Round Island Field Report

May 16 - August 12, 1999

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Summary

Round Island is one of four terrestrial haulouts for walrus (*Odobenus rosmarus*) located in Bristol Bay, Alaska. It is the only one of the four located in the Walrus Islands State Game Sanctuary and has traditionally supported the largest number of walrus. The other haulouts are Cape Newenham and Cape Pierce, both located within Togiak National Wildlife Refuge, and Cape Seniavin on the Alaskan Peninsula. Walrus at the Round Island haul out were counted daily from May 17 through August 10, 1999. Counts for all East side beaches combined ranged from 0 to a high of 4186 on June 8. Counts on the West side ranged from 0 to a high of 764 on June 25. Seabird plots were monitored for both population size and productivity. Common murres (*Uria aalge*) and black-legged kittiwakes (*Rissa tridactyla*) experienced wide-spread nesting failure, while pelagic cormorants (*Phalacrocorax pelagicus*) fledged an average of one chick per nest. Ravens (*Corvus corax*) and foxes (*Vulpes vulpes*) commonly preyed upon adult murres and kittiwakes, and on chicks and eggs of all three monitored seabird species. An average of 45 Steller sea lions (*Eumetopias jubatas*) used the East Cape haul out throughout the summer.

Introduction

The summer of 1999 marked the seventh 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 part of the Walrus Islands State Game Sanctuary and is the largest terrestrial haulout used by walrus 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 on the Alaska Peninsula northeast of Port Moller (Figure 1). Cape Pierce and Cape Newenham are both monitored by TNWR staff. In 1998 and 1999, Cape Seniavin was monitored by MMM staff. This report provides a basic synopsis of work done on Round Island during this summer field season.

Methods

Weather

The following weather information was collected daily near the cabin at 1400 hours: wind speed and direction, maximum and minimum temperature for the preceding 24 hours, amount of precipitation over the preceding 24 hours, current weather conditions, and cloud cover. In addition, the barometer was recorded daily at 0800 and at 2000.

Walrus

Walrus haul out on nine beaches on the East side of Round Island and one beach on the West side of Round Island (Figure 2). Due to its inaccessibility, and to weather and time constraints, the West main beach (WM) was counted irregularly at the beginning and end of the season. When the trail was too slippery to be safely traveled due to rain and snow, WM was counted by boat if possible. During June and July, when trails were largely clear of snow and running water, West main beach was counted at least every three days. From June 6 to June 20, West main beach was counted daily. All accessible East side beaches were counted daily just after weather information was recorded at 1400 hours, from May 17 through August 10. In addition to the 1400 count, all East side beaches were counted beginning at 0900 and again at 1900 every third day. These data will be used to assess diurnal and tidal variation in haulout use. Each observer counted independently using 10 x 42 or 7 x 32 binoculars. If more than ten walrus were present on a beach, the beach was counted three times by each observer. Observers did not discuss or compare numbers during these three counts. After three counts, observers would compare numbers and try 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. The 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 both observers were averaged. Only the counts conducted at 1400 hours were used to determine seasonal highs or daily averages.

Every effort was made to have both observers count together at the scheduled times. However, this wasn't always possible due to the needs of visitors on the island and to the timing of boat arrivals and departures. In order to accomplish as much as possible on a daily basis, two modifications to the protocol were made. It was sometimes necessary to start a count up to half an hour later so that both observers could count together. On other occasions, it simply wasn't possible to have both observers count all beaches. In these instances, the primary observer counted all of the beaches at the correct time, while the second observer either did a partial count or counted the beaches in a different order. The nine beaches along the East side were counted in the following order by the primary observer 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).

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. Type of count was recorded as: S- scheduled count which occurred at 1400, B- boat count, I- an interval count which occurred in the morning or evening, C- any land based count of WM, or O- any other count that was done opportunistically. For beach condition, we used a scale of 0-3 based on the size of waves on the beach, with 0 being calm and 3 being greater than three feet. Beach availability and beach used were both recorded as a percentage from 0 to 125% based on the amount of beach visible at mean low tide recorded as 100%. Visibility was a subjective measure of whether any walrus were hidden by obstacles such as rocks or fog, 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 that the count was and was recorded as excellent, good, fair or poor. For a complete copy of the count protocols, see Appendix A.

Every effort was made 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, 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 1993).

Seabird population and productivity

Seabird population and productivity data were collected for common murre (*Uria aalge,*) black-legged kittiwakes (*Rissa tridactyla*) and pelagic cormorants (*Phalacrocorax pelagicus*). Five 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. Photos were used to identify the plots and painted stakes were pounded into the ground to mark the observation points. Methods were consistent among years. The number of common murres, black-legged kittiwakes and their nests, pelagic cormorants and their nests on each plot were counted twice on 14 separate days between May 31 and July 17, 1999. A total of 25 nests on each of two plots of common murre and kittiwakes were monitored until we left on August 12. A total of 40 cormorant nests on three plots were also followed to determine reproductive success.

Other projects

A small Steller sea lion (*Eumetopias jubatas*) haulout located at East Cape was monitored every six days using the same methods as the walrus counts. Beach-found ivory was collected from the beaches whenever possible without disturbing walrus. All ivory will be sold by ADF&G and the precedes donated to the Ivory Fund which will help finance future walrus research. Steve Rice began a small pilot study on raven (*Corvus corax*) behavior and patterns of predation on cliff-nesting seabirds in 1999 which will continue in 2000.

Results and discussion

Technicians Mary Cody (USFWS) and Steve Rice (ADF&G) arrived on Round Island on May 16 and remained until August 12, 1999. We were initially scheduled to arrive on the island a week earlier, but both our arrival and our departure were delayed due to weather.

