SURVIVAL OF MUSKOXEN RE-LOCATED AFTER BEING STRANDED ON A LAKE ISLAND, NORTHWEST TERRITORIES, AUGUST 1996

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ABSTRACT

Muskoxen (*Ovibos moschatus*) stranded on small islands after spring break-up of lake ice appear reluctant to swim to shore. We document an instance in August 1996 where 19 muskoxen were stranded on a 23-ha island in Pellatt Lake, Northwest Territories, less than 3 km from the nearest mainland shore. Site visits determined that the vegetation was significantly over grazed and muskoxen looked thin. One bull shot prior to our arrival and left there did not have any fat reserves upon our subsequent inspection of the carcass. A young bull shot to assess its condition had moderate fat reserves, suggesting that the remaining animals could have the physiological capability to survive the stress associated with translocation via helicopter to the mainland. We immobilized the remaining 17 muskoxen and transported them with a Bell 212 helicopter. We ear-tagged all muskoxen except one, and radio-collared one adult female. We heard the radio-signal once later that fall, but did not see it. The radio-collar was not in mortality mode. However, in July 1997 we heard the radio-collar in mortality mode and located the carcass of the collared muskox. In spring 2001, an Inuk hunter and guide saw about 20 muskoxen near the Pellatt Lake area, with ear-tags. Given his description of the tags, and location of the sighting, we believe that most of the muskoxen survived the initial translocation and subsequent winters. We discuss other instances of stranded muskoxen and available management actions.

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INTRODUCTION

Muskoxen (*Ovibos moschatus*) can become stranded on small islands during spring break-up of lake ice. When muskoxen were observed stranded on a small lake island on Victoria Island in 1984, the muskoxen would not swim even when driven into the lake, and the muskoxen returned to the island where they had grazed and browsed the available forage (Appendix A). Muskoxen appear to be reluctant swimmers, and when they do swim, stay low in the water with the top part of their face and muzzle clearing the surface.

Records about the swimming ability of muskoxen vary. Mallory (1995) and P. Reynolds (U.S. Fish and Wildlife Service, pers. comm., 2001) described muskoxen swimming across a river. Gray (1987) did not observe muskoxen swim, but described an instance of muskoxen crossing a river and being swept under water by a current for a short distance. Alex Hall (Thelon River canoe guide) has seen muskoxen stranded on a small island in Whitefish Lake in July and also observed them swim across the Thelon River, although infrequently. One of us (HDC) has since observed a foraging muskox in August 2004 successfully swim across a 20 m river narrows with a strong current (estimated 1–2 m/s) and continue foraging. Inuit hunters in the Queen Maud Gulf area used to drive muskoxen into lakes to drown them, allowing for harvest of the meat (Freeman, 1976).

We were aware of instances where muskoxen had become stranded on islands. Instances occurred on southeast Victoria Island in 1997, and again in

1984 (Appendix B), with another occurrence in Pellatt Lake involving 38 muskoxen in 1980 (Bobby Algona, pers. comm., in Griller, 2001).

On 25 August 1996, we were informed that 19 muskoxen were stranded on an island (65°00.5′ N, 109°44′ W) in Pellatt Lake (southeast of Contwoyto Lake), Northwest Territories, near the border with Nunavut. The island (23 ha) is 2–3 km from the nearest mainland shore. One of us (DP) visited the site the next day and observed that the vegetation was heavily grazed. Birch (*Betula* sp.) clumps were about 95% stripped of leaves, sedges (*Carex* spp.) and cotton grass (*Eriophorum* spp.) tussocks were grazed to ground level, and the few willows (*Salix* spp.) present were eaten down to 1-cm diameter branches. Bear berries (*Arctostaphylos spp.*) were depleted, and the muskoxen had begun to dig, or crater, for roots. The muskoxen had trampled, and may have eaten, the lichens. In Alaska, muskoxen forage on and digest lichens (Ihl, 1999).

We gauged the condition of the muskoxen as poor based on the carcass of a mature bull. The bull was killed by a hunter from an outfitting camp on the east side of Pellatt Lake and only the head and some meat were removed. One of us (DP) examined the carcass and found no fat reserves present along the back ribs, or under the skin. We judged from the bull's condition, and the depleted vegetation on the island, that the muskoxen might not survive until freeze-up. Even if the muskoxen were able to survive until freeze-up, we surmised that they might not survive the winter because of depleted fat reserves. In 1984, one of us (AG) had used the same logic to decide that muskoxen marooned on an island would not survive the winter, at which point the animals were harvested for meat (Appendix A).

For the muskoxen on the island at Pellatt Lake in 1996, we listed five options to address the situation. These were to: 1) do nothing; 2) supplement feeding; 3) drive the muskoxen off the island; 4) immobilize and remove the muskoxen to another location; and 5) kill the muskoxen humanely, and salvage the horns and usable meat.

We discussed those options with the Kugluktuk Hunters and Trappers Organization (HTO). The HTO's recommendation was to kill the muskoxen for humane reasons. Although initially supportive of the muskoxen being killed, we recognized that since 1984 more was known about muskoxen digestive physiology. Adamczewski *et al.* (1994a, 1994b) found that muskoxen have low maintenance energy requirements, exceptionally long retention times for fibrous forage through the gastrointestinal tract, and consequently high digestibility of low-quality forages. These characteristics suggested that some of the smaller-bodied muskoxen might be in better condition than expected from the state of the vegetation on the island and that of the large-bodied bull.

Consequently, a joint Kugluktuk HTO and Departmental field crew would visit the island to assess the muskoxen and consider whether all the animals would be killed. Specifically, the feasibility of removing the healthiest individuals would be explored. This option became more feasible when a helicopter (Bell 212), under contract for Fire Operations in the North Slave Region, was made available.

