# ROUND ISLAND WALRUS HUNT: 1996 FIELD REPORT

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**Summary**

Between 28 September and 31 October, 1996, a U. S. Fish and Wildlife Service biological technician and a volunteer from the Alaska Department of Fish and Game monitored walrus numbers and behavior, and collected biological samples from animals harvested during subsistence hunting at the haulouts on Round Island. During the study period, the number of walrus on Round Island haulouts ranged from 0 to 537 ($\bar{x}$ =99). The number of walrus at Round Island declined over the course of the monitoring period. Hunts occurred on 4 days between 7 and 15 October. Hunting took place on Main, West Main, and South West Main beaches. Six animals were harvested over the monitoring period; 1 additional animal was struck and lost.

Hunters and monitors worked together to collect measurements and biological samples from all harvested walrus. Harvested animals generally appeared to be healthy. The age of harvested animals ranged from 27-31 years ($\bar{x}$ = 29). Hunt monitors spent 36.5 hours observing walrus behavior. Walrus displacement rate was highest during hunting activities. The rates of 2 other behaviors, head raises and orientations, did not change during hunting activities. Hunting activities temporarily cleared the beaches of walrus. Walrus were not observed on beaches where hunting had recently occurred for 1 or more days after the hunt. Walrus may have responded to hunting activities by leaving Round Island, moving to another beach, or staying offshore for 1 or more days before hauling out again.

## Introduction

Round Island is one of the largest terrestrial walrus haulouts in the United States. The island is a part of the Walrus Islands State Game Sanctuary (WISGS) in Bristol Bay, Alaska (Figures 1 and 2). Although Alaska Natives from the Bristol Bay region historically hunted walrus at Round Island, hunting on the island was prohibited when the WISGS was established in 1960.

In October 1995, subsistence walrus hunting resumed on Round Island after a 35 year prohibition. Prior to reauthorizing access to the island for walrus hunts, the Alaska Department of Fish and Game (ADFG) organized a task force of walrus biologists, resource managers, Native hunters, and the Eskimo Walrus Commission (EWC) to evaluate the potential effects of hunting on the continued use of the haulout by walrus. The task force recommended that the hunt be carefully monitored for at least 3 years to evaluate the effects of hunting (Round Island Task Force, 1993). In response to this recommendation, the US Fish and Wildlife Service (USFWS), ADFG, EWC, and the Qayassiq Walrus Commission (QWC) initiated a hunt monitoring program in 1995 (Kruse 1997).

In most respects, this first hunt was very successful (Van Daele 1995). The hunt gave Bristol Bay Natives an invaluable cultural link to their past and restored access to an important subsistence resource. The hunt also provided biologists a unique opportunity to observe the effects of hunting on terrestrial walrus haulouts and to collect valuable biological information.

Behavioral observations made during the 1995 hunt season showed increased walrus activity in the presence of human activities and a gradual decrease in walrus numbers over the course of the season, but were insufficient to address questions of long-term changes in haulout use (Kruse 1997). Seasonality and environmental stimuli such as rough weather are known to affect haulout use (Taggart 1987; Fay 1982; Nikulin *in* O'Neill and Haggblom 1987; Wilson 1995), and this variability further complicates analysis of behavior based on a single year of observations. Observing trends in walrus counts over several years will help to resolve these

problems. In addition, prior to the 1995 hunt very few hunters had experience harvesting walrus on Round Island. Managers hoped that hunters would use their experiences from 1995 to become more efficient at harvesting walrus in the future, thereby minimizing disturbance.

Hunt monitoring continued during the 1996 Round Island subsistence walrus hunt. A USFWS biological technician (S. Rice) and an ADFG volunteer (M. McClaran) monitored walrus numbers and behavior between 28 September-31 October, 1996. Hunt monitors also worked with hunters to collect biological samples from harvested animals. Although additional information will be needed to address questions of long-term changes in haulout use, this report summarizes preliminary results of hunt effects and presents recommendations to manage the impacts of disturbance during future hunts.

**Methods**

*Walrus counts*:

Between 28 September- 31 October, we made daily counts of walrus hauled out on the beaches and in near shore waters of the east side of Round Island (Figure 2). Following the protocol established by Hessing and Van Daele (1991), counts were conducted during daylight hours within 2 hours of low tide. On hunt days we conducted regular low tide counts, but we report the peak count for the day when hunting preceded the low tide count. We also counted WMB (Figure 2) opportunistically when time and weather conditions permitted.

The counting method varied with location. Main Beach (MB) was counted from an observation point approximately 350 m east of the haulout and 75 m above sea level. This observation point had a relatively flat perspective that often made counting difficult. We estimated the total number of walrus by counting the animals in a small subsection of the group (usually 5-20 walrus) and extrapolating that number over the remaining herd area. Counts were repeated until we obtained 2 counts within 10% of each other. All other beaches

were counted from observation points above the walrus and within 100 m of the haulout. We were able to count individual animals on these beaches. All counts were made using 8x40 binoculars.

*Behavioral observations:*

Behavioral observations followed the protocol used during the 1995 Round Island hunt (Kruse 1997). During each observation, we watched a focal animal for 2 minutes. We recorded type, duration, and closest approach of human activities, environmental data, and each occurance of 3 target behaviors: head raising (HR), changes in orientation (OR), and displacements (DS). We classified focal animal observations as "disturbed" samples if anthropogenic activities were recorded at any time during the 2 min period. Observations were classified as "undisturbed" when humans were not present. Monitors were not considered to be disturbances while conducting behavioral observations; it was assumed that walrus could detect an unmoving, seated observer.

During hunting activities, 1 monitor began observing walrus behavior from a terrestrial observation point at least 30 minutes prior to the onset of hunting, and continued until all animals left the beach. The other monitor accompanied hunters and recorded environmental conditions on the beach, qualitatively described hunting technique and walrus response, and collected biological materials from harvested walrus.

After each hunt, we monitored the deserted haulout for reoccupation by walrus. When hunting occurred on MB, we checked the beach and adjacent waters several times during the remaining daylight hours. We rechecked MB early in the morning after each hunt, but then resumed our normal schedule of low tide counts. When hunts occurred on WMB, we attempted to make daily counts until animals returned to the beach.

*Data analyses:*

Data were managed in a Paradox data base. We used SAS software to perform descriptive statistics and nonparametric tests on walrus behavioral data (Sokal and Rohlf 1981). Wilcoxon 2-Sample Tests were used to determine whether the presence of humans affected overall activity levels of resting walrus. Significance was set at $p<0.05$ for all analyses.

