Walrus Islands State Game Sanctuary
Annual Report 2000

Steven Rice
Alaska Department of Fish and Game
333 Raspberry Road
Anchorage, AK 99518

October 2000

Introduction

Project goals

A management plan for the Walrus Islands State Game Sanctuary was drafted in October 1992. The plan has not been finalized and no formal management goals have been developed by the Department. In the interim, the management goals for the Sanctuary are to:

1) protect walruses and other wildlife within the Sanctuary;
2) provide an opportunity for scientific and educational study of walruses; and
3) provide an opportunity to view, photograph, and enjoy walruses.

Methods and materials

The Alaska Department of Fish and Game (ADFG) and the US Fish and Wildlife Service (USFWS) have cooperatively staffed Round Island since 1993. Under the terms of the cooperative agreement, each agency provides one wildlife technician and half the cost of transportation and supplies. This year, USFWS purchased the initial supplies and ADFG paid for additional supplies during the field season. ADFG paid for all fuel, and ADFG staff in Dillingham provided logistic support.

Steven Rice (ADFG) and Mary Cody (USFWS) were stationed on Round Island from May 5- August 17, 2000. Andy and Liz Hoffman (ADFG) replaced Rice from July 5- July 18. Paul Markoff was on the island between July 18- July 30 as a USFWS/ Bristol Bay Native Association intern, and Stephen Destefano (Unit Leader, Massachusetts Cooperative Fish and Wildlife Research Unit) volunteered on the island between June 30- July 5. Duties included assisting and educating visitors; maintaining and improving island facilities; patrolling the island for access violations; monitoring walrus disturbance; and counting walrus, sea lions and seabirds. ADFG is primarily responsible for managing the Sanctuary, while USFWS takes the lead in walrus research; however, all responsibilities are shared.

Visitor program

Round Island has drawn visitors from around the world for more than 20 years, and enhancing the visitor experience while protecting the island's wildlife is one of our primary responsibilities. Visitor-related duties included monitoring the radio daily and providing would-be visitors with condition reports, authorizing visits, issuing permits and collecting user fees, explaining Sanctuary rules, answering visitor questions, maintaining facilities, and assisting visitors unprepared for the island's extreme conditions.

Access violations/disturbances

Boat access is restricted within three miles (4.8 km) of Round Island, and airplane access is strongly discouraged within three miles and 5,000 vertical feet (1,524 m) of the island. In addition, visitors to the island are required to stay on the trails and are not permitted on the beaches except when arriving and departing the island at Boat Cove. Staff recorded all observed access violations and reported serious violations to ADFG staff in Dillingham. Staff also attempted to contact any boat or airplane within the restricted area. No further action was taken against vessels which immediately and cooperatively responded.

Staff also monitored walrus response to both authorized and unauthorized disturbance. Staff recorded both the number of walrus affected and the degree of their response, using three distinct behaviors (head raising, reorienting, and dispersing) as measures of increasing disturbance (Kruse, 1993).

Walrus counts

Pacific walrus (*Odobenus rosmarus divergens*) were counted daily throughout the summer using a standardized methodology provided by USFWS (Appendix 1). This count methodology was initiated in 1998 and is similar to that used on the island in preceding years. The only significant difference is that counts were conducted at 2:00 PM every day instead of timing the count to coincide with the daily low tide. The new methodology also introduced regular (every three days) counts of West Main Beach and interval counts designed to look at diurnal periodicity. Walrus on West Main and South West Main Beaches were opportunistically counted from an inflatable skiff, as weather permitted.

Sea lion counts

Steller's sea lions (*Eumetopias jubatas*) hauled out at the southeast tip of the island were counted every six days throughout the summer. Sea lions were typically counted from the terrestrial observation point; however, counts were occasionally conducted from our inflatable skiff.

Seabird counts and research

Counts of seabirds and seabird nests begun in 1997 were continued. All black-legged kittiwakes (*Rissa tridactyla*), common murre (*Uria aalge*), and pelagic cormorants (*Phalacrocorax pelagic*) on established plots were counted ten times. A subset of nests within these plots was selected and nesting chronology and productivity were monitored. These nests were checked approximately every three days from the time the first egg was seen through the end of the field season. This research is described in greater detail in this season's USFWS field report (Cody 2000).

Raven research

Ravens visible from the Main Beach observation point were monitored for one hour each day between 4:00 AM and 2:00 AM (or from one hour before sunrise until one hour after sunset) using 10x42 binoculars and a 15x60 spotting scope. The identity and fate (eaten, cached, lost, etc) of each raven prey item, forage method (forced, opportunistic, etc.), and the total number of visible ravens were recorded with each observation. When items were cached within view, the slope of the surrounding area and dominant vegetation were recorded. Similar data was also recorded from all opportunistic observations.

Sixty experimental caches, each consisting of one chicken egg buried last summer at a known distance and bearing from a wooden stake, were relocated this summer to assess the potential retrieval of raven-cached eggs by foxes. This experiment was based on the assumption that any eggs that were not recovered were taken by foxes; however, retrieval by ravens was also possible. To control for retrieval by ravens, three 12-meter fox exclosures were constructed this year, and eggs were cached both inside and outside the exclosure. These cache sites will be relocated next season, and differences between retrieval outside exclosures (ravens and foxes) and inside exclosures (ravens only) will be used to estimate the degree of retrieval by foxes more accurately.

A noose carpet and modified Australian crow trap (Johnson and Altman 1983) were used to trap ravens. All trapped ravens were banded with aluminum USFWS leg bands and a uniquely colored combination of Herculite™ patagial tags.

Steven Rice will present this research as a Master's thesis for the University of Arizona.

Other work

Other opportunistic observations were recorded in the Round Island Daily Logbook. These included the first sighting of birds and mammals on the island and subsequent unusual sightings, first sightings of blooming plants, beach-cast marine mammals, and environmental conditions.