We counted all East side walrus haulout beaches at 1400 hours on 86 consecutive days from May 17 through August 10. All counts by both observers were averaged to determine the number of walrus using the haulout on a daily basis. Walrus counts ranged from a high of 4186 walrus (for all East side beaches combined) on July 8 to a low of 0 walrus on August 4. The July 8 count was substantially higher than the 1998 high count of 1746 walrus for the East side only (Stroka 1998). On July 8, an additional 620 walrus were counted on the West side for an island high of 4806 walrus (Figure 3). West main counts ranged from a low of 0 on 5 days to a high of 765 on June 25. The mean count on West main from May 20 to August 6 was 311. Haulout use appeared to be highest during low tides with fair weather and calm seas and lowest during high tides in periods of storms with onshore winds and high surf. The daily mean of all beaches except West main was 1332 walrus. In May, counts ranged from 0 to 748 with a mean of 279. In June, counts ranged from 92 to 2540 with a mean of 1333. In July, counts ranged from 276 to 4186 with a mean of 1807. In August, counts ranged from 0 to 2972 with a mean of 1438. Walrus numbers remained high when we ended the season on August 10 (1141 walrus). East side counts are summarized in Appendix B. West side counts are summarized in Appendix C.

Walrus numbers varied greatly throughout the season, but were highest during periods of fair weather from mid-June to late July. For purposes of this report, the mean of all counts conducted at 1400 was used to determine a daily walrus count (Figure 4). All haulout beaches were counted at a variety of times and tides to facilitate an evaluation of the effects of tidal variation and diurnal patterns of walrus use of the haulout. These data will be pooled with data from the other haulouts and analyzed together. In all, interval counts took place on 22 days between May 21 and August 5. On average, counts were slightly higher during evening counts than at mid-day, and lowest during morning counts (Table 1). Observer variation data from all haulouts will also be pooled and analyzed together. On Round Island, observer variation appeared to be small, as would be expected with two experienced counters. Also as expected, the least amount of variation between observers occurred when walrus numbers were small. Figure 5 graphs each observer's mean count for the day, but without accounting for any differences in the time each beach was counted. On less than six occasions some of the smaller beaches were counted as much as half an hour apart. Since the number of walrus on the beach doesn't change dramatically in such a short time, I don't think that this difference is significant.

Instances of walrus disturbance were recorded on 29 occasions. Causes of disturbance were identified as aircraft on seven occasions, humans at overlooks or onshore on three occasions, and skiff /boat activity on nine occasions (Table 2). On ten occasions the source of disturbance could not be identified. See Rice (1999) for further information on access violations and walrus disturbance. In late May and again in early July, we circumnavigated the island by boat to check for ivory and walrus on other beaches. We did not see any walrus or sea lions using any beach areas other than those counted.

In general, seabirds began nesting later than is usual in the Bristol Bay region (Ann Hawthorn, TNWR, pers. comm). and both common murres and black-legged kittiwakes experienced almost complete nesting failure. In contrast, pelagic cormorants had a successful year, fledging approximately one chick per nest (Table 3). Cormorant chicks which were nearly adult-sized and fully feathered on August 10 are assumed to have fledged. Murre chicks which disappear after more than 15 days are commonly assumed to have fledged (Ann Harding and John Piatt, pers. comm.) In our plots, two murre chicks which survived to 13 and 15 days respectively were both observed to be preyed upon by ravens. Three other chicks survived to 18, 20, and 22 days before disappearing and we assume that these fledged.

Only counts that were done during peak laying time were used to determine population means. We saw the first common murre egg on a plot on June 7. Very low numbers from June 14 to June 19 probably reflect the time period when most murres were spending several days at sea before coming to the colony to lay their eggs (Ann Harding and John Piatt, pers. comm). Seven counts done from June 21 to July 17 were used to determine a mean for murres on each plot (Table 4). Kittiwake colony attendance was consistent from June 8 until July 12, when it began to drop off dramatically (half as many kittiwakes counted at each plot). Ten counts between June 8 and June 29 were used to determine population means for kittiwakes (Table 4). Cormorant breeding was largely asynchronous and colony attendance peaked slightly in late June, but was

fairly consistent. From May 31 through July 17, cormorant counts ranged from 46 to 71 at the FB colony. Ten counts from May 31 to June 9 were used to determine the mean for cormorant plots (Table 4).

All five plots were 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 were located near the main beach overlook area and may be negatively 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 250,000 seabirds nest annually on Round Island (Haggblom 1994). However, most are located along cliffs that are not observable from land. Due to frequent high seas and poor weather, it isn't possible to regularly monitor any sites by boat. In future, we would like to add murre and kittiwake plots that are less subject to human disturbance and closer to the center of the colony, but have yet to locate plot sites that would be appropriate. It is possible that the high level of predation that occurred on both murre and kittiwake productivity plots was influenced by being at the edge of the colony. Adult birds may also have left their nests more frequently to escape the close proximity of humans.

The last seabird census of Round Island was in 1994. We asked volunteers to come out for a week in June to help us with another census. Unfortunately, bad weather conditions kept us from being able to census the island. We hope to make another attempt in 2000. Parakeet auklets, pigeon guillemots, horned and tufted puffins also nest on Round Island, but we made no attempt to estimate their numbers or to follow their breeding phenology. In general, their nest sites were inaccessible either due to rotten cliff edges that made them too dangerous to approach safely without ropes and climbing gear or they were too near resting walrus to be approached without causing disturbance. Crested and least auklets were also seen on the island. On several occasions early in the season, crested auklets were observed investigating crevices, resting on rocks and calling. Based upon their behavior, a few crested auklets may be nesting among the parakeet auklets (Fiona Hunter, pers. comm). We took advantage of a visiting seabird biologist with many years experience with crested auklets to search for nesting auklets, but were unable to locate any.

From May 17 to August 2 an average of 45 Steller sea lions were counted at the East Cape haulout (Table 5). Monthly averages were 87 in May, 50 in June, and 25 in July. The haulout was only counted once in August. On August 2nd, 14 sea lions were at the haul out. Most counts were done late in the evening. Sea lions may also have hauled out below cliffs near East Cape where they would not have been visible from shore. We could some times hear them barking below us, but could not find a safe vantage point without disturbing nesting puffins.

Two fox dens were active on Round Island this season. The den at East Cape produced three pups. A second den on the hill side behind the cabin produced 2-3 pups. Bald eagles and an unidentified owl were observed irregularly on the island. At least four pair of ravens had active nests this year and fledged three to four chicks each. Grey whales were observed almost daily throughout May and in early June. One male grey whale carcass, approximately 35 feet long

floated into boat cove where it remained when we left. Another whale was observed floating past Round Island but was too badly decomposed to identify the sex or estimate length. In all, 22 Grey whales were reported dead in the Bristol Bay area, apparently as part of a die off that was occurring all along the coast from Mexico to Alaska (Rice 1999).

