

ALASKA DEPARTMENT OF FISH AND GAME

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ANNUAL REPORT OF
SURVEY-INVENTORY ACTIVITIES

PART X. MUSK-OXEN

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CONTENTS

Game Management Unit Map.....	11
Statewide Harvest and Population Status.....	111
Game Management Unit/Geographical Description	
GMU 18 - Yukon-Kuskokwim Delta.....	1
GMU 22 - Seward Peninsula.....	14
GMU 23 - Kotzebue Sound.....	21
GMU 26B and 26C - Eastern Arctic Slope.....	24

ARCTIC OCEAN

ALASKA

GAME MANAGEMENT UNITS



Statewide Harvest and Population Status

Except for the parent Nunivak herd, all musk-oxen herds in Alaska results from transplants conducted from 1967-1981 from Nunivak. All herds are thinning, with the possible exception of Unit 23 (Cape Thompson). The Nunivak population is now at a very high level again, raising fears of overgrazing and natural mortality. The Nelson Island population has declined somewhat, partially due to emigration to mainland Unit 18. The Seward Peninsula and eastern Arctic herds are growing rapidly.

Controlled (permit) hunts are conducted only on the Nunivak, Nelson Island, and eastern Arctic herds. Legal harvest for 1983-84 totalled 79 animals. Status and harvests are summarized below:

<u>Herd</u>	<u>Population Estimate (Spring 1984)</u>	<u>Legal Harvest</u>		
		<u>Bulls</u>	<u>Cows</u>	<u>Total</u>
Nunivak	744	22	28	50
Seward Peninsula	225 (precalving)	--	--	--
Nelson Island	176	15	9	24
Unit 23	58 (+?)	--	--	--
Eastern Arctic	344	5	0	5

Robert A. Hinman
Deputy Director

MUSK-OXEN

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 18

GEOGRAPHICAL DESCRIPTION: Yukon-Kuskokwim Delta

PERIOD COVERED: 1 July 1983-30 June 1984

Season and Bag Limit

See Hunting Regulations No. 24.

Population Status and Trend

Nunivak Island:

The Nunivak Island musk-ox population appeared productive and thriving in 1984, with a large short yearling age class and an even larger number of 3- and 4-year-old females.

The Nunivak Island musk-ox population was estimated at 744 animals following calving in spring 1984. A census in mid-March 1984 enumerated 552 animals, compared with 483 animals in 1983. The 1984 count was believed to be the most complete in recent years. Forty-six musk-oxen were taken in the spring 1984 hunt immediately prior to the census; therefore, the prehunt, precalving population on Nunivak Island in 1984 was approximately 598 animals. This is identical to the estimate (600) made by B. Dinneford in 1983.

Nelson Island:

The Nelson Island musk-ox population is unstable, given previous rapid population growth, recent hunting and disturbance pressures, and current emigration.

The prehunt, precalving population was estimated at 200 animals, a decline from the 1983 estimate of 220-230 animals. Spring hunting further reduced this number to 176 animals (22 animals were taken during the regular spring season). Two cases of wanton waste occurred during the winter of 1983-84.

T. Smith and I spent 6 hours flying surveys over Nelson Island during 3 days in March 1984 attempting to count musk-oxen on ridges and sea cliffs. Strong winds, turbulence, and some white-out conditions hindered work, but the following observations were made:

The westernmost Cape Vancouver area (from VABM Nelson to Cape Vancouver) serves as a refuge for approximately 35% of the musk-ox population. The musk-oxen reside on rocky plateaus above sea cliffs below precipitous slopes. Difficult access and hazardous conditions here provide a winter sanctuary for musk-oxen. However, the remainder of the population appears quite disturbed. These animals flee as soon as they recognize a snowmachine, often from miles away. Hunting pressure and disturbance are causing some musk-oxen to emigrate from Nelson Island. Habitat factors may also affect emigration.

In 1984 most of Nelson Island was snow-covered, while surrounding tundra was bare. Musk-oxen in search of "greener" pastures leave the island by crossing frozen inlets and do not return in spring. Our survey revealed fewer animals than expected, but as many as 20-30 emigrants reside on the adjacent mainland. The Nelson Island situation will be closely watched, with additional aircraft surveys planned in late summer 1984.

Mainland Muskoxen:

Emigration of musk-oxen from Nelson Island to mainland areas of Unit 18 continues. Musk-oxen gain access to mainland Unit 18 after freeze-up, and local residents report that wandering intensifies in late winter and early spring (March-April).

Known sightings of musk-oxen on the Unit 18 mainland are summarized in Table 1. The 1st recorded sighting was made in 1974 on Cheching Mountain, 6 mi southeast of Chefornek. The 1st musk-ox reported killed on the mainland was shot by a resident of Napaskiak in 1976. Another single musk-ox was observed along the Lower Johnson River, near Atmaultluk, in 1979. Apparently, these 1st musk-oxen reported on the mainland were lone bulls.

