OCS Study
BOEM 2016-053

Pinniped Movements and Foraging

Village-Based Walrus Habitat Use Studies in the Chukchi Sea – Final Report

U.S. Department of the Interior
Bureau of Ocean Energy Management
Alaska Region
www.boem.gov

OCS Study
BOEM 2016-053

OCS Study
BOEM 2016-053

Prepared under BOEM Contract M09PC00027

Pinniped Movements and Foraging:

Village-Based Walrus Habitat Use Studies in the Chukchi Sea

Authors

Lori T. Quakenbush
Justin A. Crawford
John J. Citta
Mark A. Nelson

Prepared under BOEM Contract
M09PC00027
by
Alaska Department of Fish and Game
P.O. Box 25526
Juneau, Alaska 99802-5526

Published by
U.S. Department of the Interior
Bureau of Ocean Energy Management **Anchorage, Alaska**
Alaska Outer Continental Shelf Region **June 2016**

DISCLAIMER

Study concept, oversight, and funding were provided by the U.S. Department of the Interior, Bureau of Ocean Energy Management, Environmental Studies Program, Washington, DC under Contract Number M09PC00027. This report was prepared under contract between the Bureau of Ocean Energy Management (BOEM) and the Alaska Department of Fish and Game. This report has been technically reviewed by BOEM, and it has been approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of BOEM, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

REPORT AVAILABILITY

This report may be downloaded from the boem.gov website through the Environmental Studies Program Information System (ESPIS) by referencing OCS Study BOEM 2016-053. It is also available from the Alaska Department of Fish and Game website adfg.alaska.gov. You will be able to obtain this report also from the National Technical Information Service in the near future. Here are the addresses. You may also inspect copies at selected Federal Depository Libraries.

U.S. Department of the Interior
Bureau of Ocean Energy Management
Alaska Region
Environmental Studies Section
3801 Centerpoint Dr. Suite 500
Anchorage, AK 99503-5823
Telephone requests may be placed at
(907) 334-5200
Fax: (907) 334-5242

U.S. Department of Commerce
National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161
Phone: (703) 605-6040
Fax: (703) 605-6900
Email: bookstore@ntis.gov

CITATION

Quakenbush, L. T., J. A. Crawford, J. J. Citta, M. N. Nelson. 2016. Pinniped movements and foraging: village-based walrus habitat use studies in the Chukchi Sea. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Alaska Outer Continental Shelf Region, Anchorage, AK. OCS Study BOEM 2016-053. 82 pp + appendices.

The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the sound use of our land and water resources, protecting our fish, wildlife and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island communities.

The Bureau of Ocean Energy Management

The Bureau of Ocean Energy Management (BOEM) works to manage the exploration and development of the nation's offshore resources in a way that appropriately balances economic development, energy independence, and environmental protection through oil and gas leases, renewable energy development and environmental reviews and studies.

Project Organization Page

Authors:

Lori T. Quakenbush (M.S.) is a Wildlife Biologist IV and Program Leader for the Arctic Marine Mammal Program within the Alaska Department of Fish and Game. Her role in this project was that of Principal Investigator and Project Manager and her activities included coordination, communication, contracting, permitting, tagging, presentations, traditional knowledge interviews, report writing, and manuscript preparation.

Justin A. Crawford (M.S.) is a Wildlife Biologist II for the Arctic Marine Mammal Program within the Alaska Department of Fish and Game. His role in this project was that of Principal Investigator and his activities included coordination, tagging, data management, archive, analysis, map production, and report and manuscript preparation.

John J. Citta (PhD.) is a Biometrician II with the Arctic Marine Mammal Program within the Alaska Department of Fish and Game. His role in this project was assistance with data management, analysis, and report, and manuscript preparation.

Mark A. Nelson (M.S. candidate) is a Fish and Wildlife Technician V for the Arctic Marine Mammal Program within the Alaska Department of Fish and Game. His role in this project was assistance with tagging and documentation of traditional knowledge.

Key Project Personnel:

Mikkel Jensen is an Industrial Designer within his Denmark-based company called Mikkel's Vaerkstad. He is an expert in walrus and bowhead whale tag anchor and deployment systems and his role in this project was to manufacture and attach tag anchors and provide tag deployment equipment.

Henry P. Huntington is a social scientist within his Alaska-based company called Huntington Consulting. He is an expert in traditional knowledge and arranged and conducted traditional knowledge interviews, and assisted in report and manuscript preparation.

Clarence Irrigoo, Perry Pungowiyi, and Edwin Noongwook are Alaskan subsistence walrus hunters who were key participants as walrus taggers. They also educated research crews regarding walrus behavior and sea ice conditions.

Willard Neokok, Warren Harding Lampe, and Leo Ferrero III are subsistence hunters and residents of Pt. Lay who were key participants as stewards of the terrestrial haulout. They accompanied researchers and assisted with erecting remote camera towers to minimize disturbance to walruses. They also conducted beach surveys for haulout sites and carcass surveys.

Table of Contents

List of Figures

List of Tables

List of Appendices

Appendix F-11. Crawford, J. A., L. T. Quakenbush, J. J. Citta, C. Irrigoo Jr. and P. R. Lemons. 2015. Using movement, diving and haul out behavior to identify the relative importance of foraging areas for walruses in the Alaskan Chukchi Sea. 21th Biennial Conference on the Biology of Marine Mammals. 14–18 December, 2015. San Francisco, CA, USA. (Abstract and oral presentation).

Appendix F-12. Crawford, J. A., L. T. Quakenbush, J. J. Citta, C. Irrigoo Jr. and P. R. Lemons. 2016. Using movement, diving and haul out behavior to identify the relative importance of foraging areas for walruses in the Alaskan Chukchi Sea. Alaska Marine Science Symposium, 25–29 January, Anchorage, AK. (Abstract and poster).

Appendix G. Traditional Knowledge reports listed chronologically.

Appendix G-1. Huntington, H. P., M. Nelson, and L. T. Quakenbush. 2012. Traditional knowledge regarding walrus near Point Lay and Wainwright, Alaska. Report to the Eskimo Walrus Commission and the Bureau of Ocean Energy Management for contract #M09PC00027. 11 pp.

Appendix G-2. Huntington, H. P., and L. T. Quakenbush. 2013. Traditional knowledge regarding walrus near Point Hope, Alaska. Report to the Native Village of Point Hope, Alaska and Bureau of Ocean Energy Management for contract #M09PC00027. 9 pp.

Appendix G-3. Huntington, H. P., M. Nelson, and L. T. Quakenbush. 2015a. Traditional knowledge regarding walrus, ringed seals, and bearded seals near Barrow, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015. 8 pp.

Appendix G-4. Huntington, H. P., M. Nelson, and L. T. Quakenbush. 2015b. Traditional knowledge regarding ringed seals, bearded seals and walrus near Elim, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015. 7 pp.

Appendix G-5. Huntington, H. P., M. Nelson, and L. T. Quakenbush. 2015c. Traditional knowledge regarding ringed seals, bearded seals, and walrus near St. Michael and Stebbins, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015. 7 pp.

Appendix G-6. Huntington, H. P., M. Nelson, and L. T. Quakenbush. 2016a. Traditional knowledge regarding ringed seals, bearded seals, and walrus near Kivalina, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015. 8 pp.

Appendix G-7. Huntington, H. P., M. Nelson, and L. T. Quakenbush. 2016b. Traditional knowledge regarding ringed seals, bearded seals, and walrus near Kotzebue, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015. 11 pp.

Appendix G-8. Huntington, H. P., M. Nelson, and L. T. Quakenbush. 2016c. Traditional knowledge regarding ringed seals, bearded seals, and walrus near Shishmaref, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015. 8 pp.

Executive Summary

Working cooperatively with the Eskimo Walrus Commission and walrus hunters from Alaskan coastal communities, we designed a study to deploy satellite transmitters and conduct counts, carcass surveys, and observations on haulouts that are encountered near villages in spring and fall. During the seven years (2009–2016) of this study titled, "*Village-Based Walrus Habitat Use Studies in the Chukchi Sea,"* we combined satellite-linked transmitter technology and the traditional knowledge and skills of Native subsistence walrus hunters to greatly increase our understanding of walrus movements and behavior. Satellite-linked transmitters placed on walruses provided information on movements, speed of travel, feeding areas, and haulout behavior. We documented intensive summer use of Chukchi Lease Sale Area 193, especially Hanna Shoal by female walruses with calves-of-the-year and females without calves. Local and traditional knowledge was documented at Point Lay, Point Hope, Wainwright, Barrow, Elim, and St. Michaels/Stebbins to further our understanding of walrus behavior and how it may be changing. This final report covers 2009–2016 and includes satellite tracking 82 walruses in the Bering, Chukchi, and Beaufort seas, terrestrial haulout surveillance, carcass surveys, necropsies and documentation of traditional knowledge. Activities were coordinated with the Eskimo Walrus Commission, North Slope Borough, U.S. Fish and Wildlife Service (USFWS), U.S. Geological Survey (USGS), and the villages of Barrow, Wainwright, Point Lay, Point Hope, Wales, Little Diomede, Gambell, and Savoonga.

We found that walruses migrating north with the receding sea ice were not limited to the marginal ice zone but traveled deep into the ice. Walruses migrated on both the U.S. and Russian sides of the Chukchi Sea, generally staying closer to shore (average 100 km, 62 miles) as they migrated north in June, and progressively moved farther from shore in the Chukchi Sea during July (average 119 km, 74 miles), August (average 138 km, 86 miles), and September (average 171 km, 106 miles).

The Hanna Shoal Walrus Use Area (HSWUA) is known to be important for walruses (Jay *et al.* 2012) and 59% of the walruses we tagged spent time there, presumably to forage. The average arrival date was 30 June and departure was 2 August. Prior to arriving in the HSWUA they traveled 49.5 km/day (30.7 miles/day), once within the area, however, travel rates slowed to about half that (25.7 km/day, 16.0 miles/day).

Females hauled out on ice a higher proportion of time when in Hanna Shoal than when in coastal foraging areas near Icy Cape. Specifically, haulout percentages of females with calves in Hanna Shoal were higher than females with calves near Icy Cape and higher than females with calves in the rest of the Chukchi Sea, as well as higher than females without calves in all areas. Haulout percentages were also highest during the day (0900–2000). For all females, dive duration was longest and dive rate was lowest in Hanna Shoal than in the rest of the Alaskan Chukchi Sea.

Not all walruses used the terrestrial haulouts at Point Lay during their southward migration. During the times when walruses hauled out in large numbers near Point Lay, two of seven tagged walruses used the haulout, and only in 2015.

Introduction

Pacific walruses (*Odobenus rosmarus*) are an important subsistence and cultural resource for coastal people of western Alaska and they are an important component of the Bering and Chukchi seas ecosystem. Walruses winter together in the Bering Sea but females with calves and subadults summer in the Chukchi Sea feeding on the sea floor in water less than 100 m and using sea ice as a resting platform; most adult males remain in the Bering Sea where they use terrestrial haulouts for resting. When the ice edge retreats too far north of the continental shelf it is no longer useable for resting between feeding bouts because the water is too deep for feeding. The rapid retreat of sea ice in recent years is changing walrus summer habitat in the Chukchi Sea and may be changing summer distribution and hauling out behavior, requiring that walruses haul out on land instead of ice. These ice conditions may require that females with calves and subadults feed near terrestrial haulouts, which may cause nearby feeding areas to be depleted and disturbance events on terrestrial haulouts can cause increased calf mortality. Walruses on ice floes can quickly get to deep water when disturbed, but on large land haulouts disturbances may lead to stampedes that cause calves and subadults to be trampled as the larger animals run over them to get to water. Polar bears congregate at terrestrial haulouts and can cause stampedes for the opportunity to prey on injured calves. Thus, the changes in the extent and duration of the sea ice in summer may be changing the distribution of females, calves, and subadults. For example, females with young calves may need to remain close to shore where calves can haul out to rest.

Due to these concerns walruses were petitioned for listing under the Endangered Species Act (ESA) in 2008. In 2011, although the population was not believed to be in decline, listing was determined to be warranted but precluded by other more urgent listing needs and the Pacific walrus was delegated as a candidate species. Court settlements have dictated that the Pacific walrus must either be listed under the ESA or removed as a candidate species by 2017. Concomitant with rapidly retreating summer sea ice, oil and gas activity increased in the Chukchi Sea until 2015 adding to the importance of understanding walrus movements, feeding areas, and habitat requirements necessary to plan lease sales, permit development activities, and design effective mitigation measures for better conservation and management of the species, however, substantial oil and gas activities in the near future appear unlikely.

During the seven years of this study (2009–2016) we learned about the movements and behavior of walruses during summer in the Chukchi Sea, including the amount of time spent in the Chukchi Lease Sale Area 193, which includes Hanna Shoal. We also learned about diving and hauling out behavior of adult females, both those with calves and those without calves, during a period of diminishing sea ice.

Goals and Objectives

This study was designed to work in close-cooperation with Native Alaskan subsistence hunters to deploy satellite-linked transmitters, conduct observations, document traditional knowledge regarding walruses, and to integrate our findings with concurrent research on walruses and other marine mammals in the Chukchi Sea Lease Sale area.

***Objective 1*:** Estimate patterns of movement and behavior of walruses migrating to and moving within the Chukchi Sea Planning Area. Particular emphasis will be placed on estimating movements within industrial ship traffic lanes and between terrestrial haulout sites and feeding areas near Hanna Shoal and other potential oil and gas development sites.

***Objective 2*:** Estimate and evaluate the effect of any changes in walrus behavior related to changes in ice coverage and ice quality in the Chukchi Sea.

Objective 3: Estimate walrus use of terrestrial haulouts by demographic class and estimate the duration of occupancy as related to weather, disturbance, and other potential factors.

Objective 4: Create a database of traditional knowledge of walrus behaviors including, but not necessarily limited to, movements, social behavior, and use of habitat including use of ice and land as haulout substrates.

Methods

Coordination

Meetings, workshops, other communication. Meetings with the Eskimo Walrus Commission (EWC), walrus hunters, Point Lay Community, U.S. Fish and Wildlife Service (USFWS), and U.S. Geological Survey (USGS) have been fundamental to this tagging project. We also co-sponsored and participated in the "Adapting to Climate Change: A Community Workshop on the Conservation and Management of Walruses on the Chukchi Sea Coast" held in Barrow in 2012 (Appendix A).

Tag development and deployment

We researched satellite-linked transmitters (tags) available for use on walruses, including those used by USGS. We chose a system of deployment and attachment developed by Mads Peter Heide-Jørgensen and Mikkel Jensen from the Greenland Institute of Natural Resources that has been used successfully with walruses in Alaska and Canada. These tags are manufactured by Wildlife Computers, Inc. and use the Argos system of satellites for data collection. Tags were deployed by crossbow with shafts modified for tag delivery. Crossbows were used to deploy tags only on adult walruses that were hauled out on ice or land. With the input of the walrus hunters, we developed a pole deployment system based on hunter harpoon methods to deploy tags on walruses that were either swimming at the surface of the water or were hauled out on sea ice. The pole was thrown (harpoon style) to tag walruses at a distance of 2–4 m.

We used two types of tags; 1) SPLASH tags (Model: SPLASH10, Dimensions: 5.5 x 3.0 x 2.5 cm) that provide both location and dive data and 2) SPOT tags (Models: SPOT5 during 2010–2014, 4.5 x 3.0 x 2.3 cm and SPOT6 during 2015, 5.2 x 3.0 x 2.0 cm) that provide location and haulout behavior (i.e., time wet and dry). Both tag types were mounted on top of a stainless steel shaft (7 cm long). The shaft has a cutting head and petal combination on the bottom (Fig. 1). The cutting head is designed to cut through the tough skin upon deployment and the petals are to impede the transmitter shaft from working out of the skin and blubber. The transmitter sits on top of the skin and serves as a stop during deployment. A (17 cm long) antenna wire protrudes

from the top of the transmitter. The SPOT tags and shaft weighed 49 g in air, and the SPLASH tags and shaft weighed 63 g.

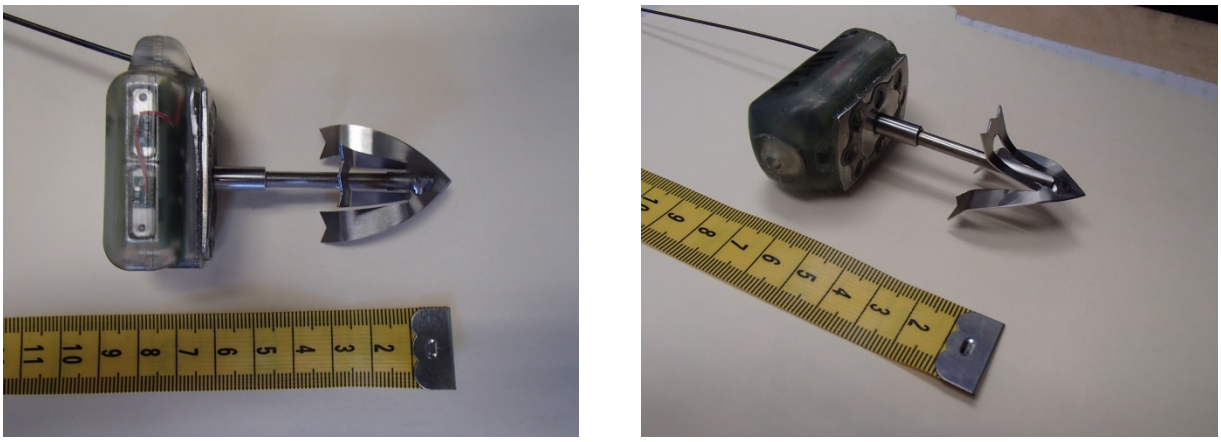


Figure 1. Satellite transmitter (Wildlife Computers SPOT tags) mounted on stainless steel shaft and cutting head and petals (made by Mikkel Jensen) used for tagging walruses. Ruler is in cm.

We attempted to minimize disturbance to non-target animals during all activities (e.g., see 2013 Research Permit Report, Appendix B). Walruses on the ice were approached very slowly from small boats with outboard motors. Walruses hauled out on land were approached from downwind by a person crawling on their stomach. Tagging and biopsy activities were not attempted on groups larger than 300 walruses to minimize injury from potential stampedes.

During 2010, we deployed two SPOT tags that were set to attempt 175 transmissions per day. Given that tags on walruses rarely transmit for more than a few months this limit was too conservative. For the remainder of the study, SPLASH and SPOT tags were set to attempt 250 transmissions per day. Tags were set to transmit all hours of the day and all days of the week; there was no "duty cycle" or "dead time." Tags only send data when at the surface and more than one transmission is required by Argos satellites to calculate a location. The number of transmissions received from tags was variable and likely dependent upon the position of the tag on the walrus (e.g., along the mid-line versus lower on the shoulder) in addition to the tag settings.

The SPLASH tags transmitted dive data in compressed and simplified histogram form, as well as more detailed dive information. Specifically, SPLASH tags collect the following forms of dive and haul out data:

1) *Maximum Dive Depth* data are a collection of accumulated dive depths during a 6-hr period. These histograms (DEPTH) tally the number of dives where the maximum depth recorded falls into pre-determined ranges or bins (0–5 m; 5–10 m; 10–20 m; 20–30 m; 30–40 m; 40–50 m; 50–60 m; 60–70 m; 70–80 m; 80–90 m; 90–100 m; 100–110 m; 110–120 m; and > 120 m).
2) *Dive Duration* data are a collection of accumulated dive durations during a 6-hr period. These histograms (DURATION) tally the number of dives where the dive duration of each recorded dive falls into pre-determined ranges or bins (0–2 mins; 2–

4 mins; 4–6 mins; 6–8 mins; 8–10 mins; 10–12 mins; 12–14 mins; 14–16 mins; 16–18 mins; 18–20 mins; 20–22 mins; 22–24 mins; 24–26 mins; and > 26 mins).

3) *Time-At-Depth* data are a collection of accumulated times the walrus spent at specific water depths during a 6-hr period. These histograms (TAD) store the data into pre-determined ranges or bins (0–5 m; 5–10 m; 10–20 m; 20–30 m; 30–40 m; 40–50 m; 50–60 m; 60–70 m; 70–80 m; 80–90 m; 90–100 m; 100–110 m; 110–120 m; and > 120 m).
4) *Hourly Timelines* summarize the proportion of each hour the tag reported being out of the water and dry (at the surface and dry or hauled out; PERCENT). A minute was classified as "dry" if the tag was dry for the entire minute. SPOT tags also collected these data.
5) *Dive Behavior* records the maximum depth and duration of a dive, along with its general shape. A walrus needed to go below 2 m for the behavior to be considered a dive. Possible dive profile shapes include "square," "V," or "U" shapes. This setting also records how much time is spent at the surface between dives.
6) *Dry-Deep-Neither* data classify the dominant behavioral state of the walrus for each hour and duplicated the chronologies of hourly haul-out and foraging state data collected by USGS. We collected this so that we could increase data available for USGS analyses. An hour was classified as "dry/hauled out" if the tag measured dry (out of the water) for more than 90% of the hour. An hour was classified as deep ("foraging") if it was deeper than 10 m for more than 50% of the hour. Otherwise the hour was classified as neither. The depth sensor was set to sample pressure every 1 second.

Genetic Samples

For our study, skin samples were only needed if sex was not evident from physical morphology. We collected a skin biopsy during tag deployment only when DNA was necessary to determine sex of the tagged walrus. Biopsy tips (manufactured by CETA-DART, Denmark) were a 2.5 cm-long, hollow, stainless steel cylinder, 0.6 cm diameter with internal barbs to retain the sample. When tagging with the crossbow, a biopsy was collected using a replaceable biopsy tip on a separate arrow shaft with a float and a retrieval string. When tagging with the pole system a replaceable biopsy tip was mounted next to the bolt holding the satellite transmitter. Penetration depth was controlled by a stopper on the plastic projectile when using the crossbow and by a plastic backing that holds the transmitter onto the pole. Skin biopsies from tagged walruses were provided to USFWS for their genetic mark-recapture study. If needed, DNA was extracted and analyzed to determine sex by genetics experts at the National Marine Fisheries Service, Southwest Fisheries Science Center and then archived.

Mapping

To keep all interested parties informed of the project and share the movements of any tagged walruses, we produced weekly maps and sent them to an extensive mailing list that included many subsistence hunters as well as agency and oil company personnel. ArcMap version 10.2 (ESRI Inc. 2012) was used for all mapping. We also created annual animations that depicted

daily walrus locations and sea ice concentrations throughout the monitoring period each year. The maps and information about the project are also posted at the Alaska Department of Fish and Game's (ADFG) website:
http://www.adfg.alaska.gov/index.cfm?adfg=marinemammalprogram.walrustracking

In addition to the general maps that included all tagged walruses and their movements, beginning in 2014, we also provided more detailed maps of tagged walruses in the active oil and gas lease areas near Hanna Shoal at the request of BOEM for weekly meetings with industry and agencies.

Movement and Dive Analyses

This report includes descriptive and quantitative analyses of walrus movements and behavior in the Chukchi Sea, from June through October, including their specific use of the Hanna Shoal Walrus Use Area (HSWUA; Jay *et al.* 2012; Fig. 2). These analyses include movement rates, distance from shore, density estimates highlighting high use and potentially important foraging areas, and haulout and diving behavior.

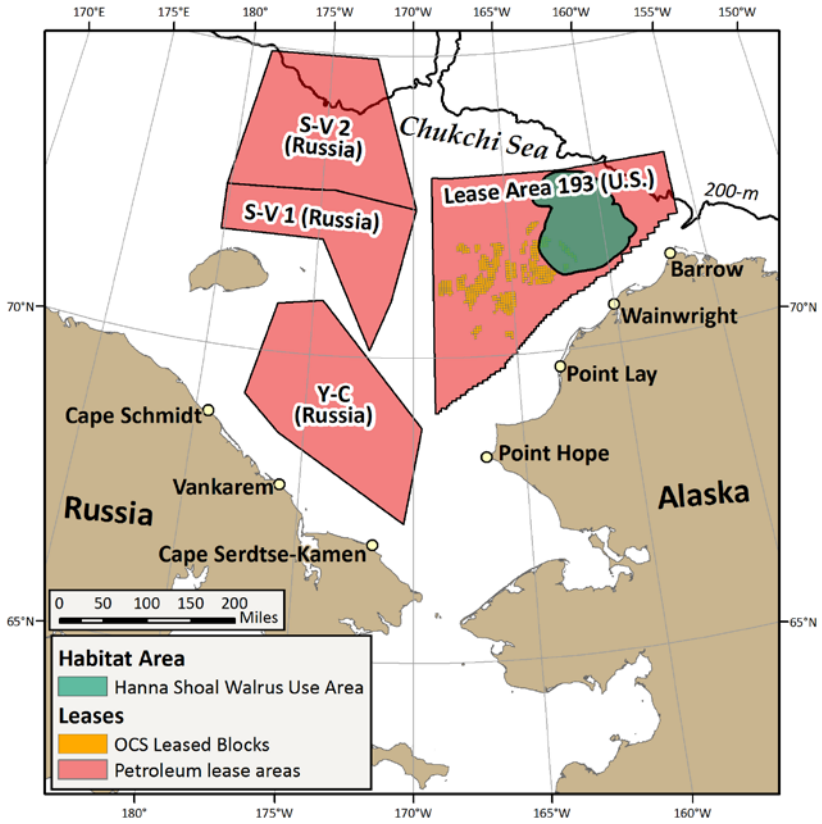


*Figure 2. Map of the Chukchi Sea with active U.S. and proposed Russian petroleum exploration/development lease areas (red), and Outer Continental Shelf (OCS) leased blocks (orange). Russian petroleum areas include: Severo-Vrangelevskiy 1 (S-V 1), Severo-Vrangelevskiy 2 (S-V 2), and Yuzhno-Chukotsky (Y-C). The Hanna Shoal Walrus Use Area, recognized as an important foraging area for walruses was delineated by Jay et al. (2012) using utilization distributions of tagged walruses from June through September, is also shown (green). (** OCS Leased Blocks associated with Chukchi Sea Lease Sale 193 were active during the study period; all but one lease block has been relinquished as of May 2016).*

Data Management and Location Processing

Location data were collected using the Argos system (Harris *et al.* 1990) and a copy of the raw data has been archived at ADFG in Fairbanks, Anchorage, and Juneau. Metadata, raw data files, and processed data files are archived on the State of Alaska web server. On this server (WinfoNet), we have an archival application specifically for the storage of data and the creation of metadata. The server is backed-up daily and cached in Fairbanks, Anchorage, and Juneau. Processed locations were imported into a geographic information system (ArcMap or R) for analysis. Location error was estimated by the Argos system and characterized by "location classes" (see the Argos User's Manual for a complete description; available online from argos-system.org/manual/). Location qualities provided by Argos include B, A, 0, 1, 2, and 3 with 3 representing the highest quality and most accurate position.

To determine which locations to use for analyses we used a speed-distance-angle (SDA) filter (Freitas *et al.* 2008) in R version 3.1 (Package argosfilter) to remove less accurate locations. Walrus locations that resulted in swim velocities of >2.77 m/s (Udevitz *et al.* 2009) were removed unless they were within 5 km of the previous location. The angular component of the filter is used to remove locations with a high degree of location error that fall far from the line of travel, but still within the threshold velocity. These locations are essentially outliers and they create "spikes" or acute deviations in the line of travel (e.g., Keating 1994, Freitas *et al.* 2008). For location *i*, this deviation is measured as the angle between locations *i*-1, *i*, and *i*+1. We used the default settings within the Freitas *et al.* (2008) filter; i.e., within 2.5 km of the track line, locations resulting in angles <15° were removed and locations between 2.5 and 5 km of the track line were removed if they resulted in angles <25° (see the manual for Package 'argosfilter' for more detail, available online at cran.R-project.org). We then removed locations that fell on land to establish the final set of locations used to determine walrus movements and areas of concentrated use.

For specific analyses, we also used a continuous-time, correlated random walk, state-space model to estimate the true locations and provide a single daily estimated location (Johnson *et al.* 2008) in R version 3.1 (Package crawl). In effect, the true location can be treated as an unknown variable and statistically estimated. The advantage of this technique is that all locations can potentially be used, regardless of location quality, and the estimated locations are more accurate than the raw data. Estimated locations of walruses were then used for analyses.

Movement Behavior of Tagged Walruses

We describe the seasonal movements of walruses in the Chukchi Sea during June through October. Because it is likely that walruses spend more time in higher quality foraging areas during summer, we compared movement rates and descriptive statistics of walruses in the HSWUA (Fig. 2) with the rest of the Chukchi Sea. We used all locations retained by the SDA filter in ArcMap 10.2 (ESRI Inc. 2012) to calculate minimum distances traveled and rates of travel (km/day). We recognize that rates of travel using Argos locations may be biased due to location error and gaps in data that result in failure to capture complete animal movements (i.e., rates of travel are likely underestimated for walruses with fewer locations). Therefore, distances traveled and rates of travel are minimum estimated values. We investigated whether movement rates differed by reproductive category (females with calves versus females without calves), area of use (whether the walrus was located in the HSWUA or in the rest of the Chukchi Sea), and

year using a linear mixed model and SAS software, version 9.3 (SAS Institute, 2010; PROC MIXED). We also investigated whether the distance walruses were from shore changed while they were in the Chukchi Sea. For each walrus, we determined the distance between the daily estimated location from the correlated random walk, state-space model (Johnson *et al.* 2008) and the nearest shoreline in ArcMap 10.2 (ESRI Inc. 2012). We then tested if distances to shore differed by reproductive category, month, and year using a repeated measures linear mixed model (PROC MIXED) and SAS software. We included month as a covariate because it represented the stage of migration in the Chukchi Sea. We did not include male walruses in our analyses of movement rates or distance to shore because our sample size was insufficient.

Density Estimates

We were interested in identifying high use areas within the Chukchi Sea, by month, during June–October when we had walrus locations. We counted the number of locations within each cell of a 50 x 50 km gridded matrix that covered the Chukchi Sea to estimate the scaled probability of a walrus being located within each cell. We used R software to count the number of daily estimated locations from the correlated random walk, state-space model (Johnson *et al.* 2008) for each walrus that were located within each 50 x 50 km cell. Counts were made for each month of walrus locations (June–October). Next, we calculated the probability of finding a location in each cell by dividing the count of locations in each cell by the total number of locations. Finally, we estimated density contours, scaling the probability of finding a location in each cell by dividing the probability of finding a location in each cell by the overall maximal cell probability. Density contours were mapped in ArcMap 10.2.

Haulout and Diving Behavior

We investigated the haul out and dive behavior for female walruses while they were in the Chukchi Sea to determine if their behaviors differed by location or their reproductive category (i.e., whether or not the female had a calf of the year when tagged). The dive and haul out data collected by the tags (see *Tagging* section above) were organized into 6 and 24 hour histograms, respectively, and regularly did not have a location associated with them. Therefore, we used the correlated random walk, state-space model (Johnson *et al.* 2008) to estimate locations to match the time stamp of the haul out (every 24 hrs) and dive (every 6 hrs) data for each walrus (see *Movement Behavior of Tagged Walruses* section above). Next, we calculated density estimates (see *Density Estimates* section above) from the estimated haul out and dive locations and used estimates of 90% probability to identified potentially important foraging areas.

We were interested in the following behavior parameters: time hauled out (the proportion of an hour the walrus was hauled out (*Hourly Timelines*)), dive duration (*Dive Duration*), and dive rate (number of dives per hr). We calculated dive duration indices (used as response variables and derived from the data in the DURATION histograms) for each 6-hr histogram to allow statistical analyses and interpretation (Folkow and Blix 1999, Folkow *et al.* 2004; 2010).

$$Index_{Duration} = \sum (f_i M_i)$$

f_i : Proportion of dives assigned to the duration bin i,

M_i: Median duration value of bin i.

We defined the diving rate for each 6-hr histogram as the total number of dives in DEPTH Bins 2 through 14 divided by 6 hours. Although the depth resolution of the tags was small (±0.5 m), we excluded Bin 1 (0–2 m) to define a "dive" as >2 m to eliminate issues of wave height and near-surface behavior that are not likely to be related to foraging (Hastings *et al.* 2004, Folkow *et al.* 2010).

We used a linear modeling framework to examine haul out and dive parameters. For each parameter of behavior, we used model selection to examine the relationship between the behavior and reproductive category (females with calves versus females without calves), the area of use (whether the walrus was in an area identified as a potentially important foraging area or the rest of the Chukchi Sea), and time of day using a repeated measures, linear mixed model and SAS software, version 9.3 (SAS Institute, 2010). Time hauled out is proportional data (the proportion of an hour the walrus was hauled out), bound by 0 and 1, therefore we modeled these data using a logit link and a beta distribution as appropriate for proportional data with PROC GLIMMIX in SAS. We modeled dive duration and rate with PROC MIXED in SAS. To account for autocorrelated haul out and dive behavior and unequal time spacing among repeated measures within individuals, we used a spatial power covariance matrix structure (SP(POW)). For model selection, we fit repeated-measures mixed models with the REML method for estimating variances, and used a backward elimination procedure that sequentially eliminated statistically non-significant variables ($P > 0.05$) until only statistically significant variables remained ($P < 0.05$).

Analysis of Time Spent Within Program Areas

We used all telemetry data collected between 2010 and 2015 to quantify when tagged walruses were present within petroleum areas. Transmitter locations were filtered as described above. When calculating the number of calendar days that walruses transmitted within various oil and gas exploration/lease areas we pooled all study years (i.e., 1 July 2013, 2014, and 2015 are all simply "1 July"). Although pooling across years provides a more general understanding of when walruses might be located within a petroleum area, it removes the ability to detect annual variability. Tags were deployed in May and June and few tags lasted longer than three months. Therefore documenting the range of days that walruses were present within an area will be a minimum because many tags likely went off the air while walruses were still in those areas. We examined walrus use of the following program areas (Fig. 2):

1. Alaskan Chukchi Sea: All of Lease Sale Area 193.
2. Russian Chukchi Sea: Russia's main oil and gas company, Rosneft, recently signed an agreement with ExxonMobil to explore three areas for liquefied natural gas (LNG) reserves (Appendix C). These areas include Severo-Vrangelevskiy 1, Severo-Vrangelevskiy 2, and Yuzhno-Chukotsky (Fig. 2).

Haulout Activities

Locate terrestrial haulouts

Traveling by boat, walrus hunters located terrestrial haulouts near their villages as they occurred so that they could be protected from disturbance. They reported the location and estimated number of animals to USFWS. Surveillance equipment (spotting scopes, blinds, cameras, and GPS units) was used to monitor numbers, determine the general sex and age composition, and

identify animals that may be sick or injured. Hunters escorted researchers to and from the haulout and provided polar bear protection. Additionally, this project supported walrus hunters who assisted the Alaska SeaLife Center in the construction and maintenance of camera towers at walrus haul outs near Point Lay. Camera towers were designed to house cameras to document the formation, composition, and persistence of the terrestrial haulout and record causes and results of disturbances.

Carcass surveys

To quantify the number of walruses that died at haulouts and document their condition, the hunters also surveyed the beach after the walrus herd left the haulout. To avoid causing stampedes, carcass surveys were only conducted if they would not cause disturbance to the walrus herd. The hunters examined each carcass looking for signs of trauma such as tusk punctures, bullet wounds, broken bones, bruising, and blood from the nose and mouth. A data sheet was filled out for each carcass (Appendix D). Body length (straight line length from the nose to the tail tip) and blubber thickness (midline between the fore-flippers over the sternum) measurements were taken, sex was determined, and age was estimated by body size or tusk length (Fig. 3). Each carcass was photographed and marked with a durable numbered tag so that it did not get sampled more than once. These data were shared with USFWS.

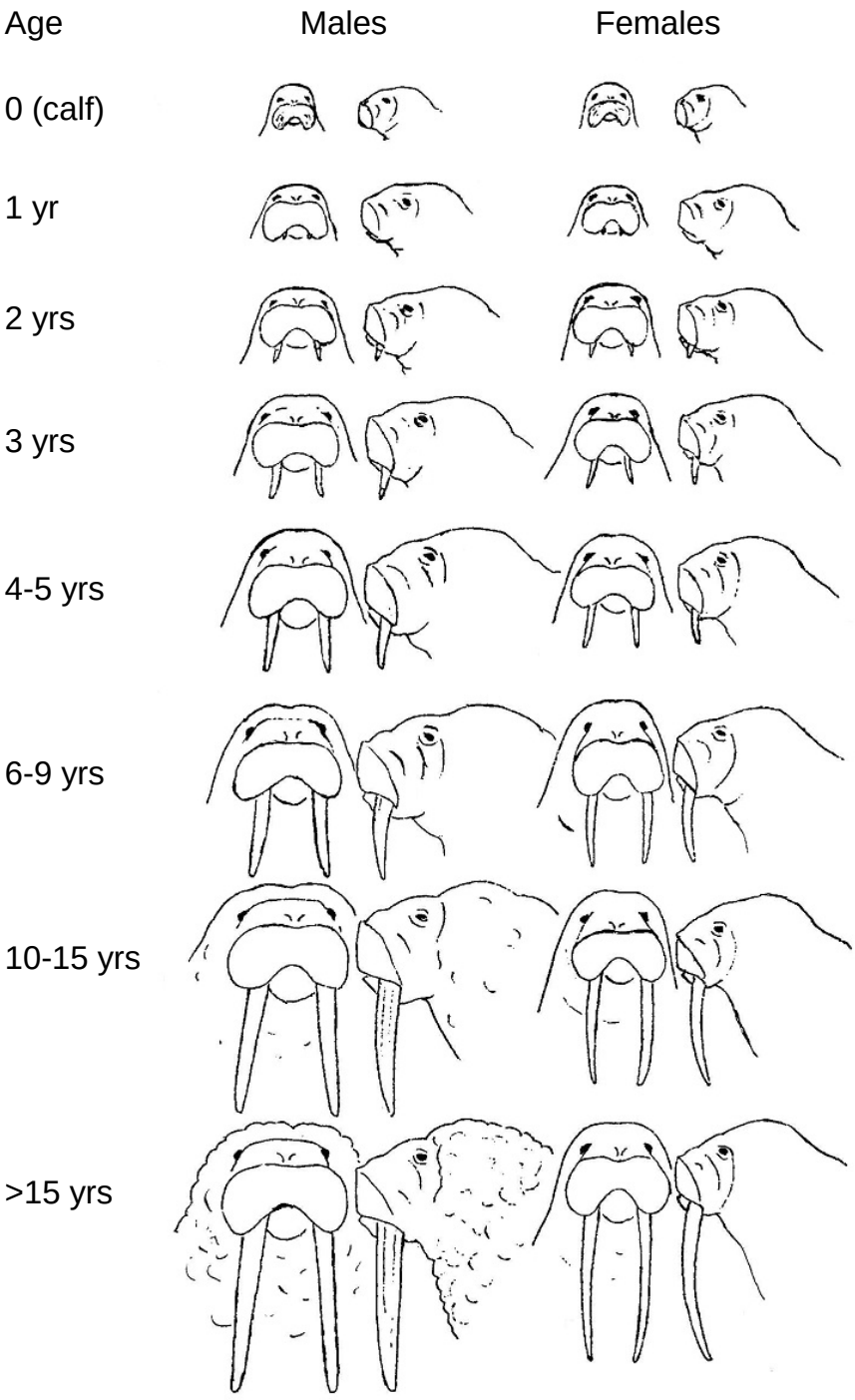


Figure 3. Average facial characters of walruses by sex/age classes used to classify tagged walruses. Age classification is based primarily on tusk size in relation to the width and height of the snout (Fay et al. 1986; Fay and Kelly 1989, published in Citta et al. 2013).

Local and Traditional Knowledge
Walrus hunters contributed local and traditional knowledge regarding walrus movements, timing of migration, and haul out behavior. Hunters shared their experiences of how to approach walruses on land, and in the water, without being detected, and their observations were critical to this study. Hunters also know when and where to look for walruses and how to approach them on the ice. We worked with EWC to identify walrus hunters with extensive knowledge that were interested in the project.

To collect local and traditional knowledge, interviews were conducted by Dr. Henry Huntington, a social scientist with experience in local and traditional knowledge studies and assisted by PI Quakenbush and by Mark Nelson. We used the same methods as those used by Noongwook *et al.* (2007); specifically, the semi-directive interview as described by Huntington (1998). Unlike Noongwook *et al.* (2007), however, our interviews were with one or two persons at a time, as well as with larger groups. In the semi-directive interview, researchers initiate a discussion around various topics of interest, but allow the person being interviewed to determine the order in which topics are discussed and to make connections among various topics that the researchers might not have anticipated. The interview is more fluid than would be a standardized questionnaire.

The persons interviewed were recommended by each community's representative to the EWC or by another participant's recommendation. The interviews were conducted in English, as all participants were comfortable in that language; occasionally terms were translated by participants for clarification. We brought maps of the region and local area and had participants draw walrus movements, haulouts, and other information directly on the maps, as they were being discussed during the interviews, to ensure that we accurately interpreted what was being described. We also recorded other information in notebooks. After information from the interviews was compiled, a draft report with annotated maps was sent to the interviewees to comment on for accuracy and for approval.

Safety
Safety plans were specific for each area and tagging effort. We purchased safety equipment and trained participants in its use. Safety equipment included Mustang floatation suits, waterproof marine VHF handheld radios, satellite phones, personal satellite-linked locator beacons, and GPS units. Communication with a shore-base was coordinated prior to each trip.

Results

Coordination
We worked closely with EWC, local walrus hunters, USFWS, USGS, and BOEM. A chronology of the project history and accomplishments are included in Table 1. We maintained a webpage on the State of Alaska, Division of Wildlife Conservation website that explained the project and was updated weekly with a map of walrus movements (http://www.wildlife.alaska.gov/index.cfm?adfg=marinemammals.walrustracking). We also sent maps to an extensive list of interested entities including individual subsistence hunter, Village

Council Offices, EWC, USFWS, USGS, NSB (North Slope Borough), USCG (United States Coast Guard), and BOEM.

Table 1. Project history from July 2009 to June 2016.

Month	Year	Event
July	2009	Received contract from MMS (now BOEM). Submitted applications for research permits to USFWS and Animal Care and Use to ADFG.
September		Worked with USFWS and NSB to provide transportation for walrus hunters to conduct carcass surveys after a large (2,500–4,000) walrus haulout formed near Icy Cape and Wainwright. Gave project update to EWC Executive Committee in Anchorage. Purchased 15 satellite-linked transmitters. Received approved ADFG Animal Care and Use Protocol for walrus research.
October		Met with USFWS and USGS to discuss project during the 18th Biennial Conference of the Society for Marine Mammalogy in Quebec City, Canada.
December		Received research permit from USFWS to tag and biopsy walruses. Planned for travel to Pt. Hope, Pt. Lay, Wainwright, and Barrow in February to discuss monitoring terrestrial haulouts and tagging walruses.
January	2010	Submitted Annual Report to BOEM.
February		Traveled to Pt. Hope, Pt. Lay, Wainwright, and Barrow to discuss terrestrial haulouts and tagging activities as part of a visiting Chukotka hunter (Umpky Patrol) tour to share information about walrus and polar bear conservation (Appendix E).
June		Worked with hunters from Wales and Pt. Hope, but poor ice and weather conditions prevented tagging walruses.
September		Tagged two female walruses near Cape Lisburne (one with and one without a calf). Hunters from Pt. Lay monitored status of a large (25,000–35,000) walrus haulout near Pt. Lay and conducted carcass surveys.
October		Hunters from Pt. Lay on standby to conduct carcass surveys once herd left but a storm ended the haulout and washed the carcasses away. Submitted abstract for the Alaska Marine Science Symposium.
December		Provided a written project update to EWC in Anchorage (Appendix F-1).
January	2011	Poster presentation: *Results from village-based walrus studies in Alaska, 2010* at the Alaska Marine Science Symposium in Anchorage (Quakenbush et al. 2011; Appendix F-2). Submitted annual research permit report to USFWS.
March		Conducted traditional knowledge interviews in Pt. Lay and Wainwright.
June		Worked with hunters from Wales and Pt. Hope to tag but poor ice conditions and weather prevented tagging. Also tried to work with hunters from Little Diomede Island but travel to Diomede was restricted due to helicopter problems.
September		Pt. Lay hunters monitored ~22,000 walruses at the terrestrial haulout and conducted carcass surveys (Garlich-Miller et al. 2011; Appendix F-3).

October		Project update to EWC in Nome (oral update). Submitted abstract for the Alaska Marine Science Symposium.
November		Project update at hunter's meeting in Gambell and Savoonga.
January	2012	This study included in update to the Marine Mammal Commission on Arctic Marine Mammal research. Poster presentation: *Results from village-based walrus studies in Alaska, 2011* at the Alaska Marine Science Symposium in Anchorage (Crawford et al. 2012; Appendix F-4). Submitted annual research permit report to USFWS.
February		Co-sponsor of "A Community Workshop on the Conservation and Management of Walruses on the Chukchi Coast" workshop in Barrow (Garlich-Miller et al. 2012; Appendix A). Sponsored two hunters (Pt. Lay and Savoonga) to attend.
March		Provided project update to joint U.S.-Russian "Assessing Pacific Walrus Population Attributes from Coastal Haul-outs" workshop in Anchorage. Research permit amended to tag swimming walruses using "harpoon" method.
May		Worked with hunters to tag walruses near Little Diomede Island for three weeks but ice and weather conditions were unsafe until after walruses had migrated north of the island.
August		Worked with Pt. Lay to prepare for terrestrial haulout, reviewed traditional knowledge reports and provided update on the project and movements of tagged walrus. Supported Alaska SeaLife Center installing camera towers at walrus haulouts near Point Lay.
September		Pt. Lay hunters prepared to monitor haulout, but none occurred. Little Diomede Island hunters prepared to monitor haulout, conducted surveys for haulouts, but no haulouts occurred.
October		Conducted traditional knowledge interviews in Pt. Hope. Submitted abstract for the Alaska Marine Science Symposium.
November		Project update to EWC in Anchorage (oral update).
December		Final report on Pt. Lay and Wainwright traditional knowledge completed (Huntington et al. 2012; Appendix G-1).
January	2013	Poster presentation: *Results from village-based walrus studies in Alaska, 2012* at the Alaska Marine Science Symposium in Anchorage (Crawford et al. 2013; Appendix F-5). Submitted annual research permit report to USFWS.
February		Project update at hunter meetings in Gambell and Savoonga.
May		Cold water survival and tagging training for hunters participating in research cruise.
June		Tagged 34 walruses in Bering and Chukchi seas during walrus research cruise.
August		Trip to Pt. Lay to prepare for terrestrial haulout and update on project and tagged walrus movements. Supported Alaska SeaLife Center installing camera towers at walrus haulouts near Point Lay.
September		Included project in research summary for 40th Anniversary of the Environmental Studies Program, DOI, Anchorage, AK.

		Pt. Lay hunters monitored 2,000–10,000 walruses at the terrestrial haulout and conducted carcass surveys.
October		Submitted abstract for the Alaska Marine Science Symposium. Supported Alaska SeaLife Center maintenance of camera towers at walrus haulouts near Point Lay.
November		Final report on Pt. Hope traditional knowledge completed (Huntington and Quakenbush 2013; Appendix G-2).
December		Project update to EWC in Anchorage (Appendix F-6).
January	2014	Poster presentation: *Results from village-based walrus studies in Alaska, 2013* at the Alaska Marine Science Symposium (Crawford et al. 2014; Appendix F-7). Submitted research permit report to USFWS. Supported Alaska SeaLife Center maintenance of camera towers at walrus haulouts near Point Lay.
February		Project update presented at hunter meetings in Gambell and Savoonga.
April		Project end date extended to 30 June 2016 due to slow start with tagging. Coordination with USFWS and USGS for walrus research cruise.
May		Hunters in Gambell and Savoonga attempted to tag but were not successful due to ice conditions and weather.
June		Tagged 33 walruses in the Chukchi Sea during walrus research cruise.
August		Supported Alaska SeaLife Center installing camera towers at walrus haulouts near Point Lay.
September		Pt. Lay hunters monitored ~35,000 walruses at the terrestrial haulout and conducted carcass surveys.
October		Trip to Pt. Lay to assess carcasses, conduct necropsies, and collect samples from dead walruses (trampled) at the terrestrial walrus haulout north of the old village of Pt. Lay. In the field, we worked with NSB-DWM staff and Pt. Lay hunters (Appendix F-8). Submitted abstract for the Alaska Marine Science Symposium.
November		Supported Alaska SeaLife Center maintenance of camera towers at walrus haul outs near Point Lay.
December		Project update to EWC in Anchorage (Appendix F-8).
January	2015	Poster presentation: *Results from village-based walrus studies in Alaska, 2014* at the Alaska Marine Science Symposium (Crawford et al. 2015; Appendix F-9). Submitted research permit report to USFWS. Assisted with Alaska SeaLife Center's plans to erect camera towers for haulouts near Cape Lisburne.
February		Project update presented at hunter meetings in Gambell and Savoonga.
April		Project end date extended to 30 June 2016 due to slow start with tagging. Coordination with USFWS and USGS for walrus research cruise. Submitted abstract for the Society for Marine Mammalogy Conference.
May-June		Tagged 26 walruses in the Russian and U.S. Chukchi Sea during walrus research cruise.
August		Coordinated transfer of carcass surveys and haulout surveillance to USFWS due to end of BOEM project.

September		Pt. Lay had ~35,000 walruses on the terrestrial haulout.
October		Submitted abstract for the Alaska Marine Science Symposium.
December		Project update to EWC in Anchorage (Appendix F-10). Oral Presentation: *Using movement, diving and haul out behavior to identify the relative importance of foraging areas for walruses in the Alaskan Chukchi Sea* at the Society for Marine Mammalogy Conference (Crawford et al. 2015; Appendix F-11). Final report on Barrow traditional knowledge completed (Huntington et al. 2015a; Appendix G-3). Final report on Elim traditional knowledge completed (Huntington et al. 2015b; Appendix G-4). Final report on St. Michael and Stebbins traditional knowledge completed (Huntington et al. 2015c; Appendix G-5).
January	2016	Poster presentation: *Using movement, diving and haul out behavior to identify the relative importance of foraging areas for walruses in the Alaskan Chukchi Sea* at the Alaska Marine Science Symposium (Crawford et al. 2016; Appendix F-12).
February		Prepared manuscript on TEK including walrus TEK (Huntington *et al.* in press).
June		Final report on Kivalina traditional knowledge completed (Huntington *et al.* 2016a; Appendix G-6). Final report on Kotzebue traditional knowledge completed (Huntington *et al.* 2016b; Appendix G-7) Final report on Shishmaref traditional knowledge completed (Huntington *et al.* 2016c; Appendix G-8). Final Report

Tagging Walruses and Tag Performance

Our original goal was to tag walruses and work with hunters based from coastal villages. Our attempts to tag walruses included travel to Wales and Point Hope during 2010 and 2011, and travel to Little Diomede Island during 2012. In all three years, ice and weather conditions, primarily wind, near these coastal villages prevented safe travel by boat. Also, ice retreated north quickly, leaving no opportunities for tagging walruses. In 2012, we began exploring the option of ship-based tagging as part of multi-agency walrus research cruises with USFWS and USGS and started tagging walruses offshore, in the Bering and Chukchi seas in 2013, 2014, and 2015. We realized it would be important to the success of the research to have the expertise of the native subsistence hunters. Walrus hunters from Saint Lawrence Island, Clarence Irrigoo Jr. (2013–2015), Perry Pungowiyi (2013), and Edwin Noongwook (2014) taught the researchers how to approach most efficiently and safely with minimal disturbance to walruses.

Walruses have excellent hearing and are sensitive to noises, as well as to smells and movement, therefore approaching walruses on ice when they are resting is done quietly from downwind (Appendix G-1). Walruses are also sensitive to the type of noise and hunters say that speaking in a normal voice is less disturbing to walruses than whispering (Appendix G-3). The hunters know that walruses can be aggressive and can team up to attack small boats when disturbed from the ice (Appendices G-1 and G-3). Large herds and juvenile walruses can be especially dangerous to

people. Females are protective of their calves and hunters have been cautioned by elders about females with calves. Elders know of times when hunters butchering a walrus on an ice floe have been surrounded by other walruses that put their tusks on the ice and chipped away at it (Appendix G-1). It is this knowledge and experience that was used to determine how and which groups the small boats could safely approach for tagging and biopsies. At times the reason to avoid a certain group of walruses was not known by the researchers, but their advice was heeded.

Recently, because of less ice, hunters have begun to harpoon walruses in the water when they cannot find them on the ice (Appendix G-1). The hunters helped us develop a harpoon style tag deployment system based on their hunting method.

We tagged a total of 95 walruses during this study between 2010 and 2015 (Table 2). Two walruses were tagged onshore near Cape Lisburne in September 2010 and 93 were tagged offshore, in the Bering and Chukchi seas, during walrus research cruises in June 2013 and 2014 and May and June 2015 (Fig. 4). Of the 95 walruses tagged, 86 were adult females (39 of which were accompanied by calves of the year) and nine were adult males (Table 2). We tagged some males to see if they summered in the Chukchi Sea with the females and young walruses or if they returned to the Bering Sea and to generally compare their behavior to females.

Of the 95 tags deployed on walruses; 56 were SPLASH tags and 39 were SPOT tags. In September 2010 we deployed two SPOT tags on adult female walruses, one with a calf and one without, hauled out near Cape Lisburne. No tags were deployed during 2011 and 2012. The rest of the tags were deployed in May and June 2013–2015; we deployed 38 transmitters on adult females with calves (28 SPLASH and 10 SPOT tags), 46 on adult females without calves (28 SPLASH and 18 SPOT tags), and 9 on adult males (9 SPOT tags). Not all tags transmitted data; 13 (5 SPLASH and 8 SPOT) did not transmit any data or only transmitted data for <24 hours after deployment due to an error in the tags' software or for other unknown reasons (Table 3). Therefore, our dataset includes data from 34 of 38 adult females with calves (28 of 28 SPLASH and 6 of 10 SPOT tags), 40 of 46 adult females without calves (23 of 28 SPLASH and 17 of 18 SPOT tags), and 6 of 9 adult males (all SPOT tags).

Tag longevity did not differ among females with calves, females without calves, and male walruses or among deployment years ($P > 0.53$). SPOT tags (mean duration 69.8 days, range 1–134 days) did transmit, on average, 25.8 days longer than SPLASH tags (mean duration 44.0 days, range 4–67 days, $P < 0.01$). Overall, fewer than 5 tags transmitted after 15 September (Fig. 5).

In 2013, three tags were lost during deployment attempts due to the fitting between the deployment rod and tag loosening in cold temperatures. The fitting was tightened by using a fabric tape that broke upon impact and no other tags were lost. In 2014, two tags were lost during deployment. In 2015, the first five tags deployed did not transmit after the first day of deployment (30 May) due to an error in the tag software. We were able to obtain new software to upload onto the remaining tags. The tags with the new software functioned properly after deployment so we were able to deploy the remaining 26 transmitters.

Table 2. *Walruses instrumented with satellite-linked transmitters in the Bering and Chukchi seas in 2010, 2013, 2014, and 2015. Females with calves are noted by *. Tags that transmitted data for <24 hours after deployment due to an error in the tags' software or for other unknown reasons are noted by* [+].

Walrus Id	Date tagged	Latitude N	Longitude	Sex	Tag type	Tag duration (days)
W10-01	17-Sep-10	68.881	-166.194	F*	SPOT[1]	26
W10-02	19-Sep-10	68.861	-165.831	F	SPOT	2
W13-01	6-Jun-13	62.417	-168.827	F*	SPLASH[2]	53
W13-02	6-Jun-13	62.520	-168.799	F*	SPLASH	34
W13-03	13-Jun-13	68.234	-168.893	F*	SPOT	44
W13-04	13-Jun-13	68.233	-168.888	F	SPOT	26
W13-05	13-Jun-13	68.241	-168.889	F	SPOT	124
W13-06	13-Jun-13	68.253	-168.912	F*	SPOT	96
W13-07	13-Jun-13	68.278	-168.909	F	SPOT	88
W13-08	13-Jun-13	68.223	-168.907	F	SPOT	92
W13-09	13-Jun-13	68.228	-168.894	F	SPLASH	51
W13-10	13-Jun-13	68.226	-168.891	F	SPLASH	0[+]
W13-11	13-Jun-13	68.227	-168.895	F	SPLASH	34
W13-12	13-Jun-13	68.226	-168.901	F	SPLASH	45
W13-13	13-Jun-13	68.224	-168.890	F*	SPLASH	49
W13-14	13-Jun-13	68.225	-168.899	F	SPLASH	4
W13-15	13-Jun-13	68.217	-168.919	F*	SPLASH	55
W13-16	14-Jun-13	68.286	-169.086	F*	SPLASH	52
W13-17	14-Jun-13	68.286	-169.086	F*	SPLASH	56
W13-18	14-Jun-13	68.259	-169.321	F	SPLASH	0[+]
W13-19	16-Jun-13	68.828	-167.486	M	SPOT	86
W13-20	16-Jun-13	68.843	-167.461	F*	SPLASH	50
W13-21	17-Jun-13	68.811	-167.201	F*	SPLASH	29
W13-22	17-Jun-13	68.817	-167.201	F*	SPLASH	49
W13-23	17-Jun-13	68.816	-167.200	F	SPLASH	31
W13-24	17-Jun-13	68.825	-167.111	M	SPOT	0[+]
W13-25	17-Jun-13	68.824	-167.112	M	SPOT	63

W13-26	17-Jun-13	68.824	-167.112	M	SPOT	56
W13-27	19-Jun-13	69.662	-165.577	F	SPLASH	50
W13-28	21-Jun-13	69.438	-165.585	M	SPOT	0^{+}
W13-29	21-Jun-13	69.440	-165.600	F	SPLASH	56
W13-30	22-Jun-13	69.590	-164.964	F	SPOT	115
W13-31	25-Jun-13	69.424	-166.132	M	SPOT	0^{+}
W13-32	26-Jun-13	69.856	-165.891	F*	SPLASH	50
W13-33	26-Jun-13	69.861	-165.877	F	SPLASH	19
W13-34	27-Jun-13	70.246	-165.250	F*	SPLASH	33
W14-01	1-Jun-14	67.401	167.977	F	SPLASH	47
W14-02	1-Jun-14	67.401	167.977	F	SPLASH	7
W14-03	2-Jun-14	67.486	167.971	F	SPLASH	0^{+}
W14-04	2-Jun-14	67.482	168.008	F*	SPLASH	52
W14-05	5-Jun-14	68.338	167.844	F	SPLASH	47
W14-06	5-Jun-14	68.342	167.852	F*	SPLASH	44
W14-07	5-Jun-14	68.341	167.873	F*	SPLASH	7
W14-08	5-Jun-14	68.321	167.847	F*	SPLASH	47
W14-09	5-Jun-14	68.333	167.863	F	SPLASH	38
W14-10	5-Jun-14	68.333	167.891	F*	SPLASH	48
W14-11	5-Jun-14	68.333	167.891	F*	SPLASH	24
W14-12	5-Jun-14	68.328	167.979	F	SPLASH	28
W14-13	13-Jun-14	70.140	163.014	F*	SPLASH	53
W14-14	13-Jun-14	70.100	162.931	F	SPLASH	49
W14-15	13-Jun-14	70.091	162.894	F	SPLASH	48
W14-16	13-Jun-14	70.085	162.866	F	SPLASH	39
W14-17	13-Jun-14	70.053	162.773	F	SPLASH	58
W14-18	13-Jun-14	69.978	162.890	F	SPLASH	30
W14-19	15-Jun-14	70.432	162.897	F	SPLASH	55
W14-20	15-Jun-14	70.454	162.916	F*	SPLASH	66
W14-21	15-Jun-14	70.477	162.857	F*	SPLASH	55
W14-22	15-Jun-14	70.435	162.892	F*	SPLASH	7
W14-23	15-Jun-14	70.437	162.878	F*	SPLASH	46
W14-24	15-Jun-14	70.471	162.814	F	SPOT	62

W14-25	15-Jun-14	70.470	162.810	F	SPOT	49
W14-26	22-Jun-14	69.759	163.708	M	SPOT	53
W14-27	22-Jun-14	69.751	164.438	F	SPLASH	57
W14-28	21-Jun-14	69.813	163.581	M	SPOT	74
W14-29	22-Jun-14	69.813	163.581	F	SPOT	105
W14-30	22-Jun-14	69.813	163.581	F	SPOT	57
W14-31	22-Jun-14	69.813	163.581	F*	SPOT	80
W14-32	22-Jun-14	69.810	164.503	F	SPOT	40
W14-33	23-Jun-14	70.473	162.847	F	SPOT	92
W15-01	30-May-15	67.218	-171.125	F	SPOT	1^{+}
W15-02	30-May-15	67.298	-171.202	F*	SPOT	1^{+}
W15-03	30-May-15	67.305	-171.242	F*	SPOT	1^{+}
W15-04	30-May-15	67.308	-171.280	F*	SPOT	1^{+}
W15-05	30-May-15	67.308	-171.280	F*	SPOT	1^{+}
W15-06	4-Jun-15	67.995	-170.630	F	SPLASH	67
W15-07	4-Jun-15	67.947	-170.563	F*	SPLASH	37
W15-08	4-Jun-15	67.925	-170.683	F	SPLASH	53
W15-09	4-Jun-15	67.926	-170.684	F*	SPLASH	37
W15-10	4-Jun-15	67.914	-170.688	F*	SPLASH	54
W15-11	6-Jun-15	69.290	-175.559	F*	SPLASH	31
W15-12	7-Jun-15	69.436	-173.903	F	SPLASH	66
W15-13	7-Jun-15	69.439	-173.848	F*	SPLASH	57
W15-14	7-Jun-15	69.437	-173.824	F*	SPLASH	60
W15-15	16-Jun-15	71.835	-164.086	M	SPOT	39
W15-16	17-Jun-15	71.743	-164.028	F	SPLASH	35
W15-17	17-Jun-15	71.724	-164.018	F	SPLASH	0^{+}
W15-18	17-Jun-15	71.724	-164.018	F	SPOT	68
W15-19	17-Jun-15	71.720	-164.009	F*	SPOT	28
W15-20	17-Jun-15	71.727	-164.013	F	SPOT	1^{+}
W15-21	17-Jun-15	71.695	-164.035	F*	SPOT	97
W15-22	18-Jun-15	71.537	-164.402	F	SPOT	41
W15-23	18-Jun-15	71.543	-164.378	F*	SPOT	85
W15-24	18-Jun-15	71.543	-164.374	F	SPOT	35

W15-25	18-Jun-15	71.546	-164.364	F	SPOT	95
W15-26	18-Jun-15	71.549	-164.349	F	SPOT	134

[1] SPOT: Tag that provides locations and haul out timelines (*see Methods*).
[2] SPLASH: Tag that provides locations, haul out timelines, and dive data.

Table 3. Number of instrumented walruses whose tags successfully transmitted locations (i.e., number of tags that transmitted/total number of tags deployed) in the Bering and Chukchi seas in 2010, 2013, 2014, and 2015. Walruses are grouped by year tagged and reproductive category.

Year	Females with calves	Females without calves	Males	Total
2010	1/1	1/1	0	2/2
2013	13/13	13/15	3/6	29/34
2014	12/12	18/19	2/2	32/33
2015	9/13	9/12	1/1	19/26
Total	**35/39**	**41/47**	**6/9**	**82/95**

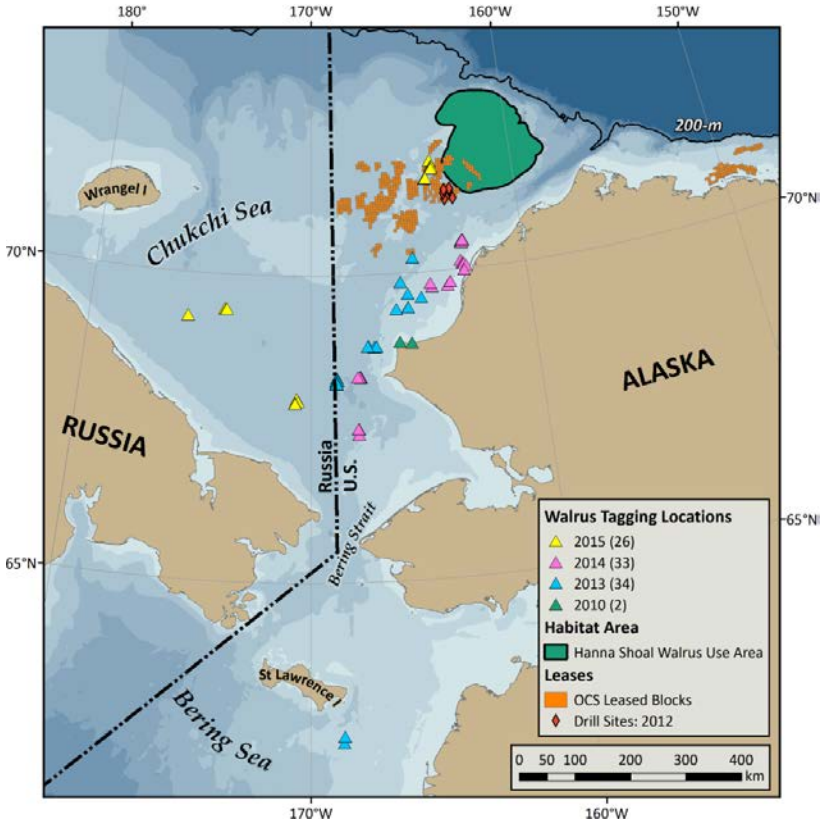


*Figure 4. Locations where satellite-linked transmitters were deployed on walruses in September 2010, June 2013 and 2014, and May and June 2015. (** OCS Leased Blocks associated with Chukchi Sea Lease Sale 193 were active during the study period; all but one lease block has been relinquished as of May 2016).*

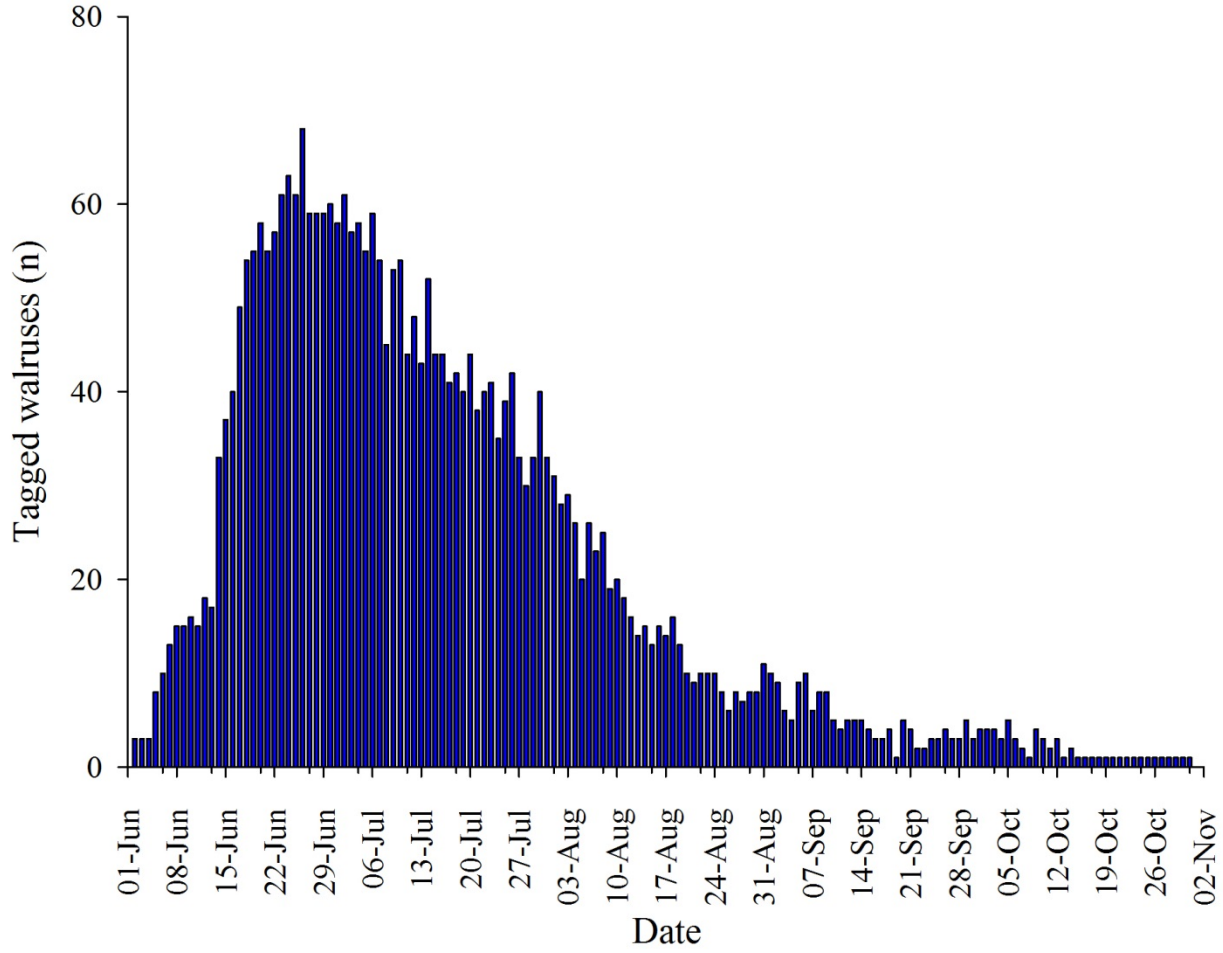


Figure 5. Number of tagged walruses that transmitted by day, all years combined (2010–2015).

Walrus Movements and Behavior

Walruses tagged during this study traveled an average minimum distance of 1,648 km, ranging from 21 to 4,457 km (Table 4). Although males traveled farther than females with and without calves, differences were not significant ($P = 0.37$). Annual movements of tagged walruses are shown in Figures 6–9. Satellite tracking has allowed us to identify variation in summer movements across the Chukchi Sea and unexpected movements by some individuals near coastal areas.

Table 4. Distances traveled by tagged walruses in the Bering and Chukchi seas during 2010, 2013, 2014, and 2015. Walruses are grouped by reproductive category.

	Females with calf (n = 35)	**Females without calf (n = 41)**	**Male (n = 6)**	**Total (n = 82)**
Ave. min. distance (km)	1,494	1,718	2,071	1,648
Min. distance (km)	175	21	1,289	21
Max. distance (km)	3,719	4,457	3,280	4,457

Sea ice conditions influence the movements and behavior of walruses. Summer sea ice conditions, both coverage and the ice receding patterns, in 2013, 2014 and 2015 were generally similar in the Bering and Chukchi seas, although there was slightly more ice in the central Bering Sea in 2013 during tagging in May and less ice in the central Chukchi Sea during the end of our research cruise in June 2015 (i.e., the research vessel was able to travel farther north in 2015). In all years, during late-May and June, the ice edge arched to the north, and generally was farther north in the mid Chukchi Sea between Vankarem, Russia and Point Hope, Alaska and ice continued to retreat northward until September. By September, the summer sea ice minimum was generally north of the continental shelf, delineated by the 200-m isopleth (Fig. 4).

Figure 6. Tracks of two tagged walruses in the Chukchi Sea from September through October, 2010. The tag deployed on the female without a calf (red "X") only transmitted locations for three days while the walrus was on shore near Cape Lisburne, Alaska.

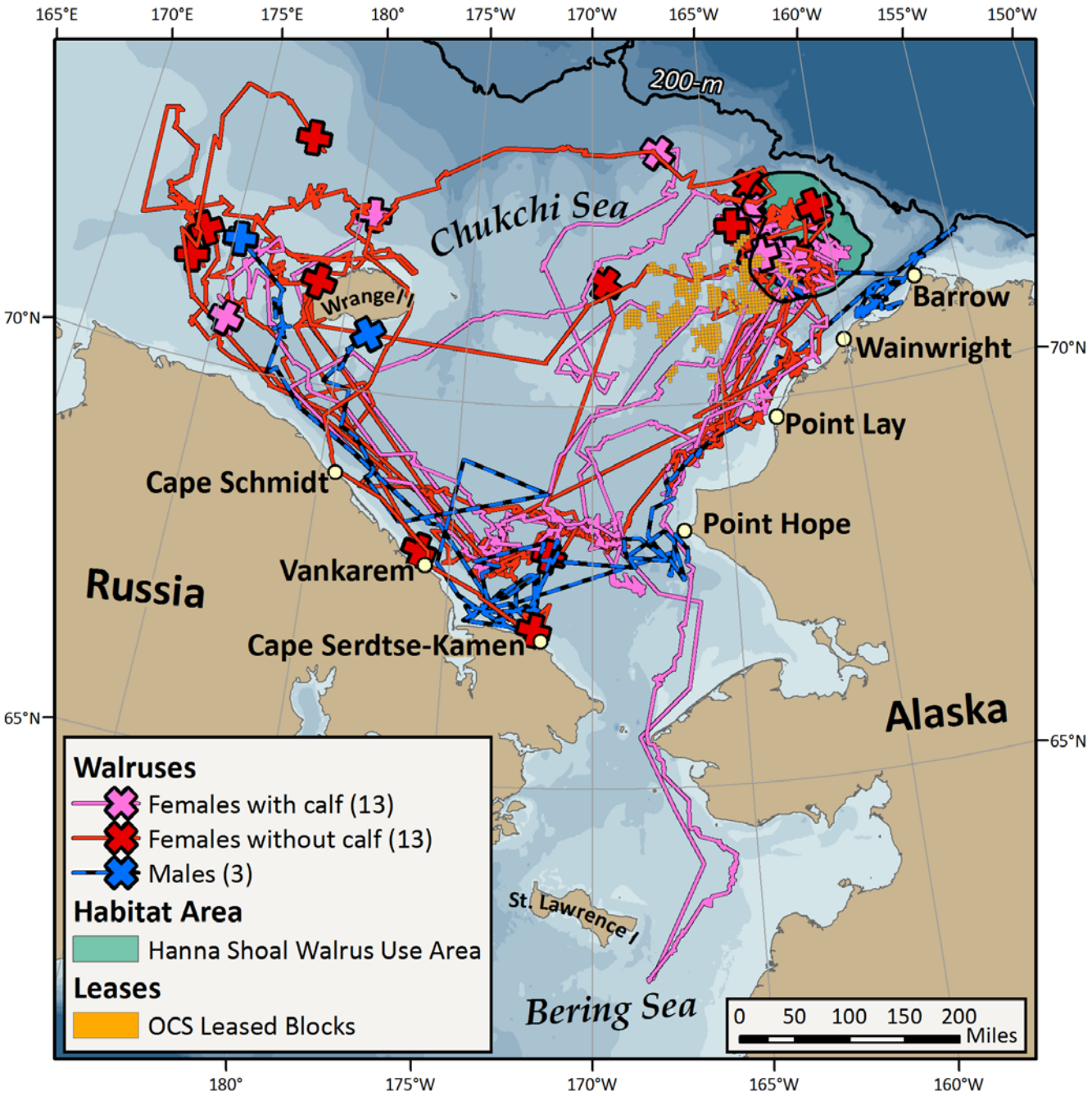


*Figure 7. Tracks of 29 tagged walruses in the Bering and Chukchi seas from June through October, 2013 relative to Outer-Continental Shelf Leased Blocks and the Hanna Shoal Walrus Use Area (Jay et al. 2012). Colored crosses are the location of the last transmission. (** OCS Leased Blocks associated with Chukchi Sea Lease Sale 193 were active during the study period; all but one lease block has been relinquished as of May 2016).*

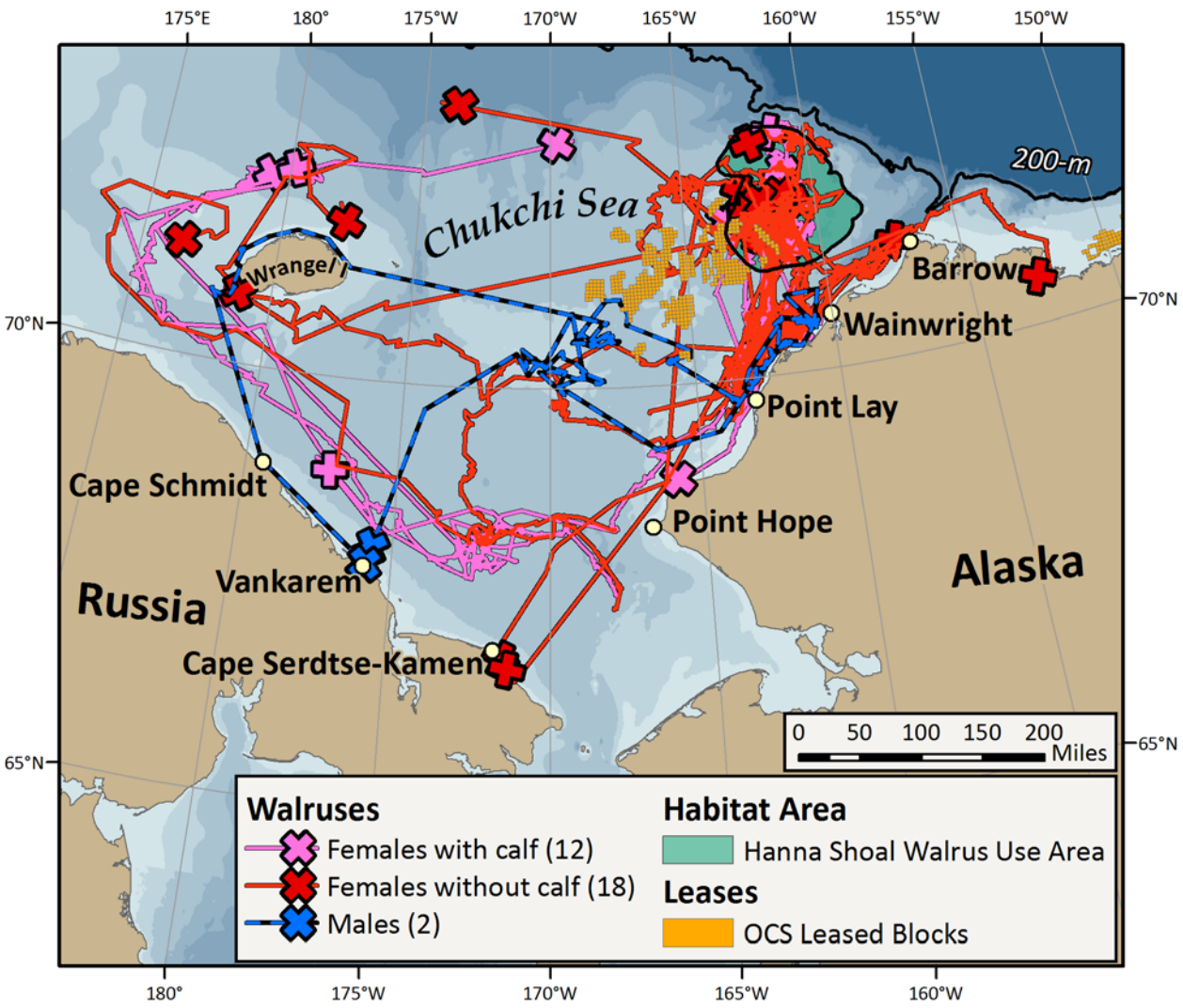


*Figure 8. Tracks of 32 tagged walruses in the Chukchi Sea from June through October, 2014 relative to Outer-Continental Shelf Leased Blocks and the Hanna Shoal Walrus Use Area (Jay et al. 2012). Colored crosses are the location of the last transmission. (** OCS Leased Blocks associated with Chukchi Sea Lease Sale 193 were active during the study period; all but one lease block has been relinquished as of May 2016).*

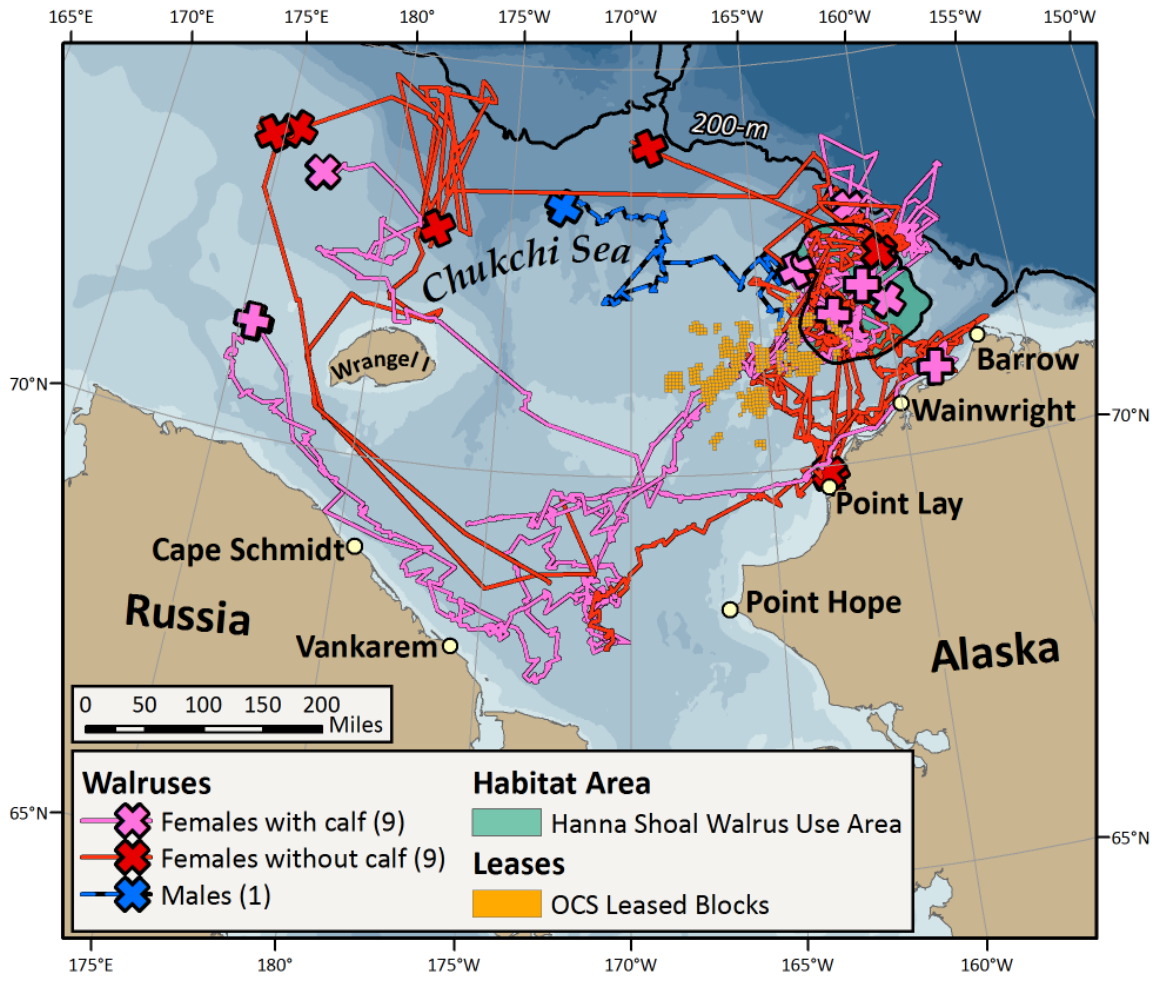


*Figure 9. Tracks of 19 tagged walruses in the Chukchi Sea from June through October, 2015 relative to Outer-Continental Shelf Leased Blocks and the Hanna Shoal Walrus Use Area (Jay et al. 2012). Colored crosses are the location of the last transmission. (** OCS Leased Blocks associated with Chukchi Sea Lease Sale 193 were active during the study period; all but one lease block has been relinquished as of May 2016).*

North Migration: Late May–June, Bering and Chukchi Seas

We tagged walruses opportunistically as they migrated from the Bering Sea, north through the Bering Strait, and into the Chukchi Sea during 2013–2015. Two walruses were tagged in the Bering Sea, both were females with calves tagged on the same day but in different groups. These two walruses migrated northward into the Chukchi Sea along similar paths through the eastern Bering Strait near Wales, Alaska. At ~100 km (62 miles) south of Point Hope, W13-01 turned west and traveled northwest along the Russian coast, while W13-02 continued northward past Point Hope toward Hanna Shoal (Fig. 7). Point Hope typically sees (and hears) walruses in May after the bowhead whaling season. Hunters say walruses make sounds like a dog with a sore throat. The spring migration includes all sexes and ages of walruses (male, female, old, and young); some migrate close to shore coming from the southeast either riding on the ice or swimming. (Appendix G-2).