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 each beach, since it varies considerably throughout a single count and onshore winds do seem to affect whether walrus are using a particular beach.

2. If we continue doing multiple counts at each beach in 2000, I would recommend that each observer carry three clickers and do three completely independent counts before looking at the clickers. I would also recommend that we decide what level of variation we are willing to accept, both among observers three counts or between observers. If variation is higher than say, a 10-20% difference, then I think it would be worth spending some time trying todetermine the cause of the difference using a telescope or digital camera.

3. Rather than doing a water count once at each beach, I would suggest doing a water count with each land count or not at all. Although water counts are not very accurate because animals in the water are not very visible, when done in conjunction with each land count, the water counts document whether a lot of walrus are entering or leaving the beach between counts. This documents observer variation between counts that is due to walrus movements and not due to mistakes on the part of the observer. I would also recomend counting a little further out, since a lot of walrus seem to hang out just off shore and go back and forth between the surf and 20-30 meters out before finally hauling out or swimming away.

4. Buy a digital camera and an inexpensive color laser printer to field check the accuracy of walrus counts. A digital camera could be used in the field to photograph beaches. We could then print the photos, count the walrus in the photos and check our numbers for immediate feedback on the accuracy of our counts. Based on photos that Matt Kerchoff took while on Round Island this summer, the resolution was excellent and this would work very well. Several visitors to the island this summer had cameras that would automatically match the edges of photos, so that you could take as many photos as needed to cover all of a beach, and then print them as one print of the entire beach. This would allow count quality to be based on comparison with photos rather than subjective feelings. This would be especially useful for FB and S beaches. When numbers are high, both beaches need to be counted from two separate vantage points and its difficult not to either miss some or overcount at the area where the views overlap. The camera and printer would also be useful for seabird census work.

5. Have a computer and printer on Round Island to facilitate data entry while in the field. This would save a lot of time in the fall.

6. Try to take advantage of the many experienced marine mammal experts at ADF&G and MMM and have Steve's mid-summer replacement be a marine mammal person. Mid-summer seems to be when the visitor program is busiest, walrus numbers are high, and the seabird

productivity monitoring takes the most time. It would be good to have a replacement who is already familiar with haulout count protocals and issues of disturbance in order to minimize training time.

7. 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 type group) 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.

8. 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 seems to vary considerably in Bristol Bay due to river flow, wind speed, wind direction and duration and the tide charts don't seem to be very accurate.

9. I'd also recommend that some annual progress occur on the statistical analysis of the multiple count/ multiple observer data. A benefit of this would be to better gauge whether the protocals should be amended

Acknowledgments

Like any remote field project with a long season, the Round Island project relies on a lot of people. Sue Lapkass (USFWS) and John Westland (ADF&G) designed the project, found the funding 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 Refuge from Dillingham in spite of a daunting list of other duties. Don and Kathy Winkleman (Don's Round Island Charters) brought us groceries, mail and visitors every five days and provided the occasional salmon barbecue. Terry Johnson (Johnson Maritime/Walrus Island Expeditions) also brought us visitors and treats. Matt and Trevor Kirchhoff (ADF&G) happily replaced Steve for a ten day stint mid-summer, helped with the counts, the visitor program, and built us a new outhouse! Andy Aderman (TNWR), Melissa Maclaran (TNWR), Ann Hawthorne (TNWR), Rob MacDonald (TNWR), and Lisa Haggblom all provided seabird information and moral support while we were in the field. Greg Hamm (Alaska State Troopers), and Jim Woolington quickly responded to an illegal disturbance that occurred at the haulout. Bev Short (BRD) and Joel Schmutz (BRD) took time out from the emperor goose project on the Yukon-Kuskokwim Delta to help us with a seabird census. Jonathan Snyder (USFWS), Derek Wilson (USFWS), and Chris Bailey (USFWS), helped enter, edit, and prepare 86 days of walrus data. Jeb Benson (USFWS), Ann Harding (BRD), Mike Schultz (BRD) and John Piatt (BRD) answered seabird questions back in the office. Steve Rice was a terrific field partner and a mean euchre player.

References

Haggblom, L. M. 1994. Trip report--research vessel Rex M., June 1994. Unpubl. Rept. Togiak National Wildlife Refuge, Dillingham, AK. 13 pp.

Hessing, P. And Sheffield. 1989. Round Island field report 1989. Unpubl. Rept. Walrus Islands State Game Sanctuary, ADF&G Dillingham, AK. 29pp.

Kruse, S. 1997. Behavioral changes of Pacific walrus (*odobenus rosmarus*) in response to human activities. Technical Rept. MMM 97-4. Marine Mammals Management, USFWS, Anchorage, AK. 16pp.

Rice, S. 1999. Round Island field report 1999. Unpubl. Rept. Walrus Islands State Game Sanctuary, ADF&G Anchorage, AK. 17pp.

Stroka, S. 1998. Round Island field report, May-August, 1998. Unpubl. Rept. Marine Mammals Management, USFWS, Anchorage, AK. 42pp.