*Biological sampling:*

Morphological measurements and biological samples were collected from harvested walrus. Each harvested animal received a unique identification number (ID#) prior to butchering. The ID# later identified all samples and measurements collected from that individual. Unless otherwise noted, biological samples were stored frozen in liquid nitrogen during the field season, and then moved to a -30° C freezer until analysis. The following measurements and samples were collected:

Measurements: Standard length (a straight-line measurement from tip of nose to tip of tail), zoological length (a dorsal, curvilinear measurement from the tip of the nose to the tip of the tail), and axillary girth (girth immediately behind and under the foreflippers) were measured using a tape measure. Sternal blubber depth was measured by making a 2-3 cm incision through the skin and blubber above the sternum, inserting a rigid plastic ruler into the cut, and measuring the blubber layer between the epidermis and the first muscle layer.

Blood Samples: Blood samples for serological studies of animal health were drawn from all harvested walrus within 15 minutes of death. Four vacutainers (2 Heparin-treated, 2 untreated) were filled from flowing wounds or freshly pooled organ blood. Blood samples were gently rocked for 3-4 minutes, cooled to ambient seawater temperatures (~ 4-7° C), and held in a small cooler for 3-4 hours until they were centrifuged. Samples were spun in a centrifuge for 15 minutes, and serum and plasma samples were pipetted off the platelet layer.

Blood samples were sent to the Wildlife Conservation Society (Bronx, New York) for analysis.

Teeth: We attempted to collect all lower teeth from each harvested animal for age determination studies and to compare cementum deposition rates between lower canines and other teeth. After separating the mandible from the head, teeth were removed by striking the lateral surface of each tooth with a mallet. The teeth were cleaned of excess tissue, labeled, and stored dry. Thin longitudinal cross-sections were later cut from the teeth using a water-cooled Felker model 11-BR saw and diamond blades. Dental annula in the resulting sections were counted under 10x magnification to estimate the animal's age (Mansfield 1958; Fay 1982).

Histology Samples: Samples (~3-4 ml) of liver, kidney, heart, lung, spleen, bladder, and pancreas were collected to examine organ health. Additional histology samples were collected from any organs that appeared abnormal. Histology samples were preserved in 10% buffered formalin solution and sent to the Armed Forces Institute of Pathology (AFIP; Washington, D.C.) for histopathological examination.

Archival Samples: Approximately 200 g each of liver, kidney, and blubber were collected from each animal for the Alaska Marine Mammals Tissue Archival Project (Becker et al. 1991). Small samples (1-2 ml) of liver, kidney, heart, and muscle were collected for the University of Alaska at Fairbanks (UAF) frozen tissue collection. Urine (250 ml when available) was collected from the bladders of walrus and archived by USFWS for potential disease and hormonal assays.

Other Samples: Two ~40 g samples of muscle were collected from each walrus for myoglobin research at UAF.

## Results

*Walrus counts*:

East side beaches were counted on 35 consecutive days between 28 September and 31 October, 1996 (Figure 3). Of the 7 east side beaches used regularly by walrus during the summer, only MB was used regularly during the fall monitoring period (Figure 2). On 2 occasions, groups of 1-5 walrus were observed around Flat Rock (FR). East side counts ranged from 0 to 537 walrus ($\bar{x}$= 99, Figure 3). The peak count of 537 was observed on 29 September, and a second, smaller peak of 435 walrus was observed on 5 October. Walrus numbers declined over the course of the season. After the first hunt on 7 October, east side counts did not exceed 30 walrus, and walrus were rarely seen after mid-October. It is impossible to determine from these data whether hunt effects contribute to normal seasonal decline.

West Main Beach was counted 10 times from a terrestrial observation point and once from the boat of a hunting party. WMB counts ranged from 0 to a peak of 130 walrus on 6 October ($\bar{x}$=38, Figure 3). A single walrus was seen on South West Main Beach (SWMB, Figure 2) during 1 of the hunts.

*Behavioral observations:*

We made 723 2-minute focal animal behavioral observations (695 undisturbed, 28 disturbed). Fourteen percent of the observations were conducted from the WMB overlook, and the rest were made from the MB overlook (Figure 2). We were unable to make focal animal observations during 1 hunt which occurred on SWMB, and we interrupted observations during another hunt to search for a walrus which had been struck and lost. We were unable to make behavioral observations on any beach immediately following hunting because all walrus left the beach during hunts.

Human activities were generally limited to hunters' initial approach in a boat, the stalk, and shooting. There was 1 terrestrial disturbance event not related to hunting. Small boats constituted 82% of the human activity observed; 18% of the human activity was terrestrial. Because of limited observations, it was not possible to test how particular types of disturbance or proximity of disturbance affected walrus behavior. All disturbances were analyzed collectively.

In order to assess changes in walrus activity associated with human activities, we compared behavior rates observed during disturbed and undisturbed conditions. Walrus were displaced significantly more often in the presence of human activities (Table 1). Rates of HR and OR during human activities were insignificantly different from undisturbed observations (Table 1).

It was our subjective opinion that walrus were fairly tolerant of terrestrial and small boat activities and did not change behavior patterns until approached closely. For example, during the first hunt, there were 2 groups of walrus hauled out on MB approximately 75 meters apart. There were approximately 100 walrus in the first group and 30 in the second group. Hunters attempted to kill a walrus in the first group, but the wounded animal escaped. Hunters spent more than 40 minutes looking for the wounded animal from their boat, making several passes along MB within 100 m of the second group of walrus. These walrus did not noticeably react to the boat activity. Approximately 20 of these animals left the beach when hunters came ashore to kill a walrus from this group, but the remaining 10 walrus had to be deliberately driven off the beach with shouts before hunters could butcher their animal.

In contrast, we occasionally observed very dramatic responses to subtle stimuli. For example, on our first day on the island, we witnessed a group about 90 walrus on MB disperse to the water with no obvious stimulus. We were more than 500 m downwind of the walrus, and we had not observed any anthropogenic disturbance offshore since we arrived in Boat Cove 4 hours earlier. This dispersal may have been caused by a rockfall or other stimulus that was not detectable from our position.

Hunting activities eventually cleared the beach of all walrus. Many walrus left the area immediately; however, other walrus gathered into offshore groups after hunting (following all hunts of more than 1 animal). These walrus gradually dispersed, but groups of 10 or more walrus lingered within as little as 20 m of people throughout butchery (4-5 hours).

After leaving the beach, walrus did not reoccupy the hunted beach for at least 24 hours (although it was impossible to determine positively whether walrus used the beach during the night). Walrus returned to MB approximately 3.5 days after the first hunt. The second hunt took place on WMB, and walrus took at least 2.5 days to return to that haulout after the hunt.[1] The only animal present during the third hunt was killed, so this hunt doesn't provide any information about reoccupation rate. Walrus returned to MB within 24 hours of the fourth hunt.