In this report, we describe the assessment of the muskoxen condition on Pellatt Lake, NWT in August 1996 and their subsequent capture. We also present evidence suggesting that at least some of the muskoxen survived, and we offer recommendations for dealing with muskoxen marooned on small islands. We include as appendices previously unreported information about muskoxen harvested for meat after being stranded on lake islands in southeast Victoria Island in 1984 and 1996.

METHODS

A 5-person crew was assembled from both the North Slave and Kitikmeot regions and consisted of a biologist, veterinarian, two wildlife officers, and the president of the Kugluktuk HTO. The crew left Yellowknife on 29 August and flew by helicopter to Pellatt Lake. Prior to making a decision as to the fate of the muskoxen, a young bull was shot to determine its body condition and health status. This information was used to assess the ability of the remaining muskoxen to handle field anaesthesia and the likelihood of them surviving the winter following translocation. The hunter from the Kugluktuk HTO shot a young bull as planned under the authority of a NWT wildlife research permit (WL 000958). A quick field necropsy and general condition assessment of the muskox was undertaken.

The condition of the young bull was such that we decided to capture and move the remaining muskoxen. Two people walked close to the animals and each used a Pneudart capture rifle to deliver a dart loaded with carfentanil to chemically immobilize all muskoxen, except one. The immobilized animals were ear-tagged (yellow All-Flex dangle tags, black number on front and "NWT" on the back), front and hind legs bound, and then manually lifted into the helicopter. We used the helicopter to transport the immobilized muskoxen from the island to the mainland (approx. 2 km). Once on the mainland, the muskoxen were unbound and administered naltrexone to reverse the carfentanil. We radio-collared one adult female muskox (VHF 150.340 MHz) in order to track the herd in the future and evaluate their survival.

One calf was not chemically immobilized. We caught this small calf by herding it to a narrow peninsula on the northern part of the island. A helicopter cargo net was held low to the ground and the calf was approached with people surrounding the net on either side. The calf, seeing an apparent space between the people, ran through the space and onto the net. The net was then quickly raised, entangling the animal. We bound its legs and lifted it into the helicopter to be physically restrained during transport.

In October 1996 and July 1997, we listened for the muskox radio-collar frequency while radio-tracking grizzly bears (*Ursus arctos*). We did not search in the Pellatt Lake area for ear-tagged muskoxen, but we did have a reported sighting from George Haniliak, a hunter and guide in the Pellatt Lake area.

The vegetation on the island was sampled in 1997 as part of a study on how plants respond to a bout of intense utilization (Griller, 2001).

RESULTS

The young bull that we shot appeared to be in similar condition to the other animals. Upon necropsy it had limited back fat (<1 mm), moderate internal fat reserves (kidney, abdominal), and a fairly solid white-coloured bone marrow. Its musculature appeared normal, with no evidence of muscle atrophy or catabolism. There was still a relatively normal rumen pack, and some intestinal contents. Based on the field evaluation of this animal, we believed the muskoxen herd was in suitable nutritional condition to endure anaesthesia and had a reasonable likelihood of surviving the winter.

We captured and released 11 muskoxen on 29 August and the remaining 6 muskoxen on 30 August (Table 1). Only barbed Pneudarts delivered the full volume of the drug to the animal. Collared darts (no barb) sprayed some of the drug in the air after impact with the animal.

The muskoxen were immobilized using a combination of carfentanil citrate and xylazine hydrochloride. The carfentanil was administered at a dosage of 0.015 mg/kg (based on weight estimates ranging from 150 to 225 kg), with a total dose of 3.5 mg for most adult females, and 2.5 mg administered to juvenile animals. Induction times ranged from 3 to 11 minutes. Once at the release site, naltrexone hydrochloride was administered as a reversal agent, with recovery times between 2 and 6 minutes. Naltrexone was administered intramuscularly at a rate of 100 mg/mg carfentanil, which is the recommended dosage in free-ranging ungulates to prevent narcotic recycling. Each animal also received an injection of prophylactic antibiotics (Penlong XL®) as well as vitamin E and selenium (Dystosel®) to protect against effects of possible exertional myopathy.

Table 1. Sex, age, and ear-tag number for 17 relocated muskoxen from Pellatt Lake, Northwest Territories, in August 1996.

29 August 1996			30 August 1996		
Tag	Sex	Age Class	Tag[1]	Sex	Age Class
1	female	adult	13	male	young bull
2	female	adult	14	male	young
3	female	adult	15	female	young
4	male	young	16	male	young
5	female	adult	17	female	young
6[2]	female	adult	18	female	young
7	female	adult			
8	male	young bull			
9	female	young			
10	female	old			
no tag	male	1 yr old			

[1] Tag numbers 11 & 12 missing from series and therefore not used
[2] VHF collar 153.340 MHz

On 30 October 1996, while radio-tracking collared grizzly bears, we heard the muskox radio-collar signal south of Fry Inlet on Contwoyto Lake (65°05.79′ 110°20.76′). We did not see any muskoxen, but the radio transmitter was not in mortality mode. Subsequently, on 21 July 1997 during grizzly bear fieldwork, we heard the muskox radio-collar in mortality mode and located the carcass site (65°08.868′ N, 110°23.831′ W). Only scattered hair and one piece of the femur remained. The carcass location was about 6 km from where the signal was heard in October.

Despite the over-winter death of the radio-collared muskoxen, it is likely that the other muskoxen survived. George Haniliak, a hunter and guide in the Pellatt Lake area, observed muskoxen in spring 2001 that had yellow and blue ear tags. Mr. Haniliak relayed the information to Alex Buchan in August 2002.

The tags were described as having a number and "NWT" inscribed on them. Mr. Haniliak reported that about 20 animals were in the herd and tagged in this fashion. At the time these muskoxen were traveling east towards the south end of Contwoyto Lake. We suspect that Mr. Haniliak's observation refers to the 17 muskoxen tagged in August 1996, as these are the only ear-tagged muskoxen in the area.

