	9-FR	0	
6/18	17:38		helicopter, A	3 miles	200-spit	50+ HR	Coast Guard,flying low to north sounded very loud
6/22	10:35		boat,A/V	300'	10-FR	3-HR	Inconnu arrives
		17:25	boat,A/V	300'	7-FR	3-DS	Inconnu departs
6/23	8:55	9:05	boat		0		Linsey Mary
6/26	21:00	21:45	boat		0		Inconnu
6/27	10:00	10:20	boat		0		Linsey Mary
6/29	10:25	10:34	boat,A/V	250'	7-FR	7-DS	Linsey Mary
	14:53		boat,A	1/2 mile	350-spit	25 in water	Inconnu, walrus in water posse up at spit
6/29		20:35	boat				Inconnu departs
6/30	9:15		boat	1/2 mile	175-spit	ND	Inconnu arrives
		16:00	boat,A	1/2 mile	50-spit	50-DS	Inconnu departs, not sure it caused DS
6/30	9:45	9:50	boat	1/2 mile	350-spit	ND	Linsey Mary
7/3	14:03		boat		0	ND	Inconnu arrives
7/3		21:45	boat,A	1/2 mile	75-spit	50-DS,25-OR	Inconnu departs
7/4	9:10		boat,A	1/2 mile	150-MB	50-DS	Inconnu arrives
7/4		19:45	boat, A	1/2 mile	80-spit	20-OR	Inconnu departs
7/5	9:30	9:35	boat		0		Linsey Mary
7/5	10:30	11:25	boat, A	1/2 mile	30-spit	ND	Inconnu
7/5	15:15	15:45	boat, A	1/2 mile	30-spit	ND	Inconnu
7/5	19:25	22:05	boat, A	1/2 mile	50-spit	50-DS	Inconnu departure
7/7	9:18	9:23	boat,A/V	150'	1-BC, 2-FR	ND	Linsey Mary
7/7	11:40		boat,A/V	800'	1-BC, 2-FR	ND	Inconnu arrives
		16:30	boat, A	1/2 mile	200-spit	ND	Inconnu departs
7/8	14:20	14:40	boat, A	1/2 mile	136-spit	ND	Inconnu
7/9	10:54	11:34	boat, A	1/2 mile	30-spit	ND	Inconnu
7/10	11:56	13:05	boat,A	1/2 mile	24-spit	4-DS	Inconnu
7/10	19:00	19:30	boat, A	1/2 mile	45-spit	ND	Inconnu

Appendix A. continued.

Date	Start time	End time	Dist. Type A/V	Closest approach to walrus	# Walruses and beach ID	# Walruses react and beach ID	Boat name/Comments
7/11	9:00	9:10	boat,A	1/2 mile	125-spit	ND	Lindsey Mary
7/11	11:26	12:00	boat, A	1/2 mile	125-spit	ND	Inconnu
7/11	21:00	21:30	boat,A	1/2 mile	125-spit	ND	Inconnu
7/13	14:39	15:26	boat,A	1/2 mile	105-spit	ND	Inconnu
7/14	10:10	10:58	boat,A/V	300'	7-FR	6-HR,1-DS	Inconnu
7/14	15:00	15:30	boat,A/V	300'	6-FR	1-OR	Inconnu
					500-MB	ND	
7/17	17:00	22:30	boat,A/V	300'	1-FR	ND	Inconnu
7/18	9:45		boat,A/V		0	ND	Inconnu
		16:15			1-FR	1-DS	
7/18	20:01	22:25	boat,A/V		0		Inconnu
7/19	8:30	8:45	boat,A/V	300'	8-FR	ND	Lindsey Mary
					200-MB	ND	
7/19	10:20		boat,A/V	600'	7-FR	ND	Inconnu arrives
		14:10		600'	12-FR	ND	Inconnu departs
7/22	7:54	8:15	helicopter,AV	landed at cabin	4 - FR	ND	Pollux Aviation med evac.
7/22	9:10	9:20	boat, AV	300'	4 - FR	ND	Lindsey Mary
7/23	8:30	8:45	boat, AV	600'	8-BC,12FR	ND	Lindsey Mary
7/26	22:00	22:10	boat,AV	none	0	ND	Linsey Mary
7/27	21:00	21:30	boat	50'	off shore	ND	F/V. Miss Krissy @2.6 miles.Moved out as requested.
7/28	10:00	10:15	boat,AV	none	0	ND	Linsey Mary, Lauri Jemison
8/1	9:10		boat, AV	none	0	ND	FV Dream Boat arrives
		17:00	boat, AV	none	0	ND	FV Dream Boat departs
8/1	9:28	9:40	boat, AV	none	0	ND	Lindsey Mary
8/5	8:30	8:45	boat, AV	300'	8 - FR	ND	Lindsey Mary
8/5	9:30		boat, AV	600'	12 - FR	ND	F/V Dream Boat arrived
		19:15	boat, AV	none	0	ND	F/V Dream Boat departed
8/5	14:47	14:50	jet,A	30,000 ft.	52 - FB	48 DS, 4 HR	jet flew over and sound bounced off the cliff
8/11	10:40	11:00	boat, AV	300'	1 - FR	1 DS, FR	Lindsey Mary
8/12	19:00	19:15	plane, A	1,200 ft agl	85 - MB	non observed	plane # N222ME - see detailed report
8/16	8:00	8:30	boat, AV	300'	8 - FR	ND	Lindsey Mary

Beach Id; MB-Main Beach, FR-Flat Rock, BC-Boat Cove, CG-Camp Ground.

Reaction of Walrus; DS-Dispersal, OR-Reorient, HR-Head Raise, ND-No Disturbance, agl: above ground limit

Appendix B. Daily walrus counts, Round Island 2008.

Date	Time	OBS	BCH	Start Time	End Time	BSS	Bch Cond	Vis.	Land count #1	Water Count #1	Land count #2	Water count #2	Land count #3	Water count #3
5/7	1840													
5/9	1400	DCO	SP	1400		1	1	C	0	0	0	0	0	0
		DCO	S			1	1	C	1	0	1	0	1	0
		DCO	FP			1	1	C	0	0	0	0	0	0
		DCO	F			1	1	C	0	0	0	0	0	0
		DCO	CG			1	1	C	0	0	0	0	0	0
		DCO	BC			1	1	C	0	0	0	0	0	0
		DCO	FR			1	0	C	0	0	0	0	0	0
		DCO	NBC			1	0	C	0	0	0	0	0	0
		DCO	MB		1545	1	0	C	1560	36	1450	40	1650	29
			WM											
5/10	900	DCO	SP	915		1	1	P	0	4	0	4	0	4
		DCO	S			1	1	P	0	13	0	13	0	14
		DCO	FP			1	1	P	0	0	0	0	0	0
		DCO	F			1	1	P	0	31	0	35	0	30
		DCO	CG			1	1	C	0	26	0	26	0	27
		DCO	BC			1	1	C	0	2	0	2	0	2
		DCO	FR			1	1	P	3	28	3	27	3	28
		DCO	NBC		1032	1	1	P	1	2	1	2	1	2
		BJO	MB	1425	1445	1	1	C	2450	12	2475	12	2275	15
			WM											
5/11	1400	DCO	SP	1415		5	3	C	0	0	0	0	0	0
		DCO	S			5	3	C	0	0	0	0	0	0
		DCO	FP			5	3	C	0	0	0	0	0	0
		DCO	F			5	3	C	0	0	0	0	0	0
		DCO	CG			5	3	C	0	0	0	0	0	0
		DCO	BC			5	3	C	0	0	0	0	0	0
		DCO	FR			5	3	C	0	0	0	0	0	0
		DCO	NBC			5	3	C	0	0	0	0	0	0
		DCO	MB		1528	5	3	C	7	7	7	7	7	7
			WM											
5/12	1400	DCO	SP	1416		2	1	C	0	0	0	0	0	0
		DCO	S			2	1	C	0	0	0	0	0	0
		DCO	FP			2	1	C	0	0	0	0	0	0
		DCO	F			2	1	C	0	0	0	0	0	0
		DCO	CG			2	1	C	0	0	0	0	0	0
		DCO	BC			2	1	C	0	0	0	0	0	0
		DCO	FR			2	1	C	0	0	0	0	0	0
		DCO	NBC			2	1	C	0	0	0	0	0	0
		DCO	MB		1532	2	1	C	0	0	0	0	0	0
			WM											
5/13	900	DCO	SP	916		3	2	C	0	0	0	0	0	0
		DCO	S			3	1	C	0	0	0	0	0	0
		DCO	FP			3	1	C	0	0	0	0	0	0
		DCO	F			3	1	C	0	0	0	0	0	0
		DCO	CG			3	1	C	0	0	0	0	0	0
		DCO	BC			2	1	C	0	0	0	0	0	0
		DCO	FR			2	1	C	0	0	0	0	0	0
		DCO	NBC			2	1	C	0	0	0	0	0	0
		DCO	MB		1030	2	1	P	10	0	10	0	10	0
			WM											
5/14	900	DCO	SP	914		4	2	C	0	0	0	0	0	0
		DCO	S			4	2	C	0	0	0	0	0	0
		DCO	FP			4	3	C	0	0	0	0	0	0
		DCO	F			4	3	C	0	0	0	0	0	0
		DCO	CG			4	2	C	0	0	0	0	0	0
		DCO	BC			4	2	C	0	0	0	0	0	0
		DCO	FR			4	2	C	0	0	0	0	0	0
		DCO	NBC			3	2	C	0	0	0	0	0	0
		DCO	MB		1055	3	2	C	105	6	95	6	116	6
			WM											

Appendix B. continued.

Date	Time	OBS	BCH	Start Time	End Time	BSS	Bch Cond	Vis.	Land count #1	Water Count #1	Land count #2	Water count #2	Land count #3	Water count #3	
5/15	1400	DCO	SP	1355		3	1	C	0	0	0	0	0	0	
		DCO	S		3	1	C	0	0	0	0	0	0		
		DCO	FP		3	1	C	0	0	0	0	0	0		
		DCO	F		3	1	C	0	2	0	2	0	2		
		DCO	CG		4	1	C	0	0	0	0	0	0		
		DCO	BC		4	1	C	0	1	0	1	0	1		
		DCO	FR		4	1	C	15	5	15	5	15	5		
		DCO	NBC		4	1	C	0	0	0	0	0	0		
		DCO	MB			1547	3	1	C	1300	45	1500	47	1280	40
5/16	1400	DCO	SP	1415		2	1	C	0	0	0	0	0	0	
		DCO	S		2	1	C	0	0	0	0	0	0		
		DCO	FP		2	1	C	0	0	0	0	0	0		
		DCO	F		2	1	C	1	0	1	0	1	0		
		BJO	CG		2	1	C	0	0	0	0	0	0		
		BJO	BC		2	1	C	1	0	1	0	1	0		
		BJO	FR		2	1	C	1	1	1	1	1	1		
		BJO	NBC		2	1	C	0	0	0	0	0	0		
		BJO	MB			1506	2	1	C	1230	12	1175	9	1830	16
		BJO	WM												
5/17	900	BJO	SP	918		3	2	C	0	0	0	0	0	0	
		BJO	S		3	2	C	0	0	0	0	0	0		
		BJO	FP		3	2	C	0	0	0	0	0	0		
		BJO	F		3	2	C	0	0	0	0	0	0		
		BJO	CG		3	2	C	0	0	0	0	0	0		
		BJO	BC		3	2	C	0	0	0	0	0	0		
		BJO	FR		3	2	C	2	1	2	1	2	1		
		BJO	NBC		3	2	P	0	0	0	0	0	0		
		BJO	MB			1100	2	1	P	750	17	675	17	850	17
		BJO	WM												
5/18	900	DCO	SP	925		1	1	C	0	0	0	0	0	0	
		DCO	S		1	1	C	0	0	0	0	0	0		
		DCO	FP		1	1	C	0	0	0	0	0	0		
		DCO	F			945	1	1	C	0	0	0	0	0	
		BJO	CG		915	1	1	C	0	0	0	0	0		
		BJO	BC		1	1	C	0	0	0	0	0	0		
		BJO	FR		1	1	C	0	6	0	6	0	6		
		BJO	NBC		1	1	C	0	0	0	0	0	0		
		BJO	MB			1014	1	0	C	595	13	583	15	623	12
BJO	WM														
5/19	1700	DCO	SP	1720	1721	1	0	C	0	0	0	0	0	0	
		DCO	S	1710	1715	1	0	C	0	0	0	0	0	0	
		DCO	FP	1706	1707	1	0	C	0	0	0	0	0	0	
		DCO	F	1700	1704	1	0	C	0	0	0	0	0	0	
		BJO	CG	1737	1	1	C	0	0	0	0	0	0		
		BJO	BC	1	1	C	0	0	0	0	0	0	0		
		BJO	FR	1	1	C	0	0	0	0	0	0	0		
		BJO	NBC	1	1	C	0	0	0	0	0	0	0		
		BJO	MB		1836	1	0	C	1775	7	1750	10	1825	3	
		BJO	WM												
5/20	1700	BJO	SP	1655		1	1	C	0	0	0	0	0	0	
		BJO	S		1	1	C	0	0	0	0	0	0		
		BJO	FP		1	1	C	0	0	0	0	0	0		
		BJO	F		1	1	C	0	0	0	0	0	0		
		BJO	CG		1	1	C	0	0	0	0	0	0		
		BJO	BC		1	1	C	0	0	0	0	0	0		
		BJO	FR		1	1	C	0	0	0	0	0	0		
		BJO	NBC		1	1	C	0	0	0	0	0	0		
		BJO	MB			1816	1	0	C	1150	5	1150	5	1275	5
		BJO	WM												

Appendix B. continued.