It is possible that walrus may move to adjacent beaches and haulout within 24 hours of hunting. We observed walrus on WMB the day after the first hunt on MB (walrus had been observed on WMB prior to the hunt on MB). We also observed a group of 4-5 walrus haul out on MB within 5 hours of the hunt on WMB. In each case, some of the walrus may have been recently displaced from the adjacent beach by hunting.

*Hunt specifics*:

Hunts took place on 4 days between 7 and 14 October (Table 2). Three hunting parties used 10m fishing boats to travel to the island and a 4-5m Lund skiff to approach the walrus haulout; 1 village used 3 skiffs to make the entire trip. Three of 4 hunting parties choose to hunt at high or falling tide so that advancing water would not interfere with butchering. Two

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[1]WMB was counted on the first and second days after this hunt, and no walrus were seen. We did not count on the third and fourth days due to bad weather. We counted again on the fifth and sixth days without seeing walrus, did not count for a week, and finally observed walrus on WMB 14 days after the second hunt.

hunts were conducted on MB, 1 on WMB, and 1 on SWMB (Figure 2). Hunts were conducted on groups of 1-130 walrus ($\bar{x}$= 64). Hunting parties ranged from 4 to 9 people ($\bar{x}$=5, Table 2). One to 3 people in each group shot the animals, and the remaining participants helped with butchering and loading meat into skiffs.

Hunter strategy varied with location, walrus group size, and the amount of cover available for hunters (Table 2). Two hunting groups approached walrus quickly in boats with no attempt to conceal their presence. They beached their skiffs approximately 30m from the walrus, ran to within 3-15m of the animals, and began shooting as the walrus started to leave the beach. Another hunting party approached on foot from downwind and used the terrain to conceal their presence to within 3-15m of the walrus. The fourth hunting party approached to within 10m of a lone walrus near the water and shot from their boat to impede its dispersal, and because surrounding boulders prevented a clear shot from the beach.

Five of the 7 walrus shot were taken from the back of the herd, presumably to minimize the chance that the animal would be pushed into the water or trampled by other walrus leaving the beach. Hunters also appeared to target an animals high on the beach to maximize the time available for butchering (if the tide was rising) and to reduce the potential for struck and loss. However, 1 hunting party waited until walrus were near the water to shoot because they intended to take the animals back to their village intact and did not want to drag the carcasses from high on the beach.

Hunters used a variety of rifle calibers and ammunition. Four hunters used 30-06 calibers, 2 used .270 calibers, and 1 hunter each used 7mm, 30-30, and .223 caliber rifles (Table 2). All hunters used soft-tipped ammunition. No walrus were struck and lost due to inadequate rifle caliber or ammunition.

Six mature male walrus were harvested. Table 3 summarizes the ages and measurements of these animals. The animals generally appeared to be very healthy. The recovery of useable

parts of walrus by hunters was nearly absolute. Three of 4 villages butchered walrus on the island, while 1 hunting party towed the unbutchered carcasses back to their village, where the entire community participated in the butchering and division of meat.

One additional walrus (14% of total) was struck and lost. The targeted animal was near the front of the herd and very close to the water. Dispersing walrus pushed the wounded animal into the water where it was lost. The animal was severely wounded and likely died as a result of its wounds.

*Biological sampling*:

Samples for contaminants, histology, disease monitoring, age determination, and archival were collected from all harvested walrus (Table 4). Flatworms were found in the gut of 1 animal, but were not collected. The liquid nitrogen in our cryo-freezers evaporated after about 4 weeks in the field, and 2 sample sets (blood, urine, and tissue samples) warmed to ambient temperature (~ 3-5° C) for 3-4 days before being refrozen on ice. Two additional sets of uncentrifuged blood samples were packed on ice and transported to Dillingham with hunters. Red cells in these samples lysed, and the samples will not be useful for analysis.

All animals appeared to be healthy, and histological analysis (Appendix) did not indicate any serious threats to walrus or consumers. Serum analysis has not yet been completed. Walrus ranged in age from 27-31 years ($\bar{x}$=29).

Anomalous tissues were collected from 2 animals at the request of hunters. A benign fibrovascular proliferation was collected from the intercostal muscles of 1 animal's (RI960017) thoracic cavity (Appendix). We also collected a section of spleen (Walrus RI960018) which had contracted and appeared to have a 4-5 cm cyst filled with milky, light brown fluid on its surface. This spleen was healthy, but had contracted to release stored blood in response to severe wounding (Appendix).

## Discussion

*Walrus counts*:

Diminished use of the Round Island haulout as a consequence of hunting was the primary concern of the Round Island Task Force (1993). The Task Force recommended that both annual and abrupt intra-seasonal declines in the number of walrus hauled out on Round Island should be carefully monitored as possible signs of changing haulout use. The annual peak count for the summer of 1996, the first year after hunting resumed on Round Island, was 6,331 walrus on 25 July (Koenen and Rice 1996). This was 34% lower than the 1995 peak of 9,550 (Koenen and Kruse 1995). However, walrus use of Bristol Bay haulouts is known to be highly variable from year to year (Taggart and Zabel 1985; Frost et al. 1986; and Hills 1992), and this year's peak count was similar to the 10 year average of 6,019 observed on Round Island between 1986-1996 (summarized in Koenen 1996). Due to the high level of interseasonal variation in haulout use, it is impossible to assess whether hunting affected the number of animals using the haulout during the summer.

Walrus numbers decreased steadily prior to the first hunt in 1996. After the first hunt, there was a sharp decline in numbers, and walrus counts stayed low for the duration of the season. Previous studies have shown that an autumn decline is normal at Round Island and other Bristol Bay walrus haulouts, as male walrus migrate north to rejoin females (Taggart and Zabel 1985; Frost et al. 1986; and Hills 1992). It is impossible to determine whether the rate of decline this fall would have been different if walrus had not been exposed to the hunt. However, we should continue to monitor abrupt intra seasonal declines carefully.

The peak fall walrus count in 1996 was lower than in 1995, but the average fall count for 1996 was higher than in 1995. However, in addition to normal annual variation, we began monitoring walrus numbers later in the season. Comparison of counts from the first 2 years of hunting does not reveal any clear trend.

Walrus appeared to take longer to reoccupy beaches after hunting in 1996 than in 1995. Kruse (1997) reported that walrus reoccupied the haulout within 24 hours in 4 of 5 hunts, and speculated that the exception was due to rough weather. This year, walrus took more than a day to haulout on hunted beaches after 2 of 3 hunts (only 1 walrus present in the fourth hunt), and weather did not appear to inhibit reoccupation. The weather was mild to moderate during the 2 periods when walrus took more than a day to reoccupy beaches. The reason for this difference in reoccupation rate between 1995 and 1996 is unknown. It was impossible to determine from this limited data whether reoccupation rate changes as the season progresses.

