

Round Island Field Report
May 14 - August 10, 2001



photo by Mary Cody

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Summary

Alaska Department of Fish and Game and U. S. Fish and Wildlife Service personnel were present at the Round Island State Game Sanctuary from May 14 through August 10, 2001. We counted walrus (*Odobenus rosmarus*) on all east side beaches daily from May 15 through August 9, 2001. We counted walrus on West Main Beach daily from June 4 through August 8, 2001. Counts for all east side beaches combined ranged from a low of 226 on July 15 to a high of 4,017 on July 22. Counts on the west side ranged from 0 on several days to a high of 860 on June 30. The island-wide high count for the summer was 4,823 on July 22. We monitored seabird plots for both population size and productivity. Common murre (*Uria aalge*), black-legged kittiwakes (*Rissa tridactyla*) and pelagic cormorants (*Phalacrocorax pelagicus*) fledged chicks of 2%, 0% and 58% respectively of the eggs laid. The number of common murre, black-legged kittiwakes and pelagic cormorants decreased by about 50% overall for each species on all plots when compared with the 2000 counts. We counted Steller sea lions (*Eumetopias jubatas*) at the East Cape haulout every six days. Counts of Steller sea lions ranged from a low of 0 on July 15 to a high of 356 on May 22. An average of 99 Steller sea lions used the east cape haulout throughout the summer. Steve Rice continued a study of raven (*Corvus corax*) predation upon seabirds. In addition, we administered a visitor program, monitored haulout disturbance, and performed routine maintenance and improvement of the trails and facilities on the island.

Introduction

The summer of 2001 marked the ninth consecutive year of a cooperative program between the Alaska Department of Fish and Game (ADF&G) and the Marine Mammals Management Division (MMM) of the U. S. Fish and Wildlife Service (USFWS). The two agencies provide staff and funding to monitor walrus (*Odobenus rosmarus*) and seabird populations on Round Island while also administering a visitor program, monitoring haulout disturbance, and maintaining and improving trails and facilities on the island. Round Island is located in the Walrus Islands State Game Sanctuary and has traditionally supported the largest number of walrus of the four terrestrial walrus haulouts in Bristol Bay, Alaska. The other terrestrial walrus haulouts located in Bristol Bay are Cape Pierce and Cape Newenham, both within the Togiak National Wildlife Refuge (TNWR), and Cape Seniavin located northeast of Port Moller on the Alaska Peninsula (Figure 1). Cape Pierce and Cape Newenham are both monitored by TNWR staff. In 1998, 1999 and 2001, Cape Seniavin was monitored by MMM staff. This report provides a synopsis of walrus numbers throughout the summer, walrus disturbance events, Steller sea lion (*Eumetopias jubatus*) counts and seabird research conducted on Round Island during this summer field season. For more information on the visitor program, raven (*Corvus corax*) research, trail and cabin maintenance, see the ADF&G report (Rice 2001).

Methods

Weather

We collected the following weather information daily near the cabin at 1400 hours: current wind speed and direction, current cloud cover and type of precipitation (if any), maximum and minimum temperature for the preceding 24 hours, and amount of precipitation over the preceding 24 hours. In addition, the barometric pressure was recorded daily at 0800 and at 2000.

Walrus Monitoring

Walrus haul out on nine beaches on the east side of Round Island and on two beaches on the west side of Round Island (Figure 2). All accessible beaches on the east side were counted daily from May 15 through August 9, immediately after weather information was recorded at 1400 hours. Heavy snow fall left avalanche chutes along the trail leading to the west side impassable and also prohibited us from setting up the boat and boat anchor system until much of the snow and ice had melted. Therefore, West Main Beach was not counted until early June. From June 4 through August 8, West Main Beach was counted daily, usually from land or occasionally from a skiff. In addition to the 1400 count, all beaches on the east side were counted by the FWS observer at 0900 and again at 1900 every third day during the month of July. These data will be used to assess diurnal and tidal variation in haulout use. During all counts, each observer counted independently using 10 x 42 binoculars. If ten or more walrus were present, each beach was counted three times by each observer using a separate tally meter for each count. Tally meters were not used when fewer than ten animals were present. We've found that tally meters became an additional source of error rather than adding precision when so few animals were

being counted. During the month of June, beaches were only counted once if fewer than ten walrus were present. Observers did not discuss or compare numbers during counts. After three counts, observers compared numbers and tried to locate where discrepancies may have occurred.

If the observers felt that the amount of variation in their counts was excessive (20% or more) and had time, additional counts were done. These multiple counts will be analyzed by Mark Udevitz of the Biological Resource Division (BRD) of the U. S. Geological Survey (USGS) to determine the amount of variability within and among observers at all haulouts. For purposes of this report, all counts by all observers at each beach were averaged. Only the counts conducted at 1400 hours were used to determine seasonal highs, seasonal means and daily averages.

Every effort was made to have both observers count together during the daily 1400 counts. This was not always possible due to the needs of visitors on the island, the timing of boat arrivals and departures, or conflicts with scheduled raven work. If the delay was less than an hour, we started the count later so that both observers could count together. If the delay was longer, then only one observer counted walrus. Conflicts with the scheduled arrival of the visitor boat or with raven work made it impossible for both observers to do the scheduled 1400 counts on 16 days. When raven work or the arrival of day visitors created a scheduling conflict, only one observer did the scheduled count. The nine beaches along the east side were counted in the following order during each count: 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 Main Beach (MB). West Main Beach was counted as quickly as possible after the east side beaches. The hike from the Main Beach observation point to West Main Beach takes approximately 45 minutes. Every effort was made to have both observers count West Main Beach, however due to constraints of the visitor program, this was not always possible. West Main Beach South (WMS) is only visible by skiff, and so was only counted rarely. It is not included in West Main Beach counts or in daily averages or totals in this report. However, we have rarely seen more than 50 walrus on West Main Beach South and usually don't see any walrus there, so it probably does not significantly effect total numbers for Round Island. On days when interval counts were conducted, one observer counted all of the beaches on the east side at 900, 1400 and 1900, while the other observer counted all of the beaches on the east side at 1400 and West Main Beach immediately afterward.

The following information was recorded by each observer during each count: start time, end time, type of count, Beaufort sea state, beach condition, beach availability and beach used, visibility, land and water counts, and count quality. Walrus counts were divided into categories and each count was recorded as one of the following: a scheduled count of east side beaches which occurred at 1400, a boat-based count of any beach, an interval count of east side beaches which occurred in the morning or evening, a land-based count of West Main Beach, or any count done opportunistically that did not fit into the other categories. For beach condition, we used a scale based on the size of waves breaking on the beach: calm, wave height up to one foot, wave height of one to three feet, or wave height greater than three feet. Beach availability was recorded as a percentage in quartiles from 0 to 125% based on the amount of beach visible at mean low tide. Mean low tide was recorded as 100%. Beach used was recorded in 5 percent increments from 0 to 100%. Visibility was a subjective measure of whether any walrus were

hidden by obstacles, such as rock walls or fog, and was recorded as clear, partially obscured or obscured. Land counts included all walrus on the beach and those in the surf zone. Water counts were only done once for each beach and included all walrus in the water within ten meters of shore. Count quality was a subjective measure of how accurate the observer felt the count was and was recorded as excellent, good, fair or poor. Count quality was recorded before looking at the actual count recorded on the clicker. For a more complete description of the count protocols, see Appendix A.

Sources of anthropogenic disturbance included unauthorized boat traffic, boat traffic along the access corridor, authorized and unauthorized overflights by small aircraft, land based visitor disturbance, staff and visitor arrivals and departures. We made every effort to minimize walrus disturbance by observers and visitors. When disturbances did occur, the following information was recorded: date, time, location, number of walrus on the beach where the disturbance occurred, number of walrus affected by the disturbance, behavior of the animals disturbed, and, in some cases, the amount of time that passed before the walrus returned to their prior state, and the source of disturbance (if identified). Disturbance of walrus on the haulout was defined as any event that caused walrus to raise their heads, change their physical location or orientation on the beach, or to leave the beach (Hessing and Sheffield 1989, Kruse 1997).

Seabird Population and Productivity

We collected seabird population and productivity data for common murre (*Uria aalge*), black-legged kittiwakes (*Rissa tridactyla*) and pelagic cormorants (*Phalacrocorax pelagicus*) following protocols used by the TNWR. Five population plots containing common murre, black-legged kittiwake and pelagic cormorants were delineated in 1997 (Rice 1997). In addition to the five plots used in 1997 and 1998 (Rice 1997, Stroka 1998), a plot containing a small pelagic cormorant colony was added in 1999. An additional pelagic cormorant colony plot was added in 2000. Photos were used to identify the plots and painted stakes marked the observation points. Methods were consistent among years. Observers counted the number of common murre, black-legged kittiwakes, black-legged kittiwake nests, pelagic cormorants and pelagic cormorant nests twice in each plot on 8 days between June 16 and June 28, 2001. Tufted puffins (*Fratercula cirrhata*) and horned puffins (*Fratercula corniculata*) were not recorded although some were present on all plots. In order to determine some measure of reproductive success, 25 black-legged kittiwake nests on each of two plots, 25 pairs of common murre on each of two plots, 5 pelagic cormorant nests on one plot and 23 pelagic cormorant nests on another plot were monitored until we left the island on August 10. Productivity plots were checked for status upon our arrival and pelagic cormorant nests were already active. Cormorant data was collected from May 16 through August 9. Black-legged kittiwake nests, and murre pairs were checked every two or three days from June 3 until August 10. A spotting scope or 10 x 42 binoculars were used to determine nest contents and presence and behavior of adult birds.