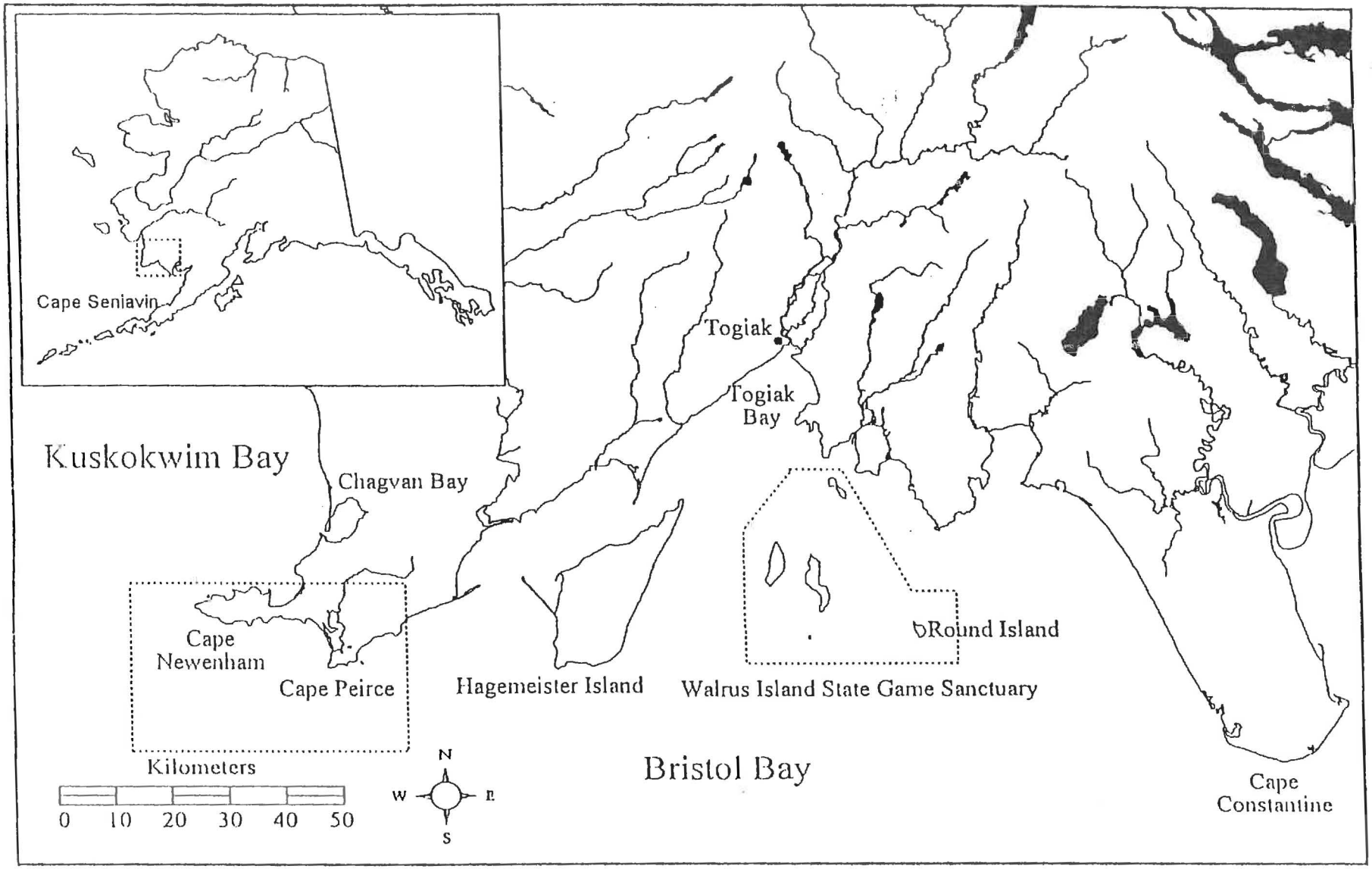


Figure 1. Marine Mammal Study Areas, Cape Peirce, Cape Newenham, Cape Seniavin and Round Island, Alaska.