DISCUSSION

We suspect that the muskoxen did immediately survive removal from the island in Pellatt Lake in 1996, and survived the subsequent winter, based on the sightings of the ear-tagged muskoxen in 2001. In July 1997, we found the carcass of the one radio-tracked muskoxen a straight-line distance of about 31 km from the release site**.** We had no reports of muskoxen carcasses in the release area.

Observations of muskoxen stranded on small islands have been reported before. Earlier, in 1984 and 1993, muskoxen were stranded on islands in Surrey Lake on southern Victoria Island. In 1984, an attempt was made to drive the animals off the island but an adult bull drowned. Therefore, the muskoxen were shot, and salvaged meat distributed to several communities (Appendix A). The starving muskoxen were also shot in the 1993 situation.

At the time, the belief was that had the muskoxen remained on the island until freeze-up, they would not have likely been in adequate body condition to escape the island or survive the winter. This opinion is based on the lean condition of the animals at the time of death and on the assumption that muskoxen must develop adequate fat reserves prior to winter.

Subsequently, we have learned that muskoxen are remarkably efficient in their ability to digest poor quality forage (Adamczewski, 1995). Muskoxen are conservative in their ecological requirements (Gunn and Adamczewski, 2001) and can regain condition after freeze-up (Adamczewski *et al.*, 1994a, b, 1995). Thus, since 1984, we have responded differently to stranding of muskoxen by: 1) doing nothing; 2) killing with or without meat salvage; and 3) capture and removal. The option of supplemental feeding has not been attempted.

In 1996, the Department declined supplemental feeding because of concerns that high quality food abruptly introduced to animals on a coarse, low quality diet would likely causes rumenitis (Radostits *et al.*, 2000). There were also fears exotic plant species could be introduced if forage such as hay was provided. The Kugluktuk HTO did not support feeding the muskoxen, as they felt this would only delay the inevitable deaths of the animals.

We suggest that there is no single option for dealing with stranded muskoxen, and that action on each occasion should depend on the individual circumstances. Circumstances should include the month, location, size of the island, proximity to larger islands on mainland, and practicality of logistic support. In the 1996 case for Pellatt Lake, the availability of staff, and a helicopter were considerations in the option of translocation. Another consideration was the expansion of muskoxen range back into the Lac de Gras area. Maintaining the

1996 Pellatt Lake herd would encourage re-colonization, as the herd was mostly females and young males.

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PERSONAL COMMUNICATIONS

Alex Hall, Canoe North, Fort Smith

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APPENDIX A. Gross and histological pathology of muskoxen stranded on a lake island, southeast Victoria Island, N.W.T., August 1984 (report by S.V. Tessaro, Western College of Veterinary Medicine and A. Gunn).

In early August 1984, the High Arctic Fishing Lodge reported concerns for a herd of about 20 muskoxen stranded on a small island in Merkeley Lake after the break-up of the ice. After consultation with the Cambridge Bay Hunter's and Trapper's Association, we decided to drive the muskoxen in the lake to swim about 1 km to the nearest shore. On 9 August 1984, using a group of five hunters holding lengths of burlaps as a visual barrier, we drove the muskoxen to the water's edge and watched as they followed a cow into the lake and swam parallel to the shore. The calves and yearlings swam without obvious difficulty with their backs visible. The cows entered the water reluctantly and held their faces out of the water while they swam. The two large bulls had difficulty holding their noses out of the water and in less than 2 minutes, one bull rolled over, apparently dead. We stood back and the muskoxen came ashore immediately.

We retrieved the dead bull from the water and noted that its lips, mouth, and tongue were completely white (shock). Although froth was noted in the mouth and trachea, the lungs did not contain any visible water. The bull was 5–8 years old based on tooth eruption and horn development, and had no signs of any pathological conditions. There was a trace of subcutaneous fat and visceral fat, and bone marrow was pink. While we watched the muskoxen on the island we noted no signs of breeding behaviour and no play, suggesting relatively poor condition for the time of year.

We returned to Cambridge Bay and discussed options with the Hunters and Trapper's Association. The argument against doing nothing was that the muskoxen might survive to freeze-up (based on the condition of the bull) but would then have insufficient body reserves to survive the winter. Moving the muskoxen (forced swimming, or drugging and rafting), and feeding, were rated as impractical. We estimated that to feed the muskoxen for 3 months would require at least a maintenance ration of 6,480 kg of hay. We estimated that killing the muskoxen would produce 1,700 kg meat, which we could ship to the eastern Kitikmeot communities who were without a muskox quota at that time.

On August 24–25, 1984, we returned with 4 hunters, a wildlife officer, a wildlife veterinarian, and a cameraman, and shot 27 muskoxen. This herd comprised four calves (2 females, 2 males), nine yearlings (6 females, 3 males), and 14 adults (10 females, 4 males). At necropsy, the adult and yearling muskoxen lacked subcutaneous fat stores but did have small amounts of epicardial, perirenal, omental, and mesenteric fat. The smaller-bodied animals appeared to have slightly more reserves. None of the animals had serious atrophy, although femoral fat content was not measured. All rumens were relatively full with coarse forage, mostly willow stems and roots. Cows with calves were still lactating and calves were in good body condition. None of the adult females were pregnant.

Macroscopic lesions were seen in two muskoxen. The 6+ year old bull (specimen #8) had a 1–2 cm diameter penetrating wound through the skin and abdominal musculature behind the last rib on the left side. The tract continued through the ventral sac of the rumen and through the reticulum. There was haemorrhage in the musculature of the right abdominal wall adjacent to the exit hole in the reticulum. There was a small amount of fibrin and gut contents in the omental sling, and the rest of the abdominal cavity. The lesion appeared to be a bullet wound, although a bullet was not found. The small amount of fibrin and peritoneal reaction indicated that the wound had occurred within a few hours of death, and the large amount of subcutaneous edema and clotted blood indicated that the wound had happened prior to the hunter's killing shot.