Other Projects

A small Steller sea lion (*Eumetopias jubatas*) haulout located at East Cape was monitored every six days using the same methodology as walrus counts. Beach-found ivory was collected from the beaches whenever possible without disturbing walrus. All ivory was sold by the Eskimo

Walrus Commission (EWC) in conjunction with the FWS and ADF&G during the Alaska Federation of Natives Convention in October, 2001. The proceeds were deposited in the Ivory Fund which will help finance future walrus research. When collecting ivory from beach cast carcasses, we also collected a tooth for aging and, when the ventral side was accessible, the baculum. The bacula were sent to Professor Stephen DeStephano, of the University of Massachusetts in Amherst, for a study on breaking strength. A single satellite image of Round Island taken on June 16 was used to assess the possible usefulness of satellite images in counting walrus at remote sites. Land based counts were used to ground truth the counts based on this image. This project may be expanded in 2002. Steve Rice continued his research on raven behavior and predation on cliff-nesting seabirds. Fox dens were monitored informally and the presence and number of kits noted. Unusual sightings, first sightings of the season of bird species, the first flowers observed of each plant species and anything else of interest were recorded in a daily log book.

Results and discussion

Technicians Mary Cody (USFWS) and Steve Rice (ADF&G) arrived on Round Island on May 14. Our projected arrival date of May 1 was delayed by two weeks due to mechanical problems with the boat, icy weather and the onset of the commercial herring fishery. From May 28 until June 25, Mary Cody was off island due to a family emergency. During this time period, she was replaced by George Roestler from Togiak Fisheries, Inc. (May 28-June 3), Marc Webber of FWS (June 3- June 10), Joel GarlichMiller of FWS (June 10- June 15), and Melissa McClaran of FWS (June 15-June 25). Three of the four staff who filled in during my absence were experienced marine mammal biologists. This expertise enhanced the program and their personal experience at Round Island will be helpful in planning haul out procedures and protocols in the future. Using replacements who were already familiar with haulout count protocols and issues of disturbance minimized training time. We left Round Island for Dillingham on the morning of August 10, 2001.

Walrus Monitoring

We counted all east side walrus haulout beaches on 87 consecutive days from May 15 through August 9. All counts by all observers were averaged to determine the number of walrus using the haulout on a daily basis. Walrus counts for all east side beaches combined ranged from a high of 4,017 walrus on July 22 to a low of 226 walrus on July 15, with an overall mean of 1,271 (Table 1). We counted West Main Beach on 66 consecutive days from June 4 through August 8. Counts of West Main Beach ranged from a low of 0 on 10 days to a high of 860 on June 30. The mean count on the west side from June 4 to August 8 was 266 (Table 2). The daily mean of east and west side beaches combined, based only upon days when all beaches were counted, was 1,576 walrus. For a complete list by date of all east side, west side and total island counts, see Appendix B.

Walrus numbers tend to build gradually and then to drop off sharply over cycles of about two weeks duration. Within this pattern, the average walrus numbers remained fairly consistent throughout May, June and July, but were starting to drop off when we left in mid-August. For

purposes of this report, the mean of all scheduled 1400 counts by all observers were used to determine a daily walrus count (Figure 3). Every third day during the month of July, all haulout beaches were counted three times a day at set times that encompassed a variety of tides. This data will be used to evaluate the effects of tidal variation and diurnal patterns of walrus use of the haulout. These data will be pooled with data from other years and other haul outs and analyzed together at a future time. In all, interval counts took place on 12 days between June 14 and July 29 (Table 3). On average, counts were higher during evening counts (mean of 1,600) than at mid-day (mean of 1,412) or in the morning (mean of 788). This may be at least partially an artifact of tidal influence since the high tide series occurred in the morning coinciding with morning counts during most of July. In 2001, interval counts were primarily conducted during the month of July when all four Bristol Bay haul outs were being monitored, rather than throughout the summer as in previous years. This change significantly reduced our work load, allowing us to do daily counts of West Main Beach. This change may also have improved overall accuracy by reducing the level of eye fatigue for staff. Observer variation data from all haul outs will be pooled and analyzed together. On Round Island, observer variation appeared to be smallest between experienced counters. The least amount of variation between observers occurred when walrus numbers were small. Observer variation was greatest with “new” observers without previous counting experience and when walrus numbers were high (Figure 4). It should be noted that most beaches (S, FP, FB, CG, and BC) are counted from two separate vantage points when walrus numbers are high since there is no single vantage point that offers an unobstructed view of the entire beach. Count times include hiking time between vantage points and do not accurately reflect the amount of time spent counting walrus. Count time is also affected by the needs of visitors (answering questions, meeting boats as they arrive or depart, etc.). Count time does not accurately reflect effort and should not be used as a measure of effort.

We recorded 49 walrus disturbance events in 2001. A walrus disturbance event was defined as any action or event which causes a visible reaction in one or more walrus on a haulout beach. Three distinct behaviors were used to measure disturbance. The categories, in increasing levels of severity, were head raises, re-orienting their bodies toward the water, and dispersal. Dispersal includes moving one body length or more toward the water as well as actually dispersing from the beach (Kruse 1997). We recorded 36 occasions when the disturbance could be attributed to a boat, one occasion when the disturbance could be attributed to a plane and three occasions when the disturbance could be attributed to staff or visitors on foot. We also recorded nine occasions when similar activities caused no visible signs of disturbance when walrus were present. On nine occasions no specific anthropogenic cause of the disturbance could be determined, however rock fall or seabirds flushing may have initiated the walrus response and dispersal. An additional 29 potential disturbance events were recorded where staff were unable to observe the walrus and so could not determine whether a disturbance had occurred or not. See Appendix C for a complete list of all recorded potential disturbance events.

The daily walrus count for June 16 correlated well with counts based on an IKONOS image taken by satellite (Figure 5). The satellite image was taken about 6 hours before the ground count and the resolution of the image was enhanced and analyzed using ERDAS Imagine software by Doug Burn of MMM (Doug Burn, pers. comm.). Mean ground counts for Main

Beach, First Beach and Second Beach were 1,135, 158, and 196 respectively. Mean estimates based on the IKONOS image for the same beaches were 1,005, 220 and 266 respectively. Island totals for ground counts and satellite image counts were 1,524 and 1,533 walrus, respectively.

Seabird Population and Productivity

We began seabird population counts on June 16 and completed the eighth count on June 28 (Table 4). We counted daily beginning on June 16, unless weather or plot disturbance by ravens or other predators prevented us from counting. We counted each species on each plot twice. Average numbers of common murre, black-legged kittiwakes and pelagic cormorants decreased by 48%, 62% and 46% respectively from the previous year. Each species decreased on each plot. Pelagic cormorants were already on eggs when we first checked nests on May 15. We observed the first black-legged kittiwake egg on May 25 and the first common murre egg on June 11.

Murre, kittiwakes and pelagic cormorants fledged 2%, 0% and 58% of the eggs laid respectively (Table 5). All kittiwake chicks had died by July 29. Kittiwake and murre productivity plots were last checked on August 8. Following APEX protocols (Kettle *et al.*, 1997) we assumed that murre chicks fledged successfully if the murre chicks were 15 days old or older when we left the island. We therefore assumed that a single murre chick aged 18 days fledged successfully. Two pairs of murre were still incubating eggs on August 8, these were assumed not to have hatched. We assumed that six murre chicks aged 9 to 14 days old did not fledge. Most pelagic cormorant chicks (41 out of 48 chicks remaining) were 48 days old or older, and were leaving their nests regularly by August 5, returning to them in the evening to roost and throughout the day to be fed. Cormorant productivity plots were last checked on August 9. Chicks of all three species were commonly lost due to storms. Murre and kittiwake chicks were commonly lost due to predation as well. Although some cormorants were in attendance at the First Beach colony early in the season, only five pairs began to build or built nests there. In 2000, 22 pair of cormorants had built nests at First Beach, however only five pair hatched chicks and no chicks fledged from First Beach. The five nest sites at the First Beach colony that were active in 2001 were the only five nest sites at the colony to produce chicks in 2000. In 2000, all chicks were lost at this site before fledging, apparently because of weakness or disease introduced due to parasitism by ticks (Cody 2000). In 2001, no eggs were seen and colony attendance at First Beach had dissipated by the end of May. Its possible that the colony site was abandoned due to the high number of ticks infesting nests and cormorants at this site the previous year.