Residents of the village of Kasigluk, 80 mi east-northeast of Nelson Island, reported seeing 8 musk-oxen 15-20 mi due north of the village in late July 1982. On 19 September 1982, a pilot reported seeing 7 musk-oxen 34 mi northeast of Chefornek and 8 mi east of Dall Lake. A Mountain Village resident observed a lone bull near the Kusilvak Mountains (east-northeast of Scammon Bay) in November 1982. A lone mature bull was shot near the village of Chevak in December 1982, and may have been the same animal.

Three musk-oxen were reported southwest of Bethel (between Kipnuk, Nelson Island, and Nunapitchuk) during winter 1982-83. Repeated observations were made of at least 3 additional musk-oxen in the Askinuk Mountains between Hooper Bay and Scammon Bay during winter 1982-83. One large bull was

illegally killed in the Askinuk Mountains in August 1983. Chefornek residents reported 15 musk-oxen east of Dall Lake in January 1984. A local pilot reported 9 musk-oxen 10 mi east-northeast of Dall Lake in February 1984. This was confirmed by ADF&G on 13 February when 9 musk-oxen (1 large bull, 3 cows, 3 calves and 2 subadults) were observed and photographed during an aerial survey.

T. Smith and I used a Siberian husky with previous "backyard" moose experience to herd the group of musk-oxen near Dall Lake in late March 1984. The technique proved highly successful. The dog kept 9 musk-oxen within 1/2 mile of the biologists for 4 hours while 4 of the animals were darted, radio-collared, and tagged. This herd had expanded to 12 musk-oxen by June 1984, with the addition of 3 new calves. Another herd of musk-oxen was reported in late February 1984 in Ingrisarak Mountain, 12 mi east of Chevak.

The number of reports of mainland musk-oxen is steadily increasing, as well as the number of animals observed per sighting. Musk-oxen dispersing from Nelson Island are in the process of occupying most areas of suitable habitat in Unit 18. There is a striking correlation between mainland locations where musk-ox have been observed and upland areas believed suitable for musk-oxen (Table 2). Musk-oxen are attempting to colonize both exposed upland and open tundra areas that are topographically and floristically similar to Nelson and Nunivak Islands. Musk-oxen are reported in the Romanzof Hills, Mt. Towak, the Askinuk Mountains near Scammon Bay, on the Mud Volcanoes east of Chevak (Ingrisarak Mountain), and on open steppe-like tundra and low rolling hills northeast of Dall Lake. In these areas winds blow the tundra free of snow during critical winter periods.

In certain years, much of the eastern portion of the Askinuk Range near Scammon Bay may be relatively unsuitable for musk-oxen because of heavy snow cover. However, the area along the coast from Pt. Dyer west and south to VABM Young is suitable and similar to Nelson Island. The carrying capacity of the Askinuk Mountains is conservatively estimated to be 50 musk-oxen, based on the amount of potential winter habitat. The Mud Volcanoes east of Chevak may be capable of supporting smaller populations of musk-oxen.

The area northeast of Dall Lake is low, rolling, steppe-like tundra. To the north toward the Johnson River, this area merges with grassy sand dunes similar to those preferred in winter by musk-oxen on Nunivak Island. Here, wind blows the tundra partially free of snow in late winter, exposing grass tussocks over a large area. These open areas are generally a sedge-grass complex, changing to a willow complex in riparian

areas. Willows are commonly referred to as a major food item in the literature by Tenner and others.

The area northeast of Dall Lake is now inhabited by a growing herd of at least 12 musk-oxen (Table 2). Nine musk-oxen have been reported there for the last 3 years (Table 1). Game Division and U. S. Fish and Wildlife Service biologists in Bethel believe that available habitat on the mainland of Unit 18 will support a population of at least several hundred musk-oxen.

Population Composition

Nunivak Island:

No fall aerial surveys were conducted during the reporting period. The annual ground census was conducted by snowmachine on 10-13 March 1984. Relatively mild and stable weather facilitated survey work. Essentially the entire musk-ox population was included in the census. Game Division and Fish and Wildlife Service staff classified 552 animals in 40 herds, ranging in size from 1 to 42 animals. Most animals were located in the southern and southwestern portions of the Island, where strong winds had blown large areas of the tundra free of snow. Concentrations of musk-oxen were observed south of Mount Roberts, near the Nanwaksjiak Crater, and around the Chakwakamiut River on the southwest coast.

The post-hunt population exhibited a breeding bull (4+ age class) to breeding cow (2, 3, and 4+ age class) ratio of 35:100. The recent census enumerated 189 3- and 4-year-old cows. Examination of cow musk-oxen taken during the 1984 spring hunting season indicated a minimum pregnancy rate of 77%. These 189 cows were thus expected to produce approximately 145 calves. The census also enumerated 22 2-year-old cows, which were expected to produce 17 additional calves. Assuming that approximately 40% of the 102 unclassified animals counted during the survey were cows with a similar pregnancy rate, another 30 calves may be added to the population. The total post-hunt, post-calving population is calculated to be approximately 744 animals. This is well above management guidelines for this herd, and suggests a rapidly expanding population.

Nelson Island:

An aerial survey was conducted on 20, 23, and 24 March 1984. A ground census was conducted by snowmachine on 24, 25, and 26 March. Data collected during both air and ground censuses were obtained under difficult weather conditions. Winds, turbulence, fog, and blowing snow hindered counting efforts.