Because U.S. research vessels were restricted from entering Russian waters in 2013 and 2014 and ice conditions limited travel in Russian waters when we were on board a Russian vessel in 2015, the majority of the walruses were tagged in the Alaskan Chukchi Sea (73 of the 82 (89.9%) tags that transmitted locations). Of the 73 walruses tagged in Alaskan waters, however, 32 (43.8%) spent some time in Russian waters, and of the 9 walruses tagged in Russian waters 4 (44.4%) spent some time in Alaskan waters.

During the northward migration (late-May and June), walruses spent time in three general locations; 1) southern Chukchi Sea, offshore and midway between Vankarem, Russia and Point Hope, Alaska; 2) northern Chukchi Sea nearshore between Point Lay and Wainwright (centered at Icy Cape); and 3) southern HSWUA (Fig. 10). During late-May and June, 16.2% of all daily locations were within the HSWUA. Point Lay hunters typically see walruses in May and early June traveling north on the ice, particularly during break-up when they are hunting for bearded seals (Appendix G-1). Female walruses moved an average of 49.5 km/day and were generally within 100 km of shore during the northward migration in June (Fig. 11).

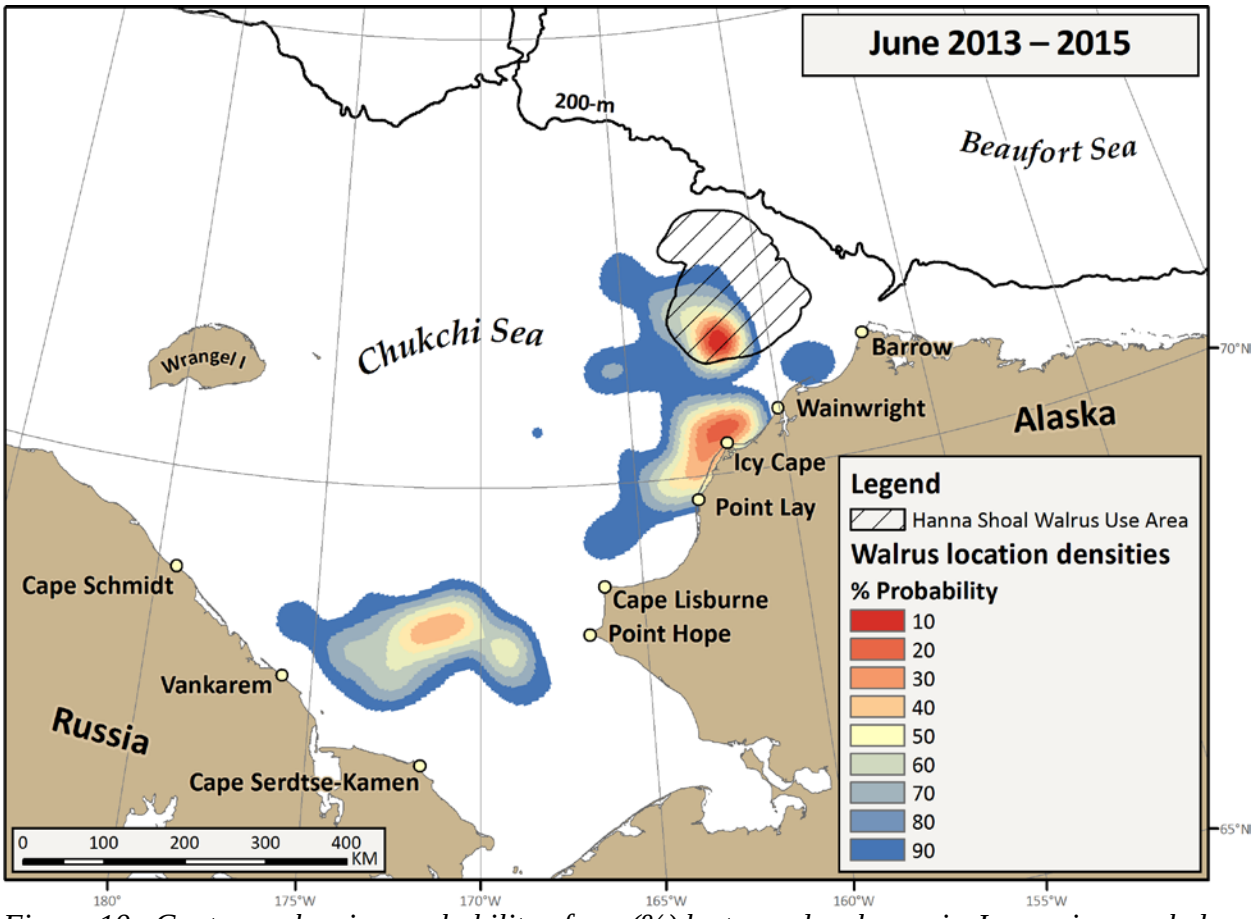


Figure 10. Contours showing probability of use (%) by tagged walruses in June using pooled location data (2013–2015; n = 82).

Summer Feeding: July–August, Chukchi Sea

In July and August, walruses generally continued to move north with the receding sea ice. Hunters from Wainwright rarely see walruses in July now that the ice breaks up earlier (in June) and does not return again, as it used to multiple times through the summer, bringing walruses close to shore (Appendix G-1). During these months, walruses were primarily located in or near the HSWUA (Figs. 11 and 12) having moved offshore from the Icy Cape area in late June. During July and August, 41.7 and 47.2% of all daily locations, respectively, were within the HSWUA and movement rates slowed to an average of 25.7 km/day. Walruses were farther offshore in August (average 138.2 km) than in July (average 119.2 km; Fig. 13), which was generally the same for females with calves, females without calves, and males (Fig. 11).

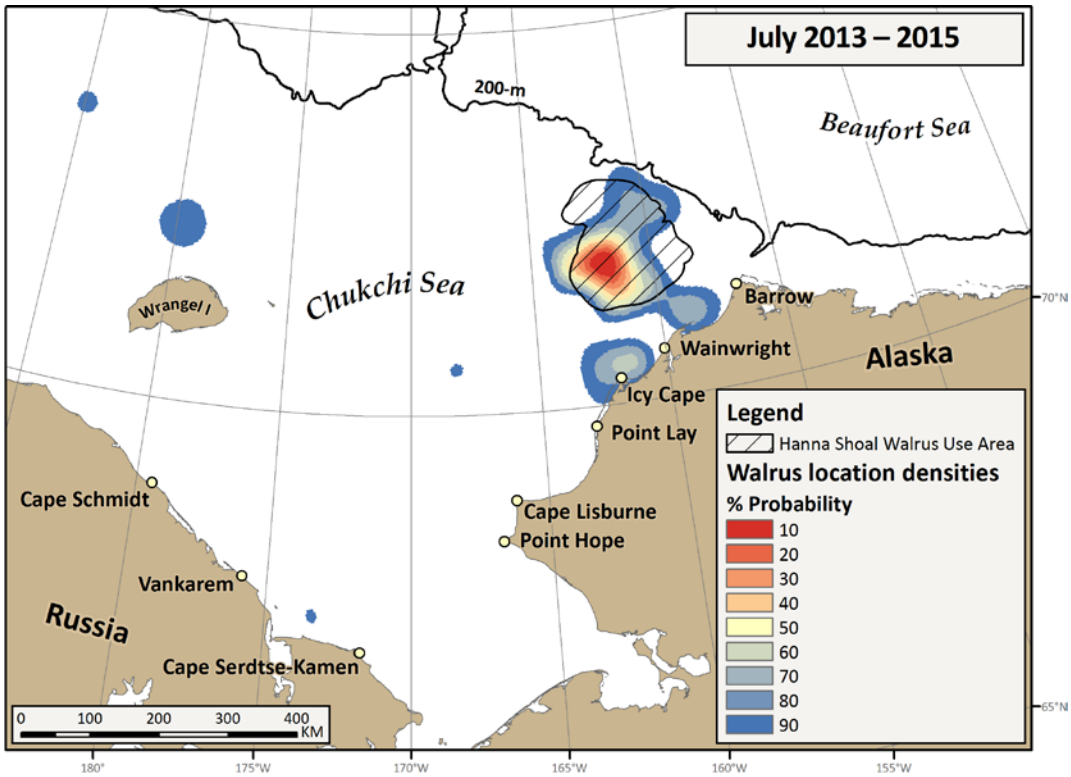


Figure 11. Contours showing probability of use (%) by tagged walruses in July using pooled location data (2013–2015; n = 74).

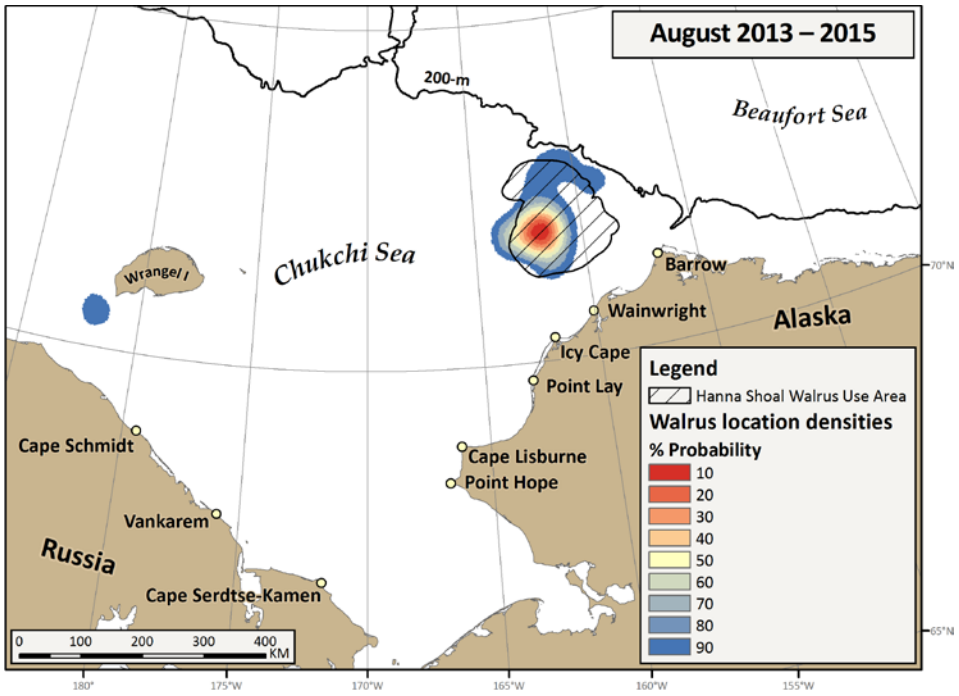


Figure 12. Contours showing probability of use (%) by tagged walruses in August using pooled location data (2013–2015; n = 40).

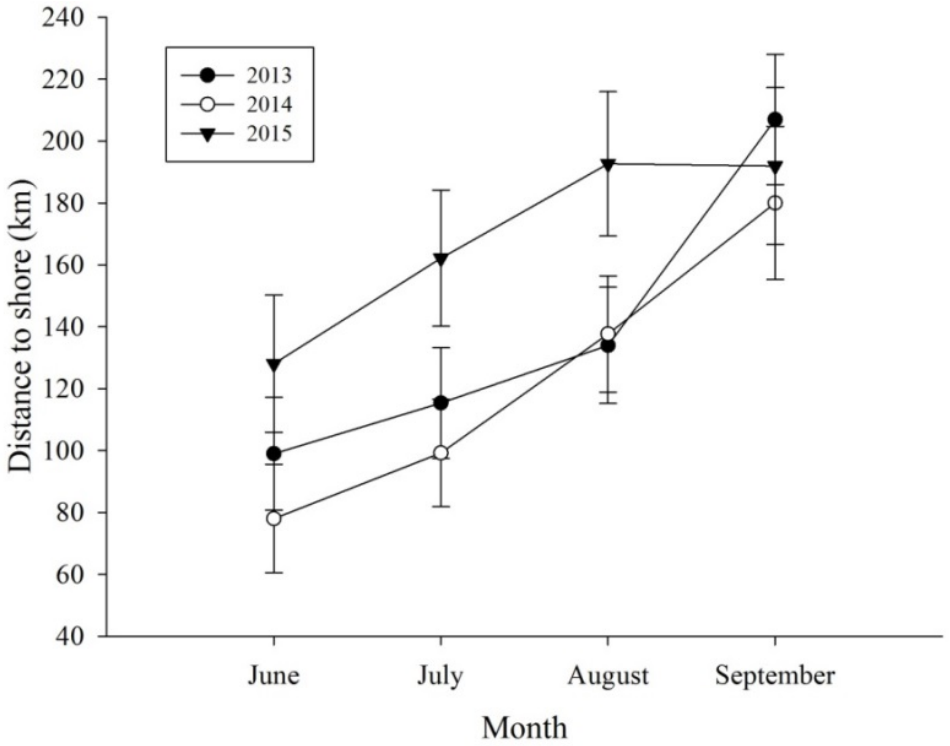


Figure 13. Average distance to shore by month for tagged adult female walruses in the Chukchi Sea, June through September of 2013–2015.

Hanna Shoal Walrus Use Area (HSWUA)

During our study, 20 of 34 (58.8%) females with calves and 26 of 40 (65.0%) females without calves spent an average of 35.2 and 31.6 days in the Hanna Shoal area, respectively (Table 5, Fig. 14). The first walrus entered the HSWUA on 18 June (average 30 June) and the last walrus left on 18 September (average 2 August). In general, walruses spent the entire month of July in the HSWUA. Distances traveled by females were lower within the HSWUA (average 25.7 km/day) than during migration (average 49.5 km/day). Within the HSWUA, the pattern of habitat use was generally the same for females with calves, females without calves, and males (although only one of six males used the HSWUA). The male that used the HSWUA (W13-26) entered on 8 August 2013 and stayed until at least 11 August, when the tag stopped transmitting. The percent of all daily locations within the HSWUA increased from mid-May and June (16.2%), peaked in July (41.7%) and August (47.2%), and decreased in September (18.4%).

Table 5. Summary of tagged walruses that entered the Hanna Shoal Walrus Use Area (HS) during 2013–2015. Average first and last days listed in the subtotal rows are average dates based on all individuals regardless of sex and reproductive category.

Year	Sex and reproductive category	# in HS	% tagged	Average first day in HS	Average last day in HS	Mean days in HS	Mean distance traveled in HS (km)	Mean rate of travel (km/day)
2013	Females with calf	9	69.2	30-Jun	29-Jul	29.1	639.5	22.0
	Females w/o calf	7	53.8	1-Jul	2-Aug	32.0	723.0	22.6
	Males	1	33.3	7-Aug	11-Aug	4.0	80.0	20.0
	Subtotal	**17**	**55.2**	**3-Jul**	**31-Jul**	**28.8**	**641.1**	**22.3**
2014	Females with calf	6	50.0	29-Jun	4-Aug	35.5	1,023.1	28.8
	Females w/o calf	12	66.7	4-Jul	2-Aug	29.1	782.8	26.9
	Males	0	0.0	-	-	-	-	-
	Subtotal	**18**	**56.3**	**3-Jul**	**3-Aug**	**31.2**	**862.9**	**27.6**
2015	Females with calf	5	55.6	22-Jun	6-Aug	45.6	1,032.4	22.6
	Females w/o calf	7	77.8	25-Jun	31-Jul	35.6	1,096.1	30.8
	Males	0	0.0	-	-	-	-	-
	Subtotal	**12**	**63.2**	**24-Jun**	**2-Aug**	**39.8**	**1,069.5**	**26.9**
Total	Females with calf	20	58.8	28-Jun	2-Aug	35.2	864.0	24.4
	Females w/o calf	26	65.0	1-Jul	2-Aug	31.6	851.1	26.9
	Males	1	16.7	7-Aug	11-Aug	4.0	80.0	20.0
	All	**47**	**58.8**	**30-Jun**	**2-Aug**	**32.5**	**839.6**	**25.7**

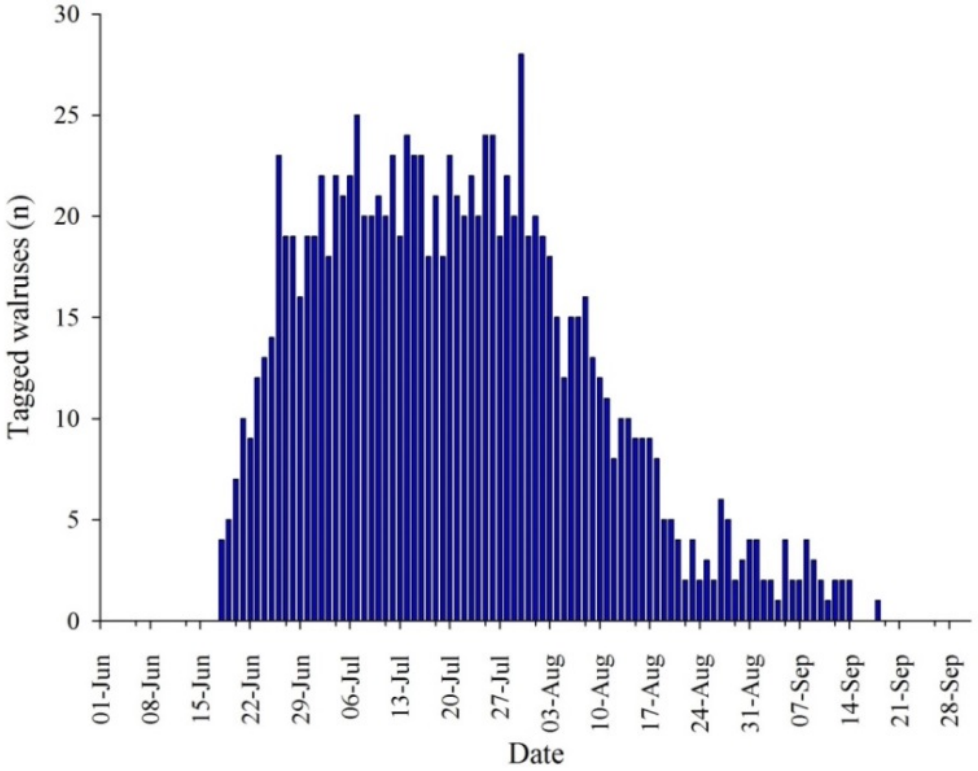


Figure 14. Number of tagged walruses that were in the Hanna Shoal Walrus Use Area (Jay et al. 2012) by day, all years combined (2013–2015).

In early August 2015, five tagged walruses were using the HSWUA when sea ice started to recede north of the continental shelf break (200 m isopleth). From 1 August through 20 September, four of these five walruses (two females without calves and two females with calves) made trips to the receding ice edge, north of the HSWUA (Fig. 15). Between 3 and 4 August, a female without a calf (W15-18) hauled out on ice ~20 km north of the shelf break (~50 km north of the HSWUA) for >24 hrs, (Fig. 15a). This same walrus also hauled out at the terrestrial haulout near Pt. Lay on 22 August (Figs. 15d and e; also see section *Use of Terrestrial Haulouts* and Fig. 18). A female with a calf (W15-23) hauled out on ice at the shelf break and ~30–100 km north of it on seven occasions: between 3 and 4 August (>29 hrs; Fig. 15a), between 6 and 7 August (>24 hrs), on 10 August (12 hrs; Fig. 15b), between 16 and 17 August (>24 hrs; Figs. 15b and c), on 18 August (9 hrs; Fig. 15c), on 20 August (7 hrs), and between 30 and 31 August (>18 hrs; 15e). Another female with a calf (W15-21) hauled out on ice ~45–100 km north of the shelf break on four occasions: between 21 and 22 August (>20 hrs; Figs. 15c and d), on 23 August (4 hrs; Fig. 15d), between 31 August and 1 September (>42 hrs; Fig. 15e) and between 15 and 16 September (>24 hrs; Fig. 15f). The second female without a calf (W15-26), hauled out on ice ~20 km north of the shelf break (~100 km north of HSWUA) between 15 and 16 August (>24 hrs; Fig. 15c) before moving west to an area north of Wrangel Island, Russia.

Although sea ice data derived from the Advanced Microwave Scanning Radiometer (AMSR2) depicted in the panels in Figure 15 show ice concentrations between 5 and 100%, AMSR2 ice data do not detect ice concentrations <15% accurately. Therefore, although the tracks of walruses appear to be in open water near the ice edge they apparently had access to ice in

concentrations <15% that supported hauling out. Also, sea ice data depicted on the maps in Figure 15 are for the day that represents the mid-point for each time period (e.g., sea ice data for 4 August 2015 was used for mapping walrus tracks during 1–7 August 2015); therefore, the sea ice data may not represent the particular day when the walruses used the ice to haul out.

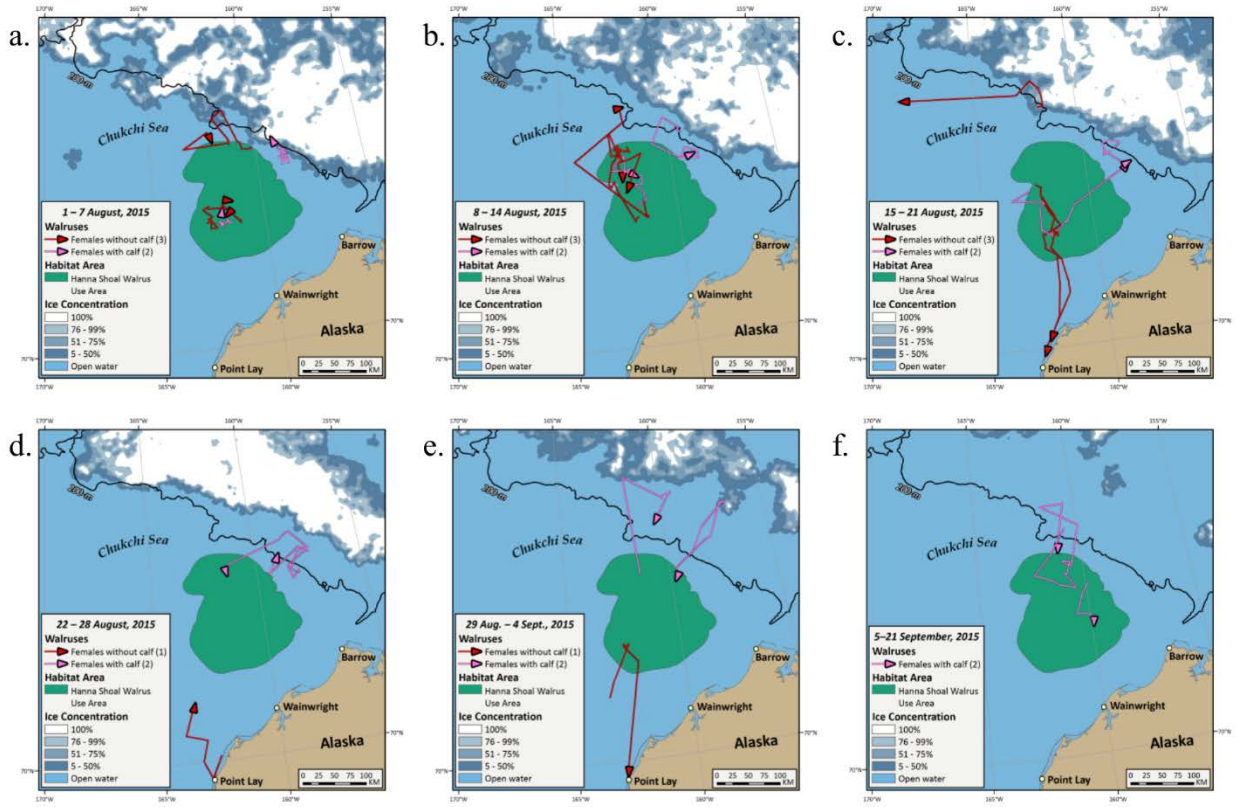


Figure 15. Tracks of five tagged walruses that traveled to and from the HSWUA and used sea ice north the continental shelf break (200 m isopleth) for resting during 1 August to 21 September 2015. One walrus used the ice north of the shelf break and the terrestrial haulout near Point Lay. AMSR2 sea ice data do not detect ice concentrations <15% accurately. Therefore, although walruses appear to be in open water when near the ice edge ice concentrations of <15% may have been present. Data from the tags were used to indicate when and where resting bouts occurred on top of ice. Figures 15a–e represent tracks during one week intervals and Figure 15f represents tracks during a two week interval.

Southern Migration: Fall (September–October) Chukchi Sea

During September, walruses were primarily located in the north central and northeastern Chukchi Sea near the shelf break, in the HSWUA, and at coastal haulouts near Point Lay and Cape Lisburne, Alaska (Fig. 16). Tagged walruses began to move south in September, leaving the HSWUA and the central Chukchi Sea prior to the formation of sea ice. This southern migration generally started 1–2 weeks before the ice edge advanced north of the continental shelf (200 m isobath). During September, walruses were on average 171.1 km offshore (Fig. 11) and by October, were primarily located north of Wrangel Island and along the Russian coastline (Fig. 17). Walruses that used the HSWUA migrated south by one of three routes: 1) directly south toward Point Lay (n = 3), 2) directly south toward Cape Lisburne (n = 3), and 3) west toward Wrangel Island and then south (n = 4). Walruses near Wrangel Island migrated south by traveling along the north coast of Russia (n = 4). The one walrus that left Point Lay (W14-29) traveled toward Cape Lisburne. The two walruses that left Cape Lisburne (W10-01 and W14-29) crossed the Chukchi Sea to the haulout at Cape Serdtse-Kamen, Russia. This pattern of movement was generally the same for females with calves, females without calves, and males. We did not receive locations often enough in October to estimate a movement rate for that month, however for the months after moving away from the HSWUA, walruses averaged 55.1 km/day, which did not differ among reproductive categories or sexes (P = 0.57). We received locations for only one male (W13-19) during September; he was west of Wrangel Island until at least 9 September, when the tag stopped transmitting.

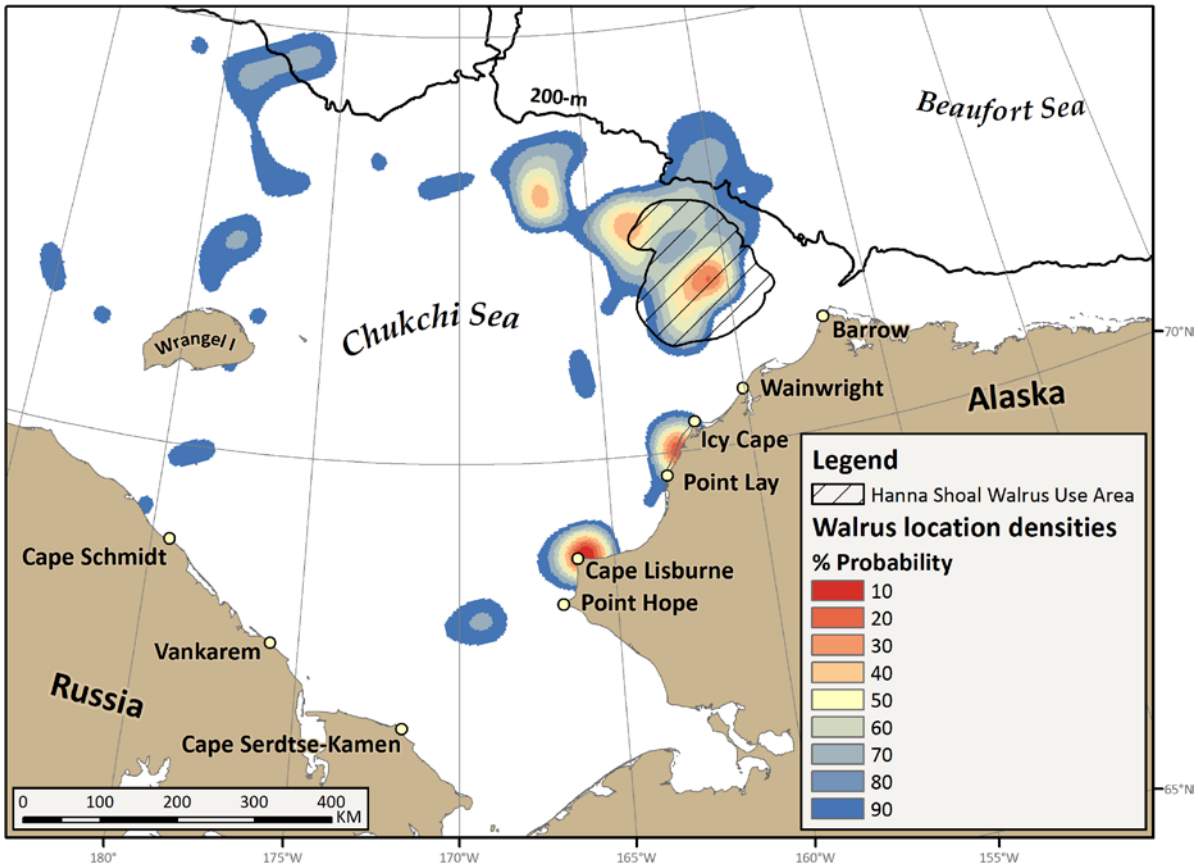


Figure 16. Contours showing probability of use (%) by tagged walruses in September using pooled location data (2013–2015; n = 15).

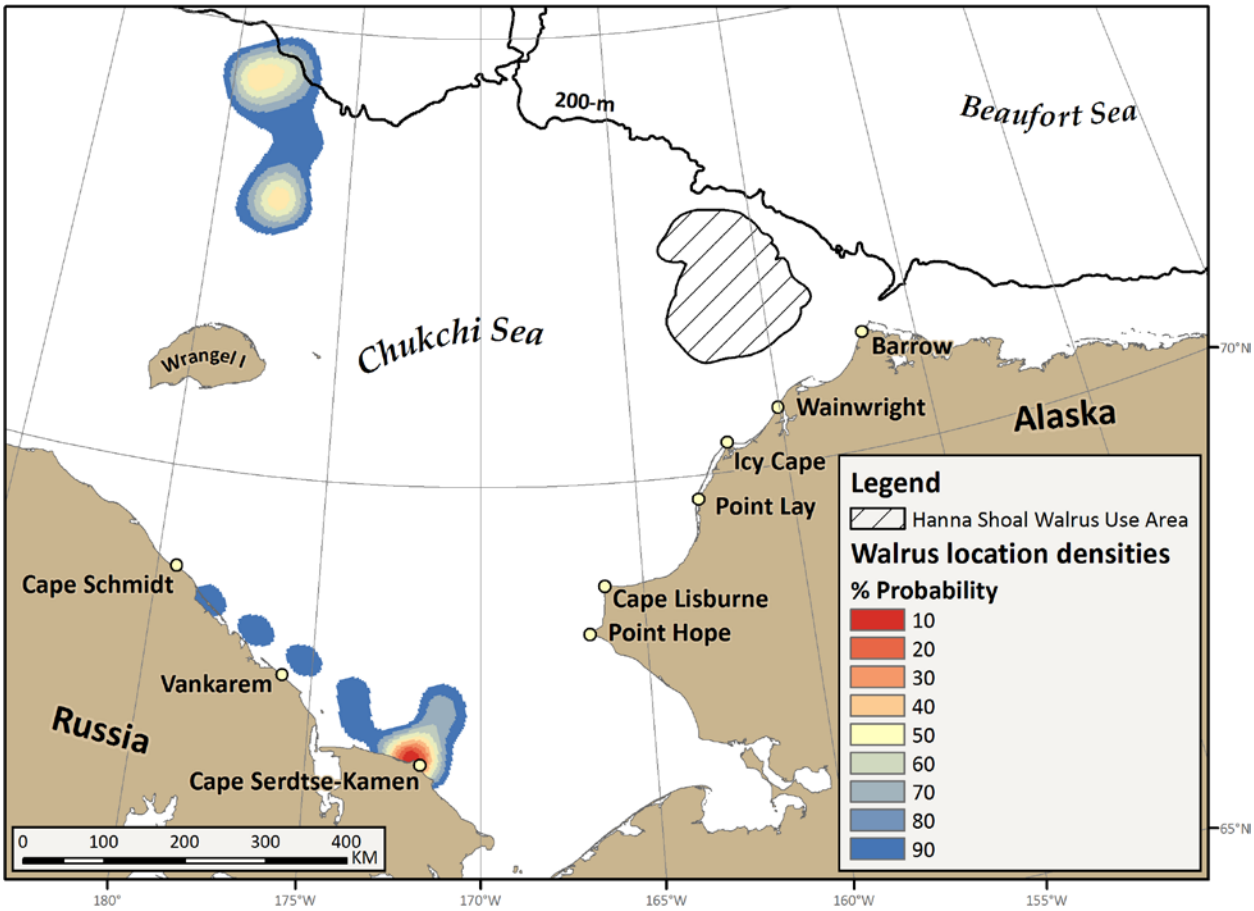


Figure 17. Contours showing probability of use (%) by tagged walruses in October using pooled location data (2013–2015; n = 5).

Use of Terrestrial Haulouts.

Terrestrial haulouts formed in Alaska or Russia in late summer in all years in which we tagged walruses (2010, 2013, 2014, and 2015). In five of the seven years of our study, walruses formed large terrestrial haulouts (1,500–35,000 walruses) near Point Lay, Alaska. Large terrestrial haulouts (2,000–>100,000 walruses) also occurred near Cape Serdtse-Kamen, Russia every year. Despite the large numbers of walruses observed at these haulouts, only 8 of 28 (29%) walruses with tags that were active when the haulouts formed hauled out on land (Table 6).

Walruses regularly haul out on shore in small numbers and hunters reported this activity in Norton Sound, near Point Hope, Point Lay, Wainwright, and Barrow (Appendices G-1–G-5). Walruses sometimes haulout in small numbers between Cape Thompson and Cape Lisburne, but regularly haul out by the dozens near Cape Lisburne. However, fewer walruses have hauled out near Cape Lisburne recently, possibly because barges sometimes wait there for better ice or weather conditions (Appendix G-2). In the past, typically a few walruses were seen at various locations on the islands in Kasegalek Lagoon. Large numbers were seen on shore between Point Lay and Wainwright in the 1950s, but much larger numbers began hauling out on the Alaskan coast in 2007 (Appendix G-1).

Large terrestrial haulouts have regularly occurred on Russian Islands and coasts for decades (e.g., Tomilin and Kibal'chich 1975), however even larger numbers have been reported during the 2000s. For example, Cape Serdtse-Kamen was documented as a terrestrial haulout as early as 1927 (Arsen'ev 1927), again in 1937 (Nikulin 1941), and during all of the aerial survey years; 1960, 1964, 1975, 1980, 1985, and 1990 (Fedoseev 1966, Gol'tsev 1968, Fedoseev 1981, Estes and Gol'tsev 1984, Fedoseev and Razlivalov 1986, Gilbert *et al.* 1992). Although numbers on haulouts have also been large in the past (9,000 to 12,000 in 1975 and >12,000 in 1990) they were much larger in 2009 (97,000) and 2011 (115,000) (Kochnev, unpubl. data).

During 2010, one of one tagged walruses hauled out at Cape Serdtse-Kamen in October (Table 6). In early September 2013, one of six tagged walruses hauled out at Vankarem on the Russian coast. In mid-September, none of the three walruses with active tags hauled out near Point Lay. From 27 September to 9 October, one of two walruses with active tags, W13-30, moved southwest along the Russian coast, hauling out at Cape Schmidt, Vankarem, and Cape Serdtse-Kamen over the course of 13 days. During 2014, only two of five tagged walruses hauled out at terrestrial haulouts. During August, one of five walruses with active tags hauled out at Russian haulouts, including the southeastern shore of Wrangel Island (18–22 August) and Cape Schmidt (29–30 August) (Table 6). In September, one of two hauled out near Cape Lisburne, Alaska, and none hauled out near Point Lay. Also in 2014, two walruses approached terrestrial haulouts, W14-31 near Point Lay and W14-33 near Cape Lisburne, but stayed in the water and did not haul out.

During 2015, two of four tagged female walruses hauled out near the Point Lay haulout (Table 6, Fig. 18). Both of these walruses left the HSWUA and followed relatively direct paths for ~180 km to the Point Lay haulout; W15-18 took three days traveling at 60.5 km/day while W15-25 took six days traveling at 29.2 km/day. W15-25 first arrived at the Point Lay haulout on 24 August and spent 1.5 days there. This walrus then left Point Lay, traveling for 4.4 days at 55.2 km/day, to return to the HSWUA where she spent four days before leaving on 3 September to return to the Point Lay haulout on 4 September, traveling for 1.7 days at 99.4 km/day. W15-25 then stayed on land for at least three days before we received the tag's last signal on 6 September. During our study, two of seven walruses (29%), whose tags were still transmitting when terrestrial haulouts formed near Point Lay, hauled out there; both in 2015.

Table 6. Tagged walruses that hauled out at terrestrial haulouts during 2010 and 2013–2015.

Year	Dates	Location	# Walruses hauled out (%)[a]	Walrus IDs	# Walruses transmitting[b]
2010	4–8* Oct	Cape Serdtse-Kamen, Russia	1 (100%)	W10-01	1
2013	4–8 Sept	Cape Vankarem, Russia	1 (17%)	W13-07	6
	12–27 Sept	Point Lay, Alaska	0 (0%)	-	3
	27 Sept–1 Oct	Cape Schmidt, Russia	1 (50%)	W13-30	2
	4–5 Oct	Vankarem, Russia	1 (50%)	W13-30	2
	8–9* Oct	Serdtse-Kamen, Russia	1 (50%)	W13-30	2
2014	18–22 Aug	SE Wrangel Island, Russia	1 (20%)	W14-28	5
	29–30 Aug	Cape Schmidt, Russia	1 (33%)	W14-28	3
	5 Sept	Cape Lisburne, Alaska	1 (50%)	W14-31	2
	25 Sept–5 Oct	Point Lay, Alaska	0 (0%)	-	1
2015	22–24* Aug	Point Lay, Alaska	2 (50%)	W15-18	4
	24–25 Aug			W15-25	4
	4–6* Sept	Point Lay, Alaska	1 (33%)	W15-25	3
	1–4* Oct	Cape Serdtse-Kamen, Russia	1 (100%)	W14-29	1
Total			**8[c] (29%)**		**28[d]**

* Last date located at haulout was the last day we received a location from the tag.

[a] Percentage of walruses hauled out from the total number of walruses whose tags were still transmitting when the haulout formed

[b] Number of walruses whose tags were still transmitting when the haulout formed.

[c] Total number of unique walruses that hauled out at terrestrial haulouts.

[d] Total number of unique walruses whose tags were transmitting when haulouts formed.

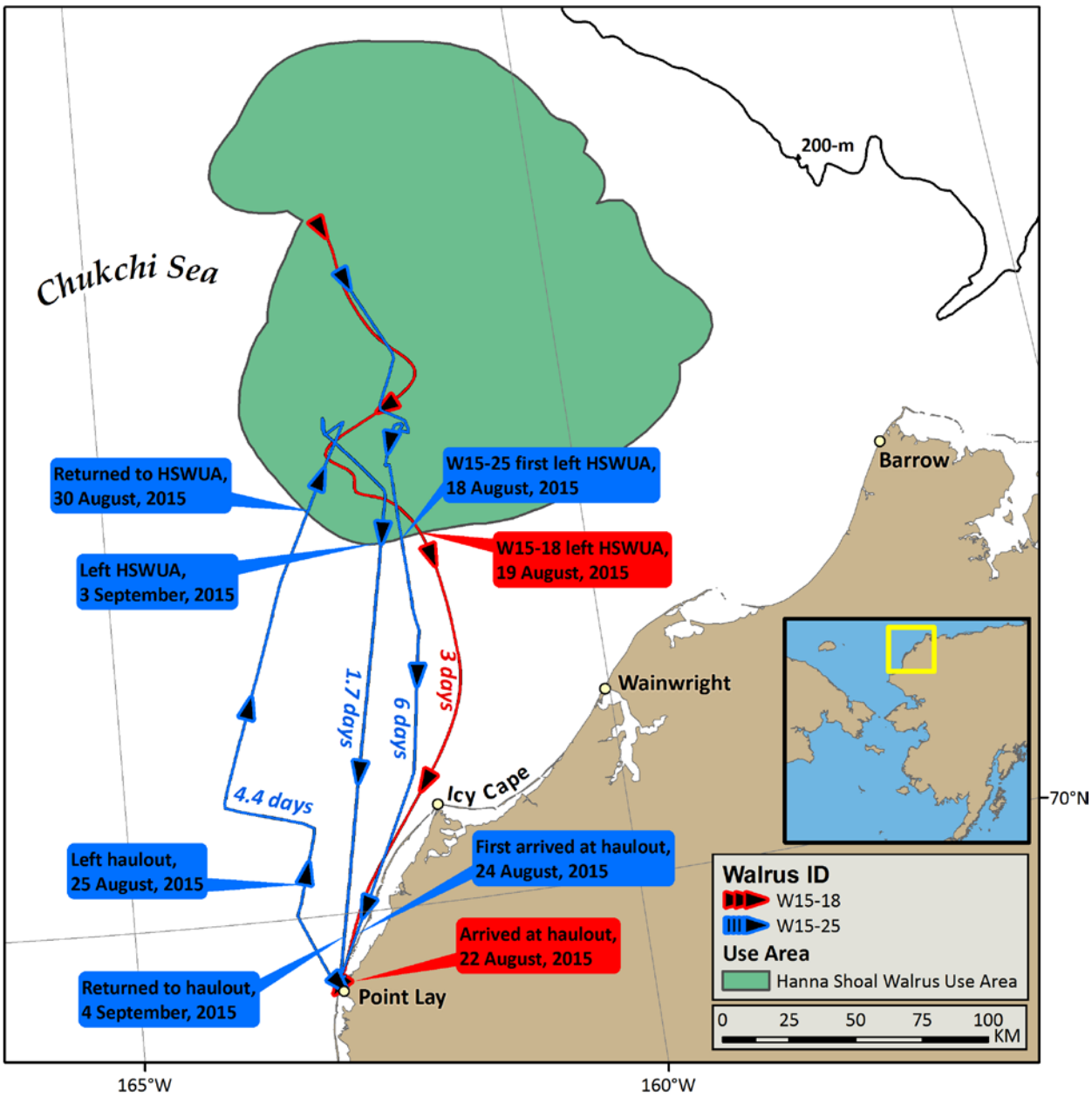


Figure 18. Tracks of two walruses tagged in the Chukchi Sea that hauled out at the terrestrial haulout near Point Lay, Alaska, between 14 August and 6 September, 2015. The number of transit days between the HSWUA and the haulout near Point Lay are listed next to each walrus track. Walrus W15-25 made two trips to the haulout.

Movement Analyses

During the northward migration in June, female walruses traveled farther per day (49.5 km/day) than walruses using the HSWUA in July and August (25.7 km/day; $P < 0.01$) and farther than walruses that did not enter the HSWUA in July and August (46.5 km/day; $P = 0.03$). During July and August, walruses outside the HSWUA traveled farther per day than walruses inside the HSWUA ($P < 0.01$). Movement rates did not differ between females with calves and females without calves ($P = 0.39$). Males on northward migration traveled twice as far per day (45.4 km)

as the one male that used the HSWUA (20 km/day), but our sample size of male locations was too small to quantify statistical significance.

Movement rates of females during the southern migration (55.1 km/day) did not differ from rates during the northern migration (49.5 km/day; $P = 0.96$). Migration movement rates, however, were higher than rates in July and August, regardless of whether walruses had entered the HSWUA ($P < 0.01$).

During late-May and June, walruses generally were closer (within 100 km) to shore than during July to September (Fig. 13). Distance to shore was best explained by a model that only included month ($P < 0.01$) and was not different by reproductive or sex category ($P = 0.57$).

Prior to this study, no male walruses had been tagged in the Chukchi Sea. Large, male only terrestrial haulouts occur in the Bering Sea in summer and males are seen and harvested in the Chukchi Sea in summer, but male movement behavior in the Chukchi Sea in summer is not well understood. Although many males spend the summer in the Bering Sea using terrestrial haulouts along the Russia coast and in Bristol Bay, Alaska, hunters in the Bering and Chukchi seas see adult male walruses migrating north in the spring (Appendix G-2 and G-5). Point Hope hunters see fewer males and fewer walruses overall passing by, possibly due to noise from ships, smells from engines, or changes in sea ice. Ships traveling north and south in Alaskan Chukchi Sea pass closer to Point Hope than other villages along the coast because Point Hope is located at the end of Lisburne Peninsula. Therefore, if walruses are currently following ice breakers north in the spring they may pass Point Hope farther from shore than they did in the past (Appendix G-2). In September and October most walruses migrating from the north near Point Hope are older males. Overall, fewer walruses are seen in fall than in spring. In the past, most of the walruses that hauled out on land near Point Hope were males (Appendix G-2).

We tagged six males in the Chukchi Sea in June; during July and August, three stayed in the central Chukchi and three moved north; one along the Alaskan and two along the Russian coast. Two males had active tags in late August 2013; one was in the HSWUA and the other was between Wrangel Island and the northern Russian coast. By late-August 2014, two male walruses moved south from Wrangel Island to the Russian coast and hauled out on land near Cape Schmidt.

Walruses tagged in previous telemetry studies in the Chukchi Sea had not traveled east of Barrow (Anthony Fischbach, USGS, personal communication; Jay et al. 2012, Fig 2). Barrow hunters say walrus hunting occurs in the Chukchi Sea but not in the Beaufort Sea. Hunters travel west or south then west from Barrow (Appendix G-3). Only occasionally are walruses seen in the Beaufort Sea, east of Point Barrow. However, a female without a calf (W14-17) that was tagged in the Chukchi Sea in June 2014 moved north and east of Barrow, Alaska into the Beaufort Sea on 14 July 2014. On 23 July, this walrus moved into Kogru River Inlet, roughly 180 km east of Barrow. Based on the dive and haulout data collected from the Kogru River Inlet, this walrus continued to dive in the inlet and haul out on land until its last transmission on 10 August.

Walrus Presence and Timing within Program Areas

Most walruses tagged during 2013–2015 (77 of 80, 96%) entered at least one of the active or proposed program areas in the Chukchi Sea (Fig. 19), 56 of 80 (70%) entered the general Lease Area 193 in the U.S. and 43 of 80 (54%) entered leased blocks within the larger Lease Area 193. We documented the timing of use of these active and proposed program areas and show the days for which tagged walruses were present in active (Fig. 20) and proposed program areas (Fig. 21). Because we combined all years and not all tags transmitted locations for the same length of time, the histograms show the general use period and the peak of use, but do not show residence time for individuals. Hence, reporting the range of days that walruses were present within a program area is more informative than the actual number of walruses, which would be an underestimate.

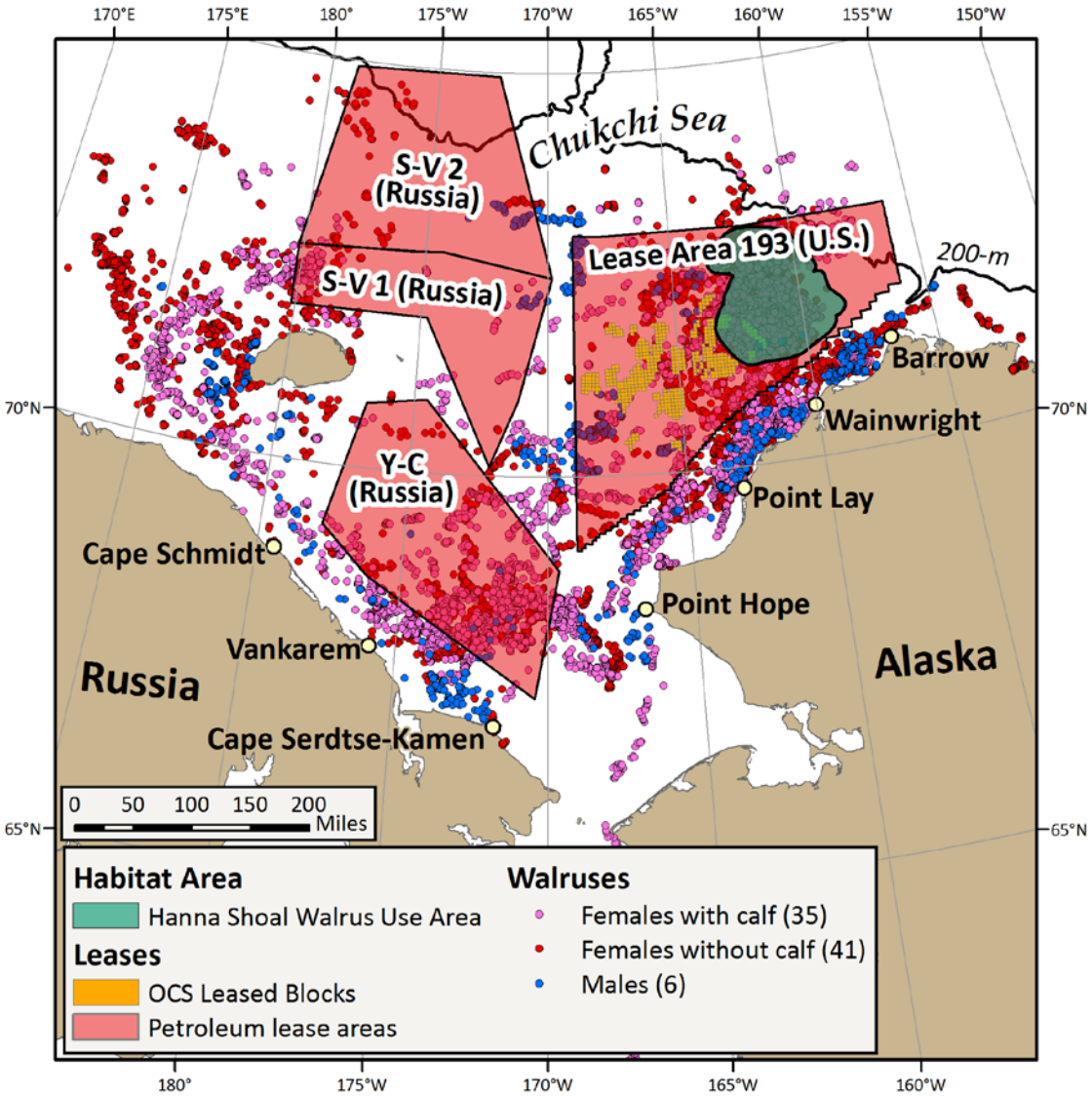


*Figure 19. Locations of 82 tagged walruses in the Chukchi Sea from June through October 2010–2015 relative to active and proposed program areas: Yuzhno-Chukotsky (YC) and Severo-Vrangelevskiy (SV) areas 1 and 2. (** OCS Leased Blocks associated with Chukchi Sea Lease Sale 193 were active during the study period; all but one lease block has been relinquished as of May 2016).*

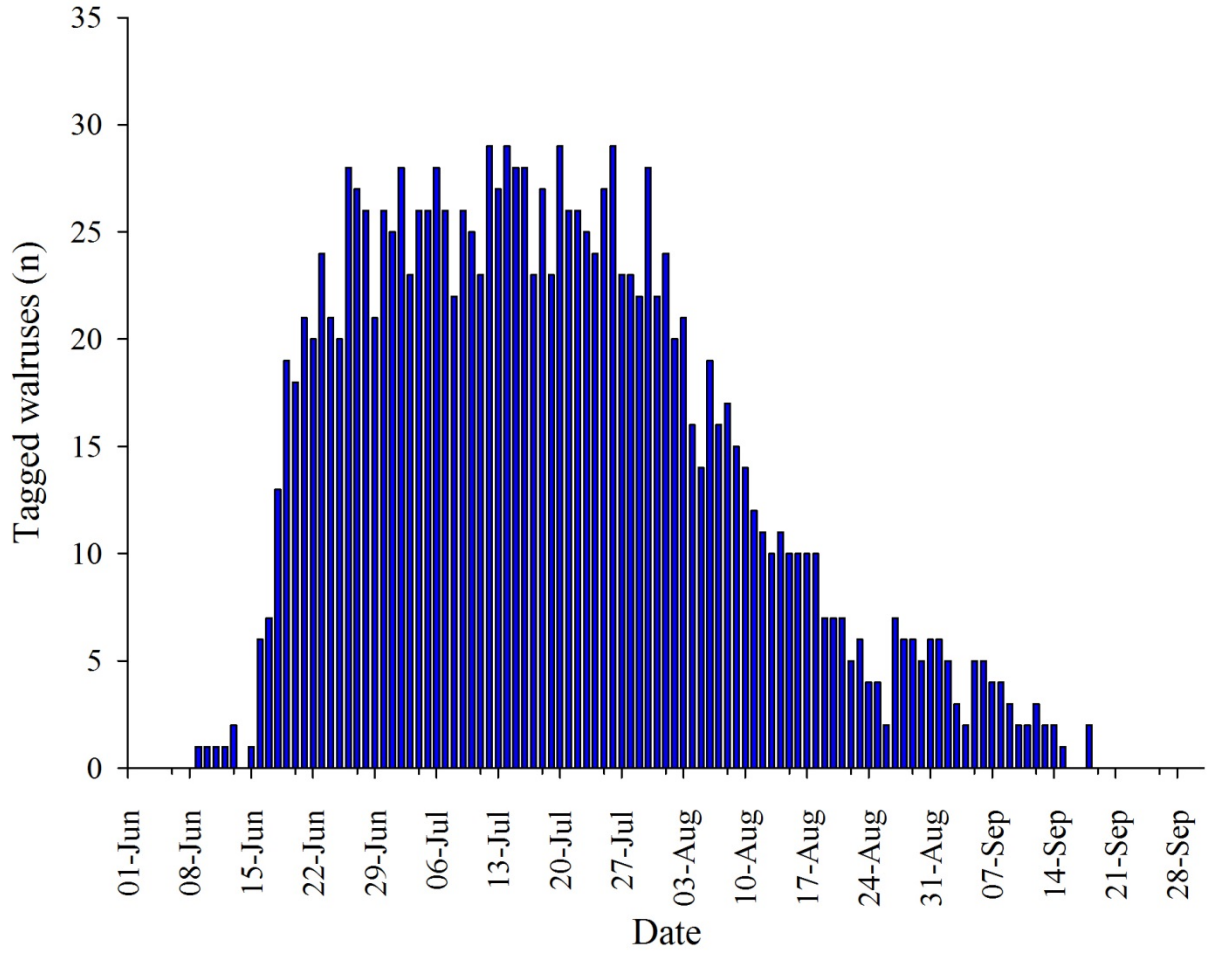


Figure 20. Number of tagged walruses that were in the Lease Area 193 program area in Alaskan waters by day, all years combined (2013–2015).

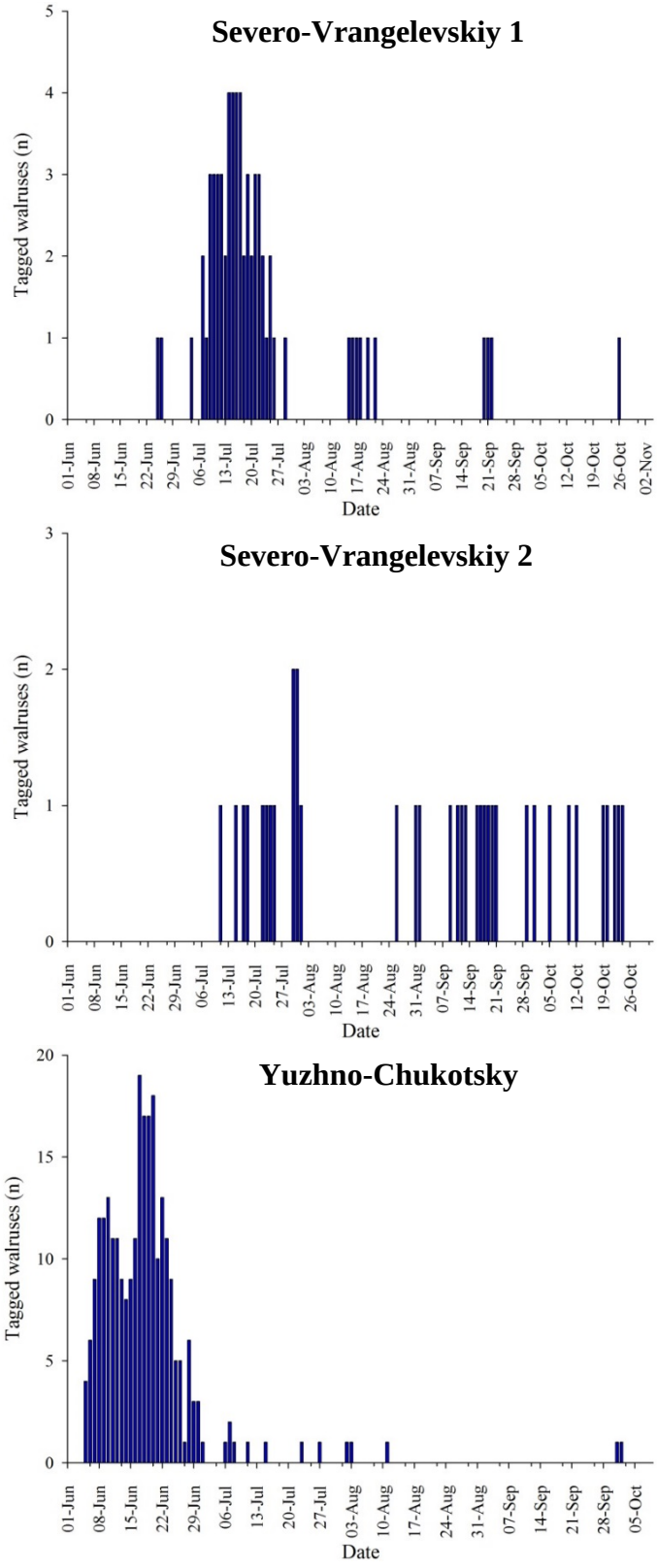


Figure 21. Number of tagged walruses that were in proposed program areas in Russian waters by day, all years combined (2013–2015).

Chukchi Sea Lease Area 193. From 2013 to 2015, 56 of 80 (70%) tagged walruses entered Chukchi Sea Lease Sale Area 193 and the leased blocks. We did not include the two walruses tagged in 2010 in this summary because they had likely migrated south of Area 193 prior to being tagged at Cape Lisburne in late September. For walruses migrating north in the Alaskan Chukchi Sea, the spring migration followed the coast and some walruses entered the Area 193 and the leased blocks as they followed the receding ice north. However, the majority of walruses that entered Area 193, and the leased blocks, did so when they moved into the HSWUA, which is wholly contained within the boundaries of Area 193 (Fig. 19). Walruses were located within Area 193 between 9 June and 18 September, however >50% of the walruses that entered Area 193 were present between 19 June and 8 August (Fig. 20). On average, tagged walruses were located within Area 193 for 35 days (range = 1–93 days, n = 56 walruses).

Residence patterns within the leased blocks were similar to those within the larger Area 193 (Fig. 19), except that the leased blocks represent a small area, thus fewer walruses were located within the block boundaries (43 of 80, 54%) and those that were in the leased blocks were there for a shorter period of time (17 June–10 September). On average, tagged walruses were located within the leased blocks for 18 days (range = 1–71 days, n = 43 walruses), however, because the leased blocks are relatively small areas, residence time in the overall lease area is likely more representative of when walruses might be found within leased blocks than the data from leased blocks alone.

Program Areas in Russia. Although most walruses (73 of the 82 (89.9%)) were tagged on the U.S. side of the international dateline, they used U.S. and Russian waters. Specifically, 43 of 82 (52%) spent some time in Russian waters and 33 of 82 (40%) entered the Yuzhno-Chukotsky (YC) Area. Use of the YC, however, is expected because of its location in the southern Chukchi Sea, just north of Bering Strait, and walruses migrating north generally travel through this area during June (Figs. 10 and 21) before following either the Alaskan or Russian coast to continue their northward migration. Similarly, walruses will also travel through this area during their southern migration. Tagged walruses were located within the YC Area between 5 June and 2 October (Fig. 21). On average, tagged walruses were present within the YC Area for 11 days (range = 1–34 days, n = 33 walruses). Fewer walruses entered the Severo-Vrangelevskiy (SV) 1 and 2 Areas, located in the central Chukchi Sea, east and north of Wrangel Island where fewer tagged walruses were located overall (Figs. 10, 11, 12, 16, 17, 19). During this study, only 14 (18%) and 6 (7.5%) tagged walruses entered the SV Areas 1 and 2, respectively. Walruses transmitted within the SV 1 Area between 25 June and 26 October (Fig. 21). On average, tagged walruses were present within the SV 1 Area for 8 days (range = 1–29 days, n = 14 walruses). Walruses transmitted within the SV 2 Area between 11 July and 24 October (Fig. 21). On average, tagged walruses were present within the SV 2 Area for 17 days (range = 1–59 days, n = 6 walruses).

Seismic Analyses

The activity associated with oil and gas exploration that has the greatest potential for harm in the Chukchi Sea is seismic testing due to the high noise levels associated with it. Many seismic arrays tow 36 airguns and noise levels can be as high as 210 dB depending on water depth, bottom substrate, and distance from the source. There is little information about how noise affects walrus communication, navigation, and movements. Walruses have good hearing and are

sensitive to noise, especially when they are on land (Appendix G-1). Noise or noise in combination with movement is known to cause disturbance related stampedes on terrestrial haulouts (Tomilin and Kibal'chich 1975, Ovsyanikov *et al.* 1994).

Although tagged walruses were located within an active program area during summer and fall of 2013–2015, we found only one 2D operation in 2013 that overlapped in space and time with walrus locations. Although we have made contact with the company that performed the operation we have not been successful in acquiring the information need to overlay walrus locations with the seismic operation to conduct an analysis of walrus behavior before, after, and during the survey.

Haulout and dive behavior

Using the 90% probability density estimates of the estimated haulout and dive locations, we identified two potentially important foraging areas within the Alaskan Chukchi Sea in summer (June–September). One area overlapped the HSWUA and the other was offshore of Icy Cape, between Point Lay and Wainwright, Alaska (Fig. 22). Walruses began using these two areas around 26 June in all years. For this analysis we did not include any dive or haulout behavior of walruses using terrestrial haulouts (n = 2).

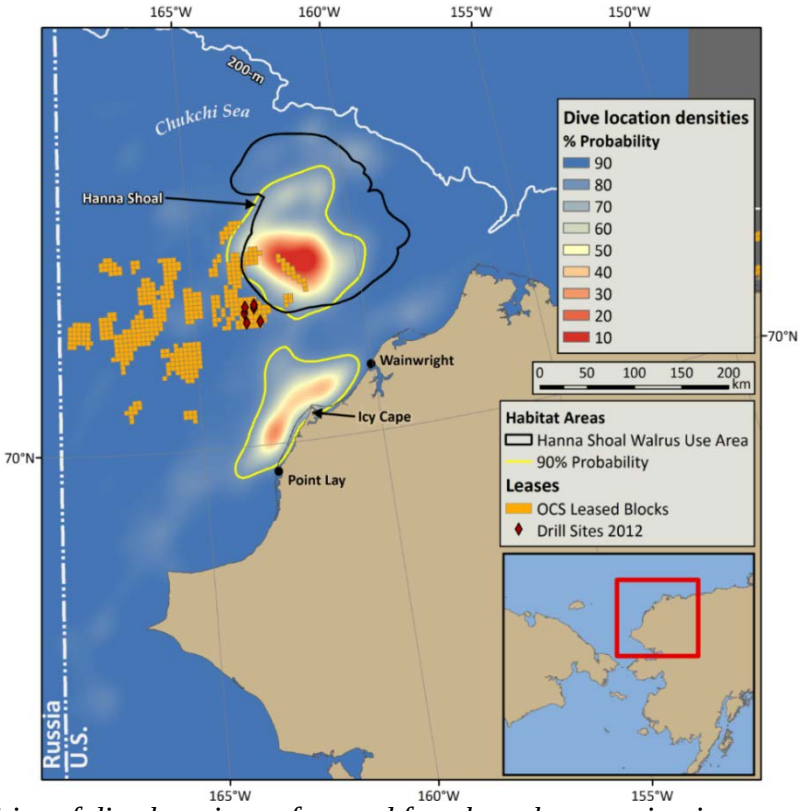


*Figure 22. Densities of dive locations of tagged female walruses using ice as a haulout platform from June–September during 2013–2015 (n = 82). Yellow polygons in Hanna Shoal and near Icy Cape contain areas with >90% probability of diving locations and thus were considered potentially important foraging areas. (** OCS Leased Blocks associated with Chukchi Sea Lease Sale 193 were active during the study period; all but one lease block has been relinquished as of May 2016).*

The model that best approximated the proportion of time hauled out (i.e., haulout percentage) included area of use, reproductive category, and time of day (Area × Reproductive Category + Time) (Figs. 23 and 24). For all females, haulout percentage was, on average, 10% higher in Hanna Shoal than in Icy Cape after controlling for reproductive category and time of day ($P < 0.01$; Fig. 25). Specifically, haulout percentages of females with calves in Hanna Shoal was higher than females with calves in Icy Cape and the rest of the Chukchi Sea and higher than all females without calves in all areas ($P < 0.01$). Within Hanna Shoal and Icy Cape, haulout percentage was, on average, 4.4% higher for females with calves than females without calves ($P < 0.01$). However, in the rest of the Alaskan Chukchi Sea, haulout percentages did not differ by reproductive category ($P = 0.65$).

Haulout percentages of female walruses also differed by time of day (Fig. 24). Walruses hauled out, on average, 6.3% longer between 0900 and 2000 than during the rest of the day ($P < 0.01$). Although the best model did not indicate that hourly differences in haulout percentages were different for females with and without calves ($P = 0.99$) (i.e., the best model did not include an interaction term with Reproductive category and Time of day), we plotted the hourly haulout percentages of each category separately because our data suggest there may be slight differences between categories, especially between 1300 and 1600, and survey-related studies are interested in specific hourly differences in haulout percentages between each category to adjust those analyses for time of day.

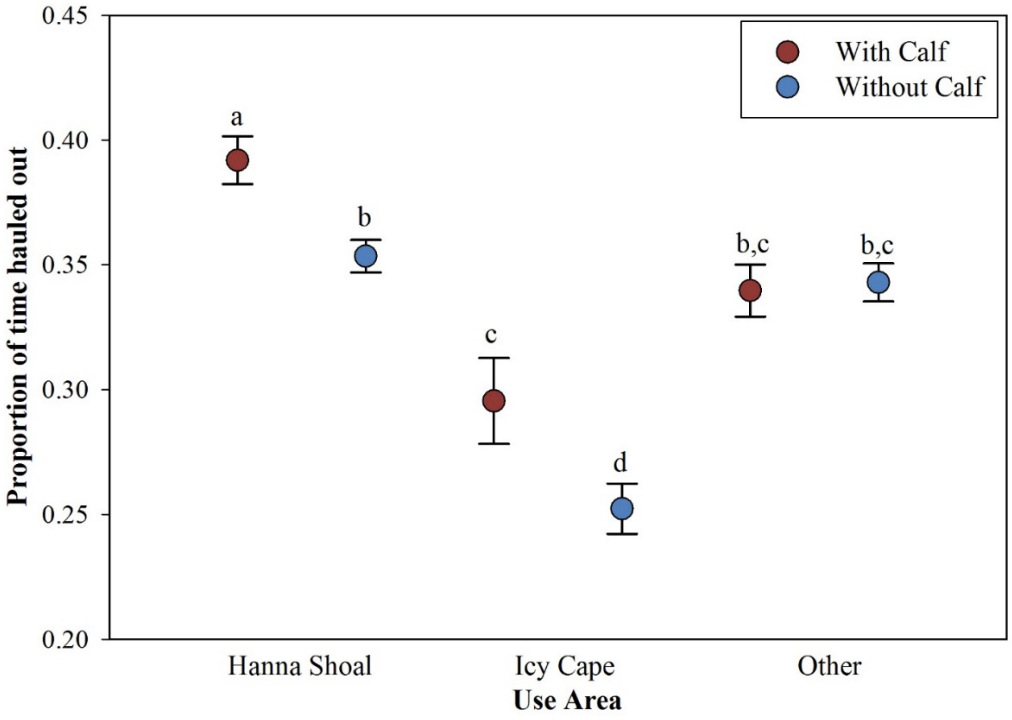


Figure 23. Proportion of time hauled out on ice by reproductive category for tagged female walruses in the Alaskan Chukchi Sea from June–September during 2013–2015. Error bars represent 95% confidence intervals and letters on error bars that are different denote statistically significant differences. Hanna Shoal and Icy Cape were identified as potentially important foraging areas based on 90% density probability of haulout locations. "Other" represents the rest of the Alaskan Chukchi Sea.

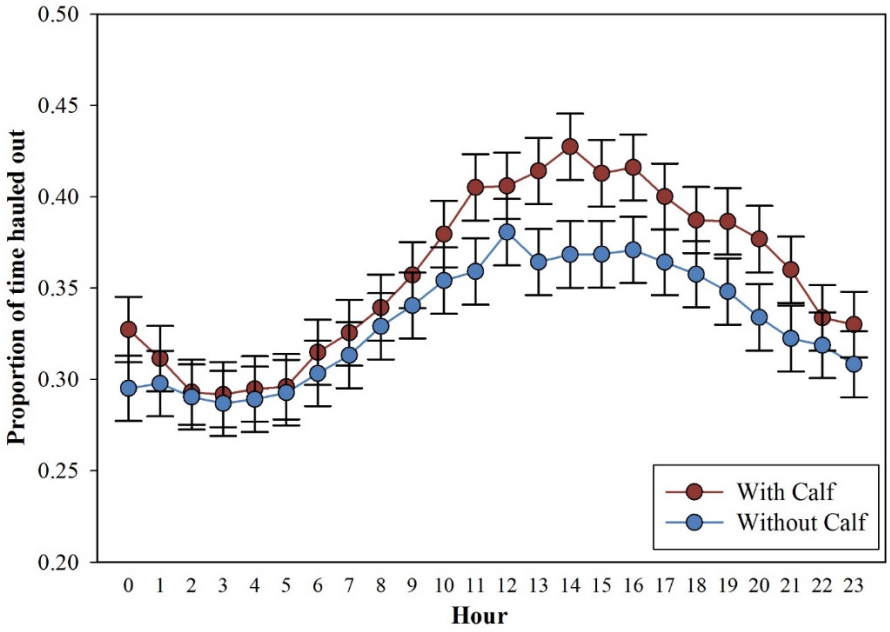


Figure 24. Proportion of time hauled out on ice by hour for tagged female walruses (with and without calves) in the Alaskan Chukchi Sea from June–September during 2013–2015. Error bars represent 95% confidence intervals.

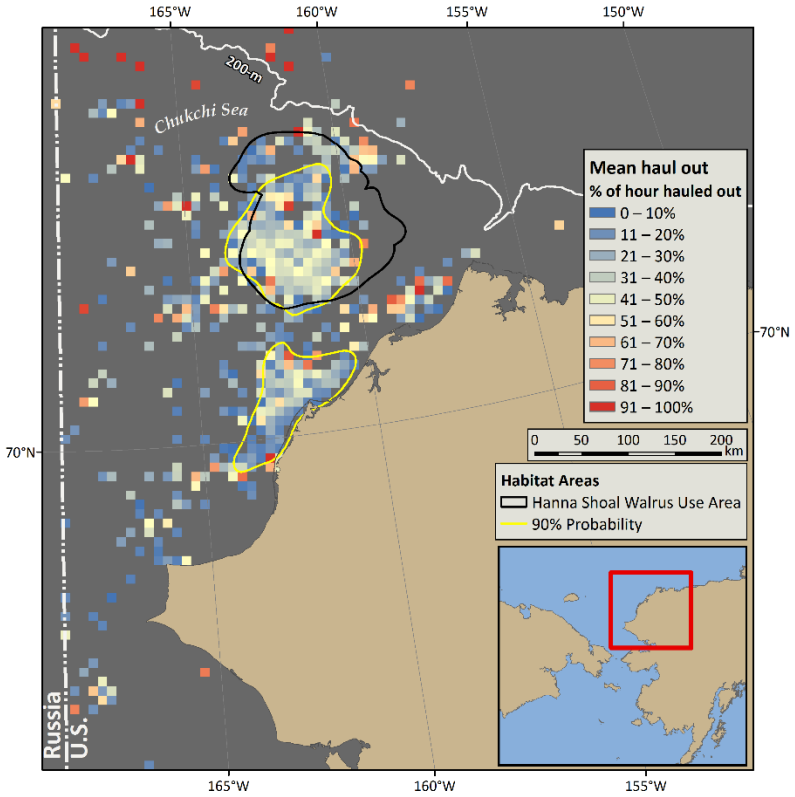


Figure 25. Spatial representation of mean haul out percentages for tagged female walruses on ice from June–September during 2013–2015. Yellow polygons in Hanna Shoal and near Icy Cape contain areas identified as potentially important foraging areas based on 90% density probability of on ice haulout locations.

The model that best approximated dive duration included area of use and time of day (Area + Time) (Fig. 26). Dive durations of all females were 1.6 minutes longer when in Hanna Shoal than Icy Cape and the rest of the Alaskan Chukchi Sea ($P < 0.01$); which did not differ ($P = 0.99$; Figs. 26 and 27). After controlling for the area used, walruses dove longer in the morning (0300–0859) than midday (0900–1459; $P < 0.01$) and evening (1500–2059; $P = 0.02$; Fig. 28). Dive durations at night (2100–0259), however, did not differ from any other time of day ($P > 0.36$).

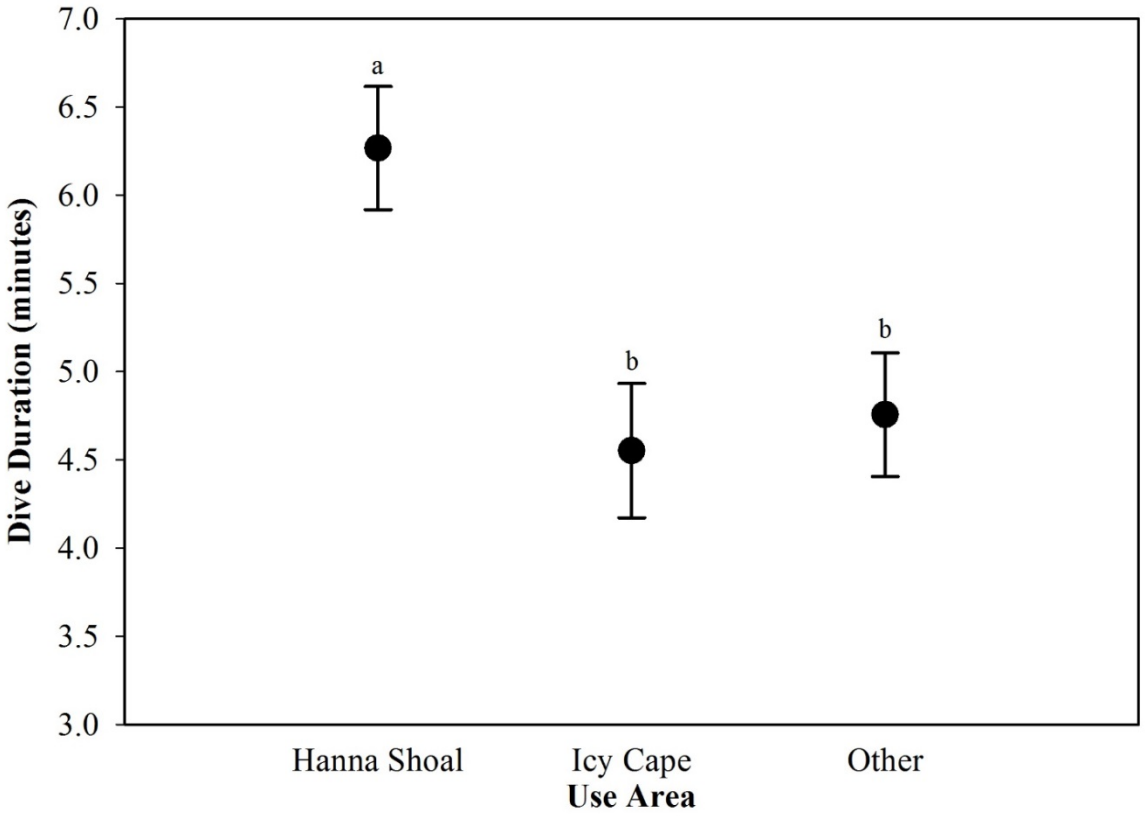


Figure 26. Mean dive durations (in minutes) by use area for tagged female walruses using ice as a haulout platform in the Alaskan Chukchi Sea from June–September during 2013–2015, after controlling for time of day. Error bars represent 95% confidence intervals and letters on error bars that are different denote statistically significant differences. Hanna Shoal and Icy Cape were identified as potentially important foraging areas based on 90% density probability of dive locations. "Other" represents the rest of the Alaskan Chukchi Sea.