Ivory from beach-cast walrus carcasses was collected to discourage off-season trespassers and supplement state and federal funding of the program at Round Island. The Eskimo Walrus Commission will sell this ivory to other Alaskan natives, and the proceeds will be used for future walrus research and management. Ivory was collected from all accessible carcasses, but weather and the presence of other walrus limited access in some areas.

Approximately 550 feet of new boardwalk was constructed through muddy, wet areas this summer; the cabin and outbuildings were repainted; and rotten molding around cabin windows was replaced.

Results

Visitor program

Visitors traveled to the island with one of two charter services or via an independent vessel. Don's Round Island Charters (DRIC) made nine trips to the island between June 16- July 30 (DRIC made one additional trip on August 17 to pick up staff). Johnson Maritime/ Walrus Island Expeditions (JMWIE) made 19 trips between June 23- August 10. The remaining visitors traveled to the island throughout the summer via 14 fishing vessels and one research vessel.

Nineteen campers spent a total of 99 days on the island, and the five administrative visitors and volunteers spent an additional 48 days on the island. Length of stay ranged from two to eight days, based largely on weather. Fifty-four percent of the campers were from Alaska, but visitors came from across the nation and around the world (Table 1). DRIC provided transportation for 92% of the campers; the remaining 8% traveled to the island with JMWIE.

One hundred and twenty day-visitors spent a total of 140 days on the island (some, like the guide for JMWIE, made multiple day-visits). Forty-two percent of the day-visitors came from Alaska, but day-visitors also came from around the world. Sixty-eight day-visitors traveled with JMWIE; the remaining 52 day-visitors reached the island independently, primarily on fishing boats.

Total visitation to the island increased in 2000, from 115 visitors in 1999 to 144 in 2000. There were twice as many campers (n = 40) in 1999, but the number of both independent and JMWIE day-visitors increased dramatically in 2000. Fishermen took advantage of good weather between openers and at the end of the herring season to visit the island. As in 1999, the number of fishermen requesting permission to visit during these times exceeded the sanctuary's 17-visitor limit (originally 12 day-visitors and five campers, but there were no campers on the island at this time). Staff maintained a waiting list and were able to accommodate most of the fishermen who asked to visit. The increase in JMWIE visitors is probably due, in part, to increased awareness of this new travel option. In addition, one of the local fishing lodges offered day-trips with JMWIE this season. There are many other lodges in the area that may follow suite in the future, so day-visitation may continue to increase.

On July 13, MaryAnn Hollick, a JMWIE day-visitor, stepped into a .5 m deep hole just off the trail and broke her lower leg. The group (which included a veterinarian) assessed the injury, administered some first aid, and evacuated Ms. Hollick. After the accident, a small bridge was built to span the hole; however, many other areas remain hazardous, particularly after heavy rainfall. Constructing boardwalk through all of these areas will take several more years.

Among other visitors, a film crew from Spain, several professional still photographers, and a *National Geographic Traveler* crew visited the island this summer. The *National Geographic* crew was interested in walrus behavior and other aspects of Round Island's ecology, and they interviewed island staff for the article.

Access violations and disturbances

Most of the walrus disturbances observed this season were caused by authorized activities within the Sanctuary (Appendix 2). These activities included visits by independent boats and charter operators, aerial counts of walrus by USFWS, and human activity at overlooks and on the beach at Boat Cove. Staff also used a 12-foot Achilles inflatable skiff with a 25 horsepower outboard motor to count walrus periodically and collect beach-cast ivory. Walrus often appeared undisturbed by this traffic (such as when visiting boats used the access corridor and no walrus were present in Boat Cove), but other authorized activities caused significant disturbance.

A USFWS- chartered airplane flew over the island five times- twice on July 10, once on July 11, and twice on July 18, to take aerial photographs of walrus hauled out on the island (Appendix 2). Staff were unable to monitor disturbance during overflights on July 10 and 11; however, walrus were observed during both of the overflights on July 18. Approximately 20 walrus in the Boat Cove area were observed during the first of these overflights, but there was no obvious disturbance. However, during the second overflight at least 800 of the approximately 900 walrus on Main Beach were disturbed, and roughly 250 of these dispersed into the water. The pilot reported a minimum elevation of 762 m above ground level (AGL) during both of these overflights.

Four unauthorized airplanes approached the island closer than the recommended boundary (Appendix 2). ADFG staff in Dillingham were notified of each incident and given a partial description of the aircraft; however, it was not possible to positively identify the planes based on our descriptions. Although ADFG does not have the authority to regulate airspace, pilots who harass walrus can be prosecuted under the Marine Mammal Protection Act.

Airplanes flying outside the recommended boundary may also disturb walrus. A commercial jet flying overhead at about 6,500 m disturbed 15 walrus and caused at least two animals to disperse (Appendix 2). Ambient noise from wind and surf usually covers the sound of distant aircraft, so these disturbances are rare.

Unauthorized boats (or groups of boats) were observed within the restricted area three times this summer (Appendix 2). Staff were unable to monitor walrus behavior during these incidents; however, the boats were all at least 1.5 km offshore, so it is unlikely that any of the boats caused a serious disturbance. All of these boats were contacted and moved out of the restricted area. No further action was taken if the boat captain was cooperative; however, one incident was reported to ADFG staff in Dillingham because the boat approached very close to the island and ignored our initial radio calls. Several boat captains have complained that NOAA maps incorrectly indicate a 2-mile (3.2 km) restricted area around Round Island.

At least three major walrus disturbances occurred without any detected anthropogenic stimulus; up to 250 walrus were disturbed during each incident (Appendix 2). These disturbances may initially be triggered by a minor rockfall or seabird activity undetectable from our observation point and then exaggerated by the walrus's herd behavior. Walrus response to disturbance is unpredictable and probably influenced by a number factors including group size, time spent hauled out, environmental conditions, and others.