Ravens and foxes (*Vulpes vulpes*) were commonly seen predators. Ravens preyed upon adult murre and kittiwakes, on murre and kittiwake chicks, and on the eggs of all three monitored seabird species. Foxes took adults, chicks and eggs of all three species, but were limited to more accessible cliff areas. Ravens were frequently seen hunting and harassing murre and kittiwakes at all Main Beach plots. Ravens often flew by each cormorant plot and were observed taking unattended eggs, but were not observed hunting or harassing cormorants. We also saw peregrine falcons (*Falco peregrinus*), rough-legged hawks (*Buteo lagopus*) and bald eagles (*Haliaeetus leucocephalus*) hunting at the seabird cliffs.

All five plots are located at the edge of the main colony and may not reflect success or failure rates that occur in the center of the colony. The plots are located near the Main Beach overlook area and may be affected by the daily human activity at the observation point. Plots at Main Beach are between 2 and 100 meters from the cliff edge platform where visitors and staff commonly sit. It has been estimated that over 210,000 seabirds nest annually on Round Island (Haggbloom 1994). However, most are located along cliffs that cannot be observed from land. Due to frequent high seas and poor weather, it is not possible to regularly monitor any sites by boat. Near the West Main Beach overlook, there is a seabird plot site that Judy Sherbourne monitored in the 1980's. Since we are not able to access this area until the snow melts (usually early to mid-June,) we cannot get adequate data to determine laying success at this site. However, this site could provide some comparative data from a different part of the island. This year, there were many kittiwake and murre chicks in this area when we last visited this site on August 8. The phrenology appeared to be very spread out with some murre and kittiwakes still on eggs, while others had chicks that were very near fledging. Casual observation suggested much higher success rates for common murre and black-legged kittiwakes at this location. In future, if we are going to continue hiking over to this area daily to count walrus, it may be feasible to add one or two seabird population plots at West Main Beach. Although we aren't able to access this area early enough in the spring to determine nesting attempts or egg-laying accurately, we could determine the number of birds on the plots early enough in the season to include them in our population plots. We could then check the number of chicks remaining when we do our 'chick checks' during the first week of August. This would give us some comparative data for a different section of the island that is more densely covered by seabirds and is less subject to human disturbance than are the Main Beach plots.

Other Projects

From May 16 to August 8, an average of 98 Steller sea lions were counted on land at the East Cape haulout (Table 6). Monthly averages were 298 in May, 71 in June, 29 in July and 37 in the first half of August. We counted sea lions between 1:40 pm and 7:40 pm, usually from a land-based observation point. Sea lions also hauled out below cliffs near East Cape where they were not visible from onshore observation points. We were unable to find a safe vantage point and do not know how many additional sea lions were under the cliff edge. On June 16 and July 27, we were able to count from a skiff approximately 200 meters from the beach. On June 9 we observed one subadult with yellow tags on the right and left fore flippers, but we were unable to read any numbers on the tags.

Three or four fox dens were active on Round Island this season; however, we saw fox kits less frequently than in the previous two years. The den at East Cape produced at least one kit. One den on the hillside behind the cabin produced at least two kits. Visitors reported that the den about 200 meters above the trail at the North Boat Cove area had two kits, but we were not able to confirm this. Visitors frequently confuse adult foxes with kits, especially when they observe the adults 'playing.' A pair of foxes were frequently seen in the West Main Beach area, but no kits were observed in this area and the old den site in this area did not appear to be active.

A pair of rough-legged hawks were occasionally seen by campers and staff in the Main Beach

area and along Traverse Trail, but they did not appear to be nesting in that area this year. They may have nested elsewhere on the island. Bald eagles and a pair of peregrines may also have been nesting on the island. We again saw a short-eared owl (*Asio flammeus*) off and on throughout the early part of the summer in the fields near the campground area.

Recommendations

1. Collect cloud ceiling data along with the other weather data; this is standard in many field camps and both ADF&G and TNWR routinely collect it. Cloud ceiling is thought to affect seabird colony attendance (Lisa Haggblom, pers. comm). Consider recording wind speed and direction at several beaches, since it varies considerably throughout a single count and onshore winds do seem to affect whether walrus are using a particular beach. To maintain consistency, I would recommend continuing to record wind speed and direction at the cabin. The cabin is a sheltered area, and the wind speed and direction at the cabin don't accurately reflect that at the northwest and southeast beaches. In order to collect a more accurate representation, I recommend also recording wind speed and direction at Second Prime, Main Beach and West Main Beach during the scheduled count.
2. If variation between counts at a single beach is higher than a 10-20% difference, I think it would be worth spending some time trying to determine the cause of the variation using a spotting scope or digital camera and to get a more accurate count. This is particularly important if these counts will be used to ground truth aerial or satellite photo counts.
3. Use the spotting scope to count MB at set intervals when there are more than approximately 500 walrus (every 3 days for ex.) or count MB once a day using the spotting scope instead of doing three binocular counts. When there are more than one observer, one could use the spotting scope to do one count while the other observer did three counts using binoculars. I think that given the distance from the observation point to main beach, a spotting scope count, though time consuming, is far more accurate. We would need to have at least one season of both binocular and spotting scope counts by the same observer(s) for purposes of comparison.
4. During interval days, doing three counts per beach at each of the nine beaches on Round Island is exhausting, especially when walrus numbers are high. By the 1900 count, accuracy is greatly reduced and observer variation increases. This year we scaled back our approach and only did interval counts during July. This greatly reduced the problems associated with fatigue. I would recommend continuing with this schedule and doing interval counts only during the month of July when all four haul outs are being monitored.
5. Currently, count quality reflects the observer's subjective opinion before looking at the tally meters. It might also be useful to record how accurate the observer thinks the count is after looking at the number on the tally meter.
6. Start/end times don't accurately reflect time spent counting since each start time has to be recorded as a different time due to data base constraints. When there are few walrus on a beach, an observer may complete three counts in one to two minutes, but has to record the times differently. Also on some beaches, observers count from more than one spot (travel time). I'd recommend changing the data base to reflect this reality of data collection. Removing 'start time' as a key field and substituting a numerical or alphabetical field to track the number of daily counts at each beach would suffice. This additional column could be an auto-fill column that

would not add to data entry.

7. If the purpose of the water counts is to document whether walrus are entering or leaving the beach between land counts, then I would suggest doing a water count just prior to or just after each land count. Although water counts are not accurate because animals in the water are not easily visible, when done in conjunction with land counts, the water counts document observer variation that is due to walrus movements and not due to mistakes on the part of the observer. I would recommend counting further out, since a lot of walrus seem to remain just off shore and go back and forth between the surf and 20-30 meters out before finally hauling out or swimming away. At Round Island, we have several coves where walrus often hang out at off-shore rocks adjacent to the beach. At the Campground beach, we frequently have walrus that are clearly cruising past that are included in our water counts because they are within ten meters of shore. Rather than using a ten meter limit, it would more accurately reflect the number of walrus associating with the beaches if we counted all that are stationary within the coves, but none that are swimming by.

8. Try to get some volunteers to come out and do a major one time trail-fixing party. Some areas of the trail are very rutted from years of use in muddy conditions and water run off. During wetter periods, the trails are several inches deep in mud and standing water. Building board walk in many areas seems like the best way to preserve the trails and also makes it obvious to visitors where the trails are (sometimes difficult to discern when the grass is high). I'm sure we could get a volunteer group (Boy Scouts or an Earth Watch, for example) who'd be delighted to come out and help us build the trails. In that way, we might be able to get it done all at once rather than doing it piecemeal over several years. These groups typically pay their own expenses to volunteer in remote and beautiful locations like Round Island.

9. Install a water gauge to measure tide height, possibly in Boat Cove. This would provide a more concrete measure of tide height than our estimates. Tidal flow varies considerably in Bristol Bay due to river flow, wind speed, wind direction and duration. Tide charts are often inaccurate at the local level.

10. Add seabird population plots near the West Main Beach area. We would not get a detailed measure of productivity at these plots, but we would add them to our population plots. We would also check on the number of chicks mid-way through the breeding season and again near the end. This would give us some idea if the productivity plots located at Main Beach accurately represent the rest of the island.

Acknowledgments

Like any remote field project with a long season, the Round Island project relies heavily on people back in the office to keep things running smoothly. In the Anchorage offices, Ellen Baier, Rosa Meehan, Joel Garlich-Miller, Wells Stephensen and Marc Webber (USFWS) and Colleen Matt (ADF&G) all helped with logistics and managed the Anchorage end of things. Jim Woolington (ADF&G) and Eunice Dyasuk (ADF&G) provided daily field support, were our link with civilization and managed the Sanctuary from Dillingham in spite of a daunting list of other duties. Don and Kathy Winkleman (Don's Round Island Charters) and Terry Johnson (Johnson Maritime/Walrus Island Expeditions) brought us groceries, mail and visitors and provided the occasional salmon barbecue. Steve Rice is a pleasure to work with in and out of the field, his expertise and willingness to step in made it possible for me to leave for an extended period of time mid-summer.