Date	Time	OBS	BCH	Start Time	End Time	BSS	Bch Cond	Vis.	Land count #1	Water Count #1	Land count #2	Water count #2	Land count #3	Water count #3	
5/21	900	DCO	SP	915		1	1	C	0	0	0	0	0	0	
		DCO	S		1	1	C	0	0	0	0	0	0		
		DCO	FP		1	1	C	0	0	0	0	0	0		
		DCO	F		1	1	C	0	0	0	0	0	0		
		DCO	CG		1	1	C	0	0	0	0	0	0		
		DCO	BC		1	1	C	0	0	0	0	0	0		
		DCO	FR		1	1	C	0	0	0	0	0	0		
		DCO	NBC		1	1	C	0	0	0	0	0	0		
		DCO	MB WM			1040	1	1	C	530	32	560	37	590	28
5/22	900	BJO	SP	925		0	1	C	0	0	0	0	0	0	
		BJO	S		0	0	C	1	0	1	0	1	0		
		BJO	FP		0	0	C	0	0	0	0	0	0		
		BJO	F		0	1	C	0	0	0	0	0	0		
		DCO	CG		945	1	1	C	0	0	0	0	0	0	
		DCO	BC			1	1	C	0	0	0	0	0	0	
		DCO	FR			1	1	C	2	1	2	1	2	1	
		DCO	NBC			1	1	C	0	0	0	0	0	0	
		DCO	MB WM				1019	1	1	C	400	48	430	53	370
5/23	1700	BJO	SP	1700			7	3	C	0	0	0	0	0	0
		BJO	S			7	3	C	0	0	0	0	0	0	
		BJO	FP			7	3	C	0	0	0	0	0	0	
		BJO	F			7	3	C	0	0	0	0	0	0	
		BJO	CG		7	3	C	0	0	0	0	0	0		
		BJO	BC		7	3	C	0	0	0	0	0	0		
		BJO	FR		7	3	C	0	0	0	0	0	0		
		BJO	NBC		7	3	C	0	0	0	0	0	0		
		BJO	MB WM			7	3	C	0	0	0	0	0	0	
5/24	1700	DCO	SP	1700		4	3	C	0	0	0	0	0	0	
		DCO	S		4	3	C	0	0	0	0	0	0		
		DCO	FP		4	3	C	0	0	0	0	0	0		
		DCO	F		4	3	C	0	0	0	0	0	0		
		DCO	CG		4	2	C	0	0	0	0	0	0		
		BJO	BC		4	1	C	0	0	0	0	0	0		
		BJO	FR		4	1	C	0	0	0	0	0	0		
		BJO	NBC		4	2	C	0	0	0	0	0	0		
		BJO	MB WM			1804	4	2	C	16	8	16	8	16	10
5/25	1700	BJO	SP	1717		5	3	C	0	0	0	0	0	0	
		BJO	S		5	2	C	0	0	0	0	0	0		
		BJO	FP		5	2	C	0	1	0	1	0	1		
		BJO	F		5	2	C	0	1	0	1	0	1		
		DCO	CG		5	1	C	0	0	0	0	0	0		
		DCO	BC		5	1	C	0	0	0	0	0	0		
		DCO	FR		5	1	C	2	0	2	0	2	0		
		DCO	NBC		5	1	C	0	0	0	0	0	0		
		DCO	MB WM			1817	5	1	C	1290	99	1400	104	1100	94
5/26	900	BJO	SP	859		2	2	C	0	0	0	0	0	0	
		BJO	S		2	1	C	0	13	0	13	0	13		
		BJO	FP		2	1	C	0	0	0	0	0	0		
		BJO	F		2	1	C	4	8	4	8	4	8		
		BJO	CG		2	1	C	1	6	1	6	1	6		
		BJO	BC		2	0	C	10	16	8	16	10	17		
		BJO	FR		2	1	C	16	10	15	15	20	6		
		BJO	NBC		2	1	C	0	12	0	14	0	11		
		BJO	MB WM			1042	2	1	C	1620	54	1670	43	1520	56



Appendix B. continued.

Date	Time	OBS	BCH	Start Time	End Time	BSS	Bch Cond	Vis.	Land count #1	Water Count #1	Land count #2	Water count #2	Land count #3	Water count #3	
5/27	1400	BJO	SP	1412		1	1	P	0	0	0	0	0	0	
		BJO	S		1	0	C	56	0	53	0	56	0		
		BJO	FP		1	0	C	0	0	0	0	0	0		
		BJO	F		1	0	C	125	0	130	0	125	0		
		BJO	CG		1	1	C	4	2	4	2	4	2		
		BJO	BC		1	0	C	29	2	29	2	27	2		
		BJO	FR		0	0	C	19	0	19	0	19	0		
		BJO	NBC		0	0	C	0	0	0	0	0	0		
		BJO	MB WM			1656	1	0	C	3117	3	3167	3	3067	3
5/28	1400	BJO	SP	1405		0	1	C	0	0	0	0	0	0	
		BJO	S		1	0	C	39	0	38	0	40	0		
		BJO	FP		1	0	C	0	0	0	0	0	0		
		BJO	F		1	0	C	59	0	59	0	60	0		
		BJO	CG		1	1	C	2	2	2	2	2	2		
		BJO	BC		1	0	C	7	0	7	0	7	0		
		BJO	FR		1	0	C	21	0	21	0	21	0		
		BJO	NBC		1	0	C	0	0	0	0	0	0		
		BJO	MB			1605	0	0	C	1932	11	1758	9	2208	13
		DCO	WM			1608 1625	1	1	C	380	3	324	1	380	5
5/29	900	BJO	SP	928		1	1	C	0	1	0	1	0	1	
		BJO	S		1	0	C	19	7	19	6	19	7		
		BJO	FP		1	1	C	0	1	0	1	0	1		
		BJO	F		1	1	C	11	6	11	5	10	10		
		BJO	CG		0	1	C	0	6	0	6	0	6		
		BJO	BC		0	1	C	0	0	0	0	0	0		
		BJO	FR		0	1	C	10	3	10	4	10	2		
		BJO	NBC		0	1	C	0	4	0	4	0	4		
		BJO	MB			1124	0	0	C	1010	35	1030	30	822	42
		DCO	WM			1120 1128	1	1	C	155	9	156	9	154	5
5/30	900	BJO	SP	918		3	2	C	0	0	0	0	0	0	
		BJO	S		3	2	C	0	0	0	0	0	0		
		BJO	FP		3	2	C	0	0	0	0	0	0		
		BJO	F		3	2	C	0	1	0	1	0	1		
		BJO	CG		3	2	C	0	0	0	0	0	0		
		BJO	BC		3	2	C	0	1	0	1	0	1		
		BJO	FR		3	2	C	1	0	1	0	1	0		
		BJO	NBC		3	2	C	0	0	0	0	0	0		
		BJO	MB			1021	3	2	C	141	13	143	12	139	15
		DCO	WM						C						
5/31	900	BJO	SP	925		3	3	C	0	0	0	0	0	0	
		BJO	S		3	3	C	0	0	0	0	0	0		
		BJO	FP		3	2	C	0	0	0	0	0	0		
		BJO	F		3	3	C	0	0	0	0	0	0		
		BJO	CG		3	2	C	0	0	0	0	0	0		
		BJO	BC		3	1	C	0	0	0	0	0	0		
		BJO	FR		3	2	C	0	0	0	0	0	0		
		BJO	NBC		3	2	C	0	0	0	0	0	0		
		BJO	MB			1012	3	1	C	121	7	118	4	125	13
		DCO	WM			1015 1024			C	298	17	320	10	264	17
6/1	1700	BJO	SP	1730		4	3	C	0	0	0	0	0	0	
		BJO	S		4	3	C	0	0	0	0	0	0		
		BJO	FP		4	3	C	0	0	0	0	0	0		
		BJO	F		4	3	C	0	0	0	0	0	0		
		BJO	CG		4	3	C	0	0	0	0	0	0		
		BJO	BC		4	2	C	0	0	0	0	0	0		
		BJO	FR		4	2	C	0	0	0	0	0	0		
		BJO	NBC		4	2	C	0	0	0	0	0	0		
		BJO	MB			1830	4	2	C	45	0	40	0	53	0
		DCO	WM			1732 1748	1	1	C	560	5	590	4	600	0

Appendix B. continued.

Date	Time	OBS	BCH	Start Time	End Time	BSS	Bch Cond	Vis.	Land count #1	Water Count #1	Land count #2	Water count #2	Land count #3	Water count #3
6/2	1400	BJO	SP	1406		2	2	C	0	0	0	0	0	0
		BJO	S		2	2	C	0	0	0	0	0	0	
		BJO	FP		2	2	C	0	0	0	0	0	0	
		BJO	F		2	2	C	0	1	0	1	0	1	
		BJO	CG		2	2	C	0	0	0	0	0	0	
		BJO	BC		2	2	C	0	0	0	0	0	0	
		BJO	FR		2	2	C	0	1	0	1	0	1	
		BJO	NBC		2	2	C	0	0	0	0	0	0	
		BJO	MB			1557	2	2	C	102	9	110	4	92
		DCO	WM	1600	1620	1	1	C	560	0	540	5	600	0
6/3	1200	BJO	SP	1158	59	1	1	C	3	0	3	0	3	0
		BJO	S	1156	57	1	1	C	11	0	11	0	11	0
		BJO	FP	1154	55	1	1	C	0	0	0	0	0	0
		BJO	F	1150	51	1	1	C	39	0	39	0	30	3
		BJO	CG	1145	46	1	1	C	0	0	0	0	0	0
		BJO	BC	1115	16	1	0	C	2	0	2	0	2	0
		BJO	FR	1110	12	1	1	C	23	0	23	0	23	0
		BJO	NBC	1313	1314	1	1	C	0	0	0	0	0	0
		BJO	MB	1550	1610	1	1	C	3050	8	3050	12	2650	4
		DCO	WM	1226	28	1	1	C	945	?	945	?	945	?
6/4	1700	BJO	SP	1718		1	1	C	4	0	4	0	4	0
		BJO	S		1	0	C	56	0	61	0	56	0	
		BJO	FP		1	0	C	0	0	0	0	0	0	
		BJO	F		1	0	C	102	0	96	0	104	0	
		BJO	CG		3	1	C	10	0	10	0	10	0	
		BJO	BC		3	0	C	9	0	9	0	9	0	
		BJO	FR		3	0	C	17	0	17	0	17	0	
		BJO	NBC		3	1	C	0	0	0	0	0	0	
		BJO	MB			1847	2	0	C	2175	5	2235	4	2075
		DCO	WM	1820	1835	2	2	C	430	0	450	0	430	0
6/5	900	BJO	SP	918		3	1	C	0	0	0	0	0	0
		BJO	S		2	1	C	0	0	0	0	0	0	
		BJO	FP		2	1	C	0	0	0	0	0	0	
		BJO	F		2	1	C	0	2	0	2	0	2	
		BJO	CG		2	1	C	0	0	0	0	0	0	
		BJO	BC		2	1	C	0	0	0	0	0	0	
		BJO	FR		2	1	C	0	7	0	7	0	7	
		BJO	NBC		2	1	C	0	0	0	0	0	0	
		BJO	MB			1031	2	1	C	161	10	155	8	169
		DCO	WM					C						
6/6		BJO	SP	1419		4	1	C	0	0	0	0	0	0
		BJO	S		4	1	C	0	0	0	0	0	0	
		BJO	FP		4	1	C	0	0	0	0	0	0	
		BJO	F		4	1	C	0	1	0	1	0	1	
		BJO	CG		4	1	C	0	0	0	0	0	0	
		BJO	BC		4	1	C	0	0	0	0	0	0	
		BJO	FR		4	1	C	3	1	3	1	3	1	
		BJO	NBC		4	2	C	0	0	0	0	0	0	
		BJO	MB			1530	4	1	C	750	43	800	42	725
		DCO	WM					C						
6/7	900	BJO	SP	915		3	1	C	0	3	0	3	0	3
		BJO	S		3	1	C	0	0	0	0	0	0	
		BJO	FP		3	1	C	0	0	0	0	0	0	
		BJO	F		3	1	C	0	0	0	0	0	0	
		BJO	CG		3	2	C	0	2	0	2	0	2	
		BJO	BC		3	2	C	0	2	0	2	0	2	
		BJO	FR		3	2	C	0	1	0	1	0	1	
		BJO	NBC		3	3	C	0	0	0	0	0	0	
		BJO	MB			1035	3	1	C	370	38	370	42	400
		DCO	WM					C						

Appendix B. continued.

Date	Time	OBS	BCH	Start Time	End Time	BSS	Bch Cond	Vis.	Land count #1	Water Count #1	Land count #2	Water count #2	Land count #3	Water count #3	
6/8	1400	BJO	SP	1409		3	1	C	0	0	0	0	0	0	
		BJO	S		3	1	C	0	0	0	0	0	0		
		BJO	FP		3	1	C	0	0	0	0	0	0		
		BJO	F		3	1	C	1	0	1	0	1	0		
		BJO	CG		3	1	C	0	0	0	0	0	0		
		BJO	BC		3	1	C	2	0	2	0	2	0		
		BJO	FR		3	1	C	7	0	7	0	7	0		
		BJO	NBC		3	1	C	0	0	0	0	0	0		
		BJO	MB			1533	3	1	C	925	9	975	6	925	10
		DCO	WM		1430	1431	3	1	C	0	0	0	0	0	0
6/9	900	BJO	SP	925		1	1	C	0	0	0	0	0	0	
		BJO	S		1	1	C	0	6	0	6	0	6		
		BJO	FP		1	1	C	0	0	0	0	0	0		
		BJO	F		1	1	C	4	10	4	12	5	10		
		BJO	CG		1	1	C	1	9	1	8	1	10		
		BJO	BC		1	1	C	2	4	2	4	2	4		
		BJO	FR		1	1	C	4	38	4	41	4	38		
		BJO	NBC		1	1	C	0	0	0	0	0	0		
		BJO	MB			1050	1	1	C	975	86	1000	81	975	90
		DCO	WM		1020	1021	2	2	C	5	0	5	0	5	0
6/10	1400	BJO	SP	1428		2	1	C	1	2	1	2	1	2	
		BJO	S		2	1	C	89	12	88	11	90	13		
		BJO	FP		2	1	C	0	0	0	0	0	0		
		BJO	F		2	1	C	158	6	150	11	158	5		
		BJO	CG		3	1	C	2	0	2	0	2	0		
		BJO	BC		3	1	C	0	0	0	0	0	0		
		BJO	FR		3	1	C	7	2	7	2	7	2		
		BJO	NBC		3	1	C	0	0	0	0	0	0		
		BJO	MB			1607	3	1	C	2150	7	2100	6	2200	12
		DCO	WM		1520	1522	3	2	C	232	0				
6/11	1700	BJO	SP	1713		5	1	C	1	2	1	2	1	2	
		BJO	S		5	1	C	126	0	127	0	119	0		
		BJO	FP		5	1	C	0	0	0	0	0	0		
		BJO	F		5	1	C	134	0	133	0	137	0		
		BJO	CG		5	1	C	0	0	0	0	0	0		
		BJO	BC			1802	5	1	C	0	0	0	0	0	
		DCO	FR		1710	1802	5	1	C	7	0	7	0	7	0
		DCO	NBC				5	1	C	0	0	0	0	0	0
		DCO	MB		1720	1725	5	1	C	2500	?				
		DCO	WM						C						
6/12	1400	BJO	SP	1424		1	1	C	1	0	1	0	1	0	
		BJO	S		1	1	C	38	14	38	21	38	14		
		BJO	FP		1	1	C	0	0	0	0	0	0		
		BJO	F		1	1	C	41	6	41	5	45	6		
		BJO	CG		1	1	C	1	7	1	7	1	8		
		BJO	BC		1	1	C	1	0	1	0	1	0		
		BJO	FR		1	1	C	1	2	1	2	1	2		
		BJO	NBC		1	1	C	0	0	0	0	0	0		
		BJO	MB			1542	1	1	C	1350	23	1325	24	1350	22
		DCO	WM						C						
6/13	1400	BJO	SP	1426		5	1	C	0	0	0	0	0	0	
		BJO	S		5	1	C	59	11	59	5	61	8		
		BJO	FP		5	1	C	0	0	0	0	0	0		
		BJO	F		5	1	C	34	3	34	3	34	3		
		BJO	CG		4	2	C	0	1	0	1	0	1		
		BJO	BC		4	2	C	0	0	0	0	0	0		
		BJO	FR		4	1	C	0	0	0	0	0	0		
		BJO	NBC		4	2	C	0	0	0	0	0	0		
		BJO	MB			1545	4	1	C	1150	22	1050	22	1250	22
		DCO	WM						C						

Appendix B. continued.