Walrus counts

The east-side beaches of Round Island were counted on 103 consecutive days between May 6 and August 16 (Figure 1). The peak east-side count of 7,573 walrus occurred on August 8 (there were also 1,143 walrus on West Main beach on this day). The minimum east-side count was 17 walrus on June 7. The average east-side count for 2000 was 1,355 walrus.

West Main Beach was counted a total of 23 times between June 15 and August 16. West Main counts were initiated late in the season because Traverse Trail was snow-covered and dangerous until mid-June. The peak West Main count of 1,612 walrus was on July 30. Walrus were totally absent from West Main Beach

on four count days (July 18, July 27, August 5, and August 16). The average West Main count was 508 walrus.

Steller's sea lion counts

Steller's sea lions hauled out at the southern tip of the island (East Cape) were counted 19 times between May 8- August 12 (Table 2). The peak count of 378 sea lions occurred on May 14; the low count of 14 sea lions occurred on July 19; the mean count was 85 sea lions. Sea lions were often seen swimming around the island, alone or in small groups, and lone sea lions hauled out sporadically on Second Prime. Sea lion and walrus herds at Round Island are almost entirely segregated.

What appeared to be the carcass of a newborn sea lion pup (with umbilical cord still attached) was observed at East Cape between May 14- June 7; however, it was impossible to collect the animal before it washed away. Sea lions have never been observed giving birth on Round Island, so this unusual observation is noteworthy.

Seabird research

Black-legged kittiwake and common murre counts were 10-20% higher than in 1999 (Cody 2000). There were fewer pelagic cormorants on established population plots this year; however, cormorants often change nest sites from year-to-year, so variation within plots is expected.

Seabird productivity was monitored from the time the first kittiwake egg was observed on June 3 through August 16 (cormorant productivity was monitored beginning June 1). Although many chicks were still present at the end of the field season, murre, kittiwakes, and cormorants probably fledged roughly 24%, 26%, and 40% of their eggs respectively (Cody 2000).

Raven Research

Raven behavior data for 2000 has not yet been analyzed; however, preliminary analysis indicates that seabirds, seabird eggs and chicks again comprised the bulk (up to 90%) of the summer diet of Round Island ravens. Black-legged kittiwake and common murre eggs were the most common prey items this summer. Ravens predation on Main Beach seabird nests was estimated to exceed 5,000 eggs this summer, and predation may have been a factor in the relatively poor seabird productivity this season. Other food items included adult and chick kittiwakes and murre, kittiwake and cormorant eggs, adult puffins (*Fratercula* sp.), voles (*Microtus* sp.), insects, dead fish, berries, and other unidentified items.

In addition to four previously identified raven nests, three more nests were identified on the west side of the island. Nests seem to be more closely spaced on the west side of the island, perhaps due to the greater number of seabirds in this area, and additional nests may be discovered here next summer.

This year's raven banding effort was largely unsuccessful. One juvenile raven was trapped in late July with the noose carpet and banded with USFWS leg band #1497266 and two white patagial tags; however, no other birds were trapped.

Other observations

A pod of seven to eight orcas was observed passing the island on July 5. The whales passed within 100 m of a lone walrus swimming in the opposite direction, but did not pursue the walrus (Cody 2000). This contrasts with behavior observed in 1999 when a pod of orcas was observed repeatedly chasing, but not killing walrus, near Main Beach (Rice 1999).

Foxes used the dens behind the cabin, near the sea lion observation point, and above North Boat Cove this summer. Litters varied from one to three observed kits. No kits were seen in the West Main observation area or on top of the island (infrequently visited) where dens have been reported in the past.

Approximately ten walrus carcasses were observed this year. Only five carcasses were observed on the island in 1999, but 12 carcasses were observed in 1998. Ivory was collected from five carcasses, but staff were unable to reach the others before they floated away. Several loose pieces of ivory were also found during beach-walks.

Discussion

Visitor program

Visitation to Round Island has been highly variable since the Sanctuary's inception. It is affected by the success and timing of commercial fishing in Bristol Bay, the number of charter operators and the amount of effort they put into attracting clients, ADFG budget and ability to staff the island, national and international economic conditions, and other factors. A peak of 305 visitors (including 14 campers, 9 day-visitors, and >250 tour boat day-visitors) was reported in 1978 (summarized in Koenen 1996). Total visitation fluctuated between 58 and 273 through the '80's, but was high near the end of the decade. Visitation dropped again to a low of 61 visitors (including 18 campers, 41 day-visitors) in 1994, and stayed low in 1995 and 1996. This slump was largely attributed to the uncertainty of transportation during this period when only one charter service was operating (Koenen and Spencer 1994; Koenen and Kruse 1995). In 1996, many foreign and out-of-state visitors cancelled their visits in response to the uncertainty of legislative funding for Round Island (Koenen and Rice 1996). Recently, the addition of a second charter service in 1997 and adequate legislative funding in the past four years have strengthened the Round Island visitor program. However, the program remains vulnerable to a number of factors currently beyond our control.

Walrus counts

As many as 14,000 walrus have been counted at Round Island in a single day (summarized in Koenen, 1996). The peak in recent years was 9,550 walrus in 1995 but peak counts declined to a low of 1,746 walrus in 1998 (Raymond 1998). Walrus numbers began to increase again in 1999 (Rice 1999), and our peak count this year was the highest since 1995.

The number of walrus using Round Island is no doubt affected by a number of diverse elements. One such factor is the increased use of other haulouts including Capes Peirce, Newenham, and Seniavin. These haulouts had been all but abandoned by the time the Walrus Islands State Game Sanctuary was established, but they now rival Round Island as important walrus haulouts. Cape Peirce, in particular, reached a peak count of 12,500 in 1985. Walrus move between the haulouts and often peak at Cape Peirce after the Round Island field season (MacDonald, pers. comm.); however, extremely high use of other haulouts may reduce walrus use of Round Island. At the time this report was written, Togiak National Wildlife Refuge and the Marine Mammals Management office of USFWS had not released count data from these other haulouts for the 2000 season, but preliminary reports indicated low walrus numbers at Cape Peirce during the Round Island field season.