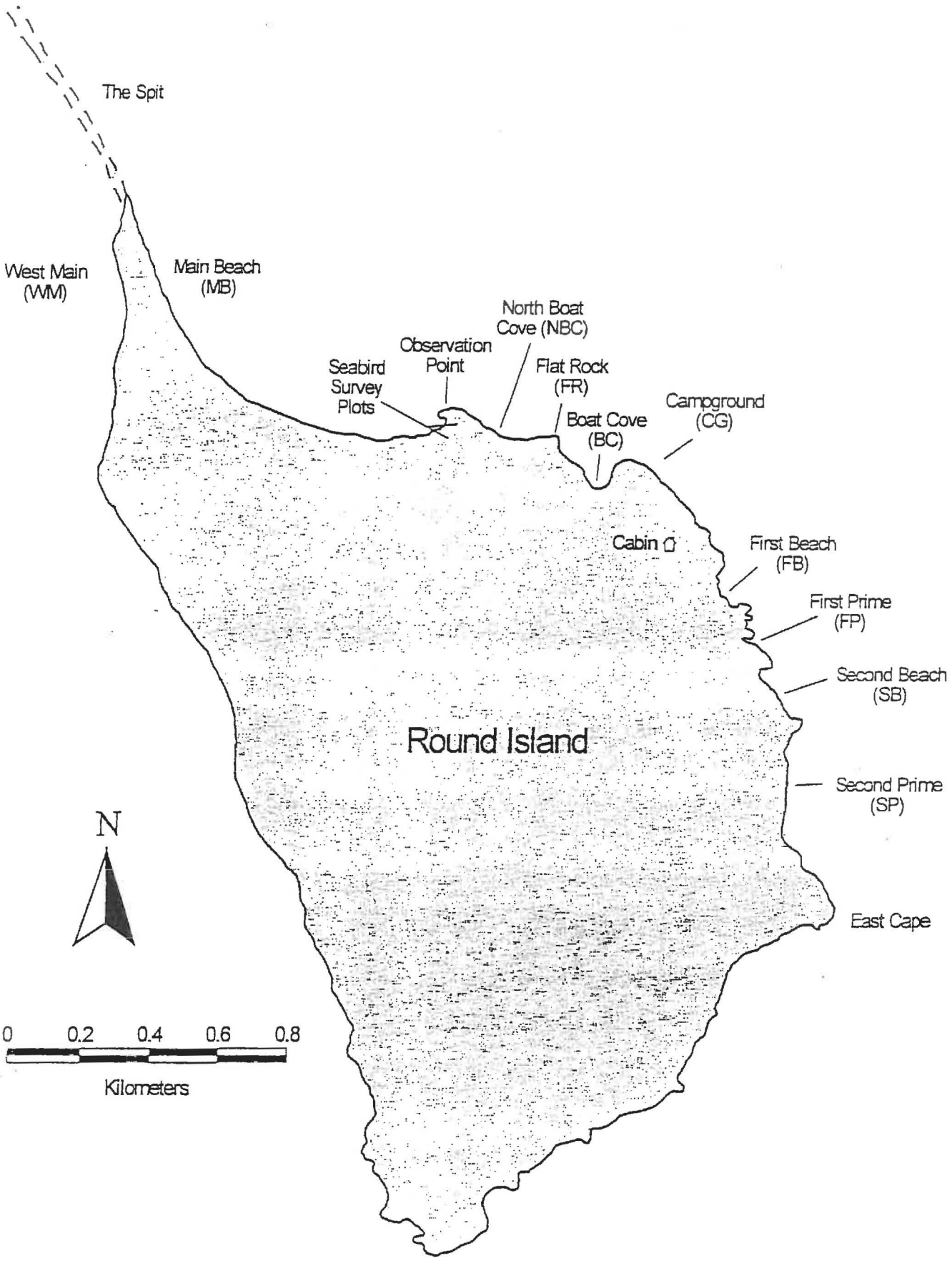
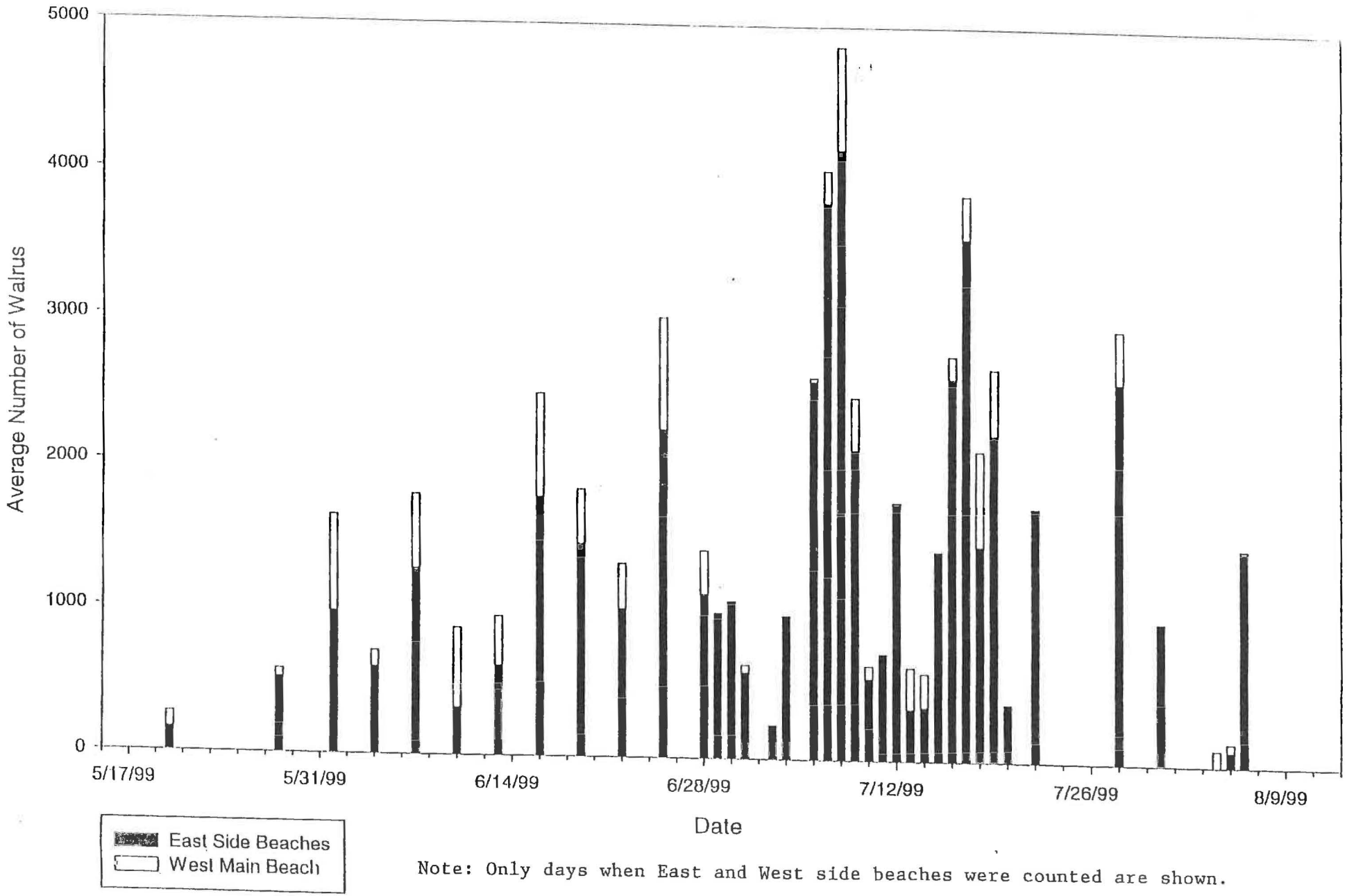


Figure 2. Area map of Round Island including landmarks and walrus haulout beaches.

Figure 3. Daily Average Counts of Walrus on East & West Side Beaches Combined.



Note: Only days when East and West side beaches were counted are shown.