One female yearling (specimen #10) had nephrosis of the right kidney. The renal pelvis was approximately twice normal volume and the right ureter was dilated from the renal pelvis to a point 3 cm from the bladder, at which point the luminal diameter was greatly reduced by fibrous connective tissue in the wall of the ureter. The cause of the lesion was not evident. The left kidney was normal.

In another female yearling (specimen #16) a 2 cm long nematode was found in the lumen of a major bronchus in the caudal lobe of the right lung. This parasite was submitted to the Western College of Veterinary Medicine for identification. The lungs of a third muskox appeared grossly and histologically normal, and no other nematodes were seen.

Formalin fixed samples of lung, liver, kidney, spleen, heart, abomasums, and adrenal glands were routinely collected from each muskox. Other tissues were taken if warranted on gross inspection. All of these samples were examined histologically.

Specimen #1, a 3+ year old cow, had notable chronic interstitial pneumonia. Some of the large bronchioles were plugged and partly to completely obliterated by large aggregations of lymphocytes, macrophages, and fibroblasts that had granular, eosinophilic debris located centrally. In some of these lesions there were numerous eosinophils and a few giant cells immediately around the debris. There was very extensive smooth muscle hyperplasia throughout the lung. There were also a few large lymphocyte aggregates present, and some alveoli contained edemal fluid. The alveolar septa were diffusely thickened by infiltration of lymphocytes, macrophages and fibroblasts. The macrophages frequently contained brown granular pigment. The etiologic agent(s) was not evident but the appearance of the lesion suggested a chronic, immune-mediated reaction. Microbiological analysis may have provided more information on the cause of this pneumonia. It was noted that this animal had been in the poorest condition at the time of slaughter.

Three other muskoxen (specimens #3, 21, and 23) had mild to moderate thickening of the alveolar septa due to mononuclear cell infiltration. Lung lesions had previously been seen in muskoxen on Banks Island, NWT, but the predominant lesion was subacute to acute bronchiolitis suggestive of viral infection. This was not seen in the Merkeley Lake animals. Further bacteriology and virology research are needed to determine the cause(s) of pneumonia in muskoxen.

Sarcocysts were seen in the myocardium of one yearling (specimen #4) and eight adults (specimens #1, 3, 5, 11, 21, 23, 25, and 26). There was no tissue reaction around these parasites. Given the presence of low numbers of sarcocysts in these animals, it is likely that other muskoxen in the sample were infected, even though cysts were not seen in the single myocardial sections examined.

Cross-sections of adult nematodes were seen mixed in with the ingesta on the mucosal surface of the abomasums of four yearlings (specimens #12, 14, 18, and 19) and six adults (specimens #1, 8, 21, 23, 24, and 26). The parasites did not occur in the crypts or within host tissues, and there were no lesions associated with the presence of the nematodes. Dr. G. Wobeser (pers. comm.) recently found *Ostertagia*-like lesions in the abomasums of some Banks Island muskoxen. More than one species of nematode may occur in the abomasums of NWT muskoxen.

In summary, gross and histological examination of the 27 muskoxen indicated that the adults and yearling were lean but not yet in the late stages of starvation. Calves were in good condition. The parasites observed in the muskoxen included *Sarcocystis* sp., an intraluminal abomasal nematode, and an intra-bronchiolar nematode. No remarkable disease lesions were found, with the exception of one case of chronic interstitial pneumonia of undetermined etiology.

APPENDIX B. Summary of muskoxen stranded on two small islands in lakes, southeast Victoria Island, July 1997 (compiled by A. Gunn from Damian Panayi's report (wildlife technician), Grant Corey's report (wildlife officer, Cambridge Bay), and Natalie Griller's notes (researcher) - all reports were on file.)

On 16 July 1997, Steve Whetmore (High Arctic Lodge) called John Nishi (Kitikmeot Regional Biologist) to report that 30 muskoxen were stranded on four islands in the Surrey Lake area. High Arctic Lodge was concerned about the animals' welfare due to a previous stranding incident in 1993. Grant Corey met with the Ekaluktutiak Hunters and Trappers Organization to discuss several options, which included:

1) assess and relocate
2) do nothing and let nature take its course
3) assess and harvest using tags from the existing MX/11 (B/2-4) quota, and collect samples

As a result of the meeting, Grant Corey and three EHTO board members flew to the Surrey Lake area in order to conduct an assessment, and harvest, if necessary, using tags from the MX/11 quota. An attempt would be made to salvage any meat considered fit for human consumption. The salvaged meat would be distributed to elders within the community.

On 26 July 1997, Grant Corey, Peter Avalak Sr., John Hikoaluk, and Ikey Evalik departed from Cambridge Bay and flew to Surrey Lake, where they found the first group of 10 muskoxen (site A) on a small island (69°37.14′ N, 107°10.26′ W). The second group of 15 muskoxen (site B) were on a small island west of

Surrey Lake (69°48.09′ 108°40.65′). We concluded that the island was of insufficient size to support the herd until freeze-up, and that the physical condition of the muskox was poor. The muskoxen were shot, and because their condition was poor, the meat was not salvaged though samples were collected.

At Site A, the muskoxen appeared to be in somewhat better condition, and it was decided to salvage what we could of the meat for use in the community. The muskoxen were shot, sampled, and the meat taken back to Cambridge Bay.

Only 5 of the 23 animals had any measurable back fat at all, and all 5 of these were from West Lake. No animal had more than 3 mm of back fat. Average back fat was 0.36 mm, compared to an average of about 10 mm from lactating muskox cows collected in July (Adamczewski, 1995). Because of the poor body condition of the animals, only 8 of the animals were used for human consumption.

The poor body condition was also reflected in the bone marrow and kidney fat measurements, conducted later in the regional laboratory. Femur marrow fat was measured according to Nieland (1970). The figures were not corrected for nonfat residue. The marrows had an average fat content of 17%. Kidney fat was measured as the percentage of kidney fat to total weight of kidney and fat. The fat was not trimmed before measuring. The average percent untrimmed kidney fat was 22% (Table 1). Age, sex, and lactating status of the muskox on each island were determined (Table 2). Animals were aged using tooth eruption.