Since 1996, Bristol Bay area natives have also been given limited access to Round Island for a traditional hunt of up to 20 walrus, including struck and lost animals. In the fall of 1999, hunters from five villages harvested 13 walrus at Round Island. However, this hunt occurs between September 20-October 20 and there are usually less than 200 walrus on the island during this period. Because disturbance is minimized in this manner, and because walrus numbers began to rebound in 1999 and 2000, it seems unlikely that this limited hunt has affected walrus use of Round Island.

Raven research

Raven trapping was not authorized by USFWS and ADFG until early June this season. By this time, seabirds were incubating and ravens showed little interest in trap bait. Raven trapping may be more successful early in the season when there is less food available for ravens.

Raven research will be continued in 2001, and research goals will include:

1) Accurately quantifying the composition and degree of raven predation on seabirds and other prey at Round Island.

2) Determining the number of ravens that use Round Island, determining whether ravens are year-round or seasonal residents and how they subsist during the winter, mapping their nests, and evaluating their reproductive success.

3) Studying the social structure of Round Island ravens.

4) Determining the effect of ravens on both their prey and co-predators.

Recommendations

1) Continue to follow walrus count protocols initiated in 1998. Maintain or increase the effort to regularly count the walrus on West Main beach. Research remote sensing technologies that would allow daily counts of West Main and South West Main beaches, as well as provide a better view of Main Beach.

2) Use aerial photographs and walrus count data to generate a correction factor for each observer.

3) Weather permitting, initiate regular whole-island seabird surveys at five-year intervals.

4) Work cooperatively with other agencies to broaden the scope of Round Island research and better monitor the entire ecosystem.

5) Continue to protect walruses and other wildlife within the Sanctuary, while providing an opportunity for scientific study and enjoyment of the Sanctuary.

Acknowledgements

First and foremost, I would like to thank Mary Cody for all of her help in and out of the field. I would also like to thank John Westlund, Jim Woolington, Eunice Dyasuk, Don Winkleman, Cathy Yahr, and Terry Johnson for their support during the field season.

Literature cited

Cody, M. 2000. Round Island Field Report: May 6- August 16, 2000. USFWS rept. Marine Mammals Management. Anchorage, AK.

Johnson, R. and R.W. Altman. 1983. Prevention and control of wildlife damage. Great Plains Agricultural Council, Wildlife Resources Committee and Cooperative Extension Service, University of Nebraska, Lincoln, NE.

Koenen, K. 1996. Round Island Chronology (1968-1996). ADFG rept. Anchorage, AK.

Koenen, K. and S. Kruse. 1995. Walrus Islands State Game Sanctuary Annual Report. ADFG rept. Anchorage, AK.

Koenen, K. and S. Rice. 1996. Walrus Islands State Game Sanctuary Annual Report. ADFG rept. Anchorage, AK.

Koenen, K. and T. Spencer. 1994. Walrus Islands State Game Sanctuary Annual Report. ADFG rept. Anchorage, AK.

Kruse, S. 1993. Round Island Summer Field Report. USFWS rept., Marine Mammals Management, Anchorage, AK.

MacDonald, R. Pers. comm. Togiak National Wildlife Refuge, Dillingham, AK.

Raymond, R. 1998. Walrus Islands State Game Sanctuary Annual Report. ADFG rept. Anchorage, AK.

Rice, S. 1999. Walrus Islands State Game Sanctuary Annual Report 1999. ADFG rept. Anchorage, AK.

Origin	Campers	Independent day-visitors	JMWIE day-visitors
Alabama		1	
Alaska	13	32	18
Arizona			2
California		2	
Colorado	1		3
Connecticut	1		
Georgia			4
Illinois			6
Maryland			2
Massachusetts	1		
Missouri			1
Montana		1	
New Hampshire			2
New Jersey			4
Oregon		3	3
Pennsylvania			2
South Carolina			2
Tennessee			2
Texas			4
Washington	1	13	
Washington D.C.	2		
Wisconsin	1		
Canada			3
Germany			1
Japan	1		
Netherlands			2
Spain			4
Sweden	3		
Switzerland			2
Turkey			1
Total	**24**	**52**	**68**

Table 1. State or country of origin of Round Island visitors, summer 2000.

Date	Land count	Water count	Total
5/8/00	213	63	276
5/14/00	378	7	385
5/20/00	200	45	245
5/26/00	169	7	176
6/1/00	140	8	148
6/7/00	39	6	45
6/13/00	19	4	23
6/19/00	24	4	28
6/26/00	76	4	80
6/28/00	49	4	53
7/1/00	75	0	75
7/7/00	26	5	31
7/12/00	25	0	25
7/13/00	23	1	24
7/19/00	14	2	16
7/25/00	31	8	39
7/31/00	60	0	60
8/6/00	17	1	18
8/12/00	37	2	39
Mean value	85	9	94

Table 2. Counts of Steller's sea lions at Round Island, Alaska; May 8- August 16, 2000.