Figure 4. Round Island 1999 Average Scheduled Walrus Counts

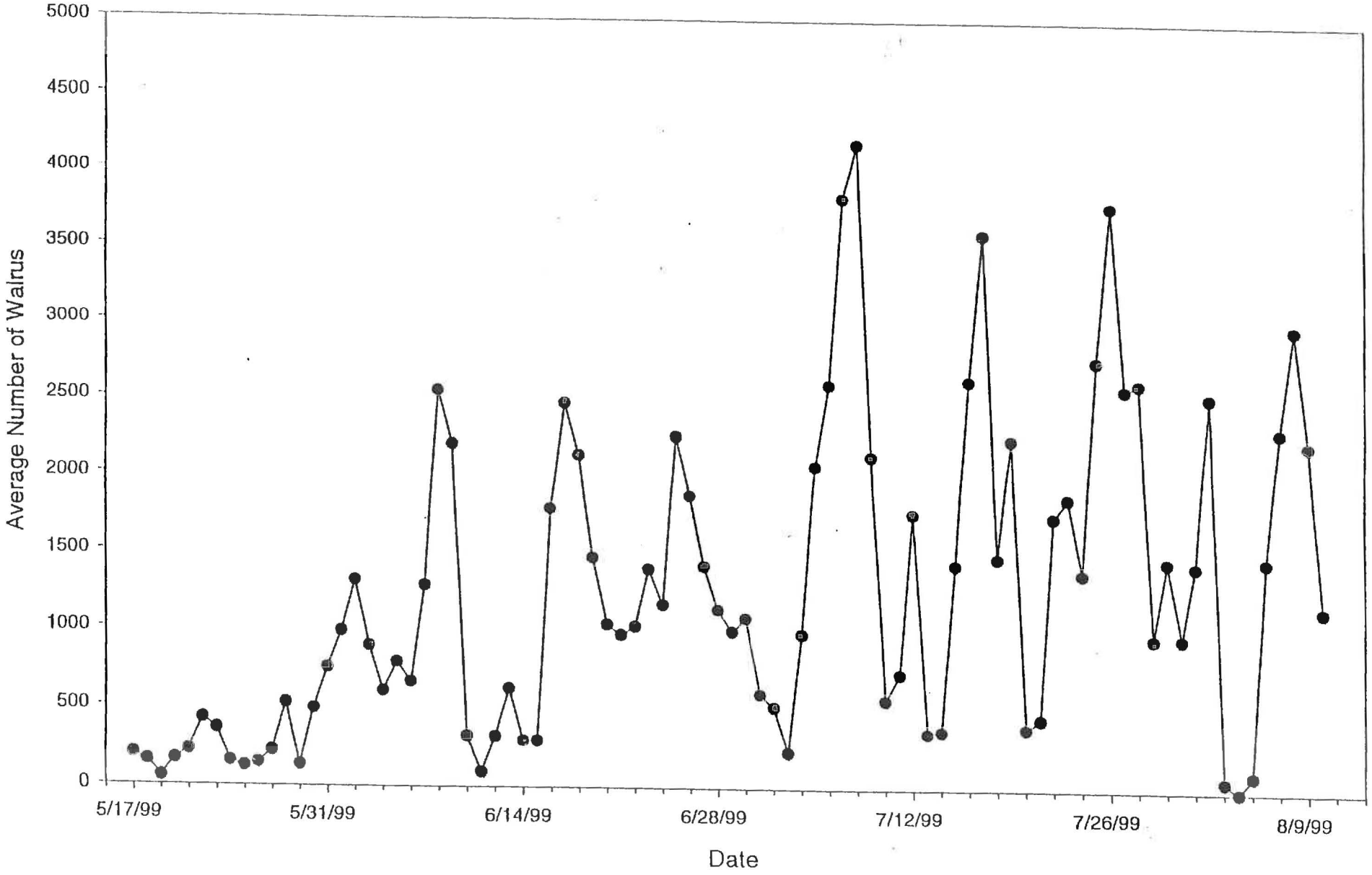


Figure 5. Round Island 1999 Average Scheduled Walrus Counts by Observer

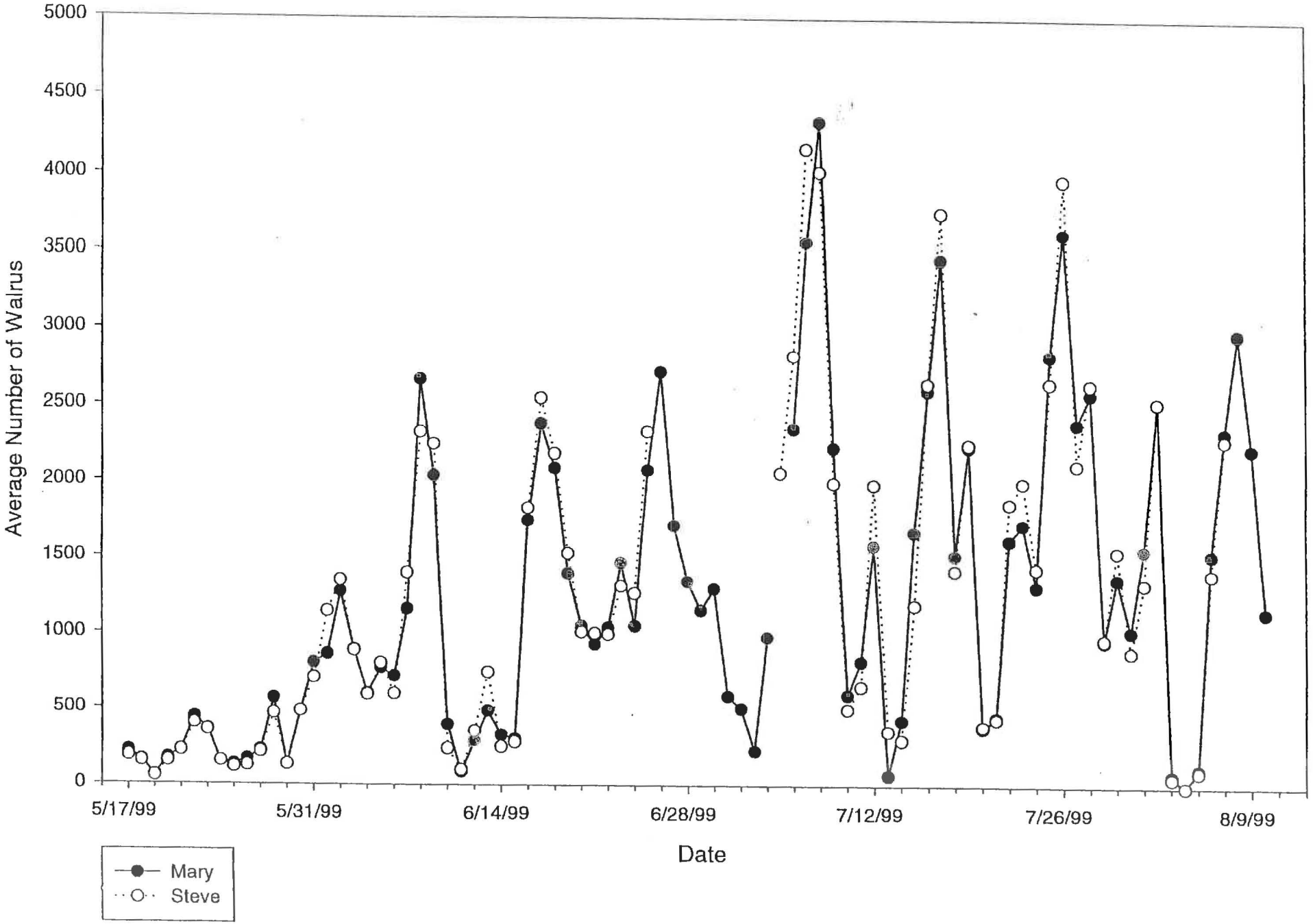


Table 1. Interval walrus counts for Round Island, Alaska, 1999. Counts combine all East side beaches, all observers counts were averaged.