I especially wish to thank Rusty and George Roestler from Togiak Fisheries, Inc. and the crew of the *Camia*. Because of their support, and in spite of bad weather, I was able to leave Round Island within six hours of learning that my father was dying and to make it back to Michigan to be with him before he passed away. Words simply can't express how grateful I am. George Roestler from Togiak Fisheries, Inc. (May 28-June 3), Marc Webber of FWS (June 3- June 10), Joel GarlichMiller of FWS (June 10- June 15), and Melissa McClaran of FWS (June 15-June 25) all stepped in to replace me on short notice so that I could spend that time with my family.

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Table 1. Summary of scheduled daily walrus counts at Round Island, Alaska, 2001. The mean of all observers' counts at 1400 have been combined for all east side beaches.

Month	Range	Mean
May	363 - 2,465	1,108
June	527 - 2,797	1,384
July	226 - 4,017	1,395
August	563 - 1,169	770

Table 2. Summary of correlation counts of West Main Beach, Round Island, Alaska, 2001.
The mean of all observers' counts have been combined.

Month	Range	Mean
June	0 - 965	367
July	0 - 828	225
August	0 - 451	84

Table 3. Interval walrus counts for Round Island, Alaska, 2001. All observers counts were averaged and all east side beaches were combined.

Date	0900	1400	1900
6/14/01	410	570	720
6/29/01	769	1,381	1,708
7/2/01	2,254	2,780	3,254
7/5/01	441	799	1,006
7/8/01	601	965	1,121
7/11/01	627	3,552	4,022
7/14/01	367	1,866	1,376
7/17/01	859	977	1,070
7/20/01	407	685	1,038
7/23/01	1564	1,845	2,158
7/26/01	566	931	1,103
7/29/01	588	594	624
mean	788	1,412	1,600

Table 4. Seabird population summary for Round Island, Alaska, 2001. Mean of counts conducted at peak laying for each species, common murre (*Uria aalge*), black-legged kittiwakes (*Rissa tridactyla*) and their nests, and pelagic cormorants (*Phalacrocorax pelagicus*) and their nests.

Plot ID	MB-1	MB-2	MB-3	MB-4	MB-5	FB	FP
common murre	54	136	19	270	70	0	0
black-legged kittiwake	32	78	70	74	20	0	0
black-legged kittiwake nests	34	72	62	70	21	0	0
pelagic cormorant	0	1	0	0	0	0	25
pelagic cormorant nests	0	0	0	0	0	5	23

Table 5. Seabird productivity summary for Round Island, Alaska, 2001. For common murre (*Uria aalge*,) 50 pairs of adults were monitored on two plots. For black-legged kittiwakes (*Rissa tridactyla*,) 54 nests were monitored on two plots. For pelagic cormorants (*Phalacrocorax pelagicus*,) 28 nests were monitored on two plots.

	common murre	black-legged kittiwake	pelagic cormorant
no. of nests/pairs	50	54	28
no. of eggs laid	48	40	83
no. of chicks hatched	8	19	68
no. of chicks fledged	1	0	48
laying success	0.78	0.52	0.75
hatching success	0.18	0.48	0.82
reproductive success	0.02	0	0.58
productivity	0.02	0	1.7
nesting success	N/A	0	0.68
brood reduction	N/A	1.00	0.57

Laying success: pairs/nest structures where 1+ egg is layed per total pairs/nest structures.

Hatching success: eggs that hatch per total eggs layed.

Reproductive success: chicks that fledge per total eggs layed.

Productivity: chicks fledged per pair/nest structure.

Nesting Success: nests where 1+ chicks fledge per total nest structures

Brood reduction: number of 2+ chick nests where brood reduction occurred per total nests with 2+ chicks.

Table 6. Summer 2001 Steller sea lion counts (*Eumetopias jubatas*) from the East cape haulout on Round Island, Walrus Islands State Game Sanctuary, located in Bristol Bay, Alaska.

Date	Start Time	Platform	Land Count	Water Count	Total
5/16/01	1:45 pm	East Cape	264	38	302
5/22/01	7:36 pm	East Cape	356	25	381
5/28/01	7:41 pm	East Cape	273	35	308
6/3/01	1:45 pm	East Cape	91	62	153
6/9/01	1:43 pm	East Cape	140	9	149
6/16/01	1:40 pm	skiff	101		
6/21/01	2:14 pm	East Cape	15	9	24
6/28/01	1:45 pm	East Cape	6	1	7
7/3/01	7:11 pm	East Cape	4	6	10
7/9/01	3:18 pm	East Cape	46	0	46
7/15/01	1:55 pm	East Cape	0	0	0
7/21/01	2:00 pm	East Cape	16	0	16
7/27/01	1:56 pm	skiff	79	0	79
8/2/01	2:50 pm	East Cape	27	9	36
8/8/01	2:15 pm	East Cape	47	0	47

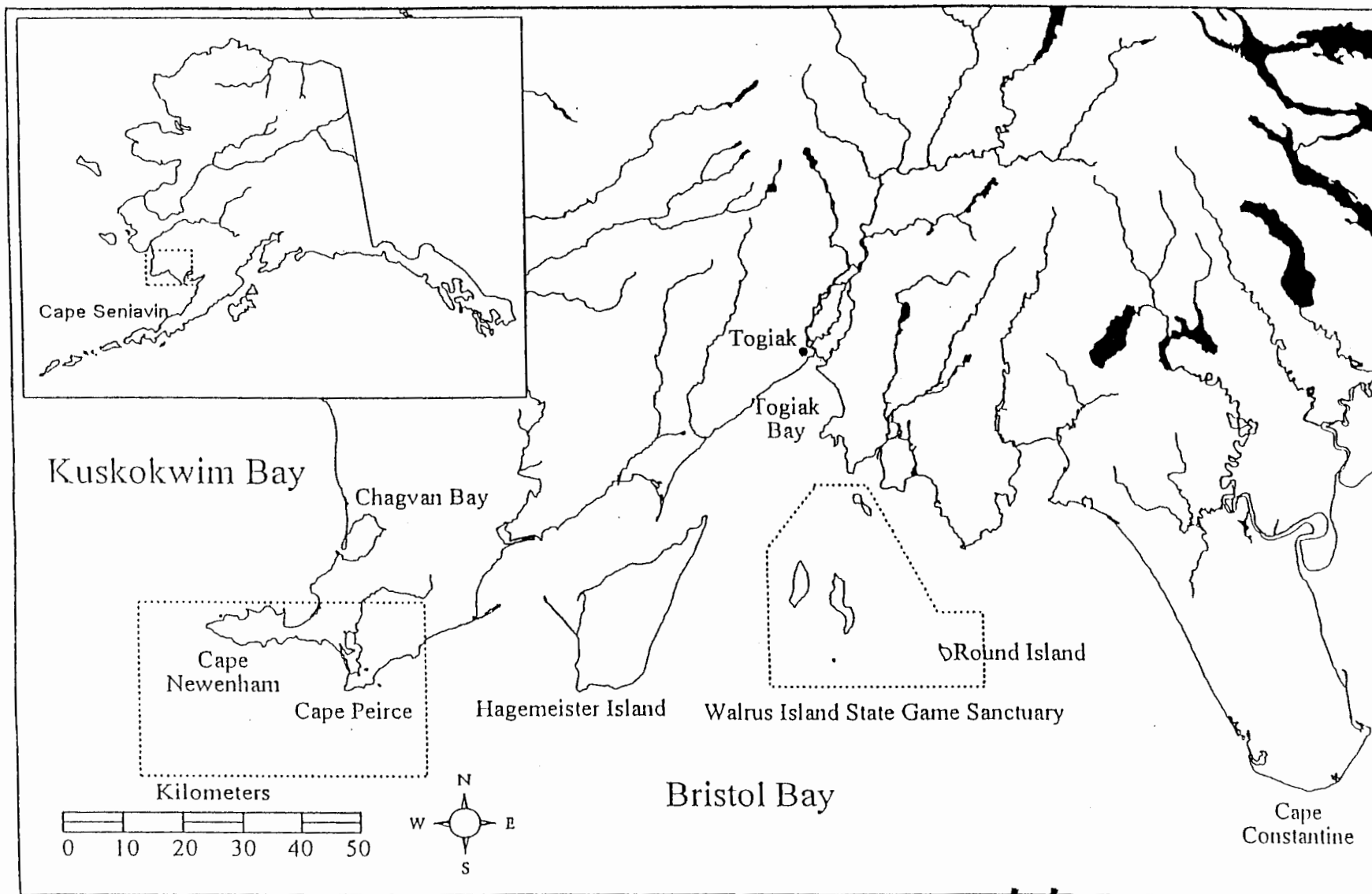


Figure 1. Marine Mammal Study Areas, Cape Peirce, Cape Newenham, Cape Seniavin and Round Island, Alaska.