Although we did not monitor walrus movements between beaches, we considered the possibility that some walrus may alternate between beaches in response to hunting disturbances. However, because we were unable to recognize individual animals, it is impossible to prove that these walrus were among the animals hunted the previous day. If movement between beaches occurs, it may be the most energetically conservative alternative to leaving the island completely. This behavior may indicate relatively low-level stress. Determining whether walrus alternate between beaches in response to hunting should be a goal of future monitoring efforts.

Although regular counts of walrus on WMB are desirable, difficulties with access may limit counts. We were unable to count WMB daily or make multiple counts on critical days because the hike was very time consuming (3-4 hours round trip), and trail conditions across the traverse were often unsafe. Although we counted WMB on 1 occasion when winds were greater than 25 kts, WMB was generally only counted during moderate weather when winds were less than 15 kts.

*Behavioral observations:*

Walrus displacement rate increased when human activities were recorded near the haulout. This observation was consistent with other studies where human activities were correlated

with increases in walrus activity levels (e.g. Fay et al. 1986; Salter 1979; Brueggeman 1993; Kruse 1997). We did not observe increases in HR and OR in the presence of human activity.

We expected to find similar trends for all 3 behavior rates, and the lack of close association between trends in DS, OR, and HR is puzzling. Rates of HR and OR may not have differed significantly between disturbed and undisturbed observations because the sample size for disturbed observations was small and walrus response was extremely variable. Another possible explanation is that HR and OR are only accurate indices of low-level environmental and anthropogenic disturbance. In the fall, walrus may be so disturbed by environmental stimuli and the onset of fall migration that they reach the maximum rate of HR and OR.

*Effects of disturbance:*

Anthropogenic disturbance of wildlife has been found to cause physiological stress and changes in energy budgets, habitat use, distribution, animal fecundity, and other important population parameters (Knight and Cole 1991). Kruse (1997) reviewed literature related to disturbance effects. Walrus have abandoned some of their traditional haulout sites in response to human disturbances and unmanaged hunting (Fay et al. 1986; Frost et al. 1986; Richardson et al. 1989; Jemison 1992). However, it may be possible to sustain a well-managed, traditional harvest on Round Island in perpetuity, if hunters and managers work together to minimize disturbance to walrus (Round Island Task Force 1993).

*Hunt specifics*:

Native hunters drew on experience gained in 1995 to improve the hunt in 1996, particularly by reducing struck and loss this year. All hunting groups used soft-tipped bullets which eliminated accidental wounding from bullets passing through the targeted animal. Most hunters used large caliber rifles (up to 30-06). The smallest caliber used was a .223. Although the .223 was sufficient to kill the walrus, we continue to encourage the use of larger caliber rifles

to improve efficiency. No animals were lost as a result of inadequate rifle caliber or ammunition. Hunters reduced the rate of struck and loss from 29% in 1995 to 14% in 1996, and they should be commended for this. A 30-06 caliber rifle with soft-tipped, heavy grained bullets appeared to be very efficient for killing walrus quickly, while minimizing the potential for accidental wounding caused by bullets passing through the targeted animal and striking a nearby walrus.

Hunters cooperated well with hunt monitors, particularly in the collection of biological samples. Hunters chose to transport a monitor to the hunt site to facilitate collecting and cataloging the samples. This allowed hunters to focus their efforts on butchering their kills while the monitor concentrated on collecting morphometric and biological samples. Hunters delivered frozen samples to Dillingham. This cooperation facilitated the collection of good samples from each walrus.

Communication between hunters and with monitors was not as good as in 1995 (Kruse, 1997) and created some problems. Monitors did not always have adequate notification to conduct the desired amount of behavioral observations before hunters arrived. Hunters also failed to coordinate multiparty hunts in 1996. Multiparty hunts would have reduced the number of disturbances to walrus and given hunters an opportunity to learn from one another. Better communication would also make the hunt safer for all.

*Biological sampling:*

All animals appeared to be healthy, and histological analysis did not indicate any serious threats to walrus or consumers (Appendix). The benign fibrovascular proliferation collected from walrus RI960017 was probably formed during repair of a previous injury. The abnormal appearance of the RI960018's spleen was caused by the contraction of the spleen to release stored blood. Contraction of the spleen is normal in walrus that have been shot. Serum analysis has not yet been completed.

*Changes approved for the 1997 Round Island walrus hunt:*

The primary purpose for scheduling the hunt during October was to maximize the chances for successful hunts while minimizing the number of animals exposed to repeated haulout disturbances. While the exact number of walrus exposed to hunting disturbance this year is unknown, it probably falls between 130 (the number of walrus observed on MB during the first hunt) and 350 (the number of walrus observed on both MB and WMB the day before the first hunt, and the best estimate of total island population during the first hunt). This is less than 6% of the walrus that used Round Island at any one time in 1996, so disturbance at a regional level is probably effectively minimized.

Although the hunt season minimizes disturbance, the timing of the hunt this year worked against Native hunters due to difficulty locating walrus and increasingly rough weather later in the season. One hunting party traveled to the island on 10 October and found only 2 walrus. Hunters harvested 1 walrus, but judged the other to be too old for consumption and left the island without filling their quota. After 18 October, we only sighted walrus sporadically on the island. By mid-October rivers had begun to freeze over in the entire Bristol Bay area, which made the trip difficult for hunters from villages without access to open water, and seas were frequently too rough for safe travel.

Because of problems associate with the late fall hunt, the Alaska Board of Game (BOG) approved a proposal to change the dates of the hunt season to 20 September- 20 October. Before making this decision, managers considered the possibility of increased walrus disturbance. Based on available late summer and early fall data, expected peak counts in late-September probably lie between 500-1,000 walrus, so more animals could potentially be affected (Kruse 1997; Koenen and Rice 1996; Koenen and Kruse 1995, 1993; Koenen and Spencer 1994). However, the revised hunt season is likely to make the hunt safer and more convenient for hunters without causing a great increase in disturbance.

The BOG has also approved a second QWC proposal to increase the annual Round Island harvest to 20 walrus. The 7 villages involved in the hunt have honored a self-imposed limit of 10 walrus. However, villagers reported that 10 walrus was insufficient to meet their needs (Chythlook 1996). Other Bristol Bay area villages have also expressed an interest in harvesting walrus at Round Island next fall. An increased harvest could cause increased haulout disturbance if hunters make additional trips to the island.

Since these changes may cause increased walrus disturbance, hunters should be encouraged to minimize disturbance by coordinating with monitors to hunt during periods of low walrus numbers, hunting on less populated beaches, and coordinating multiparty hunts with other villages.

**Recommendations:**

1) Hunters should coordinate activities with ADFG staff, monitors, and other hunting parties at least one day before hunting. Hunters should confirm their plans on the morning of the hunt so monitors can better prepare for the arrival of hunters. Monitors should provide information to hunters about weather conditions and the number of walrus using the island.