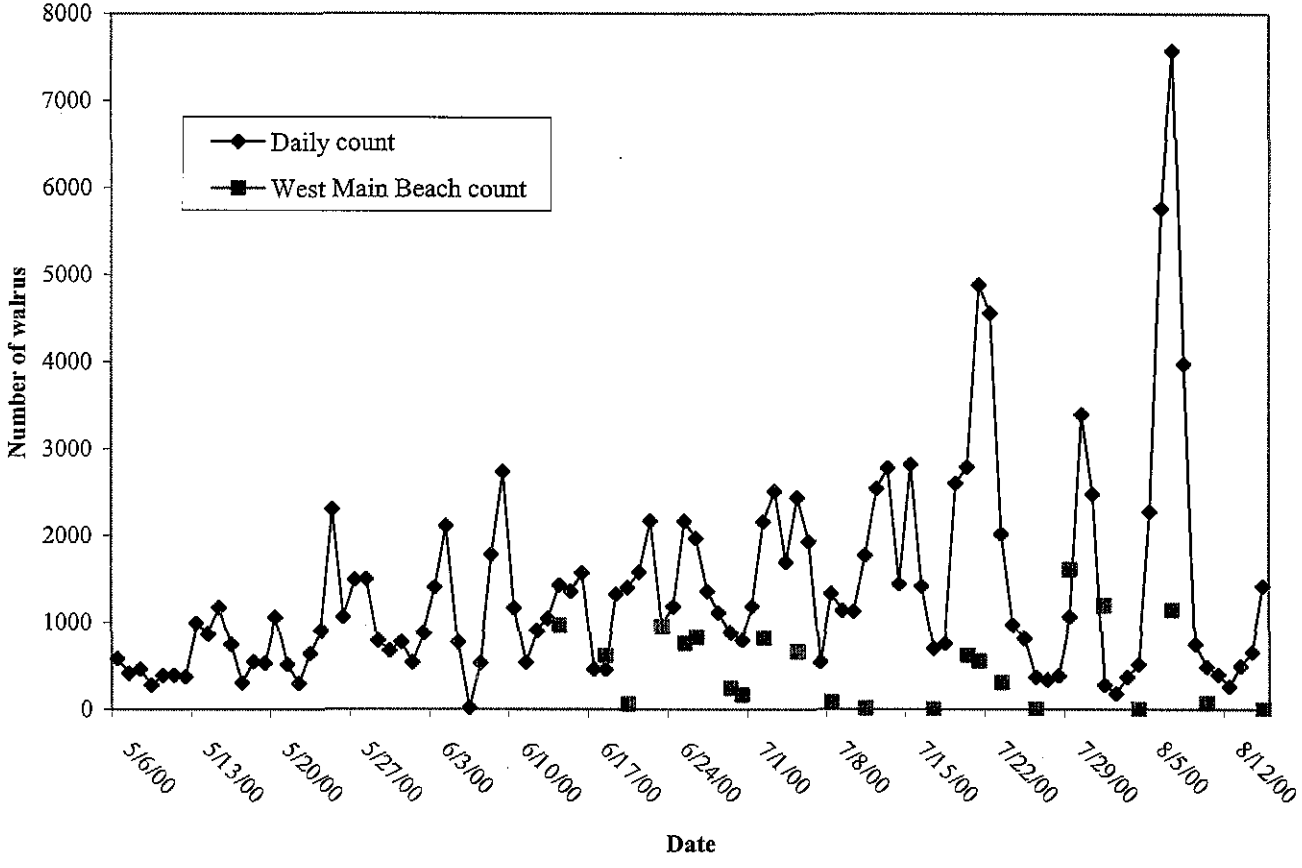


Figure 1. Mean daily and West Main counts of walrus on Round Island, Alaska; May 6- August 16, 2000.

Appendix I

Data collection protocols for Bristol Bay walrus haulout counts.

DAYLOG Information - recorded on the upper half of the field data sheet (one data sheet for each day).

Log ID: Concatenation of location code and the date in *yymmdd* format. For example, a data sheet from Round Island on May 10, 1997 would be entered as RI970510.

Location: General location of haulout counts.
CP = Cape Peirce
CN = Cape Newenham
CS = Cape Seniavin
RI = Round Island
OT = Other

Date: Date in *mm/dd/yy* format

Time: Time in *hh:mm* (24 hr) format. Record at the start of environmental data collection at designated weather observation site.

Cloud Cover: A qualitative description of the visible sky. Recorded at the designated weather observation site.
C = Clear 0/8 (amount of sky obscured - no clouds or haze)
F = Few 1/8-2/8
S = Scattered 3/8-4/8
B = Broken 5/8-7/8
O = 0vercast 8/8

Wind Speed: The wind speed reported at the designated weather observation site (km/hr). Record the estimated average reading after watching changes in the anemometer for 60-90 seconds.

Wind Direction: Compass direction of prevailing wind measured at camp's weather station. Measured at the weather observation site.
N = North
S = South
E = East
W = West
NE = Northeast
SE = Southeast
NW = Northwest
SW = Southwest
V = Variable
NO = No wind detectable

COUNT Information - recorded in the table on the lower half of the field data sheet (one beach count per line). In general, environmental information for the count should be recorded before counting.

Beach — Code for the beach being counted (Table 1). Additional beach codes can be added to the database.

Start Time — Time the count begins in *hh:mm* (24 hr) format.

End Time — Time the count ends in *hh:mm* (24 hr) format.

Method — The method used for counting the beach. Record appropriate code before counting.

- **S =** Scheduled ground count. A count scheduled on the basis of time of day. (The daily count described in the count methodology)
- **I =** Interval count. Regularly scheduled, repeated counts of beaches used to assess diurnal variability of walrus on beaches.
- **C =** Correlation count. Scheduled counts of West Main beach (Round Island) to determine relationship between use of Main beach and West Main.
- **O =** Opportunistic ground count. An unscheduled count which occurred because you were just walking by or were doing something else (as opposed to counting this beach as part of a regularly scheduled count).
- **T =** Tide ground count. A count scheduled to correspond with particular tide stage.
- **A =** Aerial count.
- **GP =** Ground photograph. While the actual number of walrus will not be recorded in the field, record the available information on the data sheet to indicate that photographs were taken. *Enter the Roll and frame #'s into the comments section of the DAYLOG part of the data sheet.*
- **AP =** Aerial photograph. Similar to ground photographs, record available information on the data sheet to indicate that aerial photographs were taken. *Enter the Roll and frame #'s into the comments section of the DAYLOG part of the data sheet.*
- **B =** Boat count.

Observer — Initials of person making the count.

Beaufort — Beaufort sea state (Table 2) of offshore waters, away from Sea State land effects. Identify an area which is not in a wind shadow or otherwise immediately influenced by land. This is important because islands and shore

topography can have major effects on perceived water conditions. Record before counting.