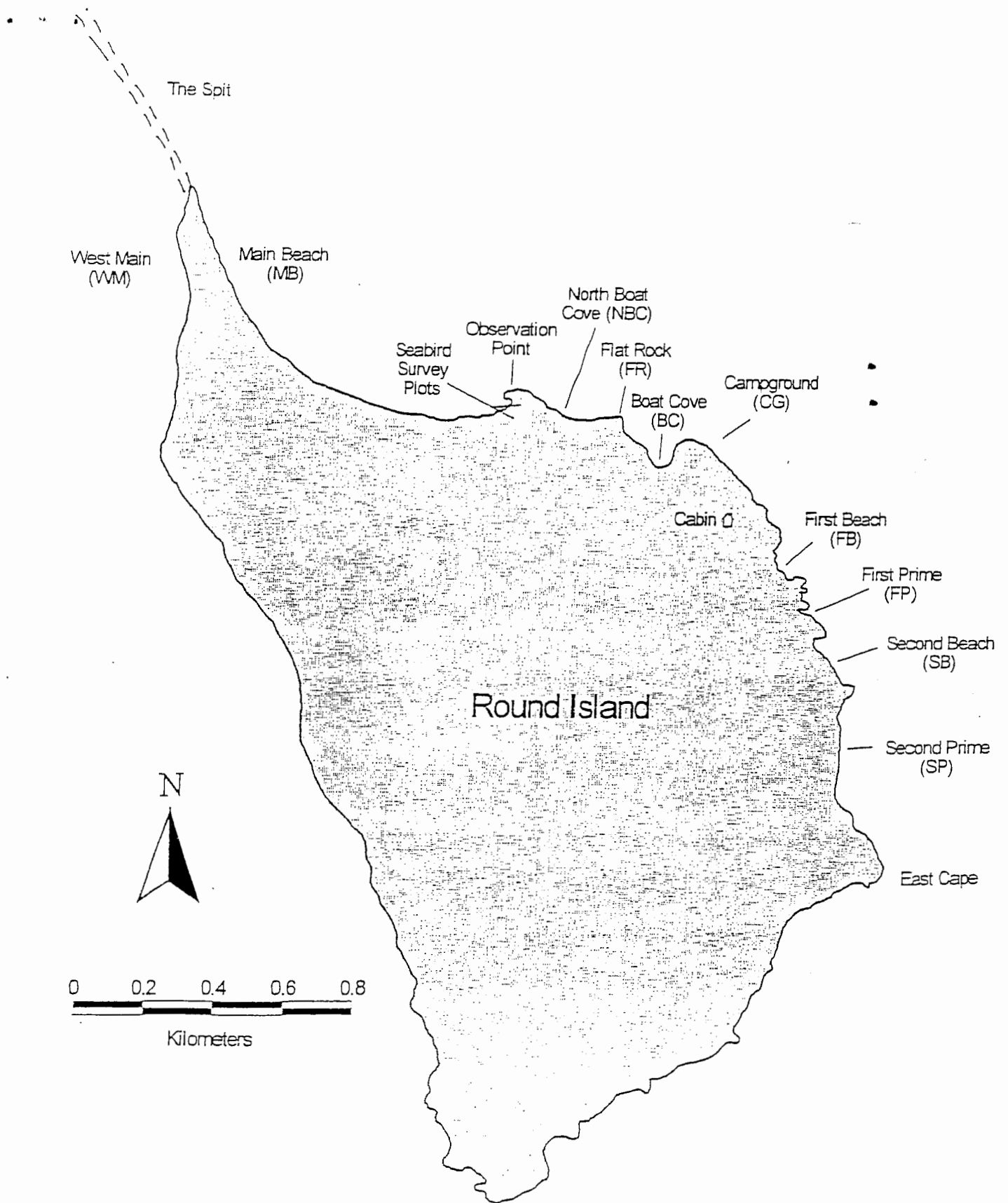


Figure 2. Area map of Round Island including landmarks and wairus hauiour beaches.

Figure 3. Daily variation in walrus counts on Round Island, Bristol Bay, Alaska, 2001. Means of all observers counts for east side beaches and west side beaches have been combined.

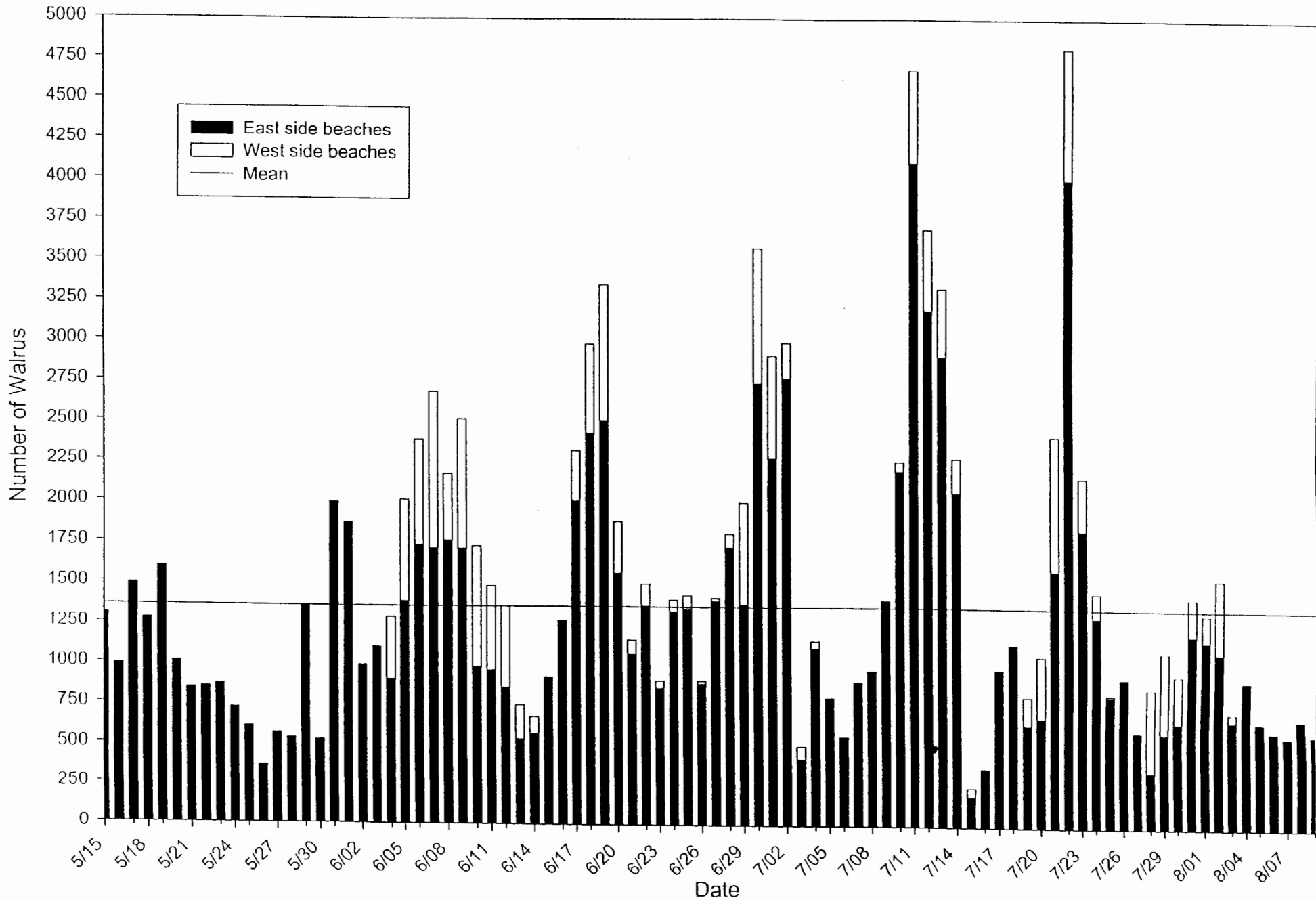


Figure 4. Variation in individual observers' daily scheduled walrus counts of all east side beaches combined, on Round Island, Bristol Bay, Alaska, 2001. Several observers participated over only a short time period in 2001.