Date	Time	OBS	BCH	Start Time	End Time	BSS	Bch Cond	Vis.	Land count #1	Water Count #1	Land count #2	Water count #2	Land count #3	Water count #3	
6/14	900	BJO	SP	917		4	1	C	0	0	0	0	0	0	
		BJO	S		4	1	C	21	0	21	0	21	0		
		BJO	FP		4	1	C	0	0	0	0	0	0		
		BJO	F		4	1	C	8	0	8	0	8	0		
		BJO	CG		4	2	C	0	0	0	0	0	0		
		BJO	BC		4	2	C	0	1	0	1	0	1		
		BJO	FR		4	2	C	1	1	1	1	1	1		
		BJO	NBC		4	3	C	0	0	0	0	0	0		
		BJO	MB			1026	4	1	C	575	13	575	10	575	13
		DCO	WM												
6/15	900	BJO	SP	923		3	1	C	0	0	0	0	0	0	
		BJO	S		3	1	C	0	3	0	3	0	3		
		BJO	FP		3	1	C	0	0	0	0	0	0		
		BJO	F		3	1	C	4	7	4	7	4	7		
		BJO	CG		3	1	C	0	0	0	0	0	0		
		BJO	BC		3	1	C	1	0	1	0	1	0		
		BJO	FR		3	1	C	0	3	0	3	0	3		
		BJO	NBC		3	1	P	0	0	0	0	0	0		
		BJO	MB			1045	?	?	O	?	?	?	?	?	
		DCO	WM												
6/16	900	BJO	SP	920		3	1	C	0	0	0	0	0	0	
		BJO	S		3	1	C	1	1	1	1	1	1		
		BJO	FP		3	1	C	0	0	0	0	0	0		
		BJO	F		3	1	C	0	2	0	2	0	2		
		BJO	CG		3	2	C	0	0	0	0	0	0		
		BJO	BC		3	1	C	1	0	1	0	1	0		
		BJO	FR		3	1	C	1	1	1	1	1	1		
		BJO	NBC		3	2	C	0	0	0	0	0	0		
		BJO	MB			1025	3	1	C	550	13	500	15	550	16
		DCO	WM			1015	1017	3	2	C	0	0	0	0	0
6/18	900	BJO	SP	948		1	1	C	0	1	0	1	0	1	
		BJO	S		1	0	C	16	10	16	10	16	10		
		BJO	FP		1	0	C	0	0	0	0	0	0		
		BJO	F		1	0	C	101	10	104	5	100	6		
		BJO	CG		1	0	C	1	1	1	1	1	1		
		BJO	BC		1	1	C	0	0	0	0	0	0		
		BJO	FR		1	0	C	11	6	11	6	11	6		
		BJO	NBC		1	0	C	0	0	0	0	0	0		
		BJO	MB			1103	1	0	P	925	28	850	24	950	29
		DCO	WM						C						
6/19	900	BJO	SP	947		2	1	C	0	0	0	0	0	0	
		BJO	S		2	1	C	25	9	25	9	26	7		
		BJO	FP		2	1	C	0	0	0	0	0	0		
		BJO	F		2	1	C	65	5	62	4	67	6		
		BJO	CG		2	1	C	3	2	3	2	3	2		
		BJO	BC		2	1	C	0	0	0	0	0	0		
		BJO	FR		2	1	C	10	8	10	8	10	8		
		BJO	NBC		2	1	C	0	0	0	0	0	0		
		BJO	MB			1137	2	1	C	750	12	775	12	700	12
		DCO	WM				1	0	C	0	0	0	0	0	
6/20	900	BJO	SP	924		2	1	C	0	0	0	0	0	0	
		BJO	S		2	1	C	16	1	16	0	16	1		
		BJO	FP		2	1	C	0	0	0	0	0	0		
		BJO	F		2	1	C	38	11	37	11	40	13		
		BJO	CG		2	1	C	0	0	0	0	0	0		
		BJO	BC		2	0	C	0	0	0	0	0	0		
		BJO	FR		2	1	C	12	8	12	8	12	8		
		BJO	NBC		2	1	C	1	0	1	0	1	0		
		DCO	MB			1020	2	1	C	650	50	620	39	675	58
		DCO	WM						C						

Appendix B. continued.

Date	Time	OBS	BCH	Start Time	End Time	BSS	Bch Cond	Vis.	Land count #1	Water Count #1	Land count #2	Water count #2	Land count #3	Water count #3
6/21	1400	BJO	SP	1454		2	1	C	0	0	0	0	0	0
		BJO	S		2	1	C	7	0	7	0	7	0	
		BJO	FP		2	1	C	0	0	0	0	0	0	
		BJO	F		2	1	C	18	0	18	0	18	0	
		BJO	CG		1	1	C	1	0	1	0	1	0	
		DCO	BC			1741	1	1	C	0	0	0	0	0
		DCO	FR		2000		1	1	C	4	4	4	4	4
		DCO	NBC			2006	1	1	C	0	0	0	0	0
		DCO	MB		1700	1705	1	1	C	450	10	450	10	450
		DCO	WM						C					
6/22	900	BJO	SP	914		1	1	C	0	0	0	0	0	0
		BJO	S		1	0	C	0	2	0	2	0	2	
		BJO	FP		1	0	C	0	0	0	0	0	0	
		BJO	F		1	0	C	2	13	2	13	2	13	
		DCO	CG		1034		1	0	C	0	0	0	0	0
		DCO	BC				1	0	C	0	0	0	0	0
		DCO	FR			1020	1	0	C	7	8	7	8	7
		DCO	NBC		1145	1146	1	1	C	0	0	0	0	0
		DCO	MB		1135	1138	1	1	C	300	5	300	5	300
		DCO	WM		1115	1120	1	1	C	0	0	0	0	0
6/23	1400	BJO	SP	1500		3	2	C	0	0	0	0	0	0
		BJO	S		3	2	C	1	0	1	0	1	0	
		BJO	FP		3	2	C	0	0	0	0	0	0	
		BJO	F		3	2	C	0	0	0	0	0	0	
		BJO	CG		3	2	C	0	0	0	0	0	0	
		BJO	BC		3	1	C	0	1	0	1	0	1	
		BJO	FR			1700	3	2	C	0	0	0	0	0
		BJO	NBC		1427	28	3	2	C	0	0	0	0	0
		DCO	MB		1430	1433	3	1	C	96	1	85	1	102
		DCO	WM		1600	1601	3	1	C	0	0	0	0	0
6/24	1700	BJO	SP	1700		6	3	C	0	0	0	0	0	0
		BJO	S		6	3	C	0	0	0	0	0	0	
		BJO	FP		6	3	C	0	0	0	0	0	0	
		BJO	F		6	3	C	0	0	0	0	0	0	
		BJO	CG		6	3	C	0	0	0	0	0	0	
		BJO	BC		6	3	C	0	0	0	0	0	0	
		BJO	FR		6	3	C	0	0	0	0	0	0	
		BJO	NBC		6	3	C	0	0	0	0	0	0	
		DCO	MB			1745	6	2	C	28	0	28	0	28
		DCO	WM						C					
6/25	1400	BJO	SP	1310		6	3	C	0	0	0	0	0	0
		BJO	S		6	3	C	0	0	0	0	0	0	
		BJO	FP		6	3	C	0	0	0	0	0	0	
		BJO	F		6	3	C	0	0	0	0	0	0	
		BJO	CG		6	3	C	0	0	0	0	0	0	
		BJO	BC		6	3	C	0	0	0	0	0	0	
		BJO	FR		6	3	C	0	0	0	0	0	0	
		BJO	NBC		6	3	C	0	0	0	0	0	0	
		DCO	MB				6	3	C	0	0	0	0	0
		DCO	WM			1538	3	1	C	0	0	0	0	0
6/26	900	BJO	SP	923		4	3	C	0	0	0	0	0	0
		BJO	S		4	3	C	0	0	0	0	0	0	
		BJO	FP		4	3	C	0	0	0	0	0	0	
		BJO	F		4	3	C	0	0	0	0	0	0	
		BJO	CG		4	3	C	0	0	0	0	0	0	
		BJO	BC		3	3	C	0	0	0	0	0	0	
		BJO	FR		3	3	C	0	0	0	0	0	0	
		BJO	NBC		3	3	C	0	0	0	0	0	0	
		DCO	MB				3	3	C	6	1	6	1	6
		DCO	WM			1126	3	1	C	1	3	1	3	1

Appendix B. continued.

Date	Time	OBS	BCH	Start Time	End Time	BSS	Bch Cond	Vis.	Land count #1	Water Count #1	Land count #2	Water count #2	Land count #3	Water count #3		
6/27	1400	DCO	SP	1330		2	1	C								
		DCO	S			2	1	C	0	0	0	0	0	0		
		DCO	FP			2	1	C	0	0	0	0	0	0		
		DCO	F			2	1	C	0	0	0	0	0	0		
		DCO	CG			2	1	C	0	0	0	0	0	0		
		DCO	BC			2	1	C	0	0	0	0	0	0		
		DCO	FR			2	1	C	0	0	0	0	0	0		
		DCO	NBC			2	1	C	0	0	0	0	0	0		
		DCO	MB			2	1	C	382	5	350	4	400	5		
		DCO	WM				1630	2	1	C	3	0	3	0	3	0
6/29	1700	BJO	SP	1721		0	0	C	0	0	0	0	0	0		
		BJO	S			0	0	C	0	0	0	0	0	0		
		BJO	FP			0	0	C	0	0	0	0	0	0		
		BJO	F			0	0	C	0	0	0	0	0	0		
		BJO	CG				1806	0	0	C	0	0	0	0	0	
		DCO	BC			1712		0	0	C	0	0	0	0	0	0
		DCO	FR				0	0	C	0	0	0	0	0	0	
		DCO	NBC				0	0	C	0	0	0	0	0	0	
		DCO	MB				0	0	C	350	5	320	2	410	6	
		DCO	WM				1735	0	0	C	0	0	0	0	0	0
6/30	900	BJO	SP	958		2	1	C	0	0	0	0	0	0		
		BJO	S			2	1	C	0	0	0	0	0	0		
		BJO	FP			2	1	C	0	0	0	0	0	0		
		BJO	F			2	1	C	0	0	0	0	0	0		
		BJO	CG			2	1	C	0	0	0	0	0	0		
		DCO	BC			2	1	C	0	0	0	0	0	0		
		DCO	FR			2	1	C	0	0	0	0	0	0		
		DCO	NBC			2	1	C	0	0	0	0	0	0		
		DCO	MB				1137	2	1	C	175	3	167	3	182	3
		DCO	WM								C					
7/1	1400	BJO	SP	1414		5	3	C	0	0	0	0	0	0		
		BJO	S			5	3	C	0	0	0	0	0	0		
		BJO	FP			5	3	C	0	0	0	0	0	0		
		BJO	F			5	2	C	0	0	0	0	0	0		
		BJO	CG			4	2	C	0	0	0	0	0	0		
		BJO	BC				1455	4	1	C	0	0	0	0	0	
		DCO	FR			1405		3	2	C	0	0	0	0	0	0
		DCO	NBC				3	2	C	0	0	0	0	0	0	
		DCO	MB				3	2	C	28	0	28	0	28	0	
		DCO	WM					1621	3	2	C	0	0	0	0	0
7/2	1400	BJO	SP	1401		5	3	C	0	0	0	0	0	0		
		BJO	S			5	3	C	0	0	0	0	0	0		
		BJO	FP			5	3	C	0	0	0	0	0	0		
		BJO	F			5	3	C	0	0	0	0	0	0		
		BJO	CG			4	2	C	0	0	0	0	0	0		
		BJO	BC			4	2	C	0	0	0	0	0	0		
		BJO	FR			4	2	C	0	0	0	0	0	0		
		BJO	NBC			3	2	C	0	0	0	0	0	0		
		BJO	MB				1451	3	2	C	0	0	0	0	0	
		BJO	WM								C					
7/3	1400	CA	SP	1555		2	1	C	0	1	0	1	0	1		
		CA	S			2	1	C	0	0	0	0	0	0		
		CA	FP			2	1	C	0	0	0	0	0	0		
		CA	F			2	1	C	1	0	1	0	1	0		
		CA	CG			2	1	C	0	0	0	0	0	0		
		CA	BC				1631	1	1	C	0	0	0	0	0	
		PSA	FR			1237		1	1	C	0	0	0	0	0	0
		PSA	NBC				2	1	C	0	0	0	0	0	0	
		PSA	MB				2	1	C	0	7	0	7	0	7	
		PSA	WM					1612	2	1	C	0	0	0	0	0

Appendix B. continued.