Date	0900	1400	1900
5/21/99	100	221	237
5/24/99	128	152	140
5/27/99	158	218	287
5/30/99	401	485	562
6/02/99	1563	1306	1540
6/05/99	600	785	805
6/08/99	1014	2540	2090
6/11/99	101	92	91
6/14/99	158	287	320
6/17/99	2131	2460	3047
6/23/99	1038	1382	1343
6/29/99	1202	988	1121
7/02/99	482	505	447
7/11/99	525	721	890
7/14/99	101	362	776
7/17/99	2720	3582	3102
7/20/99	357	382	400
7/23/99	403	1848	1797
7/26/99	3715	3772	3943
7/30/99	176	1442	1347
8/01/99	1057	1417	1405
8/05/99	19	104	452
Mean:	824	1139	1188

Table 2. Walrus disturbances observed on Round Island from May 16 -August 12, 1999.

Date	Time	Beach	Description on walrus response	Cause of disturbance
6/17/99	2200	MB	3000+ on beach, 20+ HR/OR/DS	airplane
6/18/99	1430	SB	115 on beach, 3-4 HR/OR/DS	airplane
6/20/99	1030	FR	unknown	skiff
6/22/99	1610	MB	~1000 on beach, ~900 HR/OR, ~250 DS	unknown
6/24/99	1609	MB/FR	all 1000 on MB HR/OR, ~250 DS. All 5 on FR HR	airplane
6/25/99	1503	MB	~2000 on beach, 150 HR, 10-20 DS	unknown
6/27/99	2200	FR	8-12 on beach, 4 HS/OR, possibly 4 DS	visitor on beach
7/6/99	1050	FR/BC	number of walrus not recorded, HR	skiff
7/7/99	1600	BC	89 on beach, 89 HR/OR, 26 DS	skiff
7/12/99	1015	MB	~1000 on MB, "many" HR, no DS	airplane
7/12/99	1700	SB	160 on beach, 130 HR/OR/DS	unknown
7/12/99	2030	MB	600-800 walrus HR, 300-400 HR/OR/DS	unknown
7/15/99	unknown	FR	~15 on beach, all HR/OR/DS	skiff
7/16/99	1546	CG	all 5 HR/OR/DS	staff at overlook
7/16/99	unknown	CG/NBC	~5 HR/OR/DS	skiff
7/17/99	1501	FB	~60 walrus on beach, 5-10 HR/OR/DS	staff/visitors at overlook
7/17/99	1624	MB	~3000 on beach, "several" HR/OR	airplane
7/19/99	1600	MB	~1800 on beach, ~100 HR and 3 DS	unknown
7/21/99	1631	MB	~350 on beach, ~130 HR/OR/DS	unknown
7/22/99	1615	MB	~1200 on beach, ~700 HR/OR, ~200 DS	unknown
7/22/99	1651	MB	~1000 on beach, all HR/OR, ~40 DS	unknown
7/23/99	1609	MB	~1600 on beach, ~1200 HR/OR, ~90 DS	unknown
7/27/99	1508	BC	12 on beach, 1 HR/OR, 11 DS	skiff

7/28/99	0920	FR	9 on beach, "multiple" HR, 6 DS	skiff
7/30/99	0930	FR	5 on beach, 3 HR/OR/DS, another 5 in water move off	skiff
8/1/99	2033	MB	~1000 on MB, 400 HR/OR	airplane
8/2/99	1200	FR/CG	15 on FR, all HR, 9 HR/OR/DS unknown size group at CG HR/OR/DS	skiff
8/6/99	1525	MB	~1500 on MB, 200+ HR,	unknown
8/6/99	1638	MB	~1500 on MB, 100+ HR, 10 HR/OR/DS	airplane

Disturbance codes: HR: raise heads,
OR: change orientation on beach (usually move toward water)
DS: disperse from beach

Table 3. Seabird productivity summary for Round Island, Alaska, 1999. For common murre (*Uria aalge*), 50 adults were monitored on two plots. For black-legged kittiwakes (*Rissa tridactyla*), 25 nests on two plots were monitored. For pelagic cormorants (*Phalacrocorax pelagicus*), 40 nests on three plots were monitored.

	common murre	black-legged kittiwake	pelagic cormorant
no. of nests	50	50	40
no. of eggs laid	49	1	103
no. of chicks hatched	19	0	59
no. of chicks fledged (by 8/10/99)	3	0	3
no. of chicks remaining in nest (8/10/99)	10	0	36
laying success	0.74	0.02	0.8
hatching success	0.39	0	0.57
reproductive success	0.06	0	0.66
productivity	N/A	0	0.98
nesting success	N/A	0	0.45
brood reduction	N/A	N/A	0.63

Laying success: nest structures where 1+ egg is layed per total nest structures.
Hatching success: eggs that hatch per total eggs layed.
Reproductive success: chicks that fledge per total eggs layed.
Productivity: chicks fledged per 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.

*common murre chicks that disappeared after 18 days are assumed to have fledged.

Table 4. Seabird population summary for Round Island, Alaska, 1999. 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 colony
common murre	106	175	81	521	156	0
black-legged kittiwake	41	102	80	92	19	0
black-legged kittiwake nests	51	94	75	113	28	0
pelagic cormorant	0	2	4	3	0	59
pelagic cormorant nests	0	1	3	2	0	40

Table 5. Summer 1999 Stellar sea lion counts from the East Cape haulout located on Round Island, Walrus Islands State Game Sanctuary in Bristol Bay, Alaska.