2) The USFWS should continue to work with ADFG, EWC, QWC, and Native hunters to evaluate the 1996 Round Island hunt and plan the 1997 hunt. All parties should meet prior to the 1997 hunt to exchange information which could improve hunt efficiency and minimize disturbance to the walrus. Changes in the hunt season and walrus quota should be made cautiously and on an experimental basis.

3) This report should be provided to walrus hunters and their suggestions solicited for improving future hunt monitoring and reporting. In addition, results from biological samples should be reported back to hunters and the QWC as soon as they are available.

4) Hunters should improve compliance with the Marking, Tagging, and Reporting requirement of the Marine Mammal Protection Act by tagging all walrus ivory within 30 days of harvest.

5) The USFWS, ADFG, EWC, and QWC should consider recommending a maximum walrus group size for hunts in the future. These guidelines may help to minimize the potential for mass disturbance.

6) Hunters should organize multiparty hunts and focus hunting effort on the smallest groups of walrus possible to minimize disturbance. Walrus hunters should be trained by veteran hunters to make kills as humane as possible and further reduce struck and lost animals. All hunters should be encouraged to use large caliber rifles with soft-tipped, heavy grained bullets. Hunters should also be encouraged to carefully select their target animal with regard to its

position on the beach, approach as close as possible, and accurately target the vital area.

7) A study design should be implemented to quantify the rate of reoccupation for all of the island's major beaches and determine whether animals alternate between beaches.

8) The USFWS and ADFG should continue to monitor walrus numbers and behavior during the 1997 hunt.

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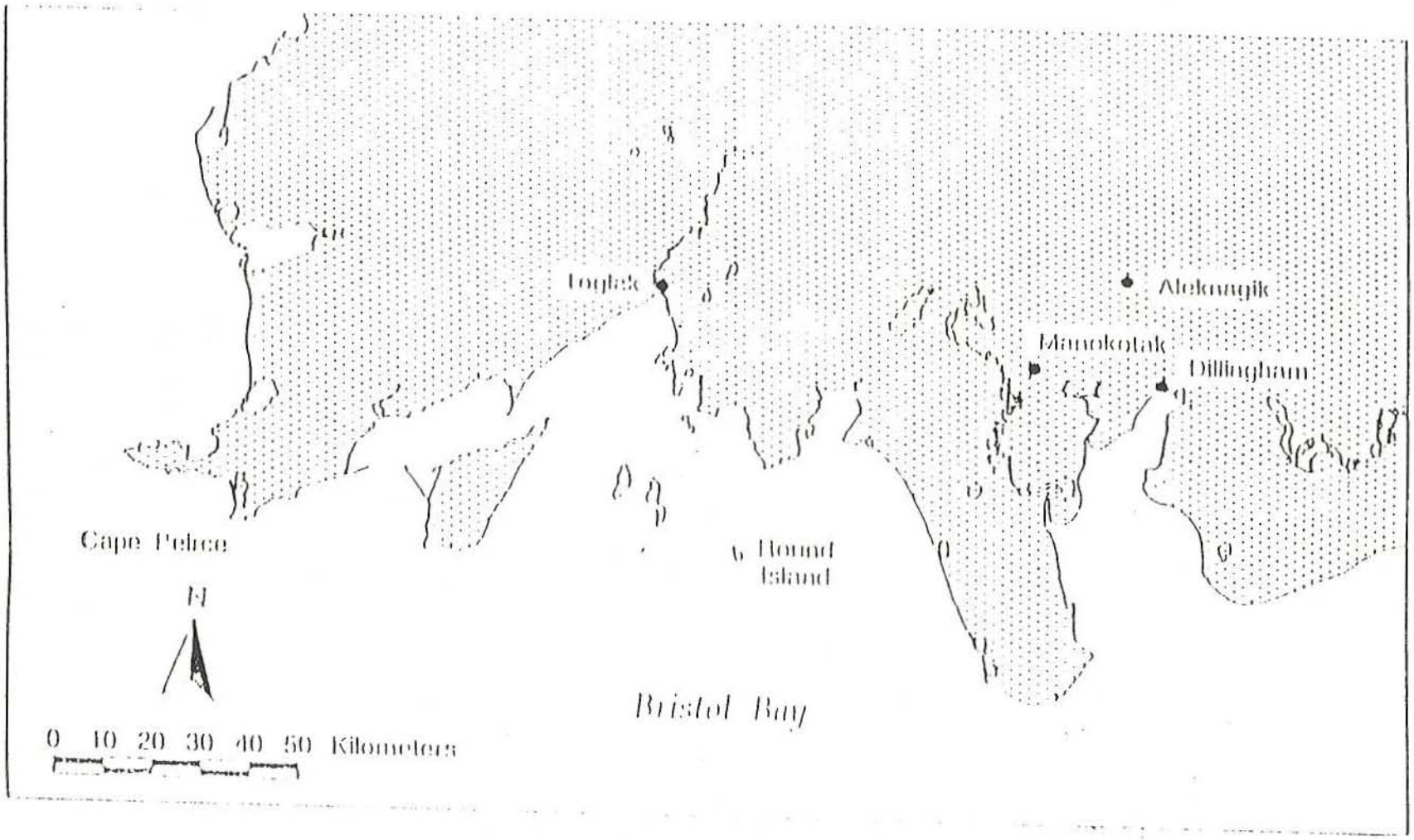


Figure 1. Area map of Bristol Bay, Round Island, and the communities participating in the 1996 Round Island walrus hunt.