Date	Time	OBS	BCH	Start Time	End Time	BSS	Bch Cond	Vis.	Land count #1	Water Count #1	Land count #2	Water count #2	Land count #3	Water count #3	
7/4	900	CA	SP	918		1	1	C	0	0	0	0	0	0	
		CA	S		1	2	C	0	0	0	0	0	0		
		CA	FP		1	2	C	0	0	0	0	0	0		
		CA	F		1	2	C	0	0	0	0	0	0		
		CA	CG		1	2	C	0	0	0	0	0	0		
		CA	BC		1	2	C	0	1	0	1	0	1		
		CA	FR		1	2	C	0	0	0	0	0	0		
		CA	NBC		1	1	C	0	0	0	0	0	0		
		DCO	MB		1	1	C	101	50	101	50	101	50		
		PSA	WM		2	1	C	87	19						
7/5	900	CA	SP	900		1	2	C	0	0	0	0	0	0	
		CA	S		1	1	C	0	0	0	0	0	0		
		CA	FP		1	1	C	0	0	0	0	0	0		
		CA	F		1	2	C	0	0	0	0	0	0		
		CA	CG		1	2	C	0	0	0	0	0	0		
		CA	BC		1	2	C	0	0	0	0	0	0		
		DCO	FR		3	1	C	0	0	0	0	0	0		
		DCO	NBC		3	2	C	0	0	0	0	0	0		
		DCO	MB		3	2	C	0	0	0	0	0	0		
		PSA	WM		900	910	2	1	C	124	8	117	8	127	9
7/6	1400	CA	SP	1405		0	0	C	0	0	0	0	0	0	
		CA	S		0	0	C	1	0	1	0	1	0		
		CA	FP		0	0	C	0	0	0	0	0	0		
		CA	F		0	0	C	0	0	0	0	0	0		
		CA	CG		0	0	C	0	0	0	0	0	0		
		CA	BC		0	0	C	0	0	0	0	0	0		
		CA	FR		0	0	C	5	0	5	0	5	0		
		DCO	NBC		0	0	C	0	0	0	0	0	0		
		DCO	MB		0	0	C	170	20	190	20	160	20		
		DCO	WM			1611	0	0	C	0	0	0	0	0	
7/7		no	count												
7/8	900	BJO	SP	936		?	1	P	0	0	0	0	0	0	
		BJO	S		?	1	C	0	0	0	0	0	0		
		BJO	FP		?	1	C	0	0	0	0	0	0		
		BJO	F		?	1	C	0	0	0	0	0	0		
		BJO	CG		1	1	C	0	0	0	0	0	0		
		BJO	BC		1	1	C	0	0	0	0	0	0		
		DCO	FR		2	1	C	0	0	0	0	0	0		
		DCO	NBC		2	1	C	0	0	0	0	0	0		
		DCO	MB		1140	1145	2	1	C	120	16	100	15	130	16
		DCO	WM		1045	1046	?	2	P	0	0	0	0	0	
7/9	1700	BJO	SP	1720		2	3	C	0	0	0	0	0	0	
		BJO	S		2	3	C	0	0	0	0	0	0		
		BJO	FP		2	2	C	0	0	0	0	0	0		
		BJO	F		2	2	C	0	0	0	0	0	0		
		BJO	CG		2	1	C	0	0	0	0	0	0		
		BJO	BC		2	1	C	0	0	0	0	0	0		
		DCO	FR		1745	1746	3	1	C	0	0	0	0	0	
		DCO	NBC		1737	1738	3	1	C	0	0	0	0	0	
		DCO	MB		1730	1735	3	1	C	29	0	25	0	30	0
		DCO	WM						C	0	0	0	0	0	
7/10	1400	BJO	SP	1412		2	2	C	0	0	0	0	0	0	
		BJO	S		2	1	C	0	0	0	0	0	0		
		BJO	FP		2	1	C	0	0	0	0	0	0		
		BJO	F		2	1	C	0	0	0	0	0	0		
		DCO	CG		1405	1426	2	1	C	0	0	0	0	0	
		DCO	BC		2	1	C	0	0	0	0	0	0		
		DCO	FR		2	1	C	0	0	0	0	0	0		
		DCO	NBC		2	1	C	0	0	0	0	0	0		
		DCO	MB			1227	2	1	C	28	12	25	13	28	11
		DCO	WM						C						

Appendix B. continued.

Date	Time	OBS	BCH	Start Time	End Time	BSS	Bch Cond	Vis.	Land count #1	Water Count #1	Land count #2	Water count #2	Land count #3	Water count #3		
7/11	900	BJO	SP	844		0	1	C	0	0	0	0	0	0		
		BJO	S			0	1	C	0	0	0	0	0	0		
		BJO	FP			0	1	C	0	0	0	0	0	0		
		BJO	F			0	1	C	0	0	0	0	0	0		
		BJO	CG			1	1	C	0	0	0	0	0	0		
		BJO	BC			0	0	C	0	0	0	0	0	0		
		DCO	FR			947	1	0	C	0	0	0	0	0	0	0
		DCO	NBC				1	0	C	0	0	0	0	0	0	
		DCO	MB				1	0	C	125	4	125	6	128	3	
		DCO	WM				1051	1	1	C	0	0	0	0	0	
7/12	1400	BJO	SP	1345		5	3	C	0	0	0	0	0	0		
		BJO	S			5	3	C	0	0	0	0	0	0		
		BJO	FP			5	3	C	0	0	0	0	0	0		
		BJO	F			5	3	C	0	0	0	0	0	0		
		BJO	CG			4	2	C	0	0	0	0	0	0		
		BJO	BC			4	1	C	0	0	0	0	0	0		
		BJO	FR			4	1	C	0	0	0	0	0	0		
		BJO	NBC			4	1	C	0	0	0	0	0	0		
		BJO	MB			1440	4	1	C	150	0	150	0	150	0	
		DCO	WM						C							
7/13	1700	BJO	SP	1713		1	1	C	0	0	0	0	0	0		
		BJO	S			1	1	C	0	0	0	0	0	0		
		BJO	FP			1	1	C	0	0	0	0	0	0		
		BJO	F			1	1	C	0	0	0	0	0	0		
		BJO	CG			1	1	C	0	0	0	0	0	0		
		BJO	BC			1	1	C	0	0	0	0	0	0		
		DCO	FR			1	0	C	0	0	0	0	0	0		
		DCO	NBC			1	0	C	0	0	0	0	0	0		
		DCO	MB			1	0	C	164	0	191	0	153	0		
		DCO	WM			1756	1	2	C	0	0	0	0	0		
7/14	1700	DCO	SP	1700		2	1	C	0	0	0	0	0	0		
		DCO	S			2	1	C	0	0	0	0	0	0		
		DCO	FP			2	1	C	0	0	0	0	0	0		
		DCO	F			2	1	C	0	0	0	0	0	0		
		DCO	CG			2	1	C	0	0	0	0	0	0		
		DCO	BC			2	1	C	0	0	0	0	0	0		
		DCO	FR			2	1	C	6	0	6	0	6	0		
		DCO	NBC			2	1	C	0	0	0	0	0	0		
		DCO	MB			1810	2	1	C	310	19	320	17	290	27	
		DCO	WM						C							
7/15	900	DCO	SP	920		2	1	C	0	0	0	0	0	0		
		DCO	S			2	1	C	0	0	0	0	0	0		
		DCO	FP			2	1	C	0	0	0	0	0	0		
		DCO	F			2	1	C	0	0	0	0	0	0		
		DCO	CG			2	1	C	0	0	0	0	0	0		
		DCO	BC			2	1	C	0	0	0	0	0	0		
		DCO	FR			2	1	C	2	0	2	0	2	0		
		DCO	NBC			2	1	C	0	0	0	0	0	0		
		DCO	MB			2	1	C	27	0	23	0	28	0		
		DCO	WM			1126	2	2	C	0	0	0	0	0		
7/16	1400	DCO	SP	1400		5	3	C	0	0	0	0	0	0		
		DCO	S			5	3	C	0	0	0	0	0	0		
		DCO	FP			5	3	C	0	0	0	0	0	0		
		DCO	F			5	3	C	0	0	0	0	0	0		
		DCO	CG			4	2	C	0	0	0	0	0	0		
		DCO	BC			4	2	C	0	0	0	0	0	0		
		DCO	FR			3	2	C	0	0	0	0	0	0		
		DCO	NBC			3	1	C	0	0	0	0	0	0		
		DCO	MB			1451	3	2	C	0	0	0	0	0		
		DCO	WM						C							



Appendix B. continued.

Date	Time	OBS	BCH	Start Time	End Time	BSS	Bch Cond	Vis.	Land count #1	Water Count #1	Land count #2	Water count #2	Land count #3	Water count #3	
7/17	1700	DCO	SP	1632		5	2	C	0	0	0	0	0	0	
		DCO	S		5	1	C	0	0	0	0	0	0		
		DCO	FP		5	1	C	0	0	0	0	0	0		
		DCO	F		5	1	C	0	0	0	0	0	0		
		DCO	CG		5	1	C	0	0	0	0	0	0		
		DCO	BC		5	1	C	0	0	0	0	0	0		
		DCO	FR		5	1	C	1	0	1	0	1	0		
		DCO	NBC		5	1	C	0	0	0	0	0	0		
		DCO	MB			1841	5	1	C	0	0	0	0	0	0
		DCO	WM						C						
7/18	900	DCO	SP	940		4	1	C	0	0	0	0	0	0	
		DCO	S		4	1	C	0	0	0	0	0	0		
		DCO	FP		4	1	C	0	0	0	0	0	0		
		DCO	F		4	1	C	0	0	0	0	0	0		
		DCO	CG		4	1	C	0	0	0	0	0	0		
		DCO	BC		3	1	C	0	0	0	0	0	0		
		DCO	FR		3	1	C	0	1	0	1	0	1		
		DCO	NBC		3	1	C	0	1	0	1	0	1		
		DCO	MB			1100	3	1	C	0	1	0	1	0	1
		DCO	WM						C						
7/19	1400	DCO	SP	1440		2	1	C	0	0	0	0	0	0	
		DCO	S		2	1	C	0	0	0	0	0	0		
		DCO	FP		2	1	C	0	0	0	0	0	0		
		DCO	F		2	1	C	25	0	25	0	25	0		
		DCO	CG		2	1	C	0	0	0	0	0	0		
		DCO	BC		2	1	C	0	0	0	0	0	0		
		DCO	FR		2	1	C	11	0	11	0	11	0		
		DCO	NBC		2	1	C	0	0	0	0	0	0		
		DCO	MB			1711	2	1	C	380	0	360	0	360	0
		DCO	WM					2	2	C	0	0	0	0	0
7/21	1400	DCO	SP	1345		4	1	C	0	0	0	0	0	0	
		DCO	S		4	1	C	0	6	0	6	0	6		
		DCO	FP		4	1	C	0	0	0	0	0	0		
		DCO	F		4	1	C	0	2	0	2	0	2		
		DCO	CG		4	1	C	0	0	0	0	0	0		
		DCO	BC		4	1	C	0	0	0	0	0	0		
		DCO	FR		3	1	C	0	0	0	0	0	0		
		DCO	NBC		3	1	C	0	0	0	0	0	0		
		DCO	MB			1455	3	1	C	130	7	122	9	135	9
		DCO	WM						C						
7/22	1400	DCO	SP	1415		2	1	C	0	0	0	0	0	0	
		DCO	S		2	1	C	0	0	0	0	0	0		
		DCO	FP		2	1	C	0	0	0	0	0	0		
		DCO	F		2	1	C	0	0	0	0	0	0		
		DCO	CG		2	1	C	0	0	0	0	0	0		
		DCO	BC		2	1	C	0	0	0	0	0	0		
		DCO	FR		2	1	C	5	2	5	2	5	2		
		DCO	NBC		2	1	C	0	0	0	0	0	0		
		DCO	MB			1540	2	1	C	265	12	250	12	270	12
		DCO	WM						C						
7/23	1700	DCO	SP	1700		2	0	C	0	0	0	0	0	0	
		DCO	S		2	0	C	67	0	68	0	67	0		
		DCO	FP		2	0	C	0	0	0	0	0	0		
		DCO	F		2	0	C	111	0	111	0	112	0		
		DCO	CG		2	1	C	0	0	0	0	0	0		
		DCO	BC		2	1	C	8	0	8	0	8	0		
		DCO	FR		2	1	C	10	0	10	0	10	0		
		DCO	NBC		2	1	C	0	0	0	0	0	0		
		DCO	MB			1811	2	1	C	800	14	850	14	730	17
		DCO	WM						C						

Appendix B. continued.

Date	Time	OBS	BCH	Start Time	End Time	BSS	Bch Cond	Vis.	Land count #1	Water Count #1	Land count #2	Water count #2	Land count #3	Water count #3
7/24	900	DCO	SP	920		3	1	C	0	0	0	0	0	0
		DCO	S		3	0	C	97	19	102	18	96	18	
		DCO	FP		3	1	C	0	1	0	1	0	1	
		DCO	F		3	1	C	124	9	122	7	134	8	
		DCO	CG		3	1	C	0	0	0	0	0	0	
		DCO	BC		3	1	C	0	1	0	1	0	1	
		DCO	FR		3	1	C	6	6	6	6	6	6	
		DCO	NBC		3	1	C	0	0	0	0	0	0	
		DCO	MB		3	1	C	400	20	390	19	420	19	
		DCO	WM			1154	3	1	C	48	0	48	0	50
7/25	1700	DCO	SP	1700		3	1	C	0	0	0	0	0	0
		DCO	S		3	1	C	117	2	122	2	114	2	
		DCO	FP		3	1	C	0	0	0	0	0	0	
		DCO	F		3	1	C	105	1	105	1	109	1	
		DCO	CG		3	1	C	0	0	0	0	0	0	
		DCO	BC		3	1	C	0	0	0	0	0	0	
		DCO	FR		3	1	C	0	0	0	0	0	0	
		DCO	NBC		3	1	C	0	0	0	0	0	0	
		DCO	MB		3	1	C	375	0	375	0	375	0	
		DCO	WM							C				
7/26	1400	DCO	SP	1400		3	1	C	1	1	1	1	1	1
		DCO	S		3	1	C	79	0	74	0	79	0	
		DCO	FP		3	1	C	0	0	0	0	0	0	
		DCO	F		3	1	C	81	1	84	1	80	1	
		DCO	CG		3	1	C	0	0	0	0	0	0	
		DCO	BC		3	1	C	0	0	0	0	0	0	
		DCO	FR		3	1	C	0	0	0	0	0	0	
		DCO	NBC		3	1	C	0	0	0	0	0	0	
		DCO	MB		3	1	C	270	0	280	0	260	0	
		DCO	WM			1524				C				
7/27	1400	DCO	SP	1430		3	1	C	0	0	0	0	0	0
		DCO	S		3	1	C	67	0	67	0	72	0	
		DCO	FP		3	1	C	0	0	0	0	0	0	
		DCO	F		3	1	C	63	2	63	2	62	2	
		DCO	CG		3	1	C	0	8	0	8	0	8	
		DCO	BC		3	1	C	0	0	0	0	0	0	
		DCO	FR		3	1	C	0	0	0	0	0	0	
		DCO	NBC		3	1	C	0	0	0	0	0	0	
		DCO	MB		3	1	C	250	5	255	5	240	5	
		DCO	WM			1543				C				
7/28	1400	DCO	SP	1430		2	1	C	0	0	0	0	0	0
		DCO	S		2	0	C	56	1	56	1	57	1	
		DCO	FP		2	0	C	0	0	0	0	0	0	
		DCO	F		2	0	C	52	1	52	1	52	0	
		DCO	CG		2	1	C	0	0	0	0	0	0	
		DCO	BC		2	1	C	0	0	0	0	0	0	
		DCO	FR		2	1	C	0	0	0	0	0	0	
		DCO	NBC		2	1	C	0	0	0	0	0	0	
		DCO	MB		2	1	C	230	0	240	0	190	0	
		DCO	WM			1731	2	1	C	0	0	0	0	0
7/29	900	DCO	SP	945		2	1	C	0	0	0	0	0	0
		DCO	S		3	1	C	60	4	60	4	61	4	
		DCO	FP		3	1	C	0	0	0	0	0	0	
		DCO	F		3	1	C	0	0	0	0	0	0	
		DCO	CG		3	1	C	0	0	0	0	0	0	
		DCO	BC		3	1	C	0	0	0	0	0	0	
		DCO	FR		3	1	C	0	0	0	0	0	0	
		DCO	NBC		3	1	C	0	0	0	0	0	0	
		DCO	MB		3	1	C	0	0	0	0	0	0	
		DCO	WM			1217	4	1	C	61	5	58	5	62

Appendix B. continued.