Composition data were too limited for extrapolation, but the total number of musk-oxen counted during the March 1984 census (176 animals) suggests a population below the expected level (Table 3).

Musk-oxen on Nelson Island were concentrated around Cape Vancouver, Killinupak Mountain, in the Kaluyut Mountains, and near Erchakrtuk Mountain. In 1984 musk-oxen were not sighted in the vicinity of Chakchak Creek, in contrast to 1983; whether this represents an oversight or an actual change in distribution remains unknown.

The Cape Vancouver area contained a large number of musk-oxen in a relatively small area in 1984. The remainder of the musk-oxen on Nelson Island were dispersed over a large area, principally on ridges northeast of Tanunak and Toksook Bay.

The low census value in 1984 (176 animals) may be due either to bad weather during the survey period or to a relatively high rate of emigration. Substantial emigration of musk-oxen from Nelson Island to the mainland did not begin until after the hunting season opened in 1981, according to local residents. In 1984, much of Nelson Island was snow-covered, while the surrounding tundra was bare. This may have contributed additional impetus for emigration.

Mortality

Nunivak Island:

Two bulls and 2 cows were harvested during the fall 1983 hunting season on Nunivak Island (Hunt Nos. 1001 and 1002). All animals taken were in the 4+ age class. The 2 bulls were harvested by Anchorage residents; the 2 cows were harvested by Mekoryuk residents. Fifty-six permits in total were available for Hunt Nos. 1003 and 1061 (registration and drawing permits) for the spring 1984 hunt; all permits were applied for, but 10 hunters later canceled out. Hunters were issued either cow or bull permits. All hunters participated in an orientation course on determining age and sex of musk-oxen in order to receive permits. Thirty registration permits for cow musk-oxen were issued on 31 January at Fish and Game offices in Anchorage, Bethel, and Fairbanks, and at the Mekoryuk City Office. Five permits were originally available at Fairbanks, 10 in Bethel, 10 in Mekoryuk, and 5 in Anchorage. Demand for these permits was highest in Mekoryuk. Twenty-six people lined up for 10 permits. Thirteen people lined up for 10 permits in Bethel. All 5 available permits were issued in Anchorage, with 3 people on waiting lists. Demand was lowest for registration permits in Fairbanks; only 1 permit was

issued after 4 days. The 4 remaining permits were transferred to Mekoryuk, and the final permit to Sterling, Alaska.

All hunters who entered the field on Nunivak Island in spring 1984 were successful in bagging musk-oxen. No hunters took musk-oxen of the wrong sex during the spring 1984 season on Nunivak. Forty-six musk-oxen were taken during the spring 1984 season on Nunivak Island: 20 were bulls and 26 were cows.

All bulls taken were in the 4+ age class. This is not surprising, because the drawing permit hunt is managed as a trophy hunt of international reputation. Twenty-six cows (14 in the 4+ age class, 6 in the 3-year age class, and 6 of unknown age) were harvested by Alaska resident registration permit holders. Twenty of the 26 cows taken were known to be pregnant. The heaviest harvest of musk-oxen took place on the south side of Nunivak Island in the Cape Mendenhall area. Secondary locations of musk-ox harvest in 1984 were the Nash Harbor area, Chakwakamiut area, Roberts Mountain, Karon Lake area, and the Bankookthleet Dunes. Other locations were scattered along the southern and central portions of the island (Table 4).

Several musk-oxen were reported by USFWS to have washed ashore on Nunivak Island during summer 1984; these apparently became stranded on sea ice and perished. One musk-ox was wounded with a .22 caliber weapon on the south side of Nunivak Island after it reportedly charged a local resident. The fate of this animal is unknown.

There was no evidence of contagious ecthyma, Q fever, epizootic hemorrhagic disease, or bluetongue in any of the 6 sera collected from Nunivak Island during March 1983.

In March 1982, the Board of Game created a permit system for the taking of musk-oxen stranded on drifting sea ice. No animals have been reported taken under these permits during the past winter.

Nelson Island:

Permits for the Nelson Island musk-ox season were issued in Cheforak on 25 January 1984. Thirty-three applicants appeared for the 30 permits; everyone present at the beginning of the permit issuance (0900 hours) received a permit. Residency of permit holders was as follows: Cheforak, 16; Kipnuk, 5; Bethel, 4; Toksook Bay, 3; Nightmute, 2. All permit holders were residents of Unit 18, and 70% were residents of Nelson Island (UVNI). Eight permittees cancelled out because of prolonged periods of high winds and extreme wind-chill factors during the hunting season.

Twenty-four hunters took musk-oxen, of which 15 were bulls and 9 were cows. Nine bulls were in the 4+ age class, 2 were in the 3-year age class, and 4 were unclassified. Five cows were in the 4+ age class, 2 were in the 3-year age class, and 2 were of unknown age. One adult bull and 1 yearling bull were apparently wantonly wasted during the winter of 1983-84 on Nelson Island. One Chefornek hunter took a cow musk-ox under a bull permit in 1984; there were no other known violations of permit conditions. Kill locations are itemized in Table 5.