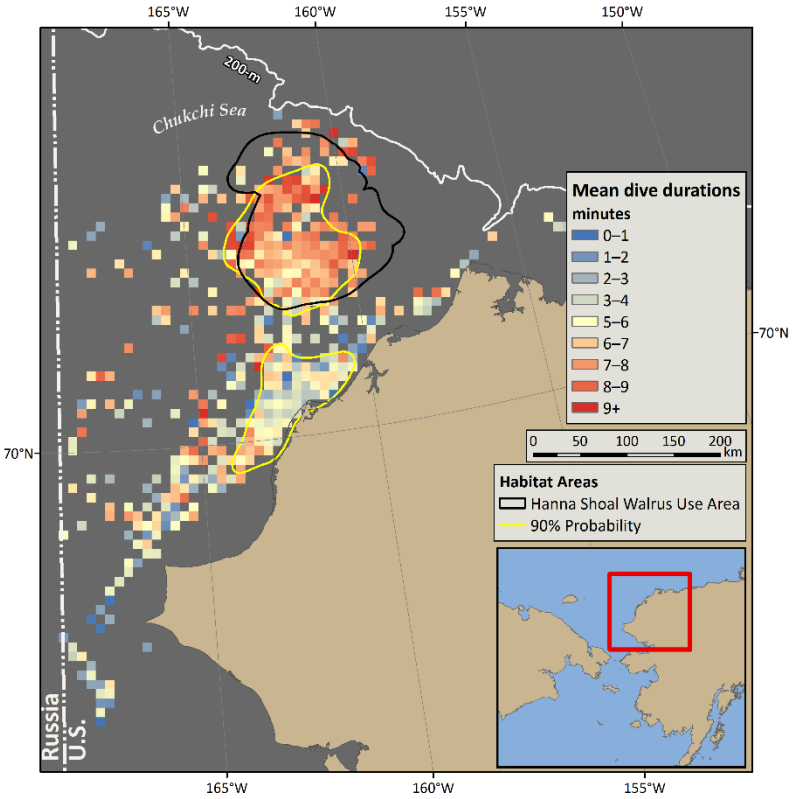


Figure 27. Spatial representation of mean dive durations for tagged female walruses using ice as a haulout platform from June–September during 2013–2015. Yellow polygons in Hanna Shoal and near Icy Cape contain areas identified as potentially important foraging areas based on 90% density probability of dive locations.

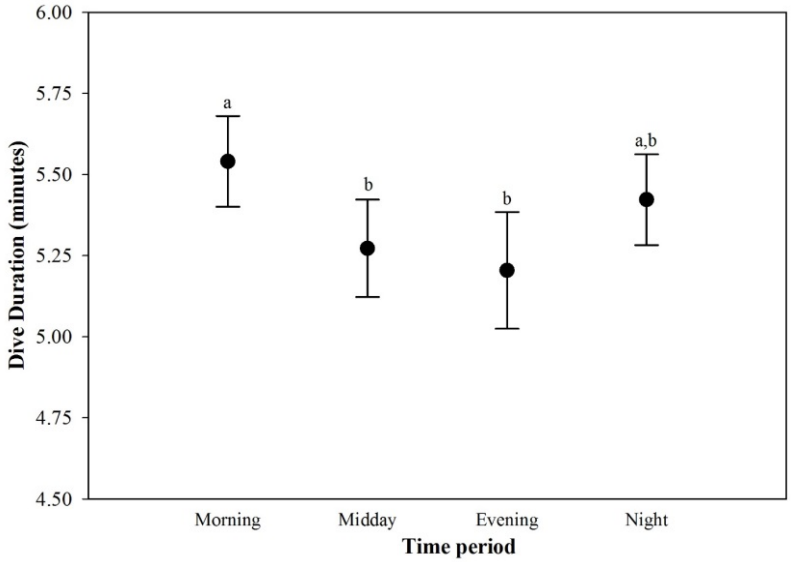


Figure 28. Mean dive durations (in minutes) by time of day (Morning: 0300–0859, Midday: 0900–1459, Evening: 1500–2059, Night: 2100–0259) for tagged female walruses using ice as a haulout platform in the Alaskan Chukchi Sea from June–September during 2013–2015, after controlling for area used. Error bars represent 95% confidence intervals and letters on error bars that are different denote statistically significant differences.

The model that best approximated dive rate included area of use and reproductive category (Area × Reproductive Category) (Fig. 29). When in Hanna Shoal, females made 1.4 fewer dives per hour than when in all other areas ($P < 0.01$; Fig. 30). When in Hanna Shoal ($P = 0.84$) and Icy Cape ($P = 0.41$), the dive rate of females with calves and without calves did not differ. However, in the rest of the Alaskan Chukchi Sea, females with calves made 1.25 more dives per hour than females without calves ($P = 0.04$; Fig. 29).

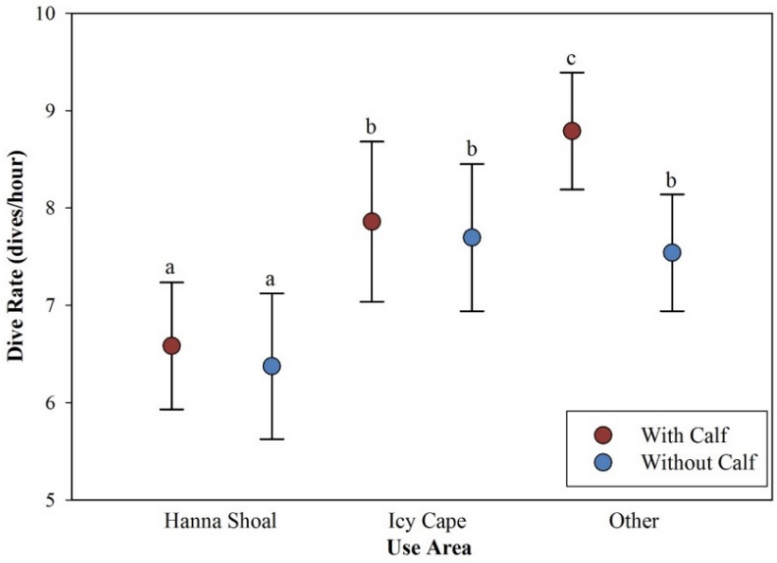


Figure 29. Mean dive rate (dives/hour) by use area for tagged female walruses using ice as a haulout platform in the Alaskan Chukchi Sea from June–September during 2013–2015. Error bars represent 95% confidence intervals and letters on error bars that are different denote statistically significant differences. Hanna Shoal and Icy Cape were identified as potentially important foraging areas based on 90% density probability of dive locations. "Other" represents the rest of the Alaskan Chukchi Sea.

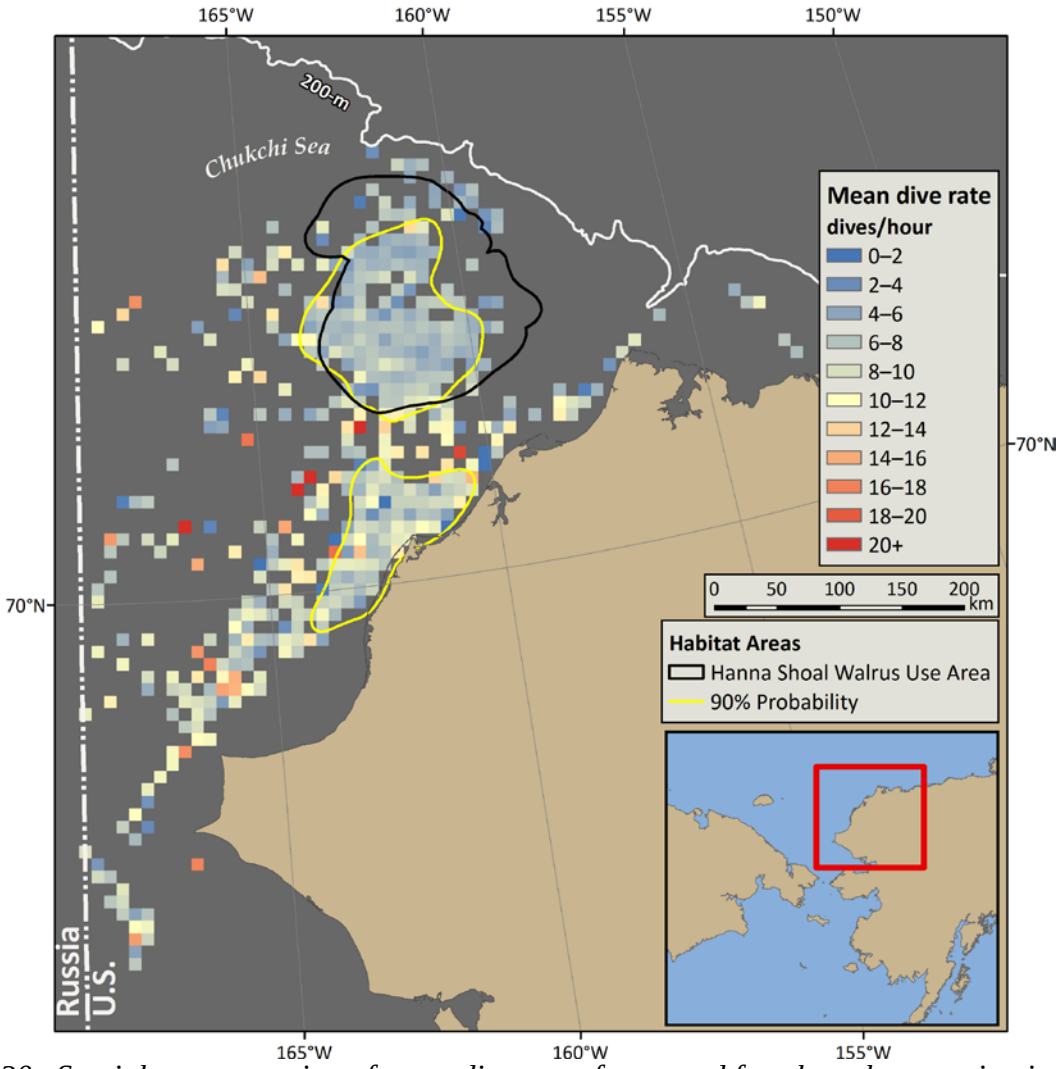


Figure 30. Spatial representation of mean dive rates for tagged female walruses using ice as a haulout platform during 2013–2015. Yellow polygons in Hanna Shoal and near Icy Cape contain areas identified as potentially important foraging areas based on 90% density probability of dive locations.

Surveys and other Activities at Terrestrial Haulouts

Hunters in Point Lay conducted haulout and carcass surveys during 2010, 2011, 2013, and 2014 (Table 7) and assisted ADFG and NSB biologists with carcass surveys in 2014 (Table 8). Although one of our objectives was to conduct shore-based surveys of demographic classes of walruses hauled out, often the risk of disturbance was determined to be too high. From USGS activities (i.e., tagging Jay *et al.* 2012) and high altitude helicopter gimbal photography (Monson *et al.* 2013) however, it was well established that the herds were mostly females with dependent young and juveniles.

Calves were the most frequently identified age class of walrus carcasses surveyed, 49 of 111 (44.1%), and calves were observed with symptoms of trauma more often, 36 of 49 (73.5%), than older age classes (Table 9). Each subsequently older age class; yearlings, subadults, and adults, had a smaller proportion of individuals showing signs of trauma.

Table 7. Walrus carcass survey results from Point Lay, Alaska, September and October 2010, and September 2011, 2013, and 2014. Signs of trauma included blood from the nose and mouth, symptomatic of trampling as the cause of death. Fresh, moderate, advanced, and mummified carcass conditions refer to the level of decomposition observed; advanced and mummified (skeletal) decomposition suggests the walrus died the previous year.

Year	Sample ID	Carcass condition	Sex	Age class	Body condition	Length (cm)	Signs of Trauma	Skin lesions
2010	PLW10-001	Moderate	F	Calf	Robust	155	Y	N
	PLW10-002	Fresh	F	Calf	Robust	144	Y	N
	PLW10-003	Fresh	M	Calf	Emaciated	135	Y	N
	PLW10-004	Moderate	M	Calf	Robust	142	Y	N
	PLW10-005	Fresh	F	Calf	Robust	132	Y	N
	PLW10-006	Fresh	M	Calf	Robust	126	Y	N
	PLW10-007	Moderate	F	Calf	Robust	127	Y	N
2011	PLW11-001	Moderate	M	Yearling	Robust	163	U	Y
	PLW11-002	Mummified	F	Adult	Unknown	U	U	U
	PLW11-003	Moderate	F	Calf	Unknown	146	U	N
	PLW11-004	Mummified	U	Adult	Unknown	U	U	U
	PLW11-005	Moderate	F	Calf	Robust	123	Y	Y
	PLW11-006	Fresh	M	Yearling	Robust	154	Y	Y
	PLW11-007	Advanced	F	Adult	Unknown	U	U	U
	PLW11-008	Fresh	M	Subadult	Robust	215	Y	Y
	PLW11-009	Moderate	F	Calf	Emaciated	123	U	Y
	PLW11-010	Fresh	F	Adult	Robust	277	Y	Y
	PLW11-011	Moderate	M	Yearling	Unknown	147	N	Y
	PLW11-012	Fresh	F	Calf	Emaciated	121	N	Y
	PLW11-013	Moderate	F	Yearling	Unknown	135	Y	Y
	PLW11-014	Fresh	F	Adult	Robust	269	Y	N
	PLW11-015	Fresh	M	Calf	Robust	145	Y	Y
	PLW11-016	Moderate	F	Calf	Robust	142	Y	Y
	PLW11-017	Moderate	U	Calf	Emaciated	130	Y	N
	PLW11-018	Moderate	F	Yearling	Robust	138	Y	Y
	PLW11-019	Advanced	U	Yearling	Unknown	U	U	U
	PLW11-020	Moderate	F	Adult	Emaciated	279	Y	N
	PLW11-021	Advanced	F	Calf	Unknown	127	N	U
	PLW11-022	Advanced	U	Calf	Unknown	U	U	U
	PLW11-023	Advanced	F	Yearling	Unknown	140	U	U
	PLW11-024	Advanced	F	Calf	Unknown	140	U	U
	PLW11-025	Advanced	U	Calf	Unknown	U	U	U
	PLW11-026	Moderate	F	Adult	Unknown	U	U	N
	PLW11-027	Moderate	F	Calf	Emaciated	U	N	Y
	PLW11-028	Fresh	M	Subadult	Emaciated	178	N	Y

2013	PLW13-001	Advanced	M	Adult	Robust	366	N	U
	PLW13-002	Advanced	M	Adult	Robust	274	N	U
	PLW13-003	Advanced	U	Adult	Unknown	396	N	N
	PLW13-004	Fresh	F	Yearling	Robust	170	Y	N
	PLW13-005	Moderate	M	Calf	Emaciated	155	Y	N
	PLW13-006	Fresh	F	Calf	Robust	185	Y	N
	PLW13-007	Fresh	F	Yearling	Robust	218	Y	N
	PLW13-008	Fresh	F	Calf	Robust	157	Y	N
	PLW13-009	Fresh	U	Subadult	Robust	272	N	N
	PLW13-010	Fresh	M	Calf	Emaciated	178	Y	Y
	PLW13-011	Fresh	U	Yearling	Robust	191	Y	N
	PLW13-012	Fresh	U	Calf	Robust	145	Y	U
	PLW13-013	Fresh	U	Yearling	Robust	185	Y	U
	PLW13-014	Fresh	F	Yearling	Robust	198	N	N
	PLW13-015	Fresh	M	Adult	Robust	284	N	N
	PLW13-016	Fresh	U	Calf	Robust	160	N	N
2014	PLW14-001	Advanced	F	Calf	Robust	153	U	U
	PLW14-002	Advanced	U	Yearling	Unknown	U	U	U
	PLW14-003	Moderate	U	Adult	Unknown	235	U	U
	PLW14-004	Moderate	U	Yearling	Unknown	202	U	U
	PLW14-005	Moderate	U	Subadult	Unknown	223	U	U
	PLW14-006	Fresh	F	Adult	Unknown	315	Y	N
	PLW14-007	Fresh	F	Adult	Robust	318	Y	N
	PLW14-008	Fresh	M	Calf	Robust	186	Y	N
	PLW14-009	Fresh	U	Subadult	Robust	264	Y	N
	PLW14-010	Fresh	M	Calf	Robust	179	Y	N
	PLW14-011	Fresh	M	Calf	Robust	192	Y	N
	PLW14-012	Fresh	F	Adult	Robust	300	Y	N
	PLW14-013	Fresh	F	Adult	Robust	310	Y	N
	PLW14-014	Fresh	M	Calf	Robust	216	Y	N
	PLW14-015	Fresh	F	Calf	Robust	U	Y	N
	PLW14-016	Fresh	F	Calf	Robust	178	Y	N
	PLW14-017	Fresh	F	Calf	Robust	165	Y	N
	PLW14-018	Fresh	U	Calf	Robust	169	Y	N
	PLW14-019	Fresh	F	Adult	Robust	310	Y	N
	PLW14-021	Fresh	M	Calf	Robust	145	Y	N
	PLW14-022	Fresh	F	Calf	Robust	140	Y	N
	PLW14-023	Fresh	F	Yearling	Robust	170	Y	N
	PLW14-024	Advanced	U	Yearling	Unknown	180	N	N
	PLW14-025	Fresh	U	Calf	Robust	105	N	N
	PLW14-026	Fresh	U	Subadult	Robust	240	Y	N
	PLW14-027	Fresh	F	Calf	Robust	160	Y	N
	PLW14-028	Fresh	M	Calf	Robust	145	Y	N
	PLW14-029	Fresh	F	Calf	Robust	151	Y	N
	PLW14-030	Fresh	F	Yearling	Robust	183	Y	N

U: Unknown

Table 8. Walrus carcass survey results from Point Lay, Alaska, 3–4 October 2014 and conducted in cooperation with the North Slope Borough, Department of Wildlife Management. Signs of trauma included blood from the nose and mouth, symptomatic of trampling as the cause of death. Moderate and advanced carcass conditions refer to the level of decomposition observed; advanced decomposition suggests the walrus died the previous year.

Sample ID	Carcass condition	Sex	Age class	Body condition	Length (cm)	Signs of Trauma	Skin lesions
PLW14-031	Unknown	F	Adult	Unknown	281	N	N
PLW14-032	Unknown	F	Calf	Unknown	170	Y	N
PLW14-033	Unknown	F	Adult	Unknown	281	N	N
PLW14-034	Unknown	F	Adult	Unknown	270	N	N
PLW14-035	Unknown	F	Adult	Unknown	302	N	N
PLW14-036	Unknown	F	Adult	Unknown	274	N	N
PLW14-037	Unknown	F	Adult	Unknown	318	N	N
PLW14-038	Unknown	F	Subadult	Unknown	251	N	N
PLW14-039	Moderate	F	Yearling	Unknown	191	Y	N
PLW14-040	Unknown	F	Adult	Unknown	279	N	N
PLW14-041	Advanced	F	Subadult	Unknown	201	Y	N
PLW14-042	Unknown	F	Adult	Unknown	286	N	N
PLW14-043	Moderate	F	Adult	Unknown	310	Y	N
PLW14-044	Unknown	F	Adult	Unknown	284	N	N
PLW14-045	Unknown	F	Adult	Unknown	287	N	N
PLW14-046	Advanced	U	Calf	Unknown	U	Y	N
PLW14-047	Advanced	U	Calf	Unknown	163	Y	N
PLW14-048	Advanced	F	Calf	Unknown	157	Y	N
PLW14-049	Unknown	F	Subadult	Unknown	221	N	N
PLW14-050	Unknown	F	Calf	Unknown	U	Y	N
PLW14-051	Unknown	F	Adult	Unknown	290	N	N
PLW14-052	Unknown	M	Calf	Unknown	141	Y	N
PLW14-053	Unknown	F	Yearling	Unknown	196	Y	N
PLW14-054	Unknown	U	Subadult	Unknown	241	Y	N
PLW14-055	Unknown	F	Adult	Unknown	259	Y	N
PLW14-056	Advanced	F	Adult	Unknown	297	N	N
PLW14-057	Fresh	M	Yearling	Unknown	183	Y	N
PLW14-058	Unknown	M	Calf	Unknown	147	N	N
PLW14-059	Unknown	M	Calf	Unknown	154	Y	N
PLW14-060	Moderate	U	Subadult	Unknown	251	Y	N
PLW14-061	Unknown	F	Calf	Unknown	149	N	N

U: Unknown

Table 9. Summary of walrus carcasses that were observed with symptoms of trauma in 2010, 2011, 2013, and 2014.

Age class	No. sampled	Signs of Trauma (%)
Calf	49	36 (73.5%)
Yearling	20	12 (60.0%)
Subadult	11	6 (54.6%)
Adult	31	10 (32.3%)
Total	**111**	**64 (57.7%)**

Determining the duration of occupancy at haulout locations and follow-up carcass surveys were problematic at Point Lay. In the late fall, the water level drops in the lagoon between the village of Point Lay and the haulout on the barrier island making boating difficult. As the temperature drops there is a period when neither boats nor 4-wheelers or snowmachines can be used for access. During this period when access is limited, high winds can cause the haulout beaches to be inundated. The high water and wave action simultaneously displaces the herd and washes away unsurveyed carcasses that were too close to the herd to be visited when the haulout was active. For these reasons demographic data, duration of haulout occupancy, and carcass surveys are incomplete.

Surveys for newly formed haulouts were conducted regularly by boat, both north and south, of Point Lay. Haulout surveys were also conducted during 2012 on Little Diomede Island at an area known to be used but no walruses were found hauled out on land.

An important part of the surveillance of the Point Lay haulout was done by camera as part of a project conducted by the Alaska SeaLife Center. Point Lay hunters supported by this project assisted in the construction and maintenance of camera towers. In 2015, two of the camera towers got pushed over by walruses as the haulout hit its maximum size. Tens-of-thousands of photos were taken and researchers at the Alaska SeaLife Center are currently examining these photos and plan to produce a final report by October 2016.

In August 2015, in anticipation of the end of this project, we transferred carcass survey and haulout surveillance responsibilities to the USFWS. Data was shared with USFWS and USGS throughout the project.

Local and Traditional Knowledge

The contribution of walrus hunters including local and traditional knowledge regarding walrus movements, timing of migration, and haulout behavior was a valuable contribution of this study. Information from interviews in Point Lay, Wainwright, Point Hope, Barrow, Elim, St. Michael, Stebbins, Kivalina, Kotzebue, and Shishmaref, during this study (2010–2015) are contained in reports made for the communities and incorporated into the results of this final report. Final reports are available from interviews in Point Lay and Wainwright (Huntington *et al.* 2012; Appendix G-1), Point Hope (Huntington and Quakenbush 2013; Appendix G-2), Barrow (Huntington *et al.* 2015a; Appendix G-3), Elim (Huntington *et al.* 2015b; Appendix G-4), St.

Michaels and Stebbins (Huntington *et al.* 2015c; Appendix G-5), Kivalina (Huntington *et al.* 2016a; Appendix G-6), Kotzebue (Huntington *et al.* 2016b; Appendix G-7), and Shishmaref (Huntington *et al.* 2016c; Appendix G-8) are available on the Alaska Department of Fish and Game's webpage at http://www.adfg.alaska.gov/index.cfm?adfg=marinemammalprogram.traditionalknowledgereports. Some of the information contained in these reports is also presented in a peer-reviewed publication in Biology Letters (Huntington *et al.* in press). Details of the communities, topics, and numbers interviewed are presented in Table 10 and all traditional knowledge reports are included as Appendices G-1–G-8.

Hunter experience in approaching walruses on land without being detected was critical to the success of tagging and observations done during this study. Hunters also know when and where to look for walruses and how to approach them on the ice. We worked with the EWC to identify walrus hunters that had extensive knowledge and were interested in the project.

Walrus hunters Clarence Irrigoo, Perry Pungowiyi, and Edwin Noongwook, all from Saint Lawrence Island, taught us about walruses and sea ice during the walrus research cruises in 2013–2015. During the walrus research cruises, when the ship was between concentrated ice and the shore the hunters were consulted about the best course to take relative to the prevailing wind and currents.

Table 10. Summary of traditional ecological knowledge interviews and final reports.

Community	Year	Species discussed	No. interviewed	Reference
Point Lay and Wainwright	2012	Walrus and seals	5 13	Huntington *et al.* 2012; Appendix G-1
Point Hope	2013	Walrus, seals, bowhead whales, and beluga whales	8	Huntington and Quakenbush 2013; Appendix G-2
Barrow	2015	Walrus, seals, polar bears, bowhead whales, and beluga whales	10	Huntington *et al.* 2015a; Appendix G-3
Elim	2015	Walrus, seals, and beluga whales	8	Huntington *et al.* 2015b; Appendix G-4
St. Michael and Stebbins	2015	Walrus and seals	8 2	Huntington *et al.* 2015c; Appendix G-5
Kivalina	2016	Walrus, seals, bowhead whales	5	Huntington *et al.* 2016a; Appendix G-6
Kotzebue	2016	Walrus, seals	6	Huntington *et al.* 2016b; Appendix G-7
Shishmaref	2016	Walrus, seals	5	Huntington *et al.* 2016c; Appendix G-8
Total 10 communities	**4 years**	**7 species**	**70 interviews**	**8 reports**

Accomplishment of Objectives and Tasks

Overall Objective: The overall objective of this study was to work with subsistence hunters to deploy satellite transmitters and conduct observations on walruses in order to collect data that can be used to accomplish the following specific objectives.

Between 2009 and 2016 we worked with subsistence hunters from Gambell, Savoonga, Diomede, Wales, Point Hope, Point Lay, Wainwright, and Barrow to deploy satellite transmitters, conduct observations, carcass surveys, and TEK interviews.

***Objective 1*:** Estimate patterns of movement and behavior of walrus migrating to and moving within the Chukchi Sea Planning Area. Particular emphasis will be placed on estimating movements within industrial ship traffic lanes and between terrestrial haulout sites and feeding areas near Hanna Shoal and other potential oil and gas development sites.

The greatest potential for overlap with ship traffic not related to oil and gas activities would occur during September and October when walruses are migrating south and ships are still traveling through Bering Strait. Although our tag data did not cover those months well because most tags were deployed in June and did not last through September, the data we have for September and October indicate that walruses would be near the coast of Chukotka and using terrestrial haulouts there. The potential danger of ship strikes to walruses is probably far less than if ships came close enough to shore to disturb large haulouts.

Use of the Chukchi Sea Planning Area 193 was high with 56 of 80 (70%) tagged walruses entering the area with most using the Hanna Shoal area (Fig. 19). Although >50% of the walruses that entered Area 193 were present between 19 June and 8 August (Fig. 20), the earliest day of use was 9 June and the latest was 18 September. On average, tagged walruses were located within Chukchi Sea Planning Area 193 for 35 days between June and September (range = 1–93 days, n = 56 walruses) with the highest density of use in the HSWUA.

Residence patterns within the leased blocks were similar to those within the larger Area 193 (Fig. 19), except that the leased blocks represent a smaller area, thus fewer walruses were found within the block boundaries (43 of 80, 54%) and those that were in the leased blocks were there for a shorter period of time (17 June–10 September). On average, tagged walruses were located within the leased blocks for 18 days (range = 1–71 days, n = 43 walruses).

Although terrestrial haulouts occurred on Russian and Alaskan coasts each year of tagging, few tagged walruses used terrestrial haulout sites. Only 8 of 28 (29%) tagged walruses used any terrestrial haulout (Table 6), and only two used the Point Lay haulout on the Alaskan coast (Fig. 18). During our study, two of seven walruses (29%), whose tags were still transmitting when terrestrial haulouts formed near Point Lay, hauled out there; both in 2015 (Fig. 18).

***Objective 2*:** Estimate and evaluate the effect of any changes in walrus behavior related to changes in ice coverage and ice quality in the Chukchi Sea.

Tagged walruses arrived in the HSWUA in spring when ice was present, often traveling through the pack ice and north of the retreating ice edge to access the HSWUA. They did not begin to

haulout at Point Lay until most of the ice had retreated north of the Chukchi Shelf, however some walruses continued to use ice that did not show up on satellite images and ice that was north of the shelf, over water deeper than 200 m (Fig. 15).

Whether walruses have always moved ahead (northward) of the retreating ice in the spring is not clear, however, the intensive use of the HSWUA in late June and early July when most walruses were still in the Bering Sea in the past (Fay 1982) indicates that the spring migration is earlier now than described by Fay (1982).

Objective 3: Estimate walrus use of terrestrial haulouts by demographic class and estimate the duration of occupancy as related to weather, disturbance, and other potential factors.

The terrestrial haulout at Point Lay was used by all demographic classes beginning in late August and continuing into September until winds from fall storms brought waves crashing on the haulout beach and walruses would leave. The waves also removed the carcasses that were too near the haulout to be counted and evaluated when walruses were present, preventing a complete count.

Carcasses were mostly calves and yearlings indicating that females and dependent young used the haulout. Photographs and observations of the haulout indicated that older juveniles and adult males were also present (Monson *et al.* 2013).

Objective 4: Document traditional knowledge of walrus behaviors including, but not necessarily limited to, movements, social behavior, and use of habitat including use of ice and land as haulout substrates.

Interviews involving 70 people from 10 coastal Alaska communities produced valuable information that were presented in eight final reports to EWC and the communities. Final reports are available on ADFG and BOEM websites, and are included in this document as Appendices G-1–G-8.

TEK findings specific to walrus behavior included their excellent hearing and sensitivity to smells and movement. Females are protective of their calves and have been known to attack boats and hunters. Hunter knowledge of how to work around large groups of walruses, including many females with calves was important to this study.

Walruses regularly haul out on shore in small numbers and hunters reported this activity in Norton Sound, near Point Hope, Point Lay, Wainwright, and Barrow (Appendices G-1–G-5). Walruses sometimes haulout in small numbers between Cape Thompson and Cape Lisburne, but regularly haul out near Cape Lisburne by the dozens. However, fewer walruses have hauled out near Cape Lisburne recently, possibly because barges sometimes wait there for better ice or weather conditions (Appendix G-2). In the past, typically a few walruses were seen at various locations on the islands in Kasegalek Lagoon. Large numbers were seen on shore between Point Lay and Wainwright in the 1950s, but the much larger numbers began hauling out on the Alaskan coast in 2007 (Appendix G-1).

Task 1 – Data Review and Hypothesis Development. We reviewed available data on walruses throughout the project. In addition to examining our own data, we peer reviewed manuscripts and read published literature on walrus movements and behavior to refine and develop working hypotheses.

Task 2 – Experimental Design and Field Work. We continued to develop our collaborations originally established during "The Planning Phase" of this study that begun as a University of Alaska Coastal Marine Institute Study in 2008. We worked with the walrus hunters, EWC, USFWS, and USGS to address objectives. We worked with walrus hunters from Point Lay to conduct carcass surveys and to make observations of the terrestrial haulout when it formed and to look for other haulouts. We worked with hunters from Wales, Diomede, and Point Hope to tag walruses from shore during the spring migration but the weather and ice conditions prevented any tag deployments. Hunters from Gambell and Savoonga were critical members of the walrus research cruises in the Bering and Chukchi seas (2013–2015). We avoided conflicts with subsistence hunting by allowing each community to determine if tagging activities conflicted with their hunting.

We tracked 82 walruses for a maximum of 134 days. Tag longevity was limited by retention or antenna durability and not battery longevity. We coordinated with USGS to match the data collection parameters of the tags both agencies deployed on walruses so that data collected by both agencies were comparable and could be combined for some analyses. This was accomplished even though we used a different tag manufacturer and attachment anchor.

Task 3 – Data Analysis and Reporting. We used findings from this study to test and refine hypotheses. We provided weekly maps of all tagged walruses by reproductive category (i.e., females with and without calves) to interested parties via an extensive email list and an additional map focused on the Chukchi Leases and the Hanna Shoal area for BOEM to accommodate weekly meetings that BOEM held with industry in order to provide the most recent locations of tagged walruses for near real-time evaluations of walruses and industry. We also supplied density estimate maps and maps that depicted walrus movements relative to the Distributed Biological Observatory areas in the Bering, Chukchi, and Beaufort seas for BOEM presentations at workshops. We have presented research results at six Alaska Marine Science Symposiums (2011–2016) and at the Society for Marine Mammalogy Biennial Conference in 2015. We have begun to prepare manuscripts on dive and haulout behavior, and movements relative to ice concentration. We intend to continue collaborations with USFWS, USGS, and others on data analyses and products that will improve our understanding of walrus behavior and ecology.

Task 4 – Integration of Findings with other Tasks. Walrus movement data from this study will be included in a Synthesis of Arctic Research (SOAR) publication that will overlay the distribution of marine mammal use of the Chukchi Sea (Citta *et al.* In prep.)

We have accommodated many requests for data to augment other projects and efforts. Although we anticipated contributions to the U.S. Coast Guard efforts for planning shipping lanes in Bering Strait the date of tagging and the longevity of the tags have not provided sufficient data in Bering Strait. We make our maps and other products available through our website and many

consulting companies and other entities use them for their reports. We have offered data to USGS to augment their studies.

Task 5 – Data Management and Archival. We have maintained an archive of all data collected during this study. We have ensured that all data are properly recorded, validated, backed up, and archived in order to be available to BOEM and other investigators after the objectives and obligations of this project are met. Location data from Argos have been downloaded weekly from the Argos webpage and complete summaries have been received monthly. Metadata, raw data files, and processed data files are archived on the State of Alaska web server. On this server (WinfoNet), we have an archival application specifically for the storage of data and the creation of metadata. The server is backed-up daily and cached in Fairbanks, Anchorage, and Juneau, Alaska. Processed locations were imported into a geographic information system (ArcMap or R) to analyze location and dive data that we plan to present in future manuscripts. Our data archive and access policy is consistent with standards adopted by BOEM, the National Oceanographic Data Center, NOAA, and other federal agencies.

Task 6 – Local Coordination, Outreach and Permitting. We coordinated with EWC and the local communities for tagging, haulout monitoring, and traditional knowledge interview activities. We provided handouts at annual EWC meetings (Appendices F-1, F-6, F-8, and F-10). Our primary method of outreach consisted of sending weekly project updates and maps to a list of interested persons, including subsistence hunters, scientists, industry, and managers. Updates included a map with the most recent tagged walrus locations, a description of sea ice conditions, and a description of any additional pertinent information. Recipients often responded and generated real-time discussions regarding walrus movements. Maps were then posted on the ADFG website, where they are available along with other information about the walrus tagging project. We also prepared posters and gave presentations in coastal communities. We held two Federal Walrus Research Permits from USFWS (MA220876 and MA57198B) and used a permit issued to USFWS in 2015 (MA039386). We also maintained Institutional Animal Care and Use Committee (IACUC) protocols from ADFG approved annually for our research (2010-13R, 2012-020, 2013-20, 2014-03, and 2015-25).

Task 7 – Logistics/Safety Plan. Safety plans were developed specific to each tagging effort based on local logistics, infrastructure, and measures already in place. Safety equipment was inspected to ensure it was in working order. Radio communication was established between boats and with a contact on shore. In addition to marine VHF radios, radio beacons, and satellite telephones were present on all tagging boats.

Discussion

Coordination

Collaboration between walrus hunters, walrus hunting communities, EWC, USGS, USFWS, and BOEM was important for tagging and exchanging information during this study. Our original study design was for ADFG to tag from coastal communities with local walrus hunters because USGS had been focused on tagging offshore from ships. When this project began in 2009, however, large numbers of walruses were hauling out at Point Lay and USGS began an onshore

tagging effort there. Although we were working with Point Lay for haulout surveillance and carcass surveys we did not tag there and instead tried to work from other village locations including Point Hope, Little Diomede, and Wales, but weather and ice conditions were not conducive to tagging. All of these tagging attempts were coordinated with the communities so that tagging operations would not interfere with walrus hunting.

In order to keep the EWC informed of the study progress and for them to relay questions and concerns we made regular oral presentations at EWC meetings and provided handouts for EWC commissioners. In order to keep as many people informed as possible we sent weekly maps of the locations and movements of tagged walruses to partners and anyone that expressed an interest in receiving them. The e-mail list included >200 addresses; many people also forward our maps to their own list of addresses.

Upon receiving maps, recipients often replied to the list with their thoughts, questions, or other information about current walrus observations. This often stimulated a mini-discussion that provided valuable real-time information with perspective on the movements of the tagged walruses relative to the rest of the population and allowed us to clarify some confusion about USGS versus ADFG tagging activities.

After the maps were distributed to the e-mail list they were placed on the ADFG website for people without e-mail addresses and for archiving. We know that the website was checked regularly because we received inquiries if we were slow to post a map. We also posted publications, analyses, posters, and other products on our webpage. These products are used by many entities for environmental assessments, biological opinions, incidental harassment applications and authorizations in oil company reports and in species and habitat maps.

We coordinated with research conducted by USGS and USFWS and participated in joint research cruises where all but two of our tags were deployed. We produced maps specific to the regulatory needs of BOEM to use for meetings with oil companies and other agencies.

Tagged Walruses, Biopsy and Tag Performance

The amount of data collected from each tag varied greatly and was dependent on many factors, some of which are impossible to identify with certainty. Although the tags we deployed had relatively good tag longevity for walruses (mean tag duration; SPOT tags: 69.8 days; SPLASH tags: 44.0 days), walruses do not retain tags very long for reasons we do not completely understand, but are possibly related to how walruses lay and roll on their backs and on each other when hauled out, potentially breaking the antenna from the tag, crushing the tag's circuitry, or shearing the tag off of the anchor plate. Very few tags have been observed attached to walruses after being deployed so there is little information available for improving tag attachment design for longevity and for further minimizing effects to the walrus. A walrus was harvested by Point Hope hunters in fall 2011 that had a satellite transmitter and the walrus was healthy with no apparent problems on the skin near the transmitter attachment location (Appendix G-2).

Most tags performed well and collected reliable data, however in trying to provide USGS with equivalent behavioral data to those collected by their Telonics tags, we worked with engineers at Wildlife Computers to develop a new setting to collect these data on SPLASH tags. In 2013, this

behavioral setting did not collect the data properly, although location, dive, and haulout information were not affected. After the research cruise in 2013, we worked with Wildlife Computers again to fix this setting and the problem was resolved prior to deploying tags in 2014 and the additional behavioral data was collected in 2014 and 2015. We checked all tags thoroughly before deployment by dunking them in salt water to be sure they will activate once deployed and to confirm battery strength. Of 95 tags deployed, 13 did not transmit any data or only transmitted data for <24 hours after deployment due to an error in the tags' software or for other unknown reasons (Table 3).

During this study (2009–2016), we deployed 95 tags on walruses (39 on females with calves, 47 on females without calves and 9 on males). These are the first data collected on Pacific walruses where it is known if females had calves when they were tagged, and therefore allows comparisons between females with and females without calves to be made, although it is unknown if any calves were lost after tagging. Because we only deployed tags on nine male walruses, and only six of these tags transmitted data, results of our analyses between sexes (e.g., tag longevity, travel distances, distance to shore) may be a function of the small sample size of males tagged. The success of this program was largely due to the partnership with Native walrus hunters. Walrus hunters could safely approach walruses and deploy tags accurately using a crossbow or a traditional harpoon style delivery with minimal disturbance to the group and maximal safety for the taggers.

Conclusions

This project collected important information about walruses during spring and summer in the Chukchi Sea. We worked with Native subsistence hunters to develop new study objectives and to deploy tags. We worked with tag manufacturers to make our data compatible with those collected by USGS and to improve longevity of the tags. We shared our results with the EWC, subsistence hunters, and their communities, scientists, oil company personnel, agency personnel, and other interested parties by sending out weekly maps and information updates. We have offered to share data with USGS and USFWS. We maintained an active website that allowed public access of our data products. This website was used by many entities for diverse purposes, including species and habitat maps, environmental assessments, biological opinions, incidental harassment applications and authorizations. We made numerous oral and poster presentations at conferences, symposia, and meetings (Appendices F-1–F-13) and general summer distribution data will be published in a peer-reviewed scientific publication in 2016 (Citta *et al.* In prep.). We also intend to publish manuscripts on migration, diving and haulout behavior, and habitat use.

This project has contributed a greater understanding of the distribution, movements, and habitat use of Pacific walruses by combining data collected by satellite transmitters with Traditional Ecological Knowledge. These include, but are not limited to:

1. Further documentation of the spring, summer, and fall distribution of walruses, including migratory routes and summer movements by reproductive category.

2. Documentation of the relative importance of feeding areas. Specifically we compared Hanna Shoal, Icy Cape, and the rest of the Chukchi Sea and, based on walrus behavior, found indications that Hanna Shoal is likely the most important of these areas.

3. Documentation of the use and timing of sea ice, terrestrial haulouts, and foraging areas.

4. We have documented walrus presence within U.S. and Russian program areas in the Chukchi Sea. Based on movements and behavior of tagged walruses from all years, the greatest potential for anthropogenic disturbances from industrial activities, including local shipping, occur near Hanna Shoals Walrus Use Area from June–September.

5. We deployed tags in U.S. (n = 81) and Russian waters (n = 14) and, although the sample size in Russian waters was small, found that walruses often crossed the International Date Line and movements on both sides were generally similar

Recommendations

1. Further analyze available telemetry data to determine if female walruses with calves exhibit movements (e.g., southern migration), diving, and haulout behavior that are different from females without calves. Include an analysis of difference between using terrestrial haulouts vs. sea ice.

2. Conduct a comprehensive analysis of walrus interactions with seismic activities. Walrus tracks that spatially and temporally overlap with seismic operations need to be analyzed to learn about walrus behavior near seismic activities. Oil and seismic companies need to be forthcoming with their program tracklines (location and time) for this analysis to occur.

3. Investigate the combination of satellite telemetry and acoustic technology to directly monitor noise levels that walruses are exposed to and how walrus vocalizations change with level. This knowledge could then be used to better interpret passively monitored acoustic information.

4. Conduct a comprehensive analysis of terrestrial haulout (historic and recent) use patterns to better anticipate their use in the future. Using historic information about how many consecutive years particular haulouts were used may help predict how long Point Lay will be used and where the next haulout might form.

Acknowledgments

The Eskimo Walrus Commission has supported this project since its beginning. Special thanks to Charles D.N. Brower, Victor Karmen, Vera Metcalf, and the late Chris Perkins for their support. Joel Garlich-Miller and Patrick Lemons at USFWS and Chad Jay at USGS have been helpful in planning and coordination. Funding for this research was provided by BOEM with support and assistance from Charles Monnett and Catherine Coon. We thank the Point Lay crew Willard Neakok, Arthur Upicksoun, Harold Tukrook, Jack Tukrook, Martha Tukrook, Warren Harding Lampe, Leo Ferreira III, and James Tazorok. Andrea Soolook conducted surveys on Little Diomede Island. Clarence Irrigoo, Edwin Noongwook, and Perry Pungowiyi were incredible assets to the research cruises. Their knowledge of walrus and their willingness to work with and teach the research crew greatly increased the productivity and the success of all projects aboard. We thank the captains and crew of the R/V Norseman II and the R/V Professor Multanovskiy for their skill in accommodating our challenging walrus research objectives. We thank Ronald Oviok, Theodore Frankson, and Steve Oomittuk in Point Hope; Willard Neakok in Point Lay and Enoch Oktollik in Wainwright for their help with traditional knowledge interviews. In addition to the movements and habitat use objectives of this project, the tags we deployed also helped other projects on the research cruises by providing the locations of the walruses we had sampled relative to the ship location to minimize re-sampling. Haulout data collected by these tags were also important to determining correction factors for classifications by measuring differences in how females with calves and females without hauled out and if they hauled out more during certain times of day. We thank Wildlife Computers and their engineers for their products, willingness to modify them to fit our needs and to resolve problems quickly. Research was conducted under USFWS Permit Nos. MA220876-0, MA220876-1, and MA039386-2 and ADFG Animal Care and Use Protocol Nos. 2013-20, 2014-03, and 2015-25.

List of Project Reports, Presentations, and Products

Project update to EWC Executive Board, 28–29 September 2009 in Anchorage
Project update to EWC Full Board, October 2011 in Nome
Project update to EWC Full Board, November 2012 in Anchorage
Project update to EWC Full Board, December 2013 in Anchorage
Project update to EWC Full Board, December 2014 in Anchorage
Project update to EWC Full Board, December 2015 in Anchorage
Annual Research Permit Reports to U.S. Fish and Wildlife Service

Garlich-Miller, J., W. Neakok, and R. Stimmelmayr. 2011. Field Report: walrus carcass survey, Point Lay Alaska, September 11–15, 2011. (Appendix F-3)

Quakenbush, L., J. Crawford, A. Bryan, M. Nelson. 2011. Results from village-based walrus studies in Alaska, 2010. Alaska Marine Science Symposium, 17–21 January, Anchorage, AK. (Abstract and poster; Appendix F-2)

Crawford, J. A., W. Neakok, M. A. Nelson, J. Garlich-Miller, and L. Quakenbush. 2012. Results from village-based walrus studies in Alaska, 2011. Alaska Marine Science Symposium, 16–20 January, Anchorage AK. (Abstract and poster; Appendix F-4)

Garlich-Miller, J. 2012. Adapting to climate change: a community workshop on the conservation and management of walruses on the Chukchi Sea coast. Feburary 24–24, Barrow, Workshop Proceedings prepared by USFWS, Anchorage, 41 pp.

Huntington, H. P., M. Nelson, and L. T. Quakenbush. 2012. Traditional knowledge regarding walrus near Point Lay and Wainwright, Alaska. Report to the Eskimo Walrus Commission and the Bureau of Ocean Energy Management for contract #M09PC00027. 11 pp. (Appendix G-1)

Crawford, J. A., W. Neakok, M. A. Nelson, J. Garlich-Miller, and L. Quakenbush. 2013. Results from village-based walrus studies in Alaska, 2012. Alaska Marine Science Symposium, 21–25 January, Anchorage AK. (Abstract and poster; Appendix F-5)

Huntington, H. P., and L. T. Quakenbush. 2013. Traditional knowledge regarding walrus near Point Hope, Alaska. Report to the Native Village of Point Hope, Alaska and Bureau of Ocean Energy Management for contract #M09PC00027. 9 pp. (Appendix G-2)

Crawford, J. A., L. Quakenbush, C. Irrigoo, P. Pungowiyi, W. Neakok, W. H. Lampe, and J. Garlich-Miller. 2014. Results from village-based walrus studies in Alaska, 2013. Alaska Marine Science Symposium, 20–24 January, Anchorage AK. (Abstract and poster; Appendix F-7)

Crawford, J. A., L. T. Quakenbush, C. Irrigoo, E. Noongwook, and J. Garlich-Miller. 2015. Results from village-based walrus studies in Alaska, 2014. Alaska Marine Science Symposium, 19–22 January, Anchorage, AK. (Abstract and poster; Appendix F-9)

Crawford, J. A., L. T. Quakenbush, J. J. Citta, C. Irrigoo Jr. and P. R. Lemons. 2015. Using movement, diving and haul out behavior to identify the relative importance of foraging areas for walruses in the Alaskan Chukchi Sea. 21th Biennial Conference on the Biology of Marine Mammals. 14–18 December, 2015. San Francisco, CA, USA. (Abstract and presentation; Appendix F-11)

Crawford, J. A., L. T. Quakenbush, J. J. Citta, C. Irrigoo Jr. and P. R. Lemons. 2016. Using movement, diving and haul out behavior to identify the relative importance of foraging areas for walruses in the Alaskan Chukchi Sea. Alaska Marine Science Symposium, 25–29 January, Anchorage, AK. (Abstract and poster; Appendix F-12)

Huntington, H. P., M. Nelson, and L. T. Quakenbush. 2015a. Traditional knowledge regarding walrus, ringed seals, and bearded seals near Barrow, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015. 8 pp. (Appendix G-3)

Huntington, H. P., M. Nelson, and L. T. Quakenbush. 2015b. Traditional knowledge regarding ringed seals, bearded seals and walrus near Elim, Alaska. Final report to the Eskimo

Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015. 7 pp. (Appendix G-4)

Huntington, H. P., M. Nelson, and L. T. Quakenbush. 2015c. Traditional knowledge regarding ringed seals, bearded seals, and walrus near St. Michael and Stebbins, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015. 7 pp. (Appendix G-5)

Huntington, H. P., M. Nelson, and L. T. Quakenbush. 2016a. Traditional knowledge regarding ringed seals, bearded seals, and walrus near Kivalina, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015. 8 pp. (Appendix G-6).

Huntington, H. P., M. Nelson, and L. T. Quakenbush. 2016b. Traditional knowledge regarding ringed seals, bearded seals, and walrus near Kotzebue, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015. 11 pp. (Appendix G-8).

Huntington, H. P., M. Nelson, and L. T. Quakenbush. 2016c. Traditional knowledge regarding ringed seals, bearded seals, and walrus near Shishmaref, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015. 8 pp. (Appendix G-7).

Literature Cited

Arsen'ev, V. K. 1927. The Pacific walrus. Knizhnoe Delo, Khabarvosk-Vladivostok. p. Transl. 40 pp by F.H. Fay and B.A. Fay 1980.

Citta, J. J., P. L. Boveng, M. Cameron, F., J. A. Crawford, K. J. Frost, and e. al. In prep. Seasonal distribution and overlap of marine mammals in the Bering, Chukchi, and Beaufort seas. Deep Sea Research Part II.

Estes, J. A., and V. N. Gol'tsev. 1984. Abundance and distribution of the Pacific walrus *Odobenus rosmarus divergens*: Results of the first Soviet-American joint aerial survey, autumn 1975. Pages 67–76 *in* F. H. Fay, and G. A. Fedoseev, eds. Soviet-American cooperative research on marine mammals. Vol 1—Pinnipeds. NOAA Technical Report NMFS 12.

Fay, F. H. 1982. Ecology and biology of the Pacific walrus, *Odobenus rosmarus divergens* Illiger.North American Fauna No. 74. 279 p.

Fedoseev, G. A. 1966. Aerial observations on marine mammals in the Bering and Chukchi seas. Izvestiya TINRO 58. (avail. NMFS, MML Seattle WA).

_____. 1981. Aerovisual survey of walrus and bowhead whales in the eastern Arctic and Bering Sea. Pages 25–37 *in* L. A. Popov, ed. Scientific investigational work on marine mammals in the northern part of the Pacific Ocean in 1980-81. All Union Scientific Investigational Institute of Marine Fisheries and Oceanography (VNIRO), Moscow, USSR.

Fedoseev, G. A., and E. V. Razlivalov. 1986. The distribution and number of walruses in the eastern Arctic and Bering Sea in the autumn of 1985. Pages 93–98 *in* L. A. Popov, ed. Scientific-investigative work on marine mammals of the northern part of the Pacific Ocean in 1984/85. Vniro, Moscow, Russia. Transl. by F. H. Fay (avail. NMFS, MML Seattle WA).

Folkow, L. P., and A. S. Blix. 1999. Diving behaviour of hooded seals (*Cystophora cristata*) in the Greenland and Norwegian seas. Polar Biology 22:61–74.

Folkow, L. P., E. S. Nordøy, and A. S. Blix. 2004. Distribution and diving behaviour of harp seals (*Pagophilus groenlandicus*) from the Greenland Sea stock. Polar Biology 27:281–298.

_____. 2010. Remarkable development of diving performance and migrations of hooded seals (*Cystophora cristata*) during their first year of life. Polar Biology 33:433–441.

Freitas, C., C. Lydersen, M. A. Fedak, and K. M. Kovacs. 2008. A simple new algorithm to filter marine mammal Argos locations. Marine Mammal Science 24:315–328.

Gilbert, J. R., G. A. Fedoseev, D. J. Seagars, E. V. Razlivalov, and A. Lachugin. 1992. Aerial census of Pacific walrus, 1990. U.S. Fish and Wildlife Service, Administrative Report R7/MMM 92-1. 33 pp. (avail. USFWS, 1011 E. Tudor, Anchorage, AK 99503).

Gol'tsev, V. N. 1968. Dynamics of coastal herds of the walrus in connection with its distribution and numbers. Pages 205–215 *in* V. A. Arsen'ev, and K. I. Panin, eds. Pinnipeds of the North Pacific. Pishchevaya Promyshlennost', Moscow, USSR. (transl. from Russian).

Harris, R. B., S. G. Fancy, D. C. Douglas, G. W. Garner, S. C. Amstrup, T. R. McCabe, and L. F. Pank. 1990. Tracking wildlife by satellite: current systems and performance. .

Hastings, K. K., K. J. Frost, M. A. Simpkins, G. W. Pendleton, U. G. Swain, and R. J. Small. 2004. Regional differences in diving behavior of harbor seals in the Gulf of Alaska. Canadian Journal of Zoology 82:1755–1773.

Huntington, H., L. Quakenbush, and M. Nelson. in press. Effects of changing sea ice on marine mammals and subsistence hunters in northern Alaska from traditional knowledge interviews. Biological Letters.

Huntington, H. P. 1998. Observations on the utility of the semi-directive interview for documenting traditional ecological knowledge. Arctic 51:237–242.

Huntington, H. P., M. Nelson, and L. T. Quakenbush. 2012. Traditional knowledge regarding walrus near Point Lay and Wainwright, Alaska. Final report to the Eskimo Walrus

Commission and the Bureau of Ocean Energy Management for contract #M09PC00027 11 pp.

_____. 2015a. Traditional knowledge regarding walrus, ringed seals, and bearded seals near Barrow, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015 8 pp.

_____. 2015b. Traditional knowledge regarding ringed seals, bearded seals, and walrus near Elim, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015 7 pp.

_____. 2015c. Traditional knowledge regarding ringed seals, bearded seals, and walrus near St. Michael and Stebbins, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015 7 pp.

_____. 2016a. Traditional knowledge regarding ringed seals, bearded seals, and walrus near Kivalina, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015 8 pp.

_____. 2016b. Traditional knowledge regarding ringed seals, bearded seals, and walrus near Kotzebue, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015 11 pp.

_____. 2016c. Traditional knowledge regarding ringed seals, bearded seals, and walrus near Shishmaref, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015 8 pp.

Huntington, H. P., and L. T. Quakenbush. 2013. Traditional knowledge regarding walrus near Point Hope, Alaska. Report to Native Village of Point Hope and Bureau of Ocean Energy Management for contract #M09PC00027 9 pp.

Jay, C. V., A. S. Fischbach, and A. A. Kochnev. 2012. Walrus areas of use in the Chukchi Sea during sparse sea ice cover. Marine Ecology Progress Series 468:1–13.

Johnson, D. S., J. M. London, M.-A. Lea, and J. W. Durban. 2008. Continuous-time correlated random walk model for animal telemetry data. Ecology 89:1208–1215.

Keating, K. A. 1994. An alternative index of satellite telemetry location error. Journal of Wildlife Management 58:414–421.

Monson, D. H., M. S. Udevitz, and C. V. Jay. 2013. Estimating age ratios and size of pacific walrus herds on coastal haulouts using video imaging. PLoS ONE 8:e69806. doi: 10.1371/journal.pone.0069806.

Nikulin, P. G. 1941. The Chukchi walrus. Izvestiya TINRO 20:21–59. Transl by D. Wakhroucheff (avail. NMFS, MML Seattle WA).

Noongwook, G., Native Village of Savoonga, Native Village of Gambell, H. P. Huntington, and J. C. George. 2007. Traditional knowledge of the bowhead whale (*Balaena mysticetus*) around St. Lawrence Island, Alaska. Arctic 80:47–54.

Ovsyanikov, N. G., L. L. Bove, and A. A. Kochnev. 1994. Causes of mass mortality of walruses on coastal haulouts. Zoologicheskii Zhurnal 73:80–87. Transl. by M. Bell, Anchorage, AK marina@ak.net.

Tomilin, A. G., and A. A. Kibal'chich. 1975. Walruses of the Wrangel Island region. Zoologicheskii Zhurnal 54:266–272. Transl. from Russian. Fisheries and Marine Service Translation Series Canada No. 3721.

Udevitz, M. S., C. V. Jay, A. S. Fishbach, and J. L. Garlich-Miller. 2009. Modeling haul-out behavior of walruses in Bering Sea ice. Canadian Journal of Zoology 87:1111–1128.

Appendix A. "A Community Workshop on the Conservation and Management of Walruses on the Chukchi Sea Coast" held in Barrow in 2012.

ADAPTING TO CLIMATE CHANGE:

A COMMUNITY WORKSHOP ON THE CONSERVATION AND MANAGEMENT OF WALRUSES ON THE CHUKCHI SEA COAST

FEBRUARY 23-24, 2012

IÑUPIAT HERITAGE CENTER
BARROW, ALASKA

Photo Credit: Bill Tracey Sr., Point Lay, Alaska

ACKNOWLEDGEMENTS

This workshop was organized and sponsored by the U.S. Fish and Wildlife Service, Eskimo Walrus Commission, Alaska Department of Fish and Game, and the North Slope Borough Department of Wildlife Management. The workshop planning committee consisted of: Charles Brower, Joel Garlich-Miller, Vera Metcalf, Willard Neakok, Enoch Oktollik, Ronald Oviok, Sr., Leslie Pierce, and Lori Quakenbush. *Alaska Summit Enterprises* coordinated and facilitated the meeting; Cynthia Callivrourssi – project manager, Christine Celentano - meeting facilitator, Karen Morgan – recorder, and Joyce Winton – travel and logistics coordinator. Billy Adams, Michael Pederson, Joseph Sage, and Ernest Nageak provided logistical support and transportation to workshop participants while in Barrow. Funding for the workshop was provided by the U.S. Fish and Wildlife Service.

ADAPTING TO CLIMATE CHANGE:

A COMMUNITY WORKSHOP ON THE CONSERVATION AND MANAGEMENT OF WALRUSES ON THE CHUKCHI SEA COAST

FEBRUARY 23-24, 2012

IÑUPIAT HERITAGE CENTER
BARROW, ALASKA

SPONSORED BY:

U.S. FISH AND WILDLIFE SERVICE
ESKIMO WALRUS COMMISSION
ALASKA DEPARTMENT OF FISH AND GAME
NORTH SLOPE BOROUGH DEPARTMENT OF WILDLIFE MANAGEMENT

WORKSHOP PROCEEDINGS COMPILED AND EDITED BY:
JOEL GARLICH-MILLER, USFWS

USFWS ADMINISTRATIVE REPORT, R7/MMM 12-1

MARINE MAMMALS MANAGEMENT, U.S. FISH AND WILDLIFE SERVICE,
1011 EAST TUDOR ROAD, ANCHORAGE, ALASKA 99503

APRIL, 2012

WORKSHOP PARTICIPANTS

BARROW
Billy Adams, NSB-DWM
Charles Brower, EWC Chairman*
Leandra de Sousa, NSB-DWM
George Edwardson, Community Elder and ICAS President
Taqulik Hepa, NSB-DWM
William Hopson, NSB Fish & Game Management Committee
Ernest Nageak, USFWS
Mike Pederson, NSB-DWM
Brian Person, NSB-DWM
Leslie Pierce, NSB-DWM*
Joseph Sage, NVB
Raphaela Stimmelmayr, NSB-DWM

POINT HOPE
Steve Oomittuk, Mayor
Ronald Oviok, Sr., EWC*

POINT LAY
Warren Harding Lampe, NSB Fish & Game Management Committee
Willard Neakok, EWC*
Bill Tracey, Sr., Director, North Slope Borough Fire Department
Marie Tracey, NSB Village Communication Liaison

SAVOONGA
Perry Pungowiyi, Invited Guest Speaker

WAINWRIGHT
Enoch Oktollik, EWC*
Rossman Peetook, Community Elder

OTHER WORKSHOP PARTICIPANTS
Rosemary Ahtuangaruak, Alaska Wilderness League
Joel Garlich-Miller, USFWS*
Henry Huntington, Consultant
Patrick Lemons, USFWS
Vera Metcalf, EWC Executive Director*
Lori Quakenbush, ADFG*
John Trent, USFWS

WORKSHOP COORDINATORS
Alaska Summit Enterprises
Christine Celentano, Meeting Facilitator
Joyce Winton, Logistics Coordinator
Karen Morgan, Recorder

*Workshop Steering Committee Member

Photo Credit: Marie Tracey

WORKSHOP OVERVIEW

The Arctic habitat of the walrus (*Aiviq or Aghveq*) is rapidly changing. In recent years, the Chukchi Sea has become sea ice-free in late summer forcing walruses to move to coastal areas (known as haulouts) to rest on land. As sea ice cover in the Chukchi Sea declines, human activity in the region is expanding, bringing humans and walruses into frequent contact. As walruses become increasingly dependent on coastal haulout areas, local conservation and management efforts are becoming increasingly important. The coastal communities of Alaska are first hand witnesses to the effects of climate change on walruses and are well positioned to take an active role in their management.

This report is a summary of a community workshop on the conservation and management of Pacific walruses along the Chukchi Sea coast of Alaska. Workshop participants included community elders and subsistence walrus hunters from the coastal communities of Point Hope, Point Lay, Barrow, Wainwright and Savoonga, Alaska. The purpose of the workshop was to provide an opportunity for coastal communities and resource managers to exchange information and observations about the increase in use of coastal haulouts, and discuss ways to increase the involvement and participation of coastal communities in walrus research and management activities.

LIST OF ACRONYMS USED IN THE REPORT

ADFG	Alaska Department of Fish and Game
COB	City of Barrow
EWC	Eskimo Walrus Commission
FAA	Federal Aviation Administration
ICAS	Iñupiat Community of the Arctic Slope
IRA	Indian Reorganization Act
NOAA	National Oceanic and Atmospheric Administration
NSB-DWM	North Slope Borough Department of Wildlife Management
NVB	Native Village of Barrow
OMB	Office of Management and Budget
UAF	University of Alaska, Fairbanks
UIC	Ukpeaġvik Iñupiat Corporation
UME	Unusual Mortality Event
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

OPENING REMARKS

Taqulik Hepa, Director, North Slope Borough - Department of Wildlife Management
Taqulik welcomed the Eskimo Walrus Commission (EWC) and community representatives to Barrow. She noted that many changes have occurred in the Arctic in recent years which are creating new wildlife management issues. She stressed the importance of working on wildlife management issues at the local level. She cited the community polar bear patrols in North Slope Borough (NSB) villages as a positive example of how local organizations have taken a leadership role in wildlife management, with federal and state agencies providing support. She recognized the village of Point Lay for taking on a leadership role with walrus haulout management issues, and thanked the community elders for participating in the meeting. Elders have a lot of knowledge and have watched and taken care of their resources for many years.

Joel Garlich-Miller, Wildlife Biologist-Walrus, US Fish and Wildlife Service
Joel thanked everyone for taking the time to come talk about walrus issues. He shares Taqulik's view that the most effective management efforts are likely to occur at the local level. A fine example is the work that the community of Point Lay has accomplished to develop local programs that have been successful at reducing disturbance-related mortality at their haulout.

Charles Brower, Chair, Eskimo Walrus Commission
Charles welcomed workshop participants to Barrow. He noted that in 2008 the EWC adopted a resolution encouraging coastal communities to develop local ordinances concerning disturbances at coastal walrus haulout sites (Appendix A). This was a proactive step taken by the EWC to respond to the coastal walrus haulouts developing on the North Slope of Alaska. He expressed concern that walruses landing on Barrow area beaches might be considered a haulout. His personal opinion is that this level of use does not qualify as a haulout. It is his hope that one outcome from the workshop will be improved communication about walrus issues with coastal communities.

Vera Metcalf, Director, Eskimo Walrus Commission
Vera shared that the EWC mission statement is: "*To encourage self-regulation of walrus hunting and management of walrus stock by Alaska Natives who use and need walrus to survive.*" In addition to the 2008 resolution encouraging local initiatives to minimize disturbances at walrus haulouts, the EWC has also worked with the communities of Saint Lawrence Island to develop local marine mammal ordinances. Other recent activities and priorities for the EWC include: building research capacity in the walrus hunting community, traditional knowledge studies about walruses in Chukotka, and the development of a marine mammal disease handbook for hunters. The EWC works closely with the U.S. Fish and Wildlife Service (USFWS) on co-management activities and has a good working relationship with the North Slope Borough Department of Wildlife Management (NSB-DWM). A EWC contact list was distributed to the group along with an offer to help identify funding sources to address community needs.

BACKGROUND PRESENTATIONS

EMERGING WALRUS MANAGEMENT ISSUES ON THE CHUKCHI SEA COAST

Joel Garlich-Miller, Walrus Biologist, USFWS

Female walruses and their dependent young migrate north in spring following the receding pack ice to shallow productive feeding grounds in the Chukchi Sea. Broken sea ice provides a platform for resting within easy access of offshore feeding areas, isolation from terrestrial predators, and a sheltered environment for young animals against stormy seas. Traditionally, broken sea ice has persisted in offshore areas of the Chukchi Sea through the summer and walruses have remained offshore. In recent years, the Chukchi Sea shelf has become entirely ice-free by late summer and periods without ice cover have ranged from a few weeks to three months. The recent trend of rapid sea ice retreat from continental shelf regions in July and August is expected to persist and perhaps accelerate in the future.

When sea ice retreats to waters too deep to feed, walruses abandon the ice and move to shore. Over the past decade, the number of walruses using haulouts along the Chukchi Sea coast has increased dramatically, and the season of use seems to increase with each coming year. Several tens of thousands of animals haul out in some locations in Chukotka, Russia. Up until a few years ago, the formation of coastal haulouts along the Chukchi Sea coast was primarily a Russian phenomenon; however, we are starting to see a similar pattern develop in Alaska.

The most pressing conservation concern associated with large densely packed coastal haulouts is the potential for injuries and mortalities associated with stampedes caused by disturbance events. Several thousand walruses have perished along the Russian coastline in recent years as the result of disturbances at coastal haulouts. Young animals are particularly vulnerable to trampling injuries and mortality. Some stampedes are caused by human activities such as gunfire or aircraft over-flights, and others are caused by animals such as polar bears and feral dogs drawn to the haulout sites. Trampling mortalities at coastal haulouts in Alaska have also been observed ─ one disturbance event at Icy Cape in the fall of 2009 resulted in approximately 150 dead walruses.

Some of the largest coastal walrus haulouts in Chukotka, Russia have formed near coastal villages. Several communities have developed local management programs to help reduce disturbances and mortalities. Efforts have included the establishment of "*quiet zones*" on beaches when walruses are present, tying up stray dogs, and keeping vehicles off the beach. To prevent disturbances, haulout visitors are accompanied by a community guide who keeps them at a safe distance and down-wind of the animals. Subsistence hunters have modified their hunting practices and are using spears instead of guns to take walruses near the haulout so they do not cause large disturbances. Some communities have appointed an elder as a haulout steward to oversee hunting efforts and visitor programs. These efforts have been quite successful, and although some disturbances and mortalities still occur, the number of mortalities is down considerably from just a few years ago.

Photo Credit: Vladilen Kavriy, Walrus haulout near the village of Vankarem, Chukotka

Minimizing disturbances at coastal walrus haulouts along the Arctic coast of Alaska has also become important in recent years. Outreach efforts have included public service announcements, village visits, and posters to raise awareness of emerging haulout areas and the potential impacts of disturbances. The USFWS has also developed flight advisories and guidelines for local air carriers and pilots, and has worked with the Federal Aviation Administration (FAA) to establish temporary flight restrictions over large haulout areas. It will be important to build flexibility into response plans in case walruses begin to haulout in new locations. It will also be important to establish a communication network along the coast to report haulouts when they develop so that management responses can be adapted.

Some of the most important and effective efforts to minimize disturbance related mortalities at coastal haulouts in Alaska have occurred at the local level. A large coastal haulout, composed primarily of females and calves, has formed near the community of Point Lay in recent years. The community of Point Lay took an active and effective stewardship role and minimized human activities that could result in disturbance events at the haulout. The community worked with air carriers to change flight routes into the community and made sure that visitors kept a respectful distance from the haulout. Hunters did not hunt the main herd despite its easy access. Efforts appear to be working – disturbance related mortalities at the Point Lay haulout have been remarkably low over the past two seasons.

Photo Credit: NOAA. Coastal walrus haulout near the village of Point Lay, Alaska

As walruses become more dependent on coastal haulouts, local conservation and management efforts are going to become increasingly important. The coastal communities of Alaska are well positioned to take an active role in conserving and managing the species. This workshop is an opportunity for resource managers and subsistence users to exchange information, ideas, and observations about the haulouts, and to discuss ways to increase the involvement and participation of coastal communities in walrus research and management activities.

COMMENTS AND QUESTIONS

Comment: I am uncomfortable with climate models that project 50 years out – no one can predict that far into the future.

Response: We don't need models to show the loss of sea ice that has already occurred – walruses are already starting to occupy the coast. The models simply suggest that this is likely to continue to be the pattern in the coming years and we need to be prepared for increased use of coastal haulout areas.

Question: What about the walrus haulouts in the Bering Sea?

Response: Bering Sea summer haulouts are mostly used by adult males who don't migrate north and instead, stay behind during the ice-free season. Females and young calves generally do not come to shore, and always choose sea ice to rest on when given the choice. In the summer, they follow the ice-pack north into the Chukchi Sea and only come to shore when there is the no more

ice over the continental shelf. Females and young walruses appear to be more vulnerable to disturbance related mortalities than male walruses.

Comment: A suggestion was made to make the herd healthier by harvesting them rather than letting them trample each other on the coastal haulouts.

Response: The clarification was made that no one is suggesting not hunting walruses – we are looking for suggestions to prevent unnecessary disturbances that can lead to the loss of calves, which can affect population size. There is a lot of traditional knowledge from hunters in Russia and Arctic Canada who live near coastal walrus haulouts to draw on regarding hunting techniques near haulouts without causing disturbance related mortalities or displacing animals away from hunting areas.

Comment: Our (Alaskan) elders also have knowledge to share. Haulout hunting can result in unnecessary dispersal of animals and deaths and carcasses rotting near villages. There was a recommendation to hunt down the coast or on isolated beaches so that the main herd is not disturbed. It was also noted that many hunters preferred to hunt on ice because it is cleaner to butcher animals on sea ice versus a sandy beach.

Comment: Talking about hunting issues is a touchy subject and can bring up defenses in wanting to protect our Native food and tribal way of living in order to preserve these things for our children. Before statehood, our Alaska Native people knew how to deal with land and sea animals. The participant noted respect for Joel and where he stands on these issues. Native organizations don't have enough financial resources to bring communities together, or to give presentations on how to protect their own subsistence resources. Getting this workshop funded allows us to interact as one large group.

Comment: We need to think about what our elders have taught us about leaving animals alone to adapt and rest before they continue heading south. Reference was made to the long migration distances walruses had to make in 2007 (sea ice moved far north away from the coast that year). There was a recommendation to focus management efforts on where the haulouts form and communicate with hunters to stay away from the herd when they are resting on the beach. We should take advice from our elders to leave them alone.

Question: Is there some central information source about walruses?

Response: There is a lot of information about walruses and management efforts available on the USFWS website (http://alaska.fws.gov/fisheries/mmm/walrus/wmain.htm). There are also links to scientific publications, federal regulations and other resources. If someone can't find information there, USFWS staff can help you find it.

DISEASE SYMPTOMS SEEN AT THE POINT LAY HAULOUT– UPDATE ON CAUSE

Dr. Raphaela Stimmelmayr, Research Biologist and Wildlife Veterinarian, North Slope Borough Department of Wildlife Management

In August and September 2011 some of the walruses hauled out on the barrier island near the community of Point Lay, Alaska were reported by hunters and U.S. Geological Survey (USGS) biologists to have bleeding sores on their skin. In response, USFWS wildlife biologists, the NSB-DWM wildlife veterinarian, and local hunters from Point Lay conducted two ground-based surveys near the haulout. Fifty-one carcasses were examined. The cause of death could not be determined for some carcasses, but many had injuries associated with trampling (i.e., bleeding from the nose, bruises, crushed chest, etc.). Many of the carcasses examined confirmed the presence of unusual round lesions (sores) on the skin of the face, body, and flippers. Calves and sub-adults were affected most often by these skin lesions. Several random surveys of the herd were conducted to estimate how many walruses were affected. Approximately six percent of the estimated 15,000-20,000 walruses hauled out on the barrier island appeared to have the skin condition. More sub-adults (65%) had sores than adults (35%). Live walruses with skin lesions generally appeared otherwise healthy and robust. One sub-adult male walrus was observed separated from the herd and was obviously sick; he had skin sores and blood was coming from the nose and mouth. This animal was put out of its misery and necropsied by the veterinarian to see if the cause of its illness could be determined.

Two field necropsies were conducted at the haulout; one on a fresh, beach-cast carcass of a female calf, and one on the euthanized male sub-adult. Some common findings included blood-filled lungs, soft discolored liver, smaller than normal thymus, and smaller than normal lymph nodes. Laboratory findings included inflammation of blood vessels in the skin, inflammation of the heart muscle, and inflammation of the liver (hepatitis). Preliminary laboratory findings were suggestive of a virus; however, despite exhaustive efforts, none have been identified. Several bacteria have also been found in the samples, but nothing unusual that could cause the observed symptoms. Preliminary testing for toxic algae, like paralytic shellfish poison, has been negative or at very low detectable levels. So far, the disease and where it came from remains unclear. However, a similar disease condition in young walruses at coastal haulouts has been observed in Chukotka, Russia. In Alaska, the skin condition in young walruses has only been observed at the Point Lay haulout; other Alaskan walrus hunting communities report healthy walruses.

In December 2011, the National Oceanic and Atmospheric Association (NOAA) and USFWS declared an Unusual Mortality Event (UME) for ice seals and Pacific walrus (2011 Northern Pinniped UME). An investigative team made up of scientists from many institutions has been established. Further testing is underway for possible causes including factors such as diseases, man-made and natural bio-toxins, radiation, contaminants, and nutritional, hormonal and environmental factors. Although some similarities exist between the symptoms observed in ice seals and Pacific walruses, it is still unknown if the two are related.

Photo Credit: Anthony Fischbach, USGS. Walrus with skin lesions at the Point Lay walrus haulout, August, 2011

COMMENTS AND QUESTIONS

Comment: Saint Lawrence Island hunters have not encountered any sick walruses like this in our region. So far, the walruses seen this year have been healthy and fat.

Comment: Elders talk about the health of animals over time. We have not seen animals as sick as they are now.

Comment: We rely on subsistence delicacies such as *ugruk* (bearded seal) and fermented walrus to build energy for our elders. We need to share this information with our people in order to protect our continued consumption of these foods. We have had other scares in the past; some people are still scared to eat duck and geese (avian influenza). We do not want to see that happen with our seals and walruses. Communicating the laboratory test results back to our communities is important.

Comment: We have not seen or heard of people or dogs getting sick from touching or eating affected seals or walruses. Human health experts do, however, recommend that people avoid touching or consuming them. If you see a sick animal, it is telling you — "*don't eat me*." Trust that your traditional practices will guide you. You do not need agencies to tell you if something

is safe to eat. The investigative team is trying to find out what is causing the illness and to get information out to the communities about the disease investigation. Communities that have questions and/or need clarification can contact the NSB-DWM for more information.

Comment: Perhaps the sores are a symptom of stress. When walruses are stressed, they hit each other with their tusks and drive weak ones away from the herd. The noise associated with seismic surveys in the Chukchi Sea could cause stress in walruses because the noise can travel for many miles.

Comment: There are several military radar sites along the North Slope as well as chemical dumps and we all know that walruses are bottom feeders. Walruses could be picking things up from the food they eat.

Comment: There is concern about the Red Dog zinc-lead mine near Kivalina because a line in the water can be seen drifting northward from the dock. These things (mining products) could affect fish and marine mammals.

Comment: Increasing water temperature could also be a factor and could facilitate bacterial growth.

Comment: A recommendation was made to test ballast water from ships that travel through the area because they could be carrying bacteria or contaminants.

Comment: The melting ice pack is releasing elements that we do not know about. We are also starting to see strange algae blooms in our region.

Comment: We also have concerns about possible offshore nuclear releases.

Comment: The USFWS hopes to visit Saint Lawrence Island this spring to collect baseline data from healthy animals to further the investigation. We would also like to work with the community of Point Lay to collect additional samples from carcasses at the haulout. There will also be meetings with Russian colleagues in March to find out about their observations from haulouts in Chukotka and discuss ways to jointly monitor for sick walruses at coastal haulouts.

Local observations are a very important part of the ongoing walrus and seal disease investigation. If people observe animals with unusual symptoms they are encouraged to contact local wildlife officials at the numbers below:

North Slope: North Slope Borough Department of Wildlife Management: 907-852-0350

Nome/Bering Strait: Eskimo Walrus Commission: 1-877-277-4392

Nome/Bering Strait: UAF Marine Advisory Program: 1-800-478-2202, or: 907-443-2397

Statewide: NOAA Alaska Marine Mammal Stranding Network: 1-877-925-7773

WALRUS OBSERVATIONS FROM SAINT LAWRENCE ISLAND

Invited Guest Speaker Perry Pungowiyi, Traditional Hunter from Savoonga

Perry shared a map of the walrus haulouts on Saint Lawrence Island (Appendix B), and noted that large mixed (both sexes) herds of walruses use the haulouts in the fall and early winter.

Saint Lawrence Island is 100 miles long and its narrowest point is 25 miles wide. Its Siberian Yupik name is *Sivuqaq* which means "squeezed" – it looks like the island is being squeezed by the Creator. That is why Saint Lawrence Island is thinner in the middle. There are approximately 800 people living in each of the villages of Gambell and Savoonga.

In late spring, Savoonga hunters travel as much as 70 to 100 miles out to pursue walruses. Although they share hunting information with Gambell hunters, they try not to overlap hunting areas and speak on different radio channels. Some walruses do not migrate north in summer and remain near Saint Lawrence Island year round. A lot of clams wash up on the south side of the island when there is a southerly storm. Biologists and scientists say clams only grow in deep water, but this (shallow) area is rich in clams. When walruses are harvested in this region their stomachs are full of clams.

Some walruses are carnivorous and feed on seals. Seals are not part of the natural walrus diet, so the people of Saint Lawrence Island do not eat these seal-eating walruses. The elders say that these walruses must have lost their mothers when they were young and they were not taught to eat walrus food, so they started to eat fish and then seals instead. Their tusks are yellow and scarred from eating seals and their meat is very oily.

Saint Lawrence Island walrus haulouts form in late October, November, and December. Large haulouts form on the Punuk Islands off the eastern end of Saint Lawrence Island. Every year hunters find dead walruses on the islands. Even though there are no people there, they trample each other. Community members have observed carcasses of aborted fetuses, calves, pregnant females and large bulls. Polar bears also use this area and know where to look for dead walruses.

When Saint Lawrence Island hunters visit the Punuk Islands in the fall, the elders tell them to take only what is needed. Approaching from down-wind and hunting at the edges of the haulout are important to limit disturbances. Wind direction also determines whether Gambell or Savoonga hunters reach the haulout areas first. If hunters find dead walruses, they salvage the tusks and share the resource.

Walruses generally haul out onto sandy areas; they also haul out on one of the rocky islands. A haulout for spotted seals has also been observed near the island. There used to be thousands of seals there; however, because of disturbances, the numbers are not as high as they used to be. In recent years, Gambell hunters have also seen a lot of sea lions on the west side of the island. Although it is unknown why they are hauling out there, Perry suggests they are probably following their food source.

Perry noted that the main migratory pathway for bowhead whales and other marine mammals is to the west (Russian) side of the Island. The community is concerned about increased shipping traffic in the area. If possible, they would like ships to pass on the east (U.S.) side of the island.

They have also encountered fishing boats from Nome traveling to Saint Lawrence and the Punuk Islands to look for ivory. Perry wrote a letter to the Norton Sound Economic Development Corporation to protest the collection of walrus parts, bones, and tusks from the island (which is privately owned) but has not received a response. Fishing fleets from the south are also starting to move into the region. Perry notes concern about potential impacts because the region is such an important habitat for sea mammals and water fowl.

Occasionally, air traffic from Nome can disrupt hunting opportunities. When hunters see a plane, they call the USFWS agent in Nome and notify him that people are scaring walruses and interfering with the subsistence hunt. Perry noted that a few years ago researchers were studying walruses from a U.S. Coast Guard ship. A camera crew used a helicopter to take video footage of some walruses, and even though they stayed one mile away from the herds, with the wind direction, the animals moved off the ice when they heard the helicopter.

Saint Lawrence Island communities have recently adopted local hunting ordinances revived from the 1940s that limit the number of walruses taken per trip. This shows that they are able to manage their own resources. Although the ordinances focus on walrus trip limits right now, they may try to revive sea bird ordinances in the future. The IRA Councils worked with the EWC, Kawerak's legal counsel, and the USFWS to develop these ordinances. The Native Villages of Savoonga and Gambell received funding through a tribal wildlife grant to implement the program and are currently working to form marine mammal councils in both communities.

COMMENTS AND QUESTIONS

Comment: We have also seen a carnivorous walrus in Barrow. We were excited to get the animal and people ate it based on a first come/first served announcement made on the radio. Some light joking followed – now you know that if you eat meat from a carnivorous walrus, you will go bald (Joke).

Comment: Generally, people try to stay away from larger walrus herds (on land or ice) and try to either pick smaller groups or hunt at the edges of the group. Large walrus groups are fearless and dangerous as they feel there is safety in numbers.

Question: Does the vegetation grow back after walrus haul out on Saint Lawrence Island?

Response: There is a tough sharp grass on the Punuk Island that grows back.

Question: Have walruses been killed by ship traffic?

Response: We have no idea.

COMMUNITY OBSERVATIONS AND SHARED TRADITIONAL KNOWLEDGE

WALRUS OBSERVATIONS FROM POINT LAY, ALASKA

Bill Tracey, Director, North Slope Borough Fire Department

Bill shared that he is humbled to be a part of this process. He has been living on the North Slope for more than 40 years. His wife's (Marie) parents and family shared their knowledge and taught him about the animals in the area. He has seen a lot of changes in his lifetime and suggests that people need to look at what humans are doing to the planet to cause these rapid changes.