Date	Time	Land count	Water count
05/17/99	16:30	82	5
05/22/99	14:07	130	8
05/29/99	13:56	48	18
06/03/99	20:51	73	9
06/09/99	19:00	57	20
06/13/99	18:15	127	0
06/15/99	20:39	12	9
06/21/99	21:30	18	4
06/27/99	20:57	12	0
07/03/99	20:35	22	0
07/09/99	22:13	13	0
07/15/99	20:30	13	0
07/18/99	19:19	22	0
07/21/99	18:25	44	0
07/27/99	22:24	33	0
08/02/99	21:23	14	0
Mean		45	5

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

Location: General location of haulout counts.
= Cape Peirce
= Cape Newenham
= Cape Seniavin
= Round Island
= Other

Date: Date in format

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

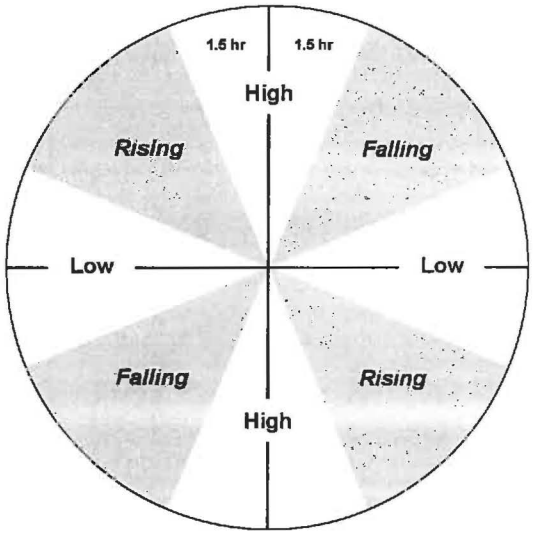
Cloud Cover: A qualitative description of the visible sky. Recorded at the designated weather observation site.
= Clear 0/8 (amount of sky obscured - no clouds or haze)
= Few 1/8-2/8
= Scattered 3/8-4/8
= Broken 5/8-7/8
= Overcast 8/8

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.
= North
= South
= East
= West
= Northeast
= Southeast
= Northwest
= Southwest
= Variable
= 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.

= No precipitation occurred during your weather evaluation
= Rain
F = Fog
= Snow
• = Rain and fog
= Sleet



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

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

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.

= High
= Low
= Rising
• = 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.

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.

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 (24 hr) format.

End Time — Time the count ends in (24 hr) format.

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

- = Scheduled ground count. A count scheduled on the basis of time of day. (The daily count described in the count methodology)
- Interval count. Regularly scheduled, repeated counts of beaches used to assess diurnal variability of walrus on beaches.
- = Correlation count. Scheduled counts of West Main beach (Round Island) to determine relationship between use of Main beach and West Main.
- = 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).
- = Tide ground count. A count scheduled to correspond with particular tide stage.
- = Aerial count.
- = 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.
- = Aerial photograph. Similar to ground photographs, record available information on the data sheet to indicate that aerial photographs were taken.
- = Boat count.

Observer — Initials of person making the count.

Beaufort Sea State — Beaufort sea state (Table 2) of offshore waters, away from 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.

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

▲ = 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.

= 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.

= 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.

= 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.

- = Excellent
- = Good
- = Fair
  = 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.

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 averages of walrus counts of all East side beaches combined, Round Island, Alaska. Beaches were counted from May 17, 1999 through August 10, 1999, and all observers counts have been averaged together.

DATE	0900 Interval Counts		1400 Scheduled Counts		1900 Interval Counts
5/17/99			195		
5/18/99			153		
5/19/99			54		
5/20/99			161		
5/21/99	100		221		237
5/22/99			420		
5/23/99			358		
5/24/99	128		152		140
5/25/99			122		
5/26/99			145		
5/27/99	158		218		287
5/28/99			519		
5/29/99			131		
5/30/99	401		485		562
5/31/99			748		
6/01/99			981		
6/02/99	1563		1306		1540
6/03/99			888		
6/04/99			598		
6/05/99	600		785		805
6/06/99			658		
6/07/99			1274		
6/08/99	1014		2540		2090
6/09/99			2190		
6/10/99			316		
6/11/99	101		92		91
6/12/99			314		
6/13/99			615		
6/14/99	158		287		320
6/15/99			289		
6/16/99			1772		
6/17/99	2131		2460		3047
6/18/99			2122		
6/19/99			1454		
6/20/99			1027		1159
6/21/99			963		

6/22/99			1014		
6/23/99	1038		1382		1343
6/24/99			1154		
6/25/99			2245		
6/26/99			1857		2346
6/27/99			1403		
6/28/99			1122		
6/92/99	1202		988		1121
6/30/99			1069		
7/01/99			588		
7/02/99	482		505		477
7/03/99			226		
7/04/99			972		
7/05/99			2055		
7/06/99			2587		
7/07/99			3822		
7/08/99	487		4186		
7/09/99			2120		1880
7/10/99			553		
7/11/99	525		721		890
7/12/99			1744		
7/13/99			70		
7/14/99	101		362		776
7/15/99			1416		
7/16/99			2616		
7/17/99	2720		3582		3102
7/18/99			1462		
7/19/99			2231		
7/20/99	357		382		400
7/21/99			443		
7/22/99			1849		
7/23/99	403		1848		1797
7/24/99			1362		
7/25/99			2750		
7/26/99	3715		3772		3943
7/27/99			2565		
7/28/99			2604		
7/29/99			955		
7/30/99	176		1442		1347
7/31/99			957		
8/01/99	1057		1417		1405
8/02/99			2518		
8/03/99			63		
8/04/99			0		

8/05/99	1		104		452
8/06/99			1450		
8/07/99			2299		
8/08/99			2972		
8/09/99			2216		
8/10/99			1141		

Appendix C. Daily averages of walrus counts of West main beach, Round Island, Alaska. West main beach was counted from May 20, 1999 through August 6, 1999, and all observers counts have been averaged together.

Site and date	Average of Land_Count
RI990520	99
RI990528	54
RI990601	651
RI990604	106
RI990607	504
RI990610	549
RI990613	331
RI990616	708
RI990619	367
RI990622	300
RI990625	765
RI990628	290
RI990701	46
RI990704	0
RI990706	24
RI990707	214
RI990708	681
RI990709	357
RI990710	84
RI990711	0
RI990712	10
RI990713	280

Site and date	Average of Land_Count
RI990714	225
RI990715	1
RI990716	150
RI990717	295
RI990718	651
RI990719	454
RI990720	0
RI990722	0
RI990728	355
RI990731	0
RI990804	180
RI990805	51
RI990806	11