Mainland Musk-oxen:

The following is a brief history of known mortality of mainland musk-oxen. The 1st musk-oxen reported killed on the mainland was shot by a resident of Napaskiak. The hunter was not sure what sort of animal he had killed. The head, cape, and hooves were seized by the Department of Fish and Game, but the hunter was allowed to keep the meat and was not prosecuted. Another lone mature bull was shot near the village of Chevak in December 1982; 3 Chevak residents were prosecuted for taking a musk-ox out of season. Three additional musk-oxen reported southwest of Bethel during the winter of 1982-83 were believed taken and consumed by local hunters. One large bull was killed in the Askinuk Mountains in August 1983; the carcass was retrieved by ADF&G. Illegal harvests of mainland musk-oxen will probably increase as these animals continue to disperse from Nelson Island. At least 6 musk-oxen have been taken by mainland hunters since 1976. The Alaska Board of Game (consistent with action taken by the Lower Yukon and Lower Kuskokwim Advisory Committees) recently closed the season on mainland musk-oxen for the foreseeable future with the intent of allowing the herds to grow large enough to eventually sustain a regulated harvest.

Management Summary and Recommendations

Nunivak Island:

The Nunivak Island population is currently well above the level called for in Department management plans and in the memorandum of understanding between ADF&G and USFWS. Light snowfall over the last 3 winters has led to minimal natural mortality, and the musk-ox population on Nunivak Island is rapidly expanding. This is cause for concern because when the population has reached similar levels in the past, significant mortality has occurred during winters with heavy snowfall and crusting conditions. We have proposed a significant increase in harvest quotas (30 bulls, 50 cows) for 1984-85. Even if 80 animals are removed from the population, the post-hunt, precalving herd will number approximately 660 animals in 1985, given

another mild winter. If this occurs we will propose further substantial harvest increases.

Nelson Island:

Our 1984 survey work indicated a Nelson Island population below expected size. The Nelson Island situation will be closely watched with additional calf productivity surveys conducted in late summer 1984. We do not recommend any change in harvest quotas given present data.

Mainland Musk-oxen:

Emigration of musk-oxen to mainland areas of Unit 18 continues. The area northeast of Dall Lake is now inhabited by a growing herd of at least 12 musk-oxen. As many as 20-30 musk-oxen may now reside on the mainland. The Board of Game has closed the season on mainland musk-oxen for the foreseeable future with the intent of allowing the herds to grow. Cooperation from local residents will be required to protect the growing numbers of mainland musk-oxen.

PREPARED BY:

SUBMITTED BY:

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David A. Anderson
Survey-Inventory Coordinator

Table 1. Chronology of musk-ox sightings on the Unit 18 mainland.

Number observed (sex and age class, if known)	Location	Date	Comments
1 bull	Cheching Mountain	1974	Reported by resident of Chefornak.
1 bull killed	Lower Johnson River	1976	Cape, hooves and head seized, no prosecution; apparently 1st mainland musk-ox reported killed.
8 individuals ^a	just north of Kayigyalik Lake, 15-20 mi north of Kasigluk	Jul 82	Unverified report; M. Gotschalk.
9 individuals ^a	8 mi east of Dall Lake	Aug 82	Observed by residents of Kasigluk.
6 adult, 1 subadult ^a (yearling)	8 mi east of Dall Lake	Sep 82	Observed by local pilot.
1 individual	near Kusilvak Mountains	Nov 82	Observed by Mt. Village resident.
1 bull killed	7 mi northeast of Chevak	Dec 82	May be same animal as above; 3 hunters charged w/illegal take.
3 individuals	southwest of Bethel; between Kipnuk, Nelson Island and Nunapitchuk	winter 82-83	Believed killed by local hunters.
3 individuals	Askinuk Mountains	winter 82-83	Repeated sightings.
9 individuals	12 mi west of Tuntutuliak	Feb 83	Aerial survey by ADF&G.

Table 1. Continued.

Number observed (sex and age class, if known)	Location	Date	Comments
1 large bull killed	Askinuk Mountains	Aug 83	Carcass retrieved by ADF&G.
15 musk-oxen; 3 sets of tracks	East of Dall Lake	Jan 84	Reported by Chefnak residents.
9 musk-oxen (1 large bull, 3 cows, 3 calves, 2 subadults ^a)	10 mi northeast of Dall Lake	Feb 84	Reported by local pilot; confirmed by ADF&G aerial survey.
some musk-oxen; "a herd"	Ingrisarak Mountain	Feb 84	Reported by local pilot.
12 musk-oxen (1 large bull, 1 smaller bull, 3 cows, 3 new calves, 4 subadults ^a)	15 mi northeast of Dall Lake	Jun-Jul 84	Radio-tracked by ADF&G; definitely same herd as above.

^a May be same herd.

Table 4. Nunivak Island musk-ox harvest by kill location, 1984.

Kill location	Harvest
South side	9
Cape Mendenhall	8
Chakwakamiut	4
Nash Harbor	4
Roberts Mountain	3
Bankookthleet Dunes	3
Karon Lake	3
Muskox Mountain	2
Kigoumiut	1
Seemalik Mountain	2
Nakooytoolekmiut	1
Nanwaksjiak	1
G. Williams Fish Camp	4
Unknown	1

Table 5. Nelson Island musk-ox harvest by kill location, 1984.