He recalled that years ago you could boat for days on the Chukchi Sea without encountering another person. Today, boats are encountered from Point Hope to the south and Wainwright to the north. Travel by boat from Barrow to Point Lay used to require the movement of ice to make head way; however, now there is open ocean and there is no ice for sea mammal or human protection. Smaller boats sometimes have to take shelter from large waves and storms. With the sea ice gone, walruses are starting to come on land because the beach is their only refuge. He also noted that some adaptation is taking place – he has seen some animals sleeping offshore in the open water.

In his observations at the Point Lay haulout, he has noted that the animals seem to arrive in pulses. You can hear them arrive from the village. Some animals arriving at the haulout are extremely tired and cannot make it all the way out of the surf. Some of the animals have shown signs of sickness on their skin and respiratory distress, and he has noticed that there is a strong smell of ammonia at the haulout.

Community members can see and hear the walruses from their homes. Point Lay is on a shallow lagoon and belugas also like the shallow waters. Belugas, seals, and walruses all use the area and the community coexists with these animals on a daily basis.

The community issued an official statement to the media that due to the risk of disturbances, they do not want them to come into the community to film and report on the haulout. Instead, they have provided the media with pictures to use in their stories. The community of Point Lay did allow one media crew to conduct local interviews and arranged for photos to be taken at a distance from the haulout. This approach worked and people left the walruses alone. Locals have also changed boating habits along the lagoon and the barrier islands in order to avoid disturbing walruses at the haulout.

Bill cautions that if communities take a "*do-nothing*" approach—someone or some other agency will step in. This is not the approach to take. Point Lay's community motto is: *"To live and let live."* He recommends that we continue to non-invasively study these animals and use local community members who know the animals and the territory. He warns that helicopters should not be used near the haulout because they could cause a big disruption.

Bill suggests we listen to the wisdom of the community elders because they know what to do.

Warren Harding Lampe, NSB Fish & Game Management Committee Member

Warren shared that he is originally from Barrow and was raised living a subsistence lifestyle by his grandparents. Point Lay is fortunate to have elders to guide them about appropriate behavior with respect to walruses coming on shore. The Point Lay community understands what it means to live and let live.

With respect to media interest, the Village and IRA Council decided that they do not want disturbances at the haulout and oppose outsiders coming in to either take pictures or just take a quick look. Disturbances by hunters are not seen as a big concern because they would rather hunt a fat caribou to the south instead of traveling north past the haulout. The boating channel is next to the haulout on the barrier island so there is a need to be careful to not disturb the walruses. Warren noted that he harvested a walrus the week before the main herd arrived; however, once the main herd got there, hunters left them alone.

The people of Point Lay are capable of managing their community and know what and what not to do. Warren has worked with the USGS, USFWS, NSB-DWM, and ADFG on satellite tagging and collecting walrus samples from carcasses. He is grateful for the ongoing scientific research when done in consultation with the community. Warren recommends that if someone wants to work in the village, they should first come and explain what they are doing and keep disturbances to a minimum.

There have been efforts in Point Lay over the last two years to document subsistence use areas for oil and gas impact assessment. Steve Braund is leading the study, and has provided community hunters with GPS devices to mark traditional hunting areas by boat. Warren has taken coordinates in areas where he hunted with his grandparents and uncles when he was growing up. They are trying to get an additional two years of funding and would also like to include traditional land areas, but for now, work has focused on marine areas. He noted that the area of traditional subsistence use (both land and sea) is huge.

Photo Credit: Anthony Fischbach, USGS. Walruses at the Point Lay haulout

Marie Tracey, NSB Village Communications Liaison

Marie shared that there was a lot of sea ice during the summer months when she was growing up, but now there is hardly any. People now have to scramble to hunt *ugruk* (the skins are needed to cover their boats) and seals. The elders used to guide them in these activities; however, they are now losing elders and have to grow into the role of community elders themselves.

They never saw walruses come to shore when she was growing up. When they hear that walruses are on the beach, they notify USFWS and ask them to close the airspace, and share the news with the community via radio. The walruses haul out onto a sandy beach with grassy areas at the top of the slope. Some walruses coming ashore look exhausted and tired; they appear to be sleeping in the waves. Some walruses weigh over a ton and have to stick their tusks in the sand to pull themselves up onto the beach.

Some of the walruses she observed at the haulout site last year were sick. It was hard to witness an old sick walrus that had lost weight and had parts of its tusks missing. Sick animals are not afraid of humans, they barely move when they are sick ─ they are at the end of their time. They counted 106 walrus carcasses and some juvenile seal carcasses along an 11 mile stretch of beach near the haulout this season. They also observed several carcasses that had lesions/sores. Most of the walruses they saw at the haulout were healthy and they were amazing to see.

When caribou are scarce, the Point Lay community turns to the ocean for their food supply. Different food groups are needed each season. Hunters harvest from smaller groups when they hunt for walruses. Point Lay hunters are not after ivory. They hunt for food ─ not tusks. The community of Point Lay primarily hunts beluga and seals and is looking at what can be done to preserve our hunting areas.

The people of Point Lay did not grow up vegetarian and the store is very expensive. The community wants their children and grandchildren to be able to provide for their families and to hunt like their ancestors and community elders did. Hunters now have to buy licenses to hunt subsistence food, which is something they never had to do before. The community does not want outsiders to control when to hunt this or that. Marie finds it disturbing that some community members are being arrested because they did not have a hunting license. They do not want to see a hunting ban for walruses ─ they just want people to be smart and hunt from smaller groups.

As the Village Communications Liaison, Marie receives a lot of phone requests from the media to come to Point Lay to take pictures of walruses. Her response is: "S*orry you are not going to be able to fly in and take pictures.*" Some of them expect a waiting car and to be taken straight out to the haulout for pictures. Marie asked two rhetorical questions: *"Do we want to see tourism or preserve our way of life? Do we want money or our way of life? — You choose.*" The community does not want to see an invasion into the village. She shared that NBC news came to shoot a news story and agreed to the community's requirements. NBC employed a local boat owner so that someone from the village could watch what was going on. The village allowed the

visit and hosted a bonfire and cookout. Marie noted that the people of Point Lay want to take care of their land and wildlife just like their ancestors did.

The community has participated in tagging (tracking) studies for walrus and beluga. Tracking shows that they feed at Hanna Shoal which is where the oil companies want to drill. The question is: *"Why not drill on land?"* We need to preserve the lagoon for all wildlife. It is a sanctuary, and we want to be able to hunt and continue our subsistence way of life.

Willard Neakok, IRA Council / EWC Commissioner

Willard shared that he has lived in Point Lay since 1973. He remembers that there were very few walruses hauling out on shore in those days, but remembers hearing his uncles' talk about walruses sometimes going ashore on the barrier islands to rest. The ocean has been changing for the past ten to twelve years: winters are milder, break up is earlier, sea ice is thinner, and things start growing earlier in the spring. Last summer they saw animals they had not seen before. They saw ribbon seals which are usually only seen in the Bering Sea, as well as black cormorants and other new birds. It was unusual for them to be found so far north. For the past two years, walruses have been congregating four miles north of the old village on the barrier island. He noted that it is good to see and hear the walruses before going to work in the morning but he did not enjoy the smell so much. Point Lay has been fortunate to have the help of USFWS, ADFG, and NSB-DWM to help protect and study their walrus haulout.

Last year he noticed that calves were trampled by disturbances caused by planes flying overhead. They had a village meeting to inform the community on what needs to be done to protect the haulout. They asked hunters traveling north to idle their engine when they pass by the haulout so the herd is not disturbed. They are fortunate to see and learn from the haulout so they try to keep the noise down and enjoy the experience. Everyone realizes the importance of walruses to the community. Point Lay will have another village meeting in late August as a reminder to the community of what they can do to protect the walrus haulout.

Point Lay would like to have contact information of who to call in order to restrict air space around the haulout. The last two years has been a learning experience of what needs to get done and who to call to establish protections. Willard shared his observations of a Lear jet flying towards the haulout and a sailboat sightseeing for approximately five to six hours. It is possible that barges may even start coming through to see the haulouts. Perhaps a maritime border should be considered. Willard would like to have a meeting before July or August to discuss what needs to get done. There is a need to do something to preserve the walruses for our great grandchildren.

Willard was very pleased to be a part of the walrus carcass survey project. He saw approximately 20,000 walruses on the beach and another 10,000 swimming and feeding. He and Joel traveled by boat as far north as Eleven Mile Inlet and walked the ocean side of the island to look for dead walruses. Dr. Raphaela Stimmelmayr was contacted to help conduct necropsies of fresh animals.

Photo Credit: Joel Garlich-Miller, USFWS. Willard Neakok examines a walrus carcass near Point Lay

One sick animal had to be put down. As Iñupiaq people, we have compassion for animals and put them out of their misery if they are suffering from injuries or sickness. Hopefully research will help find out what is going on with the walrus lesions. The information to not eat infected walruses or ringed seals has been shared with the villagers.

Walruses travel to Hanna Shoal to feed. This is a very important feeding area because the depth is just right for clams and mussels; however, it is also near where the oil companies will be drilling next summer. He is sad that they will be drilling right where walruses like to feed. Willard shared that he wrote an editorial to the Anchorage Daily News last year in opposition of exploratory drilling in the Chukchi Sea. His big concern is the potential for a blowout and noted the challenging conditions for oil recovery. An oil spill could affect all the migratory animals, bowhead/beluga whales, walruses, fish and birds. He wants his kids and grand-kids to continue to experience a subsistence lifestyle.

COMMENTS AND QUESTIONS

Comment: A tribal resolution was passed with respect to the discharge of oil drilling material into the Chukchi Sea. It asks oil companies to haul out their drilling materials rather than discharging them into the ocean. The resolution was written because this is an important marine mammal feeding area. Salmon fingerlings can be found about 130 miles out which is where belugas feed.

Comment: There is high unemployment in our villages, so it is good that researchers are doing local hires.

Comment: A recommendation was made to share and build traditional knowledge with young hunters so that everyone in the community can stay healthy and become strengthened to deal with what is coming. Part of the communication should be to talk about ways to protect important habitat areas, restrict activities, and work on building a process of what needs to be done to preserve our traditional lifestyle.

Comment: Point Lay would like to speak just as strong as Barrow speaks. Our adult population unemployment rate is at least 80%. If community members are not working or collecting unemployment, they are not counted by the federal government, but they still need to eat. These are the people we need to take care of.

Comment: Communication at the local, state, and national level is critical to our survival. Point Lay wants to create opportunities for communication, and encourages and invites anyone who wants to work and study in Point Lay to come and visit. Even though some in the community are not in favor of offshore drilling, we invite those involved to come to our village and communicate with us so there is a two-way exchange of information.

Comment: Ocean transportation traffic has increased. In Wainwright, they have to remediate their beach due to erosion.

Question: How much are you paid to do the walrus surveys?

Response: We received $250/day plus gas. We like the idea of more than one boat and made a recommendation to hire more people for 24 hour observations. We also noted the need for stronger spotting scopes in order to have accurate walrus counts ─ USFWS or ADFG may already have this type of equipment available.

Comment: USFWS has a tribal wildlife grant program that can help monitor and study haulout issues. (The Native Village of Barrow (NVB) received a grant to start an education program for young hunters.)

Response: Point Lay will look into this as a funding source.

WALRUS OBSERVATIONS FROM BARROW, ALASKA

Billy Adams, Subsistence Research Coordinator, NSB-DWM

Billy shared that the world could learn a lesson from the community of Point Lay. Pride is important — people are proud when they act responsibly. He also noted that the EWC resolution to promote local management to prevent disturbances was a step in the right direction.

Barrow is a big community and it sometimes seems like there are 9,000 people hunting along the coast. It is hard to manage so many people at one time. Barrow hunters mostly hunt walruses on the ice. Walruses start arriving in Barrow the first week in July — communities further south see them earlier. There have been a lot of changes in the past 10-15 years. In recent years, weather and ice patterns have affected animal distributions so that now people need to harvest walruses on the beach, and getting sand in your meat is an issue.

Billy stated that there is a place a little ways west of Barrow called *Atuutigruaq* that is filled with a lot of old walrus remains — which shows that walruses have hauled out in these areas in the past. There are also certain places the spotted seals like to go and they have probably done this for thousands of years.

In reference to Point Lay having a dependence on beluga, the same holds true for bowhead whales in Barrow. Barrow now shares a hunt with 10 whaling communities capable of landing bowhead whales. This is something to be proud of. He noted that every community is different; Barrow hunts bowhead whales and Point Lay hunts beluga, walruses, and caribou.

Walruses need the ice so their young do not get trampled. Animals have to eat and then rest after eating. A stampede can be caused by anything — even a bee. He feels that it is important for communities to keep airplanes away from the haulouts. The FAA can reroute planes and ask pilots to fly at certain altitudes. Every year will be different, and communities need to act swiftly like Point Lay did when a large haulout forms.

One drawback about having a meeting like this is that some people may think we are law enforcement. It is important to say that coastal people are here, that we have been here for thousands of years, and that we are here to protect our way of life. Coastal people try to harvest in a responsible manner. We share a common goal of co-managing our resources. When law enforcement comes to the community it causes tension –something needs to be done to reduce the need for law enforcement presence in the villages.

Barrow primarily hunts walruses when the ice first goes offshore in the summer. People prefer to hunt on the ice but some also harvest animals on land. Walruses with calves are protected; lone walruses can be properly harvested. It is hard to say no to someone who wants to get a walrus on shore. They have to take what they need. Everyone scrambles for a piece of walrus meat. It is hard to cut up a walrus on the beach because sand gets on everything. People are going to have to learn to butcher on the beach.

The NSB-DWM is doing a good job gathering baseline health data for the disease investigation. The right people are doing the work and completing samples. It takes time to do research on what is causing the sickness. It was good that research started before the seal outbreak because we are getting closer to knowing what is causing it. Outreach is important so there is a need for increased communication with community members about management issues. It is important to do outreach and provide updates as soon as possible. The NSB has done some important radio shows that are going well. They have been asked to have longer shows (two hours vs. one hour).

William Hopson, Traditional Hunter from Barrow

William shared that he was born and raised in Barrow and is a subsistence hunter. He has traditionally hunted walruses in July and August. Over the last five years, they have not seen any ice or walruses. To have a successful hunt today, it is necessary to go out right after the whaling season. Hunts have moved up a month or more from when they normally were in the past. There are a few haulouts to the west of town on the barrier islands. A few walruses haul out near Barrow, and people do try to hunt them because people need walrus meat. William stated he was glad everyone was here to discuss the issue. He wonders whether a look two or three years into the future will reveal a community hunt at haulouts with 20 boats participating in one hunt in order to reduce disturbances instead of 10 different hunts. He can see that way of hunting coming and thinks it is good to think about the future and adjust techniques with the changing times.

William noted that people who do not know walruses well can be mistaken about illness. Walruses are born with red eyes and are dirty so the definition of a sick animals needs to be clarified because what an outsider may consider sick is a normal walrus to us.

Photo Credit: Craig George, NSB-DWM. A bull walrus on the beach at Barrow Alaska

COMMENTS AND QUESTIONS

Comment: In looking for solutions to help walruses — why not try artificial ice floes to see if they work? A suggestion to use dredge tubes to create offshore resting platforms was also made. California sea lions use docks — why not see if they can work for other species?

Comment: A baseline study needs to be done because the oil industry is trying to extract oil. A baseline study was not done in Prudhoe Bay.

Comment: There is concern about how USFWS will use the information from this workshop. This information should not to be used by agencies to bring law enforcement into the villages.

Response: This workshop is not about regulations or law enforcement, rather the purpose is to document community concerns, and come up with ideas for local management (promote local stewardship). We need to find ways that communities can address conservation concerns so that law enforcement efforts do not become necessary. The workshop report belongs to everyone participating in the workshop and their respective communities. You can use this information as a basis for developing local community initiatives.

Comment: There is a law enforcement expectation of how walruses are harvested. If a hunter does not take the proper amount from a walrus, they are subject to a fine and loss of their hunting equipment. Hunters never know when law enforcements are going to come because they approach people when they beach up to check their equipment. It is important for USFWS to recognize that this is a touchy subject. There is a need for better outreach to communities about the rules so people do not get into trouble.

Comment: In reference to EWC Resolution 2008-01: There is a need for each village to have their own emergency plan to address unwanted disturbances at haulouts. Tribal councils need to discuss and develop plans and villages need to take ownership with the understanding that agencies like the NSB-DWM, USFWS, and the ADFG can help protect our natural resources.

Comment: We have historically stored meat from harvested walruses and bowhead whales in ice cellars, and the meat would keep for two to three years. Today, ice cellars are affected by global warming. Ground thaw issues and human waste contamination of the water table is becoming a problem in larger villages like Barrow and Wainwright. Refrigerators are not adequate storage for walrus meat - so alternative systems to store and keep food safe are needed. Participants were asked to take back the message to your respective communities that we need to develop solutions to address this issue. Rossman Peetook added that whaling captains have a traditional practice to not harvest a whale if they do not have a way to protect and save the meat. Ice cellars are the traditional way to store the harvest for distribution to the community. The damaged ice cellars in the community need to be rebuilt – which will cost money. Compensation is not to an individual captain but to the community, because the harvest belongs to and is shared by the all. Money to rebuild could potentially come from federal funds or the agencies who build the utilidors.

WALRUS OBSERVATIONS FROM WAINWRIGHT, ALASKA

Rossman Peetook, Community Elder. Rossman shared his observations and thoughts in Iñupiaq with translation provided by Enoch Oktollik and Billy Adams.

Rossman started hunting walruses in 1939. He was eight years old and his older brother wanted him to come along with the group. They went out on an old whaling boat towing a small skin boat. When they got near the walruses, they turned off the motor and gathered to pray. They got into the skin boat and paddled towards the walrus herd. This was his first experience and he was scared. He and his brother were left behind and he started to cry. He was so frightened when the walruses started to make a lot of grunting noises. He tried to hide behind his brother when they started to harvest the animals.

All animals have a cycle. Their movements have a pattern that is unique. The movements seen in the past are different from today's movement patterns — the bowheads have started to migrate earlier; a big change. Now people only have a short window to hunt before the ice goes away.

The weather has also changed dramatically. There has been a lot of thick snowfall in recent years, much more than in the past. Sometimes when rain follows a snowfall, a crust is created and prevents animals from getting to the grass or produces jagged edges that can cut up their legs. It can be a dangerous time to be an herbivore. There is sorrow for these animals because they are wounded and cannot get to the grass. There is a great love for these animals, so hunters do not want to see them suffer. His father taught him how to hunt. When he started to hunt on own, his father said to shoot the animal in the neck but to not injure them in the rump or guts. The animal has to be taken care of swiftly or it will get injured and run away.

He has been working with the Alaska Eskimo Whaling Commission on conflict avoidance agreements with the oil and gas industry. Many years ago, hunters did not want any distractions or interference before they hunted. Dependent on weather, there are only a few days to get an animal as they migrate through. In the past, they had to hunt for their dogs as well. In those days, dog teams were used to travel, so they had to gather food for the whole winter for both themselves and their dogs. Nowadays, other means of travel are used so only enough walrus meat for people to eat is gathered.

The currents can be very dangerous — they can take people far away so they have to act fast to get food for their community. He shared that he once went to Point Franklin (30 miles out of Wainwright) on a hunt with his son and the current was so swift that when they were done butchering they were near Barrow.

He has seen how a walrus will separate from the herd when it is sick. When other walruses approach a sick animal they can sense that the animal is different from the others and will leave it alone. Hunters feel sorrow for sick animals and put them out of their misery.

Nowadays, when the ice comes from the south in June, it keeps traveling north. Walruses need the ice to rest and now they haul out on land because they are tired from being in the water. The

season of travel and migration movements have really changed and have impacted a lot of people. Whether it is *ugruk* or walruses, we hunt these animals on the ice. When a lot of the walruses get on the ice, they can lower it so it looks level with the water. When spooked, they get off the ice which causes it to rise and makes it dangerous. He agrees with, and seconds the idea about making artificial ice bergs for walruses to rest on offshore.

Oil and gas activities have impacted our hunting grounds and caused disturbances during the hunting season. We only have a short period of time to gather animals. Elders do not want any interference at all and are serious about getting food for survival. When they hunt, they work really hard and have to act swiftly after the animals are sighted. Our elders taught us to gather only what we need. In the past, the cycles were always predictable and now the movement of the animals has changed dramatically. He shared that he is humbled that others now know more than he knows.

The unusual mortality of ringed seals this summer, along with their permanent hair loss, has been observed in his community. We do not know what the illness is. He wonders whether there will be any chemicals found in these animals that we should be looking at. He would be very happy if someone could tell him whether there are updates on ongoing investigations.

Enoch Oktollik, City Mayor and EWC Commissioner

Enoch shared that he grew up in Point Hope. Walrus hunting in Wainwright is different — they do not get the big bulls he saw in Point Hope. He remembers hunting out of Point Hope with Ronald Oviok, and seeing some very big bulls popping up out of the water. Wainwright hunters rarely see walruses with huge tusks —some of the walrus may be big, but their tusks are small.

Enoch noted concern that human disturbances may be interrupting walrus migrations and haulout use. Air traffic near walrus haulouts needs to be controlled and he recommends notifying pilots each year. Enoch noted that everyone impacts walruses in some way when they go out on the ocean. He feels that too many studies are being conducted on sea mammals in the name of education. University work can impact the Native and subsistence way of living. Communities know how to manage their resources — the animals should be left alone.

Walruses know how to use the ocean and now they are being pushed onto land. He noted that he has seen walruses sleeping together offshore in open water creating their own haulout (with their bodies). He and his crew were amazed to see this, and they did not want to disturb them.

Enoch noted that in Kaktovik, they put whale bone piles close to the islands and now polar bears are roaming around there. Now people want to go there to see the bears. He asks: "*what is their motivation?*" He feels that people should leave these animals alone. Animals that people have been eating all their life should not be used as a tool to attract people to come, take pictures, and make posters.

He recalls Joel bringing the people from Chukotka to Wainwright to share their approach to develop a local haulout management plan. It was a good visit, so Wainwright residents hosted a big community event. More community meetings like this one are needed to educate ourselves and talk about these issues. Law enforcement agents should also visit the village to let everyone know what the hunting rules are so that people do not get into trouble.

WALRUS OBSERVATIONS FROM POINT HOPE, ALASKA

Ronald Oviok, Sr., City Councilman and EWC Commissioner

Ronald shared that he grew up in Point Hope and learned to hunt from community elders. Point Hope used to be like a long straight finger, which is what its Iñupiaq name "*Tikigaq*" means, but is now more like a curved finger because of erosion. He was told by his elders that when walruses came to Point Hope in mid-fall (August and September) they would get five shooters from the community to harvest walruses when they came to shore (that was when ammunition was hard to get). When they harvest walruses they tell a story. "*We are just like them, the walrus, when we talk about them, they listen and hear*." In the spring, the males come and are harvested but their meat and skin are hard. But in the fall, the females are tender and fat. Elders are always happy when walruses are tender and fat!

In the fall, walruses come to shore at Cape Lisburne to rest in big groups and nobody bothers them. It is the same when thousands of walruses are resting on the ice — they are too dangerous to hunt so we leave them alone. We hunt along the coast like everyone else. When he was growing up, community elders were respected; however, times have changed, and our young hunters do not always listen to their elders.

Ronald noted that the people of Point Hope are concerned about global warming. Sea ice conditions have changed — 20 years ago the ice was eight feet thick and now it is only 3-4 feet thick. The community is also concerned about the impact of disturbances of marine mammals from seismic activities. He noted that it is getting tough to find the animals we hunt.

Steve Oomittuk, City Mayor

Steve shared that his people live in a cycle of life passed down from generations. Our knowledge is thousands of years old. We know when each animal is coming, how to prepare, and where to be. We are starting to see changes in the ocean. Animals are taking different migratory routes. We are seeing more traffic in our ocean. Not that long ago we lived in sod houses with no electricity. The ocean is our way of life — our garden. We want to make sure it is protected. Without animals, we have no identity and no food. We need to protect all the animals that migrate north — not just walruses but also the whale, the seal, and the duck. A lot of traditional knowledge is gained when you live a subsistence way of life.

WORKSHOP RECOMMENDATIONS

Recommendations from workshop participants to address emerging conservation and management issues associated with the increased dependence of walruses on coastal haulout areas are summarized below. Community members also developed community-specific recommendations during community breakout sessions (Appendix C).

REDUCING DISTURBANCES AT COASTAL HAULOUTS

Workshop participants agreed that efforts to address disturbance at coastal haulouts was needed to minimize mortality levels. Participants also noted that disturbances could lead to the accumulation of walrus carcasses near communities resulting in increased interactions with predators, and that disturbances could drive walruses away from subsistence hunting areas.

Aircraft over-flights were identified as a primary source of disturbance to walrus herds along the coast. Aircraft noise in traditional hunting areas can also impact hunting opportunities and success. Recommendations to reduce disturbances at coastal haulouts from aircraft over-flights included education and outreach to pilots operating in the area, flight advisories with guidelines, and flight restrictions over haulout areas when walruses are present.

Boat traffic along the coast was also identified as a disturbance concern. Some of the issues and recommended solutions are site specific; for example, the travel corridor in the shallow waters of Kasegaluk Lagoon requires boaters to travel in close proximity to the coastal haulout site at Point Lay. The community of Point Lay has requested that boats slow to near idle and motor quietly past the haulout site when animals are present. Supply barges and sightseeing vessels operating near haulouts are also of concern. The development of education materials for marine vessels, and approach guidelines and restrictions for vessels operating near coastal haulouts was recommended. There is also a desire to increase communication between communities and marine vessels to avoid interference with subsistence hunting activities.

In order to reduce disturbances, the haulouts need to be identified and their locations communicated so that protection measures can be put in place. The coastal communities are important to the development of this process. There was a recommendation to develop a contact list and establish a communication network to exchange information about the haulouts during the active season so that site specific protection measures can quickly be established.

Media interest in access to large walrus haulouts and people wanting to see walruses and take pictures at the haulout has put a lot of pressure on the small rural community of Point Lay. Point Lay has been very proactive in dealing with the media, and has limited access to the haulout to reduce the risk of disturbances. Their efforts have included a formal statement discouraging

unnecessary visits to the haulout to reduce the risk of stampedes. They have provided their own photographs for media use rather than allowing them to take their own pictures. They encourage all visitors to the haulout area to travel with a local guide whose knowledge of the area and walrus behavior can help prevent disturbing the animals.

Hunting activities can also cause disturbances. The elders have knowledge to share regarding proper hunting techniques and this knowledge should be used to guide hunters on ways to reduce disturbance to walruses at coastal haulouts. Specific recommendations included:

- Avoid hunting large groups of walruses (on land or ice) – it can be dangerous.
- Hunt away from the main herd to minimize trampling mortalities.
- Target solitary or small groups of animals.
- Look for hunting opportunities before (or after) major concentrations form.
- Hunt walruses on sea ice (when available); this reduces the risk of trampling deaths and also provides a clean surface for butchering (no sand in your meat).
- Take note of the wind direction when operating near haulouts and remain downwind (walruses have a good sense of smell).
- Hold cultural exchanges and training on hunting techniques that are successful at other coastal haulouts.
- Plan a community hunt rather than many individual hunts to avoid repeated disturbances at haulouts.

Research activities can also cause disturbances at coastal walrus haulouts. Recommendations for walrus researchers to reduce disturbances included:

- Researchers should work with knowledgeable locals who know the area and walrus behavior to avoid disturbing animals.
- Researchers should consult with local communities about ways to minimize impacts to walruses at the haulouts and prevent interference with subsistence hunting activities.
- Researchers should avoid using helicopters near coastal haulouts – there is a significant danger in creating a disturbance.
- Researchers should evaluate whether their project is worth the risk and consequences of disturbances - noting that the advice of the community elders is to not disturb the animals resting on the coast.

DEVELOPING LOCAL MANAGEMENT AND RESPONSE PLANS

The EWC has encouraged coastal communities to work towards developing local ordinances and management plans to reduce disturbances to walruses resting on the coast. Workshop participants were supportive of this idea and recommended that communities interested in developing local ordinances work through their tribal governments. Community elders play an influential role in shaping community behavior and should be included in the process. Likewise, active hunters in the community who are most likely to be affected by community decisions should also be involved in the process to ensure that there is community buy in and support.

Potential funding sources for developing and implementing local management programs include USFWS Tribal Wildlife Grants, and co-management funding under section 119 of the Marine Mammal Protection Act. It was also noted that that the Office of Management and Budget (OMB) has established a tribal liaison position in Kotzebue. The position's focus is to find funding specifically for tribes to implement federal programs and laws such as the Marine Mammal Protection Act and Endangered Species Act. The EWC also offered support to help communities find funding to develop community-based programs.

It was noted that the community of Point Lay has already adopted many practical protection measures to reduce disturbances at their large haulout, and they have also taken an active role in walrus research and monitoring efforts. The community has been successful at preventing disturbance events and mortality at the haulout has been extremely low. Recommendations to improve response planning and preparedness included holding a community meeting prior to the haulout season to discuss protection measures and developing a communication plan with appropriate officials to get protection measures in place quickly when the haulouts form.

RESEARCH RECOMMENDATIONS

There was general interest among workshop participants to see increased involvement and participation of community members in walrus research and management efforts on the North Slope. Community members have great traditional and local knowledge of their territory and the behavior of animals which can contribute greatly to the success of research projects. There was a recommendation to consult with local communities prior to doing a research project at a coastal walrus haulout. The community can provide good advice about how to accomplish the work and prevent disturbances. It was also noted that compensating hunters fairly for their time and effort will help improve participation in biological sampling programs.

A number of recommendations regarding priorities for walrus research were generated at the workshop:

- Explore the potential for developing offshore artificial platforms to serve as resting habitat for walruses.
- Investigate the impacts of climate change and changing ice conditions on marine mammals and subsistence hunters.
- Test the ballast water from ships that travel through the area for bacteria that might be causing the observed disease symptoms in seals and walruses. Other possible causes of the observed skin lesions include: environmental contaminants from mining operations and military sites, compounds released from the melting polar ice pack, and new algal blooms seen in the Arctic.
- Conduct baselines studies of important habitat areas prior to oil and gas development to understand potential impacts.
- Identify impacts from oil and gas activities in hunting grounds and whether they cause disturbances during the hunting season.

Workshop participants also recommended that resource management agencies invest in training for students and help them pursue careers in resource management. It was noted that there are some student scholarships available to students interested in biology including the Mathew Iya scholarship, established through the Pacific Walrus Conservation Fund (contact EWC, USFWS, or ADFG workshop participants for additional information).

COMMUNICATION AND OUTREACH

Participants noted that communication and outreach in coastal communities on walrus conservation and management activities is critically important. In order to promote stewardship efforts, people need to understand the issues. Walrus managers, researchers, EWC representatives, and the NSB-DWM were encouraged to make regular visits to the communities to share information about ongoing walrus research and management issues, and to let communities know how they can become involved. People are very interested in hearing about walrus issues at all levels (local, regional, and international).

Workshop participants stressed the importance of sharing the traditional knowledge of community elders, both with scientists and within the community. The elders have great knowledge and experience with the animals and how to hunt them efficiently and sustainably. Specific recommendations regarding communication and outreach include:

- Share the traditional knowledge of the elders with younger hunters. Part of the communication should be to talk about ways to protect haulout areas and provide guidance on responsible hunting techniques.
- Communicate safety concerns and risks to people's health regarding sick seals/walruses as food and communicate the results of studies in a timely and culturally sensitive manner to avoid scaring people from eating their food.
- Communicate research and testing results back to the communities in a consistent and timely manner. Insure scientific terminology is translated into simple terms so all may understand and participate in the discussion.
- Radio talk shows are a good way to engage coastal communities on the North Slope on wildlife management issues.
- Visit participating workshop communities to share and discuss this report.
- Increase outreach and education in the communities regarding hunting rules and regulations so people can avoid trouble.
- Make use of the local (Barrow) USFWS liaison office for outreach.

APPENDIX A – EWC RESOLUTION 2008-01

Eskimo Walrus Commission

Resolution 2008-01

A Resolution to Minimize Disturbance of Hauled-Out Walrus

WHEREAS, the Eskimo Walrus Commission was formed in 1978 with representation of 19 walrus hunting communities throughout the Northern, Northwestern, and Western Alaska coastal communities; and

WHEREAS, a stated purpose of the Eskimo Walrus Commission is to conserve and enhance marine resources such as walrus, and

WHEREAS, the continued health of the walrus population is important for the subsistence of coastal Alaska Native people of the Bering, Chukchi, and Beaufort Seas, and

WHEREAS, rapid decline in summer sea ice extent and quality in the Arctic have resulted in a greater number of walrus moving to the Chukchi Sea's shoreline, and

WHEREAS, the extent and quality of summer sea ice in the Arctic is predicted to continue diminishing, and

WHEREAS, groups of walrus are expected to continue spending more time on land where they are more prone to disturbances, and

WHEREAS, when disturbed on land, walrus frequently stampede in a manner that results in mortalities and can lead to site abandonment, and

WHEREAS, there is great concern about the future consequences of the changes in sea ice and walrus ecology on the health of the walrus population;

NOW THEREFORE BE IT RESOLVED THAT the Eskimo Walrus Commission is strongly urging communities to implement ordinances and guidelines regarding hunting and disturbance of groups of walrus while they rest on shore, and

BE IT FURTHER RESOLVED THAT the Eskimo Walrus Commission seeks input from communities about their concerns and suggestions for effectively protecting walrus while they rest on land, and

BE IT FURTHER RESOLVED THAT the Eskimo Walrus Commission urges their co-management partner, the U.S. Fish and Wildlife Service, to ensure that new and existing

development and transportation initiatives conduct activities in a precautionary manner with respect to preventing disturbance to hauled-out walruses.

Charles D.N. Brower

Charles D.N. Brower, Chair

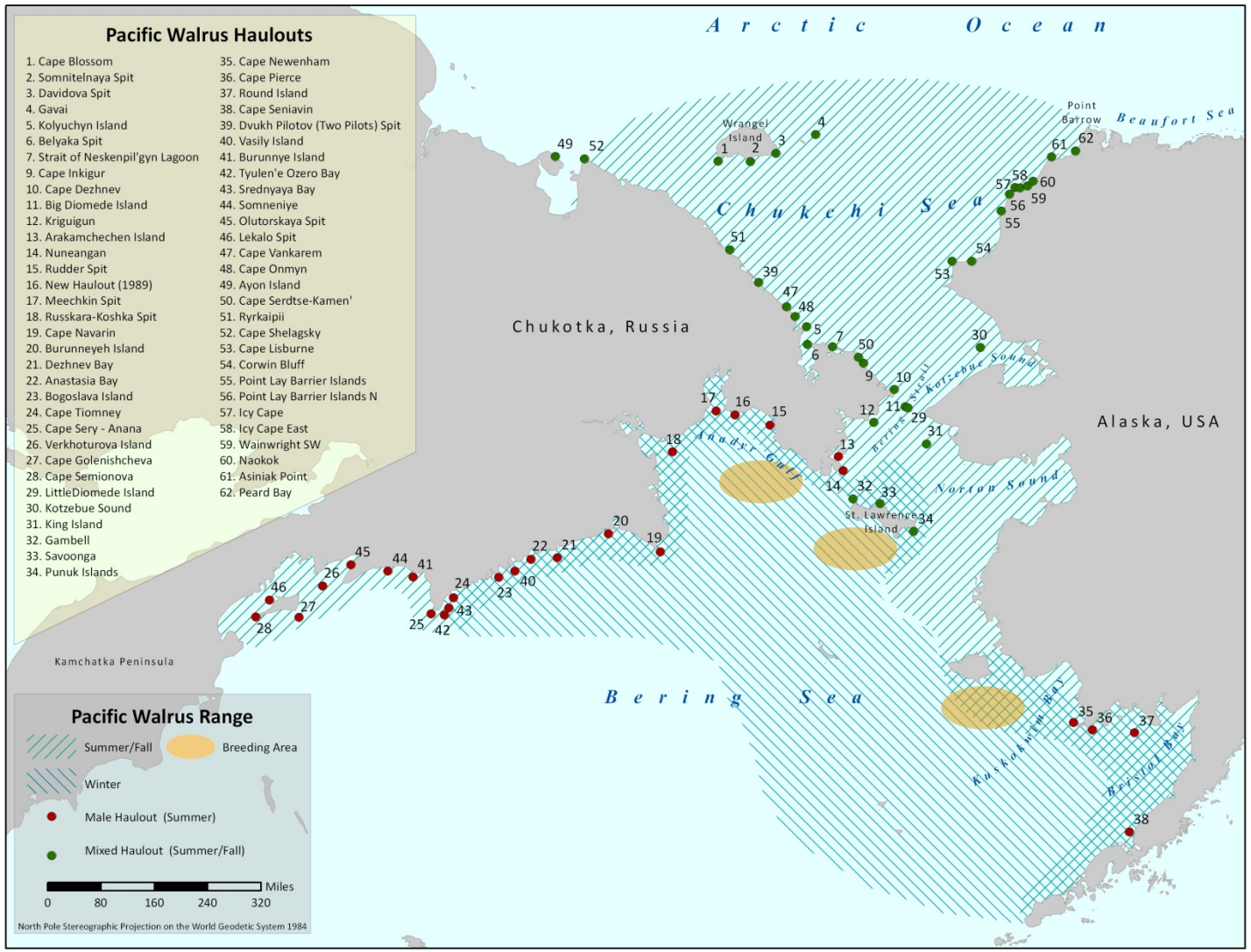
CERTIFICATION:

I, the undersigned Secretary of Eskimo Walrus Commission hereby certify that the foregoing resolution 2008-01 was adopted by majority vote of the Commissioners. Passed this 15th day of January 2008 at a duly called meeting of the Eskimo Walrus Commssion.

Elmer Sectof Jr.

Elmer Sectof, Jr., Secretary

APPENDIX B – MAP OF COASTAL WALRUS HAULOUTS



APPENDIX C: COMMUNITY RECOMMENDATIONS

POINT LAY

Communication and coordination:

- Develop and distribute a contact list (including agency and community contacts) prior to the haulout season so that people know who to call when animals show up on the beach.
- Set up a teleconference with community and agency representatives (USFWS, NSB, FAA, and the U.S. Coast Guard) prior to the haulout season to get protective measures in place.
- Hold a community meeting prior to the haulout season to develop plans.
- Present information about walrus research and management efforts in the classrooms – walrus researchers and NSB staff should plan on presenting information to students.

Haulout Studies:

- Continue to involve community members in walrus haulout monitoring projects.
- Consider establishing a base camp on the barrier island during the haulout season (noting the difficulty in crossing the lagoon during shallow water conditions).
- Explore the possibility of setting up observation towers equipped with web cameras at the haulout to allow remote monitoring of walruses and unwanted ships and planes.

Equipment and supplies needed to conduct haulout studies:

- *Communication equipment:* 150 watt VHF radios (recommendation to use a different frequency to avoid interference with village communications), Satellite phone for emergencies, fax machine for sending information to community communication centers.
- *Shelter:* Camouflage tents (2). It was noted that there is an old building built by students on the barrier island. Suggestion to talk to village council regarding its use during the field season. Blinds at haulouts are needed as a warm up place to get out of elements and to accomplish observations without scaring animals.
- *Camp supplies:* Stove, coffee pot, thermos, propane fuel (not gas, worried about smell causing stampede), water containers, emergency food (ready to eat), lanterns, bucket.
- *Safety equipment:* PLB or SPOT locators, flares, a shot gun with slugs and cracker shells to keep bears away, fire starter.
- *Observation equipment:* Two spotting scopes with built in cameras to allow zooming in for pictures of lesions or sick animals.

BARROW

Barrow does not have well developed haulouts near the community, but does get some animals showing up on local beaches. Minimizing public interactions with walruses on area beaches is the primary management issue at present.

Local control and management structure:

- Recommendation for the Native Village of Barrow (NVB) to take the lead on local walrus management issues – backed up by locals and the NSB-DWM.
- Recommendation to create a local task force to address walrus management issues in the community – include the NVB, ICAS, UIC, COB, NSB, hunters, and Community elders.
- Consult local task force and the EWC regarding the development of local ordinances (will not affect traditional hunt). Discuss issues and how to deal with them with elders and active hunters and then take the information back to the community to share and seek their approval and buy in. Put these guidelines in place before a situation arises.
- Develop a response plan that can be referred to clarify who will take the lead role.
- Develop a system to get air restrictions in place over haulouts.

Funding:

- Work with the EWC to identify and pursue funding for local management programs.

Communication and coordination:

- Increase communications among EWC, NVB, NSB, and USFWS on walrus issues.
- Barrow is a regional hub and can help facilitate communication with the other villages.

Outreach and education:

- Utilize local radio shows to raise awareness of walrus haulout issues on the North Slope.
- Utilize local USFWS liaison office in dealing with haulout issues.
- Develop educational videos.
- Develop school curriculum, and have elders share their knowledge and traditional ways.

Improve/reduce interactions with USFWS law enforcement:

- Recommendation to have the local USFWS community liaison evaluate situations before law enforcement comes to the community.
- Work with the local task force to try to resolve law enforcement issues locally.

Hunting at haulouts:

- If large haulouts form near the community like in Point Lay, and nutritional needs need to be met, consider coordinating community hunting efforts to reduce disturbances. Invite other hunters with experience hunting at coastal haulouts to share their experience.

POINT HOPE AND WAINWRIGHT

Representatives from Point Hope and Wainwright worked together to develop a list of recommendations for their communities:

- Develop awareness programs in the communities and educate young hunter about proper walrus hunting techniques.
- Take what you can take from harvested walrus – do not waste.
- Remove unwanted carcasses away from the community to avoid predators.
- Encourage our children to pursue careers in wildlife management, and encourage the USFWS and the State of Alaska to recruit our youth.
- Increase communication with marine vessels to avoid disturbances to subsistence hunting.
- Invite the USFWS and other agencies to regularly visit communities and present information about walrus issues. The visit by Chukotka hunters in 2009 was very effective at raising awareness on these issues in the communities. It was noted that July or August, after whaling, is a good time to visit the villages.
- Increase communication with law enforcement officers regarding wildlife regulations.
- Develop walrus haulout plans (local ordinances). Integrate Native language, culture, and the wisdom of community elders into the process.
- Revisit old treaties and our native rights concerning subsistence hunting.
- Establish communication with neighboring communities regarding the migration of sea mammals and birds.
- Integrate our native language into walrus issues and interpret the information from our elders to our children.

BERING STRAIT REGION

Regional experience sharing:

- Promote hunter knowledge exchanges. Bering Strait participants would like to visit Point Lay when walruses are there to observe what is being done (learn from each other). Note the availability of a walrus hunting video that shares the traditional hunting practices of Saint Lawrence Island hunters; you can contact the EWC for a copy of the video.

Research planning and approvals:

- Increase community involvement in walrus research activities. Note that research results are not always shared in a timely manner, and hunters need to be fairly compensated for their sampling efforts. This would improve community participation in sampling projects.
- There is a need to study the impacts of climate change and changing sea ice conditions on marine mammals and on subsistence hunters.

Harvest guidelines:

- Hunters need to get better (clearer) directions on salvage requirements for harvested walruses. Noted that parts of the current salvage guidelines are unclear and this has caused confusion and problems for some hunters. Need to make the rules clear so hunters are not fined.

Local hunting ordinances:

- The reintroduction of local hunting ordinances on St Lawrence Island is moving forward. Local advisory councils in Savoonga and Gambell will meet and review them.

Shipping traffic:

- There is no mechanism in place to monitor real time vessel traffic through the Bering Strait. There is a proposed workshop to discuss this issue in the fall of 2012.
- There is a need for a better understanding of the regulatory environment concerning Arctic shipping. We need to have a close look at the federal regulations, and work closely with the U.S. Coast Guard on shipping traffic issues.
- There is no voice speaking for subsistence users in the International Maritime Organization which is a concern.

Participant Comment on increased shipping traffic: With the ice pack receding, Arctic shipping should be our number one focus as it can affect all the marine animals in the food chain. Native tribes need to come together and support one another on this issue as we all live off the same animals. We need to give these Native organizations our full support in dealing with traffic going through the Bering Straits to the Arctic. Marine mammals are our soul food, and we can't get it anywhere else in the world. It is our responsibility to protect our resources for future use.

WORKSHOP PARTICIPANT REFLECTIONS

"*I hope that a proclamation will result from this workshop for us to work together. We all need to work together to protect the Arctic Ocean for the greater good." ─ Enoch Oktollik, EWC Commissioner Wainwright*

"*Thank you everyone for coming to Barrow, especially our elders. It was a heartfelt, productive, and humbling meeting. I will help carry this workshop information forward to other villages*." *—Joe Sage, Wildlife Director, Native Village of Barrow*

"*Deepest thanks to our elders for their wise words and the EWC and USFWS for organizing the meeting. A special thank you to Point Lay residents for leading the way on walrus issues on the coast. We need to continue dialogue with hunters, who have valuable information about climate change and wisdom and advice on how to adapt to changes." ─ Taqulik Hepa, Director, NSB-DWM*

"*It doesn't matter who we are, we are all here to conserve our resources for a sustainable life in this harsh environment." ─ Ernest Nageak, USFWS Tribal Liaison, Barrow*

"*Conservation and science work best together when local people take the lead and agencies step back and support their efforts*." *─ John Trent, Wildlife Biologist, USFWS*

For a copy of this report contact:

Marine Mammals Management, U.S. Fish and Wildlife Service
MS-341, 1011 East Tudor Road, Anchorage, Alaska 99503

1 (800) 362-5148

Appendix B. Walrus Research Permit Report for 2013.

THE STATE of ALASKA
GOVERNOR SEAN PARNELL

Department of Fish and Game

DIVISION OF WILDLIFE CONSERVATION
Interior/Northeast Region

1300 College Road
Fairbanks, Alaska 99701-1551
Main: 907.459.7213
Fax: 907.459.7332

23 December 2013

Lisa Lierheimer, Chief
Division of Management Authority
U.S. Fish and Wildlife Service
4401 N. Fairfax Dr., Rm 212
Arlington, VA 22203

and

Deborah Pierce Williams, Chief
Marine Mammals Management
1011 East Tudor Road, MS-341
Anchorage, AK 99503

RE: Annual Report on Federal Fish and Wildlife Permit No. MA220876-1

This report covers our research activities on walruses for the calendar year of 2013.

Summary of research results – Prior to this reporting period we tagged two adult female walruses in September 2010; one with a calf and one without. Other attempts to tag from shore (Wales, Diomede, and Point Hope) were unsuccessful due to poor ice and weather conditions. During this reporting period we tagged 34 walruses (28 females and six males) as part of a joint walrus research cruise with U.S. Geological Survey (USGS) and U.S. Fish and Wildlife Service (USFWS). Tags were deployed between 6 and 27 June 2013 in several locations including east of St. Lawrence Island in the Bering Sea north to Pt. Lay in the Chukchi Sea. The satellite tags were active 6 June – 16 October, 2013 and transmitted for an average of 55 days (4 –124 days). No walrus skin biopsies were collected under this permit in 2013, however 23 of the 34 tagged walruses were biopsied. These biopsies were collected as part of the USFWS genetic mark recapture project and will be reported under their permit.

We coordinated with the Eskimo Walrus Commission (EWC) representatives, USFWS, and USGS for the June tagging effort.

Problems or complications – Although previous tagging efforts were unsuccessful because unsafe ice and weather conditions prevented shore-based tagging crews from boating, there were no problems or complications this year tagging from small boats launched from a ship in June. There were no injuries or mortalities to walruses related to our research activities.

Table 1. Walruses tagged with satellite-linked transmitters in June 2013.

Tag date	Tag no.	Latitude N	Longitude W	Sex	With Calf	Age class (yrs)	Tag type	Tag Method	Days trans-mitted
6/6/2013	93092	62.4168	-168.8274	Female	Yes	6-9	Splash10	Crossbow	53
6/6/2013	93109	62.52	-168.7987	Female	Yes	6-9	Splash10	Crossbow	34
6/13/2013	50679	68.228	-168.894	Female	No	6-9	Splash10	Crossbow	51
6/13/2013	60009	68.226	-168.891	Female	No	> 15	Splash10	Crossbow	1
6/13/2013	60014	68.227	-168.895	Female	No	10-15	Splash10	Crossbow	34
6/13/2013	60015	68.226	-168.901	Female	No	6-9	Splash10	Crossbow	45
6/13/2013	60018	68.225	-168.899	Female	No	6-9	Splash10	Crossbow	4
6/13/2013	93090	68.217	-168.919	Female	Yes	> 15	Splash10	Crossbow	55
6/13/2013	93111	68.224	-168.89	Female	Yes	10-15	Splash10	Crossbow	49
6/13/2013	96418	68.278	-168.9088	Female	No	> 15	SPOT5	Crossbow	88
6/13/2013	96421	68.223	-168.907	Female	No	> 15	SPOT5	Crossbow	92
6/13/2013	96422	68.253	-168.9115	Female	Yes	6-9	SPOT5	Crossbow	96
6/13/2013	96425	68.233	-168.888	Female	No	> 15	SPOT5	Crossbow	26
6/13/2013	96427	68.241	-168.8893	Female	No	> 15	SPOT5	Crossbow	124
6/13/2013	96431	68.234	-168.8931	Female	Yes	> 15	SPOT5	Crossbow	44
6/14/2013	42522	68.259	-169.321	Female	No	10-15	Splash10	Crossbow	0
6/14/2013	50687	68.286	-169.086	Female	Yes	> 15	Splash10	Crossbow	56
6/14/2013	93110	68.286	-169.086	Female	Yes	10-15	Splash10	Crossbow	52
6/16/2013	60011	68.843	-167.461	Female	Yes	10-15	Splash10	Crossbow	50
6/16/2013	96430	68.828	-167.486	Male	No	10-15	SPOT5	Crossbow	86
6/17/2013	50685	68.817	-167.201	Female	Yes	10-15	Splash10	Crossbow	49
6/17/2013	93080	68.811	-167.201	Female	Yes	10-15	Splash10	Crossbow	29
6/17/2013	93087	68.816	-167.2	Female	No	10-15	Splash10	Crossbow	31
6/17/2013	96417	68.824	-167.112	Male	No	10-15	SPOT5	Crossbow	63
6/17/2013	96423	68.824	-167.112	Male	No	10-15	SPOT5	Crossbow	56
6/17/2013	96428	68.825	-167.111	Male	No	> 15	SPOT5	Crossbow	0
6/19/2013	60013	69.662	-165.577	Female	No	10-15	Splash10	Crossbow	50
6/21/2013	37286	69.44	-165.6	Female	No	10-15	Splash10	Harpoon	56
6/21/2013	96426	69.438	-165.585	Male	No	10-15	SPOT5	Crossbow	0
6/22/2013	96424	69.59	-164.964	Female	No	6-9	SPOT5	Crossbow	115
6/25/2013	96420	69.424	-166.132	Male	No	10-15	SPOT5	Crossbow	0
6/26/2013	37280	69.856	-165.891	Female	Yes	10-15	Splash10	Harpoon[1]	50
6/26/2013	37288	69.861	-165.877	Female	No	10-15	Splash10	Harpoon	19
6/27/2013	37283	70.246	-165.25	Female	Yes	10-15	Splash10	Harpoon[1]	33

[1]Tagged while swimming at the surface.

Summary of tagging – We tagged 32 walruses on the ice and two swimming at the surface. Sex, age, presence of calf, and type of tag deployed are presented in Table 1. Of the transmitters deployed, 21 were Splash tags that provide both location and dive data and 13 were SPOT tags that record location and haulout behavior (i.e., time wet and dry). During previous tagging attempts we noticed that swimming walrus often presented the midline of their back before diving, which provides an additional opportunity to tag walruses not hauled-out on sea ice. In 2012, we received an amendment to our permit to deploy tags on swimming walruses using a harpoon pole deployment system. Two walruses were tagged with this harpoon method.

Reactions of the target animals tagged on the ice included head lifting (two), getting up and facing the tagging boat (three), entering the water (25) and two had no noticeable reaction. Calves with females that were tagged reacted by getting up and facing the boat or by entering the water if their mothers did. Reactions of the two target animals tagged in the water were to dive as the boat approached. As the animals dove they presented the mid-back for good tag placement. Both of these were females with calves and in both cases the boat approached on the females' left with the calves on their right. As the boat approached, the females slowed down in defense of the calves who continued ahead following other animals in the group. Once the tags were deployed the boat was stopped. In both cases, the females joined the calves and they swam away together.

We lost three tags during tagging attempts when they detached from the deployment device prior to reaching the target animal and fell into the water. Once the tag detached, the deployment device changed direction and did not contact any walruses. We have included the disturbance to those animals in the numbers below. We fixed the problem by securing the tags to the deployment device with break-away tape.

Summary of disturbance to non-target walruses – During the tagging of the 34 tagged walruses, 160 other walruses were disturbed (130 entered the water, 18 lifted their heads, six got up and faced the boat, and six that were in the water, dove). During five unsuccessful tag deployments another nine walruses were disturbed (the five target animals and four adjacent animals). Of the 13 adult females that had calves with them when they were tagged, 10 calves reacted to the tag deployment by entering the water with their mothers. All calves that left the ice with their mothers remained with them; there were no cases where calves were separated from their mothers (i.e., no interruption of pair-bonding). Although seals and birds were occasionally seen in the vicinity of walrus groups, none were encountered in the immediate area or disturbed during walrus tagging activities. No polar bears were disturbed during tagging activities. No Steller's or spectacled eiders were seen during tagging activities.

Summary of disturbance related to haulout monitoring and carcass examinations – A relatively small haulout (1,500–4,000 walruses) that formed near Point Lay in mid-September 2013 and grew to ~10,000 in late September was monitored. Local walrus hunters monitored the status of the haulout and for disturbances. They also documented the number and condition of carcasses accessible near the haulout, and traveled the coast looking for other haulouts and carcasses. They reported that there were no human-caused disturbances at the Point Lay haulout this year. During carcass surveys one calf, four yearlings and one subadult were found. All appeared to die from crushing-related trauma indicating that some sort of disturbance event occurred; possibly a grizzly bear. A local observer on Little Diomede Island periodically observed a known haulout there to document numbers and composition.

Observations are conducted from the cliffs above and have not resulted in any disturbance. No walruses were disturbed during our shore-based activities this year.

Evaluation of Progress – We were able to deploy 34 tags on walruses to track their movements, in general, and relative to oil and gas activities in the lease sale area in the Chukchi Sea. We were able to determine at the time of tagging if the tagged females had calves of the year or not. There may be important differences in distances moved and haulout patterns between adult females with and without calves. This information has not been available in other tagging datasets. It is important to know if females with calves haul out at certain times of day, or for longer or more often, as there are implications for other walrus studies such as age composition and aerial surveys. It is also important to know if distances traveled are shorter suggesting less sea ice may be a greater problem for females with calves than for females with older offspring.

Although our original objectives were to only tag females we observed more adult males in the Chukchi Sea (i.e., farther north than we expected), as most adult males are known to summer in the Bering Sea. Therefore, we tagged six adult males to see if they remained with the females in the Chukchi Sea during the summer or if they went to the male haulouts in the Bering Sea (see Appendix A for a map of their movements). Interestingly, none of the walruses whose tags were still active in late September and early October used the Point Lay haulout. Tags lasted an average of 55 days and ranged from 4 to 124 days allowing us to track some individuals from June to October. We will be able to use the data collected by the tagged walruses to determine distances traveled, areas of use, haulout vs. feeding behavior, female with calf vs. female without calf behavior.

Activities planned for 2014 – At this time, our research activities for 2014 include tagging from a ship in June on a similar research cruise to the one conducted in 2013. We will continue to look for opportunities to deploy tags at several locations including Little Diomede and Hooper Bay. We will continue to work with walrus hunters to identify and monitor terrestrial haulouts, deploy tags, and document carcasses.

Research Findings – None of our findings have been published yet, however during this reporting period we provided weekly e-mailings of maps of the locations and movements of tagged walruses, a handout (Appendix A) and oral presentation to the EWC at their meeting in December 2013, and submitted an abstract for a poster to be presented at the Alaska Marine Science Symposium in January 2014 (Appendix B). The abstract and last year's poster are listed below and provided as appendices. Walrus location maps and information about our tagging efforts are also available on our website: http://www.adfg.alaska.gov/index.cfm?adfg=marinemammalprogram.walrustracking

We are currently preparing our annual report to the Bureau of Ocean Energy Management who funds this project. We will make that report available in next year's permit report.

Research Products –

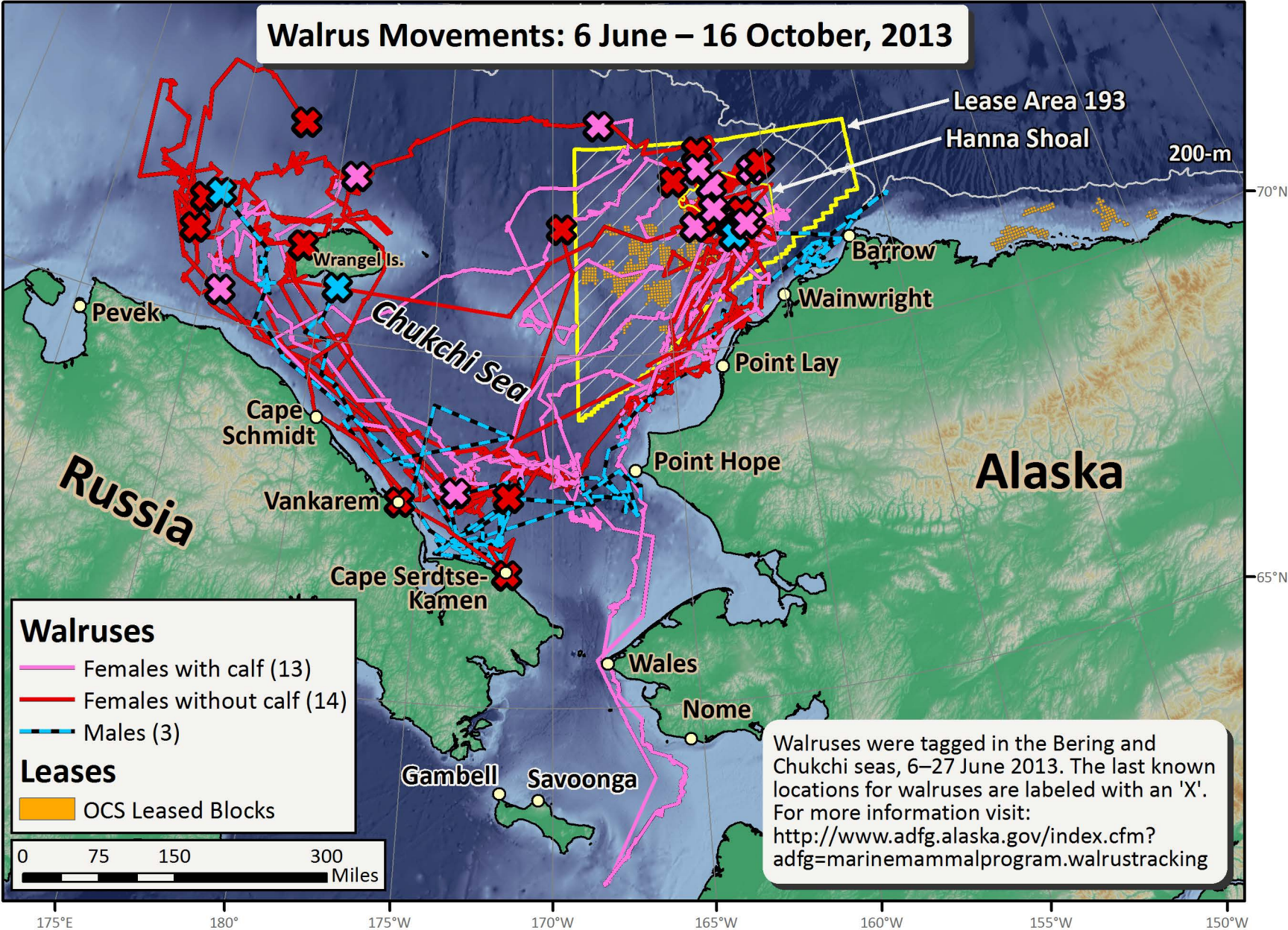
Crawford, J. A., W. Neakok, M. A. Nelson, J. Garlich-Miller, and L. T. Quakenbush. 2013. Results from village-based walrus studies in Alaska, 2012. Alaska Marine Science Symposium, 21–25 January, Anchorage, AK. (Abstract and poster).

Crawford, J.A., L. Quakenbush, C. Irrigoo, P. Pungowiyi, W. Neakok, W.H. Lampe, and J. Garlich-Miller. 2014. Results from village-based walrus studies in Alaska, 2013. Alaska Marine Science Symposium, 20–24 January, Anchorage AK (Abstract and poster).

Submitted by: Lori Quakenbush

Appendix A. Map of the movements of walruses tagged in June 2013, handout to the Eskimo Walrus Commission December 2013 meeting.

Appendix B. Abstract for 2014 Alaska Marine Science Symposium.


Walrus Movements: 6 June – 16 October, 2013
Lease Area 193
Hanna Shoal
200-m
70°N
65°N
Barrow
Wainwright
Point Lay
Point Hope
Wrangel Is.
Pevek
Chukchi Sea
Cape Schmidt
Vankarem
Russia
Alaska
Cape Serdtse-Kamen
Wales
Nome
Gambell
Savoonga
Walruses
Females with calf (13)
Females without calf (14)
Males (3)
Leases
OCS Leased Blocks
0 75 150 300 Miles
Walruses were tagged in the Bering and Chukchi seas, 6–27 June 2013. The last known locations for walruses are labeled with an 'X'. For more information visit: http://www.adfg.alaska.gov/index.cfm?adfg=marinemammalprogram.walrustracking
175°E
180°
175°W
170°W
165°W
160°W
155°W
150°W

Satellite-linked transmitters were deployed on walruses in the Bering and Chukchi seas in June 2013. The tags transmitted for an average of 55 days, ranging from 4 to 124 days (~4 months). During this time walruses traveled, on average, a minimum distance of 1,118 miles, ranging from 158–2,765 miles. At a minimum, these walruses traveled, about 21.7 miles per day.

Tags were deployed on 34 walruses (15 females without calves, 13 females with calves and 6 males).

This tagging project is part of the Village-based Walrus Studies funded by BOEM. This funding supported Clarence Irrigoo from Gambell and Perry Pungowiyi from Savoonga to participate in all of the activities on the walrus research cruise including the tagging. They tagged some of the walruses using a crossbow and some with a pole. They assisted Patrick Lemons in collecting biopsies, and they advised the researchers and small boat drivers about how to approach walruses safely and effectively.

The information from these tagged walruses will be used to understand how much time walruses spend in the Chukchi Sea Lease Sale area and when. It also provides general walrus movement and haulout patterns.

Report to the Eskimo Walrus Commission presented on 10 December 2013 by Lori Quakenbush (907-459-7214).

Results from village-based walrus studies in Alaska, 2013

Justin A. Crawford[1]*, Lori Quakenbush[1], Clarence Irrigoo[2], Perry Pungowiyi[3], Willard Neakok[4], Warren H. Lampe[5], and Joel Garlich-Miller[6]

[1] Alaska Department of Fish and Game, Fairbanks, Alaska 99701;
[2] Walrus hunter and resident of Gambell, Alaska;
[3] Walrus hunter and resident of Savoonga, Alaska;
[4] Eskimo Walrus Commission and resident of Point Lay, Alaska;
[5] Walrus hunter and resident of Point Lay, Alaska
[6] U.S. Fish and Wildlife Service, Anchorage, Alaska 99503

* *Correspondence: Justin.Crawford@alaska.gov*

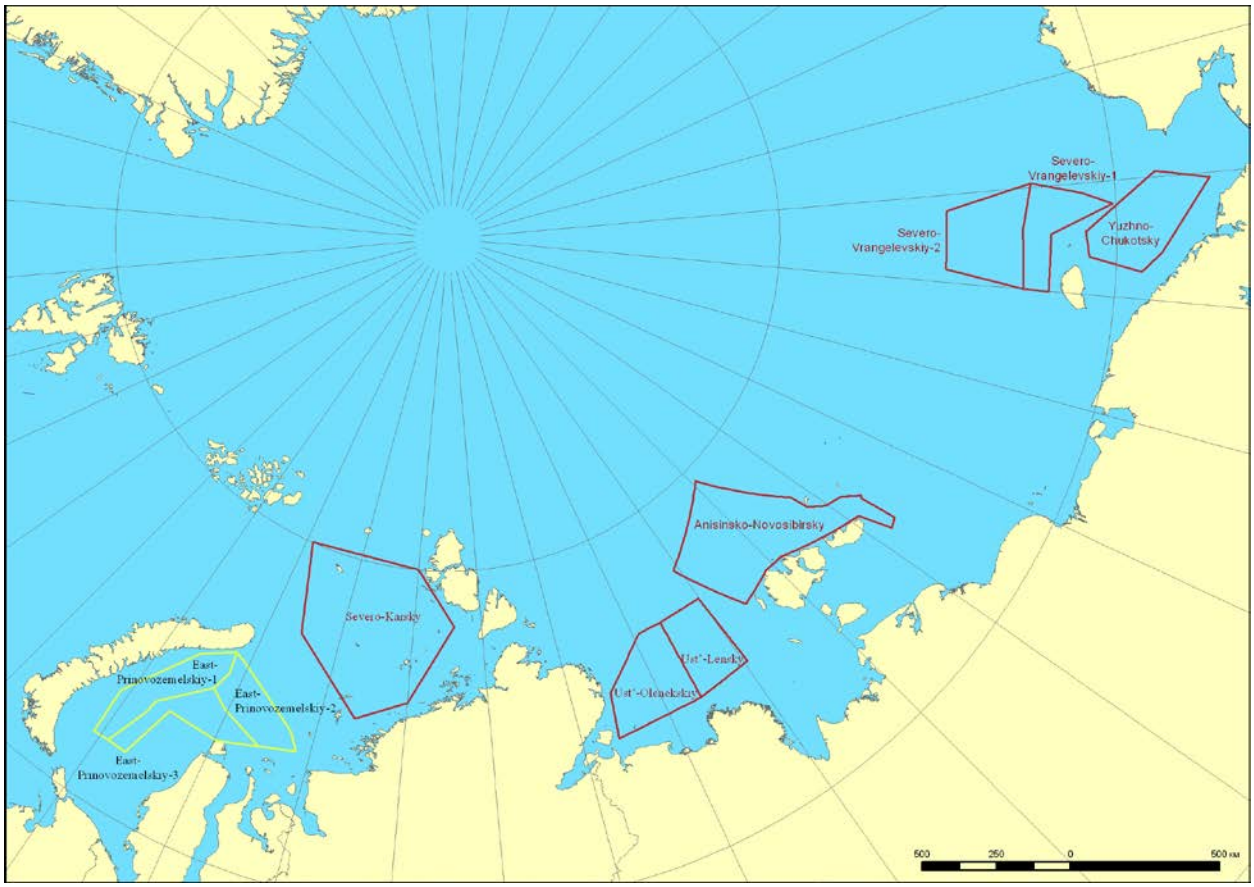
Alaska Marine Science Symposium, 20–24 January 2014, Anchorage AK

Pacific walruses winter in the Bering Sea, but females and young summer in the Chukchi Sea resting on sea ice; most adult males remain in the Bering Sea where they rest on land. The rapid retreat of sea ice is changing summer walrus habitat in the Chukchi Sea and may be changing summer distributions and haulout behavior, requiring that walruses haul out on land when ice is not available. The purpose of this project is to work with subsistence walrus hunters to conduct observations at terrestrial haulouts accessible from coastal communities, deploy satellite-linked tags to monitor movements and feeding behavior, and to document local knowledge regarding terrestrial walrus haulouts. In preparation for a potential terrestrial haulout near Point Lay in 2013, local hunters assisted in the placement of camera towers. A relatively small haulout (1,500–4,000 walruses) that formed near Point Lay in mid-September and grew to ~10,000 in late September was monitored. Skiff surveys were conducted to look for other haulouts and for carcasses, when possible and without disturbing the haulouts. Traditional and local knowledge interviews were conducted in Point Hope and final reports are now available for Point Hope and for Wainwright and Point Lay, jointly. In association with a multi-agency walrus research cruise in June, walrus hunters from Saint Lawrence Island deployed 34 satellite-linked transmitters in the Bering and Chukchi seas. Of the 34 tagged walruses, 28 were females, (13 of which were accompanied by calves of the year) and six were adult males. Preliminary data show the highest concentration of tagged walruses occurred in the Hanna Shoal area within Lease Sale 193 in the eastern Chukchi Sea during July and August, however areas north of Wrangel Island and along the northern Chukotka coast, Russia were also used. All tagged walruses left Hanna Shoal during the first week of September. None of the five tags still transmitting in September were located at the terrestrial haulout near Point Lay, although one female hauled out on the Chukotka coast near Vankarem, Russia.

****

Current word count = 334
Word max = 350

Appendix C. Russia's main oil and gas company, Rosneft, agreement with ExxonMobil to explore three areas for liquefied natural gas (LNG) reserves.
Found at: http://www.rosneft.com/news/pressrelease/130220133.html



Name of the license block	Sea	Acreage, sq.km*	Acreage, acres*	Water depth, m*
1. East Prinovozemelskiy-1 2. East Prinovozemelskiy-2 3. East Prinovozemelskiy-3	Kara	125,904	31.1 M	10-440
4. Severo-Karsky	Kara	196,000	48.4 M	20-480
5. Ust' Olenekskiy	Laptev	64,103	15.8	19-90
6. Ust' Lensky	Laptev	46,851	11.6	15-90
7. Anisinsko Novosibirsky	Laptev	140,981	34.8	20-2000
8. Severo-Vrangelevskiy-1 9. Severo-Vrangelevskiy-2	Chukchi	115,176	28.4	40-370
10. Yuzhno Chukotsky	Chukchi	73,197	18.0	40-70

*estimated

February 13, 2013

Rosneft and ExxonMobil Expand Strategic Cooperation

- Companies to add seven Arctic license areas covering approximately 600,000 square kilometers (150 million acres) in the Chukchi, Laptev and Kara seas
- Rosneft is provided with an option to acquire a 25 percent interest in Point Thomson natural gas and condensate project in Alaska operated by ExxonMobil
- Companies to jointly study potential for LNG project in Russian Far East.
- Moscow, Russia – February 13, 2013. Rosneft and ExxonMobil have agreed to expand their cooperation under their 2011 Strategic Cooperation Agreement to include approximately additional 600,000 square kilometers (150 million acres) of exploration acreage in the Russian Arctic, and potential participation by Rosneft (or its affiliate) in the Point Thomson project in Alaska. They have also agreed to conduct a joint study on a potential LNG project in the Russian Far East.
- The agreements, which include plans to explore seven new blocks in the Chukchi Sea, Laptev Sea and Kara Sea, were signed by Igor Sechin, president of Rosneft and Stephen Greenlee, president of ExxonMobil Exploration Company, in the presence of Russian President Vladimir Putin.
- The license blocks include Severo-Vrangelevsky-1, Severo-Vrangelevsky-2 and Yuzhno-Chukotsky blocks in Chukchi Sea, Ust' Oleneksky, Ust' Lensky and Anisinsko-Novosibirsky blocks in Laptev Sea and Severo-Karsky block in Kara Sea, which are among the most promising and least explored offshore areas globally.
- A separate Heads of Agreement was signed providing Rosneft (or its affiliate) with an opportunity to acquire a 25 percent interest in the Point Thomson Unit which covers the project of developing a remote natural gas and condensate field on Alaska's North Slope. It is estimated that Point Thomson contains approximately 25 percent of the known gas resource base in Alaska's North Slope.
- Rosneft and ExxonMobil also executed a Memorandum of Understanding to jointly study the economic viability of an LNG development in the Russian Far East, including the possible construction of an LNG facility. The companies will form a joint working group which is expected to commence work in the coming weeks to study the viability of an LNG project using available natural gas resources.

  Commenting on the agreements signed, Igor Sechin said, "The agreements signed today bring the already unprecedented scale of Rosneft and ExxonMobil

partnership to a completely new level. The acreage in the Russian Arctic subject to geological exploration and subsequent development increased nearly six-fold. That means the enormous resource potential of Russian Arctic offshore fields will be explored and developed in the most efficient manner with the application of cutting-edge technologies and expertise of our strategic partner, ExxonMobil, using state-of-the-art environmental protection systems. Participation in the Point Thomson project will increase Rosneft's access to the latest gas and condensate field development technologies used in harsh climatic conditions".

- Greenlee said the agreement builds on the ongoing successful cooperation between the companies.
  "This expansion is an illustration of the strength of the partnership that exists between ExxonMobil and Rosneft," said Greenlee. "We look forward to working together on these new projects."
- The companies are committed to using global best practices and state-of-the-art safety and environmental protection systems for the Arctic operations. The work will be supported by the recently signed Declaration on the Russian Arctic Shelf Environmental protection. Also, ExxonMobil and Rosneft will work together through an Arctic Research Center to provide a full range of research and design services to support their cooperation on Arctic projects.
- Rosneft and ExxonMobil continue to implement a program of staff exchanges of technical and management employees to help strengthen relationships between the companies.
- License areas factsheet

- **Rosneft Information Division**

Tel.: +7 (499) 517 88 97
Fax: +7 (495) 411 54 21
www.rosneft.com

February 13, 2013

- *These materials contain statements about future events and expectations that are forward-looking in nature. Any statement in these materials that is not a statement of historical fact is a forward-looking statement that involves known and unknown risks, uncertainties and other factors which may cause actual results, performance or achievements expressed or implied by such forward-looking statements to differ. We assume no obligations to update the forward-looking statements contained herein to reflect actual results, changes in assumptions or changes in factors affecting these statements.*

Appendix D. Sample datasheet for carcass surveys.

Clear Form

PACIFIC WALRUS MORBIDITY AND MORTALITY REPORT – LEVEL A DATA

ANIMAL ID: PL-W-14-01 **DATE OF OBSERVATION:** 8/6/14 ~~FWS ANIMAL ID:~~

LOCATION: Point Lay barrier Island

LAT. (dec. deg.): 69.46.550 **LONG.** (dec. deg.): 163.02.647

EXAMINER: JH, LF, JGM **CONTACT INFORMATION:**

~~**REPORTER:**~~ ~~**CONTACT INFORMATION:**~~

GROUP EVENT? ☐ YES ☑ NO ☐ UNKNOWN IF YES, NUMBER OF CARCASSES/SICK ANIMALS: ___ (within 100 meters of each other)

REPORT DETAILS: (SITE SPECIFIC AND CIRCUMSTANTIAL INFORMATION)

Point Lay survey #1. training + review of methods.

(USE BACK OF FORM FOR ADDITIONAL REMARKS)

ANIMAL STATUS: ☐ INJURED OR SICK ☐ FRESH DEAD ☐ MODERATE DECOMPOSITION ☑ ADVANCED DECOMPOSITION ☐ MUMMIFIED/SKELETAL ☐ CONDITION UNKNOWN

GENDER: ☐ MALE ☑ FEMALE ☐ UNKNOWN **AGE:** ☑ CALF ☐ YEARLING ☐ SUBADULT ☐ ADULT ☐ UNKNOWN

BODY CONDITION: ☑ NORMAL OR ROBUST ☐ EMACIATED ☐ UNKNOWN (if pelvic bones or rib cage are clearly visible –emaciated)

STANDARD LENGTH (cm): 153 ☑ ACTUAL ☐ ESTIMATED ☐ UNKNOWN (straight line measurement -snout to tail)

BLUBBER DEPTH AT STERNUM (cm): 7 ☐ UNKNOWN (depth of blubber + skin at sternum)

only for fresh carcasses

WOUNDS OR SIGNS OF TRAUMA? ☐ YES ☐ NO ☑ UNKNOWN IF YES, DESCRIBE BELOW

SKIN LESIONS ? ☐ YES ☐ NO ☑ UNKNOWN IF YES, DESCRIBE BELOW

OTHER TISSUE ABNORMALITES? ☐ YES ☐ NO ☑ UNKNOWN IF YES, DESCRIBE BELOW

BEHAVIOR ABNORMALITES? ☐ YES ☐ NO ☑ UNKNOWN IF YES, DESCRIBE BELOW

HUMAN INTERACTION? ☐ YES ☐ NO ☑ UNKNOWN IF YES, CHOOSE ONE OR MORE:

☐ BOAT COLLISION ☐ GUN SHOT/HARVEST ☐ FISHERY INTERACTION ☐ DISTURBANCE EVENT ☐ OTHER:

PHOTOS? ☑ YES ☐ NO (CONTACT/REFERENCE): See PL camera

NECROPSY REPORT? ☐ YES ☐ NO (CONTACT/REFERENCE):

SAMPLES COLLECTED? ☐ YES ☐ NO (CONTACT/REFERENCE):

IDENTIFICATION TAG? ☐ YES ☐ NO (TAG #, COLOR, PLACEMENT): White flipper tag # PL-W-14-01

ANIMAL DETAILS: (ANIMAL SPECIFIC INFORMATION: DESCRIBE ANY INJURIES, LESIONS, ABNORMAL TISSUES OR BEHAVIOR)

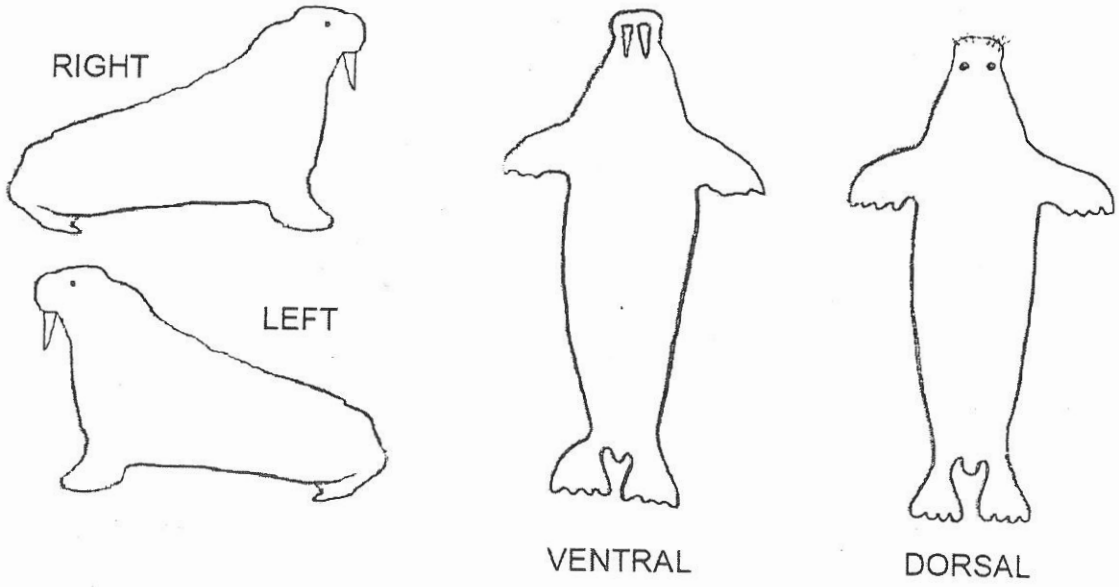
Decomposed Walrus calf @ last years haulout site. estimated to have died last fall.

(USE BACK OF FORM FOR ADDITIONAL REMARKS)

REPORT DETAILS CONTINUED: (SITE SPECIFIC AND CIRCUMSTANTIAL INFORMATION)

ANIMAL DETAILS CONTINUED: (ANIMAL SPECIFIC INFORMATION: INJURIES, LESIONS, ABNORMAL TISSUES OR BEHAVIOR)

(USE DIAGRAM BELOW TO ILLUSTRATE THE LOCATION AND DISTRIBUTION OF WOUNDS OR LESIONS)



Send this form to: USFWS, Marine Mammals Management, MS 341, 1011 East Tudor Rd, Anchorage, AK 99503

Phone: 1-800 362-5148, Fax: (907) 786-3816, email: Joel_GarlichMiller@fws.gov

Adapting to climate change: Community dialog on the conservation and management of Pacific walruses in Alaska and Chukotka

February 2-10, 2010, Point Hope, Point Lay, Wainwright, and Barrow Alaska

"We have come to see how you live and to tell you about our work with walruses and polar bears."- Vladilen Kaviry, setting the tone for the village meetings.

Sponsored by:

The U.S. Fish and Wildlife Service and World Wildlife Fund

Introduction

The United States and Russia share many wildlife species in the rich marine area between Russia and Alaska. Walruses, polar bears, seals, whales, fish, and many species of birds are among the area's biological treasures. Indigenous communities are an equally remarkable component of the Arctic ecosystem and they possess a wealth of unique cultural traditions. The participation of native communities in wildlife conservation is paramount for the sustainability of many important species in the Arctic.