The animals on Surrey Lake appeared to be in better condition than those on West Lake, thus all the animals from which meat was taken were from Surrey

Lake. The Surrey Lake animals had an average percent marrow fat of 39%, compared to 28% for those on West Lake. There were 4 lactating females on Surrey Lake, and a corresponding 3 yearlings and 1 calf. West Lake had 6 lactating females, and a corresponding 5 calves and 3 yearlings.

Table 1
% Marrow & Kidney Fat

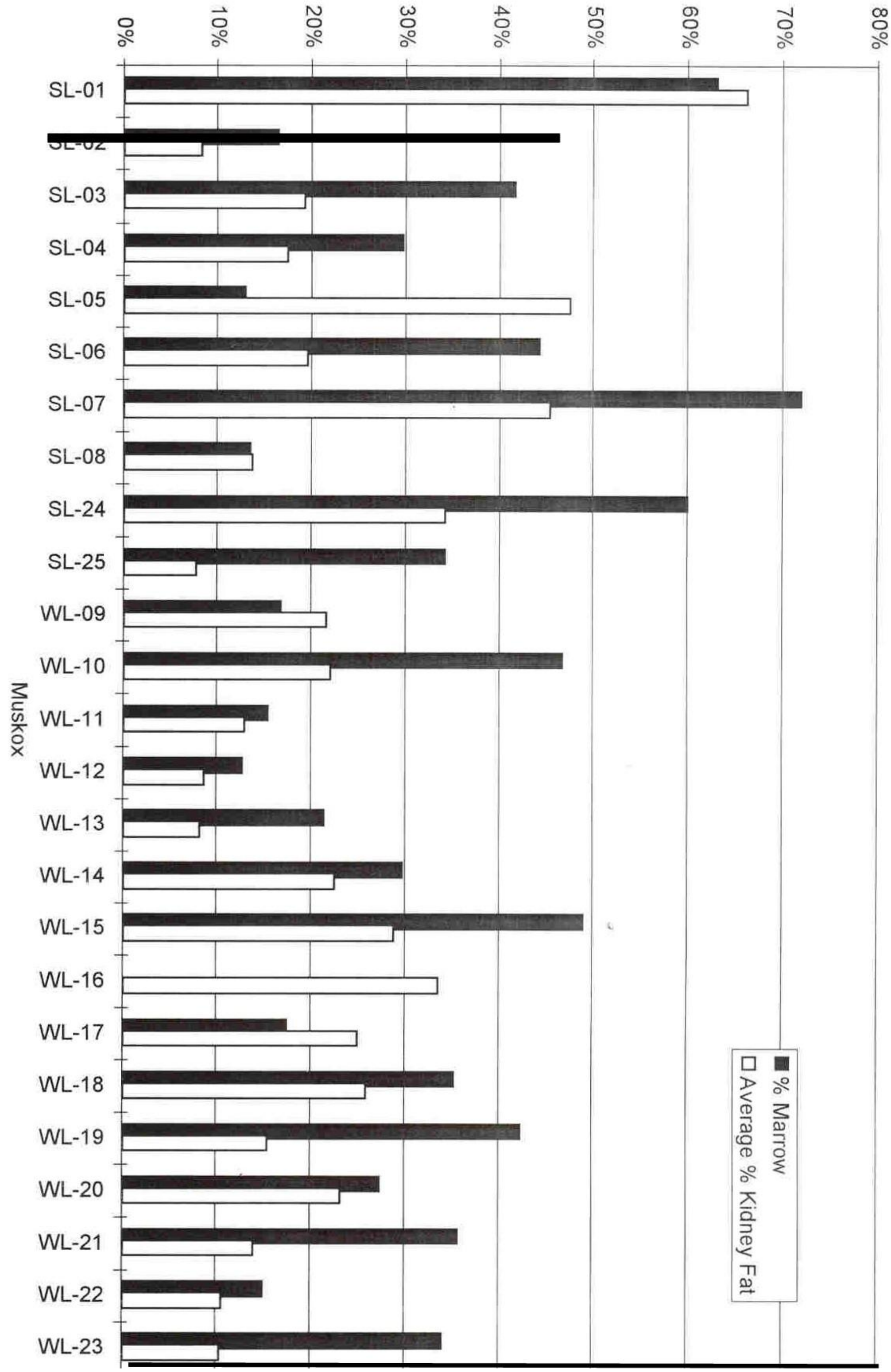
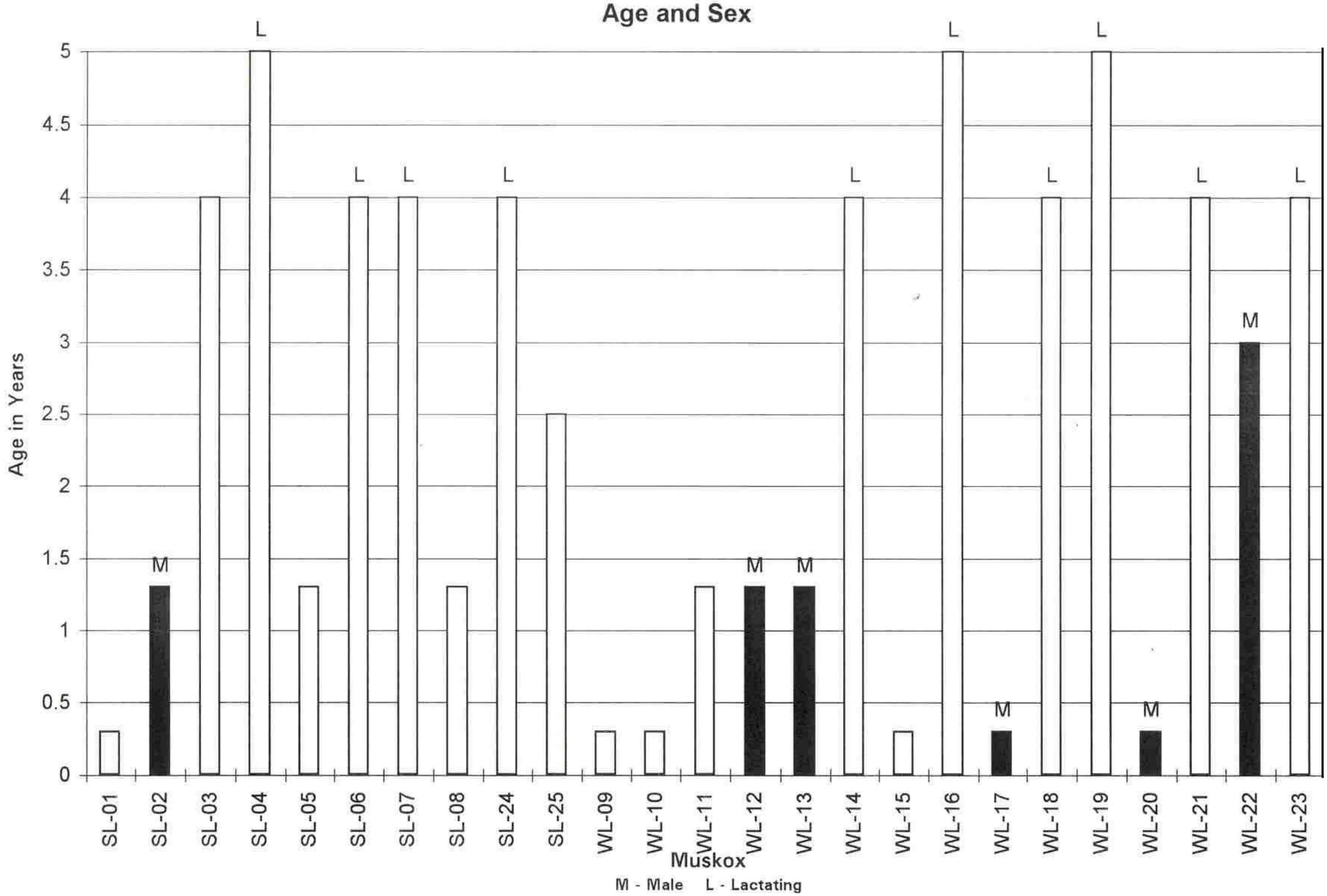