Kill location	Harvest
Erchakrtuk Mountain	12
Kaluyut Mountain	3
Kasinuk Mountain	3
Emperor Island	2
Cape Vancouver	1
Northeast Nelson Island	1
Unknown	2

Table 3. Nelson Island posthunt, precalving musk-ox population and harvest removals, 1981-84.

Year	Total	Ratio of mature bulls to cows	Harvest quota	Harvest
1981	245	81:100	20 cows	20 cows
1982	190	122:100	30 cows	19 cows 8 bulls
1983	206	68:100	25 bulls	25 bulls
1984	176	ND ^a	15 bulls 15 cows	14 bulls 9 cows 1 yearling bull ^b

^a Data not presently available.

^b 1 adult bull and 1 yearling bull apparently wantonly wasted during the winter of 1983-84.

Table 2. Upland areas of Unit 18 mainland believed suitable for musk-oxen.

Area	Location	Habitat	Sightings and comments (age structure if known)
Northeast of Dall Lake	West of Tuntutuliak	steppe/tundra; low hills	1 large bull, 3 cows, 3 calves, 2 subadults (Feb 84); 3 new calves by June 84 (a total of 12).
Askinuk Mountains	Between Hooper Bay and Scammon Bay	mountain tundra	Repeated sightings of at least 3 individuals in winter 83; 1 large bull shot in summer 83.
Ingrisarak Mountain	East of Chevak	upland tundra	"Some" musk-oxen, "a herd" (Feb 84).
West of Ingrisarak Mountain	Northeast of Chevak	upland tundra	1 bull killed (Dec 82).
Kusilvak Mountains	East-northeast of Scammon Bay	mountain tundra	Single animal observed (Nov 82).
Cheching-Tern Mt.	Southwest of Chefornak	upland tundra	Single animal observed (1974).
Ingakslugwat Hills	East of Chevak	upland tundra	
Nushkolik Mountain	East of Chevak	upland tundra	
Divide between Kuka and Mogak Creek	South-southwest of Marshall	upland tundra	
Andreafsky Hills (West side windswept)	North and west of St. Mary's	mountain tundra	Predators such as bears and wolves are present.
Kilbuck Mountains	Southeast of Bethel	mountain tundra	Predators such as bears and wolves are present.

MUSK-OXEN

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 22

GEOGRAPHICAL DESCRIPTION: Seward Peninsula

PERIOD COVERED: 1 July 1983-30 June 1984

Season and Bag Limit

See Hunting Regulations No. 24.

Population Status and Trend

Musk-oxen were introduced to the Seward Peninsula in 1970 when 36 animals from Nunivak Island were released on the Feather River 30 mi northwest of Nome. In 1981 an additional 37 musk-oxen were transplanted from Nunivak Island to a release site near Port Clarence. Animals from the 2 transplants have established a growing population on the Seward Peninsula.

Since the initial introduction, most of the population has occupied the western end of the Seward Peninsula; however, widely scattered observations in areas as far removed as the Tagagawik River (200 mi from the core area) and Shaktoolik (165 mi from the core area) indicate that extensive movements of individuals and groups occur. Radio-telemetry has shown that some of these movements are circular with the animals eventually returning to the core area. In at least 1 instance, a long-distance movement resulted in a permanent home range shift. A radio-tagged female from the 1981 transplant and 4 juveniles moved to an area 13 mi north of Nome in 1981 and have remained there for the past 3 years. This herd had grown through reproduction and by the addition of wandering individuals to 14 animals by May 1984. Radio-telemetry has also increased population census accuracy. Early growth of the population was monitored through aerial surveys. Because of the size of the area occupied and the limited survey time available, the probability of obtaining a comprehensive count in any year was low. When the population was small the error resulting from missing 1 or more groups of musk-oxen was proportionately high. Four females transplanted to the Seward Peninsula in 1981 carried radio-collars. The value of these radios was soon realized, and 6 more collars were placed on musk-oxen in 1982. In 1983 a research project was undertaken to examine in more detail population characteristics and habitat use of the expanding musk-ox population on the Seward Peninsula. Since 1981 the number of radio-collared musk-oxen

in the population has steadily increased (Table 1). Twenty additional radio-collars will be placed on musk-oxen during the course of this project.

As a result of the increased number of radio-collars distributed through the population, aerial surveys conducted in April 1984 were the most complete to date (Table 2). Prior to calving, 225 musk-oxen were counted on the Seward Peninsula. This count reflects 1st calf production from musk-oxen transplanted as yearlings in 1981. Female musk-oxen on the Seward Peninsula produce calves at 3 years of age. Calves born in 1983 were counted as yearlings in pre-calving surveys conducted in 1984. This factor, plus increased ability to locate animals with the aid of radio-telemetry, accounts for the substantial increase since 1983 when the 1st comprehensive count was done.

Composition

Musk-oxen on the western Seward Peninsula were classified by ground observation in October 1983. Composition of group No. 11 (Table 3) near the Nome River, was obtained in March 1984. Because of the distance between group No. 11 and other groups, I do not believe that any interchange of animals occurred between these surveys. The preponderance of adult females resulted from the fact that the survey was conducted during the rut. Composition was obtained mostly from harem groups which include few bulls. The observed ratio of 73 yearlings:100 cows is high for musk-oxen and reflects the relatively large proportion of productive young females in the population as well as good calf survival over the past winter.