Beach Condition An evaluation of the size of waves breaking on the beach. Record before counting.

0 = Very calm. No wave splash at all.
1 = Small waves, ranging to 1 ft (0.3 m).
2 = Moderate waves, ranging from 1-3 ft (0.3- 1.0 m).
3 = Rough waves > 3 ft (>1m).

Beach Availability — An assessment of amount of beach available to walrus for hauling out. Record before counting. Beach availability combines aspects of both tide and weather conditions. 100% available is the amount of beach visible during mean low tide during a calm day. Observers will have to make observations of each beach counted to determine what 100% is. Identify landmarks you can reliably see to help you identify levels of beach availability. Using the amount of beach exposed during mean low tide on a calm day as 100%, and record to the nearest quartile. For example: if it's a pretty low tide and an additional 25% of beach is available, record the beach availability as 125%. If the tide is high and only half of the mean low beach is exposed, record as 50%.

Beach Used — An estimate of the amount of the available haulout area being used by walrus. For example, if it is high tide and only 25% of the beach is available for hauling out, and 50% of that area is being used by walrus, record 50%.

Visibility — A qualitative assessment of the visibility of the haulout you are counting. Record before counting.

C = Clear. No obstructions (physical: i.e. rocks, sand dunes, etc; weather; or sun glare) which impede your ability to clearly see all of the haulout.
P = Partially obscured. Fog blows in and out during the count, partially obscuring some of the haulout all of the time. The sun glare might be bad, but you can still squint hard and make a count.
O = Obscured. Bad weather or sun glare can make it impossible to count a beach. If you linger for a time and conditions don't change- you probably can't get a decent count, so enter this qualifier.

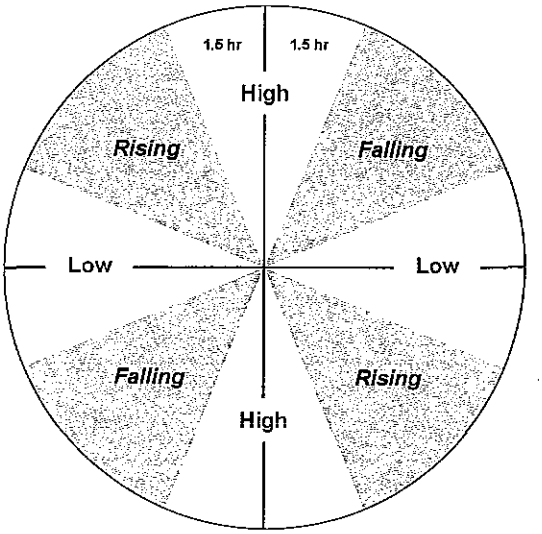
Land — The number of walrus on a particular beach. Animals must be on exposed beach or standing in surf zone.

Water — All walrus in the water and within 10m of the shoreline. Count once.

Precipitation Any precipitation, such as rain, sleet, snow, or fog. Recorded at weather observation site. Usually, conditions are very dynamic, so record weather encountered while you were collecting the above weather information.

N = No precipitation occurred during your weather evaluation

R = Rain
F = Fog
S = Snow
RF = Rain and fog
SL = Sleet



Barometer AM Barometer reading at about 08:00 (mmHg). Figure 1.

Barometer PM Barometer reading at about 20:00 (mmHg).

Tide Tidal stage. Record just before leaving camp to begin counts. Each location has different methods for determining tidal stage. If your location relies on a published tide table, look up the day's record and if necessary, extrapolate tide stage according to corrections provided in the tide book for time zone and area. Tide stages are defined by breakpoints 1.5 hours before and after high and low tides. A more detailed example of determination of tidal stage is presented in Figure 1.

H = High
L = Low
R = Rising
F = Falling.

Max Temp Maximum temperature (degrees Fahrenheit) over the last 24 hrs as read from a minimum-maximum thermometer. Record when you take the pm barometer reading.

Min Temp Minimum temperature (degrees Fahrenheit) over the last 24 hrs as read from a minimum-maximum thermometer. Record when you take the pm barometer reading. *Remember to reset the thermometer after you record the temperature data.*

Comments Record comments at any time. This is a narrative pertaining to walrus observations, problems with methodology, or needed changes. If comments are extensive, continue on the back of the field data sheet.

Count Quality Subjective rating of count quality. If counts are scored fair or poor, explain the situation leading to this assessment in the comments section.

E = Excellent
G = Good
F = Fair
P = Poor

Table 1. Beach codes for Bristol Bay Walrus Haulout database.

Location	Beach Code	Description
Cape Newenham	AFC	Air Force Cove
	BRC	Bird Rock Cove
	CNP	Cape Newenham Point
	WC	Wally Cove
Cape Peirce	CB	Channel Bar
	FB	Far Bar
	IB	In Between Bar
	MB	Maggy Beach
	MBB	Mid-Bay Bar
	NFB	North Firebaugh
	NS	North Spit
	OC	Odobenus Cove
	PB	Parlier Beach
	SFB	South Firebaugh
	RP	Rugged Point
	PECO	Pelagic Cormorant Rocks
Cape Seniavin	CS	Cape Seniavin
Round Island	BC	Boat Cove
	CG	Campground
	EC	East Cape
	FB	First Beach
	FP	First Prime
	FR	Flat Rock
	MB	Main Beach
	NBC	North Boat Cove
	OBP	OB Point
	S	Second
	SP	Second Prime
	TM	Third Main
	WM	West Main Beach
	WMS	West Main South
Other	OT	Other
	BR	Black Rock
	BRC	Bird Rock Cove
	CLM	Calm Point
	CAS	Castle Rock
	CB	Chagvan bay
	CRK	Crooked Island
	EST	Estus Point
	NH	North Hagemeister
	WHS	West Hagemeister South
	WHN	West Hagemeister North
	T-E	Halfway Between Tongue Pt.and

	Estus Pt.
EHIN	East High Island North
EHIS	East High Island South
WHI	West High Island
MTV	Metervik Rock
ENG	East Negukthik Bay
NUN	Nunavachak Bay
RP	Rocky Point
OOS	Oosik Bay
ORA	Oracle Mtn.
OWB	Owen's Bay
PP	Pyrite Point
RUG	Rugged Point
SUM	Summit Island
TT	The Twins

Add new beaches as needed. Describe them clearly in the daylog for reference.