Table 2
Age and Sex



Stranded Surrey Lake Muskox Database

	Data Sheet									Bone Marrow (g)					
Tag#	ID#	Kill Dat	Locatio	Lat	Long	Sex	Field Ag	Lactating	Back Fa	Dish	Wet	Dry	Colou	%	Kidney 1
68337	SL-01	26/07/97	SL	693714	1071026	F	CALF	N	1	6.6	9.3	8.3	7	**63%**	62.1
68335	SL-02	26/07/97	SL	693714	1071026	M	1-2yr	N	0	7.5	17.3	9.1	6	**16%**	78.2
68333	SL-03	26/07/97	SL	693714	1071026	F	2-3yr	Y	0	7.5	30.8	17.2	6.5	**42%**	145.2
68338	SL-04	26/07/97	SL	693714	1071026	F	ADULT	N	1	6.3	25.2	11.9	6.5	**30%**	152.4
68336	SL-05	26/07/97	SL	693714	1071026	F	CALF	N	0	7.5	17.6	8.8		**13%**	65.3
68332	SL-06	26/07/97	SL	693714	1071026	F	ADULT	Y	1	7.5	23.8	14.7	2	**44%**	149.9
68334	SL-07	26/07/97	SL	693714	1071026	F	2-3yr	Y	3	7.5	20.3	16.7	1	**72%**	143.6
68330	SL-08	26/07/97	SL	693714	1071026	F	2-3yr	N	0	7.5	28.3	10.3	6	**13%**	81.3
68329	SL-24	26/07/97	SL	693714	1071026	F	ADULT	Y	3	6.2	42.7	28.1	2	**60%**	47.9
68331	SL-25	26/07/97	SL	693714	1071026	F	2-3yr	N	0	6.8	34.9	16.4	6.5	**34%**	99.3
68340	SL-09	26/07/97	WL	694809	1084065	F	CALF	N	0	6.6	7.8	6.8	6	**17%**	43.2
68341	SL-10	26/07/97	WL	694809	1084065	F	CALF	N	0	6.6	9.6	8	6	**47%**	41.4
68339	SL-11	26/07/97	WL	694809	1084065	F	1-2yr	N	0	6.3	16.1	7.8	6	**15%**	88.4
68342	SL-12	26/07/97	WL	694809	1084065	M	1-2yr	N	0	6.3	27.7	9	6	**13%**	83.1
68343	SL-13	26/07/97	WL	694809	1084065	M	1-2yr	N	0	7.5	22	10.6	6	**21%**	92
68292	SL-14	26/07/97	WL	694809	1084065	F	2-3yr	Y	0	7.5	18.3	10.7	2	**30%**	136.4
68293	SL-15	26/07/97	WL	694809	1084065	F	CALF	N	0	6.5	11.4	8.9		**49%**	111.5
68291	SL-16	26/07/97	WL	694809	1084065	F	2-3yr	Y	0			11.8	2		159.3
68344	SL-17	26/07/97	WL	694809	1084065	M	CALF	N	0	6.6	8.9	7	6	**17%**	45.5
68290	SL-18	26/07/97	WL	694809	1084065	F	ADULT	Y	0	7.6	26.9	14.4	6.5	**35%**	157.7
68289	SL-19	26/07/97	WL	694809	1084065	F	ADULT	Y	0	6.5	18.1	11.4	1	**42%**	173.5
68288	SL-20	26/07/97	WL	694809	1084065	M	CALF	N	0	6.6	7.7	6.9	6	**27%**	157.1
68287	SL-21	26/07/97	WL	694809	1084065	F	1-2yr	Y	0	6.9	21.19	12	2	**36%**	165
68286	SL-22	26/07/97	WL	694809	1084065	M	2-3yr	N	0	7.6	17	9	7	**15%**	110.3
68345	SL-23	26/07/97	WL	694809	1084065	F	2-3yr	Y	0	6.5	29.2	14.2	6.5	**34%**	125.8