Mortality

Known mortality to date is summarized in Table 4. One male and 1 female tagged in the 1970 transplant died in late winter, 1984. The bull was 16 years old and the cow 15. The cow had been recaptured and radio-collared in 1982. The relatively poor condition of animals handled in April 1984 suggested that the winter of 1983-84 was difficult for musk-oxen. The age of these 2 musk-oxen probably reduced their ability to cope with the long period of extreme cold and forage limitations imposed by icing conditions. Natural mortality will probably increase in the future because animals transplanted in 1970 are now 15-17 years old. Although musk-oxen are known to survive to age 27, few are expected to attain this age in the wild. Specimens from old animals of known age on the Seward Peninsula will provide a valuable test of age-determination techniques.

Four adult females and 1 3-year-old male died apparently as a result of capture complications in April 1984. Only the bull died at the time of capture. Two cows were revived after immobilization but died less than 1 mi from the capture site. Two other cows were seen alive 5 days after immobilization but were found dead 14 days after immobilization. One of these had given birth to a live calf but the calf apparently died shortly after the death of its mother. Drug effectiveness was extremely erratic in this capture operation and numerous problems were encountered in immobilizing animals. The large doses required and the advanced stage of gestation are thought to have contributed to the high loss rate. Future capture operations which rely on narcotic immobilizing agents will be scheduled several months on either side of calving.

An adult bull captured near Black Mountain in April had several deep, partially healed parallel scars on its shoulder and back, possibly inflicted by a brown bear. It has been suspected, though not confirmed, that brown bears occasionally prey upon musk-oxen.

Management Summary and Recommendations

Productivity of the Seward Peninsula musk-ox population increased substantially when females transplanted in 1981 reached reproductive age. Population growth is expected to continue. The current research project will promote understanding of distribution and movement of musk-oxen on the Seward Peninsula. Aerial surveys by Department personnel and reported sightings by the public indicate a pattern of increasing movement outward from core wintering areas in the summer with a reverse movement and concentration on traditional winter range in late fall. Fidelity to a relatively limited winter range is difficult to understand given the abundance of apparently homogeneous habitat. The Seward Peninsula appears to be capable of supporting large numbers of musk-oxen. Population control measures should not be implemented until there is clear evidence of range limitation or competition with other species. Clearly, this will not occur in the near future.

A significant number of radio-tagged animals should be maintained in the population. The expense of maintaining active radios is quickly offset by reduction in search time and increased confidence in survey results.

In past years population censuses and composition work were often done in stages at different times of the year. In general, it was assumed that interchange of animals counted at different times did not occur in the interval between counts. Radio-telemetry data have cast doubt on the validity of this

assumption. North-south movements of animals between the Nuluk and Black Mountain herds have been observed. Major movements between northern and southern winter ranges occurred around calving time in April and May 1984. Substantial interchange between supposedly discrete subpopulations was found on the Arctic National Wildlife Refuge when the movements of identifiable individuals were followed. In light of newly acquired information, a reassessment of population identity concepts is needed for all musk-ox populations.

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Table 1. Numbers of musk-oxen collared on the Seward Peninsula by year and numbers of active collars.

	1981	1982	1983	1984
Animals collared	4	6	7	6
Active collars	4	9	15	21
Estimated % of population	4	7	9	9

Table 2. Composition of the Seward Peninsula musk-ox population from precalving surveys, 1983 and 1984.

Year	4+ yr		3 yr		2 yr		Yrlgs.	Unid.	Totals
	M	F	M	F	M	F			
1983	25	31	9	14	11	12	24	36	162
1984	9	46	8	7	6	7	34	108	225

Table 3. Number and composition of musk-oxen observed in ground surveys on the Seward Peninsula, 1983 and 1984.

Herd No.	4+ yr		3 yr (30 mo)		2 yr (18 mo)		Yearling (6 mo)	Unid. sex or age	Total	Date
	M	F	M	F	M	F				
1	2	13	1	3	3	4	7	0	33	10-14-83
2	1	7	1	3		1	7	0	20	10-14-83
3	1	1	4	1	2	2	11	0	32	10-14-83
4	1 _b	2 ^a					2	1	6	10-14-83
5	1 _b		1 _c		1		2	5	10	10-14-83
6			1 _c						1	10-13-83
7	1	3					3	11	18	10-14-83
8								30-35 ^d	30-35 ^d	10-14-83
9		2 ^e							2	10-14-83
10		2 _f						22	24	10-14-83
11	3 _h	3 ^g	1	1			2		10	03-17-84
12	1 _h	3 ⁱ						2	6	10-17-83
Totals	11	46	9	8	6	7	34	71-76	192-197	

^a Radio-collared animal No. 43.

^b Radio-collared animal No. 45.

^c Radio-collared animal No. 1.

^d Radio-collared animal No. 63.

^e Radio-collared animal No. 65.

^f Radio-collared animals No. 62 and 64.

^g Radio-collared animal No. 48.