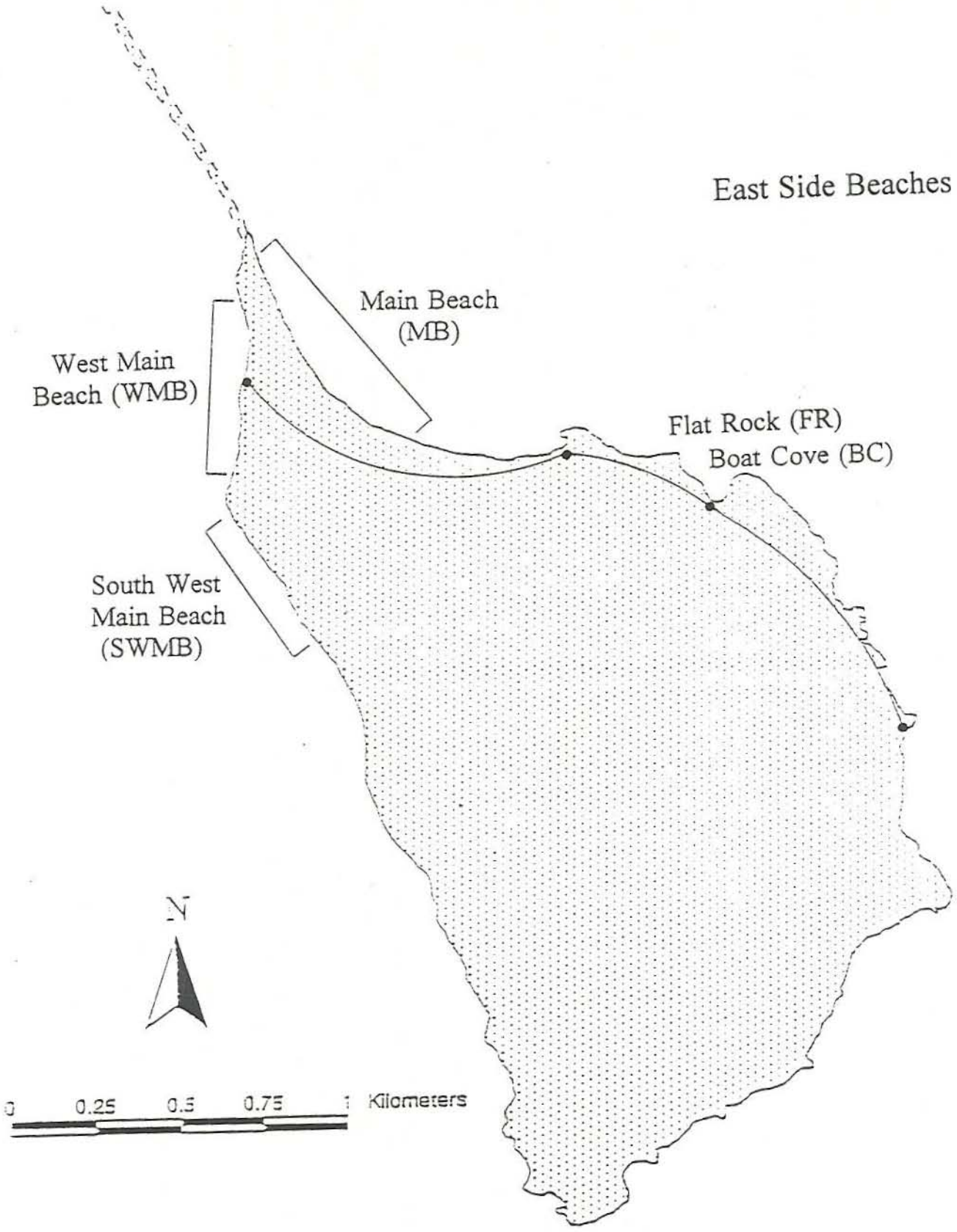


Figure 2. Detail of Round Island, Bristol Bay, Alaska. Observation areas are indicated as dots along the trail system (solid line).

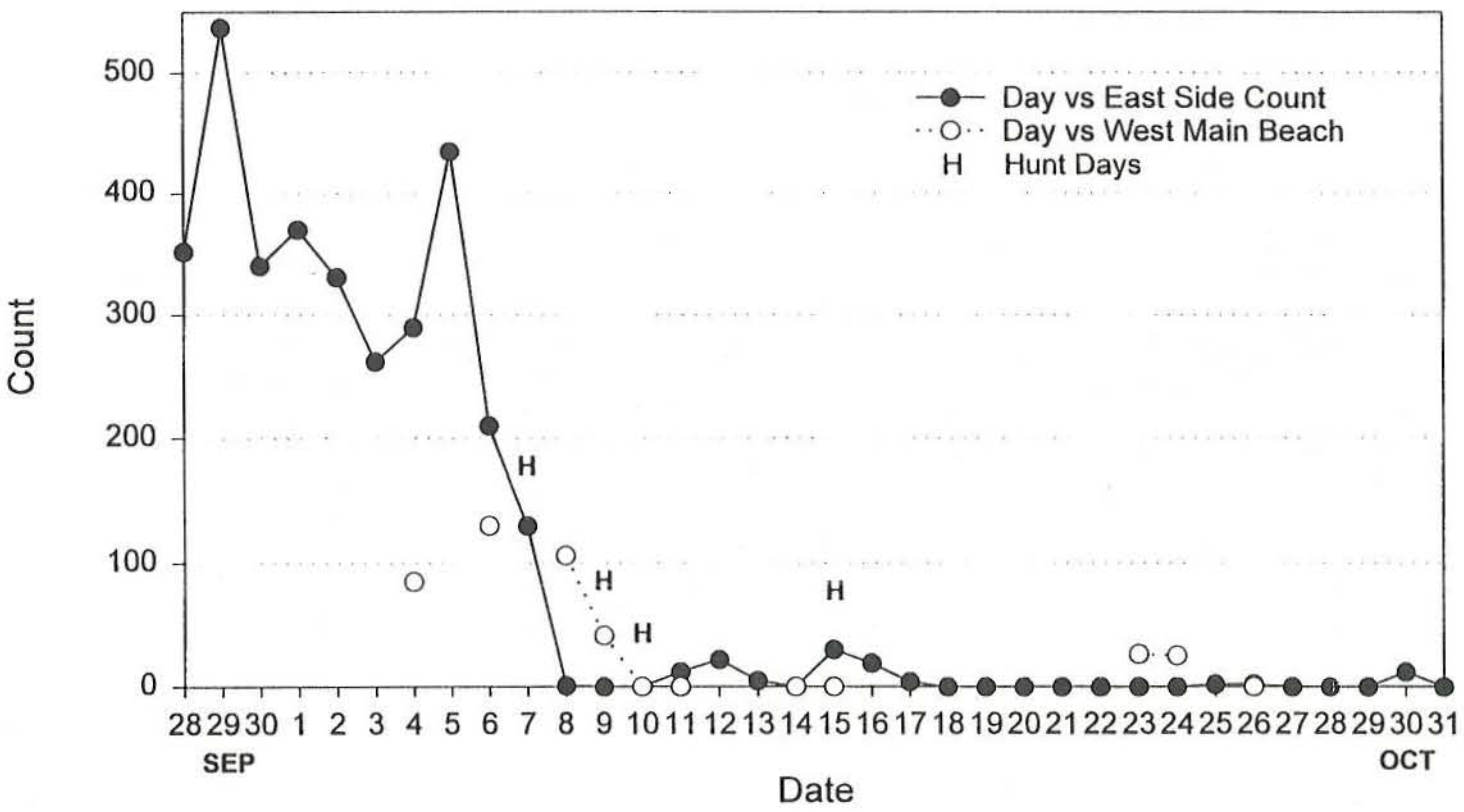


Figure 3. Daily Counts of Walrus on East Side Beaches and West Main Beach: 28 September- 31 October, 1996.