Stranded Surrey																		
	Kidney Fat (g)					Tooth Eruption											Age	
Tag#	Kidney 2	Fat 1	Fat 2	%1	%2	RI1	RI2	RI3	RC4	RP	RP2	RP3	RP4	RM	RM2	RM3	Est. Age	Age Class
68337	54.1	35.3	40.8	57%	75%	D	D	D	D	D	D	D	D	N	N	N	0.3	0-0.5
68335	77.4	4	8.9	5%	11%	D	D	D	D	D	P	N	N	N	N	N	1.3	0.5-1
68333	133	37.4	16.7	26%	13%	P	P	P	P	P	P	P	P	P	P	P	4	3-4yr
68338	147.5	27.3	25	18%	17%	B	P	P	E	P	P	P	P	P	P	P	5	4-5yr
68336	69.1	30.3	33.6	46%	49%	D	D	D	D	D	D	D	D	P	N	N	1.3	4-5yr
68332	142.4	20.1	36.6	13%	26%	P	P	P	N	P	P	P	P	P	P	P	4	4-5yr
68334	143.6	84	46.1	58%	32%	P	P	P	D	P	P	P	P	P	P	P	4	4-5yr
68330	82.5	8.5	14	10%	17%	D	D	D	D	D	D	D	D	P	N	N	1.3	0.5-1
68329	42.7	15.2	15.6	32%	37%	P	P	D	D	E	P	P	P	P	P	E	4	3-4yr
68331	105.7	7.5	8.3	8%	8%	P	D	D	B	P	P	P	D	P	P	N	2.5	2-3yr
68340	45.6	10.2	8.9	24%	20%	D	D	D	D	D	D	D	D	N	N	N	0.3	0-0.5
68341	41.5	6.3	11.9	15%	29%	D	D	D	D	D	D	D	D	N	N	N	0.3	0-0.5
68339	95.2	13.6	9.9	15%	10%	P	D	D	D	D	D	D	D	P	P	N	1.3	1-2yr
68342	82.7	5.4	8.8	6%	11%	D	D	D	D	D	P	D	D	P	E	N	1.3	1-2yr
68343	82.3	7.4	6.8	8%	8%	D	D	D	D	D	D	D	P	N	N	N	1.3	0.5-1
68292	147.4	42.5	20.4	31%	14%	P	P	P	E	P	P	P	P	P	N	N	4	4-5yr
68293	107.5	32.4	30.5	29%	28%	D	D	D	D	D	D	D	D	N	N	N	0.3	0-0.5
68291	154	48.8	56.1	31%	36%	P	P	P	E	P	P	P	P	P	P	P	5	>5
68344	46.5	11.7	11.2	26%	24%	D	D	D	D	D	D	D	D	N	N	N	0.3	0-0.5
68290	152.3	42.4	37.7	27%	25%	P	P	P	N	P	P	P	P	P	P	P	4	4-5yr
68289	172.1	21.4	31.7	12%	18%	P	P	P	P	P	P	P	P	P	P	P	5	>5
68288	139.9	33.8	34.7	22%	25%	D	D	D	D	D	D	D	D	N	N	N	0.3	0-0.5
68287	173.3	24.8	22	15%	13%	B	D	D	N	P	P	P	P	P	P	P	4	4-5yr
68286	116.2	14	9.8	13%	8%	P	P	D	N	D	P	P	P	P	P	E	3	3-4yr
68345	128.4	16.4	9.8	13%	8%	P	P	P	P	P	P	P	P	P	P	P	4	4-5yr

Stranded Surrey										
	Incisor Breakage				Mandible Size (mm)					
Tag#	RI1	RI2	RI3	RC	DL	DH	DW	NH	TL	Comments
68337	N	N	N	N	41.63	16.26	7.97	70.36	187.24	QUARTERS TAKEN
68335	BG	BG	N	N	58.73	20.92	108.97	93.38	246.26	QUARTERS TAKEN
68333	N	N	N	N	80.66	24.82	14.53	131.05	337.14	QUARTERS/SHOULDERS TAKEN
68338	GL	N	N	N	80.78	24.14	15.16	127.5	336.84	QUARTERS/SHOULDERS TAKEN
68336	N	N	N	N	52.45	20.26	11.17	83.76	234.18	POOR CONDITION
68332	G	BG	N	N	79.25	23.6	15.1	129.94	329.48	QUARTERS/SHOULDERS TAKEN
68334	N	N	N	N	78.45	26.66	14.68	127.2	334.46	QUARTERS TAKEN BACK &SHOULDERS
68330	N	N	N	N	63.15	20.42	10.25		254.78	POOR CONDITION
68329						24.94	13.89	121.67	331.12	Measurements of right side of jaw. Quarters/shoulders taken
68331	N	N	N	GL	71.27	22.33	12.71	108.69	291.63	QUARTERS/SHOULDERS TAKEN
68340	N	N	N	N	36.83	13.55	6.75	62.15	172.81	POOR CONDITION
68341	N	N	N	N	38.22	14.89	7.34	66.02	180.35	POOR CONDITION
68339	N	N	N	N	65.58	21.39	12.48	100.47	279.72	POOR CONDITION
68342	BG	N	N	N	60.87	21.92	11.75	98.62	266.54	POOR CONDITION
68343	N	BGL	N	N	54.3	19.78	10.88	91.83	245.27	POOR CONDITION
68292	N	N	N	N	77.22	22.7	16.92	33.43	246.05	POOR CONDITION
68293	N	N	N	N	42.75	14.27	7.03	69.46	185.49	POOR CONDITION
68291	N	N	N	N	80.56	25.88	14.29	126.92	343.71	POOR CONDITION
68344	N	N	N	N	38.15	14.85	7.18	65.67	182.02	POOR CONDITION
68290	N	N	N	N	80.1	22.85	13.69	126.02	343.41	POOR CONDITION
68289	G	N	N	N	87.48	26.38	18.5	133.1	361.26	POOR CONDITION
68288	N	N	N	N	38.53	13.31	6.58	63.02	174.4	POOR CONDITION
68287	G	N	N	N	80.5	24.44	14.07	125.6	336.85	POOR CONDITION
68286	N	N	N	N	78.56	24.81	14.94	121.92	309.42	POOR CONDITION
68345	N	N	N	N	75.67	22.74	13.4	114.55	333.61	POOR CONDITION