^h Radio-collared animal No. 2.

ⁱ Radio-collared animal No. 3.

Table 4. Observed mortality of musk-oxen on the Seward Peninsula since introduction.

Year	Sex/age of animal	Location	Probable cause of death
1970	No mortalities reported		
1971	Yearling female	On beach 30 mi east of Nome	Fell through ice
	2-3 year-old female	Foothills between Sinuk and Feather Rivers	Bear kill?
1972	Adult, sex unknown	10 mi below Tin City on beach	Drowned
1973	No mortalities reported		
1974	6 year-old male	Near Selawik	Mistaken for bear and shot
1975	No mortalities reported		
1976	No mortalities reported		
1977	No mortalities reported		
1978	No mortalities reported		
1979	No mortalities reported		
1980	No mortalities reported		
1981	Radio-collared adult	2 mi off Port Clarence	Fell through ice
	Yearling, sex unknown	Nuluk River	Unknown
	Adult Male	Golden Gate Creek	Unknown
1982	2 adult females radio-collared in 1981	Tagagawik River	Unknown
	1 adult male	Near Teller	Illegal
1983	No mortalities reported		
1984	16-year-old male from 1970 transplant		Unknown
	15-year-old female from 1970 transplant, radio-collared		Unknown
	4 adult females		Capture mortalities
	3-year-old male		Capture mortality

MUSK-OXEN
SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 23

GEOGRAPHICAL DESCRIPTION: Kotzebue Sound

PERIOD COVERED: 1 July 1983-30 June 1984

Season and Bag Limit

See Hunting Regulations No. 24.

Population Composition

Three musk-ox surveys were conducted in portions of Unit 23 and Subunit 26A during the reporting period. In addition, other agency biologists, pilots and big game guides provided miscellaneous sightings of musk-oxen in the region.

The Lisburne Hills/Cape Thompson area was surveyed on 30 March and 28 June 1984. During the March survey 5 groups of musk-oxen totaling 40-44 animals were observed (9 adults, 4 adults, 2 adults, 3 adults and 22-26 adults and calves). All but 3 animals were observed on or near Iviangik Mountain, approximately 20 mi northeast of Point Hope. The groups of 3 musk-oxen sighted near Cape Thompson contained an animal radio-collared during summer 1983. During the June survey 3 groups of musk-oxen were observed (4 adults, 5 adults, 27 adults and 7 calves), totaling 43 animals (36 adults and 7 calves). Most of these animals were in the willows along Kugirarok Creek (a tributary of the Kukpuk River) where they are normally located in June.

During a conversation with J. Coady, registered guide Phil Driver indicated that there were about 200 musk-oxen in Unit 23. Because of this, aerial surveys were conducted on 14 and 15 May 1984 in portions of northwestern Unit 23 and adjacent portions of Unit 26 which are normally not surveyed for musk-ox but which may contain the extra animals reported by Phil Driver. Areas surveyed included a portion of the Kivalina River Drainage, most of the Kukpuk River Drainage, the Pitmegea River Drainage, the hills west of the Kukpowruk River, the hills between Cape Lisburne and Cape Beaufort, and the northern portion of the Lisburne Hills which are normally not covered during musk-ox surveys. No musk-oxen were observed. However, considering the size of the area, musk-oxen may have been present.

On 25 July 1984, I visited Phil Driver at his guiding camp along the Wulik River and we discussed musk-oxen. Mr. Driver has seen musk-oxen in most of the places we have seen them or where other people have reported sightings to Fish and Game in the past. This led me to the conclusion that a phantom population of an additional 100-120 musk-oxen probably does not exist in the region.

On 22 January 1984, 2 groups of musk-oxen were sighted in the Mulgrave Hills, including a group of 7 adults and 1 calf and a group of 4 adults. On 19 May 1984, Derek Craighead observed a group of 13 adults and 2 calves in the same general area as the January sightings.

Mortality

During the March survey the carcass of a musk-ox was seen 4 miles south of Iviangik Mountain. From the air the skull appeared to be that of a young female.

Snowmachine tracks were noted throughout the area, suggesting that the animal may have been shot. Musk-oxen have been poached in the past by residents of Point Hope. The animals are easily accessible during the winter and the temptation to kill one may be high, especially if caribou are scarce in the region.

Management Summary and Recommendations

It is doubtful that musk-oxen will be legally hunted in Unit 23 in the near future. The core population in the Lisburne Hills appears to be declining, although I believe there is at least 1 more herd that was not observed during surveys. These musk-oxen reside most of the year on Native lands, they are accessible and represent a readily available source of meat when caribou are scarce. A single protection officer in Unit 23 cannot provide adequate enforcement if the population is to increase to a harvestable level.

The musk-oxen which have taken up residence in the Mulgrave Hills are within the Cape Krusenstern National Monument boundaries. The Monument is open only to subsistence hunting, and musk-oxen are not classified as a subsistence species. Most of the adults in this population are bulls, and production is so low (1 or 2 calves/year) that it will probably be decades before there is sufficient emigration to establish herds outside the Monument.