Table 1. Rates of 3 target behaviors of focal animals observed during disturbed and undisturbed conditions. Test statistics and values for Wilcoxon 2-Sample Test comparisons between disturbed and undisturbed behaviors; 1996 Round Island walrus hunt.

| Behavior | Disturbance Condition | Mean | Standard error | Test Statistic | p value | Degrees of freedom |
|---|---|---|---|---|---|---|
| **Head raises** | Undisturbed | 0.351 | 0.023 | Z=1.592 | p=0.111 | DF=1 |
| | Disturbed | 0.464 | 0.103 | | | |
| **Orientations** | Undisturbed | 0.019 | 0.005 | Z=-0.908 | p=0.364 | DF=1 |
| | Disturbed | 0 | 0 | | | |
| **Displacements** | Undisturbed | 0.008 | 0.003 | Z=4.035 | p=0.0001 | DF=1 |
| | Disturbed | 0.054 | 0.030 | | | |

Table 2. Summary of hunt characteristics of the 1996 Round Island walrus hunt.

| Date | 7 October[1] | 7 October[1] | 9 October | 10 October | 15 October |
|---|---|---|---|---|---|
| Monitor Accompanied Throughout Hunt | Yes | Yes | Yes | Yes | No |
| Time Hunt Begins [2] | 12:15 | 14:04 | 15:12 | 14:16 | 13:40 |
| Beach Hunted | MB | MB | WMB | SWMB | MB |
| Time Hunters on Beach | 12:51 | 14:06 | 15:25 | 14:36 | 13:47 |
| # People on Beach | 5 | 5 | 6 | 6 | 7 |
| Method of Approach | Foot[3] | Foot | Foot | Boat[4] | Foot |
| Closest Approach | 15 m | 3 m | 3 m | 10 m | 15 m |
| # Walrus in Group | 100 | 30 | 35 | 1 | 19 |
| # Shooters | 1 | 1 | 2 | 3 | 2 |
| # Shots Fired | 4 | 2 | 3 | 5 | 12 |
| Rifle Calibers Used | 30-06 | 30-06 | 30-06 | 7mm, .270, 30-30 | .223, .270 |
| # Walrus Harvested | 0 | 1 | 2 | 1 | 2 |
| #Walrus Struck/Lost | 1 | 0 | 0 | 0 | 0 |
| Time Hunters Leave Beach | 17:02 | 17:02 | 20:04 | 18:18 | ~17:10 |

1. Two separate groups of walrus on one beach were hunted with a ~2 hr intermission between hunts.
2. Time hunters begin to approach walrus using a skiff. Togiak hunters made the entire trip by skiff, therefore the onset of the hunt was considered to be the time hunters contacted monitors to notify that they were within 1/4 mile of the island.
3. Hunters anchor skiff 20-50 meters from walrus and approach by foot.
4. Walrus shot from the boat before hunters disembarked.

Table 3. Summary of morphometrics and ages of walrus killed during the 1996 Round Island walrus hunt.

| Walrus ID# | Date | Standard Length | Zoological Length | Axillary Girth | Blubber Depth | Tooth Age |
|---|---|---|---|---|---|---|
| RI960016 | 7 October | 300cm | 329cm | 290cm | 23cm | 30 |
| RI960017 | 9 October | -- | 301cm | 304cm | 63cm | 28 |
| RI960018 | 9 October | 292cm | 318cm | -- | 31cm | 27 |
| RIR60019 | 10 October | 270cm | -- | 296cm | 33cm | 28 |
| RI960020 | 15 October | -- | 336cm | -- | 17cm | 31 |
| RI9600021 | 15 October | -- | 318cm | -- | 50cm | 31 |

Table 4. Summary of biological samples collected during the 1996 Round Island walrus hunt.

| WALRUS ID# | TEETH (AGE) | KIDNEY, LIVER, BLUBBER (AMMTAP) | BLOOD (ANIMAL HEALTH) | URINE (ANIMAL HEALTH) | ORGANS (HISTOLOGY) | ORGANS (UAF FROZEN TISSUE) | MUSCLE (UAF ) | OTHER |
|---|---|---|---|---|---|---|---|---|
| RI960016 | x | x | x | x | x | x | x | 1 |
| RI960017 | x | x | * | x | x | x | x | 2 |
| RI960018 | x | x | * | x | x | x | x | 3 |
| RI960019 | x | x | x | x | x | x | x | |
| RI960020 | x | x | x | 0 | x | x | x | |
| RI960021 | x | x | x | x | x | x | x | |

X = Samples were collected.
* = Samples were initially collected, but cannot be analyzed due to technical difficulties.
0 = No sample was collected.
1 = Flatworms observed; not collected.
2 = Benign fibrovascular proliferation.
3 = Contracted spleen.

DEPARTMENT OF DEFENSE
ARMED FORCES INSTITUTE OF PATHOLOGY
WASHINGTON, DC 20306-6000

REPLY TO
ATTENTION OF

12 February 1997

2567113-2 00
ANIMAL, PINNEPED WALRUS
RI960017 T
TPL/LAM/TWB/mab

Joel Garlich-Miller
U.S. Fish and Wildlife Service
Marine Mammals Management Field Office
1011 E. Tudor Road
Anchorage, AK 99503

AFIP DIAGNOSES:

RI960017 1. Fluid-filled sac from inside thoracic cavity: Benign fibrovascular proliferation, Pacific walrus (*Odobenus rosmarus divergens*), pinniped.
2. Liver: Hepatitis, lymphohistiocytic and granulomatous, portal, multifocal and random, mild to moderate.
3. Lung: Congestion, acute, multifocal, moderate, with mild alveolar hemorrhage.
4. Spleen; heart; skeletal muscle; pancreas; kidney; stomach; urinary bladder: No significant lesions.

COMMENT: The tissue from the thoracic cavity consists of fibrous connective tissue and blood vessels. This may represent repair of a previous injury by fibrosis. The inflammation in the liver probably represents residual inflammation from previous parasitism or infection. The congestion in the lung and scattered mild hemorrhage probably occurred at the time of death; these changes caused the discoloration that was found when the animal was butchered. None of the changes found in these tissues were likely to have affected the health of the walrus at the time of death.

Thomas P. Lipscomb, DVM, DACVP
LTC, VC, USA
Chief, Division of Veterinary Pathology

LuAnn McKinney, DVM, DACVP
LTC, VC, USA
Division of Veterinary Pathology

DEPARTMENT OF DEFENSE
ARMED FORCES INSTITUTE OF PATHOLOGY
WASHINGTON, DC 20306–6000

RECEIVED
JAN 13 1997

REPLY TO
ATTENTION OF

27 December 1996

2567114-0 00
ANIMAL, PINNIPED WALRUS
RI960018 T
TPL/LDY/mab

Joel Garlich-Miller
U.S. Fish and Wildlife Service
Marine Mammals Management Field Office
1011 E. Tudor Road
Anchorage, AK 99503

AFIP DIAGNOSES:

RI960018 1. Spleen: Contraction, Pacific walrus (*Odobenus rosmarus divergens*), pinniped.
2. Liver: Fibrosis, portal and subcapsular, multifocal, moderate, with mild lymphoplasmacytic and occasionally eosinophilic hepatitis.
2. Heart, myocardium: Fibrosis, multifocal, mild.
3. Pancreas: Pancreatitis, periductular, lymphoplasmacytic and occasionally eosinophilic, multifocal, mild.
4. Kidney; skeletal muscle; lung: No significant lesions.