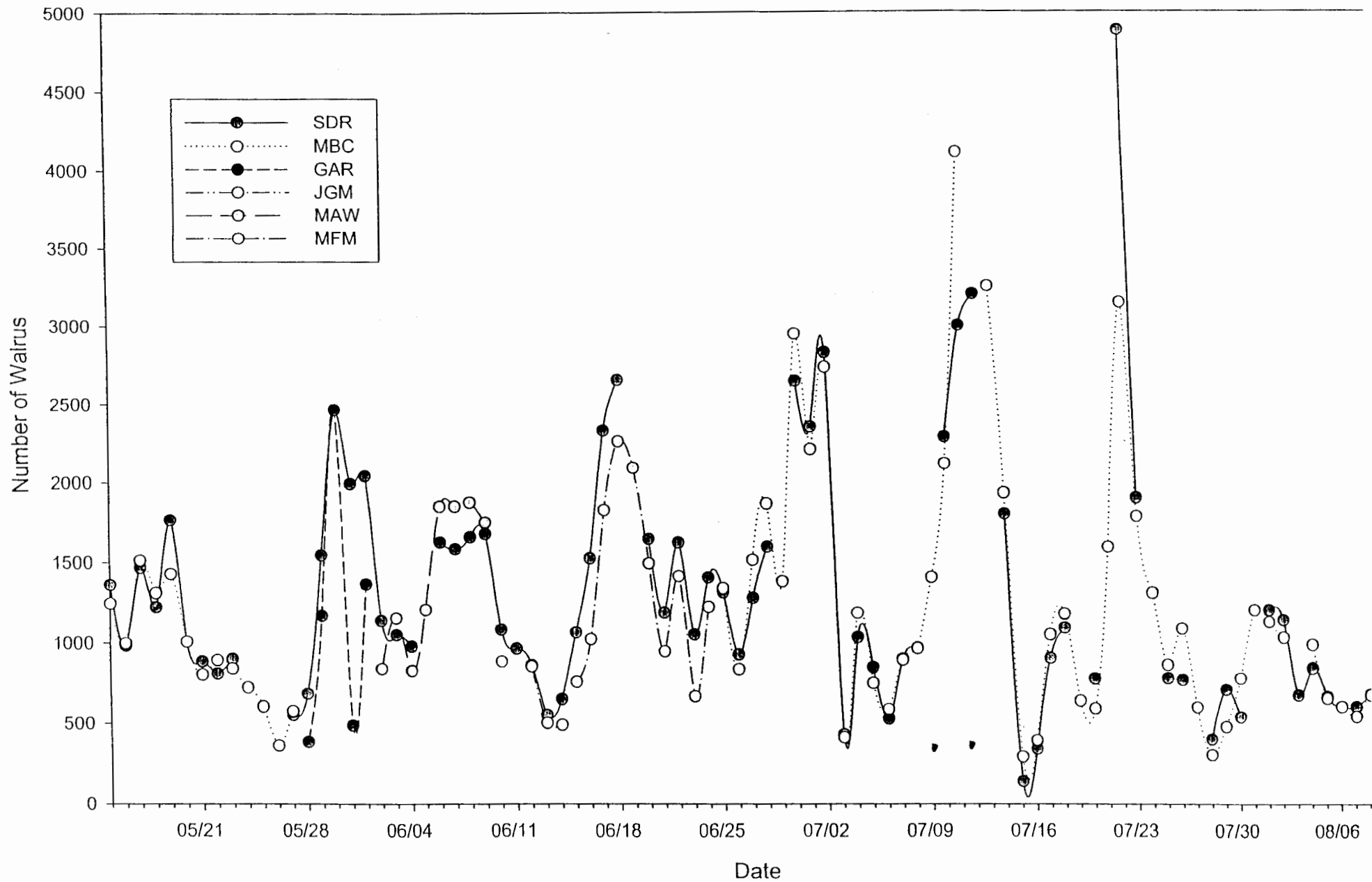


Figure 5. IKONOS image of Round Island taken via satellite on June 16, 2001. The average total island ground count for the day was 1524 walrus, while the estimate based on the satellite image was 1533 walrus (copyright 2001 Space Imaging.)



Appendix A

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 <i>yymmdd</i> 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 <i>mm/dd/yy</i> format
Time	Time in <i>hh:mm</i> (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 = Overcast 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

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

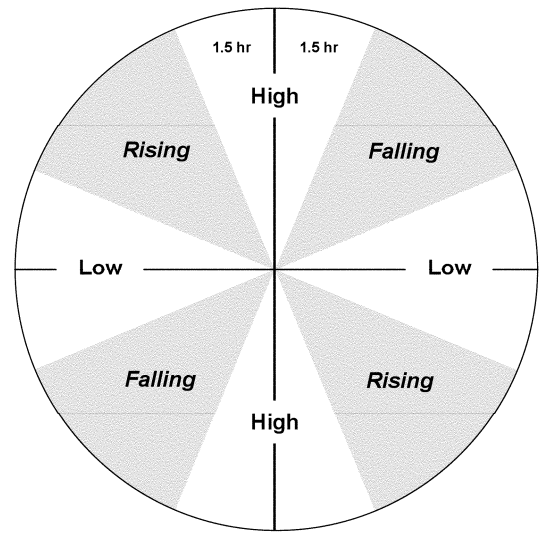
R = Rain

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 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 <i>hh:mm</i> (24 hr) format.
End Time	Time the count ends in <i>hh:mm</i> (24 hr) format.
Method	<p>The method used for counting the beach. Record appropriate code before counting.</p> <p>S = Scheduled ground count. A count scheduled on the basis of time of day. (The daily count described in the count methodology)</p> <p>I = Interval count. Regularly scheduled, repeated counts of beaches used to assess diurnal variability of walrus on beaches.</p> <p>C = Correlation count. Scheduled counts of West Main beach (Round Island) to determine relationship between use of Main beach and West Main.</p> <p>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).</p> <p>T = Tide ground count. A count scheduled to correspond with particular tide stage.</p> <p>A = Aerial count.</p> <p>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. <i>Enter the Roll and frame #'s into the comments section of the DAYLOG part of the data sheet.</i></p> <p>AP = Aerial photograph. Similar to ground photographs, record available information on the data sheet to indicate that aerial photographs were taken. <i>Enter the Roll and frame #'s into the comments section of the DAYLOG part of the data sheet.</i></p> <p>B = Boat count.</p>
Observer	Initials of person making the count.
Beaufort	Beaufort sea state (Table 2) of offshore waters, away from Sea Stateland 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	<p>An evaluation of the size of waves breaking on the beach. Record before counting.</p> <p>0 = Very calm. No wave splash at all.</p> <p>1 = Small waves, ranging to 1 ft (0.3 m).</p> <p>2 = Moderate waves, ranging from 1-3 ft (0.3- 1.0 m).</p> <p>3 = Rough waves > 3 ft (>1m).</p>
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.

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.

<i>Beaufort Number</i>	<i>Wind Speed</i>			<i>Effects Observed at Sea</i>
	<i>Knots</i>	<i>mph</i>	<i>km/hr</i>	
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 B. Daily walrus counts for east side beaches, west side beaches and totals for Round Island walrus haulout, located in Bristol Bay, Alaska, for 2001. All observers' counts have been averaged together to get daily counts.

Date	East Side Count	West Side Count	Total Island Count
05/15/2001	1,304		
05/16/2001	990		
05/17/2001	1,490		
05/18/2001	1,274		
05/19/2001	1,598		
05/20/2001	1,008		
05/21/2001	845		
05/22/2001	852		
05/23/2001	867		
05/24/2001	724		
05/25/2001	606		
05/26/2001	363		
05/27/2001	565		
05/28/2001	536		
05/29/2001	1,356		
05/30/2001	2,465		
05/31/2001	1,993		
06/01/2001	1,869		
06/02/2001	990		
06/03/2001	1,102		
06/04/2001	903	387	1,290
06/05/2001	1,208	621	1,829
06/06/2001	1,738	648	2,386
06/07/2001	1,718	965	2,683
06/08/2001	1,767	401	2,168

06/09/2001	1,716	798	2,514
06/10/2001	983	745	1,728
06/11/2001	964	518	1,482
06/12/2001	858	498	1,356
06/13/2001	527	209	736
06/14/2001	570	104	674
06/15/2001	912	6	918
06/16/2001	1,273	0	1,273
06/17/2001	2,078	309	2,387
06/18/2001	2,432	550	2,982
06/19/2001	2,090	835	2,925
06/20/2001	1,568	312	1,880
06/21/2001	1,066	86	1,152
06/22/2001	1,516	131	1,647
06/23/2001	857	42	899
06/24/2001	1,313	71	1,384
06/25/2001	1,326	82	1,408
06/26/2001	880	16	896
06/27/2001	1,399	14	1,413
06/28/2001	1,731	78	1,809
06/29/2001	1,381	622	2,003
06/30/2001	2,797	860	3,657
07/01/2001	2,281	636	2,917
07/02/2001	2,780	215	2,995
07/03/2001	418	81	499
07/04/2001	1,108	44	1,152
07/05/2001	799	0	799
07/06/2001	557	0	557
07/07/2001	896	0	896

07/08/2001	965	2	967
07/09/2001	1,404	0	1,404
07/10/2001	2,200	60	2,260
07/11/2001	3,552	566	4,118
07/12/2001	3,199	503	3,702
07/13/2001	3,251	419	3,670
07/14/2001	1,866	209	2,075
07/15/2001	226	52	278
07/16/2001	366	0	366
07/17/2001	977	0	977
07/18/2001	1,136	1	1,137
07/19/2001	640	174	814
07/20/2001	685	379	1,064
07/21/2001	1,595	828	2,423
07/22/2001	4,017	806	4,823
07/23/2001	1,845	319	2,164
07/24/2001	1,310	147	1,457
07/25/2001	823	7	830
07/26/2001	931	1	932
07/27/2001	600	1	601
07/28/2001	353	517	870
07/29/2001	594	502	1,096
07/30/2001	661	293	954
07/31/2001	1,204	224	1,428
08/01/2001	1,169	165	1,334
08/02/2001	1,080	451	1,531
08/03/2001	676	49	725
08/04/2001	917	2	919
08/05/2001	662	0	662