Transplants should be considered as an alternative for enhancing musk-ox populations in the region. Possible transplant sites include Cape Lisburne, Cape Beaufort, Eagle Creek, and

Red Dog. Cape Lisburne may be the best alternative because personnel stationed at Lisburne and working for the government or RCA would not pose a threat to musk-oxen and might tend to "watch over" the animals. No transplants should be made without the presence of additional enforcement officers in Unit 23, a critical element in insuring survival and growth of musk-ox herds. Public relations and I&E should not be considered a substitute for law enforcement in this situation.

Radio collars should be placed within existing herds in the Lisburne Hills to facilitate surveys and to enhance enforcement. The Game Division should purchase radio tracking gear for FWP aircraft and instruct officers in its use.

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MUSK-OXEN

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 26B and 26C

GEOGRAPHICAL DESCRIPTION: Central and Eastern Arctic Slope

PERIOD COVERED: 1 July 1983-30 June 1984

Season and Bag Limit

See Hunting Regulations No. 24.

Population Status and Trend

U.S. Fish and Wildlife Service biologists counted 311 musk-oxen in and adjacent to the Arctic National Wildlife Refuge (ANWR) in November 1983, 301 (best estimate 304) in April 1984, and 333 (best estimate 344) in July 1984 (P. Reynolds, pers. commun.). These counts and estimates include several bulls in the Yukon Territory, but exclude 3 to 12 musk-oxen west of the Kavik River in Subunit 26B. Annual population growth rates appear to have stabilized at about 15%, based on ANWR annual spring surveys from 1981 through 1984. The ANWR musk-oxen population tripled in size from summer 1978 to summer 1984 (ANWR Progress Report No. FY 84-10).

Distribution

Although musk-oxen remain concentrated within the ANWR near the Tamayariak, Sadlerochit, and Okerokovik Rivers, approximately 10 different musk-oxen of various sex and age classes were observed near Toolik Lake along the Trans-Alaska Pipeline in August 1983 (D. Neel, pers. commun.). It is unknown whether these musk-oxen include the 6 to 8 animals that have frequently been observed on the Kavik River since winter 1982-83. I observed only 1 bull musk-oxen during extensive moose surveys in Subunit 26B in April 1984. This bull was at the mouth of Gilead Creek on the Ivishak River and may be one of several bulls observed along the pipeline during past summers. A few bull musk-oxen have also been observed as far east as the Malcolm River in Canada.

Population Composition

Fish and Wildlife Service biologists classified 333 musk-oxen in Subunit 26C in July 1984, as follows: 20% adult bulls, 20% adult cows, 6% 3-year-old bulls, 8% 3-year-old cows, 5%

2-year-old bulls, 6% 2-year-old cows, 15% yearlings, and 21% calves.

Mortality

Hunters killed 5 bull musk-oxen during the March 1984 drawing permit hunt, all from the Sadlerochit River population. This population numbers 110-130 musk-oxen. In addition, grizzly bears apparently killed 2 adult bull musk-oxen in the Yukon Territory in August 1983. No other mortality was observed during this reporting period. All 46 calves observed in August 1983 were accounted for as yearlings in July 1984. Calculated annual mortality rates for musk-oxen older than yearlings was 3% during 1983-84 based on intensive Fish and Wildlife Service surveys and composition counts using 30 radio-collared animals. Mortality among old-age musk-oxen may increase because survivors of transplants are 14 to 17 years old.

Management Summary and Recommendations

Musk-oxen were eliminated from Alaska prior to 1860. Sixty-four musk-oxen were transplanted to Barter Island and the Kavik River in 1969 and 1970 to reestablish viable herds on historic ranges and to provide for a high-quality recreational hunt. Musk-oxen in Subunits 26B and 26C now number approximately 350 (31% bulls, 34% cows, 15% yearlings, and 20% calves), and the population is increasing at an annual rate of approximately 15%. The population is dispersing to new areas as far west as Toolik Lake, and suitable habitat is not limited.

Encouraging dispersal and protecting suitable musk-oxen habitat from rapidly expanding oil exploration and development are the primary current management objectives for Subunits 26B and 26C. Intensive monitoring of musk-oxen populations by U.S. Fish and Wildlife Service biologists in the ANWR is expected to continue through 1986.

The Board of Game instituted the March resident drawing permit hunt for 5 bull musk-oxen in the ANWR in 1983. This hunt has been extremely popular among participants and has attracted 40-50 applicants annually. Guided snowmachine hunts (N = 5) from Kaktovik and hunts using private aircraft (N = 4) have been successful. Although 7 of the 9 musk-oxen shot to date on the ANWR were from the most accessible Sadlerochit River population, immigration by bulls among the 3 main subpopulations and from other areas is common (ANWR Progress Report No. FY 84-10). Therefore, overhunting is not anticipated under current regulations.

An increase in the number of drawing permits is clearly justifiable from the biological standpoint, but increases in numbers of hunters would detract from the quality of the hunt, particularly in the existing brief March hunting season. For the 1985-86 season I recommend the number of drawing permits be increased to 10, a season of 1 March through 10 April, and no change in the hunt area. An October hunt with 5 permits is also an option, but total number of permits in 1986 should not exceed 10. The recommended increase in harvest within the ANWR would likely not adversely affect dispersal of musk-oxen to new areas.

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