Date	Time	OBS	BCH	Start Time	End Time	BSS	Bch Cond	Vis.	Land count #1	Water Count #1	Land count #2	Water count #2	Land count #3	Water count #3	
7/31	1400	LAJ	SP	1413		1	1	C	0	0	0	0	0	0	
		LAJ	S		1	1	C	0	1	0	1	0	1		
		LAJ	FP		1	1	C	0	0	0	0	0	0		
		LAJ	F		1	1	C	0	0	0	0	0	0		
		LAJ	CG		1	1	C	0	0	0	0	0	0		
		LAJ	BC		2	1	C	0	0	0	0	0	0		
		LAJ	FR		3	1	C	0	0	0	0	0	0		
		LAJ	NBC		3	1	C	0	0	0	0	0	0		
		LAJ	MB		3	1	C	20	4	20	4	20	4		
		LAJ	WM			1634	3	1	C	0	0	0	0	0	
8/1	1400	LAJ	SP	1414		1	1	C	0	0	0	0	0	0	
		LAJ	S		1	1	C	0	0	0	0	0	0		
		LAJ	FP		1	1	C	0	0	0	0	0	0		
		LAJ	F		1	1	C	3	0	3	0	3	0		
		LAJ	CG		1	1	C	0	0	0	0	0	0		
		LAJ	BC		1	1	C	0	0	0	0	0	0		
		LAJ	FR		1	1	C	0	0	0	0	0	0		
		LAJ	NBC		1	1	C	0	0	0	0	0	0		
		LAJ	MB			1525	1	1	C	165	2	170	2	150	2
		LAJ	WM												
8/2	900	DCO	SP	930		3	1	C	0	0	0	0	0	0	
		DCO	S		3	1	C	33	3	33	3	32	3		
		DCO	FP		3	1	C	0	0	0	0	0	0		
		DCO	F		3	1	C	39	1	39	1	39	1		
		DCO	CG		4	2	C	0	0	0	0	0	0		
		DCO	BC		4	2	C	0	0	0	0	0	0		
		DCO	FR		3	2	C	2	2	2	2	2	2		
		DCO	NBC		3	2	C	0	0	0	0	0	0		
		DCO	MB		3	1	C	140	3	150	9	130	9		
		DCO	WM			1201	3	2	C	0	0	0	0	0	
8/3	900	DCO	SP	915		2	1	C	0	0	0	0	0	0	
		DCO	S		2	1	C	1	0	1	0	1	0		
		DCO	FP		2	1	C	0	0	0	0	0	0		
		DCO	F		2	1	C	4	0	4	0	4	0		
		DCO	CG		2	1	C	0	0	0	0	0	0		
		DCO	BC		2	1	C	0	0	0	0	0	0		
		DCO	FR		2	1	C	0	0	0	0	0	0		
		DCO	NBC		2	1	C	0	0	0	0	0	0		
		DCO	MB			1047	2	1	C	33	6	34	6	29	6
		DCO	WM												
		8/5	1400		DCO	SP	1436		2	1	C	0	0	0	0
DCO	S			2	1	C		0	0	0	0	0	0		
DCO	FP			2	1	C		0	0	0	0	0	0		
DCO	F			2	1	C		29	2	29	2	30	2		
DCO	CG			2	1	C		0	0	0	0	0	0		
DCO	BC			2	0	C		0	0	0	0	0	0		
DCO	FR			2	0	C		0	0	0	0	0	0		
DCO	NBC			2	0	C		0	0	0	0	0	0		
DCO	MB				1645	1		0	C	604	18	604	17	554	18
DCO	WM														
8/6	900			DCO	SP	925			2	1	C	0	0	0	0
		DCO	S	2	1		C	0	0	0	0	0	0		
		DCO	FP	2	1		C	0	0	0	0	0	0		
		DCO	F	2	1		C	10	3	10	3	10	3		
		DCO	CG	3	1		C	0	0	0	0	0	0		
		DCO	BC	3	1		C	0	0	0	0	0	0		
		DCO	FR	3	1		C	0	0	0	0	0	0		
		DCO	NBC	3	1		C	0	0	0	0	0	0		
		DCO	MB		1046		3	1	C	63	9	63	9	63	9
		VISITOR	WM	945	946		3	2	C	0	0	0	0	0	0

Appendix B. continued.

Date	Time	OBS	BCH	Start Time	End Time	BSS	Bch Cond	Vis.	Land count #1	Water Count #1	Land count #2	Water count #2	Land count #3	Water count #3	
8/8	1700	GH	SP		1718	1	0	C	0	0	0	0	0	0	
		GH	S			1	0	C	0	0	0	0	0	0	
		GH	FP			1	0	C	0	0	0	0	0	0	
		GH	F	1658		1	0	C	0	0	0	0	0	0	
		DCO	CG	1730		1	0	C	0	0	0	0	0	0	0
		DCO	BC			1	0	C	0	0	0	0	0	0	
		DCO	FR			1	0	C	0	0	0	0	0	0	
		DCO	NBC			1	0	C	0	0	0	0	0	0	
		DCO	MB			1	0	C	63	2	63	2	61	2	
		DCO	WM												
8/9	1700	GH	SP	1638		0	0	C	0	0	0	0	0	0	
		GH	S			0	0	C	0	0	0	0	0	0	
		GH	FP			0	0	C	0	0	0	0	0	0	
		GH	F		1653	0	0	C	0	0	0	0	0	0	
		DCO	CG	1630		1	0	C	0	0	0	0	0	0	
		DCO	BC			1	0	C	0	0	0	0	0	0	
		DCO	FR			1	0	C	0	0	0	0	0	0	
		DCO	NBC			1	0	C	0	0	0	0	0	0	
		DCO	MB		1652	1	0	C	63	0	61	0	64	0	
		JS	WM	1730		1732	1	0	C	0	0	0	0	0	
8/11	1700	DCO	SP	1728		2	1	C	0	0	0	0	0	0	
		DCO	S			2	1	C	0	0	0	0	0	0	
		DCO	FP			2	1	C	0	0	0	0	0	0	
		DCO	F			2	1	C	0	0	0	0	0	0	
		DCO	CG			2	1	C	0	0	0	0	0	0	
		DCO	BC			2	1	C	0	0	0	0	0	0	
		DCO	FR			2	0	C	0	0	0	0	0	0	
		DCO	NBC			2	0	C	0	0	0	0	0	0	
		DCO	MB		1930	2	0	C	300	0	300	0	300	0	
		DCO	WM												
8/12	1700	DCO	SP	1700		1	1	C	0	0	0	0	0	0	
		DCO	S			1	1	C	0	0	0	0	0	0	
		DCO	FP			1	1	C	0	0	0	0	0	0	
		DCO	F			1	1	C	0	0	0	0	0	0	
		DCO	CG			1	1	C	0	0	0	0	0	0	
		DCO	BC			1	1	C	0	0	0	0	0	0	
		DCO	FR			1	1	C	0	0	0	0	0	0	
		DCO	NBC			1	1	C	0	0	0	0	0	0	
		DCO	MB		1830	1	1	C	65	0	68	0	64	0	
		DCO	WM												
8/13	900	DCO	SP	930		1	1	C	0	0	0	0	0	0	
		DCO	S			1	1	C	0	0	0	0	0	0	
		DCO	FP			1	1	C	0	0	0	0	0	0	
		DCO	F			1	1	C	0	0	0	0	0	0	
		DCO	CG			2	2	C	0	0	0	0	0	0	
		DCO	BC			2	2	C	0	0	0	0	0	0	
		DCO	FR			2	2	C	0	0	0	0	0	0	
		DCO	NBC			2	2	C	0	0	0	0	0	0	
		DCO	MB			2	2	C	6	0	6	0	6	0	
		DCO	WM		2101	2	2	C	0	0	0	0	0	0	
8/14	900	DCO	SP	950		3	1	C	0	0	0	0	0	0	
		DCO	S			3	1	C	0	2	0	2	0	2	
		DCO	FP			3	1	C	0	0	0	0	0	0	
		DCO	F			3	1	C	3	0	3	0	3	0	
		DCO	CG			3	1	C	0	0	0	0	0	0	
		DCO	BC			3	1	C	0	0	0	0	0	0	
		DCO	FR			4	2	C	0	0	0	0	0	0	
		DCO	NBC			4	2	C	0	0	0	0	0	0	
		DCO	MB		1201	4	2	C	60	0	60	0	68	0	
		DCO	WM												

Walrus count observers: DCO: Diane Calamar Okonek BJO: Brian Okonek, LAJ: Lauri Jemison, GH: Grant Hilderbrant

Appendix C. Steller sea lion monitoring, Round Island 2008

Date	Start/Finish Time	View 1 land/water	View 2 land/water	View 3 land/water	Total Land	Total Water	Total	Brand	Photo	% Certain
5/8	1050/1105	62/0	0/0	22/0	84	0	84	A345	y	100
								A78	n	80
5/9	1250/1305	101/2	0/0	25/0	125	2	127	none		
5/12	1415/1430	139/0	0/0	22/0	161	0	161	A345	y	100
								A253	y	100
5/14	0845/0900	77/3	0/0	20/0	97	3	100	X3	y	100
	1400/1500	140/3	0/0	20/0	160	3	163	A234	y	100
								A280	y	100
								A253	y	100
								A345	y	100
								X3	y	100
								X168	y	100
5/15	1320/1340	107/10	0/0	16/0	123	10	133	none		
5/16	1240/1350	59/17	3/0	18/8	80	25	105	A230	y	100
								A280	y	100
								A234	y	100
								A430	y	100
5/17	1520/1605	52/10	0/0	30/1	82	11	93	A234	y	100
5/18	855/910	6/1	0/0	26/0	32	1	33	A230	y	100
5/19	1730/1800	5/2	7/0	61/0	73	2	75	none		
5/20	1445/1540	22/2	0/0	40/3	62	5	67	X168	y	100
								A234	y	100
								A256	y	100
5/21	1108/1200	53/3	21/2	30/0	104	5	109	A430	y	100
5/24	1355/1415	22/14	0/0	20/6	42	16	58	none		
5/25	1540/1645	32/2	22/0	38/6	102	8	110	A280	y	100
								A332	y	100
								V16	y	100
								A230	y	100
								A345	y	100
								X168	y	100
								A291	y	100
5/26	1320/1450	121/2	30/0	42/0	193	2	195	A234	y	100
								A256	y	100
								X3	y	100
5/27	2000/2035	47/0	26/0	31/2	94	2	96	A280	y	100
								X168	y	100
								A420	n	75
5/28		76/10	27/5	37/6	140	21	161	A291	y	100
								V16	y	100
								A316	y	100
								A345	y	100
								X3	y	100
								A280	y	100
5/30	950/1122	51/7	8/8	18/11	77	18	95	X168	n	100
								A514	y	100
								A430	n	75
								A234	n	100
6/2	1200/1258	98/6	0/0	24/0	122	6	128	A256	y	100
								A316	y	100
								V16	y	100
								A33	n	?
								A23	n	?

Appendix C. continued.

Date	Start/Finish Time	View 1 land/water	View 2 land/water	View 3 land/water	Total Land	Total Water	Total	Brand	Photo	% Certain
6/3	1159/1207	95/0	42/0	89/0	226	0	226	none		
6/5	1140/1200	68/0	5/0	16/0	89	0	89	A281	y	100
6/7	1220/1400	70/0	28/0	22/0	120	0	120	A345	y	100
								A234	y	100
								A316	y	100
								A284	y	100
6/9	1555/1638	60/0	34/0	40/0	134	0	134	A514	y	100
								A345	y	100
								A420	y	100
								X168	y	100
								A256	y	100
6/11	1125/1205	53/6	17/0	18/1	88	7	95	A234	y	100
								A281	y	100
								A514	y	100
								A358	y	100
6/13	1615/1630	27/0	33/0	26/0	86	0	86	A256	y	100
								A420	Y	100
6/15	937/1000	60/0	28/1	20/0	108	1	109	none		
6/20	1720/1740	12/1	40/4	36/5	88	10	98	A514	y	100
								A234	y	100
6/21	no count							A373	y	100
								A332	y	100
6/24	918/930	0/0	25/6	7/0	32	6	38	A253	y	100
6/25	1125/1135	0/5	18/6	0/0	18	11	29	A345	n	100
6/28	945/1020	23/0	39/6	20/1	82	7	89	A345	n	100
								M618	y	100
7/1	936/1020	87/0	44/0	10/10	141	0	141	M618	y	100
								A358	y	100
								A373	y	100
7/3	0900/0910	69/5	61/4	35/0	165	9	174	A514	y	100
								A345	y	100
								A481	y	100
7/4	1345/1430	55/3	46/5	32/22	131	30	161	A286	y	100
								A316	y	100
								A481	y	100
								A420	y	100
								A256	y	100
7/5	1045/1125	43/3	48/2	25/4	116	7	123	none		
7/6	1450/1515	1/0	33/13	70/0	104	13	117	none		
7/8	1506/1535	1/0	39/4	35/1	75	5	80	A256	y	100
7/10	950/1015	32/15	26/1	43/2	101	18	119	A420	n	100
7/13	1330/1430	82/2	16/25	53/5	151	32	183	A373	y	100
								A332	y	100
								A420	y	100
								A347	y	100
								M618	y	100
7/16	1327/1340	0/0	39/42	47/1	86	43	129	none		
7/17	1115/1140	0/0	62/0	56/1	118	1	119	A420	y	100
7/23	1300/1320	14/0	48/0	39/0	101	0	101	A514	y	100
								A433	y	100
								A25?	y	75
7/25	1606/1640	0/0	0/50	40/2	90	2	92	A358	y	100
7/28	1326/1400	0/0	48/9	110/10	158	19	177	A434	y	100
								M618	n	75
								A347	y	75
								A481	y	100

Appendix C. continued.

Date	Start/Finish Time	View 1 land/water	View 2 land/water	View 3 land/water	Total Land	Total Water	Total	Brand	Photo	% Certain
7/29	1950/2100	0/0	51/4	165/5	216	9	225	A420	y	100
								A481	y	100
								A332	y	100
								A286	y	100
								A373	y	100
								A434	y	80
								A347	y	100
7/30	1527/1605	0/0	51/2	106/1	157	3	160	A434	y	100
								A481	y	100
								A347	y	100
								A420	y	100
								A345	y	100
7/30	1730/1810	0/0	57/0	118/1	175	1	176	none		
7/31	1012/1800	0/0	29/14	43/85	72	99	172	A420	y	100
								A322	y	100
								A345	y	100
								A347	y	100
								suckling	y	100
8/1	1228/1247	0/0	17/110	47/5	64	115	179	A358	y	100
								A514	y	100
								M618	?	100
								A434	y	100
								A332	y	100
								A345	y	100
								A286	?	50
								A420	y	100
8/1	2040/2120	0/0	56/0	142/1	198	1	199	none		
8/2	1408/1429	5w/0L	30/37	59/36	95	73	168	A332	y	100
8/2	1443/1500	15/0	29/27	58/45	103	72	175	A347	y	100
								A420	y	100
8/3	1700/1730	0/0	17/7	37/2	49/55	67	62	A332	y	100
8/4	1350/1420	0/0	38/22	92/40	131	62	193	A420	y	100
								A332	y	100
								M618	y	100
								A430	n	100
								A345	n	100
8/6	1720/1750	0/0	36/7	72/18	108	25	132	A420	y	100
8/8	1030/1130	33/0	25/5	73/120	141	125	266	A434	y	100
								A??4	y	25
								M618	y	100
								A358	y	100
								A420	y	100
8/10	1825/1905	0/0	44/4	181/10	225	14	239	M618	n	100
								A358	y	100
								A332	y	100
8/12	1010/1050	0/0	33/3	83/140	116	143	259	A420	y	100
								A373	y	100
								M618	n	100
								A514	y	50
8/14	1000/1030	16/1	18/5	55/134	89	140	229	A286	y	100
								A434	n	100
								suckling	y	100
								A373	y	100
								M618	n	100
A514	y	50								

Appendix D. Productivity data from three species of seabirds on Round Island.