08/06/2001	606	0	606
08/07/2001	575	0	575
08/08/2001	680	1	681
08/09/2001	563		

Appendix C. Round Island access violations and walrus disturbances as recorded during staff's presence on the island from May 14 through August 10, 2001. Unless otherwise noted, visiting boats were only monitored during their approach to the island and not during departure. Walrus responses were grouped by behavior as follows, HR= head raises, OR= reorientation toward the water or the source of disturbance and DS= dispersal from the haulout. Locations on Round Island are given by beach codes as follows, WM = West Main Beach, MB = Main Beach, NBC = North Boat Cove, FR = Flat Rock, BC = Boat Cove, CG = Campground Beach, FB = First Beach, FP = First Prime, S = Second Beach, and SP = Second Prime. Walrus responses to boats or airplanes outside the restricted area were not recorded. (Rice, 2001)

<i>Date</i>	<i>Approximate start time</i>	<i>Disturbance type</i>	<i>Closest approach to island</i>	<i>Elevation</i>	<i>Walrus response</i>	<i>Comments</i>
5/14/01	1000	Staff transport via helicopter and boat.	Boat anchored about 100 m offshore, helicopter lands on island.	0 m	Unknown.	Staff arrive via helicopter and helicopter slings loads ashore from boat. Walrus not observed.
5/14/01	1600	Authorized visit by independent boat.	Anchored at about 100 m, beached skiff.	N/A	Unknown.	No walrus in BC area; walrus not observed elsewhere.
5/16/01	0807	Authorized visit by independent boat.	Anchored at about 200 m, beached skiff.	N/A	1 HR/OR twice then DS from FR.	Several walrus in water group together and orient toward boat, eventually disperse.
5/22/01	Unknown.	Possible unauthorized visit by independent boat.	3-6 km	N/A	Unknown.	Boat may have been within the restricted area but did not respond to radio hail. Walrus not observed.
5/25/01	Unknown.	Possible unauthorized visit by airplane.	Unknown.	Unknown.	No obvious response.	Airplane not seen but clearly audible during MB count.
5/28/01	Unknown.	Staff exchange via boat.	Anchored at about 200 m, beached skiff.	N/A	Unknown.	No walrus in BC area, but boat approached from east along beach so disturbance at FB or S possible.
5/29/01	Unknown	Authorized staff skiff operations.	Beached skiff 1.5 km from walrus.	N/A	Unknown.	No walrus in BC area; walrus not observed elsewhere. Testing outboard in BC area.
6/1/01	1740	Staff exchange via floatplane.	.5 km, skiff to and from shore.	0 m	1 HR/OR/DS from high on FR; 30-40 at S and 20-30 at FB HR/OR/DS.	Plane flying approximately 500' AGL along east side of island causes slow dispersal from FB and S- no injuries observed. Walrus in BC area restless, but minor disturbance.
6/1/01	1815	Authorized staff skiff operations.	Beached skiff about 100 m from walrus.	N/A	3 HR/OR and DS to waterline.	Beached skiff near small group of walrus on MB to retrieve ivory.
<i>Date</i>	<i>Approximate</i>	<i>Disturbance type</i>	<i>Closest approach to</i>	<i>Elevation</i>	<i>Walrus response</i>	<i>Comments</i>

	<i>start time</i>		<i>island</i>			
6/8/01	1803	Unknown-possibly caused by staff counting from WM OBP.	50 m.	50 m.	120 HR/OR/DS into water; most settle w/i 5 m of shore but ~10 DS completely.	No human stimuli observed other than staff standing at OBP.
6/10/01	0915	Authorized visit by charter operator.	100 m; beached skiff.	N/A	5 HR/OR/DS from FR; walrus at CG and BC not obviously disturbed.	Walrus left FR as boat begins to leave the island. High water so injury unlikely.
6/15/01	1020	Authorized visit by charter operator.	100 m; beached skiff.	N/A	Unknown.	No walrus in BC area; walrus not observed elsewhere.
6/16/01	1030	Authorized staff skiff operations.	Beached skiff at BC.	N/A	3 HR and 1 DS from FR as we left BC; no other obvious disturbance.	Took skiff around island to count walrus.
6/20/01	1055	Authorized visit by charter operator.	100 m; beached skiff.	N/A	≥1 HR at FR and one in water DS; no obvious disturbance.	
6/23/01	1830	Authorized staff skiff operations.	Passed w/i 100-150 m of walrus at FR, tip of MB and WM; beached skiff at BC.	N/A	10-20 HR at MB; no other obvious disturbance.	Took skiff to WM to count walrus.
6/25/01	1045	Authorized visit by charter operator.	100 m; beached skiff.	N/A	1 HR/OR/DS from BC before boat arrives in response to campers on beach; walrus not observed after boat arrives.	Rough conditions preclude monitoring walrus behavior after boat arrives.
6/27/01	Unknown.	Authorized visit by charter operator.	150 m; beached skiff.	N/A	No obvious disturbance of walrus on land but walrus in water group together and then DS.	Staff not present when boat arrived; disturbance reported by visitors. Boat departed several hours later and departure was not monitored.
6/29/01	1750	Unknown-possible rockfall.	N/A	N/A	~150 HR/OR and 10-15 DS into water from MB4.	Approximately 350-400 walrus on MB4; approximately 500 walrus on other parts of MB not obviously disturbed.
6/29/01	1803	Unknown.	N/A	N/A	~50 HR; 10 of these OR and DS to waterline and 30 more OR/DS completely.	
<i>Date</i>	<i>Approximate start time</i>	<i>Disturbance type</i>	<i>Closest approach to island</i>	<i>Elevation</i>	<i>Walrus response</i>	<i>Comments</i>

6/30/01	0900	Authorized visit by charter operator.	150 m; beached skiff.	N/A	~20 HR and 3-4 HR/OR/DS from FR. Group of ~20 walrus swim to w/i 60 m of boat.	Boat departed several hours later and departure was not monitored.
6/30/01	1000	Authorized visit by charter operator.	100 m; beached skiff.	N/A	Walrus on FR appear restless and 40+ in water group together within 30 m of boat. Walrus in water begin to DS approximately 35 min later as engines start.	
6/30/01	1530	Staff counting from FB OBP.	30 m.	30 m.	~10 in nearshore water DS 5-10 m further into water.	Walrus DS as staff stand after completing count.
6/30/01	1902	Staff counting from WM OBP.	60 m.	60 m.	~20 HR and 7-10 OR/DS from MB4.	
7/1/01	0830	Authorized visit by charter operator.	200 m; beached skiff.	N/A	30 HR/OR begin to DS; ~24 DS into water.	Boat sits in BC for ~75 min before skiff to shore; charter operator did not observe any disturbance during this period. Staff monitor walrus as skiff to shore. Walrus scattered around BC so alternate landing area used.
7/1/01	1820	Departure of above authorized charter operator.	200 m; skiff to boat from shore.	N/A	~10 HR, 6 OR, and 2 DS	
7/6/01	Unknown.	Authorized visit by charter operator.	150 m; skiff to shore.	N/A	Unknown.	No walrus in BC area; walrus not observed elsewhere. Charter operator decided too rough to bring visitors ashore so left island within approximately 1/2 hour.
7/8/01	1510	Authorized staff skiff operations.	Skiff beached within about 100 m of 2 walrus on WM.	N/A	2 HR/OR/DS at WM.	No walrus in BC area and walrus on MB not obviously disturbed.
7/10/01	0830	Authorized visit by charter operator.	150 m; skiff beached.	N/A	1 HR/OR/DS and approximately 50 walrus in water investigate the boat.	Staff not present when boat arrives; disturbance reported by charter operator.
<i>Date</i>	<i>Approximate start time</i>	<i>Disturbance type</i>	<i>Closest approach to island</i>	<i>Elevation</i>	<i>Walrus response</i>	<i>Comments</i>