<u>Natalie Griller's Report (West Island, Site A)</u>

The island on West Lake, Victoria Island, NWT is located at 69°48.12′ N and 108°40.59′ W. Its steep sides and high relief distinguish it from neighbouring islands. The island's south side has a more moderate slope, with vegetation, rather than just rock, adjacent to the shore line. The island's long axis is oriented in a west-east direction, and its highest point is situated at the western end. The eastern portion of the island is relatively small. One could walk around the island's perimeter in less than half an hour

The top and south shore of the island are dominated by willow-graminoid communities. This community type is favored by muskox for grazing. The steep sides are dominated by heather-graminoid communities. The leaves of heather are usually not grazed since they are evergreen and relatively unpalatable.

Nine muskoxen were stranded on the islands at the time of ice break-up in the spring of 1997. It was determined by the Department of Resources, Wildlife and Economic Development that there was insufficient forage for the muskox, so the animals were euthanized. Their bodies were left on the east side of the island. A more comprehensive survey of the plant communities was conducted a month later.

The whole island showed evidence of grazing. The western portion of the island had large patches bare of vegetation. The ground was littered with abundant muskox droppings. Lichens were sparse, with fragments scattered on the ground surface. The eastern portion of the island had continuous plant cover, and lichens were more abundant, but the vascular plants were cropped very close to the ground. The shore-side vegetation on the southern side was also continuous, but grazed very closely. There was essentially no available forage remaining on the island top or south shore.

The heather-graminoid communities on the steep slopes had more available forage remaining. The presence of muskox trails and abundant kiviut indicated that these areas were being grazed. While graminoids and willows were still available, their total estimated biomass was likely inadequate to maintain the resident muskox in reasonable condition.

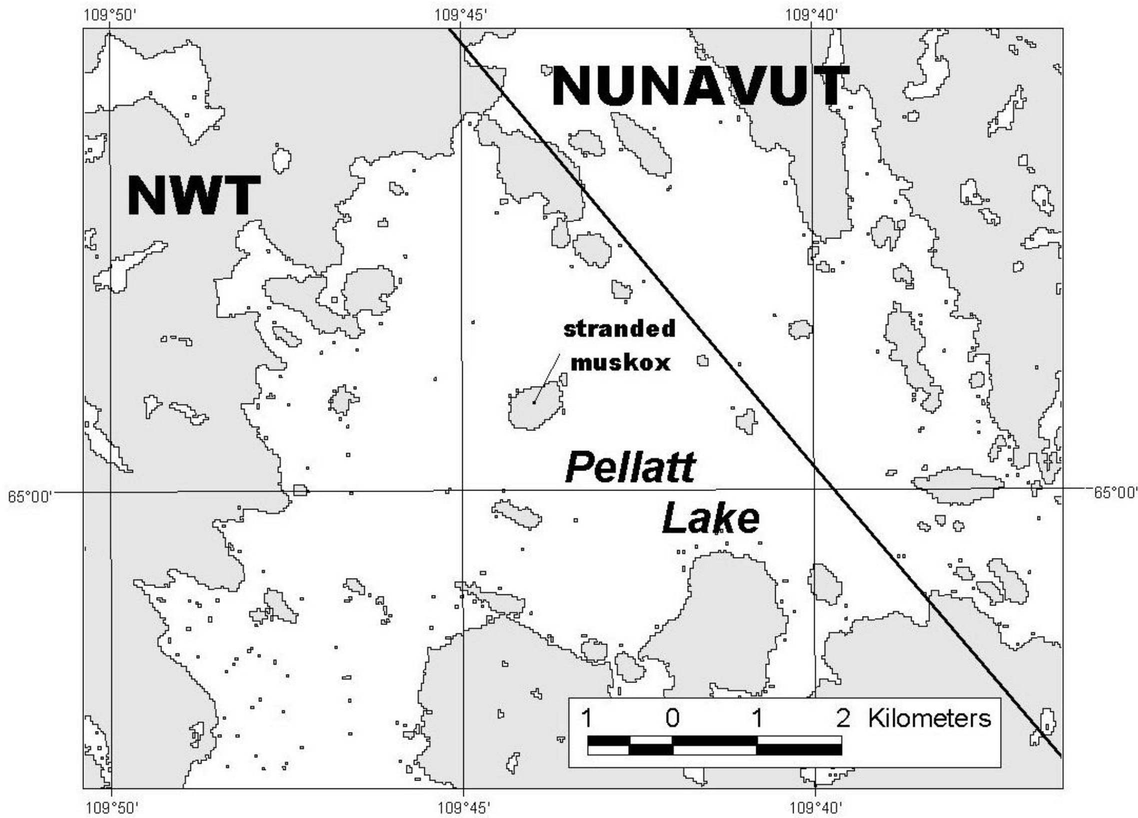


Figure 1. Location of the 23 ha island in Pellatt Lake, Northwest Territories where 18 muskoxen were stranded in 1996. Sixteen of the muskoxen were relocated to the mainland approximately 3 km due west of the island.