2008 BLKI Productivity Plot 2 - Observation Point																								
NEST #	6/5	6/6	6/7	6/8	6/9	6/10	6/12	6/17	6/20	6/24	6/27	7/1	7/4	7/6	7/9	7/12	7/18	7/22	7/26	7/29	8/1	8/3	8/5	
1	e1	IP	e1+	B	B	B	B	B	B	B	B	B	b	B	B	B	B	B	B	B	B	N	N	N
2	e1	B	IP	e1	e1	IP	IP	e2	e1	P	e1	e1	e1	e1c1	c1	e1	B	B	B	B	N	N	N	
3		e1	IP	e2	IP	e2	IP	e2	e1+	e2	e2	IP	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	
4			e1+	IP	IP	e1	IP	e2	e2	P	e1	e1+	e2	e2	e1+	e2	e1	e1	B	B	N	N	N	
5				e1	e1	e2	IP	e1+	e2	P	c2	e2	e1	c1	c1	c1	c1	c1	B	B	N	N	N	
6				e1	e1	IP	IP	e1	e1	e1	IP	e1	e1	e1	IP	IP	B	B	B	B	N	N	N	
7				e1	IP	IP	IP	IP	e1+	P	e1	e1	e1	e1	e1+	IP	B	B	B	B	B	B	B	
8				e1	IP	e1	IP	e2	e2	e2	e1	e1	e1	e1	c1	c1	c1	c1	c1	c1	c1	c1	c1	
9				e2	IP	e2	IP	e2	e2	e2	e2	c1	dead	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	
10				e1	e1+	e1	IP	e1	e1+	e1+	IP	e1	e1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	
11				e1	e1	IP	IP	e1	e1	e1	IP	e1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	
12				e1	IP	e1	IP	e1	e1	e1	e1	e1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	
13				e2	e2	e1+	IP	IP	e2	e2	IP	e1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	
14					e1	IP	IP	e1	e1	e1	e1	e1	dead	N	N	N	N	N	N	N	N	N	N	
15					e1?	e1+	IP	B	B	B	IP	e1	e1	e1	e1	ip	e1	B	B	B	B	B	B	
16					e1	e1	e1	e1	e2	e2	e2	e2	e2	e2	c1e1	c1e1	c1	B	B	B	B	B	B	
17							e1	e2	e2	e2	e2	e1+	e2	e2	e2	c1	c1	B	B	B	B	B	B	
18							e1	e1+	e1	e1	e1	e1	e1	IP	IP	c1	c1	B	B	B	N	N	N	
19							e1+	e2	e2	e1+	e2	e2	e2	c1e?	c1e?	c1	c1	c1	c1	c1	c1	B	B	
20							e1	IP	e2	e2	IP	IP	c1	c1	c1	BP	c1	c1	c1	c1	c1	c1	c1	
21							e1	e1	e1	e1	e1	e1	e1	e1	IP	c1	c1	c1	c1	c1	c1	c1	c1	
22							e1	e1	e1	e1	e1	e1	e1	e1	c1	c1	c1	B	B	B	B	B	B	
23							e1	e1	e1	P	e1	IP	B	B	B	B	B	B	B	B	B	B	B	

2008 BLKI Productivity Plot 3 - Observation Point																							
NEST #	6/5	6/6	6/8	6/9	6/16	6/21	6/24	6/27	7/1	7/4	7/6	7/9	7/13	7/22	7/26	7/28	8/1	8/3	8/5	8/8	8/11	8/15	
1	e1	e1	e1	e1	e1	e1	e1	e1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1
2	e1	e1	e1	e2	e1+	e1	e2	e1	B	B	B	B	B	N	N	N	N	N	N	N	N	N	N
3	e1	e1	e2	e2	e1	e1	B	B	B	B	B	B	B	N	N	N	N	N	N	N	N	N	N
4	e1	e1	e1	IP	e1	e1	e1	e1	e1	c1	c1	BP	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	
5	e1	e1	IP	IP	B	B	e1	e1	e1	IP	IP	IP	IP	c1	c1	c1	c1	c1	c1	c1	c1	c1	
6	B	B	e1	IP	e1	e2	e2	e1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	
7	B	B	e1	e1	e1	e1	e1	e1	c1	e1	c1	c1	c1	B	B	B	B	B	B	N	N	N	
8	B	e1	e1	IP	e2	e1+	e2	IP	e2	e2	c1	c1e1	e1c1	c1	B	B	B	B	B	N	N	N	
9	B	e1	e1	IP	e2	e1+	IP	e2	e2	e2	e1c1	c2	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	
10	B	e1	e1	e1	e1	e1	e1	e1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	
11	B	e1	e1	IP	e1	e1	IP	e1	IP	e1	IP	e1	B	N	N	N	N	N	N	N	N	N	
12	B	B	B	e1	e1	e1	IP	e1	e1	IP	c1	c1	B	B	B	B	N	N	N	N	N	N	
13	B	e1	e1	B	B	B	B	e1	e1	e1	IP	e1c1	IP	B	B	B	N	N	N	N	N	N	
14	B	B	e1	B	IP	e2	e2	e2	IP	e2	e2	e2	e2	c1	c1	c1	c1	c1	c1	c1	c1	c1	
15	B	e1	e1	IP	e2	e2	e2	e2	IP	e1+	BP	e1	c1	B	B	B	B	B	B	N	N	N	
16	e1	e1	e1	IP	e1	e1	e1	e1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	B	
17	IP	IP	e2	e2	e2	N	N	B	N	B	B	B	N	B	B	B	B	B	N	N	N	N	
18	e1	e1	e1	e2	IP	e1+	e2	e2	c1	IP	c1	c1	c1	c1	c1	c1	c1	c1	c1	N	c1	B	
19	e1	e1	e1	IP	e2	e2	IP	e1+	IP	e1+	c1	c1	c1	c1	c1	P	P	c1	c1	c1	c1	c1	
20	B	B	B	e1	e1	e1+	e1	e1	e1	c1	c1	c1	c1	c1	c1	c1	c1	c1	c1	B	c1	c1	
21	e1	e1	e1	IP	e1	e1	e1	IP	c1	c1	c1	c1	c1	c1e1	c1	c1	c1	c1	c1	c1	c1	c1	
22	IP	IP	e2	IP	e2	e2	e2	e2	c1e1	c1e1	e1c1	c1e1	c1e1	c1	c1	B	B	B	B	N	N	N	
23	B	B	IP	e1	B	B	B	B	B	B	B	B	N	N	N	N	N	N	N	N	N	N	
24	IP	e1	e2	IP	e2	N	N	B	N	B	N	N	N	N	N	N	N	N	N	N	N	N	
25	B	B	e1	e1+	B	B	B	B	B	B	B	B	N	N	N	N	N	N	N	N	N	N	

N=empty nest and is used when the egg or chick that was in the nest has been lost and the adult was not present.  
B= Bird, Adult bird occupying a site, with no egg or chick present. Used when observer is sure the bird has no egg or chick.  
P= Bird, present and don't know if egg or chick present (this is recommended by Byrd and Dragoo but not found in the above report).  
E= Egg, Egg present, with no adult. If the egg is obviously damaged, record it as E<sub>ad</sub> (dead egg).  
C= Chick, Chick present. C<sup>3</sup> (three chicks) C<sup>3+</sup> (three chicks plus possibly more).



Appendix D. continued.

2008 Pelagic Cormorant Productivity First Prime (FP)																	
Nest #	5/15	5/16	5/18	5/19	5/20	5/21	5/22	5/25	5/28	5/31	6/2	6/5	6/8	6/11	6/14	6/17	6/21
1	e1	e2	e2	IP	e3	IP	e1+	IP	e2+	e4	e4	e5	e3+	e2+	e4+	c1e2+	B
2	e1	e1	e2	IP	e3	IP	e1+	e3+	IP	e2+	IP	IP	e1+	e2+	IP	IP	c3+
3				e1	e1	e2	e2	e2	e3	e4	e4	e4	e4	e3+	e2+	e4	c1+e1+
4				e1	IP	IP	e1	e2	e1+	B	B	B	B	N	N	N	B
5					e2	IP	e1+	e3	e2+	e3	e1+	e3	e3	e1+	IP	c1e2+	c1+e3
6					e1 +	IP	e3	e3	IP	IP	IP	e3+	e2+	e4	IP	e4	c2e1
7					e1	IP	e2	e3+	B	N	N	N	N	N	N	N	N
8					e1	IP	e2	e3	e4	e4	e3+	e4	IP	e4	e4	e4	c2e2
9					e1	e1	e2	e3	e2+	e1+	e2+	IP	e3+	e3+	e3+	e3+	c2+e1+
10					e1	IP	e2	e2	e2+	e3	e3	e2+	e3+	e3	e2+	e3	c1+e1+
11					e1	e1	e2	e3	e4	e3+	e4	e5	IP	e2+	e2+	e5	c1e3+
12						e1	e1	e2	e2+	e2+	e4	e2+	e3+	e3+	IP	e2+	e2+
13						e2	e3	e3	e3	e4	e4	IP	e4	e3+	e2+	e2+	IP
14						e1	e2+	e2+	B	B	N	B	B	B	N	N	N
15						e1	e2	e3	e2+	e2+	IP	e3+	e3	e3	e2+	e2	e2
16						e1	e3	e3	e2+	e3+	e3+	e2+	e2+	e3	e3	e3	c2+
17						e1	e1	B	B	B	B	e2	e3	e3	e2+	e3	e3
18						e1	e1	e1+	e1+	e3+	e4	e3+	e4	e2+	e2+	e2+	e2+
19							e2	e2	e2+	e1+	e3	e1+	e3	e3+	e3	e3	e2=
20							e2	B	N	e1	e1	N	N	N	N	N	N
21							e1	B	B	B	B	N	N	N	N	N	N
22							e2	e1+	e1+	e3	e3	e2+	e3	e2+	e1+	e1+	e1+
23							e1+	e1+	e1+	e2+	e2+	IP	e3+	e3+	e2+	e2+	B
24								e1	e3	e2+	e2+	e3	e3	e3	e3	e2+	e3
25								e1	e2+	e3	e2+	e2+	e3	e2+	e3	e2+	e3
26								e2	e1+	e3	e3+	e1+	e3+	e2+	e3	IP	IP
27									e2	IP	e2+	IP	IP	e3	e2+	e2+	e3
28										e1+	e1+	e3	IP	e1+	IP	e2+	IP
29										e1	e2	e2+	e2+	e2+	e2+	IP	e3
30											e3	IP	e1+	e2+	e2+	e1+	e3
Nest #	6/23	6/26	6/28	7/1	7/3	7/6	7/9	7/13	7/17	7/20	7/23	7/26	7/29	7/31	8/3	8/8	
1	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
2	c?	B	B	N	N	N	N	N	N	N	N	N	N	N	N	N	N
3	c1+	c3+	c2+	c3+	c3+	C3+	c3	c3	c3	c3	c3	c3	c3	c2f1	c2f1	c2f1	c2f1
4	N	N	B	N	N	N	N	N	N	N	N	N	N	N	N	N	N
5	B	B	B	N	N	N	N	N	N	B	B	B	B	B	B	B	B
6	P	c1+	c2+	c2+	c2+	c2	c2	P	c2	c2	c2	c2	c2	c3	c3	c1f2	c1f2
7	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
8	c1+e2	c3e1	e1+	c3+	c1+	c3+	c4	c3+	c3+	c3	c3	c3	c3	c3	c3	c3	c3
9	c2+	c2+	c2+	c2+	c2+	c3	c2+	c3&1dead	c3	c2	c2	c2	c2	c2	c2	c2	c2
10	c1+	c1+	c1+	c1+	c2+	c2+	c2+	c3	c2+	c2+	c3	c3	c3	c3	c3	c3	c3
11	c1+	c2e1	c1+e1	c2+	c3+	c4+	c3+	c3+	c3+	c3	c3	c3	c3	c3	c3	c3	c3
12	p	P	c2+	c2+	c1+	c2+	c3	c3	c2+	c3	c3	c3	c3	c3	c3	c3	c3
13	p	c2+	c2+	c1+	c3+	c3+	c2+	c3	P	c3	c3	c3	c3	c3	c3	c3	f3
14	N	B	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
15	IP	c1+	c2+	c1+	c1+	c1+	c1	c1	c1	c1	c2	c1	c1	c1	c1	c1	f1
16	c1+	c1+	c2+	c2+	c2+	c2+	c3	c3	c3	c3	c3	c3	c3	c3	c3	c3	c2f1
17	e3	e3	e3	e3	e3	e3	c1+	c2+	P	c2+	c2+	c2+	c2	c2	c3!	c3	c3
18	P	P	c1+	c2+	c1+	c1+	c2	c2+	c1+	c2	c2	c2	c2	c2	c2	c2	c2
19	B	B	B	N	N	N	N	N	N	N	N	N	N	N	N	N	N
20	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
21	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
22	P	c1+	c2+	c2+	c2+	c2+	c2	c2	c2+	c2	c2	c2	c2	c2	c2	c2	c2
23	B	B	B	N	N	N	N	N	N	N	N	N	N	N	N	N	N
24	P	c1e2	c1+	c2+	c1+e1	c2+	c2+	c1+	c1+	c2	c2	c2	c2	c2	c2	c2	c2
25	e3	e3	c2e1	P	c1+	c3	c2+	c3	c1+	c3	c2	c2+	c3	c3	c3	c3	c3
26	e2+	e2+	c2e1	P	c2+	c1+	c2	c2	c1+	c2	c2	c2	c2	c2	c2	c2	c2
27	e3	c1e2	c2e1	c2+	c2+	c2e1	c2+	c2	c2	c2	c2	c2	c2	c2	c2	c2	c2
28	e1+	e1+	e1+	P	c1+	c1+	c3	c1+	c2+	c2	c2	c2	c2	c2	c2	c2	c2
29	e3	P	e2+	P	e1+	c1+	c1+	c1+	c1+	c1+	c1+	c2	c1	c1	c1	c1	c1
30	e3	e2+	c1e2	c3	c1+	c1+	c3	c3	e2+	c3	c3	c3	c3	c3	c3	c3	c3

B= Bird, Adult bird occupying a site, with no egg or chick present. Used when observer is sure the bird has no egg or chick.  
P= Bird, present and don't know if egg or chick present (recommended by Byrd and Dragoo but not found in the above report).  
C= Chick, Chick present. C<sup>3</sup> (three chicks) C<sup>3+</sup> (three chicks plus possibly more).  
BP= Brooding posture  
IP= Incubating posture

Appendix D. continued.