COMMENT: The submitted spleen is contracted but otherwise normal. One of the functions of the spleen is storage of blood. When an animal is shot and begins to bleed, the spleen contracts to provide more blood to the rest of the body. When the spleen contracts, most of the blood passes out of the spleen, but some may remain in the localized areas creating the appearance of blood-filled cysts. The fibrosis affecting liver and heart is a common, insignificant change. The mild hepatitis and pancreatitis were probably caused by parasites.

Thomas P. Lipscomb, DVM, DACVP
LTC, VC, USA
Chief, Division of Veterinary Pathology

Department of Veterinary Pathology, Building 54, Room G-117, 14th St. and Alaska Ave NW, Washington, D.C. 20306-6000
Phone: 202-782-2600 DSN: 662-2600 fax: 202-782-9150 Email: afipvet@email.afip.osd.mil

DEPARTMENT OF THE ARMY
ARMED FORCES INSTITUTE OF PATHOLOGY
WASHINGTON, DC 20306-6000

REPLY TO
ATTENTION OF

27 January 1997

2567115-7 00
ANIMAL, PINNIPED WALRUS
R1960019 T GARLICH-MILLER
TPL/RBM/LDY/dyj

Joel Garlick-Miller
U.S. Fish and Wildlife Service
Marine Mammals Management Field Office
1011 E. Tudor Road
Anchorage, AK 99503

AFIP DIAGNOSIS:

RI960019 1. Kidney, glomeruli: Glomerulopathy, diffuse, mild to moderate, with increased mesangial matrix, multifocal thickening of glomerular membranes and multifocal periglomerular fibrosis, Pacific walrus *(Odobenus rosmarus divergens)*, pinniped.
2. Liver: Fibrosis, portal, multifocal, moderate, with mild bile duct proliferation.
3. Liver: Hepatitis, subacute, multifocal, mild.
4. Pancreas: Pancreatitis, lymphoplasmacytic, chronic, multifocal to coalescing, mild, with fibrosis, acinar loss and ductal epithelial proliferation.
5. Pancreatic duct: Inflammation, subacute, diffuse, mild.
6. Heart; spleen; urinary bladder; skeletal muscle; lymph node; lung: No significant lesions.

COMMENT: We are attempting to more accurately classify the changes in the kidney by using special stains and electron microscopy. An addendum report will be sent to you as soon as the results become available. The causes of the hepatic fibrosis, mild hepatitis and mild pancreatitis are not evident. The pancreatic and hepatic changes are considered to have had little if any effect on the health of the animal.

for Robert B. Moeller Jr., DVM, DACVP
LTC, VC, USA
Division of Veterinary Pathology

Thomas P. Lipscomb, DVM, DACVP
LTC, VC, USA
Chief, Division of Veterinary
Pathology

Department of Veterinary Pathology, Building 54, Room G-117.14th St. and Alaska Ave NW.Washington. D.C. 20306-6000
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DEPARTMENT OF DEFENSE
ARMED FORCES INSTITUTE OF PATHOLOGY
WASHINGTON, DC 20306–6000

REPLY TO
ATTENTION OF

12 February 1997

2567116-5 00
ANIMAL, PINNEPED WALRUS
RI960020 T
TPL/LAM/BHS/mab

Joel Garlich-Miller
U.S. Fish and Wildlife Service
Marine Mammals Management Field Office
1011 E. Tudor Road
Anchorage, AK 99503

AFIP DIAGNOSES:

RI960020 1. Liver: Cholangiohepatitis, lymphoplasmacytic, chronic, multifocal, mild to moderate, with biliary hyperplasia, Pacific walrus (*Odobenus rosmarus*), pinniped.
2. Kidney: Nephritis, interstitial, granulomatous and lymphoplasmacytic, multifocal, moderate.
3. Lung: Granulomas, multiple, few.
4. Liver, hepatocytes: Vacuolar change (glycogen type), diffuse, moderate.
5. Heart; artery; spleen; skeletal muscle: No significant lesions.

Comment: The lymphoplasmacytic inflammation in the liver probably represents residual inflammation from previous infection or parasitism. The most likely cause of the granulomatous inflammation in the kidney and lung is parasitism. Many hepatocytes have changes characteristic of glycogen accumulation. This is a common finding in walruses and is probably a normal physiologic change in this species. None of the changes found in these tissues were likely to have affected the health of this animal at the time of death.

TPL lipscomb

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LuAnn McKinney, DVM, DACVP
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Division of Veterinary Pathology

DEPARTMENT OF THE ARMY
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WASHINGTON, DC 20306-6000

REPLY TO
ATTENTION OF

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FEB

27 January 1997

2567117-3 00
ANIMAL, PINNIPED WALRUS
R1960021 T GARLICH-MILLER
TPL/RBM/BHS/dvj

Joel Garlick-Miller
U.S. Fish and Wildlife Service
Marine Mammals Management Field Office
1011 E. Tudor Road
Anchorage, AK 99503

AFIP DIAGNOSIS:

RI960021 Kidney; heart; liver; urinary bladder; pancreas; skeletal muscle; spleen; lung: No significant lesions, Pacific walrus (*Odobenus rosmarus divergens*), pinniped.

Comment: Microscopic examination of the submitted samples revealed essentially normal tissues.

for Robert B. Moeller Jr., DVM, DACVP
LTC, VC, USA
Division of Veterinary Pathology

Thomas P. Lipscomb, DVM, DACVP
LTC, VC, USA
Chief, Division of Veterinary
Pathology

# United States Department of the Interior

FISH AND WILDLIFE SERVICE
Marine Mammals Management Field Office
1011 E. Tudor Rd.
Anchorage, Alaska 99503

IN REPLY REFER TO:
MMM

APR 25 1997

Dear Interested Party:

Enclosed is a copy of the "Round Island Walrus Hunt, 1996 Field Report." This report summarizes the results of walrus counts, behavioral observations, biosampling, and harvest success during the 1996 fall monitoring period. For additional copies of this report, please contact:

Marine Mammals Management
U.S. Fish and Wildlife Service
1011 East Tudor Road
Anchorage, Alaska 99503
(907) 786-3800

Thank you for your interest in walrus conservation.

Sincerely,

Steven Rice
Biological Technician

Enclosure