Table 2. Beaufort scale description.

Beaufort Number	*Wind Speed*			*Effects Observed at Sea*
	Knots	*mph*	*km/hr*	
0	<1	<1	<1	Sea like a mirror, no waves.
1	1-3	1-3	1-5	Ripples with appearance of scales; no foam crests.
2	4-6	4-7	6-11	Small wavelets; crests of glassy appearance, not breaking. Breeze can be felt on face, and causes grasses to rustle.
3	7-10	8-12	12-19	Large wavelets; crests begin to break, scattered whitecaps. A light flag would be extended by the wind.
4	11-16	13-18	20-28	Small wave 0.5-1.25m high, becoming longer; numerous whitecaps. Loose clothing will flap in the wind.
5	17-21	19-24	29-38	Moderate waves of 1.25-2.5m taking longer to form; many whitecaps; some spray. Wind will cause eyes to tear; difficult to hold binoculars steady.
6	22-27	25-31	39-49	Larger waves 2.5-4m forming; whitecaps everywhere; more spray. Cannot look directly into the wind without squinting; may have to lean into the wind when walking.
7	28-33	32-38	50-61	Sea heaps up, waves 4-6m; white foam from breaking waves begins to be blown in streaks. Extremely poor conditions for walrus counts. Little chance of holding binoculars steady enough for a reliable count

Appendix 2. Round Island access violations and walrus disturbances. Unless otherwise noted, visiting boats were only monitored as they approached the island and not during departure. HR= head raising; OR= reorienting; and DS= dispersing. Walrus response to boats or airplanes outside the restricted area was not recorded.

Date	Approximate start time	Disturbance type	Closest approach to island	Elevation	Walrus response	Comments
5/8/00	1550	Unauthorized airplane traffic.	500 m	~650 m	Unknown.	Walrus not observed.
5/15/00	1130	Authorized visit by independent boat.	Anchored at 100 m, beached skiff.	N/A	2 HR/DS from BC.	Two recently hauled-out walrus at BC DS, but walrus on FR not obviously disturbed.
5/17/00	1345	Authorized visit by independent boat.	Anchored at 200 m, beached skiff.	N/A	3 HR/OR/DS from BC.	One DS as boat approaches; two remaining on FR DS as boat drops anchor. No obvious disturbance at MB.
5/19/00	1500	Unauthorized boat traffic.	~3 km	N/A	Unknown.	Walrus not observed, but disturbance unlikely. Tender and three fishing boats pass close to the island. Captain apologized and moved out immediately when contacted by VHF; no further action taken.
5/19/00	1620	Airplane traffic.	Unknown.	Unknown.	75 HR.	Incomplete record; no other information available.
5/24/00	1130	Unauthorized airplane traffic.	~3 km	<650 m	No obvious response.	Coast Guard plane flying toward Cape Newenham. No further action taken.
5/28/00	2100	Visitors on trail.	50 m	N/A	9 HR/OR/DS from FB.	12 people scattered between the two FB observation points; several standing at cliff edge.
6/5/00	1405	Unauthorized airplane traffic.	Overhead.	100m	>1500 HR/OR at MB.	Airplane flew low over all east-side beaches. All MB walrus visible from cabin area were disturbed. Likely additional disturbance at other beaches and possible DS.
6/7/00	1740	Unauthorized boat traffic.	~4 km	N/A	Unknown.	Walrus not observed; no disturbance likely. Three boats pass island just inside restricted area. Moved out to 5 km when contacted.

						Captain using old map that indicated 3 km rather than 5 km restricted area. No further action taken.
6/9/00	1600	Unknown- possible rockfall.	N/A	N/A	250 HR/OR and begin to DS. 25 DS into water from MB.	
6/10/00	1434	Staff counting from SB observation point.	50 m	N/A	2 HR/OR/DS from SB.	Two young walrus from group of about 73 on SB were disturbed and DS.
6/25/00	1000	Authorized visit by charter operator.	Anchored at 100 m, beached skiff.	N/A	A couple walrus HR on FR and two already in water DS.	
6/26/00	1130	Authorized staff skiff operations.	100 m	N/A	5 HR on FR and four already in water DS from BC.	Used skiff to count west side of island.
6/26/00	1630	Authorized visit by charter operator.	Anchored at 100 m, beached skiff.	N/A	5-10 HR on FR.	
6/28/00	0845	Authorized visit by charter operator.	Anchored at 100 m, beached skiff.	N/A	No obvious disturbance.	Walrus present on FR. Noise of surf may have covered boat noise.
6/30/00	1630	Authorized staff skiff operations.	300-400 m	N/A	7 HR/OR/DS from MB.	Attempted to count west side by boat, but too rough. Walrus disturbed when we landed on MB (to climb gully and count WM from observation point).
7/1/00	1400	Authorized staff skiff operations.	100 m	N/A	No obvious disturbance.	Used skiff to count west side of island. Walrus present on several beaches.
7/2/00	0815	Authorized visit by charter operator.	Anchored at 100 m, beached skiff.	N/A	>10 HR at FR and BC.	Used alternate landing area near CG because walrus hauled out in BC. Only FR walrus visible to staff, but visitors reported a few additional HR in BC. No obvious disturbance when visitors left, but we reached BC as visitors climbing into boat from skiff.
7/3/00	1615	Airplane traffic outside restricted area.	Overhead.	~7,000 m	15 HR and 2 OR/DS from BC.	Commercial jet high overhead, but very audible. Wlarus settle quickly after plane gone and no obvious response at FR.