2008 COMU Productivity Plot 1 - Observation Point																			
Nest #	6/17	6/20	6/24	6/27	7/1	7/4	7/6	7/9	7/13	7/18	7/22	7/26	7/29	8/1	8/3	8/5	8/8	8/11	8/15
1	e1	e1	e1	e1	IP	IP	IP	IP	P	B	B	B	B	B	N	N	N	N	N
2	B	e1	IP	e1	IP	P	IP	IP	P	IP	IP	BP	BP	BP	BP	c1	c1	P	N
3	B	e1	IP	IP	e1	e1	IP	IP	IP	IP	IP	BP	BP	c1	c1	c1	c1	c1	N
4	e1	e1	IP	IP	IP	e1	IP	IP	IP	IP	IP	BP	BP	c1	BP	c1	c1	c1	c1
5	e1	e1	e1	IP	IP	IP	IP	IP	e1	IP	BP	BP	BP	c1	BP	c1	c1	c1	N
6	e1	e1	B	B	B	B	B	B	B	N	N	N	N	c1	c1	BP	c1	P	c1
7	e1	e1	e1	IP	IP	IP	IP	IP	IP	IP	IP	c1	BP	BP	c1	c1	BP	c1	N
8	B	e1	e1	IP	IP	IP	IP	IP	IP	IP	c1	c1	BP	c1	BP	c1	c1	P	c1
9	B	e1	e1	IP	IP	e1	IP	IP	e1	IP	e1	BP	c1	c1	c1	c1	c1	c1	N
10	B	e1	e1	IP	IP	e1	IP	IP	e1	IP	e1	c1	c1	c1	c1	BP	c1	c1	c1
11	e1	e1	IP	IP	IP	e1	IP	IP	IP	IP	IP	c1	BP	c1	c1	c1	c1	N	B
12	B	e1	IP	IP	IP	e1	IP	IP	IP	IP	c1	BP	c1	c1	c1	c1	c1	c1	c1
13	B	e1	IP	IP	IP	IP	IP	IP	e1	e1	IP	BP	c1	c1	c1	c1	c1	c1	N
14	e1	e1	IP	IP	IP	e1	IP	IP	IP	IP	BP	BP	BP	BP	BP	BP	BP	c1	BP
15	B	B	e1	e1	IP	e1	e1	IP	e1	IP	IP	BP	BP	c1	BP	c1	c1	c1	B
16	B	B	e1	e1	IP	e1	IP	IP	IP	IP	IP	BP	BP	c1	BP	BP	BP	BP	c1
17	B	B	e1	e1	IP	e1	IP	IP	IP	IP	e1	BP	c1	c1	BP	BP	c1	BP	B

2008 COMU Productivity Plot 2 - Observation Point																		
Nest #	6/16	6/20	6/24	6/27	7/1	7/4	7/6	7/9	7/13	7/18	7/22	7/26	7/29	8/1	8/5	8/8	8/11	8/15
1	e1	e1	IP	e1	IP	e1	e1	IP	e1	e1	IP	P	P	P	B	N		
2	e1	e1	e1	IP	e1	e1	e1	IP	e1	e1	c1	BP	B	c1	B	B		
3	e1	IP	IP	IP	IP	IP	IP	IP	IP	IP	e1	IP	P	P	P	P	B	
4	e1	e1	e1	e1	e1	e1	IP	e1	IP	c1	c1	BP	c1	c1	BP	c1	B	B
5	e1	e1	IP	e1	B	IP	IP	e1	IP	IP	c1	BP	BP	BP	BP	P	B	B
6	e1	e1	e1	IP	IP	e1	e1	IP	e1	e1	c1	BP	c1	BP	c1	c1	c1	N
7	e1	e1	e1	P	e1	IP	IP	e1	P	e1	P	P	P	P	P	N	N	N
8	e1	IP	IP	IP	IP	e1	IP	IP	IP	N	N	N	N	N	B	B	N	N
9	e1	IP	IP	e1	IP	IP	IP	IP	IP	e1	IP	BP	BP	c1	P	P	N	N
10	e1	IP	e1	e1	IP	IP	e1	IP	IP	c1	c1	BP	c1	c1	c1	c1	c1	N
11	e1	e1	e1	e1	e1	e1	IP	IP	e1	IP	c1	BP	c1	c1	BP	c1	B	B
12		e1	e1	e1	e1	e1	IP	IP	e1	c1	c1	BP	c1	BP	c1	11/B	B	B
13		e1	e1	e1	e1	e1	IP	IP	e1	c1	c1	c1	BP	P	c1	c1	B	B
14		e1	e1	IP	IP	e1	IP	IP	e1	c1	c1	BP	BP	P	B	B	N	N
15		e1	e1	IP	IP	e1	IP	e1	e1	e1	e1	IP	c1	c1	c1	c1	BP	c1
16		e1	IP	e1	IP	IP	IP	IP	IP	IP	BP	BP	BP	P	P	N	N	N
17		B	e1	IP	IP	e1	P	P	P	e1	IP	BP	BP	c1	BP	BP	BP	BP

2008 COMU Productivity Plot 4 - Observation Point																			
NEST #	6/16	6/20	6/24	6/27	7/1	7/4	7/6	7/9	7/13	7/18	7/22	7/26	7/29	8/1	8/3	8/5	8/8	8/11	8/15
1	e1	N	P	IP	P	P	e1	IP	IP	c1	B	B	B	B	P	P	B	B	B
2	e1	IP	IP	e1	IP	e1	e1	IP	e1	IP	c1	c1	P	BP	P	P	B	B	B
3	e1	e1	IP	e1	IP	e1	e1	c1	IP	c1	c1	BP	BP	BP	BP	P	B	B	B
4	e1	IP	IP	e1	e1	IP	IP	IP	e1	IP	IP	IP	IP	c1	e1	e1	e1	B	B
5	e1	e1	e1	e1	e1	e1	IP	IP	e1	c1	c1	BP	BP	BP	c1	BP	c1	c1	B
6	e1	e1	e1	IP	IP	IP	e1	IP	e1	IP	e1	c1	BP	c1	c1	BP	P	P	B
7	e1	e1	e1	e1	IP	IP	IP	IP	e1	BP	c1	BP	c1	c1	c1	BP	P	P	P
8	e1	e1	e1	IP	IP	IP	e1	IP	IP	IP?	P	P	B	P	B	P	B	B	B
9	e1	IP	e1	IP	IP	e1	e1	IP	P	P	e1	B	B	B	B	BP	B	B	B
10	e1	IP	IP	e1	IP	IP	IP	IP	BP	BP	BP	BP	c1	c1	BP	c1	c1	cq	B
11		e1	IP	e1	IP	e1	e1	IP	e1	c1	BP	c1	BP	BP	BP	c1	c1	c1	B
12		e1	IP	e1	IP	e1	e1	IP	P	P	B	B	B	N	N	N	N	N	N
13		e1	IP	IP	IP	IP	P	P	P	IP	B	B	B	N	N	N	N	N	N
14		e1	IP	e1	IP	IP	IP	IP	e1	IP	P	BP	BP	c1	c1	c1	c1	c1	c1
15	e1	e1	IP	IP	IP	IP	IP	IP	e1	IP	IP	BP	BP	c1	c1	c1	BP	BP	P
16			e1	e1	IP	IP	e1	IP	IP	c1	c1	BP	c1	BP	c1	BP	c1	BP	c1
17			e1	e1	IP	IP	IP	IP	IP	IP	P	B	B	N	N	N	N	N	N
18				e1	IP	IP	IP	IP	e1	P	N	N	N	N	N	N	N	N	N

N=empty nest and is used when the egg or chick that was in the nest has been lost and the adult was not present.  
 B= Bird, Adult bird occupying a site, with no egg or chick present. Used when observer is sure the bird has no egg or chick.  
 P= Bird, present and don't know if egg or chick present (recommended by Byrd and Dragoo but not found in the above report).  
 E= Egg, Egg present, with no adult. If the egg is obviously damaged, record it as E<sub>dead</sub> (dead egg).  
 C= Chick, Chick present. C<sup>3</sup> (three chicks) C<sup>3+</sup> (three chicks plus possibly more).  
 BP= Brooding posture  
 IP= Incubating posture

*Appendix E. Seabird population counts from Observation Point, Round Island.*

<b>2008 Population Count - Plot 1 - Observation Point</b>										
<b>Date</b>	<b>Count #</b>	<b>Start</b>	<b>Finish</b>	<b># BLKI</b>		<b># PECO</b>		<b># COMU</b>	<b># HOPU</b>	<b># TUPU</b>
		<b>Time</b>	<b>Time</b>	<b># BLKI</b>	<b>Nests</b>	<b># PECO</b>	<b>Nests</b>			
6/16	1	16:00		24	20	0	0	114	1	0
	2		16:07	25	20	0	0	111	1	0
6/22	1	14:35		25	20	0	0	123	0	0
	2		14:42	24	20	0	0	129	0	0
6/24	1	12:25		30	20	0	0	129	0	0
	2		12:52	29	20	0	0	126	0	0
6/26	1	13:10		24	20	0	0	124	0	0
	2		13:17	24	20	0	0	120	0	0
6/29	1	15:32		24	21	0	0	127	0	0
	2		15:37	23	21	0	0	126	0	0
7/1	1	13:21		26	22	0	0	119	0	0
	2		13:30	27	22	0	0	120	0	0
7/3	1	13:50		25	20	0	0	111	0	0
	2		13:56	25	20	0	0	114	0	0
7/4	1	11:44		23	21	0	0	116	0	0
	2		11:50	22	21	0	0	116	0	0
7/6	1	10:07		28	18	0	0	111	0	0
	2		10:14	28	18	0	0	115	0	0
7/8	1	11:46		23	20	0	0	130	0	0
	2		11:53	24	21	0	0	133	0	0
7/9	1	16:15		24	21	0	0	107	0	0
	2		16:20	25	21	0	0	100	0	0

<b>2008 Population Count - Plot 2 - Observation Point</b>										
<b>Date</b>	<b>Count #</b>	<b>Start</b>	<b>Finish</b>	<b># BLKI</b>		<b># PECO</b>		<b># COMU</b>	<b># HOPU</b>	<b># TUPU</b>
		<b>Time</b>	<b>Time</b>	<b># BLKI</b>	<b>Nests</b>	<b># PECO</b>	<b>Nests</b>			
6/12	1	15:50		93	61	0	0	258	0	0
	2		16:02	95	63	0	0	259	0	0
6/18	1	10:06		88	55	0	0	238	0	0
	2		11:18	99	57	0	0	238	0	0
6/22	1	14:45		94	60	0	0	259	0	0
	2		14:52	96	58	0	0	270	0	0
6/24	1	13:57		98	64	0	0	286	0	0
	2		14:08	98	61	0	0	276	0	0
6/26	1	13:18		108	61	0	0	281	0	0
	2		13:35	105	61	0	0	288	0	0
6/29	1	15:38		92	61	0	0	296	0	0
	2		15:50	87	61	0	0	292	0	0
7/1	1	13:35		106	60	0	0	275	0	0
	2		13:55	108	59	0	0	271	0	0
7/3	1	14:00		91	64	0	0	284	0	0
	2		14:15	90	62	0	0	254	0	0
7/4	1	11:11		93	64	0	0	296	0	0
	2		11:36	97	64	0	0	294	0	0
7/6	1	9:15		103	59	0	0	310	0	0
	2		9:27	101	59	0	0	285	0	0
7/8	1	11:55		99	62	0	0	274	0	0
	2		12:04	103	63	0	0	291	0	0
7/9	1	16:22		93	61	0	0	283	0	0
	2		16:34	91	62	0	0	286	0	0

Pelagic commorant (PECO), black-legged kittiewake (BLKI), and common murre (COMU), horned puffin (HOPU), Tufted puffin (TUPU)

Appendix E. continued.

<b>2008 Population Count - Plot 3 - Observation Point</b>										
Date	Count #	Start Time	Finish Time	# BLKI		# PECO		# COMU	# HOPU	# TUPU
				# BLKI	Nests	# PECO	Nests			
6/12	1	16:05		99	46	0	0	133	0	0
	2		16:14	101	46	0	0	128	0	0
6/18	1	11:18		86	55	0	0	121	0	0
	2		11:26	92	56	0	0	129	0	0
6/22	1	15:00		102	60	0	0	110	0	0
	2		15:10	104	59	0	0	108	0	0
6/24	1	14:09		106	58	0	0	115	0	0
	2		14:17	100	56	0	0	118	0	0
6/26	1	13:40		100	60	0	0	123	0	0
	2		13:57	106	64	0	0	127	0	0
6/29	1	15:51		101	61	0	0	100	0	0
	2		16:00	100	61	0	0	103	0	0
7/1	1	13:56		102	59	0	0	102	0	0
	2		14:08	106	60	0	0	104	0	0
7/3	1	14:16		84	56	0	0	107	0	0
	2		14:26	85	56	0	0	105	0	0
7/4	1	11:10		93	57	0	0	133	0	0
	2		11:17	97	58	0	0	133	0	0
7/6	1	10:16		106	50	0	0	140	0	0
	2		10:26	110	51	0	0	128	0	0
7/8	1	12:05		88	55	0	0	105	0	0
	2		12:12	94	53	0	0	100	0	0
7/9	1	16:36		87	50	0	0	111	0	0
	2		16:42	87	50	0	0	104	0	0

<b>2008 Population Count - Plot 4 - Observation Point</b>										
Date	Count #	Start Time	Finish Time	# BLKI		# PECO		# COMU	# HOPU	# TUPU
				# BLKI	Nests	# PECO	Nests			
6/16	1	16:20		142	87	0	0	728	0	0
	2		16:45	155	88	0	0	741	0	0
6/22	1	15:23		123	82	0	0	691	0	0
	2		15:51	117	82	0	0	692	0	0
6/24	1	13:15		119	85	0	0	736	0	0
	2		13:41	120	86	0	0	698	0	0
6/26	1	14:06		134	80	0	0	702	0	0
	2		14:25	137	82	0	0	728	0	0
6/29	1	16:10		124	85	0	0	680	0	0
	2		16:30	123	83	0	0	676	0	0
7/1	1	14:37		133	83	0	0	685	0	0
	2		15:00	133	83	0	0	661	0	0
7/3	1	13:15		112	80	0	0	638	0	0
	2		13:37	120	82	0	0	650	0	0
7/4	1	10:20		131	83	0	0	816	0	0
	2		10:53	131	87	0	0	802	0	0
7/6	1	9:40		131	80	0	0	817	0	0
	2		10:02	133	83	0	0	813	0	0
7/8	1	12:25		116	78	0	0	766	0	0
	2		12:47	117	78	0	0	728	0	0
7/9	1	15:32		114	60	0	0	671	0	0
	2		15:53	115	62	0	0	663	0	0

Appendix E. continued.