In February 2010, the World Wildlife Fund (WWF) and U.S. Fish and Wildlife Service (USFWS) hosted an international exchange to allow native Chukchi representatives from Chukotka to visit a number of small Alaskan Arctic villages to share their traditional knowledge and practical experience with walrus and polar bear conservation, and to demonstrate the importance of local native communities' involvement in conservation activities. Opportunities to directly share experiences and concerns are especially important, as indigenous communities throughout the Arctic have been observing significant changes in the distribution and behavior of wildlife from climate change-induced transformations of the Arctic. As such, this exchange was a great opportunity for Alaskans to learn from the Chukotka experience, and for the Chukotkans to learn from their Alaska neighbors.

From February 2-10, 2010, the Chukotka team and their interpreters visited several predominantly Inupiat communities on Alaska's North Slope– Point Hope, Point Lay, Wainwright, and Barrow –to meet with community members and deliver presentations on their Russian walrus monitoring efforts, human-polar bear conflict prevention, and recent efforts to protect coastal walrus haul-outs. The information exchange between the native representatives across the Chukchi Sea proved to be very important for both sides of the border. Alaskan hosts and the Chukotkan visitors voiced that these encounters, though brief, helped to reveal the bigger picture of the status of transnational species such as Pacific walrus.

Profiles of Russian Participants

Sergey Kavriy, a long-time resident of Chukotka's coastal region, resides in the village of Vankarem on the Arctic coast of Chukotka. He is also the local representative for the Russian Association of Indigenous Peoples of the North (RAIPON), one of the leading NGOs advocating for the involvement of Russian Native peoples in resource management and other civil society issues. Sergey serves as the indigenous representative for Russia on the U.S.-Russia Bilateral Polar Bear Treaty.

Vladilen Kavriy, also a long-time resident of Chukotka's coastal region, is a respected native hunter with extensive knowledge of the Arctic environment. Over the past 10 years, Vladilen has become an important partner for biologists, local officials, and the WWF, having participated in WWF's "Climate Witness" project and organized two international expeditions for WWF to the Russian Arctic. He is also a leader of the newly created "Umky" (polar bear) patrol in Ryrkaipiy, Chukotka.

Fedor Tymnetagin is a member of the Vankarem "Umky" patrol and a long-time resident of this Russian Arctic village. Fedor has actively participated in the community's efforts to protect its large walrus haul-out (an annual phenomenon), which over the last 10 years has brought more than 20,000 walruses ashore in search of a resting place while the winter ice freezes. Fedor is a subsistence hunter and the official steward of the Vankarem walrus haul-out.

Anatoly Kochnev is a marine mammal biologist with the Chukotka branch of the Pacific Institute of Fisheries and Oceanography (ChukotTINRO). Anatoly, a long-time resident of Chukotka, has spent

years studying walrus and polar bear populations in the eastern Russian Arctic. He participated in the 2008 U.S.-Russian Survey of Pacific Walrus in the Chukchi Sea, and has been a member of additional bilateral research initiatives for decades. Anatoly is also an accomplished nature photographer.

Presentations

Below are transcribed notes from the presentations given by the Chukotka delegation at community meetings and school classrooms in Point Hope, Point Lay, Wainwright and Barrow Alaska.

Anatoly Kochnev, Wildlife Biologist
I have been a wildlife biologist for 30 years studying walrus and polar bear. I will set the stage by telling you about the changes that have been occurring in the Chukchi Sea and how they affect walruses and polar bears. My friends will tell you how they work as keepers of the walrus haulout and as polar bear patrollers. There have been big changes in the last 30 years. I started working in Chukotka in 1980. In the 1980s there was lots of sea ice and the population of walruses was increasing. Now the sea ice cover is decreasing and the ice edge is far from shore. From 1980 to 1989 most of the walrus hauled out at sea all summer. In Chukotka, haulouts on shore were only used late in the fall and for a short period of time. They were located on the western border of the Chukotka Peninsula near Bering Strait and on the southern border of the peninsula in the Bering Sea. From 2000–2009 the ice has been leaving the Chukchi Sea in summer and the walruses are forming large haulouts on shore on the northern Chukotka coast.

The warming is causing less sea ice, big fall storms, and late formation of sea ice in the fall. All of this causes problems for walruses. Calves get separated from their mothers in storms and walruses spend more energy moving from the beach to feed and back to rest. When walruses could rest on the ice in summer, the ice took them over more of the Chukchi Sea for feeding and provided a resting place near the food without having to swim to shore. Now walruses are using coastal haulouts for more of summer and in greater numbers. Some coastal haulouts have as many as 50,000 walruses as one time.

In 2007, the summer sea ice edge was a record distance away from shore (~1,200 km) in September. We put satellite transmitters on walruses in October 2007 and the locations from the transmitters showed us that walruses did not go far from shore to feed. Walruses did not go farther than 60 km from shore and most only went about 30 km. Without the ice for resting they cannot reach the central part of the Chukchi Sea for feeding and so the food supply near shore will soon be depleted. Some calves were observed in poor body condition and pregnant females sometimes aborted fetuses due to lack of nutrition and crowding on the beaches. We have also observed skin infections from tusk wounds and other injuries. Polar bears have always been predators of walrus on ice and on shore, but on shore there are other predators as well including brown bears, dogs, and wolverines. Predators, including humans can panic walruses and cause a stampede that tramples many calves and juveniles, crushing them to death. Airplanes and boats can also cause stampedes. In 2007 we observed the highest mortality and counted a minimum of 3,000 carcasses; the actual number was probably more like 10,000. About 80% of the carcasses were calves. Cape Schmidt had the highest number of carcasses followed by Vankarem and then

Kolyuchin Island. The number of carcasses is related to the number on the haulout; the larger the haulout the higher the mortality. This amount of mortality was not seen before 2000 because the sea ice was present and walruses did not haul out in such large numbers on land. Dead walruses attract polar bears and in 1990, 150 polar bears were counted at Cape Blossom, Wrangel Island in September. At first we thought this was very unusual but after 1990 we observed 50–150 polar bears there each year. After 2000, however fewer walruses hauled out at Wrangel Island and more began hauling out along the northern Chukotka coast.

Warming causes problems for polar bears too. If they stay with the ice in summer as they used to do the ice takes them far to the north, over deep water, where few seals go so there is little food. If they stay on land they risk injury by hunting walruses. If pregnant females cannot find enough food they cannot produce cubs. Hungry bears cause problems for people and bears are killed too. I have a theory that many bears stayed with the ice at first, but after a few years when there was no food and they could not wait for 6 months to get to land on the ice, they left the sea ice and walked and swam to the closest land in Russia and maybe in Canada too. For a few years there were not many bears on land but after 2003 more bears began concentrating on the northern Chukotka coast. In 2006, more than 200 polar bears came to Vankarem and other villages on the northern Chukotka Peninsula and threatened people's safety. Since 2000 there have been three incidents of polar bears killing people. This is when my friends started a polar bear patrol.

There are not enough biologists to monitor the walrus haulouts, but there are hunters who can collect valuable information. Together scientists and hunters are monitoring seven haulouts. Some are monitored by hunters and biologists and some only by hunters. None of the hunters involved in this project could be here to tell you about it, so I will tell you. The objectives of this study are to 1) record the chronology of the haulout (i.e., when the haulout becomes active and how the walruses come and go), 2) keep track of the numbers and the sex and age composition, and 3) record the causes of the disturbances and the number and causes of mortality. There is a website for this project it is www.pacificwalrus.ru.

Vladilen Kavriy and Fedor Tymnetagin, Walrus Haulout Keepers

Our objectives as haulout keepers and polar bear patrollers are to conserve nature, show people how to live with polar bears, manage walrus haulouts, and help local people participate in science projects. This work started in Vankarem. We have the same marine mammals you have in Alaska. We have walruses, seals, bowhead whales, gray whales, and polar bears. Our villages have names that mean something. Vankarem means "people who live on the land shaped like a walrus tusk". There are about 200 people living in Vankarem today, but people have lived there for 1,500 years. In 1996 there was an economic crisis in our region. We had no bullets, fuel, or motors for our boats so all we could do was watch the walruses swim by. We remembered the past when walruses used to haul out near our villages. So we decided to create a quiet zone where the haulout used to be. We tied up the dogs and kept the people away. And the walruses hauled out near our village in 1996 and have every year since then, sometimes in numbers >30,000 at a time. We had to set up rules to visit the haul out so that the walruses would not be disturbed and stampede.

Polar bears also came and were scaring the walruses on the haulouts. At first we tried to keep the polar bears off of the haulouts. But when we chased them off the beach they came into our village so we gave up and let nature take its course. When the polar bears and other things scare the walruses and there are mortalities, we gather up the carcasses. If they are fresh sometimes people eat them or feed them to their dogs.

People still needed to harvest walruses for food but, in order to minimize disturbances on the haulouts we decided to hunt our traditional way with spears instead of rifles. We appointed a steward of the haulout and re-initiated a spear hunt which was also the tradition. The hunters must have the steward's approval before a spear hunt can begin. Once a hunt is approved the hunters conduct a ritual to feed the spirits. This ritual occurs the evening or morning before the hunt.

We use two methods to conduct the spear hunt depending upon the terrain of the haulout. If the shoreline is complex and only a few walruses are visible, we walk slowly with our long spears. Once a walrus is speared the other walruses do not panic or go very far away. We use another method when the haulout area is flat and walruses can see us from a long way. In this situation, we walk very slowly and stop frequently. The walruses get used to us. When we get close enough we spear one and then back away. The walrus dies quickly (2–5 seconds). Later we go and get it.

In October 2006, the people in Vankarem formed a nature monument of the walrus haulout area for the walruses, polar bears, and the archeological sites. In 2007, after a vote of the people it was approved by the government.

Polar bears arrive in the late fall, attracted by the walrus carcasses, and some bears stay all winter. The bears migrate in from the northwest and migrate past the villages. In 2006, a girl was killed and we decided to start a polar bear patrol to protect the people. In 2007, we moved walrus carcasses to feeding spots for polar bears. The feeding spots were located away from the village so that polar bears could feed in a place safe for polar bears and for villagers. This worked well, and 90% of the bears (~200 bears) used the feeding spots and stayed out of our village and the villages nearby. The Umky Patrol does other things too. We talk to school classes about polar bear safety. We put up street lights near the school, and we remove some bears that come into the village.

Ryrkaipiy is another village where we have a walrus haulout and a polar bear patrol. Ryrkaipiy means "the land that sticks out into the ocean and blocks the walrus migration". There is a beach nearby where walruses used to haul out. An elder in the village, Grandfather Apo, said to go and get some rocks from Vankarem where the walruses are hauling out and bring them here. That same year Grandfather Apo died but the walruses hauled out for the first time and have come for three years in a row. Grandfather Apo may have given us too good a recipe for walruses because sometimes there are 70,000 to 80,000 walruses on the beach and any disturbance can cause many deaths. The walruses hauled out close to two villages of 1,700 people and the people want to come close and watch the walruses. We had to make rules for visiting the haulout so that people could watch the walruses without disturbing them. So visitors go with a haulout steward in groups of four. We do not allow activities that are loud, smell strongly, or show bright colors.

So, there is no drinking, smoking, perfume, or bright colored clothing allowed. No airplanes, helicopters, or dogs are allowed near the haulout. People approach the haulout from downwind. We kept track of the number of walruses hauled out each year and the number of deaths. Small walruses are most susceptible and 80–90% of the deaths are young 0–1 year old walruses. When walruses hauled out on ice the mortality was very low, but now with large haulouts on shore we need to help reduce disturbances. We clean up the beaches after the walruses leave to control the polar bears and reduce diseases.

Sergei Kavriy, Polar Bear Den Monitor
The World Wildlife Fund and Marine Mammal Hunters work together to collect traditional knowledge, identify concentrated denning areas, and let people know about the results. We started in 2007 and surveyed 60 km west of Vankarem. We also worked 150 km of coastline around Kolychin Island. We start our den survey with the first thaw in spring. If we find a den and it is empty we look at tracks to see how many cubs there were. We also look at the tracks of the female to see how healthy she was. If her tracks are wide and deep we say she is healthy. If they are narrow and shallow she is probably skinny. We record the den location using GPS. In 2008, we found 15 dens that produced 20 cubs. In 2009, we surveyed 300 km of coast. During the first year of den surveys we left seals near the dens for the bears to eat. But we worried that the seals would attract male polar bears that eat cubs so we did not do this again. In 2009 although we surveyed more area we found only three dens. We are not sure why. A storm may have covered up the dens before we found them or the bears may have denned on the ice near shore or farther west then our survey area.

Our work demonstrates how important it is for native people to work with scientists. Combining science with traditional knowledge has helped us learn more about polar bears. Scientists can teach us how to use new technologies. We would like to collaborate with native people in Alaska to study the polar bear population that we share.

Community Dialog:

Below are transcribed notes from community meetings in Point Hope, Point Lay, Wainwright and Barrow Alaska.

Point Hope

Q. What about human waste? Where does it go?
A. There are no sewage facilities in the villages.

Comment. Things have changed because there used to be more walruses in Alaska than Russia, but now there are more in Russia than Alaska. We can't live without walruses. We should make a partnership with the Russians so we can have Eskimo food.

Q. Are biologists from both sides working on those (Russian) haulouts?
A. Not yet, but we are starting to. US biologists have helped with satellite tagging and logistics.

Q. Are bears and walruses still being counted at Wrangel Island?
A. Wrangel Island is a park and they do get counted but the information is not available yet. After 2000 fewer walruses hauled out at Wrangel Island.

Q. What do you do with the tusks?
A. The tusks get sold in the village of Uelen where there are carvers and some of the money comes back to the village with the haulout.

Q. Is there a limit on the number of walruses you can hunt per year?
A. Yes, each village has a different quota that depends on the population of the village. The number is higher than we usually get. Vankarem quota is 50 per year and so is Ryrkaipiy.

Q. What time of year do walruses haul out?
A. September and October. In June and July they haul out on the ice and we hunt them there.

Q. Do you have carvers?
A. Yes. There is one village (Uelen) that has carvers and sells the ivory.

Q. How do the animals taste now compared to the past?
A. All taste the same, except for gray whales which taste like medicine.

Q. How about for you in Pt. Hope?
A. We hear from Kivalina that their fish tastes different.

Q. How many hunters are in your village?
A. In Vankarem there are seven. In Ryrkaipiy there are six.

Q. How are the quotas set?
A. The villages request a harvest level based on traditional use levels, size of the community, and other factors. The scientists come up with a recommendation based on the community requests and the walrus population estimate. The harvest number leaves enough so the population can grow. The suggested number is sent to Moscow for government approval. The government then tells the region how many walruses they can hunt. The villages decide how to distribute the quota.

Q. What happens when people violate the rules of the haulout?
A. They get a warning or a fine depending on the severity of the violation. The fine is related to the number of walruses that are killed in the stampede that is caused.

Q. I notice that you are speaking Russian. Do any villages speak native languages as a first language?
A. Vankarem is small and our school has only three grades. After that our children go to boarding schools where they speak Russian. We are losing our native language. Our inland reindeer communities are doing better at keeping their language.

Q. Do you have stores and eat white man food?
A. Yes, we have stores for food and other goods, but we mostly eat fish, seal, walrus, berries, and whale.

Q. Do you hunt whales?
A. Yes we get 135 gray and 5 bowhead/year for all of Chukotka. Lorino, a town of 3,500 people, harvest 60-70 gray whales/year.

Q. What kind of boats do you use for whaling?
A. We use skin and wood boats.

Q. Is your native language similar to Siberian Yupik?
A. Coastal people speak Chukchi with different dialects, but Chukchi is not related to Siberian Yupik.

Q. How do you celebrate a whale harvest and Christmas?
A. Vankarem only recently started hunting whales. There used to be too much ice. Before we hunt we pray to our spirits and after a hunt we give thanks to our spirits. We give the tastiest part of the whale, the tail, to the sea and have a big party. We do not celebrate Christmas, our main celebration is New Years; sometimes we have fireworks.

Q. I have a question for Pt. Hope. Do you have projects like ours? Polar bear patrols? Haulout monitoring?
A. On the North Slope we do polar bear patrols as needed. These have been funded by the North Slope Borough, and the US Fish and Wildlife Service. We use a vehicle and 12-ga shotguns with cracker shells to deter bears and have a patrol during the week, before and after school. We need authorization from USFWS to scare bears but if hunters want to kill them (for subsistence) we don't need permission.

Q. Another question for Pt. Hope. Do you hunt at land haulouts?
A. No, we hunt walruses on the ice or in the water.

Q. Is seismic testing a problem for you (In Russia)?
A. We don't have it and don't know its effects.

Q. We didn't have any tom cod this year. Do you know what they are?
A. Yes, there was lots of tom cod last year, more than usual. It even washed ashore.

Q. What activities prevent walruses from coming ashore?
A. Vehicles are not allowed on the beach for 2 months (while walrus are there). Airplanes and helicopters are not allowed to fly over the haulouts and barges agree not to use fog horns near haulouts.

Q. People here have floated away on the ice. Do you know of anyone who has come there on the ice from here?
A. No, I know of one person that went from Vankarem to Wrangel Island.

Q. Is the large number of walruses on the haulouts new or has is always been this way?
A. We have always had haulouts but they were short term (a few weeks) and fewer animals when ice was present. But now there are more animals and they stay longer.
Comment. So this is something we should be thinking about for the future on the Alaska side.

Comment. A reporter announced that she was looking for stories, pictures, and video for a website where native people tell their own stories.

Sergei responded. I understand that what you are asking for is not the same as filmmakers but they put video out that makes us look like bloody savages. We believe that if we take care of nature, nature will take care of us.

Point Lay

Q. Were the deaths from the polar bears because there were no rifles in the village?
A. No, there were just too many bears and dumpsters near the houses and school.

Comment. We had a similar incident here in 1994. Polar bears can surprise you.

Q. Was the bear skinny?
A. It was hungry but not starving.

Q. What month was it?
A. January.

Q. When this happens here we check the bear to see if anything is wrong with it. Did you check?
A. It was handled by police so we did not get that information. It would be better to do what you do. In 1993 there were three attacks on people in Chukotka. All of the bears involved were in good shape. One bear was a male, one a female, and the other was a 2 yr old cub.

Q. What year were polar bears considered endangered in Russia?
A. 1956. This was a mistake because it made all hunting of bears illegal and people poached and there was no reporting.

Q. Do you see any bears inland in summer?
A. A few.

Comment. It was predicted by Wainwright elders that there would be less ice and now the time has come.

Comment. We have had haulouts for the last few years near the old village (located on a barrier island near the present village of Point Lay). Airplanes have caused disturbances.

Q. Do you look in their stomachs when you cut them open (referring to walruses)?
A. They are usually young ones and we don't eat their stomachs so we don't look. Often they have been on the beach and not eaten for awhile, the stomachs are empty.

Q. How many walrus do you harvest per year? Is that up to the steward?
A. Quota is 50/yr for Vankarem.

Q. What months do you hunt?
A. September and October on haulout also on ice in summer.

Q. During the spear hunt have any walruses tried to attack you.
A. They will try to catch you with their tusks but they don't charge at us.

Q. For Pt. Lay: Do you hunt at haulouts?
A. We hunt on the ice and only if we don't get any do we hunt on land.

Comment. In Alaska we don't hunt for ourselves, we hunt for our community and the elders come first.

Q. Are your ice cellars in the ground like here?
A. Yes, we use ice cellars dug into the ground and we have two modern freezers.

Q. In the fall before the ice comes do you get brown bears together with polar bears?
A. At the feeding spots, brown bears go to one and polar bears go to different one that is close to shore. Polar bears feed during the day and brown bears at night. We do not see them together.

Comment. We work on teaching people what to do around bears. Someone from the audience said give them Coca Cola (referring to the television commercials where Coca Cola makes bears happy). Yes, Coca Cola funds our patrol.

Q. What do you do with the ivory?
A. We remove it and send it to Uelen, a village with an art studio that sells the carvings. The money is distributed among the villages.

Q. Are you paid for the polar bear patrol?
A. Yes.

Q. How? Money or something else?
A. We get paid slightly lower than a normal salary, but we also get equipment like satellite phone, GPS and snow machines.

Q. How do you say Grandpa?
A. We say Apa.

Q. Why did so many (~70,000-80,000) walruses show up in 2007?
A. Because the ice receded very far north and there were heavy storms.

Q. Have you seen any satellite tags on any walruses? The Eskimo Walrus Commission tags some and a few went there.

A. Not at Ryrkaipiy but Anatoly had a tagged walrus resting in his boat. It was a walrus tagged near Pt. Lay. It was your walrus (applause). The walrus sunk its tusks into my boat. He asked that Alaskans teach their walruses better manners. Vladilen said he thinks that Anatoly is hinting to EWC for compensation for his boat. Pt. Lay said no, ADF&G should compensate him for his boat. Lori Quakenbush joked that she was sorry but she did not hear any of that conversation.

Q. How many families use an ice cellar?
A. One.

Q. Question for Point Lay: Do you do any monitoring in your village related to climate change?
A. The temperatures in our ice cellars are monitored. We see warming from erosion, dips in the land that we never used to see. We tell people who ask and tell the North Slope Borough in Barrow.

Q. Have you seen any collared bears?
A. No but elders have seen bears with collars.

Q. Do you use dogs when you look for dens?
A. No. Anatoly used dogs on Wrangel Island until a dog killed a cub, then they stopped using them. Joel Garlich-Miller said that trained dogs are used in Alaska to find dens and also Forward looking Infra-red (FLIR) technology from airplanes.

Q. Do you involve students in your study?
A. No, because they are going to school then. Our older kids go to another village to study.

Q. A question for Joel. What is the status of polar bears?
A. They are listed as threatened under the Endangered Species Act. There is no change in their use for subsistence. Now critical habitat is being determined.

Q. Do you have a website?
A. Yes, www.pacificwalrus.ru and www.belyemedved.ru

Q. What will happen to the ice during the next 200 years?
A. There are different theories. Walrus may become a coastal species like sea lions.

Q. Can we do an exchange? We can go there and they can come here.
A. Alaska could learn to use a spear for hunting and tagging.

Q. Spectacled eiders are threatened here. What is there status there?
A. Some studies are done in Russia sponsored by the U.S., but none of the Russians knew the status of eiders because they are not ornithologists.

Wainwright

Q. What was the population of polar bears in 1975 and in 2005?
A. I don't know but there are fewer now than in 1975.

Q. Who funds the programs?
A. All of these projects are funded by WWF, Pacific Environment, and TINRO in Chukotka.

Q. Do you look inland for polar bear dens? Here polar bears den up inland.
A. We mostly look along the coast, because it is more likely and we have so much area to survey.

Q. Do you radio-collar bears to keep track of them?
A. No.

Barrow

Q. There is a higher mortality level on the Russian side than the Alaska side.
A. You are right. It is because of the larger haulouts in Russia. There have been some large trampling events in Alaska, such as on St. Lawrence Island in the '50s and '70s.

Q. Have you tried tagging polar bears to see where they go? Do they come to Alaska?
A. No, we have not tagged in Chukotka. Bears have been tagged on Wrangel Island and in Alaska.

Q. What year did population counts begin?
A. The first surveys were done in the 1930s and then from time to time until the 1980s when regular counts began.

Q. Do you know of any that den far inland on the Russian side? We had one bear that went way inland in Alaska.

A. Some bears in the Gulf of Anadyr in spring will cross the Chukotka Peninsula across the land instead of following the coast.

Q. Do walrus and polar bear go farther west than what you show?
A. We do not know of any large haulouts farther west than Ryrkarpiy. We talk to hunters so we would hear of any if they develop.

Q. Do you have a website with information that our region could see? Do you have anything from the 1930s?
A. . Yes, www.pacificwalrus.ru and www.belyemedved.ru. We don't have anything from the 1930s but USFWS might.

Q. You mentioned illness and infections of walrus. If we run across sick walrus should we take it home? Should we be worried about eating it?

A. We have not done those studies, so we don't know about diseases, but I don't think they are dangerous to humans. Our hunters look for healthier ones, but may feed the sick ones to dogs. In 2007 we took some samples but did not find any diseases harmful to humans.

Q. Could a sick walrus pass disease to other walrus or to humans?
A. It is possible, but we have not seen it. Some infections might be passes on to other walruses on a crowded beach.

Q. Do you monitor all year or only part of the year?
A. We monitor 3-4 months when walruses are on the haulouts.

Comment. It is alarming what is happening in Russia. Walrus and polar bears are two species of a renewable resource that sustains Inupiat people. We are seeing changes in the ice. As a marine mammal hunter we should advocate protection. That is my request as an individual.

Response. In Russia, we are working with the government to protect haulouts. Other species are important too, but walruses and polar bears are experiencing the greatest impacts currently.

Q. What about hunting? Are you being asked not to hunt?
A. No, we hunt on haulouts, on the ice, and in the water.

Q. The village of Novo Chaplino was moved to a different location. Does the new location make it harder to get to walrus hunting areas?
A. It is harder to get there but all of the coastal villages hunt walrus.

Q. Do they have to travel by boat?
A. Yes, there are no haulouts at Novo Chaplino so they use boats. Even villages that can hunt at haulouts use boats and hunt on the ice in the spring.

Comment. I am worried about large number of carcasses and diseases that might transmit to villages. We don't know when they will stop hauling out in large numbers. It may happen for some time.
Response. We take the carcasses away from the village to keep the bears away and it should help with diseases too. In some years there are so many carcasses the bears don't eat them all and they are still in the tundra 3 years later.

Comment. Thank you for your presentation. Sustainable populations are important especially for the populations that we share. I am sure there will be cooperative projects for walruses and bears as there are for whales. It is hard to express the emotions that I am feeling.

Q. What do the people in the villages think of your work?
A. Making the Nature Monument was not well received at first. People were concerned that they would lose local rights. We had to explain many times that they would not lose the right to hunt. Most of the regulations were on restricting the disturbances like airplanes and activities from outside the village. Military airplanes caused a large trampling event. It is important to work

together with the government and others. Now we have agreements and the people want to take care of the haulouts.

Q. We often wonder what is going on across the Chukchi Sea. Thank you for your presentations. Are hunters paid? How is funding handled? Who owns the information you collect? Are reports made make to you?
A. We get support from the government, a little less than a regular salary. The salary is small and we rely mostly on subsistence. The projects are supported by WWF, US, and Russia. We get computers and snow machines and other equipment. We would not be able to do this work by dog team or on our old Russian snow machines. We suggest and discuss how to do things in the community. The initiative for the projects came from the villages. We work closely with the scientists and get advice from them. We share the information with biologists and the communities. The information is important for everyone and we share it.

Q. Are communities Russian government or tourist or are they native villages.
A. Villages in Chukotka have several layers of government.

Q. How does the Russian government treat its First Nation people?
A. At first I talked about polar bears as a sacred animal but people thought I meant like sacred cows in India, but they are not because we hunt them. We discuss with other communities our needs for each species. The government understands our need and rights to harvest. We help prepare the information to make the decisions.

Comment. The NSB and the Native Village of Barrow are going to meet with the Russian group to share how Alaska does polar bear patrols. In Alaska, we need to get authorization from USFWS to chase bears away and we need to report those activities.

Q. We helped a lot with science through the years but don't have the records. We should have kept the information; we don't know where it is. It could be at universities in the U.S. or China. Do you have an archive?
A. Data collected by marine mammal hunters is shared. One copy goes to scientists one copy goes to hunters. We don't have an established way to exchange information. We want to work on that.

Comment. I appreciate your presentations. To my knowledge I have never seen this kind of exchange. We should put together our information and take it to you in Russia.

Comment. WWF collects a lot of money in their fund-raising. They should pay you more.

Comment. We are worried about what the oil and gas industry is planning. They will be working hard in our Chukchi Sea. You many have some of this too. We had a trampling here too so it is happening on both sides. Industry makes lots of noise that can make walrus panic. We need to think about this carefully.

Comment. We respect WWF but don't take our hunting away. Please continue to show respect for our way of life now and in the future.

Comment. I commend you on your identity. You have your language, diet, and identity. We are losing our language. Keep your language and identity.

Post-Trip Activities

Following their "Arctic tour", Sergey Kavriy, Vladilen Kavriy and Anatoly Kochnev (Fedor Tymnetagin returned to his home in Chukotka following the Alaska village visits) spent three weeks in Anchorage, where they accomplished additional goals of their visit. In discussions with biologists from the U.S. Fish and Wildlife Service and WWF-Alaska, they shared their experience and received feedback on their polar bear and walrus haul-out monitoring and management projects. The Chukotkan delegation also participated in the Annual meeting of Alaska's Eskimo Walrus Commission, met with representatives from the Barrow and Kaktovik polar bear patrols, and participated in the Alaska Forum on the Environment's session on resource management and spatial planning using traditional knowledge. The group also participated in the first scientific working group meeting of the U.S.-Russia Bilateral Polar Bear Treaty, which occurred March 1-5, 2010, and during which concrete strategies for monitoring and managing the Chukotka-Alaska polar bear population were discussed by Russian and U.S. experts.

For additional copies of this report, contact:

Joel Garlich-Miller
USFWS, Marine Mammals Management
1011 East Tudor Road
Anchorage, Alaska 99503
(907) 786-3820
Joel_garlichmiller@fws.gov

Appendix F. Project abstracts, presentations, and reports listed chronologically.

Appendix F-1. Project update to EWC for December 2010 meeting.

Village-based Walrus Studies in the Chukchi Sea

Report to Eskimo Walrus Commission, 9 December 2010

In early September we received reports from USFWS that walruses were hauled out on beaches near Pt. Lay and Corwin Bluffs, Alaska. We contacted Willard Neakok, the Eskimo Walrus Commissioner for Point Lay, who put together a crew to survey the beaches near Pt. Lay that were accessible without disturbing live walruses. The crew estimated 18 carcasses were visible and seven were accessible without disturbing the haulout. We prepared carcass survey datasheets, a camera, measuring tapes, and a GPS unit. Anna Bryan went to Pt. Lay to pass along the equipment, explain the datasheet, and answer any questions. Neakok's crew accompanied by Bryan examined and measured seven carcasses. All seven were calves of the year that showed signs of being crushed; most likely by larger walruses. In addition to examining carcasses, the crew also recorded GPS locations for the north and south ends of the haulout and recorded the most recent haulout location boundaries. Neakok and his crew also traveled to Icy Cape on 24 September and reported that they did not see any walrus carcasses or live walruses on the beaches between Pt. Lay and Icy Cape, except for those still hauled out near the original location.

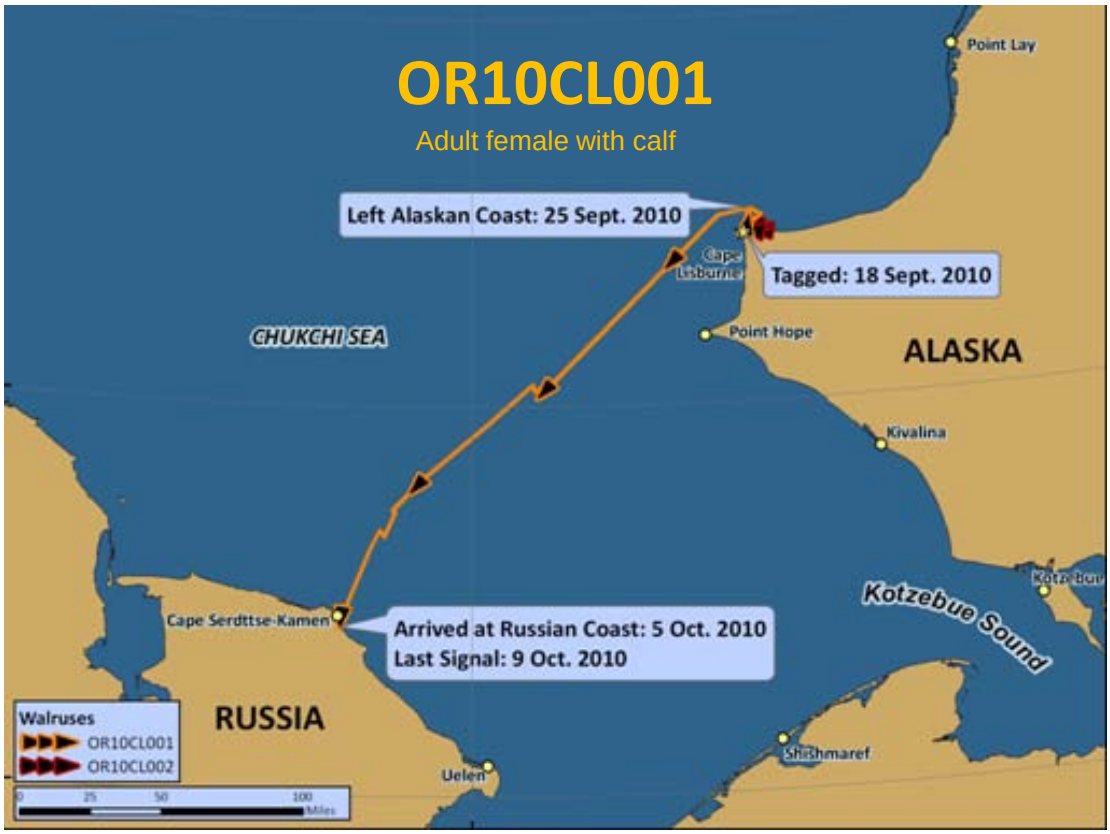
We coordinated with USFWS, USGS, Alaska SeaLife Center (ASLC), the North Slope Borough (NSB) and Mr. Neakok in order to collect samples from the walrus carcasses and try to examine additional carcasses. The carcasses however were located near or within the active haulout and could not be accessed without disturbing the haulout and risking more calf fatalities. Kasegaluk Lagoon began to

Report submitted by: Lori Quakenbush
Alaska Department of Fish and Game, Arctic Marine Mammal Program

freeze before the haulout dissipated so that boating to the carcasses was no longer an option. The NSB was willing to provide helicopter services to take personnel, including a veterinarian from the ASLC, to the carcasses. On 26 September, a storm caused waves to cover the haulout beach which drove the live walruses off the beach and washed the carcasses off the beach. Plans to examine carcasses were put on hold until an area with a concentration of carcasses could be identified.

We worked with USGS to map the footprint of the haulout as accurately as possible in order to try to estimate the number of walruses that hauled out. Dr. Dan Monson (USGS) sent us composite photographs of the haulout taken by the COMIDA survey on 6 September and Dr. John Citta (ADF&G) worked with the photographs, ArcGIS, Google Earth and GPS locations from people on the ground to create a shapefile from which to calculate area covered. Using all of these tools the estimated area covered 48,822 m^2. The width of the beach was the most difficult to estimate and may have the largest effect on the accuracy of the estimated area. Although there is no significant tide in this area the direction and speed of the wind can narrow or widen the beach significantly.

Justin Crawford and Mark Nelson (ADF&G) went to Cape Lisburne to see if they could access small haulouts there to deploy satellite tags without disturbance. Two satellite transmitters were deployed near Cape Lisburne; one on 17 and one on 19 September. Both tags were deployed on adult females 10-15 years of age, one of which was accompanied by a calf of the year; the other female was alone. The tag on the female with the calf worked well and showed that the pair hauled out several times near Cape Lisburne prior to going to sea and hauling out on the Russian coast near Cape Serdse Kamen on 6 October. The other tag appeared to deploy fine and was positioned well on the body, however it transmitted for only 2 days after deployment.



Report submitted by: Lori Quakenbush
Alaska Department of Fish and Game, Arctic Marine Mammal Program

Appendix F-2. Quakenbush, L., W. Neakok, J. Crawford, A. Bryan, and M. Nelson. 2011. Results from village-based walrus studies in Alaska, 2010. Alaska Marine Science Symposium, 17–21 January, Anchorage, AK. (Abstract and poster).

Results from Village-Based Walrus Studies in Alaska, 2010

Lori Quakenbush[1], Willard Neakok[2], Justin Crawford[1], Anna Bryan[1], and Mark Nelson[1]
[1]Alaska Department of Fish and Game, Fairbanks, AK, Lori.Quakenbush@alaska.gov
[2]Eskimo Walrus Commission and resident of Point Lay, AK

Walruses (*Odobenus rosmarus divergens*) winter in the Bering Sea, but females with young summer in the Chukchi Sea resting on sea ice; most adult males remain in the Bering Sea where they rest on land. The rapid retreat of sea ice is changing walrus summer habitat in the Chukchi Sea and may be changing summer distribution and haulout behavior, requiring that walruses haul out on land instead of ice. Oil and gas activity has increased, elevating the importance of understanding walrus movements, feeding behavior, and habitat requirements necessary to develop effective mitigation measures for conservation. In Alaska, some terrestrial haulouts are likely to be accessible from coastal communities. The purpose of this study is to work with subsistence walrus hunters to conduct observations, deploy satellite-linked tags to monitor movements and feeding behavior, and collect traditional and local knowledge on walruses in the Chukchi Sea. In September of 2010, a large haulout (10–20,000 walruses) formed near the village of Pt. Lay. Large haulouts are susceptible to stampedes, which cause calf mortality. Local walrus hunters documented the number and condition of carcasses accessible near the haulout, monitored the status of the haulout, and travelled the coast looking for other haulouts and carcasses. In addition, two tags were deployed on adult females near Cape Lisburne. One tag lasted a few days, but the other transmitted for 26 days, tracking a nine day crossing of the Chukchi Sea followed by a haul out period near Cape Serdse Kamen on the Chukotka Peninsula.

Alaska Marine Science Symposium, 18–22 January 2011, Anchorage AK

Results from Village-based Walrus Studies in Alaska, 2010

Lori Quakenbush[1], Willard Neakok[2], Justin Crawford[1], Anna Bryan[1], and Mark Nelson[1]

[1]Alaska Department of Fish and Game, Fairbanks AK, Lori.Quakenbush@alaska.gov
[2]Eskimo Walrus Commission and resident of Point Lay

Introduction. Walruses (*Odobenus rosmarus*) winter together in the Bering Sea, and most adult males remain there where they rest on land. Females with young spend the summer in the Chukchi Sea using sea ice for resting. The rapid retreat of sea ice in summer is changing walrus habitat in the Chukchi Sea, which may require walruses to haul out on land instead of ice, causing changes in summer distribution and haulout behavior. Terrestrial haulouts along the Alaska coast are expected to occur more often, but their locations are not predictable. It is likely, however, that some terrestrial haulouts will be accessible from coastal communities (Fig. 1). If large haulouts are disturbed they are susceptible to stampedes, which cause calf mortality.

The purpose of this project is to prepare subsistence walrus hunters to be the first responders to terrestrial haulouts by minimizing disturbances, conducting observations, and deploying satellite-linked tags to monitor movements and feeding behavior.

Methods. Local walrus hunters examine and document walrus carcasses (e.g., record length, age, sex, blubber thickness, and take photographs) (Fig. 2). They also monitor the status of haulouts, and deploy satellite-linked transmitters.

Figure 2. Willard Neakok (on left) and crew examining a dead walrus calf.

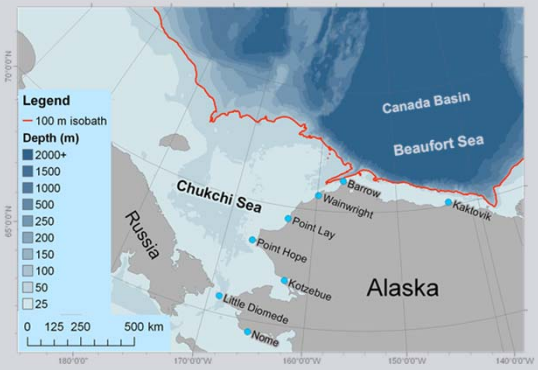


Figure 1. Locations of Alaskan communities along the Chukchi Sea coast near walrus summer habitat.

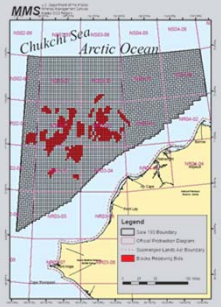


Figure 3. Chukchi Sea Lease Sale Area.

As summer sea ice has decreased in the Chukchi Sea, oil and gas activity has increased, elevating the importance of understanding walrus movements, feeding behavior, and habitat requirements.

Figure 4. Adult walrus tagged near Cape Lisburne.

Future Activities. We plan to continue preparing local teams to respond to future haulouts. We will also visit villages this winter to document hunters' experiences with walruses on terrestrial haulouts in the past, and we will identify hunters interested in participating in Village-Based Walrus Studies.

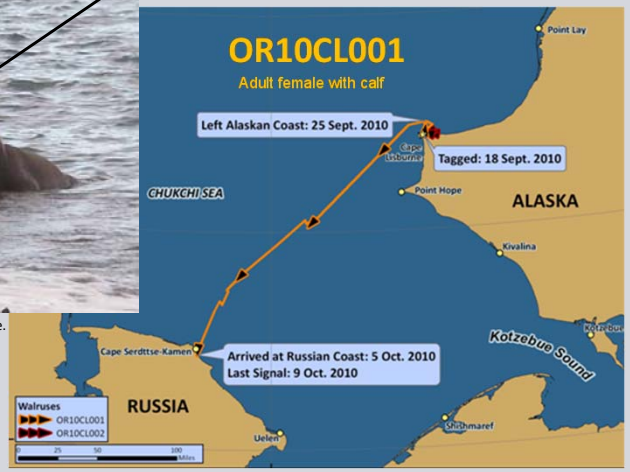


Figure 5. Track of satellite-linked tagged walrus across the Chukchi Sea.

Acknowledgements. This project was ***funded by the Minerals Management Service*** (now the ***Bureau of Ocean Energy Management Regulation and Enforcement***). We appreciate the support and assistance of the Eskimo Walrus Commission, the U.S. Geological Survey, and the U.S. Fish and Wildlife Service (USFWS). Research on walruses was conducted under permit # MA220876-0 issued to the Alaska Department of Fish and Game (ADF&G) by USFWS and under an approved ADF&G Animal Care and Use Committee Protocol #2010-13R.

Results. In September of 2010, a large haulout (25–35,000 walruses) formed near the village of Pt. Lay. Local walrus hunters documented the condition of seven (4 female and 3 male) carcasses accessible near the haulout and reported an additional 11 that could not be reached without disturbance to the herd. All of the carcasses were calves and all showed signs of trauma due to trampling. One of the calves was skinny. The local crew also monitored the status of the haulout, and travelled the coast looking for other haulouts and carcasses but did not find any. A storm caused the live walruses to leave the beach and washed away the unexamined carcasses; therefore no estimate of total mortality was possible.

Two satellite-linked transmitters were deployed on adult walruses near Cape Lisburne. One tag lasted only a few days, but the other transmitted for 26 days, documenting a nine day crossing of the Chukchi Sea followed by a haul out period near Cape Serdtse Kamen on the Chukotka Peninsula.

Appendix F-3. 2011 Haulout Report for Pt. Lay.

Field Report:

Walrus Carcass Survey, Point Lay Alaska

September 11-15, 2011

By:

Joel Garlich-Miller, US Fish and Wildlife Service, Marine Mammals Management

Willard Neakok, Eskimo Walrus Commission, Native Village of Point Lay

Raphaela Stimmelmayr, North Slope Borough, Department of Wildlife Management

Photo credit: Justin Crawford, ADFG

BACKGROUND

Pacific walruses (*Odobenus rosmarus divergens*) range across the shallow continental shelf waters of the Bering and Chukchi Seas. Broken pack ice has traditionally served as a platform for accessing offshore feeding areas. Over the past decade, sea ice in the Chukchi Sea has begun to retreat north beyond shallow continental shelf waters in late summer and walruses have begun to utilize coastal areas (termed haulouts, or haulout sites) as a base for resting and foraging. Large aggregations of walruses have formed along the Arctic coast of Alaska in 4 of the past 5 years. Projections of future sea-ice conditions in the Chukchi Sea generated from global circulation models suggest that the observed trend of declining sea ice cover in the Chukchi Sea will likely persist, and perhaps accelerate in the future (Douglas 2010).

As sea ice cover in the Chukchi Sea declines, human activity in the region is expanding. Offshore oil and gas exploration, marine transportation, and aircraft traffic along the coast have all increased significantly in recent years. Walruses occupying coastal haulout sites are highly sensitive to disturbances. Disturbance events at crowded haulouts caused by interactions with terrestrial predators or exposure to human activities along the coast can displace animals from the haulouts and cause trampling related injuries and mortalities. Walrus calves and yearlings are particularly vulnerable to trampling deaths and high rates of calf mortality have been reported at coastal haulout sites in Alaska and Chukotka in recent years (Fischbach *et. al.* 2009; Ovsyanikov *et al.* 2007; Kochnev 2008; WWF 2010).

Climate warming also appears to be changing the distribution of some diseases and creating new disease vectors in the Arctic (Harvell *et al.* 1999) which could result in the exposure of walruses to new pathogens. Increased numbers of animals occupying crowded haulout sites may also increase the risk of disease transmission in the population (Fay 1974). The number of sick or diseased animals observed at coastal walrus haulouts in Chukotka Russia has increased in recent years (Anatoly Kochnev, Chukotka TINRO, *pers. comm.*). Although little is known about rates and incidences of diseases at coastal walrus haulouts in Alaska, in August 2011 several walrus carcasses and a few live animals with unusual multi-focal ulcerated skin lesions of unknown origin were reported at a walrus haulout near the community of Point Lay, Alaska (Anthony Fischbach USGS, *pers. comm.*). The reported symptoms observed at the walrus haulout site were similar to those described for a number of morbid ringed seals (*Phoca hispida*) reported in the same region in July and August, 2011. It is unknown whether the symptoms observed in these two species have a common etiology (http://alaskafisheries.noaa.gov/protectedresources/seals/ice/diseased/).

Information regarding the magnitude and sources of morbidity and mortality at coastal haulouts is needed to make informed management decisions for this species. Here we report the results of a carcass survey carried out in September, 2011 at a walrus haulout site near the community of Point Lay, Alaska. Our objectives were to enumerate the number of mortalities, gather information on the age, sex and body condition of dead animals, and investigate potential sources of mortality. We also collected samples from a subset of the carcasses at the haulout for disease screening.

Study Area

In the summer of 2011, a large walrus haulout formed on a Barrier Island approximately four kilometers to the north across Kasegaluk lagoon from the Native village of Point Lay (Figure 1). This site has been seasonally occupied by walrus herds in four of the last five years. The barrier island is quite narrow (approximately 300 meters wide) at the haulout site, with very little vertical relief (3-5 meters maximum elevation). The haulout site is characterized by a gently sloping sand beach transitioning gradually to upland habitats consisting primarily of silt, sand and low-lying gravel ridges covered with sparse vegetation (primarily grasses). Walruses occupying the haulout site typically spread out laterally along beach and inland to grass-covered upland areas (Figure 2).

Figure 1. Map of study site. We surveyed the coastline along a 28.5 km stretch of Barrier Island between Kukpowruk Pass and Akunik Pass near Point Lay on the Chukchi Sea coast. The white symbols on the map indicate the location of observed walrus carcasses.

Figure 2. Aerial photograph of the Point Lay walrus haulout (August 17, 2011). Photo courtesy of NOAA.

The Kasegaluk lagoon is quite shallow in the vicinity of the haulout site (1-3 meters) and water depth in the lagoon is influenced by tide and wind patterns. Shallow water conditions in the lagoon intermittently restrict boat traffic between the community and haulout site. A relatively deep-water channel running along the shoreline of the barrier island is the primary travel corridor for boats within the lagoon.

2011 Haulout use patterns

Walruses were first reported at the Point Lay haulout site by local observers from the community of Point Lay in the first week of August. A National Marine Fisheries Service aerial survey crew photographed the site on August 17th and estimated haulout abundance at 8,000 animals (http://www.afsc.noaa.gov/NMML/cetacean/bwasp/flights_COMIDA.php; Figure 2). The haulout site was occupied through the month of September, peaking at approximately 20,000 animals in mid September (Table 1). The number of animals using the haulout site dropped off significantly in early October and the haulout was abandoned by the end of the month.

Table I. Abundance estimates at the Point Lay walrus haulout in the summer of 2011

Date	Abundance estimate	Source
July, 2011	0	Willard Neakok, personal observation
04 August 2011	Many swimming near shore	Bill Tracey Sr. Pt. Lay. *pers. comm*.
06 August 2011	0	COMIDA – Flight 228*
08 August 2011	0	COMIDA – Flight 230*
10 August 2011	Small numbers on shore	Julius Rexford, Pt. Lay. *pers. comm.*
14 August 2011	Small numbers on shore	Bill Tracey Sr. Pt. Lay. *pers. comm.*
17 August 2011	8,000	COMIDA – Flight 234*
19 August 2011	10,000	COMIDA – Flight 235*
24 August 2011	10,500	COMIDA – Flight 237*
26 August 2011	20,000	COMIDA – Flight 238*
27 August 2011	~20,000	Daniel Monson, USGS. *pers. comm.*
05 September 2011	5,000	COMIDA – Flight 243*
11 September 2011	800-1,000	This study
12 September 2011	3,000 -5,000	This study
13 September 2011	15,000-20,000	This study
14 September 2011	18,000	COMIDA – Flight 250*
23 September 2011	12,000	COMIDA – Flight 253*
25 September 2011	8,000	COMIDA – Flight 255*
30 September 2011	13,000	COMIDA – Flight 258*
02 October 2011	~1,000 on shore, 500 in water	Bill Tracey Sr. Pt. Lay. *pers. comm.*
06 October 2011	1,000	COMIDA – Flight 263*
17 October 2011	0	COMIDA – Flight 265*
18 October 2011	Small numbers on shore	Bill Tracey Sr. Pt. Lay. *pers. comm.*
11 November 2011	None for more than a week	Bill Tracey Sr. Pt. Lay. *pers. comm.*

* http://www.afsc.noaa.gov/NMML/cetacean/bwasp/flights_COMIDA.php

METHODS

We planned our carcass survey effort to coincide with the anticipated tail end of the haulout season to reduce potential interactions with large herds of animals and allow for the examination of carcasses that would otherwise be obscured by living animals in the herd. We surveyed the coastline (both lagoon and ocean sides) along a 28.5 km stretch of Barrier Island between Kukpowruk Pass and Akunik Pass, as well as upland areas adjacent the haulout site for walrus carcasses (Figure 1). Survey effort was carried out primarily on foot; however some exposed stretches of coastline devoid of vegetation or debris were surveyed from a small boat.

Each carcass examined was assigned a unique identification number and outfitted with labeled plastic tag; typically wired through a slit through the front flipper. The location (latitude, longitude) and condition (state of decomposition) of each carcass were recorded on a data sheet. The gender, age class, body condition, standard length (cm), blubber thickness at

sternum (cm), and notes regarding evidence of disease, trauma or injury were recorded when carcass condition allowed.

A number of the carcasses bore unusual skin lesions of unknown origin. We collected ulcer, nasal and rectal swabs and skin samples from four reasonably fresh carcasses with well developed lesions and performed a necropsy on a freshly dead 2 year old animal. We also attempted to assess what proportion of animals in the living herd exhibited the skin lesions by collecting 10 sets of visual observations, each consisting of 30 randomly selected animals from the herd. Each animal was examined closely using binoculars to assess whether they had the characteristic skin lesions or not (Figure 3).

Figure 3. A sub-adult walrus with skin lesions. Point Lay Alaska, September 2011.

RESULTS

A total of 28 walrus carcasses were encountered during our survey of the barrier island (Table 2). Many of the carcasses were found along the high tide mark on the seaward coast, some distance (3-5 km) from the active haulout site. We suspect that many of the carcasses had been repositioned or moved from the haulout site by heavy surf and wave action in the days preceding our survey effort. Seven carcasses found in upland areas near the active haulout site appear to have died in place. One additional carcass was found floating in a small pond on the island. Only one animal (a morbid, unresponsive 2 year old) was found along the lagoon

coastline; this animal was subsequently euthanized by a hunter and necropsied and sampled for disease screening.

The observed carcasses were in various states of decomposition. Two mummified carcasses were judged to have died the previous season. Seven carcasses in an advanced state of decomposition (carcass soft and collapsed; large patched of sloughing or missing skin; strong odor; severe scavenger damage) were likely more than a month old. Twelve moderately decomposed carcasses (bloated; minor scavenging; carcass could still be moved intact) were thought to be 2 or more weeks old. We found six reasonably fresh carcasses (normal appearance; firm blubber and musculature; little or no bloating or scavenger damage; no odor) which were thought to be less than two weeks old, and one morbid animal that died (euthanized) while we were at the site.

Most (19/28; 68 %) of the carcasses were calves or yearling animals. Two (7 %) 2 year old animals and seven (25 %) adult carcasses (6+ years old based on tusk morphology) were also encountered. The documented sex ratio of the carcasses was skewed seventeen females to six males. The bodies of six (21 %) animals were judged to be emaciated (thin blubber layer, visible pelvic bones); nine (32 %) appeared to be normal or robust; the rest of the carcasses could not be evaluated for body condition due to their state of decomposition.

We found no evidence of predation or hunting related mortality. Although carcasses of adult animals were typically missing parts of their skull, in the absence of evidence of gunshot wounds we attributed this condition to postmortem salvage of the ivory tusks by local beachcombers. External evidence of trauma (including bruises; flattened bodies; epistaxis (blood from nose and mouth); prolapsed eyes; one instance of a fractured skull) was apparent in eleven (65 %) of seventeen carcasses (the rest could not be evaluated due to their state of decomposition).

Fourteen of nineteen (74 %) fresh or moderately decomposed carcasses exhibited unusual ulcerative lesions of the skin of unknown etiology (Figure 4). The erosive cutaneous lesions were round to irregular in shape and often coalesced into larger patches of epidermal necrosis and ulceration. The skin lesions had a generalized distribution on the head and trunk of afflicted animals. Lesions were in variable developmental stages from open weeping sores to white apparently resolving lesions. In fresh carcasses and live animals the lesions were often weeping blood. Some lesions appeared to have penetrated deep into the sub dermal layers – however we note that scavenging gulls may have contributed to the size and depth of some of these wounds. Obvious mechanical injuries, wounds or healed scars (which are very common in walruses) were not considered in this assessment category.

We collected ulcer, nasal and rectal swabs and samples of abnormal skin tissue from the four freshest carcasses with well developed lesions and performed a necropsy on a freshly dead 2 year old animal. The necropsied animal had originally been discovered alive in extremely poor health. The animal was unresponsive to vigorous prodding. Its breathing was shallow and labored and it had thick blood tinged mucous running from its nose and mouth. Its skin was covered with open weeping sores. Its body condition was extremely poor (emaciated) (Figure 5).

Table 2. Walrus carcass survey results. Point Lay Alaska, September 2011.

Sample_ID	Carcass condition	Sex	Age class	Body condition	Length (cm)	Signs of Trauma?	Skin lesions?
PLW11-001	Moderate	M	Yearling	Robust	163	U	Y
PLW11-002	Mummified	F	Adult	Unknown	U	U	U
PLW11-003	Moderate	F	Calf	Unknown	146	U	N
PLW11-004	Mummified	U	Adult	Unknown	U	U	U
PLW11-005	Moderate	F	Calf	Robust	123	Y	Y
PLW11-006	Fresh	M	Yearling	Robust	154	Y	Y
PLW11-007	Advanced	F	Adult	Unknown	U	U	U
PLW11-008	Fresh	M	Sub-adult	Robust	215	Y	Y
PLW11-009	Moderate	F	Calf	Emaciated	123	U	Y
PLW11-010	Fresh	F	Adult	Robust	277	Y	Y
PLW11-011	Moderate	M	Yearling	Unknown	147	N	Y
PLW11-012	Fresh	F	Calf	Emaciated	121	N	Y
PLW11-013	Moderate	F	Yearling	Unknown	135	Y	Y
PLW11-014	Fresh	F	Adult	Robust	269	Y	N
PLW11-015	Fresh	M	Calf	Robust	145	Y	Y
PLW11-016	Moderate	F	Calf	Robust	142	Y	Y
PLW11-017	Moderate	U	Calf	Emaciated	130	Y	N
PLW11-018	moderate	F	Yearling	Robust	138	Y	Y
PLW11-019	Advanced	U	Yearling	Unknown	U	U	U
PLW11-020	Moderate	F	Adult	Emaciated	279	Y	N
PLW11-021	Advanced	F	Calf	Unknown	127	N	U
PLW11-022	Advanced	U	Calf	Unknown	U	U	U
PLW11-023	Advanced	F	Yearling	Unknown	140	U	U
PLW11-024	Advanced	F	Calf	Unknown	140	U	U
PLW11-025	Advanced	U	Calf	Unknown	U	U	U
PLW11-026	Moderate	F	Adult	Unknown	U	U	N
PLW11-027	Moderate	F	Calf	Emaciated	U	N	Y
PLW11-028	Fresh	M	Sub-adult	Emaciated	178	N	Y

Figure 4. Examples of skin lesions observed on walrus carcasses at the Point Lay walrus haulout site September 2011.

During dissection of the euthanized animal we found no physical evidence of injury or trauma. The blubber layer was remarkably thin and there was no visible mesenteric fat and/or cardiac fat. Major organs (lung, liver) appeared severely congested, and clear fluid was weeping from the muscle tissues. We observed abnormal tissue in the spleen, liver and lungs. We collected fresh and formalin fixed tissue samples from observed skin lesions and from all major organs for histological and microbiological analysis.

Figure 5. Morbid 2 year old male walrus observed at the haulout site. Photographs (left to right) illustrating poor body condition; bloody mucous from nose and mouth; and representative examples of weeping skin sores which were distributed broadly across the animal's body.

Observations of live walruses occupying the Point Lay haulout site

The walrus herd occupying the haulout site appeared to be composed predominately of adult females and juvenile animals. Adult males (bulls) were rare (estimated at < 1% of the herd). Approximately 10-15% of the adult females observed were accompanied by either a newborn or yearling calf.

We attempted to assess what proportion of animals in the living herd exhibited the characteristic skin lesions observed in the carcasses. We collected 10 sets of visual observations, each consisting of 30 randomly selected animals from the herd. Each animal was examined closely using binoculars to assess whether they had the characteristic skin lesions or not. Overall, 17 of the 300 randomly selected animals (6%) appeared to have the skin condition. Most of the animals (11/17; 65 %) observed with skin lesions were sub-adult animals

(2-6 years old) the other 6 animals were adults (Table 3). In general the animals with skin lesions appeared to be otherwise robust, active and healthy.

Table 3. Prevalence of ulcerative skin lesions amongst walruses occupying the Point Lay walrus haulout site in September 2011.

Age class	Lesions	No-lesions	Percent Lesions
Calf/yearling	0	33	0
Sub-Adult (2-6 yr)	11	74	14.86
Adult (6+ yrs)	6	176	3.41
All age classes	17	283	6.01

DISCUSSION

The number of walrus carcasses encountered during our survey effort (N =28) was likely lower than the true number of mortalities that occurred at the haulout site. When we began our survey effort on September 11th there was heavy pounding surf along the seaward coast of the barrier island and the number of animals occupying the site was relatively low (approximately 800 -1,000 animals). According to local reports, the high surf had driven much of the herd from the haulout site. We speculated the surge action of the waves at the haulout site may have also have swept some of the carcasses away from the haulout site. This is consistent with our observations of several groups of carcasses mixed with woody debris encountered along a surf line at the top of the beach. Although the onshore winds appear to have re-deposited the carcasses in close proximity to the haulout site, it is possible that other carcasses were swept out to sea and not accounted for in our survey.

The number of carcasses encountered during our survey (28) was relatively low compared with the number of animals utilizing the haulout site. After the surf subsided on September 12th, the haulout was quickly re-colonized. On September 13th the herd occupied a 2.6 km stretch of coastline and we estimate that there were a minimum of 15,000 animals present at that time. A NOAA aerial survey crew over flew the haulout on September 14th and provided an independent estimate of 18,000 animals (Table 1). Unless significant numbers of carcasses were washed away from the site by storm surges and wave action, it appears that mortality levels at the haulout site were quite low (< 1%).

Potential factors contributing to the relatively low number of trampling mortalities observed at the Point Lay haulout site include local and regional management efforts to reduce disturbances at the haulout site. Outreach programs and public service announcements have been developed in recent years to raise awareness of the vulnerability of walrus herds to

disturbance events in coastal communities and amongst area pilots flying along the coast. The community of Point Lay has also taken on an active stewardship role of the local haulout site by minimizing activities that could potentially result in disturbance events. The Federal Aviation Administration has worked with resource managers to establish temporary flight restrictions over the haulout site when walruses are present. All of these factors likely help reduce the potential for disturbance events at the haulout site.

The geographic and spatial features of the Point Lay haulout site may also help reduce the potential for crushing injuries or mortalities. The haulout occurs along a long gently sloping sand beach, and animals tend to spread out laterally as the haulout grows. This allows animals to move to, or from, the haulout site in a relatively unobstructed fashion when disturbed. In contrast, at some of the large haulouts in Chukotka, Russia walruses stack many layers deep away from the shoreline. Obstructions at the water line (rocks and boulders) which can impede or slow animal movements into the water can also influence the severity of mortality events during a stampede (Anatoly Kochnev, Chukot TINRO; *pers. comm.*).

Although most of the carcasses examined at the Point Lay site were calves and yearling animals, these age classes were poorly represented in the living herd. We estimate that less than 15% of the adult females observed at the haulout site were accompanied by a newborn or yearling calf. In consideration of their life history and reproductive rates one might expect approximately 40% of adult females to give birth to a calf in a given year (Fay 1982). It is unknown whether the low number of calves observed in the living herd reflects lower than expected reproductive rates, higher than expected mortality rates among calves, or the unique demographic structure of animals occupying the Point Lay haulout site (females with dependent calves may have chosen to use different haulout areas).

Most of the carcasses examined, and most of the live animals observed at the haulout site appeared to be in normal or robust body condition. Four emaciated newborn calves were observed which we speculate may have been orphaned or abandoned for a period of time prior to their death. We also found one emaciated adult animal that appeared to have succumbed to trampling injuries at the haulout site, and an emaciated, sick, 2 year old animal with no evidence of trauma or injury.

Most (14/19) of the fresh or moderately decomposed carcasses bore multi-focal ulcerated cutaneous lesions on their head, limbs, and trunk. Observations of live animals at the haulout site indicate that approximately 6 % of the herd was afflicted with a similar skin condition, and that the condition was more commonly observed in younger age classes of animals.

The cause(s) and significance of the observed cutaneous lesions observed at the Point Lay walrus haulout site are unknown. Cutaneous lesions and scars tissue are quite common in this

species; usually as a consequence of intra-specific fighting (tusk wounds). Scavenging by gulls, molting pelage and post mortem decay of dermal layers could also have contributed to some of the lesions. Notwithstanding difficulties of interpretation, the widespread disseminated nature of the skin lesions observed in several fresh carcasses and many otherwise healthy animals at the haulout site were not consistent in appearance with tusk strike injuries; they were more suggestive of some form of generalized parasitic, bacteriological, or viral infection. It is not clear whether the skin lesions observed on carcasses were directly linked with a pathological agent responsible for the animal's death. Although the lesions were prevalent in the carcasses examined, many of the afflicted carcasses also bore evidence of trauma suggestive of trampling. It is possible that two or more factors may be linked – sick or unhealthy animals may have compromised mobility and consequently, be more susceptible to trampling. The occurrence of healed lesions among live animals that were otherwise healthy in appearance also suggests that the condition is not necessarily lethal.

The ulcerative skin condition at the haulout was initially reported in late August by a research team conducting telemetry studies at the haulout site. During the course of their field work, they noted eighteen carcasses near the site, some of which had unusual skin lesions. They also noted several live animals at the haulout site with unusual ulcerated sores, including one morbid, emaciated, unattended calf which appeared near death (Anthony Fischbach, USGS, *pers. comm*. Figure 6).

Russian colleagues have also observed and photographed animals with similar skin conditions at coastal haulout in Russia over the past several years (Figure 7). They note that these types of lesions are most prevalent in younger age classes of animals and most commonly associated with animals in poor physical condition (Anatoly Kochnev, Chukotka TINRO*, pers. comm.*). They have speculated that the observed lesions may have originated as relatively minor skin injuries or tusk strikes that have become inflamed and infected (Anatoly Kochnev Chukotka TINRO *pers. comm.*, relaying the interpretation of the wounds by Chukchi walrus hunters). The potential for skin defects to become infected is potentially greater at terrestrial haulout sites than temporarily occupied sea-ice haulouts, due to the accumulation of urine and feces at these sites.

Figure 6. Walrus with ulcerated skin lesions at the Point Lay walrus haulout in August, 2011. The animal in the foreground is a yearling calf; the animal in the background is a calf of the year. Photographs courtesy of Anthony Fischbach, U.S. Geological Survey.

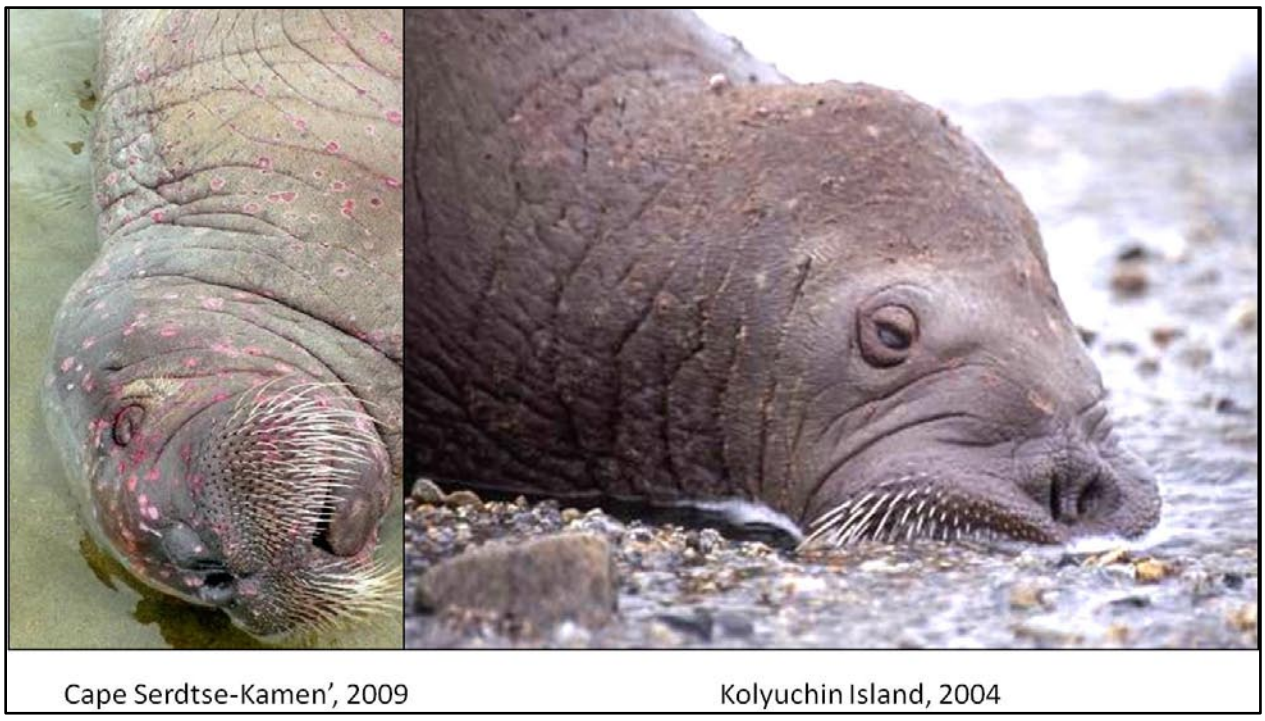


Figure 7. Examples of ulcerative skin lesions on walrus calves at coastal haulouts in Chukotka Russia. Photographs courtesy of Anatoly Kochnev, Chukotka TINRO.

Another hypothesis under investigation is that the ulcerative skin lesions observed in walruses at the Point Lay site might be associated with a suspected disease agent which appears to be affecting other seal species in the region. In July 2011, subsistence hunters from Barrow, Alaska began reporting a number of ringed seals (*Phoca hispida*) either hauling out on land or washing up dead across the North Slope of Alaska. Live seals appeared weak, lethargic, often had labored breathing, and typically lacked a normal flight response when approached. Other reported symptoms included alopecia (patchy to extensive hair loss), sloughing of skin at the base of the tail, and ulcerated skin lesions on the face, flippers and scattered across their body. Since these early observations similar symptoms have been reported in ringed seals, spotted seals (*Phoca largha*) and bearded seals (*Erignathus barbatus*), in the Bering Strait region of Alaska and Chukotka (only ringed seals). Clinical and pathological investigation of potential disease agents in sampled seals and walruses from the region is ongoing. Preliminary diagnostics indicate a virus is probably not the primary cause of the observed symptoms. Testing continues for a wide range of possible factors that may be responsible for the animals' condition, including immune system-related diseases, fungi, man-made and bio-toxins, radiation exposure, contaminants, and stressors related to sea ice change.

ACKNOWLEDGEMENTS

The authors would like to thank the residents of Point Lay for their help and hospitality during our visit to their community. In particular, we would like to acknowledge the efforts of Leo Ferriera III and Bill Tracey Sr., who contributed invaluable logistical support and advice to the project. Patrick Lemons (USFWS) and Justin Crawford (ADFG) assisted us with data collection efforts and shared their observational notes and photographs of walruses at the haulout site. Dr. Kathy Burek (AVPS) and Dr. Carrie Goertz (ASLC) provided technical advice, equipment and supplies for sampling walrus carcasses. Financial, technical, and administrative support for the project was provided by Lori Quakenbush (ADFG) with funding from the Bureau of Ocean Energy Management.

REFERENCES

Douglas, D.C. 2010. Arctic sea lice decline: Projected changes in timing and extent of sea-ice in the Bering and Chukchi Seas. U.S. Department of the Interior, U.S. Geological Survey, Open File Report 2010-1176. Reston, VA., 32 pp.

Fay, F.H. 1974. The role of ice in the ecology of marine mammals of the Bering Sea. Pp. 383-399 *in*: Hood, E.W. and E.J. Kelley, (*Eds*) Oceanography of the Bering Sea. University of Alaska Fairbanks, AK.

Fay, F.H. 1982. Ecology and biology of the Pacific walrus, *Odobenus rosmarus divergens* illiger. U.S. Fish and Wildlife Service, North American Fauna, Washington, D. C., 279 pp.

Fischbach, A.S., D.H. Monson and C.V. Jay. 2009. Enumeration of Pacific walrus carcasses on beaches of the Chukchi Sea in Alaska following a mortality event, September 2009. US Geological Survey Open-File Report 2009-1291, Reston, VA.

Harvell, C.D., K. Kim, J.M. Burkholder, R.R. Colwell, P.R. Epstein and D.J. Grimes. 1999. Emerging marine diseases - climate links and anthropogenic factors. Science 285:1505-1514.

Kochnev, A.A. 2008. 2007 activity report. Pacific Research Fisheries Center, Chukotka Branch. Marine Mammal Council Newsletter, Moscow, 20 pp.

Ovsyanikov, N.G., I.E. Menyushina and A.V. Bezrukov. 2007. Unusual walrus mortality at Wrangel Island in 2007. Wrangel Island State Nature Reserve, Chukotskyi AO, Russia.

WWF (World Wildlife Fund) 2010. U.S.-Russia Polar Bear Exchange. Report to the US Fish and Wildlife Service:17 pp.

PERSONAL COMMUNICATIONS

Fischbach, Anthony. U.S. Geological Survey. afischbach@usgs.gov

Kochnev, Anatoly. Chukot TINRO. kochnev@anadyr.ru

Appendix F-4. Crawford, J. A., W. Neakok, J. Garlich-Miller, M. A. Nelson, and L. T. Quakenbush. 2012. Results from village-based walrus studies in Alaska, 2011. Alaska Marine Science Symposium, 16–20 January, Anchorage, AK. (Abstract and poster).

Results from village-based walrus studies in Alaska, 2011

Justin A. Crawford[1*], Willard Neakok[2], Mark A. Nelson[1], Joel Garlich-Miller[3], and Lori Quakenbush[1]

[1] Alaska Department of Fish and Game, Fairbanks, Alaska 99701;
[2] Eskimo Walrus Commission and resident of Point Lay, Alaska;
[3] U.S. Fish and Wildlife Service, Anchorage, Alaska 99503
* Correspondence: Justin.Crawford@alaska.gov

Pacific walruses winter in the Bering Sea, but females with young summer in the Chukchi Sea resting on sea ice; most adult males remain in the Bering Sea where they rest on land. The rapid retreat of sea ice is changing summer walrus habitat in the Chukchi Sea and may be changing summer distributions and haulout behavior, requiring that walruses haul out on land instead of ice. The purpose of this project is to work with subsistence walrus hunters to conduct observations at terrestrial haulouts accessible from coastal communities, deploy satellite-linked tags to monitor movements and feeding behavior, and to document local knowledge regarding walrus land haulouts. During fall 2011, a large haulout (20–25,000 walruses) formed near the village of Point Lay where residents minimized disturbances to the haulout by directing boat traffic and other potential human disturbances. Large haulouts are susceptible to stampedes, which can cause calf mortalities. Local hunters also documented the number and condition of carcasses near the haulout and, in doing so, observed skin lesions on several dead walruses. Samples were collected from potentially infected walruses for analysis. During spring 2011, efforts to tag walruses near Wales and Point Hope were unsuccessful due to unfavorable sea ice and weather conditions. We met with elders and walrus hunters in Wainwright and Point Lay to document historical terrestrial haulouts and walrus behavior. Future plans include deploying tags with local hunters near Little Diomede and meeting with elders at Barrow and Point Hope.

Alaska Marine Science Symposium, 16–20 January 2012, Anchorage AK

Results from village-based walrus studies in Alaska, 2011

Justin A. Crawford[1], Willard Neakok[2], Mark A. Nelson[1], Joel Garlich-Miller[3], and Lori T. Quakenbush[1]

[1]Alaska Department of Fish and Game, Fairbanks, Alaska, Justin.Crawford@alaska.gov
[2]Eskimo Walrus Commission and resident of Point Lay, Alaska
[3]U.S. Fish and Wildlife Service, Anchorage, Alaska

Introduction

Pacific walruses (*Odobenus rosmarus*) winter in the Bering Sea, but females with young summer in the Chukchi Sea resting on sea ice; most adult males remain in the Bering Sea where they rest on land. Over the past decade, sea ice in the Chukchi Sea has receded north beyond the shallow continental shelf in late summer. The rapid retreat of sea ice is changing summer walrus habitat in the Chukchi Sea and may be changing summer distributions and haulout behavior, requiring walruses to haul out on land instead of ice. Large terrestrial haulouts of walruses have formed along the Arctic coast of Alaska in 4 of the past 5 years and are expected to occur more often. Terrestrial haulouts are susceptible to disturbances which can cause stampedes resulting in mortality due to trampling for young walruses. Although haulout locations are not consistently used each year, some may be accessible from coastal villages (Fig. 1A).

The purpose of this project is to work with subsistence walrus hunters to conduct observations at terrestrial haulouts accessible from coastal communities, deploy satellite-linked transmitters to monitor movements and feeding behavior, and to document local knowledge regarding walrus terrestrial haulouts. As summer sea ice has decreased in the Chukchi Sea, oil and gas activity has increased, elevating the importance of understanding walrus movements, feeding behavior, and habitat requirements.

Methods

Local walrus hunters examine and document walrus carcasses (e.g., record length, age, sex, blubber thickness, and take photographs; Fig. 2). They also monitor the status of haulouts, deploy satellite-linked transmitters and help document local knowledge regarding terrestrial haulouts.

Figure 2. Willard Neakok (on left) and crew examining a dead walrus calf.

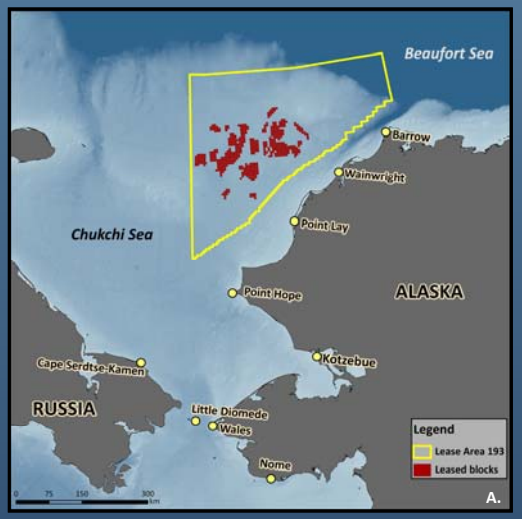


Figure 1. (A) Locations of Alaskan communities along the Chukchi Sea coast near walrus summer habitat and the Chukchi Sea Lease Sale Area and **(B)** the 2011 walrus haulout near Point Lay.

Figure 3. Terrestrial haulout north of Point Lay, as observed from the barrier island, facing southwest, September 2011.

Results

During September of 2011 a large haulout (20,000–25,000 walruses; Figs. 1B and 3) formed near the village of Point Lay; in response, residents minimized disturbances to the haulout by directing boat traffic and other potential human disturbances. Local hunters also documented the condition of 28 carcasses (17 female, 6 male and 5 unknown) during a 25 mile coastal survey near the haulout. Most (19/28; 68%) of the carcasses were calves or yearling animals. The bodies of six (21%) walruses were judged to be emaciated; 9 (32%) appeared to be normal or robust; while the rest of the carcasses could not be evaluated for body condition due to decomposition. Many of the carcasses showed signs of trauma (e.g. crushed bodies, bleeding from the nose and mouth, hemorrhages) consistent with trampling. Heavy surf prior to our survey effort caused the live walruses to leave the beach and removed many unexamined carcasses from the haulout site; therefore no estimate of total mortality was possible.

Crews conducting carcass surveys also observed ulcers on the skin of several dead walruses (See poster 127, Garlich-Miller et al., Mortality of walruses at a coastal haulout, Point Lay, Alaska, Autumn 2011). Samples from potentially infected walruses were collected for analysis.

During spring 2011, efforts to deploy satellite-linked transmitters on walruses near Wales and Point Hope were unsuccessful due to unfavorable sea ice and weather conditions. We met with elders and walrus hunters in Wainwright and Point Lay to document historical terrestrial haulouts and walrus behavior.

Figure 4. Sub-adult walrus with skin lesions.

Figure 5. Dead walrus calf with signs of trauma, consistent with trampling.

Future Activities

We will continue to prepare local teams to respond to future haulouts. We will visit Barrow and Point Hope to document hunters' experiences with walruses on terrestrial haulouts and identify hunters interested in participating in Village-Based Walrus Studies. Further, we plan to assess deploying transmitters with local hunters near Little Diomede.

Acknowledgements:

This project is funded by the Bureau of Ocean Energy Management. We appreciate the support and assistance of the Eskimo Walrus Commission, the U.S. Geological Survey, and the U.S. Fish and Wildlife Service (USFWS). Research on walruses was conducted under permit # MA220876-0 issued to the Alaska Department of Fish and Game (ADF&G) by USFWS and under an approved ADF&G Animal Care and Use Committee Protocol #2010-13R.

Appendix F-5. Crawford, J. A., W. Neakok, M. A. Nelson, J. Garlich-Miller, and L. T. Quakenbush. 2013. Results from village-based walrus studies in Alaska, 2012. Alaska Marine Science Symposium, 21–25 January, Anchorage, AK. (Abstract and poster).

Results from village-based walrus studies in Alaska, 2012

Justin A. Crawford[1*], Willard Neakok[2], Mark A. Nelson[1], Joel Garlich-Miller[3], and Lori Quakenbush[1]

[1] Alaska Department of Fish and Game, Fairbanks, Alaska 99701;
[2] Eskimo Walrus Commission and resident of Point Lay, Alaska;
[3] U.S. Fish and Wildlife Service, Anchorage, Alaska 99503
* Correspondence: Justin.Crawford@alaska.gov

Pacific walruses winter in the Bering Sea, but females with young summer in the Chukchi Sea resting on sea ice; most adult males remain in the Bering Sea where they rest on land. The rapid retreat of sea ice is changing summer walrus habitat in the Chukchi Sea and may be changing summer distributions and haulout behavior, requiring that walruses haul out on land instead of ice. The purpose of this project is to work with subsistence walrus hunters to conduct observations at terrestrial haulouts accessible from coastal communities, deploy satellite-linked tags to monitor movements and feeding behavior, and to document local knowledge regarding terrestrial walrus haulouts. Local knowledge collected in Point Lay and Wainwright described historical occurrences of terrestrial walrus haulouts and detailed the steps taken by communities to minimize disturbances. In February, we co-sponsored a workshop on coastal walrus haulouts and provided travel to Barrow for several elders and walrus hunters to discuss walrus haulout issues with each other and management agencies. In May, we worked with hunters to deploy satellite tags on walruses near Little Diomede Island, but were unsuccessful due to unfavorable sea ice and weather conditions. During August and September, local hunters were prepared to monitor the haulouts from blinds using spotting scopes and they assisted in the construction of camera towers to potentially monitor walrus behavior near the previous haulout site. Sea ice, however, persisted in the northern Chukchi Sea and walruses did not haul out in large numbers along the Alaskan coast as they had in recent years (20,000–25,000 walruses in September 2011). Also in August, residents of Little Diomede Island began to monitor terrestrial haulouts and causes of disturbance in the area.

