Field Report:

Walrus Carcass Survey, Point Lay Alaska

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By:

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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.

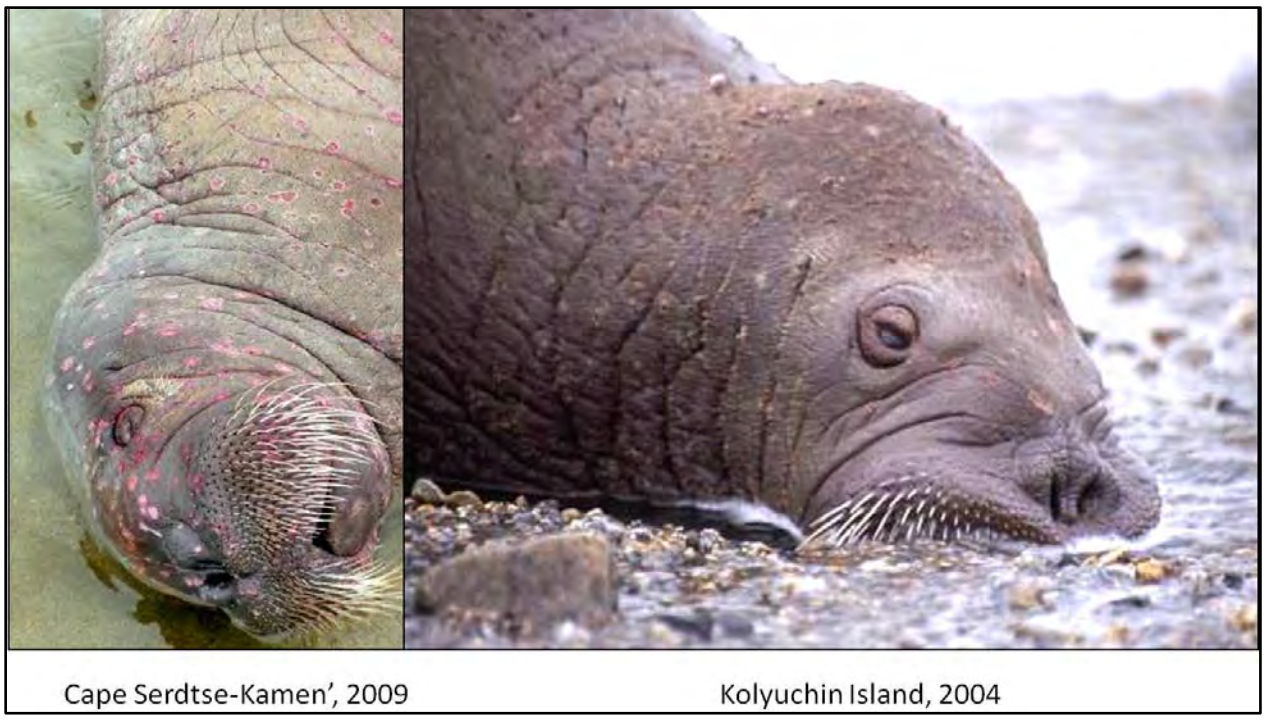

Figure 7. Examples of ulcerative skin lesions on walrus calves at coastal haulouts in Chukotka Russia. Photographs courtesy of Anatoly Kochnev, Chukotka TINRO.

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.

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