7/4/00	1125	Authorized visit by charter operator.	Anchored at 100 m, beached skiff within 5-10 m of walrus.	N/A	~30 HR and 10 OR at CG, at least one already in water DS.	BC, FR, and CG all full of walrus. Used alternate landing area near CG. Visitors walk within about 5 m of walrus. See datasheet for full narrative.
7/5/00	0800	Authorized visit by charter operator.	Anchored at 100 m. Staff within 5 m while lowering skiff.	N/A	~225 HR, 150 OR, 125 DS from BC.	Staff deliberately chased about15 walrus from the BC landing area, about 50 more DS as skiff lowered, and roughly 60 DS as charter operator arrives.
7/7/00	1628	Unauthorized airplane traffic.	Overhead.	~650 m	>1300 HR, 800 OR, 100 DS from MB.	Airplane above clouds and not visible, but very loud. All of the visible walrus HR, but most settled down by 1655.
7/9/00	<1200	Visitor at FR observation point.	~30 m	N/A	3-4 HR and 1 OR at FR.	Photographer went to FR and began taking photos before receiving RI visitor orientation. Careless behavior (standing at cliff edge and wearing bright clothing) caused disturbance.
7/9/00	1600	Staff counting from FR observation point.	~30 m.	N/A	2 HR/OR/DS from FR.	Walrus jump 2 m from top of FR as staff approach.
7/10/00	1130	Authorized aerial count of MB.	Overhead.	~650 m.	Unknown.	Walrus not observed.
7/10/00	1600	Unknown	N/A	N/A	~200 HR/OR/DS from MB.	Walrus stampeded from MB and remain grouped in nearshore water until at least 1610.
7/10/00	2130	Authorized aerial count of MB.	Overhead.	~650 m.	Unknown.	Walrus not observed.
7/11/00	1130	Authorized aerial count of MB.	Overhead.	~400 m.	Unknown.	Walrus not observed.
7/12/00	1200	Authorized staff skiff operations.	100 m.	N/A	≥1 HR at FR.	Used skiff to count west side of island.
7/13/00	Unknown	Authorized visit by charter operator.	Anchored at 100 m, beached skiff.	N/A	~17 HR/OR/DS from BC.	No disturbance recorded during visitor arrival, but walrus disturbed during emergency evacuation of visitor with broken leg.
7/14/00	1635	Unknown	N/A	N/A	~185 HR/OR/DS from BC.	Campers reported disturbance, but no obvious

						cause.
7/16/00	Unknown	Authorized visit by charter operator.	Anchored at 100 yards, beached skiff.	N/A	8 HR/OR/DS from BC.	Walrus DS as Bel Canto approaches; other animals already in the water group up near the Bel Canto.
7/18/00	1000	Two authorized visits by charter operators.	Anchored at 100 m, beached skiff.	N/A	No obvious disturbance.	
7/18/00	1100	Authorized aerial count of MB.	Overhead.	~825 m.	No obvious disturbance in BC area.	Walrus on MB not observed.
7/18/00	1543	Authorized aerial count of MB.	Overhead.	~825 m.	~800 HR, 800 OR, and 255 DS from MB.	Every animal on MB HR. About 100 of the walrus that DS stayed in nearshore water for at least 30 minutes; other 155 left area.
7/20/00	1145	Authorized visit by charter operator.	Anchored at 100 m, beached skiff.	N/A	20 HR and ≥8 DS.	Two walrus DS during visitor transfer; remaining six leave when boat pulls anchor.
7/20/00	1815	Unauthorized boat traffic.	~1.5 km	N/A	Unknown	Walrus not observed. Boat ignored repeated radio calls, but finally responded and changed course when warned that in violation of access policy. ADFG staff informed.
7/20/00	Unknown	Authorized staff skiff operations.	Unknown.	N/A	1 HR at NBC.	Used skiff to count west side of island.
7/22/00	1308	Authorized visit by two independent boats.	Anchored at ~75 m, beached skiff.	N/A	>20 HR and 2 DS from FR and BC, and walrus already in water investigate boats from 50 m. No obvious disturbance when boats left BC.	
7/23/00	1550	Authorized visit by independent boat.	Anchored at 100 m, beached skiff.	N/A	14 HR, 14 OR and 8 DS from BC; several additional HR when visitors leave.	
7/24/00	1835	Authorized visit by independent boat.	Anchored at 100 m, beached skiff.	N/A	~30 HR at FR.	May have been disturbed by noise of anchor being dropped.
7/25/00	0830	Authorized visits by two charter operators.	Anchored at 100-125 m, beached skiff.	N/A	1-3 HR at FR.	

7/30/00	Unknown.	Authorized visit by charter operator.	Anchored at 100 m, beached skiff.	N/A	Several HR at FR.	
7/31/00	Unknown	Authorized visit by charter operator.	Anchored at 100 m, beached skiff.	N/A	Unknown disturbance when visitors arrive. 60 HR, 60 OR, and 25 DS from BC as visitors leave.	Used alternate landing area, so unable to see walrus in BC when visitors arrive- probably only minor disturbance. Walrus probably disturbed by boat engine during departure.
8/7/00	1130	Authorized visit by charter operator.	Anchored at 100 m, beached skiff.	N/A	No obvious disturbance, but walrus seemed restless.	Staff arrived after boat. 20-30 walrus in water in BC area, but probably already in water when boat arrived.
8/10/00	0930	Authorized visit by charter operator.	Anchored at 100 m, beached skiff.	N/A	1 HR and OR at BC.	
8/17/00	1230	Staff activity on beach	25 m.	N/A	33 HR/OR/DS from BC.	Staff hauling gear to beach.
8/17/00	1400	Authorized visit by charter operator.	Anchored at ~75 m, beached skiff.	N/A	~60 HR/OR/DS from BC	Walrus not obviously disturbed during multiple skiff trips, but panic as boat pulls anchor and begins to leave. Some jumping from 2 m rocks, but no injuries observed.