Alaska Marine Science Symposium, 21–25 January 2013, Anchorage AK

Results from village-based walrus studies in Alaska, 2012

Justin A. Crawford[1], Willard Neakok[2], Mark A. Nelson[1], Joel Garlich-Miller[3], and Lori T. Quakenbush[1]

[1]Alaska Department of Fish and Game, Fairbanks, Alaska, Justin.Crawford@alaska.gov
[2]Eskimo Walrus Commission and resident of Point Lay, Alaska
[3]U.S. Fish and Wildlife Service, Anchorage, Alaska

Introduction

Pacific walruses (*Odobenus rosmarus*) winter in the Bering Sea, but females with young summer in the Chukchi Sea resting on sea ice; most adult males remain in the Bering Sea where they rest on land. Over the past decade, sea ice in the Chukchi Sea has receded north beyond the shallow continental shelf in late summer. The rapid retreat of sea ice is changing summer walrus habitat in the Chukchi Sea and may be changing summer distributions and haulout behavior, requiring walruses to haul out on land instead of ice. Large terrestrial haulouts of walruses have formed along the Arctic coast of Alaska in four of the past six years and are expected to occur more often. Terrestrial haulouts are susceptible to disturbances which can cause stampedes resulting in mortality due to trampling of young walruses. Haulout locations are not consistently used each year and some may be accessible from coastal villages (Fig. 1).

The purpose of this project is to work with subsistence walrus hunters to conduct observations at terrestrial haulouts accessible from coastal communities, deploy satellite-linked transmitters to monitor movements and feeding behavior, and to document local knowledge regarding walrus terrestrial haulouts. As summer sea ice has decreased in the Chukchi Sea, oil and gas activity has increased, elevating the importance of understanding walrus movements, feeding behavior, and habitat requirements.

Methods

Local walrus hunters monitor the status of terrestrial haulouts, help document local knowledge regarding terrestrial haulouts, and work with biologists to deploy satellite-linked transmitters (Fig. 2). They also examine and document walrus carcasses (e.g., record length, age, sex, blubber thickness, and take photographs).

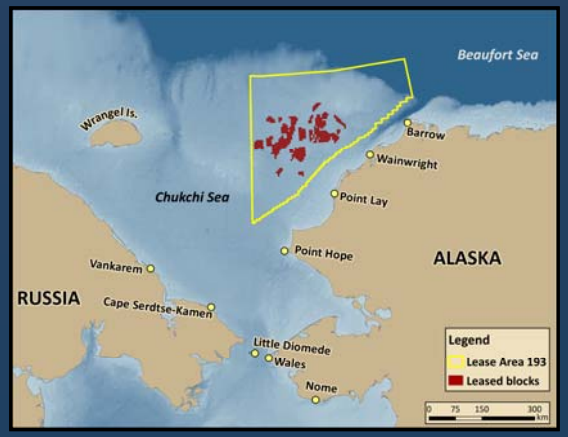


Figure 1. Locations of Alaskan communities near walrus summer habitat and the Chukchi Sea Lease Sale Area.

Figure 2. Thomas Killigvuk (on right) and crew surveying area for walruses to tag near Point Hope, June 2010.

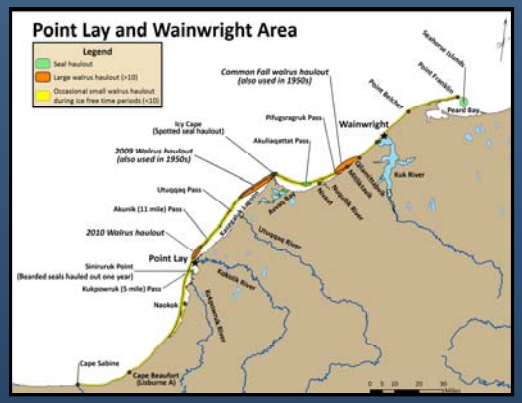


Figure 3. Walrus and seal haulout sites as documented during traditional knowledge interviews in Point Lay and Wainwright.

Figure 4. Workshop on coastal walrus haulouts in Barrow, February 2012.

Results

- We finalized a report documenting local knowledge collected in Point Lay and Wainwright that described historical occurrences of terrestrial walrus haulouts and detailed the steps taken by communities to minimize disturbances (Fig. 3).
- In February, we co-sponsored a workshop on coastal walrus haulouts and provided travel to Barrow for several elders and walrus hunters to discuss walrus haulout issues with each other and management agencies (Fig. 4).
- In May, we worked with hunters to deploy satellite-linked transmitters on walruses near Little Diomede Island, but were unsuccessful due to unfavorable sea ice and weather conditions.
- In August and September, we supported efforts of local hunters to monitor the haulouts from blinds using spotting scopes and conduct carcass surveys. They also assisted in the construction of camera towers to potentially monitor walrus behavior near the previous haulout site. Sea ice, however, persisted in the northern Chukchi Sea and walruses did not haul out in large numbers along the Alaskan coast as they had in recent years (20,000–25,000 walruses in September 2011, Fig. 5).
- Also in August, we supported efforts of residents on Little Diomede Island to monitor walrus activity and causes of disturbance in the area.

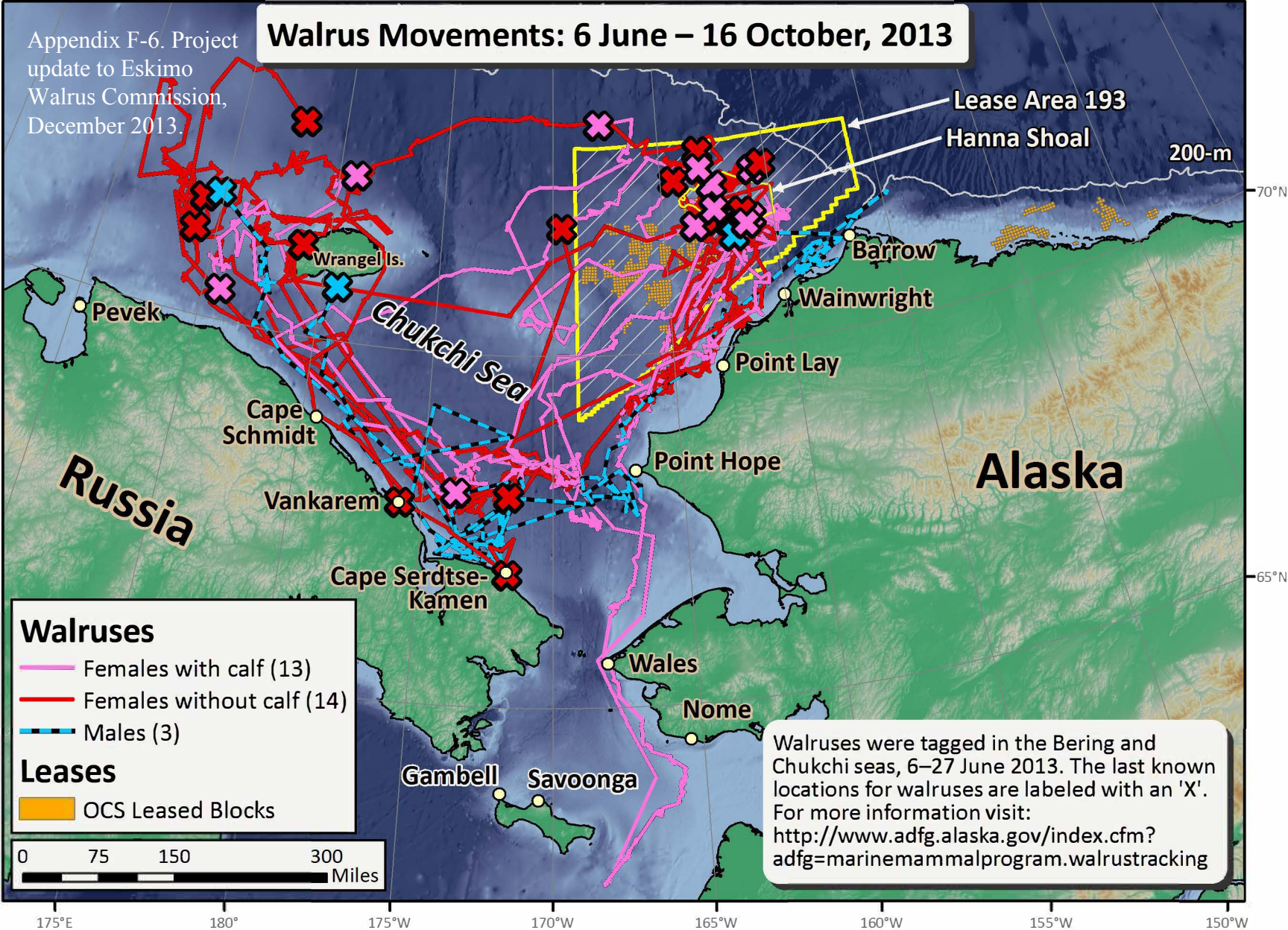
Figure 5. Terrestrial haulout north of Point Lay, as observed from the barrier island, facing southwest, September 2011.

Future Activities

We will continue to prepare local teams to respond to future haulouts near coastal villages, including Point Lay and Little Diomede Island. We will visit Barrow and Point Hope to document hunters' experiences with walruses on terrestrial haulouts and identify hunters interested in participating in Village-Based Walrus Studies. Further, we plan to evaluate the success of deploying transmitters with local hunters near coastal villages in Spring.

Acknowledgements:

This project is funded by the Bureau of Ocean Energy Management. We appreciate the support and assistance of the Eskimo Walrus Commission, the U.S. Geological Survey, and the U.S. Fish and Wildlife Service (USFWS). Research on walruses was conducted under permit # MA220876-0 issued to the Alaska Department of Fish and Game (ADF&G) by USFWS and under an approved ADF&G Animal Care and Use Committee Protocol #2010-13R.


Appendix F-6. Project update to Eskimo Walrus Commission, December 2013.
Walrus Movements: 6 June – 16 October, 2013
Lease Area 193
Hanna Shoal
200-m
70°N
65°N
Barrow
Wainwright
Point Lay
Point Hope
Wrangel Is.
Pevek
Chukchi Sea
Cape Schmidt
Vankarem
Russia
Alaska
Cape Serdtse-Kamen
Wales
Nome
Gambell
Savoonga
Walruses
Females with calf (13)
Females without calf (14)
Males (3)
Leases
OCS Leased Blocks
0 75 150 300 Miles
Walruses were tagged in the Bering and Chukchi seas, 6–27 June 2013. The last known locations for walruses are labeled with an 'X'. For more information visit: http://www.adfg.alaska.gov/index.cfm?adfg=marinemammalprogram.walrustracking
175°E
180°
175°W
170°W
165°W
160°W
155°W
150°W

Satellite-linked transmitters were deployed on walruses in the Bering and Chukchi seas in June 2013. The tags transmitted for an average of 55 days, ranging from 4 to 124 days (~4 months). During this time walruses traveled, on average, a minimum distance of 1,118 miles, ranging from 158–2,765 miles. At a minimum, these walruses traveled, about 21.7 miles per day.

Tags were deployed on 34 walruses (15 females without calves, 13 females with calves and 6 males).

This tagging project is part of the Village-based Walrus Studies funded by BOEM. This funding supported Clarence Irrigoo from Gambell and Perry Pungowiyi from Savoonga to participate in all of the activities on the walrus research cruise including the tagging. They tagged some of the walruses using a crossbow and some with a pole. They assisted Patrick Lemons in collecting biopsies, and they advised the researchers and small boat drivers about how to approach walruses safely and effectively.

The information from these tagged walruses will be used to understand how much time walruses spend in the Chukchi Sea Lease Sale area and when. It also provides general walrus movement and haulout patterns.

Report to the Eskimo Walrus Commission presented on 10 December 2013 by Lori Quakenbush (907-459-7214).

Appendix F-7. Crawford, J. A., L. T. Quakenbush, C. Irrigoo, P. Pungowyii, W. Neakok, and J. Garlich-Miller. 2014. Results from village-based walrus studies in Alaska, 2013. Alaska Marine Science Symposium, 20–23 January, Anchorage, AK. (Abstract and poster).

Results from hunter-assisted walrus studies in Alaska, 2013

Justin A. Crawford[1*], Lori Quakenbush[1], Clarence Irrigoo[2], Perry Pungowiyi[3], Willard Neakok[4], and Joel Garlich-Miller[5]

[1] Alaska Department of Fish and Game, Fairbanks, Alaska 99701;
[2] Walrus hunter and resident of Gambell, Alaska;
[3] Walrus hunter and resident of Savoonga, Alaska;
[4] Eskimo Walrus Commission and resident of Point Lay, Alaska;
[5] U.S. Fish and Wildlife Service, Anchorage, Alaska 99503
* Correspondence: Justin.Crawford@alaska.gov

Pacific walruses winter in the Bering Sea, but females with young summer in the Chukchi Sea resting on sea ice; most adult males remain in the Bering Sea where they rest on land. The rapid retreat of sea ice is changing summer walrus habitat in the Chukchi Sea and may be changing summer distributions and haulout behavior, requiring that walruses haul out on land instead of ice. The purpose of this project is to work with subsistence walrus hunters to conduct observations at terrestrial haulouts accessible from coastal communities, deploy satellite-linked tags to monitor movements and feeding behavior, and to document local knowledge regarding terrestrial walrus haulouts. In preparation for a potential terrestrial haulout near Point Lay in 2013, local hunters assisted in the placement of camera towers. A relatively small (1,500–4,000 walruses) haulout formed near Point Lay in September, 2013 and was monitored. Carcass surveys were conducted, when possible, without disturbance to the haulout. Traditional and local knowledge interviews were conducted in Point Hope and two final reports are now available= for Wainwright and Point Lay, jointly, and Point Hope. In association with a multi-agency walrus research cruise in June, walrus hunters from Saint Lawrence Island deployed 34 satellite-linked transmitters in the Bering and Chukchi seas. Of the 34 tagged walruses, 28 were females, (13 of which were accompanied by calves of the year) and six were adult males. Preliminary data show the highest concentration of tagged walruses occurred in the Hanna Shoal area within Lease Sale 193 in the eastern Chukchi Sea during July and August, however areas north of Wrangel Island and along the northern Chukotka coast were also used. All tagged walruses left Hanna Shoal during the first week of September. None of the five tags still transmitting in September were located at the terrestrial haulout near Point Lay, although one female hauled out on the Chukotka coast near Vankarem.

Alaska Marine Science Symposium, 20–24 January 2014, Anchorage AK

Results from hunter-assisted walrus studies in Alaska, 2013

Justin A. Crawford[1], Lori T. Quakenbush[1], Clarence Irrigoo[2], Perry Pungowiyi[3], Willard Neakok[4], and Joel Garlich-Miller[5]

[1]Alaska Department of Fish and Game, Fairbanks, Alaska, Justin.Crawford@alaska.gov

[2]Walrus hunter and resident of Gambell, Alaska, [3]Walrus hunter and resident of Savoonga, Alaska

[4]Eskimo Walrus Commission and resident of Point Lay, Alaska, [5]U.S. Fish and Wildlife Service, Anchorage, Alaska

Introduction

Pacific walruses (*Odobenus rosmarus*) winter in the Bering Sea, but females with young summer in the Chukchi Sea resting on sea ice; most adult males remain in the Bering Sea where they rest on land. Over the past decade, sea ice in the Chukchi Sea has receded north beyond the shallow continental shelf in late summer. The rapid retreat of sea ice is changing summer walrus habitat in the Chukchi Sea and may be changing summer distributions and haulout behavior, requiring walruses to haul out on land instead of ice. Large terrestrial haulouts of walruses have formed along the Arctic coast of Alaska in 5 of the past 7 years and are expected to occur more often. Terrestrial haulouts are susceptible to disturbances which can cause stampedes resulting in mortality due to trampling of young walruses. Haulout locations are not consistently used each year and some may be accessible from coastal villages.

The purpose of this project is to work with subsistence walrus hunters to conduct observations at terrestrial haulouts accessible from coastal communities, deploy satellite-linked transmitters to monitor movements and habitat use, and to document local knowledge regarding walrus movements and terrestrial haulouts. As summer sea ice has decreased in the Chukchi Sea, oil and gas activity has increased, elevating the importance of understanding walrus movements and habitat use.

Methods

Local walrus hunters monitor the status of terrestrial haulouts, help document local knowledge regarding walrus movements and terrestrial haulouts, prevent disturbances at terrestrial haulouts accessible from coastal communities, and work with biologists to deploy satellite-linked transmitters (Fig. 1). They also examine and document walrus carcasses (e.g., record length, age, sex, blubber thickness, and take photographs).

Figure 1. Clarence Irrigoo (left) and Perry Pungowiyi (right) tagging walruses, June 2013.

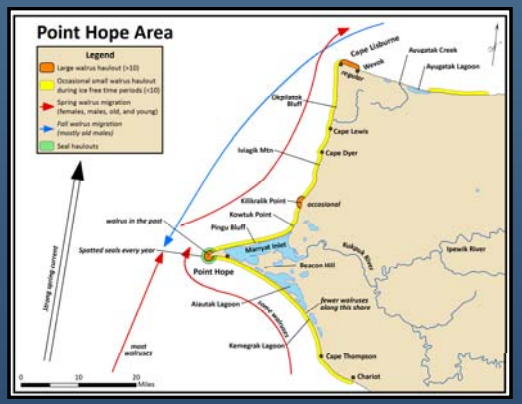


Figure 2. Walrus and seal haulout sites as documented during traditional knowledge interviews in Point Hope.

Results

- We have finalized reports documenting **local knowledge** collected in Wainwright, Point Lay, and Point Hope that describe historical occurrences of terrestrial walrus haulouts and detail actions taken by communities to minimize disturbances (Fig. 2).
- In association with a multi-agency (USGS, USFWS, and ADF&G) walrus research cruise in June, we worked with hunters to **deploy 34 satellite-linked transmitters on walruses** (28 female & 6 male) in the Bering and Chukchi seas.
  - Tags transmitted an average of 55 days (range: 4–124 days)
  - Walruses traveled an average minimum distance of 1,800 km (range: 254–4,457 km; Fig. 3)
  - 18 walruses entered the Chukchi Sea Lease Sale Area, each traveling an average of 933 km and spending an average of 36 days in the area
  - None of the tagged walruses hauled out on the northwest coast of Alaska
  - 3 walruses used terrestrial haulouts on the north coast of Chukotka, Russia
- In September and October, we supported efforts of local hunters to **monitor the haulouts** from blinds using spotting scopes and conduct carcass surveys. They also assisted in the placement of camera towers to potentially monitor walrus behavior near the previous haulout site.

Future Activities

We will continue to prepare local teams to respond to future haulouts near coastal villages, including Point Lay and Little Diomede Island. We will visit Barrow to document hunters' experiences with walruses on terrestrial haulouts and identify hunters interested in participating in Village-Based Walrus Studies. Further, we plan to work with local hunters near coastal villages in Spring to deploy more transmitters.

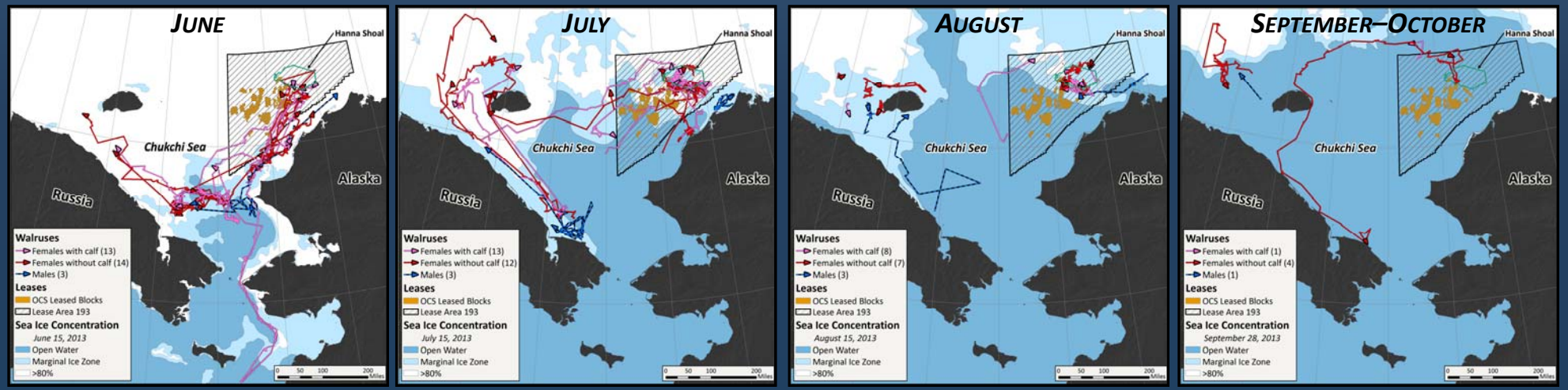
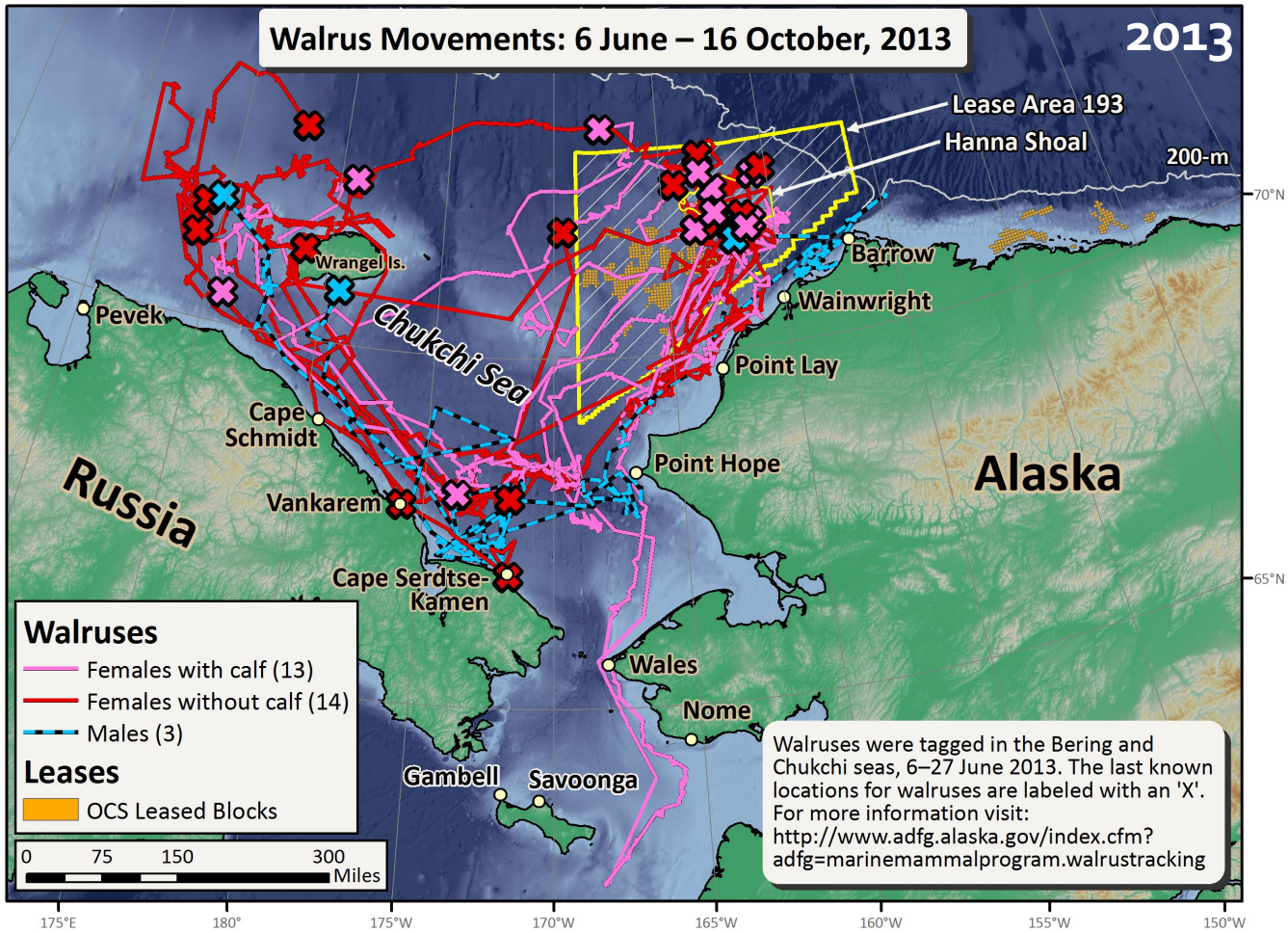
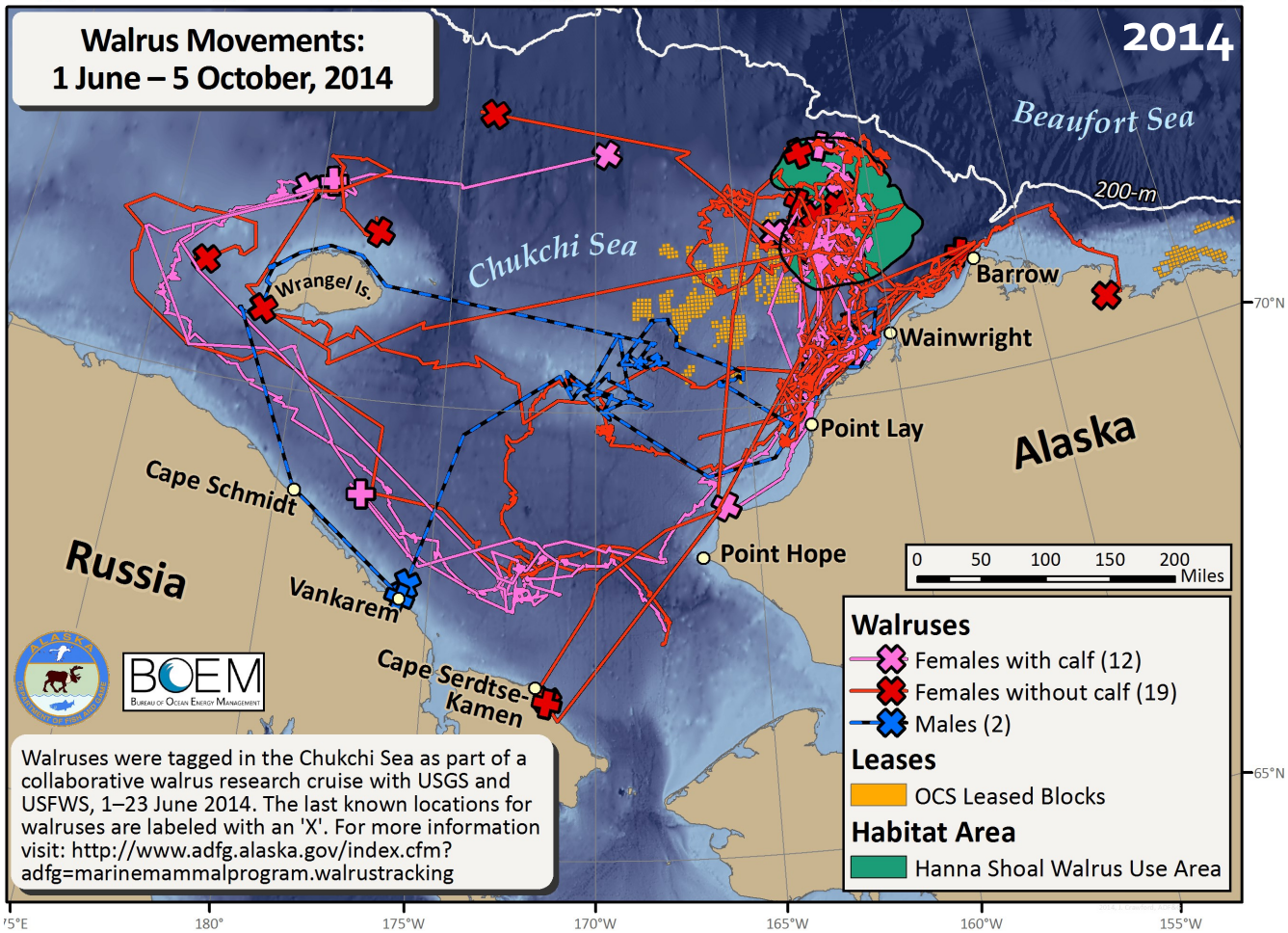


Figure 3. Movements of satellite-tagged walruses, females with and without calves and males, from June–October, 2013.

Acknowledgements:

This project is funded by the Bureau of Ocean Energy Management. We appreciate the support and assistance of the Eskimo Walrus Commission, the U.S. Geological Survey, and the U.S. Fish and Wildlife Service (USFWS). Research on walruses was conducted under permit # MA220876-0 issued to the Alaska Department of Fish and Game (ADF&G) by USFWS and under an approved ADF&G Animal Care and Use Committee Protocol #2010-13R. We thank the captain and crew of the R/V Norseman II for their skill in accommodating our challenging walrus research objectives.


Walrus Movements: 6 June – 16 October, 2013
2013
Lease Area 193
Hanna Shoal
200-m
Barrow
Wainwright
Point Lay
Point Hope
Wrangel Is.
Pevek
Chukchi Sea
Cape Schmidt
Vankarem
Cape Serdtse-Kamen
Russia
Alaska
Wales
Nome
Gambell
Savoonga
70°N
65°N
Walruses
Females with calf (13)
Females without calf (14)
Males (3)
Leases
OCS Leased Blocks
0 75 150 300 Miles
Walruses were tagged in the Bering and Chukchi seas, 6–27 June 2013. The last known locations for walruses are labeled with an 'X'. For more information visit: http://www.adfg.alaska.gov/index.cfm?adfg=marinemammalprogram.walrustracking
175°E
180°
175°W
170°W
165°W
160°W
155°W
150°W


Walrus Movements:
1 June – 5 October, 2014
2014
Beaufort Sea
200-m
Chukchi Sea
Wrangel Is.
Barrow
Wainwright
Point Lay
Alaska
Cape Schmidt
Russia
Point Hope
Vankarem
Cape Serdtse-Kamen
0 50 100 150 200 Miles
Walruses
Females with calf (12)
Females without calf (19)
Males (2)
Leases
OCS Leased Blocks
Habitat Area
Hanna Shoal Walrus Use Area
BOEM
Bureau of Ocean Energy Management
Walruses were tagged in the Chukchi Sea as part of a collaborative walrus research cruise with USGS and USFWS, 1–23 June 2014. The last known locations for walruses are labeled with an 'X'. For more information visit: http://www.adfg.alaska.gov/index.cfm?adfg=marinemammalprogram.walrustracking
70°N
65°N
180°
175°W
170°W
165°W
160°W
155°W

Satellite-linked transmitters were deployed on walruses in the Bering and Chukchi seas in June 2013 and 2014.

In 2013, tags were deployed on 34 walruses (15 females without calves, 13 females with calves and 6 males). The tags transmitted for an average of 55 days, ranging from 4 to 124 days (~4 months). During this time walruses traveled, on average, a minimum distance of 1,118 miles, ranging from 158–2,765 miles. At a minimum, these walruses traveled about 21.7 miles per day.

In 2014, tags were deployed on 33 walruses (19 females without calves, 12 females with calves and 2 males). The tags transmitted for an average of 50 days, ranging from 7 to 105 days (~3.5 months). During this time walruses traveled, on average, a minimum distance of 1,100 miles, ranging from 108–2,568 miles. As in 2013, at a minimum, these walruses traveled about 21.7 miles per day.

This tagging project is part of the Village-based Walrus Study funded by BOEM. This funding supported Clarence Irrigoo (2013 and 2014) from Gambell and Perry Pungowiyi (2013) and Edwin Noongwook (2014) from Savoonga to participate in all of the activities on the walrus research cruise including the tagging. They tagged some of the walruses using a crossbow and some with a pole. They assisted Patrick Lemons (U.S. Fish and Wildlife Service) in collecting biopsies, and they advised the researchers and small boat drivers about how to approach walruses safely and effectively.

The information from these tagged walruses will be used to determine how much time walruses spend in the Chukchi Sea Lease Sale area and when. It also provides general walrus movement and haulout patterns.

Report to the Eskimo Walrus Commission presented December 2014 by Lori Quakenbush (907-459-7214).

Appendix F-9. Crawford, J. A., L. T. Quakenbush, C. Irrigoo, P. Pungowyii, E. Noongwook, and J. Garlich-Miller. 2015. Results from village-based walrus studies in Alaska, 2014. Alaska Marine Science Symposium, 19–22 January, Anchorage, AK. (Abstract and poster).

Results from hunter-assisted walrus studies in Alaska, 2014

Justin A. Crawford[1*], Lori Quakenbush[1], Clarence Irrigoo[2], Edwin Noongwook[3], and Joel Garlich-Miller[4]

[1] Alaska Department of Fish and Game, Fairbanks, Alaska 99701;
[2] Walrus hunter and resident of Gambell, Alaska;
[3] Walrus hunter and resident of Savoonga, Alaska;
[4] U.S. Fish and Wildlife Service, Anchorage, Alaska 99503
* Correspondence: Justin.Crawford@alaska.gov

Pacific walruses winter in the Bering Sea, but females with young summer in the Chukchi Sea resting on sea ice; most adult males remain in the Bering Sea where they rest on land. The rapid retreat of sea ice is changing summer walrus habitat in the Chukchi Sea and may be changing summer distributions and haulout behavior, requiring that walruses haul out on land instead of ice. In September 2014, the minimum extent of Arctic sea ice was the sixth lowest since satellite records began in 1979. The purpose of this project is to work with subsistence walrus hunters to conduct observations at terrestrial haulouts accessible from coastal communities, train hunters to deploy satellite-linked tags to monitor movements and feeding behavior, and document local knowledge regarding walrus movements, behavior, and use of terrestrial haulouts. In preparation for a potential terrestrial haulout near Point Lay in 2014, local hunters assisted in the placement of camera towers. A large (35,000 walruses) haulout formed near Point Lay in September 2014 and was monitored. Carcass surveys were conducted, when possible, without disturbance to the haulout. Two traditional and local knowledge reports for Wainwright and Point Lay, jointly, and Point Hope are now final and available. We worked with walrus hunters from Saint Lawrence Island to deploy 33 satellite-linked tags on walruses in the Chukchi Sea during a multi-agency walrus research cruise in June. Of the 33 tagged walruses, 31 were females, (12 of which were accompanied by calves of the year) and 2 were adult males. Preliminary data show the highest concentration of tagged walruses during July and August occurred in the Hanna Shoal area in the eastern Chukchi Sea, however areas north of Wrangel Island and along the Beaufort Sea coast of Alaska, and the northern coast of Chukotka were also used. Tagged walruses left Hanna Shoal from the last week of August through the third week of September. All four tags still transmitting in September were located at terrestrial haulouts near Point Lay, Cape Lisburne, or the Chukotka coast near Vankarem, Cape Schmidt or Cape Serdtse-Kamen for at least one day.

Alaska Marine Science Symposium, 19–22 January 2015, Anchorage AK

Results from hunter-assisted walrus studies in Alaska, 2014

Justin A. Crawford[1], Lori T. Quakenbush[1], Clarence Irrigoo[2], Edwin Noongwook[3], and Joel Garlich-Miller[4]

[1]Alaska Department of Fish and Game, Fairbanks, Alaska, Justin.Crawford@alaska.gov

[2]Walrus hunter and resident of Gambell, Alaska, [3]Walrus hunter and resident of Savoonga, Alaska

[4]U.S. Fish and Wildlife Service, Anchorage, Alaska

Introduction

Pacific walruses (*Odobenus rosmarus*) winter in the Bering Sea, but females with young summer in the Chukchi Sea resting on sea ice; most adult males remain in the Bering Sea where they rest on land. Over the past decade, sea ice in the Chukchi Sea has receded north beyond the shallow continental shelf in late summer. The rapid retreat of sea ice is changing summer walrus habitat in the Chukchi Sea and may be changing summer distributions and haulout behavior, requiring walruses to haul out on land instead of ice. Large terrestrial haulouts of walruses have formed along the Arctic coast of Alaska in six of the last eight years and are expected to occur more often. Terrestrial haulouts are susceptible to disturbances which can cause stampedes resulting in mortality due to trampling of young walruses. Haulout locations are not consistently used each year and some may be accessible from coastal villages.

The purpose of this project is to work with subsistence walrus hunters to conduct observations at terrestrial haulouts accessible from coastal communities, deploy satellite-linked transmitters to monitor walrus movements and habitat use, and to document local knowledge regarding walrus movements and terrestrial haulouts. As summer sea ice has decreased in the Chukchi Sea, oil and gas activity has increased, elevating the importance of understanding walrus movements and habitat use.

Methods

Local walrus hunters monitor the status of terrestrial haulouts, help document local knowledge regarding walrus movements and terrestrial haulouts, prevent disturbances at terrestrial haulouts accessible from coastal communities, and work with biologists to deploy satellite-linked transmitters on adult walruses (Fig. 1). They also examine and document walrus carcasses (e.g., record length, age, sex, blubber thickness, and take photographs).

Figure 1. Clarence Irrigoo (left) and Edwin Noongwook (right) tagging walruses, June 2014.

Figure 2. Warren Harding-Lampe and Isaac Leavitt conducting carcass surveys of walruses near Point Lay, October 2014.

Results

- We have finalized reports documenting **local knowledge** collected in Wainwright, Point Lay, and Point Hope that describe historical occurrences of terrestrial walrus haulouts and detail actions taken by communities to minimize disturbances (Fig. 2).
- In association with a multi-agency (USGS, USFWS, and ADF&G) walrus research cruise in June, we worked with hunters to **deploy 33 satellite-linked transmitters on adult walruses** (31 female & 2 male) in the Chukchi Sea.
  - Tags transmitted an average of 50 days (range: 7–105 days)
  - Walruses traveled an average minimum distance of 1,770 km (range: 175–4,132 km; Fig. 3)
  - 18 walruses entered the **Hanna Shoal Walrus Use Area**, each traveling an average of 873 km and spending an average of 33 days in the Area. The first walrus entered the area on 17 June and the last left the area on 13 Sept.
  - None of the tagged walruses hauled out on the northwest coast of Alaska
  - 4 walruses used terrestrial haulouts on the north coast of Chukotka, Russia
- In September and October, **Point Lay** hunters **monitored the haulouts** from blinds using spotting scopes and conducted carcass surveys. They also assisted in the placement of camera towers to potentially monitor walrus behavior near the previous haulout site.

Future Activities

We will continue to prepare local teams to respond to future haulouts near coastal villages, including Point Lay. We will visit Barrow to document local and traditional knowledge of walruses and identify hunters interested in participating in Village-Based Walrus Studies. Further, we plan to work with local hunters near coastal villages in spring to deploy more transmitters.

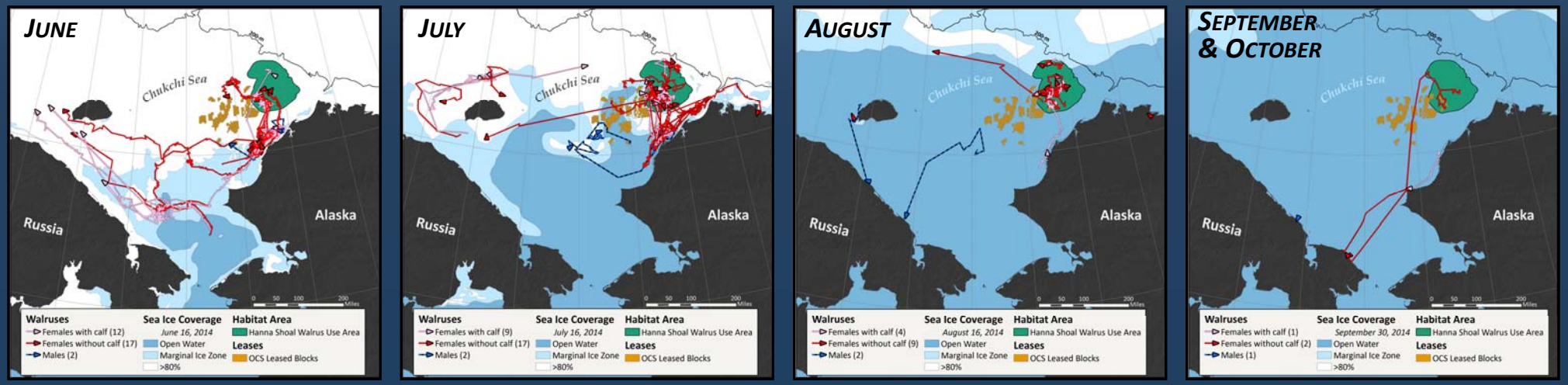


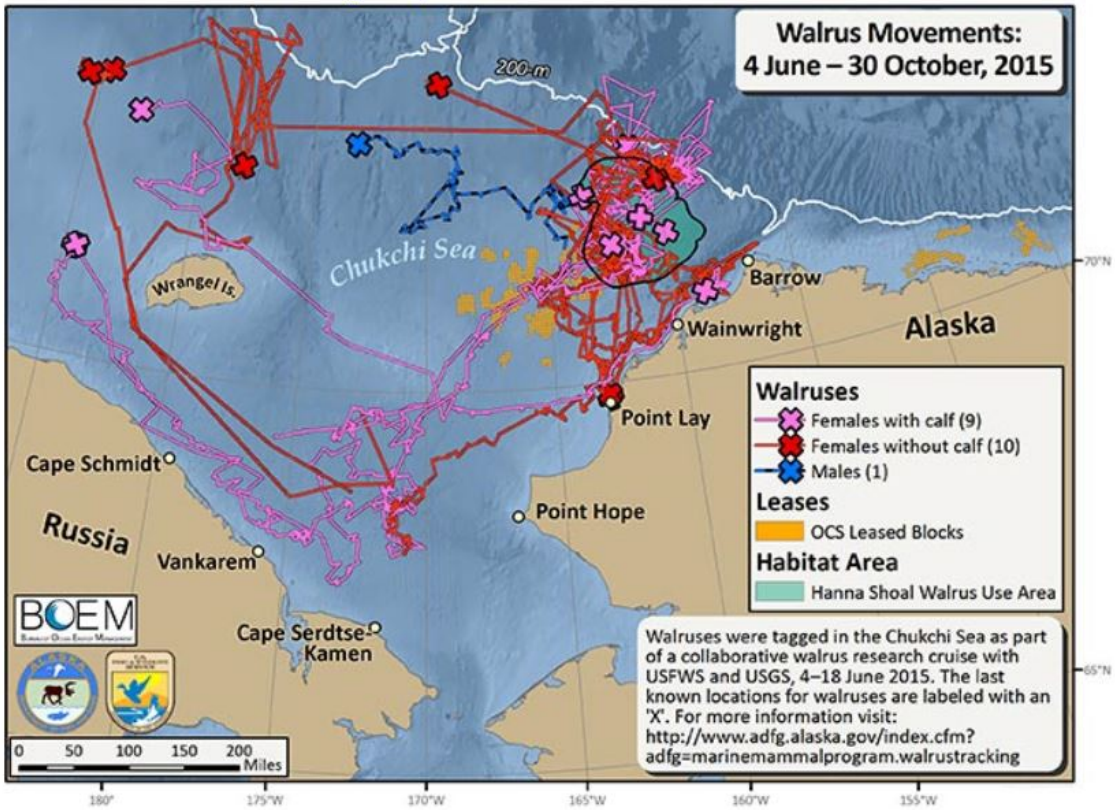
Figure 3. Movements of satellite-tagged walruses, females with and without calves and males, from June–October, 2014.

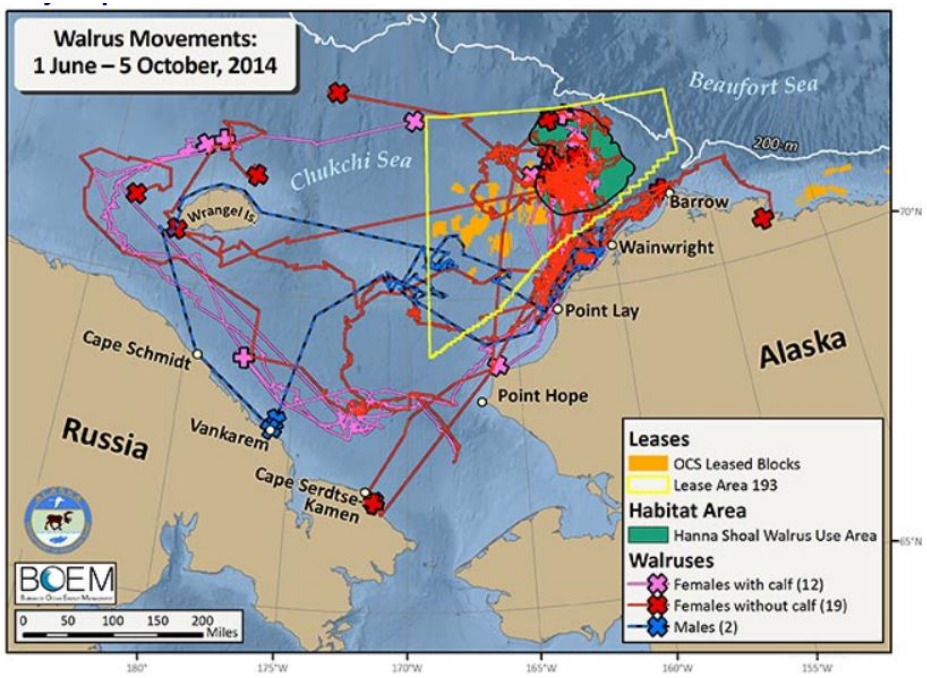
Acknowledgements:

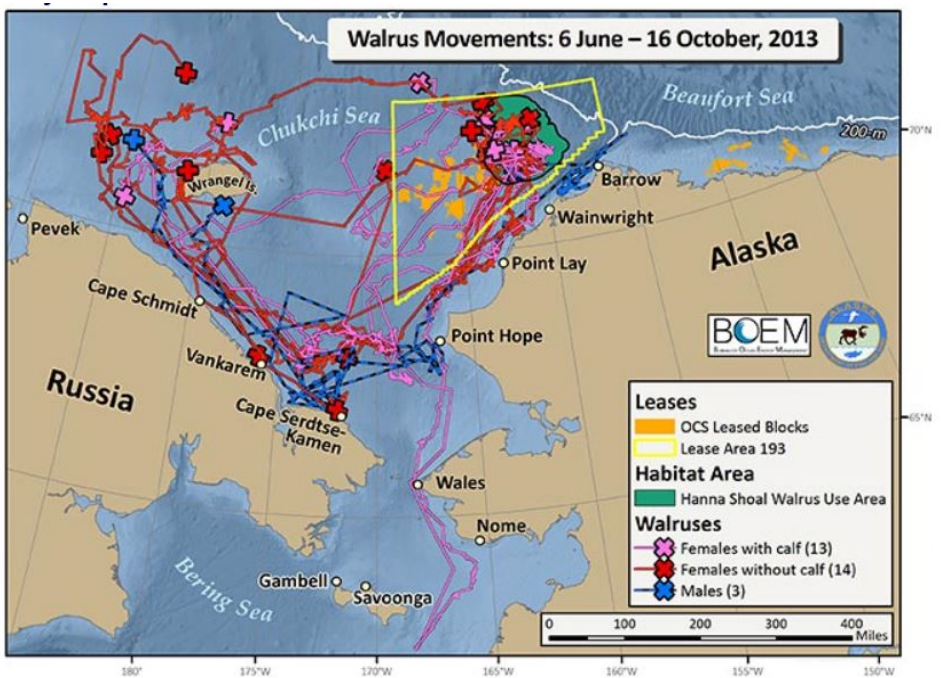
This project is funded by the Bureau of Ocean Energy Management. We appreciate the support and assistance of the Eskimo Walrus Commission, the U.S. Geological Survey, and the U.S. Fish and Wildlife Service (USFWS). Research on walruses was conducted under permit # MA220876-0 issued to the Alaska Department of Fish and Game (ADF&G) by USFWS and under an approved ADF&G Animal Care and Use Committee Protocol #2014-03. We thank the captain and crew of the R/V Norseman II for their skill in accommodating our challenging walrus research objectives.

Appendix F-10. Project update to Eskimo Walrus Commission, December 2015.

Satellite-linked transmitters were deployed on walruses in the Bering and Chukchi seas in June 2013, 2014, and 2015.







Report to the Eskimo Walrus Commission

7 December 2015 presented by Lori Quakenbush (907-459-7214).

This tagging project is part of the Village-based Walrus Studies funded by BOEM. Funding supported Clarence Irrigoo (2013–2015) from Gambell, Perry Pungowiyi (2013), and Edwin Noongwook (2014) from Savoonga to participate in all of the activities on the walrus research cruises including tagging. They tagged some of the walruses using a crossbow and some with a harpoon-style pole. They assisted Patrick Lemons, USFWS, in collecting biopsies for population assessment, and they advised the researchers and small boat drivers about how to approach walruses safely and effectively.

In total, for all three years, 83 tags were deployed on walruses (43 females without calves, 34 females with calves, and 6 males).

In 2013, 30 tags were deployed (14 females without calves, 13 females with calves, and 3 males). The tags transmitted for an average of 55 days (maximum 124 days, ~4 months). Walruses traveled an average minimum distance of 1,120 miles, ranging from 160 to 2,760 miles, at a rate of 22 miles/day (range: 9–41 miles/day).

In 2014, 33 tags were deployed on walruses (19 females without calves, 12 females with calves, and 2 males). The tags transmitted for an average of 50 days (maximum 105 days, ~3.5 months). Similar to 2013, tagged walruses traveled, on average, a minimum distance of 1,100 miles, ranging from 110–2,600 miles, at a rate of about 21.7 miles per day.

In 2015, 20 tags were deployed (10 on females without calves, 9 on females with calves, and 1 male). The tags transmitted for an average of 56 days (maximum 123 days, ~4 months).

The information from these tagged walruses will be used to:

- provide general walrus movement and haul out patterns,
- compare behavior of females with calves to females without calves to see, for example, if females with calves spend more time resting than diving,
- understand how much time walruses spend in the Chukchi Sea Lease blocks and if the avoid drilling activity.

Appendix F-11. Crawford, J. A., L. T. Quakenbush, J. J. Citta, C. Irrigoo Jr. and P. R. Lemons. 2015. Using movement, diving and haul out behavior to identify the relative importance of foraging areas for walruses in the Alaskan Chukchi Sea. 21th Biennial Conference on the Biology of Marine Mammals. 14–18 December, 2015. San Francisco, CA, USA. (Abstract and oral presentation).

Using movement, diving and haul out behavior to identify the relative importance of foraging areas for walruses in the Alaskan Chukchi Sea

Justin A. Crawford[1*], Lori T. Quakenbush[1], John J. Citta[1], Clarence Irrigoo Jr.[2], and Patrick R. Lemons[3]

[1] Alaska Department of Fish and Game, Fairbanks, Alaska 99701;
[2] Walrus hunter and resident of Gambell, Alaska;
[3] U.S. Fish and Wildlife Service, Anchorage, Alaska 99503;
* Correspondence: Justin.Crawford@alaska.gov

Female Pacific walruses and their young summer in the Chukchi Sea, resting on sea ice between benthic feeding bouts, when sea ice is available. The rapid decrease of sea ice in summer is changing walrus habitat in the Chukchi Sea and consequently the Pacific walrus is being considered for listing under the U.S. Endangered Species Act. Knowing the location and use of foraging areas is important as industrial and shipping activities increase. Satellite-linked dive recorders were placed on >50 adult female walruses (with and without calves) and tracked for up to 124 days. We identified Hanna Shoal, a known foraging area for walruses, and Icy Cape as two areas within the Alaskan Chukchi Sea with a higher than average density of dives. To evaluate the relative importance of these areas for foraging, we compared diving and haul out behavior within these two areas with that found in the rest of the Alaskan Chukchi Sea. Adult females (with and without calves) dove longer (6.2 vs. 4.5 min), made fewer dives (6.6 vs. 8.1 dives/hour), and hauled out for a larger proportion of time (22.1 vs. 17.0 min/hr) at Hanna Shoal than the other two areas ($P < 0.01$). Icy cape and the rest of the Alaskan Chukchi Sea did not differ statistically. Walruses in better quality habitat, with higher densities of prey, are expected to make fewer dives of longer duration and spend more time resting. As such, diving and haul out behavior indicated higher quality habitat near Hanna Shoal than Icy Cape and the rest of the Alaskan Chukchi Sea, which were similar to each other. Therefore, Icy Cape may not be higher quality foraging habitat than the Alaskan Chukchi Sea in general.

Society for Marine Mammalogy, 13–18 December 2015, San Francisco, CA

Appendix F-12. Crawford, J. A., L. T. Quakenbush, J. J. Citta, C. Irrigoo Jr. and P. R. Lemons. 2016. Using movement, diving and haul out behavior to identify the relative importance of foraging areas for walruses in the Alaskan Chukchi Sea. Alaska Marine Science Symposium, 25–29 January, Anchorage, AK. (Abstract and poster).

Using movement, diving and haul out behavior to identify the relative importance of foraging areas for walruses in the Alaskan Chukchi Sea

Justin A. Crawford[1*], Lori T. Quakenbush[1], John J. Citta[1], Clarence Irrigoo Jr.[2], and Patrick R. Lemons[3]

[1] Alaska Department of Fish and Game, Fairbanks, Alaska 99701;
[2] Walrus hunter and resident of Gambell, Alaska;
[3] U.S. Fish and Wildlife Service, Anchorage, Alaska 99503;
* Correspondence: Justin.Crawford@alaska.gov

Female Pacific walruses and their young summer in the Chukchi Sea, resting on sea ice between benthic feeding bouts, when sea ice is available. The rapid decrease of sea ice in summer is changing walrus habitat in the Chukchi Sea and consequently the Pacific walrus is being considered for listing under the U.S. Endangered Species Act. Knowing the location and use of foraging areas is important as industrial and shipping activities increase. We worked with walrus hunters from Saint Lawrence Island to deploy 88 satellite-linked dive recorders on walruses in the Chukchi Sea during three multi-agency walrus research cruises in June of 2013–2015. Of the 88 tagged walruses, 79 were females (34 of which were accompanied by calves of the year and 45 were not) and 9 were adult males. Walruses were tracked for up to 124 days. Using data from 2013 and 2014, we identified Hanna Shoal, a known foraging area for walruses, and Icy Cape as two areas within the Alaskan Chukchi Sea with a higher than average density of dives. To evaluate the relative importance of these areas for foraging, we compared diving and haul out behavior within these two areas with that found in the rest of the Alaskan Chukchi Sea. Adult females (with and without calves) dove longer (6.2 vs. 4.5 min), made fewer dives (6.6 vs. 8.1 dives/hour), and hauled out for a larger proportion of time (22.1 vs. 17.0 min/hr) at Hanna Shoal than the other two areas ($P < 0.01$). Icy cape and the rest of the Alaskan Chukchi Sea did not differ statistically. Walruses in better quality habitat, with higher densities of prey, are expected to make fewer dives, dives of longer duration and spend more time resting. As such, diving and haul out behavior indicated higher quality habitat near Hanna Shoal than Icy Cape and the rest of the Alaskan Chukchi Sea, which were similar to each other. Therefore, Icy Cape may not be higher quality foraging habitat than the Alaskan Chukchi Sea in general. Here we update our 2013 and 2014 results to include data from 2015.

Alaska Marine Science Symposium, 25–29 January 2016, Anchorage AK

Using movement, diving and haul out behavior to identify the relative importance of foraging areas for walruses in the Alaskan Chukchi Sea

Justin A. Crawford[1], Lori T. Quakenbush[1], John J. Citta[1], Clarence Irrigoo[2], and Patrick R. Lemons[3]

[1]Alaska Department of Fish and Game, Fairbanks, Alaska, Justin.Crawford@alaska.gov

[2]Walrus hunter and resident of Gambell, Alaska, [3]U.S. Fish and Wildlife Service, Anchorage, Alaska

Introduction

Pacific walruses (*Odobenus rosmarus*) winter in the Bering Sea. In spring, females move north with the receding sea ice and summer in the Chukchi Sea, resting on sea ice between benthic feeding bouts; most adult males remain in the Bering Sea where they rest on land. Over the past decade, sea ice in the Chukchi Sea has receded north beyond the shallow continental shelf in late summer. The rapid retreat of sea ice in summer is changing walrus habitat in the Chukchi Sea and, consequently, the Pacific walrus is being considered for listing under the U.S. Endangered Species Act. Knowing the location and use of foraging areas relative to industrial activities and shipping traffic in the Chukchi Sea is important.

Methods

- In association with a multi-agency (ADF&G, USFWS, and USGS) walrus research cruise in May and June of 2013–2015 we worked with hunters to **deploy satellite-linked transmitters on adult female walruses** in the Chukchi Sea (Fig. 1).
- We used a **state-space model** to predict locations to match the date and time of dive and haulout data.
- We **identified potentially important foraging areas** based on **kernel density estimates** of dive locations; high densities of dive locations suggest a higher quality foraging area (Fig. 2).
- **To evaluate the relative importance of areas identified for foraging**, we compared diving and haul out behavior within areas identified with that found in the rest of the Alaskan Chukchi Sea ("Other").
  - We used a repeated-measures mixed model to test for differences in:
    - **Dive rate**
    - **Dive duration**
    - **% of an hour hauled out**
  - Variables of interest included:
    - **Area of use**: determined by kernel density estimates
    - **Calf**: was the female with or without a calf of the year
    - **Time of day**
  - Models were fit using SAS software (PROCs MIXED and GLIMMIX) and the best model was selected using AICc.

Behavior expectations: In higher quality habitats, we expect walruses to:

- ↑ *Density of dive locations*
- ↑ *Dive duration*
- ↓ *Dive rate*
- ↑ *Hauled out (resting time)*

Figure 1. Clarence Irrigoo tagging walruses, June 2013.

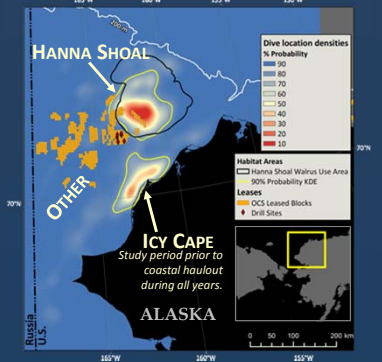


Figure 2. Kernel density estimates of dive locations used to predict potentially important foraging areas. We identified two areas as potentially important, Hanna Shoal and Icy Cape, and compared them to the rest of the Alaskan Chukchi Sea ("Other").

Results

- We deployed 80 satellite-linked transmitters on adult walruses.
  - 60 transmitters sent dive and/or haul out data (27 females with calves & 33 females without calves) while in the Chukchi Sea.
  - Tags transmitted an average of 53 days (range: 7–134 days).
- We identified **Hanna Shoal** and **Icy Cape** as two areas within the Alaskan Chukchi Sea with a high density of dives (Fig. 2).
- Adult females (with & without calves) **dove longer and made fewer dives at Hanna Shoal** than the other two areas ($P < 0.01$; Fig. 3).
- Adult females (with & without calves) **hauled out for a larger proportion of time at Hanna Shoal** than Icy Cape ($P < 0.01$; Fig. 3).
- **Adult females with calves hauled out longer** than females without calves at Hanna Shoal and Icy Cape ($P < 0.01$; Fig. 3).

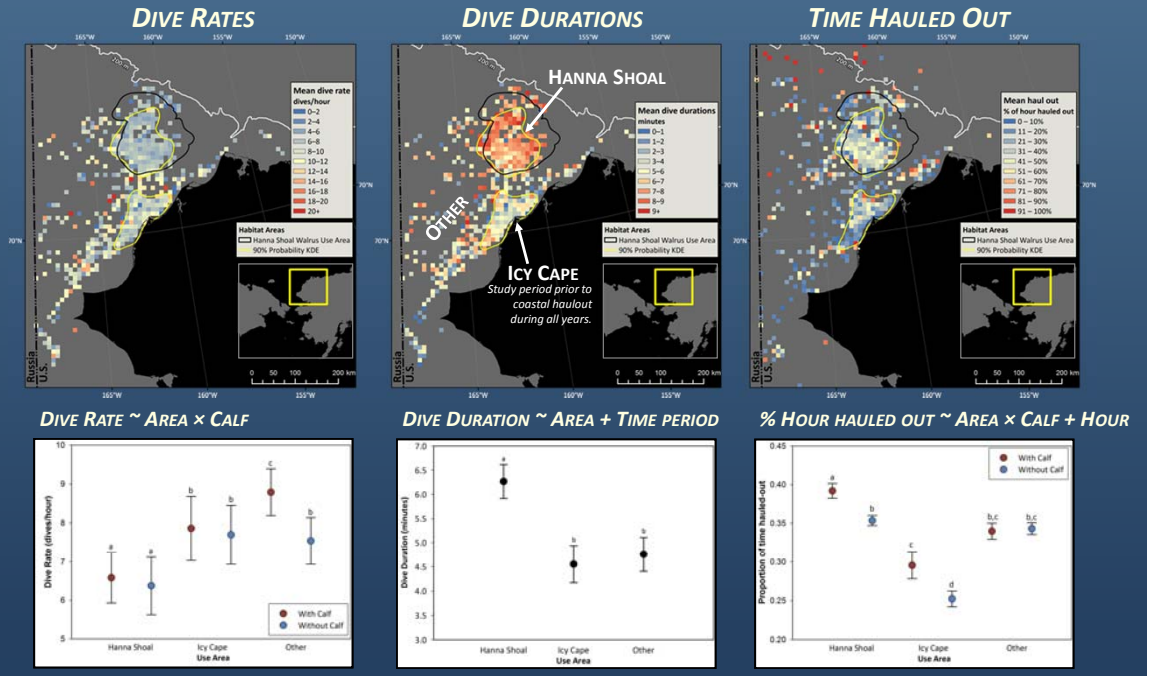


Figure 3. Spatial representation, final model from model selection, and results from final models of dive rate, dive duration, and %haul out. Differences by time are not shown but results reported do account for differences by time (time period for dive duration and hour for % hour hauled out).

Summary

- Foraging habitat near Icy Cape appears to be of lower quality than near Hanna Shoal.
- Activities associated with supporting a calf may obligate females with calves to haul out longer than females without calves.

Fewer dives of longer duration + More time hauled out → **Hanna Shoal** Higher quality habitat

More dives of shorter duration + Less time hauled out → **Icy Cape & rest of Chukchi Sea** Lower quality habitat

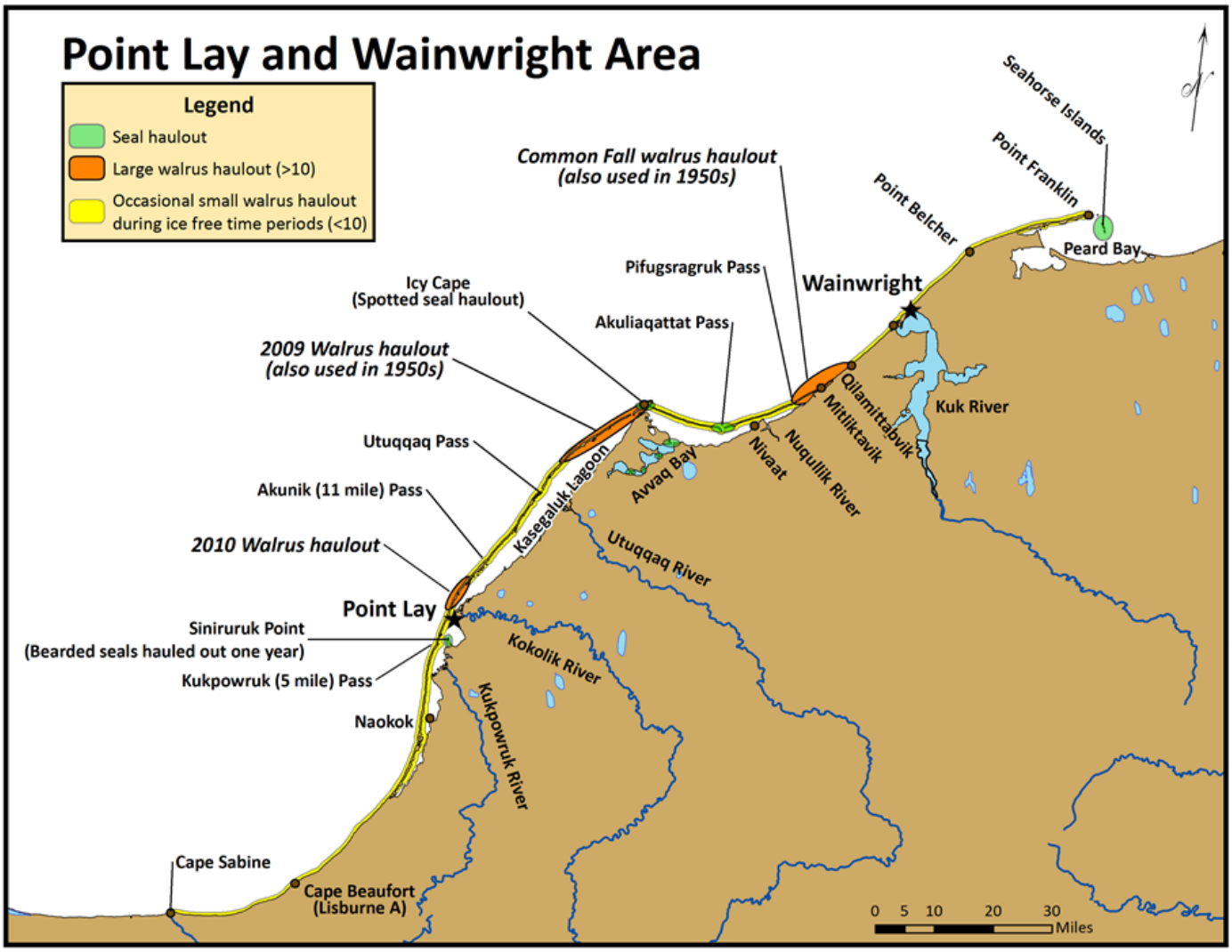
Acknowledgements

This project was primarily funded by the Bureau of Ocean Energy Management with additional support from the State of Alaska for research associated with the Endangered Species Act and marine mammals. We appreciate the support and assistance of the Eskimo Walrus Commission, the U.S. Fish and Wildlife Service (USFWS), and the U.S. Geological Survey. Research on walruses was conducted under permit #s: MA220876-0, MA220876-1, and MA039386-2 issued by USFWS and under ADF&G Animal Care and Use Permit #s: 2013-20, 2014-03, 2015-25. We thank the captains and crew of the R/V Norseman II and R/V Professor Multanovskiy for their skill in accommodating our challenging walrus research objectives.

Appendix G. Traditional Knowledge reports listed chronologically.

Appendix G-1. Huntington, H. P., M. Nelson, and L. T. Quakenbush. 2012. Traditional knowledge regarding walrus near Point Lay and Wainwright, Alaska. Report to the Eskimo Walrus Commission and the Bureau of Ocean Energy Management for contract #M09PC00027. 11 pp.

Traditional Knowledge Regarding Walrus near Point Lay and Wainwright, Alaska



Traditional Knowledge Regarding Walrus near Point Lay and Wainwright, Alaska

By:

Henry P. Huntington
Huntington Consulting
Eagle River, Alaska
hph@alaska.net
Ph: (907) 696-3564

Mark Nelson & Lori T. Quakenbush
Alaska Department of Fish and Game
Fairbanks, Alaska
mark.nelson@alaska.gov, lori.quakenbush@alaska.gov
Ph: (907) 459-7374, (907) 459-7214

Final Report
Approved December 2012

Final report should be cited as:
Huntington, H.P., M. Nelson, and L.T. Quakenbush. 2012. Traditional knowledge regarding walrus near Point Lay and Wainwright, Alaska. Final report to the Eskimo Walrus Commission and the Bureau of Ocean Energy Management for contract #M09PC00027. 11pp.

Introduction

Walrus are an important species for subsistence harvests by Iñupiat hunters in northern Alaska. They are also an iconic Arctic animal, and at risk from climate change. Increasing industrial activity in the Chukchi Sea is an additional potential stressor to walrus. The study of walrus distribution, behavior, and movements is an important contribution to monitoring the effects of a changing environment and the potential effects from industrial activity. Placing satellite transmitters on walrus provides detailed information about the movements and some behaviors of individual animals. Documenting traditional knowledge about walrus, through interviews with residents of coastal communities, provides complementary contemporaneous and historical information about general patterns in walrus distribution, movement, and behavior.

This report summarizes information gathered from interviews with hunters and other knowledgeable residents in Point Lay and Wainwright, Alaska, in March 2011. This traditional knowledge project used the same approach that the Native Village of Savoonga used when documenting traditional knowledge about bowhead whales on St. Lawrence Island (Noongwook et al. 2007).

Methods

We used the semi-directive interview method, in which the interviewers raise a number of topics with the person being interviewed, but do not rely solely on a formal list of questions (Huntington 1998). Instead, the interview is closer to a discussion or conversation, proceeding in directions determined by the person being interviewed, reflecting his/her knowledge, the associations s/he makes between walrus and other parts of the environment, and so on. The interviewers use their list of topics to raise additional points for discussion, but do not curtail discussion of additional topics introduced by the person being interviewed. In Point Lay, the interviews were conducted individually. In Wainwright, one group interview was conducted.

The topics identified by the research team in advance of the interviewers were:

Walrus distribution and abundance near communities
Distribution and sightings of walrus throughout the year
Walrus haul-out patterns on land
Sensitivity of walrus to various types of disturbance
Haul-out patterns of other pinnipeds
Changes over time for all of the topics

The results are presented under different headings, reflecting the actual information collected and the fact that some of the subjects blend together, especially changes seen over time in regard to all of the topics. The interviewers were Henry Huntington and Mark Nelson. Lori Quakenbush is the project leader.

Point Lay

In Point Lay, we interviewed five people individually: Leo P. Ferreira III, Willard Neakok, James Tazruk, and Bill Tracey Sr., and one person who chose to remain anonymous. The interviews were conducted on 15 and 16 March 2011, at various locations in Point Lay.

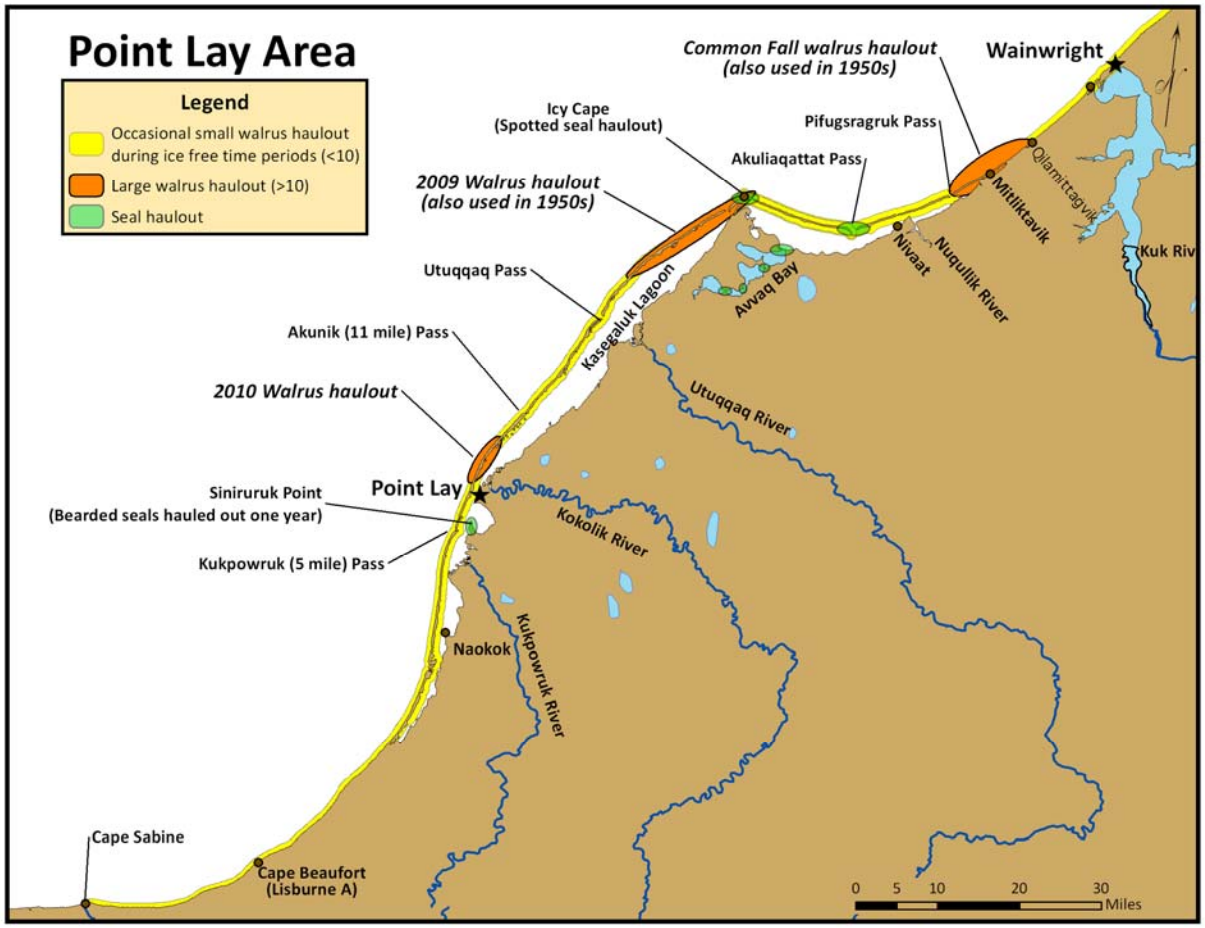


Figure 1. Seal and walrus haulout sites as recorded during traditional knowledge interviews in Point Lay.

Walrus

Walrus are seen in the Point Lay area primarily in spring and fall. In May and early June, they are seen on sea ice, particularly during break-up when hunters are out hunting for bearded seals (*ugruk*) and walrus from boats. The walrus generally travel north with the ice, in groups of a few animals to a few dozen. Occasionally, walrus are seen feeding in the passes to Kasegaluk Lagoon, in the open water there at the start of break-up. A few stragglers are occasionally seen swimming north after the ice has gone. Lone walrus are not often seen, and may be sick or tired. One hunter reported seeing a walrus in an open lead one March near Wainwright, on a day when he also saw a huge bowhead whale in the lead. There was a large breathing hole nearby and it was speculated that the walrus spent part of the winter using this breathing hole. This was a one-time occurrence.

In late August and September, walrus are seen hauled out on land. Typically, a few walrus are seen at various locations along the barrier islands that form Kasegaluk Lagoon. They may also be seen farther south, at Cape Sabine and Cape Beaufort. Larger numbers are sometimes seen east of Icy Cape, at the entrances to Avvaq Bay, and between Utuqqaq Pass and Icy Cape. Elders who are no longer alive reported seeing large numbers of walrus hauled out between Point Lay and Wainwright in the 1950s, too. A few walrus may be seen in Kasegaluk Lagoon, but this is not common, and those walrus may not be healthy.

In 2009 and 2010, however, much larger numbers of walrus hauled out on shore. In 2009, the main haul-out was near Icy Cape. In 2010, some 20,000 walrus hauled out on the barrier islands a mile or two north of Point Lay, and walrus were seen in the water all the way to Icy Cape. Although not the first time large haul-outs had been seen, this was the first time one had occurred so close to the community. Most of the walrus hauled out appeared to be juveniles and females. Few large bulls were seen. Large haulouts like this had been seen only occasionally previous to 2009, typically north of Point Lay near Icy Cape.

Walrus on land are sensitive to smells, noises, and movements of other animals. Persons approaching from upwind who are wearing cologne, have been smoking, or have been drinking strong coffee will cause the walrus to take notice and, if the approach is close enough, to flee. Outboard motors and gunshots also cause walrus to flee. Boaters have to be especially careful in the vicinity of haul-outs, since many walrus are in the water and may attack a boat if provoked. Walrus may react more to persons whispering than to those talking in conversational tones, perhaps because they distinguish stalking and hunting behavior from non-threatening curiosity. The sight of a person approaching on foot, or the sight of a polar bear or brown bear, will also cause walrus to flee. Hunters approaching carefully, however, can get within a few yards without causing the walrus to react.

In 2010, the walrus hauled out near Point Lay could be heard from the village, especially in the morning and evening. The walrus were constantly going to and from the haul-out, but may have been even more active in morning and evening. Community residents avoided the haul-out, adjusted boating routes and behavior to avoid disturbing the walrus, and requested airplanes to stay at least 1500 feet above the haul-out. Planes landing at the Point Lay runway approached and took off from the inland end of the runway rather than over the lagoon and the haul-out. The community also regulated the presence of visitors, turning down most media requests to visit the haul-out.

As a result, relatively few walrus were killed on the haul-out site. In previous years, a few walrus carcasses could usually be found between Cape Sabine and Icy Cape. In 2009 and to a lesser extent in 2010, more walrus carcasses have been found at the sites of the large haul-outs, most likely from stampedes caused by disturbance of one kind or another. The higher mortality in 2009 was likely due to greater disturbance, as there were more reports of brown bears and polar bears in the area that year. Most of these carcasses are younger walrus. Polar bears, wolverines, and gulls scavenge the carcasses.

Apart from the recent changes in haul-out locations and the number of animals hauling out, Point Lay residents have seen few if any changes in walrus abundance, distribution, and behavior.

Very rarely, walrus have three or four tusks. One hunter reported seeing an albino walrus, with white skin and red eyes.

Some walrus are seen with dark skin, the color of bearded seals. These are sometimes called the "kings of the walrus." Large bulls may overwinter in the Chukchi Sea, too, maintaining breathing holes in the ice.

Walrus are not seen during the time when the barges are delivering supplies to Point Lay. Whether the walrus have not yet returned from farther north and offshore, or whether the barges keep the walrus away, is not clear. The barge traffic is concentrated in a week or two in late summer.

Walrus body condition appears to be good, with no change over time.

Seals

Bearded seals and spotted seals are often seen hauled out on the barrier islands, particularly next to the passes into Kasegaluk Lagoon. Spotted seals are especially common on small islands on the north side of Utuqqaq Pass and also at the entrance to Avvaq Bay. A few dozen animals are seen at the former location, and several hundred may be seen at the latter. Bearded seals are seen at the entrances to other passes, and sometimes both bearded and spotted seals are seen hauled out together. On one occasion, a large number of bearded seals were seen hauled out on the mainland at Siniruruk Point just south of Point Lay, inside the Lagoon. More seals haul out north of Point Lay than to the south, perhaps because of more abundant fish.

Ringed seals are rarely seen hauled out on land. When hunters have seen them, the ringed seals are alone, and hunters suspect they may be ill or exhausted. Unlike bearded and spotted seals, ringed seals on land do not flee the approach of hunters.

Seals feed at the passes throughout the summer, and young bearded seals may be found up rivers chasing fish.

On haulouts, seals are sensitive to noise, such as outboard engines or gunshots.

Since the walrus have been hauling out near Point Lay, fewer seals have been seen because seals avoid walrus.

In late spring, ringed and bearded seals can be seen on the ice, basking in the sun, as far as the eye can see.

Other Information

There is a north-running current about 10–15 miles offshore from Point Lay. In this area, seals and birds are often found, feeding on the plankton and fishes carried by the current.

In 2010, some 200 porpoises (harbor porpoises, *Phocoena phocoena*) were seen swimming along the barrier islands near the walrus haul-out. There appeared to be no interaction between the walrus and the porpoises. Beluga whales, on the other hand, behave differently when there are walrus around, appearing more nervous and harder to herd and hunt.

Wainwright

In Wainwright, we held one group interview with 13 people: Enoch Oktollik, Andrew Ekak, Leslie Segevan, Artie Kittick, Jack Oktollik, Edwin Tazruk, Edward Kagak, and six interviewees who chose to remain anonymous. These men ranged in age from about 30 to 70+, providing a wide range of experience over time. The group interview format also allowed a great deal of interaction among the participants, including sharing of information across generations.