7/10/01	1634	Departure of authorized charter operator.	150 m; skiff to boat from shore.	N/A	2-3 HR.	Staff left BC area before boat left BC but walrus appeared relatively undisturbed.
7/13/01	1600	Authorized visit by charter operator.	150 m; beached skiff.	N/A	1 HR	
7/13/01	1808	Departure of above authorized charter operator.	150 m; skiff to boat from shore.	N/A	>5 HR and 1 OR.	
7/15/01	1550	Unknown-possibly caused by staff counting walrus.	N/A	N/A	"Lots" of HR.	
7/16/01	Unknown.	Authorized visit by charter operator.	100 m; beached skiff.	N/A	Unknown.	No walrus in BC area; walrus not observed elsewhere.
7/17/01	1100	Authorized visit by charter operator.	150 m; beached skiff.	N/A	Unknown.	No walrus in BC area; walrus not observed elsewhere.
7/17/01	1545	Unknown.	N/A	N/A	Several hundred walrus HR/OR/DS from MB.	Visitors report disturbance but no obvious cause.
7/17/01	1630	Authorized staff skiff operations.	200 m; beached skiff.	N/A	Unknown.	No walrus in BC area and no obvious disturbance at MB; walrus not observed elsewhere. Took skiff to WM to collect ivory.
7/17/01	2030	Departure of above authorized charter operator.	150 m; skiff to boat from shore.	N/A	Unknown.	No walrus in BC area; walrus not observed elsewhere.
7/20/01	0930	Authorized visit by independent boat.	100-200 m; beached skiff.	N/A	Multiple HR, but walrus seemed relatively undisturbed.	Crew make three skiff trips between boat and shore; a few HR each time skiff in/out.
7/21/01	0955	Authorized visit by charter operator.	100 m; beached skiff.	N/A	>20 HR.	Walrus enters rear of BC during disturbance but swims off as skiff makes second trip to boat.
<i>Date</i>	<i>Approximate start time</i>	<i>Disturbance type</i>	<i>Closest approach to island</i>	<i>Elevation</i>	<i>Walrus response</i>	<i>Comments</i>
7/21/01	1800	Unauthorized boat traffic.	200 m.	N/A	No obvious disturbance at MB and no walrus in	One of above boats leaves BC and approaches to within 200m of walrus on

					BC area.	MB. Captain later indicated that he had misunderstood the rules; no charges filed because no disturbance and excellent behavior while on island supported claim.
7/23/01	0830	Authorized visit by charter operator.	150 m; beached skiff.	N/A	>40 HR and ~23 OR/DS.	Walrus appeared very restless when boat still more than one mile offshore and 20 already in water. Group of about 40 walrus in water investigates boat from about 50 m.
7/24/01	1200	Authorized staff skiff operations.	75 m; beached skiff.	N/A	3 HR and 1 OR/DS.	Attempted to take skiff around island but too rough so turned back at SP.
7/25/01	1006	Authorized visit by charter operator.	100 m; beached skiff.	N/A	No obvious disturbance at BC; walrus not observed elsewhere.	
7/25/01	1917	Authorized staff skiff operations.	100 m; beached skiff.	N/A	Multiple HR by 3 walrus on FR and some on MB HR but no obvious disturbance there or other beaches. 1 HR/OR/DS from BC as skiff returns.	Sea lions may have been disturbed- seemed restless.
7/25/01	2220	Authorized visit by charter operator.	150 m; beached skiff.	N/A	No obvious disturbance at BC; walrus not observed elsewhere.	
7/26/01	0900	Visitors at S OBP.	Unknown.	N/A	Possibly up to ~68 HR/OR/DS.	Walrus appeared restless while campers standing at OBP- staff asked campers to sit. Other campers later overheard describing dispersal of all S walrus in response to above campers.
7/26/01	1449	Authorized visit by independent boat.	200 m; beach kayak.	N/A	3 HR.	
7/26/01	1750	Departure of above authorized independent boat.	200 m; kayak returns to boat.	N/A	~4 HR.	
7/27/01	0930	Authorized visit by charter operator.	200 m; beached skiff.	N/A	>30 HR and 1 probable HR/OR/DS.	Walrus in BC landing area so skiff beached 50m north of usual area. Departure not observed.
<i>Date</i>	<i>Approximate start time</i>	<i>Disturbance type</i>	<i>Closest approach to island</i>	<i>Elevation</i>	<i>Walrus response</i>	<i>Comments</i>
7/27/01	Unknown	Authorized visit	Unknown.	N/A	No walrus in BC area;	

		by independent boats.			walrus not observed elsewhere.	
7/29/01	Unknown	Possible visitors off trail at FB.	Unknown.	N/A	Possibly ~120 HR/OR/DS.	Walrus numbers decline rapidly over 4-hour period and grass appeared to have been trampled off trail.
7/30/01	1020	Authorized visit by charter operator.	100 m; beached skiff.	N/A	Up to 10 HR.	Boat arrives at BC before staff so additional disturbance possible.
7/30/01	1300	Authorized visit by charter operator.	200 m; beached skiff.	N/A	6 HR and 2 OR/DS.	Departure not observed but see 1803 observation.
7/30/01	1700	Unknown	N/A	N/A	> 50 HR/OR/DS.	Walrus leaving WM rapidly during 1/2 hour count but not panicked and no obvious disturbance.
7/30/01	1803	Unknown.	N/A	N/A	>200 HR/OR/DS.	Walrus begin panicked dispersal at same time 1000 seabirds flush from cliff. No obvious cause, but departing charter boat faintly audible 10 minutes later at approximately 3 miles offshore.
7/31/01	1230	Authorized visit by charter operator.	150 m; beached skiff.	N/A	No walrus in BC area; walrus not observed elsewhere.	
8/1/01	Unknown.	Authorized visit by charter operator.	150 m; beached skiff.	N/A	Unknown.	Staff did not observe disturbance.
8/1/01	1550	Departure of above authorized charter operator.	150 m; returned skiff to boat.	N/A	>3HR.	Staff left BC before boat so additional disturbance possible.
8/1/01	1808	Unauthorized boat traffic.	< 10- 50 m.	N/A	~1000 HR/OR/DS.	Boat passes along all beaches between CG and MB within 200 m of shore (may have circled entire island before staff observed). Approached to within 10-50 m of walrus on MB and then sat offshore for more than 1/2 hour until staff intercepted using skiff. Additional disturbance likely at beaches east of cabin.
<i>Date</i>	<i>Approximate start time</i>	<i>Disturbance type</i>	<i>Closest approach to island</i>	<i>Elevation</i>	<i>Walrus response</i>	<i>Comments</i>
8/2/01	1530	Authorized visit	150 m; beached skiff.	N/A	Walrus at FB appeared	

		by charter operator.			slightly restless but not obviously disturbed; walrus not observed elsewhere.	
8/2/01	2008	Departure of above authorized charter operator.	150 m; skiff returned to boat.	N/A	~6 HR.	
8/3/01	1030	Authorized visit by charter operator.	150 m; beached skiff.	N/A	No walrus in BC area; walrus not observed elsewhere.	
8/3/01	1630	Departure of above authorized charter operator.	150 m; beached skiff.	N/A	No walrus in BC area; walrus not observed elsewhere.	
8/3/01	Unknown	Authorized staff skiff operations.	300 m; beached skiff.	N/A	~100 HR/OR and begin to DS; ~20 DS into water.	Took skiff to MB to collect ivory. Beached skiff ~300 m from walrus and walked quietly to 150-200 m from walrus- turned back when walrus began to DS.
8/5/01	0800	Authorized staff skiff operations.	100 m; beached skiff.	N/A	2 HR and possibly OR/DS.	Took skiff to WM to collect ivory. Walrus HR as skiff leaves and gone by time skiff returns.
8/5/01	0900	Authorized visit by charter operator.	150 m; beached skiff.	N/A	No walrus in BC area; walrus not observed elsewhere.	
8/5/01	1330	Departure of above authorized visit by charter operator.	150 m; beached skiff.	N/A	No walrus in BC area; walrus not observed elsewhere.	
8/5/01	2140	Authorized visit by charter operator.	150 m; beached skiff.	N/A	No walrus in BC area; walrus not observed elsewhere.	
<i>Date</i>	<i>Approximate start time</i>	<i>Disturbance type</i>	<i>Closest approach to island</i>	<i>Elevation</i>	<i>Walrus response</i>	<i>Comments</i>
8/6/01	1000	Authorized visit by charter operator.	150 m.	N/A	No walrus in BC area; walrus not observed elsewhere.	Charter operator decided too rough to bring visitors ashore so left island within approximately 1/2 hour.
8/7/01	0830	Authorized visit by charter operator.	150 m; beached skiff.	N/A	No walrus in BC area; walrus not observed elsewhere.	

8/7/01	1700	Departure of above authorized charter operator.	150 m; skiff returned to boat.	N/A	No walrus in BC area; walrus not observed elsewhere.	
8/7/01	1230	Authorized staff skiff operations.	<200 m; beached skiff.	N/A	No walrus in BC area; walrus not obviously disturbed elsewhere.	Took skiff around island.
8/8/01	1030	Authorized visit by charter operator.	150 m; beached skiff.	N/A	No walrus in BC area; walrus not observed elsewhere.	
8/10/01	0040	Unauthorized visit by independent boat.	< 3 miles.	N/A	Unknown.	Boat appeared to be less than 3 miles away (only running lights visible). Walrus not observed.
8/10/01	~1030	Authorized visit by charter operator.	<100 m.	N/A	Multiple HR by 8-10 walrus; all OR/DS.	Boat beached at BC and staff load field gear directly onto boat. All walrus on FR DS.