2008 Population Count - Plot 5 - Observation Point										
Date	Count #	Start	Finish	# BLKI		# PECO		# COMU	# HOPU	# TUPU
		Time	Time	# BLKI	Nests	# PECO	Nests			
6/16	1	16:09		0	0	0	0	171	0	0
	2		16:15	0	0	0	0	176	0	0
6/22	1	15:05		0	0	0	0	192	0	0
	2		15:20	0	0	0	0	199	0	0
6/24	1	13:45		0	0	0	0	168	0	0
	2		13:49	0	0	0	0	199	0	0
6/26	1	14:31		0	0	0	0	201	0	0
	2		14:40	0	0	0	0	218	0	0
6/29	1	16:02		0	0	0	0	156	0	0
	2		16:06	0	0	0	0	173	0	0
7/1	1	14:25		0	0	0	0	203	0	0
	2		14:35	0	0	0	0	209	0	0
7/3	1	13:40		0	0	0	0	203	0	0
	2		13:45	0	0	0	0	193	0	0
7/4	1	10:05		0	0	0	0	235	0	0
	2		10:11	0	0	0	0	221	0	0
7/6	1	9:31		0	0	0	0	230	0	0
	2		9:36	0	0	0	0	218	0	0
7/8	1	12:15		0	0	0	0	206	0	0
	2		12:20	0	0	0	0	201	0	0
7/9	1	16:05		0	0	0	0	186	0	0
	2		16:10	0	0	0	0	193	0	0

*Appendix F. Summary Report of Archaeological Investigations.*

Summary Report of Archaeological Investigations at XNB-043 “Qayassiq”  
Walrus Islands State Game Sanctuary and National Natural Landmark

Jeanne Schaaf  
Lake Clark National Park and Preserve  
April 30, 2009

In 2004, ADF&G received a Recreational Trail Grant and funding from the National Park Service National Natural Landmarks program to improve trails and access to the boat cove on Round Island. The State Historic Preservation Officer recommended that NPS provide archaeological expertise for compliance with the National Historic Preservation Act, at little or no cost to ADF&G through an existing interagency agreement.

The ADF&G facilities, trails and campground share with archaeological site XNB-043 the only patch of relatively level, well-drained ground having access to the island’s only boat landings. Site XNB-043 was first reported by ADF&G when cultural material was encountered during facility construction in 1976. It was observed on an aerial site survey of the islands in 1982, briefly visited by the state archaeologist in 1986, and otherwise has remained unexplored until now. While the ADF&G operations have disturbed an estimated 3.5% of the total site area, the agency’s long term presence has protected the site from the wholesale looting reported for sites on other islands in Bristol Bay.

A detailed report, “The Archeology of Qayassiq “Place to Go in a Kayak” Round Island Site XNB-043 Bristol Bay, Alaska,” was completed January 2007. This report details the mapping of over 100 prehistoric surface depressions representing semi-subterranean houses, cold storage pits and other features remaining from a series of occupations that date from 3900 BC (5900 years before present or BP). A small, finely worked side blade recovered from a test and dated to about 3300 years ago suggests an Arctic Small Tool tradition occupation. Distinct house forms clustered together in later settlements appear to represent Norton and the later Thule cultural traditions spanning the last 2500 years before contact in the late 18<sup>th</sup> century. Subsurface testing provided information about site depth and chronology but was kept to a minimum due to the density of cultural deposits present. These deposits begin at the base of the current vegetation mat and extend up to a meter in depth. Thirteen hundred artifacts were recovered from a total of 1.08 cubic meters excavated. Two rock rings of unknown age with evidence of early 20<sup>th</sup> century use are located in a boulder field at the base of a nearby slope. Isolated artifacts on outlying trails indicate that there is a high probability of finding additional sites on the island.

The findings significantly alter our understanding of the region’s prehistory, with clear evidence of island-based walrus hunting occurring here nearly 6000 years ago. This is over 3500 years earlier than any island sites documented in this area and is the oldest recorded coastal site in

Alaska north of the Alaska Peninsula. Good organic preservation as well as the presence of occupations representing all cultural traditions identified in the region after 6000 years ago are attributes that make this site extremely important with the potential to address long-standing questions about the development of and relationships among the known cultural traditions. With this initial glimpse of site significance comes an understanding of the imperative to initiate in-depth research on the island, the neighboring islands and on the mainland. Plans for evaluating the Walrus Islands Game Sanctuary for listing on the National Register of Historic Places as a National Historic Landmark District are in place at NPS.

While most of the management recommendations for site protection based on the 2004 field work have been implemented, the now urgent need for replacing the two existing outhouses had not been addressed. The currently-used outhouses are located near the ADF&G management cabin and near the campground. In February 2008, I learned that the management cabin outhouse had been moved to Test 3, the one-meter square test that had been excavated in the garden area in 2004, because the existing outhouse was no longer useable. The campground outhouse had also exceeded its capacity and could not be used. Various alternatives for human waste disposal have been explored by ADF&G since the archeological discoveries in 2004 and none have been found to be practically or economically feasible.

The placement and use of the outhouse over Test 3, without having excavated it deeply into the sterile sediments, posed a threat to the cultural remains exposed in the walls of Test 3 and to the adjacent site area. This prehistoric occupation, dating to 5900 years before present, is highly significant in that it is the earliest known coastal site in Alaska north of the Alaska Peninsula, predating reported coastal sites by as much as 3,000 years. It is a unique record of early walrus hunters previously unknown in the archeological record.

In consultation with Joe Meehan and Diane Okonek (Lands and Refuge Program Coordinator and Sanctuary Manager, ADF&G), Judy Alderson (National Natural Landmarks Coordinator, NPS), Dave McMahan (State Archaeologist, Office of History and Archaeology, Department of Natural Resources) and Greg Biddle (Archaeologist BIA-Archaeology Branch), a volunteer group of archaeologists and a plan for limited excavations in the areas of concern was developed. ADF&G initiated consultation with Helen Chythlook (Marine Mammal Coordinator, Bristol Bay Native Association and also the Executive Director of the Qayassiq Walrus Commission) who secured funding for the training and participation of two interns from the Bristol Bay Summer Youth Stewardship Program. She led consultation with Moses Kritz, President and Walter Kanulie, Tribal Administrator for the Togiak Traditional Council and Frank Logusak, Sr. Chairman of the Qayassiq Walrus Commission.

With the support of Lake Clark Superintendent, Joel Hard and ADF&G, I returned to Round Island with NPS archaeologist Molly Casperson, BIA archaeologist Matt O'Leary and State Office of History and Archaeology archaeologist Richard VanderHoek to assist with meeting the immediate need for replacing the two existing outhouses in an area of intense prehistoric occupation.

In short, we excavated six one-meter square test units, recovered over 9000 artifacts, established a new oldest date for the site from the base of the campground outhouse test unit (6,300 years before present), and provided two new outhouse options for ADF&G staff. Time did not permit excavating the garden outhouse site (Test #3) below the base of the cultural deposits into sterile sediments, so this must be done prior to use so that waste deposition occurs below the cultural material exposed in the side walls. This excavation of the sterile sediments does not need to be done by an archaeologist if the sidewalls are not disturbed. A visqueen lining should be placed in the pit to protect the sidewalls. The new campground outhouse is above Test 5, a 1.0 by 1.0 meter square yielding 4000 artifacts. Artifacts were recovered from the surface to 2.0 meters below the surface. This is a very important area of the site as it contains a dense cultural deposit spanning over 6,000 years. Any disturbance in this area should be avoided.

Molly Casperson has prepared a draft field report and artifact inventory. The preliminary findings were presented at the Qayassiq Walrus Commission meeting in Dillingham, August 2008. The artifact cataloging is underway and a final report will be prepared for ADF&G as soon as possible. When the analyses are completed, the artifacts will be sent to the State repository at the University of Alaska Fairbanks Museum.

This work and the archaeological discoveries would not have been possible without the support of the above-mentioned people, in particular, the stellar ADF&G staff.



BBNA Intern Paul Askoak and Richard VanderHoek (DNR Office of History and Archaeology) examine a bone harpoon found at Qayassiq.



*Appendix G. Daily Observations; noting observations of first plant and animal sightings, rare occurrences, and general weather descriptions, Round Island, 2008.*

Date	Birds	Flowers	Mammals	Other
5/7	pelagic cormorant black-legged kittiwake raven harlequin glaucous-winged gull american pipit	30 % snow cover	no walrus on east side beaches	Staff arrives by helicopter
5/8	green-winged teal parakeet auklet common murre pigeon guillemot peregrine tufted puffin		gray whales fox no walrus	
5/9	rosemary finch  savannah sparrow  white-crowned sparrow american tree sparrow snipe common redpolls		gray whales start official walrus counts	FV Kustatan arrives Togiak Bay with R1 equipment  Pollux Aviation helicopter slings 5 loads ashore
5/10	short-eared owl		gray whales	
5/11	american robin dark-eyed junco lapland longspur			
5/12	short-billed dowitcher golden-crown sparrow sandhill crane fox sparrow tree swallow  peregrine with robin in talons horned puffin 10 canada geese asleep in campground			
5/13	wandering tattler	first sprigs of grass	1 gray whale	snow showers
5/14	northern harrier rough-legged hawk  mallard		1 gray whale	trails almost completely snow free first bumble bee first time to see thousands of COMU's on MB cliffs and in water

Appendix G. continued.

Date	Birds	Flowers	Mammals	Other
	double crested cormorants first PECO egg			
5/15	black scoters 350+ PAAU at Second Prime			
	75 PAAU at Second Beach			
5/16	northern pintail more puffins on cliffs			ice to east of island
5/17	bald eagle 2 sandhill cranes fly by 2 short-eared owls		1 gray whale	
5/18	bald eagle peregrine short-eared owls northern shoveler wandering tattler crested auklets at NBC		gray whales along ice floes to east	
5/19	harlequins at each beach		several gray whales	47 fishing boats awaiting herring fishery
5/20	hermit thrush no COMU's on cliffs		1 gray whale	seiners and gillnetters fishing herring Diane to summit
5/21	ravens nest-SP near E. Cape	no blossoms yet		6011 tons of herring caught ice floes east of island hauling water, snow patch melted ice floes east of island
5/22	COMU's back on cliffs		1 minke whale	
	12 crested auklets at NBC semi-palimanted plover			
5/23	bufflehead			storm, 62 km/hr gusts, 50 average
5/24				snow still in gullies on traverse to WM
5/25	14 PIGU at FB	wooly lousewort w/ a couple of petals tussocks starting to green		
5/26				
5/27				yellowfin sole fishery boats to east
5/28	BLKI carrying nesting material			first day to walk to WM, snow in 3 gullies herring seine fishery ends
5/29				Coast Guard patrolling area

Appendix G. continued.

Date	Birds	Flowers	Mammals	Other
5/30	Wilson warbler, short-eared owl	Alaska violets		
5/31	BLKII gathering nesting material enmass immature bald eafigle			
6/1	orange-crowned warbler	narcissus flowered anenome coltsfoot		
6/2	raven seen with BLKI egg	cardamine pratensis pixi eyed primrose		spring snow free
6/3		few-flowered cornel	4,081 walrus/peak cnt.	first time around island in boat
6/4	bald eagles, mature and immature bald eagle seen with bird in talons ravens getting lots of BLKI eggs northern harrier hernit thrushes beginning to sing	sedum roseum		water tank and line in
6/6		yellow anemone cloud berry alpine bearberry blackish oxytrope dwarf birch begins to leaf out		
6/7	2 crested auklets NBC	for-get-me-nots		
6/8		bog rosemary purple cress		
6/9	raven seen with COMU egg		3 gray whales	
6/10			several gray whales	
6/11	bald eagles lock talons over FP northern harrier		very few foxes	put stair stringers in place
6/12	bald eagles, mature and immature		one gray whale	
6/13	raven with COMU egg	brook saxifrage		
6/14	tree swallows thousands of BLKI feeding to NE	crowberry blossoms island has a green tinge	3+ minke whales feeding to NE	
6/15	4 harlequins FB	twin-flowered violet spring beauty		
6/16	first PECO chick  90 glaucous-winged gulls FB bald eagle, mature		gray whale	

Appendix G. continued.

Date	Birds	Flowers	Mammals	Other
6/17	ravens get lots of PECO eggs 12+ FP	dogwood jacobs ladder		
6/18		hairy arctic milk vetch villous cinquefoil blueberry blossoms		archaeology crew arrives
6/20		labador tea	dead shrew, 3rd seen this season	build new tent platform
6/21		star flower lupine	dead shrew at CG	group to summit
6/22		chocolate lillies		complete second new tent platform
6/23	7 harlequins in BC, 2 FP, 1 FB	Alaska poppy		interns arrive, first day visitors arrive
6/24		Langsdorff's lousewort		
6/25	songbird chick Savannah ?	cardamine umbellata	0 walrus on island	
6/26		wild geranium capitate valerian	minke whale humpback whale humpback whales	first day traverse trail snow free first campers on island
6/27			bubble feeding	
6/28		Bering Sea chickweed		
6/29	nothern pintail		humpback whales sing during night humpback whales sing during night	archaeology crew departs campground outhouse moved
6/30		Maydell's oxytrope		
7/1		dandelion		
7/3			whale, species ? 3 humpback whales	
7/4	4 raven chicks at East Cape/SP cove	cow parsnip	close to CG	
7/6		willow tops brown,	humpbacks in the night	11 campers on island
7/7		and leafless northern yellow oxytrope	humpback cow and calf Grays whales	
7/8		winter green wild iris arctic worm wood winter cress dwarf fireweed Lessing's arnica	humpback whales	

Appendix G. continued.

Date	Birds	Flowers	Mammals	Other
7/9	golden-crown fledgling	monkshood	3 dead shrews on trails	
		willow herb	walrus numbers very low for past three weeks	
7/10	4 raven fledgelings East Cape	wild celery	2 humpback whales	
	glaucous gull	yarrow	dead brown lemming by spring	
7/11			humpback whales	13 campers on island
7/12		dwarf arctic bitterweed	humpbacks breaching	
7/13		alpine bistort		Okmok Volcanoe active
7/15	common redpoll	yellow rattle	humpbacks breaching	
7/16	1000's of short-tailed shearwaters		4 humpbacks	
7/18	first COMU chicks			sockeye salmon winding down
7/19			first time 400 + walrus since 6/21	Inconnu departs for the season
7/25	2 sandpipers sp.?			
	2 surfbirds, 1 wandering tattler			
7/31				
8/1	11 harlequin females NBC			
8/4	common murre 1st fledgling			
	wandering tattlers at FB			
8/11	staff watch murre chicks jump off Plot 2 and 4 at OP			
	14 harlequins in NBC			
8/13	songbirds flocking up			