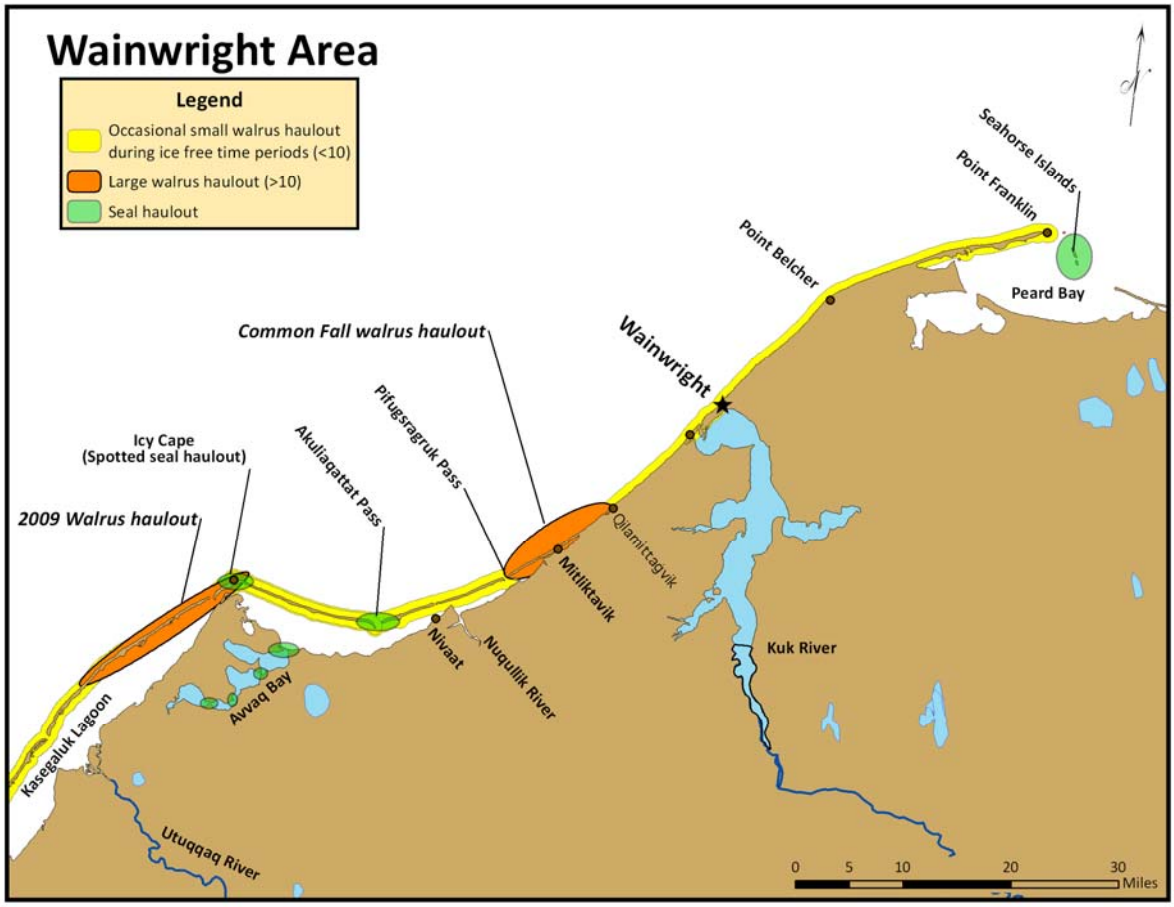


Figure 2. . Seal and walrus haulout sites as recorded during traditional knowledge interviews in Wainwright.

Walrus

Walrus are seen in the Wainwright area primarily in spring and fall. In May, June, and July, they are seen on the ice moving northwards, though they are now rarely seen in July because the ice has started breaking up earlier. In the 1940s, 1950s, and into 1960s, walrus were brought near land by south winds in spring on ice floes right in front of the village; 1964 was the last time this happened. The ice floes would appear brown like land due to the number of walrus on them, and hunters would select smaller herds to hunt. Today, fewer walrus are seen hauled out on top of the ice. Hunters go far offshore in search of walrus after the ice breaks up. Formerly, the ice would leave shore but return at various times, each time bringing more seals and walrus back with it. Now, the ice leaves shore in June rather than July and does not return, making for a short

hunting season for ice-associated seals and walrus. Hunters have had to pursue walrus in the water rather than on the ice. In about 2008, no walrus were seen at all, having migrated past the Wainwright area before the shorefast ice broke up and boating was possible. Last year, hunters went 40 miles offshore but did not see walrus.

In fall, a few walrus are seen hauled out on the beach in both directions from Wainwright, usually alone or in groups or two or three. Larger groups are occasionally seen hauled out on shore. In the late 1940s, a group of skinny, apparently ill walrus were seen on the Seahorse Islands in Peard Bay; these islands were a common haulout area during that time. About 40 years ago, ~3,000 walrus were seen hauled out at Cape Sabine. This was regarded as unusual. Near Point Franklin, 10 or so walrus hauled out in fall is a regular occurrence. In the late 1990s, some walrus occasionally hauled out at the western end of Peard Bay. More recently, hunters saw a lone, old, sick walrus there. In 2009, many walrus hauled out at Icy Cape, but this too was unusual, a response to lack of ice. A walrus was once seen in the Kuk River lagoon behind Wainwright. In fall, walrus are much more alert and wary than in spring, fleeing the hunters' approach rather than just staying on the ice, making them harder to hunt.

Walrus are seen in winter, though rarely. They maintain breathing holes like seals do. These walrus appear to be seal-eating walrus, living off of the seals that are also present all winter.

Walrus in the water are dangerous to boaters, especially juvenile walrus. Larger herds are also more dangerous to people. Walrus are especially protective of their pups, so hunters are instructed by their elders to avoid hunting groups of females that might have pups with them. Hunters are also told not to hunt additional walrus after they have caught some already and are butchering those, or the other walrus may become aggressive and attack. When today's elders were young, two of them shot at walrus while the older men were butchering walrus already. The other walrus surrounded the floe, putting their tusks up on the ice, threatening to start chipping the floe away. The older hunters admonished the younger men, and then spoke to the walrus in Iñupiaq, and the walrus went away. Wounded walrus may also attack hunters.

A "dog" walrus is sometimes seen. This is a white walrus, with red eyes and a very long tail. It commands the other walrus, using its tail like a whip to control the others. It can give the signal to attack, so hunters are wary of the dog walrus.

Walrus on land are sensitive to disturbance, so the community tries to avoid large haulouts. If a person approaches a large group on land, the walrus may stampede, possibly crushing younger animals. Wainwright residents admired Point Lay's approach to managing access to the haulout there in the fall of 2010.

In the 1940s and 1950s, when walrus would come close to the beach on the ice, the older hunters would tell everyone to keep quiet in the village, so as not to disturb the walrus. The older hunters emphasized respect for the animals, taking only what you would eat and not more. They were very strict in their teaching and their own behavior. Today's hunters have a responsibility to pass those lessons and values on to the younger generations, to teach them how to care for the animals that have sustained the Iñupiat for thousands of years and which the elders and hunters hope will sustain people here for thousands more years.

Walrus today are in good physical shape, healthy and good to eat. Walrus that are hauled out alone or in small groups may be sick or tired, perhaps from having to swim so far from their feeding areas. This is especially hard for young walrus, whereas older adults can survive longer swims and longer periods without food. Mother walrus will sometimes carry their pups on their backs while swimming.

In the early 1960s, hunters returning from taking walrus on the ice near Point Franklin encountered a long line of walrus feeding underwater on the seafloor. The hunters, knowing the walrus were dangerous, had to detour far offshore to get around the feeding walrus.

Walrus usually have clams in their stomachs, but octopus and strips of ringed seal have been found, too. Walrus can rest in the water as well as on ice and on land. They inflate their throats with air, which keeps them floating with their nostrils above water, and they can sleep in the water.

Hunting patterns have changed over the years, largely in response to larger boats and more powerful outboard motors. Hunters used to work together with several boats, but now it is common for boats to travel alone when hunting walrus in the ice.

Seals

Seals haul out on land. They haul out all along the beach in both directions from Wainwright, sometimes going up on the bluff. Spotted and bearded seals have been seen hauled out near Icy Cape since at least the 1930s. In the summer of 2010, many young ringed seals were hauled out on the beach. Some died, some were just very tired. Perhaps this was due to the lack of ice. The cause of death was unclear, and seagull predation prevented the collection of fresh carcasses for further examination.

Bearded seals swim up rivers.

Ringed and bearded seals have thinner blubber now than they used to. The blubber is also a different color, more yellow than it used to be. The taste of the meat has also changed, and this is true of many subsistence species, including marine mammals and waterfowl.

Other Information

Hunters are concerned about the possible impacts of offshore activity, including ship traffic and oil drilling. The activity may displace walrus and other animals, moving them farther from their feeding grounds. If the walrus are pushed away from shore, they will be even harder to hunt. If they are pushed closer to shore, they will have to swim a long way to feed. Changing sea ice is not the only thing affecting walrus.

If animals are harder to hunt, people's diets may change, too. Although there are concerns about contaminants in subsistence foods, hunters also like the taste of their traditional foods and know that those foods are nutritious, too. There were many concerns about the potential for radiation from the nuclear power plant disaster in Japan to reach Alaska and the animals people eat.

In the summer of 2010, there was a red tide algae bloom between Barrow and Wainwright. This was the first, or one of the first, times such an event was seen here. The hunters are concerned that the algae could affect mollusks, shrimp and krill, and the entire foodweb.

There was also concern about the potential impacts of polar bears and other species being listed as threatened or endangered under the Endangered Species Act. Hunters were concerned about the potential for regulation of subsistence hunting for marine mammals, and also about the effects of critical habitat designations on the community.

The ice is thinner in recent years than it used to be. Formerly, large floes of multi-year ice would arrive in fall and serve as "anchors" to the newly forming ice, creating a solid shorefast ice zone and allowing the ice to grow thick. Now, the thinner ice can be carried away whenever the water rises.

Killer whales will respond to calls for help from hunters. If walrus are threatening hunters, killer whales will come and scare the walrus away, allowing the hunters to return home safely.

Animals understand when they are spoken to in Iñupiaq.

Hunters are concerned about the state of their ice cellars, which are being affected by climate change. The City of Wainwright is considering purchasing some large freezers for community use, but these may not have the right temperature and variation in temperature to allow the foods to age properly to produce the delicacies that people greatly enjoy.

Acknowledgements

We appreciate the support of the Eskimo Walrus Commission for this project and are grateful to commissioners Willard Neakok, for identifying participants and helping to set up interviews in Pt. Lay, and Enoch Oktollik for similar assistance in Wainwright. The Bureau of Ocean Energy Management (BOEM) funded the work as part of BOEM AK-09-01 and we appreciate the support of Charles Monnett and Catherine Coon. Justin Crawford prepared the maps used during the interviews and the figures in this report.

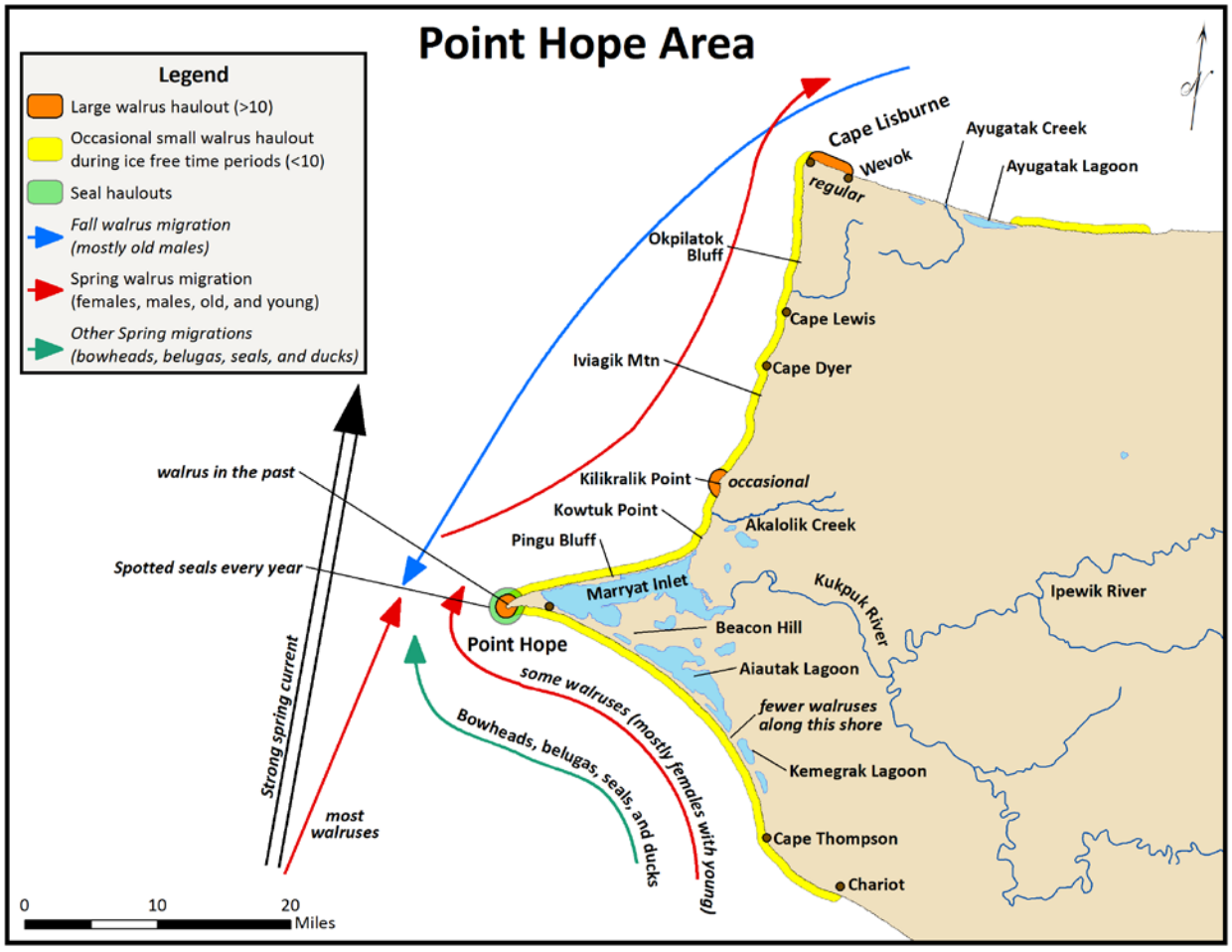
References

Huntington, H.P. 1998. Observations on the utility of the semi-directive interview for documenting traditional ecological knowledge. Arctic 51(3):237-242.

Noongwook, G., the Native Village of Gambell, the Native Village of Savoonga, H.P. Huntington, and J.C. George. 2007. Traditional knowledge of the bowhead whale (*Balaena mysticetus*) around St. Lawrence Island, Alaska. Arctic 60(1):47–54.

Appendix G-2. Huntington, H. P., and L. T. Quakenbush. 2013. Traditional knowledge regarding walrus near Point Hope, Alaska. Report to the Native Village of Point Hope, Alaska and Bureau of Ocean Energy Management for contract #M09PC00027. 9 pp.

Traditional Knowledge Regarding Walrus near Point Hope, Alaska



By:
Henry P. Huntington
Huntington Consulting
Eagle River, Alaska
hph@alaska.net
Ph: (907) 696-3564
and
Lori T. Quakenbush
Alaska Department of Fish and Game
Fairbanks, Alaska
lori.quakenbush@alaska.gov
Ph: (907) 459-7214

November 2013

This report is part of a project titled “Walrus Habitat Use in the Potential Drilling Area (Chukchi) - Village-Base Walrus Studies, contract #M09PC00027 funded by The Bureau of Ocean Energy Management (BOEM) and should be cited as follows:

Huntington, H.P., and L.T. Quakenbush. 2013. Traditional knowledge regarding walrus near Point Hope, Alaska. Report to Native Village of Point Hope and Bureau of Ocean Energy Management for contract #M09PC00027. 9 pp.

Traditional Knowledge of Walrus along the Northern Chukchi Sea Coast, Alaska: Point Hope

Introduction

Pacific walrus are an important species for subsistence harvests by Iñupiat hunters in northern Alaska. They are also an iconic Arctic animal, and at risk from climate change. Increasing industrial activity in the Chukchi Sea is an additional potential stressor to the walrus population. The study of walrus distribution, behavior, and movements is an important contribution to monitoring the effects of a changing environment and the potential effects from industrial activity. Placing satellite transmitters on walruses provides detailed information about how some individual animals are moving and behaving now. Documenting traditional knowledge about walrus, through interviews with residents of coastal communities, provides complementary information about general patterns in walrus distribution, movement, and behavior in the present and in addition provides a way to compare the present with the past.

This report summarizes information gathered from interviews with hunters in Point Hope, Alaska, in January 2013. This traditional knowledge project used the same approach that the Native Village of Savoonga used when documenting traditional knowledge about bowhead whales on St. Lawrence Island (Noongwook et al. 2007).

Methods

We used the semi-directive interview method, in which the interviewers raise a number of topics with the person being interviewed, but do not rely solely on a formal list of questions (Huntington 1998). Instead, the interview is closer to a discussion or conversation, proceeding in directions determined by the person being interviewed, reflecting his or her knowledge, the associations made between walrus and other parts of the environment, and so on. The interviewers use their list of topics to raise additional points for discussion, but do not curtail discussion of additional topics introduced by the person being interviewed.

The topics identified by the research team in advance of the interviewers were:

Walrus distribution and abundance near communities
Distribution and sightings of walrus throughout the year
Walrus haul-out patterns on land
Sensitivity of walrus to various types of disturbance
Haul-out patterns of other pinnipeds
Changes over time for all of the topics

The results are presented under different headings, reflecting the actual information collected and the fact that some of the subjects blend together, especially changes seen over time in regard to all of the topics. The interviewers were Henry Huntington and Lori Quakenbush. Lori Quakenbush is also the project leader.

Point Hope

In Point Hope, we interviewed eight people during three interviews; one with two hunters, one with six hunters (including one of the two from the first interview), and one with one hunter. Hunters interviewed included Theodore Frankson, Jr., Isaac Killigvuk, Sr., Henry Koonook, Ronald Oviok, Sr., and four others who chose to remain anonymous. Interviews were conducted on 10 and 11 January 2013 at the Qalgi Center in Point Hope. Five hunters shared the number of years that they have been observing walrus; the average was 40 years with a range of 26 to 50+ years.

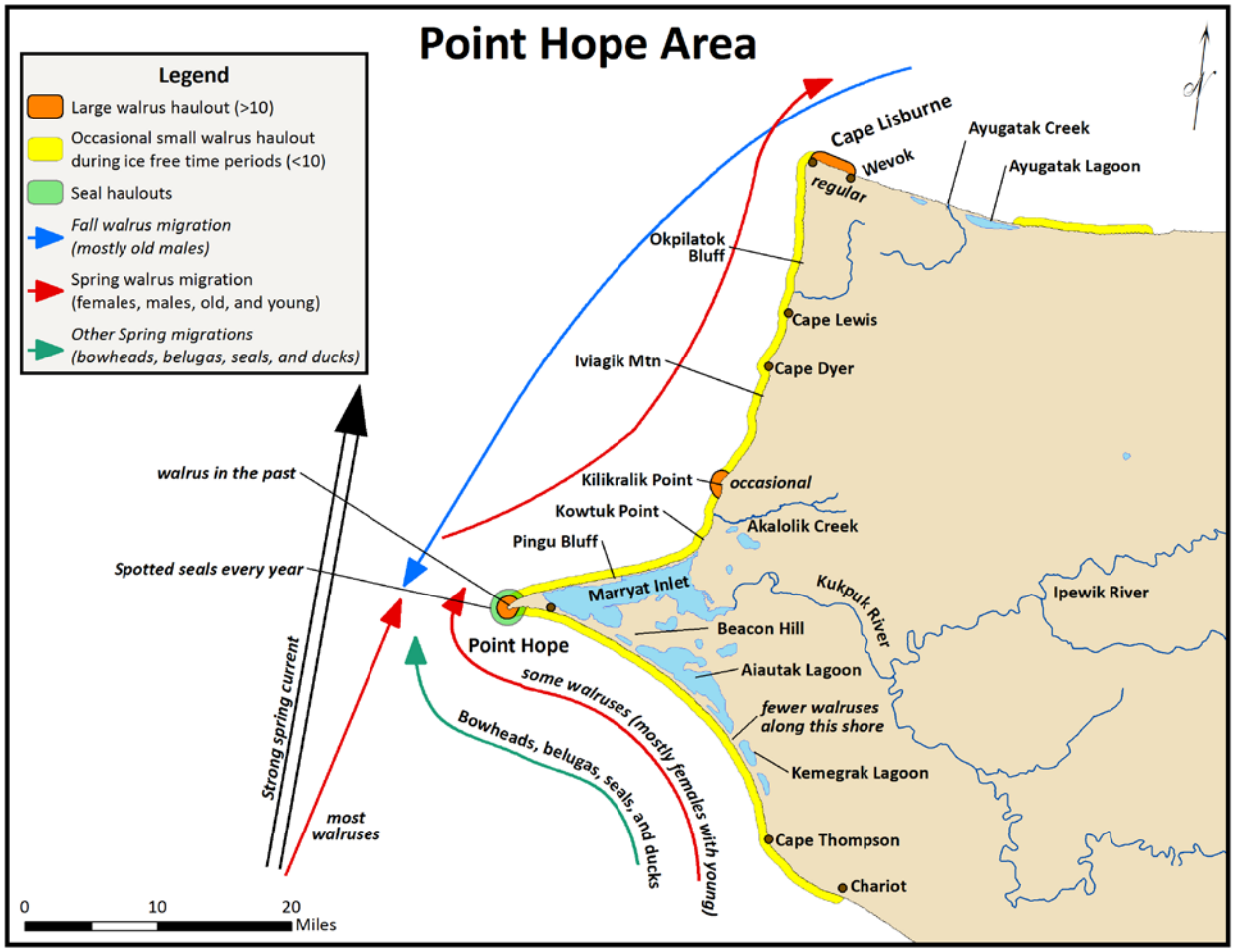


Figure 1. Seal and walrus haulout sites and general walrus migratory routes as recorded during traditional knowledge interviews in Point Hope. Other marine mammals and birds are also noted.

Walrus

Walrus typically arrive in the Point Hope area in May, after whaling season. Sometimes a few walrus have been seen migrating past in early spring, before whaling. Oddities like this happen from time to time. June and July is when they really start coming, after the bowheads and belugas have gone past. Some walrus migrate close to the shore, coming from the southeast, either riding on ice floes or swimming in open leads or cracks in the ice close to shore. They can sometimes be heard well in advance of their arrival near the village. Most walrus arrive from the

south or southwest, coming close to land only when they reach Point Hope itself. Hunters call them in by making sounds like a dog with a sore throat. Female walrus swim past Point Hope; there are also many seals here then, as long as there is still ice. Walrus are occasionally seen swimming south in spring. The spring migration includes walrus of all kinds: male, female, old, and young.

In the past five or so years, the walrus have not been coming as close to the point as usual, but appear to be traveling farther offshore as they pass Point Hope. Fewer males are seen in spring now, and fewer walrus overall. Thousands used to be seen, and now only a few hundred each year. Some hunters attributed this change to greater use of outboard engines as well as increased ship traffic in the region. The walrus are affected not just by the noise of the boats, but also by the smell of the fumes from the fuel and the engines. The shift in location also coincides with changes in sea ice, notably the loss of thick ice in winter (although the winter of 2011–2012 had thick ice as used to be the case every winter). Walrus may also be following the paths of ships that go through the ice in late spring.

In late September and October, the walrus migrate from the north, past Cape Lisburne and Point Hope. At this time of year, most of the walrus seen are older males. Fewer walrus are seen in fall than in spring. Few walrus were seen in fall 2012, only a few groups of a few walrus. A “winter walrus,” also known as an “aivialuq,” or as a “king walrus” is sometimes seen in the ice. These are very large animals.

During the fall migration, many walrus haul out on land just to the east of Cape Lisburne. This is a regular haul-out, with perhaps dozens of animals on land at any given time. In recent years, there have been fewer walrus here, perhaps due to barge traffic. Barges occasionally wait at Cape Lisburne for weather or ice, and they can disturb the walrus and keep them away.

Walrus occasionally haul out in similar numbers about halfway between Cape Lisburne and Point Hope, just to the north of Kilikralik Point. On at least one occasion in the 1940s, more than 60 walrus hauled out at Point Hope itself. Many were hunted, and people ate walrus for breakfast, lunch, and dinner. Walrus have not hauled out at the point recently. Most of the walrus that haul out on land are males.

One or two walrus may haul out anywhere along the shore from Cape Thompson to Point Hope to Cape Lisburne. This also occurs east of Ayugataq Lagoon, to the east of Cape Lisburne.

Some of the individual walrus coming to shore are following small seals, which they kill and eat. Only older male walrus eat seals. Elders said that walrus would sometimes come out of the water onto the ice to take seals. A hunter was once charged by a walrus on the beach. The walrus came very close, but then turned and went back in the water.

In the late 2000s, some people noticed yellow coloring on the flippers and around the mouths of a few walrus. Some of these drifted back in from the north side of Point Hope during the spring migration. This behavior was not unusual in itself, but due to the yellow coloring the elders said not to eat these animals. The yellow coloring has not been seen any other time. The Point Hope hunters who were interviewed have not seen walrus with green flippers or lips.

Hunters are seeing more skinny and sick walrus in spring in recent years. One male walrus taken in the fall of 2012 was ill. One walrus taken in spring 2012 had a hole in one side of its skull, although no obvious bullet hole in the hide. Its face was swollen and it smelled like a rotten tooth or worse. This animal was skinny.

A walrus with a satellite transmitter was taken in fall 2011. The walrus was healthy, and there did not appear to be any problems at the place where the transmitter was attached to the walrus's skin.

People hunt whales and then bearded seals, for the skins to make umiaq covers, and then after getting the bearded seals they need, they start hunting walrus.

People in Noorvik saw a walrus in the Kobuk River two or three years ago. Noorvik people said there was a monster in the river, as they were not used to seeing walrus.

Seals

In spring, seals and polar bears come to the Point Hope area before whaling season. They can be found in the Point Hope area during winter.

Spotted seals haul out at the tip of Point Hope every year in the summer and mainly in the fall. The group is usually about 20–30 seals. Spotted seals are usually seen on the south side of the point. About fifteen years ago, hunters traveling by boat saw about 300 spotted seals hauled out on the ice on the north side of Point Hope. They had not seen such a large aggregation of spotted seals on the ice before.

Some hunters prefer the meat of ringed and bearded seals to that of spotted seals but they do use the skin and blubber of spotted seals. One hunter said he liked the meat of spotted seals better than ringed seals. Spotted seal meat has a very strong taste. Spotted seals are much smarter than other seals. Occasionally, a black spotted seal is seen. A group of spotted seals was once seen scaring a single walrus off the beach.

Ringed seals sometimes haul out on the beach in summer. These are usually young seals. Ringed seals haul out on the ice all around the Point Hope area.

Ringed seals may swim into Marryat Inlet and up the Kukpuk River, hauling out on the bank. Spotted seals have also been seen upriver. This is new behavior, going so far up the Kukpuk.

In 2011, many small ringed seals were seen on the beaches near Point Hope, with sores around their eyes and mouths and on their tails. They were very skinny and did not move when people approached, unlike healthy seals. About half a dozen of these sick seals were seen in the fall of 2012 as well. Hunters did not want to touch these sick seals. One hunter described the lesions on the seals as looking like "scratches" on the face and hind flippers. When hunters were taking seals in June and July, they noticed small, fast-moving bugs on the hind parts of the seals. This was new. A few sick seals and bearded seals are typically seen in early summer (late May through July).

One hunter wondered if the hair loss on seals could be due in part to sun exposure. He said that the hairless areas appear to be the areas that would be in the sun when seals are hauled out on the ice in spring. He once saw a ribbon seal with hair loss. Another hunter was worried about the melting of the ice cap making the water more fresh and causing problems.

Seals seen in winter appeared healthy. Many ringed seals are being taken now (January 2013) from the ice edge. During south and east winds there is good winter seal hunting around Kowtuk Point. Ringed seals are abundant and healthy in the Point Hope area.

In March, ringed seals taste like stove oil, due to the rut.

In the late 1960s, a hunter caught a pregnant female ringed seal that had a two-headed fetus.

According to the hunters who were interviewed, the women in Point Hope say that the seal oil is changing because the blubber has been getting darker in color, though it is still edible. The blubber is darker yellow or darker pink, and sometimes with some green color. This change, from orange-yellow blubber to a greener color, has been happening over the last five years or so.

Bearded seals have not been seen on the beach, but they do haul out on the ice in spring. Bearded seals are more commonly seen on ice to the north of Point Hope, but they are seen on ice to the south, too.

In the spring of 2012, two bearded seals were caught that were skinny, with yellow blubber. When hunters tried to move one of them, its whiskers pulled out by hand, instead of needing to be pulled out by pliers as is normal.

Other Information

Point Hope is a good location for hunting because there is open water on the south side if the wind is from the north, and on the north side if the wind is from the south. Point Hope hunters are patient—they go out and wait for the animals to come. The past year, 2012, was a good year for hunting, in that the animals were healthy and edible. There was, however, much erosion along the shoreline.

In spring, all marine mammals come past Point Hope. Hunters let the first animals of each species go past, and then start hunting. This is similar to leaving a few eggs in nests when gathering eggs, to provide for the future.

Every summer, killer whales come past Point Hope, but they are not seen as much anymore. Hunters would talk with killer whales. One does not have to talk loudly. Sometimes people would give a piece of maktak or blubber to the killer whales, but otherwise people would not bother them. Killer whales eat other whales. People have seen killer whales attacking gray whales. On one occasion, two killer whales grabbed the gray whale's flippers and pushed it to the beach, while a third killer whale ate the gray whale's tongue. On one occasion, a bowhead whale carcass washed ashore on the north side of the point, with killer whale bite marks and no tongue.

A Steller sea lion was caught just north of Point Hope in the 1980s.

A live elephant seal was seen at the point in the 1980s.

A narwhal carcass was found washed up on the beach north of Point Hope in the 1970s.

Two dead minke whales were found under the ice two to three years ago.

In spring 2012, there were many polar bears on the ice during whaling season. One whaling captain saw 12 polar bears near his camp at one time. The bears were most large males, and appeared healthy. The ice that spring was thick and solid, the way it used to be every year.

In spring 2012, hardly any fish came past Point Hope. People usually get salmon, but not in the summer of 2012.

In October 2012, blue tomcod washed up on the north side of the point. They had not been seen for some time. These are the fish that seals eat. Many types of invertebrates also washed up, including clams and mussels.

Point Hope used to catch small tomcod, but now they are getting larger ones, similar to those caught at Kotzebue. This change started a couple years ago.

Recently, fish were seen acting oddly on the north side of the point. They were swimming ashore, trying to get out of the water. Some of them had lesions, like something was eating away the scales and flesh on their sides.

Once in a while, people see small, skinny trout coming by. These are believed to be from the rivers near Kivalina or from the Noatak.

A live shark washed up on the south side of the village, near Beacon Hill. Another shark was found on the north beach.

Caribou do not come as close to Point Hope as they used to. The caribou used to go all the way to the point, past the old village site. Hunters have seen a small plane scaring the caribou away. A recently installed U.S. Coast Guard navigational beacon at Beacon Hill also appears to prevent caribou from coming farther west. This station is about five miles east of Point Hope. It has a light on it, and the light appears to be responsible for scaring the caribou.

In fall 2012, there were many wolves near Point Hope. One was taken in summer near the snow fence on the edge of the village.

Hunters are struggling now to get the animals they need. There is too much traffic in the air and on the sea. Too many ships travel close to the point, in the migratory path of marine mammals and where people hunt. This deflects the animals away from the point, making them harder to get

and requiring longer trips that use more gas and thus are more expensive. This is a big concern for Point Hope hunters.

Sometime in the 1980s there was a really loud ship in the Point Hope area. Seismic testing between Point Hope and Cape Lisburne resulted in a loss of tomcod and clams in the Point Hope area, and created a wider environmental disturbance. Seals eat the tomcod, so the loss of fish affected the seals. Walrus eat clams, so the loss of clams affected the walrus. The walrus and seals appear to have moved to other places, since fewer are seen now.

There was too much rain this summer; it was not a good berry year.

In spring there is a very strong north current about 10–15 miles off Point Hope. Hunters try not to travel that far offshore, to avoid being carried north.

The ice in the winter of 2012 was 5–7 feet thick, as it used to be before the ice started thinning. But it left in May and did not return. The ice used to come and go in summer, but now it leaves and is gone until fall.

Around 1970, there was a big surge of ice on the north side of the point, pushing ice as far as the ice cellars, which had not been seen for a very long time.

In 2011, after the tsunami in Japan, sea ice piled up on the beach on the south side, making pressure ridges that were 15–20 feet high. These were unusually far up the beach.

Trash from Russia and Japan washed up near Point Hope. Russian water bottles have been seen on the north side of the point, and Japanese trash on the south side. They have seen gas cans and floats, including one float that was covered in sticky oil.

Acknowledgements

We appreciate the support of the Eskimo Walrus Commission for this project and are grateful to Commissioner Ronald Oviok, Sr. and to Point Hope Mayor Steve Oomittuk and Teddy Frankson, Jr. of the Native Village of Point Hope for identifying participants and helping to set up interviews in Point Hope. We thank Teddy Frankson, Jr., Isaac Killigvuk, Sr., Henry Koonook, and Ronald Oviok, Sr. and four other hunters for sharing their knowledge and contributing to this report. The Bureau of Ocean Energy Management (BOEM) funded the work as part of contract #M09PC00027 and we appreciate the support of Catherine Coon. Justin Crawford prepared the maps used during the interviews and the figure in this report.

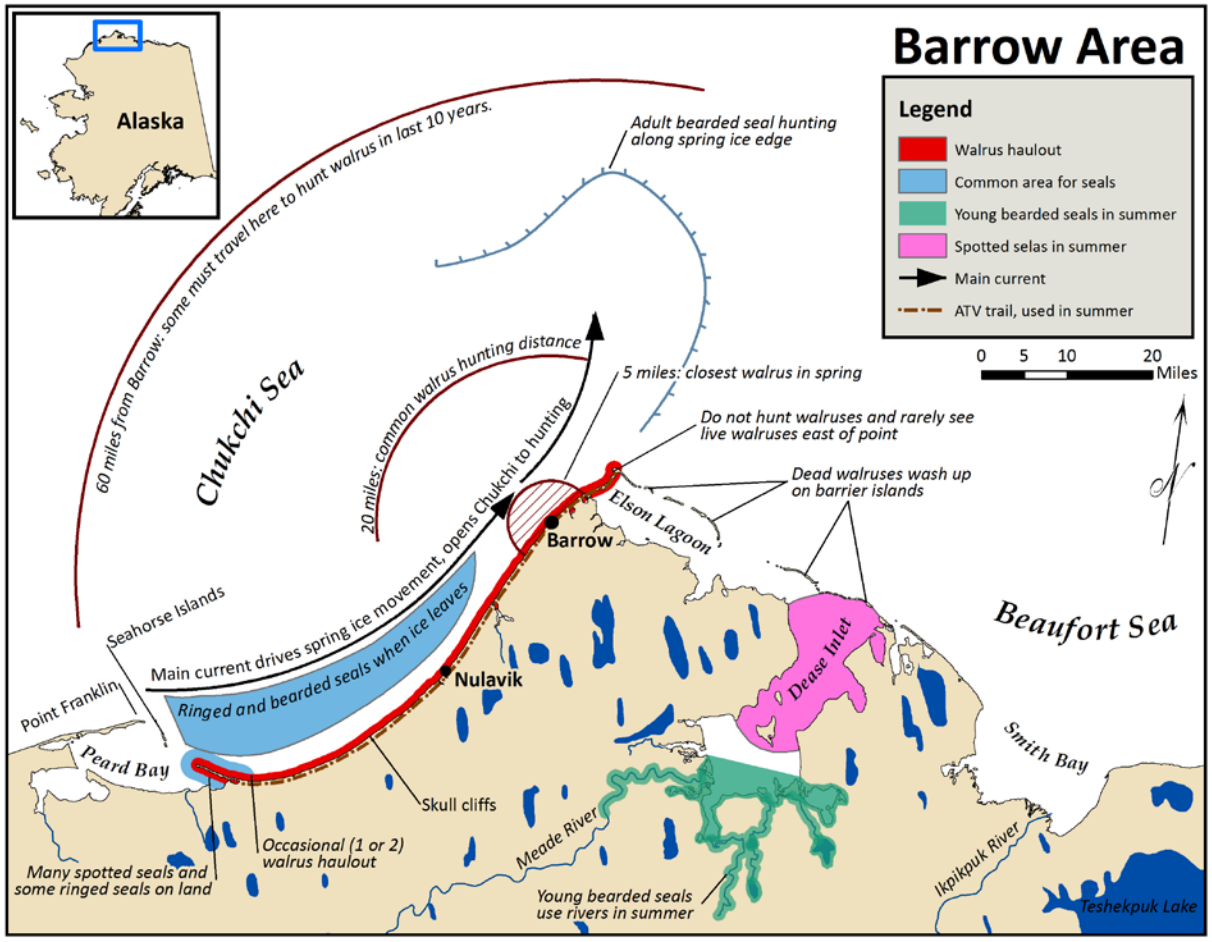
References

Huntington, H.P. 1998. Observations on the utility of the semi-directive interview for documenting traditional ecological knowledge. Arctic 51(3):237-242.

Noongwook, G., the Native Village of Gambell, the Native Village of Savoonga, H.P. Huntington, and J.C. George. 2007. Traditional knowledge of the bowhead whale (*Balaena mysticetus*) around St. Lawrence Island, Alaska. Arctic 60(1):47–54.

Appendix G-3. Huntington, H. P., M. Nelson, and L. T. Quakenbush. 2015a. Traditional knowledge regarding walrus, ringed seals, and bearded seals near Barrow, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015. 8 pp.

Traditional Knowledge Regarding Walrus, Ringed Seals, and Bearded Seals near Barrow, Alaska



Traditional Knowledge Regarding Walrus, Ringed Seals, and Bearded Seals near Barrow, Alaska

By:

Henry P. Huntington
Huntington Consulting
Eagle River, Alaska
hph@alaska.net
Ph: (907) 696-3564

Mark Nelson and Lori T. Quakenbush
Alaska Department of Fish and Game
Fairbanks, Alaska
mark.nelson@alaska.gov, lori.quakenbush@alaska.gov
Ph: (907) 459-7374, (907) 459-7214

Final Report

Approved December 2015

Final report should be cited as:
Huntington, H.P., M. Nelson, and L.T. Quakenbush. 2015. Traditional knowledge regarding walrus, ringed seals, and bearded seals near Barrow, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015. 8pp.

Introduction

Walrus, ringed seals, and bearded seals are important species for subsistence harvests by Iñupiat hunters in northern Alaska. They are also iconic Arctic marine mammals, and at risk from climate change. Increasing industrial activity in the Chukchi Sea is an additional potential stressor to walrus and seal populations. A satellite telemetry study of the distribution, behavior, and movements of walrus and seals is an important contribution to monitoring the effects of a changing environment and the potential effects from industrial activity. While placing satellite transmitters on walrus and seals provides detailed information about the movements and some behaviors of individual animals, documenting traditional knowledge about walrus and seals, through interviews with residents of coastal communities, provides valuable complementary contemporaneous and historical information about the general patterns of each species.

This report summarizes information gathered from interviews with hunters and other knowledgeable residents in Barrow, Alaska, in January 2015. This traditional knowledge project used the same approach that the Native Village of Savoonga used when documenting traditional knowledge about bowhead whales on St. Lawrence Island (Noongwook et al. 2007).

Methods

We used the semi-directive interview method, in which the interviewers raise a number of topics with the person being interviewed, but do not rely solely on a formal list of questions (Huntington 1998). Instead, the interview is closer to a discussion or conversation, proceeding in directions determined by the person being interviewed, reflecting his/her knowledge, the associations made between walrus and other parts of the environment, and so on. The interviewers use their list of topics to raise additional points for discussion, but do not curtail discussion of additional topics introduced by persons being interviewed.

In Barrow, we interviewed ten people: one group of four, two groups of two each, and two individually. Those interviewed were Ernest Nageak, Van Edwardsen, Ronald Uyeno, Jonah Leavitt, Willie Koonaloak, John Heffle, and four people who wished to remain anonymous. The interviews were conducted on January 29, at the Iñupiat Heritage Center.

The topics identified by the research team in advance of the interviewers were:

Haul-out patterns on land
Observations of orphaned calves
Timing and location of walrus and seal sightings
Behavior of walrus and seals
Parts of walrus and seals eaten by humans
Changes over time for all topics

The results are presented under different headings, reflecting the actual information collected and the fact that some of the subjects blend together, especially changes seen over time in regard to all of the topics. The interviewers were Henry Huntington and Mark Nelson. Lori Quakenbush is the project leader.

Ringed and Bearded Seals

Ringed seals are generally found on the Chukchi Sea side of Point Barrow, including in front of the town of Barrow. They are usually found closer to shore and so are the first seals seen when boating out to hunt seals or walrus. When hunting from boats, Barrow hunters prefer to hunt bearded seals, passing ringed seals by, unless they are teaching a young hunter how to hunt for seals. When the ice is far out, seals may be found near river and creek mouths, where feeding is often good.

In spring, many ringed seals haul out on the ice. Ringed seals may haul out on land to rest. This can be seen south of Barrow towards Peard Bay. It is less common near Barrow, where there is often a lot of four-wheeler traffic. Ringed seals with bald spots and sores, which were most common in the summer of 2011, hauled out more frequently on the beach than ringed seals usually do. Seals with these signs of disease have been seen in subsequent years, too, but less often. The diseased seals are thin and do not flee an approaching person. Instead, it is possible to walk right up to them. Hunters avoid animals with signs of disease, so these animals were not hunted. Hunters also avoid ringed seals with black faces, as these seals taste like kerosene (Note: these are known to be adult males in rut, which develop a strong taste and smell).

Bearded seals are generally found farther from shore. They used to be found closer to Barrow. In summer, they may be 20–30 miles north of Point Barrow, along the ice or where the Chukchi and Beaufort waters meet. They are often plentiful that far out, but not seen as often closer to shore. While bearded seals are often associated with ice, they will remain in ice-free waters, too. They can be seen in front of Barrow, and juveniles are often seen off Elson Lagoon. In summer when there is no ice, bearded seals can be found in the current about 7 miles from shore. Hunters are taught to go out to the current and drift along until they see seals. Sometimes fewer seals are seen later in the summer. In these conditions, many boats may compete while chasing the same seal, which is not the way it used to be. The best hunting time for bearded seals is in July when the ice is beginning to go out.

Bearded seals can also sleep in open water. Hunters have come across bearded seals lying on the surface. When the seals are awakened by the boat, they react quickly, diving with a splash.

Bearded seals swim up the rivers that flow into Admiralty Bay. Bearded seals of all ages have been seen to do this. The seals are probably eating whitefish in the rivers. This is not a common occurrence however, most young bearded seals are found around the barrier islands and outside Dease Inlet during the summer.

In recent years, bearded seals have had thinner blubber. Hunters need to get to a seal quickly before it sinks. The seal oil they produce is also different from the way seal oil used to be.

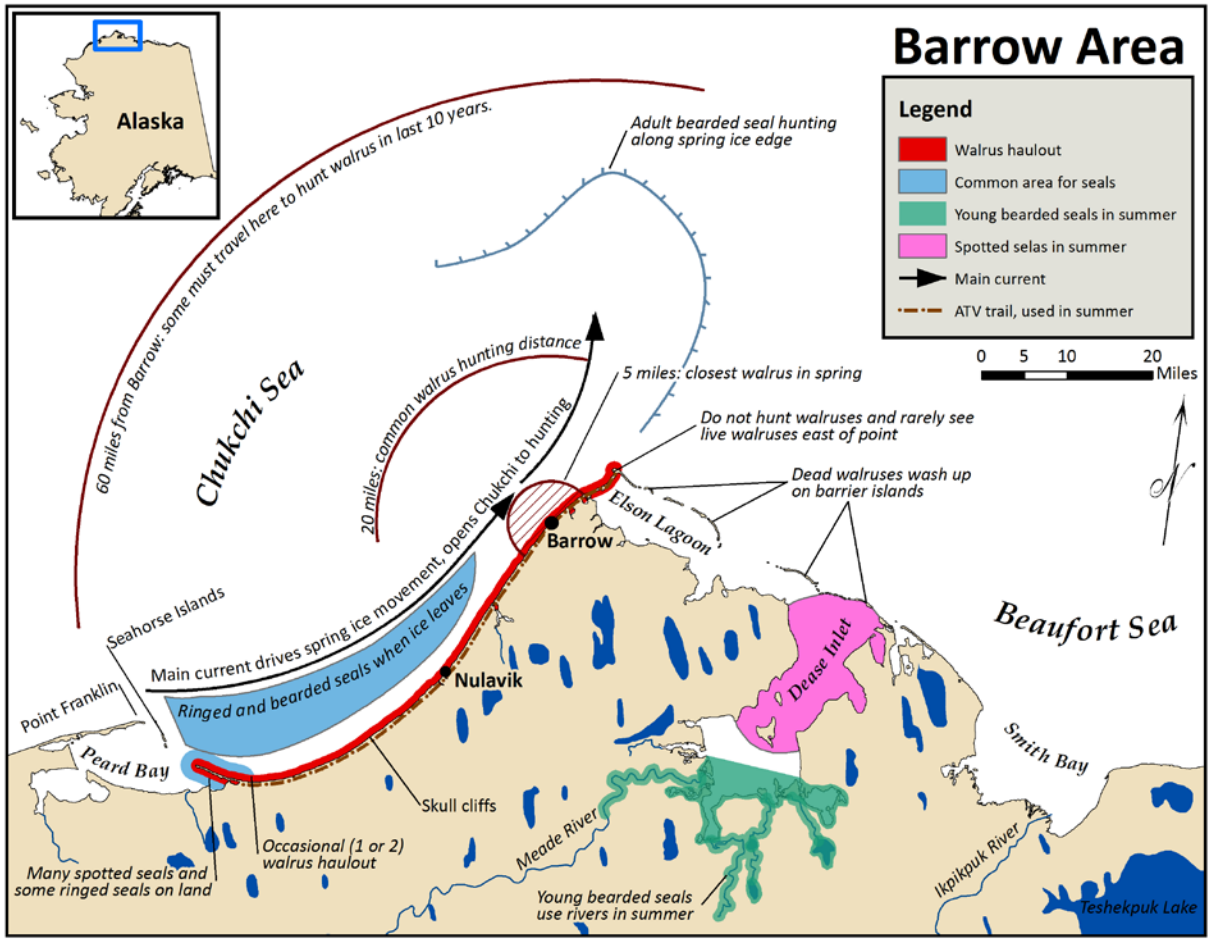


Figure 1. Movements and behavior of ringed seal, bearded seal, spotted seal, and walrus near Barrow as described during traditional knowledge interviews, January 2015.

Walrus

Walrus are harvested in Barrow when they are accessible. Walrus hunting occurs in the Chukchi Sea, but not the Beaufort Sea. Hunters typically head west, or first go south to Peard Bay and then offshore. Access depends primarily on ice conditions and can vary greatly from year to year near Barrow. Some hunters have gone as far as 60 miles offshore, which is possible now due to the fuel efficiency of four-stroke engines. Traveling this far, however carries risks if the weather changes for the worse. Recent changes in sea ice distribution and thickness have been the dominant factor responsible for changes in walrus distribution and behavior in recent years.

Walrus migrate north in spring, drifting with sea ice carried in the northbound currents of the Chukchi Sea. When shorefast ice breaks up, which is happening earlier and earlier, Barrow hunters are able to begin hunting by boat. East winds carry sea ice away from shore, making access difficult. West winds bring sea ice closer to the Barrow coast, bringing walrus and bearded seals with the ice. Walrus are typically carried north past the City of Barrow and onwards past Point Barrow. Only occasionally are walrus seen in the Beaufort Sea, to the east of Point Barrow. The eddies that form to the northeast of Point Barrow do attract beluga whales

and bearded seals, and may be responsible for walrus carcasses washing up on the barrier islands that border Elson Lagoon. Formerly, the ice would come and go during the summer as the winds shift, bringing ice and animals back several times, providing several hunting opportunities. In recent years, the ice usually does not return after it leaves the Barrow area and may leave faster when it goes out. The hunting season is thus shorter now, though still variable depending on the conditions of each year.

Ice thickness plays a role, too. Formerly, walrus were found on large ice floes in herds of up to 3,000 animals. Today, ice floes are smaller and thinner, so walrus are typically found in small groups (10–15 animals) or mid-size groups (50–100). Hunters could smell the large herds a long way away, but the smaller groups do not have as strong an odor. When walrus leave the ice floes, the floes rebound and rise higher out of the water. Thinner ice is noticeable at other times, too. During spring whaling, it is harder to find flat areas of ice that are thick enough to support a large bowhead whale for butchering. Formerly, any flat area was thick enough, but this is no longer the case.

Walrus are occasionally seen swimming in open water, presumably traveling from haulouts to feeding areas. This has been observed 4–5 miles offshore, with the walrus heading south, and no ice in sight. Individual walrus have been seen swimming along the shore in late August, with no ice in sight. Walrus can be hunted in open water, but it is much harder than hunting them when hauled out on ice floes, and they must be towed to ice or land for butchering. Walrus are also very dangerous when in the water. They can be aggressive and attack boats, and have been known to team up when doing so. This can occur when a walrus has been killed and the other walrus do not want to leave it. Dropping empty rifle shells into the water can scare walrus away, perhaps from the appearance or the sound.

Occasionally a single walrus, and more rarely two walrus together, will haul out on shore in the Barrow area. This is more common to the south of Barrow, towards Nulavik and Skull Cliffs, but can also be seen towards Point Barrow. Hunters have not seen three or more walrus hauling out together in the Barrow area. Walrus that haul out near Barrow are usually hunted; they will be seen by people who travel up and down the coast by four-wheeler, a common summer activity. Once, a sick walrus went inland from Elson Lagoon behind the Naval Arctic Research Lab (NARL) hangars. Sick walrus and sick polar bears will take themselves off to die. There does not appear to be a change in hauling out behavior in the Barrow area, although it may be more common in the past decade or so.

One hunter/carver recently saw a walrus skull that had many cavities in its teeth. He had not seen that before.

Orphaned calves are found occasionally in the Barrow area, but this is not common. It typically occurs after there has been a hunt. The last instance was three or more years prior to the interviews. When calves can be nursed to health, they are given to a zoo or other facility. There does not appear to be any trend in the frequency of orphaned calf sightings.

Walrus have excellent hearing. They do not react to people speaking in normal voices. Instead, they become suspicious if people are whispering or otherwise trying to be quiet. Walrus are

generally noisy animals, so the additional noise does not bother them. The same is sometimes true of other animals—they react more to people who are trying to sneak up to them or sneak past, than to those who show that they have seen the animals and are aware that the animals have seen or heard them.

Offshore oil and gas activity could have impacts to walrus and walrus prey. This could have a bigger impact on walrus-dependent communities, especially Gambell and Savoonga.

Barrow residents eat the skin, blubber, meat, kidneys, and heart of walrus. They do not typically eat liver or intestines. All parts are equally likely to be eaten by anyone eating walrus; there are no parts that are given specially to people of different ages or gender. Some people like to eat clams from walrus stomachs, but recently the stomachs have been mostly empty.

Polar Bears

Polar bears occasionally swim ashore in summer, having come a long way from the ice. They are typically exhausted. Polar bear monitors let them rest, rather than scaring them back into the water right away. Elders also say to leave animals alone when they come to shore, to let them rest. One bear collapsed on reaching shore and slept for a day or two, before getting up and walking to the Barrow bone pile.

Other Observations

Many things are changing. Skin boats left in the open in summer will now discolor and turn dark. They need to be covered with a tarp, whereas before they could be left out and would bleach in the sun.

Multi-year ice rarely shows up now, whereas it used to arrive reliably in October as the ocean began to freeze.

Traditional and Modern Knowledge and Ideas for Research

Younger hunters distinguished traditional knowledge from modern knowledge. The former is what can be learned from elders and others with long experience. Younger hunters have modern knowledge, having only hunted from motorboat and snowmachine, not with dog teams and other older equipment. They thus have different knowledge than their fathers and grandfathers, though they still have the skills to hunt effectively and to know how to interact with animals. The younger hunters are also well aware of how rapidly conditions are changing, and are able to provide knowledge about recent changes in a way that elders who have not hunted for many years may not.

The U.S. Fish and Wildlife Service has been paying more attention to traditional knowledge, which is a good thing and can be very helpful in many situations. At the same time, however, there are concerns about asking the same people the same kinds of questions over and over, or going to the same people to ask about different species but still taking up their time repeatedly. Better coordination in meetings and in research can help reduce the burden on the community, as it can on the ecosystem for field studies. Doing things once rather than several times would be better.

The U.S. Fish and Wildlife Service is also good at circulating information about their polar bear surveys, including photos of the aircraft involved, and flight plans and dates. This lets people know what to expect and how to recognize the aircraft and personnel who are involved, instead of wondering who is doing what and what impact they are having on hunters and on animals.

When walrus are being hunted from Barrow, there may be as many as 30–40 boats on the water. Finding ways to record the observations of these hunters could be a big contribution to walrus monitoring and research, and for other species, too. Hunters pay attention to oddities, such as unusual body condition or markings, and could take photos and bring this to the attention of biologists. Facebook might be a great way to organize hunters and report observations.

Acknowledgements

We appreciate the support of the Eskimo Walrus Commission and the Ice Seal Committee for this project and are grateful to Joe Sage and Thomas Olemaun for identifying participants and helping to set up interviews. The Bureau of Ocean Energy Management (BOEM) funded the work as part of Contract Nos. M09PC00027 and M13PC00015 and we appreciate the support of Charles Monnett, Catherine Coon, and Dan Holiday. Justin Crawford prepared the maps used during the interviews and the figures in this report.

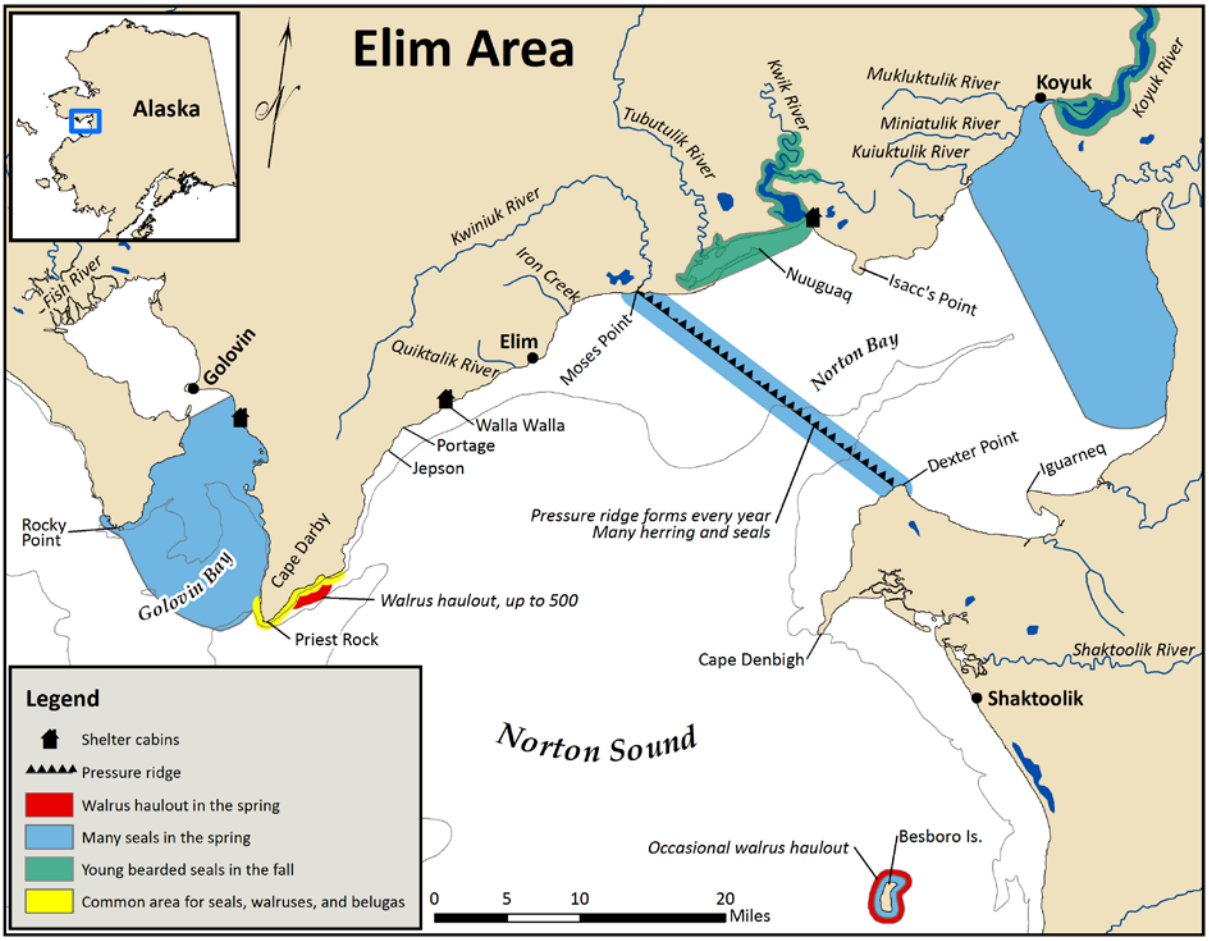
References

Huntington, H.P. 1998. Observations on the utility of the semi-directive interview for documenting traditional ecological knowledge. Arctic 51(3):237-242.

Noongwook, G., the Native Village of Gambell, the Native Village of Savoonga, H.P. Huntington, and J.C. George. 2007. Traditional knowledge of the bowhead whale (*Balaena mysticetus*) around St. Lawrence Island, Alaska. Arctic 60(1):47–54.

Appendix G-4. Huntington, H. P., M. Nelson, and L. T. Quakenbush. 2015b. Traditional knowledge regarding ringed seals, bearded seals and walrus near Elim, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015. 7 pp.

Traditional Knowledge Regarding Ringed Seals, Bearded Seals, and Walrus near Elim, Alaska



Traditional Knowledge Regarding Ringed Seals, Bearded Seals, and Walrus near Elim, Alaska

By:

Henry P. Huntington
Huntington Consulting
Eagle River, Alaska
hph@alaska.net
Ph: (907) 696-3564

Mark Nelson and Lori T. Quakenbush
Alaska Department of Fish and Game
Fairbanks, Alaska
mark.nelson@alaska.gov, lori.quakenbush@alaska.gov
Ph: (907) 459-7374, (907) 459-7214

Final Report
Approved December 2015

Final report should be cited as:
Huntington, H.P., M. Nelson, and L.T. Quakenbush. 2015. Traditional knowledge regarding ringed seals, bearded seals, and walrus near Elim, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015. 7pp.

Introduction

Ringed seals and bearded seals are important species for subsistence harvests by Iñupiat and Yup'ik hunters from Elim, in northern Norton Sound, in western Alaska. Walrus are found and hunted in this area, too. These marine mammals are iconic Arctic animals, and at risk from climate change. Increasing industrial activity in the Chukchi Sea, coastal development in the Norton Sound region, and shipping through the Bering Strait are additional potential stressors to seal and walrus populations. A satellite telemetry study of the distribution, behavior, and movements of seals and walrus is an important contribution to monitoring the effects of a changing environment and the potential effects from industrial activity. While placing satellite transmitters on seals and walrus provides detailed information about the movements and some behaviors of individual animals, documenting traditional knowledge about seals and walrus, through interviews with residents of coastal communities, provides valuable complementary contemporaneous and historical information about the general patterns of each species.

This report summarizes information gathered from interviews with hunters and other knowledgeable residents in Elim, Alaska, in February 2015. This traditional knowledge project used the same approach that the Native Village of Savoonga used when documenting traditional knowledge about bowhead whales on St. Lawrence Island (Noongwook et al. 2007).

Previous projects on traditional knowledge of seals have been conducted, one under the Elim-Shaktoolik-Koyuk Marine Mammal Commission in 1999 (Huntington 2000) and another on walrus and ice seals conducted by Kawerak Inc., in 2010–2013 in communities throughout the Bering Strait region, including Elim (Kawerak, Inc., 2013). Except as noted below, the information presented here comes from our February 2015 interviews and not from either prior project. A compilation of results from all three projects may be carried out later, to document changes over time and other aspects of seals and walrus.

Methods

We used the semi-directive interview method, in which the interviewers raise a number of topics with the person being interviewed, but do not rely solely on a formal list of questions (Huntington 1998). Instead, the interview is closer to a discussion or conversation, proceeding in directions determined by the person being interviewed, reflecting his/her knowledge, the associations made between walrus and other parts of the environment, and so on. The interviewers use their list of topics to raise additional points for discussion, but do not curtail discussion of additional topics introduced by the person being interviewed.

In Elim, we interviewed eight people in one group. Those interviewed were Darlene Katchatag, Martin Murray, Charles Saccheus, and five others who wished to remain anonymous. The interview was conducted on February 3, at the Elim IRA Council office.

The topics identified by the research team in advance of the interviewers were:

Haulouts on land
Overwintering areas and behavior
Use of lagoons and rivers
Feeding patterns and prey

Differences between ringed and bearded seals
Impacts from climate change
Parts of seals that people eat

The results are presented under different headings, reflecting the actual information collected and the fact that some of the subjects blend together, especially changes seen over time in regard to all of the topics. The interviewers were Henry Huntington and Mark Nelson. Lori Quakenbush is the project leader.

Ringed Seals

In early spring, ringed seals will lie on the sea ice by the hundreds throughout Norton Bay and stay in the area until the ice starts to break up more in the later spring. A few areas hold higher numbers of seals throughout the year and especially during the spring; Besboro Island, Golovin Bay, upper Norton Bay, Rocky Point and around Cape Darby. There is a persistent pressure ridge that forms from Moses Point to Dexter Point during the winter and spring that also holds many ringed and bearded seals. The snow is not as deep now as it used to be and there are fewer seal dens on the ice because of it, but there are still lots of seal breathing holes noticed mostly by fishermen who go out on the ice to deploy their crab pots in spring between Elim and Cape Darby. Pressure ridges like the one from Moses Point to Dexter Point are important for breathing holes and denning habitat. Ringed and bearded seals have always wintered in Norton Bay, especially near the mouths of creeks where fish are plentiful.

Ringed seals are occasionally seen hauled out on the beach. Usually this is young seals in the spring. Ringed seals do not haul out in large groups like walrus and are much more solitary. Historically in the spring and summer seals were taken with nets for subsistence, but this is less common now with most hunters choosing to use a rifle and harpoon instead. When a ringed seal is caught alive they are generally easy to control as they do not bite people. They will use their powerful claws to scratch at a person though.

Ringed seals feed on mostly fish such as herring, capelin, tomcod, skipjack (smelt, cisco?), and sometimes shrimp. Herring are found in large numbers along the pressure ridges especially between Moses Point and Dexter Point where they are sometimes pushed out onto the ice and preyed on by seagulls.

Elim residents eat the blubber (oil), meat, heart, kidneys, liver, and intestines of ringed seals. Seal oil is very healthy, especially for brain development in children. Coastal residents trade seal oil with interior Indians. A seal taken in November yielded clear seal oil with little flavor, so salt had to be added to give it more flavor.

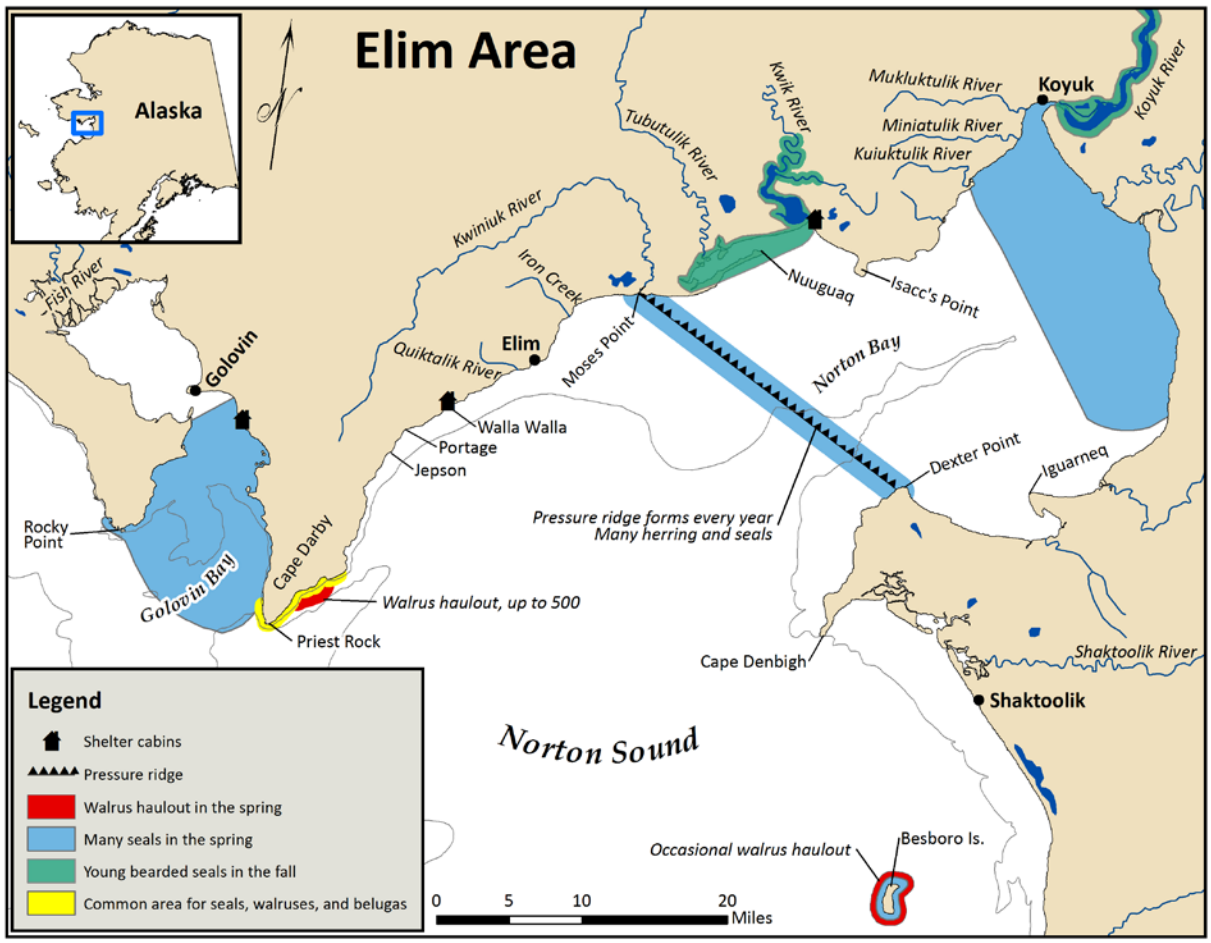


Figure 1. Movements and behavior of ringed seal, bearded seal, spotted seal, walrus, and beluga whales near Elim as described during traditional knowledge interviews, February 2015.

Bearded Seals

Bearded seals will haul out on the sea ice in spring, younger animals closer to shore on shorefast ice and older animals further out on the pack ice usually more than 15 miles from Elim. Young-of-the-year bearded seals will go up the Koyuk and Kwik Rivers in August and September. They eat clams, which can be found far upriver, and isopods. They are not found up the Tubutulik River, but can be seen in the lagoon at the mouth of the river. Adult bearded seals have been seen occasionally up the Kwik River, but not very often.

Bearded seals are more sensitive to noise than ringed or ribbon seals for example; if a ribbon seal on an ice floe is approached by hunters in a boat, it will flee away from the hunters across the floe, even if there is open water right next to it in the direction of the boat but bearded seals will dive into the open water instead. Hunters say that this behavior shows that bearded seals are much smarter and more wary than ribbon seals. Young bearded seals will fight back when caught in a net. They have long claws and will try to scratch a person, but they do not bite.

Bearded seals have clams, shrimp, and isopods in their stomachs. They do not have fish in their stomachs except for young bearded seals in rivers, they feed on whitefish. Old bearded seals have teeth that are worn down to the gums. Their blubber is yellow and yields yellow seal oil.

Elim residents eat the blubber (oil), meat, heart, kidneys, liver, and outer covering of the intestines of bearded seals.

Walrus

Walrus haul out occasionally on the east side of Cape Darby. This happens when there is no ice in Norton Sound. The walrus do not haul out on the west side of the Cape. There may be 500 or more walrus hauled out at a time. When there is no more room for walrus to haul out, other walrus will inflate their necks and float as they sleep, drifting in the current. After they drift a mile or two, they swim back to the haulout and repeat this behavior. There are sometimes some baby walrus in the haulout, in June. Walrus also haul out, though less frequently, on Besboro Island, in similar numbers to those seen at Cape Darby.

Walrus usually have clams in their stomachs. If the walrus has been on top of the ice for a while, the clams are partly digested. If the walrus has just hauled out on the ice after diving or still swimming, the clams will be fresh. These clams are ready to be cooked. Many people enjoy eating them.

Other Information

Qairaliq seals are no longer seen. These were described in the 1999 project (Huntington 2000) as small seals seen in April, May, and June, with thin skin that was useful for many purposes. The 1999 study reported that *qairaliq* seals came to the area in great numbers in the 1980s, but fewer were seen by 1999.

Elim hunters had no further information about *iigliq* seals, also reported in the 1999 study.

A bearded seal was once taken that had metal in the muscle near its ribs.

Green algae grows on the bottom of the sea ice, attracting fish. This has always happened.

In the summer of 2014 there were so many jellyfish they clogged fishing nets. The jellyfish were also larger than usual. Starfish taken in crab pots appeared to be eating jellyfish.

Small, pink krill are common throughout Norton Bay. They can be found under rocks and come to the surface with crab pots that are hauled up.

A few years ago, orange foam was found on the beaches throughout the area. The cause of this was not known and it only happened the one time.

Sea ice formed very late in the winter of 2014–15. There was a lot of open water near Unalakleet and even by Koyuk into December 2014. Beluga whales were seen swimming past Elim in January, being pursued by killer whales. It is very rare for belugas to be seen near Elim in January.

Belugas prefer to eat tomcod and shrimp, even if there are herring in the area. They also like salmon, which they eat all summer. Silver salmon in September are a favorite food of belugas. Belugas chase salmon and, when they are right behind the fish, give a blast of sound that stuns the fish, so the fish turns belly up. Then the beluga swallows the salmon whole.

Belugas can drown in a net in 10 minutes or less. They struggle, which uses up their air quickly. The belugas are used for subsistence and the lungs used to be fed to dogs. They feel spongy and were not eaten by people.

Spotted seals haul out in groups in many locations, including Rocky Point and have teeth like dogs. Spotted seals will bite people.

Animals carry their history, like human beings, including their own lives and the lives of their parents and grandparents. Animals have brains and spirits. It is essential to keep the ocean free and clean so that the animals can flourish and live healthy lives.

Concerns

Elim residents asked whether there have been any studies in the Nome area to determine if there are impacts from dredging and port construction. They expect more activity along the coastline of the region, and think it is important to learn what we can from the development that is occurring already. They pointed out that the dredging results in muddy water, which they expect affects marine mammals and other sea animals.

There is a lot more commercial crabbing in summer in the Norton Bay area now.

More hunters from other villages seem to be coming to the Norton Bay area to hunt.

Acknowledgements

We appreciate the support of the Eskimo Walrus Commission and the Ice Seal Committee for this project and are grateful to Charles Saccheus and Carol Nagaruk for helping to set up the group interview. The Bureau of Ocean Energy Management (BOEM) funded the work as part of Contract Nos. M09PC00027 and M13PC00015 and we appreciate the support of Charles Monnett, Catherine Coon, and Dan Holiday. Justin Crawford prepared the maps used during the interviews and the figures in this report.

References

Huntington, H.P. 1998. Observations on the utility of the semi-directive interview for documenting traditional ecological knowledge. Arctic 51(3):237-242.

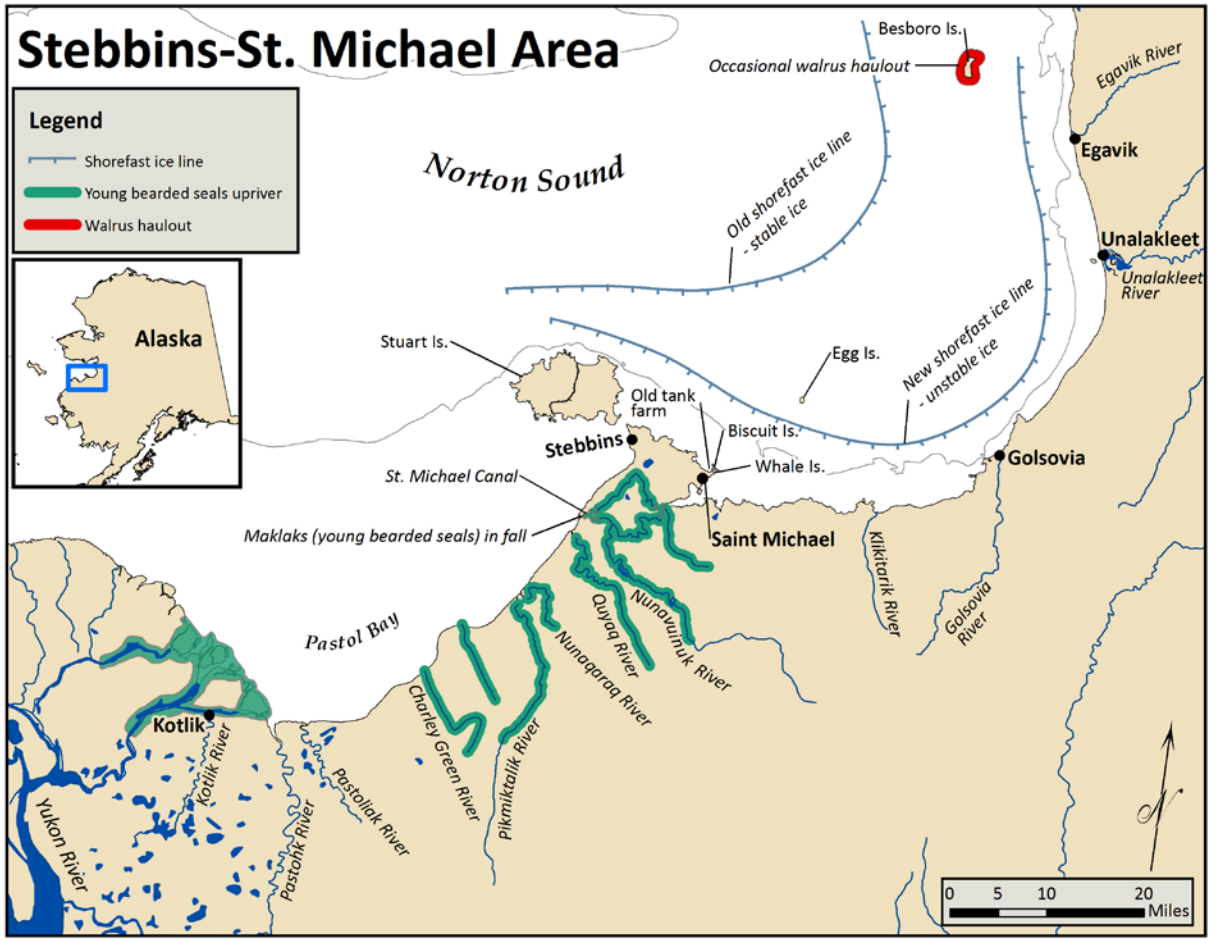
Huntington, H.P. 2000. Traditional ecological knowledge of seals in Norton Bay, Alaska. Report submitted to the Elim-Shaktoolik-Koyuk Marine Mammal Commission and the National Marine Fisheries Service. April 2000.

Kawerak, Inc. 2013. Seal and walrus harvest and habitat areas for nine Bering Strait Region communities. Nome, Alaska: Kawerak, Inc., Social Science Program.

Noongwook, G., the Native Village of Gambell, the Native Village of Savoonga, H.P. Huntington, and J.C. George. 2007. Traditional knowledge of the bowhead whale (*Balaena mysticetus*) around St. Lawrence Island, Alaska. Arctic 60(1):47–54.

Appendix G-5. Huntington, H. P., M. Nelson, and L. T. Quakenbush. 2015c. Traditional knowledge regarding ringed seals, bearded seals, and walrus near St. Michael and Stebbins, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015. 7 pp.

Traditional Knowledge Regarding Ringed Seals, Bearded Seals, and Walrus near St. Michael and Stebbins, Alaska



Traditional Knowledge Regarding Ringed Seals, Bearded Seals, and Walrus near St. Michael and Stebbins, Alaska

By:

Henry P. Huntington
Huntington Consulting
Eagle River, Alaska
hph@alaska.net
Ph: (907) 696-3564

Mark Nelson and Lori T. Quakenbush
Alaska Department of Fish and Game
Fairbanks, Alaska
mark.nelson@alaska.gov, lori.quakenbush@alaska.gov
Ph: (907) 459-7374, (907) 459-7214

Final Report
Approved December 2015

Final report should be cited as:
Huntington, H.P., M. Nelson, and L.T. Quakenbush. 2015. Traditional knowledge regarding ringed seals, bearded seals, and walrus near St. Michael and Stebbins, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015. 7pp.

Introduction

Ringed seals and bearded seals are important species for subsistence harvests by Iñupiaq and Yup'ik hunters from St. Michael and Stebbins in southern Norton Sound, Alaska. Walrus are found and hunted in this area, too. These marine mammals are iconic Arctic animals, and at risk from climate change. Increasing industrial activity in the Chukchi Sea, coastal development in the Norton Sound region, and shipping through the Bering Strait are additional potential stressors to seal and walrus populations. A satellite telemetry study of the distribution, behavior, and movements of seal and walrus is an important contribution to monitoring the effects of a changing environment and the potential effects from industrial activity. While placing satellite transmitters on seals and walrus provides detailed information about the movements and some behaviors of individual animals, documenting traditional knowledge about seals and walrus, through interviews with residents of coastal communities, provides valuable complementary contemporaneous and historical information about the general patterns of each species.

This report summarizes information gathered from interviews held in St. Michael with hunters and other knowledgeable residents from St. Michael and Stebbins in February 2015. This traditional knowledge project used the same approach that the Native Village of Savoonga used when documenting traditional knowledge about bowhead whales on St. Lawrence Island (Noongwook et al. 2007).

A previous project on traditional knowledge of walrus and ice seals was conducted by Kawerak Inc., in 2010–2013 in communities throughout the Bering Strait region, including St. Michael and Stebbins (Kawerak, Inc., 2013). Except as noted below, the information presented here comes from our February 2015 interviews and not from the Kawerak project. A compilation of results from the two projects may be carried out later, to document changes over time and other aspects of seals and walrus.

Methods

We used the semi-directive interview method, in which the interviewers raise a number of topics with the person being interviewed, but do not rely solely on a formal list of questions (Huntington 1998). Instead, the interview is closer to a discussion or conversation, proceeding in directions determined by the person being interviewed, reflecting his/her knowledge, the associations made between walrus and other parts of the environment, and so on. The interviewers use their list of topics to raise additional points for discussion, but do not curtail discussion of additional topics introduced by the person being interviewed.

In St. Michael, we interviewed eight people in one group. Those interviewed from St. Michael were Charlie Fitka, Harold T. Kobuk, Nick Lupsin, Alexander Niksik Jr., and two others that wished to remain anonymous. Two people from Stebbins were interviewed who wished to remain anonymous. The interview was conducted on February 4, at the St. Michael IRA Council office.

The topics identified by the research team in advance of the interviewers were:

Haulouts on land
Overwintering areas and behavior
Use of lagoons and rivers
Feeding patterns and prey
Differences between ringed and bearded seals
Impacts from climate change
Parts of seals that people eat

The results are presented under different headings, reflecting the actual information collected and the fact that some of the subjects blend together, especially changes seen over time in regard to all of the topics. The interviewers were Henry Huntington and Mark Nelson. Lori Quakenbush is the project leader.

Ringed Seals

During the winter and spring there are many ringed seals near Stebbins and St. Michael. They maintain breathing holes in the shorefast ice and in the drifting pack ice. When it is sunny there will by many ringed seals hauled out on the ice, occasionally they make enough noise that they can be heard from town. Ringed seals start to leave when the ice diminishes in Norton Sound, but there are still a lot around during the herring runs in June. Ringed, bearded, and spotted seals all eat herring when they are spawning and their face and whiskers are sometimes covered with herring eggs when they surface to breath. Seals gain weight quickly during the herring run. Ringed seals also eat tomcod (i.e., saffron cod, *Eleginus gracilis*) and other fish, but also eat small shrimp, which are especially plentiful in the Golsovia area.

Ringed seals start sunning with the increasing light in February and by April have started pupping in their snow dens. The rutting males during this time have black faces, smell like gasoline, and are not hunted or eaten. These rutting males are called *tiigaq*.

Residents of St. Michael and Stebbins eat seal meat, blubber (oil), heart, liver, kidneys, intestines, and the spinal cord of ringed and bearded seals. Some people like to eat aged seal flipper, but this is not common anymore.

Some sick seals were seen in 2011, but not large numbers of them. One sick young ringed seal was seen on the beach in the summer of 2014. It did not flee when approached on a four-wheeler. A sick spotted seal was seen in the fall of 2014.

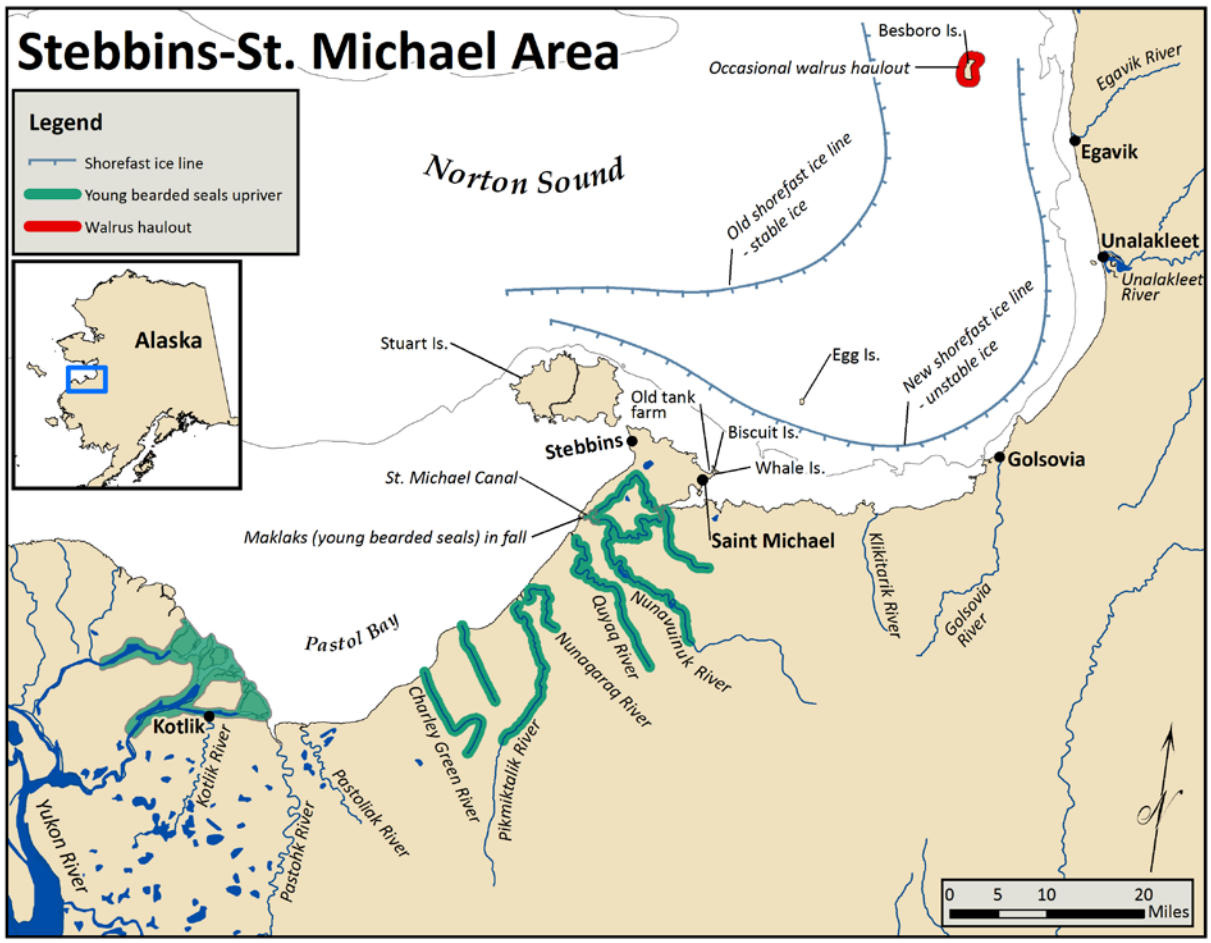


Figure 1. Movements and behavior of ringed seal, bearded seal, spotted seal and walrus near St. Michael and Stebbins as described during traditional knowledge interviews, February 2015.

Bearded Seals

Adult bearded seals are found farther away from the shore in winter and spring, than ringed seals. They are rarely seen near shore hauled out on shorefast ice, but are hunted around Whale Island. Young bearded seals are sometimes found up rivers, including the Yukon as well as smaller rivers around St. Michael and Stebbins. Older bearded seals and ringed seals are not seen in the rivers. Young bearded seals may haul out on riverbanks or mudflats but adult bearded seals are never seen on land.

Ugruq is the term for adult bearded seals; this is an Iñupiaq word. Hunters here also use the Yup'ik word *Omnigaq* for adult bearded seals. The Yup'ik word *maklak* is used for young bearded seals.

The size of adult bearded seals has decreased in recent years. In the past, hunters would see very large bearded seals off of Stuart Island that are believed to have come from farther north. More recently, it is more common to find bearded seals that are a little smaller than these very large ones.

Bearded seals eat whatever they can find farther out in the ocean: shrimp, crab, clams, and fish such as flounder. Some of the shrimp found in bearded seal stomachs are large, the size of a person's hand. When young bearded seals are in rivers they will eat whitefish and tomcod.

One hunter reported harvesting an *ugruq* with a white tissue around its liver. They described it to be white as paper and did not eat the liver, but did eat the meat and blubber.

Walrus

Walrus arrive in spring, hauled out on ice that is carried by currents. They are usually farther from shore, for example near Egg Island. The walrus include bulls, cows, and calves. Walrus are not often seen on land around Stebbins or St. Michael, but occasionally one or two will haul out on Egg Island and Whale Island; one of the small islands just north of St. Michael. One walrus swam up the Yukon River as far as Pilot Station (~120 miles) and stayed in the Pitka's Point (~100 river miles from coast) area for a while. Other walrus have been seen near the mouth of the Yukon and also in St. Michael and Little St. Michael Canal in fall. Even though living walrus are not seen very often, dead walrus wash up on shore regularly in the spring when the currents are just right.

Walrus cows will search for their calves when they become separated. The cows can find the calves when this happens.

St. Michael and Stebbins residents eat the meat, blubber, heart, and liver of walrus. They do not eat the kidney or intestines and only occasionally eat the clams from walrus stomachs.

Sea Ice

The ice has changed greatly and rapidly in the past two decades. In the 1970s and 1980s, the shorefast ice extended out to Egg Island. Hunters could travel over the ice to Egg Island or to Golsovia. Today the shorefast ice extends only a few miles from shore and it is not possible to travel that far on the ice. The ice is also thinner and breaks off more easily, making conditions more dangerous. The ice used to form large pans, but now it is more crumbled up.

In the winter of 2014–15, the ice did not freeze near Stebbins until December. The ice was only a few inches thick when it went out again. There was rain in January, and the ice remains thin and unstable.

Other Information

There are fewer spotted seals in this area since the ice started changing in the 1990s and 2000s. Spotted seals may be seen on the ice near shore during the fall and spring. Steller sea lions, gray whales, and humpback whales are rare occurrences in the area and may scare away other animals when they are around. There used to be puffins in the St. Michael/Stebbins area, but they are no longer seen here.

There used to be commercial beach seiners operating in this area during herring season. They would sometimes snag buoys and anchors belonging to St. Michael and Stebbins residents, which was not popular. This fishery is no longer being conducted.

The water level is higher in summer now than it used to be. There is more algae, and the fish are changing, too. Some St. Michael residents caught what they thought were chum salmon, but which turned out to be another kind of fish. Another fisherman caught two chum salmon a couple years ago, but they smelled like gas when his wife cut their heads off.

The old St. Michael village fuel tank farm may have affected seals. There are fewer seals around there now than there used to be. The tank farm has been moved to the west end of the village now.

Acknowledgements

We appreciate the support of the Eskimo Walrus Commission and the Ice Seal Committee for this project and are grateful to Alexander Niksik Jr. for helping to set up the group interview. The Bureau of Ocean Energy Management (BOEM) funded the work as part of Contract Nos. M09PC00027 and M13PC00015 with the support of Charles Monnett, Catherine Coon, and Dan Holiday. Justin Crawford prepared the maps used during the interviews and the figure in this report.

References

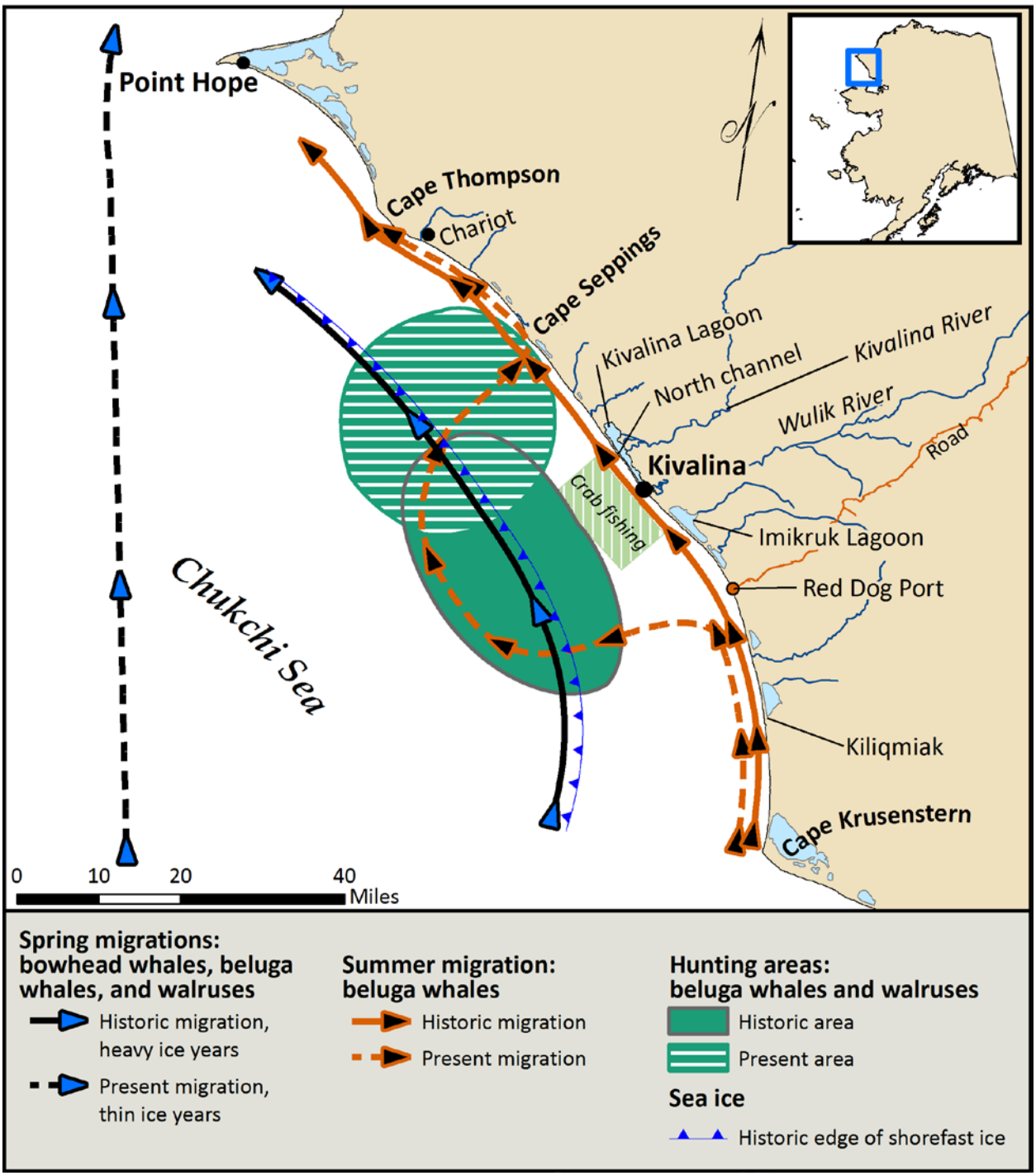
Huntington, H.P. 1998. Observations on the utility of the semi-directive interview for documenting traditional ecological knowledge. Arctic 51(3):237-242.

Kawerak, Inc. 2013. Seal and walrus harvest and habitat areas for nine Bering Strait Region communities. Nome, Alaska: Kawerak, Inc., Social Science Program.

Noongwook, G., the Native Village of Gambell, the Native Village of Savoonga, H.P. Huntington, and J.C. George. 2007. Traditional knowledge of the bowhead whale (*Balaena mysticetus*) around St. Lawrence Island, Alaska. Arctic 60(1):47–54.

Appendix G-6. Huntington, H. P., M. Nelson, and L. T. Quakenbush. 2016a. Traditional knowledge regarding ringed seals, bearded seals, and walrus near Kivalina, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015. 8 pp.

Traditional Knowledge Regarding Ringed Seals, Bearded Seals, Walrus, and Bowhead Whales near Kivalina, Alaska



Traditional Knowledge Regarding Ringed Seals, Bearded Seals, Walrus, and Bowhead Whales near Kivalina, Alaska

By:

Henry P. Huntington
Huntington Consulting
Eagle River, Alaska
hph@alaska.net
Ph: (907) 696-3564

Mark Nelson and Lori T. Quakenbush
Alaska Department of Fish and Game
Fairbanks, Alaska
mark.nelson@alaska.gov, lori.quakenbush@alaska.gov
Ph: (907) 459-7374, (907) 459-7214

Final Report
Approved July 2016

Final report should be cited as:
Huntington, H.P., M. Nelson, and L.T. Quakenbush. 2016. Traditional knowledge regarding ringed seals, bearded seals, walrus, and bowhead whales near Kivalina, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015. 8pp.

Introduction

Ringed and bearded seals are important species for subsistence harvests by Iñupiat hunters from Kivalina (population 384), on the Chukchi Sea coast of northwestern Alaska. Walrus are found and hunted in this area, too. These Arctic marine mammal populations are at potential risk from climate change, increasing industrial activity, coastal development, and shipping through Bering Strait. Scientific studies of distribution, behavior, movements, and habitat use of seals and walrus have made important contributions to understanding the effects of a changing environment and the potential effects from industrial activity. For example, placing satellite transmitters on seals and walrus provides detailed information about the movements and some behaviors of individual animals. Documenting traditional knowledge about seals and walrus, through interviews with residents of coastal communities, however, provides valuable complementary current and historical information about the general patterns of each species.

This report summarizes information gathered from interviews with hunters and other knowledgeable residents in Kivalina, Alaska, in January 2016. This traditional knowledge project used the same approach that the Native Village of Savoonga used when documenting traditional knowledge about bowhead whales on St. Lawrence Island (Noongwook et al. 2007).

Methods

We used the semi-directive interview method, in which the interviewers raise a number of topics with the person being interviewed, but do not rely solely on a formal list of questions (Huntington 1998). Instead, the interview is closer to a discussion or conversation, proceeding in directions determined by the person being interviewed, reflecting his/her knowledge, the associations made between walrus and other parts of the environment, and so on. The interviewers use their list of topics to raise additional points for discussion, but do not curtail discussion of additional topics introduced by the person being interviewed.

In Kivalina, we interviewed five people. All those interviewed wished to remain anonymous. The interviews were conducted on January 7, 2016, at the Kivalina Tribal (IRA) Council office and in the homes of interviewees.

The topics identified by the research team in advance of the interviewers were:

Haulouts on land
Overwintering areas and behavior
Use of lagoons and rivers
Feeding patterns and prey
Differences between ringed and bearded seals
Impacts from climate change
Parts of seals that people eat

The results are presented under different headings, reflecting the actual information collected and the fact that some of the subjects blend together, especially changes seen over time in regard to all of the topics. The interviewers were Henry Huntington and Mark Nelson. Lori Quakenbush is the project leader.

General Information

Marine mammals continue to be abundant in the Kivalina area. The migratory patterns remain largely the same, with variation in timing from year to year. The big change for hunters is that the ice is no longer a reliable platform for hunting, but is instead a dangerous place that prevents hunters from reaching marine mammals or limits the length of the hunting period.

The number of marine mammals coming past Kivalina has decreased considerably since construction of the Red Dog Mine Port Site in the late 1980s. The noise from that facility deflects marine mammals migrating up the coast, pushing them offshore and out of reach of Kivalina hunters. For example, beluga whales used to be seen every summer, but after the construction of the Port Site, they do not come to Kivalina from the south any more. As a consequence, hunters from Kivalina now often travel northwest of the community towards Cape Thompson to go hunting. It is expensive to travel far to go hunting. Many hunters also go to the area of the north channel into the lagoon, where it is quieter.

A great deal has changed in recent years, but hunters are adjusting to these changes. What used to take place is not what happens now. The availability of high-powered outboards and high-powered rifles has helped hunters adjust in ways that would not have been possible 50 or 100 years ago. A boat trip to Point Hope now takes two hours, instead of all day. Hunters can make day trips from the village instead of having to camp out on the land or ice. People need to be thinking in new ways a lot now.

Kivalina hunters do not pursue marine mammals in fall. They are hunting caribou at that time of year. Not many seals are seen in fall.

Bearded seals, caribou, and fish are the primary subsistence resources that sustain Kivalina. Other species, such as bowhead whales, beluga whales, and walrus are appreciated when they are available, but not essential to the community's well-being.

People eat the blubber (oil) and meat of bearded and ringed seals. They also eat many of the organs of both seals. Elders enjoy small seals of either species. Seals are fat in spring, and their blubber is good for seal oil. Fall seals are not as good for oil. In late spring, male ringed seals are darker and have a different taste "like kerosene" in the words of one hunter. Spotted seal meat is not eaten because it does not taste good, but spotted seal blubber may be used for oil if necessary. There has been no real change in the quality of seal meat or oil.

Sharing of seals and other animals is very important for Kivalina hunters. Hunters will take animals for their families, their relatives, elders, and others in the community. The first animal of the season is typically shared, so many people are excited when a hunter gets his or her first animal, knowing it will be distributed to others. People say that if you give first, more will come, so they do not like to keep their first catch. This practice applies to caribou and to marine mammals.

Shorefast ice does not stay as long as it used to. In some years, it starts to melt as early as March. The ice used to be thicker than it is now, and seems to be getting thinner. This year, in early January, there is open water to the beach. Last winter, 2015, the ice did not stay for good

until March. This winter may be similar. Shorefast ice used to form in early fall and stay until June, but this is no longer the case.

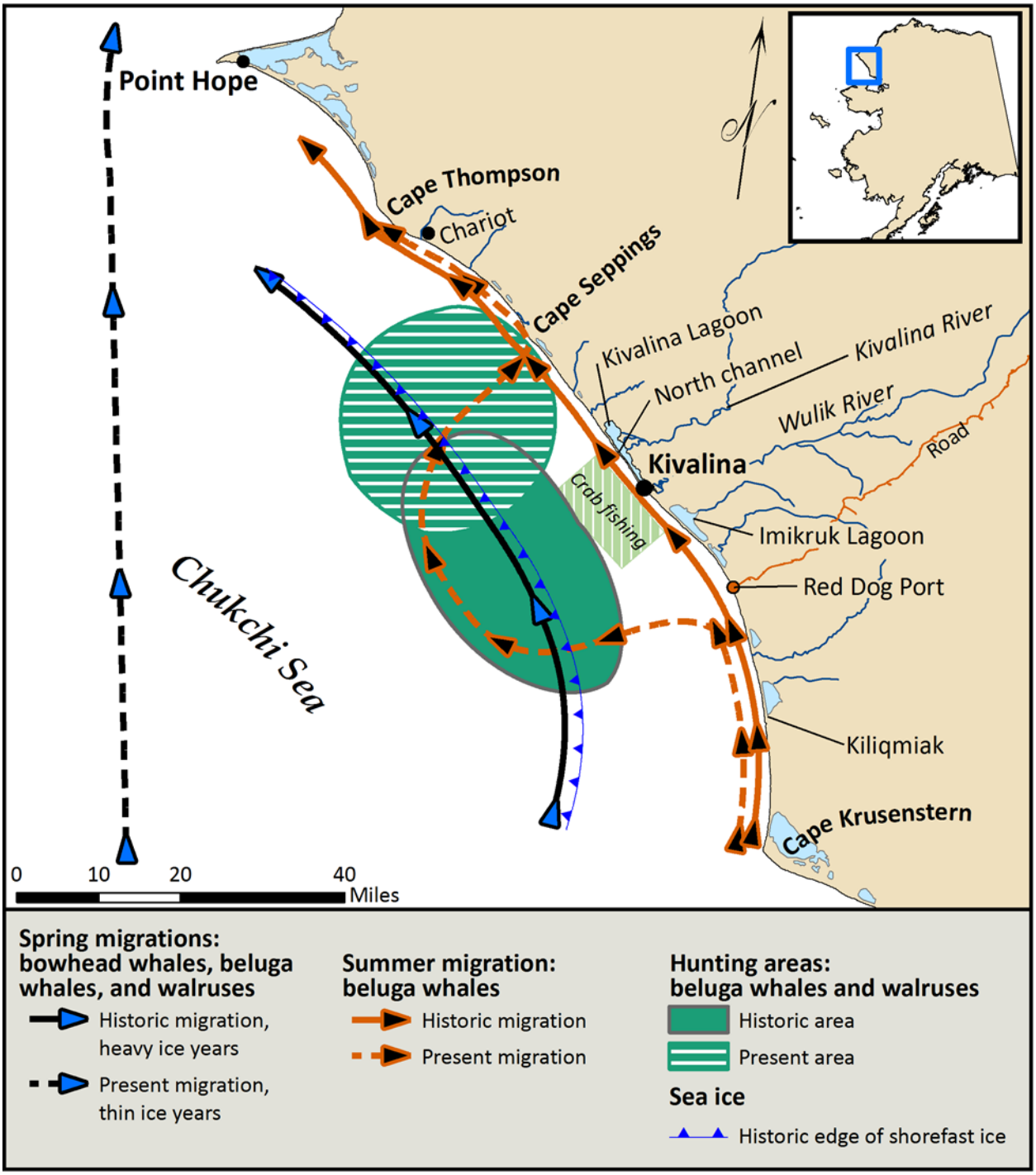


Figure 1. Movements and behavior of bearded seals, spotted seals, ringed seals, walrus, beluga whales, and bowhead whales as described during traditional knowledge interviews, January 2016.

Bearded Seals
Bearded seals start to haul out on the ice in spring when the days get longer. Many seals are seen at this time of year.

They are usually not hunted until the bowhead and beluga hunt is over, so as not to scare off the whales. Bearded seal hunting takes place before it is too warm, so that the meat will not spoil or be affected by insects as it is drying on racks.

In recent years, the thin ice has made it dangerous to go hunting for bearded seals on top of the ice. In 2015, the ice disappeared very quickly after break-up, so the opportunity for hunting bearded seals by boat was very short. In the late 1990s, hunters were caught by surprise one year when the hunting period was only a week long instead of several weeks. After that, they made sure to take advantage of the opportunity as soon as it came. That worked, until last year. In 2015, however, the season was much shorter, again catching hunters by surprise. Offshore winds carried the ice out, but the ice did not come back in after the winds died, as it used to do. This happened once before, in the 1980s. Now hunters fear it will be the new pattern.

A few bearded seals remain in the area after the ice goes out. Bearded seals come through the channel into the lagoon in summer, following fish. Young bearded seals go up rivers in fall. Bearded seals start returning to the area in fall.

A few sick bearded seals have been seen in recent years, with large hairless areas. One young bearded seal taken last October in open water had about half its hair missing. It did not have sores on its skin, but it was skinny. Most seals are healthy, but it used to be very rare to encounter a sick seal.

Ringed Seals
Some ringed seals stay all winter in the Kivalina area. In mid-winter, ringed seals are fat and in their prime. Hunters cannot get them now because the ice is thin or there is open water. Whereas hunting used to start in December or January, it is often not possible to hunt ringed seals until February or March.

It is important to take ringed seal in winter to make bleached sealskin leather, which requires cold weather to cure properly. Bleached ringed sealskin is becoming a rare commodity in Kivalina.

Small, sickly ringed seals have been seen on the beach in the past few years. They do not move off when people approach. They are not common, only a few each year, but this is a new phenomenon. One hunter said the previous time he saw a sick seal was at least 30 years ago, in contrast to seeing at least one each year now.

Spotted Seals
Spotted seals arrive after the ice leaves. Some pups can be seen on the beach all summer, going out to feed and coming back to rest and avoid danger. Spotted seals are seen all summer. Few people hunt spotted seals. Their skins are beautiful and warm, if tanned properly, but the meat is not wanted and the blubber is usually thin. People could get more spotted seals than ringed or

bearded seals these days. Spotted seals do not seem to be affected as much by changes in ice, as they come for the fish rather than the ice.

Walrus

Walrus come northwards past Kivalina in spring when the ice starts to break up, at the end of the bearded seal season. Walrus used to follow a path that brought them past Kivalina, but now seem to go straight from Shishmaref to Point Hope or Cape Thompson, which takes them 50 miles away from Kivalina, too far to go in a boat in broken ice.

Occasionally a walrus will be seen hauled out on the beach. They prefer ice, but will haul out on land if there is no ice.

Walrus are seen going south in fall. A few stray walrus are seen in summer, heading south.

One hunter took a female walrus each of the past two summers, in July, but the blubber was thin and the meat was very dark and red and stinky. They were excited about getting a walrus, because that has become rare for Kivalina hunters, but they could not eat it.

Women are not allowed to go walrus hunting because of stories from long ago of walrus chasing boats and even turning boats over.

Bowhead and Beluga Whales

Bowhead and beluga whales are normally hunted in spring as they migrate north through the leads in the ice. The whales continue to follow this pattern, but with more open water they can take a more direct route from Wales to Point Hope, bypassing Kivalina. When the ice is thick offshore, then bowheads and belugas are more likely to follow the leads along the shore in the Kivalina area. The whales that do come past Kivalina are typically 20 miles offshore. When there was stable shorefast ice in spring, hunters could go 20 miles out and camp at the ice edge to hunt whales. Now, it is too dangerous, so hunters do not have access to the whales. With the thin ice, Kivalina hunters would not be able to pull a large bowhead whale out of the water. There is still an opportunity, but it is shorter than it used to be.

A few belugas will be seen in summer, usually coming from the north. They may be deflected offshore near the Red Dog Port Site, then return to the coast near Cape Seppings. Some come south to feed in the river mouths along the coast, which is why they stay close to shore at this time. Last summer (2015), killer whales kept the belugas in the shallow water close to shore, where hunters could get them. Hunters did not see the killer whales, but heard reports of killer whales from people in Point Hope. The belugas stayed in shallow water, avoiding killer whales even though it made them vulnerable to human hunters. This happens from time to time, but not consistently. Killer whales are doing what they have always done.

Other Information

Gray whales come into the area at the end of summer.

Humpback whales were seen in front of Kivalina in July 2015, a time when there were lots of herring in the area. Humpbacks are seen every few years, usually in July when there are many chum salmon coming up the coast.

There are porpoises (harbor porpoises, *Phocoena phocoena*) in the Kivalina area in summer, but hunters do not pursue them.

Polar bears still come to the Kivalina area, but would usually be encountered by hunters at the ice edge during whaling season. Now that hunters cannot go as far out on the shorefast ice, they see fewer polar bears. Two polar bears have made dens in the hills behind Kivalina this winter.

One hunter found an eight-foot shark on the beach at the end of July one year.

Crabbing is good at Kivalina, especially in fall. The crabs are plentiful in deeper water about five miles from shore.

Some shrimp wash up on the beach after fall storms, along with small fish known as *akaluaq*. Squid and unusual fishes have been washing up on the beach in recent years, which is odd. The squid, which are black and a few inches long, have not been seen before. Some people have also seen swimming worms in the ocean, up to a foot long, the thickness of a pencil. Smaller worms were seen last summer, in a school towards Cape Thompson, at a time when there were also three gray whales nearby. Someone saw a swimming octopus in one recent year.

Acknowledgements

We are grateful for the skill, expertise, and generosity of the five people who participated in the interviews. We appreciate the support of the Eskimo Walrus Commission and the Ice Seal Committee for this project and are grateful to Enoch Adams Jr. for helping to set up the interviews and to Stanley Hawley and the Kivalina IRA Council for use of their office space. The Bureau of Ocean Energy Management (BOEM) funded the work as part of Contract Nos. M09PC00027 and M13PC00015 and we appreciate the support of Charles Monnett, Catherine Coon, Dan Holiday, and Carol Fairfield. Justin Crawford prepared the maps used during the interviews and the figures in this report.

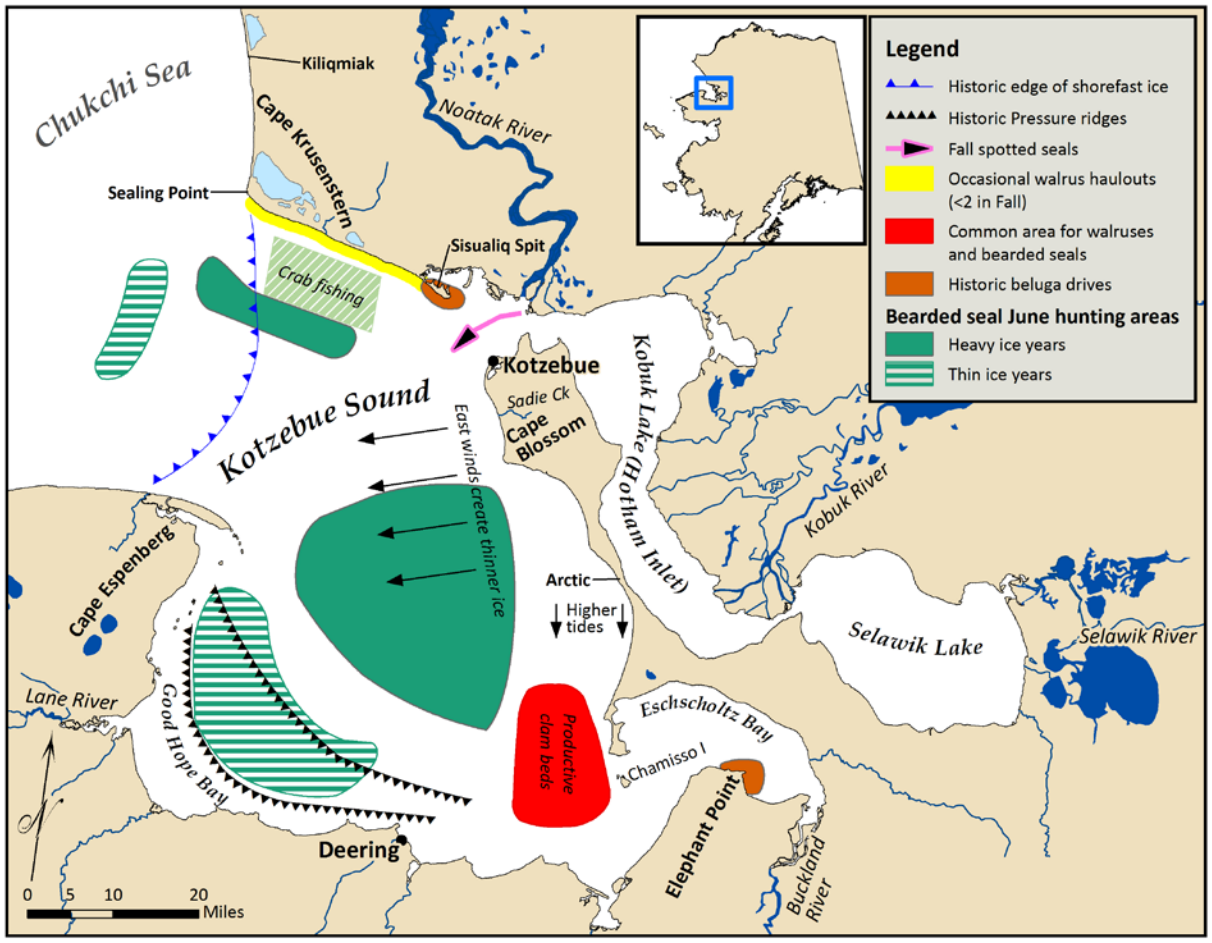
References

Huntington, H.P. 1998. Observations on the utility of the semi-directive interview for documenting traditional ecological knowledge. Arctic 51(3):237-242.

Noongwook, G., the Native Village of Gambell, the Native Village of Savoonga, H.P. Huntington, and J.C. George. 2007. Traditional knowledge of the bowhead whale (*Balaena mysticetus*) around St. Lawrence Island, Alaska. Arctic 60(1):47–54.

Appendix G-7. Huntington, H. P., M. Nelson, and L. T. Quakenbush. 2016b. Traditional knowledge regarding ringed seals, bearded seals, and walrus near Kotzebue, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015. 11 pp.

Traditional Knowledge Regarding Ringed Seals, Bearded Seals, and Walrus near Kotzebue, Alaska



Traditional Knowledge Regarding Ringed Seals, Bearded Seals, and Walrus near Kotzebue, Alaska

By:

Henry P. Huntington
Huntington Consulting
Eagle River, Alaska
hph@alaska.net
Ph: (907) 696-3564

Mark Nelson and Lori T. Quakenbush
Alaska Department of Fish and Game
Fairbanks, Alaska
mark.nelson@alaska.gov, lori.quakenbush@alaska.gov
Ph: (907) 459-7374, (907) 459-7214

Final Report
Approved July 2016

Final report should be cited as:
Huntington, H.P., M. Nelson, and L.T. Quakenbush. 2016. Traditional knowledge regarding ringed seals, bearded seals, and walrus near Kotzebue, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015. 11pp.

Introduction

Ringed seals and bearded seals are important species for subsistence harvests by Iñupiat hunters from Kotzebue (population 3,284), in northwestern Alaska. Walrus are found and hunted in this area, too. These Arctic marine mammal populations are at potential risk from climate change, increasing industrial activity, coastal development, and shipping through Bering Strait. Scientific studies of distribution, behavior, movements, and habitat use of seals and walrus have made important contributions to understanding the effects of a changing environment and the potential effects from industrial activity. For example, placing satellite transmitters on seals and walrus provides detailed information about the movements and some behaviors of individual animals. Documenting traditional knowledge about seals and walrus, through interviews with residents of coastal communities, however, provides valuable complementary current and historical information about the general patterns of each species.

This report summarizes information gathered from interviews with hunters and other knowledgeable residents in Kotzebue, Alaska, in January 2016. This traditional knowledge project used the same approach that the Native Village of Savoonga used when documenting traditional knowledge about bowhead whales on St. Lawrence Island (Noongwook et al. 2007).

Methods

We used the semi-directive interview method, in which the interviewers raise a number of topics with the person being interviewed, but do not rely solely on a formal list of questions (Huntington 1998). Instead, the interview is closer to a discussion or conversation, proceeding in directions determined by the person being interviewed, reflecting his/her knowledge, the associations made between walrus and other parts of the environment, and so on. The interviewers use their list of topics to raise additional points for discussion, but do not curtail discussion of additional topics introduced by the person being interviewed.

In Kotzebue, we interviewed six people individually. Those interviewed were John Goodwin, Cyrus Harris, Henry (Boyuk) Goodwin, and three others who wished to remain anonymous. The interviews were conducted on January 6 and 7, 2016, in the home of one interviewee, at the Kotzebue IRA Council office, at the Nullagvik Hotel, and, in one case, beginning at the Bering Air terminal, en route to Kivalina, at the Kivalina community center, and concluding at the Kivalina IRA Council office.

The topics identified by the research team in advance of the interviewers were:

- Haulouts on land
- Overwintering areas and behavior
- Use of lagoons and rivers
- Feeding patterns and prey
- Differences between ringed and bearded seals
- Impacts from climate change
- Parts of seals that people eat

The results are presented under different headings, reflecting the actual information collected and the fact that some of the subjects blend together, especially changes seen over time in regard to

all of the topics. The interviewers were Henry Huntington and Mark Nelson. Lori Quakenbush is the project leader.

General Observations about Seals

Hunters on the coast would take seals for their own families and also for families that could not hunt for themselves, such as elders and widows. They would also take seals to trade with people from upriver, getting dried fish and furs in return.

People eat seal oil, meat, heart, kidneys, intestine, and liver of seals. Bearded seals are preferred, though all seals can be eaten. From spotted seals, hunters usually take the hide and blubber, as the meat is not regarded as tasty. Bearded seal flippers would be aged underground and eaten after a few weeks. In the old days, people would store seal and other foods in sealskin pokes in ice cellars. Today, they typically use electric freezers and modern containers.

Elders like young bearded seals, which produce nice, clear oil. Older male bearded seals yield oil that is yellow and less preferred.

By May, seals are making holes in the ice and coming out to lie on top of the ice. Historically, hunters would start hunting when the seals started hauling out atop the ice. Most of the seals seen at this time are adult seals, but hunters would also take young seals when they came out of their lairs. The skins were very desirable at that stage, soft and good for liners. The best hunting for pups was in years with little snow in early spring, which did not happen every year.

Soon after break-up, only bearded and ringed seals are around. Later on, while the ice is still there, spotted seals arrive and the bearded seals and most ringed seals leave. Spotted seals are aggressive and scare off the other seals. Once spotted seals are there, hunters either stop looking for bearded seals or look elsewhere for bearded seals. This is usually in June or July.

There are seals year round in Kotzebue Sound and along the coast. From satellite tagging, hunters now know that the juveniles travel far, even into the Bering Sea, whereas older seals tend to stay closer to Kotzebue Sound.

Hunters can get bearded, ringed, and spotted seals in fall, though the bearded seals are almost all juveniles.

The quality of seal and walrus meat, blubber, other foods, oil and hides has not changed. Seal behavior has not changed, either, despite changes to the ice.

This past year, seals were fat and healthy, and there were many pups, despite the poor ice conditions for hunters. Hundreds if not thousands of seals were seen in Eschscholtz Bay in 2015. Lots of seals were seen between Kotzebue and the Chamisso Islands, including seals sleeping on the water surface. The only big change is the loss of hunting opportunity due to poor ice and rapid disappearance of ice after break-up starts.

When the snow melts early, there is no protection for seal pups from predators such as jaegers and ravens and foxes. The roof of the den collapses and the pup is exposed. Under the snow, seals move around and make escape routes from their dens.

The smallest pups do not go into the water.

There are as many or more seals now as there were in the past. There has never been a shortage of seals compared with people's needs. There is not as much hunting, largely because there are fewer dogs to feed. Hunters also used to get seals to make sealskin pokes for storing oil and meat, but today there are other containers so no need to hunt seals for this purpose.

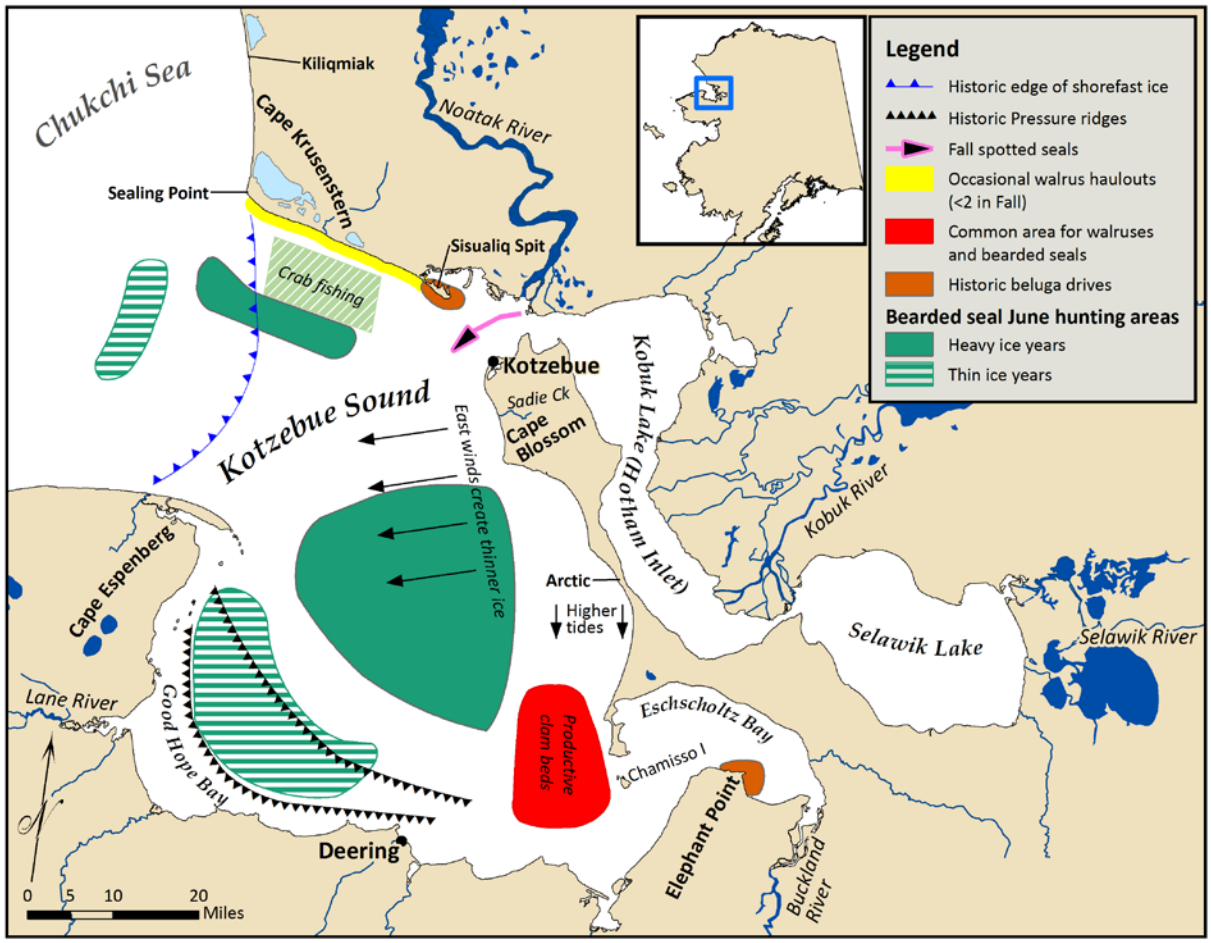


Figure 1. Movements and behavior of bearded seals, spotted seals, ringed seals, walrus, and beluga whales as described during traditional knowledge interviews, January 2016.

Seals and Disease

It seems there may even be an overpopulation of seals, which could cause starvation if there is not enough food for all the seals. When animals starve, they can develop many different kinds of disease, which may help explain the skin sores and other problems hunters saw a few years ago.

Hair loss is normal in seals, and can be seen on bearded, ringed, and spotted seals. When seals were taken, hunters' wives would pull on the hair to see if the hair was firmly attached or if the seal was in the middle of the molt. Seals that are molting or have lost hair are good for making leather, for ropes and mukluk soles and other purposes. Hairless seals would be fed to dogs, or if they seemed fat and healthy otherwise would be eaten by people. One hunter took a hairless ringed seal in winter, and his grandmother said he should burn it, so he did. People would say the seals did not spend enough time on top of the ice to molt fully. The hair loss may also have come from rubbing against the seabed. The loss of ice in recent years may mean the seals cannot spend as much time hauled out as they used to, which could affect the molt. Seals may have to learn to adapt, for example by hauling out on land instead of ice.

The recent hair loss, accompanied by skin sores and other signs of ill health, is a new phenomenon. Hunters do not want to handle, much less eat, seals that show signs of poor health. In addition to the sores, the seals appear lethargic. Ringed seals hauled out on the beach do not flee, so would be easy to catch, but hunters do not want to approach them once they see they are sick. This illness occurred first in 2011, but seems mostly to have disappeared. Some hunters see it as nature's way of dealing with overpopulation of seals.

Bearded Seals

In spring, bearded seals are the focus for hunting, getting food for spring and for the following winter. When the ice started to break up, hunters would go to Sealing Point (near Cape Krusenstern) to hunt bearded seals. In the days before outboard motors, hunters would use kayaks to go between floes and in the cracks in the ice to pursue bearded seals.

The ice edge off Cape Krusenstern is a good place to hunt bearded seals, though the seals move around. Many may be seen one day, and none the next day, in the same spot. The waters about 10 miles west of Cape Blossom are also rich with seals, but this is farther from shore and more dangerous to travel to. The waters north of Cape Krusenstern are also good for hunting, at Kiliqmiak, just south of Rabbit Creek. There are many creeks and other places on either side of Cape Krusenstern where hunters can find refuge in case of bad weather. There are fewer places to find refuge in southern Kotzebue Sound.

It used to be that there were two or three weeks of good hunting conditions for bearded seals, as the ice broke up but before it was gone entirely. In spring 2015, there was only a week or less, because the ice disappeared very quickly after break-up. This is due in part to more east wind, blowing the ice out, and in part to thinner ice during the winter, making it easier to melt and move. The lack of ice also meant that waves could build up more in Kotzebue Sound, increasing the risk for hunters. Some ice remained towards Goodhope Bay, but it was dangerous to go that far in open water. Still, if hunters can find an ice floe, there are often bearded seals nearby, so the hunting can be good. With so little ice, the bearded seals have few options left, so are concentrated near the floes that remain. The risk of exposure to wind and waves is still higher for hunters with so little ice.

Bearded seals come in earlier than they used to, but often stay on thin ice where hunters cannot reach them. Thinner ice also makes it harder to hunt for bearded seals, as travel on top of the ice is more dangerous for hunters. Bearded seals can be hunted while they are swimming in open

water, but hunters prefer to get them on the ice since hauling them in and out of the boat is difficult. The adult bearded seals come in earlier because the ice breaks up earlier, but they do not stay as long because the ice goes away quickly, leaving only swimming seals.

Bearded seals need white ice (thicker ice), but there is more and more black ice (thinner, younger ice) in Kotzebue Sound these days, which produces fewer pressure ridges and thus less denning habitat. The ice is no longer suitable for camping during the spring hunt. The ice that is left moves very quickly in the currents and can break up quickly, making it dangerous for camping. Adult bearded seals in spring have thinner blubber than they did in the past, only an inch or an inch-and-a-half thick as opposed to three to four inches.

Yearling bearded seals (*ugruchiaq*) return in September, before the ice starts to form. Many of these seals spend time up rivers, including the Ugrugvik Lakes, just north of the mouth of the Kobuk River. A bearded seal was seen close to Ambler on the Kobuk River in September 2015. There are often bearded and ringed seals up the Kobuk, and seemed to be even more this past fall (2015), well over a dozen. Some bearded and ringed seals also go up the Noatak River. There were more yearling bearded seals last fall (2015) than ever before. They appeared very healthy.

One hunter has checked the stomachs of three bearded seals in his lifetime. All were full of shrimp. The seals will feed throughout Kotzebue Sound, but a prime feeding area is off the Chamisso Islands.

Ringed Seals

Some ringed seals will stay in Kotzebue Sound during summer, but most move away because they do not like to be around spotted seals. Ringed seals return in late summer. The juveniles come first, and the adults later in fall after the spotted seals have started to leave. Adult ringed seals will stay in Kotzebue Sound all winter. They make their dens in the pressure ridges. Large ridges used to form in the middle of Kotzebue Sound, but the ice today is thinner. Merging currents at Cape Blossom also created pressure ridges close to shore, but today this area is often open water even into winter, reducing denning habitat for ringed seals. In mid-winter, ringed seals are fat and healthy, at their most prime condition. They float very well at this time of year.

Spotted Seals

After the ice is gone in summer, spotted seals are the ones seen in the area until fall. They come to feed on the fish in Kotzebue Sound and in the rivers. Spotted seals are molting when they arrive. That is the time of year when everything is molting. Many spotted seals go up the Noatak River, to just below the hatchery, though they are generally in the lower part of the river. They also go into Hotham Inlet, Kobuk Lake, and Selawik Lake. They feed on fish in the freshwater areas.

After the ice floes start to form in fall, spotted seals will haul out in the hundreds and ride the ice to the southwest when the wind blows from the northeast. In fall 2015, thousands of spotted seals were seen in front of Kotzebue. Buckland hunters took many spotted seals in Eschscholtz Bay, including by the mouth of the Buckland River.

Spotted seals may be arriving a little later than they used to, and are staying a lot longer in fall.

Walrus
Walrus come into Kotzebue Sound in spring, and feed in the waters off the Chamisso Islands in southern Kotzebue Sound. They may have young there, too. They stay while there is still ice in the area.

In fall, one or two walrus may haul out on the beach to the east of Cape Krusenstern. There are never many that do this.

When there are walrus around, seals will not be seen. The seals stay away from walrus.

A walrus taken last summer had shrimp in its stomach.

Beluga Whales
Beluga whales will come into Kotzebue Sound when the ice starts to break up, coming in the cracks that form from Cape Espenberg and Cape Krusenstern.

There has been a huge change in beluga whales in Kotzebue Sound. It is not even clear that there is a Kotzebue Sound population any more. People used to get them every year. Sisualiq is named for beluga whales (*sisuaq*), and there used to be drive hunts there every summer. The drive hunt used to be well organized and coordinated, but now people tend to go for themselves rather than as a group. Belugas do not go into Eschscholtz Bay the way they used to, either. The few sightings in recent years have been around the mouth of the Noatak River, with a few in Eschscholtz Bay, and one juvenile beluga as far upriver as Selawik Lake. One beluga was seen in the shallows between Kotzebue and Sisualiq, in only a few feet of water, during the tomcod run in October, which is very late for a beluga to be seen near Kotzebue.

There is a lot of boat traffic these days, especially hunters from Kotzebue going after bearded seals towards Cape Krusenstern or putting in crab pots north of Kotzebue. The noise may deter belugas from coming into the Sound. Elders said the belugas came in because it was quiet. When air traffic increased at Kotzebue, the belugas started to decline. The noise of jet planes can be heard even at Sisualiq. The conflict between Buckland and Kotzebue hunters over hunting in Eschscholtz Bay (Elephant Point), which was the last place belugas were plentiful in Kotzebue Sound, may also have contributed to the decline. The custom is to let the first animals pass, but these days there are no animals to follow the first ones. Today, though, hunters may pursue the first animals. Hunters no longer coordinate the hunt the way they used to. Most beluga hunting today is with nets.

The ice entrapment of belugas in Russia in the mid-1980s seems the most likely explanation for their disappearance. There was a lot of harvest prior to that, but it seems hard to believe that overharvest is the explanation for the nearly complete disappearance of belugas from Kotzebue Sound.

The belugas that came into Kotzebue Sound in large numbers in one year in the 1990s were thinner than the belugas Kotzebue hunters are used to taking.

A group of belugas came to the Sadie Creek area a few years ago. Hunters think killer whales chased them in, because the belugas nearly beached themselves in the shallows.

One year, hunters found a king salmon in the stomach of a beluga whale. Two other belugas taken at the same time had only tomcod in their stomachs. A beluga taken in summer 2015 had a stomach full of crabs. Crabs are sometimes seen in beluga stomachs, but usually the stomachs are mostly full of fish.

Killer whales

There are more killer whales than there used to be in the Kotzebue Sound area. This is known from observations and also from the results of acoustic monitoring done by the Kotzebue IRA Council. When they follow belugas, the belugas will stay very close to shore and even go into very shallow water. Killer whales stay where the water is deep. One hunter saw a killer whale kill a large male beluga by holding it under water until it died. After that, the killer whales tore the beluga apart.

Other Information

Fewer ribbon seals are seen now than in the past. Hunters used to encounter them now and then, but hardly seem them now. People never ate them, but took the hides and fed the meat and blubber to dogs. One hunter saw many ribbon seals a few years ago, between Point Hope and Cape Lisburne.

A fur seal was once seen in Kotzebue Sound, many years ago.

The waters between Cape Espenberg and Cape Krusenstern are very dynamic, with open water and moving ice in winter and spring, and an abundance of marine mammals.

The southern end of Kotzebue Sound, including Eschscholtz Bay, has tides of about four feet. Boats hauled up at Cape Espenberg can be left high and dry at low tide if hunters are not paying attention. The northern end, including Kotzebue, does not.

The water level in northern Kotzebue Sound, Hotham Inlet, Kobuk Lake, and Selawik Lake is controlled by wind. North and east winds cause the water level to drop; west and south winds cause it to rise, with the highest water coming from south winds. Fish movements are determined by the currents caused by the wind. There used to be little south wind in summer, but September would bring south winds, causing the water to rise. The prevailing wind in winter is from the east, lowering the water and preventing flooding. Today, there is more flooding due to changing wind patterns.

An east wind opens the ice to the west of a line between Cape Espenberg and Cape Krusenstern. In the old days, hunters would travel to the ice edge by dog team when there was an east wind so they could hunt seals there. They would wait for the wind to calm down, so that the risk of being blown out to sea was less, and then have a day or two of seal hunting before the open water froze over again. Today, east winds may open the ice may well within Kotzebue Sound. While new ice may form on the open water, the ice still remains thin and does not have time to become thick. It seems that the east winds are stronger than they used to be.

In those days, the ice in Kotzebue Sound was five to six feet thick, and there was no moving ice inside of the Espenberg-Krusenstern line. There were more pressure ridges in Kotzebue Sound, including very large ones in the middle of the sound. Seals make their lairs in the pressure ridges, where the ice and snow provide good habitat. Today, the ice is thinner and flatter, though there are still some smaller pressure ridges, closer to shore, so there is still denning habitat for seals. The thinner ice is more dangerous for traveling, as it can open up or form cracks well into Kotzebue Sound. No longer can hunters travel straight from Kotzebue to Cape Espenberg—the ice is too unreliable. There is much less shorefast ice, since there are not large pressure ridges to hold the ice in place. There are fewer strong west winds to push the ice into Kotzebue Sound and build up those pressure ridges, and the ice is thinner. Hunters used to be able to camp on the ice past Cape Krusenstern, but today the ice is not reliable.

While ice and weather conditions have always varied from year to year, the changes have really taken effect over the past fifteen years or so. In the 1980s, there was still ice for hunting bearded seals into July, but now the ice is gone in June.

When the ice goes out in spring, Kotzebue Sound opens up a week or two after Kobuk and Selawik Lakes. The elders have always said it is dangerous to go out while there is still ice in Kobuk Lake and Hotham Inlet. In some years, the ice goes out quickly, and in other years it goes back and forth in Kotzebue Sound for some weeks.

A strong current carries spring pack ice from Cape Espenberg northwards towards Cape Krusenstern. A current along the coast from Shishmaref merges with a current coming from Goodhope Bay and southern Kotzebue Sound to produce a stronger current going north. This current does not go into northern Kotzebue Sound, but goes north past Cape Krusenstern.

There used to be more snow, on the ice and in town.

The weather used to be easier to predict. Now it is hard to read. Clouds forming on the tops of mountains are a good indicator that winds are coming, as are the ways high clouds form or disappear in the sky.

Hunters use satellite imagery of sea ice to plan boat travel in Kotzebue Sound, to help improve safety and efficiency as they will know where to find ice for hunting bearded seals.

Concerns

Continued climate change, and subsequent changes, like more commercial shipping, remain a concern. If the ship traffic starts to occur when marine mammals are migrating, it could be a major conflict or impact. The Arctic Waterways Safety Committee is a good forum for discussing shipping. Having a shipping lane from Bering Strait to Canada would be a good way to reduce impacts and risks to hunters.

The reports of dying murres and poor salmon returns from around the state raise concern about how much the ocean is changing and what that is likely to mean for people in Kotzebue, even if seals in Kotzebue Sound appear to be doing well so far.

Acknowledgements
We are grateful for the skill, expertise, and generosity of the six hunters who participated in the interviews. We appreciate the support of the Eskimo Walrus Commission and the Ice Seal Committee for this project and are grateful to John Goodwin and Alex Whiting for helping to set up the interviews and to the Kotzebue IRA Council for providing space for interviews. The Bureau of Ocean Energy Management (BOEM) funded the work as part of Contract Nos. M09PC00027 and M13PC00015 and we appreciate the support of Charles Monnett, Catherine Coon, Dan Holiday, and Carol Fairfield. Justin Crawford prepared the maps used during the interviews and the figure in this report.

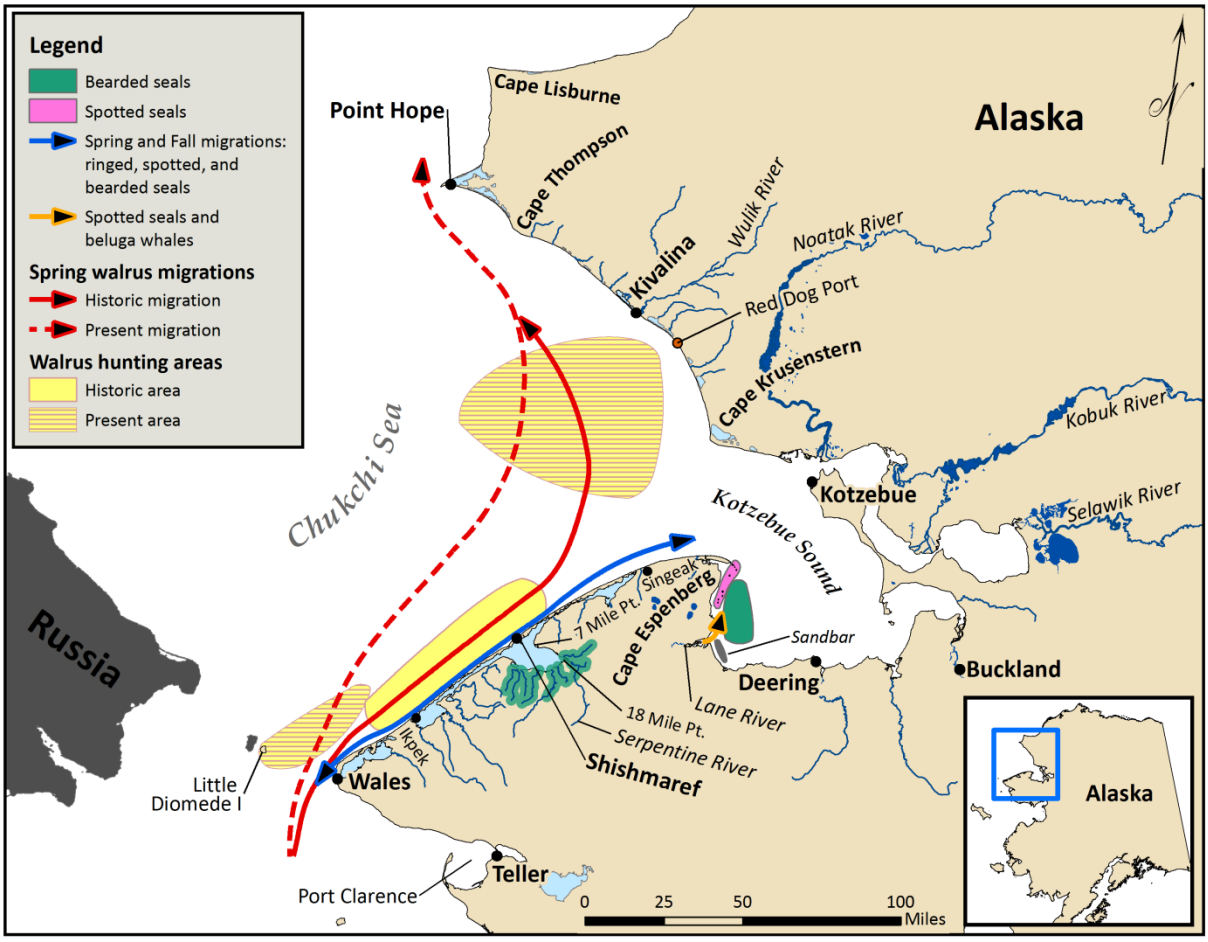
References

Huntington, H.P. 1998. Observations on the utility of the semi-directive interview for documenting traditional ecological knowledge. Arctic 51(3):237-242.

Noongwook, G., the Native Village of Gambell, the Native Village of Savoonga, H.P. Huntington, and J.C. George. 2007. Traditional knowledge of the bowhead whale (*Balaena mysticetus*) around St. Lawrence Island, Alaska. Arctic 60(1):47–54.

Appendix G-8. Huntington, H. P., M. Nelson, and L. T. Quakenbush. 2016c. Traditional knowledge regarding ringed seals, bearded seals, and walrus near Shishmaref, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015. 8 pp.

Traditional Knowledge Regarding Ringed Seals, Bearded Seals, and Walrus near Shishmaref, Alaska



Traditional Knowledge Regarding Ringed Seals, Bearded Seals, and Walrus near Shishmaref, Alaska

By:

Henry P. Huntington
Huntington Consulting
Eagle River, Alaska
hph@alaska.net
Ph: (907) 696-3564

Mark Nelson and Lori T. Quakenbush
Alaska Department of Fish and Game
Fairbanks, Alaska
mark.nelson@alaska.gov, lori.quakenbush@alaska.gov
Ph: (907) 459-7374, (907) 459-7214

Final Report
Approved July 2016

Final report should be cited as:
Huntington, H.P., M. Nelson, and L.T. Quakenbush. 2016. Traditional knowledge regarding ringed seals, bearded seals, and walrus near Shishmaref, Alaska. Final report to the Eskimo Walrus Commission, the Ice Seal Committee, and the Bureau of Ocean Energy Management for contract #M13PC00015. 9pp.

Introduction

Bearded seals, spotted seals, and ringed seals are important species for subsistence harvests by Iñupiat hunters from Shishmaref (population 579), on the northern coast of the Seward Peninsula, in the Chukchi Sea coast, just north of Bering Strait in Alaska. Walrus are found and hunted in this area, too. These Arctic marine mammal populations are at potential risk from climate change, increasing industrial activity, coastal development, and shipping through Bering. Scientific studies of distribution, behavior, movements, and habitat use of seals and walrus have made important contributions to understanding the effects of a changing environment and the potential effects from industrial activity. For example, placing satellite transmitters on seals and walrus provides detailed information about the movements and some behaviors of individual animals. Documenting traditional knowledge about seals and walrus, through interviews with residents of coastal communities, however, provides valuable complementary current and historical information about the general patterns of each species.

This report summarizes information gathered from interviews with hunters and other knowledgeable residents in Shishmaref, Alaska, in January 2016. This traditional knowledge project used the same approach that the Native Village of Savoonga used when documenting traditional knowledge about bowhead whales on St. Lawrence Island (Noongwook et al. 2007).

Methods

We used the semi-directive interview method, in which the interviewers raise a number of topics with the person being interviewed, but do not rely solely on a formal list of questions (Huntington 1998). Instead, the interview is closer to a discussion or conversation, proceeding in directions determined by the person being interviewed, reflecting his/her knowledge, the associations made between walrus and other parts of the environment, and so on. The interviewers use their list of topics to raise additional points for discussion, but do not curtail discussion of additional topics introduced by the person being interviewed.

In Shishmaref, we interviewed five people, three in one group and two individually. Those interviewed were William Olanna, Bert Iyatunguk, Fred Weyiouanna, Morris Kiyutelluk, and one other who wished to remain anonymous. The interviews were conducted on January 4 and 5, in the homes of the interviewees and at the Shishmaref IRA Council office.

The topics identified by the research team in advance of the interviewers were:

- Haulouts on land
- Overwintering areas and behavior
- Use of lagoons and rivers
- Feeding patterns and prey
- Differences between ringed and bearded seals
- Impacts from climate change
- Parts of seals that people eat

The results are presented under different headings, reflecting the actual information collected and the fact that some of the subjects blend together, especially changes seen over time in regard to

all of the topics. The interviewers were Henry Huntington and Mark Nelson. Lori Quakenbush is the project leader.

General Observations

In spring, bearded seals come first, followed by walrus, and then spotted seals. When the spotted seals are plentiful near Shishmaref, hunters know the bearded seal season is over, unless they go most of the way to Kotzebue to catch up to them. Today, the changing climate is shortening the time separating the migrations and they are blending together such that bearded seals and walrus may arrive at the same time.

Animals are arriving earlier in spring than they used to, and the spring season is over sooner. It used to be that duck hunting came before bearded seal hunting, but now bearded seal hunting takes place at the same time as duck hunting. Eggs and berries also come earlier than they used to.

Seals are not common around Shishmaref in summer, from about July to September. They are at Cape Espenberg and in Kotzebue Sound.

In fall, there are more seals in the Shishmaref area than there used to be.

Sea ice breaks up earlier than it used to and freezes much later. This winter (2015-16), there was open water on the ocean until Christmas, when it usually freezes by November. The ice is thin and dangerous much of the time, not solid and reliable as it once was in winter. There are no large pressure ridges to hold the ice in place, so in spring the ice will break up quickly and be dangerous to travel on.

Seals feed on herring and salmon, which are plentiful in the Shishmaref area.

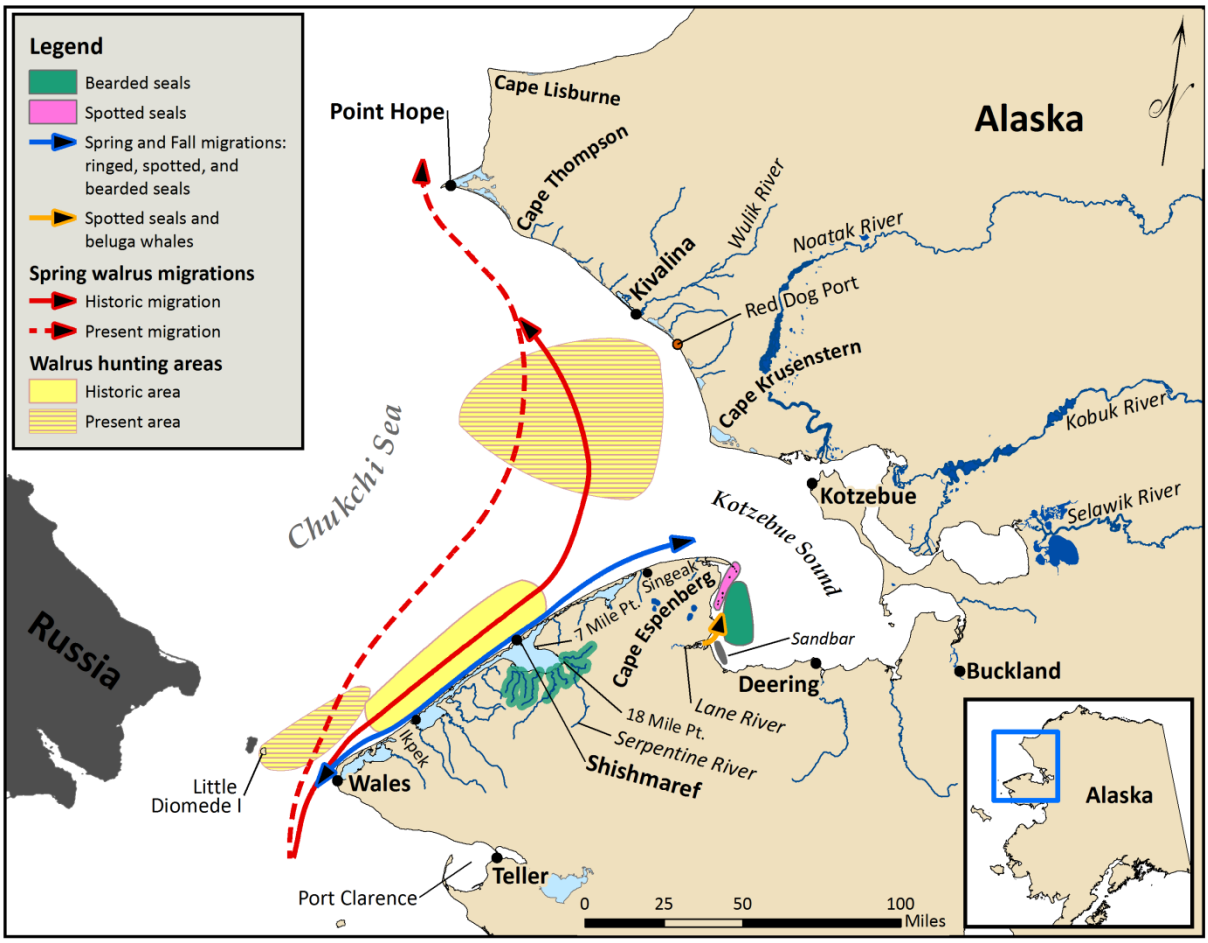


Figure 1. Movements and behavior of bearded seals, spotted seals, ringed seals, walrus, and beluga whales as described during traditional knowledge interviews, January 2016.

Bearded Seals

Bearded seals are the main source of food for Shishmaref residents. Bearded seal oil and meat are a typical winter meal. Bearded seals are hunted mainly in spring, from the shorefast ice or in the pack ice when boating is possible.

In spring, bearded seals migrate closer to the shore and the village than they used to. Hunters do not have to travel as far, unless they are held on shore because the sea ice is piled up against the land. In those years, hunters may have to travel very far, sometimes to northern Kotzebue Sound, in pursuit of bearded seals.

Young bearded seals (unmiaq) migrate north with the adults, but migrate back south slightly ahead of the adults. Unmiaq's are also found up rivers in summer, especially the Serpentine River and occasionally in smaller rivers and tributaries. They are likely feeding on salmon.

Bearded seals return to the Shishmaref area in late fall, when slush ice starts to form on the ocean. In spring, the bearded seals surface often as they migrate past the village. In fall, they travel differently, surfacing infrequently and moving fast.

One fall during the slush ice period, one hunter saw one pan of sea ice full of spotted seals and another pan nearby that was full of bearded seals.

In recent years, since the Fukushima nuclear reactor breach in 2011, hunters have seen many diseased animals, with sores around their flippers and back end, with white livers, and with bald spots or even with no hair at all. The hair can feel like sandpaper instead of being smooth, and in fall it may come out easily when it should be firmly attached to the skin. In 2015, there were more sick seals than in 2014.

Hunters once found a worm in a bearded seal's liver, most likely a liver fluke. The animal appeared healthy otherwise, though its blubber was yellow-orange.

In spring 2015, after the sea ice broke up, hunters caught a young bearded seals (*unmiaq*) but found that it was covered with white spots. This was something different from the hair loss hunters were familiar with. Hunters do not like to eat diseased animals. One hunter's grandmother told him not to eat seals that have no hair where they are supposed to have hair. Many hunters do not even want to touch animals that appear severely ill.

Bearded seals in fall also showed signs of disease. Diseased seals of all species are typically thin, with little blubber, and do not dive right away or stay down for long. One seal did not dive until three shots were fired at it. Healthy seals dive right away and can stay down for a long time.

People in Shishmaref eat the oil, meat, liver, intestines, kidneys, heart, and lungs of bearded seals. The blubber is rendered into oil. Meat is dried and stored in oil. Liver is cooked and then stored in oil. Intestines are dried, cooked, and stored in oil. Lungs are half-dried and then eaten. They can become hard as wood if left too long. Flippers are hung up with the drying meat until they become tasty. In the old days, seal oil and meat would be stored in sealskin pokes, in shallow holes in the ground, covered with wood. In fall, the ground would freeze and water in the hole would freeze, helping protect the pokes from bears and foxes. The quality of seal meat, seal oil, and seal hides does not appear to have changed.

Some bearded seals have claw marks, probably from polar bears as the seals are hunted in spring.

Albino bearded seals are seen, though rarely.

Spotted Seals

Spotted seals are typically hunted in fall when they return to the Shishmaref area from Cape Espenberg and Kotzebue Sound. They are the first seals seen in early fall before the ice starts to form.

Spotted seals haul out in large numbers on small islands south of Cape Espenberg on the Kotzebue Sound side. They are also seen in large numbers in the mouth of the Lane River, farther south of Cape Espenberg on the same side, particularly in the deep water channel on the north side of the Lane estuary.

In fall 2015, hundreds of spotted seals were seen on top of ice in Shishmaref Lagoon near the mouth of the Serpentine River. During open water, spotted seals are abundant near the entrances to Shishmaref Lagoon likely eating fish because the fishing is poor. The fish arrive in higher numbers once the ice forms and the seals leave.

Spotted seals in recent years have been larger than they used to be. The spotted seals found near Cape Espenberg, at Singeak, and at Ikpek (southwest of Shishmaref) are all big. The spotted seals in Shishmaref Lagoon are only 4-5 feet long, not the big ones.

Spotted seals also suffer from the disease that afflicts bearded seals, the one that causes hair loss.

Ringed Seals

Ringed seals, referred to as common seals, are typically hunted in fall, but can be hunted year round if they are available.

Ringed seals return to the Shishmaref area in late fall, like bearded seals, when slush ice starts to form on the ocean.

The harvest of ringed seals has declined due to the disease that has been seen on so many bearded, spotted, and ringed seals in the past five or so years. People do not want to hunt animals that may be sick. Some ringed seals and ringed seal pups are seen on the beach in summer, but people do not want to harvest them or touch them or even feed them to dogs because of the risk of disease.

Walrus

Walrus are hunted in spring as they migrate northwards with the retreating ice. Walrus migrate farther off shore now because the pack ice is less dense and more broken than in the past.

Walrus are occasionally seen in fall, as lone animals swimming past. One was seen in Shishmaref Lagoon. Some individuals are seen hauled out on the beach, by themselves.

Walrus can be seen sometimes on very small ice floes, instead of in larger groups on larger ice pans the way they used to haul out. Sometimes only the small floes are available.

In the 1970s and early 1980s, some hunters went over 50 miles offshore on the ice by snowmachine to hunt walrus. In those days, the weather was cold and the sea ice was solid.

Today, walrus are sometimes hunted from the ice edge in May. They used to be hunted along the shore north and south of Shishmaref. In some years, hunters have to go as far as Kotzebue Sound and even close to Kivalina to pursue walrus as they migrate northwards. When they do

so, hunters may go to Cape Espenberg and wait for good weather for traveling across Kotzebue Sound. Hunters have also gone as far south as Wales and Diomede to pursue animals.

Walrus appear healthy, with no sign of the disease afflicting seals. Some walrus are skinny, perhaps due to retreating sea ice and having to swim farther from their resting places atop the ice to their feeding areas.

Other Information

Ribbon seals are very skittish, diving off ice floes at the slightest sound or smell of people.

It is harder to find polar bears than it was 20 years ago. They are typically seen in spring when they go out with the sea ice. Nowadays, some get stranded on land. Some are seen swimming straight out to sea, presumably in search of sea ice. Hunters in Shishmaref do not believe the polar bears survive this attempt. Polar bears are seen more often inland than they used to be, usually in early spring before the ice goes out.

Steller sea lions are occasionally seen in the Shishmaref area. This is a relatively new phenomenon, but is still rare.

The Lane River area is a good place to hunt belugas in late summer and fall.

In spring 2015, killer whales kept a gray whale cow and calf close to shore near Shishmaref. The killer whales may have taken the calf.

Hunters can push whales in the direction they want them to go by slapping the water with their paddles. This imitates the behavior of killer whales, which slap their tails and dorsal fin on the water to scare the whales and push them in the direction the killer whales want them to go. Whales have occasionally come into Shishmaref Lagoon, but this has not happened in recent years. The bones of a whale can be found a short distance upstream from the mouth of the Serpentine River, where hunters pursued it many years ago. It is not known what species of whale it was.

Shishmaref hunters took a bowhead whale once, when it came closer to the shorefast ice than usual.

Many more gray whale carcasses are seen along the coast near Shishmaref than there used to be. Bowhead whale carcasses remain rare.

Fish arrive in spring after the ice goes out.

There are more seabirds in the Shishmaref area now than there used to be. There are also different birds

There are different crabs in the Shishmaref area in recent years.

Some hunters will print satellite images of sea ice before going out on the shorefast ice in spring.

The channels into Shishmaref Lagoon formed relatively recently. The one to the north of the village, for example, opened within the past two generations. The grandmother of one Shishmaref resident described jumping over the narrow channel when she was young, as it was forming.

Caribou are found closer to the village recently than they have been for many years. The warmer weather may be an influence. The elders said the caribou would return to this area. They can be seen on the mainland not far from Shishmaref. It used to be that only a few caribou might be seen, but now there are hundreds if not thousands. Predators are closer, too, including wolves, wolverine, and brown bears.

It used to be possible to predict good weather for a couple of days, so that hunters could cross Kotzebue Sound for example. Now, the winds and bad weather can come up very quickly.

Acknowledgements

We are grateful for the skill, expertise, and generosity of the five hunters who participated in the interviews. We appreciate the support of the Eskimo Walrus Commission and the Ice Seal Committee for this project and are grateful to Jane Kakoona, Karen Olanna, and Renee Kuzuguk from the Shishmaref IRA Council office for helping to set up the interviews. The Bureau of Ocean Energy Management (BOEM) funded the work as part of Contract Nos. M09PC00027 and M13PC00015 and we appreciate the support of Charles Monnett, Catherine Coon, Dan Holiday, and Carol Fairfield. Justin Crawford prepared the maps used during the interviews and the figure in this report.

References

Huntington, H.P. 1998. Observations on the utility of the semi-directive interview for documenting traditional ecological knowledge. Arctic 51(3):237-242.

Noongwook, G., the Native Village of Gambell, the Native Village of Savoonga, H.P. Huntington, and J.C. George. 2007. Traditional knowledge of the bowhead whale (*Balaena mysticetus*) around St. Lawrence Island, Alaska. Arctic 60(1):47–54.

Technical Summary: BOEM Publication 2016-053

Study Title: Pinnipeds Movements and Foraging

Report Title: Village-Based Walrus Habitat Use Studies in the Chukchi Sea from 2009–2016

Contract Number: M09PC00027, BOEM **Study Number:** 2016-053
Sponsoring OCS Region: Alaska
Applicable Planning Areas: Chukchi
Fiscal Years of Project Funding: 2009–2016

Completion Date of Report: June 2016
Cost by fiscal year; FY 2009: $1,880; FY 2010: $238,017; FY 2011: $128,276; FY 2012: $117,432; FY 2013: $272,520; FY 2014: $313,748; FY 2015: $441,256; FY 2016: $16,008
Cumulative Project Cost: $1,529,137
Project Manager: Lori Quakenbush
Affiliation: Alaska Department of Fish and Game
Address: 1300 College Road, Fairbanks, AK 99701
Principal Investigators: Lori Quakenbush
Key Words: Pacific walrus, Chukchi Sea, Bering Sea, foraging, satellite telemetry, movements, migration, petroleum exploration areas, traditional ecological knowledge, subsistence hunters

Background: Pacific walruses (*Odobenus rosmarus*) are highly important due to their role in the nutritional and cultural health of coastal Alaska Natives of the Bering and Chukchi seas, and in the marine ecosystem, and because their range overlaps with areas identified for potential oil and gas development and shipping. Female and juvenile walruses prefer to haul out on ice in the Chukchi Sea in summer, however, when the ice edge retreats too far north of the continental shelf it is no longer suitable for resting between benthic feeding bouts because the water is too deep. Increasing our understanding of walrus movements, habitat use, and haul out behavior will aid in resource management, spatial planning and walrus conservation and is especially important with recent reductions in summer sea ice in the Chukchi Sea due to effects of climate change.

Objectives: The overall objective of this study was to work with subsistence hunters to deploy satellite-linked transmitters on walruses, conduct observations on coastal haulouts, document traditional knowledge regarding walruses, and to integrate our findings with concurrent research on walruses and other marine mammals in the Chukchi Sea Lease Sale area. Specific objectives were to document 1) the pattern of movements, 2) changes in behavior relative to changes in sea ice, 3) use of terrestrial

haulouts, and 4) collect traditional knowledge of walrus movements, behavior and habitat use.

Description: We worked with Alaska Native walrus hunters to monitor coastal haulouts, conduct carcass surveys, collect traditional knowledge, and attach satellite transmitters to walruses to document movements, identify important habitats, and describe haul out behavior in the Chukchi Sea.

Significant Conclusions: This project has contributed to a greater understanding of the distribution, movements, and habitat use of Pacific walruses by combining data collected by satellite transmitters with Traditional Ecological Knowledge. Specifically, we provided further documentation of spring, summer, and fall movements of walruses including migratory routes and use of the Chukchi oil and gas lease sale area. We compared three areas of use (Hanna Shoal, Icy Cape, and the rest of the Alaskan Chukchi Sea) and found Hanna Shoal likely to be the most important of these areas. Females with calves spent more time hauled out at Hanna Shoal than females with and without calves at other locations. Based on movements and behavior of tagged walruses from all years, the greatest potential for anthropogenic disturbances from industrial activities including local shipping occur near Hanna Shoal from June to September. Commercial ships traveling along the northern coast of Russia north of Bering Strait in October have the potential for encountering walruses on their southern migration. The greatest potential for harm, however, occurs if the large coastal haulouts are disturbed by ships near the coast.

Study Results: We worked with Alaska Native walrus hunters to attach 95 satellite transmitters to walruses in the Bering and Chukchi seas (39 on females with calves, 47 on females without calves and 9 on males). We combined information from all years to document movements and feeding and haulout behavior. We compared the use of potential feeding areas and whether females with calves and females without calves used them differently. We conducted traditional knowledge interviews in nine villages and incorporated information collected into our final report. We estimated the amount of time walruses spent in the entire Chukchi Oil and Gas Lease Sale Area (and in the leased blocks only) in Alaska, as well as in proposed lease areas of Russian waters.

Study Products: We provided weekly updates of walrus movements by e-mailing maps and adding them to the State of Alaska website. Weekly maps of Lease Area 193 were also provided to BOEM. We made presentations to the Eskimo Walrus Commission, to

the hunters at their meetings in Gambell and Savoonga, and at scientific meetings including the Society for Marine Mammal Conference and the Alaska Marine Science Symposium. We conducted traditional knowledge interviews that included walrus behavior in nine villages. We produced annual project reports, seven village specific traditional knowledge reports; one peer-reviewed publication is in press, and another is being prepared.


160°E
170°E
180°
170°W
160°W
150°W
140°W
70°N
65°N
60°N
Beaufort Sea
Hanna Shoal
Wrangel Island
Herald Shoal
Point Barrow
Wainwright
Icy Cape
Cape Schmidt
Chukchi Sea
Point Hope
Kivalina
Chukotka
Vankarem
Little Diomede Island
Cape Serdtse-Kamen
Russia
Uelen
Alaska
Bering Strait
St. Lawrence Island
Bering Sea
0 100 200 400 km